



# Sun StorEdge™ Traffic Manager 4.6 Software User's Guide

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For Microsoft Windows 2000 and 2003  
and  
Red Hat Enterprise Linux  
Operating Systems

Sun Microsystems, Inc.  
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# Preface

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The *Sun StorEdge Traffic Manager 4.6 Software User's Guide* provides instructions for using the Sun StorEdge™ Traffic Manager software in Microsoft Windows 2000 service pack 4, Microsoft Windows 2003 and Red Hat Enterprise Linux operating environments.

This guide is designed for use with the *Sun StorEdge Traffic Manager 4.6 Software Installation Guide for Microsoft Windows and Red Hat Linux* and the documentation that came with your storage device. This guide is written for experienced system administrators of Red Hat Enterprise Linux and Microsoft Windows 2000 Service Pack 4 and 2003 operating systems and related disk storage systems.

Throughout this guide, *storage device* is used to designate the storage devices supported in this release. The supported devices are:

- Sun StorEdge T3B array
- Sun StorEdge 3510 FC array
- Sun StorEdge 6120 array
- Sun StorEdge 6130 array
- Sun StorEdge 6320 system
- Sun StorEdge 6910/6960 systems
- Sun StorEdge 6920 system
- Sun StorEdge 9900 series
- Devices complying with Asymmetric Logical Unit Access (ALUA), as defined in the T10, SPC-3, Revision 17 working document, for devices that support implicit only access management

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# Before You Read This Guide

To fully use the information in this guide, you must have thorough knowledge of the topics described in the documentation that came with your storage device.

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# How This Guide Is Organized

This guide is organized as follows:

Chapter 1 provides an overview of the Sun StorEdge Traffic Manager Software.

Chapter 2 explains the Sun StorEdge Traffic Manager Software GUI.

Chapter 3 explains the Sun StorEdge Traffic Manager command line interface.

Chapter 4 explains how to set logging for event information.

Chapter 5 describes the error messages that can be issued during software operation.

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# Typographic Conventions

Typeface*	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
<b>AaBbCc123</b>	What you type, when contrasted with on-screen computer output	% <b>su</b> password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this. To delete a file, type <code>rm filename</code> .

\* The settings on your browser might differ from these settings.

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## Related Documentation

Application	Title	Part Number
Late-breaking Information	<i>Sun StorEdge Traffic Manager 4.6 Software Release Notes for Microsoft Windows 2000 and 2003, and Red Hat Enterprise Linux Operating Systems</i>	819-0147-10
Installation Guide	<i>Sun StorEdge Traffic Manager 4.6 Software Installation Guide for Microsoft Windows and Red Hat Linux</i>	819-0145-10
Configuring the SAN	<i>Sun StorEdge SAN Foundation Software 4.4 Configuration Guide</i>	817-3672-11

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# Sun StorEdge Traffic Manager Software Overview

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This chapter contains the following topics:

- “About the Sun StorEdge Traffic Manager Software” on page 1
- “Switch Configurations” on page 3
- “Description of Specific Fields” on page 4

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## About the Sun StorEdge Traffic Manager Software

The Sun StorEdge Traffic Manager software is a system for managing multiple paths to storage devices. The Sun StorEdge Traffic Manager system consists of a graphical user interface (GUI), a command line interface (CLI), and system device drivers for managing the multiple paths. If a failure occurs in one host data path, the Sun StorEdge Traffic Manager software automatically detects the failure and provides continuous access to data through an alternate data path.

Each storage device and the LUNs associated with it are shown on the left side of the window and the paths and host bus adapters (HBA) system names are shown on the right.

# About Asymmetric Device Path Management

The Sun StorEdge Traffic Manager 4.6 software supports two types of asymmetric device path management: vendor-unique and T10 Asymmetric Logical Unit Access (ALUA) device path management. The asymmetric devices that are listed on page vii are managed with vendor-unique commands. Additionally, devices that are not specifically listed, yet comply with implicit ALUA as defined in the T10, SPC-3, Revision 17 working document, are managed according to the T10 specification.

## Vendor-Unique Asymmetric Devices

The following description of failover and failback operations apply to vendor specific asymmetric devices.

- **Failover** – A logical unit number (LUN) on an asymmetric device can have only one active controller at a time. The controller that is not active is known as the passive controller. Paths to the active controller are known as active paths; paths to the passive controller are known as passive paths.

The process by which a LUN can force a passive controller to become its active controller is known as LUN failover. When LUN failover occurs, passive paths to a controller become active, and previously active paths become passive. On the Sun StorEdge™ T3 and Sun StorEdge 6120 arrays, failover is implemented per device volume. Therefore, if volume slicing is enabled, multiple LUNs on the volume can be affected by a failover. Also, in a multi-initiator environment, a LUN failover on one host affects all other hosts using LUNs on the same volume. LUN failover can be initiated by both automatic and manual means.

- **Automatic failover by error detection** – If a path receives errors and fails, it is marked as Down or Removed. If all the active paths for a LUN are marked Down and there are remaining passive paths, the driver automatically causes a LUN failover to activate the passive paths.
- **Manual failover initiated by the `activate` command** – The user can use the `activate` command to manually initiate a LUN failover by activating a passive path, causing previously active paths to become passive. On the Sun StorEdge T3 and Sun StorEdge 6120 arrays, if the LUN is a slice on a volume, all LUNs on that volume will fail over for all hosts.
- **Manual failover initiated by the `restore` command** – On some devices, a LUN may have a default active controller, known as the preferred controller. A `restore` command initiates a failover of all LUNs that are not currently being accessed by way of their preferred controller.
- **Automatic failback initiated by an automatic restore** – If the `autofailback` parameter is set to `enabled`, the `restore` command is initiated automatically when the software recognizes that a down path has become passive. This is known as autofailback. The `autofailback` parameter must be set to `enabled` in order for this to occur.

For information on configuring and using the `autofailback` command, refer to “Setting the Failback Mode” on page 23.

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**Note** – The `autofailback` parameter is not supported in a multi-initiator environment.

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## T10 ALUA Asymmetric Devices

When using T10 ALUA asymmetric devices, only implicit logical unit access is supported. With implicit access, the device’s controller manages the states of path connections. The Sun StorEdge Traffic Manager software can monitor the path states but cannot change them, either automatically or manually. Paths can either be active or standby. Of the active paths, a path may be specified as preferred (optimized in T10), and as non-preferred (non-optimized). If there are active preferred paths, then only these paths will receive commands, and will be load balanced to evenly distribute the commands. If there are no active preferred paths then the active non-preferred paths are used in a round-robin fashion. If there are no active non-preferred paths then the LUN cannot be accessed until the controller activates its standby paths.

## About Symmetric Device Path Management

For symmetric devices, all paths are active unless a path is unhealthy and designated as down, in which case the unhealthy path is rerouted. Load balancing occurs across all active paths to improve performance by using all available paths to a storage device.

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## Switch Configurations

The Sun StorEdge Traffic Manager software works with storage device configurations that include switches. For information on configuring storage devices with switches, refer to the documentation for the switch you are using.

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# Description of Specific Fields

Throughout its operation, the Sun StorEdge Traffic Manager software presents information about devices, properties, paths, and metrics using specific fields. TABLE 1-1 lists the specific fields and a description of the contents.

TABLE 1-1 Specific Fields

Specific Field	Contents
Auto Failback	Controls how the software responds when a failed path comes back online or is re-established. When a failed path is repaired or returns from a down state, it is always re-enabled but not always activated. When auto failback is enabled and the path is the preferred path, it is automatically re-activated. Note that auto failback is only supported in a single-host environment.
Blocks Transferred	Displays the number of I/O read or write blocks transferred to and from the storage device. These values are only maintained from the last host boot. They are not persistent across a reboot of the host.
Capacity	Storage capacity of the LUN.
Device Description	Displays one of the Sun devices in the following list: <ul style="list-style-type: none"><li>• Sun StorEdge T3B array</li><li>• Sun StorEdge 3510 FC array</li><li>• Sun StorEdge 6120 array</li><li>• Sun StorEdge 6130 array</li><li>• Sun StorEdge 6320 system</li><li>• Sun StorEdge 6910/6960 systems</li><li>• Sun StorEdge 6920 system</li><li>• Sun StorEdge 9900 series</li></ul> For devices that are not listed above, yet comply with T10 ALUA, this field displays the inquiry data Vendor ID and Product ID fields.
Enabled or Active	The state field can contain the following states: <ul style="list-style-type: none"><li>• ACTIVE – indicates that the device is Enabled and Active</li><li>• PASSIVE – indicates that the device is Enabled, but not Active</li><li>• STANDBY – indicates that the device not Enabled, nor Active</li><li>• ADMIN – indicates that the device is not Enabled, nor Active</li><li>• DOWN – indicates that the device is neither Enabled, nor Active</li><li>• TRANSITIONING – state is changing</li><li>• UNKNOWN – cannot be determined</li><li>• REMOVED – indicates that the device is neither Enabled, nor Active</li></ul>

