Sun StorEdge™ QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide

Release 4.2

Sun Microsystems, Inc.
www.sun.com

Part No. 817-7722-10
September 2004, Revision A

Submit comments about this document at: http://www.sun.com/hwdocs/feedback

Please
Recycle

Contents

Preface

This manual, the *Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide*, explains the installation and upgrade procedures for the Sun StorEdge QFS and Sun StorEdge SAM-FS software products, release 4.2. The 4.2 releases can be installed on the following minimum Solaris™ Operating System (OS) platforms:

- Solaris 8 07/01
- Solaris 9 04/03

Certain features might require an operating system level that is beyond the requirements stated in the previous bullet list. For more information, see the release notes or see the specific feature's documentation.

This manual is written for system administrators responsible for configuring and maintaining Sun StorEdge QFS and Sun StorEdge SAM-FS software. You, the system administrator, are assumed to be knowledgeable about Sun Solaris procedures, including creating accounts, performing system backups, creating file systems, and other basic Sun Solaris system administrator tasks. TABLE P-1 describes the software.

TABLE P-1 Product Overview

Product	Components
Sun StorEdge QFS	Sun StorEdge QFS standalone file system.
Sun StorEdge SAM-FS	Standard file system plus the storage and archive management utility, SAM.
Sun SAM-QFS	The Sun StorEdge QFS file system combined with the storage and archive management utilities found in the Sun StorEdge SAM-FS software.

How This Book Is Organized

This manual contains the following chapters:

- Chapter 1 contains system requirements and prerequisites to installation.
- Chapter 2 explains the Sun StorEdge QFS initial installation procedure.
- Chapter 3 explains the Sun StorEdge QFS upgrade procedure.
- Chapter 4 explains the Sun StorEdge SAM-FS initial installation procedure.
- Chapter 5 explains the Sun StorEdge SAM-FS upgrade procedure.
- Appendix A provides information about administering SAM-QFS Manager.
- Appendix B describes the release package contents and the directories created at installation time.
- Appendix C is a command reference.

The glossary defines terms used in this and other Sun StorEdge QFS and Sun StorEdge SAM-FS documentation.

Using UNIX Commands

This document does not contain information about basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. Refer to one or more of the following for this information:

- Software documentation that you received with your system
- Solaris OS documentation, which is at the following URL:

  `http://docs.sun.com`

Shell Prompts

TABLE P-2 shows the shell prompts that this manual uses.

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	*machine-name*%
C shell superuser	*machine-name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Typographic Conventions

TABLE P-3 lists the typographic conventions used in this manual.

TABLE P-3 Typographic Conventions

Typeface or Symbol	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output.	`% su` `Password:`
AaBbCc123	Book titles; new words or terms; words to be emphasized; and command line variables to be replaced with a real name or value.	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be `root` to do this. To delete a file, type `rm` *filename*.

TABLE P-3 Typographic Conventions *(Continued)*

Typeface or Symbol	Meaning	Examples
[ ]	In syntax, brackets indicate that an argument is optional.	`scmadm [-d sec] [-r n[:n][,n]...] [-z]`
{ *arg* | *arg* }	In syntax, braces and pipes indicate that one of the arguments must be specified.	`sndradm -b { phost | shost }`
\	At the end of a command line, the backslash (\) indicates that the command continues on the next line.	`atm90 /dev/md/rdsk/d5 \ /dev/md/rdsk/d1`

Related Documentation

This manual is part of a set of documents that describes the operations of the Sun StorEdge QFS and Sun StorEdge SAM-FS software products. TABLE P-4 shows the complete release 4.2 documentation set for these products.

TABLE P-4 Related Sun StorEdge QFS and Sun StorEdge SAM-FS Documentation

Title	Part Number
Sun SAM-Remote Administration Guide	816-2094-11
Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide	816-2540-10
Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide	817-7721-10
Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide	817-7722-10
Sun StorEdge SAM-FS Storage and Archive Management Guide	817-4093-10
Sun StorEdge QFS and Sun StorEdge SAM-FS 4.2 Release Notes	817-7724-10

If you are configuring a Sun StorEdge QFS file system in a Sun Cluster environment, the following additional documents might interest you:

- *Sun Cluster Concepts Guide for Solaris OS*
- *Sun Cluster Software Installation Guide for Solaris OS*
- *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*
- *Sun Cluster Data Service for Oracle Real Application Clusters Guide for Solaris OS*

Accessing Sun Documentation Online

The Sun StorEdge QFS and Sun StorEdge SAM-FS software distribution includes PDF files that you can view from Sun's Network Storage documentation web site or from `docs.sun.com`.

▼ To Access Documentation from Sun's Network Storage Documentation Web Site

This web site contains documentation for Network Storage products.

1. **Go to the following URL:**

`www.sun.com/products-n-solutions/hardware/docs/Software/Storage_Software`

The Storage Software page appears.

2. **Click the appropriate link from the following list:**
   - Sun StorEdge QFS Software
   - Sun StorEdge SAM-FS Software

▼ To Access Documentation from `docs.sun.com`

This web site contains documentation for Solaris and many other Sun software products.

1. **Go to the following URL:**

   `docs.sun.com`

   The `docs.sun.com` page appears.

2. **Find the documentation for your product by searching for one of the following products in the search box:**
   - Sun StorEdge QFS 4.2
   - Sun StorEdge SAM-FS 4.2

Third-Party Web Sites

Sun is not responsible for the availability of third-party web sites mentioned in this document. Sun does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Sun will not be responsible or liable for any actual or alleged damage or loss caused by or in connection with the use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

Contacting Sun Technical Support

If you have technical questions about this product that are not answered in this document, go to the following web site:

`http://www.sun.com/service/contacting`

Licensing

For information about obtaining licenses for Sun StorEdge QFS and Sun StorEdge SAM-FS software, contact your Sun sales representative or your authorized service provider (ASP).

Diagnostics

The Sun StorEdge QFS and Sun StorEdge SAM-FS software includes the `samexplorer`(1M) script. This diagnostic script can be very useful to you and to the Sun customer support staff. This script produces a diagnostic report of the server configuration and collects log information. After the software is installed, you can access the `samexplorer`(1M) man page for more information about this script.

Installation Assistance

For installation and configuration services, contact Sun's Enterprise Services at 1-800-USA4SUN or contact your local Enterprise Services sales representative.

Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can submit your comments by going to the following web site:

`http://www.sun.com/hwdocs/feedback`

Please include the title and part number of your document with your feedback (*Sun StorEdge QFS & Sun StorEdge SAM-FS Software Installation & Configuration Guide*, part number 817-7722-10).

CHAPTER 1

System Requirements and Preinstallation Tasks

This chapter explains the system requirements for installing the Sun StorEdge QFS and Sun StorEdge SAM-FS software. This chapter starts with an overview. The remaining sections describe the requirements you must meet or the actions you must take before you begin to install and configure your software. These requirements are as follows:

Overview

The Sun StorEdge QFS and Sun StorEdge SAM-FS file systems are similar, but this manual notes differences when necessary. The following subsections describe these software products and introduce additional file system features that you can enable:

The following sections contain file system descriptions and installation checklists that you can use when configuring the file systems.

Sun StorEdge QFS File System

The Sun StorEdge QFS file system shares many features with the file system included in the Sun StorEdge SAM-FS product. The Sun StorEdge QFS file system, however, is designed for high performance and contains more features than are supported within the Sun StorEdge SAM-FS file system.

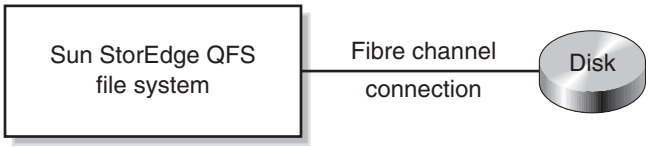

FIGURE 1-1 Sun StorEdge QFS Configuration on a Single Solaris Host

You can use TABLE 1-1 as a checklist when configuring a Sun StorEdge QFS file system.

TABLE 1-1 Steps for Configuring a Sun StorEdge QFS File System on a Single Host

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 50	
"Adding the Packages on the Sun StorEdge QFS Server" on page 51	
"Setting Up `PATH` and `MANPATH` Variables" on page 54	
"(Optional) Enabling the SAM-QFS Manager" on page 57	
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65	
"Initializing the Environment" on page 101	
"(Optional) Editing the `defaults.conf` File" on page 102	
"Verifying the License and `mcf` Files" on page 104	
"(Optional) Creating the `samfs.cmd` File" on page 107	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109	
"Initializing the File System" on page 113	
"Mounting the File System" on page 117	
"(Optional) Sharing the File System With NFS Client Systems" on page 121	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127	
"(Optional) Backing Up Configuration Files" on page 130	
"(Optional) Configuring the Remote Notification Facility" on page 131	

TABLE 1-1 Steps for Configuring a Sun StorEdge QFS File System on a Single Host

Task and Page	Accomplished?
"(Optional) Adding the Administrator Group" on page 134	
"Configuring System Logging" on page 135	
"(Optional) Configuring Other Products" on page 137	

Sun StorEdge SAM-FS File System

The Sun StorEdge SAM-FS environment includes a general-purpose file system along with the storage and archive manager, SAM. The Sun StorEdge SAM-FS environment's file system allows data to be archived to automated libraries at device-rated speeds. In addition, data can also be archived to files in another file system through a process known as *disk archiving*. The file system in the Sun StorEdge SAM-FS environment is a complete file system. The user is presented with a standard file system interface and can read and write files as though they were all on primary disk storage.

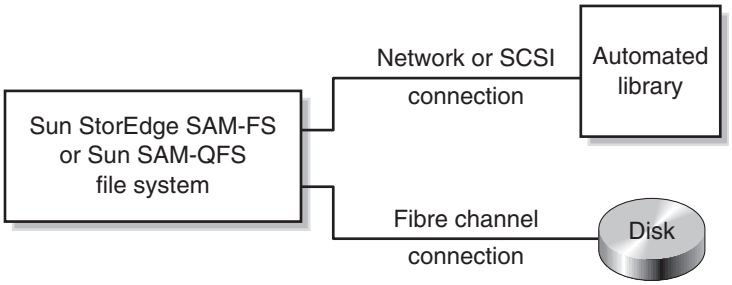

FIGURE 1-2 Sun StorEdge SAM-FS or Sun SAM-QFS Configuration on a Single Solaris Host

You can use TABLE 1-2 as a checklist when configuring a Sun StorEdge SAM-FS file system.

TABLE 1-2 Steps for Configuring a Sun StorEdge SAM-FS File System on a Single Host

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 164	
"Adding the Packages on the Sun StorEdge SAM-FS Server" on page 165	
"(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files" on page 167	
"Enabling the Sun StorEdge SAM-FS Software License" on page 180	
"Setting Up `PATH` and `MANPATH` Variables" on page 181	
"Rebooting the System" on page 182	
"(Optional) Enabling the SAM-QFS Manager" on page 183	
"Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191	
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 209	

TABLE 1-2 Steps for Configuring a Sun StorEdge SAM-FS File System on a Single Host

Task and Page	Accomplished?
"Initializing the Sun StorEdge SAM-FS Environment" on page 228	
"(Optional) Checking the Drive Order" on page 229	
"(Optional) Creating the `archiver.cmd` File" on page 236	
"(Optional) Enabling Disk Archiving" on page 244	
"(Optional) Editing the `defaults.conf` File" on page 250	
"Verifying the License and `mcf` Files" on page 254	
"(Optional) Labeling Removable Media Cartridges" on page 256	
"(Optional) Populating the Catalog" on page 258	
"(Optional) Creating the `samfs.cmd` File" on page 264	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 265	
"Initializing the File System" on page 267	
"Mounting the File System" on page 268	
"(Optional) Sharing the File System With NFS Client Systems" on page 269	
"Writing Periodic Dump Files By Using `samfsdump`(1M)" on page 272	
"(Optional) Backing Up Configuration Files" on page 275	
"(Optional) Configuring the Remote Notification Facility" on page 276	
"(Optional) Adding the Administrator Group" on page 279	
"Configuring System Logging" on page 280	
"(Optional) Configuring Other Sun StorEdge Products" on page 282	

Sun SAM-QFS File System

If you purchase licenses for both Sun StorEdge QFS and Sun StorEdge SAM-FS software, you can run the Sun StorEdge QFS file system with the storage and archive manager found in the Sun StorEdge SAM-FS software. Such a system is referred to as *Sun SAM-QFS*.

This manual does not call out the Sun SAM-QFS configuration unless it is necessary for clarity. In this manual, you can assume that references to Sun StorEdge SAM-FS software also apply to Sun SAM-QFS configurations when describing storage and archive management. Likewise, you can assume that references to Sun StorEdge QFS also apply to Sun SAM-QFS configurations when describing file system design and capabilities.

For a depiction of a Sun SAM-QFS configuration, see FIGURE 1-2.

You can use TABLE 1-3 as a checklist when configuring a Sun SAM-QFS environment. To create a Sun SAM-QFS environment, follow the instructions for creating a Sun StorEdge SAM-FS file system, but when you define your file system in the `mcf` file, use the Sun StorEdge QFS instructions for defining file system devices.

TABLE 1-3 Steps for Configuring a Sun SAM-QFS Environment on a Single Host

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 164	
"Adding the Packages on the Sun StorEdge SAM-FS Server" on page 165	
"(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files" on page 167	
"Enabling the Sun StorEdge SAM-FS Software License" on page 180	
"Setting Up `PATH` and `MANPATH` Variables" on page 181	
"Rebooting the System" on page 182	
"(Optional) Enabling the SAM-QFS Manager" on page 183	
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65 Use the information in this section for configuring the file systems in your Sun SAM-QFS environment.	
"Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191 Use the information in this section for configuring the removable media devices in your Sun SAM-QFS environment.	
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 209	
"Initializing the Sun StorEdge SAM-FS Environment" on page 228	

TABLE 1-3 Steps for Configuring a Sun SAM-QFS Environment on a Single Host

Task and Page	Accomplished?
"(Optional) Checking the Drive Order" on page 229	
"(Optional) Creating the `archiver.cmd` File" on page 236	
"(Optional) Enabling Disk Archiving" on page 244	
"(Optional) Editing the `defaults.conf` File" on page 250	
"Verifying the License and `mcf` Files" on page 254	
"(Optional) Labeling Removable Media Cartridges" on page 256	
"(Optional) Populating the Catalog" on page 258	
"(Optional) Creating the `samfs.cmd` File" on page 264	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 265	
"Initializing the File System" on page 267	
"Mounting the File System" on page 268	
"(Optional) Sharing the File System With NFS Client Systems" on page 269	
"Writing Periodic Dump Files By Using `samfsdump`(1M)" on page 272	
"(Optional) Backing Up Configuration Files" on page 275	
"(Optional) Configuring the Remote Notification Facility" on page 276	
"(Optional) Adding the Administrator Group" on page 279	
"Configuring System Logging" on page 280	
"(Optional) Configuring Other Sun StorEdge Products" on page 282	

Sun StorEdge QFS Shared File System

A Sun StorEdge QFS or Sun SAM-QFS shared file system is a distributed, multihost file system that you can mount on multiple Solaris operating system (OS) hosts. One Solaris OS host acts as the metadata server, and the others are clients. If you want the ability to change the metadata server, you must designate one or more clients as potential metadata servers.

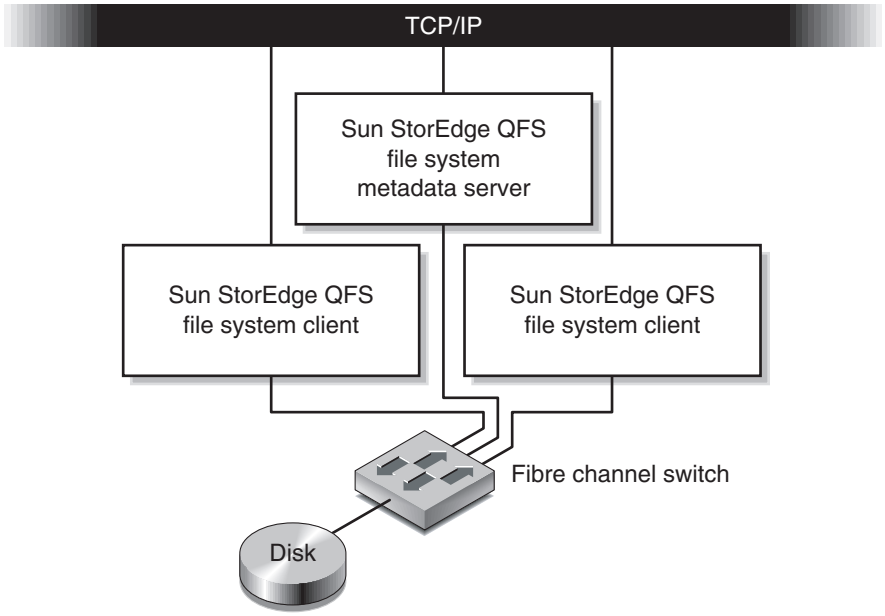

FIGURE 1-3 Sun StorEdge QFS Shared File System Configuration on Solaris Hosts

You can use TABLE 1-4 as a checklist when configuring a Sun StorEdge QFS shared file system on Solaris OS hosts. If you are configuring a Sun StorEdge QFS shared file system on Sun Cluster hosts, see "Sun StorEdge QFS File Systems in a Sun Cluster Environment" on page 10 for a checklist.

TABLE 1-4 Steps to Configuring a Sun StorEdge QFS File System on Solaris OS Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 50	
"Adding the Packages on the Sun StorEdge QFS Server" on page 51	
"Setting Up `PATH` and `MANPATH` Variables" on page 54	
"Preparing the Host Systems" on page 55	

TABLE 1-4 Steps to Configuring a Sun StorEdge QFS File System on Solaris OS Hosts

Task and Page	Accomplished?
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65	
"(Optional) Editing `mcf` Files on Other Hosts" on page 89	
"(Optional) Creating the Shared Hosts File" on page 94	
"Initializing the Environment" on page 101	
"(Optional) Editing the `defaults.conf` File" on page 102	
"Verifying the License and `mcf` Files" on page 104	
"(Optional) Creating the `samfs.cmd` File" on page 107	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109	
"Initializing the File System" on page 113	
"(Optional) Verifying That the Daemons Are Running" on page 115	
"Mounting the File System" on page 117	
"(Optional) Sharing the File System With NFS Client Systems" on page 121	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127	
"(Optional) Backing Up Configuration Files" on page 130	
"(Optional) Configuring the Remote Notification Facility" on page 131	
"(Optional) Adding the Administrator Group" on page 134	
"Configuring System Logging" on page 135	
"(Optional) Configuring Other Products" on page 137	

Sun StorEdge QFS File Systems in a Sun Cluster Environment

The following sections describe the type of Sun StorEdge QFS file systems you can configure in a Sun Cluster Environment.

Sun StorEdge QFS Local File System in a Sun Cluster Environment

A Sun StorEdge QFS local file system is local to one host. This manual contains all the instructions you need to configure this type of file system. A local file system is one that is configured on disks that are accessible only to the host system upon which the Sun StorEdge QFS software is installed. In a Sun Cluster environment, local file systems are accessible only to the node upon which they are created.

For a checklist to use when configuring a Sun StorEdge QFS file system as a local file system in a Sun Cluster environment, see TABLE 1-1.

Sun StorEdge QFS Highly Available File System in a Sun Cluster Environment

A Sun StorEdge QFS highly available file system is a multihost file system resource that the Sun Cluster software can move to another node in the event of a Sun Cluster host failure. This file system uses the `SUNW.HAStoragePlus` resource type, and it can automatically fail over to other nodes.

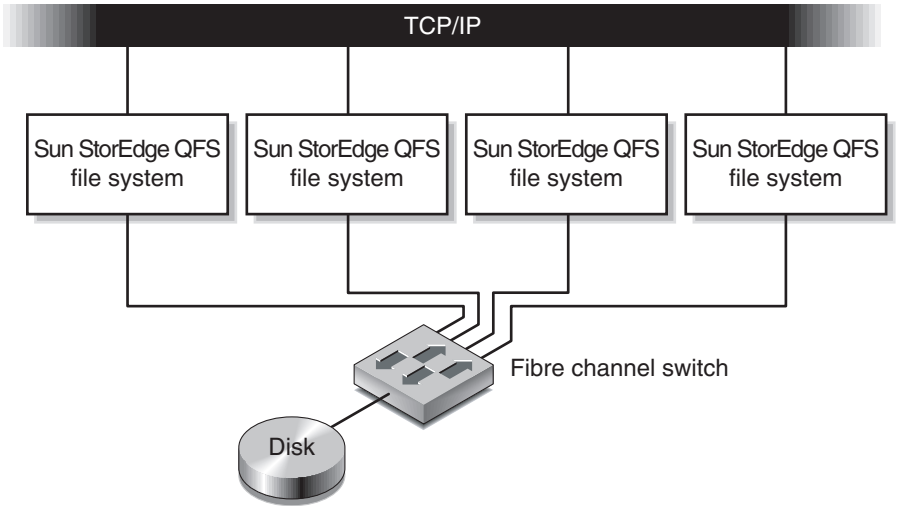

FIGURE 1-4 Sun StorEdge QFS Highly Available File System Configuration in a Sun Cluster

You can use TABLE 1-5 as a checklist when configuring a Sun StorEdge QFS highly available file system on Sun Cluster hosts.

TABLE 1-5 Steps for Configuring a Sun StorEdge Highly Available File System on Sun Cluster Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 50	
"Adding the Packages on the Sun StorEdge QFS Server" on page 51	
"Enabling the Sun StorEdge QFS Software License" on page 53	
"Setting Up `PATH` and `MANPATH` Variables" on page 54	
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65	
"(Optional) Editing `mcf` Files on Other Hosts" on page 89	
"Initializing the Environment" on page 101	

TABLE 1-5 Steps for Configuring a Sun StorEdge Highly Available File System on Sun Cluster Hosts *(Continued)*

Task and Page	Accomplished?
"(Optional) Editing the `defaults.conf` File" on page 102	
"Verifying the License and `mcf` Files" on page 104	
"(Optional) Creating the `samfs.cmd` File" on page 107	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109	
"Initializing the File System" on page 113	
"Mounting the File System" on page 117	
"(Optional) Configuring the HAStoragePlus Resource" on page 120	
"(Optional) Bringing the Shared Resource Online" on page 125	
"(Optional) Verifying the Resource Group on All Nodes" on page 126	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127	
"(Optional) Backing Up Configuration Files" on page 130	
"(Optional) Configuring the Remote Notification Facility" on page 131	
"(Optional) Adding the Administrator Group" on page 134	
"Configuring System Logging" on page 135	
"(Optional) Configuring Other Products" on page 137	

Sun StorEdge QFS Shared File System in a Sun Cluster Environment

A Sun StorEdge QFS shared file system is a scalable, multihost file system on Sun Cluster nodes. If you configure a Sun StorEdge QFS shared file system on Sun Cluster nodes, the Sun Cluster software moves this file system's metadata server operations to another node if the Sun Cluster node that is the metadata server fails. This file system uses the `SUNW.qfs`(5) resource type.

Unlike a Sun StorEdge QFS shared file system on Solaris OS hosts, all Sun Cluster nodes configured in the Sun StorEdge QFS shared file system are potential metadata servers.

If the metadata server for the Sun StorEdge QFS shared file system is a node in a Sun Cluster, all hosts of the file system must also be cluster nodes. No hosts can reside outside the cluster.

This manual describes how to install the software and select the devices to use.

TABLE 1-6 shows the tasks you must perform and the documentation you need to consult in order to configure a Sun StorEdge QFS shared file system.

TABLE 1-6 Tasks for Configuring a Sun StorEdge QFS Shared File System

Task	Documentation
Install the Sun Cluster software.	Sun Cluster documentation
Install the Sun StorEdge QFS software and create the file system.	This manual
Configure additional highly available resources.	*Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*
Enable other applications to interoperate with the Sun StorEdge QFS shared file system.	Sun Cluster documentation

You can use TABLE 1-7 as a checklist when configuring a Sun StorEdge QFS shared file system on Sun Cluster hosts.

TABLE 1-7 Steps for Configuring a Sun StorEdge QFS Shared File System on Sun Cluster Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 50	
"Adding the Packages on the Sun StorEdge QFS Server" on page 51	
"Enabling the Sun StorEdge QFS Software License" on page 53	
"Setting Up `PATH` and `MANPATH` Variables" on page 54	

TABLE 1-7 Steps for Configuring a Sun StorEdge QFS Shared File System on Sun Cluster Hosts *(Continued)*

Task and Page	Accomplished?
"Preparing the Host Systems" on page 55	
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65	
"(Optional) Editing `mcf` Files on Other Hosts" on page 89	
"(Optional) Creating the Shared Hosts File" on page 94	
"Initializing the Environment" on page 101	
"(Optional) Editing the `defaults.conf` File" on page 102	
"Verifying the License and `mcf` Files" on page 104	
"(Optional) Creating the `samfs.cmd` File" on page 107	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109	
"Initializing the File System" on page 113	
"(Optional) Verifying That the Daemons Are Running" on page 115	
"Mounting the File System" on page 117	
"(Optional) Configuring the `SUNW.qfs` Resource Type" on page 119	
"(Optional) Bringing the Shared Resource Online" on page 125	
"(Optional) Verifying the Resource Group on All Nodes" on page 126	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127	
"(Optional) Backing Up Configuration Files" on page 130	
"(Optional) Configuring the Remote Notification Facility" on page 131	
"(Optional) Adding the Administrator Group" on page 134	
"Configuring System Logging" on page 135	
"(Optional) Configuring Other Products" on page 137	

Sun SAM-Remote

Sun SAM-Remote client and the Sun SAM-Remote server storage management system allow you to share libraries and other removable media devices in a Sun StorEdge SAM-FS or Sun SAM-QFS environment. All host systems included in a Sun SAM-Remote environment must have the same Sun StorEdge SAM-FS software release level installed and operational.

If you want to configure SAM-Remote, follow the procedures in this manual to create a Sun StorEdge SAM-FS file system. After the Sun StorEdge SAM-FS file system is tested and is known to be configured properly, you can use the instructions in the *Sun SAM-Remote Administration Guide* to enable remote storage and archive management.

Server Requirements

The Sun StorEdge QFS and Sun StorEdge SAM-FS software must be installed on a Sun server based on UltraSPARC® technology.

For example, the following `uname`(1M) command retrieves information for `ontheball`:

```
ontheball# uname -p
sparc
```

If you plan to install the SAM-QFS Manager graphical user interface tool, there are additional requirements for the server that you want to use as the web server host. For more information about these requirements, see "(Optional) Verifying Requirements for the SAM-QFS Manager" on page 45.

Solaris Operating System Requirements

Sun StorEdge QFS and Sun StorEdge SAM-FS software packages run on many Sun workstations and servers. Before installation, you should verify the applicability of the hardware, the level of the Solaris Operating System (OS), and the patch release installed. To install the Sun StorEdge QFS or Sun StorEdge SAM-FS software, you also must ensure that you have root-level access to your system.

▼ To Verify the Environment

Repeat these steps for each host on which you want to install the Sun StorEdge QFS or Sun StorEdge SAM-FS software.

1. **Verify that your system has a CD-ROM drive or that it can access the release package at the Sun Download Center.**

   The Sun Download Center is at the following URL:

   `http://www.sun.com/software/downloads`

2. **Log in to your system as root.**

   You must have superuser access to install the software.

3. **Verify your system's Solaris OS level.**

   The software relies on properly configured Solaris sofware at one of the following minimum release levels:

   - Solaris 8 7/01
   - Solaris 9 4/03

   For example, the following command retrieves operating system and release level information for `ontheball`:

```
ontheball% cat /etc/release
                Solaris 9 4/04 s9s_u6wos_08a SPARC
  Copyright 2004 Sun Microsystems, Inc.  All Rights Reserved.
                Use is subject to license terms.
                     Assembled 22 March 2004
ontheball%
```

Installing Solaris OS Patches

Sun Microsystems provides Solaris OS patches to customers with a maintenance contract by means of CD-ROM, anonymous FTP, and the Sun Microsystems SunSolve^{SM} web site (`http://sunsolve.sun.com`).

To install a patch after you install the Sun StorEdge QFS or Sun StorEdge SAM-FS release packages, load the CD-ROM or transfer the patch software to your system. Follow the instructions outlined in the *Patch Installation Instructions and Special Install Instructions* in the README file included in the patch or jumbo patch cluster.

Sun StorEdge QFS and Sun StorEdge SAM-FS Software Host Requirements

If you plan to install Sun StorEdge QFS or Sun StorEdge SAM-FS software in a multihost environment, for example in a Sun SAM-Remote configuration or in a Sun StorEdge QFS shared file system configuration, make sure that you install the same release level and patch collection on all hosts that you want to include in the configuration. All host systems included in a multihost environment must have the same Sun StorEdge QFS or Sun StorEdge SAM-FS software release level installed and operational.

Planning Your File System and Verifying Disk Cache

The Sun StorEdge QFS and Sun StorEdge SAM-FS software packages require a certain amount of disk cache (file system devices) in order for them to create and manage data files and directories.

- The Sun StorEdge QFS software requires at least two disk devices or partitions, one for file data and one for metadata. Multiple disk devices or partitions increase I/O performance.
- The Sun StorEdge SAM-FS software requires at least one disk device or partition.

The disk devices or partitions do not require any special formatting. You might see better performance if you configure multiple devices across multiple interfaces (HBAs) and disk controllers.

Caution – Make sure that the disks and partitions that you plan to use are not currently in use and do not contain any existing data because any existing data is lost when you create the Sun StorEdge QFS or Sun StorEdge SAM-FS file system.

The disks must be connected to the server through a Fibre Channel or SCSI controller. You can specify individual disk partitions for a disk, or you can use the entire disk as a disk cache. The software supports disk arrays, including those under the control of volume management software, such as Solstice DiskSuite™, Solaris Volume Manager, and other volume management software products.

▼ To Plan Your File System

- **Familiarize yourself with Sun StorEdge QFS and Sun StorEdge SAM-FS file system layout possibilities.**

  Describing all the aspects of Sun StorEdge QFS and Sun StorEdge SAM-FS file systems is beyond the scope of this manual. For information on volume management, file system layout, and other aspects of file system design, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

▼ To Estimate Disk Cache Requirements

1. **Estimate the minimum disk cache requirements for Sun StorEdge QFS software (`ma` file systems).**
   - Disk cache = largest file (in bytes) + amount of space needed for working files
   - Metadata cache = ((number of files + number of directories) * 512) + (16384 * number of directories)
2. **Estimate the minimum disk cache requirements for Sun StorEdge SAM-FS software.**
   - Disk cache = largest file (in bytes) + ((number of files + number of directories) * 512) + (4096 * number of directories) + amount of space needed for working files
3. **Estimate the minimum disk cache requirements for Sun SAM-QFS software (`ma` file systems plus the storage and archive manager).**

   You can create a Sun SAM-QFS file system when you install both the `SUNWsamfsr` and `SUNWsamfsu` packages and you are licensed for both Sun StorEdge QFS and Sun StorEdge SAM-FS software. You install the Sun StorEdge SAM-FS software package, and the license key enables the faster Sun StorEdge QFS file system. Use the following guidelines if you are creating Sun SAM-QFS file systems:
   - Disk cache = largest file (in bytes) + amount of space needed for working files
   - Metadata cache = ((number of files + number of directories) * 512) + (16384 * number of directories)
4. **Enter the `format`(1M) command to verify that you have sufficient disk cache space.**

   Use the `format`(1M) command if you are installing a Sun StorEdge QFS or Sun StorEdge SAM-FS file system on a single server or if you are installing a Sun StorEdge QFS file system as a local file system on a Sun Cluster node.

   Remember to use Ctrl-d to exit the `format`(1M) command.

Example 1 - Using the `format`(1M) Command on Fibre Channel-Attached Disks

CODE EXAMPLE 1-1 shows six disks attached to a server. There are two internal disks connected by means of controller 0 on targets 10 and 11 (`c0t10d0` and `c0t11d0`). The other disks are external.

For the sake of clarity, the `format`(1M) command output in CODE EXAMPLE 1-1 has been edited.

CODE EXAMPLE 1-1 `format`(1M) Command for a Fibre Channel-Attached Disks

```
# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c0t11d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@b,0
      2. c9t60020F2000003A4C3ED20F150000DB7Ad0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed20f150000db7a
      3. c9t60020F2000003A4C3ED215D60001CF52d0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed215d60001cf52
      4. c9t60020F2000003A4C3ED21628000EE5A6d0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed21628000ee5a6
      5. c9t60020F2000003A4C3ED216500009D48Ad0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed216500009d48a
Specify disk (enter its number):^d
#
# format /dev/rdsk/c9t60020F2000003A4C3ED216500009D48Ad0s2
# format f
partition> p

Part      Tag    Flag     Cylinders         Size            Blocks
  0 unassigned    wm       0 -  4778       14.00GB    (4779/0/0)   29362176
  1 unassigned    wm    4779 -  9557       14.00GB    (4779/0/0)   29362176
  2     backup    wu       0 - 34529      101.16GB    (34530/0/0) 212152320
  3 unassigned    wm    9558 - 14336       14.00GB    (4779/0/0)   29362176
  4 unassigned    wm   14337 - 19115       14.00GB    (4779/0/0)   29362176
  5 unassigned    wm   19116 - 23894       14.00GB    (4779/0/0)   29362176
  6 unassigned    wm   23895 - 28673       14.00GB    (4779/0/0)   29362176
  7 unassigned    wm   28674 - 33452       14.00GB    (4779/0/0)   29362176
```

CODE EXAMPLE 1-1 `format`(1M) Command for a Fibre Channel-Attached Disks *(Continued)*

```
partition> ^D
#
```

Example 2 - Using the `format`(1M) Command on SCSI-Attached Disks

CODE EXAMPLE 1-2 shows four disks attached to a server. There are two internal disks connected by means of controller `0` on targets `0` (`c0t0d0`) and `1` (`c0t1d0`). There are two external disks connected by means of controller `3` on targets `0` (`c3t0d0`) and `2` (`c3t2d0`).

CODE EXAMPLE 1-2 `format`(1M) Command for SCSI-Attached Disks

```
# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@0,0
       1. c0t1d0 <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@1,0
       2. c3t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@1f,0/QLGC,isp@0,10000/sd@0,0
       3. c3t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@1f,0/QLGC,isp@0,10000/sd@2,0
Specify disk (enter its number): 1
selecting c0t1d0
[disk formatted]
Warning: Current Disk has mounted partitions.


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
```

CODE EXAMPLE 1-2 `format`(1M) Command for SCSI-Attached Disks *(Continued)*

```
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> par

PARTITION MENU:
        0      - change `0' partition
        1      - change `1' partition
        2      - change `2' partition
        3      - change `3' partition
        4      - change `4' partition
        5      - change `5' partition
        6      - change `6' partition
        7      - change `7' partition
        select - select a predefined table
        modify - modify a predefined partition table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        !<cmd> - execute <cmd>, then return
        quit
partition> pri
Current partition table (original):
Total disk cylinders available: 2733 + 2 (reserved cylinders)

Part      Tag    Flag     Cylinders        Size            Blocks
  0        var     wm       0 - 2732        1.98GB    (2733/0/0) 4154160
  1 unassigned    wm       0               0         (0/0/0)          0
  2     backup    wm       0 - 2732        1.98GB    (2733/0/0) 4154160
  3 unassigned    wm       0               0         (0/0/0)          0
  4 unassigned    wm       0               0         (0/0/0)          0
  5 unassigned    wm       0               0         (0/0/0)          0
  6 unassigned    wm       0               0         (0/0/0)          0
  7 unassigned    wm       0               0         (0/0/0)          0

partition> q
```

Verifying Disk Space

The software requires a disk cache consisting of RAID devices, JBOD devices, or both. It also requires a certain amount of disk space in the / (root), /opt, and /var directories. The actual amount needed varies depending on the packages you install. TABLE 1-8 shows the minimum amount of disk space required in these various directories.

TABLE 1-8 Minimum Disk Space Requirements

Directory	Sun StorEdge QFS Minimums	Sun StorEdge SAM-FS Minimums	SAM-QFS Manager Minimum
/ (root) directory	2,000 kilobytes	2,000 kilobytes	25,000 kilobytes
/opt directory	8,000 kilobytes	21,000 kilobytes	5,000 kilobytes
/var directory	1,000 kilobytes	6,000 kilobytes	2,000 kilobytes
/usr directory	2,000 kilobytes	2,000 kilobytes	7,000 kilobytes
/tmp directory	0 kilobytes	0 kilobytes	200,000 kilobytes

Note that the archiver data directory, the archiver queue files, and the log files are written to the /var directory, so the sizes shown in TABLE 1-8 should be considered a minimum amount for the /var directory.

▼ To Verify Disk Space

The following procedure shows how to verify whether there is enough disk space on your system to accommodate the SUNWsamfsu and SUNWsamfsr packages.

1. **Issue the df(1M) command.**

   CODE EXAMPLE 1-3 shows this command and its output.

CODE EXAMPLE 1-3 Using the df(1M) Command to Verify Disk Space

```
# df -k /
Filesystem            kbytes    used   avail capacity  Mounted on
/dev/dsk/c0t1dos0     76767     19826  49271    29%     /
# df -k /opt
Filesystem            kbytes    used   avail capacity  Mounted on
/dev/dsk/c0t1dos4     192423    59006  114177   35%     /opt
```

2. **Verify that there are at least 2,000 kilobytes available in the `avail` column for the `/` directory.**

3. **Verify that there are at least 21,000 kilobytes in the `avail` column for the `/opt` directory.**

4. **Verify that there are at least 6,000 kilobytes available in the `/var` directory.**

   A quantity of 30,000 kilobytes or more is recommended to allow for the growth of log files and other system files.

5. **If there is not enough room for the software under each directory, repartition the disk to make more space available to each file system.**

   To repartition a disk, see your Sun Solaris system administration documentation.

(Optional) Verifying Archive Media

Perform this verification if you plan to use the Sun StorEdge SAM-FS software.

If you plan to archive to disk space in another file system, which is called disk archiving, verify the following:

- That the host system to which the disks are attached has at least one Sun StorEdge SAM-FS file system created upon it.
- That there is enough space available on the disk to accommodate the archive copies.

If you plan to archive to removable media devices, your environment must include the following:

- At least one removable media device for archiving files. This device can be a single tape or optical drive, or it can be multiple devices such as the drives within an automated library.
- Tape or magneto-optical cartridges to which archive files can be written. For most SCSI-attached and Fibre Channel-attached libraries, the Sun StorEdge SAM-FS software supports only one media type. If you have a tape library that can be partitioned logically into two or more libraries, you can have one media type in one logical library and a different media type in another. The Sun StorEdge SAM-FS software records the cartridges used for each library in a library *catalog*. You cannot mix the tape media types in a library catalog, so plan to use only one media type per library or logical library.

The Sun StorEdge SAM-FS environment supports a wide variety of removable media devices. You can obtain a list of currently supported drives and libraries from your Sun Microsystems sales or support staff. To make sure that your devices are attached and enumerated in an easily retrieved list, perform one or both of the following procedures:

- If your removable media devices are not attached to your server, perform the procedure in "To Attach Removable Media Devices" on page 25.
- Enumerate your devices using the instructions in "To Create a List of Devices" on page 30. You will use this list again in the "Sun StorEdge SAM-FS Initial Installation Procedure" on page 163.

▼ To Attach Removable Media Devices

This section explains how to attach removable media devices to a server. These are general guidelines for attaching removable media hardware to a server. For explicit instructions on connecting these peripherals to a server, refer to the hardware installation guide supplied by the vendor with the automated library and drives.

1. **Ensure that you are on a console connection to the server.**
2. **Power off the server before connecting devices.**

   Typically, you power off central components first and then the peripheral equipment. So, use the `init`(1M) command to power off the server, as follows:

   ```
   # init 5
   ```

   This command brings down the system to the PROM level. At this point it is safe to power off the server and peripherals. For specific instructions regarding your equipment, see the documentation from the hardware vendor for proper power-on and power-off sequences.
3. **Ensure that the removable media devices and the disk(s) to be used for the Sun StorEdge SAM-FS file system are connected and properly addressed.**
4. **(Optional) Ensure that the SCSI target IDs are unique for each SCSI initiator (host adapter).**

   Perform this step if you have libraries attached to the host system through a SCSI interface.

   Avoid setting SCSI target IDs for peripherals to ID `7` because this ID is typically reserved for the initiator. For example, if you are using a SCSI host adapter with a previously attached disk drive set to use a target ID of `3`, any additional peripheral connected to this bus must not have an ID of `3`. Typically, the internal disk drive ID is `3` for SPARC® systems and `0` for UltraSPARC systems.

5. **Power on the peripherals according to the manufacturer's recommended sequence.**

   Typically, you power on the outermost peripherals first, working toward more central components in sequence.

6. **Disable autobooting.**

   At the `>ok` prompt, enter the following command to disable autobooting:

```
>ok setenv auto-boot? false
```

7. **Type `reset` at the next prompt.**

   For example:

```
>ok reset
```

   Reenabling autobooting is described later in this procedure.

8. **(Optional) Conduct an inventory of target IDs and LUNs for each device connected to the host system through a SCSI interface.**

   Perform this step if you have libraries attached to the host system through a SCSI interface.

   CODE EXAMPLE 1-4 shows the PROM `>ok` prompt and the output from the `probe-scsi-all` command.

CODE EXAMPLE 1-4 Output From the `probe-scsi-all` Command

```
{0} ok probe-scsi-all
/pci@6,400/scsi@2,1
Target 0
  Unit 0   Removable Device type 8     STK 9730        1700
Target 1
  Unit 0   Removable Tape   type 7     QUANTUM DLT7000 2565
Target 2
  Unit 0   Removable Tape   type 7     QUANTUM DLT7000 2565

/pci@1f,4000/scsi@3
Target 0
  Unit 0   Disk     SEAGATE ST318404LSUN18G 4207
Target 6
  Unit 0  Removable Read Only device   TOSHIBA XM6201TASUN32XCD1103
```

9. **(Optional) Save the output from the previous step.**

   If you performed the previous step, save the output. You use the information in this output for the next procedure, "To Create a List of Devices" on page 30.

10. **(Optional) Conduct an inventory of target IDs and LUNs for each device connected to the host system through a Fibre Channel interface.**

Perform this step if you have libraries or tape drives attached to the host system through a Fibre Channel interface.

CODE EXAMPLE 1-5 shows the commands to use to locate the host adapter directory, to select an item, and to display the Fibre Channel host bus adapter (HBA) devices.

CODE EXAMPLE 1-5 Commands and Output Showing How to Conduct an Inventory of Target IDs and LUNs

```
{0} ok show-devs
/SUNW,ffb@1e,0
/SUNW,UltraSPARC-II@2,0
/SUNW,UltraSPARC-II@0,0
/counter-timer@1f,1c00
/pci@1f,2000
/pci@1f,4000
/virtual-memory
/memory@0,a0000000
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,2000/SUNW,qlc@1
/pci@1f,2000/SUNW,qlc@1/fp@0,0
/pci@1f,2000/SUNW,qlc@1/fp@0,0/disk
/pci@1f,4000/SUNW,ifp@2
/pci@1f,4000/scsi@3,1
/pci@1f,4000/scsi@3
/pci@1f,4000/network@1,1
/pci@1f,4000/ebus@1
/pci@1f,4000/SUNW,ifp@2/ses
{0} ok select /pci@1f,2000/SUNW,qlc@1
{0} ok show-children
LiD HA LUN  --- Port WWN ---  ----- Disk description -----
 2  7e   0  500104f00041182b  STK     L700            0236
7c  7e   0  500104f00043abfc  STK     9840            1.28
7d  7e   0  500104f00045eeaf  STK     9840            1.28
6f  7e   0  500104f000416304  IBM     ULT3580-TD1     16E0
6e  7e   0  500104f000416303  IBM     ULT3580-TD1     16E0
```

If the server does not acknowledge all the known devices (disk drives, tape or optical drives, the automated library, and so on), you should check the cabling. Cabling is often the problem when devices and controllers are not communicating. Do not proceed until all devices appear when probed.

11. **(Optional) Save the output from the previous step.**

    If you performed the previous step, save the output. You use the information in this output for the next procedure, "To Create a List of Devices" on page 30.

12. **Reenable autobooting.**

    At the `>ok` prompt, enter the following command to enable autobooting:

```
>ok setenv auto-boot? true
```

13. **Boot the system.**

    For example:

```
>ok boot
```

14. **Review system files.**

    Review the following files:

    - `/var/adm/messages` to ensure that all devices were recognized
    - `/dev/rmt` for expected tape devices
    - `/dev/dsk` and `/dev/rdsk` for expected disks

    Due to special driver requirements, no device information appears in `/var/adm/messages` for magneto-optical devices or libraries until after you install the Sun StorEdge SAM-FS software packages.

15. **Disable autocleaning and autoloading.**

    If your automated library supports autocleaning or autoloading, disable those features when using that library with the Sun StorEdge SAM-FS software. Consult the documentation from your library's manufacturer for information on disabling autocleaning and autoloading.

    Note – The only times you can use autoloading are during the initial loading of cartridges and when the Sun StorEdge SAM-FS software is not running. Remember to disable autoload when the Sun StorEdge SAM-FS system is running.

    ---

16. **Go to "Creating a List of Devices" on page 29.**

Creating a List of Devices

The device(s) that you intend to use must be attached and recognized by the server upon which you intend to install the Sun StorEdge SAM-FS software. To configure the Sun StorEdge SAM-FS software, you need to know the following about your devices:

- The device type, manufacturer, and model number.
- The mechanism by which the device is attached to the server. You can attach devices in one of the following ways:
  - Drives can use either a SCSI attachment or a Fibre Channel attachment. Each drive accepts either tape cartridges or magneto-optical (MO) cartridges.

    For SCSI-attached drives, you need to know each drive's SCSI target ID and LUN.

    For Fibre Channel-attached drives, you need to know each drive's LUN and worldwide node name.
  - Automated libraries can use a SCSI attachment, a Fibre Channel attachment, or a network attachment.

    Libraries that use SCSI or Fibre Channel attachments are called *direct-attached* libraries. For SCSI-attached libraries, you need to know each library's SCSI target ID and LUN. For Fibre Channel-attached libraries, you need to know each library's LUN and worldwide node name.

    Libraries that use a network attachment are called *network-attached* libraries. You cannot configure network-attached libraries in the existing system configuration files. You need to create a parameters file for each network-attached library; this is explained later in the installation process.

▼ To Create a List of Devices

This procedure shows you how to gather device information.

1. **Make an inventory list of your devices.**

   Fill in TABLE 1-9 to include the name, manufacturer, model, and connection types for each device that you want to include in your Sun StorEdge SAM-FS environment.

TABLE 1-9 Inventory List of Devices to Be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	Worldwide Node Name
SCSI-Attached Tape Drives			
			Not applicable
			Not applicable
			Not applicable
			Not applicable
			Not applicable
Fibre Channel-Attached Tape Drives			
	Not Applicable		
	Not Applicable		
	Not Applicable		
	Not Applicable		
	Not Applicable		
SCSI-Attached MO Drives			
			Not applicable
			Not applicable
			Not applicable
			Not applicable
			Not applicable
Fibre Channel-Attached MO Drives			
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		
SCSI-Attached Automated Libraries			

TABLE 1-9 Inventory List of Devices to Be Configured *(Continued)*

Device Name, Manufacturer, and Model	Target ID	LUN	Worldwide Node Name
			Not applicable
			Not applicable
			Not applicable
			Not applicable
			Not applicable
Fibre Channel-Attached Automated Libraries			
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		

2. **Retain** TABLE 1-9 **for use again later in the configuration procedure.**

Obtaining a Software License Key

Make sure that you have a software license key for the Sun StorEdge QFS or Sun StorEdge SAM-FS release that you are installing.

If you do not have a Sun Microsystems license key for the release level that you are installing, contact your authorized service provider (ASP) or Sun. When you contact Sun for a license, you will be asked to provide information regarding your environment.

For a Sun StorEdge QFS license, you will need to provide information such as the following:

- Your Sun sales order number.
- The host IDs of the system(s) upon which you will be installing the Sun StorEdge QFS software.
- The server type of each host system to be used in the Sun StorEdge QFS environment. If you plan to configure a multihost file system, such as a Sun StorEdge QFS shared file system, you must have a license for each host.

For a Sun StorEdge SAM-FS license, you will need to provide information such as the following:

- Your Sun sales order number.
- The host IDs of the system(s) upon which you will be installing the Sun StorEdge SAM-FS software.
- The types of libraries to be used in the Sun StorEdge SAM-FS environment.
- The media types of the drives to be used in the Sun StorEdge SAM-FS libraries.
- The amount of archive data, in terabytes, that you want to maintain.
- The total number of slots to be available to the Sun StorEdge SAM-FS software.

The license keys for the Sun StorEdge QFS and Sun StorEdge SAM-FS packages allow the system to run indefinitely unless one of the following conditions is present:

- You were issued a temporary license. When a temporary license expires, the system is no longer able to load and unload cartridges, or to archive, stage, or release files.
- You are using Sun StorEdge SAM-FS software and you have exceeded the number of slots allowed for the license. In this case, you cannot import or label cartridges. Access continues unaffected for files already on a disk.
- You have changed the hardware with which the software must interoperate. These types of changes include changes to drives, automated libraries, and servers. Licenses are assigned to a specific `hostid` and are not transferable.

If your license expires, you can mount the file systems, but you cannot archive or stage files in a Sun StorEdge SAM-FS environment.

After your initial installation, if you upgrade your software or if you change your environment's configuration, you might need to change your software license. Changes to the environment that might necessitate upgrading your license include adding a library or changing a host system. If you have questions regarding your existing license, you can enter the `samcmd`(1M) `l` command (lowercase l for *license*). If you need to upgrade your license, contact your Sun sales representative.

Note – If you are upgrading from a Sun StorEdge QFS or Sun StorEdge SAM-FS 4.0 or 4.1 release, you might need to upgrade your license depending on other changes in your environment.

Obtaining the Release Files

Make sure that you have a copy of the release software. You can obtain the Sun StorEdge QFS and Sun StorEdge SAM-FS software from the Sun Download Center or on a CD-ROM. Contact your authorized service provider (ASP) or your Sun sales representative if you have questions on obtaining the software.

After the release, upgrade patches are available from the following URL:

`http://sunsolve.sun.com`

Caution – If you have not read the *Sun StorEdge QFS and Sun StorEdge SAM-FS 4.2 Release Notes*, please do so before continuing. You can access the *Sun StorEdge QFS and Sun StorEdge SAM-FS 4.2 Release Notes* for this release at any time from one of the documentation web sites described in this manual's preface.

▼ To Obtain the Software From the Sun Download Center

1. **Enter the following URL in your browser:**

   `http://www.sun.com/software/download/sys_admin.html`

2. **Click on the Sun StorEdge QFS or Sun StorEdge SAM-FS software package you want to receive.**

3. **Follow the instructions at the web site for downloading the software.**

▼ To Install From a CD-ROM

1. **Log in as root on your Sun StorEdge QFS or Sun StorEdge SAM-FS server.**

   The Sun StorEdge QFS and Sun StorEdge SAM-FS software uses the Sun Solaris operating system (OS) packaging utilities for adding and removing software. You must be logged in as superuser (`root`) to make changes to software packages. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the packages.

2. **Insert the CD into the CD-ROM drive.**

   The system should automatically detect the CD's presence. If it does not, issue the commands shown in CODE EXAMPLE 1-6 to stop and start the Sun Solaris Volume Manager and to change to the directory that contains the Sun StorEdge QFS and Sun StorEdge SAM-FS software packages.

CODE EXAMPLE 1-6 Commands to Use to Access the Sun StorEdge QFS and Sun StorEdge SAM-FS Packages

```
# /etc/init.d/volmgt stop
# /etc/init.d/volmgt start
# volcheck
# cd /cdrom/cdrom0
```

On the CD, the packages reside in the `/cdrom/cdrom0` directory organized by Sun Solaris version.

