Sun StorEdge™ SAM-FS Installation and Upgrade Guide

Version 4, Update 5

Sun Microsystems, Inc.
www.sun.com

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Preface

This manual explains the installation and upgrade procedures for the Sun StorEdge SAM-FS software product, Version 4, Update 5 (4U5). The software can be installed on the following minimum Solaris™ Operating System (OS) platforms:

- Solaris 9 04/03 or later on SPARC platforms
- Solaris 10 on SPARC or x64 platforms

Certain features might require a specific operating system level. 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 the 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.

How This Book Is Organized

This manual contains the following chapters:

- Chapter 1 has information about designing your Sun StorEdge SAM-FS environment.
- Chapter 2 describes system requirements and prerequisites to installation.
- Chapter 3 explains the Sun StorEdge SAM-FS initial installation procedure.
- Chapter 4 explains the Sun StorEdge SAM-FS upgrade procedure.
- Appendix A describes the release package contents and the directories created at installation time.
- Appendix B gives instructions for uninstalling the File System Manager software.
- Appendix C is a command reference.
- Appendix D provides configuration (`mcf`) file examples.

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-1 shows the shell prompts used in this manual.

TABLE P-1 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-2 lists the typographic conventions used in this manual.

TABLE P-2 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-2 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-3 shows the complete release 4U5 documentation set for these products.

TABLE P-3 Related Sun StorEdge QFS and Sun StorEdge SAM-FS Documentation

Title	Part Number
Sun StorEdge SAM-FS File System Configuration and Administration Guide	819-4333-10
Sun StorEdge SAM-FS Storage and Archive Management Guide	819-4329-10
Sun StorEdge SAM-FS Troubleshooting Guide	819-4331-10
Sun StorEdge QFS Configuration and Administration Guide	819-4332-10
Sun StorEdge QFS Installation and Upgrade Guide	819-4334-10
Sun StorEdge QFS and Sun StorEdge SAM-FS 4.5 Release Notes	819-4335-10

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 `docs.sun.com`

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

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

   `http://docs.sun.com`

   The `docs.sun.com` page appears.

2. **Find the documentation for your product by searching for the appropriate product in the search box.**

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:**

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

   The Storage Software page appears.

2. **Click the link for the Sun StorEdge SAM-FS Software.**

Third-Party Web Sites

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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 SAM-FS software, contact your Sun sales representative or your authorized service provider (ASP).

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

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

Please include the title and part number of your document with your feedback (*Sun StorEdge SAM-FS Installation and Upgrade Guide*, part number 819-4330-10).

CHAPTER 1

Planning Your Archiving System

This chapter provides an overview of the Sun StorEdge SAM-FS product and outlines design considerations for setting up a Sun StorEdge SAM-FS storage and archive management system. It also provides a high-level overview of the installation process.

This chapter contains the following sections:

Product Overview

The Sun StorEdge SAM-FS environment includes a storage and archive manager and a basic file system. The Sun StorEdge SAM-FS software enables data to be archived to automated libraries at device-rated speeds. In addition, it enables data to be archived to files in another file system through a process known as *disk archiving*. 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.

The Sun StorEdge SAM-FS software archives files by copying the files from online disk cache to archive media. The archive media can consist of disk slices in another file system, or it can consist of removable tape or magneto-optical cartridges in automated or manually loaded storage devices. In addition, the Sun StorEdge SAM-FS software automatically maintains online disk space at site-specified usage thresholds. It releases disk space associated with archived file data and restores the files to online disk when they are needed.

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 *SAM-QFS*.

SAM-Remote

The Sun SAM-Remote client and server storage management system enables you to share libraries and other removable media devices in a Sun StorEdge SAM-FS 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 the SAM-Remote software, 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 SAM-Remote instructions in the *Sun StorEdge SAM-FS Storage and Archive Management Guide* to enable remote storage and archive management.

Design Considerations

The following are some of the design considerations that need to be taken into account in the planning and implementation of a Sun StorEdge SAM-FS environment:

- Access and usage patterns will have a significant impact on the tape systems required, including the types of tapes and the number and types of drives and libraries needed. If much staging is anticipated, linear rather than helical scan tapes are strongly recommended.
- The following will strongly influence the number of drives and media required:
  - File system sizes and usage patterns: frequency of file updates, average file sizes, batch jobs that will wait for drives/media or users that must have priority
  - Archiving policies: number of media copies, release policies, level of disk over-subscription
  - Media characteristics: size, drive setup times
- For best performance, Fibre Channel tape drives and disk devices should be accessed through separate host bus adapters (HBAs).

If you are managing a server that has the Sun StorEdge SAM-FS software installed locally and you are configuring standalone file systems on the server to be archiving, it is recommended that you have at least one tape library associated with the current server. The library must contain media of a single media type.

The following table describes archiving configuration guidelines, on a per-tape-library basis, that can prevent you from overextending your environment.

TABLE 1-1 Archiving Configuration Guidelines

Number of Tape Drives	Number of Archive Policies (Sets)	Max. Number of File Systems	Max. Number of Files per File System	Library Recycler Values
2–3	1	4	6 million	• Minimum Gain - 90% • VSN Limit (#) - 2 • High Water Mark - 50% • Size Limit - 30 Gbytes
4–5	1	6	6 million	• Minimum Gain - 90% • VSN Limit (#) - 3 • High Water Mark - 50% • Size Limit - 40 Gbytes
6–7	2	10	8 million	• Minimum Gain - 90% • VSN Limit (#) - 5 • High Water Mark - 50% • Size Limit - 50 Gbytes
8–10	4	10	10 million	• Minimum Gain - 90% • VSN Limit (#) - 8 • High Water Mark - 50% • Size Limit - 70 Gbytes

The following are some further considerations that can help you from overloading your archiving system:

- Tape drives are designed to write large amounts of data at one time, so a well-designed archiving system should reduce the number of loads for the tape drives and increase the amount of data being written at one time.
- If you have only one tape drive with one media type, the `startage`, `startsize`, and `startcount` archive parameters should be set as follows:
  - `startage` – no less than 8 hours
  - `startsize` – no less than 50% of the capacity of a single tape
  - `startcount` – use some number in the thousands; do not exceed 500,000
- Do not run the recycler more than three times per day.

Installation Process Overview

The following list is a high-level overview of the software installation process. For detailed installation instructions, see Chapter 3 of this manual.

1. Verify that the hardware and software requirements have been met (see "Hardware and Software Requirements" on page 5).
2. Install the software packages ("Installing the Software Packages" on page 24).
3. If you want to configure the system using File System Manager, install the File System Manager software ("Installing the File System Manager Software" on page 26).
4. Configure the Sun StorEdge SAM-FS environment (beginning with "Configuring Storage Devices" on page 33).

CHAPTER 2

Pre-installation Tasks

This chapter explains the system requirements for the Sun StorEdge SAM-FS software and the tasks you must complete before you begin to install and configure your software.

This chapter contains the following sections:

Hardware and Software Requirements

The Sun StorEdge SAM-FS software can be installed either on a Sun server based on UltraSPARC® technology or on a server based on AMD Opteron x64 technology.

If you plan to install the File System Manager browser 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 "Verifying Requirements for File System Manager" on page 7.

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

Operating System Requirements

Sun StorEdge QFS software package runs in the following operating system environments:

- Solaris 9 04/03 or later
- Solaris 10

Before installation, you should verify the applicability of the hardware, the level of the operating system, and the patch release installed. To install the Sun StorEdge SAM-FS software, you also must ensure that you have root-level access to your system.

Note – The Sun StorEdge SAM-FS software always supports the two most recent versions of the Solaris OS. When a new version of the Solaris OS is released, Sun StorEdge SAM-FS adds support of the new version and drops support of the oldest version. The only exception to this policy occurs when the new Solaris OS version is released right near the time of the Sun StorEdge SAM-FS software release. In this case, three Solaris OS versions may be supported temporarily until the next Sun StorEdge SAM-FS software release.

▼ To Verify the Environment

Repeat these steps for each host on which you want to install the 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 software at one of the following minimum release levels:

   - Solaris 9 4/03
   - Solaris 10

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 web site (`http://sunsolve.sun.com`).

To install a patch after you install the 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 SAM-FS Software Host Requirements

If you plan to install the Sun StorEdge SAM-FS software in a multihost environment, for example in a Sun SAM-Remote configuration, all host systems must have the same Sun StorEdge SAM-FS software release level installed and operational. Hosts can be running different releases of the Solaris OS, but make sure that the same patch collection for the applicable release is installed on all hosts with the release that you want to include in the configuration.

Verifying Third-Party Compatibilities

The 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 SAM-FS package. Consult the *Sun StorEdge QFS and Sun StorEdge SAM-FS 4.5 Release Notes* for information pertaining to library model numbers, firmware levels, and other compatibility information.

Verifying Requirements for File System Manager

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

You can install the File System Manager software in one of the following configurations:

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

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

If you plan to use File System Manager, the host upon which you are configuring the File System Manager software must meet the requirements described in the following subsections:

Hardware Requirements

The minimum hardware requirements for the File System Manager software are as follows:

- SPARC 400 MHz (or more) or x64 AMD CPU
- 1 gigabyte of memory
- One 20-gigabyte disk
- At least 250 Mbytes free space in `/tmp`
- At least 100 Mbytes free space in `/` (the root partition)
- 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 level indicated, must be installed on the web server:
  - Netscape 7.*x* / Mozilla 1.4 on the Solaris OS or Microsoft Windows 98, SE, ME, 2000 or XP operating system
  - Internet Explorer 6.0 on Microsoft Windows 98, SE, ME, 2000, or XP operating system
- 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`.
- You must clear the browser cache before using File System Manager for the first time if you are upgrading from an earlier version.

Operating System Requirements

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

- Solaris 9 4/03
- Solaris 10

Web Software Requirements

The File System Manager installation packages include revisions of the following software at the minimum levels indicated:

- Java 2 Standard Edition version 1.4.2
- JavaHelp 2.0
- JATO 2.1.2
- 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.

Note – File System Manger is registered in the Sun Java Web Console and can co-exist with other applications that use the same console. The Java Web Console uses port 6789. This is an IANA reserved port, so no application other than Java Web Console should use this port.

Determining Disk Space Requirements

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

The Sun StorEdge SAM-FS file system requires only a single partition. If Sun StorEdge QFS is also installed, the file system requires either one or two partitions. The Sun StorEdge QFS file system is described in the *Sun StorEdge QFS Installation and Upgrade Guide*. See that manual for Sun StorEdge QFS disk space requirements.

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. Any existing data will be lost when you create the Sun StorEdge SAM-FS file system.

The disks must be connected to the server through a Fibre Channel (FC) 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 Estimate Disk Cache Requirements

1. **Estimate the minimum disk cache requirements for Sun StorEdge SAM-FS software (file systems plus the storage and archive manager).**

   Use the following guidelines to estimate the disk cache needed for Sun StorEdge SAM-FS file systems:

   - Disk cache = largest file (in bytes) + amount of space needed for working files
   - Metadata cache

     Use the following information to estimate the metadata cache requirements. The metadata cache must have enough space to contain the following data:

     - Two copies of the superblock (16 Kbytes each)
     - Reservation maps for metadata space plus data space
       ((metadata + file data)/DAU/32,000) * 4 Kbytes
     - Inode space
       (number of files + number of directories) * 512 bytes
     - Indirect blocks – a minimum of 16 Kbytes each
     - Directory data space
       (number of directories * 16 Kbytes)

2. **Enter the `format`(1M) command to verify that you have sufficient disk cache space.**

   The `format`(1M) command shows how the disks are partitioned and the size of each partition.

Note – EFI labels are required on all shared disks if you are using a Sun StorEdge QFS shared file system configuration that contains both the Solaris 10 OS on x64 platforms and the Solaris 9 or Solaris 10 OS on SPARC platforms. See "Configuring EFI Labels for Shared x64 and SPARC Volumes" on page 128 for information on relabeling disks.

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

CODE EXAMPLE 2-1 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 2-1 has been edited.

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

```
partition> ^D
#
```

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

CODE EXAMPLE 2-2 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 2-2 `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
```

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

```
        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> 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 2-1 shows the minimum amount of disk space required in these various directories.

TABLE 2-1 Minimum Disk Space Requirements

Directory	Sun StorEdge SAM-FS	File System Manager
/ (root) directory	2 Mbytes	25 Mbytes
/opt directory	21 Mbytes	5 Mbytes
/var directory	6 Mbytes	2 Mbytes
/usr directory	2 Mbytes	7 Mbytes
/tmp directory	0 Kbytes	200 Mbytes

Note – The space requirements for the /var directory take into account the fact that the archiver data directory, the archiver queue files, and the log files are written to 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 software packages.

1. **Enter the following command to verify that there are at least 2 Mbytes available in the** avail **column for the** / **directory.**

```
# df -k /
Filesystem        kbytes  used    avail capacity   Mounted on
/dev/dsk/c0t1dos0 76767   19826   49271    29%     /
```

2. **Enter the following command to verify that there are at least 21 Mbytes in the** avail **column for the** /opt **directory.**

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

3. **Verify that there are at least 6 Mbytes available in the `/var` directory.**

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

4. **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.

Verifying Archive Media

If you plan to perform disk archiving (to archive to disk space in another file system), verify the following:

- That the host system to which the disks are attached has at least one file system created on it that is compatible with the Sun StorEdge SAM-FS software.
- 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 FC-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 16.
- Enumerate your devices using the instructions in “To Create a List of Devices” on page 19. You will use this list again in the “Installing the Software Packages” on page 24.

▼ To Attach Removable Media Devices

The following steps 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.**
3. **Ensure that the removable media devices and the disks to be used for the Sun StorEdge SAM-FS file system are connected and properly addressed.**
4. **If you have libraries attached to the host system through a SCSI interface, ensure that the SCSI target IDs are unique for each SCSI initiator (host adapter).**

   Avoid setting SCSI target IDs for peripherals to already used IDs. In addition, if you are using a SCSI host adapter with a previously attached disk drive, any additional peripheral connected to this bus must have a different ID. Typically, the initiator uses ID `7`, and the internal disk drive uses ID `3` for SPARC systems and ID `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:**

   ```
   >ok reset
   ```

8. **Do one of the following:**
   - If you have libraries attached to the host system through a SCSI interface, use the `probe-scsi-all` command to conduct an inventory of target IDs and LUNs for each device connected to the host system. Save the output. You will use the information in this output for the next procedure, "To Create a List of Devices" on page 19.

For example:

```
{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
```

- If you have libraries or tape drives attached to the host system through an FC interface, conduct an inventory of target IDs and LUNs for each device connected to the host system. Save the output. You will use the information in this output for the next procedure, "To Create a List of Devices" on page 19.