**TABLE 1-1** Specific Fields (*Continued*)

Specific Field	Contents
Error Returns	Indicates that an error has been returned. Information on returned errors is located in Chapter 5.
Firmware Revision	Displays the high-level firmware that is currently installed on the storage device.
HBA	Displays the name of an HBA according to the conventions of your operating environment.
Host Requests	Displays the number of I/O requests that the upper-level drivers have given to the Sun StorEdge Traffic Manager software. These values are only maintained from the last host boot. They are not persistent across a reboot of the host.
I/O Errors	Displays the number of errors handled by the failover driver for the specified LUN. These values are only maintained from the last host boot. They are not persistent across a reboot of the host.
IP Address	Displays the management IP address for the Sun StorEdge storage device, if available.
Log Level	Determines the messaging detail that is sent to the host system log. Multiple log levels can be ORed together. All log levels can be turned on by specifying 0x1F from the CLI.
LUN Name Field	The operating-system specific name for the specified LUN. If the operating LUN name cannot be determined, it is presented as LUN.
LUN State	The LUN states are: <ul style="list-style-type: none"><li>• Up</li><li>• Down</li><li>• Waiting for an active path</li><li>• Transitioning</li><li>• Removed (for Windows platforms only)</li><li>• Unknown</li></ul>
LUN Unique ID	Displays a number unique to each LUN that indicates connection to the host.
Nexus Name	Displays the nexus name for the HBA to storage device controller. The nexus name is defined by the Sun StorEdge Traffic Manager software. The format varies with each supported operating system.
Outstanding I/Os	Displays the number of I/Os that have been sent to the device but have not been completed. This value is comparable to the I/O queue depth from this host to a given LUN. These values are only maintained from the last host boot. They are not persistent across a reboot of the host.
Pathing Mode	This field displays the pathing mode that can be used by the device, which is either symmetric, asymmetric or ALUA-implicit.

**TABLE 1-1** Specific Fields (*Continued*)

<b>Specific Field</b>	<b>Contents</b>
Poll Rate	Healthy poll rate determines how often the software checks the status of paths that are not down and are currently available. Unhealthy poll rate determines how often the software checks the status of paths that are down.
Single Character Column	On the left side of the information produced by the command line interface is a column that has an asterisk (*) as the column head. This column contains warning and error states if they exist. The possible values in this column are: ' ' - No warnings X - The path is down or removed ! - The path is not active and is the preferred path ! - The path is in admin mode - (hyphen) - The path is in transition ? - The path is in an unknown state
Storage Device	Defined as a collection of LUNs contained by a specific storage product (for example, a Sun StorEdge 6120 partner pair). If a storage system cannot be determined, LUNs are put in collections based on their SCSI INQUIRY VENDOR/PRODUCT/SERIAL values. For example, a third-party storage device that is attached through Sun Solaris Open-MpxIO.
Unique ID	A internal identification that is used to associate LUNs to a specific storage device.
Worldwide Name (WWN)	A unique number assigned to each device.

# The Sun StorEdge Traffic Manager GUI Software

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This chapter describes the Sun StorEdge Traffic Manager GUI software and its uses. This chapter contains the following topics:

- “Working With Data Paths” on page 9
- “Working With Data Paths” on page 9
- “Getting Storage Device Information” on page 16
- “Setting the Software Preferences” on page 22

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## Understanding the Sun StorEdge Traffic Manager GUI

This section describes the Sun StorEdge Traffic Manager GUI and explains the purpose of the various icons meanings.

When the Sun StorEdge Traffic Manager GUI starts, the Sun StorEdge Traffic Manager window, as shown below, is displayed. In a device tree on the left of the window is a list of supported storage devices attached to the current host and the LUNs contained in each of those storage devices. The first storage device is always selected and the information about that storage device is displayed on the right of the window. The right of the window contains:

- Type of device
- Unique ID
- IP address
- Firmware revision
- Name of the host the storage device is attached to

The names used in the device tree are the operating system-specific names for the particular storage devices and LUNs.

If the name of a storage device cannot be obtained, “storage device” is used for the name on the left of the window. If a LUN name cannot be obtained, “LUN” is used for the LUN name.

If the Sun StorEdge Traffic Manager driver or library files are not installed and working properly, the left of the window displays a message indicating improper installation.

If no storage devices are attached, the left of the window displays a message indicating that no storage devices are attached.



## Device and Status Icons

The left of the Sun StorEdge Traffic Manager GUI window shows storage device and the LUNs contained in each using the following icons.



The name of the storage device known to the Sun StorEdge Traffic Manager software.



The LUNs that are contained in each of the storage devices.



Removed icon for a path, storage device, or LUN that is removed and needs attention.

---

The following status icons indicate that a storage device, LUN or path needs attention. For example, if a LUN is not able to allow I/O due to path conditions or it contains a broken path, the critical icon is layered on top of the LUN icon and storage device icon. Or, if a LUN has failed over and not in its normal state, the minor icon is layered on top of the LUN and the storage device icon



Minor icon for a path, storage device, or LUN that might need attention.



Critical icon for a path, storage device, or LUN that is down or broken and needs attention.



Icon that indicates the path is in transition.



Icon that is displayed if the status of the path is unknown

---

## Working With Data Paths

This section describes how to manipulate a data path between the host and the storage device. The following changes can be made to the data path:

- Removing a data path from `admin` mode
- Putting a data path into `admin` mode
- Activating a data path (not applicable to ALUA)
- Activating all preferred data paths for a storage device (not applicable to ALUA)
- Activating all preferred data paths for a particular LUN (not applicable to ALUA)
- Removing all data paths to a particular HBA from `admin` mode,
- Putting all data paths to a particular HBA into `admin` mode,

## Data Path States

The Path table contains a column labeled State. Each path listed in this column will have the following states:

- Active, if the path is active
- Passive, if the path is healthy but not active
- Admin, if the path has been put into `admin` mode and is not being considered for I/O
- Transition, if the state of the path is changing
- Down, if the path is broken and needs repair
- Standby, the path is healthy yet cannot be activated manually. (This state applies only for ALUA-Implicit devices.)
- Unknown, if the state of the path cannot be determined
- Removed, if a Downed path that has been removed as a Windows Plug & Play Device. (This state applies only for the Windows 2000 and 2003 operating systems.)

## Updating Path Status

When the Sun StorEdge Traffic Manager software detects a change in the status for a path (for example, a path goes down, fails over, or the user disconnects a cable), it sends a message to the Sun StorEdge Traffic Manager GUI to update. The GUI gets the updated information from the software and displays the new status.

The information displayed by the GUI automatically updates when the state of a path changes. However, if you don't want to wait (for example, a long poll rate has been specified or you think the data displayed is out-of-date), you can quickly update the information displayed by the GUI in one of two ways:

- Choose Refresh under the File menu
- Press the F5 key

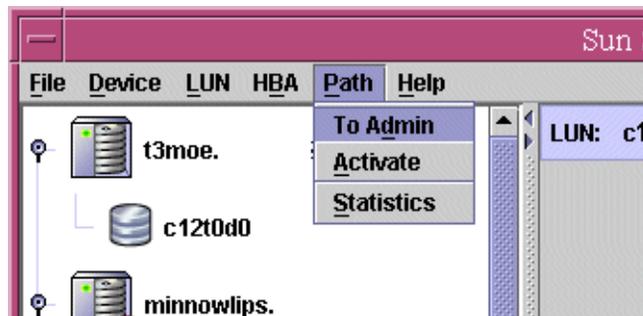
## Putting a Single Data Path Into `admin` Mode

Putting a data path into `admin` mode prevents all normal I/O from using the path. For example, you might want to put a path in `admin` mode to perform maintenance on a component in the data path. A path must be in `passive` mode before it can be put into `admin` mode.

See “Removing a Single Data Path From `admin` Mode” on page 11 to remove a data path from `admin` mode.

## ▼ To Put a Data Path Into admin Mode

1. From the device tree on the left of the window, select the LUN that contains the path you want to put into admin mode.
2. Select the path that you want to put into admin mode.
3. Choose To Admin from the Path menu.



---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

---

A dialog box is displayed to indicate the path is being put into admin mode and that you should wait until the operation is complete.

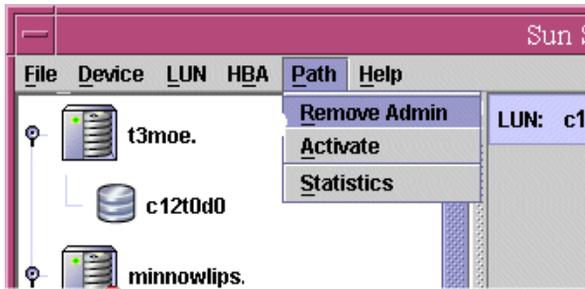
## Removing a Single Data Path From admin Mode

Removing a data path from admin mode does not guarantee that the path will become active. For example, a path that is down due to a defective cable, stays down after being removed from admin mode if the cable is still defective.

## ▼ To Remove a Data Path From admin Mode

1. From the device tree on the left of the window, select the LUN that contains the path you want to remove from admin mode.
2. Select the path that you want to remove from admin mode.

### 3. Choose Remove Admin from the Path menu.



---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

---

A dialog box is displayed to indicate that the path is being removed from `admin` mode and that you should wait until the operation is complete.

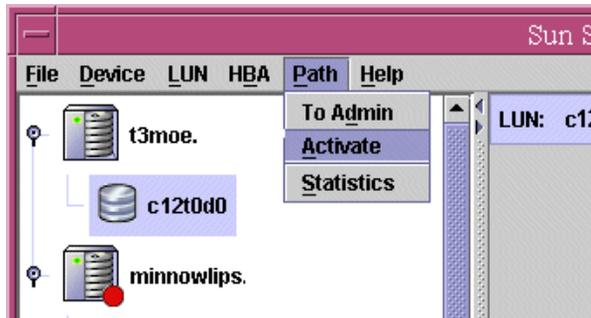
## Activating Data Paths

A data path must be healthy but not active (that is, passive) before it can be activated. Standby paths cannot be activated.

