Netfinity® FAStT Storage Manager

Enterprise Management Online Help

P/N 19K8480

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Introducing the Enterprise Management Window

NOTE: See Using the Enterprise Management Window for information on using the Enterprise Management Window interface.

Important:

The Enterprise Management Window must be open if you want to:

- Monitor the condition of Storage Subsystems included in your management domain.
- Have the ability to send alert notifications (e-mail or SNMP traps) to a designated network management station.

The Enterprise Management Window is Java-based software that runs on a Management Station. A Device Tree in the left pane of the window presents a picture of the management domain, showing discovered and added devices and their status conditions. A Device Table in the right pane presents more detailed information for each Storage Subsystem. The Enterprise Management Window provides the following primary storage management functions:

- Discovers Hosts and Storage Subsystems on your local sub-network to add to your management domain. For more information, see Discovering Hosts and Storage Subsystems, Rescanning a Discovered Host, and Enterprise Storage Subsystem Management.
- Provides the ability to manually add Hosts and Storage Subsystems to your management domain and also remove them. For more information, see Adding a Host or Storage Subsystem, Removing a Host or Storage Subsystem, and Enterprise Storage Subsystem Management.
- Allows you to add Storage Subsystem comments to the Device Table. For more information, see Adding or Editing a Storage Subsystem Comment.
- Provides the ability to sort rows in the Device Table according to different criteria.
- Stores your Enterprise Management Window view preferences and management domain data in local configuration files. The next time you open the Enterprise Management Window from this management station, data from your configuration files is used to display your custom

management domain and other view preferences.

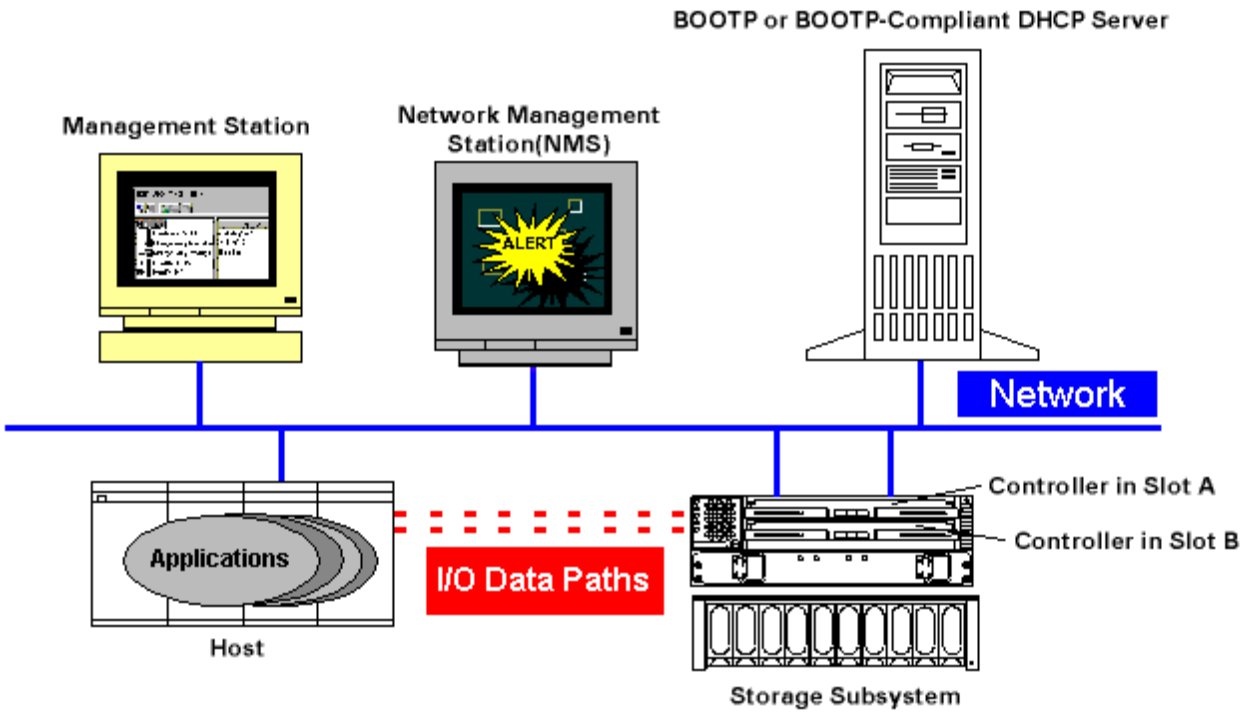
- Monitors the condition of Storage Subsystems and reports a high-level status using appropriate icons. For more information, see Monitoring Storage Subsystem Health Status.
- Provides the ability to configure alert notifications (e-mail or SNMP traps) and report critical events to the configured alert destinations. For more information, see Configuring SNMP and E-mail Alert Notification Settings and Configuring Alert Global Settings.
- Loads the appropriate Subsystem Management Window for a selected Storage Subsystem to allow detailed configuration and management operations. For more information, see Launching the Subsystem Management Window for a Selected Storage Subsystem.
- Executes a script to perform batch management tasks on a particular Storage Subsystem. For more information, see Using the Script Editor.

Overview of Enterprise Storage Subsystem Management

This topic describes the major hardware and software components in the Enterprise Storage Management environment and describes the two different network management connections you can use to manage Storage Subsystems.

What are the Major Hardware Components?

The management of your Storage Subsystems occurs over the network. The following are the major hardware components connected to the network. For a detailed description of the network set-up requirements, refer to the Software Installation Guide.



Hardware Component	Description
Management Station	The computer you use to manage the Storage Subsystems on your network.
Network Management Station (Optional)	A Network Management Station (NMS) is a console with installed SNMP-compliant network management software that receives and processes information about managed network devices in a form that is supported by the Management Information Base (MIB) it uses. The Enterprise Management software provides information about critical Storage Subsystem events, using SNMP trap messages, to a configured NMS.

BOOTP or BOOTP-Compliant DHCP Server	A BOOTP or BOOTP-Compliant DHCP Server is used to assign the network-specific information such as IP address and host name for each controller. This server is not required if you are going to manage all of your Storage Subsystems using the Host Agent.
Host	A computer running one or more applications that accesses the Storage Subsystem over the I/O path.
Storage Subsystem	A storage entity managed by the Storage Management software. A Storage Subsystem consists of a collection of both physical components (such as drives, controllers, fans, and power supplies) and logical components (such as arrays and logical drives). A Storage Subsystem can span multiple physical enclosures.
File Server (Optional)	The storage management software can optionally be stored on a central file server. Management Stations on the network can then access the storage management software remotely.

What are the Major Software Components?

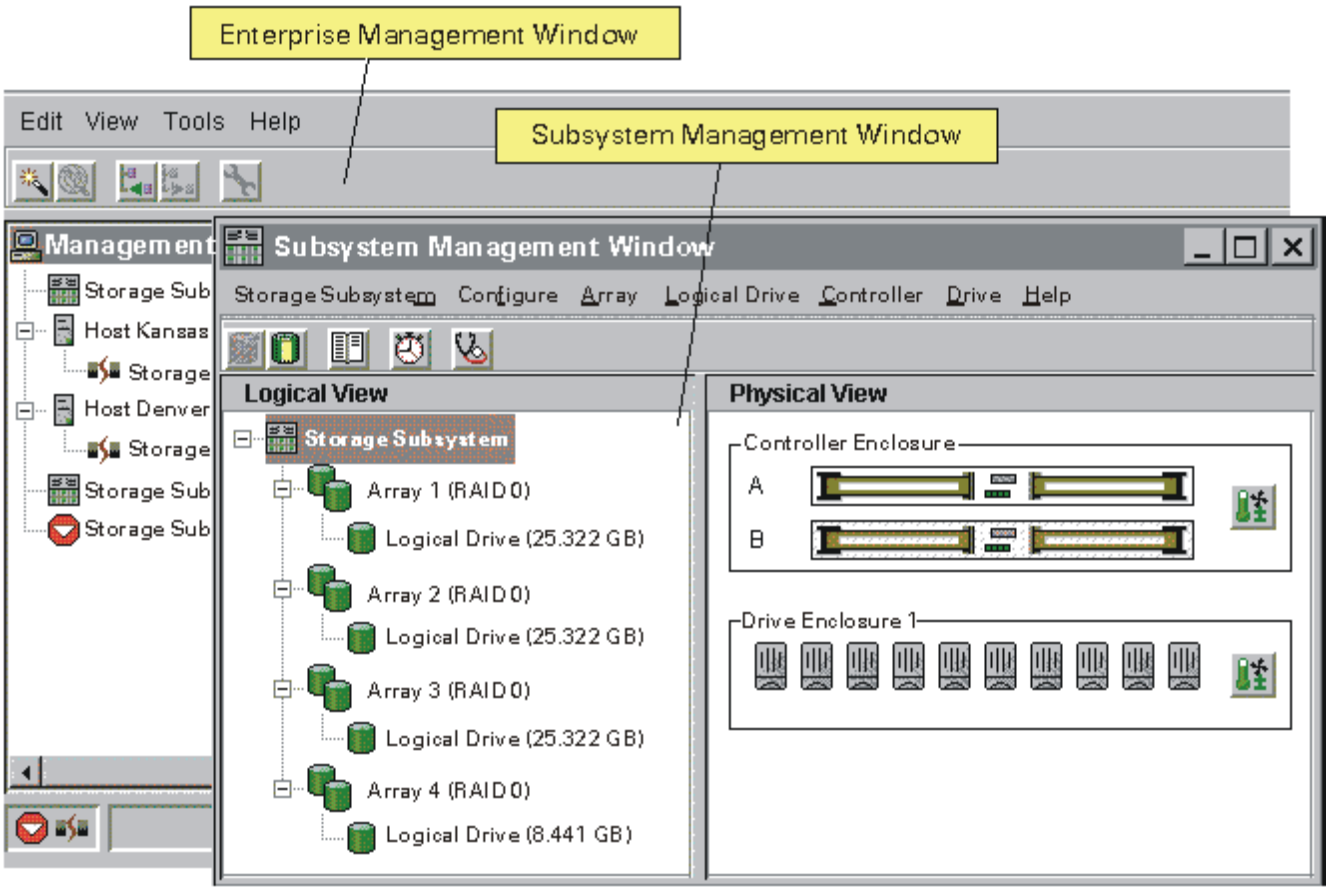
The storage management software is comprised of three major pieces:

- Client management
- Host-Agent (optional - this software component is only required if you intend to manage a Storage Subsystem through a Host.)
- Redundant Dual Active Controller (RDAC) multi-path driver software

Client Management
The Client Management piece of the storage management software has two main windows: the Enterprise Management Window and the Subsystem Management Window.

The Enterprise Management Window is the first window that appears when you first start the software. You use the Enterprise Management Window to add and discover the Storage Subsystems you want to manage and to provide a comprehensive view of all Storage Subsystems in your management domain. A list of Storage Subsystems that should be included in the management domain is stored in a local configuration file. After you have added the Storage Subsystems, you primarily use the Enterprise Management Window for coarse-level monitoring and alert notification of non-optimal Storage Subsystems. You also use it as the home base for launching an Subsystem Management Window for a particular Storage Subsystem. All Storage Subsystem-specific management tasks are provided in the Subsystem Management Window.

You use the Subsystem Management Window to manage (configure, maintain, and recover) the physical components (controllers, drives, fans, etc.) and logical components (logical drives and arrays) that comprise a Storage Subsystem. The Subsystem Management Window is specific to an individual Storage Subsystem. Therefore, you can only manage a single Storage Subsystem within an Subsystem Management Window. However, you can launch other Subsystem Management Windows to manage other Storage Subsystems.



Host-Agent
The Host-Agent management software is an optional piece of software that you can install on one or more Hosts that are connected to the Storage Subsystems. The Host-Agent, along with the Ethernet connection on the Host, provides you with another network management connection to the Storage Subsystem (see Host-Agent Managed Storage Subsystem description, below) rather than using the individual Ethernet connections on each controller in the Storage Subsystem (see Directly Managed Storage Subsystem description, below).

Your management station can communicate with a Storage Subsystem through the Host that has Host-Agent management software installed. The host agent takes requests from the management station through the Ethernet connection to the host and sends them to the controllers in the Storage Subsystem through the I/O connections between the Host and Storage Subsystem.

RDAC Multi-Path Driver Software
RDAC is an I/O path fail-over driver. There is typically a redundant pair of active controllers in a Storage Subsystem. When you create a logical drive in the Storage Subsystem, one of the controllers is automatically or manually chosen to "own" the logical drive and control the I/O between the logical drive and the application host along the I/O path.

When a component along the I/O path to a controller or the controller itself fails, ownership of the logical drives that had been assigned to that controller will automatically transfer to the other controller in the pair. The RDAC multi-path driver manages this failover process.

What are the Different Ways to Manage a Storage Subsystem?

Types of Network Management Connections

The storage management software manages all Storage Subsystems over the network. However, the software allows you to configure two different types of network management connections into a Storage Subsystem: a direct connection or a host-agent connection.

For increased connectivity, you can manage a Storage Subsystem using any combination of network management connections (direct only, host-agent only, or multiple host-agents). A direct and host-agent combination is also allowed but isn't a recommended configuration because you would be using three Ethernet connections (one to each controller and the one through the Host). When you configure more than one network management connection into a Storage Subsystem, the storage management software is aware of each connection and automatically chooses a connection when you attempt to manage the Storage Subsystem by launching an Subsystem Management Window. If a particular connection is currently not responding, the software tries all other configured network management connections into that Storage Subsystem.

Directly Managed Storage Subsystems

The controllers in the Storage Subsystem are managed directly over the network through each controller's Ethernet connection on the Storage Subsystem. To manage the Storage Subsystem through these Ethernet connections, you must define each controller's IP address (or optionally, each controller's host name) and attach a cable to the Ethernet connections on the Storage Subsystem. You can then use the Enterprise Management software to include the Storage Subsystem in the management domain.

Host-Agent Managed Storage Subsystems

The controllers in the Storage Subsystem are managed through an Ethernet connection on a Host instead of using the Ethernet connections on each controller. The Host-Agent software on the Host, described above, facilitates communication between the management station and the controllers in the Storage Subsystem. To manage a Storage Subsystem using this method, you must install the Host-Agent software on the Host and then use the Enterprise Management software to include the Host in the management domain (by including the Host in the domain, you will also be including any attached Host-Agent Managed Storage Subsystems).

