Sun StorEdge™ T3 Dual Storage Array - Part 3

Basic Management

By Mark Garner - Enterprise Engineering

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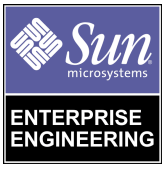

Sun Microsystems, Inc.
901 San Antonio Road
Palo Alto, CA 94303 USA
650 960-1300 fax 650 969-9131

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Sun StorEdge™ T3 Dual Storage Array - Part 3

Basic Management

This article is intended for system administrators and those responsible for the design and configuration of Sun StorEdge™ T3 arrays. This is the third of a three-article series and completes the roadmap for the configuration of the Sun StorEdge T3 storage array partner group. The topics of the articles in this series are as follows:

- *Part 1 – Installation, Planning, and Design*, Sun BluePrints OnLine, February 2001
- *Part 2 – Configuration*, Sun BluePrints OnLine, March 2001
- *Part 3 – Basic Management*, Sun BluePrints OnLine, April 2001

Information presented in this article is covered in greater detail in the Sun StorEdge T3 array, VERITAS Volume Manager, and Sun StorEdge™ Component Manager documentation and is available from:

`http://docs.sun.com/` and `http://www.veritas.com/`

This three-article series discusses the following best practices:

- Layout of storage (manageability)
- Using VERITAS Volume Manager (maintainability)
- Wide Thin striping (performance)
- Basic systems management (availability)

This article addresses the configuration of basic systems management functions and how to monitor the Sun StorEdge T3 array. In addition, this article describes how to automate the configuration using Expect scripts.

Monitoring

The Sun StorEdge T3 array can be configured to provide remote notification of system events on designated hosts with the `syslog` facility and SNMP traps. This remote notification is essential because the hardware controller transparently manages the recovery of most failures and allows them to go unnoticed unless the system administrator watches the status lights on the array.

This section explains how to configure the Sun StorEdge T3 array to provide remote notification by editing the `syslog.conf` file, redirecting SNMP traps, and installing the Sun StorEdge Component Manager to monitor the Sun StorEdge T3 arrays.

▼ Editing `/etc/syslog.conf` on the Sun StorEdge T3 Array

The `/etc/syslog.conf` file on the Sun StorEdge T3 array should be edited to log system events into a suitable management host. The Sun StorEdge T3 array does not have an editor; therefore, use FTP on either the Sun StorEdge T3 array or on a host to transfer the `syslog.conf` file to a location where it can be edited. Modify the file and transfer it back to the Sun StorEdge T3 array. The following is an example `syslog.conf` file:

```
# syslog.conf
# facility.level action
# messages to local syslog file
*.notice /syslog
# messages to syslog on another host
*.info @remotehost
#messages sent as SNMP traps
*.warn | snmp_trap 192.168.49.100
```

This `syslog.conf` file configures `syslog` to log “notice” messages and higher in the `/syslog` directory (`*.notice /syslog`) to limit the growth of the local `syslog` file and reduce the volume of events. In addition, this `syslog.conf` file configures `syslog` to log all messages to the remote host (`*.info @remotehost`).

After editing the /etc/syslog.conf file, set the Sun StorEdge T3 array to route syslog messages as specified in the /etc/syslog.conf file with the following command:

```
blueprints:/:<1>set logto *
```

The definition of an “error” to syslog is that it has corrupted or threatens to corrupt data and requires immediate attention. With the inherent resilience of the Sun StorEdge T3 array, nearly all failures (for example, a disk or power supply) generate warning messages only. Therefore, the *.warn facility level of syslog must be tracked as a minimum; consequently, the Sun StorEdge T3 array loglevel must be set to 2, 3, or 4 with the following command:

```
blueprints:/:<2>set loglevel n
```

The loglevel setting on the Sun StorEdge T3 array controls the severity of event that is logged and has priority over the setting in the Sun StorEdge T3 array’s syslog.conf file. The settings for loglevel are:

- *0* – No Logging
- *1* – Errors (critical events requiring immediate intervention)
- *2* – Warnings (events that will eventually require intervention) and above
- *3* – Notices (events indirectly caused by other actions) and above
- *4* – Informational (events that require no intervention) and above

---

Note – Every command issued on a Sun StorEdge T3 array generates a “notice” level syslog event.

