Oracle FS1-2 Flash Storage System

Customer Release Notes

Documentation Accessibility

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Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit *http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info* or visit *http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs* if you are hearing impaired.

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Revision History

Table 1: Revisions

Revision description	Revision date
Release 06.02.00	2015-11-17
Release 06.02.01	2015-12-02
Release 06.02.02	2016-01-19
Release 06.02.02	2016-02-08

Product Release Information

Purpose

This document describes release 06.02.02 of the Oracle Flash Storage System.

- Hardware features and software features of the Oracle FS System
- System configuration requirements
- System operating limits and ranges
- Specific notes of interest

The information provided is accurate at the time of printing. Newer information might be available from your Oracle authorized representative.

Note: For information regarding defects and how to work around them, sign in to *My Oracle Support* (https://support.oracle.com/) and then, in the Information Center, locate the *Oracle Flash Storage System Software Patch ReadMe* for the latest software patch for this release.

Product Features

Release 06.02.02 of the Oracle Flash Storage System is a general availability release.

The overall system functions that are provided in this release are similar to the functions that are available in release 06.02.00. The 06.02.02 release, however, provides an improvement in system efficiency and in system robustness. The 06.02.02 release includes a roll-up of all of the defects that have been fixed in customer patches up to and including release 06.02.00.

Software Enhancements

- Enhanced drive failure prediction and protection using Oracle Pre-Emptive Copy. (Sometimes referred to as *copyaway*.)
- Sector repair using background media scan across the entire surface of the drives for any bad sectors.
- Write coalescing optimization that groups multiple, small write operations to a particular stripe into a single write operation. This optimization

particularly benefits RAID 5 and RAID 6 storage arrays and auto-tiered LUNs.

- New FSCLI features:

    - Automatic computation of the next LUN number. Used with the `clone_lun`, `hostmap`, and `lun` commands.

    - Separation of the `-prepare` and `-commit` requests when making LUN clones or LUN copies to allow time-coordinated copies of multiple LUNs.

    - Creation of a LUN with an exact size as presented to a SAN client through the use of the `-exactCapacity` flag. Used to support Oracle Database 12.1.0.2, Oracle MaxRep, and other SAN clients that require this feature.

Note: Drive encryption references have been removed from the Oracle FS System Manager user interface. Oracle FS System drive encryption is not supported in this release.

Hardware Enhancements

- A new feature of Guided Maintenance that provides non-disruptive, systematic, cable-by-cable instructions for new Drive Enclosures added to the system.

- In a system-down chassis replacement (where there is physical movement of the drives with data intact to a new Drive Enclosure), the system rebinds the drives to the new Drive Enclosure. This enhancement provides the ability to replace a Drive Enclosure and move the drives with data intact from the old enclosure to the new enclosure. This operation is disruptive.

- The Pilot now supports the Oracle Server X5-2 hardware. Both Pilots in the Oracle FS System must be X4-2 or both Pilots must be X5-2. The Pilot X5-2 software changes are outlined in the following list:

    - ILOM firmware has been updated.

    - The service processor has been updated.

    - The Pilot Linux OS has been updated to version 6.6.

New High-Capacity Hard Disk Drives Available

Beginning with Version 6.2.0, Oracle FS System supports the following new drive types.

- 1.2 TB HDD (replaces 900 GB HDD)

- 8 TB HDD (replaces 4 TB HDD)

Contact your Oracle Account Representative for more information.

Inhibit Single Parity for Capacity Disk Storage Classes

Beginning with Version 6.2.0, Oracle FS System prevents the creation of volumes with single parity (RAID 5) on the Capacity Disk Storage Classes. All new volumes are created with double parity (RAID 6) for added data protection in the event of a drive failure. Existing volumes that were created with single parity are not affected. However, if these single parity volumes undergo maintenance, such as being unmapped and then remapped, the system will automatically migrate them to double parity as well.

Contact your Oracle Account Representative for more information.

Localization

For this product release, the following guides have been localized.

