Application Storage Manager™ (ASM) for Unix

ASM-Remote Administrator's Guide

Version 3.5.0

Part Number 313498201

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Application Storage Manager™ (ASM) for Unix Version 3.5.0, Edition 2, July 15, 2002, Part Number 313498201

This edition applies to the Application Storage Manager™ (ASM) for Unix product and to all modifications of that product until otherwise indicated in new editions or revisions pages. If there are changes in the product or improvements in the information about the product, this document will be revised and reissued.

Comments concerning the contents of the manual should be directed to:

ASM Product Management
Storage Technology Corporation
One StorageTek Drive, MS 2129
Louisville, CO 80028-2129

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New Features

The ASM-Remote Administrator's Guide, Part Number 313498201, revision 3.5.0, supports the ASM and ASM-QFS 3.5.0 releases running on the Solaris 2.6, 2.7, and 2.8 platforms. No new features were added to this release specifically to support ASM-Remote, but the changes to the default file locations in the ASM and ASM QFS environments also affect the ASM-Remote environment.

Record of Revision

Revision	Description
3.3	June 1998. Original printing.
3.5.0	July 2001. This rewrite supports version 3.5.0-20 and later releases.
3.5.0	July 2002. Document update.

Table of Contents

Preface

This manual describes the ASM-Remote client and ASM-Remote server storage management system. This software allows you to share libraries and other removable media devices in an ASM or ASM QFS environment. The release level of the ASM-Remote software must be the same as the release level of ASM or ASM QFS software that is running on the client or server systems. In addition, the release levels of the StorageTek software running on the client and server systems must be the same.

The ASM-Remote Administrator's Guide is written for system administrators responsible for setting up and maintaining ASM and ASM QFS software. You, the system administrator, are assumed to be knowledgeable about Solaris operating system procedures, including creating accounts, performing system backups, and other basic Solaris system administrator tasks. It is also assumed that you are familiar with installing, configuring, administering, and using StorageTek software.

Other StorageTek software products, such as ASM-Segment, can be licensed for use within the ASM-Remote environment. For more information on this and other StorageTek products, see the Licensing subsection in this preface.

This manual is organized as follows:

Section	Title
Chapter 1	Overview
Chapter 2	Initial Installation and Configuration Procedure
Chapter 3	Upgrade Procedure
Chapter 4	Recycling With ASM-Remote
Chapter 5	Notes
Appendix	StorageTek Product Support

In addition to the preceding sections, the glossary section defines terms used in StorageTek documentation.

Conventions

The following conventions and terms are used throughout this manual:

Convention	Meaning
Courier	The fixed-space courier font denotes literal items such as commands, files, path names, system prompts, system output, and messages. For example: `/etc/opt/LSCsamfs/mcf`
Bold courier	The **`bold courier`** font denotes text you enter at the shell prompt. For example: **`server# sls -D`**
[ ]	Brackets enclose optional portions of commands or optional arguments to commands.
Italic	Italics indicate either a variable or a term being defined. For a variable, you must replace the variable with a real name or value. For example: `server# mount` *mnt_pt*
|	The pipe symbol indicates that one of two or more optional arguments must be specified.

Certain terms are used throughout this manual. Many terms can be found in the glossary, but some of the most commonly used ones are as follows:

Term	Meaning
Archiving	Automatically copying online, magnetic disk cache files to archive media.
Automated library	An automated device for storing tape and optical cartridges.
Cartridge	A tape or magneto optical cartridge.
Partition	A side of a magneto optical disk or a partition on an Ampex tape.
Staging	Automatically copying files located on archive media back to online disk.
Volume	A named area on a cartridge for storing data. A cartridge has one or more volumes. Double-sided cartridges have two volumes, one on each side.

Other StorageTek Publications

In addition to this manual, the following StorageTek publications might be useful to you:

ASM Migration Toolkit Guide

ASM for Unix Man Page Reference Manual

ASM File System Administrator's Guide

ASM Installation and Configuration Guide

ASM Administrator's Guide

Peripherals and Third-Party Software Supported
`http://www.StorageTek.com` in the Customer Resource Center (CRC)

All of the preceding manuals are available in PDF format from the following website:

http://www.StorageTek.com in the Customer Resource Center (CRC)

To order additional manuals, please send us a request using one of the methods described in the "Reader Comments" subsection.

Other File System Publications

In addition to publications from StorageTek, the following publications on UNIX file systems might interest you:

Filesystem Hierarchy Standard (FHS) web pages at the following URL:
`http://www.pathname.com/fhs/2.0/fhs-toc.html`

Sun Microsystems online documentation web pages at the following URL:
`http://docs.sun.com`

Licensing

Licenses for StorageTek products can be obtained from StorageTek. In some cases, the capabilities that these additional licenses can provide are described in the ASM or ASM QFS documentation because these products can be used within those environments. For information on obtaining licenses for StorageTek software, contact your sales representative, your Authorized Service Provider (ASP), or StorageTek.

Each of the following StorageTek products are licensed separately:

ASM Migration Toolkit

ASM QFS standalone

ASM

ASM QFS

ASM-Remote client

ASM-Remote server

ASM-Segment

ASM QFS Share

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, please let us know. We value your comments and will respond to them promptly. You can contact us by one of the following methods:

Send a facsimile (FAX) with your comments to ASM Product Management at: 303-661-8088

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ASM Product Management
StorageTek
MS 2138
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Chapter 1 - Overview

The ASM-Remote client and the ASM-Remote server form a client/server package that allows the sharing of libraries and other removable media devices on ASM and ASM QFS servers. ASM-Remote also allows you to configure multiple storage clients that archive and stage files from a centralized optical and/or tape library.

Figure 1-1 shows an environment configured with two ASM-Remote servers, each with two clients.

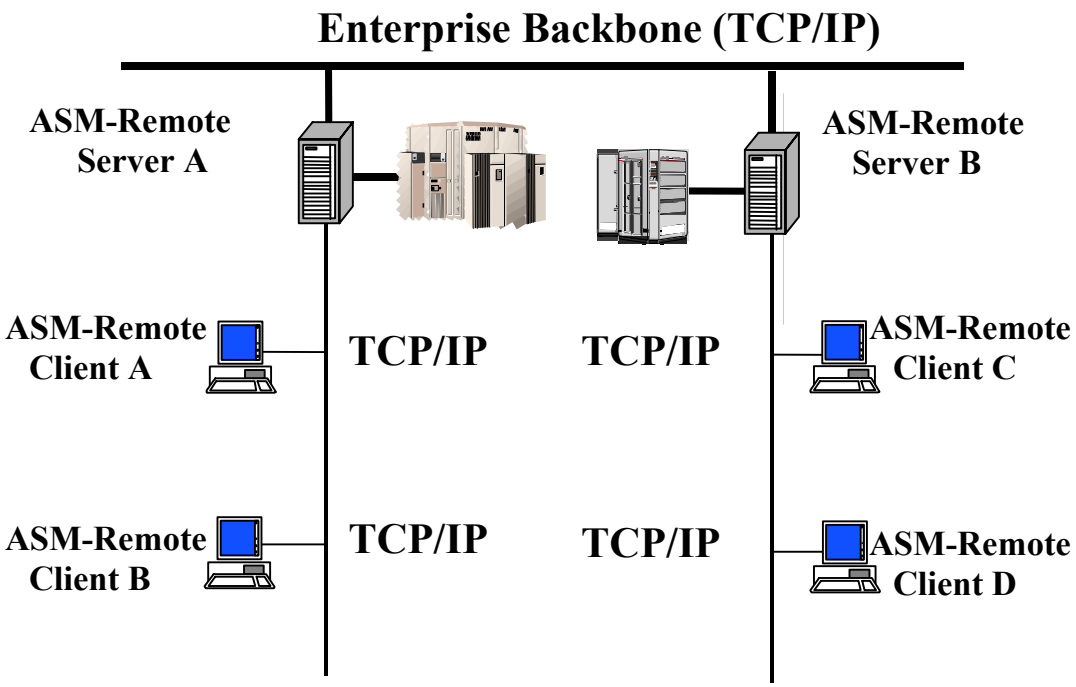

Figure 1-1. ASM-Remote Servers and Clients

ASM-Remote Features

ASM-Remote provides the following advantages:

Allows for remote sharing of an expensive removable media resource, such as a library, between one or more ASM-Remote clients.

Allows clients to migrate data to a server with or without buffering of data.

Allows multiple ASM servers to be hosts to one another.

ASM-Remote Requirements

ASM-Remote 3.5.0 requires the following:

Licensed and installed ASM or ASM QFS 3.5.0 software.

A licensed Solaris 2.6, 2.7, or 2.8 client configured with ASM or ASM QFS 3.5.0.

A network connection running TCP/IP between the clients and the server upon which ASM or ASM QFS 3.5.0 is installed.

ASM-Remote Limitations

You can recycle media using ASM-Remote, but this should only be attempted after thorough testing of your environment. For more information, see chapter 4, “Recycling With ASM-Remote”.

ASM-Remote Technical Overview

ASM-Remote clients interact with the ASM-Remote server using TCP/IP. The network between the ASM-Remote clients can be any network type supported by the Solaris operating system, such as Ethernet, Fast Ethernet, FDDI, Fiber Channel, and HIPPI.

Figure 1-2 shows an ASM-Remote client and ASM-Remote server interactions.

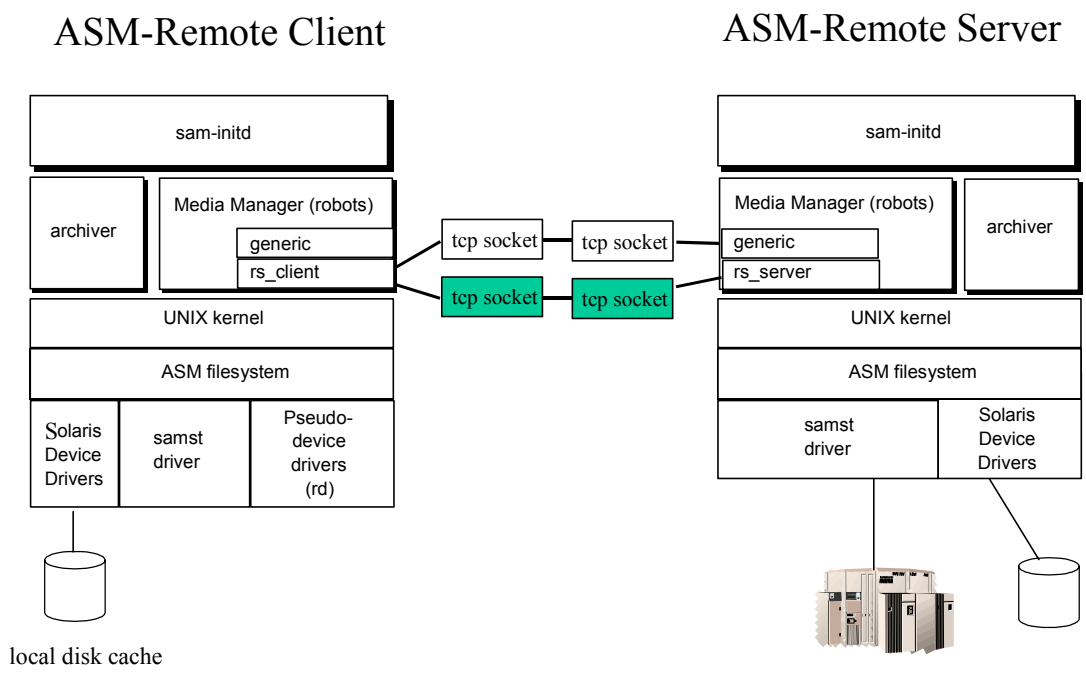

Figure 1-2. ASM-Remote Servers and Clients

The ASM-Remote Client

The ASM-Remote client is an ASM or ASM QFS system that establishes an ASM-Remote client daemon containing a number of pseudo-devices. The client daemon is defined in the client's `/etc/opt/LSCsamfs/mcf` file with an equipment type of `sc` , which is a mnemonic for ASM-Remote client. For more information on the client daemon, see the `sam-clientd`(1M) man page.

A pseudo-device defines a network connection to an actual device on the ASM-Remote server. Pseudo-devices have an equipment type of `rd`, which is a mnemonic for remote device, and are defined in the ASM-Remote client's `/etc/opt/LSCsamfs/mcf` file. The ASM-Remote daemon and pseudo-devices are associated with one particular server.

By default, the ASM-Remote daemon allows up to 32 pseudo-devices for each client. The actual number of pseudo-devices to be used by the client is configurable. How many pseudo-devices should be configured per client? Think of these devices as the number of simultaneous data transfers that can occur between the client and the server. As more pseudo-devices are defined, the possibility of increasing the total network traffic load increases. It is up to you, the system administrator, to determine the actual number of pseudo-devices needed for the system.

