# IBM

IBM Systems

## ServeRAID Management
## Installation and User's Guide

*Version 5.10*

IBM Systems

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> **Note**
> Before using this information and the product it supports, read the information in "Notices."

# Contents

## Chapter 5. Troubleshooting ServeRAID Manager . . . . . . . . . . . . . 211

# Figures

# Tables

ix

# About this book

This book provides instructions for using IBM® Director 4.20 for systems-management tasks. IBM Director consists of the following tools to meet your systems-management needs:

- IBM Director Console is the graphical user interface (GUI) for IBM Director Server. Using IBM Director Console, you can conduct comprehensive systems management using either a drop-and-drag action or a single click.
- IBM Director command-line interface (dircli) is the command-line interface for IBM Director Server. You can use a command-line prompt to access, control, and gather information from IBM Director Server.

This documentation also provides planning and implementation information for event management.

## Conventions and terminology

These notices are designed to highlight key information:

**Note:** These notices provide important tips, guidance, or advice.

**Important:** These notices provide information or advice that might help you avoid inconvenient or difficult situations.

**Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice appears before the instruction or situation in which damage can occur.

## Related information

This topic provides links to additional information related to IBM Director.

### IBM Director resources on the World Wide Web

The following Web pages provide resources for understanding, using, and troubleshooting IBM Director and other systems-management tools.

**IBM Director information center**
> publib.boulder.ibm.com/infocenter/eserver/
> v1r2/topic/diricinfo/fqm0_main.html

> Updated periodically, the IBM Director information center contains the most up-to-date documentation available on a wide range of topics.

**IBM Director Web site on ibm.com®**
> www.ibm.com/servers/eserver/xseries/
> systems_management/ibm_director/

> The IBM Director Web site on ibm.com has links to downloads and documentation for all currently supported versions of IBM Director. Information on this site includes:

> - IBM Director 5.10 - downloads and documentation
> - IBM Director 4.22 - downloads and documentation

- IBM Director 4.22 Upward Integration Modules (UIMs) - downloads and documentation
- IBM Director 4.21 - downloads and documentation
- IBM Director 4.20 - downloads and documentation
- IBM Director Hardware and Software Compatibility document - lists supported @server and IBM xSeries® systems, as well as all supported operating systems. It is updated every 6 to 8 weeks.
- Printable documentation for IBM Director - available in Portable Document Format (PDF) in several languages

**IBM Systems Software information center**

www.ibm.com/servers/library/infocenter/

This Web page provides information about IBM Virtualization Engine™, IBM Director, and other topics.

**IBM ServerProven® page**

www.ibm.com/pc/us/compat/index.html

This Web page provides information about IBM xSeries, BladeCenter®, and IntelliStation® hardware compatibility with IBM Director.

**IBM Systems Management Software: Download/Electronic Support page**

www.ibm.com/servers/eserver/xseries/
systems_management/ibm_director/

Use this Web page to download IBM systems-management software, including IBM Director. Check this Web page regularly for new IBM Director releases and updates.

**IBM Servers**

www.ibm.com/servers/

This Web page on ibm.com links to information, downloads, and IBM Director extensions such as Remote Deployment Manager, Capacity Manager, Systems Availability and Software Distribution (Premium Edition) for IBM servers:
- IBM BladeCenter
- IBM iSeries™
- IBM pSeries®
- IBM xSeries
- IBM zSeries®

## IBM Redbooks™

www.ibm.com/redbooks/

You can download the following documents from the IBM Redbooks Web page. You also might want to search this Web page for documents that focus on specific IBM hardware; such documents often contain systems-management material.

**Note:** Be sure to note the date of publication and to determine the level of IBM Director software to which the Redbooks publication refers.
- *Creating a Report of the Tables in the IBM Director 4.1 Database* (TIPS0185)
- *IBM Director Security* (REDP-0417-00)
- *IBM eServer™ BladeCenter Systems Management with IBM Director V4.1 and Remote Deployment Manager V4.1* (REDP-3776-00)
- *Implementing Systems Management Solutions using IBM Director* (SG24-6188)

- *Integrating IBM Director with Enterprise Management Solutions* (SG24-5388)
- *Managing IBM TotalStorage® NAS with IBM Director* (SG24-6830)
- *Monitoring Redundant Uninterruptible Power Supplies Using IBM Director* (REDP-3827-00)

## Remote Supervisor Adapter

**Remote Supervisor Adapter overview**

www.ibm.com/support/docview.wss?uid=psg1MIGR-4UKSML

This Web page includes links to the *Remote Supervisor Adapter User's Guide* and *Remote Supervisor Adapter Installation Guide*.

**Remote Supervisor Adapter II overview**

www.ibm.com/support/docview.wss?uid=psg1MIGR-50116

This Web page includes information about the Remote Supervisor Adapter II.

## Other documents

For planning purposes, the following documents might be of interest:
- *Planning and installation guide - IBM eServer BladeCenter (Type 8677)*
- *IBM Management Processor Command-Line Utility User's Guide version 3.00*

# How to send your comments

Your feedback is important in helping to provide the most accurate and highest quality information. If you have any comments about this book or any other IBM Director publication, use the form for reader's comments is provided at the back of this publication. If the form has been removed, you may address your comments to:

International Business Machines Corporation
Design & Information Development
Department CGFA
PO Box 12195
Research Triangle Park, NC 27709-9990
U.S.A.

# Chapter 1. Getting started

## Introducing IBM Director

This topic provides an overview of IBM Director.

IBM Director is an integrated, easy-to-use suite of tools that provide you with comprehensive systems-management capabilities to help realize maximum system availability and lower IT costs. Its open, industry-standard design enables heterogeneous-hardware management and broad operating-system support, including most Intel® microprocessor-based systems and certain IBM @server System p5®, iSeries, pSeries, System z9®, and zSeries servers.

IBM Director automates many of the processes that are required to manage systems proactively, including capacity planning, asset tracking, preventive maintenance, diagnostic monitoring, troubleshooting, and more. It has a graphical user interface that provides easy access to both local and remote systems.

IBM Director can be used in environments with multiple operating systems and integrated with robust workgroup and enterprise management software from IBM (such as Tivoli® software), Computer Associates, Hewlett-Packard, Microsoft®, NetIQ, and BMC Software.

### IBM Director environment

IBM Director is designed to manage a complex environment that contains numerous servers, desktop computers, workstations, mobile computers (notebook computers), and assorted devices. IBM Director can manage up to 5000 Level-2 systems.

An IBM Director environment contains the following groups of hardware:
- One or more servers on which IBM Director Server is installed. Such servers are called *management servers*.
- Servers, workstations, desktop computers, and mobile computers that are managed by IBM Director. Such systems are called *managed systems*.
- Network devices, printers, or computers that have Simple Network Management Protocol (SNMP) agents installed or embedded. Such devices are called *SNMP devices*.
- Additional managed objects such as platforms and chassis. Collectively, all managed systems, devices, and objects are referred to as *managed objects*.

Figure 1 on page 2 shows the hardware in an IBM Director environment.
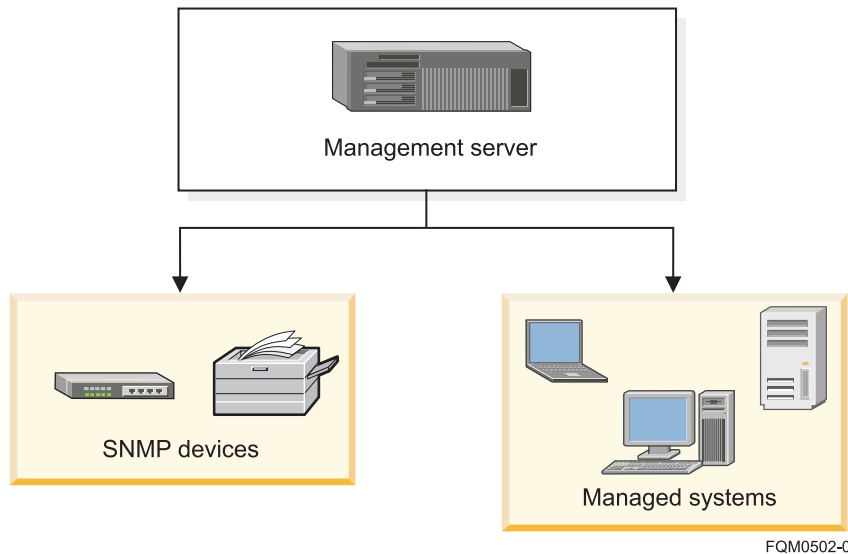
Figure 1. Hardware in an IBM Director environment

## Using IBM Director Console

You can use IBM Director Console to group managed objects, view associations, start tasks, and set IBM Director options and preferences.

### The IBM Director Console interface

This topic describes the main components of the IBM Director Console interface.

Before you begin using IBM Director Console, review the layout of its interface.
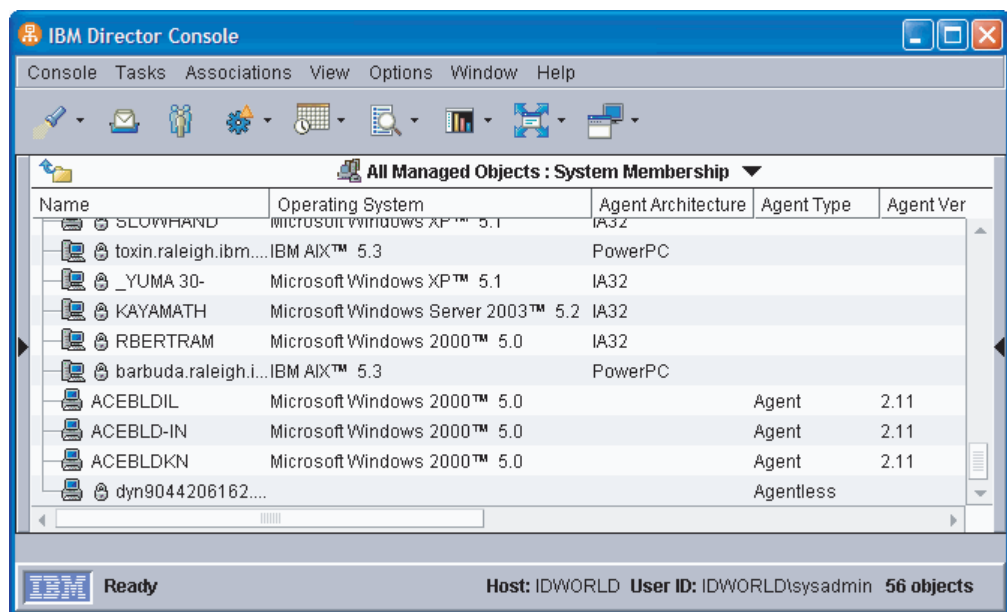


Figure 2. IBM Director Console

Along the top of the IBM Director Console interface is both a menu and a toolbar.

Below the menu and toolbar, one, two, or three panes will be visible. From left to right, these are:
- Groups
- Group contents (pane title indicates selected group)
- Tasks

Below the panes is the marquee area and hardware-status alert display. The ticker-tape messages scroll across the marquee area. The hardware-status alert display is located in the bottom-right corner of the interface.

At the bottom of the IBM Director Console interface is a status bar indicating the ready or busy status of IBM Director, the host and login information for IBM Director Server, and the number of managed objects in the Group Contents pane.

IBM Director Console is usually accessed on the management server. On Windows® management servers, an additional, and separate, Server Status icon displays the ready or busy status of IBM Director Server in the Windows system tray.

**Note:** Icons in the Windows tray, including the IBM Director Server Status icon, may disappear when a user selects the Windows High Contrast display. To enable display of the Server Status icon after selecting the high contrast display, select **All Programs** → **Startup** → **Server Status** from the Start menu.

## IBM Director Console toolbar

This topic describes each of the icons on the IBM Director Console.

Along the top of the IBM Director Console interface is a toolbar containing nine icons.
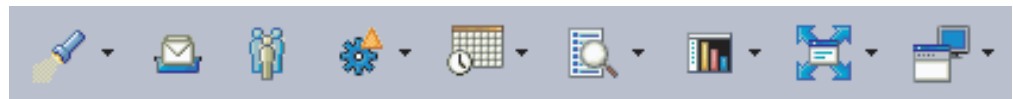


*Figure 3. IBM Director Console toolbar*

From left to right, the icons are briefly described below:

**Discover**
> Clicking the button for this icon starts discovery of all systems and devices. Clicking the menu arrow for this icon allows you to select a type of system or device to discover.

**Message Browser**
> Clicking the button for this icon opens the Message Browser window.

**User Administration**
> Clicking the button for this icon opens the User Administration window.

**Event Action Plans**
> Clicking the button for this icon opens the Event Action Plan Builder window. Clicking the menu arrow for this icon allows you to select the Event Action Plan Wizard, event logging options, or help for event action plans.

**Scheduler**
> Clicking the button for this icon opens the Scheduler window. Clicking the menu arrow for this icon allows you to open help for scheduler.

**Inventory**

Clicking the button for this icon opens the Inventory Query Browser window. Clicking the menu arrow for this icon allows you to build a custom query, edit the software dictionary, collect inventory, create custom collections, create or view inventory monitors, or open help for inventory.

**Resource Monitors**

Clicking the button for this icon opens the Resource Monitors window. Clicking the menu arrow for this icon allows you to import a plan file, open the All Available Recordings or All Available Thresholds window, or open help for resource monitors.

**Software Distribution**

Clicking the button for this icon opens the Software Distribution Manager window. Clicking the menu arrow for this icon allows you to manage file distribution servers, view package history, create a package category, open a software distribution package, or open help for software distribution.

**Remote Control**

Clicking the button for this icon opens the Remote Control window. Clicking the menu arrow for this icon allows you to open help for remote control.

## Panes in IBM Director Console

The IBM Director Console interface includes three panes: Groups, Group Contents, and Tasks.

You can resize the panes by dragging the borders between them. You can hide either the Groups or Tasks pane by clicking on the border between that pane and the Group Contents pane.

**Note:** The Group Contents pane may not be hidden.

**Groups**

The Groups pane lists all the groups available, including the default groups and any groups you have defined.

- Clicking a group selects that group for certain tasks performed from the toolbar or the menu. It also selects that group in the Group Contents pane.
- Right-clicking some groups also displays a context menu allowing tasks to be performed on the group.

**Group Contents**

The Group Contents pane lists the managed objects included in the group selected in the Groups pane. The title of the Group Contents pane indicates which group is selected.

- Clicking the title opens a menu from which you can select a group to display.
- Clicking a listed object selects that object for certain tasks performed from the toolbar or the menu.
- Right-clicking an object selects that object and displays a context menu allowing tasks to be performed on the object.

The icon for each managed object indicates both the type of managed object and its online status: icons for online objects appear in color, while icons for offline objects appear in gray.

A padlock icon beside a managed object indicates that the object is secured and inventory information about the object cannot be collected. To request access to the object, right-click the managed object and click **Request Access**. By providing a valid user name that has local administrative rights to that managed object and password, you can access the system.

**Notes:**

1. (BladeCenter chassis and physical platforms only) The padlock icon is displayed if a valid login profile does not exist for the service processor. You can access the system using the **Request Access** action as above.

2. (ISMP systems only) You cannot log in to an ISMP directly, as it lacks a userid and password. Instead, connect out-of-band to an ISMP installed on an ASM interconnect network through a Remote Supervisor Adapter or Remote Supervisor Adapter II serving as the ASM gateway.

3. (ASM processor systems only) Use the Management Processor Assistant to configure an out-of-band path to the ASM processor system, then change the userid and password to request access the physical platform using IBM Director Console.

**Tasks**   The Tasks pane lists tasks which can be performed in IBM Director.

**Note:** Although the list of tasks in the Task pane is static, not all tasks are available for all groups or managed objects.

Right-clicking blank space in any pane displays a context menu from which you can change the pane's appearance or sorting, or perform tasks specific to that pane. For example, in the Group Contents pane you can create new managed objects manually, find and view objects, or perform actions on the selected group.

## Working with tables

This topic describes general procedures for viewing tabular information in IBM Director Console.

In IBM Director Console, information is often displayed in tables. You can customize the display of data in many of these tables in several ways.

**Note:** Not all of these actions may be available for all tabular views. These actions must be performed with a mouse or other pointing device, and are not available through the keyboard.

**Sort table data on a column**
Click a column header to sort the data in the table by the values in that column. Click the header again to change the sort order.

- An upward-pointing triangle symbol indicates the column is sorted in ascending order
- A downward-pointing triangle symbol indicates the column is sorted in descending order
- Some columns may have additional sort options that are displayed as parenthetical text in the column header

**Resize table columns**
Drag the border of a table column heading to resize it.

**Rearrange table columns**

Drag a table column heading left or right to a new column location to rearrange table columns.

In addition, the details view of the Group contents pane in the main IBM Director Console window may be customized by selecting what columns are displayed. Right-click a column heading and select Customize columns. The Console Preferences window opens to the Details View Preferences page. Select the columns you wish to view, then click OK.

## Starting tasks

This topic describes how to start tasks in IBM Director.

You can start most tasks in IBM Director in four ways:

- Dragging a task from the tasks pane onto a managed object (or a managed group, in some cases)
- Dragging a managed object (or a managed group, in some cases) onto a task in the tasks pane
- Right-clicking a managed object (or managed group, in some cases)
- Selecting the managed object or group, then selecting a task from the menu bar

Throughout this documentation, only dragging a task onto a managed object or group is explained as the method of starting tasks, although you can use any of the methods.

Some IBM Director functions, such as the Event Action Plan Builder and Scheduler, may be started either from the menu bar or from the toolbar.

**Note:** When IBM Director Console is processing a task, the hourglass is displayed for that window and you cannot use the mouse to work with the window. Although it might be possible to work with the window using key strokes, do *not* do so.

# Chapter 2. Installing ServeRAID Manager

This topic describes the general procedure for installing the ServeRAID™ Manager extension for IBM Director 5.10.

ServeRAID Manager may be installed on both Windows and Linux® platforms. Installing ServeRAID Manager is performed in several steps, each of which is described in a topic in this section.

1. Download the ServeRAID Manager extension.
   a. In a Web browser, navigate to the following Web site: www.ibm.com/servers/eserver/xseries/ systems_management/ibm_director/.
   b. Navigate to the ServeRAID Manager extension for your operating system, and download the extension files to a temporary directory.
2. Install ServeRAID Manager on the management server.

| Option | Description |
| --- | --- |
| **Windows server** | "Installing the ServeRAID Manager extension on a Windows server" on page 8 |
| **Linux server** | "Installing the ServeRAID Manager extension on a Linux server" on page 9 |

3. **Optional:** Install ServeRAID Manager user-interface components for IBM Director Console on remote management consoles.

| Option | Description |
| --- | --- |
| **Windows console** | "Installing the ServeRAID Manager extension on a Windows console" on page 10 |
| **Linux console** | "Installing the ServeRAID Manager extension on a Linux console" on page 11 |

> **Note:** ServeRAID Manager user-interface components for IBM Director Console are automatically installed on the management server when the ServeRAID Manager server components are installed. It is not necessary or possible to separately install ServeRAID Manager console components on a management server.

4. Install ServeRAID Manager components for IBM Director Agent on managed systems.

| Option | Description |
| --- | --- |
| **Windows systems** | "Installing the ServeRAID Manager extension on a managed Windows system" on page 12 |
| **Linux systems** | "Installing the ServeRAID Manager extension on a managed Linux system" on page 13 |
| **NetWare systems** | "Installing the ServeRAID Manager extension on a managed NetWare system" on page 14 |

> **Note:** ServeRAID Manager agent components are automatically installed on the management server when the ServeRAID Manager server components

are installed. It is not necessary or possible to separately install ServeRAID Manager agent components on a management server.

# Installing the ServeRAID Manager extension on a Windows server

This topic describes the procedure for installing the ServeRAID Manager extension for IBM Director on a Windows management server.

Complete the following steps to install ServeRAID Manager on a Windows management server:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation.
2. Close all applications, including any command-prompt windows.
3. Click **Start → Run**.
4. In the Run dialog, type the following command in the **Open** field and press **Enter**:

   *download*\raid\server\windows\serveraid_5.10_server_windows.exe

   *download* represents the location to which the ServeRAID Manager download package was unzipped.
5. In the first panel of the ServeRAID Manager Server InstallShield Wizard, click **Next**.
6. In the second panel of the ServeRAID Manager Server InstallShield Wizard, complete the following steps:

   a. Ensure that the hard disk drive icon  appears to the left of ServeRAID Manager Server in the list box. If a different icon appears, click the icon and select **This feature, and all subfeatures, will be installed on local hard drive** from the menu.

   b. Ensure that the hard disk drive icon  appears to the left of each of the other features you wish to install. You can install the ServeRAID Manager Agent, ServeRAID Manager Console, and IBM Management Station along with ServeRAID Manager Server.

   c. Click **Next**.
7. (Only if Management Station is being installed) In the next panel of the ServeRAID Manager Server InstallShield Wizard, complete the following steps:

   a. Type the user name and password (enter twice for confirmation) for the user for the ServeRAID Management Station service.

   b. Click **Next**.
8. In the next panel of the ServeRAID Manager Server InstallShield Wizard, click **Install**. A new panel displays the installation progress.
9. When installation has completed, click **Finish**.
10. In the dialog that appears, respond to the prompt to reboot the management server. Click **Yes** to reboot immediately, or click **No** if you will reboot the management server yourself.

The management server must be rebooted before the ServeRAID Manager extension will operate. After installing the server components of the ServeRAID Manager extension, you need to install the console components.

# Installing the ServeRAID Manager extension on a Linux server

This topic describes the procedure for installing ServeRAID Manager on a Linux management server.

Complete the following steps to install ServeRAID Manager on a Linux management server:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation. The downloaded installation files are contained in a tar file. Use the tar -x command to extract the contents to a temporary directory.

2. Stop IBM Director. From a command prompt, type the following command and press **Enter**:

   `/opt/ibm/director/bin/twgstop`

3. Change to the directory in which the installation package is located. Type the following command and press **Enter**:

   `cd /`*download*`/raid/server/linux/`

   *download* represents the location into which the ServeRAID Manager download package was extracted.

4. **Optional:** To install the management station service on the Linux management server, perform the following substeps.

   The management station is used to administer IBM System Storage DS300 and IBM System Storage DS400 devices. This step is only necessary if *both* of the following conditions are true:

   - You wish to manage IBM System Storage DS300 and IBM System Storage DS400 devices using IBM Director
   - You do not have the standalone version of ServeRAID Manager installed

   If either of these conditions is not met, there is no need to install the management station service.

   **Note:** Although it is possible to install the management station service on a system other than that on which IBM Director Server is installed, this is not a recommended configuration, and is not documented here. To use the standalone version of ServeRAID Manager, or for instructions for installing the management station service on a different system than the management server on which IBM Director Server is installed, refer to the documentation and downloads available on the ServeRAID Web site at www.ibm.com/pc/support/site.wss/MIGR-495PES.html.

   a. List the directory contents. There should be several files named `serveraid-mgmt-`*version*`-`*build*`.`*os*`.i586.rpm`, with *version*, *build*, and *os* indicating the version number, build number, and operating system for the package. Note the *version* and *build* numbers for the following step.

   b. Type one of the following commands (substituting the actual values for *version* and *build*) and press **Enter**:

| Installation scenario | Command |
| --- | --- |
| **Performing a new installation on Red Hat Enterprise Linux AS, ES, and WS, version 3.0 (Update 3 required)** | `rpm -ivh serveraid-mgmt-`*version*`-`*build*`.rhel33.i586.rpm` |

| Installation scenario | Command |
|---|---|
| Upgrading from a previous version on Red Hat Enterprise Linux AS, ES, and WS, version 3.0 (Update 3 required) | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director serveraid-mgmt-version-build.rhel33.i586.rpm` |
| Performing a new installation on Red Hat Enterprise Linux AS, ES, and WS, version 4.0 | `rpm -ivh serveraid-mgmt-version-build.rhel4.i586.rpm` |
| Upgrading from a previous version on Red Hat Enterprise Linux AS, ES, and WS, version 4.0 | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director serveraid-mgmt-version-build.rhel4.i586.rpm` |
| Performing a new installation on SUSE LINUX Enterprise Server 8 | `rpm -ivh serveraid-mgmt-version-build.sles8.i586.rpm` |
| Upgrading from a previous version on SUSE LINUX Enterprise Server 8 | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director serveraid-mgmt-version-build.sles8.i586.rpm` |
| Performing a new installation on SUSE LINUX Enterprise Server 9 | `rpm -ivh serveraid-mgmt-version-build.sles9.i586.rpm` |
| Upgrading from a previous version on SUSE LINUX Enterprise Server 9 | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director serveraid-mgmt-version-build.sles9.i586.rpm` |

The installation progress is displayed.

5. Type one of the following commands and press **Enter**:

| Installation scenario | Command |
|---|---|
| Performing a new installation | `rpm -ivhRAIDLxServer-5.10-1.i386.rpm` |
| Upgrading from a previous version | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director RAIDLxServer-5.10-1.i386.rpm` |

The installation progress is displayed.

6. Restart IBM Director Server. From a command prompt, type the following command and press **Enter**:

   `/opt/ibm/director/bin/twgstart`

The IBM Director ServeRAID Manager Server installation process installs the server, console, and agent components of ServeRAID Manager on the management server.

The management server must be rebooted before the ServeRAID Manager extension will operate. After installing the server components of the ServeRAID Manager extension, you need to install the console components.

## Installing the ServeRAID Manager extension on a Windows console

This topic describes the procedure for installing the ServeRAID Manager extension on a Windows management console.

The ServeRAID Manager extension should be installed on the management server before installing the console components of ServeRAID Manager.

Complete the following steps to install the ServeRAID Manager extension on a Windows management console:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation.
2. Close IBM Director Console.
3. Click **Start → Run**.
4. In the Run dialog, type the following command in the **Open** field and press **Enter**:

   `download\raid\console\windows\serveraid_5.10_console_windows.exe`

   *download* represents the location into which the ServeRAID Manager download package was unzipped.
5. In the first panel of the ServeRAID Manager Console InstallShield Wizard, click **Next**.
6. In the second panel of the ServeRAID Manager Console InstallShield Wizard, complete the following steps:

   a. Ensure that the hard disk drive icon ▭▾ appears to the left of ServeRAID Manager Console in the list box. If a different icon appears, click the icon and select **This feature, and all subfeatures, will be installed on local hard drive** from the menu.
   b. Click **Next**.
7. In the third panel of the ServeRAID Manager Console InstallShield Wizard, click **Install**. A new panel displays the installation progress.
8. When installation has completed, click **Finish**.
9. Restart IBM Director Console.

After installing the console components of the extension, you need to install the ServeRAID Manager Agent components on your managed systems.

## Installing the ServeRAID Manager extension on a Linux console

This topic describes the procedure for installing ServeRAID Manager on a Linux management console.

The ServeRAID Manager extension should be installed on the management server before installing the console components of ServeRAID Manager.

**Note:** ServeRAID Manager user-interface components for IBM Director Console are automatically installed on the management server when the ServeRAID Manager server components are installed. It is not necessary or possible to separately install ServeRAID Manager console components on a management server.

Complete the following steps to install ServeRAID Manager on a Linux console:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation.
2. Close IBM Director Console.
3. Change to the directory in which the installation package is located. Type the following command and press **Enter**:

```
cd /download/raid/console/linux/
```

*download* represents the location to which the ServeRAID Manager download package was extracted.

4. Type one of the following commands and press **Enter**:

| Installation scenario | Command |
|---|---|
| **Performing a new installation** | `rpm -ivh RAIDLxConsole-5.10-1.i386.rpm` |
| **Upgrading from a previous version** | `rpm -Uvh --relocate /opt/ibm/director=/opt/IBM/director RAIDLxConsole-5.10-1.i386.rpm` |

The installation progress is displayed.

5. Restart IBM Director Console.
6. Remove the CD from the CD-ROM drive.

After installing the console components of the extension, you need to install the ServeRAID Manager Agent components on your managed systems.

## Installing the ServeRAID Manager extension on a managed Windows system

This topic describes the procedure for installing ServeRAID Manager on a Windows managed system.

The following prerequisites apply to this installation:

- ServeRAID Manager should be installed on the management server and management console before installing the agent components of ServeRAID Manager on managed systems.
- IBM Director Agent should be installed on the managed system before installing ServeRAID Manager.

**Note:** An alternative installation method is to use Update Assistant and Software Distribution. For more information, refer to the "Creating software packages to distribute" section of the *IBM Director Systems Management Guide*.

Complete the following steps to install ServeRAID Manager on a Windows managed system:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation. The downloaded installation files are contained in a zip file. Use the unzip command to extract the contents to a temporary directory.
2. Click **Start** → **Run**.
3. In the Run dialog, type the following command in the **Open** field and press **Enter**:

   ```
   download\raid\agent\windows\serveraid_5.10_agent_windows.exe
   ```

   *download* represents the location to which the ServeRAID Manager download package was extracted.
4. In the first panel of the ServeRAID Manager Agent InstallShield Wizard, click **Next**.

5. In the second panel of the ServeRAID Manager Agent InstallShield Wizard, complete the following steps:

   a. Ensure that the hard disk drive icon ![icon] appears to the left of ServeRAID Manager Agent in the list box. If a different icon appears, click the icon and select **This feature, and all subfeatures, will be installed on local hard drive** from the menu.

   b. Click **Next**.

6. In the third panel of the ServeRAID Manager Agent InstallShield Wizard, click **Install**. A new panel displays the installation progress.

7. When installation has completed, click **Finish**.

8. In the dialog that appears, respond to the prompt to reboot the managed system. Click **Yes** to reboot immediately, or click **No** if you will reboot the managed system yourself.

You must reboot the managed system before the ServeRAID Manager Agent will operate.

## Installing the ServeRAID Manager extension on a managed Linux system

This topic describes the procedure for installing ServeRAID Manager on a Linux managed system.

The following prerequisites apply to this installation:

- ServeRAID Manager should be installed on the management server and management console before installing the agent components of ServeRAID Manager on managed systems.
- IBM Director Agent should be installed on the managed system before installing ServeRAID Manager.

**Note:** An alternative installation method is to use Update Assistant and Software Distribution. For more information, refer to the "Creating software packages to distribute" section of the *IBM Director Systems Management Guide*.

Complete the following steps to install ServeRAID Manager on a Linux managed system:

1. Copy the downloaded installation files to a temporary directory on the machine on which you will be performing the installation. The downloaded installation files are contained in a tar file. Use the tar -x command to extract the contents to a temporary directory.

2. Change to the directory in which the installation package is located. Type the following command and press **Enter**:

   `cd /download/raid/agent/linux/`

   *download* represents the location to which the ServeRAID Manager download package was extracted.

3. Type one of the following commands and press **Enter**:

| Installation scenario | Command |
|---|---|
| **Performing a new installation (32-bit agent)** | `rpm -ivhRAIDLxAg-5.10-1.i386.rpm` |

| Installation scenario | Command |
|---|---|
| Performing a new installation (64-bit agent for Opteron or EM64T) | `rpm -ivhRAIDLxAg-5.10-1.x86_64.rpm` |
| Upgrading from a previous version (32-bit agent) | `rpm -Uvh --relocate`<br>`/opt/ibm/director=/opt/IBM/director`<br>`RAIDLxAg-5.10-1.i386.rpm` |
| Upgrading from a previous version (64-bit agent for Opteron or EM64T) | `rpm -Uvh --relocate`<br>`/opt/ibm/director=/opt/IBM/director`<br>`RAIDLxAg-5.10-1.x86_64.rpm` |

The installation progress is displayed.

You must reboot the managed system before the ServeRAID Manager Agent will operate.

## Installing the ServeRAID Manager extension on a managed NetWare system

This topic describes the procedure for installing the ServeRAID Manager extension on a NetWare managed system.

- The ServeRAID Manager extension should be installed on the management server and management console before installing the agent components of the ServeRAID Manager extension on managed systems.
- IBM Director Agent should be installed on the managed system before installing the ServeRAID Manager extension.

**Note:** To install the ServeRAID Manager extension, you must log on to the NetWare server from a Windows workstation running the NetWare Client for Windows. The SYS volume must be mapped as a drive to the system running Windows. Also, you must have administrator or supervisor access on the NetWare server.

Complete the following steps on the Windows workstation running NetWare Client for Windows to install the ServeRAID Manager extension on a NetWare managed system:

1. Copy the downloaded installation files to a temporary directory on the Windows workstation on which you will be performing the installation.
2. Click **Start → Run**.
3. In the Run dialog, type the following command in the **Open** field and press **Enter**:

   *download*\raid\agent\windows\serveraid_5.10_agent_netware.exe

   *download* represents the location to which the ServeRAID Manager extension download package was saved.
4. If prompted for the language, select a language from the dropdown list and click **OK**.
5. In the first panel of the IBM ServeRAID Manager Agent 5.10 Setup Wizard, click **Next**.
6. In the second panel of the IBM ServeRAID Manager Agent 5.10 Setup Wizard, complete the following steps:

      a. Select the mapped NetWare drive on which to install ServeRAID Manager extension Agent.

      b. Click **Next**.

