STORAGETEK®

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ASM

APPLICATION STORAGE MANAGER® (ASM) SOFTWARE

INSTALLATION AND CONFIGURATION GUIDE

For Solaris

PRODUCT TYPE
SOFTWARE

StorageTek ASM and StorageTek QFS Installation and Configuration Guide

Version 4.2

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Preface

This manual, the ASM Solaris 4.2 Install and Configuration Guide, explains the installation and upgrade procedures for the StorageTek QFS and StorageTek ASM software products, release 4.2. The 4.2 releases can be installed on the following minimum Solaris™ Operating System (OS) platforms:

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

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

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

Table 1. Product Overview

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

How This Book Is Organized

This manual contains the following chapters:

- Chapter 1 contains system requirements and prerequisites to installation.
- Chapter 2 explains the StorageTek QFS initial installation procedure.
- Chapter 3 explains the StorageTek QFS upgrade procedure.
- Chapter 4 explains the StorageTek ASM initial installation procedure.

- Chapter 5 explains the StorageTek ASM upgrade procedure.
- Appendix A provides information about administering ASM QFS Manager.
- Appendix B describes the release package contents and the directories created at installation time.
- Appendix C is a command reference.

The glossary defines terms used in this and other StorageTek QFS and StorageTek ASM documentation.

Related Documentation

This manual is part of a set of documents that describes the operations of the StorageTek QFS and StorageTek ASM software products. Table 2 shows the complete release 4.2 documentation set for these products.

Table 2. Related StorageTek QFS and StorageTek ASM Documentation

Title	Part Number
ASM Solaris 4.2 Remote Administrator Guide	312603301
ASM Solaris 4.2 ASM/QFS Disaster Recovery Guide	312603601
ASM Solaris 4.2 File System Administration Guide	312603501
ASM Solaris 4.2 Install and Configuration Guide	312603401
ASM Solaris 4.2 Storage and Archive Management Guide	312603201
<Title>StorageTek QFS and StorageTek ASM 4.2 Release Notes<Title>	312603801

Additional Information

StorageTek offers several methods for you to obtain additional information.

StorageTek's External Web Site

StorageTek's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the StorageTek external Web site is http://www.storagetek.com

Customer Resource Center

StorageTek's CRC is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. StorageTek employees may enter the CRC through PowerPort.

The URL for the CRC is http://www.support.storagetek.com.

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StorageTek's e-Partners site is a Web site that provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek's e-Partners. Access to this site, beyond the e-Partners Login page, is restricted. On the e-Partners Login page, StorageTek employees and current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the e-Partners site is http://members.storagetek.com.

Hardcopy Publications

You may order paper copies of publications listed on the CRC. Send e-mail to DistrL@louisville.stortek.com.

System Requirements and Preinstallation Tasks

1

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

Overview

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

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

StorageTek QFS File System

The StorageTek QFS file system shares many features with the file system included in the StorageTek ASM product. The StorageTek QFS file system, however, is designed for high performance and contains more features than are supported within the StorageTek ASM file system.

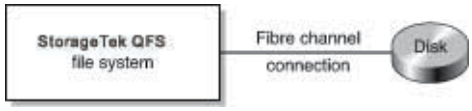

Figure of a single-host StorageTek QFS file system showing its fibre channel connection to a disk.

Figure 1. StorageTek QFS Configuration on a Single Solaris Host

You can use Table 3 as a checklist when configuring a StorageTek QFS file system.

Table 3. Steps for Configuring a StorageTek QFS File System on a Single Host

Task and Page	Accomplished?
“Ensuring That the Installation Prerequisites Are Met” on page 45	
“Adding the Packages on the StorageTek QFS Server” on page 46	
“Setting Up `PATH` and `MANPATH` Variables” on page 48	
“(Optional) Enabling the ASM QFS Manager” on page 50	
“Defining the StorageTek QFS Configuration By Creating the `mcf` File” on page 57	
“Initializing the Environment” on page 91	

Table 3. Steps for Configuring a StorageTek QFS File System on a Single Host (Continued)

Task and Page	Accomplished?
"(Optional) Editing the `defaults.conf` File" on page 91	
"Verifying the License and `mcf` Files" on page 92	
"(Optional) Creating the `samfs.cmd` File" on page 94	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 95	
"Initializing the File System" on page 99	
"Mounting the File System" on page 102	
"(Optional) Sharing the File System With NFS Client Systems" on page 106	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110	
"(Optional) Backing Up Configuration Files" on page 112	
"(Optional) Configuring the Remote Notification Facility" on page 113	
"(Optional) Adding the Administrator Group" on page 115	
"Configuring System Logging" on page 116	
"(Optional) Configuring Other Products" on page 117	

StorageTek ASM File System

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

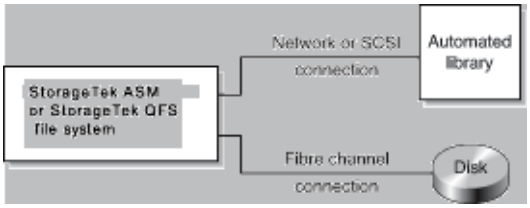

Figure of a single-host StorageTek ASM or StorageTek ASM-QFS file system.

The file system is attached to an automated library by a network or SCSI connection and attached to a disk through a fibre channel connection.

Figure 2. StorageTek ASM or StorageTek ASM-QFS Configuration on a Single Solaris Host

You can use Table 4 as a checklist when configuring a StorageTek ASM file system.

Table 4. Steps for Configuring a StorageTek ASM File System on a Single Host

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 131	
"Adding the Packages on the StorageTek ASM Server" on page 132	
"(Optional) Verifying and Updating the st.conf and samst.conf Files" on page 133	
"Enabling the StorageTek ASM Software License" on page 146	
"Setting Up PATH and MANPATH Variables" on page 147	
"Rebooting the System" on page 148	
"(Optional) Enabling the ASM QFS Manager" on page 148	
"Defining the StorageTek ASM Configuration By Creating the mcf File" on page 155	
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 174	
"Initializing the StorageTek ASM Environment" on page 192	
"(Optional) Checking the Drive Order" on page 192	

Table 4. Steps for Configuring a StorageTek ASM File System on a Single Host (Continued)

Task and Page	Accomplished?
“(Optional) Creating the archiver.cmd File” on page 199	
“(Optional) Enabling Disk Archiving” on page 206	
“(Optional) Editing the defaults.conf File” on page 210	
“Verifying the License and mcf Files” on page 213	
“(Optional) Labeling Removable Media Cartridges” on page 215	
“(Optional) Populating the Catalog” on page 217	
“(Optional) Creating the samfs.cmd File” on page 222	
“Updating the /etc/vfstab File and Creating the Mount Point” on page 223	
“Initializing the File System” on page 224	
“Mounting the File System” on page 225	
“(Optional) Sharing the File System With NFS Client Systems” on page 226	
“Writing Periodic Dump Files By Using samfsdump(1M)” on page 228	
“(Optional) Backing Up Configuration Files” on page 230	
“(Optional) Configuring the Remote Notification Facility” on page 231	
“(Optional) Adding the Administrator Group” on page 233	
“Configuring System Logging” on page 234	
“(Optional) Configuring Other StorageTek Products” on page 235	

ASM-QFS File System

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

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

For a depiction of a StorageTek ASM-QFS configuration, see Figure 2.

You can use Table 5 as a checklist when configuring a StorageTek ASM-QFS environment. To create a StorageTek ASM-QFS environment, follow the instructions for creating a StorageTek ASM file system, but when you define your file system in the `mcf` file, use the StorageTek QFS instructions for defining file system devices.

Table 5. Steps for Configuring a StorageTek ASM-QFS Environment on a Single Host

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 131	
"Adding the Packages on the StorageTek ASM Server" on page 132	
"(Optional) Verifying and Updating the st.conf and samst.conf Files" on page 133	
"Enabling the StorageTek ASM Software License" on page 146	
"Setting Up PATH and MANPATH Variables" on page 147	
"Rebooting the System" on page 148	
"(Optional) Enabling the ASM QFS Manager" on page 148	
"Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57 Use the information in this section for configuring the file systems in your StorageTek ASM-QFS environment.	
"Defining the StorageTek ASM Configuration By Creating the mcf File" on page 155 Use the information in this section for configuring the removable media devices in your StorageTek ASM-QFS environment.	
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 174	

Table 5. Steps for Configuring a StorageTek ASM-QFS Environment on a Single Host (Continued)

Task and Page	Accomplished?
“Initializing the StorageTek ASM Environment” on page 192	
“(Optional) Checking the Drive Order” on page 192	
“(Optional) Creating the archiver.cmd File” on page 199	
“(Optional) Enabling Disk Archiving” on page 206	
“(Optional) Editing the defaults.conf File” on page 210	
“Verifying the License and mcf Files” on page 213	
“(Optional) Labeling Removable Media Cartridges” on page 215	
“(Optional) Populating the Catalog” on page 217	
“(Optional) Creating the samfs.cmd File” on page 222	
“Updating the /etc/vfstab File and Creating the Mount Point” on page 223	
“Initializing the File System” on page 224	
“Mounting the File System” on page 225	
“(Optional) Sharing the File System With NFS Client Systems” on page 226	
“Writing Periodic Dump Files By Using samfsdump(1M)” on page 228	
“(Optional) Backing Up Configuration Files” on page 230	
“(Optional) Configuring the Remote Notification Facility” on page 231	
“(Optional) Adding the Administrator Group” on page 233	
“Configuring System Logging” on page 234	
“(Optional) Configuring Other StorageTek Products” on page 235	

StorageTek QFS Shared File System

A StorageTek QFS or StorageTek ASM-QFS shared file system is a distributed, multihost file system that you can mount on multiple Solaris operating system (OS) hosts. One Solaris OS host acts as the metadata server, and the others are clients. If you want the ability to change the

metadata server, you must designate one or more clients as potential metadata servers.

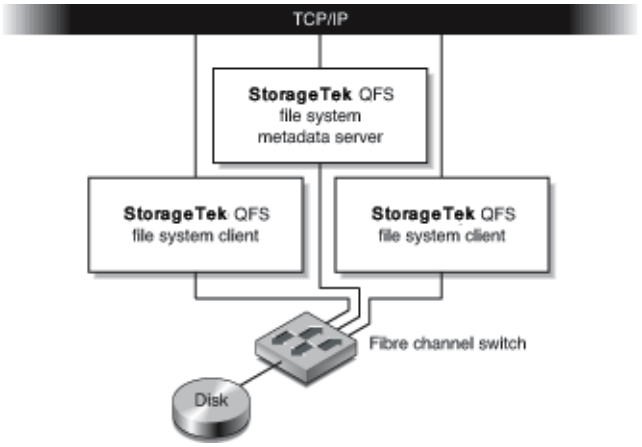

Figure of a StorageTek QFS shared file system on multiple hosts.

The hosts are attached to a TCP/IP network and are connected to the disk through a fibre channel connection.

Figure 3. StorageTek QFS Shared File System Configuration on Solaris Hosts

You can use Table 6 as a checklist when configuring a StorageTek QFS shared file system on Solaris OS hosts. If you are configuring a StorageTek QFS shared file system on Sun Cluster hosts, see "StorageTek QFS File Systems in a Sun Cluster Environment" on page 9 for a checklist.

Table 6. Steps to Configuring a StorageTek QFS File System on Solaris OS Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 45	
"Adding the Packages on the StorageTek QFS Server" on page 46	
"Setting Up `PATH` and `MANPATH` Variables" on page 48	
"Preparing the Host Systems" on page 49	
"Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57	
"(Optional) Editing `mcf` Files on Other Hosts" on page 79	

Table 6. Steps to Configuring a StorageTek QFS File System on Solaris OS Hosts (Continued) (Continued)

Task and Page	Accomplished?
"(Optional) Creating the Shared Hosts File" on page 83	
"Initializing the Environment" on page 91	
"(Optional) Editing the `defaults.conf` File" on page 91	
"Verifying the License and `mcf` Files" on page 92	
"(Optional) Creating the `samfs.cmd` File" on page 94	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 95	
"Initializing the File System" on page 99	
"(Optional) Verifying That the Daemons Are Running" on page 101	
"Mounting the File System" on page 102	
"(Optional) Sharing the File System With NFS Client Systems" on page 106	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110	
"(Optional) Backing Up Configuration Files" on page 112	
"(Optional) Configuring the Remote Notification Facility" on page 113	
"(Optional) Adding the Administrator Group" on page 115	
"Configuring System Logging" on page 116	
"(Optional) Configuring Other Products" on page 117	

StorageTek QFS File Systems in a Sun Cluster Environment

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

StorageTek QFS Local File System in a Sun Cluster Environment

A StorageTek QFS local file system is local to one host. This manual contains all the instructions you need to configure this type of file system. A local file

system is one that is configured on disks that are accessible only to the host system upon which the StorageTek QFS software is installed. In a Sun Cluster environment, local file systems are accessible only to the node upon which they are created.

For a checklist to use when configuring a StorageTek QFS file system as a local file system in a Sun Cluster environment, see Table 3.

StorageTek QFS Highly Available File System in a Sun Cluster Environment

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

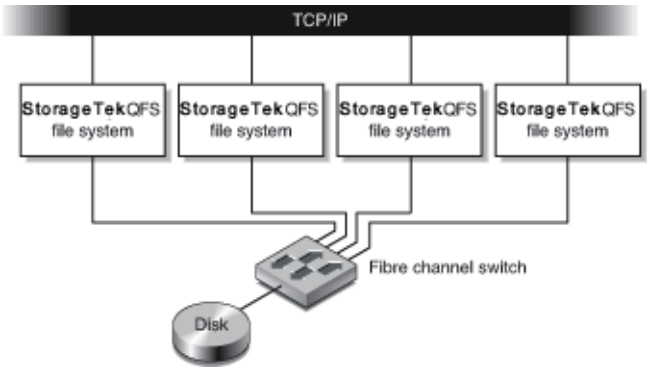

Figure of a StorageTek QFS highly available file sytem in a Sun Cluster.

The hosts are attached to a TCP/IP network and are connected to the disk through a fibre channel connection.

Figure 4. StorageTek QFS Highly Available File System Configuration in a Sun Cluster

You can use Table 7 as a checklist when configuring a StorageTek QFS highly available file system on Sun Cluster hosts.

Table 7. Steps for Configuring a StorageTek Highly Available File System on Sun Cluster Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 45	
"Adding the Packages on the StorageTek QFS Server" on page 46	
"Enabling the StorageTek QFS Software License" on page 47	
"Setting Up `PATH` and `MANPATH` Variables" on page 48	
"Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57	
"(Optional) Editing `mcf` Files on Other Hosts" on page 79	
"Initializing the Environment" on page 91	
"(Optional) Editing the `defaults.conf` File" on page 91	
"Verifying the License and `mcf` Files" on page 92	
"(Optional) Creating the `samfs.cmd` File" on page 94	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 95	
"Initializing the File System" on page 99	
"Mounting the File System" on page 102	
"(Optional) Configuring the HAStoragePlus Resource" on page 105	
"(Optional) Bringing the Shared Resource Online" on page 109	
"(Optional) Verifying the Resource Group on All Nodes" on page 110	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110	
"(Optional) Backing Up Configuration Files" on page 112	
"(Optional) Configuring the Remote Notification Facility" on page 113	

Table 7. Steps for Configuring a StorageTek Highly Available File System on Sun Cluster Hosts (Continued)

Task and Page	Accomplished?
“(Optional) Adding the Administrator Group” on page 115	
“Configuring System Logging” on page 116	
“(Optional) Configuring Other Products” on page 117	

StorageTek QFS Shared File System in a Sun Cluster Environment

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

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

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

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

Table 8 shows the tasks you must perform and the documentation you need to consult in order to configure a StorageTek QFS shared file system.

Table 8. Tasks for Configuring a StorageTek QFS Shared File System

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

You can use Table 9 as a checklist when configuring a StorageTek QFS shared file system on Sun Cluster hosts.

Table 9. Steps for Configuring a StorageTek QFS Shared File System on Sun Cluster Hosts

Task and Page	Accomplished?
"Ensuring That the Installation Prerequisites Are Met" on page 45	
"Adding the Packages on the StorageTek QFS Server" on page 46	
"Enabling the StorageTek QFS Software License" on page 47	
"Setting Up `PATH` and `MANPATH` Variables" on page 48	
"Preparing the Host Systems" on page 49	
"Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57	
"(Optional) Editing `mcf` Files on Other Hosts" on page 79	
"(Optional) Creating the Shared Hosts File" on page 83	
"Initializing the Environment" on page 91	
"(Optional) Editing the `defaults.conf` File" on page 91	
"Verifying the License and `mcf` Files" on page 92	
"(Optional) Creating the `samfs.cmd` File" on page 94	
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 95	
"Initializing the File System" on page 99	
"(Optional) Verifying That the Daemons Are Running" on page 101	
"Mounting the File System" on page 102	
"(Optional) Configuring the `SUNW.qfs` Resource Type" on page 104	
"(Optional) Bringing the Shared Resource Online" on page 109	
"(Optional) Verifying the Resource Group on All Nodes" on page 110	
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110	

Table 9. Steps for Configuring a StorageTek QFS Shared File System on Sun Cluster Hosts (Continued)

Task and Page	Accomplished?
“(Optional) Backing Up Configuration Files” on page 112	
“(Optional) Configuring the Remote Notification Facility” on page 113	
“(Optional) Adding the Administrator Group” on page 115	
“Configuring System Logging” on page 116	
“(Optional) Configuring Other Products” on page 117	

StorageTek ASM-Remote

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

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

Server Requirements

The StorageTek QFS and StorageTek ASM software must be installed on a Sun server based on UltraSPARC® technology.

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

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

If you plan to install the ASM QFS Manager graphical user interface tool, there are additional requirements for the server that you want to use as the web server host. For more information about these requirements, see “(Optional) Verifying Requirements for the ASM QFS Manager” on page 42.

Solaris Operating System Requirements

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

To Verify the Environment

Repeat these steps for each host on which you want to install the StorageTek QFS or StorageTek ASM software.

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

   The Sun Download Center is at the following URL:

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

2. Log in to your system as root.

   You must have superuser access to install the software.

3. Verify your system's Solaris OS level.

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

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

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

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

Installing Solaris OS Patches

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

To install a patch after you install the StorageTek QFS or StorageTek ASM 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.

StorageTek QFS and StorageTek ASM Software Host Requirements

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

Planning Your File System and Verifying Disk Cache

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

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

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

CAUTION: Make sure that the disks and partitions that you plan to use are not currently in use and do not contain any existing data because any existing data is lost when you create the StorageTek QFS or StorageTek ASM file system.

The disks must be connected to the server through a Fibre Channel or SCSI controller. You can specify individual disk partitions for a disk, or you

can use the entire disk as a disk cache. The software supports disk arrays, including those under the control of volume management software, such as Solstice DiskSuite™, Solaris Volume Manager, and other volume management software products.

To Plan Your File System

- Familiarize yourself with StorageTek QFS and StorageTek ASM file system layout possibilities.

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

To Estimate Disk Cache Requirements

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

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

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

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

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

Figure 5 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 Figure 5 has been edited.

Figure 5. `format`**(1M) Command for a Fibre Channel-Attached Disks**

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


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

Part      Tag    Flag     Cylinders         Size            Blocks
  0 unassigned    wm       0 -  4778       14.00GB    (4779/0/0)
29362176
```

Figure 5. `format`**(1M) Command for a Fibre Channel-Attached Disks (Continued)**

```
  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

partition> ^D
#
```

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

Figure 6 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`).

Figure 6. `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
```

Figure 6. `format`**(1M) Command for SCSI-Attached Disks (Continued)**

```
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> 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 10 shows the minimum amount of disk space required in these various directories.

Table 10. Minimum Disk Space Requirements

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

Note that the archiver data directory, the archiver queue files, and the log files are written to the /var directory, so the sizes shown in Table 10 should be considered a minimum amount for the /var directory.

To Verify Disk Space

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

1. Issue the df(1M) command.

   Figure 7 shows this command and its output.

Figure 7. Using the df(1M) Command to Verify Disk Space

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

Figure 7. Using the `df`(1M) Command to Verify Disk Space

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

2. Verify that there are at least 2,000 kilobytes available in the `avail` column for the `/` directory.
3. Verify that there are at least 21,000 kilobytes in the `avail` column for the `/opt` directory.
4. Verify that there are at least 6,000 kilobytes available in the `/var` directory.

   A quantity of 30,000 kilobytes or more is recommended to allow for the growth of log files and other system files.
5. If there is not enough room for the software under each directory, repartition the disk to make more space available to each file system.

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

(Optional) Verifying Archive Media

Perform this verification if you plan to use the StorageTek ASM software.

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

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

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

- At least one removable media device for archiving files. This device can be a single tape or optical drive, or it can be multiple devices such as the drives within an automated library.
- Tape or magneto-optical cartridges to which archive files can be written. For most SCSI-attached and Fibre Channel-attached libraries, the StorageTek ASM 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 StorageTek ASM 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 StorageTek ASM environment supports a wide variety of removable media devices. You can obtain a list of currently supported drives and libraries from your StorageTek 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 23.
- Enumerate your devices using the instructions in “To Create a List of Devices” on page 27. You will use this list again in the “StorageTek ASM Initial Installation Procedure” on page 131.

To Attach Removable Media Devices

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

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

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

```
# init 5
```

   This command brings down the system to the PROM level. At this point it is safe to power off the server and peripherals. For specific instructions regarding your equipment, see the documentation from the hardware vendor for proper power-on and power-off sequences.

3. Ensure that the removable media devices and the disk(s) to be used for the StorageTek ASM file system are connected and properly addressed.
4. (Optional) Ensure that the SCSI target IDs are unique for each SCSI initiator (host adapter).

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

   Avoid setting SCSI target IDs for peripherals to ID `7` because this ID is typically reserved for the initiator. For example, if you are using a SCSI host adapter with a previously attached disk drive set to use a target ID of

3, any additional peripheral connected to this bus must not have an ID of 3. Typically, the internal disk drive ID is 3 for SPARC® systems and 0 for UltraSPARC systems.

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

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

6. Disable autobooting.

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

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

7. Type reset at the next prompt.

   For example:

```
>ok reset
```

   Reenabling autobooting is described later in this procedure.

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

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

   Figure 8 shows the PROM >ok prompt and the output from the probe-scsi-all command.

Figure 8. Output From the probe-scsi-all Command

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

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

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

If you performed the previous step, save the output. You use the information in this output for the next procedure, "To Create a List of Devices" on page 27.

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

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

    Figure 9 shows the commands to use to locate the host adapter directory, to select an item, and to display the Fibre Channel host bus adapter (HBA) devices.

Figure 9. Commands and Output Showing How to Conduct an Inventory of Target IDs and LUNs

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

If the server does not acknowledge all the known devices (disk drives, tape or optical drives, the automated library, and so on), you should check

the cabling. Cabling is often the problem when devices and controllers are not communicating. Do not proceed until all devices appear when probed.

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

    If you performed the previous step, save the output. You use the information in this output for the next procedure, "To Create a List of Devices" on page 27.

12. Reenable autobooting.

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

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

13. Boot the system.

    For example:

```
>ok boot
```

14. Review system files.

    Review the following files:

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

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

15. Disable autocleaning and autoloading.

    If your automated library supports autocleaning or autoloading, disable those features when using that library with the StorageTek ASM 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 StorageTek ASM software is not running. Remember to disable autoload when the StorageTek ASM system is running.

16. Go to "Creating a List of Devices" on page 27.

Creating a List of Devices

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

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

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

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

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

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

To Create a List of Devices

This procedure shows you how to gather device information.

1. Make an inventory list of your devices.

   Fill in Table 11 to include the name, manufacturer, model, and connection types for each device that you want to include in your StorageTek ASM environment.

Table 11. Inventory List of Devices to Be Configured

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

Table 11. Inventory List of Devices to Be Configured (Continued)

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

2. Retain Table 11 for use again later in the configuration procedure.

Obtaining a Software License Key

Make sure that you have a software license key for the StorageTek QFS or StorageTek ASM release that you are installing.

If you do not have a StorageTek license key for the release level that you are installing, contact your authorized service provider (ASP) or StorageTek.

When you contact StorageTek for a license, you will be asked to provide information regarding your environment.

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

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

For a StorageTek ASM license, you will need to provide information such as the following:

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

The license keys for the StorageTek QFS and StorageTek ASM packages allow the system to run indefinitely unless one of the following conditions is present:

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

If your license expires, you can mount the file systems, but you cannot archive or stage files in a StorageTek ASM environment.

After your initial installation, if you upgrade your software or if you change your environment’s configuration, you might need to change your software license. Changes to the environment that might necessitate upgrading your license

include adding a library or changing a host system. If you have questions regarding your existing license, you can enter the `samcmd`(1M) `l` command (lowercase l for *license*). If you need to upgrade your license, contact your StorageTek sales representative.

Note: If you are upgrading from a StorageTek QFS or StorageTek ASM 4.0 or 4.1 release, you might need to upgrade your license depending on other changes in your environment.

Obtaining the Release Files

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

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

`http://www.support.storagetek.com`

CAUTION: If you have not read the *StorageTek QFS and ASM 4.2 Release Notes*, please do so before continuing. You can access the *StorageTek QFS and ASM 4.2 Release Notes* for this release at any time from one of the documentation web sites described in this manual's preface.

To Obtain the Software From the StorageTek Download Center

1. Enter the following URL in your browser:

   `http://www.support.storagtek.coml`

2. Click on the StorageTek QFS or StorageTek ASM software package you want to receive.

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

To Install From a CD-ROM

1. Log in as root on your StorageTek QFS or StorageTek ASM server.

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

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

The system should automatically detect the CD's presence. If it does not, issue the commands shown in Figure 10 to stop and start the Sun Solaris Volume Manager and to change to the directory that contains the StorageTek QFS and StorageTek ASM software packages.

Figure 10. Commands to Access the StorageTek QFS and StorageTek ASM Packages

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

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

To Remove the StorageTek QFS or StorageTek ASM 4.2 Software

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

1. (Optional) Remove the ASM QFS Manager software from the management station and from the StorageTek QFS and StorageTek ASM server.

   If you have installed the ASM QFS Manager software, perform the procedure described in "Removing the StorageTek ASM QFS Manager Software" on page 256.

2. Use the `pkginfo`(1) command to determine which StorageTek QFS and StorageTek ASM software packages are installed on your system.

   To find the StorageTek QFS 4.2 packages, enter the following command:

```
# pkginfo | grep qfs
```

   To find the StorageTek ASM 4.2 packages, enter the following command:

```
# pkginfo | grep sam
```

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

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

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

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

`SUNWqfsr` must be the last package removed.

Example 2. To remove all possible StorageTek ASM packages, enter the following command:

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

`SUNWsamfsr` must be the last package removed.

Verifying Third-Party Compatibilities

The StorageTek QFS and StorageTek ASM 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 StorageTek QFS or StorageTek ASM packages. Consult the *StorageTek QFS and ASM 4.2 Release Notes* for information pertaining to library model numbers, firmware levels, and other compatibility information.

(Optional) Verifying StorageTek QFS Shared File System Requirements

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

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

Metadata Server Requirement

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

The following are configuration recommendations with regard to metadata:

- A StorageTek QFS shared file system should have multiple metadata (`mm`) partitions. This spreads out metadata I/O and improves file system throughput.

- A StorageTek QFS shared file system should use a separate, private metadata network so typical user traffic does not interfere with metadata traffic. A switch-based (not hub-based) network is recommended for this.

Operating System and Hardware Requirements

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

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

StorageTek QFS Release Levels

- Ensure that your configuration meets the following StorageTek QFS requirements:
- Each host to be configured in the StorageTek QFS shared file system must have a StorageTek QFS software package installed upon it.
- All StorageTek QFS software installed on the Solaris systems in the StorageTek QFS shared file system must be at the same release level. This ensures that all Solaris systems in a StorageTek QFS shared file system have identical over-the-wire protocol versions. If these levels do not match, the system generates the following message when mounting is attempted:

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

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

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

StorageTek ASM-QFS Requirements

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

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

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

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

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

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

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

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

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

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

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

  Also make sure that your environment meets the requirements listed in "(Optional) Verifying StorageTek QFS Shared File System Requirements" on page 33.

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

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

1. Verify your hardware.

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

2. Verify your software.

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

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

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

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

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

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

   - *Sun Cluster Concepts Guide for Solaris OS*

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

4. Verify your disk space according to the instructions in "Verifying Disk Space" on page 21.

   "Verifying Disk Space" on page 21 explains how much disk space to allow for the various directories that the file systems need.

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

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

   - If you are going to configure a StorageTek QFS shared file system, use raw DID (device identification) devices. In the `scdidadm`(1M) command output, these appear as `/dev/did/*` devices. The Sun Cluster nodes that share the file system must have access to each DID device through an HBA (host bus adapter) direct connection. All devices must be accessible to the file system from all nodes in the Sun Cluster that mount the StorageTek QFS shared file system. For more information about DID devices, see the `did`(7) man page.

   When you specify these devices in your `mcf` file, you use the `/dev/did` devices from the `scdidadm`(1M) output. For more information about this, see "Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57.

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

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

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

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

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

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

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

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

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

6. Verify device redundancy.

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

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

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

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

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

Determining High Availability

Figure 11 shows the `scdidadm`(1M) Sun Cluster command. This example uses the `-L` option for this command to list paths of the devices in the DID configuration file for all nodes. In the output from the `scdidadm`(1M) command, look for output that shows a device that is visible from two or more nodes and that bears the same worldwide name. These are global devices.

Figure 11 uses StorageTek T3 arrays in a RAID-5 configuration. The command output on your disk devices might differ depending on the equipment you use.

Figure 11. `scdidadm`**(1M) Command Example**

```
ash# scdidadm -L
1        ash:/dev/rdsk/c0t6d0        /dev/did/rdsk/d1
2        ash:/dev/rdsk/c1t1d0        /dev/did/rdsk/d2
3        ash:/dev/rdsk/c1t0d0        /dev/did/rdsk/d3
4        elm:/dev/rdsk/c6t50020F2300004921d1 /dev/did/rdsk/d4
4        ash:/dev/rdsk/c5t50020F2300004921d1 /dev/did/rdsk/d4
5        elm:/dev/rdsk/c6t50020F2300004921d0 /dev/did/rdsk/d5
5        ash:/dev/rdsk/c5t50020F2300004921d0 /dev/did/rdsk/d5
6        elm:/dev/rdsk/c6t50020F23000049CBd1 /dev/did/rdsk/d6
6        ash:/dev/rdsk/c5t50020F23000049CBd1 /dev/did/rdsk/d6
7        elm:/dev/rdsk/c6t50020F23000049CBd0 /dev/did/rdsk/d7
7        ash:/dev/rdsk/c5t50020F23000049CBd0 /dev/did/rdsk/d7
8        elm:/dev/rdsk/c6t50020F23000055A8d0 /dev/did/rdsk/d8
8        ash:/dev/rdsk/c5t50020F23000055A8d0 /dev/did/rdsk/d8
9        elm:/dev/rdsk/c6t50020F23000078F1d0 /dev/did/rdsk/d9
9        ash:/dev/rdsk/c5t50020F23000078F1d0 /dev/did/rdsk/d9
10       elm:/dev/rdsk/c0t6d0        /dev/did/rdsk/d10
11       elm:/dev/rdsk/c1t1d0        /dev/did/rdsk/d11
12       elm:/dev/rdsk/c1t0d0        /dev/did/rdsk/d12

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


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


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
```

Figure 11. `scdidadm`**(1M) Command Example (Continued)**

```
        analyze     - surface analysis
        defect      - defect list management
        backup      - search for backup labels
        verify      - read and display labels
        save        - save new disk/partition definitions
        inquiry     - show vendor, product and revision
        volname     - set 8-character volume name
        !<cmd>      - execute <cmd>, then return
        quit
format> verify

Primary label contents:

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

Figure 11 shows that you can use devices 4 through 9 for configuring the disk cache for a file system.

Determining Redundancy

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

- RAID-based disk redundancy is achieved in RAID-1 (mirroring) and RAID-5 (striping with parity) configurations. These disk configurations allow you to configure the raw devices in a Sun Cluster without a volume manager. These raw devices are accessible from multiple nodes, so you can issue the `format`(1M) command from any node to obtain information on the disks.

- Data path redundancy is achieved with multiple host bus adapters (HBAs), which are configured from a single node. If your environment includes multiple HBAs for redundancy, be aware that the StorageTek QFS file systems require multipathing software like Sun Traffic Manager software (MPxIO) to enable data path redundancy. For more information, see the *Sun StorEdge Traffic Manager Software Installation and Configuration Guide*, or see the `scsi_vhci`(7D) man page.

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

Analyzing the Output From the Commands

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

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

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

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

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

Performance Considerations

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

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

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

(Optional) Verifying Requirements for the ASM QFS Manager

Perform this verification if you want to use ASM QFS Manager to configure, control, monitor, or reconfigure a StorageTek QFS or StorageTek ASM environment through a web server.

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

- As a standalone management station to manage one or more StorageTek QFS or StorageTek ASM hosts.
- As additional software on the StorageTek QFS or StorageTek ASM host.

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

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

- "Hardware Requirements" on page 42
- "Browser Requirements" on page 43
- "Operating System Requirements" on page 43
- "Web Software Requirements" on page 43

Hardware Requirements

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

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

Browser Requirements

Ensure that your installation meets the following browser requirements:

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

Operating System Requirements

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

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

Web Software Requirements

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

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

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

(Optional) Verifying the Network Management Station

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

You can configure the StorageTek QFS and StorageTek ASM 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 StorageTek QFS and

StorageTek ASM software detects potential problems in its environment, it sends information to a management station, which allows you to monitor the system remotely.

The management stations you can use include the following:

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

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

StorageTek QFS Initial Installation Procedure

2

This chapter describes the procedure for installing and configuring StorageTek QFS standalone software for the first time. Use this procedure if this is the initial installation of the StorageTek QFS standalone software package at your site. If you are upgrading StorageTek QFS software on an existing server, see the “StorageTek QFS Upgrade Procedure” on page 119.

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

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

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

Ensuring That the Installation Prerequisites Are Met

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

- “Server Requirements” on page 14
- “Solaris Operating System Requirements” on page 15
- “Planning Your File System and Verifying Disk Cache” on page 16
- “Verifying Disk Space” on page 21
- “Obtaining a Software License Key” on page 29
- “Obtaining the Release Files” on page 31
- “Verifying Third-Party Compatibilities” on page 33

- "(Optional) Verifying Requirements for the ASM QFS Manager"
- "(Optional) Verifying the Network Management Station" on page 43

Adding the Packages on the StorageTek QFS Server

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

To Add the Packages

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

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 31. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

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

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

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

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

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

   For example:

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

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

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

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

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. Figure 12 shows the commands to use to install the localized packages.

Figure 12. Using the pkgadd(1M) Command to Install Localized Packages

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

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

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

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

   Figure 13 shows the needed SUNWqfsr/SUNWqfsu packages.

Figure 13. pkginfo(1M) Command Example on a StorageTek ASM-QFS File System

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

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

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

   Repeat this procedure and install the packages on each host.

Enabling the StorageTek QFS Software License

You need a license key to run the StorageTek QFS software. For more information, see “Obtaining a Software License Key” on page 29.

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

To Enable the StorageTek QFS Software License

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

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

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

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

Setting Up `PATH` and `MANPATH` Variables

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

To Set Up `PATH` and `MANPATH` Variables

1. For users who need to access the StorageTek QFS user commands (for example, `sls`(1)), add `/opt/SUNWsamfs/bin` to the users' `PATH` variables.
2. Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.
   a. In the Bourne or Korn shell, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.