  For example:

```
{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), check the cabling. Do not proceed until all devices appear when probed.

9. **Reenable autobooting, and then boot the system:**

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

10. **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.

11. **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 autoloading when the Sun StorEdge SAM-FS system is running.

Creating a List of Devices

The devices 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 an FC attachment. Each drive accepts either tape cartridges or magneto-optical cartridges.

    For SCSI-attached drives, you need to know each drive's SCSI target ID and logical unit number (LUN).

    For FC-attached drives, you need to know each drive's LUN and node World Wide Name (WWN).
  - Automated libraries can use a SCSI attachment, an FC attachment, or a network attachment.

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

    Libraries that use a network attachment are called network attached libraries. You cannot configure network attached libraries in the existing system configuration files; instead, you must create a parameters file for each network attached library. This is explained later in the installation process.

▼ To Create a List of Devices

- **Fill in** TABLE 2-2 **to include the name, manufacturer, model, and connection types for each device that you want to include in your Sun StorEdge SAM-FS environment. Retain this list for use again later in the configuration procedure.**

TABLE 2-2 Devices to Be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	Node WWN
SCSI-attached tape drives			
			Not applicable
			Not applicable
			Not applicable
FC-attached tape drives			
	Not applicable		
	Not applicable		
	Not applicable		
SCSI-attached magneto-optical drives			
			Not applicable
			Not applicable
			Not applicable
FC-attached magneto-optical drives			
	Not applicable		
	Not applicable		
	Not applicable		
SCSI-attached automated libraries			
			Not applicable
			Not applicable
			Not applicable
FC-attached automated libraries			
	Not applicable		
	Not applicable		
	Not applicable		

Obtaining the Release Files

Make sure that you have a copy of the release software. You can obtain the 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 4.5 Release Notes*, please do so before continuing. You can access the *Sun StorEdge QFS and Sun StorEdge SAM-FS 4.5 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 the Sun StorEdge SAM-FS software package you want to receive.**

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

Software Licensing

You must agree to all binary and right-to-use (RTU) software license agreements before installing Sun StorEdge SAM-FS software. Beginning with version 4, update 3, of the software, all media kits and software license options are delivered online, and license keys are no longer required.

Setting Up the Network Management Station

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

You can configure the 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 SAM-FS software detects potential problems in its environment, it sends information to a management station, which enables you to monitor the system remotely.

The management stations you can use include the following:

- Sun Storage Automated Diagnostic Environment (StorADE)
- Sun Management Center (Sun MC)
- Sun Remote Server (SRS)
- Sun Remote Services Net Connect

If you want to enable SNMP traps, make sure that the management station software is installed and operating correctly before installing the 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 SAM-FS software can detect are defined in the 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 SAM-FS software supports the TRAP SNMP (V2c) protocol. The software does not support `GET-REQUEST`, `GETNEXT-REQUEST`, and `SET_REQUEST`.

CHAPTER 3

Installation and Configuration Tasks

This chapter describes the procedures for installing and configuring the Sun StorEdge SAM-FS software for the first time. Use these procedures 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 Chapter 4, "Upgrade and Configuration Tasks" on page 109.

You can install and configure the Sun StorEdge SAM-FS environment entirely using command-line interface (CLI) commands, or you can use a combination of CLI commands and the File System Manager browser interface tool.

You must have superuser (`root`) access to perform most of the tasks described in this chapter.

This chapter contains the following sections:

Installing the Software Packages

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.**

   You obtained the release files as described in "Obtaining the Release Files" on page 21. 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, change to the directory on the CD-ROM that corresponds to your operating system version.
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 whether 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 "Adding the Administrator Group" on page 101 or the `set_admin`(1M) man page.

5. **Examine** `/tmp/SAM_install.log`**, 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
```

▼ To Set Up `PATH` and `MANPATH` Variables

In order to have access to the commands and man pages for the Sun StorEdge SAM-FS commands, you must modify your `PATH` and `MANPATH` environment variables.

1. **For users who will 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.**

   - In the Bourne or Korn shells, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.

     CODE EXAMPLE 3-1 shows how your `.profile` file might look after editing.

CODE EXAMPLE 3-1 Finished `.profile` File

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

   - 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 3-2 shows how the `MANPATH` in your `.login` file might look like after editing.

CODE EXAMPLE 3-2 Finished `MANPATH` in the `.login` File

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

Installing the File System Manager Software

Perform the tasks in this section to install the File System Manager software and to change the session timeout.

The procedures in this section are as follows:

- "To Install the File System Manager Software" on page 26.
- "To Set the Session Timeout" on page 29.

▼ To Install the File System Manager Software

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

1. **Ensure that you have met the installation requirements described in "Verifying Requirements for File System Manager" on page 7.**
2. **Log in to the server that you want to use as the management station.**

   This can be the same server on which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages or a different server on the same network.
3. **Become superuser.**
4. **Use the `cd`(1) command to change to the directory where the software package release files reside on your server.**
5. **Execute the `fsmgr_setup` script to start the installation process.**

   For example:

```
# fsmgr_setup
```

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

   During the installation procedure, you are asked questions about your environment.

   The `fsmgr_setup` script automatically installs the following:

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

   The installation scripts prompt you to specify whether you want to install localized packages.

   After installing the packages, it starts the Tomcat Web Server and enables logging.

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

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

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

CODE EXAMPLE 3-3 Finished `.profile` File

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

   - 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/SUNWfsmgr/bin)
```

     CODE EXAMPLE 3-4 shows how the `MANPATH` in your `.login` file might after you have finished editing.

CODE EXAMPLE 3-4 Finished `MANPATH` in the `.login` File

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

```
# 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 to start the `rpcbind` service:

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

11. **(Optional) Start the File System Manager (`fsmgmtd`) daemon.**

    If you did not choose to start the File System Manager daemon automatically during the installation process, do one of the following:

    - Enter the following command to start the File System Manager daemon and have it restart automatically every time the daemon process dies. With this configuration, the daemon also automatically restarts at system reboot.

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

    - Enter the following command if you want the File System Manager daemon to run only once and not automatically restart:

```
# /opt/SUNWsamfs/sbin/fsmadm start
```

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

12. **(Optional) Give additional users access to File System Manager.**

    By default, the `root` user has privileges to perform all operations available from the File System Manager software. You can assign other users full or partial access to File System Manager operations.

    To give an additional user access to File System Manger, use the `useradd` command. See "To Add Users" on page 29 and "Assigning Privilege Levels" on page 30 for information about adding users and assigning File System Manager user privilege levels.

▼ To Set the Session Timeout

The Sun Web Console framework has a default session timeout of 15 minutes. If File System Manger is the only application registered in the Sun Web Console, the File System Manager installation program changes the session timeout to 60 minutes. You can change the session timeout to a different value, but it is recommended that you not set it to a value greater than 60 minutes in order to preserve security.

- **To change the session timeout value, enter the following command on the management station:**

  `/opt/SUNWfsmgr/bin/fsmgr session` <*timeout-in-minutes*>

  For example, to change the timeout value to 45 minutes, type:

  ```
  /opt/SUNWfsmgr/bin/fsmgr session 45
  ```

Using the File System Manager Software

After File System Manager is installed, you can log in to the software using the `root` user name and the root password for the management station.

The `root` login grants you full administrator privileges to configure, monitor, control, and reconfigure the devices in your Sun StorEdge SAM-FS environment. Only the Sun StorEdge SAM-FS administrator should log in using the root login. All other users should log in using another user name.

By default, File System Manager is set up to manage the server on which it is installed. It can also be used to manage other servers running Sun StorEdge SAM-FS software, but those additional servers must first be configured to allow File System Manager access. For instructions on adding additional managed servers, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide* or the File System Manager online help.

▼ To Add Users

To add additional users for File System Manager, complete the following procedure.

1. **Outside of the browser interface, log in to the management station server as** `root`**.**

2. **Use the** `useradd` **and** `passwd` **commands to add each user.**

   For example, to add a user with account name `bobsmith`, type the following:

   # **/usr/sbin/useradd/useradd bobsmith**

   # **/usr/bin/passwd bobsmith**

   Each user account that you add in this way has read-only viewing privileges for File System Manager functions. To add additional privileges see the following section, "Assigning Privilege Levels" on page 30.

Assigning Privilege Levels

You can assign users full or partial access to File System Manager functions. The following table lists the five levels of privileges you can assign to File System Manager users.

TABLE 3-1 File System Manager Permission Levels

Administrative Privilege Level	Description
`com.sun.netstorage.fsmgr.config`	User has unlimited access.
`com.sun.netstorage.fsmgr.operator.media`	User can add or remove libraries; add or remove stand-alone drives; reserve VSNs; import VSNs; load and unload VSNs; export VSNs; and so on.
`com.sun.netstorage.fsmgr.operator.sam.control`	User can start, stop, or idle archiving operations.
`com.sun.netstorage.fsmgr.operator.file`	User can start or stop staging, and can restore a file system.
`com.sun.netstorage.fsmgr.operator.filesystem`	User can mount or unmount a file system, edit mount options, and perform file system checks (`fsck`).

To specify full or partial configuration privileges for a user, add the following line to the `/etc/user_attr` file:

account-name`::::auths=`*privilege-level*

account-name is the name of the user's account and *privilege-level* is the level of authorization that you want to assign to the user.

For example, to assign full privileges (privilege level `com.sun.netstorage.fsmgr.config`) for user account `bobsmith`, add the following line to the `/etc/user_attr` file:

bobsmith::::auths=com.sun.netstorage.fsmgr.config

To assign bobsmith privileges only for staging and restoring file systems (privilege level com.sun.netstorage.fsmgr.operator.file) and exporting, importing, and assigning VSNs (privilege level com.sun.netstorage.operator.media), add the following line to the /etc/user_attr file:

```
bobsmith::::auths=com.sun.netstorage.fsmgr.operator.file,
com.sun.netstorage.fsmgr.operator.media
```

To Create an Account for Multiple Users

You can create a generic File System Manager account that can be used by multiple users, and then add a role with privileges that only some of those users can access.

1. **Use the** useradd **and** passwd **commands to add the account.**

   For example, to add a user account called guest for multiple users, type the following:

   # **/usr/sbin/useradd/useradd guest**

   # **/usr/bin/passwd guest**

2. **Use the** roleadd **and** passwd **commands to add the role.**

   To create a role called admin with special privileges within the guest account, type the following:

   # **/usr/sbin/roleadd admin**

   # **/usr/bin/passwd admin**

3. **Specify the privilege levels in the** /etc/user_attr **file.**

   To assign the admin role privileges to restore and stage file systems, add the following lines to the /etc/user_attr file:

   admin::::auths=com.sun.netstorage.fsmgr.operator.file

   guest::::type=normal;roles=admin

   In this example, when a user logs in as guest, File System Manager prompts the user to select either No Role or Admin. If users know the Admin role password, they can select Admin, enter the Admin password, and have privileges to restore and stage file systems. All other users must select No Role and have read-only privileges.

   Because multiple users with the same privilege level can be logged in to the software concurrently, there is a risk of one user's changes overwriting another user's previous changes. To prevent this, develop policies about who can make changes and how to notify others.

▼ To Invoke File System Manager for the First Time

Perform this procedure if you want to invoke File System Manager and use it, rather than CLI commands, to perform some of the configuration steps.

1. **Log in to the server where File System Manager is installed, or in to any computer that has network access to it.**
2. **If you upgraded from a previous version of the File System Manager software, open the web browser and clear the browser cache.**
3. **From the web browser, invoke the File System 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 Java Web Console login screen appears.
4. **At the User Name prompt, enter `root` or another valid File System Manager user name.**

   Note – If you have upgraded the File System Manager software from an earlier version, the `samadmin` user account is still available. You may type `samadmin` in the User Name field and then type the `samadmin` password to gain full access to all File System Manager operations.

   ---
5. **At the Password prompt, enter the password.**
6. **Click Log In.**
7. **In the Storage section, click File System Manager.**

   You are now logged in to the File System Manager interface.

   - If you want to configure your environment at this time using the File System Manager, stay on this page and add the server that you want to administer.

     If you need help accomplishing this task, click Help.
   - If you want to quit using the File System Manager at this time, click Log Out.

Configuring Storage Devices

Perform the tasks in this section if you plan to enable archiving to tape or magneto-optical media. You do not need to perform these tasks if you plan to archive to disk.

This section introduces you to 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 FC 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 FC 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 that are supported with settings that do not accommodate Sun StorEdge SAM-FS software.

This section includes the following procedures:

Before You Begin

Before starting the configuration process, locate the list of devices that you created in "Creating a List of Devices" on page 19.

If you have not already taken an inventory of your devices and listed them in TABLE 2-2, do so now.

The procedures in this task include an example that is based on the inventory list shown in TABLE 3-2.

TABLE 3-2 Example Inventory List - Devices to Be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	Node WWN
SCSI-attached tape drives			
QUANTUM DLT7000	1	0	Not applicable
QUANTUM DLT7000	2	0	Not applicable
FC-attached tape drives			
StorageTek 9840	Not applicable	0	500104f00043abfc
StorageTek 9840	Not applicable	0	500104f00045eeaf
IBM ULT3580-TD1	Not applicable	0	500104f000416304
IBM ULT3580-TD1	Not applicable	0	500104f000416303
SCSI-attached automated libraries			
StorageTek 9730	0	0	Not applicable
FC-attached automated libraries			
StorageTek L700	Not applicable	0	500104f00041182b

Note – The device names in TABLE 3-2 are as they appear in the discovery output.

Depending on the devices on your inventory list, you must 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 "To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 35.
- If there are any magneto-optical drives, SCSI-attached automated libraries, or FC-attached automated libraries that you want to include in your Sun StorEdge SAM-FS environment, go to "To Add Device Support in `samst.conf` Using the CLI" on page 40.

▼ To Add Tape Devices to the /kernel/drv/st.conf File

Perform this procedure if you have tape drives that you want to include in your Sun StorEdge SAM-FS environment.

In this procedure, you make an entry in the `st.conf` file for each unique tape drive that is on your inventory list.

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:**

```
#tape-config-list=
```

4. **Remove the pound character (`#`) from column 1 of this line.**

5. **Use `vi`(1) or another editor to open file `/opt/SUNWsamfs/examples/st.conf_changes`.**

6. **Follow these steps for each tape drive on your inventory list that you want to configure.**

   a. **Search the file to find the device definition for the device.**

      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",
```

b. Copy the line containing the device definition from `st.conf_changes` to `st.conf` so it appears after the `tape-config-list` line.

CODE EXAMPLE 3-5 shows how the `st.conf` file looks at this point.

CODE EXAMPLE 3-5 `st.conf` With Its First Device Definition Entry

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
...
```

c. Examine the line you just copied and note the final string enclosed in quotation marks.

In this example, the final string is `"dlt7-tape"`.

d. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find another line that begins with the final string you noted in Step c.

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;
```

e. Copy the tape configuration value from Step d to file `st.conf`, placing it after the device definition line you copied in Step b.

CODE EXAMPLE 3-6 shows the lines now contained in the `st.conf` file.

CODE EXAMPLE 3-6 `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;
...
```

CODE EXAMPLE 3-7 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 3-7 `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;
...
```

Note – Some tape configuration value lines in `st.conf_changes` support more than one device definition, but you need only one tape configuration value 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;` tape configuration value needs to appear in the `st.conf` file.

---

7. **Replace the comma (`,`) at the end of the last device definition line with a semicolon (`;`).**

   CODE EXAMPLE 3-8 shows the sample `st.conf` file, with the semicolon after `"CLASS_3580"`.

   CODE EXAMPLE 3-8 `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;
   ...
   ```

8. **Save your changes.**

   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

For each tape drive on your hardware inventory list that is attached through a SCSI or FC 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.

Note – Do not use this procedure to add interface information for magneto-optical drives.

---

1. **If the file `/kernel/drv/st.conf` is not open, use `vi`(1) or another editor to open it.**
2. **If you have tape drives to include that are attached through a SCSI interface, do the following:**
   a. **In the `st.conf` file, find the list of SCSI target IDs and LUNs by looking 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.

   b. **In the list of SCSI targets and LUNs, find the entry that corresponds to each SCSI target and LUN that are on your inventory list.**

   If the entry is preceded by a pound character (#), delete the character. A pound character marks a line as a comment.

   For example, CODE EXAMPLE 3-9 shows the two lines that correspond to the two Quantum DLT 7000 drives, which are attached to LUN 0 and have target IDs 1 and 2.

CODE EXAMPLE 3-9 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 an entry might extend over two lines if it contains return characters.

   If a SCSI target and LUN line you need is not already listed in `st.conf`, create an entry for it, following the format shown in Step a.

3. **If you have tape drives to include that are attached through an FC interface and you are not using the Sun StorEdge SAN Foundation Software I/O stack, create a line for each FC-attached device.**

   Place these lines at the end of the SCSI target ID and LUN list, using the following format:

```
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 (WWN) for the drive.

   For example, CODE EXAMPLE 3-10 shows lines added to support the StorageTek 9840 and IBM ULT3580 tape drives included in the sample inventory list in TABLE 3-2.

CODE EXAMPLE 3-10 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"
```

4. **Save your changes and exit the `st.conf` file.**

   Proceed to "To Add Device Support in `samst.conf` Using the CLI" on page 40 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

Adding Device Support in the `samst.conf` File

The `/kernel/drv/samst.conf` file contains a list of SCSI and FC entries. The following procedures show 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.

If you have automated libraries attached through a SCSI or FC interface, you must verify or update the `samst.conf` file. You can use File System Manager or the CLI to update the `samst.conf` file, depending on your environment:

- You can use the File System Manager software to discover and display the tape libraries with the correct drive ordering after the library is attached to, and recognized by, the current server. As part of this process, the software updates the `samst.conf` file for the server with the WWN, if the WWN does not exist in the `samst.conf` file.
- You must use the CLI to update the `samst.conf` file if you have a small direct attached library with a target number larger than 6 or a LUN identifier larger than 1.

Note – You do not need to verify device support if you have only network attached automated libraries.

▼ To Add Device Support in `samst.conf` Using File System Manager

Repeat this procedure for each device in your environment.

1. **From the File System Manager Servers page, click the name of the server to which you want to add a library.**

   The File Systems Summary page is displayed.

