Sun StorEdge™ T3 Single Storage Array Design and Installation

By Mark Garner - Enterprise Engineering

Sun BluePrints™ OnLine - September 2000

Please
Recycle

Adobe PostScript

Sun StorEdge™ T3 Single Storage Array Design and Installation

This article provides a roadmap for the configuration of a single Sun StorEdge™ T3 Storage Array. It addresses:

- Prerequisites
- Storage Layout Design
- Implementation
- Configuration
- Basic Management

A subsequent article will address the configuration of dual Sun StorEdge T3 Arrays. All of the information presented in this article is covered in greater detail in the Sun StorEdge T3 Array documentation.

The best practices covered in this article are:

- Layout of storage for manageability;
- Use of VERITAS Volume Manager for maintainability;
- Wide Thin striping for performance;
- Basic Systems Management for availability.

A future article will cover Sun™ Management Center with particular emphasis on the Sun StorEdge T3 Arrays.

Prerequisites

The physical prerequisites are listed below. Each is explained in the paragraphs that follow.

- **Physical Configuration**
  - Height: 5.25

- Width: 17.5
- Depth: 18.5 + 4 inches front and back for cooling
- Weight: 67lb

- **Power**

  - 2 x 100-120 or 200-240VAC (450W) electrical supplies from independent sources
  - 1540 BTU/hr. cooling

- **Physical Connections**

  - One 10BaseT ethernet connection between the Sun StorEdge T3 Array and the local area network
  - One Fibre Channel (FC-AL) connection between the Sun StorEdge T3 Array and the host

- **IP Addresses**

  - One TCP/IP address

- **Volume Layout**

  - One 7+1 (Raid 5) volume with 1 hot spare for performance (Wide Thin Striping) and availability

- **Volume Manager**

  - Install VERITAS Volume Manager for maintainability

- **Systems Management**

  - Install Sun StorEdge Component Manager for manageability

Physical Configuration

The Sun StorEdge T3 Storage Array features hardware RAID. There are currently two supported Sun StorEdge T3 Array configurations:

- Single Array
- Dual Arrays (fully redundant)

The Single Array configuration is shown in FIGURE 1.

FIGURE 1   Sun StorEdge T3 Single Disk Array

Power

The Sun StorEdge T3 Array has two power supplies, each capable of powering the entire array. Each supply should be powered from a separate distribution. New equipment should only be powered up during a planned quiet period in order to minimize possible disruptions.

Physical Connection

The Sun StorEdge T3 Array requires the following physical connections:

- A 10BaseT ethernet connection between the Sun StorEdge T3 Array and the local area network to allow administration of the array.
- A Fibre Channel (FC-AL) connection between the Sun StorEdge T3 Array and the host for data access.

IP Addresses

The Sun StorEdge T3 Array controller has a 10BaseT network connection for configuration and management. For each Sun StorEdge T3 Array configuration the following information is required.

- IP Address
- Netmask
- Gateway IP Address

Systems Management

The Sun StorEdge T3 Array are supplied with Sun StorEdge Component Manager software. This software will need to be installed on an appropriate host, such as a systems management server or a systems administration server. It will be used to monitor and manage the Sun StorEdge T3 Array and can route alerts to E-mail. Some planning should be undertaken as to where the software will be installed and where the alerts are to be sent.

The Sun StorEdge T3 Array can be configured to forward SNMP traps. If this is applicable the destination TCP/IP address or machine name should be defined in preparation for implementation.

Storage Layout Design

Volume Layout

A Sun StorEdge T3 Array controller can present a maximum of 2 LUNs (Logical Unit Numbers), for example, c0t0d0, c0t0d1. The drives within the Sun StorEdge T3 Array can be configured in to one or two volumes. A volume is restricted to be a minimum of 2 disks.

The RAID 5 performance of the Sun StorEdge T3 Array is comparable to RAID 1 for most workloads except small random write operations where RAID 1 performance is approximately 20% better. Therefore, for most applications, a 7 + 1 disk (RAID 5), 1 disk hot spare configuration is recommended. In a high availability environment or where the application mandates relatively small file systems, a Volume Manager must be employed to break up the 112GB of usable space, assuming 18.2GB drives. The Sun StorEdge T3 Array can also be ordered with 36.4GB drives.