      Figure 14 shows how your `.profile` file might look after editing.

Figure 14. Finished `.profile` File

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

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

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

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

Figure 15 shows how the MANPATH in your .login file might look after you have finished editing.

Figure 15. Finished MANPATH in the .login File

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

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

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

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

Preparing the Host Systems

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

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

To Prepare the Host Systems

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

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

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

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

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

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

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

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

For example:

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

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

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

This line has the following format:

```
server IP-address prefer
```

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

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

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

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

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

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

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

3. Repeat the preceding steps on each host.

(Optional) Enabling the ASM QFS Manager

Perform this task if you want to be able to use the ASM QFS Manager to configure, control, monitor, or reconfigure your StorageTek QFS environment.

The procedures in this section are as follows:

- "To Install the ASM QFS Manager Software" on page 51.
- "To Invoke the ASM QFS Manager for the First Time" on page 54.

- "To Use the ASM QFS Manager for Configuration" on page 55. Use this procedure to decide which configuration tasks you want to perform using the ASM QFS Manager software.

In addition to the information in this section, this manual's appendix, "StorageTek ASM QFS Manager Software Notes" on page 255, describes other aspects of using the ASM QFS Manager.

Note: The ASM QFS Manager does not support the StorageTek QFS shared file system nor does it support file systems in Sun Cluster environments.

To Install the ASM QFS Manager Software

1. Ensure that you have met the installation requirements in "(Optional) Verifying Requirements for the ASM QFS Manager" on page 42.
2. Log in to the server that you want to use as the management station.

   This can be the same server upon which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages.
3. Become superuser.
4. Use the `cd`(1) command to change to the directory where the software package release files reside on your server.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 31. Use the `cd`(1) command to change to the directory that contains the release files.

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

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

   If you downloaded the release files, change to the directory to which you downloaded the files.
5. Execute the `samqfsmgr_setup` script to install the ASM QFS Manager software.

   For example:

```
# samqfsmgr_setup
```

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

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

The `samqfsmgr_setup` script automatically installs the following:

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

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

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

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

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

      Figure 16 shows how your `.profile` file might look after editing.

Figure 16. Finished `.profile` File

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

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

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

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

      Figure 17 shows how the `MANPATH` in your `.login` file might look after you have finished editing.

Figure 17. Finished `MANPATH` in the `.login` File

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

8. Log in to the StorageTek QFS server and become superuser.
9. Use the `ps`(1) and `grep`(1) commands to make sure that the `rpcbind` service is running.

For example:

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

10. Examine the output from the preceding commands.

    The output should contain a line similar to the following:

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

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

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

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

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

    Enter the following command to start the ASM QFS Manager daemon:

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

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

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

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

    The preceding command also prevents the daemon from restarting automatically.

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

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

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

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

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

Using the ASM QFS Manager Software

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

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

    Only the StorageTek QFS administrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.
  - The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.
- If you log in as `samuser`, you can only monitor the environment. You cannot change or reconfigure it in any way.

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

To Invoke the ASM QFS Manager for the First Time

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

1. Log in to the management station web server.
2. From a web browser, invoke the ASM QFS Manager software.

   The URL is as follows:

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

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

   Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.
3. At the `User Name` prompt, enter `samadmin`.

4. At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the ASM QFS Manager Software" on page 51.
5. Click on the `SAMadmin` role.
6. Only the StorageTek QFS administrator should ever log in with the `SAMadmin` role.
7. At the `Role Password` prompt, enter the password you entered in Step 4.
8. Click `Log In`.
9. Click `ASM QFS Manager 1.1`.
   - You are now logged in to the ASM QFS Manager.
   - If you want to configure your environment at this time using the ASM QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click Help. After you add the servers, see "To Use the ASM QFS Manager for Configuration" on page 55 for more information about configuring your environment using the ASM QFS Manager.
   - If you want to quit using the ASM QFS Manager at this time, click `Log Out`.
   - If you want to create additional accounts at this time, see "StorageTek ASM QFS Manager Software Notes" on page 255.

To Use the ASM QFS Manager for Configuration

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

1. Click `Help`, in the upper right corner of the screen, to access the ASM QFS Manager online documentation.
2. Complete the configuration tasks.

   Table 12 shows the rest of the steps you must perform to install and configure a StorageTek QFS file system and the means by which you can accomplish each task.

   Perform the configuration steps in Table 12 in the order in which they appear. You can open a terminal window next to the ASM QFS Manager

window for use when you need to alternate between using commands and using the ASM QFS Manager.

Table 12. StorageTek QFS Installation Tasks

Task	Accomplish Through GUI	Accomplish Through Commands
"Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57	Yes	Yes
"(Optional) Editing the `defaults.conf` File" on page 91	No	Yes
"Verifying the License and `mcf` Files" on page 92	No	Yes
"(Optional) Creating the `samfs.cmd` File" on page 94	Yes	Yes
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 95	Yes	Yes
"Initializing the File System" on page 99	Yes	Yes
"Mounting the File System" on page 102	Yes	Yes
"(Optional) Sharing the File System With NFS Client Systems" on page 106	No	Yes
"Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110	No	Yes
"(Optional) Backing Up Configuration Files" on page 112	No	Yes
"(Optional) Configuring the Remote Notification Facility" on page 113	No	Yes
"(Optional) Adding the Administrator Group" on page 115	No	Yes
"Configuring System Logging" on page 116	No	Yes
"(Optional) Configuring Other Products" on page 117	Not applicable	Not applicable

Table 12 describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and `mcf` Files" on page 92. You need to verify that your license file is installed and is working correctly, but if you use ASM QFS Manager to create your `mcf` file, you do not need to verify your `mcf` file.

- "Establishing Periodic Dumps Using qfsdump(1M)" on page 110. Performing this step is essential to preserving your data.

The other installation steps in Table 12 are necessary, or are highly recommended, depending on your environment.

Defining the StorageTek QFS Configuration By Creating the mcf File

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

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

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

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

Note: For information about file system design considerations, see the *StorageTek ASM and QFS File System Administration Guide*.

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

- "To Create an mcf File" on page 58
- "mcf File Fields" on page 58
- "Configuration Examples for Local File Systems" on page 61
- "Configuration Examples for StorageTek QFS Highly Available File Systems" on page 73
- "Configuration Example for a StorageTek QFS Shared File System on a Sun Cluster Platform" on page 75

Note: The instructions for creating the mcf file differ depending on whether you are creating a StorageTek QFS environment or a StorageTek ASM-QFS environment.

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

If you are creating a StorageTek ASM-QFS environment, the instructions for configuring the file system portion of the `mcf` file are contained in this section. The instructions for library and drive configuration are contained in "Defining the StorageTek ASM Configuration By Creating the mcf File" on page 155.

To Create an `mcf` File

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

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

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

  Figure 18 shows the fields of each line entry in the `mcf` file.

Figure 18. `mcf` **File Fields**

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

Where to Go From Here

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

- If you are creating a shared file system, go to "(Optional) Creating the Shared Hosts File" on page 83.
- If you are creating a StorageTek QFS single-host file system or a StorageTek QFS highly available file system, go to "Initializing the Environment" on page 91.

`mcf` File Fields

The fields in an mcf file are the same regardless of what kind of file system you are configuring. Figure 18 shows the fields. The following sections explain the fields. For more information about the content of these `mcf` file fields, see the *StorageTek ASM and QFS File System Administration Guide*.

The Equipment Identifier Field

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

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

  The specification for a disk partition or disk slice is limited to 127 characters in length. Table 13 shows the kinds of devices to use when creating StorageTek QFS file systems.

Table 13. File System Types and Allowed Disk Devices

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

The following notes pertain to the information in Table 13.:

- In a Sun Cluster environment, you can configure a StorageTek QFS highly available file system from raw devices or from devices managed by a volume manager. You can use either a Sun or a VERITAS volume manager.
- Do not use a volume manager for devices configured in a StorageTek QFS shared file system.
- If you are creating a StorageTek QFS highly available file system, using a volume manager does not guarantee that the disks are highly available. For information about determining how a device can be configured in a Sun Cluster environment, see “(Optional) Verifying Requirements for Installing the StorageTek QFS File System in a Sun Cluster Environment” on page 35.

The Equipment Ordinal Field

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

The Equipment Type Field

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

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

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

The Family Set Field

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

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

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

The Device State Field

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

The Additional Parameters Field

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

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

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

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

Figure 19 shows file system entries in an mcf file for a StorageTek QFS file system that is local to one Solaris OS host.

Figure 19. Example StorageTek QFS mcf File

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

Note: If you change the mcf file after the StorageTek QFS file system is in use, you must convey the new mcf specifications to the StorageTek QFS software. For information about propagating mcf file changes to the system, see the *StorageTek ASM and QFS File System Administration Guide*.

Configuration Examples for Local File Systems

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

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

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

Configuration Example 1

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

You can use the `format`(1M) command to determine how the disks are partitioned. Figure 20 shows the `format`(1M) command's output.

Figure 20. `format`**(1M) Command Output for Configuration Example 1**

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

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

 # format(1M) shows the partition layout of all drives.

```
# format /dev/rdsk/c6t2d0s2
```

 # Only the last lines of format(1M) output are shown.

Output Deleted From Example

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

To Configure the System

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

1. Write the mcf file.

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

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

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

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

      The finished mcf file defines the following two file systems:

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

      Figure 21 shows the resulting mcf file.

Figure 21. mcf File for StorageTek QFS Example 1

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment         Eq   Eq     Family   Device   Additional
# Identifier        Ord  Type    Set     State    Parameters
#-----------        ---  ----   ------   ------   ----------
#
qfs1                 10    ma   qfs1       on
/dev/dsk/c8t2d0s4    11    mm   qfs1       on
/dev/dsk/c6t2d0s4    12    mr   qfs1       on
/dev/dsk/c6t3d0s4    13    mr   qfs1       on
#
qfs2                 20    ma   qfs2       on
/dev/dsk/c8t2d0s5    21    mm   qfs2       on
/dev/dsk/c6t2d0s5    22    mr   qfs2       on
/dev/dsk/c6t3d0s5    23    mr   qfs2       on
```

2. Modify the /etc/vfstab file.

   Make entries in the /etc/vfstab file for the qfs1 and qfs2 file systems you defined in the mcf file. The last two lines in Figure 22 show entries for these new file systems.

Figure 22. /etc/vfstab File for StorageTek QFS Example 1

```
# cat /etc/vfstab
# device            device                        file            mount
# to                to                  mount     system   fsck   at
mount
```

Figure 22. `/etc/vfstab` **File for StorageTek QFS Example 1 (Continued)**

```
# mount              fsck                   point    type      pass    boot
params
# -----              ----                   -----    ----      ----    ----
------
fd                   -                      /dev/fd  fd        -       no     -
/proc                -                      /proc    proc      -       no     -
/dev/dsk/c0t10d0s1   -                      -        swap      -       no     -
/dev/dsk/c0t10d0s0   /dev/rdsk/c0t10d0s0    /         ufs       1       no
logging
swap                 -                      /tmp     tmpfs     -       yes    -
qfs1                 -                       /qfs1    samfs     -       yes
stripe=1
qfs2                 -                       /qfs2    samfs     -       yes
stripe=1
```

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

Configuration Example 2

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

This example assumes the following:

- The metadata device is a single partition (`s1`) used on controller 8, disk 4.
- The data devices consist of four disks attached to controller 6. Each disk is on a separate target (`1-4`).

To Configure the System

This example introduces the round-robin data layout. For more information about data layout, see the *StorageTek ASM and QFS File System Administration Guide*.

1. Write the `mcf` file.

   Figure 23 shows the `mcf` file for this round-robin disk configuration.

Figure 23. `mcf` **File for StorageTek QFS Example 2**

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

Figure 23. mcf File for StorageTek QFS Example 2 (Continued)

```
/dev/dsk/c6t3d0s4    13    mr   qfs3        on
/dev/dsk/c6t4d0s4    14    mr   qfs3        on
/dev/dsk/c6t5d0s4    15    mr   qfs3        on
```

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

2. Modify the /etc/vfstab file.

   Edit the /etc/vfstab file to explicitly set round-robin allocation on the file system by specifying stripe=0 in the mount params field. Figure 24 shows stripe=0 for the qfs3 file system.

Figure 24. /etc/vfstab File for StorageTek QFS Example 2

```
# cat /etc/vfstab
#device             device                          file           mount
#to                to                  mount    system  fsck  at    mount
#mount              fsck                   point    type    pass  boot
params
#-----              ----                   -----    ----    ----  ----  -
-----
fd                  -                      /dev/fd  fd      -     no    -
/proc               -                      /proc    proc    -     no    -
/dev/dsk/c0t10d0s1  -                      -        swap    -     no    -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0    /        ufs     1     no
logging
swap                -                      /tmp     tmpfs   -     yes   -
qfs3                -                      /qfs3    samfs   -     yes
stripe=0
```

3. Run the sammkfs(1M) command.

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

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

Configuration Example 3

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

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

To Configure the System

1. Write the `mcf` file.

   Write the `mcf` file using the disk configuration assumptions. Figure 25 shows a sample `mcf` file for a striped disk configuration.

Figure 25. `mcf` **File for StorageTek QFS Example 3**

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

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

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

   Set the stripe width by using the `stripe=` option. Figure 26 shows the `/etc/vfstab` file with a mount parameter of `stripe=1` set for the `qfs4` file system.

Figure 26. `/etc/vfstab` **File for StorageTek QFS Example 3**

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

   The `stripe=1` specification stripes file data across all four of the `mr` data disks with a stripe width of one disk allocation unit (DAU). Note that the

DAU is the allocation unit you set when you use the sammkfs(1M) command to initialize the file system.

3. Run the sammkfs(1M) command.

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

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

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

Configuration Example 4

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

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

allocation_unit x *number of disks in the group*

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

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

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

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

To Configure the System

1. Write the `mcf` file.

   Write the `mcf` file by using the disk configuration assumptions. Figure 27 shows a sample `mcf` file for a striped group configuration.

Figure 27. `mcf` **File for StorageTek QFS Example 4**

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment         Eq   Eq     Family   Device   Additional
# Identifier        Ord  Type    Set     State    Parameters
#-----------        ---  ----   ------   ------   ----------
#
qfs5                 50    ma   qfs5       on
/dev/dsk/c8t4d0s5    51    mm   qfs5       on
/dev/dsk/c6t2d0s5    52    g0   qfs5       on
/dev/dsk/c6t3d0s5    53    g0   qfs5       on
/dev/dsk/c6t4d0s5    54    g1   qfs5       on
/dev/dsk/c6t5d0s5    55    g1   qfs5       on
```

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

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

   Use the the `stripe=` option to set the stripe width. Figure 28 shows the `/etc/vfstab` file with a mount parameter of `stripe=0`, which specifies a round-robin allocation between striped group `g0` to striped group `g1`.

Figure 28. `/etc/vfstab` **File for StorageTek QFS Example 4**

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

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

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

```
# sammkfs qfs5
```

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

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

Figure 29 illustrates a StorageTek QFS shared file system configuration in a StorageTek ASM-QFS environment.

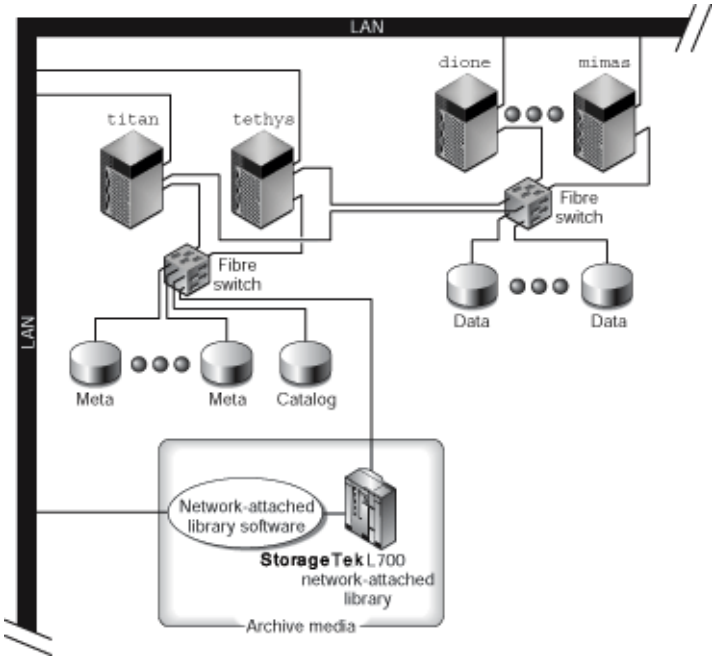

Figure of a shared StorageTek ASM-QFS environment. Shows hosts titan, tethys, dione, and mimas connected to a LAN.

A Sun L700 library is attached to the LAN, to titan, and to tethys.

Figure 29. StorageTek QFS Shared File System Configuration in a StorageTek ASM-QFS Environment

Figure 29 shows four network-attached hosts: `titan`, `tethys`, `dione`, and `mimas`. The `tethys`, `dione`, and `mimas` hosts are the clients, and `titan` is the current metadata server. The `titan` and `tethys` hosts are potential metadata servers.

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

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

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

To Configure the System

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

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

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

   Figure 30 shows the `format`(1M) command output for `titan`. There is one metadata disk on controller 2, and there are three data disks on controller 3.

Figure 30. `format` (1M) Command Output on `titan`

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


AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e9c296,0
```

Figure 30. format **(1M) Command Output on** titan **(Continued)**

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

Figure 31 shows the format(1M) command output for tethys. There is one metadata disk on controller 2, and there are four data disks on controller 7.

Figure 31. format **(1M) Command Output on** tethys

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


AVAILABLE DISK SELECTIONS:
       0. c0t1d0 <IBM-DNES-318350Y-SA60 cyl 11112 alt 2 hd 10 sec 320>
          /pci@1f,4000/scsi@3/sd@1,0
       1. c2t2100002037E9C296d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e9c296,0
       2. c2t50020F23000065EEd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128
sec 256>
          /pci@1f,4000/SUNW,qlc@4/ssd@w50020f23000065ee,0
       3. c7t50020F2300005D22d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128
sec 256>
          /pci@1f,4000/SUNW,qlc@5/ssd@w50020f2300005d22,0
       4. c7t50020F2300006099d0 <SUN-T300-0116 cyl 34901 alt 2 hd 128
sec 256>
          /pci@1f,4000/SUNW,qlc@5/ssd@w50020f2300006099,0
       5. c7t50020F230000651Cd0 <SUN-T300-0116 cyl 34901 alt 2 hd 128
sec 256>
          /pci@1f,4000/SUNW,qlc@5/ssd@w50020f230000651c,0
```

Note the following in Figure 31:

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

World Wide Name is 50020F2300005D22. This is the same name as number 3 on controller 7 on tethys.

- For titan's metadata disk, the World Wide Name is 50020F23000065EE. This is the same metadata disk as tethys' controller 2, target 0.

  Figure 32 shows the format(1M) command's output for mimas. This shows three data disks on controller 1 and no metadata disks.

Figure 32. format (1M) Command Output on mimas

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


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

Figure 31 and Figure 32 show that the data disks on titan's controller 3 are the same disks as mimas' controller 1. You can verify this by looking at the World Wide Name, which is the last component in the device name. For titan's number 3 disk, the World Wide Name is 50020F2300005D22. This is the same name as number 3 on controller 1 on mimas.

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

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

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

   The only difference between the mcf file of a shared StorageTek QFS file system and an unshared StorageTek QFS file system is the presence of

the shared keyword in the Additional Parameters field of the file system name line of a StorageTek QFS shared file system.

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

Figure 33 shows an mcf file fragment for titan that defines several disks for use in the StorageTek QFS shared file system. It shows the shared keyword in the Additional Parameters field on the file system name line.

Figure 33. StorageTek QFS Shared File System mcf File Example for titan

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

Note: In a StorageTek ASM-QFS shared file system, for each host that is a metadata server or potential metadata server, that hosts's mcf file must define all libraries and library catalogs used by its own shared file systems and by its potential shared file systems. This is necessary if you want to change the metadata server. For information on defining libraries in an mcf file, see the "StorageTek ASM Initial Installation Procedure" on page 131.

Configuration Examples for StorageTek QFS Highly Available File Systems

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

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

To Create an mcf File for a StorageTek QFS Highly Available File System

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

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

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

Example 1. Figure 34 is an example `mcf` file entry for a StorageTek QFS highly available file system that uses raw devices.

Figure 34. `mcf` File That Specifies Raw Devices

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

Example 2. Figure 35 is an example `mcf` file entry for a StorageTek QFS highly available file system that uses Solaris Volume Manager metadevices. The example assumes that the Solaris Volume Manager metaset in use is named `red`.

Figure 35. `mcf` File That Specifies Solaris Volume Manager Devices

```
Equipment             Eq   Eq     Family   Additional
Identifier            Ord  Type   Set      Parameters
--------------------- ---  ----   ------   ----------
qfs1                    1   ma    qfs1     on
/dev/md/red/dsk/d0s0   11   mm    qfs1
/dev/md/red/dsk/d1s0   12   mr    qfs1
```

Example 3. Figure 36 is an example `mcf` file entry for a StorageTek QFS highly available file system that uses VxVm devices.

Figure 36. `mcf` File That Specifies VxVM Devices

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

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

This example assumes that both ash and elm are nodes in a Sun Cluster. Host ash is the metadata server. The keyword shared in this example's mcf file indicates to the system that this is a shared file system. This example builds upon "Example - Using the scdidadm(1M) Command in a Sun Cluster" on page 38.

To Create an mcf File for a StorageTek QFS Shared File System on a Sun Cluster

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

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

   The scdidadm(1M) command administers the device identifier (DID) devices. The -L option lists all the DID device paths, including those on all nodes in the Sun Cluster. Figure 37. shows the format output from all the /dev/did devices. This information is needed when you build the mcf file.

Figure 37. format**(1M) Command Output**

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

Primary label contents:

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

Figure 37. `format`**(1M) Command Output (Continued)**

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

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

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

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


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

Figure 37. format**(1M) Command Output (Continued)**

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

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

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


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

Volume name = <        >
ascii name  = <SUN-T300-0118 cyl 34530 alt 2 hd 128 sec 128>
pcyl        = 34532
ncyl        = 34530
```

Figure 37. `format`**(1M) Command Output (Continued)**

```
acyl        =    2
nhead       =  128
nsect       =  128
Part      Tag    Flag     Cylinders         Size            Blocks
  0        usr    wm       0 - 17264      134.88GB    (17265/0/0)
282869760
  1        usr    wm   17265 - 34529      134.88GB    (17265/0/0)
282869760
  2     backup    wu       0 - 34529      269.77GB    (34530/0/0)
565739520
  3 unassigned    wu       0                 0        (0/0/0)           0
  4 unassigned    wu       0                 0        (0/0/0)           0
  5 unassigned    wu       0                 0        (0/0/0)           0
  6 unassigned    wu       0                 0        (0/0/0)           0
  7 unassigned    wu       0                 0        (0/0/0)           0
```

The `format`(1M) command reveals the space available on a device, but it does not reveal whether a disk is mirrored or striped. Put the file system's `mm` devices on mirrored (RAID-1) disks. The `mm` devices should constitute about 10% of the space allocated for the entire file system. Figure 37's `format`(1M) output reveals the following information that is used when writing the `mcf` file shown in Figure 38:

- Output for devices `d4s0` and `d6s0` show 16.86 GB each. These devices are Equipment Ordinal `501` and Equipment Ordinal `502`, respectively.
- Output for devices `d8s0` and `d9s0` show 134.88 GB each. These devices are Equipment Ordinal `503` and Equipment Ordinal `504`, respectively.

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

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

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

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

   Figure 38 shows the `mcf` file.

Figure 38. `mcf` **File on Metadata Server** `ash`

```
Equipment             Eq   Eq     Family   Additional
Identifier            Ord  Type   Set      Parameters
--------------------- ---  ----   ------   ----------
#
# Family Set sqfs1 (shared FS for SunCluster)
#
```

Figure 38. mcf **File on Metadata Server** ash **(Continued)**

```
sqfs1                 500   ma    sqfs1    shared
/dev/did/dsk/d4s0     501   mm    sqfs1    -
/dev/did/dsk/d6s0     502   mm    sqfs1    -
/dev/did/dsk/d8s0     503   mr    sqfs1    -
/dev/did/dsk/d9s0     504   mr    sqfs1    -
```

(Optional) Editing mcf Files on Other Hosts

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

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

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

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

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

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

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

To Edit `mcf` Files on Other Hosts for a StorageTek QFS Shared File System

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

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

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

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

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

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

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

   The `samfsconfig`(1M) command generates configuration information that can help you to identify the devices included in the StorageTek QFS shared file system. Enter a separate `samfsconfig`(1M) command on each client host. Note that the controller number might not be the same

controller number as on the metadata server because the controller numbers are assigned by each client host.

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

Examples

Example 1 - Solaris OS hosts. Figure 39 shows how the samfsconfig(1M) command is used to retrieve device information for family set sharefs1 on client tethys. Note that tethys is a potential metadata server, so it is connected to the same metadata disks as titan.

Figure 39. samfsconfig(1M) Command Example on tethys

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

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

- Each Device State field must be set to on.
- The shared keyword must appear in the Additional Parameters field for the file system name.

Figure 40 shows the resulting mcf file.

Figure 40. mcf File for sharefs1 Client Host tethys

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

In Figure 40, note that the Equipment Ordinal numbers match those of the example mcf file for metadata server titan. These Equipment Ordinal

numbers must not already be in use on client host tethys or any other client host.

Example 2 - Solaris OS hosts. Figure 41. shows how the samfsconfig(1M) command is used to retrieve device information for family set sharefs1 on client host mimas. Note that mimas can never become a metadata server, and it is not connected to the metadata disks.

Figure 41. samfsconfig**(1M) Command Example on** mimas

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

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

- Create a file system Family Set declaration line, beginning with sharefs1, in the mcf file for client host mimas. Enter the shared keyword into the Additional Parameters field of the file system Family Set declaration line.
- Create one or more nodev lines for each missing Equipment Ordinal. For these lines, the keyword nodev must appear in the Equipment Identifier field for each inaccessible device. In this example, you create a device entry in the mcf file named nodev to represent the missing metadata disk.
  - Ensure that each Device State field is set to on.
  - Uncomment the device lines.

Figure 42 shows the resulting `mcf` file for `mimas`.

Figure 42. `mcf` File for Client Host `mimas`

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

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

(Optional) Creating the Shared Hosts File

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

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

To Create the Shared Hosts File on the Metadata Server

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

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

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

   Comments are permitted in the hosts file. Comment lines must begin with a pound character (#). Characters to the right of the pound character are ignored.
3. Use the information in Table 14 to fill in the lines of the hosts file.

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

Table 14 shows the fields in the hosts file.

Table 14. Hosts File Fields

Field Number	Content
1	The Host Name field. This field must contain an alphanumeric host name. It defines the StorageTek QFS shared file system hosts. You can use the output from the hostname(1) command to create this field.
2	The Host IP Addresses field. This field must contain a comma-separated list of host IP addresses. You can use the output from the ifconfig(1M) -a command to create this field. You can specify the individual addresses in one of the following ways: • Dotted-decimal IP address form • IP version 6 hexadecimal address form • A symbolic name that the local domain name service (DNS) can resolve to a particular host interface The metadata server uses this field to determine whether a host is allowed to connect to the StorageTek QFS shared file system. If the metadata server receives a connect attempt from any interface not listed in this field, it rejects the connection attempt. Conversely, use care when adding elements here because the metadata server accepts any host with an IP address that matches an address in this field. The client hosts use this field to determine the metadata server interfaces to use when attempting to connect to the metadata server. Each host evaluates the addresses from left to right, and the connection is made using the first responding address in the list.

Table 14. Hosts File Fields (Continued)

Field Number	Content
3	The Server field. This field must contain either a dash character (-) or an integer ranging from 0 through *n*. The - and the 0 are equivalent. If the Server field is a nonzero integer number, the host is a potential metadata server. The rest of the row defines the server as a metadata host. The metadata server processes all the metadata modification for the file system. At any one time there is at most one metadata server host, and that metadata server supports archiving, staging, releasing, and recycling for a StorageTek ASM-QFS shared file system. If the Server field is - or 0, the host is not eligible to be a metadata server.
4	Reserved for future use by StorageTek. This field must contain either a dash character (-) or a 0. The - and the 0 are equivalent.
5	The Server Host field. This field can contain either a blank or the server keyword in the row that defines the active metadata server. Only one row in the hosts file can contain the server keyword. This field must be blank in all other rows.

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

Example for Solaris OS Hosts

Figure 43 is an example hosts file that shows four hosts.

Figure 43. StorageTek QFS Shared File System Hosts File Example

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

Figure 43 shows a hosts file that contains fields of information and comment lines for the `sharefs1` file system. In this example, the Server

Priority field contains the number 1 in the Server Priority field to define the primary metadata server as `titan`. If `titan` is down, the next metadata server is `tethys`, and the number `2` in this field indicates this secondary priority. Note that neither `dione` nor `mimas` can ever be a metadata server.

Example for Sun Cluster Hosts

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

Figure 44 shows the local hosts configuration file for a shared file system, `sharefs1`. This file system's participating hosts are Sun Cluster nodes `scnode-A` and `scnode-B`. Each node's private interconnect name is listed in the Host IP Addresses field.

Figure 44. StorageTek QFS Shared File System Hosts File Example

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

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

Perform this procedure under the following circumstances:

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

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

   Using `vi`(1) or another editor, create an ASCII local hosts configuration file that defines the host interfaces that the metadata server and the client

hosts can use when accessing the file system. The local hosts configuration file must reside in the following location:

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

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

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

Table 15 shows the fields in the local hosts configuration file.

Table 15. Local Hosts Configuration File Fields

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

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

Obtaining Addresses

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

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

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

1. The client obtains the list of metadata server host IP interfaces from the file system's on-disk shared hosts file. To examine this file, issue the `samsharefs`(1M) command from the metadata server or from a potential metadata server.
2. The client searches for an `/etc/opt/SUNWsamfs/hosts.`*fsname*`.local` file. Depending on the outcome of the search, one of the following occurs:
   - If a `hosts.`*fsname*`.local` file does not exist, the client attempts to connect, in turn, to each address in the server's line in the shared hosts file until it succeeds in connecting.
   - If the `hosts.`*fsname*`.local` file exists, the client performs the following tasks:

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

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

Example

This example expands on Figure 29. Figure 43 shows the hosts file for this configuration. Figure 45 shows the interfaces to these systems.

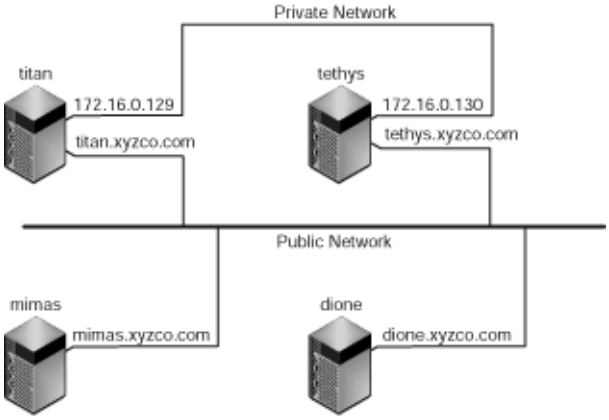

Figure of a shared Storagetek ASM-QFS environment showing public and private networks.

Shows hosts titan, tethys, dione, and mimas connected to a public network. Shows hosts titan and tethys connected by a private network.

Figure 45. Network Interfaces

Systems `titan` and `tethys` share a private network connection with interfaces `172.16.0.129` and `172.16.0.130`. To guarantee that `titan` and `tethys` always communicate over their private network connection, the system administrator has created identical copies of `/etc/opt/SUNWsamfs/hosts.sharefs1.local` on each system. Figure 46 shows the information in these files.

Figure 46. File `hosts.sharefs1.local` on Both `titan` and `tethys`

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

Systems `mimas` and `dione` are not on the private network. To guarantee that they connect to `titan` and `tethys` through `titan`'s and `tethys`' public interfaces, and never attempt to connect to `titan`'s or `tethys`' unreachable private interfaces, the system administrator has created identical copies of `/etc/opt/SUNWsamfs/hosts.sharefs1.local` on `mimas` and `dione`. Figure 47 shows the information in these files.

Figure 47. File `hosts.sharefs1.local` on Both `mimas` and `dione`

```
# This is file /etc/opt/SUNWsamfs/hosts.sharefs1.local
# Host Name    Host Interfaces
```

Figure 47. File `hosts.sharefs1.local` **on Both** `mimas` **and** `dione`

```
# ----------   --------------
titan          titan.xyzco.com
tethys         tethys.xyzco.com
```

■ Initializing the Environment

This procedure initializes the environment.

To Initialize the Environment

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

  For example:

```
# samd config
```

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

■ (Optional) Editing the `defaults.conf` File

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

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

To Set Up Default Values

1. Read the `defaults.conf`(4) man page and examine this file to determine if you want to change any of the defaults.
2. Use the `cp`(1) command to copy `/opt/SUNWsamfs/examples/defaults.conf` to its functional location.

   For example:

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

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

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

For example, if you are configuring a StorageTek QFS shared file system in a Sun Cluster, Figure 48 shows `defaults.conf` entries that are helpful when debugging.

Figure 48. `defaults.conf` **Entries for Debugging**

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

4. Use the `samd`(1M) `config` command to restart the `sam-fsd`(1M) daemon and enable the daemon to recognize the changes in the `defaults.conf` file.
5. (Optional) Repeat this procedure for each host that you want to include in a StorageTek QFS shared file system or a StorageTek QFS highly available file system.

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

Verifying the License and `mcf` Files

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

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

The procedures in this section show you how to verify the correctness of these configuration files.

Perform these verifications on all hosts if you are configuring a StorageTek QFS shared file system or a StorageTek QFS highly available file system.

To Verify the License File

- Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

The samcmd(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in Figure 49, return to “Enabling the StorageTek QFS Software License” on page 47.

Figure 49. Using samcmd(1M)

```
# samcmd l

License information samcmd     4.2    Fri Aug 27 16:24:12
2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled

QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

To Verify the mcf File

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

  Examine the output for errors, as follows:

- If your mcf file is free from syntax errors, the sam-fsd(1M) the output is similar to that shown in Figure 50. It contains information about the file systems and other system information.

