ArcFiniti™ Operations Guide

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Contents

About This Guide . . . . . **xiii**
Related Publications xiii
Obtaining Publications xiii
Conventions xiv
Reader Comments xiv

1. Introduction **1**
What is the ArcFiniti™ Solution? 1
Components 2
Capacity 7
Power Management 8
How Does Archiving Work? 9
DMF-Managed User Filesystems 11
Using ArcFiniti 12
ArcFiniti Tools 12
Monitoring 14
Backing Up Data 14
Modifying the Configuration 15
Fixing Problems 15
For More Information 15

2. Managing the ArcFiniti Solution **17**
ArcFiniti Storage Applications Portal 17
Portal Overview 17
Portal Requirements 19

Launching the Portal 19
Archive Management 19
Accessing DMF Manager 20
Monitoring DMF Status 21
Viewing Daily Reports 25
Monitoring Capacity of the Primary Filesystem 25
Monitoring Capacity of the Archive Tier 27
Determining the Migration State of a File 27
Clustered Filesystem Management 29
NFS and CIFS Management 31
Overview of NFS and CIFS Management 31
Accessing SMC IS 33
Samba Differences 33
COPAN Cabinet Management 34
Accessing PSM 34
Monitoring the Hardware Components 35
Automatically Monitoring MAID Disks 37
IS5000 RAID Management 37

3. Modifying the ArcFiniti Configuration 39

Changing the Network Addresses 39
Using DMF Email Notification 40
Using PSM Email Notification 40
Modifying DMF Space-Management Policies 41

4. Troubleshooting the ArcFiniti Solution 43

Collecting Data for Problem Analysis 43

Learning More about DMF Problems 44
Restoring DMF Filesystems and Databases 47
Firefox is Already Running 47
Unable to Recall Data 47
YaST2 Disk Space Warning 48
Power On Requires SGI Support 48
Contacting SGI Support 48

Index 49

Figures

Figure 1-1 ArcFiniti Components 4

Figure 1-2 Relationships Among the Nodes, RAID, and MAID Shelves 5

Figure 1-3 Example Data Path from NFS Client to COPAN MAID 6

Figure 1-4 MAID Shelf Contents 7

Figure 1-5 Archiving and Recalling File Data 10

Figure 1-6 ArcFiniti Storage Applications Portal 13

Figure 2-1 DMF Manager 22

Figure 2-2 DMF Details Dialog 24

Figure 2-3 User Filesystem Capacity in DMF Manager 26

Figure 2-4 CXFS Manager GUI Showing Details for a Node 30

Figure 2-5 SGI Management Center for Infinite Storage (SMC IS) 32

Figure 2-6 PSM GUI 36

Figure 2-7 ISSM-EE Summary Window 38

Figure 4-1 DMF Manager Showing Problems 44

Figure 4-2 DMF Manager Alerts Panel 46

Tables

Table 1-1 ArcFiniti Models 8

About This Guide

This guide provides basic information about using the SGI® ArcFiniti™ integrated data archive solution.

Related Publications

The following publications contain additional information:

- *CXFS 6 Administration Guide for SGI InfiniteStorage*
- *DMF 5 Administrator's Guide for SGI InfiniteStorage*
- *DMF 5 Filesystem Audit Guide for SGI InfiniteStorage*
- *InfiniteStorage System Manager Enterprise Edition (ISSM-EE) Administration Guide*
- *InfiniteStorage System Manager Enterprise Edition (ISSM-EE) Software Concepts Guide*
- *SGI C1103-TY12 User's Guide*
- *SGI Management Center for InfiniteStorage Administrator's Guide*

Also see the *Platform Service Manager Online Help* available from the PSM **Help** menu.

Obtaining Publications

You can obtain SGI documentation as follows:

- See the SGI Technical Publications Library at http://docs.sgi.com. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.
- You can view release notes on your system by accessing the `README.txt` file for the product. This is usually located in the `/usr/share/doc/`*productname* directory, although file locations may vary.
- You can view man pages by typing `man` *title* at a command line.

Conventions

The following conventions are used throughout this document:

Convention	Meaning
`command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
variable	Italic typeface denotes variable entries and words or concepts being defined.
`user input`	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. (Output is shown in nonbold, fixed-space font.)
[ ]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
`manpage`(*x*)	Man page section identifiers appear in parentheses after man page names.
GUI	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this publication, contact SGI. Be sure to include the title and document number of the publication with your comments. (Online, the document number is located in the front matter of the publication. In printed publications, the document number is located at the bottom of each page.)

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Introduction

This chapter discusses the following:

- "What is the ArcFiniti™ Solution?" on page 1
- "Components" on page 2
- "Capacity" on page 7
- "Power Management" on page 8
- "How Does Archiving Work?" on page 9
- "DMF-Managed User Filesystems" on page 11
- "Using ArcFiniti" on page 12
- "For More Information" on page 15

What is the ArcFiniti™ Solution?

ArcFiniti is an integrated disk-based data archiving solution that offers performance, accessibility, power efficiency, and long-term data integrity advantages over tape.

Because ArcFiniti is preconfigured at the factory, it is easy to deploy and use. All files are always in an available online state to users. Archived files appear as normal files to users and are easily accessible via high-performance network connections. By transparently managing the placement of file data on the appropriate storage tier, ArcFiniti lets you cost-effectively maintain a seemingly infinite amount of data without sacrificing accessibility.

ArcFiniti also monitors the health of disk drives; if ArcFiniti detects a mechanical problem, it automatically migrates data and alerts the administrator. By operating a subset of the disk drives at any given time, ArcFiniti reduces both the cost of operation and the risk of hardware failure.

Components

ArcFiniti integrates the following major components:

- ArcFiniti Storage Applications Portal provides access to other tools you will need to manage the ArcFiniti solution
- CXFS™ software for sharing DMF-managed user filesystems among NFS server nodes
- Data Migration Facility (DMF) software manages the archiving of files, making use of the OpenVault™ mounting service
- DMF Manager is a web-based interface for monitoring and managing DMF data migration between storage tiers
- Power Managed RAID® software operates a subset of disk drives at any given time, capping power consumption and turning off drives not in use
- Disk Aerobics® software automatically monitors the health of powered-on disk drives and periodically tests all disk drives in each MAID array
- SGI Management Center for Infinite Storage (SMC IS) is a web-based interface that lets you monitor local disk metrics and configure Network File System (NFS) exports or Common Internet File System (CIFS) shares from existing filesystems
- InfiniteStorage System Manager Enterprise Edition (ISSM-EE) is a GUI for configuring and monitoring the SGI InfiniteStorage 5000 (IS5000) RAID
- Primary cache of DMF-managed user filesystems for transactional storage on the higher-performance IS5000 RAID
- Archive of migrated file data for persistent storage on cost-effective COPAN™ 400M native massive array of idle disks (MAID), with up to 6 shelves

- SGI® Rackable® C1103-TY12 server nodes that have various functions:

  Note: For simplicity, the ArcFiniti nodes are referred to in this guide by their primary function for DMF. The individual DMF processes that archive and recall data are known as *data mover processes*. These mover processes run on the *DMF server* as well as any *parallel data mover nodes*. For brevity, the parallel data mover nodes are referred to in this guide as *mover nodes*.

  - The *DMF server* performs the following functions:
    - Coordinates DMF activity as the DMF server
    - Moves data to the assigned MAID shelves in the archive tier
    - Coordinates CXFS activity for the primary filesystem as the CXFS metadata server
    - Mounts CXFS filesystems for access by the DMF server, the mover nodes, and NFS
    - Shares NFS mount points with network-attached NFS clients as an NFS server
  - Up to two DMF parallel data *mover nodes*. A *mover node* performs the following functions:
    - Moves data to assigned MAID shelves in the archive tier
    - Mounts CXFS filesystems for access by the DMF server, the mover nodes, and NFS as a CXFS client-only node
    - Shares NFS mount points with network-attached NFS clients as an NFS server
- Embedded Platform Service Manager (PSM) server and GUI, which lets you control and monitor the ArcFiniti hardware and software components
- Embedded Ethernet switch for intra-cabinet cluster communication

Figure 1-1 shows a conceptual drawing of the ArcFiniti components and their uses, showing the largest model.

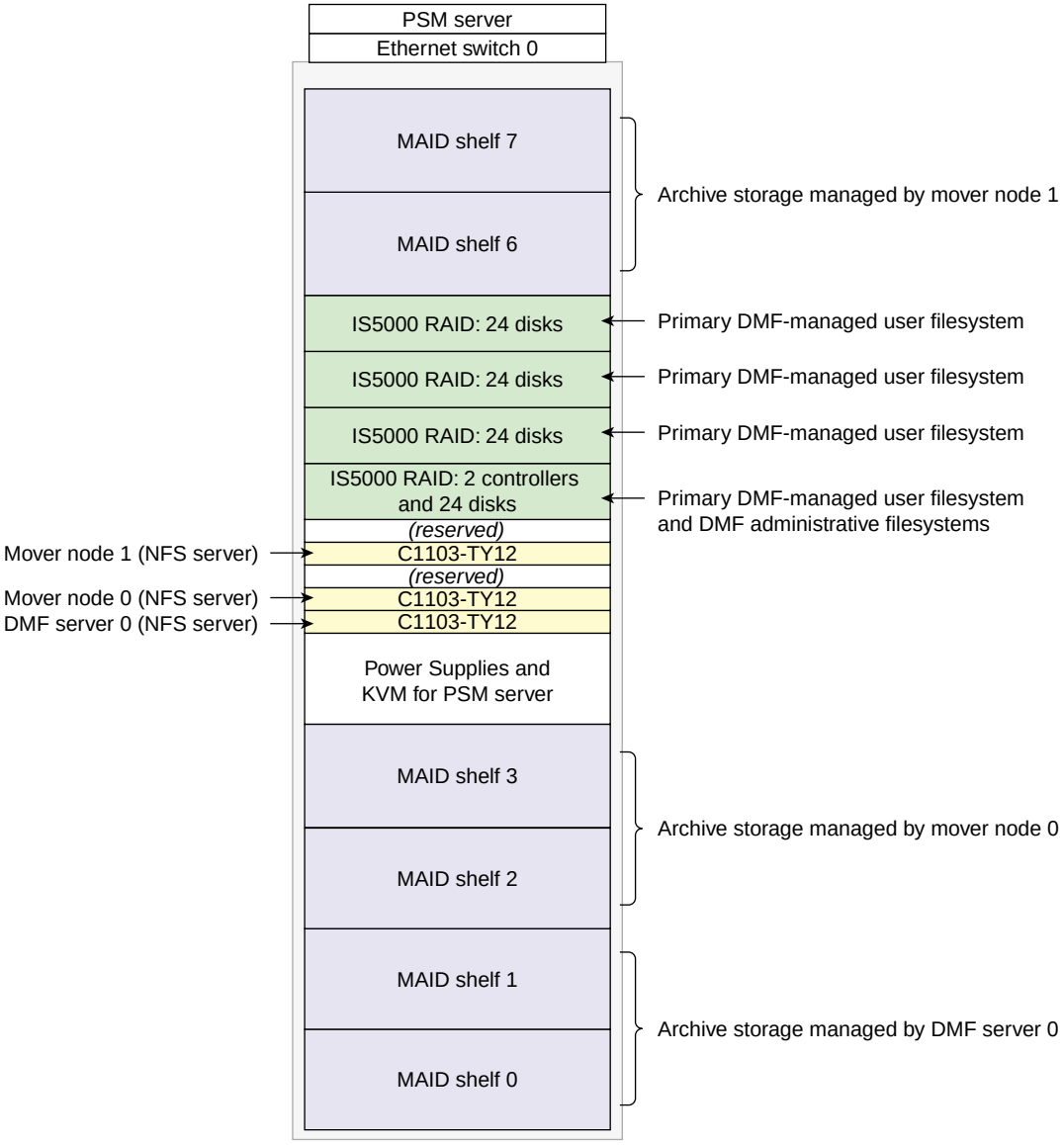

Figure 1-1 ArcFiniti Components

Figure 1-2 is a conceptual drawing of the data path relationships among the nodes and the storage, showing that all nodes have access via two connections to the primary filesystem on the IS5000 cache, but that each node has access to only two MAID shelves, such as DMF server 0 connects to MAID shelves 0 and 1. (Connections to the client network are not represented in the figure.)