7. In the third panel of the ServeRAID Manager extension Agent InstallShield Wizard, click **Install**.

    **Note:** ServeRAID Manager Agent is the only component in the list of components to be installed, and should already be selected.

   A new panel displays the installation progress.

8. When installation has completed, click **Finish**.

# Chapter 3. Using ServeRAID Manager

## Introducing the ServeRAID Manager

You might want to review the following information before using the ServeRAID Manager:

- Using the ServeRAID Manager interface
- Configuring the ServeRAID controller: the basic steps
- What's new in the ServeRAID Manager
- IBM ServeRAID publications
- Finding information on the World Wide Web

You can use the ServeRAID Manager to configure, administer, and monitor controllers that are installed locally or remotely in your IBM xSeries servers.

The first time you start the ServeRAID Manager, it will display only your local system. The local system is displayed in the Enterprise view "tree" and information about the system is displayed in the right pane, in the Physical and Logical device views.

Whenever you start the ServeRAID Manager **after** the first time, it will display an unknown system icon  for any remote systems that you have added. When the ServeRAID Manager connects with the remote systems, it will update the status in the tree.

For additional information, see the IBM ServeRAID publications on the *IBM ServeRAID Support* CD.

### More information

- Using the ServeRAID Manager in bootable-CD mode
- Working with systems in the ServeRAID Manager
- Monitoring systems over the network
- ServeRAID software features

## What's new in the ServeRAID TM Manager

This release of the ServeRAID Manager has the following new features:

- Ability to manage FlashCopy backups of logical drive data in external storage enclosures

## About ServeRAID Manager

### ServeRAID software features

You can use the ServeRAID software with the following controllers. Most advanced features are available only with ServeRAID controllers.

| ServeRAID features | HostRAID controller | ServeRAID- 8i | ServeRAID- 7K | ServeRAID- 7t | ServeRAID- 6i/6i+ | ServeRAID- 6M | ServeRAID- 5i |
|---|---|---|---|---|---|---|---|
| ROM Update Wizard | No | Yes | Yes | Yes | Yes | Yes | Yes |
| ServeRAID Manager | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| BIOS Configuration program | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| ServeRAID features | HostRAID controller | ServeRAID- 8i | ServeRAID-7K | ServeRAID- 7t | ServeRAID-6i/6i+ | ServeRAID-6M | ServeRAID- 5i |
|---|---|---|---|---|---|---|---|
| Comand-Line Tool | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| IPSSEND FlashCopy function (Windows XP Professional, Windows 2000, Windows Server 2003, and Windows NT only) | No | No | Yes | No | Yes | Yes | No |
| IPSMON (NetWare only) | No | No | Yes | No | Yes | Yes | Yes |
| Copy Back | No | Yes | Yes | No | Yes | Yes | No |
| Clustering (Windows 2000 and Windows NT only) | No | No | No | No | No | Yes | No |
| Failover (Windows 2000 and Windows NT only) | No | No | No | No | No | Yes (Windows 2000 only) | No |
| RAID level-1, RAID level-1E | Yes (1 only) | Yes | Yes | Yes (1 only) | Yes | Yes | Yes |
| RAID level-0, RAID level-5 | Yes (0 only) | Yes | Yes | Yes | Yes | Yes | Yes |
| RAID level-5E | No | No | No | No | No | No | No |
| RAID level-5EE | No | Yes | Yes | No | Yes | Yes | No |
| RAID level-6 | No | Yes | No | No | No | No | No |
| RAID level-x0 | No | Yes | Yes | Yes (10 only) | Yes | Yes | Yes |

| ServeRAID features | Integrated RAID controller | ServeRAID-4 | ServeRAID-3 | ServeRAID-II |
|---|---|---|---|---|
| ServeRAID ROM Update Wizard | No | Yes | Yes | Yes |
| ServeRAID Manager | Yes | Yes | Yes | Yes |
| ServeRAID Mini-Configuration program | No | Yes | Yes | Yes |
| IPSSEND | No | Yes | Yes | Yes |
| IPSSEND FlashCopy function (Windows XP Professional, Windows 2000, Windows Server 2003, and Windows NT only) | No | Yes | Yes | Yes |
| IPSMON (NetWare only) | No | Yes | Yes | Yes |
| Copy Back | No | No | No | No |
| Clustering (Windows 2000 and Windows NT only) | No | Yes | Yes | Yes |
| Failover (Windows 2000 and Windows NT only) | No | Yes | Yes | Yes |
| RAID level-1, RAID level-1E | Yes (1 only) | Yes | Yes | Yes |
| RAID level-0, RAID level-5 | No | Yes | Yes | Yes |
| RAID level-5E | No | Yes | Yes | No |
| RAID level-5EE | No | Yes ( *except* 4H) | No | No |
| RAID level-6 | No | No | No | No |
| RAID level-x0 | No | Yes | No | No |

**IBM ServeRAID-3 hardware features:** The following table lists the hardware features for the IBM ServeRAID-3 controllers:

| Feature | ServeRAID-3HB | ServeRAID-3H | ServeRAID-3L |
|---|---|---|---|
| Arrays (max.) | 8 | 8 | 8 |
| Battery-backup cache | Yes | Optional | No |
| Cache memory | 32 MB | 32 MB | 4 MB |
| Hard disk drives (max.) | 45 | 45 | 15 |
| Logical drives (max.) | 8 | 8 | 8 |
| Microprocessor | 40 MHz | 40 MHz | 25 MHz |

| Feature | ServeRAID-3HB | ServeRAID-3H | ServeRAID-3L |
|---|---|---|---|
| SCSI channels | 3 | 3 | 1 |
| SCSI transfer speed (max.) | 80 MB per sec. | 80 MB per sec. | 80 MB per sec. |
| Supported RAID levels | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E) | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E) | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E) |
| System PCI data bus | 64 bit | 64 bit | 32 bit |

**IBM ServeRAID-4 hardware features:**  The following tables list the hardware features for the IBM ServeRAID-4 controllers:

| Feature | ServeRAID-4H | ServeRAID-4Mx | ServeRAID-4Lx |
|---|---|---|---|
| Arrays (max.) | 8 | 8 | 8 |
| Battery-backup cache | Yes | Yes | No |
| Cache memory | 128 MB | 64 MB | 32 MB |
| Hard disk drives (max.) | 60 | 30 | 15 |
| Logical drives (max.) | 8 | 8 | 8 |
| Microprocessor | 266 MHz | 100 MHz | 100 MHz |
| SCSI channels | 4 | 2 | 1 |
| SCSI transfer speed (max.) | 160 MB per sec. | 160 MB per sec. | 160 MB per sec. |
| Supported RAID levels | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50 | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50 | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50 |
| System PCI data bus | 64 bit at 33 MHz | 64 bit at 33 to 66 MHz | 64 bit at 33 to 66 MHz |

| Feature | ServeRAID-4M | ServeRAID-4L |
|---|---|---|
| Arrays (max.) | 8 | 8 |
| Battery-backup cache | Yes | No |
| Cache memory | 64 MB | 16 MB |
| Hard disk drives (max.) | 30 | 15 |
| Logical drives (max.) | 8 | 8 |
| Microprocessor | 100 MHz | 100 MHz |
| SCSI channels | 2 | 1 |
| SCSI transfer speed (max.) | 160 MB per sec. | 160 MB per sec. |
| Supported RAID levels | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50 | 0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50 |
| System PCI data bus | 64 bit at 33 MHz | 64 bit at 33 MHz |

**IBM ServeRAID-5i hardware features:**  The following tables list the hardware features for the IBM ServeRAID-5i controller:

| Feature | ServeRAID-5i |
| --- | --- |
| Arrays (max.) | 8 |
| Battery-backup cache | Yes |
| Cache memory | 128 MB |
| Hard disk drives (max.) | 30 |
| Logical drives (max.) | 8 |
| Microprocessor | 100 MHz |
| SCSI channels | 0 |
| SCSI transfer speed (max.) | 320 MB per sec. |
| Supported RAID levels | 0, 1, 5, Enhanced-1 (1E), 00, 10, 1E0, 50 |
| System PCI data bus | 64 bit at 66 MHz |

## Using the ServeRAID Manager interface

Before you begin using the ServeRAID Manager, take some time to review the layout of its user interface.

- Menubar
- Toolbar
- Enterprise view
- Physical and Logical device views
- Event viewer
- Status bar

You can work with the ServeRAID Manager interface by doing any of the following:

- Select actions from the menubar.
- Click an item on the toolbar.
- Right-click an object in the Enterprise view, the Physical devices view, or Logical devices view.
- Drag and drop objects in the Configuration wizard.
- Double-click objects and events.

## More information

- Using ServeRAID Manager Assist, hints and tips
- Finding information in the ServeRAID Manager
- Hints and tips (action)
- Searching for information in ServeRAID Manager Assist
- ServeRAID Manager accessibility features
- Setting your preferences in the ServeRAID Manager

**Using ServeRAID Manager Assist, hints, and tips:** Use ServeRAID Manager Assist to tour and familiarize yourself with objects in the ServeRAID Manager Enterprise view and the Physical and Logical device views. Click on an object to view information about that object.

**Tip:** If you right-click on an object, you can select Hints and tips to view information about the object and the valid actions for that object.

Click ![Back] (Back) and ![Forward] (Forward) to review pages already presented during your current ServeRAID Manager Assist session.

If the ServeRAID Manager is installed on a server that is connected to a printer and its operating system supports printing in the ServeRAID Manager, the ![Print] (Print) is displayed on the ServeRAID Manager Assist toolbar. Click this icon to print the current page.

**Note:**

1. The ServeRAID Manager might print some pages with overlapping text.
2. You cannot print in bootable-CD mode.

To search for terms in the ServeRAID Manager Assist pages, type one or more words in the entry field and click ![Search] (Search). Search will list any page that contains all the words you typed (it is a Boolean AND search). To search for a specific phrase, surround the phrase with double quotes. For example, "logical-drive migration."

**Note:** The search is *not* case sensitive.

To exit the ServeRAID Manager Assist window, click ![Exit] (Exit) and you return to the ServeRAID Manager.

## More information
- Finding information in the ServeRAID Manager
- Hints and tips (action)
- Searching for information in ServeRAID Manager Assist (action)

*Finding information in ServeRAID Manager:*

**Tip:** If you want to learn more about objects in the Enterprise view or the Physical and Logical devices views, right-click

If you want to learn more about the ServeRAID Manager interface, use the tool tips that are displayed when you hover the mouse over a window element.



**Hints and tips** .

**Note:** If tool tips are not displayed when you hover over a window, verify that tool tips are enabled. Click **View** → **Tool tips** to enable or disable tool tips.

If you want context-sensitive information about the current window (for example, "Creating logical drives" in the Configuration wizard), click **Help** → **Information about this window** or the Help push-button.

The following items on the Help menu provide additional information resources:

- Search lets you search for terms in the ServeRAID Assist pages.
- ServeRAID publications lists IBM publications and where to find them.
- IBM online support lists IBM Web sites and available online support.
- What's new in the ServeRAID Manager lists the new features delivered in this version of the ServeRAID Manager program.
- About ServeRAID Manager reports the ServeRAID Manager version number, copyright, and legal information.

## More information

- Using ServeRAID Assist, hints, and tips
- Hints and tips (action)
- Searching for information in ServeRAID Assist (action)

*Using hints and tips:*   Use this action to view information about objects in the Enterprise view or the Physical and Logical device views.

1. In the Enterprise view, Physical devices view, or Logical devices view, click an object.
2. Right-click **Hints and tips**. The ″ServeRAID Manager Assist″ window opens.

To exit the ServeRAID Manager Assist window, click  to return to the ServeRAID Manager.

## More information

- Using ServeRAID Manager Assist, hints, and tips

*Searching for information in ServeRAID Manager Assist:*   Use this action to search the ServeRAID Manager Assist pages.

1. Click **Help** → **Search**. The Search window opens.
2. Type one or more words in the entry field of the topic that you want to find. Search looks for any page that contains all the words you typed (that is, it is a Boolean AND search). To search for a specific phrase, surround the phrase with double quotes. For example, ″logical-drive migration.″

   **Note:** The search is *not* case sensitive.
3. Click **OK**. The Search window opens listing all the pages that contain all the words you typed.
4. Click on a topic to view its information.
5. Click  (Back) on the toolbar to view the Search listing again.

**ServeRAID Manager accessibility features:**   Successful access to information and use of information technology by people who have disabilities is known as ″accessibility.″

The ServeRAID Manager provides keyboard accessibility for its supported operating systems.

On Microsoft Windows, the ServeRAID Manager works with the types of assistive technologies used by people who have disabilities and also supports high-contrast screen colors.

If you require accessibility, use the ServeRAID Manager on a Microsoft Windows operating system. If you need to work with systems that are installed with other operating systems, connect to these systems through the network using a Microsoft Windows system.

## More information
- Accessing the ServeRAID Manager using the keyboard
- Accessing the ServeRAID Manager using screen-reading software
- Adding remote systems

**Setting your preferences in the ServeRAID Manager:** You can change some settings in the ServeRAID Manager to match your preferences.

The ServeRAID Manager uses an alarm to announce warning and error events. You can turn the repeating alarm on and off, change the amount of time between each repeating alarm, and change the duration of the alarm.

You can choose to hide the toolbar, the status bar, and the tool tips. To do so, click **View** in the menubar and click the item you want to turn off.

Also, you can refresh the ServeRAID Manager, including the Enterprise view. Click **View** → **Refresh**.

Additionally, you can adjust the size of the ServeRAID Manager viewing areas to make it easier to see information in which you are interested. Just drag the horizontal and vertical bars that separate the ServeRAID Manager panes.

## More information
- Using the ServeRAID Manager interface
- Changing the alarm settings (action)

## Using ServeRAID in a cluster environment

**Note:** This action is not supported when using the following:
1. Integrated RAID controller
2. ServeRAID-5i controller
3. ServeRAID-6i/6i+ controller
4. ServeRAID-7k controller
5. ServeRAID-7t controller
6. ServeRAID-8i controller
7. HostRAID controller

A cluster is a group of independent computer systems that work together as a single logical system. A client interacts with a cluster as though it is a single server. In other words, a cluster is a group of computers linked together in such a way that they share and manage a set of resources that can support a number of users at the same time.

The ServeRAID high-availability clustering solution is based on a two-server cluster, where both servers can access the same storage devices, but only one server at a time controls the storage devices shared by both servers. If one of the two running servers fails, the remaining server automatically assumes control of the shared resources managed by the failed server while still controlling its own resources at the same time. The failed server can then be repaired offline without the loss of time or work efficiency because the shared data and applications earlier managed by the failed server are still online to the clients.

When the failed server is operational again, it can be placed back into the cluster; the resources are reallocated between the two servers and the cluster resumes normal operation.

You will need clustering hardware and software to configure a cluster. You can install IBM ServeRAID Cluster Solution by using one of the following software applications:
- Microsoft Cluster Server, which is part of Windows NT Server Enterprise Edition.
- Microsoft Cluster Server using Windows 2000, which is part of Windows 2000 Advanced Server Edition.

**Important:** Be sure to review *Installing the IBM ServeRAID Cluster Solution*.

## Using Active PCI features

**Note:** This action is not supported when using the following:
- Integrated RAID controller
- ServeRAID-5i controller
- ServeRAID-6i/6i+ controller
- ServeRAID-6M controller under Windows operating systems

Some IBM servers support Active PCI (also called hot-plug PCI) features. You can use these features to install or remove PCI controllers without turning off the server. The following table summarizes which operating systems support these features.

| Feature | Windows NT 4.0 | Windows 2000 | Windows Server 2003 | NetWare 4.x | NetWare 5.x |
|---|---|---|---|---|---|
| **Hot add** | Yes | Yes | Yes | No | Yes |
| **Hot remove** | No | Yes | Yes | Yes | Yes |
| **Hot replace** | Yes | No | No | No | No |

You can use the hot-add feature to add a controller to a running server, thus expanding its capacity.

**Note:** If you are not using the hot-add feature, restore the controller to the factory-default settings before configuring arrays and logical drives.

Use the hot-remove feature to remove a controller from a running server. If a controller fails, use the hot-replace feature to replace a controller with an identical controller.

**Attention:** Do *not* attempt a hot-replace operation on Windows 2000, Windows Server 2003, or NetWare by hot-removing a failed controller and then hot-adding a new controller. Loss of data can occur. If a controller fails on these operating systems, you *must* shut down the server to replace the controller.

## More information
- Using Windows NT 4.0 with Active PCI features
- Rebuilding a defunct drive
- Recovering from defunct drives
- Rebuilding a hot-swap drive
- Replacing a controller (action)

• Failing from the active to the passive controller (action)

**Using Windows NT 4.0 with Active PCI features:** To use Active PCI with
Windows NT 4.0 and a ServeRAID-4 controller, you must install the following
software components in this order:

1. DMI Service provider. A free version is included on the *IBM ServeRAID
   Support* CD in the following directory:

   *e*:\WINNT\DMISP\setup.exe

   where *e* is the CD-ROM drive.

   **Note:** This version is sufficient for most users' needs, but a Y2K compliant
   version is available at the following Web site:

   http://www.enablers.com

2. IBM Hot Plug for Windows NT 4.0 Package, version 4.2 or later. This package
   is available from the IBM Support Web site.

   **Note:** Be sure to read the instructions and restrictions for this software
   program.

3. ServeRAID Active PCI DMI component. This is component is installed
   automatically when you install the ServeRAID Manager program.

To perform a hot-replace operation, start the IBM ServeRAID Hot Replace Wizard.
You can start this program from within either the IBM Hot Plug for Windows NT
4.0 program or the ServeRAID Manager program. You can use the ServeRAID
Manager program to start the wizard either on the server with the failed controller,
or across the network from a remote installation of the ServeRAID Manager.

**Note:** It is useful to start the IBM ServeRAID Hot Replace Wizard from a remote
installation when the server with the failed controller does not have a
monitor.

## More information
• Using Active PCI features
• Replacing a ServeRAID controller (action)

## Understanding unattended mode
Unattended mode is a setting that alters how the ServeRAID Manager startup code
(that is, BIOS) handles failures during a system startup. Examples of possible
failures during the startup are the following:
• The BIOS cannot communicate with the controller.
• A physical drive state has changed.
• A logical drive state has changed.

You can set unattended mode: either Disabled or Enabled. The default is Disabled.

When unattended mode is disabled and the BIOS detects a failure, the system
remains at the recovery option screen and waits for the user to respond.

When unattended mode is enabled and the BIOS detects a failure, the system waits
for 30 seconds for the user to respond to the recovery options screen. If no user
responds, the BIOS automatically selects the first recovery option in the list and
continues the system startup process. This mode is useful for remote systems
where a user is not present for system startups.

Consider carefully whether to enable unattended mode. Depending on how you use the system, unattended mode might be undesirable.

For example, consider a system that includes an enclosure of multiple physical drives. If the enclosure is turned off when you start the system, the BIOS reports a drive failure. If unattended mode is enabled, the BIOS accepts a recovery option that changes the configuration. When the system restarts with the enclosure turned on, the configuration is no longer correct and the system no longer works as originally configured.

You can change unattended mode with the ServeRAID Manager in bootable-CD mode only.

**Note:** If you are configuring your system for clustering, you must enable unattended mode. If you use the ServeRAID Manager to enable your system for clustering, the ServeRAID Manager automatically enables unattended mode.

### More information
- Enabling and disabling unattended mode (action)
- Configuring controllers for clustering (action)
- Using ServeRAID Manager in a cluster environment

## Using the ServeRAID Manager interface

Before you begin using the ServeRAID Manager, take some time to review the layout of its user interface.
- Menubar
- Toolbar
- Enterprise view
- Physical and Logical device views
- Event viewer
- Status bar

You can work with the ServeRAID Manager interface by doing any of the following:
- Select actions from the menubar.
- Click an item on the toolbar.
- Right-click an object in the Enterprise view, the Physical devices view, or Logical devices view.
- Drag and drop objects in the Configuration wizard.
- Double-click objects and events.

### More information
- Using ServeRAID Manager Assist, hints and tips
- Finding information in the ServeRAID Manager
- Hints and tips (action)
- Searching for information in ServeRAID Manager Assist
- ServeRAID Manager accessibility features
- Setting your preferences in the ServeRAID Manager

# Finding information on the World Wide Web

**IBM home page** http://www.ibm.com/pc/

**IBM support page** http://www.ibm.com/pc/support/

Complete the following steps to access ServeRAID and Clustering support:

1. From the **Browse the support site** list box, select **Servers**. The IBM xSeries, Netfinity, and PC Server Support page opens.

2. From the **Family** list box, select **ServeRAID** or **Clustering**. The ServeRAID or Clustering Support page opens.

3. Click one of the following options that appear in the left margin:

   **Downloadable files**
   Download the latest versions of Clustering software, the ServeRAID Manager program, BIOS and firmware code, device-driver updates, and other important information.

   **Hints and tips**
   Obtain useful information about IBM Clustering and ServeRAID products, as well as tips for troubleshooting potential problems.

   **Online publications**
   Download the installation and user's guides, references, white papers, and other IBM publications.

   **Note:** All IBM ServeRAID publications are available on the *IBM ServeRAID Support* CD.

4. From the **. . . by Category** list box, select **RAID**; a list of downloadable files appears below the list box.

**IBM ServerProven compatibility page** http://www.ibm.com/PC/us/compat/ Detailed information about server compatibility issues.

# IBM ServeRAID publications

The following publications are available in Portable Data Format (PDF) on the *IBM ServeRAID Support* CD in the /BOOKS directory:
- *IBM ServeRAID User's Reference* (SRAID.PDF)
- *IBM ServeRAID Installation Guide (series 4, 5, 6, and 7 controllers)* (INSTALL.PDF)
- *IBM ServeRAID Device Driver Installation Instructions* (DEVDRV.PDF)

**Note:** Use Adobe Acrobat Reader to view these publications. The *IBM ServeRAID Support* CD contains the Acrobat Readers for Microsoft Windows, IBM OS/2, and Linux in the /BOOKS/READERS directory.

If you are installing the IBM ServeRAID Cluster Solution, you might need to refer to the *IBM Shared Disk Clustering Hardware Reference.* This publication provides general information about planning and configuring a shared-disk cluster using IBM server products. It contains illustrations, descriptions, and parts listings for various high-availability, shared-disk cluster examples.

**Note:** You can obtain this publication from the IBM Support Web site.

In addition, the following IBM Redbooks might be of interest:
- *Implementing Netfinity Disk Subsystems: ServeRAID SCSI, Fibre Channel, and SSA*

- *Tuning Netfinity Server for Performance: Getting the most out of Windows 2000 and Windows NT 4.0*
- *Netfinity Director: Integration and Tools*
- *Netfinity Clustering Planning Guide*

You can download these publications from the IBM Web site: www.ibm.com/redbooks

# Understanding RAID technology

Redundant array of independent disk (RAID) is the technology of grouping several **physical** drives in a computer into an array that you can define as one or more logical drives. Each **logical drive** appears to the operating system as a single drive. This grouping technique greatly enhances logical-drive capacity and performance beyond the physical limitations of a single physical drive.

When you group multiple physical drives into a logical drive, the ServeRAID controller can transfer data in parallel from the multiple drives in the array. This parallel transfer yields data-transfer rates that are many times higher than with nonarrayed drives. This increased speed makes the system better able to meet the **throughput** (the amount of data processed in a given amount of time) or productivity needs of the multiple-user network environment.

The ability to respond to multiple data requests provides not only an increase in throughput, but also a decrease in response time. The combination of parallel transfers and simultaneous responses to multiple requests enables disk arrays to provide a high level of performance in network environments.

### More information
- Things to consider when changing the RAID level
- Understanding stripe-unit size
- RAID level-0
- RAID level-1
- RAID level-1E
- RAID level-5
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes

## Understanding stripe-unit size

With RAID technology, data is **striped** across an array of physical drives. This data-distribution scheme complements the way the operating system requests data.

The granularity at which data is stored on one drive of the array before subsequent data is stored on the next drive of the array is called the **stripe-unit size** .

You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. You can maximize the performance of your ServeRAID controller by setting the stripe-unit size to a value that is close to the size of the system I/O requests. For example, performance in transaction-based environments, which typically involve large

blocks of data, might be optimal when the stripe-unit size is set to 32 KB or 64 KB. However, performance in file and print environments, which typically involve multiple small blocks of data, might be optimal when the stripe-unit size is set to 8 KB or 16 KB.

[SR-8i] [SR-7t] [HostRAID]   The ServeRAID-7t, ServeRAID-8i, and HostRAID controllers do not support an 8 KB stripe-unit size. The ServeRAID-7t and ServeRAID-8i controllers support these additional stripe-unit sizes: 128 KB, 256 KB, 512 KB, and 1024 KB.

The collection of stripe units, from the first drive of the array to the last drive of the array, is called a *stripe*.

[SR-SCSI] [HostRAID]   After you configure an array and store data on the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. The default setting is 8 KB data bytes.

- When the stripe-unit size is 8 KB or 16 KB, the maximum number of physical drives in an array is 16.
- If you have a ServeRAID-3H or ServeRAID-3HB controller using ServeRAID firmware (version 4.0, or later) and the stripe-unit size is 32 KB or 64 KB, the maximum number of physical drives in an array is 16. Otherwise, when the stripe-unit size is 32 KB or 64 KB, the maximum number of physical drives in an array is 8.
- If you have a ServeRAID-4 controller and the stripe-unit size is set to 32 KB or 64 KB, the maximum number of physical drives in an array is 16.

### More information
- Changing the stripe-unit size (action)
- Application environment groups reference

## Understanding RAID level-0

RAID level-0 stripes the data across all the drives in the array. This offers substantial speed enhancement, but provides no data redundancy. RAID level-0 provides the largest storage capacity of the RAID levels that are offered, because no room is taken for redundant data or data-parity storage.

RAID level-0 requires a minimum of one drive and, depending upon the level of firmware and the stripe-unit size, supports a maximum of 8 or 16 drives.

[SR-8i] [SR-7t] [HostRAID]   For ServeRAID-8i, ServeRAID-7t, and HostRAID controllers, RAID level-0 requires a minimum of two drives.

The following illustration shows an example of a RAID level-0 logical drive.

## RAID level-0 example

Start with two physical drives.
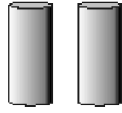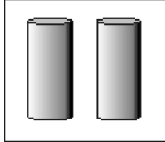
Create an array using the two physical drives.

Then create a logical drive within that array.
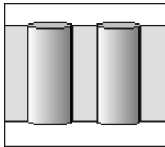
The data is striped across the drives, creating blocks. Notice that the data is striped across all the drives in the array, but no redundant data is stored.
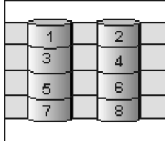
A physical drive failure within the array results in loss of data in the logical drive assigned RAID level-0, but only in that logical drive. If you have logical drives assigned RAID level-1, 1E, 5, or 5E in the same array, they will not lose data.

**Note:** If you have an array that contains only one physical drive, you can assign only RAID level-0 to the logical drive in that array.

When you replace a failed drive, the controller can rebuild all the RAID level-1, 1E, 5, 5E, and 5EE logical drives automatically onto the replacement physical drive. However, any data stored in a failed RAID level-0 logical drive is lost.

Although the risk of data loss is present, you might want to assign RAID level-0 to one of the logical drives to take advantage of the speed this RAID level offers. You can use this logical drive to store data that you back up each day and can re-create easily. You also might want to use a RAID level-0 logical drive when you require maximum capacity.

### Advantages and disadvantages

RAID level-0 offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|---|---|
| • Substantial speed enhancement<br>• Maximum utilization of physical drive storage capacity, because no room is taken for redundant data or data-parity storage | No data redundancy, resulting in data loss in the event that a physical drive fails |

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes
- Software and hardware support of RAID levels

# Understanding RAID level-1

RAID level-1 uses data mirroring. Two physical drives are combined into an array, and data is striped across the array. The first half of a stripe is the original data; the second half of a stripe is a **mirror** (that is, a copy) of the data, but it is written to the other drive in the RAID level-1 array.

RAID level-1 provides data redundancy and high levels of performance, but the storage capacity is diminished. Because the data is mirrored, the capacity of the logical drive when assigned RAID level-1 is 50% of the array capacity.

RAID level-1 requires two physical drives.

The following illustration shows an example of a RAID level-1 logical drive.

### RAID level-1 example

Start with two physical drives.
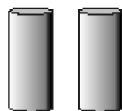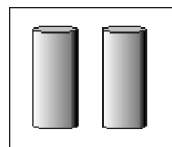
Create an array using the two physical drives.

Then create a logical drive within that array.
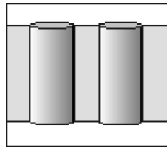
The data is striped across the drives, creating blocks. Notice that the data on the drive on the right is a copy of the data on the drive on the left.
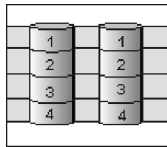
With RAID level-1, if one of the physical drives fails, the controller switches read and write requests to the remaining functional drive in the RAID level-1 array.

## Advantages and disadvantages

RAID level-1 offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|---|---|
| • 100% data redundancy<br>• High performance | Allows only 50% of the physical drive storage capacity to be used |

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes
- Software and hardware support of RAID levels

# Understanding RAID level-1 Enhanced

RAID level-1 Enhanced (RAID level-1E) combines mirroring and data striping. This RAID level stripes data and copies of the data across all of the drives in the array. As with the standard RAID level-1, the data is mirrored, and the capacity of the logical drive is 50% of the array capacity.

RAID level-1E has a similar profile to RAID level-1; it provides data redundancy and high levels of performance, but the storage capacity is diminished. However, RAID level-1E allows a larger number of physical drives to be used.

RAID level-1E requires a minimum of three drives and, depending upon the level of firmware and the stripe-unit size, supports a maximum of 8 or 16 drives.

The following illustration is an example of a RAID level-1E logical drive.

## RAID level-1 Enhanced example

Start with three physical drives.
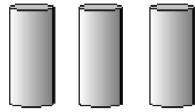
Create an array using the physical drives.
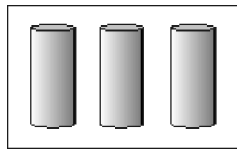
Then create a logical drive within that array.

The data is striped across the drives, creating blocks. Notice that the stripe labeled * is the data stripe and the stripe labeled ** is the copy of the preceding data stripe. Also, notice that each block on the mirror stripe is shifted one drive.
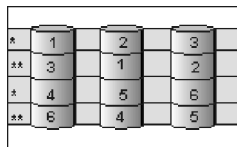
With RAID level-1E, if one of the physical drives fails, the controller switches read and write requests to the remaining functional drives in the RAID level-1E array.

## Advantages and disadvantages

RAID level-1E offers the following advantages and disadvantages:

| Advantages | Disadvantages |
|---|---|
| • 100% data redundancy<br>• High performance | Allows only 50% of the physical drive storage capacity to be used |

## More information
• Understanding RAID technology
• Understanding stripe-unit size
• Selecting a RAID level
• RAID level-0
• RAID level-1
• RAID level-5

- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes

# Understanding RAID level-5

RAID level-5 stripes data and parity across all drives in the array.

RAID level-5 offers both data protection and increased throughput. When you assign RAID level-5 to an array, the capacity of the array is reduced by the capacity of one drive (for data-parity storage). RAID level-5 gives you higher capacity than RAID level-1, but RAID level-1 offers better performance.

RAID level-5 requires a minimum of three drives and, depending upon the level of firmware and the stripe-unit size, supports a maximum of 8 or 16 drives.

The following illustration is an example of a RAID level-5 logical drive.

## RAID level-5 example

Start with four physical drives.
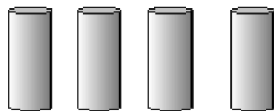
Create an array using three of the physical drives, leaving the fourth as a hot-spare drive.

Then create a logical drive within that array.
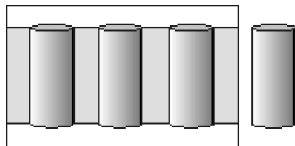
The data is striped across the drives, creating blocks.

Notice that the storage of the data parity (denoted by *) also is striped, and it shifts from drive to drive.