The ASM-Remote Server

The ASM-Remote server daemon consists of a full-capability ASM or ASM QFS storage management server and an ASM-Remote server daemon that defines libraries to be shared among the clients. The server daemon defines clients with an equipment type of `ss`, which is a mnemonic for ASM-Remote server. A unique family set name must be provided for each server daemon as well, this allows additional server daemons to be defined. Up to 10 clients can be configured per server daemon. For more information on the server daemon, see the `sam-serverd`(1M) man page.

The server also defines a disk buffer area to be used for buffering archive files. This disk buffer is used only when writing data to the server. It is not used when staging files from the server back to the client. A disk buffer is not required, but by defining a disk buffer, the data movement speeds on the network and the server tape drives can be matched for optimal performance. You can configure the disk buffer size and set minimum and maximum parameters to accommodate bypassing the disk buffer.

Interaction between the ASM-Remote Client and ASM-Remote Server

When an ASM-Remote server is initialized, the `sam-initd` daemon searches for a license key that allows for both an ASM-Remote server and one or more clients. If the license key does not exist, or if it does not match the configuration, `sam-initd` ignores all `mcf` entries related to the server and client. For more information on `sam-initd`, see the `sam-initd`(1M) man page.

The ASM-Remote server daemon, `sam-serverd`, listens for the clients on port 1000. If you want to use a different port, you should reconfigure the port the Solaris `/etc/services` directory with a service name of `rmtsam`. When an ASM-Remote client connects to the ASM-Remote server, `sam-serverd` establishes another connection on another port and communicates this port number to that client, using the defined port. The socket size is passed to the client. The socket size is configurable and is described in more detail in chapter 2, “Initial Installation and Configuration Procedure”.

Library Catalogs

The ASM-Remote library catalog is a subset of the catalog located on the ASM-Remote server. The client catalog is updated in real time. The slots allotted to an ASM-Remote client catalog are controlled only by the ASM-Remote server. A

previous figure, figure 1-2, shows a typical multiclient catalog as it resides on both a server and its clients.

Upon initialization, a client catalog is built and passed to the ASM-Remote client based on information from the ASM-Remote Server Client File, which is described in detail in chapter 2, "Initial Installation and Configuration Procedure". If the connection between the client and server is lost, this flags the media on the client side as unavailable. Media availability can be viewed through the `samu`(1M) `v` display. After the connection between the host and client is established, media available to the client is flagged as available.

Changes to the catalog are passed back and forth between hosts as necessary. Any changes in the server catalog that involve a media type associated with a client are passed on to the client and the client catalog is updated.

Archiving

ASM-Remote archive processing is the same as with ASM and ASM QFS. The ASM-Remote client makes a mount request to be added to the server's mount request table. The client then waits for the server to respond with a message indicating that the media is mounted message. Archiving begins after the media is available.

Chapter 2 - Initial Installation and Configuration Procedure

This chapter describes how to perform an initial installation and configuration of the ASM-Remote server and client software. Figure 2-1 depicts a sample configuration used in these procedures. The examples configure an ASM-Remote server, `trantor`, with two ASM-Remote clients: `ultra1` and `eyeball`.

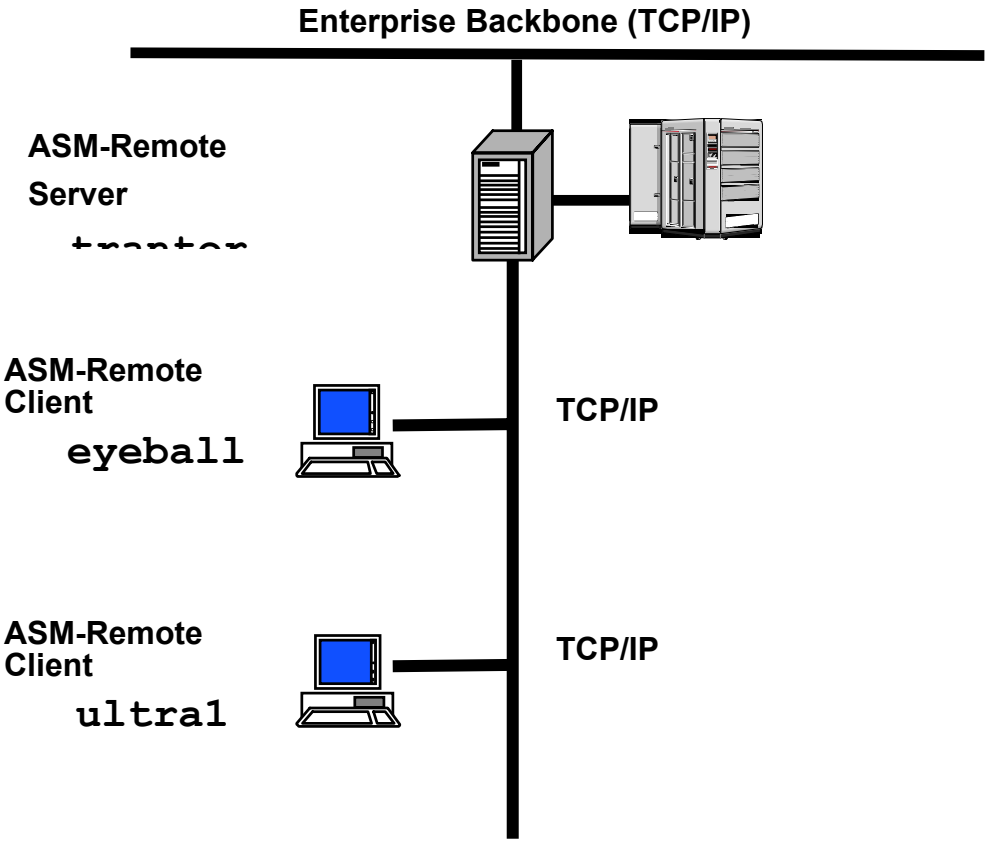

Figure 2-1. Example ASM-Remote Configuration

For information on upgrading your ASM-Remote software, see chapter 3, "Upgade Procedure".

Step 1: Obtain Superuser Access

You must have superuser (`root`) access to the systems upon which the ASM-Remote client and server software are to be installed.

Step 2: Verify Client and Server Configurations

ASM-Remote requires that both the server and clients be running ASM or ASM QFS revision 3.5.0. If you are not running ASM or ASM QFS 3.5.0 on these systems, you must install the software on the server and clients now. It is assumed that the ASM or ASM QFS environments are properly configured and operational.

Ensure that you are running ASM or ASM QFS by using the `pkginfo`(1M) command on each server and examining the output. The following example shows how to obtain ASM software package information:

```
server# pkginfo | grep LSC
application LSCjre       sam Java(tm) Runtime Environment Solaris 2.8
system      LSCsamfs     sam Advanced Storage Management Solaris 2.8
server#
```

For the installed `LSCsamfs` software package, you need to verify that the version of this package is the `sam`e as the ASM-Remote version that you are installing. The following example command shows how to use the `-l` option to the `pkginfo`(1) command to return package version information:

```
server# pkginfo -l LSCsamfs
   PKGINST:        LSCsamfs
      NAME:        ASM Solaris 2.8
  CATEGORY:        system
      ARCH:        SUNW,Ultra-60
   VERSION:        3.5.0-30
    VENDOR:        StorageTek
    PSTAMP:        cosmic20010430163055
  INSTDATE:        Apr 30 2001 22:46
   HOTLINE:        Please contact your local service provider
    STATUS:        completely installed
     FILES:        370 installed pathnames
                    21 shared pathnames
                    1 linked files
                    42 directories
                    130 executables
                    24706 blocks used (approx)
```

Using the preceding output as an example, if you are running an ASM or ASM QFS release prior to 3.5.0-30, you must upgrade to 3.5.0-30. For a complete description of the upgrade procedure, see the ASM Installation and Configuration Guide.

Step 3: Verify the Server and Client Software Licenses

Both the server and the clients must have a license key in order to run ASM-Remote. If you do not have a `StorageTek` license key for both the server and the clients, contact your Authorized Service Provider (ASP) or StorageTek. For information on contacting your ASP or StorageTek, see appendix A, "StorageTek Product Support".

You will need the following identification information:

Company purchase order (PO) number

Company name, address, phone, and contact information

Host ID upon which the ASM-Remote server is to be licensed. To display the host ID on your system, use the `hostid`(1) command. To install the ASM-Remote software package, you need the following information for each automated library to be used in the ASM-Remote environment:

- The vendor name and the model of the automated library and the type of media cartridge used in the automated library.
- The number of slots for each automated library and the media cartridge type.

Host ID upon which the ASM-Remote client is to be licensed.

The license keys for ASM-Remote 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 have exceeded the number of slots allowed for the license. If you exceed the number of slots for which the system is licensed, you cannot import or label cartridges, nor can you mount media into drives. Access continues unaffected for files already on disk.

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

After you have your license keys, place them on the server and clients, starting in column one, in the following file:

```
/etc/opt/LSCsamfs/LICENSE.3.5
```

Each license key must be on a separate line, and all keys must start in column one. No other keywords, host ids, or other information can appear. The license becomes effective the next time the `sam-initd` daemon is started.

The following `samu`(1M) `l` display shows license information:

```
License Information                          samu   3.5.0-30
Tue May 1 12:16:59
License: License never expires.

hostid = 7232855a
License never expires
Remote sam server feature enabled
Remote sam client feature enabled
Migration toolkit feature enabled
Fast file system feature enabled
Direct media access feature enabled
Segment feature enabled
Robot type Spectra Logic Library is present and licensed
    30 at slots present and licensed
```

For more information on `samu`(1M), see the ASM Administrator's Guide, or see the `samu`(1M) man page.

Step 4: Obtain the Release Files

The ASM-Remote software can be obtained on a CD-ROM or by anonymous FTP. Contact your ASP or StorageTek for information on obtaining the software in one of these ways.

If you have a CD-ROM, run the Solaris Volume Manager, insert the CD-ROM, and change the directory to the ASM-Remote software files by using the following command:

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

Step 5: Stop the ASM or ASM QFS File System (Optional)

If the ASM or ASM QFS system is running, you must stop it.

To stop the ASM or ASM QFS file system, enter the following command:

```
server# samcmd idle eq                # see NOTE
```

server# samd stop

NOTE

The drives in your ASM or ASM QFS environment should be idled prior to issuing the `samd stop` command. This allows the archiver, stager, and other processes to complete current tasks. To idle the drives, enter a `samcmd idle` *eq* command for each *eq* configured in your `mcf` file. Alternatively, you can also idle the drives by using the `samu`(1M) operator utility or by using either the `robottool`(1M) or `libmgr`(1M) Graphical User Interface (GUI) tools. For more information on the `samcmd`(1M) command, see the `samcmd`(1M) man page.

The `samd`(1M) command is installed in `/opt/LSCsamfs/sbin`.

Step 6: Install the ASM-Remote Software

The ASM-Remote software must be installed on the ASM-Remote server and all clients. ASM-Remote uses the Solaris packaging utilities for adding and deleting software. As such, you must be logged in as superuser to make changes to software packages. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the package.

Run the `pkgadd`(1M) command to install all packages. Answer `yes` to each of the questions. The following example shows the complete output from an ASM-Remote `pkgadd` session:

```
host# cd /cdrom/cdrom0/2.8
host# pkgadd -d samrem
host# pkgadd -d samrem

The following packages are available:
  1  LSCremote     sam Remote Solaris 2.8
                   (SUNW,Ultra-60) 3.5.0-30

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: all

Processing package instance <LSCremote> from </tmp/samrem>

ASM-Remote Solaris 2.8
(SUNW,Ultra-60) 3.5.0-30

        samFS - Application Storage Manager™ (ASM) File System
```

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Driver (samrd) not installed.

DO YOU ACCEPT the terms of the StorageTek License Agreement (YES,NO,VIEW) ? YES
Processing package information.
Processing system information.
1 package pathname is already properly installed.
Verifying package dependencies.
Verifying disk space requirements.
Checking for conflicts with packages already installed.

The following files are already installed on the system and are being used by another package:
/kernel/drv/sparcv9 <attribute change only>
* /opt/LSCsamfs/doc <attribute change only>
/opt/LSCsamfs/man <attribute change only>
/opt/LSCsamfs/man/man7 <attribute change only>

* - conflict with a file which does not belong to any package.

Do you want to install these conflicting files [y,n,?,q] y
Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user permission during the process of installing this package.