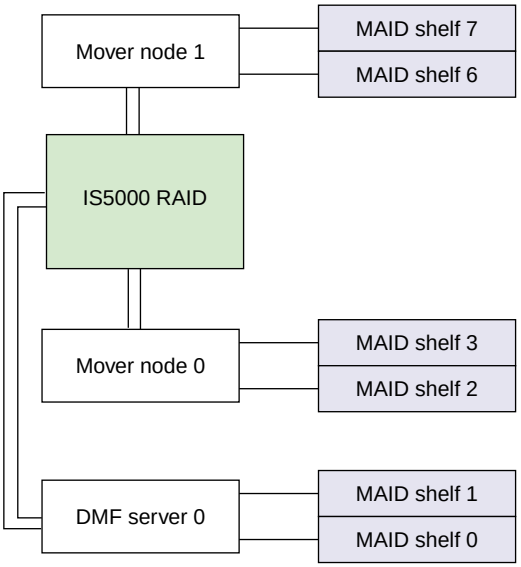

Figure 1-2 Relationships Among the Nodes, RAID, and MAID Shelves

Figure 1-3 shows an example of the path that file data might take from the NFS client to a mount point on a specific ArcFiniti node (in this case, the `/mnt1` mount point on mover node 1) to be stored in the primary filesystem on the IS5000 cache (using a mover process on mover node 1), and then being archived by another node (in this case, a mover process on the DMF server) to the archive tier on one of the MAID shelves available to that node (in this case, the mover process on the DMF server has access to either MAID shelf 1 or MAID shelf 0, and has chosen MAID shelf 0).

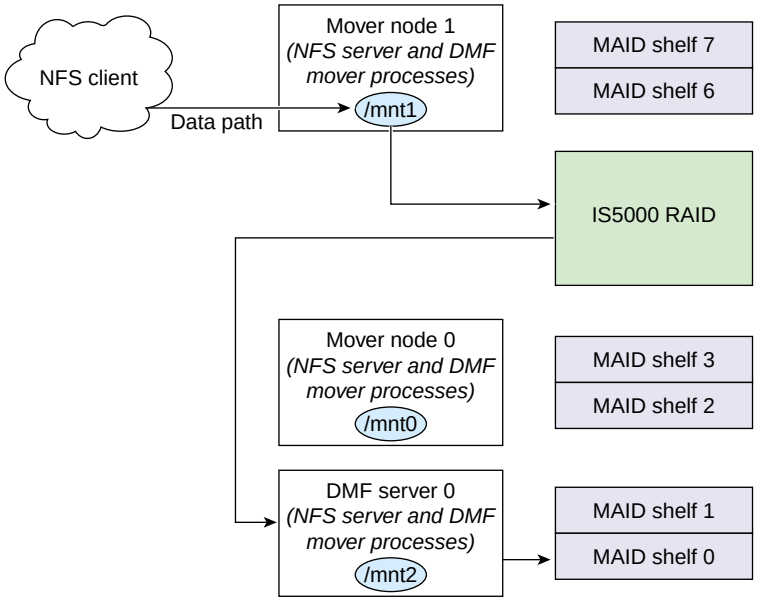

Figure 1-3 Example Data Path from NFS Client to COPAN MAID

Each MAID shelf has a RAID controller and 26 groups of disks; each group is referred to as a *RAID set*.

Each RAID set appears to the DMF server and to the mover nodes as a SCSI disk device *logical unit (LUN)*. Each RAID set has three data disks plus one parity disk (known as *RAID 5*) . Figure 1-4 shows a conceptual example of a MAID shelf.

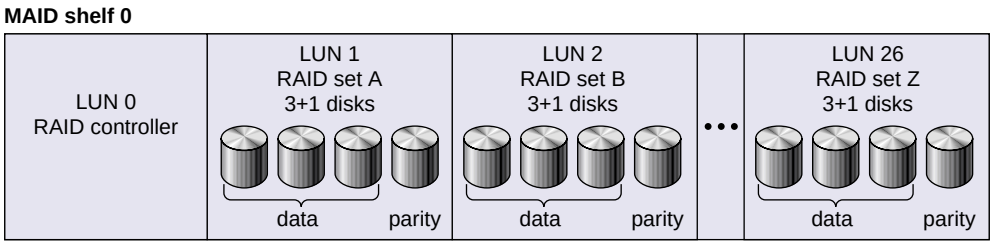

Figure 1-4 MAID Shelf Contents

Capacity

ArcFiniti has a range of five models, which enables growth in capacity and in network throughput. Table 1-1 describes the disk capacity and port options by model. (Because the primary disk content essentially overlaps with the archive disk content, the archive capacity is the total useful disk space.)

To upgrade your solution, contact SGI Professional Services.

Note: The sizes in the following table are in powers of 1000 (TB), not 1024 (TiB).

Table 1-1 ArcFiniti Models

Feature	A156	A234	A468	A936	A1404
Gigabit Ethernet ports	2	2	2	4	6
10-Gigabit Ethernet ports	2	2	2	4	6
Primary filesystem disk capacity on IS5000 RAID	10.8 TB	10.8 TB	10.8 TB	22.8 TB	34.8 TB
Archive tier disk capacity on COPAN MAID for standard ArcFiniti solution	156 TB	234 TB	468 TB	936 TB	1.4 PB
Additional primary filesystem disk capacity available with an optional extra tray of IS5000 disks	*12 TB*	*12 TB*	*12 TB*	*12 TB*	*12 TB*

Power Management

Power Managed RAID software selectively powers-on the group of drives that constitute an individual RAID set in the COPAN MAID, ensuring that a preconfigured maximum threshold of 50% of the drives within the MAID shelves are powered on at any one time. It powers off the drives in the least-recently used RAID set after a period of disuse or when a fixed power budget is exceeded. All drives will eventually power off when not in use by DMF, and power on again as needed. This has the following benefits:

- Reduces heat and vibration, which increases the reliability of drives, and therefore protects the data on those drives and minimizes repair costs
- Reduces power-consumption and therefore operational costs

To maintain the power budget, DMF carefully controls how many RAID sets are accessed at once and groups archival/retrieval requests in order to move data efficiently. If data is required from a disk that is powered down, Power Managed RAID will spin down the drives in another RAID set and then power up the drives in the RAID set that contains the data being requested.

How Does Archiving Work?

ArcFiniti uses DMF to continuously monitor the managed user filesystem. Only the most timely data resides on the higher performance primary filesystem; less timely data is automatically migrated to the archive tier. However, data always appears to be online to end users and applications, regardless of its actual location.

DMF moves file data to archive storage on the COPAN MAID disk, but it leaves critical metadata (such as index nodes, or *inodes*, and directories) in the primary filesystem on the IS5000 cache. A user retrieves a file from the IS5000 cache simply by accessing it normally through NFS; DMF automatically recalls the file's data from the archive storage, caching it on the primary filesystem. From a user's perspective, all content is visible all of the time.

Figure 1-5 describes the archiving concept, showing that data is removed from the IS5000 cache after migrating (represented by the dashed lines) and moved to the archive on MAID, but the inode remains in place in the primary filesystem. During the period when the file data has been copied to the archive storage on MAID but has not yet been deleted from the primary filesystem, the file is considered to be *dual-state*. After the file data has been deleted from the primary filesystem, the file is considered to be *offline*.

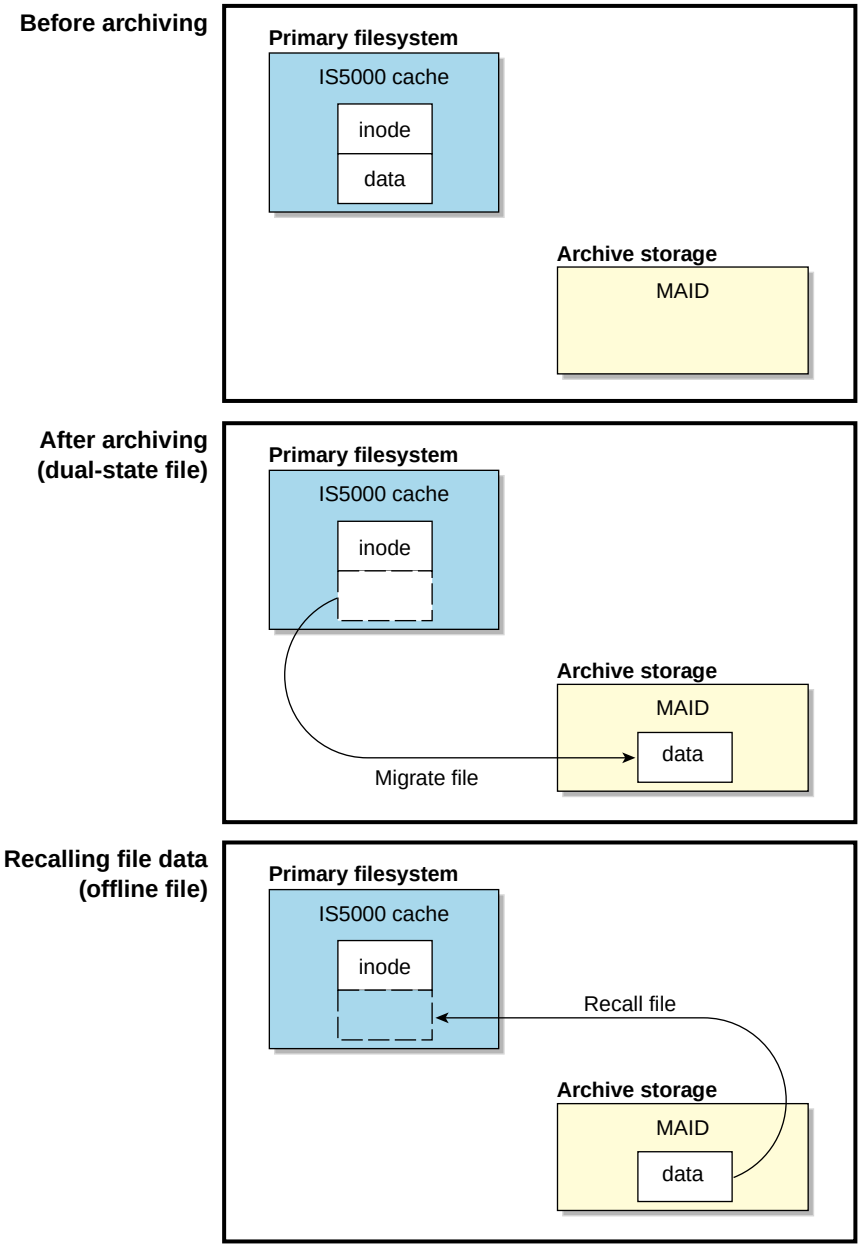

Figure 1-5 Archiving and Recalling File Data

Because the inodes and directories remain online, users and applications never need to know where the file data actually resides; archived files remain cataloged in their original directories and are accessed as if they were still online. In fact, when drilling into directories or listing their contents, a user cannot determine whether a file is online or offline; determining the data's actual residence requires special commands or command options. The only difference users might notice is a slight delay in access time.