A parity block ( *) contains a representation of the data from the other blocks in the same stripe. For example, the parity block in the first stripe contains data representation of blocks 1 and 2.
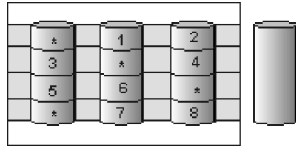
If a physical drive fails in the array, the data from the failed physical drive is reconstructed onto the hot-spare drive.
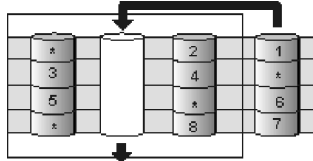


## Advantages and disadvantages

RAID level-5 offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|---|---|
| • 100% data protection<br>• Offers more physical drive storage capacity than RAID level-1 or level-1E | Lower performance than RAID level-1 and level-1E |

## More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes

# Understanding RAID level-5 Enhanced

**Note:** This RAID level is not available on all controllers.

RAID level-5E is the same as RAID level-5 with a built-in spare drive. Like RAID level-5, this RAID level stripes data and parity across all of the drives in the array.

RAID level-5E offers both data protection and increased throughput. When an array is assigned RAID level-5E, the capacity of the logical drive is reduced by the capacity of two physical drives in the array (one for parity and one for the spare).

Reading from and writing to four physical drives is more efficient than reading from and writing to three physical drives and an idle hot spare. Therefore, RAID level-5E provides a higher level of performance than RAID level-5.

The spare drive is actually part of the RAID level-5E array, as shown in the following example. With such a configuration, you cannot share the spare drive with other arrays. If you want a spare drive for any other array, you must have another spare drive for those arrays.

RAID level-5E requires a minimum of four drives and, depending upon the level of firmware and the stripe-unit size, supports a maximum of 8 or 16 drives. RAID level-5E is also firmware-specific.

**Note:** For RAID level-5E, you can have only one logical drive in an array. When using RAID level-5E, you can have a maximum of seven logical drives on the controller.

The following illustration is an example of a RAID level-5E logical drive.

## RAID level-5 Enhanced example

Start with four physical drives.
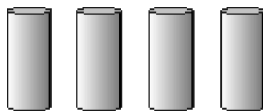


Create an array using all four physical drives.
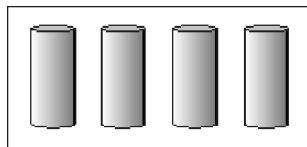


Then create a logical drive (labeled as 1) within the array. Notice that the distributed spare drive is the free space (labeled as 2) shown below the logical drive.
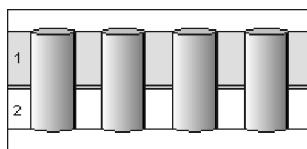


The data is striped across the drives, creating blocks in the logical drive. The storage of the data parity (denoted by * ) is striped, and it shifts from drive to drive as it does in RAID level-5. Notice that the spare drive is *not* striped.
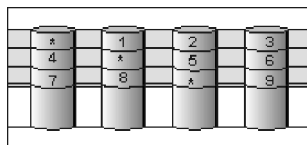


If a physical drive fails in the array, the data from the failed drive is reconstructed. The array undergoes compression, and the distributed spare drive becomes part of the array. The logical drive remains RAID level-5E.

When you replace the failed drive, the data for the logical drive decompresses and returns to the original striping scheme.
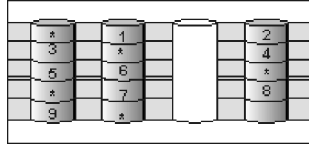
If you use a RAID level-5E logical drive in a failover or cluster configuration, the RAID level-5E logical drive will not failover while undergoing compression or decompression.

### Advantages and disadvantages

RAID level-5E offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|---|---|
| • 100% data protection<br>• Offers more physical drive storage capacity than RAID level-1 or level-1E<br>• Higher performance than RAID level-5 | • Lower performance than RAID level-1 and level-1E<br>• Supports only one logical drive per array<br>• Cannot share a hot-spare drive with other arrays<br>• Not supported on all controllers |

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5EE
- RAID level-6
- RAID level-x0
- RAID volumes

## Understanding RAID level-5EE

**Note:** This feature is not supported on all controllers.

RAID level-5EE is similar to RAID level-5E but with a more efficient distributed spare and faster rebuild times. Like RAID level-5E, this RAID level stripes data and parity across all of the drives in the array.

RAID level-5EE offers both data protection and increased throughput. When an array is assigned RAID level-5EE, the capacity of the logical drive is reduced by the capacity of two physical drives in the array: one for parity and one for the spare.

The spare drive is part of the RAID level-5EE array. However, unlike RAID level-5E, which uses contiguous free space for the spare, a RAID level-5EE spare is interleaved with the parity blocks, as shown in the following example. This allows

data to be reconstructed more quickly if a physical drive in the array fails. With such a configuration, you cannot share the spare drive with other arrays. If you want a spare drive for any other array, you must have another spare drive for those arrays.

RAID level-5EE requires a minimum of four drives and, depending upon the level of firmware and the stripe-unit size, supports a maximum of 8 or 16 drives. RAID level-5EE is also firmware-specific.

**Note:** For RAID level-5EE, you can have only one logical drive in an array.

The following illustration is an example of a RAID level-5EE logical drive.

## RAID level-5EE example

Start with four physical drives.
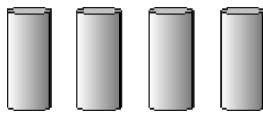
Create an array using all four physical drives.
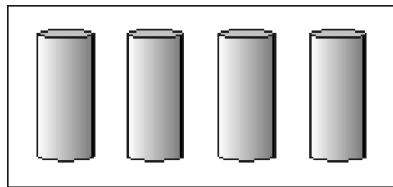
Then create a logical drive within the array.
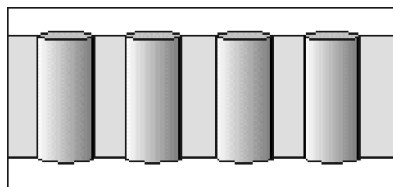
The data is striped across the drives, creating blocks in the logical drive. The storage of the data parity (denoted by *) is striped, and it shifts from drive to drive as it does in RAID level-5E. The spare drive (denoted by S) is interleaved with the parity blocks, and it also shifts from drive to drive.
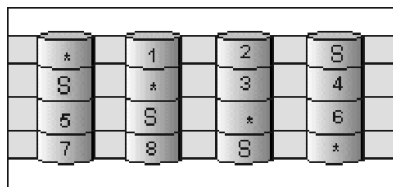
If a physical drive fails in the array, the data from the failed drive is reconstructed. The array undergoes *compaction*, and the distributed spare drive becomes part of the array. The logical drive remains RAID level-5EE.

When you replace the failed drive, the data for the logical drive undergoes *expansion* and returns to the original striping scheme.
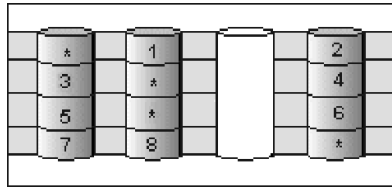


## Advantages and disadvantages

RAID level-5EE offers the following advantages and disadvantages.

**Advantages**
- 100% data protection
- Offers more physical drive storage capacity than RAID level-1 or level-1E
- Higher performance than RAID level-5
- Faster rebuild than RAID level-5E

**Disadvantages**
- Lower performance than RAID level-1 and level-1E
- Supports only one logical drive per array
- Cannot share a hot-spare drive with other arrays
- Not supported on all controllers

## More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-6
- RAID level-x0
- RAID volumes

# Understanding RAID level-6

RAID level-6 is similar to RAID level-5 but with two sets of parity information instead of one. RAID level-6 stripes blocks of data and parity across all drives in the array like RAID level-5, but adds a second set of parity information for each block of data.

When you assign RAID level-6 to an array, the capacity of the array is reduced for data-parity storage (the exact amount depends on the size of the drives in the array). The second set of parity information is added to improve fault tolerance. RAID level-6 can handle two simultaneous drive failures, where other single RAID levels can handle, at most, only one.

RAID level-6 requires a minimum of four drives and supports a maximum of 16 drives. The maximum stripe-unit size depends on the number of drives in the array.

The following illustration is an example of a RAID level-6 logical drive.

## RAID level-6 example

Start with six physical drives.

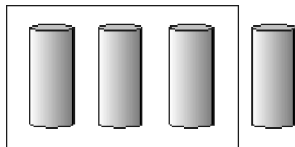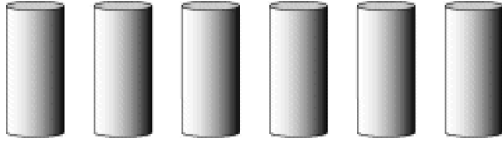Create a logical drive using four physical drives, leaving two for hot spare drives.
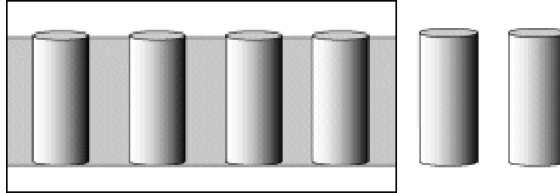
The data is striped across the drives, creating blocks in the logical drive. The storage of the data parity (denoted by * and **) is striped, and it shifts from drive to drive as it does in RAID level-5.
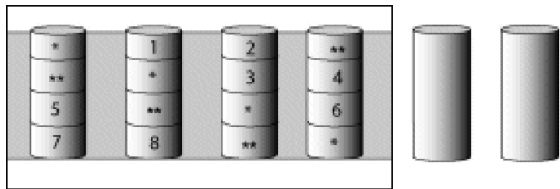
If a physical drive fails in the array, the logical drive is degraded but remains fault tolerant.
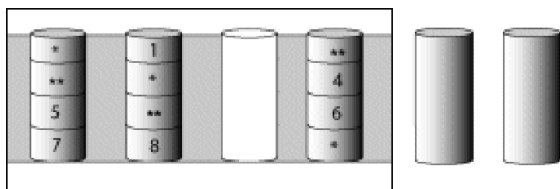
If a second physical drive fails in the array, the data from the failed drives are reconstructed onto the hot-spare drives, and the data for the logical drive return to the original striping scheme.
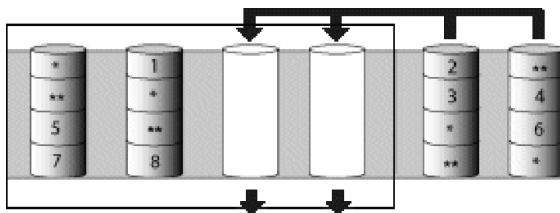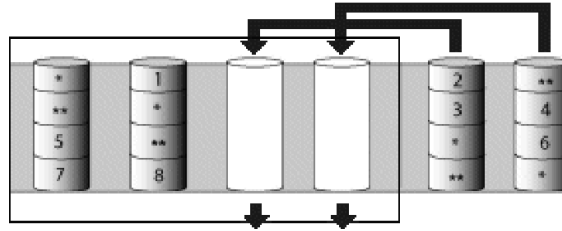
### Advantages and disadvantages

RAID level-6 offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|---|---|
| • 100% data protection<br>• Extremely high data fault tolerance<br>• Can sustain two simultaneous drive failures<br>• Good solution for mission critical applications | • Lower performance than RAID level-5 because of two parity drives<br>• Not supported on all controllers |

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5E Enhanced
- RAID level-x0
- RAID volumes

## Understanding RAID level-x0

**Note:** RAID level-x0 is not available on all controllers.

RAID level-x0 refers to RAID level-00, 10, 1E0, 50 and 60. RAID level-x0 uses an array of arrays, or a **spanned array**. The operating system uses the spanned array logical drive in the same way as a regular array logical drive.

RAID level-x0 allows more physical drives in an array. The benefits of doing so are larger logical drives, increased performance, and increased reliability. RAID level-0, 10, 1E, 5, 5E, and 6 cannot use more than 16 physical drives in an array; however, RAID level-1E0, 50, and 60 support 60 to 128 drives.

RAID level-x0 requires a minimum of two drives and supports a maximum of 60 to 128 drives, depending on the controller.

The following illustration is an example of a RAID level-10 logical drive.

## RAID level-10 example

Start with six physical drives.

Create three arrays (labeled A, B, and C), each array using two physical drives.
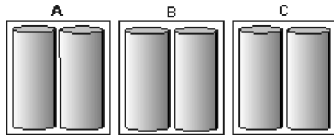
Then create a *spanned* array (labeled as *) that spans the three arrays.
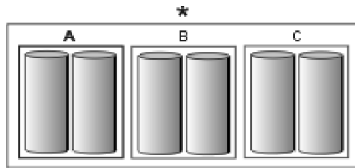
A sub-logical drive is created within *each* array (A, B, and C). Then the data is striped across the physical drives in the array, creating blocks.

Notice that, in each array, the data on the drive on the right is a copy of the data on the drive on the left. This is because the sub-logical drives (A, B, and C) are RAID level-1 in a RAID level-10 implementation (see the following table).
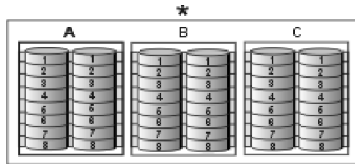
Then create a logical drive within the spanned array (*).

The data is striped across this logical drive, creating blocks ( **1**- **12**). Notice that none of these blocks are redundant. This is because the logical drive is RAID level-0 in a RAID level-x0 implementation (see the following table).
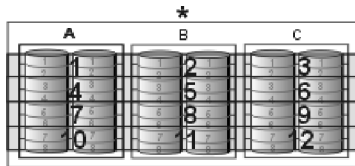
| RAID level | Sub-logical drive | Spanned array logical drive |
|------------|-------------------|------------------------------|
| 00 | RAID level-0 | RAID level-0 |
| 10 | RAID level-1 | RAID level-0 |
| 1E0 | RAID level-1E | RAID level-0 |
| 50 | RAID level-5 | RAID level-0 |

| RAID level | Sub-logical drive | Spanned array logical drive |
|------------|-------------------|------------------------------|
| 60 | RAID level-6 | RAID level-0 |

With RAID level-10, 1E0, and 50, if one of the physical drives fails in a sub-logical drive, the ServeRAID controller switches read and write requests to the remaining functional drives in the sub-logical drive. With RAID level-60, if one or two of the physical drives fails in a sub-logical drive, the ServeRAID controller switches read and write requests to the remaining functional drives in the sub-logical drive. With RAID level-00, a physical drive failure within the sub-logical drive results in loss of data.

### Advantages and disadvantages

RAID level-x0 offers the following advantages and disadvantages.

| Advantages | Disadvantages |
|------------|---------------|
| • Supports up to 60 physical drives on SCSI controllers<br>• Supports up to 128 physical drives on SAS and SATA controllers<br>• 100% data redundancy (except for RAID level-00) | • Not available on all controllers<br>• No data redundancy for RAID level-00 |

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID volumes

## Understanding RAID volumes

**Note:** HostRAID controllers do *not* support RAID volumes.

For the ServeRAID-8i SAS controller and ServeRAID-7t SATA controller, the ServeRAID Manager supports the following RAID volume types:
- **Simple Volume** - a single disk drive or segment; not redundant.
- **Spanned Volume** - two or more disk drives or segment with the same or different capacity, connected end-to-end. A spanned volume offers no redundancy or performance advantage over a single drive.
- **RAID Volume** - two or more logical drives with the same RAID level, connected end-to-end. The logical drives may have the same or different capacity and are *not* striped together; they may be redundant, depending on the RAID level.

**Notes:**

– You must create the individual logical drives before you create a RAID Volume. Use the Configuration wizard to create the logical drives; then, run the Configuration wizard again to create the RAID Volume.

– When you create a RAID Volume, the ServeRAID Manager replaces the individual logical drives with a single RAID Volume icon in the Logical devices view; then, it reports the logical drives as deleted in the event viewer. The event message is normal and does not indicate a loss of data.

### More information
- Understanding RAID technology
- Understanding stripe-unit size
- Selecting a RAID level
- RAID level-0
- RAID level-1
- RAID level-1 Enhanced
- RAID level-5
- RAID level-5 Enhanced
- RAID level-5EE
- RAID level-6
- RAID level-x0

### Creating a simple volume
Use this action to create a simple volume. A simple volume is a single disk drive or segment used for storage in a RAID system; it is not redundant.

Complete the following steps to create a simple volume:

1. In the Physical devices view, click  (online physical drive).
2. Right-click **Create simple volume**.
3. Click **Yes** to confirm.

### More information
- Understanding RAID technology

## Selecting a RAID level and tuning performance

Disk arrays are used to improve performance and reliability. The amount of improvement depends on the application programs that you run on the server and the RAID levels that you assign to the logical drive.

Each RAID level provides different levels of fault-tolerance (data redundancy), utilization of physical drive capacity, and read and write performance. In addition, the RAID levels differ in regard to the minimum and maximum number of physical drives that are supported.

When selecting a RAID level for your system, consider the following factors.

**Note:** Not all RAID levels are supported by all ServeRAID controllers.

| RAID level | Data redundancy | Physical drive capacity utili- zation | Read perfor- mance | Write perfor- mance | Built-in spare drive | Min. number of drives | Max. number of drives |
|---|---|---|---|---|---|---|---|
| RAID level-0 | No | 100% | Superior | Superior | No | 1 | 16 |

| RAID level | Data redun-dancy | Physical drive capacity utili- zation | Read perfor-mance | Write perfor-mance | Built-in spare drive | Min. number of drives | Max. number of drives |
|---|---|---|---|---|---|---|---|
| RAID level-1 | Yes | 50% | Very high | Very high | No | 2 | 2 |
| RAID level-1E | Yes | 50% | Very high | Very high | No | 3 | 16 |
| RAID level-5 | Yes | 67% to 94% | Superior | High | No | 3 | 16 |
| RAID level-5E | Yes | 50% to 88% | Superior | High | Yes | 4 | 16 |
| RAID level-5EE | Yes | 50% to 88% | Superior | High | Yes | 4 | 16 |
| RAID level-6 | Yes | 50% to 88% | Very High | High | No | 4 | 16 |
| RAID level-00 | No | 100% | Superior | Superior | No | 2 | 60 |
| RAID level-10 | Yes | 50% | Very high | Very high | No | 4 | 16 |
| RAID level-1E0 | Yes | 50% | Very high | Very high | No | 6 | 60 |
| RAID level-50 | Yes | 67% to 94% | Superior | High | No | 6 | 60 (SCSI) 128 (SAS, SATA) |
| RAID level-60 | Yes | 50% to 88% | Very High | High | No | 8 | 128 |
| Spanned Volume | No | 100% | Superior | Superior | No | 2 | 48 |
| RAID Volume | No | 50% to 100% | Superior | Superior | No | 4 | 48 |

Physical drive utilization, read performance, and write performance depend on the number of drives in the array. Generally, the more drives in the array, the better the performance.

## More information

- Understanding RAID technology
- Selecting the logical drive size
- Selecting the RAID level by array capacity
- Creating logical drives (action)
- Configuring RAID and creating arrays (action)
- Creating logical drives in the wizard
- Things to consider when changing the RAID level

# Selecting the RAID level by array capacity

**Note:** Not all RAID levels are supported by all ServeRAID controllers.

| If your array has... | Consider this RAID level... |
|---|---|
| One or more physical drives in an array.<br>**Notes:**<br>• This is the only choice if the array contains only one physical drive.<br>• You can select RAID level-0 for any logical drive. | RAID level-0 |
| Two physical drives. The default for two physical drives is RAID level-1. | RAID level-1 |
| Three or more physical drives. | RAID level-1E |
| Three or more physical drives. | RAID level-5 |
| Four or more physical drives. | RAID level-5E |
| Four or more physical drives. | RAID level-5EE |
| Four or more physical drives. | RAID level-6 |
| Two or more physical drives. | RAID level-00 |
| Four or more physical drives. | RAID level-10 |
| Six or more physical drives. | RAID level-1E0 |
| Six or more physical drives. | RAID level-50 |
| Eight or more physical drives. | RAID level-60 |

## More information

• Selecting a RAID level and performance tuning

## Example: Total disk capacity

Physical drives in an array can be of different capacities (1 GB, or 2 GB, for example). The sum of the physical drives' capacity grouped in an array is the **total disk capacity**.

For example, if you group two 2 GB drives and one 3 GB drive into an array, the total disk capacity is the 7 GB physically available.

**2 GB**          **2 GB**          **3 GB**
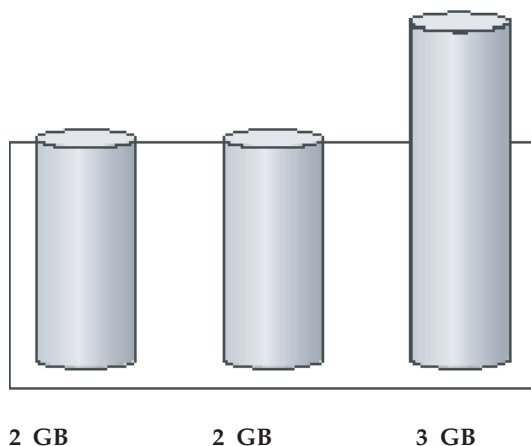
Similarly, if you group three 2 GB drives and 1 GB drive into an array, the total disk capacity is the 7 GB physically available.

## More information

- Example: Usable and unusable capacity

## Example: Usable and unusable capacity

Physical drive capacities influence the way you create arrays and logical drives. Drives in an array can be of different capacities (1 GB, or 2 GB, for example), but RAID controllers treat them as if they all have the capacity of the **smallest** physical drive.

For example, if you group two 2 GB drives and one 3 GB drive into an array, the usable capacity of the array is 2 GB times 3, or 6 GB, **not** the 7 GB physically available. The 7 GB is the total **disk** capacity. In the following diagram, usable capacity is labeled as 1 and unusable capacity is labeled as 2.
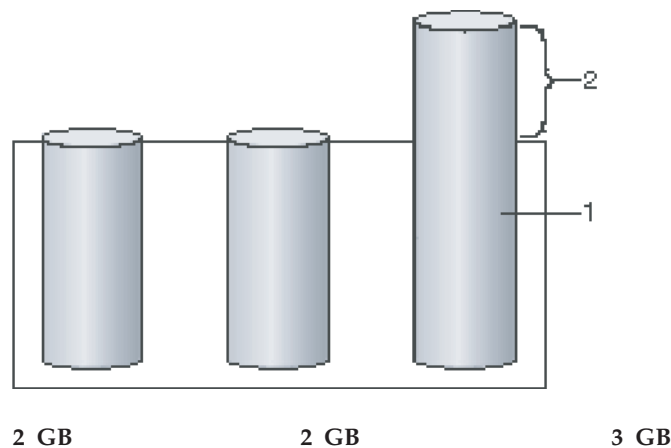


| 2 GB | 2 GB | 3 GB |

Similarly, if you group three 2 GB drives and 1 GB drive into an array, the usable capacity of that array is 4 GB, **not** the 7 GB physically available. The 7 GB is the total **disk** capacity. The remaining capacity left on the three 2 GB drive is unusable capacity.

The optimal way to create arrays is to use physical drives that have the same capacity. Doing so avoids unusable capacity





For the ServeRAID-8i controller and ServeRAID-7t controller, usable capacity is the same as the total disk capacity. That is, you can use the remaining space to define another logical drive. The segments that make up the logical drive must be the same size on each physical drive. For example, you can group two 1 GB segments with the remaining space from the previous example to define a 3 GB logical drive. In the following diagram, the new logical drive is labeled 2; 4 GB of usable capacity remain, 2 GB on each drive, labeled 3.

| 2 GB | 2 GB | 3GB | 3 GB | 3 GB |
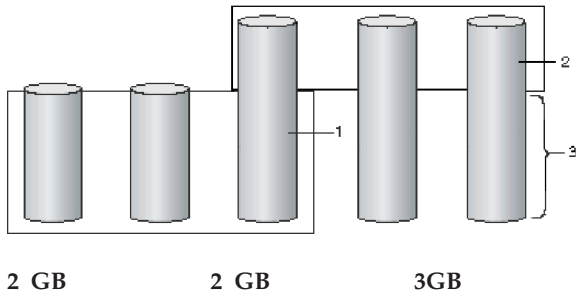
### More information
- Example: Total disk capacity
- Understanding physical drive capacity and unusable capacity

## Software and hardware support of RAID levels

| RAID level | ServeRAID software* release that supports the RAID level | Hardware levels that support the RAID level |
|---|---|---|
| 0 | All | ServeRAID on the board, ServeRAID, ServeRAID-II, ServeRAID-3 family, ServeRAID-4 family, ServeRAID-5i, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-7t, ServeRAID-8i |
| 1 | All | ServeRAID on the board, ServeRAID, ServeRAID-II, ServeRAID-3 family, ServeRAID-4 family, ServeRAID-5i, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-7t, ServeRAID-8i, integrated RAID controller |
| 1E | All | ServeRAID on the board, ServeRAID, ServeRAID-II, ServeRAID-3 family, ServeRAID-4 family, ServeRAID-5i, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-8i |
| 5 | All | ServeRAID on the board, ServeRAID, ServeRAID-II, ServeRAID-3 family, ServeRAID-4 family, ServeRAID-5i, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-7t, ServeRAID-8i |

| RAID level | ServeRAID software* release that supports the RAID level | Hardware levels that support the RAID level |
|---|---|---|
| 5E | ServeRAID 3.50 or later | ServeRAID-3 and ServeRAID-4 families. |
| 5EE | ServeRAID 6.00 or later | ServeRAID-4 family *except* ServeRAID-4H, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-8i |
| 6 | ServeRAID 7.30 or later | ServeRAID-8i |
| x0 | ServeRAID 4.00 or later | ServeRAID-4 family, ServeRAID-5i, ServeRAID-6M, ServeRAID-6i/6i+, ServeRAID-7k, ServeRAID-7t, ServeRAID-8i |

\* ServeRAID software refers to BIOS, firmware, device drivers, programs, and so forth.

## RAID levels that can use a hot-spare or standby hot-spare drive

Hot-spare and standby hot-spare drives supply additional protection to a RAID configuration. When you select the RAID level for your configuration, consider the following:

| RAID level | Can use a hot spare? | Can use a standby hot spare? |
|---|---|---|
| 0 | No | No |
| 1 | Yes | Yes |
| 1E | Yes | Yes |
| 5 | Yes | Yes |
| 5E * | Yes | Yes |
| 5EE * | Yes | Yes |
| 6 | Yes | No |
| 00 | No | No |
| 10 | Yes | Yes |
| 1E0 | Yes | Yes |
| 50 | Yes | Yes |
| 60 | Yes | No |

\* RAID level-5E and RAID level-5EE integrate a distributed hot-spare drive, but also can use traditional hot-spare and standby hot-spare drives. If a physical drive fails in a RAID level-5E or level-5EE logical drive and the configuration includes a hot-spare or standby hot-spare drive, the data is rebuilt on the hot-spare or standby hot-spare drive. A RAID level-5E compression or RAID level-5EE

compaction does not occur. If a second physical drive fails in the RAID level-5E or level-5EE logical drive, a data compression or compaction will take place on the distributed hot-spare drive.

**More information**

- Understanding RAID level-5E
- Understanding RAID level-5EE

## Selecting the RAID level in the migration wizard

To select a new RAID level for the array:

1. Click the **RAID level** radio button. Only the most common choices appear in the list.

    ✔ Select the RAID level for this array.

    ◎ **RAID 0**    (Striping, 2 or more drives required, not redundant)
    ◎ **RAID 5**    (Striping with parity, 3 or more drives required, redundant)

2. To choose a different RAID level, click **Advanced settings**; then, choose a RAID level from the available options.

    ▽ Advanced settings

    ◎ **RAID 10**   (Striped mirrors, even number of drives required, redundant)

    **Note**: Only valid RAID level migrations appear in the list. Migration requirements for each RAID level are described here.

3. When you are ready to continue, click **Next**. The " Modify array" window opens.

**More information**

- Things to consider when changing RAID levels
- Understanding RAID technology

## Starting the ServeRAID Manager task

This topic describes how to start ServeRAID Manager in IBM Director.

To start ServeRAID Manager, in the IBM Director Console Tasks pane, drag the **ServeRAID Manager** task onto a managed system that supports ServeRAID.

The left pane is the Enterprise view pane, and the right pane is the Physical and Logical devices pane. The bottom pane is the event viewer.

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem, which includes arrays, logical drives, hot-spare drives, and physical drives.

## Logging in to the ServeRAID Manager

Use this action log into the ServeRAID Manager. You must log in when you first start the ServeRAID Manager, or if you are logged out.

You can log into the ServeRAID Manager as:

- **Administrator**: The Administrator log in allows you to view and modify the RAID configuration. You can create and delete logical drives, synchronize logical

drives, perform migrations, add and remove hot-spare drives, and verify logical drives. To log in as Administrator, you must be a member of the Administrator group for your operating system. Use the Administrator user name and password or your own user name and password if you are a member of the Administrator group.

- **User**: The User log in allows you to view the RAID configuration, verify logical drives, and add and remove hot-spares. You cannot create or delete logical drives or perform migrations. To log in as User, use your normal network user name and password.

  **Note:** On Linux systems, the user name and password is defined in /etc/pam.d/storman.

- **Guest**: The Guest log in allows you to view the RAID configuration only. You cannot change or modify any information. To log in as Guest, simply click **Cancel** when the ServeRAID Manager "Log in" window opens.

### Logging in at ServeRAID Manager startup

1. In the User Name field, type your user name.
2. In the Password field, type your password.

   **Note:** The password is case sensitive.
3. Click **Connect**. (To log in as "Guest", click **Cancel**.)

### Logging in if you are currently logged out or logged in as Guest

1. In the Enterprise view, click ▦ (system).
2. Click **Action** → **Log in**. The ServeRAID Manager "Log in" window opens.
3. In the User Name field, type your user name.
4. In the Password field, type your password.

   **Note:** The password is case sensitive.
5. Click **Connect**.

### More information
- Logging out
- Configuring NetWare user authentication

## Logging out of the ServeRAID Manager

Use this action to log out of the ServeRAID Manager.

1. In the Enterprise view, click ▦ (system).
2. From Action menu, click **Action** → **Log out**.

   **Note:** After log out, you can still use the ServeRAID Manager Guest account. The Guest account allows you to view the RAID configuration but not change it.

### More information
- Logging in to the ServeRAID Manager

# Using the ServeRAID Manager from the command line

You can use the following command-line parameters when starting the ServeRAID Manager:

**–h | –? | help**

> Displays basic help for the ServeRAID Manager.

**–l**

> Starts the ServeRAID Manager in local-only mode.
>
> The ServeRAID Manager does not obtain TCP/IP information and the remote actions are disabled. The only system appearing in the Enterprise view is the local system.
>
> If you have remote systems defined in the Enterprise view when you run in nonlocal-only mode (that is, not using the **-l** flag), they do not appear in the Enterprise view when you run in local-only mode.
>
> **Note:** Starting in local-only mode does not change any remote systems you have defined. The next time you start the ServeRAID Manager in nonlocal-only mode, your remote systems will appear in the Enterprise view again.

**–r**

> Resets the Enterprise view. That is, it removes all remote systems from the Enterprise view tree.
>
> **Note:** This command does not remove remote systems from the remote notification list.

# Using the ServeRAID Manager with screen-reading software

To use the ServeRAID Manager with screen-reading software, follow these steps:</>

1. Download and install the Java 2 Platform for Microsoft Windows Operating System:

2.

   a. Go to http://java.sun.com/j2se/1.4.2/download.html and download the Java 2 Platform Standard Edition Java Runtime Environment Version 1.4.2. An executable is available for installation.

   b. Follow the instructions provided by the installation program, accepting all defaults.

3. Download and install the Java Access Bridge for Microsoft Windows Operating System:

4.

   a. Go to http://java.sun.com/developer/earlyAccess/accessbridge/ and download the compressed zip file. An older version is available at http://java.sun.com/products/accessbridge/.

   b. Extract the zip file and navigate to the Installer folder. Execute the file Install.exe.

   c. Make sure that the installation program detects the Java Virtual Machine you just installed.

   d. Follow the instructions provided by the installation program.

5. Install the screen reader software (ie, JAWS).

6. Double click the RaidManAcc.bat file to start the ServeRAID Manager program.
7.

> **Note:** Be sure that the java command is in your classpath. This should occur automatically when you install the Java Virtual Machine. If not, edit the batch file to explicitly point to the java.exe file found in the bin directory of the Java installation.

### More information

- Accessing the ServeRAID Manager using the keyboard

## Using the ServeRAID Manager in bootable-CD mode

The ServeRAID Manager program operates in two ways:
- bootable-CD mode
- As an installed software program.

When you run the ServeRAID Manager program from the *IBM ServeRAID Support* CD, you are using bootable-CD mode. The bootable-CD mode allows you to configure your ServeRAID controller *before* you install your operating system. After you have configured the ServeRAID controller and installed the operating system, you also can use bootable-CD mode to fine-tune specific ServeRAID controller settings.

