

Sun Storage Common Array Manager

Installation and Setup Guide



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About This Guide

The *Sun Storage Common Array Manager Installation and Setup Guide* describes how to install Oracle's Sun Storage Common Array Manager software and how to perform initial configuration for RAID and JBOD open systems storage arrays. For help with installing the arrays, see the hardware installation guide for your array.

Related Information

For information about	See
Review known issues and workarounds	<i>Sun Storage Common Array Manager Software Release Notes</i>
Install the software (basic steps)	<i>Sun Storage Common Array Manager Quick Start Guide</i>
Manage the array	<i>Sun Storage Common Array Manager Administration Guide</i> Online Help
Install multipath driver	<i>Sun StorageTek MPIO Device Specific Module Installation Guide, For Microsoft Windows OS</i> <i>Sun StorageTek RDAC Multipath Failover Driver Installation Guide, For Linux OS</i>
Manage the array using the command-line interface (CLI)	<i>Sun Storage Common Array Manager CLI Guide</i> <code>sscs</code> man pages
Troubleshooting information and hardware replacement procedures	Service Advisor, launched from Sun Storage Common Array Manager
Install the array	Hardware installation guide and Release Notes for your array

Documentation and Support

These web sites provide additional resources:

- Documentation <http://www.oracle.com/technetwork/documentation/oracle-unified-ss-193371.html>
- Software licensing <http://licensecodes.oracle.com/>
- Support <https://support.oracle.com>
- Training <https://education.oracle.com>

Before You Install the Software

If you are installing Sun Storage Common Array Manager software on a new management host, do the following:

- “Verify System Requirements” on page 1
- “Decide On In-Band or Out-of-Band RAID Array Management” on page 4
- “Decide On Typical or Custom Installation” on page 4

If you are updating the software from a previous version, go to:

- “Updating To a New Version” on page 5

Verify System Requirements

You can install the management software on the platforms listed in [TABLE 1-1](#).

TABLE 1-1 Supported Platforms

Platform	Operating System
Sun SPARC server, workstation, or X86 computer	Solaris 11 Express 2010.11, Solaris 10 U10 OS, Solaris 10 U9 OS, Solaris 10 U5 OS, OpenSolaris 2009.06, Solaris 9 OS 1070 megabytes available disk space
Windows Server	Windows 2008 R2, Windows 2008 SP2, Windows 2003 SP2, Windows XP Professional SP3 (32 bit) 1175 megabytes available disk space
x64 computer	Oracle Linux 6.0 with Unbreakable Enterprise Kernel 2.6.32; Oracle Enterprise Linux 5.6 and 5.5 (with Unbreakable Enterprise Kernel 2.6.32), Oracle VM 2.2, Red Hat Linux 6.0, 5.6, 5.5, 4.8; SuSE Linux Enterprise Server 11 SP1 and SuSE Linux Enterprise Server 10 SP3 1000 megabytes available disk space

Note – See the *Sun Storage Common Array Manager Release Notes* for the latest management and data host operating system support and supported array information.

Disk Space Requirements

The installation script verifies these requirements. If a requirement is not met, the script informs you.

TABLE 1-2 System Requirements—Full Installation

OS	Total Space	Directory Space	RAM
Solaris OS and OpenSolaris OS	1070 megabytes	root – 5 megabytes	1 GB (for browser interface use)
		/tmp – 190 megabytes	
		/usr – 40 megabytes	
		/var – 85 megabytes	
		/opt – 750 megabytes	
Linux	1000 megabytes	root – 5 megabytes	512 MB
		/tmp – 100 megabytes	
		/usr – 245 megabytes	
		/var – 100 megabytes	
		/opt – 550 megabytes	
Windows	1175 megabytes	On system drive (usually C:)	512 MB

Note – These space requirements are for a full installation, including Oracle Java Web Console. If Oracle Java Web Console Version 3.1 and JDK are pre-installed on the system, the required space is smaller by approximately 150 megabytes.

Windows OS Requirements

If you are installing the management software on a Windows platform check the following:

- Check for additional Windows requirements in the *Sun Storage Common Array Release Notes*.
- Be sure the TEMP environment variable is set. Investigate TEMP, TMP, and USERPROFILE environment variable settings, rather than follow the directions in the pop-up window.
- If you install the management software on Windows 2008, you must turn off User Account Control. From the Control Panel, select User Accounts, and then turn the User Account Control OFF.
- Be sure a file or directory named “%SystemDrive%\Program” does not exist. This file can prevent some applications from functioning properly. If it does exist, rename the file to “%SystemDrive%\Program1.”
- Open Storage management requires a hot-fix patch for Win2K3, # 943545 and a Win2K8 patch, # KB958387-v2-x64 (64-bit Win2008).
- Windows Installer 3.1 must be installed and the service packages listed in [TABLE 1-1](#) are required. If needed, download the files from the Microsoft Download site.
- Windows 2008 computer name must match the resolved network IP address name for the array management software to monitor the proxy host for JBOD arrays. Change the computer name and then restart Windows.
- After upgrading Sun Storage Common Array Manager software on Windows, manually restart fms on Windows using the following commands.

```
C:\>sc stop Sun_STK_FMS  
C:\>sc start Sun_STK_FMS
```
- If MegaRAID/MegaCLI is installed, version 8.00.23 and MSM 8.00-05 are required to avoid installation failure.. You can download from:
http://www.lsi.com/support/sun/sg_x_sas6-r-int-z.html

Solaris OS Special Requirements

- **Solaris Zones**—Before you install the management software in a sparse-root zone, install Lockhart 3.1 with its L10N (Localization) packages in the global zone.
- **Solaris OS 10**—Do not attempt to run the Lockhart setup script when logged into the local zone. Either install Lockhart into a whole root zone or install/upgrade Lockhart in the global zone before installing the software into the local zone.

Microsoft Operations Manager (Optional)

Included with the Sun Storage Common Array Manager installation package and DVD is Microsoft Operations Manager 2005 (MOM), an IT services management tool. MOM is a separate application that integrates with Sun Storage Common Array Manager, and is delivered as a zip file with the other Sun Storage Common Array Manager installation files.

For further information regarding MOM, refer to the readme file included in the zip file.

Decide On In-Band or Out-of-Band RAID Array Management

The management host, by default, communicates with RAID arrays out-of-band over Ethernet. The management host and the array controllers must have valid IP addresses. The IP addresses can be assigned dynamically through DHCP or you can assign static IP addresses. For information about dynamic and static IP addresses, see [“Configuring the IP Address of the RAID Array Controllers” on page 99](#).

You can configure in-band management to travel over the data path (using Fibre Channel) between data host and the array instead. For information about in-band management, see [“Configuring In-Band Management for RAID Arrays” on page 107](#).

Decide On Typical or Custom Installation

Sun Storage Common Array Manager provides two installation options:

- Typical—select this option to install the full set of management services which include the following:
 - Management host software with GUI
 - Data host proxy agent for JBOD
 - Administrator host CLI client

[Chapter 2](#) describes the typical installation procedure. You can install the typical (full) version of the software on a data host connected to an array or on a central management server that communicates with the array via a proxy agent.

- Custom—select this option to install specific device plug-in packages. You can select from the following modules:
 - Management Host Software—installs the Oracle Java Web Console and all core packages.
 - Data Host Proxy Agent—installs only the core packages for JBOD devices.
 - Administrator Host CLI Client—Installs only the remote CLI package. The remote CLI is used to communicate with a host that has the core software installed.

[Chapter 3](#) describes the custom installation procedures.

Updating To a New Version

If you are updating to a new version of the software, the install script searches the system for a previous version and if present, updates and adds only those files that require change. Existing settings and other data are preserved.

1. Before you update, do the following:

- Check for previously installed services, such as the Storage Automated Diagnostic Environment. Be sure the service is not performing a function on the array over the Ethernet port of either array controller.
- If a version of Oracle Java Web Console prior to 2.2.5 is installed, the script prompts you to upgrade to the current version of the Oracle Java Web Console. If you choose not to upgrade, the script exits and you cannot install the software.

Solaris OS and Linux Only

- Uninstall all versions of the Sun StorageTek Configuration Service management software prior to the Common Array Manager 5.0.1.1 release. Later versions do not have to be removed.

Windows OS Only

- Uninstall all versions of the Sun StorageTek Configuration Service management software prior to the Common Array Manager 5.1.0.10 release. Later versions do not have to be removed.

2. Decide on the installation type you want to perform, and go to one of these sections:

- [“Installing the Full Management Software” on page 8](#)
- [“Custom Installation Options” on page 13](#)

Installing the Typical Full Management Software

This chapter describes how to install the full management software package. Use these procedures if you are installing Sun Storage Common Array Manager for the first time or if you are upgrading to a new release of the software. For other installation options, go to [Chapter 3](#). This chapter includes the following topics:

- [“Download Sun Storage Common Array Manager Software and Patches”](#) on page 7
 - [“Installing the Full Management Software”](#) on page 8
 - [“Installation Command Summary”](#) on page 11
 - [“Installation Files and Logs”](#) on page 11
-

Download Sun Storage Common Array Manager Software and Patches

1. Sign in to My Oracle Support:

<https://support.oracle.com/>

2. At the top of the page, click the Patches & Updates tab.

3. Search for CAM software and patches in one of two ways:

- If you have the patch number for the CAM software or patch:
 - a. **Under the Patch Search section, click the Search tab.**
 - b. **In the Patch Name or Number field, enter the patch number. For example, 10272123 or 141474-01.**
 - c. **Click Search.**

- If you do not have a patch number:
 - a. Under the Patch Search section, click the Search tab, and then click the Product or Family (Advanced Search) link.
 - b. Check Include all products in a family.
 - c. In the Product field, start typing Sun Storage Common Array Manager (CAM), and select it when it appears.
 - d. In the Release field, expand Sun Storage Common Array Manager (CAM), check the release and patches you want to download, and then click Close.
 - e. Click Search.
 - 4. Select the patch you want to download.
 - 5. Click ReadMe for a patch description and installation instructions.
 - 6. Click Download for a single patch, or Add to Plan to download a group of patches.
-

Installing the Full Management Software

You can install the full version of the Sun Storage Common Array Manager on a central management server or a data host.

1. **Unpack or unzip the package you downloaded and save the unpacked files to:**
`/install_dir/Host_Software_6.x.x.x`
2. **Get the latest server patches** <https://support.oracle.com/>.
3. **Start the installation script using the steps for your OS.**

Solaris OS or Linux

- a. Open a shell or terminal window.
- b. Become superuser by typing `su`.
- c. Go to the directory containing the software you extracted.
`cd Host_Software_6.x.x.x`
- d. Run the `RunMe.bin` script.
The Welcome panel appears. Go to [Step 4](#) to continue.

OpenSolaris OS

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
`cd Host_Software_6.x.x.x`
- c. Run the `RunMe.bin` script using the `pfexec(1)` command:

Note – You must have the appropriate profile rights to run the `pfexec(1)` command.

```
pfexec ./RunMe.bin
```

The Welcome panel appears. Go to [Step 4](#) to continue.

Windows OS

- a. Log in as an Administrative user.
- b. Open the folder containing the extracted software.
- c. Double-click the `RunMe.bat` icon.
The Welcome panel appears. Go to [Step 4](#) to continue.
4. Review the `README.txt` file for the latest information on the product and the installation process.
If the wizard screen is not displayed or if you receive an error message, recheck that the host requirements in [TABLE 1-2](#) are met.
5. Click Next.
Summary information about the installation is displayed.
6. Click Next to display the license agreement screen.
7. Accept the license agreement, and click Next to display the Installation Type screen.
8. Select Typical to install the full management software on the management host, and click Next.
9. Review the software to be installed and click Install.

Note – The progress indicator reflects 50% for a significant portion of the installation process. This is the expected progress indication for the typical installation process.

When the installation is complete, the View Results screen is displayed.

For information on installation logs, refer to [“Reviewing the Installation Logs” on page 124](#).

10. Click Finish.

11. Configure the firewall on the management host to allow an exception for port 6789.

Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall, and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

TABLE 2-1 Incoming and Outgoing Port Requirements

Port	Port Number	Description
Incoming	TCP 6788	Console HTTP port that redirects to 6789
	TCP 6789	Console HTTPS port (see “Enabling Remote Access to Oracle Java Web Console” on page 21)
Outgoing	TCP 25	SMTP used for email event notification from FMS
	UDP 161	SNMP used for event notification traps from FMS
	TCP 2463	Use for RPC (remote procedure calls) with the arrays
Proxy Agent	8653	Open port only if you install the JBOD proxy agent

Installation Command Summary

TABLE 2-2 summarizes the commands you use to install the management software using the Installer or a CLI script.

TABLE 2-2 Installation Commands

Installation Task	Graphical User Interface	Command-Line Interface
Install the management software	RunMe.bin (Solaris, Linux) RunMe.bat (Windows)	RunMe.bin -c (Solaris, Linux)* RunMe.bat -c (Windows)†
Uninstall the management software	uninstall	uninstall -c
Force a complete cleanup and removal of an installation	Not Available	uninstall -f

Note: If you use the Add/Remove Programs feature in Windows, stop all `java.exe` or `javaw.exe` applications before starting the uninstaller.

* If you are using the Solaris OS or Linux operating system and a path is not defined, use `./` to run the commands (`./RunMe.bin`).

† If you are using a Windows platform and the command alone does not work, add `.\` to run the commands (`.\RunMe.bat`).

Installation Files and Logs

The following tables show the location of the Sun Storage Common Array Manager files and logs, by operating system.

TABLE 2-3 Solaris OS and OpenSolaris OS Software File Locations

File Type	Directory
Unpacked install files	<code>/var/opt/CommonArrayManager/Host_Software_6.x.x.x/bin</code>
Installation logs	<code>/var/sadm/install/se6000</code>
Copyright notice	<code>/var/opt/CommonArrayManager/Host_Software_6.x.x.x/bin</code>
ThirdPartyReadme.txt	<code>/cdrom/cam-6.x.x.x-solaris/doc</code>

TABLE 2-3 Solaris OS and OpenSolaris OS Software File Locations (*Continued*)

File Type	Directory
Remote SSCS (CLI) directory	/opt/SUNWsesscs/cli/bin
Local CLI directory	/opt/SUNWstkcam/bin
Man page directory	/opt/SUNWsesscs/cli/man

TABLE 2-4 Linux Software File Locations

File Type	Directory
Unpacked install files	/var/opt/CommonArrayManager/Host_Software_6.x.x.x
Installation logs	/var/opt/cam
Remote SSCS (CLI) directory	/opt/sun/cam/se6x20/cli/bin/sscs
Local CLI directory	/opt/sun/cam/bin
Copyright notice	/var/opt/CommonArrayManager/Host_Software_6.x.x.x/bin
ThirdPartyReadme.txt	/cdrom/cam-6.x.x.x-linux/doc
Man page directory	/opt/sun/cam/se6x20/cli/man/man1m/sscs.1m

Custom Installation Options

This chapter describes the custom and command-line interface (CLI) installation options.

- [“Installing the Management Host and Optional GUI” on page 13](#)
- [“Installing the Data Host Proxy Agent for JBOD Arrays” on page 15](#)
- [“Installing the Administrator Host CLI Client” on page 18](#)
- [“Installing and Configuring the Software Using a CLI” on page 21](#)

Installing the Management Host and Optional GUI

This feature bundle creates a management station that contains the full set of Sun Storage Common Array Manager services, with the option to install the browser GUI interface.

You can install the management host software locally on a data host connected to the array or on a central management server that communicates with the array via a proxy agent. It contains:

- Array management, monitoring and service capabilities
- Optional web browser interface
- Local and Remote CLIs
- Array firmware
- Multiple array management

During installation, you will be prompted to select the arrays installed for your site and the corresponding firmware.

- 1. Start the installation using the steps for your OS.**

Solaris OS/Linux

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
- c. Become superuser by typing `su`.
- d. Run the `RunMe.bin` script.

Note – You can also use `RunMe.bin -s` (silent mode), to perform an unattended installation at the command line or from a script.

The Welcome panel appears. Go to [Step 2](#) to continue.

OpenSolaris OS

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
- c. Run the `RunMe.bin` script using the `pfexec(1)` command:

Note – You must have the appropriate profile rights to run the `pfexec(1)` command.

```
pfexec ./RunMe.bin
```

The Welcome panel appears. Go to [Step 2](#) to continue.

Windows OS

Prerequisite: You must have Windows OS Administrator privileges to install the software.

- a. Open the folder containing the extracted software.
- b. Double-click the `RunMe.bat` icon.

Note – You can also use `Runme.bat -s` (silent mode), to perform an unattended installation at the command line or from a script.

The Welcome panel appears. Go to [Step 2](#) to continue.

2. From the Welcome panel, click Next.
3. Accept the license agreement and click Next.

4. Select Custom to reveal other installation options and click Next.
5. Select Management Host Software, and click Next.
6. Select the array types installed at your site, select Enable GUI if you want to install the browser interface, and then click Next.
 - For JBOD arrays (e.g., J4500), select Storage Expansion Array (*version*)
 - For arrays with RAID controllers (e.g., 6180), select RAID Array (*version*)
7. Review the software to be installed, and click Next to start the installation.

Note – The progress indicator reflects 50% for a significant portion of the installation process.

When the installation is complete, the View Results screen is displayed.

For information on installation logs, refer to [“Reviewing the Installation Logs” on page 124](#).

8. Click Finish.
9. Configure the firewall on the data host to allow an exception for port 6789.

Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall, and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

Installing the Data Host Proxy Agent for JBOD Arrays

This option installs all core packages on a data host attached to the array for management of storage expansion (i.e., JBOD) arrays. This option includes:

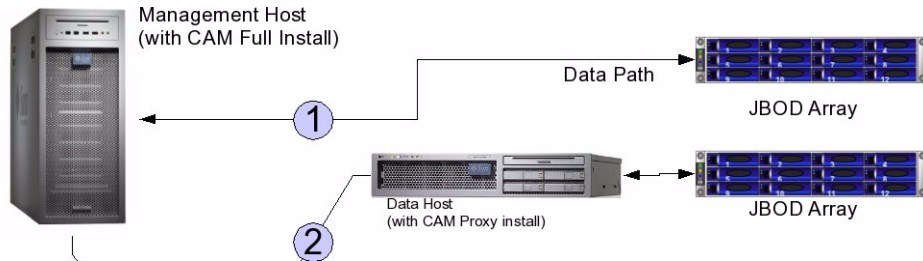
- Array management and monitoring capabilities for JBOD arrays
- A remote proxy agent
- Local CLI
- Single array management

With this option, a host can act as a proxy for the management host (this allows aggregation of information from multiple hosts as well as delegation to other hosts for firmware upgrades, and access configuration changes).

Installing the Data Host Proxy Agent for JBOD Arrays

For each Storage Expansion Array (i.e., JBOD) to be managed, the Data Host Proxy Agent must be installed on each data host that accesses the device.

FIGURE 3-1 Data Host Proxy Agent Monitoring JBOD Arrays



-
- 1 Full (typical) array management software installed on management host with in-band management connection
 - 2 Data host proxy agent installed on data host with in-band management connection
-

1. Start the installation using the steps for your OS.

Solaris OS/Linux

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
- c. Become superuser by typing `su`.
- d. Run the `RunMe.bin` script.

The Welcome panel appears. Go to [Step 2](#) to continue.

OpenSolaris OS

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
- c. Run the `RunMe.bin` script using the `pfexec(1)` command:

Note – You must have the appropriate profile rights to run the `pfexec(1)` command.

pfexec ./RunMe.bin

The Welcome panel appears. Go to [Step 2](#) to continue.