Glossary

Alert Destination

Community Name

Configuration File

Contacting Device Status

Directly Managed Storage Subsystem

Enterprise Management Window

Fixing Status

Host

Host-Agent Managed Storage Subsystem

Management Domain

Management Station

Needs Attention Status

Network Management Station

Optimal Status

Partially Managed Storage Subsystem

SMTP

SNMP

SNMP Trap Message

Storage Subsystem

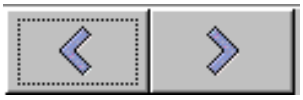
Subsystem Management Window

Unidentified Node

Unresponsive Status

Using the Enterprise Management Window Help System

The Enterprise Management Window online help is a JavaHelp™ system, featuring a window with a toolbar and two panes:

- **Toolbar** -  Features a left arrow, to return to the previously viewed topic, and a right arrow, to return to the topic that was displayed prior to going back. These are unavailable when you first open the Help Window.

  Note: You can also use the back and forward arrows to return to the previously viewed section of a topic, if you are navigating within a topic using hypertext links.
- **Navigation Pane** - The left-hand pane that contains three navigation views: The Table of Contents, Index, and Full Text Search views. Switch between views by selecting the appropriate tab.  If you want to close the Navigation Pane, click on the top arrow  on the splitter bar. This will cause the pane to close and the arrows move to the left-hand side of the Help Window. Click the bottom arrow to reopen the Navigation Pane.

  See, Tips on Using the Table of Contents, Tips on Using the Index, and Tips on Performing a Full Text Search, below.
- **Content Pane** - The right-hand pane that displays the help topics. If you want to close the Content Pane, click on the bottom arrow on the splitter bar. This will cause the Content Pane to close and the arrows to move to the right-hand side of the Help Window. Click the top arrow to reopen the Content Pane.

Tips on Using the Table of Contents

- Double-click on a folder to expand or collapse the display of topics it contains.
- Highlight a topic to display its associated help information in the Content Pane.

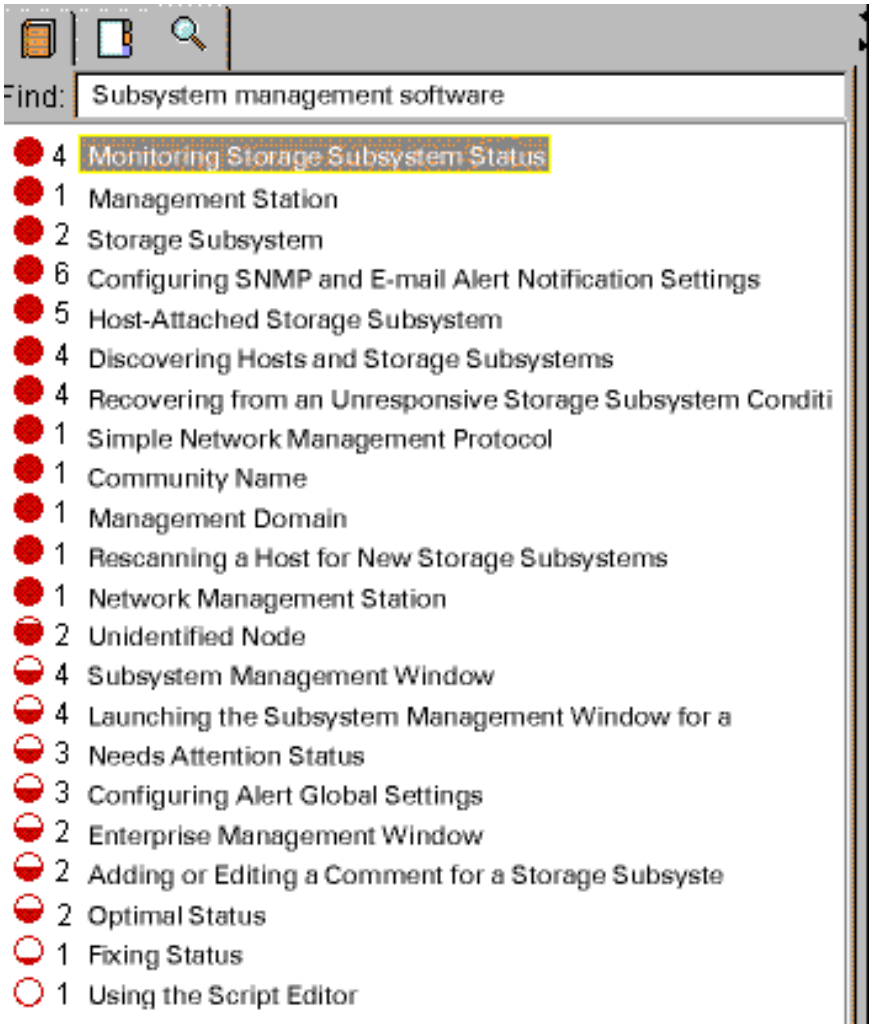
Tips on Using the Index

- Double-click on an entry to expand or collapse the display of topics under it.
- Highlight an entry to display its associated help information in the Content Pane.
- To search for an index entry term, type a word in the **Find:** textbox. This will cause the first index entry that matches your query to be highlighted. If the index entry is directly associated with a topic, the topic is displayed in the Content Pane. To see the next match for your query, press **Enter**. Continue pressing **Enter** to see every match returned from your query, one at a time.

Tips on Performing a Full Text Search

To search for a natural language phrase, select the Full Text Search tab, type the phrase in the **Find:** text box, then press **Enter**.

Example: Typing in the phrase "Subsystem management software" produces the following results in the Full Text Search pane:



There are three columns returned in the results.

Column	Description
Ranking	The red circle indicates how well the topic ranked. The more complete the circle is filled in, the higher the ranking. The best match is shown at the top of the pane, followed by other matches in descending rank order. See, "How Are Topics Ranked?", below.

Number of Matches	The second columns contains a number that indicates how many times the query was matched in the listed topic.
Topic title	The selected topic in the navigation pane displays in the topic pane with matched passages highlighted in the help text in an alternate color.

How are the Topics Ranked?

The JavaHelp search engine uses two techniques, described below, to score passages of text in the help topics as answers to your query.

Technique	Description
Relaxation Ranking	Your query is compared with occurrences of the same or related terms in the help topics. The search engine attempts to find passages in the help topics in which as many as possible of the query terms occur in the same form and the same order. The search engine relaxes the query constraints to identify the passages in which: ● Not all of the terms occur ● The terms occur in different forms ● The terms occur in a different order ● The terms occur with intervening words The search engine assigns lower rankings to the passages depending on how they deviate from your query. **Tip:** To improve the ranking process, include as much information in your query as possible.
Morphing	The JavaHelp search engine finds words with common roots. For example, if you type the word "manage" in the **Find:** textbox, matches that contain "managed", "management", "manages", and "managing" are also returned. **Note:** In version 1.0 of JavaHelp, morphing is used only when the help system language is English.

Opening the Help System

To open the help system from...	Procedure
The Enterprise Management Window	Press F1, or select either the **Help** >> **Quick Help** or the **Help** >> **Contents** menu option. **Result:** The help system opens. The **Quick Help** option initially displays the topic "Using the Enterprise Management Window" in the content pane, and the **Contents** option initially displays the "Introduction to the Enterprise Management Software" in the content pane.

The Script Editor Window	Press F1, or select either the **Help** >> **Overview** or the **Help** >> **Command Reference** menu option. **Result:** The help system opens. The **Overview** option initially displays the topic "Using the Script Editor" in the content pane, and the **Command Reference** option initially displays the "Script Editor Command Reference" in the content pane.
A dialog with a help button	Select the help button on the dialog or press F1. **Result:** The help system opens and a context-sensitive help topic is displayed in the content pane.

Printing the Help System

Printing is not supported by JavaHelp at the time of the help system development and release. However, the **EMW_help.pdf** file on your installation CD contains a copy of the Enterprise Management Window help system that can be printed using Adobe Acrobat Reader™.

Why Aren't Help Topics for the Enterprise Management Window Linked to Help Topics for the Subsystem Management Window?

The Enterprise Management Window supports multiple versions of the Subsystem Management software. Each version of the Subsystem Management software contains Help topics specific to that version. Rather than link one Enterprise Management Help topic to multiple versions of an Subsystem Management Help topic in more than one directory, appropriate references are offered. If an Enterprise Management Help topic refers you to the Subsystem Management Help, launch the appropriate Subsystem Management Window for the Storage Subsystem you are managing, and then consult the version-specific information contained in that window's Help system.

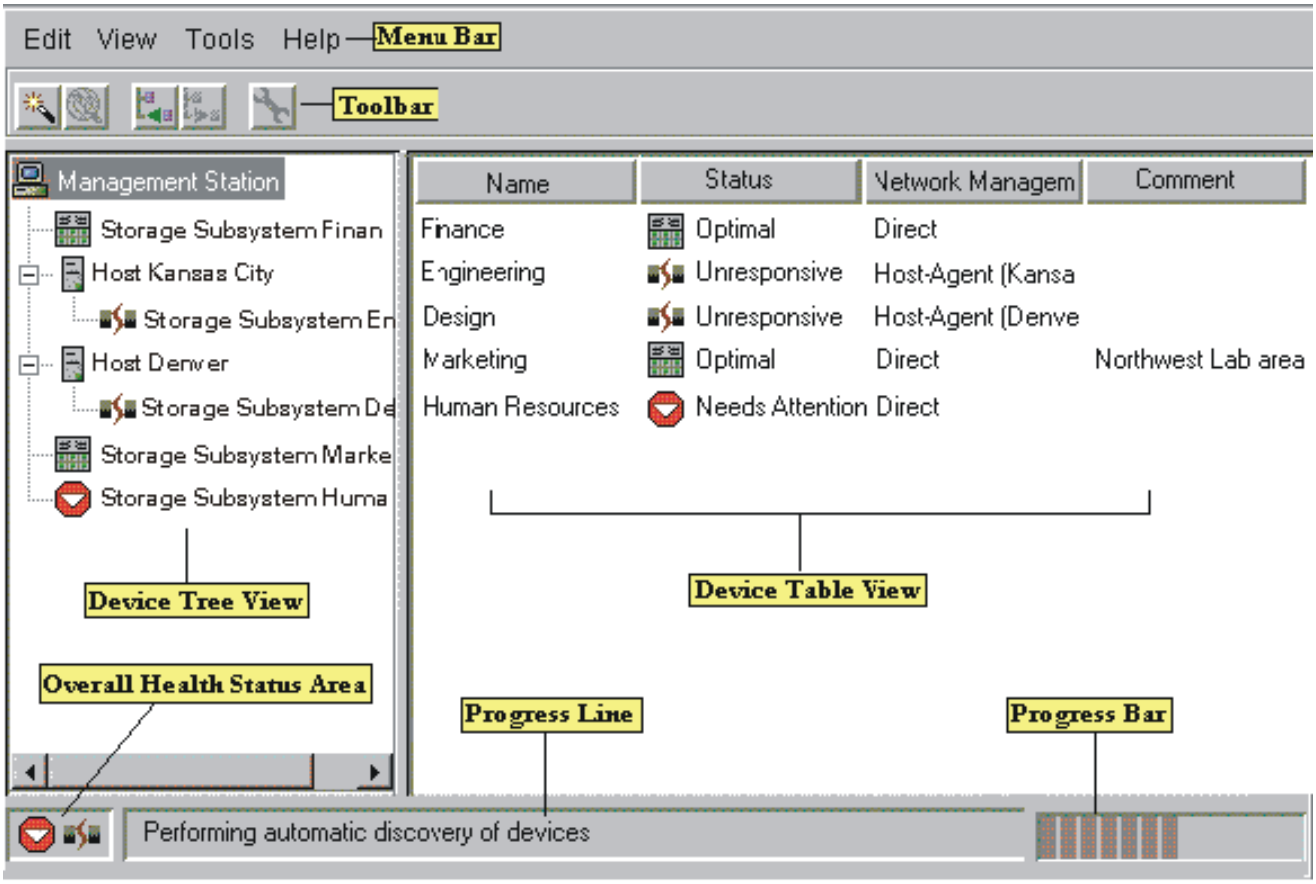
Troubleshooting

There are a few known problems with the standard underlying Java components on which the JavaHelp system is based. The following table discusses known problems that you may encounter when using the help system.

If...	Then...
Images are rendered incorrectly in the Content Pane, as shown in the example below: 	Display another help topic, then redisplay the topic with the incorrectly rendered graphic. **Result:** The graphic is correctly rendered.
You receive a "Null Pointer Exception" java error while using the help system.	In most cases, you can ignore this error and re-attempt to access the particular topic. If the problem continues to occur, contact your Customer Support representative.
When following a hypertext link in a help topic to another header within the topic, the referenced information displays in the center of the content pane instead of at the top.	This is a known problem, and there is no solution for the current release.
You receive a "Helpset File Error: Helpset is Corrupt or Not Found" error when accessing the help system.	Follow the instructions on the dialog to recover from the problem. If the problem continues to occur, contact your Customer Support representative.

Using the Enterprise Management Window

The Enterprise Management Window contains the functional areas labeled in the example below. For a functional description of this window, see Introducing the Enterprise Management Window. For quick access to information about a particular area, click on one of the links below:



Menu Bar Options

- The following menu options are described in other topics in the help system.
- If you right-mouse click on a Node in the Device Tree, a Pop-up menu containing the appropriate pull-down menu options for that node is displayed.

Menu/Option	Description
Edit Menu Options	

Add Device	Allows you to manually add Storage Subsystems to the management domain.
Remove Device	Allows you to remove Storage Subsystems from the management domain.
Alert >> Destinations	Allows you to configure the destination addresses for delivery of e-mail and SNMP trap messages containing critical event details affecting a Storage Subsystem. Also allows you to validate potential destination addresses by sending test notification messages and reporting the delivery status.
Alert >> Global Settings	Allows you to specify e-mail alert settings for every Storage Subsystem in the management domain.
Comment	Allows you to add Storage Subsystem comments to the Device Table.
View Menu Options	
By Name	Sorts rows in the Device Table according to Storage Subsystem name.
By Status	Sorts rows in the Device Table according to Storage Subsystem status.

By Management Type	Sorts rows in the Device Table according to Storage Subsystem management type.
By Comment	Sorts rows in the Device Table according to Storage Subsystem comment.
Partially Managed Devices	Lists partially managed devices in the management domain and gives you the opportunity to correct the condition.
Tools Menu Options	
Automatic Discovery	Provides an automatic mechanism for discovering Storage Subsystems on the local sub-network.
Rescan	Provides an automatic mechanism for discovering newly-attached Host-Agent Managed Storage Subsystems on a selected Host.
Manage Device	Allows you to launch the Subsystem Management Window for a selected Storage Subsystem.
Execute Script	Provides the capability to perform batch management tasks using scripts.
Help Menu Options	
Quick Help	Opens the Help System with "Using the Enterprise Management Window" in the Content Pane.