It is suggested to set the loglevel to 2 to constrain syslog to report only those events that threaten the integrity of the hardware which ensures important messages are not lost in the noise of events.

The /etc/hosts File

If it is required to reference the management host in the /etc/syslog.conf file by hostname rather than IP address, the /etc/hosts file should be edited. The Sun StorEdge T3 array does not have an editor; therefore to edit the file, use FTP on either the Sun StorEdge T3 array or on a host to transfer the hosts file to a location where it can be edited. Then modify the file and transfer it back to the Sun StorEdge T3 array.

Editing /etc/syslog.conf on the loghost

loghost is the remote host where syslog messages are sent. To ensure the syslog messages from the Sun StorEdge T3 array are tracked by the loghost, add the following lines to the /etc/syslog.conf file on the loghost:

```
local7.info           /var/adm/messages.t300
local7.info           /dev/sysmsg
```

The Sun StorEdge T3 array notifies events under the local7 facility. Therefore, the first line in the preceding codebox ensures all messages from the Sun StorEdge T3 array are written to the file /var/adm/messages.t300. The second line configures syslog to write all messages to the system message display device (normally the console).

The recommended method is to configure syslog to log all messages sent by the Sun StorEdge T3 array, regardless of severity level, and use the loglevel setting on the Sun StorEdge T3 array to filter the severity level. This method enables the system administrator to change the logging level without amending the syslog configuration files. To change the logging level, simply execute the set loglevel command on the Sun StorEdge T3 array.

Note – The message.t300 file will continue to grow until it is renamed or removed.

If changes are made to the /etc/syslog.conf file on the loghost, invoke the following command:

```
# kill -HUP <syslogd pid>
```

This command signals the syslog daemon to read its configuration file and effect the new settings.

SNMP Management Information Block (MIB)

If SNMP is used to log events, a MIB, which is required for configuration of the systems management software, can be found on the Sun StorEdge T3 array in the /web/snmp/t300.mib file.

Example `syslog` Messages

The first set of `syslog` warning messages were generated by turning off the right power supply (from the rear of the array) of the upper array in a Sun StorEdge T3 array partner group. The resulting warning messages are as follows:

```
Jan 08 15:16:08 [129.153.47.90.2.2] LPCT[1]: W: u2pcu2: Switch off
Jan 08 15:16:11 [129.153.47.90.2.2] LPCT[1]: W: u2pcu2: Off
Jan 08 15:16:13 [129.153.47.90.2.2] LPCT[1]: W: u2pcu2: DC not OK
```

The second set of `syslog` warning messages were generated by the failure of the disk in slot 1 of the lower array (`u1d1`) in a Sun StorEdge T3 array partner group. The resulting warning messages are as follows:

```
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: u1d1 SCSI Disk Error Occurred
(path = 0x1)
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Key = 0x2, Asc = 0x4, Ascq
= 0x2
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Data Description =Logical
Unit Not Ready, Initializing CMD Required
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: u1d1 SCSI Disk Error Occurred
(path = 0x1)
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Key = 0x2, Asc = 0x4, Ascq
= 0x2
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Data Description =Logical
Unit Not Ready, Initializing CMD Required
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: u1d1 SCSI Disk Error Occurred
(path = 0x1)
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Key = 0x2, Asc = 0x4, Ascq
= 0x2
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Data Description =Logical
Unit Not Ready, Initializing CMD Required
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: u1d1 SCSI Disk Error Occurred
(path = 0x1)
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Key = 0x2, Asc = 0x4, Ascq
= 0x2
Jan 08 18:30:14 [129.153.47.90.2.2] ISR1[1]: W: Sense Data Description =Logical
Unit Not Ready, Initializing CMD Required
Jan 08 18:30:14 [129.153.47.90.2.2] CMLT[1]: W: u1d1: Failed
```

The third set of `syslog` error messages were generated by removing a disk from slot 1 of the lower array (`u1d1`) in a Sun StorEdge T3 array partner group. The resulting error messages are as follows:

```
Jan 08 18:43:08 [129.153.47.90.2.2] LPCT[1]: E: u1d1: Not present
Jan 08 18:43:08 [129.153.47.90.2.2] TMRT[1]: E: u1d1: Missing; system shutting
down in 30 minutes
```

The Sun StorEdge T3 array is designed for operation with all FRUs (Field Replaceable Units) inserted. Removing a FRU disrupts the airflow cooling the array—this triggers the Sun StorEdge T3 array to shutdown in 30 minutes to avoid potential overheating and component damage.

