Configuring the Sun Fire™ X4500 Server as Network Attached Archival Storage for Symantec Enterprise Vault

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Introduction

The Sun Fire™ X4500 Server is a four-way server with an AMD Opteron™ processor and 12, 24, 36, or 48[1] TB of storage in 4U (7 inches) of rack space. Compared to a traditional server with added disk arrays, the Sun Fire X4500 Server with 48 SATA II drives in a single system delivers 2 to 5 times the density of storage and saves about 30% to 50% in power at about 1/2 to 1/3 of the cost. Best of all, bringing data close to the CPU and processing engine increases the data throughput of the system to the network.

The Sun Fire X4500 Server running the Solaris™ 10 Operating System, Sun StorageTek™ Storage Archive Manager, and Solaris ZFS delivers a high-density, high-capacity, high-performance, low-cost Network Attached Archival Storage system.

Figure 1: The Sun Fire X4500 Server

This document describes a Network Attached Archival Storage solution optimized for Symantec Enterprise Vault and based on the Sun Fire X4500 Server. For anyone wishing to deploy this solution, a configuration script for this solution should allow a competent person to configure a Sun Fire X4500 Server as Network Attached Archival Storage in just a few minutes.

See the “For More Information” section for a list of background reading about the hardware and software used to build this solution.

1 The 36 and 48 TB capacities are scheduled to be available when 750 GB and 1 TB disks are supported.

Solution Description

Symantec Enterprise Vault

Enterprise Vault software is designed to be a long-term, scalable store for unstructured information. Now in its seventh version, the Enterprise Vault software delivers not only a scalable and robust storage system, but also provides a wide choice of implementation scenarios addressing storage cost reduction and compliance-driven retention.

The Enterprise Vault software can be populated by multiple information sources (Microsoft Exchange, Lotus Domino, Microsoft SharePoint, File Systems, or customer applications) and, through its business accelerators, provides seamless interaction for both organization and user exploitation of archived information. The situations that Enterprise Vault is commonly employed to solve include:

- **Application Storage Management:** A major use of the Enterprise Vault software is to act as an online archive for information that is moved from primary storage according to customer-defined policies. This enables the store size to be controlled and allows applications to focus on their strengths: the handling of incoming information and accessing of recent and frequently accessed items.

- **Retention and Discovery for Compliance:** Many organizations are required to keep all electronic information for long periods of time. This typically includes email, network shares from NAS appliances and Microsoft Windows based file servers, Microsoft SharePoint content, and instant messages. The Enterprise Vault software can be used with the Microsoft Exchange journal feature to act as a secure repository for items that need to be retained for defined periods of time for legal or regulatory reasons.

- **Upgrade, Migration, and Consolidation:** Reducing storage requirements for Microsoft Exchange, Lotus Domino, or file servers means that more users can be housed or supported on each server, thus requiring fewer servers. For example, controlling mailbox size improves Microsoft Exchange system consolidation. In addition, the Enterprise Vault software can also be used to streamline a migration or upgrade by first slimming down the primary store and housing the bulk of the data during the process. The import and elimination of PST files is the strongest example of a migration and consolidation exercise.

- **Knowledge Exploitation:** The Enterprise Vault software acts as an "information warehouse" for personal and corporate data, which can then be mined as a knowledge resource using the Enterprise Vault index and search technology. Its business accelerators, such as Enterprise Vault Compliance and Discovery Accelerators, offer solutions for regulatory surveillance and legal discovery.

- **Operational Excellence:** The Enterprise Vault software can increase the operational excellence of any primary application in, for example, the application's service-level agreement (SLA) for backup. Many organizations find that because applications such as Microsoft Exchange grow so large, they are no longer able to meet the SLA for restore operations. By using the Enterprise Vault software to move a majority of data out of the Microsoft Exchange stores, these SLAs can be planned and achieved. In addition, end users can service their own requests for old and “lost” information without consuming help desk or administration resources.

Topology of an Enterprise Vault Site

Enterprise Vault is a Microsoft Windows application. A site will have a database server and one or more Vault Servers, the servers that run the Enterprise Vault software.

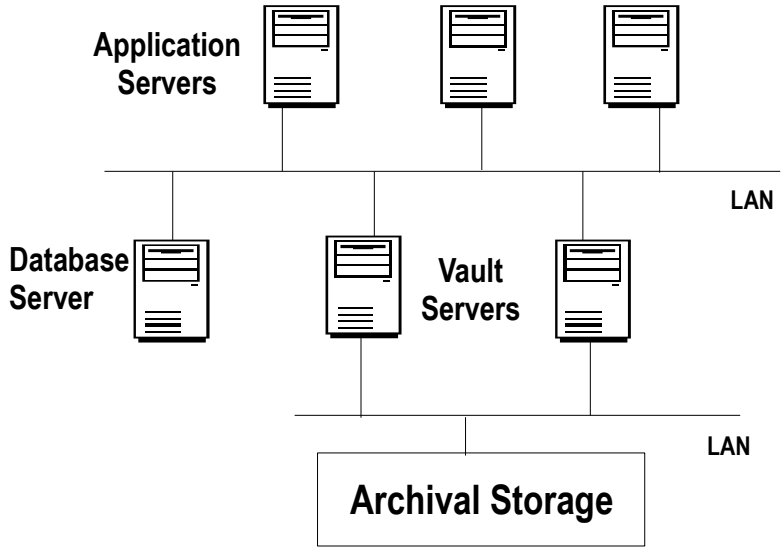

Figure 2: Symantec Enterprise Vault Site

Each Vault Server archives data from applications, storing the data as files in Vault Stores. A Vault Store is a logical storage object managed from within the Enterprise Vault software. Each Vault Store is made of partitions, and each partition is a directory of archival storage.