▼ To Remove the Sun StorEdge QFS or Sun StorEdge SAM-FS 4.2 Software

If you need to remove the 4.2 software packages in the future, perform the following steps.

1. **(Optional) Remove the SAM-QFS Manager software from the management station and from the Sun StorEdge QFS and Sun StorEdge SAM-FS server.**

   If you have installed the SAM-QFS Manager software, perform the procedure described in "Removing the SAM-QFS Manager Software" on page 311.

2. **Use the `pkginfo`(1) command to determine which Sun StorEdge QFS and Sun StorEdge SAM-FS software packages are installed on your system.**

   To find the Sun StorEdge QFS 4.2 packages, enter the following command:

```
# pkginfo | grep qfs
```

To find the Sun StorEdge SAM-FS 4.2 packages, enter the following command:

```
# pkginfo | grep sam
```

3. **Use the `pkgrm`(1M) command to remove the existing software.**

   If you are using any optional packages, make sure you remove them before removing the main `SUNWqfsr`/`SUNWqfsu` or `SUNWsamfsr`/`SUNWsamfsu` packages. In addition, make sure that you remove the `SUNWqfsu` and `SUNWsamfsu` packages before removing the `SUNWqfsr` and `SUNWsamfsr` packages.

   Example 1. To remove all possible Sun StorEdge QFS packages, enter the following command:

```
# pkgrm SUNWcqfs SUNWfqfs SUNWjqfs SUNWqfsu SUNWqfsr
```

   `SUNWqfsr` must be the last package removed.

   Example 2. To remove all possible Sun StorEdge SAM-FS packages, enter the following command:

```
# pkgrm SUNWcsamf SUNWfsamf SUNWjsamf SUNWsamfsu SUNWsamfsr
```

   `SUNWsamfsr` must be the last package removed.

Verifying Third-Party Compatibilities

The Sun StorEdge QFS and Sun StorEdge SAM-FS software interoperates with many different hardware and software products from third-party vendors. Depending on your environment, you might need to upgrade other software or firmware before installing or upgrading the Sun StorEdge QFS or Sun StorEdge SAM-FS packages. Consult the *Sun StorEdge QFS and Sun StorEdge SAM-FS 4.2 Release Notes* for information pertaining to library model numbers, firmware levels, and other compatibility information.

(Optional) Verifying Sun StorEdge QFS Shared File System Requirements

Perform this verification if you plan to configure a Sun StorEdge QFS shared file system.

The following sections describe the system requirements that must be met in order for you to install a Sun StorEdge QFS shared file system.

Metadata Server Requirement

There must be at least one Solaris metadata server. If you want to be able to change the metadata server, there must be at least one other host that can become the metadata server; these other host systems are known as *potential* metadata servers. On a Sun Cluster, all nodes included in a Sun StorEdge QFS shared file system are potential metadata servers.

The following are configuration recommendations with regard to metadata:

- A Sun StorEdge QFS shared file system should have multiple metadata (`mm`) partitions. This spreads out metadata I/O and improves file system throughput.
- A Sun StorEdge QFS shared file system should use a separate, private metadata network so typical user traffic does not interfere with metadata traffic. A switch-based (not hub-based) network is recommended for this.

Operating System and Hardware Requirements

Ensure that your configuration meets the following operating system and hardware requirements:

- The host systems to be configured in the Sun StorEdge QFS shared file system must be connected by a network.
- Online data storage devices must be directly accessible to all hosts. All online metadata storage devices must be directly accessible to all potential metadata server hosts.

Sun StorEdge QFS Release Levels

Ensure that your configuration meets the following Sun StorEdge QFS requirements:

- Each host to be configured in the Sun StorEdge QFS shared file system must have a Sun StorEdge QFS software package installed upon it.

- All Sun StorEdge QFS software installed on the Solaris systems in the Sun StorEdge QFS shared file system must be at the same release level. This ensures that all Solaris systems in a Sun StorEdge QFS shared file system have identical over-the-wire protocol versions. If these levels do not match, the system generates the following message when mounting is attempted:

```
SAM-FS: client client package version x mismatch, should be y.
```

  The system writes the preceding message to the metadata server's `/var/adm/messages` file.

- When applying patches or upgrading the software for a Sun QFS or Sun SAM-QFS shared file system, make sure to apply the same patch to all hosts that have access to the shared file system. Unexpected results might occur if all host systems are not running the same patch level.

Sun SAM-QFS Requirements

If you want to be able to change the metadata server in a Sun SAM-QFS environment, the following requirements must be met:

- Solaris systems to be configured as potential metadata servers must be attached through a storage area network (such as Sun SAN Foundation software 3.0 or later) or through a network attachment to the library and/or mount points that contain the archive media repository. This enables the other potential metadata servers to access the archive images.
- The media catalog should reside in a file system that can be accessed from the metadata server and from all potential metadata servers.
- If you want to be able to change the metadata server in a Sun SAM-QFS environment, all potential metadata servers must be connected to both the automated library and to the archive media devices.
- To maintain NFS input/output (I/O) operations during a metadata server change, take one of the following actions:
  - Mount the file system on the NFS clients with the `hard` option. For example:

```
kingkong:/sqfs1 -       /nsqfs1 nfs     -       yes     hard
```

- Set the `timeo` NFS mount parameter on the NFS client to span the time of the failover. A value of `3000` (5 minutes) should be adequate to handle most failover scenarios. For example:

```
kingkong:/sqfs1 -       /nsqfs1 nfs     -       yes     timeo=3000
```

- If the metadata server panics or fails, move any NFS mounts exported from the old metadata server to the new metadata server. To accomplish this, use clustering software or export the NFS mounts from the new metadata server. Then, unmount and remount the file systems on each NFS client.

Note – Sun Microsystems does not support the storage and archive management features of the Sun SAM-QFS software in a Sun Cluster environment. The information in this section does not apply to Sun StorEdge QFS shared file systems in a Sun Cluster environment.

(Optional) Verifying Requirements for Installing the Sun StorEdge QFS File System in a Sun Cluster Environment

Perform this verification if you want to install a Sun StorEdge QFS file system in a Sun Cluster environment.

You can configure both a Sun StorEdge QFS file system and a Sun StorEdge QFS shared file system in a Sun Cluster environment, as follows:

- For a Sun StorEdge QFS shared file system, when the Sun Cluster software fails over, it moves the Sun StorEdge QFS file system operations from the failing server to a different server. The Sun Cluster software moves the metadata server's operations from a failing node to another node without requiring you to enter commands to move the metadata server to another host.

  Also make sure that your environment meets the requirements listed in "(Optional) Verifying Sun StorEdge QFS Shared File System Requirements" on page 35.

- A Sun StorEdge QFS highly available file system is an unshared Sun StorEdge QFS file system configured in a Sun Cluster environment. Such a file system is configured on one node, but it is enabled as a highly available resource within the cluster. When the node hosting the file system fails, the cluster software moves the file system to another node.

If you plan to configure a Sun StorEdge QFS shared file system in a Sun Cluster environment, verify the following:

1. **Verify your hardware.**

   Ensure that you have between two and eight UltraSPARC hosts to use as a cluster.

2. **Verify your software.**

   Ensure that you have the following minimum software levels installed on each cluster node:

   - Solaris 8 2/02 or Solaris 9 4/03
   - Sun Cluster 3.1 4/04

   Each node must have the same Sun Cluster software level and Sun Cluster patch collection. You must install Sun StorEdge QFS software packages on each node in the cluster that will host a Sun StorEdge QFS file system.

3. **Ensure that you are familiar with how disks are used in a Sun Cluster.**

   In a Sun Cluster, the disk cache space must be configured on storage that is highly available and redundant. Ensure that you have a good understanding of the concepts in the *Sun Cluster System Administration Guide for Solaris OS*.

   You should also be familiar with Sun Cluster operations. For information on Sun Cluster operations, see the following manuals:

   - *Sun Cluster Concepts Guide for Solaris OS*
   - *Sun Cluster Software Installation Guide for Solaris OS*
   - *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*

4. **Verify your disk space according to the instructions in "Verifying Disk Space" on page 23.**

   "Verifying Disk Space" on page 23 explains how much disk space to allow for the various directories that the file systems need.

5. **Verify that you have the correct kinds of disk devices.**

   For the file system to be highly available, it must be constructed from highly available devices. The types of disk devices you can use depend on the kind of file system you are configuring and whether you are using a volume manager, as follows:

   - If you are going to configure a Sun StorEdge QFS shared file system, use raw DID (device identification) devices. In the `scdidadm`(1M) command output, these appear as `/dev/did/*` devices. The Sun Cluster nodes that share the file system

must have access to each DID device through an HBA (host bus adapter) direct connection. All devices must be accessible to the file system from all nodes in the Sun Cluster that mount the Sun StorEdge QFS shared file system. For more information about DID devices, see the `did`(7) man page.

When you specify these devices in your `mcf` file, you use the `/dev/did` devices from the `scdidadm`(1M) output. For more information about this, see "Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65.

Caution – Do not use a volume manager if you are going to configure a Sun StorEdge QFS shared file system on a Sun Cluster. Data corruption can result.

- If you are going to configure a Sun StorEdge QFS highly available file system, you can use either raw devices or devices managed by a volume manager.

  If you want to configure from raw devices, use Sun Cluster global devices. Use the output from the `scdidadm`(1M) command to determine the names of the global devices and substitute `global` for `did` when specifying the devices in the `mcf`(1) file. Global devices are accessible from all nodes in a Sun Cluster, even if these devices are not physically attached to all nodes. If all nodes that have a hardware connection to the disk crash or lose their connection, then the remaining nodes cannot access the disk. File systems created on global devices are not necessarily highly available.

  If you want to use a volume manager, use one of the following:

  - Solstice DiskSuite volume manager. Such devices are located in `/dev/md`.
  - VERITAS Volume Manager (VxVM). Such devices are located in `/dev/vx`.

  Use `scsetup`(1M) to register volume-managed devices with the Sun Cluster framework prior to configuring your file system.

Note – If you use a volume manager, use it only to provide redundancy. For performance reasons, do not use it to concatenate storage on separate devices; this causes the Sun StorEdge QFS highly available file system to distribute I/O inefficiently across the component devices.

If you are unsure about your devices, issue the `scdidadm`(1M) command with its `-L` option to determine which devices in your Sun Cluster are highly available. This command lists the paths of the devices in the DID configuration file. In the output from the `scdidadm`(1M) command, look for devices that have two or more DID devices listed with the exact same DID device number. Such devices are highly available in a Sun Cluster and can also be configured as global devices for a file system, even if they directly connect only to a single node.

I/O requests issued to global devices from a node other then the direct-attached node are issued over the Sun Cluster interconnect. These single-node, global devices cease to be available when all nodes that have direct access to the device are unavailable.

6. **Verify device redundancy.**

   After the set of highly available devices has been determined, check for device redundancy. All devices must employ mirroring (RAID-1) or striping (RAID-5) to ensure continued operation in the event of a failure, as follows:

   - If you are configuring a Sun StorEdge QFS shared file system, the redundancy must be supported in the disk device hardware. Do not use a volume manager to obtain redundancy.
   - If you are configuring a Sun StorEdge QFS highly available file system, you can use either the Solstice DiskSuite or the VERITAS Volume Manager to obtain mirroring (RAID-1) or striping (RAID-5).

   For more information about volume sizing and redundancy configurations, see the *Solaris Volume Manager Administration Guide* or your VERITAS Volume Manager documentation.

Example - Using the `scdidadm`(1M) Command in a Sun Cluster

To find suitable devices, first determine which devices are highly available, and then determine which devices are redundant.

Determining High Availability

CODE EXAMPLE 1-7 shows the `scdidadm`(1M) Sun Cluster command. This example uses the `-L` option for this command to list paths of the devices in the DID configuration file for all nodes. In the output from the `scdidadm`(1M) command, look for output that shows a device that is visible from two or more nodes and that bears the same worldwide name. These are global devices.

CODE EXAMPLE 1-7 uses Sun StorEdge T3 arrays in a RAID-5 configuration. The command output on your disk devices might differ depending on the equipment you use.

CODE EXAMPLE 1-7 `scdidadm`(1M) Command Example

```
ash# scdidadm -L
1        ash:/dev/rdsk/c0t6d0        /dev/did/rdsk/d1
2        ash:/dev/rdsk/c1t1d0        /dev/did/rdsk/d2
3        ash:/dev/rdsk/c1t0d0        /dev/did/rdsk/d3
```

CODE EXAMPLE 1-7 scdidadm(1M) Command Example *(Continued)*

```
4        elm:/dev/rdsk/c6t50020F2300004921d1 /dev/did/rdsk/d4
4        ash:/dev/rdsk/c5t50020F2300004921d1 /dev/did/rdsk/d4
5        elm:/dev/rdsk/c6t50020F2300004921d0 /dev/did/rdsk/d5
5        ash:/dev/rdsk/c5t50020F2300004921d0 /dev/did/rdsk/d5
6        elm:/dev/rdsk/c6t50020F23000049CBd1 /dev/did/rdsk/d6
6        ash:/dev/rdsk/c5t50020F23000049CBd1 /dev/did/rdsk/d6
7        elm:/dev/rdsk/c6t50020F23000049CBd0 /dev/did/rdsk/d7
7        ash:/dev/rdsk/c5t50020F23000049CBd0 /dev/did/rdsk/d7
8        elm:/dev/rdsk/c6t50020F23000055A8d0 /dev/did/rdsk/d8
8        ash:/dev/rdsk/c5t50020F23000055A8d0 /dev/did/rdsk/d8
9        elm:/dev/rdsk/c6t50020F23000078F1d0 /dev/did/rdsk/d9
9        ash:/dev/rdsk/c5t50020F23000078F1d0 /dev/did/rdsk/d9
10       elm:/dev/rdsk/c0t6d0        /dev/did/rdsk/d10
11       elm:/dev/rdsk/c1t1d0        /dev/did/rdsk/d11
12       elm:/dev/rdsk/c1t0d0        /dev/did/rdsk/d12

     # The preceding output indicates that both ash and elm can access disks 4, 5, 6, 7, 8, and 9.
     # These disks are highly available.


ash# format /dev/did/rdsk/d5s2
selecting /dev/did/rdsk/d5s2
[disk formatted]


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> verify

Primary label contents:

Volume name = <        >
```

CODE EXAMPLE 1-7 scdidadm(1M) Command Example *(Continued)*

```
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 192 sec 64>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =  192
nsect       =   64
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      101.16GB    (17265/0/0) 212152320
  1        usr    wm   17265 - 34529      101.16GB    (17265/0/0) 212152320
  2     backup    wu       0 - 34529      202.32GB    (34530/0/0) 424304640
  3 unassigned    wu       0                  0       (0/0/0)             0
  4 unassigned    wu       0                  0       (0/0/0)             0
  5 unassigned    wu       0                  0       (0/0/0)             0
  6 unassigned    wu       0                  0       (0/0/0)             0
  7 unassigned    wu       0                  0       (0/0/0)             0
```

CODE EXAMPLE 1-7 shows that you can use devices 4 through 9 for configuring the disk cache for a file system.

Determining Redundancy

There are two types of redundancy to consider in a Sun Cluster environment: RAID-based redundancy and data path redundancy. The implications of these redundancies are as follows:

- RAID-based disk redundancy is achieved in RAID-1 (mirroring) and RAID-5 (striping with parity) configurations. These disk configurations allow you to configure the raw devices in a Sun Cluster without a volume manager. These raw devices are accessible from multiple nodes, so you can issue the `format`(1M) command from any node to obtain information on the disks.
- Data path redundancy is achieved with multiple host bus adapters (HBAs), which are configured from a single node. If your environment includes multiple HBAs for redundancy, be aware that the Sun StorEdge QFS file systems require multipathing software like Sun StorEdge Traffic Manager software (MPxIO) to enable data path redundancy. For more information, see the *Sun StorEdge Traffic Manager Software Installation and Configuration Guide*, or see the `scsi_vhci`(7D) man page.

To determine redundancy, consult the hardware documentation for your disk controllers and disk devices. You need to know (or need to investigate) whether the disk controller or disk devices that are reported by `scdidadm`(1M) are on redundant storage. For information, see the storage controller vendor's documentation set and view the current controller configuration.

Analyzing the Output From the Commands

The `scdidadm`(1M) command in this example lists device `/dev/rdsk/c6t50020F2300004921d0`, which is DID device `/dev/did/rdsk/d5` or global device `/dev/global/rdsk/d5`. This device has a two partitions (`0` and `1`), each of which yields 212152320 blocks for use by a Sun StorEdge QFS highly available file system as `/dev/global/rdsk/d5s0` and `/dev/global/rdsk/d5s1`.

You need to issue the `scdidadm`(1M) and `format`(1M) commands for all devices to be configured for use by the Sun StorEdge QFS highly available file system.

- If you want to configure a Sun StorEdge QFS shared file system on a cluster, you must use highly available, redundant, devices.
- If you want to configure a Sun StorEdge QFS highly available file system and the `scdidadm`(1M) command output indicates that the devices you want to use for a Sun StorEdge QFS highly available are JBOD (just a bunch of disks) or dual-port SCSI disk devices, you need to use a volume manager that is supported in a Sun Cluster to obtain the redundancy. The options available and capabilities provided by such a volume manager are beyond the scope of this manual.

  You cannot use a volume manager to construct redundant devices to support a Sun StorEdge QFS shared file system.

For more information about configuring devices that are on redundant storage, see your Sun Cluster software installation documentation.

Performance Considerations

For optimal file system performance, the metadata and file data should be accessible through multiple interconnects and multiple disk controllers. In addition, plan to write file data to separate, redundant, highly available disk devices.

Plan to write your file system's metadata to RAID-1 disks. You can write file data to either RAID-1 or RAID-5 disks.

If are configuring a Sun StorEdge QFS highly available file system and you are using a volume manager, the best performance is realized when the file system is striping data over all controllers and disks, versus having the volume manager perform the striping. You should use a volume manager only to provide redundancy.

(Optional) Verifying Requirements for the SAM-QFS Manager

Perform this verification if you want to use SAM-QFS Manager to configure, control, monitor, or reconfigure a Sun StorEdge QFS or Sun StorEdge SAM-FS environment through a web server.

You can install the SAM-QFS Manager in one of the following configurations:

- As a standalone management station to manage one or more Sun StorEdge QFS or Sun StorEdge SAM-FS hosts.
- As additional software on the Sun StorEdge QFS or Sun StorEdge SAM-FS host.

After the SAM-QFS Manager software is installed, you can invoke the SAM-QFS Manager from any machine on the network that is allowed access to its web server.

If you plan to use SAM-QFS Manager, the host upon which you are configuring the SAM-QFS Manager software must meet the requirements described in the following sections:

- "Hardware Requirements" on page 45
- "Browser Requirements" on page 45
- "Operating System Requirements" on page 46
- "Web Software Requirements" on page 46

Hardware Requirements

You must install the SAM-QFS Manager on a SPARC server. Additional minimum hardware requirements are as follows:

- SPARC 400 MHz (or more) CPU
- 1 gigabyte of memory
- One 20-gigabyte disk
- One 10/100/1000Base-T Ethernet port

Browser Requirements

Ensure that your installation meets the following browser requirements:

- One of the following browsers, at the minimum levels indicated, must be installed on the web server:
  - Netscape 7.*x* / Mozilla 1.2.1ml on the Solaris OS
  - Netscape 7.*x* on Microsoft Windows 98, SE, ME, 2000, XP
  - Internet Explorer 5.5 on Microsoft Windows 98, SE, ME, 2000, and XP
- You must enable JavaScript™ technology in your browser. In Mozilla, for example, click through the following menus to get to a panel showing whether JavaScript technology is enabled: `Edit`, `Preferences`, `Advanced`, and `Scripts & Plugins`.

Operating System Requirements

Make sure that one of the following minimum Solaris levels is installed on the web server:

- Solaris 8 7/01
- Solaris 9 4/03

Web Software Requirements

The SAM-QFS Manager installation packages include revisions of the following software at the minimum levels indicated:

- Java 2 Standard Edition version 1.4.1_03
- TomCat version 4.0.5

During the installation procedure, you will be asked to answer questions. Based on your answers, the installation software can install the correct revisions for you if the compatible revisions of these software packages are not present.

(Optional) Verifying the Network Management Station

Perform this verification if you want to monitor your configuration through Simple Management Network Protocol (SNMP) software.

You can configure the Sun StorEdge QFS and Sun StorEdge SAM-FS software to notify you when potential problems occur in its environment. The SNMP software manages information exchange between network devices such as servers, automated libraries, and drives. When the Sun StorEdge QFS and Sun StorEdge SAM-FS software detects potential problems in its environment, it sends information to a management station, which allows you to monitor the system remotely.

The management stations you can use include the following:

- The Storage Automated Diagnostic Environment (StorADE)
- The Sun™ Management Center (Sun MC)
- The Sun Remote Server (SRS)
- The Sun Remote Services NetConnect

If you want to enable SNMP traps, make sure that the management station software is installed and operating correctly before installing the Sun StorEdge QFS and Sun StorEdge SAM-FS software. Refer to the documentation that came with your management station software for information on installation and use.

The types of problems, or events, that the Sun StorEdge QFS and Sun StorEdge SAM-FS software can detect are defined in the Sun StorEdge QFS and Sun StorEdge SAM-FS Management Information Base (MIB). The events include errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information on the MIB, see `/opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib` after the packages are installed.

The Sun StorEdge QFS and Sun StorEdge SAM-FS software supports the TRAP SNMP (V2c) protocol. The software does not support `GET-REQUEST`, `GETNEXT-REQUEST`, and `SET_REQUEST`.

CHAPTER 2

Sun StorEdge QFS Initial Installation Procedure

This chapter describes the procedure for installing and configuring Sun StorEdge QFS standalone software for the first time. Use this procedure if this is the initial installation of the Sun StorEdge QFS standalone software package at your site. If you are upgrading Sun StorEdge QFS software on an existing server, see the "Sun StorEdge QFS Upgrade Procedure" on page 139.

The procedure in this chapter explains obtaining the packages, installing the software packages on your server or node, and configuring the software to match the hardware at your site.

You can install and configure your Sun StorEdge QFS file system entirely using Solaris Operating System (OS) commands, or you can use a combination of commands and the SAM-QFS Manager, which is a graphical user interface (GUI) configuration tool, to complete the procedure.

You must be logged in as superuser to complete most of the procedures in this chapter.

Ensuring That the Installation Prerequisites Are Met

The chapter titled "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you install and configure the Sun StorEdge QFS software. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements and performing preinstallation tasks are as follows:

Adding the Packages on the Sun StorEdge QFS Server

The Sun StorEdge QFS software uses the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the packages.

▼ To Add the Packages

1. **Become superuser.**
2. **Use the `cd`(1) command to change to the directory where the software package release files reside.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.
   - If you obtained the release files from a CD-ROM, use one of the following commands:
     - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

3. **Use the `pkgadd`(1M) command to add the `SUNWqfsr` and `SUNWqfsu` packages.**

   For example:

```
# pkgadd -d . SUNWqfsr SUNWqfsu
```

4. **Enter `yes` or `y` as the answer to each of the questions.**

   When you install `SUNWqfsr` and `SUNWqfsu`, you are asked if you want to define an administrator group. Select `y` to accept the default (no administrator group) or select `n` if you want to define an administrator group. You can reset permissions on certain commands later by using the `set_admin`(1M) command. For more information on this command, see the `set_admin`(1M) man page.

5. **(Optional) Use the `pkgadd`(1M) command to add one or more localized packages.**

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. CODE EXAMPLE 2-1 shows the commands to use to install the localized packages.

CODE EXAMPLE 2-1 Using the `pkgadd`(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcqfs
# pkgadd -d SUNWfqfs
# pkgadd -d SUNWjqfs
```

   The procedure for adding the SAM-QFS Manager software appears later in this chapter. The SAM-QFS Manager installation script prompts you to add localized versions of that software.

6. **On each host, issue the `pkginfo`(1M) command and examine its output to make sure that a Sun StorEdge QFS package is installed.**

   Each host must have the `SUNWqfsr` and `SUNWqfsu` packages installed on it.

   CODE EXAMPLE 2-2 shows the needed `SUNWqfsr`/`SUNWqfsu` packages.

CODE EXAMPLE 2-2 `pkginfo`(1M) Command Example on a Sun SAM-QFS File System

```
# pkginfo | grep SUNWqfs
system  SUNWqfsr     Sun QFS software Solaris 9 (root)
system  SUNWqfsu     Sun QFS software Solaris 9 (usr)
```

7. **(Optional) Install the packages on additional host systems.**

   Perform this step if you are configuring a multihost file system.

   Repeat this procedure and install the packages on each host.

Enabling the Sun StorEdge QFS Software License

You need a license key to run the Sun StorEdge QFS software. For more information, see "Obtaining a Software License Key" on page 31.

The Sun StorEdge QFS file system uses an encrypted license key. The license key consists of an encoded alphanumeric string.

▼ To Enable the Sun StorEdge QFS Software License

1. **Create the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**
2. **Starting in column one, place the license key you have obtained from your ASP or from Sun Microsystems on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.
3. **(Optional) Install the license keys on additional host systems.**

   Perform this step if you are configuring a multihost file system.

   Repeat this procedure and install the license key for each host.

Setting Up PATH and MANPATH Variables

This procedure shows you how to modify your PATH and MANPATH environment variables so you can access the Sun StorEdge QFS commands and man pages easily.

▼ To Set Up PATH and MANPATH Variables

1. **For users who need to access the Sun StorEdge QFS user commands (for example, sls(1)), add /opt/SUNWsamfs/bin to the users' PATH variables.**

2. **Use vi(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.**

   a. **In the Bourne or Korn shell, edit the .profile file, change the PATH and MANPATH variables, and export the variables.**

   CODE EXAMPLE 2-3 shows how your .profile file might look after editing.

CODE EXAMPLE 2-3 Finished .profile File

```
PATH=$PATH:/opt/SUNWsamfs/bin:/opt/SUNWsamfs/sbin
MANPATH=$MANPATH:/opt/SUNWsamfs/man
export PATH MANPATH
```

   b. **In the C shell, edit the .login and .cshrc files.**

   When you have finished editing, the path statement in your .cshrc file might look like the following line:

```
set path = ($path /opt/SUNWsamfs/bin /opt/SUNWsamfs/sbin)
```

   CODE EXAMPLE 2-4 shows how the MANPATH in your .login file might look after you have finished editing.

CODE EXAMPLE 2-4 Finished MANPATH in the .login File

```
setenv MANPATH /usr/local/man:opt/SUNWspro/man:/$OPENWINHOME/\
share/man:/opt/SUNWsamfs/man
```

3. **(Optional) Set up the PATH and MANPATH variables on additional host systems.**

   Perform this step if you are configuring a multihost file system.

   Repeat this procedure and set up the PATH and MANPATH variables for each host.

Preparing the Host Systems

Perform this procedure if you are configuring the following types of file systems:

- Sun StorEdge QFS shared file system on Solaris OS
- Sun StorEdge QFS shared file system on Sun Cluster

▼ To Prepare the Host Systems

1. **Verify that all the hosts have the same user and group IDs.**

   If you are not running the Network Information Name service (NIS), make sure that all `/etc/passwd` and all `/etc/group` files are identical. If you are running NIS, the `/etc/passwd` and `/etc/group` files should already be identical.

   For more information about this, see the `nis+`(1) man page.

2. **(Optional) Enable the network time daemon command, `xntpd`(1M), to synchronize the times on all the hosts.**

   Perform this step if you are configuring a Sun StorEdge QFS shared file system on Solaris OS. You do not need to perform this step if you are configuring a Sun StorEdge QFS shared file system on Sun Cluster because it has already been done as part of the Sun Cluster installation.

   The clocks of all hosts must be synchronized, and must be kept synchronized, during Sun StorEdge QFS shared file system operations. For more information, see the `xntpd`(1M) man page.

   The following steps enable the `xntpd`(1M) daemon on one host:

   a. **Stop the `xntpd`(1M) daemon.**

      For example:

```
# /etc/init.d/xntpd stop
```

   b. **Use `vi`(1) or another editor to create file `/etc/inet/ntp.conf`.**

c. Create a line in file `/etc/inet/ntp.conf` **that specifies the name of the local time server.**

This line has the following format:

```
server IP-address prefer
```

In the preceding command, `server` and `prefer` are required keywords. Specify the IP Address of your local time server for *IP-address*.

If you have no local time server, see one of the following URLs for information on how to access a public time source:

```
http://www.eecis.udel.edu/~mills/ntp/servers.html
http://www.boulder.nist.gov/timefreq/general/pdf/1383.pdf
```

Alternatively, you can search for `public time sources` in a search engine.

d. Close file `/etc/inet/ntp.conf`**.**

e. Start the `xntpd`**(1M) daemon.**

```
# /etc/init.d/xntpd start
```

3. Repeat the preceding steps on each host.

(Optional) Enabling the SAM-QFS Manager

Perform this task if you want to be able to use the SAM-QFS Manager to configure, control, monitor, or reconfigure your Sun StorEdge QFS environment.

The procedures in this section are as follows:

- "To Install the SAM-QFS Manager Software" on page 57.
- "To Invoke the SAM-QFS Manager for the First Time" on page 61.
- "To Use the SAM-QFS Manager for Configuration" on page 62. Use this procedure to decide which configuration tasks you want to perform using the SAM-QFS Manager software.

In addition to the information in this section, this manual's appendix, "SAM-QFS Manager Software Notes" on page 309, describes other aspects of using the SAM-QFS Manager.

Note – The SAM-QFS Manager does not support the Sun StorEdge QFS shared file system nor does it support file systems in Sun Cluster environments.

▼ To Install the SAM-QFS Manager Software

1. **Ensure that you have met the installation requirements in "(Optional) Verifying Requirements for the SAM-QFS Manager" on page 45.**
2. **Log in to the server that you want to use as the management station.**

   This can be the same server upon which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages.
3. **Become superuser.**

4. **Use the `cd`(1) command to change to the directory where the software package release files reside on your server.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files.

   For example, if you obtained the release files from a CD-ROM, use the following command:

   ```
   # cd /cdrom/cdrom0
   ```

   If you downloaded the release files, change to the directory to which you downloaded the files.

5. **Execute the `samqfsmgr_setup` script to install the SAM-QFS Manager software.**

   For example:

   ```
   # samqfsmgr_setup
   ```

6. **Answer the questions as prompted by the `samqfsmgr_setup` script.**

   During the installation procedure, you are asked to answer questions about your environment. The script prompts you to enter passwords for the `SAMadmin` role and for the `samadmin` and `samuser` login IDs.

   The `samqfsmgr_setup` script automatically installs the following:

   - The TomCat, Java Runtime Environment (JRE), JATO, and Sun Web Console packages. If you have existing versions of these software packages that are not compatible with SAM-QFS Manager, the installation software asks you whether you want the appropriate levels to be installed at this time.
   - The `SUNWsamqfsuiu` package.
   - The `SUNWsamqfsuir` package.

   The installation scripts prompt you to answer questions regarding whether you want to install any localized packages.

   After installing the packages, it starts the TomCat Web Server, enables logging, and creates the `SAMadmin` role.

7. **Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.**

a. **In the Bourne or Korn shell, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.**

CODE EXAMPLE 2-5 shows how your `.profile` file might look after editing.

CODE EXAMPLE 2-5 Finished `.profile` File

```
PATH=$PATH:/opt/SUNWsamqfsui/bin
MANPATH=$MANPATH:/opt/SUNWsamqfsui/man
export PATH MANPATH
```

b. **In the C shell, edit the `.login` and `.cshrc` files.**

When you have finished editing, the `path` statement in your `.cshrc` file might look like the following line:

```
set path = ($path /opt/SUNWsamqfsui/bin)
```

CODE EXAMPLE 2-6 shows how the `MANPATH` in your `.login` file might look after you have finished editing.

CODE EXAMPLE 2-6 Finished `MANPATH` in the `.login` File

```
setenv MANPATH /usr/local/man:opt/SUNWspro/man:/$OPENWINHOME/\
share/man:/opt/SUNWsamfs/man:/opt/SUNWsamqfsui/man
```

8. **Log in to the Sun StorEdge QFS server and become superuser.**

9. **Use the `ps`(1) and `grep`(1) commands to make sure that the `rpcbind` service is running.**

For example:

```
# ps -ef | grep rpcbind
```

10. **Examine the output from the preceding commands.**

The output should contain a line similar to the following:

```
root   269     1  0   Feb 08 ?        0:06 /usr/sbin/rpcbind
```

If `rpcbind` does not appear in the output, enter the following command:

```
# /usr/sbin/rpcbind
```

11. **(Optional) Start the SAM-QFS Manager (`sam-mgmtrpcd`) daemon.**

    Perform this step if you did not choose to have this daemon started automatically at installation time.

    Enter the following command to start the SAM-QFS Manager daemon:

```
# /opt/SUNWsamfs/sbin/samadm config -a
```

    With this configuration, the system automatically restarts this daemon every time the daemon process dies. The daemon autorestarts at system reboots.

    If you want to stop the daemon completely, enter the following command:

```
# /opt/SUNWsamfs/sbin/samadm config -n
```

    The preceding command also prevents the daemon from restarting automatically.

    If you want the SAM-QFS Manager daemon to run only once and not automatically restart, use the following command:

```
# /opt/SUNWsamfs/sbin/samadm start
```

    If you have used the preceding command to start the daemon, use the following command to stop it:

```
# /opt/SUNWsamfs/sbin/samadm stop
```

    For more information, see the `samadm`(1M) man page.

Using the SAM-QFS Manager Software

After the SAM-QFS Manager is installed, you can log in to the software using two possible user names (`samadmin` and `samuser`) and two different roles (`SAMadmin` or `no role`). The tasks you can perform using the SAM-QFS Manager differ depending on the user name and the role you assume at login. These differences are as follows:

- If you log in as `samadmin`, you can choose from one of two roles.
  - The role of `SAMadmin` grants you full administrator privileges to configure, monitor, control, and reconfigure the devices in your Sun StorEdge QFS environment.

Only the Sun StorEdge QFS administrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.

- The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.

- If you log in as `samuser`, you can only monitor the environment. You cannot change or reconfigure it in any way.

With regard to system administration, be aware that the Solaris OS root user on the server that hosts the SAM-QFS Manager is not necessarily the administrator of the SAM-QFS Manager. Only `samadmin` has administrator priviledges for the SAM-QFS Manager application. The root user is the administrator of the management station.

▼ To Invoke the SAM-QFS Manager for the First Time

Perform this procedure if you want to invoke the SAM-QFS Manager and use it, rather than commands, to perform some of the configuration steps.

1. **Log in to the management station web server.**

2. **From a web browser, invoke the SAM-QFS Manager software.**

   The URL is as follows:

   ```
   https://hostname:6789
   ```

   For *hostname*, type the name of the host. If you need to specify a domain name in addition to the host name, specify the *hostname* in this format: *hostname*.*domainname*.

   Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.

3. **At the `User Name` prompt, enter `samadmin`.**

4. **At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the SAM-QFS Manager Software" on page 57.**

5. **Click on the `SAMadmin` role.**

   Only the Sun StorEdge QFS administrator should ever log in with the `SAMadmin` role.

6. **At the `Role Password` prompt, enter the password you entered in Step 4.**

7. **Click `Log In`.**

8. **Click `SAM-QFS Manager 1.1`.**

   You are now logged in to the SAM-QFS Manager.

- If you want to configure your environment at this time using the SAM-QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click Help. After you add the servers, see "To Use the SAM-QFS Manager for Configuration" on page 62 for more information about configuring your environment using the SAM-QFS Manager.
- If you want to quit using the SAM-QFS Manager at this time, click `Log Out`.
- If you want to create additional accounts at this time, see "SAM-QFS Manager Software Notes" on page 309.

▼ To Use the SAM-QFS Manager for Configuration

This manual guides you through the configuration process using Solaris OS commands, but you can also use the SAM-QFS Manager, instead of commands, to accomplish many of the tasks.

1. **Click `Help`, in the upper right corner of the screen, to access the SAM-QFS Manager online documentation.**

2. **Complete the configuration tasks.**

TABLE 2-1 shows the rest of the steps you must perform to install and configure a Sun StorEdge QFS file system and the means by which you can accomplish each task.

Perform the configuration steps in TABLE 2-1 in the order in which they appear. You can open a terminal window next to the SAM-QFS Manager window for use when you need to alternate between using commands and using the SAM-QFS Manager.

TABLE 2-1 Sun StorEdge QFS Installation Tasks

Task	Accomplish Through GUI	Accomplish Through Commands
"Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65	Yes	Yes
"(Optional) Editing the `defaults.conf` File" on page 102	No	Yes
"Verifying the License and `mcf` Files" on page 104	No	Yes
"(Optional) Creating the `samfs.cmd` File" on page 107	Yes	Yes
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109	Yes	Yes
"Initializing the File System" on page 113	Yes	Yes
"Mounting the File System" on page 117	Yes	Yes
"(Optional) Sharing the File System With NFS Client Systems" on page 121	No	Yes
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127	No	Yes
"(Optional) Backing Up Configuration Files" on page 130	No	Yes
"(Optional) Configuring the Remote Notification Facility" on page 131	No	Yes
"(Optional) Adding the Administrator Group" on page 134	No	Yes
"Configuring System Logging" on page 135	No	Yes
"(Optional) Configuring Other Products" on page 137	Not applicable	Not applicable

TABLE 2-1 describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and `mcf` Files" on page 104. You need to verify that your license file is installed and is working correctly, but if you use SAM-QFS Manager to create your `mcf` file, you do not need to verify your `mcf` file.

- "Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127. Performing this step is essential to preserving your data.

The other installation steps in TABLE 2-1 are necessary, or are highly recommended, depending on your environment.

Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File

Each Sun StorEdge QFS environment is unique. The system requirements and hardware that are used differ from site to site. It is up to you, the system administrator at your site, to set up the specific configuration for your Sun StorEdge QFS environment.

The master configuration file, `/etc/opt/SUNWsamfs/mcf`, defines the topology of the equipment managed by the Sun StorEdge QFS file system. This file specifies the devices and file systems included in the environment. You assign each piece of equipment a unique Equipment Identifier in the `mcf` file.

To configure Sun StorEdge QFS devices, create an `mcf` file in `/etc/opt/SUNWsamfs/mcf` that contains a line for each device and family set in your configuration. The `mcf` contains information that enables you to identify the disk slices to be used and to organize them into Sun StorEdge QFS file systems.

There are examples of `mcf` files in `/opt/SUNWsamfs/examples`.

Note – For information about file system design considerations, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

The following sections provide examples and describe activities related to creating and maintaining the `mcf` file:

Note – The instructions for creating the `mcf` file differ depending on whether you are creating a Sun StorEdge QFS environment or a Sun SAM-QFS environment.

If you are installing the Sun StorEdge QFS software, all configuration instructions are contained in this section.

If you are creating a Sun SAM-QFS environment, the instructions for configuring the file system portion of the `mcf` file are contained in this section. The instructions for library and drive configuration are contained in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191.

▼ To Create an `mcf` File

- **Use `vi`(1) or another editor to create the `mcf` file.**

  When you create the `mcf` file, follow these guidelines:

  - Delimit the fields in each line with spaces or tabs.
  - Begin each comment line entered into this file with a pound sign (#).
  - Use a dash (–) to indicate optional fields that are omitted.
  - If you are creating a Sun StorEdge QFS shared file system, create the `mcf` file on the metadata server first.

  CODE EXAMPLE 2-7 shows the fields of each line entry in the `mcf` file.

CODE EXAMPLE 2-7 `mcf` File Fields

```
#
# Sun QFS file system configuration
#
# Equipment       Equip  Equip Fam   Dev    Additional
# Identifier      Ord    Type  Set   State  Parameters
# ----------      -----  ----- ----  -----  ----------
```

Where to Go From Here

After you have created your `mcf` file, using the examples in this section as a guide, proceed on to one of the following sections depending on the type of file system you are configuring:

- If you are creating a shared file system, go to "(Optional) Creating the Shared Hosts File" on page 94.

- If you are creating a Sun StorEdge QFS single-host file system or a Sun StorEdge QFS highly available file system, go to "Initializing the Environment" on page 101.

mcf File Fields

The fields in an mcf file are the same regardless of what kind of file system you are configuring. CODE EXAMPLE 2-7 shows the fields. The following sections explain the fields. For more information about the content of these mcf file fields, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

The Equipment Identifier Field

This is a required field. Enter one of the following:

- The name of the file system. If this field contains the name of a file system, it is limited to 31 characters in length. Enter this same file system name in the Family Set fields for all devices to be included in this file system.
- The keyword nodev. This can appear in mcf files for Sun StorEdge QFS shared file system clients that are not metadata servers in Solaris OS environments. Do not use nodev for hosts configured in a Sun Cluster environment.
- The identifier for a disk partition or disk slice. The mcf file supports several kinds of file systems. The devices you specify in the Equipment Identifier field determine the kind of file system that you can configure.

  The specification for a disk partition or disk slice is limited to 127 characters in length. TABLE 2-2 shows the kinds of devices to use when creating Sun StorEdge QFS file systems.

TABLE 2-2 File System Types and Allowed Disk Devices

Platform	Sun StorEdge QFS (Shared)	Sun StorEdge QFS (Single Host)
Solaris OS	Raw devices (/dev/dsk/...)	Raw devices (/dev/dsk/*cntndnsn*) Volume-manager controlled devices (/dev/vx/... or /dev/md/...)
Sun Cluster	DID devices (/dev/did/...)	Global devices (/dev/global/...)

The following notes pertain to the information in TABLE 2-2:

- In a Sun Cluster environment, you can configure a Sun StorEdge QFS highly available file system from raw devices or from devices managed by a volume manager. You can use either a Sun or a VERITAS volume manager.

- Do not use a volume manager for devices configured in a Sun StorEdge QFS shared file system.
- If you are creating a Sun StorEdge QFS highly available file system, using a volume manager does not guarantee that the disks are highly available. For information about determining how a device can be configured in a Sun Cluster environment, see "(Optional) Verifying Requirements for Installing the Sun StorEdge QFS File System in a Sun Cluster Environment" on page 38.

The Equipment Ordinal Field

This is a required field. Enter a unique integer such that $1 \leq eq\_ord \leq 65534$.

The Equipment Type Field

This is a required field. Enter the code for the Equipment Type, as follows:

- The `ma` Equipment Type defines a file system in a Sun StorEdge QFS file system. This is the initial line for the file system. All subsequent lines for this file system define the devices.
- The `mm` Equipment Type defines a metadata device.
- The `mr` and `md` Equipment Type defines a round-robin or striped data device.
- The `g`*XXX* Equipment Type defines a striped group data device. Striped groups start with the letter `g`, followed by a 1-, 2-, or 3-digit integer. For example, both `g2` and `g14` are valid values for a striped group.

For more information about Equipment Types, see the `mcf`(4) man page.

The Family Set Field

This is a required field. Enter the name of the file system to which this device belongs. The system organizes all devices with the same Family Set name into a Sun StorEdge QFS file system. Limited to 31 characters.

If this line is the first in a series of lines that define devices for a particular file system, enter the same name you entered in the Equipment Identifier field.

If this line defines a device within a file system, enter the file system name in this field.

The Device State Field

This is an optional field. If specified, this field should contain either the keyword `on` or a dash character (-). Enter a state for the device for when the Sun StorEdge QFS file system is initialized.

The Additional Parameters Field

This is an optional field. Specify `shared` in this field only if you are configuring a Sun StorEdge QFS shared file system. For information about the Sun StorEdge QFS shared file system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

For more information, see the `mcf`(4) man page. An example `mcf` file is located in `/opt/SUNWsamfs/examples/mcf`.

Caution – Make sure you specify disk partitions that are not in use on your system. Do not use overlapping partitions.

If you give the wrong partition names, you risk damaging user or system data. This is true when creating any type of file system. The risk is greatest if the partition named contains a UFS file system that is not mounted currently.

CODE EXAMPLE 2-8 shows file system entries in an `mcf` file for a Sun StorEdge QFS file system that is local to one Solaris OS host.

CODE EXAMPLE 2-8 Example Sun StorEdge QFS `mcf` File

```
#
# Sun QFS file system configuration
#
# Equipment       Equip  Equip Fam   Dev    Additional
# Identifier      Ord    Type  Set   State  Parameters
# ----------      -----  ----- ----  -----  ----------
qfs1               1     ma    qfs1  on
/dev/dsk/c1t0d0s0 11     mm    qfs1  on
/dev/dsk/c1t1d0s4 12     mr    qfs1  on
/dev/dsk/c1t2d0s4 13     mr    qfs1  on
/dev/dsk/c1t3d0s4 14     mr    qfs1  on
```

Note – If you change the `mcf` file after the Sun StorEdge QFS file system is in use, you must convey the new `mcf` specifications to the Sun StorEdge QFS software. For information about propagating `mcf` file changes to the system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

Configuration Examples for Local File Systems

Use the configuration examples in this section for configuring the `mcf` file for a Sun StorEdge QFS file system to be installed in the following types of configurations:

- On a single Sun Solaris OS host.
- On a single host in a Sun Cluster. Such a file system is not highly available and is not shared.

For `mcf` examples that you can use in a Sun Cluster environment, see "Configuration Examples for Sun Cluster File Systems" on page 70.

Configuration Example 1

This example shows how to configure two Sun StorEdge QFS file systems using a server that has a Sun StorEdge Multipack desktop array connected by a SCSI attachment.

You can use the `format`(1M) command to determine how the disks are partitioned. CODE EXAMPLE 2-9 shows the `format`(1M) command's output.

CODE EXAMPLE 2-9 `format`(1M) Command Output for Configuration Example 1

```
# format < /dev/null
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c0t11d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@b,0
       2. c6t2d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@2,0
       3. c6t3d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@3,0
       4. c6t4d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@4,0
       5. c6t5d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@5,0
       6. c8t2d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@b,4000/SUNW,isptwo@3/sd@2,0
       7. c8t3d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@b,4000/SUNW,isptwo@3/sd@3,0
       8. c8t4d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@b,4000/SUNW,isptwo@3/sd@4,0
       9. c8t5d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@b,4000/SUNW,isptwo@3/sd@5,0
```

CODE EXAMPLE 2-9 `format`(1M) Command Output for Configuration Example 1 *(Continued)*

```
Specify disk (enter its number):
#

                                        # format(1M) shows the partition layout of all drives.
# format /dev/rdsk/c6t2d0s2             # Only the last lines of format(1M) output are shown.

Output Deleted From Example
Part      Tag    Flag     Cylinders        Size            Blocks
  0 unassigned    wm       0                0         (0/0/0)           0
  1 unassigned    wm       0                0         (0/0/0)           0
  2     backup    wu       0 - 4923         8.43GB    (4924/0/0) 17682084
  3 unassigned    wm       0                0         (0/0/0)           0
  4 unassigned    wm       0 - 1229         2.11GB    (1230/0/0)  4416930
  5 unassigned    wm    1230 - 2459         2.11GB    (1230/0/0)  4416930
  6 unassigned    wm    2460 - 3689         2.11GB    (1230/0/0)  4416930
  7 unassigned    wm    3690 - 4919         2.11GB    (1230/0/0)  4416930
```

▼ To Configure the System

Begin writing the `mcf` file for this configuration example by defining the file system and its disk partitions, as follows:

1. **Write the `mcf` file.**

   a. **Make an `ma` entry for the first file system.**

   b. **Make an `mm` entry listing the partition(s) that comprise the metadata for the `qfs1` file system.**

   c. **Make a series of `mr` entries listing the partitions that comprise the file data for the `qfs1` file system.**

   d. **Make similar entries for the second (`qfs2`) file system.**

   The finished `mcf` file defines the following two file systems:

   - The `qfs1` file system, which is created on slice `4` of the following disks: `c8t2d0` (metadata), `c6t2d0` (file data), and `c6t3d0` (file data).
   - The `qfs2` file system, which is created on slice 5 of the following disks: `c8t2d0` (metadata), `c6t2d0` (file data), and `c6t3d0` (file data).

   CODE EXAMPLE 2-10 shows the resulting `mcf` file.

CODE EXAMPLE 2-10 `mcf` File for Sun StorEdge QFS Example 1

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment          Eq   Eq     Family   Device   Additional
# Identifier         Ord  Type    Set     State    Parameters
#-----------         ---  ----   ------   ------   ----------
```

CODE EXAMPLE 2-10 `mcf` File for Sun StorEdge QFS Example 1 *(Continued)*

```
#
qfs1                  10     ma    qfs1         on
/dev/dsk/c8t2d0s4     11     mm    qfs1         on
/dev/dsk/c6t2d0s4     12     mr    qfs1         on
/dev/dsk/c6t3d0s4     13     mr    qfs1         on
#
qfs2                  20     ma    qfs2         on
/dev/dsk/c8t2d0s5     21     mm    qfs2         on
/dev/dsk/c6t2d0s5     22     mr    qfs2         on
/dev/dsk/c6t3d0s5     23     mr    qfs2         on
```

2. **Modify the `/etc/vfstab` file.**

   Make entries in the `/etc/vfstab` file for the `qfs1` and `qfs2` file systems you defined in the `mcf` file. The last two lines in CODE EXAMPLE 2-11 show entries for these new file systems.

CODE EXAMPLE 2-11 `/etc/vfstab` File for Sun StorEdge QFS Example 1

```
# cat /etc/vfstab
# device            device                          file            mount
# to                to                    mount     system   fsck   at     mount
# mount             fsck                  point     type     pass   boot   params
# -----             ----                  -----     ----     ----   ----   ------
fd                  -                     /dev/fd   fd        -     no     -
/proc               -                     /proc     proc      -     no     -
/dev/dsk/c0t10d0s1  -                     -         swap      -     no     -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0   /         ufs       1     no     logging
swap                -                     /tmp      tmpfs     -     yes    -
qfs1                -                     /qfs1     samfs     -     yes    stripe=1
qfs2                -                     /qfs2     samfs     -     yes    stripe=1
```

Note – Modifying the `/etc/vfstab` file is a later step in this chapter's configuration procedure. This step shows the `/etc/vfstab` file modifications only for completeness' sake.

Configuration Example 2

This example illustrates a Sun StorEdge QFS file system that uses round-robin allocation on four disk drives.

This example assumes the following:

- The metadata device is a single partition (`s1`) used on controller 8, disk 4.

- The data devices consist of four disks attached to controller 6. Each disk is on a separate target (1-4).

▼ To Configure the System

This example introduces the round-robin data layout. For more information about data layout, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

1. **Write the `mcf` file.**

   CODE EXAMPLE 2-12 shows the `mcf` file for this round-robin disk configuration.