Volume Manager

The disk space that results from the 7 + 1 configuration above is in the region of 112GB (assuming 18.2GB disks). This is difficult to manage as a single file system. Partitioning the disk works well only if future requirements can be predicted. Since this is rarely true, it adds no more value than leaving the disk as one slice, and it could be argued that partitioning makes maintenance more difficult.

The best practice is to use VERITAS volume manager. This allows the disk to be broken down into sub-disks, each of which can have a specific function, for example, Index, Data, Logs and Archive. As the sub-disks are spread over all 8 physical disks, I/O will be distributed evenly. VERITAS will allow the volumes to be grown or reduced in size dynamically. All of which means a much more manageable, maintainable, and available system.

Implementation

The Sun StorEdge T3 Array can be configured one of two ways.

1. Serial connection (mainly for use by service personnel)

2. Telnet configuration (uses `rarp` to assign an initial IP address)

The two methods are described below, followed by a common set of configuration commands.

▼ Serial Connection

The serial connection is not required for administration tasks. However it will prove useful if the Sun StorEdge T3 Array boot messages need to be observed. The cable required for connection to the Sun StorEdge T3 Array does not ship with the array but can be ordered as part number F370-4119.

1. **Connect to the Sun StorEdge T3 Array from a Solaris™ Operating Environment host, serial cable connected to port B, by entering:**

   `% tip -9600 /dev/ttyb`

   Ensure the connection is made at 9600 baud, 8 bits (default) and no parity (default).

2. **If** `/etc/remote` **is unmodified from its installation configuration, you can also enter:**

   `% tip hardwire`

   If you are configuring the Sun StorEdge T3 Array using the serial connection skip the next section and proceed to the "Sun StorEdge T3 Array Configuration"section.

▼ Telnet Configuration

The configuration method given below uses the local files on a single host. It could also be achieved via a distributed naming service such as NIS.

Note – You must be root to perform these procedures.

---

1. **Edit** `/etc/ethers`.

   Edit the `/etc/ethers` file and enter the Ethernet MAC address and the name that you have chosen for the Sun StorEdge T3 Array disk tray. For example, to add a machine named `blueprint` with a MAC address of `00:20:f2:00:09:07,` you would enter:

   `00:20:f2:00:09:07    blueprint`

   Note – The Ethernet MAC address of each Sun StorEdge T3 Array is recorded on a pull out tab located at the front left hand side of the array behind the removable front cover.

   ---

2. **Edit** `/etc/hosts`.

   Edit the `/etc/hosts` file and enter the IP address that has been assigned to the Sun StorEdge T3 Array disk tray. For example, to add a machine named `blueprint` with an IP address of `10.0.1.182,` you would enter:

   `10.0.1.182          blueprint`

3. **View** `/etc/netconfig`.

   The file `/etc/netconfig` should be viewed to confirm that a "`-`"exists for `<nametoaddr_libs>` of the `inet` (`udp`, `tcp`, `rawip`) transports. This is the default. The example following shows the correct configuration. If the configuration is not correct, use a text editor to correct the file.

```
#
# The "Network Configuration" File.
#
# Each entry is of the form:
#
#        <network_id> <semantics> <flags> <protofamily> <protoname> \
#                 <device> <nametoaddr_libs>
#
# The "-" in <nametoaddr_libs> for inet family transports indicates
# redirection to the name service switch policies for "hosts" and
# "services". The "-" may be replaced by nametoaddr libraries that
# comply with the SVr4 specs, in which case the name service switch
# will not be used for netdir_getbyname, netdir_getbyaddr,
# gethostbyname, gethostbyaddr, getservbyname, and getservbyport.
# There are no nametoaddr_libs for the inet family in Solaris anymore.
#
udp         tpi_clts      v    inet     udp   /dev/udp        -
tcp         tpi_cots_ord  v    inet     tcp   /dev/tcp        -
rawip       tpi_raw       -    inet     -     /dev/rawip      -
ticlts      tpi_clts      v    loopback -     /dev/ticlts     straddr.so
ticotsord   tpi_cots_ord  v    loopback -     /dev/ticotsord  straddr.so
ticots      tpi_cots      v    loopback -     /dev/ticots      straddr.so
```

4. **Edit** /etc/nsswitch.conf

The default configuration is to use NIS for hosts and ethers address resolution. The following lines appear in /etc/nsswitch.conf:

```
hosts: nis [NOTFOUND=return] files
ethers: nis [NOTFOUND=return] files
```