The final set of warning messages were generated by issuing the following command on the Sun StorEdge T3 array:

```
blueprints:/:<3>disable u1l1
```

This command disables the left controller (from the rear of the array) of the lower array in a Sun StorEdge T3 array partner group. The resulting `syslog` messages are as follows:

```
Jan 08 18:32:47 [129.153.47.90.2.2] LPCT[1]: W: u1l1: Disabled
Jan 08 18:32:47 [129.153.47.90.2.2] LPCT[1]: W: u2l1: Offline
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d9
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d9
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d8
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d7
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d6
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d5
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u2d4
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d8
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d7
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d6
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d5
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] ISR1[1]: W: u1d4
SVD_PATH_FAILOVER:path_id = 0
Jan 08 18:32:48 [129.153.47.90.2.2] LPCT[2]: W: u1l1: Disabled
```

Note – If the network address can be resolved, the hostname appears in the `syslog` messages.

▼ Installing Sun StorEdge Component Manager Software

The Sun StorEdge T3 array is supplied with the Sun StorEdge Component Manager software. The Sun StorEdge Component Manager software installation guide and release notes should be followed to install the Sun StorEdge Component Manager software. The following additional points should be noted for the installation of Sun StorEdge Component Manager 2.0 software, they may not be valid in other versions and should be verified against the installation documentation and release notes:

1. The `/dev/es` directory should exist on the system where the Sun StorEdge Component Manager software resides prior to installation, if it does not, run the following commands:

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

2. If Solaris™ Operating Environment (Solaris OE) version 2.6 is being used, install the SUNWses package from the OS distribution CD prior to installing the Component Manager software.
3. Install all patches recommended by the installation guide and release notes.
4. Check for the latest patches available from `http://sunsolve.sun.com`; download and apply patches as required.
5. Add the IP address and name(s) of the Sun StorEdge T3 arrays to be managed to the `/etc/opt/SUNWesm/mo/hosts` file.
6. If NIS is used and the Sun StorEdge Component Manager software is installed on a host that is not included in the NIS host tables, edit the `/etc/nsswitch.conf` file so that the line referring to hosts is as follows:

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

Note – If the preceding step is not performed, the Sun StorEdge Component Manager software will fail to start.

---

7. After the installation and startup of the Sun StorEdge Component Manager software, start the management console with the following command:

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

8. Configure the Sun StorEdge Component Manager software to route status messages to email addresses and log files by selecting the Configuration tab on the main screen of the Sun StorEdge™ Management Console software and entering the required email addresses and log file names.

A physical view of the Sun StorEdge T3 array that graphically shows the status of each FRU plus additional configuration and status information can be displayed by clicking on the relevant component icon. The component icons are displayed by double-clicking on “Component Manager” in the Navigation pane. FIGURE 1 displays the Sun StorEdge Management Console screen.