2. **Click the Media Management tab.**

   The Library Summary page is displayed.

3. **Click Add.**

   The Add a Library wizard is displayed.

4. **Follow the steps in the Add a Library wizard to add the device.**

   When you have completed the wizard steps, the `samst.conf` file is automatically updated with the correct information.

▼ To Add Device Support in `samst.conf` Using the CLI

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. **If you have SCSI-attached magneto-optical drives or SCSI-attached libraries that you want to include, do the following:**

a. In the `samst.conf` file, find the list of SCSI targets and LUNs by looking for entries that 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.

b. In the list of SCSI targets and LUNs, find the entry that corresponds to each SCSI target ID and LUN that are on your inventory list.

If the entry is deleted by a pound character (#), delete the character. A pound (#) character marks a line as a comment.

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 an entry might extend over two lines if it contains return characters.

c. If a SCSI target and LUN line you need is not already listed in `samst.conf`, create an entry for it, using the format shown in Step a.

4. If you have FC-attached magneto-optical drives or FC-attached automated libraries that you want to include, create a line for each FC-attached device in your inventory list.

Place these lines at the end of the SCSI target and LUN list, using the following format:

```
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 WWN for drive.

CODE EXAMPLE 3-11 shows the line added to support the StorageTek L700 tape drive in the sample inventory list in TABLE 3-2.

CODE EXAMPLE 3-11 Line Added to the `samst.conf` file

```
name="samst" parent="fp" lun=0 fc-port-wwn="500104f00041182b"
```

5. Save your changes and exit the `samst.conf` file.

▼ To Verify That All Devices Are Configured

1. **Use the `cfgadm`(1M) command to list the devices included in the Sun StorEdge SAM-FS environment.**

   For example:

```
# 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
```

2. **Examine the output to make sure that it shows all the devices you want configured 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 the following:

```
# 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.

For example, the following message might be 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'.
```

The following device log messages correspond to the sam-log message:

```
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. Follow the steps in "To Add Tape Devices to the /kernel/drv/st.conf File" on page 35 to fix the error.

▼ To Reboot the System

Note – You must reboot the system to enable the changes you have made to the st.conf and samst.conf files.

- **Issue the `touch`(1) and `init`(1M) commands to reboot the system.**

  For example:

```
# touch /reconfigure
# init 6
```

  Changes to the `st.conf` and `samst.conf` files are enabled at this time.

Setting Up the Environment Configuration

Each Sun StorEdge SAM-FS software environment is unique. The system requirements and hardware differ from site to site. 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 managed by the Sun StorEdge SAM-FS software. 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.

You can edit the `mcf` file in either of two ways:

- By using the File System Manager interface to configure Sun StorEdge SAM-FS devices. When you create a file system using File System Manager, it creates an `mcf` file in `/etc/opt/SUNWsamfs/mcf` that contains a line for each device and family set of the file system.
- By directly editing the `mcf` file using a text editor.

The `mcf` file has two kinds of entries:

- File system device entries for disk devices. In the `mcf` file, you organize them into one or more file systems.
- Removable media device entries which you can organize 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.

There are examples of `mcf` files in `/opt/SUNWsamfs/examples`. Example `mcf` file configurations can also be found Appendix D of this manual.

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

- "To Create an `mcf` File Using File System Manager" on page 45
- "To Create an `mcf` File Using a Text Editor" on page 46
- "Identifying Peripherals Using the `/var/adm/messages` File" on page 49
- "To Verify the `mcf` File" on page 49

Note – If you are configuring a SAM-QFS environment, the instructions for configuring a Sun StorEdge QFS file system the `mcf` file are contained in *Sun StorEdge QFS Installation and Upgrade Guide*.

▼ To Create an `mcf` File Using File System Manager

When you configure Sun StorEdge SAM-FS file systems using the File System Manager software, it creates or edits the appropriate Sun StorEdge SAM-FS configuration files, including the `mcf` file, on that server. You can use either File System Manager or the CLI to further edit these files later.

Note – If you want to use File System 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 "Creating Parameters Files for Network Attached Automated Libraries" on page 59.

Follow these steps to add a server and create a file system:

1. **Log in to the File System Manager browser interface as an administrator user.**

   The Servers page is displayed.

2. **Click Add.**

   The Add Server page is displayed.

3. **In the Server Name or IP Address field, type the name of the server or the IP address of the server.**

4. **Click OK.**

5. **Click New File System.**

   The New File System wizard is displayed.

6. **Complete the steps for creating a new file system.**

   When you have completed this process, the `mcf` file is created. For more information, see the File System Manager online help.

▼ To Create an `mcf` File Using a Text Editor

- **Use vi(1) or another editor to create the `/etc/opt/SUNWsamfs/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 3-12 shows the `mcf` file fields.

  CODE EXAMPLE 3-12 `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 3-3 describes the information in each field and specifies whether the field is required or optional.

TABLE 3-3 `mcf` File Fields

Field	Description
Equipment Identifier	*Required*. Identifies the physical file system device or removable media device. 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 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*. Specifies a unique integer between 1 and 65534. All devices and parent identifiers must be assigned a unique Equipment Ordinal value. The numbers specified affect the order in which devices are displayed in the user interface. Lower numbers are displayed first.
Equipment Type	*Required*. 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 3-3 `mcf` File Fields *(Continued)*

Field	Description
Family Set	*Required for most devices*. Identifies sets of devices configured to work together as a group, such as a library and its drives. For a parent device (for example, a library), enter a descriptive name for the family set. For member devices, do the following: • 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*. Specifies the state for the device when the file system is initialized. This state could be `on`, `off`, `unavail`, `down`, or a dash (-) for default behavior.
Additional Parameters	*Optional*. 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*). • If the device is a tape or magneto-optical device, leave this field 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 SAM-FS File System Configuration and Administration Guide*.

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 when initializing any type of file system, you risk damaging user or system data.

Identifying Peripherals Using the /var/adm/messages File

When your system boots, a series of messages is written to /var/adm/messages. These messages identify the Sun Solaris hardware path to each of the peripherals on your system. You can use this information to create the mcf file. To display information from the latest system reboot, search backward from the end of the file.

As CODE EXAMPLE 3-13 shows, each SCSI peripheral has three lines. The sixth field, samst2, indicates that these lines are associated with each other.

CODE EXAMPLE 3-13 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
```

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. Note that the third line wraps to the next line in CODE EXAMPLE 3-13.

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.

You might also want to 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.

▼ To Verify the mcf File

Perform this procedure if you created your mcf file using a text editor. If you created your mcf file using File System Manager, you do not need to verify its syntax.

- **Enter the sam-fsd(1M) command to verify the mcf file.**

If the mcf file is free of syntax errors, the sam-fsd(1M) output includes information about the file systems, archiving, and other system information. If the mcf file contains syntax or other errors, however, the output is similar to that shown in CODE EXAMPLE 3-14.

CODE EXAMPLE 3-14 Example sam-fsd(1M) Output Showing Errors

```
# 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 the mcf file has errors, return to "Setting Up the Environment Configuration" on page 44 and refer to the mcf(4) man page for information on how to create this file correctly. You can also refer to the mcf file examples shown in Appendix D, "mcf File Examples" on page 155.

Setting Up Mount Parameters

Use the procedures in this section to specify mount parameters for the Sun StorEdge SAM-FS file system.

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 a list of available mount options, see the mount_samfs(1M) man page.

Updating the /etc/vfstab File and Creating the Mount Point

This section describes how to edit the /etc/vfstab file.

TABLE 3-4 shows the values you can enter in the fields in the /etc/vfstab file.

TABLE 3-4 /etc/vfstab File Fields

Field	Field Title and Content
1	Device to Mount. The name of the Sun StorEdge SAM-FS file system to be mounted. 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, which indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) process 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.
5	fsck(1M) Pass. Must be a dash (-) character, which indicates that there are no options.
6	Mount at Boot. Either yes or no. • Specifying yes in this field indicates that the Sun StorEdge SAM-FS file system is to 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.

When you create a file system using File System Manager, a default /etc/vfstab file is created. However, mount options specified in File System Manager are written to the samfs.cmd file rather than to the /etc/vfstab file. For more information, see "To Create and Edit the samfs.cmd File Using File System Manager" on page 52.

To edit the mount options in the /etc/vfstab file, use the following command-line procedure, "To Update the /etc/vfstab File and Create the Mount Point Using a Text Editor" on page 52.

▼ To Update the /etc/vfstab File and Create the Mount Point Using a Text Editor

The example in this task assumes that /samfs1 is the mount point of the samfs1 file system.

1. **Use vi(1) or another editor to open the /etc/vfstab file.**
2. **Create an entry for each Sun StorEdge SAM-FS file system.**

   CODE EXAMPLE 3-15 shows header fields and entries for a Sun StorEdge SAM-FS file system.

   CODE EXAMPLE 3-15 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
```

3. **Use the mkdir(1M) command to create the mount point.**

   For example:

```
# mkdir /samfs1
```

Creating and Editing 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.

For more information on the mount(1M) command, see the mount_samfs(1M) man page.

▼ To Create and Edit the samfs.cmd File Using File System Manager

If you specify non-default mount options when creating a file system in File System Manager, the samfs.cmd file is created or updated with those mount options.

Follow these steps to edit a file system's mount options:

1. **From the Servers page, click the name of the server on which the file system is located.**

   The File Systems Summary page is displayed.

2. **Select the radio button next to the file system whose mount options you want to edit.**

3. **From the Operations menu, choose Edit Mount Options.**

   The Edit Mount Options page is displayed.

4. **Make your edits in the fields.**

   For more information about the fields on the Edit Mount Options page, see the File System Manager online help.

5. **Click Save.**

   The new mount options are written to the `samfs.cmd` file.

▼ To Create and Edit the `samfs.cmd` File Using a Text Editor

- **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 SAM-FS File System Configuration and Administration Guide*, or see the `samfs.cmd`(4) man page.

Initializing the Environment

This section tells you how to initialize the environment and the file system, and how to mount the file system.

▼ To Initialize the Environment

- **Use the `samd`(1M) `config` command to initialize the Sun StorEdge SAM-FS environment.**

  For example:

```
# samd config
```

▼ To Initialize 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 SAM-FS File System Configuration and Administration Guide* or see the `sammkfs`(1M) man page.

- **Use the `sammkfs`(1M) command to initialize a file system for each Family Set name defined in the `mcf` file.**

Caution – Running the `sammkfs`(1M) command 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.

CODE EXAMPLE 3-16 shows the command to initialize a file system with the Family Set name of `samfs1`.

CODE EXAMPLE 3-16 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.

Mounting the File System

The mount(1M) command mounts a file system and reads the /etc/vfstab and samfs.cmd configuration files. For information on the mount(1M) command, see the mount_samfs(1M) man page.

▼ To Mount the File System Using File System Manager

1. **From the Servers page, click the name of the server on which the file system is located.**

   The File Systems Summary page is displayed.

2. **Select the radio button next to the file system that you want to mount.**

3. **From the Operations menu, choose Mount.**

▼ To Mount the File System From the Command Line

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 that the file system is mounted and shows how to set permissions. CODE EXAMPLE 3-17 shows the output from a mount(1M) command issued to verify whether example file system samfs1 is mounted.

CODE EXAMPLE 3-17 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. For example:

```
# chmod 755 /samfs1
# chown root:other /samfs1
```

Performing Additional Configuration Tasks

This section outlines additional tasks that you might need to complete in order to finish the configuration of the Sun StorEdge SAM-FS environment. Some of these tasks are optional, depending on your specific environment. The following tasks are covered:

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.

▼ To NFS Share the File System

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.

1. **Use `vi`(1) or another editor to add a `share`(1M) command to the `/etc/dfs/dfstab` file.**

   For example:

```
share -F nfs -o rw=client1:client2 -d "SAM-FS" /samfs1
```

2. **Use the `ps`(1) command to determine whether `nfs.server` is running.**

   For example:

```
# 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 this sample output, the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. **If `nfs.server` is not running, start it:**

```
# /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 no NFS-shared file systems exist when the Sun Solaris OS boots, the NFS server is not started. CODE EXAMPLE 3-18 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 3-18 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.

Note – There can be a significant delay in the Sun StorEdge SAM-FS file system's response to NFS client requests 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 the operation.

To avoid this situation, it is recommended that you 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`.

---

1. **On an NFS client system, 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 mounts `server:/samfs1` on the `/samfs1` mount point:

```
server:/samfs1   -   /samfs1   nfs   -   yes   hard,intr,timeo=60
```

2. **Save and close the `/etc/vfstab` file.**

3. **Enter the `mount`(1M) command.**

   For example, the following `mount`(1M) command mounts the `samfs1` file system:

```
client# mount /samfs1
```

   Alternatively, the automounter can 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.

Creating Parameters Files for Network Attached Automated Libraries

Perform the applicable procedure in this section if you want to include network attached automated libraries in your Sun StorEdge SAM-FS environment.

You can include automated libraries in a Sun StorEdge SAM-FS environment either by directly attaching them to the server or by attaching them to the environment's network. Libraries attached through a SCSI or Fibre Channel (FC) 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 60
- "Fujitsu LMF Automated Libraries" on page 62
- "IBM 3494 Automated Libraries" on page 64
- "Sony Network Attached Automated Libraries" on page 67
- "StorageTek ACSLS-Attached Automated Libraries" on page 70

About 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, however, 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, making the drive available to multiple Sun StorEdge SAM-FS processes. However, these multiple processes cannot share media. Each Sun StorEdge SAM-FS process must still maintain its own set of VSNs.

The shared-drives 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 Sun StorEdge SAM-FS processes coordinate the use of a drive and keep the drives in a library busy.

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. All of the StorageTek ACSLS-attached libraries support shared drives in Sun StorEdge SAM-FS environments.

To implement one or more shared drives, specify the `shared` keyword 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 following 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.

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 "Setting Up the Environment Configuration" on page 44. 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. 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.

Note – ADIC/Grau network attached libraries are not supported by Sun StorEdge SAM-FS software on an x64 hardware platform.

▼ To Configure the Parameters File for an ADIC/Grau Automated Library

Follow this procedure to create a parameters file for each ADIC/Grau library that you want to configure.

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 is operational.
   - The ADIC/Grau library is operating on the DAS (Distributed AML Server).
   - Both the `avc` (avoid volume contention) and the `dismount` parameters are 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`.

Note – When you created your `mcf` file, in "Setting Up the Environment Configuration" on page 44, 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 that you create in this procedure.

---

3. **Use `vi`(1) or another editor to open a new file.**

   It is a good idea to give the new file a name that corresponds to the library that you are configuring. For example, you might 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.

   TABLE 3-5 shows the *keyword* = *value* parameters that must appear in the ADIC/Grau parameters file.

TABLE 3-5 ADIC/Grau Automated Library Parameters

Parameter	Meaning
`client` = *client-id*	The name of the client as defined in the DAS configuration file. This is a required parameter.
`server` = *server-id*	The host name of the server running the DAS server code. This is a required parameter.
`acidrive` *drive-id* = *path*	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, 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 sample ADIC/Grau parameters file shown in CODE EXAMPLE 3-19 defines one ADIC/Grau automated library supporting DLT tape and one ADIC/Grau automated library supporting a Hewlett-Packard optical drive.

CODE EXAMPLE 3-19 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
#
# the name "drive2" is from the DAS configuration file
#
acidrive drive2 = /dev/rmt/1cbn
```

Note – CODE EXAMPLE D-11 in "Example `mcf` File Entries for Network Attached Libraries" on page 166 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 the `grau50` file in the `/etc/opt/SUNWsamfs` directory.

The following directory contains diagnostic information that can be useful for 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, 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 `fujitsulmf` interface supplied by Fujitsu. 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.

Note – Fujitsu LMF network attached libraries are not supported by Sun StorEdge SAM-FS software on an x64 hardware platform.

▼ To Configure the Parameters File for a Fujitsu LMF Automated Library

Follow this procedure to create a parameters file for each Fujitsu LMF library that you want to configure.

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`.

   Note – When you created your `mcf` file, in "Setting Up the Environment Configuration" on page 44, 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 that you create in this procedure.

3. **Use `vi`(1) or another editor to open a new file.**

   It is a good idea to give the new file a name that corresponds to the library that you are configuring. For example, you might 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.

All *drivename* and *value* information is case-sensitive. TABLE 3-6 shows the values that you can specify for *drivename* and *value*.

TABLE 3-6 *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.

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 3-20 shows a parameters file for a Fujitsu LMF automated library.

