Oracle Flash Storage System

Administrator's Guide

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Preface

Oracle Resources

Table 1: Oracle resources

For help with...	Contact...
Support	*http://www.oracle.com/support* (www.oracle.com/support)
Training	*https://education.oracle.com* (https://education.oracle.com)
Documentation	• *Oracle Help Center*: (http://www.oracle.com/goto/FSStorage/docs) • From Oracle FS System Manager (GUI): Help > Documentation • From Oracle FS System HTTP access: (http://system-name-ip/documentation.php where system-name-ip is the name or the public IP address of your system)
Documentation feedback	*http://www.oracle.com/goto/docfeedback* (http://www.oracle.com/goto/docfeedback)
Contact Oracle	*http://www.oracle.com/us/corporate/contact/index.html* (http://www.oracle.com/us/corporate/contact/index.html)

Related Documentation

Familiarize yourself with the following related documents:

- *Oracle Flash Storage System Glossary*
- *Oracle Flash Storage System CLI Reference*
- *Oracle FS1-2 Flash Storage System Release Notes*

CHAPTER 1

Welcome to Oracle FS System Administration

Oracle FS System Manager

Oracle FS System Manager (GUI), pictured below, allows you to deploy, to provision, to manage, and to maintain an Oracle FS System.

Figure 1: Oracle FS System Manager

The GUI eliminates the complexity of provisioning tiered storage. For example, you can select the appropriate application storage profile to provision and to tune the storage easily by preselecting the appropriate QoS parameters.

Using the storage attributes that you provide through the GUI, the system implements predictive application performance characteristics before it physically provisions the storage. This feature puts you in control of resource allocation.

The Pilot runs the management interface for the Oracle FS System. The GUI, along with the other software that is implemented in the Oracle FS System, enables policy-based provisioning that has the following features:

- QoS Plus, which automatically places parts of a SAN LUN onto appropriate storage tiers with the goal of balancing the needs of the business with the management of system resources
- Fault management, which automatically moves system resources to a partner component to accommodate component failure or replacement while maintaining data availability
- Guided Maintenance, which guides you through every step of replacing a hardware component, including the recabling of the component

Note: If you prefer a command line interface for configuring and monitoring the Oracle FS System, you can use the Oracle FS CLI (FSCLI) to manage the system.

Related Links

Controller Management
Creating Auto-Tiered LUNs
Hardware Management
Oracle FS System CLI
QoS Plus Overview

Accessing Oracle FS System Applications

You can access and download the Oracle FS System applications using the Pilot web client. Applications include Oracle FS System Manager (GUI), Oracle MaxMan, Oracle FS CLI (FSCLI), and various other utilities. In addition, the Pilot web client provides both information about the status of the Oracle FS System and links to technical documentation.

A username and password are not required to access the web pages that contain the Management Software, Utilities, and Documentation sections. A username and password are required to access the Alerts & Events and Information & Status sections.

The following table summarizes the type of content that is available from the Pilot web pages.

Table 2: Software and system information

Category	Description
Oracle FS System Applications	Provides links to the installation files for Oracle FS System Manager (GUI) and the Oracle MaxMan applications. These applications are available in the following formats: • Windows Installer: Provides the download link for the Windows installer in MSI format. • JAR and Run Scripts: Provides the download links to the self-contained JAR (Java archive) file and scripts in ZIP and TAR archive formats.
Technical Documentation	Provides links to the Oracle FS System technical documentation in PDF format.
Utilities	Provides links to the following downloads: • Oracle FS CLI • Oracle FS Virtual Disk Service Provider • Oracle FS Volume Shadow Copy Service Provider • The management information base (MIB) text file for the Oracle Small Network Management Protocol (SNMP). • Oracle FS System Statistics Tools
Recent System Alerts and Events	Provides a list of system alerts that require administrator action and a list of the last 20 system events.
System Information and Status	Provides a summary of the Oracle FS System information and status.

Note: The web page configuration provided by the web server on the Pilot is simple HTML. You can download this content to a mobile device, which allows you to check for system alerts and the system status.

Related Links

Download the Oracle FS System Application
Install Oracle FS System Software (MSI)
Install Oracle FS System Software (JAR)

Client Application Download Formats

The client application packages are available in a variety of formats for both Microsoft Windows and Linux operating systems. For archived file formats, you

must decompress the files to your workstation before you can begin the installation.

Select from the following file formats:

MSI

Specifies a Microsoft Windows installer file. Use this file type to start the software installation in automatic mode.

ZIP

Specifies a compressed archive file. Use this file type to decompress the files into a workstation folder for manual installation.

TAR

Specifies a non-compressed tape file archive method. Use this file type to extract the files into a workstation folder for manual installation.

TGZ

Specifies a compressed tape file archive method. Use this file type to decompress and extract the files into a workstation folder for manual installation.

TXT

Specifies a text file that can be used in any operating system environment. This file type is not compressed and usually contains other information, such as configuration details.

Related Links

Download the Oracle FS System Application
Install Oracle FS System Software (MSI)
Install Oracle FS System Software (JAR)

Download the Oracle FS System Application

The software for Oracle FS System Manager (GUI) is available on the Pilot, which is accessed from a web browser.

1. Start a web browser on your workstation.
2. In the address field, specify your Oracle FS System.
   Valid address options:
   - The IP address of the Pilot
   - The name of the Oracle FS System, if DNS name resolution is available
3. Click Management Software.
4. Select the link for the software that you want to download.
5. Save the file to your client workstation.

In the next steps you will do one of the following:

- Start the installation, if you selected an automatic installation file format
- Decompress the archived files, if you selected an archive file format

Related Links

Install Oracle FS System Software (MSI)
Install Oracle FS System Software (JAR)

Install Oracle FS System Software (MSI)

After you download the Windows installer for Oracle FS System Manager (GUI) or Oracle MaxMan, install the files onto the workstation by running the Microsoft Windows installation package.

Note: Verify that you are permitted to run an automatic installation.

1. Locate the client software file on the workstation.

   For an automatic installation on Microsoft Windows platforms, the file extension is `.msi`.

*_x64.msi	For 64-bit hardware
*_x86.msi	For 32-bit hardware

2. Double-click the file to begin the installation.
3. Follow the instructions for the installation.

When the installation is complete, the following objects are created:

Oracle FS System Manager	A shortcut on the Windows desktop that permits you to run Oracle FS System Manager.
Oracle MaxMan	A shortcut on the Windows desktop that permits you to run Oracle MaxMan.
`c:\Program Files\Oracle Corporation`	A directory that stores all of the files that are necessary to run Oracle FS System Manager and Oracle MaxMan.

Related Links

Install Oracle FS System Software (JAR)

Install Oracle FS System Software (JAR)

After you download the Oracle FS System application archive, extract the files to a workstation before using the software. The archive contains a self-contained JAR (Java archive) file and the scripts needed to run Oracle FS System Manager (GUI) and Oracle MaxMan applications.

1. Locate the client software archive file on the workstation.
2. Extract the contents of the archive file to a directory of your choosing on the client host where you expect to be using the software.

- For `ZIP` files, use a ZIP utility to extract the files.
- For `TAR` or `TGZ` files, use `TAR` or a similar utility to extract the files.

3 (Optional) Add the directory where you extracted the contents of the archive files to your PATH environment variable.

This allows you to run the executable from any directory on your system.

Linux or Unix	Edit your login shell to add the directory to your PATH statement.
Windows	Edit the PATH variable by navigating to My Computer > Properties > Advanced > Environment Variables.

The extraction step creates the following objects for Oracle FS System Manager:

`jar`	The folder containing the jar files for Oracle FS System Manager
`runOracleFSSystemManager.bat`	(Windows only) The client batch file to run Oracle FS System Manager
`runOracleFSSystemManager.sh`	The client shell file to run Oracle FS System Manager
`runOracleFSSystemManager.command`	(Mac OS only) The client shell file to run Oracle FS System Manager

The extraction step creates the following objects for Oracle MaxMan:

`jar`	The folder containing the jar files for Oracle MaxMan
`runOracleFSMaxMan.bat`	(Windows only) The client batch file to run Oracle MaxMan
`runOracleFSMaxMan.sh`	The client shell file to run Oracle MaxMan
`runOracleMaxMan.command`	(Mac OS only) The client shell file to run Oracle MaxMan

Related Links

Download the Oracle FS System Application
Install Oracle FS System Software (MSI)

Accessing the Oracle FS System

After you have installed Oracle FS System Manager (GUI) software package on a client workstation, you can run the application to access an Oracle FS System.

Unless the default values have been changed during installation, use the following values the first time that you use the Primary administrator account to log in to the GUI:

Table 3: Default login values

Field	Default value
Pilot IP address	10.0.0.2
Login Name	administrator
Password	pillar

If the default value has been changed for the Pilot, use one of the following options in the Oracle FS name field:

- If the Pilot IP address has been changed to a customer-specific address, use that address.
- If you configured the IP address to a DNS host name, you can use that host name to log into the Oracle FS System.

The login name does not change.

The password does not change. However, after you login with the default password, you will be prompted to enter a new password.

Passwords must adhere to the following security policy:

- Must be eight characters to 16 characters in length
- Cannot contain dictionary words
- Cannot be any of the last 50 passwords

  Note: The system retains recent passwords for one year.
- Must contain at least one uppercase letter, one lowercase letter, one numeric character, and one special character

The following list summarizes the tasks that you should perform immediately after you change the password and log in to the system:

- Document the password and keep the password secure.
- Ensure that the Primary Administrator also obtains this password.
- Set up and test an email address for the Primary Administrator.
- Create one additional Administrator 1 account with a valid email address. Use the additional Administrator 1 or appropriate level accounts for routine system administration rather than the Primary administrator account.

If you exceed the maximum number of administrator login attempts, your account will disable. Use a Administrator 1 account, if one exists, to reset the password. Primary system administrators and administrators who are assigned to the Administrator 1 role can change the password of any administrator account without knowing the previous password. A Support administrator cannot reset the Primary system administrator password.

At any given time, the following number of administrator sessions can be active:

- Five active sessions for each administrator account
- 25 total at any given time

Note: The default time-out period is 20 minutes. When a session is inactive for more than the time-out period, the system terminates that session, and prompts you to log in again.

Related Links

Change Administrator Passwords
Modify Security Settings

Providing a Password

In order to protect your security, Oracle enforces strict rules for choosing passwords for access to Oracle FS System Manager (GUI).

Passwords must adhere to the following security policy:

- Must be eight characters to 16 characters in length
- Cannot contain dictionary words
- Cannot be any of the last 50 passwords

  Note: The system retains recent passwords for one year.
- Must contain at least one uppercase letter, one lowercase letter, one numeric character, and one special character

If you forget the Primary system administrator password, you can reset it using one of the following methods:

- Use a Administrator 1 account, if one exists, to reset the password. Primary system administrators and administrators who are assigned to the Administrator 1 role can change the password of any administrator account without knowing the previous password. A Support administrator cannot reset the Primary system administrator password.
- Click Forgot password on the Login screen and follow the instructions in the Forgot Password dialog. You must have an email address associated with your account. The system sends a password reset token to the email address associated with your account. If you receive an email with a password reset token and you did not request a password reset token, notify your system administrator.

If you need your Primary system administrator password reset, you can reset it using one of the following methods:

- Use a Administrator 1 account, if one exists, to reset the password. Primary system administrators and administrators who are assigned to the Administrator 1 role can change the password of any administrator

account without knowing the previous password. A Support administrator cannot reset the Primary system administrator password.

- Click Reset password on the Login screen and follow the instructions in the Reset Password dialog. You must have either your old password or your password token to reset your password. If you do not have your password token, click Forgot password on the Login screen and follow the instructions in the Forgot Password dialog.

Related Links

Log In to Oracle FS System Manager

Log In to Oracle FS System Manager

Logging in to Oracle FS System Manager (GUI) gives you access to the Oracle FS System so that you can perform administrative tasks, such as provisioning and tuning storage.

Prerequisites:

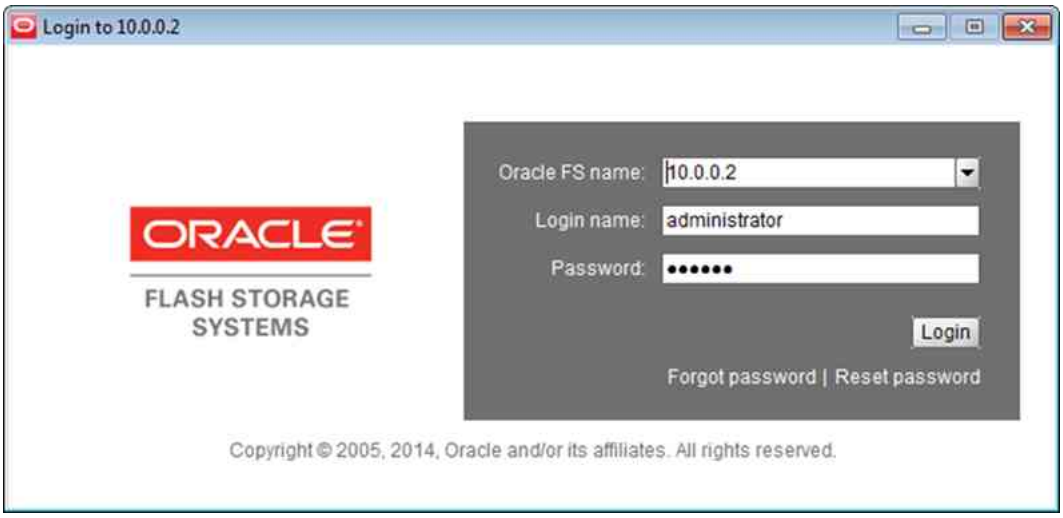
- The GUI software package has been installed on your client workstation.
- The TCP port 26012 on the Oracle FS System is open and not blocked.

1 Start the GUI application.

- For the Windows executable, double-click one of the following:
  - The `Oracle FS System Manager.exe` file located at `C:\Program Files\Oracle Corporation\`
  - The Oracle FS System Manager (GUI) shortcut on the Windows desktop
- For the Windows archive, run the `runOracleFSSystemManager.bat` batch script.
- For Linux and Unix, run the `runOracleFSSystemManager.sh` shell script.
- For Mac OS, run the `runOracleFSSystemManager.command` shell script.

The login screen appears. If you have an existing installation of the GUI, you might be prompted to update the install to match the software version of the Oracle FS System.

Figure 2: Oracle FS System Manager Login screen



2 For Oracle FS name, specify the Oracle FS System to which you want to connect.

Valid values:

- IP address of the Pilot
- Oracle FS System name as configured in your site naming services for the Pilot

3 For Login name, enter your login name.

4 For Password, enter your password.

5 Click Login.
The GUI opens to the System Information overview page, or the last page you visited when you last logged off.

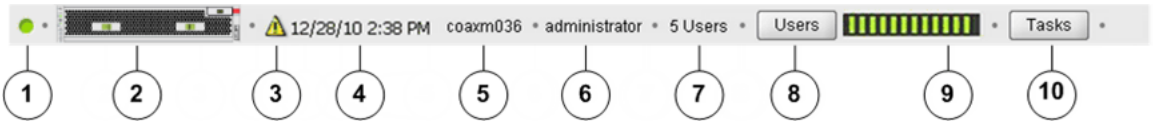
Related Links

Accessing Oracle FS System Applications
Download the Oracle FS System Application

Status Bar Description

Oracle FS System Manager (GUI) displays information about the operation of the Oracle FS System in the status bar at the bottom of each overview window.

Figure 3: Oracle FS System Manager status bar



Legend		
	1 System status	6 Account that is currently logged in
	2 Hardware status	7 Number of accounts that are currently logged in
	3 System alert	8 Displays all accounts that are currently logged in

4 Last system alert	9 Progress of current background task
5 System name	10 Displays all background tasks

The following table describes each status bar component.

Table 4: Status bar details

Status bar component	Description
System status	Displays the overall system status. A status of Normal (green) requires no action. If, however, the status is Warning (yellow) or Critical (red), click the icon to view the System Summary page to identify the cause of the status.
Hardware status	Displays the overall system status of the hardware components. A status of Normal (uncolored) requires no action. If, however, the status is Warning (yellow) or Critical (red), click the icon to view the Hardware overview page so the cause of the status can be identified.
System alert	To open the System Alerts overview page and to respond to any events that require intervention, click this icon. The icon displays only when an active system alert is present on the Oracle FS System.
Last system alert	If an alert exists, displays the date and time of the last system alert. This information lets you know, especially when multiple events exist, whether a new system alert has been generated. The date and time displays when an active system alert is present on the Oracle FS System.
System name	If a system name has been configured, displays the system name. If no system name has been configured, displays the serial number.
Account that is currently logged in	Displays the name of the account that is currently logged in to the system.
Number of accounts that are currently logged in	Displays the number of accounts currently logged in to the system.
Displays all accounts that are currently logged in	Click this icon to open the Current User Session dialog and to view details of the accounts that are currently logged in to the system.
Progress of current background tasks	Displays the progress of the currently running tasks.
Displays all background tasks	Click this icon to open the Background Processes dialog.

Related Links

View Currently Logged-in Accounts

Configure Automatic Screen Updates

You can disable automatic screen refresh if your Oracle FS System takes a long time to refresh the screen contents.

If you have a very large system configuration or a large configuration that experiences heavy activity, the system might take a few minutes to refresh the screen contents. This delay might interrupt normal operations on the system. You can disable the automatic screen refresh and manually update the screen contents, as necessary.

1. Navigate to Tools > **Configure Automatic Screen Updates**.
2. Select the option to either enable or disable automatic screen updates.

   Tip: To refresh the screen when the automatic updates is disabled, press Ctrl-Alt-R on your keyboard.

View Currently Logged-in Accounts

You can view the details of the accounts that are logged into the system to see information such as login name, role, full name, login time, and IP address.

Prerequisite: You must be logged into the Oracle FS System.

You should view a list of accounts logged into the system to decide whether you need to contact the account owners before you shut down or restart the system.

1. From the Status Bar, click Users.
   The Users dialog appears.
2. Review the accounts that are logged into the Oracle FS System.
3. Click Close when you are finished reviewing the list.

Log Out of Oracle FS System Manager

When you have completed your administrative tasks, log out of Oracle FS System Manager (GUI) to prevent unauthorized users from gaining access to the Oracle FS System from your workstation.

To log out, navigate to one of the following menu items:

Oracle FS > Connect to	Allows you to choose another Oracle FS System to log in to. You are disconnected from the current system and prompted to log in to the new Oracle FS System.
Oracle FS > **Log off**	Disconnects from the current Oracle FS System, allowing you to log in to another system.
Oracle FS > Exit	Disconnects from the current Oracle FS System and closes the GUI application.

Licensing the Optional Premium Features

All embedded software and all data services for the Oracle FS System are enabled at the factory and included in the purchase price, including Oracle MaxRep for NAS - Terabyte Perpetual. You can purchase additional Oracle MaxRep premium features.

The following optional premium features are available on the Oracle MaxRep Replication Engine:

- Oracle MaxRep Asynchronous Replication
- Oracle MaxRep Asynchronous Replication with Application Protection
- Oracle MaxRep Synchronous Replication
- Oracle MaxRep Synchronous Replication with Application Protection

Oracle FS System CLI

The Oracle FS CLI is the command line interface for configuring, operating, and monitoring an Oracle FS System. The Oracle FS CLI provides the same capabilities as Oracle FS System Manager (GUI), allowing configuration and management of the Oracle FS System performed from the command line or through custom scripts.

The following features are available with Oracle FS CLI:

- Runs as a command-line interface
- Communicates from the host system to the Oracle FS System Pilot
- Uses familiar conventions for parameters and options, and provides reasonable default values where possible
- Checks for required sets of parameters and displays error messages if the required values are missing
- Supports automation through custom scripts using common scripting languages
- Provides help for each of its commands and subcommands

CHAPTER 2

Manage Global Settings

Global Settings Configuration

The first time you log into the Oracle FS System you should perform several configuration tasks.

The following list summarizes the tasks that help you to configure the system-wide settings:

- Set and synchronize the Oracle FS System time with external time servers.
- Define the networking properties, which includes the following tasks:
    - Define and configure the IP addressing and the IP characteristics of the management ports.
    - Define an email server in your network that can receive Oracle FS System alerts and can forward them to administrator email accounts, for example, to be used to recover account credentials.
    - Enable Call-Home, a feature that notifies Oracle about issues in the system. The Call-Home feature of Oracle FS System Manager (GUI) is integrated with Oracle Auto Service Request (ASR).
    - Set system-wide iSCSI settings if your configuration requires that all iSCSI connections use the Challenge Handshake Authentication Protocol (CHAP), access control, or both. If access control is defined for each initiator, you do not need to configure iSCSI at the system level.
- Create additional Storage Profiles, if needed.
- Define session time-out periods and failed login attempts.
- Create additional administrator accounts, especially an account assigned the Administrator 1 role.
- Define SNMP host settings.

The success of other configuration tasks depends on the system-wide settings. For example, if you do not configure the email server, the system cannot send alerts or the information needed to reset an administrator password.

Related Links

System Time Synchronization
Network Interfaces
System Notifications
Settings for ASR (Call-Home)
iSCSI Settings
Controller Ports
Storage Profiles
Modifying Security Settings
Administrator Account Management
SNMP Trap Host Management

System Time Synchronization

You can set the properties of the system time to synchronize the Oracle FS System clock time with a Network Time Protocol (NTP) server or you can set the date and time manually.

To set the Oracle FS System time, use one of the following options:

Use External Time Source	Synchronizes the system time with an external NTP server. **Important:** Do not attempt to use a Windows system as an NTP server unless that system has a third-party NTP service such as Meissner installed. Alternatively, use a Linux- or Unix-compatible NTP server and sync both the Oracle FS System server and the Windows Time Service to that server. For more information about configuring time services, refer to *Appendix H: Configuring Time Services for a Heterogeneous UNIX and Windows Environment* (http://technet.microsoft.com/en-us/library/bb463171.aspx). **Note:** If the primary NTP server is not available, the Oracle FS System consults the secondary servers in round-robin fashion until a connection is made.
Use Internal Hardware Clock	Allows you to set the system time manually. This option is not valid when Oracle FS SecureWORMfs filesystems exist on the system. Oracle FS SecureWORMfs requires an NTP server, as does CIFS authentication as well as many NFS environments.

Related Links

Modify the Oracle FS System Time

Modify the Oracle FS System Time

Configure the Oracle FS System time so that event timestamps and logging timestamps are accurate and so that time-dependent applications work properly.

1. Navigate to System > **Global Settings** > System Time.
2. Select Actions > Modify.

3 Select an option for configuring the system time.

4 Depending on which option you select, enter the NTP server details or choose the system time using the date and time dialog.

Important: If either option you choose changes the time to be prior to the current time, the Pilot restarts to implement the new time.

5 Click OK.

After approximately 15 minutes, navigate to System > Alerts and Events and ensure that there are no Oracle FS System alerts and events indicating that the NTP sync has failed.

Related Links

Modify System Time Dialog

System Time Synchronization

Network Interfaces

Configure the Oracle FS System management network interfaces to ensure proper communication with devices on the customer network.

Configuring the system network affects the following types of communication:

- Management traffic between the Pilot and other devices on the customer network
- The sending of the alerts, notifications of system events, and password recovery information to an email server

The management interface provides connectivity between the customer management network and the Oracle FS System Pilot. You can choose from the following methods to assign the IP addresses to the management interface on the Pilot:

- Dynamic Host Configuration Protocol (DHCP), which assigns a public IP address dynamically when the Pilot starts. This address only applies to the public IP address of the Oracle FS System. DHCP is not supported for the individual Pilot CU addresses.
- Static IP address, which assigns a permanent, public IP address to the Oracle FS System, and assigns unique IP addresses to each of the Pilots. If the management client cannot access the public IP address, the client can access one of the unique IP addresses of the active Pilot.

The primary and secondary DNS servers provide the name resolution for the following Oracle FS System features:

- Call-Home
- Email
- Password recovery

The Call-Home feature, when enabled, allows the Oracle FS System to send to the Oracle Call-Home server (callhome.support.pillardata.com) the following types of information:

- System log bundles (for use by Oracle Customer Support)
  - System status
  - System configuration information
  - System statistics
  - Internal system logs
- System event notifications (for use by Oracle Auto Service Request (ASR))
  - System status
  - System configuration information

To send the Call-Home information, the Pilot uses a DNS server to resolve the names of the recipients.

You can define a primary DNS server and a secondary DNS server. The system uses the primary DNS server to resolve host names into IP addresses. If the primary server cannot be reached, the system uses the secondary DNS server.

Related Links

Configure the Management Interface
Configure DNS Settings

Configure the Management Interface

Configuring the management interface might involve, for example, specifying the static or dynamic IP addressing method for the Pilot.

You need to choose one of the following options when selecting how you want the Oracle FS System to assign IP addresses:

Enable DHCP	Use if your system assigns IP addresses automatically using a Dynamic Host Configuration Protocol (DHCP).
Static IP Address	Use to manually configure the IP addresses. Enter the values into the appropriate fields.

Important: When providing static IP addresses for the management interface, be sure that you enter the correct addresses and that the addresses are reachable over the management network. Otherwise, you and management clients will not be able to access the Oracle FS System. If you enter unreachable addresses or have forgotten the addresses, contact Oracle Customer Support to get an encrypted file that can be used to reset the IP addresses to the factory default settings.

1. Navigate to System > **Global Settings** > Networking.
2. Select Actions > Modify.

3 From the Interfaces tab, select how you want the Oracle FS System to assign IP addresses.

4 (Optional) Select the **Transmit Setting**.

Note: When your Ethernet network contains an auto-negotiation feature, leave this option at the default setting, Auto.

5 Click OK.

Related Links

Modify Network Settings, Interfaces Tab

Configure DNS Settings

DNS servers are used by the Pilot to resolve the address of the Oracle Auto Service Request (ASR) server and to locate mail servers for sending password recovery instructions.

You can set the primary and secondary DNS server to resolve host names to IP addresses, for example. Also, the DNS settings allow the Oracle FS System to send Call-Home information, password recovery instructions, and event notifications to designated email recipients.

1 Navigate to System > **Global Settings** > Networking.

2 Select Actions > Modify.

3 From the Interfaces tab, enter the Primary DNS Server IP address.

4 Enter the Secondary DNS Server IP address.

5 Click OK.

Related Links

Modify Network Settings, Interfaces Tab

System Notifications

Setting up system notifications allows you to define recipients for the event notifications and the system alerts, and to define the Call-Home settings that integrate with Oracle Auto Service Request (ASR).

The Oracle FS System provides various methods of setting up system notifications, including the following options:

Event Notifications	Simple Mail Transfer Protocol (SMTP) email messages that notify recipients of specified system events. System events include informational events, warning events, and critical events such as the creation of a logical volume or the occurrence of a hardware problem or software problem. Event notifications are optional and, when enabled, supplement normal event logging and Call-Home notification.

System Alerts	System Alerts are the notifications that the Oracle FS System generates to identify conditions that warrant investigation *and* action. System Alerts include the following examples: • Notifications about resources that are not fully operational, indicating a need for maintenance. • Notifications about insufficient storage, indicating a need for a reallocation of resources, a cleanup of resources, or possibly the purchase of additional storage. This kind of information is important when an administrator has implemented thin provisioning for one or more logical volumes.
Password Recovery	The notifications that the Oracle FS System generates to send users a password token which allows them to reset forgotten passwords. An email server must be set up and the user must have a valid email address associated with the user account.
Call-Home	A feature of an Oracle FS System that, when enabled, allows the system to send the system status information, the appropriate logs, and the system configuration information to Oracle Customer Support. If the Auto Service Request (ASR) feature is enabled, Call-Home also notifies Oracle Customer Support about critical issues that exist in the Oracle FS System.

You must define an email server to receive the alerts and the event notifications and to send the email messages to designated recipients.

The Oracle FS System supports the Simple Network Management Protocol (SNMP) protocol for monitoring the configuration of various system components.

Related Links

Managing Event Notifications
Managing System Alerts
Auto Service Requests
Settings for ASR (Call-Home)
Configure Email Notification Settings

Auto Service Requests

Oracle Auto Service Request (ASR) is a feature of Oracle hardware warranty and Oracle Premier Support for Systems. The ASR feature automatically generates a service request for specific Oracle FS System software and hardware events. This automated feature securely expedites system diagnostics, prioritizes your service requests, and dispatches parts, if needed.

The ASR feature performs the following activities automatically:

- Generates a service request (SR) when needed
- Handles service requests according to priority
- Dispatches parts when needed
- Attaches Call-Home logs and log bundles to the SR

My Oracle Support (MOS) allows you, or a customer user administrator (CUA), to associate your Oracle FS System with a customer support identifier (CSI), which indicates that your system is licensed for Oracle Customer Support. The CSI information includes the Oracle FS System serial number, organization, and the level of support. The CUA is typically a technical representative from your organization.

The ASR feature relies on the Call-Home feature of the Oracle FS System to communicate system events to MOS. After you configure and activate the ASR in MOS, your system is ready to notify Oracle Customer Support of certain system events.

For additional ASR support information, refer to *Oracle Auto Service Request* (http://www.oracle.com/us/support/auto-service-request/index.html) on the Oracle Support website.

Related Links

Settings for ASR (Call-Home)

Configure Email Notification Settings

Configuring email notifications allows selected individuals to receive the messages that are generated by the Oracle FS System.

1. Navigate to System > **Global Settings** > Networking.
2. Select Actions > Modify.
3. Click the **Notification** tab.
4. (Optional) To be notified by email of each Call-Home event, select **Enable Email Notification**.
5. (Optional) Enter the configuration settings for the email server.
6. Click OK.

Related Links

Modify Network Settings, Notification Tab

Settings for ASR (Call-Home)

Call-Home is a feature that, when enabled, works with the Auto Service Request (ASR) feature to send all notifications and associated logs about specific Oracle FS System events to My Oracle Support (MOS). Configure the Call-Home settings correctly to ensure that the MOS system properly manages the events.

Note: No customer data is sent in a Call-Home transmission.

The Oracle FS System sends log bundles that contain information about the system event. The log bundles assist Oracle Customer Support to diagnose the system event. The collection of the log bundles is initiated by one of the following methods:

Manual	The administrator has requested a log bundle collection. You can manually send the logs to MOS and associate the logs with an existing SR number.
Event-triggered	When a system event occurs, the Oracle FS System triggers the following activities: • Collects log bundles that contain information about the event • Uploads the logs to MOS If necessary, MOS creates an SR for the system event and then dispatches replacement parts, if appropriate.
Periodic	The system sends a notification as scheduled in Oracle FS System Manager (GUI) configuration. After the ASR feature is activated, MOS expects to receive an event, known as a heartbeat, each day from the Oracle FS System. The daily heartbeat keeps the ASR feature in an active state. The following options ensure that MOS receives daily and weekly heartbeat event notifications: • Standard periodic Call-Home • Larger periodic Call-Home For both options, do not change the option schedules. If the daily heartbeats are not received, MOS creates an SR indicating that the periodic heartbeat is overdue. MOS then dispatches the SR to Oracle Customer Support for resolution.

The Oracle FS System maintains a directory of log collections, each of which represents an event or a manual log bundle. You can select a log bundle file, a range of log bundle files, or a group of log bundle files to download or transmit to MOS. The name of each log bundle indicates the reason, date, and time (GMT) that the bundle was created, as well as the reason, date, and time the previous bundle was created.

Oracle Customer Support might request that you send multiple log bundles to MOS. When you create a manual log bundle, you can add an SR number in the Notes field. MOS then automatically associates that log bundle with your active SR.

You can send the log bundles to a local server, if necessary. However, sending log bundles to the local server disables all ASR functionality.

Related Links

Managing Event Logs
System Log Bundles

Configure Call-Home for ASR

Configure the Call-Home options to ensure that the Oracle FS System sends specific event notifications to My Oracle Support (MOS). MOS then receives these notifications and, if necessary, initiates a service request (SR).

Prerequisites

- If the Oracle FS System is configured for Call-Home options and Auto Service Request (ASR), and the connection to the Call-Home server is direct, without a proxy, then all firewalls must allow all three Pilot IP addresses to make outbound connections on TCP Port 443 to the Call-Home server at Oracle.
- If the Oracle FS System is configured for Call-Home options and ASR, but is configured to use a proxy, then the proxy must be configured to accept connections from all three Pilot IP addresses and allow them to connect from the proxy to the Oracle Call-Home server on port 443.
- Any firewalls between the Pilots and the proxy must allow the TCP port configured for the Pilot to the proxy connections to pass through firewalls for all three Pilot IP addresses.

You also configure Call-Home options that keep the ASR feature active. MOS expects to receive an event, known as a heartbeat, each day from the Oracle FS System. This heartbeat is controlled by the Enable standard periodic Call-Home option.

1. Navigate to System > **Global Settings** > Networking.
2. Select Actions > Modify.
3. Click the **Notification** tab.
4. Select the Enable event triggered Call-Home option.
5. Select the Enable standard periodic Call-Home option.

   Note: Accept the default daily periodic interval. The ASR feature expects a daily Call-Home notification.
6. Select the Enable larger periodic Call-Home option.

   Accept the default weekly periodic interval.
7. Verify that the Use Oracle Server option is selected.
8. Accept the default settings for the Use Oracle Server option.

   Note: Do not alter the server name of the HTTP Server address.

Note: If your environment does not use a proxy, you must configure at least one DNS server. Ensure that the DNS server resolves to the host name of the Oracle server: callhome.support.pillardata.com.

9 (Optional) Select Use Proxy and enter the proxy server address, port number, and protocol type as provided by your proxy administrator.

Note: Ensure that the proxy server, if used, resolves the host name of the Oracle server: callhome.support.pillardata.com.

10 Select **Enable large file transfers**.

Note: This option ensures that Oracle Customer Support receives the detailed logs that are created for an event.

11 Accept the default value for the Number of recent events to send in header option.

Note: An Oracle Customer Support professional might request that you change this value for a specific purpose.

12 Click OK.

You can test the Call-Home settings from the Networking overview page of the System tab.

Related Links

Modify Network Settings, Notification Tab
Configure the Management Interface
Settings for ASR (Call-Home)
Configure Call-Home for ASR
Activate ASR (Test Call-Home)
Upload the Call-Home Matrix

Activate ASR (Test Call-Home)

After you have configured Call-Home for the Auto Service Request (ASR) feature, send an ASR activation request to My Oracle Support (MOS).

Prerequisites:

- Call-Home is configured to access the ASR functions in MOS.
- Event triggering and periodic triggering for Call-Home are enabled and, the parameters are set to the default settings.
- Administrator privileges exist to the ASR asset that is registered in MOS.

1 Navigate to System > **Global Settings** > Networking.

2 To send the ASR activation request, select Actions > Test Call-Home.

3 Confirm that you want to send test Call-Home information, and click OK.

The Call-Home test is an ASR activation request in MOS. MOS should receive your request in a few minutes, but no longer than 60 minutes.

Note: You can repeat the activation request again, as necessary.

You or the customer user administrator (CUA) performs the following steps to verify that the ASR activation request was successful.

4 Verify the receipt of an email from MOS with instructions to complete the ASR activation process.

For information that describes how to complete the activation process, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "How to complete Auto Service Request (ASR) asset activation using My Oracle Support."

5 Log in to MOS and verify that the ASR asset status shows "pending".

An "inactive" state means that MOS has not received your activation request.

If you did not receive an email from MOS, or if the ASR asset in MOS is "inactive", then perform the detailed ASR activation (Call-Home) troubleshooting.

Note: Do not contact Oracle Customer Support until you have completed the troubleshooting checks.

Related Links

Networking Overview Page

ASR Activation (Call-Home) Troubleshooting

You might need to troubleshoot the Oracle Auto Service Request (ASR) activation request when you have not received an email from My Oracle Support (MOS) in response to an activation request.

You can check the following resources to troubleshoot where the ASR activation request communications might be failing.

Call-Home Succeeded	A `Call-Home Succeeded` Event Log message means that the Oracle FS System has successfully sent the Call-Home event or activation request. If you see the `Call-Home Succeeded` Event Log message, check the following items: • Receipt of an email notification from MOS within 60 minutes • ASR asset in MOS has a "pending" status If either of these checks fail, and your system has a proxy configured, then check the proxy logs to determine if the connection to the Oracle server was successful. If the proxy logged an error, correct the proxy settings in your network

	or correct the Oracle FS System proxy configuration. Verify your updates by running the ASR activation request again.
Call-Home Failed	A `Call-Home Failed` event creates a System Alert and an Event Log records the system fault. View the properties of the event. If you received the error `EventParameters.Callhome.error.1:HTTPS_UNKNOWN_HOST`, then Call-Home failed to locate a server. Verify the following criteria: • The Oracle FS System can contact the configured DNS servers. • The DNS servers can resolve the host name of the Oracle server, callhome.support.pillardata.com. If another error message is present, save the event message by using the Copy to Clipboard option from the Event Properties dialog. Contact Oracle Customer Support, if further assistance is required.

Related Links

Settings for ASR (Call-Home)
Activate ASR (Test Call-Home)
Display the Event Properties
Manage the System Alerts

Upload the Call-Home Matrix

Upload a custom Call-Home matrix to update the list of events that trigger a Call-Home event, or to update the logs that are collected for the event.

Prerequisites:

- You must be logged in as a Support administrator to access a Call-Home matrix.
- You must obtain an updated Call-Home matrix from Oracle Customer Support.

Important: A software update overwrites the Call-Home matrix. You might either need to upload the custom matrix after a software update or to obtain a new matrix after the software update. Contact Oracle Customer Support for information about the impact that the new Call-Home matrix might have on your system.

1. Navigate to System > **Global Settings** > Networking.
2. Select Actions > Upload Call-Home Matrix.
3. From the Upload Call-Home Matrix dialog, click the browse button […] to proceed.
4. Navigate to and select the Call-Home matrix file that you received from Oracle Customer Support.

5 Click Open.

6 From the Upload Call-Home Matrix dialog, click OK to upload the matrix file.

Verify your Call-Home settings after uploading any custom matrix file.

Related Links

Networking Overview Page

iSCSI Settings

If you have any iSCSI hosts that are configured to use Challenge Handshake Authentication Protocol (CHAP), access control, or both, you must also set up system-wide iSCSI settings on the Oracle FS System. Configuring the iSCSI settings defines the authentication methods and the access controls on the Oracle FS System that the SAN hosts must match to gain access to the system.

If you have CHAP and access control configured for each initiator, you do not need to configure iSCSI globally.

The Internet Storage Name Service (iSNS) facilitates the discovery, the management, and the configuration of iSCSI devices on a TCP/IP network. iSNS provides intelligent storage discovery and intelligent management services that are comparable to those services that are found in Fibre Channel networks. iSNS allows a normal IP network to function in a manner that is similar to that of a storage area network.

For the iSNS feature to work properly, configure all iSCSI ports on the Oracle FS System to have access to the same primary iSNS server. This rule is necessary so that all of the iSCSI ports get the same result when querying the iSNS database for the set of initiators that are members of the discovery domain set that is associated with the Oracle FS System.

Important: If an iSCSI port has no access or loses access to the iSNS server, the Oracle FS System reports the iSNS error events but continues to operate normally. For iSNS access control to function correctly, at least one iSCSI port on the Oracle FS System must have access to the iSNS server during a system restart; otherwise, all iSCSI logins are rejected.

Related Links

Configure iSCSI System Settings

Configure iSCSI System Settings

You can set the system-wide iSCSI authentication settings for the iSCSI initiator ports, which would apply to all iSCSI hosts.

1 Navigate to System > **Global Settings** > Networking.

2 Select Actions > Modify.

3 From the iSCSI tab, enter values to configure the initiator ports.

4 Click OK.

Related Links

Modify Network Settings, iSCSI Tab
iSCSI Settings

Modify iSCSI Port Settings

You can change the default values of the iSCSI port settings. For example, you might need to change the maximum transmission unit (MTU) of a port in one of the Controllers.

The default action that the Oracle FS System uses for all iSCSI ports is to interpret the IP address, the subnet mask, and the gateway address using Dynamic Host Configuration Protocol (DHCP). If you want to assign these values manually, modify each port with the values that you want to use.

1 Navigate to System > **Global Settings** > Controller Ports.

2 From the Controller Ports overview page, select either a slot or a port that you want to modify.

3 Select Actions > **Modify Port Settings**.

4 Make any necessary changes.

5 Click OK.

Related Links

Modify Controller Port Settings Dialog
Modify a Host: Reconfigure iSCSI Access Settings
iSCSI Settings

Controller Ports

Oracle FS System Manager (GUI) allows you to update the protocol properties of a Controller for Ethernet, Fibre Channel, or iSCSI.

You can modify the following aspects of the Controller ports:

- The protocol that is used
- Whether link aggregation is enabled
- The management priority value used in link negotiation and identification for the aggregated ports

You can change port provisioning except for the following caveats:

- Cannot change the port provisioning for Ethernet ports or for SAS ports.
- Can only toggle the port provisioning between FC and iSCSI. If you do change the port provisioning, you must replace the small form factor (SFP) to match the provisioning.

- All HBA ports must be provisioned identically. For example, Port 0 cannot be FC and Port 1 be iSCSI.

The system allows you to change port provisioning while the system is running. The system applies the port provisioning to both nodes in a Controller pair.

Important: Do not change port provisioning unless you are prepared for all clients to temporarily lose access. Changing port provisioning restarts the controller pair. This is a system restart.

Related Links

Managing SAN Host Entries
View a Summary of all the Controller Ports
View the Port Details for all the Controllers
View the Port Details for a Controller
View the Settings for a Controller Port
Manage Port Provisioning for a Controller

View a Summary of all the Controller Ports

The Controller Ports overview page displays the topology properties of the network ports for each of the Oracle FS System Controllers.

From the Controller Ports overview page, you have the option to view and to modify the properties of selected Controllers and selected ports.

1. Navigate to System > **Global Settings** > Controller Ports.
2. Verify that the summary information is what you expect.

Related Links

Controller Ports Overview Page
View the Port Details for all the Controllers
View the Port Details for a Controller
View the Settings for a Controller Port
Manage Port Provisioning for a Controller

View the Port Details for all the Controllers

You can use Oracle FS System Manager (GUI) to view the port details for the Controllers in one screen. Also, you can view separately the various protocols that the Controller supports.

1. Navigate to System > **Global Settings** > Controller Ports.
2. Select Actions > **View Port Settings**.
   The View Controller Port Settings dialog appears, displaying all of the port details for all of the Controllers.
3. Click the appropriate tab to view the Controller port settings.

4 Verify that the summary information is what you expect.

5 Click Close.

Related Links

View Controller Port Settings, Ethernet Tab
View a Summary of all the Controller Ports
View the Port Details for a Controller
View the Settings for a Controller Port
Manage Port Provisioning for a Controller

View the Port Details for a Controller

You can use Oracle FS System Manager (GUI) to view the port details for the Controllers in one screen. Also, you can view separately the various protocols that the Controller supports.

1 Navigate to System > **Global Settings** > Controller Ports.

2 Select a Controller.

3 Select Actions > **View Port Settings**.

The View Controller Port Settings dialog appears displaying each of the port types on a different tab.

4 Click the appropriate tab to view the details of the Controller port.

5 Verify the summary information is what you expect.

6 Click Close.

Related Links

View Controller Port Settings, Ethernet Tab
View a Summary of all the Controller Ports
View the Port Details for all the Controllers
View the Settings for a Controller Port
Manage Port Provisioning for a Controller

View the Settings for a Controller Port

The Controller Ports overview page displays the topology properties of the network ports for each of the Oracle FS System Controllers.

1 Navigate to System > **Global Settings** > Controller Ports.

2 Select a Controller port.

3 Select Actions > **View Port Settings**.

4 Verify that the summary information is what you expect.

5 Click Close.

Related Links

View Controller Port Settings, Ethernet Tab
View a Summary of all the Controller Ports
View the Port Details for all the Controllers
View the Port Details for a Controller
Manage Port Provisioning for a Controller

Manage Port Provisioning for a Controller

You can change the port protocol at the Controller level. You can also specify whether the Ethernet ports are to be aggregated into a single link and the aggregation priority.

The system allows you to change port provisioning while the system is running. The system applies the port provisioning to both nodes in a Controller pair.

Important: Do not change port provisioning unless you are prepared for all clients to temporarily lose access. Changing port provisioning restarts the controller pair. This is a system restart.

If you select the entire Controller, you can change the protocol supported by a slot. If the protocol is Ethernet, you can aggregate the ports into a single link.

If you select a Controller slot, you can change the protocol that the slot supports (affects all of the ports in that slot). If the slot supports Ethernet, you can change whether the all of the ports in the slot are to be aggregated.

If you select a particular port, you can change the protocol that the port supports. If the port supports Ethernet, you can change whether the all of the ports in the slot are to be aggregated.

1. Navigate to System > **Global Settings** > Controller Ports.
2. Select a Controller.
3. Select Actions > Manage Port Provisioning.
4. Select a Controller Slot Number and change the protocol properties as needed.
5. Click OK.
   Any necessary changes are mirrored to the peer controller, and the system restarts.

Related Links

Manage Port Provisioning Dialog
View a Summary of all the Controller Ports
View the Port Details for all the Controllers
View the Port Details for a Controller
View the Settings for a Controller Port

Storage Profiles

When configuring a logical volume, you can select a collection of predefined properties to apply to that volume. This collection of properties is called a *Storage Profile*.

When using a specific Storage Profile, you can select a profile that you have previously created and saved, one of the pre-configured profiles, or create a new profile.

After a volume is created using a Storage Profile, removing the profile does not affect the performance characteristics of that volume.

The following properties define a Storage Profile:

RAID level	Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives.
Read ahead	Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache.
Priority	Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives.
Stripe width	Identifies the number of drive groups over which the data is written.
Writes	Identifies the write-caching rules to use for the profile.
Preferred Storage Classes	Identifies the type of physical media on which the data is stored.

Related Links

Managing Storage Profiles
Storage Tiers and Storage Profiles

Storage Tiers and Storage Profiles

For all of the predefined Storage Profiles, the most preferred Storage Class and the RAID level always correspond to a valid storage tier.

For any Storage Domain, eight different types of storage tiers are possible for holding auto-tiered LUNs. The following table summarizes the possible storage tiers in a Storage Domain:

Table 5: Possible storage tiers in a Storage Domain

	Storage tier	
Storage class	**Tier 1**	**Tier 2**
Capacity HDD	RAID 6	RAID 10
Capacity SSD	RAID 5	RAID 10
Performance HDD	RAID 5	RAID 10
Performance SSD	RAID 5	RAID 10

In any given Storage Domain, however, only some of those tiers are present.

When creating or modifying an auto-tiered LUN, if you use a Storage Profile to define the QoS characteristics of the LUN, the system determines the starting storage tier for the LUN by evaluating the desired Storage Classes and the RAID level using the following process:

- First, from the desired Storage Classes, the system selects the best Storage Class that is present in the Storage Domain.
- If none of the desired Storage Classes are present, the system returns an error.

  Note: This condition can only occur for custom storage profiles.
- Using that Storage Class, the system changes the RAID level from RAID 5 to RAID 6 or from RAID 6 to RAID 5, depending on whether the change is necessary to match one of the tiers.

Managing Storage Profiles

You can use a Storage Profile to configure the Quality of Service (QoS) properties automatically when you create a logical volume.

A Storage Profile is defined as follows: A set of QoS attributes that can be used to configure a logical volume. Oracle provides a collection of Storage Profiles that are optimized for specific uses within an application context. Administrators can select one of the available profiles, create a new profile, or modify an existing profile.

The Performance Benchmark Storage Profile is designed for *performance testing purposes only*. This Storage Profile is *not* recommended for most applications because it uses the system resources in a way that negatively impacts other applications and interferes with the functioning of other volumes in the Storage Domain. After creating a volume that uses the Performance Benchmark Storage Profile, delete the Performance Benchmark volume before you configure normal volumes for applications.

Related Links

Create a Storage Profile
Duplicate a Storage Profile
View Storage Profiles
Delete a Storage Profile

Create a Storage Profile

You can create a Storage Profile that defines a collection of Quality of Service (QoS) properties that differ in some way to the Storage Profiles that have been predefined in the system.

Important: When creating a Storage Profile, you should be familiar with the interactions among the attributes and the potential effects on system performance.

Oracle-supplied profiles are displayed with a type of *System*. Custom profiles are displayed with a type of *Custom*.

1. Navigate to System > **Global Settings** > **Storage Profiles**.
2. Select Actions > **Create Storage Profile**.
3. Set the QoS properties as needed.
   For the name of the Standard Profile, enter an appropriate value. For all other properties, select the desired value from the drop-down list.
4. Click OK.
   After saving a profile, you cannot make changes to it. You can only delete the profile.

Related Links

Create Storage Profile Dialog
Duplicate a Storage Profile
View Storage Profiles
Delete a Storage Profile

Duplicate a Storage Profile

You can create a new Storage Profile by duplicating an existing profile.

Duplicating a profile copies the properties of the original profile to a new profile. You can then customize the new profile by changing any of the existing properties.

1. Navigate to System > **Global Settings** > **Storage Profiles**.
2. Select the Storage Profile you want to duplicate.
3. Select Actions > **Duplicate Storage Profile**.
4. Change the existing QoS properties as needed.

For the name of the Standard Profile, enter an appropriate value. For all other properties, select the desired value from the drop-down list.

5 Click OK.

Related Links

Duplicate Storage Profile Dialog
Create a Storage Profile
View Storage Profiles
Delete a Storage Profile

View Storage Profiles

Before using a Storage Profile to create a logical volume, you can display the Quality of Service (QoS) properties of the profile to determine whether those properties are appropriate for your needs.

Oracle FS System Manager (GUI) lists two types of Storage Profiles:

Custom	A custom profile that was created by a storage administrator.
System	An Oracle-provided profile.

1 Navigate to System > **Global Settings** > **Storage Profiles**.
The system displays a complete list of QoS properties for all available profiles.

2 To view a specific storage profile setting, choose a profile and then select Actions > **View Storage Profile**.

3 Verify that the property information is what you expect.

4 Click Close.

Related Links

View Storage Profile Dialog
Create a Storage Profile
Duplicate a Storage Profile
Delete a Storage Profile

Delete a Storage Profile

When a custom Storage Profile is no longer needed, you can remove it from the system. You cannot delete Oracle-supplied profiles (type of *System*).

1 Navigate to System > **Global Settings** > **Storage Profiles**.

2 Select the custom Storage Profile that you want to delete.

3 Select Actions > **Delete Storage Profile**.
The Delete Storage Profile dialog appears.

4 Click OK.
The custom Storage Profile is deleted from the system.

Note: Volumes that were created using the profile are not affected when the storage profile is deleted. The volumes created using the profile continue to function normally.

Related Links

Create a Storage Profile
Duplicate a Storage Profile
View Storage Profiles

Modifying Security Settings

You can update the account security properties and the login welcome message using the security settings in Oracle FS System Manager.

You can change the following global security settings for system administrator accounts:

- Set the number of consecutive failed login attempts that the Oracle FS System allows. When the threshold is exceeded, the system disables the account and writes an entry in the event log. Only a Primary Administrator or an Administrator 1 can re-enable the account. After the account is re-enabled, the system resets the counter upon a successful login. The failed login attempts value must be between 1 and 20.
- Set the session time-out so that the Oracle FS System terminates a session after a given period of inactivity. The session time-out value must be between 1 and 999 minutes (the default is 20 minutes).

Related Links

Modify Security Settings
Modify the Login Screen Message

Modify Security Settings

Configure the Oracle FS System security by limiting the number of failed login attempts and by setting a time limit for inactive login sessions.

1. Navigate to System > **Global Settings** > Security.
2. Select Actions > Modify.
3. Enter the values in the failed login attempts field and the session time-out field.

   The value for the number of failed login attempts must be between 1 and 20 (the default is 10 minutes). The session time-out value must be between 1 and 999 minutes (the default is 20 minutes).
4. Click OK.

Related Links

Modify Security Settings Dialog

Modify the Login Screen Message

You can add a customized message to the Oracle FS System Manager login screen. For example, you might want to announce that system maintenance or system downtime will be occurring at a specific time to notify administrators to log out before that time.

1. Navigate to System > **Global Settings** > Security.
2. Select Actions > Modify.
3. Enter a login screen message.

   You can enter up to 256 Unicode characters. The login message appears on the login screen when an administrator first starts Oracle FS System Manager.
4. Click OK.

Related Links

Modify Security Settings Dialog

Administrator Account Management

Administrators have specific privileges on the Oracle FS System that are based on their assigned role for their account.

You can create multiple accounts in an Oracle FS System. More accounts are useful, for example, if you want to delegate responsibilities. For example, you might choose to create the following accounts:

- At least one additional administration account. In this way, a designated person can assume responsibility while the Primary system administrator is unavailable. Assign the Administrator 1 role to this account.

  Tip: Do not use the Primary Administrator (the account named "administrator" that comes installed with the software) account for day-to-day operations. Instead, set up an Administrator 1 account when you install the system. One reason is that besides the Primary system administrator, only an Administrator 1 can modify an account password (including that of the Primary system administrator) without knowing the previous password.
- One or more administration accounts with read-only privileges. In this way, managers can monitor the system but they cannot change configuration details. Assign these accounts to the Monitor role.

If you delegate administrative tasks, you can have the other administrators:

- Modify account attributes. For example, change the password or disable the account other than the Primary system administrator account.
- Change the security settings of accounts.
- Delete obsolete accounts.

At times, you might need to modify the attributes of other accounts. A Primary system administrator and users who are assigned to the Administrator 1 role can modify their own account or the accounts of another administrator.

Some changes take effect immediately. For example, a login session is terminated when you disable or delete the login account.

Other changes affect the account the next time an individual or a client logs in. For example, when you modify a password for an account or modify the global session time-out value, those changes take affect the next time a session is started.

Related Links

Creating Administrator Accounts
Modifying Administrator Accounts
Administrator Account Types
Create an Administrator Account
Display Administrator Account Details
Delete an Administrator Account

Administrator Account Types

Administrator accounts have certain privileges, which depend on the role of the account.

To administer an Oracle Flash Storage System, you must log in using an administrator account. Every account performs a specific role that defines system privileges.

Table 6: Administrator privileges by role

Administrator role	Privileges
Primary Administrator	Performs all configuration, management, and monitoring tasks, including the ability to modify all other accounts. This account cannot be deleted or disabled.
Administrator 1	Performs all configuration, management, and monitoring tasks except for running the Drive Enclosure console.
Administrator 2	Performs all tasks except for the following caveats: • Cannot create and manage File Servers and administrator accounts • Cannot modify software configurations or hardware configurations • Cannot shut down the system • Cannot run the Drive Enclosure console
Monitor	Displays system information only; cannot modify the configuration. Can modify their own account attributes.

Table 6: Administrator privileges by role (continued)

Administrator role	Privileges
Oracle Support	Performs limited customer service-only functions; cannot modify the configuration. This account cannot be deleted or disabled. **Note:** Only the Oracle Customer Support personnel can use this account. For the complete list of command options that this role is authorized to perform, see the PARAMETERS section in a specific Oracle FS CLI command.
Support	Performs limited customer service-only functions; cannot modify the configuration. For the complete list of command options that this role is authorized to perform, see the PARAMETERS section in a specific Oracle FS CLI command.

Related Links

Creating Administrator Accounts
Modifying Administrator Accounts
Create an Administrator Account
Modify an Administrator Account

Creating Administrator Accounts

You can create new administrator accounts, each with different roles that are authorized to perform different functions. For example, you can create a Monitor account that has the authority to perform read-only management tasks and the ability to modify only their own account attributes.

You can create multiple accounts in an Oracle FS System. More accounts are useful, for example, if you want to delegate responsibilities. For example, you might choose to create the following accounts:

- At least one additional administration account. In this way, a designated person can assume responsibility while the Primary system administrator is unavailable. Assign the Administrator 1 role to this account.

  Tip: Do not use the Primary Administrator (the account named "administrator" that comes installed with the software) account for day-to-day operations. Instead, set up an Administrator 1 account when you install the system. One reason is that besides the Primary system administrator, only an Administrator 1 can modify an account password (including that of the Primary system administrator) without knowing the previous password.

- One or more administration accounts with read-only privileges. In this way, managers can monitor the system but they cannot change configuration details. Assign these accounts to the Monitor role.

Note: If you do not enter an email address for an administrator account, administrators cannot reset their own passwords using the Reset password feature in Oracle FS System Manager.

You can create a maximum of 128 administration accounts. Only 25 user-created account sessions can be logged in at any given time. Only five accounts are permitted to be logged in at the same time. A Primary system administrator can forcefully log in to free up an account session if necessary.

Related Links

Modifying Administrator Accounts
Administrator Account Types
Create an Administrator Account
Modify an Administrator Account
Delete an Administrator Account

Create an Administrator Account

You can create new administrator accounts to allow users to perform various tasks on the Oracle FS System.

1. From Oracle FS System Manager (GUI), navigate to System > **Global Settings** > Administrator Accounts.
2. Select Actions > Create.
3. Enter the name of the account in the Login Name field.
4. Select a role from the Role list.

   Note: Refer to the Administrator Account Description that is provided on the dialog for a full description of each role.
5. Enter the remaining information about the account owner.

   Required information:

   - Full Name
   - Email Address
   - Phone Number
   - Password
   - **Confirm Password**

   Note: If you do not enter an email address for an administrator account, administrators cannot reset their own passwords using the Reset password feature in Oracle FS System Manager.
6. (Optional) To disable the account, select the Disable Account option.

Use the Disable Account option when you want to create accounts that you want to enable at a later time.

7 Click OK.

Related Links

Create Administrator Account Dialog
Administrator Account Management
Administrator Account Types
Delete an Administrator Account

Modifying Administrator Accounts

You can change the properties of select administrator accounts. For example, you might want to change the role of an administrator account to give the administrator more or fewer system privileges.

If you delegate administrative tasks, you can have the other administrators:

- Modify account attributes. For example, change the password or disable the account other than the Primary system administrator account.
- Change the security settings of accounts.
- Delete obsolete accounts.

At times, you might need to modify the attributes of other accounts. A Primary system administrator and users who are assigned to the Administrator 1 role can modify their own account or the accounts of another administrator.

Some changes take effect immediately. For example, a login session is terminated when you disable or delete the login account.

Other changes affect the account the next time an individual or a client logs in. For example, when you modify a password for an account or modify the global session time-out value, those changes take affect the next time a session is started.

Related Links

Modify an Administrator Account
Change Administrator Passwords
Reset the Primary System Administrator Password

Modify an Administrator Account

You can modify the administrator account details, disable the account, or change the user password.

1 Navigate to System > **Global Settings** > Administrator Accounts.
2 Select an account name from the list of login names.
3 Select Actions > Modify.
4 Enter values for the attributes that you want to modify.

Note: You cannot disable the Primary system administrator account or the Oracle Support account.

5 Click OK.

Related Links

Modify Administrator Account Dialog
Modifying Administrator Accounts
Change Administrator Passwords
Reset the Primary System Administrator Password

Change Administrator Passwords

You can change the administrator password as necessary when, for example, an administrator forgets the password.

Passwords must adhere to the following security policy:

- Must be eight characters to 16 characters in length
- Cannot contain dictionary words
- Cannot be any of the last 50 passwords

  Note: The system retains recent passwords for one year.
- Must contain at least one uppercase letter, one lowercase letter, one numeric character, and one special character

1 Navigate to System > **Global Settings** > Administrator Accounts.
2 Select a login name from the Administrator Accounts list.
3 Select Actions > Modify.
4 Enter the new password in both the Password and **Confirm Password** fields.
5 Click OK.

Related Links

Modify Administrator Account Dialog
Modifying Administrator Accounts
Modify an Administrator Account
Reset the Primary System Administrator Password

Reset the Primary System Administrator Password

If you forget the Primary system administrator password, an Administrator 1 can reset it.

If you need your Primary system administrator password reset, you can reset it using one of the following methods:

- Use a Administrator 1 account, if one exists, to reset the password. Primary system administrators and administrators who are assigned to the

Administrator 1 role can change the password of any administrator account without knowing the previous password. A Support administrator cannot reset the Primary system administrator password.

- Click Reset password on the Login screen and follow the instructions in the Reset Password dialog. You must have either your old password or your password token to reset your password. If you do not have your password token, click Forgot password on the Login screen and follow the instructions in the Forgot Password dialog.

If you are an Administrator 1, use the following steps to reset the password.

1. Navigate to System > **Global Settings** > Administrator Accounts.
2. Select an account name from the list of login names.
3. Select Actions > Modify.
4. Enter the new password in both the Password and **Confirm Password** fields.
5. Click OK.

Related Links

Modify Administrator Account Dialog
Modifying Administrator Accounts
Modify an Administrator Account
Change Administrator Passwords

Display Administrator Account Details

You can display details about all login accounts or about a specific login account. You can also review the accounts that are disabled or have incomplete contact information.

1. Navigate to System > **Global Settings** > Administrator Accounts.
2. Select the account you want to view, and then select Actions > View.
3. Review the displayed information to ensure that the account details are what you expect.
4. Click OK.

Related Links

View Administrator Account Dialog

Delete an Administrator Account

You might want to delete a login account when, for example, someone who has an account leaves the company.

1. Navigate to System > **Global Settings** > Administrator Accounts.
2. Select an account name from the Administrator Accounts list to that you want to remove.

3 Select Actions > Delete.
The system displays the Delete Account dialog.

4 Click OK.

Related Links

Creating Administrator Accounts
Modifying Administrator Accounts
Create an Administrator Account
Modify an Administrator Account

SNMP Trap Host Management

If you use Simple Network Management Protocol (SNMP) applications to monitor network devices, you can define SNMP trap hosts to receive Oracle FS System traps. Any workstation that has an SNMP-based management application installed on it can be a trap host.

Oracle Flash Storage Systems support SNMP version 2c. SET operations from SNMP management applications are not supported.

A management information base (MIB) table is a plain text file that provides the details on all system objects for which Oracle provides management information. To use the MIB file, you first download the file from the Utilities page of the Pilot management interface, and then import the file in to the SNMP management application.

Note: You can define event notifications as an alternative to SNMP.

Related Links

Download the MIB From the Pilot

System Objects That Can Be Monitored

The management information base (MIB) is self-documenting and lists the Oracle FS System resources that you can monitor. You can download the text-based MIB from the Utilities page of the Pilot management interface or using Oracle FS System Manager (GUI).

Some of the Oracle FS System resources that a system administrator can monitor are listed below. Some of this information can be used, for example, to graph or otherwise track the trend lines of certain resources, such as that for storage space and its utilization and for I/O operations for each second (IOPS) over certain time periods.

System Alerts

System Alerts are the notifications that the Oracle FS System generates to identify conditions that warrant investigation *and* action.

System Alerts include the following examples:

- Notifications about resources that are not fully operational, indicating a need for maintenance.
- Notifications about insufficient storage, indicating a need for a reallocation of resources, a cleanup of resources, or possibly the purchase of additional storage. This kind of information is important when an administrator has implemented thin provisioning for one or more logical volumes.

Call-Home or Manual Log Collection

Querying these resources, the administrator can check the following information:

- The time of collection
- The availability status
- The type of information that is contained in the logs

Running Tasks

Some tasks that are running in the background are normal management jobs such as scheduled clone replications or scheduled upgrades, or are the result of some administrative action. Other tasks, however, might indicate a condition in the Oracle FS System that is worth investigating, such as any of the following conditions:

- Pilot restarts
- System restarts
- Topology rediscovery

This category is also useful for seeing when a planned task has completed or might need recovery, such as when replicating a very large logical volume.

Scheduled Tasks

Querying this resource allows the administrator to determine which tasks are scheduled and when they are scheduled. Knowing this information can be useful in determining whether some traps or events can be expected.

Software Versions

Capturing software versions is useful in a large data center. To determine which Oracle FS System requires updates or to discover whether a software update is complete, you must access each system individually. Those multiple accesses can be combined into a single task by using an SNMP management utility to perform the queries.

Storage Usage

Monitoring short term trends and long term trends in capacity usage helps the system administrator avoid getting System Alerts warnings, for example, that Clone LUNs are being deleted to free up capacity. Because you can over-allocate

logical volumes when using the thin provisioning feature, such volumes need to be monitored and can require additional physical storage.

System Configuration

Use a central SNMP resource to view the configuration and the status of the resources of multiple systems, including:

- LUNs
- Interfaces
- Clones
- LUN mapping and masking

Traps

Traps are equivalent to email-based administrator alerts and provide another means of alerting system administrators to unfavorable storage conditions, which might result in a system alert.

Related Links

Download the MIB From the Pilot

Create SNMP Hosts

You can configure any workstation as a Simple Network Management Protocol (SNMP) host. When you set up an SNMP host, you can also set the threshold of the monitored event that will trigger a trap message to the SNMP host.

If you want to configure the SNMP server to monitor but not receive trap messages, clear the Receive Traps option.

1. Navigate to System > **Global Settings** > SNMP.
2. Select Actions > Create.
3. Enter a Name for the SNMP host.
4. Enter the values in the Host IP field and the Community String field to specify where the traps are directed.

   The community string must contain at least six characters.
5. (Optional) Select the Receive traps option to enable the Trap Port Number field.
6. (Optional) Enter the Trap Port Number.

   Valid values:

   - For SNMP queries, use port 161
   - For SNMP traps, use port 162
7. (Optional) Select the Severity threshold from the list of possible filters:

Informational	Requires no action for events that are information only.
Warning	Requires no immediate action for minor conditions that you can address at your convenience.
Critical	Requires prompt action to prevent system failures or offline conditions.

8 Click OK.

Related Links

Create SNMP Host Dialog
Modify SNMP Hosts
Delete SNMP Hosts
View SNMP Hosts

Modify SNMP Hosts

You can modify the hosts that receive Simple Network Management Protocol (SNMP) traps. You might, for example, need to modify the IP address of the trap host if you install your SNMP-based management application on a different workstation.

1 Navigate to System > **Global Settings** > SNMP.
2 From the SNMP Hosts overview page, select an SNMP host.
3 Select Actions > Modify.
4 Enter values for the attributes that you want to modify.
5 Click OK.

Related Links

Modify SNMP Host Dialog
Create SNMP Hosts
Delete SNMP Hosts
View SNMP Hosts

Delete SNMP Hosts

You can delete a host from the Simple Network Management Protocol (SNMP) configuration. For example, you might want to delete a host after you uninstall an SNMP-based management application from that host.

1 Navigate to System > **Global Settings** > SNMP.
2 From the SNMP Hosts overview page, select an SNMP host to delete.
3 Select Actions > Delete.
4 Click OK.

Related Links

Create SNMP Hosts
Modify SNMP Hosts
View SNMP Hosts

View SNMP Hosts

You can review a list of Small Network Management Protocol (SNMP) hosts that are configured on the Oracle FS System. For example, you might want to know the community string that a host uses for receiving traps.

1. Navigate to System > **Global Settings** > SNMP.
2. Review the list of SNMP trap hosts and ensure that the SNMP host details are what you expect.
3. To view details about a specific host, select a host from the list and select Actions > View.
4. Verify that the SNMP information is what you expect.
5. Click Close.

Related Links

View SNMP Host Dialog
Create SNMP Hosts
Modify SNMP Hosts
Delete SNMP Hosts

Download the MIB

The management information base (MIB) table that supports the Simple Network Management Protocol (SNMP) table lists the Oracle FS System resources that you can monitor. The file is available on the Pilot, but you can download it using Oracle FS System Manager (GUI).

1. Navigate to System > **Global Settings** > SNMP.
2. From the SNMP Hosts overview page, select an SNMP host.
3. Select Actions > Download Oracle FS System MIB.
4. From the Download Oracle FS System MIB dialog, click the browse button […] to proceed.
5. Navigate to the desired target download path and specify a filename.
6. Click OK.

Download the MIB From the Pilot

The management information base (MIB) table that supports the Simple Network Management Protocol (SNMP) table lists the Oracle FS System resources that you

can monitor. The file is available on the Pilot, which can be accessed from a web browser.

1. Start a web browser from your workstation.
2. Specify the public IP address of the Pilot or the name of the Oracle FS System as the address to open.
3. Click Utility Software.
4. Click Download Oracle FS System SNMP MIB.
5. From the web browser, save the file to your client workstation.

CHAPTER 3

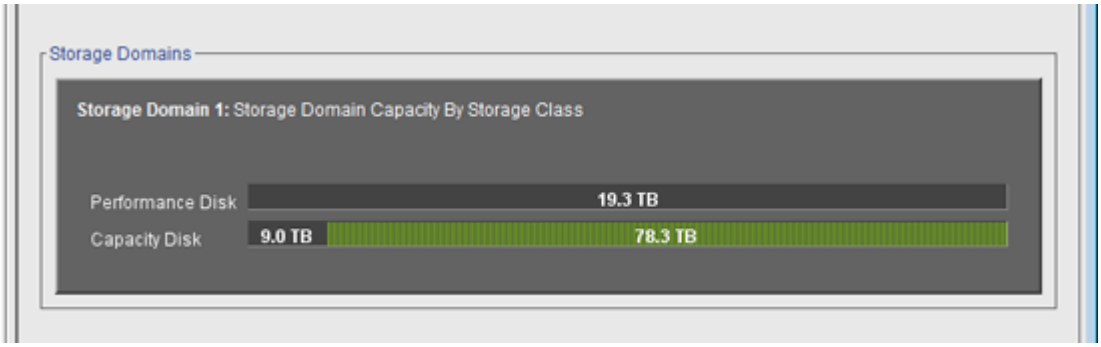
Manage Storage Groups

Display Capacity Usage

You can display the capacity usage of all Storage Domains by Storage Class and compare that usage to the total system capacity and to the assigned capacity limits of the Oracle FS System.

1. Navigate to System > Dashboard.
   The Dashboard shows the storage capacity for each Storage Domain in the system.
2. Review the displayed capacity usage for each Storage Domain.

Figure 4: Usage summary



Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Related Links

Dashboard Overview Page

Volume Groups

A volume group is an administrative system object that is used to organize logical volumes and, possibly, other volume groups. Volume groups can span Storage Domains. A volume group can contain logical storage objects, such as other volume groups, filesystems, LUNs, and Clone LUNs.

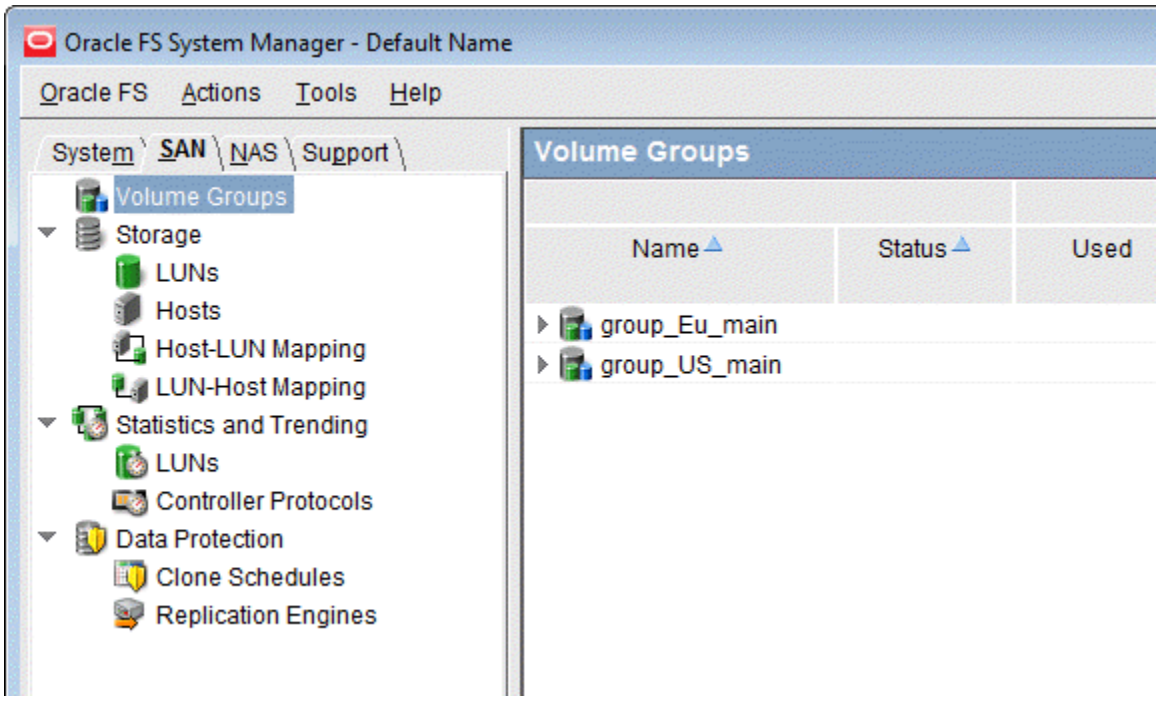
Volume groups have the following properties:

- Each volume group must have a unique name. No two volumes groups in an Oracle FS System can have the same name.
- The total number of volume groups is limited to 5000.
- The system allows up to 10 volume groups nested in a parent volume group.
- Volume groups allow you to group logical storage objects that reside in different Storage Domains.
- When deleting a volume group any nested objects, such as child volume groups, LUNs, or filesystems, will be deleted also.

You can use volume groups to organize the storage objects that parallel your organizational structure. For example, you might want to group all of your LUNs and filesystems that are located in the United States in one volume group, and the LUNs for the European sites in another volume group.

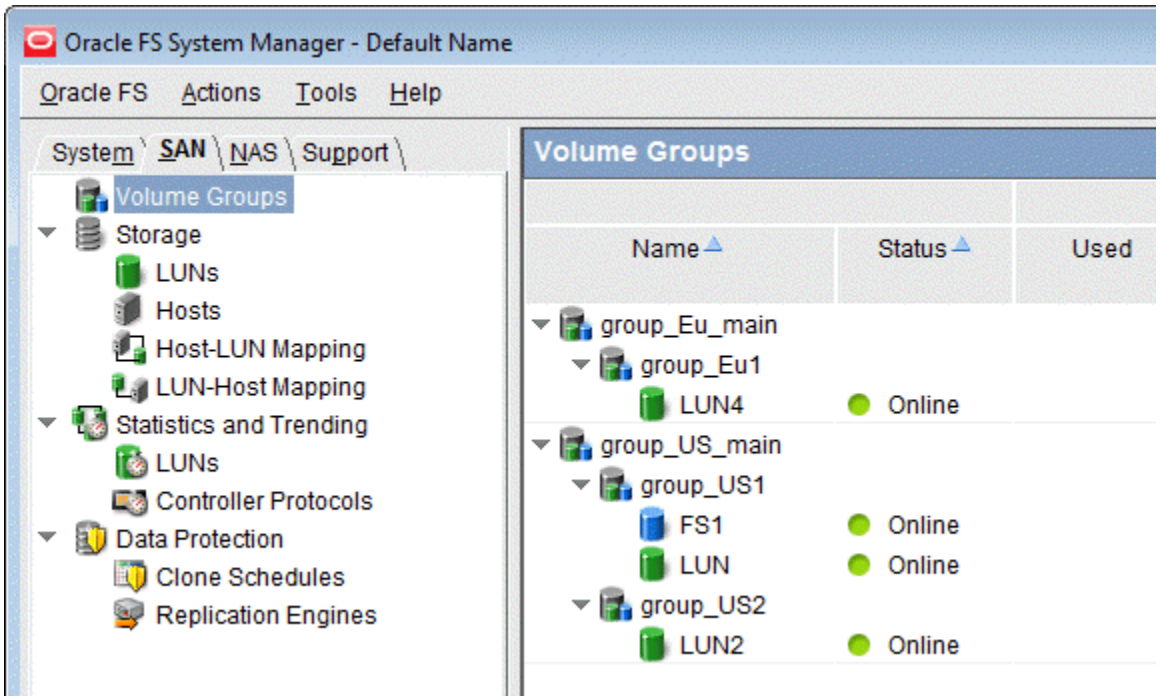
If you do not create nested volume groups, create all volumes within the default volume group to create a broad, shallow hierarchy.

Figure 5: Default volume group example



Create nested volume group by creating a parent volume group, and then assign logical volumes or other volume groups to the parent volume group.

Figure 6: Nested volume groups



Related Links

Display Volume Group Details
Create Volume Groups

Display Volume Group Details

You can view the hierarchal relationship of the volume groups and the assigned logical volumes.

1. Navigate to SAN > Volume Groups.
2. Review the characteristics of all of the available volume groups.

If necessary, you can reorganize and rename these groups.

Related Links

Volume Groups Overview Page
Volume Groups
Create Volume Groups
Delete a Volume Group
Rename a Volume Group

Create Volume Groups

Create volume groups when you want to organize logical volumes into organizational units.

1. Navigate to SAN > Volume Groups.
2. Select Actions > Manage Volume Groups.

3 Click Create.
The system creates a row for the volume group.

4 Enter the Volume Name for the volume group.

5 (Optional) From the Parent Volume Group Name list, select the volume group that you want to be the parent.

6 (Optional) To immediately delete the selected row, click Remove.

7 Click OK.

Related Links

Create Volume Group Dialog
Volume Groups
Add Volumes to a Volume Group
Add Volume Groups to a Volume Group

Add Volumes to a Volume Group

You can add logical volumes to an existing volume group as your system environment changes.

As you assign LUNs, filesystems, and possibly other volume groups to a selected volume group, Oracle FS System Manager (GUI) provides you with a preview of your selected change in the Volume Groups overview page.

1 Navigate to SAN > Volume Groups.

2 Select Actions > Manage Volume Groups.

3 From the Volumes tab, select the LUN or filesystem to add to the volume group.

4 From the Volume Group list, select the volume group in which you want to place the LUN or filesystem.

You can repeat Step 3 and Step 4 to add more volumes to the volume group.

5 Click OK.

Related Links

Manage Volume Groups, Volumes Tab
Create Volume Groups
Add Volume Groups to a Volume Group

Add Volume Groups to a Volume Group

You can add volume groups to an existing volume group as your system environment changes.

As you assign the volume group to the volume group, Oracle FS System Manager (GUI) provides you with a preview of your selected change in the Volume Groups overview page.

1. Navigate to SAN > Volume Groups.
2. Select Actions > Manage Volume Groups.
3. From the Volume Groups tab, select the volume group to modify.
4. Click Modify.
5. From the Parent Volume Group Name list, select the volume group that you want to be the parent.
6. Click OK.
7. Click OK.

Related Links

Manage Volume Groups, Volume Groups Tab
Create Volume Groups
Add Volumes to a Volume Group

Rename a Volume Group

If needed, you can modify the name of a volume group as the organization of your volume group changes.

1. Navigate to SAN > Volume Groups.
2. Select Actions > Manage Volume Groups.
3. From the Volume Groups tab, select the volume group that you want to rename.
4. Click Modify.
5. In Volume Name enter the new name for the volume group.
6. Click OK.

Related Links

Manage Volume Groups, Volume Groups Tab
Volume Groups
Delete a Volume Group
Display Volume Group Details

Delete a Volume Group

You can delete a volume group after you have reassigned all of its logical volumes to different volume groups.

1. Navigate to SAN > Volume Groups.
2. Select Actions > Manage Volume Groups.
3. From the Volume Groups tab, select a volume group to delete.

Note: If the volume group contains any objects, move or delete those objects before you delete the volume group.

4 Click Delete.

Related Links

Manage Volume Groups, Volume Groups Tab
Volume Groups
Display Volume Group Details

Move a Volume to a Different Volume Group

If needed, you can modify the association of your volumes to your volume groups. For example, after you create a volume group you can move one or more logical volumes from an existing volume group to the new volume group.

As you assign LUNs, filesystems, and possibly other volume groups to a selected volume group, Oracle FS System Manager (GUI) provides you with a preview of your selected change in the Volume Groups overview page.

1 Navigate to SAN > Volume Groups.
2 Select Actions > Manage Volume Groups.
3 From the Volumes tab, select a LUN or filesystem to move.
4 Select a Volume Group entry to modify the hierarchical structure where your volume is a child of the selected parent.

Tip: To move the volume outside of all custom volume groups, select <none>.

5 Click OK.

Related Links

Manage Volume Groups, Volumes Tab
Add Volumes to a Volume Group
Create Volume Groups

Move a Volume Group to a Different Volume Group

If needed, you can reorganize your volume groups. For example, you can remove the child volumes from a parent volume group.

As you assign LUNs, filesystems, and possibly other volume groups to a selected volume group, Oracle FS System Manager (GUI) provides you with a preview of your selected change in the Volume Groups overview page.

1 Navigate to SAN > Volume Groups.
2 Select Actions > Manage Volume Groups.
3 From the Volume Groups tab, select the volume group that you want to move.
4 Click Modify.

5 From the Parent Volume Group Name list, select the volume group that you want to be the parent.

Tip: To move the volume group outside of all custom volume groups, select <none>.

6 Click OK.

7 Click OK.

Related Links

Manage Volume Groups, Volume Groups Tab
Create Volume Groups
Add Volumes to a Volume Group

Storage Domains

Storage Domains give you the flexibility to store your data into logical groups that meet your storage requirements. Examples of such groups can include geographical location, or departmental function within your organization. You can also group your data by access frequency, or group your data by levels of confidentiality.

A Storage Domain is a virtual storage pool that consists of an assortment of drive groups. Each drive group contains drives of a particular Storage Class and of a particular capacity. The properties of the drive groups that comprise a Storage Domain can differ from one another. A Storage Domain can contain up to 1024 drive groups.

An administrator can allocate a particular drive group to a specific administrator-defined Storage Domain. When no administrator-defined domains exist, all of the drive groups reside in the default Storage Domain.

Volume groups allow you to logically organize your data based on the data content or geographical location. Storage domains allow you organize your content based on physical properties of the storage pool, such as Storage Class or auto-tiering capabilities.

Storage Domain Examples

Storage Domains enable storage administrators to assign logical volumes to specific Storage Domains. Such assignments can be made to reduce contention among volumes, to implement different levels of security for those volumes, or both. When more storage capacity is required, the administrator can add drive groups to the Storage Domain.

Storage administrators typically use Storage Domains for the following reasons:

User group separation	In this scenario, storage administrators can isolate application data to specific drive groups on a department basis (for internal cloud environments) or on a customer basis (in external cloud environments). This isolation

	eliminates interapplication contention for I/O services and provides charge-back capabilities.
Protocol separation	In this scenario, storage administrators can place application data on separate drive groups that are based on protocol and connectivity. This separation eliminates any chance of interapplication contention for I/O services. For example, an administrator could create a NAS domain, a SAN iSCSI domain, and a SAN FC domain.
Application I/O isolation	Storage administrators can create Storage Domains for use in specific applications and tiers of storage to eliminate unwanted drive group contention. For example, an administrator can place the Oracle DB indexes in a dedicated, SSD-based Storage Domain to isolate all other work from the indexes. The data table space and other components can be in a different Storage Domain.
Data security	Storage administrators can place logical volumes that contain sensitive data on a particular Storage Domain. If the data must be destroyed, the drives within those drive groups can be destroyed without the administrator having to be concerned with preserving less sensitive data. Placing those volumes in their own Storage Domain ensures that those volumes do not share drive groups with less sensitive material.
Drive group or hardware retirement	As drives age, the probability of failure increases. Storage Domains can efficiently move data to newer drive groups that have larger capacities.
Auto-tiering	Storage administrators can place all auto-tiered LUNs in a Storage Domain that is dedicated to the QoS Plus feature. The administrator can adjust the properties of the QoS Plus feature until the optimum configuration is found. The optimum configuration can then be used on other Storage Domains in the system.