To run the ServeRAID Manager program in bootable-CD mode, turn on the server; then, insert the *IBM ServeRAID Support* CD (or the CD that contains the ServeRAID Manager program that came with your server) into the CD-ROM drive.

If the ServeRAID Manager program detects unconfigured ServeRAID controllers and ready drives, the program automatically starts the Configuration wizard.

These are the actions that are available in bootable-CD mode only:
- Changing the rebuild rate
- Changing the stripe-unit size
- Changing BIOS-compatibility mapping
- Changing the SCSI-transfer speed
- Enabling and disabling read-ahead cache mode
- Enabling and disabling unattended mode
- Changing the write-cache mode on a physical drive
- Changing the write-cache mode on a logical drives
- Configuring for clustering

## Accessing the ServeRAID Manager using the keyboard

Use the following key combinations to navigate in windows, tables, text areas, and the ServeRAID Manager tree.

### Navigating in windows

| Action | Key Combination |
|---|---|
| Navigate out forward | Tab |
| Navigate out backward | Shift + Tab |

| Action | Key Combination |
|---|---|
| Activate | Enter |
| | Spacebar |
| | Alt + character accelerator key, if defined |
| Navigate within group | Arrow keys |
| Check / Uncheck | Spacebar |
| To beginning of list | Home |
| To end of list | End |
| Select all entries in list | Ctrl + A |
| Select additional item in list | Ctrl + Spacebar |
| Navigate out of menu, toolbar and tool tip components | Esc |
| Open or post menu | Up arrow, Down arrow |
| | Enter |
| | Spacebar |
| | Alt + character accelerator key, if defined |
| Retract menu | Esc |
| Activate menu item | Enter |
| | Spacebar |
| | Alt + character accelerator key, if defined |
| Open submenu | Right arrow |
| Retract submenu | Left arrow |
| | Esc |
| Toggle drop-down list | Alt + Up arrow |
| | Alt + Down arrow |
| Move to next link in Web page | Ctrl + T |
| Activate link in Web page | Ctrl + Spacebar |

## Navigating in tables or text areas

| Action | Key Combination |
|---|---|
| Navigate out forward in table or text area | Ctrl + Tab |
| Navigate out backward in table or text area | Ctrl + Shift + Tab |
| Move to next cell (wrap to next row) | Tab (Right arrow) |
| Move to previous cell (wrap to previous row) | Shift + Tab (Left arrow) |
| Move to cell above | Up |
| Move to cell below | Down |

### Accessing and navigating in the tree

| Action | Key Combination |
|---|---|
| Accessing the tree pane | Ctrl + Tab |
| Expand entry | Right |
| Collapse entry | Left |
| Single select | Ctrl + Spacebar |

### Other keyboard navigation shortcuts

| Action | Key Combination |
|---|---|
| Close active window | Alt + F4 |
| Display context menu for selected object | Enter |
| Select controller, channel, or drive object | Spacebar |
| Display selected object properties | Alt + Enter |
| Open Help window | F1 |
| Expand/collapse physical and logical devices | Up arrow<br><br>Down arrow |
| Display event detail window (focus in event viewer) | Spacebar |

#### More information
- ServeRAID Manager accessibility features
- Accessing the ServeRAID Manager using screen-reading software

## Verifying that the ServeRAID Manager agent is running

Use the following procedure to verify that the ServeRAID Manager agent is running on your system.

### Windows 2000, Windows XP, Windows Server 2003
1. In the lower-left corner of the desktop, click **Start** → **All Programs** → **Administrative Tools** → **Services**. The Services window opens.
2. In the Services table, verify that the ″ServeRAID Manager Agent″ is listed and started.

### Windows NT
1. In the lower-left corner of the desktop, click **Start** → **Settings** → **Control Panel**. The Control Panel window opens.
2. Double-click **Services**. The Services window opens.
3. In the Services table, verify that the ″ServeRAID Manager Agent″ is listed and started.

### OS/2
1. Press Ctrl + Esc. The OS/2 Window List opens.
2. Verify that the ″ServeRAID Manager Agent″ is listed.

### NetWare

1. Press Alt + Esc to cycle through the NetWare consoles.
2. Verify that "ServeRAID Manager" is displayed on the first line of a console screen. If none of the console screens display "ServeRAID Manager," the agent is not running.

### Linux, OpenServer, UnixWare and Open UNIX

1. Open a shell window.
2. At the command prompt, type the following:

   `ps -ef | grep RaidAgnt.sh`
3. If the agent is running, the process is listed as the following: sh RaidAgnt.sh.

### More information

- Using the ServeRAID agent
- Starting the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent

## ServeRAID Manager and LED flash states

The amber and blue LEDs are controlled by the backplane (for internal physical drives) or enclosure (for external physical drives). Controllers send commands to the backplane or enclosure processor to set a logical state for the LED, and the subsystem translates that LED state into the following flash states:

| Controller device state | Slot state | LED flash state |
|---|---|---|
| defunct | Device is faulty | On |
| Rebuilding | Device is rebuilding | Slow flash |
| Identify | Identify the device | Fast flash |
| Other | No error | Off |

The green LED is an activity indicator for the physical drive and is controlled by the physical drive.

### More information

- Identifying devices (action)
- Using Identify to work with your systems

# Chapter 4. Managing ServeRAID devices

## Configuring ServeRAID controllers and enclosures in the Configuration wizard

### Configuring an enclosure: the basic steps

The following steps are an overview of the enclosure configuration process:

1. In the Enterprise view, click ▦ (enclosure) that you want to configure.

2. In the Logical devices view, click 🖼 ; or click 🗄 on the toolbar. The Configuration wizard opens.

3. Select the physical drives that you want to include in your arrays or create as hot-spare drives.

4. Define the logical drives for your arrays.

5. Define the authentication method for each logical drive (iSCSI initiators only).

6. Define the initiators that can access the enclosure.

7. Assign logical drives to initiators.

8. Review the configuration summary.

9. Click **Apply**. The ServeRAID Manager will configure the controller and synchronize the logical drives.

### More information

- Configuring RAID

## Configuring ServeRAID SCSI controllers (ServeRAID series 3, 4, 5, 6, and 7K)

### Choosing between Express and Custom configuration

**Note:** If you intend to use your ServeRAID controllers in a Microsoft Windows failover or clustering environment, review the ServeRAID publications before configuring ServeRAID.

In the Configuration wizard, you can choose from two paths to configure your ServeRAID subsystem:

- Click **Express configuration** for a quick and easy path for you to automatically configure your ServeRAID controller. This path creates the most efficient ServeRAID configuration based on the number and capacity of the ready physical drives available in your system. If four or more ready drives of the same capacity are available, this choice also will define a hot-spare drive.

  Express configuration does the following:
  - Creates arrays by grouping together same-sized physical drives.
  - Creates one logical drive per array up to 2 terabytes (TB) maximum.
  - Assigns a RAID level based on the number of physical drives in an array:
    - An array with a single physical drive is assigned RAID level-0.
    - An array with two physical drives is assigned RAID level-1.
    - An array with three or more physical drives is assigned RAID level-5.

**Note:** If the physical drive size exceeds 2TB, Express configuration removes drives until the size is less than 2 TB. It creates an additional array with the left-over drive(s).

– Designates a hot-spare drive for the controller. If one or more arrays has four or more physical drives, the largest-sized drive from those arrays will be designated the hot-spare drive.

**Note:** When you choose Express configuration, you have the opportunity to review and approve the configuration before the ServeRAID Manager applies the configuration. If you need to modify the configuration, you can do it from the configuration summary.

- Click **Custom configuration** for a path that lets you manually configure your ServeRAID controller. Choose this path to do any of the following:
  – Configure your controller manually.
  – Assign RAID level-1E, RAID level-5E, RAID level-5EE, or RAID level-x0 to a logical drive.
  – Create more than one logical drive per array.

  Using the Custom path, you can:
  – Select the physical drives that you want to include in each array and that you want to use as hot-spare drives.
  – Define the number, size, and RAID level of the logical drives for each array.
  – Review the configuration summary.

Click **Automatically initialize new logical drives**. Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive. You can initialize the drive later if you do not choose automatic initialization.

When you are ready to continue, click **Next**.

## More information
- Understanding stripe-unit size
- Initializing a logical drive
- Understanding physical drive capacity and unusable capacity

## Creating arrays and hot-spare drives
Complete the following steps to create arrays:

1. Start the custom configuration wizard and complete all previous steps.

2. Click the appropriate **Array** tab in the right pane: | New array C | Spares |

3. Then, from the list of ready drives, select the drives you want to add to the array:

   System merlyn, Controller 2
   Ready Ch 1, ID 3 (1000 MB)
   Ready Ch 1, ID 4 (1000 MB)
   Ready Ch 1, ID 5 (1000 MB)
   Ready Ch 1, ID 6 (1000 MB)
   Ready Ch 1, ID 8 (1000 MB)

4. Click  >> (Add selected drives) to add the drives to the array. You can click  >> (Add all drives) to move **all** ready drives to an array.

5. Repeat steps 2 and 3 for each additional array or hot-spare drive that you want to configure.
6. If you do *not* want to create a spanned array, skip to step 6. Otherwise, select the **Span arrays** check box ☑ Span arrays . Then, click **Next**. If you created two arrays only, the ServeRAID Manager uses those arrays to create the spanned array; continue to step 6. Otherwise, the ″Create spanned arrays″ window opens.

   **Note:** To create a spanned array, each array must have the same number of physical drives.
7. After you select the ready drives for your arrays and hot-spare drive, click **Next**. The ″Create logical drives″ window opens.

To return to the ″Express and Custom configuration″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Understanding creating basic arrays
- Example: Express configuration
- Creating spanned arrays
- Understanding creating spanned arrays
- Configuring the ServeRAID controller: the basic steps

## Creating spanned arrays
If you want to assign RAID level-x0 to an array, you must create a spanned array.

**Note:** Spanned arrays are supported only by IBM ServeRAID-4 Ultra160, ServeRAID-5i Ultra320, ServeRAID-6M Ultra320, and ServeRAID-6i/6i+ Ultra320 SCSI controllers.

Complete the following steps to create one or more identical spanned arrays:
1. Start the custom configuration wizard and complete all previous steps.
2. In the list of arrays, click the arrays that you want to add to your spanned

   

   array.
3. Click 🗄 >> (Add selected arrays) to add the arrays to the spanned array. You can click 🗄 >> (Add all arrays) to move **all** arrays to the spanned array.
4. To create additional spanned arrays, click the **New spanned array** tab in the right pane.

   

   Then, repeat steps 2 and 3.
5. Click **Next**; the ″Create logical drives″ window opens.

To return to the ″Create arrays″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Understanding RAID level-x0
- Understanding creating spanned arrays

## Creating logical drives

Complete the following steps to create logical drives:

1. Start the custom configuration wizard and complete all previous steps.
2. Click the appropriate **Array** tab.

| Array C | New array D |
|---------|-------------|

3. Select a RAID level from the drop-down list.

| RAID level |
|------------|
| 5EE ▼ |
| 0 |
| 1E |
| 5 |
| 5EE |

> **Note:**
>
> a. RAID level-5E and RAID level-5EE allow only one logical drive per array.
> b. If you are configuring a spanned array, you can set the RAID level only for the first logical drive you create.
> c. If you plan to use ″ Change RAID level,″ you must assign the same RAID level to all logical drives within a single array.

**Attention:** Before assigning a logical drive RAID level-5E or RAID level-5EE, consider the following. If a physical drive fails during a post-failover resynchronization, the logical drive will enter the blocked state. Data might be lost or damaged.

4. If you do not want to use the maximum size for the logical drive, type the size in the **Data (MB)** field.

| Data (MB) |
|-----------|
| 3000 |

> **Note:**
>
> a. You can define up to eight logical drives per controller. There are two exceptions:
>   - If an array contains a logical drive assigned RAID level-5E
>   - If you want to use the logical-drive migration feature
>
>   In these cases, one logical drive slot must be left free; therefore, you must define no more than seven logical drives.
>
> b. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. For more detailed information, see your operating-system documentation.
> c. A logical drive cannot exceed 2048 GB (2 terabytes); the minimum size is $n$MB, where n equals the number of drives in the array.
> d. Typically, the first logical drive defined on the first ServeRAID controller found by system BIOS during startup will be your startup (boot) drive.
> e. The actual logical-drive size might be slightly different from what you select. The RAID level and the number of physical drives

determine the size of the logical drive. For example, an array consisting of three, 1 GB physical drives with a requested RAID level-0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

5. If you have free space available and want to create additional logical drives, click  .

6. Repeat steps 3 through 5 for each logical drive that you want to define in this array.

7. Repeat steps 2 through 6 for each additional array that you want to configure.

8. Click **Next**. The " Configuration summary" window opens.

To return to the " Create arrays" window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Selecting the RAID level by array capacity
- Selecting the array size
- Understanding physical drive capacity and unusable capacity

### Confirming your express system configuration
Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your configuration:

1. Review the information that is displayed in the "Configuration summary" window. To change the configuration, click  or  .

    **Notes:**

    a. Additional notes and attentions regarding the configuration appear in the event viewer.

    b. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. For more detailed information, see your operating-system documentation.

2. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the ServeRAID controller and in the physical drives.

    **Note:** If you clicked Automatically initialize new logical drives, the ServeRAID Manager will initialize the logical drives automatically.

3. When you have completed configuring your controllers, you can change certain controller settings to fine-tune your configuration.

## More information
- Configuration wizard notes and attentions
- Understanding logical-drive synchronization
- Initializing a logical drive
- Fine-tuning your system

### Confirming your custom system configuration
Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your configuration:

1. Review the information that is displayed in the "Configuration summary" window. To change the configuration, click **Back**.

   **Note:** Additional notes and attentions regarding the configuration appear in the event viewer.

2. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the ServeRAID controller and in the physical drives.

   **Note:** If you clicked Automatically initialize new logical drives, the ServeRAID Manager will initialize the logical drives automatically.

3. When you have completed configuring your controller, you can change certain controller settings to fine-tune your configuration.

### More information
- Configuration wizard notes and attentions
- Understanding logical-drive synchronization
- Initializing a logical drive
- Fine-tuning your system

## Configuring ServeRAID SAS, SATA, and HostRAID controllers (ServeRAID-7t, ServeRAID-8i, HostRAID)

### Choosing between Express and Custom configuration

In the Configuration wizard, you can choose from two paths to configure your ServeRAID-8i, ServeRAID-7t, or HostRAID controller:

- Click **Express configuration** for a quick and easy path for you to automatically configure your controller. This path creates the most efficient configuration based on the number and capacity of the ready physical drives available in your system. If four or more ready drives of the same capacity are available, this choice also will define a hot-spare drive.

  Express configuration does the following:

  – Creates one logical drive, up to 2 terabytes (TB) maximum, by grouping together same-sized physical drives.

    **Note:** If the physical drive size exceeds 2TB, Express configuration removes drives until the size is less than 2 TB. It creates an additional logical drive with the left-over drive(s).

  – Assigns a RAID level based on the number of available physical drives:
    - A logical drive with a single physical drive is assigned RAID level-0.
    - A logical drive with two physical drives is assigned RAID level-1.
    - A logical drive with three physical drives is assigned RAID level-5.

     For HostRAID controllers, Express configuration creates a RAID level-1 logical drive.

  – Designates a hot-spare drive for the controller. If four or more ready drives are available, the largest drive will be designated the hot-spare drive.

  **Note:** When you choose Express configuration, you have the opportunity to review and approve the configuration before the ServeRAID Manager applies the configuration. If you need to modify the configuration, you can do it from the configuration summary.

- Click **Custom configuration** for a path that lets you manually configure your controller. Choose this path to do any of the following:
  - Define the RAID level of the logical drives.
  - Select the physical drives that you want to include for each logical drive.
  - Define the number and size of the logical drives.
  - Fine tune your configuration for optimal performance
  - Review the configuration summary.

When you are ready to continue, click **Next**.

## More information
- Understanding stripe-unit size
- Understanding logical drive synchronization
- Understanding physical drive capacity and unusable capacity

## Choosing between Express and Custom configuration

In the Configuration wizard, you can choose from two paths to configure your integrated RAID controller subsystem:

- Click **Express configuration** for a quick and easy path for you to automatically configure your integrated RAID controller.

  Express configuration does the following:
  - Creates an array by grouping the first two physical drives that appear in the Physical devices view.
  - Creates a RAID level-1 logical drive.

  **Note:** If you click Express, you will have the opportunity to review and approve the configuration before the ServeRAID Manager applies the configuration. If you need to modify the configuration, you can do so from the configuration summary.

- Click **Custom configuration** for a path that lets you to manually configure your integrated RAID controller. Choose this path to do any of the following:
  - Configure your controller manually.
  - Select the two physical drives that you want to configure.
  - Create a hot-spare drive.
  - Preserve data on a mirror primary drive .

  Using this path, you can:
  - Select the physical drives that you want to include in the array and that you want to use as a hot-spare drive.
  - Review the configuration summary.

To initialize the new logical drives, click **Automatically initialize new logical drives**. Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive. You can initialize the drive later if you do not choose automatic initialization.

When you are ready to continue, click **Next**.

## More information
- Understanding stripe-unit size
- Initializing a logical drive

**Example: Express configuration:** If your server contains the following:

*   One 1024 MB ready drive,
*   Two 2150 MB ready drives,
*   And four 4300 MB ready drives,

Express configuration will create three arrays and one hot-spare drive as follows:

**Array A:**
>   The total capacity of this array is 1024 MB (1 x 1024 MB) and it contains one, 1024 MB RAID level-0 logical drive.

**Array B:**
>   The total capacity of this array is 4300 MB (2 x 2150 MB) and it contains one, 2150 MB RAID level-1 logical drive.

**Array C:**
>   The total capacity of this array is 12900 MB (3 x 4300 MB) and it contains one, 8600 MB RAID level-5 logical drive.

**Hot Spare:**
>   Express configuration defines one of the four 4300 MB drives as a hot-spare drive.

**Notes:**

1.   When there are four or more ready drives of the same capacity, Express configuration groups three of the drives into one array (as in Array C) and defines one of the drives as a hot spare.
2.   A hot-spare drive must be of equal or greater capacity than the drive that it is intended to replace. In this configuration, the 4300 MB drive can replace any failed drives in Array B or Array C. Array A is not redundant, therefore a hot-spare drive is not used.

## More information

*   Choosing between Express and Custom configuration in the wizard (SCSI)
*   Choosing between Express and Custom configuration in the wizard (SAS, SATA, HostRAID)
*   Configuring RAID and creating arrays (action)

## Choosing the RAID Level

Complete the following steps to choose the RAID level for the logical drive:

1.   Click the **RAID level** radio button to choose the RAID level for the logical drive. Only the most common choices appear in the list.



2.   To choose a different RAID level, click **Advanced settings**; then, choose a RAID level from the available options.

**Note:** Not all RAID levels are available on all controllers.

▽ Advanced settings

◎ RAID 1E
◎ RAID 5EE
◎ RAID 6
◎ RAID 10
◎ RAID 50
◎ RAID 60
◎ Simple volume
◎ Spanned volume
◎ RAID volume

[SR-8i] [SR-7t] In addition to RAID Level-1E, 5EE, 6 and x0, the ServeRAID Manager supports the following RAID types for the ServeRAID-8i and ServeRAID-7t controllers:

3.

- **Simple Volume** - a single disk drive or segment; not redundant.
- **Spanned Volume** - two or more disk drives or segments with the same or different capacity, connected end-to-end. A spanned volume offers no redundancy or performance advantage over a single drive.
- **RAID Volume** - two or more logical drives with the same RAID level, connected end-to-end. The logical drives may have the same or different capacity and are **not** striped together; they may be redundant, depending on the RAID level.

    **Notes:**

    a. You must create the individual logical drives before you create a RAID Volume. Use the Configuration wizard to create the logical drives; then, run the Configuration wizard again to create the RAID Volume.

    b. When you create a RAID Volume, the ServeRAID Manager replaces the individual logical drives with a single RAID Volume icon in the Logical devices view; then, it reports the logical drives as deleted in the event viewer. The event message is normal and does not indicate a loss of data.

4. When you are ready to continue, click **Next**. The ″Create logical drives″ window opens.

## More information
- Understanding RAID technology
- Understanding stripe-unit size
- Understanding physical drive capacity and unusable capacity

## Creating logical drives

**Note:** The ServeRAID-7t and ServeRAID-8i firmware supports a maximum of 10 ″logical slices″ per physical drive.

Complete the following steps to create logical drives:

1. In the Physical devices view (on the right), click the drives you want the logical drive to use. To view available segments on each disk drive, switch to the full-size capacity view or relative-size capacity view.

**Physical Devices**     View

Ports 0...3: 1.50 Gb/s (4 devices found)
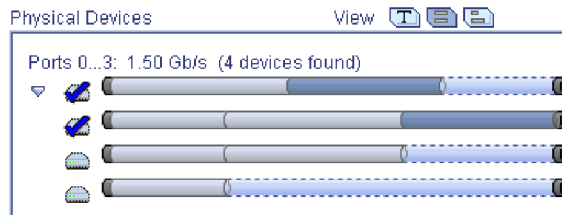
> **Note:** A segment shaded in light blue and outlined by a dashed line is not part of any logical drive.

2. To select a hot-spare for the logical drive, or to deselect a hot-spare, control-click the drive.
3. In the **Name** field, enter a name for the logical drive.
4. If you do **not** want to use the maximum size for the logical drive, click **Advanced settings**; then, type the size in the **Size (MB)** field:



> ▽ Advanced settings
>
> Size (MB)          20055
> Stripe size (KB)   64 ▼
> Write cache        Disabled (write-through)
> Read cache         Enabled ▼
> Initialize method  Auto-synchronization ▼
> Initialize priority High ▼

  For HostRAID controllers, the logical drive uses all of the space on each disk drive; you cannot adjust the logical drive size.

5. To configure the logical drive for optimal performance, adjust the advanced settings as needed.

   > **Note:** The default settings usually are adequate for most applications.

6. If you have free space available and want to create additional logical drives, click [ **Add logical drive** ] ; then, repeat steps 1-4.
7. When you are ready to continue, click **Next**. The ″ Configuration summary″ window opens.

### More information

- Understanding physical drive capacity and unusable capacity

### Creating logical drives > advanced settings

**Note:** Not all options are available for all RAID levels.

Use the **Advanced settings** in the Configuration wizard to tune your logical drive configuration for optimal performance. You can set the following options:

- **Write cache** - Determines how data is stored in the controller's cache memory. You can choose from two available settings: write-through and write-back.
- **stripe-unit size** - Determines the amount of data, in kilobytes (KB), written to one segment of a logical drive before the next segment is used for subsequent data. Depending on the controller, you can choose a stripe-unit size from 16 KB to 1024 KB.

**Notes:**

1. The default stripe size usually provides the best performance for typical applications.
2. For RAID Level-6 and Level-60 logical drives, the number of choices for stripe-unit size decreases as the number of disks in the logical drive increases.

- **Read cache** - Enables and disables read caching. When read-caching is enabled, the controller monitors read access to the logical drive. If it detects a pattern, it pre-loads the cache with the data that seems most likely to be read next. The default is Enabled.
- **Initialize method** - Determines the method used to initialize the logical drive. You can choose from three available methods:
  - **Auto-synchronization** - For RAID Level-1 logical drives, copies the data from the primary drive to the mirror drive. For RAID Level-5 logical drives, computes and writes the correct parity for the entire logical drive.

    **Note:** Auto-synchronization can be a lengthy operation. The ServeRAID Manager performs this task in the background. However, you cannot use the logical drive until the task is complete.
  - **Clear** - removes pre-existing data by overwriting every block in the logical drive. This method is faster than auto-synchronization but the logical drive is not available immediately.  For HostRAID controllers, the ServeRAID Manager supports the Clear initialization method only.
  - **Quick** - makes the logical drive available immediately. It is the fastest method but should be used only for *new* physical disks.
- **Initialize priority** - Adjusts the priority of the initialization task. The default is High: initialize the logical drive as fast as possible.

When you are ready to continue, click **Next**. The " Configuration summary" window opens.

## More information
- Understanding stripe-unit size
- Understanding write-cache mode for logical drives
- Understanding logical-drive synchronization

## Confirming your integrated RAID controller subsystem configuration
Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your configuration:

1.

   Review the information that is displayed in the "Configuration summary" window. To change the configuration, click **Back**.
2. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the integrated RAID controller.

   **Note:** If you clicked Automatically initialize new logical drives, the ServeRAID Manager will initialize the logical drives automatically.

## More information

- Configuration wizard notes and attentions
- Understanding logical-drive synchronization

## Confirming your integrated RAID controller subsystem configuration

Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your configuration:

1. Review the information that is displayed in the "Configuration summary" window. To change the configuration, click [⊞ Modify arrays] .

   **Notes:**

   a. Additional notes and attentions regarding the configuration appear in the event viewer.

   b. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. For more detailed information, see your operating-system documentation.

2. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the integrated RAID controller.

   **Note:** If you clicked Automatically initialize new logical drives, the ServeRAID Manager will initialize the logical drives automatically.

## More information

- Configuration wizard notes and attentions
- Understanding logical-drive synchronization

## Confirming your system configuration

Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your configuration:

1. Review the information that is displayed in the "Configuration summary" window. To change your Express configuration, click [Modify logical drives] ; to change your Custom configuration, click **Back**.

   **Note:** Additional notes and attentions regarding the configuration appear in the event viewer.

2. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the ServeRAID controller and in the physical drives.

   **Note:** The ServeRAID Manager will initialize the logical drives automatically. The initialization method depends on the RAID level and controller type.

3. After you configure your controller, you can change certain controller settings to fine-tune your configuration for optimal performance.

   **Note:** During Custom configuration, you can fine tune your configuration using the Advanced settings in the Configuration wizard.

**Attention:** After you apply the configuration, the logical drives will display as physical drives under your operating system. Before you can use these drives to store data, you must partition and format the drives using the disk management tools provided with your operating system. Each operating system provides its own disk management tools. For example, under Microsoft Windows, use the Computer Management tool to partition and format drives; then, assign each logical drive to a drive letter. For more information, see your operating system administrator's guide.

### More information
- Configuration wizard notes and attentions
- Understanding synchronizing logical drives

## Selecting controllers to update

To select the ServeRAID controllers or enclosures to update:

1. In the tree, click the controller(s) or enclosure(s) you want to update. You can also choose the controllers or enclosures you want to *omit* from the update process.

   For direct-attached storage devices, all controllers of the same type are selected by default. If the controller or enclosure software is already up-to-date, it is grayed out. To remove a controller or enclosure from the selection, just click it.

   **Note:** To force a controller or enclosure to be updated, for example, if you want to down-level the software, press the Control key, then click the controller or enclosure.

2. When you are ready to continue, click **Next**; the ″ Update summary″ window opens.

## Configuring ServeRAID enclosures

### Choosing the configuration path

The Configuration wizard guides you through the configuration of your external storage enclosure. You can use the Configuation wizard to create arrays and logical drives for each controller in the enclosure. The Configuration wizard allows you to add drives to the array; choose the RAID level for each logical drive; choose an authentication method; and assign logical drives to users and machines (access control).

**Note:**

- The maximum number of arrays depends on the number of physical disks on the controller. You can configure one array per disk. *Example*: 4 physical disks=4 arrays maximum.
- You can create up to 64 logical drives per array.
- You can create up to 512 logical drives for each controller.

1. In the Enterprise view, click ▦ (enclosure).

2. Right-click **Configure storage**, or click ▨ in the Logical devices view. The Configuration wizard opens.

3. In the Select a configuration option field, choose a configuration path. Click either:
   - Create a logical drive in a new array
   - Create a logical drive in existing array

4. If you choose to create a logical drive in an existing array, select the array name from the drop-down list.

5. Click **Next**. For new arrays, the ″ Create arrays″ window opens. For existing arrays, the ″ Create logical drives″ window opens.

### More information
- Configuring an enclosure: the basic steps
- Increasing logical drive capacity

### Creating arrays and hot-spare drives
Complete the following steps to create arrays:

1. Click the appropriate **Array** tab in the right pane:

    

2. Then, from the list of ready drives, select the drives you want to add to the array:
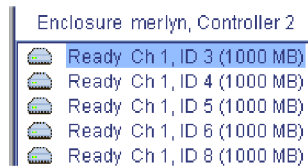
    

3. Click  >> (Add selected drives) to add the drives to the array. You can click  >> (Add all drives) to move **all** ready drives to an array.

4. Repeat steps 1 and 2 for each additional array or hot-spare drive that you want to configure.

5. If you do **not** want to create a spanned array, skip to step 5. Otherwise, select the **Span arrays** check box  . Then, click **Next**. If you created two arrays only, the ServeRAID Manager uses those arrays to create the spanned array; continue to step 5. Otherwise, the ″ Create spanned arrays″ window opens.

    **Note:** To create a spanned array, each array must have the same number of physical drives.

6. After you select the ready drives for your arrays and hot-spare drive, click **Next**. The ″ Create logical drives″ window opens.

To return to the ″ Configuration path″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

### More information
- Creating spanned arrays
- Understanding creating spanned arrays

### Creating spanned arrays
If you want to assign RAID level-x0 to an array, you must create a spanned array.

Complete the following steps to create one or more identical spanned arrays:

1. In the list of arrays, click the arrays that you want to add to your spanned array.

Enclosure merlyn, Controller 1

Array A (4000 MB) 2 drives
Array B (4000 MB) 2 drives

2.  Click  >> (Add selected arrays) to add the arrays to the spanned array. You can click  >> (Add all arrays) to move **all** arrays to the spanned arrays.

3.  To create additional spanned arrays, click the **New spanned array** tab in the right pane.



Spanned array 1 | New spanned array 2

Then, repeat steps 1 and 2.

4.  Click **Next**; the " Create logical drives" window opens.

To return to the " Create arrays" window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information

*   Understanding RAID level-x0
*   Understanding creating spanned arrays

## Creating logical drives

Complete the following steps to create logical drives:

1.  Click the appropriate **Array** tab.



Array C | New array D

2.  Select a RAID level from the drop-down list.



RAID level

5
0
1
5

*   If you are configuring a spanned array, you can set the RAID level only for the first logical drive you create.
*   In addtion to the standard RAID levels (0, 1, 5, x0), you can also create a **simple volume**: a single disk drive, non-redundant.

3.  If you do not want to use the maximum size for the logical drive, type the size in the **Data (MB)** field.



Data (MB)

3000

**Notes:**

a.  Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. For more detailed information, see your operating-system documentation.

b.  A logical drive cannot exceed 2048 GB (2 terabytes); the minimum size is 10MB.

c. Typically, the first logical drive defined on the first controller found by system BIOS during startup will be your startup (boot) drive.

d. The actual logical-drive size might be slightly different from what you select. The RAID level and the number of physical drives determine the size of the logical drive. For example, an array consisting of three, 1 GB physical drives with a requested RAID level-0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

4. From the **Stripe Size** drop-down list, select the stripe-unit for the logical drive.

Stripe size (KB)

16 ▼

**Note:** The default stripe-unit size is usually adequate for most applications.

5. From the **Controller** drop-down list, select the preferred owner for the logical drive, Controller A or Controller B. (For single controller configurations, this field is grayed out.)

**Note:** You can only choose the controller for the first logical drive in the array.

6. If you have free space available and want to create additional logical drives, click [ Define new logical drive ] . To create a new logical drive with the same settings as the current logical drive, click [ Replicate logical drive ] ; then, choose the number of replicas from the drop-down list.

**Attention:** Use care when allocating space for new a new logical drive. You must leave enough space for FlashCopy backups to grow to their virtual size. For example, if the virtual size of a FlashCopy backup is 20 GB, you must leave at least 20 GB of free space in the array. Note that the Configuration wizard displays the *actual size* of the first FlashCopy backup (not the virtual size), and 0 for all other FlashCopy backups.

7. Repeat steps 2 through 6 for each logical drive that you want to define in this array.

8. Repeat steps 1 through 7 for each additional array you want to configure.

9. Click **Next**. Depending on the initiator type, the ″ Define authentication method″ window opens or the ″ Define initiators″ window opens.

To return to the ″ Create arrays″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## Defining the authentication method

**Note:** The ServeRAID Manager supports authentication for iSCSI initiators only.

Use the Authentication information window to define the authentication method (if any) for each user permitted to use the logical drives in the array. Optionally, you can enable Radius authentication (an external authentication service) and define the SLP (Service Location Protocol) Scope name.

1. Select a logical drive from the list on the left.

2. From the **Authentication type** list, select the method used to authenticate users of this logical drive. You can choose:
   • **None** - Do not authenticate users
   • **CHAP** - Challenge Handshake Authentication Protocol

- **SRP** - Secure Remote Password

3. If you enabled authentication (by choosing CHAP or SRP), click [Add User] ; the "Global user name and password management" window opens. Then, add users to the user list.
4. To enable Radius authentication for the CHAP authentication method, click **Radius authentication**; then, enter the following:
   - In the Primary server field, enter the host name or TCP/IP address of the authentication service; then, in the Port field, enter the server's startup port.
   - In the Secondary server field, enter the host name or TCP/IP address of the authentication service; then, in the Port field, enter the server's startup port.