CODE EXAMPLE 3-20 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
#
# the name "LIB001DRV001" is from the LMF configuration
#
lmfdrive LIB001DRV001 = /dev/rmt/1cbn  # defines second drive
```

Note – CODE EXAMPLE D-12 in "Example `mcf` File Entries for Network Attached Libraries" on page 166 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.

Note – IBM 3494 network attached libraries are not supported by Sun StorEdge SAM-FS software on an x64 hardware platform.

▼ 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.

Follow this procedure to create a parameters file for each physical or logical library that you want to include in the Sun StorEdge SAM-FS environment.

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`.

   Note – When you created your `mcf` file, in "Setting Up the Environment Configuration" on page 44, 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 that you create in this procedure.

   ---

3. **Use `vi`(1) or another editor to open a new file.**

   It is a good idea to give the new file a name that correspond to the library that you are configuring. For example, you might 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 3-7 shows how to specify the parameters.

TABLE 3-7 IBM 3494 Parameters File Arguments

Parameter	Meaning
`name =` *name*	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*	A hexadecimal number between `0x0001` and `0xfeff`. By default, the Sun StorEdge SAM-FS software sets this value to 4 for media under its control. If you have divided your physical library into multiple logical libraries, make sure that the value of 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, they are added to the catalog, and their `category` = value is changed to the value specified by this `category` = *hexnumber* parameter.
`access =` *permission*	Either `shared` or `private`. • Specify `private` if you are using the library as one physical library. This is the default. • Specify `shared` if you are dividing the library into multiple logical libraries.
device-pathname = *device-number*	For *device-pathname*, specify the path of a drive. You must have a *device-pathname* entry for every drive in the library attached to this machine, and each *device-pathname* entry must match the Equipment Identifier value of the corresponding entry in the `mcf` file. For *device-number*, the device number as described in the IBM documentation. You can obtain this number by running the IBM `mtlib` utility.

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 3-21 shows an example `/etc/ibmatl.conf` file. Information for this file was obtained from the `mtlib` utility supplied by IBM.

CODE EXAMPLE 3-21 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 the IBM `mtlib` utility to obtain the device numbers. CODE EXAMPLE 3-22 shows output from `mtlib`.

CODE EXAMPLE 3-22 Output From `mtlib`

```
# mtlib -l 3493a -D
0, 00145340 003590B1A00
1, 00145350 003590B1A01
```

CODE EXAMPLE 3-23 shows a sample parameters file for an IBM 3494 library.

CODE EXAMPLE 3-23 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         # From mtlib output
access=private
category = 5
```

Note – CODE EXAMPLE D-13 in "Example `mcf` File Entries for Network Attached Libraries" on page 166 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

The 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 – Sony network attached libraries are not supported by Sun StorEdge SAM-FS software on an x64 hardware platform.

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

Follow this procedure to create a parameters file for each Sony network attached library that you want to configure.

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`.

Note – When you created your `mcf` file, in "Setting Up the Environment Configuration" on page 44, 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 that you create in this procedure.

---

3. **Use `vi`(1) or another editor to open a new file.**

   It is a good idea to give the new file a name that correspond to the library that you are configuring. For example, you might invoke `vi`(1) as follows:

```
# vi sonyfile
```

4. **Edit the Sony parameters file to consist 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 specified in the configuration file and in the Sun StorEdge SAM-FS `mcf` file.

   TABLE 3-8 shows the *keyword* = *value* parameters that must appear in the Sony parameters file. All parameters are required.

TABLE 3-8 Sony Network Attached Automated Library Parameters

Parameter	Meaning
`userid` = *user-id*	A number from 0 to 65535, inclusive. 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*	The host name of the server running the PSC server code.
`sonydrive` *drive-id* = *path*	For *drive-id*, the drive bin number as configured in the PSC configuration file. There must be one `sonydrive` line for every drive defined in the `mcf` file. For *path*, the path to the drive as entered in the Equipment Identifier field of the Sun StorEdge SAM-FS `mcf` file.

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 3-24 shows a parameters file for a Sony network attached automated library.

CODE EXAMPLE 3-24 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 3-24 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
```

Note – CODE EXAMPLE D-14 in "Example `mcf` File Entries for Network Attached Libraries" on page 166 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 way in which Sun StorEdge SAM-FS systems interoperate with StorageTek ACSLS-attached automated libraries is very similar to the way in which they interoperate with direct attached automated libraries. However, the installation and configuration procedure of a StorageTek ACSLS-attached automated library requires additional steps.

The StorageTek ACSLS software package controls the automated library. Daemon software controls the StorageTek automated library through the ACSAPI interface.

Note – The File System Manager software supports the automatic discovery and configuration of ACSLS network attached libraries. You do not need to set up the parameters file before configuring the library in File System Manager. For more information see the File System Manager online Help.

▼ To Configure the Parameters File for a StorageTek ACSLS-Attached Automated Library

Follow this procedure to create a parameters file for each StorageTek ACSLS-attached library that you want to configure.

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`.

Note – When you created your `mcf` file, in "Setting Up the Environment Configuration" on page 44, 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 that you create in this procedure.

---

3. **Use `vi`(1) or another editor to open a new file.**

   It is a good idea to give the new file a name that correspond to the library that you are configuring. For example, you might invoke `vi`(1) as follows:

```
# vi stk50
```

4. **Edit the StorageTek parameters file to consist of a list of *keyword* = *value* parameter lines.**

   TABLE 3-9 shows the keywords to use.

TABLE 3-9 StorageTek ACSLS-Attached Automated Library Parameters

Parameter	Meaning
`access =` *userid*	(Optional) The user identification value used by the StorageTek software for access control. If the `access =` parameter is not supplied, the access control string is a null string, indicating that there is no *userid*.
`hostname =` *hostname*	The host name of the server running the StorageTek ACSLS interface.
`portnum =` *portnum*	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.

TABLE 3-9 StorageTek ACSLS-Attached Automated Library Parameters *(Continued)*

Parameter	Meaning
`ssihost` = *hostname*	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*	The port on the ACSLS server to which the StorageTek SSI daemon is to send its ACSLS requests. Specify either 0 or a value from 1024 to 65535, inclusive. Setting this variable to 0 or leaving it unset causes the system to query the port mapper on the ACSLS server.
`capid` = (`acs` = *acsnum*, `lsm` = *lsmnum*, `cap` = *capnum*)	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.
`capacity` = (*index* = *value*[, *index* = *value*] . . .)	The capacities of the supported cartridges. Use a comma to separate the *index* = *value* pairs, and enclose the string in parentheses. For *index*, specify the index of the supplied `media_type` file, located in the following ACSLS directory: `/export/home/ACSSS/data/internal/mixed_media/media_types.dat`. For *value*, specify the capacity of the cartridge type in units of 1024 bytes. In general, it is necessary to supply a capacity entry only for an index of new cartridge types or to override the supported capacity.

TABLE 3-9 StorageTek ACSLS-Attached Automated Library Parameters *(Continued)*

Parameter	Meaning
device-path-name = (acs = *value*, lsm = *value*, panel = *value*, drive = *value*) [shared]	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. The following are the *value* specifications: • 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 The shared keyword is optional. It 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 "About Shared Drives" on page 59 or see the stk(7) man page.

CODE EXAMPLE 3-25 shows a parameters file for a StorageTek ACSLS-attached automated library.

CODE EXAMPLE 3-25 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
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)
```

Note – CODE EXAMPLE D-15 in "Example `mcf` File Entries for Network Attached Libraries" on page 166 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.

Checking the Drive Order

Perform the tasks described in this section if you are archiving to removable media.

For libraries with more than a single drive, the order in which drive entries appear in the `mcf` file must match the order in which they are identified by the library controller. The drive that the library controller identifies as the first drive must be the first drive entry for that library in the `mcf`, and so on. The following sections describe methods for checking the drive order as seen by Sun StorEdge SAM-FS for a direct attached library.

The main objective of this task is to develop a list of drive number identifiers and the tape devices to which they are correlated.

The procedure varies, 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 74
- "To Check the Drive Order of Tape Libraries Without a Front Panel" on page 76
- "To Check the Drive Order of Magneto-optical Libraries Without a Front Panel" on page 78

▼ To Check the Drive Order of Tape or Magneto-optical Libraries With a Front Panel

Perform this procedure in order to verify the correct association between the remote devices and the drives.

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 3-26 shows example `ls`(1M) output with drive identification information.

CODE EXAMPLE 3-26 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:
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 that you must perform depend on your specific library. Consult your vendor documentation for more information.

1. **Use the `samd`(1M) `start` command to start the Sun StorEdge SAM-FS software:**

```
# 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 in which 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 Names (WWNs) 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

Follow the steps in 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 in which 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.

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 SAM-FS File System Configuration and Administration Guide*.

1. **Use the `samd`(1M) `start` command to start the software:**

```
# samd start
```

2. **Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the Sun StorEdge SAM-FS file system:**

```
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 format of the `samcmd`(1M) command, 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
```

```
samload eq:slot deq
```

   TABLE 3-10 shows the arguments for these commands.

TABLE 3-10 Arguments for `samcmd`(1M) `load`

Argument	Meaning
mediatype	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.
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.

   For more information about the format of the `samload`(1M) command, see the `samload`(1M) man page.

4. **Use the `mt`(1) command to determine whether the correct drive responds while under Sun StorEdge SAM-FS control:**

```
mt -f /dev/rmt/x status
```

   For *x*, specify the raw tape device entry as specified in the `mcf` file.

   CODE EXAMPLE 3-27 shows `mt`(1) command output that indicates that a tape is in the drive.

CODE EXAMPLE 3-27 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 that the order is correct in the `mcf` file, and repeat this test.

▼ To Check the Drive Order of Magneto-optical Libraries Without a Front Panel

Follow the steps in 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 in which 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.

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 SAM-FS File System Configuration and Administration Guide*.

1. **Use the `samd`(1M) `start` command to start the software:**

```
# samd start
```

2. **Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the Sun StorEdge SAM-FS file system:**

```
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 format of the `samcmd`(1M) command, 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
```

```
samload eq:slot[:partition] deq
```

TABLE 3-10 shows the arguments for these commands.

TABLE 3-11 Arguments for `samcmd`(1M) `load`

Argument	Meaning
mediatype	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.
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.

For more information about the format of the `samload`(1M) command, see the `samload`(1M) man page.

4. **Use the `dd`(1M) command to determine whether the correct drive responds while under Sun StorEdge SAM-FS control:**

```
/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 3-28 shows a status message that indicates that an optical cartridge is in the selected device.

CODE EXAMPLE 3-28 `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 3-29 shows a status message that indicates that an optical cartridge is not in the selected device.

CODE EXAMPLE 3-29 `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 cartridge did not load or if the device returned messages like those in CODE EXAMPLE 3-29, the drives might not be listed in the correct order in the `mcf` file. Make sure that the order is correct in the `mcf` file, and repeat this test.

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 to suit your site's data protection needs by creating an archiver command file to reside in `/etc/opt/SUNWsamfs/archiver.cmd`. This section 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 the efficiency and performance of the archiver increase 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.

About the `archiver.cmd` File

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 3-30 shows a simple `archiver.cmd` file that you can add to or change as needed. You should add directives only to accommodate more archive sets, copies, and VSN usage.

CODE EXAMPLE 3-30 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
# Use all available volumes
allsets sg .*
endvsns
```

CODE EXAMPLE 3-31 shows a more complex `archiver.cmd` file.

CODE EXAMPLE 3-31 An Advanced `archiver.cmd` File

```
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
#
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
```

CODE EXAMPLE 3-31 An Advanced `archiver.cmd` File *(Continued)*

```
# 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
#
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
```

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.*

Note – In software versions previous to 4U4, disk archiving was enabled in the `archiver.cmd` file using a `-disk_archive` parameter in the `params` section. This parameter is no longer used, and `archiver.cmd` files created with earlier software versions that use the `-disk_archive` parameter must be edited in order for archiving to work correctly in the 4U4 and later software. See the `archiver.cmd`(4) man page for details.

▼ To Create an `archiver.cmd` File Using File System Manager

When you create or edit an archive policy for a file system within the File System Manager interface, the `archiver.cmd` file is automatically created or edited.

Follow these steps to create a policy:

1. **From the Servers page, click the name of the server for which you want to create a policy.**

   The File Systems Summary page is displayed.

2. **Click the Archive Management tab.**

   The Archive Policies Summary page is displayed.

3. **Click New.**

   The New Archive Policy wizard is displayed.

4. **Follow the steps in the wizard.**

   For detailed instructions on using the New Archive Policy wizard, see the File System Manager online help.

   When you save the new archive policy, it is automatically written to the `archiver.cmd` file.

▼ To Create an `archiver.cmd` File Using a Text Editor

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.**

   For more information about the directives in this file, see "About the `archiver.cmd` File" on page 80.

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.**

Enabling Disk Archiving

Disk archiving is the process of writing archive copies of file data to an online disk in another file system. The file system to which the archive copies are written can be any UNIX file system; it does not have to be a Sun StorEdge SAM-FS or Sun StorEdge QFS file system. However, the host system to which archive files are written must have at least one Sun StorEdge SAM-FS or Sun StorEdge QFS 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 86. Perform this procedure on the host system that contains the files to be archived.

Note – If you are configuring a Sun StorEdge SAM-FS file system for the first time at your site and have therefore not yet installed the Sun StorEdge SAM-FS software on another host, you must write the archive copies to disk in a file system that is on the same host as the source files. If you configure a Sun StorEdge SAM-FS file system on another host at a later time, you can modify your configuration files accordingly.

- "To Enable Disk Archiving on the Host to Which the Archive Copies Will Be Written" on page 88. Perform this procedure on the host system to which the archive copies will be written. At least one Sun StorEdge SAM-FS or Sun StorEdge QFS file system must be created on this host. If you want to create source files and write archive copies to the same host system, you do not need to perform this procedure.

Note – You can use the File System Manager interface to enable disk archiving by specifying that an archive policy should archive to disk VSNs. This will automatically update both the `archiver.cmd` file and the `diskvols.conf` file. See "To Create an `archiver.cmd` File Using File System Manager" on page 84.

▼ 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 the file `/etc/opt/SUNWsamfs/archiver.cmd`.**
3. **Edit the `archiver.cmd` file to add disk archive set directives.**

   CODE EXAMPLE 3-32 shows a fragment from an `archiver.cmd` file that defines disk archive sets.

   CODE EXAMPLE 3-32 `/etc/opt/SUNWsamfs/archiver.cmd` on the Client

```
#
vsns
archset1.1 dk disk01
archset2.1 dk disk02
archset3.1 dk disk03
endvsns
```

Note – In software versions previous to 4U4, disk archiving was enabled in the `archiver.cmd` file through a `-disk_archive` parameter in the `params` section. This parameter is no longer used, and `archiver.cmd` files created with earlier software versions that contain that parameter must be edited in order for archiving to work correctly in the 4U4 and later software. See the `archiver.cmd`(4) man page for details.

   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`.**
6. **In the `diskvols.conf` file, specify the online disk directories to which the archive copies will be written.**

CODE EXAMPLE 3-33 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.

CODE EXAMPLE 3-33 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
```

As CODE EXAMPLE 3-33 shows, the `diskvols.conf` file must contain data in two fields: the `VSN_name` field and the `path` field. TABLE 3-12 shows the information that must appear in this file.

TABLE 3-12 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. If you are archiving to disk on another host, you must use this field to specify the name of the destination server that will receive the archive copies. 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. If a host name is specified, it must be followed by a colon (`:`).
`path`	The full path, relative to the mount point, to the directory that will receive the archive files. This directory must be in place before archiving can start, and the destination file system must be mounted. The path should be specified relative to the mount point. For example, if archive copies were to be written to the `vsns` directory in the `archivefs1` file system, you would specify `/archivefs1/vsns` in the `path` field. Create the destination directory with write permission granted only to `root`.

The following additional rules apply to the `diskvols.conf` file:

- You can include comments in the file by starting each comment line with a pound character (#). All text to the right of the # is ignored.
- You can continue lines. To continue a line, put an apostrophe character (') at the end.

For more information about the `diskvols.conf` file, see the `diskvols.conf`(4) man page.

7. **Save and close the `diskvols.conf` file.**
8. **Create directories in the file system to which the archive copies will be written.**

   For example:

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

9. **Use the `archiver`(1M) command with its `-lv` options to verify the correctness of the syntax in the `archiver.cmd`(4) file:**

```
# archiver -lv
```

10. **If any errors are found, correct them before proceeding.**

▼ 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. At least one Sun StorEdge SAM-FS or Sun StorEdge QFS file system must be created on the server host.