Archival storage can be local disks in the Vault Server or direct- or SAN-attached storage arrays, but a typical choice is some kind of Network Attached Storage (NAS). NAS is popular because of the ease of connectivity from multiple Vault Servers; Enterprise Vault scales horizontally so cost-effective shared storage is an important part of a solution.

Only archived data is stored on the NAS device/system/appliance. The Database Server stores all its data on local disks or on direct- or SAN-attached storage arrays. The Vault Servers store their indexes and other metadata on local disks or on direct- or SAN-attached storage arrays as well.

Another efficiency of the Enterprise Vault software is that it compresses data before storing it, and its Single Instance Storage (SIS) feature uses file level de-duplication technology to stop multiple copies of the same content from being stored in a Vault Store partition.

Sun StorageTek™ Archive Manager and Enterprise Vault

Storage Archive Manager (SAM) is a 64-bit policy-driven archiving file system. The SAM's archiver[2] process copies files from the file system to disk and/or tape archives and its releaser[2] process frees the space as required. These actions are based on the policies set by the user for the file system.

2 For an overview of how Storage Archive Manager works see http://blogs.sun.com/timthomas/entry/what_does_sun_storagetek_storage1.

The SAM file system can be viewed as a cache: All the files are kept in the cache until it fills up, at which point the oldest or least recently accessed files are released[2]. If a released file is later required, the data is quickly brought back from the archives by the SAM's stager[2] process. These actions are transparent to applications with the benefit that the contents of the file system are managed so that it should never overflow[3]. However, SAM can be configured so that a file is never released from the cache.

The benefits of using Storage Archive Manager with Enterprise Vault include:

- **Tiered Storage:** Customers looking for an email archiving solution are often interested in using tiered storage as well. The customer's first objective is to relieve congestion on the email servers and related storage subsystems by migrating content from the primary email storage to cheaper archival storage, but in time the archival storage itself becomes congested. The ability of Storage Archive Manager to seamlessly migrate data from its Vault Stores to other storage tiers resolves this problem.

- **Transparent Backup of Archived Data:** SAM can make at least one, and up to four, copies of the data archived by the Enterprise Vault software. These copies can be made to local or remote tape disk, tape archives, or both. Archiving policies can be customized to suit a customer's business requirements.

- **Continuous Backup and Quick Restore:** Backing up and restoring file systems containing large numbers of files can be a long process using traditional backup software. In a SAM solution, the file system backs itself up continuously to disk archives, tape archives, or both without the requirement for a backup window. Also, a SAM file system can be brought back online very quickly following a hardware failure or when the file system is being migrated to another platform because only the metadata of the SAM file system needs to be restored; the files themselves can all be left in the archives.

3 It is still necessary to size a solution according to the amount of data that will be archived and the customer's retention policies. This information is gathered as part of the Enterprise Vault sales process.

Features and Best Practices

WORM Storage

At this time, the WORM features of the SAM file system are not certified for use with the Enterprise Vault software.

SAMBA Support

Because Storage Archive Manager is based on the Solaris OS for SPARC and x64 platforms, SAMBA[4] software, which is required to make a SAM file system available to servers running Microsoft Windows SAMBA, ships as standard with the Solaris OS and is supported by Sun Microsystems.

A SAM file system accessed via SAMBA is certified with Enterprise Vault. Enterprise Vault stores ACL and ownership-related information about the archived data in its database, so SAMBA does not need to be integrated with the Windows Domain or with Active Directory Services.

SAM Archiving Policies

To allow Enterprise Vault users to browse and search their email archives, one of the following SAM archiving policies must be implemented:

- Option 1: If the first available SAM copy of a file is on tape, the file must not be released because the latency of retrieving a file from tape causes issues with end-user tools.
- Option 2: If the first available SAM copy of a file is in a SAM disk-based archive, the file can be released.

This solution implements Option 2.

Making Copy 2

It is strongly recommended that Storage Archive Manager is configured to make a second copy of the archived data; many organizations mandate that two copies of every archived file must be made. Possible targets for Copy 2 are:

- An external tape device/tape library
- A disk archive accessed via NFS. This could be another Sun Fire X4500 Server.
- A remote instance of Storage Archive Manager, which can make a second copy to a tape library or disk archive

4 Samba is an Open Source/Freeware suite that provides seamless file and print services to SMB/CIFS clients. Samba is freely available under the GNU General Public License and can be downloaded from http://www.samba.org. Samba is packaged with Solaris 10 OS.

Testing the Sun Fire X4500 Server as Network Attached Archival Storage for the Enterprise Vault/SAM Solution

Hardware and Software

- Solaris 10 (8/07) OS
- SAMBA 3.0.25a (included in Solaris 10 8/07 OS)
- Sun StorageTek SAM 4.6
- Solaris ZFS
- Sun Fire X4500 Server configured with 48 x 500 GB SATA-II disks

Performance Tests

Extensive testing took place in Sun Microsystems' Labs in Colorado to determine the best way to configure a Sun Fire X4500 Server as Network Attached Archival Storage for Enterprise Vault and SAM. The high-level design had a single SAM file system shared with Enterprise Vault via SAMBA, making Copy 1 to a local SAM disk archive. However, there were two dilemmas:

- **One ZFS Storage Pool or Two?** With one storage pool, all disks are available to support the write-intensive workload, but the data in the SAM file system and the copy in the SAM disk archive would be in the same storage pool and potentially on the same disks. Even with RAID protection and hot spare disks, some organizations could not accept this risk. With two storage pools, the SAM file system and SAM disk archive are in different storage pools, and so on different disks. This is secure, but fewer disks are available for the workload.
- **Can we use RAID-Z?** If the write-intensive workload did not suit a RAID-Z configuration, the alternative, RAID-1, would reduce the usable capacity.