   **Note:** Radius authentication is supported by the CHAP authentication method only.
5. To modify the default SLP Scope name, click **Advanced settings**; then, in the SLP Scope Name field, type a unique scope name or choose an existing name from the drop-down list.
6. Repeat steps 1 through 5 to enable authentication for additional logical drives.

   To replicate the settings for all logical drives, click [Replicate settings] .
7. When you are ready to continue, click **Next**. The " Define initiators" window opens.

To return to the " Create logical drives" window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Adding users to the user list

## Defining initiator information
Use the Initiator information window to define an alias, or "friendly" name, for each initiator that can access the enclosure, including the initiator IQN (iSCSI Qualified Name) or fibre channel port name. An initiator represents a machine on the network that can access the enclosure.

The ServeRAID Manager displays previously defined initiators in a list. The alias is shown on the left. Depending on the initiator type (iSCSI or fibre channel), the IQN or port name is shown on the right. Initiator types are not mixed. You can add a new initiator, modify an initiator, or delete an initiator.

To add an initiator:
1. Click

   [Add]

   . Depending on the initiator type, the "Add iSCSI initiator" window opens or the "Add Port Name" window opens.
2. Follow the steps below to add an iSCSI initiator or add a fibre channel port name.
3. When you are ready to continue, click **Next**. The " Assign logical drives to initiators" window opens.

To return to the previous Configuration wizard window, click **Back**.

To leave the Configuration wizard, click **Cancel**.

## Adding an iSCSI initiator

1. In the **Initiator IQN** field, type a well-formed IQN in the format:
   `iqn.yyyy-mm.s1.s2[.|:]s3` where:
   - yyyy is the 4-digit year
   - mm is the 2-digit month (01-12)
   - s1 and s2 are 1-n character alphanumeric strings (for example, *mydomain.com*)
   - s3 is 5 or more alphanumeric characters, separated from s2 by '.' or ':'

2. In the **Initiator alias** filed, type a name for the initiator. The initiator alias must start with a letter. It can contain only letters and numbers.

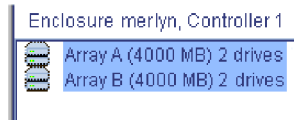3. Optionally, click **Advanced settings**; then, click the check boxes to enable or disable the following features:

| | |
|---|---|
| ▽ Advanced settings | Communications with initiator include separate status Protocol Data Unit (PDU). |
| ☑ Seperate status PDU | |
| ☑ Requires PDU alignment | Communications with initiator include PDU alignment. |
| ☐ Supports iSCSI ping | Initiator supports iSCSI ping. |

> **Note:** Refer to your initiator documentation for more information about these features.

4. Click **OK**; then, repeat steps 1-3 to add additional initiators.
5. Click **Cancel** to close the "Add iSCSI initiator" window.

## Adding a fibre channel port name

1. In the **Port Name** field, enter the 16-character Port Name. Each octet (8 characters) can be separated by a ':' or '-'.

   Port Name `5799B44907850444`

2. In the **Initiator alias** field, type a name for the initiator. The initiator alias must start with a letter. It can contain only letters and numbers.

3. Click **OK**; then, repeat steps 1 and 2 to add additional initiators.

   > **Note:** You can define a maximum of 255 ports (LUNs) for each fibre channel initiator.

4. To automatically detect initiators on your network, click

   **Discover new initiators**

   . The "Select a discovered initiator" window opens.

   > **Note:** The button will be grayed out if no new initiators are detected.

   Then, select a discovered initiator from the list.

5. Click **Cancel** to close the "Add Port Name" window.

## More information
- Modifying and deleting initiator information
- Selecting discovered initiators

## Selecting a discovered initiator
Use the "Select a discovered initiator" window to add an existing fibre channel initiator to the list of initiators that can access the enclosure.

1.

    From the Port Name list, select an initiator.

2. In the **Initiator alias** field, type a name for the initiator or accept the default.
   The initiator alias must start with a letter. It can contain only letters and
   numbers.

3. Click **OK**. The ″Select a discovered initiator″ window closes.

4. To select another discovered initiator, click | Discover new initiators | . Then, repeat
   steps 1-3 to add additional initiators.

5.

## Assigning logical drives to initiators

**Note:** You can assign up to 32 initiators to each logical drive.

Complete the following steps to assign logical drives to initiators:

1. Click the appropriate **Initiator** tab in the right pane. To allow anyone to access
   the logical drive, regardless of users in the user list, click the Unrestricted tab.

   | admin | john3 | Unrestricted |

2.  Then, from the list of logical drives, select the drives you want the initiator to
   access:

   Enclosure merlyn, Controller 1
   Logical drive 1 - Okay (10.0 GB)
   New logical drive 2 (50.0 GB)
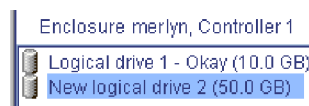
3. Click        >> (Add selected drives) to assign the logical drives to the

   initiator. You can click     >> (Add all drives) to assign **all** logical drives to
   the initiator.

4. Repeat steps 1 and 2 for each initiator.

5. After you assign logical drives to initiators, click **Next**. The ″ Configuration
   summary″ window opens.

To return to the ″ Define initiators″ window, click **Back**. To leave the Configuration
wizard, click **Cancel**.

## Confirming your system configuration
Use the configuration summary to review all the changes that the ServeRAID
Manager will apply to your configuration:

1.  Review the information that is displayed in the ″Configuration summary″
   window. To change the configuration, click **Back**.

   **Note:** The Configuration wizard displays the *actual size* of the first FlashCopy
            backup (not its virtual size), and 0 for all other FlashCopy backups.

2. Click **Yes** when asked if you want to apply the new configuration. A status
   window opens, displaying the progress of the operation. When finished, the
   configuration is saved in the controller and physical drives in the enclosure.

   **Note:** The ServeRAID Manager initializes the logical drives automatically.

**More information**

- Understanding logical-drive synchronization
- Initializing a logical drive

# Configuring NetWare user authentication

NetWare user authentication may be configured in one of two ways: out-of-box authentication and NDS authentication. The two methods are mutually exclusive.

### Out-of-box authentication

Out-of-box authentication works as follows:

- Administrative access is exclusively granted to the 'Admin' user account, which must be defined within the NetWare Bindery context of the server running the ServeRAID Manager agent.
- User access is granted to all Bindery and NetWare Directory Services (NDS) user accounts. For NDS users, the user account must reside within the same tree as the server running the ServeRAID Manager agent.

When logging into the ServeRAID Manager, NDS users must provide the fully distinguished account name.

### NDS authentication

NDS authentication is based on NDS group membership. To set up NDS group membership, create and populate a NDS group for storage administration. After you install the ServeRAID Manager, edit the ServeRAID Manager agent properties file to restrict authentication to the new group.

For example:

1. Choose the group name ".CN=StorageAdmins.O=Acme".

   **Note:** The group must reside within the same NDS tree as the server running the ServeRAID Manager agent.

2. Using the Novell Administration utility, add the appropriate users to the new group.
3. Add the following entry to the SYS:\RAIDMAN\RaidAgent.pps file:

   `agent.group.NetWareStorageAdmin=<` *fully distinguished group name>*The new entry should look like this :

   `agent.group.NetWareStorageAdmin=.CN=StorageAdmins.O=Acme`

4. Restart the server.

Limited user access is granted to all NDS user accounts.

### More information

- Logging in to the ServeRAID Manager
- Adding a remote system
- Configuring the ServeRAID Manager agent

### Novell NetWare considerations

(NetWare 5.x only) If you are preparing to install Novell NetWare 5.x from the startable Novell NetWare 5.x CD, set the write-cache mode *only* to write-through mode.

**Attention:** Do not attempt a hot-replace operation on Windows 2000, Windows Server 2003, or NetWare by hot-removing a failed controller and then hot-adding a new controller. Loss of data can occur. If a controller fails on these operating systems, you must shut down the server to replace the controller.

## Copying the configuration from drives

**Note:**

1. This action is not supported on the integrated RAID controller.
2. (Cluster environment only) Use this action to merge non-shared logical drives.

Use this action to copy the configuration from all physical drives into a ServeRAID controller. This action is useful when replacing a controller and you want to reestablish the original configuration on the new controller.

If you are replacing a controller in a cluster environment, you must first configure the cluster parameters by using the ″ Configure for clustering″ action. The cluster parameters are the following:
- The controller name
- The partner controller name
- The SCSI initiator IDs

After you have configured these parameters, you can use ″Copy configuration from drives″ to copy the configuration from only the non-shared drives into the new controller.

1. In the Enterprise view, click 📷 (controller).
2. Right-click **Copy configuration from drives**.
3. If clustering is not enabled, go to step 4. Otherwise, right-click one of the following from the menu:
   - **Non-shared 206**
   - **Non-shared 207**
4. A confirmation window opens; click **Yes**.

## Restore the configuration to the factory-default settings

**Note:** This action is not supported on the following:
1. Integrated RAID controller
2. ServeRAID-7t controller
3. ServeRAID-8i controller
4. HostRAID controller
5. Network storage controllers

Use this action to restore all parameters in the configuration to the factory-default settings:

1. In the Enterprise view, click 📷 (controller).
2. Right-click **Restore to factory-default settings**. A confirmation window opens.
3. Click **Yes**.

   **Note:** In the following step, the ServeRAID Manager will destroy all data on these logical drives.

4. If there **are** logical drives defined, click **Yes** to delete all logical drives and restore all parameters in the configuration to the factory defaults. If there are **no** logical drives defined, the ServeRAID Manager automatically restores all parameters in the configuration to the factory-default settings.

# Saving a printable configuration and event logs

Use this action to save a report of your configuration and event logs that you can print.

1. In the Enterprise view, click ![icon] (server).
2. Right-click **ServeRAID Manager Actions** → **Save printable configuration and event logs**. The ServeRAID Manager creates one text file for each controller. The file name is Raid **x**.log where **x** is a number assigned to the file.

   **Note:** If you are in bootable-CD mode, you can save the files to a diskette in the A drive only.

The ServeRAID Manager copies to each text file all configuration information for the following:
* The controller in the selected system
* Any physical drive on the controller
* Any array on the controller
* Any logical drive on the controller
* Device event logs
* defunct drive event logs
* Software event logs
* Hardware event logs

The ServeRAID Manager saves all events currently in the event log, not only the events associated with the selected system.

## More information
* Example: Printable configuration
* Saving a printable configuration

## Saving a printable configuration
Use this action to save a report of your configuration that you can print.

1. In the Enterprise view, click ![icon] (system).
2. Right-click **Save printable configuration**. The "Save file" window opens.
3. Choose the directory and file name for your report. The default directory is the directory in which the ServeRAID Manager is installed. The default file name is RaidCfg.log.

   **Note:** If you are in bootable-CD mode, you can save to a diskette in the A drive only.

The ServeRAID Manager copies to a text file all configuration information for the following:
* Each controller in the selected system
* All physical drives on the controller
* All arrays on the controller
* All logical drives on the controller

## More information

- Example: Printable configuration
- Saving a printable configuration and event logs

## Example: Printable configuration

```
July 13, 2001 7:30:58 AM EDT

   Configuration summary
   -------------------------

   Server name....................myserver
   ServeRAID Manager Version.......4.80.xx
   Number of controllers...........1
   Operating system...............Windows 2000

   Information for controller 1
   --------------------------------------------------------
   Controller type.................ServeRAID-4Mx
   BIOS version.....................4.80.xx
   Firmware version................4.80.xx
   Device driver version...........4.80.xx
   Physical slot...................4
   Battery-backup cache............Installed
   Read-ahead cache mode...........Adaptive
   stripe-unit size................8K
   Rebuild rate....................High
   Hot-swap rebuild................Enabled
   Data scrubbing..................Enabled
   Auto-synchronization............Enabled
   Clustering......................Disabled
   Unattended mode.................Disabled
   BIOS compatibility mapping......Extended
   Number of arrays................2
   Number of logical drives........2
   Number of hot-spare drives......0
   Number of ready drives..........0

   Array A
   --------------------
   Array identifier................A
   Array size in MB................4157
   Free space in MB................0
   Number of logical drives........1
   Stripe order (Channel/Device)...1/4
   Number of physical drives.......1

   Logical drives in array A
   -------------------------------
   Logical drive...................1
   Array letter....................A
   State...........................Okay
   RAID level......................0
   Data space in MB................4157
   Parity space in MB..............0
   Date created....................7/13/01
   Write-cache mode................Write back
   Merge group number..............207
   Merge group state...............Non-shared


   Physical drives in array A
   -------------------------------
   Type............................Hard disk drive
   Channel.........................1
   SCSI ID.........................4
   Vendor..........................IBM_PSG
```

```
Product or model number.........xxxxxxxx
Serial number...................xxxxxxxx
Firmware level..................1.00
Size in MB......................4157
State...........................Online
Array letter....................A
PFA error.......................No

Array B
--------------------
Array identifier...............B
Array size in MB...............6143
Free space in MB...............2
Number of logical drives.......1
Stripe order (Channel/Device)...1/0 1/1 1/2
Number of physical drives.......3

Logical drives in array B
--------------------------------
Logical drive...................2
Array letter....................B
State...........................Okay
RAID level......................5
Data space in MB................4094
Parity space in MB..............2047
Date created....................7/13/01
Write-cache mode................Write back
Merge group number..............207
Merge group state...............Non-shared


Physical drives in array B
--------------------------------
Type............................Hard disk drive
Channel.........................1
SCSI ID.........................0
Vendor..........................IBM_PSG
Product or model number.........xxxxxxx
Serial number...................xxxxxxx
Firmware level..................1.00
Size in MB......................2047
State...........................Online
Array letter....................B
PFA error.......................No

Type............................Hard disk drive
Channel.........................1
SCSI ID.........................1
Vendor..........................IBM_PSG
Product or model number.........xxxxxxx
Serial number...................xxxxxxx
Firmware level..................1.00
Size in MB......................2047
State...........................Online
Array letter....................B
PFA error.......................No

Type............................Hard disk drive
Channel.........................1
SCSI ID.........................2
Vendor..........................IBM_PSG
Product or model number.........xxxxxxx
Serial number...................xxxxxxx
Firmware level..................1.00
Size in MB......................2047
State...........................Online
Array letter....................B
```

```
                    PFA error......................No


                    SCSI channel 1
                    -------------------
                    Type...........................Hard disk drive
                    Channel........................1
                    SCSI ID........................0
                    Vendor.........................IBM_PSG
                    Product or model number........xxxxxxx
                    Serial number..................xxxxxxx
                    Firmware level.................1.00
                    Size in MB.....................2047
                    State..........................Online
                    Array letter...................B
                    PFA error......................No

                    Type...........................Hard disk drive
                    Channel........................1
                    SCSI ID........................1
                    Vendor.........................IBM_PSG
                    Product or model number........xxxxxxx
                    Serial number..................xxxxxxx
                    Firmware level.................1.00
                    Size in MB.....................2047
                    State..........................Online
                    Array letter...................B
                    PFA error......................No

                    Type...........................Hard disk drive
                    Channel........................1
                    SCSI ID........................2
                    Vendor.........................IBM_PSG
                    Product or model number........xxxxxxx
                    Serial number..................xxxxxxx
                    Firmware level.................1.00
                    Size in MB.....................2047
                    State..........................Online
                    Array letter...................B
                    PFA error......................No

                    Type...........................Hard disk drive
                    Channel........................1
                    SCSI ID........................4
                    Vendor.........................IBM_PSG
                    Product or model number........xxxxxxx
                    Serial number..................xxxxxxx
                    Firmware level.................1.00
                    Size in MB.....................4157
                    State..........................Online
                    Array letter...................A
                    PFA error......................No

                    Type...........................Enclosure
                    Channel........................1
                    SCSI ID........................14
                    Vendor.........................SDR
                    Product or model number........GEM200
                    Serial number..................0
                    Firmware level.................2

                    SCSI channel 2
                    -------------------

                    End of the configuration information for controller 1
                    --------------------------------------------------------
```

**More information**
- Saving a printable configuration (action)
- Saving a printable configuration and event logs (action)

# Working with systems in the ServeRAID Manager

You can use the ServeRAID Manager to view information about managed systems, ServeRAID controllers, and the ServeRAID Manager subsystem (such as arrays, logical drives, hot-spare drives, and physical drives).

To view information, click an object in the Enterprise view or the Physical or Logical device views; then, click [icon] (Properties) on the toolbar. Using preferences, you can sort tree objects alphabetically or chronologically.

**Note:** The local system always appears first when you sort the tree alphabetically.

To display available actions for an item, right-click the item in the Enterprise view, Physical devices view, or Logical devices view.

You can use the following actions and applications in the ServeRAID Manager to modify or monitor other ServeRAID Manager systems in a network:
- Add or remove a remote system
- Notification Manager
- Email Notification Manager
- Task Manager
- ServeRAID Manager agent

To configure a new ServeRAID controller with the Configuration wizard, click [icon] (Create) on the toolbar or [icon] (Create) in the Logical devices view.

**More information**
- The ServeRAID Manager menubar
- The ServeRAID Manager toolbar
- Using the ServeRAID Manager interface
- Changing the ServeRAID Manager interface
- Finding information in ServeRAID Manager
- Using ServeRAID Manager Assist, hints and tips

**Using the ServeRAID Manager interface > Menubar**
In addition to using the mouse, you can use keyboard shortcuts to access the menubar. Selections from the Actions menu also are available when you right-click an object in the Enterprise view, Physical devices view, and Logical devices view.

**Note:** No actions from the Actions menu are available during any of the following operations:
- Rebuild
- Foreground synchronization
- Verification
- Logical-drive migration
- RAID level-5E compression or decompression
- RAID level-5EE compaction or expansion

- FlashCopy with backup option
- Copy back

## More information
- The ServeRAID Manager menubar
- The toolbar
- The Enterprise view
- The Physical and Logical device views
- The event viewer
- The status bar

**The ServeRAID Manager menu bar:** The ServeRAID Manager menu bar has the following functions:

**File >**

> **Clear configuration event log**
> > Clears the current contents of the event viewer. This option does not clear or delete the event logging file.

> **Preferences**
> > Opens a window that you can use to specify the following settings:
> > - Remote access
> > - Alarm
> > - Display options

> **Close help**
> > Closes the Help window

> **Exit** Exits the ServeRAID Manager.

**View >**

> **Toolbar**
> > Turns the toolbar on and off. The default is on (that is, selected).

> **Status bar**
> > Turns the status bar on and off. The default is on (that is, selected).

> **Tool tips**
> > Turns the tool tips on and off. The default is on (that is, selected).

> **Refresh**
> > Refreshes the display with the latest configuration information.

**Remote >**

> **Add remote system**
> > Adds a remote system to the Enterprise view for monitoring and configuration. This action is disabled in bootable-CD mode and when the ServeRAID Manager is a plug-in to another program.

> **Remove remote system**
> > Displays a menu of all the remote systems currently in your Enterprise view. You can select one remote system to remove at a time. This action is disabled in bootable-CD mode and when the ServeRAID Manager is a plug-in to another program.

**Actions >**
> Display any action that is valid for the selected object in the Enterprise view, the Physical devices view, or Logical devices view.

**Note:** If there are no valid actions for the object you selected, the Actions menu is grayed out.

**Help >**

> **Information about this window**
>> View context-sensitive information for the current window.
>
> **Search**
>> Searches for one or more specified words in ServeRAID Assist and displays a list of topics that include the words.
>
> **Contents**
>> Presents the ServeRAID Assist contents. You can use the contents to acquaint yourself with ServeRAID Assist topics.
>
> **General Concepts**
>> Presents ServeRAID concepts that you use with the ServeRAID Manager.
>
> **Publications**
>> Lists IBM publications and where to find them.
>
> **IBM online support**
>> Lists IBM Web sites and available online support.
>
> **What's new**
>> Lists the new features in this version of the ServeRAID Manager program.
>
> **About ServeRAID Manager**
>> Reports the ServeRAID Manager version number, copyright, and legal information.

**The ServeRAID Manager toolbar:** The ServeRAID Manager toolbar has the following functions:

 **Add**

Add a remote system to the Enterprise view for monitoring and configuration.

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

 Create

Create a logical drive with the Configuration wizard. Choose Express or Custom configuration, if there are ready drives and you have not assigned the maximum number of logical drives.

 Silence

Silence the console alarm and agent alarm on all connected systems. All Warning and Error events produce an audible alarm every five minutes, notifying you of the event. You can adjust the alarm interval in the "Preferences" window.

📋 Properties

When a system, controller, or device is selected, displays system, controller, or device properties.

📋 **Events**

Open the event log in a stand-alone viewer. The stand-alone viewer shows all ServeRAID Manager events. Use the embedded event viewer to view events for the current ServeRAID Manager session.

🔧 **Configure**

List tools for configuring the local or remote ServeRAID Manager agent or management station agent. To use a tool, select it from the drop-down list.

📖 **Help**

View context-sensitive information for the current window.

**Using the ServeRAID Manager interface > Toolbar:** The toolbar provides quick-access icons for common tasks.



## More information
- The menubar
- The Enterprise view
- The Physical and Logical device views
- The event viewer
- The status bar

**Using the ServeRAID Manager interface > Enterprise view:** The Enterprise view provides an expandable "tree" view of the systems, controllers, and enclosures you are managing. It is divided into two parts:
- **Direct attached storage** - managed systems with directly attached controllers and storage devices.
- **Networked storage** - management stations with network-attached storage enclosures.

You can perform most configuration and management tasks by selecting a controller or enclosure from the tree and working with related objects in the Physical and Logical device views.

**Tip:** You can use display groups to group related systems under single tree object.

## More information

- The menubar
- The toolbar
- The Physical and Logical device views
- The event viewer
- The status bar

**Using the ServeRAID Manager interface > Physical and Logical device views:**
The Physical and Logical device views show the physical devices and logical devices connected to the controller or enclosure.

The **Physical devices** view (on the left) displays information about the drives, enclosures, and other devices attached to the controller. The devices are shown organized by the channel or port they are connected to and shown in numerical order. The display for each channel or port includes information on maximum speed capability, the number of the channel on the controller, and the number of devices attached to the controller.

The **Logical devices** view (on the right) displays information about the arrays and logical drives created using the physical devices. This information includes the number of arrays and logical drives, the RAID level of each device, and whether a logical drive is protected by a hot spare drive.

To view device information, click ⊞ in the Enterprise view to expand a managed system or management station. Then, select a controller or enclosure from the tree.
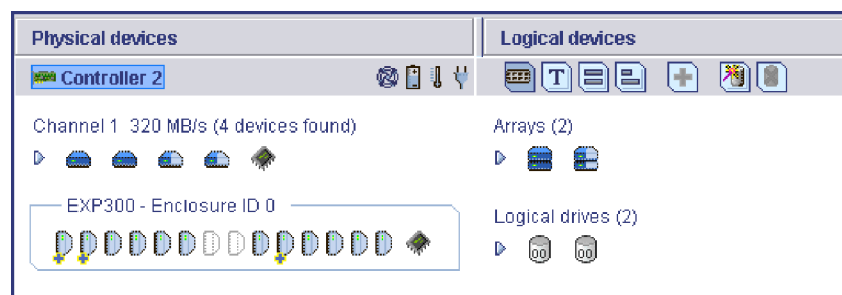


For network storage, the Physical devices view also shows the controllers in the enclosure. All other information is the same.
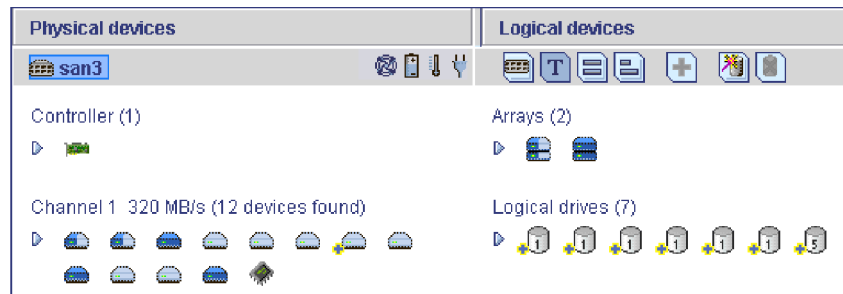
**Tip:** You can drag the bar between the Physical devices view and Logical devices view to adjust the size of each pane.

In the Physical devices view, four indicators report status of the fan, battery, temperature, and power modules on SAF-TE (enclosure management) devices and other devices that monitor these conditions. The indicator is blue for normal, yellow for warning, and red for error; the indicator is grayed out if none of the devices on the controller monitor the condition. Example: the fan indicator changes to yellow when one fan fails; it changes to red when a second fan fails and cooling is no longer adequate.

In the Logical devices view, use the buttons to create and delete arrays and logical drives. The Create option (  ) opens a wizard that presents the steps necessary to create a new array.

Other buttons in the Logical devices view allow you to:
* Change the way configuration information is displayed
* Collapse and expand configuration information
* Identify components of an array or logical drive

You can also create and delete hot-spare drives.

## More information
* The menubar
* The toolbar
* The Enterprise view
* The event viewer
* The status bar

**Using the ServeRAID Manager interface > Event viewer:** The event viewer provides advisory and progressive-status information and messages for your ServeRAID Manager system. Every event includes a severity icon, a date and time stamp, the host name where the event originated, and a description.

**Note:** All Warning and Error events cause an audible alarm to sound, notifying you of the event.

You can double-click an event in the event viewer and the "Configuration event detail" window opens. This window contains the same information as the event viewer, but in a larger, easier-to-read window. Some events have additional details listed in this window.

If the ServeRAID Manager is not in bootable-CD mode, it appends each event to a log file, RAIDEVT.LOG. If this file exceeds 200 KB, the ServeRAID Manager copies

the file to RAIDEVT.OLD and creates a new RAIDEVT.LOG. If there is a
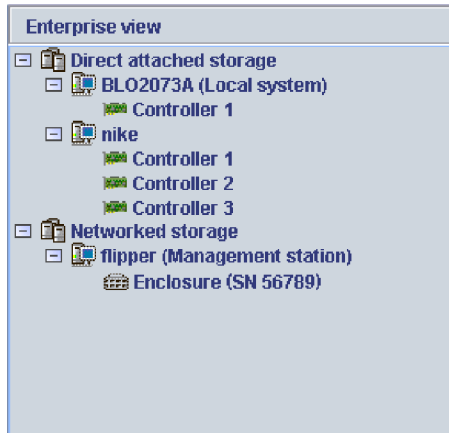RAIDEVT.OLD already, the ServeRAID Manager overwrites it.

## More information
- The menubar
- The toolbar
- The Enterprise view
- The Physical and Logical device views
- The status bar

**Using the ServeRAID Manager interface > Status bar:**  The status bar displays
the following information from left to right. You can drag the vertical bars to the
right and left to adjust the size of the viewing areas.

**Managed systems status icon.** This icon is the same as the Managed systems
icon displayed in the Enterprise view. The text next to the icon states whether the
ServeRAID Manager has detected problems on any of the systems. You can see the
text by dragging the vertical bar to the right.

**Tree path.** Reports the tree path location of the selected object.



**Progress indicator (ServeRAID legacy controllers only).** A labeled progress
indicator is displayed in this pane if the currently selected system has one or more
controllers containing a logical drive undergoing any of the following operations:
- Rebuild
- Migration
- Synchronization (either foreground or background)
- Compression or decompression (RAID level-5E only)
- Compaction or expansion (RAID level-5EE only)
- FlashCopy
- Copy back

 For ServeRAID-8i, ServeRAID-7t, and HostRAID controllers,
the ServeRAID Manager displays  (in animation) in the Logical devices view,
instead of the progress indicator.

If no action is in progress, this pane is empty. The progress indicator is labeled
with the controller number and logical drive number. If more than one controller is
undergoing one of these operations, the progress of the selected controller is
displayed in the pane.

## More information
- The menubar
- The toolbar
- The Enterprise view
- The Physical and Logical device views
- The event viewer

**Physical and Logical device views > Icons, buttons, and status indicators:**  The
ServeRAID Manager displays the following icons, buttons, and status indicators in

the Physical and Logical device views, representing the physical and logical
devices in your system, their status, and the actions you can take to manage them.

## Icons

Controller card

Array with no free space

Enclosure management device

Array with free space

Enclosure

Logical drive

Ready hard drive

Logical drive with hot spare

Hard drive with no free space

Creating/modifying array or logical drive

Hard drive with free space

Initialize logical drive

Hot spare drive protecting logical drive

FlashCopy backup

Hot spare drive **not** protecting logical drive

CD-ROM drive

defunct drive

Removable drive

Tape drive

## Buttons

Use the following buttons to view physical and logical device information and to
create and delete arrays and hot spares.

To view physical device information in enclosure view format (visible only if
system has an attached storage enclosure)

To view physical device information in text format

To view physical device information in full size capacity format

To view physical device information in relative size capacity format

To create or delete a hot spare drive

To create an array or logical drive

To delete an array or logical drive

To expand and contract information in the Enterprise view

To expand and contract physical and logical device information

## Status indicators

Use the following indicators to monitor the status of controllers and SAF-TE enclosure management devices in your system.

| | |
|---|---|
| | To monitor status of the fan module |
| | To monitor status of the battery module |
| | To monitor temperature status |
| | To monitor status of the power module |

## More information
- Physical device view options
- Component views
- Collapsed and expanded views

**Physical and Logical device views > Collapsed and expanded views:** In addition to changing the way physical device information is displayed in the Physical devices view (either textual or graphical), you can also view a collapsed or expanded view of the system configuration information. Initially, the ServeRAID Manager displays a collapsed textual view of the configuration information in both the Logical devices view and Physical devices view.

| | |
|---|---|
| In Logical devices view | Click to expand and collapse information about arrays and logical drives. The expanded display shows the following information about each logical device: <br> • Array name and capacity (if available) <br> • Logical drive size <br> • Logical drive state <br> • Build progress |
| In Physical devices view | Click to expand and collapse information about physical drives. The expanded display shows the following information about each drive: <br> • Capacity of the drive <br> • Drive ID <br> • Drive state |

## More information
- Icons, buttons, and status indicators
- Physical device view options
- Component views

**Physical and Logical device views > Physical device view options:** You can choose the way information is displayed in the Physical devices view. To choose a view option, click the associated button in the Logical devices view.

**T** Displays physical device information in text format. This is the default view for controllers with direct attached storage devices.
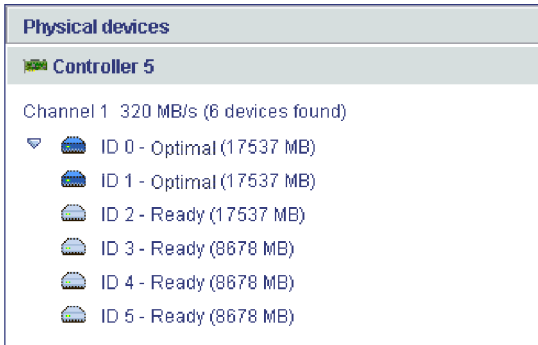
> **Physical devices**
>
> ▨ **Controller 5**
>
> Channel 1  320 MB/s (6 devices found)
> ▽ 💾 ID 0 - Optimal (17537 MB)
>    💾 ID 1 - Optimal (17537 MB)
>    💾 ID 2 - Ready (17537 MB)
>    💾 ID 3 - Ready (8678 MB)
>    💾 ID 4 - Ready (8678 MB)
>    💾 ID 5 - Ready (8678 MB)

Displays physical device information in full size capacity format. A full-length bar is displayed for each drive, regardless of capacity. A small segment on each drive is reserved for the RAID signature; this area is indicated by a gray "cap" at the end of each bar.