Windows OS

Prerequisite: You must have Windows OS Administrator privileges to install the software.

a. Open the folder containing the extracted software.

b. Double-click the RunMe.bat icon.

The Welcome panel appears. Go to [Step 2](#) to continue.

2. From the Welcome panel, click Next.

3. Accept the license agreement and click Next.

4. Select Custom to reveal other installation options.

5. Select Data Host Proxy Agent to install the proxy agent on the data host, and click Next to proceed.

6. Review your selections, and click Install.

Note – During the software installation, the progress indicator reflects 0% for a significant portion of the installation process.

When the installation is complete, the View Results screen is displayed.

For information on installation logs, refer to [“Reviewing the Installation Logs” on page 124](#).

7. Click Finish.

8. Configure the firewall on each data host to allow an exception for port 8653 for the JBOD proxy agent.

Your firewall program might prompt you to allow new programs to communicate through the firewall, and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

Remote Access via Proxy Agent

During installation, you will have the option to enable remote access to the array via a proxy agent. The proxy agent receives out-of band communication from the management software over Ethernet and delivers the information over an in-band connection between the data host and the array. Access is over HTTPS and port 8653.

If remote access is enabled, you will need to choose an access password (15 characters maximum). Be sure to remember this password, as it will be needed during array registration.

Note – Do not enable remote access if the management host is directly connected to the array.

Installing the Administrator Host CLI Client

This feature bundle installs a thin scripting client that connects via secure HTTP (HTTPS) to the management host (CLI only). The remote command-line interface (CLI) is used to communicate with a host that has Sun Storage Common Array Manager core software installed.

You can also manage and configure storage using the CLI. The CLI provides the same control and monitoring capability as the web browser, and it is scriptable for running frequently performed tasks.

FIGURE 3-2 Administrator Host CLI Client

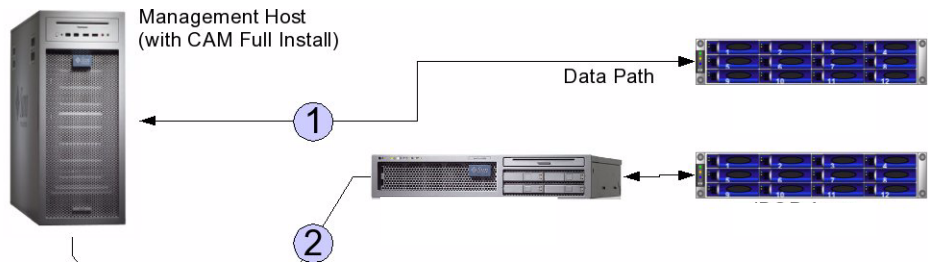


Figure Legend

-
- 1 Full (typical) array management software installed on management host
 - 2 Administrator Host CLI installed
-

The CLI is available by telnetting to the management host or from a remote CLI client that you install on the remote host. It is available for Solaris OS, Windows, Linux, and several other operating systems. See the *Sun Storage Common Array Manager Software Release Notes* for a list of supported operating system platforms.

For more information about CLI commands, see the `sscs` man page and the *Sun Storage Common Array Manager CLI Guide*.

Installing the Administrator Host CLI Software

1. Start the installation using the steps for your OS.

Solaris OS/Linux

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.
- c. Become superuser by typing `su`.
- d. Run the `RunMe.bin` script.

The Welcome panel appears. Go to [Step 2](#) to continue.

OpenSolaris OS

- a. Open a shell or terminal window.
- b. Go to the directory containing the software you extracted.

c. Run the `RunMe.bin` script using the `pfexec(1)` command:

Note – You must have the appropriate profile rights to run the `pfexec(1)` command.

```
pfexec ./RunMe.bin
```

The Welcome panel appears. Go to [Step 2](#) to continue.

Windows OS

Prerequisite: You must have Windows OS Administrator privileges to install the software.

a. Open the folder containing the extracted software.

b. Double-click the `RunMe.bat` icon.

The Welcome panel appears. Go to [Step 2](#) to continue.

- 2. From the Welcome panel, click Next.**
- 3. Accept the license agreement and click Next.**
- 4. Select Custom to reveal other installation options, and click Next.**
- 5. Select Administrator Host CLI Client.**
- 6. Click next to display the Review Selections screen.**
- 7. To continue, click the Install button.**

Note – During the software installation, the progress indicator reflects 50% for a significant portion of the installation process.

When the installation is complete, the `View Results` screen is displayed.

For information on installation logs, refer to [“Reviewing the Installation Logs” on page 124](#).

8. Configure the firewall on administrator host and management host to allow an exception for ports 6789 and 8653.

Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

Enabling Remote Access to Oracle Java Web Console

Solaris OS 10 update 6 restricts port 6789 to listen to localhost only. To change this setting and enable remote access to the Oracle Java Web Console and the Sun Storage Common Array Manager, do the following:

1. **Become superuser or assume an equivalent role on the system where the console is running.**

Roles contain authorizations and privileged commands. For more information about roles, see *Configuring RBAC (Task Map)* in *System Administration Guide: Security Services*:

<http://docs.sun.com/app/docs/doc/816-4557/rbactask-15?a=view>

2. **Set a property to allow the console server to respond to network requests, refresh the service, and restart the console server.**

```
# svccfg -s svc:/system/webconsole setprop options/tcp_listen=true
# svcadm refresh svc:/system/webconsole:console
# /usr/sbin/smcwebserver restart
```

Installing and Configuring the Software Using a CLI

This section describes how to install Sun Storage Common Array Manager using a command-line interface script and other options for experienced users.

Installing the Software Using a CLI (Solaris OS and OpenSolaris OS)

You can install the management software on a SPARC, X86, or X64 system running the Solaris Operating System or OpenSolaris.

After downloading the software, run `tar xvf filename` to unpack the file, then change to the `Host_Software_6.x.x.x` directory and begin the following procedure at [Step 2](#).

1. **Log in to the host OS.**
 - Solaris OS—log in as root.

- OpenSolaris OS—log in with profile rights set to run the `pfexec(1)` command.
2. **Review the `README.txt` file for the latest information on the product and the installation process.**
 3. **To unpack the contents of the compressed installation file, enter the following command:**

```
RunMe.bin -c
```

The files are unpacked in the default directory:

```
/var/opt/Common_Array_Manager
```

The `Host_Software_6.x.x.x` directory is unpacked into the default directory. To use a different directory, enter the following command:

```
RunMe.bin -c /path-to-new-directory
```

After a few moments, an InstallShield note will briefly display, then the software installer will begin automatically.

4. **When prompted to proceed, press 1 for Next.**
 5. **When prompted about the license agreement, read and accept the agreement by pressing 1 then Enter to select, 0 then Enter to confirm, and 1 then Enter to proceed.**
 6. **When prompted to select the installation type, do one of the following:**
 - To install the entire software package on the management host, select Typical.
 - To install the proxy agent and other software options on the data host, select Custom.
- If you select Custom, you will be prompted to choose:
- Management Host Software
 - Data Host Proxy Agent
 - Administrator Host CLI Client

7. **Continue following the prompts to install the software.**

Note – During the software installation, the progress indicator reflects 50% for a significant portion of the installation process. This is the expected progress indication for the typical installation process.

When the installation is complete, the software installer Installation Summary screen is displayed.

8. **Press Return to complete the installation.**

9. Configure the firewall on the management host, data host, and administrator host (if applicable).
 - a. Set the firewall to allow an exception for port 6789. If you have a JBOD proxy agent or CLI-only installation, also allow an exception to port 8653.
 - b. Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

Installing the Software Using a CLI (Linux)

You can use a CLI script to install Sun Storage Common Array Manager with the same options as the GUI install wizard on a host system running the Red Hat or SUSE Linux Operating System.

If installing from a download, run `tar xvf filename` to unpack the file, then change to the `Host_Software_6.x.x.x` directory and begin the following procedure at [Step 2](#).

1. Log in to the management host Linux OS as `root`.
2. Review the `README.txt` file for the latest information on the product and the installation process.
3. To unpack the contents of the compressed installation file, enter the following command:

```
RunMe.bin -c
```

The files are unpacked in the default directory:

```
/var/opt/CommonArrayManager/Host_Software_6.x.x.x
```

The `Host_Software_6.x.x.x` directory is unpacked into the default directory. To use a different directory, enter the following command:

```
RunMe.bin -c /path-to-new-directory
```

After a few moments, an InstallShield note will briefly display, then the software installer will begin automatically.

4. When prompted to proceed, press **1** for Next.
5. When prompted about the license agreement, read and accept the agreement by pressing **1** then Enter to select, **0** then Enter to confirm, and **1** then Enter to proceed.
6. When prompted to select the installation type, do one of the following:
 - To install the entire software package on the management host, select Typical.

- To install the proxy agent and other software options on the data host, select Custom.
- If you select Custom, you will be prompted to choose:
 - Management Host Software
 - Data Host Proxy Agent
 - Administrator Host CLI Client

7. Continue following the prompts to install the software.

Note – During the software installation, the progress indicator reflects 50% for a significant portion of the installation process. This is the expected progress indication for the typical installation process.

When the installation is complete, the host software installer Installation Summary screen is displayed.

8. Press Return to complete the installation.

9. Configure the firewall on the management host, data host, and administrator host (if applicable).

- a. Set the firewall to allow an exception for port 6789. If you have a proxy agent or CLI-only installation, also allow an exception to port 8653.
- b. Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.

Installing the Software Using a CLI (Windows)

You can use a CLI script to install the Common Array Manager software with the same options as the GUI install wizard on a system running Windows 2000, 2003, or XP.

Before you continue, check that all of the requirements are met, as listed in [“Verify System Requirements” on page 1](#).

- 1. Log into Windows as Administrator.**
- 2. Review the `README.txt` file for the latest information on the product and the installation process.**
- 3. To unpack the contents of the compressed installation file in the default directory, enter the following command:**

RunMe.bat -c

After a few moments, an InstallShield window will briefly display, then the software installer will begin automatically.

The files are unpacked in the default directory:

```
<system drive>:\Sun\CommonArrayManager\Host_Software_6.x.x.x
```

4. **When prompted to proceed, press 1 for Next.**
 5. **When prompted about the license agreement, read and accept the agreement by pressing 1 then Enter to select, 0 then Enter to confirm, and 1 then Enter to proceed.**
 6. **When prompted to select the installation type, do one of the following:**
 - To install the entire software package on the management host, select Typical.
 - To install the proxy agent and other software options on the data host, select Custom.
- If you select Custom, you will be prompted to choose:
- Management Host Software
 - Data Host Proxy Agent
 - Administrator Host CLI Client
7. **Continue following the prompts to install the software.**

Note – During the software installation, the progress indicator reflects 0% for a significant portion of the installation process. This is the expected progress indication for the typical installation process.

When the installation is complete, the host software installer Installation Summary screen is displayed.

8. **Press Return to complete the installation.**
9. **Configure the firewall on the management host, data host, and administrator host (if applicable).**
 - a. **Set the firewall to allow an exception for port 6789. If you have a proxy agent or CLI-only installation, also allow an exception to port 8653.**
 - b. **Some firewall programs prompt for your agreement to allow new programs to communicate through the firewall and set the port for you. Refer to your firewall documentation for instructions on how to open a port through the firewall.**

Initial Array Set Up

This chapter provides an overview of the management software and the steps required for first time you log in. It contains the following sections:

- [“Setting Up Site and Array Information”](#) on page 27
 - [“Registering Arrays”](#) on page 29
 - [“Initial Array Administration”](#) on page 31
-

Setting Up Site and Array Information

This section describes the operations you need to perform the first time you open the management software after installing it. The sections include:

- [“Starting the Array Management Software”](#) on page 27
- [“Providing Site Information”](#) on page 28
- [“Subscribing to Auto Service Request \(ASR\)”](#) on page 28

Starting the Array Management Software

1. **Open a supported web browser.**

Note – For information about supported web browsers, see the *Sun Storage Common Array Manager Release Notes*.

2. **Enter the IP address of the management host using this format:**

https://cam-management-host:6789

cam-management-host is the IP address or host name of the host where you installed the Common Array Manager software.

3. Log in as root (Solaris) or administrator (Windows).

- For Solaris OS and Linux, `root` already exists for the machine on which you installed the software. Later, you may want to add a user accounts with the storage role, see [“Adding Users And Assigning Roles” on page 59](#).
- For Windows, you can initially login with any user account with Windows administrative privileges. Later, you may want to add a user accounts with the storage role. For more information about adding users and roles to Windows, see [“Adding New Users in Windows” on page 62](#).

4. Click Log In.

The Oracle Java Web Console page is displayed.

Note – The connection closes automatically if there is no activity for approximately 15 minutes.

5. From the Oracle Java Web Console page, select Sun Storage Common Array Manager from the Storage section of the Oracle Java Web Console page.

Providing Site Information

When you open the Common Array Manager after a first-time installation, the General Configuration page displays.

1. Enter the required site and contact information for your site.

The required fields are indicated by an asterisk: (*).

2. Click Save and Continue Setup.

After you save the Site Information page, the Auto Service Request page displays during initial installations.

Subscribing to Auto Service Request (ASR)

Oracle Auto Service Request is available as a feature of your Oracle hardware warranty and Oracle Premier Support for Systems support plans. ASR addresses problems faster by using auto-case generation for Oracle’s Sun server and storage systems when specific hardware faults occur.

Note – Activation of ASR is required to maintain your array's warranty. Ensure that ASR is enabled throughout the duration of the warranty period.

Only event information is collected. Your stored data is not read and remains secure. The event information is sent by secure connection to Oracle Support:

<https://asr-services.oracle.com>

Note – See Online Help or the Administration Guide for a description of the event types that are collected by ASR.

During initial setup, you can either fill out the page, or click Decline to either decline or defer ASR service enrollment.

To configure your connection with ASR, fill in the Auto Service Request (ASR) Setup page.

1. Provide the following information:

- Oracle SSO Account username and password
- Type of Internet connection to be used

2. Click Save.

After registering CAM with ASR, use My Oracle Support to activate ASR, as described in “[Activating Auto Service Request](#)” on page 56.

Registering Arrays

When you install the management software on a new workstation, the Storage System Summary page is displayed blank with no arrays listed.

To register an array, launch the Array Registration wizard to either search for arrays that are not already registered or manually register an array.

The registration wizard will automatically discover arrays that are on the same network as the management host, or you can point the wizard to the array if it is not on the same network as the management host.

1. From the Storage Systems Summary page, click Register.

2. Select the Discovery and Authentication Method and click Next.

Note – The discovery process can take as much as five minutes per array.

a. To scan for unregistered arrays and specify a password, select Scan the local network and Enter password for the discovery.

For J4000, F5100, and Sun Blade 6000 Array Families, use this option for a central management host and enter the proxy agent password.

If each proxy agent has a different password, only the array with a proxy agent using that password will be discovered. You may want to set up a common proxy agent password.

b. To manually register an array, select Enter IP address or hostname and Enter password for the discovery.

For the J4000, F5100, and Sun Blade 6000 Array Families, enter the IP address, host name, or localhost name of the proxy agent and the proxy agent password.

For all other arrays, enter the IP address or hostname of the array controller and the array password.

c. To scan for unregistered arrays that use a default password, select Scan the local network and Use the default password.

For other IP configured arrays, such as the Sun Storage 6000 Array series, use this method to discover arrays that use the default password set at the factory.

Note – The password of the array is not a required entry. The array is shipped with a blank password by default. This field is used only if the array being registered is one that was previously managed and had a set password. To give the array a password, see [“Setting an Array Password” on page 33](#).

With the scanning discovery method, the wizard then finds the array you defined and any unregistered arrays on the subnet and adds them to the Storage System Summary page.

Note – It takes approximately five minutes for the software to discover each array.

3. Select the arrays you want to monitor, and click Finish.

The Results page displays a message indicating one of the following:

- the array was successfully registered with the software.
- the array’s firmware does not match the firmware baseline. To install the firmware, see [“Installing the Baseline Firmware” on page 31](#).

4. Click Close.

You remove an array from the management software by unregistering the array. For information about how to unregister an array, see the Online Help.

Initial Array Administration

Use the Administration page associated with each array to perform the following tasks:

- [“Installing the Baseline Firmware” on page 31](#)
- [“Setting an Array Password” on page 33](#)
- [“Naming an Array” on page 34](#)
- [“Setting the System Time” on page 34](#)
- [“Creating a Hot Spare Drive” on page 34](#)

The Administration page has other properties that you can modify later for each array. See the Online Help for more information about each field.

Installing the Baseline Firmware

New arrays come with the firmware installed. As updates to the firmware are released or you add expansion trays to any 6000 series array, you need to install the new firmware. For optimal performance, the firmware on all arrays should be at the level of the current firmware baseline.

Note – Refer to the *Sun Storage Common Array Manager Baseline Firmware* document for the latest release-specific firmware information.

1. Check the release notes for any release-specific upgrade requirements.

Upgrades to the J4000, F5100, and Sun Blade 6000 Blade Families firmware (SAS I/O modules and disks) require an offline upgrade (stop all I/O activity to the array).

2. Be sure the array is not in a degraded state.

If it is degraded, the firmware upgrade attempt might fail and damage the array. Resolve the critical alarms before continuing the upgrade. If the array is degraded only because it is not at the baseline, the upgrade can be performed.

3. Resolve any alarms.

Alarms can be checked in the Oracle Java Web Console masthead or in the Alarms Summary link in the Navigation Tree on the left. Use Service Advisor to fix any alarms.

Note – For 6xxx, FlexLine, and 25xx arrays, both controllers must be attached to the network and be accessible by the host.

4. (Optional) If you are upgrading firmware for the F5100, determine the master expander location before you begin the upgrade.

a. Go to Storage Summary, F5100, FRUs.

The Health Details for the selected F5100 chassis lists the location, name, status, host information for each F5100 expander.

b. Note the location of the master expander listed for “Chassis Master Expander Location.”

5. From the Storage System Summary page, select the array for which the firmware needs to be installed/upgraded.

Note – You can only upgrade one array in the J4000, F5100, and Sun Blade 6000 Array Families at a time.

Note – For 6xxx, FlexLine, and 25xx arrays, both controllers must be attached to the network and be accessible by the host.

6. Click Install Firmware Baseline.

The upgrade process analyzes the selected arrays to determine the current firmware versions installed and displays a recommended action.

7. In the Action field, specify the type of upgrade, and click Next.

Note – To ensure a stable firmware installation, you can choose to select “Install baseline, no disks” to update the array controller or Expander/SIM firmware first. After verifying the baseline firmware is updated correctly, restart the Wizard to update the disk drive firmware.

8. If the array password is valid, click Next.

For the J4000, F5100, and Sun Blade 6000 Array Families, for arrays registered through a remote proxy, the registration validates the proxy agent password entered during the software installation. No password is verified for local in-band arrays.

9. Review the current installation action, and click Finish.

All management operations must be stopped before the installation begins. If you are installing disk firmware, all disk I/O must be stopped.

10. When the upgrade is complete, click Close.

11. If you chose to upgrade only the array controller or expander/SIM firmware first, repeat firmware installation for the disks.

For more information about array firmware, see the Online Help.

Setting an Array Password

A new Sun Storage array is shipped with a blank, or empty, password field. Sun recommends that you establish an array password during initial setup for security purposes. The password prevents other management hosts from unauthorized access to the configuration of the array.

1. On the Administration page, click Manage Passwords.

2. On the Manage Passwords page, select Change Array Password.

3. Leave the Old Password field blank.

This is the only time you can leave this field blank, when you establish a password for a new array.

4. Enter a new password consisting of up to 30 characters for the array.

5. Enter the password again to confirm the new password.

6. Click OK.

The Administration page is redisplayed.