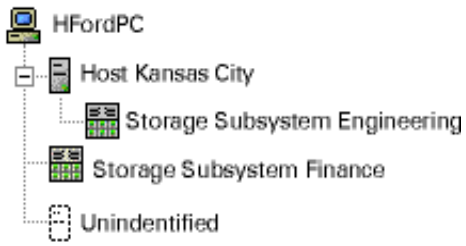
Contents	Opens the Help System with the topic "Introducing the Enterprise Management Window" in the Content Pane.
About	Contains copyright and version information for the Enterprise Management software.

Toolbar Options

Button	Equivalent Menu Option
	**Tools >> Automatic Discovery**
	**Tools >> Rescan**
	**Edit >> Add Device**
	**Edit >> Remove Device**
	**Tools >> Manage Device**

About the Device Tree View

The Device Tree View is one of two Enterprise Management Window views. The Device Tree View provides a tree-structured view of nodes in the management domain. Double-click on the Management Station node or Host node to expand or collapse the view of their child nodes. If you double-click on a Storage Subsystem node, it will launch the Subsystem Management software for that particular Storage Subsystem.



The Management Station node, labeled with its machine name (HFordPC in the example at left), is always present in the Device Tree. When Storage Subsystems and the Hosts through which they are managed are added to the management domain, they become child nodes of the Management Station node. In the example at left, Host Kansas City, Storage Subsystem Finance, and an Unidentified Node are child nodes of HFordPC.

Note: If you hold the mouse over the Management Station node, a Tooltip displays with the machine IP Address.

Child Nodes of the Management Station Node	Description
Host	Represents a host machine, with attached Host-Agent Managed Storage Subsystems. **Note:** If you hold the mouse over a Host node, a Tooltip displays the IP address of the Host.
Storage Subsystem	A Storage Subsystem node may be either Directly Managed, or Host-Agent Managed. **Notes:** • Any Host-Agent Managed Storage Subsystems are child nodes of the host node. • If a Storage Subsystem is managed through multiple hosts, it will be duplicated in the Device Tree View under each host node to which it is attached. • If you hold the mouse over a Directly Managed Storage Subsystem node, a Tooltip displays the Host Name and IP address of each controller in the Storage Subsystem. The Host Name and IP address for each controller do not display for Storage Subsystem nodes that are Host-Agent Managed. • The icon that represents the Storage Subsystem indicates its connection status or the Storage Subsystem hardware status. For more information, see Monitoring Storage Subsystem Status.
Unidentified	Devices that you add that were not accessible at the time of the **Add Device** operation.

About the Device Table View

Each Storage Subsystem is represented by a single row in the Device Table. The columns in the Device Table display data about the Storage Subsystem, as described below.

Column	Description
Name	The name of the Storage Subsystem. If the Storage Subsystem is unnamed, the default name is "<unnamed>".
Status	An icon and text label reporting the true status of the Storage Subsystem. For more information, see Monitoring Storage Subsystem Status.

<table>
<tr><td>Network Management Type</td><td>
<table>
<tr><th>Column Value</th><th>Description</th></tr>
<tr><td>Direct</td><td>This is a Directly Managed Storage Subsystem.</td></tr>
<tr><td>Host-Agent (<name of host>)</td><td>This is a Host-Agent Managed Storage Subsystem, managed through a single host.</td></tr>
<tr><td>Direct, Host-Agent (<name of host>)</td><td>This is a Storage Subsystem that is both Directly Managed and Host-Agent Managed through a single Host.</td></tr>
<tr><td>Host-Agent (<name of host>, <name of host>)...</td><td>This is a Host-Agent Managed Storage Subsystem, managed through multiple Hosts.</td></tr>
<tr><td>Direct, Host-Agent (<name of host>,<name of host>)...</td><td>This is a Storage Subsystem that is both Directly Managed and Host-Agent Managed through multiple Hosts.</td></tr>
</table>
</td></tr>
<tr><td>Comment</td><td>Any comments that you have entered about the particular Storage Subsystem.</td></tr>
</table>

Note: Sort the rows in the Device Table in ascending or descending order by either (1) clicking on a column heading; or (2) using the **View >> By Name**, **View >> By Status**, **View >> By Management Type**, or **View >> By Comment** menu options.

Displaying Storage Subsystems in the Device Table

- Select the Management Station node to display all known Storage Subsystems in the Device Table. **Note:** If no Storage Subsystems have been added to the management domain, the Device Table will be empty.
- Select a Host node in the Device Tree to display any Storage Subsystems that are attached to that specific Host in the Device Table.
- Select a Storage Subsystem node in the Device Tree to display only that Storage Subsystem in the Device Table.

  Note: Selecting an Unidentified Node in the Device Tree displays an empty Device Table.

Navigating within the Enterprise Management Window

In addition to using the mouse, you can also use the keyboard for navigation:

- The up arrow selects the next node in the tree in an upward direction.
- The down arrow selects the next node in the tree in a downward direction.
- Selecting a Storage Subsystem and pressing the Enter key launches the Subsystem Management

Window for that Storage Subsystem.

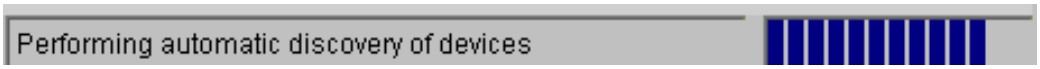
- Press the Delete key to remove a selected Storage Subsystem.
- Press the Tab key to move between the Device Tree and Device Table views.

About the Overall Health Status Area

The Overall Health Status is shown in the lower left corner of the Enterprise Management Window and displays a consolidated health status for all of the known Storage Subsystems in the management domain. For more information, see Monitoring Storage Subsystem Status.

About the Progress Line and Progress Bar

At the bottom of the Enterprise Management Window, to the right of the Overall Health Status area, is the Progress Line and the Progress bar.



Progress Line **Progress Bar**

Progress Line

Text in this area displays the current operation being performed or the results of the most recently performed operation.

Examples:

- Removed Device NOVANT and attached Storage Subsystems
- Added device MIDWEST
- Loading Subsystem Management Window for GAMMA

To clear the text from the last operation performed, select any object in the Enterprise Management Window.

Progress bar

A Progress bar, as shown in the example above, is displayed for the Automatic Discovery and Rescan operations. For more information, see Discovering Storage Subsystems and Rescanning a Host for New Storage Subsystems.

Performing an Initial Automatic Discovery

Anytime you open the Enterprise Management Window from a particular management station and the configuration files containing management domain data are not present or are empty, an **Automatic Discovery** dialog is displayed. This dialog gives you an opportunity to automatically add devices (Hosts and Storage Subsystems) from your local sub-network to your management domain.

Note: This dialog is also displayed if the primary configuration file is corrupt and the backup configuration file is empty. It is also displayed as part of the recovery sequence when the configuration files have become corrupt and have been reset as empty files.

Selection	Result/More information
Yes	An automatic discovery process begins. For more information, see Discovering Storage Subsystems.
No	To add devices to your management domain, use the **Add Device** option of the Enterprise Management software. For more information, see Adding a Storage Subsystem.

Recovering From Configuration File Errors

There are three possible configuration file errors:

Title of the Dialog	Description
Configuration File Startup Error	Either configuration file (emwdata.bin and emwback.bin) is discovered to have a read or write permissions problem when you are starting a management session. Follow the instructions on the dialog to recover from the error. **Important:** When you select **OK** on this dialog, the Enterprise Management Window will close. You MUST fix this error before you can successfully open a management session.
Configuration File Write Error	Either configuration file (emwdata.bin and emwback.bin) is discovered to have a read or write permissions problem during a management session, or the write fails because the local disk is full. Follow the instructions on the dialog to recover from the error. **Important:** If you select **Cancel** rather than correcting the problem and then selecting **Retry**, any configuration data generated during your management session will be temporarily reflected, but will not be saved for future management sessions.

Configuration File Corruption Error	Both configuration files (emwdata.bin and emwback.bin) are corrupted and cannot be recovered, or one of the configuration files is corrupt and the other one is missing. **Important:** Make sure you record the location of the directory path that is listed on the error dialog. You may need to use this directory path in the procedure below. See **Recovery from a Configuration File Corruption Error** in this help topic.

Recovery from a Configuration File Corruption Error

The only action you can initially take is to select **OK** because the current configuration files cannot be recovered. Selecting **OK** will replace the configuration files and reset them to empty files. This results in the Enterprise Management Window displaying no devices, reflecting an empty management domain. After selecting **OK**, you are given an opportunity to perform an automatic discovery to add devices back to the management domain and rebuild your files. You have the following two choices:

Recovery Choice	Description and Procedure
Use alternate configuration files	**Description** **Use alternate configuration files:** either a backup copy of your configuration files, or configuration files from another management station. **Important:** Use backup copies of your own configuration files. If these are not available, you can use another system administrator's files that have been generated from either the same or a different management station. **Procedure**

	1 Select **No** at the **Automatic Discovery** dialog. 2 Exit the Enterprise Management Window. 3 Copy the backup files from the alternate directory to the directory specified in the error dialog. 4 Restart the Enterprise Management Window. 5 Verify the devices displayed and, if necessary, use the **Add Device** option to add any devices that are missing.
Rebuild your configuration files	**Description** If you don't have backup copies of the configuration files, you will have to rebuild your management domain from scratch using one of the two alternatives listed in the procedure column. **Procedure** Either: ● Select **Yes** if you want to perform an automatic discovery to repopulate the management domain. ● Select **No** if you want to manually add the devices back to the management domain using the **Add Device** option.

Discovering Storage Subsystems

Use the **Automatic Discovery** option to automatically discover Directly Managed and Host-Agent Managed Storage Subsystems on the local sub-network and add them to the management domain.

Note: The Enterprise Management software discovers Host-Agent Managed Storage Subsystems by discovering the hosts that provide network management connections to the Storage Subsystems. Then, the host is displayed in the Device Tree along with its associated Storage Subsystems.

Important:

- Before using this option, verify that the appropriate network configuration tasks have been performed. Refer to the Software Installation Guide for details.
- The Automatic Discovery process sends out a broadcast message across the local sub-network and any device responding to the message is included in the Device Tree View.
- In rare cases, a device may respond to the broadcast message during the automatic discovery process but its response is dropped over the network before it reaches the Enterprise Management software. If this occurs, the device won't display in the Device Tree View and you must use the **Add Device** option to manually add the device.
- If you need to stop the Automatic Discovery operation for any reason, close the Enterprise Management Window.
- Use the **Add Device** option to add Hosts and Storage Subsystems to the management domains that are outside of the local sub-network.
- This option is not available if a **Rescan**, **Add**, **Remove**, or another **Automatic Discovery** operation is currently in progress.

How to Start an Automatic Discovery

1 Select one of the following:

- **Automatic Discovery**  toolbar button
- **Tools** >> **Automatic Discovery** pulldown menu option
- Management Station node, then **Automatic Discovery** from the right-mouse pop-up menu.

  Result: The **Confirm Automatic Discovery** dialog is displayed.

2 Select **OK**.

Result:

- The Enterprise Management software begins the Automatic Discovery process.
- The Progress dialog displays "`Performing automatic discovery of devices`" and the Progress Bar begins to display relative progress, shown as a percentage of the estimated time it will take to complete.
- During the Automatic Discovery process, the software updates the Progress dialog for each new host and Storage Subsystem that is discovered.

  Example: `Discovered Host NOVANT and attached Storage Subsystems.`
- At the end of the Automatic Discovery process, the progress bar is cleared to show no activity, and the Progress dialog shows either:
  - `Automatic discovery completed. Found N devices.` (where *N* is the number of devices found).

    -OR-
  - `Automatic discovery completed. No new devices were found.`
- Any discovered devices are displayed in the Device Tree View and in the Device Table.

Adding a Storage Subsystem

Use this option to manually add a Directly Managed or Host-Agent Managed Storage Subsystem to the management domain.

Note: The **Automatic Discovery** and **Rescan** options provide automatic mechanisms for discovering Hosts and Storage Subsystems.

Important:

- It can take several minutes for the Enterprise Management software to connect to the specified device.
- Before using this option, verify that the appropriate network configuration tasks have been performed. Refer to the Software Installation Guide for details.
- To add a Directly Managed Storage Subsystem, make sure you provide the host name or IP address of *each* controller in the Storage Subsystem. Note that the dialog only allows you to add one address at a time.
- To add a Host-Agent Managed Storage Subsystem, add the host through which the Storage Subsystem is attached to the network. The host will then display in the Device Tree along with any attached Storage Subsystems.

How to Add a Storage Subsystem

1 Select one of the following:

- **Add Device**  toolbar button
- **Edit** >> **Add Device** menu optio
- Management station node, then **Add Device** from the right-mouse pop-up menu.

  Result: The **Add Device** dialog is displayed.

2 For a Directly Managed Storage Subsystem, enter a host name or IP address for one of the controllers in the Storage Subsystem. For a Host-Agent Managed Storage Subsystem, enter a name or IP address for the Host through which the Storage Subsystem is attached to the network.

3 Select **OK**.

Result: The **Connecting** message dialog is displayed while the software attempts to contact the specified device.

If...	**Then...**
The device was successfully accessed	The device is added to the Device Tree and the Device Table. Also, the **Connecting** message dialog closes and the **Add Device** dialog is displayed again. You can either add another device or select **Close**.
The device was NOT successfully accessed, because of an unresolved host name.	The **Connection Error** message dialog is displayed. Select **OK** to return to the **Add Device** dialog. You can either enter a valid host name or select **Close**.
The device was NOT successfully accessed, because of an unsuccessful connection to the name or IP address of a controller in the Storage Subsystem or an unsuccessful connection to a Host.	The **Connection Problem** message dialog is displayed. Select **Yes** to add the device to the Device Tree view as an Unidentified Node  and close the dialog (see note below). Select **No** to close the dialog without adding the device. **Note:** If you add the device as an Unidentified Node, the Enterprise Management software retries the connection to this device at future intervals. If a future connection is made to this device that allows it to be identified, the node changes to either a Host or a Storage Subsystem node, whichever is appropriate. After selecting **Yes** or **No**, the **Add Device**

	dialog is displayed again. You can either add another device or select **Close**.

Important: If a Partially Managed Devices dialog displays after you have selected **Close** in the **Add Device** dialog, then one or more of the devices you have added is only partially manageable (that is, only one controller in a Storage Subsystem has been defined). This dialog provides you with information to assist you in determining what devices still need to be defined. See, Correcting a Partially Managed Storage Subsystem Condition.