The DMF server and the mover nodes can each run multiple data mover processes. For the purposes of archiving, all DMF mover processes running on each ArcFiniti node share access to the same underlying CXFS clustered filesystems on the IS5000 cache that the users access via NFS. The IS5000 cache also contains several DMF administrative filesystems that are shared among all ArcFiniti nodes; these administrative filesystems are not accessible to users.

DMF-Managed User Filesystems

Your ArcFiniti solution comes preconfigured with up to six user filesystems that will be monitored by DMF. By default, there is one large primary filesystem that incorporates all of the available user space on the IS5000 disks. If there are multiple filesystems, the ArcFiniti solution can be preconfigured to restrict a particular filesystem's data to a subset of the available MAID shelves or the filesystem can be given equal access to all MAID shelves.

When a file is archived, a copy of a file's data is placed onto one of the available MAID shelves by default; a MAID shelf will be chosen so as to balance the amount of data stored on each shelf. ArcFiniti uses RAID 5 for secondary storage and powers off disks for longer life, so it is not absolutely necessary to make a second copy of file data when archiving a file (which is different from the recommendation when using DMF with tapes). However, a second copy is recommended if the ArcFiniti cabinet has at least two MAID shelves. (The ArcFiniti solution makes at most one copy per shelf.) If desired, your system may have been preconfigured to make an additional copy on a different shelf on a per-filesystem basis. To modify the DMF configuration, contact SGI Support.

The preconfigured solution comes with all of the required DMF administrative filesystems and migration policies appropriate for typical use of the ArcFiniti solution. The default migration policies do the following:

- Copy (migrate) most file data from the primary cache to the archive tier, other than files accessed within the last hour (to allow file content to stabilize). This

occurs frequently (such as every night) or when the free-space minimum threshold is exceeded.

- Keep at least 50% of the primary filesystem free for new data. When the filesystem reaches this threshold, DMF will free the already-migrated data from the primary filesystem until 60% of the filesystem is free, selecting the oldest files first. (Optionally, a portion of the file data can be left on the primary filesystem in order to speed user access to a migrated file.)
- Compress migrated data (if appropriate for your site). By default, there is no compression.

For more information, see *DMF 5 Administrator's Guide for SGI InfiniteStorage*.

Using ArcFiniti

This section provides an overview of the following:

- "ArcFiniti Tools" on page 12
- "Monitoring" on page 14
- "Backing Up Data" on page 14
- "Modifying the Configuration" on page 15
- "Fixing Problems" on page 15

ArcFiniti Tools

The *ArcFiniti Storage Applications Portal* provides access to system administration tools that you will need to manage the ArcFiniti solution. Most of the tools are also available directly, via the user data networks. Figure 1-6 shows an example of the portal. For details about accessing and using the portal, see "ArcFiniti Storage Applications Portal" on page 17.

Note: The ArcFiniti solution was preconfigured according to the specifications for your site and is optimized for use in archiving persistent data. You should not make changes to the ArcFiniti components unless you fully understand the implications or are advised to do so by SGI Support.

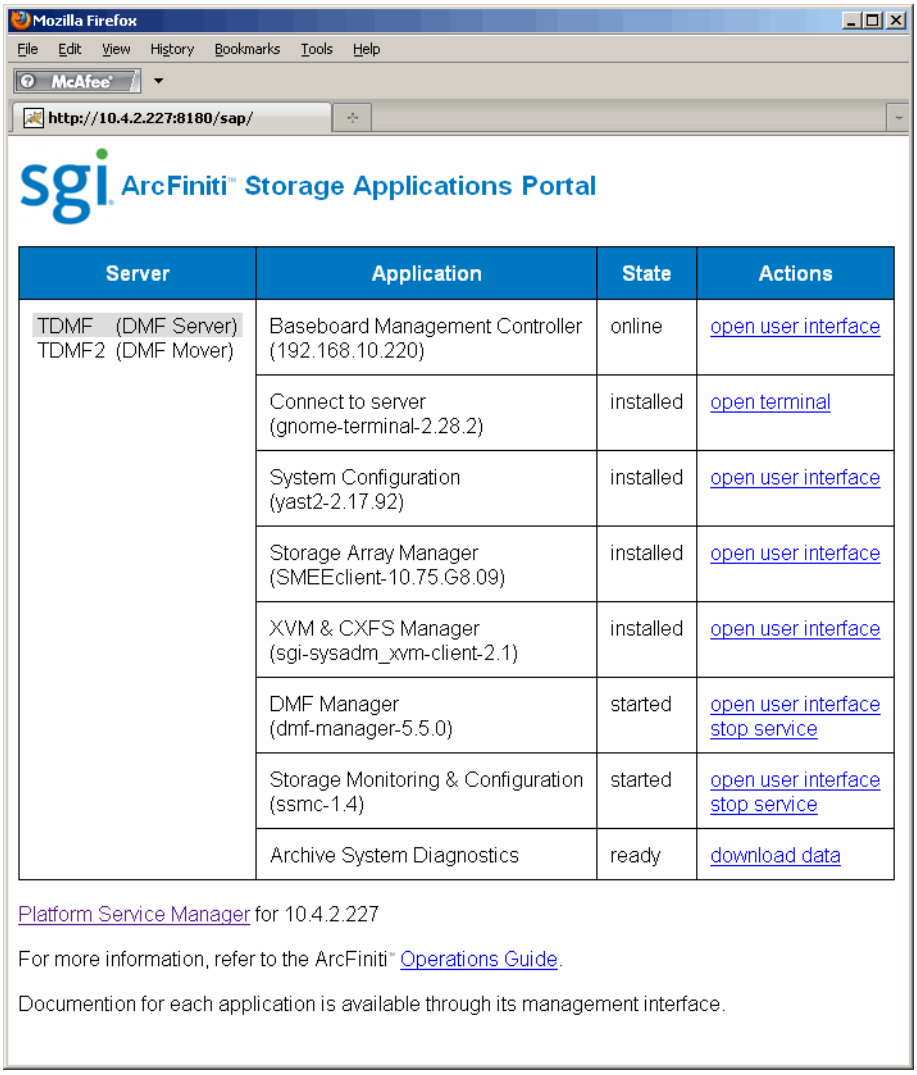

Figure 1-6 ArcFiniti Storage Applications Portal

Monitoring

You should monitor DMF on a daily basis to ensure that it is operating properly. ArcFiniti is preconfigured with several automated tasks that generate reports about activity, status, and errors. Additionally, some serious error conditions generate messages. It is important that you use DMF Manager (available through the portal) to examine these reports and messages regularly so that you can find any problems in time to retrieve important information that can help diagnose the problem.

As an alternative to monitoring the reports, you can choose to have email notification sent to a site-specific address; see "Using DMF Email Notification" on page 40.

In addition, you can configure PSM to send system event email through the administrative network, and to send regular hardware health checks to the administrator and SGI. You can also configure the IS5000 RAID to send event email through the user data network.

See Chapter 2, "Managing the ArcFiniti Solution" on page 17.

Backing Up Data

ArcFiniti is configured to copy all data to MAID storage and to back up the following on a daily basis:

- Primary filesystem inodes and directories, which allow the primary filesystem to be restored if the IS5000 disk fails
- DMF database, which maps primary filesystem inodes to file data locations on archive storage

The dumps for each day's backup are kept for 10 days before the space is recycled. One copy of each dump is kept on a non-DMF region of MAID shelf 0 in LUN 26 (RAID set Z). Another copy is kept in `/data2/backups` on the `/data2` system disk in the C1103-TY12.

For more information, see the *DMF 5 Administrator's Guide for SGI InfiniteStorage*.

Note: DMF journals provide incremental records of archival activity between DMF database backups. These journals are kept on the IS5000 cache in a different RAID set from the one used for the DMF database. Like DMF dumps, the DMF journals are stored for a preconfigured amount of time.

Modifying the Configuration

If you did not choose to have your solution preconfigured to make two copies, you can later modify the DMF policies to create another copy. If necessary, you can also modify the DMF space-management and backup tasks by using DMF tools. For more information, contact SGI Support. If changes are made to your system, you should use the **download data** link to archive the changed system configuration. See "Collecting Data for Problem Analysis" on page 43.

Fixing Problems

If you run into problems, see Chapter 4, "Troubleshooting the ArcFiniti Solution" on page 43, to determine if the issue is something you can easily solve yourself or if you should contact SGI Support.

For More Information

For more information about your ArcFiniti solution, see the documentation available online via the portal applications (also listed in the Preface), review the documentation for command-line tools (man pages) by using the `man`(1) command on the servers, and contact SGI Support to learn about technical classes, support services, and professional services. See "Contacting SGI Support" on page 48.

The release notes and manuals for some software components are also provided in the `noarch/sgi-isspdocs` RPM and will be installed on the DMF server into the following locations:

`/usr/share/doc/packages/sgi-issp-`*`VERSION/TITLE`*

Also see the *Platform Service Manager Online Help* available from the PSM **Help** menu on the GUI.

Managing the ArcFiniti Solution

This chapter discusses the following:

- "ArcFiniti Storage Applications Portal" on page 17
- "Archive Management" on page 19
- "Clustered Filesystem Management" on page 29
- "NFS and CIFS Management" on page 31
- "COPAN Cabinet Management" on page 34
- "IS5000 RAID Management" on page 37

ArcFiniti Storage Applications Portal

This section discusses the following:

- "Portal Overview" on page 17
- "Portal Requirements" on page 19
- "Launching the Portal" on page 19

Portal Overview

The ArcFiniti Storage Applications Portal provides easy access to system administration tools that you will use to manage the ArcFiniti solution. The portal displays the following:

- DMF server or mover node (the appropriate subset of links will be shown):
  - Baseboard management controller (BMC) for access to server hardware status and to each node's system console, for actions such as displaying the console output, observing server boot progress, and power-cycling the C1103-TY12
  - Terminal connection to the C1103-TY12, allowing you to run user and administrator commands
  - YaST2 tool for software installation, management, and upgrades

  - InfiniteStorage System Manager Enterprise Edition (ISSM-EE) for IS5000 storage array management
  - CXFS Manager for managing clustered filesystem volumes on the IS5000 RAID
  - DMF Manager for monitoring and managing DMF data migration between storage tiers
  - SGI Management Center for Infinite Storage (SMC IS) for monitoring local disk metrics and configuring NFS exports and CIFS shares
  - Archive System Diagnostics for CXFS and DMF (which will be available for download as a compressed `tar` file)
- COPAN Platform Service Manager (PSM) GUI for monitoring and managing the MAID and other cabinet components

The administrative applications are tunneled through the same interface as the portal for convenience. You can also access DMF Manager and CXFS Manager directly on the DMF server, and YaST2 directly on any of the nodes. For more information, see the documentation for those applications.