Do you want to continue with the installation of <LSCremote> [y,n,?q] y

```
Installing ASM-Remote Solaris 2.8 as <LSCremote>

## Installing part 1 of 1.
/kernel/drv/samrd
/kernel/drv/samrd.conf
/kernel/drv/sparcv9/samrd
/opt/LSCsamfs/doc/SG-0003.pdf
/opt/LSCsamfs/lib/librmtsam.so
/opt/LSCsamfs/man/man7/sam_remote.7
/opt/LSCsamfs/sbin/sam-clientd
/opt/LSCsamfs/sbin/sam-serverd
[ verifying class <none> ]
|## Executing postinstall script.
```
Adding device driver samrd

```
Installation of <LSCremote> was successful.
#
```

Step 7: Configure the ASM-Remote Client `mcf` File

On the client, edit the existing ASM or ASM QFS `/etc/opt/LSCsamfs/mcf` file to define the system as an ASM-Remote client.

In this subsection's example, the `mcf` file on client `eyeball` is edited. The resulting `mcf` file defines an ASM file system and shows the `ASM-Remote` client `eyeball` being defined to `ASM-Remote` server `trantor`.

The `mcf` file on `eyeball` is as follows:

```
# MCF file on eyeball
#
# sam file system
#
# Equipment               Eq   Eq  Family     Eq  Additonal
# Identifier              Ord  Ty  Set        St  Parameters
# ==========              ===  ==  ======     ==  ==========
samfs1                      1  ms  samfs1
/dev/dsk/c1t1d0s0          10  md  samfs1     on  /dev/rdsk/c1t1d0s0
/dev/dsk/c1t2d0s0          12  md  samfs1     on  /dev/rdsk/c1t2d0s0
#
# Define ASM-Remote Client eyeball to ASM-Remote server trantor
#
/etc/opt/LSCsamfs/rmt200  200 sc trantorss on
/var/opt/LSCsamfs/catalog/tcat
/dev/samrd/rd0            201  rd  trantorss
/dev/samrd/rd1            202  rd  trantorss
```

The `mcf` entry on the client consists of a single line entry for the `ASM-Remote` client and a pseudo-device entry for each device you want to configure. These entries follow the syntax as defined on the `mcf`(4) man page.

The first set of entries defines an ASM file system.

The second set of entries defines the ASM-Remote client, eyeball, to the ASM-Remote server, `trantor`. The first line defines the ASM-Remote server itself. The fields are as follows:

The `Equipment Identifier` field is the path name to the client configuration file, which is created in "Step 7: Configure the Client Configuration File". In this example, the configuration file is named `/etc/opt/LSCsamfs/rmt200`.

The `Equipment Ordinal` field contains a unique number such that $1 \leq$ `Equipment Ordinal` ≤ 65535. This `Equipment Ordinal` is `200`.

The `Equipment Type` field contains a two-letter mnemonic, `sc` , which identifies an ASM-Remote client.

The Family Set name, trantorss, is the same as the Family Set name of the server. Note that a server can have more than one server daemon. This is the Family Set name of the daemon to use on this particular server.

The Device State field specifies on, meaning to assume the default state, which is on.

The Additional Parameters field is optional. As shown, a path to the catalog file can be specified here.

The last two entries in this mcf file define the ASM-Remote pseudo devices. A pseudo device defines a network connection to an actual device on the ASM-Remote server. These entries are as follows:

The Equipment Identifier field is the path name to the /dev/samrd/rd* entry to be used by the pseudo device. These entries are created when the system is rebooted.

The Equipment Type field is the 2-letter mnemonic rd for pseudo devices.

The Family Set name trantorss is the same as the Family Set name of the client entry.

The same configuration process must be completed for client ultra1.

Step 8: Configure the ASM-Remote Client Configuration File

The ASM-Remote client's configuration file contains a single line entry: the name of the ASM-Remote server. As shown in the previous subsection, the full path name of this client configuration file is specified in the client's mcf file.

In this subsection's example, the following client configuration file on eyeball points to the system ASM-server called trantor. Here it is viewed using cat(1):

```
eyeball# cat /etc/opt/LSCsamfs/rmt200

trantor
```

Step 9: Configure the ASM-Remote Server mcf File

On the server, edit the existing ASM or ASM QFS /etc/opt/LSCsamfs/mcf file to define the system as an ASM-Remote server.

In this subsection's example, the `mcf` file on server `trantor` is edited. The resulting `mcf` file defines an ASM file system and defines `trantor` as an ASM-Remote server.

The `mcf` file on `trantor` is as follows:

```
# mcf file on ASM-Remote server trantor:
# Eq Identifier      Eq Ord  Eq Typ  Fam Set Dev St  Addl Params
#
samfs1               1     ms      samfs1
/dev/dsk/c2t6d0s0     11     md      samfs1  on  /dev/rdsk/c2t6d0s0
/dev/dsk/c2t6d0s1     12     md      samfs1  on  /dev/rdsk/c2t6d0s1
#
# define a tape library that client eyeball can use:
/dev/samst/c0t3u0  100 rb rb100 - /var/opt/LSCsamfs/catalog/rb100.cat
/dev/rmt/0cbn        101     tp      rb100   -
/dev/rmt/1cbn        102     tp      rb100   -

# Define ASM-Remote server trantor
#
/etc/opt/LSCsamfs/rmt200 50  ss      trantorss  on
```

These entries follow the syntax as defined in `mcf`(4), and in this example file, they are as follows:

The `Equipment Identifier` field is the path name to the server configuration file, which you configure in the subsequent installation step. In this example, the file is named `/etc/opt/LSCsamfs/rmt200`.

The `Equipment Ordinal` field contains a unique number such that $1 \leq$ `Equipment Ordinal` ≤ 65535. In this example, the `Equipment Ordinal` is `50`.

The `Equipment Type` field contains a two-letter mnemonic, `ss`, that identifies the ASM-Remote Server.

The `Family Set` name, `trantorrs`, matches the family set name used in the `mcf` file of the client. Note that a server may have more than one server daemon defined.

The `Device State` field, which is optional, specifies `on` in this example.

The `Additional Parameters` field is optional. In this example `mcf` file, it contains the path to the catalog file.

NOTE

There need not be any StorageTek file systems configured in the mcf file for the ASM-Remote server.

Step 10: Configure the ASM-Remote Server Configuration File

You need to create an ASM-Remote server configuration file. This file defines the disk buffer characteristics and media to be used for each client. Ten clients can be configured per server daemon. If you want to support more clients, you must configure another ASM-Remote server daemon as described previously in steps 8 and 9.

The following example shows server configuration file `/etc/opt/LSCsamfs/rmt200`, which resides on ASM-Remote server `trantor`. This file defines two clients: `eyeball` and `ultra1`.

```
#
#sam-Remote server configuration file /etc/opt/LSCsamfs/rmt200
#
eyeball
    media
    100  at  000031|000032|000034|000035|000037|000038
    endmedia
#
ultra1
    cache_path = /rmt_cache/ultra1, min_size = 100
    max_size = 50000, cache_size = 170000
    media
    30 mo OPT14|OPT11
    endmedia
```

As the preceding `sam`ple file shows, a server configuration file consists of multiline entries for each for each client. The format for this file is as follows:

```
client_name
    [ parameter1 ]
    [ parameter2 ]
    [ . . . ]
    media
        eq media_type regex
    endmedia
```

The elements of the preceding file are as follows:

The client_name is the network name for each client to be served by this invocation of the ASM-Remote daemon. The client_name must start as the first character in the line. The parameter and media specifications following a client name, and up to the next client definition, are specific to this client. The parameter and media definitions must be indented with white space or tab characters.

One or more optional parameter lines define the behavior of the cache disk to be used for buffering files for this client's archive files. The cache is not used during the staging of files to the client. The parameter lines are expressed in keyword = value pairs. If you are specifying more than one parameter, use a comma as a separator. The parameter values are as follows:

Parameter	Definition
cache_path	The path name to the disk buffer to be used on the server. A disk buffer is not required. If specified, the base name of the path cannot be the same as any commonly used system directories, such as `/usr`, `/etc`, `/dev`, `/devices`, `/platform`, `/proc`, `/var`, `/xfn`, and so on.
min_size	The minimum size, in kilobytes, that an archive must achieve before using the disk buffer defined in `cache_path`. If the archive is smaller than `min_size`, the disk buffer is bypassed.
max_size	The maximum size, in kilobytes, that an archive can achieve before bypassing the disk buffer defined in `cache_path`. Any archive larger than `max_size`, bypasses the cache buffer.
cache_size	The size of the disk buffer, in kilobytes. Any archive larger than `cache_size` bypasses the disk buffer.
net_blk_size	The network block size to be used by this client's socket, in kilobytes.
no_cache	Specifies cache processing preferences when there is not enough cache to handle a request. Three processing options are available:

abort	Aborts the request. All data transfer is stopped.
bypass	Bypasses the disk buffer altogether. Default.
wait	Waits until enough cache space becomes available to complete the request.

The `media` and `endmedia` keywords are required. They define the media that a client is allowed to use. These media associations are specified as follows:

```
media
eq media_type regex
endmedia
```

The elements of the media type specification are as follows:

- The `media` and `endmedia` keywords denote the media definition area of the ASM-Remote server configuration file.
- The eq is the `Equipment Ordinal` of a library.
- The media_type is the two-character media type. For information on valid media types, see the `media`(5) man page.
- The regex consists of the volume serial names (VSNs) of the cartridges to which the files will be archived. Each VSN specified must be expressed as an extended regular expression. For information on extended regular expressions, see the `egrep`(1) man page. You can have more than one VSN association line for each library, which allows you flexibility in defining media.

NOTE

StorageTek recommends that you DO NOT allow the same physical media cartridges to be used by more than one client. In addition, if the server has its own file system, it is not recommended that a cartridge be used by both the client and the server.

Step 11: Restart the ASM or ASM QFS Software

To ensure that the new license keys and configuration files on the server and client are read, you must start or restart your ASM or ASM QFS software.

If ASM or ASM QFS are executing at this time, enter the following commands to idle the drives and to stop these processes:

```
server# samcmd idle eq          # see NOTE
server# samd stop
```

To start or restart ASM or ASM QFS, enter the following command on both the client and the server:

```
server# samd start
```

NOTE

The drives in your ASM or ASM QFS environment should be idled prior to issuing the samd stop command. This allows the archiver, stager, and other processes to complete current tasks. To idle the drives, enter a samcmd idle eq command for

each eq configured in your mcf file. Alternatively, you can also idle the drives by using the samu(1M) operator utility or by using either the robottool(1M) or libmgr(1M) Graphical User Interface (GUI) tools. For more information on the samcmd(1M) command, see the samcmd(1M) man page.

For complete instructions on starting and restarting ASM and ASM QFS, see the ASM Installation and Configuration Guide.

Step 12: Ensure That a Connection is Established

Use `samu`(1M) and verify whether the connection between hosts has been established. The `s` and `R` displays show the status of ASM-Remote connections. For more information on `samu`(1M), see the `samu`(1M) man page or see the ASM Installation and Configuration Guide.

From the Client: samu(1M) s Display

The following is an example screen snap from the `samu`(1M) status `s` display taken on the ASM-Remote client, `eyeball`. Note the device type `sc`, which represents the ASM-Remote client. The message below this line indicates that a connection with the server `trantor` has been established.

```
Device status                    samu   3.5.0-30 Wed May 02 14:44:44
License: License never expires.

ty    eq state   device_name                fs status   pos
ms     1 on      samfs1                    1 m---------

md    10 on      /dev/dsk/c1t1d0s0            1 ----------

md    12 on      /dev/dsk/c1t2d0s0            1 ----------

s9    35 on      /dev/samst/c0t5u0           35 m--------r
      move complete
lt    36 on      /dev/rmt/0cbn               35 ---------p
      empty
lt    37 on      /dev/rmt/1cbn               35 ---------p
      empty
lt    38 on      /dev/rmt/2cbn               35 --l------r
      idle
lt    39 on      /dev/rmt/3cbn               35 --l------r
      idle
sc   200 on      /etc/opt/LSCsamfs/rmt200   200 ---------r
      server trantor connected
rd   201 on      /dev/samrd/rd0             200 ---------r
```

```
rd    202 on      /dev/samrd/rd1                200 ---------r

hy    203 on      historian                     203 ----------
```

From the Server: `samu(1M) s` Display

The following is an example screen snap from the `samu`(1M) status `s` display taken on the ASM-Remote server `trantor`. Note the device type `ss`, which represents the ASM-Remote server. This indicates that this system is an ASM-Remote server.

```
Device status                 samu   3.5.0-30 Tue Apr 24 14:49:43
License: License never expires.

ty    eq state   device_name                  fs status   pos
ms     1 on      samfs1                      1 m---------

md     11 on      /dev/dsk/c2t6d0s0              1 ----------

md     12 on      /dev/dsk/c2t6d0s1              1 ----------

ss     50 on      /etc/opt/LSCsamfs/rmt200       50 ---------r

sl    100 on      /dev/samst/c0t3u0             100 m--------r

at    101 on      /dev/rmt/0cbn                 100 ---------p
       initializing
at    102 on      /dev/rmt/1cbn                 100 ---------p
       initializing
hy    103 on      historian                     103 ----------
```

From the Server: `samu(1M) R` Display

The following is an example screen snap from the `samu`(1M) ASM-Remote `R` display taken from ASM-Remote server `trantor`.

```
Remote server eq: 50          addr: 00001ca0 3.5.0-30 Wed May 02 14:55:37
License: License never expires.

message:

Client: eyeball                cache action - bypass cache
cache size - 0                 client index – 0
cache left - 0                 network block size - 4096
max file size - 0              flags  - c0000000
min file size - 8              no-cache connected
```

If you have multiple ASM-Remote clients, pressing the `CONTROL-f` key sequence scrolls you through the clients.