### ▼ To Activate a Single Data Path

1. From the device tree on the left of the window, select the LUN that contains the path you want to activate.
2. Select the path that you want to activate.

3. Choose Activate from the Path menu.



---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

---

A dialog box is displayed to indicate that the path is being activated and that you should wait until the operation is complete.

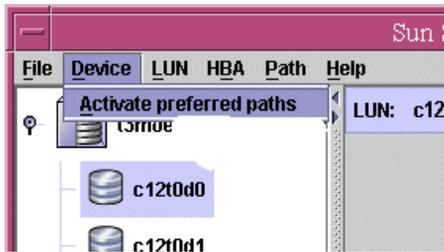
## Activating All Preferred Paths for a Storage Device

You can activate all preferred paths for a particular storage device if that device has preferred paths. Preferred paths are determined by the Sun StorEdge Traffic Manager software and are based on device type and connection. The preferred path is the optimal path to a device. The preferred path must be healthy but not active (that is, passive) before it can be activated.

### ▼ To Activate All Preferred Paths for a Storage Device

1. Select a storage device in the device tree on the left of the window.

2. Choose **Activate preferred paths** from the **Device** menu.



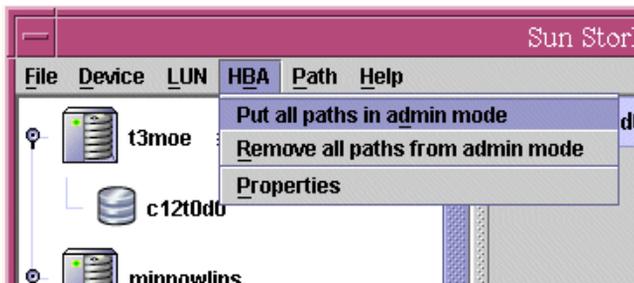
A dialog box is displayed to indicate that all preferred paths are being activated and that you should wait until the operation is complete.

## Putting All Paths to a Particular HBA Into `admin` Mode

If you want to perform maintenance on a specific HBA, to which you have several storage devices connected, you can put all paths to a particular HBA into `admin` mode.

### ▼ To Put All Paths to a Particular HBA Into `admin` Mode

1. Select the LUN that has a path using the particular HBA you are interested in.
2. From the path table on the right of the window, select the path that is using the HBA you are interested in.
3. Choose **Put all paths in admin mode** from the **HBA** menu.



---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

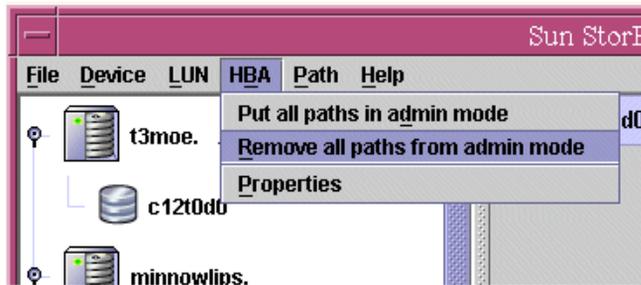
---

A dialog box is displayed to indicate that all paths to a particular HBA are being put into `admin` mode and that you should wait until the operation is complete.

## Removing All Paths to a Particular HBA From `admin` Mode

You can remove from `admin` mode all paths to a particular HBA after you have swapped out or repaired the component in the path to this HBA.

- ▼ To Remove All Paths to a Particular HBA From `admin` Mode
  1. From the device tree on the left of the window, select the LUN that has a path using the particular HBA you are interested in.
  2. Select the path that is using the HBA you are interested in.
  3. Choose **Remove all paths from admin mode** from the HBA menu.



---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

---

A dialog box is displayed to indicate that all paths to a particular HBA are being removed from `admin` mode and that you should wait until the operation is complete.

# Getting Storage Device Information

When the Sun StorEdge Traffic Manager GUI starts, the storage device and the operating-system-specific names for the storage device are selected on the left of the window. On the right of the window is detailed information about that storage device.

To get this detailed information about any storage device shown on the left of the window, select that storage device by clicking on it.



## Activating All Preferred Paths for a LUN

You can activate all preferred paths for a particular LUN if the LUN belongs to a storage device that has preferred paths. Preferred paths are determined by the Sun StorEdge Traffic Manager software and are based on device type and connection. The preferred path is the optimal path to a device. The preferred path must be healthy but not active (that is, passive) before it can be activated.

### ▼ To Activate All Preferred Paths for a LUN

1. Select a LUN in the device tree on the left of the window.
2. Choose **Activate preferred paths** from the LUN menu.

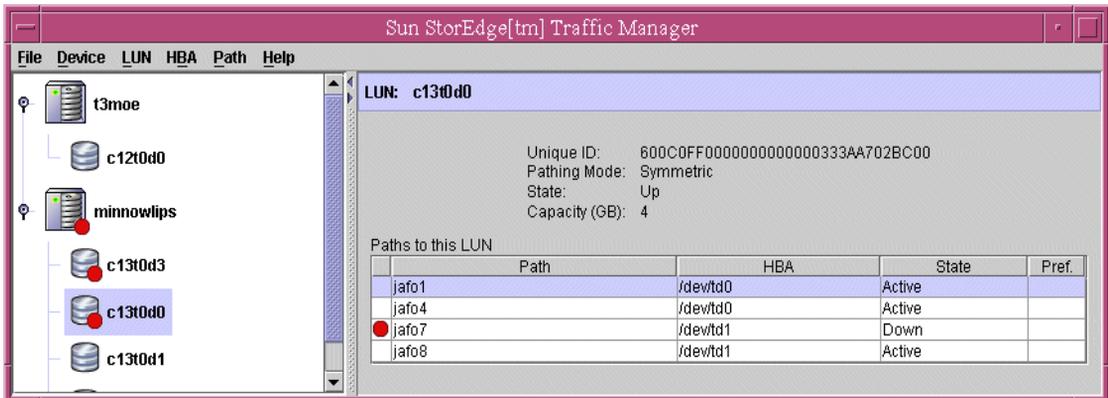
A dialog box is displayed to indicate that all preferred paths for the LUN are being activated and that you should wait until the operation is complete.

# Getting LUN Information

To get information about a particular LUN, select the LUN icon on the left of the window by clicking on it. The LUN information is displayed on the right of the window. Some of the information is in a path table and other information is shown above the table. The following information is above the table:

- The operating system-specific name of the LUN
- Unique ID of the LUN
- Type of pathing mode: symmetric, asymmetric or ALUA-Implicit
- LUN state
- Storage capacity of the LUN

In the path table, all paths to the LUN are displayed. If any path needs attention, either the minor icon or the critical icon is displayed beside the information in the path table.

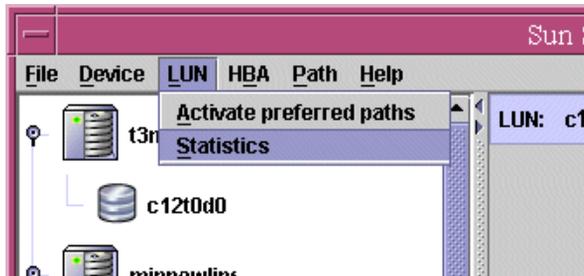


## ▼ To Get LUN Statistics

To get I/O statistics for a particular LUN, perform the following:

1. From the device tree on the left of the window, select the LUN for which you want statistics.

**2. Choose Statistics from the LUN menu.**



A dialog box is displayed containing the statistics of the selected LUN.

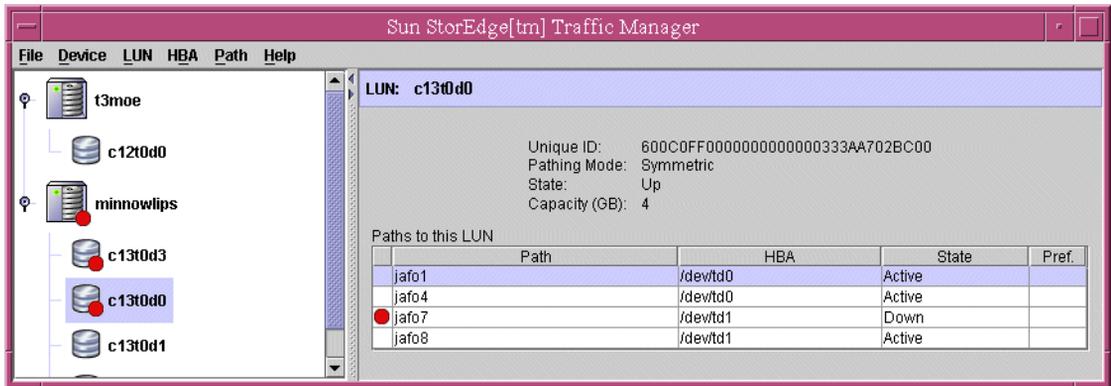


## ▼ To Get HBA Properties

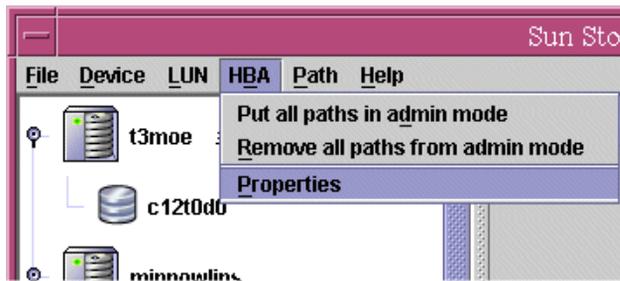
To get information about the properties of an HBA that is in the path of a particular LUN, perform the following steps:

- 1. Select the LUN from the device tree on the left of the window that has a path using the particular HBA you are interested in.**

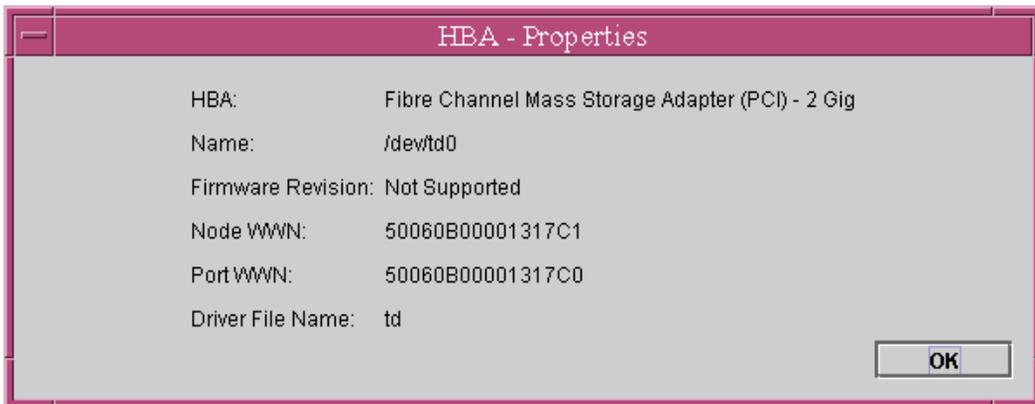
2. Select the path in the path table that is using the HBA you are interested in.



3. Choose Properties from the HBA menu.



A dialog box is displayed containing the properties of the selected HBA.

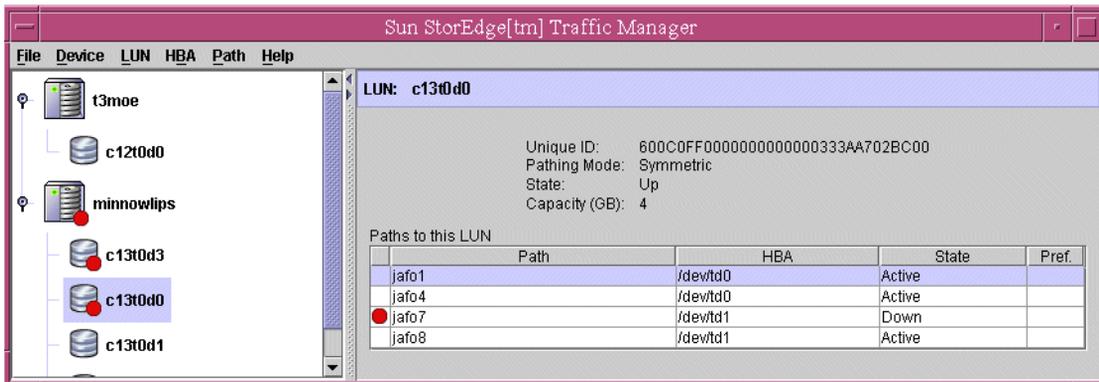


# Getting Path Statistics

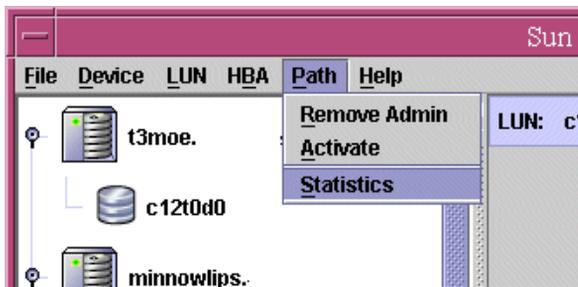
To display path information and statistics, such as the number of host requests, and I/O errors, perform the following steps:

## ▼ To Get Path Statistics

1. From the device tree on the left of the window, select the LUN that contains the path you are interested in.
2. Select the path for which you want to view statistics.



3. Choose Statistics from the Path menu.



A dialog box is displayed that contains the selected path statistics. The statistics in the dialog box do not change dynamically. Click the Refresh button to get updated statistics.



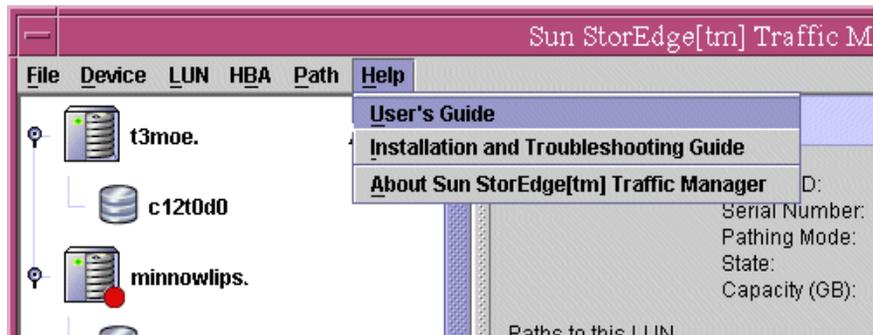
---

**Note** – Alternatively, you can right-click the path and select the action from the pop-up menu.

---

## ▼ To Get Online Help

- **Choose User's Guide from the Help menu to display the *Sun StorEdge Traffic Manager 4.6 Software User's Guide* for online help. Select Installation Guide to display the *Sun StorEdge Traffic Manager 4.6 Installation Guide*.**



---

# Setting the Software Preferences

This section describes how to configure the preferences for the Sun StorEdge Traffic Manager software. The following preferences can be configured:

- Logging level
- Failback mode
- Poll rates

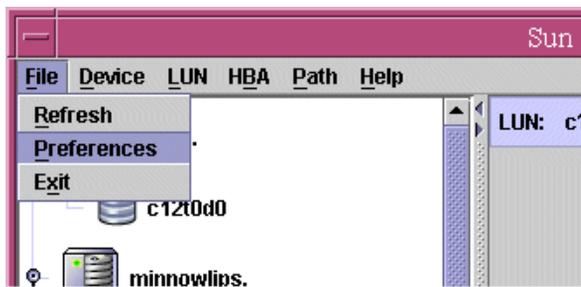
## Setting the Logging Level

The logging level is determined for the Sun StorEdge Traffic Manager software on a per system basis. That is, setting the logging level sets it for all devices attached to the specified host. This enables you to control what level of messages you want to put into the operating system's log file.

For information on viewing logs, refer to Chapter 4.

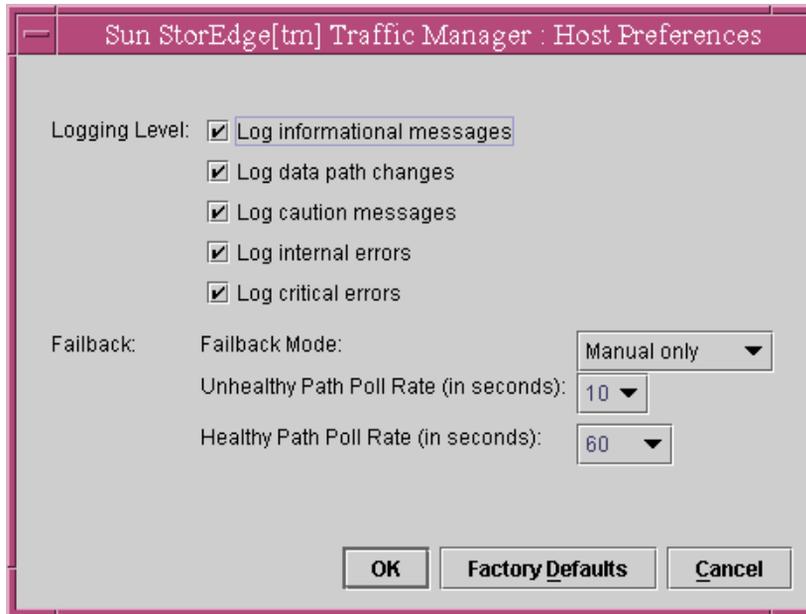
### ▼ To Set the System Logging Level

1. Choose Preferences from the File menu.



2. Select the desired log level options in the Host Preferences dialog box.

The Host Preference dialog box displays a list of the logging levels.



**3. Click OK for the selected items to take effect.**

If you do not want to save the changes made, click the Cancel button.

If you want to see the default settings for the Log Levels, click the Factory Defaults button.

The updated settings take effect unless you click OK.

---

**Note** – Be aware that by clicking the Factory Defaults button, you are also setting Failback Mode and Poll Rate to the factory default settings.

---

## Setting the Failback Mode

After the failover of a data path, the specified failback mode determines how the data path is changed from the alternate data path back to the preferred data path.

When a data path has failed over, the settings specified in the Failback Mode Host Preferences field determine how the data path is modified from the alternate data path back to the preferred data path.

## Symmetric Devices

Failback is not configured for symmetric devices. Any path that has failed over is added back into the load balancing path pool.