Related Links

Volume Groups

Managing Storage Domains

Storage Domain Objects Illustrated

Create a Storage Domain

Storage Domain Compaction

The Oracle FS System compacts fragmented storage capacity, which is caused by deleted auto-tiered LUNs, and makes the capacity available for use.

The system allocates storage capacity for QoS Plus. During normal operations, storage capacity can become fragmented when capacity is freed from deleted

auto-tiered LUNs, but that freed capacity is not made available. Fragmented capacity makes inefficient use of the available storage capacity.

As needed, the system compacts the storage capacity in the drive groups that comprise of the Storage Domain. You can manually compact the Storage Domain to make the fragmented storage capacity available for use. During compact operations, any QoS Plus data migration is suspended. Compacting the Storage Domain cannot occur when there is insufficient storage capacity in the drive group.

Related Links

Storage Domains

Compact a Storage Domain

Storage Domain Integrity Check

The Oracle FS System continuously monitors and verifies the integrity of the data that is stored or changed on the Storage Domain. For auto-tiered LUNs, the system runs the integrity check to verify that the LUN data and the LUN address locations, which describes where the data resides, are not lost or corrupted.

In the event that the system detects a problem with the auto-tier address location, the system sends a `Volumes Have Lost Mappings` system alert. Lost mappings is a condition in which data on the auto-tiered LUNs might not be accessible or available. The integrity check on the Storage Domain begins immediately after the discovery of the lost mappings. This check cannot be cancelled by the administrator. The integrity check can take several minutes to several hours to complete. The actual time depends on the number of LUNs and the amount of data that the system checks.

During the integrity check, the system verifies that the locations to the auto-tier data is correctly reported. If the Storage Domain has the Tier Reallocation option disabled, then the integrity check does not apply.

The system also automatically runs the integrity check in the following circumstances:

- After a restart operation resulting from the system not shutting down cleanly.
- After a Controller failover.
- After a warmstart, if the administrator does not respond to a `Lost Data` system alert.
- After a warmstart, if the system did not complete its data mappings or data migrations.
- After detecting a media error on a metadata volume. The media error can also result in `Volumes Have Lost Mappings` but the system does not wait for your response before proceeding with the integrity check.

You can initiate an integrity check on the Storage Domain at any time, or as instructed by Oracle Customer Support. If you initiate the integrity check while the system is already performing the check, the system ignores your request.

Related Links

Storage Domains

Check the Integrity of a Storage Domain

Storage Domain Objects Illustrated

Storage organization can be illustrated using a diagram that includes various components of the Storage Domain, drive groups, volume groups, and logical volumes.

Storage Domain Management

Storage administrators can perform regular management actions for any logical volume residing in a Storage Domain, including:

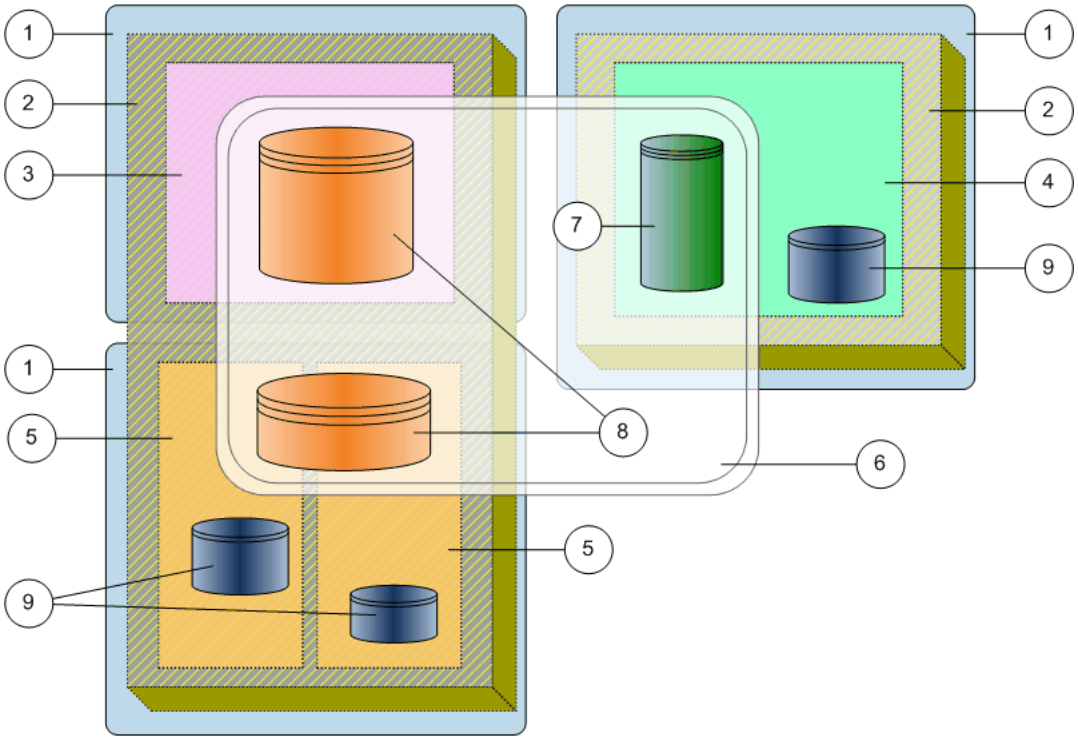
- Create logical volumes within a domain.
- Create volume copies within the same or different domain.
- Create clones of logical volumes contained in a domain.
- Move logical volumes to a different volume group or a different Storage Domain.
- Delete logical volumes from a domain.

Note: All allocation for a logical volume is confined to the drive groups within a Storage Domain.

Storage Domain Illustration

The following figure illustrates two Storage Domains and six logical volumes that are distributed across those domains. This illustration also shows the relationships among those Storage Domains and other storage objects.

Figure 7: Storage Domains and other storage objects



Legend		
	1 Drive groups	6 Volume group
	2 Storage Domains	7 Single-tier SAN LUN
	3 Capacity HDD drive group	8 Auto-tier SAN LUNs
	4 Performance HDD drive group	9 Filesystem data tiers
	5 Performance SSD drive groups	

In the illustration, a volume group (annotation 6) contains three logical volumes (annotations 7 and 8), which spans two Storage Domains (annotation 2). A volume group can contain logical storage objects, such as other volume groups, filesystems, LUNs, and Clone LUNs.

You can have a drive group that is not assigned to any Storage Domain. This unassigned state is usually temporary. While in this state, the capacity of the drive group is not included as free or available capacity. The causes of an unassigned state for a drive group include:

- Drives have been added to a Drive Enclosure.
- A drive group was removed from a Storage Domain.

Related Links

Storage Domains
Volume Groups
Moving Volumes
Create a Storage Domain

Managing Storage Domains

Occasionally, a storage administrator must perform certain management actions on a Storage Domain.

When an Oracle FS System starts up for the first time after installation, that system has one Storage Domain that contains all of the drive groups that are available in the system. That domain is referred to as the *default* Storage Domain. You can create additional Storage Domains by removing one or more of those drive groups from the default domain and adding them to new Storage Domains.

When you create a Storage Domain, ensure that sufficient storage capacity exists. You can add capacity to the Storage Domain in the following ways:

- Remove drive groups from the default Storage Domain and add those drive groups to the Storage Domain.
- Add more drives to an existing Drive Enclosure.
- Add more Drive Enclosures.

You can create a Storage Domain without drive groups. Such a Storage Domain contains no storage capacity and therefore cannot be assigned to a logical volume.

Managing your Storage Domains involves the following activities:

- Creating, modifying, and deleting the Storage Domains
- Adding drive groups to the Storage Domain
- Removing drive groups from the Storage Domain
- Compacting and verifying the Storage Domains
- Generating an auto-tier effectiveness report
- Viewing the auto-tier storage capacity

The Oracle FS System provides some advanced options for controlling the QoS Plus feature, which is called *Auto-tier* in the GUI. Use caution when performing any of the following activities:

- Disabling the tier reallocation feature
- Disabling the collection of tier reallocation statistics
- Optimizing auto-tier performance
- Allocating the auto-tier storage capacity

Related Links

Capacities
Data Migration
Effectiveness of QoS Plus
Provisioning Storage Domains
Create a Storage Domain
Optimize Auto-Tier Scans
Compact a Storage Domain
Delete a Storage Domain

Provisioning Storage Domains

When logical volumes already exist on a Storage Domain, provisioning the Storage Domain by adding or removing drive groups can cause data migration. Data migration can occur when a drive group that contains a volume is moved to another Storage Domain.

The system notifies you that attempting to perform any of the following actions causes data migration:

- When moving an existing volume to another Storage Domain, the target Storage Domain must have sufficient capacity for the volume. If sufficient capacity exists, the system migrates the volume data.
- When moving a drive group from one Storage Domain to another, you must allow the system to migrate all of the volumes off of the source drive group. Then, the drive group can be added to the target Storage Domain.
- If the drive group contains volumes, when you remove the drive group from the source Storage Domain, then the system migrates the volumes from the drive group to another drive group in the Storage Domain. Ensure that sufficient free capacity exists on the Storage Domain to move the volumes from one drive group to another.
- When reassigning a drive group that contains part or all of a volume, the existing Storage Domain that contains that drive group must have sufficient free capacity in other drive groups. This free capacity accommodates the loss of the drive group that is being moved to another Storage Domain. When the drive group is moved, the system migrates the volume data onto the remaining drive groups.
- When you add a drive group to the Storage Domain, you have the option to rebalance the existing volumes in the Storage Domain. Enable rebalance is the default, which maximizes the performance of the existing volumes that might not have sufficient capacity in the drive groups.

Important: The Storage Domain must have sufficient free capacity on the target Storage Domain to hold the entire volume that is being migrated. For a drive group, both the source and target drive groups must have sufficient storage capacity to hold the data that is being migrated.

The system also provides you the following information:

- A list of the volumes (and their associated repositories) that will require data migration
- A message indicating whether enough capacity exists to move those volumes into the selected Storage Domain
- A message indicating whether enough capacity exists for the remaining volumes to reside in an existing Storage Domain

Related Links

Moving Volumes
Storage Domains
Drive Groups
Create a Storage Domain

Create a Storage Domain

Storage Domains allow you to assign logical volumes to a specific collection of drive groups. For example, Storage Domains allow administrators to partition storage for specific users or departments in a public or private cloud storage environment.

Assigning volumes to specific Storage Domains can reduce I/O contention among volumes.

1. Navigate to System > Storage Domains.
2. Select Actions > Create Storage Domain.
3. Enter the name of the Storage Domain.
4. (Optional) Select the Background Process Priority that the system uses to respond to migrating data.

   Possible choices:

   - System Chooses
   - Minimize Impact
   - Maximize Speed
5. (Optional) Select the tier reallocation options.

   Possible choices:

   - Enable Tier Reallocation
   - Enable Tier Reallocation Statistics Collection
6. (Optional) Optimize the Auto-Tier Scan Options.

   Possible choices:

   - Performance-Optimizing Scan Cycle
   - Number of n-hour Scan Cycles

   Note: Select the lock icon to unlock and lock the fields.

The system calculates the Cost-Optimizing Scan Cycle value.

7 (Optional) In the Allowable Storage Capacity for Auto-Tiered LUNs field, enter the percentage of the storage capacity to allocate for each available Storage Class that is listed.

8 Click OK.

The Storage Domain now appears in the list of domains.

After you create a Storage Domain, add one or more drive groups to the domain so you can assign logical volumes in the domain. The number of drive groups that you add to a Storage Domain and the Storage Classes available in those drive groups directly affect the performance of the volume that is on that domain.

Related Links

Create Storage Domain Dialog
Storage Domains
Managing Storage Domains
Moving Volumes
Delete a Storage Domain

Rename a Storage Domain

Sometimes you might want to change the name of a Storage Domain to a more meaningful name.

Changing the name of a Storage Domain does not affect the data or other configurations of the domain.

1 Navigate to System > Storage Domains.
2 Select the Storage Domain to update.
3 Select Actions > Modify Storage Domain.
4 Update the Name of the Storage Domain.
5 Click OK.

Related Links

Modify Storage Domain Dialog
Create a Storage Domain
View the Properties of a Storage Domain

Update the Background Process Priority

You might need to adjust the background process priority for the Storage Domain because your system is not migrating data efficiently. For example, you can lower the migration priority to provide more resources for user data operations.

1 Navigate to System > Storage Domains.
2 Select the Storage Domain to update.

3 Select Actions > Modify Storage Domain.

4 Select the Background Process Priority that the system uses to respond to migrating data.

Possible choices:

- System Chooses
- Minimize Impact
- Maximize Speed

5 Click OK.

Related Links

Modify Storage Domain Dialog
Managing Storage Domains
Optimize Auto-Tier Scans

View the Properties of a Storage Domain

You can view the properties of a Storage Domain, such as the capacity for each Storage Class, the settings for the background activity, and properties for auto-tier (QoS Plus).

You can view the following properties of a Storage Domain from the View Storage Domain dialog:

- Storage capacities by Storage Class
- Priority of background processes
- Tier reallocation and the collection of statistics
- Scan cycling for QoS Plus
- Limits to the QoS Plus storage capacity

1 Navigate to System > Storage Domains.

2 Select the Storage Domain to view.

3 Select Actions > View Storage Domain.

4 Review the displayed information.

5 Click Close.

Related Links

View Storage Domain Dialog
Limit the Storage Capacity for QoS Plus
Update Tier Reallocation Options
Optimize Auto-Tier Scans
Update the Background Process Priority

Limit the Storage Capacity for QoS Plus

When premium storage capacity is limited, you can specify that the Storage Domain use only a specified percentage of the capacity for the QoS Plus feature.

Note: Reducing the amount of QoS Plus storage capacity below the amount of capacity that is currently being used causes the system to migrate data to available Storage Classes only if the storage capacity is available. You might need to free some storage capacity before the system can use the desired allocated percentage of your storage capacity.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to update.
3. Select Actions > Modify Storage Domain.
4. In the Allowable Storage Capacity for Auto-Tiered LUNs field, enter the percentage of the storage capacity to allocate for each available Storage Class that is listed.
5. Click OK.

Related Links

Modify Storage Domain Dialog
View Storage Allocation Details
Optimize Auto-Tier Scans

Update Tier Reallocation Options

You can temporarily disable one or both of the following aspects of storage tier reallocation: the migration of data and the collection of statistics. For example, disabling the migration of data allows you to suspend data tier reallocation for all of the auto-tiered LUNs in the Storage Domain.

Important: Disabling the tier reallocation options affects data migration for all of the LUNs that are assigned to the selected Storage Domain. Use caution before disabling these features.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to update.
3. Select Actions > Modify Storage Domain.
4. (Optional) Deselect the Enable Tier Reallocation option.
5. (Optional) Deselect the Enable Tier Reallocation Statistics Collection option.
6. Click OK.

To resume normal tier reallocation operations, remember to enable the tier reallocation and statistics options.

Related Links

Modify Storage Domain Dialog
Data Migration
View Storage Allocation Details
Optimize Auto-Tier Scans

Optimize Auto-Tier Scans

For the selected Storage Domain, you might need to optimize the frequency with which the Oracle FS System scans the data access patterns of the auto-tiered LUNs.

The Oracle FS System scans the data access patterns of the auto-tier LUNs to determine the best time to place data in the Storage Classes within the Storage Domain. You can optimize the auto-tier scans by lengthening or shortening the time between scans. A shorter time span increases the number of scans and results in frequent data migration. A longer time span might represent the actual data access patterns of your system.

Important: Adjusting the auto-tier scans might affect the efficiency of the QoS Plus feature. Use caution before adjusting the scan options.

For example, setting the Number of n-hour Scan Cycles too low can move data that is accessed frequently over a long time period to be moved to a lower performance drive.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to update.
3. Select Actions > Modify Storage Domain.
4. Select the lock icon ( ) to unlock the Auto-Tier Scan Options.
5. (Optional) In the Performance-Optimizing Scan Cycle field, enter the frequency value.
6. (Optional) In the Number of n-hour Scan Cycles field, enter the cycles value.
   The system calculates the Cost-Optimizing Scan Cycle value.
7. Click OK.

Reset the auto-tier scan options to the default values when the custom settings are no longer needed.

Related Links

Modify Storage Domain Dialog
Data Migration
Effectiveness of QoS Plus
View Storage Allocation Details
Managing Storage Domains

Compact a Storage Domain

You might want to compact the storage tier capacity that is unavailable in the Storage Domain. After the compacting is complete, the system has free capacity that is available for use.

The Oracle FS System compacts the QoS Plus storage capacity on a regular basis. However, you can manually compact the Storage Domain as needed. For example, you might want to compact the Storage Domain after you have deleted a number of auto-tier LUNs and need to quickly release any unavailable storage capacity.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to update.
3. Select Actions > Compact Storage Domain.

   The Storage Domain status changes to Background Activity.
4. Click OK.
5. Click OK.

When the compact process is complete, the Storage Domain status changes to Normal. You can monitor the compaction process by selecting Tasks from the status bar. The free storage capacity should increase after you have compacted the unavailable storage capacity.

If the compacting process is taking too long, or if the process impacts system performance, you can cancel the process by selecting Actions > Cancel Compact Storage Domain.

Related Links

Storage Domains Overview Page
Reclaiming Capacity
Storage Domains
Storage Domain Compaction
Managing Storage Domains

Check the Integrity of a Storage Domain

You can check the integrity of a Storage Domain when you suspect that the auto-tier data might be lost or corrupted. You might also be requested by Oracle Customer Support to run an integrity check.

Note: The Oracle FS System automatically runs the integrity check when the system has encountered a `Volumes Have Lost Mappings` system alert.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain on which to run the integrity check.
3. Select Actions > Verify Storage Domain.
   The Storage Domain status changes to Background Activity.
4. Click OK.

When the integrity check is complete, the Storage Domain status changes to Normal. You can monitor the process by clicking Tasks on the status bar.

If the verification process that you initiated is taking too long, or if the process impacts system performance, you can cancel the process by selecting Actions > Cancel Verify Storage Domain.

Note: Cancelling the verification process does not affect the system or data.

Related Links

Storage Domains Overview Page
Storage Domain Integrity Check
Storage Domains
Managing Storage Domains

View Storage Allocation Details

You might want to view the allocated storage capacity in a Storage Domain, which includes both capacities by RAID type and immobile storage capacity. If the capacities are nearly full, you might consider increasing the storage capacity in the Storage Domain.

If you notice that both RAID 10 and immobile capacities are nearly full, consider one or all of the following actions:

- Increase the high performance storage capacity in your Storage Domain for auto-tiered LUNs.
- Increase the percentage storage capacity limit that is set for auto-tier LUNs.
- Reduce immobile capacity by allowing the system to use low cost storage capacity for auto-tier LUNs.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to view.
3. Select Actions > View Storage Allocation Details.
4. Review the displayed information.
5. Click Close.

Related Links

Storage Domains Overview Page
Managing Storage Domains
Storage Domains
Limit the Storage Capacity for QoS Plus

Delete a Storage Domain

When you no longer need a Storage Domain, you can delete it.

Prerequisites

- The Storage Domain that you want to delete must not contain any logical volumes. If the Storage Domain contains any logical volumes, delete those volumes or move those volumes to another Storage Domain.
- The Storage Domain that you want to delete must not have any drive groups assigned to the domain. If any drive groups are assigned to the Storage Domain, perform the following actions:
  - If any of the drive groups contain any logical volumes, delete those volumes or move them to another Storage Domain.
  - Remove the drive groups from the Storage Domain.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to delete.
3. Select Actions > Delete Storage Domain.
4. Click OK.
   One of the following occurs:
   - If the operation is successful, the Storage Domain is removed from the system.
   - If the operation is unsuccessful, the system does not remove the Storage Domain and displays an appropriate error dialog:
     - The Storage Domain contains one or more logical volumes.
     - The Storage Domain has one or more drive groups assigned to it.

     If the operation is unsuccessful, move any volumes residing on the Storage Domain to another Storage Domain, if appropriate. Then remove the drive groups.

Related Links

Storage Domains Overview Page
Managing Storage Domains
Create a Storage Domain

Moving Volumes

Sometimes you might want to move a logical volume from one Storage Domain to another Storage Domain to improve the performance of that volume.

For example, if a Storage Domain is being used to support an Oracle DB application, you might want to move the database indexes into a higher-performance Storage Domain that is separate from the Storage Domain in which the database tables are located.

When you move a volume to a different Storage Domain, the system prompts you to select another Storage Domain for the volume. If sufficient free capacity exists to migrate the data to the other domain, the move request succeeds; otherwise, the system returns an error. The system successfully moves the volume when the following conditions are met:

- Sufficient free storage capacity exists in the target Storage Domain.
- For QoS Plus volumes, the target Storage Domain contains lower Storage Classes.

When the system migrates a volume with a populated clone repository to another Storage Domain, the system does not migrate the repository to the other Storage Domain. Instead, the clones remain in the original Storage Domain.

If the clone repository is empty, the system creates a repository in the other Storage Domain after the migration is complete.

Related Links

Storage Domains
Move a Volume to Another Storage Domain

Move a Volume to Another Storage Domain

Move a logical volume to another Storage Domain, for example, when you want to remove the drive group on which the volume resides. You also might want to move a volume to a Storage Domain that is dedicated for a specific purpose, such as storing database indexes.

Prerequisite	A target Storage Domain with sufficient free capacity to accept the logical volume. The target Storage Domain can contain the same or different Storage Class.

Note: Moving logical volumes and removing the drive groups from the Storage Domain are performed as separate actions.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to move.
3. Select Actions > Modify.
4. In the Storage Domain list, select the Storage Domain to which you want to move the LUN.
5. (Optional) Select a Storage Class from the available list for the target Storage Domain.
6. Click OK.
   One of the following occurs:
   - If the operation is successful, the system begins a background task to migrate the volume to the new Storage Domain. Also, the system releases and reconditions the storage in the previous domain.

- If the operation is unsuccessful, the system does not migrate the volume but instead displays an appropriate error dialog:
  - The target Storage Domain has insufficient free capacity of the selected Storage Class. To resolve, remove unneeded volumes that consume capacity on the drive groups of that Storage Class. You can also add drive groups or add more storage capacity to the drive group.
  - The target Storage Domain does not contain enough storage capacity. To resolve, add to the target Storage Domain one or more drive groups of the desired Storage Class.

Related Links

Modify SAN LUN, Quality of Service Tab, Auto Tier
Modify SAN LUN, Quality of Service Tab, Single Tier
SAN LUNs Overview Page
Moving Volumes

Drive Groups

A drive group is a logical object that manages a collection of drives of the same Storage Class, all of which are from the same Drive Enclosure. The maximum number of drive groups in the Oracle FS System is 1024.

A drive group belongs to a single Storage Domain. A drive group can also be unassigned, which means that the group can be assigned to any Storage Domain.

Managing the drive groups involves the following activities:

- Assigning the primary drive group to another drive group in the system
- Removing drive groups from a Storage Domain
- Adding drive groups to a Storage Domain
- Viewing the status of the drives in a drive group
- Viewing the RAID status across all of the volumes that occupy the drive groups

Related Links

Configure Drive Group Real-Time Statistics
Assigning Drive Groups
View the Properties of a Drive Group
Make a Drive Group the Primary Drive Group

Drive Group Data Protection

The Oracle FS System copies data away from a drive that is predicted to fail.

The data of a logical volume is striped across the drives in several drive groups. The data from several volumes can even be located on the same drive group. The

data from all of these volumes is protected by one or more levels of RAID. Because of this striping, a given drive can contain data from multiple volumes. As a result, a particular drive might be supporting several levels of RAID.

When one of the drives within a drive group fails or is about to fail, the system assigns an appropriate status to the data blocks that are located on the affected drive. The status of one data block might differ from the status of another data block, even though both data blocks reside on the same drive. If the statuses differ, the difference in the statuses results from the RAID level of those data blocks being different.

Within a given drive group, the system treats all of the data blocks that are protected by the same RAID level as a group. The system groups them by RAID level for reporting purposes.

Related Links

Data Integrity on the Drives
High Availability
Priority Level and Performance
Drive Groups
View the Properties of a Drive Group

List Drive Groups in a Storage Domain

You might want to know the state of each drive group and the state of the drives in those drive groups.

The Storage Domains overview page lists all of the drive groups, by Storage Domain.

1. Navigate to System > Storage Domains.
2. Review the displayed information.
3. Click OK.

Related Links

Storage Domains Overview Page
Drive Groups
Assigning Drive Groups
Storage Domains
View the Properties of a Drive Group

View the Properties of a Drive Group

You can view the properties of a drive group and its included drives to determine, for example, whether a particular drive might need to be replaced.

You can view the drive group properties, such as whether a drive group is primary. Use the Modify Drive Group action to view drive details and status.

1. Navigate to System > Storage Domains.
2. Select the drive group that want to view.
3. Select Actions > Modify Drive Group.
4. From the list of Replaceable Units, select a drive in the drive group.
5. Review the drive properties on the right side of the dialog.
6. Click OK.

Related Links

Modify Drive Group Dialog
Storage Domains Overview Page
Drive Groups

Primary Drive Group Description

The primary drive group is the drive group in an Oracle FS System that contains the system-wide Persistence volume. The Persistence volume is the internal name of the volume that contains the system configuration database. The system contains one primary drive group.

If only one drive group exists, the drive group is the primary drive group. If the system contains more than one drive group, the system selects one of the drive groups to be primary.

You can change the primary drive group at any time. The Oracle FS System places the primary drive group on the lowest Storage Class in the system. If you add Drive Enclosures to the system that are a lower Storage Class than the existing classes, the system automatically migrates the primary drive group to the new lowest Storage Class. The system then migrates the system configuration database that is contained in the Persistence volume to the newly assigned primary drive group.

Note: Assign the primary drive group to a lower Storage Class, such as Capacity hard disk drive (HDD).

If a nonprimary drive group becomes the primary drive group, the system migrates the system data to the new primary drive group. The administrator cannot cancel this special data migration.

For a new Oracle FS System, or after a system reset, the following sequence occurs:

- The system starts with no system configuration database.
- When powered up, the system discovers all of the Drive Enclosures and creates drive groups to contain the discovered drives.
- The system assigns one of the drive groups as the primary drive group. The default primary drive group contains drives with the lowest Storage Class in the system, such as Capacity Disk.

- The system assigns all of the remaining drive groups that it created to a default Storage Domain.
- The system then writes the initial configuration to the Persistence volume in the primary drive group.

If more Drive Enclosures are added to the system, and those Drive Enclosures contain a lower Storage Class, the system automatically designates one of the drive groups in the new Drive Enclosure as primary. The system then migrates the system configuration database contained in the Persistence volume to that new, primary drive group.

Related Links

Assigning Drive Groups

Make a Drive Group the Primary Drive Group

Make a Drive Group the Primary Drive Group

You can make another drive group the primary when, for example, you plan to replace drives in the existing primary drive group.

The primary drive group is identified by the icon.

Note: Assign the primary drive group to a lower Storage Class, such as Capacity hard disk drive (HDD).

1. Navigate to System > Storage Domains.
2. Select the drive group that you want to become the primary drive group.
3. Select Actions > Modify Drive Group.
4. Select the Make this drive group the primary drive group option.
5. Click OK.

The system runs a background process to move the system configuration database to the new primary drive group. When the background process completes, the system moves the primary drive group icon to the new primary drive group.

Related Links

Modify Drive Group Dialog

Drive Groups

Primary Drive Group Description

Assigning Drive Groups

Sometimes you might need to assign an existing drive group to another Storage Domain.

You can add multiple drive groups to a Storage Domain at one time. Wait for any background processes to complete before assigning existing drive groups to a

Storage Domain. You can view the background processes from the Tasks button on the status bar.

Reassigning drive groups from one Storage Domain to another is a two step process:

Step one — Remove the drive groups from the first Storage Domain.

You can remove multiple drive groups from a Storage Domain at one time, but you can only remove drive groups from one Storage Domain at a time. When this step completes, the drive groups are designated as unassigned.

Note: The system allows you to perform one operation to remove drive groups from a Storage Domain (or add drive groups to a Storage Domain). The add or remove operation can include multiple drive groups.

Removing the drive groups requires that the Oracle FS System migrate the data to the other drive groups in the Storage Domain. If sufficient storage capacity does not exist on the other drive groups, then the drive group removal fails.

Migrating drive group data from the drive groups can take many hours to complete, and the system migrates only one drive group at a time. To conserve system resources, plan your drive group removals carefully. You can specify the resource priority that the system uses to migrate your data. The following priorities are available to complete your request:

System Chooses	(*Default*) Specifies that the system balances the resources that are needed for background data movement with the resources that are needed to service the incoming client I/O.
Minimize Impact	Specifies that the system restricts the amount of system resources that are given to the background data movement operation. This option minimizes the impact on client I/O. Recommended for highly-loaded Storage Domains.
Maximize Speed	Specifies that the system grants resource priority to the background data movement operation. This option reduces the amount of system resources that are available for client I/O. Recommended for lightly-loaded Storage Domains.

Step two	Assign the unassigned drive groups to the second Storage Domain.

Related Links

Drive Groups
List Drive Groups in a Storage Domain
Remove Drive Groups From a Storage Domain
Add Drive Groups to a Storage Domain

Remove Drive Groups From a Storage Domain

Remove drive groups from a Storage Domain when you need to remove drive groups of a particular Storage Class. You might also need to remove the drive groups to assign the drive groups to another Storage Domain.

Prerequisite	Sufficient Storage Domain capacity to receive the data that is migrating from the removed drive group.

When you remove a drive group from the Storage Domain, the system migrates any volume data to the remaining drive groups in the Storage Domain, if sufficient free capacity exists on the remaining drive groups. This migration can take several hours to complete. Plan to remove the drive groups when the system is idle or when the system has minimal I/O activity.

1. Navigate to System > Storage Domains.
2. Select all of the drive groups that you want to remove from the Storage Domain.
3. Select Actions > Remove from Storage Domain.
4. Select the Migration Priority for the drive group removal.
5. Click OK.
6. (Optional) Click Tasks from the status bar to view the detailed status of the task that is removing the drive group.

The system places the drive groups that were successfully removed into an unassigned category. You can now add the unassigned drive groups to another Storage Domain.

Related Links

Remove from Storage Domain Dialog
Storage Domains Overview Page
Assigning Drive Groups

Add Drive Groups to a Storage Domain

Add drive groups when you need to add particular Storage Classes to a Storage Domain. You might also need to add the drive groups to a Storage Domain to increase storage capacity.

Prerequisite Drive groups with an unassigned status.

1. Navigate to System > Storage Domains.
2. Select all of the drive groups that you want to add to a Storage Domain.
3. Select Actions > Add to Storage Domain.
4. Select the Storage Domain to which you want the drive group to be assigned.
5. (Optional) To distribute data from the other drive groups in the Storage Domain to the drive groups that you are adding, select the Rebalance volume data option.
6. Confirm that the drive groups that you selected are listed in the Drive groups to be included list.
7. (Optional) Select the Include check box for any Additional Drive Groups to Include in the Storage Domain.
8. Click OK.
   The system begins assigning the drive groups to the selected Storage Domain.
9. (Optional) Click Tasks from the status bar to view the detailed status of the task that is adding the drive groups.

Related Links

Add to Storage Domain Dialog
Storage Domains Overview Page
Assigning Drive Groups

CHAPTER 4

About QoS and Provisioning

QoS Policies

Quality of Service (QoS), in general, defines a set of attributes for a logical volume that affects how the volume utilizes storage and the priority that the Oracle FS System gives to the I/O requests that target the volume.

When creating a logical volume, the administrator can select for the volume *regular* QoS features or *enhanced* QoS features (which are collectively referred to as *QoS Plus*):

- The administrator creates a regular QoS volume by selecting the Single tier option in the GUI. Such a volume is sometimes referred to as a *single-tiered* volume.
- The administrator creates a QoS Plus volume by selecting the Auto-tier option in the GUI. Such a volume is sometimes referred to as an *auto-tiered* volume.

When defining a logical volume, an administrator can set the QoS policies for the following properties of the volume:

Storage Class	The preferred type of storage media on which to place the user data initially. For QoS Plus volumes, the Storage Class and the RAID level of a volume determine the initial placement of the data. Subsequently, the data usage statistics determine whether the data is migrated to another storage tier. Infrequently used data is moved to more cost-effective but lower-performance storage, while frequently used data is moved to a storage tier that has better performance characteristics.
Priority	A relative attribute that the system uses to set the importance and the treatment of logical volumes. A volume with a higher priority than another volume receives precedence in the handling of access requests. A higher priority also allows a larger share of typically finite resources, such as the storage tiers and the system cache. Because the priority setting is relative, setting priorities to all low values or to all high values has the same effect, which nullifies the opportunity to distinguish between the service levels of volumes.

RAID level	The type of data protection and the degree of data protection from drive failures. The type of protection influences the performance characteristics of the volume. The degree of protection determines the number of failures that can occur in a RAID group before having to restore the data from a backup of some kind.
Read-ahead policy	The degree to which the storage system anticipates continuing read requests beyond an outstanding request. Correct anticipation greatly improves performance, while incorrect anticipation can waste system resources. By specifying a read-ahead policy, the administrator can provide an effective hint to the system to get the desired results of reading additional data blocks.

The RAID level and the read-ahead policy comprise the advanced view of the QoS properties for a volume. The RAID level and the read-ahead policy can be defined indirectly through the basic view of QoS. The basic view consists of the following properties:

- The level of redundancy (single or double)
- The predominant access method (random, sequential, or a mix of the two access methods)
- The predominant type of I/O request (read, write, or a mix of the two request types)

You can access the basic view of QoS by selecting a custom Storage Profile for the volume.

Related Links

Access Bias
Defining QoS Properties
I/O Bias
Priority Level and Performance
QoS Plus Overview
Redundancy and Data Protection
Storage Class Description

Defining QoS Properties

In addition to the Storage Class and the priority level for a logical volume, you must also define two other Quality of Service (QoS) properties for the volume: the RAID level and the read-ahead policy. The Oracle FS System provides two approaches to defining the RAID level and the read-ahead policy.

Note: When you create a LUN, the system automatically sets the RAID level and the read-ahead policy. You can override those default properties from the Create SAN LUN dialog by selecting Custom in the **Storage Profile** field.

You can customize the settings for the RAID level and for the read-ahead policy by using one of the following approaches:

Basic approach	Using the basic approach, you indirectly specify the RAID level and the read-ahead policy for the volume. Using this approach, you specify the data redundancy, the I/O bias, and the access bias of a logical volume. These QoS properties are referred to as the *basic* QoS properties of the volume.
Advanced approach	Using the advanced approach, you directly specify the RAID level and the read-ahead policy for a logical volume. These QoS properties are referred to as the *advanced* QoS properties of the volume.

Note: In Oracle FS System Manager (GUI), when customizing the QoS properties of a logical volume, you can set the basic QoS properties of the volume and then map them to the advanced QoS properties. You cannot, however, set the advanced QoS properties and then map them to the basic QoS properties.

The following table summarizes how the basic QoS properties map to the advanced QoS properties of a volume.

Table 7: Mapping QoS properties

Initial Storage Class	Initial redundancy	Basic QoS properties		Advanced QoS properties	
		Initial typical access	Initial I/O bias	Initial RAID level	Initial read-ahead
Capacity disk	Double	Sequential	Read	RAID 6	Aggressive
		All others	All others	RAID 6	Normal
All other Storage Classes	Single	Sequential	Read	RAID 5	Aggressive
		Random	Write	RAID 10 (mirrored)	Normal
		All others	All others	RAID 5	Normal

Related Links

Managing SAN LUNs
Access Bias
I/O Bias
Priority Level and Performance
Redundancy and Data Protection
Storage Class Description

Storage Class Description

The Storage Class QoS property allows you to specify the preferred storage media to use for a logical volume.

A Storage Class is a specific categorization of SAS physical storage, each category having distinct characteristics with regard to capacity and to data access performance. Available Storage Classes:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

A Storage Class relates to storage objects in the following ways:

- A newly created LUN that is using regular QoS (a single-tiered LUN) is associated with one Storage Class.
- A newly created LUN that is using QoS Plus (an auto-tiered LUN) is associated initially with one Storage Class. At a later time, an auto-tiered LUN migrates fully or partially onto the most cost-effective and the most performance-effective Storage Classes according to the use patterns and to the QoS priority level of the LUN.
- A newly created, single data tier filesystem is associated with one Storage Class.
- A newly created filesystem that has multiple data tiers can be associated with multiple Storage Classes. In this case, each data tier is based on a different class. Furthermore, the administrator or the file owner can migrate a file that resides in a multiple-tier filesystem from one Storage Class to another Storage Class.
- Oracle FS System Manager (GUI) shows the capacity that is available for each Storage Domain. For a given Storage Domain, the GUI displays the capacity by Storage Class and by drive group.

Related Links

Priority Level and Performance
QoS Plus Overview
Redundancy and Data Protection

Priority Level and Performance

The priority level of a logical volume determines the characteristics of the system response to the incoming I/O requests against the volume. In general, the higher the priority level that is associated with a volume, the faster the system can respond to an access request.

Available priority levels:

Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.

The time that the Oracle FS System takes to respond to an incoming I/O request depends on the factors that are listed in the following sections.

Queue Priority

The SAN interface of a Controller has one processing queue for each of the five QoS priority levels. The SAN interface places each incoming I/O request for a LUN into the processing queue that corresponds to the QoS priority that is associated with the LUN.

If the SAN interface of a Controller is overcommitted, the Oracle FS System allocates the processing resources of the Controller to each queue according to the priority of the queue. The Premium queue gets the largest allocation of processing resources. The other priority queues get proportionally smaller allocations of resources, depending on the priority level of the queue.

Data Migration

For logical volumes that use QoS Plus, the Oracle FS System adjusts the QoS bias that the system uses when determining whether and when to migrate the user data across the storage tiers. This adjustment causes the higher priority volumes to be given a greater opportunity to occupy the higher performance Storage Classes.

For example, if two data blocks have the same access statistics but one block has a higher QoS Priority setting, the block having the higher Priority migrates sooner than the block having the lower Priority.

Thin Provisioning

For a logical volume that uses QoS Plus and is thinly provisioned, the Oracle FS System selects the initial Storage Class that the system uses for infilling based on the Storage Class and the RAID level that the administrator selected for the volume.

Striping

For LUNs using regular QoS (single-tiered LUNs), if a sufficient number of drive groups exist in the Storage Domain that hosts a logical volume, the Oracle FS System places a higher priority volume on a greater number of drive groups than the system does for a lower priority volume. Placing a high priority volume on more drive groups enhances the performance of the volume.

For example, for a logical volume that has a priority level of Premium or High, the system stripes the volume across four drive groups. If, however, that volume has a priority level of Low or Archive, the system stripes the volume across only two drive groups.

For LUNs that are using QoS Plus (auto-tiered LUNs), the system creates appropriate storage tiers on which to place the auto-tiered LUNs before creating the LUNs. Because storage tiers span all of the drive groups within a Storage Domain, auto-tiered LUNs can utilize all of those drive groups, independent of priority level.

Related Links

Data Migration
Growing Thin Volumes
QoS Plus Overview
Redundancy and Data Protection
Thin Provisioning

Redundancy and Data Protection

The redundancy level of a logical volume determines the number of copies of the parity bits that the Oracle FS System creates for the volume. The number of copies of the parity bits determines the level of protection for the volume data if a drive that contains any data for the volume fails.

Important: Contact Oracle Customer Support for assistance with sizing your system and with creating your logical volumes.

The redundancy Quality of Service (QoS) property provides the following choices for parity:

Single	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

A drive group is a logical object that manages a collection of drives of the same Storage Class, all of which are from the same Drive Enclosure. The number of drives in the drive group depends on the drive type. A drive group containing hard disk drives (HDDs) consists of 12 drives. A drive group containing solid state drives (SSDs) consists of six drives.

The following list shows the number of drive groups across which the Oracle FS System allocates capacity for a logical volume that is using regular QoS (a single-tiered volume). The number of drive groups depends only on the priority level that you have chosen for the volume:

- Premium: 4 drive groups
- High: 4 drive groups
- Medium: 3 drive groups
- Low: 2 drive groups
- Archive: 2 drive groups

Note: For solid-state drives (SSDs), the system uses all of the assigned SSDs in the Storage Domain when striping a volume, regardless of the priority level chosen for the volume.

The number of drive groups that the Oracle FS System uses to stripe a single-tiered volume can, at times, be fewer than what is shown in the above list. The system might use fewer drive groups because, for example, many of the drive groups in the Storage Domain are nearing full capacity or are at full capacity. When either situation exists, the system might allocate more than one stripe for a new volume in the same drive group, degrading the overall performance for that volume.

When performance is degraded because the striping for the volume is across fewer drive groups than would normally be used, you can re-establish high performance for the volume by including additional drive groups in the Storage Domain.

Adding drive groups allows the Oracle FS System to rebalance the allocations so that the volume utilizes the proper number of drive groups. The rebalancing is achieved by the system moving the extra stripes from the drive group to the newly added drive group.

Related Links

Priority Level and Performance

Access Bias

Requests for I/O operations on a logical volume can be biased toward sequential access, random access, or a balanced mix of the two types of access. You can use the bias of these requests (in conjunction with the I/O bias property) to help optimize the performance of the volume.

As a Quality of Service (QoS) property, the access bias indicates to the system the expected pattern that is typically used to access the data in a volume:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

Note: Access bias specifies an optimization bias. Access bias is not a requirement that all data operations conform to the specified access method.

Related Links

I/O Bias

I/O Bias

Requests for I/O operations on a logical volume can be biased toward read operations, write operations, or a balanced mix of the two types of operation. You can use the bias of the type of I/O operation (in conjunction with the access bias property) to help optimize the performance of a logical volume.

As a Quality of Service (QoS) property, the I/O bias indicates to the system the type of I/O operation that is the most common or is the most expected for a particular volume:

Read	Indicates that most of the access requests are for read operations.
Write	Indicates that most of the access requests are for write operations.
Mixed	Indicates that the number of access requests are similar for read operations and for write operations.

Important: If you choose Random as the access bias and Write as the I/O Bias, and if you choose single redundancy for data protection, the Oracle FS System creates the logical volume using RAID 10 (mirrored data). This RAID level enhances the write performance but uses twice the capacity.

For write requests, the system stores all of the user data and all of the system metadata in mirrored copies of the journal. One copy is maintained in the regular

cache on the owning Controller. The mirror copy is maintained in one of the following locations:

- The memory of the partner Controller that is backed by an energy storage module (ESM). All host write operations are copied to the ESM-backed, non-volatile cache in the partner Controller. This type of operation is often refered to as a write back cache.
- The virtual LUN (VLUN) that is reserved on the physical storage for the logical volume, if the partner Controller is unavailable for the write operation. Write operations to this copy are equivalent to write-through cache.

Write operations from the journal to permanent physical storage are equivalent to write-through cache. The system flushes the user data and the corresponding metadata as a unit to the physical storage.

Related Links

Access Bias

Faster Random-Write Operations

Faster Random-Write Operations

You can enhance the performance of random-write operations on a logical volume under certain circumstances.

Using the QoS-based management tools that are provided in Oracle FS System Manager (GUI), you can improve the overall performance of random-write intensive applications by taking advantage of RAID 10 data protection, which replaces four I/O operations with a parallel mirrored-write operation.

The system utilizes this RAID level when you set the optimization settings for a logical volume to random access with a write I/O bias. In this case, the system allocates space on a RAID 10 array on which the system performs parallel mirrored-write operations (two writes).

In addition, because the data resides on two independent drives, RAID 10 allows the Oracle FS System to optimize read operations. In this case, the system can select the least busy of the two drives when performing the read operation.

Related Links

Access Bias

I/O Bias

QoS Plus Overview

Enhanced QoS, called QoS Plus, automatically adapts the location of data blocks to optimize the storage efficiencies, to yield a higher performance, and to lower the cost of storage. The QoS Plus features result in an optimal cost/IOP and the

cost/TB over time by means of specific usage characteristics and specific QoS levels.

Note: Volumes that have a large number of access requests that are skewed to a relatively small portion of the user data benefit the most from the features of QoS Plus.

When configuring QoS Plus for a LUN (by selecting the Auto-tier option), the administrator configures the initial settings for the LUN and then lets the system manage the placement of the data from that point forward. Besides initially creating the auto-tiered LUN, an administrator needs to adjust little else, if anything, after the LUN is created.

Related Links

Storage Performance Statistical Data Overview
Data Migration
Affect of Statistics on Data Migration

Storage Tiers

A *storage tier* is a collection of blocks of contiguous storage, all of which have the same RAID level. This collection is spread across one or more drive groups within a given Storage Domain. Storage tiers are used by administrators and by the Oracle FS System to provision logical volumes.

When an administrator initially creates a LUN, the administrator defines a number of QoS properties for the volume, including the initial Storage Class for the volume. If the LUN uses QoS Plus, the Oracle FS System creates two storage tiers in the Storage Domain that the administrator selects for the volume:

- For capacity HDDs, the system creates a RAID 6 storage tier, which implements double redundancy, and a RAID 10 storage tier, which implements mirroring.
- For all other drives, the system creates a RAID 5 storage tier, which implements single redundancy, and a RAID 10 storage tier as well.

Note: The RAID level of the storage tiers depends on the Storage Class that is selected for the LUN.

The storage tier on which the system places the LUN depends on the Storage Class and on the redundancy level (single parity, double parity, or mirroring) that the administrator selects for the volume.

Note: For filesystems, an Oracle FS System uses two types of storage tiers: data tiers and metadata tiers. A filesystem data tier contains user data. A filesystem metadata tier contains system-level data that describe the filesystem and the user data that it contains.

Related Links

Redundancy and Data Protection
Storage Class Description

Data Migration

Data migration that results from the QoS Plus feature occurs when the system, after an analysis of the historical usage information for the block of data, determines that another Storage Class or RAID level can better service that block of data.

When optimizing for system performance, QoS Plus moves frequently accessed data blocks of a LUN to a faster, more expensive Storage Class, such as high-performance solid-state drives (SSDs). Conversely, when optimizing for cost, QoS Plus moves infrequently accessed data blocks to a slower, less expensive Storage Class, such as high-capacity hard disk drives (HDDs).

Note: When data migration occurs, the Oracle FS System gives the higher priority volumes a greater opportunity to occupy the higher performance Storage Classes. To migrate the data, the system initiates a task that runs as a background process.

You can limit data migration to use only designated Storage Classes. When you create a LUN using QoS Plus, you can specify the Storage Classes to include for data migration and to exclude for data migration. QoS Plus moves infrequently accessed data to a lower performance Storage Class, such as Capacity Disk.

Excluding less expensive Storage Classes and including high performance Storage Classes causes *immobile* storage capacity. Immobile data occurs when the system cannot migrate the data to a lower Storage Class. Data that cannot migrate to a lower Storage Class is considered immobile and the storage capacity that this data occupies is immobile. Data migration is efficient when 100% of the system capacity is available.

Note: If the preferred Storage Class is full, data might be placed temporarily in a non-preferred Storage Class.

Provide sufficient storage for data migration and allow the system to use all of that storage capacity. Oracle FS System Manager (GUI) provides a graph that shows all of your allocated storage capacities and immobile storage capacities from the Storage Domain page.

Related Links

Affect of Statistics on Data Migration
Priority Level and Performance
QoS Plus Controls
Redundancy and Data Protection
Storage Class Description

Affect of Statistics on Data Migration

The Oracle FS System collects an extensive set of statistics that cover many aspects of the performance of the overall system, including data usage.

The Oracle FS System monitors and analyzes the data activity statistics of the LUN to determine if the initial properties make the best use of the available storage resources. If, for example, the system determines that data within a LUN has not been accessed for several days, the system moves 640 KB blocks of data from the LUN to high-capacity, low-cost drives that are suitable for archival purposes. If the volume experiences a high amount of data activity, the Oracle FS System migrates the LUN data to higher-performance drives.

For a LUN that is using QoS Plus, the Oracle FS System gathers and stores statistics about the access requests as I/O is performed on the LUN. At specific times, which can be set by the administrator for a Storage Domain, the system analyzes those statistics. From this analysis, if the system determines that certain data within the auto-tiered LUN can benefit by placing the data on a different storage tier, the system migrates that data to the storage tier that best matches the use of the data.

Related Links

QoS Plus Controls

QoS Plus Overview

QoS Plus Controls

The QoS Plus feature consumes resources that might affect overall system performance. You can control certain aspects of this feature to mitigate some of those effects.

The Oracle FS System monitors the I/O activity to determine the best time to migrate the data to another storage tier. When the system activity is low, tier migration efforts increase. Conversely, when the system load is heavy, tier migration efforts decrease, but do not cease.

Scanning

Oracle FS System Manager (GUI) provides various options that together optimize your storage utilization costs and the overall performance of the I/O operations. The options affect when QoS Plus scans your data and when QoS Plus moves the data among the available Storage Classes.

To match your application activity, you can provide delays to the scan frequency that is used by QoS Plus.

Tier Reallocation

You can disable the data migration feature at both the Storage Domain and LUN levels. Disabling data migration at the Storage Domain prevents data migration for all LUNs that are assigned to that Storage Domain. You can prevent data migration for a single LUN by deselecting the Tier Reallocation option in the

Additional Options dialog. The options for disabling data migration at the Storage Domain and LUN levels are independent. For example, if you make a data migration change to the Storage Domain, that change does not affect the settings for the LUN.

Capacity Limits

By default, QoS Plus uses all of the available storage capacity in a Storage Domain. For each Storage Class in a given Storage Domain, you can specify the percentage of storage capacity that the Oracle FS System can use for QoS Plus LUNs. Specifying a percentage of the capacity that can be used for QoS Plus is most useful for the Storage Classes that are relatively expensive.

You can allocate, for example, 80% of your performance HDD capacity for auto-tiered LUNs, which then leaves 20% of that capacity for LUNs using regular QoS and for filesystems.

Note: Reducing the amount of QoS Plus storage capacity below the amount of capacity that is currently being used causes the system to migrate data to available Storage Classes only if the storage capacity is available. You might need to free some storage capacity before the system can use the desired allocated percentage of your storage capacity.

Related Links

Limit the Storage Capacity for QoS Plus
Update Tier Reallocation Options
Optimize Auto-Tier Scans
Data Migration
Affect of Statistics on Data Migration
Storage Tiers

Effectiveness of QoS Plus

Distribution charts and effectiveness reports provide detailed information about the efficiency of the QoS Plus feature that is applied to a set of auto-tiered LUNs. The QoS Plus feature optimizes the placement of data blocks to yield higher system performance and to lower the cost of storage.

Effectiveness Graphics for QoS Plus

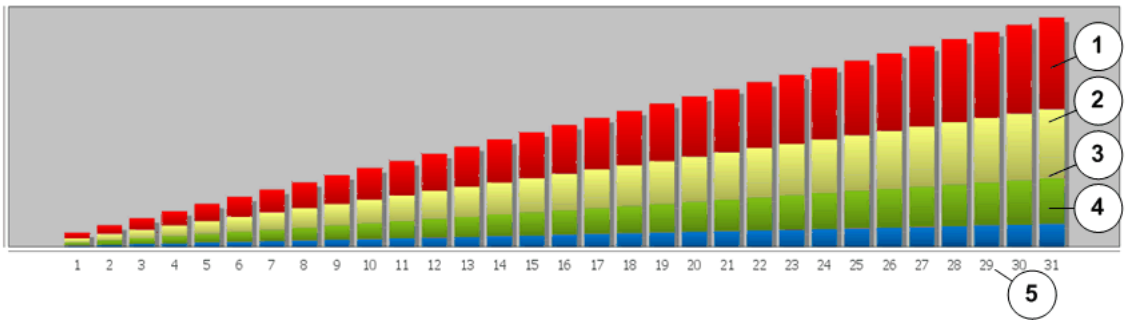
The View Auto Tier Graphs dialog displays all of the auto-tiered LUNs in the Storage Domain. You can select up to 10 of the LUNs from which to view the effectiveness graphics. When you click Update Graphs, the following graphs display:

Data Transferred By Number of Accesses	Indicates a histogram of the different regions of all of the LUNs in the Storage Domain by the frequency of I/O access.The histogram bar height represents the amount of data transferred. The y-axis is not labeled.

Tier Structure By Storage Class and Priority	Indicates a graph of the Storage Class and the capacity of the LUN regions for the selected auto-tiered LUNs. The chart also shows a number that represents the QoS priority for the auto-tiered LUN. A table at the bottom of the chart provides the list of selected LUNs. The table is also a legend for the LUNs that are represented on the graph.

The two graphs allow you to observe the placement of the data blocks and determine the effectiveness of the QoS Plus feature that is applied to the selected auto-tiered LUNs.

Figure 8: Data Transferred By Number of Accesses histogram

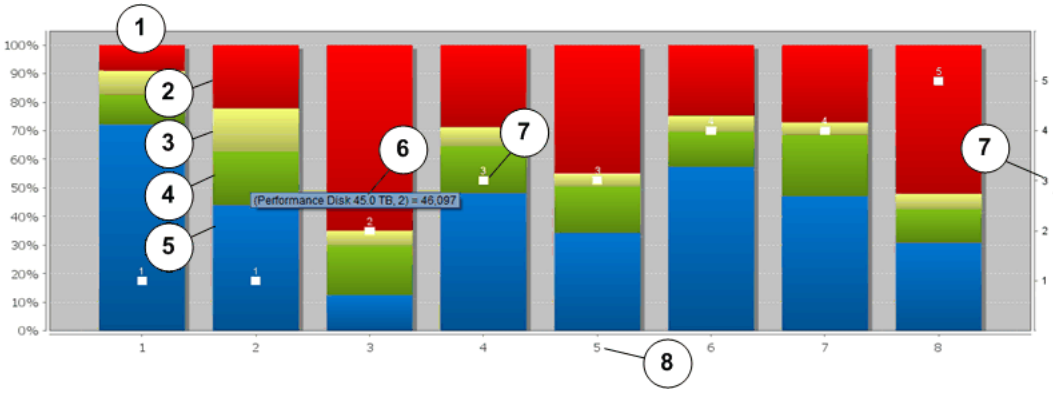


Legend		
	1 I/O activity of the LUN region that occupies the Performance SSD	4 I/O activity of the LUN region that occupies the Capacity HDD
	2 I/O activity of the LUN region that occupies the Capacity SSD	5 LUN region
	3 I/O activity of the LUN region that occupies the Performance HDD	

The histogram represents the I/O distribution and the data transfer activity for all of the auto-tiered LUNs in the Storage Domain. The system counts the number of I/O accesses that was necessary to transfer data to and from the auto-tiered LUNs. The information is then plotted on the graph from the lowest I/O activity to the highest. The system categorizes different regions of a LUN by the frequency of access and by Storage Class. The graph shows the amount of data transferred to each of these categories.

QoS Plus is most effective if the regions of the LUN that receive most of the I/O are in the best Storage Class. The graph shows that the storage is used effectively when the regions of the LUN that receive the most number of accesses are also in the most efficient Storage Class that is available, which is the Performance solid-state drives (SSDs). If the regions of the LUN with the most number of accesses are not in SSD, the performance could be improved by adding Performance SSD capacity to the Storage Domain.

Figure 9: Tier Structure by Storage Class and QoS Priority graph



Legend		
	1 Allocated capacity of the LUN	5 Relative LUN storage capacity that occupies the Capacity HDD
	2 Relative LUN storage capacity that occupies the Performance SSD	6 Tooltip
	3 Relative LUN storage capacity that occupies the Capacity SSD	7 QoS Priority value: 1 = Premium 2 = High 3 = Medium 4 = Low 5 = Archive
	4 Relative LUN storage capacity that occupies the Performance HDD	8 LUN Row number that corresponds to the list of LUNs below the graph

The above figure shows how the QoS Plus feature distributes data in the selected auto-tiered LUNs. Each bar of the graph represents 100% of the allocated capacity of the LUN and provides the following information about the LUNs:

- The Storage Class of each region within the LUN
- The storage capacity of each region
- A value that represents the QoS priority of the LUN

The graph information helps you determine if your LUNs are placed in the optimum Storage Class and assigned the appropriate QoS priority. Ideally, you want your LUNs with heavy I/O loads and larger capacity requirements assigned to the premium Storage Class and using the highest QoS priority level. Conversely, you want the LUNs with low I/O loads assigned to the low-cost Storage Class using a low QoS priority level.

Effectiveness Reports for QoS Plus

The **Generate Auto-Tier Effectiveness Report** dialog allows you to view the Auto-Tier Effectiveness report. The report summarizes the results of the analysis that the QoS Plus feature has performed on the auto-tiered LUNs in the Storage Domain.

The report contains the following information about each auto-tiered LUN:

Constrained skew Indicates the degree of uniformity of the data distribution and the I/O activity across all of the Storage Classes that are available to the auto-tiered LUN. The report provides a value between 0 and 1. Use the information in the following table as a guide in interpreting the constrained-skew value.

Table 8: Constrained skew

Approximate constrained skew value	Description
Is close to 1.0	Indicates that the I/O activity and that the LUN data are unevenly distributed across all of the available Storage Classes. The LUN contains a small amount of data, which resides on high-cost Performance SSDs, that are receiving all of the I/O activity. The same LUN also contains a majority amount of data that resides on low-cost storage, such as Capacity drives, that is never accessed. QoS Plus can benefit the LUN.
Is close to 0	Indicates that the I/O activity and data are evenly distributed across all of the available Storage Classes. QoS Plus can provide little benefit for the LUN.

Average IOPS Indicates the number of IOPS that are averaged over the previous auto-tier scan cycle.

Peak IOPS Indicates the number of IOPS for a two-minute time frame where the IOPS were the greatest during the previous auto-tier scan cycle.

Related Links

Example to Determine the Effect of Adding an Application
Example to Determine Performance During Peak Usage
Storage Performance Statistical Data Overview
Generate Auto-Tier Effectiveness Report
View the Auto-Tier Graphs

View the Auto-Tier Graphs

After your system has processed your data for a period of time, you might want to view how the QoS Plus feature distributes the data in your auto-tiered LUNs. Two graphs display information that helps you decide whether to add Performance solid-state drive (SSDs).

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to view.
3. Select Actions > View Auto-Tier Graphs.
4. Select up to 10 auto-tiered LUNs.
5. To display the graphs, click Update Graphs.
   The dialog displays the following graphs:
   - Data Transferred By Number of Accesses
   - Tier Structure By Storage Class and Priority
6. Use the arrow buttons to adjust the size of the chart window.
7. To update the chart with current information or with other LUNs, repeat Step 4 and Step 5.
8. Click Close.

Related Links

View Auto-Tier Graphs Dialog
Effectiveness of QoS Plus

Generate Auto-Tier Effectiveness Report

Installing more storage capacity to the Oracle FS System can affect the values that are used in the Auto-Tier Effectiveness Report. You can update the storage cost values that represents your system, if necessary. You can view the report immediately, or you can download the report in one of many common formats.

1. Navigate to System > Storage Domains.
2. Select the Storage Domain to report.
3. Select Actions > **Generate Auto-tier Effectiveness Report**.
4. (Optional) Update a value in the Storage Costs table.
   To update a value, double-click the cell.
5. Generate the report.

Available options:

- To create and view the report immediately, click Generate and View Report.
- To create and view the report at a later time, click OK.

To view your effectiveness report later, navigate to System > Reporting & Statistics > Generated Reports and select the effectiveness report. You can then download the report in one of many common formats.

Related Links

Storage Domains Overview Page
Generate Auto-Tier Effectiveness Report Dialog
Effectiveness of QoS Plus

Capacities

Depending on the context, the term *capacity* can refer to logical space or to actual, physical space.

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Logical capacity	The space that you request that the system set aside for a logical volume. In Oracle FS System Manager (GUI), logical capacities are used in the following contexts:

addressable	The size limit that you established for the volume. The addressable capacity is sometimes referred to as the *maximum* size of a volume. Addressable capacity includes the space that is needed for the repository when you specify clone-based data protection for the volume.
allocated	The amount of space that the system has set aside for a specific volume.
used	The amount of the allocated space in a filesystem that contains user data.

Note: Logical capacities do not include the overhead that is needed for implementing RAID protection (parity data and mirroring).

Physical capacity	The actual space that the system assigns to the volume or has available for assignment. Values that the system reports for physical capacities refer to the actual space on the physical media.

The value that is reported for the physical capacity of a volume is greater than the value that is reported for the logical capacity of the volume. The physical capacity of a volume is greater because of the overhead that is used to implement the volume. For example, the physical capacity takes into account the space that is needed for the clones of the volume and for RAID protection.

Related Links

Growing Thin Volumes

Overhead for Capacity Allocation

Free Capacity and Volume Creation

A minimum amount of free space in the selected Storage Domain is required to create a logical volume.

When you create a new volume, the actual amount of physical capacity that is consumed from the free space in the Storage Domain includes the capacity that is needed to accommodate the system overhead that is associated with the volume, such as the capacity that is required for RAID protection.

A request to create a logical volume can fail because of one of the following reasons:

- Insufficient capacity remains in the Storage Class or Storage Domain that you specified for the volume.
- The system needed to round your request to a larger value, and the rounded value is greater than the available capacity.

Related Links

Capacities

Overhead for Capacity Allocation

Reclaiming Capacity

Overhead for Capacity Allocation

Your plans for the provisioning of logical volumes must take into account the extra capacity that the Oracle FS System allocates to accommodate various needs. Together, these extra capacities comprise what is called *system overhead*.

Oracle FS System Manager (GUI) reports the physical capacities for the Storage Domains, for the drive groups, and for the logical volumes that exist in an Oracle FS System.

Overhead for RAID Protection

To account for the data protection overhead, the Oracle FS System increases the requested capacity by a certain amount when creating a volume. The amount of additional capacity depends on the RAID level of the volume that is being created and on the initial Storage Class that is selected for the volume:

- RAID 5, solid state drive (SSD): 20%
- RAID 5, hard disk drive (HDD): 10%

  Note: In the GUI, the physical capacity and the logical capacity for RAID 5 HDDs appears to be 20% because the system includes the spare space in the overhead calculation.
- RAID 6, capacity HDD: 20%
- RAID 10, all Storage Classes: 100%

For example, assume that you request 250 GB of capacity for a new volume. If you select single redundancy on any HDD Storage Class, the system uses a RAID 5 geometry for the new volume and allocates an additional 10% (25 GB) of capacity. If, however, you select double redundancy on capacity HDDs, the system uses a RAID 6 geometry for the new volume and allocates an additional 20% (50 GB) of capacity.

Note: These overhead percentages are approximate and can vary somewhat for different reasons.

The capacity that a volume consumes and the capacity that the system reports for the volume both include the overhead for RAID protection.

Overhead for Infill Reserve

For each Storage Domain that contains hard disk drives (HDDs), the Oracle FS System reserves 50 GB of physical capacity as a reserve that can be used, if needed, for infilling thin volumes. This reserve is available to all SAN LUNs that are located partly or wholly on those HDDs.

Note: The system includes the infill reserve capacity in the free physical capacities that are reported for the Storage Domains and for the drive groups.

The Oracle FS System reserves this infill reserve capacity to help prevent an inadvertent exhaustion of the physical capacity when thinly provisioned volumes grow. When a thinly provisioned volume needs to grow, the system uses this reserve capacity when all of the regular HDD capacity in the Storage Domain has been allocated.

Related Links

Capacities
Growing Thin Volumes
Redundancy and Data Protection
Storage Class Description

Thin Provisioning

Traditionally, when a system allocates storage for a logical volume, the allocation is dedicated to that volume. This dedication prevents other volumes from accessing this storage, even when the amount that is allocated is never used by the owning volume.

Thin provisioning allows you to leverage this unused storage. To leverage unused storage, perform the following actions:

- Allocate capacity based on future needs.
- Draw from a common pool of storage as the allocated capacity is consumed.

Thin provisioning on an Oracle FS System allows you to create a logical volume of any size without committing the requested capacity at the time that you create the volume. Each volume appears to have all of the storage that the volume needs for ongoing operations. The difference is that the physical capacity is not actually locked to a particular volume.

All logical volumes in an Oracle FS System have two properties that are related to the logical capacity of the volumes. Also, whether a logical volume is thinly provisioned depends on the relationship between the initial values of those two capacities.

Capacity Addressable logical capacity	The maximum amount of storage to which the logical volume can grow. Because of the rounding that the system performs internally, the value of this property can be up to 2 GB less than the value for the allocated logical capacity.
Allocated Allocated logical capacity	The amount of storage that the system dedicates to the logical volume. The allocated logical capacity can be any value up to and including the addressable logical capacity. When you create a SAN LUN, you specify this value, which becomes the initial capacity that the system allocates to the LUN. **Tip:** If you do not want thin provisioning for the LUN, set the allocated logical capacity equal to the addressable logical capacity. In contrast, when you create a NAS filesystem, the allocated logical capacity property is not available. For filesystems, the Oracle FS System creates the filesystem without allocating any initial capacity for the data tiers. Instead, when the filesystem needs additional capacity, the system automatically allocates the capacity at that time. **Note:** The action of the Oracle FS System automatically allocating additional capacity to a thinly provisioned logical volumeis called *infill*. This additional capacity might not be contiguous with the previous allocations.

Related Links

Capacities

Growing Thin Volumes

Provisioning Thin Volumes

The capacity that is reserved for thin provisioning, which is a part of the system overhead, is accounted for in the available capacity that Oracle FS System Manager (GUI) reports. Because the system has already accounted for this reserve capacity, what the GUI reports as available capacity is fully available for the provisioning of logical volumes.

For SAN LUNs, the degree to which a LUN is thinly provisioned depends on the nature of the host applications that access the LUN. If only specific portions of a LUN are ever accessed by applications, the thinness of that volume remains the same. As applications attempt to access increasingly diverse areas of the LUN, however, the Oracle FS System allocates additional physical space for the LUN, causing the thinness of the volume to decrease.

Some applications access most or all of the addressable space for a volume. In these cases, the volume transitions from being thinly provisioned to being fully provisioned while the application executes. An example of such an application is the `mkfs` utility, which creates a filesystem on a partition. As the `mkfs` utility formats the filesystem, most or all of the partition is written by the utility, causing the underlying volume on the Oracle FS System to become fully provisioned. In these cases, creating the underlying volume using thin provisioning has little value.

The Microsoft Windows operating system reserves a substantial amount of metadata for a filesystem that has been formatted as a New Technology File System (NTFS) volume. The layout of this metadata causes an early allocation of thinly provisioned space. The primary NTFS metadata consists of the following objects:

- The boot record, which is written to both the beginning and the end of the volume
- The master file table (MFT), which is written to both the beginning of the volume and the middle of the volume

To prevent the MFT from becoming fragmented, Windows reserves a buffer around the MFT. The size of this buffer can be configured to be 12.5%, 25%, 37.5%, or 50% of the drive space. Windows does not create new files in this buffer region until the unused space is consumed. Each time the remainder of the drive space becomes full, the buffer size is halved. This strategy provides new space for additional write operations.

Oracle does not recommend creating a thinly provisioned LUN that consumes more than 90% of the maximum capacity on the first infill, especially when using

NTFS. NTFS writes throughout the LUN, causing allocations that do not match the amount of data that is written.

A heavily used NTFS filesystem running without much free capacity eventually uses up all of the capacity unless the filesystem is defragmented periodically. NTFS favors writing into newly allocated space instead of reusing previously written space. NTFS works with thin provisioning initially but can quickly use up more allocation than the amount of data that the filesystem shows as used.

Because thin provisioning uses Controller resources and affects performance, a good use of thin provisioning is for a LUN that has the following characteristics:

- The initial allocation is equal to the amount of existing data, plus 10%. This value becomes the allocated logical capacity.
- The addressable logical capacity is as large as you expect that the LUN will ever need.

For example, given 420 GB of file data, the administrator should configure the allocated logical capacity of the LUN to be approximately 470 GB and the addressable logical capacity to be approximately 1 TB.

Note: How much capacity NTFS uses depends on many factors, including the amount of data involved in the write operations, where the write operations are performed, and other factors such as the type of storage used in the storage pool.

On Linux platforms, EXT2 and EXT3 filesystems write metadata over the entire range of logical block addresses (LBAs) of the LUN. The drive is organized into block groups and metadata exists at the beginning of each block group. This configuration typically causes the entire LUN to be provisioned when the administrator creates a filesystem. This full provisioning occurs because the metadata write is below the minimum allocation unit that is used by the Oracle FS Systems. This condition causes the system to expand every allocation extent to the maximum size.

In summary, the success of utilizing thin provisioning depends on the filesystem or the application using the LUN.

Related Links

Thin Provisioning

Growing Thin Volumes

When a thinly provisioned volume needs additional capacity, the Oracle FS System automatically allocates the capacity at that point in time, which *grows* (or *infills*) the thin volume.

Note: The additional capacity that is allocated, however, might not be contiguous with the previous allocations.

Growth Increments

When the Oracle FS System infills a logical volume, the system divides the allocation into slices that are called *growth increments*. The system uses as many of the slices as are needed to fulfill the allocation.

For LUNs using regular QoS (single-tiered LUNs), the size of a growth increment is between 1 GB and 2 GB. For example, if the volume is 2 TB, the system uses a number of increments between 1024 and 2048 for the allocation. The exact number depends on the results of an algorithm that utilizes the following storage properties of the single-tiered volume:

- The Storage Class of the drive groups on which the volume is placed
- The RAID level of the volume
- The number of drive groups across which the volume is striped, which is controlled by the Priority QoS property

Note: For LUNs using QoS Plus (auto-tiered LUNs), the size of a growth increment is 640 KB.

Growing LUNs

SAN LUNs reside in a single Storage Domain and utilize the capacity that is provided by the Storage Classes that you specify for the LUNs. For a thinly provisioned LUN, the following rules also apply:

- The growth of a single-tiered LUN using regular QoS is confined to the drive groups that support the Storage Class that is assigned to the LUN.
- The growth of an auto-tiered LUN can grow by utilizing the capacity in any of the storage tiers, independent of Storage Class.

Growing Filesystems

Filesystems reside in NAS-based storage tiers that are called *data tiers*, which hold user data, and *metadata tiers*, which hold filesystem metadata. Data tiers and metadata tiers are dedicated to a specific filesystem.

The growth of a NAS storage tier that supports a thinly provisioned filesystem is restricted by the following rules:

- The growth of the tier is confined to the drive groups that support the Storage Class that is assigned to the tier.
- The growth of the tier is confined within the boundaries of the Storage Domain in which the tier resides.

Related Links

Priority Level and Performance
Redundancy and Data Protection
Storage Class Description
Storage Tiers
Thin Provisioning

Reclaiming Capacity

When you delete a logical volume, the Oracle FS System reconditions the space (by writing a predefined bit pattern) before reclaiming the space for reuse. As the previously allocated capacity frees up, the capacity becomes available for allocation.

When you delete a large volume, the operation can take awhile for all of the capacity to be reclaimed. Because of the additional time that is needed to recondition the drives holding the volume data, the amount of physically allocated capacity plus the amount of physically free capacity in the owning drive groups might not equal the total physical capacity in those drive groups. Therefore, while the deleted capacity is being reconditioned, Oracle FS System Manager (GUI) displays the amount of physical capacity that remains to be reconditioned as “preparing.”

Related Links

Compact a Storage Domain

Capacities

CHAPTER 5

Manage SAN Volumes

Managing SAN LUNs

A LUN is defined as the following: A logical volume that is defined over a collection of drive groups and is addressed using SCSI protocol in a SAN. An administrator defines the QoS attributes of the LUN.

Use Oracle FS System Manager (GUI) to perform the following actions:

- Create a single-tier or auto-tiered LUN.
- Modify the properties of a LUN.
- Map a LUN to specific SAN host entries or multiple host entries.
- Move a LUN from one Storage Domain to another.
- Enable and disable the data path to a LUN.
- Provide clone and copy operations on a LUN for various purposes, including data protection.

You assign the storage resources and QoS attributes when you create the LUN. As needs change, you can later modify the QoS attributes of the LUN, the storage capacity that is assigned to the LUN, or both. You can designate the LUN as auto-tier. With an auto-tiered LUN, the system continuously monitors its I/O and gathers statistics for analysis. From this analysis, data is placed on the tier that best matches its use.

Note: When you create a LUN, the system automatically sets the tiering level of the LUN to single tier. If you want to allow for automatic data migration to higher data tiers, change the LUN to an auto-tiered LUN. If you create an auto-tiered LUN when the system contains only one Storage Class, no data migration occurs until other Storage Classes are added to the system.

The Oracle FS System creates two storage tiers for each Storage Class that is present in the Storage Domain. Depending on the type of Storage Class, the system assigns a RAID level for each tier. The administrator views the properties of the storage tier by accessing the QoS properties and Storage Class. The following table defines the RAID levels by Storage Class.

Table 9: RAID level by storage class and storage tier

	Storage tier	
Storage class	Tier 1	Tier 2
Capacity HDD	RAID 6	RAID 10
Capacity SSD	RAID 5	RAID 10
Performance HDD	RAID 5	RAID 10
Performance SSD	RAID 5	RAID 10

You can use the Oracle FS System Manager (GUI) to disable the data path to the LUN. Disabling the data path makes the LUN inaccessible to the SAN host.

To provide data protection for a LUN, you can clone the volume. You can manually clone or copy a LUN. You can also create a schedule so that the system automatically creates cloned LUNs at times that you define.

Related Links

Data Migration
LUN Statistics and Trending Overview
QoS Policies
Storage Class Description
Storage Tiers
Creating Auto-Tiered LUNs
Single-Tier QoS for LUNs
Mapping LUNs and SAN Host Entries
Disable the Data Path of a LUN

Creating Auto-Tiered LUNs

When you create an auto-tiered LUN, you select the initial properties for QoS and Storage Class, and you provide the capacity requirements for the LUN. By default, the system has access to all of the available Storage Classes for data migration.

An auto-tiered LUN is a LUN that uses the auto-tier (QoS Plus) feature. This feature uses the configured Storage Class within the Storage Domain to optimally store the data and to make the best use of the available storage types and capacities. Even though the system sets the LUN initially to single tier, you can select the auto-tier option, if desired.

As data is stored and retrieved in the LUN, the Oracle FS System migrates that portion of the data to the appropriate Storage Classes. This process is called *data migration*. Data migration that results from the QoS Plus feature occurs when the system, after an analysis of the historical usage information for the block of data, determines that another Storage Class or RAID level can better service that block of data.

Auto-tiered LUNs can access all of the configured Storage Classes in the Storage Domain. When you create an auto-tiered LUN, you are presented with a graphical representation of the Storage Domain capacities and the storage allocation by Storage Class. The graphs provide an overview of the potential storage usage for the LUN so that you can plan your storage requirements appropriately.

Administrators can create Storage Domains in the system. When the system contains more than one Storage Domain, the Storage Domain field displays on the GUI screen. Otherwise this field is not present in the GUI and the system assigns the LUN to the default Storage Domain.

The Oracle FS System calculates whether enough storage resources are available to create a new logical volume. Oracle FS System Manager (GUI) provides graphs that represent the Storage Domain capacity requirements for the volume and a second graph that represents the storage capacity by storage class. The system updates the graphs as you adjust the QoS values for Storage Class and redundancy.

Note: The capacity values displayed in the usage graphs represent the sizes of the largest volume that you can create in a particular Storage Class, given one of two performance configurations.

The Create LUN dialog contains three tabs for entering the QoS information and mapping the LUN to a host entry.

Quality of Service

(Required) The Quality of Service tab allows you to define the QoS attributes for a LUN, assign your LUN to a volume group and a Storage Domain. You can also create a volume group from this tab and view the Storage Domain properties.

Note: If no custom Storage Domains have been defined, the Storage Domain option does not appear on the tab.

Enter the LUN volume name, and then select a Storage Profile that contains predefined QoS attributes. If necessary, choose the custom QoS attributes. The system contains two levels of QoS settings: Basic and Advanced.

The QoS settings that you enter for your LUN help the system determine the initial placement of the data. When enough statistics and usage history is collected about the data, the system determines whether to move some of the data to a different storage tier.

When you create an auto-tiered LUN and request a nonzero amount of capacity to be allocated, the Oracle FS System takes a few minutes to reserve that capacity. Until the capacity allocation process completes, the system reports the allocated capacity as zero (0). After the allocation process completes, the system reports the amount of allocated capacity that you originally requested.

Mapping	(Optional) The Mapping tab allows you to specify which SAN host entries can access the LUN. You can map the LUN using one of the following methods: • Map the LUN to a SAN host entry using a specific LUN number. • Map all SAN host entries to access the LUN using the same LUN number. This method is not recommended.
Data Protection	(Optional) The Data Protection tab allows you to allocate the storage capacity for the Clone LUNs repository. You can apply unique QoS properties to the Clone LUN repository and assign the maximum storage capacity for the repository. You can also create a clone schedule to perform data protection at regular intervals.

Related Links

Free Capacity and Volume Creation
QoS Plus Overview
Storage Domains
Storage Profiles
Volume Groups
Modifying Auto-Tiered LUNs
Mapping LUNs and SAN Host Entries
Create Auto-Tiered LUN: Define Quality of Service
Create Auto-Tier LUN: Define Data Protection

Create Auto-Tiered LUN: Define Quality of Service

Define the Quality of Service (QoS) attributes to allocate the storage resources that are necessary to create the auto-tiered LUN.

1. Navigate to SAN > Storage > LUNs.
2. Select Actions > Create.
3. Click Auto Tier.
4. (Optional) From the Storage Domain list, select the Storage Domain that you want to assign to the LUN.

   If necessary, click the browse button, […] to display a list of available Storage Domains.

   Note: The Storage Domain list displays only when administrator-defined Storage Domains exist. If no administrator-defined Storage Domains exist or you do not assign the LUN to a specific Storage Domain, then the system assigns the LUN to the default Storage Domain.
5. Enter a name in the LUN Name field.

6 (Optional) From the Volume Group list, select the volume group that you want the LUN to belong.

Note: If necessary, click the browse button, […] to create a volume group.

7 To use the QoS properties of an existing Storage Profile, select the **Use Storage Profile** field, and then select the desired profile from the list.

Selecting a Storage Profile sets the remaining QoS property fields to read-only and displays the Advanced QoS settings that are associated with the Storage Profile.

8 Select the Initial Storage Class where you want to store the LUN.

Possible classes:

- Capacity Disk
- Capacity SSD
- Performance Disk
- Performance SSD

9 (Optional) Select the Basic link.

The indirect QoS properties display. Available selections:

- Initial Typical Access
- Initial I/O Bias
- Initial Redundancy

10 (Optional) From the Initial Typical Access list, select the common access method for this LUN.

Available access methods:

- Sequential
- Random
- Mixed

11 (Optional) From the Initial I/O Bias list, select the typical read-write ratio for this LUN.

Available biases:

- Read
- Write
- Mixed

12 (Optional) Select the Advanced link.

The direct QoS properties display. Available selections:

- Initial RAID Level
- Initial Read Ahead

Important: Selecting Advanced QoS properties clears the Basic QoS selections.

13 (Optional) From the Initial RAID Level list, select the RAID level to associate with this LUN.

Possible RAID levels:

- Single Parity
- Double Parity
- Mirrored

14 (Optional) From the Initial Read Ahead list, select the read-ahead polity to apply to this LUN.

Valid policies:

- Normal
- Aggressive
- Conservative

15 (Optional) From the Priority Level field, select the desired option for the LUN.

Valid choices:

- Premium
- High
- Medium
- Low
- Archive

16 (Optional) From the Migration/Copy Priority list, select the priority to define how the system performs background copies.

Valid choices:

- System Chooses
- Minimize Impact
- Maximize Speed

17 (Optional) Click the Additional Options button.
The Additional Options dialog appears.

18 (Optional) From the Additional Options dialog, select the desired Storage Classes that you want the auto-tier LUN to use.

19 (Optional) To enable auto-tiering, select the Tier Reallocation Enabled check box.

20 Click Close.

21 In the Allocated and Addressable fields, specify the logical capacities for this volume.

Note: Use the storage capacity usage graphs to determine the impact on the storage requirements for the LUN.

22 To create the LUN now, click OK.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.
- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create SAN LUN, Quality of Service Tab, Auto-tier
QoS Plus Overview
Managing SAN LUNs
Mapping LUNs and SAN Host Entries
Create Auto-Tier LUN: Define Data Protection

Create Auto-Tier LUN: Define Data Protection

You can allocate clone capacity for an auto-tier LUN and create a schedule to perform clone operations on a regular basis. The Data Protection page also allows you to either use custom QoS settings for your clones or use the LUN settings.

After the clone is created, you can change the priority level and other properties of the clone. When creating a Clone LUN, make sure that enough repository space exists for the clone. The system stores in the clone repository only the changes that are made to the source volume or to the clone.

1 Navigate to SAN > Storage > LUNs.

2 Select Actions > Create.

3 Click Auto Tier.

4 Click the Data Protection tab.

5 To allow the system to create Clone LUNs, select the Enable Clones check box.
Selecting this option enables the remaining options on the page.

6 In the Maximum Capacity field, enter a value for the Capacity for Clone Storage. The system sets a default of 110% of the LUN storage capacity. Selecting a value of 100% provides enough capacity to avoid strict control over the storage capacity without using up unnecessary capacity.

CAUTION: Allocate sufficient repository or clone storage capacity to minimize the chances of running out of this space (which could lead to data inconsistency or loss). To set sufficient capacity, use a value equal to the source volume capacity multiplied by the number of replicas multiplied by the maximum rate of change. For example, for a 100 GB volume that is projected to have 20 active replicas at a time and no more than a 20% rate of change, use a value of 400 GB for the storage capacity.

7 (Optional) Select the Match Repository QoS to LUN QoS check box. Selecting the Match Repository QoS to LUN QoS option applies the LUN QoS properties to the clones and disables the Clone Storage QoS fields.

8 (Optional) From the Storage Domain list, select the Storage Domain that you want to assign the LUN.

9 Select the Initial Storage Class where you want to store the LUN.

Possible classes:

- Capacity Disk
- Capacity SSD
- Performance Disk
- Performance SSD

10 (Optional) Select the Basic link.

The indirect QoS properties display. Available selections:

- Initial Typical Access
- Initial I/O Bias
- Initial Redundancy

11 (Optional) From the Initial Typical Access list, select the common access method for this LUN.

Available access methods:

- Sequential
- Random
- Mixed

12 (Optional) From the Initial I/O Bias list, select the typical read-write ratio for this LUN.

Available biases:

- Read
- Write
- Mixed

13 (Optional) Select the Advanced link.

The direct QoS properties display. Available selections:

- Initial RAID Level

Important: Selecting Advanced QoS properties clears the Basic QoS selections.

14 (Optional) From the Initial RAID Level list, select the RAID level to associate with this LUN.

Possible RAID levels:

- Single Parity
- Double Parity
- Mirrored

15 (Optional) From the Priority Level field, select the desired option for the LUN.

Valid choices:

- Premium
- High
- Medium
- Low
- Archive

16 (Optional) Click the Additional Options button.
The Additional Options dialog appears.

17 (Optional) From the Additional Options dialog, select the desired Storage Classes that you want the auto-tier LUN to use.

18 Click Close.

19 (Optional) To create a Clone LUN data protection schedule, click Create.

See the procedure for creating Clone LUNs on a scheduled basis.

20 (Optional) Click OK.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.
- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create SAN LUN, Data Protection Tab, Auto Tier
Managing SAN LUNs
Mapping LUNs and SAN Host Entries
Create Auto-Tiered LUN: Define Quality of Service

Modifying Auto-Tiered LUNs

You might need to modify the current Quality of Service (QoS) attributes for an auto-tiered LUN. Modifications include increasing the capacity and allocating space for Clone LUNs. You can also modify the mapping of a LUN as well as change the Controller to which the LUN is assigned. If necessary, you can also convert the auto-tiered LUN to single-tier.