The three configurations in Table 1 were stress tested on the equipment shown in Figure 3.

Case	Number of ZFS Storage Pools	ZFS Storage Pool Configuration
1	1	22 x RAID-1.1+1 stripes and two hot spares
2	1	8 x RAID-Z.5+1 stripes and six hot spares
3	2	2 x 4 x RAID-Z.5+1 stripes and three hot spares

Table 1: Tested Storage Configurations

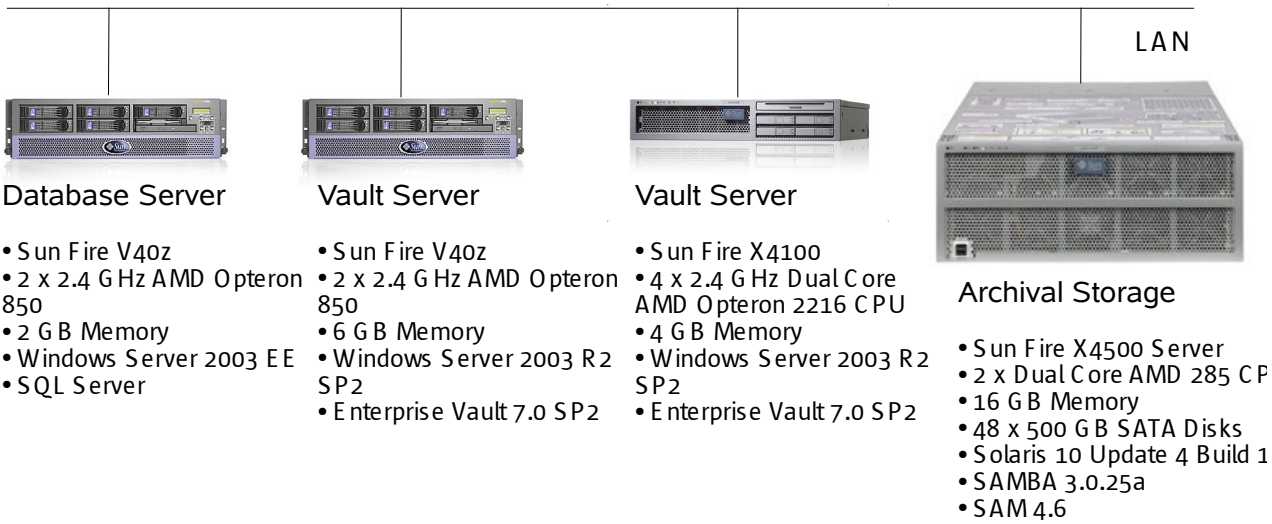

Figure 3: Enterprise Vault and Sun Fire X4500 Server Test Environment

Test Results

Test Cases 1 and 2 had all available disks configured in a single ZFS storage pool. The SAM file system and SAM disk archive were configured from the same pool. Test Case 3 had half of the available disks configured in a pool used by the SAM file system. The second storage pool, with the other half of available disks, was configured as a SAM disk archive. Table 2 shows the results of the stress tests.

Test Case	Average Archiving Rate[5] (Items/Hour)
1	92348
2	90332
3	90070

Table 2: Results of Performance Tests

The stress tests gave the following results:

- The performance difference between RAID-1 and RAID-Z is marginal.
- Having half the number of disks available was only slightly slower than having all the disks available.

Closer analysis showed that the Sun Fire X4500 Server's disks had to perform approximately 2.5 times more IOPs in the RAID-Z cases, but were able to do so without affecting the application's performance. Based on these findings, the design dilemmas are resolved:

- RAID-Z is a suitable configuration.
- Two storage pools can handle the workload.

The recommended configuration is based on Test Case 3 because it offers excellent performance and the benefit of isolating the SAM file system from the SAM disk archive.

5 The Sun Fire X4100 finished two hours before the Sun Fire v40z. This figure is the sum of the average archiving rates of both servers when they were archiving data at the same time.

Configuring the Solution

The process for setting up the solution follows this general plan:

1. Install the Solaris 10 8/07 OS (Update 4) or later with latest patches.
2. Install Sun StorageTek Storage Archive Manager 4.6 with latest patches and its File System Manager.
3. Download the `x4500samconfig` script from the site listed in the Appendix and unpack it.
4. Run the `x4500samconfig` script to create the default configuration based on Test Case 3.
5. Configure Storage Archive Manager with additional requirements.
6. Configure Enterprise Vault.

The `x4500samconfig` script creates a configuration with the following characteristics:

- The maximum size of the SAM file system is half of the available storage in the Sun Fire X4500 Server. This allows one full copy of the file system to be stored in the SAM disk archive.
- The SAM archiving policy is to continuously scan with an archive age of 8 hours and an interval of 10 minutes. One copy of every file is made to the SAM disk archive.
- ZFS storage pools are created with hot spare disks.

The script and the configuration have the following limitations:

- The script only runs on a Sun Fire X4500 Server that has not been configured.
- The only supported disk size is 500 GB.
- A SAM file system that is smaller than the default size can affect archiving performance because there are fewer disks used for the ZFS Volume.

See the Appendix for more about the `x4500samconfig` script, including how it can be used in test mode and how to reset a configured server.

Configuring the Sun Fire X4500 Server

Become the root user and then run the script. Enter the options indicated in bold text.

```
root# ./x4500samconfig

Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Main Menu - Select Items 1 to 5 To Change Them and 6 To Configure The System:

1.  Storage Profile: RAID-Z Pool for SAM FS,RAID-Z Pool for Disk Archive
2.  Name of SAM File System will be samfs0
3.  Size of SAM File System will be 7.0 TB
4.  Name of SAM Disk Archive will be diskvsn0
5.  Name of SAMBA Share for SAM File System will be samfs
6.  Configure System with These Settings
7.  Exit

Choose a menu option:  1
```

The `x4500samconfig` script inspects the system and generates unique names for the storage pool(s), SAM file system, and SAM disk archive.