## T10 ALUA Asymmetric Devices

Neither automatic nor manual failback can be configured for T10 ALUA devices. The device controller manages the path modes.

## Vendor-Unique Asymmetric Devices

The failback mode is set for the Sun StorEdge Traffic Manager software on a per system basis. That is, setting the failback mode sets it for all devices attached to the current host.

You can specify two failback modes for these devices:

- Manual failback – You can also manually fail back the data path for a storage device to its preferred data path. First, ensure that the Sun StorEdge Traffic Manager software is configured for manual failback.
- Automatic failback – You can configure the Sun StorEdge Traffic Manager software to automatically fail back to the preferred data path when that path becomes operational. By default, automatic failback is *not* enabled.

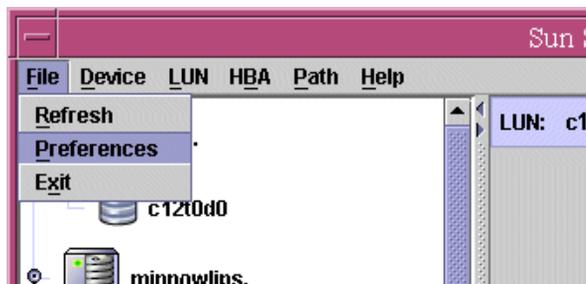
---

**Note** – Automatic failback is only supported in a single-host environment.

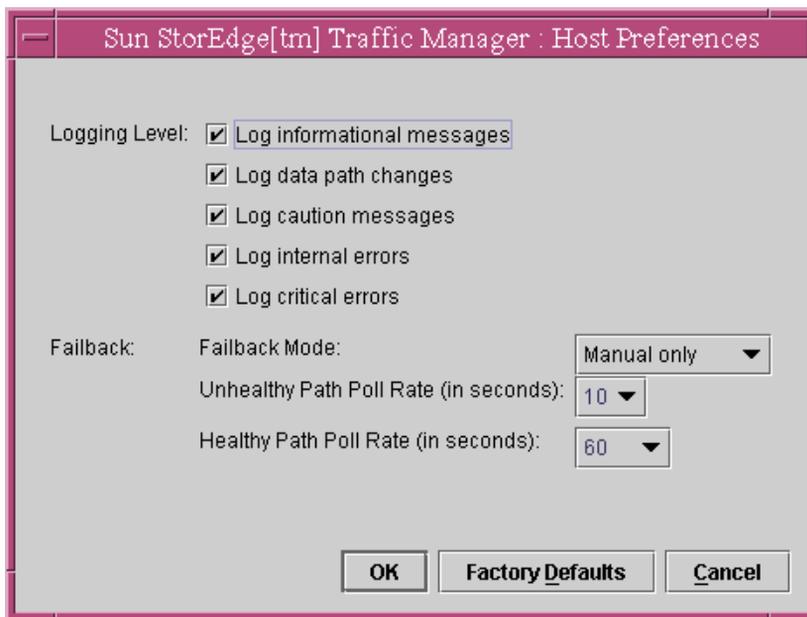
---

## ▼ To Set the Failback Mode

1. Choose Preferences from the File menu.



2. In the Host Preferences dialog box, choose the desired failback mode from the Failback Mode menu.



3. Click OK for the selected item to take effect.

If you do not want to save the changes you made, click the Cancel button.

If you want to see the factory default settings, click the Factory Defaults button. The factory default will be displayed in the Failback Mode field.

The updated settings take effect unless you click OK.

---

**Note** – Be aware that by clicking the Factory Defaults button, you are also setting the Logging level and Poll Rate to the factory default settings.

---

## Setting the Poll Rate

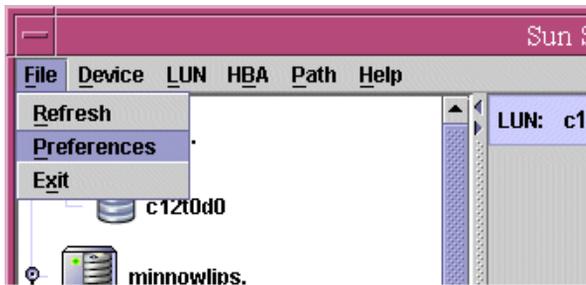
The Healthy Path Poll Rate field determines how often the Sun StorEdge Traffic Manager software checks the status of paths that are not down or removed and are currently available for I/O.

The Unhealthy Path Poll Rate field determines how often the Sun StorEdge Traffic Manager software checks the status of paths that are down or removed. If failback mode is set to automatic and the Sun StorEdge Traffic Manager software finds that the preferred path is operational after polling, the Sun StorEdge Traffic Manager software fails back to the preferred path.

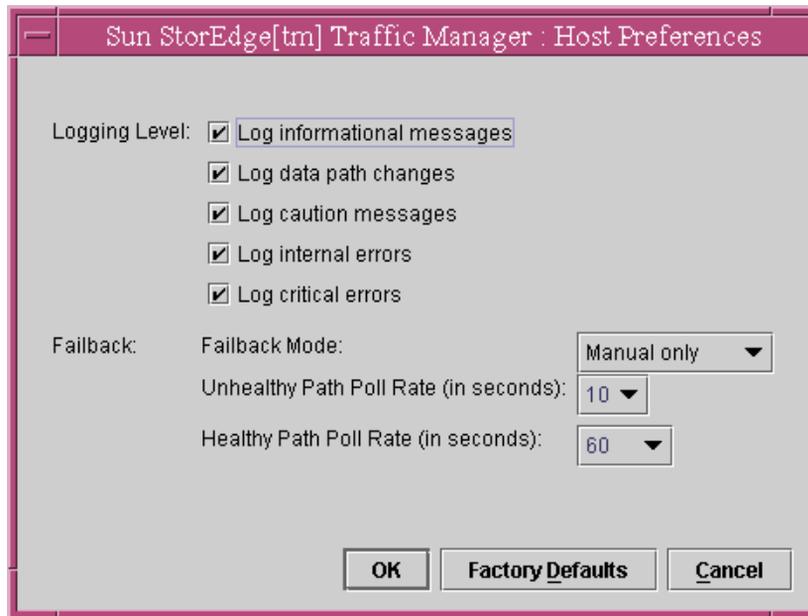
The poll rate is set for the Sun StorEdge Traffic Manager software on a per system basis. That is, setting the polling rate sets it for all devices attached to the current host.

## ▼ To Set the Poll Rate

1. Chose Preferences from the File menu.



2. In the Host Preferences dialog box, choose the desired poll rate from the Poll Rate menu.



Select Unhealthy Poll Rate to identify how often (in seconds) the software will check the status of paths that are down or removed.

Select Healthy Poll Rate to identify how often (in seconds) the software will check the status of paths that are available for I/O.

3. Click OK for the change to take effect.

If you do not want to save the change you made, click the Cancel button.

If you want to see the factory default setting, click the Factory Defaults button.

The updated settings take effect unless you click OK.

---

**Note** – Be aware that by clicking the Factory Defaults button, you are also setting the Logging level and Failback Mode to the factory default settings.

---



# Using the Sun StorEdge Traffic Manager CLI Software

This chapter describes the uses of the Sun StorEdge Traffic Manager command line interface (CLI) software.

The Sun StorEdge Traffic Manager CLI described in this chapter is named `sstm`. The `sstm` command has similar function to the Sun StorEdge Traffic Manager GUI interface described in Chapter 2. The CLI enables you to collect basic path and software state information and to manage path states and software settings.

This chapter contains the following topics:

- “Command-Line Interface Options” on page 35
- “`sstm` Command Operations” on page 37

---

## Command-Line Interface Options

TABLE 3-1 contains an overview of all the options available for the `sstm` command

---

**Note** – The `sstm` command options are case-sensitive.

---

**TABLE 3-1** `sstm` Command Options

Command	Option	Description
<code>sstm</code>	None	This default command displays information about all devices
	<code>-v</code>	Displays information about all devices (verbose)
	<code>-d device_id</code>	Displays information about the specified device

**TABLE 3-1** sstm Command Options (Continued)

Command	Option	Description
	<i>-d device_id -v</i>	Displays verbose information about the specified device
	<i>-d device_id -r</i>	Restores all preferred paths for all LUNs for the specified device
	<i>-l lun_id</i>	Displays information for a specified LUN
	<i>-l lun_id -v</i>	Displays verbose information for a specified LUN
	<i>-l lun_id -r</i>	Restores the preferred path for the specified LUN
	<i>-l lun_id -m</i>	Displays statistics for the specified LUN
	<i>-l lun_id -m -v</i>	Displays verbose statistics for the specified LUN
	<i>-p name</i>	Queries information for the specified path
	<i>-p name -v</i>	Queries verbose information for the specified path
	<i>-p name -a</i>	Activates the specified path
	<i>-p name -e</i>	Enables the specified path (take out of admin mode)
	<i>-p name -d</i>	Disables the specified path (place into admin mode)
	<i>-p name -m</i>	Displays statistics for the specified path
	<i>-p name -m -v</i>	Displays verbose statistics for the specified path
	<i>-h name</i>	Query information for this HBA
	<i>-h-name -v</i>	Query verbose information for this HBA
	<i>-h-name -e</i>	Enable all paths on this HBA (take out of admin mode)
	<i>-h name -d</i>	Disable all paths on this HBA (place into admin mode)
	<i>-P</i>	Displays public parameters
	<i>-P -r</i>	Restores default settings
	<i>-P -i seconds</i>	Sets the healthy path poll rate to the specified number of seconds (from 2 through 3600 seconds)
	<i>-P -b seconds</i>	Set the unhealthy path poll rate to the specified number of seconds (from 2 through 60 seconds)

**TABLE 3-1** `sstm` Command Options (*Continued*)

Command	Option	Description
	<code>-P -l <i>hex_value</i></code>	Sets the following log levels to determine what information to log: <ul style="list-style-type: none"><li>• 0x00 = no logging</li><li>• 0x01 = data path changes</li><li>• 0x02 = internal errors</li><li>• 0x04 = critical errors</li><li>• 0x08 = informational messages</li><li>• 0x10 = caution messages</li><li>• 0x1f = log everything</li></ul>
	<code>-P -a <i>integer</i></code>	Sets the following integers to enable or disable auto failback: <ul style="list-style-type: none"><li>• 1 = enable</li><li>• 0 = disable</li></ul>
	<code>-S</code>	Suspends command return until a state change occurs (for example, path up or path down).
	<code>-C</code>	Cancel the suspend command and return to the user.