CODE EXAMPLE 2-12 `mcf` File for Sun StorEdge QFS Example 2

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment          Eq   Eq     Family   Device   Additional
# Identifier         Ord  Type    Set     State    Parameters
#------------        ---  ----   ------   ------   ----------
#
qfs3                  10    ma   qfs3       on
/dev/dsk/c8t4d0s4     11    mm   qfs3       on
/dev/dsk/c6t2d0s4     12    mr   qfs3       on
/dev/dsk/c6t3d0s4     13    mr   qfs3       on
/dev/dsk/c6t4d0s4     14    mr   qfs3       on
/dev/dsk/c6t5d0s4     15    mr   qfs3       on
```

Note – Modifying the `/etc/vfstab` file and using the `sammkfs`(1M) command are later steps in this chapter's configuration procedure. This step shows these steps only for completeness' sake.

---

2. **Modify the `/etc/vfstab` file.**

   Edit the `/etc/vfstab` file to explicitly set round-robin allocation on the file system by specifying `stripe=0` in the `mount params` field. CODE EXAMPLE 2-13 shows `stripe=0` for the `qfs3` file system.

CODE EXAMPLE 2-13 `/etc/vfstab` File for Sun StorEdge QFS Example 2

```
# cat /etc/vfstab
#device             device                          file          mount
#to                 to                  mount       system  fsck  at    mount
#mount              fsck                point       type    pass  boot  params
#-----              ----                -----       ----    ----  ----  ------
fd                  -                   /dev/fd     fd      -     no    -
/proc               -                   /proc       proc    -     no    -
/dev/dsk/c0t10d0s1  -                   -           swap    -     no    -
```

CODE EXAMPLE 2-13 `/etc/vfstab` File for Sun StorEdge QFS Example 2 *(Continued)*

```
/dev/dsk/c0t10d0s0   /dev/rdsk/c0t10d0s0   /        ufs     1     no     logging
swap                 -                     /tmp     tmpfs   -     yes    -
qfs3                 -                     /qfs3    samfs   -     yes    stripe=0
```

3. **Run the `sammkfs`(1M) command.**

   Initialize the Sun StorEdge QFS file system by using the `sammkfs`(1M) command. The default DAU is 64 kilobytes, but the following example sets the DAU size to 128 kilobytes:

```
# sammkfs -a 128 qfs1
```

Configuration Example 3

This example illustrates a Sun StorEdge QFS file system. It stripes file data to four disk drives. This example assumes the following:

- The metadata device is a single partition (`s6`) used on controller 0, LUN `0`.
- The data devices consist of four disks attached to controller 6. Each disk is on a separate disk (2-5).

▼ To Configure the System

1. **Write the `mcf` file.**

   Write the `mcf` file using the disk configuration assumptions. CODE EXAMPLE 2-14 shows a sample `mcf` file for a striped disk configuration.

CODE EXAMPLE 2-14 `mcf` File for Sun StorEdge QFS Example 3

```
# Equipment          Eq   Eq     Family   Device   Additional
# Identifier         Ord  Type    Set      State    Parameters
#------------        ---  ----   ------   ------   ----------
#
qfs4                  40    ma   qfs4       on
/dev/dsk/c8t4d0s4     41    mm   qfs4       on
/dev/dsk/c6t2d0s4     42    mr   qfs4       on
/dev/dsk/c6t3d0s4     43    mr   qfs4       on
/dev/dsk/c6t4d0s4     44    mr   qfs4       on
/dev/dsk/c6t5d0s4     45    mr   qfs4       on
```

Note – Modifying the `/etc/vfstab` file and using the `sammkfs`(1M) command are later steps in this chapter's configuration procedure. This step shows these steps only for completeness' sake.

2. **Modify the `/etc/vfstab` file.**

   Set the stripe width by using the `stripe=` option. CODE EXAMPLE 2-15 shows the `/etc/vfstab` file with a mount parameter of `stripe=1` set for the `qfs4` file system.

CODE EXAMPLE 2-15 `/etc/vfstab` File for Sun StorEdge QFS Example 3

```
# cat /etc/vfstab
#
#device             device                          file         mount
#to                 to                   mount      system fsck  at     mount
#mount              fsck                 point      type   pass  boot   params
#-----              ----                 -----      -----  ----  ----   ------
fd                  -                    /dev/fd    fd     -     no     -
/proc               -                    /proc      proc   -     no     -
/dev/dsk/c0t10d0s1  -                    -          swap   -     no     -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0  /          ufs    1     no     logging
swap                -                    /tmp       tmpfs  -     yes    -
qfs4                -                    /qfs4      samfs  -     yes    stripe=1
```

The `stripe=1` specification stripes file data across all four of the `mr` data disks with a stripe width of one disk allocation unit (DAU). Note that the DAU is the allocation unit you set when you use the `sammkfs`(1M) command to initialize the file system.

3. **Run the `sammkfs`(1M) command.**

   Initialize the Sun StorEdge QFS file system by using the `sammkfs`(1M) command. The following example sets the DAU size to 128 kilobytes:

```
# sammkfs -a 128 qfs1
```

With this striped disk configuration, any file written to this file system is striped across all of the devices in increments of 128 kilobytes. Files less than the aggregate stripe width times the number of devices still use 128 kilobytes of disk space. Files larger than 128 kilobytes have space allocated for them as needed in total space increments of 128 kilobytes. The file system writes metadata to device 41 only.

Configuration Example 4

Striped groups allow you to build RAID-0 devices of separate disk devices. With striped groups, however, there is only one DAU per striped group. This method of writing huge, effective DAUs across RAID devices saves system update time and supports high-speed sequential I/O. Striped groups are useful for writing very large files to groups of disk devices.

Note – A DAU is the minimum disk space allocated. The minimum disk space allocated in a striped group is as follows:

allocation_unit x *number of disks in the group*

Writing a single byte of data consumes a DAU on every member of the entire striped group. Make sure that you understand the effects of using striped groups with your file system.

The devices within a striped group must be the same size. It is not possible to increase the size of a striped group. You can add additional striped groups to the file system, however.

This example configuration illustrates a Sun StorEdge QFS file system that separates the metadata onto a low-latency disk. The `mcf` file defines two striped groups on four drives. This example assumes the following:

- The metadata device is a single partition (`s5`) used on controller 8, disk 4.
- The data devices consist of four disks (two groups of two identical disks) attached to controller 6. Each device is on a separate disk (targets 2-5).

▼ To Configure the System

1. **Write the `mcf` file.**

   Write the `mcf` file by using the disk configuration assumptions. CODE EXAMPLE 2-16 shows a sample `mcf` file for a striped group configuration.

CODE EXAMPLE 2-16 `mcf` File for Sun StorEdge QFS Example 4

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment          Eq   Eq     Family   Device   Additional
# Identifier         Ord  Type    Set     State    Parameters
#-----------         ---  ----   ------   ------   ----------
#
qfs5                  50    ma   qfs5       on
/dev/dsk/c8t4d0s5     51    mm   qfs5       on
/dev/dsk/c6t2d0s5     52    g0   qfs5       on
```

CODE EXAMPLE 2-16 `mcf` File for Sun StorEdge QFS Example 4 *(Continued)*

```
/dev/dsk/c6t3d0s5     53     g0    qfs5        on
/dev/dsk/c6t4d0s5     54     g1    qfs5        on
/dev/dsk/c6t5d0s5     55     g1    qfs5        on
```

Note – Modifying the `/etc/vfstab` file and using the `sammkfs`(1M) command are later steps in this chapter's configuration procedure. This procedure shows these steps only for completeness' sake.

---

2. **Modify the `/etc/vfstab` file.**

   Use the the `stripe=` option to set the stripe width. CODE EXAMPLE 2-17 shows the `/etc/vfstab` file with a mount parameter of `stripe=0`, which specifies a round-robin allocation between striped group `g0` to striped group `g1`.

CODE EXAMPLE 2-17 `/etc/vfstab` File for Sun StorEdge QFS Example 4

```
# cat /etc/vfstab
#device             device                          file          mount
#to                 to                   mount      system  fsck  at    mount
#mount              fsck                 point      type    pass  boot  params
#-----              ----                 -----      ----    ----  ----  ------
fd                  -                    /dev/fd    fd      -     no    -
/proc               -                    /proc      proc    -     no    -
/dev/dsk/c0t10d0s1  -                    -          swap    -     no    -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0  /          ufs     1     no    logging
swap                -                    /tmp       tmpfs   -     yes   -
qfs5                -                    /qfs5      samfs   -     yes   stripe=0
```

3. **Run the `sammkfs`(1M) command.**

   Initialize the Sun StorEdge QFS file system by using the `sammkfs`(1M) command. The `-a` option is not used with striped groups because the DAU is equal to the size of an allocation, or the size, of each group.

```
# sammkfs qfs5
```

   In this example, there are two striped groups, `g0` and `g1`. With `stripe=0` in `/etc/vfstab`, devices 12 and 13 are striped; devices 14 and 15 are striped; and files are round robined around the two striped groups. You are actually treating a striped group as a bound entity. After you configure a stripe group, you cannot change it without issuing another `sammkfs`(1M) command.

Configuration Example for a Sun StorEdge QFS Shared File System on a Solaris OS Platform

FIGURE 2-1 illustrates a Sun StorEdge QFS shared file system configuration in a Sun SAM-QFS environment.

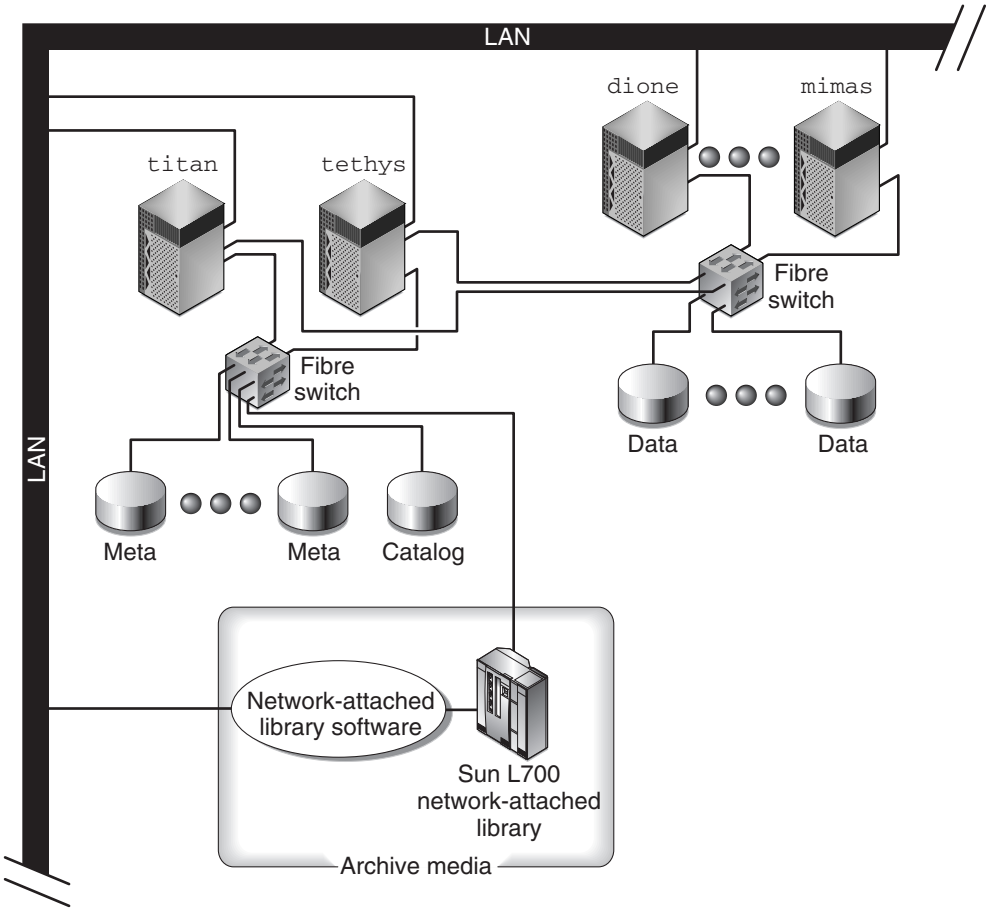

FIGURE 2-1 Sun StorEdge QFS Shared File System Configuration in a Sun SAM-QFS Environment

FIGURE 2-1 shows four network-attached hosts: `titan`, `tethys`, `dione`, and `mimas`. The `tethys`, `dione`, and `mimas` hosts are the clients, and `titan` is the current metadata server. The `titan` and `tethys` hosts are potential metadata servers.

The archive media consists of a network-attached library and tape drives that are fibre-attached to `titan` and `tethys`. In addition, the archive media catalog resides in a file system that is mounted on the current metadata server, `titan`.

Metadata travels to and from the clients to the metadata server over the network. The metadata server makes all modifications to the name space, and this keeps the metadata consistent. The metadata server also provides the locking capability, the block allocation, and the block deallocation.

Several metadata disks are connected to `titan` and `tethys`, and these disks can be accessed only by the potential metadata servers. If `titan` were unavailable, you could change the metadata server to `tethys`, and the library, tape drives, and catalog could be accessed by `tethys` as part of the Sun StorEdge QFS shared file system. The data disks are connected to all four hosts by a Fibre Channel connection.

▼ To Configure the System

1. **Issue the `format`(1M) command and examine its output.**

   Make sure that the metadata disk partitions configured for the Sun StorEdge QFS shared file system mount point are connected to the potential metadata servers. Also make sure that the data disk partitions configured for the Sun StorEdge QFS shared file system are connected to the potential metadata servers and to all the client hosts in this file system.

   If your host supports multipath I/O drivers, individual devices shown in the format(1M) command's output might show multiple controllers. These correspond to the multiple paths to the actual devices.

   CODE EXAMPLE 2-18 shows the `format`(1M) command output for `titan`. There is one metadata disk on controller 2, and there are three data disks on controller 3.

CODE EXAMPLE 2-18 `format` (1M) Command Output on `titan`

```
titan<28>format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e9c296,0
       1. c2t2100002037E2C5DAd0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e9c296,0
       2. c2t50020F23000065EEd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w50020f23000065ee,0
       3. c3t50020F2300005D22d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
          /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50020f2300005d22,0
       4. c3t50020F2300006099d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
          /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50020f2300006099,0
       5. c3t50020F230000651Cd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
          /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50020f230000651c,0
```

   CODE EXAMPLE 2-19 shows the `format`(1M) command output for `tethys`. There is one metadata disk on controller 2, and there are four data disks on controller 7.

CODE EXAMPLE 2-19 `format` (1M) Command Output on `tethys`

```
tethys<1>format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t1d0 <IBM-DNES-318350Y-SA60 cyl 11112 alt 2 hd 10 sec 320>
          /pci@1f,4000/scsi@3/sd@1,0
       1. c2t2100002037E9C296d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
```

CODE EXAMPLE 2-19 `format` (1M) Command Output on `tethys` *(Continued)*

```
           /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e9c296,0
       2. c2t50020F23000065EEd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@4/ssd@w50020f23000065ee,0
       3. c7t50020F2300005D22d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@5/ssd@w50020f2300005d22,0
       4. c7t50020F2300006099d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@5/ssd@w50020f2300006099,0
       5. c7t50020F230000651Cd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@5/ssd@w50020f230000651c,0
```

Note the following in CODE EXAMPLE 2-19:

- The data disks on `titan`'s controller 3 are the same disks as `tethys'` controller 7. You can verify this by looking at the World Wide Name, which is the last component in the device name. For `titan`'s number 3 disk, the World Wide Name is `50020F2300005D22`. This is the same name as number 3 on controller 7 on `tethys`.
- For `titan`'s metadata disk, the World Wide Name is `50020F23000065EE`. This is the same metadata disk as `tethys'` controller 2, target 0.

CODE EXAMPLE 2-20 shows the `format`(1M) command's output for `mimas`. This shows three data disks on controller 1 and no metadata disks.

CODE EXAMPLE 2-20 `format` (1M) Command Output on `mimas`

```
mimas<9>format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
           /pci@1f,4000/scsi@3/sd@0,0
       1. c1t50020F2300005D22d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@4/fp@0,0/ssd@w50020f2300005d22,0
       2. c1t50020F2300006099d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@4/fp@0,0/ssd@w50020f2300006099,0
       3. c1t50020F230000651Cd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128 sec 256>
           /pci@1f,4000/SUNW,qlc@4/fp@0,0/ssd@w50020f230000651c,0
```

CODE EXAMPLE 2-19 and CODE EXAMPLE 2-20 show that the data disks on `titan`'s controller 3 are the same disks as `mimas'` controller 1. You can verify this by looking at the World Wide Name, which is the last component in the device name. For `titan`'s number 3 disk, the World Wide Name is `50020F2300005D22`. This is the same name as number 3 on controller 1 on `mimas`.

Note – All the data disk partitions must be connected and accessible from all the hosts that share this file system. All the disk partitions, for both data and metadata, must be connected and accessible to all potential metadata servers. You can use the `format`(1M) command to verify these connections.

For some storage devices, it is possible that the `format`(1M) command's output does not present unique worldwide Names. If you find that this is the case, see the `libdevid`(3LIB) man page for information about finding such devices on different hosts.

2. **Use `vi`(1) or another editor to create the `mcf` file on the metadata server.**

   The only difference between the `mcf` file of a shared Sun StorEdge QFS file system and an unshared Sun StorEdge QFS file system is the presence of the `shared` keyword in the Additional Parameters field of the file system name line of a Sun StorEdge QFS shared file system.

Note – If Sun StorEdge QFS or Sun StorEdge SAM-FS file systems are already operational on the Sun StorEdge QFS shared file system's metadata server or on any of the client host systems, select a Family Set name and select Equipment Ordinals that do not conflict with existing Family Set names or Equipment Ordinals on any host that will be included in the Sun StorEdge QFS shared file system.

CODE EXAMPLE 2-21 shows an `mcf` file fragment for `titan` that defines several disks for use in the Sun StorEdge QFS shared file system. It shows the `shared` keyword in the Additional Parameters field on the file system name line.

CODE EXAMPLE 2-21 Sun StorEdge QFS Shared File System `mcf` File Example for `titan`

```
# Equipment                       Eq   Eq    Family   Dev   Addl
# Identifier                      Ord  Type  Set      Stat  Params
------------                      ---  ----  ------   ----  ------
sharefs1                          10   ma    sharefs1 on    shared
/dev/dsk/c2t50020F23000065EEd0s6 11   mm    sharefs1 on
/dev/dsk/c3t50020F2300005D22d0s6 12   mr    sharefs1 on
/dev/dsk/c3t50020F2300006099d0s6 13   mr    sharefs1 on
/dev/dsk/c3t50020F230000651Cd0s6 14   mr    sharefs1 on
```

Note – In a Sun SAM-QFS shared file system, for each host that is a metadata server or potential metadata server, that hosts's `mcf` file must define all libraries and library catalogs used by its own shared file systems and by its potential shared file systems. This is necessary if you want to change the metadata server. For information on defining libraries in an `mcf` file, see the "Sun StorEdge SAM-FS Initial Installation Procedure" on page 163.

Configuration Examples for Sun StorEdge QFS Highly Available File Systems

The Sun Cluster software moves a Sun StorEdge QFS highly available file system from a failing node to a viable node in the event of a node failure.

Each node in the Sun Cluster that can host this file system must have an `mcf` file. Later on in this chapter's configuration process, you copy `mcf` file lines from the metadata server's `mcf` file to other nodes in the Sun Cluster.

▼ To Create an `mcf` File for a Sun StorEdge QFS Highly Available File System

The procedure for creating an `mcf` file for a Sun StorEdge QFS highly available file system is as follows:

1. **Make an `ma` entry for the file system.**
2. **Make an `mm` entry listing the partition(s) that comprise the metadata for the `qfs1` file system.**
3. **Make a series of `mr`, `gXXX`, or `md` entries listing the partitions that comprise the file data for the `qfs1` file system.**

   You can use the `scdidadm`(1M) command to determine the partitions to use.

Example 1. CODE EXAMPLE 2-22 is an example `mcf` file entry for a Sun StorEdge QFS highly available file system that uses raw devices.

CODE EXAMPLE 2-22 `mcf` File That Specifies Raw Devices

```
Equipment             Eq   Eq     Family   Additional
Identifier            Ord  Type   Set      Parameters
--------------------- ---  ----   ------   ----------
qfs1                    1   ma    qfs1     on
/dev/global/dsk/d4s0   11   mm    qfs1
/dev/global/dsk/d5s0   12   mr    qfs1
/dev/global/dsk/d6s0   13   mr    qfs1
/dev/global/dsk/d7s0   14   mr    qfs1
```

Example 2. CODE EXAMPLE 2-23 is an example `mcf` file entry for a Sun StorEdge QFS highly available file system that uses Solaris Volume Manager metadevices. The example assumes that the Solaris Volume Manager metaset in use is named `red`.

CODE EXAMPLE 2-23 `mcf` File That Specifies Solaris Volume Manager Devices

```
Equipment             Eq   Eq     Family   Additional
Identifier            Ord  Type   Set      Parameters
--------------------- ---  ----   ------   ----------
```

CODE EXAMPLE 2-23 `mcf` File That Specifies Solaris Volume Manager Devices *(Continued)*

```
qfs1                    1    ma     qfs1      on
/dev/md/red/dsk/d0s0   11    mm     qfs1
/dev/md/red/dsk/d1s0   12    mr     qfs1
```

Example 3. CODE EXAMPLE 2-24 is an example `mcf` file entry for a Sun StorEdge QFS highly available file system that uses VxVm devices.

CODE EXAMPLE 2-24 `mcf` File That Specifies VxVM Devices

```
Equipment             Eq    Eq      Family    Additional
Identifier            Ord   Type    Set       Parameters
--------------------- ---   ----    ------    ----------
qfs1                    1    ma     qfs1      on
/dev/vx/dsk/oradg/m1   11    mm     qfs1
/dev/vx/dsk/oradg/m2   12    mr     qfs1
```

Configuration Example for a Sun StorEdge QFS Shared File System on a Sun Cluster Platform

This example assumes that both `ash` and `elm` are nodes in a Sun Cluster. Host `ash` is the metadata server. The keyword `shared` in this example's `mcf` file indicates to the system that this is a shared file system. This example builds upon "Example - Using the `scdidadm`(1M) Command in a Sun Cluster" on page 41.

▼ To Create an `mcf` File for a Sun StorEdge QFS Shared File System on a Sun Cluster

Make sure that you create the `mcf` file on the node that you want to designate as the metadata server. The procedure for creating an `mcf` file for a Sun StorEdge QFS shared file system on a Sun Cluster is as follows:

1. **Use the `scdidadm`(1M) `-L` command to obtain information about the devices included in the Sun Cluster.**

   The `scdidadm`(1M) command administers the device identifier (DID) devices. The `-L` option lists all the DID device paths, including those on all nodes in the Sun Cluster. CODE EXAMPLE 2-25 shows the format output from all the `/dev/did` devices. This information is needed when you build the `mcf` file.

CODE EXAMPLE 2-25 `format`(1M) Command Output

```
ash# format /dev/did/rdsk/d4s2
selecting /dev/did/rdsk/d4s2

Primary label contents:

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 64 sec 32>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =   64
nsect       =   32
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264       16.86GB    (17265/0/0) 35358720
  1        usr    wm   17265 - 34529       16.86GB    (17265/0/0) 35358720
  2     backup    wu       0 - 34529       33.72GB    (34530/0/0) 70717440
  3 unassigned    wu       0                0         (0/0/0)             0
  4 unassigned    wu       0                0         (0/0/0)             0
  5 unassigned    wu       0                0         (0/0/0)             0
  6 unassigned    wu       0                0         (0/0/0)             0
  7 unassigned    wu       0                0         (0/0/0)             0

ash# format /dev/did/rdsk/d5s2
selecting /dev/did/rdsk/d5s2

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 192 sec 64>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =  192
nsect       =   64
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      101.16GB    (17265/0/0) 212152320
  1        usr    wm   17265 - 34529      101.16GB    (17265/0/0) 212152320
  2     backup    wu       0 - 34529      202.32GB    (34530/0/0) 424304640
  3 unassigned    wu       0                0         (0/0/0)             0
  4 unassigned    wu       0                0         (0/0/0)             0
  5 unassigned    wu       0                0         (0/0/0)             0
```

CODE EXAMPLE 2-25 `format`(1M) Command Output *(Continued)*

```
  6 unassigned    wu       0                0         (0/0/0)             0
  7 unassigned    wu       0                0         (0/0/0)             0

ash# format /dev/did/rdsk/d6s2
selecting /dev/did/rdsk/d6s2

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 64 sec 32>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =   64
nsect       =   32
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264       16.86GB    (17265/0/0) 35358720
  1        usr    wm   17265 - 34529       16.86GB    (17265/0/0) 35358720
  2     backup    wu       0 - 34529       33.72GB    (34530/0/0) 70717440
  3 unassigned    wu       0                0         (0/0/0)             0
  4 unassigned    wu       0                0         (0/0/0)             0
  5 unassigned    wu       0                0         (0/0/0)             0
  6 unassigned    wu       0                0         (0/0/0)             0
  7 unassigned    wu       0                0         (0/0/0)             0


ash# format /dev/did/rdsk/d7s2
selecting /dev/did/rdsk/d7s2

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 192 sec 64>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =  192
nsect       =   64
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      101.16GB    (17265/0/0) 212152320
  1        usr    wm   17265 - 34529      101.16GB    (17265/0/0) 212152320
  2     backup    wu       0 - 34529      202.32GB    (34530/0/0) 424304640
  3 unassigned    wu       0                0         (0/0/0)             0
  4 unassigned    wu       0                0         (0/0/0)             0
  5 unassigned    wu       0                0         (0/0/0)             0
  6 unassigned    wu       0                0         (0/0/0)             0
  7 unassigned    wu       0                0         (0/0/0)             0

ash# format /dev/did/rdsk/d8s2
selecting /dev/did/rdsk/d8s2
```

CODE EXAMPLE 2-25 `format`(1M) Command Output *(Continued)*

```
Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 128 sec 128>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =  128
nsect       =  128
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      134.88GB    (17265/0/0) 282869760
  1        usr    wm   17265 - 34529      134.88GB    (17265/0/0) 282869760
  2     backup    wm       0 - 34529      269.77GB    (34530/0/0) 565739520
  3 unassigned    wu       0                 0        (0/0/0)             0
  4 unassigned    wu       0                 0        (0/0/0)             0
  5 unassigned    wu       0                 0        (0/0/0)             0
  6 unassigned    wu       0                 0        (0/0/0)             0
  7 unassigned    wu       0                 0        (0/0/0)             0


ash# format /dev/did/rdsk/d9s2
selecting /dev/did/rdsk/d9s2

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 128 sec 128>
pcyl        = 34532
ncyl        = 34530
acyl        =    2
nhead       =  128
nsect       =  128
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      134.88GB    (17265/0/0) 282869760
  1        usr    wm   17265 - 34529      134.88GB    (17265/0/0) 282869760
  2     backup    wu       0 - 34529      269.77GB    (34530/0/0) 565739520
  3 unassigned    wu       0                 0        (0/0/0)             0
  4 unassigned    wu       0                 0        (0/0/0)             0
  5 unassigned    wu       0                 0        (0/0/0)             0
  6 unassigned    wu       0                 0        (0/0/0)             0
  7 unassigned    wu       0                 0        (0/0/0)             0
```

The `format`(1M) command reveals the space available on a device, but it does not reveal whether a disk is mirrored or striped. Put the file system's `mm` devices on mirrored (RAID-1) disks. The `mm` devices should constitute about 10% of the space allocated for the entire file system. CODE EXAMPLE 2-25's `format`(1M) output reveals the following information that is used when writing the `mcf` file shown in CODE EXAMPLE 2-26:

- Output for devices `d4s0` and `d6s0` show 16.86 GB each. These devices are Equipment Ordinal `501` and Equipment Ordinal `502`, respectively.

- Output for devices `d8s0` and `d9s0` show 134.88 GB each. These devices are Equipment Ordinal `503` and Equipment Ordinal `504`, respectively.

2. **Make an `ma` entry for the file system.**

   In this line entry, make sure to include the `shared` keyword in the Additional Parameters field.

3. **Make an `mm` entry listing the partition(s) that comprise the metadata for the `qfs1` file system.**

4. **Make a series of `mr` entries listing the partitions that comprise the file data for the `qfs1` file system.**

   CODE EXAMPLE 2-26 shows the `mcf` file.

CODE EXAMPLE 2-26 `mcf` File on Metadata Server `ash`

```
Equipment             Eq   Eq     Family   Additional
Identifier            Ord  Type   Set      Parameters
--------------------- ---  ----   ------   ----------
#
# Family Set sqfs1 (shared FS for SunCluster)
#
sqfs1                 500   ma    sqfs1    shared
/dev/did/dsk/d4s0     501   mm    sqfs1    -
/dev/did/dsk/d6s0     502   mm    sqfs1    -
/dev/did/dsk/d8s0     503   mr    sqfs1    -
/dev/did/dsk/d9s0     504   mr    sqfs1    -
```

(Optional) Editing `mcf` Files on Other Hosts

Perform this task if you are configuring one of the following types of file systems:

- Sun StorEdge QFS shared file system on Solaris OS
- Sun StorEdge QFS shared file system on Sun Cluster
- Sun StorEdge QFS highly available file system on Sun Cluster

The `mcf` file lines that define a particular file system must be identical in the `mcf` file on each host system that supports the file system. Only one `mcf` file can reside on a host. Because you can have other, additional Sun StorEdge QFS file systems defined in an `mcf` file, the `mcf` files on each host might not be identical.

▼ To Edit `mcf` Files on Other Hosts in a Sun Cluster for a Sun StorEdge QFS Highly Available File System

Perform this procedure for a Sun StorEdge QFS highly available file system on Sun Cluster hosts.

1. **Log in to a Sun Cluster node that you want to support the file system you are configuring.**
2. **Become superuser.**
3. **Use `vi`(1) or another editor to create an `mcf` file on that node.**

   If an `mcf` file already exists on the host, add the lines for the new file system to this `mcf` file.
4. **Copy the lines that define the file system from the primary node's `mcf` file to this node's `mcf` file.**
5. **Repeat the preceding steps for each host that you want to support the file system.**

▼ To Edit `mcf` Files on Other Hosts for a Sun StorEdge QFS Shared File System

Perform this procedure for a shared file system on Solaris OS hosts or on Sun Cluster hosts.

1. **Log into another host that you want to include in the file system.**
2. **Become superuser.**
3. **Use the `format`(1M) command to verify the presence of client host disks.**
4. **Use `vi`(1) or another editor to create an `mcf` file.**

   If an `mcf` file already exists on the host, add the lines for the new file system to this `mcf` file.
5. **Issue the `samfsconfig`(1M) command.**

   Examine this command's output to locate the local device names for each additional host to be configured in the Sun StorEdge QFS shared file system.
6. **Update the `mcf` file on other client hosts.**

   Any host system that wants to access or mount a shared file system must have that file system defined in its `mcf` file. The content of these `mcf` files differs depending on whether the Solaris OS or Sun Cluster hosts the file system, as follows:

   - On Solaris hosts, there are three types of hosts: the metadata server, clients that are potential metadata servers, and clients that can never be metadata servers. For clients that can never become metadata servers, use the keyword `nodev` in the Equipment Identifier field. The examples in this section show how to use this.
   - On Sun Cluster hosts, there are two types of hosts: the primary metadata server and potential metadata servers. There are no hosts that cannot be metadata servers because the Sun Cluster software fails over system resources in the event of a node failure.

   Use `vi`(1) or another editor to edit the `mcf` file on one of the client host systems. The `mcf` file must be updated on all client hosts to be included in the Sun StorEdge QFS shared file system. The file system and disk declaration information must have the same data for the Family Set name, Equipment Ordinal, and Equipment Type as the configuration on the metadata server. The `mcf` files on the client hosts must also include the `shared` keyword. The device names, however, can change as controller assignments can change from host to host.

   The `samfsconfig`(1M) command generates configuration information that can help you to identify the devices included in the Sun StorEdge QFS shared file system. Enter a separate `samfsconfig`(1M) command on each client host. Note that the controller number might not be the same controller number as on the metadata server because the controller numbers are assigned by each client host.

7. **Repeat this procedure for each host that you want to include in the file system.**

Examples

Example 1 - Solaris OS hosts. CODE EXAMPLE 2-27 shows how the `samfsconfig`(1M) command is used to retrieve device information for family set `sharefs1` on client `tethys`. Note that `tethys` is a potential metadata server, so it is connected to the same metadata disks as `titan`.

CODE EXAMPLE 2-27 `samfsconfig`(1M) Command Example on `tethys`

```
tethys# samfsconfig /dev/dsk/*
#
# Family Set 'sharefs1' Created Wed Jun 27 19:33:50 2003
#
sharefs1                          10 ma sharefs1 on shared
/dev/dsk/c2t50020F23000065EEd0s6 11 mm sharefs1 on
/dev/dsk/c7t50020F2300005D22d0s6 12 mr sharefs1 on
/dev/dsk/c7t50020F2300006099d0s6 13 mr sharefs1 on
/dev/dsk/c7t50020F230000651Cd0s6 14 mr sharefs1 on
```

Edit the `mcf` file on client host `tethys` by copying the last five lines of output from the `samfsconfig`(1M) command into the `mcf` file on client host `tethys`. Verify the following:

- Each Device State field must be set to `on`.

- The `shared` keyword must appear in the Additional Parameters field for the file system name.

CODE EXAMPLE 2-28 shows the resulting `mcf` file.

CODE EXAMPLE 2-28 `mcf` File for `sharefs1` Client Host `tethys`

```
# Equipment                      Eq  Eq   Family   Dev   Add
# Identifier                     Ord Type Set      State Params
# ----------                     --- ---- ------   ----- ------
sharefs1                         10  ma   sharefs1 on    shared
/dev/dsk/c2t50020F23000065EEd0s6 11  mm   sharefs1 on
/dev/dsk/c7t50020F2300005D22d0s6 12  mr   sharefs1 on
/dev/dsk/c7t50020F2300006099d0s6 13  mr   sharefs1 on
/dev/dsk/c7t50020F230000651Cd0s6 14  mr   sharefs1 on
```

In CODE EXAMPLE 2-28, note that the Equipment Ordinal numbers match those of the example `mcf` file for metadata server `titan`. These Equipment Ordinal numbers must not already be in use on client host `tethys` or any other client host.

Example 2 - Solaris OS hosts. CODE EXAMPLE 2-29 shows how the `samfsconfig`(1M) command is used to retrieve device information for family set `sharefs1` on client host `mimas`. Note that `mimas` can never become a metadata server, and it is not connected to the metadata disks.

CODE EXAMPLE 2-29 `samfsconfig`(1M) Command Example on `mimas`

```
mimas# samfsconfig /dev/dsk/*
#
# Family Set 'sharefs1' Created Wed Jun 27 19:33:50 2001
#
# Missing slices
# Ordinal 0
# /dev/dsk/c1t50020F2300005D22d0s6   12    mr   sharefs1   on
# /dev/dsk/c1t50020F2300006099d0s6   13    mr   sharefs1   on
# /dev/dsk/c1t50020F230000651Cd0s6   14    mr   sharefs1   on
```

In the output from the `samfsconfig`(1M) command on `mimas`, note that `Ordinal` 0, which is the metadata disk, is not present. Because devices are missing, the `samfsconfig`(1M) command comments out the elements of the file system and omits the file system Family Set declaration line. Make the following types of edits to the `mcf` file:

- Create a file system Family Set declaration line, beginning with `sharefs1`, in the `mcf` file for client host `mimas`. Enter the `shared` keyword into the Additional Parameters field of the file system Family Set declaration line.

- Create one or more `nodev` lines for each missing Equipment Ordinal. For these lines, the keyword `nodev` must appear in the Equipment Identifier field for each inaccessible device. In this example, you create a device entry in the `mcf` file named `nodev` to represent the missing metadata disk.
- Ensure that each Device State field is set to `on`.
- Uncomment the device lines.

CODE EXAMPLE 2-30 shows the resulting `mcf` file for `mimas`.

CODE EXAMPLE 2-30 `mcf` File for Client Host `mimas`

```
# The mcf File For mimas
# Equipment                          Eq  Eq   Family   Device Addl
# Identifier                         Ord Type Set      State  Params
------------                         --- ---- ---      -----  ------
sharefs1                             10  ma   sharefs1 on     shared
nodev                                11  mm   sharefs1 on
/dev/dsk/c1t50020F2300005D22d0s6 12  mr   sharefs1 on
/dev/dsk/c1t50020F2300006099d0s6 13  mr   sharefs1 on
/dev/dsk/c1t50020F230000651Cd0s6 14  mr   sharefs1 on
```

Note – If you update a metadata server's `mcf` file at any time after the Sun SAM-QFS shared file system is mounted, make sure that you update the `mcf` files as necessary on all hosts that can access that shared file system.

(Optional) Creating the Shared Hosts File

Perform this task if you are configuring the following types of file systems:

- Sun StorEdge QFS shared file system on Solaris OS
- Sun StorEdge QFS shared file system on Sun Cluster

▼ To Create the Shared Hosts File on the Metadata Server

The system copies information from the hosts file to the shared hosts file in the shared file system at file system creation time. You update this information when you issue the `samsharefs`(1M) `-u` command.

1. **Use the `cd`(1) command to change to directory `/etc/opt/SUNWsamfs`.**
2. **Use `vi`(1) or another editor to create an ASCII hosts file called `hosts.`*fs-name*.**

   For *fs-name,* specify the Family Set name of the Sun StorEdge QFS shared file system.

   Comments are permitted in the hosts file. Comment lines must begin with a pound character (`#`). Characters to the right of the pound character are ignored.
3. **Use the information in TABLE 2-3 to fill in the lines of the hosts file.**

   File `hosts.`*fs-name* contains configuration information pertaining to all hosts in the Sun StorEdge QFS shared file system. The ASCII hosts file defines the hosts that can share the Family Set name.

TABLE 2-3 shows the fields in the hosts file.

TABLE 2-3 Hosts File Fields

Field Number	Content
1	The Host Name field. This field must contain an alphanumeric host name. It defines the Sun StorEdge QFS shared file system hosts. You can use the output from the `hostname`(1) command to create this field.
2	The Host IP Addresses field. This field must contain a comma-separated list of host IP addresses. You can use the output from the `ifconfig`(1M) `-a` command to create this field. You can specify the individual addresses in one of the following ways: • Dotted-decimal IP address form • IP version 6 hexadecimal address form • A symbolic name that the local domain name service (DNS) can resolve to a particular host interface The metadata server uses this field to determine whether a host is allowed to connect to the Sun StorEdge QFS shared file system. If the metadata server receives a connect attempt from any interface not listed in this field, it rejects the connection attempt. Conversely, use care when adding elements here because the metadata server accepts any host with an IP address that matches an address in this field. The client hosts use this field to determine the metadata server interfaces to use when attempting to connect to the metadata server. Each host evaluates the addresses from left to right, and the connection is made using the first responding address in the list.
3	The Server field. This field must contain either a dash character (`-`) or an integer ranging from `0` through *n*. The `-` and the `0` are equivalent. If the Server field is a nonzero integer number, the host is a potential metadata server. The rest of the row defines the server as a metadata host. The metadata server processes all the metadata modification for the file system. At any one time there is at most one metadata server host, and that metadata server supports archiving, staging, releasing, and recycling for a Sun SAM-QFS shared file system. If the Server field is `-` or `0`, the host is not eligible to be a metadata server.
4	Reserved for future use by Sun Microsystems. This field must contain either a dash character (`-`) or a `0`. The `-` and the `0` are equivalent.
5	The Server Host field. This field can contain either a blank or the `server` keyword in the row that defines the active metadata server. Only one row in the hosts file can contain the `server` keyword. This field must be blank in all other rows.

The system reads and manipulates the hosts file. You can use the `samsharefs`(1M) command to examine metadata server and client host information about a running system.

Example for Solaris OS Hosts

CODE EXAMPLE 2-31 is an example hosts file that shows four hosts.

CODE EXAMPLE 2-31 Sun StorEdge QFS Shared File System Hosts File Example

```
# File /etc/opt/SUNWsamfs/hosts.sharefs1
# Host    Host IP                              Server    Not  Server
# Name    Addresses                            Priority  Used Host
# ----    ---------------------------------- -------- ---- -----
titan     172.16.0.129,titan.xyzco.com         1         -    server
tethys    172.16.0.130,tethys.xyzco.com        2         -
mimas     mimas.xyzco.com                      -         -
dione     dione.xyzco.com                      -         -
```

CODE EXAMPLE 2-31 shows a hosts file that contains fields of information and comment lines for the `sharefs1` file system. In this example, the Server Priority field contains the number 1 in the Server Priority field to define the primary metadata server as `titan`. If `titan` is down, the next metadata server is `tethys`, and the number `2` in this field indicates this secondary priority. Note that neither `dione` nor `mimas` can ever be a metadata server.

Example for Sun Cluster Hosts

If you are configuring a Sun StorEdge QFS shared file system in a Sun Cluster, every host is a potential metadata server. The hosts files and the local hosts configuration files must contain node names in the Host Names field. These fields must contain Sun Cluster private interconnect names in the Host IP Addresses field.

CODE EXAMPLE 2-32 shows the local hosts configuration file for a shared file system, `sharefs1`. This file system's participating hosts are Sun Cluster nodes `scnode-A` and `scnode-B`. Each node's private interconnect name is listed in the Host IP Addresses field.

CODE EXAMPLE 2-32 Sun StorEdge QFS Shared File System Hosts File Example

```
# File /etc/opt/SUNWsamfs/hosts.sharefs1
# Host    Host IP                              Server    Not  Server
# Name    Addresses                            Priority  Used Host
# ----    ---------------------------------- -------- ---- -----
scnode-A clusternode1-priv                     1         -    server
scnode-B clusternode2-priv                     2         -
```

▼ (Optional) To Create the Local Hosts File on a Client

Perform this procedure under the following circumstances:

- If your Sun StorEdge QFS shared file system host systems have multiple host interfaces. You can use this file to specify how file system traffic should flow over public and private networks in your environment.
- If you are configuring a Sun StorEdge QFS shared file system on Solaris OS hosts. Do not create this file if you are configuring a Sun StorEdge QFS shared file system in a Sun Cluster.

1. **Create the local hosts configuration file on the client host.**

   Using `vi`(1) or another editor, create an ASCII local hosts configuration file that defines the host interfaces that the metadata server and the client hosts can use when accessing the file system. The local hosts configuration file must reside in the following location:

   ```
   /etc/opt/SUNWsamfs/hosts.fsname.local
   ```

   For *fsname*, specify the Family Set Name of the Sun StorEdge QFS shared file system.

   Comments are permitted in the local host configuration file. Comment lines must begin with a pound character (`#`). Characters to the right of the pound character are ignored.

TABLE 2-4 shows the fields in the local hosts configuration file.

TABLE 2-4 Local Hosts Configuration File Fields

Field Number	Content
1	The Host Name field. This field must contain the alphanumeric name of a metadata server or potential metadata server that is part of the Sun StorEdge QFS shared file system.
2	The Host Interfaces field. This field must contain a comma-separated list of host interface addresses. You can use the output from the `ifconfig`(1M) `-a` command to create this field. You can specify the individual interfaces in one of the following ways: • Dotted-decimal IP address form • IP version 6 hexadecimal address form • A symbolic name that the local domain name service (DNS) can resolve to a particular host interface Each host uses this field to determine whether a host will try to connect to the specified host interface. The system evaluates the addresses from left to right, and the connection is made using the first responding address in the list that is also included in the shared hosts file.

2. **Repeat this procedure for each client host that you want to include in the Sun StorEdge QFS shared file system.**

Obtaining Addresses

The information in this section might be useful when you are debugging.

In a Sun StorEdge QFS shared file system, each client host obtains the list of metadata server IP addresses from the shared hosts file.

The metadata server and the client hosts use the shared hosts file on the metadata server and the `hosts.`*fsname*`.local` file on each client host (if it exists) to determine the host interface to use when accessing the metadata server. This process is as follows (note that *client*, as in *network client*, is used to refer to both client hosts and the metadata server host in the following process):

1. The client obtains the list of metadata server host IP interfaces from the file system's on-disk shared hosts file. To examine this file, issue the `samsharefs`(1M) command from the metadata server or from a potential metadata server.
2. The client searches for an `/etc/opt/SUNWsamfs/hosts.`*fsname*`.local` file. Depending on the outcome of the search, one of the following occurs:

- If a `hosts.`*fsname*`.local` file does not exist, the client attempts to connect, in turn, to each address in the server's line in the shared hosts file until it succeeds in connecting.
- If the `hosts.`*fsname*`.local` file exists, the client performs the following tasks:

  i. It compares the list of addresses for the metadata server from both the shared hosts file on the file system and the `hosts.`*fsname*`.local` file.

  ii. It builds a list of addresses that are present in both places, and then it attempts to connect to each of these addresses, in turn, until it succeeds in connecting to the server. If the order of the addresses differs in these files, the client uses the ordering in the `hosts.`*fsname*`.local` file.

Example

This example expands on FIGURE 2-1. CODE EXAMPLE 2-31 shows the hosts file for this configuration. FIGURE 2-2 shows the interfaces to these systems.

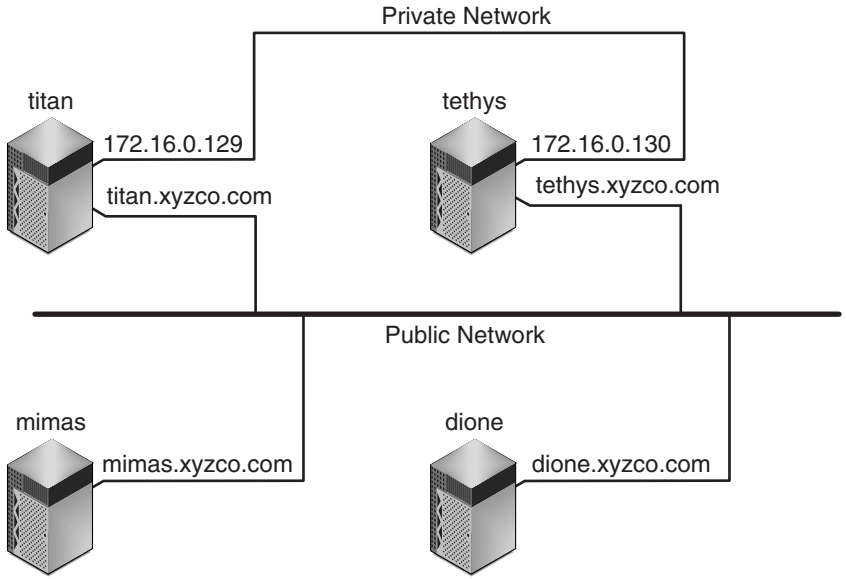

FIGURE 2-2 Network Interfaces

Systems titan and tethys share a private network connection with interfaces 172.16.0.129 and 172.16.0.130. To guarantee that titan and tethys always communicate over their private network connection, the system administrator has created identical copies of /etc/opt/SUNWsamfs/hosts.sharefs1.local on each system. CODE EXAMPLE 2-33 shows the information in these files.

CODE EXAMPLE 2-33 File hosts.sharefs1.local on Both titan and tethys

```
# This is file /etc/opt/SUNWsamfs/hosts.sharefs1.local
# Host Name    Host Interfaces
# ---------    ---------------
titan          172.16.0.129
tethys         172.16.0.130
```

Systems mimas and dione are not on the private network. To guarantee that they connect to titan and tethys through titan's and tethys' public interfaces, and never attempt to connect to titan's or tethys' unreachable private interfaces, the system administrator has created identical copies of /etc/opt/SUNWsamfs/hosts.sharefs1.local on mimas and dione. CODE EXAMPLE 2-34 shows the information in these files.

CODE EXAMPLE 2-34 File hosts.sharefs1.local on Both mimas and dione

```
# This is file /etc/opt/SUNWsamfs/hosts.sharefs1.local
# Host Name    Host Interfaces
# ----------   --------------
titan          titan.xyzco.com
tethys         tethys.xyzco.com
```

Initializing the Environment

This procedure initializes the environment.

▼ To Initialize the Environment

- **Type the `samd`(1M) `config` command to initialize the Sun StorEdge QFS environment.**

  For example:

```
# samd config
```

  Repeat this command on each host if you are configuring a Sun StorEdge QFS shared file system or a Sun StorEdge QFS highly available file system.

(Optional) Editing the `defaults.conf` File

The `/opt/SUNWsamfs/examples/defaults.conf` file contains default settings for the Sun StorEdge QFS environment. You can change these settings at any time after the initial installation. If you want to change any default settings now, examine the `defaults.conf`(4) man page to discern the types of behaviors this file controls.

Perform this task if you want to change system default values.

▼ To Set Up Default Values

1. **Read the `defaults.conf`(4) man page and examine this file to determine if you want to change any of the defaults.**

2. **Use the `cp`(1) command to copy `/opt/SUNWsamfs/examples/defaults.conf` to its functional location.**

   For example:

```
# cp /opt/SUNWsamfs/examples/defaults.conf /etc/opt/SUNWsamfs/defaults.conf
```

3. **Use `vi`(1) or another editor to edit the file.**

   Edit the lines that control aspects of the system that you want to change. Remove the pound character (#) from column 1 of the lines you change.

   For example, if you are configuring a Sun StorEdge QFS shared file system in a Sun Cluster, CODE EXAMPLE 2-35 shows `defaults.conf` entries that are helpful when debugging.

   CODE EXAMPLE 2-35 `defaults.conf` Entries for Debugging

```
# File defaults.conf
trace
all=on
endtrace
```

4. **Use the `samd`(1M) `config` command to restart the `sam-fsd`(1M) daemon and enable the daemon to recognize the changes in the `defaults.conf` file.**

5. **(Optional) Repeat this procedure for each host that you want to include in a Sun StorEdge QFS shared file system or a Sun StorEdge QFS highly available file system.**

   For debugging purposes, the `defaults.conf` file should be the same on all hosts.

Verifying the License and `mcf` Files

At this point in the installation and configuration process, the following files exist on each Sun StorEdge QFS host:

- `/etc/opt/SUNWsamfs/LICENSE.4.2`
- `/etc/opt/SUNWsamfs/mcf`

The procedures in this section show you how to verify the correctness of these configuration files.

Perform these verifications on all hosts if you are configuring a Sun StorEdge QFS shared file system or a Sun StorEdge QFS highly available file system.

▼ To Verify the License File

- **Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.**

  The `samcmd`(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in CODE EXAMPLE 2-36, return to "Enabling the Sun StorEdge QFS Software License" on page 53.

CODE EXAMPLE 2-36 Using `samcmd`(1M)

```
# samcmd l

License information samcmd     4.2    Fri Aug 27 16:24:12 2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled

QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

▼ To Verify the mcf File

- **Enter the sam-fsd(1M) command to verify the mcf file.**

  Examine the output for errors, as follows:

  - If your mcf file is free from syntax errors, the sam-fsd(1M) the output is similar to that shown in CODE EXAMPLE 2-37. It contains information about the file systems and other system information.

CODE EXAMPLE 2-37 sam-fsd(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld      off

sam-archiverd off

sam-catserverd off

sam-fsd       off

sam-rftd      off

sam-recycler  off

sam-sharefsd  off

sam-stagerd   off

sam-serverd   off

sam-clientd   off

sam-mgmt      off

License: License never expires.
```

  - If your mcf file contains syntax or other errors, however, it notes the errors in its output.

    If your mcf file has errors, refer to "Defining the Sun StorEdge QFS Configuration By Creating the mcf File" on page 65 and to the mcf(4) man page for information about how to create this file correctly.

Note – If you change the `mcf` file after the Sun StorEdge QFS file system is in use, you must convey the new `mcf` specifications to the Sun StorEdge QFS software. For information about propagating `mcf` file changes to the system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

(Optional) Creating the `samfs.cmd` File

You can create the `/etc/opt/SUNWsamfs/samfs.cmd` file as the place from which the system reads mount parameters. If you are configuring multiple Sun StorEdge QFS systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the `mount`(1M) command. Mount options specified here override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file.
- In the `/etc/vfstab` file. Mount options specified here override those specified in the `samfs.cmd` file.
- In the `samfs.cmd` file.

You can manage certain features more easily from a `samfs.cmd` file. These features include the following:

- Striping.
- Readahead, which specifies the number of bytes that are read ahead when performing paged I/O.
- Writebehind, which specifies the number of bytes that are written behind when performing paged I/O.
- Qwrite, which enables simultaneous reads and writes to the same file from different threads.

For more information about the `/etc/vfstab` file, see "Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109. For more information about the `mount`(1M) command, see the `mount_samfs`(1M) man page.

▼ To Create the `samfs.cmd` File

1. **Use `vi`(1) or another editor to create the `samfs.cmd` file.**

   Create lines in the `samfs.cmd` file to control mounting, performance features, or other aspects of file system management. For more information about the `samfs.cmd` file, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*, or see the `samfs.cmd`(4) man page.

   CODE EXAMPLE 2-38 shows a `samfs.cmd` file for a Sun StorEdge QFS file system.