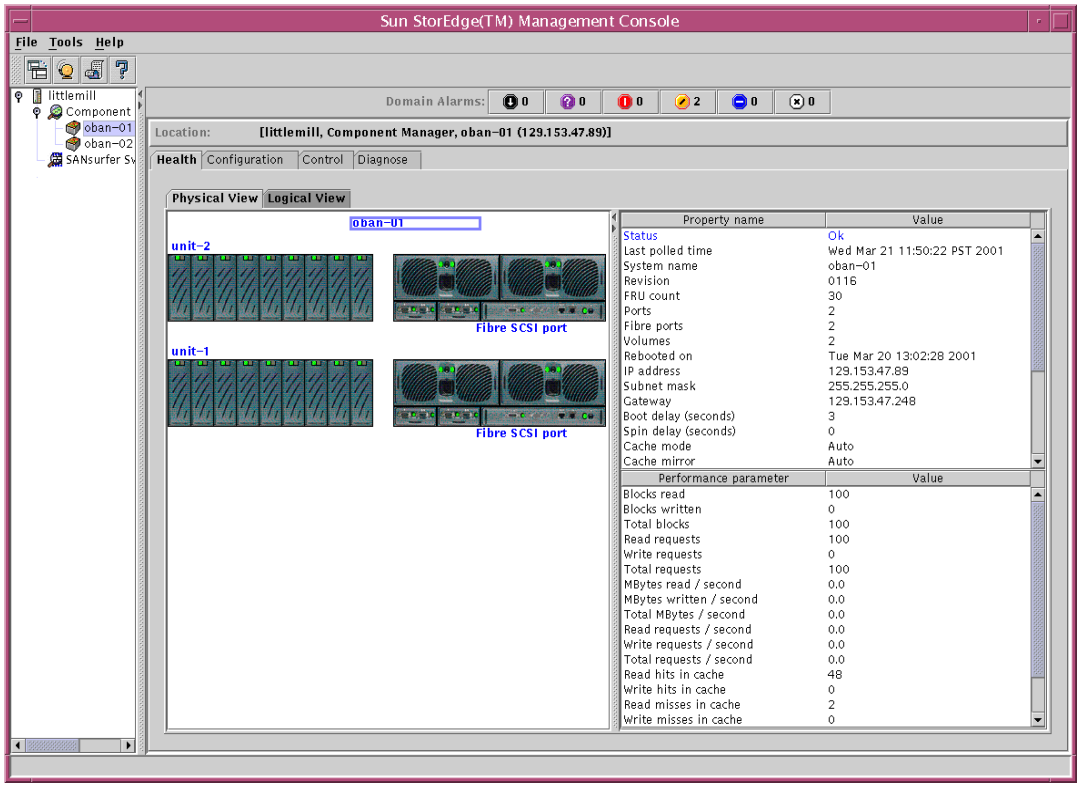

FIGURE 1 Sun StorEdge Management Console Screen

Automated Configuration

This section describes how to automate the configuration of a Sun StorEdge T3 array partner group. In this example, the first script adds two volumes to a Sun StorEdge T3 array partner group, and the second removes all volumes from a single Sun StorEdge T3 array or partner group.

Expect Application

The Expect application is freeware that enables the interaction with a program to be scripted. When executed, the Expect program waits for a prompt and then generates a predetermined response. This method is used to automate the configuration of the Sun StorEdge T3 array. For additional information on the Expect application, refer to "Exploring Expect" by Don Libes, O'Reilly, ISBN 1-56592-090-2.

Note – The Expect application is included on the Solaris OE companion CD with Solaris 8 OE update 2 and later.

Installation of the Expect Application

Download the Expect application from `http://sunfreeware.com/`.

Note – Ensure the version of Expect software downloaded corresponds to the version of the Solaris OE being used.

Follow the instructions under "Downloading/Installation" on `http://sunfreeware.com/` and use the following commands:

```
# gunzip expect-5.31-sol8-sparc-local
# pkgadd -d expect-5.31-sol8-sparc-local
```

Note – The `pkgadd` command must be run by the **root** user.

Adding Volumes

This section includes a script that adds two 7+1 (RAID-5) volumes, each with a hot spare to a Sun StorEdge T3 array partner group. Execute the script with the following command:

```
$ expect add_vol <ip address of the T3 array> <output log file name>
```

Note – The password for the array has been embedded in the following Expect script, this practice is not recommended because it is a security weakness. If a password must be embedded in a script, the password should be changed before and after running the script.