Figure 50. sam-fsd(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld       off

sam-archiverd off

sam-catserverd off

sam-fsd        off

sam-rftd       off

sam-recycler   off

sam-sharefsd   off
```

Figure 50. `sam-fsd`**(1M) Output Showing No Errors (Continued)**

```
sam-stagerd   off

sam-serverd   off

sam-clientd   off

sam-mgmt      off

License: License never expires.
```

- If your `mcf` file contains syntax or other errors, however, it notes the errors in its output.

  If your `mcf` file has errors, refer to "Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57 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 StorageTek QFS file system is in use, you must convey the new `mcf` specifications to the StorageTek QFS software. For information about propagating `mcf` file changes to the system, see the *StorageTek ASM and QFS File System Administration Guide*.

(Optional) Creating the `samfs.cmd` File

You can create the `/etc/opt/SUNWsamfs/samfs.cmd` file as the place from which the system reads mount parameters. If you are configuring multiple StorageTek QFS systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the `mount`(1M) command. Mount options specified here override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file.
- In the `/etc/vfstab` file. Mount options specified here override those specified in the `samfs.cmd` file.
- In the `samfs.cmd` file.

You can manage certain features more easily from a `samfs.cmd` file. These features include the following:

- Striping.
- Readahead, which specifies the number of bytes that are read ahead when performing paged I/O.
- Writebehind, which specifies the number of bytes that are written behind when performing paged I/O.

- Qwrite, which enables simultaneous reads and writes to the same file from different threads.

For more information about the /etc/vfstab file, see "Updating the /etc/vfstab File and Creating the Mount Point" on page 95. For more information about the mount(1M) command, see the mount_samfs(1M) man page.

To Create the samfs.cmd File

1. Use vi(1) or another editor to create the samfs.cmd file.

   Create lines in the samfs.cmd file to control mounting, performance features, or other aspects of file system management. For more information about the samfs.cmd file, see the *StorageTek ASM and QFS File System Administration Guide*, or see the samfs.cmd(4) man page.

   Figure 51 shows a samfs.cmd file for a StorageTek QFS file system.

Figure 51. Example samfs.cmd File for a StorageTek QFS File System

```
qwrite   # Global mount option. Enables qwrite for all file
systems
fs=qfs1  # Enables mount options for the qfs1 file system
only
   trace # Enables file system tracing for qfs1 only
```

2. (Optional) Copy lines, as necessary, to the samfs.cmd file on other hosts.

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

   If you have created a samfs.cmd file on one host in a Sun Cluster to describe a particular file system's mount parameters, copy those lines to samfs.cmd files on all the nodes that can access that file system.

   For debugging purposes, the samfs.cmd file, as it pertains to a specific file system, should be the same on all hosts. For example, if the qfs3 file system is accessible from all nodes in a Sun Cluster, then the lines in the samfs.cmd file that describe the qfs3 file system should be identical on all the nodes in the Sun Cluster.

   Depending on your site needs, it might be easier to manage mount options from the samfs.cmd file rather than from the /etc/vfstab file. The /etc/vfstab file overrides the samfs.cmd file in the event of conflicts.

   For more information about mount options, see "Updating the /etc/vfstab File and Creating the Mount Point" on page 95.

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

This task shows you how to edit the /etc/vfstab file.

Note: Even though `/global` is used in this chapter's examples as the mount point for file systems mounted in a Sun Cluster environment, it is not required. You can use any mount point.

Table 16 shows the values you can enter in the fields in the `/etc/vfstab` file.

Table 16. Fields in the `/etc/vfstab` File

Field	Field Title and Contents
1	Device to Mount. The name of the StorageTek QFS file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the StorageTek QFS file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount Point. Examples: • /qfs1 for a local StorageTek QFS file system on a single host. • /global/qfs1 for a StorageTek QFS shared file system in a Sun Cluster. • /global/qfs1 for a StorageTek QFS highly available file system in a Sun Cluster.
4	File System Type. Must be samfs.

Table 16. Fields in the /etc/vfstab File (Continued)

Field	Field Title and Contents
5	fsck(1M) Pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at Boot. Specify either yes or no. • Specifying yes in this field requests that the StorageTek QFS file system be mounted automatically at boot time. Do not specify yes if you are creating a file system for use in a Sun Cluster. • Specifying no in this field indicates that you do not want to mount the file system automatically. Specify no in this field if you are creating a file system for use in a Sun Cluster to indicate that the file system is under Sun Cluster control. For information about the format of these entries, see the mount_samfs(1M) man page.
7	Mount Parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the mount(1M) command, in the /etc/vfstab file, or in a samfs.cmd file. Mount options specified on the mount(1M) command override those specified in the /etc/vfstab file and in the samfs.cmd file. Mount options specified in the /etc/vfstab file override those in the samfs.cmd file. For example, stripe=1 specifies a stripe width of one DAU. For a list of available mount options, see the mount_samfs(1M) man page.

To Update the /etc/vfstab File and Create the Mount Point

1. Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each StorageTek QFS file system.

   Figure 52 shows header fields and entries for a local StorageTek QFS file system.

Figure 52. Example /etc/vfstab File Entries for a StorageTek QFS File System

```
#DEVICE    DEVICE   MOUNT  FS    FSCK  MOUNT    MOUNT
#TO MOUNT  TO FSCK  POINT  TYPE  PASS  AT BOOT  PARAMETERS
#
qfs1       -        /qfs1  samfs -     yes      stripe=1
```

   Table 16 shows the various fields in the /etc/vfstab file and their contents.

If you are configuring a file system for a Sun Cluster environment, the mount options that are required, or are recommended, differ depending on the type of file system you are configuring. Table 17 explains the mount options.

Table 17. Mount Options for a Sun Cluster File System

File System Type	Required Options	Recommended Options
StorageTek QFS shared file system	shared	forcedirectio sync_meta=1 mh_write qwrite nstreams=1024 rdlease=300 aplease=300 wrlease=300
StorageTek QFS shared file system to support Oracle Real Application Clusters database files	shared forcedirectio sync_meta=1 mh_write qwrite nstreams=1024 stripe>=1 rdlease=300 aplease=300 wrlease=300	
StorageTek QFS highly available file system		sync_meta=1

You can specify most of the mount options mentioned in Table 17 in either the `/etc/vfstab` file or in the `samds.cmd` file. The `shared` option, however, must be specified in the `/etc/vfstab` file.

> **Tip**-In addition to the mount options mentioned in Table 17, you can also specify the `trace` mount option for configuration debugging purposes.

2. Use the `mkdir`(1) command to create the file system mount point.

The mount point location differs depending on where the file system is to be mounted. The following examples illustrate this.

Example 1. This example assumes that `/qfs1` is the mount point of the `qfs1` file system. This is a local file system. It can exist on a standalone server or on a local node in a Sun Cluster. For example:

```
# mkdir /qfs1
```

Example 2. This example assumes that `/global/qfs1` is the mount point of the `qfs1` file system, which is a StorageTek QFS shared file system to be mounted on a Sun Cluster:

```
# mkdir /global/qfs1
```

Note: If you configured multiple mount points, repeat these steps for each mount point, using a different mount point (such as `/qfs2`) and Family Set name (such as `qfs2`) each time.

3. (Optional) Repeat the preceding steps for all hosts if you are configuring a StorageTek QFS shared file system or a StorageTek QFS highly available file system.

For debugging purposes, if you are configuring a StorageTek QFS shared file system, the mount options should be the same on all hosts that can mount the file system.

■ Initializing the File System

This procedure shows how to use the `sammkfs`(1M) command and the Family Set names that you have defined to initialize a file system.

Note: The `sammkfs`(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *StorageTek ASM and QFS File System Administration Guide* or see the `sammkfs`(1M) man page.

To Initialize a File System

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

CAUTION: Running `sammkfs`(1M) creates a new file system. It removes all references to the data currently contained in the partitions associated with the file system in the `/etc/opt/SUNWsamfs/mcf` file.

Example for a StorageTek QFS File System

Figure 53 shows the command to use to initialize a StorageTek QFS file system with the Family Set name of `qfs1`.

Figure 53. Initializing Example File System `qfs1`

```
# sammkfs -a 128 qfs1
Building 'qfs1' will destroy the contents of devices:
                /dev/dsk/c1t0d0s0
                /dev/dsk/c3t1d0s6
                /dev/dsk/c3t1d1s6
                /dev/dsk/c3t2d0s6
Do you wish to continue? [y/N]
```

Enter `y` in response to this message to continue the file system creation process.

Example for a StorageTek QFS Shared File System

If you are configuring a StorageTek QFS shared file system, enter the `sammkfs`(1M) comand on the metadata server only.

Enter the `sammkfs`(1M) command at the system prompt. The `-S` options specifies that the file system be a StorageTek QFS shared file system. Use this command in the following format:

```
sammkfs -S -a allocation_unit fs_name
```

Table 18. `sammkfs`(1M) Command Arguments

Argument	Meaning
allocation_unit	Specifies the number of bytes, in units of 1024 (1-kilobyte) blocks, to be allocated to a disk allocation unit (DAU). The specified *allocation_unit* must be a multiple of 8 kilobytes. For more information, see the sammkfs(1M) man page.
fs_name	Family Set name of the file system as defined in the mcf file.

For more information about the `sammkfs`(1M) command, see the `sammkfs`(1M) man page. For example, you can use the following `sammkfs`(1M) command to initialize a StorageTek QFS shared file system and identify it as shared:

```
# sammkfs -S -a 512 sharefs1
```

If the shared keyword appears in the mcf file, the file system must be initialized as a shared file system by using the -S option to the sammkfs(1M) command. You cannot mount a file system as shared if it was not initialized as shared.

If you are initializing a file system as a StorageTek QFS file system, file /etc/opt/SUNWsamfs/hosts.sharefs1 must exist at the time you issue the sammkfs(1M) command. The sammkfs(1M) command uses the hosts file when it creates the file system. You can use the samsharefs(1M) command to replace or update the contents of the hosts file at a later date.

(Optional) Verifying That the Daemons Are Running

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

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

To Verify the Daemons

Perform these steps on each host that can mount the file system.

1. Use the ps(1) and grep(1) commands to verify that the sam-sharefsd daemon is running for this file system.

   Figure 54 shows these commands.

Figure 54. Output from the ps(1) and grep(1) Commands

```
# ps -ef | grep sam-sharefsd
root 26167 26158  0 18:35:20 ?        0:00 sam-sharefsd
sharefs1
root 27808 27018  0 10:48:46 pts/21   0:00 grep sam-
sharefsd
```

   Figure 54. shows that the sam-sharefsd daemon is active for the sharefs1 file system. If this is the case for your system, you can proceed to the next step in this procedure. If, however, the output returned on your system does not show that the sam-sharefsd daemon is active for your StorageTek QFS shared file system, you need to perform some diagnostic procedures. For information about these procedures, see the *StorageTek ASM and QFS File System Administration Guide*.

   Depending on whether or not this daemon is running, perform the remaining steps in this procedure.

2. (Optional) Determine whether the sam-fsd daemon is running.

Perform this step if the previous step's output indicates that the `sam-sharefsd` daemon is not running.

a. Use the `ps`(1) and `grep`(1) commands to verify that the `sam-fsd` daemon is running for this file system.

b. Examine the output.

Figure 55 shows `sam-fsd` output that indicates that the daemon is running.

Figure 55. `sam-fsd`(1M) Output That Shows the `sam-fsd` Daemon is Running

```
cur% ps -ef | grep sam-fsd
 user1 16435 16314  0 16:52:36 pts/13   0:00 grep sam-fsd
    root   679     1  0   Aug 24 ?        0:00 /usr/lib/fs/
samfs/sam-fsd
```

- If the output indicates that the `sam-fsd` daemon is not running, and if no file system has been accessed since the system's last boot, issue the `samd`(1M) `config` command, as follows:

```
# samd config
```

- If the output indicates that the `sam-fsd` daemon is running, enable tracing in the `defaults.conf`(4) file and check the following files to determine if configuration errors are causing the problem:
  - `/var/opt/SUNWsamfs/trace/sam-fsd`
  - `/var/opt/SUNWsamfs/trace/sam-sharefsd`

Mounting the File System

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

Use one or more of the procedures that follow to mount your file system. The introduction to each procedure explains the file system to which it pertains.

To Mount the File System on One Host

Perform this procedure on all StorageTek QFS file system, as follows:

- If you are configuring a StorageTek QFS file system on a single host, perform this procedure on that host. When that is accomplished, go to "(Optional) Sharing the File System With NFS Client Systems" on page 106.

- If you are configuring a StorageTek QFS shared file system in a Solaris OS environment, perform this procedure on the metadata server first. When that is accomplished, perform this procedure on the other hosts in the file system.
- If you are configuring a StorageTek QFS shared file system in a Sun Cluster environment, perform this procedure on all nodes that can host the file system.
- If you are configuring a StorageTek QFS highly available file system in a Sun Cluster, perform this procedure on all nodes that can host the file system.

1. Use the `mount`(1M) command to mount the file system.

   Specify the file system mount point as the argument. For example:

```
# mount /qfs1
```

2. Use the `mount`(1M) command with no arguments to verify the mount.

   This step confirms whether the file system is mounted and shows how to set permissions. Figure 56 shows the output from a `mount`(1M) command issued to verify whether example file system `qfs1` is mounted.

Figure 56. Using the `mount`(1M) Command to Verify That a File System Is Mounted

```
# mount
<<< information deleted >>>
/qfs1 on qfs1 read/write/setuid/dev=8001b1 on Mon Jan 14 12:21:03 2002
<<< information deleted >>>
```

3. (Optional) Use the `chmod`(1) and `chown`(1) commands to change the permissions and ownership of the file system's root directory.

   If this is the first time the file system has been mounted, it is typical to perform this step. Figure 57 shows the commands to use to change file system permissions and ownership.

Figure 57. Using `chmod`(1M) and `chown`(1M) to Change File System Permissions and Ownership

```
# chmod 755 /qfs1
# chown root:other /qfs1
```

(Optional) To Verify Metadata Server Changes

Perform this procedure if you are creating a StorageTek QFS shared file system in either a Solaris OS or in a Sun Cluster environment. This procedure ensures that the file system is configured to support changing the metadata server.

1. Log in to the metadata server as superuser.
2. Use the `samsharefs`(1M) command to change the metadata server.

   For example:

```
ash# samsharefs -s oak qfs1
```

3. Use the `ls`(1) `-al` command to verify that the files are accessible on the new metadata server.

   For example:

```
oak# ls -al /qfs1
```

4. Repeat Step 2 and Step 3.

   If you are creating a StorageTek QFS shared file system in a Solaris OS environment, repeat these commands on each metadata server or potential metadata server.

   If you are creating a StorageTek QFS shared file system in a Sun Cluster, repeat these steps on all hosts that can mount the file system.

(Optional) Configuring the `SUNW.qfs` Resource Type

Perform this task if you are configuring a StorageTek QFS shared file system on a Sun Cluster platform.

To Enable a StorageTek QFS Shared File System as a `SUNW.qfs`(5) Resource

1. Log in to the metadata server as superuser.
2. Use the `scrgadm`(1M) `-p` command and search for the `SUNW.qfs`(5) resource type.

This step verifies that the previous step succeeded. For example:

```
metadataserver# scrgadm -p | grep SUNW.qfs
```

If the `SUNW.qfs` resource type is missing, issue the following command:

```
metadataserver# scrgadm -a -t SUNW.qfs
```

3. Use the scrgadm(1M) command to set the FilesystemCheckCommand property of the SUNW.qfs(5) resource type to /bin/true.

The SUNW.qfs(5) resource type is part of the StorageTek QFS software package. Configuring the resource type for use with your shared file system makes the shared file system's metadata server highly available. Sun Cluster scalable applications can then access data contained in the file system. For more information, see the *StorageTek ASM and QFS File System Administration Guide*.

Figure 58 shows how to use the scrgadm(1M) command to register and configure the SUNW.qfs resource type. In this example, the nodes are scnode-A and scnode-B. /global/sharefs1 is the mount point as specified in the /etc/vfstab file.

Figure 58. Configuring a SUNW.qfs Resource

```
# scrgadm -a -g qfs-rg -h scnode-A,scnode-B
# scrgadm -a -g qfs-rg -t SUNW.qfs -j qfs-res \
          -x QFSFileSystem=/global/sharefs1
```

(Optional) Configuring the HAStoragePlus Resource

Perform this task if you are configuring a StorageTek QFS highly available file system on a Sun Cluster platform.

To Configure a StorageTek QFS Highly Available File System as an HAStoragePlus Resource

- Use the scrgadm(1M) command to set the FilesystemCheckCommand property of HAStoragePlus to /bin/true.

All other resource properties for HAStoragePlus apply as specified in SUNW.HAStoragePlus(5).

The following example command shows how to use the scrgadm(1M) command to configure an HAStoragePlus resource:

```
# scrgadm -a -g qfs-rg -j ha-qfs -t SUNW.HAStoragePlus \
        -x FilesystemMountPoints=/global/qfs1 \
        -x FilesystemCheckCommand=/bin/true
```

(Optional) Sharing the File System With NFS Client Systems

Perform this task if you are configuring a file system and you want the file system to be NFS shared.

This procedure uses the Sun Solaris `share`(1M) command to make the file system available for mounting by remote systems. The `share`(1M) commands are typically placed in the `/etc/dfs/dfstab` file and are executed automatically by the Sun Solaris OS when you enter `init`(1M) state 3.

To NFS Share the File System in a Sun Cluster Environment

The following procedure explains how to NFS share a file system in a Sun Cluster environment in general terms. For more information on NFS sharing file systems that are controlled by HAStorage Plus, see the *StorageTek ASM and QFS File System Administration Guide*, see the *Sun Cluster Data Service for Network File System (NFS) Guide for Solaris OS*, and see your NFS documentation.

1. Locate the `dfstab.`*resource_name* file.

   The `Pathprefix` property of HAStoragePlus specifies the directory in which the `dfstab.`*resource_name* file resides.

2. Use `vi`(1) or another editor to add a `share`(1M) command to the *Pathprefix*`/SUNW.nfs/dfstab.`*resource_name* file.

   For example, add a line like the following to NFS share the new file system:

```
share -F nfs -o rw /global/qfs1
```

To NFS Share the File System in a Solaris OS Environment

If you are configuring a StorageTek QFS shared file system, you can perform this procedure from the metadata server or from one of the shared clients.

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

   For example, add a line like the following to direct the Solaris OS to NFS share the new StorageTek QFS file system:

```
share -F nfs -o rw=client1:client2 -d “QFS" /qfs1
```

2. Use the `ps`(1) and `grep`(1) commands to determine whether or not `nfs.server` is running.

   Figure 59 shows these commands and their output.

Figure 59. Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root   694     1  0   Apr 29 ?        0:36 /usr/lib/nfs/nfsd -a 16
en17     29996 29940  0 08:27:09 pts/5    0:00 grep nfsd
# ps -ef | grep mountd
    root   406     1  0   Apr 29 ?       95:48 /usr/lib/autofs/automountd
    root   691     1  0   Apr 29 ?        2:00 /usr/lib/nfs/mountd
en17     29998 29940  0 08:27:28 pts/5    0:00 grep mountd
```

In Figure 59, the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. (Optional) Start the NFS server.

   Perform this step if the `nfs.server` server is not running. Use the following command:

```
# /etc/init.d/nfs.server start
```

4. (Optional) Type the `share`(1M) command at a `root` shell prompt.

   Perform this step if you want to NFS share the new StorageTek QFS file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. Figure 60 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.

Figure 60. NFS Commands

```
# init 3
# who -r
.       run-level 3  Dec 12 14:39     3     2  2
# share
-           /qfs1   -   "QFS"
```

Some NFS mount parameters can affect the performance of an NFS mounted StorageTek QFS file system. You can set these parameters in the `/etc/vfstab` file as follows:

- `timeo =` *n*. This value sets the NFS timeout to *n* tenths of a second. The default is 11 tenths of a second. For performance purposes, use the default value. You can increase or decrease the value appropriately to your system.

- `rsize = n`. This value sets the read buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.
- `wsize = n`. This value sets the write buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

For more information about these parameters, see the `mount_nfs`(1M) man page.

5. Proceed to "To NFS Mount the File System on NFS Clients in a Solaris OS Environment" on page 108.

To NFS Mount the File System on NFS Clients in a Solaris OS Environment

If you are configuring a StorageTek QFS shared file system, you can perform this procedure from the metadata server or from one of the shared clients.

1. On the NFS client systems, use `vi`(1) or another editor to edit the `/etc/vfstab` file and add a line to mount the server's StorageTek QFS file system at a convenient mount point.

   The following example line mounts `server:/qfs1` on the `/qfs1` mount point:

```
server:/qfs1    -    /qfs1    nfs    -    no intr,timeo=60
```

   In this example, `server:/qfs1` is mounted on `/qfs1`, and information is entered into the `/etc/vfstab` file.

2. Save and close the `/etc/vfstab` file.
3. Enter the `mount`(1M) command.

   The following mount(1M) command mounts the `qfs1` file system:

```
client# mount /qfs1
```

   The automounter can also do this, if you prefer. Follow your site procedures for adding `server:/qfs1` to your automounter maps. For more information about automounting, see the `automountd`(1M) man page.

   Note: At times, there might be a significant delay in the StorageTek QFS file system's response to NFS client requests. This can occur in a StorageTek QFS shared file system. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, StorageTek recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000` (or greater).

(Optional) Bringing the Shared Resource Online

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

- StorageTek QFS shared file system on Sun Cluster
- StorageTek QFS highly available file system on Sun Cluster

To Bring the Shared Resource Online

1. Log into the appropriate host.

   - If you are configuring a StorageTek QFS shared file system, log in to the metadata server.
   - If you are configuring a StorageTek QFS highly available file system, log in to the node upon which the file system is based.

   You must perform this step with the file system mounted on all nodes. If it is not mounted, go back to "Mounting the File System" on page 102 and follow the instructions there.

2. Use the `scswitch`(1M) command to move the file system resource to another node.

   For example:

```
metadataserver# scswitch -Z -g qfs-rg
```

3. Use the `scstat`(1M) command to verify that the file system resource moved to a different node.

   For example:

Figure 61. Using `scstat`(1M)

```
metadataserver# scstat
< information deleted from this output >
-- Resources --
Resource Name    Node Name  State     Status Message
-------------    ---------  -----     --------------
```

Figure 61. Using `scstat`(1M)

```
Resource: qfs-res   ash     Online    Online
Resource: qfs-res   elm     Offline   Offline
Resource: qfs-res   oak     Offline   Offline
```

(Optional) Verifying the Resource Group on All Nodes

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

- StorageTek QFS shared file system on a Sun Cluster. This step ensures that the metadata server can move from node to node.
- StorageTek QFS highly available file system on a Sun Cluster. This step ensures that the file system can move from node to node when the Sun Cluster software performs a failover.

To Verify the Resource Group on All Nodes

1. From any node in the Sun Cluster, use the `scswitch`(1M) command to move the file system resource from one node to another.

   For example:

```
server# scswitch -z -g qfs-rg -h elm
```

2. Use the `scstat`(1M) command to verify that the file system resource moved to a different node.

   For example:

Figure 62. Using `scstat`(1M)

```
server# scstat
-- Resources --
Resource Name    Node Name  State     Status Message
-------------    ---------  -----     --------------
Resource: qfs-res   ash     Offline   Offline
Resource: qfs-res   elm     Online    Online
Resource: qfs-res   oak     Offline   Offline
```

3. Repeat the preceding commands on each node in the cluster.

Establishing Periodic Dumps Using `qfsdump`(1M)

File systems are made up of directories, files, and links. The StorageTek QFS file system keeps track of all the files in the `.inodes` file. The `.inodes` file

resides on a separate metadata device. The file system writes all file data to the data devices.

It is important to use the qfsdump(1M) command periodically to create a dump file of metadata and file data. The qfsdump(1M) command saves the relative path information for each file contained in a complete file system or in a portion of a file system. This protects your data in the event of a disaster.

Create dump files at least once a day. The frequency depends on your site's requirements. By dumping file system data on a regular basis, you can restore old files and file systems. You can also move files and file systems from one server to another.

The following are some guidelines for creating dump files:

- The qfsdump(1M) command dumps file names, inode information, and data. This command creates full dumps of specified files and directories. An incremental dump is not available. Because of these factors, a qfsdump(1M) dump file can be very large. The qfsdump(1M) command does not have any tape management, size estimations, or incremental dump facilities as does ufsdump(1M). In addition, the qfsdump(1M) command does not support volume overflow, so you need to weigh space considerations and make sure that the size of the file system does not exceed the size of the dump media.
- The qfsdump(1M) command dumps all the data of a sparse file, and the qfsrestore(1M) command restores all the data. These commands do not, however, preserve file qualities that enable sparse files to be characterized as sparse. This can lead to files occupying more space on dump files and on restored file systems than anticipated.
- You issue the qfsdump(1M) command on a mounted file system. Inconsistencies can arise as new files are being created on disk. Dumping file systems during a quiet period (a time when files are not being created or modified) is a good idea and minimizes these inconsistencies.
- Ensure that you dump metadata and data for all StorageTek QFS file systems. Look in /etc/vfstab for all file systems of type samfs.

You can run the qfsdump(1M) command manually or automatically. Even if you implement this command to be run automatically, you might need to run it manually from time to time depending on your site's circumstances. In the event of a disaster, you can use the qfsrestore(1M) command to recreate your file system. You can also restore a single directory or file. For more information, see the qfsdump(1M) man page and see the *ASM, ASM-QFS and ASM/ QFS-Standalone Disaster Recovery Guide*.

For more information about creating dump files, see the qfsdump(1M) man page. The following sections describe procedures for issuing this command both manually and automatically.

To Run the qfsdump(1M) Command Automatically

1. Make an entry in root's crontab file so that the cron daemon runs the qfsdump(1M) command periodically.

   For example:

```
10 0 * * * (cd /qfs1; /opt/SUNWsamfs/sbin/qfsdump -f /dev/
rmt/0cbn)
```

   This entry executes the qfsdump(1M) command at 10 minutes after midnight. It uses the cd(1) command to change to the mount point of the qfs1 file system, and it executes the /opt/SUNWsamfs/sbin/qfsdump command to write the data to tape device /dev/rmt/0cbn.

2. (Optional) Using the previous step as a guide, make similar crontab file entries for each file system.

   Perform this step if you have more than one StorageTek QFS file system. Make sure you save each dump file in a separate file.

To Run the qfsdump(1M) Command Manually

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

   For example:

```
# cd /qfs1
```

2. Use the qfsdump(1M) command to write a dump file to a file system outside of the one you are dumping.

   For example:

```
# qfsdump -f /save/qfs1/dump_file
```

■ (Optional) Backing Up Configuration Files

StorageTek QFS regularly accesses several files that have been created as part of this installation and configuration procedure. You should back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note: StorageTek strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

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

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

For more information about the files you should protect, see the *ASM, ASM-QFS and ASM/ QFS-Standalone Disaster Recovery Guide*.

(Optional) Configuring the Remote Notification Facility

The StorageTek QFS software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The StorageTek QFS and StorageTek ASM Management Information Base (MIB) defines the types of problems, or events, that the StorageTek QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information about the MIB,
see `/opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib`.

The following sections describe how to enable and how to disable remote notification.

To Enable Remote Notification

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

   "(Optional) Verifying the Network Management Station" on page 43 describes this prerequisite.

2. Use `vi`(1) or another editor to examine file `/etc/hosts`.

   For example, Figure 63 shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

Figure 63. Example `/etc/hosts` File

```
999.9.9.9       localhost
999.999.9.999   loggerhost      loghost
999.999.9.998   mgmtconsole
999.999.9.9     samserver
```

Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined. If it is not defined, add a line that defines the appropriate host.

3. Save your changes to `/etc/hosts` and exit the file.
4. Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/scripts/sendtrap`.
5. Locate the `TRAP_DESTINATION=‘hostname‘` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.

   This line specifies that the remote notification messages be sent to port 161 of the server upon which the StorageTek QFS software is installed. Note the following:

   - If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`*mgmt_console_name*`:`*port*`"`. Note the use of quotation marks (" ") rather than apostrophes (‘ ‘) in the new directive.
   - If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [
mgmt_console_name:port]"
```

   For example:

```
TRAP_DESTINATION="localhost:161 doodle:163
mgmt_station:1162"
```

6. Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.

   This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

   - If your management station’s community string is also set to `public`, you do not have to edit this value.
   - If your management station’s community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. Save your changes to `/etc/opt/SUNWsamfs/scripts/sendtrap` and exit the file.

To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. (Optional) Use the `cp`(1) command to copy file `/opt/SUNWsamfs/examples/defaults.conf` to `/etc/opt/SUNWsamfs/defaults.conf`.

   Perform this step if file `/etc/opt/SUNWsamfs/defaults.conf` does not exist.

2. Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/defaults.conf`.

   Find the line in `defaults.conf` that specifies SNMP alerts. The line is as follows:

```
#alerts=on
```

3. Edit the line to disable SNMP alerts.

   Remove the # symbol and change `on` to `off`. After editing, the line is as follows:

```
alerts=off
```

4. Save your changes to `/etc/opt/SUNWsamfs/defaults.conf` and exit the file.

5. Use the `samd`(1M) `config` command to restart the `sam-fsd`(1M) daemon.

   The format for this command is as follows:

```
# samd config
```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf` file.

■ (Optional) Adding the Administrator Group

By default, only the superuser can execute StorageTek QFS administrator commands. However, during installation you can create an administrator group. Members of the administrator group can execute all administrator commands except for `star`(1M), `samfsck`(1M), `samgrowfs`(1M), `sammkfs`(1M), and `samd`(1M). The administrator commands are located in `/opt/SUNWsamfs/sbin`.

After installing the package, you can use the `set_admin`(1M) command to add or remove the administrator group. You must be logged in as superuser to use the `set_admin`(1M) command. You can also undo the effect of this selection and make the programs in `/opt/SUNWsamfs/sbin` executable only by the superuser. For more information about this command, see the `set_admin`(1M) man page.

To Add the Administrator Group

1. Choose an administrator group name or select a group that already exists within your environment.
2. Use the `groupadd`(1M) command, or edit the `/etc/group` file.

   The following is an entry from the `/etc/group` file that designates an administrator group for the StorageTek QFS software. In this example, the `samadm` group consists of both the `adm` and `operator` users.

```
samadm::1999:adm,operator
```

Configuring System Logging

The StorageTek QFS system logs errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the StorageTek QFS facility is `local7`.

To Enable Logging

1. Use `vi`(1) or another editor to open the `/etc/syslog.conf` file.

   Read in the line from the following file:

   `/opt/SUNWsamfs/examples/syslog.conf_changes`

   The line is similar, if not identical, to the following line:

```
local7.debug  /var/adm/sam-log
```

   Note: The preceding entry is all one line and has a TAB character (not a space) between the fields.

   This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.

Figure 64 shows the commands to use to append the logging lines.

Figure 64. Using `cp`(1) and `cat`(1) to Append Logging Lines to `/etc/syslog.conf`

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

3. Create an empty log file and send the `syslogd` process a HUP signal.

   Figure 65 shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to the `syslogd` daemon.

Figure 65. Creating an Empty Log File and Sending a HUP Signal to `syslogd`

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

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

4. (Optional) Use the `log_rotate.sh`(1M) command to enable log file rotation.

   Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

(Optional) Configuring Other Products

The StorageTek QFS installation and configuration process is complete. You can configure other Sun products at this time.

For example, if you want to configure an Oracle database, see the *Sun Cluster Data Service for Oracle Real Application Clusters Guide for Solaris OS*. The Oracle Real Application Clusters application is the only scalable application that the StorageTek QFS supports in Sun Cluster environments.

StorageTek QFS Upgrade Procedure

3

This chapter describes upgrading a server to a new release of the StorageTek software. Use this procedure if you are upgrading your StorageTek QFS file system. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

Ensuring That the Installation Prerequisites Are Met

"System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you upgrade to the StorageTek QFS 4.1 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter that pertain to verifying the system requirements for your upgrade to release 4.2 are as follows:

- “Server Requirements” on page 14
- “Solaris Operating System Requirements” on page 15
- “Verifying Disk Space” on page 21
- “Obtaining a Software License Key” on page 29
- “Obtaining the Release Files” on page 31
- “Verifying Third-Party Compatibilities” on page 33
- “(Optional) Verifying Requirements for the ASM QFS Manager” on page 42
- “(Optional) Verifying the Network Management Station” on page 43

(Optional) Backing Up Existing File Systems

Perform this task if the following conditions exist:

- You are currently using a version 1 superblock with a StorageTek QFS 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In “(Optional) Reinitializing and Restoring the File Systems” on page 130, you reinitialize the file systems and restore your data.
- You suspect that your current `qfsdump`(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- “Using the Version 1 and Version 2 Superblocks” on page 121
- “To Back Up Each File System” on page 121

Figure 66 shows using the `samfsinfo`(1M) command to retrieve information about the `qfs2` file system. The second line of output indicates that this file system is using a version 2 superblock.

Figure 66. Using `samfsinfo`(1M)

```
# samfsinfo qfs2
samfsinfo: filesystem qfs2 is mounted.
name: qfs2       version:     2    shared
time:     Sun Sep 28 08:20:11 2003
count:    3
capacity:      05aa8000          DAU:         64
space:         0405ba00
meta capacity: 00b4bd20          meta DAU:    16
meta space:    00b054c0
ord  eq   capacity      space   device
```

Figure 66. Using `samfsinfo`(1M) (Continued)

```
  0  21   00b4bd20   00b054c0   /dev/md/dsk/d0
  1  22   02d54000   01f43d80   /dev/dsk/
c9t50020F2300010D6Cd0s6
  2  23   02d54000   02117c80   /dev/dsk/
c9t50020F2300010570d0s6
```

Using the Version 1 and Version 2 Superblocks

The StorageTek QFS 4.0, 4.1, and 4.2 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)
- StorageTek QFS shared file system
- `md` devices in StorageTek QFS or StorageTek ASM-QFS (`ma`) file systems
- Dual-sized disk allocation units (DAUs) on `mm` devices

The StorageTek QFS 4.1 and 4.2 releases support both the version 1 and version 2 superblocks. You can use the `sammkfs`(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the `qfsrestore`(1M) command to restore files to the new file system from the dump file created in this installation task.

If you are upgrading from a Storagetek QFS 4.0 system, note that the StorageTek QFS 4.0 file system allowed you to initialize file systems with either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note: The StorageTek QFS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek QFS 4.2 file system only allows you to initialize file systems with the version 2 superblock.

To Back Up Each File System

1. (Optional) Become superuser from a console connection.

   If you have not already logged in as `root`, do so now.

2. Use the `boot`(1M) command to boot the system in single-user mode.

For example:

```
# boot -s
```

3. Use the `mount`(1M) command to mount the StorageTek QFS file system.

   For example:

```
# mount /qfs1
```

4. Use the `qfsdump`(1M) command to back up the file data and metadata of each StorageTek QFS file system.

   The `qfsdump`(1M) command dumps file names, inode information, and file data. The destination of the `qfsdump`(1M) output (generally a file) must be as large or larger than the StorageTek QFS file system you are backing up. The destination location must have enough space (disk or tape) to hold the amount of file data and metadata you are dumping. For more information about using the `qfsdump`(1M) command, see "Establishing Periodic Dumps Using `qfsdump`(1M)" on page 110 or see the `qfsdump`(1M) man page.

   Dump each file system to a location outside of the StorageTek QFS file system. For more information, see the `qfsdump`(1M) man page.

   For example, if you have a file system named `qfs1` (mounted at `/qfs1`) that you want to back up, your choices are as follows:

   a. You can write the `qfsdump`(1M) output to a tape device.

      Figure 67 shows how to write to a tape in device `/dev/rmt/1cbn`.

Figure 67. Writing `qfsdump`(1M) Output to a Tape Device

```
# cd /qfs1
# qfsdump -f /dev/rmt/1cbn
```

5. You can write the `qfsdump`(1M) output to a file in a UFS file system

   Figure 68 shows how to write to a file in a UFS file system.

Figure 68. Writing `qfsdump`(1M) Output to a File in the UFS File System

```
# cd /qfs1
# qfsdump -f /save/qfs/qfs1.bak
```

   b. You can initialize a new StorageTek QFS file system, using a StorageTek QFS 4.2 release, and perform the `qfsrestore`(1M) directly into that new StorageTek QFS file system.

      This alternative is applicable only if you already have the StorageTek QFS software installed and operational as a file system

somewhere in your environment. Pursuing this alternative assumes that you want to use the features supported by the StorageTek QFS 4.2 release and the version 2 superblock.

For example, assume that you want to write the dump file into a second StorageTek QFS file system called `qfs2` (mounted at `/qfs2`). Make sure that you initialized the `qfs2` file system using StorageTek QFS 4.2 software. Figure 69 shows how to accomplish this using commands.

Figure 69. Writing `qfsdump`(1M) Output to a StorageTek QFS File System