   CODE EXAMPLE 2-38 Example `samfs.cmd` File for a Sun StorEdge QFS File System

```
qwrite   # Global mount option. Enables qwrite for all file systems
fs=qfs1  # Enables mount options for the qfs1 file system only
   trace # Enables file system tracing for qfs1 only
```

2. **(Optional) Copy lines, as necessary, to the `samfs.cmd` file on other hosts.**

   Perform this step if you are creating a multihost file system.

   If you have created a `samfs.cmd` file on one host in a Sun Cluster to describe a particular file system's mount parameters, copy those lines to `samfs.cmd` files on all the nodes that can access that file system.

   For debugging purposes, the `samfs.cmd` file, as it pertains to a specific file system, should be the same on all hosts. For example, if the `qfs3` file system is accessible from all nodes in a Sun Cluster, then the lines in the `samfs.cmd` file that describe the `qfs3` file system should be identical on all the nodes in the Sun Cluster.

   Depending on your site needs, it might be easier to manage mount options from the `samfs.cmd` file rather than from the `/etc/vfstab` file. The `/etc/vfstab` file overrides the `samfs.cmd` file in the event of conflicts.

   For more information about mount options, see "Updating the `/etc/vfstab` File and Creating the Mount Point" on page 109.

Updating the /etc/vfstab File and Creating the Mount Point

This task shows you how to edit the /etc/vfstab file.

Note – Even though /global is used in this chapter's examples as the mount point for file systems mounted in a Sun Cluster environment, it is not required. You can use any mount point.

TABLE 2-5 shows the values you can enter in the fields in the /etc/vfstab file.

TABLE 2-5 Fields in the /etc/vfstab File

Field	Field Title and Contents
1	Device to Mount. The name of the Sun StorEdge QFS file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the Sun StorEdge QFS file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount Point. Examples: • /qfs1 for a local Sun StorEdge QFS file system on a single host. • /global/qfs1 for a Sun StorEdge QFS shared file system in a Sun Cluster. • /global/qfs1 for a Sun StorEdge QFS highly available file system in a Sun Cluster.
4	File System Type. Must be samfs.

TABLE 2-5 Fields in the /etc/vfstab File *(Continued)*

Field	Field Title and Contents
5	fsck(1M) Pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at Boot. Specify either yes or no. • Specifying yes in this field requests that the Sun StorEdge QFS file system be mounted automatically at boot time. Do not specify yes if you are creating a file system for use in a Sun Cluster. • Specifying no in this field indicates that you do not want to mount the file system automatically. Specify no in this field if you are creating a file system for use in a Sun Cluster to indicate that the file system is under Sun Cluster control. For information about the format of these entries, see the mount_samfs(1M) man page.
7	Mount Parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the mount(1M) command, in the /etc/vfstab file, or in a samfs.cmd file. Mount options specified on the mount(1M) command override those specified in the /etc/vfstab file and in the samfs.cmd file. Mount options specified in the /etc/vfstab file override those in the samfs.cmd file. For example, stripe=1 specifies a stripe width of one DAU. For a list of available mount options, see the mount_samfs(1M) man page.

▼ To Update the /etc/vfstab File and Create the Mount Point

1. **Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each Sun StorEdge QFS file system.**

   CODE EXAMPLE 2-39 shows header fields and entries for a local Sun StorEdge QFS file system.

CODE EXAMPLE 2-39 Example /etc/vfstab File Entries for a Sun StorEdge QFS File System

```
#DEVICE    DEVICE   MOUNT   FS     FSCK   MOUNT     MOUNT
#TO MOUNT  TO FSCK  POINT   TYPE   PASS   AT BOOT   PARAMETERS
#
qfs1       -        /qfs1   samfs  -     yes       stripe=1
```

TABLE 2-5 shows the various fields in the /etc/vfstab file and their contents.

If you are configuring a file system for a Sun Cluster environment, the mount options that are required, or are recommended, differ depending on the type of file system you are configuring. TABLE 2-6 explains the mount options.

TABLE 2-6 Mount Options for a Sun Cluster File System

File System Type	Required Options	Recommended Options

Sun StorEdge QFS shared file system	`shared`	`forcedirectio`
		`sync_meta=1`
		`mh_write`
		`qwrite`
		`nstreams=1024`
		`rdlease=300`
		`aplease=300`
		`wrlease=300`

Sun StorEdge QFS shared file system to support Oracle Real Application Clusters database files	`shared`
	`forcedirectio`
	`sync_meta=1`
	`mh_write`
	`qwrite`
	`nstreams=1024`
	`stripe>=1`
	`rdlease=300`
	`aplease=300`
	`wrlease=300`	

Sun StorEdge QFS highly available file system		`sync_meta=1`

You can specify most of the mount options mentioned in TABLE 2-6 in either the `/etc/vfstab` file or in the `samds.cmd` file. The `shared` option, however, must be specified in the `/etc/vfstab` file.

Tip – In addition to the mount options mentioned in TABLE 2-6, you can also specify the `trace` mount option for configuration debugging purposes.

2. **Use the `mkdir`(1) command to create the file system mount point.**

   The mount point location differs depending on where the file system is to be mounted. The following examples illustrate this.

   Example 1. This example assumes that `/qfs1` is the mount point of the `qfs1` file system. This is a local file system. It can exist on a standalone server or on a local node in a Sun Cluster. For example:

```
# mkdir /qfs1
```

   Example 2. This example assumes that `/global/qfs1` is the mount point of the `qfs1` file system, which is a Sun StorEdge QFS shared file system to be mounted on a Sun Cluster:

```
# mkdir /global/qfs1
```

Note – If you configured multiple mount points, repeat these steps for each mount point, using a different mount point (such as `/qfs2`) and Family Set name (such as `qfs2`) each time.

---

3. **(Optional) Repeat the preceding steps for all hosts if you are configuring a Sun StorEdge QFS shared file system or a Sun StorEdge QFS highly available file system.**

   For debugging purposes, if you are configuring a Sun StorEdge QFS shared file system, the mount options should be the same on all hosts that can mount the file system.

Initializing the File System

This procedure shows how to use the `sammkfs`(1M) command and the Family Set names that you have defined to initialize a file system.

Note – The `sammkfs`(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide* or see the `sammkfs`(1M) man page.

▼ To Initialize a File System

- **Use the `sammkfs`(1M) command to initialize a file system for each Family Set defined in the `mcf` file.**

Caution – Running `sammkfs`(1M) creates a new file system. It removes all references to the data currently contained in the partitions associated with the file system in the `/etc/opt/SUNWsamfs/mcf` file.

Example for a Sun StorEdge QFS File System

CODE EXAMPLE 2-40 shows the command to use to initialize a Sun StorEdge QFS file system with the Family Set name of `qfs1`.

CODE EXAMPLE 2-40 Initializing Example File System `qfs1`

```
# sammkfs -a 128 qfs1
Building 'qfs1' will destroy the contents of devices:
                /dev/dsk/c1t0d0s0
                /dev/dsk/c3t1d0s6
                /dev/dsk/c3t1d1s6
                /dev/dsk/c3t2d0s6
Do you wish to continue? [y/N]
```

Enter `y` in response to this message to continue the file system creation process.

Example for a Sun StorEdge QFS Shared File System

If you are configuring a Sun StorEdge QFS shared file system, enter the `sammkfs`(1M) comand on the metadata server only.

Enter the `sammkfs`(1M) command at the system prompt. The `-S` options specifies that the file system be a Sun StorEdge QFS shared file system. Use this command in the following format:

```
sammkfs -S -a allocation_unit fs_name
```

TABLE 2-7 `sammkfs`(1M) Command Arguments

Argument	Meaning
allocation_unit	Specifies the number of bytes, in units of 1024 (1-kilobyte) blocks, to be allocated to a disk allocation unit (DAU). The specified *allocation_unit* must be a multiple of 8 kilobytes. For more information, see the `sammkfs`(1M) man page.
fs_name	Family Set name of the file system as defined in the `mcf` file.

For more information about the `sammkfs`(1M) command, see the `sammkfs`(1M) man page. For example, you can use the following `sammkfs`(1M) command to initialize a Sun StorEdge QFS shared file system and identify it as shared:

```
# sammkfs -S -a 512 sharefs1
```

If the `shared` keyword appears in the `mcf` file, the file system must be initialized as a shared file system by using the `-S` option to the `sammkfs`(1M) command. You cannot mount a file system as shared if it was not initialized as shared.

If you are initializing a file system as a Sun StorEdge QFS file system, file `/etc/opt/SUNWsamfs/hosts.sharefs1` must exist at the time you issue the `sammkfs`(1M) command. The `sammkfs`(1M) command uses the hosts file when it creates the file system. You can use the `samsharefs`(1M) command to replace or update the contents of the hosts file at a later date.

(Optional) Verifying That the Daemons Are Running

Perform this task if you are configuring the following types of file systems:

- Sun StorEdge QFS shared file system on Solaris OS
- Sun StorEdge QFS shared file system on Sun Cluster

▼ To Verify the Daemons

Perform these steps on each host that can mount the file system.

1. **Use the `ps`(1) and `grep`(1) commands to verify that the `sam-sharefsd` daemon is running for this file system.**

   CODE EXAMPLE 2-41 shows these commands.

   CODE EXAMPLE 2-41 Output from the `ps`(1) and `grep`(1) Commands

```
# ps -ef | grep sam-sharefsd
root 26167 26158  0 18:35:20 ?        0:00 sam-sharefsd sharefs1
root 27808 27018  0 10:48:46 pts/21   0:00 grep sam-sharefsd
```

   CODE EXAMPLE 2-41 shows that the `sam-sharefsd` daemon is active for the `sharefs1` file system. If this is the case for your system, you can proceed to the next step in this procedure. If, however, the output returned on your system does not show that the `sam-sharefsd` daemon is active for your Sun StorEdge QFS shared file system, you need to perform some diagnostic procedures. For information about these procedures, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

   Depending on whether or not this daemon is running, perform the remaining steps in this procedure.

2. **(Optional) Determine whether the `sam-fsd` daemon is running.**

   Perform this step if the previous step's output indicates that the `sam-sharefsd` daemon is not running.

   a. **Use the `ps`(1) and `grep`(1) commands to verify that the `sam-fsd` daemon is running for this file system.**

b. Examine the output.

CODE EXAMPLE 2-42 shows `sam-fsd` output that indicates that the daemon is running.

CODE EXAMPLE 2-42 `sam-fsd`(1M) Output That Shows the `sam-fsd` Daemon is Running

```
cur% ps -ef | grep sam-fsd
 user1 16435 16314  0 16:52:36 pts/13   0:00 grep sam-fsd
    root   679     1  0   Aug 24 ?        0:00
/usr/lib/fs/samfs/sam-fsd
```

- If the output indicates that the `sam-fsd` daemon is not running, and if no file system has been accessed since the system's last boot, issue the `samd`(1M) `config` command, as follows:

```
# samd config
```

- If the output indicates that the `sam-fsd` daemon is running, enable tracing in the `defaults.conf`(4) file and check the following files to determine if configuration errors are causing the problem:
  - `/var/opt/SUNWsamfs/trace/sam-fsd`
  - `/var/opt/SUNWsamfs/trace/sam-sharefsd`

Mounting the File System

The mount(1M) command mounts a file system. It also reads the /etc/vfstab and samfs.cmd configuration files. For information about the mount(1M) command, see the mount_samfs(1M) man page.

Use one or more of the procedures that follow to mount your file system. The introduction to each procedure explains the file system to which it pertains.

▼ To Mount the File System on One Host

Perform this procedure on all Sun StorEdge QFS file system, as follows:

- If you are configuring a Sun StorEdge QFS file system on a single host, perform this procedure on that host. When that is accomplished, go to "(Optional) Sharing the File System With NFS Client Systems" on page 121.
- If you are configuring a Sun StorEdge QFS shared file system in a Solaris OS environment, perform this procedure on the metadata server first. When that is accomplished, perform this procedure on the other hosts in the file system.
- If you are configuring a Sun StorEdge QFS shared file system in a Sun Cluster environment, perform this procedure on all nodes that can host the file system.
- If you are configuring a Sun StorEdge QFS highly available file system in a Sun Cluster, perform this procedure on all nodes that can host the file system.

1. **Use the mount(1M) command to mount the file system.**

   Specify the file system mount point as the argument. For example:

```
# mount /qfs1
```

2. **Use the mount(1M) command with no arguments to verify the mount.**

   This step confirms whether the file system is mounted and shows how to set permissions. CODE EXAMPLE 2-43 shows the output from a mount(1M) command issued to verify whether example file system qfs1 is mounted.

CODE EXAMPLE 2-43 Using the mount(1M) Command to Verify That a File System Is Mounted

```
# mount
<<< information deleted >>>
/qfs1 on qfs1 read/write/setuid/dev=8001b1 on Mon Jan 14 12:21:03 2002
<<< information deleted >>>
```

3. **(Optional) Use the `chmod`(1) and `chown`(1) commands to change the permissions and ownership of the file system's root directory.**

   If this is the first time the file system has been mounted, it is typical to perform this step. CODE EXAMPLE 2-44 shows the commands to use to change file system permissions and ownership.

CODE EXAMPLE 2-44 Using `chmod`(1M) and `chown`(1M) to Change File System Permissions and Ownership

```
# chmod 755 /qfs1
# chown root:other /qfs1
```

▼ (Optional) To Verify Metadata Server Changes

Perform this procedure if you are creating a Sun StorEdge QFS shared file system in either a Solaris OS or in a Sun Cluster environment. This procedure ensures that the file system is configured to support changing the metadata server.

1. **Log in to the metadata server as superuser.**
2. **Use the `samsharefs`(1M) command to change the metadata server.**

   For example:

```
ash# samsharefs -s oak qfs1
```

3. **Use the `ls`(1) `-al` command to verify that the files are accessible on the new metadata server.**

   For example:

```
oak# ls -al /qfs1
```

4. **Repeat Step 2 and Step 3.**

   If you are creating a Sun StorEdge QFS shared file system in a Solaris OS environment, repeat these commands on each metadata server or potential metadata server.

   If you are creating a Sun StorEdge QFS shared file system in a Sun Cluster, repeat these steps on all hosts that can mount the file system.

(Optional) Configuring the SUNW.qfs Resource Type

Perform this task if you are configuring a Sun StorEdge QFS shared file system on a Sun Cluster platform.

▼ To Enable a Sun StorEdge QFS Shared File System as a SUNW.qfs(5) Resource

1. **Log in to the metadata server as superuser.**
2. **Use the `scrgadm`(1M) `-p` command and search for the `SUNW.qfs`(5) resource type.**

   This step verifies that the previous step succeeded. For example:

   ```
   metadataserver# scrgadm -p | grep SUNW.qfs
   ```

   If the `SUNW.qfs` resource type is missing, issue the following command:

   ```
   metadataserver# scrgadm -a -t SUNW.qfs
   ```

3. **Use the `scrgadm`(1M) command to set the FilesystemCheckCommand property of the `SUNW.qfs`(5) resource type to `/bin/true`.**

   The `SUNW.qfs`(5) resource type is part of the Sun StorEdge QFS software package. Configuring the resource type for use with your shared file system makes the shared file system's metadata server highly available. Sun Cluster scalable applications can then access data contained in the file system. For more information, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

   CODE EXAMPLE 2-45 shows how to use the `scrgadm`(1M) command to register and configure the `SUNW.qfs` resource type. In this example, the nodes are `scnode-A` and `scnode-B`. `/global/sharefs1` is the mount point as specified in the `/etc/vfstab` file.

CODE EXAMPLE 2-45 Configuring a `SUNW.qfs` Resource

```
# scrgadm -a -g qfs-rg -h scnode-A,scnode-B
# scrgadm -a -g qfs-rg -t SUNW.qfs -j qfs-res \
          -x QFSFileSystem=/global/sharefs1
```

(Optional) Configuring the HAStoragePlus Resource

Perform this task if you are configuring a Sun StorEdge QFS highly available file system on a Sun Cluster platform.

▼ To Configure a Sun StorEdge QFS Highly Available File System as an HAStoragePlus Resource

- **Use the `scrgadm`(1M) command to set the FilesystemCheckCommand property of HAStoragePlus to `/bin/true`.**

  All other resource properties for HAStoragePlus apply as specified in `SUNW.HAStoragePlus`(5).

  The following example command shows how to use the `scrgadm`(1M) command to configure an HAStoragePlus resource:

```
# scrgadm -a -g qfs-rg -j ha-qfs -t SUNW.HAStoragePlus \
        -x FilesystemMountPoints=/global/qfs1 \
        -x FilesystemCheckCommand=/bin/true
```

(Optional) Sharing the File System With NFS Client Systems

Perform this task if you are configuring a file system and you want the file system to be NFS shared.

This procedure uses the Sun Solaris `share`(1M) command to make the file system available for mounting by remote systems. The `share`(1M) commands are typically placed in the `/etc/dfs/dfstab` file and are executed automatically by the Sun Solaris OS when you enter `init`(1M) state 3.

▼ To NFS Share the File System in a Sun Cluster Environment

The following procedure explains how to NFS share a file system in a Sun Cluster environment in general terms. For more information on NFS sharing file systems that are controlled by HAStorage Plus, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*, see the *Sun Cluster Data Service for Network File System (NFS) Guide for Solaris OS*, and see your NFS documentation.

1. **Locate the** `dfstab.`*resource_name* **file.**

   The `Pathprefix` property of HAStoragePlus specifies the directory in which the `dfstab.`*resource_name* file resides.

2. **Use** `vi`**(1) or another editor to add a** `share`**(1M) command to the** *Pathprefix*`/SUNW.nfs/dfstab.`*resource_name* **file.**

   For example, add a line like the following to NFS share the new file system:

```
share -F nfs -o rw /global/qfs1
```

▼ To NFS Share the File System in a Solaris OS Environment

If you are configuring a Sun StorEdge QFS shared file system, you can perform this procedure from the metadata server or from one of the shared clients.

1. **Use `vi`(1) or another editor to add a `share`(1M) command to the `/etc/dfs/dfstab` file.**

   For example, add a line like the following to direct the Solaris OS to NFS share the new Sun StorEdge QFS file system:

```
share -F nfs -o rw=client1:client2 -d "QFS" /qfs1
```

2. **Use the `ps`(1) and `grep`(1) commands to determine whether or not `nfs.server` is running.**

   CODE EXAMPLE 2-46 shows these commands and their output.

CODE EXAMPLE 2-46 Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root   694     1  0   Apr 29 ?        0:36 /usr/lib/nfs/nfsd -a 16
en17     29996 29940  0 08:27:09 pts/5    0:00 grep nfsd
# ps -ef | grep mountd
    root   406     1  0   Apr 29 ?       95:48 /usr/lib/autofs/automountd
    root   691     1  0   Apr 29 ?        2:00 /usr/lib/nfs/mountd
en17     29998 29940  0 08:27:28 pts/5    0:00 grep mountd
```

   In CODE EXAMPLE 2-46, the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. **(Optional) Start the NFS server.**

   Perform this step if the `nfs.server` server is not running. Use the following command:

```
# /etc/init.d/nfs.server start
```

4. **(Optional) Type the `share`(1M) command at a `root` shell prompt.**

   Perform this step if you want to NFS share the new Sun StorEdge QFS file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. CODE EXAMPLE 2-47 shows the commands to use to enable NFS sharing. You must change to run level 3 after adding the first share entry to this file.

   CODE EXAMPLE 2-47 NFS Commands

```
# init 3
# who -r
.       run-level 3  Dec 12 14:39     3     2  2
# share
-           /qfs1   -    "QFS"
```

   Some NFS mount parameters can affect the performance of an NFS mounted Sun StorEdge QFS file system. You can set these parameters in the `/etc/vfstab` file as follows:

   - `timeo = n`. This value sets the NFS timeout to *n* tenths of a second. The default is 11 tenths of a second. For performance purposes, use the default value. You can increase or decrease the value appropriately to your system.
   - `rsize = n`. This value sets the read buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.
   - `wsize = n`. This value sets the write buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

   For more information about these parameters, see the `mount_nfs`(1M) man page.

5. **Proceed to "To NFS Mount the File System on NFS Clients in a Solaris OS Environment" on page 123.**

▼ To NFS Mount the File System on NFS Clients in a Solaris OS Environment

If you are configuring a Sun StorEdge QFS shared file system, you can perform this procedure from the metadata server or from one of the shared clients.

1. **On the NFS client systems, use `vi`(1) or another editor to edit the `/etc/vfstab` file and add a line to mount the server's Sun StorEdge QFS file system at a convenient mount point.**

   The following example line mounts `server:/qfs1` on the `/qfs1` mount point:

```
server:/qfs1    -    /qfs1    nfs    -   no intr,timeo=60
```

   In this example, `server:/qfs1` is mounted on `/qfs1`, and information is entered into the `/etc/vfstab` file.

2. **Save and close the `/etc/vfstab` file.**

3. **Enter the `mount`(1M) command.**

   The following mount(1M) command mounts the `qfs1` file system:

```
client# mount /qfs1
```

   The automounter can also do this, if you prefer. Follow your site procedures for adding `server:/qfs1` to your automounter maps. For more information about automounting, see the `automountd`(1M) man page.

Note – At times, there might be a significant delay in the Sun StorEdge QFS file system's response to NFS client requests. This can occur in a Sun StorEdge QFS shared file system. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, Sun recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000` (or greater).

(Optional) Bringing the Shared Resource Online

Perform this task if you are configuring the following types of file systems:

- Sun StorEdge QFS shared file system on Sun Cluster
- Sun StorEdge QFS highly available file system on Sun Cluster

▼ To Bring the Shared Resource Online

1. **Log into the appropriate host.**
   - If you are configuring a Sun StorEdge QFS shared file system, log in to the metadata server.
   - If you are configuring a Sun StorEdge QFS highly available file system, log in to the node upon which the file system is based.

   You must perform this step with the file system mounted on all nodes. If it is not mounted, go back to "Mounting the File System" on page 117 and follow the instructions there.

2. **Use the `scswitch`(1M) command to move the file system resource to another node.**

   For example:

```
metadataserver# scswitch -Z -g qfs-rg
```

3. **Use the `scstat`(1M) command to verify that the file system resource moved to a different node.**

   For example:

CODE EXAMPLE 2-48 Using `scstat`(1M)

```
metadataserver# scstat
< information deleted from this output >
-- Resources --
Resource Name    Node Name  State     Status Message
-------------    ---------  -----     --------------
Resource: qfs-res   ash     Online    Online
Resource: qfs-res   elm     Offline   Offline
Resource: qfs-res   oak     Offline   Offline
```

(Optional) Verifying the Resource Group on All Nodes

Perform this task if you are configuring the following types of file systems:

- Sun StorEdge QFS shared file system on a Sun Cluster. This step ensures that the metadata server can move from node to node.
- Sun StorEdge QFS highly available file system on a Sun Cluster. This step ensures that the file system can move from node to node when the Sun Cluster software performs a failover.

▼ To Verify the Resource Group on All Nodes

1. **From any node in the Sun Cluster, use the `scswitch`(1M) command to move the file system resource from one node to another.**

   For example:

```
server# scswitch -z -g qfs-rg -h elm
```

2. **Use the `scstat`(1M) command to verify that the file system resource moved to a different node.**

   For example:

CODE EXAMPLE 2-49 Using `scstat`(1M)

```
server# scstat
-- Resources --
Resource Name    Node Name  State     Status Message
-------------    ---------  -----     --------------
Resource: qfs-res   ash     Offline   Offline
Resource: qfs-res   elm     Online    Online
Resource: qfs-res   oak     Offline   Offline
```

3. **Repeat the preceding commands on each node in the cluster.**

Establishing Periodic Dumps Using qfsdump(1M)

File systems are made up of directories, files, and links. The Sun StorEdge QFS file system keeps track of all the files in the .inodes file. The .inodes file resides on a separate metadata device. The file system writes all file data to the data devices.

It is important to use the qfsdump(1M) command periodically to create a dump file of metadata and file data. The qfsdump(1M) command saves the relative path information for each file contained in a complete file system or in a portion of a file system. This protects your data in the event of a disaster.

Create dump files at least once a day. The frequency depends on your site's requirements. By dumping file system data on a regular basis, you can restore old files and file systems. You can also move files and file systems from one server to another.

The following are some guidelines for creating dump files:

- The qfsdump(1M) command dumps file names, inode information, and data. This command creates full dumps of specified files and directories. An incremental dump is not available. Because of these factors, a qfsdump(1M) dump file can be very large. The qfsdump(1M) command does not have any tape management, size estimations, or incremental dump facilities as does ufsdump(1M). In addition, the qfsdump(1M) command does not support volume overflow, so you need to weigh space considerations and make sure that the size of the file system does not exceed the size of the dump media.
- The qfsdump(1M) command dumps all the data of a sparse file, and the qfsrestore(1M) command restores all the data. These commands do not, however, preserve file qualities that enable sparse files to be characterized as sparse. This can lead to files occupying more space on dump files and on restored file systems than anticipated.
- You issue the qfsdump(1M) command on a mounted file system. Inconsistencies can arise as new files are being created on disk. Dumping file systems during a quiet period (a time when files are not being created or modified) is a good idea and minimizes these inconsistencies.
- Ensure that you dump metadata and data for all Sun StorEdge QFS file systems. Look in /etc/vfstab for all file systems of type samfs.

You can run the qfsdump(1M) command manually or automatically. Even if you implement this command to be run automatically, you might need to run it manually from time to time depending on your site's circumstances. In the event of a disaster, you can use the qfsrestore(1M) command to recreate your file system.

You can also restore a single directory or file. For more information, see the qfsdump(1M) man page and see the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

For more information about creating dump files, see the qfsdump(1M) man page. The following sections describe procedures for issuing this command both manually and automatically.

▼ To Run the qfsdump(1M) Command Automatically

1. **Make an entry in root's crontab file so that the cron daemon runs the qfsdump(1M) command periodically.**

   For example:

```
10 0 * * * (cd /qfs1; /opt/SUNWsamfs/sbin/qfsdump -f /dev/rmt/0cbn)
```

   This entry executes the qfsdump(1M) command at 10 minutes after midnight. It uses the cd(1) command to change to the mount point of the qfs1 file system, and it executes the /opt/SUNWsamfs/sbin/qfsdump command to write the data to tape device /dev/rmt/0cbn.

2. **(Optional) Using the previous step as a guide, make similar crontab file entries for each file system.**

   Perform this step if you have more than one Sun StorEdge QFS file system. Make sure you save each dump file in a separate file.

▼ To Run the qfsdump(1M) Command Manually

1. **Use the cd(1) command to go to the directory that contains the mount point for the file system.**

   For example:

```
# cd /qfs1
```

2. **Use the `qfsdump`(1M) command to write a dump file to a file system outside of the one you are dumping.**

   For example:

```
# qfsdump -f /save/qfs1/dump_file
```

(Optional) Backing Up Configuration Files

Sun StorEdge QFS regularly accesses several files that have been created as part of this installation and configuration procedure. You should back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note – Sun Microsystems strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

The following files are among those that you should back up regularly and whenever you modify them:

- `/etc/opt/SUNWsamfs/mcf`
- `/etc/opt/SUNWsamfs/LICENSE.4.2`
- `/etc/opt/SUNWsamfs/samfs.cmd`

For more information about the files you should protect, see the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

(Optional) Configuring the Remote Notification Facility

The Sun StorEdge QFS software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The Sun StorEdge QFS and Sun StorEdge SAM-FS Management Information Base (MIB) defines the types of problems, or events, that the Sun StorEdge QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information about the MIB, see `/opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib`.

The following sections describe how to enable and how to disable remote notification.

▼ To Enable Remote Notification

1. **Ensure that the management station is configured and known to be operating correctly.**

   "(Optional) Verifying the Network Management Station" on page 46 describes this prerequisite.

2. **Use `vi`(1) or another editor to examine file `/etc/hosts`.**

   For example, CODE EXAMPLE 2-50 shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

   CODE EXAMPLE 2-50 Example `/etc/hosts` File

   ```
   999.9.9.9        localhost
   999.999.9.999    loggerhost      loghost
   999.999.9.998    mgmtconsole
   999.999.9.9      samserver
   ```

   Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined. If it is not defined, add a line that defines the appropriate host.

3. **Save your changes to `/etc/hosts` and exit the file.**

4. **Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

5. **Locate the `TRAP_DESTINATION=‘hostname‘` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

   This line specifies that the remote notification messages be sent to port 161 of the server upon which the Sun StorEdge QFS software is installed. Note the following:

   - If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`*mgmt_console_name*`:`*port*`"`. Note the use of quotation marks (`" "`) rather than apostrophes (`‘ ‘`) in the new directive.
   - If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [ mgmt_console_name:port]"
```

   For example:

```
TRAP_DESTINATION="localhost:161 doodle:163 mgmt_station:1162"
```

6. **Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

   This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

   - If your management station’s community string is also set to `public`, you do not have to edit this value.
   - If your management station’s community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. **Save your changes to `/etc/opt/SUNWsamfs/scripts/sendtrap` and exit the file.**

▼ To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. **(Optional) Use the `cp`(1) command to copy file `/opt/SUNWsamfs/examples/defaults.conf` to `/etc/opt/SUNWsamfs/defaults.conf`.**

   Perform this step if file `/etc/opt/SUNWsamfs/defaults.conf` does not exist.

2. **Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/defaults.conf`.**

   Find the line in `defaults.conf` that specifies SNMP alerts. The line is as follows:

   ```
   #alerts=on
   ```

3. **Edit the line to disable SNMP alerts.**

   Remove the # symbol and change `on` to `off`. After editing, the line is as follows:

   ```
   alerts=off
   ```

4. **Save your changes to `/etc/opt/SUNWsamfs/defaults.conf` and exit the file.**

5. **Use the `samd`(1M) `config` command to restart the `sam-fsd`(1M) daemon.**

   The format for this command is as follows:

   ```
   # samd config
   ```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf` file.

(Optional) Adding the Administrator Group

By default, only the superuser can execute Sun StorEdge QFS administrator commands. However, during installation you can create an administrator group. Members of the administrator group can execute all administrator commands except for `star`(1M), `samfsck`(1M), `samgrowfs`(1M), `sammkfs`(1M), and `samd`(1M). The administrator commands are located in `/opt/SUNWsamfs/sbin`.

After installing the package, you can use the `set_admin`(1M) command to add or remove the administrator group. You must be logged in as superuser to use the `set_admin`(1M) command. You can also undo the effect of this selection and make the programs in `/opt/SUNWsamfs/sbin` executable only by the superuser. For more information about this command, see the `set_admin`(1M) man page.

▼ To Add the Administrator Group

1. **Choose an administrator group name or select a group that already exists within your environment.**
2. **Use the `groupadd`(1M) command, or edit the `/etc/group` file.**

   The following is an entry from the `/etc/group` file that designates an administrator group for the Sun StorEdge QFS software. In this example, the `samadm` group consists of both the `adm` and `operator` users.

```
samadm::1999:adm,operator
```

Configuring System Logging

The Sun StorEdge QFS system logs errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the Sun StorEdge QFS facility is `local7`.

▼ To Enable Logging

1. **Use `vi`(1) or another editor to open the `/etc/syslog.conf` file.**

   Read in the line from the following file:

   `/opt/SUNWsamfs/examples/syslog.conf_changes`

   The line is similar, if not identical, to the following line:

   ```
   local7.debug   /var/adm/sam-log
   ```

   Note – The preceding entry is all one line and has a TAB character (not a space) between the fields.

   This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. **Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.**

   CODE EXAMPLE 2-51 shows the commands to use to append the logging lines.

CODE EXAMPLE 2-51 Using `cp`(1) and `cat`(1) to Append Logging Lines to `/etc/syslog.conf`

```
# cp /etc/syslog.conf /etc/syslog.conf.orig
# cat /opt/SUNWsamfs/examples/syslog.conf_changes >> /etc/syslog.conf
```

3. **Create an empty log file and send the `syslogd` process a HUP signal.**

   CODE EXAMPLE 2-52 shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to the `syslogd` daemon.

   CODE EXAMPLE 2-52 Creating an Empty Log File and Sending a HUP Signal to `syslogd`

```
# touch /var/adm/sam-log
# pkill -HUP syslogd
```

   For more information, see the `syslog.conf`(4) and `syslogd`(1M) man pages.

4. **(Optional) Use the `log_rotate.sh`(1M) command to enable log file rotation.**

   Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

(Optional) Configuring Other Products

The Sun StorEdge QFS installation and configuration process is complete. You can configure other Sun products at this time.

For example, if you want to configure an Oracle database, see the *Sun Cluster Data Service for Oracle Real Application Clusters Guide for Solaris OS*. The Oracle Real Application Clusters application is the only scalable application that the Sun StorEdge QFS supports in Sun Cluster environments.

CHAPTER 3

Sun StorEdge QFS Upgrade Procedure

This chapter describes upgrading a server to a new release of the Sun StorEdge software. Use this procedure if you are upgrading your Sun StorEdge QFS file system. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

Ensuring That the Installation Prerequisites Are Met

"System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you upgrade to the Sun StorEdge QFS 4.1 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter that pertain to verifying the system requirements for your upgrade to release 4.2 are as follows:

- "Server Requirements" on page 16
- "Solaris Operating System Requirements" on page 16
- "Verifying Disk Space" on page 23
- "Obtaining a Software License Key" on page 31
- "Obtaining the Release Files" on page 33
- "Verifying Third-Party Compatibilities" on page 35
- "(Optional) Verifying Requirements for the SAM-QFS Manager" on page 45
- "(Optional) Verifying the Network Management Station" on page 46

(Optional) Backing Up Existing File Systems

Perform this task if the following conditions exist:

- You are currently using a version 1 superblock with a Sun QFS 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In "(Optional) Reinitializing and Restoring the File Systems" on page 158, you reinitialize the file systems and restore your data.
- You suspect that your current `qfsdump`(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- "Using the Version 1 and Version 2 Superblocks" on page 141
- "To Back Up Each File System" on page 142

CODE EXAMPLE 3-1 shows using the `samfsinfo`(1M) command to retrieve information about the `qfs2` file system. The second line of output indicates that this file system is using a version 2 superblock.

CODE EXAMPLE 3-1 Using `samfsinfo`(1M)

```
# samfsinfo qfs2
samfsinfo: filesystem qfs2 is mounted.
name: qfs2       version:     2    shared
time:     Sun Sep 28 08:20:11 2003
count:    3
capacity:      05aa8000          DAU:         64
space:         0405ba00
meta capacity: 00b4bd20          meta DAU:    16
meta space:    00b054c0
ord  eq   capacity      space   device
  0  21   00b4bd20   00b054c0   /dev/md/dsk/d0
  1  22   02d54000   01f43d80   /dev/dsk/c9t50020F2300010D6Cd0s6
  2  23   02d54000   02117c80   /dev/dsk/c9t50020F2300010570d0s6
```

Using the Version 1 and Version 2 Superblocks

The Sun StorEdge QFS 4.0, 4.1, and 4.2 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)

- Sun StorEdge QFS shared file system
- `md` devices in Sun StorEdge QFS or Sun SAM-QFS (`ma`) file systems
- Dual-sized disk allocation units (DAUs) on `mm` devices

The Sun StorEdge QFS 4.1 and 4.2 releases support both the version 1 and version 2 superblocks. You can use the `sammkfs`(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the `qfsrestore`(1M) command to restore files to the new file system from the dump file created in this installation task.

If you are upgrading from a Sun QFS 4.0 system, note that the Sun StorEdge QFS 4.0 file system allowed you to initialize file systems with either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note – The Sun StorEdge QFS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The Sun StorEdge QFS 4.2 file system only allows you to initialize file systems with the version 2 superblock.

▼ To Back Up Each File System

1. **(Optional) Become superuser from a console connection.**

   If you have not already logged in as `root`, do so now.

2. **Use the `boot`(1M) command to boot the system in single-user mode.**

   For example:

```
# boot -s
```

3. **Use the `mount`(1M) command to mount the Sun StorEdge QFS file system.**

   For example:

```
# mount /qfs1
```

4. **Use the `qfsdump`(1M) command to back up the file data and metadata of each Sun StorEdge QFS file system.**

   The `qfsdump`(1M) command dumps file names, inode information, and file data. The destination of the `qfsdump`(1M) output (generally a file) must be as large or larger than the Sun StorEdge QFS file system you are backing up. The destination location must have enough space (disk or tape) to hold the amount of file data and metadata you are dumping. For more information about using the `qfsdump`(1M) command, see "Establishing Periodic Dumps Using `qfsdump`(1M)" on page 127 or see the `qfsdump`(1M) man page.

   Dump each file system to a location outside of the Sun StorEdge QFS file system. For more information, see the `qfsdump`(1M) man page.

   For example, if you have a file system named `qfs1` (mounted at `/qfs1`) that you want to back up, your choices are as follows:

   a. **You can write the `qfsdump`(1M) output to a tape device.**

      CODE EXAMPLE 3-2 shows how to write to a tape in device `/dev/rmt/1cbn`.

CODE EXAMPLE 3-2 Writing `qfsdump`(1M) Output to a Tape Device

```
# cd /qfs1
# qfsdump -f /dev/rmt/1cbn
```

   b. **You can write the `qfsdump`(1M) output to a file in a UFS file system**

      CODE EXAMPLE 3-3 shows how to write to a file in a UFS file system.

CODE EXAMPLE 3-3 Writing `qfsdump`(1M) Output to a File in the UFS File System

```
# cd /qfs1
# qfsdump -f /save/qfs/qfs1.bak
```

   c. **You can initialize a new Sun StorEdge QFS file system, using a Sun StorEdge QFS 4.2 release, and perform the `qfsrestore`(1M) directly into that new Sun StorEdge QFS file system.**

      This alternative is applicable only if you already have the Sun StorEdge QFS software installed and operational as a file system somewhere in your environment. Pursuing this alternative assumes that you want to use the features supported by the Sun StorEdge QFS 4.2 release and the version 2 superblock.

For example, assume that you want to write the dump file into a second Sun StorEdge QFS file system called `qfs2` (mounted at `/qfs2`). Make sure that you initialized the `qfs2` file system using Sun StorEdge QFS 4.2 software. CODE EXAMPLE 3-4 shows how to accomplish this using commands.

CODE EXAMPLE 3-4 Writing `qfsdump`(1M) Output to a Sun StorEdge QFS File System

```
# mount /qfs2
# cd /qfs1
# qfsdump -f - | (cd /qfs2; qfsrestore -f -)
```

5. **Repeat these steps for each Sun StorEdge QFS file system in your environment.**

   For more information about backing up your file systems, see the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

(Optional) Unsharing the File Systems

Perform this task if your Sun StorEdge QFS file systems are NFS shared file systems.

▼ To Unshare the File Systems

- **Use the `unshare`(1M) command on the Sun StorEdge QFS file system.**
  For example, the following command unshares the `qfs1` file system:

```
# unshare /qfs1
```

Unmounting the File Systems

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to "Removing Existing Sun StorEdge QFS Software" on page 148.

▼ To Unmount Using the umount(1M) Command

- **Using the umount(1M) command, unmount each Sun StorEdge QFS file system.**

  If necessary, use the -f option to the umount(1M) command. The -f option forces a file system to unmount.

▼ To Unmount Using the fuser(1M), kill(1), and umount(1M) Commands

If umount(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. **Use the fuser(1M) command to determine whether or not any processes are still busy.**

   For example, the following command queries the qfs1 file system:

   ```
   # fuser -uc /qfs1
   ```

2. **If any processes are still busy, use the kill(1M) command to terminate them.**
3. **Using the umount(1M) command, unmount each Sun StorEdge QFS file system.**

▼ To Unmount by Editing the /etc/vfstab File and Rebooting

1. **Edit the /etc/vfstab file.**

   For all Sun StorEdge QFS file systems, change the Mount at Boot field from yes or delay to no.

2. **Reboot your system.**

▼ To Unmount a Sun StorEdge QFS Shared File System

- **Use the instructions in the** *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide* **for unmounting a Sun StorEdge QFS shared file system.**

Removing Existing Sun StorEdge QFS Software

The following procedures show how to remove Sun StorEdge QFS software from a release prior to 4.2.

▼ To Remove Software From a 4.1 Release

1. **Use the `pkginfo`(1) command to determine which Sun StorEdge QFS software packages are installed on your system.**

   For example:

   ```
   # pkginfo | grep qfs
   ```

2. **Use the `pkgrm`(1M) command to remove the existing Sun StorEdge QFS software.**

   You must remove all existing Sun StorEdge QFS packages before installing the new packages. If you are using any optional Sun StorEdge QFS packages, you should make sure that you remove these packages before removing the main `SUNWqfs` packages. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWqfsu` and the `SUNWqfsr` packages:

   ```
   # pkgrm SUNWqfsu SUNWqfsr
   ```

   Note – The `SUNWqfsr` package must be the last package removed. The 4.1 release does not include any localized software packages.

▼ To Remove Software From a 4.0 Release

1. **Use the `pkginfo`(1) command to determine which Sun StorEdge QFS software packages are installed on your system.**

   For example:

```
# pkginfo | grep qfs
```

2. **Use the `pkgrm`(1M) command to remove the existing Sun StorEdge QFS software.**

   You must remove all existing Sun StorEdge QFS packages before installing the new packages. If you are using any optional Sun StorEdge QFS packages, make sure that you remove these packages before removing the main `SUNWqfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWcqfs`, the `SUNWfqfs`, and the `SUNWjqfs` localized packages:

```
# pkgrm SUNWcqfs SUNWfqfs SUNWjqfs SUNWqfs
```

Note – The `SUNWqfs` package must be the last package removed.

Adding the Packages

The Sun StorEdge QFS software packages use the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) command prompts you to confirm various actions necessary to upgrade the Sun StorEdge QFS package.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the installation. You can go to another window and copy the files you want to save to an alternate location.

▼ To Add the Packages

1. **Use the `cd`(1) command to change to the directory where the software package release files reside.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.
   - If you obtained the release files from a CD-ROM, use one of the following commands:
     - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

2. **Use the `pkgadd`(1M) command to upgrade the `SUNWqfsr` and `SUNWqfsu` packages.**

   For example:

```
# pkgadd -d . SUNWqfsr SUNWqfsu
```

3. **Enter `yes` or `y` as the answer to each of the questions.**

4. **(Optional) Use the `pkgadd`(1M) command to add one or more localized packages.**

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. CODE EXAMPLE 3-5 shows the commands to use to install the localized packages.

CODE EXAMPLE 3-5 Using the `pkgadd`(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcqfs
# pkgadd -d SUNWfqfs
# pkgadd -d SUNWjqfs
```

Updating the License Keys

A license key is required to run the Sun StorEdge QFS software. For information about license keys, see "Obtaining a Software License Key" on page 31.

The Sun StorEdge QFS file system uses an encrypted license key. The license key consists of an encoded alphanumeric string.

▼ (Optional) To License the Sun StorEdge QFS Software

You do not need to perform this procedure if you are upgrading from a Sun StorEdge QFS 4.0 or 4.1 release unless you also are adding features or equipment to your environment that would change your license. If you are not adding equipment, the system copies your 4.0 or 4.1 license to the correct location when the upgrade is complete.

1. **Verify whether the license file exists.**

   The license file is as follows:

   `/etc/opt/SUNWsamfs/LICENSE.4.2`

2. **If the `/etc/opt/SUNWsamfs/LICENSE.4.2` file does not exist, create it.**

3. **Starting in column one, place the license key you have obtained from your ASP or from Sun Microsystems on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

(Optional) Enabling the SAM-QFS Manager

Perform this task if you want to be able to use the SAM-QFS Manager.

The SAM-QFS Manager is an online interface to Sun StorEdge QFS that enables you to configure many of the components in a Sun StorEdge QFS environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information about enabling the SAM-QFS Manager, see "(Optional) Enabling the SAM-QFS Manager" on page 153.

Verifying the License and mcf Files

The following files exist on your Sun StorEdge QFS server:

- /etc/opt/SUNWsamfs/LICENSE.4.2
- /etc/opt/SUNWsamfs/mcf

The procedures in this task show you how to verify the correctness of these files.

▼ To Verify the License File

1. **Use the samd(1M) config command to initialize the Sun StorEdge QFS software.**

   For example:

```
# samd config
```

2. **Enter the samcmd(1M) l (lowercase L) command to verify the license file.**

   The samcmd(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in CODE EXAMPLE 3-6, return to "Updating the License Keys" on page 152.

CODE EXAMPLE 3-6 Using samcmd(1M)

```
# samcmd l

License information samcmd     4.2      Fri Aug 27 16:24:12 2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled

QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

▼ To Verify the `mcf` File

- **Enter the `sam-fsd`(1M) command to verify the `mcf` file.**

  Examine the output for errors, as follows:

  - If your `mcf` file is free from syntax errors, the `sam-fsd`(1M) output is similar to that shown in CODE EXAMPLE 3-7. It contains information about the file systems and other system information.

CODE EXAMPLE 3-7 `sam-fsd`(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld      off

sam-archiverd off

sam-catserverd off

sam-fsd       off

sam-rftd      off

sam-recycler  off

sam-sharefsd  off

sam-stagerd   off

sam-serverd   off

sam-clientd   off

sam-mgmt      off

License: License never expires.
```

  - If your `mcf` file contains syntax or other errors, however, it notes the errors in its output.

    If your `mcf` file has errors, refer to "Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65 and to the `mcf`(4) man page for information about how to create this file correctly.

Note – If you change the `mcf` file after the Sun StorEdge QFS file system is in use, you must convey the new `mcf` specifications to the Sun StorEdge QFS software. For information about propagating `mcf` file changes to the system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

(Optional) Modifying the `/etc/vfstab` File

Perform this task if you modified the `/etc/vfstab` file in "Unmounting the File Systems" on page 146.

▼ To Modify the `/etc/vfstab` File

- **Edit this file again, and change the Mount at Boot field for all Sun StorEdge QFS file systems from `no` to `yes` or `delay`.**

(Optional) Reinitializing and Restoring the File Systems

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "(Optional) Backing Up Existing File Systems" on page 141. To accomplish this, use the `sammkfs`(1M) and `qfsrestore`(1M) commands on each file system.

Note – The Sun StorEdge QFS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The Sun StorEdge QFS 4.2 file system only allows file systems to be initialized with the version 2 superblock. If you are upgrading from 4.0 using a version 1 superblock, be aware that issuing a 4.2 `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock.

▼ To Reinitialize and Restore the File Systems

1. **Use the `samfsinfo`(1M) command to retrieve information about the file system.**

   You can examine the output from the `samfsinfo`(1M) command to determine the DAU size specified on the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. Use this DAU size again when you perform Step 2.

2. **Use the `sammkfs`(1M) command to initialize a new Sun StorEdge QFS file system.**

   The following example `sammkfs`(1M) command reinitializes a file system named `qfs1` with Sun StorEdge QFS 4.2 feature capabilities:

   ```
   # sammkfs qfs1
   ```

   For more information about the options to the `sammkfs`(1M) command, see the `sammkfs`(1M) man page.

3. **Use the `qfsrestore`(1M) command to restore the dumped data into the new file system.**

   For example, the commands in CODE EXAMPLE 3-8 assume that you have a file system named `qfs1` (mounted at `/qfs1`) that you want to back up from files dumped to `qfs1.bak`, which exists outside of the Sun StorEdge QFS file system:

CODE EXAMPLE 3-8 Using `qfsrestore`(1M) to Restore Files into the New File System

```
# cd /qfs1
# qfsrestore -f /save/qfs/qfs1.bak
```

(Optional) Checking the File System

Perform this task if you did not perform "(Optional) Reinitializing and Restoring the File Systems" on page 158.

- **Use the `samfsck`(1M) command to check your existing file systems for inconsistancies.**

  Do this for each Sun StorEdge QFS file system.

Mounting the File Systems

Use the `mount`(1M) command to mount your Sun StorEdge QFS file system.

▼ To Mount the File System

- **Use the `mount`(1M) command to mount the file systems.**

  In the following example, `qfs1` is the name of the file system to be mounted:

```
# mount qfs1
```

(Optional) Recompiling API-Dependent Applications

If you are running applications that use the Sun StorEdge QFS application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

Caution – Failure to recompile API-dependent applications at this point can cause your applications to generate unexpected results.

CHAPTER 4

Sun StorEdge SAM-FS Initial Installation Procedure

This chapter describes the procedure for installing and configuring the Sun StorEdge SAM-FS software for the first time. Use this procedure if this is the initial installation of the Sun StorEdge SAM-FS software package at your site.

If you are upgrading Sun StorEdge SAM-FS software on an existing server, see "Sun StorEdge SAM-FS Upgrade Procedure" on page 283.

The procedures in this chapter describe copying and installing the software packages onto your server and configuring the software to match the hardware at your site. You must have superuser (`root`) access to perform most of the tasks described in this chapter.

You can install and configure your Sun StorEdge SAM-FS file system entirely using Solaris commands, or you can use a combination of commands and SAM-QFS Manager, which is a graphical user interface (GUI) configuration tool, to complete the procedure.

For most of the procedures in this chapter, you must have `root` access.

Ensuring That the Installation Prerequisites Are Met

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you install and configure the Sun StorEdge SAM-FS software. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements and performing preinstallation tasks are as follows:

Adding the Packages on the Sun StorEdge SAM-FS Server

The Sun StorEdge SAM-FS software uses the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the packages.

▼ To Add the Packages

1. **Become superuser.**

2. **Use the `cd`(1) command to change to the directory where the software package release files reside.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.
   - If you obtained the release files from a CD-ROM, use one of the following commands:
     - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

3. **Use the `pkgadd`(1M) command to add the `SUNWsamfsr` and `SUNWsamfsu` packages.**

   For example:

```
# pkgadd -d . SUNWsamfsr SUNWsamfsu
```

4. **Enter `yes` or `y` as the answer to each of the questions.**

   When you install `SUNWsamfsr` and `SUNWsamfsu`, you are asked if you want to define an administrator group. Select `y` to accept the default (no administrator group) or select `n` if you want to define an administrator group. You can reset permissions on certain commands later by using the `set_admin`(1M) command. For more information on this command, see the `set_admin`(1M) man page.

5. **(Optional) Use the `pkgadd`(1M) command to add one or more localized packages.**

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. CODE EXAMPLE 4-1 shows the commands to use to install the localized packages.

   CODE EXAMPLE 4-1 Using the `pkgadd`(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcsamf
# pkgadd -d SUNWfsamf
# pkgadd -d SUNWjsamf
```

   The procedure for adding the SAM-QFS Manager software appears later in this chapter. The SAM-QFS Manager installation script prompts you to add localized versions of that software.

6. **Examine `/tmp/SAM_install.log`.**

   File `/tmp/SAM_install.log` is the Sun StorEdge SAM-FS log file.

   This file should show that the `pkgadd`(1M) command added the `SUNWsamfsr` and `SUNWsamfsu` software packages. Make sure that it also installed the Sun StorEdge SAM-FS `samst` driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files

Perform this task if you plan to enable archiving to tape or magneto-optical media. You do not need to perform this procedure if you plan to archive to disk.

This task introduces you to the the process of verifying, and perhaps updating, the following two files:

- The `/kernel/drv/st.conf` file, which lists configuration information for tape drives attached to the server through a SCSI or Fibre Channel attachment.
- The `/kernel/drv/samst.conf` file, which lists configuration information for the following devices that the Sun StorEdge SAM-FS software recognizes by default:
  - Direct-attached automated libraries.
  - Magneto-optical drives attached to the server through a SCSI or Fibre Channel attachment.

The Sun StorEdge SAM-FS package includes the `/opt/SUNWsamfs/examples/st.conf_changes` file. This file includes configuration information for the following kinds of tape drives:

- Tape drives that are not supported in the Solaris kernel by default.
- Tape drives that are supported in the Solaris kernel but are supported with settings that do not accommodate Sun StorEdge SAM-FS software.

This task includes the following procedures:

- "To Verify Device Types" on page 168
- "(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 169
- "To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File" on page 173
- "(Optional) To Verify or Add Device Support in the `samst.conf` File" on page 175
- "To Verify That All Devices Are Configured" on page 178

▼ To Verify Device Types

1. **Obtain the list of devices that you created when you completed the step called "To Create a List of Devices" on page 30.**

   "To Create a List of Devices" on page 30 is a procedure in which you enumerate the devices you want to include in your Sun StorEdge SAM-FS environment. If you have not already taken an inventory of your devices and listed them in TABLE 1-9, do so now. For the rest of the procedures in this installation, this manual refers to TABLE 1-9 as your inventory list.