If NIS is not to be used during the initial setup, edit the file so that the local files are referenced as follows, ensure the information is added to the naming service later:

```
hosts: nis files [NOTFOUND=return]
ethers: nis files [NOTFOUND=return]
```

5. **Start the RARP daemon (**rarpd**).**

The default configuration results in the RARP daemon not being started at boot time by the script /etc/rc3.d/S15nfs.server.

a. **To check if** rarpd **is running enter the following command:**

```
# pgrep rarpd
```

b. If `rarpd` is not running it can be started by entering the following command:

   `# /usr/sbin/in.rarpd -a &`

This command does not need to be executed on subsequent reboots; once the Sun StorEdge T3 Array has acquired its IP address, it is stored permanently.

6. **Ensure that the partner group cables are not connected to the Sun StorEdge T3 Array.**

7. **Power ON the Sun StorEdge T3 Array.**

   Once the Sun StorEdge T3 Array has booted it can be contacted using TELNET and specifying the host name of the Sun StorEdge T3 Array.

Sun StorEdge T3 Array Configuration

In the previous section we provided instructions on connecting to the Sun StorEdge T3 Array. This section provides instructions on configuring the following items on the Sun StorEdge T3 Array.

- Root Password
- IP configuration
- Time
- Firmware revision confirmation
- Volume creation
- Device creation
- Filesystem creation

Note – All procedures assume you are already connected to the Sun StorEdge T3 Array using one of the procedures described in the previous section.

▼ Root Password

Set the root password of the Sun StorEdge T3 Array with the `passwd` command.

`:/:<1> passwd`

Note – Initially there is no root password set on the Sun StorEdge T3 Array. To log on, use the username `root` and press return when prompted for the password.

▼ IP Configuration

Set the IP address, gateway and netmask on the Sun StorEdge T3 Array using the `set ip`, `set gateway`, `set netmask`, and `set hostname` commands, as shown below.

Note – You do not need to use the `set ip` command if you have already set the IP address previously using RARP.

```
:/:<2> set ip www.xxx.yyy.zzz

:/:<3> set gateway www.vvv.uuu.ttt
:/:<4> set netmask aaa.bbb.ccc.ddd
:/:<5> set hostname hostname
```

▼ Time Settings

1. **Set the date on the Sun StorEdge T3 Array using the** `date` **command.**

   hostname`:/:<6>`**date** *yyyymmddHHMM.SS*

2. **Set the time zone as an offset from Greenwich Mean Time (GMT), also know as Universal Time Coordinated (UTC) using the** `tzset` **command with the appropriate off-set substituted, for example -0800.**

   hostname`:/:<7>`**tzset –0800**

   The above command would be issued if the Sun StorEdge T3 Array were located on the West Coast of the United States of America.

▼ Confirm Firmware Revisions

Use the `ver` and `fru list` commands to list the version and patches on the Sun StorEdge T3 Array.

hostname`:/:<8>`**ver**

hostname`:/:<9>`**fru list**

Check `http://www.sunsolve.sun.com` to make sure you have the latest versions. Note that SunSolve[SM] has a specific Storage Product Patches page (PatchPro Interactive) where Storage Product, Operating System and disk drive type can be entered to produce a list of relevant patches.

▼ Volume Creation

Use the procedure below to create a 7 + 1 disk (RAID 5) volume with 1 hot spare.

1. **Telnet to the Sun StorEdge T3 Array, if you are not already connected, and log in as** `root`.

2. **Unmount and remove the original volume using the** `vol unmount` **and** `vol remove` **commands.**

   WARNING: The `vol remove` command will destroy any data on the volume

   hostname:`/:<1>`**vol unmount v0**
   hostname:`/:<2>`**vol remove v0**

3. **Create a 7+1 (RAID 5) disk using the** `vol add` **command.**

   hostname:`/:<3>`**vol add v0 data u1d1-8 raid 5 standby u1d9**

4. **Initialize and mount the volume using the** `vol init` **and** `vol mount` **commands.**

   hostname:`/:<4>`**vol init v0 data rate 16**
   hostname:`/:<5>`**vol mount v0**

▼ Device Configuration

On operating environments prior to the Solaris 8 Operating Environment new devices must be manually configured on the host.