The following Expect script adds the two 7+1 (RAID-5) volumes:

```
# ------------------------------------------------------------
# add_vol.exp
# 12/01/00
# input : ip address and result output file name
# output : result output file
# function : Create 2 x 7+1 RAID5 (plus hot spare) Volumes
# on a Sun StorEdge T3 array partner group
#-------------------------------------------------------------

global prompt
global purple_passwd

set prompt "<.*>$"
set purple_passwd "t3"

proc login {} {

#
#
# Procedure logs in to the T3 array.
#

global purple_passwd

        send "root\r"
        expect "Password:"
        send "$purple_passwd\r"
        set timeout 10
#
```

```
# ------------------------------------------------------------------
#
# Trap invalid usernames or passwords
#
        expect -re "Invalid" {error}
        }


proc PurpleCmd {cmd response} {

#
#
# Procedure to execute a command on the T3 array.
# The procedure is passed the command to execute and the
# expected response. The command must complete within 2 minutes.
#
   global prompt

   send "$cmd\r"
   set timeout 120
        expect {
                -re $response { return 0 }
                timeout { return 1 }
        }
}

proc PurpleLongCmd {cmd response} {

#
#
# Procedure to execute a command on the T3 array.
# The procedure is passed the command to execute and the
# expected response. The command must complete within an hour.
#
   global prompt

   send "$cmd\r"
   set timeout 3600
        expect {
                -re $response { return 0 }
                timeout { return 1 }
        }
}

proc AddVolumes {volname ud raid standby} {

#
#
# Procedure to add a volume to a T3 array.
```

```
# ------------------------------------------------------------------
# Inputs: Volume Name, Constituent disks, Raid Level, Hot Standby Disk
# e.g. AddVolumes "v0" "u1d1-8" "raid 5" "standby u1d9"
# adds the volume named v0, a 7+1 (RAID-5) volume (disks d1-8) with
# a hot spare (disk d9) to T3 array unit 1 (u1)
#
   global prompt
#
#
# Redirect syslogd to the host, enable multipathing support and
# cache mirroring. Redirect syslogd to the host, enable multipathing support and
# enable cache mirroring.
#
   if [PurpleCmd "set logto *" $prompt] {return 1}
   if [PurpleCmd "sys mp_support rw" $prompt] {return 1}
   if [PurpleCmd "sys mirror auto" $prompt] {return 1}

#
#
# Add, initialize and mount the volume.
#
   if [PurpleCmd "vol add $volname data $ud $raid $standby" $prompt] { return 1
}
   if [PurpleCmd "vol init $volname sysarea rate 16" $prompt] { return 1 }
   if [PurpleCmd "vol init $volname data rate 16" "Continue*."] { return 1 }

   if [PurpleLongCmd "y" $prompt] {return 1}
   if [PurpleCmd "vol mount $volname" $prompt] { return 1 }

   return 0
}

#
#
# Main execution, check input arguments have been supplied,
# login to the T3 array, add the volumes, logout of the
# array and exit this program.
#

set argc [llength $argv]

if {$argc != 2} {
   puts "need 2 args ip_address and result output file"
   puts "ussage: %expect add_vol.exp 192.168.208.37 result_file"
   return
} else {
   set ip [lindex $argv 0]
   set result_file [lindex $argv 1]
}
```

```
# ------------------------------------------------------------


      spawn telnet $ip
      set timeout 3
#
#
# Catch any errors during login and exit the program
#
      expect "Login:" {if [catch {send "[login]"}] {return} } timeout {

         if [catch {open $result_file "a"} output] {
            puts "error openning file $result_file"
            return
         } else {
         puts $output "no answer from host $ip"
         close $output
         return
         }
      }

       if [AddVolumes "v0" "u1d1-8" "raid 5" "standby u1d9"] {
          send_user "error adding volumes"
       }
       if [AddVolumes "v1" "u2d1-8" "raid 5" "standby u2d9"] {
          send_user "error adding volumes"
       }

   send "exit\r"
```

Removing Volumes

This section includes a script that removes all volumes on a Sun StorEdge T3 array. Execute the script with the following command:

```
$ expect remove_vol <ip address of the T3 array> <output log file name>
```

Note – The password for the array has been embedded in the following Expect script, this practice is not recommended because it is a security weakness. If a password must be embedded in a script, the password should be changed before and after running the script.