> **Physical devices**
>
> ▨ **Controller 5**
>
> Channel 1  320 MB/s (6 devices found)     136 KB reserved segment
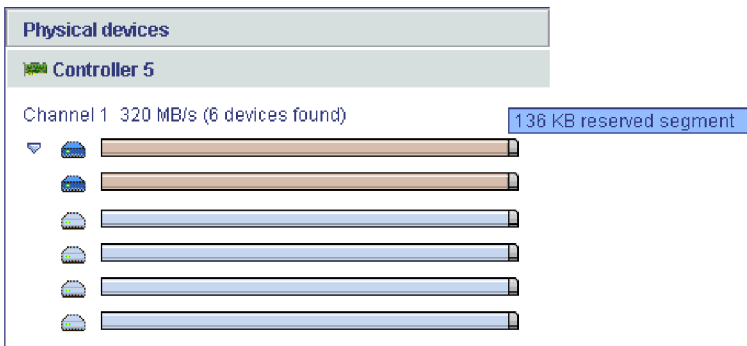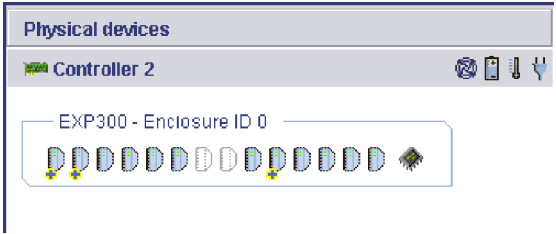
**Note:** A drive shaded in light blue is not part of any array.
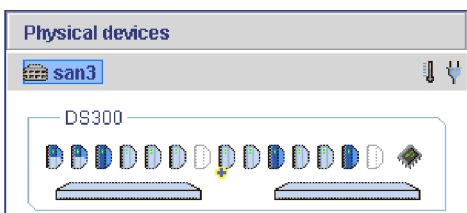
Displays physical device information in relative size capacity format. A full length bar is displayed for the largest drive. Proportionally shorter bars are displayed for other drives.

> **Physical devices**
>
> ▨ **Controller 5**
>
> Channel 1  320 MB/s (6 devices found)
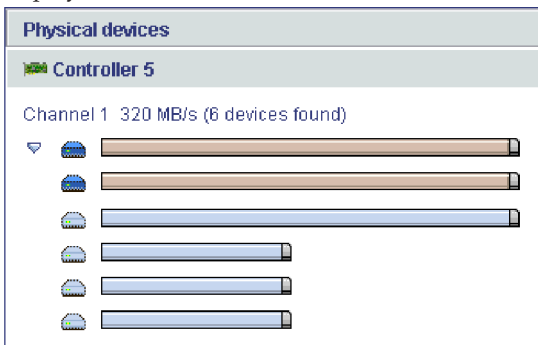
Displays physical device information in enclosure view format. Drives in the enclosure are shown in the physical slots they occupy with the proper vertical or horizontal orientation. Empty slots are shown as drive outlines. This is the default view for systems with an attached storage enclosure.



For network storage, enclosure view also shows the controllers in the enclosure.



**Attention:** The enclosure view button is visible in the Logical devices view only if an enclosure is attached to the system. HostRAID controllers do *not* support enclosure view. Nor do some older enclosures.

## More information

- Icons, buttons, and status indicators
- Component views
- Collapsed and expanded views

**Physical and Logical device views > Component views:** When you click either a physical or logical device in the device views, the related components are highlighted in the other view.

When you click an array, the associated logical drives are highlighted in the Logical devices view and the physical drives that are members of the array are highlighted in the Physical devices view.



When you click a hot spare drive, the logical drives protected by that spare are highlighted.
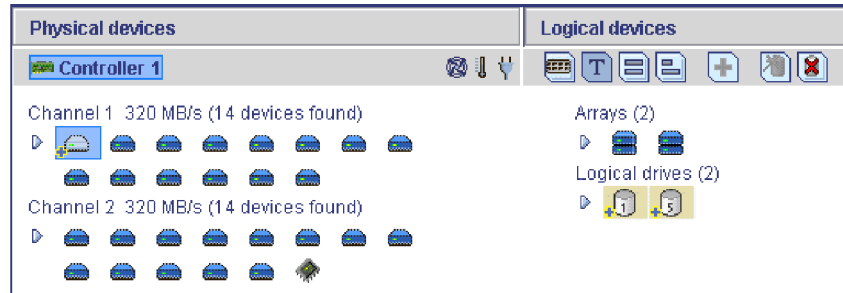
In the graphical views, if the logical drive uses only part of the available storage, only those segments are highlighted, using the following color code:

- dark blue - storage used by selected logical drive
- brown - storage used by other logical drives
- light blue - free space (not used by any logical drive)
- gray - space reserved for RAID signature
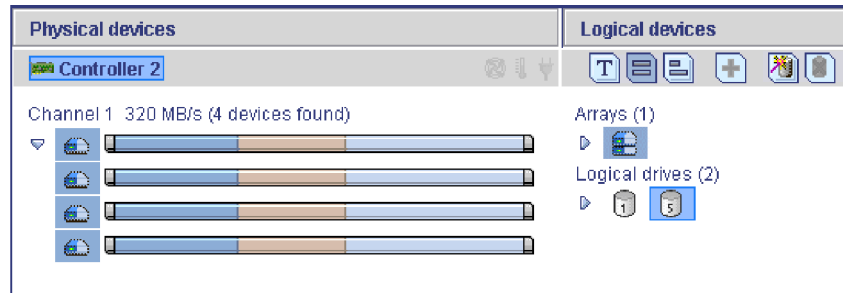


**Note:** Partially filled hard drive ![icon] and array ![icon] icons indicate that the device has free space.

## More information

- Icons, buttons, and status indicators
- Physical device view options
- Collapsed and expanded views

## Sending a test trap from the SNMP Trap Manager

Use this action to send a test trap to a remote system.

1. Click a system in the SNMP traps list.

   **Note:** This action is disabled if you do not select a system.

2. Click **Actions** → **Send test trap**.

**Note:** The SNMP Trap Manager cannot verify that the trap was received successfully. You must verify that the trap was received on the remote system. If the test fails, verify the following and try the test send again:

1. You typed the correct TCP/IP information when you added the system to the traps list.
2. The SNMP console is running on the remote system.

## More information
- Using the SNMP Trap Manager
- Adding a system to the SNMP traps list
- Deleting a system from the SNMP traps list
- Modifying system properties in the SNMP traps list

## Working with objects in the Enterprise view and device views
Use objects in the Enterprise view and the Physical and Logical device views to review information and to change or manage the ServeRAID configuration.
- Direct attached storage object
- System object
- Display group object
- Controller object
- Integrated RAID controller object
- Networked storage object
- Management station object
- Enclosure object
- arrays object
- array [letter] object
- logical drives object
- logical drive [number] object
- Channel [number] object
- Ports [numbers] object
- Physical drive [number] object
- Hot-spare drive object
- Enclosure management device object
- CD-ROM drive object
- Removable-media drive object
- Tape drive object

**Direct attached storage object:** Use this object, in the Enterprise view, to work with managed systems with direct attached storage devices or to display their properties. When you click this object, the ServeRAID Manager displays a summary of managed systems in the **Direct attached storage** view.

## Possible subobject

-  (System)

-  (Display group)

## Warning and error conditions
-  (warning) is displayed if any system has a warning or error condition.

## Actions
- Add remote system
- Remove a remote system
- Update controller images

*Adding a remote system:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to connect to a remote system or management station and add it to the Enterprise view.

**Tip:** Before adding a remote system, verify that the system is running the required software. To add a remote system with direct-attached storage, the ServeRAID Manager must be running on that system. To add a management station with a network-attached storage enclosure, the ServeRAID Manager management station software must be running on that system.

1. From the Remote menu, select **Remote** → **Add** or click ![Add icon] (Add) on the toolbar. The Add managed system window opens.
2. From the Type drop-down list, select:
   - **Managed System**, to add a remote system with direct-attached storage
   - **Management Station**, to add a remote management station with a network-attached storage enclosure
3. Type the remote host name or TCP/IP address.
4. (Managed system only) Type the remote system startup port number. The default port number is 34571.
5. Type your user name and password.

   **Note:** The password is case sensitive.
6. If you want to save the user name and password, select the **Save user name/Password** box. Once you successfully connect to the remote system, the ServeRAID Manager stores this information in a file along with the host name so you do not have to type your user name and password every time you run the ServeRAID Manager.
7. Click **Connect**.

## More information
- Failing to add a remote system
- Successfully adding a remote system
- Specifying remote access settings
- Removing a remote system

*Failing to add a remote system:* If you fail to connect to the remote system, the ServeRAID Manager displays an error message and does not add the remote system to the Enterprise view. If the ServeRAID Manager fails to connect, verify the following:

- The ServeRAID Manager is running on the remote system.
- The remote system is using a compatible version of the ServeRAID Manager.
- The remote system has TCP/IP installed.
- You supplied the correct user name and password, if security is enabled on the remote system.
- The remote system is turned on.
- The host name is defined in the Domain Name Server or a Hosts file, if you are trying to connect using a host name.
- The remote session is running on the appropriate port.

## More information
- Adding a remote system

*Successfully adding a remote system:* When you successfully add a remote system, the ServeRAID Manager updates the Enterprise view with the newly added

system. The next time you start the ServeRAID Manager, it automatically loads the systems into the Enterprise view. When you click one of these systems, the ServeRAID Manager either:

- Opens the "Add managed system" window and prompts for the security information, if the remote ServeRAID Manager has security enabled and you did not save the user name and password.
- Connects to the system and retrieves the system information, if you saved the user name and password, or security is disabled.

## More information

- Adding a remote system

*Specifying remote access settings:*

**Note:** This action is not supported when using the following:
  - ServeRAID Manager in bootable-CD mode
  - ServeRAID Manager as a plug-in application

## Local-only mode

Complete the following steps to run the ServeRAID Manager in local-only mode:

1. In the "User preferences" window, click the **Remote access settings** tab.
2. Select the **Local only** box.
3. Click **OK**.
4. Restart the ServeRAID Manager for this setting to take effect.

   The next time you start the ServeRAID Manager, TCP/IP networking will be disabled. In local-only mode, you cannot monitor any remote systems and no remote systems can monitor your system.

## Networking mode

Complete the following steps to run the ServeRAID Manager in networking mode:

1. In the "User preferences" window, click the **Remote access settings** tab.
2. If the **Local only** box is selected, deselect it.
3. Click **OK**.
4. Restart the ServeRAID Manager for this setting to take effect.

**Note:** The default port numbers for remote access are 34571-34574. If you have a conflict with these numbers, you must configure the agent to use different ports.

## More information

- Adding a remote system
- Removing a remote system
- Configuring the ServeRAID Manager agent

*Removing a remote system:*

**Note:** This action is not supported when using the following:
  - ServeRAID Manager in bootable-CD mode
  - ServeRAID Manager as a plug-in application

Removing a remote system does not take a remote system offline, but only removes it from the ServeRAID Manager Enterprise view.

1. From the Remote menu, click either:
   - **Remote → Remove managed system** and then the system name, to remove a remote system with direct-attached storage
   -
   - **Remote → Remove management station** and then the system name, to remove a remote management station with network storage

2. If you are removing a remote system with direct-attached storage, the "Remove managed system" window opens; continue to step 2. Otherwise, skip to step 3.

3. If you want to continue receiving events from the remote system after having removed it, click "Continue to receive events from the remote system" from the drop-down list.

4. Click **OK**.

## More information
- Receiving events from a removed system
- Adding a remote system
- Specifying remote access settings

**System object:** Use this object, in the Enterprise view, to work with a local or remote system, or to display its properties.

If a system object is gray, the ServeRAID agent is not available on that system.

**Note:** The ServeRAID software supports a maximum of 16 ServeRAID controllers.

## Possible subobject

-  (ServeRAID controller)

-  (Integrated RAID controller)

## Warning and error conditions
-  (warning) is displayed if any controller in the system has any problem.

## Actions

**Note:** Not all actions are supported on all controllers.
- If the system is remote, remove remote system.
- Agent actions:
  - Configure (not available in bootable-CD mode):
    -
      - Notifications
      - Email Notifications
      - Task Manager
      - General settings
  - View event log
- Save printable configuration
- ServeRAID actions:

– Save printable configuration and event logs
– Clear all controller event logs
– Validate cluster
- Change display group
- Save support archive

**Display group object:** Use this object, in the Enterprise view, to work with a display group.

## Possible subobject

-  (System)

-  (Management station)

## Warning and error conditions
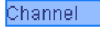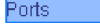
-  (warning) is displayed if any system in the display group has any problem.

## Actions

- Delete display group
- Rename display group

**ServeRAID controller object:** Use this object, in the Enterprise view, to work with ServeRAID controllers and related objects in the Physical and Logical device views, or to display controller properties.

## Possible subobject

- Arrays (Arrays)

- Logical drives (Logical drives)

- Channel (Channel [number])

- Ports (Port [numbers])

## Warning and error conditions

-  (warning) is displayed for the following conditions:
  – Any subobject of the controller has any warning or error conditions.
  – The controller has a battery-backup cache problem.
-  (error) is displayed for the following conditions:
  – The controller has failed.
  – The controller has a bad configuration.

## Actions

**Note:** Not all actions are supported on all controllers.
- Configure RAID
- Restore to the factory-default settings
- Copy configuration from drives
- Delete all arrays
- Create logical drive in array [number]
- Scan for new or removed ready drives

- Enable or disable copy back mode
- Identify all physical drives
- Clustering actions ⟶
  - Configure for clustering
  - View shared drives
  - Fail from active to passive controller
- Replace a hot-swap controller

The following actions are available only on the ServeRAID-7t, ServeRAID-8i, and network-attached storage enclosures:
- Enable data scrubbing
-  Change data scrubbing rate

The following actions are available only in bootable-CD mode:
- Enable or disable unattended mode
- Change rebuild rate
- Change stripe-unit size
- Enable or disable read-ahead cache mode
- Change BIOS-compatibility mapping

**Integrated RAID controller object:**   Use this object, in the Enterprise view, to work with integrated RAID controllers and their subobjects or to display their properties.

The integrated RAID controller is displayed in the ServeRAID Manager Enterprise view as **two** controller objects. However, you can configure only one array and RAID level-1 logical drive on an integrated RAID controller. The controller information in the tree lists the controller type as LSI 1030.
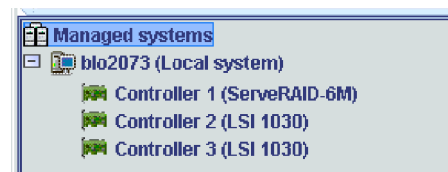


**Note:**

1. The integrated RAID controller provides limited function compared to ServeRAID controllers.
2. The ServeRAID Manager can display a maximum of four LSI 1030 controller objects in a system.
3. Under Windows, LSI 1030 controller objects are not visible unless devices are attached to one of the LSI 1030 controller channels. If devices are attached to only one channel then only one controller object will be visible.

## Possible subobject

- Arrays (Arrays)
- Logical drives (Logical drives)
- Channel (Channel [number])

## Warning and error conditions

- 🔺 (warning) is displayed for the following conditions:
    - Any subobject of the controller has any warning or error conditions.
- 🔲 (error) is displayed for the following conditions:
    - The controller has failed.
    - The controller has a bad configuration.

## Actions

- Identify all physical drives

The following actions are available only in bootable-CD mode:
- Configure RAID
- Delete all arrays
- Enable or disable unattended mode

*Enabling and disabling unattended mode:*

**Note:** This action is supported in bootable-CD mode only.

Use this action to change the unattended-mode setting. This setting determines how the ServeRAID Manager startup code (BIOS) handles failures during a system startup. The default is Disabled.

1. In the Enterprise view, click 🟦 (controller).
2. Right-click **Enable or Disable unattended mode.**
3. Click **Yes** to confirm.

## More information

- Understanding unattended mode

*Identifying devices:* You can identify the devices in a server or enclosure, such as a physical drive, because the light associated with the device you selected is flashing.

1. Click any object in the Physical devices view or Logical devices view, **except** the following:

    🟦 (Controller)

    🔵 (CD-ROM drive)

    🟫 (Tape drive)

    🟥 (Removable-media drive)

2. Right-click the appropriate **Identify**.

    The ServeRAID Manager sends a command to the firmware (microcode) to start flashing one or more physical drive or enclosure lights, depending on the following:

    - The selected object
    - Whether the item and its subsystems are all controlled by an enclosure device

    **Note:** Identify works only on controllers with a SAF-TE processor and the appropriate firmware. If a device light or a series of device lights do not flash, it is because all or part of the subsystem is not controlled by a SAF-TE processor.

3. Click **OK** to stop the drive lights from flashing.

## More information
- Using Identify to work with your systems
- ServeRAID Manager and LED flash states

*Using Identify to work with your systems:* When you click **Identify** for an object in the Physical devices view or Logical devices view, the ServeRAID Manager makes the hardware light associated with the selected object **flash**.

Depending on what you clicked, you can identify the following:
- A drive
- All drives
- A channel of drives
- A logical drive
- All logical drives
- An array
- A spanned array
- All arrays
- An enclosure

You can make only one selection at a time. The hardware will continue flashing until you click **OK** in the message window.

Identify works only on controllers with a SAF-TE processor and the appropriate firmware. The processor uses a SCSI ID; therefore, it is displayed in the Physical devices view as the following:

  Enclosure management device

If a device light or a series of device lights do not flash, it is because all or part of the subsystem is not controlled by a SAF-TE processor.

For example, if SCSI channel 1 has a SAF-TE processor, but SCSI channel 3 does not, and you select to Identify all physical drives, only SCSI channel 1 will flash.

Identify is particularly useful for enclosures. You can use Identify to clarify which drives in the enclosure you need to work with, before you pull them out of the enclosure.

If a SAF-TE processor is present and the controller supports device identification, you can identify the components by doing the following:

| Right-click: | To Identify... |
| --- | --- |
|  Enclosure management device | The enclosure itself |
|  Enclosure | All physical drives in the enclosure |
|  Array [number] | All physical drives in the selected array or spanned array |

| Right-click: | To Identify... |
|---|---|
|  Logical drive [number] | All physical drives in the selected logical drive |
|  Physical drive [number] | The selected physical drive. |
| Arrays ( Arrays object) | All physical drives in all arrays |
| Logical drives ( Logical drives object) | All physical drives in all logical drives |
| Channel ( Channel object) | All physical drives on the selected channel |
| Ports ( Ports object) | All physical drives on the selected ports |

## More information
- Identifying devices (action)
- ServeRAID Manager and LED flash states

*IBM ServeRAID SCSI controllers:* You can use the IBM ServeRAID Manager with the following:
- IBM ServeRAID-7K Ultra320 SCSI controller
- IBM ServeRAID-6i/6i+ Ultra320 SCSI controller
- IBM ServeRAID-6M Ultra320 SCSI controller
- IBM ServeRAID-5i Ultra320 SCSI controller
- IBM ServeRAID-4H Ultra160 SCSI controller
- IBM ServeRAID-4Mx Ultra160 SCSI controller
- IBM ServeRAID-4Lx Ultra160 SCSI controller
- IBM ServeRAID-4M Ultra160 SCSI controller
- IBM ServeRAID-4L Ultra160 SCSI controller
- IBM ServeRAID-3HB Ultra2 SCSI controller
- IBM ServeRAID-3H Ultra2 SCSI controller
- IBM ServeRAID-3L Ultra2 SCSI controller
- IBM ServeRAID-II Ultra SCSI controller
- IBM ServeRAID SCSI controller

## More information
- ServeRAID-5 hardware features
- ServeRAID-4 hardware features
- ServeRAID-3 hardware features
- ServeRAID software features

*Integrated RAID controller:* The integrated RAID controller (such as an LSI 1030) is a standard feature on some IBM xSeries servers. This controller has limited RAID capabilities. With an integrated RAID controller, you can use the ServeRAID Manager to:
- Configure two physical drives into a logical drive and assign it RAID level-1.
- Configure a ready physical drive as a hot-spare drive.

- Monitor the physical drives for PFA errors.
- Set drive status lights for a failed physical drive or PFA error.

The integrated RAID controller is displayed in the ServeRAID Manager Enterprise view as two controller objects. However, you can configure only one array and RAID level-1 logical drive on an integrated RAID controller. The controller information in the tree lists the controller type as LSI 1030.
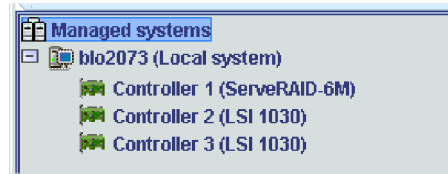


**Attention:** If you choose to install a ServeRAID controller in the server, you cannot migrate the data from an array configured on the integrated RAID controller to an array configured on the ServeRAID controller.

For additional information about the integrated RAID controller, see the installation instructions and CDs provided with your IBM xSeries server.

## More information
- Understanding RAID level-1
- Understanding RAID level-1 Enhanced
- Choosing to create a hot-spare or standby hot-spare drive
- ServeRAID software features

*Configuring the ServeRAID controller for clustering:*

**Note:** This action is not supported when using the following:
  - Integrated RAID controller
  - ServeRAID-5i controller
  - ServeRAID-6i/6i+ controller
  - ServeRAID-7k controller
  - ServeRAID-7t controller
  - ServeRAID-8i controller
  - HostRAID controller

Use this action to configure and view ServeRAID settings for clustering computers or using high-availability.

The ServeRAID Manager configures the controller name, partner controller name, and SCSI initiator IDs in bootable-CD mode only; otherwise, you can view only this information .

You can configure merge-group numbers for a logical drive that you have created during the current session of the ServeRAID Manager. If you have exited from the ServeRAID Manager since you created the logical drive, you cannot configure merge-group numbers for it. You must use the ServeRAID Manager in startable-CD mode to change merge-group numbers for logical drives that are not new.

1. In the Enterprise view, click ![icon] (controller).
2. Right-click **Clustering actions** → **Configure for clustering**.

3. Enter the controller name and partner controller name. You can specify a name up to 12 characters. When you enter the partner controller name, the merge-group information displays in the window.

   **Note:** Names are case sensitive.

4. Select the SCSI initiator IDs which can be 6 or 7.

   **Note:** The SCSI initiator IDs must be unique from the partner controller initiator IDs. The default is 7.

5. If you want a logical drive to merge to another controller if this controller fails, select the **Shared** box. Otherwise, if you do *not* want a logical drive to merge to another controller, select the **Non-shared** box.

   **Note:**

   a. Non-shared is the default for all logical drives. The merge-group number is defined as [200 + the SCSI initiator ID]. You cannot change the merge-group number for a non-shared logical drive.

   b. If a logical drive is defined as shared, all physical drives in the logical drive must be on a shared channel.

6. Enter a merge-group number for the shared logical drive. This merge-group number must be unique from the partner controller (that is, the merge-group number for any logical drive belonging to the partner controller cannot be the same merge-group number).

   **Note:** The default merge-group number is the logical-drive number.

7. Once you have configured both controllers for clustering, you can click View shared drives to view the physical drives owned by a partner controller.

## More information

- Using ServeRAID in a cluster environment

*Validating a cluster:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application
- Integrated RAID controller
- ServeRAID-5i controller
- ServeRAID-6i/6i+ controller
- ServeRAID-7t controller
- ServeRAID-8i controller
- HostRAID controller

**Note:** You must have the ServeRAID Manager installed and running on all servers in the cluster for this feature to work. You must run the Validate cluster feature from one of two nodes in the cluster; you cannot run it remotely.

Use this action to determine if your cluster configuration is configured correctly.

1. In the Enterprise view, click  (local system only).

2. Right-click **ServeRAID actions** → **Validate cluster**. The "Validate cluster" window opens. The system you selected in step 1 is listed in the **Node A** box.

**Note:** You cannot change the Node A system in the "Validate cluster" window. To select a different system, click **Cancel** to return to the tree.

3. Select your second system from the **Node B** drop-down list.

   **Note:** The Node B system defaults to the first system in the Enterprise view other than the Node A system. If there are no remote systems in the Enterprise view, click **Cancel** to return to the Enterprise view and add a remote system.

4. Click **Start**. The ServeRAID Manager scans both systems to verify the configuration.

5. If you want to stop the validation before it is completed, click **Cancel**. Otherwise, if the ServeRAID Manager found problems with the configuration, it reports the problems in the message field. If there are no problems with the configuration, the message field reports only the cluster pairings found.

6. To view the problem report events in an easy-to-read window, double-click an event in the message field.

7. To save the contents of the message field, click **Save**. A "Save as" window opens.

8. Specify the file name for the message field log and click **OK**.

9. Click **Done** to exit the "Validate cluster" window. If the configuration has problems, use " Configure for clustering" to fix the problems; then, use "Validate cluster" again.

## More information
- Configuring the ServeRAID controller for clustering
- *IBM ServeRAID User's Reference*

*Clearing controller event logs:* Use this action to clear (erase) all controller event logs. If you are having problems, do not clear the event logs; your service representative might need to reference the logs. If you must clear the logs, save the logs first.

**Note:** The event logs are automatically cleared when you update the firmware (microcode) on the controller.

1. In the Enterprise view, click  (system).

2. Right-click **ServeRAID Manager Actions** → **Clear all controller event logs**. The ServeRAID Manager clears all event logs belonging to all controllers in the selected server.

## More information
- Saving a printable configuration
- Saving a printable configuration and event logs

*Replacing a ServeRAID controller:*

**Note:** This action is not supported when using the following:
- Integrated RAID controller
- ServeRAID-5i controller
- ServeRAID-6i/6i+ controller
- ServeRAID-6M controller under the Windows operating system

Use this action to perform a hot-swap replace of a controller.

1. In the Enterprise view, click  (controller).

2. Right-click **Replace controller**. The IBM ServeRAID Hot-Swap Wizard opens.

3. Click **Next**. The wizard turns off the PCI slot.

4. Click **Next**. The "Replace the controller" window opens. This window lists the steps that you must follow to replace the controller hardware in the server.

5. When complete, click **OK**. The wizard does the following:

   a. Turns on the PCI slot.

   b. Verifies that the controller is working properly.

   c. Configures the controller by importing the configuration from the physical drives.

      **Note:** Configuration can take several minutes.
      .

6. Click **Next**.

7. Click **Finish**.

## More information
- Steps for hot-replacing a ServeRAID controller
- Using Active PCI features

*Configuring a ServeRAID controller: the basic steps:*  The following steps are an overview of the ServeRAID configuration process:

1. In the Enterprise view, click ▦ (controller) that you want to configure.

2. Right-click **Create logical drive**, or click ▦ in the Logical devices view. The Configuration wizard opens.

3. Click either **Express configuration** or **Custom configuration**: If you select Express configuration, the ServeRAID Manager automatically:

   a. Creates one or more arrays, based on the number and size of ready physical drives in your system.

   b. Defines a hot-spare drive, if four or more ready physical drives of the same size are available.

   c. Defines a logical drive for each array.

   If you select Custom configuration, the ServeRAID Manager walks you through:

   a. Selecting the physical drives that you want to include in your arrays or create as hot-spare drives.

   b. Defining the logical drives for your arrays.

4. Click **Automatically initialize new logical drives**. Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive.

5. Click **Next**; then, review the configuration summary.

6. Click **Apply**. The ServeRAID Manager will configure the controller and initialize and synchronize the logical drives.

▦ ▦ ▦  For HostRAID controllers, Express configuration creates a single logical drive. Custom configuration allows you to select the physical drives and segments used to define your logical drives.

## More information

- Example: Express configuration
- Choosing between Express and Custom configuration (SAS, SATA, HostRAID)
- Configuring RAID

*Configuring two ServeRAID controllers in a failover environment:*

**Note:** This action is not supported when using the following controllers:
- Integrated RAID controller
- ServeRAID-5i controller
- ServeRAID-6i/6i+ controller
- ServeRAID-7t controller
- ServeRAID-8i controller
- HostRAID controller

You can configure two ServeRAID controllers in a failover environment when using Microsoft Windows 2000 or Microsoft Windows NT 4.0. Recent versions of ServeRAID device drivers utilize fault-tolerant technology. With fault tolerance, you can pair two controllers and connect them to the same enclosure to ensure access to the physical drives, even after one controller fails.

Failover requires specific controller settings. You must set or change these settings by using the ServeRAID Manager in bootable-CD mode. The settings are the following:
- Controller name
- Partner controller name
- SCSI initiator IDs

Use Configure for Clustering to change these settings. You can use this action to view the settings from the installed ServeRAID Manager. To set or change these settings, you must use this action in bootable-CD mode.

**Important:** Be sure to review *Configuring IBM ServeRAID Controllers for Failover*.

## More information

- Failing from active to passive controller (action)

*Steps for hot-replacing a ServeRAID controller:* If you are hot-replacing a ServeRAID controller in a server that you are monitoring remotely, print these steps so you can refer to them while working at the server.

1. Review the Safety Information in the ServeRAID book and the Safety Information book provided with your IBM server.
2. Detach the SCSI cables from the ServeRAID controller.
3. Open the locking handle and raise the latch.
4. Unseat the controller from the PCI slot and remove the controller from the server.
5. Insert the replacement controller in the PCI slot.
6. Lower the latch and close the locking handle.
7. Connect the SCSI cables to the replacement controller.

## More information

- Replacing a ServeRAID controller (action)
- Using Active PCI features

*Failing from the active to the passive controller:*

**Note:** This action is not supported when using the following:
1.  Integrated RAID controller
2. ServeRAID-5i controller
3. ServeRAID-6i/6i+ controller
4. ServeRAID-7t controller
5. ServeRAID-8i controller
6. HostRAID controller

Use this action to force a failover from the active to the passive controller for the following reasons:
- To test your failover configuration.
- If you are having problems accessing data through ServeRAID, attempt to failover to see if that fixes the problem.

**Note:**
1. This action is available only if clustering is enabled.
2. Failover detects **only** failed controllers.

1. In the Enterprise view, click ![icon] (controller).
2. Right-click **Clustering actions** → **Fail from active to passive**.
3. Click **Yes** to confirm the failover.

**Networked storage object:** Use this object, in the Enterprise view, to work with the management stations and network-attached enclosures in your configuration or to display their properties. When you click this object, the ServeRAID Manager displays a summary of management stations in the **Networked storage** view.

## Possible subobject

- ![icon] (Management station)

- ![icon] (Display group)

## Warning and error conditions

- ![icon] (warning) is displayed if any management station has a warning or error condition.

## Actions

- Add management station
- Remove management station
- Update controller images

**Management station object:** Use this object, in the Enterprise view, to work with a managment station or to display its properties.

## Possible subobject

- ![icon] (Enclosure)

## Warning and error conditions

- ![icon] (warning) is displayed if any enclosure has a warning or error condition.

## Actions

* Add agent
* Remove agent
* Configure management station
* View management station event log
* Change display group

*Adding an agent:* Use this action add a management station agent or FlashCopy agent:

* The management station agent is a monitoring agent for network storage. After you add a management station agent, you can monitor and configure the attached enclosures from a ServeRAID Manager console.
* The FlashCopy agent monitors FlashCopy backups for network storage. You must run at least one FlashCopy agent to manage FlashCopy backups of logical devices on external storage enclosures.

## Adding a management station agent

To add a management station agent:

1. In the Enterprise view, click ▦ (management station).
2. Right click **Add agent**. The "Add agent" window opens.
3. Enter the management port host name or TCP/IP address of one of the controllers in the enclosure. (Single controller configurations have only one controller in the enclosure.)
4. Enter the administrator's password in the password field.

   **Note:** The administrator's password is established when the enclosure is installed on the network. It is not the same as the management station password.
5. Click **Add**.

## Adding a FlashCopy agent

To add a FlashCopy agent:

1. In the Enterprise view, click ▦ (management station).
2. Right click **Add agent**. The "Add agent" window opens.
3. Enter the host name or TCP/IP address of the machine on which the agent is running.

   **Note:** For the FlashCopy agent, no password is required.
4. Click **Add**.

## More information

* Using the management station agent
* Removing an agent

*Removing an agent:* Use this action to remove a management station agent or FlashCopy agent for networked storage. Removing the management station agent deletes the enclosure from the Enterprise view, but does not take the enclosure offline.

To remove an agent:

1. In the Enterprise view, click ▣ (management station).
2. Right click **Remove agent** and then the agent name. In the pull-right menu, management station agents are listed first, above the horizontal rule. FlashCopy agents are listed below the rule. The rule is visible (near the top of the panel) even if no management station agents are defined.
3. Click **Yes**.

## More information
- Using the management station agent
- Adding an agent

*Configuring a management station:*   Use this action to configure a management station. After you configure a management station, you can monitor the attached enclosures from a ServeRAID Manager console running on another system.

1. In the Enterprise view, click ▣ (management station).
2. Right click **Management station actions** → **Configure**. The "Management Station Configuration" window opens.
3. Configure the Security Manager, SNMP Traps Manager, and Email Notification Manager.

## More information
- Using the management station agent
- Using the Security Manager
- Using the SNMP Traps Manager
- Using the Email Notification Manager

*Viewing the management station event log:*   Use this action to view events in the management station event log.

1. In the Enterprise view, click ▣ (management station).
2. From the Actions menu, click **Management station actions** → **View event log**. The "Management station event viewer" window opens.
3. If you want to save the event log to a file, click **File** → **Save as**. The default is Events.txt.
4. Click **File** → **Close** to close event viewer window.

## More information
- Using the management station agent

*Using the management station agent:*   The management station agent is a monitoring agent for network storage. After you add an agent, you can configure the management station to:

- Notify users by email when events occur on the enclosures attached to the management station. Use the Email Notification Manager, from the Management Station Configuration console, to add recipients to the email notification list.
- Prevent unauthorized users from connecting to the management station using its built-in security feature. The management station checks the security list user name and password to ensure that only authorized users can log in. Use the Security Manager, from the Management Station Configuration console, to add users to the agent security list.