In this screen, the connected client is named `eyeball`. The buffer cache is bypassed in the event that there is not enough cache for a file. The disk buffer is 0 kilobytes in size, and the all of the cache is available. The `client index` field indicates that this client is the zero of a possible 0-9 clients defined for this server daemon. The maximum file size, minimum file size, and network block size is listed in bytes. Flags indicate the state of the connection, as follows: 0x80000000 - no caching will be done for this client; 0x40000000 - a connection has been established; 0x20000000 - waiting on buffer cache.

Step 13: Ensure that Catalog is Available on the Client

For each client, you should be able to view the ASM-Remote catalog available for that client by using the `samu`(1M)'s `v` display to show VSNs. From `samu`(1M), enter the following:

`:v` eq_num

The eq_num must be the `Equipment Number` of the ASM-Remote client daemon as defined in the `mcf` file.

Example 1. The following display was obtained from the `samu`(1M) display on `eyeball`. The following output is obtained by specifying `:v 200`. The following output shows the volumes that `eyeball` can access from `trantor`:

```
Robot VSN catalog by slot      : eq 200  samu   3.5.0-30 Wed May 02 15:24:13
License: License never expires.                          count 32
slot         access time count use flags         ty vsn

  1    none              0   0% -il-o-b-R-U-  at 000032
  2    none              0   0% -il-o-b-R---  at 000034
  3    none              0  91% -il-o-b-----  at 000035
  4    none              0   7% -il-o-b-----  at 000037
  5    none              0   0% -il-o-b-----  at 000038
  6    none              0   0% -il-o-b-----  at 000031
```

Step 14: Check for Archiving

You must verify that archiving is taking place from the client to the server. You can do this by using the `archiver` command and its `-A` option. This option enables a listing to be written from the archiver, and this listing includes the

VSNs from the server. For information on this command, see the `archiver`(1M) man page.

If files are not archiving, see the ASM Administrator's Guide for information on how to troubleshoot the archiver.

Chapter 3 - Upgrade Procedure

This chapter describes how to upgrade your ASM-Remote software from a release level prior to 3.5.0. For information on the initial installation and configuration procedure, see chapter 2, "Initial Installation and Configuration Procedure".

The upgrade process is very similar to the initial installation process except for the steps taken to add the ASM-Remote client and server to the `mcf` files and the steps to add the configuration files. Because these processes are so similar, few examples are provided in this chapter and you are asked to refer to chapter 2, "Initial Installation and Configuration Procedure" for detailed information and examples.

Step 1: Obtain Superuser Access

You must have superuser (`root`) access to the systems upon which the ASM-Remote software is to be installed.

Step 2: Verify Client and Server Configurations

ASM-Remote requires that both the server and clients be running ASM or ASM QFS revision 3.5.0. If you are not running ASM or ASM QFS 3.5.0 on these systems, you must install the software on the server and clients now. It is assumed that the ASM or ASM QFS environments are properly configured and operational.

Ensure that you are running ASM or ASM QFS, version 3.5.0, by using the `pkginfo`(1) command on each server and examining the output, as follows:

```
server# pkginfo | grep LSC
```

Also run the `pkginfo`(1) command with the `-l` option on the `LSCsamfs` package to determine its release and revision level. It must match the release and revision level of the ASM-Remote (`LSCrem`) package that you are about to install. This command is as follows:

server# pkginfo –l LSCsamfs

If you are running an ASM or ASM QFS release that is earlier than the ASM-Remote release package that you are about to install, you must upgrade the system to the release level of the `LSCsamfs` package. For a complete description of the ASM and ASM QFS installation process, see the ASM Installation and Configuration Guide.

Step 3: Verify the Server and Client Software Licenses

Both the server and the clients must have a license key in order to run ASM-Remote. If you do not have an StorageTek license key for both the server and the clients, contact your Authorized Service Provider (ASP) or StorageTek. For information on contacting your ASP or StorageTek, see appendix A, "StorageTek Product Support".

You will need the following identification information:

Company purchase order (PO) number

Company name, address, phone, and contact information

Host ID upon which the ASM-Remote server is to be licensed. To display the host ID on your system, use the `hostid`(1) command. To install the ASM-Remote software package, you need the following information for each automated library to be used in the ASM-Remote environment:

- The vendor name and the model of the automated library and the type of media cartridge used in the automated library.
- The number of slots for each automated library and the media cartridge type.

Host ID upon which the ASM-Remote client is to be licensed.

The license keys for ASM-Remote 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 have exceeded the number of slots allowed for the license. If you exceed the number of slots for which the system is licensed, you cannot import or label cartridges. Access continues unaffected for files already on disk.

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

After you have your license keys, place them on the server and clients, starting in column one, in the following file:

```
/etc/opt/LSCsamfs/LICENSE.3.5
```

Each license key must be on a separate line, and all keys must start in column one. No other keywords, host ids, or other information can appear. The license becomes effective the next time the `sam-initd` daemon is started.

Step 4: Obtain the Release Files

The ASM-Remote software can be obtained on a CD-ROM or by anonymous FTP. Contact your ASP or StorageTek for information on obtaining the software in one of these ways.

If you have a CD-ROM, run the Solaris Volume Manager, insert the CD-ROM, and change the directory to the ASM-Remote software files by using the following command:

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

Step 5: Stop the ASM or ASM QFS File System (Optional)

If your ASM or ASM QFS system is currently, running, you must stop it,.

To stop the ASM or ASM QFS file system, enter the following command:

```
server# samcmd idle eq              # see NOTE

server# samd stop
```

NOTE

The drives in your ASM or ASM QFS environment should be idled prior to issuing the samd stop command. This allows the archiver, stager, and other processes to complete current tasks. To idle the drives, enter a samcmd idle eq command for each eq configured in your mcf file. Alternatively, you can also idle the drives by using the samu(1M) operator utility or by using either the robottool(1M) or libmgr(1M) Graphical User Interface (GUI) tools. For more information on the samcmd(1M) command, see the samcmd(1M) man page.

The `samd`(1M) command is installed in `/opt/LSCsamfs/sbin`.

Step 6: Remove the Installed ASM-Remote Software

You must remove the existing ASM-Remote packages on each client and server upon which they are presently installed.

Enter the following `pkginfo`(1) command on each server that is presently configured as an ASM-Remote server or an ASM-Remote client:

server# pkginfo | grep LSCrem

Use the following `pkgrm`(1M) command to remove the `LSCrem` package from all clients and servers:

server# pkgrm samrem

Step 7: Install the ASM-Remote Software

The ASM-Remote software must be installed on the ASM-Remote server and all clients. ASM-Remote uses the Solaris packaging utilities for adding and deleting software. As such, you must be logged in as superuser to make changes to software packages. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the package.

Run the `pkgadd`(1M) command to install all packages. Answer `yes` to each of the questions. The following example shows the commands to be entered:

```
host# cd /cdrom/cdrom0/2.8     # use this command if you are installing from a CD-ROM
host# pkgadd -d samrem
```

If the installation process is successful, the following message is displayed at the end:

```
Installation of <LSCremote> was successful.
```

Step 8: Verify the ASM-Remote Client `mcf` File

Verify that the `mcf` file specifies the ASM-Remote client and that the `mcf` file resides in `/etc/opt/LSCsamfs/mcf`. Edit this file to include any updates, changes, or corrections needed for the 3.5.0 ASM and ASM QFS environments.

Step 9: Verify the ASM-Remote Client Configuration File

Verify that the ASM-Remote client's configuration file contains a single line entry: the name of the ASM-Remote server. Update this file to point to a different ASM-Remote server, if necessary.

Step 10: Verify the ASM-Remote Server `mcf` File

Verify that the `mcf` file specifies an ASM-Remote server and that the `mcf` file resides in `/etc/opt/LSCsamfs/mcf`. Edit this file to include any updates, changes, or corrections needed for the 3.5.0 ASM and ASM QFS environments.

Step 11: Verify the ASM-Remote Server Configuration File

The configuration file defines the disk buffer characteristics and media to be used for each client. The ASM-Remote server `mcf` file records the location of the ASM-Remote server configuration file. Assuming the example configuration in this manual, this file is located in `/etc/opt/LSCsamfs/rmt200`.

Ten clients can be configured per server daemon. If you want to support more clients, you must configure another ASM-Remote server.

Step 12: Start the ASM or ASM QFS Software

To ensure that the new license keys and configuration files on the server and client are read, you must start or restart your ASM or ASM QFS software.

To start or ASM or ASM QFS, enter the following command on both the client and the server:

server# samd start

For complete instructions on starting and restarting ASM and ASM QFS, see the ASM Installation and Configuration Guide.

Step 13: Ensure That a Connection is Established

After the `sam-initd` daemon is running on both the server and clients, you should use `samu`(1M) and verify whether the connection between hosts has been established. The `s` and `R` displays show the status of ASM-Remote connections.

For more information on using `samu`(1M) to verify connections, see chapter 2, "Initial Installation Procedure". For more information on `samu`(1M), see the `samu`(1M) man page or see the ASM Administrator's Guide.

Step 14: Ensure that the Catalog is Available on the Client

For each client, you should be able to view the ASM-Remote catalog available for that client by using the `samu`(1M) `v` display to show VSNs. From `samu`(1M), enter the following:

:v eq_num

The eq_num must be the `Equipment Number` of the ASM-Remote client daemon as defined in the `mcf` file.

Step 15: Check for Archiving

You should verify that archiving is taking place from the client to the server. This verification process is described in chapter 2, "Initial Installation Procedure".

For information on troubleshooting the archiver, see the ASM Administrator's Guide.

Chapter 4 - Recycling With ASM-Remote

This chapter contains information on recycling with ASM-Remote. StorageTek recommends recycling in an ASM-Remote environment only under the very specific circumstances described in this chapter. The restrictions on recycling are described in this chapter, and they must be followed exactly. Otherwise data loss can result. It is important that you follow StorageTek's recommendations because there is no enforcement of these restrictions in the ASM, ASM QFS, or ASM-Remote software products.

Because the recycling process involves freeing space on cartridges for more data, it is possible for the recycler to destroy needed data on archive cartridges if the recycling process is not configured properly.

WARNING

Executing commands in the wrong order, or on the wrong system, can result in an irreversible loss of data. You cannot recycle cartridges that contain removable media files.

In an ASM-Remote client and server environment, the client and server are unaware of each other's file systems, data files, and inode files. The server and the client must have exclusive use of a certain set of cartridges. Each must never use the other's cartridges.

For this reason, StorageTek recommends using the recycler in an ASM-Remote environment only after following the steps in this subsection completely and only after testing your configuration to see that correct recycling is taking place.

It is very important that recycling activities on the ASM-Remote server and ASM-Remote client not overlap. The result could be accidental relabeling of cartridges and irreversible loss of data. Likewise, make sure you have analyzed a command's actions before executing any command, such as `rearch`(1M) or `tplabel`(1M), that can delete data on the ASM-Remote client or ASM-Remote server.

Recycling with ASM-Remote can be configured only if the following conditions are present:

Each VSN in the system is used by at most one client system or by the server. There cannot be files from multiple systems on any VSN.

No ASM-Remote client has catalog entries for any VSNs other than the ones containing that client's archive images. This means you must coordinate the lists and regular expressions of `archiver.cmd` entries on all ASM, ASM QFS, and ASM-Remote systems.

The following subsections describe two methods for enabling recycling using an ASM-Remote client and server.

Recycling in an ASM-Remote Environment – Method 1

The following subsections describe the steps to take to enable recycling in an ASM-Remote environment.