- *Oracle Flash Storage System Administrator's Guide*
- *Oracle MaxRep for SAN User's Guide*
- *Oracle Enterprise Manager for Oracle Flash Storage Systems User's Guide*
- *Oracle FS Data Protection Manager User's Guide*

In addition, Oracle FS System Manager (GUI), the Guided Maintenance features, and online help for the GUI are also localized. This release supports the following languages:

- Brazilian Portuguese
- English
- French
- Japanese
- Korean
- Simplified Chinese
- Spanish

Supported Platforms

You can manage and monitor an Oracle FS System by means of any of the supported platforms that are listed below.

- Oracle FS System Manager (GUI)
- Oracle FS CLI
- Oracle MaxMan
- Oracle FS Mobile
- Oracle FS Data Protection Manager
- Oracle Enterprise Manager for Flash Storage Systems
- Oracle vSphere Plug-In for Oracle Flash Storage Systems 3.5 for VMWare

- Oracle Flash Storage System Statistics Tools

- Oracle FS Volume Shadow Copy Service Provider

- Oracle Flash Storage System RESTful API

You can monitor an Oracle FS System by means of any tool that can utilize the Oracle FS System management information base (MIB), such as a Simple Network Management Protocol (SNMP) client. Additionally, you can monitor an Oracle FS System using any application that can be written for the Oracle FS System RESTful API.

Caution: Remote access by any other means (ssh, telnet, sftp, and other such methods) by anyone other than authorized service personnel is not supported and might void the warranty for your Oracle FS System. Furthermore, remote access might also compromise the integrity of the data that is stored on the Oracle FS System.

Configuration Documentation

A variety of technical documentation is available to help you configure your Oracle Flash Storage System.

Access to Technical Documentation

Navigate to the following locations:

- In Oracle FS System Manager (GUI): Help > Documents

- On the Oracle Help Center website: *SAN Storage - Oracle Flash Storage Systems*
  (http://docs.oracle.com/en/storage/#fla)

System Features and Essential Configuration Tasks

- Read the *Oracle Flash Storage System Administrator's Guide.*

- Read the *Oracle Flash Storage System CLI Reference.*

- Read the appropriate *Oracle FS1-2 Flash Storage System Installation Guide.*

- Browse the online help in the GUI.

Connectivity and Interoperability

The iSCSI protocol and the NAS protocol are not supported in this release. See your Oracle Account Representative for details about connectivity and interoperability.

Network Requirements

Pilot Network Requirements

For a Pilot to integrate successfully into a customer network, that network needs to be configured properly.

The Pilot management network has the following requirements:

- Two 10 GbE, full-duplex ports for the public connection to the management network. For added redundancy, the two connections should be to separate switches. The Oracle FS System provides a standard Cat6 RJ-45 jack on each of the two Pilot nodes for this connection.

- Three IP addresses on the same subnet: one IP for the physical interface of each Pilot and one public IP that is shared between the two Pilots.

For complete information on setting up and using the management network, refer to the following documentation:

- *Oracle FS1-2 Flash Storage System Installation Guide*

- *Oracle Flash Storage System Administrator's Guide*

The Oracle FS Path Manager (FSPM) communicates with the Pilot using securely encrypted messages. If FSPM is installed on a SAN host, that host requires an Ethernet interface for communication with the Oracle FS System Manager that is running on the Pilot. The network configuration must allow the SAN host to reach the Pilot management IP interfaces on TCP Port 26012.

For complete information on using FSPM, refer to the appropriate version of the *Oracle FS Path Manager Installation Guide.*

Controller Network Requirements

For the Controllers to integrate successfully into a customer network, that network must be configured properly.

The data network to which the Controllers connect must use Fibre Channel data paths that are based on optical connections that are capable of 4 Gb/s, 8 Gb/s, or 16 Gb/s speeds. These connections can be single-mode or multi-mode.