The management software stores an encrypted copy of the array password, known as the local password, on the management host

Naming an Array

Each array requires a unique name to be identified on the subnet.

1. **In the Name field on the Administration page, enter a unique name consisting of up to 30 characters.**
2. **Click Save.**

Setting the System Time

When you set the system time and date for a selected array, the values are updated for all arrays registered with this management software.

There are two ways in which you can update the system time and date:

- Click Synchronize with Server to synchronize the time on the array with your management host
- Set the time manually

To set the time manually:

1. **On the Administration page, scroll down to the System Time section.**
2. **Select the current hour and minute according to a 24-hour clock.**
3. **If the date is incorrect, change the month, day, and year to the current date.**
4. **Click Save to save your changes.**

The Administration page is refreshed, and a Success message is displayed at the top of the page.

For more information about the fields and buttons on the Administration page that you can use after you set up your system, see the Online Help.

Creating a Hot Spare Drive

Hot spare drives are used by a controller to replace a disk that has failed. The management software can automatically assign a hot spare drive, balance the request for spares across all trays within the array, and ensure that the hot-spare drive is of the same type as the other disks in the same tray.

1. **From the Array Hot Spares menu on the Administration page, select the number of hot-spares that you want to assign to this array.**

2. Click Save.

The management software assigns the specified number of hot-spares, balancing the selection among trays within the array.

Refer to the Online Help for more information about assigning and unassigning hot spare drives.

Configuring RAID Storage

This chapter introduces you to the Sun Storage Common Array Manager storage components. It contains the following sections:

- “Storage Configuration Guidelines” on page 37
- “Using Storage Domains to Partition Storage” on page 38
- “Configuring RAID Storage” on page 41
- “Enabling Premium Features” on page 41
- “Configuring Basic Storage” on page 42
- “Planning Storage Allocation” on page 43
- “Using the New Volume Wizard to Create and Map Volumes” on page 47
- “RAID Configuration Tutorial” on page 48

For more information about the concepts introduced in this chapter, see the appropriate topic in the Online Help.

Storage Configuration Guidelines

When configuring a storage array, you need to determine how to organize and allocate the total storage capacity into volumes and share those volumes among your data hosts. As you plan your storage configuration, it is important that you consider the following requirements for your site:

- **Performance**—You can optimize I/O activity by selecting a predefined *storage profile* with different characteristics or by creating a custom profile.
- **Access**—You can use *storage domains* to organize and allocate storage so that only certain hosts have access to volumes. Volumes in a storage domain can be accessed only by hosts and host groups that are in the same storage domain. You can associate a storage domain with individual hosts or with a host group.

- Combination of redundancy with performance—To maximize both performance and redundancy, a combination of RAID levels is necessary. The data striping provided by RAID 0 is a cost-effective way to create high levels of performance in a disk array, and having multiple copies of data through data mirroring provided by RAID 1 is the best way to create redundancy. By combining RAID 1 with RAID 0, you can take advantage of both features.

To combine disk mirroring with disk striping, configure RAID 1 with more than four drives. The firmware automatically creates a RAID 1+0 virtual disk.

- **Using profiles and pools**—You must plan your configuration to determine what storage profile and storage pool to use. For more information, see “Planning Volumes” and related topics in the Online Help or Administration Guide.

Note – Use the planning worksheets in [Appendix A](#) as you gather data for your configuration.

Using Storage Domains to Partition Storage

A storage domain, also called a set or a storage partition, is a logical entity used to partition storage. You use storage domains to organize and allocate storage so that only certain hosts have access to volumes. Volumes in a storage domain can be accessed only by hosts and host groups that are in the same storage domain.

Data hosts, such as a data base server, initiate data to store in volumes through the physical host ports (or *initiators*), residing on host HBAs. Volume-to-LUN mapping enables you to specify the host or host group that can access a specific volume on your storage array.

By default, all hosts and host groups are part of the default storage domain. When you create volumes they are placed in the default storage domain, meaning these volumes can be accessed by all hosts and host groups. You must create a storage domain to map a volume, assign it a logical unit number (LUN), and map the volume to a host or host group. When you explicitly map a host group to a specific volume and LUN, the host group and volume are removed from the default storage domain and create a separate storage domain, which enables only the hosts in the group to share access to the specified volume.

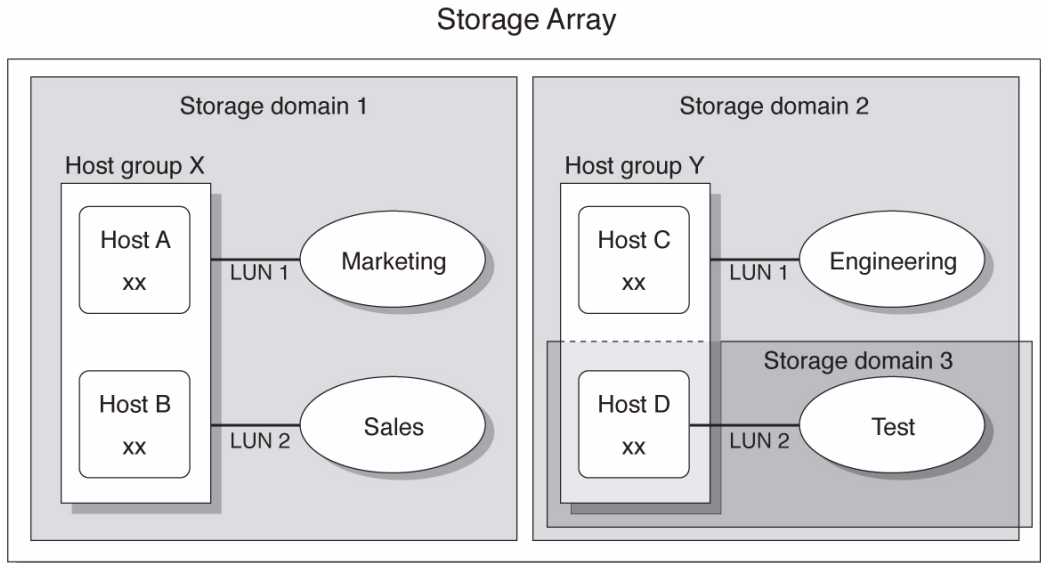
To map specific initiators to specific volumes using LUN-mapping, you need to activate a premium license for a storage domain. Usually your need for premium licenses will be determined at the time you order your array.

For information about premium feature license codes, go to:

<http://licensecodes.oracle.com/>

FIGURE 5-1 shows an example of how storage domains can be used to partition storage. It depicts a storage array configured with three storage domains.

FIGURE 5-1 Storage Array With Three Storage Domains and Four Data Hosts



- **Storage Domain 1** consists of two volumes, Marketing and Sales, that are mapped to Host Group X. Host Group X contains two hosts, Host A and Host B. All initiators associated with Host A and Host B, within Host Group X, have access to volume Marketing by way of LUN ID 1 and to volume Sales by way of LUN ID 2.
- **Storage Domain 2** consists of one volume, Engineering, that is mapped to Host Group Y. Host Group Y contains two hosts, Host C and Host D. By virtue of being associated with any host within Host Group Y, all initiators associated with Host C and Host D have access to volume Engineering by way of LUN ID 1.
- **Storage Domain 3** consists of one volume, Test, that is mapped to Host D. All initiators associated with Host D have access to volume Test by way of LUN ID 2. Note that Host D is a member of Host Group Y; however, since volume Test is mapped directly to Host D and not to Host Group Y, Host D is the only member of Host Group Y that can access volume Test.

Note – LUN IDs must be unique within a storage domain.

About the Default Domain

A non-premium, default storage domain exists to include the following:

- All host groups and hosts that are not explicitly mapped to a volume.
- All volumes that have a default volume-to-LUN mapping assigned.
- All unmapped, automatically detected initiators.

Any volumes within the default storage domain can be accessed by all hosts and host groups within that storage domain.

Note the following concerning default domains:

- LUN-mapping cannot be configured.
- Initiators are created but remain in the default domain until mapped.
- Hosts and host groups can be created but have no valid purpose without a storage domain.

About Premium Storage Domains

Premium storage domains define a volume-to-logical unit number (LUN) mapping, which will allow you to specify the host or host group that will have access to a particular volume in your storage array. The storage domain designates that only the selected host or host group has access to that particular volume through the assigned LUN.

When the storage domain consists of a volume mapped to a host group, it can enable hosts with different operating systems (heterogeneous hosts), to share access to a storage volume. A host within a host group can be mapped separately to a different volume.

A storage domain can contain up to 256 volumes. A volume can be included in only one storage domain and each LUN, from 0 to 255, can only be used once per storage domain.

Note – Not all operating systems support up to 256 LUN IDs. See the documentation for your operating system for more information.

Configuring RAID Storage

This section describes how to configure basic storage for RAID arrays. It guides you through the following tasks:

TABLE 5-1 RAID Array Configuration

Task	See Section
Activate premium licenses	“Enabling Premium Features” on page 41
Review the guidelines you will need to plan your storage.	“Storage Configuration Guidelines” on page 37
Plan whether you want the default storage or custom storage capabilities.	“Planning Storage Allocation” on page 43
Configure the storage using the New Volume Wizard and related functions.	“Using the New Volume Wizard to Create and Map Volumes” on page 47
Example steps for creating a volume and mapping the volume to a host.	“RAID Configuration Tutorial” on page 48

Use the planning worksheets in [Appendix A](#) as you gather data for your configuration.

Enabling Premium Features

License certificates are issued when you purchase premium services and contain instructions for obtaining license information.

Premium features that are available with Sun Storage Common Array Manager include:

- Storage Domains
- Volume Copy
- Volume Snapshot
- Data Replication

Refer to your license certificate and contact the Licensing Center for license key information. Direct all license inquiries to licensecodes_ww@oracle.com.

Note – To create storage domains to partition storage with other than the default domain, you must activate the storage domain licenses.

Adding a License To Enable a Premium Feature

1. From the Storage Systems Summary page, expand an array and select Administration.
2. **Expand Administration and choose Licensing.**
3. **From the Licensable Feature Summary page, click Add License.**
4. **From the Add License page, select the type of license you want to add, and specify the version number and key digest supplied by Sun.**
5. Click OK.

Configuring Basic Storage

The New Volume wizard, available from the Volume Summary page, guides you through the steps for creating a volume and other basic storage configuration.

Note – If you only use the default domain and do not activate premium storage domains, all hosts in the domain will have access to the volume and you will not be able to change the default domain's storage characteristics in the wizard.

When you create a volume, the wizard prompts you to enter or select the following information:

- Volume name and capacity.
- A storage pool, which is associated with a storage profile.
- The mode in which virtual disks will be created (automatically or other options).
- Optionally, a mapping from the volume to a host or host group and LUN to partition storage. You can also map to the default domain.

Planning Storage Allocation

Before you create a volume, you should plan the allocation of your storage. Before using the New Volume wizard, review the following topics:

- [“About Storage Profiles” on page 43](#)
- [“Viewing the Predefined Storage Profiles:” on page 44](#)
- [“Creating Storage Pools” on page 44](#)
- [“About Hosts and Host Groups” on page 45](#)
- [“Creating Initiators to Assign to Hosts” on page 46](#)

Before using the New Volume wizard, you should know:

- If you want to define default RAID characteristics with the default pool and its RAID-5 profile.

If so, you can select the defaults in the wizard.

If not, you will need to define a new pool as described in [“Creating Storage Pools” on page 44](#) and assign it a pre-defined or new profile, as described in [“About Storage Profiles” on page 43](#).

- Whether you will partition storage through storage domains.
If so, you need to activate the domain licenses as described in [“Enabling Premium Features” on page 41](#). Then you need to define hosts or host groups before or after the New Volume wizard as described in [“About Hosts and Host Groups” on page 45](#). Otherwise you will be using the default domain.
- How you will configure the storage capacity from initiators between volumes, hosts and host groups.

About Storage Profiles

Sun Storage Common Array Manager provides several storage profiles that meet most storage configuration requirements. By default, the New Volume wizard will allow you to select a default pool with its default profile of RAID-5 characteristics. The profiles that display are specific to the model of the array and the drives it supports.

Profiles are selected from pools. If the default profile does not meet your performance needs, you can create a pool and select one of several other predefined profiles, or you can create a custom profile.

Viewing the Predefined Storage Profiles:

1. **In the navigation pane, expand the array you want to work with and choose Profiles.**

The Storage Profile Summary page displays the predefined storage profiles for the selected array.

For example, the Oracle_VxFS storage profile supports RAID-5, 512 KB segment size, read-ahead mode enabled, SAS drive type, and four drives. Refer to the Online Help for a description of the predefined storage profiles provided with the software.

2. **Select a profile that matches your storage requirements.**

You will need the name of the storage profile later, when you create a storage pool.

Note – If you want to create a custom profile, click New on the Storage Profile Summary page. If you need information about any of the fields, click Help.

Creating Storage Pools

A storage pool is a collection of volumes with the same configuration. By default, you can select a pool with a default profile of RAID-5 characteristics. You can create new pools and assign other profiles to them.

1. **In the navigation pane, under the array you want to work with, choose Pools.**
2. **On the Storage Pool Summary page, click New.**
3. **On the Create New Storage Pool page, enter a name for the new storage pool, using a maximum of 30 characters.**
4. **Enter a description of the new storage pool.**
5. **Select Default or another predefined storage profile that meets your storage needs.**

For information about the characteristics of the predefined storage profiles, see the Online Help.

6. **Click OK.**

The new storage pool is displayed on the Storage Pool Summary page.

About Hosts and Host Groups

By default, the New Volume wizard assigns a default storage domain if no other hosts or host groups have been created.

Most storage users will want to create additional storage domains and host groups to partition storage. You typically create host groups to group hosts that share the same storage characteristics and so that they can share access to a volume.

You can map volumes to a host group or to individual hosts that have a LUN.

You can create the host and host groups either before or after the New Volume wizard. (If afterwards, you will have to manually complete the steps equivalent to the New Volume wizard to configure initiators for each host, assign hosts to host groups, if needed, and complete the volume-to-LUN-mapping.)

If you have many hosts to create, you may find it easier to create the hosts first and then to add the hosts to a host group.

Note – LUN-mapping requires a storage domain license. Hosts and host groups can be created without a storage domain license but have no valid purpose without a storage domain.

Creating Hosts

1. **In the navigation pane, under the array you want to work with, expand Physical Devices and choose Hosts.**
2. From the Host Summary page, **click New.**
3. **In the Create New Host page, type a name for the new host, using a maximum of 30 characters.**
Use a name that will allow you to recognize the data host on your network.
4. **(Optional) If host groups have already been created, assign the new host directly to a host group.**
5. **Click OK.**
The host is created and added to the Host Summary page.

Creating a Host Group

1. **In the navigation pane, under the array you want to work with, choose Physical Devices > Host Groups.**

2. **On the Host Group Summary page, click New.**
3. **On the New Host Group page, enter a name for the new host group, using a maximum of 30 characters.**
4. **Double-click the names of the available hosts you want to add to the group. You can also click Select All or Remove All to add or remove all of the available hosts.**
5. **Click OK.**

The new host group is created and added to the Host Group Summary page.

Creating Initiators to Assign to Hosts

To make non-default storage available to a data host or host group, you create an initiator and associate it with a host. An initiator is an FC port that is identified by a unique WWN of an HBA installed on the data host.

1. **In the navigation pane, under the array you want to work with, choose Physical Devices > Initiators.**
2. **On the Initiator Summary page, click New.**
3. **On the New Initiator page, enter a name for the new initiator, using a maximum of 30 characters.**
4. **Specify a new WWN for the initiator, or select an existing WWN from the drop-down list of unassigned WWNs.**
If you specify a new WWN, the delimiting colons (:) of the 16-character hexadecimal WWN are optional.
5. **Select the host name for the new initiator.**
6. **Select the host type for the new initiator.**
7. **Click OK.**

The Initiator Summary page displays the initiator name, host name, host type, and WWN of the new initiator.

Using the New Volume Wizard to Create and Map Volumes

A volume is a “container” into which applications, databases, and file systems can store data. A volume is created from virtual disks that are part of a storage pool. Based on your selections, the array automatically allocates storage from different disks to meet your volume configuration requirements.

As mentioned in “[Planning Storage Allocation](#)” on page 43, you may want to configure new profiles, pools, host, host-groups, or initiators before or during the wizard if the defaults do not match your storage needs.

When you are ready to begin, the New Volume wizard guides you through the steps for creating a volume.

Creating Volumes Using the New Volume Wizard

1. In the navigation pane, under the array you want to work with, choose **Volumes**.
2. On the Volume Summary page, click **New**.
The New Volume wizard is displayed.

Note – After the initial installation, you will be unable to select New if there is not enough disk space for a new volume or if no existing virtual disks match the selected profile.

3. Enter a name and capacity for the volume, and select the storage pool with which you want it to be associated.
 - The storage pool you select is associated with a storage profile, which determines the volume’s storage characteristics.
 - Only the default pool with a default RAID-5 profile will display until you create new pools.
 - The volume name can consist of a maximum of 30 characters.
 - The volume capacity equals the amount of virtual disk space to be used.
4. Click **Next**.

5. Select the method you want to use to create a virtual disk:

- Automatic—The software assigns the physical disks to be used based on the profile.
- Create Volume on an Existing Virtual Disk—Follow the wizard steps to select virtual disks.
- Create Volume on a New Virtual Disk—Follow the wizard steps to specify disks.

6. Follow the rest of the wizard to configure the virtual disks.

You are prompted to map the volume to a host or host group and to select a LUN. If you have not created additional hosts or host groups, only the default storage domain will display. You map the volume to new hosts or host groups later.

7. Select a host or host group select a LUN number.

After you click Finish, the new volume is displayed on the Volume Summary page.

About Volumes and the Default Domain or Partitioned Storage Domains

After the New Volume wizard completes, your volumes will belong to:

- The default domain if you did not activate premium storage domains.
All hosts in the domain will have access to the volume and you will not be able to change storage characteristics within the domain.
- A storage domain that partitions storage and allows you to define the storage characteristics such as the profile.

RAID Configuration Tutorial

This section guides you through a basic storage configuration. It shows you how to create a volume and map it to a host.

- [Step 1: Select a Storage Profile](#)
- [Step 2: Create a Storage Pool](#)
- [Step 3: Create a Host](#)
- [Step 4: Create a Volume](#)
- [Step 5: Map the Volume to a Host](#)

Step 1: Select a Storage Profile

A storage profile **defines** specific storage characteristics for a storage pool. You can choose a preconfigured profile, select the Default profile, or create a custom profile. See “About Storage Profiles” in the Online Help or Administration Guide for more information.

1. **In the navigation pane, expand the array you want to work with and choose Profiles.**
2. **Review the available storage profiles listed on the Storage Profile Summary page, and choose one that matches your storage requirements.**
 - **For example, the Default storage profile configures volumes with a RAID-5 level, 512 KB segment size, enabled read-ahead mode, any disk type, and a variable number of drives.**

Note – If none of the storage profiles match your requirements, create a custom profile by clicking New on the Storage Profile Summary page. If you need information about creating a profile, refer to the Online Help or Administration Guide.

3. **Note the storage profile you want to use. You will specify this profile when you create a storage pool in the next step.**

Step 2: Create a Storage Pool

A storage pool is a collection of volumes that define the configuration of the volumes within the pool. The characteristics of a storage pool are defined by a storage profile.

1. **In the navigation pane, under the array you want to work with, click Pools.**
2. **On the Storage Pool Summary page, click New.**
3. **Enter a name and description for the new storage pool.**
4. **Select the storage profile you chose in Step 2, and click OK.**

Step 3: Create a Host

When you create a host, you are associating a host name with which to identify a data host to the array; you are not creating a host on the network.