Throughout this subsection, the example environment is one in which the server is named `sky` and the client is named `zeke`. The site is configuring ASM-Remote in order to create archive copies of files on cartridges in two different libraries. Archive copy 1 is to be made using a StorageTek library that is local to `zeke`. Archive copy 2 is to be made remotely using an ADIC library attached to `sky`. Pertinent files for these two systems are shown in the following subsections.

Configuration Files for Server `sky`

The server must have ASM-Remote configuration information in its `mcf` file and in its server configuration file. These files are shown in the following subsections.

Server `mcf` File

The `mcf` file on server `sky` is as follows:

```
# This is the mcf file for the server (sky).
# The server parameters file (rmt1000) points
#    back to the correct automated library's equipment number
#    (70) for the ADIC Scalar 1000.
#
#   1.0G
#
samfs1              100   ma   samfs1
/dev/dsk/c0t0d0s5    110   mm   samfs1   on   /dev/rdsk/c0t0d0s5
/dev/dsk/c3t2d0s3    120   mr   samfs1   on   /dev/rdsk/c3t2d0s3
/dev/dsk/c3t2d0s4    121   mr   samfs1   on   /dev/rdsk/c3t2d0s4

SAMfs2              139   ma   SAMfs2
/dev/dsk/c3t4d0s3    140   mm   SAMfs2   on   /dev/rdsk/c3t4d0s3
/dev/dsk/c3t4d0s4    141   mr   SAMfs2   on   /dev/rdsk/c3t4d0s4
```

```
# ADIC Scalar 1000
/dev/SAMst/c0t0u0  70  rb  adic1  -  /var/opt/LSCsamfs/catalog/adic1
/dev/rmt/0bn        71    at   adic1   -
/dev/rmt/1bn        72    at   adic1   -
/dev/rmt/2bn        73    at   adic1   -
/dev/rmt/3bn        74    at   adic1   -
/dev/rmt/4bn        75    at   adic1   -
/dev/rmt/5bn        76    at   adic1   -
/dev/rmt/11bn       77    at   adic1   -
/dev/rmt/10bn       78    at   adic1   -
/dev/rmt/9bn        79    at   adic1   -
/dev/rmt/8bn        80    at   adic1   -
/dev/rmt/7bn        81    at   adic1   -
/dev/rmt/6bn        82    at   adic1   -

# Define ASM-Remote server skyrs
/etc/opt/LSCsamfs/rmt1000   1000   ss   skyrs   on
```

Server Configuration File

The server configuration file on server `sky` is as follows:

```
# Server configuration file /etc/opt/LSCsamfs/rmt1000 on sky.
# The eq of the automated library MUST match the eq of the
#   automated library that you want to use in the mcf file.

zeke
  cache_size 470000
  media
  70 at (00002[0-9])
  endmedia
```

Configuration Files for Client `zeke`

The server must have ASM-Remote configuration information in its `mcf` file and in its server configuration file. These files are shown in the following subsections.

Client `mcf` File

The `mcf` file on client `zeke` is as follows:

```
# mcf file for client (zeke)
#
samfs1              10    ms   samfs1
/dev/dsk/c1t3d0s0   11    md   samfs1   on   /dev/rdsk/c1t3d0s0
/dev/dsk/c1t3d0s1   12    md   samfs1   on   /dev/rdsk/c1t3d0s1
```

```
/dev/dsk/c1t3d0s3   13   md   samfs1   on   /dev/rdsk/c1t3d0s3

# Define a StorageTek L20 with 1 drive and 20 slots (including cap)
/dev/SAMst/c0t2u0   50  rb  stk_l20  on  /var/opt/LSCsamfs/catalog/L20_cat
/dev/rmt/0hbn       51  lt  stk_l20  on

# Define zeke as a ASM-Remote client using sky as the server
/etc/opt/LSCsamfs/sky  200  sc  skyrs  on  /var/opt/LSCsamfs/catalog/sky_cat
/dev/SAMrd/rd0        201  rd  skyrs
/dev/SAMrd/rd1        202  rd  skyrs
/dev/SAMrd/rd2        203  rd  skyrs
/dev/SAMrd/rd3        204  rd  skyrs
```

Client Configuration File

The client configuration file on client `zeke` is as follows:

```
# File /etc/opt/LSCsamfs/sky on ASM-Remote client zeke:
sky
```

Recycling Configuration Process

The recycling configuration process is described in the following subsections. This process includes a test for archiving and recycling. Because of the testing period, this process can take a day or two, depending on how frequently files are archived and recycled.

NOTE

Do not use the chmed(1M) command on the server to set the recycling flag (+c) for a client VSN. That action overrides the no_recycle list in the /etc/opt/LSCsamfs/recycler.cmd file on the server.

Step 1. Understand the Recycling Process

Using the recycler in an ASM-Remote environment requires a complete understanding of the steps in the recycling process. If you have not already familiarized yourself with the recycling process, take time now to read about the recycler in the ASM Installation and Configuration Guide.

Step 2. Verify the ASM-Remote Client/Server Configuration

Make sure that the ASM-Remote client and server are configured properly and that archiving is occurring. For more information on configuring and verifying your ASM-Remote environment, see chapter 2, “Initial Installation and Configuration Procedure”. This chapter contains detailed information on configuring the ASM-Remote client and server. The later subsections in chapter 2 contain information on insuring that archiving is taking place.

Step 3. Edit the `archiver.cmd` File on the Client

Edit the `archiver.cmd` file on the client system and add recycling directives.

In this ASM-Remote example of recycling, the recycling is performed by archive set, not by library. The directives specifying that recycling be done by archive set must appear in the `archiver.cmd` file.

The following `archiver.cmd` file on client `zeke` has been edited to communicate with the recycler:

```
# This is file /etc/opt/LSCsamfs/archiver.cmd
#   on ASM-Remote client zeke.
#
# wait

logfile = /var/opt/LSCsamfs/archiver/archiver.log
trace = /var/opt/LSCsamfs/trace/archiver all

interval = 1m

no_archive tmp
no_archive .

archmax = lt 2G
archmax = ib 2G
archmax = at 5G

drives = skyrs 4 # use up to four drives for remote archiving.

fs = samfs1
    1 4h
archiveset testdir0
    1 1m
    2 1m
defaultset .
    1 1m
    2 1m

params

# Start with mingain high to reduce workload.
# If you need more recycling, reduce mingain.
# If too much recycling, increase High Water Mark.
archiveset.1 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
archiveset.1 -recycle_ignore
```

```
defaultset.1 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
defaultset.1 -recycle_ignore

# Remote directives.
# Use up to three drives per archive set.
# Load will split to two drives at 100m, to three drives at 150m.
archiveset.2 -drives 3 -drivemin 50m
defaultset.2 -drives 3 -drivemin 50m

# Remote directives.
# Start with mingain high to reduce workload.
# If you need more recycling, reduce mingain.
# If too much recycling, increase High Water Mark.
archiveset.2 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
archiveset.2 -recycle_ignore
defaultset.2 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
defaultset.2 -recycle_ignore
endparams

vsns
samfs1.1     lt 000173      # local copy.
archiveset.1 lt ^CEL        # local copy.
archiveset.2 at 00002[0-4]  # remote copy, sky ait-2
                    # tapes 20 through 24.
defaultset.1 lt ^CSM        # local copy.
defaultset.2 at 00002[5-9]  # remote copy, sky ait-2
                    # tapes 25 through 29.
endvsns
```

The directives in the preceding file perform as follows:

The `-recycle_hwm` directive sets the high-water mark for the archive set. When the utilization of the VSNs exceeds this percentage, recycling of the archive set begins.

The `-recycle_ignore` directive is inserted only temporarily. This directive prevents recycling from occurring until you have your environment configured and tested. This directive can be removed in a later step.

The `-recycle_mingain` directive is set high in order to limit the amount of work needed to regain space. That is, this directive is set high to insure efficiency.

The `-recycle_vsncount 1` directive prevents recycling from overwhelming the system. This directive specifies that the recycler drain one VSN at time. When the first VSN is drained, a second is selected to begin draining. So, at any moment in

time, there is one VSN in the queue to be relabeled and one VSN in the queue to be drained.

Step 4. Edit the `recycler.cmd` file on the client

Edit the `recycler.cmd` file on the client and specify a log file to receive recycling log output.

The following `recycler.cmd` file on client `zeke` has been edited to specify a recycler log file:

```
#
# This is the /etc/opt/LSCsamfs/recycler.cmd file
# on client zeke.
#
logfile = /var/opt/LSCsamfs/recycler/recycler.log
```

Step 5. Edit the `archiver.cmd` File on the Server

Edit the `archiver.cmd` file on the server to recycle by archive set.

When using ASM-Remote, recycling must be performed by archive set, not by library. The directives specifying that recycling be done by archive set must appear in the `archiver.cmd` file.

After editing, the `archiver.cmd` file on server `sky` is as follows:

```
# This is the archiver.cmd for the server (sky).
#
# Number of drives: 10
# Number of Mounted Filesystems: 1
# Number of Tests per Filesystem: 1
# Number of Archive Copies per Test: 2

#wait
#trace = /var/opt/LSCsamfs/trace/archiver all

logfile = /var/opt/LSCsamfs/log/archiver
interval = 1m
no_archive .
archmax = at 5G
drives = adic1 6

fs = samfs1
    1 4h
testset testdir0
    1 1m
    2 1m
```

```
allsam1   .
    1 1m
    2 1m

params
allsam1.1 -drives 4 -drivemin 50m
allsam1.1 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
allsam1.1 -recycle_ignore
allsam1.2 -drives 4 -drivemin 50m
allsam1.2 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
allsam1.2 -recycle_ignore
testset.1 -drives 4 -drivemin 50m
testset.1 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
testset.1 -recycle_ignore
testset.2 -drives 4 -drivemin 50m
testset.2 -recycle_hwm 60 -recycle_mingain 90 -recycle_vsncount 1
testset.2 -recycle_ignore
endparams

vsns
samfs1.1 at 000000
allsam1.1 at 00000[1-5]    # vsns 1 through 5.
allsam1.2 at 00000[6-9]    # vsns 6 through 9.
testset.1 at 00001[0,4]    # vsns 10 and 14.
testset.2 at 00001[5,9]    # vsns 15 and 19.
endvsns
```

Step 6. Edit the `recycler.cmd` File on the Server

Edit the `recycler.cmd` file on the server and specify the following items:

A recycler log file to receive output from the recycler.

A `no_recycle` directive for the ASM-Remote client's VSNs. The ASM-Remote client is configured to write its copy2 archive copies to cartridges in the ASM-Remote server's library. The `no_recycle` directive is needed to prevent the VSNs being used by the ASM-Remote client for archiving from being recycled by the ASM-Remote server.

The following `recycler.cmd` file on server `sky` has been edited to specify a recycler log file:

```
#
# This is the /etc/opt/LSCsamfs/recycler.cmd file
# on ASM-Remote server sky.
#
logfile = /var/opt/LSCsamfs/recycler/recycler.log
```

no_recycle at 00002[0-9] # Prevents VSNs assigned to zeke from
being recycled.

Step 7. Test Run the Recycler on the ASM-Remote Client

Run the recycler on the ASM-Remote client system. This is a test to see if the recycler properly acknowledges the devices and VSNs specified in the configuration files. This testing is important because if the recycler detects that the system it is running on has no archive images on a particular VSN listed in any of that system's catalogs (including the historian catalog), the `recycler.sh` script can call for the cartridge to be labeled. Labeling a cartridge destroys all data on the cartridge. There is no communication between the ASM-Remote client and the ASM or ASM QFS servers to inform each side of the presence of archive copies. All such information is provided locally from local ASM or ASM QFS file systems.

Use the following command to perform the initial test of the recycler:

zeke# sam-recycler –dvx

The recycler runs and logs its activity to the recycler log file. The recycler log file is defined in the `recycler.cmd` file. For more information on the `sam-recycler`(1M) command, see the `sam-recycler`(1M) man page.

Examine the recycler log file and look for the following message: `Recycling is ignored on this archive set.`

The following is a sample log file:

recycler.log from client zeke.