You specify the type of connection when you order your Oracle FS System. Oracle FS System supports the following Fibre Channel (FC) topologies:

- Fabric

- Loop (arbitrated loop)
- Point-to-Point

Contact your Oracle Account Representative to change the type of physical connection.

Note: The topology is determined by the physical construction of the SAN and sometimes also by the user configuration at the host or at the switch. The topology is not something that is ordered as a part of the system and does not need Oracle involvement to change.

For complete information on setting up and using the data network, refer to the following documentation:

- *Oracle FS1-2 Flash Storage System Installation Guide*
- *Oracle Flash Storage System Administrator's Guide*

SAN Hosts Requirements

SAN hosts must adhere to specific requirements in order to properly connect to an Oracle FS System.

Solaris 11 and Solaris 10 Host Requirement

Access to the LUNs on an Oracle FS System can be affected by an issue found on certain Solaris hosts. Those hosts that can be affected are running certain Solaris 11 Support Repository Updates or certain Solaris 10 kernel patches. For those Solaris hosts, the issue exists for those hosts that also utilize I/O multipathing that connects to Fibre Channel storage devices with asymmetric access. Such storage devices include the Oracle FS System.

For detailed information, refer to the Knowledge Base article *Certain Solaris 11 SRUs and Solaris 10 Kernel Patches may Cause I/O Error on Failover* (https://support.oracle.com/rs?type=doc&id=1986424.1).

QLogic Adapters Requirement

All Linux users with QLogic adapters are advised to upgrade the QLogic driver to 8.07.00.16-k or later. This driver upgrade enables the Linux client to handle correctly any warmstarts that occur in an Oracle FS System Controller.

QLogic adapters without this driver upgrade do not properly log out after a Controller warmstart. The improper logout requires the Oracle FS System software to recognize that condition and to force an explicit logout. Usually this handling succeeds. When this handling does not succeed, loss of I/O from the adapter to the LUNs on that Controller can result.

Multipath Driver Requirement

In order to ensure data availability, all SAN hosts must be equipped with a multipath driver.

ALUA Requirement

FS1-2 LUNs are Asymmetric Logical Unit Access (ALUA) and require an ALUA-aware host.

Connection Requirement

In order to ensure continued data availability, SAN hosts must have at least two connections to the FS1-2, one to each Controller.

For complete information on SAN hosts requirements, refer to the *Oracle Flash Storage System Support and Interoperability Guide.*

Software Support

Software Versions

After the installation of an Oracle FS System, ensure that your system is running the current release of the software. You can check your installed software versions in the GUI by navigating to Support > Software and Firmware.

Verify that the following software modules in the Oracle Flash Storage System match the versions in the *Oracle Flash Storage System Software Patch ReadMe* for the release.

- Enclosure firmware
- Oracle FS1-2 Controller software
- Pilot OS
- Pilot software
- HDD and SSD firmware

Download System Software Updates

You can check for the current recommended release of the software in the Information Center on My Oracle Support (MOS).

Important: Any hardware changes that might be required must be performed before you upgrade the system software.

1 In the Oracle FS System Manager (GUI), navigate to System > System Information.
2 Click *FS System: Current Recommended Software/Firmware Matrix*.
3 In the right margin under Document References, click FS System: How to Find Software and Firmware Patches for the Oracle FS1-2 System in My Oracle Support.
4 To access the *FS System: How to Download Software and Firmware Updates for the FS1-2* article, click the Document link under the SOLUTION section.
5 Follow the instructions.

Note: All Oracle FS System updates are RPM files. The single RPM file contains system software and drive firmware. Preserve the original file names and extensions of the extracted contents. Renaming the files might prevent successful staging.

Important: After upgrading the system software, update the drive firmware as soon as possible. Drive firmware updates require a maintenance window during which the system is put in standby mode. When installing the updates, select *all* available drive firmware updates to avoid having to schedule multiple maintenance windows. For information regarding the installation of drive firmware, refer to the *Oracle Flash Storage System Software Patch ReadMe.*

Updating System Software

If you are logged in using the administrator account or a support account, do not change the default Install if newer version setting in the Install actions column unless the patch Oracle Flash Storage System Software Patch ReadMe for a specific upgrade, a My Oracle Support KB article, or Oracle Customer Support instructs you to do so.