Note – If you want this host to share access to the volume with other hosts, you can create a host group by first selecting **Physical Devices > Host Groups**.

1. In the navigation pane, under the array you want to work with, expand **Physical Devices** and click **Hosts**.
2. On the **Host Summary** page, click **New**.
3. Enter a name for the new host.
4. Optionally, select a host group.
5. Click **OK**.

Step 4: Create a Volume

Volumes are created from virtual disks, which are the logical representation of physical storage. The virtual disk distributes data across several hard disks but is seen as one single disk.

1. In the navigation pane, under the array you want to work with, click **Volumes**.
2. On the **Volume Summary** page, click **New**.
3. In the **New Volume** wizard, select **Use Existing Storage Pool**, select the pool you created in **Step 2**, and then click **Next**.
4. Select the physical storage on which to create the volume. For this example, select **Storage Selected Automatically by CAM**.

This selection causes the software to either create a new virtual disk or select an existing virtual disk.

5. Enter volume information, and click **Next**.

The wizard requires a volume name. You can also specify how many volumes to create, the size, and whether you want to associate this volume with a controller.
6. Select **Map to an Existing Host/Host Group or the Default Storage Domain**, enter the host name you created in **Step 3**, and then click **Next**.

Note – If you do not specify a host, the volume will be mapped to the **Default Storage Domain**, enabling all hosts to access this volume.

7. Review your selection for this volume, and click Finish.

After you click Finish, the volume is created and displayed on the Volume Summary page. You can now map this volume to a host or host group.

Step 5: Map the Volume to a Host

When you explicitly map a host (or host group) to a specific volume and LUN, it creates a separate storage domain, enabling only the hosts in the group to share access to the specified volume.

- 1. In the navigation pane, expand the array you want to work with, and choose Volumes.**
- 2. On the Volume Summary page, click the check box to the left of the volume to which you want to map a host or host group.**
- 3. Click Map.**
- 4. On the Map Volume page, select the host to which you want to map this volume, and click OK.**

A message specifies that the selected volume was successfully mapped.

Setting Up Array Monitoring

This chapter provides an overview of the array monitoring features. It contains the following sections:

- [“Setting Up Notification for Fault Management” on page 53](#)
- [“Configuring Array Health Monitoring” on page 54](#)
- [“Activating Auto Service Request” on page 56](#)

Setting Up Notification for Fault Management

The fault management features of Sun Storage Common Array Manager enables you to monitor and diagnose your arrays and storage environment. Alarm notification can be provided by:

- Email notification
- Simple Network Management Protocol (SNMP) traps

You can also set up Auto Service Request as described in [“Activating Auto Service Request” on page 56](#).

1. In the navigation pane, under General Configuration, choose Notification.

The Notification Setup page is displayed:

2. Enable local email.

a. Enter the name of the SMTP server.

If the host running this software has the `sendmail` daemon running, you can accept the default server, `localhost`, or the name of this host in the required field.

- b. Specify the other optional parameters, as desired.
 - c. If you have changed or entered any parameters, click Save.
 - d. (Optional) Click Test Local Email to test your local email setup by sending a test email.
If you need help on any of the fields, click the Help button.
 3. Set up local email notification recipients.
 - a. Click Administration > Notification > Email.
The Email Notification page is displayed.
 - b. Click New.
The Add Email Notification page is displayed.
 - c. Enter an email address for local notification. At least one address is required to begin monitoring events. You can customize emails to specific severity, event type, or product type.
 - d. Click Save.
 4. (Optional) Set up remote notifications by SNMP traps to an enterprise management application.
 - a. Select SNMP as the provider.
 - b. Click Save.
 5. Perform optional fault management setup tasks:
 - Confirm administration information.
 - Add and activate agents.
 - Specify system timeout settings.
-

Configuring Array Health Monitoring

To enable array health monitoring, you must configure the Fault Management Service (FMS) agent, which probes devices. Events are generated with content, such as probable cause and recommended action, to help facilitate isolation to a single field-replaceable unit (FRU).

You must also enable array health monitoring for each array you want monitored.

Configuring the FMS Agent

1. In the navigation pane, expand **General Configuration**, and select **General Health Monitoring**.
2. From the **General Health Monitoring Setup** page, select the types of arrays that you want to monitor from the **Categories to Monitor** field. Use the shift key to select more than one array type.
3. Specify how often you want to monitor the arrays by selecting a value in the **Monitoring Frequency** field.
4. Specify the maximum number of arrays to monitor concurrently by selecting a value in the **Maximum Monitoring Thread** field.
5. In the **Timeout Setting** section, set the agent timeout settings.

The default timeout settings are appropriate for most storage area network (SAN) devices. However, network latencies, I/O loads, and other device and network characteristics may require that you customize these settings to meet your configuration requirements. Click in the value field for the parameter and enter the new value.
6. When all required changes are complete, click **Save**.

The configuration is saved.

Enabling Health Monitoring for an Array

1. In the navigation pane, select an array for which you want to display or edit the health monitoring status.
2. Click **Array Health Monitoring**

The following **Array Health Monitoring Setup** page is displayed.
3. For the array to be monitored, ensure that the monitoring agent is active and that the **Device Category Monitored** is set to **Yes**. If not, go to [“Configuring Array Health Monitoring”](#) on page 54
4. Select the checkbox next to **Health Monitoring** to enable health monitoring for this array; deselect the checkbox to disable health monitoring for the array.
5. Click **Save**.

Activating Auto Service Request

To complete ASR activation, use the My Oracle Support web site:

<http://support.oracle.com>.

Note: Before activating ASR with My Oracle Support, be sure you have registered the CAM software with ASR by following the instructions in “[Subscribing to Auto Service Request \(ASR\)](#)” on page 28.

- Your My Oracle Support account must have the administrator privilege for the Support Identifiers (SIs) associated with your ASR assets. To see a list of administrators for your Support Identifier, click More -> Settings -> Account and Privileges and then click the Support Identifier. If you need administrator permissions, you can email the listed administrator to request access.
- You can look up SIs by going to More -> Settings -> Account and Privileges and entering a system serial number and organization. **Note:** If the SI cannot be found, work with your account team or contact Oracle Support at: <http://support.oracle.com>
- Use More -> Settings -> Pending ASR Activations to:
 - Add a contact who will be notified when Service Requests are created.
 - Add/edit the assets installation address
 - Optionally, provide an email distribution list address to receive ASR email notifications in addition to the contact you have specified.
 - View ASR activation status

Note: The Pending ASR Activations menu is only available to My Oracle Support accounts with the administrator privilege on the Support Identifiers associated with your Assets (array devices).

For more information about ASR, go to:

<http://oracle.com/asr>.

Configuring ASR Client Security

To configure firewalls, you will need information about the security aspects of communication between components in the client environment. Port 443 must be open to the URLs in the following table.

TABLE 6-1 depicts the data collected for case creation, used to determine entitlement.

TABLE 6-1 Data Collected for Case Creation

Data Collected	Destination URL	Port and Description
Activation event	Client Registration: https://inv-cs.oracle.com/SCRK/ClientRegistrationV1_1_0 Agent Registration: https://inv-cs.oracle.com/ProductRegistrationService/agent/ Product Registration: https://inv-cs.oracle.com/ProductRegistrationService/scrk/ Case Generation: https://asr-services.oracle.com/ServiceInformation/ServiceInformation	Port 443; Static Data collected for purpose of registration and entitlement.
Heartbeat event	Case Generation: https://asr-services.oracle.com/ServiceInformation/ServiceInformation	Port 443; Dynamic data periodically collected to establish a device is capable of connecting. Sent every 6 hours.
Audit event	Case Generation: https://asr-services.oracle.com/ServiceInformation/ServiceInformation	Event type = daily Port 443; Dynamic configuration data collected and sent every seven days.
Alert event	Case Generation: https://asr-services.oracle.com/ServiceInformation/ServiceInformation	Event type = audit Port 443; Potential case-generating events are sent via the secure transport to trigger case generation.
Note - Not all events generate cases; some represent information collected to provide context for already existing cases.		Event type = alert

Adding Users And Assigning Roles

This chapter describes host and user accounts, and includes these topics:

- [“Creating Host Accounts” on page 59](#)
- [“Adding New Users to Hosts” on page 61](#)
- [“Adding New Users and Assigning Roles” on page 61](#)

Creating Host Accounts

To use the Sun Storage Common Array Manager, users and roles must be defined on the host and assigned in the array management software. Make sure the following user names are defined on your systems:

- `root` (or an administrative user for Windows)
- `storage`
- `guest`

Note – By default, the `root` user does not exist in OpenSolaris and is not recommended. Therefore, it is recommended to either 1) create `storage` and/or `guest` accounts on your OpenSolaris host for use with the array management software, or 2) assign roles to all existing users who will use the management software.

User names must be a currently defined user on the management host.

Roles assign privileges to users. Two roles (`storage` and `guest`) are defined in the array management software.

- Storage role

Assigns a user write permission and access to all of the software features related to array configuration and management.

- Guest role

Assigns a user read permission but restricts the ability to manage the array.

By default, the array management software automatically assigns roles to:

- `root` users in Solaris and Linux
- Administrator users in Windows
- `storage` and `guest` user names if defined on the host

For all other users, you assign roles to users in the array management software.

TABLE 7-1 describes the user names and user role functions and the requirements for each.

TABLE 7-1 User Names and User Roles

User Role/Group	Description	User Name	Required Password
<code>storage</code> (initial administrator)	Use the <code>root</code> or administrative user name to initially add other users. A <code>storage</code> user can use all of the software features related to array configuration and management.	Solaris - <code>root</code> OpenSolaris OS - administrative rights. Linux - <code>root</code> Windows - administrator user, including <code>root</code> if so set up	Root or administrator password on the management host
<code>storage</code>	A <code>storage</code> user can use all of the software features related to array configuration and management.	Currently defined user on the management host	The same password used to log into the host
<code>guest</code>	A <code>guest</code> user has read-only privileges and can only view information. This user cannot modify any settings or features.	Currently defined user on the management host	The same password used to log into the host

Using Administrative Roles to Initially Log In

The first time that you access the array management software, you sign in as an administrative user defined on the management host:

- `root` in Solaris or Linux.
- Administrator user in Windows.

By default, the administrative user has the `storage` role. The administrative user can add users and assign roles to them.

Adding New Users to Hosts

User names in the array management software must be currently defined users on the host.

To add new users to hosts running Solaris or Linux OS, consult the system administration documentation.

To add new users to hosts running Windows, refer to [“Adding New Users in Windows” on page 62](#).

To share a user name for storage administration, add the following user names to your hosts:

- storage
- guest

Once these user names are added to the host, by default they are assigned the storage and guest roles.

Adding New Users and Assigning Roles

This section describes how to add new users and assign them the storage or guest role in Sun Storage Common Array Manager. The users must first be defined on the host. For users (other than the administrative user) to access the array management software, roles must be assigned to those users in the software.

You do not have to complete this step for users automatically assigned a role by the array management software:

- root user in Solaris and Linux
- Administrator users in Windows
- storage and guest user names defined on the host

- 1. To view the list of defined users, choose General Configuration > User Management in the navigation pane.**
- 2. On the User Summary page, click the Add button to add a new user.**
The is displayed.
- 3. On the Add New User page, enter a valid user name defined on this host in the User Name field.**

4. From the User Role list, select the storage or guest role you want to assign to this user.
5. Click OK.

The User Summary page is displayed with a success message and the name is added to the list.

Newly added users can log into the Oracle Java Web Console to access the array management software with the same password that they use to log into the system.

Adding New Users in Windows

This section provides the information you need to create users in Windows and assign them to groups for privileges.

Note – These instructions show you an example of how to configure an administrative user in standard Windows XP. Other versions of Windows software may vary slightly. Consult the Windows documentation.

Adding an Administrative User in Windows

1. Click Start and select Administrative Tools > Computer Management.
2. In the Computer Management window, select Local Users and Groups > Users.
3. Right click and select New User.
4. Enter a username in the User name box.

Note – Administrative user names for Windows cannot include a space character.

5. Create a password and confirm it.
6. Uncheck the box labeled User must change password at next login.
7. Check Password never expires.
8. Click Create.
9. From the Computer Management window, select Users, right click on root, and select Properties.
10. In the Properties windows, select the Member Of tab, and click Add.

- 11. In the Select Groups window, enter Administrators for the object name and click Check Names.**

The system displays the *computer-name*\Administrator group in the box labeled “Enter the object names to select.”

- 12. Click OK.**

The root Properties window shows that *root* is a member of Users and the Administrators groups. The root user now has Windows Administrator privileges and is automatically assigned the *storage* role in the array management software.

Adding Non-Administrator Users in Windows

To add non-Administrator users, follow the same steps as “[Adding an Administrative User in Windows](#)” on page 62, but define groups called *storage* and *guest* and add the user name to one of those groups instead of the Administrator group.

When done, check the Properties window of the user name and Member of tab to verify that the user is assigned to Users and to the *storage* or *guest* Group.

Proceed to assign the user name the *storage* or *guest* role in the array management software, as described in “[Adding New Users and Assigning Roles](#)” on page 61.

User Role Guidelines

- To share a user name for storage administration, add the following user names to your systems:
 - *storage*
 - *guest*Once these user names are added to the system, by default they are assigned the *storage* and *guest* roles.
- Administrative user names for Windows cannot have a space character.
- To have a common administrative role across all platforms, you can add a user name of *root* with administrative privileges on the Windows system.
- Make rules for multiple users with storage roles.

Multiple instances of the same user name can be logged in concurrently. However, because users with the `storage` user role have write privileges, there is a risk that the changes of one logged-in user will overwrite previous changes of another logged-in user. Therefore, you should develop policies about who can make changes and how to notify others.

SAS Domain Access Configuration

This chapter describes how to use Access Configuration features for JBOD arrays. You can assign each host its own storage resources, optimizing efficiency through segregation and topology control. Access configuration is accomplished on a per host SAS port, per hard-disk level.

This chapter includes the following topics:

- [“About SAS Domains” on page 66](#)
- [“Preparing for SAS Access Configuration” on page 67](#)
- [“Discovering SAS Domains” on page 70](#)
- [“Configuring SAS Access for New Arrays” on page 71](#)
- [“Cascading J4x00 Arrays to Existing Arrays” on page 73](#)
- [“Configuring Multiple Host Access for a J4x00 Array” on page 80](#)
- [“Troubleshooting Access Configuration” on page 81](#)

About SAS Domains

Serial attached SCSI (SAS) domain access configuration enables you to configure data hosts to access a specified group of storage devices. Sun Storage Common Array Manager SAS access configuration provides the traffic segregation, resource flexibility, controlled resource sharing, protection, and topology control functionality required to manage SAS-based systems.

By default, SAS access configuration is disabled, which means all hosts can access all disks.

Supported SAS Arrays

Sun Storage Common Array Manager provides SAS access configuration management for:

- J4200—a JBOD (Just-a-Bunch-Of-Disks) array enclosing 12 SAS or SATA drives. You can provide up to a maximum of 48 drives by daisy chaining four enclosures. Three 4-lane SAS ports are provided for HBA initiators.
- J4400—a JBOD array enclosing up to 24 SAS or SATA drives. You can connect up to eight J4400 arrays to a 2-port HBA. Alternatively, you can daisy chain two groups of four J4400 arrays, with each group connected to a separate HBA port. Three 4-lane SAS ports are provided for HBA initiators.
- J4500—a JBOD array enclosing 48 SATA drives. It contains SAS expanders, switching circuits that can connect disks in complex patterns. The J4500 has four SAS expanders configured in two sets (each set containing an outside and inside expander) that provide a primary and secondary (redundant) path to all 48 SATA disks.
- F5100—a storage server with four expanders providing four independent SAS domains. Each expander has 20 Flash DIMM disk modules (FMods) and four 4-lane 3GB SAS ports, for a total of 80 FMods and 16 ports. (Note that multipathing to each fabric is not supported. See the F5100 Flash Array documentation for more information.)
- Sun Blade 6000 Disk Module and Multi-Fabric Express Modules—a disk module consisting of up to eight SAS disks (2.4 TB per disk module), with each disk connected to SAS expanders. The SAS expanders, in turn, connect to a Sun Blade 6000 Modular System chassis's SAS-NEMs.

Configuring SAS Access (or Zoning)

You can design each connected SAS port to have exclusive ownership over a specific set of targets in a single array or across cascaded arrays.

The dual SAS fabric design of the J4x00 arrays is initially seen as two separately configured (zoned) SAS domains. In a clustered or multipath situation, where you want two hosts to have access to the same disks for failover, each domain must be configured identically in the array management software for each side of the multipath connection or cluster. The array management software provides zoning templates for common configurations, as well as the ability to import and export user-defined templates.

The Sun Storage F5100 Flash Array consists of four independent fabrics. See the array's documentation for more information.

Note – For F5100 arrays, the array management software will aggregate the four independent domains into a single unified view when a management host, or a management host with additional proxy agents, have visibility to each domain.

Preparing for SAS Access Configuration

- [“Checking System Requirements” on page 67](#)
- [“Planning for SAS Access Configuration” on page 68](#)
- [“Using SAS Multipathing” on page 69](#)

Checking System Requirements

Access Configuration features require one of the a supported LSI-based HBAs with the minimum required firmware installed in the array management or data host, directly connected to the J4x00 array.

- SG-XPCIE8SAS-E-Z: 8-port PCIe HBA
- SG-XPCIE8SAS-EB-Z: 8-port PCIe ExpressModule for Storage Blades

Note – Sun Storage Common Array Manager also supports JBOD management via the 8-port PCIe RAID HBA (SGXPCIESAS-R-EXT-Z). However, this HBA is not supported in an Access Configuration environment.

For more information, refer to the documentation included with the installed HBA.

Planning for SAS Access Configuration

The recommended configuration sequence is to start by connecting one SAS port to a management host. Then configure SAS Access Configuration for this port, and connect the remaining hosts per your plan.

Note – If multiple SAS ports are connected to an array consisting of any SATA based disk drives during zoning configuration, the array will remember the SAS port that last accessed each SATA disk and will not allow another SAS port to access any SATA drives until the array is power cycled.

Use the planning worksheets in [Appendix B](#) as you gather data for your configuration.

1. **Determine if your SAS storage will consist of one array or multiple arrays cascaded together.**
2. **Determine how many SAS domains you want on your storage system. If you want to form larger domains, cable SAS expanders together.**
 - Each J4200/J4400 array has its expanders cabled together which form one domain.
 - The J4500 has two internal domains.
 - The F5100 Flash Array has a separate domain for each expander.
3. **Note the available disks or FMods to be target devices.**
4. **Note which initiators to cable to which expander ports.**
5. **Decide how to assign storage:**
 - a. **Select a template to automatically assign SAS ports to targets.**
 - b. **Manually map SAS ports to targets and determine which SAS ports will map to which targets.**
 - c. **If you want to group storage devices into target groups of shared storage, decide which SAS ports to link to which target groups.**
6. **After you complete Access Configuration for one host, connect the remaining SAS ports to hosts per your plan.**

Note – Sun Storage Common Array Manager automatically saves the current SAS domain settings. This will allow you to revert back to functional settings in the event of mis-configuration, or when an array component, such as a SIM card or controller module, containing Access Configuration (zoning) information is replaced.

Using SAS Multipathing

Note – The Sun Storage F5100 Flash Array does not support multipathing or clustering.

You can use the Sun Storage J4x00 array in a serial-attached SCSI (SAS) multipathing configuration to provide fault tolerant connectivity to storage. Although J4x00 arrays use single port SATA drives, the I/O circuitry provides a redundant data path to each disk port if the connections to the drives use independent controller paths (i.e., SIM0 and SIM1 for J4200/J4400 arrays and SAS A and B for the J4500 arrays).