```
# mount /qfs2
# cd /qfs1
# qfsdump -f - | (cd /qfs2; qfsrestore -f -)
```

6. Repeat these steps for each StorageTek QFS file system in your environment.

   For more information about backing up your file systems, see the *ASM, ASM-QFS and ASM/ QFS-Standalone Disaster Recovery Guide*.

(Optional) Unsharing the File Systems

Perform this task if your StorageTek QFS file systems are NFS shared file systems.

To Unshare the File Systems

- Use the `unshare`(1M) command on the StorageTek QFS file system.

  For example, the following command unshares the `qfs1` file system:

```
# unshare /qfs1
```

Unmounting the File Systems

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to “Removing Existing StorageTek QFS Software” on page 124.

To Unmount Using the `umount`(1M) Command

- Using the `umount`(1M) command, unmount each StorageTek QFS file system.

If necessary, use the `-f` option to the `umount`(1M) command. The `-f` option forces a file system to unmount.

To Unmount Using the `fuser`(1M), `kill`(1), and `umount`(1M) Commands

If `umount`(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. Use the `fuser`(1M) command to determine whether or not any processes are still busy.

   For example, the following command queries the `qfs1` file system:

```
# fuser -uc /qfs1
```

2. If any processes are still busy, use the `kill`(1M) command to terminate them.
3. Using the `umount`(1M) command, unmount each StorageTek QFS file system.

To Unmount by Editing the `/etc/vfstab` File and Rebooting

1. Edit the `/etc/vfstab` file.

   For all StorageTek QFS file systems, change the Mount at Boot field from `yes` or `delay` to `no`.
2. Reboot your system.

To Unmount a StorageTek QFS Shared File System

- Use the instructions in the *StorageTek ASM and QFS File System Administration Guide* for unmounting a StorageTek QFS shared file system.

■ Removing Existing StorageTek QFS Software

The following procedures show how to remove StorageTek QFS software from a release prior to 4.2.

To Remove Software From a 4.1 Release

1. Use the `pkginfo`(1) command to determine which StorageTek QFS software packages are installed on your system.

   For example:

```
# pkginfo | grep qfs
```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek QFS software.

   You must remove all existing StorageTek QFS packages before installing the new packages. If you are using any optional StorageTek QFS packages, you should make sure that you remove these packages before removing the main `SUNWqfs` packages. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWqfsu` and the `SUNWqfsr` packages:

```
# pkgrm SUNWqfsu SUNWqfsr
```

   Note: The `SUNWqfsr` package must be the last package removed. The 4.1 release does not include any localized software packages.

To Remove Software From a 4.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek QFS software packages are installed on your system.

   For example:

```
# pkginfo | grep qfs
```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek QFS software.

   You must remove all existing StorageTek QFS packages before installing the new packages. If you are using any optional StorageTek QFS packages, make sure that you remove these packages before removing the main `SUNWqfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWcqfs`, the `SUNWfqfs`, and the `SUNWjqfs` localized packages:

```
# pkgrm SUNWcqfs SUNWfqfs SUNWjqfs SUNWqfs
```

Note: The SUNWqfs package must be the last package removed.

Adding the Packages

The StorageTek QFS software packages use the Sun Solaris packaging utilities for adding and deleting software. The pkgadd(1M) command prompts you to confirm various actions necessary to upgrade the StorageTek QFS package.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the installation. You can go to another window and copy the files you want to save to an alternate location.

To Add the Packages

1. Use the cd(1) command to change to the directory where the software package release files reside.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 31. Use the cd(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

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

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

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

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

2. Use the pkgadd(1M) command to upgrade the SUNWqfsr and SUNWqfsu packages.

   For example:

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

3. Enter `yes` or `y` as the answer to each of the questions.
4. (Optional) Use the `pkgadd`(1M) command to add one or more localized packages.

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. Figure 70 shows the commands to use to install the localized packages.

Figure 70. Using the `pkgadd`(1M) Command to Install Localized Packages

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

Updating the License Keys

A license key is required to run the StorageTek QFS software. For information about license keys, see “Obtaining a Software License Key” on page 29.

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

(Optional) To License the StorageTek QFS Software

You do not need to perform this procedure if you are upgrading from a StorageTek QFS 4.0 or 4.1 release unless you also are adding features or equipment to your environment that would change your license. If you are not adding equipment, the system copies your 4.0 or 4.1 license to the correct location when the upgrade is complete.

1. Verify whether the license file exists.

   The license file is as follows:

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

2. If the `/etc/opt/SUNWsamfs/LICENSE.4.2` file does not exist, create it.
3. Starting in column one, place the license key you have obtained from your ASP or from StorageTek on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

(Optional) Enabling the ASM-QFS Manager

Perform this task if you want to be able to use the ASM QFS Manager.

The ASM QFS Manager is an online interface to StorageTek QFS that enables you to configure many of the components in a StorageTek QFS environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information about enabling the ASM QFS Manager, see "(Optional) Enabling the ASM-QFS Manager" on page 128.

Verifying the License and `mcf` Files

The following files exist on your StorageTek QFS server:

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

The procedures in this task show you how to verify the correctness of these files.

To Verify the License File

1. Use the `samd`(1M) `config` command to initialize the StorageTek QFS software.

   For example:

```
# samd config
```

2. Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

   The `samcmd`(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in Figure 71, return to "Updating the License Keys" on page 127.

Figure 71. Using `samcmd`(1M)

```
# samcmd l

License information samcmd     4.2      Fri Aug 27 16:24:12
2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled
```

Figure 71. Using samcmd(1M) (Continued)

```
QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

To Verify the mcf File

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

  Examine the output for errors, as follows:

  - If your mcf file is free from syntax errors, the sam-fsd(1M) output is similar to that shown in Figure 72. It contains information about the file systems and other system information.

Figure 72. sam-fsd(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld      off

sam-archiverd off

sam-catserverd off

sam-fsd       off

sam-rftd      off

sam-recycler  off

sam-sharefsd  off

sam-stagerd   off

sam-serverd   off

sam-clientd   off

sam-mgmt      off

License: License never expires.
```

  - If your mcf file contains syntax or other errors, however, it notes the errors in its output.

If your `mcf` file has errors, refer to "Defining the StorageTek QFS Configuration By Creating the `mcf` File" on page 57 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 StorageTek QFS file system is in use, you must convey the new `mcf` specifications to the StorageTek QFS software. For information about propagating `mcf` file changes to the system, see the *StorageTek ASM and QFS File System Administration Guide*.

(Optional) Modifying the `/etc/vfstab` File

Perform this task if you modified the `/etc/vfstab` file in "Unmounting the File Systems" on page 123.

To Modify the `/etc/vfstab` File

- Edit this file again, and change the Mount at Boot field for all StorageTek QFS file systems from `no` to `yes` or `delay`.

(Optional) Reinitializing and Restoring the File Systems

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "(Optional) Backing Up Existing File Systems" on page 120. To accomplish this, use the `sammkfs`(1M) and `qfsrestore`(1M) commands on each file system.

Note: The StorageTek QFS 4.2 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek QFS 4.2 file system only allows file systems to be initialized with the version 2 superblock. If you are upgrading from 4.0 using a version 1 superblock, be aware that issuing a 4.2 `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock.

To Reinitialize and Restore the File Systems

1. Use the `samfsinfo`(1M) command to retrieve information about the file system.

   You can examine the output from the `samfsinfo`(1M) command to determine the DAU size specified on the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. Use this DAU size again when you perform Step 2.

2. Use the `sammkfs`(1M) command to initialize a new StorageTek QFS file system.

The following example `sammkfs`(1M) command reinitializes a file system named `qfs1` with StorageTek QFS 4.2 feature capabilities:

```
# sammkfs qfs1
```

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

3. Use the `qfsrestore`(1M) command to restore the dumped data into the new file system.

   For example, the commands in Figure 73 assume that you have a file system named `qfs1` (mounted at `/qfs1`) that you want to back up from files dumped to `qfs1.bak`, which exists outside of the StorageTek QFS file system:

Figure 73. Using `qfsrestore`(1M) to Restore Files into the New File System

```
# cd /qfs1
# qfsrestore -f /save/qfs/qfs1.bak
```

(Optional) Checking the File System

Perform this task if you did not perform "(Optional) Reinitializing and Restoring the File Systems" on page 130.

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

  Do this for each StorageTek QFS file system.

Mounting the File Systems

Use the `mount`(1M) command to mount your StorageTek QFS file system.

To Mount the File System

- Use the `mount`(1M) command to mount the file systems.

  In the following example, `qfs1` is the name of the file system to be mounted:

```
# mount qfs1
```

(Optional) Recompiling API-Dependent Applications

If you are running applications that use the StorageTek QFS application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

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

StorageTek ASM Initial Installation Procedure

4

This chapter describes the procedure for installing and configuring the StorageTek ASM software for the first time. Use this procedure if this is the initial installation of the StorageTek ASM software package at your site.

If you are upgrading StorageTek ASM software on an existing server, see "StorageTek ASM Upgrade Procedure" on page 271.

The procedures in this chapter describe copying and installing the software packages onto your server and configuring the software to match the hardware at your site. You must have superuser (`root`) access to perform most of the tasks described in this chapter.

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

For most of the procedures in this chapter, you must have `root` access.

Ensuring That the Installation Prerequisites Are Met

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

- "Server Requirements" on page 16
- "Solaris Operating System Requirements" on page 17
- "Planning Your File System and Verifying Disk Cache" on page 18
- "Verifying Disk Space" on page 23
- "(Optional) Verifying Archive Media" on page 24
- "Obtaining a Software License Key" on page 31
- "Obtaining the Release Files" on page 33

- “Verifying Third-Party Compatibilities” on page 35
- “(Optional) Verifying Requirements for the ASM QFS Manager” on page 44
- “(Optional) Verifying the Network Management Station” on page 45

Adding the Packages on the StorageTek ASM Server

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

To Add the Packages

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

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

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

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

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

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

3. Use the `pkgadd`(1M) command to add the `SUNWsamfsr` and `SUNWsamfsu` packages.

For example:

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

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

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

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

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. Figure 74. shows the commands to use to install the localized packages.

Figure 74. Using the pkgadd(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcsamf
# pkgadd -d SUNWfsamf
# pkgadd -d SUNWjsamf
```

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

6. Examine /tmp/SAM_install.log .

   File /tmp/SAM_install.log is the StorageTek ASM 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 StorageTek ASM samst driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

(Optional) Verifying and Updating the st.conf and samst.conf Files

Perform this task if you plan to enable archiving to tape or magneto-optical media. You do not need to perform this procedure if you plan to archive to disk.

This task introduces you to the the process of verifying, and perhaps updating, the following two files:

- The `/kernel/drv/st.conf` file, which lists configuration information for tape drives attached to the server through a SCSI or Fibre Channel attachment.
- The `/kernel/drv/samst.conf` file, which lists configuration information for the following devices that the StorageTek ASM software recognizes by default:
  - Direct-attached automated libraries.
  - Magneto-optical drives attached to the server through a SCSI or Fibre Channel attachment.

The StorageTek ASM package includes the `/opt/SUNWsamfs/examples/st.conf_changes` file. This file includes configuration information for the following kinds of tape drives:

- Tape drives that are not supported in the Solaris kernel by default.
- Tape drives that are supported in the Solaris kernel but are supported with settings that do not accommodate StorageTek ASM software.

This task includes the following procedures:

- "To Verify Device Types" on page 136
- "(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 138
- "To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File" on page 142
- "(Optional) To Verify or Add Device Support in the `samst.conf` File" on page 144
- "To Verify That All Devices Are Configured" on page 146

To Verify Device Types

1. Obtain the list of devices that you created when you completed the step called "To Create a List of Devices" on page 30.

   "To Create a List of Devices" on page 30 is a procedure in which you enumerate the devices you want to include in your StorageTek ASM environment. If you have not already taken an inventory of your devices and listed them in Table 11., do so now. For the rest of the procedures in this installation, this manual refers to Table 11. as your inventory list.

The procedures in this task include an example that assumes your inventory list is as shown in Table 19..

Table 19. An Example Inventory List - Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
SCSI-Attached Tape Drives			
QUANTUM DLT7000	1	0	Not applicable
QUANTUM DLT7000	2	0	Not applicable
Fibre Channel-Attached Tape Drives			
STK 9840	Not Applicable	0	500104f00043abfc
STK 9840	Not Applicable	0	500104f00045eeaf
IBM ULT3580-TD1	Not Applicable	0	500104f000416304
IBM ULT3580-TD1	Not Applicable	0	500104f000416303
SCSI-Attached Automated Libraries			
STK 9730	0	0	Not applicable
Fibre Channel-Attached Automated Libraries			
STK L700	Not applicable	0	500104f0004118 2b

Note: The device names in Table 19. are represented as they appear in the discovery output.

2. Proceed on to the next step in this installation and configuration procedure.

   Depending on the devices on your inventory list, you need to complete one or more of the following procedures:

- If there are any tape drives that you want to include in your StorageTek ASM environment, go to "(Optional) To Add Tape Devices to the /kernel/drv/st.conf File" on page 138.
- If there are any magneto-optical drives, SCSI-attached automated libraries, or Fibre Channel-attached automated libraries that you want to

include in your StorageTek ASM environment, go to "(Optional) To Verify or Add Device Support in the samst.conf File" on page 144.

(Optional) To Add Tape Devices to the /kernel/drv/st.conf File

Perform this pocedure if you have tape drives that you want to include in your StorageTek ASM environment.

In this procedure, you make entries for each unique tape drive type that you want to include in your StorageTek ASM environment. For each unique tape drive that is on your inventory list, there must be a corresponding entry in the st.conf file.

1. Use the cp(1) command to copy /kernel/drv/st.conf to a backup file.

   For example:

```
# cp /kernel/drv/st.conf /kernel/drv/st.conf.orig
```

2. Use vi(1) or another editor to open file /kernel/drv/st.conf.
3. Find the line that contains the tape-config-list string.

   This line is as follows:

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

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

4. Use vi(1) or another editor to open file /opt/SUNWsamfs/examples/st.conf_changes.
5. Search file /opt/SUNWsamfs/examples/st.conf_changes to find the first device on your inventory list.

   In the example inventory list, the first drive you need to find is the Quantum DLT 7000 tape drive. Find the line that contains the following entry:

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

   This is the device definition for the Quantum DLT 7000 tape drive.

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

Figure 75. shows how the st.conf file looks at this point.

Figure 75. st.conf With Its First Device Definition Entry

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

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

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

8. Search file /opt/SUNWsamfs/examples/st.conf_changes to find another line that begins with the final string you noted in Step 7.

   The line you are looking for is called the tape configuration value.

   In this example, it is as follows:

```
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
```

9. Copy the tape configuration line from Step 8 to file st.conf.

   Put the device configuration line *after* the device definition line you copied in from Step 6.

   For this example, Figure 76. shows the lines now contained in the st.conf file.

Figure 76. st.conf With a Device Entry and the Device Entry's Tape Configuration Value

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
...
```

10. Decide whether you want to configure more devices in the st.conf file.

    If this is the last or only device you want to configure, proceed to Step 17.

    If you have more devices to configure, proceed to Step 11.

11. Search file /opt/SUNWsamfs/examples/st.conf_changes to find the next device on your inventory list.

In our example inventory list, the next drive you need to find is the StorageTek 9840 tape drive. Find a line that contains the following entry:

```
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
```

This is the device definition for the StorageTek 9840 tape drive.

12. Copy the line containing the device definition you need from `st.conf_changes` to `st.conf` so it appears after preceding device definition line.

    Figure 77. shows how the `st.conf` file looks at this point.

Figure 77. `st.conf` **with Another Device Definition Entry**

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
...
```

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

    In this example, the final string is "`CLASS_9840`".

14. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find another line that begins with the final string you noted in Step 13.

    The line you are looking for is called the tape configuration value.

    In this example, it is as follows:

```
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
```

15. Copy the tape configuration line from Step 14 to file `st.conf`.

    Put the device configuration line *after* the device configuration line you copied in from Step 9.

    For this example, Figure 76. shows the tape drive configuration lines now contained in the `st.conf` file.

Figure 78. `st.conf` **With a Device Entry and the Device Entry's Tape Configuration Value**

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
```

Figure 78. st.conf With a Device Entry and the Device Entry's Tape Configuration Value (Continued)

```
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
...
```

16. Decide whether you want to configure more devices in the st.conf file.

    If you have more devices to configure, go back to Step 11.

    If this is the last device you want to configure, proceed to Step 17.

    For example, Figure 80. shows the st.conf file after you have added definitions for the Quantum DLT 7000, the StorageTek 9840, and the IBM ULT3580 tape drives.

Figure 79. st.conf Configured for Multiple Devices (Intermediate Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1",  "IBM 3580 Ultrium",
"CLASS_3580",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

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

    Figure 80 shows the resulting st.conf file if you have multiple devices configured.

Figure 80. st.conf Configured for Multiple Devices (Final Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1",  "IBM 3580 Ultrium",
"CLASS_3580";
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

Note: Some device configuration lines in st.conf_changes support more than one device definition, but you need only one device definition line

in the `st.conf` file for such devices. For example, the Sony SDT-5000 and the Sony SDT-5200 both have "`DAT`" as the final string in their device definition lines. If your environment is to include both of these Sony devices, only one instance of the `DAT = 1,0x34,0,0x0439,1,0x00,0;` device definition needs to appear in the `st.conf` file.

18. Save your changes and proceed to "To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File" on page 142.

    You do not need to close out of the `st.conf` file at this point because you continue editing `st.conf` in the next procedure. It is a good idea to save your changes, however.

To Verify or Add a Target Device, LUN, or Worldwide Name to the `st.conf` File

Perform this procedure if you have tape drives that you want to include in your StorageTek ASM environment. You typically perform this procedure after you have completed "(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" in Chapter ..

For each tape drive on your hardware inventory list that is attached through a SCSI interface, you must confirm that an entry in the `st.conf` file defines that interface. This procedure shows how to verify and, if necessary, add target ID and LUN entries. Do not use this procedure to add interface information for magneto-optical drives.

1. (Optional) Use `vi`(1) or another editor to open file `/kernel/drv/st.conf`.

   If you left the file open for editing from the previous procedure ("(Optional) To Add Tape Devices to the `/kernel/drv/st.conf` File" on page 138), you do not need to perform this step.

2. (Optional) Find the list of SCSI target IDs and LUNs in the `st.conf` file.

   Perform this step only if you have tape drives you want to include that are attached through a SCSI interface.

   In the `st.conf` file, look for entries that have the following format:

```
name="st" class="scsi" target=target lun=lun;
```

   target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

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

For example, the two Quantum DLT 7000 drives are attached to LUN 0 and have target IDs 1 and 2. Figure 81. shows the two lines that correspond to those interfaces.

Figure 81. Example SCSI Target ID and LUN Information

```
name="st" class="scsi" target=1 lun=0;
name="st" class="scsi" target=2 lun=0;
```

Note that the preceding two lines might extend over two lines in st.conf if they contain return characters.

If you cannot find the SCSI target and LUN you need, proceed to Step 5.

4. Ensure that the lines identified in Step 3 are not preceded by pound (#) characters.

   A pound (#) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 6.

5. (Optional) Create a line for the SCSI target and LUN that you need.

   Perform this step if the SCSI target and LUN line you need is not already listed in st.conf.

   Use the format shown in Step 2 as a model for the line you add.

6. Decide whether you need to configure more SCSI targets and LUNs in st.conf.

   If you have more SCSI targets and LUNs to configure, go back to Step 3.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 7.

7. (Optional) Create lines for each device attached through a Fibre Channel interface.

   Perform this step only if you have tape drives attached through a Fibre Channel interface in your inventory list and you are not using the Sun SAN Foundation Software I/O stack.

   Fibre Channel interfaces are not included in the st.conf file by default. At the end of the SCSI target ID and LUN list, create a line for each Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

```
name="st" parent="fp" lun=lun fc-port-wwn="world-wide-name"
```

   For *lun*, specify the LUN for the drive.

   For *world-wide-name*, specify the World Wide Name for drive.

For example, Figure 82. shows the lines to add to support the StorageTek 9840 and IBM ULT3580 tape drives included in the inventory list that are attached through Fibre Channel interfaces.

Figure 82. Fibre Channel Interface Definition Lines for the `st.conf` File

```
name="st" parent="fp" lun=0 fc-port-wwn="500104f00043abfc"
name="st" parent="fp" lun=0 fc-port-wwn="500104f00045eeaf"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416304"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416303"
```

8. Save your changes and exit the `st.conf` file.

   Proceed to "(Optional) To Verify or Add Device Support in the `samst.conf` File" on page 144 if you have any of the following devices in your inventory list:

- Magneto-optical drives
- Automated libraries attached through a SCSI or a Fibre Channel interface.

(Optional) To Verify or Add Device Support in the `samst.conf` File

Perform this step if you have magneto-optical drives or if you have automated libraries attached through a SCSI or a Fibre Channel interface. You do not need to perform this step if you have only network-attached automated libraries.

The `/kernel/drv/samst.conf` file contains a list of SCSI and Fibre Channel entries. This procedure shows you how to verify entries for your devices and to update the file if necessary. The `samst.conf` file works with the `/opt/SUNWsamfs/examples/inquiry.conf` file to define the devices that can be included in a StorageTek ASM environment. The `inquiry.conf` file lists all devices that are supported, so you do not need to verify or edit that file.

1. Use the `cp`(1) command to copy the `/kernel/drv/samst.conf` file to a backup file.

   For example:

```
# cp /kernel/drv/samst.conf /kernel/drv/samst.conf.orig
```

2. Use `vi`(1) or another editor to open the `/kernel/drv/samst.conf` file.
3. (Optional) Find the list of SCSI targets and LUNs in the `samst.conf` file.

   Perform this step only if you have SCSI-attached magneto-optical drives or SCSI-attached libraries that you want to include.

In the samst.conf file, the entries you are looking for have the following format:

```
name="samst" class="scsi" target=target lun=lun;
```

target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

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

   For example, the StorageTek 9730 automated library is attached to target 0 and LUN 0. The following line corresponds to that interface:

   ```
   name="samst" class="scsi" target=0 lun=0;
   ```

   Note that the preceding line might extend over two lines in st.conf if it contains return characters.

   If you cannot find the SCSI target and LUN you need, proceed to Step 6.

5. Ensure that the lines identified in Step 3 are not preceded by pound (#) characters.

   A pound (#) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 7.

6. (Optional) Create a line for the SCSI target and LUN that you need.

   Perform this step if the SCSI target and LUN line you need is not already listed in samst.conf.

   Use the format shown in Step 3 as a model for the line you add.

7. Decide whether you need to configure more SCSI targets and LUNs in samst.conf.

   If you have more SCSI targets and LUNs to configure, go back to Step 4.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 8.

8. (Optional) Create lines for the first device in your inventory list that is attached through a Fibre Channel interface.

   Perform this step only if you have Fibre Channel-attached magneto-optical drives or Fibre Channel-attached automated libraries that you want to include.

   Fibre Channel interfaces are not included in the samst.conf file by default. At the end of the SCSI target and LUN list, create a line for each

Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

```
name="samst" parent="fp" lun=lun fc-port-wwn="world-wide-name"
```

For *lun*, specify the LUN for the drive.

For *world-wide-name*, specify the World Wide Name for drive.

The following example shows the line to add to support the StorageTek L700 tape drive on the example inventory list that is attached through a Fibre Channel interface:

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

9. (Optional) Repeat Step 8 for each device that is attached through a Fibre Channel interface.
10. Save your changes and exit the `samst.conf` file.

To Verify That All Devices Are Configured

1. Use the `cfgadm`(1M) command to verify the devices included in the StorageTek ASM environment.

   For example:

Figure 83. Output From `cfgadm`(1M)

```
# cfgadm -al
Ap_Id                          Type         Receptacle   Occupant
Condition
c0                             scsi-bus     connected    configured
unknown
c0::dsk/c0t6d0                 CD-ROM       connected    configured
unknown
c1                             fc-private   connected    configured
unknown
c1::500000e0103c3a91           disk         connected    configured
unknown
c2                             scsi-bus     connected    unconfigured
unknown
c3                             scsi-bus     connected    unconfigured
unknown
c4                             scsi-bus     connected    configured
unknown
c4::dsk/c4t1d0                 disk         connected    configured
unknown
```

Figure 83. Output From cfgadm(1M) (Continued)

```
c4::dsk/c4t2d0                 disk         connected    configured
unknown
c5                             fc-fabric    connected    configured
unknown
c5::100000e00222ba0b           disk         connected    unconfigured
unknown
c5::210000e08b0462e6           unknown      connected    unconfigured
unknown
c5::210100e08b2466e6           unknown      connected    unconfigured
unknown
c5::210100e08b27234f           unknown      connected    unconfigured
unknown
c5::500104f00043abfc           tape         connected    configured
unknown
c5::500104f00043bc94           tape         connected    configured
unknown
c5::500104f00045eeaf           tape         connected    configured
unknown
c5::500104f000466943           tape         connected    configured
unknown
c5::500104f00046b3d4           tape         connected    configured
unknown
c5::500104f0004738eb           tape         connected    configured
unknown
c6                             fc           connected    unconfigured
unknown
c7                             scsi-bus     connected    unconfigured
unknown
c8                             scsi-bus     connected    unconfigured
unknown
usb0/1                        usb-kbd      connected    configured   ok
usb0/2                        usb-mouse    connected    configured   ok
usb0/3                        unknown      empty        unconfigured ok
usb0/4                        unknown      empty        unconfigured ok
```

Examine the output to make sure that it shows all the devices you want to configure in your StorageTek ASM environment. If a device is not shown as being configured, and it should be, you can use the cfgadm(1M) command to configure it. For more information, see the cfgadm(1M) man page.

Because of a bug in the cfgadm(1) command, you might receive a device busy error similar to that shown in Figure 84..

Figure 84. cfgadm(1M) Output Showing a Device Busy Error that can be Ignored

```
# cfgadm -c configure -o force_update c4::500104f000489fe3
cfgadm: Library error: failed to create device node: 500104f00043abfc:
Device busy
```

Despite the error, the `cfgadm`(1M) command completely processes the request.

Handling Errors in the `st.conf` File

Errors can occur if the `st.conf` file is not configured properly during StorageTek ASM software installation. The following example shows typical error messages and provides suggestions for problem resolution.

The following message is found in the `sam-log` file:

```
May 18 12:38:18 baggins genu-30[374]: Tape device 31 is
default type. Update ‘/kernel/drv/st.conf’.
```

Figure 85 shows the device log messages that correspond to the `sam-log` message.

Figure 85. Error Messages in the Device Log File

```
1999/05/18 12:34:27*0000 Initialized. tp
1999/05/18 12:34:28*1002 Device is QUANTUM , DLT7000
1999/05/18 12:34:28*1003 Serial CX901S4929, rev 2150
1999/05/18 12:34:28*1005 Known as Linear Tape(lt)
1999/05/18 12:34:32 0000 Attached to process 374
1999/05/18 12:38:18 1006 Slot 1
1999/05/18 12:38:18 3117 Error: Device is type default. Update /kernel/
drv/st.conf
```

The preceding messages indicate that the appropriate changes have not been made to `/kernel/drv/st.conf`.

Enabling the StorageTek ASM Software License

You need a license key to run the StorageTek ASM software. For information on obtaining license keys, see “Obtaining a Software License Key” on page 31.

The StorageTek ASM environments use encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

To License the StorageTek ASM Software

1. Create the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.
2. Starting in column one, place the license keys you have obtained from your ASP or from StoragTek on the first line and on successive lines in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the /etc/opt/SUNWsamfs/LICENSE.4.2 file.

Setting Up PATH and MANPATH Variables

This task shows you how to modify your PATH and MANPATH environment variables so you can access the StorageTek ASM commands and man pages easily.

To Set Up PATH and MANPATH Variables

1. For users who need to access the StorageTek ASM user commands (for example, sls(1)), add /opt/SUNWsamfs/bin to the users' PATH variables.
2. Use vi(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.
   a. In the Bourne or Korn shells, edit the .profile file, change the PATH and MANPATH variables, and export the variables.

      Figure 86. shows how your .profile file might look after editing.

Figure 86. Finished .profile File

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

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

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

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

      Figure 87. shows how the MANPATH in your .login file might look like after editing.

Figure 87. Finished MANPATH in the .login File

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

Rebooting the System

Note: Failure to reboot the system at this time can cause the st and samst modules to remain unconfigured.

To Reboot the System

1. Reboot the server by issuing the `touch`(1) and `init`(1M) commands.

   Figure 88. shows the commands to use to reboot.

Figure 88. Commands to Reboot the Server

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

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

■ (Optional) Enabling the ASM QFS Manager

Perform this task if you want to be able to use the ASM QFS Manager to configure, control, monitor, or reconfigure your StorageTek ASM environment.

The procedures in this section are as follows:

- “To Install the ASM QFS Manager Software” on page 150.
- “To Invoke the ASM QFS Manager for the First Time” on page 154. Use this procedure to invoke the ASM QFS Manager software.
- “To Use the ASM QFS Manager for Configuration” on page 155. Use this procedure to decide which configuration tasks you want to perform using the ASM QFS Manager software.

In addition to the information in this section, this manual’s appendix, “ASM-QFS Manager Software Notes” on page 295, describes other aspects of using the ASM QFS Manager.

To Install the ASM QFS Manager Software

1. Ensure that you have met the installation requirements described in “(Optional) Verifying Requirements for the ASM QFS Manager” on page 44.
2. Log in to the server that you want to use as the management station.

   This can be the same server upon which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages.
3. Become superuser.
4. Use the `cd`(1) command to change to the directory where the software package release files reside on your server.

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

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

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

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

5. Execute the `samqfsmgr_setup` script to install the ASM QFS Manager software.

   For example:

```
# samqfsmgr_setup
```

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

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

   The `samqfsmgr_setup` script automatically installs the following:

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

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

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

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

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

      Figure 89. shows how your `.profile` file might look after editing.

Figure 89. Finished `.profile` File

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

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

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

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

Figure 90. shows how the `MANPATH` in your `.login` file might after you have finished editing.

Figure 90. Finished `MANPATH` in the `.login` File

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

8. Log in to the StorageTek ASM server and become superuser.
9. Use the `ps`(1) and `grep`(1) commands to make sure that the `rpcbind` service is running.

   For example:

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

10. Examine the output from the preceding commands.

    The output should contain a line similar to the following:

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

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

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

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

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

    Enter the following command to start the ASM QFS Manager daemon:

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

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

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

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

The preceding command also prevents the daemon from restarting automatically.

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

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

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

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

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

Using the ASM QFS Manager Software

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

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

  Only the StorageTek ASM adminstrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.

  - The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.
- If you log in as `samuser`, you can only monitor the environent. You cannot change or reconfigure it in any way.

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

To Invoke the ASM QFS Manager for the First Time

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

1. Log in to the management station web server.
2. From a web browser, invoke the ASM QFS Manager software.

   The URL is as follows:

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

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

   Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.
3. At the `User Name` prompt, enter `samadmin`.
4. At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the ASM QFS Manager Software" on page 150.
5. Click the `SAMadmin` role.

   Only the StorageTek ASM administrator should ever log in with the `SAMadmin` role.
6. At the `Role Password` prompt, enter the password you entered in Step 4.
7. Click `Log In`.
8. Click `ASM QFS Manager 1.1`.

   You are now logged in to the ASM QFS Manager.

- If you want to configure your environment at this time using the ASM QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click on Help. After you add the servers, see "To Use the ASM QFS Manager for Configuration" on page 155 for more information on configuring your environment using the ASM QFS Manager.
- If you want to quit using the ASM QFS Manager at this time, click `Log Out`.
- If you want to create additional accounts at this time, see "ASM-QFS Manager Software Notes" on page 295.

To Use the ASM QFS Manager for Configuration

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

1. Click `Help`, in the upper right corner of the screen, to access the ASM QFS Manager online documentation.
2. (Optional) Configure your parameters file for network-attached libraries.

   If you want to use ASM QFS Manager to configure your StorageTek ASM environment and you want to include network-attached libraries in this configuration, create your parameters file *before* you create your `mcf` file. For information on creating a parameters file, see "(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 176.

Note: This is not the order in which these tasks are performed if you want to use commands to create these files. If you want to use commands to configure your StorageTek ASM environment, you create your `mcf` file first, and then you create the parameters files for network-attached libraries.

3. Complete the configuration tasks.

   Perform the configuration tasks in Table 20. in the order they appear. You can open a terminal window next to the ASM QFS Manager window for use when you have to alternate between using commands and using the ASM QFS Manager.

   Table 20. shows the rest of the tasks you must perform to complete your StorageTek ASM configuration and the means by which you can accomplish each task.

Table 20. StorageTek ASM Installation Tasks

Task	Accomplish Through ASM QFS Manager	Accomplish Through Commands
"(Optional) Creating Parameters Files for Network-Attached Automated Libraries" on page 176	No	Yes
"Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157	Yes	Yes
"Initializing the StorageTek ASM Environment" on page 194	Yes	Yes

Table 20. StorageTek ASM Installation Tasks (Continued)

Task	Accomplish Through ASM QFS Manager	Accomplish Through Commands
"(Optional) Checking the Drive Order" on page 195	Yes	Yes
"(Optional) Creating the `archiver.cmd` File" on page 201	Yes	Yes
"(Optional) Enabling Disk Archiving" on page 208	Yes	Yes
"(Optional) Editing the `defaults.conf` File" on page 212	No	Yes
"Verifying the License and `mcf` Files" on page 215	No	Yes
"(Optional) Labeling Removable Media Cartridges" on page 217	No	Yes
"(Optional) Populating the Catalog" on page 218	Yes	Yes
"(Optional) Creating the `samfs.cmd` File" on page 224	Yes	Yes
"Updating the `/etc/vfstab` File and Creating the Mount Point" on page 224	Yes	Yes
"Initializing the File System" on page 226	Yes	Yes
"Mounting the File System" on page 227	Yes	Yes
"(Optional) Sharing the File System With NFS Client Systems" on page 228	No	Yes
"Writing Periodic Dump Files By Using `samfsdump`(1M)" on page 231	No	Yes
"(Optional) Backing Up Configuration Files" on page 232	No	Yes
"(Optional) Configuring the Remote Notification Facility" on page 233	No	Yes
"(Optional) Adding the Administrator Group" on page 235	No	Yes
"Configuring System Logging" on page 236	No	Yes
"(Optional) Configuring Other StorageTek Products" on page 237	Not applicable	Not applicable

Table 20. describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and mcf Files" on page 215. You need to use Solaris OS commands to verify that your license file is installed and working correctly and that your archiver.cmd(4) file is free from syntax errors. If you use ASM QFS Manager to create your mcf file, however, you do not need to verify your mcf file.
- "Writing Periodic Dump Files By Using samfsdump(1M)" on page 231. Performing this step is essential to preserving your data.

The other installation steps in Table 20 are necessary — or are highly recommended— depending on your environment. For example, if you have network-attached automated libraries, you must perform "(Optional) Populating the Catalog" on page 218. Read through the documentation for the tasks described in the preceding list and decide which steps you need to perform.

Defining the StorageTek ASM Configuration By Creating the mcf File

Each StorageTek ASM software environment is unique. The system requirements and hardware differ from site to site. The StorageTek ASM environments support a wide variety of tape and optical devices, automated libraries, and disk drives. It is up to you, the system administrator at your site, to set up the specific configuration for your environment.

The master configuration file, /etc/opt/SUNWsamfs/mcf, defines the equipment topology that the StorageTek ASM file system manages. This file specifies the devices, automated libraries, and file systems included in the environment. You assign each piece of equipment a unique Equipment Identifier in the mcf file.

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

Note: For information on file system design considerations, see the *StorageTek ASM and QFS File System Administration Guide*.

To configure a StorageTek ASM environment, create the /etc/opt/SUNWsamfs/mcf file. The mcf file has two kinds of entries:

- File system device entries. These are the disk devices to be used. In the mcf file, you organize them into one or more StorageTek ASM file systems.
- Removable media device entries. These are lines for each device, and you organize the devices into Family Sets. The mcf file contains information that enables you to identify the drives to be used and associate them with the automated libraries to which they are attached.

Note: The instructions for creating the `mcf` file differ depending on whether you are creating a StorageTek ASM environment or a StorageTek ASM-QFS environment.

If you are installing the StorageTek ASM software, all configuration instructions are contained in this section.

If you are creating a StorageTek ASM-QFS environment, the instructions for configuring the file system portion of the `mcf` file are contained in "Defining the StorageTek QFS Configuration By Creating the mcf File" on page 62. The instructions for library and drive configuration are contained in this section.

To Create an `mcf` File

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

- Delimit the fields in each line with spaces or tabs.
- Begin each comment line entered into this file with a pound sign (#).
- Use a dash (-) to indicate optional fields that are omitted.

Figure 91 shows the `mcf` file fields.

Figure 91. `mcf` File Fields

```
#
# StorageTek ASM 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 21. `mcf` File Fields

Field	Description
Equipment Identifier	*Required*. This field specifies the physical device with which to interact. This field can contain information on file system devices or removable media devices. File System Devices • For the initial line in a group of file system definition lines, specify the file system name. This must be the same name as the Family Set name specified in the Family Set field, and it is limited to 31 characters. • If the device is a file system member device, specify a `/dev/dsk` entry. This field is limited to 127 characters. Removable Media Devices The Equipment Identifier field is limited to 127 characters for lines that define removable media devices. • If the device is a direct-attached automated library or optical drive, specify a `/dev/samst` entry. • If the device is a network-attached automated library, specify the full path name to the parameters file for that library. Each automated library in the StorageTek ASM environment must have its own identification line in the `mcf` file. To specify more than one library in the `mcf` file, put each on a separate line. • If the device is a tape drive, specify one of the following: 1. The `/dev/rmt/`***n***`cbn` entry. 2. The path to a different symbolic link that points to the same special file that the `/dev/rmt/`***n***`cbn` link points to. If you specify the tape drive in this manner, create the link before mounting the file system.