   The procedures in this task include an example that assumes your inventory list is as shown in TABLE 4-1.

   TABLE 4-1 An Example Inventory List - Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
SCSI-Attached Tape Drives			
QUANTUM DLT7000	1	0	Not applicable
QUANTUM DLT7000	2	0	Not applicable
Fibre Channel-Attached Tape Drives			
STK 9840	Not Applicable	0	500104f00043abfc
STK 9840	Not Applicable	0	500104f00045eeaf
IBM ULT3580-TD1	Not Applicable	0	500104f000416304
IBM ULT3580-TD1	Not Applicable	0	500104f000416303
SCSI-Attached Automated Libraries			
STK 9730	0	0	Not applicable
Fibre Channel-Attached Automated Libraries			
STK L700	Not applicable	0	500104f00041182b

   Note – The device names in TABLE 4-1 are represented as they appear in the discovery output.

2. **Proceed on to the next step in this installation and configuration procedure.**

   Depending on the devices on your inventory list, you need to complete one or more of the following procedures:

   - If there are any tape drives that you want to include in your Sun StorEdge SAM-FS environment, go to "(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 169.

- If there are any magneto-optical drives, SCSI-attached automated libraries, or Fibre Channel-attached automated libraries that you want to include in your Sun StorEdge SAM-FS environment, go to "(Optional) To Verify or Add Device Support in the samst.conf File" on page 175.

▼ (Optional) To Add Tape Devices to the /kernel/drv/st.conf File

Perform this pocedure if you have tape drives that you want to include in your Sun StorEdge SAM-FS environment.

In this procedure, you make entries for each unique tape drive type that you want to include in your Sun StorEdge SAM-FS environment. For each unique tape drive that is on your inventory list, there must be a corresponding entry in the st.conf file.

1. **Use the cp(1) command to copy /kernel/drv/st.conf to a backup file.**

   For example:

   ```
   # cp /kernel/drv/st.conf /kernel/drv/st.conf.orig
   ```

2. **Use vi(1) or another editor to open file /kernel/drv/st.conf.**

3. **Find the line that contains the tape-config-list string.**

   This line is as follows:

   ```
   #tape-config-list=
   ```

   Remove the pound character (#) from column 1 of this line.

4. **Use vi(1) or another editor to open file /opt/SUNWsamfs/examples/st.conf_changes.**

5. **Search file /opt/SUNWsamfs/examples/st.conf_changes to find the first device on your inventory list.**

   In the example inventory list, the first drive you need to find is the Quantum DLT 7000 tape drive. Find the line that contains the following entry:

   ```
   "QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
   ```

   This is the device definition for the Quantum DLT 7000 tape drive.

6. **Copy the line containing the device definition you need from `st.conf_changes` to `st.conf` so it appears after the `tape-config-list` line.**

   CODE EXAMPLE 4-2 shows how the `st.conf` file looks at this point.

CODE EXAMPLE 4-2 `st.conf` With Its First Device Definition Entry

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
...
```

7. **Examine the line you just copied and note the final string enclosed in quotation marks.**

   In this example, the final string is "`dlt7-tape`".

8. **Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find another line that begins with the final string you noted in Step 7.**

   The line you are looking for is called the tape configuration value.

   In this example, it is as follows:

```
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
```

9. **Copy the tape configuration line from Step 8 to file `st.conf`.**

   Put the device configuration line *after* the device definition line you copied in from Step 6.

   For this example, CODE EXAMPLE 4-3 shows the lines now contained in the `st.conf` file.

CODE EXAMPLE 4-3 `st.conf` With a Device Entry and the Device Entry's Tape Configuration Value

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
...
```

10. **Decide whether you want to configure more devices in the `st.conf` file.**

    If this is the last or only device you want to configure, proceed to Step 17.

    If you have more devices to configure, proceed to Step 11.

11. **Search file** `/opt/SUNWsamfs/examples/st.conf_changes` **to find the next device on your inventory list.**

    In our example inventory list, the next drive you need to find is the StorageTek 9840 tape drive. Find a line that contains the following entry:

```
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
```

    This is the device definition for the StorageTek 9840 tape drive.

12. **Copy the line containing the device definition you need from** `st.conf_changes` **to** `st.conf` **so it appears after preceding device definition line.**

    CODE EXAMPLE 4-4 shows how the `st.conf` file looks at this point.

CODE EXAMPLE 4-4 `st.conf` with Another Device Definition Entry

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
...
```

13. **Examine the line you just copied and note the final string enclosed in quotation marks.**

    In this example, the final string is `"CLASS_9840"`.

14. **Search file** `/opt/SUNWsamfs/examples/st.conf_changes` **to find another line that begins with the final string you noted in Step 13.**

    The line you are looking for is called the tape configuration value.

    In this example, it is as follows:

```
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
```

15. **Copy the tape configuration line from Step 14 to file `st.conf`.**

    Put the device configuration line *after* the device configuration line you copied in from Step 9.

    For this example, CODE EXAMPLE 4-3 shows the tape drive configuration lines now contained in the `st.conf` file.

CODE EXAMPLE 4-5 `st.conf` With a Device Entry and the Device Entry's Tape Configuration Value

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
...
```

16. **Decide whether you want to configure more devices in the `st.conf` file.**

    If you have more devices to configure, go back to Step 11.

    If this is the last device you want to configure, proceed to Step 17.

    For example, CODE EXAMPLE 4-7 shows the `st.conf` file after you have added definitions for the Quantum DLT 7000, the StorageTek 9840, and the IBM ULT3580 tape drives.

CODE EXAMPLE 4-6 `st.conf` Configured for Multiple Devices (Intermediate Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1",  "IBM 3580 Ultrium",     "CLASS_3580",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

17. **Replace the comma (`,`) at the end of the last device definition line with a semicolon (`;`).**

CODE EXAMPLE 4-7 shows the resulting `st.conf` file if you have multiple devices configured.

CODE EXAMPLE 4-7 `st.conf` Configured for Multiple Devices (Final Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1",  "IBM 3580 Ultrium",     "CLASS_3580";
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

Note – Some device configuration lines in `st.conf_changes` support more than one device definition, but you need only one device definition line in the `st.conf` file for such devices. For example, the Sony SDT-5000 and the Sony SDT-5200 both have `"DAT"` as the final string in their device definition lines. If your environment is to include both of these Sony devices, only one instance of the `DAT = 1,0x34,0,0x0439,1,0x00,0;` device definition needs to appear in the `st.conf` file.

---

18. **Save your changes and proceed to "To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File" on page 173.**

You do not need to close out of the `st.conf` file at this point because you continue editing `st.conf` in the next procedure. It is a good idea to save your changes, however.

▼ To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File

Perform this procedure if you have tape drives that you want to include in your Sun StorEdge SAM-FS environment. You typically perform this procedure after you have completed "(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 169.

For each tape drive on your hardware inventory list that is attached through a SCSI interface, you must confirm that an entry in the `st.conf` file defines that interface. This procedure shows how to verify and, if necessary, add target ID and LUN entries. Do not use this procedure to add interface information for magneto-optical drives.

1. **(Optional) Use `vi`(1) or another editor to open file `/kernel/drv/st.conf`.**

   If you left the file open for editing from the previous procedure ("(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 169), you do not need to perform this step.

2. **(Optional) Find the list of SCSI target IDs and LUNs in the `st.conf` file.**

   Perform this step only if you have tape drives you want to include that are attached through a SCSI interface.

   In the `st.conf` file, look for entries that have the following format:

   ```
   name="st" class="scsi" target=target lun=lun;
   ```

   target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

3. **In the list of SCSI targets and LUNs, find the entry that corresponds to a SCSI target and LUN that are on your inventory list.**

   For example, the two Quantum DLT 7000 drives are attached to LUN 0 and have target IDs 1 and 2. CODE EXAMPLE 4-8 shows the two lines that correspond to those interfaces.

   CODE EXAMPLE 4-8 Example SCSI Target ID and LUN Information

   ```
   name="st" class="scsi" target=1 lun=0;
   name="st" class="scsi" target=2 lun=0;
   ```

   Note that the preceding two lines might extend over two lines in `st.conf` if they contain return characters.

   If you cannot find the SCSI target and LUN you need, proceed to Step 5.

4. **Ensure that the lines identified in Step 3 are not preceded by pound (#) characters.**

   A pound (#) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 6.

5. **(Optional) Create a line for the SCSI target and LUN that you need.**

   Perform this step if the SCSI target and LUN line you need is not already listed in `st.conf`.

   Use the format shown in Step 2 as a model for the line you add.

6. **Decide whether you need to configure more SCSI targets and LUNs in `st.conf`.**

   If you have more SCSI targets and LUNs to configure, go back to Step 3.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 7.

7. **(Optional) Create lines for each device attached through a Fibre Channel interface.**

   Perform this step only if you have tape drives attached through a Fibre Channel interface in your inventory list and you are not using the Sun SAN Foundation Software I/O stack.

   Fibre Channel interfaces are not included in the `st.conf` file by default. At the end of the SCSI target ID and LUN list, create a line for each Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

```
name="st" parent="fp" lun=lun fc-port-wwn="world-wide-name"
```

   For *lun*, specify the LUN for the drive.

   For *world-wide-name*, specify the World Wide Name for drive.

   For example, CODE EXAMPLE 4-9 shows the lines to add to support the StorageTek 9840 and IBM ULT3580 tape drives included in the inventory list that are attached through Fibre Channel interfaces.

CODE EXAMPLE 4-9 Fibre Channel Interface Definition Lines for the `st.conf` File

```
name="st" parent="fp" lun=0 fc-port-wwn="500104f00043abfc"
name="st" parent="fp" lun=0 fc-port-wwn="500104f00045eeaf"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416304"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416303"
```

8. **Save your changes and exit the `st.conf` file.**

   Proceed to "(Optional) To Verify or Add Device Support in the `samst.conf` File" on page 175 if you have any of the following devices in your inventory list:

   - Magneto-optical drives
   - Automated libraries attached through a SCSI or a Fibre Channel interface.

▼ (Optional) To Verify or Add Device Support in the `samst.conf` File

Perform this step if you have magneto-optical drives or if you have automated libraries attached through a SCSI or a Fibre Channel interface. You do not need to perform this step if you have only network-attached automated libraries.

The `/kernel/drv/samst.conf` file contains a list of SCSI and Fibre Channel entries. This procedure shows you how to verify entries for your devices and to update the file if necessary. The `samst.conf` file works with the `/opt/SUNWsamfs/examples/inquiry.conf` file to define the devices that can be included in a Sun StorEdge SAM-FS environment. The `inquiry.conf` file lists all devices that are supported, so you do not need to verify or edit that file.

1. **Use the `cp`(1) command to copy the `/kernel/drv/samst.conf` file to a backup file.**

   For example:

   ```
   # cp /kernel/drv/samst.conf /kernel/drv/samst.conf.orig
   ```

2. **Use `vi`(1) or another editor to open the `/kernel/drv/samst.conf` file.**

3. **(Optional) Find the list of SCSI targets and LUNs in the `samst.conf` file.**

   Perform this step only if you have SCSI-attached magneto-optical drives or SCSI-attached libraries that you want to include.

   In the `samst.conf` file, the entries you are looking for have the following format:

   ```
   name="samst" class="scsi" target=target lun=lun;
   ```

   target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

4. **In the list of SCSI targets and LUNs, find the entry that corresponds to a SCSI target ID and LUN that are on your inventory list.**

   For example, the StorageTek 9730 automated library is attached to target 0 and LUN 0. The following line corresponds to that interface:

   ```
   name="samst" class="scsi" target=0 lun=0;
   ```

   Note that the preceding line might extend over two lines in `st.conf` if it contains return characters.

   If you cannot find the SCSI target and LUN you need, proceed to Step 6.

5. **Ensure that the lines identified in Step 3 are not preceded by pound (`#`) characters.**

   A pound (`#`) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 7.

6. **(Optional) Create a line for the SCSI target and LUN that you need.**

   Perform this step if the SCSI target and LUN line you need is not already listed in `samst.conf`.

   Use the format shown in Step 3 as a model for the line you add.

7. **Decide whether you need to configure more SCSI targets and LUNs in `samst.conf`.**

   If you have more SCSI targets and LUNs to configure, go back to Step 4.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 8.

8. **(Optional) Create lines for the first device in your inventory list that is attached through a Fibre Channel interface.**

   Perform this step only if you have Fibre Channel-attached magneto-optical drives or Fibre Channel-attached automated libraries that you want to include.

   Fibre Channel interfaces are not included in the `samst.conf` file by default. At the end of the SCSI target and LUN list, create a line for each Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

   ```
   name="samst" parent="fp" lun=lun fc-port-wwn="world-wide-name"
   ```

   For *lun*, specify the LUN for the drive.

   For *world-wide-name*, specify the World Wide Name for drive.

   The following example shows the line to add to support the StorageTek L700 tape drive on the example inventory list that is attached through a Fibre Channel interface:

   ```
   name="samst" parent="fp" lun=0 fc-port-wwn="500104f00041182b"
   ```

9. **(Optional) Repeat Step 8 for each device that is attached through a Fibre Channel interface.**

10. **Save your changes and exit the `samst.conf` file.**

▼ To Verify That All Devices Are Configured

- **Use the `cfgadm`(1M) command to verify the devices included in the Sun StorEdge SAM-FS environment.**

  For example:

CODE EXAMPLE 4-10 Output From `cfgadm`(1M)

```
# cfgadm -al
Ap_Id                          Type         Receptacle   Occupant     Condition
c0                              scsi-bus     connected    configured   unknown
c0::dsk/c0t6d0                  CD-ROM       connected    configured   unknown
c1                              fc-private   connected    configured   unknown
c1::500000e0103c3a91            disk         connected    configured   unknown
c2                              scsi-bus     connected    unconfigured unknown
c3                              scsi-bus     connected    unconfigured unknown
c4                              scsi-bus     connected    configured   unknown
c4::dsk/c4t1d0                  disk         connected    configured   unknown
c4::dsk/c4t2d0                  disk         connected    configured   unknown
c5                              fc-fabric    connected    configured   unknown
c5::100000e00222ba0b            disk         connected    unconfigured unknown
c5::210000e08b0462e6            unknown      connected    unconfigured unknown
c5::210100e08b2466e6            unknown      connected    unconfigured unknown
c5::210100e08b27234f            unknown      connected    unconfigured unknown
c5::500104f00043abfc            tape         connected    configured   unknown
c5::500104f00043bc94            tape         connected    configured   unknown
c5::500104f00045eeaf            tape         connected    configured   unknown
c5::500104f000466943            tape         connected    configured   unknown
c5::500104f00046b3d4            tape         connected    configured   unknown
c5::500104f0004738eb            tape         connected    configured   unknown
c6                              fc           connected    unconfigured unknown
c7                              scsi-bus     connected    unconfigured unknown
c8                              scsi-bus     connected    unconfigured unknown
usb0/1                          usb-kbd      connected    configured   ok
usb0/2                          usb-mouse    connected    configured   ok
usb0/3                          unknown      empty        unconfigured ok
usb0/4                          unknown      empty        unconfigured ok
```

Examine the output to make sure that it shows all the devices you want to configure in your Sun StorEdge SAM-FS environment. If a device is not shown as being configured, and it should be, you can use the `cfgadm`(1M) command to configure it. For more information, see the `cfgadm`(1M) man page.

Because of a bug in the `cfgadm`(1) command, you might receive a device busy error

similar to that shown in CODE EXAMPLE 4-11.

CODE EXAMPLE 4-11 `cfgadm`(1M) Output Showing a Device Busy Error that can be Ignored

```
# cfgadm -c configure -o force_update c4::500104f000489fe3
cfgadm: Library error: failed to create device node: 500104f00043abfc: Device
busy
```

Despite the error, the `cfgadm`(1M) command completely processes the request.

Handling Errors in the `st.conf` File

Errors can occur if the `st.conf` file is not configured properly during Sun StorEdge SAM-FS software installation. The following example shows typical error messages and provides suggestions for problem resolution.

The following message is found in the `sam-log` file:

```
May 18 12:38:18 baggins genu-30[374]: Tape device 31 is default
type. Update '/kernel/drv/st.conf'.
```

CODE EXAMPLE 4-12 shows the device log messages that correspond to the `sam-log` message.

CODE EXAMPLE 4-12 Error Messages in the Device Log File

```
1999/05/18 12:34:27*0000 Initialized. tp
1999/05/18 12:34:28*1002 Device is QUANTUM , DLT7000
1999/05/18 12:34:28*1003 Serial CX901S4929, rev 2150
1999/05/18 12:34:28*1005 Known as Linear Tape(lt)
1999/05/18 12:34:32 0000 Attached to process 374
1999/05/18 12:38:18 1006 Slot 1
1999/05/18 12:38:18 3117 Error: Device is type default. Update
/kernel/drv/st.conf
```

The preceding messages indicate that the appropriate changes have not been made to `/kernel/drv/st.conf`.

Enabling the Sun StorEdge SAM-FS Software License

You need a license key to run the Sun StorEdge SAM-FS software. For information on obtaining license keys, see "Obtaining a Software License Key" on page 31.

The Sun StorEdge SAM-FS environments use encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

▼ To License the Sun StorEdge SAM-FS Software

1. **Create the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**
2. **Starting in column one, place the license keys you have obtained from your ASP or from Sun Microsystems on the first line and on successive lines in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

Setting Up PATH and MANPATH Variables

This task shows you how to modify your PATH and MANPATH environment variables so you can access the Sun StorEdge SAM-FS commands and man pages easily.

▼ To Set Up PATH and MANPATH Variables

1. **For users who need to access the Sun StorEdge SAM-FS user commands (for example, sls(1)), add /opt/SUNWsamfs/bin to the users' PATH variables.**

2. **Use vi(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.**

   a. **In the Bourne or Korn shells, edit the .profile file, change the PATH and MANPATH variables, and export the variables.**

   CODE EXAMPLE 4-13 shows how your .profile file might look after editing.

CODE EXAMPLE 4-13 Finished .profile File

```
PATH=$PATH:/opt/SUNWsamfs/bin:/opt/SUNWsamfs/sbin
MANPATH=$MANPATH:/opt/SUNWsamfs/man
export PATH MANPATH
```

   b. **In the C shell, edit the .login and .cshrc files.**

   When you are finished editing, the path statement in your .cshrc file might look like the following line:

```
set path = ($path /opt/SUNWsamfs/bin /opt/SUNWsamfs/sbin)
```

   CODE EXAMPLE 4-14 shows how the MANPATH in your .login file might look like after editing.

CODE EXAMPLE 4-14 Finished MANPATH in the .login File

```
setenv MANPATH /usr/local/man:opt/SUNWspro/man:/$OPENWINHOME/\
share/man:/opt/SUNWsamfs/man
```

Rebooting the System

Note – Failure to reboot the system at this time can cause the `st` and `samst` modules to remain unconfigured.

▼ To Reboot the System

- **Reboot the server by issuing the `touch`(1) and `init`(1M) commands.**

  CODE EXAMPLE 4-15 shows the commands to use to reboot.

CODE EXAMPLE 4-15 Commands to Reboot the Server

```
# touch /reconfigure
# init 6
```

Changes to the `st.conf` and `samst.conf` files are enabled at this time.

(Optional) Enabling the SAM-QFS Manager

Perform this task if you want to be able to use the SAM-QFS Manager to configure, control, monitor, or reconfigure your Sun StorEdge SAM-FS environment.

The procedures in this section are as follows:

- "To Install the SAM-QFS Manager Software" on page 183.
- "To Invoke the SAM-QFS Manager for the First Time" on page 187. Use this procedure to invoke the SAM-QFS Manager software.
- "To Use the SAM-QFS Manager for Configuration" on page 188. Use this procedure to decide which configuration tasks you want to perform using the SAM-QFS Manager software.

In addition to the information in this section, this manual's appendix, "SAM-QFS Manager Software Notes" on page 309, describes other aspects of using the SAM-QFS Manager.

▼ To Install the SAM-QFS Manager Software

1. **Ensure that you have met the installation requirements described in "(Optional) Verifying Requirements for the SAM-QFS Manager" on page 45.**
2. **Log in to the server that you want to use as the management station.**

   This can be the same server upon which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages.
3. **Become superuser.**

4. **Use the `cd`(1) command to change to the directory where the software package release files reside on your server.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files.

   For example, if you obtained the release files from a CD-ROM, use the following command:

   ```
   # cd /cdrom/cdrom0
   ```

   If you downloaded the release files, change to the directory to which you downloaded the files.

5. **Execute the `samqfsmgr_setup` script to install the SAM-QFS Manager software.**

   For example:

   ```
   # samqfsmgr_setup
   ```

6. **Answer the questions as prompted by the `samqfsmgr_setup` script.**

   During the installation procedure, you are asked to answer questions about your environment. The script prompts you to enter passwords for the `SAMadmin` role and for the `samadmin` and `samuser` login IDs.

   The `samqfsmgr_setup` script automatically installs the following:

   - The TomCat, Java Runtime Environment (JRE), JATO, and Sun Web Console packages. If you have existing versions of these software packages that are not compatible with SAM-QFS Manager, the installation software asks you whether you want the appropriate levels to be installed at this time.
   - The `SUNWsamqfsuiu` package.
   - The `SUNWsamqfsuir` package.

   The installation scripts prompt you to answer questions regarding whether you want to install any localized packages.

   After installing the packages, it starts the TomCat Web Server, enables logging, and creates the `SAMadmin` role.

7. **Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.**

a. **In the Bourne or Korn shell, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.**

CODE EXAMPLE 4-16 shows how your `.profile` file might look after editing.

CODE EXAMPLE 4-16 Finished `.profile` File

```
PATH=$PATH:/opt/SUNWsamqfsui/bin
MANPATH=$MANPATH:/opt/SUNWsamqfsui/man
export PATH MANPATH
```

b. **In the C shell, edit the `.login` and `.cshrc` files.**

When you have finished editing, the `path` statement in your `.cshrc` file might look like the following line:

```
set path = ($path /opt/SUNWsamqfsui/bin)
```

CODE EXAMPLE 4-17 shows how the `MANPATH` in your `.login` file might after you have finished editing.

CODE EXAMPLE 4-17 Finished `MANPATH` in the `.login` File

```
setenv MANPATH /usr/local/man:opt/SUNWspro/man:/$OPENWINHOME/\
share/man:/opt/SUNWsamfs/man:/opt/SUNWsamqfsui/man
```

8. **Log in to the Sun StorEdge SAM-FS server and become superuser.**

9. **Use the `ps`(1) and `grep`(1) commands to make sure that the `rpcbind` service is running.**

For example:

```
# ps -ef | grep rpcbind
```

10. **Examine the output from the preceding commands.**

The output should contain a line similar to the following:

```
root   269     1  0   Feb 08 ?        0:06 /usr/sbin/rpcbind
```

If `rpcbind` does not appear in the output, enter the following command:

```
# /usr/sbin/rpcbind
```

11. **(Optional) Start the SAM-QFS Manager (`sam-mgmtrpcd`) daemon.**

    Perform this step if you did not choose to have this daemon started automatically at installation time.

    Enter the following command to start the SAM-QFS Manager daemon:

```
# /opt/SUNWsamfs/sbin/samadm config -a
```

    With this configuration, the system automatically restarts this daemon every time the daemon process dies. The daemon autorestarts at system reboots.

    If you want to stop the daemon completely, enter the following command:

```
# /opt/SUNWsamfs/sbin/samadm config -n
```

    The preceding command also prevents the daemon from restarting automatically.

    If you want the SAM-QFS Manager daemon to run only once and not automatically restart, use the following command:

```
# /opt/SUNWsamfs/sbin/samadm start
```

    If you have used the preceding command to start the daemon, use the following command to stop it:

```
# /opt/SUNWsamfs/sbin/samadm stop
```

    For more information, see the `samadm`(1M) man page.

Using the SAM-QFS Manager Software

After the SAM-QFS Manager is installed, you can log in to the software using two possible user names (`samadmin` and `samuser`) and two different roles (`SAMadmin` or `no role`). The tasks you can perform using the SAM-QFS Manager differ depending on the user name and the role you assume at login. These differences are as follows:

- If you log in as `samadmin`, you can choose from one of two roles.
  - The role of `SAMadmin` grants you full adminstrator privileges to configure, monitor, control, and reconfigure the devices in your Sun StorEdge SAM-FS environment.

Only the Sun StorEdge SAM-FS adminstrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.

- The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.

- If you log in as `samuser`, you can only monitor the environent. You cannot change or reconfigure it in any way.

With regard to system administration, be aware that the Solaris root user on the server that hosts the SAM-QFS Manager is not necessarily the administrator of the SAM-QFS Manager. Only `samadmin` has administrator priviledges for the SAM-QFS Manager application. The root user is the administrator of the management station.

▼ To Invoke the SAM-QFS Manager for the First Time

Perform this procedure if you want to invoke the SAM-QFS Manager and use it, rather than commands, to perform some of the configuration steps.

1. **Log in to the management station web server.**

2. **From a web browser, invoke the SAM-QFS Manager software.**

   The URL is as follows:

   ```
   https://hostname:6789
   ```

   For *hostname*, type the name of the host. If you need to specify a domain name in addition to the host name, specify the *hostname* in this format: *hostname*.*domainname*.

   Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.

3. **At the `User Name` prompt, enter `samadmin`.**

4. **At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the SAM-QFS Manager Software" on page 183.**

5. **Click the `SAMadmin` role.**

   Only the Sun StorEdge SAM-FS administrator should ever log in with the `SAMadmin` role.

6. **At the `Role Password` prompt, enter the password you entered in Step 4.**

7. **Click `Log In`.**

8. **Click `SAM-QFS Manager 1.1`.**

   You are now logged in to the SAM-QFS Manager.

- If you want to configure your environment at this time using the SAM-QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click on Help. After you add the servers, see "To Use the SAM-QFS Manager for Configuration" on page 188 for more information on configuring your environment using the SAM-QFS Manager.
- If you want to quit using the SAM-QFS Manager at this time, click `Log Out`.
- If you want to create additional accounts at this time, see "SAM-QFS Manager Software Notes" on page 309.

▼ To Use the SAM-QFS Manager for Configuration

This manual guides you through the configuration process using Solaris OS commands, but you can also use the SAM-QFS Manager, instead of commands, to accomplish many of the tasks.

1. **Click `Help`, in the upper right corner of the screen, to access the SAM-QFS Manager online documentation.**

2. **(Optional) Configure your parameters file for network-attached libraries.**

   If you want to use SAM-QFS Manager to configure your Sun StorEdge SAM-FS environment and you want to include network-attached libraries in this configuration, create your parameters file *before* you create your `mcf` file. For information on creating a parameters file, see "(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 209.

Note – This is not the order in which these tasks are performed if you want to use commands to create these files. If you want to use commands to configure your Sun StorEdge SAM-FS environment, you create your `mcf` file first, and then you create the parameters files for network-attached libraries.

---

3. **Complete the configuration tasks.**

Perform the configuration tasks in TABLE 4-2 in the order they appear. You can open a terminal window next to the SAM-QFS Manager window for use when you have to alternate between using commands and using the SAM-QFS Manager.

TABLE 4-2 shows the rest of the tasks you must perform to complete your Sun StorEdge SAM-FS configuration and the means by which you can accomplish each task.

TABLE 4-2 Sun StorEdge SAM-FS Installation Tasks

Task	Accomplish Through SAM-QFS Manager	Accomplish Through Commands
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 209	No	Yes
"Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191	Yes	Yes
"Initializing the Sun StorEdge SAM-FS Environment" on page 228	Yes	Yes
"(Optional) Checking the Drive Order" on page 229	Yes	Yes
"(Optional) Creating the `archiver.cmd` File" on page 236	Yes	Yes
"(Optional) Enabling Disk Archiving" on page 244	Yes	Yes
"(Optional) Editing the `defaults.conf` File" on page 250	No	Yes
"Verifying the License and `mcf` Files" on page 254	No	Yes
"(Optional) Labeling Removable Media Cartridges" on page 256	No	Yes
"(Optional) Populating the Catalog" on page 258	Yes	Yes
"(Optional) Creating the `samfs.cmd` File" on page 264	Yes	Yes
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 265	Yes	Yes
"Initializing the File System" on page 267	Yes	Yes
"Mounting the File System" on page 268	Yes	Yes
"(Optional) Sharing the File System With NFS Client Systems" on page 269	No	Yes
"Writing Periodic Dump Files By Using `samfsdump`(1M)" on page 272	No	Yes
"(Optional) Backing Up Configuration Files" on page 275	No	Yes

TABLE 4-2 Sun StorEdge SAM-FS Installation Tasks *(Continued)*

Task	Accomplish Through SAM-QFS Manager	Accomplish Through Commands
"(Optional) Configuring the Remote Notification Facility" on page 276	No	Yes
"(Optional) Adding the Administrator Group" on page 279	No	Yes
"Configuring System Logging" on page 280	No	Yes
"(Optional) Configuring Other Sun StorEdge Products" on page 282	Not applicable	Not applicable

TABLE 4-2 describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and `mcf` Files" on page 254. You need to use Solaris OS commands to verify that your license file is installed and working correctly and that your `archiver.cmd`(4) file is free from syntax errors. If you use SAM-QFS Manager to create your `mcf` file, however, you do not need to verify your `mcf` file.
- "Writing Periodic Dump Files By Using `samfsdump`(1M)" on page 272. Performing this step is essential to preserving your data.

The other installation steps in TABLE 4-2 are necessary — or are highly recommended— depending on your environment. For example, if you have network-attached automated libraries, you must perform "(Optional) Populating the Catalog" on page 258. Read through the documentation for the tasks described in the preceding list and decide which steps you need to perform.

Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File

Each Sun StorEdge SAM-FS software environment is unique. The system requirements and hardware differ from site to site. The Sun StorEdge SAM-FS environments support a wide variety of tape and optical devices, automated libraries, and disk drives. It is up to you, the system administrator at your site, to set up the specific configuration for your environment.

The master configuration file, `/etc/opt/SUNWsamfs/mcf`, defines the equipment topology that the Sun StorEdge SAM-FS file system manages. This file specifies the devices, automated libraries, and file systems included in the environment. You assign each piece of equipment a unique Equipment Identifier in the `mcf` file.

There are examples of `mcf` files in `/opt/SUNWsamfs/examples`.

Note – For information on file system design considerations, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

To configure a Sun StorEdge SAM-FS environment, create the `/etc/opt/SUNWsamfs/mcf` file. The `mcf` file has two kinds of entries:

- File system device entries. These are the disk devices to be used. In the `mcf` file, you organize them into one or more Sun StorEdge SAM-FS file systems.
- Removable media device entries. These are lines for each device, and you organize the devices into Family Sets. The `mcf` file contains information that enables you to identify the drives to be used and associate them with the automated libraries to which they are attached.

Note – The instructions for creating the `mcf` file differ depending on whether you are creating a Sun StorEdge SAM-FS environment or a Sun SAM-QFS environment.

If you are installing the Sun StorEdge SAM-FS software, all configuration instructions are contained in this section.

If you are creating a Sun SAM-QFS environment, the instructions for configuring the file system portion of the `mcf` file are contained in "Defining the Sun StorEdge QFS Configuration By Creating the `mcf` File" on page 65. The instructions for library and drive configuration are contained in this section.

▼ To Create an mcf File

When you create the mcf file, follow these guidelines:

- Delimit the fields in each line with spaces or tabs.
- Begin each comment line entered into this file with a pound sign (#).
- Use a dash (–) to indicate optional fields that are omitted.

CODE EXAMPLE 4-18 shows the mcf file fields.

CODE EXAMPLE 4-18 mcf File Fields

```
#
# Sun StorEdge SAM-FS file system configuration
#
# Equipment       Equip  Equip Fam   Dev    Additional
# Identifier      Ord    Type  Set   State  Parameters
# ----------      -----  ----- ----  -----  ----------
```

The mcf file can contain both comment lines and lines that pertain to a device. The types of lines that can pertain to a device are as follows:

- Family Set parent identifiers and family set devices
- Family Set member devices
- Standalone devices

TABLE 4-3 shows the information to be contained in each field and whether or not the field is a required or optional field.

TABLE 4-3 `mcf` File Fields

Field	Description
Equipment Identifier	*Required*. This field specifies the physical device with which to interact. This field can contain information on file system devices or removable media devices. File System Devices • For the initial line in a group of file system definition lines, specify the file system name. This must be the same name as the Family Set name specified in the Family Set field, and it is limited to 31 characters. • If the device is a file system member device, specify a `/dev/dsk` entry. This field is limited to 127 characters. Removable Media Devices The Equipment Identifier field is limited to 127 characters for lines that define removable media devices. • If the device is a direct-attached automated library or optical drive, specify a `/dev/samst` entry. • If the device is a network-attached automated library, specify the full path name to the parameters file for that library. Each automated library in the Sun StorEdge SAM-FS environment must have its own identification line in the `mcf` file. To specify more than one library in the `mcf` file, put each on a separate line. • If the device is a tape drive, specify one of the following: 1.The `/dev/rmt/`*n*`cbn` entry. 2.The path to a different symbolic link that points to the same special file that the `/dev/rmt/`*n*`cbn` link points to. If you specify the tape drive in this manner, create the link before mounting the file system.
Equipment Ordinal	*Required*. Specify a unique integer number. All devices and parent identifiers must be assigned a unique Equipment Ordinal. Enter a unique integer such that $1 \leq eq\_ord \leq 65534$. The number selected affects the order in which devices are displayed in the user interfaces. Lower numbers are displayed first.
Equipment Type	*Required*. This field provides information that the software uses to determine how to interact with a particular device. Enter the two- or three-character mnemonic for the device type. Most equipment can use the generic equipment types of `od` (optical disk), `tp` (tape), and `rb` (robot). For specific Equipment Types, see the `mcf`(4) man page.

TABLE 4-3 `mcf` File Fields *(Continued)*

Field	Description
Family Set	*Required for most devices*. A Family Set parent line identifies groups of devices configured to work together as a group, for example, a library and its drives. For a parent device (for example, a library), enter a descriptive name for the Family Set. The Family Set name binds its members, as follows: • If the device is a file system disk device, enter the file system name. • If the device is a member device that is associated with a Family Set parent device (that is, a file system or automated library), enter the Family Set name for the parent device. • If the device is a standalone device such as a manually loaded drive, use the dash (-) to indicate that this field is omitted. This field is limited to 31 characters.
Device State	*Optional*. Enter a state for the device for when the file system is initialized. This state could be `on`, `off`, `unavail`, `down`, or a dash (-) for default behavior.
Additional Parameters	*Optional*. If you include information in the Additional Parameters field, what you can specify varies by device type, as follows: • If the device is a disk, specify the `/dev/rdsk` entry. This is similar to the `/dev/dsk` entry in the Equipment Identifier field. • If the device is an automated library, specify an alternate path to the library's media catalog file or specify the default path to the library catalog file (`/var/opt/SUNWsamfs/catalog/`*family_set_name*). For tape and magneto-optical devices, this field should be left blank.

Note – If you change the `mcf` file after the Sun StorEdge SAM-FS file system is in use, you must convey the new `mcf` specifications to the Sun StorEdge SAM-FS software. For information on propagating `mcf` file changes to the system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

Identifying Peripherals Using the `/var/adm/messages` File

When your system boots, a series of messages are written to `/var/adm/messages`. These messages identify the Sun Solaris hardware path to each of the peripherals on your system. To display information from the latest system reboot, search backward from the end of the file.

As CODE EXAMPLE 4-19 shows, each SCSI peripheral has three lines. Note that the third line wraps to the next line in CODE EXAMPLE 4-19 and that the sixth field, `samst2`, indicates that these lines are associated with each other.

CODE EXAMPLE 4-19 SCSI Peripheral Lines in the `/var/adm/messages` File

```
# tail -200 /var/adm/messages | more
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP      C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is
/iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/esp@5,8800000/samst@2,0
```

Note – For readability, the preceding output, and many other outputs that are wider than 80 characters, have been wrapped for inclusion in this manual.

The first line displays the vendor and product information that the SCSI peripheral reported to the Sun Solaris kernel.

The second line displays the SCSI bus, SCSI target ID, and LUN of the peripheral.

The third line displays the peripheral's hardware path. This path is reflected in the `/devices` directory. Symbolic links (symlinks) to the `/devices` directory are set up in the `/dev/st`, `/dev/samst`, and `/dev/rmt` directories.

Matching the symbolic link to the correct peripheral is the key to configuring a Sun StorEdge SAM-FS environment. Use the `ls`(1) command with the `-l` option in both the `/dev/st`, `/dev/samst` and `/dev/rmt` directories to display the path name of the peripheral.

Optionally, you can set up the device down notification script at this point. The `dev_down.sh`(1M) man page contains information about setting up this script, which sends email to `root` when a device is marked `down` or `off`. For more information, see the `dev_down.sh`(1M) man page.

Example Sun StorEdge SAM-FS Configuration

Assume that the following equipment is to be included in a Sun StorEdge SAM-FS configuration:

- Two Seagate ST15230W 4-gigabyte disk drives used as cache for the file system
- One StorageTek 9730 30-slot automated library that contains two DLT tape drives
- One manually loaded DLT 2000 drive
- One HP Model C1710T magneto-optical automated library containing two HP Model C1716 magneto-optical drives

- One manually loaded HP Model C1716 magneto-optical drive

This equipment is connected to three SCSI buses with the following SCSI targets:

- The server's internal, single-ended, SCSI bus with the target IDs shown in TABLE 4-4.

TABLE 4-4 Target IDs for the Server's Internal Single-Ended SCSI Bus

Target ID	Equipment
2	Manually loaded magneto-optical drive
3	The Sun Solaris internal hard disk
4	Manually loaded DLT drive

- A differential SCSI bus connected to the HP Model C1710T automated library and file system disks with target IDs shown in TABLE 4-5.

TABLE 4-5 Target IDs for the SCSI Bus Connected to the HP Model C1710T Automated Library

Target ID	Equipment
0 and 1	Seagate 4-gigabyte disks
2	HP C1710T automated library
5	First optical drive
6	Second optical drive

- A differential SCSI bus connected to the StorageTek 9730 automated library and tape drives with target IDs shown in TABLE 4-6.

TABLE 4-6 Target IDs for the SCSI Bus Connected to the StorageTek 9730 Automated Library

Target ID	Equipment
0	StorageTek 9730 automated library
1	First DLT 7000 drive
2	Second DLT 7000 drive

Example Sun StorEdge SAM-FS Disk Cache Configuration

CODE EXAMPLE 4-20 shows the output from the Sun Solaris `format`(1M) command. It reports how the disks are partitioned.

CODE EXAMPLE 4-20 `format`(1M) Command Example

```
1. c1t0d0 <SEAGATE-ST15230W-0168 cyl 3974 alt 2 hd 19 sec 111>
/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/sd@0,0
Current partition table (original) :
Total disk cylinders available: 3974 + 2 (reserved cylinders)
Part    Tag           Flag     Cylinders    Size         Blocks
0       root          wm       0-3499       3.52GB       (3500/0/0)
1       unassigned    wm       3500-3972    487.09MB     (473/0/0)
2       backup        wu       0-3973       4.00GB       (3974/0/0)
3       unassigned    wm       0            0            (0/0/0)
4       unassigned    wm       0            0            (0/0/0)
5       unassigned    wm       0            0            (0/0/0)
6       unassigned    wm       0            0            (0/0/0)
7       unassigned    wm       0            0            (0/0/0)
2. c1t1d0 <SEAGATE-ST15230W-0168 cyl 3974 alt 2 hd 19 sec 111>
 /iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/sd@1,0
Current partition table (original):
Total disk cylinders available: 3974 + 2 (reserved cylinders)
Part    Tag           Flag     Cylinders    Size         Blocks
0       root          wm       1000-3973    2.99GB       (2974/0/0)
1       unassigned    wu       0            0            (0/0/0)
2       backup        wu       0-3973       4.00GB       (3974/0/0)
3       unassigned    wm       0            0            (0/0/0)
4       unassigned    wm       0            0            (0/0/0)
5       unassigned    wm       0-999        1.01GB       (1000/0/0)
6       unassigned    wm       0            0            (0/0/0)
7       unassigned    wm       0            0            (0/0/0)
```

This example creates one Sun StorEdge SAM-FS file system (`samfs1`) on partition `0` of disk `c1t0d0` and partition `5` of `c1t1d0`. It creates another file system (`samfs2`) on partition `1` of disk `c1t0d0` and partition `0` of disk `c1t1d0`.

The following procedure explains how to begin writing the `mcf` file for this example configuration by defining the file systems and their disk partitions.

▼ To Write the mcf File

1. **Make an ms (mass storage) entry for the first file system.**

   An ms entry is the Equipment Identifier for a Sun StorEdge SAM-FS file system. The name of this file system (samfs1) is used later when writing the /etc/vfstab entry for the file system and creating the file system. Note that the name as specified in the Equipment Identifier field must be the same as the Family Set name for the file system.

2. **Make a series of md (magnetic disk) entries listing the partitions that comprise the samfs1 file system member devices.**

3. **Make similar entries for the second (samfs2) file system.**

   CODE EXAMPLE 4-21 shows the mcf with the file systems defined.

CODE EXAMPLE 4-21 Sun StorEdge SAM-FS mcf File Showing the File Systems

```
# Disk cache configuration for 2 file systems: samfs1, samfs2
#
# Equipment       Eq    Eq   Fam.  Dev.    Additional
# Identifier      Ord  Type  Set   State   Parameters
#-----------      ---   --  ------ ------  ------------------
samfs1             10   ms  samfs1
/dev/dsk/c1t0d0s0  11   md  samfs1   on
/dev/dsk/c1t1d0s5  12   md  samfs1   on
#
samfs2             20   ms  samfs2
/dev/dsk/c1t1d0s0  21   md  samfs2   on
/dev/dsk/c1t0d0s1  22   md  samfs2   on
```

Caution – Make sure you specify disk partitions that are not in use on your system. Do not use overlapping partitions. If a Sun StorEdge SAM-FS file system attempts to use a partition that is already in use, the software usually issues a message to indicate that the device is busy.

If you give the wrong partition names, you risk damaging user or system data. This is true when initializing any type of file system. Make sure you specify only disk partitions that are not already in use on your system. Do not use overlapping partitions.

Configuring a Manually Loaded Magneto-Optical Drive

The HP Model C1716T is target ID 2 on the internal SCSI bus.

▼ To Configure the Drive

1. **Examine the `/var/adm/messages` file to find the messages for these devices.**

   CODE EXAMPLE 4-22 shows the information in `/var/adm/messages` associated with the HP Model C1716T and target 2. Note that the third line wraps to the next line in this example.

CODE EXAMPLE 4-22 Information in `/var/adm/messages`

```
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP    C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is
/iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/esp@5,8800000/samst@2,0
```

2. **Issue the `cd`(1) command to change to the `/dev/samst` directory.**

3. **Use the `ls`(1) and `grep`(1) commands to find the correct symbolic link.**

   For example, use the following `ls`(1) command:

```
# ls -l | grep "samst@2"
```

   The preceding `ls`(1) command searches for a symbolic link that points to the hardware path shown in CODE EXAMPLE 4-23.

CODE EXAMPLE 4-23 Path to `samst@2`

```
lrwxrwxrwx   1 root     other         88 Aug 23 12:27 c0t2u0 ->
/devices/iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/esp@5,8800000/samst
@2,0:a,raw
```

   The Sun `samst` driver uses the name `/dev/samst/c0t2u0` when referencing the device.

4. **Use an editor to open the `/etc/opt/SUNWsamfs/mcf` file.**

5. **Add an entry for the drive to the `mcf` file.**

   Add the following entry in `/etc/opt/SUNWsamfs/mcf`:

```
/dev/samst/c0t2u0  30  od  -  on
```

This entry contains the device name (/dev/samst/c0t2u0), a unique Equipment Ordinal (30), the Equipment Type of the drive (od), a dash (-) to indicate that a Family Set name is not associated with the drive, and the device state (on).

Configuring a Magneto-Optical Library

The HP C1710T automated library has three SCSI devices: the robotic mechanism and the two magneto-optical drives that the automated library loads and unloads.

▼ To Configure the Magneto-Optical Library

1. **Examine the** /var/adm/messages **file to find the messages for these devices.**

   CODE EXAMPLE 4-24 shows these messages.

CODE EXAMPLE 4-24 /var/adm/messages for the HP Library and two Drives

```
Aug 23 11:52:56 baggins unix: samst16: Vendor/Product ID = HP      C1710T
Aug 23 11:52:56 baggins unix: samst16 at QLGC,isp0: target 2 lun 0
Aug 23 11:52:56 baggins unix: samst16 is
/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@2,0

Aug 23 11:52:56 baggins unix: samst19: Vendor/Product ID = HP      C1716T
Aug 23 11:52:56 baggins unix: samst19 at QLGC,isp0: target 5 lun 0
Aug 23 11:52:56 baggins unix: samst19 is
/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@5,0

Aug 23 11:52:56 baggins unix: samst20: Vendor/Product ID = HP      C1716T
Aug 23 11:52:56 baggins unix: samst20 at QLGC,isp0: target 6 lun 0
Aug 23 11:52:56 baggins unix: samst20 is
/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@6,0
```

2. **Issue the** cd**(1) command to change to the** /dev/samst **directory.**

3. **Use** ls**(1) and** grep**(1) commands to find the symbolic links for the devices.**

   CODE EXAMPLE 4-25 shows the ls(1) commands to use to search for the three symbolic links that point to the /devices files with the same Sun Solaris hardware paths shown in CODE EXAMPLE 4-24.

CODE EXAMPLE 4-25 ls(1) and grep(1) Commands Used to Find Symbolic Links for the Devices in CODE EXAMPLE 4-24

```
# ls -l | grep "samst@2"
lrwxrwxrwx   1 root     other         74 Aug 23 12:27 c1t2u0 ->
/devices/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@2,0:a,raw
# ls -l | grep "samst@5"
```

CODE EXAMPLE 4-25 ls(1) and grep(1) Commands Used to Find Symbolic Links for the Devices in CODE EXAMPLE 4-24 *(Continued)*

```
lrwxrwxrwx   1 root     other         74 Aug 23 12:27 c1t5u0 ->
/devices/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@5,0:a,raw
# ls -l | grep "samst@6"
lrwxrwxrwx   1 root     other         74 Aug 23 12:27 c1t6u0 ->
/devices/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@6,0:a,raw
```

4. **Use an editor to open the** `/etc/opt/SUNWsamfs/mcf` **file.**

5. **Add entries for the library and drives to the** `/etc/opt/SUNWsamfs/mcf` **file.**

   CODE EXAMPLE 4-26 shows the `mcf` file entries.

CODE EXAMPLE 4-26 `mcf` File Entries for the HP Library and its Drives

```
/dev/samst/c1t2u0   50   rb   hp30   on
/dev/samst/c1t5u0   51   od   hp30   on
/dev/samst/c1t6u0   52   od   hp30   on
```

The first line defines the automated library itself. It contains the `/dev/samst` name for the device `(/dev/samst/c1t2u0)` followed by a unique Equipment Ordinal (`50`), the Equipment Identifier (`rb`, for a generic SCSI-attached library), the Family Set identifier specified on all devices associated with this library (`hp30`), and the Device State (`on`).

The two remaining lines define the drives inside the library. They are similar to the manually loaded drives defined in the previous section except that instead of a dash, they include the Family Set name of the library where they reside (`hp30`).

Note – The order of drives as specified in the `mcf` file must match the logical order of the drives in a SCSI-attached automated library. The first drive defined in the `mcf` must be the first logical drive in the library, and so on. For more information, see your hardware documentation for the logical orientation of drives. Incorrect configuration can cause cartridges to be mounted in the wrong drives, which will lead to total inoperability of this software.

Configuring a Manually Loaded DLT Drive

When configuring DLT drives, be sure to add the DLT definitions to the `/kernel/drv/st.conf` file (see "(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files" on page 167). DLT drives are not part of the standard Sun Solaris configuration, and the software does not recognize them if they are configured incorrectly.

▼ To Configure the DLT Drive

1. **Examine the `/var/adm/messages` file to find the messages for these devices.**

   CODE EXAMPLE 4-27 shows the `/var/adm/messages` file lines that refer to the manual DLT drive.

CODE EXAMPLE 4-27 Information in `/var/adm/messages`

```
Feb 25 13:23:29 collie scsi: [ID 365881 kern.info] /pci@1f,4000/scsi@5,1/st@0,0
(st21):
Feb 25 13:23:29 collie       <Vendor 'DEC     ' Product 'DLT2000        '>
Feb 25 13:23:29 collie scsi: [ID 193665 kern.info] st21 at glm3: target 0 lun 0
Feb 25 13:23:29 collie genunix: [ID 936769 kern.info] st21 is
/pci@1f,4000/scsi@5,1/st@0,0
```

2. **Use the `ls`(1) and `grep`(1) commands to search for the symbolic links that point to the `/devices` files with the same Sun Solaris hardware paths shown in the `/var/adm/messages` file.**

   CODE EXAMPLE 4-28 shows the `ls`(1) and `grep`(1) commands to use to locate the DLT drive identified as `scsi@5`.

CODE EXAMPLE 4-28 `ls`(1) and `grep`(1) Commands Used to Find Symbolic Links for the Device in CODE EXAMPLE 4-27

```
# ls -l /dev/rmt|grep 'pci@1f,4000/scsi@5,1/st@0'|grep cbn
lrwxrwxrwx   1 root     other         45 Feb 14 09:48 0cbn ->
../../devices/pci@1f,4000/scsi@5,1/st@0,0:cbn
```

   When making the `mcf` entry, always use the `b` and `n` options. CODE EXAMPLE 4-29 shows the symbolic link for a drive that supports compression. If the drive supports compression, and if you want compression in the hardware, use `cbn` as the prefix.

CODE EXAMPLE 4-29 Symbolic Link Showing a Drive With that Supports Compression

```
lrwxrwxrwx   1 root     other        85 Aug 15 11:37 /dev/rmt/0cbn
->
../../devices/iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/
esp@5,8800000 st@4,0:cbn
```

3. **Use `vi`(1) or another editor to open the `/etc/opt/SUNWsamfs/mcf` file.**

4. **Add the** `/etc/opt/SUNWsamfs/mcf` **entry.**

   For example:

```
/dev/rmt/0cbn   40   tp   -   on
```

   The first entry on the line is the `st` driver name for the device (`/dev/rmt/0cbn`), followed by a unique Equipment Ordinal (`40`), the Equipment Type (`tp` for a generic tape), a dash (`-`) to indicate that a Family Set name is not associated with the manually mounted device, and the Device State (`on`).

   For tape drives, you can leave the Additional Parameters field empty.

Configuring a DLT Library

The last piece of equipment to define is the STK 9730 automated library. This automated library has three SCSI devices: the robotic mechanism and the two DLT 7000 tape drives that the robot loads and unloads.

▼ To Configure the DLT Library

1. **Examine the** `/var/adm/messages` **to find the messages for these devices.**

   CODE EXAMPLE 4-30 shows the `/var/adm/messages` file.

CODE EXAMPLE 4-30 Information in `/var/adm/messages`

```
Feb  4 09:42:17 server1 samst: [ID 902828 kern.notice] samst42:
Vendor/Product ID = STK     9730
Feb  4 09:42:17 server1 scsi: [ID 193665 kern.info] samst42 at glm3: target 0
lun 0
Feb  4 09:42:17 server1 genunix: [ID 936769 kern.info] samst42 is
/pci@6,4000/scsi@2,1/samst@0,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/scsi@2,1/st@1,0
(st22):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st22 at glm3: target 1 lun 0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st22 is
/pci@6,4000/scsi@2,1/st@1,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/scsi@2,1/st@2,0
(st23):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st23 at glm3: target 2 lun 0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st23 is
/pci@6,4000/scsi@2,1/st@2,0
```

2. **Issue the** `cd`**(1) command to change to the** `/dev/samst` **directory.**

3. **Use the `ls`(1) and `grep`(1) commands to find the symbolic links that point to the `/devices` files with the same Sun Solaris hardware paths shown in the `/var/adm/messages` file.**

   CODE EXAMPLE 4-31 shows the `ls`(1) and `grep`(1) commands to use to locate the symbolic links.