Correcting a Partially Managed Storage Subsystem Condition

This condition occurs when only one controller was defined or could be reached when the Storage Subsystem was added or discovered. You are provided several indications of this condition as follows:

- When you close the **Add Device** option dialog.
- When you attempt to manage a Storage Subsystem (that is, launch its Subsystem Management Window).
- When you select the **View >> Partially Managed Devices** pull-down menu option.
- When you activate the tooltip on the Storage Subsystems by placing your cursor over the Storage Subsystem in the Device Tree. If a Storage Subsystem is partially managed, it will display "partially managed" in the tooltip.

  Important: This tooltip is only available for Directly Managed Storage Subsystems (unavailable for Host-Agent Managed Storage Subsystems)

This condition has different causes depending on how the Storage Subsystem is managed over the network:

- If the Storage Subsystem is managed through each Ethernet connection on the controllers, (Directly Managed) either you have not provided a host name or IP address of one of the controllers, or there was a connection problem. For more information, see How to Correct a Partially Managed Condition for Directly Managed Storage Subsystems.
- If a Storage Subsystem is managed through a Host's network connection (Host-Agent Managed), there was a problem detecting one of the controllers in the attached Storage Subsystem. For more information, see How to Correct a Partially Managed Condition for Host-Agent Managed Storage Subsystems.

How to Correct a Partially Managed Condition for a Directly Managed Storage Subsystem

Note: If you already have the **Partially Managed Devices** dialog displayed, you

can skip step 1 below.

1 Select the **View >> Partially Managed Devices** pull-down menu option.

Result: The **Partially Managed Devices** dialog displays.

2 Make a note of the controllers listed (both known and unknown). Use this information to identify the unknown controller.

Note: The display shows controller pairs with the known controller listed first followed by the unknown controller. The display shows the name or IP address of the known controller, its associated Storage Subsystem, and a description of the known controller's location (that is, Controller in Slot A or Slot B).

3 On the **Partially Managed Devices** dialog, select **Add More.**

Result: The **Partially Managed Devices** dialog closes. The **Add Device** dialog is displayed.

4 On the **Add Device** dialog, specify the Name or IP Address of the controller that was listed in the **Partially Managed Devices** dialog with an Unknown designation, then select **Add**.

Result: The **Connecting** message dialog is displayed while the Enterprise Management software attempts to contact the specified Name or IP address.

If...	Then...
The **Add Device** dialog is displayed again	You have resolved the partially managed condition for the particular controller, go to step 6.
A **Connection Problem** dialog displays as follows: "The specified device was not accessible. Do you want to add it as an Unidentified Device?"	Select **No**. There is either a problem with the physical connection or a faulty controller. Go to step 5.

5 Check to make sure:

- The Ethernet cable into the controller is not visibly damaged and is securely connected.
- The appropriate network configuration tasks have been performed (for example, IP address assigned to the controller, and so on). Refer to the Software Installation Guide for details.
- The controller is network-accessible. One way to do this is to use the `ping` command to verify that the controller can be reached. Use the form `ping <Host name or IP address of the controller>.`

If...	Then...
There was a cable or network accessibility problem	Fix the problem and then repeat step 4.
There wasn't a cable or network accessibility problem	Turn the power to the controller enclosure off and then on and then repeat step 4. If you continue to receive the **Connection Problem** dialog, you may have a faulty controller. Contact your Customer Support Representative.

6 Repeat step 4 for each controller that is associated with a Directly Managed Storage Subsystem that was listed with an Unknown designation, then go to step 7.

7 When you have added all names or IP addresses, select **Close** from the **Add Device** dialog.

If...	Then...
The **Partially Managed Devices** dialog is displayed again	Either you have not resolved all of the Directly Managed Storage Subsystems or the remaining controllers listed are associated with Host-Agent Managed Storage Subsystems. For more information, see How to Correct a Partially Managed Condition for Host-Agent Managed Storage Subsystems.
The **Partially Managed Devices** dialog does NOT display again	You have resolved all partially managed situations. YOU ARE FINISHED WITH THIS PROCEDURE.

How to Correct a Partially Managed Condition for a Host-Agent Managed Storage Subsystem

Note: If you already have the **Partially Managed Devices** dialog displayed, you can skip step 1 below.

1 Select the **View >> Partially Managed Devices** pull-down menu option.

Result: The **Partially Managed Devices** dialog is displayed.

2 Make a note of the controllers listed (both known and unknown). Use this information to identify the unknown controller.

Note: The display shows controller pairs with the known controller listed first followed by the unknown controller. The display shows the name or IP address of the Host, the associated Storage Subsystem, and a description of the known controller's location (that is, Controller in Slot A or B).

3 On the **Partially Managed Devices** dialog, select **Exit**.

Result: The **Partially Managed Devices** dialog is closed.

4 The two most likely reasons that the Host-Agent software could not detect the controller are:

- There is a connection problem.

  -OR-

- The controller was installed or replaced since the last time the Host-Agent software was started.

Verify the connections and rescan the controller using the following procedure:

A Check the external cable between the host adapter and the controller to make sure that it is securely connected.

B Restart the Host Agent software on the Host through which you are having problems detecting the controller. Refer to the Software Installation Guide on how to restart the Host Agent.

C Highlight the Host in the **Device Tree View** of the Enterprise Management Window and then select the **Tools >> Rescan** option to attempt to detect the controller in the Storage Subsystem.

D Determine if the problem has been corrected by selecting the **View >> Partially Managed Devices** option.

If...	Then...
• The menu option is grayed out (unavailable) -OR- • The controller associated with this Host-Agent Managed Storage Subsystem is no longer listed.	YOU ARE FINISHED WITH THIS PROCEDURE.
The controller and associated Storage Subsystem are still listed.	Turn the power to the controller enclosure off and then on and then repeat step 4. If the controller continues to be listed in the Partially Managed Devices dialog, you may have a faulty controller. Contact your Customer Support Representative.

5 Repeat step 4 for each controller associated with a Host-Agent Managed Storage Subsystem that was listed with an Unknown designation.

Removing a Host or Storage Subsystem

Use this option to remove a Storage Subsystem or a Host and its attached Storage Subsystems.

How to Remove a Host or a Storage Subsystem

1 Select a single Host or Storage Subsystem in the Device Tree View, or select a Storage Subsystem in the Device Table, then select one of the following:

- **Remove Device**  toolbar button
- **Edit** >> **Remove Device** menu option
- **Remove Device** from the right-mouse pop-up menu
- **`Delete`** key

Result: The **Remove Device** confirmation dialog is displayed.

2 Select **Yes**.

Result:

- If you selected a Directly Managed Storage Subsystem from the Device Tree View, that Storage Subsystem node is removed.
- If you selected a Host-Agent Managed Storage Subsystem from the Device Tree View, that Storage Subsystem node is removed but the Host node remains.
- If you selected a Host from the Device Tree View, the Host node and any associated Storage Subsystem nodes attached to it are removed.
- If you selected any Storage Subsystem from the right-hand Device Table, all instances of that Storage Subsystem (Directly Managed and/or Host-Agent Managed) are removed.

Rescanning a Host for New Storage Subsystems

Use this option to discover newly attached Storage Subsystems on a selected Host. Before using this option, make sure that the Host-Agent software has recognized the newly attached Storage Subsystems. Depending on your operating system, you may have to reboot the host or run a system-specific utility to allow the Host-Agent software to recognize the new Storage Subsystems. Refer to the Software Installation Guide for details.

How to Rescan a Host

1 Select a Host in the Device Tree View, then select one of the following:

- **Rescan**  toolbar button
- **Tools** >> **Rescan** pulldown menu option
- **Rescan** from the right-mouse pop up menu

Result: The **Confirm Rescan** dialog is displayed.

2 Select **OK** to begin the rescan operation.

Result:

- The Enterprise Management software, using the appropriate protocol, queries the selected Host for additional Storage Subsystems.
- The Progress dialog displays "`Performing rescan of` *`Host`*", where *`Host`* is the name of the selected Host. The Progress Bar begins to display relative progress, shown as a percentage of the estimated time it will take to complete.
- At the end of the rescan process, the progress bar is cleared to show no activity, and the Progress dialog shows either:
  - `Rescan completed`

    -OR-
  - `Rescan did not complete successfully.`

  Any newly discovered Storage Subsystems are displayed in the Device Tree View as child nodes of the selected Host. The Device Table in the right pane is also updated.

Adding or Editing a Comment for a Storage Subsystem

Use this option to add a comment for a Storage Subsystem to the Device Table of the Enterprise Management Window, or to edit a comment. A descriptive comment, in conjunction with an appropriate Storage Subsystem name, is a helpful identification tool.

Note: To name a Storage Subsystem, you must select the specific Storage Subsystem and launch its Subsystem Management Window and then select the **Storage Subsystem** >> **Rename** option. Optionally, you can select the **Tools** >> **Execute Script** option to name a Storage Subsystem and use the `set` command (for example, `set StorageArray userlabel="Engineering"`).

How to Add or Edit a Storage Subsystem Comment

1. Select a Storage Subsystem in either the Device Tree View or the Device Table, then select the **Edit** >> **Comment** pull-down menu option, or **Comment** from the right-mouse pop-up menu.

   Result: The **Edit Comment** dialog is displayed.

2. Type the comment in the text box (there is a 60 character limit).

3. Select **OK**.

   Result: The comment is updated in the Device Table, and saved in your local Management Station file system. The comment will not be displayed to administrators using other Management Stations in the domain.

Monitoring Storage Subsystem Status

When the Enterprise Management Window is opened, the storage management software establishes communication with each Storage Subsystem in the management domain and determines the current Storage Subsystem status. The status icons displayed in the Enterprise Management Window represent a summary status for each Storage Subsystem. If a Storage Subsystem has a Needs Attention or Fixing status, you must select the Storage Subsystem and launch its Subsystem Management Window to determine the condition that is causing this status. More detailed status icons are shown in the Subsystem Management Window for the various components that comprise the Storage Subsystem. Also, the Recovery Guru option provides a detailed explanation of the condition(s) and the appropriate steps to remedy any Needs Attention status.

While Storage Subsystems in the management domain are being contacted:

- The Contacting Device icon  is shown in the Device Tree (left-hand pane) and Device Table (right-hand pane) until the current status of each individual Storage Subsystem is known. See "Status Icons in the Device Tree View" and "Status Icons in the Device Table View", below.
- The overall health status area shows the Contacting Device icon, and the tooltip displays "Contacting devices in the management domain." See "Status Icons in the Overall Health Status Area", below.
- As each Storage Subsystem is contacted, its current status is obtained and shown in the Device Tree and Device Table. The applicable statuses are Optimal, Needs Attention, Fixing, or Unresponsive. See "Status Icons in the Device Tree View" and "Status Icons in the Device Table View", below.

After all of the Storage Subsystems have been contacted:

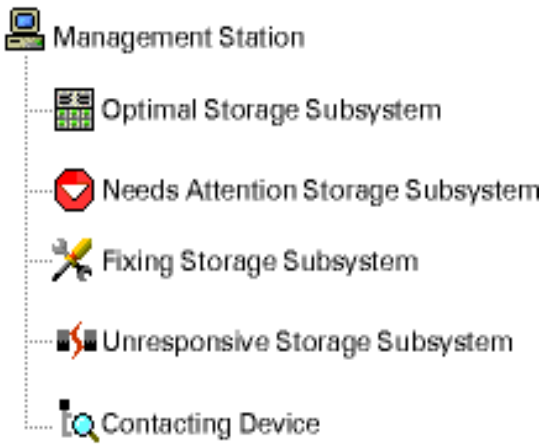
- The icon and tooltip of the overall health status area reflect the true overall health status of the Storage Subsystems in the management domain. See "Status Icons in the Overall Health Status Area", below.
- The storage management software continues to listen for status change events. These status change events are used to update:
    - The Storage Subsystem icons in the Enterprise Management Window
    - The more detailed component status icons in the Subsystem

Management Window

Important: The Storage Subsystem management software checks every network link to each Storage Subsystem controller every 5 minutes for an Unresponsive status change. If a network link goes down or comes back up right after it is checked, it could be up to 5 minutes before the corresponding status icon is updated to reflect a change to or from Unresponsive. All other status change events are updated more quickly.

Status Icons in the Device Tree View

The Device Tree View displays five possible types of Storage Subsystem status icons.



In the example at left, all five status icons are represented in the Device Tree.

Status	Indicates...
Optimal	Every component in the Storage Subsystem is in the desired working condition.
Needs Attention	There is a problem on the Storage Subsystem that requires your intervention to correct it.
Fixing	A Needs Attention condition has been corrected and the Storage Subsystem is currently transitioning to an Optimal state.

Unresponsive	The management station cannot communicate with the only controller or both controllers in the Storage Subsystem.
Contacting Device	You have started the Enterprise Management Window and the management software is establishing contact with the Storage Subsystem.

Status Icons in the Device Table View

In the Device Table, every Storage Subsystem is listed once, regardless of the number of attachments it has in the Device Tree. After the Storage Subsystem has been contacted by the Enterprise Management software, an icon representing its hardware status (Optimal, Needs Attention, or Fixing) is displayed. If, however, **all** of the network management connections from your Management Station to the Storage Subsystem (as shown in the Device Tree) are Unresponsive, the Storage Subsystem status is represented with an Unresponsive icon.

Status Icons in the Overall Health Status Area

The Enterprise Management Window provides an overall health status area in its lower left hand corner that displays a consolidated health status for all of the known Storage Subsystems in the management domain.

There are four possible Overall Health Status conditions:

Optimal		All discovered Storage Subsystems have an Optimal or a Fixing status
Needs Attention		One or more discovered Storage Subsystems has a Needs Attention status

Unresponsive		One or more discovered Storage Subsystems has an Unresponsive status
Contacting Device		One or more discovered Storage Subsystems in the management domain are still being contacted. This is a temporary status: when every Storage Subsystem has been contacted, this icon is replaced with the true overall health status.

Notes:

- Hold your mouse over the Overall Health Status icon to display a tool tip with a brief description of the status.
- The Needs Attention and Unresponsive Overall Health Status icons both display in this area if there are discovered Storage Subsystems in both conditions.

Recovering from an Unresponsive Storage Subsystem Condition

This condition occurs when your management station cannot communicate with the only controller or both controllers over its network management connection to the Storage Subsystem. An Unresponsive Status is represented by this icon  in the Device Tree or Device Table Views. You will also receive notices if you attempt to launch the Subsystem Management Window while the Storage Subsystem is currently unresponsive.