Table 21. mcf File Fields (Continued)

Field	Description
Equipment Ordinal	*Required*. Specify a unique integer number. All devices and parent identifiers must be assigned a unique Equipment Ordinal. Enter a unique integer such that $1 \leq eq\_ord \leq 65534$. The number selected affects the order in which devices are displayed in the user interfaces. Lower numbers are displayed first.
Equipment Type	*Required*. This field provides information that the software uses to determine how to interact with a particular device. Enter the two- or three-character mnemonic for the device type. Most equipment can use the generic equipment types of od (optical disk), tp (tape), and rb (robot). For specific Equipment Types, see the mcf(4) man page.

Table 21. `mcf` File Fields (Continued)

Field	Description
Family Set	*Required for most devices*. A Family Set parent line identifies groups of devices configured to work together as a group, for example, a library and its drives. For a parent device (for example, a library), enter a descriptive name for the Family Set. The Family Set name binds its members, as follows: • If the device is a file system disk device, enter the file system name. • If the device is a member device that is associated with a Family Set parent device (that is, a file system or automated library), enter the Family Set name for the parent device. • If the device is a standalone device such as a manually loaded drive, use the dash (`-`) to indicate that this field is omitted. This field is limited to 31 characters.
Device State	*Optional*. Enter a state for the device for when the file system is initialized. This state could be `on`, `off`, `unavail`, `down`, or a dash (`-`) for default behavior.
Additional Parameters	*Optional*. If you include information in the Additional Parameters field, what you can specify varies by device type, as follows: • If the device is a disk, specify the `/dev/rdsk` entry. This is similar to the `/dev/dsk` entry in the Equipment Identifier field. • If the device is an automated library, specify an alternate path to the library's media catalog file or specify the default path to the library catalog file (`/var/opt/SUNWsamfs/catalog/`*family_set_name*). For tape and magneto-optical devices, this field should be left blank.

Table 21 shows the information to be contained in each field and whether or not the field is a required or optional field.

Note: If you change the `mcf` file after the StorageTek ASM file system is in use, you must convey the new `mcf` specifications to the StorageTek ASM software. For information on propagating `mcf` file

changes to the system, see the *StorageTek ASM and QFS File System Administration Guide*.

Identifying Peripherals Using the /var/adm/messages File

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

As Figure 92. shows, each SCSI peripheral has three lines. Note that the third line wraps to the next line in Figure 92. and that the sixth field, samst2, indicates that these lines are associated with each other.

Figure 92. SCSI Peripheral Lines in the /var/adm/messages File

```
# tail -200 /var/adm/messages | more
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP
C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is /iommu@0,10000000/
sbus@0,10001000/espdma@5,8400000/esp@5,8800000/samst@2,0
```

Note: For readability, the preceding output, and many other outputs that are wider than 80 characters, have been wrapped for inclusion in this manual.

The first line displays the vendor and product information that the SCSI peripheral reported to the Sun Solaris kernel.

The second line displays the SCSI bus, SCSI target ID, and LUN of the peripheral.

The third line displays the peripheral's hardware path. This path is reflected in the /devices directory. Symbolic links (symlinks) to the /devices directory are set up in the /dev/st, /dev/samst, and /dev/rmt directories.

Matching the symbolic link to the correct peripheral is the key to configuring a StorageTek ASM environment. Use the ls(1) command with the -l option in both the /dev/st, /dev/samst and /dev/rmt directories to display the path name of the peripheral.

Optionally, you can set up the device down notification script at this point. The dev_down.sh(1M) man page contains information about setting up this script, which sends email to root when a device is marked down or off. For more information, see the dev_down.sh(1M) man page.

Example StorageTek ASM Configuration

Assume that the following equipment is to be included in a StorageTek ASM 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 22..

Table 22. 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 23..

Table 23. 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 24..

Table 24. 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 StorageTek ASM Disk Cache Configuration

Figure 93. shows the output from the Sun Solaris format(1M) command. It reports how the disks are partitioned.

Figure 93. 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)
```

Figure 93. `format`**(1M) Command Example (Continued)**

```
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 StorageTek ASM file system (`samfs1`) on partition `0` of disk `c1t0d0` and partition `5` of `c1t1d0`. It creates another file system (`samfs2`) on partition `1` of disk `c1t0d0` and partition `0` of disk `c1t1d0`.

The following procedure explains how to begin writing the `mcf` file for this example configuration by defining the file systems and their disk partitions.

To Write the `mcf` File

1. Make an `ms` (mass storage) entry for the first file system.

   An `ms` entry is the Equipment Identifier for a StorageTek ASM file system. The name of this file system (`samfs1`) is used later when writing the `/etc/vfstab` entry for the file system and creating the file system. Note that the name as specified in the Equipment Identifier field must be the same as the Family Set name for the file system.

2. Make a series of `md` (magnetic disk) entries listing the partitions that comprise the `samfs1` file system member devices.

3. Make similar entries for the second (`samfs2`) file system.

   Figure 94. shows the `mcf` with the file systems defined.

Figure 94. StorageTek ASM `mcf` **File Showing the File Systems**

```
# Disk cache configuration for 2 file systems: samfs1,
samfs2
#
# Equipment       Eq    Eq   Fam.  Dev.    Additional
# Identifier      Ord  Type  Set   State   Parameters
#-----------      ---   --  ------ ------  ---------------
---
samfs1             10   ms  samfs1
/dev/dsk/c1t0d0s0  11   md  samfs1   on
/dev/dsk/c1t1d0s5  12   md  samfs1   on
#
samfs2             20   ms  samfs2
/dev/dsk/c1t1d0s0  21   md  samfs2   on
/dev/dsk/c1t0d0s1  22   md  samfs2   on
```

CAUTION: Make sure you specify disk partitions that are not in use on your system. Do not use overlapping partitions. If a StorageTek ASM file system attempts to use a partition that is

already in use, the software usually issues a message to indicate that the device is busy.

If you give the wrong partition names, you risk damaging user or system data. This is true when initializing any type of file system. Make sure you specify only disk partitions that are not already in use on your system. Do not use overlapping partitions.

Configuring a Manually Loaded Magneto-Optical Drive

The HP Model C1716T is target ID 2 on the internal SCSI bus.

To Configure the Drive

1. Examine the /var/adm/messages file to find the messages for these devices.

   Figure 95. shows the information in /var/adm/messages associated with the HP Model C1716T and target 2. Note that the third line wraps to the next line in this example.

Figure 95. Information in /var/adm/messages

```
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP    C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is /iommu@0,10000000/
sbus@0,10001000/espdma@5,8400000/esp@5,8800000/samst@2,0
```

2. Issue the cd(1) command to change to the /dev/samst directory.
3. Use the ls(1) and grep(1) commands to find the correct symbolic link.

   For example, use the following ls(1) command:

```
# ls -l | grep “samst@2”
```

   The preceding ls(1) command searches for a symbolic link that points to the hardware path shown in Figure 96..

Figure 96. Path to samst@2

```
lrwxrwxrwx   1 root     other         88 Aug 23 12:27 c0t2u0 -> /
devices/iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/
esp@5,8800000/samst@2,0:a,raw
```

   The Sun samst driver uses the name /dev/samst/c0t2u0 when referencing the device.

4. Use an editor to open the /etc/opt/SUNWsamfs/mcf file.
5. Add an entry for the drive to the mcf file.

Add the following entry in `/etc/opt/SUNWsamfs/mcf`:

```
/dev/samst/c0t2u0   30   od   -   on
```

This entry contains the device name (`/dev/samst/c0t2u0`), a unique Equipment Ordinal (30), the Equipment Type of the drive (`od`), a dash (`-`) to indicate that a Family Set name is not associated with the drive, and the device state (`on`).

Configuring a Magneto-Optical Library

The HP C1710T automated library has three SCSI devices: the robotic mechanism and the two magneto-optical drives that the automated library loads and unloads.

To Configure the Magneto-Optical Library

1. Examine the `/var/adm/messages` file to find the messages for these devices.

   Figure 97. shows these messages.

Figure 97. `/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.

Figure 98. 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 Figure 97..

Figure 98. ls(1) and grep(1) Commands Used to Find Symbolic Links for the Devices in Figure 97.

```
# 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. Use an editor to open the /etc/opt/SUNWsamfs/mcf file.
5. Add entries for the library and drives to the /etc/opt/SUNWsamfs/mcf file.

   Figure 99. shows the mcf file entries.

Figure 99. mcf File Entries for the HP Library and its Drives

```
/dev/samst/c1t2u0   50   rb   hp30   on
/dev/samst/c1t5u0   51   od   hp30   on
/dev/samst/c1t6u0   52   od   hp30   on
```

The first line defines the automated library itself. It contains the /dev/samst name for the device (/dev/samst/c1t2u0) followed by a unique Equipment Ordinal (50), the Equipment Identifier (rb, for a generic SCSI-attached library), the Family Set identifier specified on all devices associated with this library (hp30), and the Device State (on).

The two remaining lines define the drives inside the library. They are similar to the manually loaded drives defined in the previous section except that instead of a dash, they include the Family Set name of the library where they reside (hp30).

Note: The order of drives as specified in the mcf file must match the logical order of the drives in a SCSI-attached automated library. The first drive defined in the mcf must be the first logical drive in the library, and so on. For more information, see your hardware documentation for the logical orientation of drives. Incorrect configuration can cause cartridges to be mounted in the wrong drives, which will lead to total inoperability of this software.

Configuring a Manually Loaded DLT Drive

When configuring DLT drives, be sure to add the DLT definitions to the `/kernel/drv/st.conf` file (see "(Optional) Verifying and Updating the `st.conf` and `samst.conf` Files" on page 135). DLT drives are not part of the standard Sun Solaris configuration, and the software does not recognize them if they are configured incorrectly.

To Configure the DLT Drive

1. Examine the `/var/adm/messages` file to find the messages for these devices.

   Figure 100. shows the `/var/adm/messages` file lines that refer to the manual DLT drive.

Figure 100. 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.

   Figure 101. shows the `ls`(1) and `grep`(1) commands to use to locate the DLT drive identified as `scsi@5`.

Figure 101. `ls`(1) and `grep`(1) Commands Used to Find Symbolic Links for the Device in Figure 100.

```
# 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. Figure 102. shows the symbolic link for a drive that supports compression. If the drive supports compression, and if you want compression in the hardware, use `cbn` as the prefix.

Figure 102. Symbolic Link Showing a Drive With that Supports Compression

```
lrwxrwxrwx   1 root     other         85 Aug 15 11:37 /dev/
rmt/0cbn -> ../../devices/iommu@0,10000000/
sbus@0,10001000/espdma@5,8400000/esp@5,8800000 st@4,0:cbn
```

3. Use vi(1) or another editor to open the /etc/opt/SUNWsamfs/mcf file.
4. Add the /etc/opt/SUNWsamfs/mcf entry.

   For example:

```
/dev/rmt/0cbn   40   tp   -   on
```

   The first entry on the line is the st driver name for the device (/dev/rmt/0cbn), followed by a unique Equipment Ordinal (40), the Equipment Type (tp for a generic tape), a dash (-) to indicate that a Family Set name is not associated with the manually mounted device, and the Device State (on).

   For tape drives, you can leave the Additional Parameters field empty.

Configuring a DLT Library

The last piece of equipment to define is the STK 9730 automated library. This automated library has three SCSI devices: the robotic mechanism and the two DLT 7000 tape drives that the robot loads and unloads.

To Configure the DLT Library

1. Examine the /var/adm/messages to find the messages for these devices.

   Figure 103. shows the /var/adm/messages file.

Figure 103. Information in /var/adm/messages

```
Feb  4 09:42:17 server1 samst: [ID 902828 kern.notice] samst42:
Vendor/Product ID = STK     9730
Feb  4 09:42:17 server1 scsi: [ID 193665 kern.info] samst42 at glm3:
target 0 lun 0
Feb  4 09:42:17 server1 genunix: [ID 936769 kern.info] samst42 is /
pci@6,4000/scsi@2,1/samst@0,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/
scsi@2,1/st@1,0 (st22):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st22 at glm3:
target 1 lun 0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st22 is /
pci@6,4000/scsi@2,1/st@1,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/
scsi@2,1/st@2,0 (st23):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st23 at glm3:
target 2 lun 0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st23 is /
pci@6,4000/scsi@2,1/st@2,0
```

2. Issue the cd(1) command to change to the /dev/samst directory.

3. Use the `ls`(1) and `grep`(1) commands to find the symbolic links that point to the `/devices` files with the same Sun Solaris hardware paths shown in the `/var/adm/messages` file.

   Figure 104. shows the `ls`(1) and `grep`(1) commands to use to locate the symbolic links.

Figure 104. `ls`(1) and `grep`(1) Commands Used to Find Symbolic Links for the Device in Figure 103.

```
# cd /dev/samst
# ls -l | grep "samst@0"
lrwxrwxrwx   1 root     other        49 Feb  4 09:42 c6t0u0
-> ../../devices/pci@6,4000/scsi@2,1/samst@0,0:a,raw
```

4. Use the `ls`(1) and `grep`(1) commands to find a symbolic link in `/dev/rmt` that points to the tape devices.

   Note in Figure 105. that the automated library does not have this additional link.

Figure 105. `ls`(1) and `grep`(1) Commands to Use to Find the Tape Devices

```
# cd /dev/rmt
# ls -l | grep cbn
lrwxrwxrwx   1 root     root          44 Feb  3 15:38 0cbn
-> ../../devices/pci@6,4000/scsi@2,1/st@1,0:cbn
lrwxrwxrwx   1 root     root          44 Feb  3 15:38 1cbn
-> ../../devices/pci@6,4000/scsi@2,1/st@2,0:cbn
```

   Again, there are multiple symbolic links in the directory that point to the same hardware path. To enable hardware compression, choose the one with the `cbn` suffix. If your drive does not support hardware compression, choose the symbolic link that ends with `bn`.

5. Use `vi`(1) or another editor to open the `/etc/opt/SUNWsamfs/mcf` file.

6. Add the `/etc/opt/SUNWsamfs/mcf` entries.

   Figure 106. shows the `mcf` file entries for this library and its drives.

Figure 106. `mcf` File Entries for the StorageTek Library and its Drives

```
/dev/samst/c2t0u0  60  rb  9730  on
/dev/rmt/0cbn      61  tp  9730  on
/dev/rmt/1cbn      62  tp  9730  on
```

   The first line defines the automated library and includes the `/dev/samst` name (`/dev/samst/c2t0u0`). It also contains a unique Equipment Ordinal (`60`), the Equipment Type (`rb`, for the generic robot Equipment Type), a Family Set name for the robot and the drive (`9730`), and the Device State (`on`).

The second line defines the first DLT tape drive inside the library. These entries refer to the Equipment Identifier for this tape device (/dev/rmt/0cbn), the Equipment Ordinal for the device (61), the Equipment Type (tp), the Family Set Name (9730), and the Device State (on).

The third line defines the second DLT tape drive inside the automated library. These entries refer to the Equipment Identifier for this tape device (/dev/rmt/1cbn), the Equipment Ordinal for the device (62), the Equipment Type (tp), the Family Set name (9730), and the Device State (on).

7. (Optional) Add the DLT definitions to the /kernel/drv/st.conf file.

   Perform this step if you are configuring DLT drives.

   "(Optional) Verifying and Updating the st.conf and samst.conf Files" on page 135 shows how to add definitions to the /kernel/drv/st.conf file. DLT drives are not part of the standard Sun Solaris configuration.

Figure 107 shows the completed `mcf` file.

Figure 107. Completed `mcf` File

```
# Equipment          Eq   Eq    Family  Dev   Additional
# Identifier         Ord  Type  Set     Sta   Parameters
#
samfs1               10   ms    samfs1
/dev/dsk/c1t0d0s0    11   md    samfs1  on
/dev/dsk/c1t1d0s5    12   md    samfs1  on
#
samfs2               20   ms    samfs2
/dev/dsk/c1t1d0s0    21   md    samfs2  on
/dev/dsk/c1t0d0s1    22   md    samfs2  on
#
/dev/samst/c0t2u0    30   od    -       on
#
/dev/rmt/0cbn        40   tp    -       on
#
/dev/samst/c1t2u0    50   rb    hp30    on
/dev/samst/c1t5u0    51   od    hp30    on
/dev/samst/c1t6u0    52   od    hp30    on
#
/dev/samst/c2t0u0    60   rb    9730    on
/dev/rmt/0cbn        61   tp    9730    on
/dev/rmt/1cbn        62   tp    9730    on
```

Example `mcf` File Entries for Network-Attached Libraries

The following examples show `mcf` file entries for network-attached devices. In these examples, note that the first line of each library definition is the full path to a file. This file is the parameters file for that library.

If you are using a network-attached library, you create the parameters files for network attached libraries in “(Optional) Creating Parameters Files for Network-Attached Automated Libraries” on page 176.

Example 1. Figure 108. shows the mcf file for an ADIC/Grau network-attached automated library.

Figure 108. 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. Figure 109. shows the mcf file for a Fujitsu LMF network-attached automated library.

Figure 109. 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. Figure 110. shows the mcf file for an IBM 3494 network-attached automated library.

Figure 110. 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. Figure 111. shows the `mcf` file for a Sony network-attached automated library.

Figure 111. 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. Figure 112. shows the `mcf` file for a StorageTek ACSLS-attached automated library.

Figure 112. StorageTek Automated Library `mcf` File Entries

```
# Equipment               Eq   Eq  Family  Dev  Additional
# Identifier              Ord  Ty  Set     St   Parameters
#
/etc/opt/SUNWsamfs/stk50 50   sk  sk50    on
/dev/rmt/0cbn            51   sg  sk50    on
/dev/rmt/1cbn            52   sg  sk50    on
```

For more information, see the `mcf`(4) man page. There are example `mcf` files located in `/opt/SUNWsamfs/examples/mcf`.

(Optional) Creating Parameters Files for Network-Attached Automated Libraries

Perform this task if you want to include network-attached automated libraries in your StorageTek ASM environment.

Automated libraries can be included in a StorageTek ASM environment either by attaching them to the server directly or by attaching them to the environment's network. Libraries attached through a SCSI or Fibre Channel attachment are *direct-attached* libraries. Libraries attached through a network attachment are *network-attached* libraries. In this task, you create a parameters file for each network-attached library to be included in your environment.

To configure a network-attached library in your StorageTek ASM environment, find your library in the following list and go to the page indicated:

- "ADIC/Grau Automated Libraries" on page 177

- "Fujitsu LMF Automated Libraries" on page 179
- "IBM 3494 Automated Libraries" on page 181
- "Sony Network-Attached Automated Libraries" on page 185
- "StorageTek ACSLS-Attached Automated Libraries" on page 188

"Shared Drives" on page 193 describes the shared drives feature that some libraries support.

Note: The examples and the discussions in the following subsections mention both the parameters files for network-attached automated libraries and the `mcf` file. The StorageTek ASM `mcf` file is the main configuration file for StorageTek ASM software. You created your `mcf` file in "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157. 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 StorageTek ASM environments through the `grauaci` interface. The `grauaci` interface is the interface between the StorageTek ASM software and the ADIC/Grau library. This interface uses the DAS/ACI 3.10 interface supplied by ADIC/Grau. For more information on the DAS/ACI interface, see your ADIC/Grau documentation.

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

1. Ensure that the ADIC/Grau automated library is prepared for inclusion in a StorageTek ASM environment.

   Ensure that the following are true:

- The ADIC/Grau automated library must be operational.
- The ADIC/Grau library is operating on the DAS server.
- Both the `avc` (avoid volume contention) and the `dismount` parameters must be set to `true` in the DAS configuration file for this client.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but StorageTek recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in nn"Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

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

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

```
# vi grau50
```

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

   The various *keyword* values identify the ADIC/Grau automated libraries, the drives associated with the libraries, and the server name. All *keyword* and *value* entries are case sensitive, so enter them exactly as specified in the DAS configuration file and in the StorageTek ASM `mcf` file.

   Include the following types of *keyword* = *value* parameters in the ADIC/Grau parameters file:

- `client =` *client_id*. For *client_id*, specify the name of the client as defined in the DAS configuration file. This is a required parameter.
- `server =` *server_id*. For *server_id*, specify the host name of the server running the DAS server code. This is a required parameter.
- `acidrive` *drive_id = path*. For *drive_id*, specify the name of the drive as configured in the DAS configuration file. For *path*, specify the path to the drive as entered in the Equipment Identifier field of the StorageTek ASM `mcf` file. There must be one `acidrive` line for every drive assigned to the client.

  Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

  If the ADIC/Grau library contains various media types, then there is a media changer for each media type. Each media changer has a unique client name in the DAS configuration, a unique library catalog, and a unique parameters file.

  The following code examples show two ADIC/Grau parameters files. Figure 113. and Figure 114. define one ADIC/Grau automated library supporting DLT tape and one ADIC/Grau automated library supporting a Hewlett Packard optical drive.

  Figure 113. shows the parameters file for library `grau50`.

Figure 113. Parameters File `/etc/opt/SUNWsamfs/grau50`

```
# This is file: /etc/opt/SUNWsamfs/grau50
#
client = DASclient
server = DAS-server
```

Figure 113. Parameters File `/etc/opt/SUNWsamfs/grau50` **(Continued)**

```
#
# the name "drive1" is from the DAS configuration file
#
acidrive drive1 = /dev/rmt/0cbn     # a comment
#
# the name "drive2" is from the DAS configuration file
#
acidrive drive2 = /dev/rmt/1cbn     # a comment
```

Figure 114. shows the parameters file for `grau60`.

Figure 114. Parameters File `/etc/opt/samfs/grau60`

```
# This is file: /etc/opt/SUNWsamfs/grau60
#
client = DASclient
server = DAS-server
acidrive DH03 = /dev/samst/c1t1u0
#
# the name "DH03" is from the DAS configuration file
```

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

   Figure 108. in "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157 shows the `mcf` file that corresponds with the ADIC/Grau network-attached automated library parameters file example that was created in this procedure. The example `mcf` points to files `grau50` and `grau60` in the `/etc/opt/SUNWsamfs` directory.

Diagnostic Information

The following directory contains diagnostic information that can be useful when troubleshooting:

```
/var/opt/SUNWsamfs/.grau
```

The system creates files in this directory that are named `graulog-`*eq*, where *eq* is the Equipment Ordinal as defined in the `mcf` file. For more information on this, see the `grauaci`(7) and the `mcf`(4) man pages.

Fujitsu LMF Automated Libraries

The Fujitsu LMF automated library operates in StorageTek ASM environments through the LMF interface supplied by Fujitsu. The `fujitsulmf` interface is the interface between the StorageTek ASM software and the Fujitsu LMF automated libraries. For more information on LMF, see the *LMF MTL Server/*

Client User's Guide or the *LMF SAM-FS Linkage Operations Guide*. You can obtain both of these publications from the Fujitsu Corporation.

To Configure the Parameters File for a Fujitsu LMF Automated Library

The Fujitsu LMF parameters file identifies the drives in the automated library. Create one parameters file for each automated library.

1. Ensure that the Fujitsu LMF automated library is prepared for inclusion in a StorageTek ASM 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 StorageTek recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in nn“Defining the StorageTek ASM Configuration By Creating the `mcf` File” on page 157, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

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

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

```
# vi lmf50
```

4. Edit the Fujitsu LMF parameters file to consist of a list of *drivename* = *value* parameter lines.

   The parameters file consists of `lmfdrive` *drivename* = *value* definition lines and comment lines. There must be one `lmfdrive` line for each drive assigned to the client automated library. Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

All *drivename* and *value* information is case sensitive. Table 25. shows the values you can specify for *drivename* and *value*.

Table 25. The *drivename* and *value* Arguments

Argument	Definition
drivename	The name of the drive according to the LMF configuration.
value	The path to the drive. This path must match the Equipment Identifier field of the `mcf` file.

Figure 115. shows a parameters file for a Fujitsu LMF automated library.

Figure 115. 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
```

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

   Figure 109. in "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157 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 StorageTek ASM environments with the assistance of the IBM `lmcpd` daemon package. You can obtain the IBM `lmcpd` daemon package from IBM.

To Configure the Parameters File for an IBM 3494 Automated Library

The IBM 3494 automated library can be used as a single physical library or as multiple logical libraries. If you divide this library into multiple logical libraries, create a parameters file for each logical library.

1. Ensure that the IBM 3494 automated library is prepared for inclusion in a StorageTek ASM 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 StorageTek recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in nn“Defining the StorageTek ASM Configuration By Creating the `mcf` File” on page 157, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

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

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

```
# vi ibm50
```

4. Edit the IBM 3494 parameters file to consist of a list of *keyword* = *value* and *pathname* = *value* pairs.

All arguments are case-sensitive. Table 26. shows how to specify the parameters.

Table 26. IBM 3494 Parameters File Arguments

Parameter	Meaning
`name =` *name*	This is the name assigned by you, the system administrator, and specified in the `/etc/ibmatl.conf` file. This is also the symbolic name of the library. This parameter must be supplied, there is no default.
`category =` *hexnumber*	The category is a hexadecimal number such that `0x0001` < *hexnumber* < `0xfeff`. The StorageTek ASM software sets the `category` to this *hexnumber* for media under its control. The default is `4`. If you have divided your physical library into multiple logical libraries, create a parameters file for each logical library and make sure that the `category =` *hexnumber* parameter is different in each logical library. This parameter determines which tapes are assigned to which library. When you import media into the library, it is added to the catalog, and its `category=` value is changed to the value specified by this `category` = *hexnumber* parameter.

Table 26. IBM 3494 Parameters File Arguments

Parameter	Meaning
`access =` *permission*	For *permission*, specify either `shared` or `private`. • Specify `private` if you are using the library as one physical library. Default. • Specify `shared` if you are dividing the library into multiple logical libraries.
device-pathname = *device-number* [`shared`]	Specify a *device-pathname* entry for every drive in the library attached to this machine. Each *device-pathname* must match the Equipment Identifier of an entry in the `mcf` file. The *device-number* is the device number as described in the IBM documentation. You can derive this number by running the IBM `mtlib` utility obtained from IBM. The `shared` parameter is optional. You can specify it if the drive is shared with other StorageTek ASM servers. For more information about shared drives, see "Shared Drives" on page 193.

Figure 116. shows an example `/etc/ibmatl.conf` file. Information for this file was obtained from the `mtlib` utility supplied by IBM.

Figure 116. Example `/etc/ibmatl.conf` File

```
#
# This is file: /etc/ibmatl.conf
# Set this file up according the documentation supplied by
IBM.
3493a   198.174.196.50  test1
```

After the `lmcpd` daemon is running, you can use IBM's `mtlib` utility to get the device numbers. Figure 117. shows output from `mtlib`.

Figure 117. Output From `mtlib`

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

Figure 118. shows a sample parameters file and `mcf` entries for an IBM 3494 library.

Figure 118. Parameters File `/etc/opt/SUNWsamfs/ibm50`

```
#
# This is file: /etc/opt/SUNWsamfs/ibm50
#
name = 3493a                        # From /etc/ibmatl.conf
/dev/rmt/1bn = 00145340             # From mtlib output
/dev/rmt/2bn = 00145350 shared      # From mtlib output
access=private
category = 5
```

5. Repeat this procedure and create a parameters file for each IBM 3494 library that you want to configure.

   You must create a parameters for file for each physical or logical library you want to include in the StorageTek ASM environment.

   Figure 110 in "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157 shows the `mcf` file that corresponds with the IBM 3494 network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `ibm50` in the `/etc/opt/SUNWsamfs` directory.

Sony Network-Attached Automated Libraries

A Sony network-attached automated library operates within the StorageTek ASM environment through the DZC-8000S Application Interface Library package. This software package provides the application programmer interface (API) to the PetaSite Controller (PSC). For more information on the DZC-8000S interface, see the *Sony PetaSite Application Interface Library DZC-8000S*, which is available from Sony.

Note: The information in this section applies only to Sony automated libraries that are network-attached through a Sony DZC-8000S interface. If you want to include Sony direct-attached B9 and B35 automated libraries or Sony direct-attached 8400 PetaSite automated libraries, you do not need this information because you do not need to create a parameters file for your library.

To Configure the Parameters File for a Sony Network-Attached Automated Library

1. Ensure that the Sony network-attached automated library is prepared for inclusion in a StorageTek ASM 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 StorageTek recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

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

   For example, you could invoke `vi`(1) as follows:

```
# vi sonyfile
```

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

   The Sony parameters file consists of a list of *keyword* = *value* parameter lines. The various *keyword* values identify the Sony automated libraries, the drives associated with the libraries, and the host name. All *keyword* and *value* entries are case sensitive, so enter them exactly as used in the configuration file and in the StorageTek ASM `mcf` file.

   Table 27. shows the *keyword* = *value* parameters that must appear in the Sony parameters file. All parameters are required.

Table 27. Sony Network-Attached Automated Library Parameters

Parameter	Meaning
`userid` = *user-id*	For *user-id*, specify a number in the range 0 ≤ *user-id* ≤ 65535. If you specify a number other than 0, it must be the PSC ID. The `userid` parameter identifies the user during initialization of the PetaSite automated library functions.

Table 27. Sony Network-Attached Automated Library Parameters

Parameter	Meaning
`server` = *server_id*	For *server_id* specify the host name of the server running the PSC server code.
`sonydrive` *drive_id* = *path* [shared]	There must be one `sonydrive` line for every drive defined in the `mcf` file. For *drive_id*, specify the drive bin number as configured in the PSC configuration file. For *path*, specify the path to the drive as entered in the Equipment Identifier field of the StorageTek ASM `mcf` file. The `shared` keyword is optional. You can configure this library to share its media drives with two or more StorageTek ASM processes from two or more hosts. For more information on implementing shared drives, see "Shared Drives" on page 193 or see the `sony`(7) man page.

Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

Figure 119. shows the parameters file, `/etc/opt/SUNWsamfs/sonyfile`.

Figure 119. 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
#
# europa is the hostname for the server running
# the DZC-8000S server code.
#
server = europa
#
# The bin numbers 1001 and 1002 are from the PSC
# configuration file.
#
sonydrive 1001 = /dev/rmt/1cbn
sonydrive 1002 = /dev/rmt/2cbn shared
```

5. Repeat this procedure and create a parameters file for each Sony network-attached library that you want to configure.

   Figure 111. in "Defining the StorageTek ASM Configuration By Creating the mcf File" on page 157 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 StorageTek ASM systems interoperate with a StorageTek ACSLS-attached automated library in a manner similar to direct-attached automated libraries. However, a StorageTek ACSLS-attached automated library requires additional steps in the installation and configuration procedure as compared to a direct-attached automated library.

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

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

1. Ensure that the StorageTek ACSLS-attached automated library is prepared for inclusion in a StorageTek ASM 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 StorageTek recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration By Creating the mcf File" on page 157, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

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

   For example, you could invoke `vi`(1) as follows:

```
# vi stk50
```

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

   Each line of the parameters file must begin with a keyword or a comment. Table 28. shows the keywords to use.

Table 28. StorageTek ACSLS-Attached Automated Library Parameters

Parameter	Meaning
`access =` *userid*	Specifies the user identification. For *userid*, enter the *userid* used by StorageTek for access control. This is an optional entry to the parameters file. If the `access =` parameter is not supplied, the access control string is a null string. This indicates that there is no *userid*.
`hostname =` *hostname*	Specifies the host name of the server. For *hostname*, enter the host name of the server running the StorageTek ACSLS interface.
`portnum =` *portnum*	Specifies the port number used for communication between ACSLS and the StorageTek ASM software. For information on what to enter for the *portnum* argument, see the `stk`(7) man page.
`ssihost` = *hostname*	Specifies the name of the server when you are using a multihomed StorageTek ASM server. This is the name of the StorageTek ASM server on the LAN that connects to the ACSLS host. Specify this directive only if you are including a multihomed StorageTek ASM server in your environment. The default is the name of the local host.
`csi_hostport` = *csi_port*	This firewall environment variable specifies the port to which the SSI sends its ACSLS requests on the ACSLS server. Setting this variable eliminates queries to the portmapper on the ACSLS server. Instead, it sends requests to this port on the ACSLS server. For *csi_port*, specify either 0 or a value such that 1024 ≤ *csi_port* ≤ 65535. Setting this variable to zero or leaving it unset causes the system to query the portmapper on the ACSLS server.

Table 28. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
`capid` = (`acs =` *acsnum*, `lsm =` *lsmnum*, `cap =` *capnum*)	
	Specifies the CAP (Cartridge Access Port), in terms of the StorageTek library, to be used when the `export`(1M) `-f` command is specified. The `capid` description starts with an open parenthesis followed by three `keyword` = *value* pairs followed by a closing parenthesis. Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs. For *acsnum*, specify the ACS number for this CAP as configured in the StorageTek library. For *lsmnum*, specify the LSM number for this CAP as configured in the StorageTek library. For *capnum*, specify the CAP number for this CAP as configured in the StorageTek library.