   CODE EXAMPLE 4-31 `ls`(1) and `grep`(1) Commands Used to Find Symbolic Links for the Device in CODE EXAMPLE 4-30

```
# cd /dev/samst
# ls -l | grep "samst@0"
lrwxrwxrwx   1 root     other          49 Feb  4 09:42 c6t0u0 ->
../../devices/pci@6,4000/scsi@2,1/samst@0,0:a,raw
```

4. **Use the `ls`(1) and `grep`(1) commands to find a symbolic link in `/dev/rmt` that points to the tape devices.**

   Note in CODE EXAMPLE 4-32 that the automated library does not have this additional link.

   CODE EXAMPLE 4-32 `ls`(1) and `grep`(1) Commands to Use to Find the Tape Devices

```
# cd /dev/rmt
# ls -l | grep cbn
lrwxrwxrwx   1 root     root           44 Feb  3 15:38 0cbn ->
../../devices/pci@6,4000/scsi@2,1/st@1,0:cbn
lrwxrwxrwx   1 root     root           44 Feb  3 15:38 1cbn ->
../../devices/pci@6,4000/scsi@2,1/st@2,0:cbn
```

   Again, there are multiple symbolic links in the directory that point to the same hardware path. To enable hardware compression, choose the one with the `cbn` suffix. If your drive does not support hardware compression, choose the symbolic link that ends with `bn`.

5. **Use `vi`(1) or another editor to open the `/etc/opt/SUNWsamfs/mcf` file.**

6. **Add the `/etc/opt/SUNWsamfs/mcf` entries.**

   CODE EXAMPLE 4-33 shows the `mcf` file entries for this library and its drives.

   CODE EXAMPLE 4-33 `mcf` File Entries for the StorageTek Library and its Drives

```
/dev/samst/c2t0u0   60   rb   9730   on
/dev/rmt/0cbn       61   tp   9730   on
/dev/rmt/1cbn       62   tp   9730   on
```

   The first line defines the automated library and includes the `/dev/samst` name (`/dev/samst/c2t0u0`). It also contains a unique Equipment Ordinal (`60`), the Equipment Type (`rb`, for the generic robot Equipment Type), a Family Set name for the robot and the drive (`9730`), and the Device State (`on`).

   The second line defines the first DLT tape drive inside the library. These entries refer to the Equipment Identifier for this tape device (`/dev/rmt/0cbn`), the Equipment Ordinal for the device (`61`), the Equipment Type (`tp`), the Family Set Name (`9730`), and the Device State (`on`).

   The third line defines the second DLT tape drive inside the automated library. These entries refer to the Equipment Identifier for this tape device (`/dev/rmt/1cbn`), the Equipment Ordinal for the device (`62`), the Equipment Type (`tp`), the Family Set name (`9730`), and the Device State (`on`).

7. **(Optional) Add the DLT definitions to the `/kernel/drv/st.conf` file.**

   Perform this step if you are configuring DLT drives.

   "(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files" on page 167 shows how to add definitions to the `/kernel/drv/st.conf` file. DLT drives are not part of the standard Sun Solaris configuration.

TABLE 4-7 shows the completed mcf file.

TABLE 4-7 Completed mcf File

```
# Equipment          Eq   Eq    Family  Dev   Additional
# Identifier         Ord  Type  Set     Sta   Parameters
#
samfs1               10   ms    samfs1
/dev/dsk/c1t0d0s0    11   md    samfs1  on
/dev/dsk/c1t1d0s5    12   md    samfs1  on
#
samfs2               20   ms    samfs2
/dev/dsk/c1t1d0s0    21   md    samfs2  on
/dev/dsk/c1t0d0s1    22   md    samfs2  on
#
/dev/samst/c0t2u0    30   od    -       on
#
/dev/rmt/0cbn        40   tp    -       on
#
/dev/samst/c1t2u0    50   rb    hp30    on
/dev/samst/c1t5u0    51   od    hp30    on
/dev/samst/c1t6u0    52   od    hp30    on
#
/dev/samst/c2t0u0    60   rb    9730    on
/dev/rmt/0cbn        61   tp    9730    on
/dev/rmt/1cbn        62   tp    9730    on
```

Example mcf File Entries for Network-Attached Libraries

The following examples show mcf file entries for network-attached devices. In these examples, note that the first line of each library definition is the full path to a file. This file is the parameters file for that library.

If you are using a network-attached library, you create the parameters files for network attached libraries in "(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 209.

Example 1. CODE EXAMPLE 4-34 shows the mcf file for an ADIC/Grau network-attached automated library.

CODE EXAMPLE 4-34 ADIC/Grau Automated Library mcf File Entries

```
#
# Sample mcf file entries for a GRAU library - DLT
#
```

CODE EXAMPLE 4-34 ADIC/Grau Automated Library `mcf` File Entries *(Continued)*

```
/etc/opt/SUNWsamfs/grau50  50   gr   gr50  -
/dev/rmt/0cbn              51   lt   gr50  -
/dev/rmt/1cbn              52   lt   gr50  -
#
# Sample mcf file entries for a GRAU library - HP optical
#
/etc/opt/SUNWsamfs/grau60   60   gr  gr60  -
/dev/samst/c1t1u0           61   od  gr60  -
```

Example 2. CODE EXAMPLE 4-35 shows the `mcf` file for a Fujitsu LMF network-attached automated library.

CODE EXAMPLE 4-35 Fujitsu LMF Automated Library `mcf` File Entries

```
#
# Sample mcf file entries for an LMF library
#
/etc/opt/SUNWsamfs/lmf50 50  fj  fj50  -
/dev/rmt/0cbn            51  fd  fj50  -
/dev/rmt/1cbn            52  fd  fj50  -
```

Example 3. CODE EXAMPLE 4-36 shows the `mcf` file for an IBM 3494 network-attached automated library.

CODE EXAMPLE 4-36 IBM 3494 Automated Library `mcf` File Entries

```
# The mcf file entries.
#
# IBM 3494 library
#
/etc/opt/SUNWsamfs/ibm50 50      im      ibm3494e - ibmcat
/dev/rmt/1bn             51      tp      ibm3494e
/dev/rmt/2bn             52      tp      ibm3494e
```

Example 4. CODE EXAMPLE 4-37 shows the `mcf` file for a Sony network-attached automated library.

CODE EXAMPLE 4-37 Sony Network-Attached Automated Library mcf File Entries

```
#
# Sample mcf file entries for a Sony network-attached library
#
/etc/opt/SUNWsamfs/sonyfile 100   pe   psc  on
/dev/rmt/1cbn               101   so   psc  on
/dev/rmt/2cbn               102   so   psc  on
```

Example 5. CODE EXAMPLE 4-38 shows the `mcf` file for a StorageTek ACSLS-attached automated library.

CODE EXAMPLE 4-38 StorageTek Automated Library `mcf` File Entries

```
# Equipment                Eq   Eq  Family  Dev  Additional
# Identifier               Ord  Ty  Set     St   Parameters
#
/etc/opt/SUNWsamfs/stk50 50   sk  sk50    on
/dev/rmt/0cbn              51   sg  sk50    on
/dev/rmt/1cbn              52   sg  sk50    on
```

For more information, see the `mcf`(4) man page. There are example `mcf` files located in `/opt/SUNWsamfs/examples/mcf`.

(Optional) Creating Parameters Files for Network-Attached Automated Libraries

Perform this task if you want to include network-attached automated libraries in your Sun StorEdge SAM-FS environment.

Automated libraries can be included in a Sun StorEdge SAM-FS environment either by attaching them to the server directly or by attaching them to the environment's network. Libraries attached through a SCSI or Fibre Channel attachment are *direct-attached* libraries. Libraries attached through a network attachment are *network-attached* libraries. In this task, you create a parameters file for each network-attached library to be included in your environment.

To configure a network-attached library in your Sun StorEdge SAM-FS environment, find your library in the following list and go to the page indicated:

- "ADIC/Grau Automated Libraries" on page 209
- "Fujitsu LMF Automated Libraries" on page 212
- "IBM 3494 Automated Libraries" on page 214
- "Sony Network-Attached Automated Libraries" on page 218
- "StorageTek ACSLS-Attached Automated Libraries" on page 220

"Shared Drives" on page 226 describes the shared drives feature that some libraries support.

Note – The examples and the discussions in the following subsections mention both the parameters files for network-attached automated libraries and the `mcf` file. The Sun StorEdge SAM-FS `mcf` file is the main configuration file for Sun StorEdge SAM-FS software. You created your `mcf` file in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191. The parameters file and the `mcf` file are both mentioned in this section because the two files reference each other.

ADIC/Grau Automated Libraries

The ADIC/Grau automated library operates within Sun StorEdge SAM-FS environments through the `grauaci` interface. The `grauaci` interface is the interface between the Sun StorEdge SAM-FS software and the ADIC/Grau library. This interface uses the DAS/ACI 3.10 interface supplied by ADIC/Grau. For more information on the DAS/ACI interface, see your ADIC/Grau documentation.

▼ To Configure the Parameters File for an ADIC/Grau Automated Library

1. **Ensure that the ADIC/Grau automated library is prepared for inclusion in a Sun StorEdge SAM-FS environment.**

   Ensure that the following are true:

   - The ADIC/Grau automated library must be operational.
   - The ADIC/Grau library is operating on the DAS server.
   - Both the `avc` (avoid volume contention) and the `dismount` parameters must be set to `true` in the DAS configuration file for this client.

2. **Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.**

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. **Use `vi`(1) or another editor to open a file.**

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

   ```
   # vi grau50
   ```

4. **Edit the ADIC/Grau parameters file to consist of a list of *keyword* = *value* parameter lines.**

   The various *keyword* values identify the ADIC/Grau automated libraries, the drives associated with the libraries, and the server name. All *keyword* and *value* entries are case sensitive, so enter them exactly as specified in the DAS configuration file and in the Sun StorEdge SAM-FS `mcf` file.

   Include the following types of *keyword* = *value* parameters in the ADIC/Grau parameters file:

   - `client` = *client_id*. For *client_id*, specify the name of the client as defined in the DAS configuration file. This is a required parameter.
   - `server` = *server_id*. For *server_id*, specify the host name of the server running the DAS server code. This is a required parameter.

- `acidrive` *drive_id* = *path*. For *drive_id*, specify the name of the drive as configured in the DAS configuration file. For *path*, specify the path to the drive as entered in the Equipment Identifier field of the Sun StorEdge SAM-FS `mcf` file. There must be one `acidrive` line for every drive assigned to the client.

Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

If the ADIC/Grau library contains various media types, then there is a media changer for each media type. Each media changer has a unique client name in the DAS configuration, a unique library catalog, and a unique parameters file.

The following code examples show two ADIC/Grau parameters files. CODE EXAMPLE 4-39 and CODE EXAMPLE 4-40 define one ADIC/Grau automated library supporting DLT tape and one ADIC/Grau automated library supporting a Hewlett Packard optical drive.

CODE EXAMPLE 4-39 shows the parameters file for library `grau50`.

CODE EXAMPLE 4-39 Parameters File `/etc/opt/SUNWsamfs/grau50`

```
# This is file: /etc/opt/SUNWsamfs/grau50
#
client = DASclient
server = DAS-server
#
# the name "drive1" is from the DAS configuration file
#
acidrive drive1 = /dev/rmt/0cbn     # a comment
#
# the name "drive2" is from the DAS configuration file
#
acidrive drive2 = /dev/rmt/1cbn     # a comment
```

CODE EXAMPLE 4-40 shows the parameters file for `grau60`.

CODE EXAMPLE 4-40 Parameters File `/etc/opt/samfs/grau60`

```
# This is file: /etc/opt/SUNWsamfs/grau60
#
client = DASclient
server = DAS-server
acidrive DH03 = /dev/samst/c1t1u0
#
# the name "DH03" is from the DAS configuration file
```

5. **Repeat this procedure and create a parameters file for each ADIC/Grau library that you want to configure.**

   CODE EXAMPLE 4-34 in "Defining the Sun StorEdge SAM-FS Configuration By Creating the mcf File" on page 191 shows the `mcf` file that corresponds with the ADIC/Grau network-attached automated library parameters file example that was created in this procedure. The example `mcf` points to files `grau50` and `grau60` in the `/etc/opt/SUNWsamfs` directory.

Diagnostic Information

The following directory contains diagnostic information that can be useful when troubleshooting:

```
/var/opt/SUNWsamfs/.grau
```

The system creates files in this directory that are named `graulog-`*eq*, where *eq* is the Equipment Ordinal as defined in the `mcf` file. For more information on this, see the `grauaci`(7) and the `mcf`(4) man pages.

Fujitsu LMF Automated Libraries

The Fujitsu LMF automated library operates in Sun StorEdge SAM-FS environments through the LMF interface supplied by Fujitsu. The `fujitsulmf` interface is the interface between the Sun StorEdge SAM-FS software and the Fujitsu LMF automated libraries. For more information on LMF, see the *LMF MTL Server/Client User's Guide* or the *LMF SAM-FS Linkage Operations Guide*. You can obtain both of these publications from the Fujitsu Corporation.

▼ To Configure the Parameters File for a Fujitsu LMF Automated Library

The Fujitsu LMF parameters file identifies the drives in the automated library. Create one parameters file for each automated library.

1. **Ensure that the Fujitsu LMF automated library is prepared for inclusion in a Sun StorEdge SAM-FS environment.**

   Ensure that the following are true:

   - The Fujitsu LMF automated library is operational.
   - The Fujitsu LMF software package is installed and working.

2. **Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.**

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. **Use `vi`(1) or another editor to open a file.**

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

```
# vi lmf50
```

4. **Edit the Fujitsu LMF parameters file to consist of a list of *drivename* = *value* parameter lines.**

   The parameters file consists of `lmfdrive` *drivename* = *value* definition lines and comment lines. There must be one `lmfdrive` line for each drive assigned to the client automated library. Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

   All *drivename* and *value* information is case sensitive. TABLE 4-8 shows the values you can specify for *drivename* and *value*.

TABLE 4-8 The *drivename* and *value* Arguments

Argument	Definition
drivename	The name of the drive according to the LMF configuration.
value	The path to the drive. This path must match the Equipment Identifier field of the `mcf` file.

CODE EXAMPLE 4-41 shows a parameters file for a Fujitsu LMF automated library.

CODE EXAMPLE 4-41 Parameters File `/etc/opt/SUNWsamfs/lmf50`

```
#
# This is file /etc/opt/SUNWsamfs/lmf50
#
# The name "LIB001DRV000" is from the LMF configuration.
#
lmfdrive LIB001DRV000 = /dev/rmt/0cbn   # defines first drive
#
```

CODE EXAMPLE 4-41 Parameters File `/etc/opt/SUNWsamfs/lmf50` *(Continued)*

```
# the name "LIB001DRV001" is from the LMF configuration
#
lmfdrive LIB001DRV001 = /dev/rmt/1cbn  # defines second drive
```

5. **Repeat this procedure and create a parameters file for each Fujitsu LMF library that you want to configure.**

   CODE EXAMPLE 4-35 in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191 shows the `mcf` file that corresponds with the Fujitsu LMF network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `lmf50` in the `/etc/opt/SUNWsamfs` directory.

IBM 3494 Automated Libraries

The IBM 3494 automated tape library operates in Sun StorEdge SAM-FS environments with the assistance of the IBM `lmcpd` daemon package. You can obtain the IBM `lmcpd` daemon package from IBM.

▼ To Configure the Parameters File for an IBM 3494 Automated Library

The IBM 3494 automated library can be used as a single physical library or as multiple logical libraries. If you divide this library into multiple logical libraries, create a parameters file for each logical library.

1. **Ensure that the IBM 3494 automated library is prepared for inclusion in a Sun StorEdge SAM-FS environment.**

   Ensure that the following are true:

   - The IBM 3494 automated library is operational.
   - The IBM `lmcpd` daemon package is installed and working.
   - The `/etc/ibmatl.conf` file is configured and working.

2. **Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.**

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. **Use `vi`(1) or another editor to open a file.**

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

```
# vi ibm50
```

4. **Edit the IBM 3494 parameters file to consist of a list of *keyword* = *value* and *pathname* = *value* pairs.**

   All arguments are case-sensitive. TABLE 4-9 shows how to specify the parameters.

TABLE 4-9 IBM 3494 Parameters File Arguments

Parameter	Meaning
`name` = *name*	This is the name assigned by you, the system administrator, and specified in the `/etc/ibmatl.conf` file. This is also the symbolic name of the library. This parameter must be supplied, there is no default.
`category` = *hexnumber*	The category is a hexadecimal number such that `0x0001` < *hexnumber* < `0xfeff`. The Sun StorEdge SAM-FS software sets the `category` to this *hexnumber* for media under its control. The default is `4`. If you have divided your physical library into multiple logical libraries, create a parameters file for each logical library and make sure that the `category` = *hexnumber* parameter is different in each logical library. This parameter determines which tapes are assigned to which library. When you import media into the library, it is added to the catalog, and its `category=` value is changed to the value specified by this `category` = *hexnumber* parameter.
`access` = *permission*	For *permission*, specify either `shared` or `private`. • Specify `private` if you are using the library as one physical library. Default. • Specify `shared` if you are dividing the library into multiple logical libraries.
device-pathname = *device-number* [`shared`]	Specify a *device-pathname* entry for every drive in the library attached to this machine. Each *device-pathname* must match the Equipment Identifier of an entry in the `mcf` file. The *device-number* is the device number as described in the IBM documentation. You can derive this number by running the IBM `mtlib` utility obtained from IBM. The `shared` parameter is optional. You can specify it if the drive is shared with other Sun StorEdge SAM-FS servers. For more information about shared drives, see "Shared Drives" on page 226.

CODE EXAMPLE 4-42 shows an example `/etc/ibmatl.conf` file. Information for this

file was obtained from the `mtlib` utility supplied by IBM.

CODE EXAMPLE 4-42 Example `/etc/ibmatl.conf` File

```
#
# This is file: /etc/ibmatl.conf
# Set this file up according the documentation supplied by IBM.
3493a   198.174.196.50  test1
```

After the `lmcpd` daemon is running, you can use IBM's `mtlib` utility to get the device numbers. CODE EXAMPLE 4-43 shows output from `mtlib`.

CODE EXAMPLE 4-43 Output From `mtlib`

```
# mtlib -l 3493a -D
0, 00145340 003590B1A00
1, 00145350 003590B1A01
```

CODE EXAMPLE 4-44 shows a sample parameters file and `mcf` entries for an IBM 3494 library.

CODE EXAMPLE 4-44 Parameters File `/etc/opt/SUNWsamfs/ibm50`

```
#
# This is file: /etc/opt/SUNWsamfs/ibm50
#
name = 3493a                        # From /etc/ibmatl.conf
/dev/rmt/1bn = 00145340             # From mtlib output
/dev/rmt/2bn = 00145350 shared      # From mtlib output
access=private
category = 5
```

5. **Repeat this procedure and create a parameters file for each IBM 3494 library that you want to configure.**

   You must create a parameters for file for each physical or logical library you want to include in the Sun StorEdge SAM-FS environment.

   CODE EXAMPLE 4-36 in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191 shows the `mcf` file that corresponds with the IBM 3494 network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `ibm50` in the `/etc/opt/SUNWsamfs` directory.

Sony Network-Attached Automated Libraries

A Sony network-attached automated library operates within the Sun StorEdge SAM-FS environment through the DZC-8000S Application Interface Library package. This software package provides the application programmer interface (API) to the PetaSite Controller (PSC). For more information on the DZC-8000S interface, see the *Sony PetaSite Application Interface Library DZC-8000S*, which is available from Sony.

Note – The information in this section applies only to Sony automated libraries that are network-attached through a Sony DZC-8000S interface. If you want to include Sony direct-attached B9 and B35 automated libraries or Sony direct-attached 8400 PetaSite automated libraries, you do not need this information because you do not need to create a parameters file for your library.

▼ To Configure the Parameters File for a Sony Network-Attached Automated Library

1. **Ensure that the Sony network-attached automated library is prepared for inclusion in a Sun StorEdge SAM-FS environment.**

   Ensure that the following are true:

   - The Sony network-attached automated library is operational.
   - The Sony PSC configuration file is installed and working.

2. **Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.**

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. **Use `vi`(1) or another editor to open a file.**

   For example, you could invoke `vi`(1) as follows:

```
# vi sonyfile
```

4. **Edit the Sony parameters file to consist of a list of *keyword* = *value* parameter lines.**

   The Sony parameters file consists of a list of *keyword* = *value* parameter lines. The various *keyword* values identify the Sony automated libraries, the drives associated with the libraries, and the host name. All *keyword* and *value* entries are case sensitive, so enter them exactly as used in the configuration file and in the Sun StorEdge SAM-FS `mcf` file.

   TABLE 4-10 shows the *keyword* = *value* parameters that must appear in the Sony parameters file. All parameters are required.

TABLE 4-10 Sony Network-Attached Automated Library Parameters

Parameter	Meaning
`userid` = *user-id*	For *user-id*, specify a number in the range 0 ≤ *user-id* ≤ 65535. If you specify a number other than 0, it must be the PSC ID. The `userid` parameter identifies the user during initialization of the PetaSite automated library functions.
`server` = *server_id*	For *server_id* specify the host name of the server running the PSC server code.
`sonydrive` *drive_id* = *path* [shared]	
	There must be one `sonydrive` line for every drive defined in the `mcf` file.
	For *drive_id*, specify the drive bin number as configured in the PSC configuration file.
	For *path*, specify the path to the drive as entered in the Equipment Identifier field of the Sun StorEdge SAM-FS `mcf` file.
	The `shared` keyword is optional. You can configure this library to share its media drives with two or more Sun StorEdge SAM-FS processes from two or more hosts. For more information on implementing shared drives, see "Shared Drives" on page 226 or see the `sony`(7) man page.

Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

CODE EXAMPLE 4-45 shows the parameters file, `/etc/opt/SUNWsamfs/sonyfile`.

CODE EXAMPLE 4-45 Parameters File `/etc/opt/SUNWsamfs/sonyfile`

```
#
# This is file: /etc/opt/SUNWsamfs/sonyfile
#
# The userid identifies the user during initialization of
# the PetaSite library functions
#
userid = 65533
```

CODE EXAMPLE 4-45 Parameters File `/etc/opt/SUNWsamfs/sonyfile` *(Continued)*

```
#
# europa is the hostname for the server running
# the DZC-8000S server code.
#
server = europa
#
# The bin numbers 1001 and 1002 are from the PSC
# configuration file.
#
sonydrive 1001 = /dev/rmt/1cbn
sonydrive 1002 = /dev/rmt/2cbn shared
```

5. **Repeat this procedure and create a parameters file for each Sony network-attached library that you want to configure.**

   CODE EXAMPLE 4-37 in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191 shows the `mcf` file that corresponds with the Sony network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `sonyfile` in the `/etc/opt/SUNWsamfs` directory.

StorageTek ACSLS-Attached Automated Libraries

In many respects, the Sun StorEdge SAM-FS systems interoperate with a StorageTek ACSLS-attached automated library in a manner similar to direct-attached automated libraries. However, a StorageTek ACSLS-attached automated library requires additional steps in the installation and configuration procedure as compared to a direct-attached automated library.

The ACSLS software package supplied by StorageTek controls the automated library. Daemon software controls the StorageTek automated library through the ACSAPI interface.

▼ To Configure the Parameters File for a StorageTek ACSLS-Attached Automated Library

1. **Ensure that the StorageTek ACSLS-attached automated library is prepared for inclusion in a Sun StorEdge SAM-FS environment.**

   Ensure that the following are true:

   - The StorageTek ACSLS automated library is operational.
   - The StorageTek ACSLS software package is installed and working.

2. **Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.**

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. **Use `vi`(1) or another editor to open a file.**

   For example, you could invoke `vi`(1) as follows:

```
# vi stk50
```

4. **Edit the StorageTek parameters file to consist of a list of *keyword* = *value* parameter lines.**

   Each line of the parameters file must begin with a keyword or a comment. TABLE 4-11 shows the keywords to use.

TABLE 4-11 StorageTek ACSLS-Attached Automated Library Parameters

Parameter	Meaning
`access =` *userid*	Specifies the user identification. For *userid*, enter the *userid* used by StorageTek for access control. This is an optional entry to the parameters file. If the `access =` parameter is not supplied, the access control string is a null string. This indicates that there is no *userid*.
`hostname =` *hostname*	Specifies the host name of the server. For *hostname*, enter the host name of the server running the StorageTek ACSLS interface.
`portnum =` *portnum*	Specifies the port number used for communication between ACSLS and the Sun StorEdge SAM-FS software. For information on what to enter for the *portnum* argument, see the `stk`(7) man page.
`ssihost =` *hostname*	Specifies the name of the server when you are using a multihomed Sun StorEdge SAM-FS server. This is the name of the Sun StorEdge SAM-FS server on the LAN that connects to the ACSLS host. Specify this directive only if you are including a multihomed Sun StorEdge SAM-FS server in your environment. The default is the name of the local host.
`csi_hostport =` *csi_port*	This firewall environment variable specifies the port to which the SSI sends its ACSLS requests on the ACSLS server. Setting this variable eliminates queries to the portmapper on the ACSLS server. Instead, it sends requests to this port on the ACSLS server. For *csi_port*, specify either 0 or a value such that $1024 \leq csi\_port \leq 65535$. Setting this variable to zero or leaving it unset causes the system to query the portmapper on the ACSLS server.

TABLE 4-11 StorageTek ACSLS-Attached Automated Library Parameters *(Continued)*

Parameter	Meaning
`capid` = (`acs` = *acsnum*, `lsm` = *lsmnum*, `cap` = *capnum*)	
	Specifies the CAP (Cartridge Access Port), in terms of the StorageTek library, to be used when the `export`(1M) `-f` command is specified. The `capid` description starts with an open parenthesis followed by three `keyword` = *value* pairs followed by a closing parenthesis. Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs. For *acsnum*, specify the ACS number for this CAP as configured in the StorageTek library. For *lsmnum*, specify the LSM number for this CAP as configured in the StorageTek library. For *capnum*, specify the CAP number for this CAP as configured in the StorageTek library.

TABLE 4-11 StorageTek ACSLS-Attached Automated Library Parameters *(Continued)*

Parameter	Meaning
`capacity` = (*index* = *value*[, *index* = *value*] . . .)	Sets the capacity of the cartridges supported by StorageTek. Use a comma to separate the *index* = *value* pairs and enclose them in parentheses. For *index*, specify the index of the `media_type` file supplied by StorageTek and located in the following ACSLS directory: `/export/home/ACSSS/data/internal/mixed_media/media_types.dat` For *value*, enter the capacity of the cartridge type in units of 1024 bytes. TABLE 4-12 shows the capacity defaults that were current at the time of the Sun StorEdge SAM-FS 4.1 release. In general, it is necessary only to supply a capacity entry for an index of new cartridge types or to override the capacity supported by StorageTek.
device_path_name = (`acs` = *value*, `lsm` = *value*, `panel` = *value*, `drive` = *value*) [`shared`]	Specifies the path to the device on the client. Specify one *device_path_name* = entry for each drive attached to this client. This parameter describes the drive within the StorageTek automated library. This description starts with an open parenthesis followed by four *keyword* = *value* pairs and a closing parenthesis. Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs. For the *value* arguments, use the information supplied by the ACSLS query drive command. TABLE 4-13 shows the *value* specifications. The `shared` keyword can follow the specification for the device path name. This specifies that the drive can be shared between two or more Sun StorEdge SAM-FS processes from two or more hosts. For more information on implementing shared drives, see "Shared Drives" on page 226 or see the `stk`(7) man page.

TABLE 4-12 shows the capacity defaults.

TABLE 4-12 Capacity Defaults

index	**Type**	**Capacity**
0	3480	210 MB (215040)
1	3490E	800 MB (819200)
2	DD3A	10 GB (10485760)
3	DD3B	25 GB (26214400)
4	DD3C	50 GB (52428800)
5	DD3D	0 (DD3 cleaning tape)
6	DLTIII	10 GB (10485760)
7	DLTIV	20 GB (20971520)
8	DLTIIIXT	15 GB (15728640)
9	STK1R (9840)	20 GB (20971520)
10	STK1U	0 (STK1R cleaning tape)
11	EECART	1.6 GB (16777216)
12	JCART	0 GB (foreign label)
13	STK2P (T9940A)	60 GB (62914560)
14	STK2W	0 GB (T9940A cleaning tape)
15	KLABEL	0 GB (unsupported)
16	LTO-100G	100 GB (104857600)
17	LTO-50G	50 GB (52428800)
18	LTO-35G	35 GB (36700160)
19	LTO-10G	10 GB (10485760)
20	LTO-CLN2	0 GB (cleaning tape)
21	LTO-CLN3	0 GB (cleaning tape)
22	LTO-CLN1	0 GB (cleaning tape)
23	SDLT	110 GB (115343360)
24	LTO-CLNU	0 GB (cleaning tape)
25	Virtual	0 GB (unsupported)
26	LTO-200G	200 GB (209715200)

TABLE 4-13 shows the *value* specifications.

TABLE 4-13 The *value* Specifications

Value	Content
`acs`	ACS number for the drive as configured in the StorageTek library
`lsm`	LSM number for the drive as configured in the StorageTek library
`panel`	PANEL number for the drive as configured in the StorageTek library
`drive`	DRIVE number for the drive as configured in the StorageTek library

CODE EXAMPLE 4-46 shows a parameters file for a StorageTek ACSLS-attached automated library:

CODE EXAMPLE 4-46 Parameters File `/etc/opt/SUNWsamfs/stk50`

```
#
#  This is file: /etc/opt/SUNWsamfs/stk50
#
hostname = baggins
portnum = 50014
access = some_user  # No white space allowed in user_id
capacity = ( 7 = 20971520, 9 = 20971520 )
ssi_inet_port = 0
csi_hostport = 0
capid = (acs=0, lsm=1, cap=0)
/dev/rmt/0cbn = (acs=0, lsm=1, panel=0, drive=1) shared
/dev/rmt/1cbn = (acs=0, lsm=1, panel=0, drive=2)
```

5. **Repeat this procedure and create a parameters file for each ACSLS-attached library that you want to configure.**

   CODE EXAMPLE 4-38 in "Defining the Sun StorEdge SAM-FS Configuration By Creating the `mcf` File" on page 191 shows the `mcf` file that corresponds with the StorageTek ACSLS-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `stk50` in the `/etc/opt/SUNWsamfs` directory.

Shared Drives

Typically, the Sun StorEdge SAM-FS processes have exclusive control over a library's drives as declared in the host system's `mcf` file. In many cases, drives are defined in individual `mcf` files that are used by independent copies of Sun StorEdge SAM-FS processes. If a process is not using a drive, the drive stays idle.

The shared drives capability enables two or more `mcf` files to define the same drive, and this makes the drive available to more than one Sun StorEdge SAM-FS process. The shared drives capability enables each Sun StorEdge SAM-FS process to share a drive, but it does not allow the processes to share media. Each Sun StorEdge SAM-FS process must still maintain its own set of VSNs. Processes cannot share a single piece of media.

This feature can be useful, for example, if a library is attached to more than one host system in a Sun StorEdge SAM-FS environment. The shared drives capability enables you to keep the drives in a library busy. The Sun StorEdge SAM-FS processes coordinate the use of the drive.

You can configure some network-attached libraries to share one or all media drives between multiple Sun StorEdge SAM-FS processes on multiple host systems. The following types of libraries support shared drives:

- IBM 3494 libraries that use the `lmcpd` interface
- StorageTek ACSLS-attached libraries

Each of the preceding libraries requires you to create a parameters file. To implement one or more shared drives, make sure that the `shared` keyword is specified in the parameters file for each drive that is to be shared. The placement of the `shared` keyword is specific to each manufacturer's library, so see the preceding vendor-specific sections for more information.

By default, a cartridge in a shared drive can be idle for 60 seconds before being unloaded. To change this timing, specify the `shared_unload` directive in the `defaults.conf` file. For more information on this directive, see the `defaults.conf`(4) man page.

Initializing the Sun StorEdge SAM-FS Environment

This procedure initializes the environment.

- **Use the `samd`(1M) `config` command to initialize the Sun StorEdge SAM-FS environment.**

  For example:

```
# samd config
```

(Optional) Checking the Drive Order

Perform this task if you are archiving to removable media.

The main objective of this task is to develop a list of drive number identifiers and the tape devices to which they are correlated. Because every automated library is a little different, this step in Sun StorEdge SAM-FS configuration process differs from library to library.

The drive order check procedure differs depending on whether your automated library has a front panel and whether it has tape or magneto-optical drives. Use one of the following procedures to check the drive order of each library:

- "To Check the Drive Order of Tape or Magneto-Optical Libraries With a Front Panel" on page 229
- "To Check the Drive Order of Tape Libraries Without a Front Panel" on page 231
- "To Check the Drive Order of Magneto-Optical Libraries Without a Front Panel" on page 233

▼ To Check the Drive Order of Tape or Magneto-Optical Libraries With a Front Panel

This procedure has two main phases:

- Mapping the drives to SCSI target IDs. This is accomplished through the following:
  - Visual examination of the automated library's front panel.
  - Physical examination of the drives.

  For information on the order in which the drives appear in the front panel, consult the documentation from the vendor. This differs from library to library.
- Mapping the SCSI target IDs to tape devices by using output from the `ls`(1M) command. CODE EXAMPLE 4-47 shows example `ls`(1M) output with drive identification information.

CODE EXAMPLE 4-47 Using `ls`(1) to Retrieve Tape Device Information

```
230-gort# ls -l /dev/rmt/?
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/0 ->
../../devices/pci@1f,4000/scsi@2,1/st@2,0:
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/1 ->
../../devices/pci@1f,4000/scsi@4,1/st@5,0:
```

CODE EXAMPLE 4-47 Using `ls`(1) to Retrieve Tape Device Information *(Continued)*

```
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/2 ->
../../devices/pci@1f,4000/scsi@4,1/st@6,0:
lrwxrwxrwx   1 root     other         40 Dec 13  2000 /dev/rmt/3 ->
../../devices/pci@1f,4000/scsi@4/st@1,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/4 ->
../../devices/pci@1f,4000/scsi@4/st@2,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/5 ->
../../devices/pci@1f,4000/scsi@4/st@3,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/6 ->
../../devices/pci@1f,4000/scsi@4/st@4,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/7 ->
../../devices/pci@1f,4000/scsi@2/st@2,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/8 ->
../../devices/pci@1f,4000/scsi@2/st@3,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/9 ->
../../devices/pci@1f,4000/scsi@2/st@4,0:
231-gort#
```

The procedure that follows is a framework for an iterative process. The actual steps you perform differ depending on your specific library. Consult your vendor documentation and follow this procedure to check the order of tape and magneto-optical drive devices for libraries with a front panel.

1. **Use the `samd`(1M) `start` command to start the Sun StorEdge SAM-FS software.**

   For example:

   ```
   # samd start
   ```

2. **Verify the order of the drives.**

   If the automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

3. **Verify the order in which the drives are recognized by the automated library's controller.**

   Check the SCSI target IDs or world wide numbers displayed by the control panel of the automated library. For optical drives, read the SCSI target IDs displayed on the control panel for your automated library. The order in which the drive targets are reported should be the order in which they are configured in the `mcf` file.

   To determine whether the drives become active when loaded with a cartridge, you can visually inspect the drives or you can use the `samu`(1M) utility's `r` display.

   Refer to your hardware maintenance manual for instructions on identifying and setting target addresses.

▼ To Check the Drive Order of Tape Libraries Without a Front Panel

1. **Use the `samd`(1M) `start` commaned to start the software.**

   For example:

```
# samd start
```

2. **Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the Sun StorEdge SAM-FS file system.**

   Use this command in the following format:

```
samcmd unavail eq
```

   For *eq*, specify the Equipment Ordinal, as specified in the `mcf` file, of the drive you are testing.

   For more information about the `samcmd`(1M) command's format, see the `samcmd`(1M) man page.

3. **Use the `samload`(1M) command to load a cartridge into the drive.**

   Use this command in one of the following formats:

```
samload mediatype.vsn deq
```

   or:

```
samload eq:slot deq
```

   TABLE 4-14 shows the arguments for these commands.

TABLE 4-14 Arguments for `samcmd`(1M) `load`

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

   For more information about the `samload`(1M) command's format, see the `samload`(1M) man page.

4. **Use the `mt`(1) command to determine if the correct drive responds while under Sun StorEdge SAM-FS control.**

   Use this command in the following format:

```
mt -f /dev/rmt/x status
```

   For *x*, specify the raw tape device entry as specified in the `mcf` file.

   CODE EXAMPLE 4-48 shows `mt`(1) command output that indicates that a tape is in the drive.

CODE EXAMPLE 4-48 Status Message Showing that a Tape is in a Drive

```
# mt -f /dev/rmt/0 status
DLT 7000 tape drive tape drive:
   sense key(0x2)= Not Ready   residual= 0   retries= 0
   file no= 0   block no= 0
```

   If the tape did not load or the drive did not return a status, the drive might not be listed in the proper order in the `mcf`. Make sure the order is correct in the `mcf` file, and repeat this test.

5. **Repeat this procedure for each drive in the library.**

   If your automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

   Make sure you check *each* drive in a library.

   If you change any information in the `mcf` file as a result of this procedure, you must propagate the changes to the rest of the system. For information on propagating `mcf` file changes, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

▼ To Check the Drive Order of Magneto-Optical Libraries Without a Front Panel

1. **Use the `samd`(1M) `start` command to start the software.**

   For example:

```
# samd start
```

2. **Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the Sun StorEdge SAM-FS file system.**

   Use this command in the following format:

   ```
   samcmd unavail eq
   ```

   For *eq*, specify the Equipment Ordinal, as specified in the `mcf` file, of the drive you are testing.

   For more information about the `samcmd`(1M) command's format, see the `samcmd`(1M) man page.

3. **Use the `samload`(1M) command to load a cartridge into the drive.**

   Use this command in one of the following formats:

   ```
   samload mediatype.vsn deq
   ```

   or:

   ```
   samload eq:slot deq
   ```

   TABLE 4-14 shows the arguments for these commands.

TABLE 4-15 Arguments for `samcmd`(1M) `load`

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
partition	A side of a magneto-optical disk. The partition must be 1 or 2.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

For more information about the `samload`(1M) command's format, see the `samload`(1M) man page.

4. **Use the `dd`(1M) command to determine if the correct drive reponds while under Sun StorEdge SAM-FS control.**

   Use this command in the following format:

```
/bin/dd if=device_path bs=2k iseek=3374 of=/tmp/foo count=10
```

   For *device_path*, specify the `samst` device entry as specified in the `mcf` file.

   CODE EXAMPLE 4-49 shows a status message that indicates that an optical catridge is in the selected device:

CODE EXAMPLE 4-49 `dd`(1M) Showing a Cartridge in a Drive

```
# dd if=/dev/samst/c0t3u0 bs=2k iseek=3374 of=/tmp/junk count=10
10+0 records in
10+0 records out
```

   CODE EXAMPLE 4-50 shows a status message that indicates that an optical catridge is not in the selected device:

CODE EXAMPLE 4-50 `dd`(1M) Showing That a Cartridge is Not in the Drive

```
# dd if=/dev/samst/c0t5u0 bs=2k iseek=3374 of=/tmp/junk1 count=10
read: I/O error
0+0 records in
0+0 records out
```

   If the optical catridge did not load or if the device returned messages like those in CODE EXAMPLE 4-50, the drives might not be listed in the correct order in the `mcf` file. Make sure the order is correct in the `mcf` file, repeat this test.

5. **Repeat this procedure for each drive in the library.**

   If your automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

   Make sure you check *each* drive in a library.

   If you change any information in the `mcf` file, you must propagate the changes to the rest of the system. For information on propagating `mcf` file changes, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

(Optional) Creating the `archiver.cmd` File

The archiver copies files from a Sun StorEdge SAM-FS file system to volumes on removable media cartridges or to disk partitions in another file system. You can tune the archiver operations to suit the types of files at your site and your site's data protection needs by creating an archiver command file to reside in `/etc/opt/SUNWsamfs/archiver.cmd`. This installation task guides you through the process of configuring an `archiver.cmd` file.

By default, the archiver automatically archives all files under all Sun StorEdge SAM-FS mount points. You are not required to create an `archiver.cmd` file, but archiver efficiency and performance increases if you tune the archiver to your site. The default settings for the archiver are as follows:

- The archiver archives all files to all available volumes in all configured libraries.
- The archiver makes one copy of each file.
- The archive age for all files is four minutes.
- The archive interval is 10 minutes.

▼ To Create an `archiver.cmd` File

1. **Use `vi`(1) or another editor to create file `/etc/opt/SUNWsamfs/archiver.cmd`.**
2. **Add directives to satisfy the archiving needs at your site.**

   You can divide your `archiver.cmd` file into two main areas, as follows:

   - The first part of this file is for *global directives* that apply to all file systems defined in your `mcf` file. You specify these directives at the top of the file.

- The second part of this file is for *file-system specific directives* that apply to only one file system. These directives must come after the global directives. For an individual file system, these directives override the global directives. The file-system specific directives are specified toward the bottom and are headed by an `fs=`*name* directive for each file system mentioned.

Certain directives are typically specified globally and others are typically specified only for individual file systems.

CODE EXAMPLE 4-51 shows a simple `archiver.cmd` file.

CODE EXAMPLE 4-51 Simple `archiver.cmd` File

```
# archiver.cmd
# One file system = samfs
# One automated media library with 5 sg drives = aml

archivemeta = off  # Do not archive meta data

archmax = sg 2G  # A reasonable size for tarballs

fs = samfs
logfile = /var/opt/SUNWsamfs/log/archiver.samfs
data .
   1 -norelease 10m
   2 -norelease 30m

params
# Start scheduling archive requests in a timely, efficient manner
allsets -startage 20m -startcount 1000 -startsize 100G

# Assure that the Archive Sets are not mixed on the tapes
allsets -reserve set

# Recycling has lower priority
allsets -priority rearchive -10

# Use multiple tape drives efficiently
allsets -drivemin 10G -drivemax 20G -tapenonstop
allsets.1 -drives 3
allsets.2 -drives 2

endparams

vsns
```

CODE EXAMPLE 4-51 Simple `archiver.cmd` File *(Continued)*

```
# Use all available volumes
allsets sg .*
endvsns
```

CODE EXAMPLE 4-51 shows a simple `archiver.cmd` file that you can add to or change as needed. A site should need to add directives only to accommodate more archive sets, copies, and VSN usage. CODE EXAMPLE 4-54 shows a more complex `archiver.cmd` file.

For information on some directives that are commonly found in `archiver.cmd` files, see "Archiver Command File Directives" on page 238. For comprehensive information on the `archiver.cmd` directives, see the `archiver.cmd`(4) man page and see the information on the archiver in the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

3. **Close the `archiver.cmd` file.**

4. **Verify the `archiver.cmd` file for correctness.**

   Enter the following command:

```
# archiver -lv
```

5. **Correct any errors in the `archiver.cmd` file before proceeding to the next task in this installation and configuration procedure.**

Archiver Command File Directives

This section shows some of the recommended `archiver.cmd` file directives.

Specifying a Log File: `logfile=`*pathname* Directive

This directive specifies the file to which the archiver writes log messages. This log file contains information about each file that is archived, rearchived, or automatically unarchived. The log consists of a list of all archived files and their location on archive media. Specify this directive as a global directive so it affects all file systems configured in your `mcf` file. This archiver log information is important in disaster recovery situations if recent metadata is not available or not trustworthy.

Determining the Number of Archive Copies: *copy_number* [`-norelease`] [*archive_age*] Directive

By default, the archiver creates one archive copy of each file. For better data protection, however, you should define two archive copies for each file and write the copies to physically different pieces of media.

The *copy_number* portion of this directive can be `1`, `2`, `3`, or `4`, which specifies that the archiver write from one to four archive copies. If you create more than one archive copy on more than one type of media, your data is better protected in the event that a piece of media is found to be faulty.

This directive also allows you to specify a `-norelease` option. The `-norelease` option prevents a file from being released from disk cache until *all* archive copies are made. By default, the releaser begins freeing up online disk cache when *one* archive copy is made. By specifying `-norelease`, you can avoid disk cache thrashing.

The *archive_age* specification for this directive allows you to specify the interval between the last time the file is written and when the file is archived. The interval is specified with an integer number and one of `s`, `m`, `h`, `d`, `w`, `y` to signify seconds, minutes, hours, days, weeks, or years.

Reserving Volumes: `vsns` and `endvsns` Directives

A set of reserved VSNs specifies individual VSN identifiers. These are the VSNs to be used as archive media for an archive set. As CODE EXAMPLE 4-52 shows, the `vsns` and `endvsns` directives surround the VSN identifiers.

CODE EXAMPLE 4-52 Fragment of an `archiver.cmd` File Showing Reserved VSNs

```
vsns
builds.2   sg    .*
builds.3   li    .*
support.2   sg    .*
support.3   li    .*
archive.2   sg    .*
archive.3   li    .*
samdev.1   sg    .*
samdev.2   li    .*
endvsns
```

You can accomplish the goal of creating archive copies on two different types of media by using reserved VSNs.

Determining Whether Metadata Is Archived: `archivemeta=on|off` Directives

Depending on your file system characteristics, you might want to archive file system metadata frequently and to multiple volumes, or you might not want to archive it at all. By default, `archivemeta=on` is enabled.

File system metadata changes when files are moved to different directories or when files are renamed. If this directory information changes rapidly and is important to your site, you might want to archive it frequently and to different media types.

Depending on how frequently you want the metadata archived, the result can be excessive drive activity as archive media is loaded and unloaded. If frequent loading and unloading is not desirable, you can go to the other extreme and specify that metadata not be archived by using the `archivemeta=off` directive.

Defining Archive Sets: the Archive Set Naming Directive

By default, files are archived as part of an archive set that has the same name as the file system. You can associate files into more meaningful groups by defining archive sets. This directive has the following format:

```
archive_set_name  path
```

CODE EXAMPLE 4-53 shows archive set assignment directives that assign files to archive sets `audiofiles` and `xrayfiles`.

CODE EXAMPLE 4-53 Archive Set Assignment Directives

```
xrayfiles medical/radiology/rochester/xrays
audiofiles net/home/cleveland/audio
```

Setting the Maximum Archive File Size: `archmax=`*media size* Directive

The `archmax=` directive specifies the maximum size of an archive file. The archiver groups user files to form this archive file. The maximum possible size of this archive file depends on your archive media's capacity, as follows:

- For tapes, the default is `archmax=512M`, which is 512 megabytes.
- For magneto-optical disks, the default is `archmax=5M`, which is 5 megabytes.

Depending on your archive media, you might want to specify that a larger or smaller archive file be written. Using the `archmax` directive can improve archiver performance by reducing the number of starts and stops to write tape marks.

Setting Miscellaneous Directives

The `archiver.cmd` file supports several other miscellaneous directives for tuning your site's archive policies. Directives are available for specifying an archive interval, the number of drives to use when archiving, and many other activities.

In addition, other directives in the `archiver.cmd` file control staging, releasing, and recycling behavior in conjunction with the `stager.cmd`, `recycler.cmd`, and `releaser.cmd` files.

For more information on all the directives that can appear in the `archiver.cmd` file, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

Advanced Archiver Command File Example

CODE EXAMPLE 4-51 shows a simple `archiver.cmd` file. CODE EXAMPLE 4-54 shows a more advanced `archiver.cmd` file.

CODE EXAMPLE 4-54 An Advanced `archiver.cmd` File

```
### Fri Jun  8 14:44:30 CDT 2001     ####
### Implemented ReservedVSNs feature ####
### using VSNs CFX.*                 ####

interval = 1h
logfile = /opt/logs/archive.log
archmax = li 5G
archmax = sg 2G
archmax = lt 3500M
archmax = at 1G
#
#  mounted on /support
#
fs = samfs2
        1 7y
no_archive tmp
support .
        2 -norelease 4h
        3 -norelease 4h

# mounted on /builds
```

CODE EXAMPLE 4-54 An Advanced `archiver.cmd` File *(Continued)*

```
#
fs = samfs3
        1 10y
interval = 2h
no_archive daily
builds  .
        2 8h
        3 8h
#
# mounted on /archive
#
fs = samfs4
        1 7y
archive .
        2 1h
        3 1h
#
# mounted on /samdev
#
fs = samfs6
        1 7y
samdev  .
        1 -norelease 1h
        2 -norelease 1h

# We're not doing .inode copies.  File system data is archived
# yearly.  Plan to use samfsdumps for restores when needed.
params
#allsets -offline_copy stageahead
allsets -offline_copy direct
builds.2 -drives 2
builds.2 -reserve set
support.2 -reserve set
samdev.1 -reserve set
samdev.1 -offline_copy none
samdev.2 -offline_copy none
endparams

vsns
builds.2        sg      .*
builds.3        li      .*
#builds.4       at     -pool rmt_pool
#
support.2       sg      .*
support.3       li      .*
#support.4      at     -pool rmt_pool
#
```

CODE EXAMPLE 4-54 An Advanced `archiver.cmd` File *(Continued)*

```
archive.2       sg      .*
archive.3       li      .*
#archive.4      at      -pool rmt_pool
#
samdev.1        sg      .*
samdev.2        li      .*
#
samfs2.1        i7      TAPE19
samfs3.1        i7      TAPE19
samfs4.1        i7      TAPE19
samfs6.1        i7      TAPE19
endvsns
```

(Optional) Enabling Disk Archiving

Disk archiving is the process of writing archive copies of file data to online disk in another file system. The file system to which the archive copies are written can be any UNIX file system. The destination file system does not have to be a Sun StorEdge SAM-FS file system, but the host system to which archive files are written must have at least one Sun StorEdge SAM-FS file system installed on it.

Disk archiving differs from traditional archiving in several ways. For example, it does not use automated libraries or removable media cartridges. You can, however, specify that one set of archive copies be written to disk and another set be written to other archive media. For additional information on disk archiving, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

If you plan to enable disk archiving, complete the following procedures:

- "To Enable Disk Archiving on the Host That Contains the Files to Be Archived" on page 244. Perform this procedure on the host system that contains the files to be archived.
- "(Optional) To Enable Disk Archiving on the Host to Which the Archive Copies Will Be Written" on page 248. Perform this procedure on the host system to which the archive copies will be written. There must be at least one Sun StorEdge SAM-FS file system created on this host. If you want to create your source files and write your archive copies to the same host system, you do not need to perform this procedure.

▼ To Enable Disk Archiving on the Host That Contains the Files to Be Archived

1. **Become superuser on the host system that contains the files you want to archive.**
2. **Use `vi`(1) or another editor to create (or to open) file `/etc/opt/SUNWsamfs/archiver.cmd`.**

   If you are archiving to disk only, or if you have not yet created an `archiver.cmd` file, you create the `archiver.cmd` file in this step.

   If you created an `archiver.cmd` file in "(Optional) Creating the `archiver.cmd` File" on page 236, you reopen the file in this step.

3. **Edit the `archiver.cmd` file to add disk archive set directives.**

   CODE EXAMPLE 4-55 shows a fragment from an `archiver.cmd` file that defines disk archive sets.

   CODE EXAMPLE 4-55 `/etc/opt/SUNWsamfs/archiver.cmd` on the Client

```
# This is the part of the archiver.cmd file that defines
# disk archive sets.
#
params
archset1.1 -disk_archive disk01
archset2.1 -disk_archive disk02
archset3.1 -disk_archive disk03
endparams
```

   For more information on specifying archive sets, see the `archiver.cmd`(4) man page or see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

4. **Save and close the `archiver.cmd` file.**

5. **Use `vi`(1) or another editor to create a file named `diskvols.conf`.**

   The `diskvols.conf` file specifies the online disk directories to which the archive copies will be written.