Using the multipathing feature of the SAS protocol, you can configure the J4x00 to provide a redundant data path from host to disk. When used in conjunction with RAID and clustered server configurations, multipathing can help increase the availability of your J4x00 storage.

Note – The J4500 array is not supported in a clustering configuration.

The J4x00 multipathing supports active-active and active-passive operation, as follows:

- During an active-active operation, a host can communicate with a hard disk by two different paths.
- During an active-passive operation, a host can communicate with a hard disk using only one path. Should that path become unavailable, a failover occurs where the host begins using the path in the other SAS domain (or fabric) to communicate with the hard disk.
- Operating system-specific driver software controls the multipathing capability (active-active or active-passive). You enable, disable, and configure multipathing through the server's operating system software.

Discovering SAS Domains

1. **Check to be sure the full version of Sun Storage Common Array Manager is installed on the server. If needed, follow the instructions in “Installing the Typical Full Management Software” on page 7.**
2. **Log in to the management software.**
3. **Register the array using the auto-discover wizard or manually. See “Registering Arrays” on page 29 for details.**

After the array is registered, the SAS Domain Summary page displays the new array.

Viewing Discovered SAS Domains

1. **From the left navigation pane, select the desired SAS Domains page located under the Host or Array that you want to configure.**

The SAS Domain Summary page displays, showing the discovered domains.

2. **Click a domain name in the SAS Domain Summary page.**

The SAS Domain Details page is displayed.

3. **Expand a domain name in the navigation pane.**

The Access Configuration and Administration menu items are displayed.

4. **Click one of the following links:**

Link	If you want to
Access Configuration	Set up access between SAS ports and specified targets (disks or FMods). You can configure access manually or import a predefined template.
Administration	Change the name of the selected domain, change the access configuration state for the selected domain, or manage the access configuration password.

Renaming the SAS Domain Name

If you want to change a SAS domain’s default name to a name that you can easily identify, do the following:

1. Select the SAS domain name to open the SAS Domain Details page.
2. Double-click the Name field and enter a unique, meaningful name for this SAS domain.
3. Click Save.

Configuring SAS Access for New Arrays

Note – You should always configure one server at a time.



Caution – Use these procedures for configuring a new array. If data exists on the array, perform a full back up as a precautionary measure. Verify that no host-to-disk I/O will take place during Access Configuration (zoning) operations.

Importing Access Configuration Using a Template

Several templates are provided from which you can choose to configure access between SAS ports and targets. You can also create your own templates (see Creating a SAS Access Configuration Template in Online Help).

1. **From the left navigation pane, click Access Configuration for the SAS domain you want to configure.**

The Access Configuration Summary page displays showing any existing access configurations.

2. **Click Configure.**

The Configure Access Between Ports and Targets page is displayed.

3. **Click Import.**

The Import Access Configuration wizard is displayed.

4. **Select the template that matches your configuration needs.**

The templates represent some common configurations. For example, Simple Zone Split will evenly divide all available targets across all SAS ports. You can also create a custom configuration and Export to a template, as described in the Online Help.

5. **If you select a template that requires more information, the wizard displays a page similar to the following. Select the appropriate targets you want to configure from the drop down menu and click Next.**
6. **Review the selected configuration, and select one of the following:**
 - Click Finish to save the configuration
 - Click Edit imported Access Configuration, to make additional modifications, and click Finish.
7. **If you select Edit imported Access Configuration, the Configure Access Between Ports and Targets page is displayed. Make any additional modifications to the template and click Save.**

Manually Configuring SAS Port to Target Access

1. **From the left navigation pane, click Access Configuration for the SAS domain you want to configure.**

The Access Configuration Summary displays showing any existing access configurations.
2. **Click the Configure button to configure access between SAS ports and targets.**
3. **Select the SAS port you want to configure.**
4. **Select the targets you want the selected SAS port to access.**
5. **Click Add/Modify.**

The selected SAS port and target configuration is displayed.
6. **To save this configuration, click Save.**

The array management software saves the configuration to allow access control between the specified SAS ports and targets.
7. **Click Export to save the configuration to a template (see the Online Help for more information about creating SAS Access Configuration templates.**

Cascading J4x00 Arrays to Existing Arrays

Note – Sun Storage F5100 Flash Arrays do not support cascading between individual domains or between F5100 arrays.

There are three sets of steps required to cascade (or add) a J4x00 array to an existing J4x00 series array from the browser interface.

If multiple arrays are to be cascaded, add them one at a time, using the following procedures:

- [“Preparing Existing Arrays Prior to Cascading Additional Storage” on page 73](#)
- [“Preparing New Arrays for Cascading \(Adding Storage Capacity\)” on page 74](#)
- [“Cascading the New Array to the Existing Storage” on page 75](#)



Caution – For Linux hosts: newly added (or removed) targets (that is, disks or FMods) due to changes in Access Configuration or the addition of new storage can potentially cause the host to hang or panic due to known Linux kernel issues. Rebooting the host should solve this problem.

Preparing Existing Arrays Prior to Cascading Additional Storage

This procedure takes you through the steps required to disable the Access Configuration state for existing arrays, in preparation for cascading additional arrays.

1. Create a backup of all existing data.

This is a precautionary step.

2. From the Access Configuration page, check the SAS addresses, write down the SAS port WWN's and associated drives for each domain, and then perform an Export operation for each.

Prior to re-cabling, you must record the SAS port WWN and the desired associated targets. The configuration will need to be recreated because the SAS port might be attached to a different array in the cascade or different ports on an array.

3. Unregister related arrays in the array management software:

a. From the navigation pane, select Storage Systems.

The Storage System Summary page is displayed.

b. Select the checkbox to the left of the array and click Remove.

c. Click OK.

Proxy hosts for un-registered arrays will automatically be removed as well.

Preparing New Arrays for Cascading (Adding Storage Capacity)

Before cascading can occur, all arrays that will be cascaded as new or additional storage must be prepared using this procedure.

1. Specify ports for each array: Connect both sides of the new array (see TABLE 8-1) directly to a server running a full CAM installation.

TABLE 8-1 Array Ports for Cascading

Array	Port
J4200	SIM0/SIM1
J4400	Host or SIM Link In
J4500	SAS A/SAS B

The array must not be cascaded to another J4x00 array at this time.

2. Log into the management host by entering the address: <https://host-name:6789>

where *host-name* is the DNS name of the server connected to the array

3. From the Storage System Summary Page, click Register and then register the attached array (following the instructions in the wizard), using the host name or host IP address of the data host in the Registration window.

4. Expand the Array tree for the server until the Access Configuration screen for the first SAS Domain appears.



Caution – Be sure you have selected the appropriate array before going to [Step 5](#). The Reset to Default procedure clears existing zoning configurations.

Typically, new arrays will not have a password set. If you assigned a password for the array's Access Configuration, you will need it to perform [Step 5](#). If the previous password is not known, you can clear it using the methods specified in your J4200, J4400, F5100, or J4500 documentation.

5. For each SAS domain of the array, go to SAS Domains >Administration > Cascade Storage for the selected SAS domain, and click Prepare Storage.

Note – The CLI equivalent command is

```
sscs modify -p,--prepare-cascade sas-domain <sas-domain-name> command
```

6. Unregister all arrays to be cascaded from the array management software:
 - a. From the navigation pane, select Storage Systems.
 - b. On the Storage System Summary page, select the checkbox to the left of the array and click Remove.
 - c. Click OK.
7. Disconnect the array from the server, and then disconnect AC power to the array.

Cascading the New Array to the Existing Storage

Prerequisite: If any SAS ports from any attached hosts are not seen, verify that multipathing is disabled on those hosts. In addition, a reboot might be necessary to force an attached host to register its SAS ports with the storage arrays.

1. Disconnect all other attached hosts so your configuration resembles:

- J4500 arrays—attach to SAS-A and SAS-B (see [FIGURE 8-1](#))
- J4200 arrays—attach to SIM0 and SIM1 (see [FIGURE 8-2](#))
- J4400 arrays—attach to Host or SIM Link In

2. Connect the new array in cascade fashion to the existing J4x00 array(s).

In [FIGURE 8-1](#) and [FIGURE 8-2](#), Array 1 is either an existing or a new storage array. Array 2 is a new array which is attached to the primary array management server.

Note – This configuration differs from the configuration that will be used during normal operation. This configuration is temporary but required in order to synchronize the settings between the old array(s) and the new array being cascaded.

FIGURE 8-1 Temporary Cabling of J4500 for Initialization of the Cascade

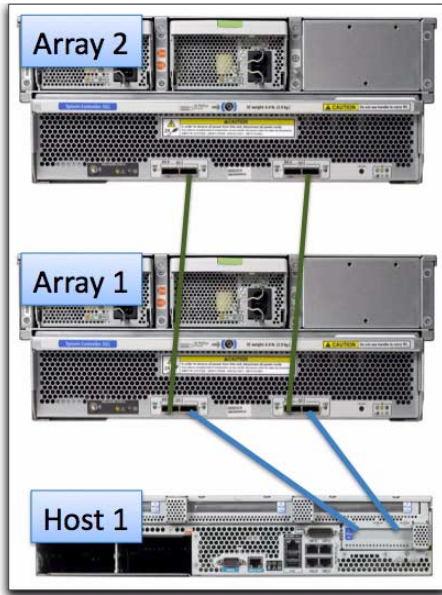
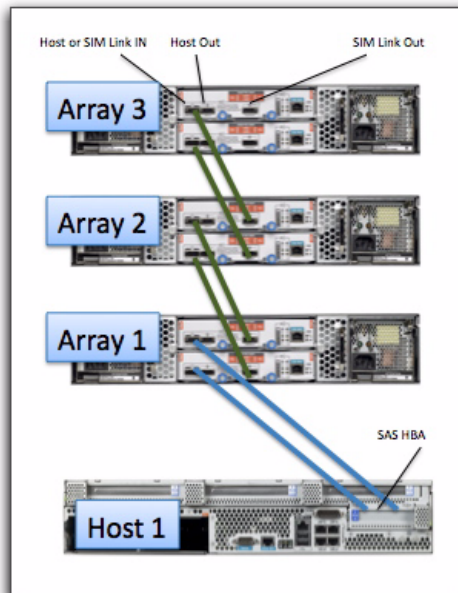


FIGURE 8-2 Temporary Cabling of J4200 Arrays for Initialization of the Cascade



3. Power on all arrays by reconnecting AC power.

The new array might take a few minutes to be recognized by the server's HBA.

4. From the Storage System Summary page, register the newly cascaded array configuration.

All attached arrays should be found. If they are not, perform a host reboot (i.e., Full reboot reconfigure on Solaris) and attempt the registration again.

5. Synchronize the password for the selected SAS domain with the current and newly attached arrays. (For more information about the SAS domain password, see Online Help.)

a. From the Administration page for the selected SAS domain, select "Change Password in the Array Registration Database."

b. Enter your desired (or existing) password

c. Click Save.

Note – If the existing (primary) JBOD had a zoning password set before cascading: After re-discovering the JBOD cascade and before performing Synchronize Cascade, you must update the zoning password in the array database for the aggregated SAS domain with the zoning password of the primary array(s). To do this, select the third option for Zoning Password Management from the SAS Domain Administration page. This step is necessary because a new SAS domain database file is created for the aggregated SAS domain and the new SAS domain database file does not contain the zoning password.

6. Go to SAS Domains > Administration > Cascade Storage for the first SAS domain, and click Synchronize Cascade.

This synchronizes the zoning permission tables and initializes the connections between the arrays.

Note – The CLI equivalent command is:

```
sscs modify -y,--synch-cascade sas-domain <sas-domain-name> command
```

7. Attach additional hosts and change cabling from the primary array management server (host) as shown in cabling diagrams for your particular array.

When you have completed [Step 7](#), all the arrays in the cascade should be discovered and the access configuration for all domains will be in the "disabled" state.

Note – See [FIGURE 8-3](#) and [FIGURE 8-4](#) for the initial cascading setup for J4500 arrays.

Important Notes

- Access configuration information will be retained for any host connections that do not need to be moved in order to properly cable the cascaded configuration. Any host connections that must be moved to new array ports (or ports on the new array) must have access configuration manually recreated for that SAS port.
- For additional cabling instructions, see the appropriate documentation: *Sun Storage J4500 Array System Overview*, *Sun Storage J4200/J4400 Array Hardware Installation Guide*, or other user documentation for your particular arrays.
- Disk drives should not be used by more than one host path unless multipathing is planned. Drives in an array (especially SATA drives) should not be shared by more than one host unless clustering software is being used.
- For information about clustering J4200/J4400 arrays, search for Sun Cluster 3.2 Release Notes and related information at <http://www.sun.com/documentation>. Sun Storage J4500 and F5100 Flash arrays are not supported in a clustering configuration.

[FIGURE 8-3](#) shows an example of how two hosts attach to two J4500 arrays. Refer to your user documentation for cabling instructions for your particular array.

FIGURE 8-3 Recommended Cascading Configuration for J4500 Array

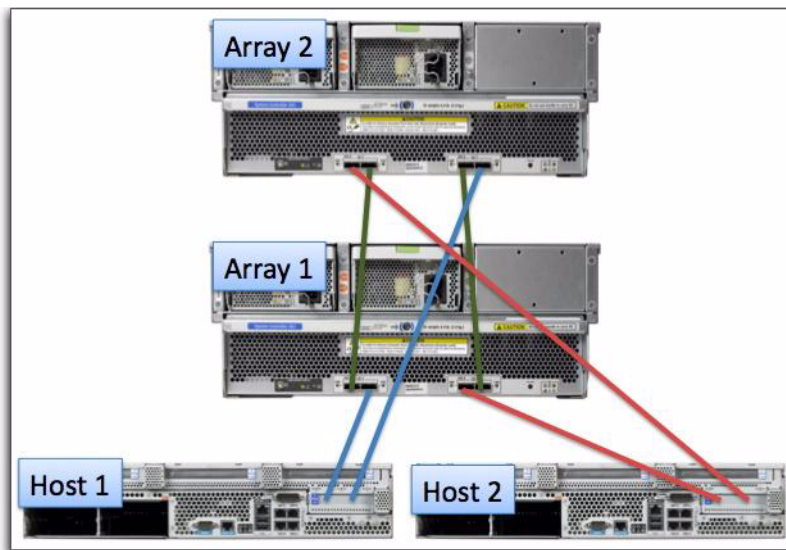
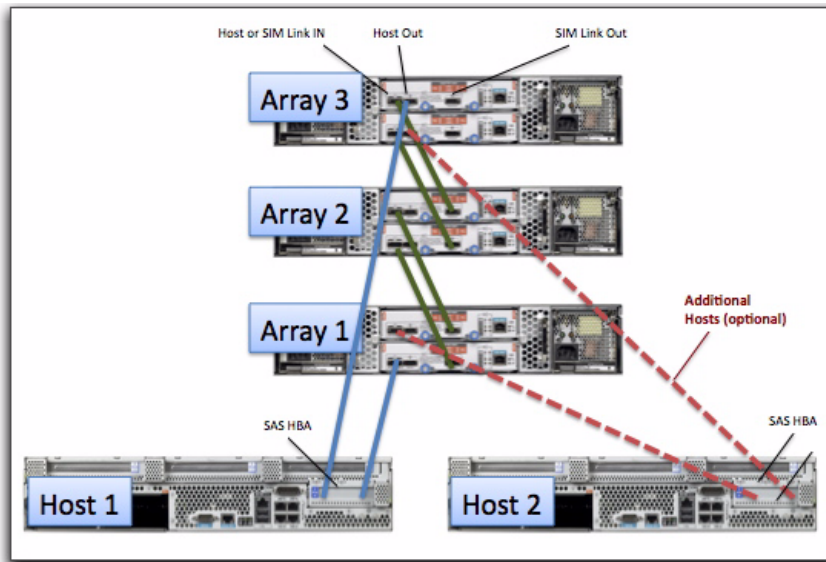


FIGURE 8-4 Recommended Cascading Configuration for J4200/J4400 Array Types



8. From the selected SAS Domain's Access Configuration page, click Configure.
At this time, all arrays, domains, and SAS ports from all attached hosts should be seen within the corresponding Access Configuration Pages.
If SAS ports from any attached hosts are not seen, verify that multipathing is disabled on those hosts. In addition, a reboot might be necessary to force an attached host to register their SAS ports with the storage arrays.
9. For connections between the host and array that do not attach to a different port on this array (or another array due to configuration guidelines), implement Access Configuration for those SAS ports.
 - a. From the selected SAS Domain's Access Configuration page, configure the SAS port and storage for the SAS domain.
 - b. If multiple SAS ports are seen, they should also be configured at this time (i.e., SAS port #1 might have disks 1-6 and SAS port #2 might have disks 7-12).
10. Repeat Step 8 and Step 9 to assign targets to the server (host) for all SAS domains found under the entry for the primary management server.
11. Configure the multipathing software for each attached host so that the multipathing drivers control any drives shared by multiple paths.
12. Export Access Configuration information for each SAS port.

Configuring Multiple Host Access for a J4x00 Array

Prerequisite: If you have configured multipathing, disable multipath software until after the access configuration is complete so the arrays will see all SAS ports.

Configuring Hosts for Access Configuration

The first server you will configure is referred to as the “primary array management server” and each additional server you set up for Access Configuration is referred to as “(additional) host.” The server used to configure access configuration can also be the combination of a management station and single proxy server.

1. **Install the full version of the array management software that supports zoning for the J4x00 array on the primary array management server (unless it is already installed).**

2. **Attach all SAS cables from all desired hosts, as indicated in your array user documentation.**

For example, you might attach the first server for the J4x00 array to either the input port on one controller or an input on each side (SAS A/B or SIM 0/1) if multipathing is desired.

3. **Log into Sun Storage Common Array Manager from the primary array management server you configured by opening the browser and entering the following address:**

<https://host-name:6789>

Where *host-name* is the DNS name of the server connected to the array.

4. **From the Storage System Summary page, click Register and follow the instructions in the wizard to register the arrays to the IP address of the first server.**

5. **If all attached SAS ports are not shown in the Access Configuration page, configure and reboot the primary array management and configure your multipathing software if multiple paths are attached at this point.**

If the primary array management does not immediately recognize the array, use the appropriate host commands to scan for storage.

6. **Configure the Access Configuration for each SAS port attached to the storage.**

In the Access Configuration page, the SAS port(s) from the additional host(s) should be visible; however, they may only be represented as unique SAS addresses (no host names) since the proxy has not been discovered yet. Configuration for the additional host SAS ports should be done at this time by selecting the desired drives for one of the second host's SAS ports, then repeating for each SAS port on the second host.

 - a. **Expand the array tree for the server until the Access Configuration page for the first SAS Domain is displayed.**
 - b. **Click Access Configuration > Configure to assign targets to each server.**
 - c. **For each SAS port, choose the desired targets (disks or FMods) to which the SAS port should have access.**

For multipath HBA initiator pairs, make sure the targets are the same.
 - d. **Click Add/Modify.**
 - e. **Verify the Access Configuration setting is set to "Enable" and click Save.**

The selected settings will be applied to the SAS Expander devices in the storage.
 - f. **Click OK.**
7. **Repeat [Step 6](#) for each SAS domain.**
8. **Power cycle the attached hosts using the appropriate options (i.e., reconfigure-reboot on Solaris) which will perform a full re-scan of the attached storage.**

Troubleshooting Access Configuration

This section includes possible issues you might encounter when using the Access Configuration (SAS Zoning) features.