Figure 1-6 on page 13 shows an example of the portal.

The tool you will use most often to monitor the ArcFiniti solution is DMF Manager. When you initially open DMF Manager, you will see the **Overview** panel, which displays a high-level graphical view of the ArcFiniti environment and status for each component. At a glance, you can see if everything is operating properly. For more information, see "Monitoring DMF Status" on page 21.

Caution: Access to each application requires entry of the system's password. You should take care to allow only knowledgeable system administrators access to the administrative tools. Improper use of these tools may result in loss of access to data, loss of data, or reduced system performance. For information about administrative training, contact SGI. See "Contacting SGI Support" on page 48.

Portal Requirements

The portal is supported on Linux® systems and has the following system requirements:

- Firefox™ 3.*x* or newer with JavaScript™ enabled, displayed through an X11 server
- `xterm`
- OpenSSH
- Java® Web Start

Launching the Portal

To access the portal, launch a web browser to the following URL:

`https://`*`YOURSERVER`*`:8180/sap/`

When prompted on how to handle a JNLP file, select `/usr/bin/javaws` as the application.

Archive Management

This section discusses the following:

- "Accessing DMF Manager" on page 20
- "Monitoring DMF Status" on page 21
- "Viewing Daily Reports" on page 25
- "Monitoring Capacity of the Primary Filesystem" on page 25
- "Monitoring Capacity of the Archive Tier" on page 27
- "Determining the Migration State of a File" on page 27

Accessing DMF Manager

To access DMF Manager, do the following:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Select the DMF server name to display system administration links for that node.
3. For the **DMF Manager** application, click the **open user interface** link.
4. Enter the password for the server (verification required by the portal).
5. If necessary, accept the DMF Manager security certificate.

   Note: DMF Manager generates its own SSL certificates, rather than having the SSL certificates signed by a commercial certificate authority. Therefore, the certificate warning is safe to ignore.

6. When prompted, enter the following information:
   - DMF Manager user name: **dmfman**
   - DMF Manager default password: **INSECURE**

If you need help using DMF Manager, select the following from the DMF Manager menu bar:

Help
> Getting Started

Note: You should click the **open terminal** link for the DMF server in the portal and change the DMF Manager access password by using the `htpasswd2`(1) command. Only provide the password to those persons who you want to access the GUI. For more information, see the `htpasswd2`(1) man page.

Monitoring DMF Status

When you initially open DMF Manager, you will see the **Overview** panel, which displays a high-level logical view of the ArcFiniti environment, including the relationships and status of components.

With a glance at the DMF Manager **Overview** panel, you can see if the system is operating properly. An icon in the upper-right corner indicates if DMF is up (green) or down (upside down and red). If DMF requires attention, DMF Manager makes actions available to identify and resolve problems. The tool volunteers information and provides context-sensitive online help. DMF Manager also displays performance statistics, allowing you to monitor DMF activity, filesystems, and hardware.

Figure 2-1 is an example of the **Overview** panel. It shows that DMF is up (green icon), but that it has some errors that require action (red indicator icon). It shows that there are two C1103-TY12 server nodes: **TDMF** (the DMF server) and **TDMF2** (a mover node). There is one DMF-managed user filesystem named **/dmfusr1**. The flag indicates that there are messages, likely about the tasks that have yellow warning indicator icons associated with them.

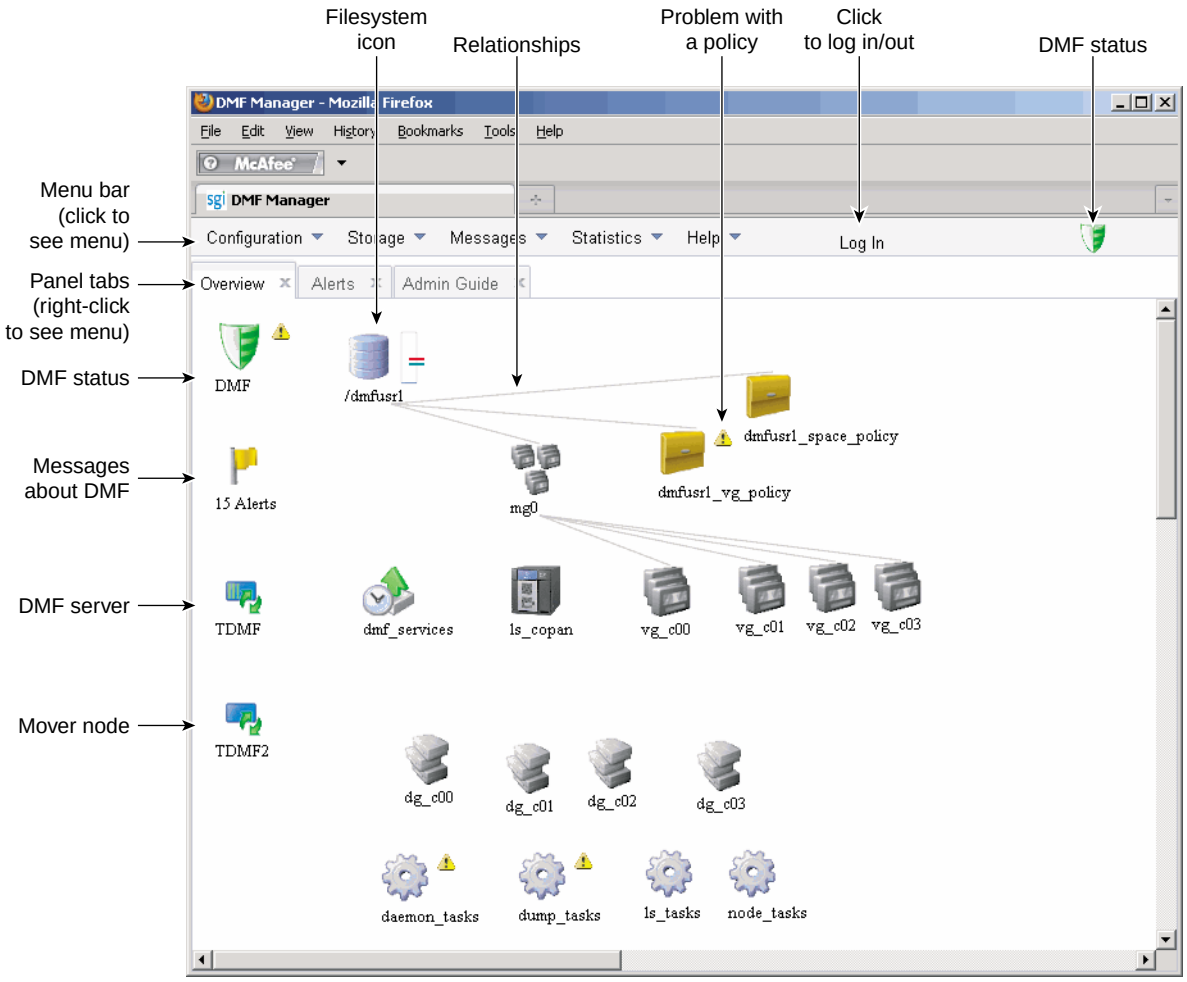

Figure 2-1 DMF Manager

Hover over a node's icon to view its DMF and CXFS states:

- DMF states:

  ```
  Active
  Inactive
  Disabled
  ```

- CXFS states, such as:

  ```
  Stable
  Establishing membership
  Inactive
  Disabled
  ```

Right-click the icon and select **Details...** to display a dialog containing more information about DMF and CXFS, including CXFS filesystem mount information. Items in green font indicate that all is well; items in red font indicate a problem. Click **Help** for more information about the fields in the dialog.

Figure 2-2 shows that `TDMF` is the DMF server and CXFS metadata server, and that `TDMF2` is a DMF mover node and CXFS client-only node. Both nodes have normal DMF and CXFS status. To see the CXFS mount information for the DMF administrative and DMF-managed user filesystems, scroll down in the dialog window.

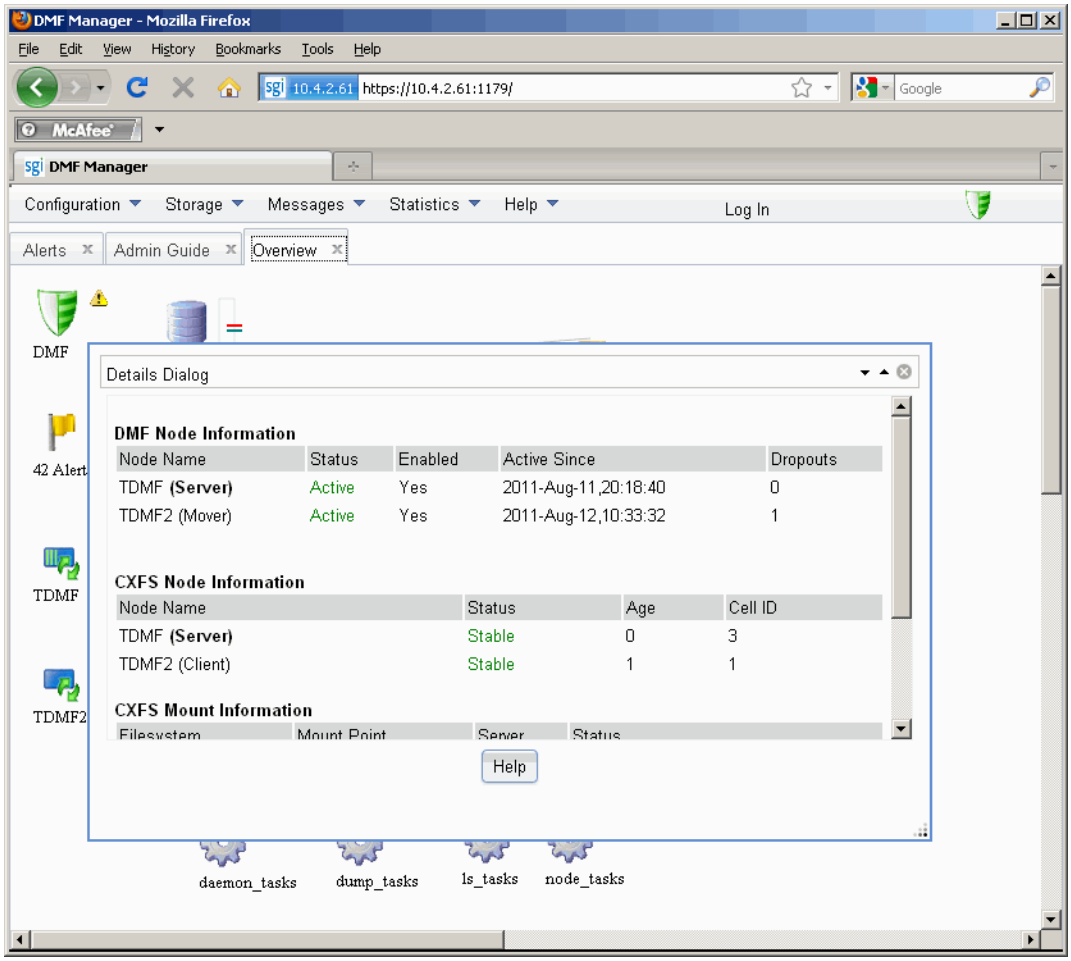

Figure 2-2 DMF Details Dialog

If you suspect a problem with DMF, see "Collecting Data for Problem Analysis" on page 43.