Note: When you change the Storage Class of a logical volume, the volume is migrated to the new Storage Class. Any existing clones of that volume are not migrated to the new Storage Class.

You modify a LUN by entering the QoS attributes on the Oracle FS System Manager screen. The Modify LUN screen contains three tabs for entering QoS information and mapping the LUN to a host entry.

Quality of Service	(Required) The Quality of Service tab allows you to change the assigned volume group or Storage Domain. You can also create a group if one does not exist. This tab also allows you to customize QoS attributes, including selecting a storage profile, storage class, redundancy, and other properties, depending on the selected parameters. You can also set the capacity limits for the LUN and view the effects that the selected QoS attributes would have on the storage class and overall system storage capacities.
Mapping	(Optional) The Mapping tab allows you to specify which SAN host entries can access the LUN. You can map the LUN using one of the following methods: • Map the LUN to a SAN host entry using a specific LUN number. • Map all SAN host entries to access the LUN using the same LUN number. This method is not recommended.
Data Protection	(Optional) The Data Protection tab allows you to allocate the storage capacity for the Clone LUNs repository. You can apply unique QoS properties to the Clone LUN repository and increase, but not decrease, the maximum clone capacity of your clone. You can also create a clone schedule to perform data protection at regular intervals.

Related Links

QoS Plus Overview
Modify Auto-Tiered LUN: Define Quality of Service
Modify Auto-Tiered LUN: Change to Single-Tier QoS
Modify Auto-Tiered LUN: Define Data Protection

Modify Auto-Tiered LUN: Define Quality of Service

You might need to modify the current QoS attributes for an auto-tiered LUN. Modifications include increasing the capacity or allocate space for Clone LUNs.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. From the Quality of Service tab, modify the necessary QoS attributes.
5. To save your changes to the LUN, click OK.

Related Links

Modify SAN LUN, Quality of Service Tab, Auto Tier
QoS Plus Overview
Modifying Auto-Tiered LUNs

Modify Auto-Tiered LUN: Change to Single-Tier QoS

You might want to change an auto-tiered LUN to single-tier LUN when you want to use fixed QoS resources and Storage Classes.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. Click the Quality of Service tab.
5. Click Single Tier.
6. Update the QoS properties, as necessary.
7. To save your changes to the LUN, click OK.

The Tier Reallocation column of the LUNs overview page changes states from an auto-tier state, such as Enabled, to a dash (**- -**). This state change indicates that the LUN is now single-tier.

Related Links

Modify SAN LUN, Quality of Service Tab, Single Tier
Modifying Auto-Tiered LUNs

Modify Auto-Tiered LUN: Define Data Protection

You can modify the allocated clone capacity and QoS properties for your auto-tiered LUN and manage the data protection schedules.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. Click the Data Protection tab.
5. Update the fields, as necessary.
6. (Optional) To create a Clone LUN data protection schedule, click Create.
   See the procedure for creating Clone LUNs on a scheduled basis.
7. (Optional) To update an existing data protection schedule, select the schedule from the Clone Schedules list and then click Modify.
   See the procedure for modifying the schedule for details.
8. (Optional) To remove an existing data protection schedule, select the schedule from the Clone Schedules list and then click Delete.

   Note: You are not prompted to confirm the removal of the data protection schedule.
9. To save your changes to the LUN, click OK.

Related Links

Modify SAN LUN, Data Protection Tab, Auto Tier
Create a LUN Data Protection Schedule
Modifying Auto-Tiered LUNs

Single-Tier QoS for LUNs

Single-tier LUNs have QoS properties that specify the Storage Class and other performance parameters for storing data on the LUN on the Oracle FS System.

The QoS properties of a single-tier LUN remains unchanged until the administrator changes these properties. An auto-tier LUN monitors the data activity and automatically adjusts the QoS properties based on system performance and data activity. For some applications, you might not want the Oracle FS System to make changes to your QoS properties. In this case a single-tier is preferred.

Consider creating a single-tier LUN when the following reasons apply:

- Your application requires low latency for all I/O. A single-tier allows you to specify the Storage Class, such as a Performance SSD. Specifying the Storage Class ensures that the system uses this class regardless of the access frequency by your application.

- Your application is accessed frequently but has no particular performance requirement. A single-tier allows you to isolate your long-term data to a high-capacity drive, which has regular performance characteristics.
- You are migrating an application from an existing system to the Oracle FS System and the existing system has LUNs configured for specific performance requirement of your applications.

If needed, you can change the tier type to auto-tier after you create the LUN.

Related Links

QoS Policies
Managing SAN LUNs
Creating Single-Tier LUNs
Modifying Single-Tier LUNs

Creating Single-Tier LUNs

The Oracle FS System creates LUNs in a single storage tier, which consists of Quality of Service (QoS) properties and Storage Classes.

When you create a LUN, the Oracle FS System calculates whether there is enough storage resources available to create a new logical volume. The Oracle FS System Manager (GUI) provides graphs that represent the storage capacity requirements for the volume and a second graph that represents the overall system capacity requirements. The system updates the graphs as you adjust the QoS values for Storage Class and redundancy.

Note: The capacity values displayed in the usage graphs represent the sizes of the largest volume that you can create in a particular Storage Class, given one of two performance configurations.

Administrators can create Storage Domains in the system. When the system contains more than one Storage Domain, the Storage Domain field displays on the GUI screen. Otherwise this field is not present in the GUI and the system assigns the LUN to the default Storage Domain.

You can also assign a LUN to a volume group. If a volume group is not available, you can create one on the screen. administrative system object that is used to organize logical volumes and, possibly, other volume groups. Volume groups can span Storage Domains.

The Create LUN dialog contains three tabs for entering the QoS information and mapping the LUN to a host entry.

Quality of Service	(Required) The Quality of Service tab allows you to define the QoS attributes for a LUN, assign your LUN to a volume group and a Storage Domain. You can also create a volume group from this tab and view the Storage Domain properties.

	Note: If no custom Storage Domains have been defined, the Storage Domain option does not appear on the tab. Enter the LUN volume name, and then select a Storage Profile that contains predefined QoS attributes. If necessary, choose the custom QoS attributes. The system contains two levels of QoS settings: Basic and Advanced.
Mapping	(Optional) The Mapping tab allows you to specify which SAN host entries can access the LUN. You can map the LUN using one of the following methods: • Map the LUN to a SAN host entry using a specific LUN number. • Map all SAN host entries to access the LUN using the same LUN number. This method is not recommended.
Data Protection	(Optional) The Data Protection tab allows you to allocate the storage capacity for the Clone LUNs repository. You can apply unique QoS properties to the Clone LUN repository and assign the maximum storage capacity for the repository. You can also create a clone schedule to perform data protection at regular intervals.

Related Links

Free Capacity and Volume Creation
Storage Domains
Storage Profiles
Volume Groups
Single-Tier QoS for LUNs
Mapping LUNs and SAN Host Entries
Create Single-Tier LUN: Define Quality of Service
Create Single-Tier LUN: Define Data Protection

Create Single-Tier LUN: Define Quality of Service

Define the Quality of Service (QoS) attributes to allocate the storage resources that are necessary to create the Single-Tier LUN.

Oracle FS System Manager (GUI) provides a list of Storage Profiles that contain QoS attributes. When you select a Storage Profile, the system automatically fills in the QoS fields with the values defined for the Storage Profile. Selecting a Storage Profile disables the custom QoS settings. To define custom QoS settings, you can create your own Storage Profile. A custom Storage Profile can then be selected from the Storage Profile list.

Storage Domains enable storage administrators to assign logical volumes to specific Storage Domains. Such assignments can be made to reduce contention among volumes, to implement different levels of security for those volumes, or

both. When more storage capacity is required, the administrator can add drive groups to the Storage Domain.

Volume groups allow you to group logical volumes into one administrative unit. You can then treat this volume group as a single, large volume.

1 Navigate to SAN > Storage > LUNs.

2 Select Actions > Create.

3 Click Single Tier.

4 (Optional) From the Storage Domain list, select the Storage Domain that you want to assign to the LUN.

If necessary, click the browse button, […] to display a list of available Storage Domains.

Note: The Storage Domain list displays only when administrator-defined Storage Domains exist. If no administrator-defined Storage Domains exist or you do not assign the LUN to a specific Storage Domain, then the system assigns the LUN to the default Storage Domain.

5 Enter a name in the LUN Name field.

6 (Optional) From the Volume Group list, select the volume group that you want the LUN to belong.

Note: If necessary, click the browse button, […] to create a volume group.

7 To use the QoS properties of an existing Storage Profile, select the **Use Storage Profile** field, and then select the desired profile from the list.

Selecting a Storage Profile sets the remaining QoS property fields to read-only and displays the Advanced QoS settings that are associated with the Storage Profile.

8 Select the Storage Class where you want to store the LUN.

Possible classes:

- Capacity Disk
- Capacity SSD
- Performance Disk
- Performance SSD

9 (Optional) Select the Basic link.

The indirect QoS properties display. Available selections:

- Typical Access
- I/O Bias
- Redundancy

10 (Optional) From the Typical Access list, select the common access method for this LUN.

Available access methods:

- Sequential
- Random
- Mixed

11 (Optional) From the I/O Bias list, select the typical read-write ratio for this LUN.

Available biases:

- Read
- Write
- Mixed

12 (Optional) From the Redundancy list, select the number of parity bits to copy for this LUN.

Available redundancies:

- Single
- Double

13 (Optional) Select the Advanced link.

The direct QoS properties display. Available selections:

- RAID Level
- Read Ahead

Important: Selecting Advanced QoS properties clears the Basic QoS selections.

14 (Optional) From the RAID Level list, select the RAID level to associate with this LUN.

Possible RAID levels:

- Single Parity
- Double Parity
- Mirrored

15 (Optional) From the Read Ahead list, select the read-ahead policy to apply to this LUN.

Valid policies:

- Normal
- Aggressive
- Conservative

16 (Optional) From the Priority Level field, select the desired option for the LUN.

Valid choices:

- Premium
- High
- Medium
- Low
- Archive

17 (Optional) From the Migration/Copy Priority list, select the priority to define how the system performs background copies.

Valid choices:

- System Chooses
- Minimize Impact
- Maximize Speed

18 In the Allocated and Addressable fields, specify the logical capacities for this volume.

Note: Use the storage capacity usage graphs to determine the impact on the storage requirements for the LUN.

19 To create the LUN now, click OK.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.
- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create SAN LUN, Quality of Service Tab, Single Tier
Managing SAN LUNs
Mapping LUNs and SAN Host Entries
Create Single-Tier LUN: Define Data Protection

Create Single-Tier LUN: Define Data Protection

You can allocate clone capacity for a single-tier LUN and create a schedule Clone LUN to perform clone operations on a regular basis. The Data Protection page also allows you to use custom QoS settings for your clones or use the LUN settings.

After the clone is created, you can change the priority level and other properties of the clone. When creating a Clone LUN, make sure that enough repository

space exists for the clone. The system stores in the clone repository only the changes that are made to the source volume or to the clone.

1 Navigate to SAN > Storage > LUNs.

2 Select Actions > Create.

3 Click Single Tier.

4 Click the Data Protection tab.

5 To allow the system to create Clone LUNs, select the Enable Clones check box.
Selecting this option enables the remaining options on the page.

6 In the Maximum Capacity field, enter a value for the Capacity for Clone Storage. The system sets a default of 110% of the LUN storage capacity. Selecting a value of 100% provides enough capacity to avoid strict control over the storage capacity without using up unnecessary capacity.

CAUTION: Allocate sufficient repository or clone storage capacity to minimize the chances of running out of this space (which could lead to data inconsistency or loss). To set sufficient capacity, use a value equal to the source volume capacity multiplied by the number of replicas multiplied by the maximum rate of change. For example, for a 100 GB volume that is projected to have 20 active replicas at a time and no more than a 20% rate of change, use a value of 400 GB for the storage capacity.

7 (Optional) Select the Match Repository QoS to LUN QoS check box.
Selecting the Match Repository QoS to LUN QoS option applies the LUN QoS properties to the clones and disables the Clone Storage QoS fields.

8 (Optional) From the Storage Domain list, select the Storage Domain that you want to assign the LUN.

9 Select the Storage Class where you want to store the LUN.

Possible classes:

- Capacity Disk
- Capacity SSD
- Performance Disk
- Performance SSD

10 (Optional) Select the Basic link.

The indirect QoS properties display. Available selections:

- Typical Access
- I/O Bias
- Redundancy

11 (Optional) From the Typical Access list, select the common access method for this LUN.

Available access methods:

- Sequential
- Random
- Mixed

12 (Optional) From the I/O Bias list, select the typical read-write ratio for this LUN.

Available biases:

- Read
- Write
- Mixed

13 (Optional) From the Redundancy list, select the number of parity bits to copy for this LUN.

Available redundancies:

- Single
- Double

14 (Optional) Select the Advanced link.

The direct QoS properties display. Available selections:

- RAID Level
- Read Ahead

Important: Selecting Advanced QoS properties clears the Basic QoS selections.

15 (Optional) From the RAID Level list, select the RAID level to associate with this LUN.

Possible RAID levels:

- Single Parity
- Double Parity
- Mirrored

16 (Optional) From the Priority Level field, select the desired option for the LUN.

Valid choices:

- Premium
- High
- Medium
- Low
- Archive

17 (Optional) To create a Clone LUN data protection schedule, click Create.

See the procedure for creating Clone LUNs on a scheduled basis.

18 (Optional) Click OK.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.
- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create SAN LUN, Data Protection Tab, Single Tier
Managing SAN LUNs
Mapping LUNs and SAN Host Entries
Create Single-Tier LUN: Define Quality of Service

Modifying Single-Tier LUNs

You might need to modify the current Quality of Service (QoS) attributes for a Single-Tier LUN, such as increase the capacity or allocate space for Clone LUNs. You can also modify the mapping of a LUN as well as change the Controller to which the LUN is assigned.

Note: When you change the Storage Class of a logical volume, the volume is migrated to the new Storage Class. Any existing clones of that volume are not migrated to the new Storage Class.

You modify a LUN by entering the QoS attributes on the Oracle FS System Manager screen. The Modify LUN screen contains three tabs for entering QoS information and mapping the LUN to a host entry.

Quality of Service	(Required) The Quality of Service tab allows you to change the assigned volume group or Storage Domain. You can also create a group if one does not exist. This tab also allows you to customize QoS attributes, including selecting a storage profile, storage class, redundancy, and other properties, depending on the selected parameters. You can also set the capacity limits for the LUN and view the effects that the selected QoS attributes would have on the storage class and overall system storage capacities.
Mapping	(Optional) The Mapping tab allows you to specify which SAN host entries can access the LUN. You can map the LUN using one of the following methods:

	• Map the LUN to a SAN host entry using a specific LUN number. • Map all SAN host entries to access the LUN using the same LUN number. This method is not recommended.
Data Protection	(Optional) The Data Protection tab allows you to allocate the storage capacity for the Clone LUNs repository. You can apply unique QoS properties to the Clone LUN repository and increase, but not decrease, the maximum clone capacity of your clone. You can also create a clone schedule to perform data protection at regular intervals.

Related Links

Modify Single-Tier LUN: Quality of Service
Modify Single-Tier LUN: Change to Auto-Tiered LUN
Modify Single-Tier LUN: Data Protection

Modify Single-Tier LUN: Quality of Service

You might need to modify the current QoS attributes for a LUN, such as increase the capacity or allocate space for Clone LUNs.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. From the Quality of Service tab, modify the necessary QoS attributes.
5. To save your changes to the LUN, click OK.

Related Links

Modify SAN LUN, Quality of Service Tab, Single Tier
Modifying Single-Tier LUNs

Modify Single-Tier LUN: Change to Auto-Tiered LUN

You might want to change a single-tier LUN to an auto-tiered LUN when you want to make efficient use of the Oracle FS System resources.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. Click the Quality of Service tab.
5. Click Auto Tier.
6. (Optional) Click the Additional Options button.
   The Additional Options dialog appears.
7. (Optional) From the Additional Options dialog, select the desired Storage Classes that you want the auto-tier LUN to use.

8 (Optional) To enable auto-tiering, select the Tier Reallocation Enabled check box.

9 Click Close.

10 Update the QoS properties, as necessary.

11 To save your changes to the LUN, click OK.

The Tier Reallocation column of the LUNs overview page changes states from a dash (**- -**) to some other state, such as Enabled. This state change indicates that the LUN is now auto-tier.

Related Links

Modify SAN LUN, Quality of Service Tab, Auto Tier
Modifying Single-Tier LUNs

Modify Single-Tier LUN: Data Protection

You can modify the allocated clone capacity and QoS properties for your single-tier LUN. You can also manage the data protection schedules.

1 Navigate to SAN > Storage > LUNs.

2 Select the LUN that you want to modify.

3 Select Actions > Modify.

4 Click the Data Protection tab.

5 Update the fields, as necessary.

6 (Optional) To create a Clone LUN data protection schedule, click Create.
See the procedure for creating Clone LUNs on a scheduled basis.

7 (Optional) To update an existing data protection schedule, select the schedule from the Clone Schedules list and then click Modify.
See the procedure for modifying the schedule for details.

8 (Optional) To remove an existing data protection schedule, select the schedule from the Clone Schedules list and then click Delete.

Note: You are not prompted to confirm the removal of the data protection schedule.

9 To save your changes to the LUN, click OK.

Related Links

Modify SAN LUN, Data Protection Tab, Single Tier
Modifying Single-Tier LUNs

Display LUN Details

You can display details about a selected LUN.

The LUN details include:

- Single-tier LUN or auto-tier LUN
- Quality of Service (QoS) attributes
- Allocated storage capacity
- Volume group and Storage Domain associations
- SAN host entry mapping details and Controller port masking assignments
- Clone capacity and cloning schedules

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN you want to view.
3. Select Actions > View.
4. Select any of the tabbed pages to view the LUN properties.
5. Click Close.

Related Links

View SAN LUN, Data Protection Tab, Single Tier
View SAN LUN, Mapping Tab
View SAN LUN, Quality of Service Tab, Single Tier
Controller Ports
QoS Policies
Storage Domains
Volume Groups
Modifying Auto-Tiered LUNs
Modifying Single-Tier LUNs
Mapping LUNs and SAN Host Entries

Disable the Data Path of a LUN

You might want to remove the ability of a SAN host to access a LUN or Clone LUN.

Disabling the data path to the logical volume prevents I/O operations on the volume. However, mappings to the SAN host entries are retained.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to disable from the data path.
3. Select Actions > Disable Data Path.
   A confirmation dialog displays.
4. To disable the data path for the LUN, click OK.

On the LUN overview page, the Host Access status of the volume changes to *Inactive*. You must enable the LUN to start I/O and make the LUN accessible on the network

Related Links

SAN LUNs Overview Page
Managing SAN LUNs
Enable the Data Path of a LUN

Enable the Data Path of a LUN

Enabling the data path to a LUN restores the communication between the mapped SAN host and the volume. When the data path to a LUN has been disabled, you can provide the ability of a SAN host to access that LUN using the host mappings already established.

The LUN overview page identifies the Host Access status of a disabled LUN as *Inactive*.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to enable.
3. Select Actions > Enable Data Path.
4. To enable the data path, click OK.

On the LUN overview page, the Host Access status of the volume changes from *Inactive* to the original status.

Related Links

SAN LUNs Overview Page
Managing SAN LUNs
Disable the Data Path of a LUN

Relocating LUNs

You can relocate a LUN from its assigned Controller to another Controller.

If you relocate a LUN from one Controller to another, the system reconfigures the volume at the new location while attempting to maintain the integrity of the data.

CAUTION: If a client attempts to modify that LUN while the LUN is being relocated, the client loses its connection and data becomes corrupted or lost. Before you relocate a LUN to another Controller, clients unmount the LUN to ensure data integrity during the move.

Keep LUN copies on the same Controller as the source LUN until the background copy has completed. You can monitor the status of this task from the Task window.

Important: If the LUN is a member of a SAN replication pair, isolate the pair before relocating the LUN to a different Controller. For more information, see the *Oracle MaxRep for SAN User's Guide*.

Related Links

Data Replicas and System Capacity
Managing SAN LUNs
Change the LUN Location on a Controller

Change the LUN Location on a Controller

You can relocate a LUN from one Controller to another.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. Click the Mapping tab.
   The current Controller assignment is displayed in the Current Controller field.
5. From the Assigned Controller list, select the desired Controller.
6. To save your changes, click OK.

Related Links

Modify SAN LUN, Mapping Tab
Relocating LUNs

Delete a LUN

When a LUN is longer needed, you can delete it.

Note: When you delete a LUN, any clones that are in process or completed are also deleted.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to delete.
3. Select Actions > Delete.
   The system displays the Delete LUN dialog. The Delete LUN dialog lists the LUN and the affected clones that the system identifies for deletion.

   Note: The system displays the option, Delete LUNs and existing host mappings when the LUN you are deleting contains host mappings. Deleting a LUN with host mappings causes each of those hosts to lose access to the LUN and clones.
4. To acknowledge that you want to delete the LUN, along with any clones and host mappings, select the option Delete LUNs and existing host mappings.
5. Click OK.

Related Links

Delete LUN
Creating Auto-Tiered LUNs
Creating Single-Tier LUNs

Mapping LUNs and SAN Host Entries

After creating your LUNs, map them to the SAN host entry so that the volumes can be used by the Oracle FS System.

Mapping allows you to specify which SAN host entries can access the LUN. Mapping your LUN to a host entry makes the LUN available to the Oracle FS System.

You can map the LUN using one of the following methods:

- Map the LUN to a SAN host entry using a specific LUN number.
- Map all SAN host entries to access the LUN using the same LUN number. This method is not recommended.

Related Links

Create LUN: Define Mapping by Selected Host Entries
Create LUN: Define Mapping by LUN Number
Modify LUN: Define Mapping by Selected Host Entries
Modify LUN: Define Mapping by LUN Number

Create LUN: Define Mapping by Selected Host Entries

Mapping your LUN makes the LUN available to the host entry. You can specify that your LUN map to a specific host entry and LUN number.

1. Navigate to SAN > Storage > LUNs.
2. Select Actions > Create.
3. Click the Mapping tab.
4. Select the Access Protocol that permits access to the LUN.
   Valid options:
   - Fibre Channel (FC)
   - iSCSI
5. Select the option Only selected hosts (via maps).
   The system displays the Hosts mapping table.
6. From the LUN Controller Assignment controls, allow the Oracle FS System to assign the Controller, by leaving the Assigned Controller option set to the default, which is <auto assign>.
7. Click Create.
8. From the Create LUN Map dialog, define the mapping for the LUN, then click OK or click OK and Continue.

Valid options:

- LUN Name
- Host Name
- LUN Number

Tip: If network clients are running on Windows 2000 or 2003 platforms, and you want those clients to be able to access the LUN, do not select LUN number 255.

Note: Clicking OK and Continue allows you to map more hosts to this LUN. Clicking OK creates the LUN mapping and closes the dialog.

9 (Optional) From the Ports Masked for this LUN table, select Yes for each Controller port that you want to mask.

When you mask a port, the LUN cannot be accessed from the specified ports.

Note: If you use Oracle FS System LUN masking or switch zoning and do not use LUN assignment, you could create a situation in which a LUN is not exposed on the ports through which you want the clients to be able to access the LUN. To avoid this situation, assign the LUN to the Controller on which you have the mapping set.

10 Click OK.

If the host entry that you want to allow access to the LUN is not displayed in the list, add the host entry by associating the host initiator to the host entry.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.
- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create LUN Map Dialog
Create SAN LUN, Mapping Tab
Mapping LUNs and SAN Host Entries
Creating Auto-Tiered LUNs
Creating Single-Tier LUNs

Create LUN: Define Mapping by LUN Number

Mapping a LUN makes the LUN available to the host. You can specify that the LUN map to a specific LUN number that any SAN host entry can use.

You might want all SAN host entries to be able to access a LUN using the same unique LUN number. This approach requires that you not map any host to this LUN.

1. Navigate to SAN > Storage > LUNs.
2. Select Actions > Create.
3. Click the Mapping tab.
4. Select the Access Protocol that permits access to the LUN.

   Valid options:

   - Fibre Channel (FC)
   - iSCSI
5. Select the option All hosts may access the LUN using LUN number.
6. Select a LUN number from the drop-down list to assign to the LUN.

   Tip: If network clients are running on Windows 2000 or 2003 platforms, and you want those clients to be able to access the LUN, do not select LUN number 255.
7. From the LUN Controller Assignment controls, allow the Oracle FS System to assign the Controller, by leaving the Assigned Controller option set to the default, which is <auto assign>.
8. (Optional) From the Ports Masked for this LUN table, select Yes for each Controller port that you want to mask.

   When you mask a port, the LUN cannot be accessed from the specified ports.

   Note: If you use Oracle FS System LUN masking or switch zoning and do not use LUN assignment, you could create a situation in which a LUN is not exposed on the ports through which you want the clients to be able to access the LUN. To avoid this situation, assign the LUN to the Controller on which you have the mapping set.
9. Click OK.

Clicking OK creates the LUN using the default settings on the remaining tabs. You can perform the tasks associated with the other tabs to fine-tune the remaining LUN properties. The default properties include:

- The LUN is assigned to the default Volume Group and the default Storage Domain.
- The LUN is mapped to the same host entry as the most recent LUN mapping.

- The system does not create repository capacity for Clone LUNs.
- The system does not create schedules for automatic Clone LUNs.

Related Links

Create LUN Map Dialog
Mapping LUNs and SAN Host Entries
Creating Auto-Tiered LUNs
Creating Single-Tier LUNs

Modify LUN: Define Mapping by Selected Host Entries

You might need to modify the LUN mapping properties of a host entry when the host is offline (for example, for maintenance).

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.
4. From the Mapping tab, select the host mapping to modify, and then click Modify.
5. From the Modify LUN Number dialog, select a new LUN to map for this LUN, then click OK.

   Tip: If network clients are running on Windows 2000 or 2003 platforms, and you want those clients to be able to access the LUN, do not select LUN number 255.
6. To save your changes, click OK.

If the host entry that you want to allow access to the LUN is not displayed in the list, add the host entry by associating the host initiator to the host entry.

Related Links

Modify LUN Number Dialog
Modify SAN LUN, Mapping Tab
Mapping LUNs and SAN Host Entries
Modifying Auto-Tiered LUNs
Modifying Single-Tier LUNs

Modify LUN: Define Mapping by LUN Number

You might want to modify the LUN number that all SAN host entries use to access the LUN.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to modify.
3. Select Actions > Modify.

4 From the Mapping tab, select a LUN number from the drop-down list to assign to the LUN.

Tip: If network clients are running on Windows 2000 or 2003 platforms, and you want those clients to be able to access the LUN, do not select LUN number 255.

5 To save your changes, click OK.

Related Links

Modify SAN LUN, Mapping Tab
Mapping LUNs and SAN Host Entries
Modifying Auto-Tiered LUNs
Modifying Single-Tier LUNs

Oracle FS VDS Provider

The Oracle FS Virtual Disk Service Provider (VDS Provider) software provides a plug-in that allows administrators to manage LUNs on the Oracle FS System. The software is available from the Pilot management interface.

The Oracle FS System Pilot management interface provides links that allow you to download and install the Oracle FS Virtual Disk Service Provider software. During the installation process, you can register a single Oracle FS System. After installation, you can register more systems.

Note: Verify the VDS software installation before registering any systems.

Related Links

Managing SAN LUNs
Download and Install the VDS Provider
Verify the VDS Provider Installation
Register an Oracle FS System with the VDS Provider

Download and Install the VDS Provider

The Pilot management interface provides links to download the Oracle FS Virtual Disk Service Provider software. The software is available for both 32- and 64-bit systems.

Prerequisites

- An Oracle FS System configured with FC protocol.
- You need the following information to register the Oracle FS System with the Oracle FS Virtual Disk Service Provider software:
  - System serial number
  - Login account: username
  - Login account: password

The software installer allows the configuration of an Oracle FS System. Additional systems can be configured from a command-line tool, called `registerAxiom`.

1. Start a web browser.
2. Specify the IP address of the Pilot or the name of the Oracle FS System as the address to open.
3. Click the Utility Software tab.
4. Download the VDS software and save the file to your server.
   Select the software version that is appropriate for your system architecture.
   - Download Oracle FS VDS Provider - 32 bit
   - Download Oracle FS VDS Provider - 64 bit
5. Locate the file on your server and double-click the file to begin the installation.
6. Follow the instructions to install the software on the server.

   Note: You are prompted for the Oracle FS System serial number, user name, and password during the installation.
7. To close the installation wizard, click Close from the Installation Complete page.
8. Restart the Windows server.

Next, verify that the software is installed correctly.

Related Links

Oracle FS VDS Provider
Verify the VDS Provider Installation

Verify the VDS Provider Installation

After you install the Oracle FS Virtual Disk Service Provider software, verify the installation. After you have verified the installation, you can register more Oracle FS Systems.

Prerequisite	Installed Oracle FS Virtual Disk Service Provider software.

Use the Windows `diskRAID` program to verify that the Oracle FS Virtual Disk Service Provider software is installed on your workstation.

1. Navigate to Start > run from your workstation.
2. From the Open field, type `diskraid`.
3. Click OK.
   You are prompted to confirm access to your workstation.
4. To continue, click Yes.
   A new console window opens with the prompt `DISKRAID>`.

5 From the command prompt, type `list providers`.
Verify that the VDS provider name is listed. If VDS provider name is not listed, install the software again, or contact your system administrator.

6 To close the `DISKRAID` command window, type `exit`.

Related Links

Oracle FS VDS Provider
Download and Install the VDS Provider

Register an Oracle FS System with the VDS Provider

After you install the Oracle FS Virtual Disk Service Provider software, you can register additional Oracle FS Systems with the software.

Prerequisite

- Installed Oracle FS Virtual Disk Service Provider plug-in
- You need the following information to register each Oracle FS System with the Oracle FS Virtual Disk Service Provider plug-in:
  - System serial number
  - Login account: user name
  - Login account: password

The Oracle FS Virtual Disk Service Provider installs a utility that adds and removes Windows registry entries for the Oracle FS System.

1 Start a command prompt from your workstation.

2 Change the directory to the `bin` folder of the VDS provider installation.

3 (Optional) To view a list of acceptable usage options, type `registerAxiom`.

4 To register a Oracle FS System, type `registerAxiom` *sample-serial user-name user-password*.

Note: Enter the required information in the order listed.

5 (Optional) To remove the registered Oracle FS System, type `registerAxiom` *sample-serial*.

Related Links

Oracle FS VDS Provider
Download and Install the VDS Provider

CHAPTER 6

Manage SAN Host Entries

SAN Host Entries

A SAN host entry is a record in Oracle FS System Manager (GUI) that represents a group of one or more *initiators*. An *initiator* is the World Wide Name (WWN) of an FC HBA port or the name of an iSCSI initiator. You create host entries manually using the GUI, or automatically using Oracle FS Path Manager (FSPM).

Note: The GUI uses the term *host* to refer to SAN host entries. Also, the term *SAN host* refers to any computer that is connected to the Oracle FS System by way of a Storage Area Network.

The Oracle FS System can contain the following types of SAN host entries:

Unassociated host	The Oracle FS System automatically creates unassociated SAN host entries when an initiator is discovered on the SAN. The name of the initiator and the unassociated SAN host entry are the same.
Associated host	A host entry that an administrator associates with one or more host initiators. Use the Associate Hosts option to manually associate the initiators as associated hosts. After associating the initiators to the host, the associated host is a host entry, referred to in the GUI as a *host*.
FSPM host	A host that FSPM associates with one or more host initiators after logging in to the Pilot. FSPM manages the association of the initiators on the FSPM host to the FSPM host name. The FSPM host entry contains the following information: • The name of the FSPM host, which is the SAN host that runs FSPM • The list of initiators, which includes the FC ports in the host system, and, if iSCSI is configured, the names of the iSCSI initiators

If the Oracle FS System has LUNs, you can map them to any type of host entry. Mapping the LUNs makes them visible to all of the initiators that the host entry owns.

You can move initiators into associated host entries as necessary. When you move an initiator from an unassociated host to an associated host, the system adds the

unassociated initiator to the host entry and deletes the unassociated host entry. The system moves the mapped LUNs to the host entry and retains the LUN mappings.

For example, you want to move a LUN (mapped to LUN number 3) to a host that contains a LUN (mapped to LUN number 5). After the move, the associated host contains both LUNs, each mapped to its respective LUN number. If the new and existing LUN numbers are the same, the Oracle FS System assigns a new LUN number to the newly mapped LUN.

Moving initiators from one associated host entry to another requires the following actions:

- Remove the initiator from the first host entry.
- Associate the initiator to the new host entry.

The LUN mappings from the original host entry are not applied to the new host entry. If, after moving the initiator, there are no more initiators that are associated with the original host entry, then the Oracle FS System removes that entry.

When you delete a SAN host entry, the Oracle FS System creates an unassociated host for each initiator that is connected to the system. When deleting a host, you have the following options:

- Keep all of the LUN mappings that belong to the deleted host with each new unassociated host. Keeping the LUN mappings allows you to map a LUN to another host.
- Delete all of the LUN mappings that belong to the deleted host.

Related Links

Managing SAN Host Entries

FSPM on SAN Hosts

FSPM on SAN Hosts

Oracle FS Path Manager (FSPM) monitors the initiator ports on the SAN host and the data paths between the SAN host and the Oracle FS System.

For many operating systems, FSPM performs the following key functions:

- Enables the use of multiple paths between HBA ports on the host and Controller ports
- Balances the load across HBA channels and Controller ports
- Monitors path failure and transfers traffic to different paths if a failure occurs
- Maps LUNs to host volumes
- Reports the status of host drivers and paths in Oracle FS System Manager (GUI)

- Collects logs to include in Call-Home files when SAN hosts are selected
- Automates the recognition and configuration of the FSPM host in the GUI

A host system accesses LUNs through a SCSI-over-FC driver or an iSCSI driver. These drivers are provided with the operating system or by the HBA manufacturer.

Related Links

Controller Ports
Managing Event Logs
Mapping LUNs and SAN Host Entries
FSPM Hosts Management

FSPM Hosts Management

Oracle FS Path Manager (FSPM) runs on a SAN host to create FSPM hosts and monitor data paths on the Oracle FS System.

When FSPM logs in to the Pilot, FSPM provides the name of the SAN host and the list of host initiators. If necessary, the Oracle FS System creates any FSPM hosts that are not found on the system and assigns the available initiators to the FSPM host.

FSPM is operating normally when the following conditions apply:

- FSPM successfully logs in to the Pilot.
- The Pilot has registered the host initiators as an FSPM host.
- An active TCP connection exists between the Pilot and FSPM daemon.

The FSPM host entry contains the following information:

- The name of the FSPM host, which is the SAN host that runs FSPM
- The list of initiators, which includes the FC ports in the host system, and, if iSCSI is configured, the names of the iSCSI initiators

When you need to change the name of the FSPM host entry, change the name of the SAN host that is running FSPM.

CAUTION: If you improperly change the name of the FSPM host, you could lose access to your data.

FSPM that is running on the SAN host provides information to the Oracle FS System on a continuous basis. For example, FSPM reports for each LUN the number of optimized and non-optimized paths that are currently usable at the host.

You can perform the following actions using FSPM:

- Monitor the multiple data paths to the Oracle FS System Controllers.
- Verify the connection status of each initiator on the host.

- Balance the load traffic among the multiple paths.

FSPM sends a list of SAN host initiators to the Pilot. If any of the SAN host initiators are not currently associated with the FSPM host entry, then they are added to it. As a result, all the LUN mappings that are associated with the FSPM host entry are applied to the new initiators.

Deleting FSPM host entries releases the initiators that are members of that FSPM host. However, a new FSPM host is created the next time that FSPM logs in to the Pilot.

For more information about FSPM, refer to the *Oracle FS Path Manager Installation Guide* and to the *Oracle FS Path Manager Release Notes* for the appropriate SAN host platform.

Related Links

SAN Host Entries

Rename an FSPM Host

Rename an FSPM Host

You can rename the Oracle FS Path Manager (FSPM) host by deleting the old host entry and renaming the SAN host that is running FSPM. FSPM creates a new host entry with the new SAN host name.

The FSPM host name contains the name of the SAN host that is running FSPM. To change the name of the FSPM host, delete the FSPM host and then rename the SAN host. FSPM creates a new FSPM host when you restart FSPM. Correctly renaming the FSPM host ensures that the Oracle FS System maintains the internal record of the FSPM host.

1. Stop FSPM.

   For instructions, refer to *Oracle FS Path Manager Installation Guide*.

2. To view the list of SAN host entries, including the FSPM host, from Oracle FS System Manager (GUI), navigate to SAN > Storage > Hosts.
3. Verify that at least one initiator is connected to the FSPM host.
4. Select the FSPM host that you want to delete.
5. Select Actions > Delete Host.
   The system displays the FSPM host and any LUN mappings.
6. Verify that the Delete mappings and initiators? option is not selected.

   Because you did not select the Delete mappings and initiators? option, the Oracle FS System retains any mappings to the host initiators. FSPM uses these initiators when the system creates the FSPM host using the new SAN host name.
7. To delete the FSPM host, click OK.
8. Rename the SAN host on which you have installed the FSPM software.

The process for renaming the SAN host varies depending on the host operating system. Check the documentation for your host operating system.

9 Restart FSPM.

For instructions, refer to *Oracle FS Path Manager Installation Guide*.

FSPM logs in to the Pilot and reports the new SAN host name. Then, the Oracle FS System creates an FSPM host entry with the new SAN host name. The FSPM host contains the host initiators and any LUN mappings.

Related Links

Hosts Overview Page

FSPM Hosts Management

Rename an Associated Host Entry

Managing SAN Host Entries

Use Oracle FS System Manager (GUI) to manage SAN host entries. If you have installed the Oracle FS Path Manager (FSPM), FSPM creates FSPM host entries for you.

The configuration of the Controller and SAN hosts includes the following tasks:

- Configure the FC ports or iSCSI ports in the Controller for network access. When these ports are configured, a successful connection can be made from the initiator ports on the SAN host to the target ports on the Controller.
- Provide an alias for the SAN host initiator ports. An alias makes the ports easier to identify.
- Configure authentication between the iSCSI Controller ports and the hosts.
- Enable the HP-UX compatibility option that allows the system to use the HP-UX addressing scheme for LUNs.
- Configure the FSPM load balancing settings on some operating systems.
- Map a LUN to a selected host entry. Mapping is the mechanism that enables the SAN host to identify and access the LUN.
- Optionally mask a Controller port so that the LUN cannot be accessed through that port.
- Associate the host entry to a host group, which is a named, logical collection of hosts.

When you delete a host entry, by default the Oracle FS System retains the mappings to the initiators of that deleted entry. These retained mappings allow you to transfer the mappings to another host entry. You can optionally remove these mappings when deleting a host entry. When you delete a host entry, the Oracle FS System creates new unassociated host entries for any initiators that are

discovered by the system. You might need to refresh the screen (Ctrl-Alt-R) to view the new initiators.

You can group hosts together using host groups. A *host group* is a named, logical collection of one or more host entries. Host groups are a convenient way to associate many SAN host entries into a single, manageable object. Host groups are compatible with associated hosts and FSPM hosts.

Related Links

Mapping LUNs and SAN Host Entries
Configure iSCSI System Settings
Manage Port Provisioning for a Controller

Create an Associated Host Entry

When you do not have Oracle FS Path Manager (FSPM) installed on the SAN host system, you create associated host entries by associating one or more initiators to a named host entry.

Associate initiators to a host when the Host overview page lists that host in one of the following manners:

- Unknown state
- By a world wide name (WWN) for FC initiators
- By an iSCSI initiator name

1. Navigate to SAN > Storage > Hosts.
2. Select Actions > Associate Hosts.
   The Associate Hosts dialog appears.
3. Specify the name of the host in the Host Name field.
4. Select the initiators from the Create Association list.
   Valid methods:
   - Select the initiators from the discovered WWN or iSCSI name list.
   - Enter a WWN or iSCSI name of an initiator on the SAN network.
5. To associate the initiators to the host entry, click Add.
   The selected initiator moves to the Associations table.
6. Continue adding initiators to the Associations table, as necessary.
7. (Optional) To enable the Challenge Handshake Authentication Protocol (CHAP), select Enable Authentication.
8. (Optional) Enter the CHAP **iSCSI Host Specific Settings**.
   Required authentication credentials:
   - CHAP Name
   - CHAP Secret
   - Retype CHAP Secret

9 (Optional) To grant access to the Oracle FS System from iSCSI login attempts, select the Grant Access to Oracle FS option.

10 (Optional) To remove an entry from the Associations table, select the item and then click Remove.

11 Click OK.

The Host overview page displays the host entry name with the desired associated initiators.

Related Links

Associate Hosts Dialog
Hosts Overview Page
SAN Host Entries

Rename an Associated Host Entry

You can rename an associated host entry without affecting associated mappings.

You cannot rename FSPM host entries and unassociated host entries directly. For these host entry types, the Host Name field is not enabled.

- If you want to rename an unassociated host entry, create an associated host entry with the desired name.
- If you want to rename an FSPM host entry, you must rename the FSPM host.

1 Navigate to SAN > Storage > Hosts.

2 Select the associated host that you want to rename.

3 Select Actions > Modify Host.

4 From the Host Name field, enter a new name for the host.

5 Click OK.

Related Links

Hosts Overview Page
Modify Host, Ports Tab

Delete a Host Entry

Delete the host entry when you want to disassociate the initiators from the entry.

The Oracle FS System retains your LUN mappings to the initiators of your deleted host entry. You can remove the mappings, as necessary.

1 Navigate to SAN > Storage > Hosts.

2 Select a host from the list to delete.

3 Select Actions > Delete Host.
The system displays the Delete Host dialog.

4 (Optional) Select the Delete mappings and initiators? option.

By selecting the Delete mappings and initiators? option, the system removes any LUN mappings and from the associated initiators, and does not immediately create unassociated host entries for the initiators. In this case, the system creates unassociated host entries for any of the discovered initiators on the SAN.

5 Click OK.

If necessary, refresh the screen to view the unmapped host initiators by clicking the refresh icon ().

Related Links

Hosts Overview Page
Managing SAN Host Entries

View SAN Host Entry Settings

You can view the SAN host entry status and associated initiators. If Oracle FS Path Manager (FSPM) is installed, you can also view details about load balance and communication status.

1 Navigate to SAN > Storage > Hosts.
2 Select a host from the list to view.
3 Select Actions > View Host.
4 Select any of the tabbed pages to view the host settings.
5 Click Close.

Related Links

Hosts Overview Page
View Host, Advanced Tab
View Host, iSCSI Access Tab
View Host, Oracle FS Path Manager Tab
View Host, Ports Tab
Managing SAN Host Entries

Modifying SAN Host Entries

You can modify information about a host including adding an alias name for a host HBA port, enabling the iSCSI host Challenge Handshake Authentication Protocol (CHAP) authentication, and setting the HP-UX compatibility option.

You can change the FSPM settings of the FSPM host entries only when FSPM is installed and communicating with the Oracle FS System.

Also, if you have hosts that are running the HP-UX Operating System, enable the HP-UX compatibility you can option for these hosts. When this option is enabled, the system presents LUN numbers using the HP-UX addressing scheme, allowing up to 4095 LUNs. When enabled, the host cannot have a visible LUN using ID 0.

Modify the host by using the following tabbed pages as necessary:

Ports	Allows you to create or modify an HBA port alias and view FC and iSCSI port information.
Oracle FS Path Manager	Allows you to view the installed FSPM version and path manager settings. From this page, you can modify the load balancing settings and view the number of optimized and non-optimized data paths.
iSCSI Access	If you select a host with an iSCSI connection, you can manage the CHAP authorization and grant access to the Oracle FS System.
Advanced	If the SAN host is running the HP-UX operating system, you can set the HP-UX compatibility mode option from this page.

Related Links

FSPM on SAN Hosts
Modify a Host: Assign a Port Alias
Modify a Host: FSPM Load Balancing
Modify a Host: Reconfigure iSCSI Access Settings
Modify a Host: Reconfigure Advanced Settings

Modify a Host: Assign a Port Alias

Assign an alias to an HBA port to make the host and the port easier to identify.

1. Navigate to SAN > Storage > Hosts.
2. Select a host from the list to modify.
3. Select Actions > Modify Host.
4. From the Ports tab, select a port from the list.
5. Enter an Alias name for the port you wish to modify.
6. Click OK.

Related Links

Modify Host, Ports Tab
Modifying SAN Host Entries

Modify a Host: FSPM Load Balancing

You can change the load balancing method that Oracle FS Path Manager (FSPM) uses to access LUNs.

1. Navigate to SAN > Storage > Hosts.
2. Select a host from the list to modify.
3. Select Actions > Modify Host.

4 From the Oracle FS Path Manager tab, select a LUN, then select an option from the Load Balancing list.

Available methods:

- Static
- Round Robin

Note: Some operating systems do not allow you to update this option.

5 Click OK.

Related Links

Modify Host, Oracle FS Path Manager Tab

Modifying SAN Host Entries

Modify a Host: Reconfigure iSCSI Access Settings

If you want to allow iSCSI initiator access to the Oracle FS System, enable the Challenge Handshake Authentication Protocol (CHAP) option and grant access to the system.

1 Navigate to SAN > Storage > Hosts.

2 Select a host from the list to modify.

3 Select Actions > Modify Host.

4 From the iSCSI Access tab, select Enable Authentication to allow CHAP authentication credentials.

5 Enter the necessary CHAP credentials in the fields provided.

6 (Optional) To allow iSCSI initiator login attempts to the Oracle FS System, select Grant Access to Oracle FS option.

7 Click OK.

Related Links

Modify Host, iSCSI Access Tab

Modifying SAN Host Entries

Modify a Host: Reconfigure Advanced Settings

If you have hosts that are running the HP-UX Operating System, enable the HP-UX compatibility option. When the HP-UX compatibility option is enabled, the system presents the LUN numbers by using the HP-UX addressing scheme.

The LUN numbers by using the HP-UX addressing scheme allows you to access up to 4095 LUNs.

Note: When enabled, the HP-UX host cannot have a visible LUN using ID 0.

1 Navigate to SAN > Storage > Hosts.

2 Select a host from the list to modify.

3 Select Actions > Modify Host.

4 Select the Advanced tab.

5 To enable HP-UX LUN addressing scheme, select the HP-UX Compatibility Mode option.

6 Click OK.

Related Links

Modify Host, Advanced Tab

Modifying SAN Host Entries

Initiator-to-Controller Connectivity

Oracle FS System Manager (GUI) provides the connectivity status of each Controller ports and host initiator. After you have mapped LUNs to the hosts, you can view the connectivity status of every data path in the system.

The inter-connectivity among the Controllers and host initiators creates highly redundant data paths. This redundancy ensures that data reliably transfers among the host, the Controller, and the mapped LUNs. The Oracle FS System provides connectivity status among the various data paths. Such states might indicate that an FC switch is offline.

You can view the connectivity status from the Initiator-to-Controller Connectivity menu items that are available from various locations in the GUI. Depending on the object that you have selected, the GUI shows the state of the initiator that is assigned to the host entry, host initiator, or LUN. The following table summarizes the connectivity information among the Controllers ports, LUNs, hosts, and initiators.

Table 10: Initiators-to-Controller connectivity information in the GUI

GUI page source	Selected object	Connectivity information
Hosts overview	Host	Displays connectivity between all Controller ports and all host initiators that are assigned to the host entries.
Hosts overview	Host initiator	Displays connectivity between all Controller ports and selected host initiator.
LUN-to-Hosts overview	LUN	The page provides connectivity status between the LUN and host. The page also, displays connectivity between the host initiators and all Controller ports.
Hosts-to-LUNs overview	Host	The page provides connectivity status between the host and LUN. The page also, displays connectivity between the host initiators and all Controller ports.

Related Links

Controller Ports
Mapping LUNs and SAN Host Entries
SAN Host Entries
Managing SAN Host Entries

Host Groups

You can easily manage the mapping of a LUN to hosts by assigning the host entries to a specific group. This group is a named, logical collection of hosts.

Your system might contain the following hosts:

- Hosts that Oracle FS Path Manager (FSPM) registered, called *FSPM host entries*
- Hosts that an administrator created by associating various initiators, called *associated host entries*

You can create more hosts by either using the FSPM service or manually creating host entries. Creating host groups is useful if you have SAN host clusters, each of which contains many SAN hosts and each SAN host contains a few initiators.

If this SAN host cluster is not defined in the GUI as a host group, when you want to map a LUN to the cluster, map each host to the LUN one at a time. Furthermore, if you must move a SAN host to a different cluster, manually update each LUN mapping, also one at a time.

A more efficient method, however, is to define the cluster as a host group and then assign the hosts to the host group. When you later move a host from one host group to another, all the initiators that are associated with that host inherit the LUN mappings associated with that host group.

Note: The Pilot automatically manages the deletion of the old mappings and the creation of the new initiator mappings.

Host groups have the following properties:

- A host can belong to only one host group.
- You can map unlimited hosts to a host group.
- A host group can have zero or more mappings.
- You can map a LUN to either a host or a host group.
- If a host group has mappings, then all hosts in the host group have all of the mappings of the host group, but any given host may also have other mappings. No mappings may conflict with other mappings.
- When assigning a host with mappings to a host group without mappings, you are prompted to migrate mappings on the host to the host group. Migrating these mappings make them available to all hosts in the group, not just the single host.

For example, consider the following host group (cluster) configuration:

Host group Alpha	LUN1 is mapped to this host group as LUN number 0.	
	Host A	Initiators A1 and A2 are mapped to LUN1. The LUN number is 0.
	Host B	Initiators B1 and B2 are mapped to LUN1. The LUN number is 0.
Host group Omega	LUN2 is mapped to this host group as LUN number 0.	
	Host C	Initiators C1 and C2 are mapped to LUN2. The LUN number is 0.

If you move Host B from host group Alpha to host group Omega, the LUN mappings for Host B are automatically adjusted, as shown below:

Host group Alpha	LUN1 is mapped to this host group as LUN number 0.	
	Host A	Initiators A1 and A2 are mapped to LUN1. The LUN number is 0.
Host group Omega	LUN2 is mapped to this host group as LUN number 0.	
	Host B	Initiators B1 and B2 are mapped to LUN2. The LUN number is 0.
	Host C	Initiators C1 and C2 are mapped to LUN2. The LUN number is 0.

Related Links

Managing Host Groups

Create a Host Group

Managing Host Groups

Managing host groups involves understanding the host mappings to the hosts groups and host access to the LUNs.

To use the host group feature, first create the host group, then assign your hosts to the group. After the host group is created and the hosts are assigned to the group, you can map your LUNs to the host group. A host that is assigned to a host group is still available for mapping by way of the host or the host group to which the host is assigned.

When deleting a host group, remove the host members first. Ideally, you would delete an empty host group that contains no host memberships. Emptying a host group involves moving each host to another group or removing the host from the group. This action might affect the current host-to-LUN mapping. After moving a mapped host to another host group, you will receive a confirmation to unassociate the host from the host group.

The system displays the confirmation to unassociate a host from a host group when there are LUNs mapped to a group. You can decide how you want the system to process the residual mappings. You are presented with two options:

Retain Host Mappings	Allows you to copy all mappings for the deleted host group to the hosts that belong to the group. The hosts that belonged to the deleted host group retains access to any LUNs to which they had access while a member of their host group.
Delete Mappings	Allows you to remove all mappings for the deleted host group. The hosts that belonged to the deleted host group lose access to any LUNs to which they had access while a member of the host group. Choosing this option causes the message *No Mappings* to appear in the LUNs overview page if the LUN is not assigned to a host or host group. The Delete Mappings option does not affect any LUNs that are mapped to the host (and not to the host group).

Related Links

Host Groups
Create a Host Group
Delete a Host Group

Create a Host Group

You can create a host group that allows you to associate host entries into logical organizational units.

1. Navigate to SAN > Storage > Hosts.
2. Select Actions > Manage SAN Host Groups.
   The system displays the Manage SAN Host Groups dialog.
3. Click Create.
4. Enter a name for the host group.
5. (Optional) From the Hosts tab, assign the host entries to an available host group.
6. Click OK.

The system organizes the host entries into the new host group.

Related Links

Manage SAN Host Groups, Groups Tab
Host Groups
Managing Host Groups

Modify a Host Group

You can modify a host group by changing its name, removing SAN host entries, or by assigning SAN host entries to the group.

You can modify a host group in the following ways:

- Update the host group name
- Assign a host to a host group
- Remove a host entry from a host group

1. Navigate to SAN > Storage > Hosts.
2. Select Actions > Manage SAN Host Groups.
   The system displays the Manage SAN Host Groups dialog.
3. To change the host group name, select a host group and update the name from the Group tab.
4. To reassign a host to a new host group, select a host and choose a new host group from the Host Group list from the Hosts tab.
5. To remove a host entry from a host group, select the Hosts tab, and then select a host and select [--] from the Host Group list.

   Note: Specify how the LUN mappings are processed for the mapped hosts.
6. Click OK.

Related Links

Manage SAN Host Groups, Groups Tab
Host Groups
Create a Host Group
Delete a Host Group

Delete a Host Group

Delete a host group when the group is no longer needed.

When possible, delete a host group that contains no host entries. If you delete a host group that contains host entries, the system prompts you for more action on how to map the entries.

1. Navigate to SAN > Storage > Hosts.
2. Select Actions > Manage SAN Host Groups.
   The system displays the Manage SAN Host Groups dialog.
3. From the Manage SAN Host Groups, Groups tab, select a host group from the available list.
4. Click Delete.
   The host group is removed from the list.
5. Click OK.
   If the host group was empty when you deleted it, the system deletes the host group from the system. However, if the host group contains mapped

host entries, more information is required about how to map the LUNs that were mapped to the host entry that you deleted from the host group.

6 (Optional) From the Confirm SAN Host Group Unassociation of Hosts dialog, specify how to process the LUN mappings for the mapped host entries.

Valid options:

- Retain Host Mappings
- Delete Mappings

7 Click OK.

Review the *Host Access* status from the LUNs overview page for the affected LUNs. Verify that the host mapping are correct.

Related Links

Manage SAN Host Groups, Groups Tab

Host Groups

Create a Host Group

CHAPTER 7

Manage Data Protection

Data Replicas and System Capacity

You can create online data replicas in different ways. Each method consumes the capacity in the storage array differently.

Oracle FS System Manager (GUI) displays the relationship of the Clone LUNs and associated parent LUNs in a hierarchal relationship called a replica tree. A replica tree can also include clones of clones.

The Oracle FS System ensures that all of the logical volumes that are associated with a particular replica tree reside on the same Controller.

Note: This discussion of replica trees on a Controller does not apply to replicated objects created by the Oracle MaxRep for SAN.

If you change the home Controller of any of these logical volumes, the system changes the home Controller for all of them. The system updates the home Controller on the following objects:

- Clone LUNs
- Volume copies

Volume copies and logical volumes that are being migrated because of QoS changes continue to reside in the original replica tree until the data operations are complete. After the volume copy or the migration completes, the volume is removed from the original replica tree and becomes the root of a new replica tree.

After you start a volume copy operation or the system starts a data migration operation, if you rehome any object that is in the replica tree, the method for rehoming the Controller differs by replica type. If the system has not yet detached the copy from its source volume, the system rehomes the copy. If, however, the system has already detached the copy, the copy is no longer in the original replica tree; therefore the copy is not rehomed.

The following table summarizes the replica types and capacity usage.

Table 11: Capacity usage by online data replicas

Replica type	Description	Capacity usage
Clone LUN	Creates a readable and writable point-in-time snapshot of a LUN that only stores the delta between the source LUN and the clone. The Clone relies on the source LUN for unmodified LUN data.	Consumes system space allocated for clones. Only changes to the source or clone are stored.
volume copy	Creates a block-level, full-image, read-write copy of a logical volume. QoS attributes for a volume copy can differ from the QoS attributes of the original.	Consumes free space from system capacity that is equal to the current size of the volume.

The online data replicas have the following characteristics:

- The replicas require no prior configuration (other than initial QoS allocation).
- The system creates the replicas as an explicit one-time operation.
- The system creates the replicas on the same Oracle FS System as the source volume.
- The system creates independent replicas from the source volumes. When data changes in the source volume, those changes are not reflected in the replica.

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Related Links

Create an Immediate Clone LUN
Copy a LUN

Copying and Cloning LUNs

You can make a copy of a LUN or create a point-in-time clone of a LUN. When creating a copy, you copy all of the LUN data to the new LUN. You also have the option to copy the LUN properties to a new LUN without copying the source data.

Create a Clone LUN when you want to create an exact image of the original LUN. A Clone LUN is a point-in-time, read-write copy of a LUN that you can immediately use. A Clone LUN retains the same QoS parameters as the source LUN and consumes storage capacity from the Clone LUN storage space created

for the source LUN. A Clone LUN only stores the differences between the source LUN and the clone. The Clone LUN uses the source LUN for most data. A Clone LUN is available immediately after creation. Clone LUNs provide a convenient method to branch from the source data without the need to do a full block-level copy.

Another reason to create a clone or a copy is to preserve a point-in-time view of the data. If you create a clone for this purpose, you can later restore the data to the source LUN.

Copy a LUN when you need a new LUN with the same starting data as an existing LUN.

Before creating a Clone LUN or a copy of a LUN, ensure that changes to the source LUN are minimized. For best results, pause the host applications that access the LUN, or use host software, such as Oracle FS Volume Shadow Copy Service Provider (VSS), before creating the Clone LUN. When the system displays the replica in the Oracle FS System Manager (GUI), you can resume writing to the LUN.

Unlike a clone, the new blocks for the copy might be on a different drive group or on a drive group of a different Storage Class. For example, a volume copy of a LUN that uses a high performance Storage Class, such as a Performance solid-state drive, premium priority LUN may be created in a low performance Capacity drive.

You can also create a LUN that has the QoS and storage capacity settings of an existing LUN. Creating a LUN in this manner copies the properties of the LUN without copying the associated data. After you create a LUN with the desired properties, you can use the LUN as a template for creating new LUNs.

Related Links

Data Replicas and System Capacity
Managing Clone LUNs
Copy a LUN
Create a LUN Like an Existing LUN

Copy a LUN

You can copy an existing LUN and give the new LUN different QoS properties. Copying a LUN allows system resources to be maximized for the task at hand.

For example, if you have a volume copy that is used for reporting purposes, you might want to assign to the copy a lower performance Storage Class and a higher read-centric access pattern than you would assign to the source volume.

You can also copy a Clone LUN. The copy then is independent of the source LUN from which the clone was created. You might want to copy a Clone LUN when you do not want to recover any changes to the source LUN.

1. Navigate to SAN > Storage > LUNs.
2. Select a LUN from the list that you want to copy.

3 Select Actions > Copy LUN.

4 Enter a new, unique name for the LUN.

5 Update the QoS parameters and remaining fields, selecting the tabs as necessary.

6 Click OK.

Related Links

Copy SAN LUN, Data Protection Tab, Auto Tier
Copy SAN LUN, Data Protection Tab, Single Tier
Copy SAN LUN, Mapping Tab
Copy SAN LUN, Quality of Service Tab, Auto Tier
Copy SAN LUN, Quality of Service Tab, Single Tier
Capacities
QoS Policies
Data Replicas and System Capacity
Copying and Cloning LUNs

Create a LUN Like an Existing LUN

You can create a LUN using the QoS properties of an existing LUN as a template. Creating a LUN from a template does not copy any data to the new LUN.

Creating a LUN from an existing LUN copies the QoS properties from the existing LUN to the new LUN. The following properties are not copied to the new LUN:

- LUN host mappings

  Map your new LUN to a host entry.

- Clone LUN schedules

  If you want to create automated Clone LUNs, create a data protection schedule for the LUN.

1 Navigate to SAN > Storage > LUNs.

2 Select a LUN from the list that contains the QoS properties that you want to copy.

3 Select Actions > Create LUN like selected.
The system displays the Create SAN LUN dialog with a unique LUN name.

4 (Optional) Enter a new, unique name for the LUN.

Note: The system creates a new LUN name that is based on the name of the source LUN.

5 Make any necessary changes to the LUN properties.

6 (Optional) Select the Mapping tab and map the LUN to a host entry.

7 (Optional) Select the Data Protection tab and create a data protection schedule.

8 Click OK.

Related Links

Create SAN LUN, Data Protection Tab, Auto Tier
Create SAN LUN, Data Protection Tab, Single Tier
Create SAN LUN, Mapping Tab
Create SAN LUN, Quality of Service Tab, Auto-tier
Create SAN LUN, Quality of Service Tab, Single Tier
QoS Policies
Copying and Cloning LUNs
Copy a LUN

Managing Clone LUNs

Clone LUNs are writable snapshot images of a LUN using partial-block snapshot technology. This technology allows the Oracle FS System to use the modified information in the clone and the unmodified information from the source LUN. You can create clones of clones. You can create a Clone LUN at any time.

A Clone LUN is defined as: A point-in-time, read-write, partial-block snapshot of a LUN that can be accessed immediately.

Before creating a Clone LUN, ensure that changes to the source LUN are minimized. For best results, pause the host applications that access the LUN, or use host software, such as Oracle FS Volume Shadow Copy Service Provider (VSS), before creating the Clone LUN. When the system displays the replica in the Oracle FS System Manager (GUI), you can resume writing to the LUN.

Important: Make sure that the clone repository does not fill up, consuming the maximum amount of space allocated. Monitor the amount of space available and modify the volume to allocate more clone capacity, as needed. If a clone requires more space from the repository, but space is not available, the clone is taken offline and a System Alert is generated.

Deleting a LUN or Clone LUN, affects the associated clones:

- Deleting a LUN also deletes any clones of the LUN.
- Deleting a Clone LUN retains any clones of the Clone LUN.

Related Links

Oracle FS VSS Provider Plug-In
Delete a Clone LUN
Create an Immediate Clone LUN

Create an Immediate Clone LUN

You can create Clone LUNs from an existing LUN or from a Clone LUN.

After the clone is created, you can change the priority level and other properties of the clone. When creating a Clone LUN, make sure that enough repository space exists for the clone. The system stores in the clone repository only the changes that are made to the source volume or to the clone.

1. Navigate to SAN > Storage > LUNs.
2. Select the LUN that you want to clone.
3. Select Actions > Clone.
4. Enter a new, unique name for the Clone LUN.
5. (Optional) Make any necessary changes to the QoS properties.
6. (Optional) Select the Mapping tab and map the Clone LUN to a host entry.
7. (Optional) Select the Data Protection tab and create a data protection schedule.
8. Click OK.

The name of the new Clone LUN appears on the LUN overview page.

Related Links

Create SAN Clone LUN, Mapping Tab
Create SAN Clone LUN, Quality of Service Tab
Data Replicas and System Capacity
Managing Clone LUNs
Create a Clone LUN Schedule

Delete a Clone LUN

You can delete a single Clone LUN when the clone is no longer needed.

When you delete a Clone LUN, only the target clone is deleted. When the target clone is the parent or source for other clones, the child clones are not deleted. Instead, the child clones become children of the next higher parent in the hierarchy.

1. Navigate to SAN > Storage > LUNs.
2. Select the Clone LUN that you want to delete.
3. Select Actions > Delete.

   Note: The system displays the Delete LUN dialog. This dialog indicates that, if this clone is a parent or source of Clone LUNs, those Clone LUNs are not deleted.

4 To acknowledge that you want to delete the LUN, along with any clones and host mappings, select the option Delete LUNs and existing host mappings.

5 Click OK.

If the deleted Clone LUN has child clones, the child clones move up one level in the hierarchy of clones.

Related Links

Delete LUN

Managing Clone LUNs

Delete All Clone LUNs

Delete All Clone LUNs

When a collection of Clone LUNs that are derived from a common source LUN are no longer needed, you can delete the entire collection.

When you delete a collection of clones that have a common parent LUN, the system determines the most efficient and quickest order of deletion.

1 Navigate to SAN > Storage > LUNs.

2 Select the parent LUN of all of the Clone LUNs that you want to delete.

3 Select Actions > Delete Clones.
The system displays the Delete Clone LUNs dialog want a list of all the clones to delete.

4 To acknowledge that you want to delete the LUN, along with any clones and host mappings, select the option Delete LUNs and existing host mappings.

5 Click OK.

Related Links

Managing Clone LUNs

Delete a Clone LUN

Display Clone LUN Details

You can view specific information about a Clone LUN, such as the host mappings for the clone.

The details of a Clone LUN includes information about the following properties:

- QoS attributes
- Allocated storage capacity
- Volume group and Storage Domain memberships
- SAN host mapping details and Controller port masking assignments
- Clone capacity and cloning schedules

1. Navigate to SAN > Storage > LUNs.
2. Select the Clone LUN that you want to view.
3. Select Actions > View.
4. Select any of the tabbed pages to view the LUN properties.
5. Click Close.

Related Links

View SAN LUN, Data Protection Tab, Auto Tier
View SAN LUN, Data Protection Tab, Single Tier
View SAN LUN, Mapping Tab
View SAN LUN, Quality of Service Tab, Auto Tier
View SAN LUN, Quality of Service Tab, Single Tier
Create an Immediate Clone LUN

Restore a LUN from a Clone LUN

You can restore a LUN to its state when the Clone LUN was created.

Restoring a LUN from a Clone LUN results in returning the LUN to the exact point-in-time image of the clone, plus any changes made to the clone. This method quickly restores the data online, especially when compared to copying the entire data set back from a tape backup. Furthermore, restoring from the clone allows access to the data while the restore is in progress.

You might want to restore a Clone LUN if the following scenarios apply:

- Some undesirable changes to the data were made.
- An external client application or virus corrupted the LUN.

1. Navigate to SAN > Storage > LUNs.
2. Select the Clone LUN that you want to restore.

   Note: The restoration process resets the creation date of the LUN to that of the selected Clone LUN.
3. Select Actions > Restore from Clone.
4. Click OK.

The system restores the LUN, during which time system performance might be slightly degraded. The system starts a task in the background to perform the restore operation. When the background task completes, the system writes an event to the event log and removes the “In Progress” status from the LUN overview page.

Related Links

Data Replicas and System Capacity
Display Clone LUN Details

Data Protection Schedules

A data protection schedule defines the following parameters:

- The time units in which the data protection event occurs, such as hourly, daily, or weekly.
- The time intervals at which a replica is created, such as every hour, every two hours, and so on.
- If you perform a data protection job only one time, use the Run Once option when you create or modify your job schedule. After the system runs this job, the system deletes the schedule. Check the event log for the completion status of your job.

You can modify an existing data protection schedule or delete a schedule when the schedule is no longer needed.

Related Links

Data Replicas and System Capacity
Managing Clone LUNs
Create a Clone LUN Schedule

Create a Clone LUN Schedule

When you create a LUN, you can also create a schedule that instructs the system to clone your LUN at regular intervals.

Note: A schedule should be synchronized with the host applications that access the logical volume so that all data I/O is quieted before the replication operation starts.

1. Navigate to SAN > Storage > LUNs.
2. Select Actions > Create LUN.
3. From the Data Protection tab, select the Enable Clones option.
4. To display the Create Job Schedule dialog, click Create.
5. Enter a Schedule Name.
6. (Optional) Select Enabled if you want the schedule to start protecting your data at the scheduled time.

   If you do not enable the schedule now, you can do so later by modifying the schedule.
7. From the Select a Volume to Protect table, select a LUN from which to create the Clone LUN.

   Note: Select a volume that has allocated capacity for clones.
8. Click the expansion button to the right of Start Time to select the day and time for your schedule to start.
9. Use the controls in the Modify Date/Time dialog to select the date and time.

10 To close the Modify Date/Time dialog, click OK.

11 Select a frequency for the schedule.

Valid frequencies:

- Run Once
- Hourly
- Daily
- Weekly

12 Select a recurrence value for the schedule.

If you chose a frequency of Weekly, select the day of the week that you would like the schedule to run.

13 Click OK.
The schedule is listed on the Clone Schedules table and the Clone Schedules overview page.

Related Links

Create Job Schedule Dialog
Data Replicas and System Capacity
Managing Clone LUNs

Create a LUN Data Protection Schedule

You can create a data protection schedule that in turn creates a clone of a protected volume (LUN or Clone LUN) at regular intervals.

1 Navigate to SAN > Data Protection > Clone Schedules.

2 Select Actions > Create.

3 Enter a name for the data protection schedule.

4 (Optional) Select a Volume Group in which to create the Clone LUNs.

5 (Optional) Select Enabled if you want the schedule to start protecting your data at the scheduled time.

If you do not enable the schedule now, you can do so later by modifying the schedule.

6 From the Select a Volume to Protect table, select a LUN from which to create the Clone LUN.

Note: Select a volume that has allocated capacity for clones.

7 Click the expansion button to the right of Start Time to select the day and time for your schedule to start.

8 Use the controls in the Modify Date/Time dialog to select the date and time.

9 To close the Modify Date/Time dialog, click OK.

10 Select a frequency for the schedule.

Valid frequencies:

- Run Once
- Hourly
- Daily
- Weekly

11 Select a recurrence value for the schedule.

If you chose a frequency of Weekly, select the day of the week that you would like the schedule to run.

12 Click OK.

The schedule is listed on the Clone Schedules overview page.

Related Links

Create Data Protection Schedule Dialog

Data Replicas and System Capacity

Managing Clone LUNs

Modify a LUN Data Protection Schedule

You can modify characteristics of a data protection schedule, such as its frequency to reduce the number of clones.

1 Navigate to SAN > Data Protection > Clone Schedules.

2 From the available list, select a data protection schedule that you want to update.

3 Select Actions > Modify.

4 (Optional) Enter a new name for the data protection schedule.

5 (Optional) Select a Volume Group in which to create the Clone LUNs.

6 (Optional) Select Enabled if you want the schedule to start protecting your data at the scheduled time.

7 (Optional) Update the Start Time and for Recurrence for the data protection schedule.

8 Click OK.

Related Links

Modify Data Protection Schedule Dialog

Create a LUN Data Protection Schedule

Delete a LUN Data Protection Schedule

Delete a LUN Data Protection Schedule

You can delete a data protection schedule when data protection requirements change. After deleting the schedule, no automatic data protection occurs on the affected LUN.

1. Navigate to SAN > Data Protection > Clone Schedules.
2. From the available list, select a data protection schedule that you want to delete.
3. Select Actions > Delete.
4. Click OK.

Related Links

Clone Schedules Overview Page
Create a LUN Data Protection Schedule
Modify a LUN Data Protection Schedule

View a LUN Data Protection Schedule

You can display the details of a data protection schedule. For example, you can view the volume group that is associated with the Clone LUNs, or you can review the schedule details.

1. Navigate to SAN > Data Protection > Clone Schedules.
2. From the available list, select a data protection schedule that you want to display.
3. Select Actions > View.
4. Review the displayed information to ensure that the data protection schedule details are what you expect.
5. Click Close.

Related Links

View Data Protection Schedule Dialog
Create a LUN Data Protection Schedule
Modify a LUN Data Protection Schedule

Oracle FS VSS Provider Plug-In

The Microsoft Volume Shadow Copy Service (VSS) works with your hardware to write data to the volumes on the Oracle FS System while backing up those volumes. The Pilot web client provides links for the VSS hardware provider software.

The Oracle FS Volume Shadow Copy Service Provider is a VSS hardware provider that makes volume shadow copies of VSS-enabled applications that use Oracle FS System LUNs without interrupting normal operations.

VSS enables data protection and management services through a standard set of configuration and monitoring capabilities. These capabilities include creating

and manipulating backups without shutting down applications or essential services. During a restore operation, VSS shuts down or pauses applications as needed to enable the restore operation.

For more information about VSS, refer to the following documentation:

- The *Volume Shadow Copy Service Technical Reference* (http://technet.microsoft.com/en-us/library/cc738819(WS.10).aspx) provided by Microsoft.
- The Microsoft Developers Network (MSDN) article *The VSS Model (Windows)* (http://msdn.microsoft.com/en-us/library/aa384625.aspx).

Refer to your VSS-enabled backup application documentation for instructions on configuring and using VSS with your backup application.

Related Links

Managing Clone LUNs

Download and Install the VSS Software

Download and Install the VSS Software

The Pilot web client provides links to download the Oracle FS Volume Shadow Copy Service Provider (VSS) software and install the software on your SAN host. The software is available for both 32- and 64-bit systems.

Prerequisites

- The SAN host must have TCP/IP connectivity, over Ethernet, to the Pilot.
- For the VSS Provider to create volume shadow copies, the SAN host must have Fibre Channel connectivity to the Controller.
- During the installation, you need to provide the system serial number, user name, and password.

The software installer allows the configuration of an Oracle FS System. Additional systems can be configured from a command-line tool, called `registerAxiom`.

1. Start a web browser.
2. Specify the IP address of the Pilot or the name of the Oracle FS System as the address to open.
3. Click the Utility Software tab.
4. Download the VSS software and save the file to your server.

   Select the software version that is appropriate for your system architecture.

   - Download Oracle FS Volume Shadow Copy Service Provider - 32 bit
   - Download Oracle FS Volume Shadow Copy Service Provider - 64 bit

5 Locate the file on your server and double-click the file to begin the installation.

6 Follow the instructions to install the software on the server.

Note: You are prompted for the Oracle FS System serial number, user name, and password during the installation.

7 To close the installation wizard, click Close from the Installation Complete page.

8 Restart the Windows server.

Next, verify that the software is installed correctly.

Related Links

Oracle FS VSS Provider Plug-In
Verify the Oracle FS VSS Provider Installation

Verify the Oracle FS VSS Provider Installation

After you install the Oracle FS Volume Shadow Copy Service Provider (VSS) software, verify the installation so that you can register more Oracle FS Systems.

Prerequisite Installed VSS software.

Verify the software installation from the command prompt on your server.

1 From your Windows server, navigate to Start > Run.

2 From the Open field, enter `cmd`.

3 Verify installation by running the following command.

```
C:\vssadmin List Providers
```

This command returns the name of the VSS provider, for example:

```
Provider name: 'Oracle FS VSS HW Provider'
```

If the VSS Provider returns the provider name, *Oracle FS VSS HW Provider*, then the installation was successful and your server can use the VSS provider to create shadow copies.

Related Links

Oracle FS VSS Provider Plug-In
Download and Install the VSS Software
Register Additional Systems with VSS

Register Additional Systems with VSS

As your system configurations change, you can register more Oracle FS Systems with the Oracle FS Volume Shadow Copy Service Provider (VSS).

Prerequisites Installed VSS software.

You need the following information to register each Oracle FS System with the VSS software:

- System serial number
- Login account: user name
- Login account: password

The VSS software adds and removes Windows registry entries for the Oracle FS System.

The VSS installer allows you to configure a single Oracle FS System. To configure more systems or remove systems, use the `registerAxiom` command-line tool:

1. From your Windows server, navigate to Start > Run.
2. From the Open field, enter `cmd`.
3. (Optional) To view a list of acceptable usage options, enter `registerAxiom`.
4. To register an Oracle FS System, enter `registerAxiom` *sample-serial-number user-name user-password*.

   Note: Enter the required information in the order listed.
5. (Optional) To remove a registered Oracle FS System, enter `registerAxiom` *sample-serial-number*.

Related Links

Oracle FS VSS Provider Plug-In
Verify the Oracle FS VSS Provider Installation

CHAPTER 8

Manage Software Components

Display Software and Firmware Versions

Before performing an update of the Oracle FS System software and firmware, check the current version of the system software and firmware to ensure that you stage the correct package.

The following modules include version information:

- Drive firmware and Enclosure (EBOD) Firmware in the Drive Enclosures
- Application software and operating system in the Pilots
- Controller software and Controller BIOS

Note: For administrator accounts that have the Support or the Oracle Support role, the system displays complete packaging information, including the compatibility matrix for the software and firmware. For all other administrator accounts, the system displays only the release number of the software and firmware.

1. Navigate to Support > Software and Firmware.

   The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2. Verify that the current version of the installed system software and firmware to ensure that you stage the correct package.

   You should stage a newer version of the software than the software that is installed.

Related Links

Software and Firmware Overview Page

View the Upgrade Paths to the Staged Package

View the Upgrade Paths From the Installed Package

Download Software and Firmware Updates

Download the latest software and firmware updates from My Oracle Support (MOS) to ensure that your Oracle FS System is up to date. You can download

general availability releases, as well as patches specific to your system, from MOS.

Prerequisites:

- Ensure that you are registered on MOS.
- For restricted patches, contact Oracle Customer Support to request the password.
- Have available the serial number for the Oracle FS System for which you want the software or firmware update.
- Have available the patch number for the Oracle FS System for which you want the software or firmware update.

1. Using your registered username and password, log in to *My Oracle Support* (https://support.oracle.com).

   For more information about all the features and functionality of MOS, including information about patches and updates, see *My Oracle Support Documentation* (http://docs.oracle.com/cd/E25290_01/index.htm).
2. In the menu bar, select Patches and Updates.
3. In the Patch Search pane, choose one of the following search methods:

Number/Name or Bug Number (Simple)	Search for the patch name, the patch number, or the platform.
Product or Family (Advanced)	Search for the product, the release, and the platform, as well as other criteria. **Note:** The product you want to search for is *Oracle FS1-2 Flash Storage System*.
Recommended Patch Advisor	Search for recommended patches for products, releases, and platforms.

4. Complete all the fields necessary to perform your search.
5. Click Search.
6. On the Patch Search window, review all patch information.

   Check the file size of the download and ensure that your workstation has sufficient space for the download.
7. Click the row of the patch that you want to download, and then click Read Me.

   Important: Always review the Read Me file before downloading the patch or update to ensure that you are downloading the correct version.
8. To download the software and firmware package, click Download.

   The system displays a dialog box that identifies the software package to be downloaded. A single patch or software update can contain multiple files.

   Tip: If your browser window displays an information bar that states that the download is blocked, click the appropriate options to allow the download to proceed.

9 On the File Download screen, click Show Digest Details to display the SHA-1 and MD5 checksums for each of the ZIP files.

10 To begin the download, click the filename of the selected file.

11 To save the software package on your workstation, click Save.

After you successfully download the software update package, close the original dialog box.

12 Using the Digest Information from the Patch Download screen, verify the integrity of the downloaded files before proceeding.

13 Extract the ZIP files.

Important: You cannot stage the ZIP file. You must stage the RPM Package Manager (.rpm) file.

Upload (stage) the extracted software or firmware RPM Package Manager (.rpm) file to the Oracle FS System.

Related Links

Upload the Software and Firmware Package

Upload the Software and Firmware Package

After downloading a software and firmware update package from My Oracle Support (MOS), and extracting the RPM files from the ZIP archive, you can stage (upload) the RPM files on the Pilot to prepare the system for the software and firmware update. You can perform the update immediately or schedule the update for a later time.

Prerequisite: Place the update package on a workstation or client located on the same network as the Pilot or on a workstation located on a network that has a LAN connection speed to the Pilot of at least 100 Mb/s. The workstation must support either Oracle FS System Manager or Oracle FS CLI.

1 Navigate to Support > Software and Firmware.

The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2 From the Software and Firmware page, click Upload Software Package.

3 From the Upload Software Package dialog, click the browse button […].

4 In the Upload Software Package dialog, navigate to the software package you downloaded, highlight it, and click Open.

5 Click OK.

The software package is placed onto the Pilot. When the upload is complete, the update package displays in the Staged Software and Firmware panel.

Tip: Click Tasks on the Software and Firmware screen to view the staging progress in Oracle FS System Manager. The staging task only appears on the screen after the RPM file has been uploaded.

After staging is complete, verify that the software or firmware module and the version number of a software or firmware module match what you intended to upload.

Related Links

Software and Firmware Overview Page

Updating the Software and Firmware

An update operation installs a new version of software or firmware onto an Oracle FS System. You can manually update the software or the firmware using Oracle FS System Manager (GUI).

You must download the software and firmware updates from My Oracle Support (MOS) to your local host, stage the software and firmware updates on the Pilot to prepare the system for the update, ensure that there are no system alerts and that all statuses are normal in the GUI, and then update the software and firmware.

An update affects one or more of the following components:

- Drive Enclosure
  - Drive firmware

    Note: Drive firmware is listed by drive type (for example, Hitachi 300Gb HDD or SanDisk 1600GB SSD). Updating the drive firmware requires a system restart.
  - Enclosure Firmware

    Note: Enclosure Firmware is listed by type and version (for example, Enclosure Firmware Xrtx Ebod 7044319).
- Pilot
  - Pilot Software
  - Pilot OS
- Controller
  - Oracle FS1-2 Controller Software
  - Controller BIOS

    Note: Controller BIOS is listed by model number (for example, M3 Controller BIOS). Updating the Controllers requires a system restart.

Note: A software update always includes the Pilot Software and the Oracle FS1-2 Controller Software. The Pilot Software and the Oracle FS1-2 Controller Software must be installed at the same time and their versions must match.

Related Links

Software and Firmware Update Prerequisites
Software Update Options
Download Software and Firmware Updates
Upload the Software and Firmware Package
Upload Storage Class Mapping File

View the Upgrade Paths to the Staged Package

You can review a history of the software and firmware packages that have been staged on your Oracle FS System to see which upgrades are available, as well as whether an upgrade causes Pilot or data disruption.

Note: For administrator accounts that have the Support or the Oracle Support role, the system displays complete packaging information, including the compatibility matrix for the software and firmware. For all other administrator accounts, the system displays only the release number of the software and firmware.

1. Navigate to Support > Software and Firmware.

   The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2. Select Actions > View Upgrade Paths to Staged Package.

   The Upgrade Paths to Staged Package dialog displays the packages that have been staged to the Pilot.

3. Verify that the information is what you expect.

   If the list shows more than one upgrade version, install the earliest software version first, followed by the subsequent versions.

Related Links

Software and Firmware Overview Page

View the Upgrade Paths From the Installed Package

You can review a history of the software and firmware packages that are installed on your Oracle FS System. Knowing which software and firmware packages that are installed on your Oracle FS System helps you decide which upgrades are needed.

Note: For administrator accounts that have the Support or the Oracle Support role, the system displays complete packaging information, including the compatibility matrix for the software and firmware. For all other administrator accounts, the system displays only the release number of the software and firmware.

1. Navigate to Support > Software and Firmware.

The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2 Select Actions > View Upgrade Paths from Installed Package.

The Upgrade Paths from Installed Package dialog displays the upgrade path information.

Related Links

Software and Firmware Overview Page

Types of Software Updates

Both standard (non-disruptive) software updates and disruptive software updates can be performed to the Oracle FS System. You need to understand the different update types before you perform an update.

Standard (non-disruptive) software updates do not require a restart of the entire system. Disruptive software updates require a restart of the entire system.

Note: In addition to software updates that you perform, the system performs automatic updates to hardware components using firmware already stored in the system.

For example, when replacement hardware is installed and the replacement hardware is at a lower firmware version than the current system version, the firmware in the new hardware is automatically updated. Automatic updates also occur during a system, Controller, or Drive Enclosure restart where a system software update contains non-critical hardware firmware updates and the update has been purposely ignored by the system during non-disruptive updates due to the additional time needed for installation.

Drive firmware updates are never installed on a system restart unless an administrator specifies that the drive firmware is to be updated.

As system software updates are installed, only one type of update can be performed at a time. You can either update the system software or update the drive firmware but not both at the same time. For drive firmware updates, install all updates unless instructed not to install all updates by Oracle Customer Support.