- Send SNMP traps. You can receive SNMP traps using any available SNMP management program. Use the SNMP Trap Manager, from the Management Station Configuration console, to add systems to the SNMP traps destination list.

The agent monitors and generates events for critical or fatal problems in the enclosure configuration every 5 seconds. These changes include, but are not limited to:
- defunct drives
- PFA drives
- Failed battery
- Offline or critical logical drives
- Failed controllers
- Enclosure problems
- Non-warranted drives. An event is sent at startup, console connection, and every 30 days

## More information
- Adding a management station agent
- Configuring a management station
- Viewing the management station event log

**Enclosure object:** Use this object to work with an enclosure or to display its properties.

## Possible subobject

None.

## Warning and error conditions
- ▦⚠ (warning) is displayed if the enclosure has the following conditions:
  – A fan has failed.
  – A power supply has failed.
- ▦⊗ (error) is displayed if the enclosure has the following conditions:
  – It is not responding.
  – It is overheating.
  – Multiple fans have failed.
  – Multiple power supplies have failed.
- ▦ (enclosure) is displayed if the enclosure is one of the following:
  – Working properly.
  – Not supported.
  – Supported, but not monitored for problems. For example, enclosures that are internal to a server do not have separate fans or power supplies.

## Actions
- Identify all physical drives
- Fail back storage (dual controller configurations only)
- Shut down enclosure
- Restart enclosure

- Enter software key
- Change controller date and time
- Save support archive

*Save support archive:* Use this action to save the ServeRAID Manager configuration and status information in an archive file. Your ServeRAID Manager service representative might ask you to create this file to help diagnose a problem with your system.

1. In the Enterprise view, click  (system) or  (enclosure).
2. From Action menu, select **Save support archive**. The "Save as" window opens.
3. In the File name field, type a name for the archive file or accept the default name.
4. Click **Save**.

## More information
- View event log
- Save printable configuration
- Save printable configuration and event logs

**Arrays object:** Use this object, in the Logical devices view, to work with basic arrays or spanned arrays or to display their properties:



**Note:** A controller supports a maximum of eight arrays or four spanned arrays. An integrated RAID controller supports a maximum of one basic array.

## Possible subobject

-  (Array or spanned array)

## Warning and error conditions
- None.

## Actions
- Delete all arrays
- Identify all arrays
- If the array has free space, Create logical drive in array

*Understanding creating basic arrays:* When you group one or more physical drives together and configure the ServeRAID controller to access them in a particular pattern, you create a basic array. The maximum number of basic arrays depends on the controller and RAID level.

Arrays are used to improve security, performance, and reliability. The amount of improvement depends on the application programs that you run on the server, ServeRAID parameters, and the RAID levels that you assign to the logical drives in your arrays. The ServeRAID software supports RAID levels-0, 1, 1E, 5, 5E, and 6. (Not all RAID levels are supported by all controllers.)

**Note:** Each ServeRAID controller supports up to eight logical drives. If any of the existing arrays contain a RAID level-5 Enhanced logical drive, you can have only seven logical drives on a controller.

For the ServeRAID-8i controller you can configure a maximum of 128 logical drives. For the ServeRAID-7t controller, you can configure a maximum of 24 logical drives.

## More information
- Understanding creating spanned arrays
- Creating arrays and hot-spare drives in the wizard
- Configuring RAID and creating arrays (action)
- Example: Express configuration
- Physical drive capacity and unusable capacity

*Understanding creating spanned arrays:*

**Note:** This feature is not supported on the integrated RAID controller.

When you group one or more arrays together and configure the ServeRAID controller to access them in a particular pattern, you create a spanned array.

Spanned arrays are used to create logical drives using as many as 60 physical drives. The ServeRAID controller supports RAID level-00, 10, 1E0, and 50.

## More information
- Creating spanned arrays in the wizard
- Understanding RAID level-x0
- Understanding when RAID level-x0 logical drives change state
- Understanding creating basic arrays
- Physical drive capacity and unusable capacity

*Configuring RAID and creating arrays:*

**Note:** This action is supported on the integrated RAID controller in bootable-CD mode only.

You can use the Configuration wizard to create up to eight arrays and up to eight logical drives for each ServeRAID controller. The Configuration wizard provides two configuration options: Express and Custom. Express configuration automatically configures your ServeRAID controller. Custom configuration allows you to configure your controller manually. If you want to use RAID level-1E, RAID level-5E, RAID level-5EE, or RAID level-x0, you must use Custom configuration.

**Note:** If you intend to use your ServeRAID controllers in a Microsoft Windows failover or clustering environment, review the ServeRAID publications before configuring ServeRAID.

1. In the Enterprise view, click (controller).

   **Note:** The integrated RAID controller is displayed in the ServeRAID Manager Enterprise view as two controller objects. However, you can configure only one array and RAID level-1 logical drive on an integrated RAID controller.

2. Right-click **Create logical drive**, or click ![icon] on the toolbar or Logical devices view. The Configuration wizard opens.

3. Click either **Express configuration** or **Custom configuration**.

   **Note:** If you click **Express configuration**, you will have the opportunity to review and approve the configuration before the ServeRAID Manager applies the configuration.

4. Click **Automatically initialize new logical drives**. Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive.

5. Create the arrays and hot-spare drives.

6. If you want spanned arrays, create the spanned arrays.

7. Create the logical drives.

8. Review the configuration summary and apply the configuration.

## More information

- Configuring a ServeRAID controller: the basic steps
- Initializing a logical drive

*Creating arrays and a hot-spare drive for your integrated RAID controller subsystem:*
Complete the following steps to create arrays:

1. Click the **Array** tab in the right pane:



2. Then, from the list of ready drives, select the drives you want to move to the array:
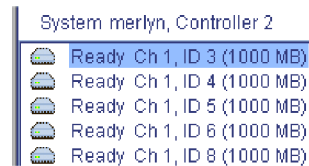


3. Click ![icon] >> (Add selected drives) to add the drives to the array.

4. If you want to configure a hot-spare drive, complete the following steps:

   a. Click the **Spares** tab.

   b. Select the physical drive you want to designate as the hot-spare drive; then,

      click ![icon] >> (Add selected drives).

5. Click **Next**. The " Configuration summary" window opens.

To return to the " Express and Custom configuration" window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information

- Understanding creating basic arrays

*Deleting all arrays:*

**Note:**

1. This action is supported on the integrated RAID controller in bootable-CD mode only.
2. This action is not supported on the ServeRAID-8i and ServeRAID-7t controllers.

Use this action to delete all arrays on the specified controller.

For some operating systems, deleting an array and its associated logical drives might change the drive-letter assignments of the remaining drives when you restart the system.

**Attention:** If you delete all arrays associated with the controller, all data on the controller is destroyed.

1. In the Enterprise view, click ▦ (controller).

   **Attention:** Before proceeding, ensure that you have backed up any data and programs that you want to save.
2. Right-click **Delete all arrays**.
3. Click **Yes** to confirm the delete.

*Replacing physical drives in an array:* If you have an array built with one or more physical drives that are not the same size, or you simply want to upgrade the array with new, larger drives, you can replace the physical drives in the array.

**Attention:** During the rebuild operation, if another physical drive fails, there is the risk of losing data.

1. Replace the physical drive in the server or enclosure with a larger physical drive.
2. Wait for the rebuild to complete.
3. Repeat steps 1 and 2 until you have replaced all the smaller physical drives in the array.

## More information

- Example: Usable and unusable capacity

*Modifying an array in the migration wizard:* To add or remove drives in an array:

1. In the Physical devices view (on the right), click the drives you want the array to use. To view available segments on each disk drive, switch to the full-size capacity view or relative-size capacity view:
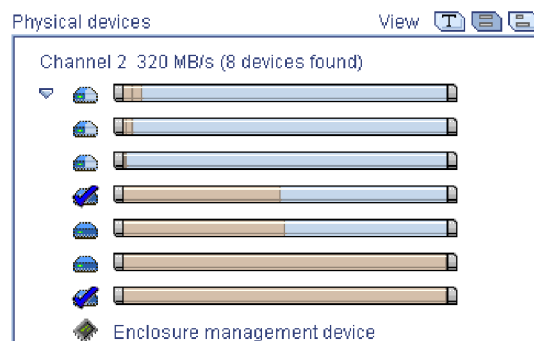


   **Note:** A segment shaded in light blue is not part of any array or logical drive.

2. To remove or replace a physical drive, click the drive you want to remove (indicated by ✖). Then, click the drive you want to replace it with. To cancel your changes and start over, click [ Revert array ] .
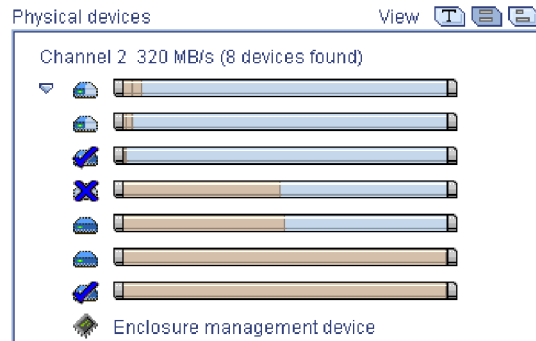


3. When you are ready to continue, click **Next**. The ″ Configuration summary″ window opens.

## More information

- Understanding physical drive capacity and unusable capacity

*Choosing the primary physical drive of the array:* When you create a RAID level-1 logical drive on an integrated RAID controller, you must specify the primary physical drive. Doing so ensures that you retain the data on the primary physical drive. In a RAID level-1 logical drive, the data on the primary physical drive is copied to the secondary physical drive (the mirror). Any data on the secondary physical drive is destroyed.

After the logical drive is created, the physical drive Properties panel reports the mirror role (primary or secondary) of each drive:
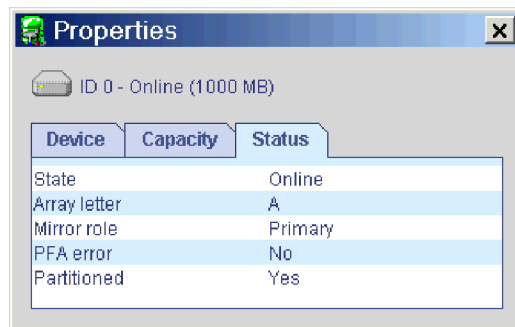


Knowing the mirror role of each physical drive can be useful in the following situations:

- Creating a logical drive with a physical drive that already contains data. A server has one physical drive and the operating system is installed on that physical drive. You decide that you want a RAID level-1 logical drive to achieve redundancy. When you install a second physical drive and configure the logical drive, you must specify the original physical drive as the primary physical drive so you do not destroy the data on that drive.
- During a synchronization failure. After the logical drive is created, a synchronization begins to create the mirror of the primary physical drive. While the synchronization is in progress, the logical drive is displayed as critical, because the mirror is not complete and the logical drive has not achieved redundancy. During the synchronization, if the primary physical drive fails, all

of the data on the drive is lost because the mirror is incomplete. If the secondary physical drive fails, the data on the primary physical drive is intact and you can create the mirror using a hot-spare drive.

## More information
- Understanding RAID level-1
- Understanding logical-drive synchronization

*Confirming your array migration configuration:*   Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your modified array and logical drive configuration.

1.   Review the information displayed in the "Configuration summary" window. It describes how the new configuration will affect the RAID level and free space. To change the configuration, click **Back**.
2. Click **Apply**.
3. Click **Yes** when asked if you want to apply the new configuration.

> **Note:** Logical-drive migration is a lengthy process. The ServeRAID Manager displays ![icon] (in animation) in the Logical devices view while the operation is in progress. When the migration is complete, the configuration is saved in the controller and in the physical drives.

## More information
- Understanding logical-drive migration

*Exporting an array:*   Use this action to export the specified array. Exporting an array prepares the RAID configuration for transfer to another enclosure.

**Note:** When you export an array, its status changes to foreign. You cannot perform any action on a foreign array except view array components and import a RAID configuration.

To export an array:

1. In the Logical devices view, click ![icon]   (array).
2. Right-click **Export array**.
3. Click **Yes** to confirm the export.

## More information
- Managing Foreign arrays and Alien arrays
- Importing an array
- Deleting an array

*Deleting an array:*

**Note:** This action is supported on the integrated RAID controller in bootable-CD mode only.

Use this action to delete a specified array.

For some operating systems, deleting an array and its associated logical drives might change the drive-letter assignments of the remaining drives when you restart the system.

**Attention:** If you delete an array, you delete all logical drives that are defined in that array. All data and programs on the logical drives in the array are lost during this procedure.

To delete an array:

1. In the Logical devices view, click ▓ (array).

   **Attention:** Before proceeding, ensure that you have backed up any data and programs that you want to save.

2. Right-click **Delete array**.
3. Click **Yes** to confirm the delete.

*Importing an array:* Use this action to import the RAID configuration into the specified foreign array. Importing the RAID configuration completes the transfer of an array from another enclosure.

To import an array:

1. In the Logical devices view, click ▓ (foreign array).
2. Right-click **Import array**.
3. Click **Yes** to confirm the import.

## More information
- Managing Foreign arrays and Alien arrays
- Exporting an array
- Deleting an array

*Moving an array to a different controller:*

**Note:** This action is not supported on enclosures with a single controller configuration.

Use this action to move an array to a different controller in the enclosure. This action changes the preferred owner of the array and moves all associated logical drives to the new controller.

1. In the Logical devices view, click ▓ (array).
2. Right-click **Move to controller** and then the controller name (A or B).
3. Click **Yes** when prompted to confirm the move.

## More information
- Recovering storage with fail back

**Array [letter] object:** Use this object, in the Logical devices view, to work with an array or to display its properties.

**Notes:**

1. Basic arrays are labeled with letters starting with A. Spanned arrays are labeled with numbers starting with 1. Spanned arrays are used in RAID level-x0 configurations only.
2. To view the array labels, switch to Text view; then, expand the array list.

3. A ServeRAID SCSI controller supports a maximum of eight basic arrays or four spanned arrays. An integrated RAID controller supports a maximum of one basic array.

## Possible subobject

- Logical drives (Logical drives)

-  (Logical drive)

## Warning and error conditions

-  (warning) is displayed if the logical drives object has a warning condition.

-  (error) is displayed if the logical drives object has an error condition.

## Actions

- Identify array
- If the selected array is **not** a subarray in a RAID level-x0 configuration, the following actions are available:
  - Delete array
  - Change RAID level from...
    - RAID 0 to RAID 5
    - RAID 1 to RAID 5
    - RAID 5 to RAID 0
    - RAID 5E to RAID 5
  - Increase free space
  - Increase logical drive size
- If the array is on a network-attached storage enclosure:
-
  - Export array (if the array is online)
  - Import array (if the array is foreign)
  - Move array to controller (dual controller configurations only)
  - Expand or migrate array

**Logical drives object:** Use this object, in the Logical devices view, to work with logical drives or to display their properties:
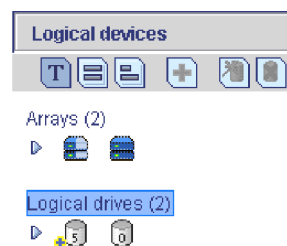


**Notes:**

1. ServeRAID SCSI controllers support a maximum of eight logical drives.
2. The ServeRAID-7t SATA controller supports a maximum of 24 logical drives.
3. The ServeRAID-8i SAS controller supports a maximum of 128 logical drives.

4. An integrated RAID controller supports a maximum of one logical drive.

## Possible subobject

-  (Logical drive)

## Warning and error conditions

- None.

## Actions

- Delete > logical drive number
- Identify all logical drives
- Configure access control list (networked storage only)
- Configure target information (networked storage only)

*Understanding when RAID level-x0 logical drives change state:* Start with four physical drives.

Use two physical drives to create array A and two physical drives to create array B.

Use arrays A and B to create spanned array 1. As part of a spanned array, arrays A and B are now called "subarrays."

A sub-logical drive is created in array A and another sub-logical drive is created in array B.

Then, create a logical drive in spanned array 1.

If the sub-logical drive in subarray A is in the okay state and the sub-logical drive in subarray B is in the okay state, then the logical drive in spanned array 1 is in the okay state.

If a physical drive fails in subarray A, then the sub-logical drive in subarray A changes to the critical state. Subarray B is still in the okay state. The logical drive in spanned array 1 changes to the critical state.

If the second physical drive fails in subarray A, then the sub-logical drive in subarray A changes to the offline state. Subarray B remains in the okay state. The logical drive in spanned array 1 changes to the offline state.

If the sub-logical drive in subarray A is in the critical state and a physical drive fails in subarray B, then the sub-logical drive in subarray B changes to the critical state. With both sub-logical drives in the critical state, the logical drive in spanned array 1 remains in the critical state.

## More information

- Understanding creating spanned arrays
- Creating spanned arrays in the wizard
- Understanding RAID level-x0
- Physical drive capacity and unusable capacity
- Understanding creating basic arrays

*Understanding logical-drive synchronization:*   The purpose of synchronizing logical drives is to compute and write the parity data on the selected drives. Synchronizing a logical drive verifies that the data redundancy for the logical drive is correct.

**Note:** You can determine if your controller firmware supports auto-synchronization and data scrubbing by viewing the controller properties. The properties pane reports if these features are enabled or disabled.

## Using auto-synchronization

If the logical drive is attached to a controller that supports auto-synchronization, the ServeRAID Manager automatically synchronizes all new RAID level-5, 5E, 5EE, and 50 logical drives. These logical drives must be synchronized before storing data. Auto-synchronization ensures that the parity data is accurately computed. Accurate parity is critical for updating the parity when you begin to store data.

 For the ServeRAID-8i controller and ServeRAID-7t controller, the ServeRAID Manager also supports auto-synchronization for RAID level-1 and 10 logical drives. During auto-synchronization, data from the primary drive is automatically copied to the mirror drive.

Depending on the controller, the ServeRAID Manager displays either a progress indicator in the status bar or a  (in animation) in the Logical devices view, indicating that auto-synchronization is in progress. You can perform some actions on the controller during an auto-synchronization, such as deleting a logical drive; however, you **cannot** perform a logical drive migration. Also, you can turn off the server during an auto-synchronization and, when you turn on the server, the firmware will continue the auto-synchronization where it left off.

## Using manual synchronization

When you create a logical drive that is attached to a controller that does **not** support auto-synchronization, you will receive a warning event in the event viewer stating that you must **manually** synchronize the logical drive before storing data. Use ″Synchronize logical drives″ to manually synchronize the logical drive. You must synchronize **new** RAID level-5 logical drives after you create them.

Manual synchronization can be a lengthy operation. You **cannot** perform any other actions on the controller until the manual synchronization is completed. You can synchronize the logical drive immediately or schedule it for a later date and time. You can also schedule the synchronization as a recurring task. A recurring synchronization task starts at the initial start time, then runs periodically according to the given interval: the same time each day, each week, or each month. Do **not** turn off the server until the manual synchronization is complete.

## Using manual synchronization for data scrubbing

Data scrubbing is an automatic background synchronization process. Data scrubbing keeps data ″fresh″ by doing the following:
- (For RAID level-5, 5E, 5EE, or 50) Reading data and rewriting the data parity.
- (For RAID level-1, 1E, 10, 1E0) Reading data and rewriting the mirror data.

If data scrubbing is disabled or your controller firmware does not support data scrubbing, consider manually synchronizing your logical drives weekly. This does not alter data on the drive.

**Note:** If data scrubbing is disabled on your controller, you **can** enable data scrubbing, but not through the ServeRAID Manager. Instead, use the IPSSEND command-line program. This program comes with the device option and is on the *IBM ServeRAID Support* CD. For more information, refer to the *IBM ServeRAID User's Reference*.

## More information

- Synchronizing logical drives (action)
- Understanding scheduled tasks
- Using the Task Manager

*Creating logical drives:* Complete the following steps to create logical drives:

1. Start the custom configuration wizard and complete all previous steps.
2. Click the appropriate **Array** tab.

| Array C | New array D |
|---------|-------------|

3. Select a RAID level from the drop-down list.

| RAID level |
|------------|
| 5EE ▼ |
| 0 |
| 1E |
| 5 |
| 5EE |

   **Note:**

   a. RAID level-5E and RAID level-5EE allow only one logical drive per array.
   b. If you are configuring a spanned array, you can set the RAID level only for the first logical drive you create.
   c. If you plan to use "Change RAID level," you must assign the same RAID level to all logical drives within a single array.

   **Attention:** Before assigning a logical drive RAID level-5E or RAID level-5EE, consider the following. If a physical drive fails during a post-failover resynchronization, the logical drive will enter the blocked state. Data might be lost or damaged.

4. If you do not want to use the maximum size for the logical drive, type the size in the **Data (MB)** field.

| Data (MB) |
|-----------|
| 3000 |

   **Note:**

   a. You can define up to eight logical drives per controller. There are two exceptions:
      - If an array contains a logical drive assigned RAID level-5E
      - If you want to use the logical-drive migration feature

In these cases, one logical drive slot must be left free; therefore, you must define no more than seven logical drives.

b. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. For more detailed information, see your operating-system documentation.

c. A logical drive cannot exceed 2048 GB (2 terabytes); the minimum size is $n$MB, where n equals the number of drives in the array.

d. Typically, the first logical drive defined on the first ServeRAID controller found by system BIOS during startup will be your startup (boot) drive.

e. The actual logical-drive size might be slightly different from what you select. The RAID level and the number of physical drives determine the size of the logical drive. For example, an array consisting of three, 1 GB physical drives with a requested RAID level-0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

5. If you have free space available and want to create additional logical drives, click [ 🗋 **Define new logical drive** ] .

6. Repeat steps 3 through 5 for each logical drive that you want to define in this array.

7. Repeat steps 2 through 6 for each additional array that you want to configure.

8. Click **Next**. The ″ Configuration summary″ window opens.

To return to the ″ Create arrays″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Selecting the RAID level by array capacity
- Selecting the array size
- Understanding physical drive capacity and unusable capacity

*Creating arrays and hot-spare drives:* Complete the following steps to create arrays:

1. Start the custom configuration wizard and complete all previous steps.

2. Click the appropriate **Array** tab in the right pane: [ New array C | Spares ]

3. Then, from the list of ready drives, select the drives you want to add to the array:

> System merlyn, Controller 2
> Ready Ch 1, ID 3 (1000 MB)
> Ready Ch 1, ID 4 (1000 MB)
> Ready Ch 1, ID 5 (1000 MB)
> Ready Ch 1, ID 6 (1000 MB)
> Ready Ch 1, ID 8 (1000 MB)

4. Click 🖲 >> (Add selected drives) to add the drives to the array. You can click 🖳 >> (Add all drives) to move **all** ready drives to an array.

5. Repeat steps 2 and 3 for each additional array or hot-spare drive that you want to configure.

6. If you do *not* want to create a spanned array, skip to step 6. Otherwise, select the **Span arrays** check box ☑ Span arrays . Then, click **Next**. If you created two

arrays only, the ServeRAID Manager uses those arrays to create the spanned array; continue to step 6. Otherwise, the ″ Create spanned arrays″ window opens.

> **Note:** To create a spanned array, each array must have the same number of physical drives.

7. After you select the ready drives for your arrays and hot-spare drive, click **Next**. The ″ Create logical drives″ window opens.

To return to the ″ Express and Custom configuration″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Understanding creating basic arrays
- Example: Express configuration
- Creating spanned arrays
- Understanding creating spanned arrays
- Configuring the ServeRAID controller: the basic steps

*Creating spanned arrays:* If you want to assign RAID level-x0 to an array, you must create a spanned array.

**Note:** Spanned arrays are supported only by IBM ServeRAID-4 Ultra160, ServeRAID-5i Ultra320, ServeRAID-6M Ultra320, and ServeRAID-6i/6i+ Ultra320 SCSI controllers.

Complete the following steps to create one or more identical spanned arrays:

1. Start the custom configuration wizard and complete all previous steps.
2. In the list of arrays, click the arrays that you want to add to your spanned



array.

3. Click  >> (Add selected arrays) to add the arrays to the spanned array. You can click  >> (Add all arrays) to move **all** arrays to the spanned array.
4. To create additional spanned arrays, click the **New spanned array** tab in the right pane.



   Then, repeat steps 2 and 3.
5. Click **Next**; the ″ Create logical drives″ window opens.

To return to the ″ Create arrays″ window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Understanding RAID level-x0
- Understanding creating spanned arrays

*Creating additional logical drives:*

**Note:** This action is not supported on the integrated RAID controller.

Use this action to create additional logical drives in an existing configuration. If you configured your ServeRAID subsystem but left free space in an array, you can use this action to create additional logical drives using the free space.

1. In the Enterprise view, click  (controller) that contains the array in which you want to create the logical drives.
2. In the Logical devices view, click  ( Arrays object).
3. Right-click **Create logical drive**. If the controller includes more than one array, right click **Create logical drive in array** and then the array name. The Configuration wizard opens with the "Create logical drives" window.
4. Create the logical drive.
5. Review the configuration summary and apply the configuration.

*Changing the logical drive name:* Use this action to change the name of a logical drive:

1. Press the Delete key to clear the drive's current name.
2. In the Type new name field, type the drive's new name.
3. Click **OK**.

*Clearing a logical drive:* Use this action to initialize a logical drive using the Clear initialization method. Initialization is usually automatic when you create a logical drive.

**Attention:** The Clear initialization method erases the entire logical drive and prevents access to any data previously stored on the drive.

1. In the Logical devices view, click  (logical drive).
2. Right-click **Clear**.
3. Click **Yes**.

*Deleting a logical drive:*

**Note:**

1. This action is supported on the integrated RAID controller in bootable-CD mode only.

2.  For ServeRAID SCSI controllers, this action is available only if the selected logical drive is the last logical drive that was created in the array.

3.  To delete a partitioned logical drive on a HostRAID controller, you must remove the partition with your operating system disk management tools first. Then, you can delete the logical drive with the ServeRAID Manager.

4.  To delete a logical drive on a networked storage enclosure, all iSCSI initiators must be disconnected first. Then, you can delete the logical drive.

**Attention:** If you delete a logical drive, all data on that logical drive is destroyed. Before proceeding, ensure that you have backed up any data and programs that you want to save.

1. In the Logical devices view, click  (logical drive).

2. Right-click **Delete**.
3. Click **Yes** to confirm the delete.

*Initializing a logical drive:* Use this action to initialize a logical drive. Initialization is usually automatic when you create a logical drive.

**Attention:** Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive.

1. In the Logical devices view, click  (logical drive).
2. Right-click **Initialize**.
3. Click **Yes**.

*Synchronizing logical drives:*

**Note:** This action is not supported on the integrated RAID controller.

If auto-synchronization is not supported on your controller, you must use this action to manually synchronize **new** RAID level-5, 5E, and 50 logical drives after you create them.

If data scrubbing is disabled or your controller firmware does not support data scrubbing, consider manually synchronizing your logical drives weekly using this action.

Manual synchronization can be a lengthy operation. You can synchronize the logical drive immediately or schedule it for a later date and time. You can also schedule the synchronization as a recurring task. A recurring task starts at the initial start time, then runs periodically according to the given interval: the same time each day, each week, or each month.

**Note:** You cannot perform any other actions on the controller until the manual synchronization is completed. For example, you cannot schedule a synchronization if another logical drive synchronization is in progress.

## An example

You schedule a synchronization task with an initial start time of Sunday, October 13, 2004 at 2:00 AM. It recurs weekly. It will run again on Sunday October 20, 2004 at 2:00 AM.

**Note:** Do not turn off the server while manual synchronization is in progress.

To synchronize a logical drive:

1. In the Logical devices view, click  (logical drive).
2. Right-click **Synchronize**.
3. Click **Yes** to synchronize the logical drive immediately (now). Depending on the controller, the ServeRAID Manager displays either a progress indicator in the status bar or  (in animation) in the Logical devices view, indicating that the operation is in progress.
4. Or click **Schedule** to schedule the synchronization for a later date and time. The ServeRAID Manager displays the Synchronization Scheduler pane:
   - From the drop-down lists and calendar display, select the day, month, year, and time you want the task performed.

- From the Recurring drop-down list, select the interval at which you want the task to recur: Never, Daily, Weekly, Monthly.
- Click **OK** to schedule the task; click **Cancel** to cancel the scheduled task and return to the initial confirmation pane.

## More information
- Understanding logical-drive synchronization
- Understanding scheduled tasks
- Using the Task Manager

*Unblocking a logical drive:*

**Note:** This action is not supported on the integrated RAID controller.

After the rebuild operation is completed on an array, if the array contained RAID level-0 logical drives, you can unblock the RAID level-0 logical drives and access them once again. But remember, the logical drive contains damaged data. You must re-create, install, or restore the data from the most recent backup disk or tape.

To unblock a blocked logical drive:

1. In the Logical devices view, click  (logical drive).
2. Right-click **Unblock logical drive**.
3. Click **Yes** to confirm, understanding that the data on the logical drive is not valid. The ServeRAID Manager unblocks the blocked logical drive.
4. Initialize all unblocked logical drives before using them.
5. Restore the data to the drive from your most recent backup disk or tape.

## More information
- Recovering from a defunct drive

*Selecting the logical drive size:*  When you select the logical drive size, consider the following:
- If you change the RAID level of a logical drive, the total size (data plus parity) of the logical drive might change.
- If you do not use all available free space, you can create another logical drive. Click **Create new logical drive** to do so. You can assign the same or a different RAID level to additional logical drives.
- You cannot delete the last remaining logical drive in the array. You must have at least one logical drive for each array.
- Refer to the documentation provided with your operating system for information about the recommended logical-drive size.
- The default RAID configuration uses all available free space.

## More information
- Selecting the RAID level by array capacity
- Creating logical drives (action)
- Configuring RAID and creating arrays (action)
- Creating logical drives in the wizard
- Example: Usable and unusable capacity

*Scheduling the logical-drive migration:*  Use the calendar display to choose the date and time for the logical drive migration:

- From the calendar display, select the day, month, year, and time that you want the task performed.
- Click **Apply**.
- Click **Yes** when asked if you want to schedule the migration.

## More information
- Understanding logical-drive migration
- Confirming your logical drive migration configuration
- Understanding scheduled tasks
- Using the Task Manager

**Logical drive [number] object:** Use this object, in the Logical devices view, to work with a logical drive or to display its properties.

**Notes:**

1. ServeRAID SCSI controllers support a maximum of eight logical drives.
2. The ServeRAID-7t SATA controller supports a maximum of 24 logical drives.
3. The ServeRAID-8i SAS controller supports a maximum of 128 logical drives.
4. HostRAID controllers support a maximum of 2 logical drives.
5. An integrated RAID controller supports a maximum of one logical drive.

## Possible subobject
- None.

## Warning and error conditions
- (warning) is displayed if the logical drive is in a critical, critical migrating, or critical system state. It is also displayed if a physical drive in the logical drive is a defunct drive or a defunct hot-spare drive.
- (error) is displayed if the logical drive is in a blocked or offline state.
- (initialize) is displayed when the logical drive is initialized (ServeRAID-8i, ServeRAID-7t, HostRAID controllers only).
- (build/modify) is displayed during a logical-drive migration (ServeRAID-8i, ServeRAID-7t, HostRAID controllers only).

## Actions

**Note:** Not all actions are supported on all controllers.
- Delete logical drive
- Initialize logical drive
- Clear logical drive
- Synchronize logical drive
- Enable read-ahead cache
- Expand or change logical drive
- If a logical drive is blocked, unblock logical drive

- Identify logical drive [number]
- Create FlashCopy
- Remove FlashCopy

  The following actions are supported for networked storage only (enclosures):
- Configure access control list
- Configure target information
- Increase logical drive capacity

  The following action is supported in bootable-CD mode only, **except** for ServeRAID-8i and ServeRAID-7t controllers:
- Change write-cache mode to write back or write through

**Channel [number] object:**  Use this object, in the Physical devices view, to work with a selected SCSI channel or to display its properties:



**Notes:**

1. A controller supports a maximum of four SCSI channels.
2. The ServeRAID-5i controller does not support tape drives and physical drives on the same channel.

## Possible subobject

-  (Physical drive)

-  (Hot-spare drive)

-  (Enclosure management device)

-  (CD-ROM drive)

-  (Tape drive)

-  (Removable drive)

## Warning and error conditions

None.

## Actions
- Scan for new or removed ready drives
- Identify all physical drives on SCSI channel [number]

The following action is available only in bootable-CD mode:
- Change the SCSI transfer speed

*Scanning for new or removed ready drives:*

**Note:** This action is not supported on the integrated RAID controller.

Use this action to scan all SCSI channels or ports for either of the following:
- Physical drives that have been added.
- Ready physical drives that have been removed.