========== Recycler begins at Mon Jun 4 09:49:41 2001 ==========
Initial 7 catalogs:

0 Family: stk_l20 Path: /var/opt/LSCsamfs/catalog/L20_cat
Vendor: STK Product: L20

SLOT	ty	capacity	space	vsn
0	lt	33.0G	33.0G	000173
1	lt	32.8G	44.1M	CEL170
2	lt	33.0G	33.0G	CEL139
4	lt	32.8G	16.8G	CFC504
5	lt	33.0G	33.0G	CFC503
6	lt	32.9G	0	CSM689
7	lt	32.9G	19.6G	CSM690
8	lt	33.0G	33.0G	CSM691
9	lt	33.0G	33.0G	CSM692

```
  10              lt      10.0G       10.0G CLN018
  11              lt      33.0G       33.0G 000766
Total Capacity:  339.2G bytes, Total Space Available: 244.3G bytes
Volume utilization 27%, high 95% VSN_min 50%
Recycling is ignored on this robot.


1  Family: skyrs              Path: /var/opt/LSCsamfs/catalog/sky_cat
Vendor: (NULL)             Product: (NULL)
SLOT              ty    capacity        space vsn
  0               at      48.5G       23.3G 000020
  1               at      23.8G       23.8G 000021
  2               at      48.5G       48.5G 000022
  3               at      48.5G       48.5G 000023
  4               at      48.5G       48.5G 000024
  5               at      48.5G        2.6G 000025
  6               at      48.5G      361.4k 000026
  7               at      48.5G       48.5G 000027
  8               at      48.5G       48.5G 000028
  9               at      48.5G        0    000029
Total Capacity:  460.8G bytes, Total Space Available: 292.5G bytes
Volume utilization 36%, high 95% VSN_min 50%
Recycling is ignored on this robot.


2  Family: hy                 Path: /var/opt/LSCsamfs/catalog/historian
Vendor: ASM                Product: Historian
SLOT              ty    capacity        space vsn
  (no VSNs in this media changer)
Total Capacity:  0    bytes, Total Space Available: 0    bytes
Volume utilization 0%, high 95% VSN_min 50%
Recycling is ignored on this robot.


3  Family: defaultset.1       Path: /etc/opt/LSCsamfs/archiver.cmd
Vendor: ASM                Product: Archive set
SLOT              ty    capacity        space vsn
  0               lt      33.0G       33.0G 000766
  1               lt      33.0G       33.0G 000173
  2               lt      32.9G        0    CSM689
  3               lt      32.9G       19.6G CSM690
  4               lt      33.0G       33.0G CSM691
  5               lt      33.0G       33.0G CSM692
Total Capacity:  197.6G bytes, Total Space Available: 151.5G bytes
Volume utilization 23%, high 60% VSN_min 90%
Recycling is ignored on this archive set.
```

```
4  Family: defaultset.2         Path: /etc/opt/LSCsamfs/archiver.cmd
  Vendor: ASM              Product: Archive set
  SLOT              ty    capacity        space vsn
    0               lt       32.9G         0    CSM689
    1               at       48.5G        23.3G 000020
    2               at       23.8G        23.8G 000021
    3               at       48.5G         2.6G 000025
    4               at       48.5G       361.4k 000026
    5               at       48.5G        48.5G 000027
    6               at       48.5G        48.5G 000028
    7               at       48.5G         0    000029
  Total Capacity:  348.0G bytes, Total Space Available: 146.8G bytes
  Volume utilization 57%, high 60% VSN_min 90%
  Recycling is ignored on this archive set.


5  Family: archiveset.1         Path: /etc/opt/LSCsamfs/archiver.cmd
  Vendor: ASM              Product: Archive set
  SLOT              ty    capacity        space vsn
    0               lt       32.8G        44.1M CEL170
    1               lt       32.8G        16.8G CFC504
    2               lt       33.0G        33.0G CFC503
  Total Capacity:  98.6G bytes, Total Space Available: 49.8G bytes
  Volume utilization 49%, high 60% VSN_min 90%
  Recycling is ignored on this archive set.


6  Family: archiveset.2         Path: /etc/opt/LSCsamfs/archiver.cmd
  Vendor: ASM              Product: Archive set
  SLOT              ty    capacity        space vsn
    0               at       48.5G        23.3G 000020
    1               at       23.8G        23.8G 000021
    2               at       48.5G        48.5G 000022
    3               at       48.5G        48.5G 000023
    4               at       48.5G        48.5G 000024
  Total Capacity:  218.0G bytes, Total Space Available: 192.8G bytes
  Volume utilization 11%, high 60% VSN_min 90%
  Recycling is ignored on this archive set.


21 VSNs:

                ---Archives---  -----Percent-----  defaultset.1
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
```

```
in multiple sets      0     0       0   100      0 stk_l20:lt:CSM689
partially full      111     2.8G    8    31     61 stk_l20:lt:CSM690
empty VSN             0     0       0    0    100 stk_l20:lt:000173
empty VSN             0     0       0    0    100 stk_l20:lt:CSM691
empty VSN             0     0       0    0    100 stk_l20:lt:CSM692
empty VSN             0     0       0    0    100 stk_l20:lt:000766

                ---Archives---   -----Percent-----   defaultset.2
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
no-data VSN           0     0       0   100      0   skyrs:at:000029
no-data VSN           0     0       0   99       1   skyrs:at:000026
partially full      111     2.8G    6    88      6   skyrs:at:000025
empty VSN             0     0       0    0    100   skyrs:at:000028
empty VSN             0     0       0    0    100   skyrs:at:000027

                ---Archives---   -----Percent-----   archiveset.1
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
no-data VSN           0     0       0   99       1 stk_l20:lt:CEL170
partially full      677     2.3G    8    40     52 stk_l20:lt:CFC504
empty VSN             0     0       0    0    100 stk_l20:lt:CFC503

                ---Archives---   -----Percent-----   archiveset.2
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
in multiple sets      0     0       0    51     49   skyrs:at:000020
empty VSN             0     0       0    0    100   skyrs:at:000022
empty VSN             0     0       0    0    100   skyrs:at:000023
empty VSN             0     0       0    0    100   skyrs:at:000024
in multiple sets      0     0       0    0    100   skyrs:at:000021

                ---Archives---   -----Percent-----   stk_l20
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
empty VSN             0     0       0    0    100 stk_l20:lt:CLN018
partially full       13     80.3k   0    0    100 stk_l20:lt:CEL139


Recycler finished.

========== Recycler ends at Mon Jun  4 09:49:53 2001 ==========
```

Step 8. Test Run the Recycler on the ASM-Remote Server

Run the recycler on the ASM-Remote server system. Make sure that the recycler is not recycling any VSNs reserved for the ASM-Remote client.

Use the following command to perform the initial test of the recycler:

zeke# sam-recycler –dvx

The recycler runs and logs its activity to the recycler log file. For more information on the `sam-recycler`(1M) command, see the `sam-recycler`(1M) man page.

The following is a `sam`ple log file:

```
# recycler.log file from server sky.

========== Recycler begins at Mon Jun  4 09:50:44 2001 ==========
Initial 6 catalogs:

0  Family: adic1              Path: /var/opt/LSCsamfs/catalog/adic1
   Vendor: ADIC               Product: Scalar 1000
   SLOT             ty    capacity        space vsn
     0              at       1.3G        1.2G 000001
     1              at       1.3G        1.3G 000002
     2              at       1.3G        1.3G 000004
     3              at      48.5G         0   000010
     4              at      48.5G         0   000011
     5              at      48.5G       43.5G 000018
     6              at      48.5G         0   000019
     7              at      48.5G       23.3G 000020
     8              at      23.8G       23.8G 000021
     9              at      48.5G       48.5G 000022
    10              at      48.5G       48.5G 000023
    11              at      48.5G       48.5G 000024
    12              at      48.5G        2.6G 000025
    13              at      48.5G      361.4k 000026
    14              at      48.5G       48.5G 000027
    15              at      48.5G       48.5G 000028
    16              at      48.5G         0   000029
    17              at       1.3G        1.3G 000005
    18              at      48.5G       48.5G 000016
    19              at      23.8G       23.8G CLN001
    20              at      23.8G       23.8G CLN002
    21              at      23.8G       23.8G CLN004
    22              at      23.8G       23.8G CLN003
    23              at      48.5G      421.6M 000015
    24              at       1.3G        1.3G 000000
    25              at      48.5G         0   000013
    26              at       1.3G        1.3G 000003
    27              at      48.5G       43.6G 000007
    28              at      48.5G       41.8G 000008
    29              at      48.5G       46.9G 000006
    30              at      48.5G       48.3G 000009
    31              at      48.5G         0   000014
```

```
  32              at      48.5G       0    000012
  33              at      48.5G      40.1G 000017
Total Capacity:  1.2T bytes, Total Space Available: 708.7G bytes
Volume utilization 43%, high 95% VSN_min 50%
Recycling is ignored on this robot.


1  Family: hy                Path: /var/opt/LSCsamfs/catalog/historian
Vendor: ASM                  Product: Historian
SLOT              ty    capacity        space vsn
  (no VSNs in this media changer)
Total Capacity:  0    bytes, Total Space Available: 0    bytes
Volume utilization 0%, high 95% VSN_min 50%
Recycling is ignored on this robot.


2  Family: testset.1          Path: /etc/opt/LSCsamfs/archiver.cmd
Vendor: ASM                  Product: Archive set
SLOT              ty    capacity        space vsn
  0               at      48.5G       0    000010
  1               at      48.5G       0    000014
Total Capacity:  97.1G bytes, Total Space Available: 0    bytes
Volume utilization 100%, high 60% VSN_min 90%: *** Needs recycling ***
Recycling is ignored on this archive set.


3  Family: testset.2          Path: /etc/opt/LSCsamfs/archiver.cmd
Vendor: ASM                  Product: Archive set
SLOT              ty    capacity        space vsn
  0               at      48.5G       0    000019
  1               at      48.5G      421.6M 000015
Total Capacity:  97.1G bytes, Total Space Available: 421.6M bytes
Volume utilization 99%, high 60% VSN_min 90%: *** Needs recycling ***
Recycling is ignored on this archive set.


4  Family: allsam1.1          Path: /etc/opt/LSCsamfs/archiver.cmd
Vendor: ASM                  Product: Archive set
SLOT              ty    capacity        space vsn
  0               at      1.3G        1.2G 000001
  1               at      1.3G        1.3G 000002
  2               at      1.3G        1.3G 000004
  3               at      1.3G        1.3G 000005
  4               at      1.3G        1.3G 000003
Total Capacity:  6.5G bytes, Total Space Available: 6.3G bytes
Volume utilization 3%, high 60% VSN_min 90%
```

```
  Recycling is ignored on this archive set.


5  Family: allsam1.2          Path: /etc/opt/LSCsamfs/archiver.cmd
  Vendor: ASM             Product: Archive set
  SLOT              ty    capacity       space vsn
    0               at       48.5G       43.6G 000007
    1               at       48.5G       41.8G 000008
    2               at       48.5G       46.9G 000006
    3               at       48.5G       48.3G 000009
  Total Capacity:  194.2G bytes, Total Space Available: 180.6G bytes
  Volume utilization 6%, high 60% VSN_min 90%
  Recycling is ignored on this archive set.


Need to select candidate for media changer testset.1 to free up 39.8G bytes.
Quantity of data to move limited to (no limit) bytes and 1 VSNs.
Checking 000010.  Need to free 39.8G, quantity limit: (no limit), VSN count: 1.
  VSN is in correct media changer... good.
  VSN is not already recycling... good.
  VSN has no request files... good.
  VSN has no 'archive -n' files...good.
  VSN was not specified as "no_recycle" in recycler.cmd file... good.
  VSN does not exceed VSN count limit... good.
  VSN does not exceed data quantity limit... good.
  VSN meets minimum gain requirement.
  Recycling is ignored on this media changer - VSN not marked for recycling.
Checking 000014.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN is in correct media changer... good.
  VSN is not already recycling... good.
  VSN has no request files... good.
  VSN has no 'archive -n' files...good.
  VSN was not specified as "no_recycle" in recycler.cmd file... good.
  VSN exceeds VSN count limit - skipped.
Checking 000019.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000015.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000001.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000003.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000004.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000005.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
```

Checking 000002. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000008. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000007. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000006. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000009. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000011. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000029. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000013. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000012. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000026. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000025. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000020. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000017. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000018. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN003. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000021. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000022. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000027. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000028. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000023. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000024. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000016. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN001. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.

```
Checking CLN002.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking CLN004.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000000.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
No candidate was found in this media changer.

Need to select candidate for media changer testset.2 to free up 38.8G bytes.
Quantity of data to move limited to (no limit) bytes and 1 VSNs.
Checking 000010.  Need to free 38.8G, quantity limit: (no limit), VSN count: 1.
  VSN not in correct media changer.
Checking 000014.  Need to free 38.8G, quantity limit: (no limit), VSN count: 1.
  VSN not in correct media changer.
Checking 000019.  Need to free 38.8G, quantity limit: (no limit), VSN count: 1.
  VSN is in correct media changer... good.
  VSN is not already recycling... good.
  VSN has no request files... good.
  VSN has no 'archive -n' files...good.
  VSN was not specified as "no_recycle" in recycler.cmd file... good.
  VSN does not exceed VSN count limit... good.
  VSN does not exceed data quantity limit... good.
  VSN meets minimum gain requirement.
  Recycling is ignored on this media changer - VSN not marked for recycling.
Checking 000015.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN is in correct media changer... good.
  VSN is not already recycling... good.
  VSN has no request files... good.
  VSN has no 'archive -n' files...good.
  VSN was not specified as "no_recycle" in recycler.cmd file... good.
  VSN exceeds VSN count limit - skipped.
Checking 000001.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000003.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000004.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000005.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000002.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000008.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000007.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
  VSN not in correct media changer.
Checking 000006.  Need to free 0E, quantity limit: (no limit), VSN count: 0.
```

VSN not in correct media changer.
Checking 000009. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000011. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000029. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000013. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000012. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000026. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000025. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000020. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000017. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000018. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN003. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000021. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000022. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000027. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000028. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000023. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000024. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000016. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN001. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN002. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking CLN004. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
Checking 000000. Need to free 0E, quantity limit: (no limit), VSN count: 0.
VSN not in correct media changer.
No candidate was found in this media changer.