Related Links

Standard Software Updates

Disruptive Software Updates

Standard Software Updates

You should be aware of which software updates are standard before you perform them. The Oracle FS System implements standard software updates by installing

both the Oracle FS1-2 Controller Software and the Pilot Software, and if applicable, the Pilot OS.

Standard updates interrupt data access for a few seconds. However, the software can be updated without restarting the entire system and user applications do not lose access to the Oracle FS System storage arrays during the software update.

The Pilot does shut down and restart. When the Pilot shuts down, the connection between the Oracle FS System and Oracle FS System Manager (GUI) is disconnected. A message stating that the connection has been lost displays, followed by the login panel from which you can log back in. If the update is still in progress after you log back in, navigate to the Status Summary screen to view the status of the Pilots, Controllers, and Drive Enclosures.

Tip: To check the overall status of the system, go to the System Information screen. If the status is *BOOT_STATE_PILOT*, the update is still in progress.

Related Links

Disruptive Software Updates

Disruptive Software Updates

You should be aware of which software updates are disruptive before you perform them. Oracle FS Systems implement disruptive software updates by restarting the entire system to bring up the new software. User applications lose access to the Oracle FS System storage arrays during a disruptive software update.

Examples of disruptive updates include drive updates and Controller BIOS component updates. You choose to perform a disruptive update by selecting Restart and update software or Shutdown Controller.

Note: If the upgrade package includes enclosure firmware updates, and you do not select Restart and update software or Shutdown Controller, the update proceeds without restarting the system. The enclosure firmware updates are not applied until the next system restart. If you do select Restart and update software or Shutdown Controller, the system installs the enclosure firmware on the resulting system startup.

You need to perform disruptive updates under the following conditions:

- The system is not reporting a Normal state
- Pinned data is found within the system
- The compatibility matrix validation needs to be overridden to complete the installation
- System alerts are active
- A previous software update failed

- The new Controller BIOS version is an newer version than the current version installed on the system
- Another task fails to complete within 10 minutes of starting the update

Related Links

Standard Software Updates

Software Update Options

You can choose to ignore certain system conditions in order to perform an update.

You might choose to ignore certain system conditions in the following circumstances:

- System conditions are preventing you from performing an upgrade
- To recover from a failed upgrade
- To perform an upgrade to recover from a system condition
- To install an older release that the one that is installed

Whether you are performing a standard software update or a disruptive software update, you can choose to ignore system conditions, to force a controller shutdown, and to override a previously failed software update. Select any of the following overrides:

Ignore compatibility	Ignoring the compatibility matrix validation should be performed only if all other attempts to correct system configuration have failed and you have been instructed by the release notes, a My Oracle Support Knowledge article, or Oracle Customer Support to ignore the validation.
Shutdown the Controller	Disrupts data access and forces a system restart. The Controllers shut down and then restart with the new software installed. Only use this option if you have been instructed to do so by the release notes, a My Oracle Support Knowledge article, or Oracle Customer Support.
Ignore hardware status (except Pilots)	Used to upgrade a system with a minor issue, such as a single failed drive. If the issue is in a Controller, do not use the option unless instructed to do so by Oracle Customer Support or the release notes.
Ignore system alerts	An upgrade of any type will be blocked if there are any system alerts unless this option is selected. System alerts for issues that do not affect the operation of the system do not affect the ability to perform a standard update, for example, a failed email, a failed Call-Home, a failed FTP server, or task failure due to an invalid requested configuration change. For system alerts indicating topology issues or hardware conditions, contact Oracle Customer Support or resolve the condition before attempting a standard update.

	Important: Always check the details of all the system alerts before using this option.
Ignore current requests	Used to cancel Pilot software tasks in progress, such as log collection or Call-Home. For any task that is modifying storage, host access, or system software, do not use this option without advice from Oracle Customer Support. The system waits for up to 10 minutes for running tasks to complete. If non-upgrade tasks do not complete within 10 minutes, the upgrade fails with a *Failed To Drain Operation Pool* error unless this option is selected.
Override previously failed software updates	Used to retry a software update after the issue involved in the prior failed attempt is corrected. Using this option does not cause a disruptive update. Do not use this option more than once for any software update without advice from Oracle Customer Support.

Related Links

Update the Oracle FS System Software

Cancel a Scheduled Software Update

Software and Firmware Update Prerequisites

Ensure that all prerequisites are met before performing any software and firmware update so that your software and firmware update is successful.

Important: Always read the Release Notes for any patch or update for a complete list of upgrade requirements and prerequisites.

Prerequisites:

- For minor updates (for example, R6.1 to R6.2) and patch release updates (for example, R6.1.1 to R6.1.2), perform the following actions:
    - On the Software and Firmware page, verify the currently installed release to ensure that you staged the correct package. Your staged release should be more recent than your installed release.
    - On the System Alerts page, check for system alerts and resolve all issues by performing the recommended actions. Contact Oracle Customer Support if you require assistance.
    - On the Status Summary page, ensure that all Oracle FS System Manager statuses are Normal.
    - On the Tasks page, check for tasks that are pending. If you have tasks that are pending, the system waits for the existing tasks to complete before running the update.
- For a major update (for example, R6.x to R7), read the release notes and complete any of the following necessary tasks:

- Ensure that all prerequisites are met for any minor and patch release updates.
- Halt all data path I/O.
- Open a service request with Oracle Customer Support to ensure that a system audit is not required.

- For a Pilot BIOS update, ensure that you have a USB keyboard and VGA monitor, as well as the login credentials for the Pilot `root` password and the Oracle Integrated Lights Out Manager (ILOM) `root` password. See *Oracle FS1-2 Flash Storage System Field Service Guide* for more information.

Related Links

Update the Oracle FS System Software
Cancel a Scheduled Software Update

Update the Oracle FS System Software

After staging a software package on the Pilot, you can update the system software. You can perform the update immediately or schedule the update for a later time.

Note: Perform the update operation as the Primary administrator and in an Administrator 1 role.

Important: When logged into the system as a support administrator, you can select individual components to update from the software module package. You can also select Always Install, Install if newer version, or Do not install. Contact Oracle Customer Support before installing individual software components.

1. Navigate to Support > Software and Firmware.

   The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.
2. Select Actions > Update Software.
3. (Optional) Select the individual software module you want to update, using the Install Action column at the top of the screen.

   Valid options are:

   - Do not install
   - Install if newer version
   - Always Install

   Important: Only update individual software modules under the direction of Oracle Customer Support.
4. Unless explicitly directed to select Restart and update software (disrupts data access) by the Read Me file, Release Notes, or Oracle Customer Support, select the option Update software without restarting system.

5 (Optional) Select any of the other options available in the Software Update Options pane.

Note: A software update validation errors message appears on the bottom of this page if you select an option that cannot be performed. You must clear any software update validation errors before proceeding. Some options will cause data access disruptions. Be sure to read each option carefully.

6 (Optional) To schedule your software update for a later time, click the Schedule tab and enter the time on which the system should perform the operation. You can schedule updates to occur within 72 hours.

7 Click OK.

8 Click Yes.

If you selected any of the upgrade options, you need to accept the agreements for all those options.

Related Links

Update Software

Restart the Oracle FS System

Schedule the Software Update

You can schedule software updates to occur at a specified time. For example, you can schedule an update to occur during off-peak hours when there is less I/O activity.

Prerequisites:

- Software updates uploaded and ready to install.
- Logged in to Oracle FS System Manager (GUI) using the Administrator role.

You can schedule updates to occur within 72 hours.

1 Navigate to Support > Software and Firmware.

The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2 Select Actions > Update Software.

3 (Optional) Select the individual software module that you want to update.

The default action is Install if newer version.

Valid options are:

- Do not install
- Install if newer version
- Always Install

Important: Only update individual software modules under the direction of Oracle Customer Support.

4. To enable a software update schedule for a later time, click the Schedule software update to occur at a later time option.
5. Click the ellipsis control (...) and enter the date and time on which the system should perform the operation. You can schedule updates to occur within 72 hours.
6. Click OK.
   After clicking OK, the Software and Firmware page displays the scheduled software update.

   Important: At the scheduled time of the update, the system status must be normal with no system alerts. If the system status is not normal or the system has alerts, the scheduled update fails.

You can click Cancel Scheduled Update at any time to cancel the scheduled software update.

Related Links

Cancel a Scheduled Software Update

Cancel a Scheduled Software Update

You can cancel a scheduled software update, for example, if you need to reschedule the update for an earlier or later time.

1. Navigate to Support > Software and Firmware.
   The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.
2. Click Cancel Scheduled Update.
   If a scheduled software update is active, a notice appears on the page.
3. Confirm that you want to cancel the update and click OK.
   The system deletes the scheduled task and removes the software update notice from the Software and Firmware page.

Related Links

Software and Firmware Overview Page

Update the Drive Firmware

Update the drive firmware so that the drive performs at an optimum level as specified by the manufacturer.

1. Navigate to Support > Software and Firmware.
   The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.
2. Confirm that the correct firmware version is staged on the Oracle FS System.

3 Select Actions > Update Drive Firmware.

4 To choose the firmware that you want to update, select the Install checkbox in the Pending Drive Firmware Updates pane.

5 When you are ready to update the drive firmware and disrupt data access to the system, click OK.

The system updates the firmware of the drives that match the criteria specified in the firmware package. One drive is taken offline and the firmware updated. Then the drive is placed online and the RAID information updated. The process repeats for each drive. When the update completes, the Oracle FS System restarts. During restart, the system updates any drives that contain outdated firmware.

If the update fails, the update for the rest of the drives is cancelled, and the Oracle FS System displays a system alert. To resolve the issue, you can either try the update process again or replace the affected drive. If the problem continues, contact Oracle Customer Support.

Related Links

Update Drive Firmware Dialog

CHAPTER 9

Manage Hardware Components

Pilot Management

The Pilot is a hardware component that provides system management services, system restart services, Call-Home services, administrative access, and maintenance access. Administrators can connect to the Pilot nodes over the Ethernet using Oracle FS System Manager (GUI) or Oracle FS CLI.

You manage the Pilot by performing the following tasks:

- Troubleshooting network connectivity to the Pilot
- Identifying, troubleshooting, and repairing a Pilot hardware
- Ensuring that network access is configured to necessary external applications
- Ensuring that Call-Home and Auto Service Request (ASR) is configured and enabled

Pilot management also includes ensuring that certain network ports needed by either the client applications or the Pilot are open.

Related Links

View the Properties of the Pilots
View the Network Connectivity of a Pilot
Identify a Pilot
Repair a Pilot

Pilot Overview

The Pilot is an out-of-band management controller that directs and manages all system activity.

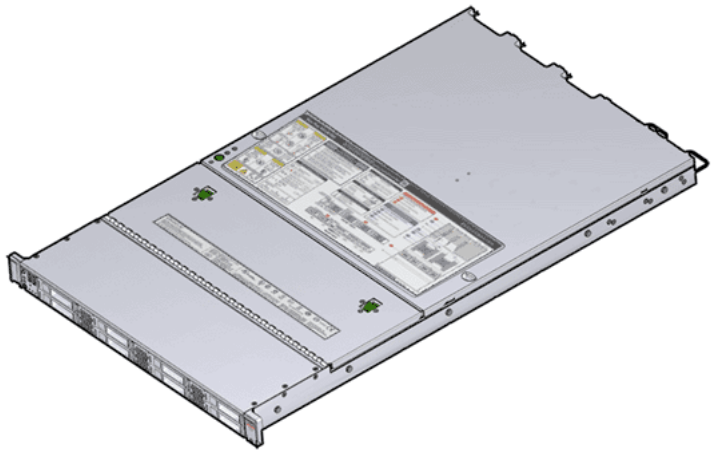
Each Oracle FS System has one active Pilot and one standby Pilot.

The Pilot provides access to the following:

- All management functions for the Oracle FS System
- System monitoring, alerts, log collection, and automatic log transmission
- Management for restarting, replacing, updating, and recovering Controller and Drive Enclosure resources

The following figure shows the front of the Pilot.

Figure 10: Pilot



View the Properties of the Pilots

You can view the properties of the Pilots on your Oracle FS System. For example, you might want to know the status and OS version of both the standby and the active Pilot node.

Ensure that one Pilot is in active mode and the other Pilot in standby mode, and that the displayed OS versions and server versions for both Pilots are the same.

1. Navigate to System > Hardware > Pilots.
2. Verify that the information is what you expect.

   If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.

Related Links

Pilot Overview Page

View the Network Connectivity of a Pilot

You can view the network connectivity of a Pilot to determine which network interfaces are connected, as well as the status of the network interfaces for the management of the system and for the servicing of the system.

1. Navigate to System > Hardware > Pilots.
2. Select a Pilot.
3. Select Actions > View Pilot.
4. Verify that the information is what you expect.

   If you see a status other than Connected and Consistent, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer

Support. If the Consistency of Status shows Intermittent for any interface, check both ends of the cable to make sure they are securely inserted.

5 Click Close.

Related Links

View Pilot Dialog
Configure the Management Interface
Pilot Management
View the Properties of the Pilots
Identify a Pilot
Repair a Pilot

Identify a Pilot

You can identify a specific Pilot. The system uses flashing LEDs to identify hardware components. In a crowded data center, the flashing LEDs allow you to locate the Pilot on which you want to perform maintenance.

1 Navigate to System > Hardware > Pilots.

2 Select a Pilot.

3 Select Actions > Identify Pilot.
The Identify dialog is displayed.

4 Follow the instructions provided by Guided Maintenance to identify the hardware component.

5 Click Finish.

Related Links

Pilot Management
View the Properties of the Pilots
View the Network Connectivity of a Pilot
Repair a Pilot

Repair a Pilot

Guided Maintenance enables you to replace components on either your active or your standby Pilot nodes.

1 Contact Oracle Customer Support prior to replacing a Pilot component.
Oracle Customer Support identifies the failed component on the Pilot for you.

2 Navigate to System > Hardware > Pilots.

3 Select the Pilot you want to repair.

4 Select Actions > Repair Pilot.
Guided Maintenance displays the list of Pilot components.

5 Based on the information from your Oracle Customer Support representative, select the correct component from the list.

6 Click Next.

Guided Maintenance sends a request to flash the white locate LED on the Pilot to help you identify the Pilot in the data center.

7 Click Next.

Guided Maintenance displays a link to *Pilot Repair Procedures*.

8 Click the *Pilot Repair Procedures* link to open and print the procedures.

9 Click Next.

- If you are replacing a component located on the active Pilot, Guided Maintenance brings the active Pilot offline and fails over to the standby Pilot. After the active Pilot is offline, the GUI closes. You can safely disconnect the power cords and data cables. When the failover is complete, you can log back into the GUI.
- If you are replacing a component located on the standby Pilot, Guided Maintenance brings the standby Pilot offline. After the standby Pilot is offline, you can safely disconnect the power cords and data cables. When servicing the standby Pilot, failover is not required.
- If you are replacing a power supply or a fan module, you are not required to bring the Pilot offline. The power supplies and fan modules are hot-serviceable.

  Note: You can replace one power supply without bringing the Pilot offline, as long as the second power supply remains online and operational.

Related Links

Pilot Management
View the Properties of the Pilots
View the Network Connectivity of a Pilot
Identify a Pilot

Management Network Ports

If there are any firewalls located between the Pilot and the source or destination of a service, the ports must be open for that service to function.

The following table lists all of the software ports that are used by the Pilot for communicating with other components within the Oracle FS System and with services running on the network.

Table 12: Pilot TCP ports

Port number	Application	Description
22	SSH	Used by Oracle Customer Support. This port is disabled by default and may be opened only in rare situations if required during a service call. In those cases, Oracle Customer Support will notify the will be notified that this port needs to be opened.
25	Simple Mail Transfer Protocol (SMTP)	Used by the Pilot for email notifications that are sent by the Oracle FS System and for account password recovery. This port is only used for outbound communication to a configured mail server.
53	DNS	Used by the Oracle FS System for name resolution of other servers and services in the environment, for example, to resolve the name of an external mail server as needed for email notifications.
80	HTTP	Used by the Oracle FS System for status monitoring and the download from the Pilot of documentation and various applications, such as Oracle FS System Manager (GUI).
123	Network Time Protocol (NTP)	Used by the Oracle FS System to synchronize the system time with an external time service provider.
161	Simple Network Management Protocol (SNMP)	Used by a host SNMP Management Server to monitor the Oracle FS System.
162	SNMP traps	Used by the Oracle FS System to transmit SNMP traps to an external management application or by UPS devices to send notifications to an Oracle FS System. For example, used by compliant UPS devices to warn the Oracle FS System that the UPS device is running on battery power.
443	HTTPS	Used by the HTTPS Call-Home option on the Pilot. This port must be open on all three Pilot ports to the Oracle Call-Home server. Also used by HTTPS for checking status and alerts, using a web browser.
8083	Oracle FS CLI interface	Used by the Oracle FS System for the Oracle FS CLI interface and for application integration.

Table 12: Pilot TCP ports (continued)

Port number	Application	Description
8085	REST interface	Used by the Oracle FS System for application integration with a REST-based management application. This port is disabled by default.
10000	Network Data Management Protocol (NDMP)	Used by the Pilot to provide backup and restore access to all file systems on the Oracle FS System. This port must be open between the three IP addresses of the Pilots and the Backup Management Server.
26012	Oracle FS System Manager	Used by Oracle FS System Manager (GUI) and Oracle FS Path Manager (FSPM) to communicate with the Oracle FS System.

Controller Management

A Controller is one of the nodes in an active-active pair of nodes, each of which provides access to user data and mirrors the cached data and the state of the partner node. When a Controller fails or when a Controller is taken offline through Guided Maintenance, the Oracle FS System uses failover and failback to return the Oracle FS System to a normal state. Failover transfers all of the resources of the offline node to the node that remains online. Failback transfers those resources back to the node that was offline when the node comes back online.

Managing Controllers consists of the following tasks:

- Viewing the overall status of all Controllers, as well as the details of specific Controllers
- Modifying comments, chassis IDs, and the service types of each Controller
- Identifying Controllers
- Replacing failed components
- Monitoring Controller failover and failback

Related Links

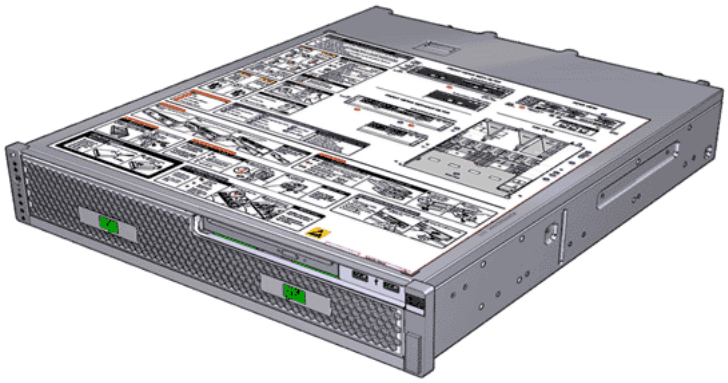
Controller Diagnostics and Command Testing
SAN Controller Protocols Statistics and Trending Overview
Controller Commands

Controller Overview

Controllers provide I/O access to the customer LAN or SAN and provide an internal SAS interface that is used to interconnect all Drive Enclosures and other Controllers. The Oracle FS System supports two storage Controllers.

The following figure shows an Oracle FS System Controller.

Figure 11: Oracle FS System Controller



View the Status of the Controllers

Viewing the status of the Controllers can help you to respond quickly to problems that can occur on a Controller.

1. Navigate to System > Hardware > Controllers.
   The Controllers overview page displays the status summary of each Controller, the chassis, the comment, the service type, the failover Controller , temperature, and a summary of the FRUs and CRUs.
2. Verify that the information is what you expect.
   If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.

Related Links

Controllers Overview Page

View the Details of a Controller

You can view the details of any Controller. For example, you might want to view the status of each field replaceable unit (FRU) and customer replaceable unit (CRU) to determine whether Guided Maintenance is needed to replace a component. You can also view the status of the I/O ports.

The Controller details include the following information:

- Controller identifier, memory size, and model
- Replaceable unit part number, serial number, location, and specifications

1. Navigate to System > Hardware > Controllers.
   The Controllers overview page displays the status summary of each Controller, the chassis, the comment, the service type, the failover Controller , temperature, and a summary of the FRUs and CRUs.
2. Select a Controller.
3. Select Actions > View.

4 Verify that the information is what you expect.

If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.

5 Click Close.

Related Links

View Controller, Components Tab

View Controller, I/O Ports Tab

Controller Ports

Modify the Controller Comment

The Controller comment is the descriptive text that is assigned to a Controller. You can change or assign unique, meaningful comments to help you more easily locate specific Controller components. The Controller comment can contain up to 255 alphanumeric characters.

1 Navigate to System > Hardware > Controllers.
The Controllers overview page displays the status summary of each Controller, the chassis, the comment, the service type, the failover Controller , temperature, and a summary of the FRUs and CRUs.

2 Select a Controller.

3 Select Actions > Modify.

4 In the Comment field, enter a string of text that associates a comment with the Controller.

You can enter up to 255 alphanumeric characters.

5 Click OK.

Related Links

Modify Controller, Components Tab

Modify a Chassis ID

The chassis ID is the Controller Name as displayed in the Controllers summary. Chassis IDs are unique, numeric identifiers that are displayed on the Controllers and the Drive Enclosures. You can use Oracle FS System Manager (GUI) to modify the chassis IDs.

1 Navigate to System > Hardware > Controllers.
The Controllers overview page displays the status summary of each Controller, the chassis, the comment, the service type, the failover Controller , temperature, and a summary of the FRUs and CRUs.

2 Select a Controller.

3 Select Actions > Modify Chassis ID.
The Modify Chassis ID dialog is displayed.

4 From the Desired ID list, select a new Chassis ID number.

5 Click OK.

Related Links

Modify Chassis ID Dialog

Pilot Management

Identify a Controller

You can identify a specific Controller. The system uses flashing LEDs to identify hardware components. In a crowded data center, the flashing LEDs allow you to locate the Controller on which you want to perform maintenance.

1 Navigate to System > Hardware > Controllers.
The Controllers overview page displays the status summary of each Controller, the chassis, the comment, the service type, the failover Controller , temperature, and a summary of the FRUs and CRUs.

2 Select a Controller.

3 Select Actions > Identify.
The Identify dialog is displayed.

4 Select one of the identification options.

5 Click Next.

6 Follow the instructions provided by Guided Maintenance to identify the hardware component.

7 Click Finish.

Related Links

Pilot Management

Drive Enclosure Management

You can expand the storage pool that is available to an Oracle FS System to accommodate increased storage demands by adding additional Drive Enclosures. Additionally, moving drive groups from one Storage Domain to another can help balance the capacity provisioning across domains.

Managing Drive Enclosures consists of the following tasks:

- Viewing the overall status of all Drive Enclosures, as well as the details of specific Drive Enclosures
- Modifying comments and chassis IDs
- Identifying Drive Enclosures
- Replacing failed components

Related Links

Drive Groups
Storage Domains
Run the Drive Enclosure Commands
Upload Storage Class Mapping File

Drive Enclosure Overview

Drive Enclosures are used as back-end storage for the Oracle Flash Storage System. The Oracle FS System can be configured for as many as 30 Drive Enclosures. The two types of Drive Enclosure are the DE2-24P Drive Enclosure and the DE2-24C Drive Enclosure. Both Drive Enclosure types can co-exist in the same system.

Drive Enclosure are high-availability, serial-attached SCSI (SAS-2) storage enclosures. The DE2-24P Drive Enclosure has a 2U chassis that supports 24 small form factor (SFF), 2.5-inch (6.35-cm) hard disk drives (HDDs). The DE2-24P Drive Enclosure also supports configurations with seven, 13, or 19 solid state drives (SSDs). The DE2-24C Drive Enclosure has a 4U chassis that supports 24 large form factor (LFF), 3.5-inch (8.89-cm) HDDs.

The following figures show the front of the DE2-24P Drive Enclosure and the DE2-24C Drive Enclosure.

Figure 12: DE2-24P Drive Enclosure (front view)

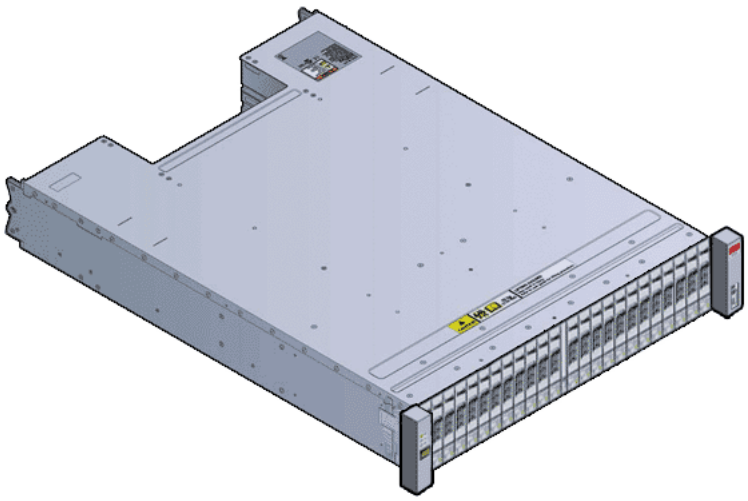
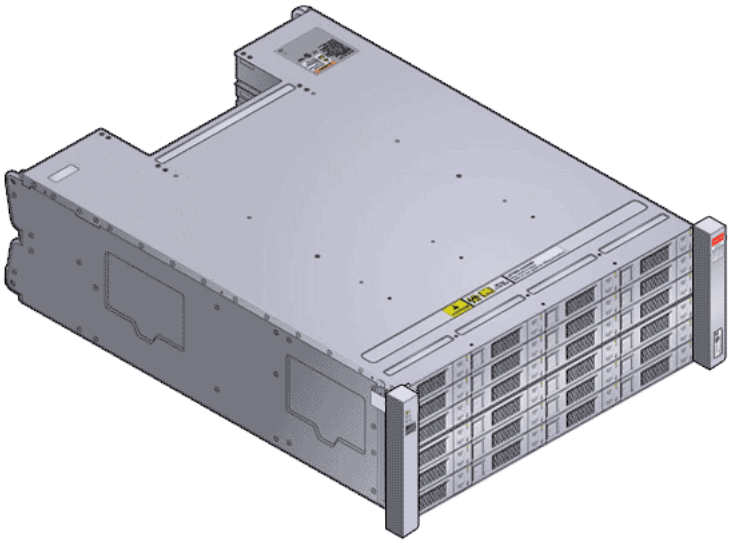


Figure 13: DE2-24C Drive Enclosure (front view)



Both types of Drive Enclosures have the following physical configuration:

- Two hot-serviceable I/O modules with two interface slots that comply with the Storage Bridge Bay (SBB) standard
- Two hot-serviceable 580W power cooling modules with dual load-sharing power supplies and integrated fans
- 19-inch rack-compatible enclosure
- Front access to all drives
- Back access to the I/O modules and the power cooling modules
- LEDs with status information for the I/O modules, the drives, and the power cooling modules

The following figures show the back of the DE2-24P Drive Enclosure and the DE2-24C Drive Enclosure.

Figure 14: DE2-24P Drive Enclosure (back view)

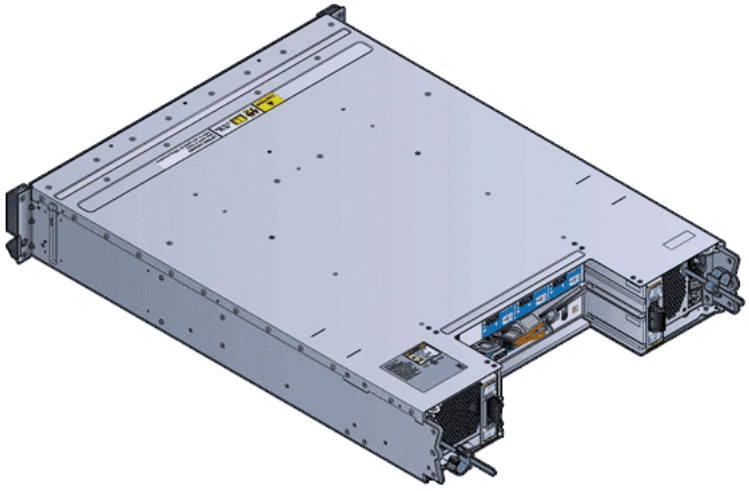
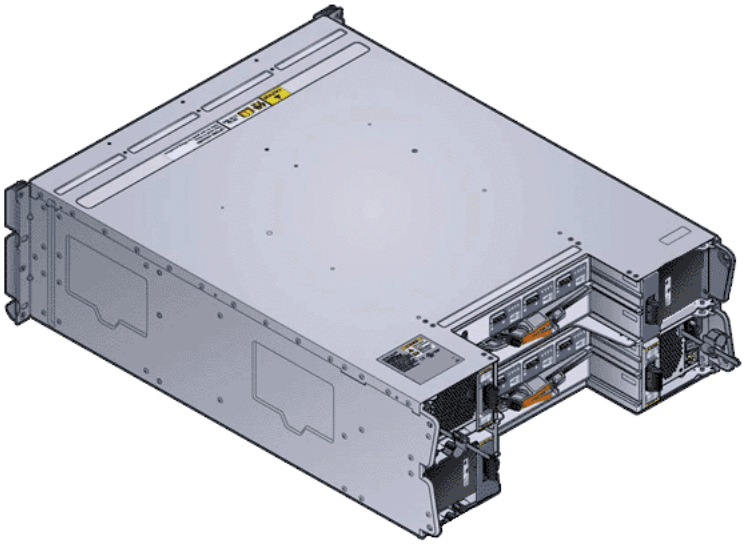


Figure 15: DE2-24C Drive Enclosure (back view)



Related Links

High Availability
HDD Failure and Recovery
SSD Failure and Recovery

High Availability

High availability centers around RAID levels, redundancy, pre-emptive copy, dynamic spares, dedicated spares, and copyback. With high availability, the Oracle FS System can respond gracefully to an unexpected hardware or software failure that has the potential for service disruption. Furthermore, this feature keeps customer data highly accessible even during hardware replacements.

The Oracle FS System includes the following high-availability features:

Single Parity	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
Double Parity	Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.
Mirroring	A RAID level in which the Oracle FS System maintains an exact duplicate of a logical volume at a different location. No parity data is used. Mirroring protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented using RAID 10 technology.
Oracle Pre-Emptive Copy	A feature of the Oracle FS System firmware that copies the data on a drive that has been predicted to fail to a spare drive before the suspect drive fails and is subsequently taken offline for replacement. This feature avoids performance degradation and potential exposure to data loss when the drive does fail.
Dynamic Spare	Unallocated strips on high-capacity hard disk drives (HDDs) in a given drive group. This spare capacity is striped across all of the HDDs in the drive group. Dynamic spares are used to support the RAID 5 protection level and the RAID 10 protection level. Dynamic spares cannot cross drive group boundaries.
Spare Drive	An unused solid state drive (SSD) that can support the rebuilding of a drive group by means of copy-away operations. Drive Enclosures and drive groups do not contain an SSD that is dedicated only to this purpose. If, however, an unused SSD exists in a Drive Enclosure and if an SSD in that Drive Enclosure fails or is removed, the system uses that unused drive to rebuild the drive that failed or was removed. Furthermore, if no unused SSD exists, the system can use its parity data to continue functioning with a lost SSD.
Copyback	Copyback is the process of moving data from an active spare strip, for HDDs, or from a dedicated spare drive, for SSDs, to a newly replaced drive.

Related Links

Priority Level and Performance

Redundancy and Data Protection

SSD Failure and Recovery

If a solid state drive (SSD) fails, the Oracle FS System uses RAID 5 (single parity) and the RAID 10 (mirroring), along with the dedicated spare drives, to recover lost data.

SSD arrays are configured with a dedicated spare drive. If the Oracle FS System detects a failing SSD, the system performs an *Oracle Pre-emptive Copy*, which copies the data from the failing SSD to the spare drive. An *Oracle Pre-emptive Copy* protects the system from performance degradation and potential data loss when an SSD fails. A spare drive can have different performance or data retention characteristics.

After the failing SSD is replaced, the system performs a copyback operation. The copyback operation copies the data from the spare drive to the replacement SSD. The copyback operation restores the SSD array to its original capabilitieswith a normal rebuild to spare and copyback from spare.

Note: You can view the remaining life expectancy (in months) and pro-actively replace the drive using Guided Maintenance in Oracle FS System Manager (GUI).

Related Links

Redundancy and Data Protection

HDD Failure and Recovery

If a hard disk drive (HDD) fails, the Oracle FS System uses the parity and the mirroring features of RAID technology, along with the dynamic spares, to ensure that data is not lost.

HDD arrays are configured with dynamic spares. In a RAID configuration, an HDD failure triggers a rebuild operation. During a rebuild operation, the reconstructed data is built on the spare HDD that is within the rebuilt stripe. When the failed HDD is replaced, the data held in the spare HDD is copied back to the replacement HDD.

Related Links

Redundancy and Data Protection

View the Status of the Drive Enclosures

Viewing the status of the Drive Enclosures helps you to identify and to respond to problems that can occur on a Drive Enclosure.

1. Navigate to System > Hardware > Drive Enclosures.
2. Verify that the information is what you expect.

   If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.

Related Links

Drive Enclosures Overview Page

View the Details of a Drive Enclosure

Viewing the details of a Drive Enclosure helps you to identify and to respond to problems that can occur on each field replaceable unit (FRU) and customer replaceable unit (CRU), as well as on the I/O ports within the Drive Enclosure.

The Drive Enclosure details include the following information:

- The properties of the Drive Enclosure
- A list of all the FRUs and CRUs
- A list of all the I/O ports and the I/O port properties

1. Navigate to System > Hardware > Drive Enclosures.
2. Select a Drive Enclosure.
3. Select Actions > View.
4. Verify that the information is what you expect.

   If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.
5. Click Close.

If you see a status other than Normal for any of the FRUs or CRUs, you might need to replace that component. Select a FRU or CRU to replace it.

Related Links

View Drive Enclosure, Components Tab
View Drive Enclosure, I/O Ports Tab
Drive Enclosure Management
View the Details of a Drive Enclosure

Modify the Drive Enclosure Comment

The Drive Enclosure comment is the descriptive text that is assigned to a Drive Enclosure. You can change or assign unique, meaningful comments to help you more easily locate specific Drive Enclosure components. The Drive Enclosure comment can be up to 255 alphanumeric characters.

1. Navigate to System > Hardware > Drive Enclosures.
2. Select a Drive Enclosure.
3. Select Actions > Modify.
4. In the Comment field, enter a string of text that describes the Drive Enclosure.

   You can enter up to 255 alphanumeric characters.
5. Click OK.

Related Links

Modify Drive Enclosure, Components Tab

Identify a Drive Enclosure

You can identify a specific Drive Enclosure. The system uses flashing LEDs to identify hardware components. In a crowded data center, the flashing LEDs allow you to locate the Drive Enclosure on which you want to perform maintenance.

1. Navigate to System > Hardware > Drive Enclosures.
2. Select a Drive Enclosure.
3. Select Actions > Identify.
   The Identify dialog is displayed.
4. Select one of the identification options.
5. Click Next.
6. Follow the instructions provided by Guided Maintenance to identify the hardware component.
7. Click Finish.

Related Links

Drive Enclosure Management

Modify the Drive Enclosure Comment

Modify a Chassis ID

Modify a Chassis ID

The Chassis ID is the Drive Enclosure Name as displayed in Drive Enclosures summary. Chassis IDs are unique, numeric identifiers that are displayed on the Controllers and the Drive Enclosures. You can use Oracle FS System Manager (GUI) to modify the chassis IDs.

1. Navigate to System > Hardware > Drive Enclosures.
2. Select a Drive Enclosure.
3. Select Actions > Modify Chassis ID.
   The Modify Chassis ID dialog is displayed.
4. From the Desired ID list, select a new Chassis ID number.
5. Click OK.

Related Links

Modify Chassis ID Dialog

Drive Enclosure Management

Modify the Drive Enclosure Comment

Identify a Drive Enclosure

Data Integrity on the Drives

The SCSI Protection Information field is a mechanism to prevent silent data corruption. SCSI Protection Information ensures that any data that is successfully read by a host from an Oracle FS System is the intended data, and that the data is the same as when it was last written by a host. This integrity check is only internal to the Oracle FS System.

The RAID firmware in the Oracle FS System formats all of the drives in the storage arrays to a sector size of 520 bytes. As SAN data is received from the host, eight bytes of integrity metadata is generated for every 512 bytes of host data. The integrity metadata is appended to the host data to form the internal 520-byte sector. When data is transferred back to the host, the eight bytes of metadata is stripped off and used to check that the 512 bytes of host data is correct. If the check fails, a read error is reported to the host.

The eight bytes of metadata includes a Cyclic Redundancy Check (CRC) of the host data and a Reference Tag that identifies the offset of the sector within the host LUN or file. These two pieces of information allow the firmware to check that the data being transferred belongs to the location that the host requested and that the data is the same as it was when last written.

Reference Tag checking is one part of the normal data integrity processing that is performed by the RAID firmware. However, if a client application reads a large number of sectors that have never been written, the client application might experience degraded performance when reading these sectors. Such client applications can include:

- Sector level backup applications
- Replication applications

If unusual performance issues exist for such client applications, you can disable Reference Tag checking on any given LUN to see if you can improve the performance of those applications. If Reference Tag checking is disabled, the Oracle FS System continues to validate CRCs for these sectors but bypasses the Reference Tag checking.

Related Links

Drive Enclosure Management

Hardware Management

Even if you do not manage the hardware in the Oracle FS System yourself, it is important that you understand some details about hardware management in the Oracle FS System.

Hardware management consists of drive replacement, component replacement, and system expansion. Both drive replacement and component replacement can be performed using Guided Maintenance in the GUI. Guided Maintenance in the GUI is the preferred method of hardware replacement. System expansion is not a performed using Guided Maintenance in the GUI.

Related Links

Drive Enclosure Management

Hardware Replacement

Your Support Services contract provides guidelines to replace field replaceable units (FRUs) and customer replaceable units (CRUs) in your Oracle FS System.

Based on the terms of your contract, you can perform the following actions:

- Replace the FRU or CRU yourself.
- Place a service request so that a service technician comes to your site to replace the FRU.

  Tip: You can enable Auto Service Request (ASR) in My Oracle Support (MOS) to automatically create a service request for you.

  Important: Replacement of a FRU or a CRU requires that you use Guided Maintenance in Oracle FS System Manager (GUI) or the Oracle FS CLI to perform the following actions:

  - Prepare the system for the FRU or the CRU replacement.
  - Integrate the new FRU or the new CRU into the system.

  Note: Guided Maintenance in the GUI provides a step-by-step graphical representation of the hardware replacement process. Guided Maintenance in the GUI is the preferred method of hardware replacement.
  Consult the appropriate *Oracle FS System Service Guide* for details.

Check the power supply fan filters annually for accumulated dust. If needed, vacuum the power supplies, even if no component replacement or repair is required. This type of maintenance does not require Guided Maintenance.

Related Links

Replace a Component

Drive Replacement

Drive replacement is a procedure performed using Guided Maintenance. The replacement drive can be a new drive or a drive previously used in a Drive Enclosure.

Important: The Oracle FS System accepts only Oracle-supplied drives. The capacity and the type of a replacement drive must be same as the other drives in the Drive Enclosure.

The Oracle FS System considers all drives as foreign drives until you accept the drives into the Drive Enclosure. If data exists on the drive you are inserting, all the data is lost when the drive is accepted.

You start the drive replacement process using Guided Maintenance. Guided Maintenance prepares the system and the Drive Enclosure for the drive

replacement. After you have inserted a replacement drive into a Drive Enclosure, continue using Guided Maintenance to complete the process.

Replace a Component

To maintain or to restore reliability to an Oracle FS System, you sometimes need to replace a component.

Oracle supports only Oracle-supplied components in an Oracle FS System.

Guided Maintenance in Oracle FS System Manager (GUI) provides you a step-by-step graphical representation of the hardware replacement process. Guided Maintenance in the GUI is the preferred method of hardware replacement.

CAUTION: Hardware that does not conform to Oracle specifications or is not an Oracle-supplied component might compromise data integrity and voids the warranty of the Oracle FS System.

1. Navigate to System > Hardware and then select Controllers or Drive Enclosures.
2. In the overview page, click the Controller or Drive Enclosure that contains the component that you want to replace.
3. Select Actions > View.
4. On the Components tab in the View dialog, select the component that you want to replace and click Replace Component.
5. Follow the instructions provided by Guided Maintenance to repair the component.

   Refer as well to the appropriate *Oracle FS System Service Guide* for detailed instructions.
6. Click Finish.

Related Links

View Controller, Components Tab

View Drive Enclosure, Components Tab

System Expansion

To accommodate increased storage demands and to expand the storage pool available to the Oracle FS System, you can add Drive Enclosures to the system. You can combine additional DE2-24P Drive Enclosures and DE2-24C Drive Enclosures in the same system.

Before adding a Drive Enclosure, make sure that the system has the latest software version installed:

- In Oracle FS System Manager (GUI), log in with a support administrator account and select Support > Software and Firmware.
- In Oracle FS CLI, run the `software_update -list -installed` command.

Additionally, determine whether sufficient space exists in the rack for the new Drive Enclosures. The PDUs installed in the rack must have enough free circuits. If the PDUs cannot accommodate more Drive Enclosures or if the rack lacks space for more Drive Enclosures, then you must set up additional racks.

Note: Adding Drive Enclosures can be disruptive to the system in the following circumstances:

- The existing PDU arrangements are insufficient to fulfill power requirements. The system must be powered off to add PDUs to the existing PDU arrangement.

  Note: If the system uses Oracle-supplied racks with PDUs designed for the system, you rarely need additional PDUs to fulfill power requirements. It might be necessary to enable the second half of an Oracle PDU in order to utilize additional power receptacles. Enabling the second half of an Oracle PDU is not disruptive to the system.

- The current layout of the hardware in the racks requires changes to accommodate the length limits for cables that are used for Controller-to-Drive Enclosure connections and Drive Enclosure-to-Drive Enclosure connections.

Based on the configuration of Drive Enclosure strings, adding Drive Enclosures to the system requires one of the following scenarios:

- Distribute the new Drive Enclosures across the existing Drive Enclosure strings that contain less than five Drive Enclosures. Adding to an existing Drive Enclosure string is non-disruptive to the system.

  When adding Drive Enclosures to an existing Drive Enclosure string, attach the new Drive Enclosure to the last Drive Enclosure on the string.

- Create a new Drive Enclosure string. You can add up to five Drive Enclosures to a new string. A new Drive Enclosure string requires an available SAS HBA port.

Related Links

Display Software and Firmware Versions

UPS Devices

UPS devices provide backup power to the Oracle FS System in the event of a power failure. The system monitors the UPS activities and reports the health of the device.

Typically, enterprise class products like the Oracle FS System do not use a UPS and rely on generator backed power supply in the data centers. However, if you use a UPS, it must be based on the maximum wattage requirements of the sum total of all the Oracle FS System components. The UPS, if used, should conform to the APC PowerNet MIB specifications so that it can send SNMP traps to the Oracle FS System to indicate that it is operating in battery mode or in normal

mode and that the Oracle FS System should be configured to receive the traps. For more information about managing APC products that can be monitored and configured with SNMP, see the *Schneider Electric MIB Reference Guide* (http://www.apcmedia.com/salestools/JGAY-83UPH9/JGAY-83UPH9_R0_EN.pdf). In short, a UPS system must be based on the maximum wattage requirements of the sum total of all the Oracle FS System components. Up to four devices can be monitored by the system. The information gathered from the UPS includes:

- Communication status
- Power source
- Battery status

In the event of a power failure, the UPS device switches from AC to battery power, and then sends an SNMP Trap message to the Oracle FS System indicating that the UPS is on battery power. The Oracle FS System then switches to a conservative operating state, where all data writes are to the storage arrays to protect data should the UPS battery drain before normal power can be restored. This conservative state is exited when the UPS device sends an SNMP Trap message to the Oracle FS System indicating that the UPS is not on battery and returns the Oracle FS System to normal cached operation.

Related Links

Create a UPS Device
View a UPS Device
Modify a UPS Device
Delete a UPS Device

Create a UPS Device

You can create a connection to a UPS device that is connected to the Oracle FS System to allow you to see the battery status, the communication status, and the properties of the UPS. Up to four UPS devices can be configured for the system.

1. Navigate to System > Hardware > UPSs.
2. Select Actions > Create UPS.

   Do not use the community strings "public" or "private" if the UPS device allows configuration of more secure strings.
3. Enter the information in the fields that are provided.
4. Click OK.

Related Links

Create UPS Dialog

View a UPS Device

You can review the properties, the battery status, and the communication status of a UPS device that is connected to the Oracle FS System.

1. Navigate to System > Hardware > UPSs.
2. Select a UPS.
3. Select Actions > View UPS.
   The View UPS dialog appears.
4. Verify that the information is what you expect.

   If you see a status other than Normal, view the details of that hardware component to diagnose and to resolve the issue. If you encounter an issue that you cannot resolve, contact Oracle Customer Support.
5. Click Close.

Related Links

View UPS Dialog

Modify a UPS Device

You can modify the properties of a UPS device. For example, you can update the name of the UPS device or change the name of the community string that is used to receive traps that monitor the device activities.

1. Navigate to System > Hardware > UPSs.
2. Select a UPS.
3. Select Actions > Modify UPS.

   Do not use the community strings "public" or "private" if the UPS device allows configuration of more secure strings.
4. Update the properties for the UPS connection.
5. Click OK.

Related Links

Modify UPS Dialog

Delete a UPS Device

If a UPS device is removed from the Oracle FS System, you can no longer monitor the device activities. Because you can no longer monitor the device activities, you should remove the connection from Oracle FS System Manager (GUI).

1. Navigate to System > Hardware > UPSs.
2. Select a UPS.
3. Select Actions > Delete UPS.
   The Confirm Delete dialog appears.
4. Click OK.

Related Links

UPSs Overview Page

CHAPTER 10

Manage Alerts and Events

View a Summary of the System Status

Oracle FS System Manager (GUI) provides a summary of all the hardware components in the system and a list of the events, alerts, and notifications that have occurred.

The System Summary page allows you to quickly access the hardware status pages and view the number of system alerts and system events.

Tip: You can also obtain a brief set of the same information by pointing your browser to the IP address or name of the Oracle FS System. The web server on the Oracle FS System is a convenient facility when you want to download this information to a mobile device.

1. Navigate to System > Alerts and Events > Status Summary.
2. Verify that the hardware status and event information are what you expect.
3. (Optional) If you detect a situation that needs to be addressed, you can click on the item in question.
   The system displays the appropriate page where you can view more details about the situation.

Related Links

Status Summary Overview Page
Managing System Alerts
Managing Event Logs
Managing Event Notifications

Managing System Alerts

Some configuration events in an Oracle FS System require administrator intervention to resolve the underlying issue.

The system notifies you of a system alert by displaying a flashing exclamation-point icon (⚠) on Oracle FS System Manager (GUI) status bar. When this flashing icon is displayed, the GMT time of the most recent alert is displayed to the right of the icon. When you click the icon, the GUI displays the System Alerts page that includes the following information:

- The name of system alert.

- Information about the alert and the time that it occurred. Some of the alerts include recommended actions.
- The date and time that the alert occurred.

To resolve the issue, perform the recommended action.

Related Links

System Notifications
Display the System Alerts
Manage the System Alerts
Delete a System Alert

Display the System Alerts

If the Oracle FS System has any system alerts, you can view details about the alerts and perform any required action. You can sort the available list of system alerts by category. You can also manage the system alerts from this page.

1. Navigate to System > Alerts and Events > System Alerts.
2. Review the system alert list to ensure that the information is what you expect.

If the alert is resolved, the system deletes the alert from the list. If the alert persists, the alert remains on the System Alerts page.

Related Links

System Alerts Overview Page
Managing System Alerts
Manage the System Alerts
Delete a System Alert

Manage the System Alerts

You can view the details of a system alert that is generated by the Oracle FS System. You can also copy the alert information to your workstation clipboard.

1. Navigate to System > Alerts and Events > System Alerts.
2. Select an alert from the list.
3. To display details about the alert, select Actions > Manage.

   Tip: You can also double-click the alert.
4. Read the information about the system alert.
5. (Optional) Click Copy to Clipboard to save the alert information to your workstation clipboard.
6. Click OK.

If you copied the alert information to your workstation clipboard, then you can use this information in an email, for example.

Related Links

System Alerts Overview Page
Managing System Alerts
Delete a System Alert

Delete a System Alert

You can delete a single alert or multiple alerts that are generated by the Oracle FS System. However, before deleting the alert, ensure that you first address the source of the alert.

1. Navigate to System > Alerts and Events > System Alerts.
2. Select one or more alerts from the list.
3. Select Actions > Delete.
4. Click OK.

Related Links

System Alerts Overview Page
Display the System Alerts
Manage the System Alerts

Clearing Pinned Data

Pinned data can occur when issues arise regarding the Drive Enclosure storage array. In such a case, data that is to be written to that array remains in the flash-backed memory of the Controller.

Each LUN maintains a sequential record of committed transactions (a set of modified blocks) that are guaranteed to be written to the underlying drive group storage. The Oracle FS System maintains one cache for each LUN. In the background, the system asynchronously flushes each cache to permanent storage. These records are managed within what are called *write cache*.

The system maintains two copies of the cache in flash-backed memory. The primary copy exists on the same Controller node on which the LUN resides. The secondary copy (a mirror) exists in the flash-backed memory in the partner node to allow recovery in the event of a failure of the home Controller.

Pinned data is modified data that the system cannot flush from memory to physical storage due to a system failure or a power failure. The Oracle FS System protects this in-memory data until the system can flush the data to physical storage. To resolve any pinned data, you can perform the following actions:

- Fix the issue, which would then let the system flush the pinned data.
- Discard the pinned data.

An administrator-initiated shutdown request fails if any user data is still cached and has not yet been written to physical storage. Pinned data causes the shutdown to fail. If the Controllers cannot communicate with the Drive

Enclosures to flush the cached data, the Oracle FS System retains, or *pins*, the data in cache.

If you receive a system alert about pinned data when you initiate a shutdown request, navigate to System > Hardware > Drive Enclosures to review the details about the Drive Enclosures. Resolve any hardware issues that might exist. Hardware issues can prevent communication between Controllers and Drive Enclosures and can prevent the system from flushing the cached data to storage.

Related Links

Controller Management
Drive Enclosure Overview
Managing System Alerts
Display the System Alerts

Managing Event Logs

Event logs display the events of the Oracle FS System. Events include management actions such as the creation or deletion of LUNs and any problems encountered by the Oracle FS System, such as hardware issues or other problems detected in the Controller or Oracle FS System Manager (GUI). You can set filters for severity and category types.

When you encounter an issue that you cannot resolve, you can bundle a collection of the logs and send the bundle to your Call-Home server. From there, Oracle Customer Support can analyze the logs to help you resolve the issue.

Possible event severities:

Informational	Requires no action for events that are information only.
Warning	Requires no immediate action for minor conditions that you can address at your convenience.
Critical	Requires prompt action to prevent system failures or offline conditions.

Possible event categories:

Security	Events to notify of a security problem, such as an unauthorized request.
Audit	Events that track what users are doing, such as the operations that they performed.
System	Events to notify of system problems, such as a missing Drive Enclosure or Controller.

Related Links

Create a Log Bundle
View a Summary of the System Status
Display the Event Log Entries
Delete the Event Logs

Display the Event Log Entries

Review the event log to monitor events that have occurred in the Oracle FS System. If too many events display on the screen, you can filter the list of events.

1. Navigate to System > Alerts and Events > Event Log.
2. Review the event log details to ensure that the information is what you expect.
3. (Optional) Click the Events per page list to select the maximum number of events to display on each page.
4. (Optional) Click the page number on the upper right side of the page to navigate quickly to a desired page.
5. (Optional) Select Actions > Set Event Log Filter to specify the types of events to display in the list.
6. (Optional) Click the Refresh icon ( ) on the upper right side of the page to update the list.

Related Links

Event Log Overview Page
Set Event Log Filter Dialog
Managing Event Logs
Display the Event Log Entries
Delete the Event Logs

Display the Event Properties

You can review the event properties from the Oracle FS System and copy the properties to the clipboard. Copying the event properties permits you to capture the event details and send them to Oracle Customer Support, for example.

1. Navigate to System > Alerts and Events > Event Log.
2. Select an event from the list.
3. Select Actions > Event Properties.

   Tip: You can also double-click the event.
4. (Optional) To copy the event properties to the clipboard, click Copy to Clipboard.
5. Click Close.

You can now paste the contents of the event property information in an email and send the information to Oracle Customer Support, if requested.

Related Links

Events Properties Dialog
Display the Event Log Entries
Delete the Event Logs
Filter Event Log Entries

Filter Event Log Entries

You might want to view only certain types of entries in the event log. Filter the events to limit the type of events that appear.

1. Navigate to System > Alerts and Events > Event Log.
2. Select Actions > Set Event Log Filter.
3. Set the filter type.

   Valid types:

   - Event Categories: Select all that apply.
   - Event Severities: Select all that apply.
   - Event Date Range: Select the Display Events that occur in a date range option, and then select the Beginning date and Ending date.
4. (Optional) To reset the dialog to its default state, click Reset to Defaults.
5. Click OK.
6. (Optional) Click the Refresh icon ( ) on the upper right side of the page to update the list.

The Event Log overview page displays the **(filtered)** label at the top of the list, indicating that the events match your filtered criteria.

Related Links

Set Event Log Filter Dialog
Managing Event Logs
Display the Event Log Entries
Delete the Event Logs

Delete the Event Logs

If the number of events becomes too large, you can remove all of the events in one operation.

Prerequisite:	Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.

Important: Deleting the event logs removes all of the logs from the system, including logs that are not shown because a filter is in effect.

1. Navigate to System > Alerts and Events > Event Log.
2. Select Actions > Delete Event Logs.
3. Click OK.

Related Links

Event Log Overview Page
Managing Event Logs
Display the Event Log Entries
Display the Event Properties

Managing Event Notifications

Create event notifications so that certain individuals can be notified when specific Oracle FS System events occur. You can display the details of an event and make changes as needed. You can also test notifications to make sure that the specified email addresses are correct.

Event notifications are Simple Mail Transfer Protocol (SMTP) email messages that notify recipients of specified system events. System events include informational events, warning events, and critical events such as the creation of a logical volume or the occurrence of a hardware problem or software problem. Event notifications are optional and, when enabled, supplement normal event logging and Call-Home notification.

You must designate one or more email recipients to receive event notifications. You must have a configured and functioning email server to send the notifications.

Note: The email server is also used to notify recipients of any Call-Home notifications.

Related Links

System Notifications
Display Event Notifications
Create an Event Notification
Delete an Event Notification

Display Event Notifications

You can view a list of existing event notifications and determine if any changes are needed. Use the Event Notification overview page to create, modify, delete, or view the event notifications.

1. Navigate to System > Alerts and Events > **Event Notification**.
2. Review the event notification details to ensure that the information is what you expect.

Related Links

Event Notification Overview Page
Managing Event Notifications
Display the Event Notification Details
Create an Event Notification
Modify an Event Notification
Delete an Event Notification

Create an Event Notification

Create event notifications so that the system can generate email when specific events occur in the Oracle FS System. You can specify the types of system events that trigger alerts, as well as designate the recipients who receive the notices.

If you do not set up notices, you can still monitor system events using the event log. Call-Home notifications are independent of email notifications and will be sent to Oracle Customer Support about issues in the Oracle FS System.

1 Navigate to System > Alerts and Events > **Event Notification**.

2 Select Actions > Create.

3 Enter a name for the event notification.

4 Enter a description for the event notification.

5 To enable the notification, select **Enable Event Notification**.

6 Review the list of events.

Tip: To sort the list by severity, click By severity, then category. To sort the list by category, click By category, then severity.

Tip: To expand or collapse the list of events, click the expand (▸) or collapse (▾) symbols.

7 From the Monitored Events list, select the events that you want to trigger the notification.

8 To add one or more event notification recipients, click Add.

For example, to be notified of any login failures, in the Events Not Monitored column navigate to the Informational > Audit list. Select Login Failed, and then click the right-facing arrow to move the item to the Monitored Events column.

Tip: To add an entire event type, select the severity or category name and move that event type to the Monitored Events column.

For example, to monitor all Critical events, select Critical and move the event type to the Monitored Events column.

9 Enter the email address of each notification recipient.

10 (Optional) Click Test Email to make sure that the alert is sent to the correct email addresses and that the SMTP server is properly configured.

Note: Allow at least 10 minutes between email tests.

11 (Optional) To remove an email address from the list, select the address and click Remove.

12 Click OK.

Related Links

Create Event Notification Dialog
Configure Email Notification Settings
Managing Event Notifications
Display the Event Notification Details
Modify an Event Notification
Delete an Event Notification

Display the Event Notification Details

You can view the details of an event notification and determine if any changes are needed.

1 Navigate to System > Alerts and Events > **Event Notification**.

2 Select the name of the event notification you want to view.

3 Select Actions > View.

4 Review the event notification details to ensure that the information is what you expect.

5 Click Close.

If any changes to an event notification are needed, you can modify the notification entry.

Related Links

View Event Notification Dialog
Managing Event Notifications
Display the Event Notification Details
Modify an Event Notification
Delete an Event Notification

Modify an Event Notification

You can modify the properties of an event notification. For example, for a given notification, you can change the events that are monitored or the email address to which the notification is sent.

1 Navigate to System > Alerts and Events > **Event Notification**.

2 Select the name of the event notification that you want to modify.

3 Select Actions > Modify.

4 (Optional) Enter a new name for the event notification.

5 (Optional) Enter a new description for the event notification.

6 (Optional) Update the **Event Notification Recipient Email Addresses** list. Possible choices:

- To add an email recipient, click Add.
- To remove an email recipient, click Remove.

7 (Optional) Select new event categories or severities to monitor.

8 Click OK.

Related Links

Modify Event Notification Dialog
Configure Email Notification Settings
Managing Event Notifications
Create an Event Notification
Delete an Event Notification

Delete an Event Notification

You can delete an existing event notification. For example, you might want to delete an event notification if someone leaves the company and you no longer want event notifications to be sent to an inactive email account.

1 Navigate to System > Alerts and Events > **Event Notification**.

2 Select the event notification that you want to delete.

3 Select Actions > Delete.

4 Click OK.

Related Links

Event Notification Overview Page
Managing Event Notifications
Display Event Notifications
Create an Event Notification

CHAPTER 11

Perform Diagnostic Operations

Oracle FS System Diagnostics

Someone from the Oracle Customer Support might request that you run one or more of the support tools and send the diagnostic output to Oracle.

The Oracle FS System is fault tolerant. The system detects anomalies and automatically fails over to a partner component to maintain data availability. No intervention is required, unless a technician is needed to replace a hardware component.

Even fault-tolerant systems with a long mean time between failure (MTBF) rate cannot avoid component failure forever. If a component failure results in system instability, support tools are available to diagnose and to fix the issue.

To support the Oracle FS System, you can perform any of the following actions:

- Collect system information and download the system log bundle from the Pilot to a local host or send the bundle to the Call-Home server
- Diagnose Controller hardware and software issues
- Run Controller commands
- Access the Drive Enclosure console to check and diagnose drive groups
- Shut down and restart the Oracle FS System
- Set halt points that pause the system startup process
- Reset the system to its factory configuration

Related Links

Create a Log Bundle
Run Controller Diagnostics
Run Controller Command
View the Drive Enclosure Console
Shut Down the Oracle FS System
Restart the Oracle FS System
Manage System Halt Points
Reset the Oracle FS System

System Log Bundles

To help diagnose a situation that might exist, Oracle Customer Support might request that you collect into a single bundle certain logs and other diagnostic information. Then you can send the bundle to My Oracle Support (MOS) for analysis.

System information can be collected from the following sources and placed into the system log bundle:

- Pilot hardware component
- Controller hardware components
- Drive Enclosure hardware components
- Hosts
- Statistics
- Replication appliances
- System configuration

When you create a system log bundle, you can indicate the extent of information coverage for each of the above selected sources. You can specify that all logs are to be included, or just the more recent logs. For the recent logs, you can specify the number of hours back in time for which information is to be collected.

You can also include in the log bundle the statistics and the existing configuration of the Oracle FS System. All log bundles contain the time and date at which the bundle was collected.

If you have an open service request (SR) and know the SR number, you can use that number in the log notes and send the bundle to the Call-Home server. The SR number must be the first entry in the Notes field, followed by any other notes for that bundle. The log bundles that you send to Call-Home will then be associated with that SR number with Oracle Customer Support.

You can send the log bundle directly to the Oracle server, or you can download the bundle and then attach that bundle to an existing SR in MOS. In either case, the logs are transferred securely using encryption.

Note: Downloaded log bundles cannot be sent directly to the Oracle server.

Related Links

Create a Log Bundle

Send Logs to the Call-Home Server

View UI Client Logs

You can display a folder of client logs that contain a history of the Oracle FS System Manager (GUI) activities that have been performed on the Oracle FS System.

1 Navigate to Support > System Logs.

2 Select Actions > View UI Client Logs.

Tip: You can use Alt-Ctrl-L to view all of the logs and Alt-Ctrl-Z to create a zip archive containing all of the logs.

Depending on your operating system, one of the following actions occurs:

- Windows: The system opens Windows Explorer and displays the location of the client logs.
- Linux: The system changes the directory to the location of the client logs.

Use a text editor or reader to view the contents of any of the client logs.

Related Links

System Logs Overview Page

System Log Bundles

Create a Log Bundle

Oracle Customer Support might request that you create a log bundle and send the bundle to Oracle for analysis. You can specify that the log bundle be associated with an existing service request (SR).

1 Navigate to Support > System Logs.

2 Select Actions > Create.
The Create Log Bundle dialog is displayed with all of the components selected for data collection.

3 Click Select All.

Note: Oracle Customer Support might request that you select specific components.

4 (Optional) To send the log files to the Oracle server, select the Send to Call-Home server option.

5 (Optional) To specify a collection period of the last hours or last days, select Most Recent Logs.

6 (Optional) Enter the desired value, and then select the units in Hours or Days.

7 (Optional) To select a collection period from the last log collection to the present, select All Logs Since Last Log Collection.

8 (Optional) To collect logs from the SAN hosts that are running Oracle FS Path Manager (FSPM), click Select Host and then select the hosts from the list.

Note: The SAN host must have FSPM installed and the host is in a communicating state.

When you are finished selecting the hosts, click OK.

9 (Optional) To download the log bundle to your workstation, select the Download to option, and then specify the file path for the log bundle.

10 (Optional) Enter a short description for the log collection in the Notes field.

For example, you can enter a service request (SR) number.

Note: If you use an SR number, it must be the first entry followed by any other notes about the log bundle.

11 To create the log bundle, click OK.

The system begins collecting the data logs and displays the log bundle in the System Logs overview page. If you selected the Send to Call-Home server option, then the log bundle is sent directly to the Oracle server.

From the System Logs overview page, you can download the log bundle to your workstation or, if you are logged in using a Support role, you can send the log bundle to the Oracle server.

Related Links

Create Log Bundle Dialog
Configure Call-Home for ASR
System Log Bundles
Settings for ASR (Call-Home)
Send Logs to the Call-Home Server
Download Log Bundles
Delete Log Bundles

Collect Statistics

The Oracle FS System generates performance statistics for logical volumes and for SAN protocols. The statistics also include capacity usage and system health information. Oracle Customer Support might request that you collect the system performance statistics and transmit the data to Oracle for analysis.

The downloaded statistics can be reviewed using the Oracle FS System Statistics Tool. For more information, review the *Oracle Flash Storage System Statistics Tools User's Guide*.

1 Navigate to Support > System Logs.

2 Select Actions > Create.
The Create Log Bundle dialog is displayed with all of the components selected for data collection.

3 Click Deselect All.

4 From the Component or Item table, select the Statistics option.

5 (Optional) To specify a collection period of the last hours or last days, select Most Recent Logs.

6 (Optional) Enter the desired value, and then select the units in Hours or Days.

7 (Optional) To select a collection period from the last log collection to the present, select All Logs Since Last Log Collection.

8 (Optional) To collect logs from the SAN hosts that are running Oracle FS Path Manager (FSPM), click Select Host and then select the hosts from the list.

Note: The SAN host must have FSPM installed and the host is in a communicating state.

When you are finished selecting the hosts, click OK.

9 (Optional) Enter a short description for the log collection in the Notes field.

For example, you can enter a service request (SR) number.

Note: If you use an SR number, it must be the first entry followed by any other notes about the log bundle.

10 (Optional) To download the log bundle to your workstation, select the Download to option, and then specify the file path for the log bundle.

11 Click OK.

To delete a log, you must be logged in with support login privileges.

Related Links

Create Log Bundle Dialog
Storage Performance Statistical Data Overview
Storage Performance Statistical Data Overview
Delete Log Bundles

Download Log Bundles

When an Oracle FS System system event occurs, the system records the incident information in system logs. These logs are useful when troubleshooting.

A log bundle contains a number of system logs and is formatted as a TAR file, which you can download to your workstation. Oracle Customer Support might request that you collect the logs and send them to Oracle for analysis.

1 Navigate to Support > System Logs.

2 Select a log bundle to download from the System Logs list.

3 Select Actions > Send to > Download.

4 To select the file location on your workstation, click the browse button [...].

5 Click OK.

Send the log bundles to Oracle Customer Support, if requested.

You can also attach the log bundle to an existing service request (SR). Access the SR in My Oracle Support (MOS) and upload the logs.

Related Links

System Logs Overview Page
System Log Bundles
Send Logs to the Call-Home Server

Send Logs to the Call-Home Server

If a significant Oracle FS System event occurs, the system writes logs that contain information about the incident. Support administrators and administrators with Support role privileges can manually send the system log bundles to the Oracle server.

Prerequisite	Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.

Logs are generated by the system when a significant event occurs, or manually created by the administrator. Oracle Customer Support might request that you create a log bundle and send the bundle to Oracle for analysis. If you want to automatically send the logs to the Call-Home server, select the Send to Call-Home server option when you create the log bundle.

1. Navigate to Support > System Logs.
2. From the System Logs list, select a log bundle to send to the Call-Home server.
3. Select Actions > Send to > Call-Home Server.
4. Click OK.

If Oracle Customer Support requested the log bundle, confirm that the file was received.

Related Links

System Logs Overview Page
Configure Call-Home for ASR
System Log Bundles
Settings for ASR (Call-Home)
Download Log Bundles

Clear the System Logs

If you are instructed by Oracle Customer Support, you can delete all of the Controller logs and log bundles from the Oracle FS System.

Prerequisite	Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.

Clearing the system logs removes log collections and Controller logs. To remove an individual log bundle, use the Delete Log Bundles option.

Important: Deleting the system logs permanently removes all record of the past system behavior.

1. Navigate to Support > System Logs.
2. Select Actions > Clear Logs.
3. Select the types of logs to delete.
   Valid choices:
   - Controller Logs
   - Log Collections
4. Click OK.

Related Links

Create Log Bundle Dialog
System Log Bundles
Delete Log Bundles

Delete Log Bundles

If you are instructed by Oracle Customer Support, you can remove some or all of the log bundles that have been created by the system and by the administrators of the Oracle FS System.

Prerequisite	Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.

Important: Deleted log bundles cannot be recovered.

1. Navigate to Support > System Logs.
2. Select one or more of the log bundles from the System Logs list.

   Tip: Use the Ctrl or Shift keys to select and deselect multiple log bundles.
3. Select Actions > Delete.
4. Click OK.

Related Links

System Log Bundles
Create a Log Bundle

Data Consistency

The data consistency test verifies the integrity of the RAID parity data, not the integrity of user-created data.

You might want to run the data consistency test after replacing a drive in a Drive Enclosure. Also, Oracle Customer Support might request that you run a data consistency test for diagnostic purposes.

Running the data consistency test impacts Oracle FS System performance. You have two options to choose from when performing this test:

- High priority: The verification check could affect I/O performance by up to 30%. The high-priority option yields faster results, but has a greater impact on system performance.
- Low priority: The verification check could affect I/O performance by up to 10%. The low-priority option is recommended if you want to check the Drive Enclosure after replacing a drive.

Data consistency failures are typically isolated to the drive or drive group error handling. The Oracle FS System compensates for some of the errors that are encountered during the tests. However, if an error persists that cannot be fixed, the system displays Fail on the Data Consistency overview page. In this case, collect the Oracle FS System data logs and contact Oracle Customer Support.

Related Links

Data Integrity on the Drives
Verify the Data Consistency of a Drive Group

Verify the Data Consistency of a Drive Group

You can verify the integrity of the RAID parity data that is maintained by the Oracle FS System software by running the data consistency test on a selected drive group. The Oracle FS System writes and maintains the parity data on various drives within a certain drive group. After replacing a drive in one of those drive groups, you might want to confirm that the parity data is consistent on that drive group.

1 Navigate to Support > Data Consistency.

2 Select a drive group that you want to verify.

3 Select Actions > Data Consistency.

4 From the Verify Data Consistency dialog, specify how much I/O time to give to this operation.

Valid choices:

- High Priority
- Low Priority

For example, if you specify High Priority, this operation could impact Drive Enclosure performance by up to 30%.

5 To start the data verification, click OK.

After data verification completes, the results appear on the Data Consistency page. Use the refresh button ( ) to update the page, if necessary. The system displays the date and time of the most recent integrity test results.

Related Links

Data Consistency Overview Page
Data Consistency

Controller Diagnostics and Command Testing

Administrators can use two features of the Oracle FS System Manager (GUI) to help characterize and isolate the source of Controller issues. These issues can be related to Controller hardware or software, or can be related to the connections between the Controller and the public data network.

The Controller diagnostics feature performs a suite of diagnostic tests on the hardware components and the software modules in a Controller. The hardware that is tested includes, for example, the motherboard, the network interface cards, the fans, and the power supplies that are contained within the Controller.

Note: During startup, the Oracle FS System always performs diagnostics on the Controller nodes.

The diagnostic tests on the hardware and software return detailed information to help a support administrator to characterize and to isolate specific faults in the system. With this information, the support administrator can more easily determine which field replaceable unit (FRU) needs to be replaced.

Important: Close all of the applications that are using the Controller before running diagnostics, then disconnect the Controller from the public data network.

While the diagnostic tests are being run, the status of the Controller appears as Failed Over. When the tests are complete, the status changes to Normal.

To run diagnostics on a Controller, the system disables the write cache in the target Controller, moves all the resources of the Controller to its partner Controller, and takes the target Controller offline. All of the LUNs that are assigned to the Controller are put into Conservative mode. During the diagnostic period, the performance of the partner Controller is diminished because all I/O is performed directly to disk.

Related Links

Controller Management
Run Controller Diagnostics
Run Controller Command

Run Controller Diagnostics

Oracle Customer Support might request that you run diagnostics on a selected Controller to test its hardware components. The results of these tests can help you take the appropriate steps to ensure data integrity and to reduce downtime.

Prerequisites

- Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.
- All of the clients that are connected to the target Controller are idle. Alternatively, ensure that the zoning and client configuration are set up to handle the condition of the Controller going offline with all data access moved to the partner Controller.

You can run hardware diagnostics in response to various conditions such as certain hardware faults, the crossing of critical statistics thresholds, and certain generated events. The goal of these diagnostics is to isolate the cause of that condition. After a hardware diagnostic is invoked, it performs a particular test and returns a Pass status or a Fail status. For a Fail status, the diagnostic test returns detailed information about the failure.

CAUTION: Do not initiate diagnostics on a Controller that is currently serving data. If you do, data loss could occur.

During the diagnostic period, the performance of the partner Controller is diminished because all I/O is performed directly to disk.

1. Navigate to System > Hardware > Controllers.
2. Select Actions > Run Diagnostics.
3. Select the Controller on which you want to run diagnostics.
4. Read the warning on the Controller Diagnostics dialog box, then click Next.
   After the diagnostics is completed, the Success dialog appears.
5. To display the diagnostics test results, click Next.
6. Review the results of the diagnostics test.
7. To close the diagnostics dialog, click Finished.

Related Links

Controllers Overview Page
Controller Diagnostics and Command Testing
View Controller Diagnostics

View Controller Diagnostics

Administrators who are logged in with one of the support roles can review the results of the latest Controller diagnostics.

Prerequisite — Logged in to Oracle FS System Manager (GUI) using the Oracle Support role or the Support role.

1. Navigate to System > Hardware > Controllers.
2. Select Actions > View Diagnostics.
3. Select the Controller for which you want to view the diagnostic results.

4 To display the diagnostics test results, click Next.

5 Review the results of the diagnostics test.

6 To close the diagnostics dialog, click Finished.

Related Links

Controller Diagnostics and Command Testing

Run Controller Diagnostics

Controller Commands

You can run commands on a Controller to obtain internal information about the Controller, such as a failed component or a list of failed field replaceable units (FRUs) or to diagnose other issues.

You can also use the Controller statistics tool that by navigating to System > Reporting & Statistics > CPU Statistics.

Note: Use the prefix command `ipmifm` when entering commands in the Controller command line.

Table 13: Controller commands

Command	Syntax	Description
`fmadm`	`ipmifm fmadm faulty [-afgiprsv]` **`-a`** Displays all faults. By default, the `fmadm faulty` command only lists output for resources that are currently present and not working correctly. If you specify the `-a` option, all resource information cached by the Fault Manager (FM) is listed, including faults that have been automatically corrected or when no recovery action is needed. The listing includes information for resources that might no longer be present in the system. **`-f`** Displays all field replaceable units (FRUs). **`-g`** Groups faults that have the same FRU, class, and fault message. **`-i`** Displays the persistent cache identifier for each resource in the Fault Manager. **`-p`** Pipes output and adds a page break between each fault message. **`-r`** Displays the Fault Management Resource with their Identifier (FMRI) and the fault management state. **`-s`** Displays a single-line summary of each fault event. **`-v`** Displays the full output of the fault.	Allows administrators and service personnel to view and to modify the system configuration parameters that are maintained by the Solaris FM. FM receives telemetry information relating to the problems that are detected by the system software, diagnoses these problems, and initiates proactive self-healing activities such as disabling faulty components. Example: The following example displays a single line fault summary and groups the faults by FRU: **`ipmifm fmadm faulty -ags`**

Related Links

Controller Management

Controller Diagnostics and Command Testing

Run Controller Diagnostics

Run Controller Command

You might need to view information about a particular Controller. For example, you can obtain the fault management (FM) status of a Controller. The FM status provides details about a failed component.

1. Navigate to Support > System Trouble.
2. Select Actions > Run Controller Command.
3. Select a Controller from the list.
4. Enter the command in the Command Line field.
5. Enter any necessary variables in the Environment Variables field.

   Enter the variables in the form of *variablename=value*, where *variablename* is the environment variable and *value* is the text passed to the operating system that is running in the Controller.
6. Click Execute.
   The Command Output displays the results that are returned by the command that was executed.

Related Links

Run Controller Command Dialog
Controller Diagnostics and Command Testing
Controller Commands

Drive Enclosure Console

When checking or diagnosing drive group issues, a support administrator or a primary administrator can access the Drive Enclosure console. You can use the console to view RAID command output from the Oracle FS System. You can also run RAID commands to a particular Drive Enclosure and view the responses from those commands.

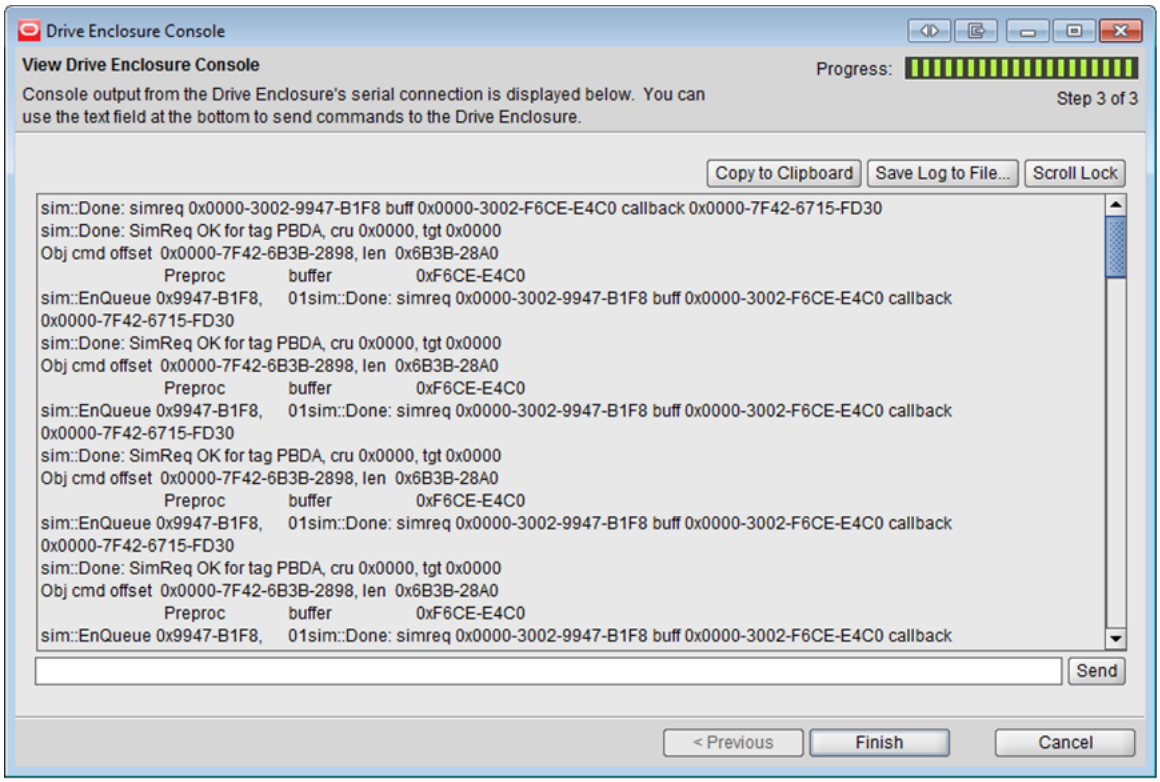
WARNING: When troubleshooting, do not power-cycle a Drive Enclosure. Power-cycling a Drive Enclosure impacts the primary and secondary data paths in the Drive Enclosure and puts user data at risk.

Run the Drive Enclosure console commands under the direction of Oracle Customer Support. The support representative will supply the support administrator with the necessary commands to run in the console.

RAID output is generated by the Oracle FS System and written to the Drive Enclosure console. You can copy the output and, if requested, send that output to Oracle Customer Support.

When you use the Drive Enclosure console to access a Drive Enclosure, the output being generated by that Drive Enclosure appears in the console.

Figure 16: Drive Enclosure console



Note: The Drive Enclosure console can be used by only one login session at a time. When launching the console, the support administrator has the option of forcing other sessions to disconnect.

During a debug session, you have the option of capturing all generated output at any time, and copying that output to the clipboard or saving the output to a file. The name of the saved file contains the World Wide Name (WWN) of the Drive Enclosure and a timestamp, which can help in a review of the debug session.

When a fault, a failure, or a sub-optimum condition occurs within a Drive Enclosure, the recovery of that Drive Enclosure might require access to a number of RAID commands that can be run from the Drive Enclosure console. The Drive Enclosure console provides access to those commands.

CAUTION: Use Drive Enclosure console commands for recovery purposes or diagnostic purposes only, as instructed by Oracle Customer Support. These command are used to gather information or to clear conditions that cannot otherwise be accomplished. To avoid data loss, do not execute Drive Enclosure console commands without assistance from Oracle Customer Support.

Oracle Customer Support will provide you with the commands that you can run. These commands allows you to view, test, or debug the drives in the Drive Enclosure in some way.

Related Links

Drive Enclosure Management

View the Drive Enclosure Console

View the Drive Enclosure Console

After you replace a drive in the Drive Enclosure, you can view the RAID output in the Drive Enclosure console.

Prerequisite	Logged in to Oracle FS System Manager (GUI) using the Administrator role, the Oracle Support role, or the Support role.

RAID output is generated by the Oracle FS System and written to the Drive Enclosure console. You can copy the output and, if requested, send that output to Oracle Customer Support.

1. Navigate to System > Hardware > Drive Enclosures.
2. Select Actions > View Drive Enclosure Console.
   The Drive Enclosure Console dialog appears and an informational warning is displayed.
3. Click Next.
4. Select the Drive Enclosure that you want monitor.
5. Select the I/O Module that you want to monitor.
6. (Optional) To ensure that no other Drive Enclosure console session is running on the Oracle FS System, select the Disconnect other users from the Drive Enclosure console option.
7. Click Next.
   Oracle FS System writes output from the Drive Enclosure to the console.
8. (Optional) To pause the display, click Scroll Lock.
   To restart the display, click Scroll Lock again.
9. (Optional) Capture all of the output from the console.
   Valid choices:
   - Copy to Clipboard
   - Save Log to File
10. To terminate the Drive Enclosure console session, click Finish.

If you selected the option Save Log to File, you might be asked to send the log file to Oracle Customer Support, or to attach the file to a service request in My Oracle Support (MOS).

Related Links

Drive Enclosure Console

Run the Drive Enclosure Commands

Run the Drive Enclosure Commands

You can run RAID code commands that control the Drive Enclosure. For example, you might need to run the commands to help in the recovery from a drive group error or a Drive Enclosure error.

CAUTION: Use Drive Enclosure console commands for recovery purposes or diagnostic purposes only, as instructed by Oracle Customer Support. These command are used to gather information or to clear conditions that cannot otherwise be accomplished. To avoid data loss, do not execute Drive Enclosure console commands without assistance from Oracle Customer Support.

Important: The Drive Enclosure continuously writes output to the console. When you run a Drive Enclosure command, always capture the output before and after running the command.

Prerequisite	Logged in to Oracle FS System Manager (GUI) using the Administrator role, the Oracle Support role, or the Support role.

1. Navigate to System > Hardware > Drive Enclosures.
2. Select Actions > View Drive Enclosure Console.
   The Drive Enclosure Console dialog appears and an informational warning is displayed.
3. Click Next.
4. Select the Drive Enclosure that you want monitor.
5. Select the I/O Module that you want to monitor.
6. (Optional) To ensure that no other Drive Enclosure console session is running on the Oracle FS System, select the Disconnect other users from the Drive Enclosure console option.
7. Click Next.
   Oracle FS System writes output from the Drive Enclosure to the console.
8. If instructed by Oracle Customer Support, enter a Drive Enclosure command, and then click Send.

   The Oracle FS System runs the command and displays the results in the console.
9. (Optional) Capture all of the output from the console.

   Valid choices:

   - Copy to Clipboard
   - Save Log to File
10. To terminate the Drive Enclosure console session, click Finish.

Related Links

Drive Enclosure Management
Drive Enclosure Console
View the Drive Enclosure Console

Shut Down the Oracle FS System

Use the shut down option to systematically shut down all of the software that is running on the Oracle FS System. After the software is shut down, you can safely power off the hardware.

The Oracle FS System is composed of many hardware components and software processes that have dependencies on other components and processes. To ensure that all dependencies are satisfied and that the Oracle FS System is shut down in an orderly fashion, use the Shut Down option.

While the system is in a shutdown state, the Oracle FS System Manager (GUI) is still running and accessible. The only actions that you can perform from the GUI are to display system status, collect logs, and restart the Oracle FS System.