Recovery Steps

A Storage Subsystem may be unresponsive for several reasons. Use the following steps to determine a possible cause and solution.

Important: It can take up to 5 minutes before the Enterprise Management software detects that a Storage Subsystem has gone unresponsive or becomes responsive again. Therefore, when you perform the suggested actions below, make sure you wait a sufficient amount of time before concluding that the Storage Subsystem is still unresponsive.

1. Check the Device Tree to see if all of the Storage Subsystems in the management domain are unresponsive. If this is the case, check the management station network connection and make sure that it can reach the network; otherwise, continue with step 2.

2 Check to make sure that the controllers are installed and that there is power to the Storage Subsystem. If there is a problem, correct it. Otherwise...

If you are attempting to manage the Storage Subsystem through...	**Then...**
Each Ethernet connection on the controllers (Directly Managed)	Go to step 3.
A Host's network connection (Host-Agent Managed)	Go to step 4.

3 For a Directly Managed Storage Subsystem:

- Check the Ethernet cables to make sure that there is no visible damage, and they are securely connected.
- Make sure the appropriate network configuration tasks have been performed (for example, IP addresses assigned to each controller, and so on.). Refer to the Software Installation Guide for details.
- Make sure the controller(s) are network-accessible. One way to do this is to use the `ping` command to verify that the controller can be reached. Use the form `ping <Host name or IP address of controller>`.

If there is a cable or network accessibility problem, fix the problem, otherwise go to step 5.

4 For a Host-Agent Managed Storage Subsystem:

- Check that the host is turned on and operational and that the host adapters have been installed.
- Make sure the host is network-accessible. One way to do this is to use the `ping` command to verify that the host can be reached. Use the form `ping <Host name or IP address of Host>.`
- Check all external cables and switches or hubs to make sure that there is no visible damage, and they are securely connected.
- Make sure the Host Agent software is installed and running. If you started the host system before you were connected to the controllers in the Storage Subsystem, the Host Agent software will not be able to find the controllers. If this is the case, make sure the connections are

secure and then re-start the Host Agent software. Refer to the Software Installation Guide on how to restart the Host Agent.

- If you have recently replaced or added the controller, re-start the Host Agent software so that the new controller is recognized.

If there is a problem, make the appropriate host modifications, otherwise continue with step 5.

5 Check with other administrators to see if a firmware upgrade was performed on the controllers from another management station. If this happened, the Enterprise Management software on your management station may not be able to locate the new Subsystem Management Window software needed to manage the Storage Subsystem with the new version of firmware.

If this is the problem, contact your customer support representative, otherwise continue with step 6.

6 Determine if there is an excessive amount of network traffic to one or more controllers. This is a self-correcting problem, because the Enterprise Management software periodically retries, in the background, to establish communication with the controllers in the Storage Subsystem. If the Storage Subsystem was unresponsive and then a future attempt to connect to the Storage Subsystem succeeds, the Storage Subsystem becomes responsive.

For a Directly Managed Storage Subsystem, determine if management operations are taking place on the Storage Subsystem from other Management Stations. There is a controller-determined limit to the number of TCP/IP connections that can be made to it before it stops responding to subsequent connection attempts. The type of management operations being performed and the number of management sessions taking place together determine the number of TCP/IP connections made to a controller. This is a self-correcting problem, because after some of the TCP/IP connections terminate, the controller then becomes responsive to other connection attempts.

7 If the Storage Subsystem is still unresponsive, you probably have faulty controllers. Contact your Customer Support Representative.

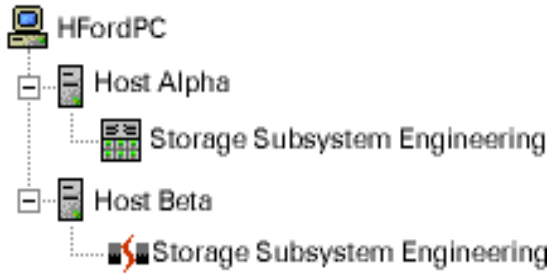
Launching the Subsystem Management Window for a Selected Storage Subsystem

If you need to perform individual management operations (such as creating logical drives or recovering from failures) on a particular Storage Subsystem, you must launch its Subsystem Management Window using one of the following methods:

- Select the Storage Subsystem in either the Device Tree View or the Device Table, then select the **Manage Device**  toolbar button, or the **Tools** >> **Manage Device** pull-down menu option.
- Right-click the Storage Subsystem in the Device Tree View or Device Table, then select **Manage Device** from the displayed pop-up menu.
- Double-click on a Storage Subsystem node in either the Device Tree View or the Device Table.
- Select the Storage Subsystem in either the Device Tree View or the Device Table, then press `Enter`.

Result: The Subsystem Management Window is opened, in a separate window. (If the appropriate Subsystem Management Window for the selected Storage Subsystem is already open on that management station, a second instance is not opened.)

Important: If you have configured more than one network management connection into the Storage Subsystem, the storage management software is aware of each connection and automatically chooses a connection when you attempt to manage the Storage Subsystem by launching an Subsystem Management Window. If a particular connection is currently not responding, the software tries all other configured network management connections into that Storage Subsystem.



In the example on the left, Hosts Alpha and Beta are each providing network management connections to the Storage Subsystem Engineering (the Storage Subsystem appears under each Host in the Device Tree).

The Storage Subsystem is unresponsive through the network management connection provided by Beta and therefore cannot be managed using this connection. However, if you select the Storage Subsystem node under Beta and launch an Subsystem Management Window, the Enterprise Management software opens an Subsystem Management window to manage the Storage Subsystem using the network management connection provided by Alpha.

Configuring E-mail and SNMP Alert Notification Settings

Use the **Add/Edit Alerts** option to:

- Configure the destination addresses for delivery of e-mail and ASCII SNMP trap messages containing critical event details affecting a Storage Subsystem.
- Validate potential destination addresses by sending test notification messages and reporting the delivery status.
- Configure alert notification to send an e-mail alert to a specified customer support organization. The e-mail alert will contain a summary of the critical event, detailed information about the affected Storage Subsystem, and custom contact information. For more information on this option, see Configuring Customer Support Alert Notifications.

What information is contained in an e-mail or trap message?

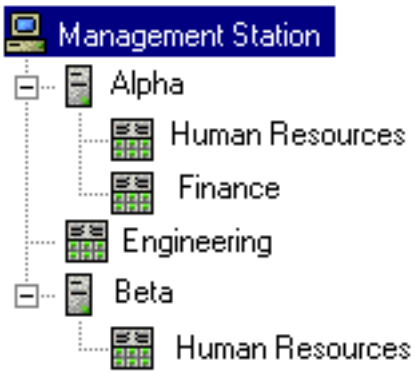
- Name of the affected Storage Subsystem
- Host IP address (only for a Host-Agent Managed Storage Subsystem)
- Host name/ID (shown as Directly Managed if the Storage Subsystem is directly attached to the network)
- Event error type related to an Event Log entry
- Date and time when the event occurred
- Brief description of the event

For more information about event types, see "Viewing Events with the Event Log" in the Subsystem Management Window help system.

Important:

- If you are going to configure e-mail alert destinations, you must use the **Alert>>Global Settings** option to specify a mail server and sender e-mail address.
- Host destinations for SNMP traps must be running an SNMP service so that the trap information can be processed.
- The Enterprise Management Window must be open to send alert notifications (e-mail or SNMP traps).

- You can configure the alert destinations at the different levels, Management Station, Host and Storage Subsystem, for tailored notifications (see the examples below).

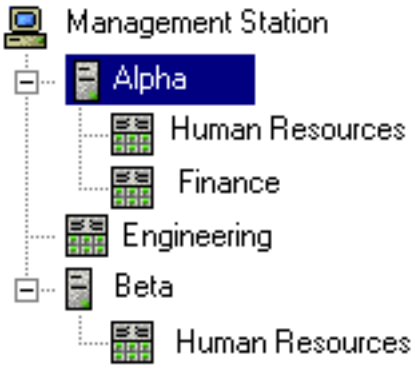


Management Station-Level Notifications

Select the Management Station node if you want to configure e-mail and/or SNMP trap destinations to receive notifications for *every* Storage Subsystem in the management domain.

Note: If there are alert destinations also configured for hosts or Storage Subsystems in the domain, the Enterprise Management software eliminates duplicate Storage Subsystem notifications delivered to the same destination.

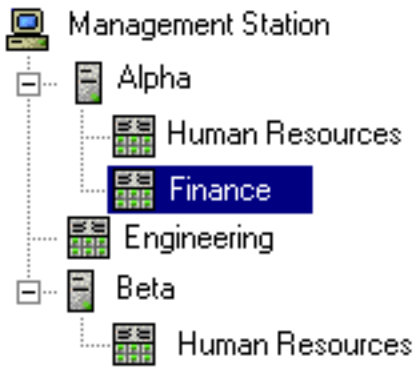
In the example at left, selecting the Management Station node and configuring alert destinations will cause those destinations to receive notifications for every Storage Subsystem in the management domain.



Host-Level Notifications

Select a host node if you want to configure e-mail and/or SNMP trap destinations to receive notifications for *only* those Storage Subsystems that are managed through the selected host.

In the example at left, selecting the Alpha host and configuring alert destinations will cause those destinations to receive notifications only for the Human Resources and Finance Storage Subsystems.



Storage Subsystem-Level Notifications

Select a Storage Subsystem node if you want to configure e-mail and/or SNMP trap destinations to receive notifications for *only* the selected Storage Subsystem.

Note: If both Host-level and Storage Subsystem-level settings are configured for a Storage Subsystem, the Enterprise Management software eliminates duplicate Storage Subsystem notifications delivered to the same destination.

In the example at left, selecting the Finance Storage Subsystem and configuring alert destinations will cause those destinations to receive notifications only for the Finance Storage Subsystem.

A Host-Agent Managed Storage Subsystem Attached to Multiple Hosts

If the Storage Subsystem is managed through multiple hosts, you can configure alert destinations for more than one host node. In this case, the Enterprise Management software eliminates duplicate Storage Subsystem notifications delivered to the same destination, and only one host (host name and IP address) is shown in the notifications.

In the example at left, the Human Resources Storage Subsystem is managed through both the Alpha and the Beta hosts. Alert notifications about "Human Resources" lists the host name and IP address of either Alpha or Beta, instead of duplicating the notifications and listing

both hosts.

How to Edit the Alert Settings

1 Select a node in the Device Tree View; then select the **Edit >>Alert >>Destinations** pull-down menu option, or **Alert >>Destinations** from the right-mouse pop-up menu.

Result: The **Add/Edit Alerts** dialog is displayed. Note that the Node name indicates the node you selected and the level at which the alert will take place.

2 Configure e-mail destinations, if desired.

- You must provide a mail server name and an e-mail sender address using the **Alert >> Global Settings** option for the e-mail addresses to work.
- Any e-mail destinations you had previously configured for this Management Station are displayed in the **Configured e-mail addresses:** list.
- Use fully qualified e-mail addresses (for example, name@mycompany.com)
- You can configure multiple destinations before you select **OK.**

TASK	PROCEDURE
Adding an e-mail address	To add an e-mail address, type the address in the **E-mail address:** text box, then select **Add**. **Result:** The selected e-mail address is listed in the **Configured e-mail addresses:** list box. After you select **OK**, alert notifications will be delivered to this e-mail address.

Replacing an e-mail address	To replace an e-mail address, select it in the **Configured e-mail addresses:** list, type the replacement address in the **E-mail address:** text box, then select **Replace**. **Result:** The selected e-mail address is replaced in the **Configured e-mail addresses:** list. After you select **OK**, alert notifications will be delivered to this e-mail address.
Deleting an e-mail address	To delete an e-mail address, select it in the **Configured e-mail addresses:** list, then select **Delete**. **Result:** The e-mail address is deleted from the **Configured e-mail addresses:** list. After you select **OK**, alert notifications are no longer sent to this e-mail address.
Validating an e-mail address	To validate an e-mail address, type the address in the text box or select it in the **Configured e-mail addresses:** list, then select **Validate**. **Result:** A test message is sent to the selected e-mail address. A message box with the results of the validation and any error information is displayed. Select **OK** on the message box to close it.

3 Configure SNMP trap destinations, if desired.

- Any SNMP trap destinations you had previously configured for this Management Station are displayed in the **Configured SNMP addresses:** list.
- The **SNMP Community Name** is set in the NMS configuration file by a Network Administrator. The default is `public`.
- The **SNMP trap destination** is the IP address or the host name of a station running an SNMP service. At a minimum, this will be the Network Management station.

TASK	PROCEDURE
Adding an SNMP address	To add an SNMP address, type the Community Name and the Trap destination in the appropriate text boxes, then select **Add**. Trap destinations can be machine names or IP addresses in dotted decimal format. **Result:** The selected SNMP address is listed in the **Configured SNMP addresses:** list. After you select **OK**, alert notifications will be delivered to this SNMP address.
Replacing an SNMP address	To replace an SNMP address, select it in the **Configured SNMP addresses:** list, type the replacement Community Name and the Trap destination in the appropriate text boxes, then select **Replace**. **Result:** The selected SNMP address is replaced in the **Configured SNMP addresses:** list. After you select **OK**, alert notifications will be delivered to this new SNMP address.
Deleting an SNMP address	To delete an SNMP address, select it in the **Configured SNMP addresses:** list, then select **Delete**. **Result:** The SNMP address is deleted from the **Configured SNMP addresses:** list. After you select **OK**, alert notifications are no longer sent to this SNMP address.
Validating an SNMP address	To validate an SNMP address, type the address in the text box, then select **Validate**. **Result:** A test message is sent to the SNMP address. A message box with the results of the validation and any error information is displayed. Select **OK** on the message box to close it.

4 Select **OK** to save the e-mail and SNMP destinations.

Configuring Alert Global Settings

Use this option to specify e-mail alert settings for every Storage Subsystem in the management domain. The e-mail alert settings you can globally configure are SMTP server name and e-mail sender address.

Note: There are no global settings required for the SNMP trap messages. Traps sent to a Network Management Station or other SNMP server are standard network traffic and security issues are handled by a system or network administrator.

Information	Description
SMTP Server Name	The name of the Mail server that forwards the e-mail to configured e-mail alert destinations.
E-mail sender's address	The sender's e-mail address (usually the Network Administrator) that will appear on every mail message sent to configured e-mail alert destinations.

Important:

- If you do not specify an SMTP server name, the Enterprise Management software attempts to send the e-mail using a mail server on the local Management Station.
- The e-mail sender's address, required in the SMTP protocol, must be specified or an error will result.