Important: Before you update the software that is running on your Oracle Flash Storage System, ensure that all background processes are completed and that no task appears to be hung. You can check for running background processes from Oracle FS System Manager (GUI) by clicking Task in the lower right corner of the GUI screen.

System software updates and drive firmware updates are packaged into a single archive. However, each type of update must be installed separately.

- The *Oracle Flash Storage System Software Patch ReadMe* indicates whether the system software requires a disruptive update or can be installed as a non-disruptive update.

  Note: A disruptive update temporarily places the Oracle FS System in an inactive state and takes all user data paths offline.

- All drive firmware updates are disruptive. Drive firmware updates do not need to be installed with the software update unless the *Oracle Flash Storage System Software Patch ReadMe* indicates otherwise.

Before updating the system software, read the entire *Oracle Flash Storage System Software Patch ReadMe.*

To update the system software and firmware to the latest versions, refer to the *FS System: FS1-2 Upgrade R6.x to R6.x Procedures* article as a general guideline. You can find this article under the Patch and Upgrade tab in the Information Center on *My Oracle Support* (https://support.oracle.com/).

After a successful software update, all system components report Normal in the GUI and all user data, if any, is accessible. Refer to the release *Oracle Flash Storage System Software Patch ReadMe* that is available with the software download for any specific post upgrade validation information.

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FSPM Support

The Oracle FS Path Manager (FSPM) is optional software that can be installed on a SAN host to manage multiple paths to the Oracle Flash Storage System.

Important: SAN hosts that access the Oracle FS System over multiple paths must use FSPM, not Pillar Axiom Path Manager (APM).

FSPM release 4.0 and higher support both Oracle Flash Storage Systems and Pillar Axiom systems (release 4.5 or higher).

The FSPM software performs the following primary functions:

- Shares traffic among the available paths and ensures that access to the LUNs is not interrupted if some paths fail.

- Automatically configures the host into the Oracle FS System Manager and updates the configuration if it changes.

Table 2: FSPM support

Operating system (OS)	OS release	FSPM	Notes
AIX	5.3 6.1 7.1	4.0	All platforms
Community Enterprise Operating System (CentOS)	5.8 5.9 5.10 5.11 6.2 6.3 6.4 6.5 6.6 6.7 7.0 7.1 7.2	4.0 Linux	32-bit x86, 64-bit x86
HP-UX	11i v3	4.0	All platforms

Table 2: FSPM support (continued)

Operating system (OS)	OS release	FSPM	Notes
Oracle Linux (OL)	5.8 5.9 5.10 5.11 6.2 6.3 6.4 6.5 6.6 6.7 7.0 7.1 7.2	4.0 Linux	32-bit x86, 64-bit x86
Oracle Solaris	10 11	4.0	All platforms
Oracle VM Server for x86	3.1 3.2 3.3	4.0 Linux	All platforms
Red Hat Enterprise Linux (RHEL)	5.8 5.9 5.10 5.11 6.2 6.3 6.4 6.5 6.6 6.7 7.0 7.1 7.2	4.0 Linux	32-bit x86, 64-bit x86

Table 2: FSPM support (continued)

Operating system (OS)	OS release	FSPM	Notes
SUSE Linux Enterprise Server (SLES)	11.1 11.2 11.3 12.0 12.1	4.0 Linux	32-bit x86, 64-bit x86
Windows	Server 2008 Server 2008 R2 Server 2012 Server 2012 R2	4.0	All platforms

- OS releases that are earlier than those listed above are not supported.
- OS releases that are later than those listed above might be supported in future FSPM releases.
- FSPM release 4.0 and later support both Oracle Flash Storage Systems and Pillar Axiom systems.

For FSPM release information, refer to the *Oracle FS Path Manager Release Notes* for your platform.