1 From Oracle FS System Manager (GUI), select Oracle FS > Shut Down.

  The system displays the Confirm Shut Down dialog.

Important: Shutting down stops all software processes and closes the data path. While the system is shut down, users cannot access data.

2 Read the information on the Confirm Shut Down dialog.

3 To shut down the system, click OK.

The system status icon changes to a yellow triangle with the message: *Prepare for Shutdown*. The system continues to shut down all of the software processes, however the GUI remains running. After the software is shutdown, the System Information page displays, Shutdown.

When you are ready to restart the system, use the Oracle FS > Restart action.

If the shutdown fails, the system displays a System Alert indicating the shutdown failure. That System Alert presents an option to force the system shutdown.

CAUTION: Use of the force shutdown action will cause data loss.

The option to force a system shutdown should only be used when it is absolutely necessary. For example, shut down the system when you need to power off the facility.

Related Links

System Startup
Restart the Oracle FS System

Restart the Oracle FS System

Restarting the Oracle FS System reinitializes all software components. Reinitializing the software is necessary, for example, when preparing for a disruptive software update process.

CAUTION: Data loss is possible if client I/O is active when the system restarts.

If the system is currently in an Online state, you might want to send a message to the system users that a system restart is about to begin. Stopping all user I/O 15 minutes before you restart a running system minimizes the risk of data loss. This time ensures that the flash backed memory is written to the storage arrays before the restart begins. You cannot schedule a system restart.

When you restart a running system, it begins a shutdown operation, which takes all data paths offline, writes all cached data to the storage arrays, and quiets the software modules. The system then begins the startup process. During this phase of the restart operation, the startup process verifies the system configuration and attempts to bring the system online.

Note: When restarting the system after the system has been shut down, the system initiates the startup process. This process verifies the system configuration and attempts to bring the system online.

1. Select Oracle FS > Restart.

   The system displays the restart confirmation dialog.

2. Read the information on the confirmation dialog, and then click OK.

   The system starts up and, when the startup process completes, the System Information page (System > System Information) displays *Status: Normal*.

   If the Pilot cannot safely shut down the system to begin the restart process, a second dialog is displayed. Read the message, then do one of the following:

   - To close the dialog so you can resolve the problem, click Cancel.
   - To ignore the problem and continue with the system restart, click Force Restart.

     CAUTION: Data loss is possible. Be certain you want to force a restart operation.

Related Links

System Startup

Shut Down the Oracle FS System

System Startup

The Oracle FS System starts up when the system is powered on, when the system undergoes a disruptive software update, or when a system administrator explicitly requests a restart.

Controlled by the Pilot management software, the startup process proceeds in an orderly way.

Note: When a system is starting up, the data paths are not available until the Controllers have completed the startup process.

During a system startup, the management software on the Pilot obtains heartbeats from the Controllers and verifies the configuration of the Oracle FS System

When the Oracle FS System starts, all Controller nodes progress through two stages. The first stage is controlled by the Controller BIOS that resides on the Controller. The second stage is controlled by Pilot software and the Configuration Manager (CM) software component on the Controller.

Related Links

Shut Down the Oracle FS System

Restart the Oracle FS System

System Halt Points

By enabling system halt points, you can more easily diagnose those situations in which you cannot get a Controller to start successfully because of some hardware or software condition.

CAUTION: Use system halt points for troubleshooting purposes only. System halt points are used to gather information or to clear conditions that cannot otherwise be accomplished. Never set or clear halt points without assistance from Oracle Customer Support. Only the Primary administrator and the Support administrator can manage system halt points.

When the Oracle FS System starts, all Controller nodes progress through two stages. The first stage is controlled by the Controller BIOS that resides on the Controller. The second stage is controlled by Pilot software and the Configuration Manager (CM) software component on the Controller.

First Startup Stage

A Controller node starts by executing page code that resides in its Controller BIOS. You can watch the Controller LEDs to monitor the progress of this stage. (Refer to the *Oracle FS1-2 Flash Storage System Installation Guide* for an explanation of these LED startup codes.)

During the first stage, the page code in the Controller BIOS performs many actions, including the following sequence:

- First, the page code runs a set of power-on tests.
- Next, the code begins monitoring flash backed memory.

- Then, the code initializes the private management interface (PMI) on the Controller.
- Finally, the code passes control to *pxeboot*, which downloads the Controller software from the Pilot.

If this stage succeeds, the second stage begins, in which the Controller software components are initialized.

Second Startup Stage

In this second stage, the Pilot performs several checks on each Controller node and, if all is well, puts the node into an Initialization state. When the initialization of the software components finishes, the Pilot then, by sending commands in a defined sequence, brings the Controller software components to a Normal state.

Both the Oracle FS System Manager (GUI) and the Oracle FS CLI products identify the names of these Controller software components with a prefix of `PDS_COMP_`. This prefix is followed by the initials for the component. For example, `CM` identifies the Configuration Manager. Support administrators can selectively control the execution of these software components by enabling and disabling halt points on those software components.

If the Support administrator has previously enabled a halt point on one of these software components, the Controller boot process is halted at the specified halt point. The halt points are unique for each component.

When the startup process stops, the Support administrator can take various diagnostic actions, such as dumping a log file or reading an internal table.

After completing those actions, the Support administrator can instruct the startup process to continue. At this point, the Pilot now sends commands to each Controller to resume the startup process from the point at which it was halted. If there are multiple halt points, the system starts up to the next halt point

Related Links

System Startup
Manage System Halt Points
Continue System Startup

Manage System Halt Points

You can enable halt points for diagnostic purposes. Halt points pause the startup sequence of the Oracle FS System at the specified component step, allowing you to perform various diagnostics tasks.

CAUTION: Use system halt points for troubleshooting purposes only. System halt points are used to gather information or to clear conditions that cannot otherwise be accomplished. Never set or clear halt points without assistance from Oracle Customer Support. Only the Primary administrator and the Support administrator can manage system halt points.

1. Navigate to Support > System Halt Points.
2. Select Actions > Manage Halt Points.

   The system displays a list of available halt points. The system displays a check mark in the Paused on Halt Point column where the startup sequence has halted.
3. (Optional) Select the Active box for each the step where you want the system to halt.

   Note: You can enable up to eight halt points on your system.
4. (Optional) To remove all active halt points in the list, click Clear.

   Clearing all active halt points enables the system, when you instruct it to continue, to resume the startup process without any additional system halts.
5. If you selected one or more halt points, click OK.

The selected halt points display in the System Halt Points overview page.

After the system restarts, the system pauses at the designated halt point. The System Halt Points overview page displays a check mark in the Paused on Halt Point column where the system has paused. You can perform diagnostic tasks such as collecting logs, reviewing the contents of system tables, and so forth. After you complete these tasks, you can direct the system to continue the startup process.

Related Links

Manage Halt Points Dialog
System Halt Points
Continue System Startup

Continue System Startup

After using system halt points to stop the Oracle FS System startup sequence at a specified component step, you can easily resume system startup.

Important: Use system halt points for troubleshooting purposes only. System halt points are used to gather information or to clear conditions that cannot otherwise be accomplished. Never set or clear halt points without assistance from Oracle Customer Support. Only the Primary administrator and the Support administrator can manage system halt points.

1. Navigate to Support > System Halt Points.
   The system displays a list of selected halt points. The currently halted step is indicated in the Paused on Halt Point column.
2. Select the halt point from the list.
3. To continue the startup sequence, select Actions > Continue.

   The system continues the startup process and proceeds to the next halt point, if any.

4 Click OK.

5 Repeat Step 3 and Step 4 until the system has processed all of the halt points.

Related Links

System Halt Points Overview Page

System Halt Points

Manage System Halt Points

Reset the Oracle FS System

In extremely rare circumstances, you might need to reset your system serial number and system configuration.

Prerequisite	A special system reset file that is associated with the system serial number from Oracle Customer Support.

WARNING: Because this action deletes all user data along with the system configuration, the system prompts you to confirm the system reset operation. Be absolutely sure you want to reset your system, because *all data in your system will be lost*.

The system reset file performs the following actions:

- Deletes all data stored on the Oracle FS System
- Resets the configuration to an initial state

1 Navigate to Support > System Trouble.

2 Select Actions > Reset System.
The Reset System dialog box is displayed.

3 Read the WARNING text and, when you are ready, click the browse button (...) to proceed.

4 Navigate to and select the system reset file that you received from Oracle Customer Support.

5 Click OK.

6 When prompted to confirm the deletion of all data and the system configuration, click OK to reset your system.

The Oracle FS System restarts and the user data is no longer available. Set the Controller service type as the system restarts. The startup process will not continue until you set the service type. When the startup is complete, the system is returned to an initial state.

Related Links

Reset System Dialog
System Startup
Oracle FS System Diagnostics
Restart the Oracle FS System

CHAPTER 12

Manage Reports

Generated Reports Overview

Generated reports provide listings of configuration details, storage and performance information, and statistical information about your system that you can download to your client from the Oracle FS System.

You can generate a report immediately at the Generated Reports page, or you can schedule a report to be generated at a specified time at the Scheduled Reports page.

You can generate the following types of reports:

SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free, and preparing capacity is also presented per storage class.
Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures.

Note: You might want to generate and archive the *System Configuration* report as the report provides a record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.

System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.

You can download reports in the following formats:

Table 14: Report download formats

Format	Usage
CSV	Comma-separated values. Import into any spreadsheet or database.
Excel	Import (XSL) directly into Microsoft Excel or compatible spreadsheet applications.
HTML	Display in a browser.
PDF	Printer-friendly online document.
XML	XML, tagged document.

Related Links

Generate a Report

Download a Report

Delete a Report

Generate a Report

You can generate predefined reports to view statistical information about the Oracle FS System.

An example where you can use generated reports is to generate and save a performance report and then generate and save a storage use report. This combination of reports provides information on trends to manage system storage capacity upgrades.

1. From the System tab, click Reporting & Statistics > Generated Reports.
2. Select Actions > Generate.
3. From the Type drop-down menu in the Generate Report dialog, select a report.
4. Click OK.

When the report is complete, the Generated Reports page displays the name of the report, the time the report was created, and the size of the report.

To see the contents of the report, select the name of the report in the Generated Reports Overview page and download it in your preferred format. You cannot view the report from the Generated Reports Overview page.

Related Links

Generate Report Dialog

Download a Report

Delete a Report

Download a Report

You can download generated reports to your client workstation in a variety of formats.

Only reports listed on the Generated Reports page can be downloaded.

Download reports to see their contents.

1. From the System tab, navigate to Reporting and Statistics > Generated Reports.
2. Select the name of the report you want to download on the Generated Reports page.
3. Select Actions > Download.
4. Choose a file format from the Format drop-down menu in the Download Report dialog.

   Valid formats:

   - CSV (comma-separated values)
   - Excel
   - HTML
   - PDF
   - XML
5. Click the browse button (...) and choose the desired destination for the report.
6. Enter a filename in the File Name field, and click Save.
   The path, filename, and extension appear in the Target Download Path field in the Download Report dialog.
7. Click OK.

The report is downloaded in the specified format to the target location.

You must have the appropriate viewer to view the downloaded report. For example, Adobe Reader is required to view PDF reports.

Related Links

Download Report Dialog

Delete a Report

Delete a Report

You can delete any generated report listed in the Generated Reports page. Deleting a report removes the report from the Oracle FS System.

Delete a report to make room for additional reports, or to remove older reports that are no longer needed.

1. From the System tab, navigate to Reporting and Statistics > Generated Reports.
2. Select the name of the report you want to delete.
3. Select Actions > Delete from the menu.
4. Click OK.

Scheduled Reports Overview

You can schedule a report to be generated at a time and frequency that you specify.

You can use reporting schedules to generate different types of reports whenever you need them. The Oracle FS System generates these scheduled reports at the desired time and lists them on the Generated Reports page for you to download in the format of your choice.

All schedules for generating reports are listed on the Reporting Schedules page. You can create new reporting schedules, and view, modify, or delete existing schedules, from the Reporting Schedules page.

You can create a reporting schedule and enable the schedule to start generating reports immediately at the specified start time. Or, if you prefer, you can store the schedule on the Reporting Schedules page and enable the schedule later. You can also disable a schedule temporarily (if, for example, you want to keep it from interfering with scheduled maintenance) and then enable the schedule again. Deleting a schedule removes the schedule from the system, but disabling a schedule leaves the schedule available for enabling later on.

Scheduled reports continue to be generated until you disable or delete the reporting schedule.

Here are some examples of reports you can schedule; the frequency you schedule these reports depends upon your storage environment:

- *Storage Performance* report scheduled to run weekly to provide a performance summary over a period of time. You can archive these reports to create a historical storage performance record.
- *Storage Use* report scheduled to run every four weeks to monitor free capacity in a static environment where you are not adding or deleting LUNs often. In a more dynamic environment where you are adding or deleting LUNs often, you can schedule the *Storage Use* report to run more frequently, such as daily or weekly.

- *Storage Performance* and *Storage Use* reports scheduled to run at the same time and frequency if you want to compare storage performance with capacity.

Related Links

Create a Reporting Schedule
View a Reporting Schedule
Modify a Reporting Schedule
Delete a Reporting Schedule
Create a Reporting Schedule
View a Reporting Schedule
Modify a Reporting Schedule
Delete a Reporting Schedule

Create a Reporting Schedule

You can schedule a report to be generated at a time and frequency that you specify.

To generate a particular report on a regular basis, create a schedule for generating that report on the Reporting Schedules page.

1. From the System tab, navigate to Reporting and Statistics > Reporting Schedules.
2. Select Actions > Create.
3. Enter a name for your schedule in the Schedule Name field.

   If you do not provide a name, the system uses the default name `untitled`.

   Note: The name you enter is for your use in identifying the schedule listed in the Reporting Schedules. For example, if you want to run a weekly report on storage use, you enter `weeklystorageuse` as the schedule name to help locate that report. When a report is generated, the system automatically creates a name for the report. The name the system creates is based on the report type, (for example StorageUse_1374861600286), not the name you assigned to the report schedule. The report name is displayed in the Generated Reports name column.
4. Select the type of report you want to generate from the Report Type menu.

   Choose one of:

   - SAN Hosts
   - Storage Performance
   - Storage Use
   - Storage Use per Volume
   - **System Configuration**
   - **System Configuration Summary**

5 (Optional) Select Enabled if you would like your schedule to start as soon as the schedule is created.

If you do not enable your schedule now, you can do so at a later time by modifying the schedule.

6 Click the expansion button to the right of Start Time to select the day and time for your schedule to start.

7 Use the controls in the Modify Date/Time dialog to select the date and time.

8 Select a frequency for your schedule:

- Run Once
- Hourly
- Daily
- Weekly

9 Select a recurrence value for your schedule.

If the schedule frequency is Weekly, specify to generate the report every one, two, three, or four weeks, and on which day of the week to generate the report. Select multiple days to generate the report on more than one day during each week.

10 Click OK.

Your schedule is listed on the Reporting Schedules page. If you enabled the schedule, the scheduled report is listed on the Generated Reports page when the report is generated.

Related Links

Create Reporting Schedule Dialog
View a Reporting Schedule
Modify a Reporting Schedule
Delete a Reporting Schedule

View a Reporting Schedule

View a reporting schedule to see the name, report type, enabled status, start time, frequency, and recurrence of the reporting schedule.

View reporting schedules from the Reporting Schedules page.

1 From the System tab, navigate to Reporting and Statistics > Reporting Schedules.

2 Select the name of the reporting schedule you want to view.

3 Select Actions > View.

The View Reporting Schedule dialog lists the parameters of the selected schedule.

Related Links

View Reporting Schedule Dialog
Modify a Reporting Schedule
Delete a Reporting Schedule

Modify a Reporting Schedule

Modify a reporting schedule to change the name, report type, enabled status, start time, frequency, or recurrence of the reporting schedule.

1. From the System tab, navigate to Reporting and Statistics > Generated Reports.
2. Select Actions > Modify.
3. (Optional) Enter a new name for the reporting schedule in the Schedule Name field.

   Note: The name you enter is for your use in identifying the schedule listed in the Reporting Schedules. For example, if you want to run a weekly report on storage use, you enter `weeklystorageuse` as the schedule name to help locate that report. When a report is generated, the system automatically creates a name for the report. The name the system creates is based on the report type, (for example. StorageUse_1374861600286), not the name you assigned to the report schedule. The report name is displayed in the Generated Reports name column.
4. (Optional) Select a new type of report to generate from the Report Types menu.
5. (Optional) Click the expansion button to the right of Start Time to select a new start date and time.
6. (Optional) Select a new frequency.
7. (Optional) Select a new Recurrence value.

   If the schedule frequency is Weekly, specify to generate the report every one, two, three, or four weeks, and on which day of the week to generate the report. Select multiple days to generate the report on more than one day during each week.
8. Click OK to save your modifications.

Your modified schedule is listed on the Reporting Schedules page. If you enabled the schedule, the scheduled report is listed on the Generated Reports page when the report is generated.

Related Links

Modify Reporting Schedule Dialog
Delete a Reporting Schedule

Delete a Reporting Schedule

Delete a reporting schedule when you no longer need to generate a report of this type on a regular basis.

1. From the System tab, navigate to Reporting and Statistics > Reporting Schedules.
2. Select the name of the reporting schedule you want to delete on the Reporting Schedules page.
3. Select Actions > Delete.
4. Click OK in the Confirm Delete Reporting Schedule dialog.

This removes the schedule name from the Reporting Schedules page, and no further reports are generated from this schedule. Reports that were generated from this schedule remain on the Generated Reports page until you delete them.

CHAPTER 13

Manage Statistics and Trending

Storage Performance Statistical Data Overview

Statistical data is collected to help compare storage management objectives with storage performance. The statistical data is also used to supplement troubleshooting storage performance issues.

The Oracle FS System collects statistical data that enables you to perform the following tasks:

- Monitor system performance
- Review performance details by port, storage object, protocol, and Control Unit
- Analyze performance details to improve overall metrics

Performance data is available for the following functions:

- Drive Group
- CPU
- SAN LUNs
- SAN Controller Protocols

Statistical data is displayed as either performance or real-time data. The data is updated as follows:

Performance data	Performance data is refreshed every two minutes. An example of performance data is the data displayed under SAN > Statistics and Trending > LUNs, overview page.
Real-time data	Real-time data is refreshed every second. An example of real-time data is the LUN Real Time Statistics graph.

Note: Data is refreshed automatically if the **Configure Automatic Screen Updates** is set to the default value, Enable Automatic Screen Updates. If this is disabled, you need to use the keyboard combination of `Ctrl-Alt-R` to manually refresh the data. To change the settings, navigate to Tools > **Configure Automatic Screen Updates**.

You can also access the following statistical data:

Historical data	Historical data is available from a minimum of the previous one hour to a period you specify in hours or days. For further

	information on collecting and analyzing historical data, refer to the *Oracle Flash Storage System Statistics Tools User's Guide*.
Predefined report data	Statistical data is also available through predefined reports such as Storage Performance. These reports are available under System > Reporting & Statistics > Generated Reports.

Related Links

Effectiveness of QoS Plus

Storage Performance Statistical Data Terminology

Before reviewing performance data, review the key terminology used to describe storage performance as these terms form the base for understanding performance statistics.

These terms are used frequently to describe storage performance:

Input/Output per second	Measurement of the number of input and output operations completed per second. Input/Output per second (IOPS) is usually shown as read, write, and total IOPS.
Latency	When reading and writing data, latency is defined as the time it takes for a read operation or write operation to complete. Factors that contribute to latency include the amount of time to read data and write data from a disk, and the amount of time required to transfer the data over a storage link.
Queue Depth	Queue depth, sometimes referred to as I/O queue depth, is the number of I/O requests (pending or outstanding I/Os) waiting to be completed.
Response Time	Response time is the average time, in milliseconds, to complete an I/O operation.
Throughput	Throughput is measured as the amount of data, in megabtyes per second, that is processed by the Oracle FS System. Throughput is also expressed in IOPS when measuring sequential data. Whether expressed as megabtyes per second or as IOPS, throughput represents bandwidth.

Drive Group Statistics Overview

Access drive group statistics for real-time statistics that can be used to review performance.

When reviewing drive group statistics, consider the following information:

- The statistics include all drives contained within the drive group.
- The media type affects latency. For example, latency is higher for HDD and lower for SSD.

When reviewing drive group statistics, take note of the media type in the drive group as different media types have different performance characteristics. To

determine the media type for a drive group, navigate to System > Hardware > Drive Groups and review the information under the Media Type column.

Note: Drive Group Statistics are only available as real-time statistics from the Drive Group Real Time Statistics graph which is accessed from System > Reporting & Statistics > Drive Group Statistics > Actions > Drive Group Real Time Statistics.

The available statistics that are displayed from the Drive Group Real Time Statistics include:

Drive Group	Displays statistics for the selected drive group. Valid statistics:	
	Read IOPS	Indicates the average number of read operations per second per drive group.
	Write IOPS	Indicates the average number of write operations per second per drive group.
	Total IOPS	Indicates the average number of read operations and write operations per second per drive group.
	Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive group during read operations.
	Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive group during write operations.
	Total bytes per second	Indicates the total number of bytes for read and write activity per drive group.
	Read latency	Indicates the average time to complete a read operation per drive group.
	Write latency	Indicates the average time to complete a write operation per drive group.
	Total latency	Indicates the average time to complete read operations and write operations at the frequency the operations occurred per drive group.
	Read block size	Indicates the average read block size per drive group.
	Write block size	Indicates the average write block size per drive group.
	Total block size	Indicates the average block size per drive group.
	Read queue depth	Indicates the number of read operations waiting to be completed for the drive group.
	Write queue depth	Indicates the number of write operations waiting to be completed for the drive group.

Total queue depth	Indicates the number of read operations and write operations waiting to be completed for the drive group.

Related Links

Configure Drive Group Real-Time Statistics

Configure Drive Group Real-Time Statistics

You create a real-time statistics graph to display drive group statistics.

Prerequisite:

- Review the list of statistics that is available for the drive groups.

Statistics for drive groups are available in real-time and are updated every second.

1. To access real-time statistics for a drive group, navigate to System > Reporting and Statistics > Drive Group Statistics.
2. Select the drive group.
3. Select Actions > Drive Group Real Time Statistics.
4. Click Add Graph, select a statistic, and click OK.

   If you want to display another statistic, select Add Graph, select a statistic, and click OK. A graph for that statistic is added to the Drive Group Real Time Statistics below the first graph.

   You could also select another drive group and display a real-time statistic graph for that drive group. With both real-time graphs displayed, you can compare statistics between the drive groups.
5. To delete a graph, click Remove Graph

Related Links

Display Multiple Real-Time Statistics Graphs

Controller CPU Statistics Overview

Statistics are available for the selected Controller, which include percent time in kernel and total percent time busy. These statistics are used to identify system behaviors or variances in performance.

The two real-time statistics available are:

Percent Time in Kernel	Percentage of CPU utilization that occurred while executing commands at the system level. The scale is 0 to 100 percent.
Total Percent Time Busy	Percentage of time the CPU was busy on the Controller. The scale is 0 to 100 percent.

The measurements are used to identify trends in Controller usage. These statistics can be requested by Oracle Customer Support to help resolve potential system load issues, identity system capacity issues, or identify application issues.

Related Links

Configure Controller CPU Real-Time Statistics
Display Multiple Real-Time Statistics Graphs

Configure Controller CPU Real-Time Statistics

You can display statistics, which are percent time in kernel and total percent time busy, for a selected Controller CPU. The statistics and are used to identify performance issues in the system.

The CPU statistics are used to identify trends in Controller CPU usage.

1. To generate statistics about a Controller CPU, navigate to System > Reporting and Statistics > CPU Statistics.
2. Select a Controller.
3. Select Actions > Controller CPU Real Time Statistics.

   When you select a real-time statistic, default statistics are automatically graphed and displayed. You can add or remove statistics as needed.

   For Controller CPU real-time statistics, the default statistics graphed and displayed are percent time in kernel and total percent time busy.
4. Select Add Graph, then select either Percent Time in Kernel or Total Percent Time Busy.
5. Click OK.

   After you select and display one statistic, you can select the other statistic to be displayed as a separate graph within the same panel. For example, you could select Percent Time in Kernel and display that graph and then choose Total Percent Time Busy and also display that graph in the same panel. With both graphs displayed, you can view the statistics at the same time.
6. To delete a graph, click Remove Graph.

A graph displays the data for the statistic that you selected. The displayed data is updated every second.

Related Links

Display Multiple Real-Time Statistics Graphs

LUN Statistics and Trending Overview

The Oracle FS System collects statistics that provide information about storage network status and performance of the LUNs on the system.

LUN statistics are displayed in a table that is updated every two minutes, a detailed view that is updated every two minutes, or a real time statistics graph that is updated every second.

From the LUNs view, statistics are arranged by LUN name in the LUN statistics table. The statistics can be sorted by column by clicking on the column header.

Related Links

Detailed LUN Statistics Descriptions
LUN Statistics Descriptions
LUN Real-Time Statistics Graphs Description
View LUN Statistics
Configure a Real-Time LUN Statistics Graph
View Detailed LUN Statistics
Display Multiple Real-Time Statistics Graphs

LUN Statistics Descriptions

LUN statistics provide an overview of all LUNs present on your Oracle FS System.

You can review information and statistical data for each LUN. The data is refreshed every two minutes. You can manually refresh the data by pressing (entering) the keyboard combination of Ctrl > Alt > R.

Name	Identifies the name that is assigned to a LUN for administrative purposes.
Physical Allotted Capacity	Identifies the capacity, in gigabytes (GB), that is reserved for the LUN.
Priority Level	Identifies the priority level assigned to the specified LUN. Valid levels: • Archive • Low • Medium • High • Premium
IOPS	Indicates the average read and write operations per second.
Throughput	Indicates the data transfer rate in MB/s for read and write operations.

I/O Latency	Indicates the average time, in milliseconds, to complete the read operations or write operations.
I/O Size	Indicates the average size of the read operations and write operations.
Collection Period	Displays the start and the end time at which information was last collected from the Oracle FS System.

You can use this information to monitor the LUNs in your Oracle FS System or compare LUN performance and capacity for planning improvements to your system.

View LUN Statistics

You can view information and statistical data about all LUNs configured on the Oracle FS System on the LUN Statistics and Trending Overview page.

Prerequisite:
- One or more LUNs must be present on your Oracle FS System to create a LUN real-time statistics graph.

1. Navigate to SAN > Statistics and Trending > LUNs.
   All LUNs are presented in the table.
2. (Optional) Click a column heading to sort the list by the contents of that column to view the information in a different order.

The displayed data is refreshed every two minutes.

Related Links

LUNs Overview Page

Detailed LUN Statistics Descriptions

Detailed statistics for each LUN is available from the LUNs page.

The following statistical data is refreshed every two minutes.

Name	Identifies the name of the selected LUN.

Oracle FS System Performance

Specifies throughput and IOPS data divided by the CPU cycles needed to process those I/O requests from the LUN. The difference between Oracle FS System Performance and System Load is thatOracle FS System Performance includes the CPU cycles needed to perform read operations or write operations.

Read Throughput	Indicates the data transfer rate for read operations.
Write Throughput	Indicates the data transfer rate for write operations.
Total Throughput	Indicates the data transfer rate for read operations and write operations.

Read IOPS	Indicates the average number of read operations per second.
Write IOPS	Indicates the average number of write operations per second.
Total IOPS	Indicates the total read and writes operations per second.

System Load

Specifies throughput and IOPS data if the system devoted all resources to process those I/O requests from the LUN. The difference between System Load and Oracle FS System Performance is that the System Load does not include the CPU cycles needed to perform read operations or write operations.

Read Throughput	Indicates what the data transfer rate for data inputs, which are read operations, of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Write Throughput	Indicates the data transfer rate for data outputs, which are write operations, of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Total Throughput	Indicates the average data transfer rate for data read operations and write operations of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Read IOPS	Indicates the average number of read operations per second for read operations would be if the system devoted all of the CPU resources to the LUN.
Write IOPS	Indicates the average number of write operations per second for write operations would be if the system devoted all of the CPU resources to the LUN.
Total IOPS	Indicates the combined read and write operations per second would be if the system devoted all of the CPU resources to the LUN.

I/O Latency

Specifies the average time to complete a read or write operation (in milliseconds) and the average operation size (in KB).

Read Response Time	Identifies the average time to perform a read operation in the last sample period.
Write Response Time	Identifies the average time to perform a write operation in the last sample period.
Response Time	Identifies the average time to perform a read or write operation in the last sample period.

Read Operation Size	Identifies the average size of a read operation in the last sample period.
Write Operation Size	Identifies the average size of a write operation in the last sample period.

General

Specifies the I/O activity of the cache usage.

Cache Flushes per Second	Indicates the rate per second for which cache lines were flushed (written) to disk in the last sample period.
Cache Hit Ratio	Indicates the percentage of read operations that were completed from the read cache, which is also called cache hits, in the last sample period.
Read-Ahead IOPS	Indicates the average read operations per second from read-ahead fetching in the last sample period. Read-ahead fetching utilizes read access behavior in the sample period to determine read-ahead IOPS.
Non-Optimized IOPS	Indicates the total read operations and write operations per second that passed through non-optimized data paths in the last sample period. Optimized paths are preferred over non-optimized paths for performance. Non-optimized paths occur when there is no path management software used to manage data paths, the path management software is not configured correctly, or an optimized path is not available. Path management software and applications provide load balancing and path management for improved performance

View Detailed LUN Statistics

You can view statistical information about all LUNs configured on the Oracle FS System on the LUN Statistics and Trending Overview page.

Prerequisite:
- One or more LUNs must be present on your Oracle FS System to create a LUN real-time statistics graph.

1. Navigate to SAN > Statistics and Trending > LUNs.
   All LUNs are listed in the LUN Statistics and Trending table.
2. Select a LUN from the list.
3. Navigate to Actions > View Details to view detailed information about the selected LUN.

The displayed statistics are refreshed every two minutes.

Related Links

View LUN Statistics Detail

LUN Real-Time Statistics Graphs Description

Real-time statistics collected from LUNs can be used to produce graphs that include performance data. Examples of performance data include read operations, write operations, latency, and queue depth.

The following real-time statistics are available for a LUN:

Read IOPS	Indicates the average number of read operations per second.
Write IOPS	Indicates the average number of write operations per second.
Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive during read operations.
Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive during write operations.
Read latency	Indicates the average time to complete a read operation.
Write latency	Indicates the average time to complete a write operation.
Read block size	Displays the average amount of data read that are red in a read operation.
Write block size	Displays the average amount of data that are written in a write operation.
Total block size	Displays the average amount of data that are transferred in a read or write operation.
Read queue depth	Displays the number of read operations that are waiting to be fulfilled, on average.
Write queue depth	Displays the number of write operations that are awaiting to be processed, on average.
Total bytes per second	Displays the total bytes transmitted per second, on average.
Total IOPS	Indicates the total number of read and write operations per second.
Total latency	Indicates the average time to complete operations.
Total queue depth	Displays the total number of I/O operations that are queued for processing, on average.

Configure a Real-Time LUN Statistics Graph

LUN real-time statistics graphs provide a graphical view of the statistics available for the LUNs on your Oracle FS System.

To display a LUN real-time statistics graph, you need to select a LUN, and then select one or more statistics to display in the graph.

Prerequisite:

- One or more LUNs must be present on your Oracle FS System to create a LUN real-time statistics graph.

1. Navigate to SAN > Statistics and Trending > LUNs.
2. Select a LUN.
3. Select Actions > LUN Real Time Statistics.

   When you select a real-time statistic, default statistics are automatically graphed and displayed. You can add or remove statistics as needed.

   For LUN real-time statistics, the default statistics graphed and displayed are total latency and total I/O per second.
4. Click Add Graph, select a statistic, and click OK.

   If you want to display another statistic, click Add Graph, select a statistic, and click OK. A graph for that statistic is added to the LUN Real Time Statistics below the first graph.

   You could also select another LUN, and display a real-time statistic graph for that LUN. With both real-time graphs displayed, you could compare statistics between the LUNs.
5. To delete a graph, click Remove Graph.

The displayed statistical data is updated every second.

Related Links

Display Multiple Real-Time Statistics Graphs

SAN Controller Protocols Statistics and Trending Overview

The Oracle FS System collects statistics that can keep you informed about the storage network status and performance of the Controllers on the system.

SAN Controller statistics and details can be displayed for reference in static tables or displayed dynamically in a real-time statistics graph.

Statistics are arranged by Controller name in the SAN Controller Protocol Statistics table.

Related Links

SAN Controller Statistics Descriptions
Detailed SAN Controller Protocol Statistics Descriptions
SAN Controller Real-Time Statistics Graph Description
View SAN Controller Protocols
View Detailed SAN Controller Protocols Statistics
Configure a Real-Time Statistics Graph for a SAN Controller

SAN Controller Statistics Descriptions

SAN Controller protocol statistics provide an overview of the Controller ports on your Oracle FS System.

You can review the status of the following:

Name	Identifies the name of the selected Controller.
Port Type	Identifies the Controller port protocol type, FC, or iSCSI.
Slot Number	Identifies the Controller PCI slot assignment.
Port Number	Identifies the port numbers which are 0 or 1.
Negotiated Speed	Displays the transmission speed in Gbps/second for the port. The transmission speed is negotiated between the HBA or FC switch and the Controller.
Throughput (per Second)	Identifies the throughput in MB/second. Read Identifies the read throughput in MB/second. Write Identifies the write throughput in MB/second.
I/O Latency	Identifies the time in milliseconds to read or write data. Displays the following: Read Identifies the time to read data in milliseconds. Write Identifies the time to write data in milliseconds Combined Identifies the combined amount of time to read and write data in milliseconds.
I/O Size	Identifies the average size of the read and write operations.
Commands Received (per Second)	Displays the number of read and write commands received on the Oracle FS System each second over the last sampling period.
Channel Errors Since Activated	Displays the cumulative number of channel errors that have occurred since the Controller was activated.
Collection Period	Identifies the start and end times at which information was last collected from the Oracle FS System. Data is collected for a two-minute period and the data is refreshed every two minutes.

You can view more detailed information about Controllers by viewing details for a selected Controller. Detailed information is available for Fibre Channel (FC) or iSCSI Controllers, depending on the type of Controller selected.

You can use this statistical information to monitor the Controllers or to compare Controller characteristics for planning improvements to your system.

View SAN Controller Protocols

You can view statistical information about all Controllers on the Oracle FS System at the SAN Controller Protocols page.

1. From the SAN tab, navigate to Statistics and Trending > SAN > Controller Protocols.
   All Controllers are listed in the SAN Controller Protocol Statistics and Trending table.
2. Click the Name column heading to sort the list of Controllers.

Related Links

Controller Protocol Statistics Overview Page

Detailed SAN Controller Protocol Statistics Descriptions

Provides detailed statistics about Fibre Channel (FC) or iSCSI ports on a Controller.

The detailed information includes descriptions of both FC and iSCSI ports on a Controller. Content that is specific to either an FC or iSCSI port is noted in the description.

Name	Identifies the name of the Controller.
Slot	Identifies the HBA location (slots 1, 4, and 5) on the Controller.
Port Number	Identifies the HBA port numbers on the Controller.
Port Type	Identifies the HBA port type.

General Information

Read Throughput	Identifies the data transfer rate for data inputs (reads).
Write Throughput	Identifies the data transfer rate for data outputs (writes).
Total Throughput	Identifies the average combined input and output data transfer rates (reads and writes).
Total IOPS	Identifies the total number of I/O operations per second.

Performance

Max Read Throughput	Identifies the maximum input data transfer rate (reads).
Max Write Throughput	Identifies the maximum output data transfer rate (writes).
Max Total Throughput	Identifies the maximum combined input and output data transfer rate (reads and writes).

Max Read IOPS	Identifies the maximum number of input (read) I/O operations per second.
Max Write IOPS	Identifies the maximum number of output (write) I/O operations per second.
Max Total IOPS	Identifies the maximum total number of input and output (read and write) I/O operations per second.

SCSI Task Management Operations

Abort Task	Indicates the number of abort task commands processed on the selected port.
Abort Task Set	Indicates the number of abort task set commands processed on the selected port. A task set is a group of tasks.
Clear ACA	Indicates the number of Clear ACA (Auto Contingent Allegiance) commands processed on the selected port.
Clear Task Set	Indicates the number of clear task set commands processed on the selected port.
Logical Unit Reset	Indicates the number of reset logical unit commands processed on the selected port.
Target Reset	Indicates the number of target reset commands processed on the selected port.

I/O Latency

Specifies the average time to complete a read or write operation (in milliseconds) and the average operation size (in KB).

Read Response Time	Identifies the average time to perform a read operation in the last sample period.
Write Response Time	Identifies the average time to perform a write operation in the last sample period.
Response Time	Identifies the average time to perform a read or write operation in the last sample period.
Read Operation Size	Identifies the average size of a read operation in the last sample period.
Write Operation Size	Identifies the average size of a write operation in the last sample period.

FC Only

Channel Errors

Total Channel Errors	Indicates the total number of channel errors associated with this port.
Command Timeout Errors	Indicates the number of command timeout errors that have occurred on the channel associated with this port.
DMA Errors	Indicates the number of Direct Memory Access (DMA) errors that have occurred on the channel associated with this port.
Invalid RXID Errors	Indicates the number of invalid responder exchange identifier (RXID) errors that have occurred on the channel associated with this port.
Loop Init Errors	Indicates the number of loop initialization errors that have occurred on the channel associated with this port.
Overrun Errors	Indicates the number of overrun errors that have occurred on the channel associated with this port.
PCI Errors	Indicates the number of Peripheral Component Interconnect (PCI) errors that have occurred on the channel associated with this port.
Port Unavailable Errors	Indicates the number of port unavailable errors that have occurred on the channel associated with this port.
Reselection Timeout Errors	Indicates the number of reselection timeout errors that have occurred on the channel associated with this port.
Bad Frame Errors	Indicates the number of frames dropped from first-in or first-out buffer that have occurred on the channel associated with this port.
System Errors	Indicates the number of system errors that have occurred on the channel associated with this port.
Unacknowledged Host Event Errors	Indicates the number of unacknowledged host event errors that have occurred on the channel associated with this port.
Underrun Errors	Indicates the number of underrun errors that have occurred on the channel associated with this port.
Transfer Errors	Indicates the number of data transfer errors that have occurred on the channel associated with this port.

iSCSI Only

iSCSI Port Errors

Underrun Errors	Indicates the number of underrun errors during the collection period.
Overrun Errors	Indicates the number of overrun errors during the collection period.
Command Timeout Errors	Indicates the number of command timeout errors during the collection period.
DMA Errors	Indicates the number of Direct Memory Access (DMA) errors during the collection period.
Transport Errors	Indicates the number of transport errors during the collection period.
Device Unavailable Errors	Indicates the number of device unavailable errors during the collection period.
Data Digest Errors	Indicates the number of data digest errors during the collection period.
Header Digest Errors	Indicates the number of header digest errors during the collection period.
Invalid Snack Errors	Indicates the number of invalid SNACK (selective negative acknowledgment) errors during the collection period.
Unsolicited Data Errors	Indicates the number of unsolicited data errors, which are SCSI writes which include data but immediate data is disabled because the total data string would exceed the burst length, during the collection period.
Unexpected Data SN Errors	Indicates the number of unexpected data storage network (SN) errors caused from data sequence number in the Protocl Data Unit (PDU) during the collection period.
Initiator Task Tag Errors	Indicates the number of initiator task tag errors during the collection period.
System Errors	Indicates the number of system errors during the collection period.
MAC CRC Errors	Indicates the number of Media Access Control Cyclic Redundancy Check (MAC CRC) errors during the collection period.
MAC Encoding Errors	Indicates the number of MAC encoding errors during the collection period.

iSNS Errors	Indicates the number of Internet storage name service (iSNS) errors during the collection period.
Command PDUs Rejected	Indicates the number of command Protocol Data Unit (PDUs) rejected during the collection period.
Connection Failures	Indicates the number of connection failures during the collection period.
Session Login Failures	Indicates the number of session login failures during the collection period.
FW Dump Errors	Indicates the number of firmware (FW) dump errors during the collection period.

iSCSI Port Requests

Reinitialize Requests	Indicates the number of re-initialization requests during the collection period.
Target Cold Reset Requests	Indicates the number of cold target reset requests during the collection period. A target cold reset cancels all pending operations.
Task Reassign Requests	Indicates the number of task reassign requests during the collection period. A task reassign creates a new allegiance connection for the task.
ISNS Messages	Indicates the number of Internet Storage Name Service (iSNS) messages during the collection period.

iSCSI Port Events

Link Up Events	Indicates the number of link up events during the collection period.
Link Down Events	Indicates the number of link down events during the collection period.
IP Address Change Events	Indicates the number of IP address change events during the collection period.
Duplicate IP Address Events	Indicates the number of duplicate IP address events during the collection period.

View Detailed SAN Controller Protocols Statistics

You can view statistical information about all Controllers configured on the Oracle FS System on the SAN Controller Protocols page.

1. From the SAN tab, navigate to Statistics and Trending > SAN > Controller Protocols.
   All Controllers are listed in the SAN Controller Protocol Statistics and Trending table.
2. Click the Name column heading to sort the list of Controllers.
3. Select a Controller from the list.
4. To view detailed information about the selected Controller, select Actions > View Details.

Related Links

View Details Dialog (Fibre Channel)

View Details Dialog (iSCSI)

SAN Controller Real-Time Statistics Graph Description

You can create charts of statistics collected from the Controller ports in your Oracle FS System to show trends in the data.

Statistics collected from Controller ports that can be used to produce trending charts include:

- The total amounts and rates of data read and written through a specified Controller port
- Statistics specific to the Fibre Channel (FC) or iSCSI protocol

The statistics that can be displayed include IOPS and bytes read and written:

Read IOPS	Indicates the number of read I/O operations per second.
Write IOPS	Indicates the number of write I/O operations per second.
Total IOPS	Indicates the total number of read and write IOPS.
Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive during read operations.
Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive during write operations.
Total bytes per second	Displays the total number of bytes for read and write operations.

Configure a Real-Time Statistics Graph for a SAN Controller

A real-time statistics graph for a SAN Controller provides a graphical view of the statistics available for the Controllers on your Oracle FS System.

Prerequisite:
- One or more Controllers must be accessible on your Oracle FS System to create a real-time statistics graph.

1. Navigate toSAN > Statistics and Trending > Controller Protocol.
2. Select a Controller.

3 Select either Actions > FC Port Real Time Statistics or iSCSI Port Real Time Statistics

When you select a real-time statistic, default statistics are automatically graphed and displayed. You can add or remove statistics as needed.

For FC port real-time statistics, the default statistic graphed and displayed is total I/O per second.

For iSCSI port real-time statistics, the default statistic graphed and displayed is total I/O per second.

4 Click Add Graph, select a statistic, and click OK to display the graph. If you want to display another statistic, click Add Graph, select a statistic, and click OK.

A graph for that statistic is added to the FC Port Real Time Statistics or iSCSI Port Real Time Statistics below the first graph.

The displayed statistical data is updated every second.

Related Links

Display Multiple Real-Time Statistics Graphs

Example to Determine Performance During Peak Usage

The following example describes a process to measure Oracle FS System performance to determine if performance objectives are met in peak usage periods.

In this example, the administrator wants to determine if performance objectives are met during a peak usage period by reviewing latency and IOPS on key LUNs. The administrator needs to:

- measure system performance in real-time during a peak period when user activity is high.
- validate the performance of key LUNs used during the peak period.

The administrator needs to collect the following data in real-time:

- Latency on the selected LUNs that are most active during the peak period
- IOPS on the selected LUNs that are most active during the peak period
- Percentage CPU is busy on the Controller
- IOPS on the Fibre Channel ports
- Latency on all drive groups

Determine Performance During Peak Time

These are suggested steps to determine Oracle FS System performance using the Oracle FS System Manager (GUI) during a peak usage period to capture

statistics. The statistics are used to determine the overall health of the system and of specific LUNs.

Prerequisite:
- Knowledge of LUNs and drive groups including host-to-LUN mapping.

1. To determine latency for a selected LUN, navigate to SAN > Statistics and Trending > LUNs and select the LUN. You can choose one of these methods to view the data:
    1. You can view the I/O latency data from the LUNs Overview page.
    2. For additional I/O latency data from the LUNs Overview page, select a LUN and then select Actions > View Details for more information.
    3. If you want to view the I/O latency in a real-time graph, select Actions > LUN Real Time Statistics. From the LUN Real Time Statistics, click Add Graph, select Total Latency, and click OK.
2. To determine the IOPS for a selected LUN, navigate to SAN > Statistics and Trending > LUNs and select the LUN.
    1. You can view the IOPS data from the LUNs page.
    2. You can select Actions > View Details to display more details.
    3. If you want to view the IOPS in a real time graph, select Actions > LUN Real Time Statistics From the LUN Real Time Statistics, click Add Graph, select Total IO Per Second, and click OK.
3. To determine the percentage the CPU is busy on the Controller, navigate to System > Reporting and Statistics > CPU Statistics.
    1. Select the Controller.
    2. Select Actions > Controller CPU Real Time Statistics.
    3. Click Add Graph and select Total Percent Time Busy.
    4. Click OK.
4. To determine the IOPS for FC ports, navigate to SAN > Statistics and Trending > Controller Protocols and select the Controller.
    1. Select Actions > View Details to display IOPS data.
    2. If you want to view the IOPS in a real time graph, select Actions > FC Port Real Time Statistics.
    3. From the FC Port Real Time Statistics, click Add Graph, select Total IO Per Second, and click OK.
5. To determine the latency of a drive group, navigate to System > Reporting and Statistics > Drive Group Statistics.
    1. Select the Controller.
    2. Select Actions > Drive Group Real Time Statistics.

3 Click Add Graph, select Total Latency.

4 Click OK.

By checking latency and IOPS on the key LUNs, you can determine if performance meets performance objectives. If these values appear to be problematic, the other values already charted provide you with information on where to begin to identify the cause. The FC port information can provide insight into FC throughput. Latencies on LUNs or drive groups should not exceed a limit established by the administrator's guidelines. Based on experience, you can identify LUN values that are high or low.

Related Links

CPU Statistics Overview Page
Drive Group Statistics Overview Page
View Details Dialog (Fibre Channel)
View Details Dialog (iSCSI)
View LUN Statistics Detail
Display Multiple Real-Time Statistics Graphs

Example to Determine the Effect of Adding an Application

This is an example of how to measure Oracle FS System performance to determine if adding an application to the system impacts application performance of other applications.

Before adding an application and after adding an application to a new LUN or existing LUNs, performance data, specifically latency and IOPS, is collected. The data is collected to create a baseline to determine if adding an application impacts performance or causes contention with other applications.

By checking latency and IOPS on existing LUNs, you can determine if data performance is acceptable on the LUNs after adding an application to a new LUN or existing LUNs. If the data performance is not acceptable, you might need to install the application on another LUN or you might need to move the LUN to another Storage Domain.

Determine if Adding an Application Impacts Performance

These steps provide an example of how to measure Oracle FS System performance using the Oracle FS System Manager (GUI) to determine if adding an application impacts performance.

Prerequisites:

- Name of the LUNs where the application is installed.
- Storage Domain for the application LUN or LUNs and existing LUNs.

The process begins when you capture real-time statistics for the existing LUNs in the Storage Domain before the application is installed and after the application is

installed. If new a LUN or LUNs were created for the application, you would capture real-time statistics for the LUN or LUNs after the application is installed.

Note: This example assumes that the applications on the LUNs are generating the same amount of data before and after installation of the new application.

These steps describe the process for capturing total latency and total IOPS. You would capture this data before you added the application and after you added the application. If a new LUN or LUNs were added for the application, you would capture the data for that LUN or LUNs after the application was installed.

1. To determine the Storage Domain for the LUNs, navigate to SAN > Storage > LUNs. The Storage Domain is listed under the column Groups.
2. To determine latency for a LUN, navigate to SAN > Statistics and Trending > LUNs and select the LUN.
   - You can view the I/O latency data from the LUNs page.
   - You can select Actions > View Details to display more details.
   - If you want to view the I/O latency in a real-time graph, select Actions > LUN Real Time Statistics.
   - From LUN Real Time Statistics, click Add Graph, select Total Latency, and click OK.
3. To determine the IOPS for a LUN, navigate to SAN > Statistics and Trending > LUNs and select the LUN.
   - You can view the IOPS data from the LUNs page.
   - You can select Actions > View Details to display more details.
   - If you want to view the IOPS in a real- time graph, select Actions > LUN Real Time Statistics.
   - From LUN Real Time Statistics, click Add Graph, select Total IO Per Second, and click OK.

   From the same LUN, you could first open the graph for Total Latency and then for Total IO Per Second so that both graphs appear within the same pane to compare statistics. You could also do this for other LUNs if you want to compare statistics for multiple LUNs at one time.

By checking latency, and IOPS, on the LUNs, the administrator determines if the performance changed and is acceptable after adding the application.

Related Links

View LUN Statistics Detail

Display Multiple Real-Time Statistics Graphs

Display Multiple Real-Time Statistics Graphs

Display multiple real-time statistics graphs in one panel to view or compare multiple statistics.

1. Choose a function where real-time statistic graphs are available:
   - System > Reporting and Statistics > Drive Group Statistics
   - System > Reporting and Statistics > CPU Statistics
   - SAN > Statistics and Trending > LUNs
   - SAN > Statistics and Trending > Controller Protocols
2. Select one of the following actions to access the real-time graph function:
   - Actions > Controller CPU Real Time Statistics
   - Actions > Drive Group Real Time Statistics
   - Actions > LUN Real Time Statistics
   - Actions > FC Port Real Time Statistics
   - Actions > iSCSI Port Real Time Statistics
3. For example, choose LUN Real Time Statistics, click Add Graph, select Read Queue Depth, and click OK.
4. After Read Queue Depth is displayed, click Add Graph, select Write Queue Depth and click OK.
5. After Read Queue Depth is displayed, click Add Graph, select Total Queue Depth and click OK.

Graphs for all three statistics are displayed in the same panel, and are refreshed every second. This process applies to all real time statistics graphs.

Note: You can delete a graph by clicking Remove Graph in order to view different statistics.

Customize the Appearance of a Real-Time Statistic Graph

You can customize the appearance of any real-time statistic graph using the Properties function that is accessed from the graph.

Create a real-time statistics graph and then customize the labels, fonts, color, and plot line appearance displayed in the graph using graph's controls from the Properties function.

1. Choose a function where real-time statistic graphs are available:
   - System > Reporting and Statistics > Drive Group Statistics
   - System > Reporting and Statistics > CPU Statistics

- SAN > Statistics and Trending > LUNs
- SAN > Statistics and Trending > Controller Protocols

2 Select one of the following actions to access the real-time graph function:

- Actions > Controller CPU Real Time Statistics
- Actions > Drive Group Real Time Statistics
- Actions > LUN Real Time Statistics
- Actions > FC Port Real Time Statistics
- Actions > iSCSI Port Real Time Statistics

3 Select a statistic and then click Draw Graph.

4 Click inside the graph, and then click the right mouse button to modify the graph.

A menu is displayed with choices for modifying the graph.

5 Select Properties.

The Chart Properties dialog is displayed.

6 Select Title, Plot, or Other to change labels, fonts, color, and plot line appearance used in the graph.

7 Click OK to save your changes.

The changes are saved during the time the graph is displayed. Once you close the graph, the changes to the graph are discarded.

Customize the View of a Real-Time Statistics Graph

You can customize the view of a real-time statistics graph by zooming in and zooming out to view details in the graph.

Create a real-time statistics graph and then modify the graph using controls available with the graph.

1 Choose a function where real-time statistic graphs are available:

- System > Reporting and Statistics > Drive Group Statistics
- System > Reporting and Statistics > CPU Statistics
- SAN > Statistics and Trending > LUNs
- SAN > Statistics and Trending > Controller Protocols

2 Select one of the following actions to access the real-time graph function:

- Actions > Controller CPU Real Time Statistics
- Actions > Drive Group Real Time Statistics
- Actions > LUN Real Time Statistics
- Actions > FC Port Real Time Statistics
- Actions > iSCSI Port Real Time Statistics

3 Click Add Graph, select a statistic, and click OK.

4 Click inside the graph, and then click the right mouse button to modify the graph.

A menu is displayed with choices for modifying the graph.

5 Click Zoom In or Zoom Out to expand or shrink the data displayed in the graph.

You can use the Auto Range to reset the graph.

Save a Real-Time Statistics Graph

You can save a real-time statistics graph as a Portable Network Graphic (PNG) file. The file you save is snapshot of the graphic displayed on your workstation and reflects what you see; no additional data is included in the graphic.

You can copy, save, or print a real-time statistics graph as a file when the graph is displayed in the Real Time Statistic Graph dialog. For example, if you are reviewing CPU Statistics, a graph for either Percent Time in Kernel or Total Time Busy is displayed in the Controller CPU Real Time Statistics dialog. You can copy, save, or print that graph as a PNG file.

Copied, saved, or printed graphs provide a snapshot of the statistics shown at one point in time.

1 Choose a function where real-time statistic graphs are available:

- System > Reporting and Statistics > Drive Group Statistics
- System > Reporting and Statistics > CPU Statistics
- SAN > Statistics and Trending > LUNs
- SAN > Statistics and Trending > Controller Protocols

2 Select one of the following actions to access the real-time graph function:

- Actions > Controller CPU Real Time Statistics
- Actions > Drive Group Real Time Statistics
- Actions > LUN Real Time Statistics
- Actions > FC Port Real Time Statistics
- Actions > iSCSI Port Real Time Statistics

3 Click Add Graph, select a statistic, and click OK.

4 Click inside the graph, and then click the right mouse button to modify the graph.

A menu is displayed with choices for modifying the graph.

5 Click Save as ... .

6 Navigate to a location on your local workstation where you want to save the graph.

7 Enter a filename for the graph. For example, the statistic was percent real-time kernel from the Controller CPU Real Time Statistics graph. You could use the filename, `percentrealtimekernel`.

8 Click OK.

The graph is saved as a PNG file with a file extension of `png`.

Copy a Real-Time Statistics Graph

Copy a real-time statistics graph as a Portable Network Graphic (PNG) file to import the file directly into another program such as word processing application.

You can copy, save, or print a real-time statistics graph as a file when the graph is displayed in the Real Time Statistic Graph dialog. For example, if you are reviewing CPU Statistics, a graph for either Percent Time in Kernel or Total Time Busy is displayed in the Controller CPU Real Time Statistics dialog. You can copy, save, or print that graph as a PNG file.

Copied, saved, or printed graphs provide a snapshot of the statistics shown at one point in time.

1 Choose a function where real-time statistic graphs are available:

- System > Reporting and Statistics > Drive Group Statistics
- System > Reporting and Statistics > CPU Statistics
- SAN > Statistics and Trending > LUNs
- SAN > Statistics and Trending > Controller Protocols

2 Select one of the following actions to access the real-time graph function:

- Actions > Controller CPU Real Time Statistics
- Actions > Drive Group Real Time Statistics
- Actions > LUN Real Time Statistics
- Actions > FC Port Real Time Statistics
- Actions > iSCSI Port Real Time Statistics

3 Click Add Graph, select a statistic, and click OK.

4 Click inside the graph, and then click the right mouse button to modify the graph.

A menu is displayed with choices for modifying the graph.

5 Click Copy and import the PNG file into the application, such as a word processing application.

The image file of the chart is inserted into the application.

Print a Real-Time Statistics Graph

Print real-time statistics graphs to provide a graphical snapshot of the trends shown at one point in time in the chart.

You can copy, save, or print a real-time statistics graph as a file when the graph is displayed in the Real Time Statistic Graph dialog. For example, if you are reviewing CPU Statistics, a graph for either Percent Time in Kernel or Total Time Busy is displayed in the Controller CPU Real Time Statistics dialog. You can copy, save, or print that graph as a PNG file.

Copied, saved, or printed graphs provide a snapshot of the statistics shown at one point in time.

1. Choose a function where real-time statistic graphs are available:
   - System > Reporting and Statistics > Drive Group Statistics
   - System > Reporting and Statistics > CPU Statistics
   - SAN > Statistics and Trending > LUNs
   - SAN > Statistics and Trending > Controller Protocols
2. Select one of the following actions to access the real-time graph function:
   - Actions > Controller CPU Real Time Statistics
   - Actions > Drive Group Real Time Statistics
   - Actions > LUN Real Time Statistics
   - Actions > FC Port Real Time Statistics
   - Actions > iSCSI Port Real Time Statistics
3. Click Add Graph, select a statistic, and click OK.
4. Click inside the graph, and then click the right mouse button to modify the graph.

   A menu is displayed with choices for modifying the graph.
5. Select Print and then follow your operating system print instructions.

The system sends a print image of the real-time statistics graphic to the printer you selected.

APPENDIX A

Oracle FS System Limits

Operating Limits for an Oracle FS System

The following table lists the numbers of objects that can be configured for an Oracle FS System.

Table 15: System limits

Object	Quantity range
repositories[1]	Maximum: 1024
Storage Domains	Minimum: 1 Maximum: 64 per Oracle FS System
virtual LUNs (VLUNs)	Maximums:[2] • 8192 per Controller • 8192 per Oracle FS System
VLUN block snapshots, full (copies)	Maximum: 12 full snapshots per VLUN
VLUN block snapshots, partial (clones)	Maximum: 1024 partial snapshots of a single source volume active at a time
volume groups	Minimum: 1 Maximum: 5000 total
volume size	Minimum: • 1 GB and 50% of maximum capacity • Minimum growth increment: 1 GB Maximum: System capacity

[1] A repository is a VLUN and is associated with a logical volume. A repository holds metadata for the clones of that volume. A volume has at most one repository VLUN.

[2] Recommended maximums are 4096 per Controller and 4096 per system.

The following table lists the numbers of objects that are related to a Drive Enclosure that can be configured for an Oracle FS System.

Table 16: Drive Enclosure configuration limits

Object	Quantity range
Drive Enclosures (DE)	Minimum: 1 Maximums: • Per Oracle FS System: 30 • Per Storage Domain: 30 • Per SAS HBA: 10 • Per DE string: 5
drive groups	Minimum: 1 Maximums: • Per Oracle FS System: 1024 • Per Storage Domain: 1024
drives	Per DE • HDDs: 24 drives of the same type (in groups of 12) • Performance SSDs: 13 drives of the same type (in groups of 6, plus 1 as a hot spare) • Capacity SSDs: 19 drives of the same type (in groups of 6, plus 1 as a hot spare) Per drive group • HDDs: 12 • SSDs: 6

System Limits for SAN Objects

The following table lists the numbers of SAN-related objects that can be configured for an Oracle FS System.

Table 17: SAN operating limits

Object	Quantity range
LUN-to-host mappings	Maximum: 33,554,432 per Oracle FS System
SAN host connections (active)	Maximum: • 512 active connections per SAN CU port • 3072 per SAN CU (with 6 ports) • 6144 per Oracle FS System (with 12 ports)
SAN LUNs	Maximum[3]: • 4096 visible for any given SAN Controller • 4096 visible across all SAN Controllers in a given system • 4096 visible per SAN host
SAN LUN size	Minimum: • 1 GB and 50% of maximum capacity • Minimum growth increment: 1 GB Maximum: System capacity

The following table lists the numbers of SAN-related objects that can be configured for an Oracle FS Path Manager (FSPM) host. See the appropriate *Oracle FS Path Manager Installation Guide* for a complete list of operating limits.

Table 18: FSPM operating limits

Object	Quantity range
system connections	Maximum: 8 **Note:** The connections can be to any combination of Oracle FS Systems and Pillar Axiom systems.
LUN data paths	Maximum: 32 to each LUN
HBA ports	Maximum: 32

[3] A visible (active) SAN LUN requires one virtual LUN (VLUN) for user data and one VLUN for metadata. A clone of a SAN LUN requires one VLUN for the metadata and one VLUN for the data repository. If the clone is active, a third VLUN is required, making a total of five VLUNs for the SAN LUN and its clone.

APPENDIX B

System Tab Reference Pages

Add to Storage Domain Dialog

Navigation: System > Storage Domains > Actions > Add to Storage Domain

Adds an unassigned drive group to a Storage Domain.

Before a drive group can be used, the drive group must be assigned (added) to a Storage Domain.

Note: For the most effective rebalancing and use of system resources, include as many drive groups as possible in a single request.

Storage Domain	Specifies the assigned Storage Domain for the selected drive groups.
Rebalance Volume Data	Specifies that the system balances the existing volumes across the drive groups when you add drive groups to the Storage Domain. When enabled, the system distributes the data of the existing volumes to all of the drive groups in the Storage Domain. Not selecting the option retains the data distribution across the existing drive groups in the Storage Domain.
Drive Groups to be Included	Displays the drive groups that are to be associated with the Storage Domain.
Additional Drive Groups to Include	Displays additional drive groups that are not associated with a Storage Domain. You can also add those drive groups to the Storage Domain. Select the drive groups you want to include. **Note:** If there is only one drive group, this list of additional drive groups to include is not displayed.

Related Links

Assigning Drive Groups

Add Drive Groups to a Storage Domain

Administrator Accounts Overview Page

*Navigation: System > **Global Settings** > Administrator Accounts*

Displays the user name, ID or Fully Qualified Name (FQN), role, full name, email address, phone number, and whether each account is enabled.

This page provides options to create, modify, delete, and view administrator accounts.

Up to 10 active administrator sessions can be defined. Of these 10 sessions, one is reserved for the Primary Administrator role and another one for the Administrator 1 role.

Login Name	Lists administrator login, or user names. Click a name to review or modify the administrator account.
Role	Identifies the role that is assigned to the administrator account. A role defines which permissions are granted to the administrator. • Primary Administrator • Administrator 1 • Administrator 2 • Monitor • Support • Oracle support
Disabled	Identifies whether the administrator account is disabled. **No** — Indicates that the account is active. Administrators whose accounts are enabled can log in to the Oracle FS System. **Yes** — Indicates that the account is inactive. Administrators whose accounts are disabled cannot log in.
Full Name	Identifies the first and last name associated with the administrator account.
Email Address	Identifies the email address of the recipient. The email server to which the Oracle FS System sends alerts must be able to receive messages at this address. The system does not validate this address.
Phone Number	Identifies the phone number associated with the administrator account. The Oracle FS System does not verify the validity of this entry.

Related Links

Administrator Account Management

Alerts and Events Overview

Navigation: *System* > *Alerts and Events*

Displays links for managing system alerts and events and for reviewing the system status and the hardware details.

Status Summary	Displays the overall system status allowing you, for example, to discover the status of individual hardware components.
System Alerts	Manages the system alerts allowing you, for example, to know when to allocate additional capacity to a volume.
Event Log	Manages the event logs and the event filters.
Event Notification	Manages the types of events to be monitored and the email addresses of the notification recipients.

Related Links

System Notifications

Controllers Overview Page

Navigation: System > Hardware > Controllers

Displays the properties of the Controllers that are a part of the Oracle FS System.

Options available from this page allow you to run diagnostics, locate Controllers on the Oracle FS System, and view Controller details.

Name	Lists the names of hardware components. Click a name to display details about that hardware component.
Comment	Displays descriptive text that is associated with a Controller. A comment can include up to 256 characters.
Service Type	Lists whether the Controller
Failover Controller	Identifies the Controller that is used if the other Controller fails in the pair.
Status	Displays the current status of the Controller. A status of Normal requires no action.
Temperature	Displays the temperature status of the Controller.
Chassis	Displays the current status of the Controller chassis.
Motherboard	Displays the current status of the Controller motherboard assembly.
Power Supply	Displays the current status of the Controller power supply.
Fans	Displays the current status of the Controller fans.
Energy Storage Modules	Displays the current status of the Controller energy storage modules.

HBA Module	Displays the status of installed Host Bus Adapter (HBA) on the Controller. This includes HBAs that connect to host servers and HBAs that connect to Drive Enclosures.

Related Links

Controller Management

View the Status of the Controllers

Controller Ports Overview Page

*Navigation: System > **Global Settings** > Controller Ports*

Lists the topology properties of the network ports for each of the Oracle FS System Controllers. An administrator can manage the properties of a Controller from this page.

Name	Identifies the information about the Controller. The column includes the following information: • Controller name • Adapter slot number • Adapter port number	
Status	Identifies the HBA connection status. Valid states: • Normal • Connected • Not connected	
Port Type	Indicates the type of HBA. Valid types: • Ethernet • Fibre Channel (FC) • Internet SCSI (Small Computer System Interface) (iSCSI) • Serial Attached SCSI (SAS)	
Address	Identifies the unique address of the Oracle FS System Controller port on the network.	
Network Link	Negotiated Link Speed	Indicates the port transmission speed in Gigabits each second.
	Medium Type	Identifies the types of small form-factor pluggable (SFP) transceiver interface devices used for data path traffic between

the customer network switches and the Controllers.

Valid SFP interface types:

- Copper
- Optical
- Long Wave Optical
- Short Wave Optical

Related Links

Controller Ports

View a Summary of all the Controller Ports

CPU Statistics Overview Page

Navigation: *System* > *Reporting and Statistics* > *CPU Statistics*

Provides access to details about statistics that are available for the selectedController CPU. No statistics are displayed on this page; statistics are only available by selecting ActionsCPU Statistics.

Valid choices:

Controller	Identifies the selected Controller.

To generate statistics about a Controller CPU, select a Controller and then select Actions > Controller CPU Real Time Statistics. Click Add Graph and select a statistic (you can review the following list for details).

The two choices are:

Percent Time in Kernel	Percentage of CPU utilization that occurred while executing commands at the system level. The scale is 0 to 100 percent.
Total Percent Time Busy	Percentage of time the CPU was busy on theController. The scale is 0 to 100 percent.

Theses measurement can be used to identify trends in Controller CPU usage that can cause performance issues. For example, if the Total Percent Time Busy for the CPU exceeds 90%, there can be I/O bottleneck at the Controller. These statistics are generally requested by Oracle Customer Support to help resolve potential system load issues, identity system capacity issues, or application issues.

Related Links

Controller CPU Statistics Overview

Create Administrator Account Dialog

*Navigation: System > **Global Settings** > Administrator Accounts > Actions > Create*

Creates new administrator accounts.

Login Name Identifies the login name assigned to the administrator account. This field is limited to 20 characters.

Role Identifies the authorized privileges for an administrator account. Different roles are authorized to perform different functions:

- **Administrator 1** The administrator role for a login account that provides the authority to perform all administrative tasks and all configuration tasks except for certain tasks that are reserved for the support roles.
- **Administrator 2** The administrator role for a login account that provides the authority to perform most administrative and configuration tasks. A login account assigned to this role cannot, however, perform the following tasks:
  - Manage the administrator accounts and other global system settings such as those settings for networking, the Controller ports, system security, and the system time.
  - Perform software upgrades or use Guided Maintenance to replace hardware components.
  - Shut down the Oracle FS System system.
- **Monitor** An administrator role for login accounts that provides the authority for those accounts to perform read-only management tasks and to modify their own account properties.
- **Support** A unique login account solely for support representatives. This login account is not authorized to modify or delete data resources, system alerts, or administrator accounts.

  Important: Use this account only if you are familiar with it or instructed by Oracle Customer Support.

For the following predefined roles, you cannot assign administrators to them and you cannot delete them:

Primary system administrator	A login account that has the same privileges as the Administrator 1 role.
Primary support administrator	A login account that has the same privileges as the Monitor role, as well as privileges to perform support-related tasks.

Full Name	Identifies the first and last name associated with the administrator account.
Email Address	Identifies the email address associated with the administrator account. The email username can have up to 64 characters and the email domain can have up to 255 characters. The email server to which the Oracle FS System sends alerts must be able to receive messages at this address. The system does not validate this address. **Note:** An IP address cannot be entered as the email domain.
Phone Number	Identifies the phone number associated with the administrator account. The Oracle FS System does not verify the validity of this entry.
Password	Identifies the password of the administrator account. Enter the password; follow the password rules displayed on the dialog.
Confirm Password	Confirms that the password was entered correctly.
Password Duration	Select a duration between 1 to 180 days to determine when the password expires. Refer to your company's policy on password expiration to determine the duration you should set.
Disable Account	Indicates whether the administrative account is disabled. The Oracle FS System maintains disabled accounts but does not allow them to log in. A disabled account can be enabled later by modifying it. This setting takes effect immediately. If the administrator is logged in when you disable the account, the system logs out the administrator immediately. **Note:** You cannot disable the Primary system administrator account.

Related Links

Create an Administrator Account

Create Event Notification Dialog

*Navigation: System > Alerts and Events > **Event Notification** > Actions > Create*

Creates event notices when specified events occur.

When an event is triggered, the Oracle FS System sends a notification to the designated email recipients.

Name	Identifies the name of the event notification.
Description	Describes the event notification.
Enable Event Notification	Indicates whether event notification is enabled. Select this option to activate the notification when the event occurs on the Oracle FS System.
Event Notification Recipient Email Addresses	Identifies the email addresses of the recipients who are to receive event notifications. The email server to which the Oracle FS System sends notifications must be able to send messages to the email addresses.
Add	Allows you to add email recipients to the event notification.
Test Email	Sends a message to the specified email addresses to test the recipient email addresses. Recipients receive a message that is titled "[Oracle-QoS] Test email" in their email in-boxes. **Note:** Allow at least 10 minutes between email tests.
Remove	Deletes the selected email address from the list.

Monitored Events

By severity, then category	Sorts the list of events by severity with a list of event categories. The severity categories include:	
	Informational	Requires no action for events that are information only.
	Warning	Requires no immediate action for minor conditions that you can address at your convenience.
	Critical	Requires prompt action to prevent system failures or offline conditions.
By category, then severity	Sorts the list of events by categories with a list of event severity. The categories include:	
	Security	Events to notify of a security problem, such as an unauthorized request.
	Audit	Events that track what users are doing, such as the operations that they performed.

	System	Events to notify of system problems, such as a missing Drive Enclosure or Controller.
Events Not Monitored		Provides the list of events not set to be monitored. The Oracle FS System does not trigger a notification when an event listed occurs. From the list, you can specify the events to be monitored. You can sort the list by severity or category.
Monitored Events		Provides the list of events that you specified to be monitored. The Oracle FS System triggers a notification each time an event that you specified occurs. The email addresses specified in the **Event Notification Recipient Email Addresses** field receive the event notifications. You can sort the list by severity or category.

Related Links

Create an Event Notification

Create Reporting Schedule Dialog

Navigation: *System* > *Reporting and Statistics* > *Reporting Schedules* > *Actions* > *Create*

Creates new schedules for generating reports.

Schedule Name		Enter a name for the schedule. The name is displayed in the Name column on the Reporting Schedules page. If you do not specify a name, the system uses the default name of `untitled`. **Note:** The name you enter is for your use in identifying the schedule listed in the Reporting Schedules. For example, if you want to run a weekly report on storage use, you might enter `weeklystorageuse` as the schedule name to help you locate that report. When a report is generated, the system automatically creates a name for the report, itself. The name the system creates is based on the report type, such as StorageUse_1374861600286 not the name you assigned to the report schedule. The report name is displayed in the Generated Reports name column.
Report Type	SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
	Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the

		report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
	Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free, and preparing capacity is also presented per storage class.
	Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
	System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures. **Note:** You might want to generate and archive the *System Configuration* report as the report provides a record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.
	System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.
Enabled	Specifies whether the scheduled report is active or inactive. To make a scheduled report active, check the Enable checkbox. If you do not want the scheduled report to be active, do not check the Enable checkbox. The scheduled report is still listed under Reporting Schedule but reports are not generated.	
Start Time	Specifies the date and time to begin generating reports.	

Schedule Frequency	Specifies the frequency at which the schedule generates reports. Frequencies include: • Run Once • Hourly • Daily • Weekly
Recurrence	Specifies how many hours, days, or weeks to wait before generating this scheduled report again. You can also specify a specific day on which you want the report to be generated.

Related Links

Create a Reporting Schedule

Create SNMP Host Dialog

*Navigation: System > **Global Settings** > SNMP > Actions > Create*

Creates Simple Network Management Protocol (SNMP) trap hosts.

Name	Identifies the name for the SNMP host.
Host IP	Identifies the IP address or domain name of a client that receives the Oracle FS System SNMP information.
Community string	Identifies the community string for use when the Oracle FS System sends an event trap to the SNMP host. **Note:** When an administrator does not specify a community string for read-only access, SNMP servers and clients typically use `public`.
Receive traps	Indicates that the SNMP host receives event traps sent to it.
Trap Port Number	Identifies the SNMP host port number to use for sending an event trap.
Severity threshold	Identifies the severity threshold for events that the system sends to the SNMP host by event traps. Severity levels: • Informational • Warning • Critical

Related Links

Create SNMP Hosts

Create Storage Domain Dialog

Navigation: System > Storage Domains > Actions > Create Storage Domains

Creates and configures properties for a new Storage Domain.

Name	Specifies the name of this Storage Domain. This name must be unique within the Oracle FS System. Storage Domain names can consist of up to 82 UTF-8 printable characters. The name cannot include the following characters: • / (forward slash) • \ (backward slash) • . (dot) • .. (dot dot) • tab	
Background Process Priority	System Chooses	(*Default*) Specifies that the system balances the resources that are needed for background data movement with the resources that are needed to service the incoming client I/O.
	Minimize Impact	Specifies that the system restricts the amount of system resources that are given to the background data movement operation. This option minimizes the impact on client I/O. Recommended for highly-loaded Storage Domains.
	Maximize Speed	Specifies that the system grants resource priority to the background data movement operation. This option reduces the amount of system resources that are available for client I/O. Recommended for lightly-loaded Storage Domains.
Enable Tier Reallocation	Specifies that any tiered data that resides in this Storage Domain has data progression enabled. Individual objects might have tier reallocation disabled. Enabling tier reallocation at the Storage Domain level does not override any objects that have tier reallocation disabled. The default value is enabled.	
Enable Tier Reallocation Statistics Collection	Collects data usage patterns for the Storage Domain internally to analyze and determine the optimum storage classes for the data. The default value is enabled. It is recommended you do not change this setting unless you need to test different profiles. Disable this setting if you are modifying your storage profile for testing purposes and did not want to collect statistics during the test. You do not want to collect tier reallocation statistics during the test as this might distort future tier reallocation.	

After you complete testing, enable tier reallocation statistics collection.

Note: Enabling or disabling the tier reallocation statistics collection has no effect on statistics you can view for CPU, drive groups, Filesystems, or LUNs. (Those are a different set of statistics.)

Auto-Tier Scan Options (Advanced)

Optimizes the auto-tier algorithm for moving data to different Storage Classes. You can specify the interval for when auto-tier moves frequently accessed data blocks and infrequently accessed data blocks to match your application activity.

Note: To unlock the auto-tier scan options, select the lock icon. Selecting the lock icon again resets the values to the state when the fields were unlocked.

Performance-Optimizing Scan Cycle	Specifies the frequency, in hours, that auto-tier scans to move frequently accessed data blocks to a high performance Storage Class. For example, a value of 32 means that every 32 hours auto-tier scans the system to move frequently accessed data blocks to a high performance Storage Class. Updates to this field affect the label of the Number of *n*-hour Scan Cycles field. For example, a value of 32 changes the label for the Number of *n*-hour Scan Cycles to Number of 32-hour Scan Cycles. Enter a value from **1** through **168**.
Number of n-hour Scan Cycles	Specifies the frequency that auto-tier runs the performance-optimizing scan cycles before auto-tier runs the cost-optimizing scan cycle. The value entered in the Number of n-hour Scan Cycles field is multiplied by the value entered in the Performance-Optimizing Scan Cycle field to obtain the value set in the Cost-Optimizing Scan Cycle field. For example, a value of 5 means that every fifth time that auto-tier runs the performance-optimizing scan cycle, auto-tier then runs the cost-optimizing scan cycle to move infrequently accessed data to a less expensive storage class. Enter a value from **2** through **31**.
Cost-Optimizing Scan Cycle	*(Read-only)* Displays the frequency, in hours, that auto-tier scans to move infrequently accessed data blocks to a less expensive Storage Class. The value displayed in this field is calculated as the product of the value you entered in the Performance-Optimizing Scan Cycle field and the value you entered in the Number of n-hour Scan Cycles field.

For example, to set auto-tier to move infrequently accessed data blocks to a less expensive Storage Class every 200 hours, enter the following values:

- Performance Optimizing Scan Cycle: **25**
- Number of 25-hour Scan Cycles: **8**

The system displays 200 in the Cost-Optimizing Scan Cycle field. In this example, the values that you enter instruct auto-tier to run the performance-optimizing scan every 25 hours. Then, during every eighth scan cycle (or every 200 hours), auto-tier runs a cost-optimizing scan to move infrequently accessed data blocks to a less expensive Storage Class.

Allowable Storage Capacity for Auto-Tiered LUNs

Indicates the maximum percentage of storage capacity to dedicate to auto-tier reallocation for each Storage Class of the Storage Domain. Enter a percentage for each available Storage Class.

The default value is 100%.

Related Links

Create a Storage Domain

Create Storage Profile Dialog

Navigation: System > ***Global Settings*** > ***Storage Profiles*** > *Actions* > ***Create Storage Profile***

Adds a new Storage Profile with custom QoS. The Storage Profile can then be selected when managing a logical volume.

Name	Identifies the name of the Storage Profile. The name includes, in some instances, the name of the application that is associated with the profile. Storage Profile names can consist of up to 128 UTF-8 characters.
Enter Basic QoS Settings	Opens the Enter Basic QoS Settings dialog where you can enter the following basic QoS parameters. The system converts the basic setting selections to the following advanced QoS settings: • RAID Level • Read Ahead

Typical Access	Identifies the most common method of data access. Valid biases:

	Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
	Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
	Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias Identifies the typical read-write ratio. Valid I/O biases:

Read	Indicates that most of the access requests are for read operations.
Write	Indicates that most of the access requests are for write operations.
Mixed	Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

Single	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the

default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

RAID Level — Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives.

Possible RAID levels:

Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.

Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.

Mirrored — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead — Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority — Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:

Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.

Advanced

Provides access to the QoS properties that might affect system performance.

Note: This option is recommended for expert administrators who understand the full range of QoS properties.

Writes — Identifies the write-caching rules to use for the profile.

Valid options:

Write-through	Writes data to the Controller cache and to the storage arrays before the write request completes. This rule ensures that the data is safely written to the storage before the write request returns to the application. Write-through caching performs more slowly than does write-back caching because the data is being written to the storage arrays as well as to the cache.
Write-back caching	Writes data to the Controller cache, and the write request returns immediately without waiting for the write-to-disk to complete. During idle cycles, the system writes the data from the cache to the storage arrays. Write-back caching performs faster than does write-through because the data only needs to be written to the cache before the write request returns. **Important:** If the system goes down unexpectedly, the data in the cache that has not been written to the storage arrays could be lost. During the shutdown process, the system writes all cached data to the storage arrays.
Default	Indicates that the Oracle FS System selects the appropriate write-caching rule based on the selected QoS settings.

Stripe Width — Identifies the number of drive groups over which the data is written.

For custom Storage Profiles, you can select a stripe width from the list of predefined values. You can also enter a value from **1** to **64**.

Predefined stripe widths values:

1	Indicates a stripe width of 1 drive group.
2	Indicates a stripe width of 2 drive groups.
3	Indicates a stripe width of 3 drive groups.
4	Indicates a stripe width of 4 drive groups.

6	Indicates a stripe width of 6 drive groups.
8	Indicates a stripe width of 8 drive groups.
64	Indicates a stripe width of 64 drive groups.
All	Indicates that the logical volume is striped across all of the available drive groups.
auto-select	Indicates that the Oracle FS System determines the stripe width based on the Priority option that you selected. **Note:** We recommend that you use the auto-select option. When you choose auto-select the system uses the following stripe widths for the Priority that you selected. However, the GUI displays auto-select not the actual stripe width that the system determines. • Archive priority: The system uses a stripe width of 2 drive groups. • Low priority: The system uses a stripe width of 2 drive groups. • Medium priority: The system uses a stripe width of 3 drive groups. • High priority: The system uses a stripe width of 4 drive groups. • Premium priority: The system uses a stripe width of 4 drive groups.

Preferred Storage Classes

Allows you to specify the Storage Class media on which the logical volume resides and the preferred order that the Oracle FS System uses the media.

Preferred Order	Indicates the preferred order in which the Oracle FS System uses the available Storage Classes. For example, if you are creating a profile for archiving database records, choose a Storage Class with large capacity as your first choice. For profiles that manage large data volumes, select a Storage Class that is optimized for read and write operations.
Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types: Performance SSD — Specifies that the data is stored on solid state drives (SSDs) that are optimized for the

	performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Related Links

Create a Storage Profile

Create UPS Dialog

Navigation: System > Hardware > UPSs > Actions > Create UPS

Creates and adds an uninterruptible power supply (UPS) device to the Oracle FS System using a simple network management protocol (SNMP).

Name	Identifies the name of the UPS device. UPS names must be unique across the Oracle FS System and must be 256 or fewer UTF-8 characters.
IP Address	Identifies the IP address that is assigned to the external UPS device.
SNMP Community	The UPS device sends information to the Oracle FS System such as battery low. Identifies a community for which a specific trap host should receive traps that the Oracle FS System generates. You can specify different community strings for each trap host so that multiple administrators can receive specific types of SNMP traps. The default community string is public (lower case). It is recommend you change the default community string. **Note:** This community string entered here must match the community string configured on the UPS device.

Related Links

Create a UPS Device

Dashboard Overview Page

Navigation: System > Dashboard

Displays the recent system alerts and event notifications for the Oracle FS System. The dashboard also provides bar graphs that represents the capacity for each Storage Class within the Storage Domains.

Recent Alerts and Events

Lists the recent system alerts and event notifications for the Oracle FS System.

Severity	Displays the 10 most recent alerts and error notifications for the Oracle FS System. The dashboard lists the system alerts first, followed by the severe event notifications. Select an item to display the details about the alert or event. Possible severity levels: **Critical** — Requires prompt action to prevent system failures or offline conditions. **Warning** — Requires no immediate action for minor conditions that you can address at your convenience.
Description	Displays the information about the system alert or event notification.
Creation Date	Indicates the date and time when the system alert or event notification occurred.

Storage Domains

Displays graphically the storage classes, and their capacities, for each Storage Domain of the Oracle FS System.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce

	the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

For each storage class, the dashboard graphically displays the Storage Domain physical capacities. The graph uses colored bars of different thicknesses to indicate the capacity status of each storage class. Hover the mouse pointer over each graph to display the capacity type.

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Possible physical storage capacities:

Free Space	Displays the amount of capacity that is available for allocation in the indicated Storage Class.
Used Capacity	Displays the amount of capacity that is consumed by data and system overhead.
Total Capacity	Displays the total amount of raw capacity provided by the drive groups that are defined within the indicated Storage Class.
Allocated Space	Displays the amount of capacity that has been assigned and designated to all storage classes residing on the indicated Storage Class.
Preparing Capacity	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Class.
Allocated to Logical Maximum	Displays the maximum capacity to which the Storage Class can grow.

The dashboard provides a refresh button ( ) in the upper-right corner of the page that allows you update the contents of the page.

Delete Drive Group Dialog

Navigation: System > Storage Domains > Actions > Delete Drive Group or System > Hardware > Actions > Delete Drive Group

Removes the selected drive group.

OK	Removes the selected drive group. You can only select a drive group that is not associated with a Storage Domain. If the operation is successful, the drive group record is removed from the list of drive groups and data is migrated to other drive groups. If the operation is unsuccessful, the system does not remove the drive group and displays an appropriate error dialog:
Cancel	Cancel the operation and close the dialog box.