The the following screen is displayed:

```
-----------------------Next Screen------------------------

Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Choose Storage Pool Profile:

1.  RAID-Z Pool for SAM FS,RAID-Z Pool for Disk Archive
2.  Return To Main Menu

Choose a menu option: 2
```

The script provides one storage profile and then displays the following screen:

```
-----------------------Next Screen------------------------
Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Main Menu - Select Items 1 to 5 To Change Them and 6 To Configure The System:

1.  Storage Profile: RAID-Z Pool for SAM FS,RAID-Z Pool for Disk Archive
2.  Name of SAM File System will be samfs0
3.  Size of SAM File System will be 7.0 TB
4.  Name of SAM Disk Archive will be diskvsn0
5.  Name of SAMBA Share for SAM File System will be samfs
6.  Configure System with These Settings
7.  Exit

Choose a menu option: 3
```

The following screen displays the options for changing the size of the file system:

```
-----------------------Next Screen------------------------
Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Set Size of SAM File System (Currently 7.0 TB):

1.  5.0 TB
2.  7.0 TB
3.  Return To Main Menu

Choose a menu option: 3
```

The script allows SAM to use only approximately 50% of the usable storage on the system. The remaining storage is for the SAM disk archive. If you choose the option for a SAM file system that is smaller than the default size, the ZFS storage pool used for the ZFS Volume will have fewer disks, which might affect archiving performance.

Press 3 to accept the default size and return to the main menu.

```
-----------------------Next Screen------------------------
Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Main Menu - Select Items 1 to 5 To Change Them and 6 To Configure The System:

1.  Storage Profile:  RAID-Z Pool for SAM FS,RAID-Z Pool for Disk Archive
2.  Name of SAM File System will be samfs0
3.  Size of SAM File System will be 7.0 TB
4.  Name of SAM Disk Archive will be diskvsn0
5.  Name of SAMBA Share for SAM File System will be samfs
6.  Configure System with These Settings
7.  Exit

Choose a menu option: 6
```

Press 6 to start the configuration. The script reviews the configuration information, as shown in the following screen:

```
----------------------Next Screen-------------------------

Configure Sun Fire X4500 as Network Attached Archival Storage - Release 2.1

Review Configuration:

Storage Profile: RAID-Z Pool for SAM FS,RAID-Z Pool for Disk Archive
The SAM File System and SAM Disk Archive are in the different Storage Pools.

SAM File System Name: samfs0 (Will be mounted as /samfs0)
SAM File System Size: 7.0 TB

Space not used by the SAM file system is used as SAM Disk Archives.
SAM Disk Archive Name: diskvsn0 (Will be mounted as /diskvsn0)

Name of SAMBA Share of SAM File system: samfs

Do you want to configure the system with these parameters ? [y/n] y
```

Type **y** to begin the configuration and type **y** at the prompt to continue.

```
----------------------Next Screen-------------------------

Create ZFS Storage Pool...this can take a few minutes.
Create ZFS Volume for SAM File System.
Create ZFS File System for SAM Disk Archive /diskvsn0.
Configure SAM.
Create releaser.cmd file.
Create stager.cmd file.
Create samfs.cmd file.
Create mcf file.
Create archiver.cmd file.
Create diskvols.conf file.
Create SAM File System.
Configuring SAM-FS
sammkfs: samfs0: One or more partitions exceeds 1 TB in size
sammkfs: file system samfs0 will not mount on 32 bit Solaris and
sammkfs: some earlier versions of Solaris
Building 'samfs0' will destroy the contents of devices:
               /dev/zvol/dsk/samfspool0/samfs0vol
Do you wish to continue? [y/N]y
Create vfstab entry for filesystem samfs0.
Backed up /etc/vfstab to /etc/vfstab.18893.
Mount samfs0.
Configure SAMBA.
Provide a SAMBA password for user root.
This DOES NOT need to be your systems root password.
New SMB password: xxxxxxxx
Retype new SMB password: xxxxxxxx
Enable SAMBA Services.

System Configuration is Complete.

The system is ready to use. For information on managing
SAM and SAMBA please consult the README file
Press Return to exit the script.
```

Verify that the script created two storage pools, a SAM, and a ZFS file system, as in the following example:

```
root# df -hl
Filesystem             size   used  avail capacity  Mounted on
/dev/md/dsk/d0         7.9G   4.3G   3.5G    56%    /
.
```

```
samfspool0              7.1T    39K   129G     1%    /samfspool0
diskvsnpool0            7.1T    39K   7.1T     1%    /diskvsnpool0
diskvsnpool0/diskvsn0   7.1T    40K   7.1T     1%    /diskvsn0
samfs0                  7.0T    57M   7.0T     1%    /samfs0
```

Configuring Storage Archive Manager

File System Manager ships with SAM and is described in the *SAM File System Manager User's Guide* listed in the "For More Information" section. Use File System Manager to configure the Storage Archive Manager:

1. Customize the archiving policies to suit local requirements.

2. Create a second copy of every archived file, as described in the "Best Practices" section. Most organizations require two copies of every archived file.

3. Configure the system to make safety copies of the SAM file system metadata. These copies are called Recovery Points and are equivalent to managing the backup catalogs of a conventional backup product. The management of Recovery Points is explained in the *SAM File System Manager User's Guide*.