Note – If you are configuring a Sun StorEdge SAM-FS file system for the first time at your site, write the archive copies to disk in a file system that is on the same host that the source files reside on. This is because you have not yet installed the Sun StorEdge SAM-FS software on another host. If you configure a Sun StorEdge SAM-FS file system on another host at a later time, you can modify your configuration files.

CODE EXAMPLE 4-56 shows an example `diskvols.conf` file:

CODE EXAMPLE 4-56 Example `diskvols.conf` File on the Client

```
# This is file sourceserver:/etc/opt/SUNWsamfs/diskvols.conf
# on the client.
#
# VSN_name [host_name:] path
#
disk01 otherserver:/sam/archset1
disk02 otherserver:/sam/archset2
disk03 /sam/archset3
```

CODE EXAMPLE 4-56 shows a `diskvols.conf` file that archives files from three archive sets. The disk volumes named `disk01` and `disk02` reside in a file system on the server system named `otherserver`. Disk volume `disk03` resides on the same host as the files to be archived.

As CODE EXAMPLE 4-56 shows, the `diskvols.conf` file can contain comment lines that begin with a pound character (`#`), and it must contain data in two fields: the VSN name field and the path field. You can leave the host name field blank if you

are archiving to a file system that resides on the same host system as the source files, but if specified, it must be followed by a colon character (:). TABLE 4-16 shows the information that must appear in this file.

TABLE 4-16 Format of the `diskvols.conf` File

Field Name	Content
VSN Name	A unique alphanumeric name for the disk VSN to receive the archive copies. Can be up to 31 characters long.
Host Name	The name of the host to which archive copies will be written. This is an optional field. If you are archiving to disk on another host, you must use this field to specify the name of the destination server to receive the archive copies. If a host name is specified, it must be followed by a colon (`:`). If you are archiving to a file system that resides on the same server as the source file system, you do not need to specify the host name.
Path	The full path, relative to the mount point, to the directory to receive the archive files. This directory must be in place before archiving can commence, and the destination file system must be mounted. The Path should be specified relative to the mount point. For example, if archive copies are to be written to the `vsns` directory in the `archivefs1` file system, you would specify `/archivefs1/vsns` in the Path field. Sun Microsystems recommends that the destination directory be created with write permission granted only to `root`.

For more information about the `diskvols.conf` file, see the `diskvols.conf`(4) man page.

The following additional rules pertain to the `diskvols.conf` file:

- You can include comments in the `diskvols.conf` file. A pound character (#) indicates a comment, and all text to the right of the # is ignored.
- You can continue lines. To continue a line, put an apostrophe character (`'`) at the end.

6. **Save and close the `diskvols.conf` file.**

7. **Create directories in the file system to which the archive copies will be written.**

   CODE EXAMPLE 4-57 shows the commands to create the directories to which archive copies will be written.

CODE EXAMPLE 4-57 Creating Archive Copy Directories

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

8. **Use the `archiver`(1M) command with its `-lv` options to verify the correctness of the `archiver.cmd`(4) file.**

   Enter the following command:

```
# archiver -lv
```

   The preceding command verifies the `archiver.cmd` file syntax for errors. If any are found, correct them before proceeding.

▼ (Optional) To Enable Disk Archiving on the Host to Which the Archive Copies Will Be Written

Perform this procedure only if you are writing your archive copies to a host system that is different from the host system upon which the source files reside. In this situation, you are creating a client/server environment:

- The client is the host that contains the source files.
- The server is the host to which the archive copies are written. There must be at least one Sun StorEdge SAM-FS file system created on the server host.

Note – If you are installing a Sun StorEdge SAM-FS file system for the first time at your site, you cannot use this procedure because you cannot enable the writing of archive copies to a different host. If you configure a Sun StorEdge SAM-FS file system on another host at a later time, you can modify your configuration files.

---

1. **Become superuser on the server system.**

   This is the system to which the archive copies will be written.

2. **Use the `cd`(1) command to change to the file system to which you want to write the archive copies.**

   For example:

```
# cd /ufs1
```

3. **Create directories in the file system to which the archive copies will be written.**

   CODE EXAMPLE 4-58 shows the commands to create the directories to which archive copies will be written.

CODE EXAMPLE 4-58 Creating Archive Copy Directories

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

4. **Use `vi`(1) or another editor to create file `/etc/opt/SUNWsamfs/diskvols.conf`.**

   This file contains the `clients` and `endclients` directives and names the client system upon which the the files to be archived reside.

   For more information on disk archiving, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

CODE EXAMPLE 4-59 Example `diskvols.conf` File on the Server

```
# This is
# file destination_server:/etc/opt/SUNWsamfs/diskvols.conf
# on the server
#
clients
sourceserver
endclients
```

5. **Save and close the `diskvols.conf` file.**

(Optional) Editing the `defaults.conf` File

The `/opt/SUNWsamfs/examples/defaults.conf` file contains directives that control automated library actions in a Sun StorEdge SAM-FS environment. You can change these settings at any time after the initial installation. If you change the information in the `defaults.conf` file after the system is up and running, for example, to accommodate changes in your site's library information, you must issue commands to propagate the `defaults.conf` file changes to the file system. The procedures for propagating the `defaults.conf` file changes are described in the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

CODE EXAMPLE 4-60 shows lines from an example `defaults.conf` file. This file shows several parameters that can affect the configuration of an automated library.

CODE EXAMPLE 4-60 Example `defaults.conf` File

```
exported_media = unavailable
attended = yes
tape = lt
log = LOG_LOCAL7
timeout = 300
# trace
# all on
# endtrace
labels = barcodes_low
lt_delay = 10
lt_unload = 7
lt_blksize = 256
```

Another sample file is located in `/opt/SUNWsamfs/examples/defaults.conf`.

▼ To Customize Default Values for Your Site

1. **Read the `defaults.conf`(4) man page to determine the defaults you want to change.**

2. **Use the** `cp`**(1) command to copy** `/opt/SUNWsamfs/examples/defaults.conf` **to its functional location.**

   For example:

```
# cp /opt/SUNWsamfs/examples/defaults.conf /etc/opt/SUNWsamfs/defaults.conf
```

3. **Use** `vi`**(1) or another editor to edit the file.**

   Edit the lines that control aspects of the system that you want to change. Remove the pound character (`#`) from column 1 of the lines you change.

4. **Use the** `pkill`**(1M) command to send a SIGHUP signal to the** `sam-fsd`**(1M) daemon.**

   For example:

```
# pkill -HUP sam-fsd
```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf`(4) file.

Features You Can Control From `defaults.conf`

The following sections describe two of the more common features you can control from this file. For more information on the `defaults.conf`(4) file, see the `defaults.conf`(4) man page.

Barcodes

If you have a tape library that uses a barcode reader, you can configure the system to set the tape label equal to the first or last characters of the barcode label. You can accomplish this by setting the `labels` directive in the `defaults.conf` file, as shown in TABLE 4-17.

TABLE 4-17 The `labels` Directive in the `defaults.conf` File

Directive	Action
`labels = barcodes`	Uses the first six characters of the barcode as the label. This setting enables the archiver to label new media on blank media automatically if the tape is chosen. Default.
`labels = barcodes_low`	Uses the last six characters of the barcode as the label.
`labels = read`	Reads the label from the tape. This setting prevents the archiver from labeling new media automatically.

If `labels = barcodes` or `labels = barcodes_low` is in effect, the Sun StorEdge SAM-FS system writes a label before the write is started for any tape that is mounted for a write operation that is write enabled, unlabeled, and has a readable barcode.

Drive Timing Values

You can set the load, unload, and unload wait time for devices using the *dev*`_delay` and *dev*`_unload` directives, respectively. These directives allow you to set these times to an interval that meets your site's requirements.

The format of the *dev*`_delay` directive is as follows:

```
dev_delay = seconds
```

For *dev*, specify the device type as specified in the `mcf`(4) man page.

For *seconds*, specify an integer number specifying the minimum elapsed time between a cartridge being loaded and the same cartridge's ability to be unloaded. The default is `30`.

The format of the *dev*`_unload` parameter is as follows:

```
dev_unload = seconds
```

For *dev*, specify the device type as specified in the `mcf`(4) man page.

For *seconds*, specify an integer number for the amount of time to wait after an `unload` command is issued. This gives the automated library time to eject the cartridge, open the door, and perform other operations before the cartridge is removed. The default is `0`.

For example:

```
hp_delay = 10
lt_unload = 7
```

Verifying the License and `mcf` Files

At this point in the installation and configuration process, the following files exist on your Sun StorEdge SAM-FS server:

- `/etc/opt/SUNWsamfs/LICENSE.4.2`
- `/etc/opt/SUNWsamfs/mcf`

The procedures in this task show you how to verify the correctness of these configuration files.

▼ To Verify the License File

- **Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.**

  The `samcmd`(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in CODE EXAMPLE 4-61, return to "Enabling the Sun StorEdge SAM-FS Software License" on page 180.

CODE EXAMPLE 4-61 Using `samcmd`(1M)

```
# samcmd l

License information samcmd     4.1.71 Fri Aug 27 16:24:12 2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled

Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled
```

CODE EXAMPLE 4-61 Using samcmd(1M) *(Continued)*

```
Shared filesystem support enabled

SAN API support enabled

Robot type ATL 2640, P1000, or Sun L1000 Library is present and
licensed

    0 tp slots not licensed

    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

▼ To Verify the mcf File

- **Enter the sam-fsd(1M) command to verify the mcf file.**

  If your mcf file is free from syntax errors, the sam-fsd(1M) output includes information about the file systems, archiving, and other system information. If your mcf file contains syntax or other errors, however, the output is similar to that shown in CODE EXAMPLE 4-62.

CODE EXAMPLE 4-62 Example sam-fsd(1M) Output

```
# sam-fsd
13: /dev/dsk/c1t1d0s0   10      md      samfs1  on
/dev/rdsk/c1t1d0s0
 *** Error in line 13: Equipment name '/dev/dsk/c1t1d0s0' already
in use by eq 10
72: /dev/rmt/3cbn       45      ug      l1000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn' already in
use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your mcf file has errors, refer to "Defining the Sun StorEdge SAM-FS Configuration By Creating the mcf File" on page 191 and to the mcf(4) man page for information on how to create this file correctly.

(Optional) Labeling Removable Media Cartridges

If you have standalone tape or optical devices, or if your automated library has no barcode reader, you must perform this task.

To prepare cartridges, use the `tplabel`(1M) command for tapes or use the `odlabel`(1M) command for optical disks. These commands create a cartridge label that the Sun StorEdge SAM-FS software can read.

The `tplabel`(1M) command has the following format:

```
tplabel -new -vsn new_vsn eq:slot
```

TABLE 4-18 Arguments for the `tplabel`(1M) Command

Argument	Meaning
new_vsn	The new volume serial name.
eq	The Equipment Ordinal of the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog. This argument is not applicable for manually loaded drives.

The `odlabel`(1M) command has the following format:

```
# odlabel -new -vsn new_vsn eq:slot:partition
```

TABLE 4-19 Arguments for the `odlabel`(1M) Command

Argument	Meaning
new_vsn	The new volume serial name.
eq	The Equipment Ordinal of the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog. This argument does not apply to manually loaded drives.
partition	A side of a magneto-optical disk. The partition must be 1 or 2.

You can use the cartridges after you issue these commands. Both the `tplabel`(1M) and the `odlabel`(1M) commands accept a `-old` option that you can use to relabel previously labeled cartridges. For more information about these commands, see the `tplabel`(1M) and `odlabel`(1M) man pages.

Example 1. The following command labels a tape:

```
# tplabel -vsn TAPE01 -new 50:0
```

Example 2. The following command labels one side of an optical disk:

```
# odlabel -vsn OPTIC01 -new 30:1:1
```

If you are not using an automated library with a barcode reader, label all cartridges manually before using the Sun StorEdge SAM-FS system.

If your library uses barcodes, `labels = barcodes` is set by default, and the result is that the first six characters are used for the VSN.

If your library uses barcodes, and you want the last six characters to become the VSN for the cartridge, edit the `/etc/opt/SUNWsamfs/defaults.conf` file and include the following line:

```
labels = barcodes_low
```

When the software loads a barcoded cartridge for a write operation, it writes a label on the cartridge before the write begins. The cartridge must be write enabled, unlabeled, and have a readable barcode.

(Optional) Populating the Catalog

Perform this task if you have a network-attached automated library configured in your Sun StorEdge SAM-FS environment.

After you mount the Sun StorEdge SAM-FS file systems, the software creates catalogs for each automated library configured in the `mcf` file. If you have a network-attached automated library, however, you need to populate the library's catalog. There are several ways to populate an automated library. The appropriate method depends on the number of volumes you want to include in the catalog.

The following sections describe various methods for populating an automated library's catalog:

- "To Populate an Automated Library With Many Volumes" on page 258. You can use this procedure for ADIC/Grau, Fujitsu LMF, Sony Network-Attached, StorageTek ACSLS-Attached, and IBM 3494 automated libraries.
- "To Populate an Automated Library With a Small Number of Volumes" on page 260. You can use this procedure for ADIC/Grau, Fujitsu LMF, Sony Network-Attached, StorageTek ACSLS-Attached, and IBM 3494 automated libraries.
- "To Populate an IBM 3494 Automated Library" on page 260. This is an additional procedure for populating an IBM 3494 library. You can use this procedure only if you are using the library as one physical library (`access=private` in the `mcf` file). Do not use this procedure if you divided the library into multiple logical libraries.
- "To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)" on page 261. This is an alternative, and in some cases faster, method of populating the catalog of a StorageTek ACSLS-attached automated library.

Note – The slot position of a tape in a network-attached automated library has no relationship to the slot number of the volume in a Sun StorEdge SAM-FS library catalog.

▼ To Populate an Automated Library With Many Volumes

1. **Use `vi`(1) or another editor to create an input file that contains the slot number, the volume's VSN, the barcode number, and the media type.**

   Note the following when creating the input file:

- The file has four fields in each row. Each row identifies a volume. For each volume, specify the slot number, the VSN, the bar code, and the media type.
- Use a space character or a tab character to separate the fields in this file.
- If a VSN contains one or more space characters, enclose the VSN name in quotation marks (“ ”).

CODE EXAMPLE 4-63 shows example file `input_vsns`.

CODE EXAMPLE 4-63 Example File `input_vsns`

```
0 TAPE01  “TAPE 01” lt
1 TAPE02  TAPE02  lt
2 TAPE03  TAPE03  lt
```

2. **Use the `build_cat`(1M) command to create the catalog.**

The syntax for the `build_cat`(1M) command is as follows:

```
build_cat input-file catalog-file
```

Argument	Content
input-file	Specify the name of an input file. Typically, this is a file containing a list of VSNs.
catalog-file	Specify the full path to the library catalog. By default, the Sun StorEdge SAM-FS software creates a catalog and writes it to `/var/opt/SUNWsamfs/catalog/`*family-set-name*, where *family-set-name* is derived from the `mcf` file entry for this automated library. Alternatively, if you have specified a catalog name in the Additional Parameters field of the `mcf` file, use that catalog file name for *catalog-file*.

For example, you can specify the following `build_cat`(1M) command:

```
# build_cat input_vsns /var/opt/SUNWsamfs/catalog/grau50
```

For more information on the `build_cat`(1M) command, see the `build_cat`(1M) man page.

▼ To Populate an Automated Library With a Small Number of Volumes

1. **Use the `import`(1M) command to import catalog entries into the default catalog.**

   The syntax for the `import`(1M) command is as follows:

   ```
   import -v VSN eq
   ```

Argument	Content
VSN	Specify the VSN identifier for a volume. If a VSN name contains one or more space characters, enclose the VSN name in quotation marks (" ").
eq	Specify the Equipment Ordinal as specified for the device in the `mcf` file.

   For example:

   ```
   # import -v TAPE01 50
   ```

   In the preceding `import`(1M) command, note the following:

   - `TAPE01` is the VSN.
   - `50` is the Equipment Ordinal of the automated library as specified in the `mcf` file.

   The cartridges must be physically present in the automated library for the `import`(1M) commands to be successful. If a cartridge is not present, the entry goes into the historian.

   For more information on the `import`(1M) command, see the `import`(1M) man page.

2. **Repeat Step 1 for each cartridge you want to include in the catalog.**

▼ To Populate an IBM 3494 Automated Library

- **Insert the media cartridges you want to include in this library's catalog through the mail slot.**

  The library automatically builds a catalog that includes the media that you put into the slot.

Note – Do not use this method to populate an IBM 3494 automated library that has been divided into multiple logical libraries. Use this method only if `access=private` in the IBM 3494 parameters file. If you have an IBM 3494 library that is divided into multiple logical libraries (`access=shared` in the IBM 3494 parameters file), use one of the following methods to populate the catalog: "To Populate an Automated Library With Many Volumes" on page 258 or "To Populate an Automated Library With a Small Number of Volumes" on page 260.

▼ To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)

If you have an ACSLS-Attached library, you can use the `import`(1M) command with its `-c` and `-s` options to import from a pool of VSNs. This procedure is a faster method for populating a library catalog than the methods described in "To Populate an Automated Library With Many Volumes" on page 258 and "To Populate an Automated Library With a Small Number of Volumes" on page 260.

For more information on this, see the `import`(1M) man page. You can use this method only if you have a StorageTek ACSLS-attached automated library.

StorageTek ACSLS-Attached Automated Libraries — Common Problems and Error Messages

If errors exist in the configuration files for StorageTek ACSLS-attached automated library, the system generates several error messages. The following examples show common problems and the messages that the system generates.

Example 1. CODE EXAMPLE 4-64 shows the messages generated when there are syntax errors in the StorageTek parameters file. Check your StorageTek parameters file for syntax errors and remember that each line must begin with a keyword or a comment. For more information on the StorageTek parameters file, see the `stk`(7) man page.

CODE EXAMPLE 4-64 Errors From an Incorrect StorageTek Parameters File

```
May 23 09:26:13 baggins stk-50[3854]: initialize: Syntax error in
stk configuration file line 4.
May 23 09:26:13 baggins stk-50[3854]: initialize: Syntax error in
stk configuration file line 5.
```

Example 2. Assume that you receive two sets of error messages. CODE EXAMPLE 4-65 shows the first set.

CODE EXAMPLE 4-65 Error Messages from a Misconfigured StorageTek Library

```
May 23 09:29:48 baggins stk-50[3854]: main: Waiting for 2 drive(s)
to initialize
May 23 09:29:59 baggins stk-50[3854]: main: Waiting for 2 drive(s)
to initialize
May 23 09:30:39 baggins stk-50[3854]: main: Waiting for 2 drive(s)
to initialize
```

The following is the second set:

```
May 23 09:31:19 baggins stk-50[3854]: main: 2 drive(s) did not
initialize.
```

CODE EXAMPLE 4-66 shows the `samu`(1M) utility's `:r` display.

CODE EXAMPLE 4-66 Output Shown in `samu`(1M)'s `:r` Display

```
ty   eq  status      act  use  state    vsn
sg   51  ---------p    0   0%  off
         drive set off due to ACS reported state
sg   52  ---------p    0   0%  off
         drive set off due to ACS reported state
lt   61  ---------p    0   0%  off
         drive set off due to ACS reported state
tp   62  ----------    0   0%  off
         empty
```

Drives that are hung in an initializing state or that do not initialize usually indicate a configuration error. Verify that ACSLS is up and running. Verify the host name. Determine whether you can you ping the host name using the `ping`(1M) command.

Check the `portnum` specification in the StorageTek parameters file. In ACSLS 5.3, for example, the default port number, 50004, is used for a different application. Try a higher port number, such as 50014.

Example 3. CODE EXAMPLE 4-67 shows messages generated after the `import`(1M) command was used to import a VSN to the library catalog, but the VSN was not in the StorageTek automated library. The cartridge must be present in the ACSLS-managed automated library before the `import`(1M) command can be successful.

CODE EXAMPLE 4-67 Message Generated After an Attempted `import`(1M)

```
May 20 15:09:33 baggins stk-50[6117]: view_media
returned:STATUS_VOLUME_NOT_IN_LIBRARY
May 20 15:09:33 baggins stk-50[6117]: add_to_cat_req: view_media:
failed:STATUS_VOLUME_NOT_IN_LIBRARY. A
```

The `sam-stkd` daemon uses the `ssi.sh` script to ensure that a copy of the SSI daemon, `ssi_so`, is running. If `ssi_so` exits, the daemon starts another. If your site has its own version of `ssi.sh`, you should modify it to wait for a `SIGTERM` signal and then exit. The daemon sends a `SIGTERM` signal to stop the process. File `/opt/SUNWsamfs/examples/ssi.sh` contains an example `ssi.sh` script. The system copies the `ssi.sh` script to `/etc/opt/SUNWsamfs/scripts/ssi.sh` during installation if one does not already exist.

(Optional) Creating the `samfs.cmd` File

You can create the `/etc/opt/SUNWsamfs/samfs.cmd` file as the place from which the system reads mount parameters. If you are configuring multiple Sun StorEdge SAM-FS systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the `mount`(1M) command. Mount options specified here override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file.
- In the `/etc/vfstab` file. Mount options specified here override those specified in the `samfs.cmd` file.
- In the `samfs.cmd` file.

For more information about the `/etc/vfstab` file, see "Updating the `/etc/vfstab` File and Creating the Mount Point" on page 265. For more information on the `mount`(1M) command, see the `mount_samfs`(1M) man page.

▼ To Create the `samfs.cmd` File

- **Use `vi`(1) or another editor to create the `samfs.cmd` file.**

  Create lines in the `samfs.cmd` file to control mounting, performance features, or other aspects of file system management. For more information on the `samfs.cmd` file, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*, or see the `samfs.cmd`(4) man page.

Updating the /etc/vfstab File and Creating the Mount Point

The example in this task assumes that /samfs1 is the mount point of the samfs1 file system.

▼ To Update the /etc/vfstab File and Create the Mount Point

1. **Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each Sun StorEdge SAM-FS file system.**

   CODE EXAMPLE 4-68 shows header fields and entries for a Sun StorEdge SAM-FS file system.

CODE EXAMPLE 4-68 Example /etc/vfstab File Entries for a Sun StorEdge SAM-FS File System

```
#DEVICE    DEVICE   MOUNT    FS     FSCK  MOUNT    MOUNT
#TO MOUNT  TO FSCK  POINT    TYPE   PASS  AT BOOT  PARAMETERS
#
samfs1     -        /samfs1  samfs  -     yes      high=80,low=60
```

TABLE 4-20 shows the various fields in the /etc/vfstab file and their content.

TABLE 4-20 /etc/vfstab File Fields

Field	Field Title and Content
1	Device to mount. The name of the Sun StorEdge SAM-FS file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the Sun StorEdge SAM-FS file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount point. For example, /samfs1.
4	File system type. Must be samfs.

TABLE 4-20 `/etc/vfstab` File Fields *(Continued)*

Field	Field Title and Content
5	`fsck`(1M) pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at boot. Specifying `yes` in this field requests that the Sun StorEdge SAM-FS file system be mounted automatically at boot time. Specifying `no` in this field indicates that you do not want to mount the file system automatically. For information about the format of these entries, see the `mount_samfs`(1M) man page.
7	Mount parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the `mount`(1M) command, in the `/etc/vfstab` file, or in a `samfs.cmd` file. Mount options specified on the `mount`(1M) command override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file. Mount options specified in the `/etc/vfstab` file override those in the `samfs.cmd` file. For a list of available mount options, see the `mount_samfs`(1M) man page.

2. **Use the `mkdir`(1M) command to create the mount point.**

   For example:

```
# mkdir /samfs1
```

Initializing the File System

This task shows how to use the `sammkfs`(1M) command and the Family Set names that you have defined to initialize a file system.

Note – The `sammkfs`(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide* or see the `sammkfs`(1M) man page.

▼ To Initialize the File System

- **Use the `sammkfs`(1M) command to initialize a file system for each Family Set name defined in the `mcf` file.**

  CODE EXAMPLE 4-69 shows the command to initialize a file system with the Family Set name of `samfs1`.

CODE EXAMPLE 4-69 Initializing Example File System `samfs1`

```
# sammkfs samfs1
sammkfs: Configuring file system
Building 'samfs1' will destroy the contents of devices:
                /dev/dsk/c2t0d0s3
                /dev/dsk/c2t0d0s7
Do you wish to continue? [y/N] y
total data kilobytes       = 16777728
total data kilobytes free  = 16777152
#
```

The actual numbers returned vary from file system to file system.

Caution – Running the `sammkfs`(1M) command creates a new file system. It removes all data currently contained in the partitions associated with the file system in the `/etc/opt/SUNWsamfs/mcf` file.

Mounting the File System

The mount(1M) command mounts a file system and reads the /etc/vfstab configuration file. For information on the mount(1M) command, see the mount_samfs(1M) man page.

▼ To Mount the File System

1. **Use the mount(1M) command to mount the file system.**

   Specify the file system mount point as the argument. For example:

```
# mount samfs1
```

2. **Use the mount(1M) command with no arguments to verify the mount.**

   This step confirms whether the file system is mounted and shows how to set permissions. CODE EXAMPLE 4-70 shows the output from a mount(1M) command issued to verify whether example file system samfs1 is mounted.

CODE EXAMPLE 4-70 Using the mount(1M) Command to Verify that a File System is Mounted

```
# mount
<<< information deleted >>>
/samfs1 on samfs1 read/write/setuid/intr/largefiles/onerror=panic/dev=8001e3 on
Thu Feb  5 11:01:23 2004
<<< information deleted >>>
```

3. **(Optional) Issue the chmod(1) and chown(1) commands to change the permissions and ownership of the file system's root directory.**

   If this is the first time the file system has been mounted, it is typical to perform this step. CODE EXAMPLE 4-71 shows the commands to use to change file system permissions and ownership.

CODE EXAMPLE 4-71 Using chmod(1M) and chown(1M) to Change File System Permissions and Ownership

```
# chmod 755 /samfs1
# chown root:other /samfs1
```

(Optional) Sharing the File System With NFS Client Systems

Perform this task if you want the Sun StorEdge SAM-FS file system to be NFS shared.

Run the Sun Solaris `share`(1M) command to make the file system available for mounting by remote systems. The `share`(1M) commands are typically placed in the `/etc/dfs/dfstab` file and are executed automatically by the Sun Solaris OS when you enter `init`(1M) state 3.

▼ To NFS Share the File System

1. **Use `vi`(1) or another editor to add a `share`(1M) command to the `/etc/dfs/dfstab` file.**

   For example, add a line like the following to direct the Solaris OS to NFS share the new Sun StorEdge SAM-FS file system:

   ```
   share -F nfs -o rw=client1:client2 -d "SAM-FS" /samfs1
   ```

2. **Use the `ps`(1) command to determine whether or not `nfs.server` is running.**

   CODE EXAMPLE 4-72 shows these commands and their output.

CODE EXAMPLE 4-72 Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root   694     1  0   Apr 29 ?        0:36 /usr/lib/nfs/nfsd -a 16
en17     29996 29940  0 08:27:09 pts/5    0:00 grep nfsd
# ps -ef | grep mountd
    root   406     1  0   Apr 29 ?       95:48 /usr/lib/autofs/automountd
    root   691     1  0   Apr 29 ?        2:00 /usr/lib/nfs/mountd
en17     29998 29940  0 08:27:28 pts/5    0:00 grep mountd
```

In CODE EXAMPLE 4-72, the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. **(Optional) Start the NFS server.**

   Perform this step if `nfs.server` is not running.

Use the following command:

```
# /etc/init.d/nfs.server start
```

4. **(Optional) Type the `share`(1M) command at a `root` shell prompt.**

   Perform this step if you want to NFS share the file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. CODE EXAMPLE 4-73 shows the commands to use to enable NFS sharing. You must change to run level 3 after adding the first share entry to this file.

CODE EXAMPLE 4-73 NFS Commands

```
# init 3
# who -r
.       run-level 3  Dec 12 14:39     3     2  2
# share
-           /samfs1   -    "SAM-FS"
```

Some NFS mount parameters can affect the performance of an NFS mounted Sun StorEdge SAM-FS file system. You can set these parameters in the `/etc/vfstab` file as follows:

- `timeo = n`. This value sets the NFS timeout to *n* tenths of a second. The default is eleven tenths of a second. For performance purposes, Sun Microsystems recommends using the default value. You can increase or decrease the value appropriately to your system.
- `rsize = n`. This value sets the read buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.
- `wsize = n`. This value sets the write buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

For more information on these parameters, see the `mount_nfs`(1M) man page.

▼ To Mount the File System on Clients

On the client systems, mount the server's Sun StorEdge SAM-FS file system at a convenient mount point.

1. **On the client systems, use `vi`(1) or another editor to edit the `/etc/vfstab` file and add a line to mount the server's Sun StorEdge SAM-FS file system at a convenient mount point.**

   The following example line mounts `server:/samfs1` on the `/samfs1` mount point:

```
server:/samfs1   -   /samfs1   nfs   -   yes   hard,intr,timeo=60
```

   In this example, `server:/samfs1` is mounted on `/samfs1`, and information is entered into the `/etc/vfstab` file.

2. **Save and close the `/etc/vfstab` file.**

3. **Enter the `mount`(1M) command.**

   For example:

```
client# mount /samfs1
```

   The automounter can also do this, if you prefer. Follow your site procedures for adding `server :/samfs1` to your automounter maps. For more information on automounting, see the `automountd`(1M) man page.

Note – At times, there might be a significant delay in the Sun StorEdge SAM-FS file system's response to NFS client requests. This can occur if a requested file resides on a cartridge that must be loaded into a DLT tape drive, if all tape drives are full, or if drives are slow. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, Sun recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000`.

Writing Periodic Dump Files By Using samfsdump(1M)

It is important to use the samfsdump(1M) command periodically to create a metadata dump file.

When using the samfsdump(1M) command, please note the following:

- The samfsdump(1M) command dumps file names and inode information, not data. That is, the dump file does not include the archive data stored in your file system. The dump file does include the inode and directory structure information necessary to quickly locate the data on your archive media. This information is necessary for recovering from a file system failure. For more information on this, see the samfsdump(1M) man page.
- You can use the -u option to the samfsdump(1M) command to dump metadata and file data for files that have not yet been archived. A samfsdump(1M) dump taken using the -u option can be very large. The samfsdump(1M) command does not have any tape management or estimations as does ufsdump(1M). You need to weigh the tradeoffs of space and unarchived data when using the -u option. For more information about these commands, see the samfsdump(1M) and ufsdump(1M) man pages.
- You can use the samfsrestore(1M) command to restore the metadata dump file after initializing the file system if a failure occurs.

For more information about using the samfsdump(1M) command, see the samfsdump(1M) man page. Also see the information on metadata, disaster preparation, and recovery in the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

The following sections describe procedures for issuing this command both automatically and manually.

▼ To Run the samfsdump(1M) Command Automatically

1. **Make an entry in the root user's `crontab` file so the `cron` daemon runs the `samfsdump`(1M) command periodically.**

   CODE EXAMPLE 4-74 shows a cron(1) entry.

   CODE EXAMPLE 4-74 `cron`(1) Entry to Run `samfsdump`(1M) Automatically

```
0 0 * * * find /csd.directory/sam -type f -mtime +7 \
-print| xargs -l1 rm -f; cd /sam; \
/opt/SUNWsamfs/sbin/samfsdump -f \
/csd.directory/sam/'date +\%y\%m\%d'
```

   This example `crontab` entry uses a Sun StorEdge SAM-FS file system mounted on `/sam`. Replace `/csd.directory` with an existing directory of your choice. This entry causes the commands to execute each day at midnight. First, the old dumps are renamed and a new dump is created in `/csd.directory/sam/`*yymmdd*. After that, `cron`(1M) emails the `samfsdump`(1M) output to `root`.

2. **(Optional) Using the previous step as a guide, make similar `crontab` entries for each file system.**

   If you have multiple Sun StorEdge SAM-FS file systems, make similar entries for each. Make sure you save each dump in a separate file.

▼ To Run the samfsdump(1M) Command Manually

1. **Use the `cd`(1) command to go to the directory that contains the mount point for the file system.**

   For example:

```
# cd /samfs1
```

   In this example, `samfs1` is a Sun StorEdge SAM-FS mount point.

2. **Use the `samfsdump`(1M) command to write the output to a file system outside of the one you are dumping.**

   For example:

```
# samfsdump -T -u -f /dumpster/dump.file
```

   In this example, `dump.file` is the newly created dump structure.

(Optional) Backing Up Configuration Files

Sun StorEdge SAM-FS regularly accesses several files that have been created as part of this installation and configuration procedure. Back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note – Sun Microsystems strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

The following files are among those that you should back up regularly and whenever you modify them:

- `/etc/opt/SUNWsamfs/mcf`
- `/etc/opt/SUNWsamfs/LICENSE.4.2`
- `/etc/opt/SUNWsamfs/samfs.cmd`
- `/etc/opt/SUNWsamfs/archiver.cmd`

For more information on the files you should protect, see the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

(Optional) Configuring the Remote Notification Facility

The Sun StorEdge SAM-FS software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software within the software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The Sun StorEdge QFS and Sun StorEdge SAM-FS Management Information Base (MIB) defines the types of problems, or events, that the Sun StorEdge QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information on the MIB, see `/opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib`.

The following sections describe how to enable and how to disable remote notification.

▼ To Enable Remote Notification

1. **Ensure that the management station is configured and known to be operating correctly.**

   "(Optional) Verifying the Network Management Station" on page 46 describes this prerequisite.

2. **Use `vi`(1) or another editor to open file `/etc/hosts`.**

   Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined.

   For example, CODE EXAMPLE 4-75 shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

   CODE EXAMPLE 4-75 Example `/etc/hosts` File

```
999.9.9.9        localhost
999.999.9.999    loggerhost      loghost
999.999.9.998    mgmtconsole
999.999.9.9      samserver
```

3. **Save your changes to `/etc/hosts` and exit the file.**

4. **Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

5. **Locate the `TRAP_DESTINATION=‘hostname‘` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

   This line specifies that the remote notification messages be sent to port 161 of the server upon which the Sun StorEdge SAM-FS software is installed. Note the following:

   - If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`*management-console-name*`:`*port*`"`. Note the use of quotation marks (`" "`) rather than apostrophes (`‘ ‘`) in the new directive.
   - If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [ mgmt_console_name:port]"
```

   For example:

```
TRAP_DESTINATION="localhost:161 doodle:163 mgmt_station:1162"
```

6. **Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.**

   This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

   - If your management station’s community string is also set to `public`, you do not have to edit this value.
   - If your management station’s community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. **Save your changes to `/etc/opt/SUNWsamfs/scripts/sendtrap` and exit the file.**

▼ To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. **(Optional) Use the `cp`(1) command to copy file `/opt/SUNWsamfs/examples/defaults.conf` to `/etc/opt/SUNWsamfs/defaults.conf`.**

   Perform this step if file `/etc/opt/SUNWsamfs/defaults.conf` does not exist.

2. **Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/defaults.conf`.**

   Find the line in `defaults.conf` that specifies SNMP alerts. The line is as follows:

   ```
   #alerts=on
   ```

3. **Edit the line to disable SNMP alerts.**

   Remove the # symbol and change `on` to `off`. After editing, the line is as follows:

   ```
   alerts=off
   ```

4. **Save your changes to `/etc/opt/SUNWsamfs/defaults.conf` and exit the file.**

5. **Use the `pkill`(1M) command to send a SIGHUP signal to the `sam-fsd`(1M) daemon.**

   The format for this command is as follows:

   ```
   # pkill -HUP sam-fsd
   ```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf` file.

(Optional) Adding the Administrator Group

By default, only the superuser can execute the Sun StorEdge SAM-FS administrator commands. However, during installation you can supply an administrator group name. The `pkgadd`(1M) process prompts you for this group name during Sun StorEdge SAM-FS installation.

Members of the administrator group can execute all administrator commands except for `star`(1M), `samfsck`(1M), `samgrowfs`(1M), `sammkfs`(1M), and `samd`(1M). The administrator commands are located in `/opt/SUNWsamfs/sbin`.

You can use the `set_admin`(1M) command to add or remove the administrator group after installing the package. This action performs the same function that occurs when you select an administrator group during the package install. You must be logged in as superuser to use the `set_admin`(1M) command. You can also undo the effect of this selection and make the programs in `/opt/SUNWsamfs/sbin` executable only by the superuser. For more information on this command, see the `set_admin`(1M) man page.

▼ To Add the Administrator Group

1. **Choose a group name or select a group that already exists within your environment.**
2. **Use the `groupadd`(1M) command, or edit the `/etc/group` file.**

   The following is an entry from the group file designating an administrator group for the Sun StorEdge SAM-FS software. In this example, the `samadm` group consists of both the `adm` and `operator` users.

```
samadm::1999:adm,operator
```

Configuring System Logging

The Sun StorEdge SAM-FS systems log errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the Sun StorEdge SAM-FS facility is `local7`.

▼ To Enable Logging

1. **Use vi(1) or another editor to open the `/etc/syslog.conf` file.**

   Read in the line from the following file:

   `/opt/SUNWsamfs/examples/syslog.conf_changes`

   The line is similar, if not identical, to the following line:

   ```
   local7.debug   /var/adm/sam-log
   ```

   Note – The preceding entry is all one line and has a TAB character (not a space) between the fields.

   This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. **Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.**

   CODE EXAMPLE 4-76 shows the commands to use to append the logging lines.

CODE EXAMPLE 4-76 Using `cp`(1) and `cat`(1) to Append Logging Lines to `/etc/syslog.conf`

```
# cp /etc/syslog.conf /etc/syslog.conf.orig
# cat /opt/SUNWsamfs/examples/syslog.conf_changes >> /etc/syslog.conf
```

3. **Create an empty log file and send the `syslogd` a HUP signal.**

   CODE EXAMPLE 4-77 shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to `syslogd`.

   CODE EXAMPLE 4-77 Creating an Empty Log File and Sending a HUP Signal to `syslogd`

```
# touch /var/adm/sam-log
# pkill -HUP syslogd
```

   For more information, see the `syslog.conf`(4) and `syslogd`(1M) man pages.

4. **(Optional) Use the `log_rotate.sh`(1M) command to enable log file rotation.**

   Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

(Optional) Configuring Other Sun StorEdge Products

The Sun StorEdge SAM-FS installation and configuration process is complete. You can configure other Sun StorEdge SAM-FS products at this time. For example, if you want to configure Sun SAM-Remote, see the *Sun SAM-Remote Administration Guide*.

CHAPTER 5

Sun StorEdge SAM-FS Upgrade Procedure

This chapter explains how to upgrade a server to a new release of the Sun StorEdge SAM-FS software. Use this procedure if you are upgrading your Sun StorEdge SAM-FS environment. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

Ensuring That the Installation Prerequisites Are Met

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you upgrade to the Sun StorEdge SAM-FS 4.2 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements for your upgrade to 4.2 are as follows:

- "Server Requirements" on page 16
- "Solaris Operating System Requirements" on page 16
- "Verifying Disk Space" on page 23
- "(Optional) Verifying Archive Media" on page 24
- "Obtaining a Software License Key" on page 31
- "Obtaining the Release Files" on page 33
- "Verifying Third-Party Compatibilities" on page 35
- "(Optional) Verifying Requirements for the SAM-QFS Manager" on page 45
- "(Optional) Verifying the Network Management Station" on page 46

(Optional) Backing Up Existing File Systems

Perform this task under the following conditions:

- You are currently using a version 1 superblock with a Sun SAM-FS 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In "(Optional) Reinitializing and Restoring the File Systems" on page 304, you reinitialize the file systems and restore your data.
- You suspect that your current `samfsdump`(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- "Using the Version 1 and Version 2 Superblocks" on page 285
- "To Back Up File Systems" on page 286

CODE EXAMPLE 5-1 shows using the `samfsinfo`(1M) command to retrieve information about the `samfs4` file system. The second line of output indicates that this file system is using a version 2 superblock.

CODE EXAMPLE 5-1 Using `samfsinfo`(1M)

```
# samfsinfo samfs4
samfsinfo: filesystem samfs4 is mounted.
name:     samfs4       version:     2
time:     Sat Sep 20 08:24:34 2003
count:    1
capacity:       04b00000          DAU:         16
space:          02e22ff0
ord  eq   capacity      space   device
  0  41   04b00000   02e22ff0   /dev/dsk/c9t50020F2300010570d0s1
```

Using the Version 1 and Version 2 Superblocks

The Sun StorEdge SAM-FS 4.0, 4.1, and 4.2 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)
- Dual-sized disk allocation units (DAUs) on `mm` devices

The Sun StorEdge SAM-FS 4.1 and 4.2 releases support both the version 1 and version 2 superblocks. You can use the `sammkfs`(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the `samfsrestore`(1M) command to restore files to the new file system from the dump file created in this installation task.

If you are upgrading from a Sun SAM-FS 4.0 system, note that the Sun StorEdge SAM-FS 4.0 file system allowed you to initialize file systems with either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note – The Sun StorEdge SAM-FS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The Sun StorEdge SAM-FS 4.2 file system only allows you to initialize file systems with the version 2 superblock.

▼ To Back Up File Systems

1. **(Optional) Become superuser from a console connection.**

   If you have not already logged in as `root`, do so now.

2. **Make sure that all files are archived.**

   The following example assumes that `sam1` is the mount point of the file system. You can complete this step by entering a command similar to the following:

```
# sfind /sam1 ! -type d ! -archived > /tmp/notarchived.list
```

   The preceding command finds all files that are not archived and sends the output to a file. Depending on the size of your file system, this command can take a long time to complete.

   Examine this command's output. The files in this output are those that have not been archived. If you want any of these files to appear in the dump file, archive them now before you proceed to the next step. Alternatively, you can use the `-u` option to the `samfsdump`(1M) command to dump unarchived data if you suspect some files have not yet been archived. The `-u` option can create very large dump files, however, so you need to weigh space considerations when using this option.

3. **Use the `samfsdump`(1M) command to back up each Sun StorEdge SAM-FS file system's metadata.**

   Dump each file system's metadata to a location outside the Sun StorEdge SAM-FS file system.

   CODE EXAMPLE 5-2 assumes that you have a file system mounted at `/sam1` that you want to back up to `samfs1.dump`, which exists outside of the Sun StorEdge SAM-FS file systems.

CODE EXAMPLE 5-2 Using `samfsdump`(1M)

```
# cd /sam1
# samfsdump -f /csd_dump_dir/samfs1.dump
```

   The `samfsdump`(1M) command dumps file names and inode information, not data. For more information, see the `samfsdump`(1M) man page.

   You must back up the metadata information for each file system, so repeat the preceding steps for each file system in your Sun StorEdge SAM-FS environment.

   For more information about backing up your file systems, see the *Sun QFS, Sun SAM-FS, and Sun SAM-QFS Disaster Recovery Guide*.

Stopping the Sun StorEdge SAM-FS File System

The procedure in this task shows how to halt Sun StorEdge SAM-FS operations.

▼ To Stop the File System

1. **Use the `samcmd`(1M) idle command to idle the drives in your system.**

   This step enables the archiver, stager, and other processes to complete current operations. Use this command in the following format:

   ```
   samcmd idle eq
   ```

   For *eq*, specify the Equipment Ordinal of a device defined in your `mcf` file.

   You can also idle the drives by using the `samu`(1M) operator utility. For more information about the `samcmd`(1M) command, see the `samcmd`(1M) man page.

   Repeat this step for each removable media drive *eq* configured in your `mcf` file:

2. **(Optional) Use the `samcmd`(1M) `aridle` command to idle the archiver.**

   Perform this step only if you are upgrading from a Sun StorEdge SAM-FS 4.0 system.

   For example:

   ```
   # samcmd aridle
   ```

3. **Use the `samd`(1M) `stop` command to stop all operations.**

   For example:

   ```
   # samd stop
   ```

(Optional) Unsharing the File Systems

Perform this task if your Sun StorEdge SAM-FS file systems are NFS shared file systems.

▼ To Unshare the File Systems

- **Use the `unshare`(1M) command on the Sun StorEdge SAM-FS file system.**

  For example, the following command unshares the `samfs1` file system:

```
# unshare samfs1
```

Unmounting the File System

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to"Removing Existing Sun StorEdge SAM-FS Software" on page 292.

▼ To Unmount Using the umount(1M) Command

- **Using the umount(1M) command, unmount each Sun StorEdge SAM-FS file system.**

  If necessary, use the `-f` option to the umount(1M) command. The `-f` option forces a file system to unmount.

▼ To Unmount Using the fuser(1M), kill(1), and umount(1M) Commands

If umount(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. **Use the fuser(1M) command to determine whether or not any processes are still busy.**

   For example, the following command queries the samfs1 file system:

   ```
   # fuser -uc /samfs1
   ```

2. **If any processes are still busy, use the kill(1M) command to terminate them.**
3. **Using the umount(1M) command, unmount each Sun StorEdge SAM-FS file system.**

▼ To Unmount By Editing the `/etc/vfstab` File and Rebooting

1. **Edit the `/etc/vfstab` file.**

   For all Sun StorEdge SAM-FS file systems, change the Mount at Boot field from `yes` or `delay` to `no`.

2. **Reboot your system.**

Removing Existing Sun StorEdge SAM-FS Software

This task shows how to remove Sun StorEdge SAM-FS software from a release prior to 4.2.

▼ To Remove Software From a 4.1 Release

1. **Use the `pkginfo`(1) command to determine which Sun StorEdge SAM-FS packages are installed on your system.**

   For example:

```
# pkginfo | grep sam
```

2. **Use the `pkgrm`(1M) command to remove the existing Sun StorEdge SAM-FS software.**

   You must remove all existing Sun StorEdge SAM-FS packages before installing the new packages. If you are using any optional Sun StorEdge SAM-FS packages, you should make sure that you remove these packages before removing the main `SUNWsamfs` packages. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWsamfsu` and the `SUNWsamfsr` packages:

```
# pkgrm SUNWsamfsu SUNWsamfsr
```

Note – The `SUNWsamfsr` package must be the last package removed. The 4.1 release does not include any localized software packages.

▼ To Remove Software From a 4.0 Release

1. **Use the `pkginfo`(1) command to determine which Sun StorEdge SAM-FS packages are installed on your system.**

   For example:

```
# pkginfo | grep sam
```

2. **Use the `pkgrm`(1M) command to remove the existing Sun StorEdge SAM-FS software.**

   You must remove all existing Sun StorEdge SAM-FS packages before installing the new packages. If you are using any optional Sun StorEdge SAM-FS packages, make sure that you remove these packages before removing the main `SUNWsamfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWcsamf`, the `SUNWfsamf`, and the `SUNWjsamf` localized packages in addition to the `SUNWsamfs` package:

```
# pkgrm SUNWcsamf SUNWfsamf SUNWjsamf SUNWsamfs
```

Note – The `SUNWsamfs` package must be the last package removed.

Adding the Packages

The Sun StorEdge SAM-FS software packages use the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) command prompts you to confirm various actions necessary to upgrade the packages.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the installation. You can go to another window and copy the files you want to save to an alternate location.

▼ To Add the Packages

1. **Use the `cd`(1) command to change to the directory where the software package release files reside.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 33. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.
   - If you obtained the release files from a CD-ROM, use one of the following commands:
     - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

2. **Use the** `pkgadd`**(1M) command to upgrade the** `SUNWsamfsr` **and** `SUNWsamfsu` **packages.**

   For example:

```
# pkgadd -d . SUNWsamfsr SUNWsamfsu
```

3. **Enter** `yes` **or** `y` **as the answer to each of the questions.**

   When you install `SUNWsamfsr` and `SUNWsamfsu`, the system asks you if you want to define an administrator group. Select `y` to accept the default (no administrator group), or select `n` if you want to define an administrator group. You can use the `set_admin`(1M) command to reset permissions on certain commands later. For more information, see the `set_admin`(1M) man page.

4. **(Optional) Use the** `pkgadd`**(1M) command to add one or more localized packages.**

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. CODE EXAMPLE 5-3 shows the commands to use to install the localized packages.

CODE EXAMPLE 5-3 Using the `pkgadd`(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcsamf
# pkgadd -d SUNWfsamf
# pkgadd -d SUNWjsamf
```

5. **Examine** `/tmp/SAM_install.log` **.**

   File `/tmp/SAM_install.log` is the Sun StorEdge SAM-FS log file.

   This file should show that the `pkgadd`(1M) command added the `SUNWsamfsr` and `SUNWsamfsu` software packages. Make sure that it also installed Sun StorEdge SAM-FS `samst` driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

Note – The tools package, `SUNWsamtp`, is available separately. Contact your Sun sales representative for information about obtaining the 4.2 version of the `SUNWsamtp` package.

Restoring File Changes (`inquiry.conf` and `samst.conf`)

Sun Microsystems does not guarantee correct operation with peripherals other than those included in the `/opt/SUNWsamfs/examples/inquiry.conf` file supplied with the release. The installation script compares this file with an existing one, if any, in `/etc/opt/SUNWsamfs`. CODE EXAMPLE 5-4 shows the warning message issued if these files differ.

CODE EXAMPLE 5-4 Warning Message for Differing `inquiry.conf` Files

```
inquiry.conf has been updated.
/opt/SUNWsamfs/examples/inquiry.conf is the latest version;
please add your changes and copy this file to
/etc/opt/SUNWsamfs/inquiry.conf
```

If you have modified `/kernel/drv/samst.conf`, you need to merge any changes to it that might be needed for your configuration. The installation script compares this file with an existing one, if any, in `/kernel/drv/samst.conf`. The exact error message issued if the files differ depends on your Sun Solaris OS level. CODE EXAMPLE 5-5 shows the beginning of the warning message issued if these files differ.

CODE EXAMPLE 5-5 Warning Messages for Differing `samst.conf` Files

```
samst.conf has been updated.
/opt/SUNWsamfs/examples/samst.conf is the latest version;
please add your changes and copy it to /kernel/drv/samst.conf
```

Updating the License Keys

A license key is required to run the Sun StorEdge SAM-FS software. For information about license keys, see "Obtaining a Software License Key" on page 31.

The Sun StorEdge SAM-FS software uses encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

▼ (Optional) To License the Sun StorEdge SAM-FS Software

You do not need to perform this procedure if you are upgrading from a Sun StorEdge SAM-FS 4.0 or 4.1 release unless you are also added to or changing the equipment in your enviroment that would change your license. If you are not adding equipment, the system copies your 4.0 license to the correct location when the upgrade is complete.

1. **Verify whether the license file exists.**

   The license file is as follows:

   `/etc/opt/SUNWsamfs/LICENSE.4.2`

2. **If the `/etc/opt/SUNWsamfs/LICENSE.4.2` file does not exist, create it.**

3. **Starting in column one, place the license key you have obtained from your ASP or from Sun Microsystems on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.**

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

(Optional) Enabling the SAM-QFS Manager

Perform this task if you want to be able to use the SAM-QFS Manager.

The SAM-QFS Manager is an online interface to Sun StorEdge SAM-FS that enables you to configure many of the components in a Sun StorEdge SAM-FS environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information about enabling the SAM-QFS Manager, see "(Optional) Enabling the SAM-QFS Manager" on page 183.

Verifying the License, `mcf`, `archiver.cmd`, and `stager.cmd` Files

The following files exist on your Sun StorEdge SAM-FS server:

- `/etc/opt/SUNWsamfs/LICENSE.4.2`
- `/etc/opt/SUNWsamfs/mcf`

The following additional files can also exist on your Sun StorEdge SAM-FS server:

- `/etc/opt/SUNWsamfs/archiver.cmd`
- `/etc/opt/SUNWsamfs/stager.cmd`

The procedures in this task show you how to verify the correctness of these files.

▼ To Verify the License File

1. **Use the `samd`(1M) `config` command to initialize the Sun StorEdge SAM-FS environment.**

   For example:

```
# samd config
```

2. **Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.**

   The `samcmd`(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in CODE EXAMPLE 5-6, return to "Updating the License Keys" on page 297.

CODE EXAMPLE 5-6 Using `samcmd`(1M)

```
# samcmd l

License information samcmd     4.2       Fri Aug 27 16:24:12 2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled
```

CODE EXAMPLE 5-6 Using `samcmd`(1M) *(Continued)*

```
Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled

Shared filesystem support enabled

SAN API support enabled

Robot type ATL 2640, P1000, or Sun L1000 Library is present and
licensed

    0 tp slots not licensed

    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

▼ To Verify the mcf File

- **Enter the sam-fsd(1M) command to verify the mcf file.**

  If your mcf file is free from syntax errors, the sam-fsd(1M) output includes information about the file systems, archiving, and other system information. If your mcf file contains syntax or other errors, however, the output is similar to that shown in CODE EXAMPLE 5-7.