1. **The system must be rebooted with the** `−r` **flag.**

   `{0} ok` **boot −r**

   On the Solaris 8 Operating Environment the new devices will be automatically recognized and configured by the `devfseventd` and `devfsadmd` daemons.

2. **The** `format` **and** `vxdctl` **commands are then executed as follows to complete the configuration.**

   a. **Label the volume that has been created on the Sun StorEdge T3 Array using the** `format` **command. This will allow VERITAS Volume Manager to recognize the new device.**

   b. **If VERITAS Volume Manager is being used, and is already configured use the** `vxdctl` **command to add the new device to its configuration.**

      `#` **vxdctl enable**

   Instructions for configuring a new installation of VERITAS Volume Manager appear later in the "Creating Disk Groups" section.

▼ File System Creation

VERITAS Volume Manager

If VERITAS Volume Manager is not being used, skip this section and proceed to the next section, "Creating the File System."

The Sun StorEdge T3 Array hardware is designed for high availability. To complement this feature VERITAS Volume Manager should be used. The Volume Manager will allow maintenance operations such as file system extension without needing to take the file system off-line.

Configure the volumes within VERITAS Volume Manager by creating a disk group and a volume as described in the following sections.

▼ Creating a Disk Group

If you have just installed VERITAS Volume Manager on the host, you must now configure VERITAS Volume Manager using the `vxinstall` command, as shown below. Refer to the VERITAS Volume Manager for Solaris Operating Environment Installation Guide for more information of vxinstall.

```
# vxinstall
```

This configures VERITAS and allows disks to be added to the `rootdg` disk group. At least one disk must belong to the `rootdg` disk group.

If VERITAS Volume Manager is already installed and configured on the host, add the disks to a disk group using the `vxdiskadd` command.

```
# vxdiskadd target
```

where *target* can be `c2` or `c2t3` or `c2t3d4` or `c2 c3t5d1` or `all`

▼ Creating a Volume

Once the disk has been added to a disk group, a volume can be created from that disk. Volume Manager will automatically select the disks comprising a volume unless they are specified. Use the `vxassist make` command to create a volume from a specific disk.

```
# vxassist make volume_name length diskname
```

For example,

```
# vxassist make data01 3g disk01
```

The above command will create a concatenated volume. To create a Striped (RAID-0), RAID-5 or Mirrored (RAID-1) volumes see the vxassist man pages and *VERITAS Volume Manager Command Line Interface Administrator's Guide*. In this instance, the Sun StorEdge T3 Array's hardware takes care of the RAID-5 functions, so a concatenated volume is the correct choice.

▼ Disabling VERITAS Volume Manager Hot Relocation

Although not strictly applicable to this configuration, as the Sun StorEdge T3 Array hardware will handle hardware and data resilience, disabling hot relocation and enabling hot sparing within VERITAS Volume Manager is very strongly recommended.

Hot relocation attempts to relocate each subdisk of a failed disk. This can have unpredictable and possibly undesirable results, for example both plexes of a mirror on the same physical disk, as VERITAS will place the sub-disks wherever it can find free space within the pool of hot relocation spares.

Hot sparing in contrast substitutes a failed disk with an entire spare disk from the pool of hot spares. This yields predictable results and more importantly a less complex recovery procedure.

Hot relocation is enabled by default and can be disabled and hot sparing enabled by editing the file /etc/rc2.d/S95vxvm-recover so that the last 10 lines of /etc/rc2.d/S95vxvm-recover look as follows:

```
# start the watch daemon. This sends E-mail to the administrator
# any problems are found. To change the address used for sending
# problem reports, change the argument to vxrelocd.

# vxrelocd root &

# to enable hot sparing instead of hot relocation.
# (comment out vxrelocd before uncommenting vxspare)

vxsparecheck root &

exit 0
```

To enable the changes above without rebooting the machine stop the vxrelocd daemon using the kill command and start the vxsparecheck daemon manually.

Execute the commands below to specify hot spares:

```
# /etc/vx/bin/vxdisksetup -i disk device name
# vxdg -g disk group name adddisk hotspare=disk device name
# vxedit -g disk group name set spare=on hotspare
```

▼ Creating the File System

When the volume has been created on the Sun StorEdge T3 Array a file system can be created and mounted by the host.