Important Notes

- Multipath connections to a J4x00 array using separate SAS fabrics will not cause SATA affiliation issues because each host uses a separate path to the disks.



Caution – In a failover (multipath or clustered) configuration, granting multiple hosts access to the same disks through different controllers can lead to data loss. Be careful to properly assign the Access Configuration relationships between the hosts and storage while considering multipathing software to be used.

- Sun Storage Common Array Manager saves the current SAS domain configuration allowing you to revert back to functional settings in the event of misconfiguration, or when you replace an array component, such as a SIM card or controller module, containing Access Configuration (zoning) information. You can restore Access configuration information using templates.
- If you detect a performance problem after modifying access configuration on a Solaris host, run the following command:

```
devfsadm -Cv
```
- Problems with PHY port data could be caused by incorrect cabling for cascaded J4400 arrays. When cabling J4400 arrays, use the Host or SIM Link In port.

About SATA Affiliation Conflicts

The potential for SATA affiliation conflicts exists in J4500 and F5100 arrays, or in J4200 or J4400 arrays when any SATA drives are installed. Conflict can occur when more than one SAS port tries to access the drive via the same SIM or Controller path (i.e., more than one host attached to SIM0/1 on a J4200/J4400 array; more than one host attached to a F5100 array domain; or more than one host attached to SAS-A/B on a J4500 array).

Possible symptoms of SATA affiliation conflicts are:

- operating system hangs
- zoning operations take longer than 10 minutes to complete
- disk utilities like “format” will not return device lists in a timely manner

When more than one instance of Sun Storage Common Array Manager probes a SATA drive from a single SAS domain, SATA affiliation issues occur which lead to possible symptoms as stated above. For this reason, only a single array management host is connected to a SAS domain unless drives have already been zoned to prevent SATA affiliation issues. After the access configuration (zoning) is completed from a primary array management server (or a primary array management server with only one active proxy agent), the array management software can be installed or enabled on additional proxy hosts as desired.

Clearing SATA Affiliation Conflicts

1. **Un-register all CAM proxy agents on any hosts other than the one being used to configure the Access Configuration.**

This can also be accomplished by un-installing the CAM proxy agent or by not installing the CAM proxy agent until Access Configuration is complete.

Note – A single CAM proxy can be used if the primary array management host is not directly attached to the storage via a SAS connection.

2. **Do not run commands on hosts other than the one used to configure the Access Configuration (i.e., `format`, `cfgadm`, etc.) which might attempt to access the attached storage.**

RAID Configuration Worksheets

Use these worksheets to help you collect the information required to configure the RAID arrays and data hosts you are managing. Two worksheets are provided:

- [“Configuration Worksheet” on page 86](#)
- [“Data Host Information” on page 87](#)

TABLE A-2 lists the information you need to configure the array.

TABLE A-1 Configuration Worksheet

Controller A MAC address:	
Controller B MAC address:	
Controller A IP address:	
Controller B IP address:	
Management host IP address:	
Network mask:	
Name server domain name:	
IP address of the domain name server (DNS):	
Gateway IP address:	
Email notification address:	
Notes:	

TABLE A-2 lists the information you need to collect for each data host connected to Sun.

TABLE A-2 Data Host Information

Host name:	
Vendor:	
Model:	
Operating system:	
Patch/Service pack:	
Number of HBAs:	
HBA World Wide Name (WWN):	
HBA model:	
HBA driver:	
Notes:	

SAS Access Configuration Planning Worksheets

Use the worksheets in this section to help you organize data for your configuration.

- [“Planning Worksheet for J4200/J4400 Arrays” on page 90](#)
- [“Planning Worksheet for J4500 Arrays” on page 91](#)
- [“Planning Worksheet for F5100 Flash Arrays” on page 92](#)
- [“J4200 Array Disk Drive to HBA Mapping Worksheet” on page 93](#)
- [“J4400 Array Disk Drive to HBA Mapping Worksheet” on page 94](#)
- [“J4500 Array Disk Drive to HBA Mapping Worksheet” on page 95](#)
- [“F5100 Flash Array FMod to HBA Mapping Worksheet” on page 96](#)

Planning Worksheet for J4200/J4400 Arrays



Hosts

Host Type / Host OS Version	<input type="checkbox"/> Solaris OS <input type="checkbox"/> OpenSolaris OS <input type="checkbox"/> Windows <input type="checkbox"/> Linux	HBA	<input type="checkbox"/> SG-XPCIE8SAS-E-Z <input type="checkbox"/> SG-XPCIE8SAS-EB-Z
Multipathing enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Access Configuration (zoning) enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Devices for each zone	_____	Logical device name	_____
RAID level	_____	Size	_____
Stripe size (KB)	_____	Physical devices	_____

Sun Storage Common Array Manager Software

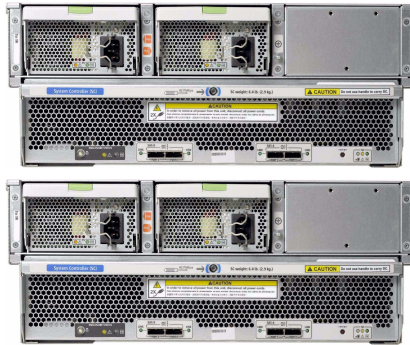
CAM version	_____		_____
Master CAM server	_____	CAM proxy host(s)	_____
JBOD name	_____	JBOD type	_____
JBOD firmware	_____		_____
SAS domain name	_____	Access Configuration password	_____

Array

Model	_____	Number of Expanders	_____
Number of Disks	_____	Disk Capacity	_____

Use [“J4200 Array Disk Drive to HBA Mapping Worksheet”](#) on page 93 to plan initiator to disk mappings.

Planning Worksheet for J4500 Arrays



Hosts

Host Type / Host OS Version	<input type="checkbox"/> Solaris OS <input type="checkbox"/> OpenSolaris OS <input type="checkbox"/> Windows <input type="checkbox"/> Linux	HBA	<input type="checkbox"/> SG-XPCIE8SAS-E-Z <input type="checkbox"/> SG-XPCIE8SAS-EB-Z
Multipathing enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Access Configuration (zoning) enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Devices for each zone	_____	Logical device name	_____
RAID level	_____	Size	_____
Stripe size (KB)	_____	Physical devices	_____

Sun Storage Common Array Manager Software

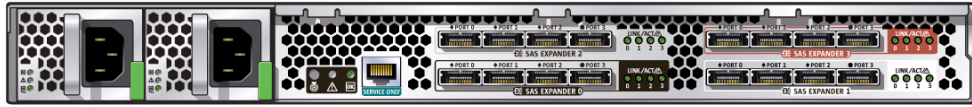
CAM version	_____		_____
Master CAM server	_____	CAM proxy host(s)	_____
JBOD name	_____	JBOD type	_____
JBOD firmware	_____		_____
SAS domain name	_____	Access Configuration password	_____

Array

Model	_____	Number of Expanders	_____
Number of Disks	_____	Disk Capacity	_____

Use the “[J4500 Array Disk Drive to HBA Mapping Worksheet](#)” on page 95 to plan initiator to disk mappings.

Planning Worksheet for F5100 Flash Arrays



Hosts

Host Type /	<input type="checkbox"/> Solaris OS	HBA	<input type="checkbox"/> SG-XPCIE8SAS-E-Z
Host OS Version	<input type="checkbox"/> OpenSolaris OS		<input type="checkbox"/> SG-XPCIE8SAS-EB-Z
	<input type="checkbox"/> Windows		
	<input type="checkbox"/> Linux		
Multipathing enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Access Configuration (zoning) enabled?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Devices for each zone	_____	Logical device name	_____
RAID level	_____	Size	_____
Stripe size (KB)	_____	Physical devices	_____

Sun Storage Common Array Manager Software

CAM version	_____		_____
Master CAM server	_____	CAM proxy host(s)	_____
JBOD name	_____	JBOD type	_____
JBOD firmware	_____		_____
SAS domain name	_____	Access Configuration password	_____

Array

Model	_____	Number of Expanders	_____
Number of Disks	_____	Disk Capacity	_____

J4200 Array Disk Drive to HBA Mapping Worksheet

The J4200 array scales from two to 12 hard disk drives per tray.

Host	Disk
	Disk.00
	Disk.01
	Disk.02
	Disk.03
	Disk.04
	Disk.05
	Disk.06
	Disk.07
	Disk.08
	Disk.09
	Disk.10
	Disk.11

Host	Disk
	Disk.12
	Disk.13
	Disk.14
	Disk.15
	Disk.16
	Disk.17
	Disk.18
	Disk.19
	Disk.20
	Disk.21
	Disk.22
	Disk.23

J4400 Array Disk Drive to HBA Mapping Worksheet

The J4400 array scales from 12 to 24 hard disk drives per tray.

Host	Disk	Host	Disk
	Disk.00		Disk.12
	Disk.01		Disk.13
	Disk.02		Disk.14
	Disk.03		Disk.15
	Disk.04		Disk.16
	Disk.05		Disk.17
	Disk.06		Disk.18
	Disk.07		Disk.19
	Disk.08		Disk.20
	Disk.09		Disk.21
	Disk.10		Disk.22
	Disk.11		Disk.23

Host	Disk	Host	Disk
	Disk.24		Disk.36
	Disk.25		Disk.37
	Disk.26		Disk.38
	Disk.27		Disk.39
	Disk.28		Disk.40
	Disk.29		Disk.41
	Disk.30		Disk.42
	Disk.31		Disk.43
	Disk.32		Disk.44
	Disk.33		Disk.45
	Disk.34		Disk.46
	Disk.35		Disk.47

J4500 Array Disk Drive to HBA Mapping Worksheet

The J4500 array is fully populated at 48 hard disk drives per tray.

Host	Disk	Host	Disk
	Disk.00		Disk.24
	Disk.01		Disk.25
	Disk.02		Disk.26
	Disk.03		Disk.27
	Disk.04		Disk.28
	Disk.05		Disk.29
	Disk.06		Disk.30
	Disk.07		Disk.31
	Disk.08		Disk.32
	Disk.09		Disk.33
	Disk.10		Disk.34
	Disk.11		Disk.35
	Disk.12		Disk.36
	Disk.13		Disk.37
	Disk.14		Disk.38
	Disk.15		Disk.39
	Disk.16		Disk.40
	Disk.17		Disk.41
	Disk.18		Disk.42
	Disk.19		Disk.43
	Disk.20		Disk.44
	Disk.21		Disk.45
	Disk.22		Disk.46
	Disk.23		Disk.47

F5100 Flash Array FMod to HBA Mapping Worksheet

The F5100 flash array has a total of 80 FMod disks, organized in four groups of 20.

TABLE B-1 Disks 00 through 19 for Expander 0 and Expander 1

Host	Disk	Host	Disk
	EXP0FMod.00		EXP1FMod.00
	EXP0FMod.01		EXP1FMod.01
	EXP0FMod.02		EXP1FMod.02
	EXP0FMod.03		EXP1FMod.03
	EXP0FMod.04		EXP1FMod.04
	EXP0FMod.05		EXP1FMod.05
	EXP0FMod.06		EXP1FMod.06
	EXP0FMod.07		EXP1FMod.07
	EXP0FMod.08		EXP1FMod.08
	EXP0FMod.09		EXP1FMod.09
	EXP0FMod.10		EXP1FMod.10
	EXP0FMod.11		EXP1FMod.11
	EXP0FMod.12		EXP1FMod.12
	EXP0FMod.13		EXP1FMod.13
	EXP0FMod.14		EXP1FMod.14
	EXP0FMod.15		EXP1FMod.15
	EXP0FMod.16		EXP1FMod.16
	FEXP0Mod.17		EXP1FMod.17
	EXP0FMod.18		EXP1FMod.18
	EXP0FMod.19		EXP1FMod.19

TABLE B-2 Disks 00 through 19 for Expander 2 and Expander 3

Host	Disk	Host	Disk
	EXP2FMod.00		EXP3FMod.00
	EXP2FMod.01		EXP3FMod.01
	EXP2FMod.02		EXP3FMod.02
	EXP2FMod.03		EXP3FMod.03
	EXP2FMod.04		EXP3FMod.04
	EXP2FMod.05		EXP3FMod.05
	EXP2FMod.06		EXP3FMod.06
	EXP2FMod.07		EXP3FMod.07
	EXP2FMod.08		EXP3FMod.08
	EXP2FMod.09		EXP3FMod.09
	EXP2FMod.10		EXP3FMod.10
	EXP2FMod.11		EXP3FMod.11
	EXP2FMod.12		EXP3FMod.12
	EXP2FMod.13		EXP3FMod.13
	EXP2FMod.14		EXP3FMod.14
	EXP2FMod.15		EXP3FMod.15
	EXP2FMod.16		EXP3FMod.16
	EXP2FMod.17		EXP3FMod.17
	EXP2FMod.18		EXP3FMod.18
	EXP2FMod.19		EXP3FMod.19

Configuring the IP Address of the RAID Array Controllers

This appendix describes how to use Sun Storage Common Array Manager to substitute a static IP address for the default internal IP address. It contains the following sections:

- [“Configuring Static IP Addresses” on page 99](#)
- [“Establishing Temporary IP Connectivity” on page 101](#)
- [“Assigning IP Addresses to the Controllers” on page 104](#)
- [“Restoring the Management Host IP Configuration” on page 106](#)

In order for there to be an out-of-band Ethernet connection between the local management host and the array controllers, the management host and the array controllers must have valid IP addresses. There are three methods for adding the IP address:

- Dynamic Host Configuration Protocol (DHCP), for assigning IP addresses dynamically
- The serial port for assigning static IP addresses
- The Common Array Manager software for assigning static IP addresses

The first two methods are documented in your array installation guide.

Configuring Static IP Addresses

Use static IP addressing to assign a specific IP address to Ethernet port 1 of each array controller. Static IP addresses remain in effect until you modify or remove them.

Note – Some array models, such as the StorageTek 2500 Series, have only one Ethernet port on the controllers. In that case “Ethernet Port 1” applies to that single port.

Sun array controllers are shipped with the following default IP addresses:

- Ethernet port 1 of Controller A is assigned IP address 192.168.128.101
- Ethernet port 1 of Controller B is assigned IP address 192.168.128.102

The controller IP address configuration tasks are listed in [TABLE C-1](#).

TABLE C-1 IP Addressing Configuration Tasks

Step	Task	Section
1	Establish temporary IP connectivity between the management host and the array controllers	“Establishing Temporary IP Connectivity” on page 101
2	Assign static IP addresses to the controllers	“Assigning IP Addresses to the Controllers” on page 104
3	Restore the original host IP configuration	“Restoring the Management Host IP Configuration” on page 106

IPv6 Support

No IPv6 address is configured by default on IPv6-capable arrays. To configure IPv6, access the array via IPv4 or via the array’s serial console.

When enabled, IPv6 can be configured in one of two modes using the Physical Devices > Controllers page:

- **Obtain Configuration Automatically**

Select this for the array to obtain a stateless, auto-configured address.

- **Specify Network Configuration**

Select this if you have a specific, pre-assigned IPv6 address you want assigned to the array.

Establishing Temporary IP Connectivity

In order to assign IP addresses to the controllers, you must establish temporary IP connectivity between the management host and Ethernet port 1 of each controller.

There are two methods by which to do that, depending on the method by which the management host and controller's Ethernet ports are physically connected to the Ethernet, and the availability of an Ethernet interface on the management host.

The two methods of establishing temporary IP connectivity are as follows:

- Assigning a temporary IP address to a management host Ethernet interface in the same subnet as the default IP addresses of the controller's Ethernet ports (for example, IP address 192.168.128.100).

Use this method if the following conditions are true:

- You have an available Ethernet interface on the management host or you can temporarily reassign the IP address of an Ethernet interface on the management host.
- Ethernet port 1 of each controller can be directly connected to an Ethernet interface on the management host by an Ethernet crossover cable, or Ethernet port 1 of each controller and an Ethernet interface of the management host are connected to the same Ethernet hub.

For information on changing the IP address of an Ethernet interface on the management host, see [“Configuring the IP Address of the Management Host” on page 102](#).

- Creating a temporary virtual subnet on the management host.

Use this method if there is not an available Ethernet interface on the management host or if Ethernet port 1 of each controller is connected to a subnet on the local area network (LAN) that is not the subnet of the management host.

For information on creating a temporary virtual subnet on the management host, see [“Creating a Temporary Virtual Subnet on a Management Host” on page 103](#).

Configuring the IP Address of the Management Host

To configure IP addressing for the array, you may have to temporarily change the IP address of the management host.

The method you use to configure the IP address on the host depends on the platform you are using. Follow the instructions in one of the following sections, depending on your platform:

- [“Configuring the IP Address on the Management Host for the Solaris or Linux Operating System” on page 102](#)
- [“Configuring the IP Address for Windows 2000 Advanced Server” on page 102](#)
- [“Configuring the IP Address for Windows Server 2003” on page 103](#)

Configuring the IP Address on the Management Host for the Solaris or Linux Operating System

For information about changing the IP address on a Solaris or Linux server, see the `ifconfig` man page.

Configuring the IP Address for Windows 2000 Advanced Server

1. From the Control Panel, select Network and Dial-Up Connections.
2. Select Local Area Connection > Properties > Internet Protocol (TCP/IP).
3. Make sure that a static IP address is configured, and click Advanced.
4. In Advanced TCP/IP Settings, select the IP address you want to configure, and click Add directly below the IP addresses listing.
5. Type the IP address and subnet mask, and click Add.
The new IP address is added to the IP addresses listing.
6. Open a command window and try to ping the IP addresses of the controller's Ethernet ports, as shown in the following example:

```
> ping 192.188.128.101
```

If the `ping` is unsuccessful, try rebooting the server and entering the `ping` command again.

Configuring the IP Address for Windows Server 2003

1. From the Control Panel, select Network and Dial-Up Connections.
2. Select Local Area Connection > Properties > Internet Protocol (TCP/IP).
3. Make sure a static IP address is configured, and click Advanced.
4. In Advanced TCP/IP Settings, click Add directly below the IP addresses listing.
5. Type an IP address that is on the same subnet as Controller A (192.168.128.101) and Controller B (192.168.128.102).

For example, you can use 192.168.128.100 because it is on the same subnet and does not conflict with the controller IP addresses.

6. Click Add.

The new IP address is added to the IP addresses listing.

Creating a Temporary Virtual Subnet on a Management Host

To configure static IP addressing for an array, you might have to establish a virtual subnet in order to temporarily access the array from the management host. You should delete the virtual subnet after you configure static IP addressing for the array (see [“Deleting a Temporary Virtual Subnet on a Management Host” on page 106](#)).

Note – The following procedure applies to Solaris or Linux management hosts only. On Linux hosts, the syntax of the commands shown may vary slightly, depending on the Linux version used.

1. To display the Ethernet ports that are in use on the server, type the following:

```
ifconfig -a
```

The Ethernet ports that are in use are displayed, as shown in the following example:

```
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232 index
1

inet 127.0.0.1 netmask ff000000

bge0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500
index 2

inet 10.4.30.110 netmask ffffffff broadcast 10.4.30.255
```

2. ether 0:3:ba:32:4d:f1As root, configure a temporary virtual subnet by typing the following:

```
# ifconfig ethernet-port:1 plumb
# ifconfig ethernet-port:1 192.168.128.100 up
```

For example:

```
# ifconfig bge0:1 plumb
# ifconfig bge0:1 192.168.128.100 up
```

3. Type the following command to view the changes and thereby verify that you have established IP connectivity between the management host and the array controllers:

```
# ipconfig -a
```

Assigning IP Addresses to the Controllers

After you have established temporary IP connectivity between the controller's Ethernet ports and the management host, you can use the Common Array Manager software to assign a static IP address to Ethernet port 1 of each controller.