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.**

   For example:

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

4. **Use `vi`(1) or another editor to create the file `/etc/opt/SUNWsamfs/diskvols.conf`.**

   This file contains the `clients` and `endclients` directives and names the client system upon which the files to be archived reside, as shown in CODE EXAMPLE 3-34.

CODE EXAMPLE 3-34 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.**

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. You might change them to accommodate changes in your site's library information, for example. If you change the information in the `defaults.conf` file after the system is running, you must then 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 SAM-FS File System Configuration and Administration Guide*.

CODE EXAMPLE 3-35 shows lines from an example `defaults.conf` file. This file shows several parameters that can affect the configuration of an automated library.

CODE EXAMPLE 3-35 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

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 those 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`

This section describes two common features that you can control from the `defaults.conf`(4) file. For more information, 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 3-13.

TABLE 3-13 The `labels` Directive in the `defaults.conf` File

Directive	Action
`labels = barcodes`	Default. 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.
`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, is unlabeled, and has a readable barcode.

Drive Timing Values

You can set the unload and unload wait time for devices using the *dev*`_unload` and *dev*`_delay` directives, respectively. These directives enable you to set values that meet your site's requirements.

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 the number of seconds that you want the system 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`.

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 the minimum number of seconds that you want to have elapse between the time when a cartridge is loaded and the time when the same cartridge is able to be unloaded. The default is `30`.

For example:

```
hp_delay = 10
lt_unload = 7
```

Labeling Removable Media Cartridges

If you have standalone tape or optical devices, or if your automated library has no barcode reader, you must label cartridges as described in this section.

To label 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 3-14 shows the arguments for this command.

TABLE 3-14 Arguments for the `tplabel`(1M) Command

Argument	Meaning
new-vsn	The cartridge volume serial number.
eq	The Equipment Ordinal value for the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of the storage slot in an automated library as recognized in the library catalog. This argument is not applicable for manually loaded drives.

For example:

```
# tplabel -vsn TAPE01 -new 50:0
```

The `odlabel`(1M) command has the following format:

```
# odlabel -new -vsn new-vsn eq:slot:partition
```

TABLE 3-15 shows the arguments for this command.

TABLE 3-15 Arguments for the `odlabel`(1M) Command

Argument	Meaning
new-vsn	The disk volume serial number.
eq	The Equipment Ordinal value for the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of the storage slot in an automated library as recognized in the library catalog. This argument does not apply to manually loaded drives.
partition	The side of a magneto-optical disk to be labeled. The partition must be 1 or 2.

For example:

```
# odlabel -vsn OPTIC01 -new 30:1:1
```

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.

If your library uses barcodes, `labels = barcodes` is set by default, and the result is that the first six characters are used for the volume serial number (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, be unlabeled, and have a readable barcode.

Populating the Catalog

After you mount the Sun StorEdge SAM-FS file system, 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 95. 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 96. 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 96. 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 (if `access=private` is specified in the `mcf` file). Do not use this procedure if you divided the library into multiple logical libraries.
- "Quickly Populating a StorageTek ACSLS-Attached Library" on page 97. 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 3-36 shows the example file `input_vsns`.

   CODE EXAMPLE 3-36 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
```

   TABLE 3-16 shows the arguments for this command.

   TABLE 3-16 Arguments for the `build_cat`(1M) Command

Argument	Content
input-file	The name of an input file. Typically, this is a file containing a list of VSNs.
catalog-file	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 might specify the following build_cat(1M) command:

```
# build_cat input_vsns /var/opt/SUNWsamfs/catalog/grau50
```

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

▼ To Populate an Automated Library With a Small Number of Volumes

Perform this procedure for each cartridge that you want to include in the catalog. The cartridge must be physically present in the automated library for the import(1M) command to be successful. If the cartridge is not present, the entry goes into the historian.

- **Use the import(1M) command to import catalog entries into the default catalog:**

```
import -v VSN eq
```

For *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 (" ").

For *eq*, specify the Equipment Ordinal as specified for the device in the mcf file.

For example:

```
# import -v TAPE01 50
```

For more information on the import(1M) command, see the import(1M) man page.

▼ To Populate an IBM 3494 Automated Library

Use this procedure to populate an IBM 3494 automated library for which access=private is specified in the IBM 3494 parameters file.

Note – If you have an IBM 3494 library that is divided into multiple logical libraries (for which access=shared is specified in the IBM 3494 parameters file), use one of the previous methods to populate the catalog: "To Populate an Automated Library With Many Volumes" on page 95 or "To Populate an Automated Library With a Small Number of Volumes" on page 96.

- **Insert into the mail slot the media cartridge that you want to include in this library's catalog.**

  The library automatically builds a catalog that includes the media cartridge that you put into the slot.

Quickly Populating a StorageTek ACSLS-Attached Library

If you have a StorageTek 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 of populating a library catalog than the methods described in "To Populate an Automated Library With Many Volumes" on page 95 and "To Populate an Automated Library With a Small Number of Volumes" on page 96.

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

StorageTek ACSLS-Attached Automated Libraries: Common Problems and Error Messages

If errors exist in the configuration files for a 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 3-37 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 3-37 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 3-38 shows the first set.

CODE EXAMPLE 3-38 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
```

CODE EXAMPLE 3-39 shows the second set.

CODE EXAMPLE 3-39 Error Messages from a Misconfigured StorageTek Library

```
May 23 09:31:19 baggins stk-50[3854]: main: 2 drive(s) did not
initialize.
```

CODE EXAMPLE 3-40 shows the `samu`(1M) utility's `:r` display.

CODE EXAMPLE 3-40 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 3-41 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 3-41 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.

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 Network Management Protocol (SNMP) software within the software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The Sun StorEdge SAM-FS Management Information Base (MIB) defines the types of problems, or events, that the Sun StorEdge SAM-FS 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 procedures describe how to enable and disable remote notification.

▼ To Enable Remote Notification

1. **Ensure that the management station is configured and known to be operating correctly.**

   "Setting Up the Network Management Station" on page 22 describes this prerequisite.

2. **Using `vi`(1) or another editor, examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined.**

   The following sample file defines a management station with a host name of `mgmtconsole`.

```
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. **Using `vi`(1) or another editor, open the file `/etc/opt/SUNWsamfs/scripts/sendtrap` and locate the `TRAP_DESTINATION=‘hostname‘` directive.**

   This line specifies that 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 host name 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"
```

5. **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 do one of the following, depending on the community string value of your management station:

   - 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 to replace `public` with the value that is used in your management station.

6. **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. **If the file** `/etc/opt/SUNWsamfs/defaults.conf` **does not exist, use the** `cp`**(1) command to copy file** `/opt/SUNWsamfs/examples/defaults.conf` **to** `/etc/opt/SUNWsamfs/defaults.conf`**.**

2. **Using** `vi`**(1) or another editor, open the file** `/etc/opt/SUNWsamfs/defaults.conf`**, and find the line 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 and exit the file.**

5. **Use the** `pkill`**(1M) command to send a SIGHUP signal to the** `sam-fsd`**(1M) daemon.**

```
# 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.

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`.

After installing the package, you can use the `set_admin`(1M) command to add or remove the administrator group. This action performs the same function as selecting an administrator group during the package installation. 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
```

▼ To Enable 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`.

1. **Use vi(1) or another editor to open the `/etc/syslog.conf` file.**
2. **From the file `/opt/SUNWsamfs/examples/syslog.conf_changes`, locate the logging line, which is similar, if not identical, to the following:**

```
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.

The default facility is `local7`. 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.

3. **Append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to the `/etc/syslog.conf` file.**

   For example:

```
# cp /etc/syslog.conf /etc/syslog.conf.orig
# cat /opt/SUNWsamfs/examples/syslog.conf_changes >> /etc/syslog.conf
```

4. **Create an empty log file and send the `syslogd` a HUP signal.**

   For example, to create a log file in `/var/adm/sam-log` and send the HUP to the `syslogd` daemon, type the following:

```
# touch /var/adm/sam-log
# pkill -HUP syslogd
```

   For more information, see the `syslog.conf`(4) and `syslogd`(1M) man pages.

5. **(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.

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 the Sun SAM-Remote software, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.

Backing Up Data

This section describes the recommended procedures for regularly backing up important data and files in the Sun StorEdge SAM-FS environment.

About Metadata Snapshots

It is important to use File System Manager or `samfsdump`(1M) command periodically to create a metadata snapshot file.

When using the `samfsdump`(1M) command, note the following:

- The `samfsdump`(1M) command dumps file names and inode information, not data. That is, the snapshot file does not include the archive data stored in your file system. The snapshot 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, see the `samfsdump`(1M) man page.
- You can use the `-u` option to the `samfsdump`(1M) command to back up metadata and file data for files that have not yet been archived. A `samfsdump`(1M) snapshot taken using the `-u` option can be very large. Unlike `ufsdump`(1M), the `samfsdump`(1M) command does not have any tape management or estimations. 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.
- If a failure occurs after file system initialization, you can use File System Manager or the `samfsrestore`(1M) command to restore the metadata snapshot file.

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 StorEdge SAM-FS Troubleshooting Guide*.

Scheduling Automatic Metadata Snapshots

This section describes the setup procedures for issuing the `samfsdump`(1M) command automatically.

▼ To Schedule Automatic Snapshots Using File System Manager

Scheduling a metadata snapshot through the File System Manager interface is the equivalent of creating a `crontab`(1) entry that automates the Sun StorEdge SAM-FS software process.

Follow these steps to schedule a metadata snapshot:

1. **From the Servers page, click the server on which the archiving file system that you want to administer is located.**

   The File Systems Summary page is displayed.

2. **Select the radio button next to the archiving file system for which you want to schedule a metadata snapshot.**

3. **From the Operations menu, choose Schedule Metadata Snapshots.**

   The Schedule Metadata Snapshots page is displayed.

4. **Specify values on the Schedule Metadata Snapshots page.**

   For instructions on using this page, see the File System Manager online help.

5. **Click Save.**

▼ To Schedule the `samfsdump`(1M) Command Using `cron`

If you have multiple Sun StorEdge SAM-FS file systems, make similar `crontab` entries for each file system. Save each dump in a separate file.

- **Make an entry in the root user's `crontab` file so that the `cron` daemon runs the `samfsdump`(1M) command periodically.**

  CODE EXAMPLE 3-42 shows a cron(1) entry.

CODE EXAMPLE 3-42 `cron`(1) Entry to Run `samfsdump`(1M) Automatically

```
0 0 * * * find /csd.directory/sam -type f -mtime +7 \
-print| xargs -11 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`.

Creating Metadata Snapshots Manually

This section describes the setup procedures for issuing the `samfsdump`(1M) command manually.

▼ To Create a Metadata Snapshot Using File System Manager

You can create a metadata snapshot from the File System Manager interface at any time.

Before starting this procedure, make a note of the path that is specified in the Snapshot File Path field on the Schedule Metadata Snapshot page for this file system. You will need this path during the procedure.

Follow these steps to create a metadata snapshot:

1. **From the Servers page, click the server on which the file system that you want to administer is located.**

   The File Systems Summary page is displayed.

2. **Select the radio button next to the file system for which you want to create a metadata snapshot.**

3. **From the Operations menu, choose Take Metadata Snapshots.**

   The Take Metadata Snapshot pop-up window is displayed.

4. **In the Fully Qualified Snapshot File field, type the path and the name of the snapshot file that you noted from the Schedule Metadata Snapshot page.**

   Note – If you provide a different path, this snapshot file will not be displayed on the Restore File System page when you try to restore files for the file system.

   ---

5. **Click Submit.**

   For more information on creating metadata snapshots, see the File System Manager online help.

▼ To Run the `samfsdump`(1M) Command From the Command Line

1. **Use the `cd`(1) command to go to the directory that contains the mount point for the file system.**

   For example:

```
# cd /samfs1
```

2. **Use the `samfsdump`(1M) command to write the output to a file system outside of the one that you are backing up.**

   For example:

```
# samfsdump -T -u -f /dumpster/dump.file
```

Backing Up Configuration Files

The Sun StorEdge SAM-FS software 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 then restore these files from your backup copies.

The following files are among those that you should back up regularly and whenever you modify them:

- `/etc/opt/SUNWsamfs/mcf`
- `/etc/opt/SUNWsamfs/samfs.cmd`
- `/etc/opt/SUNWsamfs/archiver.cmd`

For more information on the files that you should protect, see the *Sun StorEdge SAM-FS Troubleshooting Guide*.

CHAPTER 4

Upgrade and Configuration Tasks

This chapter describes the procedures for upgrading a server to a new release of the Sun StorEdge SAM-FS software. Use these procedures if you are upgrading your Sun StorEdge SAM-FS environment. You must perform all the tasks in this chapter as superuser.

This chapter contains the following sections:

Preparing for an Upgrade

Follow the instructions in this section to prepare for a Sun StorEdge SAM-FS software upgrade.

Backing Up the File System

Back up your existing file system if the following conditions exist:

- You are currently using a version 1 superblock with a Sun StorEdge SAM-FS 4U0 system and you want to reinitialize your file systems with a version 2 superblock. In "To Reinitialize and Restore the File Systems" on page 123, you reinitialize the file systems and restore your data.

- You suspect that your current `samfsdump`(1M) file is incorrect or outdated.

The following subsections 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 110
- "To Back Up a File System" on page 111

CODE EXAMPLE 4-1 shows the `samfsinfo`(1M) command you use 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 4-1 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

Sun StorEdge SAM-FS 4U1 and later releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports Access Control Lists (ACLs).

The Sun StorEdge SAM-FS 4U1 and later 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 snapshot file created during the backup procedure.

If you are upgrading from a Sun StorEdge SAM-FS 4U0 system, note that the Sun StorEdge SAM-FS 4U0 file system allows 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 – Sun StorEdge SAM-FS 4U2 and later releases do not allow you to initialize a file system with a version 1 superblock. These more recent versions enable you to initialize file systems only with the version 2 superblock.

▼ To Back Up a File System

1. **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.

3. **Examine this command's output, and do one of the following:**

   - If you want any of these unarchived files to appear in the dump file, archive them now.
   - Use the `-u` option to the `samfsdump`(1M) command to dump unarchived data if you suspect that some files have not yet been archived. The `-u` option can create very large dump files, however, so consider space limitations when using this option.

4. **Use the `samfsdump`(1M) command to back up each Sun StorEdge SAM-FS file system's metadata. See "About Metadata Snapshots" on page 104.**

   Dump each file system's metadata to a location outside the Sun StorEdge SAM-FS file system.

   CODE EXAMPLE 4-2 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 4-2 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 StorEdge SAM-FS Troubleshooting Guide*.

Stopping the Sun StorEdge SAM-FS Software

The procedures in this section show how to halt Sun StorEdge SAM-FS operations.

▼ To Stop the File System From File System Manager

You can idle or stop archiving activity from the File System Manager software.

1. **From the Servers page, click the name of the server for which you want to control archiving activity.**

   The File Systems Summary page is displayed.

2. **Click the Archive Management tab and click the Activity Management local tab.**

   The Activity Management page is displayed.

3. **In the Archiving section of the page, select the radio button next to the option that you want to control, and click Submit Job:**

   - Idle - Stops archiving after it reaches a logical point in the process.
   - Stop - Immediately stops the archiving process.

4. **To view the progress of the archiving activity, click the Jobs tab and look for the job that you submitted.**

   For complete information about controlling archiving activity from File System Manager, see the File System Manager online help.

▼ To Stop the File System From the Command Line

1. **Use the `samcmd`(1M) `idle` command to idle each removable media drive configured in your `mcf` file.**

   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 the device as 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.

2. **If you are upgrading from a Sun StorEdge SAM-FS 4U0 system, use the `samcmd`(1M) `aridle` command to idle the archiver:**

```
# samcmd aridle
```

3. **Use the `samd`(1M) `stop` command to stop all operations.**

For example:

```
# samd stop
```

▼ To Unshare File Systems

Perform this task if your Sun StorEdge SAM-FS file systems are NFS-shared 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 File Systems

You can unmount a file system using any of the methods described in this section. After the file system is unmounted, you can proceed to "Removing the Existing Software" on page 114.

▼ To Unmount Using File System Manager

1. **From the Servers page, click the name of the server on which the file system is located.**

The File System Summary page is displayed.