For more information, access the *DMF 5 Administrator's Guide for SGI InfiniteStorage* by clicking on the **Help** in the DMF Manager menu bar.

Viewing Daily Reports

You can use the following DMF Manager panel to view daily activity reports (those containing critical log errors show red warning symbols):

Messages
> Reports

For more information about understanding the reports, see the *DMF 5 Administrator's Guide for SGI InfiniteStorage*.

Monitoring Capacity of the Primary Filesystem

To determine the capacity of the filesystem in the primary filesystem, do the following:

1. Right-click on the filesystem icon.
2. Select **Show Configuration...**
3. Examine the output under **File System Information**:
   - **Size** represents the total capacity of the filesystem
   - **Used** represents the amount of data currently residing in the filesystem
   - **Available** represents the amount of space that is free in the filesystem

Figure 2-3 shows an example for the `/dmfusr1` filesystem.

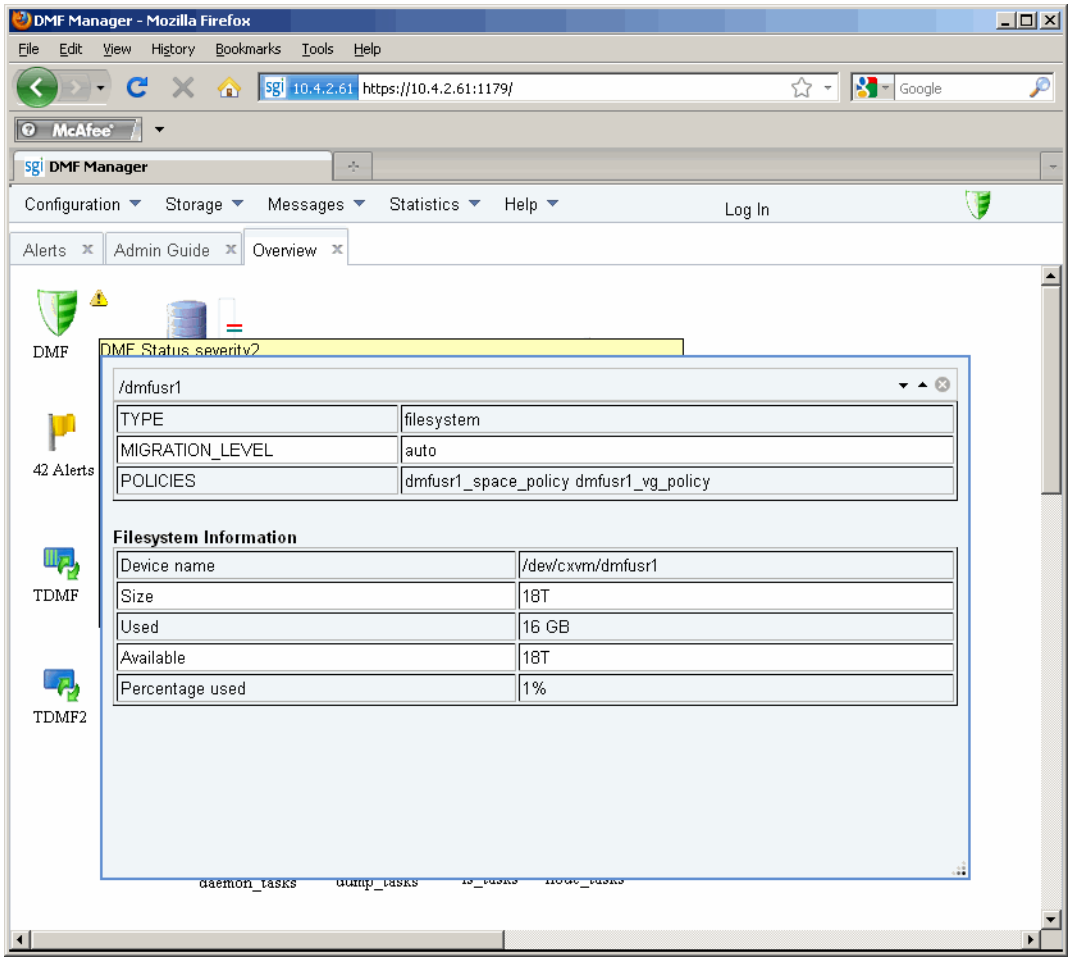

Figure 2-3 User Filesystem Capacity in DMF Manager

You can also hover the cursor over the DMF shield icon to display the current fullness of the DMF administrative filesystems.

Monitoring Capacity of the Archive Tier

To determine the available space on the COPAN MAID, do the following:

1. Select the following menu:

   Statistics
   > DMF Resources

2. Select **Volume Groups** and the particular volume group that you want to monitor.
3. Examine the display.

Note: Some DMF configuration parameters use multipliers that are powers of 1000, such as KB, MB, and GB. However, the **DMF Activity**, **DMF Resources**, and **DMF I/O** panels use multipliers that are powers of 1024, such as kiB, MiB, and GiB. For example, this means that 1 MiB/s is 2^{20} = 1048576 bytes per second.

Determining the Migration State of a File

To determine the migration state of a given file, do the following:

1. Select **open terminal** for the DMF server from the portal window.
2. In the terminal window, use the `dmls`(1) or `dmfind`(1) commands, which are similar to the Linux `ls`(1) and `find`(1) commands.

For example, the following command displays the files in the `/dmi4/abc` directory:

```
#  dmls -l /dmi4/abc
total 68584
-rw-r--r-- 1 abc   sys  16373855 2006-07-22 15:01 (OFL) dmf_tst.00005
-rw-r--r-- 1 abc   sys  26362860 2006-07-22 15:02 (OFL) dmf_tst.00015
-rw-r--r-- 1 abc   sys  36199305 2006-07-22 15:03 (OFL) dmf_tst.00025
-rw-r--r-- 1 abc   sys  39310090 2006-07-22 15:04 (OFL) dmf_tst.00035
-rw-r--r-- 1 abc   sys  51488786 2006-07-22 15:06 (OFL) dmf_tst.00045
-rw-r--r-- 1 abc   sys  16373855 2006-07-22 15:52 (OFL) dmf_tst.00163
-rw-r--r-- 1 abc   sys  36199305 2006-07-22 15:53 (UNM) dmf_tst.00183
-rw-r--r-- 1 abc   sys  39310090 2006-07-22 15:55 (OFL) dmf_tst.00193
-rw-r--r-- 1 abc   sys  17829904 2006-07-22 15:59 (UNM) dmf_tst.00223
-rw-r--r-- 1 abc   sys  14572782 2006-07-22 16:06 (UNM) dmf_tst.00233
-rw-r--r-- 1 abc   sys  16373855 2006-07-22 16:08 (OFL) dmf_tst.00246
```

```
-rw-r--r-- 1 abc   sys  27294750 2006-07-22 17:12 (DUL) dmf_tst.00606
-rw-r--r-- 1 abc   sys  72121722 2006-07-22 17:17 (OFL) dmf_tst.00616
-rw-r--r-- 1 abc   sys  22807602 2006-07-22 17:24 (DUL) dmf_tst.00636
```

DMF regards files as being of one of the following types:

- *Regular files* (REG) are user files residing only on the primary filesystem.
- *Migrating files* (MIG) are files whose copies on the archive tier on MAID are in progress.
- *Migrated files* are files that have one or more complete archive copies and no pending or incomplete archive copies. Migrated files are one of the following types:
  - *Dual-state files* (DUL) are files where the data resides both on primary filesystem and on the archive tier
  - *Offline files* (OFL) are files where the data is no longer on the primary filesystem
  - *Unmigrating files* (UNM) are previously offline files in the process of being recalled to primary filesystem
  - *Partial-state files* (PAR) are files with some combination of dual-state, offline, and/or unmigrating regions

---

Note: DMF does not migrate pipes, directories, or special files.

Like a regular file, a migrated file has an inode. An offline file or a partial-state file requires the intervention of DMF to recall its offline data; a dual-state file is accessed directly from the primary filesystem.

The operating system informs the DMF daemon when a migrated file is modified. If anything is written to a migrated file, the offline copy is no longer valid, and the file becomes a regular file until it is migrated again.

For more information, see the man pages and the *DMF 5 Administrator's Guide for SGI InfiniteStorage.*

Clustered Filesystem Management

To manage volumes via CXFS, depending upon the software installed, do the following:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Select the DMF server name.
3. For the **XVM & CXFS Manager** application, click the **open user interface** link.
4. Enter the password for the server (verification required by the portal).
5. Select the **Local** connection in the CXFS Manager startup dialog.
6. Click the **OK** button.
7. To monitor the state of a component, click on it in the **View** area.
8. To make changes, select the desired item from the **Tasks** menu.

   For example, to mount a filesystem, you would select:

   Tasks
   > Filesystems
   > Mount CXFS Filesystem

Figure 2-4 shows the **CXFS Manager** window displaying information for a specific component in the *details area.*