How to Specify Alert Global Settings

1 Select either the **Edit >> Alert >> Global Settings** pull-down menu option, or **Alert >> Global Settings** from the right-mouse pop-up menu.

Result: The **Alert Global Settings** dialog is displayed.

2 Type the name of the SMTP mail server and the e-mail sender address (required field) in the appropriate text boxes. Use a valid e-mail address.

3 Select **OK**.

Result: The global configuration settings are saved and are used when sending future e-mail critical alert messages about Storage Subsystems in this management domain.

Using the Script Editor

Many storage management commands available through the Subsystem Management Window can also be sent to the Storage Subsystem using statements in scripts. Use the Script Editor to create or edit a script file, save a script file to the Management Station local disk, or load a script file from disk. The Script Editor has an underlying engine that verifies statement syntax, interprets the statements, converts statements to the appropriate protocol-compliant commands, and passes the commands to the Storage Subsystem where they are executed by the Storage Subsystem controller. For a list of command statements and how to use them, see Script Editor Command Reference.

How to Open the Script Editor

To open the Script Editor, first select the desired Storage Subsystem in the Device Tree View or Device Table. Then, select either the **Tools >> Execute Script** pull-down menu option, or **Execute Script** from the right-mouse pop-up menu.

Result: The Script Editor opens. There are two views in the window:

- **Script View** - Provides an area for inputting/editing script commands.
- **Output View** - Displays verification or execution results.

A splitter bar divides the window between Script View and Output View. You can use the splitter bar to resize the views.

Usage Guidelines

- All statements must end with a semi-colon (;)
- Separate each base command and its associated primary and secondary parameters with a space.
- The Script Editor is not case sensitive.
- Put each statement on a separate line.
- Add comments to your scripts to make it easier for yourself and future users to understand the purpose of the command statements.

Adding Comments to a Script

The Script Editor supports the following comment formats, as described below:

- Text contained after two forward-slashes `//` until an **`Enter`** character is

reached.

Example: In the following example, the comment "`The following command assigns hot spare drives`" is included for clarification and is not processed by the Script Editor.

```
//The following command assigns hot spare
drives.

set drives [1,2 1,3] hotspare=true;
```

Important: You must end a comment beginning with `//` with an end-of-line character, inserted by pressing the **`Enter`** key. If the script engine does not find an end of line character in the script after processing a comment, an error message is displayed and the script execution is terminated. This error commonly occurs when a comment is placed at the end of a script and you have forgotton to press **`Enter`**.

- Text contained between the characters /* and */.

  Example: In the following example, the comment "`The following command assigns hot spare drives`" is included for clarification and is not processed by the Script Editor.

  ```
  /* The following command assigns hot spare
  drives.*/

  set drives [1,2 1,3] hotspare=true;
  ```

  Important: You must end a comment beginning with `/*` with `*/`. If the script engine does not find both a beginning and ending comment notation, an error message is displayed and the script execution is terminated.

Using the `show` statement

Use the **`show`** statement to embed comments in your script that will display in the Output View during script execution.

Example: The inclusion of a **`Show "setting controller mode"`** statement in your script results in the display of `setting controller mode` in the Output

View when this line is processed during script execution.

For more information about the **show** statement, see Script Editor Command Reference.

Script Editor File Options

Task	How to Perform
Open a new script	Select the **File >> New Script** option. **Result:** The Script View is cleared for new script input and the Output View is cleared.
Edit an existing script	1 Select the **File >> Load Script** pull-down menu option. **Result:** The **Load Script** file selection dialog is displayed. 2 Select the script file you want to edit from your file system, then select **OK**. **Result:** The **Load Script** dialog closes and the selected script file is loaded into the Script View. For a list of command statements and how to use them, see Script Editor Command Reference.
Save the script in the Script View without prompting for a new filename	Select the **File >> Save Script** pull-down menu option. **Note:** If you exit the Script Editor without saving a modified script, you are prompted to save your script before exiting.

Save the script in the Script View with a new filename	1 Select the **File** >> **Save Script As** pull-down menu option. **Result:** The **Save Script As** dialog is displayed, listing any subdirectory folders and showing any filenames with a `.scr` extension. To show all files, select **All Files** from the **Files of type:** list box. 2 Select a subdirectory folder, name the script file, and select **Save**. **Note:** You can specify any file extension, but the **Save Script As** dialog by default shows files with a `.scr` extension. The Script Editor does not automatically append the `.scr` to the end of a file. **Result:** The **Save Script As** dialog closes and the script file is saved in the selected directory.
Save the script execution results to a local file	1 Select the **File** >> **Save Output As** pull-down menu option. **Result:** The **Save Output As** dialog is displayed, listing any subdirectory folders and showing any filenames with a `.txt` extension. To show all files, select **All Files** from the **Files of type:** list box. 2 Select a subdirectory folder, if desired, name the output file, and select **Save**. **Note:** You can use any file extension, but the **Save Output As** dialog by default shows files with a `.txt` extension. The Script Editor does not automatically append the `.txt` extension. **Result:** The **Save Output As** dialog closes and the output file is saved in the selected directory.

Script Editor Edit Options

Use the following **Edit** menu options for convenient script editing.

Task	How to Perform
Cut selected text from the script in the Script View	Select the **Edit** >> **Cut** pull-down menu option.
Copy selected text from the Script View or Output View to system memory	Select the **Edit** >> **Copy** pull-down menu option.
Paste information from system memory into the script	Select the **Edit** >> **Paste** pull-down menu option.
Clear the text in the Script View	Select the **Edit** >> **Clear Script** pull-down menu option.
Clear the text in the Output View	Select the **Edit** >> **Clear Output** pull-down menu option.
Select all of the text in the Script View	Select the **Edit** >> **Select All** pull-down menu option.

Script Editor Tools Options

Task	How to Perform
Verify script command syntax	Select the **Tools** >> **Verify Syntax** pull-down menu option. **Result:** The Script Editor engine parses the statements, one line at a time, in your script file and verifies that they have the correct syntax. Any syntax errors are displayed in the Output View, reporting the line number of the error and a description of the error. If the Script Editor encounters a syntax error, no further syntax verification is performed on the script. Fix the syntax error and rerun the **Verify Syntax** command to validate the error correction and check the remainder of the statements in the script.

Execute the currently loaded script	Select the **Tools >> Verify and Execute** option or the **Tools >> Execute Only** option. (Both options display an error message if a syntax error is encountered, but the **Tools >> Verify and Execute** option checks the script a line at a time for correct syntax before the script is executed, and it provides syntax error feedback in the Output View.) **Result:** The Script Editor engine parses the command statements in the script, interprets and converts the statements to the appropriate commands, and sends the commands to the Storage Subsystem controller. If a syntax error is encountered, the execution stops and an error message is displayed. Fix the error, then use the **Verify Syntax** or **Verify and Execute** options to validate the error correction. **Important:** If an execution error occurs, the script may or may not continue to execute depending on the included **On Error** script statement. • The **`On Error Stop`** statement stops the script if an execution error is encountered (this is the default) • The **`On Error Continue`** statement allows the script to continue even after an execution error is encountered

Interpreting the Script Execution Results

During script execution, messages are displayed in the Output View beginning with:

```
Executing script....
```

After a successful script execution, you see the message

```
Script execution complete.
```

If there is an error during the parse phase, an error is displayed in the output area giving the line and column number and a description of the syntax error.

Example: If you enter the following statement in a script:

```
set controller[a] mod = passive;
```

Then the resulting syntax error is displayed in the Output View as shown below:

```
Encountered "mod" at line 2, column 19

Was expecting one of...

     "mode"...

     "availability"...

     "NVSRAMbyte"...
```

If there is an error during execution, a message is displayed in the output area stating that the command failed and reporting a description of the error.

Example: If you enter the following statement in a script:

```
set logical drive [three] userLabel = "OneOne";
```

In this example, the command could not be sent to the Storage Subsystem because it was in an Unresponsive state. The resulting error is displayed in the Output View as follows:

```
Unable to change the logical drive user label using the
Set Logical Drive command at line 1

Error - 1 - Could not communicate with the Storage
Subsystem to complete this request.
```

Important: Certain execution errors, including the inability to communicate with the Storage Subsystem, always cause script execution to halt. In these cases, execution stops even if you have used the **`On Error Continue`** statement. For more information, see Recovering from an Unresponsive Controller or Storage Subsystem Condition.

Script Editor Command Reference

Overview

The Script Editor supports the use of the following seven commands. These commands, used in conjunction with specific parameters, allow you to perform various Storage Subsystem management tasks. Click on the name of the command in the **Command** column to jump to the command syntax and examples.

Command	Allows you to...
create logicalDrive	create logical drives on a set of drives (unconfigured capacity), turning those drives into a new array or create logical drives on an existing array (free capacity).
delete	delete an array or logical drive.
download	download new firmware or NVSRAM to the Storage Subsystem.
on error	dictate the script behavior when execution fails. The default behavior is for the script to continue executing subsequent commands after a command has failed.
set	change a component's properties. You can set multiple properties for a specific component using one set command.
show	display the properties of the different logical and physical components comprising the Storage Subsystem. You can also use the show command to embed text strings (comments) in your script that will display in the output area during script execution.

use	specify the password to use for destructive commands. Currently there is only one option for the use command. **Notes:** • This command does NOT set the password. In the set command, there is a password parameter for the Storage Subsystem. • This command is only required once in a script, not in front of each destructive command.

Grammar

Common Syntax

- All statements must end with a semi-colon (;).
- Separate each base command and primary/secondary parameters with a space.
- The script editor is not case-sensitive. You can enter any combination of upper and lowercase letters. The usage shown in the following tables follows the convention of having a capital letter start the second word of a parameter.

Create Logical Drive Command

Create Logical Drive Syntax		
If you want to...	**Base Command**	**Primary and Secondary Parameters**

create a logical drive using any unassigned drives (unconfigured capacity)	**create logicalDrive**	**Primary Parameters** **driveCount [number of drives]** where: [number of drives] = number of unassigned drives you want to use. **Secondary Parameters[1]** ● **capacity** = integer or decimal value + capacity units where capacity units = Bytes, KB, MB, GB, or TB. If you don't specify a capacity, all of the capacity available on the drives in the array are used. If you don't specify a capacity unit, Bytes is used by default. ● **owner** = a or b where a = controller in slot A and b = controller in slot B. If you don't specify an owner, the owner is determined by the controller firmware. ● **RAIDLevel[2]** = 0, 1, 3, or 5 (RAID 1 is also commonly referred to as RAID 10 or 0+1). ● **usageHint** = fileSystem, dataBase, or multiMedia. If you don't specify a usageHint, fileSystem is used by default. ● **userLabel[3]** = "any double-quoted string up to 30 characters". The string cannot contain a newline. ● **segmentSize** = any positive integer value. This value is checked against the supported values provided by the controller at run time. If the value entered is not valid, the controller will return a list of appropriate values.

create a logical drive using specific unassigned drives (unconfigured capacity)	**create logicalDrive**	**Primary Parameters** **drive**or**drives [drive list]** where: [drive list] = enclosureID, slotID of each unassigned drive, separated by spaces. **Secondary Parameters[1]** ● **capacity** = integer or decimal value + capacity units where capacity units = Bytes, KB, MB, GB, or TB. If you don't specify a capacity, all of the capacity available on the drives in the array are used. If you don't specify a capacity unit, Bytes is used by default. ● **owner** = a or b where a = controller in slot A and b = controller in slot B. If you don't specify an owner, the owner is determined by the controller firmware. ● **RAIDLevel[2]** = 0, 1, 3, or 5 (RAID 1 is also commonly referred to as RAID 10 or 0+1). ● **usageHint** = fileSystem, dataBase, or multiMedia. If you don't specify a usageHint, fileSystem is used by default. ● **userLabel[3]** = "any double-quoted string up to 30 characters". The string cannot contain a newline. ● **segmentSize** = any positive integer value. This value is checked against the supported values provided by the controller at run time. If the value entered is not valid, the controller will return

		a list of appropriate values.
create a logical drive on an existing array (free capacity)	**create logicalDrive**	**Primary Parameters** **array [array number]** where: [array number] = the sequence number of the array. **Secondary Parameters[1]** ● **capacity** = integer or decimal value + capacity units where capacity units = Bytes, KB, MB, GB, or TB. If you don't specify a capacity, all of the capacity available on the drives in the array are used. If you don't specify a capacity unit, Bytes is used by default. ● **owner** = a or b where a = controller in slot A and b = controller in slot B. If you don't specify an owner, the owner is determined by the controller firmware. ● **RAIDLevel[2]** = 0, 1, 3, or 5 (RAID 1 is also commonly referred to as RAID 10 or 0+1). ● **usageHint** = fileSystem, dataBase, or multiMedia. If you don't specify a usageHint, fileSystem is used by default. ● **userLabel[3]** = "any double-quoted string up to 30 characters". The string cannot contain a newline. ● **segmentSize** = any positive integer value. This value is checked against the supported values provided by the controller at run time. If the value entered is not valid, the controller will return

		a list of appropriate values.

[1]You can specify all other logical drive parameters using the set Command.
[2]RAIDLevel is a required parameter for the first two Create Logical Drive commands.
[3]userLabel is a required parameter for all Create Logical Drive commands.

Create Logical Drive Examples	
Task	**Command Statement and Execution Results**
Create a logical drive using any unassigned drives.	**Command Statement** create logicalDrive driveCount[4] RAIDLevel=1 capacity=10GB owner=a usageHint=multiMedia userLabel="Chevelle"; **Execution Results** ● A RAID 1, 10 GB logical drive is created with the name "Chevelle" using 4 available, unassigned drives. ● The logical drive is owned by the controller in slot A with a specified usage of multimedia.
Create a logical drive using specific unassigned drives.	**Command Statement** create logicalDrive drives [1,1 1,2 1,3 1,4 1,5] RAIDLevel=5 userLabel="Nova"; **Execution Results** ● A RAID 5 logical drive is created with the name "Nova" using the 5 specified drives with the enclosureID, slotID designation. ● The logical drive's capacity uses the entire capacity included on the 5 specified drives minus the factor included for redundancy. ● Because the owner was not specified, it is determined by the controller firmware. ● FileSystem is used by default for the specified logical drive usage.

Create a logical drive on array number 3.	**Command Statement** create logicalDrive array[3] capacity=2000MB userLabel="Chevy II"; **Execution Results** ● An additional 2000 MB logical drive is created on array 3 with the name "Chevy II". ● The logical drive is owned by the controller owning the other logical drives on array 3. ● The RAID level of the logical drive is the RAID level of the other logical drives on array 3. ● FileSystem is used by default for the specified logical drive usage.