2. **Select the radio button next to the file system that you want to unmount.**
3. **From the Operations menu, choose Unmount.**

▼ To Unmount Using CLI Commands

- **Use the `umount`(1M) command to 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. Before using this option, verify that all archiving operations have been completed, if possible.

  If `umount`(1M) is not successful, it might be because the files in the file system are being used or because you have used the `cd` command to change to a directory that is within the file system. In this case, follow these steps:

1. **Use the `fuser`(1M) command to determine whether 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. **Use the `umount`(1M) command to 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 the system.**

Removing the Existing Software

Use the `pkgrm`(1M) command to remove the existing software. You must remove the existing Sun StorEdge SAM-FS package before installing the new package.

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 installation script prompts you to confirm several of the removal steps.

▼ To Remove Existing Software

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.**

   The following example command removes the `SUNWsamfsu` and the `SUNWsamfsr` packages from a 4U1 release:

```
# pkgrm SUNWsamfsu SUNWsamfsr
```

Note – The `SUNWsamfsr` package must be the last package removed. The 4U1 release does not include any localized software packages.

The following example command removes the `SUNWcsamf`, the `SUNWfsamf`, the `SUNWjsamf` localized packages and the `SUNWsamfs` package from a 4U0 release:

```
# pkgrm SUNWcsamf SUNWfsamf SUNWjsamf SUNWsamfs
```

Note – The `SUNWsamfs` package must be the last package removed.

Adding the Upgrade 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 you want to continue with the installation. You can go to another window and copy the files that 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.**

   This is one of the following, depending on your release media:

   - If you downloaded the release files as described in "Obtaining the Release Files" on page 21, change to the directory to which you downloaded the files.
   - If you obtained the release files from a CD-ROM, change to the directory on the CD-ROM that corresponds to your OS version.

2. **Use the `pkgadd`(1M) command to upgrade the `SUNWsamfsr` and `SUNWsamfsu` packages.**

   For example:

   ```
   # pkgadd -d . SUNWsamfsr SUNWsamfsu
   ```

3. **In response to questions about conflicting files, enter `yes` or `y`.**

   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 wish to save to an alternate location.

4. **When prompted 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.

5. **Examine the Sun StorEdge SAM-FS log file, `/tmp/SAM_install.log`.**

   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 were 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 4U5 version of the `SUNWsamtp` package.

To Install File System Manager

File System Manager is an online interface 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.

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

1. **Ensure that you have met the installation requirements described in "Verifying Requirements for File System Manager" on page 7.**
2. **Log in to the server that you want to use as the management station.**

   This can be the same server on which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages or a different server on the same network.
3. **Become superuser.**
4. **Use the `cd`(1) command to change to the directory where the software package release files reside on your server.**
5. **Execute the `fsmgr_setup` script to start the installation process.**

   For example:

   ```
   # fsmgr_setup
   ```

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

   During the installation procedure, you are asked questions about your environment.

   The `fsmgr_setup` script automatically installs the following:

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

   The installation scripts prompt you to specify whether you want to install localized packages.

   After installing the packages, it starts the Tomcat Web Server and enables logging.
7. **Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.**

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

  CODE EXAMPLE 4-3 shows how your `.profile` file might look after editing.

CODE EXAMPLE 4-3 Finished `.profile` File

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

- 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/SUNWfsmgr/bin)
```

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

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

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

```
# 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 to start the `rpcbind` service:

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

11. **(Optional) Start the File System Manager (`fsmgmtd`) daemon.**

    If you did not choose to start the File System Manager daemon automatically during the installation process, do one of the following:

    - Enter the following command to start the File System Manager daemon and have it restart automatically every time the daemon process dies. With this configuration, the daemon also automatically restarts at system reboot.

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

    - Enter the following command if you want the File System Manager daemon to run only once and not automatically restart:

```
# /opt/SUNWsamfs/sbin/fsmadm start
```

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

12. **(Optional) Give additional users access to File System Manager.**

    When you upgrade from version 2.0 or before, the `samadmin` account from the previous software version will be preserved, but the `samuser` account will be deleted. Logging in with the `samadmin` user name and password will give you full access to all File System Manager features.

    By default, the `root` login also has privileges to perform all operations available from the File System Manager software. You can assign other users full or partial access to all File System Manager operations.

    To give an additional user access to File System Manger, see "To Add Users" on page 29 and "Assigning Privilege Levels" on page 30.

    For information about using File System Manager see "Using the File System Manager Software" on page 29, or see the File System Manager online help.

Restoring the File System

The instructions in this section cover the tasks involved in restoring the Sun StorEdge SAM-FS environment after an upgrade.

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 4-5 shows the warning message issued if these files differ.

CODE EXAMPLE 4-5 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 4-6 shows the beginning of the warning message issued if these files differ.

CODE EXAMPLE 4-6 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
```

Reinitializing and Verifying the File System

Complete the following tasks in order to reinitialize, and verify the configuration of, the Sun StorEdge SAM-FS file system.

Verifying the mcf, archiver.cmd, and stager.cmd Files

The following file exists on your Sun StorEdge SAM-FS server:

- /etc/opt/SUNWsamfs/mcf

The following additional files might 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 mcf File

1. **Enter the sam-fsd(1M) command.**
2. **Examine the output for errors, as follows:**
   - If the mcf file is free of 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 4-7.

CODE EXAMPLE 4-7 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 the mcf file has errors, refer to "Setting Up the Environment Configuration" on page 44 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 propagate the changes to the software. For information about propagating `mcf` file changes to the system, see the *Sun StorEdge SAM-FS File System Configuration and Administration Guide*.

▼ To Verify the `archiver.cmd` File

Perform this task 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.

Note – In software versions previous to 4U4, disk archiving was enabled in the `archiver.cmd` file using a `-disk_archive` parameter in the `params` section. This parameter is no longer used, and `archiver.cmd` files created with earlier software versions that use the `-disk_archive` parameter must be edited in order for archiving to work correctly in the 4U4 and later software. See the `archiver.cmd`(4) man page for details.

- **Enter the `archiver`(1M) `-lv` (lowercase L) command to verify the `archiver.cmd` file:**

```
# archiver -lv
```

The output from this command can be quite lengthy. Examine it to verify that the archiving directives are as expected. If you have questions, see "Creating the `archiver.cmd` File" on page 80, and see the `archiver.cmd`(4) man page.

▼ To Modify the `/etc/vfstab` File

Perform this task if you modified the `/etc/vfstab` file in "Unmounting File Systems" on page 113.

- **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`.**

▼ To Reinitialize and Restore the File Systems

In this task, you reinitialize the file systems and restore the saved data in the new file systems. This task completes the process initiated in "Backing Up the File System" on page 109. To accomplish this, use the `sammkfs`(1M) and `samfsrestore`(1M) commands on each file system.

Caution – The Sun StorEdge SAM-FS 4U2 and later software does not allow you to initialize a file system with a version 1 superblock. The Sun StorEdge SAM-FS 4U2 or later file system enables file systems to be initialized only with the version 2 superblock. If you are upgrading from 4U0 using version 1 superblocks, be aware that using a 4U2 or later `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock.

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

   The output tells you the DAU size that was specified with the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. You will use this DAU size in Step 2.

2. **Use the `sammkfs`(1M) command to initialize a new Sun StorEdge SAM-FS file system.**

   The following example command reinitializes a file system named `samfs1` with a DAU size of 512 kilobytes:

   ```
   # sammkfs -a 512 samfs1
   ```

   For more information about the options to the `sammkfs`(1M) command, see the `sammkfs`(1M) man page.

3. **Use File System Manager or the `samfsrestore`(1M) command to restore the dumped data in the new file system.**

   For example, suppose you had a file system named `samfs1` (mounted at `/samfs1`) that you wanted to restore from files dumped to `samfs1.bak`, which existed outside of the Sun StorEdge SAM-FS file system. In this case, you would issue the following commands:

   ```
   # cd /samfs1
   # samfsrestore -f /save/samfs/samfs1.bak
   ```

▼ To Check the File System

Perform this task if you did not reinitialize and restore the file system as just described.

- **Use the `samfsck`(1M) command to check your existing file systems for inconsistencies.**

Mounting the File System

You can mount the Sun StorEdge SAM-FS file system using File System Manger or the CLI.

▼ To Mount the File System Using File System Manager

1. **From the Servers page, click the name of the server on which the file system is located.**

   The File System Summary page is displayed.

2. **Select the radio button next to the file system that you want to mount.**

3. **From the Operations menu, choose Mount.**

▼ To Mount the File System Using the CLI

- **Issue the `mount`(1M) command.**

  In the following example, `samfs1` is the name of the file system to be mounted:

```
# mount samfs1
```

Recompiling API-Dependent Applications

File headers, the calling sequence, and other elements of the Sun StorEdge SAM-FS application programming interface (API) can change from release to release. If you are running applications the use the API, you should recompile them all at this time.

Caution – Failure to recompile API-dependent applications at this point can cause your applications to generate unexpected results.

Upgrading Hardware

The following sections describe the steps that must be taken when upgrading the hardware in a Sun StorEdge SAM-FS environment.

Preparing for a Hardware Device Upgrade

Whether upgrading a server, adding a new tape drive, adding an automated library, or installing a different drive into an existing automated library, it is best to plan in advance. This section prepares you for hardware upgrades to devices within your environment.

General Prerequisites

Before starting the upgrade process, be sure to do the following:

- Determine whether the hardware addition or change requires a software upgrade from Sun Microsystems.

  Examples of changes that do not require a software upgrade include additions to memory and increases in disk cache. Examples of changes that require a software upgrade include changes to the class of your server or significant increases in storage capacity.
- If you are switching from a SPARC to an AMD server platform (or from AMD to SPARC), you must take precautions to prevent loss of data. See "Switching Between SPARC and AMD Platforms" on page 126 for details.
- Read the hardware manufacturer's installation instructions carefully. Also read the documentation on adding hardware in your Solaris OS system administrator documentation.
- Check the Equipment Ordinal values in your old and new `mcf` files. For information about the `mcf` file, see the `mcf`(4) man page.
- Decide whether the backup copies you have on hand are sufficient. For information about backing up your data and metadata, see "Backing Up the File System" on page 109.

- In Sun StorEdge SAM-FS environments, the `samfsdump`(1M) command dumps all metadata. You must ensure that all files that need to be archived have an archive copy. Use the `archive_audit`(1) command on each Sun StorEdge SAM-FS file system to see which files do not have an archive copy. In the following example, `/sam` is the mount point.

```
# archive_audit /sam
```

- Ensure that the system is quiet, with no users logged in.
- Ensure that the archiver is in `wait` mode. The archiver must be in `wait` mode, and not running, during an upgrade.

  You can idle the archiver in one of the following ways:

  - By inserting a `wait` directive into the `/etc/opt/SUNWsamfs/archiver.cmd` file. For more information about the `wait` directive and the `archiver.cmd` file, see the `archiver.cmd`(4) man page.
  - By using the `samu`(1M) operator utility.
  - By issuing the following command:

```
# samcmd aridle
```

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

Switching Between SPARC and AMD Platforms

The following are some important considerations if you are combining or changing between SPARC and x86 hardware platforms:

- Sun StorEdge QFS and Sun StorEdge SAM-FS software is supported only for the Solaris 10 OS on x64 platforms (AMD64 architecture), not for the EM64T architecture. With the exception of the Sun StorEdge QFS shared Linux client, it is also not supported for any 32-bit x86 architectures.
- All functionality that is supported by Sun StorEdge QFS and Sun StorEdge SAM-FS on the SPARC platform is also supported on the x64 platform except for the following:
  - The ADIC/Grau, Fujitsu LMF, IBM3494, and Sony network attached libraries are not supported on x64 platforms. StorageTek (STK) ACSLS-attached automated libraries are supported on x64 platforms.
  - Optical (MO and UDO) storage libraries and drives are not supported on x64 platforms.
  - SANergy software is not supported on x64 platforms.

- The multireader file system mount options are not supported in mixed architecture environments (SPARC and x64).

- EFI labels are required on all shared disks if your Sun StorEdge QFS shared file system configuration contains both the Solaris 10 OS on x64 platforms and the Solaris 9 or Solaris 10 OS on SPARC platforms. See "Configuring EFI Labels for Shared x64 and SPARC Volumes" on page 128 for information on relabeling disks.
- You can add Sun StorEdge QFS shared file system Linux clients to Solaris SPARC configurations that are using SMI VTOC8 disk labels and to Solaris AMD64 configurations that are using SMI VTOC16 disk labels. You can also add Sun StorEdge QFS shared file system Linux clients to these configurations when they are using EFI disk labels, but you may need to rebuild the Linux kernel for this capability. This is dependent on the particular Linux distribution. See the Linux README on the Sun StorEdge QFS Linux client software CD for more details.
- You must exercise caution when accessing the same SAN attached storage from a Solaris environment on both SPARC and x64 platforms. The Solaris OS on x64 platforms cannot interpret the SMI VTOC8 disk label created by the Solaris OS on SPARC platforms, and the Solaris OS on SPARC platforms cannot interpret the SMI VTOC16 disk label created by the Solaris OS on x64. This can make it appear as though a disk is unlabeled, when in fact it is labeled and in use by a platform of a different architecture type. For example, a disk that is labeled with SMI VTOC8 may have mounted partitions in use by Solaris on a SPARC platform, but will appear as unlabeled when viewed with the `format`(1M) partition command by Solaris on an x64 platform. If you make the mistake of running `fdisk`(1M) as prompted by the `format`(1M) command, you will destroy the contents of that disk.
- You cannot change the architecture type of the server responsible for control of the file system metadata operations (i.e. the server that was used to create the file system with the `sammkfs`(1M) command). For a Sun StorEdge QFS standalone file system, this means that you cannot mount the file system on a server that has a different architecture type from the one that created it. For a Sun StorEdge QFS shared file system, this means that you cannot change the architecture type of the metadata server or any potential metadata servers. This is because the different architectures use different byte-ordering schemes (endianness). However, you can migrate data from one architecture type to the other by copying the file system to temporary storage using either `qfsdump`(1M) or `samfsdump`(1M), re-creating the file system using `sammkfs`(1M), and then repopulating the file system with `qfsrestore`(1M) or `samfsrestore`(1M).
- The Sun StorEdge Traffic Manager I/O multipathing feature (MPxIO) is disabled by default for the Solaris 9 OS and 10 OS on the SPARC platform and enabled by default for the Solaris 10 OS on x64. This feature should be configured the same way for all systems in your Sun StorEdge QFS shared file system configuration. It is configured in `/kernel/drv/scsi_vhci.conf` for the Solaris 9 OS and in `/kernel/drv/fp.conf` for the Solaris 10 OS.

- In a Sun StorEdge QFS shared file system environment, a configuration error will be generated if you have potential metadata servers of different architecture types (SPARC and x64) defined in the `/etc/opt/SUNWsamfs/hosts.fs` file.

Configuring EFI Labels for Shared x64 and SPARC Volumes

Caution – Relabeling a disk will destroy the contents of that disk.

Use the Solaris `prtvtoc`(1M) command to determine whether a disk contains SMI or EFI labels. Under the Dimensions section of the output, SMI labels list the number of accessible cylinders, whereas EFI labels list the number of accessible sectors.

To convert disk labels from the default SMI VTOC8 to EFI, copy the file system to temporary storage using `qfsdump`(1M) or `samfsdump`(1M), relabel the disks with EFI labels using the Solaris `format -e` command, re-create the file system using `sammkfs`(1M), and repopulate the file system with `qfsrestore`(1M) or `samfsrestore`(1M).

When using the Solaris `format -e` command to create EFI labels, you can select the partition command from the menu to create and modify partitions (slices). When doing this, you must specify a tag id name of `usr`, rather than `stand` or `unassigned`, for EFI labels.

Note that EFI labels reserve the first 34 sectors, which misaligns Sun RAID-5 storage from a performance perspective. Unless you realign the storage, you will incur a RAID-5 read/modify/write performance penalty when writing. You can avoid this performance penalty by selecting the proper starting sector for all disk partitions for your particular storage configuration. For example, an 8+P Sun StorEdge T3 array with a 64K block size should have starting sectors that are multiples of 1024 for all disk slices ((8 * 64 * 1024) / 512 = 1024). Similarly, a 5+P Sun StorEdge FC 3510 array with a 128K block size should have starting sectors that are multiples of 1280 for all disk slices ((5 * 128 * 1024) / 512 = 1280).

Verifying Drive Order

When the Sun StorEdge SAM-FS system is initialized after the addition of a new library, it recognizes that the number of slots in the automated library has changed. The system runs a full audit on the automated library to update the library catalog. A full audit must be completed before archiving is resumed.

If there are problems in the audit, the most likely reason is that the ordering of the drives in the automated library does not match the ordering in the `/etc/opt/SUNWsamfs/mcf` file.

Drives have two attributes: the SCSI target ID and the position in the automated library. Both of these attributes must be correct both before and after the upgrade.

The automated library calls the drives by position number. When the system wants to load a cartridge into a drive, it must, for example, send a command to the automated library to load a cartridge from slot 123 into drive 3.

Drive 3 might be SCSI target 6 based on the third `mcf` entry. The system knows it is drive 3 because it is the third drive entry in the `mcf` file. The automated library knows that it is drive 3 because of the physical location it occupies in the automated library.

After the automated library receives a request to load the cartridge into the drive, the system tests the drive for unit ready status. Here, the system uses the SCSI target ID as defined in the `/dev/samst/`*scsi-target* entry in the `mcf` file. Therefore, it is important that the file entry match the drive that was just loaded with the cartridge.

Usually, the manufacturer ships the automated library with ascending SCSI IDs on the drives. If you cannot determine a drive number, you can use the `samu`(1M) utility's `:load` command to load a cartridge, and then watch the `samu`(1M) utility's `s` display to see which drive shows the `r`, rather than the `p`, in the status flags of the `t` display.

Performing Hardware Upgrades

This section describes how to upgrade the hardware within your existing Sun StorEdge SAM-FS environment. The following topics are presented:

▼ To Add Slots in an Automated Library

To increase the number of cartridge slots managed by the Sun StorEdge SAM-FS system, follow these steps.

1. **Use the `samcmd`(1M) `unload` command to unload the library catalog:**