Assigning an IP Address to Each Ethernet Port

1. Start Sun Storage Common Array Manager:

- a. Open a web browser and enter the IP address of the management host:

```
https://management-host:6789
```

management-host is the IP address of the machine where you installed the management software.

The login page is displayed.

- b. Log in as root:

Login: **root**

Password: *root-password*

root-password is the root password of the machine where you installed the management software.

- c. From the Oracle Java Web Console page, click Sun Storage Common Array Manager.

The Storage System Summary page is displayed.

2. Temporarily register the array with the default Ethernet port IP addresses.
See [“Registering Arrays” on page 29](#) for instructions.

3. Assign a static IP address to Ethernet port 1 on each controller.

- a. In the navigation pane, expand Storage Systems and choose the array to which you want to assign an IP address.

The Administration page is displayed. (This procedure assumes that you previously set the array general information.)

- b. Enter the array name and click OK.

- c. In the navigation pane, under the array you want to work with, expand Physical Devices and choose Controllers.

The Controller Summary page is displayed.

- d. First for Controller A's (Controller 1) Ethernet port 1 and then for Controller B's (Controller 2) Ethernet port 1, select Specify Network Configuration and then enter the IP address, gateway address, and netmask. Click OK.

You might see an error message indicating that contact has been lost with the array as a result of the changed IP address. You can ignore this message.

4. Delete the array to remove the default IP addresses:

- a. Log out of the console and then log in again.

The Storage System Summary page is displayed.

- b. On the Storage System Summary page, click the check box next to the original array with the original IP address, and click the Remove button to remove the old IP address.

5. Reregister the array with the static IP addresses.

To register the array, see [“Registering Arrays” on page 29](#) for instructions.

6. If you are configuring multiple arrays, use the following Solaris OS commands to clear the Address Resolution Protocol (ARP) table entry for each controller:

```
arp -d ip-address-controller-A
```

```
arp -d ip-address-controller-B
```

Restoring the Management Host IP Configuration

If you changed the IP address of the management host, once you have configured static IP addresses for the controllers you must restore the original IP address of the management host.

To restore the original IP address of an Ethernet interface on the management host, see [“Configuring the IP Address of the Management Host” on page 102](#).

If you established a virtual subnet to assign IP addresses, you should delete it. To delete the temporary virtual subnet on the management host, see [“Deleting a Temporary Virtual Subnet on a Management Host” on page 106](#).

Deleting a Temporary Virtual Subnet on a Management Host

1. Enter the following commands as `root`:

```
# ifconfig ethernet-port:1 down
# ifconfig ethernet-port:1 unplumb
```

2. View the changes:

```
# ifconfig -a
```

Configuring In-Band Management for RAID Arrays

Setting up the array for in-band management is outlined in the following sections:

- [“About In-Band Management for RAID Arrays” on page 107](#)
- [“Configuring In-Band Management for RAID Arrays” on page 109](#)
- [“Copying Configuration Files and In-Band Management” on page 110](#)
- [“Known RAID Array Proxy Agent Limitations” on page 111](#)

About In-Band Management for RAID Arrays

The management host typically communicates with RAID arrays over the network. If the RAID array does not have access to a network, or if the network address of the RAID array is unknown, CAM can communicate with the RAID array by using an in-band RAID array proxy.

In-band management uses a proxy agent running on a data host which is directly connected to a RAID array (FC or SAS). Sun Storage Common Array Manager (CAM) discovers the proxy agents on the subnet and then queries arrays registered with the software. The proxy agent receives the queries over the network and passes them on to the array over the data path between the data host and the array.

New arrays can be registered with the software using the CAM registration wizard. You can register the RAID array either by selecting auto discovery (if the data host is on the same subnet), or by providing the data host’s IP address. Once an array is discovered and registered, management of that array is identical to any out-of-band managed RAID array. If the RAID array is managed in-band, the Network Address column on the CAM Storage System Summary page lists In-band after the address.

Note – CAM typically manages a RAID array directly over the network (out-of-band). After CAM discovers and registers the RAID array via the in-band RAID array proxy data host, CAM checks if the RAID array can be directly contacted over the network based on the network configuration on the RAID array controllers. If CAM can directly communicate to the RAID array, CAM switches management to the out-of-band connection. If CAM cannot directly communicate to the RAID array over the network, it continues using the in-band RAID array proxy connection.

About the RAID Array Proxy Agent

The in-band management proxy agent is a package that is added to a host (or group of hosts) with in-band connectivity via Fibre Channel to the storage array. An external management station can then talk to this proxy host via an out-of-band connection and the management commands are then relayed to the storage device via the in-band path. This is a transparent proxy agent which simply converts the RPC request packets to UTM SCSI- specific messages. The API Sun Storage Common Array Manager uses to manage the arrays is identical whether the array is managed via the in-band or out-of-band path.

The RAID array proxy agent is located in the Add_On/RaidArrayProxy directory and is delivered with the other Sun Storage Common Array Manager installation files. See [“Download Sun Storage Common Array Manager Software and Patches”](#) on [page 7](#) for information about getting the software.

LUN Mapping

In-band management uses a special access LUN mapping to facilitate communications between the management software and the storage array. You can view all mappings on the array on the Mapping Summary Page in CAM. For in-band communication, an access volume is mapped to LUN 31. This special access LUN (also called the UTM LUN) is mapped to the default domain. (All arrays have a default domain for volumes not registered with a storage domain.)

With new arrays, the mapping of the access LUN to the default domain is installed at the factory. If you lose this mapping, before installing in-band, use out-of-band management and the Common Array Manager software to re-map the access LUN to the default domain. See the Online Help in the software for more information about mapping.

Sun Storage Common Array Manager supports Solaris Sparc and x86, Windows, and Linux for in-band management. For Red Hat Enterprise Linux AS, Release 5.1 or higher is required. Check the *Sun Storage Common Array Manager Release Notes* for the latest list of packages to install.

Configuring In-Band Management for RAID Arrays

Prerequisite: Download the RAID Proxy Agent package for your OS located in the Add_On/RaidArrayProxy directory of the latest CAM software distribution.

- 1. Connect two in-band (FC) cables between HBAs on the data host where the proxy is to be installed and the array (one cable to each controller).**
- 2. Install the SMruntime and SMagent packages on the proxy host, using the pkgadd command in Solaris and rpm command in Linux.**

- Installation example on Solaris:

```
pkgadd -d <directory or disk-directory> SMruntime-SOL-xx.xx.xx.xx.pkg
```

```
pkgadd -d <directory or disk-directory> SMagent-SOL-xx.xx.xx.xx.pkg
```

- Installation example on Linux:

```
rpm -ivh SMruntime.xx.xx.xx.xx-xxxx.rpm
```

```
rpm -ivh SMagent-LINUX-xx.xx.xx.xx-xxxx.rpm
```

- 3. Solaris only—to verify that the host sees the access LUN to manage the array via the in-band path, perform the following commands on the data host:**

```
setenv LD_LIBRARY_PATH /opt/SMgr/agent
```

```
java -classpath /opt/SMgr/agent/SMagent.jar  
devmgr.versioned.agent.DeviceIdentifier | grep "Volume Access"
```

The arrays with access LUNs visible to the agent will display as follows:

```
/dev/rdisk/c5t200600A0B82458D4d31s2 [Storage Array fms-lca1, Volume  
Access, LUN 31, Volume ID <600a0b80002458d20000000000000000>]
```

```
/dev/rdisk/c5t200700A0B82458D3d31s2 [Storage Array fms-lca1, Volume  
Access, LUN 31, Volume ID <600a0b80002fc07400000000000000000>]
```

- 4. Verify that the Proxy Agent is running. If necessary, check the SMagent process and restart in /opt/SMgr/agent/SMagent.**

5. To start the agent, perform this command in Solaris or its equivalent:

```
/opt/SMgr/agent/SMagent start
```

If the agent was running, it will stop and then restart after a status check.

6. Check the process status:

```
# ps -ef | grep SMagent | grep -v grep  
  
/opt/SMgr/agent/jre/bin/java -classpath  
/opt/SMgr/agent/SMagent.jar devmgr.launch
```

7. Sign in to the software and begin configuring as described in [“Initial Array Set Up” on page 27](#).

After the registration process discovers arrays, they display on the Storage System Summary page. The Network Address field displays whether the connection with each array is in-band or out-of-band. The Common Array Manager software can manage arrays with either in-band and out-of-band connections at the same time.

Copying Configuration Files and In-Band Management

If you copy a configuration file to a management host that will have in-band communication with the array, you need to preserve the mapping between the access LUN and the management host using the `import array` command with the `-n` (noclear) option.

```
import -x <XML-location> [ -L <list> ] [ -n ] array <array-name>
```

The `import` command typically applies an array configuration file to the specified array. The `-n` option preserves the current array configuration, including the mapping between the access LUN (LUN 31) and the default domain of the management host. This mapping is required for in-band management of the array.

OPTIONS

```
-x, --xml <XML-location>
```

Specifies the location of the XML file to be imported. The XML location can be in the form of a URL (`http://...` or `file:///...`) or a file name.

```
-L, --list
```

Specifies that no import take place. Instead, the array is checked against the XML file to ensure that it is compatible.

```
-n, --noclear
```

Specifies that the current array configuration will not be cleared.

```
array <array-name>
```

Specifies the array to which the configuration file is applied.

Known RAID Array Proxy Agent Limitations

A proxy agent restart is required after disruptive changes to the storage configuration. This does not apply to changes in volumes exposed from a single array, but it does apply if storage arrays are re-cabled differently or if the storage array configuration has changed (i.e., adding new storage arrays to the configuration).

The in-band proxy agents will start when the host boots, but the agents will terminate if storage is not immediately seen. A restart of the agent (instructions below) will force a re-scan for storage arrays and, if any are found, the agent will remain running.

Solaris: Checking the UTM LUNs and Start/Stop of the Proxy Agent

To verify the host sees the arrays management (UTM) LUN, do the following:

1. Restart the agent (Solaris):

```
# /opt/SMgr/agent/SMagent start
```

If the agent is running, this will stop and then restart it.

2. Check the status of the agent:

```
# ps -ef | grep SMagent | grep -v grep
```

```
root  5144      1    0 11:58:24 pts/3          0:01  
/opt/SMgr/agent/jre/bin/java -classpath  
/opt/SMgr/agent/SMagent.jar devmgr.launch
```

Linux: Checking the UTM LUNs and Start/Stop of the Proxy Agent

Note – The SMagent requires Red Hat 5.1 (also known as “5 update 1”) or higher. It is not supported on Red Hat 5.0.

Note – This information applies only to RAID arrays.

To verify the host sees the array management (UTM) LUN:

1. Restart the agent:

```
# /opt/SMgr/agent/SMagent start
Stopping Agent process 12632.
SMagent started.
# SANtricity Storage Array Host Agent, Version 09.17.A0.03
Built Tue Dec 05 14:52:38 CST 2nnn
Copyright (C) 1999-2006 LSI Logic Corporation. All rights
reserved.
Checking device /dev/sda (/dev/sg0): Skipping
Checking device /dev/sdb (/dev/sg1): Skipping
Checking device /dev/sdc (/dev/sg2): Activating
Running...
```

2. Check for UTM LUN:

```
# java -classpath /opt/SMgr/agent/SMagent.jar
devmgr.versioned.agent.DeviceIdentifier | grep "Volume Access"
/dev/sdc
(/dev/sg2) [Storage Array fms-lca1, Volume Access, LUN 31,
Volume ID <600a0b80002fc07400000000000000000>]
```

Windows: Checking the UTM LUNs and Start/Stop of the Proxy Agent

To verify the host sees the arrays management (UTM) LUN, do the following:

1. Restart the agent:

```
E:\Program Files (x86)\StorageManager\agent>net start  
"SANtricity Storage Manager Agent"
```

The Storage Manager Agent service is starting.

The Storage Manager Agent service was started successfully.

2. Check for UTM LUN:

```
E:\Program Files (x86)\StorageManager\agent>C:\Java\  
jdk1.5.0_11\bin\java -classpath SMagent.jar  
devmgr.versioned.agent.DeviceIdentifier | findstr Access  
\\.\PHYSICALDRIVE0 [Storage Array fms-lca1, Volume Access, LUN  
31, Volume ID <600a0b80002458d20000000000000000>]  
\\.\PHYSICALDRIVE1 [Storage Array fms-lca1, Volume Access, LUN  
31, Volume ID <600a0b80002fc074
```


Using SNMP

This appendix provides an overview for using SNMP with Sun Storage Common Array Manager.

The array management software provides SNMP traps as well as an agent that can be queried.

SNMP Traps

Sun Storage Common Array Manager provides SNMP traps for all actionable events. The trap fields are defined by the SNMP trap MIB (see [“SNMP Trap MIB” on page 116](#)).

The traps that can be received are based on the alarms possible for the specific device. Traps are sent through port 162 to the IP addresses configured in the user interface (UI) or command-line interface (CLI). The minimum alarm priority used for trap generation can be selected using UI or CLI interfaces. Traps can only be sent to the default ‘public’ community at this time.

Sun Storage Common Array Manager does not provide an SNMP agent that can be queried using SNMP ‘GET’ operations. At times, the devices themselves support SNMP ‘GET’ operations although all the arrays supported by the array management software at this time do not. Instead customers typically do remote scripting using the remote CLI (SSCS) or the SMI-S industry standard provider is used.

SNMP Trap MIB

```
-----
-- Copyright 2001 - Sun Microsystems, Inc. All Rights Reserved.
-- FIXED for RFC 2578compatibility --
-- Sun Storage Agent Notification --
-- Definitions of the Sun Storage Agent Notification and Notification attributes
--
SUNSTORAGEAGENT-NOTIFICATION-MIB DEFINITIONS ::= BEGIN
    IMPORTS

        enterprises, MODULE-IDENTITY, NOTIFICATION-TYPE, OBJECT-TYPE
            FROM SNMPv2-SMI
        OBJECT-GROUP
            FROM SNMPv2-CONF;
    alertTrap MODULE-IDENTITY
        LAST-UPDATED "200210160000Z"
        ORGANIZATION "Sun Microsystems Inc."
        CONTACT-INFO
            "
                Sun Microsystems Inc.
                Customer Support
                Postal: 901 San Antonio Road
                Palo Alto, CA-94303-4900, USA
                Tel: 650-960-1300
                E-mail: service@sun.com"

    DESCRIPTION
        "This mib defines the trap sent by the Sun Storage Agent
        with the variable bindings. Any outside entity can
        subscribe for this trap."

    REVISION "200210160000Z"
        DESCRIPTION
            "Rev 1.0 19 January 2000 12:00, Initial version Of MIB."
        ::= { storagent 0 }
    sun OBJECT IDENTIFIER ::= { enterprises 42 }
    prod OBJECT IDENTIFIER ::= { sun 2 }
    storagent OBJECT IDENTIFIER ::= { prod 95 }
    alert OBJECT IDENTIFIER ::= { storagent 1 }
    alertInfoGroup OBJECT IDENTIFIER ::= { alert 3 }
```

```

-- alertInfoGroup OBJECT-GROUP
--     OBJECTS { deviceName, alertLevel, message }
--     STATUS current
--     DESCRIPTION
--         "Varbinds of alertMessage trap"
--     ::= { alertInfoGroup 3 }

alertMessage NOTIFICATION-TYPE
    OBJECTS { deviceName, alertLevel, message }
    STATUS current
    DESCRIPTION
        "An alertMessage trap signifies that an alert was
         generated for a storage device monitored
         by the Storage Agent."
    ::= { alertTrap 6 }

deviceName OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
        "The name of the storage device that the alert message
         pertains to."
    ::= { alertInfoGroup 1 }

alertLevel OBJECT-TYPE
    SYNTAX INTEGER {
        notice(0),
        warning(1),
        failure(2),
        down(3)
    }
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
        "The level of importance of the alert related to failure."
    ::= { alertInfoGroup 2 }

```

```
message OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
        "The alert message for the storage device."
    ::= { alertInfoGroup 3 }
gridId OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
        "Event Grid ID"
    ::= { alertInfoGroup 4 }
deviceId OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
        "Device ID ie: t3:serialno"
    ::= { alertInfoGroup 5 }
```

END

Installation Troubleshooting

This appendix provides information related to installation problems and removing the software from the server:

- [“Installation Issues” on page 120](#)
- [“Reviewing the Installation Logs” on page 124](#)
- [“CLI Installation Troubleshooting” on page 124](#)
- [“Uninstalling Software” on page 125](#)

Installation Issues

TABLE F-1 describes potential issues that could occur during installation of Sun Storage Common Array Manager.

TABLE F-1 Installation Issues and Workarounds

Problem	Description / Workaround
Datahost RevisionDeltaEvent Mismatch alarm	<p>CAM version mismatch alarm is generated when customers register the different platform types.</p> <p>Example alarm scenario: Linux - CAM Management Host 6.7.0.12 Patched Windows - CAM proxy data host 6.7.0.13</p> <p>Description: Revision mismatch between data host and management host. The data host agent is at version 6.7.0.13 but the management station is at version 6.7.0.12</p> <p>Probable Cause: A data host agent is running a version of the Sun Storage Common Array Manager software that is different from the management host.</p>
General Password Mismatch error	<p>Using an invalid array password might result in configuration error messages.</p> <p>Workaround: Use the correct array password.</p>
Installation fails when MegaRAID / MegaCLI is present	<p>Description: Install fails when MegaRAID/MegaCLI is present since both use the same library location.</p> <p>Workaround: Install on MegaCLI version 8.00.23 and MSM 8.00-05 or older, available at: http://www.lsi.com/support/sun/sg_x_sas6-r-int-z.html</p>
Windows platforms	
Installation fails due to missing TEMP—Windows platforms only	<p>Windows users should investigate TEMP, TMP, and USERPROFILE environment variable settings, rather than follow the directions in the pop-up window.</p>
Installation fails when user account control is On—Windows 2008	<p>Description: Users with Administrative privileges who install Sun Storage Common Array Manager on Windows 2008 must have User Account Control turned off.</p> <p>Workaround: From the Control Panel, select User Accounts, and then turn the User Account Control OFF.</p>
Upgrading from version 6.2.0.15: arrays must be removed/re-registered	<p>After upgrading Sun Storage Common Array Manager software on Windows, manually restart fms on Windows using the following commands.</p> <pre>C:\sc stop Sun_STK_FMS C:\sc start Sun_STK_FMS</pre>

TABLE F-1 Installation Issues and Workarounds (Continued)

Problem	Description / Workaround
Windows proxy does not run after reboot	<p>Description: Communication lost with Win2k8 SP2 remote data host after OS reboot.</p> <p>Workaround: Re-execute <code>proxycfg.bat</code> enable.</p>
Uninstaller-stop applications before running—Windows only	Stop all applications that are running a <code>java.exe</code> or <code>javaw.exe</code> before running the uninstaller.
Linux platforms	
Adding or removing SATA drives requires host boot	<p>Description: Linux kernel:mptbase(Abort) occurs when SATA drives are added or removed. This issue has been discovered on both RedHat 5.2 and SuSE 10.</p> <p>Adding or removing SATA drives to a Linux host yields the following message:</p> <pre>kernel: mptsas: ioc2: removing sata device: fw_channel 0, fw_id 4, phy 4, sas_addr 0x500163600010a390 kernel: mptbase: ioc1: LogInfo(0x31120101): Originator={PL}, Code={Abort}, SubCode(0x0101)</pre> <p>The following message is also common:</p> <pre>multipathd: sdd: checker msg is "tur checker reports path is down"</pre> <p>Normally the (kernel: mptsas) messages are seen for zoning operations but when the (kernel:mptbase) message is also seen, only a reboot will recover the hosts' ability to properly see the drives.</p> <p>Workaround: Reboot host.</p>
Email notification not working on RH4	<p>Do not use SMTP required authentication for email notification. To learn how to disable authentication in Sendmail in Red Hat Enterprise Linux 4, go to:</p> <p>http://kbase.redhat.com/faq/docs/DOC-4113</p>
Sun Storage J4000 and F5100 Flash arrays—Linux hot plug issues	<p>Two categories of J4x00/F5100 hot plug issues have been identified:</p> <ul style="list-style-type: none"> • Those that require a Linux host reboot. • Those in which the hot plug is not supported.