For a description of the specific fields shown in these examples, see “Description of Specific Fields” on page 3.

In the case of a failure of a command, a variety of meaningful messages are returned. To view a list of error messages, see Chapter 5.

---

## `sstm` Command Operations

The following examples show the operations of the `sstm` command and the expected output.

Topics in this section include:

- “Obtaining a Default Report” on page 38
- “Device Reports” on page 40
- “LUN Reports” on page 42
- “Path Reports” on page 44
- “Getting Software Settings” on page 50
- “Changing Software Settings” on page 50
- “The Suspend Command” on page 51
- “The Cancel Command” on page 51

## Obtaining a Default Report

This section shows the default report that is created by typing the `sstm` command with no options specified. The following example is a sample output taken from a Microsoft Windows host with one storage device with two LUNs, each available to the host. All LUNs are attached to the host through two redundant paths. On other operating systems the output is nearly identical with the exception of the operating system device names, path names, and HBA names presented.

**CODE EXAMPLE 3-1** sstm Command Default Report

```
sstm

Device: storage device
Device Name:          t3mojo.Central.Sun.COM
Failover Capable:    yes
Device Desc:         Sun StorEdge T3B Disk Array
Unique Id:           60020f20000069960000000000000000
IP Address:          172.20.24.100
Firmware Revision:  0201

LUN: \\.\PhysicalDrive4
Unique Id:           60020f20000069963ee74a2a000829f6
Serial Number       00535030
Capacity:           5.00GB
State:              UP
Pathing Mode:       Asymmetric-MPXIO

Paths to this LUN:

* Path                HBA                State                Cntr
- - - - -            - - - - -            - - - - -            - - - - -
  2,1,0,6             \\.\Scsi2:         ACTIVE              yes
! 3,1,0,6             \\.\Scsi3:         ADMIN               no

LUN: \\.\PhysicalDrive3
Unique Id:           60020f20000069963edb185e00033644
Capacity:           10.00GB
State:              UP
Pathing Mode:       Asymmetric-MPXIO

Paths to this LUN:

* Path                HBA                State                Cntr
- - - - -            - - - - -            - - - - -            - - - - -
! 2,1,0,3             \\.\Scsi2:         ADMIN               no
  3,1,0,3             \\.\Scsi3:         ACTIVE              yes
```

# Device Reports

This section describes the device reports that can be run on a storage device. For the device report, a storage device is defined as a collection of LUNs contained by a specific storage product (for example, a Sun StorEdge 6120 array).

The report generated by the `sstm -d device_id` is a subset of the default report that shows only the information about the device specified and its associated LUNs and paths.

**CODE EXAMPLE 3-2 Specific Device Report**

```
sstm -d 60020f20000069960000000000000000

Device: storage device
Device Name:          t3mojo.Central.Sun.COM
Failover Capable:    yes
Device Desc:         Sun StorEdge T3B Disk Array
Unique Id:           60020f20000069960000000000000000
IP Address:          172.20.24.100
Firmware Revision:  0201

LUN: \\.\PhysicalDrive4
Unique Id:           60020f20000069963ee74a2a000829f6
Capacity:           5.00GB
State:              UP
Pathing Mode:       Asymmetric-MPXIO

Paths to this LUN:

* Path                HBA                State                Cntr
- - - - -             - - - - -          - - - - -          - - -
  2,1,0,6             \\.\Scsi2:         ACTIVE              yes
! 3,1,0,6             \\.\Scsi3:         ADMIN               no

LUN: \\.\PhysicalDrive3
Unique Id:           60020f20000069963edb185e00033644
Serial Number        00210500
Capacity:           10.00GB
State:              UP
Pathing Mode:       Asymmetric-MPXIO

Paths to this LUN:

* Path                HBA                State                Cntr
- - - - -             - - - - -          - - - - -          - - -
! 2,1,0,3             \\.\Scsi2:         ADMIN               no
  3,1,0,3             \\.\Scsi3:         ACTIVE              yes
```

In addition to the ability to limit a report to a specific device, the `-d` option can be used with the additional argument of `-r` to restore all the preferred paths to all the LUNs in this system. Refer to TABLE 3-1 for the correct syntax.

If the command restores all the LUNs on the device to their preferred path, a successful message is displayed.

The following is an example of a command completing successfully:

**CODE EXAMPLE 3-3** Successful Completion of `sstm -d` Command

```
sstm -d 60020f20000072250000000000000000 -r
The operation completed successfully. (0)
```

## LUN Reports

This section describes the LUN reports and the types of reports the options produce when they are used with this command. The report generated by the `sstm -l lun_id` command is a subset of the default report that shows only the information about the specified LUN and its associated paths.

The following is an example of the output from this option

**CODE EXAMPLE 3-4** Specific LUN Report

```
sstm -l 60020f20000077043f1c0b0800007720
LUN: \\.\PhysicalDrive3
Unique Id:                60020f20000077043f1c0b0800007720
Capacity:                 11.00GB
State:                    UP
Pathing Mode:             Asymmetric-MPXIO

Paths to this LUN:

* Path                    HBA                    State                    Cntr
* -----                -
3,0,0,1                  \\.\Scsi3:             ACTIVE                   no
! 3,0,10,1                \\.\Scsi3:             PASSIVE                  yes
! 4,0,16,1                 \\.\Scsi4:             PASSIVE                  yes
4,0,19,1                  \\.\Scsi4:             ACTIVE                   no
```

In addition to the ability to limit a report to a specific LUN, the `-l` option can be used with the additional argument of `-r` to restore all the preferred paths to a LUN.

The following is an example using the `-v` (Verbose) option.

**CODE EXAMPLE 3-5** Verbose Option Specified

```
sstm -l 60020f20000069963edb1844000d9214 -v

LUN: \\.PhysicalDrive2
  Unique Id:                60020f20000069963edb1844000d9214
  Capacity:                 10.00GB
  State:                    UP
  Pathing Mode:             Asymmetric-MPXIO

Paths to this LUN:

* Path                      HBA                      State      Cntr  In
-----                    -
2,1,0,2                    \\.Scsi2:                ACTIVE     yes   yes
  state:ACTIVE numOut=0 flags:0x7
3,1,0,2                    \\.Scsi3:                PASSIVE    no    no
  state:PASSIVE numOut=0 flags:0x2
```

The `-l` option of the LUN commands also has the option similar to the Device command to restore a LUN's path to the preferred controller. The In Use column indicates which path was the last path used to send I/O to the device.

The following is an example of a `-l` command completing successfully.

```
sstm -l 60020f20000072250000000000000000 -r
The operation completed successfully. (0)
```

The `-m` option returns statistical information about the LUN. The following is an example from this option and the verbose option:

**CODE EXAMPLE 3-6** With Statistical and Verbose Options Specified

```
sstm -l 60020f20000072253dad916300061f41 -m -v
LUN Statistics:
  LUN:                60020f20000072253dad916300061f41
  Host Requests:     198
  Outstanding IO:    0
  Blocks Transferred: 1682
  IO Errors:         0
  Temp Dropouts:     0
  HW Dropouts:       0
  Full Dropouts:     0
```

# Path Reports

The basic Path Report returns information about a specific path. The report generated by the `sstm -p name` command is a subset of the default report that only shows the information about the path specified.

This report contains a *nexus name* for the HBA to storage device controller. In these examples, it is noted by `3,0,10,1`. The nexus name is defined by the failover software.

The following is an example of the Path Report:

**CODE EXAMPLE 3-7** Path Report Output

```
sstm -p 3,0,10,1

* Path                HBA                State                Cntr
- - - - -            - - - - -            - - - - -            Pref
! 3,0,10,1           \\.\Scsi3:         PASSIVE              yes
```

## Activating a Data Path

The `-a` Path command option activates a path that is passive. When this option is used, a message indicating success is sent if the command is successful. Otherwise, an error message is issued. A list of all messages is described in Chapter 5.

The following example of the `-a` option builds on the `sstm -p` example. It uses the `-a` option to activate a path. The success of the command can be verified by running a second Path Report to list the results. In the second Path Report, the `State` status is reported as `ACTIVE`.

**CODE EXAMPLE 3-8** Activating a Data Path

```
sstm -p 3,0,10,1 -a
The operation completed successfully. (0)

sstm -p 3,0,10,1

* Path                HBA                State                Cntr
- - - - -            - - - - -            - - - - -            Pref
  3,0,10,1           \\.\Scsi3:         ACTIVE              yes
```

## Putting a Path into admin Mode

The `-d` Path command option puts a path into an `admin` mode. This option is used to stop all I/O on a path and can be used to help isolate problems in a configuration.