Delete Storage Domain Dialog

Navigation: System > Storage Domains > Actions > Delete Storage Domain

Removes the selected Storage Domain.

OK	Removes the selected Storage Domain. If the operation is successful, the Storage Domain is removed from the list of Storage Domains. If the operation is unsuccessful, the system does not remove the Storage Domain and displays an appropriate error dialog: • The Storage Domain contains one or more logical volumes. • The Storage Domain has one or more drive groups that are assigned to the Storage Domain. • If the operation is unsuccessful, move the drive groups or logical volumes on the Storage Domain to another Storage Domain.
Cancel	Cancel the operation and close the dialog box.

Related Links

Delete a Storage Domain

Download Report Dialog

Navigation: *System > Reporting and Statistics > Generated Reports > Actions > Download*

Specifies the file format to use when downloading a generated report, as well as the location to save the file on the client.

Format	Indicates the file format for the generated report. Available formats:

- CSV (comma-separated values)
- Excel
- HTML
- PDF
- XML

Target Download Path	Indicates the filename and path for where to save the downloaded file.

Related Links

Download a Report

Drive Enclosures Overview Page

Navigation: System > Hardware > Drive Enclosures

Lists the Drive Enclosures that are installed on the Oracle FS System.

Displays the current status of the hardware components. A status of Normal requires no action.

Name	Identifies the name of the Drive Enclosure including the chassis ID, which is displayed on the front of the Drive Enclosure.
Comment	Displays the user-defined comment that helps identify the Drive Enclosure.
Overall	Displays the summary status of the Drive Enclosure.
Temperature	Displays the status of the Drive Enclosure temperature.
Chassis	Displays the status of the Drive Enclosure chassis.
I/O Modules	Displays the status of the I/O Modules within the Drive Enclosure.
Power Cooling Modules	Displays the status of the power cooling modules within the Drive Enclosure.
Drives	Displays the status of the drives within the Drive Enclosure.

Related Links

View the Status of the Drive Enclosures

Drive Groups Overview Page

Navigation: System > Hardware > Drive Groups

Lists the properties of each drive group that is defined on an Oracle FS System.

Drive Group Number	Displays the number that uniquely identifies the drive group. **Note:** The primary drive group in a Storage Domain is indicated by this icon . The primary drive group contains system configuration information.
Drive Group Status	Indicates the operating condition of the drive group. Status conditions include:

Normal	The drives are accessible and no action is required.
Degraded Warning	A drive has failed but this is not yet critical. This applies only to double parity.
Degraded Critical	Two or more drives have failed. The loss of one more drive causes a failure.
Failed	Multiple drives have failed. The drives are offline and data may be lost.

Media Type	Specifies the category of physical media that comprises the drive group. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Enclosure Chassis ID	Displays the numeric identifier of the Drive Enclosure. The Enclosure Chassis ID is located and displayed on the front of the Drive Enclosure. The numeric values range from 01 to 99; the hexadecimal values from A0 to FF.
Storage Domain	Displays the Storage Domain to which the drive group is assigned.

Physical Capacity

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Allocated	Displays the amount of capacity that has been assigned and designated to all logical volumes residing on the indicated Storage Domain.
Free	Displays the amount of capacity that is available for allocation in the indicated Storage Class.
Preparing	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Class.
Total Capacity	Displays the total amount of raw capacity provided by the drive groups that are defined within the indicated Storage Class.
Physical Distribution	Provides a graphical representation of the capacity that is used compared to the maximum that is allocated

Drive Group Statistics Overview Page

Navigation: *System* > *Reporting and Statistics* > *Drive Group Statistics*

Provides access to details about drive group statistics including performance. No statistics are displayed on this page; statistics are only available by selecting ActionsDrive Group Real Time Statistics.

To generate statistics about a drive group, select a drive group, then select Actions > Drive Group Real Time Statistics. Click Add Graph and select a statistic (you can review the following list for details).

The available statistics that are displayed are:

Drive Group	Displays statistics for the selected drive group.

Valid statistics:

Read IOPS	Indicates the average number of read operations per second per drive group.
Write IOPS	Indicates the average number of write operations per second per drive group.
Total IOPS	Indicates the average number of read operations and write operations per second per drive group.
Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive group during read operations.
Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive group during write operations.
Total bytes per second	Indicates the total number of bytes for read and write activity per drive group.
Read latency	Indicates the average time to complete a read operation per drive group.
Write latency	Indicates the average time to complete a write operation per drive group.
Total latency	Indicates the average time to complete read operations and write operations at the frequency the operations occurred per drive group.
Read block size	Indicates the average read block size per drive group.
Write block size	Indicates the average write block size per drive group.
Total block size	Indicates the average block size per drive group.
Read queue depth	Indicates the number of read operations waiting to be completed for the drive group.
Write queue depth	Indicates the number of write operations waiting to be completed for the drive group.
Total queue depth	Indicates the number of read operations and write operations waiting to be completed for the drive group.

Related Links

Drive Group Statistics Overview

Duplicate Storage Profile Dialog

Navigation: System > ***Global Settings*** > ***Storage Profiles*** > *Actions* > ***Duplicate Storage Profile***

Copies an existing Storage Profile.

Name — Identifies the name of the Storage Profile. The name includes, in some instances, the name of the application that is associated with the profile.

Storage Profile names can consist of up to 128 UTF-8 characters.

Enter Basic QoS Settings — Opens the Enter Basic QoS Settings dialog where you can enter the following basic QoS parameters. The system converts the basic setting selections to the following advanced QoS settings:

- RAID Level
- Read Ahead

Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery

of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

RAID Level — Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives.

Possible RAID levels:

- **Single parity** — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- **Double parity** — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
- **Mirrored** — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead — Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:

Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.

Advanced

Provides access to the QoS properties that might affect system performance.

Note: This option is recommended for expert administrators who understand the full range of QoS properties.

Writes Identifies the write-caching rules to use for the profile.

Valid options:

Write-through	Writes data to the Controller cache and to the storage arrays before the write request completes. This rule ensures that the data is safely written to the storage before the write request returns to the application.

	Write-through caching performs more slowly than does write-back caching because the data is being written to the storage arrays as well as to the cache.
Write-back caching	Writes data to the Controller cache, and the write request returns immediately without waiting for the write-to-disk to complete. During idle cycles, the system writes the data from the cache to the storage arrays. Write-back caching performs faster than does write-through because the data only needs to be written to the cache before the write request returns. **Important:** If the system goes down unexpectedly, the data in the cache that has not been written to the storage arrays could be lost. During the shutdown process, the system writes all cached data to the storage arrays.
Default	Indicates that the Oracle FS System selects the appropriate write-caching rule based on the selected QoS settings.

Stripe Width

Identifies the number of drive groups over which the data is written.

For custom Storage Profiles, you can select a stripe width from the list of predefined values. You can also enter a value from **1** to **64**.

Predefined stripe widths values:

1	Indicates a stripe width of 1 drive group.
2	Indicates a stripe width of 2 drive groups.
3	Indicates a stripe width of 3 drive groups.
4	Indicates a stripe width of 4 drive groups.
6	Indicates a stripe width of 6 drive groups.
8	Indicates a stripe width of 8 drive groups.
64	Indicates a stripe width of 64 drive groups.
All	Indicates that the logical volume is striped across all of the available drive groups.
auto-select	Indicates that the Oracle FS System determines the stripe width based on the Priority option that you selected.

Note: We recommend that you use the auto-select option.

When you choose auto-select the system uses the following stripe widths for the Priority that you selected. However, the GUI displays auto-select not the actual stripe width that the system determines.

- Archive priority: The system uses a stripe width of 2 drive groups.
- Low priority: The system uses a stripe width of 2 drive groups.
- Medium priority: The system uses a stripe width of 3 drive groups.
- High priority: The system uses a stripe width of 4 drive groups.
- Premium priority: The system uses a stripe width of 4 drive groups.

Preferred Storage Classes

Allows you to specify the Storage Class media on which the logical volume resides and the preferred order that the Oracle FS System uses the media.

Preferred Order	Indicates the preferred order in which the Oracle FS System uses the available Storage Classes. For example, if you are creating a profile for archiving database records, choose a Storage Class with large capacity as your first choice. For profiles that manage large data volumes, select a Storage Class that is optimized for read and write operations.
Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class

	sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Related Links

Duplicate a Storage Profile

Event Log Overview Page

Navigation: System > Alerts and Events > Event Log

Displays the event logs that are associated with the Oracle FS System.

You can set a filter to display specific types of events if the list is too long.

Event	Displays the name of the event in the Oracle FS System event log.
Severity	Displays the severity level of entries in the Oracle FS System event log. Possible severity levels:
	Informational — Requires no action for events that are information only.
	Warning — Requires no immediate action for minor conditions that you can address at your convenience.
	Critical — Requires prompt action to prevent system failures or offline conditions.
Category	Identifies the type of event. Valid values:
	Security — Events to notify of a security problem, such as an unauthorized request.
	Audit — Events that track what users are doing, such as the operations that they performed.
	System — Events to notify of system problems, such as a missing Drive Enclosure or Controller.
Time Occurred	Identifies the time at which the event was sent to the designated recipients.

Affected Item	Provides the specific object name affected by the Event Type. For example, if the Event reads Drive Enclosure Firmware Invalid, then the Affected Item column lists the Drive Enclosure name that caused the event to occur. Such details provide more information for troubleshooting purposes.
User	Identifies the name of the user logged in at the time the event occurred.
Description	Displays the event description text.

Related Links

Display the Event Log Entries

Event Notification Overview Page

Navigation: System > Alerts and Events > ***Event Notification***

Displays the list of event notifications created for the Oracle FS System.

This page provides options to manage event notifications.

Name	Lists the name of event notification. Click a name to review, modify, or delete the notification settings.
Enabled	Indicates whether the event notification is enabled. • Checked: The event notification is actively collecting event information. • Unchecked: The event notification is inactive and not collecting event information.
Time Last Sent	Identifies the time at which the event was sent to the designated recipients.
Number of Events	Indicates the number of events collected by the notification.
Number of Recipients	Indicates the number of email recipients subscribed to the event notification.
Description	Displays the description of the event notification.

Related Links

Display Event Notifications

Events Properties Dialog

Navigation: System > Alerts and Events > Event Log > Actions > Event Properties

Views detailed information for a selected event.

Copy to Clipboard	Copies the contents of the event properties to your clipboard. For example, click Copy to Clipboard to copy the event properties to the clipboard. You can then paste the information into an email and send the email to a system administrator.
Event	Displays the name of the event in the Oracle FS System event log.
Category	Identifies the type of event. Valid values: **Security** — Events to notify of a security problem, such as an unauthorized request. **Audit** — Events that track what users are doing, such as the operations that they performed. **System** — Events to notify of system problems, such as a missing Drive Enclosure or Controller.
Time Occurred	Identifies the time at which the event was sent to the designated recipients.
User	Identifies the name of the user logged in at the time the event occurred.
Affected Item	Provides the specific object name affected by the Event Type. For example, if the Event reads Drive Enclosure Firmware Invalid, then the Affected Item column lists the Drive Enclosure name that caused the event to occur. Such details provide more information for troubleshooting purposes.
Description	Displays the event description text. The Description also provides more information that Oracle Customer Support can use to help resolve the event.

Related Links

Display the Event Properties

Generate Auto-Tier Effectiveness Report Dialog

Navigation: System > Storage Domains > Actions > ***Generate Auto-Tier Effectiveness Report***

Modifies the storage costs, per GB and I/O per second (IOPS), that are used to report the effectiveness of the QoS Plus feature.

Storage Costs

Provides the initial storage cost for each GB and for each IOPS of the Oracle FS System. Enter the actual costs for each Storage Class in your system.

Performance SSD	Cost per GB	Specifies the cost for each GB for the Performance solid-state drives (SSDs) that are in the system.
	Cost per IOPS	Specifies the cost for each IOPS for the Performance SSDs that are in the system.
Capacity SSD	Cost per GB	Specifies the cost for each GB for the Capacity SSDs that are in the system.
	Cost per IOPS	Specifies the cost for each IOPS for the Capacity SSDs that are in the system.
Performance HDD	Cost per GB	Specifies the cost for each GB for the Performance hard disk drives (HDDs) that are in the system.
	Cost per IOPS	Specifies the cost for each IOPS for the Performance HDDs that are in the system.
Capacity HDD	Cost per GB	Specifies the cost for each GB for the Capacity HDDs that are in the system.
	Cost per IOPS	Specifies the cost for each IOPS for the Capacity HDDs that are in the system.

Generate and View Report

Creates the Auto-Tier Effectiveness Report and displays the report in a dialog for review. The report is stored in the Generated Reports page under System > Reporting & Statistics.

OK

Creates the Auto-Tier Effectiveness Report in the Generated Reports page under System > Reporting & Statistics.

Related Links

Generate Auto-Tier Effectiveness Report

Generate Report Dialog

Navigation: *System* > *Reporting and Statistics* > *Generated Reports* > *Actions* > *Generate*

Generates reports based on pre-defined report types for the Oracle FS System.

Based on the report type you select, the system generates a real-time report containing information about SAN hosts, storage performance and use, or system configuration. The report provides a snapshot of the information available at the moment you generate the report.

Type Specifies the type of report to be generated:

SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free, and preparing capacity is also presented per storage class.
Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures. **Note:** You might want to generate and archive the *System Configuration* report as the report provides a

	record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.
System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.

Related Links

Generate a Report

Generated Reports Overview Page

Navigation: *System* > *Reporting and Statistics* > *Generated Reports*

Manages generated reports. From this page, you can create, delete, and modify reports.

All reports, whether manually generated or generated by a reporting schedule, are stored on the Oracle FS System and listed on this page. The Generated Reports page lists the names, creation dates, and sizes of all currently available generated reports. Use the Generated Reports list to select reports for downloading in the format of your choice or to delete selected reports.

Name	Displays the name of the generated report.
Created	Displays the date and time that the report was created.
Size	Indicates the size of the raw report file in kilobytes (KB) or megabytes (MB). **Note:** The size of the downloaded report will vary depending on the chosen format.

Global Settings Overview Page

Navigation: System > ***Global Settings***

Displays links that allow you to select and modify system-wide settings for the Oracle FS System.

After you select a category of settings, you can review or modify the collection of settings for that category.

Networking	Review or modify various characteristics of the customer network, including for example: • The Oracle FS System management interface

	• Call-Home configuration • iSCSI connectivity
Controller Ports	View the Controller and port topology. Controller port provisioning is also available from this page.
Storage Profiles	View and manage the Oracle FS System Storage Profiles. **Note:** Modifying or creating Storage Profiles is recommended for expert users.
Security	Manage account security settings including number of failed login attempts allowed and session time-out period.
Administrator Accounts	Create and manage the administrator accounts that are configured on the Oracle FS System.
SNMP	Manage and configure the Simple Network Management Protocol (SNMP) trap hosts.
System Time	Set and synchronize the time across all Oracle FS System components.

Hardware Overview Page

Navigation: System > Hardware

Displays links to pages that allow you to select options to display hardware components installed on the Oracle FS System. After you select a type, you can select and review the status and current configuration of a specific hardware component.

Lists hardware components by type. Click a component identifier to display details about the component.

Pilots	Allows you to review the Pilot status and properties.
Controllers	Allows you to review the Controller status and properties.
Drive Enclosures	Allows you to review the Drive Enclosure status and properties.
Drive Groups	Allows you to review the drive group status and properties.
UPS	Allows you to review the uninterruptible power supply (UPS) status and properties.
Component Status Overview	Displays the overall health status of the following hardware components. Click the graphic to display details about the component. • Pilots • Controllers

- Drive Enclosures

Manage Port Provisioning Dialog

*Navigation: System > **Global Settings** > Controller Ports > Actions > Manage Port Provisioning*

Updates the Controller protocol used by the Oracle FS System.

Controller	Identifies the name of the Controller.
Slot Number	Identifies the Controller HBA slot number.
Manufacturer	Identifies the HBA maker.
Model	Identifies the HBA model number.
Number of Ports	Identifies the number of ports that are available on the HBA.
Protocol	Identifies the HBA protocol. Valid protocols: • Ethernet • FC • iSCSI • SAS

Link Aggregation

Specifies the link aggregation properties for the Ethernet HBA port.

Aggregate HBA Ports	*This property is valid for Ethernet protocols only.* Specifies whether link aggregation is enabled on the HBA port. Link aggregation allows theOracle FS System to group pairs of Ethernet ports and treat the group as though the physical links were one logical link. By default, link aggregation is disabled. When enabled, link aggregation allows the system and customer-supplied Ethernet switch to negotiate link aggregation priority.
Management Priority	*This property is valid for Ethernet protocols only.* Specifies the link aggregation management priority. A higher number indicates that the Ethernet switch has the priority to manage link aggregation; a smaller number indicates that the Oracle FS System is likely to assume this role.

Related Links

Manage Port Provisioning for a Controller

Modify Administrator Account Dialog

*Navigation: System > **Global Settings** > Administrator Accounts > Actions > Modify*

Changes the properties of a specific administrator account.

Login Name Identifies the login name assigned to the administrator account. This field is limited to 20 characters.

Role Identifies the authorized privileges for an administrator account. Different roles are authorized to perform different functions:

- **Administrator 1** The administrator role for a login account that provides the authority to perform all administrative tasks and all configuration tasks except for certain tasks that are reserved for the support roles.
- **Administrator 2** The administrator role for a login account that provides the authority to perform most administrative and configuration tasks. A login account assigned to this role cannot, however, perform the following tasks:
  - Manage the administrator accounts and other global system settings such as those settings for networking, the Controller ports, system security, and the system time.
  - Perform software upgrades or use Guided Maintenance to replace hardware components.
  - Shut down the Oracle FS System system.
- **Monitor** An administrator role for login accounts that provides the authority for those accounts to perform read-only management tasks and to modify their own account properties.
- **Support** A unique login account solely for support representatives. This login account is not authorized to modify or delete data resources, system alerts, or administrator accounts.

  Important: Use this account only if you are familiar with it or instructed by Oracle Customer Support.

For the following predefined roles, you cannot assign administrators to them and you cannot delete them:

Primary system administrator	A login account that has the same privileges as the Administrator 1 role.
Primary support administrator	A login account that has the same privileges as the Monitor role, as well as privileges to perform support-related tasks.

Note: You cannot change the role on predefined administrator accounts such as the primary administrator; the Role drop-down box is disabled.

Full Name	Identifies the first and last name associated with the administrator account.
Email Address	Identifies the email address associated with the administrator account. The email username can have up to 64 characters and the email domain can have up to 255 characters. The email server to which the Oracle FS System sends alerts must be able to receive messages at this address. The system does not validate this address. **Note:** An IP address cannot be entered as the email domain.
Phone Number	Identifies the phone number associated with the administrator account. The Oracle FS System does not verify the validity of this entry.
Password	Identifies the password of the administrator account. Enter the password; follow the password rules displayed on the dialog.
Password Duration	Select a duration between 1 to 180 days to determine when the password expires. Refer to your company's policy on password expiration to determine the duration you should set.
Confirm Password	Confirms that the password was entered correctly.
Disable Account	Indicates whether the administrative account is disabled. The Oracle FS System maintains disabled accounts but does not allow them to log in. A disabled account can be enabled later by modifying it. This setting takes effect immediately. If the administrator is logged in when you disable the account, the system logs out the administrator immediately. **Note:** You cannot disable the Primary system administrator account.

Related Links

Modify an Administrator Account

Modify Asset Information Dialog

Navigation: System > System Information > Actions > Modify

Updates the Oracle FS System asset and contact information.

Name	Indicates the name that is assigned to the Oracle FS System. The system name also appears in the status bar.
Description	Indicates the short description of the Oracle FS System. We recommend that you keep the description to less than 80 characters.
Location	Indicates the physical location of the Oracle FS System.
Contact Name	Lists the individual, or group of individuals, responsible for the Oracle FS System.
Contact Phone	Indicates the phone number of the individual or group of individuals responsible for the system.
Asset Number	Indicates the corporate asset number that is assigned to the Oracle FS System.

Modify Chassis ID Dialog

Navigation: System > Hardware > Controllers > Actions > Modify Chassis ID

Updates the chassis ID number of the Controller. The chassis number appears on the front of the Controller.

Current ID	Identifies the current chassis ID.
Desired ID	Select a chassis ID number from the pull-down list. You can choose from 1 to 99 or A0 to FF in hexadecimal. If you choose a chassis ID that is already in use, you can swap the numbers. For example, if you want to change chassis ID 15 to chassis ID 10 and chassis ID 10 is already assigned, you will be prompted to confirm you want to swap the chassis ID numbers. Chassis ID 15 becomes chassis ID 10 and chassis ID 10 becomes chassis ID 15.

Related Links

Modify a Chassis ID

Modify Controller, Components Tab

Navigation: System > Hardware > Controllers > Actions > Modify > Components

Displays the status of the selected Controller and the components.

If there is a hardware failure, select the component and click Replace Component. Oracle FS System Manager (GUI) starts Guided Maintenance.

Guided Maintenance presents you with a sequence of dialogs that guides you through the process of replacing a component.

Note: For more information about Guided Maintenance, refer to *Oracle FS1-2 Flash Storage System Field Service Guide.*

Comment	Allows you to enter descriptive text that is associated with a Controller. A comment can include up to 256 characters.
Identifier	Displays the World Wide Number (WWN) associated with a Controller.
Memory	Displays the amount of random access memory (RAM) provided by the DIMMs configured in the Controller.
Model	Displays the model number of the Controller.
Replaceable Unit	Lists the Controller components that are replaceable through Guided Maintenance. Select a component, and then click Replace Component to start Guided Maintenance. **Note:** For fan replacement, the Replaceable Unit list displays the names of each fan. Each power supply contains one fan, and each fan module contains two fans. If a fan fails in a power supply, replace the power supply. If a fan fails in a fan module, replace the fan module. The following list identifies the names of the fans and the corresponding customer replaceable unit (CRU).

If the following fan fails	Replace the following CRU
Fan 0	Power supply 0
Fan 1	Power supply 1
Fans 2, 3	Fan module 0
Fans 4, 5	Fan module 1
Fans 6, 7	Fan module 2
Fans 8, 9	Fan module 3
Fans 10, 11	Fan module 4

Status	Displays the current status of a hardware component. A status of Normal requires no action.

Related Links

Modify the Controller Comment

Modify Controller, I/O Ports Tab

Navigation: System > Hardware > Controllers > Actions > Modify > I/O Ports

Displays the I/O ports of the selected Controller.

Slot	Location of the HBA installed on the Controller
Port	HBA port number.
Connection Type	Identifies the types of network ports for data path traffic between the customer network switches and the Controllers:

Copper	Identifies copper interfaces.
Long Wave Optical	Identifies longwave optical small form-factor pluggable (SFP) transceiver interfaces.
Short Wave Optical	Identifies shortwave optical SFP transceiver interfaces.
Unknown	Indicates that the connection type cannot be determined.

Status — Identifies the connection state between the HBA port and Controller.

Possible states:

Connected	Indicates that the HBA port on the host is connected to the port on the Controller. In most operating systems, host ports log in to the Controller ports immediately after the two are physically connected and enabled and remain logged in until the physical connection is broken. So, Connected effectively means that there is an enabled physical connection between the ports.
Not Connected	Indicates that the HBA port on the host is not connected to the port on the Controller.

Note: On HP-UX platforms, however, some HBA device drivers use a different approach. These drivers log out of the connection when there is no traffic to send. The HP-UX initiator often logs out when the initiator does not discover any accessible LUNs attached to the target port. For these reasons, an HP-UX HBA port often shows as Not Connected even though there is an enabled physical connection between the ports.

Bandwidth	Displays the data rate of the port interface.
SFP Status	Displays the status of the SFP transceiver. • Bypassed • Bypassed-No SFP

	• Bypassed-Incorrect Speed • Bypassed-Read Error • Bypassed-Incorrect Type • Bypassed-Lost Sync If the interface module itself should fail, the SFP status shows Hardware Failure.
SFP Vendor	Displays the vendor's part number for the SFP. If that information is not available, the system displays Unknown.
SFP Part Number	Displays the vendor's part number for the SFP. If that information is not available, the field is blank or displays Unknown.
SFP Revision	Displays the part revision number for the SFP. If that information is not available, the field is blank or displays Unknown.

Modify Controller Port Settings Dialog

Navigation: System > ***Global Settings*** > *Controller Ports* > *Actions* > ***Modify Port Settings***

Updates the Controller iSCSI port properties. An administrator can also view iSCSI port properties from this dialog.

Port Information

Controller Name	Identifies the name of the Controller.
Slot Number	Identifies the Controller HBA slot number.
Port	Identifies the HBA port number.
Slot	Identifies the Controller HBA slot number.
Status	Identifies the HBA connection status. Valid states: • Connected • Not connected • Offline
Type	Indicates the type of HBA. Valid types: • Ethernet • Fibre Channel (FC)

- Internet SCSI (Small Computer System Interface) (iSCSI)
- Serial Attached SCSI (SAS)

Negotiated Speed	Indicates the port transmission speed in Gigabits each second.
Maximum Speed	Indicates the maximum speed of the port.

Port Information

MAC Address	Identifies the unique identifier of the HBA port.
Portal Group Tag	Identifies the iSCSI target portal group tag that is assigned to the port.
Link Up	Indicates the iSCSI port link up status. Valid states: • No • Yes
iSNS Client Status	Indicates the iSNS client status for the iSCSI port. Valid states: • Access lost • Established • In progress • Unknown
MTU Bytes Minimum	Indicates the minimum number of bytes supported by the maximum transmission unit (MTU).
MTU Bytes Maximum	Indicates the maximum number of bytes supported by the maximum transmission unit (MTU).

iSCSI Settings

IP Assignment	Specifies the configuration method that the Oracle FS System uses to obtain the IP address of the HBA port. Valid methods: DHCP — Specifies whether a DHCP server automatically assigns the IP addresses to network clients. This setting makes the Oracle FS System known to the DHCP software. For this option, use a Microsoft DHCP server that is configured by the Microsoft iSNS Server installer to return

		the server IP address using DHCP option 43 (vendor-specific) or DHCP option 83 (iSNS).
	Static	Specifies whether a permanent IP address is assigned to the Pilot in an Oracle FS System. Choose this option if you do not use DHCP.
Netmask		Specifies the netmask for the primary IP address that is permanently assigned to the management interface of the Oracle FS System.
Gateway		Specifies the gateway IP address that is permanently assigned to the management interface of the Oracle FS System.
TCP Port		Specifies the Transmission Control Protocol (TCP) port number that is configured on the iSCSI port.
VLAN Enabled		Signifies whether a virtual LAN (VLAN) has been defined for the iSCSI network.
VLAN ID		Specifies the group portal tag number.
MTU		Specifies the maximum transmission unit (MTU) value in bytes for the Controller node. The frame size (MTU) does not include the Ethernet header portion of the packet. If your network switch has trouble with the MTU size, you can set the switch to a larger value or lower the MTU size to correct the problem. If your network supports extended Ethernet (jumbo) frames, enter an integer greater than 1500 and less than 9001. Make sure that this Oracle FS System MTU size matches the network MTU size. If the MTU sizes are mismatched, performance might be severely degraded.

SFP Information

Status — Identifies the small form-factor pluggable (SFP) device port status.

Valid SFP device states:

- Enabled 1 Gb
- Enabled 2 Gb
- Enabled 4 Gb
- Enabled 8 Gb
- Enabled 10 Gb
- Enabled 16 Gb

- No SFP
- Incorrect Speed
- Read Error
- Incorrect Type
- Loss of Sync
- Other

Connection Type	Identifies the types of SFP transceiver interface devices used for data path traffic between the customer network switches and the Controllers. Valid SFP interface types: • Copper • Optical • Long Wave Optical • Short Wave Optical
Vendor	Identifies the SFP device manufacturer.
Part Number	Identifies the SFP device part number.
Revision	Identifies the SFP device revision number.

Modify Controller Service Type Dialog

Navigation: System > Hardware > Controllers > Actions > Modify Controller Service Type

Modifies the Service Type of a selected Controller.

Desired Service Type	The Service Type defines how much memory is optimized for I/O performance to support either SAN or NAS by reallocating cache resource. The cache allocations are approximate. **Note:** Both Controllers must be set to the same Service Type. **Note:** The service type can be selected based on the type of HBA installed. For example, if you are using the Ethernet port on the system, you would choose NAS Only. If you only have an FC HBA installed, you would use SAN Only. Available Service Types:

SAN Only	Allocates 100 percent of cache allocated to SAN.
NAS Only	Allocates 100 percent of cache allocated to NAS.

Biased to SAN	Allocates 70 percent of cache allocated to SAN, and 30 percent of cache allocated to NAS.
Biased to NAS	Allocates 70 percent of cache allocated to NAS, and 30 percent of cache allocated to SAN.

Data Access Disruption Required

Shutdown	Controllers shut down to enable hardware to be removed and added as necessary. When the Controllers are powered on, the Desired Service Type is applied.
Restart	Controllers are restarted but no hardware can be removed or added.

Modify Drive Enclosure, Components Tab

Navigation: System > Hardware > Drive Enclosures > Actions > Modify > Components

Modifies the Comment field of the selected Drive Enclosure.

You can view the status of the selected Drive Enclosure and its components including chassis, drives, I/O modules, and power cooling module. You can also control the option for automatic Drive Enclosure operations.

If there is a hardware failure, select the failed component and then click Replace Component. The Oracle FS System Manager starts the Guided Maintenance, which begins a process of resolving the hardware failure.

Note: For more information on Guided Maintenance, refer to the *Oracle FS1-2 Flash Storage System Customer Service Guide*.

Comment	Specifies the new name that is assigned to the Drive Enclosure. Use a unique, meaningful name to help you easily locate specific components. The Oracle FS System maps the assigned name to the component's serial number and updates the map if you modify the component name. By default, the Drive Enclosures are assigned names such as `Enclosure 01`. This string is a logical Drive Enclosure name and does not necessarily reflect the physical location of the Drive Enclosure. You can use the Comment field to provide descriptive information such as the rack location where the Oracle FS System is located. For example, you could enter, Rack 07.
Model	Indicates the model number of the Drive Enclosure in which the drive resides.

Serial Number	Indicates the serial number of the selected Drive Enclosure.
Drive Enclosure ID	Indicates the unique identifier (the World Wide Name) of the selected Drive Enclosure.
Perform Automatic Drive Enclosure Operations	Indicates whether data protection operations, such as copyback, copy-away, and rebuild run in the background, as necessary. Deselect this option as instructed by Oracle Customer Support. You might also need to deselect this option as instructed in a My Oracle Support (MOS) Knowledge Article that is specific to your issue.
Replaceable Unit	Indicates the Drive Enclosure components that are replaceable.
Status *(Chassis)*	Provides the operational state of the Drive Enclosure chassis. Oracle FS System Manager (GUI) displays a status icon followed by the chassis state. Possible states, by status icon: (Normal) The following operational states are associated with a normal chassis status: Normal — The chassis is operating normally. (Warning) The following operational states are associated with a warning chassis status: Unknown — The system is unable to read the chassis state.
Status *(Drives)*	Provides the operational state of the drive in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the drive state. Possible states, by status icon: (Normal) The following operational states are associated with a normal drive status: Normal — The drive is a member of the drive group. Not Used — The drive is operating normally, but is not a member of a drive group. (Warning) The following operational states are associated with a warning drive status: Booting — The drive is starting up.

Copy Away Source	The system has detected a failure on the drive and is currently copying the data to a target drive. The drive state changes to Failed when copying is complete.
Copy Away Target	The system has detected a failure on another drive and is currently copying the data to this target drive.
Copyback	An active spare drive is copying data to this drive.
Degraded Connectivity	The connection to the drive is limited to only a single Controller.
Foreign	The drive is not a member of this drive group. Accept this drive using the associated System Alert to make the drive a member of the drive group.
Missing	The drive is not found in the Drive Enclosure.
Rebuilding	The drive is a target of a rebuild operation for a drive group.
Recovered	The drive has failure history, but is now online and is not a member of a drive group.
Recovered In Use	The drive has failure history. The drive is now online and is a member of a drive group.
Shutdown	The system is in shutdown mode and cannot access the drive.
Unknown	The system is unable to read the drive state.

(Critical)

The following operational states are associated with a critical drive status:

Critical	The drive has experienced a failure.

Restore	The drive is currently being restored.

Status *(I/O modules)*

Provides the operational state of the I/O module in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the I/O module state.

Possible states, by status icon:

(Normal) The following operational states are associated with a normal I/O module status:

Normal	The I/O module is operating normally.

(Warning) The following operational states are associated with a warning I/O module status:

Offline	The I/O module is offline.
Missing	The I/O module is not found in the Drive Enclosure.
Unknown	The system is unable to read the I/O module state.

(Critical) The following operational states are associated with a critical I/O module status:

Critical	The I/O module has experienced a failure.

Status *(Power Cooling Module)*

Provides the operational state of the Drive Enclosure power cooling module. Oracle FS System Manager (GUI) displays a status icon followed by the power cooling module state.

Possible states, by status icon:

(Normal) The following operational states are associated with a normal power cooling module status:

Normal	The power cooling module is operating normally.

(Warning) The following operational states are associated with a warning power cooling module status:

Offline	The system reports that the power cooling module is failed or is disabled.

Missing	The power cooling module is not found in the Drive Enclosure.
Warning	The power cooling module is functioning but shows signs of failure.
Unknown	The system is unable to read the power cooling module state.

(Critical) The following operational states are associated with a critical power cooling module status:

Critical	The power cooling module has experienced a failure.

Replace Component — Starts Guided Maintenance that steps you through the component replacement process.

The system displays details about the selected replaceable component.

Chassis information — Provides detailed information about the selected chassis.

Number	Indicates the number that uniquely identifies the chassis within the Drive Enclosure.
Status	Indicates the operational state of the component.
Part Number	Indicates the manufacturer part number of the component.
Serial Number	Indicates the serial number of the component.

Drive information — Provides detailed information about the selected drive.

Status	Indicates the operational state of the drive.
Model	Indicates the manufacturers model number of the drive.
Serial Number	Indicates the serial number of the drive.
Firmware Number	Indicates the firmware version number of the drive.
Drive Slot Number	Indicates the Drive Enclosure slot number where the drive is installed.
Storage Class	Specifies the category of physical media that comprises the drive group. Valid media types:

		Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
		Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
		Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
		Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
	Drive Enclosure	Indicates the unique identifier of the Drive Enclosure.	
	Drive Capacity	Indicates the storage capacity of the drive.	
	Remaining Life Expectancy	*(SSD only)* Indicates the remaining months in the life of the drive.	
I/O Module information	Provides detailed information about the selected I/O module.		
	Number	Indicates the number that uniquely identifies the I/O module within the Drive Enclosure.	

	Status	Indicates the operational state of the I/O module.
	Part Number	Indicates the manufacturer part number of the I/O module.
	Serial Number	Indicates the serial number of the I/O module.
	Firmware Number	Indicates the firmware version number of the I/O module.
Power Cooling Module information	Provides detailed information about the selected Power Cooling Module.	
	Status	Indicates the operational state of the Power Cooling Module.
	Model	Indicates the manufacturer model number of the Power Cooling Module.
	Serial Number	Indicates the serial number of the Power Cooling Module.
	Number of Fans	Indicates the number of cooling fans in the Power Cooling Module.
	Number of Failed Fans	Indicates the number of failed cooling fans in the Power Cooling Module.

Related Links

Modify the Drive Enclosure Comment

Modify Drive Enclosure, I/O Ports Tab

Navigation: System > Hardware > Drive Enclosures > Actions > Modify > I/O Ports

Displays the status of the Serial Attached SCIS (SAS) interfaces of the selected Drive Enclosures. No changes can be made from this panel.

Port	Lists the *PHYs* that are associated with the I/O module port.
Phy State	Indicates the state of the PHY connection. A wide port has two or more of the PHY states indicate Link Up. A narrow port has only one PHY state is Link Up. Possible states: Link Up — Indicates that the PHY connection is functioning properly.

	Link Down	Indicates that the PHY connection is disconnected.
	Disabled	Indicates that the PHY connection is disabled.
	Reset	Indicates that the system is resetting the PHY connection.
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.	
Maximum Speed	Indicates the maximum speed of the port.	

Modify Drive Group Dialog

Navigation:

- *System* > *Storage Domains* > *Actions* > *Modify Drive Group*
- *System* > *Hardware* > *Drive Groups* > *Actions* > *Modify*

Displays information about drives within a drive group. You can also set a drive group as the primary drive group.

Replaceable Units

Replaceable Unit	Displays the drives available in a drive group. The details about a selected drive are displayed on the right-hand side of the dialog.	
Status *(Drives)*	Provides the operational state of the drive in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the drive state. Possible states, by status icon:	
	(Normal)	The following operational states are associated with a normal drive status:
		Normal — The drive is a member of the drive group.
		Not Used — The drive is operating normally, but is not a member of a drive group.
	(Warning)	The following operational states are associated with a warning drive status:
		Booting — The drive is starting up.
		Copy Away Source — The system has detected a failure on the drive and is

		currently copying the data to a target drive. The drive state changes to Failed when copying is complete.
	Copy Away Target	The system has detected a failure on another drive and is currently copying the data to this target drive.
	Copyback	An active spare drive is copying data to this drive.
	Degraded Connectivity	The connection to the drive is limited to only a single Controller.
	Foreign	The drive is not a member of this drive group. Accept this drive using the associated System Alert to make the drive a member of the drive group.
	Missing	The drive is not found in the Drive Enclosure.
	Rebuilding	The drive is a target of a rebuild operation for a drive group.
	Recovered	The drive has failure history, but is now online and is not a member of a drive group.
	Recovered In Use	The drive has failure history. The drive is now online and is a member of a drive group.
	Shutdown	The system is in shutdown mode and cannot access the drive.
	Unknown	The system is unable to read the drive state.
(Critical)	The following operational states are associated with a critical drive status:	
	Critical	The drive has experienced a failure.

	Restore	The drive is currently being restored.

Drive information — Provides detailed information about the selected drive.

Status	Indicates the operational state of the drive.
Model	Indicates the manufacturers model number of the drive.
Serial Number	Indicates the serial number of the drive.
Firmware Number	Indicates the firmware version number of the drive.
Drive Slot Number	Indicates the Drive Enclosure slot number where the drive is installed.
Storage Class	Specifies the category of physical media that comprises the drive group. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity,

rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Drive Enclosure	Indicates the unique identifier of the Drive Enclosure.
Drive Capacity	Indicates the storage capacity of the drive.
Remaining Life Expectancy	*(SSD only)* Indicates the remaining months in the life of the drive.

Make this drive group the primary drive group — Make the drive group the primary drive group within the Drive Enclosure. The primary drive group contains system configuration data.

RAID Levels and Status

RAID Level — Indicates the types of RAID data protection that is provided by the selected drive group.

Each entry in the table represents a particular set of minimum allocation units (MAUs) in the drive group. Each of the MAUs in a given set has the same level of RAID protection, forming a RAID protection segment for the drive group.

If a drive goes offline, the event affects all of the MAUs in the protection segment in the same way. Therefore, the reported status for a given RAID level applies to the entire protection segment.

Single Parity	Indicates that each of the MAUs in the RAID protection segment uses one set of parity bits to protect against the loss of one drive in the drive group. Single parity is implemented as a variant of the RAID 5 storage technology.
Double Parity	Indicates that each of the MAUs in the RAID protection segment uses two sets of parity bits to protect against the loss of one or two drives in the drive group. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that each of the MAUs in the RAID protection segment is written across two drives in the drive group.

Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

RAID Status	Possible states:	
	Normal	Indicates that the drive group is accessible and no action is required.
	Degraded Warning	Indicates that the drive has failed in the drive group, but the drive group is still accessible. Replace the failed drive. If the drive group is the primary drive group, then replace the drive immediately. The primary drive group contains system overhead, including all system configuration data.
	Degraded Critical	Indicates that two or more of the drives have failed. The drive group can become inaccessible unless you replace the drives.
	Failed	Indicates that multiple drives have failed. The drive group is not accessible. Replace the failed drives. After the failed drives are replaced, the drive group becomes accessible.
	Unknown	Indicates that the drive status information is not available to display.

Related Links

Make a Drive Group the Primary Drive Group

Modify Chassis ID Dialog

Navigation: System > Drive Enclosures > Actions > Modify Chassis ID

Updates the chassis ID number of the Drive Enclosure. The chassis ID appears on the Drive Enclosure.

Current ID	Identifies the current chassis ID.
Desired ID	Lists the available chassis ID numbers. You can select from 01 to 99 or A0 to FF in hexadecimal. If you select a chassis ID that is already in use, the system issues a message to indicate that the selected chassis ID is already in use. You can choose swap the two chassis ID numbers or cancel the operation.

Related Links

Modify a Chassis ID

Modify Event Notification Dialog

*Navigation: System > Alerts and Events > **Event Notification** > Actions > Modify*

Changes the selected event notification.

When an event is triggered, the Oracle FS System sends a notification to the designated recipients. You can change which notifications are monitored as well who receives the notification.

Name	Identifies the name of the event notification.
Description	Describes the event notification.
Enable Event Notification	Indicates whether event notification is enabled. Select this option to activate the notification when the event occurs on the Oracle FS System.
Event Notification Recipient Email Addresses	Identifies the email addresses of the recipients who are to receive event notifications. The email server to which the Oracle FS System sends notifications must be able to send messages to the email addresses.
Add	Allows you to add email recipients to the event notification.
Test Email	Sends a message to the specified email addresses to test the recipient email addresses. Recipients receive a message that is titled "[Oracle-QoS] Test email" in their email in-boxes. **Note:** Allow at least 10 minutes between email tests.
Remove	Deletes the selected email address from the list.

Monitored Events

By severity, then category	Sorts the list of events by severity with a list of event categories. The severity categories include:	
	Informational	Requires no action for events that are information only.
	Warning	Requires no immediate action for minor conditions that you can address at your convenience.
	Critical	Requires prompt action to prevent system failures or offline conditions.
By category, then severity	Sorts the list of events by categories with a list of event severity. The categories include:	
	Security	Events to notify of a security problem, such as an unauthorized request.
	Audit	Events that track what users are doing, such as the operations that they performed.

	System	Events to notify of system problems, such as a missing Drive Enclosure or Controller.

Events Not Monitored	Provides the list of events not set to be monitored. The Oracle FS System does not trigger a notification when an event listed occurs. From the list, you can specify the events to be monitored. You can sort the list by severity or category.
Monitored Events	Provides the list of events that you specified to be monitored. The Oracle FS System triggers a notification each time an event that you specified occurs. The email addresses specified in the **Event Notification Recipient Email Addresses** field receive the event notifications. You can sort the list by severity or category.

Related Links

Modify an Event Notification

Modify Network Settings, Interfaces Tab

*Navigation: System > **Global Settings** > Networking > Actions > Modify > Interfaces*

Updates the network and data-path interfaces for the Oracle FS System.

Management Interface

Enable DHCP	Indicates whether you have a Dynamic Host Configuration Protocol (DHCP) server that automatically assigns IP addresses to network clients. This setting makes the Oracle FS System known to the DHCP software.
Static IP Address	Identifies whether to assign a permanent IP address to the Oracle FS System Pilot. Choose this option if you do not use DHCP. **Note:** Selecting this option enables the Public Interface fields.
Transmit Setting	**Important:** Use care when setting the transmit speed and duplex mode. If your external network does not support the management interface setting, a loss of access to the Pilot could result. If access is lost, contact Oracle Customer Support for assistance. Select from the drop-down list the speed and duplex mode that you want the Pilot management interface to use. **Note:** Auto negotiate is the default transmit setting. We recommend the default setting for all but special circumstances. Valid speeds:

- Auto
- Half 10 Mbps
- Full 10 Mbps
- Half 100 Mbps
- Full 100 Mbps
- Half 1000 Mbps
- Full 1000 Mbps
- Full 10 Gbps

Speed	Displays the actual speed and duplex mode that the management interface uses.
Public Interface *(when Static IP Address is selected)*	Specifies the IP address that is permanently assigned to the public interface to the Pilot.
Pilot 1/Pilot 2	Specifics the IP addresses that are permanently assigned to the Pilot nodes. You can use these static IP addresses as an alternate method to access the active Pilot node.
Netmask	Specifies the subnet mask for the public IP address that is permanently assigned to the Oracle FS System.
Gateway	Specifies the public IP address of the gateway server in the subnet of which the Oracle FS System is a member.

DNS Settings

Primary DNS Server	Specifies the Domain Name Server (DNS) that is used to resolve IP addresses.
Secondary DNS Server	Specifies the IP address of the secondary DNS server in the network if the primary DNS server cannot be reached.

Static Routes

Manages TCP/IP traffic to non-local network routes for a File Server.

Routes are used to send network traffic to specific IP addresses or to specific subnets. Typically, a File Server uses the gateway attribute of the virtual interface (VIF) to route outgoing traffic.

By default, the routing table is empty. If you define one or more static routes for a File Server, you can define up to 32 routes.

Destination	Identifies the route destination network or host.
Netmask	Identifies the subnet mask for the destination route IP address.

Gateway	Identifies the IP address that is assigned to the gateway host. The gateway IP address is used to route messages from this network to other networks.
Order	Identifies the routing position in the table.

Add Route	Adds a TCP/IP route for access by all File Servers.
Remove Route	Removes one or more TCP/IP routes.

Related Links

Configure the Management Interface

Modify Network Settings, iSCSI Tab

*Navigation: System > **Global Settings** > Networking > Actions > Modify > iSCSI*

Updates system-wide iSCSI settings if you have iSCSI hosts configured to use Challenge Handshake Authentication Protocol (CHAP), Access Control, Internet Storage Name Service (iSNS), or a combination of these parameters.

The iSCSI settings configures the authentication and access controls on the Oracle FS System, which the host must match to gain access. If you have CHAP and Access Control configured for each initiator, you do not need to configure iSCSI globally.

Connectivity and Communication

iSCSI Device Name	Identifies the name of the iSCSI initiator for the SAN host. An initiator encapsulates SCSI commands and data requests within iSCSI packets and transfers the packets across the IP network.
iSCSI Device Alias	Identifies an easily understood, alternative name for the iSCSI device. By default, the device alias is constructed using the Oracle FS System model plus the system serial number using the following format: • Oracle FS System <model-number> SSN:<serial-number>
Enable Header Digest	When an iSCSI initiator logs in to the Oracle FS System, the initiator negotiates the parameters for the iSCSI session. If the initiator does not give the system a choice regarding the use of iSCSI header digests, the system complies with what the initiator wants. If the initiator gives the system a choice and if Enable Header Digest is enabled, the system chooses to use header digests, regardless of the preference identified by the initiator. **Note:** When selected, this parameter provides more error checking for the header portion of the iSCSI packet.

Enable Data Digest	When an iSCSI initiator logs in to the Oracle FS System, the initiator negotiates the parameters for the iSCSI session. If the initiator does not give the system a choice regarding the use of iSCSI data digests, the system complies with what the initiator wants. If the initiator gives the system a choice and if Enable Data Digest is enabled, the system will choose to use data digests, regardless of the preference identified by the initiator. **Note:** When selected, this parameter provides additional error checking for the data portion of the iSCSI packet.

iSNS Server Registration

Enable iSNS Server Registration	Choosing this option allows Oracle FS System iSCSI targets to be registered in the iSNS server. For discovery of the iSNS server IP address, specify either DHCP or static addressing:
Static	This option requires the following information:

Server	Indicates the server IP address.
TCP port	Indicates the TCP port that the Oracle FS System uses to register with the iSNS server.

Security

Access Control	Specifies the access control method for iSCSI initiators. Valid options:

None	Specifies that the Oracle FS System permits all iSCSI initiators to login.
Oracle FS	Specifies that the Oracle FS System rejects iSCSI login attempts from initiators that have not explicitly been granted permission by the user through the Oracle FS System Manager interface.

Authentication	Identifies the authentication of the host (initiator) during login. Valid options:

All Initiators	Specifies that CHAP authentication is required for all iSCSI connections to the Oracle FS System, regardless of what is configured for each host.
Per Initiator	Specifies that CHAP authentication is required only for those iSCSI

connections for which it is configured for each host.

Note: If the initiator on the SAN host has been configured to require CHAP authentication, login fails unless the Oracle FS System is configured to authenticate to All Initiators or authentication is set to Per Initiator and the Enable Bi-Directional CHAP option is selected. In either case, specify the CHAP Secret for the initiator.

Authentication Server	Specifies whether the Oracle FS System or a Radius server performs the authentication.
Oracle FS	Indicates that the Oracle FS System performs the authentication.
Radius	Indicates that a RADIUS server performs the authentication. **Note:** When this option is selected, the system ignores any CHAP name or secret that is configured for a host in the Oracle FS System Manager.
Enable Bi-Directional CHAP	Enables the CHAP protocol to be used for requests for data (from the iSCSI initiator) and responses to requests (from the iSCSI target). If bi-directional CHAP support is disabled for the Oracle FS System, disable bi-directional CHAP for all initiators; otherwise the initiator login fails.
CHAP Secret	Identifies the encrypted CHAP authentication password (secret) used in the exchange of user names and secrets between two iSCSI devices. Both devices must support Point-to-Point Protocol (PPP) authentication. **Note:** The Oracle FS System supports up to 100 UTF-8 non-integer characters. However, when connecting to Windows servers, limit the secret to a value between 12 and 16 characters in length.
Retype CHAP Secret	Re-enter the encrypted CHAP authentication password used.
Primary Radius Server and Secondary Radius Server	Identifies the details for connecting to the primary and secondary Radius servers. This information is required when the Authentication Server is set to Radius.
IP Address	Specifies the IP address of the Radius server.

UDP Port	Specifies the UDP port of the Radius server to which the Radius server is listening.
Radius Secret	Specifies the secret used to access the Radius server.
Retype Radius Secret	Specifies the retyped secret used to access the primary Radius server.

Related Links

Configure iSCSI System Settings

Modify Network Settings, Notification Tab

Navigation: System > ***Global Settings*** > *Networking* > *Actions* > *Modify* > ***Notification***

Updates the email server that receives email and Call-Home notifications from the Oracle FS System and sends the email messages to the designated recipients.

Email Notifications

Specifies the email server details necessary to send notification from the Oracle FS System.

Enable Email Notifications	Identifies whether email is enabled. • Enable email if you intend to define alerts to send email notifications. • Disable email if you do not want to send email notifications from the Oracle FS System.
SMTP Server IP Address	Identifies the Simple Mail Transfer Protocol (SMTP) server to use for sending any emails. Valid options: • IP: The IP address for the SNMP server • DNS: The Domain Name Service (DNS) for the SNMP server
SMTP Server Port	Specifies the port to which the SMTP server listens for incoming email.
Email Domain	Specifies the sending domain identifier other than the Oracle FS System.
Email Flood Prevention	Identifies the time interval in which the system is permitted to send two subsequent emails when an event occurs on the Oracle FS System. The smaller the number, the more frequent the system sends event notification emails. The default time is 300 seconds (5 minutes).

Call-Home Triggering

Allows you to specify when events logs and messages are sent to the Call-Home server.

Enable event triggered Call-Home

Enables Call-Home support, which enables the Oracle FS System to send status messages to the designated server.

Enable standard periodic Call-Home

Enables the periodic sending of the Oracle FS System event logs to the Call-Home server.

- **Start Date** — Indicates the time and date when to begin the periodic transfers.
- **Interval** — Indicates the unit of occurrence at which the system performs the scheduled transfer. Valid options:
  - **Daily** — Performs the scheduled task on a daily basis.
  - **Weekly** — Performs the scheduled task on a weekly basis.
  - **Monthly** — Performs the scheduled task on a monthly basis.
- **Recurrence** — Indicates the number of intervals to wait before starting the next scheduled Call-Home operation. Enter or select a value from 1 to 100.

  The default interval is weekly.

Enable larger periodic Call-Home

Enables large files to be sent to the Call-Home server so that trace logs and performance statistics are automatically included in the Call-Home logs.

- **Start Date** — Indicates the time and date when to begin the periodic transfers.
- **Interval** — Indicates the unit of occurrence at which the system performs the scheduled transfer. Valid options:
  - **Daily** — Performs the scheduled task on a daily basis.

	Weekly	Performs the scheduled task on a weekly basis.
	Monthly	Performs the scheduled task on a monthly basis.
Recurrence	Indicates the number of intervals to wait before starting the next scheduled Call-Home operation. Enter or select a value from 1 to 100. The default interval is weekly.	

Call-Home Configuration

Specifies the Call-Home server settings. You can configure an Oracle server or a local server to receive the event logs and messages.

Use Oracle Server	Specifies that Call-Home logs and messages should be sent to Oracle.	
	Server Address	Identifies the IP address or the domain name of the Call-Home server, callhome.support.pillardata.com. Valid options: • IP: The IP address for the SNMP server • DNS: The Domain Name Service (DNS) for the SNMP server
	Connect via SCP	Specifies the use of secure copy (SCP) with 1024-bit encryption and secure keys to transfer files directly over the Internet to Oracle Customer Support.
	Connect via HTTPS	Sends files either directly to the Oracle server through a secure Internet connection or to a proxy server.
	Use Proxy	Sends Call-Home logs through a proxy server for security purposes or when the Oracle FS System does not have direct access to the Internet.
	Proxy Server Address	Identifies the DNS server name or IP address of the proxy server.
	Proxy Server Port	Identifies the port that the proxy server uses to send the Call-Home log files.

	Protocol	Identifies the type of protocol that Call-Home uses to access the proxy server. Valid options: HTTP SOCKS4 SOCKS5 Unknown
Use Local Server	Specifies that Call-Home status messages should be sent to a local server by providing the IP address or domain name of the local server.	
	SCP Server	Specifies the use of secure copy (SCP) with 1024-bit encryption and secure keys to transfer files directly over the Internet to Oracle Customer Support.
	Remote Directory	Identifies the full directory path on the target server in which to store the Call-Home log files.
Password Authentication	Specifies that authentication is required to access the local server. Use login credentials or a customer-supplied certificate to authenticate access to the local server.	
	Username	Specifies the name of the user.
	Password	Specifies the password associated with the username.
Enable large file transfers	Identifies whether trace logs and performance statistics are included in Call-Home data transfers. The size of the log file is not limited and can become large. • Enable this option to allow large files so that trace logs and performance statistics are automatically included in the messages that are sent to Oracle Customer Support. • Disable this option to exclude trace logs and performance statistics from the Call-Home messages that are sent to Oracle Customer Support. You can collect, download, and transmit the trace logs separately if they are needed.	
Number of recent events to send in header	Specifies the maximum number of system events to include in the Call-Home status messages. The number of system events should be greater than or equal to zero.	

Related Links

Configure Email Notification Settings

Modify Reporting Schedule Dialog

Navigation: *System* > *Reporting and Statistics* > *Reporting Schedules* > *Actions* > *Modify*

Changes the properties of the selected reporting schedule.

Schedule Name	Enter a name for the schedule. The name is displayed in the Name column on the Reporting Schedules page. If you do not specify a name, the system uses the default name of `untitled`. **Note:** The name you enter is for your use in identifying the schedule listed in the Reporting Schedules. For example, if you want to run a weekly report on storage use, you might enter `weeklystorageuse` as the schedule name to help you locate that report. When a report is generated, the system automatically creates a name for the report, itself. The name the system creates is based on the report type, such as StorageUse_1374861600286 not the name you assigned to the report schedule. The report name is displayed in the Generated Reports name column.	
Report Type	SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
	Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
	Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free, and preparing capacity is also presented per storage class.

Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures. **Note:** You might want to generate and archive the *System Configuration* report as the report provides a record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.
System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.

Enabled	Specifies whether the scheduled report is active or inactive. To make a scheduled report active, check the Enable checkbox. If you do not want the scheduled report to be active, do not check the Enable checkbox. The scheduled report is still listed under Reporting Schedule but reports are not generated.
Start Time	Specifies the date and time to begin generating reports.
Schedule Frequency	Specifies the frequency at which the schedule generates reports. Frequencies include: • Run Once • Hourly • Daily • Weekly
Recurrence	Specifies how many hours, days, or weeks to wait before generating this scheduled report again. You can also specify a specific day on which you want the report to be generated.

Related Links

Modify a Reporting Schedule

Modify Security Settings Dialog

Navigation: System > ***Global Settings*** > *Security* > *Actions* > *Modify*

Updates the account security properties and the login welcome message.

Account Security

Consecutive failed login attempts allowed	Identifies the number of times that an administrator can attempt, and fail, to log in to the Oracle FS System. When the number of failed login attempts exceeds this limit, the system locks out the account. Only the Primary system administrator and administrators having the role of Administrator 1 can unlock the account.
Session timeout period (in minutes) for all administrators	Identifies an inactivity time limit, after which an administrator session is terminated. Sessions in progress continue to use the previous value and are not affected by changes that you make. Sessions that start after you change the value use the modified session time-out value. The default for the session time-out is 999 minutes. After an administrator logs in, if the administrator is inactive for a length of time equal to the session time-out period, the Oracle FS System automatically logs the account out of the system. The session time-out period applies only to property dialogs and popup windows in the Oracle FS System Manager. The session time-out period does not apply to the main window because of activity that occurs to verify the system status and health.

Login Screen Message

Specifies a message that is displayed when system administrators log in to the Oracle FS System. You can enter up to 256 Unicode characters.

Related Links

Modify Security Settings

Modify SNMP Host Dialog

Navigation: System > ***Global Settings*** > *SNMP* > *Actions* > *Modify*

Changes the properties of the Simple Network Management Protocol (SNMP) trap hosts.

Name	Identifies the name for the SNMP host.
Host IP	Identifies the IP address or domain name of a client that receives the Oracle FS System SNMP information.

Community String	Identifies the community string for use when the Oracle FS System sends an event trap to the SNMP host. **Note:** When an administrator does not specify a community string for read-only access, SNMP servers and clients typically use `public`.
Receive traps	Indicates that the SNMP host receives event traps sent to it.
Trap Port Number	Identifies the SNMP host port number to use for sending an event trap.
Severity Threshold	Identifies the severity threshold for events that the system sends to the SNMP host by event traps. Severity levels: • Informational • Warning • Critical

Related Links

Modify SNMP Hosts

Modify Storage Domain Dialog

Navigation: System > Storage Domains > Actions > Modify Storage Domain

Modifies the properties of the selected Storage Domain.

Storage Domain Capacity by Storage Class

Displays graphically the storage classes, and their capacities, for the selected Storage Domain.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.

Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

For each storage class, the system graphically displays the Storage Domain physical capacities. The graph uses colored bars of different thicknesses to indicate the capacity status of each storage class. Hover the mouse pointer over each graph to display the capacity type.

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Possible physical storage capacities:

Free Space	Displays the amount of capacity that is available for allocation in the indicated Storage Class.
Used Capacity	Displays the amount of capacity that is consumed by data and system overhead.
Total Capacity	Displays the total amount of raw capacity provided by the drive groups that are defined within the indicated Storage Class.
Allocated Space	Displays the amount of capacity that has been assigned and designated to all storage classes residing on the indicated Storage Class.
Preparing Capacity	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Class.
Allocated to Logical Maximum	Displays the maximum capacity to which the Storage Class can grow.

Name	Specifies the name of this Storage Domain. This name must be unique within the Oracle FS System. Storage Domain names can consist of up to 82 UTF-8 printable characters. The name cannot include the following characters: • / (forward slash) • \ (backward slash)

- . (dot)
- .. (dot dot)
- tab

Background Process Priority	System Chooses	(*Default*) Specifies that the system balances the resources that are needed for background data movement with the resources that are needed to service the incoming client I/O.
	Minimize Impact	Specifies that the system restricts the amount of system resources that are given to the background data movement operation. This option minimizes the impact on client I/O. Recommended for highly-loaded Storage Domains.
	Maximize Speed	Specifies that the system grants resource priority to the background data movement operation. This option reduces the amount of system resources that are available for client I/O. Recommended for lightly-loaded Storage Domains.

Enable Tier Reallocation	Specifies that any tiered data that resides in this Storage Domain has data progression enabled. Individual objects might have tier reallocation disabled. Enabling tier reallocation at the Storage Domain level does not override any objects that have tier reallocation disabled. The default value is enabled.
Enable Tier Reallocation Statistics Collection	Collects data usage patterns for the Storage Domain internally to analyze and determine the optimum storage classes for the data. The default value is enabled. It is recommended you do not change this setting unless you need to test different profiles. Disable this setting if you are modifying your storage profile for testing purposes and did not want to collect statistics during the test. You do not want to collect tier reallocation statistics during the test as this might distort future tier reallocation. After you complete testing, enable tier reallocation statistics collection. **Note:** Enabling or disabling the tier reallocation statistics collection has no effect on statistics you can view for CPU, drive groups, Filesystems, or LUNs. (Those are a different set of statistics.)

Auto-Tier Scan Options (Advanced)

Optimizes the auto-tier algorithm for moving data to different Storage Classes. You can specify the interval for when auto-tier moves frequently accessed data blocks and infrequently accessed data blocks to match your application activity.

Note: To unlock the auto-tier scan options, select the lock icon. Selecting the lock icon again resets the values to the state when the fields were unlocked.

Performance-Optimizing Scan Cycle	Specifies the frequency, in hours, that auto-tier scans to move frequently accessed data blocks to a high performance Storage Class. For example, a value of 32 means that every 32 hours auto-tier scans the system to move frequently accessed data blocks to a high performance Storage Class. Updates to this field affect the label of the Number of *n*-hour Scan Cycles field. For example, a value of 32 changes the label for the Number of *n*-hour Scan Cycles to Number of 32-hour Scan Cycles. Enter a value from **1** through **168**.
Number of n-hour Scan Cycles	Specifies the frequency that auto-tier runs the performance-optimizing scan cycles before auto-tier runs the cost-optimizing scan cycle. The value entered in the Number of n-hour Scan Cycles field is multiplied by the value entered in the Performance-Optimizing Scan Cycle field to obtain the value set in the Cost-Optimizing Scan Cycle field. For example, a value of 5 means that every fifth time that auto-tier runs the performance-optimizing scan cycle, auto-tier then runs the cost-optimizing scan cycle to move infrequently accessed data to a less expensive storage class. Enter a value from **2** through **31**.
Cost-Optimizing Scan Cycle	*(Read-only)* Displays the frequency, in hours, that auto-tier scans to move infrequently accessed data blocks to a less expensive Storage Class. The value displayed in this field is calculated as the product of the value you entered in the Performance-Optimizing Scan Cycle field and the value you entered in the Number of n-hour Scan Cycles field. For example, to set auto-tier to move infrequently accessed data blocks to a less expensive Storage Class every 200 hours, enter the following values: • Performance Optimizing Scan Cycle: **25** • Number of 25-hour Scan Cycles: **8** The system displays 200 in the Cost-Optimizing Scan Cycle field. In this example, the values that you enter instruct auto-tier to run the performance-optimizing scan every 25 hours. Then, during every eighth scan cycle (or every 200 hours), auto-tier runs a cost-optimizing scan to move infrequently accessed data blocks to a less expensive Storage Class.

Allowable Storage Capacity for Auto-Tiered LUNs

Indicates the maximum percentage of storage capacity to dedicate to auto-tier reallocation for each Storage Class of the Storage Domain. Enter a percentage for each available Storage Class.

The default value is 100%.

Related Links

Limit the Storage Capacity for QoS Plus
Optimize Auto-Tier Scans
Rename a Storage Domain
Update the Background Process Priority
Update Tier Reallocation Options

Modify System Time Dialog

*Navigation: System > **Global Settings** > System Time > Actions > Modify*

Changes the properties of the system time to synchronize the Oracle FS System clock time with a Network Time Protocol (NTP) server or to set the date and time manually.

Use External Time Source	Identifies that the Oracle FS System synchronizes its clocks with Network Time Protocol (NTP) servers. You can specify a primary NTP server and up to two alternate NTP servers with which the system synchronizes its clocks. Enter the IP addresses assigned to the primary NTP server and up to two alternate NTP servers into the following fields: • NTP Server 1 • NTP Server 2 • NTP Server 3 If the primary NTP server is unavailable, the system polls the alternate NTP servers in a round-robin fashion until the Oracle FS System connects to an available NTP server. Enter IP addresses or DNS names for up to two alternate NTP servers.
Use Internal Hardware Clock	Identifies that the Oracle FS System synchronizes its clocks with a date and time that you set manually. Oracle FS System clocks are synchronized with each other, and their time may differ from other clocks in your network.
Date/Time	Presents a wizard that allows you to set the Oracle FS System date and time. The time that you set is converted internally to the Coordinated Universal Time (abbreviated UTC) format.

Related Links

Modify the Oracle FS System Time

Modify UPS Dialog

Navigation: System > Hardware > UPSs > Actions > Modify UPS

Changes the properties of a selected uninterruptible power supply (UPS) device. For example, you can assign the UPS device to an alternate simple network management protocol (SNMP) community string.

Name	Identifies the name of the UPS device. UPS names must be unique across the Oracle FS System and must be 256 or fewer UTF-8 characters.
IP Address	Identifies the IP address that is assigned to the external UPS device.
SNMP Community	Identifies a community for which a specific trap host should receive traps that the Oracle FS System generates. You can specify different community strings for each trap host so that multiple administrators can receive specific types of SNMP traps. The default community string is public (lower case). It is recommend you change the default community string. **Note:** This community string entered here must match the community string configured on the UPS device.

Current Status

Provides read-only details and status about the UPS device.

Model	Identifies the model number of the UPS device.
Firmware Revision	Identifies the firmware version that is installed on the UPS device.
Serial Number	Identifies the serial number of the UPS device.
Power Source	Identifies the source of the UPS power. Valid sources: • AC (alternating current) • Battery • Unknown
Battery Status	Identifies the status of the UPS batteries. Valid values: • Normal • Warning • Critical • Unknown
Communication Status	Identifies the communication status between the UPS device and the Oracle FS System system. Valid values:

- OK
- Failed

Related Links

Modify a UPS Device

Networking Overview Page

*Navigation: System > **Global Settings** > Networking*

Lists the networking properties for the Oracle FS System.

Management Interface

DHCP Enabled	Specifies whether the Dynamic Host Configuration Protocol (DHCP) is enabled.
IP Address	Identifies the public or the shared IP address that is assigned to the Pilot. This IP address is what the administrator uses to access the Oracle FS System over the management interface.
Subnet Mask	Assigns the subnetwork mask for the public IP address that is permanently assigned to the Pilot.
Gateway	Assigns the IP address of the gateway network node in the subnetwork of which the Oracle FS System (the Pilot) is a member.
MAC Address	Identifies the unique network identifier of the *active* Pilot node. When a Pilot node fails, the passive node becomes the active node. The MAC address changes to the unique network identifier of the formerly passive node
Speed	Identifies the actual port speed and duplex mode at which the management interface is running.

DNS Settings

Primary DNS Server	Identifies the IP address of the primary Domain Name Server (DNS) that is used to resolve the IP addresses.
Secondary DNS Server	Identifies the IP address of the secondary DNS server that should be used if the primary DNS server cannot be reached.

Notification

Email Enabled	Identifies whether email is enabled to notify recipients of system events.

Email Server IP	Identifies the IP address of the Simple Mail Transfer Protocol (SMTP) server that receives system event notifications.
Email Server Port	Identifies the port that the SMTP server listens to for incoming email requests.
Email Flood Preventions	(Optional) Specifies the interval, in seconds, that the Oracle FS System waits before sending event notification emails to the administrator for the same event.
Event Triggered	Indicates whether event-triggered Call-Home is enabled.
Standard Periodic	Indicates whether standard Call-Home messages are scheduled and enabled.
Larger Periodic	Indicates whether larger Call-Home messages are scheduled and enabled.
Large Files	Indicates whether large files are sent to the Call-Home server.
Call-Home Matrix Version	Indicates the revision level of the Call-Home matrix.

iSCSI Connectivity and Communication

Device Name	Identifies the name of the iSCSI initiator for the SAN host. An initiator encapsulates SCSI commands and data requests within iSCSI packets and transfers the packets across the IP network.
Device Alias	Identifies an easily understood, alternative name for the iSCSI device. By default, the device alias is constructed using the Oracle FS System model plus the system serial number using the following format: • Oracle FS System <model-number> SSN:<serial-number>
Header Digest	Identifies that the system is using iSCSI header digests.
Data Digest	Identifies that the system is using iSCSI data digests.

iSNS Settings

iSNS Server Registration	Identifies whether the Oracle FS System iSCSI targets are registered in the iSNS server.

iSCSI Security

Access Control	Specifies that the Oracle FS System rejects iSCSI login attempts from initiators that have not explicitly been granted permission by the user through the Oracle FS System Manager interface or Oracle FS CLI.
Authentication	Identifies the authentication of the host (initiator) during login.
Authentication Server	Indicates the server name used to authenticate the iSCSI requests.
Bi-directional CHAP Enabled	Identifies the status of the CHAP protocol for data requests (from the iSCSI initiator) and request responses (from the iSCSI target).

Pilot Overview Page

Navigation: System > Hardware > Pilots

Displays the status of the Pilots that are installed on the Oracle FS System.

Pilot	Identifies the Pilot which is labeled either 1 or 2.
Status	Displays the current status of the Pilot. A status of Normal requires no action.
Mode	Displays the current operational mode of the Pilot. Valid options: **Active** Indicates which Pilot performs all configuration tasks that administrators request. **Standby** Indicates which Pilot acts as a secondary device and does nothing unless the active Pilot fails over to this standby Pilot.
OS Version	Identifies the operating system version of the Pilot.
Server Version	Identifies the software version installed on the Oracle FS System.
Serial Number	Identifies the serial number that is assigned to the Pilot. **Note:** The serial number for the Oracle FS System, which is a different serial number than the Pilot serial number, is displayed in the System Information panel.

Related Links

View the Properties of the Pilots

Remove from Storage Domain Dialog

Navigation: System > Storage Domains > Actions > Remove from Storage Domain

Removes the selected drive group from a Storage Domain.

After a drive group is removed from a Storage Domain, the drive group is displayed as unassigned. If you want to move a drive group from one Storage Domain to another, remove the drive group from the Storage Domain and then add the drive group to a different Storage Domain.

Note: Removing drive groups from Storage Domains can take many hours and the system only processes one removal at a time. Therefore, it is recommended that you select all drive groups you need to remove and remove the drive groups in a single operation.

Migration Policy	System Chooses	(*Default*) Specifies that the system balances the resources that are needed for background data movement with the resources that are needed to service the incoming client I/O.
	Minimize Impact	Specifies that the system restricts the amount of system resources that are given to the background data movement operation. This option minimizes the impact on client I/O. Recommended for highly-loaded Storage Domains.
	Maximize Speed	Specifies that the system grants resource priority to the background data movement operation. This option reduces the amount of system resources that are available for client I/O. Recommended for lightly-loaded Storage Domains.

Related Links

Remove Drive Groups From a Storage Domain

Reporting Schedules Overview Page

Navigation: *System* > *Reporting and Statistics* > *Reporting Schedules*

Manages reporting schedules. From this page you can create, delete, and modify schedules.

Name	Displays the user defined name of the schedule.	
Report Type	SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
	Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the

		report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
	Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free, and preparing capacity is also presented per storage class.
	Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
	System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures. Note: You might want to generate and archive the *System Configuration* report as the report provides a record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.
	System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.
Start Time	Specifies the date and time to begin generating reports.	
Frequency	Specifies the frequency at which the schedule generates reports. Frequencies include:	

- Run Once
- Hourly
- Daily
- Weekly

Enabled	Specifies whether the scheduled report is active or inactive. You can activate or deactivate a reporting schedule on the Modify Reporting Schedule dialog. If you want to stop the report from being generated, you can modify the report schedule to make the report inactive by unchecking the Enable checkbox. If a schedule is inactive, you can modify the schedule to make the report active by checking the Enable checkbox.

Reporting and Statistics Overview Page

Navigation: *System* > *Reporting and Statistics*

Displays links to the Reporting Schedules Overview page and the Generated Reports Overview page.

You can schedule a report to be generated at a specific time. You can also generate real-time reports.

The Oracle FS System collects the following information and makes the information available in reports:

- Statistical information about SAN hosts
- Storage and performance information
- System configuration information

Scheduled Reports	Opens the Reporting Schedules overview page. From this page, you can view reports that are scheduled, modify scheduled reports, and schedule a report to be generated at a specific time.
Generated Reports	Opens the Generated Reports overview page. From this page, you can view reports, generate a real-time report, and download reports to a location that you choose.
Drive Group Statistics	Opens the Drive Group Statistics overview page. From this page, you can generate and download drive group statistics to a location that you choose.
CPU Statistics	Opens the CPU Statistics overview page. From this page, you can generate and download Controller CPU statistics to a location that you choose.

Security Overview Page

Navigation: System > ***Global Settings*** > *Security*

Lists the security configuration for administrator accounts. An administrator can manage the security properties from this page.

Account Security

Consecutive failed login attempts allowed	Identifies the number of times that an administrator can attempt, and fail, to log in to the Oracle FS System. When the number of failed login attempts exceeds this limit, the system locks out the account. Only the Primary system administrator and administrators having the role of Administrator 1 can unlock the account.
Session timeout period (in minutes) for all administrators	Identifies an inactivity time limit, after which an administrator session is terminated. Sessions in progress continue to use the previous value and are not affected by changes that you make. Sessions that start after you change the value use the modified session time-out value. The default for the session time-out is 999 minutes. After an administrator logs in, if the administrator is inactive for a length of time equal to the session time-out period, the Oracle FS System automatically logs the account out of the system. The session time-out period applies only to property dialogs and popup windows in the Oracle FS System Manager. The session time-out period does not apply to the main window because of activity that occurs to verify the system status and health.

Login Screen Message

Specifies a message that is displayed when system administrators log in to the Oracle FS System. You can enter up to 256 Unicode characters.

Set Event Log Filter Dialog

Navigation: System > Alerts and Events > Event Log > Actions > Set Event Log Filter

Creates and modifies the event filters that are configured on the Oracle FS System system.

Event Categories	Identifies a list of event categories. Choose from:	
	Security	Events to notify of a security problem, such as an unauthorized request.
	Audit	Events that track what users are doing, such as the operations that they performed.

	System	Events to notify of system problems, such as a missing Drive Enclosure or Controller.
Event Severities	Identifies a list of event types. Choose from:	
	Informational	Requires no action for events that are information only.
	Warning	Requires no immediate action for minor conditions that you can address at your convenience.
	Critical	Requires prompt action to prevent system failures or offline conditions.
Event Date Range	Indicates whether to filter events by occurrence date.	
	Display Events that occur in a date range	Select this option to activate the Beginning date and Ending date options. To filter the events by type and by severity level only, then clear this option.
	Beginning date	Specifies the date so that events that occurred on or after this date, and that match the selected filters, are displayed.
	Ending date	Specifies the date so that events that occurred on or before this date, and that match the selected filters, are displayed.
Reset to Defaults	Resets the page to default values. Select this option to enable all of the Event Severities and Event Categories and to clear any set date range.	

Related Links

Filter Event Log Entries

SNMP Hosts Overview Page

Navigation: System > ***Global Settings*** > *SNMP*

Displays whether any hosts were created to support the Simple Network Management Protocol (SNMP) software feature.

This page provides options to modify the SNMP host settings and delete SNMP hosts.

Name	Identifies the name for the SNMP host.
Authorized Host IP	Identifies the IP address or domain name of a client that receives the Oracle FS System SNMP information.

Community String	Identifies the community string for use when the Oracle FS System sends an event trap to the SNMP host. **Note:** When an administrator does not specify a community string for read-only access, SNMP servers and clients typically use `public`.
Receives Traps	Indicates that the SNMP host receives event traps sent to it.

Related Links

View SNMP Hosts

Status Summary Overview Page

Navigation: System > Alerts and Status > Status Summary

Displays the status and health of the Pilots, Controllers, and Drive Enclosures that are installed on the Oracle FS System.

If a Replication Engine (Oracle MaxRep for SAN or Oracle MaxRep for NAS) is configured for the Oracle FS System, information is also displayed about the Replication Engine.

If a uninterruptible power supply (UPS) is configured for the Oracle FS System, information is also displayed about the UPS.

Pilots

The Pilots table lists the following information:

Pilot	Displays the operational status of the Pilot.	
Mode	Displays the current operational mode of the Pilot.	
	Active	Indicates which server currently functions as the active Pilot and performs all requested configuration tasks.
	Standby	Indicates which server currently functions as the standby Pilot and only performs configuration tasks during a failover.
Status	Displays the status of a Pilot.	
	(Normal)	A Normal status requires no action.
	(Warning)	A Warning status requires action.
	(Critical)	A Critical status requires action.

Note: To obtain more information about the component status, select the component.

Controllers

The Controllers table lists the following information:

Controller Name	Lists the names of hardware components.
Service Type	Lists the type of Controller.
Status	Identifies the status of the Controller.

(Normal)	A Normal status requires no action.
(Warning)	A Warning status requires action.
(Critical)	A Critical status requires action.

Note: To obtain more information about the component status, select the component.

Replication Engines

Service Status	Identifies the health of the processes running on the Replication Engine.
Agent Status	Identifies the communication status of the Oracle MaxRep for SAN agents registered with the Oracle FS System.
Name	Identifies the name of the Replication Engine.
IP Address	Identifies the IP address of the Replication Engine or high availability Replication Engine cluster.

UPSs

The uninterruptible power supply (UPS) table lists the following information:

Name	Identifies the name assigned to the external UPS device.
Power Source	Identifies the source of the UPS power. Valid sources: • AC (alternating current) • Battery • Unknown
Battery Status	Identifies the status of the UPS batteries. Valid values: • Normal • Warning • Critical • Unknown

Drive Enclosures

The Drive Enclosures table lists the following information:

Drive Enclosure Name	Lists the names of hardware components.	
Status	(Normal)	A Normal status requires no action.
	(Warning)	A Warning status requires action.
	(Critical)	A Critical status requires action.

Note: To obtain more information about the component status, select the component.

Event Log

The Event Log table lists the following information:

Severity	Displays the severity level of entries in the Oracle FS System event log. Possible severity levels:	
	Informational	Requires no action for events that are information only.
	Warning	Requires no immediate action for minor conditions that you can address at your convenience.
	Critical	Requires prompt action to prevent system failures or offline conditions.
Number of Events	The number of events that have occurred on the Oracle FS System.	

Event Notification

The Event Notification table lists the following information:

Number of Recipients	Indicates the total number of email recipients.
Disabled Email Subscriptions	Indicates the number of event notifications that are currently disabled.
Enabled Email Subscriptions	Indicates the number of event notifications that are currently enabled.
Number of Monitored system Events	Indicates the number of monitored events.

Refresh

Updates the page with current data.

Storage Domains Overview Page

Navigation: System > Storage Domains

Lists the properties of each Storage Domain that is defined on this Oracle FS System.

Name

Specifies the name of the Storage Domain and the names of the drive groups that are assigned to the domain.

Note: The primary drive group in a Storage Domain is indicated by this icon . The primary drive group contains system configuration information.

Storage Domain Status

Provides the operating condition of the Storage Domain.

Status conditions include:

Normal	Indicates that no action is required.
Background Activity	Indicates that a process is running which effects the Storage Domain. For example, if you started a Compact Storage Domain process, the Storage Domain status would change from Normal to Background Activity.

Drive Group Status

Indicates the operating condition of the drive group.

Status conditions include:

Normal	The drives are accessible and no action is required.
Degraded Warning	A drive has failed but this is not yet critical. This applies only to double parity.
Degraded Critical	Two or more drives have failed. The loss of one more drive causes a failure.
Failed	Multiple drives have failed. The drives are offline and data may be lost.

Tier Reallocation

Identifies the tier reallocation status of the Storage Domain. When tier reallocation is enabled, the Oracle FS System dedicates resources and uses statistical data and QoS priority property to migrate data from one storage tier to another.

Valid states:

Enabled	Indicates that the tier reallocation is active on the Storage Domain. Enabled makes possible the migration of high-usage data to higher performing storage tiers in this Storage Domain.

Disabled	Indicates that tier reallocation is not active on the Storage Domain. Disabled does not allow the migration of high-usage data to higher performing storage tiers in this Storage Domain.
Statistics Collection Disabled	Indicates that statistical data used by the Oracle FS System to migrate the data is not collected. Oracle recommends not using this option as the statistical data is required for the tier reallocation process.
Tier reallocation disabled	Indicates that the tier reallocation is not active. The statistics collection is active.

Media Type Specifies the category of physical media that comprises the drive group.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Enclosure Chassis ID Displays the numeric identifier of the Drive Enclosure. The Enclosure Chassis ID is located and displayed on the front of the Drive Enclosure. The numeric values range from 01 to 99; the hexadecimal values from A0 to FF.

Physical Capacity

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Allocated	Displays the amount of capacity that has been assigned and designated to all logical volumes residing on the indicated Storage Domain.
Free	Displays the amount of capacity that is available for allocation in the indicated Storage Domain.
Preparing	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Domain.
Total Capacity	Displays the total amount of raw capacity provided by the Drive Enclosures that are defined within the indicated Storage Domain.
Physical Distribution	Provides a graphical representation of the capacity that is used compared to the maximum that is allocated

Storage Profiles Overview Page

Navigation: System > ***Global Settings*** > ***Storage Profiles***

Lists the Quality of Service (QoS) settings for all of the available Storage Profiles on the system. Administrators can manage custom profiles from this page.

Type	Identifies the type of the Storage Profile. Valid profile types:

Custom	Indicates a Storage Profile that consists of administrator-defined QoS settings. **Note:** Custom profiles cannot be modified. Also, if a logical volume uses a custom profile, that profile cannot be deleted.
System	Indicates a Storage Profile that ships with the Oracle FS System. **Note:** System profiles cannot be modified or deleted.

Name	Identifies the name of the Storage Profile. The name includes, in some instances, the name of the application that is associated with the profile.
RAID Level	Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives. Possible RAID levels: **Single parity** — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology. **Double parity** — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology. **Mirrored** — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.
Read Ahead	Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies: **Normal** — Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner. **Aggressive** — Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations. **Conservative** — Indicates that the input requests and the output requests are mostly

sequential and that the workload is biased toward write operations.

Priority Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:

Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.

Stripe Width Identifies the number of drive groups over which the data is written.

Possible values:

1 through **64**	Indicates the specified stripe width.
all	Indicates that the logical volume is striped across all of the available drive groups.
auto-select	Indicates that the Oracle FS System determines the stripe width based on the Priority option that you selected.

Writes Identifies the write-caching rules to use for the profile.

Valid options:

Write-through	Writes data to the Controller cache and to the storage arrays before the write request completes. This rule ensures that the data is safely written to the storage before the write request returns to the application. Write-through caching performs more slowly than does write-back caching because the data is being written to the storage arrays as well as to the cache.

Write-back caching	Writes data to the Controller cache, and the write request returns immediately without waiting for the write-to-disk to complete. During idle cycles, the system writes the data from the cache to the storage arrays. Write-back caching performs faster than does write-through because the data only needs to be written to the cache before the write request returns. **Important:** If the system goes down unexpectedly, the data in the cache that has not been written to the storage arrays could be lost. During the shutdown process, the system writes all cached data to the storage arrays.
Default	Indicates that the Oracle FS System selects the appropriate write-caching rule based on the selected QoS settings.

Preferred Storage	Indicates the preferred order in which the Oracle FS System uses the available Storage Classes.

System Alerts Overview Page

Navigation: System > Alerts and Events > System Alerts

Displays links that allow you to manage alerts that are generated when specific events occur.