CODE EXAMPLE 5-7 Example sam-fsd(1M) Output

```
# sam-fsd
13: /dev/dsk/c1t1d0s0   10      md      samfs1  on
/dev/rdsk/c1t1d0s0
 *** Error in line 13: Equipment name '/dev/dsk/c1t1d0s0' already
in use by eq 10
72: /dev/rmt/3cbn       45      ug      l1000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn' already in
use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your mcf file has errors, refer to "Defining the Sun StorEdge SAM-FS Configuration By Creating the mcf File" on page 191 and to the mcf(4) man page for information about how to create this file correctly.

Note – If you change the mcf file after the Sun StorEdge SAM-FS file system is in use, you must convey the new mcf specifications to the Sun StorEdge SAM-FS software. For information about propagating mcf file changes to the system, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

▼ (Optional) To Verify the archiver.cmd File

Perform this step if you have an archiver.cmd file. If you do not have an archiver.cmd file, and you are using the archiver's defaults, you do not need to perform this step.

- **(Optional) Enter the `archiver`(1M) `-lv` (lowercase L) command to verify the `archiver.cmd` file.**

  The command is as follows:

```
# archiver -lv
```

  The output from this command can be quite lengthly. Examine it and verify that the archiving directives are as expected. If you have questions, see "(Optional) Creating the `archiver.cmd` File" on page 236 and see the `archiver.cmd`(4) man page.

(Optional) Modifying the `/etc/vfstab` File

Perform this task if you modified the `/etc/vfstab` file in "Unmounting the File System" on page 290.

▼ To Modify the `/etc/vfstab` File

- **Edit this file again, and change the Mount at Boot field for all Sun StorEdge SAM-FS file systems from `no` to `yes` or `delay`.**

(Optional) Reinitializing and Restoring the File Systems

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "(Optional) Backing Up Existing File Systems" on page 285. To accomplish this, use the `sammkfs`(1M) and `samfsrestore`(1M) commands on each file system.

Note – The Sun StorEdge SAM-FS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The Sun StorEdge SAM-FS 4.2 file system allows file systems to be initialized only with the version 2 superblock. If you are upgrading from 4.0 using version 1 superblocks, be aware that using a 4.2 `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock.

▼ To Reinitialize and Restore the File Systems

1. **Use the `samfsinfo`(1M) command to retrieve information about the file system.**

   You can examine the output from the `samfsinfo`(1M) command to determine the DAU size specified on the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. Use this DAU size again when you perform Step 2.

2. **Use the `sammkfs`(1M) command to initialize a new Sun StorEdge SAM-FS file system.**

   The following example `sammkfs`(1M) command reinitializes a file system named `samfs1` with Sun StorEdge SAM-FS 4.2 feature capabilities.

```
# sammkfs samfs1
```

   For more information about the options to the `sammkfs`(1M) command, see the `sammkfs`(1M) man page.

3. **Use the `samfsrestore`(1M) command to restore the dumped data into the new file system.**

   CODE EXAMPLE 5-8 assumes that you have a file system named `samfs1` (mounted at `/samfs1`) that you want to back up from files dumped to `samfs1.bak`, which exists outside of the Sun StorEdge SAM-FS file system.

CODE EXAMPLE 5-8 Using `samfsrestore`(1M)

```
# cd /samfs1
# samfsrestore -f /save/samfs/samfs1.bak
```

(Optional) Checking the File System

If you did not perform "(Optional) Reinitializing and Restoring the File Systems" on page 304, you are encouraged to complete this task.

- **Use the `samfsck`(1M) command to check your existing file systems for inconsistancies.**

  Do this for each Sun StorEdge SAM-FS file system.

Mounting the File Systems

Use the `mount`(1M) command to mount your Sun StorEdge QFS file system.

▼ To Mount the File System

- **Use the `mount`(1M) command to mount the file systems.**

  In the following example, `samfs1` is the name of the file system to be mounted:

```
# mount samfs1
```

(Optional) Recompiling API-Dependent Applications

If you are running applications that use the Sun StorEdge SAM-FS application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

Caution – Failure to recompile API-dependent applications at this point can cause your applications to generate unexpected results.

APPENDIX **A**

SAM-QFS Manager Software Notes

This appendix section contains additional information on using the SAM-QFS Manager. It includes the following topics:

Creating Additional Administrator and User Accounts

You can create additional administrator and guest accounts at any time after the initial SAM-QFS Manager configuration. These guest accounts are local to the management station.

Aftering installing the SAM-QFS Manager, SAM-QFS Manager creates the following two Solaris operating system (OS) login accounts and the following role:

- Accounts: `samadmin`, `samuser`
- Role: `SAMadmin`

The user account `samadmin` is assigned the `SAMadmin` role. This user has administrator privileges (read and write) for managing the SAM-QFS Manager, the Sun StorEdge QFS software, and the Sun StorEdge SAM-FS software.

The user account `samuser` is assigned only `Guest` privileges. This user has read-only access to Sun StorEdge QFS and Sun StorEdge SAM-FS operations.

If you remove the SAM-QFS Manager software, the system removes both the `samadmin` and `samuser` Solaris accounts and the `SAMadmin` role. However, the removal scripts do not remove any additional accounts that you create manually. It is your responsibility to use one or both of the following procedures to administer any accounts you add manually.

▼ To Create Additional Administrator Accounts

An administrator account holder has administrator priviledges (read and write) for managing the SAM-QFS Manager, the Sun StorEdge QFS software, and the Sun StorEdge SAM-FS software.

1. **Log in to the management station.**
2. **Type** `useradd` *username*.
3. **Type** `passwd` *username*.
4. **Type the password as instructed on the screen.**
5. **Type** `usermod -R SAMadmin` *username*.

Note – Do not use `root` as the *username*.

▼ To Create Additional Guest Accounts

A guest account holder has read-only access to Sun StorEdge QFS and Sun StorEdge SAM-FS operations.

1. **Log in to the management station.**
2. **Type** `useradd` *account_name*.
3. **Type** `passwd` *account_name*.
4. **Type the password as instructed on the screen.**

Removing the SAM-QFS Manager Software

The following procedure explains how to remove the SAM-QFS Manager software from a Sun StorEdge QFS or Sun StorEdge SAM-FS server.

▼ To Remove the SAM-QFS Manager Software From the Sun StorEdge QFS or Sun StorEdge SAM-FS Server

1. **Log in to the server upon which the SAM-QFS Manager software is installed.**

   This is the host upon which you ran the `samqfsmgr_setup` script at installation time.

2. **Become superuser.**

3. **Remove the SAM-QFS Manager software.**

   To remove all the applications that are installed with the SAM-QFS Manager software, type the following command:

```
# /var/sadm/samqfsui/samqfsmgr_uninstall
```

   This script asks you to confirm removal of the TomCat Web Server, JRE packages, and information pertaining to administrator and user accounts.

Messages

This section shows some of the messages you might see when using the SAM-QFS Manager software.

Message:

```
An unrecoverable error occurred during the page display.
If the problem persists, please restart the web server.
```

Click the HOME button to return to the Server Selection page, which is the default page of the SAM-QFS Manager application.

If the system cannot display the Server Selection page, enter the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message:

```
HTTP 500 Internal server error
```

Run the following command to restart the web server:

```
# /usr/sbin/smcwebserver restart
```

Message:

```
The page cannot be displayed.
```

Run the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message:

```
Starting Sun(TM) Web Console Version 2.0.2.
Startup failed. See /var/log/webconsole/console_debug_log for
detailed error information.
```

Examine the contents of the following file:

```
/var/log/webconsole/console_debug_log
```

If the log says the port(6789) is in use by some other process, type commands shown in CODE EXAMPLE A-1.

CODE EXAMPLE A-1 Restarting the Web Console

```
# pkill -9 noaccess
# /usr/sbin/smcwebserver restart
```

Message:

```
Failed to create the filesystem
mount_samfs: fopen(mnttab) error: : Too many open files
```

The system generates this message if you are trying to create a file system with a large number of LUNs. To remedy this problem, use the following procedure:

1. **Use the `ps`(1) and `grep`(1) commands to find the process ID for the `sam-mgmtrpcd` process.**

   For example:

   ```
   # ps -ef | grep sam-mgmtrpcd
   ```

2. **Use the `plimit`(1) command to increase the descriptors for the process.**

   For example:

   ```
   # plimit -n 512 process-id
   ```

   For *process-id*, specify the process number.

3. **Create the file system.**

Log and Trace Files

The SAM-QFS Manager software enables logging after it is installed, but if you want tracing, you have to enable it manually. You do not need to create or modify any logging files for the SAM-QFS Manager software, but if you want to enable tracing for SAM-QFS Manager, use the instructions in "Tracing" on page 315.

Log rotation is not supported for log or trace files.

TABLE A-1 lists the files that the SAM-QFS Manager uses for logging and tracing.

TABLE A-1 SAM-QFS Manager Log and Trace Files

Activity	File Location	Created by the User?
SAM-QFS Manager Logging	`/var/log/webconsole/samqfsui.log`	No
TomCat Web Console Logging	`/var/log/webconsole/console_debug_log`	No
Tracing for SAM-QFS Manager and native code	`/var/log/webconsole/samqfsui.trace_syslog`	Yes
Stack trace file	`/var/log/webconsole/localhost_log.`*yyyy-mm-dd*`.txt`	No

The following sections describe the log and trace files.

SAM-QFS Manager Logging

The SAM-QFS Manager software creates the `samqfsui.log` log file when the application starts. It records information about operations that the user performs, and whether those operations were successful. Do not delete or modify this file. If you delete or modify this file, logging stops. When the webserver restarts, it erases the contents of this file and creates a new `samqfsui.log` file.

The SAM-QFS Manager software uses an additional file, `/var/webconsole/samqfsui.log.lck`, to ensure that only one process at a time writes to the log file. Do not delete or modify this lock file.

Web Server Logging

The Sun Common Console Framework creates the `/var/webconsole/console_debug_log` file. It includes console-specific information such as environment variable setting that the console uses and a record of users logged in to the console.

If this file becomes too large, you can delete this file. The system creates another instance of this file the next time the web server restarts.

Tracing

The SAM-QFS Manager trace file records the following information:

- Messages regarding whether operations were successful.
- Functions invoked with the application stack. This can be verbose.
- Messages that are important to developers for debugging purposes.

Tracing is not enabled by default.

▼ To Enable Tracing for SAM-QFS Manager and Native Code

The syslog daemon performs detailed tracing for SAM-QFS Manager and for native code. Use the following procedure to enable detailed tracing for SAM-QFS Manager and for native code.

1. **Use the `touch`(1) command to create the trace file.**

   For example:

```
# touch /var/log/webconsole/samqfsui.trace_syslog
```

2. **Use `vi`(1) or another editor to add the following line to the `/etc/syslog.conf` file:**

```
local6.debug    /var/log/webconsole/samqfsui.trace_syslog
```

   Use a tab character to separate the two fields in this line.

3. **Type the following command:**

```
# pkill -HUP syslogd
```

4. **(Optional) Enable log file rotation.**

   Log files can become very large. Use `logadm`(1M) to manage the log file for SAM-QFS Manager.

Note – You cannot use the `log_rotate.sh`(1M) script to manage the SAM-QFS Manager log file.

▼ To Enable Tracing or To Adjust the Tracing Level

Use the the following command to enable tracing or to adjust the tracing level:

```
# /opt/SUNWsamqfsui/bin/samadm trace trace_level
```

For *trace_level*, specify one of the values shown in TABLE A-2.

TABLE A-2 Arguments for *trace_level*

trace_level	**Tracing Requested**
`off`	Disables tracing.
`1`	Enables tracing for very important messages only. This includes severe errors that occur within the application.
`2`	Enables tracing for moderately important messages. This includes level 1 messages as well as debugging statements within the application that are useful for developers.
`3`	Enables tracing for all messages. This includes level 1 and level 2 messages as well as entry and exit points of functions within the application on the stack.

You can enable and disable tracing dynamically during run time by using the `samadm`(1M) command.

SAM-QFS Manager Daemon Information

The following procedure can help you obtain troubleshooting information for the RPC daemon, `sam-mgmtrpcd`(1M).

▼ To Determine Whether the RPC Daemon Is Running

Perform the following procedure to verify whether or not the RPC daemon is running and to obtain status information.

1. **Log in to the Sun StorEdge QFS or Sun StorEdge SAM-FS server.**
2. **Become superuser.**

3. **Display status information for the SAM-QFS Manager daemon (`sam-mgmtrpcd`).**

   Enter the following command to display the daemon:

```
# /opt/SUNWsamfs/sbin/samadm status
```

   If the daemon is not running, it does not display its status. Enter the following command to start the daemon:

```
# /opt/SUNWsamfs/sbin/samadm config -a
```

   The preceding command starts the daemon and enables it to automatically restart if it dies.

APPENDIX B

Release Package Contents and Directories Created

This chapter describes the content of the release packages and shows the directories and files that the software creates when it is installed. Specifically, it contains the following topics:

Release Package Contents

The Sun StorEdge QFS and the Sun StorEdge SAM-FS software packages are in Sun Solaris `pkgadd`(1M) format. These packages reflect the Sun Solaris version for the platform upon which you will be installing the Sun StorEdge QFS or the Sun StorEdge SAM-FS software.

TABLE B-1 shows the release packages.

TABLE B-1 Release Packages

Installed Package	Description
`SUNWqfsr`, `SUNWqfsu`	Sun StorEdge QFS software packages
`SUNWcqfs`	Chinese localized package for Sun StorEdge QFS software
`SUNWjqfs`	Japanese localized package for Sun StorEdge QFS software
`SUNWfqfs`	French localized package for Sun StorEdge QFS software
`SUNWsamfsr`, `SUNWsamfsu`	Sun StorEdge SAM-FS software packages

TABLE B-1 Release Packages *(Continued)*

Installed Package	Description
`SUNWcsamf`	Chinese localized package for Sun StorEdge SAM-FS software
`SUNWjsamf`	Japanese localized package for Sun StorEdge SAM-FS software
`SUNWfsamf`	French localized package for Sun StorEdge SAM-FS software
`SUNWsamqfsuir`, `SUNWsamqfsuiu`	SAM-QFS Manager software packages
`SUNWcsamqfsui`	Chinese localized package for SAM-QFS Manager software
`SUNWjsamqfsui`	Japanese localized package for SAM-QFS Manager software
`SUNWfsamqfsui`	French localized package for SAM-QFS Manager software

The releases are identified using characters arranged in the following format:

major . *minor* . *patch*

TABLE B-2 explains the release numbering scheme.

TABLE B-2 Release Numbering

Release Level Component	Meaning
major	The release level of a major release.
minor	The release level of a minor feature release.
patch	The patch number. A number between 1 and 99 indicates a patch release. A letter from A through Z indicates prerelease software. The base release of a first feature release of a major release might not contain a patch level.

Examples:

- 4.0 is a major release with no minor release revisions and no bug fixes.
- 4.2 is a minor release.
- 4.2.1 is a patch release that contains software fixes for a major or minor release. This number appears in the patch's README file.

Directories and Files Created

This section describes the directories and files associated with the Sun StorEdge QFS and Sun StorEdge SAM-FS products. You can obtain additional information about the files in this section from the man pages after the software is installed.

Directories Created at Installation

TABLE B-3 lists the directories created when the Sun StorEdge QFS and Sun StorEdge SAM-FS software packages are installed.

TABLE B-3 Directories Created

Directory	Content	Used By
/dev/samst	Device driver special files.	Sun StorEdge SAM-FS
/etc/fs/samfs	Commands specific to Sun StorEdge QFS and Sun StorEdge SAM-FS software.	Sun StorEdge QFS Sun StorEdge SAM-FS
/etc/opt/SUNWsamfs	Configuration and license files.	Sun StorEdge QFS Sun StorEdge SAM-FS
/etc/opt/SUNWsamfs/scripts	Site-customizable scripts.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/bin	User command binaries.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/client	Files for RPC API client.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/examples	Various example configuration files.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/include	API include files.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/lib	Relocatable libraries.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/man	man(1) pages.	Sun StorEdge QFS Sun StorEdge SAM-FS
/opt/SUNWsamfs/sbin	System administrator commands and daemon binaries.	Sun StorEdge QFS Sun StorEdge SAM-FS

TABLE B-3 Directories Created *(Continued)*

Directory	Content	Used By
`/opt/SUNWsamfs/sc`	Sun Cluster binaries and configuration files.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/opt/SUNWsamfs/doc`	Documentation repository for any informational files included in the release. The README file, which summarizes the installed release's features, is included in this directory.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/opt/SUNWsamqfsui/bin`	SAM-QFS Manager administrator commands.	SAM-QFS Manager
`/opt/SUNWsamqfsui/doc`	SAM-QFS Manager online documentation repository.	SAM-QFS Manager
`/opt/SUNWsamfs/mibs`	Standard MIB files and product MIB (`SUN-SAM-MIB.mib`).	Sun StorEdge QFS Sun StorEdge SAM-FS
`/var/opt/SUNWsamfs`	Device catalogs; catalog trace file; log files; archiver data directory and queue files.	Sun StorEdge SAM-FS

Files Created at Installation

TABLE B-4 and TABLE B-5 list the files created when the Sun StorEdge QFS or Sun StorEdge SAM-FS software is installed.

TABLE B-4 Files Created - Miscellaneous

File	Description	Used By
`/etc/opt/SUNWsamfs/inquiry.conf`		
	Vendor and product identification strings for recognized SCSI devices.	Sun StorEdge SAM-FS
`/etc/sysevent/config/SUNW,SUNWsamfs,sysevent.conf`		
	Solaris system event handler configuration file.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/kernel/drv/samst`	Driver for SCSI media changers, optical drives, and non-motion I/O for tape drives.	Sun StorEdge SAM-FS
`/kernel/drv/samst.conf`	Configuration file for the `samst` driver.	Sun StorEdge SAM-FS
`/kernel/drv/samioc`	Sun Solaris 32-bit file system interface module.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/kernel/drv/samioc.conf`	Configuration file for `samioc` module.	Sun StorEdge QFS Sun StorEdge SAM-FS

TABLE B-4 Files Created - Miscellaneous *(Continued)*

File	Description	Used By
`/kernel/drv/sparc9/samioc`	Sun Solaris 32- and 64-bit file system interface module.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/kernel/fs/samfs`	Sun Solaris 32-bit file system module.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/kernel/fs/sparcv9/samfs`	Sun Solaris 64-bit file system module.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/opt/SUNWsamfs/sc/etc/SUNW.qfs`		
	Sun Cluster configuration file. This is a link. Created only in the presence of Sun Cluster software.	Sun StorEdge QFS
`/usr/cluster/lib/rgm/rtreg/SUNW.qfs`		
	Sun Cluster configuration file. Created only in the presence of Sun Cluster software.	Sun StorEdge QFS
`/var/log/webconsole/host.conf`		
	SAM-QFS Manager configuration file.	SAM-QFS Manager
`/var/opt/SUNWsamfs/faults`	Faults history file.	Sun StorEdge QFS,Sun StorEdge SAM-FS
`/var/sadm/samqfsui/samqfsmgr_uninstall`		
	Software for removing SAM-QFS Manager and its supporting applications.	SAM-QFS Manager

The Sun StorEdge QFS and Sun StorEdge SAM-FS file systems have dynamically loadable components that are stored in the Sun Solaris `/kernel` directory (see TABLE B-4). You can determine the modules that are loaded by using the `modinfo`(1M) command. Typically, the kernel loads the file system module at boot time. Alternatively, you can load the file system module when the file system is first mounted after the Sun software is installed.

After the Sun StorEdge QFS or Sun StorEdge SAM-FS software is installed, it creates files that it uses for fault notification. TABLE B-5 lists these files. When the software detects faults serious enough to merit user attention, the software uses these trap and log files to convey fault information through the SAM-QFS Manager software.

TABLE B-5 Files Created - Fault Notification

File	Description	Used By
`/etc/opt/SUNWsamfs/scripts/sendtrap`	Sends trap information.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/opt/SUNWsamfs/sbin/tapealert_trap`	Sends `tapealert`(1M) traps.	Sun StorEdge SAM-FS
`/opt/SUNWsamfs/sbin/tapealert_log`	Records `tapealert`(1M) faults.	Sun StorEdge SAM-FS
`/opt/SUNWsamfs/sbin/fault_log`	Records faults.	Sun StorEdge QFS Sun StorEdge SAM-FS

The software creates the files listed in TABLE B-5 with `-rwxr-x---` permissions. Do not change these file permissions. If execute permissions are lost, for example, the system writes messages such as the following to `/var/adm/messages`:

```
SUNW,SUNWsamfs,sysevent.conf, line1: no execute access to
/opt/SUNWsamfs/sbin/tapealert_trap - No such file or directory.
```

Site Files

The configuration procedures in this manual direct you to create several files. The Sun StorEdge QFS and Sun StorEdge SAM-FS software uses these site files.

Note – Your site's configuration files must contain ASCII characters only.

TABLE B-6 and TABLE B-7 list the site files you create. Some of the files in these lists are optional, depending on your configuration, and others are required.

TABLE B-6 shows the required site files. These are files that you must create at your site in order to use the Sun StorEdge QFS and Sun StorEdge SAM-FS software.

TABLE B-6 Required Site Files

File	Description	Used By
`/etc/opt/SUNWsamfs/LICENSE.4.2`	License file. For more information, see the licensing information pertinent to your installation in "Obtaining a Software License Key" on page 31. This is a required file.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/etc/opt/SUNWsamfs/mcf`	Master configuration file. For more information, see the `mcf`(4) man page. This is a required file.	Sun StorEdge QFS Sun StorEdge SAM-FS

TABLE B-7 shows the optional site files. This is a partial list of the files that you might or might not create depending on the software packages you install and the features you use.

TABLE B-7 Optional Site Files

File	Description	Used By
`/etc/opt/SUNWsamfs/archiver.cmd`	Archiver command file. For more information, see the `archiver.cmd`(4) man page or see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.	Sun StorEdge SAM-FS
`/etc/opt/SUNWsamfs/samfs.cmd`	File system mount parameter command file. For more information, see the `samfs.cmd`(4) man page or see the *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.	Sun StorEdge QFS Sun StorEdge SAM-FS
`/etc/opt/SUNWsamfs/recycler.cmd`	Recycler command file. For more information, see the `recycler.cmd`(4) man page or see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.	Sun StorEdge SAM-FS

TABLE B-7 Optional Site Files *(Continued)*

File	Description	Used By
`/etc/opt/SUNWsamfs/releaser.cmd`	Releaser command file. For more information, see the `releaser.cmd`(4) man page or see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.	Sun StorEdge SAM-FS
`/etc/opt/SUNWsamfs/preview.cmd`	Previewer command file. For more information, see the `preview.cmd`(4) man page or see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.	Sun StorEdge SAM-FS
`/etc/opt/SUNWsamfs/defaults.conf`	Miscellaneous default values. For more information, see the `defaults.conf`(4) man page.	Sun StorEdge QFS Sun StorEdge SAM-FS

Modified System Files

During installation, Sun StorEdge QFS and Sun StorEdge SAM-FS software adds information to certain Sun Solaris system files. These system files are ASCII text files. Sun Solaris uses these files to identify loadable kernel modules by number rather than by name.

The Sun StorEdge QFS and Sun StorEdge SAM-FS software adds information to the following files:

- `/etc/name_to_major`. This file maps drivers to major numbers. The Sun StorEdge SAM-FS software uses this file. The `samst` and `samrd` major numbers can vary depending on the major numbers in use by the Sun Solaris software. The system adds the lines shown in CODE EXAMPLE B-1.

CODE EXAMPLE B-1 Lines Added to `/etc/name_to_major`

```
samst 63
samrd 64
```

- `/etc/security/auth_attr`. This file is the authorization description database, and it is used by both Sun StorEdge QFS and Sun StorEdge SAM-FS software. The system adds the lines shown in CODE EXAMPLE B-2.

CODE EXAMPLE B-2 Lines Added to `/etc/security/auth_attr`

```
com.sun.netstorage.samqfs.web.read:::SAM-FS Read Access::
com.sun.netstorage.samqfs.web.write:::SAM-FS Write Access::
com.sun.netstorage.samqfs.web.*:::SAM-FS All Access::
```

- `/etc/user_attr`. This file is the extended user attributes database. The SAM-QFS Manager uses this file. The system adds the lines shown in CODE EXAMPLE B-3.

CODE EXAMPLE B-3 Lines Added to `/etc/user_attr`

```
SAMadmin::::type=role;auths=com.sun.netstorage.samqfs.web.*
samadmin::::type=normal;roles=SAMadmin
```

APPENDIX C

Command Reference

The Sun StorEdge QFS and Sun StorEdge SAM-FS environments consist of a file system, daemons, processes, various types of commands (user, administrator, and so on), and tools. This appendix describes the commands that are included in the Sun StorEdge QFS and Sun StorEdge SAM-FS software distributions.

The Sun StorEdge QFS and Sun StorEdge SAM-FS commands operate in conjunction with the standard UNIX file system commands. Some commands are specific to only one product. All the commands are documented in UNIX `man`(1) pages.

The *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide* contains overview information for the daemons, but individual daemons are described throughout the documentation set where appropriate.

This appendix introduces the commands and indicates which commands you can use with the Sun StorEdge QFS or Sun StorEdge SAM-FS software. See the man pages that are included in the software distribution for more information.

This appendix contains the following topics:

User Commands

By default, file system operations are transparent to the end user. Depending on your site practices, however, you might want to make some commands available to users at your site to fine-tune certain operations. TABLE C-1 summarizes these commands.

TABLE C-1 User Commands

Command	Description	Used By
`archive`(1)	Archives files and sets archive attributes on files.	Sun StorEdge SAM-FS
`release`(1)	Releases disk space and sets release attributes on files.	Sun StorEdge SAM-FS
`request`(1)	Creates a removable media file.	Sun StorEdge SAM-FS
`sdu`(1)	Summarizes disk usage. The `sdu`(1) command is based on the GNU version of the `du`(1) command.	Sun StorEdge QFS Sun StorEdge SAM-FS
`segment`(1)	Sets segmented file attributes.	Sun StorEdge SAM-FS
`setfa`(1)	Sets file attributes.	Sun StorEdge QFS Sun StorEdge SAM-FS
`sfind`(1)	Searches for files in a directory hierarchy. The `sfind`(1) command is based on the GNU version of the `find`(1) command and contains options for searching based on Sun StorEdge QFS and Sun StorEdge SAM-FS file attributes.	Sun StorEdge QFS Sun StorEdge SAM-FS
`sls`(1)	Lists contents of directories. The `sls`(1) command is based on the GNU version of the `ls`(1) command and contains options for displaying file system attributes and information.	Sun StorEdge QFS Sun StorEdge SAM-FS
`squota`(1)	Reports quota information.	Sun StorEdge QFS Sun StorEdge SAM-FS
`ssum`(1)	Sets the checksum attributes on files.	Sun StorEdge SAM-FS
`stage`(1)	Sets stage attributes on files and copies offline files to disk.	Sun StorEdge SAM-FS

General System Administrator Commands

TABLE C-2 summarizes the commands that you can use to maintain and manage the system.

TABLE C-2 General System Administrator Commands

Command	Description	Used By
samadm(1M)	Starts or stops the sam-mgmtrpcd daemon.	Sun StorEdge QFS Sun StorEdge SAM-FS SAM-QFS Manager
samcmd(1M)	Executes one samu(1M) operator interface utility command.	Sun StorEdge QFS Sun StorEdge SAM-FS
samd(1M)	Starts or stops robotic and removable media daemons.	Sun StorEdge SAM-FS
samexplorer(1M)	Generates a Sun StorEdge QFS or Sun StorEdge SAM-FS diagnostic report script.	Sun StorEdge QFS Sun StorEdge SAM-FS
samqfsmgr_setup(1M)	Installs, removes, and upgrades the SAM-QFS Manager software	SAM-QFS Manager
samset(1M)	Changes Sun StorEdge SAM-FS settings.	Sun StorEdge SAM-FS
samu(1M)	Invokes the full-screen, text-based operator interface. This interface is based on the curses(3CURSES) software library. The samu utility displays the status of devices and allows the operator to control automated libraries.	Sun StorEdge QFS Sun StorEdge SAM-FS

File System Commands

TABLE C-3 summarizes the commands that you can use to maintain the file system.

TABLE C-3 File System Commands

Commands	Description	Used By
`mount`(1M)	Mounts a file system. The man page name for this command is `mount_samfs`(1M).	Sun StorEdge QFS Sun StorEdge SAM-FS
`qfsdump`(1M) `qfsrestore`(1M)	Creates or restores a dump file containing the file data and metadata associated with a Sun StorEdge QFS file system.	Sun StorEdge QFS
`sambcheck`(1M)	Lists block usage for a file system.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samchaid`(1M)	Changes file admin set ID attribute. For use with quotas.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samfsck`(1M)	Checks and repairs metadata inconsistencies in a file system and reclaims allocated, but unused, disk space.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samfsconfig`(1M)	Displays configuration information.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samfsdump`(1M) `samfsrestore`(1M)	Creates or restores a dump file of the metadata associated with a Sun StorEdge SAM-FS file system.	Sun StorEdge SAM-FS Sun SAM-QFS
`samfsinfo`(1M)	Displays information about the layout of a Sun StorEdge QFS or Sun StorEdge SAM-FS file system.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samfstyp`(1M)	Determines the Sun StorEdge QFS or Sun StorEdge SAM-FS file system type.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samgrowfs`(1M)	Expands a file system by adding disk devices.	Sun StorEdge QFS Sun StorEdge SAM-FS
`sammkfs`(1M)	Initializes a new file system from disk devices.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samncheck`(1M)	Returns a full directory path name given the mount point and inode number.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samquota`(1M)	Reports, sets, or resets quota information.	Sun StorEdge QFS Sun StorEdge SAM-FS
`samquotastat`(1M)	Reports on active and inactive file system quotas.	Sun StorEdge QFS Sun StorEdge SAM-FS

TABLE C-3 File System Commands *(Continued)*

Commands	Description	Used By
samsharefs(1M)	Manipulates the Sun StorEdge QFS shared file system configuration information.	Sun StorEdge QFS
samtrace(1M)	Dumps the trace buffer.	Sun StorEdge QFS Sun StorEdge SAM-FS
samunhold(1M)	Releases SANergy file holds.	Sun StorEdge QFS Sun StorEdge SAM-FS
trace_rotate(1M)	Rotates trace files.	Sun StorEdge QFS Sun StorEdge SAM-FS

Automated Library Commands

TABLE C-4 summarizes the automated library commands that you can use to configure, initialize, and maintain the automated libraries and devices within the Sun StorEdge SAM-FS environment.

TABLE C-4 Automated Library Commands

Command	Description
auditslot(1M)	Audits a single media cartridge slot within a specified automated library.
build_cat(1M)	Builds a media catalog file for an automated library. Optionally, can also populate the catalog file.
chmed(1M)	Sets or clears library catalog flags and values on a specific cartridge.
cleandrive(1M)	Requests that a tape drive be loaded with a cleaning tape.
dump_cat(1M)	Displays the content of a binary catalog file in various ASCII formats.
import(1M) samexport(1M)	Imports or exports cartridges from a library by placing it in the mailbox. For network-attached libraries, this command updates the library catalog, but it does not physically move cartridges.
samload(1M) unload(1M)	Loads or unloads a cartridge for a specified device.
move(1M)	Moves a cartridge from one slot to another.

TABLE C-4 Automated Library Commands *(Continued)*

Command	Description
odlabel(1M)	Labels optical disks for use with the Sun StorEdge SAM-FS system.
samdev(1M)	Adds /dev/samst logical device entries. Used to communicate automated library, optical disk, and tape drive information.
tplabel(1M)	Labels tapes for use with the Sun StorEdge SAM-FS system.

Archiver Commands

TABLE C-5 summarizes the commands that control the archiver's actions within the Sun StorEdge SAM-FS environment.

TABLE C-5 Archiver Commands

Command	Description
archiver(1M)	Evaluates the archiver commands file for syntax completeness and semantic accuracy.
archiver.sh(1M)	Logs exceptional archiver events.
showqueue(1M)	Displays the content of an archiver queue file.
reserve(1M) unreserve(1M)	Reserves and unreserves volumes.

Specialized Maintenance Commands

TABLE C-6 summarizes the various maintenance commands you can use in a Sun StorEdge SAM-FS environment.

TABLE C-6 Specialized Maintenance Commands

Command	Description
archive_audit(1M)	Generates a report of all archived files on each cartridge.
dmpshm(1M)	Dumps the shared memory segments.
exarchive(1M)	Manipulates (exchanges) archive copies.
itemize(1M)	Catalogs an optical disk.
rearch(1M) unrearch(1M)	Marks or unmarks archive entries to be rearchived.

TABLE C-6 Specialized Maintenance Commands *(Continued)*

Command	Description
sam-recycler(1M)	Reclaims space used by expired archive copies from archive media.
sam-releaser(1M)	Releases disk space from online disk cache file systems.
samdev(1M)	Creates symbolic links in the /dev/samst directory that point to the actual devices to be used by the Sun StorEdge SAM-FS file system. This command is similar in function to the UNIX makedev(1M) command.
samset(1M)	Changes or displays variables used in Sun StorEdge SAM-FS operations.
set_admin(1M)	Adds or removes permission for an administrator group to execute administrator commands.
set_state(1M)	Sets the state of a Sun StorEdge SAM-FS device.
stageback.sh(1M)	Stages files from Sun StorEdge SAM-FS or Sun SAM-QFS archive tapes
star(1M)	Creates tape archives and adds or extracts files. This is a GNU version of the tar(1) command, and it has been extended for use with the Sun StorEdge SAM-FS file system. You can use this command in a disaster recovery situation if you need to read data from archive tapes.
tapealert(1M)	Decodes TapeAlert events.
unarchive(1M)	Deletes archive entries for one or more files.
undamage(1M)	Marks an archive entry for one or more files or directories as undamaged.

Site-Customizable Scripts

TABLE C-7 summarizes the site-customizable scripts that you can use to monitor and control the Sun StorEdge SAM-FS environment. By default, the software installs these scripts in /opt/SUNWsamfs/examples. You can move these scripts from

/opt/SUNWsamfs/examples to /etc/opt/SUNWsamfs/scripts and modify them to perform the desired action for your site. For more information about these scripts, see their respective man pages.

TABLE C-7 Site-Customizable Scripts

Script	Description
dev_down.sh(1M)	Sends email to root when a device is marked down or off.
load_notify.sh(1M)	Notifies the operator when the Sun StorEdge SAM-FS software requests a cartridge that resides outside the library.
log_rotate.sh(1M)	Rotates log files.
recover.sh(1M)	Recovers files archived after the last samfsdump(1M) was taken.
restore.sh(1M)	Restores files to their online or partially online status.
stageback.sh(1M)	Stages files from archive media.
tarback.sh(1M)	Reloads files from archive media.

Application Programming Interface

You can use the application programming interface (API) to make file system requests from within a user application. The requests can be made locally or remotely to the machine on which the file system is running. The API consists of the libsam and libsamrpc libraries. These libraries contain library routines for obtaining file status; for setting archive, release, and stage attributes for a file; and for manipulating the library catalog of an automated library. The sam-rpcd remote procedure call daemon handles remote requests. To automatically start the sam-rpcd daemon, set samrpc=on in the defaults.conf file.

For more information about the API, see the intro_libsam(3) man page. This man page provides overview information for using the library routines in libsam and libsamrpc.

Operational Utilities

Within the Sun StorEdge SAM-FS environment, you can use the `samu`(1M) operator utility and SAM-QFS Manager to perform basic operations. TABLE C-8 summarizes the operational tools.

TABLE C-8 Operational Utilities

GUI Tools	Description
SAM-QFS Manager	Provides a web-based graphical user interface to the Sun StorEdge QFS and Sun StorEdge SAM-FS software. You can use this interface to configure, control, monitor, and reconfigure the components of your Sun StorEdge QFS and Sun StorEdge SAM-FS environment. For information on installing SAM-QFS Manager, see the *Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide*. For information on using the SAM-QFS Manager, see its online help.
`samu`(1M)	Provides the starting point for accessing the `samu`(1M) operator utility.

Glossary

A

addressable storage The storage space encompassing online, nearline, offsite, and offline storage that is user-referenced through a Sun StorEdge QFS or Sun StorEdge SAM-FS file system.

archive media The media to which an archive file is written. Archive media can be removable tape or magneto-optical cartridges in a library. In addition, archive media can be a mount point on another system.

archive storage Copies of file data that have been created on archive media.

archiver The archive program that automatically controls the copying of files to removable cartridges.

audit (full) The process of loading cartridges to verify their VSNs. For magneto-optical cartridges, the capacity and space information is determined and entered into the automated library's catalog.

automated library A robotically controlled device designed to automatically load and unload removable media cartridges without operator intervention. An automated library contains one or more drives and a transport mechanism that moves cartridges to and from the storage slots and the drives.

B

backup storage A snapshot of a collection of files for the purpose of preventing inadvertent loss. A backup includes both the file's attributes and associated data.

block allocation map A bitmap representing each available block of storage on a disk and indicating whether the block is in use or free.

block size See DAU.

C

cartridge A physical entity that contains media for recording data. A tape or optical disk. Sometimes referred to as *a piece of media*, *a volume*, or *the medium*.

catalog A record of the VSNs in an automated library. There is one catalog for each automated library, and at a site, there is one historian for all automated libraries.

client-server The model of interaction in a distributed system in which a program at one site sends a request to a program at another site and awaits a response. The requesting program is called the client. The program satisfying the response is called the server.

connection The path between two protocol modules that provides reliable stream delivery service. A TCP connection extends from a TCP module on one machine to a TCP module on the other.

D

data device For a Sun StorEdge QFS or Sun StorEdge SAM-FS file system, a device or group of devices upon which file data is stored.

DAU (Disk allocation unit) The basic unit of online storage. Also called block size.

In addition, the Sun StorEdge QFS file systems support a fully adjustable DAU, sized from 16 kilobytes through 65,528 kilobytes. The DAU you specify must be a multiple of 8 kilobytes.

The Sun StorEdge SAM-FS file systems support both a small and a large DAU. The small DAU is 4 kilobytes (2^{14} or 4096 bytes). The large DAU is 16, 32, or 64 kilobytes. The available DAU size pairs are 4 and 16; 4 and 32; and 4 and 64.

device logging A configurable feature that provides device-specific error information used to analyze device problems.

device scanner Software within the Sun StorEdge SAM-FS file system that periodically monitors the presence of all manually mounted removable devices and that detects the presence of mounted cartridges that can be requested by a user or other process.

direct access A file attribute (stage never) designating that a nearline file can be accessed directly from the archive media and need not be retrieved to disk cache.

direct-attached library An automated library connected directly to a server using a SCSI interface. A SCSI attached library is controlled directly by the Sun StorEdge SAM-FS software by using the SCSI standard for automated libraries.

direct I/O An attribute used for large block-aligned sequential I/O. The `setfa`(1) command's `-D` option is the direct I/O option. It sets the direct I/O attribute for a file or directory. If applied to a directory, the direct I/O attribute is inherited.

directory A file data structure that points to other files and directories within the file system.

disk allocation unit See DAU.

disk buffer When using Sun SAM-Remote software, the disk buffer is a buffer on the server system that is used when archiving data from the client to the server.

disk cache The disk-resident portion of the Sun StorEdge SAM-FS file system software. It is used to create and manage data files between online disk cache and archive media. Individual disk partitions or an entire disk can be used as disk cache.

disk space thresholds An administrator-defined amount of disk space that is available to a user. This defines the range of desirable disk cache utilization. The high threshold indicates the maximum level of disk cache utilization. The low threshold indicates the minimum level of disk cache utilization. The releaser controls disk cache utilization based on these predefined disk space thresholds.

disk striping The process of recording a file across several disks, thereby improving access performance and increasing overall storage capacity. See also entries for striping.

drive A mechanism for transferring data to and from a removable media volume.

E

Ethernet A local-area, packet-switched network technology. Originally designed for coaxial cable, it is now found running over shielded, twisted-pair cable. Ethernet is a 10- or 100-Mbytes/sec LAN.

extent array The array within a file's inode that defines where each data block assigned to the file is located on the disk.

F

family device set See Family Set.

Family Set A storage device that is represented by a group of independent physical devices, such as a collection of disks or the drives within an automated library. Also see storage Family Set.

FDDI (Fiber distributed data interface) A 100-Mbytes/sec fiber-optic LAN.

fibre channel The ANSI standard that specifies high-speed serial communication between devices. Fibre channel is used as one of the bus architectures in SCSI-3.

fiber-distributed data interface See FDDI.

file system A hierarchical collection of files and directories.

file system specific directives Archiver and releaser directives that follow global directives, are specific to a particular file system, and begin with `fs =`. File system specific directives apply until the next `fs =` directive line or until the end of file is encountered. If multiple directives affect a file system, the file system-specific directives override the global directives.

FTP (File transfer protocol) An internet protocol for transferring files between two hosts over a TCP/IP network.

G

global directives Archiver and releaser directives that apply to all file systems and that appear before the first `fs =` line.

grace period For disk quotas, this is the amount of time that can elapse during which a user is allowed to create files and allocate storage after the user reaches their soft limit.

H

hard limit For disk quotas, a maximum limit on file system resources, blocks and inodes, that users cannot exceed.

I

indirect block A disk block that contains a list of storage blocks. The Sun StorEdge QFS and Sun StorEdge SAM-FS file systems have up to three levels of indirect blocks. A first-level indirect block contains a list of blocks used for data storage. A second-level indirect block contains a list of first-level indirect blocks. A third-level indirect block contains a list of second-level indirect blocks.

inode Index node. A data structure used by the file system to describe a file. An inode describes all the attributes associated with a file other than the name. The attributes include ownership, access, permission, size, and the file location on the disk system.

inode file A special file (`.inodes`) on the file system that contains the inode structures for all files resident in the file system. All Sun StorEdge QFS and Sun StorEdge SAM-FS inodes are 512 bytes long. The inode file is a metadata file, which is separated from file data in the Sun StorEdge QFS file systems.

K

kernel The central controlling program that provides basic system facilities. The UNIX kernel creates and manages processes, provides functions to access the file system, provides general security, and supplies communication facilities.

L

LAN Local area network.

lease In a Sun StorEdge QFS shared file system, a lease grants a client host permission to perform an operation on a file for as long as the lease is valid. The metadata server issues leases to each client host. The leases are renewed as necessary to permit continued file operations.

library See automated library.

library catalog See catalog.

local file system A file system that is installed on one node of a Sun Cluster and is not made highly available to another node. Also a file system that is installed on a standalone server.

LUN Logical unit number.

M

mcf Master configuration file. The file that is read at initialization time that defines the relationships between the devices (the topology) within a Sun StorEdge QFS or Sun StorEdge SAM-FS environment.

media Tape or optical disk cartridges.

media recycling The process of recycling or reusing archive media with low use. Archive media with low use is archive media with few active files.

metadata Data about data. Metadata is the index information needed to locate the exact data position of a file on a disk. It consists of information about files, directories, access control lists, symbolic links, removable media, segmented files, and the indexes of segmented files. Metadata must be protected because if data is lost, the metadata that locates the data must be restored before the lost data can be retrieved.

metadata device A separate device (for example, a solid-state disk or mirrored device) upon which Sun StorEdge QFS file system metadata is stored. Separating the file data from the metadata can increase performance. In the `mcf` file, a metadata device is declared as an `mm` device within an `ma` file system.

mirror writing The process of maintaining two copies of a file on disjointed sets of disks to prevent loss from a single disk failure.

mount point The directory on which a file system is mounted.

multireader file system The Sun StorEdge QFS multireader file system is a single-writer, multireader capability that enables you to specify a file system that can be mounted on multiple hosts. Multiple hosts can read the file system, but only one host can write to the file system. Multiple readers are specified with the `-o reader`

option on the `mount`(1M) command. The single-writer host is specified with the `-o writer` option on the `mount`(1M) command. For more information on the `mount`(1M) command, see the `mount_samfs`(1M) man page.

N

name space The metadata portion of a collection of files that identifies the file, its attributes, and its storage locations.

nearline storage Removable media storage that requires robotic mounting before it can be accessed. Nearline storage is usually less expensive than online storage, but it incurs a somewhat longer access time.

network-attached automated library A library, such as those from StorageTek, ADIC/Grau, IBM, or Sony, that is controlled using a software package supplied by the vendor. The Sun StorEdge SAM-FS file system interfaces with the vendor software using a Sun StorEdge SAM-FS media changer daemon designed specifically for the automated library.

NFS Network file system. A Sun distributed file system that provides transparent access to remote file systems on heterogeneous networks.

NIS The SunOS 4.0 (minimum) Network Information Service. A distributed network database containing key information about the systems and the users on the network. The NIS database is stored on the master server and all the slave servers.

O

offline storage Storage that requires operator intervention for loading.

offsite storage Storage that is remote from the server and is used for disaster recovery.

online storage Storage that is immediately available (for example, disk cache storage).

P

partition A portion of a device or a side of a magneto-optical cartridge.

preallocation The process of reserving a contiguous amount of space on the disk cache for writing a file. This ensures that the space is contiguous. Preallocation can be performed only on zero-sized files. That is, the `setfa -l` command can be specified only for a file that is size zero. For more information, see the `setfa`(1) man page.

prioritizing preview requests Assigning priority to archive and stage requests that cannot be immediately satisfied.

pseudo device A software subsystem or driver with no associated hardware.

Q

quota The amount of system resources that a user is allowed to consume.

R

RAID Redundant array of independent disks. A disk technology that uses several independent disks to reliably store files. It can protect against data loss from a single disk failure, can provide a fault-tolerant disk environment, and can provide higher throughput than individual disks.

recycler A Sun StorEdge SAM-FS utility that reclaims space on cartridges that is occupied by expired archive copies.

release priority A method of calculating the release priority of a file within a file system by multiplying various weights by the corresponding file properties and then summing the results.

releaser A Sun StorEdge SAM-FS component that identifies archived files and releases their disk cache copies, thus making more disk cache space available. The releaser automatically regulates the amount of online disk storage to high and low thresholds.

remote procedure calls See RPC.

removable media file A special type of user file that can be accessed directly from where it resides on a removable media cartridge, such as magnetic tape or optical disk cartridge. Also used for writing archive and stage file data.

robot The portion of an automated library that moves cartridges between storage slots and drives. Also called a transport.

round robin A data access method in which entire files are written to logical disks in a sequential fashion. When a single file is written to disk, the entire file is written to the first logical disk. The second file is written to the next logical disk, and so on. The size of each file determines the size of the I/O.

By default, Sun StorEdge QFS and Sun StorEdge SAM-FS file systems implement striped data access unless striped groups are present. Files are round-robined if round robin access is specified. If the file system contains mismatched striped groups, striping is not supported and round robin is forced.

Also see glossary entries for disk striping and striping.

RPC Remote procedure calls. The underlying data exchange mechanism used by NFS to implement custom network data servers.

S

samfsdump A program that creates a control structure dump and copies all the control structure information for a given group of files. It is analogous to the UNIX `tar`(1) utility, but it does not generally copy file data.

samfsrestore A program that restores inode and directory information from a control structure dump.

SCSI Small Computer System Interface. An electrical communication specification commonly used for peripheral devices such as disk and tape drives and automated libraries.

small computer system interface See SCSI.

soft limit For disk quotas, a threshold limit on file system resources (blocks and inodes) that you can temporarily exceed. Exceeding the soft limit starts a timer. When you exceed the soft limit for the specified time (default is one week), no further system resources can be allocated until you reduce file system use to a level below the soft limit.

staging The process of copying a nearline or offline file from archive storage back to online storage.

storage Family Set A set of disks that are collectively represented by a single disk family device.

storage slots Locations inside an automated library in which cartridges are stored when not being used in a drive. If the library is direct-attached, the contents of the storage slots are kept in the automated library's catalog.

stripe size The number of disk allocation units (DAUs) to allocate before moving to the next device of a stripe. If `stripe=0`, the file system uses round-robin access, not striped access.

striped group A collection of devices within a Sun StorEdge QFS file system and defined in the `mcf` file as one (usually two) or more `g`*XXX* devices. Striped groups are treated as one logical device and are always striped with a size equal to the disk allocation unit (DAU). You can specify up to 128 striped groups within a file system, but you can specify no more than 252 total devices.

striping A data access method in which files are simultaneously written to logical disks in an interlaced fashion. All Sun StorEdge QFS and Sun StorEdge SAM-FS file systems enable you to declare either striped or round robin access for each individual file system. The Sun StorEdge QFS file systems enable you to declare striped groups within each file system. Also see the glossary entry for round robin.

Sun StorEdge QFS A high-speed UNIX file system that separates the file system metadata from the file data by storing them on separate devices. The Sun StorEdge QFS software controls the access to all files stored and all devices configured in the master configuration file (`mcf`).

Sun StorEdge SAM-FS The Sun Storage and Archive Manager File System. The Sun StorEdge SAM-FS software controls the access to all files stored and all devices configured in the master configuration file (`mcf`).

Sun SAM-QFS The Sun SAM-QFS software combines the Sun StorEdge SAM-FS software with the Sun StorEdge QFS file system. Sun SAM-QFS offers a high-speed, standard UNIX file system interface to users and administrators in conjunction with the storage and archive management utilities. It uses many of the commands available in the Sun StorEdge SAM-FS command set as well as standard UNIX file system commands.

Sun SAM-Remote client A Sun SAM-Remote client is a Sun StorEdge SAM-FS system that establishes a Sun SAM-Remote client daemon that contains a number of pseudodevices. It might or might not have its own library devices. The client depends on a Sun SAM-Remote server for archive media for one or more archive copies.

Sun SAM-Remote server The Sun SAM-Remote server is both a full-capacity Sun StorEdge SAM-FS storage management server and a Sun SAM-Remote server daemon that defines libraries to be shared among Sun SAM-Remote clients.

superblock A data structure in the file system that defines the basic parameters of the file system. It is written to all partitions in the storage Family Set and identifies the partition's membership in the set.

T

tar Tape archive. A standard file and data recording format used by the Sun StorEdge SAM-FS software for archive images.

TCP/IP Transmission Control Protocol/Internet Protocol. The internet protocols responsible for host-to-host addressing and routing, packet delivery (IP), and reliable delivery of data between application points (TCP).

thresholds A mechanism for defining the desirable available storage window for online storage. Thresholds set the storage goals for the releaser. Also see disk space thresholds.

timer Quota software that keeps track of the time elapsed between a user reaching a soft limit and a hard limit being imposed on the user.

V

volume A named area on a cartridge for sharing data. A cartridge has one or more volumes. Double-sided cartridges have two volumes, one on each side.

volume overflow A capability that enables the system to span a single file over multiple volumes. Volume overflow is useful for sites using very large files that exceed the capacity of their individual cartridges.

VSN Volume serial name. If you are archiving to removable media cartridges, the VSN is a logical identifier for magnetic tape and optical disk that is written in the volume label. If you are archiving to disk cache, this is the unique name for the disk archive set.

W

WORM Write once read many. A storage classification for media that can be written only once but read many times.

Index

Symbols

A

B

C

D

E

F

Q

R

S

T

U

V

X