The following Expect script removes all volumes on a Sun StorEdge T3 array:

```
#-----------------------------------------------------------------
# remove_vol.exp
# 10/24/99
# input : ip address and result output file name
# output : result output file
# function : Removes all volumes on a Sun StorEdge T3 array
#-----------------------------------------------------------------

global prompt
global result_file
global purple_passwd

set prompt "<.*>$"
set purple_passwd "t3"


proc login {} {

#
#
# Procedure logins in to the T3 array.
#

global purple_passwd

        send "root\r"
        expect "Password:"
        send "$purple_passwd\r"
        set timeout 10
#
```

```
#-----------------------------------------------------------------
#
# Trap invalid usernames or passwords
#
        expect -re "Invalid" {error}
        }

proc PurpleCmd {cmd response} {

#
#
# Procedure to execute a command on the T3 array.
# The command must complete within 20 seconds.
#

   global prompt

   send "$cmd\r"
        set timeout 20
        expect {
                -re $response {
                   return 0
                }
                timeout {
                   return 1
                 }
        }
}

proc PurpleRemoveAllVolumes { } {

#
#
# Procedure to remove all volumes on a T3 array.
# The procedure loops, listing the volumes present,
# attempts to remove the first one, if it is mounted
# it is unmounted and then removes. This loop continues
# until no volumes are listed. Need to mention test_hostname.
#
   global prompt

   set no_volumes 0
   while {!$no_volumes} {
        send "vol list\r"
#
# In the output from "vol list" look for the string "standby" followed
# by two characters .. then place in element 1 of expect_out, denoted by
# the (), the first non-space characters that are followed by a single
# digit, 0-9, then match any characters, .*, followed by a "<" followed by
```

```
#-----------------------------------------------------------------
# any characters, .*, and a ">" at the end, $, of the output string.
# Note this will yield v0, v1... in $expect_out(1, string)
#
        expect -re "standby..(\[^ ]*).*\[0-9] .*<.*>$" {
                send "vol remove $expect_out(1,string)\r"
#
#
# Try to remove the volume, if it is mounted, unmount it and loop
# around and try again
#
                expect -re "ERROR.* volume already mounted.*>$" {
                        if [PurpleCmd "vol unmount $expect_out(1,string)"
$prompt] {
                                return 0
                        }
                } -re ".*>$" {}
        } -re "standby.*>$" {
                set no_volumes 1
                send_user "no volumes\n"
        }
    }
}

#
#
# Main execution, check input arguments have been supplied,
# login to the T3 array, remove the volumes, logout of the
# array and exit this program.
#

set argc [llength $argv]

if {$argc != 2} {
   puts "need 2 args ip_address and result output file"
   puts "ussage: %expect remove_vol.exp 192.168.208.37 result_file"
   return
} else {
   set ip [lindex $argv 0]
   set result_file [lindex $argv 1]
}


      spawn telnet $ip
      set timeout 3
#
#
# Catch any errors during login and exit the program
#
```

```
#-------------------------------------------------------------------
      expect "Login:" {if [catch {send "[login]"}] {return} } timeout {

         if [catch {open $result_file "a"} output] {
            puts "error opening file $result_file"
            return
         } else {
         puts $output "no answer from host $ip"
         close $output
         return
         }
      }

      PurpleRemoveAllVolumes

   send "exit\r"
```

Summary

The “intelligence” provided by the hardware RAID controller combined with the hardware resilience within the Sun StorEdge T3 array results in most failures being masked from the host. The Sun StorEdge T3 array recovers failures and continues operation without the need for intervention; hence, failures are transparent to users. For this reason it is imperative to monitor the Sun StorEdge T3 array. This article addressed how to monitor the Sun StorEdge T3 array and covered:

- Monitoring with the `syslog` facility
  - Configuration files
  - Redirection to a `loghost`
  - Logging levels, facilities, and severities
  - Example `syslog` messages
- Redirecting SNMP traps and the SNMP MIB
- Sun StorEdge Component Manager software

Additionally, this article described a method of automating the configuration of the Sun StorEdge T3 array partner group with Expect scripts to add and remove volumes.

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.