You can copy the system alert information to your workstation clipboard or remove the alert as necessary.

Alert	Identifies item that caused the system alert.
Time Occurred	Indicates the date and time the system alert occurred.
Affected Items	Identifies the name of the system object that caused the system alert.
Description	Provides a brief description of the system alert.

Related Links

Display the System Alerts

System Information Page

Navigation: System > System Information

Displays the Oracle FS System information, including the name, administrator contact information, and software version. The page also provides an overview of the Controller configuration and the Storage Classes of the available Drive Groups.

The administrator controls the following fields on this page:

- Name
- Description
- Location
- Contact Name
- Contact Phone
- Asset Number

Name	Identifies the name that is assigned to the Oracle FS System. The system name also appears in the status bar.
Description	Displays the system description as defined by the system administrator.
Model	Displays the model number of Oracle FS System.
Status	Displays the overall health status of the Oracle FS System.
Controllers	Displays the number and service type of Controllers that are installed in the system. The Controller service types include: • SAN Only • NAS Only • SAN and NAS with SAN bias • SAN and NAS with NAS bias
Drive Groups	Displays the available Storage Classes that are installed in the system and the number of drives in each Storage Class.
Manufacturer	Displays the manufacturer of the Oracle FS System.
Location	Displays the system location as defined by the system administrator.
Contact Name	Displays the primary contact person as defined by the system administrator.
Contact Phone	Displays the phone number of the primary contact person as defined by the system administrator.

Asset Number	Displays the system asset number as defined by the system administrator.
Serial Number	Identifies the system serial number (SSN) that Oracle assigned to the system.
IP Address	Identifies the public IP address of the Oracle FS System management interface. This interface provides access to the Oracle FS System Manager. The administrator provides this IP address in the Interfaces tab of the **Global Settings** > Networking page.
MAC Address	Identifies the Media Access Control (MAC) address of the currently active Pilot node.
Software Version	Identifies the release level of the software and firmware modules that manage the entire Oracle FS System.

System Time Overview Page

*Navigation: System > **Global Settings** > System Time*

Displays the system time and any Network Time Protocol (NTP) servers with which the system clock is synchronized.

System Time	Identifies the current Oracle FS System date, time, and time zone.
NTP Servers	Identifies whether the Oracle FS System synchronizes its clocks with: • Network Time Protocol (NTP) servers • A manual time setting that you specify from the internal hardware clock

UPSs Overview Page

Navigation: System > Hardware > UPSs

Displays the current status of the uninterruptible power supply (UPS) battery and power.

The Oracle FS System retrieves information from each device using Simple Network Management Protocol (SNMP) over the Pilot Ethernet connection to monitor and report status. This page provides options to create and manage the UPS devices connected to the Oracle FS System.

Name	Identifies the name assigned to the external UPS device.
IP Address	Identifies the IP address that is assigned to the external UPS device.

Model	Identifies the model number of the UPS device.
Power Source	Identifies the source of the UPS power. Valid sources: • AC (alternating current) • Battery • Unknown
Battery Status	Identifies the status of the UPS batteries. Valid values: • Normal • Warning • Critical • Unknown

View Administrator Account Dialog

*Navigation: System > **Global Settings** > Administrator Accounts > Actions > View*

Displays details about the selected account from the Administrator Accounts list.

Login Name	Identifies the login name assigned to the administrator account. This field is limited to 20 characters.
Role	Identifies the authorized privileges for an administrator account. Different roles are authorized to perform different functions:

Administrator 1	The administrator role for a login account that provides the authority to perform all administrative tasks and all configuration tasks except for certain tasks that are reserved for the support roles.
Administrator 2	The administrator role for a login account that provides the authority to perform most administrative and configuration tasks. A login account assigned to this role cannot, however, perform the following tasks: • Manage the administrator accounts and other global system settings such as those settings for networking, the Controller ports, system security, and the system time. • Perform software upgrades or use Guided Maintenance to replace hardware components. • Shut down the Oracle FS System system.

Monitor	An administrator role for login accounts that provides the authority for those accounts to perform read-only management tasks and to modify their own account properties.
Support	A unique login account solely for support representatives. This login account is not authorized to modify or delete data resources, system alerts, or administrator accounts. **Important:** Use this account only if you are familiar with it or instructed by Oracle Customer Support.

For the following predefined roles, you cannot assign administrators to them and you cannot delete them:

Primary system administrator	A login account that has the same privileges as the Administrator 1 role.
Primary support administrator	A login account that has the same privileges as the Monitor role, as well as privileges to perform support-related tasks.

Full Name	Identifies the first and last name associated with the administrator account.
Email Address	Identifies the email address associated with the administrator account. The email username can have up to 64 characters and the email domain can have up to 255 characters. The email server to which the Oracle FS System sends alerts must be able to receive messages at this address. The system does not validate this address. **Note:** An IP address cannot be entered as the email domain.
Phone Number	Identifies the phone number associated with the administrator account. The Oracle FS System does not verify the validity of this entry.
Disabled	Indicates whether the administrative account is disabled. The Oracle FS System maintains disabled accounts but does not allow them to log in. A disabled account can be enabled later by modifying it. This setting takes effect immediately. If the administrator is logged in when you disable the account, the system logs out the administrator immediately. **Note:** You cannot disable the Primary system administrator account.

Related Links

Display Administrator Account Details

View Auto-Tier Graphs Dialog

Navigation: System > Storage Domains > Actions > View Auto-Tier Graphs

Displays graphically the effectiveness of the QoS Plus feature for a collection of auto-tiered LUNs.

Provides details about a collection of auto-tiered LUNs in a Storage Domain. You can select up to 10 LUNs to analyze.

Name	Identifies the name that is assigned to the LUN.
LUID	Identifies the unique identifier of the LUN.
Priority Level	Identifies the assigned priority level of the volume at the time that it was created.
Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.
Capacity Disk Capacity	Identifies the amount of capacity that is allocated to the auto-tiered LUNs that reside on RAID 6 and RAID 10 storage tiers.
Performance Disk Capacity	Identifies the amount of capacity that is allocated to the auto-tiered LUNs that reside on RAID 5 and RAID 10 storage tiers.
Capacity SSD Capacity	Identifies the amount of capacity that is allocated to the auto-tiered LUNs that reside on RAID 5 and RAID 10 storage tiers.
Performance SSD Capacity	Identifies the amount of capacity that is allocated to the auto-tiered LUNs that reside on RAID 5 and RAID 10 storage tiers.

Displays two graphs: a graph that depicts the number of data migration calculations that the system performed and another graph that summarizes the capacities by Storage Class.

Update Graphs	Creates the following graphs that are based on the data from the selected auto-tiered LUNs. Click Update Graphs to refresh the contents of the graphs.

Data Transferred By Number of Accesses	Indicates a histogram of the different regions of all of the LUNs in the Storage Domain by the frequency of I/O access.The histogram bar height represents the amount of data transferred. The y-axis is not labeled.
Tier Structure By Storage Class and Priority	Indicates a graph of the Storage Class and the capacity of the LUN regions for the selected auto-tiered LUNs. The chart also shows a number that represents the QoS priority for the auto-tiered LUN. A table at the bottom of the chart provides the list of selected LUNs. The table is also a legend for the LUNs that are represented on the graph.

Related Links

View the Auto-Tier Graphs

View Controller, Components Tab

Navigation: System > Hardware > Controllers > Actions > View > Components

Displays the status of the selected Controller and the components.

If there is a hardware failure, select the component and click Replace Component. Oracle FS System Manager (GUI) starts Guided Maintenance. Guided Maintenance presents you with a sequence of dialogs that guides you through the process of replacing a component.

Note: For more information about Guided Maintenance, refer to *Oracle FS1-2 Flash Storage System Field Service Guide.*

Comment	Displays descriptive text that is associated with a Controller. A comment can include up to 256 characters.
Identifier	Displays the World Wide Number (WWN) associated with a Controller.
Memory	Displays the amount of random access memory (RAM) provided by the DIMMs configured in the Controller.
Model	Displays the model number of the Controller.
Replaceable Unit	Lists the Controller components that are replaceable through Guided Maintenance. Select a component, and then click Replace Component to start Guided Maintenance. **Note:** For fan replacement, the Replaceable Unit list displays the names of each fan. Each power supply contains one fan, and each fan module contains two fans. If a fan fails in a power

supply, replace the power supply. If a fan fails in a fan module, replace the fan module. The following list identifies the names of the fans and the corresponding customer replaceable unit (CRU).

If the following fan fails	Replace the following CRU
Fan 0	Power supply 0
Fan 1	Power supply 1
Fans 2, 3	Fan module 0
Fans 4, 5	Fan module 1
Fans 6, 7	Fan module 2
Fans 8, 9	Fan module 3
Fans 10, 11	Fan module 4

Status	Displays the current status of a hardware component. A status of Normal requires no action.

Related Links

View the Details of a Controller

View Controller, I/O Ports Tab

Navigation: System > Hardware > Controllers > Actions > View > I/O Ports

Displays I/O port information for the selected Controller.

Slot	Location of the HBA installed on the Controller
Port	HBA port number.
Connection Type	Identifies the types of network ports for data path traffic between the customer network switches and the Controllers:

Copper	Identifies copper interfaces.
Long Wave Optical	Identifies longwave optical small form-factor pluggable (SFP) transceiver interfaces.
Short Wave Optical	Identifies shortwave optical SFP transceiver interfaces.
Unknown	Indicates that the connection type cannot be determined.

Status	Identifies the connection state between the HBA port and Controller. Possible states:

Connected	Indicates that the HBA port on the host is connected to the port on the Controller. In most operating systems, host ports log in to the Controller ports immediately after the two are physically connected and enabled and remain logged in until the physical connection is broken. So, Connected effectively means that there is an enabled physical connection between the ports.
Not Connected	Indicates that the HBA port on the host is not connected to the port on the Controller.

Note: On HP-UX platforms, however, some HBA device drivers use a different approach. These drivers log out of the connection when there is no traffic to send. The HP-UX initiator often logs out when the initiator does not discover any accessible LUNs attached to the target port. For these reasons, an HP-UX HBA port often shows as Not Connected even though there is an enabled physical connection between the ports.

Bandwidth	Displays the data rate of the port interface.
SFP Status	Displays the status of the SFP transceiver. • Bypassed • Bypassed-No SFP • Bypassed-Incorrect Speed • Bypassed-Read Error • Bypassed-Incorrect Type • Bypassed-Lost Sync If the interface module itself should fail, the SFP status shows Hardware Failure.
SFP Vendor	Displays the vendor's part number for the SFP. If that information is not available, the system displays Unknown.
SFP Part Number	Displays the vendor's part number for the SFP. If that information is not available, the field is blank or displays Unknown.
SFP Revision	Displays the part revision number for the SFP. If that information is not available, the field is blank or displays Unknown.

Related Links

View the Details of a Controller

View Controller Port Settings, Ethernet Tab

Navigation: System > ***Global Settings*** > *Controller Ports* > *Actions* > ***View Port Settings*** > *Ethernet*

Displays the Controller Ethernet port properties.

Port Information

Controller Name	Identifies the name of the Controller.
Slot Number	Identifies the Controller HBA slot number.
Port Number	Identifies the HBA port number.
Status	Identifies the HBA connection status. Valid states: • Connected • Not connected • Offline
Type	Indicates the type of HBA. Valid types: • Ethernet • Fibre Channel (FC) • Internet SCSI (Small Computer System Interface) (iSCSI) • Serial Attached SCSI (SAS)
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.
Maximum Speed	Indicates the maximum speed of the port.

Ethernet Information

MAC Address	Identifies the unique identifier of the HBA port.
MTU Bytes Maximum	Indicates the maximum number of bytes supported by the maximum transmission unit (MTU).
MTU Bytes Minimum	Indicates the minimum number of bytes supported by the maximum transmission unit (MTU).

SFP Information

Status	Identifies the small form-factor pluggable (SFP) device port status.

	Valid SFP device states: • Enabled 1 Gb • Enabled 2 Gb • Enabled 4 Gb • Enabled 8 Gb • Enabled 10 Gb • Enabled 16 Gb • No SFP • Incorrect Speed • Read Error • Incorrect Type • Loss of Sync • Other
Connection Type	Identifies the types of SFP transceiver interface devices used for data path traffic between the customer network switches and the Controllers. Valid SFP interface types: • Copper • Optical • Long Wave Optical • Short Wave Optical
Vendor	Identifies the SFP device manufacturer.
Part Number	Identifies the SFP device part number.
Revision	Identifies the SFP device revision number.

Related Links

View the Port Details for a Controller

View Controller Port Settings, Fibre Channel Tab

Navigation: System > ***Global Settings*** > *Controller Ports* > *Actions* > ***View Port Settings*** > *Fibre Channel*

Displays the Controller Fibre Channel port properties.

Port Information

Controller Name	Identifies the name of the Controller.
Slot	Identifies the Controller HBA slot number.

Port	Identifies the HBA port number.
Status	Identifies the HBA connection status. Valid states: • Connected • Not connected • Offline
Type	Indicates the type of HBA. Valid types: • Ethernet • Fibre Channel (FC) • Internet SCSI (Small Computer System Interface) (iSCSI) • Serial Attached SCSI (SAS)
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.
Maximum Speed	Indicates the maximum speed of the port.

Fibre Channel Information

Address	Identifies the unique address of the Oracle FS System Controller port on the network.
Topology	Identifies the FC transport topology in use by the ports in the network interface module (NIM) to connect to the storage area network (SAN) employed by the customer. Valid types:

Fabric	Indicates that the port is an N_Port in a switched fabric (FC-SW).
Loop	Indicates that the port is an NL_Port in an arbitrated loop (FC-AL).
Point-to-Point	Indicates that the port is an N_Port that is connected to another N_Port, back to back (FC-P2P).
Public Loop	Indicates that the port is an NL_Port that is connected to a loop in which one port in the loop is an FL_Port in the fabric (FC-FLA). **Note:** The topology used by the Backend SAS Interconnect between the Controllers and the Drive Enclosure is private and not reported.

SFP Information

Status	Identifies the small form-factor pluggable (SFP) device port status. Valid SFP device states: • Enabled 1 Gb • Enabled 2 Gb • Enabled 4 Gb • Enabled 8 Gb • Enabled 10 Gb • Enabled 16 Gb • No SFP • Incorrect Speed • Read Error • Incorrect Type • Loss of Sync • Other
Connection Type	Identifies the types of SFP transceiver interface devices used for data path traffic between the customer network switches and the Controllers. Valid SFP interface types: • Copper • Optical • Long Wave Optical • Short Wave Optical
Vendor	Identifies the SFP device manufacturer.
Part Number	Identifies the SFP device part number.
Revision	Identifies the SFP device revision number.

Related Links

View the Port Details for a Controller

View Controller Port Settings, iSCSI Tab

*Navigation: System > **Global Settings** > Controller Ports > Actions > **View Port Settings** > iSCSI*

Displays the Controller iSCSI port properties.

Port Information

Controller Name	Identifies the name of the Controller.
Slot	Identifies the Controller HBA slot number.
Port	Identifies the HBA port number.
Status	Identifies the HBA connection status. Valid states: • Connected • Not connected • Offline
Type	Indicates the type of HBA.
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.
Maximum Speed	Indicates the maximum speed of the port.

iSCSI Information

MAC Address	Identifies the unique identifier of the HBA port.
Portal Group Tag	Identifies the iSCSI target portal group tag that is assigned to the port.
Link Up	Indicates the iSCSI port link up status. Valid states: • No • Yes
iSNS Client Status	Indicates the iSNS client status for the iSCSI port. Valid states: • Access lost • Established • In progress • Unknown
MTU Bytes Minimum	Indicates the minimum number of bytes supported by the maximum transmission unit (MTU).
MTU Bytes Maximum	Indicates the maximum number of bytes supported by the maximum transmission unit (MTU).

iSCSI Settings

IP Address Assignment	Identifies the configuration method that the Oracle FS System uses to obtain the IP address of the HBA port. Valid methods: **DHCP** — Indicates that the DHCP server automatically assigns the IP addresses to network clients. **Static** — Indicates that a permanent IP address is assigned to the network client.
IP Address	Identifies the IP address that is assigned to the Oracle FS System.
Netmask	Identifies the netmask that is assigned to the Oracle FS System.
Gateway	Identifies the gateway IP address that is assigned to the Oracle FS System.
TCP Port	Identifies the Transmission Control Protocol (TCP) port number that is configured on the iSCSI port.
VLAN Enabled	Signifies whether a virtual LAN (VLAN) has been defined for the iSCSI network.
VLAN ID	Identifies the group portal tag number.
MTU	Identifies the maximum transmission unit (MTU) value for the Controller node.

SFP Information

Status	Identifies the small form-factor pluggable (SFP) device port status. Valid SFP device states: • Enabled 1 Gb • Enabled 2 Gb • Enabled 4 Gb • Enabled 8 Gb • Enabled 10 Gb • Enabled 16 Gb • No SFP • Incorrect Speed • Read Error

	• Incorrect Type • Loss of Sync • Other
Connection Type	Identifies the types of SFP transceiver interface devices used for data path traffic between the customer network switches and the Controllers. Valid SFP interface types: • Copper • Optical • Long Wave Optical • Short Wave Optical
Vendor	Identifies the SFP device manufacturer.
Part Number	Identifies the SFP device part number.
Revision	Identifies the SFP device revision number.

Related Links

View the Port Details for a Controller

View Controller Port Settings, SAS Tab

Navigation: System > ***Global Settings*** > *Controller Ports* > *Actions* > ***View Port Settings*** > *SAS*

Displays the Controller SAS port properties.

Port Information

Controller Name	Identifies the name of the Controller.
Slot	Identifies the Controller HBA slot number.
Port	Identifies the HBA port number.
Status	Identifies the HBA connection status. Valid states: • Connected • Not connected • Offline
Type	Indicates the type of HBA.
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.

Maximum Speed	Indicates the maximum speed of the port.
WWN	Identifies the world-wide name (WWN) of the Controller port.

Related Links

View the Port Details for a Controller

View Drive Enclosure, Components Tab

Navigation: System > Hardware > Drive Enclosures > Actions > View > Components

Displays status of the selected Drive Enclosure, and its components including chassis, drives, I/O modules, and power control modules.

Comment	Identifies a descriptive name that is assigned to a hardware component.
Model	Indicates the model number of the Drive Enclosure in which the drive resides.
Serial Number	Indicates the serial number of the selected Drive Enclosure.
Drive Enclosure ID	Indicates the unique identifier (the World Wide Name) of the selected Drive Enclosure.
Perform Automatic Drive Enclosure Operations	Indicates whether data protection operations, such as copyback, copy-away, and rebuild run in the background, as necessary. This option is deselected under the direction of Oracle Customer Support or as directed in a My Oracle Support (MOS) Knowledge Article.
Replaceable Unit	Indicates the Drive Enclosure components that are replaceable.
Status *(Chassis)*	Provides the operational state of the Drive Enclosure chassis. Oracle FS System Manager (GUI) displays a status icon followed by the chassis state. Possible states, by status icon: (Normal) The following operational states are associated with a normal chassis status: Normal — The chassis is operating normally. (Warning) The following operational states are associated with a warning chassis status: Unknown — The system is unable to read the chassis state.

Status *(Drives)*

Provides the operational state of the drive in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the drive state.

Possible states, by status icon:

** (Normal)**

The following operational states are associated with a normal drive status:

Normal	The drive is a member of the drive group.
Not Used	The drive is operating normally, but is not a member of a drive group.

** (Warning)**

The following operational states are associated with a warning drive status:

Booting	The drive is starting up.
Copy Away Source	The system has detected a failure on the drive and is currently copying the data to a target drive. The drive state changes to Failed when copying is complete.
Copy Away Target	The system has detected a failure on another drive and is currently copying the data to this target drive.
Copyback	An active spare drive is copying data to this drive.
Degraded Connectivity	The connection to the drive is limited to only a single Controller.
Foreign	The drive is not a member of this drive group. Accept this drive using the associated System Alert to make the drive a member of the drive group.
Missing	The drive is not found in the Drive Enclosure.
Rebuilding	The drive is a target of a rebuild operation for a drive group.

Recovered	The drive has failure history, but is now online and is not a member of a drive group.
Recovered In Use	The drive has failure history. The drive is now online and is a member of a drive group.
Shutdown	The system is in shutdown mode and cannot access the drive.
Unknown	The system is unable to read the drive state.

(Critical) The following operational states are associated with a critical drive status:

Critical	The drive has experienced a failure.
Restore	The drive is currently being restored.

Status *(I/O modules)* Provides the operational state of the I/O module in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the I/O module state.

Possible states, by status icon:

(Normal) The following operational states are associated with a normal I/O module status:

Normal	The I/O module is operating normally.

(Warning) The following operational states are associated with a warning I/O module status:

Offline	The I/O module is offline.
Missing	The I/O module is not found in the Drive Enclosure.
Unknown	The system is unable to read the I/O module state.

(Critical) The following operational states are associated with a critical I/O module status:

Critical	The I/O module has experienced a failure.

Status *(Power Cooling Module)*	Provides the operational state of the Drive Enclosure power cooling module. Oracle FS System Manager (GUI) displays a status icon followed by the power cooling module state. Possible states, by status icon: (Normal) The following operational states are associated with a normal power cooling module status: Normal — The power cooling module is operating normally. (Warning) The following operational states are associated with a warning power cooling module status: **Offline** — The system reports that the power cooling module is failed or is disabled. Missing — The power cooling module is not found in the Drive Enclosure. Warning — The power cooling module is functioning but shows signs of failure. Unknown — The system is unable to read the power cooling module state. (Critical) The following operational states are associated with a critical power cooling module status: Critical — The power cooling module has experienced a failure.

The system displays details about the selected replaceable component.

Chassis information	Provides detailed information about the selected chassis.
Number	Indicates the number that uniquely identifies the chassis within the Drive Enclosure.
Status	Indicates the operational state of the component.
Part Number	Indicates the manufacturer part number of the component.
Serial Number	Indicates the serial number of the component.
Drive information	Provides detailed information about the selected drive.
Status	Indicates the operational state of the drive.

Model	Indicates the manufacturers model number of the drive.
Serial Number	Indicates the serial number of the drive.
Firmware Number	Indicates the firmware version number of the drive.
Drive Slot Number	Indicates the Drive Enclosure slot number where the drive is installed.
Storage Class	Specifies the category of physical media that comprises the drive group. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class

		always provides the lowest cost for each GB of capacity.
	Drive Enclosure	Indicates the unique identifier of the Drive Enclosure.
	Drive Capacity	Indicates the storage capacity of the drive.
	Remaining Life Expectancy	*(SSD only)* Indicates the remaining months in the life of the drive.
I/O Module information	Provides detailed information about the selected I/O module.	
	Number	Indicates the number that uniquely identifies the I/O module within the Drive Enclosure.
	Status	Indicates the operational state of the I/O module.
	Part Number	Indicates the manufacturer part number of the I/O module.
	Serial Number	Indicates the serial number of the I/O module.
	Firmware Number	Indicates the firmware version number of the I/O module.
Power Cooling Module information	Provides detailed information about the selected Power Cooling Module.	
	Status	Indicates the operational state of the Power Cooling Module.
	Model	Indicates the manufacturer model number of the Power Cooling Module.
	Serial Number	Indicates the serial number of the Power Cooling Module.
	Number of Fans	Indicates the number of cooling fans in the Power Cooling Module.
	Number of Failed Fans	Indicates the number of failed cooling fans in the Power Cooling Module.

Related Links

View the Details of a Drive Enclosure

View Drive Enclosure, I/O Ports Tab

Navigation: System > Hardware > Drive Enclosures > Actions > View > I/O Ports

Displays the status of I/O ports of the Serial Attached SCSI (SAS) of the selected Drive Enclosure.

Port	Lists the *PHYs* that are associated with the I/O module port.
Phy State	Indicates the state of the PHY connection. A wide port has two or more of the PHY states indicate Link Up. A narrow port has only one PHY state is Link Up. Possible states: **Link Up** — Indicates that the PHY connection is functioning properly. **Link Down** — Indicates that the PHY connection is disconnected. **Disabled** — Indicates that the PHY connection is disabled. **Reset** — Indicates that the system is resetting the PHY connection.
Negotiated Speed	Indicates the port transmission speed in Gigabits each second.
Maximum Speed	Indicates the maximum speed of the port.

Related Links

View the Details of a Drive Enclosure

View Drive Group Dialog

Navigation:

- *System* > *Storage Domains* > *Actions* > *View Drive Group*
- *System* > *Hardware* > *Drive Groups* > *Actions* > *View*

Displays information about the drive group.

Replaceable Unit

Replaceable Unit	Displays the drives available in a drive group. The details about a selected drive are displayed on the right-hand side of the dialog.
Status *(Drives)*	Provides the operational state of the drive in the drive group. Oracle FS System Manager (GUI) displays a status icon followed by the drive state. Possible states, by status icon: (Normal) — The following operational states are associated with a normal drive status:

Normal	The drive is a member of the drive group.
Not Used	The drive is operating normally, but is not a member of a drive group.

(Warning) The following operational states are associated with a warning drive status:

Booting	The drive is starting up.
Copy Away Source	The system has detected a failure on the drive and is currently copying the data to a target drive. The drive state changes to Failed when copying is complete.
Copy Away Target	The system has detected a failure on another drive and is currently copying the data to this target drive.
Copyback	An active spare drive is copying data to this drive.
Degraded Connectivity	The connection to the drive is limited to only a single Controller.
Foreign	The drive is not a member of this drive group. Accept this drive using the associated System Alert to make the drive a member of the drive group.
Missing	The drive is not found in the Drive Enclosure.
Rebuilding	The drive is a target of a rebuild operation for a drive group.
Recovered	The drive has failure history, but is now online and is not a member of a drive group.
Recovered In Use	The drive has failure history. The drive is now

		online and is a member of a drive group.
	Shutdown	The system is in shutdown mode and cannot access the drive.
	Unknown	The system is unable to read the drive state.
(Critical)	The following operational states are associated with a critical drive status:	
	Critical	The drive has experienced a failure.
	Restore	The drive is currently being restored.

Make this drive group the primary drive group	Make the drive group the primary drive group within the Drive Enclosure. The primary drive group contains system configuration data.

RAID Levels and Status

RAID Level — Indicates the types of RAID data protection that is provided by the selected drive group.

Each entry in the table represents a particular set of minimum allocation units (MAUs) in the drive group. Each of the MAUs in a given set has the same level of RAID protection, forming a RAID protection segment for the drive group.

If a drive goes offline, the event affects all of the MAUs in the protection segment in the same way. Therefore, the reported status for a given RAID level applies to the entire protection segment.

Single Parity	Indicates that each of the MAUs in the RAID protection segment uses one set of parity bits to protect against the loss of one drive in the drive group. Single parity is implemented as a variant of the RAID 5 storage technology.
Double Parity	Indicates that each of the MAUs in the RAID protection segment uses two sets of parity bits to protect against the loss of one or two drives in the drive group. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that each of the MAUs in the RAID protection segment is written across two drives in the drive group. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

RAID Status	Possible states:	
	Normal	Indicates that the drive group is accessible and no action is required.
	Degraded Warning	Indicates that the drive has failed in the drive group, but the drive group is still accessible. Replace the failed drive. If the drive group is the primary drive group, then replace the drive immediately. The primary drive group contains system overhead, including all system configuration data.
	Degraded Critical	Indicates that two or more of the drives have failed. The drive group can become inaccessible unless you replace the drives.
	Failed	Indicates that multiple drives have failed. The drive group is not accessible. Replace the failed drives. After the failed drives are replaced, the drive group becomes accessible.
	Unknown	Indicates that the drive status information is not available to display.

View Event Notification Dialog

*Navigation: System > Alerts and Events > **Event Notification** > Actions > View*

Displays event notices.

When an event is triggered, the Oracle FS System sends a notification to the designated email recipients.

Name	Displays the user-defined name of the event notification.
Description	Displays the user-defined description of the event notification.
Enable Event Notification	Displays whether the event notification is enabled. When checked, this option activates the notification when the event occurs on the Oracle FS System.
Event Notification Recipient Email Addresses	Displays the email addresses of the recipients who are to receive event notifications. The email server to which the Oracle FS System sends notifications must be able to send messages to these email addresses.

Monitored Events

By severity, then category	Sorts the list of events by severity with a list of event categories. The severity categories include:

	Informational	Requires no action for events that are information only.
	Warning	Requires no immediate action for minor conditions that you can address at your convenience.
	Critical	Requires prompt action to prevent system failures or offline conditions.
By category, then severity	Sorts the list of events by categories with a list of event severity. The categories include:	
	Security	Events to notify of a security problem, such as an unauthorized request.
	Audit	Events that track what users are doing, such as the operations that they performed.
	System	Events to notify of system problems, such as a missing Drive Enclosure or Controller.
Events Not Monitored	Displays the list of events not set to be monitored. The Oracle FS System does not trigger a notification when an event listed occurs.	
Monitored Events	Displays the list of events that you specified to be monitored. The Oracle FS System triggers a notification each time an event that you specified occurs. The email addresses specified in the **Event Notification Recipient Email Addresses** field receive the event notifications.	

Related Links

Display the Event Notification Details

View Pilot Dialog

Navigation: System > Hardware > Pilots > Actions > View Pilot

Displays the status of the selected Pilot management controller that is installed on the Oracle FS System.

Control Unit Number	Identifies the node of the Pilot, which is either 1 or 2.
Operation Mode	Displays the current operational mode of the Pilot. Possible modes:

	Active	Indicates which Pilot performs all configuration tasks that administrators request.
	Standby	Indicates which Pilot acts as a secondary (passive) device and if the active Pilot fails over to this standby Pilot. The passive Pilot monitors the health of the active Pilot and Controller but is not active in managing the data resources of the Oracle FS System.
	Unknown	Indicates that the Pilot operational state could not be determined.
Status	Displays the current operational state of the Pilot.	
	Possible states:	
	Normal	Indicates that the Pilot is operating normally.
	Warning	Indicates that the Pilot has a minor error that requires attention at your earliest convenience.
	Critical	Indicates that the Pilot has a major error that requires prompt action.
	Booting	Indicates that the Pilot is starting up.
	Upgrading	Indicates that the Pilot firmware is being updated.
	Shutdown	Indicates that the Pilot is shutting down.
Configuration Server Status	Indicates the state of the configuration server that runs from the active Pilot.	

Pilot Network Connectivity

Provides the port status of the following network interfaces for the Pilot.

Ethernet 0	Indicates the connectivity status of the PilottoPilot interface connection.	
	Possible states:	
	Connected	Indicates that the port connection is normal and no administrator action is required.
	Not Connected	Indicates that the port cannot connect.

	Unknown	Connection state cannot be determined.

Ethernet 1 — Indicates the connectivity status of the PilottoController interface connection.

Possible states:

Connected	Indicates that the port connection is normal and no administrator action is required.
Not Connected	Indicates that the port cannot connect.
Unknown	Connection state cannot be determined.

Management — Indicates the connectivity status of the external management network.

Possible states:

Connected	Indicates that the port connection is normal and no administrator action is required.
Not Connected	Indicates that the port cannot connect.
Unknown	Connection state cannot be determined.

Serial — Indicates the connectivity status of the internal Pilot-to-Pilot communication.

Possible states:

Connected	Indicates that the port connection is normal and no administrator action is required.
Not Connected	Indicates that the port cannot connect.
Unknown	Connection state cannot be determined.

Service Port — Indicates the connectivity status of the service port, which is reserved for Oracle use.

Possible states:

Connected	Indicates that the port connection is normal and no administrator action is required.
Not Connected	Indicates that the port cannot connect.
Unknown	Connection state cannot be determined.

Consistency of Status — Identifies the connection reliability of the network interfaces.

Possible states:

Consistent	Indicates that the connection is reliable.
Inconsistent	Indicates that the connection is not reliable. You will need to perform troubleshooting to resolve the problem. Inconsistent status might not be caused by network issues, particularly on the Ethernet and the Serial ports.

Related Links

View the Network Connectivity of a Pilot

View Reporting Schedule Dialog

Navigation: *System* > *Reporting and Statistics* > *Reporting Schedules* > *Actions* > *View Schedule*

Displays details about the selected reporting schedule.

Schedule Name	Displays the user defined name of the schedule.	
Report Type	SAN Hosts	Provides detailed configuration information on the host servers and configured components currently included in your storage area network (SAN). The data includes the SAN Host operating system, Fibre Channel Initiator, Fibre Channel ports, load balancing settings, LUNs, and other information describing the SAN Hosts.
	Storage Performance	Provides performance information about the LUNs on the Oracle FS System at the time the report was generated. The performance data includes: read operations per second, write operations per second, and total read and write operations per second; read MB per second, write MB per second, and total read and write MB per second for each LUN. Additional storage performance data, including real-time statistics, is available for each LUN from the SAN > Statistics and Trending > LUNs feature.
	Storage Use	Provides capacity information on the storage currently available on the Oracle FS System. The data includes the total, allocated, free, and preparing capacity for all available storage. The data for total, allocated, free,

	and preparing capacity is also presented per storage class.
Storage Use per Volume	Provides capacity information for each logical volume on the Oracle FS System. The data includes the allocated, maximum, and used capacity per volume.
System Configuration	Provides detailed information on the configuration and current status of the Oracle FS System and all of its components, such as serial numbers, firmware versions, ports, and status, for the Pilot, Controllers, and Drive Enclosures. **Note:** You might want to generate and archive the *System Configuration* report as the report provides a record of your system configuration at the time the report was generated. A record of system changes would be useful for system planning and customer support.
System Configuration Summary	Provides a summary of the Pilot, Controllers, and Drive Enclosures information included in the detailed *System Configuration* report. The data includes the current status of the components listed above and system information.

Enabled	Specifies whether the scheduled report is active or inactive. To make a scheduled report active, check the Enable checkbox. If you do not want the scheduled report to be active, do not check the Enable checkbox. The scheduled report is still listed under Reporting Schedule but reports are not generated.
Start Time	Specifies the date and time to begin generating reports.
Schedule Frequency	Specifies the frequency at which the schedule generates reports. Frequencies include: • Run Once • Hourly • Daily • Weekly
Recurrence	Specifies how many hours, days, or weeks to wait before generating this scheduled report again. You can also specify a specific day on which you want the report to be generated.

Related Links

View a Reporting Schedule

View SNMP Host Dialog

*Navigation: System > **Global Settings** > SNMP > Actions > View SNMP Host*

Displays information about the selected Simple Network Management Protocol (SNMP) trap hosts.

Name	Identifies the name for the SNMP host.
Host IP	Identifies the IP address or domain name of a client that receives the Oracle FS System SNMP information.
Community string	Identifies the community string for use when the Oracle FS System sends an event trap to the SNMP host. **Note:** When an administrator does not specify a community string for read-only access, SNMP servers and clients typically use `public`.
Receive traps	Indicates that the SNMP host receives event traps sent to it.
Severity threshold	Identifies the severity threshold for events that the system sends to the SNMP host by event traps. Severity levels: • Informational • Warning • Critical

Related Links

View SNMP Hosts

View Storage Allocation Details Dialog

Navigation: System > Storage Domains > Actions > View Storage Allocation Details

Displays, by Storage Class, the storage capacities for all of the single tier LUNs and auto-tier LUNs in the selected Storage Domain.

For each available Storage Class, the system displays a graph for the following storage capacities.

Single Tier	Indicates the allocated storage capacity for single tier LUNs.
Auto Tier	Indicates the allocated storage capacity for auto-tier LUNs. The solid portion of the graph identifies the allocated capacity that is using to RAID 5 or RAID 6. The shaded portion of the graph identifies the allocated capacity that is using to RAID 10. **Note:** RAID 6 is only available on a Capacity HDD Storage Class.

Immobile	Indicates that the storage capacity cannot move to a lower cost, lower performance Storage Class. You can reduce immobile capacity by including low performance Storage Classes in the LUNs. The solid portion of the graph identifies the allocated capacity that is using to RAID 5 or RAID 6. The shaded portion of the graph identifies the allocated capacity that is using to RAID 10. **Note:** RAID 6 is only available on a Capacity HDD Storage Class.
Free	Displays the amount of capacity that is available for allocation in the indicated Storage Domain.
Unused	Displays the amount of capacity that is allocated for, but not used by auto-tiered LUNs. The unused free capacity can only be used for auto-tiered LUNs. Compact the Storage Domain to release the unused space for non-auto-tiered LUNs.
Preparing	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Domain.

Related Links

View Storage Allocation Details

View Storage Domain Dialog

Navigation: System > Storage Domains > Actions > View Storage Domain

Displays information about the selected Storage Domain.

Storage Domain Capacity by Storage Class

Displays graphically the storage classes, and their capacities, for the selected Storage Domain.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce

	the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

For each storage class, the system graphically displays the Storage Domain physical capacities. The graph uses colored bars of different thicknesses to indicate the capacity status of each storage class. Hover the mouse pointer over each graph to display the capacity type.

Note: Drive manufacturers often report drive capacities in decimal units (powers of 10). An Oracle FS System reports the capacity of physical storage and the size of logical volumes in binary units (powers of two):

1 MB = 1024^2 (1,048,576) bytes
1 GB = 1024^3 (1,073,741,824) bytes
1 TB = 1024^4 (1,099,511,627,776) bytes

Possible physical storage capacities:

Free Space	Displays the amount of capacity that is available for allocation in the indicated Storage Class.
Used Capacity	Displays the amount of capacity that is consumed by data and system overhead.
Total Capacity	Displays the total amount of raw capacity provided by the drive groups that are defined within the indicated Storage Class.
Allocated Space	Displays the amount of capacity that has been assigned and designated to all storage classes residing on the indicated Storage Class.
Preparing Capacity	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Class.
Allocated to Logical Maximum	Displays the maximum capacity to which the Storage Class can grow.

Name	Specifies the name of this Storage Domain. This name must be unique within the Oracle FS System.	
Background Process Priority	System Chooses	(*Default*) Specifies that the system balances the resources that are needed for background data

	movement with the resources that are needed to service the incoming client I/O.
Minimize Impact	Specifies that the system restricts the amount of system resources that are given to the background data movement operation. This option minimizes the impact on client I/O. Recommended for highly-loaded Storage Domains.
Maximize Speed	Specifies that the system grants resource priority to the background data movement operation. This option reduces the amount of system resources that are available for client I/O. Recommended for lightly-loaded Storage Domains.

Enable Tier Reallocation	Specifies that any tiered data that resides in this Storage Domain has data progression enabled. Individual objects might have tier reallocation disabled. Enabling tier reallocation at the Storage Domain level does not override any objects that have tier reallocation disabled. The default value is enabled.
Enable Tier Reallocation Statistics Collection	Collects data usage patterns for the Storage Domain internally to analyze and determine the optimum storage classes for the data. The default value is enabled. It is recommended you do not change this setting unless you need to test different profiles. Disable this setting if you are modifying your storage profile for testing purposes and did not want to collect statistics during the test. You do not want to collect tier reallocation statistics during the test as this might distort future tier reallocation. After you complete testing, enable tier reallocation statistics collection. **Note:** Enabling or disabling the tier reallocation statistics collection has no effect on statistics you can view for CPU, drive groups, Filesystems, or LUNs. (Those are a different set of statistics.)

Auto-Tier Scan Options (Advanced)

Optimizes the auto-tier algorithm for moving data to different Storage Classes. You can specify the interval for when auto-tier moves frequently accessed data blocks and infrequently accessed data blocks to match your application activity.

Performance-Optimizing Scan Cycle	Specifies the frequency, in hours, that auto-tier scans to move frequently accessed data blocks to a high performance Storage Class. For example, a value of 32 means that every 32 hours auto-tier scans the system to move frequently accessed data blocks to a high performance Storage Class.

	Updates to this field affect the label of the Number of *n*-hour Scan Cycles field. For example, a value of 32 changes the label for the Number of *n*-hour Scan Cycles to Number of 32-hour Scan Cycles.
Number of 24-hour Scan Cycles	Specifies the frequency that auto-tier runs the performance-optimizing scan cycles before auto-tier runs the cost-optimizing scan cycle. The value entered in the Number of n-hour Scan Cycles field is multiplied by the value entered in the Performance-Optimizing Scan Cycle field to obtain the value set in the Cost-Optimizing Scan Cycle field. For example, a value of 5 means that every fifth time that auto-tier runs the performance-optimizing scan cycle, auto-tier then runs the cost-optimizing scan cycle to move infrequently accessed data to a less expensive storage class.
Cost-Optimizing Scan Cycle	*(Read-only)* Displays the frequency, in hours, that auto-tier scans to move infrequently accessed data blocks to a less expensive Storage Class. The value displayed in this field is calculated as the product of the value you entered in the Performance-Optimizing Scan Cycle field and the value you entered in the Number of n-hour Scan Cycles field.

Allowable Storage Capacity for Auto-Tiered LUNs

Indicates the maximum percentage of storage capacity to dedicate to auto-tier reallocation for each Storage Class of the Storage Domain.

Related Links

View the Properties of a Storage Domain

View Storage Domains Dialog

Navigation:

NAS > Storage > Filesystems > Actions > Create Filesystem > View Storage Domains

SAN > Storage > LUNs > Actions > Create LUN > View Storage Domains

Displays properties of the available Storage Domains and associated drive groups.

Name	Specifies the name of the Storage Domain and lists the Drive Enclosures and drive groups that are assigned to the domain.
Status	Displays the status of the Storage Domains and of the drive groups that are associated with those Storage Domains. Normal means that no action is required.

Normal	Indicates that the drive group is accessible and no action is required.
Degraded Warning	Indicates that the drive has failed in the drive group, but the drive group is still accessible. Replace the failed drive. If the drive group is the primary drive group, then replace the drive immediately. The primary drive group contains system overhead, including all system configuration data.
Degraded Critical	Indicates that two or more of the drives have failed. The drive group can become inaccessible unless you replace the drives.
Failed	Indicates that multiple drives have failed. The drive group is not accessible. Replace the failed drives. After the failed drives are replaced, the drive group becomes accessible.
Unknown	Indicates that the drive status information is not available to display.

Tier Reallocation

Identifies the tier reallocation status of the Storage Domain. When tier reallocation is enabled, the Oracle FS System dedicates resources and uses statistical data and QoS priority property to migrate data from one storage tier to another.

Valid states:

Enabled	Indicates that the tier reallocation is active on the Storage Domain. Enabled makes possible the migration of high-usage data to higher performing storage tiers in this Storage Domain.
Disabled	Indicates that tier reallocation is not active on the Storage Domain. Disabled does not allow the migration of high-usage data to higher performing storage tiers in this Storage Domain.
Statistics Collection Disabled	Indicates that statistical data used by the Oracle FS System to migrate the data is not collected. Oracle recommends not using this option as the statistical data is required for the tier reallocation process.
Tier reallocation disabled	Indicates that the tier reallocation is not active. The statistics collection is active.

Media Type

Specifies the category of physical media that comprises the drive group.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Enclosure Chassis ID	Displays the numeric identifier of the Drive Enclosure. The Enclosure Chassis ID is located and displayed on the front of the Drive Enclosure. The numeric values range from 01 to 99; the hexadecimal values from A0 to FF.

Physical Capacity

Allocated	Displays the amount of capacity that has been assigned and designated to all logical volumes residing on the indicated Storage Domain.
Free	Displays the amount of capacity that is available for allocation in the indicated Storage Domain.
Unavailable	Displays the amount of capacity that is being initialized. This value typically results from a volume having been deleted. This value decreases over time while the value for free space correspondingly increases for the indicated Storage Domain.
Total Capacity	Displays the total amount of raw capacity provided by the Drive Enclosures that are defined within the indicated Storage Domain.

Physical Distribution	Provides a graphical representation of the capacity that is used compared to the maximum that is allocated.

Related Links

Create Auto-Tiered LUN: Define Quality of Service

Create Single-Tier LUN: Define Quality of Service

View Storage Profile Dialog

Navigation: System > ***Global Settings*** > ***Storage Profiles*** > *Actions* > ***View Storage Profile***

Displays the properties of a Storage Profile.

Name	Identifies the name of the Storage Profile. The name includes, in some instances, the name of the application that is associated with the profile.
RAID Level	Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives. Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead	Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:

Premium	Indicates the highest priority for responding to requests in the processing queue.
High	Indicates the next highest priority for responding to requests in the processing queue.
Medium	Indicates an intermediate priority for responding to requests in the processing queue.
Low	Indicates the next to lowest priority for responding to requests in the processing queue.
Archive	Indicates the lowest priority for responding to requests in the processing queue.

Advanced

Displays addition QoS properties of the Storage Profile.

Writes Identifies the write-caching rules to use for the profile.

Valid options:

Write-through	Writes data to the Controller cache and to the storage arrays before the write request completes. This rule ensures that the data is safely written to the storage before the write request returns to the application. Write-through caching performs more slowly than does write-back caching

		because the data is being written to the storage arrays as well as to the cache.
	Write-back caching	Writes data to the Controller cache, and the write request returns immediately without waiting for the write-to-disk to complete. During idle cycles, the system writes the data from the cache to the storage arrays. Write-back caching performs faster than does write-through because the data only needs to be written to the cache before the write request returns. **Important:** If the system goes down unexpectedly, the data in the cache that has not been written to the storage arrays could be lost. During the shutdown process, the system writes all cached data to the storage arrays.
	Default	Indicates that the Oracle FS System selects the appropriate write-caching rule based on the selected QoS settings.

Stripe Width	Identifies the number of drive groups over which the data is written. Possible values:
	1 through **64** Indicates the specified stripe width.
	all Indicates that the logical volume is striped across all of the available drive groups.
	auto-select Indicates that the Oracle FS System determines the stripe width based on the Priority option that you selected.

Preferred Storage Classes

Displays the Storage Class media on which the logical volume resides and the preferred order that the Oracle FS System uses the media.

Preferred Order	Indicates the preferred order in which the Oracle FS System uses the available Storage Classes.
Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Related Links

View Storage Profiles

View UPS Dialog

Navigation: System > Hardware > UPSs > Actions > View UPS

Displays properties of a selected uninterruptible power supply (UPS) device.

Name	Identifies the name of the UPS device. UPS names must be unique across the Oracle FS System and must be 256 or fewer UTF-8 characters.
IP Address	Identifies the IP address that is assigned to the external UPS device.
SNMP Community	Identifies a community for which a specific trap host should receive traps that the Oracle FS System generates. You can specify different community strings for each trap host so that multiple administrators can receive specific types of SNMP traps. The default community string is public (lower case). It is recommend you change the default community string. **Note:** This community string entered here must match the community string configured on the UPS device.

Current Status

Provides read-only details and status about the UPS device. You cannot modify this information.

Model	Identifies the model number of the UPS device.
Firmware Revision	Identifies the firmware version that is installed on the UPS device.
Serial Number	Identifies the serial number of the UPS device.
Power Source	Identifies the source of the UPS power. Valid sources: • AC (alternating current) • Battery • Unknown
Battery Status	Identifies the status of the UPS batteries. Valid values: • Normal • Warning • Critical • Unknown
Communication Status	Identifies the communication status between the UPS device and the Oracle FS System system. Valid values: • OK • Failed

Related Links

View a UPS Device

APPENDIX C

SAN Tab Reference Pages

Additional Options Dialog

Navigation: *SAN* > *Storage* > *LUNs* > *Actions* > ... > *Quality of Service* > *Auto-tier* > *Additional Options*

Lets you select which Storage Classes to use for tier migration. You can also specify whether tier migration is enabled for the auto-tiered LUN.

Storage Classes for Auto-Tiering

Use All Classes	Specifies that the auto-tiering feature uses all of the Storage Classes that are available on the Oracle FS System. **Note:** Oracle recommends using the default value of Use All Classes.
Use only the following	Specifies that the auto-tiered LUN uses only the selected Storage Classes. Deselecting a Storage Class from the list excludes that Storage Class and its capacity from tier migration. Excluding less expensive Storage Classes and including high performance Storage Classes causes *immobile* storage capacity. Immobile data occurs when the system cannot migrate the data to a lower Storage Class. Data that cannot migrate to a lower Storage Class is considered immobile and the storage capacity that this data occupies is immobile. Immobile capacity can significantly restrict the efficiency of tier migration. **Note:** A Storage Class that contains the text "(not present)", indicates that the particular class is not available in the Storage Domain. However, when the storage becomes available then the tier migration process uses that Storage Class.
Tier Reallocation Enabled	Specifies whether to apply storage tier migration to the LUN. Selecting the Tier Reallocation Enabled option does not override the disabled Tier Reallocation setting in the Storage Domain. When enabled, the system moves data from one storage tier to another storage tier to achieve the best overall performance and lowest overall cost. For the tier migration process to work,

select the Tier Reallocation Enabled option and enable the same option in the Storage Domain.

Related Links

Managing SAN LUNs
Create Auto-Tiered LUN: Define Quality of Service
Modify Auto-Tiered LUN: Define Quality of Service

Associate Hosts Dialog

Navigation: SAN > Storage > Hosts > Actions > Associate Hosts

Enables the Oracle FS System to recognize Fibre Channel (FC) or iSCSI SAN hosts that do not have Oracle FS Path Manager installed.

Host Name	Identifies the SAN host that accesses LUNs or Clone LUNs configured on the Oracle FS System.

Create Association

Specifies the name of the SAN initiator that is used for the SAN host association.

Valid options:

Specify WWN	Specifies the Fibre Channel port world-wide name (WWN) that the Oracle FS System has not discovered.
Select iSCSI device name	Specifies the iSCSI initiator name that the Oracle FS System has not discovered.
Select from discovered WWNs	Specifies the list Fibre Channel port WWNs that the Oracle FS System discovered on the network.
Select from discovered iSCSI Names	Specifies the list of iSCSI initiator names that the Oracle FS System discovered on the network.

iSCSI Host Specific Settings

Enable Authentication	Indicates whether the Challenge Handshake Authentication Protocol (CHAP) protocol for iSCSI sessions between the SAN host and the Oracle FS System is enabled. **Note:** Depending on the global settings, the CHAP name property and the CHAP secret property might not be required. Those properties are not required, for example, when authentication is performed through a RADIUS server.
CHAP Name	Identifies the name of the iSCSI initiator that is to be used during authentication.

CHAP Secret	Identifies the encrypted CHAP authentication password (secret) to be used in the exchange of user names and secrets between two devices. Both devices must support Point-to-Point (PPP) authentication. **Note:** The Oracle FS System supports up to 100 UTF-8 non-integer characters. However, when connecting to Windows servers, you must limit the secret to a value from 12 to 16 characters in length.
Retype CHAP Secret	Confirms the encrypted CHAP authentication password.
Grant Access to Oracle FS	Specifies whether the Oracle FS System must reject iSCSI login attempts from initiators that have not explicitly been granted permission by the user through the Oracle FS System Manager interface or through the Oracle FS System Command Line Interface (CLI).

Associations

Type	Identifies the type of initiator that is associated with the SAN host entry.
HBA Alias	Identifies an alternative friendly name that is assigned to the host port.
Device / HBA Port Name	Identifies the name of the device or initiator that is associated with the SAN host entry.

Controls

Remove	Deletes the selected objects.

Related Links

Create an Associated Host Entry

Controller Protocol Statistics Overview Page

Navigation: *SAN* > *Statistics and Trending* > *Controller Protocols*

Displays statistics for storage area network (SAN) protocols. The SAN protocols are either Fibre Channel (FC) or Internet Small Computer System Interface (iSCSI)

Name	Identifies the name of the selected Controller.
Port Type	Identifies the Controller port protocol type, FC, or iSCSI.
Slot Number	Identifies the Controller PCI slot assignment.
Port Number	Identifies the port numbers which are 0 or 1.

Negotiated Speed	Displays the transmission speed in Gbps/second for the port. The transmission speed is negotiated between the HBA or FC switch and the Controller.
Throughput (per Second)	Identifies the throughput in MB/second. Read Identifies the read throughput in MB/second. Write Identifies the write throughput in MB/second.
I/O Latency	Identifies the time in milliseconds to read or write data. Displays the following: Read Identifies the time to read data in milliseconds. Write Identifies the time to write data in milliseconds Combined Identifies the combined amount of time to read and write data in milliseconds.
I/O Size	Identifies the average size of the read and write operations.
Commands Received (per Second)	Displays the number of read and write commands received on the Oracle FS System each second over the last sampling period.
Channel Errors Since Activated	Displays the cumulative number of channel errors that have occurred since the Controller was activated.
Collection Period	Identifies the start and end times at which information was last collected from the Oracle FS System. Data is collected for a two-minute period and the data is refreshed every two minutes.

To generate real-time statistics about an FC or iSCSI port, select the port, then select Actions > FC Port Real Time Statistics or iSCSI Port Real Time Statistics. Click Add Graph and select a statistic (you can review the following list for details.

The statistics displayed include:

Read IOPS	Indicates the number of read I/O operations per second.
Write IOPS	Indicates the number of write I/O operations per second.
Total IOPS	Indicates the total number of read and write IOPS.
Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive during read operations.
Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive during write operations.
Total bytes per second	Displays the total number of bytes for read and write operations.

Related Links

View SAN Controller Protocols

Copy SAN LUN, Data Protection Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > Copy > Data Protection > Auto Tier

Adds data protection schedules to LUN copies. You can also manage data replication schedules from this page.

Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clone Storage

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.

Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Initial Storage Class	Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic	Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired. **Note:** After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Initial Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

Initial I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

Initial RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- Double parity — Indicates that, in addition to the actual data, two sets of parity bits

exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.

Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.

Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.
Additional Options	Displays a dialog that allows you to select Auto Tier Storage Class options.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled. **Enabled** — Indicates that the scheduled operation performs at the specified time. **Disabled** — Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.
Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

QoS Policies
Copy a LUN

Copy SAN LUN, Data Protection Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Copy > Data Protection > Single Tier

Adds data protection schedules to LUN copies. You can also manage data replication schedules from this page.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity by Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clone Storage

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much

	addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone QoS Storage

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.

Capacity Disk — Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic — Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost

data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.

Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.

Mirrored — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the

performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

- Premium — Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
- High — Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
- Medium — Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
- Low — Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
- Archive — Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

- Name — Identifies the name of the schedule.
- Start Time — Identifies the date and time that the schedule begins.
- Frequency — Identifies the frequency at which the schedule runs. Frequencies include:

- Run Once
- Hourly
- Daily
- Weekly

Enabled	Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.

Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

Copy a LUN

Copy SAN LUN, Mapping Tab

Navigation: SAN > Storage > LUNs > Actions > Copy > Mapping

Creates the LUN-to-host mapping settings for a logical volume.

Access Protocol	Specifies the protocols that are allowed for accessing the logical volume. Valid options:

Fibre Channel (FC)	Specifies that hosts can use the FC protocol to access this LUN. **Tip:** The system always uses FC paths at a preference over iSCSI paths. Also, load balancing is not mixed between these two protocols.
iSCSI	Specifies that hosts can use the iSCSI protocol to access this LUN.

Only selected hosts (via maps)	Specifies that only designated SAN hosts can access this LUN using a specific, possibly different, LUN number on each of those hosts. If the LUN is mapped, the LUN number must be unique to the mapped SAN host.

All hosts may access this LUN using LUN Number	Specifies all SAN hosts accessing this LUN use the same LUN number. Select this option to activate the LUN number selection drop-down list.

LUN Controller Assignment

The LUN Controller Assignment option allows you to home the LUN copy on a Controller other than the Controller on which the source LUN is homed. The default is to home the copy on the same Controller as the source LUN.

Current Controller	Identifies the current Controller on which the LUN is homed. **Note:** For new source LUNs, this field is not available; instead, use the Assigned Controller option.
Assigned Controller	Identifies the Controller to which the system should assign the LUN. Choose an available Controller node from the list.

Ports Masked for this LUN

Displays the physical Controller ports to exclude (mask) so they cannot access the LUN.

Masked	Indicates whether the port for the LUN is masked.
Protocol	Identifies the type of access protocol, FC or iSCSI.
Controller	Identifies the name of the Controller.
Slot	Identifies the slot number of the Controller HBA.
Port	Identifies the Controller port number.
Controller Port Address	Identifies the unique identifier of each Controller network port. For FC networks, this identifier is the World Wide Name (WWN). For iSCSI networks, this identifier is the Media Access Control (MAC) address.

LUN Mapping

Manages the LUN-to-Host mapping assignments.

Note: The LUN mapping table only displays when you select the Only selected hosts (via maps) option.

You can map a LUN or Clone LUN to either a single host or a host group.

Hosts Mapped to this LUN	Name	Identifies the SAN host that accesses LUNs configured on the Oracle FS System. If the Oracle FS Path Manager is not installed, the system displays the WWN of the FC HBA or the IP address of the iSCSI device.

Map via LUN Number	Identifies the number to assign to the LUN for the associated SAN host. This number must be unique for that particular host. It need not to be unique across all hosts.
Create	Opens the dialog that allows you to create the LUN-to-host mapping based on your selections for host name and assign the LUN number that the host uses.
Modify	Opens the dialog that allows you to change the LUN mapped to the associated host.
Remove	Removes the LUN mapping for the selected SAN host.

Related Links

Copy a LUN

Copy SAN LUN, Quality of Service Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > Copy > Quality of Service > Auto Tier

Copies an existing logical volume.

Selected Storage Class Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Allocation By Storage Class and RAID Level

Indicates graphically the actual physical capacity of the auto-tiered LUN plus the capacity that is required for RAID Level parity. The graph contains stacked bars that represent the sum of the Storage Class physical capacity and the RAID Level parity. A legend at the bottom of the graphic provides detailed information about each bar.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
View Storage Domains	Displays a dialog that lists the available Storage Domains.
LUN Name	Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements: • Must be unique across the Oracle FS System

- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group — Allows you to assign the LUN to a volume group.

[...] — Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile — Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

[...] — Opens the View Storage Profiles dialog, which allows you to review the profile details.

Storage Class — Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic — Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by

selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
- Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost

data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead — Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the

amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level

Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.

Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Additional Options

Displays a dialog that allows you to select Auto Tier Storage Class options. The dialog also provides options for selecting tier reallocation, which allows data migration to the appropriate storage class based on data usage.

Capacity

Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity

Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference Tag Checking

Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block

Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected.

If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect.

If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options:

- Use as a Boot LUN
- Disable Reference Tag Checking

When the host or application is finished, then deselect these options.

If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue.

Note: For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."

Use as a Boot LUN

Modifies the default error response returned to the host or application when a block of data is read that has not been previously written by the host. There is no other effect on the LUN.

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.

Capacity Estimates

Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.

Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

QoS Policies
Copy a LUN

Copy SAN LUN, Quality of Service Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Copy > Quality of Service > Single Tier

Copies an existing logical volume.

Selected Storage Class Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity By Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Storage Domain	Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains — Displays a dialog that lists the available Storage Domains.

LUN Name — Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group — Allows you to assign the LUN to a volume group.

[...]	Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile — Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

[...]	Opens the View Storage Profiles dialog, which allows you to review the profile details.

Storage Class — Specifies the category of physical media on which the logical volume resides.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed.

For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology

and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.

Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.

Mirrored — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is

implemented as a variant of the RAID 10 storage technology.

Read Ahead Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.

Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity

Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity

Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference

Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block

Tag Checking	Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected. If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect. If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options: • Use as a Boot LUN • Disable Reference Tag Checking When the host or application is finished, then deselect these options. If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue. **Note:** For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."
Use as a Boot LUN	Modifies the default error response returned to the host or application when a block of data is read that has not been previously written by the host. There is no other effect on the LUN. Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot. Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.
Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.

Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Copy a LUN

Create Job Schedule Dialog

Navigation: SAN > Storage > LUNs > Actions > ... > Data Protection > Create

Creates a volume replication job schedule.

Note: A schedule should be synchronized with the host applications that access the logical volume so that all data I/O is quieted before the replication operation starts.

Schedule Name	Identifies the unique name of a scheduled operation, which is an action that the Oracle FS System performs at the specified time or at regular intervals.
Volume Group	Allows you to assign the clone volume to an existing volume group.
Enabled	Indicates whether the schedule is enabled. • Enable the schedule so that the operation is performed at the specified time. • Disable the schedule so that operations are not performed. This option allows you to define a schedule before the source volume has been made available to users.
Start Time	Identifies the date and time at which the Oracle FS System starts a scheduled operation. Valid options:

Run Once	Indicates that the schedule runs immediately and only one time.
Hourly	Indicates that the schedule runs every hour.
Daily	Indicates that the schedule runs every day.
Weekly	Indicates that the schedule runs every week.

Recurrence	Identifies how often the system should perform the scheduled operation. Valid values vary based on the recurrence interval and frequency of the schedule. Valid values are listed in the following table.

Table 19: Schedule recurrence intervals

Recurrence interval	Valid values
Hourly	1 through 24
Daily	1 through 7
Weekly	1 though 4

Related Links

Create a Clone LUN Schedule

Create Data Protection Schedule Dialog

Navigation: SAN > Data Protection > Clone Schedules > Actions > Create

Creates a data replication schedule on a selected logical volume.

Schedule Name	Identifies the unique name of a scheduled operation, which is an action that the Oracle FS System performs at the specified time or at regular intervals.
Volume Group for Created Clones	Allows you to assign the clone volume to an existing volume group.
Enabled	Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled.

Select a Volume to Protect

Volume to Replicate	Identifies the name of the logical volume from which the scheduled clone is created.
Number of Existing Clones	Identifies the number of child Clone LUNs associated with the existing LUN.
Used Capacity Allocated for Clones	Displays the amount of space allocated for Clone LUNs.
Maximum Capacity Allocated for Clones	Displays the maximum space allocated for Clone LUNs.

Schedule

Start Time	Identifies the date and time that the schedule begins.

Schedule Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Recurrence	Identifies how often the system should perform the scheduled operation. Valid values vary based on the recurrence interval and frequency of the schedule.

Related Links

Create a LUN Data Protection Schedule

Create LUN Map Dialog

Navigation: SAN > Storage > LUNs > Actions > ... > Mapping > Create

Establishes the LUN connections to a specified host.

LUN Name	Identifies the name of the LUN or Clone LUN on the Oracle FS System.
Host Name	Identifies the SAN host that accesses LUNs or Clone LUNs configured on the Oracle FS System. You can map a LUN or Clone LUN to either a single host or a host group.
LUN Number	Specifies the LUN number to which the logical volume is assigned.

Related Links

Create LUN: Define Mapping by Selected Host Entries

Modify LUN: Define Mapping by Selected Host Entries

Create SAN Clone LUN, Mapping Tab

Navigation: SAN > Storage > LUNs > Actions > Clone > Mapping

Creates the LUN-to-host mapping settings for a Clone LUN.

Access Protocol	Specifies the protocols that are allowed for accessing the logical volume. Valid options:

Fibre Channel (FC)	Specifies that hosts can use the FC protocol to access this LUN.

		Tip: The system always uses FC paths at a preference over iSCSI paths. Also, load balancing is not mixed between these two protocols.
	iSCSI	Specifies that hosts can use the iSCSI protocol to access this LUN.
Only selected hosts (via maps)	Specifies that only designated SAN hosts can access this LUN using a specific, possibly different, LUN number on each of those hosts. If the LUN is mapped, the LUN number must be unique to the mapped SAN host.	
All hosts may access this LUN using LUN Number	Specifies all SAN hosts accessing this LUN use the same LUN number. Select this option to activate the LUN number selection drop-down list.	

LUN Controller Assignment

Current Controller	Identifies the current Controller on which the LUN is homed. **Note:** For new source LUNs, this field is not available; instead, use the Assigned Controller option.
Assigned Controller	Identifies the Controller to which the system should assign the LUN. Choose an available Controller node from the list.

Ports Masked for this LUN

Displays the physical Controller ports to exclude (mask) so they cannot access the LUN.

Masked	Indicates whether the port for the LUN is masked.
Protocol	Identifies the type of access protocol, FC or iSCSI.
Controller	Identifies the name of the Controller.
Slot	Identifies the slot number of the Controller HBA.
Port	Identifies the Controller port number.
Controller Port Address	Identifies the unique identifier of each Controller network port. For FC networks, this identifier is the World Wide Name (WWN). For iSCSI networks, this identifier is the Media Access Control (MAC) address.

LUN Mapping

Manages the LUN-to-Host mapping assignments.

Note: The LUN mapping table only displays when you select the Only selected hosts (via maps) option.

You can map a LUN or Clone LUN to either a single host or a host group.

Hosts Mapped to this LUN	Name	Identifies the SAN host that accesses LUNs configured on the Oracle FS System. If the Oracle FS Path Manager is not installed, the system displays the WWN of the FC HBA or the IP address of the iSCSI device.
	Map via LUN Number	Identifies the number to assign to the LUN for the associated SAN host. This number must be unique for that particular host. It need not to be unique across all hosts.
Create	Opens the dialog that allows you to create the LUN-to-host mapping based on your selections for host name and assign the LUN number that the host uses.	
Modify	Opens the dialog that allows you to change the LUN mapped to the associated host.	
Remove	Removes the LUN mapping for the selected SAN host.	

Related Links

Create an Immediate Clone LUN

Create SAN Clone LUN, Quality of Service Tab

Navigation: SAN > Storage > LUNs > Actions > Clone > Quality of Service

Creates a Clone LUN from an existing LUN.

Clone Storage for Source Volume LUN

Displays the allocated and growth potential for the Clone LUN within the source LUN repository. The graph uses colored bars to indicate the capacity status of the logical volume you are creating.

LUN Name	Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements: • Must be unique across the Oracle FS System • Must be 82 or fewer UTF characters • Must be 255 or fewer ASCII characters
Volume Group	Allows you to assign the LUN to a volume group. [...] Opens the Manage Volume Groups dialog, which allows you to create a volume group.
Storage Class	*(Read only)* Specifies the category of physical media on which the logical volume resides.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic *(Read only)*

Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access	Identifies the most common method of data access. Valid biases:	
	Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
	Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
	Mixed	Indicates that the read requests and the write requests operate on the data

sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
- Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced *(Read only)* — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume.

		This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
	Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
	Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.
Read Ahead	Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:	
	Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
	Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.

	Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level

Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

(Read only)

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity — Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Disable Reference Tag Checking — Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected.

If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect.

If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options:

- Use as a Boot LUN
- Disable Reference Tag Checking

When the host or application is finished, then deselect these options.

If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue.

Note: For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."

Use as a Boot LUN — Modifies the default error response returned to the host or application when a block of data is read that has not been

previously written by the host. There is no other effect on the LUN.

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.

Related Links

Create an Immediate Clone LUN

Create SAN LUN, Mapping Tab

Navigation: SAN > Storage > LUNs > Actions > Create > Mapping

Creates the LUN-to-host mapping settings for a LUN.

Access Protocol	Specifies the protocols that are allowed for accessing the logical volume. Valid options:	
	Fibre Channel (FC)	Specifies that hosts can use the FC protocol to access this LUN. **Tip:** The system always uses FC paths at a preference over iSCSI paths. Also, load balancing is not mixed between these two protocols.
	iSCSI	Specifies that hosts can use the iSCSI protocol to access this LUN.
Only selected hosts (via maps)	Specifies that only designated SAN hosts can access this LUN using a specific, possibly different, LUN number on each of those hosts. If the LUN is mapped, the LUN number must be unique to the mapped SAN host.	
All hosts may access this LUN using LUN Number	Specifies all SAN hosts accessing this LUN use the same LUN number. Select this option to activate the LUN number selection drop-down list.	

LUN Controller Assignment

The LUN Controller Assignment option allows you to home the LUN copy on a Controller other than the Controller on which the source LUN is homed. The default is to home the copy on the same Controller as the source LUN.

Current Controller	Identifies the current Controller on which the LUN is homed. **Note:** For new source LUNs, this field is not available; instead, use the Assigned Controller option.
Assigned Controller	Identifies the Controller to which the system should assign the LUN. Choose an available Controller node from the list.

Auto-assign	Assigns your LUN to an available Controller. This option allows the Pilot to move resources to the other Controller node in the event of a failover and maximizes performance by balancing the system load with existing logical volumes. You can modify this field after the LUN has been created. **Note:** If you select this option, you cannot set up port masking and port mapping until after the LUN is created.
Controller Name	Select a Controller node from the drop-down list. Use this option when you want to access the data from a particular port (port masking).

Ports Masked for this LUN

Displays the physical Controller ports to exclude (mask) so they cannot access the LUN.

Masked	Indicates whether the port for the LUN is masked.
Protocol	Identifies the type of access protocol, FC or iSCSI.
Controller	Identifies the name of the Controller.
Slot	Identifies the slot number of the Controller HBA.
Port	Identifies the Controller port number.
Controller Port Address	Identifies the unique identifier of each Controller network port. For FC networks, this identifier is the World Wide Name (WWN). For iSCSI networks, this identifier is the Media Access Control (MAC) address.

LUN Mapping

Manages the LUN-to-Host mapping assignments.

Note: The LUN mapping table only displays when you select the Only selected hosts (via maps) option.

You can map a LUN or Clone LUN to either a single host or a host group.

Hosts Mapped to this LUN	Name	Identifies the SAN host that accesses LUNs configured on the Oracle FS System. If the Oracle FS Path Manager is not installed, the system displays the WWN of the FC HBA or the IP address of the iSCSI device.
	Map via LUN Number	Identifies the number to assign to the LUN for the associated SAN host. This number must be unique for that particular host. It need not to be unique across all hosts.
Create	Opens the dialog that allows you to create the LUN-to-host mapping based on your selections for host name and assign the LUN number that the host uses.	
Modify	Opens the dialog that allows you to change the LUN mapped to the associated host.	
Remove	Removes the LUN mapping for the selected SAN host.	

Related Links

Create LUN: Define Mapping by Selected Host Entries

Create SAN LUN, Data Protection Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Create > Data Protection > Single Tier

Adds data protection schedules for creating Clone LUNs.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity by Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.

Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clones

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Domain Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

Storage Class Specifies the category of physical media on which the logical volume resides.

Valid media types:

- **Performance SSD** Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
- **Capacity SSD** Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
- **Performance Disk** Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
- **Capacity Disk** Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access Identifies the most common method of data access.
Valid biases:

- **Sequential** Indicates that the read requests and the write requests operate on the data

mostly by accessing the records one after the other in a physical order.

Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.

Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read — Indicates that most of the access requests are for read operations.

Write — Indicates that most of the access requests are for write operations.

Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when

	the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.

Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

Create Single-Tier LUN: Define Data Protection
Modify Single-Tier LUN: Data Protection

Create SAN LUN, Data Protection Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > Create > Data Protection > Auto Tier

Adds data protection schedules for creating Clone LUNs.

Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clones

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.

Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
Initial Storage Class	Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic	Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Initial Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

Initial I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

Initial RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is

		implemented as a variant of the RAID 5 storage technology.
	Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
	Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.

Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Additional Options — Displays a dialog that allows you to select Auto Tier Storage Class options.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled. **Enabled** — Indicates that the scheduled operation performs at the specified time. **Disabled** — Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.
Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

QoS Policies
Create Auto-Tier LUN: Define Data Protection
Modify Auto-Tiered LUN: Define Data Protection

Create SAN LUN, Quality of Service Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Create > Quality of Service > Single Tier

Creates and configures the capacity and performance settings for a single tier LUN.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity By Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
View Storage Domains	Displays a dialog that lists the available Storage Domains.
LUN Name	Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements: • Must be unique across the Oracle FS System • Must be 82 or fewer UTF characters • Must be 255 or fewer ASCII characters
Volume Group	Allows you to assign the LUN to a volume group. [...] Opens the Manage Volume Groups dialog, which allows you to create a volume group.
Use Storage Profile	Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

[...]	Opens the View Storage Profiles dialog, which allows you to review the profile details.

Storage Class Specifies the category of physical media on which the logical volume resides.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access Identifies the most common method of data access.

Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.

Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read	Indicates that most of the access requests are for read operations.
Write	Indicates that most of the access requests are for write operations.
Mixed	Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

Single	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
Double	Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level	Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead — Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.

	Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level

Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity

Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity

Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference Tag Checking

Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected.

If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect.

If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options:

- Use as a Boot LUN
- Disable Reference Tag Checking

When the host or application is finished, then deselect these options.

If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue.

Note: For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."

Use as a Boot LUN

Modifies the default error response returned to the host or application when a block of data is read that has not been

previously written by the host. There is no other effect on the LUN.

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.

Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Create Single-Tier LUN: Define Quality of Service

Create SAN LUN, Quality of Service Tab, Auto-tier

Navigation: SAN > Storage > LUNs > Actions > Create > Quality of Service > Auto Tier

Creates and configures the capacity and performance settings for an auto-tier LUN.

Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Allocation By Storage Class and RAID Level

Indicates graphically the estimated physical capacity that is required for the following settings:

- Allocated Logical Capacity
- Initial RAID Level

The actual values display after the auto-tiered LUN is created.

Storage Domain

Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains

Displays a dialog that lists the available Storage Domains.

LUN Name

Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group

Allows you to assign the LUN to a volume group.

[...] Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile

Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

[...] Opens the View Storage Profiles dialog, which allows you to review the profile details.

Note: The RAID level that the system uses might be different that the RAID level that is specified by the Storage Profile. The difference, if any, depends on the RAID levels that are available in the selected Storage Domain.

Initial Storage Class

Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance.

Valid media types:

Performance SSD — Specifies that the data is stored on solid state drives (SSDs) that are optimized for the

performance of balanced read and write operations.

Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read — Indicates that most of the access requests are for read operations.

Write — Indicates that most of the access requests are for write operations.

Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

Initial RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.

Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level

Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to

		have a minimal impact on client I/O throughput at the expense of longer copy times.
	Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.
Additional Options	Displays a dialog that allows you to select Auto Tier Storage Class options. The dialog also provides options for selecting tier reallocation, which allows data migration to the appropriate storage class based on data usage.	
Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.	
Allocated Logical Capacity	Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.	
Disable Reference Tag Checking	Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected. If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect. If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options: • Use as a Boot LUN • Disable Reference Tag Checking When the host or application is finished, then deselect these options. If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue. **Note:** For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled “When To Use “Use as Boot LUN” and “Disable Reference Tag Checking” Options For FS1-2 LUNs.”	
Use as a Boot LUN	Modifies the default error response returned to the host or application when a block of data is read that has not been previously written by the host. There is no other effect on the LUN.	

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.

Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Managing SAN LUNs

QoS Policies

Storage Tiers and Storage Profiles

Create Auto-Tiered LUN: Define Quality of Service

Create Volume Group Dialog

Navigation:

NAS > Storage > Filesystems > Actions > Create Filesystem > Quality of Service > Volume Group ... > Volume Groups > Create

SAN > Storage > LUNs > Actions > Create LUN > Quality of Service > Volume Group ... > Volume Groups > Create

Adds an organizational unit that can group a collection of logical volumes on the Oracle FS System.

Volume Name	Identifies the name of the volume group. Valid volume group names consist of letters and numerals and can be up to 14 characters in length. Each volume group name must be unique within its parent volume group.

Parent Volume Group Name	Identifies the name of the top-level node in a nested volume group relationship.

Related Links

Create Auto-Tiered LUN: Define Quality of Service
Create Single-Tier LUN: Define Quality of Service

Delete LUN

Navigation: SAN > Storage > LUNs > Actions > Delete

Confirms the removal of a selected LUN.

Important: If the LUN is a member of a SAN replication pair, delete the Oracle MaxRep protection plan before deleting the LUN. For more information, see the *Oracle MaxRep for SAN User's Guide*.

Volumes to Delete	Identifies the LUN, and any Clone LUNs, to remove from the Oracle FS System. **CAUTION:** Data loss might occur. Carefully review the list before deleting the LUNs.

Related Links

Delete a LUN

Host to LUN Mapping Overview Page

Navigation: SAN > Storage > Host-LUN Mapping

Displays the mapping properties between the SAN hosts and the Oracle FS System LUNs with which the hosts are associated. This page also displays the status of the connections between these hosts and the associated Controller ports.

Host to LUN Map

HBA Port/Device	Displays the following for each host mapping: • SAN LUN or Clone LUN name • Host name or WWN • Host group name
Controller-Initiator Connectivity	Identifies the connection status between the Controller and initiator port. The status might indicate masked Controller ports or disabled protocols. Valid states:

- Connected
- Connected, Masked
- Connected, Masked, Protocol Disabled
- Connected, Partially Masked
- Connected, Partially Masked, Some Protocols Disabled
- Connected, Protocol Disabled
- Connected, Some Protocols Disabled
- Not Connected

Mapped Via LUN Number	Identifies the LUN number used for the SAN host mapping.
LUN Name on Host	Identifies the name used by the SAN host to identify the LUN, if known.

Initiator-To-Controller Connectivity Dialog

Navigation: SAN > Storage > Hosts > Actions > Initiator-to-Controller Connectivity

Displays information about connectivity between host initiators and Controller ports.

Name	Identifies the information about the Controller. The column includes the following information: • Controller name • Adapter slot number • Adapter port number
Port Type	Displays the Controller port type. Valid types: • iSCSI • FC
Address	Identifies the unique address of the Oracle FS System Controller port on the network.
Host Name	Displays the host name and a column for each initiator port in the host. The contents of each column show the state of connectivity between that host initiator port and each Controller port.

Related Links

Initiator-to-Controller Connectivity

LUN to Host Mapping Overview Page

Navigation: SAN > Storage > LUN-Host Mapping

Displays the mapping properties between the Oracle FS System LUNs and the SAN hosts. This page also displays the status of the connections between the SAN hosts and the associated Controller ports.

LUN to Host Map

Name	Displays the following for each host mapping: • SAN LUN or Clone LUN name • Host name or WWN • Host group name
Controller-Initiator Connectivity	Identifies the connection status between the Controller and initiator port. The status might indicate masked Controller ports or disabled protocols. Valid states: • Connected • Connected, Masked • Connected, Masked, Protocol Disabled • Connected, Partially Masked • Connected, Partially Masked, Some Protocols Disabled • Connected, Protocol Disabled • Connected, Some Protocols Disabled • Not Connected
Mapped via LUN Number	Identifies the LUN number used for the SAN host mapping.
LUN Name on Host	Identifies the name used by the SAN host to identify the LUN, if known.

LUNs Overview Page

Navigation: *SAN > Statistics and Trending > LUNs*

Displays performance statistics for LUNs.

Name	Identifies the name that is assigned to a LUN for administrative purposes.
Physical Allocated Capacity	Identifies the capacity, in gigabytes (GB), that is reserved for the LUN.

Priority Level	Identifies the priority level assigned to the specified LUN. Valid levels: • Archive • Low • Medium • High • Premium
IOPS	Indicates the average read and write operations per second.
Throughput	Indicates the data transfer rate in MB/s for read and write operations.
I/O Latency	Indicates the average time, in milliseconds, to complete the read operations or write operations.
I/O Size	Indicates the average size of the read operations and write operations.
Collection Period	Displays the start and the end time at which information was last collected from the Oracle FS System.

To generate real-time statistics for a LUN, select a LUN, then select Actions > LUN Real Time Statistics. Click Add Graph and select a statistic (you can review the following list for details).

The statistics displayed include:

Read IOPS	Indicates the average number of read operations per second.
Write IOPS	Indicates the average number of write operations per second.
Read bytes per second	Indicates the rate at which the system has transferred bytes from a drive during read operations.
Write bytes per second	Indicates the rate at which the system has transferred bytes to a drive during write operations.
Read latency	Indicates the average time to complete a read operation.
Write latency	Indicates the average time to complete a write operation.
Read block size	Displays the average amount of data read that are red in a read operation.
Write block size	Displays the average amount of data that are written in a write operation.
Total block size	Displays the average amount of data that are transferred in a read or write operation.

Read queue depth	Displays the number of read operations that are waiting to be fulfilled, on average.
Write queue depth	Displays the number of write operations that are awaiting to be processed, on average.
Total bytes per second	Displays the total bytes transmitted per second, on average.
Total IOPS	Indicates the total number of read and write operations per second.
Total latency	Indicates the average time to complete operations.
Total queue depth	Displays the total number of I/O operations that are queued for processing, on average.

Related Links

View LUN Statistics

Manage SAN Host Groups, Groups Tab

Navigation: SAN > Stroage > Hosts > Actions > Manage SAN Host Groups > Groups

Creates and modifies Storage Area Network (SAN) host groups. You can assign any SAN host to a host group.

A *host group* is a named collection of SAN hosts that the system manages as a group, which simplifies the task of associating hosts to LUNs.

Name	Indicates the name of the host group.
Create	Creates a new row in the table from which you can type the host group name.
Delete	Deletes the selected host group.

Related Links

Create a Host Group

Modify a Host Group

Manage SAN Host Groups, Hosts Tab

Navigation: SAN > Storage > Hosts > Actions > Manage SAN Host Groups > Hosts

Assigns registered Storage Area Network (SAN) hosts to a host group.

Note: Register at least one host to the Oracle FS System before assigning that host to your host group.

A *host group* is a named collection of SAN hosts that the system manages as a group, which simplifies the task of associating hosts to LUNs.

Name	Indicates the name of the SAN host that is available for host group assignment.
Host Group	Indicates the name of the host group to which the host is assigned.

Related Links

Create a Host Group

Modify a Host Group

Manage Volume Groups Dialog

Navigation:

NAS > Storage > Filesystems > Actions > Create Filesystem > Quality of Service > Volume Group ... > Volume Groups

SAN > Storage > LUNs > Actions > Create LUN > Quality of Service > Volume Group ... > Volume Group ... > Volume Groups

Manages the organizational units that group the collections of logical volumes on the Oracle FS System, including the nesting of volume groups.

Volume Group	Identifies the name of the volume group. Valid volume group names consist of letters and numerals and can be up to 14 characters in length. Each volume group name must be unique within its parent volume group.
Parent Volume Group Name	Identifies the name of the top-level node in a nested volume group relationship.
Logical Capacity (GB)	Provides an overview of the logical capacity usage and the logical capacity requirements of the volume group.

Used	Indicates the amount of allocated capacity that is consumed. • For LUNs, this amount is the same as the allocated amount. • For filesystems, this amount is the allocated capacity that contains user data.
Allocated	Identifies the total amount of storage capacity that is reserved for this volume or this volume group.
Distribution	Displays a graphical comparison of the allocated capacity that this

	volume uses to the unused allocated capacity.
Create	Opens a dialog that allows you to add a volume group.
Modify	Opens a dialog that allows you to modify the properties of a volume group.
Delete	Removes the selected volume group.

Related Links

Create Auto-Tiered LUN: Define Quality of Service
Create Single-Tier LUN: Define Quality of Service
Modify Auto-Tiered LUN: Define Quality of Service
Modify Single-Tier LUN: Quality of Service

Manage Volume Groups, Volume Groups Tab

Navigation:

NAS > *Volume Groups* > *Actions* > *Manage Volume Groups* > *Volume Groups*
SAN > *Volume Groups* > *Actions* > *Manage Volume Groups* > *Volume Groups*

Manages the organizational units that group the collections of logical volumes on the Oracle FS System, including the nesting of volume groups.

Volume Group	Identifies the name of the volume group. Valid volume group names consist of letters and numerals and can be up to 14 characters in length. Each volume group name must be unique within its parent volume group.	
Parent Volume Group Name	Identifies the name of the top-level node in a nested volume group relationship.	
Logical Capacity (GB)	Provides an overview of the logical capacity usage and the logical capacity requirements of the volume group.	
	Used	Indicates the amount of allocated capacity that is consumed. • For LUNs, this amount is the same as the allocated amount. • For filesystems, this amount is the allocated capacity that contains user data.
	Allocated	Identifies the total amount of storage capacity that is reserved for this volume or this volume group.

	Distribution	Displays a graphical comparison of the allocated capacity that this volume uses to the unused allocated capacity.

Create	Opens a row for creating a volume group.
Modify	Opens a dialog that allows you to modify the properties of a volume group.
Delete	Removes the selected volume group.