This example also builds on the basic Path Report example. After issuing the Path command with the `-d` option, the path becomes disabled and inactive. A warning character(!) is also placed in the left column noting that the path is in `admin` mode and not down. If the path was down, an `x` would be placed in the column. Only a single character (for example, `!` or `x`) can be placed in the left column.

### CODE EXAMPLE 3-9 Putting a Path Into admin Mode

```
sstm -p 3,0,10,1 -d
The operation completed successfully. (0)

sstm -p 3,0,10,1
```

* Path	HBA	State	Cntr Pref
! 3,0,10,1	\\.\Scsi3:	ADMIN	yes

## Taking a Path Out of admin Mode

The `-e` Path command option takes a path out of `admin` mode. After the Path command is issued with the `-e` option, the path becomes available for use.

- For symmetric devices, the path becomes active immediately if not broken.
- For ALUA devices, the path transitions to a state based upon information received from the device.
- For asymmetric devices, like the Sun StorEdge 6120, if the path is the preferred path and auto failback is not on, the path becomes passive.
- For asymmetric devices, like the Sun StorEdge T3+, if the path is the preferred path and auto failback is on, the path becomes active immediately.

This status is shown by issuing the `sstm` command without options.

**CODE EXAMPLE 3-10** Taking a Path Out of admin Mode

```
sstm -p 3,0,10,1 -e
The operation completed successfully. (0)

sstm -p 3,0,10,1
```

* Path	HBA	State	Cntr Pref
3,0,10,1	\\.\Scsi3:	PASSIVE	yes

## Getting Path Statistical Information

The Path command `-m` option returns the statistical information for a specific path.

**CODE EXAMPLE 3-11** Returning Statistical Path Information

```
sstm -p 3,0,10,1 -m -v
Path Statistics
Path: 3,0,10,1
Host Requests: 6266756
Outstanding IO: 1
Blocks Transferred: 702227085
IO Errors: 154
HW Dropouts: 0
Full Dropouts: 53
```

## Getting HBA Reports

The `-h` option returns information about a specific HBA. The specific information returned contains the Vendor Name, Product ID, Firmware Version, Port WWN, and Node WWN of the HBA, and the HBA driver file name.

The report also contains all the paths seen only by the particular HBA. The listing is similar to the Path reports.

---

**Note** – The paths listed might belong to additional devices.

---

**CODE EXAMPLE 3-12** Returning Information About a Specific HBA

```
sstm -h \\.\Scsi4:
Name: Qlogic 2230 Fibre-Channel Adapter
Firmware Revision: 5.12
Node WWN: 00000000000000000000000000000001
Port WWN: 00000000000000000000000000000011
Driver File Name: qla23xx

* Path          HBA          State      Cntr
-----
4,1,0,6        \\.\Scsi4:    ACTIVE     no
4,1,0,5        \\.\Scsi4:    ACTIVE     no
4,1,2,1        \\.\Scsi4:    ACTIVE     no
4,1,2,0        \\.\Scsi4:    ACTIVE     no
4,1,1,0        \\.\Scsi4:    ACTIVE     yes
4,1,1,1        \\.\Scsi4:    ACTIVE     yes
```

It is also possible to enable (-e) or disable (-d) all the paths to a particular HBA. The following example shows disabling all the paths to a particular HBA and placing the paths in admin mode. The output after the disable command looks like the following example:

**CODE EXAMPLE 3-13** Placing All Paths to a Particular HBA in admin Mode

```
sstm -h \\.\Scsi3: -d
pathId:3,0,0,1 status:The operation completed successfully.
pathId:3,0,10,1 status:The operation completed successfully.
pathId:3,0,0,0 status:The operation completed successfully.
pathId:3,0,10,0 status:The operation completed successfully.
pathId:3,0,3,3 status:The operation completed successfully.
pathId:3,0,21,3 status:The operation completed successfully.
pathId:3,0,4,0 status:The operation completed successfully.
pathId:3,0,20,0 status:The operation completed successfully.
pathId:3,0,1,0 status:The operation completed successfully.
pathId:3,0,13,0 status:The operation completed successfully.
pathId:3,0,1,1 status:The operation completed successfully.
pathId:3,0,13,1 status:The operation completed successfully.
pathId:3,0,2,0 status:The operation completed successfully.
pathId:3,0,5,0 status:The operation completed successfully.

The operation completed successfully. (0)
```

If the verbose (-v) option is used, the output looks like the following example.

**CODE EXAMPLE 3-14** Verbose Information on a Specific HBA With the `sstm -v` Command

```

sstm -h \\.\Scsi3: -v

HBA:                QLogic Corporation 2300 Fibre-Channel Adapter
Name:               \\.\Scsi3:
Firmware Revision: 3.01.20
NodeWWN:           200000e08b07642e
PortWWN:           210000e08b07642e
Driver File Name:  ql2300.sys

      * Path                HBA                State      Cntr  In
      -----                -----                -----  ----  --
! 3,0,0,1                \\.\Scsi3:        ADMIN      no    no
      state:ADMIN numOut=0 flags:0x2
! 3,0,10,1               \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,0,0                \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,10,0               \\.\Scsi3:        ADMIN      no    no
      state:ADMIN numOut=0 flags:0x2
! 3,0,3,3                \\.\Scsi3:        ADMIN      no    no
      state:ADMIN numOut=0 flags:0x2
! 3,0,21,3               \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,4,0                \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,20,0               \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,1,0                \\.\Scsi3:        ADMIN      yes   yes
      state:ADMIN numOut=0 flags:0x7
! 3,0,13,0               \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,1,1                \\.\Scsi3:        ADMIN      yes   no
      state:ADMIN numOut=0 flags:0x6
! 3,0,13,1               \\.\Scsi3:        ADMIN      yes   no

The operation completed successfully. (0)

```

# Getting Software Settings

If the `sstm -P` command is issued without specifying options, a report is returned of all the software parameters plus the version of the failover software.

**CODE EXAMPLE 3-15** Returning a Report About All Software Parameters

```
sstm -P
Driver Public Parameters
          Driver Version: 4.6.0.xx
    Healthy Path Poll Rate: 30 (seconds)
    Unhealthy Path Poll Rate: 30 (seconds)
          Auto Failback: 0 (off)
          Log Level: 0x00 (none)
```

# Changing Software Settings

The `-P` command, with no subcommands, returns a report of all the driver parameters plus the failover driver version. Any of the parameters can be changed by using their respective subcommittees.

The following `sstm` commands can be used to change the software settings displayed by the `sstm -P` command:

**TABLE 3-2** Changing Software Settings

Supported Subcommittees	Action
<code>-P -r</code>	Restores default settings
<code>-P -i seconds</code>	Sets healthy path poll rate (2 through 3600 seconds)
<code>-P -b seconds</code>	Sets unhealthy path poll rate (2 through 60 seconds)
<code>-P -l hex value</code>	Sets the log level to any of the following: <ul style="list-style-type: none"><li>• 0x00 = no logging</li><li>• 0x01 = data path changes</li><li>• 0x02 = internal errors</li><li>• 0x04 = critical errors</li><li>• 0x08 = informational messages</li><li>• 0x10 = caution messages</li><li>• 0x1f = log everything</li></ul>
<code>-P -a integer</code>	Enables or disables auto failback <ul style="list-style-type: none"><li>• 1 = enable</li><li>• 0 = disable</li></ul>

A complete list of all the command options and their explanations are found in TABLE 3-1.

## The Suspend Command

The `sstm -S` command blocks or stalls the return of the command and does not return to the user until some form of path state change occurs. For example, if a path goes down, comes back online, or is disabled, the command initiates a return to the user.

This is a very useful command for scripting because you can create your own form of logging by making a script that issues a `sstm` command default report, then an `sstm -S` command in a loop.

### CODE EXAMPLE 3-16 The Suspend Command

```
sstm -S  
C:>
```

## The Cancel Command

The `cancel (-C)` command cancels the suspend command.

### CODE EXAMPLE 3-17 The Cancel Command

```
sstm -C
```

## Logging Event Information

---

This chapter describes the events that can be logged by the Sun StorEdge Traffic Manager package for later inspection by the Event Viewer application for the Microsoft Windows operating system, or the system log file in the Red Hat Enterprise Linux operating environment.

This chapter contains the following topics:

- “Accessing the Log Files” on page 45
- “Logging Levels” on page 46
- “Windows Log Messages” on page 47
- “Linux Log Messages” on page 49

---

## Accessing the Log Files

The Sun StorEdge Traffic Manager Software monitors and tracks a variety of system events, writing the resulting information either to the Microsoft Windows Event Viewer, or to log files.

### ▼ To Access the Log Files for Microsoft Windows 2000 and 2003

Events are logged in the system log with a source of `jafo` for Microsoft Windows 2000 and 2003.

1. **Click Start -> Settings -> Control Panel.**

The Control Panel opens.

2. In the Control Panel, double-click Administrative Tools -> Event Viewer.

## ▼ To Access the Log Files for Linux

The Sun StorEdge Traffic Manager Software writes status information to the following text file:

```
/var/log/messages
```

Use a text editor or the `cat` command to display the contents of the Linux log file. To view only Sun StorEdge Traffic Manager Software messages, type:

```
grep "JAFO" /var/log/messages
```

---

## Logging Levels

This section describes the various log messages at the various logging levels as configured by the GUI or CLI.