1. **Use** `format` **to partition the volume on the Sun StorEdge T3 Array unless a volume has been created via VERITAS Volume Manager. Then create and mount the file system, example commands are shown below.**

   ```
   # newfs -v /dev/rdsk/c5t1d0s2
   # mount /dev/dsk/c5t1d0s2 /mnt
   ```

   or if using VERITAS Volume Manager the paths will be as follows:

   ```
   # newfs -v /dev/vx/rdsk/data01
   # mount /dev/vx/dsk/data01 /mnt
   ```

2. **Create directories for the permanent mount points and edit** /etc/vfstab **to include the new file systems.**

3. **Complete the configuration by following the information in the "Management" section.**

Management

/etc/syslog.conf

Edit the /etc/syslog.conf file on the Sun StorEdge T3 Array so that the Sun StorEdge T3 Array system events are logged to a suitable management host. An example syslog.conf file is shown following.

```
# syslog.conf
# facility.level action
# messages to local syslog file

*.notice /syslog

# messages to syslog on another host

*.warn @remotehost

# messages sent as SNMP traps

*.warn | snmp_trap 10.1.6.201
```

1. **Use FTP from either the Sun StorEdge T3 Array or on a host to transfer the** syslog.conf **file to the host.**

2. **Edit the** `syslog.conf` **file then FTP the file back to the Sun StorEdge T3 Array.**

/etc/hosts

If you need to reference the management host in the file `/etc/syslog.conf` by hostname rather than IP address, then the `/etc/hosts` file on the Sun StorEdge T3 Array should be edited using the method described in the previous section.

Sun StorEdge Component Manager

The Sun StorEdge T3 Array includes the Sun StorEdge Component Manager software. The *Sun StorEdge Component Manager Installation Guide* and *Release Notes* should be followed to install the Sun StorEdge Component Manager. The following points should be noted from the installation of Component Manager 2.0 but should be verified against later versions:

1. **The directory** `/dev/es` **should exist prior to installation. If it does not, create the directory and change the permissions to 755, as shown below.**

```
# mkdir /dev/es
# chmod 755 /dev/es
```

2. **If the Solaris 2.6 Operating Environment is being run then the** `SUNWses` **package must be installed prior to the Sun StorEdge Component Manager installation.**

   a. **Install all patches recommended by the** *Installation Guide* **and** *Release Notes.*

   b. **Check for later patches at** http://sunsolve.sun.com**. Download and install the appropriate patches.**

   c. **Edit** `/etc/opt/SUNWesm/mo/hosts` **to add the IP address and name of the Sun StorEdge T3 Arrays to be managed.**

3. **If you are using NIS, and Sun StorEdge Component Manager is installed on a host that is not included in the NIS host tables, edit the file** `/etc/nsswitch.conf` **so that the line referring to hosts looks as follows:**

```
hosts: nis file [NOTFOUND=return]
```

   If this is not done Component Manager will fail to start.

4. **After the installation and startup of Sun StorEdge Component Manager, the Management Console can be started with the** `esm_gui` **command.**

```
# /usr/opt/SUNWesm/bin/esm_gui &
```

5. **Configure Sun StorEdge Component Manager to route status messages to e-mail addresses and Log files.**

   a. **Select the Configuration tab on the main screen of the Sun StorEdge Component Manager Management Console.**

   b. **Enter the required e-mail addresses and Log file names.**

6. **To display a physical view of the Sun StorEdge T3 Array that graphically shows the status of each FRU (Field Replaceable Unit) plus additional configuration and status information, click on the FRU's icon.**

   The component icons are found by double-clicking on Sun StorEdge Component Manager in the Navigation pane.

References

Sun StorEdge T3 *Administrator's Guide*

Sun StorEdge T3 *Installation, Operation and Service Manual*

VERITAS Volume Manager *Command Line Interface for Solaris Administrator's Guide*

VERITAS Volume Manager *for Solaris Installation Guide*

Author's Bio: Mark Garner

Mark Garner is a Systems Engineer for Enterprise Engineering at Sun Microsystems. Prior to joining Sun, Mark spent three years as a Systems Architect specializing in Email and Office Automation architectures and before this over eight years in systems administration. While at Sun Mark has focused on the design and implementation of mission critical business and Internet application's infrastructure principally to provide for high availability and scalability.