Related Links

Create Auto-Tiered LUN: Define Quality of Service
Create Single-Tier LUN: Define Quality of Service
Modify Auto-Tiered LUN: Define Quality of Service
Modify Single-Tier LUN: Quality of Service

Manage Volume Groups, Volumes Tab

Navigation:

NAS > *Volume Groups* > *Actions* > *Manage Volume Groups* > *Volumes*
SAN > *Volume Groups* > *Actions* > *Manage Volume Groups* > *Volumes*

Reassigns the logical volumes on the Oracle FS System to different volume groups.

Volume Name	Identifies the names of the configured logical volumes.	
Volume Group	Identifies the name of the volume group in which the logical volume resides. This field can be used to reassign the volume to another group.	
Logical Capacity (GB)	Provides an overview of the logical capacity usage and the logical capacity requirements of the volume group.	
	Used	Indicates the amount of allocated capacity that is consumed. • For LUNs, this amount is the same as the allocated amount. • For filesystems, this amount is the allocated capacity that contains user data.
	Allocated	Identifies the total amount of storage capacity that is reserved for this volume or this volume group.

	Maximum	Identifies the sum of the addressable capacity for the logical volume and its clone repository.	
	RAID Level	Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
		Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
		Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.
Physical Capacity (GB)	Provides an overview of the physical capacity usage and the physical capacity requirements of all the volumes on the system.		

		Volume Overhead	Identifies the physical and logical storage capacity that is required to meet the logical volume Quality of Service (QoS) settings.
		Used	Identifies the current capacity that the volume consumes.
		Allocated	Specifies the amount of raw capacity in gigabytes (GB) that the system has assigned and designated to this logical volume.
		Maximum	Identifies the maximum capacity for the volume group. The maximum capacity of the logical volumes and nested volume groups that are associated with the volume group cannot exceed this value. A value of 0 (zero) identifies that the volume group is configured with unlimited capacity. You can increase the maximum capacity of the associated logical volumes and the nested volume groups without constraints.
Priority Level	Filesystems	Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:	
		Premium	Indicates the highest priority for responding to requests in the processing queue.
		High	Indicates the next highest priority for responding to requests in the processing queue.
		Medium	Indicates an intermediate priority for responding to requests in the processing queue.
		Low	Indicates the next to lowest priority for responding to requests in the processing queue.
		Archive	Indicates the lowest priority for responding to requests in the processing queue.

LUNs — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Related Links

Move a Volume to a Different Volume Group

Modify Data Protection Schedule Dialog

Navigation: SAN > Data Protection > Clone Schedules > Actions > Modify

Updates the properties of an existing data protection schedule. You can also enable or disable the schedule from this page.

Schedule Name Identifies the name of the schedule.

Volume Group for Created Clones Allows you to assign the clone volume to an existing volume group.

Enabled Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.

Protected Volume Identifies the name of the logical volume from which the scheduled clone is created.

Schedule Identifies the date and time that the schedule begins.

Identifies the frequency at which the schedule runs. Frequencies include:

- Run Once
- Hourly
- Daily
- Weekly

Recurrence Specifies how many hours, days, or weeks to wait before generating this scheduled operation again.

Valid values are listed in the following table.

Table 20: Schedule recurrence intervals

Recurrence interval	Valid values
Hourly	1 through 24
Daily	1 through 7
Weekly	1 though 4

Related Links

Modify a LUN Data Protection Schedule

Modify Host, Advanced Tab

Navigation: SAN > Stroage > Hosts > Actions > Modify Host > Advanced

Enables HP-UX Compatibility mode to a host in a Storage Area Network (SAN).

HP-UX Compatibility Mode	Use this option when the SAN host is running the HP-UX operating system. When compatibility mode option is enabled, the system uses an alternative method to present LUNs on the SAN host. This alternative method is compatible with HP-UX. When this option is enabled, you might not have a LUN visible to the host as LUN number 0. HP-UX compatibility mode enables the full range of LUN numbers (other than 0) to be used with HP-UX operating systems. You can verify the current host mappings from the Flash Storage Path Manager tab.

Related Links

Modify a Host: Reconfigure Advanced Settings

Modify Host, Oracle FS Path Manager Tab

Navigation: SAN > Storage > Hosts > Actions > Modify Host > Oracle FS Path Manager

Modifies the configuration settings for Oracle FS Path Manager (FSPM).

You can configure the load balancing settings of LUNs. You can also view the optimized (fastest paths) available to a LUN.

Host Information

Host Name	Identifies the name of the SAN host that has access to the Oracle FS System.
Management IP Address	Identifies the IP address of the SAN host. The system uses this address to exchange management requests and responses with the FSPM that is installed on the host. If FSPM is not installed, this field displays *N/A*.
Operating System	Identifies the operating system that is associated with the SAN host, when Oracle FS Path Manager is installed on that host; otherwise, this field displays *N/A*.
Oracle FS Path Manager Version	Identifies the version of the FSPM that is installed and running on the SAN host.

Path Manager Settings

LUN Name	Identifies the name of the LUN or Clone LUN on the Oracle FS System.
Name on Host	Identifies the name used by the SAN host to identify the LUN.
Load Balancing	Identifies the type of load balancing that the storage area network (SAN) hosts performs to access Oracle FS System LUNs. **Note:** If the Load Balancing option is not selectable, then the version of FSPM does not allow load balancing on the host. Valid types: **Static** — Indicates load balancing across multiple paths to the configured LUNs. The software selects the best available path, and all commands are sent over that path until the path is no longer operational, in which case the failed path fails over to another appropriate path. **Round Robin** — Indicates load balancing across multiple paths to the configured LUNs. The system sends the commands one by one using the best available paths, which ensures that LUN commands are evenly distributed over any path that is available to access the LUNs.
Optimized Paths	Identifies the number of optimized (fastest path available) access paths to the LUN.
Non-Optimized Paths	Identifies the number of non-optimized access paths to the LUN.

Related Links

Modify a Host: FSPM Load Balancing

Modify Host, iSCSI Access Tab

Navigation: SAN > Storage > Hosts > Actions > Modify Host > iSCSI Access

Modifies the iSCSI access settings for iSCSI connections from a Storage Area Network (SAN) host.

If you configure iSCSI on a host port and want that port to be able to connect to the Oracle FS System, you must also configure iSCSI for that port on the Oracle FS System.

Note: iSCSI settings are only available if the host is configured to use iSCSI.

iSCSI Host Specific Settings

Enable Authentication	Indicates whether the Challenge Handshake Authentication Protocol (CHAP) protocol for iSCSI sessions between the SAN host and the Oracle FS System is enabled. **Note:** Depending on the global settings, the CHAP name property and the CHAP secret property might not be required. Those properties are not required, for example, when authentication is performed through a RADIUS server.
Chap Name	Identifies the name of the iSCSI initiator that is to be used during authentication.
CHAP Secret	Identifies the encrypted CHAP authentication password (secret) to be used in the exchange of user names and secrets between two devices. Both devices must support Point-to-Point (PPP) authentication. **Note:** The Oracle FS System supports up to 100 UTF-8 non-integer characters. However, when connecting to Windows servers, you must limit the secret to a value from 12 to 16 characters in length.
Retype CHAP Secret	Confirms the encrypted CHAP authentication password.
Grant Access to Oracle FS	Specifies whether the Oracle FS System must reject iSCSI login attempts from initiators that have not explicitly been granted permission by the user through the Oracle FS System Manager interface or through the Oracle FS System Command Line Interface (CLI).

Related Links

Modify a Host: Reconfigure iSCSI Access Settings

Modify Host, Ports Tab

Navigation: SAN > Storage > Hosts > Actions > Modify Host > Ports

Modifies the host driver information of the storage area network (SAN).

If you are configuring iSCSI on the host port, also configure iSCSI on the Oracle FS System.

Depending upon the host configuration, the port information is shown as FC or iSCSI.

Host Name	Identifies the name of the SAN host entry.

FC Port Information

Alias	Identifies the HBA alternative, friendly, name for the port, which can be set to any useful value. **Note:** Select this field to make necessary changes.
Port	Identifies the WWN assigned to an FC HBA port.
Speed	Indicates the speed, in Gb/s, of the connection between the SAN host and the device to which the host is directly connected. That device is typically a network switch or possibly the Controller. **Note:** The actual data transfer rate between the SAN host and the Controller can be less than the reported speed. It can be less because the data transfer rate is governed by the slowest link on the path between the host and the Controller.
Manufacturer	Identifies the manufacturer of a hardware component.
HBA Model	Identifies the model number of a hardware component.
Driver Version	Identifies version of the HBA driver.
Firmware Version	Identifies the HBA firmware version.

iSCSI Port Information

Alias	Identifies an alternative friendly name that is assigned to the host port. **Note:** Select the field to make necessary changes.
iSCSI Device Name	Identifies the name of the iSCSI initiator for the SAN host. An initiator encapsulates SCSI commands and data requests within iSCSI packets and transfers the packets across the IP network.
IP Addresses	Identifies the IP address of the host iSCSI port.

Related Links

Modify a Host: Assign a Port Alias

Modify Job Schedule Dialog

Navigation: SAN > Storage > LUNs > Actions > ... > Data Protection > Modify

Updates a data replication schedule.

Schedule Name	Identifies the unique name of a scheduled operation, which is an action that the Oracle FS System performs at the specified time or at regular intervals.
Data Protection Type	Identifies the type of data protection, such as clone, that is used in the schedule.
Volume Group	Allows you to assign the clone volume to an existing volume group.
Enabled	Indicates whether the schedule is enabled. • Enable the schedule so that the operation is performed at the specified time. • Disable the schedule so that operations are not performed. This option allows you to define a schedule before the source volume has been made available to users.
Start Time	Identifies the date and time at which the Oracle FS System starts a scheduled operation.
Recurrence	Identifies how often the system should perform the scheduled operation. Valid values vary based on the recurrence interval and frequency of the schedule.

Related Links

Modify Auto-Tiered LUN: Define Data Protection
Modify Single-Tier LUN: Data Protection

Modify LUN Number Dialog

Navigation: SAN > Storage > LUNs > Actions > Create > Mapping > Modify

Updates the assigned LUN number that is assigned to host.

LUN Number	Identifies the number to assign to the LUN for the associated host.

Related Links

Modify LUN: Define Mapping by LUN Number
Modify LUN: Define Mapping by Selected Host Entries

Modify SAN LUN, Data Protection Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Modify > Data Protection > Single Tier

Updates the storage capacity of a logical volume. You can also manage data replication schedules from this page.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity by Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clone Storage

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on

	the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Number of Clones	Identifies the number of clones that have been created for this LUN and its clones.
Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve

the optimizations for read performance and for capacity.

Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read	Indicates that most of the access requests are for read operations.
Write	Indicates that most of the access requests are for write operations.

Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
- Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance.

		Double parity is implemented as a variant of the RAID 6 storage technology.
	Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled. Enabled — Indicates that the scheduled operation performs at the specified time. Disabled — Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.
Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

Modify Single-Tier LUN: Data Protection

Modify SAN LUN, Data Protection Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > Modify > Data Protection > Auto Tier

Updates the storage capacity of a logical volume. You can also manage data replication schedules from this page.

Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Enable Clones	Specifies whether to enable the Capacity for Clones options. Selecting this option also enables the Specify Clone QoS options.

Capacity for Clones

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Estimated Maximum Capacity	Specifies the estimated storage space to allocate for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Estimated Available Capacity	Identifies the estimated available capacity for Clone LUNs. The value of this field changes as the Maximum Capacity percentage changes and as the Capacity value changes that you provided in the Quality of Service tab.
Number of Clones	Identifies the number of clones that have been created for this LUN and its clones.

Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.
Initial Storage Class	Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Initial Typical Access — Identifies the most common method of data access. Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data

sometimes in sequential order and sometimes in random order.

Initial I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

Initial RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
- Mirrored — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more

	drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.
Additional Options	Displays a dialog that allows you to select Auto Tier Storage Class options.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.

Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

QoS Policies
Modify Auto-Tiered LUN: Define Data Protection

Modify SAN LUN, Mapping Tab

Navigation: SAN > Storage > LUNs > Actions > Modify > Mapping

Updates the LUN-to-host mapping settings for a logical volume.

Access Protocol	Specifies the protocols that are allowed for accessing the logical volume.
Only selected hosts (via maps)	Specifies that only designated SAN hosts can access this LUN using a specific, possibly different, LUN number on each of those hosts. If the LUN is mapped, the LUN number must be unique to the mapped SAN host.
All hosts may access this LUN using LUN Number	Specifies all SAN hosts accessing this LUN use the same LUN number. Select this option to activate the LUN number selection drop-down list.

LUN Controller Assignment

Current Controller	Identifies the current Controller on which the LUN is homed. **Note:** For new source LUNs, this field is not available; instead, use the Assigned Controller option.
Assigned Controller	Identifies the Controller to which the system should assign the LUN. Choose an available Controller node from the list.

Ports Masked for this LUN

Displays the physical Controller ports to exclude (mask) so they cannot access the LUN.

Masked	Indicates whether the port for the LUN is masked.
Protocol	Identifies the type of access protocol, FC or iSCSI.
Controller	Identifies the name of the Controller.
Slot	Identifies the slot number of the Controller HBA.
Port	Identifies the Controller port number.
Controller Port Address	Identifies the unique identifier of each Controller network port. For FC networks, this identifier is the World Wide Name (WWN). For iSCSI networks, this identifier is the Media Access Control (MAC) address.

LUN Mapping

Manages the LUN-to-Host mapping assignments.

Note: The LUN mapping table only displays when you select the Only selected hosts (via maps) option.

You can map a LUN or Clone LUN to either a single host or a host group.

Hosts Mapped to this LUN	Name	Identifies the SAN host that accesses LUNs configured on the Oracle FS System. If the Oracle FS Path Manager is not installed, the system displays the WWN of the FC HBA or the IP address of the iSCSI device.
	Map via LUN Number	Identifies the number to assign to the LUN for the associated SAN host. This number must be unique for that particular host. It need not to be unique across all hosts.
Create	Opens the dialog that allows you to create the LUN-to-host mapping based on your selections for host name and assign the LUN number that the host uses.	
Modify	Opens the dialog that allows you to change the LUN mapped to the associated host.	
Remove	Removes the LUN mapping for the selected SAN host.	

Related Links

Modify LUN: Define Mapping by LUN Number
Modify LUN: Define Mapping by Selected Host Entries

Modify SAN LUN, Quality of Service Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > Modify > Quality of Service > Single Tier

Updates an existing logical volume.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity By Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to

achieve the optimizations for read performance and for capacity.

Performance Disk — Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.

Capacity Disk — Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Storage Domain — Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains — Displays a dialog that lists the available Storage Domains.

LUN Name — Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group — Allows you to assign the LUN to a volume group.

[...] — Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile — Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

[...] — Opens the View Storage Profiles dialog, which allows you to review the profile details.

Storage Class — Specifies the category of physical media on which the logical volume resides.

Valid media types:

Performance SSD — Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.

Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read	Indicates that most of the access requests are for read operations.

Write — Indicates that most of the access requests are for write operations.

Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.

Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.

Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the

		loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
	Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.

Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity

Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity

Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference Tag Checking

Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected.

If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect.

If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options:

- Use as a Boot LUN
- Disable Reference Tag Checking

When the host or application is finished, then deselect these options.

If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue.

Note: For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."

Use as a Boot LUN

Modifies the default error response returned to the host or application when a block of data is read that has not been previously written by the host. There is no other effect on the LUN.

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response

	because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.
Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Modify Single-Tier LUN: Quality of Service

Modify SAN LUN, Quality of Service Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > Modify > Quality of Service > Auto Tier

Updates an existing logical volume.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Allocation By Storage Class and RAID Level

Indicates graphically the actual physical capacity of the auto-tiered LUN plus the capacity that is required for RAID Level parity. The graph contains stacked bars that represent the sum of the Storage Class physical capacity and the RAID Level parity. A legend at the bottom of the graphic provides detailed information about each bar.

Storage Domain	Specifies the name of the storage domain associated with the LUN. **Note:** All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains
: Displays a dialog that lists the available Storage Domains.

LUN Name
: Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group
: Allows you to assign the LUN to a volume group.

  [...] Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile
: Specifies whether the logical volume uses a custom set of QoS properties. Selecting this option disables the remaining QoS properties on the page.

  [...] Opens the View Storage Profiles dialog, which allows you to review the profile details.

Initial Storage Class
: Specifies the initial category of physical media on which the logical volume resides. For auto-tiered LUNs, the Oracle FS System determines the actual Storage Class that matches the data usage statistics on the volume to get the most optimal performance.

  Valid media types:

  Performance SSD
  : Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.

  Capacity SSD
  : Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.

  Performance Disk
  : Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.

  Capacity Disk
  : Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed.

For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic — Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Initial Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

Initial I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

Initial RAID Level — Identifies the initial RAID level associated with the Storage Profile. The Oracle FS System determines the actual RAID Level that matches the data usage statistics on the volume to get the most optimal performance.

Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Initial Read Ahead

Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.

	Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level

Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference Tag Checking Disables a portion of the internal data integrity checks for the LUN. Selecting this option disables checking whether any given block of data has the same identity, known as the Logical Block Address (LBA), as that which was written by the host. Data CRC integrity checking is not affected.

If you select the Disable Reference Tag Checking option, then the Use as a Boot LUN option has no effect.

If necessary, when the LUN is being initialized or is being prepared by a host or an application, temporarily select the following options:

- Use as a Boot LUN
- Disable Reference Tag Checking

When the host or application is finished, then deselect these options.

If your host or application has interoperability problems with the Oracle FS System, then you can use the Disable Reference Tag Checking option to temporarily work around the issue.

Note: For information that describes when to select the Disable Reference Tag Checking option, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "When To Use "Use as Boot LUN" and "Disable Reference Tag Checking" Options For FS1-2 LUNs."

Use as a Boot LUN Modifies the default error response returned to the host or application when a block of data is read that has not been

previously written by the host. There is no other effect on the LUN.

Select this option if you have hosts and application that read data blocks that they have not written as part of a validation process, such as preparing the LUN for system boot.

Reading a data block before it is written causes the reference tag check to fail, which returns an error to the host. After receiving this error, the host retries the operation, and inhibits the reference tag check. The Use as a Boot LUN option does not modify the reference tag check. This option only changes the error response because some hosts and applications modify the retry timing depending on the error that is returned. Always try both settings of the Use as a Boot LUN option before using the Disable Reference Tag Checking option.

Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

QoS Policies

Modify Auto-Tiered LUN: Define Quality of Service

Modify Volume Group Dialog

Navigation:

NAS > Storage > Filesystems > Actions > Create Filesystem > Quality of Service > Volume Group ... > Volume Groups > Modify

SAN > Storage > LUNs > Actions > Create LUN > Quality of Service > Volume Group ... > Volume Groups > Modify

Changes the properties of an organizational unit that groups a collection of logical volumes on the Oracle FS System.

Volume Name	Identifies the name of the volume group. Valid volume group names consist of letters and numerals and can be up to 14 characters in length. Each volume group name must be unique within its parent volume group.

Parent Volume Group Name	Identifies the name of the top-level node in a nested volume group relationship.

Related Links

Modify Auto-Tiered LUN: Define Quality of Service
Modify Single-Tier LUN: Quality of Service

Replication Engines Overview Page

Navigation: SAN > Data Protection > Replication Engines

Displays the status of the available Oracle MaxRep for SAN Replication Engines registered with the Oracle FS System. You can manage the Replication Engine from this page.

Service Status	Identifies the health of the processes running on the Replication Engine. Valid states: • Normal • Warning • Unknown
Agent Status	Identifies the communication status of the Oracle MaxRep for SAN agents registered with the Oracle FS System. Valid states: • All Communicating • Warning • Unknown
Name	Identifies the name of the Replication Engine.
IP Address	Identifies the IP address of the Replication Engine or high availability Replication Engine cluster.
Version	Identifies the Oracle MaxRep for SAN software version that is running on the Replication Engine.

Clone Schedules Overview Page

Navigation: SAN > Data Protection > Clone Schedules

Displays a summary of the data protection schedules. You can also create and manage the data protection schedules.

Name	Identifies the name of a schedule. Select a schedule name and use the Actions menu to review or modify the schedule settings.
Start Time	Identifies the time and date on which the Oracle FS System started a schedule recurrence.
Frequency	Identifies the interval at which the Oracle FS System starts a recurrent schedule.
Protected Volume	Identifies the name of the logical volume from which a Clone LUN was created.
Enabled	Identifies whether the data protection schedule is enabled.
	Yes Indicates that the schedule is actively cloning the protected volumes.
	No Indicates that the schedule is not cloning the protected volumes.

Data Protection Overview

Navigation:SAN > Data Protection

Displays links to pages that allow you to manage the data protection schedules and access connected Oracle FS System Replication Engines.

Clone Schedules	Allows you to view the list of available data protection schedules.
Replication Engines	Allows you to view a list of available Replication Engines.

Hosts Overview Page

Navigation: SAN > Storage > Hosts

Manages properties of the storage area network (SAN) hosts defined on an Oracle FS System.

Actions from this page allow you to manage the host on the system.

Host Name	Identifies the name of the SAN host entry.
Controller-initiator Connectivity	Identifies the connection status between the Controller and initiator port. The status might indicate masked Controller ports or disabled protocols.
	Valid states:

- Connected
- Connected, Masked
- Connected, Masked, Protocol Disabled
- Connected, Partially Masked
- Connected, Partially Masked, Some Protocols Disabled
- Connected, Protocol Disabled
- Connected, Some Protocols Disabled
- Not Connected

Number of LUNs Mapped	Identifies the number of LUNs that are mapped to that particular SAN host either because of specific mapping or because the LUN is available to all SAN hosts.

Oracle FS Path Manager

Identifies certain global characteristics associated with the Oracle FS Path Manager (FSPM).

Status	Identifies whether FSPM is communicating, or if it is not registered. Valid states:

Communicating	Indicates that the host control path is logged into the Pilot. Communicating status is required for the FSPM control path to report path status, configure load balancing, and use the Oracle FS System to collect FSPM diagnostic logs.
Not Communicating	The FSPM host control path has previously logged in to the Pilot, but it is not currently logged in.
Not Registered	A control path from an FSPM host with this name has never logged in to the Pilot.

Version	Identifies the version of the FSPM that is installed and running on the SAN host.
Host IP Address	Identifies the IP address of the SAN host. The system uses this address to exchange management requests and responses with the FSPM that is installed on the host. If FSPM is not installed, this field displays *N/A*.

HBA

HBA Alias Name	Identifies an alternative friendly name that is assigned to the host port.

SAN LUNs Overview Page

Navigation: SAN > Storage > LUNs

Displays various properties of the logical volumes that are configured on the Oracle FS System. Actions on this page allow you to manage those volumes as well as to create an immediate Clone LUN.

Name	Identifies the name that is assigned to the LUN.
Status	Identifies the status of each LUN. Valid states:

Online	Indicates that the volume is fully accessible.
Offline	Indicates that the volume is not accessible.
Conservative	Indicates that the write-back cache of the volume is disabled, which reduces system performance. A Conservative state might indicate a hardware problem.
Prepared	Indicates that the storage resources for the volume are reserved for the clone, but the clone is not committed to the storage device.
Read Only	Indicates that the volume is in write protect mode and is set to read-only.
Unknown	Indicates that not enough information is obtained from the volume to report its status.

Background Activity	Indicates the LUN creation and deletion status. Valid states: • Idle • In-Progress
Tier Reallocation	Identifies the tier reallocation status of the Storage Domain. When tier reallocation is enabled, the Oracle FS System dedicates resources and uses statistical data and QoS priority property to migrate data from one storage tier to another. Valid states:

Enabled	Indicates that tier reallocation is active on the logical volume.
Disabled	Indicates that tier reallocation is not active on the logical volume.

	Storage Domain Disabled	Indicates that tier reallocation is disabled on the Storage Domain and therefore disabled on the LUN.

Host Access

Identifies the SAN host mapping status associated with the LUN.

Valid states:

Mapped	Indicates that the LUN is mapped to one or more SAN hosts.
No Mappings	Indicates that the LUN is not mapped to a SAN host.
Inactive	Indicates that the data path of the LUN is disabled, which makes the LUN inaccessible on the network.
All	Indicates that the LUN is accessible by all of the hosts on the network.

Protocol Access

Identifies the access protocol used to map the LUN to the Controller.

Protocols include:

- FC only
- iSCSI only
- No Access
- All

Groups

Displays the volume group or storage domain to which the logical volumes belong.

Volume Group	Lists the name of the volume group where the logical volume is located.
Storage Domain	Specifies the name of the Storage Domain.

Logical Capacity (GB)

Displays the storage requirements for the logical volumes.

Allocated	Identifies the total amount of storage capacity that is reserved for this volume.
Addressable	Identifies the capacity limit to which the volume can grow.
Logical Distribution	Displays a graphical comparison of the allocated capacity that this volume uses to the allocated capacity that is unused.

QoS

Displays the RAID and priority levels.

RAID Level — Identifies the storage mechanism that is used to enhance the ability of the system to recover data from the loss of one or more drives. Possible RAID levels:

- **Single Parity** — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- **Double Parity** — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
- **Mirrored** — Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Valid priority levels:

- **Premium** — Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.

	High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
	Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
	Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
	Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.
Clone Capacity (GB)	Displays the physical storage usage for the Clone LUNs.	
	Logical Maximum	Identifies the amount of storage that was requested for the clone repository.
	Physical Used	Identifies the amount of clone capacity that is allocated to the volume for clone data. The amount of capacity includes the overhead that is needed to create the logical volume. The overhead is parity for data protection.
	Physical Allocated	Identifies the total amount of clone capacity that the system reserved for the logical volume. The amount of capacity includes the overhead that is needed to create the logical volume.
	Physical Maximum	Identifies the maximum clone capacity allowed. For clones. This field identifies

		how much space is available for clone data.
Total Physical Capacity (GB)	Displays the total physical storage capacity for the logical volumes and Clone LUNs.	
	LUN Overhead	Identifies the physical and logical storage capacity that is required to meet the LUN Quality of Service (QoS) settings.
	Allocated	Specifies the amount of raw capacity in gigabytes (GB) that the system has assigned and designated to this logical volume.
	Maximum	Identifies the sum of the addressable capacity for the logical volume and its clone repository.
	Physical Distribution	Displays a graphical comparison of the capacity that is used to the maximum capacity that is allocated.

Global LUN Number	Identifies the globally unique identifier of the LUN.
LUID	Identifies the unique identifier of the LUN.

Statistics and Trending Overview Page

Navigation: *SAN > Statistics and Trending*

Displays links to pages that provide access to statistics on LUNs and Controller protocols.

LUNs	Opens the LUNs statistics page. You can view details on LUN statistics as well as real time statistics.
Controller Protocols	Opens the Controller Protocol statistics page. You can view details on FC and iSCSI port statistics as well as real time statistics for those ports.

SAN Storage Overview Page

Navigation: SAN > Storage

Displays links that allow you to create and manage logical volumes and storage area network (SAN) hosts that are configured on the Oracle FS System.

LUNs	Allows the administrator to create, view, and modify a logical volume within a SAN. Administrators assign storage resources and Quality of Service (QoS) attributes to each LUN.

Hosts	Allows the administrator to manage the SAN hosts, including creating host groups, renaming hosts, and, if Oracle FS Path Manager is not installed, associating hosts with an HBA.
Hosts to LUN Map	Provides a topology overview of the hosts and associated mapped LUNs.
LUN to Host Map	Provides a topology overview of the LUNs and associated mapped hosts.

View Data Protection Schedule Dialog

Navigation: SAN > Data Protection > Clone Schedules > Actions > View

Displays the data protection schedule properties.

Schedule Name	Identifies the name of the scheduled job.
Volume Group for Created Clones	Identifies the volume group to which the clone is assigned.
Enabled	Identifies whether the schedule is enabled.

Enabled	Indicates that the scheduled operation performs at the specified time.
Disabled	Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.

Protected Volume	Identifies the name of the logical volume from which the scheduled clone is created.
Schedule	Identifies the schedule of the data protection.
Recurrence	Identifies the interval by which the scheduled job occurs.

Related Links

View a LUN Data Protection Schedule

View LUN Statistics Detail

Navigation: *SAN > Statistics and Trending > LUNs > Actions > View Details*

Displays detailed information about the LUN you selected from the LUNs page.

If the dialog is kept open, the displayed information is refreshed, every two minutes.

Name	Identifies the name of the selected LUN.

Oracle FS System Performance

Read Throughput	Indicates the data transfer rate for read operations.
Write Throughput	Indicates the data transfer rate for write operations.
Total Throughput	Indicates the data transfer rate for read operations and write operations.
Read IOPS	Indicates the average number of read operations per second.
Write IOPS	Indicates the average number of write operations per second.
Total IOPS	Indicates the total read and writes operations per second.

System Load

Specifies the performance of the LUN while processing I/O requests.

Read Throughput	Indicates what the data transfer rate for data inputs, which are read operations, of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Write Throughput	Indicates the data transfer rate for data outputs, which are write operations, of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Total Throughput	Indicates the average data transfer rate for data read operations and write operations of the specified LUN would be if the system devoted all of the CPU resources to the LUN.
Read IOPS	Indicates the average number of read operations per second for read operations would be if the system devoted all of the CPU resources to the LUN.
Write IOPS	Indicates the average number of write operations per second for write operations would be if the system devoted all of the CPU resources to the LUN.
Total IOPS	Indicates the combined read and write operations per second would be if the system devoted all of the CPU resources to the LUN.

I/O Latency

Specifies the average time to complete a read or write operation (in milliseconds) and the average operation size (in KB).

Read Response Time	Identifies the average time to perform a read operation in the last sample period.
Write Response Time	Identifies the average time to perform a write operation in the last sample period.
Response Time	Identifies the average time to perform a read or write operation in the last sample period.
Read Operation Size	Identifies the average size of a read operation in the last sample period.
Write Operation Size	Identifies the average size of a write operation in the last sample period.

General

Specifies the I/O activity of the cache usage.

Cache Flushes per Second	Indicates the rate per second for which cache lines were flushed (written) to disk in the last sample period.
Cache Hit Ratio	Indicates the percentage of read operations that were completed from the read cache, which is also called cache hits, in the last sample period.
Read-Ahead IOPS	Indicates the average read operations per second from read-ahead fetching in the last sample period. Read-ahead fetching utilizes read access behavior in the sample period to determine read-ahead IOPS.
Non-Optimized IOPS	Indicates the total read operations and write operations per second that passed through non-optimized data paths in the last sample period. Optimized paths are preferred over non-optimized paths for performance. Non-optimized paths occur when there is no path management software used to manage data paths, the path management software is not configured correctly, or an optimized path is not available. Path management software and applications provide load balancing and path management for improved performance

Related Links

View Detailed LUN Statistics

View Details Dialog (Fibre Channel)

Navigation: *SAN* > *Statistics and Trending* > *Controller Protocols* > *Actions* > *View Details*

Displays information about the Fibre Channel (FC) port you have selected on the Controller Statistics page.

The View Details panel displays data shown in the Controller Protocol Statistics page as well as additional information. The information displayed is refreshed, if the panel is kept open, every two minutes as this is the collection period time.

Name	Identifies the name of the Controller.
Slot	Identifies the HBA location (slots 1, 4, and 5) on the Controller.
Port Number	Identifies the HBA port numbers on the Controller.
Port Type	Identifies the HBA port type.

General Information

Read Throughput	Identifies the data transfer rate for data inputs (reads).
Write Throughput	Identifies the data transfer rate for data outputs (writes).
Total Throughput	Identifies the average combined input and output data transfer rates (reads and writes).
Total IOPS	Identifies the total number of I/O operations per second.

Performance

Max Read Throughput	Identifies the maximum input data transfer rate (reads).
Max Write Throughput	Identifies the maximum output data transfer rate (writes).
Max Total Throughput	Identifies the maximum combined input and output data transfer rate (reads and writes).
Max Read IOPS	Identifies the maximum number of input (read) I/O operations per second.
Max Write IOPS	Identifies the maximum number of output (write) I/O operations per second.
Max Total IOPS	Identifies the maximum total number of input and output (read and write) I/O operations per second.

SCSI Task Management Operations

Abort Task	Indicates the number of abort task commands processed on the selected port.
Abort Task Set	Indicates the number of abort task set commands processed on the selected port. A task set is a group of tasks.
Clear ACA	Indicates the number of Clear ACA (Auto Contingent Allegiance) commands processed on the selected port.
Clear Task Set	Indicates the number of clear task set commands processed on the selected port.
Logical Unit Reset	Indicates the number of reset logical unit commands processed on the selected port.
Target Reset	Indicates the number of target reset commands processed on the selected port.

I/O Latency

Specifies the average time to complete a read or write operation (in milliseconds) and the average operation size (in KB).

Read Response Time	Identifies the average time to perform a read operation in the last sample period.
Write Response Time	Identifies the average time to perform a write operation in the last sample period.
Response Time	Identifies the average time to perform a read or write operation in the last sample period.
Read Operation Size	Identifies the average size of a read operation in the last sample period.
Write Operation Size	Identifies the average size of a write operation in the last sample period.

Channel Errors

Total Channel Errors	Indicates the total number of channel errors associated with this port.
Command Timeout Errors	Indicates the number of command timeout errors that have occurred on the channel associated with this port.
DMA Errors	Indicates the number of Direct Memory Access (DMA) errors that have occurred on the channel associated with this port.

Invalid RXID Errors	Indicates the number of invalid responder exchange identifier (RXID) errors that have occurred on the channel associated with this port.
Loop Init Errors	Indicates the number of loop initialization errors that have occurred on the channel associated with this port.
Overrun Errors	Indicates the number of overrun errors that have occurred on the channel associated with this port.
PCI Errors	Indicates the number of Peripheral Component Interconnect (PCI) errors that have occurred on the channel associated with this port.
Port Unavailable Errors	Indicates the number of port unavailable errors that have occurred on the channel associated with this port.
Reselection Timeout Errors	Indicates the number of reselection timeout errors that have occurred on the channel associated with this port.
Bad Frame Errors	Indicates the number of frames dropped from first-in or first-out buffer that have occurred on the channel associated with this port.
System Errors	Indicates the number of system errors that have occurred on the channel associated with this port.
Unacknowledged Host Event Errors	Indicates the number of unacknowledged host event errors that have occurred on the channel associated with this port.
Underrun Errors	Indicates the number of underrun errors that have occurred on the channel associated with this port.
Transfer Errors	Indicates the number of data transfer errors that have occurred on the channel associated with this port.

Loop Activity

LIPs	Indicates the number of loop initialization primitive (LIP) sequences which are used to initialize or reset attached ports to a known state.
Loop Ups	Indicates the number of loop ports that are up and available.
Loop Downs	Indicates the number of loop ports that are down and not available.

Related Links

View Detailed SAN Controller Protocols Statistics

View Details Dialog (iSCSI)

Navigation: *SAN* > *Statistics and Trending* > *Controller Protocols* > *Actions* > *View Details*

Displays information about the iSCSI port you selected on them Controller Protocol Statistics page.

The View Details panel displays data shown in the Controller Protocol Statistics page and other information. If the panel is kept open, the information displayed is refreshed every two minute.

Name	Identifies the name of the Controller.
Slot	Identifies the HBA location (slots 1, 4, and 5) on the Controller.
Port Number	Identifies the HBA port numbers on the Controller.
Port Type	Identifies the HBA port type.

General Information

Read Throughput	Identifies the data transfer rate for data inputs (reads).
Write Throughput	Identifies the data transfer rate for data outputs (writes).
Total Throughput	Identifies the average combined input and output data transfer rates (reads and writes).

Performance

Max Read Throughput	Identifies the maximum input data transfer rate (reads).
Max Write Throughput	Identifies the maximum output data transfer rate (writes).
Max Total Throughput	Identifies the maximum combined input and output data transfer rate (reads and writes).
Max Read IOPS	Identifies the maximum number of input (read) I/O operations per second.
Max Write IOPS	Identifies the maximum number of output (write) I/O operations per second.
Max Total IOPS	Identifies the maximum total number of input and output (read and write) I/O operations per second.

SCSI Task Management Operations

Abort Task	Indicates the number of abort task commands processed on the selected port.

Abort Task Set	Indicates the number of abort task set commands processed on the selected port. A task set is a group of tasks.
Clear ACA	Indicates the number of Clear ACA (Auto Contingent Allegiance) commands processed on the selected port.
Clear Task Set	Indicates the number of clear task set commands processed on the selected port.
Logical Unit Reset	Indicates the number of reset logical unit commands processed on the selected port.
Target Reset	Indicates the number of target reset commands processed on the selected port.

I/O Latency

Specifies the average time to complete a read or write operation (in milliseconds) and the average operation size (in KB).

Read Response Time	Identifies the average time to perform a read operation in the last sample period.
Write Response Time	Identifies the average time to perform a write operation in the last sample period.
Response Time	Identifies the average time to perform a read or write operation in the last sample period.
Read Operation Size	Identifies the average size of a read operation in the last sample period.
Write Operation Size	Identifies the average size of a write operation in the last sample period.

iSCSI Port Errors

Underrun Errors	Indicates the number of underrun errors during the collection period.
Overrun Errors	Indicates the number of overrun errors during the collection period.
Command Timeout Errors	Indicates the number of command timeout errors during the collection period.
DMA Errors	Indicates the number of Direct Memory Access (DMA) errors during the collection period.
Transport Errors	Indicates the number of transport errors during the collection period.

Device Unavailable Errors	Indicates the number of device unavailable errors during the collection period.
Data Digest Errors	Indicates the number of data digest errors during the collection period.
Header Digest Errors	Indicates the number of header digest errors during the collection period.
Invalid Snack Errors	Indicates the number of invalid SNACK (selective negative acknowledgment) errors during the collection period.
Unsolicited Data Errors	Indicates the number of unsolicited data errors, which are SCSI writes which include data but immediate data is disabled because the total data string would exceed the burst length, during the collection period.
Unexpected Data SN Errors	Indicates the number of unexpected data storage network (SN) errors caused from data sequence number in the Protocl Data Unit (PDU) during the collection period.
Initiator Task Tag Errors	Indicates the number of initiator task tag errors during the collection period.
System Errors	Indicates the number of system errors during the collection period.
MAC CRC Errors	Indicates the number of Media Access Control Cyclic Redundancy Check (MAC CRC) errors during the collection period.
MAC Encoding Errors	Indicates the number of MAC encoding errors during the collection period.
iSNS Errors	Indicates the number of Internet storage name service (iSNS) errors during the collection period.
Command PDUs Rejected	Indicates the number of command Protocol Data Unit (PDUs) rejected during the collection period.
Connection Failures	Indicates the number of connection failures during the collection period.
Session Login Failures	Indicates the number of session login failures during the collection period.
FW Dump Errors	Indicates the number of firmware (FW) dump errors during the collection period.

iSCSI Port Requests

Reinitialize Requests	Indicates the number of re-initialization requests during the collection period.

Target Cold Reset Requests	Indicates the number of cold target reset requests during the collection period. A target cold reset cancels all pending operations.
Task Reassign Requests	Indicates the number of task reassign requests during the collection period. A task reassign creates a new allegiance connection for the task.
ISNS Messages	Indicates the number of Internet Storage Name Service (iSNS) messages during the collection period.

iSCSI Port Events

Link Up Events	Indicates the number of link up events during the collection period.
Link Down Events	Indicates the number of link down events during the collection period.
IP Address Change Events	Indicates the number of IP address change events during the collection period.
Duplicate IP Address Events	Indicates the number of duplicate IP address events during the collection period.

Related Links

View Detailed SAN Controller Protocols Statistics

View Host, Advanced Tab

Navigation: SAN > Storage > Hosts > Actions > View Host > Advanced

Displays the HP compatibility option setting for the selected Storage Area Network (SAN) host.

HP-UX Compatibility Mode	Use this option when the SAN host is running the HP-UX operating system. When compatibility mode option is enabled, the system uses an alternative method to present LUNs on the SAN host. This alternative method is compatible with HP-UX. When this option is enabled, you might not have a LUN visible to the host as LUN number 0. HP-UX compatibility mode enables the full range of LUN numbers (other than 0) to be used with HP-UX operating systems. You can verify the current host mappings from the Flash Storage Path Manager tab.

Related Links

View SAN Host Entry Settings

View Host, Oracle FS Path Manager Tab

Navigation: SAN > Storage > Hosts > Actions > View Host > Oracle FS Path Manager

Displays configuration information about Oracle FS Path Manager that is running on the host.

Host Information

Host Name	Identifies the name of the SAN host entry.
Management IP Address	Identifies the IP address of the SAN host. The system uses this address to exchange management requests and responses with the FSPM that is installed on the host. If FSPM is not installed, this field displays *N/A*.
Operating System	Identifies the operating system that is associated with the SAN host, when Oracle FS Path Manager is installed on that host; otherwise, this field displays *N/A*.
Oracle FS Path Manager Version	Identifies the version of the FSPM that is installed and running on the SAN host.

Oracle FS Path Manager Settings

LUN Name — Identifies the name of the LUN or Clone LUN on the Oracle FS System.

Name on Host — Identifies the name used by the SAN host to identify the LUN.

Load Balancing — Identifies the type of load balancing that the storage area network (SAN) hosts performs to access Oracle FS System LUNs.

Note: If the Load Balancing option is not selectable, then the version of FSPM does not allow load balancing on the host.

Valid types:

Static	Indicates load balancing across multiple paths to the configured LUNs. The software selects the best available path, and all commands are sent over that path until the path is no longer operational, in which case the failed path fails over to another appropriate path.

	Round Robin	Indicates load balancing across multiple paths to the configured LUNs. The system sends the commands one by one using the best available paths, which ensures that LUN commands are evenly distributed over any path that is available to access the LUNs.
Number of Optimized Paths	Identifies the number of optimized (fastest path available) access paths to the LUN.	
Number of Non-Optimized Paths	Identifies the number of non-optimized access paths to the LUN.	

Related Links

View SAN Host Entry Settings

View Host, iSCSI Access Tab

Navigation: SAN > Storage > Hosts > Actions > View Host > iSCSI Access

Displays iSCSI information for the Storage Area Network (SAN) host.

Note: iSCSI settings are not available for a SAN host using Fibre Channel protocol.

iSCSI Host Specific Settings

Enable Authentication	Indicates whether the Challenge Handshake Authentication Protocol (CHAP) protocol for iSCSI sessions between the SAN host and the Oracle FS System is enabled. **Note:** Depending on the global settings, the CHAP name property and the CHAP secret property might not be required. Those properties are not required, for example, when authentication is performed through a RADIUS server.
Chap Name	Identifies the name of the iSCSI initiator that is to be used during authentication.
CHAP Secret	Identifies the encrypted CHAP authentication password (secret) to be used in the exchange of user names and secrets between two devices. Both devices must support Point-to-Point (PPP) authentication.

Retype CHAP Secret	No information is available for this field.
Grant Access to Oracle FS	Specifies whether the Oracle FS System must reject iSCSI login attempts from initiators that have not explicitly been granted permission by the user through the Oracle FS System Manager interface or through the Oracle FS System Command Line Interface (CLI).

Related Links

View SAN Host Entry Settings

View Host, Ports Tab

Navigation: SAN > Stroage > Hosts > Actions > View Host > Ports

Displays port information about a selected host.

Host Name	Identifies the name of the SAN host entry.

FC Port Information

Alias	Identifies an alternative friendly name that is assigned to the host port.
Port	Identifies the WWN assigned to a Fibre Channel HBA port.
Speed	Indicates the speed, in Gb/s, of the connection between the SAN host and the device to which the host is directly connected. That device is typically a network switch or possibly the Controller. **Note:** The actual data transfer rate between the SAN host and the Controller can be less than the reported speed. It can be less because the data transfer rate is governed by the slowest link on the path between the host and the Controller.
Manufacturer	Identifies the manufacturer of a hardware component.
HBA Model	Identifies the model number of a hardware component.
Driver Version	Identifies version of the HBA driver.
Firmware Version	Identifies the HBA firmware version.

iSCSI Port Information

Alias	Identifies an alternative friendly name that is assigned to the host port.
iSCSI Device Name	Identifies the name of the iSCSI initiator for the SAN host. An initiator encapsulates SCSI commands and data requests

	within iSCSI packets and transfers the packets across the IP network.
IP Addresses	Identifies the IP address of the host iSCSI port.

Related Links

View SAN Host Entry Settings

View SAN LUN, Data Protection Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > View > Data Protection > Single Tier

Displays the data replication schedules of a logical volume.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity by Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Enable Clones	Indicates whether the Capacity for Clones option is set.

Capacity for Clone Storage

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs. **Note:** Changes to this field updates the Maximum and Available Capacity values. The capacity values are based on the Addressable Logical Capacity value that you provided in the Quality of Service tab.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Number of Clones (of this clone)	Identifies the number of clones that have been created for this LUN.
Number of Clones (total)	Identifies the number of clones that have been created for this LUN and its clones.

Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Specifies the enhanced QoS settings to apply to the clone storage that are created by the data protection schedule, or manually created by the administrator.

Storage Class	Specifies the category of physical media on which the logical volume resides. Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the

latency of the read operations and of the write operations.

Capacity Disk — Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic — Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

- Sequential — Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
- Random — Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
- Mixed — Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

- Read — Indicates that most of the access requests are for read operations.
- Write — Indicates that most of the access requests are for write operations.
- Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the RAID level associated with the Storage Profile.

Valid redundancy levels:

Single	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
Double	Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one

drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

- Premium — Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
- High — Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
- Medium — Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
- Low — Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
- Archive — Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name — Identifies the name of the schedule.

Start Time — Identifies the date and time that the schedule begins.

Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled. **Enabled** — Indicates that the scheduled operation performs at the specified time. **Disabled** — Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.
Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

Display Clone LUN Details

View SAN LUN, Data Protection Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > View > Data Protection > Auto Tier

Displays the data replication schedules of a logical volume.

Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Enable Clones	Indicates whether the Capacity for Clones option is set.

Capacity for Clones

Maximum capacity	Specifies the percentage of storage space to allocate for Clone LUNs.
Current Maximum Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how

	much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Current Available Capacity	Identifies the amount of current storage capacity allocated for clones of this LUN.
Number of Clones (of this clone)	Identifies the number of clones that have been created for this LUN.
Number of Clones (total)	Identifies the number of clones that have been created for this LUN and its clones.
Match Repository QoS to LUN QoS	Specifies whether to apply the clone storage QoS properties using a Data Protection schedule, or manually applied by the administrator.

Clone Storage QoS

Indicates the QoS settings that are applied to the logical volume.

Initial Storage Class	Indicates the category of physical media on which the logical volume resides. Valid media types:	
	Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
	Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.
	Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
	Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Basic	Initial Typical Access	Identifies the most common method of data access. Valid biases:

		Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
		Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
		Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.
	Initial I/O Bias	Identifies the typical read-write ratio. Valid I/O biases:	
		Read	Indicates that most of the access requests are for read operations.
		Write	Indicates that most of the access requests are for write operations.
		Mixed	Indicates that the number of access requests are similar for read operations and for write operations.
Advanced	Initial RAID Level	Identifies the RAID level associated with the Storage Profile. Possible RAID levels:	
		Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
		Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
		Mirrored	Indicates that no parity bits exist for the volume. Instead, the

	system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Clone Schedules

Lists the data protection schedules that are associated with the logical volume.

Name	Identifies the name of the schedule.
Start Time	Identifies the date and time that the schedule begins.
Frequency	Identifies the frequency at which the schedule runs. Frequencies include: • Run Once • Hourly • Daily • Weekly
Enabled	Identifies whether the schedule is enabled. **Enabled** — Indicates that the scheduled operation performs at the specified time. **Disabled** — Indicates that the operation is not performed as scheduled. Disable the schedule, for example, when the source volume (LUN or Clone LUN) has not been made available to users.
Create	Displays a dialog to create a scheduled operation.
Modify	Displays a dialog to modify an existing schedule.
Delete	Removes an existing schedule.

Related Links

Display Clone LUN Details

View SAN LUN, Mapping Tab

Navigation: SAN > Storage > LUNs > Actions > View > Mapping

Displays the LUN-to-host mapping settings for a logical volume.

Access Protocol	Specifies the protocols that are allowed for accessing the logical volume.
Only selected hosts (via maps)	Specifies that only designated SAN hosts can access this LUN using a specific, possibly different, LUN number on each of those hosts. If the LUN is mapped, the LUN number must be unique to the mapped SAN host.
All hosts may access this LUN using LUN Number	Specifies all SAN hosts accessing this LUN use the same LUN number. Select this option to activate the LUN number selection drop-down list.

LUN Controller Assignment

Current Controller	Identifies the current Controller on which the LUN is homed. **Note:** For new source LUNs, this field is not available; instead, use the Assigned Controller option.
Assigned Controller	Identifies the Controller to which the system should assign the LUN. Choose an available Controller node from the list.

Ports Masked for this LUN

Displays the physical Controller ports to exclude (mask) so they cannot access the LUN.

Masked	Indicates whether the port for the LUN is masked.
Protocol	Identifies the type of access protocol, FC or iSCSI.
Controller	Identifies the name of the Controller.
Slot	Identifies the slot number of the Controller HBA.
Port	Identifies the Controller port number.
Controller Port Address	Identifies the unique identifier of each Controller network port. For FC networks, this identifier is the World Wide Name (WWN). For iSCSI networks, this identifier is the Media Access Control (MAC) address.

LUN Mapping

Manages the LUN-to-Host mapping assignments.

Note: The LUN mapping table only displays when you select the Only selected hosts (via maps) option.

You can map a LUN or Clone LUN to either a single host or a host group.

Hosts Mapped to this LUN	Name	Identifies the SAN host that accesses LUNs configured on the Oracle FS System. If the Oracle FS Path Manager is not installed, the system displays the WWN of the FC HBA or the IP address of the iSCSI device.
	Map via LUN Number	Identifies the number to assign to the LUN for the associated SAN host. This number must be unique for that particular host. It need not to be unique across all hosts.
Create	Opens the dialog that allows you to create the LUN-to-host mapping based on your selections for host name and assign the LUN number that the host uses.	
Modify	Opens the dialog that allows you to change the LUN mapped to the associated host.	
Remove	Removes the LUN mapping for the selected SAN host.	

Related Links

Display LUN Details

View SAN LUN, Quality of Service Tab, Single Tier

Navigation: SAN > Storage > LUNs > Actions > View > Quality of Service > Single Tier

Displays the QoS properties of a selected logical volume.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Capacity By Storage Class

Identifies the type of physical media on which the data is stored. Valid media types (listed from the highest performance priority to the lowest performance priority):

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.

Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Storage Domain — Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains — Displays a dialog that lists the available Storage Domains.

LUN Name — Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group — Allows you to assign the LUN to a volume group.

[...]	Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Uses Storage Profile — Specifies whether the logical volume uses a custom set of QoS properties.

[...]	Opens the View Storage Profiles dialog, which allows you to review the profile details.

Storage Class — Specifies the category of physical media on which the logical volume resides.

Valid media types:

Performance SSD	Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
Capacity SSD	Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for

this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.

Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.

Basic Allows you to specify indirectly the parity level of the data and the read-ahead policy for the data. You specify those properties indirectly by selecting how the data is typically accessed and the level of data protection that is desired.

Note: After you select how the data is typically accessed and the level of redundancy for the data, the system displays the parity level and the read-ahead policy for the volume that supports your selections.

Typical Access — Identifies the most common method of data access. Valid biases:

Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.

I/O Bias — Identifies the typical read-write ratio. Valid I/O biases:

Read	Indicates that most of the access requests are for read operations.
Write	Indicates that most of the access requests are for write operations.

Mixed — Indicates that the number of access requests are similar for read operations and for write operations.

Redundancy — Identifies the number of copies of the parity bits that the Oracle FS System creates for the volume.

Valid redundancy levels:

- Single — Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
- Double — Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.

Advanced — Allows you to specify directly the parity level of the data and the read-ahead policy for the data.

Important: Use of this option clears the selections, if any, that were made in the Basic option.

RAID Level — Identifies the RAID level associated with the Storage Profile.

Possible RAID levels:

- Single parity — Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
- Double parity — Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance.

Double parity is implemented as a variant of the RAID 6 storage technology.

Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Read Ahead Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity	Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.
Allocated Logical Capacity	Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.
Disable Reference Tag Checking	Indicates that a portion of the internal data integrity checks is disabled for the LUN. If set, the Use as a Boot LUN option has no effect.
Use as a Boot LUN	Indicates the status returned from the LUN is modified for unwritten data blocks. Setting this option affects the host or application retry timing.
Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Display LUN Details

View SAN LUN, Quality of Service Tab, Auto Tier

Navigation: SAN > Storage > LUNs > Actions > View > Quality of Service > Auto Tier

Displays the QoS properties of a selected logical volume.

Selected Storage Domain Capacity

Displays the storage capacity of the selected storage class and Storage Domain that is available for the logical volume. The graph uses colored bars of different thicknesses to indicate the capacity status of the logical volume you are creating as well as the overall system capacity.

Allocation By Storage Class and RAID Level

Indicates graphically the actual physical capacity of the auto-tiered LUN plus the capacity that is required for RAID Level parity. The graph contains stacked bars that represent the sum of the Storage Class physical capacity and the RAID Level parity. A legend at the bottom of the graphic provides detailed information about each bar.

Storage Domain — Specifies the name of the storage domain associated with the LUN.

Note: All Storage Domain options appear when the Oracle FS System contains custom Storage Domains.

View Storage Domains — Displays a dialog that lists the available Storage Domains.

LUN Name — Identifies the name that is assigned to a LUN for administrative purposes. LUN names must meet the following requirements:

- Must be unique across the Oracle FS System
- Must be 82 or fewer UTF characters
- Must be 255 or fewer ASCII characters

Volume Group — Allows you to assign the LUN to a volume group.

- **[...]** — Opens the Manage Volume Groups dialog, which allows you to create a volume group.

Use Storage Profile — Specifies whether the logical volume uses a custom set of QoS properties.

- **[...]** — Opens the View Storage Profiles dialog, which allows you to review the profile details.

Initial Storage Class — Specifies the category of physical media on which the logical volume resides.

Valid media types:

- **Performance SSD** — Specifies that the data is stored on solid state drives (SSDs) that are optimized for the performance of balanced read and write operations.
- **Capacity SSD** — Specifies that the data is stored on SSDs that are optimized for the performance of capacity and for read operations. The write performance for this Storage Class is sacrificed somewhat to achieve the optimizations for read performance and for capacity.

		Performance Disk	Specifies that the data is stored on high-speed hard disk drives (HDDs). This Storage Class sacrifices some capacity to reduce the access time and the latency of the read operations and of the write operations.
		Capacity Disk	Specifies that the data is stored on high-capacity, rotating HDDs. This Storage Class optimizes capacity at some sacrifice of speed. For a storage system that does not include tape storage as an option, this Storage Class always provides the lowest cost for each GB of capacity.
Basic	Initial Typical Access	Identifies the most common method of data access. Valid biases:	
		Sequential	Indicates that the read requests and the write requests operate on the data mostly by accessing the records one after the other in a physical order.
		Random	Indicates that the read requests and the write requests operate on the data mostly by accessing the records in an arbitrary order.
		Mixed	Indicates that the read requests and the write requests operate on the data sometimes in sequential order and sometimes in random order.
	Initial I/O Bias	Identifies the typical read-write ratio. Valid I/O biases:	
		Read	Indicates that most of the access requests are for read operations.
		Write	Indicates that most of the access requests are for write operations.
		Mixed	Indicates that the number of access requests are similar for read operations and for write operations.
	Initial Redundancy	Identifies the RAID level associated with the Storage Profile. Valid redundancy levels:	
		Single	Stores the original user data plus one set of parity bits to help in the recovery of lost data. Access to the data is preserved even

				after the failure of one drive. Single parity is implemented using RAID 5 technology and is the default redundancy level for the Storage Classes that specify the performance-type media.
			Double	Stores the original user data plus two sets of parity bits to help in the recovery of lost data. Access to the data is preserved even after the simultaneous failure of two drives. Double parity is implemented using RAID 6 technology and is the default redundancy level for the Storage Classes that specify the capacity-type media.
Advanced	Initial RAID Level	Identifies the RAID level associated with the Storage Profile. Possible RAID levels:		
			Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
			Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.
			Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Initial Read Ahead — Identifies the read-ahead policy that the system uses for sequential read operations. The policy determines the amount of additional data, if any, that the system places into the Controller cache. Valid policies:

Normal	Indicates that the input requests and the output requests are accessing the data mostly in a random manner or in a mixed sequential and random manner.
Aggressive	Indicates that the input requests and the output requests are accessing the data mostly in a sequential manner and that the workload is biased toward read operations.
Conservative	Indicates that the input requests and the output requests are mostly sequential and that the workload is biased toward write operations.

Priority Level — Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.

Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.

Premium	Indicates the highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate

priority when the system migrates the data to the higher-performing storage tiers.

Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Migration/ Copy Priority

Identifies the strategy the system should use to control the impact on performance when background tasks need to copy or move data from one location in the storage pool to another.

Note: When the system is idle or lightly loaded, the background task maximizes the amount of work done regardless of the option selected.

Valid priorities:

System Chooses	Balances the background copy with the incoming client I/O. This option is the default.
Minimize Impact	Restricts the amount of work performed on a loaded system. This option is intended to have a minimal impact on client I/O throughput at the expense of longer copy times.
Maximum Speed	Prioritizes the background copy at the expense of client I/O throughput.

Capacity

Identifies the maximum capacity to which the logical volume can grow. For a clone, this field identifies how much addressable space is available. Capacity must be greater than or equal to the allocated logical capacity.

Allocated Logical Capacity

Identifies the amount of capacity that is reserved for the logical volume. The reserve capacity must be less than or equal to the maximum capacity.

Disable Reference Tag Checking

Indicates that a portion of the internal data integrity checks is disabled for the LUN. If set, the Use as a Boot LUN option has no effect.

Use as a Boot LUN

Indicates the status returned from the LUN is modified for unwritten data blocks. Setting this option affects the host or application retry timing.

Capacity Estimates	Provides an estimate of the physical storage capacity requirements, which are based on your QoS attribute selections.

Estimated Physical Capacity	Identifies the estimated physical capacity (allocated and maximum) for this logical volume.
Estimated Clone Capacity	Identifies the estimated capacity (allocated and maximum) for clones of this logical volume.
Estimated Total Capacity	Identifies the estimated total capacity (allocated and maximum) for this logical volume.

Related Links

Display LUN Details

Volume Groups Overview Page

Navigation:

NAS > Volume Groups
SAN > Volume Groups

Manages the volume groups and the logical volumes that are configured on the Oracle FS System.

From this page you can create, modify, view, and delete volume groups and logical volumes. You can copy and clone the logical volumes. You can also change the QoS settings of any volume from standard to enhanced.

Note: A dash in a field signifies that the property does not apply to the volume.

Name	Lists the names of the logical volumes and the names of the volume groups that are configured on this Oracle FS System. If a logical volume belongs to a volume group, the volume is listed beneath that group.
Status	Identifies the accessibility of the logical volume.

filesystems Valid states:

Online	Indicates that the filesystem is fully accessible and functional.
Busy	Indicates that the filesystem is fully functional but no external access is currently allowed.

	Degraded Writes	Indicates that the filesystem is functional but, instead of writing the data to the Controller journal, the system is writing the data directly to disk. As a result, the performance of the filesystem is degraded.
	Read-Only	Indicates that the Controller journal has been pinned or that the journal has been lost.
	Partial Online	Indicates that the filesystem is functional but one or more of the data tiers is offline.
	Offline	Indicates that the filesystem is not accessible.
LUNs	Valid states:	
	Online	Indicates that the volume is fully accessible.
	Offline	Indicates that the volume is not accessible.
	Conservative	Indicates that the write-back cache of the volume is disabled, which reduces system performance. A Conservative state might indicate a hardware problem.
	Prepared	Indicates that the storage resources for the volume are reserved for the clone, but the clone is not committed to the storage device.
	Read Only	Indicates that the volume is in write protect mode and is set to read-only.
	Unknown	Indicates that not enough information is obtained from the volume to report its status.

Logical Capacity (GB)

Provides an overview of the logical capacity usage and the logical capacity requirements of the volume group.

Used	Indicates the amount of allocated capacity that is consumed.

	• For LUNs, this amount is the same as the allocated amount. • For filesystems, this amount is the allocated capacity that contains user data.
Allocated	Identifies the total amount of storage capacity that is reserved for this volume or this volume group.
Addressable	Identifies the capacity limit to which the volume can grow.
Distribution	Displays a graphical comparison of the allocated capacity that this volume uses to the unused allocated capacity.
Logical Maximum	Identifies the sum of the addressable capacity for the logical volume and its clone repository.

Capacity (GB) for Clone LUNs

Provides an overview of the physical capacity usage and the physical capacity requirements of any Clone LUNs that might exist in the volume group.

Physical Used	Identifies the amount of clone capacity that is allocated to the volume for clone data. The amount of capacity includes the overhead that is needed to create the logical volume. The overhead is parity for data protection.
Physical Allocated	Identifies the total amount of clone capacity that the system reserved for the logical volume. The amount of capacity includes the overhead that is needed to create the logical volume.
Physical Maximum	Identifies the maximum clone capacity allowed. For clones. This field identifies how much space is available for clone data.

RAID Level	Single parity	Indicates that, in addition to the actual data, one set of parity bits exists for the logical volume. This parity level protects against the loss of one drive. Single parity is implemented as a variant of the RAID 5 storage technology.
	Double parity	Indicates that, in addition to the actual data, two sets of parity bits exist for the logical volume. This parity level protects against the loss of one or two drives with a slight cost to write performance. Double parity is implemented as a variant of the RAID 6 storage technology.

	Mirrored	Indicates that no parity bits exist for the volume. Instead, the system writes the data in two different locations. This RAID level protects against the loss of at least one drive and possibly more drives with an improvement of the performance of random write operations. Mirrored RAID is implemented as a variant of the RAID 10 storage technology.

Note: For LUNs, the system displays the RAID levels that are in use by each LUN. For filesystems, the system displays the RAID levels that are in use by the filesystem storage tiers.

Priority Level	Filesystems	Identifies the priority that the system gives to various operational aspects of a logical volume, such as the Controller processing queue. The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume. Identifies as well where the data is striped on rotating drives. Valid priority levels:
		Premium — Indicates the highest priority for responding to requests in the processing queue.
		High — Indicates the next highest priority for responding to requests in the processing queue.
		Medium — Indicates an intermediate priority for responding to requests in the processing queue.
		Low — Indicates the next to lowest priority for responding to requests in the processing queue.
		Archive — Indicates the lowest priority for responding to requests in the processing queue.
	LUNs	Identifies the priority that the system gives to various operational aspects of a logical volume. These operational aspects include the Controller processing queue, the SAN interface requests, and the migration of the auto-tiered LUN extents.
		Note: The processing-queue priority defines the percentage of the Controller CPU cycles that are dedicated to the volume.
		Premium — Indicates the highest priority for responding to requests in the processing

	queue. For auto-tiered LUNs, busy LUN extents receive the highest priority when the system migrates the data to the higher-performing storage tiers.
High	Indicates the next highest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next highest priority when the system migrates the data to the higher-performing storage tiers.
Medium	Indicates an intermediate priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive an intermediate priority when the system migrates the data to the higher-performing storage tiers.
Low	Indicates the next to lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the next to lowest priority when the system migrates the data to the higher-performing storage tiers.
Archive	Indicates the lowest priority for responding to requests in the processing queue. For auto-tiered LUNs, busy LUN extents receive the lowest priority when the system migrates the data to the higher-performing storage tiers.

Related Links

Display Volume Group Details

APPENDIX D

Support Tab Reference Pages

Clear Log Dialog

Navigation: Support > System Logs > Actions > Clear Logs

Clears (deletes) all existing collected log bundles from the Oracle FS System. This does not clear logs which are not contained in a log bundle.

Note: Clearing (deleting) system logs requires support administrator login privileges. Contact Oracle Customer Support before proceeding.

Controller Logs	Select this option if you want to clear (delete) only Controller logs. This leaves logs, like event log, intact.
Log Collections	Select this option to clear (delete) all logs displayed in the System Logs view.

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Related Links

Clear the System Logs

Create Log Bundle Dialog

Navigation: Support > System Logs > Actions > Create

Defines the hardware components and system events to include in the log files.

You can define the collection period, select SAN hosts to gather information from, and choose if logs are sent to a Call-Home server or downloaded to a workstation. You can also associate the log file with a server request (SR).

Component or Item	Provides a list of available components and system events for data collection.	
	Collect	Indicates whether the object is selected for data collection
	Name	Indicates the name of the object for data collection.
Select buttons	Specifies all or a group of system components.	

	Select All	Sets all object events in the list to Yes. This selection provides a record of all events on the system.
	Deselect All	Resets the available object events in the list to No so that no logs are collected.

Collection Period

Controls the extent of information coverage for each selected source.

Most Recent Logs	Indicates the age of the collected data logs. For example, a setting of four hours means that the logs are less than four hours old. (Four hours is the default value. You can also specify days instead of hours.)
All Logs Since Last Log Collection	Indicates that the data collection logs are continually updated.

SAN Host Log Selection

Allows you to select the SAN host for log collection:

This feature is only available if the SAN host is running

Oracle FS Path Manager and the SAN hosts are logged in at the time of collection.

Number of hosts selected for log collection	Indicates the number of hosts selected for log collection.
Select Hosts	Opens a dialog that allows you to select recognized SAN hosts on the system for log collection.

Collect	Indicates whether the host is selected for data collection.
SAN host	Indicates the name of the SAN host for data collection

Notes

Provides user-defined information about the system logs collection. This information appears in the Notes column. The notes information appears in the Notes column of the System Logs overview page for easily identification. This information is also included in the header of the log bundle for identification.

The Notes field is also used to associate the log bundles with an open service request (SR). The SR number must be the first entry in the field. Add any other notes that are related to the

	log bundles after the SR number. Select the Send to Call-Home server option when using the SR number.
Send to Call-Home server	Collects the log and then transmits the log to the configured Call-Home server.
Download to	Creates the log bundle and then downloads that log bundle to a user specified directory on the workstation.

Related Links

Create a Log Bundle

Data Consistency Overview Page

Navigation: Support > Data Consistency

Displays the data consistency check results for the Oracle FS System Drive Group or allows you to create tasks to verify data consistency. Data consistency refers to the integrity of the parity data and not the user-created data.

Note: The data consistency check requires significant system resources and is usually performed at the direction of Oracle Customer Support.

You can perform the data consistency check by selecting a Drive Group and then select Actions > Verify Data Consistency.

When you select Verify Data Consistency, you can choose whether to run the check at low priority or high priority. At low priority, there is a 10 percent potential system impact to the system and at high priority, there is a 30 percent potential to impact system performance. If you select low priority, the check talkes longer to complete but with less potential system impact. If you do not see the results displayed after a period of time, refresh the page to display the results.

After you start a data consistency check, you cannot cancel the process. Also, the process might be shown as completed in the Tasks panel, the process can continue to run in the background until actual completion.

If the data consistency check fails, you may see the Status change to degraded. If you see a status of degraded, with or without a data consistency check, contact Oracle Customer Support.

Drive Group	Identifies the name of the Drive Group.
Status	Identifies the state of the Drive Group. Valid states:

Normal	Requires no action
Warning	Requires no immediate action for minor conditions.
Critical	Requires prompt action to prevent system failures or offline conditions

	Unknown Additional information is required.
Date of Result	Specifies the date and time when the data consistency test was completed.
Consistency Result	Specifies the result of the data consistency test. Valid results: • Pass • Fail
Errors Found	Identifies the number of consistency test errors.
Errors Fixed	Identifies the number of errors corrected during the test.

Manage Halt Points Dialog

Navigation: Support > System Halt Points > Manage Halt Points

Manages the system halt points that are available on the Oracle FS System. A halt point set for a software component causes the system to pause the startup sequence at a step associated with that component to enable troubleshooting and diagnostics.

CAUTION: Use system halt points for troubleshooting purposes only. System halt points are used to gather information or to clear conditions that cannot otherwise be accomplished. Never set or clear halt points without assistance from Oracle Customer Support. Only the Primary administrator and the Support administrator can manage system halt points.

Active	Indicates whether the startup process is to halt at the indicated step for this software component.
Order	Identifies where in the startup sequence the software component step is to be executed.
Paused on Halt Point	Indicates the step at which the startup sequence is halted.
Component Name	Identifies the name of the software component that is associated with the system halt point. The system lists the components in the normal startup sequence.
Step	Identifies the name of the software component step where the halt point is to occur. The system lists the steps in the normal startup sequence.
Clear	Deselects all of the selected halt points that appear in the Paused on Halt Point field.

Related Links

Manage System Halt Points

Reset System Dialog

Navigation: Support > System Trouble > Actions > Reset System

Resets the system configuration as directed by Oracle Customer Support. Do not use this feature unless directed by Oracle Customer Support. Resetting the system changes the system serial number which can cause issues with service entitlement.

Requires an encrypted file provided by Oracle Customer Support for configuration information.

CAUTION: Because this action deletes all user data along with the system configuration, the system prompts you to confirm the operation. Be absolutely sure you want to take this action. All data in the system is lost. After you select OK, this action cannot be canceled or undone.

Resetting the system configuration, performs the following actions:

- Deletes all data stored on the Oracle FS System.
- Resets the configuration to an initial state.
- Resets the system serial number.

Reset File[...]	Select the filename and folder location for the encrypted file provided by Oracle Customer Support.

Related Links

Reset the Oracle FS System

Software and Firmware Overview Page

Navigation: Support > Software and Firmware

Displays the software and firmware packages currently installed on the Drive Enclosures, Controllers, and Pilots.

Other information includes listing of all software and firmware packages staged for an upgrade and whether a given software module applies to current hardware installed n the system.

Software Update Scheduled

Note: The Software Update Scheduled information appears only if there is an active software update scheduled. The Scheduled Software Update allows you to update the software at a later time.

Task Name	Identifies the type of scheduled task: Software Update.
Scheduled Start Time	Indicates the date and time of the schedule software update.

Cancel Scheduled Update	Allows you to remove the scheduled software update.

Installed Software

Package Version	Identifies the version number of the currently installed software package. The package version is the version of the Red Hat Package Manger (RPM) package already installed.
Compatibility Matrix Version	Identifies the package version of the currently installed compatibility matrix. The matrix version is usually the same as the package version unless you have staged a higher revision package.
Module	Identifies the name of a software or firmware module that is installed on the Oracle FS System.

Table 21: Software module types

Name	Description
Pilot OS	Operating system for the Pilot.
Pilot Software	Software that runs on the Pilot, such as the GUI interface and web server, online help, and Simple Network Management Protocol (SNMP).
Controller BIOS	Programmable ROM (PROM), which includes BIOS and netboot code, for the Controllers.
Controller Software	Software that manages the Controllers.
Drive Enclosures Firmware	Firmware for Drive Enclosures.

Version	Identifies the version number of a software module. A value of *unsupported* indicates there is a problem with the individual software module. Contact Oracle Customer Support for assistance.
Applies to Current Hardware *(Support roles only)*	Indicates that the affected hardware component uses the software module. **Note:** The Applies to Current Hardware column is displayed only for user accounts set up with support role privileges.

Staged Software

Package Version	Identifies the version number of the currently installed software package. The package version is the version of the Red Hat Package Manger (RPM) package already installed.
Can Upgrade to Staged Version	Indicates that an upgrade path is available based on the installed software module version and the staged software package.
Upload Software Package	Permits you to select and upload a software update package. Software packages are downloaded from My Oracle Support (support.oracle.com). Contact Oracle Customer Support if assistance is needed.

Related Links

Display Software and Firmware Versions

System Halt Points Overview Page

Navigation: Support > System Halt Points

Displays the system halt points, if any, that have been enabled on the Oracle FS System and allows you to set or clear a halt point.

The system halt points are used for diagnostics and typically requested by Oracle Customer Support to aid in isolating problems. In most instances, you should not create a system halt point unless instructed by Oracle Customer Support.

Order	Identifies where in the startup sequence the software component step is to be executed.
Paused on Halt Point	Indicates the step at which the startup sequence is halted.
Component Name	Identifies the name of the software component that is associated with the system halt point. The system lists the components in the normal startup sequence.
Step	Identifies the name of the software component step where the halt point is to occur. The system lists the steps in the normal startup sequence.

System Logs Overview Page

Navigation: Support > System Logs

Displays collected system information available on an Oracle FS System. You can view logs as well as create new logs from this page.

You can manage logs from this page, including sending logs to a Call-Home server, downloading logs to a user-defined location, deleting logs, and clearing logs.

File Name — Lists the name of the log file bundle containing the collected system information. (The logs are compressed in the tar format.)

Note: The log name includes two time stamps. In this example, A990033ZIO-130714104814-130718095816-PCP_EVT_FOUND_PILOT_CORE_FILE-e-02-02.tar, the two timestamps indicate:

1. The first field, 130714104814 is the time stamp of the previous log bundle created before the most recent log bundle was created. For example, if the last log file was created on July 14, 2013, at 10:48:14 am, that information is added to the first part of the log file bundle name.
2. The second field, 130718095816, is the time stamp of the log file that was created. For example, if a log file was created on July 18, 2013, at 9:58:16 am; the time and date is shown as 130718095816 in the log file name.

Time Collected — Identifies the time and date at which the download bundle was collected from the Oracle FS System.

Collection Type — Indicates the method by which the system logs are collected:

Manual	Indicates user initiated system logs.
Event Generated	Indicates event triggered system logs where the triggering event is also in the name of the log bundle. .
Periodic	Indicates periodic or schedule driven Call-Home system or test logs. The periodic method is used to produce a small log that contains the entire system configuration and last 100 events.

Content — Identifies the types of system information that have been collected and are included in the current download bundle.

Size — Identifies the size of the download bundle.

Notes — Provides user-defined information about the system logs collection. This information is transferred in the header of the log bundle and may be used to identify the reason for this collection. For example, the user-defined information could include the Service Request number for tracking purposes.

System Trouble Overview Page

Navigation: Support > System Trouble

Reviews the status and health of the Controllers that are installed on the Oracle FS System. The Actions menu options allow you to test the connectivity

between the Oracle FS System and the customer network as well as reset the system to an initial state.

Controller Name	Identifies the name of the Controllers selected for test connectivity.
Comment	Displays descriptive text that is associated with a Controller. A comment can include up to 256 characters.
Service Type	Identifies the service type of Controller attached to Oracle FS System. The service type is displayed as SAN Only, Biased to SAN, NAS Only, or Biased to NAS for each Controller.
Failover Controller	Identifies the Controller that is used to provide services when the other Controller in the pair fails.
Status	Displays the status of the Controller.

Normal	Requires no action
Warning	Requires no immediate action for minor conditions.
Critical	Requires prompt action to prevent system failures or offline conditions
Unknown	Additional information is required.

Run Controller Command Dialog

Navigation: Support > System Trouble > Actions > Run Controller Command

Runs commands on a selected Controller.

Controller	Identifies the Controller that you want to run the commands.
Command Line	Identifies the command to perform on the specified Controller. fmadm **Note:** Use the prefix command `ipmifm` when entering commands in the Controller command line.
Environment Variables	Identifies the space-delimited pairs of environment variables and values to use while executing the command.
Execute	Runs the specified command.
Command Output	Displays the results of the command that was run to resolve a connectivity issue. The command output cannot be saved to a file.

Related Links

Run Controller Command

Update Drive Firmware Dialog

Navigation: Support > Software and Firmware > Actions > Update Drive Firmware

Installs the firmware for all of the selected drive types in the Oracle FS System.

Pending Drive Firmware Updates

Provides information about the drives that match the specifications for the firmware update.

Install?	Indicates whether the Oracle FS System updates the firmware for the selected item.
Drive Type	Indicates the following information about the drive: • Manufacturer name • Storage capacity • Media type: HDD or SSD The system updates the firmware for all of the drives that match the selected drive types.
Current Firmware Version	Identifies the version number of the drive firmware.
Pending Firmware Version	Identifies the version number of the drive firmware staged for update.

Related Links

Update the Drive Firmware

Update Software

Navigation: Support > Software and Firmware > Actions > Update Software

Manages the software and firmware updates on the Oracle FS System. Enables you to create an update schedule or immediately update, and also allows you to select the upgrade options and system overrides.

The update process affects all software modules and firmware on the Oracle FS System. To specify which updates are installed on individual components, login as support administrator.

Important: When logged into the system as a support administrator, you can select individual components to update from the software module package. You

can also select Always Install, Install if newer version, or Do not install. Contact Oracle Customer Support before installing individual software components.

Install Action	Identifies the action to perform on the selected module during the software update. The support administrator role allows you to select individual software packages to install. **Note:** When you selectively update the software modules, the Oracle FS System cannot determine the current software module version and displays *unsupported* as the installed software version. The choices include: **Do not install** — Select this option to keep the existing module version. **Install if newer version** — Select this option to upgrade the existing module only if the update is a later version. This is the default action and the only action available to administrators. This action does not require you to be logged in as a support administrator. **Always Install** — Select this option always install the selected module. **Note:** The Always Install option may cause an upgrade or downgrade to the currently installed module version. You may also use this feature to install a module that does not apply to your current hardware. For example, to prepare for new hardware to be installed.
Module	Identifies the name of a module that is in the staged package.
Installed Version	Identifies the version number of a software module. A value of *unsupported* indicates there is a problem with the individual software module. Contact Oracle Customer Support for assistance.
Staged Version	Identifies the version number of the staged software module. Staged software is a newer version of the software that can be installed.
Update Software without restarting	Updates the software on the Oracle FS System. The update is performed without a system restart and I/O data access is not disrupted unless Oracle Customer Support instructs you to choose the Shutdown Controller software update option. This the default setting for most updates. Based on the type of updated, the system recommends which update option to use. If this option is selected by the system, use this option.

	Note: You may need to change this value to the Restart and update software (disrupts data access) if requested to do so by Oracle Customer Support based on your system configuration.
Restart and update software (disrupts data access)	Updates the software on the Oracle FS System. The update performs a shutdown which disrupts I/O data access and the restarts the system to install the update. Based on the type of update, the system recommends which update option to use. If the option is selected by the system, use this option.

Software Update Options

Note: Only select any of the following options if instructed to by Oracle Customer Support or if the *Oracle FS1-2 Flash Storage System Release Notes* describes specific options or recovery from standard conditions.

The following options provide additional control of the software update. These options apply to all software modules that are ready for update.

CAUTION: Turning on some of these options disrupts data access.

Ignore compatibility (not recommended)	During the update process, the Oracle FS System verifies that the version of the staged module is compatible with existing hardware and software. Select this option to override a failed compatibility check. This option does not automatically change a non-disruptive upgrade to a disruptive upgrade.
Shutdown Controller	Select this option to force the software update to shutdown all Controller software components for the upgrade. This option affects data access and requires you to select Restart and update software (disrupts data access).
Ignore hardware status (except for Pilots)	Select this option to force the software update regardless of the state of the system hardware. This option can affect data access, depending on the specific hardware and state of the Controller or Drive Enclosure hardware. If the Controller has issues, do not use this option without first contacting Oracle Customer Support to determine whether the Shutdown Controller option should also be used.
Ignore system alerts	Select this option to proceed with the software upgrade and ignore any system alerts. An upgrade of any type is blocked if there are any system alerts unless this option is turned on. This option may or may not affect data access, depending on the specific system alert.
Ignore current requests	Select this option to proceed with the software upgrade regardless of pending system requests. This option allows you to begin the upgrade even if there are blocking tasks

	running which are visible in the Tasks list. (A blocking task is a task that normally would be completed before a system restart.) If a task is running that is modifying storage, host access, or system software, contact Oracle Customer Support before turning on this option. This option may or may not affect data access, depending on the specific task.
Override failed software update	Select this option to overwrite a previous, failed software update. Once an upgrade fails, that status is kept, and you can only clear it by selecting this option and having a successful upgrade. Do not use this option unless instructed to by Oracle Customer Support or described in the *Oracle FS1-2 Flash Storage System Release Notes*.

Schedule Software Update

Adds scheduling capabilities to the software update.

Schedule software update to occur at a later time	Enables you to select the upgrade and options and schedule it for a later time. Lists any existing scheduled updates with the options listed. **Note:** The Schedule software update to occur at a later time option is only available to users logged in with administrator role; users logged in with support role cannot access this feature.
Time to Perform Software Update	**Note:** This option is displayed whether or not there is a scheduled update. If there is an existing schedule, then that schedule is displayed. Identifies the time at which the Oracle FS System starts a scheduled software update. **Note:** The pop-up calendar that is used to set the software update schedule is limited to the next 72-hours. Note that not all of the drop-down lists and other features of this calendar are functional. This behavior is normal.

Software Update Validation Errors

The Software Update Validation Errors appears if the options you selected cause a conflict with existing software or hardware. If there are no conflicts, the Software Update Validation Errors is not displayed.

Information is provided why the update is not allowed but for guidance on how to resolve the issue, contact Oracle Customer Support or review the *Oracle FS1-2 Flash Storage System Release Notes*

Note: If there is an issue with a software update and the issues results in a validation error, the scheduled upgrade is blocked, and a system alert is also created.

Related Links

Update the Oracle FS System Software

Upgrade Paths From Installed Package Dialog

Navigation: Support > Software and Firmware > Actions > View Upgrade Paths from Installed Package

Displays the software updates that are installed. The information also indicates if the upgrades will cause Pilot or data disruption. If you want to upgrade a software update, you review this panel to verify which upgrades are installed.

Package Version	Indicates the version of the software package which is installed and the upgrade paths supported for this installed package.
Pilot Disruption Required	Indicates if the upgrade may disrupt activities on the Pilot. If just restarting the Pilot, this would not affect data access unless the data disruption flag is also set.
Data Disruption Required	Indicates if the upgrade may disrupt data path. The field will display one of: • Yes: Indicates that the upgrade interrupts data access and the upgrade should be performed during a maintenance period. • No: Indicates that the software upgrade does not disrupt data access.
Pilot Software	Lists the version number.
Pilot OS	Lists the version number.
Controller Software	Indicates the supported software package to which you can upgrade.
Controller BIOs	Indicates the supported software package to which you can upgrade.
Drive Enclosure Firmware	Indicates the supported software package to which you can upgrade.

Related Links

View the Upgrade Paths From the Installed Package

Upgrade Paths to Staged Package Dialog

Navigation: Support > Software and Firmware > Actions > View Upgrade Paths to Staged Package

Displays staged software which is the last version of software you staged. The version could be lower or the version could be a non-software firmware only package. When you upload a software package, if the upload and the internal staging of the software by the system was successful, that version is listed here. That version is ready to be installed on the system from the Update Software panel. The information also indicates if the upgrade causes Pilot or data disruption.

Package Version	Indicates the version of the staged package and the upgrade paths to that package. This might not include the current installed package. Also the version of the staged package might not be available for installation if the compatibility matrix does not allow the upgrade due to hardware incompatibility.
Pilot Disruption Required	Indicates if the upgrade may disrupt activities on the Pilot. If just restarting the Pilot, this would not affect data access unless the data disruption flag is also set.
Data Disruption Required	Indicates if the upgrade may disrupt data path. The field will display one of: • Yes: Indicates that the upgrade interrupts data access and the upgrade should be performed during a maintenance period. • No: Indicates that the software upgrade does not disrupt data access.
Pilot Software	Lists the version number.
Pilot OS	Lists the version number.
Controller Software	Indicates the supported software package to which you can upgrade.
Controller BIOs	Indicates the supported software package to which you can upgrade.
Drive Enclosure Firmware	Indicates the supported software package to which you can upgrade.

Related Links

View the Upgrade Paths to the Staged Package

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