Configuring Enterprise Vault

1. Create a share by mapping the Sun Fire X4500 Server's network drive to the Vault Server.

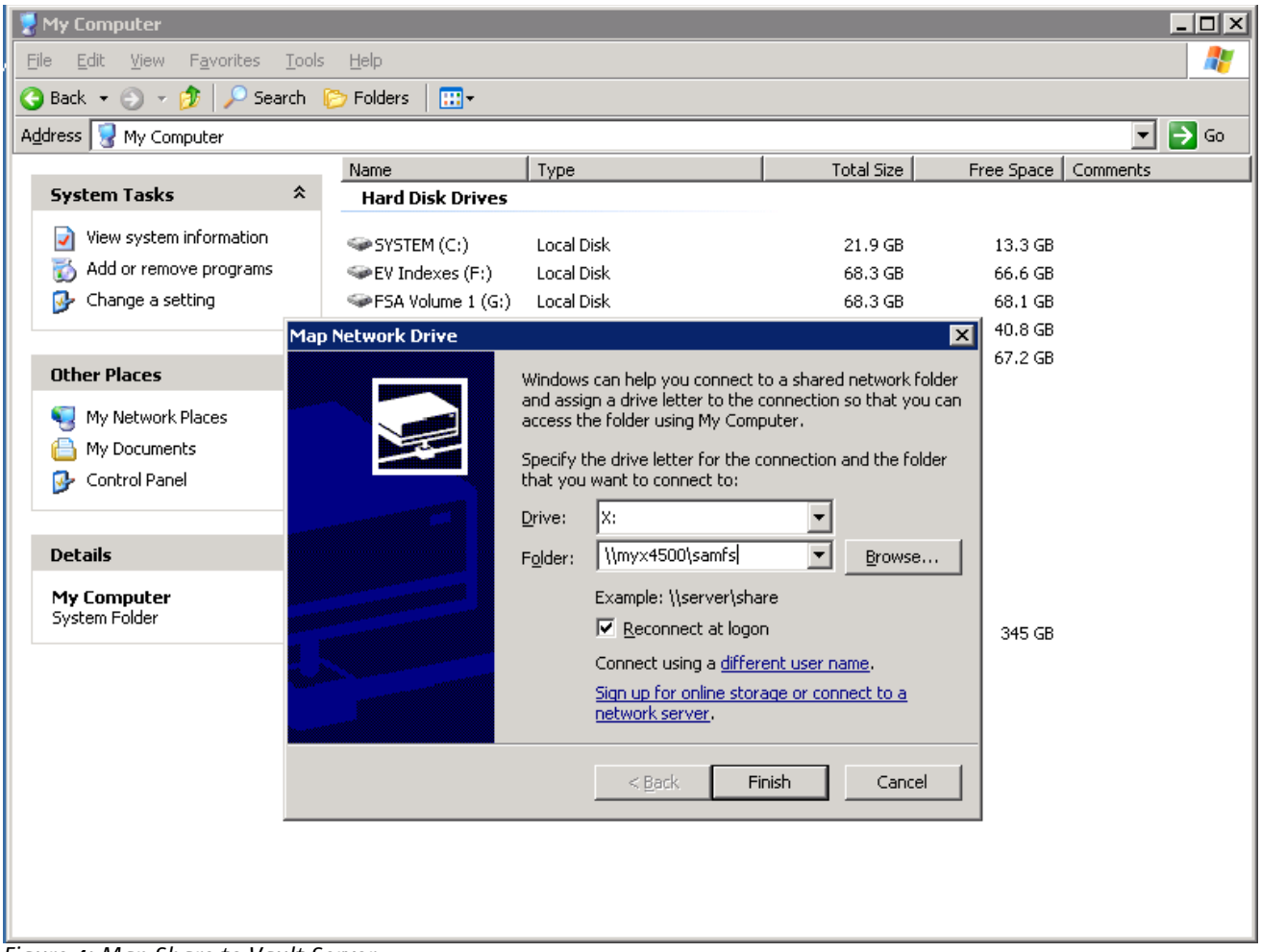

Figure 4: Map Share to Vault Server

2. Navigate to the share and create a new directory to be used as a Vault Store Partition by the Vault Server.

3. Use the Vault Administration Console to configure the partition as part of a new Vault Store or as a new partition for an existing Vault Store. Add the share as storage type Network Share.

4. Complete the configuration of the Vault Store Partition as normal for the Enterprise Vault site.

Managing the Solution

Sun Fire X4500 Server

Use the same tools to manage the Sun Fire X4500 Server as you use for any other Solaris system. You can also manage the server using its Integrated Lights Out Management (ILOM) to power the server off and on and to connect remotely to the system console using its `ssh` interface and a web interface.

SAM

Use File System Manager to manage the SAM environment by using a browser to connect to the following site: `https://hostname:6789` where *`hostname`* is the network name of the Sun Fire X4500 Server. The main page is shown in Figure 5.