```
samcmd unload eq
```

For *eq*, specify the Equipment Ordinal of the automated library as defined in the `mcf` file. This command moves the library catalog entries into the historian catalog and preserves the catalog information for each cartridge.

After this command executes, you can use samu(1M) v display to observe the automated library's v display become empty and the historian's v display fill up with the VSNs that used to be in the automated library.

2. **Stop Sun StorEdge SAM-FS operations.**

   For instructions, see "Stopping the Sun StorEdge SAM-FS Software" on page 112.

3. **Power off the host system and the library according to the manufacturer's suggested procedure.**

4. **Have the library hardware engineer add slots to the automated library.**

5. **Power on the host system using your normal startup procedure.**

6. **Start the Sun StorEdge SAM-FS system.**

   For instructions, see "Reinitializing and Verifying the File System" on page 121.

▼ To Replace or Upgrade a Library

Before disconnecting one automated library and installing a different automated library, prepare for the upgrade as described in "Preparing for a Hardware Device Upgrade" on page 125.

1. **Use the samcmd(1M) command to unload the library catalog:**

```
samcmd unload eq
```

   For *eq*, specify the Equipment Ordinal of the automated library as defined in the mcf file. This command moves the library catalog entries into the historian catalog and preserves the catalog information for each cartridge.

   After this command executes, you can use samu(1M) v display to observe the automated library's v display become empty and the historian's v display fill up with the VSNs that used to be in the automated library.

2. **(Optional) Update the /etc/opt/SUNWsamfs/inquiry.conf file.**

   The new library should be identified in this file by the vendor, the automated library model, and a Sun StorEdge SAM-FS internal name.

   For example, the released inquiry.conf file includes the following line:

```
"HP",   "C1710T",  "hpoplib"   # HP optical library
```

   This line indicates that if the system detects a SCSI device made by vendor HP of model C1710T, the system drives it as an hpoplib. The first two fields (vendor/product) are returned from the hardware devices. The last field, hpoplib,

is a name that the system uses internally to determine how to communicate with the device. If the `inquiry.conf` file needs to be changed, the change does not become effective until the `sam-amld` daemon is restarted.

3. **Save the current `/etc/vfstab` file as `/etc/vfstab.cur`.**
4. **Edit the `/etc/vfstab` file to change any Sun StorEdge SAM-FS mounts from `yes` to `no`.**
5. **Save the `/etc/opt/SUNWsamfs/archiver.cmd` file as `archiver.cmd.cur`.**
6. **Edit the `/etc/opt/SUNWsamfs/archiver.cmd` file to add a `wait` directive as the first line.**
7. **Power off the host system and peripherals using the manufacturer's suggested procedure.**
8. **Disconnect the automated library.**
9. **Attach the connecting cable to the new automated library.**
10. **Power on the peripherals and the host system using the suggested power-on sequence.**
11. **Use the following command to verify that the host system identifies the new automated library:**

```
> probe-scsi-all
```

Make sure that the new automated library and its drives are displayed before you proceed. If these devices are not identified, the automated library and its drives probably have a connection problem.

12. **Issue the following command to boot the system with the new configuration:**

```
> boot -rv
```

13. **If the target numbers of the drives or automated library changed, or if the ordering or number of the drives in the automated library changed, modify the `/etc/opt/SUNWsamfs/mcf` file to reflect the new configuration.**
14. **If you are adding new equipment, create new `/dev/samst` entries by using the following command:**

```
# samdev
```

15. **Initialize the Sun StorEdge SAM-FS system by mounting the file system or by issuing the following command:**

```
# samd start
```

The system runs an audit on the library to update the library catalog. If the audit completes without problems, proceed to the next step. If there are problems in the audit, see "Verifying Drive Order" on page 128.

16. **Replace the** `/etc/vfstab` **and** `/etc/opt/SUNWsamfs/archiver.cmd` **files with the pre-upgrade versions.**

Use the saved `/etc/vfstab.cur` and `/etc/opt/SUNWsamfs/archiver.cur` files, respectively.

17. **Reboot the system to ensure that no errors exist in the configuration.**

Upgrading DLT Tape Drives

To take advantage of high-density and fast tape technology, you can upgrade DLT tape drives in an automated library or a standalone tape drive. For example, you can move from DLT 4000 drives to DLT 7000 drives.

In a Sun StorEdge SAM-FS environment, this is a matter of adding the new drive, rebooting the new configuration, and updating the `mcf` file as necessary before starting the Sun StorEdge SAM-FS software.

Note the following restrictions and general information before upgrading drives:

- Sun StorEdge SAM-FS environments do not support mixed DLT tape drives within the same direct attached automated library. For example, a Sun StorEdge SAM-FS system cannot differentiate between a DLT 4000 tape drive and a DLT 7000 tape drive in the same automated library. Therefore, you should plan on replacing all the DLT drives with the new drives at the same time.
- Low-density tapes can coexist with high-density tapes and tape drives. You can continue to read and write to the low-density tapes using a high-density drive.
- To take full advantage of the high-density DLT tapes, you might want to recycle existing files and migrate them to a high-density tape. You can accomplish this by marking all the low-density tapes as read-only and then marking these tapes to be recycled. For information on recycling tape, see the *Sun StorEdge SAM-FS Storage and Archive Management Guide*.
- As each tape is labeled, the density of the tape is acknowledged and recorded in the library catalog.

▼ To Upgrade Tape Drives

1. **If you determine that your current dump files are not sufficient, perform a** `samfsdump`**(1M) on your file systems.**

2. **Update the** `/kernel/drv/st.conf` **file to identify the new drives.**

   The tape drives are identified in this file by the vendor, the tape model, and a Sun StorEdge SAM-FS internal name. For example, the released `st.conf` file contains the following line:

   ```
   "QUANTUM DLT7000", "DLT 7000 tape drive",   "dlt7-tape"
   ```

   An example file is provided in `/opt/SUNWsamfs/examples/st.conf_changes`. You can read in the entire file to `/kernel/drv/st.conf`, or you can merge the necessary changes. For more information on updating the `st.conf` file, see "Configuring Storage Devices" on page 33.

3. **Power off the host system and peripherals using the manufacturer's suggested procedure.**

4. **Replace the tape drives with the new drives.**

5. **Power on the peripherals and host system using the suggested power-on sequence.**

6. **Use the following command to verify that the host system identifies the new drives:**

   ```
   > probe-scsi-all
   ```

   Make sure that the automated library and the new drives are displayed before you proceed. If these devices do not appear, a connection problem probably exists.

7. **Issue the following command to boot the system with the new configuration:**

   ```
   > boot -rv
   ```

8. **If the target numbers of the drives or the ordering or number of the drives in the automated library have changed, modify the** `/etc/opt/SUNWsamfs/mcf` **file to reflect the new configuration.**

9. **(Optional) Create new `/dev/samst` entries for the new equipment by using the following command:**

```
# samdev
```

10. **Start your Sun StorEdge SAM-FS system.**

11. **Mount the file systems.**

    You can now continue to use the existing Sun StorEdge SAM-FS tapes.

Upgrading the Solaris OS

The following section describes how to upgrade the Solaris OS when running the Sun StorEdge SAM-FS software.

▼ To Upgrade the Solaris OS in a Sun StorEdge SAM-FS Environment

Many of the steps involved in upgrading your Solaris OS level are identical to the steps involved in upgrading your Sun StorEdge SAM-FS environment.

1. **Obtain the Sun StorEdge SAM-FS and Solaris OS software upgrades.**

   Sun StorEdge SAM-FS software supports various levels of the Solaris OS. You should not reinstall your old Sun StorEdge SAM-FS software on your newly upgraded Solaris OS unless you are sure they are compatible.

   Contact your application service provider or Sun Microsystems to obtain new copies of the software.

2. **Back up all site-customized system files and configuration files.**

   These files include `mcf`, `archiver.cmd`, `defaults.conf`, `samfs.cmd`, `inquiry.conf`, and so on. Back up these files for all file systems in your Sun StorEdge SAM-FS environment.

3. **Ensure that each affected file system is backed up.**

   The file systems should be backed up regularly according to your site's policies as described in "Backing Up Data" on page 104. If you are comfortable with the backup files that already exist for your file systems, there is no need to back them up again now.

The samfsdump(1M) command issues warnings when creating the dump file if it encounters unarchived files in the file system. If warnings are issued, you must archive these files before unmounting the file systems.

4. **Unmount the file systems.**

   For instructions, see "Unmounting File Systems" on page 113.

5. **Issue the** samd**(1M)** stop **command to stop all archiving and Sun StorEdge SAM-FS activity:**

```
# samd stop
```

6. **Remove the existing Sun StorEdge SAM-FS software.**

   You must remove all existing Sun StorEdge SAM-FS packages before installing either the new packages or the new operating system level. For instructions see "Removing the Existing Software" on page 114.

7. **Upgrade the Solaris OS.**

   Install the new Solaris OS revision using the corresponding Sun Solaris upgrade procedures.

8. **Add the upgrade packages that you obtained in Step 1.**

   The Sun StorEdge SAM-FS software packages use the Solaris OS packaging utilities for adding and deleting software. You must be logged in as superuser to make changes to software packages. The pkgadd(1M) command prompts you to confirm various actions necessary to upgrade the Sun StorEdge SAM-FS package. For instructions, see "Adding the Upgrade Packages" on page 115.

9. **(Optional) Update the** mcf **file.**

   If device names have changed, it might be necessary to update the mcf file to match the new device names. Verify the new device names, and then follow the procedure in "Restoring the File System" on page 120.

10. **If your** /etc/vfstab **file does not have** yes **in the Mount at Boot field, mount the file systems.**

    Use the procedure described in "Mounting the File System" on page 124.

APPENDIX **A**

Release Package Contents

This appendix describes the content of the release packages and shows the directories and files that the software creates when it is installed.

This appendix contains the following sections:

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 on which you will be installing the Sun StorEdge SAM-FS software.

TABLE A-1 shows the release packages.

TABLE A-1 Release Packages

Installed Package	Description
`SUNWqfsr, SUNWqfsu`	Sun StorEdge QFS software packages
`SUNWsamfsr, SUNWsamfsu`	Sun StorEdge SAM-FS software packages
`SUNWfsmgrr, SUNWfsmgru`	File System Manager software packages

The releases are identified using characters arranged in the following format:

major `U` *update*`.`*patch*

The "U" in this format stands for "update."

In the patch number field, a number between 1 and 99 indicates a patch release and a letter from A through Z indicates pre-release software. The base release of a first feature release of a major release might not contain a patch level.

For example:

- 4U0 is release 4, update 0, a major release with no minor release revisions and no bug fixes.
- 4U2 is release 4, update 2, a minor release.
- 4U2.1 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 SAM-FS product. 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 A-2 lists the directories created when the Sun StorEdge SAM-FS software packages are installed.

TABLE A-2 Directories Created

Directory	Content
`/dev/samst`	Device driver special files.
`/etc/fs/samfs`	Commands specific to Sun StorEdge QFS and Sun StorEdge SAM-FS software.
`/etc/opt/SUNWsamfs`	Configuration files.
`/etc/opt/SUNWsamfs/scripts`	Site-customizable scripts.
`/opt/SUNWsamfs/bin`	User command binaries.
`/opt/SUNWsamfs/client`	Files for remote procedure call API client.
`/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.
`/opt/SUNWsamfs/examples`	Various example configuration files.
`/opt/SUNWsamfs/include`	API include files.

TABLE A-2 Directories Created *(Continued)*

Directory	Content
/opt/SUNWsamfs/lib	Relocatable libraries.
/opt/SUNWsamfs/man	man(1) pages.
/opt/SUNWsamfs/mibs	Standard MIB files and product MIB (SUN-SAM-MIB.mib).
/opt/SUNWsamfs/sbin	System administrator commands and daemon binaries.
/opt/SUNWsamfs/sc	Sun Cluster binaries and configuration files.
/opt/SUNWfsmgr/bin	File System Manager administrator commands.
/opt/SUNWfsmgr/doc	File System Manager online documentation repository.
/var/opt/SUNWsamfs	Device catalogs, catalog trace file, log files, and archiver data directory and queue files.

Files Created at Installation

TABLE A-3 lists miscellaneous files created when the Sun StorEdge SAM-FS software is installed.

TABLE A-3 Files Created - Miscellaneous

File	Description
/etc/opt/SUNWsamfs/inquiry.conf	Vendor and product identification strings for recognized SCSI devices.
/etc/sysevent/config/SUNW,SUNWsamfs,sysevent.conf	Solaris system event handler configuration file.
/kernel/drv/amd64/samaio	File system asynchronous I/O pseudo-driver (64-bit version for x64 platforms).
/kernel/drv/amd64/samioc	Sun Solaris 64-bit file system interface module (for x64 platforms).
/kernel/drv/amd64/samst	Sun StorEdge SAM-FS driver for SCSI media changers and optical drives for tape drives (64-bit version for x64 platforms).
/kernel/drv/samaio.conf	Configuration file for samaio.
/kernel/drv/samaio	File system 32-bit asynchronous I/O pseudo-driver (not present under Solaris 10).
/kernel/drv/samioc.conf	Configuration file for the samioc module.
/kernel/drv/samioc	Sun Solaris 32-bit file system interface module (not present under Solaris 10).

TABLE A-3 Files Created - Miscellaneous *(Continued)*

File	Description
/kernel/drv/samst.conf	Configuration file for the samst driver.
/kernel/drv/samst	Driver for SCSI media changers and optical drives for tape drives (not present under Solaris 10).
/kernel/drv/sparcv9/samaio	File system asynchronous I/O pseudo-driver (64-bit version for SPARC platforms).
/kernel/drv/sparcv9/samioc	Sun Solaris 64-bit file system interface module (for SPARC platforms).
/kernel/drv/sparcv9/samst	Sun StorEdge SAM-FS driver for SCSI media changers and optical drives for tape drives (64-bit version for SPARC platforms).
/kernel/fs/amd64/samfs	Sun Solaris 64-bit file system module for the x64 platform.
/kernel/fs/samfs	Sun Solaris 32-bit file system module (not present under Solaris 10 SPARC).
/kernel/fs/sparcv9/samfs	Sun Solaris 64-bit file system module for SPARC platforms.
/var/log/webconsole/host.conf	File System Manager configuration file.
/var/opt/SUNWsamfs/faults	Faults history file.
/var/sadm/samqfsui/fsmgr_uninstall	Software for removing File System Manager and its supporting applications.

Note – The 32-bit modules are not distributed for Solaris 10 packages on a SPARC platform.

The Sun StorEdge SAM-FS file system has dynamically loadable components that are stored in the Sun Solaris /kernel directory (see TABLE A-3). 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 SAM-FS software is installed, it creates files that it uses for fault notification. TABLE A-4 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 File System Manager software.

TABLE A-4 Files Created - Fault Notification

File	Description
/etc/opt/SUNWsamfs/scripts/sendtrap	Sends trap information.
/opt/SUNWsamfs/sbin/fault_log	Records faults.
/opt/SUNWsamfs/sbin/tapealert_log	Records tapealert(1M) faults.
/opt/SUNWsamfs/sbin/tapealert_trap	Sends tapealert(1M) traps.

The software creates the files listed in TABLE A-4 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 SAM-FS software uses these site files.

Note – Your site's configuration files must contain ASCII characters only.

There is only one site file that you are required to create at your site in order to use the Sun StorEdge SAM-FS software. It is the master configuration (mcf) file /etc/opt/SUNWsamfs/mcf. For more information about this file, see the mcf(4) man page.

You might also create the files shown in TABLE A-5, depending on the software packages you install and the features you use.

TABLE A-5 Optional Site Files

File	Description
/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*.
/etc/opt/SUNWsamfs/defaults.conf	Miscellaneous default values. For more information, see the defaults.conf(4) man page.

TABLE A-5 Optional Site Files *(Continued)*

File	Description
`/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*.
`/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*.
`/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*.
`/etc/opt/SUNWsamfs/samfs.cmd`	File system mount parameter command file. For more information, see the `samfs.cmd`(4) man page.

Modified System Files

During installation, the Sun StorEdge SAM-FS software adds information to certain Sun Solaris system files. These system files are ASCII text files. The Solaris OS uses these files to identify loadable kernel modules by number rather than by name.

The Sun StorEdge SAM-FS software adds information to the following files:

- `/etc/name_to_major` – The Sun StorEdge SAM-FS software uses this file to map drivers to major numbers. The `samst` and `samrd` major numbers can vary, depending on the major numbers in use by the Solaris OS. The system adds the following lines to this file:

```
samst 63
samrd 64
samioc 236
samaio 237
```

- `/etc/security/auth_attr` – This file is the authorization description database. The system adds the following lines to this file:

```
# File System Manager Authorizations
com.sun.netstorage.fsmgr.config:::File System Manager All Access::
com.sun.netstorage.fsmgr.operator.media:::File System Manager Media
Related Operation Access::
com.sun.netstorage.fsmgr.operator.sam.control:::File System Manager
Start/Stop/Idle Archiving Access::
com.sun.netstorage.fsmgr.operator.file:::File System Manager File
LevelOperation Access::
com.sun.netstorage.fsmgr.operator.filesystem:::File System Manager
FileSystem Level Operation Access::
```

- `/etc/user_attr` – This file is the extended user attributes database used by File System Manager. The system adds the text shown in bold to this file:

```
root::::profiles=Web Console Management,All;auths=
Solaris.*,solaris.grant,com.sun.netstorage.fsmgr.*;
lock_after_retries=no
```

- `/etc/inittab` – The system adds the following lines to this file:

```
sf:023456:respawn:/usr/lib/fs/samfs/sam-fsd
```

  Depending on the software configuration, the system might also add the following lines to `/etc/inittab`:

```
sfad:3:respawn:/opt/SUNWsamfs/sbin/fsmgmtd
```

APPENDIX **B**

Uninstalling the File System Manager Software

This appendix tells you how to uninstall the File System Manager software.

For instructions on uninstalling the Sun StorEdge SAM-FS packages, see "Removing the Existing Software" on page 114.

Follow these steps to uninstall the File System Manager software:

1. **Log in to the server on which File System Manager software is installed.**

   This is the host on which you ran the `fsmgr_setup` script at installation time.

2. **Become superuser.**

3. **Issue the following command to remove the File System Manager software and all the applications that were installed with it:**

```
# /var/sadm/samqfsui/fsmgr_uninstall
```

   This script prompts you to confirm removal of the Tomcat Web Server, JRE packages, and information pertaining to administrator and user accounts.

APPENDIX **C**

Command Reference

The Sun StorEdge SAM-FS environment consists 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 SAM-FS software distribution.

The Sun StorEdge SAM-FS commands operate in conjunction with the standard UNIX file system commands. All the commands are documented in UNIX `man`(1) pages.

This appendix contains the following sections:

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
`archive`(1)	Archives files and sets archive attributes on files.
`release`(1)	Releases disk space and sets release attributes on files.
`request`(1)	Creates a removable media file.
`sdu`(1)	Summarizes disk usage. The `sdu`(1) command is based on the GNU version of the `du`(1) command.
`segment`(1)	Sets segmented file attributes.
`setfa`(1)	Sets file attributes.
`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.
`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.
`squota`(1)	Reports quota information.
`ssum`(1)	Sets the `checksum` attributes on files.
`stage`(1)	Sets `stage` attributes on files and copies offline files to disk.

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
`fsmadm`(1M)	Starts or stops the `fsmgmtd` daemon.
`fsmgr_setup`(1M)	Installs or upgrades the File System Manager software.
`samcmd`(1M)	Executes one `samu`(1M) operator interface utility command.
`samd`(1M)	Starts or stops robotic and removable media daemons.
`samexplorer`(1M)	Generates a Sun StorEdge SAM-FS diagnostic report script.
`samset`(1M)	Changes Sun StorEdge SAM-FS settings.
`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 enables the operator to control automated libraries.

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
`mount`(1M)	Mounts a file system. The man page name for this command is `mount_samfs`(1M).
`sambcheck`(1M)	Lists block usage for a file system.
`samchaid`(1M)	Changes the `file admin set ID` attribute. This command is used with quotas.
`samfsck`(1M)	Checks and repairs metadata inconsistencies in a file system and reclaims allocated, but unused, disk space.

TABLE C-3 File System Commands *(Continued)*

Commands	Description
samfsconfig(1M)	Displays configuration information.
samfsdump(1M) samfsrestore(1M)	Creates or restores a dump file of the metadata associated with a Sun StorEdge SAM-FS file system.
samfsinfo(1M)	Displays information about the layout of a Sun StorEdge SAM-FS file system.
samfstyp(1M)	Determines the Sun StorEdge SAM-FS file system type.
samgrowfs(1M)	Expands a file system by adding disk devices.
sammkfs(1M)	Initializes a new file system from disk devices.
samncheck(1M)	Returns a full directory path name, given the mount point and inode number.
samquota(1M)	Reports, sets, or resets quota information.
samquotastat(1M)	Reports on active and inactive file system quotas.
samtrace(1M)	Dumps the trace buffer.
samunhold(1M)	Releases SANergy file holds.
trace_rotate(1M)	Rotates trace files.

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. This command can also be used to 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.

TABLE C-4 Automated Library Commands *(Continued)*

Command	Description
`import`(1M) `samexport`(1M)	Imports or exports a cartridge 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.
`odlabel`(1M)	Labels optical disks for use with the Sun StorEdge SAM-FS system.
`samdev`(1M)	Adds `/dev/samst` logical device entries. This command is 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.
`reserve`(1M) `unreserve`(1M)	Reserves and unreserves volumes.
`showqueue`(1M)	Displays the content of an archiver queue file.

Specialized Maintenance Commands

TABLE C-6 summarizes the various maintenance commands that 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.
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 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 tape alert 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 File System Manager to perform basic operations. TABLE C-8 summarizes the operational tools.

TABLE C-8 Operational Utilities

GUI Tools	Description
File System Manager	Provides a web-based graphical user interface to the Sun StorEdge SAM-FS software. You can use this interface to configure, control, monitor, and reconfigure the components of your Sun StorEdge SAM-FS environment. For information on installing File System Manager, see "To Install the File System Manager Software" on page 26. For information on using the File System Manager, see its online help.
`samu`(1M)	Provides the starting point for accessing the `samu`(1M) operator utility.

APPENDIX **D**

mcf File Examples

This appendix contains some specific examples of `mcf` files for complex Sun StorEdge SAM-FS environments.

This appendix contains the following sections:

Example Sun StorEdge SAM-FS Configuration

For the examples in this appendix, assume that the following equipment is to be included in the 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 D-1.

TABLE D-1 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 D-2.

TABLE D-2 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 D-3.

TABLE D-3 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 D-1 shows the output from the Sun Solaris `format`(1M) command. It reports how the disks are partitioned.

CODE EXAMPLE D-1 `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

Follow these steps first for the `samfs1` file system and then for the `samfs2` file system.

1. **Make an `ms` (mass storage) entry for the file system.**

   The `ms` entry is the Equipment Identifier for a Sun StorEdge SAM-FS file system.

   You will use the name of the file system later when writing the `/etc/vfstab` entry for the file system and creating the file system.

Note – 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 for the file system member devices.**

   CODE EXAMPLE D-2 shows the `mcf` with the file systems defined.

CODE EXAMPLE D-2 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 – Be sure to specify disk partitions that are not in use on your system. Do not use overlapping partitions. If you give the wrong partition names when initializing any type of file system, you risk damaging user or system data.

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 D-3 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.

CODE EXAMPLE D-3 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:**

```
# ls -l | grep "samst@2"
```

   The `ls`(1) command searches for a symbolic link that points to the hardware path shown in CODE EXAMPLE D-4.

CODE EXAMPLE D-4 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. **Open the** `/etc/opt/SUNWsamfs/mcf` **file, and add the following entry for the drive:**

```
/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 D-5 shows these messages.

CODE EXAMPLE D-5 `/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 D-6 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 D-5.

CODE EXAMPLE D-6 `ls`(1) and `grep`(1) Commands Used to Find Symbolic Links for the Devices in CODE EXAMPLE D-5

```
# 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"
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. **Open the `/etc/opt/SUNWsamfs/mcf` file, and add the following entries for the library and 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`).

Caution – The order of drives as specified in the `mcf` file must match the logical order of the drives in a SCSI-attached automated library. For more information, see "Checking the Drive Order" on page 74, or refer to your hardware documentation. 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. DLT drives are not part of the standard Sun Solaris configuration, and the software does not recognize them if they are configured incorrectly. For more information, see "Configuring Storage Devices" on page 33.

▼ To Configure the DLT Drive

1. **Examine the `/var/adm/messages` file to find the messages for these devices.**

   CODE EXAMPLE D-7 shows the `/var/adm/messages` file lines that refer to the manual DLT drive.

CODE EXAMPLE D-7 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.**

   The following `ls`(1) and `grep`(1) commands are used to locate the DLT drive identified as `scsi@5`.

```
# 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 D-8 shows the symbolic link for a drive that supports compression. If the drive supports compression and you want compression in the hardware, use cbn as the prefix.

CODE EXAMPLE D-8 Symbolic Link Showing a Drive 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/e
sp@5,8800000 st@4,0:cbn
```

3. **Open the** /etc/opt/SUNWsamfs/mcf **file, and add the following entry for the device:**

```
/dev/rmt/0cbn  40  tp  -  on
```

This entry contains the st driver name for the device (/dev/rmt/0cbn), 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).

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 D-9 shows the /var/adm/messages file.

CODE EXAMPLE D-9 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
```

CODE EXAMPLE D-9 Information in `/var/adm/messages` *(Continued)*

```
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:**

```
# 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:**

```
# 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
```

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 link that ends with `bn`.

5. **Open the `/etc/opt/SUNWsamfs/mcf` file, and add entries for this 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. It includes the `/dev/samst` name (`/dev/samst/c2t0u0`), 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. It contains 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.

6. **If you are configuring DLT drives, add the DLT definitions to the `/kernel/drv/st.conf` file.**

"Configuring Storage Devices" on page 33 describes how to add definitions to the `/kernel/drv/st.conf` file. DLT drives are not part of the standard Sun Solaris configuration.

CODE EXAMPLE D-10 shows the completed `mcf` file.

CODE EXAMPLE D-10 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
#
```

CODE EXAMPLE D-10 Completed `mcf` File

```
/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, the first line of each library definition is the full path to the parameters file for that library.

You create the parameters files for network attached libraries as described in "Creating Parameters Files for Network Attached Automated Libraries" on page 59.

Example 1. CODE EXAMPLE D-11 shows the `mcf` file for an ADIC/Grau network attached automated library.

CODE EXAMPLE D-11 ADIC/Grau Automated Library `mcf` File Entries

```
#
# Sample mcf file entries for a GRAU library - DLT
#
/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 D-12 shows the `mcf` file for a Fujitsu LMF network attached automated library.

CODE EXAMPLE D-12 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 D-13 shows the `mcf` file for an IBM 3494 network attached automated library.

CODE EXAMPLE D-13 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 D-14 shows the `mcf` file for a Sony network attached automated library.

CODE EXAMPLE D-14 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 D-15 shows the `mcf` file for a StorageTek ACSLS-attached automated library.

CODE EXAMPLE D-15 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`.

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.

archiver The archive program that automatically controls the copying of files to removable cartridges.

archive storage Copies of file data that have been created on archive media.

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, such as 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 In a 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*.

device logging A configurable feature that provides device-specific error information used to analyze device problems.

device scanner Software 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.

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 In a Sun SAM-Remote configuration, the buffer on the server system that is used for archiving data from the client to the server.

disk cache The disk-resident portion of the file system software, 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 threshold The maximum or minimum level of disk cache utilization, as defined by an administrator. 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 *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/second LAN.

extent array The array within a file's inode that defines the disk location of each data block assigned to the file.

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. See also *storage family set*.

FDDI Fiber-distributed data interface is a standard for data transmission in a local area network that can extend in range up to 200 km (124 miles). The FDDI protocol is based on the token ring protocol.

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.

file system A hierarchical collection of files and directories.

file-system-specific directives Archiver and releaser directives that follow global directives in the `archiver.cmd` file, are specific to a particular file system, and begin with `fs =`. File-system-specific directives apply until the next `fs =` directive line or 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, the amount of time for which a user is allowed to create files and allocate storage after reaching the soft limit.

H

hard limit For disk quotas, the 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. 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. Inodes are 512 bytes long. The inode file is a metadata file, which is separated from file data in the file system.

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 A function that grants a client host permission to perform an operation on a file for a specified period of time. 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 system 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) in a file system environment.

media Tape or optical disk cartridges.

media recycling The process of recycling or reusing archive media with few active files.

metadata Data about data. Metadata is the index information used 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 device A device (for example, a solid-state disk or mirrored device) upon which file system metadata is stored. Having file data and metadata on separate devices can increase performance. In the `mcf`(4) 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 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 with the `mount`(1M) command. The single-writer host is specified with the `-o writer` option with 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 takes somewhat longer to access.

network attached automated library A library, such as those from 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 file system distributed by Sun that provides transparent access to remote file systems on heterogeneous networks.

NIS The Sun OS 4.0 (minimum) Network Information Service. A distributed network database containing key information about systems and users on the network. The NIS database is stored on the master server and all 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, such as 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. Preallocation can be specified only for a file that is size zero. For more information, see the `setfa`(1) man page.

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 The priority according to which a file in a file system is released after being archived. Release priority is calculated by multiplication of various weights of file properties and then summation of 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 according to high and low thresholds.

remote procedure call 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.

See also *disk striping* and *striping*.

RPC Remote procedure call. 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. See also *samfsrestore*.

SAM-QFS A configuration that combines the Sun StorEdge SAM-FS software with the Sun StorEdge QFS file system. 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.

`samfsrestore` A program that restores inode and directory information from a control structure dump. See also *samfsdump*.

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, 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.

striped group A collection of devices within a file system that is defined in the `mcf`(4) file as one 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).

stripe size The number of disk allocation units (DAUs) to be allocated before writing proceeds to the next device of a stripe. If the `stripe=0` mount option is used, the file system uses round-robin access, not striped access.

striping A data access method in which files are simultaneously written to logical disks in an interlaced fashion. SAM-QFS file systems provide two types of striping: "hard striping," using stripe groups, and "soft striping," using the `stripe=`*x* mount parameter. Hard striping is enabled when a file system is set up, and requires the definition of stripe groups within the `mcf`(4) file. Soft striping is enabled through the `stripe=`*x* mount parameter, and can be changed for the file system or for individual files. It is disabled by setting `stripe=0`. Hard and soft striping can both be used if a file system is composed of multiple stripe groups with the same number of elements. See also *round robin*.

Sun SAM-Remote client A Sun StorEdge SAM-FS system with a client daemon that contains a number of pseudodevices, and can also 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 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. The superblock 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 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).

timer Quota software that keeps track of the period starting when a user reaches a soft limit and ending when the hard limit is 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. In the context of archiving to removable media cartridges, the VSN is a logical identifier for magnetic tape and optical disk that is written in the volume label. In the context of 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.

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