TABLE F-1 Installation Issues and Workarounds (*Continued*)

Problem	Description / Workaround
	<p data-bbox="491 239 853 256">Issues that require a Linux host reboot:</p> <ul data-bbox="491 267 1248 1251" style="list-style-type: none"><li data-bbox="491 267 1219 319">• The array or any of its components are not recognized after changes such as cable re-configurations, firmware upgrades<li data-bbox="491 329 1076 347">• StorageTek SAS RAID HBA hot plug is not supported.<li data-bbox="491 357 1190 444">• Sun StorageTek SAS RAID HBA is inconsistent with reports and missing FRU disk information. This is expected J4x00 registration behavior during SAS bus re-scan.<li data-bbox="491 454 1119 472">• Firmware upgrade failed for Sun Blade 6000 Disk Module.<li data-bbox="491 482 1205 534">• J4x00—Name issues during registration and upgrade connected to B0/B1 side.<li data-bbox="491 545 1248 597">• J4x00—Linux J4x00 registration <code>sg_map -i</code> must be clear of all errors or it fails; leads to host reboot to clear <code>sg_map</code>.<li data-bbox="491 607 1248 711">• Newly added or removed targets (i.e. disks) due to changes in Access Configuration, cable re-configuration, firmware upgrades, or the addition of new storage can potentially cause the host to hang or panic due to known Linux kernel issues.<li data-bbox="491 739 1148 791">• After Linux hot plug, the JBOD is no longer monitored by the management software.<li data-bbox="491 802 1219 871">• J4200/J4400: Sun StorageTek PCI-Express SAS Host Bus Adapter B3: SuSE 9 SP4: Multipath (device mapper): Alternate SIM failure causes host to hang.<li data-bbox="491 881 1233 968">• J4200/J4400: Sun StorageTek PCI-Express SAS Host Bus Adapter B3: SLES9SP4: Multipath: Lost Communication to JBOD after Sun Storage Common Array Manager software SIM firmware upgrade.<li data-bbox="491 979 1033 996">• Cannot register J4x00 on Linux until host reboot3.<li data-bbox="491 1006 1219 1058">• MPT 3.16.00.00 HBA SAS cable insert, expander reset or power cycle hang x86 host until reset.<li data-bbox="491 1069 1248 1121">• OS does not see zoning filtering through to proxy server correctly. This issue is specific to Linux hosts.<li data-bbox="491 1131 1248 1183">• As a result of JBOD expander firmware upgrade, expander reset might hang Linux OS.<li data-bbox="491 1194 1205 1246">• 1.26.03.00: linux missing targets, <code>fdisk -l</code> and <code>sg_map -i</code> hangs after JBOD second power cycle. <p data-bbox="491 1270 1025 1288">Sun StorageTek SAS RAID HBA hot plug is not supported:</p> <p data-bbox="491 1298 1190 1350">Generally, the workaround is to reboot the array between any cable changes.</p> <ul data-bbox="491 1361 1233 1447" style="list-style-type: none"><li data-bbox="491 1361 1233 1378">• J4x00 failed disk drive (Sun StorageTek SAS RAID HBA) not reported.<li data-bbox="491 1388 1162 1440">• J4x00 Windows agent (Sun StorageTek SAS RAID HBA) 0.0 MB reported; drive FRU missing unique identifier.

TABLE F-1 Installation Issues and Workarounds (Continued)

Problem	Description / Workaround
Solaris platforms	
Error—"no execute access to <code>opt/SMgr/agent/notifysmagent.sh</code> "—occurs during system boot-up	<p>Description: This error occurs when <code>/opt(SMagent install directory)</code> is built on a disk partition other than root partition. Though event notification is lost as a result, there are no adverse effects because the SMagent detects the disk device(UTM volume) during re-scan. The <code>notifysmagent.sh</code> script should be available to the <code>syseventd</code> since the script is located in the same directory of SMagent startup script.</p>
Solaris runtime and RAID array proxy agent packages install on wrong architectures	<p>Description: If you perform installation using the incorrect package, Sun Storage Common Array Manager installs but does not run. For example, if the in-band proxy agent packages are being delivered as architecture-dependent (SPARC and x86 for Solaris), then the SPARC package installation should not succeed on an x86 platform. The risk of this happening is low.</p> <p>Workaround: Install the correct package. See the <i>Sun Storage Common Array Manager Software Installation and Setup Guide</i> for instructions.</p>
Solaris Target Port Group Support (TPGS) not supported	<p>Solaris Target Port Group Support (TPGS) is not a supported host type at this time. Do not select this host type until Solaris provides the necessary support.</p>
Upgrading Solaris to version 10 or higher might disable Oracle Java Web Console connections	<p>After performing the upgrade, open port 6789 for incoming connections: Check current status of port 6789: <pre>#netstat -an grep 6789</pre> Typical output is: <code>*.6789 *.* 0 0 49152 0 LISTEN</code> Enable port 6789: <pre># svccfg -s svc:/system/webconsole setprop options/tcp_listen = true # smcwebserver restart*</pre> </p>
UTM LUNs Controlled by "Solaris Traffic Manager"—6000/2500 arrays	<p>Description: After you upgrade to S10U3 (or later), the in-band management UTM LUNs are controlled by Solaris Traffic Manager (MPxIO). In most cases, in-band management will not fail as a result of this; however, it is best practice to ensure that the UTM LUNs are not controlled by MPxIO.</p> <p>Workaround: Use the format inquire command to get the eight-character Vendor (VID) and Product IDs. Follow this procedure:</p> <ol style="list-style-type: none"> 1. Edit the file <code>/kernel/drv/scsi_vhci.conf</code> The following line should read: <pre>device-type-scsi-options-list = "SUN Universal Xport", "disable-option"; disable-option = 0x7000000</pre> 2. Run the <code>stmsboot -u</code> command. Respond to the prompts as follows: WARNING: This operation will require a reboot. Do you want to continue? [y/n] (default: y) y The changes will result when the system is rebooted. Reboot the system now? [y/n] (default: y) y

Reviewing the Installation Logs

You can verify the success of the installation or problems that might have occurred during installation by reviewing the installation logs. Note that the installation logs are mainly intended for debugging by developers. By scrolling to the end of the installation log, you can verify the successful installation message or any error messages.

If an error occurs:

1. Review the requirements in [“Verify System Requirements”](#) on page 1.
2. Review the `Readme.txt` file located in the installation directory (see the **Sun Storage Common Array Manager**) for late-breaking information, and attempt a reinstallation.
3. Consult the installation logs.

TABLE F-2 Installation Logs

Platform	Installation Log Location
Solaris	<code>/var/sadm/install/se6000/</code>
Linux	<code>/var/opt/cam/</code>
Windows 32-bit	<code>\Program Files\Common Files\Sun Microsystems\se6000</code>
Windows 64-bit	<code>\Program Files (x86)\Common Files\Sun Microsystems\se6000</code>

4. Verify that you made the firewall changes after you finished the installation.

CLI Installation Troubleshooting

1. Log into the CAM CLI by entering the following command:

```
% sacs login -h cam-hostname -u username
```

where:

cam-hostname is the management host machine where you installed the software.

username is one of the users defined in the management host software. See [“Adding Users And Assigning Roles”](#) on page 59.

2. At the CLI prompt, enter:

```
sscs list mgmt-sw
```

3. Review the installation logs as noted in [“Reviewing the Installation Logs”](#) on page 124.

Uninstalling Software

If you need to remove Sun Storage Common Array Manager from your system, there are wizards and scripts to uninstall the software for Solaris OS, Linux, and Windows platforms.



Caution – Do not attempt to remove individual Sun Storage Common Array Manager components. If you want to remove the complete management software application, uninstall the entire application using the `uninstall.bat` script or using Control Panel - Add/Remove Programs.

Uninstalling on Solaris OS or Linux Using the Uninstall GUI

1. Log in to the management host as `root`.
2. Change to the bin directory in the installation directory for the appropriate OS (see TABLE 2-3).

Example:

```
cd /var/opt/CommonArrayManager/Host_Software_6.x.x.x/bin
```

3. Run the `uninstall` command.

```
./uninstall
```

The uninstall GUI opens.

4. Click Next.
5. From the Review Selections window, select the software to be uninstalled, and click the Uninstall button.

When the uninstall completes, the View Results screen is displayed.

6. Click Finish.

Uninstalling on Solaris OS or Linux Using the CLI

1. Log in to the management host as `root`.

2. Change to the bin directory in the installation directory for the appropriate OS (see TABLE 2-3).

Example:

```
cd /var/opt/CommonArrayManager/Host_Software_6.x.x.x/bin
```

3. Execute the uninstall command

```
./uninstall -c
```

4. Follow the prompts in the install console dialog.

If for any reason the uninstall failed, run the uninstall script with the `-f` option:

```
./uninstall -f
```

5. Click Next.

6. From the Review Selections window, select the software to be uninstalled, and click the Uninstall button.

When the uninstall completes, the View Results screen is displayed.

7. Click Finish.

Uninstalling on a Windows System

Note – Before you uninstall Sun Storage Common Array Manager from a Windows platform, stop all applications that are running a `java.exe` or `javaw.exe` process.

1. Navigate to the bin directory:

```
<system drive>:\Sun\CommonArrayManager\Host_Software_6.x.x.x\bin
```

2. Click the `uninstall.bat` icon.

To run the uninstaller in console mode, enter: `uninstall.bat -c`

To clean up (remove all associated files), enter: `uninstall.bat -f`

Alternatively, you can remove the software using the Control Panel - Add/Remove Programs.



Caution – Do not attempt to remove individual Sun Storage Common Array Manager components. If you want to completely remove the software, uninstall the entire application using the `uninstall.bat` script or using Control Panel - Add/Remove Programs.

3. Follow the uninstall wizard steps as described in the [“Uninstalling on Solaris OS or Linux Using the Uninstall GUI”](#) on page 125.

Glossary

Definitions obtained from the Storage Networking Industry Association (SNIA) Dictionary are indicated with “(SNIA)” at the end. For the complete SNIA Dictionary, go to www.snia.org/education/dictionary.

agent	The component of the system monitoring and diagnostic software that collects health and asset information about the array.
alarm	A type of event that requires service action. See also event .
alert	A subtype of an event that requires user intervention. The term <i>actionable event</i> often describes an alert. See also event .
array	Multiple disk drives that function as a single storage device. A high-availability (HA) array configuration has redundant controllers and expansion trays of disk drives.
array hot-spare	A disk that serves as a hot-spare within an array as part of the storage pool; a reserve disk that can be made available to all virtual disks within an array. See also hot-spare .
block	The amount of data sent or received by the host per I/O operation; the size of a data unit.
capacity	The amount of storage you must allocate to storage elements, including volumes, pools, and virtual disks. Capacity planning should include allocations for volume snapshots and volume copies.
control path	The route used for communication of system management information, usually an out-of-band connection.
customer LAN	See site LAN .
DAS	See direct attached storage (DAS) .

data host	Any host that uses the system for storage. A data host can be connected directly to the array (direct attach storage, or DAS) or can be connected to an external switch that supports multiple data hosts (storage area network, or SAN). See also host .
data path	The route taken by a data packet between a data host and the storage device.
direct attached storage (DAS)	A storage architecture in which one or two hosts that access data are connected physically to a storage array.
disk	A physical drive component that stores data.
end devices	End devices are at ends relative to the expander. They are both initiating devices (host initiators on servers) and storage target devices such as disks or FMods.
event	A notification of something that happened on a device. There are many types of events, and each type describes a separate occurrence. See also alarm and alert .
expander devices	<p>A physical device with ports to connect devices. SAS access configuration is implemented in expander devices in one or more arrays.</p> <p>The expander devices controls which physical connections (PHYs) can be made between end devices. Expanders may be connected to each other via inter-expander links to form a cascade or daisy-chain.</p>
extent	A set of contiguous blocks with consecutive logical addresses on a physical or virtual disk.
failover and recovery	The process of changing the data path automatically to an alternate path.
fault coverage	The percentage of faults detected against all possible faults or against all faults of a given type.
FC	See Fibre Channel (FC) .
Fibre Channel (FC)	A set of standards for a serial I/O bus capable of transferring data between two ports at up to 100 MB/second, with standards proposals to go to higher speeds. Fibre Channel supports point to point, arbitrated loop, and switched topologies. Fibre Channel was completely developed through industry cooperation, unlike SCSI, which was developed by a vendor and submitted for standardization after the fact. (SNIA)
Fibre Channel switch	A networking device that can send packets directly to a port associated with a given network address in a Fibre Channel storage area network (SAN). Fibre Channel switches are used to expand the number of servers that can connect to a particular storage port. Each switch is managed by its own management software.
HBA	See host bus adapter (HBA) .

host	A representation of a data host that is mapped to initiators and volumes to create a storage domain. See also data host , initiator .
host bus adapter (HBA)	An I/O adapter that connects a host I/O bus to a computer's memory system. (SNIA) See also initiator .
host group	A group of hosts with common storage characteristics that can be mapped to volumes. See also host .
hot-spare	The drive used by a controller to replace a failed disk. See also array hot-spare .
in-band traffic	System management traffic that uses the data path between a host and a storage device. See also out-of-band traffic .
initiator	A system component that initiates an I/O operation over a Fibre Channel (FC) network. If allowed by FC fabric zoning rules, each host connection within the FC network has the ability to initiate transactions with the storage array. Each host in the FC network represents a separate initiator, so if a host is connected to the system through two host bus adapters (HBAs), the system identifies two different initiators (similar to multi-homed, Ethernet-based hosts). In contrast, when multipathing is used in round-robin mode, multiple HBAs are grouped together, and the multipathing software identifies the group of HBAs as a single initiator.
IOPS	A measure of transaction speed, representing the number of input and output transactions per second.
JBOD	Just-a-Bunch-Of-Disks array that encloses SAS or SATA disk drives.
LAN	Local area network.
logical unit number (LUN)	The SCSI identifier for a volume as it is recognized by a particular host. The same volume can be represented by a different LUN to a different host.
LUN	See logical unit number (LUN) .
MAC address	See media access control (MAC) address .
management host	A Solaris host serving the configuration, management, and monitoring software for the Common Array Manager. The software on the station can be accessed with a browser to run the browser interface or with a remote scripting command-line interface (CLI) client to access the <i>SSCS</i> CLI commands.
master / alternate master	A design for reliability that uses redundant configuration. Array configurations share master/alternate master configurations: each array configuration has two controller trays that are grouped as one host. In each case, the master component uses the IP address and name. If the master fails, the alternate master assumes the IP address and name and takes over the master's functions.

media access control (MAC) address	The physical address identifying an Ethernet controller board. The MAC address, also called an Ethernet address, is set at the factory and must be mapped to the IP address of the device.
mirroring	A form of storage – also called RAID Level 1, independent copy, and real-time copy – whereby two or more independent, identical copies of data are maintained on separate media. Typical mirroring technologies enable the cloning of data sets to provide redundancy for a storage system.
multipathing	A design for redundancy that provides at least two physical paths to a target.
out-of-band traffic	System management traffic outside of the primary data path that uses an Ethernet network. See also in-band traffic .
pool	See storage pool .
ports and PHYs	A single SAS physical connection. The supported arrays have x4 SAS ports requiring 4 PHYs. All PHYs in a port have the same PHY information.
profile	See storage profile .
provisioning	The process of allocation and assignment of storage to hosts.
RAID	An acronym for Redundant Array of Independent Disks, a family of techniques for managing multiple disks to deliver desirable cost, data availability, and performance characteristics to host environments. (SNIA)
remote monitoring	Monitoring of the functions and performance of a hardware system from a location other than where the hardware resides.
remote scripting CLI client	A command-line interface (CLI) that enables you to manage the system from a remote management host. The client communicates with the management software through a secure out-of-band interface, HTTPS, and provides the same control and monitoring capability as the browser interface. The client must be installed on a host that has network access to the system.
SAN	See storage area network (SAN) .
SAS	An acronym for Serial Attached SCSI. A SCSI interface standard that provides for attaching HBAs and RAID controllers to both SAS and SATA disk and tape drives, as well as other SAS devices. (SNIA)
SAS Domain	A group of SAS expander devices and end devices that are physically connected. When SAS expanders are connected, they form one SAS domain.
SATA	An acronym for Serial Advanced Technology Attachment. A version of the ATA interface that uses a serial connection architecture. (SNIA)
site LAN	The local area network at your site. When the system is connected to your LAN, the system can be managed through a browser from any host on the LAN.

snapshot	An copy of a volume's data at a specific point in time.
SSCS	Sun Storage Command System. The command-line interface (CLI) that can be used to manage the array.
storage area network (SAN)	An architecture in which the storage elements are connected to each other and to a server that is the access point for all systems that use the SAN to store data.
storage domain	A secure container that holds a subset of the system's total storage resources. Multiple storage domains can be created to securely partition the system's total set of storage resources. This enables you to organize multiple departments or applications into a single storage management infrastructure.
storage pool	A container that groups physical disk capacity (abstracted as virtual disks in the browser interface) into a logical pool of available storage capacity. A storage pool's characteristics are defined by a storage profile. You can create multiple storage pools to segregate storage capacity for use in various types of applications (for example, high throughput and online transaction-processing applications).
storage profile	A defined set of storage performance characteristics such as RAID level, segment size, dedicated hot-spare, and virtualization strategy. You can choose a predefined profile suitable for the application that is using the storage, or you can create a custom profile.
storage tray	An enclosure containing disks. A tray with dual RAID controllers is called a controller tray; a tray without controllers is called an expansion tray.
stripe size	The number of blocks in a stripe. A striped array's stripe size is the stripe depth multiplied by the number of member extents. A parity RAID array's stripe size is the stripe depth multiplied by one less than the number of member extents. See also striping .
striping	Short for data striping; also known as RAID Level 0 or RAID 0. A mapping technique in which fixed-size consecutive ranges of virtual disk data addresses are mapped to successive array members in a cyclic pattern. (SNIA)
target	The system component that receives a SCSI I/O command. (SNIA)
thin-scripting client	See remote scripting CLI client .
tray	See storage tray .
virtual disk	A set of disk blocks presented to an operating environment as a range of consecutively numbered logical blocks with disk-like storage and I/O semantics. The virtual disk is the disk array object that most closely resembles a physical disk from the operating environment's viewpoint.(SNIA)

volume A logically contiguous range of storage blocks allocated from a single pool and presented by a disk array as a logical unit number (LUN). A volume can span the physical devices that constitute the array, or it can be wholly contained within a single physical disk, depending on its virtualization strategy, size, and the internal array configuration. The array controller makes these details transparent to applications running on the attached server system.

volume snapshot See [snapshot](#).

WWN World Wide Name. A unique 64-bit number assigned by a recognized naming authority such as the Institute of Electrical and Electronics Engineers (IEEE) that identifies a connection (device) or a set of connections to the network. The World Wide Name (WWN) is constructed from the number that identifies the naming authority, the number that identifies the manufacturer, and a unique number for the specific connection.

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