Delete Command

Delete Syntax		
If you want to...	**Base Command**	**Primary Parameters**
delete a logical drive	**delete**	**logicalDrive [userLabel]** where: [userLabel] = "any double-quoted string up to 30 characters".
delete an array	**delete**	**array [array number]** where: [array number] = the sequence number of the array.

Delete Examples	
Task	**Command Statement and Execution Results**
Delete the logical drive named Chevelle.	**Command Statement** delete logicalDrive ["Chevelle"]; **Execution Results** ● The logical drive named Chevelle is deleted. ● Any data on this logical drive is lost.
Delete array number 3 and its associated logical drives.	**Command Statement** delete array[3]; **Execution Results** ● Array 3 and its associated logical drives are deleted. ● Any data on this array is lost.

Download Command

Download Syntax		
If you want to...	**Base Command**	**Primary Parameters**
download a firmware file	**download**	**storageSubsystem firmwareFile** = filename where: filename = is a valid firmware file.
download an NVSRAM file	**download**	**storageSubsystem NVSRAMFile =** filename where: filename = is a valid NVSRAM file.

Download Examples	
Task	**Command Statement and Execution Results**
Download a firmware file.	**Command Statement** download storageSubsystem firmwareFile=04000001.dlp; **Execution Results** ● The firmware file, 04000001.dlp, is downloaded to the controllers in the Storage Subsystem.
Download an NVSRAM file.	**Command Statement** download storageSubsystem NVSRAMFile=06000001.dlp; **Execution Results** ● The NVSRAM file, 06000001.dlp, is downloaded to the controllers in the Storage Subsystem.

On Error Command

On Error Syntax		
If you want to...	**Base Command**	**Primary Parameters**
stop execution of the script if any commands following the On Error Stop command fail.	**on error**	**stop**
continue execution of the script even if any commands following the On Error Continue command fail.	**on error**	**continue**[1]
[1]The default behavior is for the script to continue executing subsequent commands after a command has failed. This command is for execution errors, not syntax errors. Also, there may be certain error conditions that override the "on error continue" parameter.		

On Error Examples	
Task	**Command Statement and Execution Results**
Stop execution of the script when an error is encountered.	**Command Statement** on error stop; **Execution Results** ● Any commands following the on error stop statement that fail to execute cause the script execution to stop.
Continue execution of the script when an error is encountered.	**Command Statement** on error continue; **Execution Results** ● Any commands following the on error continue statement that fail to execute do not cause the script execution to stop.

Set Command

Set Syntax		
If you want to...	**Base Command**	**Primary Parameters**
set properties of the Storage Subsystem	**set**	**Primary Parameters** **storageSubsystem** **Secondary Parameters** ● **batteryInstallDate** = true (battery is reset to the current date) ● **cacheBlockSize** = any positive integer value (normally 4 or 16). This value is in KB and is checked against the supported values provided by the controller at run time. If the value entered is not valid, the controller will return a list of appropriate values. ● **cacheFlushStart** = 0 to 100 (this indicates the point in the cache memory area, in percentage, that cache flushing should

start).

- **cacheFlushStop** = 0 to 100 (this indicates the point in the cache memory area, in percentage, that cache flushing should stop).
- **mediaScanRate** = number indicating the duration (in days) over which to run the media scan. Current range is 1 to 30 days. If you want to disable the media scan, use the term disabled instead of a 1 to 30 value. Note that you must also enable the media scan parameter and optionally, the redundancy check parameter on each individual logical drive on which you want to run the media scan.
- **userLabel** = "any double-quoted string up to 30 characters"
- **resetConfiguration** = true (configuration on the Storage Subsystem is reset back to a default configuration. **Attention:** Use with extreme caution!).
- **timeOfDay** = true (synchronizes the clocks on the controllers in the Storage Subsystem with the client host).
- **clearEventLog** = true (all events stored in the event log are deleted. **Attention:** Use with extreme caution!).
- **password** = "any double-quoted string up to 30 characters". Note that the password characters are not hidden (masked).

set properties of a controller	**set**	**Primary Parameters** **controller [controller-spec]** where: [controller-spec] = a or b (a = controller in slot A, and b = controller in Slot B). **Secondary Parameters[1]** ● **mode** = active or passive ● **availability** = online or offline  **Caution:** Using the **NVSRAMByte** parameter incorrectly could cause your Storage Subsystem to malfunction. The following procedure is provided as an example and should be used **only** under the guidance of a customer support representative. ● **NVSRAMByte [nvsram-offset]** = value; where: [nvsram-offset] = 0 to 0x3F and value = 0 to 255. **Note:** To set specific bits within an NVSRAM Byte, use the parameter as follows. **NVSRAMByte [nvsram-offset] =** mask,value The mask and value are used to set specific bits in an NVSRAM Byte and leave others unchanged. For each bit turned on (set to 1) in the "mask", the corresponding bit in the NVSRAM byte is set to match the value of that bit in "value". For each bit turned off (set to 0) in the mask, the original NVSRAM bit will be unchanged, regardless of the value for that bit. Use a range of 0 to 0x3F for **[nvsram-offset]**. Choose a number for

		"mask" and "value" within a hexadecimal range of 0x00 to 0xFF. The binary equivalent of a hexadecimal parameter setting is used to set individual bits within the byte. For example, a hexadecimal setting of 0x80 corresponds to the binary number of 1000 0000. Using 0x80 for the mask setting will allow bit 7 in the byte to be modified (because the number in the bit 7 position is 1.) All other bits in the byte will be masked (the mask values are set to 0). To set the value for bit 7, choose a hexadecimal setting for "value" whose binary equivalent contains the desired value in the bit 7 position. (Any values in other bit positions are ignored, because the bits are masked.) **Notes:** ❍ In this example, the bits are numbered from right to left starting with bit 0. ❍ If you want the NVSRAM in both controllers in a Storage Subsystem to match, you must run this command for each controller.
set properties of an array	**set**	**Primary Parameters** **array [array number]** where: [array number] = the sequence number of the array. **Secondary Parameters** ● **owner** = a or b where a = controller in slot A and b = controller in slot B.

set properties of a logical drive	**set**	**Primary Parameters** **logicalDrive [userLabel]** where: [userLabel] = "any double-quoted string up to 30 characters" **Secondary Parameters** ● **readCacheEnabled** = true (enabled) or false (disabled) ● **writeCacheEnabled** = true (enabled) or false (disabled) ● **mirrorEnabled** = true (enabled) or false (disabled) ● **cacheWithoutBatteryEnabled** = true (enabled) or false (disabled) ● **cacheFlushModifier** = immediate, 0.25 to 1.5 (increments of 0.25), 2, 5, 10, 20, 60, 120, 300, 1200, 3600, or infinite. The value is in seconds.  **Caution:** Setting cache flush modifier values above 10 seconds is not recommended except for controlled test situations! Even in a controlled test situation, the value should be set back to 10 seconds or below after the test has completed. ● **readAheadMultiplier** = any positive number ● **mediaScanEnabled** = true (enabled) or false (disabled) ● **redundancyCheckEnabled** = true (enabled) or false (disabled) ● **modificationPriority** = lowest, low, medium, high, or highest

create a hot spare drive from an unassigned drive	**set**	**Primary Parameters** **drive or drives [drive list]** where: [drive list] = enclosureID, slotID of each drive. **Secondary Parameters** ● **hotspare** = true (assign) or false (deassign)

Set Examples	
Task	**Command Statement and Execution Results**
Provide a name for the Storage Subsystem and set the cache to flush when it reaches 85 percent full, and stop flushing the cache when it reaches 15 percent full.	**Command Statement** set storageSubsystem userLabel="Engineering" cacheFlushStart=85 cacheFlushStop=15; **Execution Results** ● The Storage Subsystem is renamed to "Engineering". ● The cache flush start value is set to 85 percent. ● The cache flush stop value is set to 15 percent.
Set the controller in slot A to active mode.	**Command Statement** set controller[a] mode=active; **Execution Results** ● The controller in Slot A is set to the active mode.
Turn off the NVSRAM bit that enables the Access Logical Drive	**Command Statement** set controller[a] NVSRAMByte [0x32]=0x80,0x00; **Execution Results** ● NVSRAM Bit 7 of offset 0x32 is set to 0, disabling the Access Logical Drive.

Change the owner of array 3, and its associated logical drives, to the controller in slot B.	**Command Statement** set array[3] owner=b; **Execution Results** ● Array 3, and it associated components, are owned by the controller in slot B.
Enable the write cache and cache mirroring properties on the logical drive named Nova.	**Command Statement** set logicalDrive["Nova"] writeCacheEnabled=true mirrorEnabled=true; **Execution Results** ● The write cache and cache mirroring parameters are enabled on the logical drive named Nova.
Create two hot spares using the unassigned drives at enclosureID = 1, slotID = 2, and enclosureID = 1, slotID = 3.	**Command Statement** set drives [1,2 1,3] hotspare=true; **Execution Results** ● The unassigned drive at enclosure 1, slot 2 is assigned as a hot spare drive. ● The unassigned drive at enclosure 1, slot 3 is assigned as a hot spare drive.

Show Command

Show Syntax		
If you want to...	**Base Command**	**Primary and Secondary Parameters**
show properties of Storage Subsystem	**show**	**Primary Parameters** **storageSubsystem** **Secondary Parameters** ● **batteryAge** - displays the age of the battery in days and also the number of days until replacement. ● **healthStatus** - displays the overall health of the Storage Subsystem in the output area. ● **profile** - displays all of the various properties of the logical and physical components that comprise the Storage Subsystem in the output area.
show properties of controller	**show**	**Primary Parameters** **controller [controller-spec]** where: [controller-spec] = a or b (a = controller in slot A, and b = controller in Slot B). **Secondary Parameters** ● **mode** - displays the mode of the controller (active or passive) in the output area. ● **NVSRAMByte[nvsram-offset]** - displays the current value in the output area for the nvsram-offset specified.
show a comment and display it to the output area	**show**	**Primary Parameters** **string** where: string = "any double-quoted string". **Secondary Parameters** ● **None**

Show Examples	
Task	**Command Statement and Execution Results**
Display the health and profile of the Storage Subsystem.	**Command Statement** show storageSubsystem healthStatus profile; **Execution Results** ● The health of the Storage Subsystem and the various properties of the logical and physical components of the Storage Subsystem is displayed in the output area.
Show the current mode of the controller in Slot B.	**Command Statement** show controller[b] mode; **Execution Results** ● The current mode (active or passive) of the controller in Slot B is displayed in the output area.
Include several comments in the script.	**Command Statement** show "Starting logical drive creation..."; **Execution Results** ● The comment as specified is displayed in the output area.

Use Command

Use Syntax		
If you want to...	**Base Command**	**Primary Parameters**
specify the password to use for destructive commands	**use**	**password** where: password = "password set on Storage Subsystem"

Notes:

- This command does NOT set the password. In the set command, there is a password parameter for the Storage Subsystem.
- This command is only required once in a script, not in front of each destructive command.

Use Example	
Task	**Command Statement and Execution Results**
specify the password to use for destructive commands	**Command Statement** use password "coda4"; delete logicalDrive ["Chevelle"]; **Execution Results** The delete logical drive command, which is destructive, executes because the use password statement with the appropriate password was previously specified in the script.

Alert Destination

The SNMP or e-mail address for delivery of critical alert messages. See Configuring SNMP and E-mail Alert Notification Settings.

Community Name

A community name is a string of ASCII characters that identifies a known set of Network Management Stations and SNMP agents. In this version of the Enterprise Management software, the default community name is **`public`**.

When the Enterprise Management software sends an SNMP trap message because of a critical error on a Storage Subsystem, it includes the community name in the message. The SNMP trap receiver (typically a Network Management Station) will receive the trap message and compare the community name to its own configuration. If the community name is recognized, the trap message will be logged and processed; otherwise, the trap message is discarded.

For information on configuring a community name, see Configuring SNMP and E-mail Alert Notification Settings.

Configuration File

The Enterprise Management Window uses a primary and a backup configuration file (emwdata.bin and emwback.bin) to store the following information:

- A list of Storage Subsystems and Hosts that should be included in the management domain (when you perform the **Automatic Discovery**, **Add Device**, **Rescan** and **Remove Device** options, this list is automatically updated).
- Custom comments about displayed Storage Subsystems to include in the Device Table.
- The name of the Mail server you have set to forward e-mail to configured e-mail alert destinations.
- The sender's e-mail address you have set that will appear on every mail message sent to configured e-mail alert destinations.
- Alert notification destination addresses you have set for e-mail and SNMP trap messages regarding individual Storage Subsystems in the management domain.

These user-specific configuration files allow every system administrator to create their own unique view of the devices in the management domain, without affecting the information shown to other system administrators.

Both configuration files are stored in a default directory depending on your operating system. If needed, you can use your operating system's find option to locate these files.

Important: Be sure to make additional back-up copies of these files and place them in an alternate directory.

The Role of the Configuration Files in Enterprise Management Window Initialization

The backup configuration file (emwback.bin), is not immediately synchronized with the primary configuration file (emwdata.bin), in case the primary file is corrupted. Instead, when you first start the Enterprise Management Window, the software first attempts to locate and validate the primary configuration file.

If...	Then...
The primary configuration file is present, valid, and isn't empty	The backup configuration file is overwritten to match the primary configuration file. The Enterprise Management Window is displayed according to the user information in the primary configuration file.
The primary configuration file is not present or is corrupted -AND- The backup configuration file is present, valid, and isn't empty	The primary configuration file is overwritten to match the backup configuration file. The Enterprise Management Window is displayed according to the user information in the backup configuration file. This may not be the most current user data. It will be that data written to the backup file the last time the Enterprise Management Window was opened.
Both configuration files are corrupted -OR- One of the configuration files is corrupted -AND- The other configuration file is missing	The **Configuration File Error** dialog is displayed. See, Recovering From Configuration File Errors.

If...	Then...
Neither configuration file is present -OR- The primary configuration file is empty but valid -OR- The primary configuration file is corrupted and the backup configuration file is empty but valid	The **Initial Automatic Discovery** dialog is displayed. See, Performing an Initial Automatic Discovery.
Either configuration file is read or write protected	The **Configuration File Error** dialog is displayed. See, Recovering From Configuration File Errors.

Contacting Device Status

This temporary Storage Subsystem status, represented by this icon  , displays when you start the Enterprise Management Window and the management software is establishing contact with each individual Storage Subsystem.

When the Storage Subsystem has been contacted, the status icon is updated to reflect the current status of the Storage Subsystem (Optimal, Needs Attention, Fixing, or Unresponsive.)