34 VSNs:

```
                ---Archives---  -----Percent-----  testset.1
-----Status-----   Count   Bytes  Use Obsolete Free  Library:Type:VSN
no-data VSN            0     0       0   100     0  adic1:at:000010
no-data VSN            0     0       0   100     0  adic1:at:000014

                ---Archives---  -----Percent-----  testset.2
-----Status-----   Count   Bytes  Use Obsolete Free  Library:Type:VSN
no-data VSN            0     0       0   100     0  adic1:at:000019
partially full       677   2.3G      5    93     2  adic1:at:000015

                ---Archives---  -----Percent-----  allsam1.1
-----Status-----   Count   Bytes  Use Obsolete Free  Library:Type:VSN
partially full        97  173.8M     1     9    90  adic1:at:000001
no-data VSN            0     0       0     2    98  adic1:at:000003
no-data VSN            0     0       0     2    98  adic1:at:000004
empty VSN              0     0       0     0   100  adic1:at:000005
empty VSN              0     0       0     0   100  adic1:at:000002

                ---Archives---  -----Percent-----  allsam1.2
-----Status-----   Count   Bytes  Use Obsolete Free  Library:Type:VSN
no-data VSN            0     0       0    13    87  adic1:at:000008
partially full        98   1.6G      3     7    90  adic1:at:000007
no-data VSN            0     0       0     3    97  adic1:at:000006
empty VSN              0     0       0     0   100  adic1:at:000009

                ---Archives---  -----Percent-----  adic1
-----Status-----   Count   Bytes  Use Obsolete Free  Library:Type:VSN
no-data VSN            0     0       0   100     0  adic1:at:000011
no_recycle VSN         0     0       0   100     0  adic1:at:000029
no-data VSN            0     0       0   100     0  adic1:at:000013
no-data VSN            0     0       0   100     0  adic1:at:000012
no_recycle VSN         0     0       0    99     1  adic1:at:000026
no_recycle VSN         0     0       0    94     6  adic1:at:000025
no_recycle VSN         0     0       0    51    49  adic1:at:000020
no-data VSN            0     0       0    17    83  adic1:at:000017
no-data VSN            0     0       0    10    90  adic1:at:000018
empty VSN              0     0       0     0   100  adic1:at:CLN003
no_recycle VSN         0     0       0     0   100  adic1:at:000021
no_recycle VSN         0     0       0     0   100  adic1:at:000022
no_recycle VSN         0     0       0     0   100  adic1:at:000027
no_recycle VSN         0     0       0     0   100  adic1:at:000028
no_recycle VSN         0     0       0     0   100  adic1:at:000023
no_recycle VSN         0     0       0     0   100  adic1:at:000024
empty VSN              0     0       0     0   100  adic1:at:000016
```

```
empty VSN          0     0      0    0   100   adic1:at:CLN001
empty VSN          0     0      0    0   100   adic1:at:CLN002
empty VSN          0     0      0    0   100   adic1:at:CLN004
partially full    12   88.3k   0    0   100   adic1:at:000000


Recycler finished.

========== Recycler ends at Mon Jun  4 09:51:05 2001 ==========
```

When selecting VSNs to recycle, examine the last part of the recycler log file that shows columnar data. The leftmost column is the one headed by `Status`. In the preceding recycler log file, the `Status` column indicates several VSNs with a `no_recycle` status. These VSNs are those used by the client.

The best candidates for recycling are those with a 0 value in the `Count`, `Bytes`, and `Use` columns. The last VSN in the list shows its status as `partially full`. This VSN, with `Count`, `Bytes`, and `Use` statistics of `12`, `88.3k`, and 0, respectively, is not a good candidate for recycling.

Note that some of the lines in the preceding output have been wrapped for inclusion in this manual.

Step 9. Analyze the Client and Server `recycler.log` Files

This step describes how to choose VSNs that are candidates for recycling.

Examine the `recycler.log` file from the client. Toward the end of the file, there is a `Status` column. VSNs with the following types of status entries are candidates for recycling:

no-data VSN

partially full

Regardless of the VSNs you choose to recycle, if there is any active data on the VSN, you must be sure to rearchive all active data from the client and the server prior to relabeling the VSN.

The following subsections describe how to recycle the preceding two types of VSNs.

The no-data VSNs

The `no-data` VSNs are the easiest VSNs to recycle. For these, the `Count`, `Bytes`, and `Use` fields are all zero.

1) Examine the `recycler.log` file from the client and see if there are any `no-data` VSNs.

   Using the example in this chapter, VSNs `000029` and `000026` from the client, `zeke`, can be considered for recycling because they are `no-data` VSNs. This can be determined from the client `recycler.log` file on `zeke`:

   # From the client zeke recycler.log file:

	---Archives---		-----Percent-----		defaultset.2
-----Status-----	Count	Bytes	Use	Obsolete	Free	Library:Type:VSN
no-data VSN	0	0	0	100	0	skyrs:at:000029
no-data VSN	0	0	0	99	1	skyrs:at:000026
partially full	111	2.8G	6	88	6	skyrs:at:000025
empty VSN	0	0	0	0	100	skyrs:at:000028
empty VSN	0	0	0	0	100	skyrs:at:000027

2) Examine the `recycler.log` file from the server and determine if the VSNs you selected from the previous step are represented identically in the server's recycler log file. You are trying to affirm that there is no active data from the server archived on those VSNs.

   For example, look at the data for the `no_recycle` VSNs in the server's `recycler.log` file. VSNs `000029` and `000026` were selected for recycling from the previous step, and the data in the server's `recycler.log` file is identical to that in the client's `recycler.log` file.

   # From the Server log file:

	---Archives---		-----Percent-----		adic1
-----Status-----	Count	Bytes	Use	Obsolete	Free	Library:Type:VSN
no-data VSN	0	0	0	100	0	adic1:at:000011
no_recycle VSN	0	0	0	100	0	adic1:at:000029
no-data VSN	0	0	0	100	0	adic1:at:000013
no-data VSN	0	0	0	100	0	adic1:at:000012
no_recycle VSN	0	0	0	99	1	adic1:at:000026
no_recycle VSN	0	0	0	94	6	adic1:at:000025
no_recycle VSN	0	0	0	51	49	adic1:at:000020
no-data VSN	0	0	0	17	83	adic1:at:000017
no-data VSN	0	0	0	10	90	adic1:at:000018
empty VSN	0	0	0	0	100	adic1:at:CLN003
no_recycle VSN	0	0	0	0	100	adic1:at:000021
no_recycle VSN	0	0	0	0	100	adic1:at:000022
no_recycle VSN	0	0	0	0	100	adic1:at:000027
no_recycle VSN	0	0	0	0	100	adic1:at:000028
no_recycle VSN	0	0	0	0	100	adic1:at:000023

```
no_recycle VSN      0     0      0    0   100   adic1:at:000024
empty VSN           0     0      0    0   100   adic1:at:000016
empty VSN           0     0      0    0   100   adic1:at:CLN001
empty VSN           0     0      0    0   100   adic1:at:CLN002
empty VSN           0     0      0    0   100   adic1:at:CLN004
partially full     12    88.3k   0    0   100   adic1:at:000000
```

3) If no active data from the server is archived on that VSN, you can relabel the VSN. This destroys all data on the VSN and reclaims space.

   For VSN `000029`, use the following command:

   server# tplabel –vsn 000029 –old 000029 at.000029

   When this VSN is relabed, you regain 100% of the space on that VSN.

The partially full VSNs

The VSNs for which a partially full status is reported can also be recycled. This process is as follows:

Examine the `recycler.log` file from the client and see if there are any `partially full` VSNs.

4) Using the example in this chapter, VSN 000025 from the client, zeke, can be considered for recycling because its status is partially full. This can be determined from the client recycler.log file on zeke, which is as follows:

   # From the client zeke recycler.log file:

```
                ---Archives---          -----Percent-----       defaultset.2
-----Status-----   Count    Bytes   Use Obsolete Free   Library:Type:VSN
no-data VSN          0      0       0   100     0    skyrs:at:000029
no-data VSN          0      0       0    99     1    skyrs:at: 000026
partially full     111      2.8G    6    88     6    skyrs:at: 000025
empty VSN            0      0       0    0    100   skyrs:at: 000028
empty VSN            0      0       0    0    100   skyrs:at: 000027
```

   VSN 000025 shows 6% of its space to be in use. These are active archive images that must be rearchived before this VSN can be recycled. The following steps in this process show how to ensure that these active archive images are rearchived to another VSN.

5) Check the server side to ensure that there is no active data from the server archived on that VSN.

For example, look at the data for VSN `000025` that was selected for recycling from the previous step. The server's `recycler.log` file indicates that VSN `000025` is 6% free, which is the same percentage free that was reported in the client's `recycler.log` file. The server has no knowledge of the client's archive images, so the server cannot report that the percent occupied is divided into 6% in-use archive images and 88% obsolete images. The server reports that all of the remaining 94% is consumed by obsolete archive images.

From the Server log file:

```
                ---Archives---   -----Percent-----   adic1
-----Status-----    Count    Bytes   Use Obsolete Free   Library:Type:VSN
no-data VSN           0     0       0   100      0   adic1:at:000011
no_recycle VSN        0     0       0   100      0   adic1:at:000029
no-data VSN           0     0       0   100      0   adic1:at:000013
no-data VSN           0     0       0   100      0   adic1:at:000012
no_recycle VSN        0     0       0    99      1   adic1:at:000026
no_recycle VSN        0     0       0    94      6   adic1:at:000025
no_recycle VSN        0     0       0    51     49   adic1:at:000020
no-data VSN           0     0       0    17     83   adic1:at:000017
no-data VSN           0     0       0    10     90   adic1:at:000018
empty VSN             0     0       0     0    100   adic1:at:CLN003
no_recycle VSN        0     0       0     0    100   adic1:at:000021
no_recycle VSN        0     0       0     0    100   adic1:at:000022
no_recycle VSN        0     0       0     0    100   adic1:at:000027
no_recycle VSN        0     0       0     0    100   adic1:at:000028
no_recycle VSN        0     0       0     0    100   adic1:at:000023
no_recycle VSN        0     0       0     0    100   adic1:at:000024
empty VSN             0     0       0     0    100   adic1:at:000016
empty VSN             0     0       0     0    100   adic1:at:CLN001
empty VSN             0     0       0     0    100   adic1:at:CLN002
empty VSN             0     0       0     0    100   adic1:at:CLN004
partially full       12    88.3k    0     0    100   adic1:at:000000
```

6) Use the `chmed`(1M) command with the `+c` option on the VSN.

   For the example in this subsection, this command is, as follows:

   server# chmed +c at.000025

   This command indicates to the recycler that you want to rearchive the active files on this VSN. The files to be rearchived constitute (the 6% as reported by the client's `recycler.log` file in the `Use` column. For more information on the `chmed`(1M) command, see the `chmed`(1M) man page.

7) Run the recycler again.

   For the example in this subsection, this command is as follows:

   client# sam-recycler -dvx

   This marks each active file to be rearchived, which indicates to the archiver that each active file should be rearchived to another VSN.

8) Let the archiver run normally, or type `:arrun` from `SAMu` on the client to start the archiver. For more information on the `arrun` command, see the `SAMu`(1M) man page or the ASM Installation and Configuration Guide .

9) When archiving is completed, rerun the recycler on the client to make sure that all active files have been rearchived.

   For the example in this subsection, this command is as follows:

   client# sam-recycler -dvx

10) If the `Count`, `Bytes`, and `Use` fields are all zero, you can relabel the VSN from the server.

    For the example in this subsection, you can use the following command:

    server# tplabel –vsn 000025 –old 000025 at.000025

    The preceding command relabels the VSN and destroys all data on the VSN. If the media had been a magneto-optical disk, you would have used the `odlabel`(1M) command. For more information on the `odlabel`(1M) command, see the `odlabel`(1M) man page.