Table 28. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
`capacity` = (*index* = *value*[, *index* = *value*] . . .)	Sets the capacity of the cartridges supported by StorageTek. Use a comma to separate the *index* = *value* pairs and enclose them in parentheses. For *index*, specify the index of the `media_type` file supplied by StorageTek and located in the following ACSLS directory: `/export/home/ACSSS/data/internal/mixed_media/media_types.dat` For *value*, enter the capacity of the cartridge type in units of 1024 bytes. Table 29. shows the capacity defaults that were current at the time of the StorageTek ASM 4.1 release. In general, it is necessary only to supply a capacity entry for an index of new cartridge types or to override the capacity supported by StorageTek.
device_path_name = (`acs` = *value*, `lsm` = *value*, `panel` = *value*, `drive` = *value*) [`shared`]	Specifies the path to the device on the client. Specify one *device_path_name* = entry for each drive attached to this client. This parameter describes the drive within the StorageTek automated library. This description starts with an open parenthesis followed by four *keyword* = *value* pairs and a closing parenthesis. Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs. For the *value* arguments, use the information supplied by the ACSLS query drive command. Table 30. shows the *value* specifications. The `shared` keyword can follow the specification for the device path name. This specifies that the drive can be shared between two or more StorageTek ASM processes from two or more hosts. For more information on implementing shared drives, see “Shared Drives” on page 193 or see the `stk`(7) man page.

Table 29. shows the capacity defaults.

Table 29. Capacity Defaults

index	**Type**	**Capacity**
0	3480	210 MB (215040)
1	3490E	800 MB (819200)
2	DD3A	10 GB (10485760)
3	DD3B	25 GB (26214400)
4	DD3C	50 GB (52428800)
5	DD3D	0 (DD3 cleaning tape)
6	DLTIII	10 GB (10485760)
7	DLTIV	20 GB (20971520)
8	DLTIIIXT	15 GB (15728640)
9	STK1R (9840)	20 GB (20971520)
10	STK1U	0 (STK1R cleaning tape)
11	EECART	1.6 GB (16777216)
12	JCART	0 GB (foreign label)
13	STK2P (T9940A)	60 GB (62914560)
14	STK2W	0 GB (T9940A cleaning tape)
15	KLABEL	0 GB (unsupported)
16	LTO-100G	100 GB (104857600)
17	LTO-50G	50 GB (52428800)
18	LTO-35G	35 GB (36700160)
19	LTO-10G	10 GB (10485760)
20	LTO-CLN2	0 GB (cleaning tape)
21	LTO-CLN3	0 GB (cleaning tape)
22	LTO-CLN1	0 GB (cleaning tape)
23	SDLT	110 GB (115343360)
24	LTO-CLNU	0 GB (cleaning tape)
25	Virtual	0 GB (unsupported)
26	LTO-200G	200 GB (209715200)

Table 30 shows the *value* specifications.

Table 30. The *value* Specifications

Value	Content
`acs`	ACS number for the drive as configured in the StorageTek library
`lsm`	LSM number for the drive as configured in the StorageTek library
`panel`	PANEL number for the drive as configured in the StorageTek library
`drive`	DRIVE number for the drive as configured in the StorageTek library

Figure 120. shows a parameters file for a StorageTek ACSLS-attached automated library:

Figure 120. Parameters File `/etc/opt/SUNWsamfs/stk50`

```
#
#  This is file: /etc/opt/SUNWsamfs/stk50
#
hostname = baggins
portnum = 50014
access = some_user  # No white space allowed in user_id
capacity = ( 7 = 20971520, 9 = 20971520 )
ssi_inet_port = 0
csi_hostport = 0
capid = (acs=0, lsm=1, cap=0)
/dev/rmt/0cbn = (acs=0, lsm=1, panel=0, drive=1) shared
/dev/rmt/1cbn = (acs=0, lsm=1, panel=0, drive=2)
```

5. Repeat this procedure and create a parameters file for each ACSLS-attached library that you want to configure.

   Figure 112. in “Defining the StorageTek ASM Configuration By Creating the `mcf` File” on page 157 shows the `mcf` file that corresponds with the StorageTek ACSLS-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `stk50` in the `/etc/opt/SUNWsamfs` directory.

Shared Drives

Typically, the StorageTek ASM processes have exclusive control over a library’s drives as declared in the host system’s `mcf` file. In many cases, drives are defined in individual `mcf` files that are used by independent copies of

StorageTek ASM processes. If a process is not using a drive, the drive stays idle.

The shared drives capability enables two or more `mcf` files to define the same drive, and this makes the drive available to more than one StorageTek ASM process. The shared drives capability enables each StorageTek ASM process to share a drive, but it does not allow the processes to share media. Each StorageTek ASM process must still maintain its own set of VSNs. Processes cannot share a single piece of media.

This feature can be useful, for example, if a library is attached to more than one host system in a StorageTek ASM environment. The shared drives capability enables you to keep the drives in a library busy. The StorageTek ASM processes coordinate the use of the drive.

You can configure some network-attached libraries to share one or all media drives between multiple StorageTek ASM processes on multiple host systems. The following types of libraries support shared drives:

- IBM 3494 libraries that use the `lmcpd` interface
- StorageTek ACSLS-attached libraries

Each of the preceding libraries requires you to create a parameters file. To implement one or more shared drives, make sure that the `shared` keyword is specified in the parameters file for each drive that is to be shared. The placement of the `shared` keyword is specific to each manufacturer's library, so see the preceding vendor-specific sections for more information.

By default, a cartridge in a shared drive can be idle for 60 seconds before being unloaded. To change this timing, specify the `shared_unload` directive in the `defaults.conf` file. For more information on this directive, see the `defaults.conf`(4) man page.

Initializing the StorageTek ASM Environment

This procedure initializes the environment.

1. Use the `samd`(1M) `config` command to initialize the StorageTek ASM environment.

   For example:

```
# samd config
```

(Optional) Checking the Drive Order

Perform this task if you are archiving to removable media.

The main objective of this task is to develop a list of drive number identifiers and the tape devices to which they are correlated. Because every automated library is a little different, this step in StorageTek ASM configuration process differs from library to library.

The drive order check procedure differs depending on whether your automated library has a front panel and whether it has tape or magneto-optical drives. Use one of the following procedures to check the drive order of each library:

- “To Check the Drive Order of Tape or Magneto-Optical Libraries With a Front Panel” on page 195
- “To Check the Drive Order of Tape Libraries Without a Front Panel” on page 197
- “To Check the Drive Order of Magneto-Optical Libraries Without a Front Panel” on page 199

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

This procedure has two main phases:

- Mapping the drives to SCSI target IDs. This is accomplished through the following:
  - Visual examination of the automated library’s front panel.
  - Physical examination of the drives.

  For information on the order in which the drives appear in the front panel, consult the documentation from the vendor. This differs from library to library.
- Mapping the SCSI target IDs to tape devices by using output from the `ls`(1M) command. Figure 121. shows example `ls`(1M) output with drive identification information.

Figure 121. 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:
```

Figure 121. Using `ls`(1) to Retrieve Tape Device Information

```
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/
rmt/2 ->
../../devices/pci@1f,4000/scsi@4,1/st@6,0:
lrwxrwxrwx   1 root     other         40 Dec 13  2000 /dev/
rmt/3 ->
../../devices/pci@1f,4000/scsi@4/st@1,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/
rmt/4 ->
../../devices/pci@1f,4000/scsi@4/st@2,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/
rmt/5 ->
../../devices/pci@1f,4000/scsi@4/st@3,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/
rmt/6 ->
../../devices/pci@1f,4000/scsi@4/st@4,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/
rmt/7 ->
../../devices/pci@1f,4000/scsi@2/st@2,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/
rmt/8 ->
../../devices/pci@1f,4000/scsi@2/st@3,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/
rmt/9 ->
../../devices/pci@1f,4000/scsi@2/st@4,0:
231-gort#
```

The procedure that follows is a framework for an iterative process. The actual steps you perform differ depending on your specific library. Consult your vendor documentation and follow this procedure to check the order of tape and magneto-optical drive devices for libraries with a front panel.

1. Use the `samd`(1M) `start` command to start the StorageTek ASM software.

   For example:

   ```
   # samd start
   ```

2. Verify the order of the drives.

   If the automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

3. Verify the order in which the drives are recognized by the automated library's controller.

Check the SCSI target IDs or world wide numbers displayed by the control panel of the automated library. For optical drives, read the SCSI target IDs displayed on the control panel for your automated library. The order in which the drive targets are reported should be the order in which they are configured in the `mcf` file.

To determine whether the drives become active when loaded with a cartridge, you can visually inspect the drives or you can use the `samu`(1M) utility's `r` display.

Refer to your hardware maintenance manual for instructions on identifying and setting target addresses.

To Check the Drive Order of Tape Libraries Without a Front Panel

1. Use the `samd`(1M) `start` commaned to start the software.

   For example:

```
# samd start
```

2. Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the StorageTek ASM file system.

   Use this command in the following format:

```
samcmd unavail eq
```

   For *eq*, specify the Equipment Ordinal, as specified in the `mcf` file, of the drive you are testing.

   For more information about the `samcmd`(1M) command's format, see the `samcmd`(1M) man page.

3. Use the `samload`(1M) command to load a cartridge into the drive.

   Use this command in one of the following formats:

```
samload mediatype.vsn deq
```

   or:

```
samload eq:slot deq
```

Table 31 shows the arguments for these commands.

Table 31. Arguments for `samcmd`(1M) `load`

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

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

4. Use the `mt`(1) command to determine if the correct drive responds while under StorageTek ASM control.

   Use this command in the following format:

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

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

   Figure 122. shows `mt`(1) command output that indicates that a tape is in the drive.

Figure 122. Status Message Showing that a Tape is in a Drive

```
# mt -f /dev/rmt/0 status
DLT 7000 tape drive tape drive:
   sense key(0x2)= Not Ready   residual= 0   retries= 0
   file no= 0   block no= 0
```

   If the tape did not load or the drive did not return a status, the drive might not be listed in the proper order in the `mcf`. Make sure the order is correct in the `mcf` file, and repeat this test.

5. Repeat this procedure for each drive in the library.

   If your automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

   Make sure you check *each* drive in a library.

If you change any information in the `mcf` file as a result of this procedure, you must propagate the changes to the rest of the system. For information on propagating `mcf` file changes, see the *StorageTek ASM and QFS File System Administration Guide*.

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

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

   For example:

```
# samd start
```

2. Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the StorageTek ASM file system.

   Use this command in the following format:

```
samcmd unavail eq
```

   For *eq*, specify the Equipment Ordinal, as specified in the `mcf` file, of the drive you are testing.

   For more information about the `samcmd`(1M) command's format, see the `samcmd`(1M) man page.

3. Use the `samload`(1M) command to load a cartridge into the drive.

   Use this command in one of the following formats:

```
samload mediatype.vsn deq
```

   or:

```
samload eq:slot deq
```

Table 31 shows the arguments for these commands.

Table 32. Arguments for `samcmd`(1M) `load`

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
partition	A side of a magneto-optical disk. The partition must be 1 or 2.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

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

4. Use the `dd`(1M) command to determine if the correct drive reponds while under StorageTek ASM control.

   Use this command in the following format:

```
/bin/dd if=device_path bs=2k iseek=3374 of=/tmp/foo count=10
```

   For *device_path*, specify the `samst` device entry as specified in the `mcf` file.

   Figure 123. shows a status message that indicates that an optical catridge is in the selected device:

Figure 123. `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
```

Figure 124. shows a status message that indicates that an optical catridge is not in the selected device:

Figure 124. dd(1M) Showing That a Cartridge is Not in the Drive

```
# dd if=/dev/samst/c0t5u0 bs=2k iseek=3374 of=/tmp/junk1
count=10
read: I/O error
0+0 records in
0+0 records out
```

If the optical catridge did not load or if the device returned messages like those in Figure 124., the drives might not be listed in the correct order in the mcf file. Make sure the order is correct in the mcf file, repeat this test.

5. Repeat this procedure for each drive in the library.

   If your automated library contains more than one drive, list the drives in the mcf file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the /var/adm/messages file.

   Make sure you check *each* drive in a library.

   If you change any information in the mcf file, you must propagate the changes to the rest of the system. For information on propagating mcf file changes, see the *StorageTek ASM and QFS File System Administration Guide*.

(Optional) Creating the archiver.cmd File

The archiver copies files from a StorageTek ASM file system to volumes on removable media cartridges or to disk partitions in another file system. You can tune the archiver operations to suit the types of files at your site and your site's data protection needs by creating an archiver command file to reside in /etc/opt/SUNWsamfs/archiver.cmd. This installation task guides you through the process of configuring an archiver.cmd file.

By default, the archiver automatically archives all files under all StorageTek ASM mount points. You are not required to create an archiver.cmd file, but archiver efficiency and performance increases if you tune the archiver to your site. The default settings for the archiver are as follows:

- The archiver archives all files to all available volumes in all configured libraries.
- The archiver makes one copy of each file.
- The archive age for all files is four minutes.

- The archive interval is 10 minutes.

To Create an `archiver.cmd` File

1. Use `vi`(1) or another editor to create file `/etc/opt/SUNWsamfs/archiver.cmd`.
2. Add directives to satisfy the archiving needs at your site.

   You can divide your `archiver.cmd` file into two main areas, as follows:

- The first part of this file is for *global directives* that apply to all file systems defined in your `mcf` file. You specify these directives at the top of the file.
- The second part of this file is for *file-system specific directives* that apply to only one file system. These directives must come after the global directives. For an individual file system, these directives override the global directives. The file-system specific directives are specified toward the bottom and are headed by an `fs=`*name* directive for each file system mentioned.
- Certain directives are typically specified globally and others are typically specified only for individual file systems.
- Figure 125. shows a simple `archiver.cmd` file.

Figure 125. 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
```

Figure 125. Simple archiver.cmd File (Continued)

```
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
```

Figure 125. shows a simple archiver.cmd file that you can add to or change as needed. A site should need to add directives only to accommodate more archive sets, copies, and VSN usage. Figure 128. shows a more complex archiver.cmd file.

For information on some directives that are commonly found in archiver.cmd files, see "Archiver Command File Directives" on page 203. For comprehensive information on the archiver.cmd directives, see the archiver.cmd(4) man page and see the information on the archiver in the *StorageTek ASM Storage and Archive Manager Guide*.

3. Close the archiver.cmd file.
4. Verify the archiver.cmd file for correctness.

   Enter the following command:

```
# archiver -lv
```

5. Correct any errors in the archiver.cmd file before proceeding to the next task in this installation and configuration procedure.

Archiver Command File Directives

This section shows some of the recommended archiver.cmd file directives.

Specifying a Log File: logfile=*pathname* Directive

This directive specifies the file to which the archiver writes log messages. This log file contains information about each file that is archived, rearchived, or automatically unarchived. The log consists of a list of all archived files and their location on archive media. Specify this directive as a global directive so it affects all file systems configured in your mcf file. This archiver log information

is important in disaster recovery situations if recent metadata is not available or not trustworthy.

Determining the Number of Archive Copies: *copy_number* [`-norelease`] [*archive_age*] Directive

By default, the archiver creates one archive copy of each file. For better data protection, however, you should define two archive copies for each file and write the copies to physically different pieces of media.

The *copy_number* portion of this directive can be `1`, `2`, `3`, or `4`, which specifies that the archiver write from one to four archive copies. If you create more than one archive copy on more than one type of media, your data is better protected in the event that a piece of media is found to be faulty.

This directive also allows you to specify a `-norelease` option. The `-norelease` option prevents a file from being released from disk cache until *all* archive copies are made. By default, the releaser begins freeing up online disk cache when *one* archive copy is made. By specifying `-norelease`, you can avoid disk cache thrashing.

The *archive_age* specification for this directive allows you to specify the interval between the last time the file is written and when the file is archived. The interval is specified with an integer number and one of `s`, `m`, `h`, `d`, `w`, `y` to signify seconds, minutes, hours, days, weeks, or years.

Reserving Volumes: `vsns` and `endvsns` Directives

A set of reserved VSNs specifies individual VSN identifiers. These are the VSNs to be used as archive media for an archive set. As Figure 126. shows, the `vsns` and `endvsns` directives surround the VSN identifiers.

Figure 126. Fragment of an `archiver.cmd` File Showing Reserved VSNs

```
vsns
builds.2   sg   .*
builds.3   li   .*
support.2   sg   .*
support.3   li   .*
archive.2   sg   .*
archive.3   li   .*
samdev.1   sg   .*
samdev.2   li   .*
endvsns
```

You can accomplish the goal of creating archive copies on two different types of media by using reserved VSNs.

Determining Whether Metadata Is Archived: archivemeta=on|off Directives

Depending on your file system characteristics, you might want to archive file system metadata frequently and to multiple volumes, or you might not want to archive it at all. By default, archivemeta=on is enabled.

File system metadata changes when files are moved to different directories or when files are renamed. If this directory information changes rapidly and is important to your site, you might want to archive it frequently and to different media types.

Depending on how frequently you want the metadata archived, the result can be excessive drive activity as archive media is loaded and unloaded. If frequent loading and unloading is not desirable, you can go to the other extreme and specify that metadata not be archived by using the archivemeta=off directive.

Defining Archive Sets: the Archive Set Naming Directive

By default, files are archived as part of an archive set that has the same name as the file system. You can associate files into more meaningful groups by defining archive sets. This directive has the following format:

```
archive_set_name  path
```

Figure 127. shows archive set assignment directives that assign files to archive sets audiofiles and xrayfiles.

Figure 127. Archive Set Assignment Directives

```
xrayfiles medical/radiology/rochester/xrays
audiofiles net/home/cleveland/audio
```

Setting the Maximum Archive File Size: archmax=*media size* Directive

The archmax= directive specifies the maximum size of an archive file. The archiver groups user files to form this archive file. The maximum possible size of this archive file depends on your archive media's capacity, as follows:

- For tapes, the default is archmax=512M, which is 512 megabytes.
- For magneto-optical disks, the default is archmax=5M, which is 5 megabytes.

Depending on your archive media, you might want to specify that a larger or smaller archive file be written. Using the archmax directive can improve archiver performance by reducing the number of starts and stops to write tape marks.

Setting Miscellaneous Directives

The `archiver.cmd` file supports several other miscellaneous directives for tuning your site's archive policies. Directives are available for specifying an archive interval, the number of drives to use when archiving, and many other activities.

In addition, other directives in the `archiver.cmd` file control staging, releasing, and recycling behavior in conjunction with the `stager.cmd`, `recycler.cmd`, and `releaser.cmd` files.

For more information on all the directives that can appear in the `archiver.cmd` file, see the *StorageTek ASM Storage and Archive Manager Guide*.

Advanced Archiver Command File Example

Figure 125. shows a simple `archiver.cmd` file. Figure 128. shows a more advanced `archiver.cmd` file.

Figure 128. An Advanced `archiver.cmd` File

```
### Fri Jun  8 14:44:30 CDT 2001     ####
### Implemented ReservedVSNs feature ####
### using VSNs CFX.*                 ####

interval = 1h
logfile = /opt/logs/archive.log
archmax = li 5G
archmax = sg 2G
archmax = lt 3500M
archmax = at 1G
#
#  mounted on /support
#
fs = samfs2
        1 7y
no_archive tmp
support .
        2 -norelease 4h
        3 -norelease 4h

# mounted on /builds
#
fs = samfs3
        1 10y
interval = 2h
no_archive daily
builds  .
        2 8h
        3 8h
#
```

Figure 128. An Advanced archiver.cmd File (Continued)

```
# mounted on /archive
#
fs = samfs4
        1 7y
archive .
        2 1h
        3 1h
#
# mounted on /samdev
#
fs = samfs6
        1 7y
samdev  .
        1 -norelease 1h
        2 -norelease 1h

# We're not doing .inode copies.  File system data is
archived
# yearly.  Plan to use samfsdumps for restores when needed.
params
#allsets -offline_copy stageahead
allsets -offline_copy direct
builds.2 -drives 2
builds.2 -reserve set
support.2 -reserve set
samdev.1 -reserve set
samdev.1 -offline_copy none
samdev.2 -offline_copy none
endparams

vsns
builds.2        sg      .*
builds.3        li      .*
#builds.4       at     -pool rmt_pool
#
support.2       sg      .*
support.3       li      .*
#support.4      at     -pool rmt_pool
#
archive.2       sg      .*
archive.3       li      .*
#archive.4      at      -pool rmt_pool
#
samdev.1        sg      .*
samdev.2        li      .*
#
samfs2.1        i7      TAPE19
samfs3.1        i7      TAPE19
samfs4.1        i7      TAPE19
samfs6.1        i7      TAPE19
endvsns
```

(Optional) Enabling Disk Archiving

Disk archiving is the process of writing archive copies of file data to online disk in another file system. The file system to which the archive copies are written can be any UNIX file system. The destination file system does not have to be a StorageTek ASM file system, but the host system to which archive files are written must have at least one StorageTek ASM 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 *StorageTek ASM Storage and Archive Manager 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 208. Perform this procedure on the host system that contains the files to be archived.
- "(Optional) To Enable Disk Archiving on the Host to Which the Archive Copies Will Be Written" on page 211. Perform this procedure on the host system to which the archive copies will be written. There must be at least one StorageTek ASM file system created on this host. If you want to create your source files and write your archive copies to the same host system, you do not need to perform this procedure.

To Enable Disk Archiving on the Host That Contains the Files to Be Archived

1. Become superuser on the host system that contains the files you want to archive.
2. Use `vi`(1) or another editor to create (or to open) file `/etc/opt/SUNWsamfs/archiver.cmd`.

   If you are archiving to disk only, or if you have not yet created an `archiver.cmd` file, you create the `archiver.cmd` file in this step.

   If you created an `archiver.cmd` file in "(Optional) Creating the `archiver.cmd` File" on page 201, you reopen the file in this step.
3. Edit the `archiver.cmd` file to add disk archive set directives.

Figure 129. shows a fragment from an `archiver.cmd` file that defines disk archive sets.

Figure 129. `/etc/opt/SUNWsamfs/archiver.cmd` **on the Client**

```
# This is the part of the archiver.cmd file that defines
# disk archive sets.
#
params
archset1.1 -disk_archive disk01
archset2.1 -disk_archive disk02
archset3.1 -disk_archive disk03
endparams
```

For more information on specifying archive sets, see the `archiver.cmd`(4) man page or see the *StorageTek ASM Storage and Archive Manager Guide*.

4. Save and close the `archiver.cmd` file.
5. Use `vi`(1) or another editor to create a file named `diskvols.conf`.

   The `diskvols.conf` file specifies the online disk directories to which the archive copies will be written.

Note: If you are configuring a StorageTek ASM file system for the first time at your site, write the archive copies to disk in a file system that is on the same host that the source files reside on. This is because you have not yet installed the StorageTek ASM software on another host. If you configure a StorageTek ASM file system on another host at a later time, you can modify your configuration files.

Figure 130. shows an example `diskvols.conf` file:

Figure 130. 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
```

Figure 130. shows a `diskvols.conf` file that archives files from three archive sets. The disk volumes named `disk01` and `disk02` reside in a file system on the server system named `otherserver`. Disk volume `disk03` resides on the same host as the files to be archived.

As Figure 130. shows, the `diskvols.conf` file can contain comment lines that begin with a pound character (#), and it must contain data in two

fields: the VSN name field and the path field. You can leave the host name field blank if you are archiving to a file system that resides on the same host system as the source files, but if specified, it must be followed by a colon character (:). Table 33. shows the information that must appear in this file.

Table 33. Format of the `diskvols.conf` File

Field Name	Content
VSN Name	A unique alphanumeric name for the disk VSN to receive the archive copies. Can be up to 31 characters long.
Host Name	The name of the host to which archive copies will be written. This is an optional field. If you are archiving to disk on another host, you must use this field to specify the name of the destination server to receive the archive copies. If a host name is specified, it must be followed by a colon (`:`). If you are archiving to a file system that resides on the same server as the source file system, you do not need to specify the host name.
Path	The full path, relative to the mount point, to the directory to receive the archive files. This directory must be in place before archiving can commence, and the destination file system must be mounted. The Path should be specified relative to the mount point. For example, if archive copies are to be written to the `vsns` directory in the `archivefs1` file system, you would specify `/archivefs1/vsns` in the Path field. StorageTek recommends that the destination directory be created with write permission granted only to `root`.

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

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

- You can include comments in the `diskvols.conf` file. A pound character (#) indicates a comment, and all text to the right of the # is ignored.
- You can continue lines. To continue a line, put an apostrophe character (’) at the end.

6. Save and close the `diskvols.conf` file.

7. Create directories in the file system to which the archive copies will be written.

   Figure 131. shows the commands to create the directories to which archive copies will be written.

Figure 131. Creating Archive Copy Directories

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

8. Use the `archiver`(1M) command with its `-lv` options to verify the correctness of the `archiver.cmd`(4) file.

   Enter the following command:

```
# archiver -lv
```

   The preceding command verifies the `archiver.cmd` file syntax for errors. If any are found, correct them before proceeding.

(Optional) To Enable Disk Archiving on the Host to Which the Archive Copies Will Be Written

Perform this procedure only if you are writing your archive copies to a host system that is different from the host system upon which the source files reside. In this situation, you are creating a client/server environment:

- The client is the host that contains the source files.
- The server is the host to which the archive copies are written. There must be at least one StorageTek ASM file system created on the server host.

Note: If you are installing a StorageTek ASM file system for the first time at your site, you cannot use this procedure because you cannot enable the writing of archive copies to a different host. If you configure a StorageTek ASM file system on another host at a later time, you can modify your configuration files.

1. Become superuser on the server system.

   This is the system to which the archive copies will be written.

2. Use the `cd`(1) command to change to the file system to which you want to write the archive copies.

For example:

```
# cd /ufs1
```

3. Create directories in the file system to which the archive copies will be written.

   Figure 132. shows the commands to create the directories to which archive copies will be written.

Figure 132. Creating Archive Copy Directories

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

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

   This file contains the `clients` and `endclients` directives and names the client system upon which the the files to be archived reside.

   For more information on disk archiving, see the *StorageTek ASM Storage and Archive Manager Guide*.

Figure 133. Example `diskvols.conf` File on the Server

```
# This is
# file destination_server:/etc/opt/SUNWsamfs/
diskvols.conf
# on the server
#
clients
sourceserver
endclients
```

5. Save and close the `diskvols.conf` file.

(Optional) Editing the `defaults.conf` File

The `/opt/SUNWsamfs/examples/defaults.conf` file contains directives that control automated library actions in a StorageTek ASM environment. You can change these settings at any time after the initial installation. If you change the information in the `defaults.conf` file after the system is up and running, for example, to accommodate changes in your site's library information, you must issue commands to propagate the `defaults.conf` file changes to the file system. The procedures for propagating the `defaults.conf` file changes are described in the *StorageTek ASM and QFS File System Administration Guide*.

Figure 134. shows lines from an example defaults.conf file. This file shows several parameters that can affect the configuration of an automated library.

Figure 134. Example defaults.conf File

```
exported_media = unavailable
attended = yes
tape = lt
log = LOG_LOCAL7
timeout = 300
# trace
# all on
# endtrace
labels = barcodes_low
lt_delay = 10
lt_unload = 7
lt_blksize = 256
```

Another sample file is located in /opt/SUNWsamfs/examples/defaults.conf.

To Customize Default Values for Your Site

1. Read the defaults.conf(4) man page to determine the defaults you want to change.
2. Use the cp(1) command to copy /opt/SUNWsamfs/examples/defaults.conf to its functional location.

   For example:

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

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

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

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

   For example:

```
# pkill -HUP sam-fsd
```

   This command restarts the sam-fsd(1M) daemon and enables the daemon to recognize the changes in the defaults.conf(4) file.

Features You Can Control From `defaults.conf`

The following sections describe two of the more common features you can control from this file. For more information on the `defaults.conf`(4) file, see the `defaults.conf`(4) man page.

Barcodes

If you have a tape library that uses a barcode reader, you can configure the system to set the tape label equal to the first or last characters of the barcode label. You can accomplish this by setting the `labels` directive in the `defaults.conf` file, as shown in Table 34..

Table 34. The `labels` Directive in the `defaults.conf` File

Directive	Action
`labels = barcodes`	Uses the first six characters of the barcode as the label. This setting enables the archiver to label new media on blank media automatically if the tape is chosen. Default.
`labels = barcodes_low`	Uses the last six characters of the barcode as the label.
`labels = read`	Reads the label from the tape. This setting prevents the archiver from labeling new media automatically.

If `labels = barcodes` or `labels = barcodes_low` is in effect, the StorageTek ASM system writes a label before the write is started for any tape that is mounted for a write operation that is write enabled, unlabeled, and has a readable barcode.

Drive Timing Values

You can set the load, unload, and unload wait time for devices using the *dev*`_delay` and *dev*`_unload` directives, respectively. These directives allow you to set these times to an interval that meets your site's requirements.

The format of the *dev*`_delay` directive is as follows:

```
dev_delay = seconds
```

For *dev*, specify the device type as specified in the `mcf`(4) man page.

For *seconds*, specify an integer number specifying the minimum elapsed time between a cartridge being loaded and the same cartridge's ability to be unloaded. The default is `30`.

The format of the *dev*_unload parameter is as follows:

```
dev_unload = seconds
```

For *dev*, specify the device type as specified in the mcf(4) man page.

For *seconds*, specify an integer number for the amount of time to wait after an unload command is issued. This gives the automated library time to eject the cartridge, open the door, and perform other operations before the cartridge is removed. The default is 0.

For example:

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

Verifying the License and mcf Files

At this point in the installation and configuration process, the following files exist on your StorageTek ASM server:

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

The procedures in this task show you how to verify the correctness of these configuration files.

To Verify the License File

1. Enter the samcmd(1M) l (lowercase L) command to verify the license file.

   The samcmd(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in Figure 135., return to "Enabling the StorageTek ASM Software License" on page 148.

Figure 135. Using samcmd(1M)

```
# samcmd l

License information samcmd     4.1.71 Fri Aug 27 16:24:12
2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled
```

Figure 135. Using `samcmd`(1M) (Continued)

```
Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled

Shared filesystem support enabled

SAN API support enabled

Robot type ATL 2640, P1000, or Sun L1000 Library is present
and licensed

    0 tp slots not licensed

    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

To Verify the `mcf` File

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

   If your `mcf` file is free from syntax errors, the `sam-fsd`(1M) output includes information about the file systems, archiving, and other system information. If your `mcf` file contains syntax or other errors, however, the output is similar to that shown in Figure 136..

Figure 136. 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
```

Figure 136. Example `sam-fsd`(1M) Output (Continued)

```
72: /dev/rmt/3cbn       45      ug      11000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn'
already in use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your `mcf` file has errors, refer to "Defining the StorageTek ASM Configuration By Creating the `mcf` File" on page 157 and to the `mcf`(4) man page for information on how to create this file correctly.

(Optional) Labeling Removable Media Cartridges

If you have standalone tape or optical devices, or if your automated library has no barcode reader, you must perform this task.

To prepare cartridges, use the `tplabel`(1M) command for tapes or use the `odlabel`(1M) command for optical disks. These commands create a cartridge label that the StorageTek ASM software can read.

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

```
tplabel -new -vsn new_vsn eq:slot
```

Table 35. Arguments for the `tplabel`(1M) Command

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

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

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

Table 36. Arguments for the `odlabel`(1M) Command

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

You can use the cartridges after you issue these commands. Both the `tplabel`(1M) and the `odlabel`(1M) commands accept a `-old` option that you can use to relabel previously labeled cartridges. For more information about these commands, see the `tplabel`(1M) and `odlabel`(1M) man pages.

Example 1. The following command labels a tape:

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

Example 2. The following command labels one side of an optical disk:

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

If you are not using an automated library with a barcode reader, label all cartridges manually before using the StorageTek ASM system.

If your library uses barcodes, `labels = barcodes` is set by default, and the result is that the first six characters are used for the VSN.

If your library uses barcodes, and you want the last six characters to become the VSN for the cartridge, edit the `/etc/opt/SUNWsamfs/defaults.conf` file and include the following line:

```
labels = barcodes_low
```

When the software loads a barcoded cartridge for a write operation, it writes a label on the cartridge before the write begins. The cartridge must be write enabled, unlabeled, and have a readable barcode.

■ (Optional) Populating the Catalog

Perform this task if you have a network-attached automated library configured in your StorageTek ASM environment.

After you mount the StorageTek ASM file systems, the software creates catalogs for each automated library configured in the `mcf` file. If you have a network-attached automated library, however, you need to populate the library's catalog. There are several ways to populate an automated library. The appropriate method depends on the number of volumes you want to include in the catalog.

The following sections describe various methods for populating an automated library's catalog:

- "To Populate an Automated Library With Many Volumes" on page 219. 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 220. 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 221. This is an additional procedure for populating an IBM 3494 library. You can use this procedure only if you are using the library as one physical library (`access=private` in the `mcf` file). Do not use this procedure if you divided the library into multiple logical libraries.
- "To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)" on page 222. 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 StorageTek ASM 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 (" ").

Figure 137. shows example file `input_vsns`.

Figure 137. Example File `input_vsns`

```
0 TAPE01  "TAPE 01" lt
1 TAPE02  TAPE02  lt
2 TAPE03  TAPE03  lt
```

2. Use the `build_cat`(1M) command to create the catalog.

   The syntax for the `build_cat`(1M) command is as follows:

```
build_cat input-file catalog-file
```

Argument	Content
input-file	Specify the name of an input file. Typically, this is a file containing a list of VSNs.
catalog-file	Specify the full path to the library catalog. By default, the StorageTek ASM software creates a catalog and writes it to `/var/opt/SUNWsamfs/catalog/`*family-set-name*, where *family-set-name* is derived from the `mcf` file entry for this automated library. Alternatively, if you have specified a catalog name in the Additional Parameters field of the `mcf` file, use that catalog file name for *catalog-file*.

   For example, you can specify the following `build_cat`(1M) command:

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

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

To Populate an Automated Library With a Small Number of Volumes

1. Use the `import`(1M) command to import catalog entries into the default catalog.

   The syntax for the `import`(1M) command is as follows:

```
import -v VSN eq
```

Argument	Content
VSN	Specify the VSN identifier for a volume. If a VSN name contains one or more space characters, enclose the VSN name in quotation marks (“ “).
eq	Specify the Equipment Ordinal as specified for the device in the `mcf` file.

For example:

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

In the preceding `import`(1M) command, note the following:

- `TAPE01` is the VSN.
- `50` is the Equipment Ordinal of the automated library as specified in the `mcf` file.

The cartridges must be physically present in the automated library for the `import`(1M) commands to be successful. If a cartridge is not present, the entry goes into the historian.

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

2. **Repeat Step 1 for each cartridge you want to include in the catalog.**

To Populate an IBM 3494 Automated Library

1. Insert the media cartridges you want to include in this library’s catalog through the mail slot.

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

Note: Do not use this method to populate an IBM 3494 automated library that has been divided into multiple logical libraries. Use this method only if `access=private` in the IBM 3494 parameters file. If you have an IBM 3494 library that is divided into multiple logical libraries (`access=shared` in the IBM 3494 parameters file), use one of the following methods to populate the catalog: “To Populate an Automated Library With Many Volumes” on page 219 or “To Populate an Automated Library With a Small Number of Volumes” on page 220.

To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)

If you have an ACSLS-Attached library, you can use the `import`(1M) command with its `-c` and `-s` options to import from a pool of VSNs. This procedure is a faster method for populating a library catalog than the methods described in "To Populate an Automated Library With Many Volumes" on page 219 and "To Populate an Automated Library With a Small Number of Volumes" on page 220.

For more information on this, see the `import`(1M) man page. You can use this method only if you have a StorageTek ACSLS-attached automated library.

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

If errors exist in the configuration files for StorageTek ACSLS-attached automated library, the system generates several error messages. The following examples show common problems and the messages that the system generates.

Example 1. Figure 138. 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.

Figure 138. 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. Figure 139. shows the first set.

Figure 139. Error Messages from a Misconfigured StorageTek Library