Note: When you start the Enterprise Management Window and one or more Storage Subsystems in the management domain are being contacted, the Overall Health Status area shows this icon  and the tooltip for this area displays "Contacting devices in management domain." When all Storage Subsystems have been contacted and their current status conditions are known, the icon in the Overall Health Status area is updated to reflect the current overall health status. For more information, see Monitoring Storage Subsystem Status.

Directly Managed Storage Subsystem

The controllers in the Storage Subsystem are managed directly over the network through each controller's Ethernet connection on the Storage Subsystem.

To manage the Storage Subsystem through these Ethernet connections, you must define each controller's IP address (or optionally, each controller's host name) and attach a cable to the Ethernet connections on the Storage Subsystem. You can then use the **Add Device** option or **Automatic Discovery** option in the Enterprise Management Window to include the Storage Subsystem in the management domain.

Notes:

- Another way to manage a Storage Subsystem is through a Host that has Host-Agent management software installed. Using this software, the Host can provide management connections to the controllers in the Storage Subsystem over its network connection and then through its I/O connection to the Storage Subsystem instead of the Ethernet connections. For more information, see Host-Agent Managed Storage Subsystem.
- You can manage a Storage Subsystem using one or both types of network management connections (Direct or Host-Agent). The Enterprise Management Window will display the appropriate management connections in its Device Tree View and Device Table. For more information see Using the Enterprise Management Window.

Enterprise Management Window

Use the **Enterprise Management Window** to:

- Add and/or discover the Storage Subsystems you want to manage in your management domain.
- Monitor the health of the Storage Subsystems in the management domain.
- Configure e-mail and SNMP alert notifications.
- Launch an appropriate Subsystem Management Window for a particular Storage Subsystem to perform configuration, maintenance, or recovery operations.
- Edit and execute a script to perform batch management tasks on a particular Storage Subsystem.

Fixing Status

This temporary Storage Subsystem status, represented by this icon  in the Subsystem Management Window Logical View and the Enterprise Management Window, displays when a Needs Attention condition has been corrected and the Storage Subsystem is currently transitioning to an Optimal state (for example, a reconstruction operation is in progress). A Fixing status requires no action other than if you want to check on the progress of the operation in the Subsystem Management Window.

Note: Some recovery actions cause the Storage Subsystem state to change directly from Needs Attention to Optimal, without an interim state of Fixing.

Host

A Host is a computer running one or more applications that accesses the Storage Subsystem over the I/O path. If the Host has Host-Agent management software installed, the Management Station can manage the Storage Subsystem over the host's I/O path (in this case, the Storage Subsystem is called a Host-Agent Managed Storage Subsystem).

Host-Agent Managed Storage Subsystem

The controllers in the Storage Subsystem are managed through an Ethernet connection on a Host instead of using the Ethernet connections on each controller. The management station communicates with the Storage Subsystem through the Host that has Host-Agent management software installed. The host agent takes requests from the management station through the Ethernet connection to the host, and then sends them to the controllers in the Storage Subsystem through the I/O connections between the Host and Storage Subsystem. The controllers also use the I/O connections to send event information back to the management station.

To manage a Storage Subsystem through a Host, you must define the host name or IP address of the Host that is connected to the Storage Subsystem(s). You can then use the **Add Device** option or **Automatic Discovery** option in the Enterprise Management Window to include the Host (and attached Storage Subsystems) in the management domain. The Enterprise Management software uses the Host's name or IP address to communicate with and find each Storage Subsystem (and its controllers) connected to that Host. The Device Tree in the Enterprise Management Window displays the Storage Subsystem under each Host that provides network management connections to the controllers in the Storage Subsystem.

Notes:

- Another way to manage a Storage Subsystem is through the Ethernet connection on each controller in the Storage Subsystem. For more information, see Directly Managed Storage Subsystem.
- You can manage a Storage Subsystem using one or both types of network management connections (Direct or Host-Agent). The Enterprise Management Window will display the appropriate management connections in its Device Tree View and Device Table. For more information, see Using the Enterprise Management Window.
- You can configure multiple Hosts to provide network management connections to a Storage Subsystem. In this case, the Storage Subsystem appears in the Device Tree under each Host that is providing a management connection.

Management Domain

A set of Storage Subsystems managed by a system administrator from a particular management station.

Note: If the management domain contains a Storage Subsystem that is managed through a Host that has the Host Agent software installed (a Host-Agent Managed Storage Subsystem), then that Host is included as part of the domain, although it is not a managed device.

Storage Subsystems and Hosts that have been added to the management domain are displayed in the Device Tree of the Enterprise Management Window. Storage Subsystem information is shown in the Device Table.

To add devices to your management domain, use the **Automatic Discovery**, **Rescan**, or **Add Device** options of the Enterprise Management software. To remove devices from your management domain, use the **Remove Device** option.

Management domain data is stored in configuration files on the management station so that it continues to be available for future management sessions.

Management Station

The computer you use to add, monitor, and manage the Storage Subsystems on your network.

The Management Station is displayed as the root node in the Device Tree View with the Management Station machine name. It is always present.

For information on the computer used to monitor SNMP trap messages, see Network Management Station.

Needs Attention Status

A Needs Attention Status indicates a problem on a Storage Subsystem that requires your intervention to correct it. To correct the problem, you should launch the Subsystem Management Window for the particular Storage Subsystem and then use the Recovery Guru to pinpoint the cause of the problem and obtain appropriate instructions.

A Storage Subsystem has a Needs Attention status, represented by this icon  in the Subsystem Management Window Logical View and in the Enterprise Management Window, to represent a coarse-level indication that one or more of its components are in a Needs Attention state. A Needs Attention icon is also used in the Physical View of the Subsystem Management Window on controllers, drives, or the components button to pinpoint the exact component having the problem.

Network Management Station

A Network Management Station (NMS) is a console with installed SNMP-compliant network management software that receives and processes information about managed network devices in a form that is supported by the Management Information Base (MIB) it uses.

The Enterprise Management software provides information about critical Storage Subsystem events, using SNMP trap messages, to the configured NMS. To configure a host destination to receive SNMP trap messages in the Enterprise Management Window, use the **Edit >> Alert >> Destinations** option.

Refer to your Software Installation Guide for information on setting up an NMS, such as compiling and installing the appropriate MIB.

For information on the computer used to manage the Storage Subsystems, see Management Station.

Optimal Status

An Optimal Status indicates every component in the Storage Subsystem is in the desired working condition.

A Storage Subsystem has an Optimal status, represented by this icon  in the Subsystem Management Window Logical View and in the Enterprise Management Window, to indicate that the Storage Subsystem is Optimal.

Partially Managed Storage Subsystem

This condition occurs when only one controller was defined or could be reached when the Storage Subsystem was added or discovered. Because you are able to communicate with only one of the controllers in a partially managed Storage Subsystem, logical drive management operations can only be performed on logical drives owned by the reachable controller, and many other management operations that require access to both controllers are not available.

- If the Storage Subsystem is managed through each Ethernet connection on the controllers (Directly Managed), either you have not provided a host name or IP address of one of the controllers, or there was a connection problem.
- If the Storage Subsystem is managed through a Host's network connection (Host-Agent Managed), there was a problem detecting one of the controllers in the attached Storage Subsystem.

See, Correcting a Partially Managed Storage Subsystem Condition.

Indications of a Partially Managed Storage Subsystem

There is no visual indication in the Device Tree or Device Table that a device is only partially manageable. To check for this condition, use the following methods:

- Select the **View >> Partially Managed Devices** pull-down menu option. If no Storage Subsystems in the Management Domain are currently in a Partially Managed state, this menu option will be unavailable (grayed out).
- Select a Storage Subsystem and launch the Subsystem Management Window. If the Storage Subsystem is partially managed, an error message is displayed, and you are given the opportunity to continue or stop launching the Subsystem Management Window.
- Activate the tooltip on the Storage Subsystems by placing your cursor over the Storage Subsystem in the Device Tree. If a Storage Subsystem is partially managed, it will display "partially managed" in the tooltip.

  Important: This tooltip is only available for Directly Managed Storage Subsystems (unavailable for Host-Agent Managed Storage Subsystems).

Simple Mail Transfer Protocol (SMTP)

The standard protocol used to send e-mail messages across the Internet.

Simple Network Management Protocol (SNMP)

A standard network management protocol used by Network Management Stations to manage devices. If you have configured SNMP trap messages to be sent for Storage Subsystem critical events using the **Alert >> Destinations** option, the Enterprise Management software sends remote notification of these critical events to the network management stations you designated.

SNMP Trap Message

If you have configured trap messages to report predefined critical events that have occurred on a Storage Subsystem, the Management Station sends these alerts to specified Host destinations running an SNMP service (usually a Network Management Station).

For information on configuring a host destination to receive SNMP trap messages, see Configuring SNMP and E-mail Alert Notification Settings.

Storage Subsystem

A Storage Subsystem is a storage entity managed by the Storage Management software. A Storage Subsystem consists of a collection of both physical components (such as drives, controllers, fans, and power supplies) and logical components (such as arrays and logical drives). A Storage Subsystem can span multiple physical enclosures.

For example, several drive enclosures connected to a controller enclosure constitutes one Storage Subsystem. A unit that contains drives and a controller in a single enclosure is also considered one Storage Subsystem. A rackmount subsystem might contain more than one Storage Subsystem.

Storage Subsystem replaces the term **RAID Module** that was used in the previous versions of this Storage Management software.

Subsystem Management Window

The **Subsystem Management Window** provides the options you need to manage an individual Storage Subsystem in the management domain.

Use this window to:

- Manage physical components, such as controllers and drives
- Configure and manage logical drives and arrays
- Recover from failures using the Recovery Guru
- Monitor performance
- View the event log

See Launching an Subsystem Management Window.

Unidentified Node

Represents a device that when added, was inaccessible to the Enterprise Management software. Causes include network connection problems, the device is turned off, or the device doesn't exist.

The device is added to the Device Tree View as an Unidentified Node, represented by this icon  . The Enterprise Management software continues to check the device at regular intervals. If the device becomes available and can be identified, the node is changed in the Device Tree to either a single, Directly Managed Storage Subsystem or a Host device with zero or more attached, Host-Agent Managed Storage Subsystems.

Unresponsive Status

What is an Unresponsive Controller?

A controller that is unresponsive cannot be reached by the management station. If there is another operational controller in the Storage Subsystem, you can still launch the Subsystem Management Window, but all management operations that require communication with the unresponsive controller will fail. Although there are no visual indications of an unresponsive controller, you will receive error messages when you attempt to perform operations that send requests to the unresponsive controller. These error messages will guide you through the steps to resolve this condition.

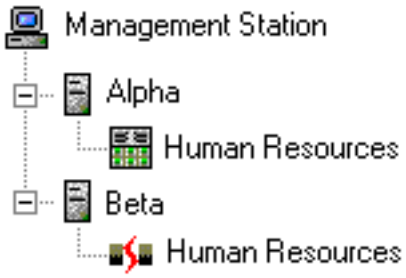
What is an Unresponsive Storage Subsystem?

An Unresponsive Storage Subsystem status occurs when the management station cannot communicate with the only controller or both controllers over its network management connection to the Storage Subsystem. An Unresponsive status is represented by this icon  in the Device Tree and Device Table views.

Important:

An individual Storage Subsystem can appear multiple times in the Device Tree. This occurs when: (1) a Storage Subsystem has been configured to be managed through each Ethernet connection on the controllers (Directly Managed) and through a Host's network connection (Host-Agent Managed), or (2) the Storage Subsystem is managed through more than one host with the Host Agent management software installed (that is, multiple Host-Agent Managed).

- If a Storage Subsystem is both Directly Managed and Host Agent-Managed, a network connection problem on the controllers might prevent direct communication with the Storage Subsystem over the network, but the Storage Subsystem might still be manageable over the network management connections provided by the host. The reverse situation can also occur.
- If a Storage Subsystem is managed through more than one host, it is possible that the Storage Subsystem might become unresponsive to communication over the connections provided by one host, but the Storage Subsystem might still be manageable over the connections provided by another host.



In the example at left, the Storage Subsystem named Human Resources is attached to both the Alpha and Beta hosts. Both Alpha and Beta have Host Agent management software installed and therefore each can provide network management connections to Human Resources.

- The Storage Subsystem displays an Optimal status under the Alpha host, meaning that the Storage Subsystem is accessible through the connections provided by Alpha.
- The Storage Subsystem displays an Unresponsive status under the Beta host, meaning that both of the controllers in the Storage Subsystem are inaccessible through the connection provided by Beta.

Notes:

- If there is a problem with the controllers themselves, then all instances of the Storage Subsystem in the Device Tree display the Unresponsive icon.
- In the Device Table, every Storage Subsystem is listed once, regardless of the number of times it appears in the Device Tree. An icon representing its hardware status (Optimal, Needs Attention, or Fixing) is displayed, unless the Storage Subsystem is unresponsive over all connections. In this case, the Storage Subsystem's status is represented with an Unresponsive icon.
- The Subsystem Management window never displays a status of Unresponsive; rather, this window displays the hardware status of the Storage Subsystem (Optimal, Needs Attention, or Fixing).

For information about possible causes and solutions to an unresponsive Storage Subsystem, see Recovering from an Unresponsive Storage Subsystem Condition.

Configuring Customer Support Alert Notifications

Use the **Edit** >> **Alert** option to send e-mail notification to a specified customer support group if a critical event occurs on one of your Storage Subsystems. Once it is properly set up, the e-mail alert notification includes a summary of the critical event, detailed information about the affected Storage Subsystem, and custom contact information.

Important:

- If you do not configure this option, the e-mail alert notification will contain only a summary of the critical event.
- If you do configure this option, all specified e-mail addresses will include the summary, detailed information about the affected Storage Subsystem, and the specified contact information.

How to Configure Customer Support Alert Notification

1. Create a text file containing the contact information you want to send to the customer support group. For example, you might include the names and pager numbers of your network administrators.
2. Name the file userdata.txt and save it in the home directory (for example, Winnt\profiles\) on the client machine you are using to manage the Storage Subsystem.

   Note: This may be your host machine if you installed the client software on the host.
3. Configure the alert notifications by selecting the appropriate node in the device tree and then selecting **Edit** >> **Alert** >> **Destinations**. Specify the e-mail address of the customer support organization. For more information on selecting nodes for alert notifications, see Configuring E-mail and SNMP Alert Notification Settings.

   Important: Remember to set up your mail server and sender address by selecting **Edit** >> **Alert** >> **Global Settings**.