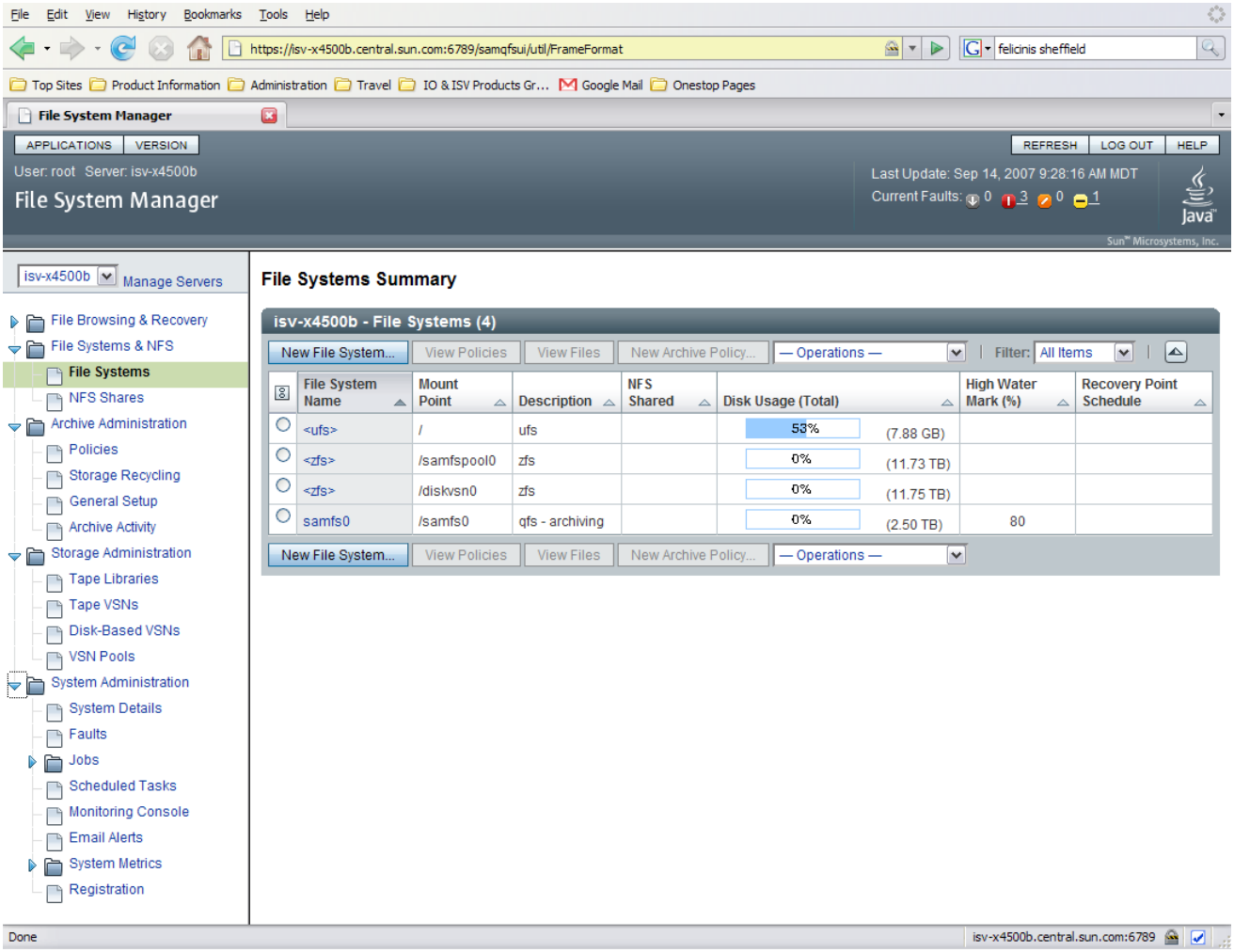

Figure 5: File System Manager

SAMBA

Use the SAMBA Web-based Administration Tool (SWAT) to manage SAMBA. SWAT ships with the Solaris OS and is enabled when the `x4500samconfig` script runs. Use a browser to connect to the following site: `http://hostname:901` where *`hostname`* is the network name of the Sun Fire X4500 Server.