The following are Sun StorEdge Traffic Manager Software logging levels:

- Informational messages – These include all critical error messages as well as non-critical alerts. Non-critical alerts are usually when something has changed but no functionality is lost.
- Data path change messages – Changes to the state of a host data path.
- Critical error messages – Unrecoverable errors, such as when the Sun StorEdge Traffic Manager software loses access to a LUN or is out of memory.
- Caution and internal error messages – Errors the Sun StorEdge Traffic Manager software encounters but does not handle.

If logging level Data Path Changes is not set with the Host Preferences menu, data path change messages are not shown.

If logging levels Data Path Changes and Critical Error messages are set with the Host Preferences menu, only critical information is shown.

If logging levels Data Path Changes and Internal Errors are set with the Host Preferences menu, only non-critical information is shown.

Refer to “Setting the Logging Level” on page 22 for information on setting host preferences.

---

# Windows Log Messages

There are three general log messages that Sun StorEdge Traffic Manager writes to the system log file. The messages and an explanation of the variable fields are:

- JAFO: Driver Loaded. Major version: %VERSION Minor version: %VERSION Point version: %VERSION Release version: %VERSION.
- JAFO: Path state changed. Lun: %LUN\_NAME Path: %PATH\_NAME - Old State: %PATH\_STATE New State: %PATH\_STATE Reason: %REASON.
- JAFO: Lun state changed. Lun: %LUN\_NAME - Old State: %LUN\_STATE New State: %LUN\_STATE.

The variable fields in the general log message are described in TABLE 4-1.

**TABLE 4-1** Description of the Log Messages Variable Fields

Variable Field	Description
LUN_NAME	Replaced with <code>\\.\PhysicalDisk#</code>
LUN_STATE	Replaced with one of the following states: <ul style="list-style-type: none"><li>• WAITING_FOR_ACTIVE_PATH</li><li>• DOWN</li><li>• DOWN_GRACE</li><li>• UP</li><li>• TRANSITIONING</li></ul>

**TABLE 4-1** Description of the Log Messages Variable Fields (*Continued*)

Variable Field	Description
PATH_NAME	Replaced with #, #, #, #
PATH_STATE	Replaced with one of the following states: <ul style="list-style-type: none"> <li>• ADMIN</li> <li>• DOWN</li> <li>• REMOVED</li> <li>• TRANSITIONING</li> <li>• UP_ACTIVE</li> <li>• UP_PASSIVE</li> <li>• STANDBY</li> </ul>
REASON	Replaced with one of the following (NOTE: Reason codes are primarily for the expert user and support): <ul style="list-style-type: none"> <li>• <code>init</code> - New path addition</li> <li>• <code>recovered</code> - Path returning from a removed state</li> <li>• <code>io failure</code> - I/O error. This reason is not exposed to upper-level drivers. It is routed down available paths when possible.</li> <li>• <code>IRP_MN_SURPRISE_REMOVAL</code> - A lower-level driver removed the path check. A state occurred that caused the driver to determine this path might be in a state of TRANSITIONING.</li> <li>• <code>failover:success</code> - Asymmetric device failover was successful</li> <li>• <code>failover:failure</code> - Asymmetric device failover failed</li> <li>• <code>#_#_#</code> - <code>%NTSTATUS</code>, <code>%SRB_STATUS</code>, <code>%SCSISTAT</code> - are Microsoft Windows I/O status and can be looked up at <a href="http://msdn.microsoft.com">http://msdn.microsoft.com</a>.</li> <li>• <code>#_#_#_#_#</code> - same as the preceding bullet except the fourth and fifth values are SCSI and ASC/ASCQ and can be looked up at <a href="http://www.t10.org">http://www.t10.org</a>.</li> </ul>

The Sun StorEdge Traffic Manager software settings for logging level using the command line interface or graphical user interface effects the messaging in TABLE 4-1. The logging levels that affect Microsoft Windows are Internal, Critical, and Path status changes. When internal logging is enabled, state changes ending in Transitioning occur.

- Internal error messages normally end in a state of TRANSITIONING, UNKNOWN, or LUN\_HARDWARE\_ERROR
- Critical error messages normally end in a state of DOWN or REMOVED
- Path change messages normally end in a state of UP\_ACTIVE, UP\_STANDBY or ADMIN.

---

# Linux Log Messages

This section describes the various Linux specific log messages at the various logging levels as configured by the GUI or CLI.

**TABLE 4-2** Log Informational Messages

Message	Message Explanation	Information in the Message
Driver loaded	The operating system has loaded the Traffic Manager driver.	<ul style="list-style-type: none"><li>• Major version</li><li>• Minor version</li><li>• Point version</li><li>• Release version</li></ul>

**TABLE 4-3** Log Data Path Changes and Log Critical Errors

Message	Message Explanation	Information in the Message
Path state change	This message is logged when the state of any path changes for critical reasons.	<p>Old state and new state. Valid values are:</p> <ul style="list-style-type: none"><li>• Active</li><li>• Passive</li><li>• Down</li><li>• Standby</li><li>• Path name</li><li>• Unique LUN ID</li></ul> <p>Reason string, valid values are:</p> <ul style="list-style-type: none"><li>• <code>I/O status</code>—state change as a result of I/O status. There will also be detail data consisting of operating system specific SCSI status.</li><li>• <code>User initiated</code>—state change as a result of user initiated action, for example, activate or disable</li><li>• <code>AutoFailback initiated</code>—state change as a result of auto failback action</li><li>• <code>Failover initiated</code>—state change due to the need for passive to active action</li></ul>

**TABLE 4-4** Critical Log Messages

Message	Message Explanation	Information in the Message
Failover command sent to	This message is logged when the state of any path changes for critical reasons and the logging levels Log Data Path Changes is set in addition to Log Critical Error.	<ul style="list-style-type: none"><li>• Path name on which the failover command was sent</li><li>• Unique LUN ID</li><li>• Unique array ID</li><li>• Controller ID</li></ul> Reason string, valid values are: <ul style="list-style-type: none"><li>• User initiated—failover command sent as a result of user initiated action. For example, activate or disable.</li><li>• AutoFailBack initiated—failover command sent as a result of auto restore fallback action</li><li>• Failover initiated—failover command sent due to the need for passive to active action</li></ul>

**TABLE 4-5** Log Internal Messages

Message	Message Explanation	Information in the Message
LUN state changed	This message is logged when any noncritical LUN state changes occur.	Old LUN state and new LUN state. Valid values are: <ul style="list-style-type: none"><li>• Unknown</li><li>• Up</li><li>• Transition</li><li>• Down_Grace</li><li>• Down</li><li>• Removed</li><li>• LUN unique ID</li></ul>

**TABLE 4-6** Log Data Path Changes and Log Internal Errors

Message	Message Explanation	Information in the Message
Path state changed to	This message is logged when the state of any path changes for critical or non-critical reasons and the logging levels Log Data Path Changes and Log Internal Errors are set.	<p>Old state and new state. Valid values are:</p> <ul style="list-style-type: none"> <li>• Unknown</li> <li>• Active</li> <li>• Passive</li> <li>• Transition</li> <li>• Down</li> <li>• Admin</li> <li>• Removed</li> <li>• Standby</li> <li>• Path name</li> <li>• Unique LUN ID</li> </ul> <p>Reason string, valid values are:</p> <ul style="list-style-type: none"> <li>• IO status—state change as a result of I/O status. There will also be detail data consisting of operating system specific SCSI status.</li> <li>• Device added—state change as a result of a new path</li> <li>• Device removed—state change as a result of a path removed</li> <li>• User initiated—state change as a result of a user initiated action. For example, activate or disable.</li> <li>• AutoFailBack initiated—state change as a result of auto failback action</li> <li>• Failover initiated—state change due to a need for passive to active action</li> </ul>



## Error Return Messages

---

The following table contains all the return messages from the command line interface to the initiator of the command. To obtain a number value for these returns echo %ERRORLEVEL% after the `ssm` command completes. The echo response will be integers.

**TABLE 5-1** Error Return Codes and Meanings

<b>Code</b>	<b>Meaning</b>
00	The operation completed successfully.
100	The operation contained an invalid parameter.
101	An I/O error occurred during the operation.
102	The operation did not complete within the specified time.
103	The specified HBA could not be found or does not exist.
104	The specified device could not be found or does not exist.
105	The specified LUN could not be found or does not exist.
106	The specified path could not be found or does not exist.
107	The specified device was busy and could not accept the request.
108	The host OS has no memory left to allocate.
109	An internal error was encountered during the operation.
110	No supported devices were detected.
111	There are no alternate paths available to the device.
112	The specified path could not be enabled.
113	The specified path is already the active path.
114	The specified path is down or offline and is currently not available.
115	The selection of the specified path failed.

**TABLE 5-1** Error Return Codes and Meanings (*Continued*)

<b>Code</b>	<b>Meaning</b>
116	An invalid state change was attempted for the specified path.
117	The preferred path is down or offline and is currently not available.
118	An illegal or out-of-range command was specified.
119	The specified SCSI pass-through command failed.
120	The buffer specified was too small for the operation.
121	The restore operation failed.
122	A reservation conflict was encountered during the operation.
123	The operation is not supported.
124	A reboot is required.
125	The operation failed for some paths.

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