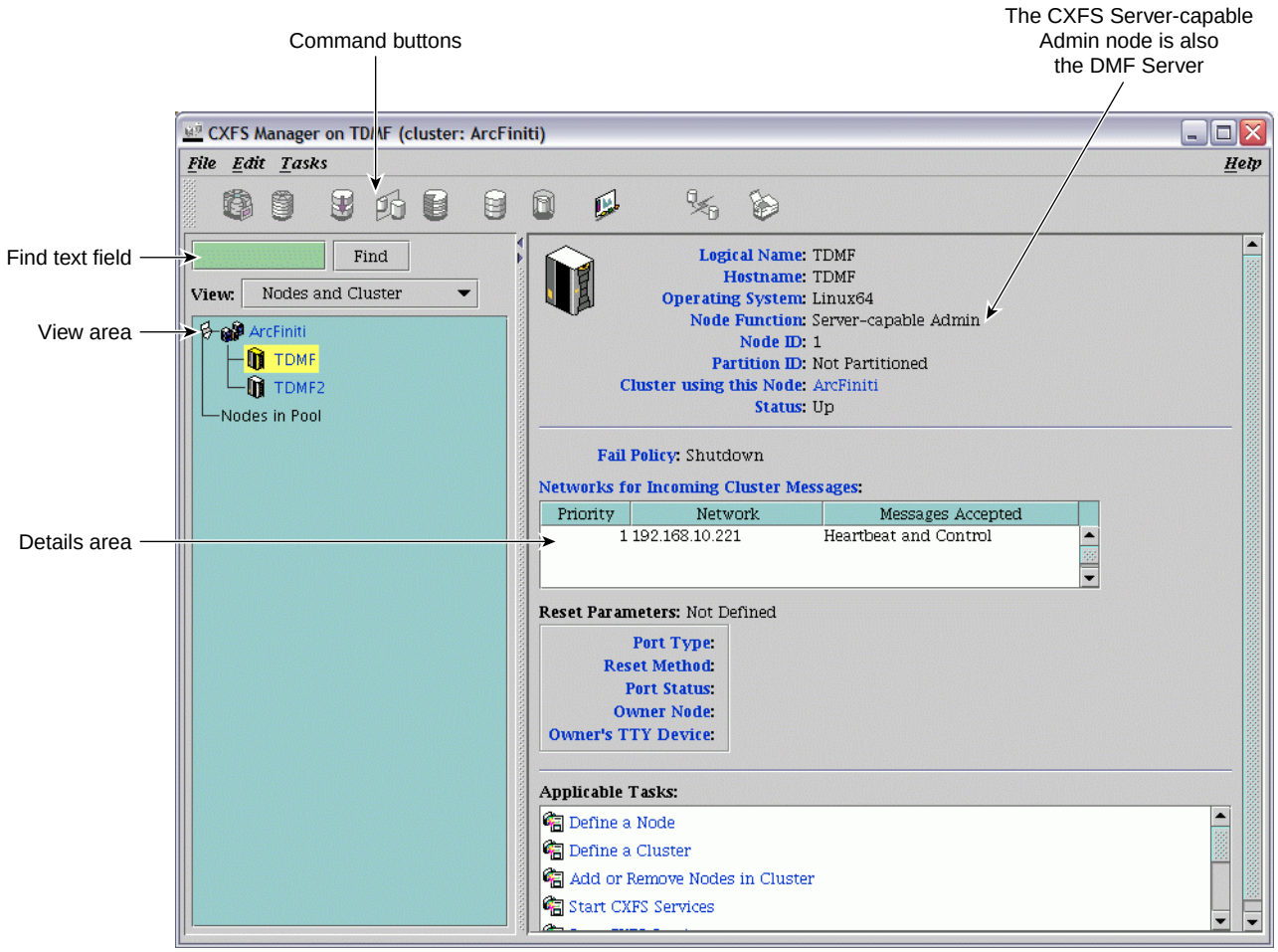

Figure 2-4 CXFS Manager GUI Showing Details for a Node

Click the **Help** button for more help.

For some tasks, you may wish to use the `cxfs_admin`(8) command. To access this command, select the **open terminal** link for the server in the portal.

If desired, you can also access CXFS Manager directly from the DMF server. For details, see *CXFS 6 Administration Guide for SGI InfiniteStorage*.

NFS and CIFS Management

This section discusses the following:

- "Overview of NFS and CIFS Management" on page 31
- "Accessing SMC IS" on page 33
- "Samba Differences" on page 33

Overview of NFS and CIFS Management

To manage NFS or CIFS on ArcFiniti, you will use SGI Management Center for Infinite Storage (SMC IS). You can use SMC IS to do the following:

- Monitor the state and performance of the storage server, including the following:
  - CPU utilization
  - Local disk throughput and IOPS
  - Network throughput
- Review historical data describing the state and individual performance of the node on which SMC IS is running
- View connected clients and determine how each of these contribute to the current NFS or CIFS workload
- Configure NFS exports or CIFS shares from existing filesystems

---

Note: Reverse lookup for NFS clients must be properly configured in the DNS server because the NFS server will always try to do a reverse lookup on client IP addresses (improper configuration will cause delays).

Figure 2-5 shows an example of the **Summary** screen.

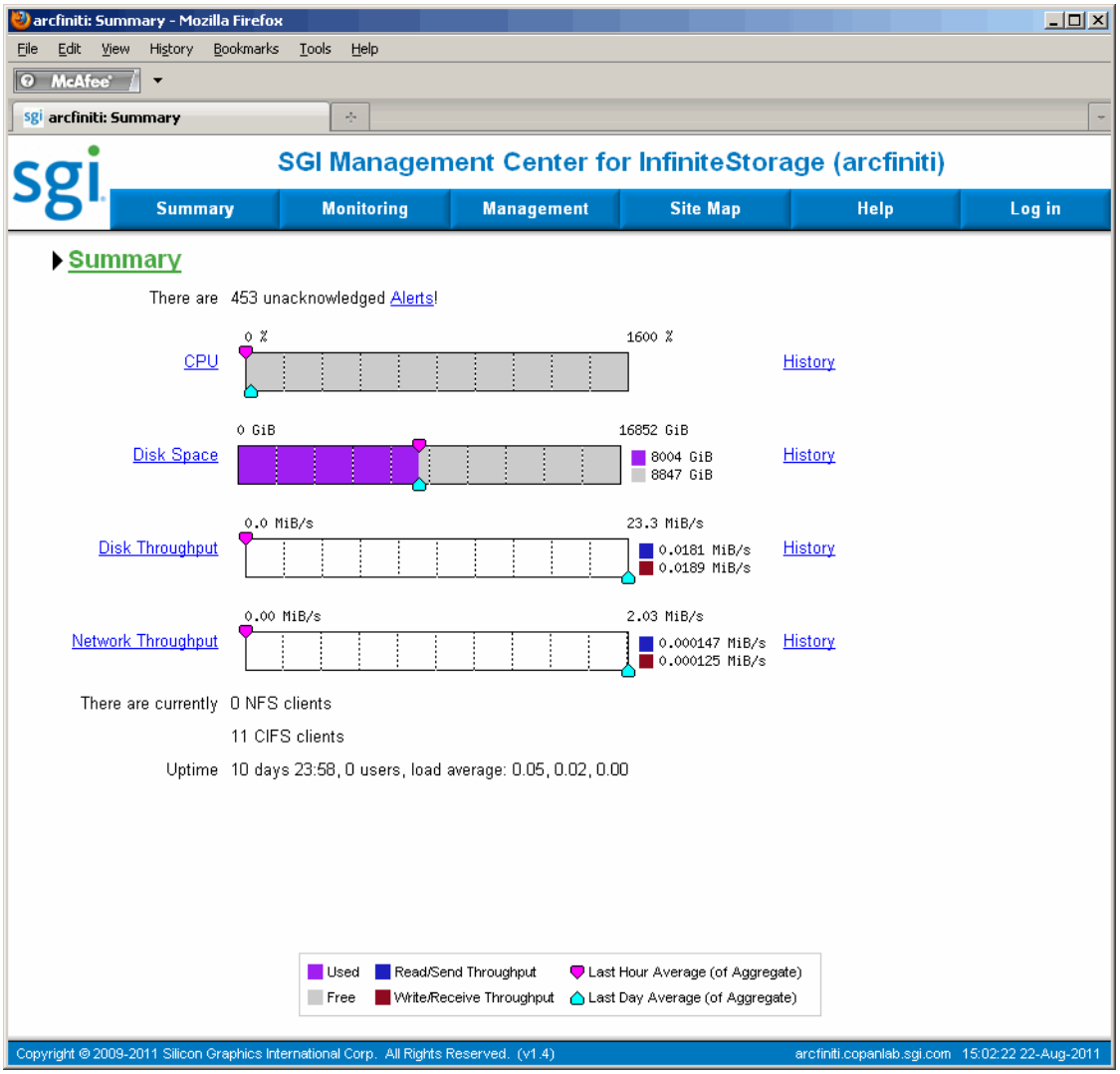

Figure 2-5 SGI Management Center for Infinite Storage (SMC IS)

Accessing SMC IS

To access SMC IS, do the following:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Select the appropriate node name.
3. For **Storage Monitoring & Configuration** application, click the **open user interface** link.
4. Enter the password for the node (verification required by the portal).
5. If necessary, accept the security certificate.

Note: SMC IS generates its own SSL certificates, rather than having the SSL certificates signed by a commercial certificate authority. Therefore, the certificate warning is safe to ignore.

The first time you access SMC IS, you must set the administrator password. You must be logged in to configure NFS exports or CIFS shares.

For more information, click the **Help** button to access the *SGI Management Center for InfiniteStorage Administrator's Guide*.

Samba Differences

A CXFS filesystem may be shared via Samba from a CXFS node to other types of machines that are not running CXFS software, such as a Windows machine. The Samba server should run on the active metadata server for optimal performance. There can be one Samba server per CXFS filesystem. You must not serve the same CXFS filesystem from multiple nodes in a cluster.

The architecture of Samba assumes that each share is exported by a single server. Because all Samba client accesses to files and directories in that share are directed through a single Samba server, the Samba server is able to maintain private metadata state to implement the required concurrent access controls (in particular, share modes, write caching, and oplock states). This metadata is not necessarily promulgated to the filesystem and there is no protocol for multiple Samba servers exporting the same share to communicate this information between them.

Running multiple Samba servers on one or more CXFS clients exporting a single share that maps to a common underlying filesystem has the following risks:

- File data corruption from writer-writer concurrency
- Application failure due to inconsistent file data from writer-reader concurrency

These problems do not occur when a single Samba server is deployed, because that server maintains a consistent view of the metadata used to control concurrent access across all Samba clients.

Caution: SGI recommends that you do not use multiple Samba servers.

COPAN Cabinet Management

This section discusses the following:

- "Accessing PSM" on page 34
- "Monitoring the Hardware Components" on page 35
- "Automatically Monitoring MAID Disks" on page 37

Accessing PSM

To access the Platform Service Manager (PSM) GUI, do the following:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Click the **Platform Service Manager** link.
3. Enter the password for the server (verification required by the portal).
4. Enter the following:
   - PSM user name: **`admin`**
   - Default PSM password: **`CPN200tx`**

Note: You should change the password and only provide it to those persons who you want to access the PSM GUI.

Monitoring the Hardware Components

The PSM **System View** page displays recent high-priority alerts and overall MAID shelf hardware performance. Basic C1103-TY12 server hardware status is available by clicking on the picture of the server in the cabinet image.

Figure 2-6 shows an example of the PSM GUI.

Figure 2-6 PSM GUI

You can configure PSM email alerts; see "Using PSM Email Notification" on page 40.

For more information, see the *Platform Service Manager Online Help* available from the PSM **Help** menu and *SGI C1103-TY12 User's Guide*.

Automatically Monitoring MAID Disks

The Disk Aerobics software continuously verifies data on a drive-by-drive basis. It periodically exercises all disks and detects potential drive failures before they occur. Disk Aerobics does the following on each drive:

1. Powers on and spins up the disk drive.
2. Ensures that the drive functions within parameters.
3. Inspects the health of drive segments, tracks, and sectors.
4. Reads the data to ensure its integrity.
5. Spins down and powers off the drive.
6. Records details of the operation.

If Disk Aerobics detects a potential problem in a disk, it will automatically migrate the data to a spare disk within the same MAID shelf and contact the administrator. If so notified, you should contact SGI Support for help in replacing failed hardware.

Note: PSM does not monitor the IS5000 disks. See "IS5000 RAID Management" on page 37.

IS5000 RAID Management

You can use the InfiniteStorage System Manager Enterprise Edition (ISSM-EE) for monitoring the IS5000 RAID.

To access ISSM-EE:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Select the appropriate node name.

3. For the **Storage Array Manager** application, click the **open user interface** link.
4. Enter the password for the server (verification required by the portal).

You should configure email alerts for ISSM-EE.

Figure 2-7 shows an example of the **Summary** window.