```
May 23 09:29:48 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
May 23 09:29:59 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
May 23 09:30:39 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
```

The following is the second set:

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

Figure 140. shows the samu(1M) utility's :r display.

Figure 140. 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. Figure 141 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.

Figure 141. Message Generated After an Attempted import(1M)

```
May 20 15:09:33 baggins stk-50[6117]: view_media
returned:STATUS_VOLUME_NOT_IN_LIBRARY
May 20 15:09:33 baggins stk-50[6117]: add_to_cat_req:
view_media: failed:STATUS_VOLUME_NOT_IN_LIBRARY. A
```

The sam-stkd daemon uses the ssi.sh script to ensure that a copy of the SSI daemon, ssi_so, is running. If ssi_so exits, the daemon starts another. If your site has its own version of ssi.sh, you should modify it to wait for a SIGTERM signal and then exit. The daemon sends a SIGTERM signal to stop the process. File /opt/SUNWsamfs/examples/ssi.sh contains an example ssi.sh script. The system copies the ssi.sh script to /etc/opt/SUNWsamfs/scripts/ssi.sh during installation if one does not already exist.

(Optional) Creating the samfs.cmd File

You can create the /etc/opt/SUNWsamfs/samfs.cmd file as the place from which the system reads mount parameters. If you are configuring multiple StorageTek ASM systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the mount(1M) command. Mount options specified here override those specified in the /etc/vfstab file and in the samfs.cmd file.
- In the /etc/vfstab file. Mount options specified here override those specified in the samfs.cmd file.
- In the samfs.cmd file.

For more information about the /etc/vfstab file, see "Updating the /etc/vfstab File and Creating the Mount Point" on page 224. For more information on the mount(1M) command, see the mount_samfs(1M) man page.

To Create the samfs.cmd File

1. Use vi(1) or another editor to create the samfs.cmd file.

   Create lines in the samfs.cmd file to control mounting, performance features, or other aspects of file system management. For more information on the samfs.cmd file, see the *StorageTek ASM and QFS File System Administration Guide*, or see the samfs.cmd(4) man page.

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

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

To Update the /etc/vfstab File and Create the Mount Point

1. Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each StorageTek ASM file system.

   Figure 142. shows header fields and entries for a StorageTek ASM file system.

Figure 142. Example /etc/vfstab File Entries for a StorageTek ASM File System

```
#DEVICE    DEVICE   MOUNT   FS    FSCK  MOUNT    MOUNT
#TO MOUNT  TO FSCK  POINT   TYPE  PASS  AT BOOT  PARAMETERS
#
samfs1     -        /samfs1 samfs  -    yes
high=80,low=60
```

   Table 37. shows the various fields in the /etc/vfstab file and their content.

Table 37. /etc/vfstab File Fields

Field	Field Title and Content
1	Device to mount. The name of the StorageTek ASM file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the StorageTek ASM file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount point. For example, /samfs1.
4	File system type. Must be samfs.

Table 37. `/etc/vfstab` **File Fields (Continued)**

Field	Field Title and Content
5	`fsck`(1M) pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at boot. Specifying `yes` in this field requests that the StorageTek ASM file system be mounted automatically at boot time. Specifying `no` in this field indicates that you do not want to mount the file system automatically. For information about the format of these entries, see the `mount_samfs`(1M) man page.
7	Mount parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the `mount`(1M) command, in the `/etc/vfstab` file, or in a `samfs.cmd` file. Mount options specified on the `mount`(1M) command override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file. Mount options specified in the `/etc/vfstab` file override those in the `samfs.cmd` file. For a list of available mount options, see the `mount_samfs`(1M) man page.

2. Use the `mkdir`(1M) command to create the mount point.

   For example:

```
# mkdir /samfs1
```

Initializing the File System

This task shows how to use the `sammkfs`(1M) command and the Family Set names that you have defined to initialize a file system.

Note: The `sammkfs`(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *StorageTek ASM and QFS File System Administration Guide* or see the `sammkfs`(1M) man page.

To Initialize the File System

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

   Figure 143. shows the command to initialize a file system with the Family Set name of `samfs1`.

Figure 143. Initializing Example File System `samfs1`

```
# sammkfs samfs1
sammkfs: Configuring file system
Building 'samfs1' will destroy the contents of devices:
                /dev/dsk/c2t0d0s3
                /dev/dsk/c2t0d0s7
Do you wish to continue? [y/N] y
total data kilobytes       = 16777728
total data kilobytes free  = 16777152
#
```

The actual numbers returned vary from file system to file system.

CAUTION: Running the `sammkfs`(1M) command creates a new file system. It removes all data currently contained in the partitions associated with the file system in the `/etc/opt/SUNWsamfs/mcf` file.

Mounting the File System

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

To Mount the File System

1. Use the `mount`(1M) command to mount the file system.

   Specify the file system mount point as the argument. For example:

```
# mount samfs1
```

2. Use the `mount`(1M) command with no arguments to verify the mount.

This step confirms whether the file system is mounted and shows how to set permissions. Figure 144 shows the output from a `mount`(1M) command issued to verify whether example file system `samfs1` is mounted.

Figure 144. 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. Figure 145. shows the commands to use to change file system permissions and ownership.

Figure 145. Using `chmod`(1M) and `chown`(1M) to Change File System Permissions and Ownership

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

(Optional) Sharing the File System With NFS Client Systems

Perform this task if you want the StorageTek ASM file system to be NFS shared.

Run the Sun Solaris `share`(1M) command to make the file system available for mounting by remote systems. The `share`(1M) commands are typically placed in the `/etc/dfs/dfstab` file and are executed automatically by the Sun Solaris OS when you enter `init`(1M) state 3.

To NFS Share the File System

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

   For example, add a line like the following to direct the Solaris OS to NFS share the new StorageTek ASM file system:

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

2. Use the `ps`(1) command to determine whether or not `nfs.server` is running.

Figure 146. shows these commands and their output.

Figure 146. Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root   694     1  0   Apr 29 ?        0:36 /usr/lib/nfs/nfsd -a 16
en17     29996 29940  0 08:27:09 pts/5    0:00 grep nfsd
# ps -ef | grep mountd
    root   406     1  0   Apr 29 ?       95:48 /usr/lib/autofs/automountd
    root   691     1  0   Apr 29 ?        2:00 /usr/lib/nfs/mountd
en17     29998 29940  0 08:27:28 pts/5    0:00 grep mountd
```

In Figure 146., the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. (Optional) Start the NFS server.

   Perform this step if `nfs.server` is not running.

   Use the following command:

```
# /etc/init.d/nfs.server start
```

4. (Optional) Type the `share`(1M) command at a `root` shell prompt.

   Perform this step if you want to NFS share the file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. Figure 147 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.

Figure 147. 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 StorageTek ASM 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, StorageTek 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 StorageTek ASM file system at a convenient mount point.

1. On the client systems, use `vi`(1) or another editor to edit the `/etc/vfstab` file and add a line to mount the server's StorageTek ASM file system at a convenient mount point.

   The following example line mounts `server:/samfs1` on the `/samfs1` mount point:

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

   In this example, `server:/sam`fs1 is mounted on `/samfs1`, and information is entered into the `/etc/vfstab` file.

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

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

   For example:

```
client# mount /samfs1
```

   The automounter can also do this, if you prefer. Follow your site procedures for adding `server :/samfs1` to your automounter maps. For more information on automounting, see the `automountd`(1M) man page.

Note: At times, there might be a significant delay in the StorageTek ASM file system's response to NFS client requests. This can occur if a requested file resides on a cartridge that must be loaded into a DLT tape drive, if all tape drives are full, or if drives are slow. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, StorageTek recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000`.

Writing Periodic Dump Files By Using samfsdump(1M)

It is important to use the samfsdump(1M) command periodically to create a metadata dump file.

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

- The samfsdump(1M) command dumps file names and inode information, not data. That is, the dump file does not include the archive data stored in your file system. The dump file does include the inode and directory structure information necessary to quickly locate the data on your archive media. This information is necessary for recovering from a file system failure. For more information on this, see the samfsdump(1M) man page.
- You can use the -u option to the samfsdump(1M) command to dump metadata and file data for files that have not yet been archived. A samfsdump(1M) dump taken using the -u option can be very large. The samfsdump(1M) command does not have any tape management or estimations as does ufsdump(1M). You need to weigh the tradeoffs of space and unarchived data when using the -u option. For more information about these commands, see the samfsdump(1M) and ufsdump(1M) man pages.
- You can use the samfsrestore(1M) command to restore the metadata dump file after initializing the file system if a failure occurs.

  For more information about using the samfsdump(1M) command, see the samfsdump(1M) man page. Also see the information on metadata, disaster preparation, and recovery in the *ASM, ASM-QFS and ASM/QFS-Standalone Disaster Recovery Guide*.

The following sections describe procedures for issuing this command both automatically and manually.

To Run the samfsdump(1M) Command Automatically

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

   Figure 148 shows a cron(1) entry.

Figure 148. cron(1) Entry to Run samfsdump(1M) Automatically

```
0 0 * * * find /csd.directory/sam -type f -mtime +7 \
-print| xargs -l1 rm -f; cd /sam; \
/opt/SUNWsamfs/sbin/samfsdump -f \
/csd.directory/sam/‘date +\%y\%m\%d‘
```

This example `crontab` entry uses a StorageTek ASM file system mounted on `/sam`. Replace `/csd.directory` with an existing directory of your choice. This entry causes the commands to execute each day at midnight. First, the old dumps are renamed and a new dump is created in `/csd.directory/sam/`*yymmdd*. After that, `cron`(1M) emails the `samfsdump`(1M) output to `root`.

2. (Optional) Using the previous step as a guide, make similar `crontab` entries for each file system.

   If you have multiple StorageTek ASM file systems, make similar entries for each. Make sure you save each dump in a separate file.

To Run the `samfsdump`(1M) Command Manually

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

   For example:

```
# cd /samfs1
```

   In this example, `samfs1` is a StorageTek ASM mount point.

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

   For example:

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

   In this example, `dump.file` is the newly created dump structure.

■ (Optional) Backing Up Configuration Files

StorageTek ASM regularly accesses several files that have been created as part of this installation and configuration procedure. Back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note: StorageTek strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

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

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

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

For more information on the files you should protect, see the *ASM, ASM-QFS and ASM/ QFS-Standalone Disaster Recovery Guide*.

(Optional) Configuring the Remote Notification Facility

The StorageTek ASM software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software within the software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The StorageTek QFS and StorageTek ASM Management Information Base (MIB) defines the types of problems, or events, that the StorageTek QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information on the MIB, see `/opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib`.

The following sections describe how to enable and how to disable remote notification.

To Enable Remote Notification

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

   "(Optional) Verifying the Network Management Station" on page 45 describes this prerequisite.

2. Use `vi`(1) or another editor to open file `/etc/hosts`.

   Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined.

   For example, Figure 149. shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

Figure 149. Example `/etc/hosts` File

```
999.9.9.9       localhost
999.999.9.999   loggerhost      loghost
999.999.9.998   mgmtconsole
999.999.9.9     samserver
```

3. Save your changes to `/etc/hosts` and exit the file.
4. Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/scripts/sendtrap`.
5. Locate the `TRAP_DESTINATION=‘hostname‘` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.

   This line specifies that the remote notification messages be sent to port 161 of the server upon which the StorageTek ASM software is installed. Note the following:

- If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`*management-console-name*`:`*port*`"`. Note the use of quotation marks (" ") rather than apostrophes (‘ ‘) in the new directive.
- If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [
mgmt_console_name:port]"
```

For example:

```
TRAP_DESTINATION="localhost:161 doodle:163
mgmt_station:1162"
```

6. Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/scripts/sendtrap`.

   This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

- If your management station’s community string is also set to `public`, you do not have to edit this value.
- If your management station’s community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. Save your changes to `/etc/opt/SUNWsamfs/scripts/sendtrap` and exit the file.

To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. (Optional) Use the cp(1) command to copy file /opt/SUNWsamfs/examples/defaults.conf to /etc/opt/SUNWsamfs/defaults.conf.

   Perform this step if file /etc/opt/SUNWsamfs/defaults.conf does not exist.

2. Use vi(1) or another editor to open file /etc/opt/SUNWsamfs/defaults.conf.

   Find the line in defaults.conf that specifies SNMP alerts. The line is as follows:

```
#alerts=on
```

3. Edit the line to disable SNMP alerts.

   Remove the # symbol and change on to off. After editing, the line is as follows:

```
alerts=off
```

4. Save your changes to /etc/opt/SUNWsamfs/defaults.conf and exit the file.

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

   The format for this command is as follows:

```
# pkill -HUP sam-fsd
```

   This command restarts the sam-fsd(1M) daemon and enables the daemon to recognize the changes in the defaults.conf file.

(Optional) Adding the Administrator Group

By default, only the superuser can execute the StorageTek ASM administrator commands. However, during installation you can supply an administrator group name. The pkgadd(1M) process prompts you for this group name during StorageTek ASM installation.

Members of the administrator group can execute all administrator commands except for star(1M), samfsck(1M), samgrowfs(1M), sammkfs(1M), and samd(1M). The administrator commands are located in /opt/SUNWsamfs/sbin.

You can use the set_admin(1M) command to add or remove the administrator group after installing the package. This action performs the same function that occurs when you select an administrator group during the package install. You

must be logged in as superuser to use the `set_admin`(1M) command. You can also undo the effect of this selection and make the programs in `/opt/SUNWsamfs/sbin` executable only by the superuser. For more information on this command, see the `set_admin`(1M) man page.

To Add the Administrator Group

1. Choose a group name or select a group that already exists within your environment.
2. Use the `groupadd`(1M) command, or edit the `/etc/group` file.

   The following is an entry from the group file designating an administrator group for the StorageTek ASM software. In this example, the `samadm` group consists of both the `adm` and `operator` users.

```
samadm::1999:adm,operator
```

Configuring System Logging

The StorageTek ASM systems log errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the StorageTek ASM facility is `local7`.

To Enable Logging

1. Use vi(1) or another editor to open the `/etc/syslog.conf` file.

   Read in the line from the following file:

   `/opt/SUNWsamfs/examples/syslog.conf_changes`

   The line is similar, if not identical, to the following line:

```
local7.debug  /var/adm/sam-log
```

Note: The preceding entry is all one line and has a TAB character (not a space) between the fields.

   This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.

Figure 150. shows the commands to use to append the logging lines.

Figure 150. Using `cp`(1) and `cat`(1) to Append Logging Lines to `/etc/syslog.conf`

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

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

   Figure 151. shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to `syslogd`.

   Figure 151. Creating an Empty Log File and Sending a HUP Signal to `syslogd`

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

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

4. (Optional) Use the `log_rotate.sh`(1M) command to enable log file rotation.

   Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

(Optional) Configuring Other StorageTek Products

The StorageTek ASM installation and configuration process is complete. You can configure other StorageTek ASM products at this time. For example, if you want to configure StorageTek ASM-Remote, see the *StorageTek ASM-Remote Administration Guide*.

StorageTek ASM Upgrade Procedure

5

This chapter explains how to upgrade a server to a new release of the StorageTek ASM software. Use this procedure if you are upgrading your StorageTek ASM environment. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

Ensuring That the Installation Prerequisites Are Met

The chapter called “System Requirements and Preinstallation Tasks” on page 1 describes the items you need to verify before you upgrade to the StorageTek ASM 4.2 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements for your upgrade to 4.2 are as follows:

- “Server Requirements” on page 14
- “Solaris Operating System Requirements” on page 15
- “Verifying Disk Space” on page 21
- “(Optional) Verifying Archive Media” on page 22
- “Obtaining a Software License Key” on page 29
- “Obtaining the Release Files” on page 31
- “Verifying Third-Party Compatibilities” on page 33
- “(Optional) Verifying Requirements for the ASM QFS Manager” on page 42
- “(Optional) Verifying the Network Management Station” on page 43

(Optional) Backing Up Existing File Systems

Perform this task under the following conditions:

- You are currently using a version 1 superblock with a ASM 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In “(Optional) Reinitializing and Restoring the File Systems” on page 252, you reinitialize the file systems and restore your data.
- You suspect that your current `samfsdump`(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- “Using the Version 1 and Version 2 Superblocks” on page 241
- “To Back Up File Systems” on page 242

Figure 152. shows using the samfsinfo(1M) command to retrieve information about the samfs4 file system. The second line of output indicates that this file system is using a version 2 superblock.

Figure 152. Using samfsinfo(1M)

```
# samfsinfo samfs4
samfsinfo: filesystem samfs4 is mounted.
name:     samfs4       version:     2
time:     Sat Sep 20 08:24:34 2003
count:    1
capacity:      04b00000          DAU:         16
space:         02e22ff0
ord  eq   capacity      space   device
  0  41   04b00000   02e22ff0   /dev/dsk/
c9t50020F2300010570d0s1
```

Using the Version 1 and Version 2 Superblocks

The StorageTek ASM 4.0, 4.1, and 4.2 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)
- Dual-sized disk allocation units (DAUs) on mm devices

The StorageTek ASM 4.1 and 4.2 releases support both the version 1 and version 2 superblocks. You can use the sammkfs(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the samfsrestore(1M) command to restore files to the new file system from the dump file created in this installation task.

If you are upgrading from a StorageTek ASM 4.0 system, note that the StorageTek ASM 4.0 file system allowed you to initialize file systems with either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note: The StorageTek ASM 4.2 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek ASM 4.2 file system only allows you to initialize file systems with the version 2 superblock.

To Back Up File Systems

1. (Optional) Become superuser from a console connection.

   If you have not already logged in as `root`, do so now.

2. Make sure that all files are archived.

   The following example assumes that `sam1` is the mount point of the file system. You can complete this step by entering a command similar to the following:

```
# sfind /sam1 ! -type d ! -archived > /tmp/notarchived.list
```

   The preceding command finds all files that are not archived and sends the output to a file. Depending on the size of your file system, this command can take a long time to complete.

   Examine this command's output. The files in this output are those that have not been archived. If you want any of these files to appear in the dump file, archive them now before you proceed to the next step. Alternatively, you can use the `-u` option to the `samfsdump`(1M) command to dump unarchived data if you suspect some files have not yet been archived. The `-u` option can create very large dump files, however, so you need to weigh space considerations when using this option.

3. Use the `samfsdump`(1M) command to back up each StorageTek ASM file system's metadata.

   Dump each file system's metadata to a location outside the StorageTek ASM file system.

   Figure 153 assumes that you have a file system mounted at `/sam1` that you want to back up to `samfs1.dump`, which exists outside of the StorageTek ASM file systems.

Figure 153. 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 StorageTek ASM environment.

   For more information about backing up your file systems, see the *ASM, ASM-QFS and ASM/ QFS-Standalone Disaster Recovery Guide*.

Stopping the StorageTek ASM File System

The procedure in this task shows how to halt StorageTek ASM operations.

To Stop the File System

1. Use the `samcmd`(1M) idle command to idle the drives in your system.

   This step enables the archiver, stager, and other processes to complete current operations. Use this command in the following format:

```
samcmd idle eq
```

   For *eq*, specify the Equipment Ordinal of a device defined in your `mcf` file.

   You can also idle the drives by using the `samu`(1M) operator utility. For more information about the `samcmd`(1M) command, see the `samcmd`(1M) man page.

   Repeat this step for each removable media drive *eq* configured in your `mcf` file:

2. (Optional) Use the `samcmd`(1M) `aridle` command to idle the archiver.

   Perform this step only if you are upgrading from a StorageTek ASM 4.0 system.

   For example:

```
# samcmd aridle
```

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

   For example:

```
# samd stop
```

(Optional) Unsharing the File Systems

Perform this task if your StorageTek ASM file systems are NFS shared file systems.

To Unshare the File Systems

- Use the `unshare`(1M) command on the StorageTek ASM file system.

For example, the following command unshares the `samfs1` file system:

```
# unshare samfs1
```

Unmounting the File System

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to"Removing Existing StorageTek ASM Software" on page 245.

To Unmount Using the `umount`(1M) Command

- Using the `umount`(1M) command, unmount each StorageTek ASM file system.

  If necessary, use the `-f` option to the `umount`(1M) command. The `-f` option forces a file system to unmount.

To Unmount Using the `fuser`(1M), `kill`(1), and `umount`(1M) Commands

If `umount`(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. Use the `fuser`(1M) command to determine whether or not any processes are still busy.

   For example, the following command queries the `samfs1` file system:

```
# fuser -uc /samfs1
```

2. If any processes are still busy, use the `kill`(1M) command to terminate them.
3. Using the `umount`(1M) command, unmount each StorageTek ASM file system.

To Unmount By Editing the `/etc/vfstab` File and Rebooting

1. Edit the `/etc/vfstab` file.

   For all StorageTek ASM file systems, change the Mount at Boot field from `yes` or `delay` to `no`.

2. Reboot your system.

Removing Existing StorageTek ASM Software

This task shows how to remove StorageTek ASM software from a release prior to 4.2.

To Remove Software From a 4.1 Release

1. Use the `pkginfo`(1) command to determine which StorageTek ASM packages are installed on your system.

   For example:

```
# pkginfo | grep sam
```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek ASM software.

   You must remove all existing StorageTek ASM packages before installing the new packages. If you are using any optional StorageTek ASM packages, you should make sure that you remove these packages before removing the main `SUNWsamfs` packages. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWsamfsu` and the `SUNWsamfsr` packages:

```
# pkgrm SUNWsamfsu SUNWsamfsr
```

   Note: The `SUNWsamfsr` package must be the last package removed. The 4.1 release does not include any localized software packages.

To Remove Software From a 4.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek ASM packages are installed on your system.

   For example:

```
# pkginfo | grep sam
```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek ASM software.

   You must remove all existing StorageTek ASM packages before installing the new packages. If you are using any optional StorageTek ASM packages, make sure that you remove these packages before removing

the main SUNWsamfs package. The install script prompts you to confirm several of the removal steps.

The following example command removes the SUNWcsamf, the SUNWfsamf, and the SUNWjsamf localized packages in addition to the SUNWsamfs package:

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

Note: The SUNWsamfs package must be the last package removed.

Adding the Packages

The StorageTek ASM software packages use the Sun Solaris packaging utilities for adding and deleting software. The pkgadd(1M) command prompts you to confirm various actions necessary to upgrade the packages.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the installation. You can go to another window and copy the files you want to save to an alternate location.

To Add the Packages

1. Use the cd(1) command to change to the directory where the software package release files reside.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 31. Use the cd(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

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

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

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

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

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

   For example:

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

3. Enter yes or y as the answer to each of the questions.

   When you install SUNWsamfsr and SUNWsamfsu, the system asks you if you want to define an administrator group. Select y to accept the default (no administrator group), or select n if you want to define an administrator group. You can use the set_admin(1M) command to reset permissions on certain commands later. For more information, see the set_admin(1M) man page.

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

   Perform this step only if you want to install the packages localized for Chinese, French, or Japanese. Figure 154. shows the commands to use to install the localized packages.

Figure 154. Using the pkgadd(1M) Command to Install Localized Packages

```
# pkgadd -d SUNWcsamf
# pkgadd -d SUNWfsamf
# pkgadd -d SUNWjsamf
```

5. Examine /tmp/SAM_install.log.

   File /tmp/SAM_install.log is the StorageTek ASM log file.

   This file should show that the pkgadd(1M) command added the SUNWsamfsr and SUNWsamfsu software packages. Make sure that it also installed StorageTek ASM samst driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

   Note: The tools package, SUNWsamtp, is available separately. Contact your StorageTek sales representative for information about obtaining the 4.2 version of the SUNWsamtp package.

Restoring File Changes (`inquiry.conf` and `samst.conf`)

StorageTek 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`. Figure 155 shows the warning message issued if these files differ.

Figure 155. 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. Figure 156 shows the beginning of the warning message issued if these files differ.

Figure 156. Warning Messages for Differing `samst.conf` Files

```
samst.conf has been updated.
/opt/SUNWsamfs/examples/samst.conf is the latest version;
please add your changes and copy it to /kernel/drv/
samst.conf
```

Updating the License Keys

A license key is required to run the StorageTek ASM software. For information about license keys, see “Obtaining a Software License Key” on page 29.

The StorageTek ASM software uses encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

(Optional) To License the StorageTek ASM Software

You do not need to perform this procedure if you are upgrading from a StorageTek ASM 4.0 or 4.1 release unless you are also added to or changing the equipment in your enviroment that would change your license. If you are not adding equipment, the system copies your 4.0 license to the correct location when the upgrade is complete.

1. Verify whether the license file exists.

   The license file is as follows:

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

2. If the `/etc/opt/SUNWsamfs/LICENSE.4.2` file does not exist, create it.
3. Starting in column one, place the license key you have obtained from your ASP or from StorageTek on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.2` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

(Optional) Enabling the ASM QFS Manager

Perform this task if you want to be able to use the ASM QFS Manager.

The ASM QFS Manager is an online interface to StorageTek ASM that enables you to configure many of the components in a StorageTek ASM environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information about enabling the ASM QFS Manager, see "(Optional) Enabling the ASM QFS Manager" on page 148.

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

The following files exist on your StorageTek ASM server:

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

The following additional files can also exist on your StorageTek ASM server:

- `/etc/opt/SUNWsamfs/archiver.cmd`
- `/etc/opt/SUNWsamfs/stager.cmd`

The procedures in this task show you how to verify the correctness of these files.

To Verify the License File

1. Use the `samd`(1M) `config` command to initialize the StorageTek ASM environment.

   For example:

```
# samd config
```

2. Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

   The `samcmd`(1M) output includes information about features that are enabled. If the output you receive is not similar to that shown in Figure 157, return to "Updating the License Keys" on page 248.

Figure 157. Using `samcmd`(1M)

```
# samcmd l

License information samcmd    4.2      Fri Aug 27 16:24:12
2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled

Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled

Shared filesystem support enabled

SAN API support enabled

Robot type ATL 2640, P1000, or Sun L1000 Library is present
and licensed

    0 tp slots not licensed
```

Figure 157. Using samcmd(1M) (Continued)

```
    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

To Verify the mcf File

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

  If your mcf file is free from syntax errors, the sam-fsd(1M) output includes information about the file systems, archiving, and other system information. If your mcf file contains syntax or other errors, however, the output is similar to that shown in Figure 158.

Figure 158. Example sam-fsd(1M) Output

```
# sam-fsd
13: /dev/dsk/c1t1d0s0   10      md      samfs1  on      /
dev/rdsk/c1t1d0s0
 *** Error in line 13: Equipment name '/dev/dsk/c1t1d0s0'
already in use by eq 10
72: /dev/rmt/3cbn       45      ug      l1000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn'
already in use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your mcf file has errors, refer to "Defining the StorageTek ASM Configuration By Creating the mcf File" on page 155 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 StorageTek ASM file system is in use, you must convey the new mcf specifications to the StorageTek ASM software. For information about propagating mcf file changes to the system, see the *StorageTek ASM and QFS File System Administration Guide*.

(Optional) To Verify the archiver.cmd File

Perform this step if you have an archiver.cmd file. If you do not have an archiver.cmd file, and you are using the archiver's defaults, you do not need to perform this step.

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

  The command is as follows:

```
# archiver -lv
```

  The output from this command can be quite lengthly. Examine it and verify that the archiving directives are as expected. If you have questions, see "(Optional) Creating the archiver.cmd File" on page 199 and see the `archiver.cmd`(4) man page.

(Optional) Modifying the `/etc/vfstab` File

Perform this task if you modified the `/etc/vfstab` file in "Unmounting the File System" on page 244.

To Modify the `/etc/vfstab` File

- Edit this file again, and change the Mount at Boot field for all StorageTek ASM file systems from `no` to `yes` or `delay`.

(Optional) Reinitializing and Restoring the File Systems

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "(Optional) Backing Up Existing File Systems" on page 240. To accomplish this, use the `sammkfs`(1M) and `samfsrestore`(1M) commands on each file system.

Note: The StorageTek ASM 4.2 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek ASM 4.2 file system allows file systems to be initialized only with the version 2 superblock. If you are upgrading from 4.0 using version 1 superblocks, be aware that using a 4.2 `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock.

To Reinitialize and Restore the File Systems

1. Use the `samfsinfo`(1M) command to retrieve information about the file system.

   You can examine the output from the `samfsinfo`(1M) command to determine the DAU size specified on the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. Use this DAU size again when you perform Step 2.

2. Use the `sammkfs`(1M) command to initialize a new StorageTek ASM file system.

   The following example `sammkfs`(1M) command reinitializes a file system named `samfs1` with StorageTek ASM 4.2 feature capabilities.

```
# sammkfs samfs1
```

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

3. Use the `samfsrestore`(1M) command to restore the dumped data into the new file system.

   Figure 159 assumes that you have a file system named `samfs1` (mounted at `/samfs1`) that you want to back up from files dumped to `samfs1.bak`, which exists outside of the StorageTek ASM file system.

Figure 159. Using `samfsrestore`(1M)

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

(Optional) Checking the File System

If you did not perform "(Optional) Reinitializing and Restoring the File Systems" on page 252, you are encouraged to complete this task.

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

  Do this for each StorageTek ASM file system.

Mounting the File Systems

Use the `mount`(1M) command to mount your StorageTek QFS file system.

To Mount the File System

- Use the `mount`(1M) command to mount the file systems.

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

```
# mount samfs1
```

(Optional) Recompiling API-Dependent Applications

If you are running applications that use the StorageTek ASM application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

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

StorageTek ASM QFS Manager Software Notes

A

This appendix section contains additional information on using the StorageTek ASM QFS Manager. It includes the following topics:

Creating Additional Administrator and User Accounts

You can create additional administrator and guest accounts at any time after the initial StorageTek ASM QFS Manager configuration. These guest accounts are local to the management station.

Aftering installing the StorageTek ASM QFS Manager, StorageTek ASM QFS Manager creates the following two Solaris operating system (OS) login accounts and the following role:

- Accounts: `samadmin`, `samuser`
- Role: `SAMadmin`

The user account `samadmin` is assigned the `SAMadmin` role. This user has administrator privileges (read and write) for managing the StorageTek ASM QFS Manager, the StorageTek QFS software, and the StorageTek ASM software.

The user account `samuser` is assigned only `Guest` privileges. This user has read-only access to StorageTek QFS and StorageTek ASM operations.

If you remove the StorageTek ASM QFS Manager software, the system removes both the `samadmin` and `samuser` Solaris accounts and the `SAMadmin` role. However, the removal scripts do not remove any additional accounts that you create manually. It is your responsibility to use one or both of the following procedures to administer any accounts you add manually.

To Create Additional Administrator Accounts

An administrator account holder has administrator priviledges (read and write) for managing the StorageTek ASM QFS Manager, the StorageTek QFS software, and the StorageTek ASM software.

1. Log in to the management station.
2. Type `useradd` *`username`*.
3. Type `passwd` *`username`*.
4. Type the password as instructed on the screen.
5. Type `usermod -R SAMadmin` *`username`*.

   Note: Do not use `root` as the *`username`*.

To Create Additional Guest Accounts

A guest account holder has read-only access to StorageTek QFS and StorageTek ASM operations.

1. Log in to the management station.
2. Type `useradd` *`account_name`*.
3. Type `passwd` *`account_name`*.
4. Type the password as instructed on the screen.

Removing the StorageTek ASM QFS Manager Software

The following procedure explains how to remove the StorageTek ASM QFS Manager software from a StorageTek QFS or StorageTek ASM server.

To Remove the StorageTek ASM QFS Manager Software From the StorageTek QFS or StorageTek ASM Server

1. Log in to the server upon which the ASM QFS Manager software is installed.

   This is the host upon which you ran the `samqfsmgr_setup` script at installation time.
2. Become superuser.
3. Remove the StorageTek ASM QFS Manager software.

To remove all the applications that are installed with the StorageTek ASM QFS Manager software, type the following command:

```
# /var/sadm/samqfsui/samqfsmgr_uninstall
```

This script asks you to confirm removal of the TomCat Web Server, JRE packages, and information pertaining to administrator and user accounts.

Messages

This section shows some of the messages you might see when using the StorageTek ASM QFS Manager software.

Message:

An unrecoverable error occurred during the page display.
If the problem persists, please restart the web server.

Click the HOME button to return to the Server Selection page, which is the default page of the StorageTek ASM QFS Manager application.

If the system cannot display the Server Selection page, enter the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message:

HTTP 500 Internal server error

Run the following command to restart the web server:

```
# /usr/sbin/smcwebserver restart
```

Message:

The page cannot be displayed.

Run the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message:

Starting Sun(TM) Web Console Version 2.0.2.
Startup failed. See /var/log/webconsole/console_debug_log for detailed error information.

Examine the contents of the following file:

```
/var/log/webconsole/console_debug_log
```

If the log says the port(6789) is in use by some other process, type commands shown in Figure 160..

Figure 160. Restarting the Web Console

```
# pkill -9 noaccess
# /usr/sbin/smcwebserver restart
```

Message:

Failed to create the filesystem
mount_samfs: fopen(mnttab) error: : Too many open files

The system generates this message if you are trying to create a file system with a large number of LUNs. To remedy this problem, use the following procedure:

1. Use the `ps`(1) and `grep`(1) commands to find the process ID for the `sam-mgmtrpcd` process.

   For example:

   ```
   # ps -ef | grep sam-mgmtrpcd
   ```

2. Use the `plimit`(1) command to increase the descriptors for the process.

   For example:

   ```
   # plimit -n 512 process-id
   ```

   For *`process-id`*, specify the process number.

3. Create the file system.

Log and Trace Files

The StorageTek ASM QFS Manager software enables logging after it is installed, but if you want tracing, you have to enable it manually. You do not need to create or modify any logging files for the StorageTek ASM QFS Manager software, but if you want to enable tracing for StorageTek ASM QFS Manager, use the instructions in “Tracing” on page 260.

Log rotation is not supported for log or trace files.

Table 38 lists the files that the StorageTek ASM QFS Manager uses for logging and tracing.

Table 38. StorageTek ASM QFS Manager Log and Trace Files

Activity	File Location	Created by the User?
StorageTek ASM QFS Manager Logging	/var/log/webconsole/samqfsui.log	No
TomCat Web Console Logging	/var/log/webconsole/console_debug_log	No
Tracing for StorageTek ASM QFS Manager and native code	/var/log/webconsole/samqfsui.trace_syslog	Yes
Stack trace file	/var/log/webconsole/localhost_log.*yyyy-mm-dd*.txt	No

The following sections describe the log and trace files.

StorageTek ASM QFS Manager Logging

The StorageTek ASM QFS Manager software creates the `samqfsui.log` log file when the application starts. It records information about operations that the user performs, and whether those operations were successful. Do not delete or modify this file. If you delete or modify this file, logging stops. When the webserver restarts, it erases the contents of this file and creates a new `samqfsui.log` file.

The StorageTek ASM QFS Manager software uses an additional file, `/var/webconsole/samqfsui.log.lck`, to ensure that only one process at a time writes to the log file. Do not delete or modify this lock file.

Web Server Logging

The Sun Common Console Framework creates the `/var/webconsole/console_debug_log` file. It includes console-specific information such as environment variable setting that the console uses and a record of users logged in to the console.

If this file becomes too large, you can delete this file. The system creates another instance of this file the next time the web server restarts.

Tracing

The StorageTek ASM QFS Manager trace file records the following information:

- Messages regarding whether operations were successful.
- Functions invoked with the application stack. This can be verbose.
- Messages that are important to developers for debugging purposes.

Tracing is not enabled by default.

To Enable Tracing for ASM QFS Manager and Native Code

The syslog daemon performs detailed tracing for StorageTek ASM QFS Manager and for native code. Use the following procedure to enable detailed tracing for StorageTek ASM QFS Manager and for native code.

1. Use the `touch`(1) command to create the trace file.

   For example:

```
# touch /var/log/webconsole/samqfsui.trace_syslog
```

2. Use `vi`(1) or another editor to add the following line to the `/etc/syslog.conf` file:

```
local6.debug   /var/log/webconsole/samqfsui.trace_syslog
```

   Use a tab character to separate the two fields in this line.

3. Type the following command:

```
# pkill -HUP syslogd
```

4. (Optional) Enable log file rotation.

   Log files can become very large. Use `logadm`(1M) to manage the log file for ASM QFS Manager.

   Note: You cannot use the `log_rotate.sh`(1M) script to manage the ASM QFS Manager log file.

To Enable Tracing or To Adjust the Tracing Level

Use the the following command to enable tracing or to adjust the tracing level:

```
# /opt/SUNWsamqfsui/bin/samadm trace trace_level
```

For *trace_level*, specify one of the values shown in Table 39..

Table 39. Arguments for *trace_level*

trace_level	**Tracing Requested**
off	Disables tracing.
1	Enables tracing for very important messages only. This includes severe errors that occur within the application.
2	Enables tracing for moderately important messages. This includes level 1 messages as well as debugging statements within the application that are useful for developers.
3	Enables tracing for all messages. This includes level 1 and level 2 messages as well as entry and exit points of functions within the application on the stack.

You can enable and disable tracing dynamically during run time by using the samadm(1M) command.

StorageTek ASM QFS Manager Daemon Information

The following procedure can help you obtain troubleshooting information for the RPC daemon, sam-mgmtrpcd(1M).

To Determine Whether the RPC Daemon Is Running

Perform the following procedure to verify whether or not the RPC daemon is running and to obtain status information.

1. Log in to the StorageTek QFS or StorageTek ASM server.
2. Become superuser.
3. Display status information for the StorageTek ASM QFS Manager daemon (sam-mgmtrpcd).

   Enter the following command to display the daemon:

```
# /opt/SUNWsamfs/sbin/samadm status
```

If the daemon is not running, it does not display its status. Enter the following command to start the daemon:

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

The preceding command starts the daemon and enables it to automatically restart if it dies.

Release Package Contents and Directories Created

B

This chapter describes the content of the release packages and shows the directories and files that the software creates when it is installed. Specifically, it contains the following topics:

Release Package Contents

The StorageTek QFS and the StorageTek ASM software packages are in Sun Solaris `pkgadd`(1M) format. These packages reflect the Sun Solaris version for the platform upon which you will be installing the StorageTek QFS or the StorageTek ASM software.

Table 40 shows the release packages.

Table 40. Release Packages

Installed Package	Description
SUNWqfsr, SUNWqfsu	StorageTek QFS software packages
SUNWcqfs	Chinese localized package for StorageTek QFS software
SUNWjqfs	Japanese localized package for StorageTek QFS software
SUNWfqfs	French localized package for StorageTek QFS software
SUNWsamfsr, SUNWsamfsu	StorageTek ASM software packages
SUNWcsamf	Chinese localized package for StorageTek ASM software
SUNWjsamf	Japanese localized package for StorageTek ASM software

Table 40. Release Packages (Continued)

Installed Package	Description
SUNWfsamf	French localized package for StorageTek ASM software
SUNWsamqfsuir, SUNWsamqfsuiu	ASM QFS Manager software packages
SUNWcsamqfsui	Chinese localized package for ASM QFS Manager software
SUNWjsamqfsui	Japanese localized package for ASM QFS Manager software
SUNWfsamqfsui	French localized package for ASM QFS Manager software

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

major . *minor* . *patch*

Table 41 explains the release numbering scheme.

Table 41. Release Numbering

Release Level Component	Meaning
major	The release level of a major release.
minor	The release level of a minor feature release.
patch	The patch number. A number between 1 and 99 indicates a patch release. A letter from A through Z indicates prerelease software. The base release of a first feature release of a major release might not contain a patch level.

Examples:

- 4.0 is a major release with no minor release revisions and no bug fixes.
- 4.2 is a minor release.
- 4.2.1 is a patch release that contains software fixes for a major or minor release. This number appears in the patch's README file.

Directories and Files Created

This section describes the directories and files associated with the StorageTek QFS and StorageTek ASM products. You can obtain additional information about the files in this section from the man pages after the software is installed.

Directories Created at Installation

Table 42 lists the directories created when the StorageTek QFS and StorageTek ASM software packages are installed.

Table 42. Directories Created

Directory	Content	Used By
/dev/samst	Device driver special files.	StorageTek ASM
/etc/fs/samfs	Commands specific to StorageTek QFS and StorageTek ASM software.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs	Configuration and license files.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs/scripts	Site-customizable scripts.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/bin	User command binaries.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/client	Files for RPC API client.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/examples	Various example configuration files.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/include	API include files.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/lib	Relocatable libraries.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/man	man(1) pages.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/sbin	System administrator commands and daemon binaries.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/sc	Sun Cluster binaries and configuration files.	StorageTek QFS StorageTek ASM

Table 42. Directories Created (Continued)

Directory	Content	Used By
/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.	StorageTek QFS StorageTek ASM
/opt/SUNWsamqfsui/bin	ASM QFS Manager administrator commands.	ASM QFS Manager
/opt/SUNWsamqfsui/doc	ASM QFS Manager online documentation repository.	ASM QFS Manager
/opt/SUNWsamfs/mibs	Standard MIB files and product MIB (SUN-SAM-MIB.mib).	StorageTek QFS StorageTek ASM
/var/opt/SUNWsamfs	Device catalogs; catalog trace file; log files; archiver data directory and queue files.	StorageTek ASM

Files Created at Installation

Table 43 and Table 44 list the files created when the StorageTek QFS or StorageTek ASM software is installed.

Table 43. Files Created - Miscellaneous

File	Description	Used By
/etc/opt/SUNWsamfs/inquiry.conf		
	Vendor and product identification strings for recognized SCSI devices.	StorageTek ASM
/etc/sysevent/config/SUNW,SUNWsamfs,sysevent.conf		
	Solaris system event handler configuration file.	StorageTek QFS StorageTek ASM
/kernel/drv/samst	Driver for SCSI media changers, optical drives, and non-motion I/O for tape drives.	StorageTek ASM
/kernel/drv/samst.conf	Configuration file for the samst driver.	StorageTek ASM
/kernel/drv/samioc	Sun Solaris 32-bit file system interface module.	StorageTek QFS StorageTek ASM

Table 43. Files Created - Miscellaneous (Continued)

File	Description	Used By
/kernel/drv/samioc.conf	Configuration file for samioc module.	StorageTek QFS StorageTek ASM
/kernel/drv/sparc9/samioc	Sun Solaris 32- and 64-bit file system interface module.	StorageTek QFS StorageTek ASM
/kernel/fs/samfs	Sun Solaris 32-bit file system module.	StorageTek QFS StorageTek ASM
/kernel/fs/sparcv9/samfs	Sun Solaris 64-bit file system module.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/sc/etc/SUNW.qfs		
	Sun Cluster configuration file. This is a link. Created only in the presence of Sun Cluster software.	StorageTek QFS
/usr/cluster/lib/rgm/rtreg/SUNW.qfs		
	Sun Cluster configuration file. Created only in the presence of Sun Cluster software.	StorageTek QFS
/var/log/webconsole/host.conf		
	ASM QFS Manager configuration file.	ASM QFS Manager
/var/opt/SUNWsamfs/faults	Faults history file.	StorageTek QFS,StorageTek ASM
/var/sadm/samqfsui/samqfsmgr_uninstall		
	Software for removing ASM QFS Manager and its supporting applications.	ASM QFS Manager

The StorageTek QFS and StorageTek ASM file systems have dynamically loadable components that are stored in the Sun Solaris `/kernel` directory (see Table 43). 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 StorageTek QFS or StorageTek ASM software is installed, it creates files that it uses for fault notification. Table 44 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 ASM QFS Manager software.

Table 44. Files Created - Fault Notification

File	Description	Used By
/etc/opt/SUNWsamfs/scripts/sendtrap	Sends trap information.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/sbin/tapealert_trap	Sends tapealert(1M) traps.	StorageTek ASM
/opt/SUNWsamfs/sbin/tapealert_log	Records tapealert(1M) faults.	StorageTek ASM
/opt/SUNWsamfs/sbin/fault_log	Records faults.	StorageTek QFS StorageTek ASM

The software creates the files listed in Table 44 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 StorageTek QFS and StorageTek ASM software uses these site files.

Note: Your site's configuration files must contain ASCII characters only.

Table 45 and Table 46 list the site files you create. Some of the files in these lists are optional, depending on your configuration, and others are required.

Table 45 shows the required site files. These are files that you must create at your site in order to use the StorageTek QFS and StorageTek ASM software.

Table 45. Required Site Files

File	Description	Used By
/etc/opt/SUNWsamfs/LICENSE.4.2	License file. For more information, see the licensing information pertinent to your installation in "Obtaining a Software License Key" on page 29. This is a required file.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs/mcf	Master configuration file. For more information, see the mcf(4) man page. This is a required file.	StorageTek QFS StorageTek ASM

Table 46 shows the optional site files. This is a partial list of the files that you might or might not create depending on the software packages you install and the features you use.

Table 46. Optional Site Files

File	Description	Used By
/etc/opt/SUNWsamfs/archiver.cmd	Archiver command file. For more information, see the archiver.cmd(4) man page or see the *StorageTek ASM Storage and Archive Management Guide*.	StorageTek ASM
/etc/opt/SUNWsamfs/samfs.cmd	File system mount parameter command file. For more information, see the samfs.cmd(4) man page or see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs/recycler.cmd	Recycler command file. For more information, see the recycler.cmd(4) man page or see the *StorageTek ASM Storage and Archive Management Guide*.	StorageTek ASM

Table 46. Optional Site Files (Continued)

File	Description	Used By
/etc/opt/SUNWsamfs/releaser.cmd	Releaser command file. For more information, see the releaser.cmd(4) man page or see the *StorageTek ASM Storage and Archive Management Guide*.	StorageTek ASM
/etc/opt/SUNWsamfs/preview.cmd	Previewer command file. For more information, see the preview.cmd(4) man page or see the *StorageTek ASM Storage and Archive Management Guide*.	StorageTek ASM
/etc/opt/SUNWsamfs/defaults.conf	Miscellaneous default values. For more information, see the defaults.conf(4) man page.	StorageTek QFS StorageTek ASM

Modified System Files

During installation, StorageTek QFS and StorageTek ASM software adds information to certain Sun Solaris system files. These system files are ASCII text files. Sun Solaris uses these files to identify loadable kernel modules by number rather than by name.

The StorageTek QFS and StorageTek ASM software adds information to the following files:

- `/etc/name_to_major`. This file maps drivers to major numbers. The StorageTek ASM software uses this file. The `samst` and `samrd` major numbers can vary depending on the major numbers in use by the Sun Solaris software. The system adds the lines shown in Figure 161.

Figure 161. Lines Added to `/etc/name_to_major`

```
samst 63
samrd 64
```

- `/etc/security/auth_attr`. This file is the authorization description database, and it is used by both StorageTek QFS and StorageTek ASM software. The system adds the lines shown in Figure 162.

Figure 162. Lines Added to `/etc/security/auth_attr`

```
com.sun.netstorage.samqfs.web.read:::SAM-FS Read Access::
com.sun.netstorage.samqfs.web.write:::SAM-FS Write Access::
com.sun.netstorage.samqfs.web.*:::SAM-FS All Access::
```

- `/etc/user_attr`. This file is the extended user attributes database. The ASM QFS Manager uses this file. The system adds the lines shown in Figure 163.

Figure 163. Lines Added to `/etc/user_attr`

```
SAMadmin::::type=role;auths=com.sun.netstorage.samqfs.web.*
samadmin::::type=normal;roles=SAMadmin
```

Command Reference

C

The StorageTek QFS and StorageTek ASM environments consist of a file system, daemons, processes, various types of commands (user, administrator, and so on), and tools. This appendix describes the commands that are included in the StorageTek QFS and StorageTek ASM software distributions.

The StorageTek QFS and StorageTek ASM commands operate in conjunction with the standard UNIX file system commands. Some commands are specific to only one product. All the commands are documented in UNIX `man`(1) pages.

The *StorageTek QFS and StorageTek ASM File System Administration Guide* contains overview information for the daemons, but individual daemons are described throughout the documentation set where appropriate.

This appendix introduces the commands and indicates which commands you can use with the StorageTek QFS or StorageTek ASM software. See the man pages that are included in the software distribution for more information.

This appendix contains the following topics:

User Commands

By default, file system operations are transparent to the end user. Depending on your site practices, however, you might want to make some commands

available to users at your site to fine-tune certain operations. Table 47 summarizes these commands.

Table 47. User Commands

Command	Description	Used By
archive(1)	Archives files and sets archive attributes on files.	StorageTek ASM
release(1)	Releases disk space and sets release attributes on files.	StorageTek ASM
request(1)	Creates a removable media file.	StorageTek ASM
sdu(1)	Summarizes disk usage. The sdu(1) command is based on the GNU version of the du(1) command.	StorageTek QFS StorageTek ASM
segment(1)	Sets segmented file attributes.	StorageTek ASM
setfa(1)	Sets file attributes.	StorageTek QFS StorageTek ASM
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 StorageTek QFS and StorageTek ASM file attributes.	StorageTek QFS StorageTek ASM
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.	StorageTek QFS StorageTek ASM
squota(1)	Reports quota information.	StorageTek QFS StorageTek ASM
ssum(1)	Sets the checksum attributes on files.	StorageTek ASM
stage(1)	Sets stage attributes on files and copies offline files to disk.	StorageTek ASM

General System Administrator Commands

Table 48 summarizes the commands that you can use to maintain and manage the system.

Table 48. General System Administrator Commands

Command	Description	Used By
samadm(1M)	Starts or stops the sam-mgmtrpcd daemon.	StorageTek QFS StorageTek ASM ASM QFS Manager
samcmd(1M)	Executes one samu(1M) operator interface utility command.	StorageTek QFS StorageTek ASM
samd(1M)	Starts or stops robotic and removable media daemons.	StorageTek ASM
samexplorer(1M)	Generates a StorageTek QFS or StorageTek ASM diagnostic report script.	StorageTek QFS StorageTek ASM
samqfsmgr_setup(1M)	Installs, removes, and upgrades the ASM QFS Manager software	ASM QFS Manager
samset(1M)	Changes StorageTek ASM settings.	StorageTek ASM
samu(1M)	Invokes the full-screen, text-based operator interface. This interface is based on the curses(3CURSES) software library. The samu utility displays the status of devices and allows the operator to control automated libraries.	StorageTek QFS StorageTek ASM

File System Commands

Table 49 summarizes the commands that you can use to maintain the file system.

Table 49. File System Commands

Commands	Description	Used By
mount(1M)	Mounts a file system. The man page name for this command is mount_samfs(1M).	StorageTek QFS StorageTek ASM
qfsdump(1M) qfsrestore(1M)	Creates or restores a dump file containing the file data and metadata associated with a StorageTek QFS file system.	StorageTek QFS
sambcheck(1M)	Lists block usage for a file system.	StorageTek QFS StorageTek ASM
samchaid(1M)	Changes file admin set ID attribute. For use with quotas.	StorageTek QFS StorageTek ASM
samfsck(1M)	Checks and repairs metadata inconsistencies in a file system and reclaims allocated, but unused, disk space.	StorageTek QFS StorageTek ASM
samfsconfig(1M)	Displays configuration information.	StorageTek QFS StorageTek ASM
samfsdump(1M) samfsrestore(1M)	Creates or restores a dump file of the metadata associated with a StorageTek ASM file system.	StorageTek ASM StorageTek ASM-QFS
samfsinfo(1M)	Displays information about the layout of a StorageTek QFS or StorageTek ASM file system.	StorageTek QFS StorageTek ASM
samfstyp(1M)	Determines the StorageTek QFS or StorageTek ASM file system type.	StorageTek QFS StorageTek ASM
samgrowfs(1M)	Expands a file system by adding disk devices.	StorageTek QFS StorageTek ASM
sammkfs(1M)	Initializes a new file system from disk devices.	StorageTek QFS StorageTek ASM
samncheck(1M)	Returns a full directory path name given the mount point and inode number.	StorageTek QFS StorageTek ASM

Table 49. File System Commands (Continued)

Commands	Description	Used By
samquota(1M)	Reports, sets, or resets quota information.	StorageTek QFS StorageTek ASM
samquotastat(1M)	Reports on active and inactive file system quotas.	StorageTek QFS StorageTek ASM
samsharefs(1M)	Manipulates the StorageTek QFS shared file system configuration information.	StorageTek QFS
samtrace(1M)	Dumps the trace buffer.	StorageTek QFS StorageTek ASM
samunhold(1M)	Releases SANergy file holds.	StorageTek QFS StorageTek ASM
trace_rotate(1M)	Rotates trace files.	StorageTek QFS StorageTek ASM

Automated Library Commands

Table 50 summarizes the automated library commands that you can use to configure, initialize, and maintain the automated libraries and devices within the StorageTek ASM environment.

Table 50. Automated Library Commands

Command	Description
auditslot(1M)	Audits a single media cartridge slot within a specified automated library.
build_cat(1M)	Builds a media catalog file for an automated library. Optionally, can also populate the catalog file.
chmed(1M)	Sets or clears library catalog flags and values on a specific cartridge.
cleandrive(1M)	Requests that a tape drive be loaded with a cleaning tape.
dump_cat(1M)	Displays the content of a binary catalog file in various ASCII formats.
import(1M) samexport(1M)	Imports or exports cartridges from a library by placing it in the mailbox. For network-attached libraries, this command updates the library catalog, but it does not physically move cartridges.

Table 50. Automated Library Commands (Continued)

Command	Description
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 StorageTek ASM system.
samdev(1M)	Adds /dev/samst logical device entries. Used to communicate automated library, optical disk, and tape drive information.
tplabel(1M)	Labels tapes for use with the StorageTek ASM system.

Archiver Commands

Table 51 summarizes the commands that control the archiver's actions within the StorageTek ASM environment.

Table 51. Archiver Commands

Command	Description
archiver(1M)	Evaluates the archiver commands file for syntax completeness and semantic accuracy.
archiver.sh(1M)	Logs exceptional archiver events.
showqueue(1M)	Displays the content of an archiver queue file.
reserve(1M) unreserve(1M)	Reserves and unreserves volumes.

Specialized Maintenance Commands

Table 52 summarizes the various maintenance commands you can use in a StorageTek ASM environment.

Table 52. 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.

Table 52. Specialized Maintenance Commands (Continued)

Command	Description
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 StorageTek ASM file system. This command is similar in function to the UNIX makedev(1M) command.
samset(1M)	Changes or displays variables used in StorageTek ASM operations.
set_admin(1M)	Adds or removes permission for an administrator group to execute administrator commands.
set_state(1M)	Sets the state of a StorageTek ASM device.
stageback.sh(1M)	Stages files from StorageTek ASM or StorageTek ASM-QFS archive tapes
star(1M)	Creates tape archives and adds or extracts files. This is a GNU version of the tar(1) command, and it has been extended for use with the StorageTek ASM file system. You can use this command in a disaster recovery situation if you need to read data from archive tapes.
tapealert(1M)	Decodes TapeAlert events.
unarchive(1M)	Deletes archive entries for one or more files.
undamage(1M)	Marks an archive entry for one or more files or directories as undamaged.

Site-Customizable Scripts

Table 53 summarizes the site-customizable scripts that you can use to monitor and control the StorageTek ASM 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 53. 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 StorageTek ASM 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 StorageTek ASM environment, you can use the `samu`(1M) operator utility and ASM QFS Manager to perform basic operations. Table 54 summarizes the operational tools.

Table 54. Operational Utilities

GUI Tools	Description
ASM QFS Manager	Provides a web-based graphical user interface to the StorageTek QFS and StorageTek ASM software. You can use this interface to configure, control, monitor, and reconfigure the components of your StorageTek QFS and StorageTek ASM environment. For information on installing ASM QFS Manager, see the *StorageTek QFS and StorageTek ASM Software Installation and Configuration Guide*. For information on using the ASM QFS Manager, see its online help.
samu(1M)	Provides the starting point for accessing the samu(1M) operator utility.

Glossary

A

addressable storage The storage space encompassing online, nearline, offsite, and offline storage that is user-referenced through a StorageTek QFS or StorageTek ASM file system.

archive media The media to which an archive file is written. Archive media can be removable tape or magneto-optical cartridges in a library. In addition, archive media can be a mount point on another system.

archive storage Copies of file data that have been created on archive media.

archiver The archive program that automatically controls the copying of files to removable cartridges.

audit (full) The process of loading cartridges to verify their VSNs. For magneto-optical cartridges, the capacity and space information is determined and entered into the automated library's catalog.

automated library A robotically controlled device designed to automatically load and unload removable media cartridges without operator intervention. An automated library contains one or more drives and a transport mechanism that moves cartridges to and from the storage slots and the drives.

B

backup storage A snapshot of a collection of files for the purpose of preventing inadvertent loss. A backup includes both the file's attributes and associated data.

block allocation map A bitmap representing each available block of storage on a disk and indicating whether the block is in use or free.

block size See DAU.

C

cartridge A physical entity that contains media for recording data. A tape or optical disk. Sometimes referred to as *a piece of media*, *a volume*, or *the medium*.

catalog A record of the VSNs in an automated library. There is one catalog for each automated library, and at a site, there is one historian for all automated libraries.

client-server The model of interaction in a distributed system in which a program at one site sends a request to a program at another site and awaits a response. The requesting program is called the client. The program satisfying the response is called the server.

connection The path between two protocol modules that provides reliable stream delivery service. A TCP connection extends from a TCP module on one machine to a TCP module on the other.

D

data device For a StorageTek QFS or StorageTek ASM file system, a device or group of devices upon which file data is stored.

DAU (Disk allocation unit) The basic unit of online storage. Also called block size.

In addition, the StorageTek QFS file systems support a fully adjustable DAU, sized from 16 kilobytes through 65,528 kilobytes. The DAU you specify must be a multiple of 8 kilobytes.

The StorageTek ASM file systems support both a small and a large DAU. The small DAU is 4 kilobytes (2^{14} or 4096 bytes). The large DAU is 16, 32, or 64 kilobytes. The available DAU size pairs are 4 and 16; 4 and 32; and 4 and 64.

device logging A configurable feature that provides device-specific error information used to analyze device problems.

device scanner Software within the StorageTek ASM file system that periodically monitors the presence of all manually mounted removable devices and that detects the presence of mounted cartridges that can be requested by a user or other process.

direct access A file attribute (stage never) designating that a nearline file can be accessed directly from the archive media and need not be retrieved to disk cache.

direct-attached library An automated library connected directly to a server using a SCSI interface. A SCSI attached library is controlled directly by the StorageTek ASM software by using the SCSI standard for automated libraries.

direct I/O An attribute used for large block-aligned sequential I/O. The `setfa`(1) command's `D` option is the direct I/O option. It sets the direct I/O attribute for a file or directory. If applied to a directory, the direct I/O attribute is inherited.

directory A file data structure that points to other files and directories within the file system.

disk allocation unit See DAU.

disk buffer When using StorageTek ASM-Remote software, the disk buffer is a buffer on the server system that is used when archiving data from the client to the server.

disk cache The disk-resident portion of the StorageTek ASM file system software. It is used to create and manage data files between online disk cache and archive media. Individual disk partitions or an entire disk can be used as disk cache.

disk space thresholds An administrator-defined amount of disk space that is available to a user. This defines the range of desirable disk cache utilization. The high threshold indicates the maximum level of disk cache utilization. The low threshold indicates the minimum level of disk cache utilization. The releaser controls disk cache utilization based on these predefined disk space thresholds.

disk striping The process of recording a file across several disks, thereby improving access performance and increasing overall storage capacity. See also entries for striping.

drive A mechanism for transferring data to and from a removable media volume.

E

Ethernet A local-area, packet-switched network technology. Originally designed for coaxial cable, it is now found running over shielded, twisted-pair cable. Ethernet is a 10- or 100-Mbytes/sec LAN.

extent array The array within a file's inode that defines where each data block assigned to the file is located on the disk.

F

family device set See Family Set.

Family Set A storage device that is represented by a group of independent physical devices, such as a collection of disks or the drives within an automated library. Also see storage Family Set.

FDDI (Fiber distributed data interface) A 100-Mbytes/sec fiber-optic LAN.

fibre channel The ANSI standard that specifies high-speed serial communication between devices. Fibre channel is used as one of the bus architectures in SCSI-3.

fiber-distributed data interface See FDDI.

file system A hierarchical collection of files and directories.

file system specific directives Archiver and releaser directives that follow global directives, are specific to a particular file system, and begin with `fs =`. File system specific directives apply until the next `fs =` directive line or until the end of file is encountered. If multiple directives affect a file system, the file system-specific directives override the global directives.

FTP (File transfer protocol) An internet protocol for transferring files between two hosts over a TCP/IP network.

G

global directives Archiver and releaser directives that apply to all file systems and that appear before the first `fs =` line.

grace period For disk quotas, this is the amount of time that can elapse during which a user is allowed to create files and allocate storage after the user reaches their soft limit.

H

hard limit For disk quotas, a maximum limit on file system resources, blocks and inodes, that users cannot exceed.

I

indirect block A disk block that contains a list of storage blocks. The StorageTek QFS and StorageTek ASM file systems have up to three levels of indirect blocks. A first-level indirect block contains a list of blocks used for data storage. A second-level indirect block contains a list of first-level indirect blocks. A third-level indirect block contains a list of second-level indirect blocks.

inode Index node. A data structure used by the file system to describe a file. An inode describes all the attributes associated with a file other than the name. The attributes include ownership, access, permission, size, and the file location on the disk system.

inode file A special file (`.inodes`) on the file system that contains the inode structures for all files resident in the file system. All StorageTek QFS and StorageTek ASM inodes are 512 bytes long. The inode file is a metadata file, which is separated from file data in the StorageTek QFS file systems.

K

kernel The central controlling program that provides basic system facilities. The UNIX kernel creates and manages processes, provides functions to access the file system, provides general security, and supplies communication facilities.

L

LAN Local area network.

lease In a StorageTek QFS shared file system, a lease grants a client host permission to perform an operation on a file for as long as the lease is valid. The metadata server issues leases to each client host. The leases are renewed as necessary to permit continued file operations.

library See automated library.

library catalog See catalog.

local file system A file system that is installed on one node of a Sun Cluster and is not made highly available to another node. Also a file system that is installed on a standalone server.

LUN Logical unit number.

M

mcf Master configuration file. The file that is read at initialization time that defines the relationships between the devices (the topology) within a StorageTek QFS or StorageTek ASM environment.

media Tape or optical disk cartridges.

media recycling The process of recycling or reusing archive media with low use. Archive media with low use is archive media with few active files.

metadata Data about data. Metadata is the index information needed to locate the exact data position of a file on a disk. It consists of information about files, directories, access control lists, symbolic links, removable media, segmented files, and the indexes of segmented files. Metadata must be protected because if data is lost, the metadata that locates the data must be restored before the lost data can be retrieved.

metadata device A separate device (for example, a solid-state disk or mirrored device) upon which StorageTek QFS file system metadata is stored. Separating the file data from the metadata can increase performance. In the `mcf` file, a metadata device is declared as an `mm` device within an `ma` file system.

mirror writing The process of maintaining two copies of a file on disjointed sets of disks to prevent loss from a single disk failure.

mount point The directory on which a file system is mounted.

multireader file system The StorageTek QFS multireader file system is a single-writer, multireader capability that enables you to specify a file system that can be mounted on multiple hosts. Multiple hosts can read the file system, but only one host can write to the file system. Multiple readers are specified with the `-o reader` option on the `mount`(1M) command. The single-writer host is specified with the `-o writer` option on the `mount`(1M) command. For more information on the `mount`(1M) command, see the `mount_samfs`(1M) man page.

N

name space The metadata portion of a collection of files that identifies the file, its attributes, and its storage locations.

nearline storage Removable media storage that requires robotic mounting before it can be accessed. Nearline storage is usually less expensive than online storage, but it incurs a somewhat longer access time.

network-attached automated library A library, such as those from StorageTek, ADIC/Grau, IBM, or Sony, that is controlled using a software package supplied by the vendor. The StorageTek ASM file system interfaces with the vendor software using a StorageTek ASM media changer daemon designed specifically for the automated library.

NFS Network file system. A Sun distributed file system that provides transparent access to remote file systems on heterogeneous networks.

NIS The SunOS 4.0 (minimum) Network Information Service. A distributed network database containing key information about the systems and the users on the network.

The NIS database is stored on the master server and all the slave servers.

O

offline storage Storage that requires operator intervention for loading.

offsite storage Storage that is remote from the server and is used for disaster recovery.

online storage Storage that is immediately available (for example, disk cache storage).

P

partition A portion of a device or a side of a magneto-optical cartridge.

preallocation The process of reserving a contiguous amount of space on the disk cache for writing a file. This ensures that the space is contiguous. Preallocation can be performed only on zero-sized files. That is, the `setfa l` command can be specified only for a file that is size zero. For more information, see the `setfa`(1) man page.

prioritizing preview requests Assigning priority to archive and stage requests that cannot be immediately satisfied.

pseudo device A software subsystem or driver with no associated hardware.

Q

quota The amount of system resources that a user is allowed to consume.

R

RAID Redundant array of independent disks. A disk technology that uses several independent disks to reliably store files. It can protect against data loss from a single disk failure, can provide a fault-tolerant disk environment, and can provide higher throughput than individual disks.

recycler A StorageTek ASM utility that reclaims space on cartridges that is occupied by expired archive copies.

release priority A method of calculating the release priority of a file within a file system by multiplying various weights by the corresponding file properties and then summing the results.

releaser A StorageTek ASM component that identifies archived files and releases their disk cache copies, thus making more disk cache space available. The releaser automatically regulates the amount of online disk storage to high and low thresholds.

remote procedure calls See RPC.

removable media file A special type of user file that can be accessed directly from where it resides on a removable media cartridge, such as magnetic tape or optical disk cartridge. Also used for writing archive and stage file data.

robot The portion of an automated library that moves cartridges between storage slots and drives. Also called a transport.

round robin A data access method in which entire files are written to logical disks in a sequential fashion. When a single file is written to disk, the entire file is written to the first logical disk. The second file is written to the next logical disk, and so on. The size of each file determines the size of the I/O.

By default, StorageTek QFS and StorageTek ASM file systems implement striped data access unless striped groups are present. Files are round-robined if round robin access is specified. If the file system contains mismatched striped groups, striping is not supported and round robin is forced.

Also see glossary entries for disk striping and striping.

RPC Remote procedure calls. The underlying data exchange mechanism used

by NFS to implement custom network data servers.

S

samfsdump A program that creates a control structure dump and copies all the control structure information for a given group of files. It is analogous to the UNIX `tar`(1) utility, but it does not generally copy file data.

samfsrestore A program that restores inode and directory information from a control structure dump.

SCSI Small Computer System Interface. An electrical communication specification commonly used for peripheral devices such as disk and tape drives and automated libraries.

small computer system interface See SCSI.

soft limit For disk quotas, a threshold limit on file system resources (blocks and inodes) that you can temporarily exceed. Exceeding the soft limit starts a timer. When you exceed the soft limit for the specified time (default is one week), no further system resources can be allocated until you reduce file system use to a level below the soft limit.

staging The process of copying a nearline or offline file from archive storage back to online storage.

storage Family Set A set of disks that are collectively represented by a single disk family device.

storage slots Locations inside an automated library in which cartridges are stored when not being used in a drive. If the library is direct-attached, the contents of the storage slots are kept in the automated library's catalog.

stripe size The number of disk allocation units (DAUs) to allocate before moving to the next device of a stripe. If `stripe=0`, the file system uses round-robin access, not striped access.

striped group A collection of devices within a StorageTek QFS file system and defined in the `mcf` file as one (usually two) or more `g`*XXX* devices. Striped groups are treated as one logical device and are always striped with a size equal to the disk allocation unit (DAU). You can specify up to 128 striped groups within a file system, but you can specify no more than 252 total devices.

striping A data access method in which files are simultaneously written to logical disks in an interlaced fashion. All StorageTek QFS and StorageTek ASM file systems enable you to declare either striped or round robin access for each individual file system. The StorageTek QFS file systems enable you to declare striped groups within each file system. Also see the glossary entry for round robin.

StorageTek QFS A high-speed UNIX file system that separates the file system metadata from the file data by storing them on separate devices. The StorageTek QFS software controls the access to all files stored and all devices configured in the master configuration file (`mcf`).

StorageTek ASM The StorageTek Storage and Archive Manager File System. The StorageTek ASM software controls the access to all files stored and all devices configured in the master configuration file (`mcf`).

StorageTek ASM-QFS The StorageTek ASM-QFS software combines the StorageTek ASM software with the StorageTek QFS file system. StorageTek ASM-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

StorageTek ASM command set as well as standard UNIX file system commands.

StorageTek ASM-Remote client A StorageTek ASM-Remote client is a StorageTek ASM system that establishes a StorageTek ASM-Remote client daemon that contains a number of pseudodevices. It might or might not have its own library devices. The client depends on a StorageTek ASM-Remote server for archive media for one or more archive copies.

StorageTek ASM-Remote server The StorageTek ASM-Remote server is both a full-capacity StorageTek ASM storage management server and a StorageTek ASM-Remote server daemon that defines libraries to be shared among StorageTek ASM-Remote clients.

superblock A data structure in the file system that defines the basic parameters of the file system. It is written to all partitions in the storage Family Set and identifies the partition's membership in the set.

T

tar Tape archive. A standard file and data recording format used by the StorageTek ASM software for archive images.

TCP/IP Transmission Control Protocol/ Internet Protocol. The internet protocols responsible for host-to-host addressing and routing, packet delivery (IP), and reliable delivery of data between application points (TCP).

thresholds A mechanism for defining the desirable available storage window for online storage. Thresholds set the storage goals for the releaser. Also see disk space thresholds.

timer Quota software that keeps track of the time elapsed between a user reaching a soft limit and a hard limit being imposed on the user.

V

volume A named area on a cartridge for sharing data. A cartridge has one or more volumes. Double-sided cartridges have two volumes, one on each side.

volume overflow A capability that enables the system to span a single file over multiple volumes. Volume overflow is useful for sites using very large files that exceed the capacity of their individual cartridges.

VSN Volume serial name. If you are archiving to removable media cartridges, the VSN is a logical identifier for magnetic tape and optical disk that is written in the volume label. If you are archiving to disk cache, this is the unique name for the disk archive set.

W

WORM Write once read many. A storage classification for media that can be written only once but read many times.

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