System Limits

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 3: SAN operating limits

Object	Quantity range
SAN host connections (active)	Maximum: • 512 active connections per SAN Controller port • 3072 per SAN Controller (with 6 ports) • 6144 per Oracle FS System (with 12 ports)
SAN LUNs	Maximum: • 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	Maximum: System capacity
Volume copies	Maximum: 13 volume copies (per volume) in progress at any given time
LUN clones (partial block snapshots)	Maximum: 1024 partial block snapshots of a single source volume active at a time **Note:** Internal Oracle FS System resources might prevent you from configuring maximum settings.

Table 3: SAN operating limits (continued)

Object	Quantity range
volume groups	Minimum: 1 (default volume group) Maximum: 5000 total
repositories[1]	Maximum: 4096

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 4: System limits

Object	Quantity range
Storage Domains	Minimum: 1 (the default Storage Domain) Maximum: 32 per Oracle FS System
volume size	Maximum: System capacity

Configuration Limits for Drive Enclosures

The following table lists the numbers of objects that are related to a Drive Enclosure that can be configured for an Oracle FS System.

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[1] A repository is a space reserved for clones 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. For every SAN LUN that is not autotiered, a metadata VLUN exists. For every autotiered SAN LUN, a Progression Map (metadata) VLUN exists.

Table 5: 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: 90
	   • Per Storage Domain: 90	

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

Operating Limits for FSPM

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 6: FSPM operating limits

Object	Quantity range
Oracle FS Systems and Pillar Axiom systems visible on the SAN	Maximum: 8 **Note:** Any combination of Oracle FS Systems and Pillar Axiom systems.
LUN data paths	Maximum: 32 to each LUN
Fibre Channel (FC) ports[2]	Maximum: 32

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[2] FC ports include physical or virtual FC or Fibre Channel over Ethernet (FCoE) ports in the host which are visible to the Operating System.

Additional Notes

Migrating Pillar Axiom Data

Oracle MaxRep 3.0 supports the replication of data between a Pillar Axiom system and an Oracle FS System. To migrate some of the data or all of the data from the Pillar Axiom system to the Oracle FS System, use Oracle MaxRep.

Note: To use Oracle MaxRep to migrate data or to perform replication operations between a Pillar Axiom system and an Oracle FS System, your software must meet the following requirements:

Oracle MaxRep	Release 3.0.3 (or higher)
Pillar Axiom	Release 5.4.16 (or higher)
Oracle FS System	Release 6.1.14 (or higher)

After the Oracle FS System enters production mode, you can use the Pillar Axiom system as a replication target or as a repository for legacy data.

Alternative methods include the use of a host-based copy operation or the use of a third-party migration appliance or a combination of both.

For more information about Oracle MaxRep, refer to the *Oracle MaxRep for SAN white paper*.
(http://www.oracle.com/us/products/maxrep-r3-ds-2301400.pdf)

Call-Home and ASR Configuration

Enable the Call-Home feature in the Oracle FS System Manager (GUI) and the Oracle Auto Service Request (ASR) capability for the system in My Oracle Support. Enabling Call-Home and ASR ensures that if an issue with your Oracle FS System or your data center environment occurs, Oracle Customer Support is notified immediately, and the appropriate system logs are automatically transmitted for analysis by Oracle Customer Support.

Oracle Flash Storage System Administrator's Guide

Some information was not able to be corrected in time for the current release of the Oracle FS System.

The NAS protocol is not supported in this release. As such, ignore all references to the NAS protocol throughout *Oracle Flash Storage System Administrator's Guide.*

Oracle Flash Storage System CLI Reference

The following items describe information that was not able to be corrected in time for the current release of the Oracle FS System.

- The iSCSI protocol is not supported in this release. As such, ignore all references to the iSCSI protocol throughout this document.

- The NAS protocol is not supported in this release. As such, ignore all references to the NAS protocol throughout *Oracle Flash Storage System CLI Reference.*

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