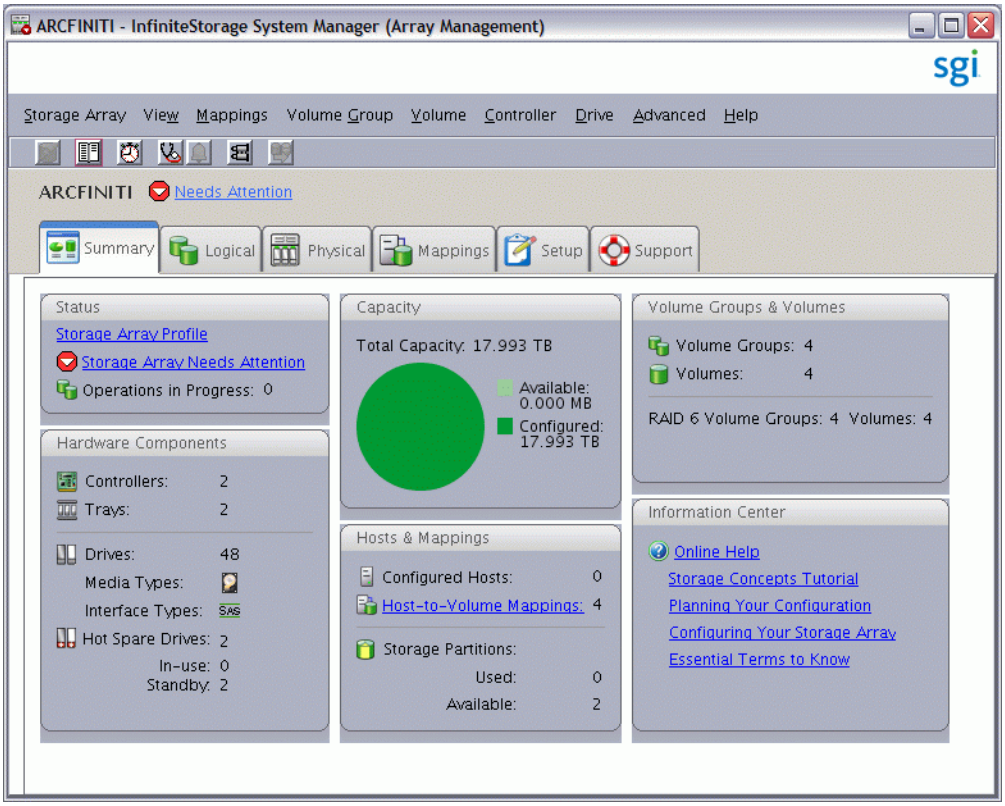

Figure 2-7 ISSM-EE Summary Window

For more information, see:

- *InfiniteStorage System Manager Enterprise Edition (ISSM-EE) Administration Guide*
- *InfiniteStorage System Manager Enterprise Edition (ISSM-EE) Software Concepts Guide*

Modifying the ArcFiniti Configuration

This chapter discusses the following:

- "Changing the Network Addresses" on page 39
- "Using DMF Email Notification" on page 40
- "Using PSM Email Notification" on page 40
- "Modifying DMF Space-Management Policies" on page 41

If you require other modifications, call SGI Professional Services.

Changing the Network Addresses

Warning: Do not change the network addresses assigned to the built-in Gigabit Ethernet interfaces `eth0` and `eth1`. These interfaces are used internally for administration of the ArcFiniti product.

To modify the network, use YaST2. To access YaST2:

1. Open the ArcFiniti Storage Applications Portal (see "Launching the Portal" on page 19).
2. Select the appropriate node name.
3. For the **System Configuration** application, click the **open user interface** link.
4. In YaST2, select:

   Network Devices
   > Network Settings

5. Select the desired device and click **Edit**.

Using DMF Email Notification

Notification messages sent by DMF are available via DMF Manager. However, you can request email notification about these messages by modifying the `ADMIN_EMAIL` parameter in the DMF configuration file. Do the following in DMF Manager (see "Accessing DMF Manager" on page 20):

1. Right-click on the DMF shield icon and select:

   Configure ...
   > Modify Base ...

2. Enter the email address that you want to receive DMF notifications in the value for the `ADMIN_EMAIL` parameter.

   Note: Click **Help** in the dialog for more information, or right-click on a parameter name for details about that parameter.

   ---

3. Select **Continue**.

4. Validate the changes by selecting:

   Overview
   > Configure ...
   > Validate Configuration

5. Save your changes permanently by selecting:

   Overview
   > Configure ...
   > Apply Configuration

Using PSM Email Notification

To configure PSM email alerts, doing the following in the PSM GUI (see "Accessing PSM" on page 34):

1. Click **Setup** on the top menu bar.

2. Click **Email Setup**.

3. Enter the required information.

4. Click the **Email Alerts Setup** tab.
5. Click **Create New Email Alert**.
6. Enter the required information.

For more information, see the *Platform Service Manager Online Help* available from the PSM **Help** menu and *SGI C1103-TY12 User's Guide.*

Modifying DMF Space-Management Policies

To modify the amount of free space that is maintained in the primary filesystem or the amount that is freed when this minimum is reached, you must modify a number of parameters in the DMF configuration file, such as:

- `FREE_SPACE_MINIMUM`
- `FREE_SPACE_TARGET`

To modify the amount of data that is left on the primary filesystem for a file that is fully migrated (by default, 32 KiB), you must modify the `AGE_WEIGHT` configuration parameter and the associated `range` clause.

You can make these modifications by doing the following:

1. Open DMF Manager. See "Accessing DMF Manager" on page 20.
2. Click the **Log In** button in the upper-right corner of the window. The default password is `INSECURE`.
3. In the **Overview** panel, right-click on the space-management policy for the filesystem (such as **dmfusr1_space_policy**).
4. Enter in the desired values for the parameters. Click **Help** in the dialog for more information, or right-click on a parameter name for details about that parameter.
5. Click **Continue**. The temporarily changed configuration is indicated by the gray background color of the **Overview** display.

6. Validate the changes by selecting:

   Overview
   > Configure ...
   > Validate Configuration

7. Save your changes by selecting:

   Overview
   > Configure ...
   > Apply Configuration

For details, see the information about DMF Manager, DMF configuration, automated space management, and partial-state files in the *DMF 5 Administrator's Guide for SGI InfiniteStorage* or contact SGI Support.

Troubleshooting the ArcFiniti Solution

This chapter discusses the following:

- "Collecting Data for Problem Analysis" on page 43
- "Learning More about DMF Problems" on page 44
- "Restoring DMF Filesystems and Databases" on page 47
- "Firefox is Already Running" on page 47
- "Unable to Recall Data" on page 47
- "YaST2 Disk Space Warning" on page 48
- "Power On Requires SGI Support" on page 48
- "Contacting SGI Support" on page 48

Collecting Data for Problem Analysis

As soon as you suspect a problem with DMF or CXFS, click the **download data** link for the Archive System Diagnostics application. This will run a script to gather the relevant DMF and CXFS information that will help SGI Support analyze the problem. Click this link for the DMF server and for each mover node. The script will then send a compressed file to the PSM.

Note: If the file cannot be uploaded to the PSM, you can access it on the DMF server:

`/var/log/scoop/scoop-`*DATE*`+`*TIME*`.tar.gz`

You should also use the PSM GUI's collection utility to gather information about the MAID hardware and general cabinet components.

After you have collected the data, contact SGI Support.

Learning More about DMF Problems

DMF Manager denotes areas with problems by adding a yellow or red icon next to the component that is experiencing problems, depending upon severity. For example, Figure 4-1 shows that although DMF is still running, there are warnings that may require action (yellow icon). To investigate, hover the mouse over the shield icon to display pop-up help that describes the warning.

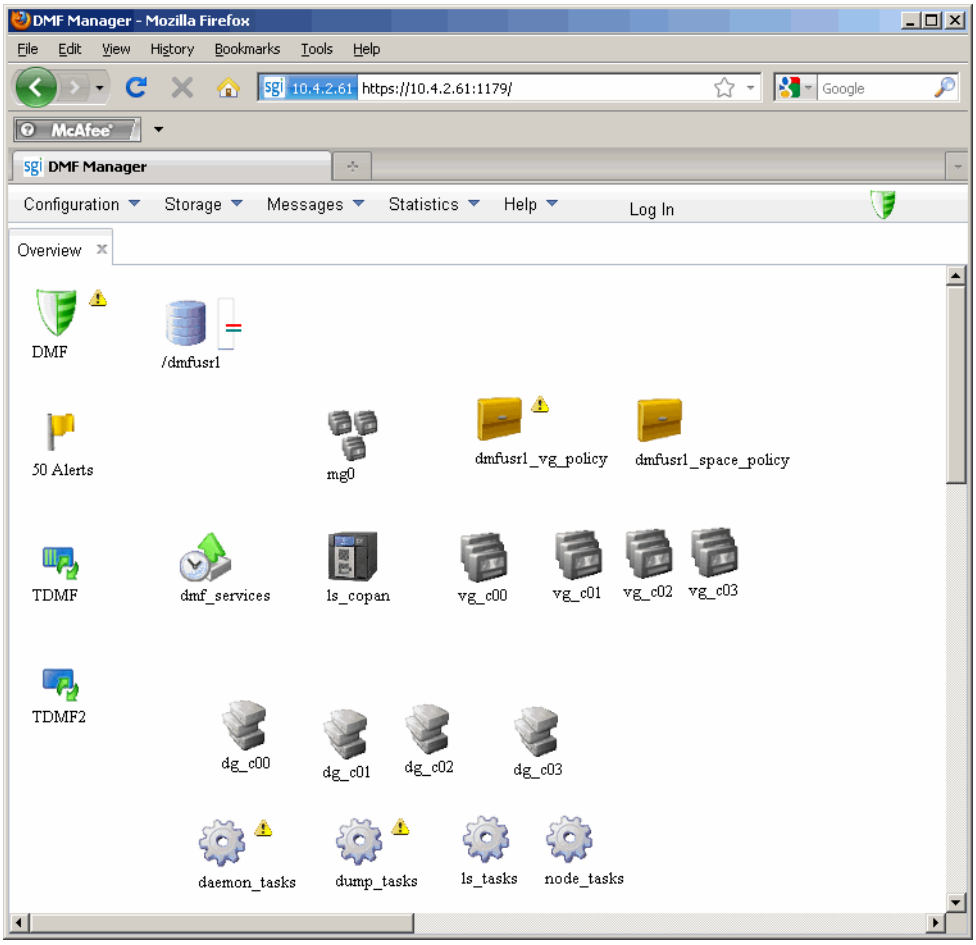

Figure 4-1 DMF Manager Showing Problems

For details, click the **Alerts** icon flag and select **Show Alerts...** or choose the following from the menu bar:

Messages
> Alerts

Either action will open the **Alerts** panel, which displays the unacknowledged messages, as shown in Figure 4-2. For more information about an alert, select it and choose **Help on this alert**.

You can also use the following panel to view daily activity reports (those containing critical log errors show red warning symbols):

Messages
> Reports

If the **Overview** panel indicates that there are problems, consult the *DMF 5 Administrator's Guide for SGI InfiniteStorage* or call SGI Support.