After this VSN is relabeled, you regain 88% of the space on this VSN.

Step 10. Devise a Recycling Schedule

In an StorageTek environment in which ASM-Remote is not enabled, recycling can be performed on an automatic basis by creating a `cron`(1) job. If ASM-Remote is enabled, do not automate the recycler.

It is very important that recycling activities not be undertaken on the ASM-Remote client at the same time that recycling is occurring on the ASM-Remote server. You should manually recycle on a time-interval basis that meets the needs of your site. Recycling in this manner takes more effort. However, this is the only way to ensure that data is well protected against relabeling cartridges incorrectly.

Recycling in an ASM-Remote Environment – Method 2

This subsection presents another way to recycle volumes using ASM-remote.

Using the recycler in an ASM-Remote environment requires a complete understanding of each step of the recycler. Executing commands in the wrong order or on the wrong system can result in the irreversible loss of data.

StorageTek recommends using the recycler in an ASM-Remote environment only after you have gained a complete understanding of the recycling process and only after you have carefully tested your configuration.

StorageTek recommends that you create a `no_recycle` list in the ASM-Remote server's `/etc/opt/LSCsamfs/recycler.cmd` file to prevent accident recycling of VSNs used by ASM-Remote clients. Be careful of using the `chmed`(1M) command's `+c` option on volumes in a `no_recycle` list, however. When you use this command to set the recycling flag (`+c`) on a volume, that action overrides the `no_recycle` list in the `/etc/opt/LSCsamfs/recycler.cmd` file.

It is very important that recycling activities on the ASM-Remote server and the ASM-Remote client not overlap. The result could be inappropriate relabeling of cartridges and irreversible loss of data.

A recycling script is included in the following file:

/opt/LSCsamfs/examples/recycler.sh

You can modify this script for use with ASM-Remote. One modified script should reside on the ASM-Remote client, and another modified script should reside on the ASM-Remote server. After modification, the scripts should be moved to the following location on their respective servers:

/etc/opt/LSCsamfs/recycler.sh

One modification to consider is whether or not to comment out the `itemize`(1M) commands in the `recycler.sh` file. The `itemize`(1M) command returns information about a library, including whether or not any of the cartridges in the library have been marked `BAD MEDIA`. A cartridge marked as `BAD MEDIA` would not be a good candidate for recycling. On the ASM-Remote client, the `recycler.sh` script should be modified to comment out the lines having to do with the `itemize`(1M) command. This becomes a manual step. On the ASM-Remote server, the lines containing `itemize`(1M) commands should not be modified.

After modifying the `recycler.sh` script, you may have to manually determine if any of the ASM-Remote client candidates for recycling have been marked with the `E` flag. They should not be automatically recycled as this can result in problems.

StorageTek strongly recommends that no site attempt to recycle volumes on the ASM-Remote server and ASM-Remote client on the same day.

The steps for recycling volumes on the ASM-Remote client are as follows:

1) On the ASM-Remote client, run the following command to determine which volumes are the best candidates for recycling.

   client# sam-recycler –dvx

   You will be able to determine this by analyzing the recycler log file.

2) On the ASM-Remote server, use the following command to set the recycle flag on the desired VSNs:

   server# chmed + c

3) On the ASM-Remote client, run the following command to recycle the desired VSNs on the ASM-Remote client:

   client# sam-recycler –dvx

4) Wait until the VSNs being recycled is completely drained of archive images. The archiver on the client side does this.

5) On the ASM-Remote server, use the `tplabel`(1M) command to relabel the volumes after they are completely drained of archive images.

6) On the ASM-Remote server, clear any flags that prevent the volumes from being used for archiving on the ASM-Remote client (such as `R` or `c`).

Again, it is very important that these recycling activities not be undertaken on the ASM-Remote client at the same time you are recycling volumes on the ASM-Remote server.

Notes

This chapter contains miscellaneous configuration notes and man page information.

Configuration Notes

The ASM-Remote server and clients can be configured to provide multiple archive copies between two or more Solaris systems. For example, two Solaris systems running ASM can be configured as both an ASM server and client to each other.

Benefits of this configuration include the ability to create local copies for each server with an additional back-up copy of data on the other server. File systems can be shared between servers using standard NFS. In the event of a loss of access to the local library, ASM would automatically fail over and stage the remote backup copy. Users of both servers would see no loss of access to their data, even if their primary storage library were unavailable.

ASM-Remote Man Pages

The following man pages are included with the ASM and ASM QFS release packages, and they are of specific interest to ASM-Remote users:

sam-robotsd(1M)

sam-remote(7)

Glossary

addressable storage

The storage space encompassing online, nearline, and offline storage that is user referenced through an ASM file system.

archiver

The archive program that automatically controls the copying of files to removable cartridges.

archive storage

Copies of file data that have been created on removable cartridges for long-term offline storage.

ASM

The ASM File System. The ASM software controls the access to all files stored and all devices configured in the Master Configuration File (`mcf`).

ASM QFS

The ASM QFS software combines ASM with the QFS file system. 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 ASM command set as well as standard UNIX file system commands.

ASM-Remote client

An ASM-Remote client is an ASM or ASM QFS system that establishes an ASM-Remote client daemon containing a number of pseudo devices (`/samdev/rd`). It may or may not have its own library devices. The client depends on an ASM-Remote server for cartridges.

ASM-Remote daemon

A process initiated by the ASM-Remote client that establishes and controls the network connection between ASM-Remote and the ASM or ASM QFS server. This daemon, named `sam-clientd`, also establishes pseudo device connections to be used for data transfer.

ASM-Remote server

The ASM-Remote server is both a full-capacity ASM or ASM QFS storage management server and an ASM-Remote server daemon that defines libraries to be shared among ASM-Remote clients.

audit (full)

The process of reading the VSNs from each cartridge in an automated library. For non-tape cartridges, the capacity and space information is determined and entered into the automated library's catalog.

automated library

See library.

backup storage

A snapshot of a collection of files for the express purpose of preventing inadvertent loss. A backup includes both the file's attributes and associated data.

block allocation map

A bit map representing each available block of storage on a disk and indicating whether the block is in use or free.

cartridge

The 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 request 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.

data device

For a file system, a device or group of devices upon which file data is stored.

data space

The portion of a collection of files that is the actual data information.

DAU (Disk Allocation Unit)

The basic unit of online storage.

The ASM file system uses several sizes. The small DAU is 4 kilobytes (2^{17} or 4096 bytes). The large DAU is 16, 32, or 64 kilobytes. The available DAU size pairs are 4/16, 4/32, and 4/64.

The ASM QFS file systems support a fully adjustable DAU, sized from 16 kilobytes through 65528 kilobytes. The DAU you specify must be multiple of 8 kilobytes.

device logging

A feature that provides device-specific error information used to analyze device problems.

device scanner

Software within the ASM file system that periodically monitors the presence of all manually mounted removable devices and detects the presence of mounted cartridges that may be requested by a user or other process.

devicetool

An ASM and ASM QFS administrative tool with a graphical user interface for viewing information about and managing individual devices.

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.

disk allocation unit

See DAU.

disk buffer (also called 'cache')

The disk buffer is used to buffer files when writing data to the ASM-Remote server. This is frequently referred to as *cache*, but it is not to be confused with *disk cache*.

disk cache

The disk cache is used by ASM and ASM QFS to create and manage data files between online disk and removable cartridges. Individual disk partitions or an entire disk can be used as disk cache.

disk cache family set

The definition for the devices that make up a family set. The name of the disk cache family set is found in the equipment identifier field of the Master Configuration File (`mcf` file). This is sometimes referred to as a *metadevice* in industry literature. Also see family set.

disk striping

The process of recording a file across several disks, thereby improving access performance and increasing overall storage capacity.

direct access

A file attribute (stage never) designating that a nearline file can be accessed directly from the archive cartridges and need not be staged for online access.

directory

A file data structure that points to other files and directories within the file system.

disk space thresholds

User-defined disk space thresholds that define 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 the pre-defined disk space thresholds.

drive

A mechanism for transferring data to and from a cartridge.

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 megabyte-per-second 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.

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 mounted within an automated library.

Also see disk cache family set.

FDDI

Fiber Distributed Data Interface. FDDI is a 100 megabytes-per-second fiber optic LAN.

file system-specific directives

Directives that follow global directives 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.

file system

A hierarchical collection of files and directories.

FTP

File Transfer Protocol. An internet protocol for transferring files between two hosts over a TCP/IP network.

global commands

Commands that apply to all file systems and appear before the first "`fs =` " line.

indirect block

A disk block that contains a list of storage blocks. The 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.

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 ASM inodes are 512 bytes long. The inode file is a metadata file, which is separated from file data in the ASM QFS file systems.

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.

LAN

Local Area Network.

library

A robotically controlled device designed to automatically load and unload removable media cartridges without operator intervention. An library contains one or more drives and a robot that moves cartridges to and from the storage slots and the drives.

library catalog

See catalog.

LUN

Logical Unit Number.

mcf

Master Configuration File. The file that is read at initialization time that defines the relationships between the devices (the topology) within an ASM and ASM QFS environment.

media

Tape or optical disk cartridges.

media recycling

The process of recycling or reusing archive cartridges with low use (that is, archive cartridges with few active files).

metadata

Data about data. The index information needed to locate the exact data position of a file on a disk. Metadata contains information pertaining to the directory, symbolic link, removable media, segmented file index, and `.inodes`.

metadata device

A separate device (for example a solid-state disk or mirrored device) upon which ASM QFS file system metadata is stored. Separating file data from 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 disjoint sets of disks to prevent loss from a single disk failure. It is often referred to as shadowing.

mount point

The path to a directory where a file system is mounted.

name space

The portion of a collection of files that identifies the file, its attributes, and its storage locations.

nearline storage

Removable 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 network-attached automated library, such as those from ASM, ADIC/Grau, IBM, or Sony, is controlled using a software package supplied by the vendor. The ASM and ASM QFS file systems interface with the vendor software using an ASM media changer daemon specifically designed for the automated library.

NFS

Network File System. A standard protocol that allows a UNIX file system to be remotely mounted via a network.

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).

partition

A portion of a device.

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 only be performed on zero-sized files. That is, the `setfa -l` command can only be specified for a file that is size zero. For more information, see the `setfa`(1) man page.

prioritizing preview requests

A method of assigning priority to archive and stage requests that cannot be immediately satisfied.

pseudo device

A network connection to an actual device on the ASM or ASM QFS server.

RAID

Redundant Array of Inexpensive/Independent Disks. A disk technology that uses several inexpensive disks to reliably store files. It may protect against data loss from a single disk failure, may provide a fault-tolerant disk environment, and may provide higher throughput than individual disks.

recycler

An ASM and ASM QFS component that reclaims space on cartridges that is occupied by unused 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

An ASM and ASM QFS 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.

robot

The portion of an library that moves cartridges between storage slots and drives.

robottool

An ASM and ASM QFS administrative tool with a graphical user interface (GUI) for viewing and managing automated libraries.

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, 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 striping.

RPC

Remote Procedure Calls. The underlying data exchange mechanism used by NFS to implement custom network data servers.

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 copy data.

samfsrestore

A program that restores a control structure dump.

samtool

An ASM and ASM QFS administrative tool with a GUI for invoking `robottool`, `devicetool`, and `previewtool`.

SCSI

Small Computer System Interface. An electrical communication specification commonly used for peripheral devices such as disk and tape drives and automated libraries.

SCSI-attached Library

An automated library connected directly to a server using the SCSI interface. These libraries are controlled directly by the ASM or ASM QFS software by using the SCSI standard for automated libraries.

shared writer/shared reader

The ASM QFS shared reader/shared writer capability allows you to specify a file system that can be shared by multiple servers. Multiple hosts can read the file system while only one host can write to the file system. Shared readers are specified with the `-o shared_reader` option on the `mount`(1M) command. The one-writer host is specified with the `-o shared_writer` option on the `mount`(1M) command. For more information on the `mount`(1M) command, see the `mount_samfs`(1M) man page.

small computer system interface

See SCSI.

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. 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 an ASM QFS file system and defined in the `mcf` file as 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.

striping

A data access method in which files are simultaneously written to logical disks in an interlaced fashion.

All ASM file systems allow you to declare either striped or round robin access for each individual file system. The ASM QFS file systems allow you to declare striped groups within each file system.

Also see the glossary entry for round robin.

super block

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.

tar

Tape Archive. A standard file/data recording format used by the ASM and ASM QFS 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.

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

Allows 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. A logical identifier for magnetic tape and optical disk that is written in the volume label.

WORM

Write Once Read Many. A storage classification for media that can be written only once but read many times.

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