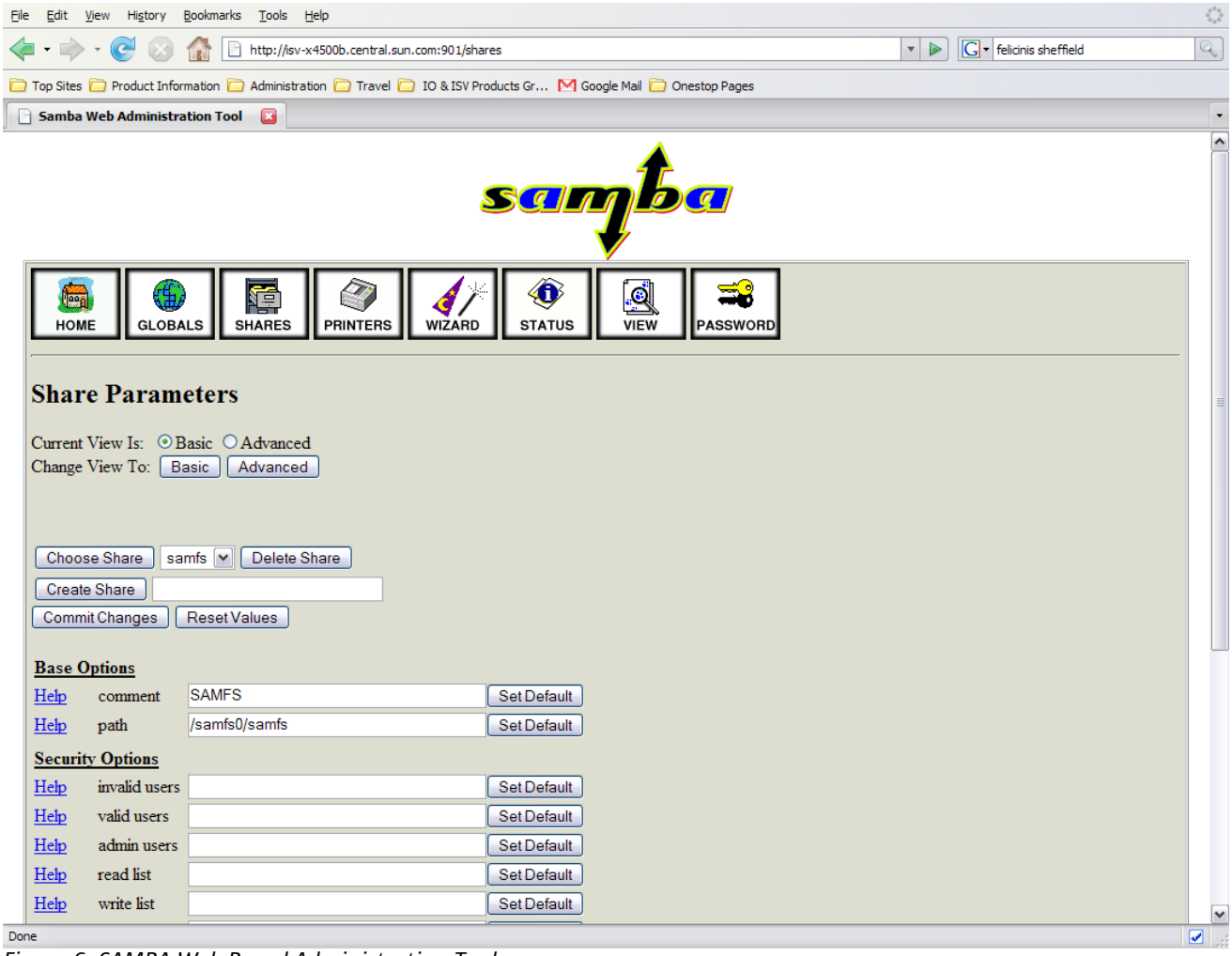

Figure 6: SAMBA Web-Based Administration Tool

Scaling the Solution

In some environments, multiple archival storage units are required due to the rate or volume of data to be archived. Symantec Enterprise Vault scales horizontally and the partitions of a Vault Store can be placed on different network shares. Likewise, the Sun Fire X4500 Server Network Attached Archival Storage solution can also be scaled horizontally by adding more servers.

It is a best practice to configure SAM to make a second copy of the archived data to an external device, such as a tape library. However, in large-scale environments, it can become complex and cost-prohibitive to have each Sun Fire X4500 Server attached to a tape library. It might be simpler to consider a tape-less solution, using the NFS-based disk archives supported with Storage Archive Manager. Configure a second tier of one or more Sun Fire X4500 Servers as NFS servers to act as a SAM disk archives, as shown Figure 7.

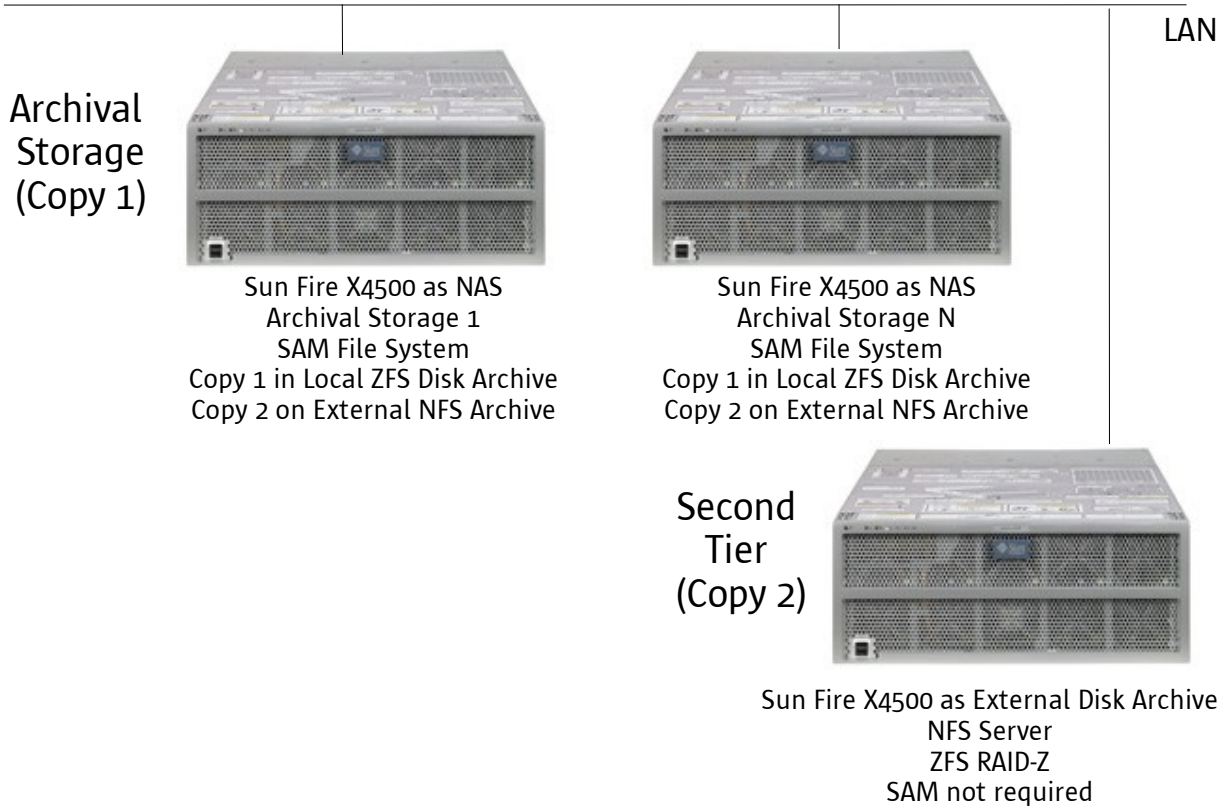

Figure 7: Scaling the Solution

Appendix: The x4500samconfig Script

Download the x4500samconfig script from the following location:

http://www.sun.com/bigadmin/jsp/descFile.jsp?url=descAll/x4500samconfig_tar_

Test Mode

The x4500samconfig script has a test mode to simplify development. The test mode gives you the following advantages:

- You can run the script on any server running the Solaris OS and as any user.
- The SAM packages are not required.
- Most of the safety checks are switched on.
- The script can be run on a previously configured system.
- No changes are made to the system or its files when you select options. All configuration files are created or modified, but they are all installed in /var/tmp/SAMFSTEST.
- All commands are echoed to the console so that you can see how the script works.