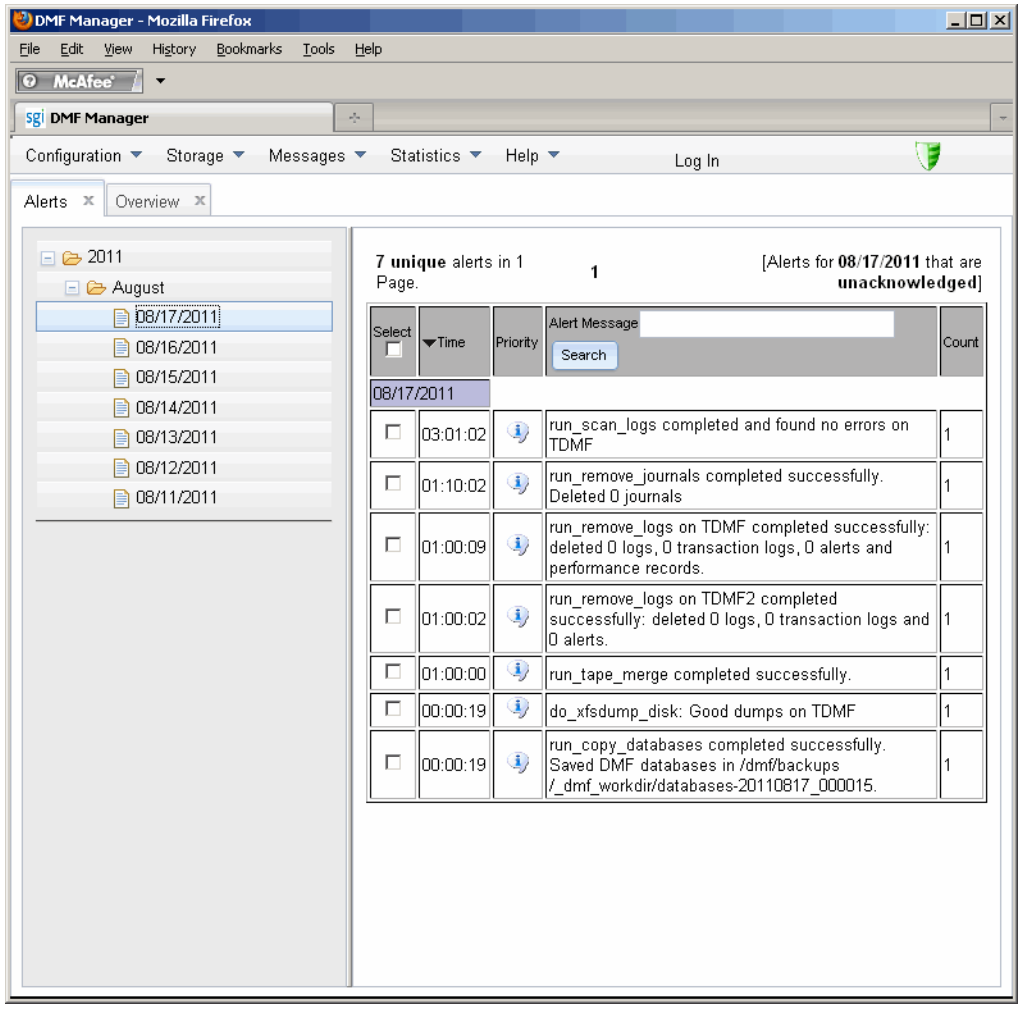

Figure 4-2 DMF Manager Alerts Panel

Restoring DMF Filesystems and Databases

To restore DMF filesystems and databases, you can use the `dmxfsrestore`(8) command via the **open terminal** action for the DMF server on the ArcFiniti Storage Applications Portal.

For details, see the information about backups and DMF in *DMF 5 Administrator's Guide for SGI InfiniteStorage* or contact SGI Support.

Firefox is Already Running

If you are unable to use the ArcFiniti Storage Applications Portal, verify that you have all of the software requirements in place. See "Portal Requirements" on page 19.

If you are unable to access an application such as DMF Manager, you might have to exit the existing Firefox process. For details, see:

http://kb.mozillazine.org/Profile_in_use

Unable to Recall Data

Each node connects to only two MAID shelves, such as DMF server 0 connects to MAID shelves 0 and 1. Under circumstances such as the following, the migrated data on the MAID shelves controlled by a given node will be unavailable:

- The node is down
- The shelf is down
- The LUN is down
- There are problems with the filesystem on the LUN

If a second copy of a file exists and is available, it will be used when the first copy is unavailable. If the DMF server is down, access to all data on the MAID shelves is unavailable.

YaST2 Disk Space Warning

If you try to use YaST2 while RAID sets in the COPAN MAID are mounted by OpenVault, `yast2` displays a graphic that contains the following warning:

```
Warning: Disk space is running out!
```

However, the red disk usage shown for filesystems such as `/var/opt/openvault/clients/mounts/copan_J00d02` is expected; it indicates that the RAID sets are mounted by OpenVault. You can safely click the **OK** button at the bottom of the window.

Power On Requires SGI Support

Powering on an ArcFiniti system requires a specific sequence of steps. You must call SGI Support for assistance.

Contacting SGI Support

If the other topics in this chapter do not solve the problem, contact your local SGI Customer Support Center:

http://www.sgi.com/support

You can also contact your authorized service provider.

If you are in North America, you can call the Technical Assistance Center at: 1 (800) 800 4SGI

If you are outside North America, see the following website for the appropriate Customer Service phone number:

http://www.sgi.com/support/supportcenters.html

Index

A

activity reports, 25
ADMIN_EMAIL, 40
AGE_WEIGHT, 41
Alerts panel in DMF Manager, 45
ArcFiniti Storage Applications Portal
  See "portal", 12
archive management, 19
Archive System Diagnostics, 43
archive system diagnostics, 43
archive tier, 3
automated DMF tasks, 14
automated space-management policies, 41

B

backups, 14
browser requirements, 19

C

C1103–TY12, 3
capacity of ArcFiniti, 7
CIFS, 2
classes, 15
client-only node, 3
clustered filesystem management, 29
clustered filesystems, 2
components of ArcFiniti, 4
compression of data, 12
contact SGI, 15
contacting SGI, 48
COPAN MAID, 2
CPU utilization, 31
Customer Service, 48
CXFS
  client-only node, 3
  component of ArcFiniti, 2
  GUI, 29
  management, 29
  metadata server, 3
  mounting a filesystem, 29
  node states, 23
CXFS Manager, 29
cxfs_admin, 30

D

data compression, 12
data download, 43
Data Migration Facility
  See "DMF", 2
data migration policies, 11
data mover processes, 3
data path relationships, 5
diagnostics, 43
directories are not migrated, 28
Disk Aerobics, 2, 37
disk capacity
  archive tier, 27, 31
  primary filesystem, 25
disk drive health, 1
disk monitoring
  COPAN MAID, 37
  IS5000 RAID, 37
disk space warning, 48
disk throughput, 31
DMF
  administrative filesystems, 11
  archiving overview, 9

backups, 14
collecting data for analysis, 43
component of ArcFiniti, 2
compression, 12
email notification, 40
file migration state, 27
filesystem capacity, 25
free-spaced threshold and target, 12
journals, 14
managed user filesystems, 11
migration frequency and triggers, 12
migration policies, 11
monitoring, 21
mover processes, 3
node functions, 3
node statues, 23
reports, 25
restoring filesystems and databases, 47
status, 21
tools, 20
DMF Manager
accessing, 20
Alerts panel, 45
archive tier, 27
component of ArcFiniti, 2
icons, 21
monitoring status, 21
nodestates, 23
Overview panel, 21, 22, 46
primary filesystem capacity monitoring, 25
relationships among DMF components, 21, 22
Reports panel, 45
viewing reports, 25
DMF-managed user filesystems, 11
dmfind, 27
dmls, 27
dmxfsrestore, 47
documentation installed on the server, 15
dual-state file, 28
DUL file, 28

E

email notification
DMF, 40
PSM, 40
email notification for DMF, 40
Ethernet switch, 3
exporting files, 31

F

file capacity in a DMF-managed user filesystem, 11
file migration state, 27
filesystem mounting, 29
Firefox, 19
free-spaced threshold and target, 12
FREE_SPACE_MINIMUM, 41
FREE_SPACE_TARGET, 41

H

hardware monitoring, 35
health of disk drives, 1
htpasswd2, 20

I

InfiniteStorage 5000 (IS5000), 2
InfiniteStorage System Manager Enterprise Edition
See "ISSM-EE", 2
inode and file migration, 28
inodes remain on primary filesystem, 9
intra-cabinet cluster communication, 3
introduction, 1
IS5000, 2
IS5000 RAID management, 37
ISSM-EE

accessing, 37
component of ArcFiniti, 2

J

Java Web Start, 19
JavaScript, 19
JNLP file, 19
journal retention, 14

L

logical unit, 7
LUN, 7

M

MAID, 2
managing ArcFiniti, 17
massive array of idle disks, 2
metadata server, 3
MiB vs MB and DMF Manager, 27
MIG file, 28
migrated file, 28
migrating file, 28
migration frequency and triggers, 12
migration policies, 11
models, 7
modifying the configuration, 15
monitoring DMF, 14
mounting filesystems, 29
mover node, 3

N

network address, 39
network modification, 39
network throughput, 31
NFS
component of ArcFiniti, 2
management, 31
server, 3
workload, 31
node states, 23
non-DMF regions of RAID sets, 14

O

offline file, 28
OFL, 28
OpenSSH, 19
overview of ArcFiniti, 1
Overview panel, 21
Overview panel in DMF Manager, 46

P

PAR file, 28
parallel data mover node, 3
partial-state file, 28
pipes are not migrated, 28
Platform Service Manager
See "PSM", 3
portal
component of ArcFiniti, 12
launching, 19
overview, 17
requirements, 19
Power Managed RAID, 2, 8
power on requirements, 48
power-management, 8
preconfiguration, 1
primary cache, 2
primary filesystem, 2
professional services, 15
PSM
accessing, 34

component of ArcFiniti, 3
PSM email notification, 40

R

Rackable C1103–TY12, 3
RAID, 2
RAID 5, 7, 11
RAID management, 37
RAID set, 7
REG file, 28
regular file, 28
Reports panel in DMF Manager, 45
reverse lookup, 31

S

Samba, 33
scoop, 43
secondary storage (archive tier), 3
security certificate, 20
SGI Management Center for Infinite Storage
See "SMC IS", 2
SGI Professional Services, 7
SGI Support, 48
shelves (MAID), 5
SMC IS
component of ArcFiniti, 2
GUI, 33
managing, 31
space-management policies, 41
special files are not migrated, 28
Storage Monitoring & Configuration, 33
support services, 15
system diagnostics, 43
System View, 36

T

Technical Assistance Center, 48
theory of archiving, 9
tmcollect, 43
tools, 12
total useful disk space, 7
troubleshooting
collecting data for analysis, 43
contacting SGI, 48
DMF, 44
Firefox problems, 47
portal access, 47
power on, 48
restoring DMF filesystems and databases, 47
unable to recall data, 47
YaST2 disk space, 48

U

unit measures and DMF Manager, 27
UNM file, 28
unmigrating file, 28
URL for the portal, 19
/usr/bin/javaws, 19

W

Web Start, 19
Windows nodes, 33

X

X11 server, 19
xterm, 19

Y

YaST2, 39
YaST2 disk space warning, 48