To run the script in test mode, type the following:

```
#./x4500samconfig samfstest 4.6
```

A banner is displayed to announce that the script is running in test mode. Then the script continues as normal. When you configure the server, the following additions are made to the standard output:

```
Create ZFS Storage Pool...this can take a few minutes.
##TEST MODE . ./zfspoolprofiles/2praidz/makepools.sh
Create ZFS Volume for SAM File System.
##TEST MODE zfs create -V 7.0TB -b 16KB samfspool0/samfs0vol
Create ZFS File System for SAM Disk Archive /diskvsn0.
##TEST MODE zfs create -o mountpoint=/diskvsn0 samfspool0/diskvsn0
##TEST MODE mkdir /diskvsn0/diskvsn
Configure SAM.
Create releaser.cmd file.
Create stager.cmd file.
Create samfs.cmd file.
Create mcf file.
Create archiver.cmd file.
Create diskvols.conf file.
Create SAM File System.
##TEST MODE samd config
##TEST MODE sammkfs -a 16K samfs0
Create vfstab entry for filesystem samfs0.
Backed up /var/tmp/SAMFSTEST/vfstabtmp to /var/tmp/SAMFSTEST/vfstabtmp.6210.
##TEST MODE mkdir /samfs0
Mount samfs0.
##TEST MODE mount samfs0
Configure SAMBA.
##TEST MODE mkdir /samfs0/samfs
Provide a SAMBA password for user root.
This DOES NOT need to be your systems root password.
##TEST MODE smbpasswd -a root
Enable SAMBA Services.
##TEST MODE svcadm disable samba wins swat
##TEST MODE svcadm enable samba wins swat
```

```
##### TEST MODE - NO CHANGES WERE MADE TO YOUR SYSTEM #####
#### All configuration files placed in /var/tmp/SAMFSTEST ####

System Configuration is Complete.

The system is ready to use. For information on managing
SAM and SAMBA please consult the README file

Hit Return to Exit Script.
```

Resetting a Configured Sun Fire X4500 Server

WARNING!: This procedure destroys your data.

To reset a Sun Fire X4500 Server so that you can run the `x4500samconfig` script, use the following procedure.

1. Unmount all SAM file systems.
2. Stop SAM processes.
3. Remove `/etc/vfstab` entries for any SAM file systems.
4. Destroy all ZFS pools and ZFS file systems.
5. Make copies of the following files:

   `/etc/sfw/smb.conf`

   `/etc/opt/SUNWsamfs/archiver.cmd`

   `/etc/opt/SUNWsamfs/diskvols.conf`

   `/etc/opt/SUNWsamfs/mcf`

   `/etc/opt/SUNWsamfs/releaser.cmd`

   `/etc/opt/SUNWsamfs/samfs.cmd`

   `/etc/opt/SUNWsamfs/stager.cmd`
6. Remove the original files.

You can now run the `x4500samconfig` script.

For More Information

About Sun StorageTek Archive Manager:

- Sun StorageTek Archive Manager page: http://www.sun.com/storagetek/management_software/data_management/sam/index.xml
- Sun StorageTek Secure Archive page: http://www.sun.com/storagetek/archive/index.jsp
- What Does Sun StorageTek Archive Manager Do? http://blogs.sun.com/timthomas/entry/what_does_sun_storagetek_storage1

About Sun Fire X4500 Server:

- Sun Fire X4500 Server page: http://www.sun.com/servers/x64/x4500/
- Tape support matrix for Sun Fire X4500 Server: http://www.sun.com/servers/x64/x4500/storage_options.jsp#TapeBackup

About Symantec Enterprise Vault:

- Symantec Enterprise Vault page: http://www.symantec.com/enterprise/products/overview.jsp?pcid=1018&pvid=322_1
- Sun and Symantec Enterprise Vault: http://www.sun.com/third-party/global/symantec/feature.jsp?intcmp=hp2007nov06_symantec_read

Downloads:

- Sun StorageTek Archive Manager: http://www.sun.com/download/index.jsp?cat=Systems%20Administration&tab=3&subcat=Storage%20Management
- Sun Fire X4500 Server: http://www.sun.com/servers/x64/x4500/downloads.jsp

Sun training courses at http://www.sun.com/training/:

- Sun Fire X4500 Server Administration (WET-5060)
- Sun StorageTek Storage Archive Manager and Sun StorageTek QFS 4.X (PK-NWS-4510)

Support:

- Register your Sun gear: https://sunconnection.sun.com/inventory/
- Services: http://www.sun.com/services
- SunSolve Online: http://sunsolve.sun.com
- Sun StorageTek Archive Manager support matrix: Contact your Sun or Sun Partner representative.

Hardware and Storage Forums: http://forum.java.sun.com/index.jspa?tab=hardware

Documentation:

- Sun StorageTek Archive Manager 4.6 Documentation: http://docs.sun.com/app/docs/coll/sam4.6?l=en
- *File System Manager User's Guide*: http://docs-pdf.sun.com/819-7939-10/819-7939-10.pdf
- Sun Fire X4500 Server - Release and Integrated Lights Out Manager (ILOM) Documentation
- Sun Fire X4500 Server - Maintenance and Operations Documentation
- Sun Fire X4500 Server - Installation Documentation

Wikis:

- Storage Administration Wiki: http://wikis.sun.com/display/StorageAdmin/Home
- Storage Developer's Wiki: http://wikis.sun.com/display/StorageDev/Home
- Sun Fire x64 Servers Wiki: http://wikis.sun.com/display/SunFireX64/Home

Events of interest to users of Sun products:

- Worldwide Developer Events: http://developers.sun.com/events/
- Current Events: http://www.sun.com/events/index.jsp