After physically removing a ready drive from a server or enclosure, the ServeRAID Manager still reports the drive as ready. The firmware (microcode) does not communicate with ready drives, therefore the firmware does not report the drive as removed. Use this action to remove the ready drive from the configuration.

1. In the Enterprise view, click ![icon] (controller) or ![icon] (enclosure).
2. Click ![icon]   (Scan for new or removed ready drives).
3. ![SR-SCSI icon]    For ServeRAID SCSI controllers, the "Scan for new or removed ready drives on controller" window opens. The ServeRAID Manager scans all SCSI channels on the selected controller. Review the scan report; then, click **Done**. To stop the scan before it completes click **Cancel**.
4. ![SR-8i icon] ![SR-7t icon] ![HostRAID icon]    For the ServeRAID-8i, ServeRAID-7t, and HostRAID controllers, the ServeRAID Manager scans all ports on the selected controller. It reports the results of the scan in the event viewer.

*Changing the SCSI-transfer speed:*

**Note:**

1. This action is supported in bootable-CD mode only.
2. This action is not supported on the integrated RAID controller.
3. This action is not supported on the ServeRAID-8i controller and ServeRAID-7t controller.

Use this action to change the SCSI-transfer speed.

1. In the Physical devices view, click the SCSI channel identifier:



2. Right-click **Change the SCSI transfer speed** and then a transfer speed. The following choices are available:

- Optimal

   This value is available if your controller supports it; otherwise, Optimal does not appear in the menu. Optimal is the default value. When the transfer speed is set to Optimal, the ServeRAID controller determines the best transfer speed, based on the types of SCSI drives and enclosures in use.
- Ultra320 SCSI
- Ultra160 SCSI
- Ultra2 SCSI
- UltraSCSI
- Fast SCSI-2
- SCSI-2
- SCSI-1

   This value is available if your controller is set to SCSI-1; otherwise, SCSI-1 does not appear in the menu.

**Ports [numbers] object:** Use this object, in the Physical devices view, to work with selected ports or to display their properties:



## Possible subobject

-  (Physical drive)

-  (Hot-spare drive)

## Warning and error conditions
- None.

## Actions
- Scan for new or removed ready drives

**Physical drive [number] object:** Use this object, in the Physical devices view, to work with a physical drive or to display its properties.

**Note:** A SCSI channel supports a maximum 15 physical drives.

## Possible subobject

None.

## Warning and error conditions
-  (warning) is displayed if the selected physical drive is undergoing a rebuild operation, reports a PFA, or is a non-warranted physical drive.
-  (error) is displayed if the selected physical drive is a defunct drive.

## Actions
- Identify physical drive
- If the drive is ready:
  - Create hot-spare drive
  - Create standby hot-spare drive
  - Create assigned hot-spare drive
  - Clear
  - Verify
  - Initialize
- Rebuild drive
- If the drive is defunct, Remove the defunct drive
- Set drive state to online
- Change write-cache mode to write back or write through
- If the drive is rebuilding, online, or reports a PFA, set drive state to defunct
- Verify physical drive

*Understanding physical drive capacity and unusable capacity:* Physical drive capacities influence the way you create arrays. Drives in the array can be of different

capacities (1 GB or 2 GB, for example), but the ServeRAID controller treats them as if they all have the capacity of the smallest physical drive.

For example, if you group three 1 GB drives and one 2 GB drive into an array, the total capacity of the array is 1 GB times 4, or 4 GB, not the 5 GB physically available. The remaining space on the 2 GB drive is unusable capacity.

For the ServeRAID-8i controller and ServeRAID-7t controller, the remaining space is usable capacity. That is, you can use the remaining space to define another logical drive; see Example: Usable and unusable capacity.

Conversely, if you add a smaller drive to an array of larger drives, such as a 1 GB drive to a group containing three 2 GB drives, the total capacity of that array is 4 GB, not the 7 GB physically available. Therefore, the optimal way to create arrays is to use physical drives that have the same capacity.

A hot-spare drive also must be at least as large as the smallest drive in the array.

## More information
- Example: Usable and unusable capacity
- Example: Total disk capacity
- Understanding creating basic arrays

*Clearing a disk drive:*   Use this action to remove all data from a disk drive:

1. In the Physical devices view, click   (online physical drive).
2. Right-click **Clear**.
3. Click **Yes** to confirm.

## More information
- Identify physical drive

*Verifying physical drives:*   Use this action to check a physical drive for inconsistent or bad data. The Verify action examines each sector and block on the disk to ensure that it is readable. It does not repair the drive if bad data is found.

To verify a physical drive:

1. In the Physical devices view, click   (physical drive).
2. Right-click **Verify**.
3. Click **Yes** to verify the drive.

   **Note:** To check the progress of the operation, switch to text view.

## More information
- Understanding synchronizing logical drives

*Initializing physical drives:*   Use this action to erase the metadata for a ready physical drive. The metadata includes all logical drive definition data.

To initialize a physical drive:

1. In the Physical devices view, click   (physical drive).
2. Right-click **Initialize**.
3. Click **Yes** to initialize the drive.

> **Note:** To check the progress of the operation, switch to text view.

## More information
- Verifying physical drives

*Manually rebuilding a defunct drive:* Use this action to rebuild a critical logical drive when a physical drive in the array is defunct. Normally, the controller rebuilds a logical drive when it detects the removal and reinsertion of a drive that is part of an array. Use this operation to force the rebuild to begin immediately, without physically removing and replacing the disk drive.

**Note:** The controllers can rebuild RAID level-1, level-1E, level-5, level-5E, level-5EE, level-10, level-1E0, and level-50 logical drives. They cannot, however, rebuild RAID level-0 logical drives because RAID level-0 is not redundant.

Complete the following steps to manually rebuild a defunct drive:
1. In the Physical devices view, click ![icon] (defunct physical drive).
2. Right-click **Rebuild drive**.
3. Click **Yes** to confirm.

> **Note:** During the rebuild operation, the defunct drive enters the rebuild state and the logical drive remains critical until the rebuild operation is completed.

## More information
- Rebuilding a defunct drive (concepts)
- Recovering from defunct drives

*Removing a defunct drive:*

**Note:** This action is not supported on network storage controllers. It is supported on the integrated RAID controller in bootable-CD mode only.

You can use this action *only* on defunct physical drives that are **not** part of any array. Although the ServeRAID software implicitly removes defunct drives from the configuration, this action is useful if you want to remove a defunct drive from the Physical devices view so you can view an accurate configuration.
1. In the Physical devices view, click ![icon] (defunct physical drive).
2. Right-click **Remove defunct drive**. The ServeRAID Manager removes the defunct drive from the configuration.

*Setting a drive state to online:*

**Note:** This action is not supported on the integrated RAID controller.

You can use this action *only* when the following is true:
- The defunct drive is part of an array.
- There are no critical logical drives in the array.

**Attention:** When you set a defunct drive to online, there is a high risk of data loss.
1. In the Physical devices view, click ![icon] (defunct physical drive).
2. Right-click **Set drive state to online**.

3. Click **Yes** to confirm.

*Setting a drive state to defunct:*

**Note:** This action is not supported on the ServeRAID-8i controller and ServeRAID-7t controller.

You can use this action only on a physical drive that is part of an array. If a physical drive is part of an array, you must change the drive state to defunct before removing the drive from the server or enclosure. Doing so eliminates the risk of losing data. After you replace the physical drive, you can rebuild the affected array.

This action is useful in situations such as the following:
• You want to replace a physical drive that is marked with a PFA.
• You want to replace a physical drive that is unwarranted.
• You have an array built with one or more physical drives that are not the same size. You can replace the smaller physical drives in the array with larger physical drives so that the array no longer has unusable capacity and an inefficient configuration.

**Attention:**
1.

   If you do *not* change an online physical drive state to defunct before removing the drive from the server or enclosure, you risk losing data or damaging the physical drive.
2. You cannot use this action on a physical drive undergoing a rebuild operation.
3. (For non-RAID level-x0 logical drives) If you choose to use this action and a logical drive is:
   • In a critical state, the logical drive state *will* change to offline.
   • RAID level-0 and in an okay state, the logical drive *will* change to offline.
   • Not RAID level-0 and in an okay state, the logical drive state *will* change to critical.
4. (For RAID level-x0 logical drives) If you choose to use this action and a logical drive is in a critical state, the logical drive state *might* change to offline.

1. In the Physical devices view, click ⚠ (physical drive) or 🖥 (physical drive).
2. Right-click **Set drive state to defunct**. A confirmation window opens to warn that this action might corrupt data.

   **Note:** If the logical drive that contains this physical drive is already offline, the ServeRAID Manager does not display this warning because the data is already corrupt. Continue to step 4.
3. Click **Yes**. The ServeRAID Manager sets the drive status to defunct.
4. Replace the selected physical drive. If the logical drive is not offline, a rebuild automatically occurs.

## More information
• Replacing physical drives in an array
• Understanding when RAID level-x0 logical drives change state

*Rebuilding a defunct drive:*   A physical drive is marked defunct when there is a loss of communication between the controller and the physical drive. This can be caused by any of the following:
- An improperly connected cable, physical drive, or controller
- Loss of power to a drive
- An improperly assembled SCSI channel in an unsupported configuration
- A defective cable, backplane, physical drive, or controller
- Connecting unsupported SCSI devices (such as tape drives or CD-ROM drives) to the same SCSI channel used for an array

In each case, after the communication problem is resolved, a rebuild operation is required to reconstruct the data for the device in its disk array. The ServeRAID controllers can reconstruct RAID level-1, level-1E, level-5, level-5E, level-5EE, level-10, level-1E0, and level-50 logical drives. They cannot, however, reconstruct data stored in RAID level-0 logical drives because RAID level-0 is not redundant. If an array contains only RAID level-0 logical drives, the logical drives in the array are marked offline and the logical drives contain damaged data. You cannot rebuild the logical drives. You must correct the cause of the failure or replace the physical drives; then, you must restore your data.

To prevent data-integrity problems, the ServeRAID controllers set the RAID level-0 logical drives in the affected array to blocked during the rebuild operation for RAID level-1 or RAID level-5. After the rebuild operation is completed, you can unblock the RAID level-0 logical drives and access them once again. Remember, however, that the RAID level-0 logical drives contain damaged data.

**Note:** For logical drives in an IBM ServeRAID Cluster Solution:
- Because shared logical drives can have *only* one logical drive for each array, blocking a RAID level-0 logical drive during a rebuild operation does *not* apply to shared logical drives.
- Because non-shared logical drives can have *more* than one logical drive for each array, blocking a RAID level-0 logical drive during a rebuild operation *does* apply to non-shared logical drives.

## More information
- Recovering from defunct drives
- Rebuilding a hot-swap drive
- Manually rebuilding a defunct drive
- Changing the rebuild rate (action)
- Unblocking a logical drive (action)
- RAID level-0
- RAID level-1
- RAID level-1E
- RAID level-5
- RAID level-5E
- RAID level-5EE
- RAID level-x0

*Recovering from defunct drives:*   If the defunct drives are not part of an array, contact your service representative.

If a physical drive fails in an array or multiple physical drives fail in separate arrays (one physical drive per array), complete the following steps:

1. Replace each defunct physical drive. The controller starts the rebuild operation when it detects the removal and reinsertion of a drive that is part of an array.

   **Note:** (For a configuration that contains a hot-spare drive) If you replace a failed physical drive, it is not necessary to position the new physical drive on the same SCSI channel and SCSI ID as the original hot-spare drive. The replacement physical drive is automatically incorporated into the configuration as a hot-spare drive. Here is an example of how this works:

   a. The original configuration consists of a RAID level-5 logical drive composed of four physical drives. The physical drives are connected to SCSI channel 1; they are assigned SCSI IDs 0, 1, 2, and 3. SCSI ID 3 is a hot-spare drive.

   b. The physical drive at Channel 1, SCSI ID 2, fails; the logical drive enters the critical state.

   c. The hot-spare drive at Channel 1, SCSI ID 3, is rebuilt into the array.

   d. You remove the failed physical drive at Channel 1, SCSI ID 2, and replace it with a new physical drive. The new physical drive at Channel 1, SCSI ID 2, is automatically assigned to be a hot-spare drive.

2. If a rebuild operation is in progress, wait until the rebuild is complete. Otherwise, go to step 3.

   **Note:** If you are replacing multiple defunct drives, you must wait for each rebuild operation to complete before starting subsequent rebuild operations.

3. Verify the cables, physical drives, and controllers are installed properly.

4. Attempt to rebuild the defunct physical drive by performing a hot-swap rebuild.

5. If the hot-swap rebuild fails, contact your service representative.

## More information

- Rebuilding a defunct drive
- Rebuilding a hot-swap drive
- Manually rebuilding a defunct drive
- Changing the rebuild rate (action)
- Unblocking a logical drive (action)
- RAID level-0
- RAID level-1
- RAID level-5

*Viewing shared drives:*

**Note:** This action is not supported when using the following:
  - Integrated RAID controller
  - ServeRAID-5i controller
  - ServeRAID-6i/6i+ controller
  - ServeRAID-7k controller
  - ServeRAID-7t controller
  - ServeRAID-8i controller
  - HostRAID controller

Use this action to view the physical drives owned by a cluster partner system in the Enterprise view.

1. In the Enterprise view, click ![icon] (controller).
2. Right-click **Clustering actions** → **View shared drives** to view the physical drives owned by a partner system.
3. Select the **Enable view shared drives** box. To disable viewing shared drives, deselect the **Enable view shared drives** box.
4. Define the location of the partner system online drive by specifying the SCSI channel and SCSI ID in the drop-down lists.
5. Click **OK**.

The ServeRAID Manager displays the physical drives owned by the partner system in the Enterprise view as ![icon] (Reserved). You only can view these reserved drives; you cannot perform any actions upon them.

## More information

- Configure controller for clustering

**Hot-spare drive object:**  Use this object, in the Physical devices view, to work with a hot-spare drive in your configuration or to display its properties.

## Possible subobject

None.

## Warning and error conditions

- ![icon] (warning) is displayed if the hot-spare drive reports a PFA or is a non-warranted physical drive.
- ![icon] (error) is displayed if the hot-spare drive is defunct.

## Actions

- Create standby hot-spare drivce
- Delete hot-spare drive

*Hot-spare configuration summary:*  If a hot-spare drive of the appropriate size is available, this column reports **Yes**.

If the logical drive is redundant (that is, RAID level-1, 1E, or 5), but a hot-spare drive of the appropriate size is not available, this column reports **No** (in red).

If the logical drive is RAID level-0, this column reports **No** (in black).

*Creating a hot-spare drive:*

**Note:** This action is supported on the integrated RAID controller in bootable-CD mode only.

Use this action to create a hot-spare drive.

1. In the Physical devices view, click ![icon] (ready physical drive) or ![icon] (standby hot-spare drive).
2. Click ![icon] in the Logical devices view. The ServeRAID Manager creates the hot-spare drive.

**Note:** A hot-spare drive with a blue plus sign next to it indicates that the logical devices are protected by the hot spare. A hot-spare drive with a yellow plus sign next to it indicates that:

- The drive is too small to protect any drives in the logical devices
- None of the logical devices support hot spares (for example, a RAID Level-0 array)
- No logical devices are defined

## More information
- Choosing to create a hot-spare drive
- RAID levels that can use a hot-spare or standby hot-spare drive

*Creating a standby hot-spare drive:*

**Note:** This action is not supported on the ServeRAID-8i SAS controller, ServeRAID-7t SATA controller, and the integrated RAID controller.

Use this action to create a standby hot-spare drive.

1. In the Physical devices view, click ⬢ (ready physical drive) or ⬢ (hot-spare drive).
2. Right-click **Create standby hot-spare drive**. The ServeRAID Manager creates the standby hot-spare drive.

   **Note:** A standby hot-spare drive with a blue plus sign next to it indicates that the logical devices are protected by the hot spare. A standby hot-spare drive with a yellow plus sign next to it indicates that:

   - The drive is too small to protect any drives in the logical devices
   - None of the logical devices support hot spares (for example, a RAID Level-0 array)
   - No logical devices are defined

## More information
- Choosing to create a standby hot-spare drive
- Deleting a hot-spare drive
- RAID levels that can use a hot-spare or standby hot-spare drive

   *Creating an assigned hot-spare drive:*

**Note:** This action is supported only on the ServeRAID-7t, ServeRAID-8i, and external storage enclosures (networked storage).

Use this action to assign one or more hot-spare drives to a logical drive. An assigned hot-spare drive is a dedicated spare: it is used only to rebuild the logical drive to which it is assigned. An unassigned hot-spare drive is "global": it can be used to rebuild any logical drive on the controller.

**Note:** You cannot assign a hot-spare drive while a logical drive is being built or modified (such as a logical drive migration).

1. In the Physical devices view, click ⬢ (ready physical drive).
2. Right-click **Create assigned hot-spare drive for** the logical device name. The ServeRAID Manager creates a dedicated hot-spare drive for the logical drive.

## More information

- Choosing to create a hot-spare drive
- RAID levels that can use a hot-spare or standby hot-spare drive

*Deleting a hot-spare drive:*

**Note:** This action is supported on the integrated RAID controller in bootable-CD mode only.

Use this action to delete a hot-spare physical drive from your configuration.

1. In the Physical devices view, click ![icon] (hot-spare drive).
2. Right-click **Delete hot-spare drive**. The ServeRAID Manager deletes the hot-spare drive from the configuration by setting the drive state to ready. If you removed the drive from the server, the ServeRAID Manager removes the drive from the configuration.

*Deleting a standby hot-spare drive:*

**Note:** This action is not supported on the ServeRAID-8i SAS controller, ServeRAID-7t SATA controller and the integrated RAID controller.

Use this action to delete a standby hot-spare physical drive from your configuration.

1. In the Physical devices view, click ![icon] (standby hot-spare drive).
2. Right-click **Delete standby hot-spare drive**. The ServeRAID Manager deletes the standby hot-spare drive from the configuration by setting the drive state to ready. If you have physically removed the drive, the ServeRAID Manager removes the drive from the configuration.

*Choosing to create a hot-spare or standby hot-spare drive:* Hot-spare drives and standby hot-spare drives supply additional protection to a RAID configuration. If a physical drive fails in configurations other than RAID level-0 and RAID level-00, the hot-spare drive automatically replaces the failed physical drive. Subsequently, the logical drive can be rebuilt automatically.

**Note:** You cannot use hot-spare drives with RAID level-0 and RAID level-00.

You can create a hot-spare drive in the Configuration wizard when you first configure the controller. If you choose not to create a hot-spare drive at that time, you can do so later.

## More information

- Creating a hot-spare drive (action)
- Creating a standby hot-spare drive (action)
- Creating an assigned hot-spare drive (action)
- Deleting a hot-spare drive (action)
- RAID levels that can use a hot-spare or standby hot-spare drive

*Rebuilding a hot-swap drive:* A hot-swap rebuild refers to a rebuild operation that is started by the controller when it detects that a drive that is part of an array and in the defunct state has been removed and reinserted on the SCSI cable or backplane. The reinsertion of the physical drive, whether it is the same drive or a new drive, will trigger the controller to start the rebuild operation. During the rebuild operation, the drive being rebuilt is in the rebuild state, and the logical drive remains critical until the rebuild operation has been successfully completed.

On most servers, when a hot-spare drive is available, the rebuild operation begins automatically without the need to replace the failed drive. If more than one drive fails within the same array, no rebuild takes place. If multiple drives fail in separate arrays (one physical drive per array), the controller initiates a rebuild operation for the logical drives within the array containing the first failed physical drive. This rebuild operation is performed on the *first* hot-spare drive of sufficient size to become a valid member of the array.

Complete the following steps to start a hot-swap rebuild:

1. Without removing the drive completely, gently remove the physical drive from the server, using the handle of the hot-swap tray. If necessary, refer to the documentation that comes with your server for information about removing a physical drive.

   **Attention:** When power is removed from a hot-swap drive, the drive immediately parks the heads, locks the actuator in the "landing zone," and begins spinning down. However, the spinning down of the disk might require up to 20 seconds after power is removed. Do not move the drive while it is spinning down. Moving the drive while it is spinning down might damage the drive.

2. Wait 20 seconds to allow the physical drive to completely stop spinning.

3. If you are certain there is nothing wrong with the physical drive you removed, gently reinstall the drive into the server. Make sure the drive is completely installed in the backplane connector.

   Otherwise, replace the physical drive with a new drive that is the same size (or larger) and continue with the rebuild operation.

   **Note:**

   a. If multiple drives fail in separate arrays (one physical drive per array), replace each defunct physical drive. If multiple physical drives fail at the same time within the *same* array, contact your service representative.

   b. Although it is possible to rebuild a defunct physical drive to an online physical drive that is defective, avoid doing so.

## More information
- Rebuilding a defunct drive
- Recovering from defunct drives
- Manually rebuilding a defunct drive
- Changing the rebuild rate (action)
- Unblocking a logical drive (action)

**Enclosure management device object:** Use this object, in the Physical devices view, to work with a storage enclosure attached to controller with a SAF-TE processor.

**Note:** The integrated RAID controller does not support enclosure monitoring. Any enclosure in an integrated RAID controller RAID subsystem is displayed in the ServeRAID Manager Enterprise view; however, the ServeRAID Manager and the ServeRAID Manager agent will not generate any events or enclosure status information.

## Possible subobject

None.

### Warning and error conditions

- ![warning icon] (warning) is displayed if the enclosure has the following conditions:
  - A fan has failed.
  - A power supply has failed.
- ![error icon] (error) is displayed if the enclosure has the following conditions:
  - It is not responding.
  - It is overheating.
  - Multiple fans have failed.
  - Multiple power supplies have failed.
- ![enclosure icon] (enclosure) is displayed if the enclosure is one of the following:
  - Working properly.
  - Not supported.
  - Supported, but not monitored for problems. For example, enclosures that are internal to a server do not have separate fans or power supplies.

### Actions

Identify enclosure

**CD-ROM drive object:** Use this object to display CD-ROM drive properties.

**Note:** The ServeRAID-5i, 6i/6i+, 6M, and 7t controllers do not support CD-ROM drives.

### Possible subobject

None.

### Warning and error conditions

CD-ROM drive objects cannot have warning or error conditions.

### Actions

None.

**Removable-media drive object:** Use this object to display removable-media drive properties.

### Possible subobject

None.

### Warning and error conditions

Removable-media drive objects cannot have warning or error conditions.

### Actions

None.

**Tape drive object:** Use this object to display tape drive properties.

**Note:** The ServeRAID-5i controller does not support tape drives and physical drives on the same channel.

## Possible subobject

None.

## Warning and error conditions

Tape drive objects cannot have warning or error conditions.

## Actions

None.

## Using display groups

**Note:** Display groups are not available when using:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Display groups allow you organize related systems in the Enterprise view under an expandable tree object. Using actions on the System object, the Management station object, and the Display group object, you can:
- Create, delete, and rename display groups
- Move a system into a display group
- Remove a system from a display group
- Move a system from one display group to another

In this example, managed systems are organized by location, using three display groups.

Display groups are sorted alphabetically. They appear in the tree below all systems that are not part of any display group.
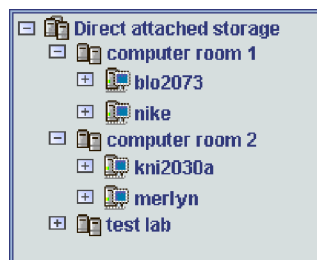


**Note:** A system can be part of only one display group at a time; it cannot appear in multiple display groups.

## More information
- The Enterprise view

  **Creating a display group:**

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode

- ServeRAID Manager as a plug-in application

Use this action to add a system or enclosure to a new display group. This action creates the display group and moves the system into it in a single step.

1. In the Enterprise view, click ![system icon] (system) or ![enclosure icon] (enclosure).
2. Right-click **Change display group** → **new group**. The ″Group name″ window opens.
3. Enter a name for the group.
4. Click **OK**.

## More information
- Using display groups
- Moving systems in and out of a display group (action)
- Deleting or renaming a display group (action)

**Deleting or renaming a display group:**

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to delete or rename a display group.

1. In the Enterprise view, click ![display group icon] (display group).
2. To delete the display group, right-click **Delete display group.** All systems in the group move back to their original location in the tree.
3. To rename the display group:
   a. Right-click **Rename display group**. The ″Group name″ window opens.
   b. Enter a new name for the display group.
   c. Click **OK**.

## More information
- Using display groups
- Creating a display group (action)
- Moving systems in and out of a display group (action)

**Moving systems in and out of a display group:**

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to move a system or enclosure into an existing display group; to move the system or enclosure from one display group to another; or to remove the system or enclosure from a display group.

1. In the Enterprise view, click ![system icon] (system) or ![enclosure icon] (enclosure).
2. To move the system into a display group or from one display group to another, right-click **Change display group** and then the display group name.
3. To remove the system from the display group, right-click **Change display group** → **none**.

Chapter 4. Managing ServeRAID devices **143**

**Note:** When you remove the last system in a display group, the ServeRAID
Manager deletes the display group.

## More information
- Using display groups
- Creating a display group (action)
- Deleting or renaming a display group (action)

**Changing the display options:** You can sort objects in the ServeRAID Manager
Enterprise view alphabetically or chronologically. You can also view the disk
capacity unit of measure in megabytes (MB), gigabytes (GB), or terabytes (TB).

**Note:** The local system always appears first when you sort objects alphabetically.

Complete the following steps set the display options:

1. In the "User Preferences" window, click the **Display options** tab.
2. From the System tree sorting list, select chronological or alphabetical.

   **Note:** This action is not supported in bootable-CD mode.
3. From the Capacity display units list, select one of the following:
   - MB (megabytes)
   - GB (gigabytes)
   - TB (terabytes)
   - Auto-select

   Choose Auto-select to let the ServeRAID Manager choose the unit of measure
   for you, based on the drive size. With this option, the ServeRAID Manager may
   display different drives with different units.
4. Click **OK**.

## Monitoring systems over a network
You can monitor other systems over a network. To do so, the ServeRAID Manager
must be installed and running on your local system and on the other systems.
Then, you can add the remote systems to your ServeRAID Manager Enterprise
view. Also, you can choose to use the ServeRAID Manager agent, instead of the
ServeRAID Manager program.

**Note:** You cannot monitor other systems when using:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

In addition to the ServeRAID Manager, you can use the following:

- The Notification Manager is a tool that you can use to notify other systems
  running the ServeRAID Manager of all events that occur on this (that is, the
  local) system.
- Use the Email Notification Manager to notify users by email when events occur
  on the local system. You can send email notifications to anyone on the network;
  the recipient does not have to be running ServeRAID Manager.
- Use the Task Manager to manage scheduled tasks on local or remote systems,
  such as logical drive migration or synchronization. You can modify the task
  schedule, delete the scheduled task, or view task properties.

## More information
- Adding a remote system (action)
- Using the ServeRAID Manager agent

- Starting the ServeRAID Manager agent
- Verifying that the ServeRAID Manager agent is running
- Using the Notification Manager
- Using the Email Notification Manager
- Using the Task Manager

**Using the Notification Manager:**

**Note:** You cannot use the Notification Manager when using:
  - ServeRAID Manager in bootable-CD mode
  - ServeRAID Manager as a plug-in application

The Notification Manager is a tool that you can use to notify other systems running the ServeRAID Manager of all events that occur on this (that is, the local) system. The user of the system types system names in the notification list. Each system in the list is notified of all events that occur on the local system.

You can use the Notification Manager to:
- Add a system to the notification list
- Delete a system from the notification list
- Modify system properties in the notification list
- Send a test event to a system in the notification list
- Monitor events sent from the Notification Manager

The Notification Manager is enabled by default. To disable the Notification Manager, click **Actions** → **Disable notifications** . If you disable the Notification Manager, the events are generated, but not dispatched to remote systems.

## An example

You install SystemA in a lab with a ServeRAID Manager subsystem. You run the ServeRAID Manager on SystemA to monitor for events and problems, but you want to monitor from your workstation and not from SystemA. You open the SystemA Notification Manager from the ServeRAID Manager and define your workstation in the notification list. When running the ServeRAID Manager from your workstation, you are notified of all problems and events that occur on SystemA.

**Note:** You can use the Email Notification Manager to notify users of events by email. This allows you to notify users who have not installed or are not currently running ServeRAID Manager.

## The Notification Manager and its events

Events generated by the Notification Manager include the following:
- Progress information, such as rebuilds, synchronizations, and migrations.
- Problems, such as defunct physical drives and PFA errors.
- Changes to the local configuration, such as creating a hot-spare drive or defining a logical drive.

When an event is generated on a system, the Notification Manager connects with each system in the notification list and relays the event to these systems' ServeRAID Manager. If the Notification Manager successfully connects and sends

the event, the notification list updates its " Last event sent" column. If the Notification Manager does not successfully connect or send the event, the Notification Manager:

- Updates the "Last event sent" column with a ● notifying you of a problem.
- Logs an event in the Notification Manager event viewer detailing why the event could not be sent.

### The Notification Manager interface

The Notification Manager consists of the following:

**Toolbar**
> Provides quick-path icons for common tasks.

**Notification list**
> Displays the remote systems configured to receive event notification.

**Notification event viewer**
> Displays status information for the Notification Manager.
>
> In addition to displaying the events in the event viewer, the Notification Manager appends each event to a logging file, RAIDNOT.LOG. If this file exceeds 200 KB, the ServeRAID Manager copies the file to RAIDNOT.OLD and creates a new RAIDNOT.LOG. If there is a RAIDNOT.OLD already, the ServeRAID Manager overwrites it.

### More information
- Adding a system to the notification list
- Deleting a system from the notification list
- Modifying system properties in the notification list
- Sending a test event to a system in the notification list
- Monitoring events sent from the Notification Manager
- The Notification Manager menubar
- The Notification Manager toolbar
- Using the Email Notification Manager
- Using the ServeRAID Manager agent

*Notification Manager menubar:*  The Notification Manager menu bar has the following functions:

**File >**

> **Clear event log**
> > Click Notification Manager from the menu. Clears the current contents of the Notification Manager event viewer. This option does not clear or delete the event logging file.
>
> **Close**   Closes the Notification Manager.

**View >**

> **Toolbar**
> > Turns the toolbar on and off. The default is on (selected).

**Actions >**

> Add system

Delete system

Modify system
Send test event

**Help >**

**Information about this window**
> View context-sensitive information for the current window.

**Search**
> Searches for one or more specified words in ServeRAID Manager Assist and displays a list of topics that include the words.

**Contents**
> Presents the ServeRAID Manager Assist contents. You can use the contents to acquaint yourself with ServeRAID Manager Assist topics.

**About ServeRAID Manager**
> Reports the ServeRAID Manager version number, copyright, and legal information.

*Notification Manager toolbar:* The Notification Manager toolbar has the following functions:

Add system

Delete system

Modify system

**Information about this window** View context-sensitive information for the current window.

*Adding a system in the Notification Manager:*

**Note:** This action is not supported when using the ServeRAID Manager in bootable-CD mode.

Use this action to add a new system to the notification list. Every new system that you add to the list is notified of all events that occur on this system.

1. Click (Add system).
2. Type the host name or TCP/IP address of the system that you want to add.
3. Type the TCP/IP port for the remote system Startup port number. The default port is 34571. If you changed the system Startup port number in the "User preferences" window on the remote system, type that number here.
4. Click **Add**.
5. Continue to add systems, or click **Cancel** to close the window.

After you add the system to the notification list, the ServeRAID Manager will attempt to connect to the remote system and send an initial set of events. The Manager uses these events to update the ServeRAID Manager interface running on the remote system.

## More information
- Using the Notification Manager
- Deleting a system from the notification list
- Modifying system properties in the notification list
- Sending a test event to a system in the notification list
- Monitoring events sent from the Notification Manager

*Deleting a system in the Notification Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to delete a remote system from the notification list. After deleting the remote system, the Notification Manager no longer notifies the remote system of events occurring on the local system.

1. Click the system you want to delete from the notification list.
2. Click ![icon] (Delete system).
3. Click **Yes** to confirm. The Notification Manager deletes the system from the notification list.

## More information
- Using the Notification Manager
- Adding a system to the notification list
- Modifying system properties in the notification list
- Sending a test event to a system in the notification list
- Monitoring events sent from the Notification Manager

*Monitoring events sent from the Notification Manager:* For each system in the notification list, you can view details about the last event the Notification Manager sent (or tried to send) to that system.

In the notification list, double-click the **Last event sent** column for the system in which you are interested. The "Last event detail" window opens. This window contains information about the last event the Notification Manager sent (or tried to send) to the selected system. The event information includes the following: status, type, date, time, source, target, and description.

## More information
- Using the Notification Manager
- Adding a system to the notification list
- Deleting a system from the notification list
- Modifying system properties in the notification list
- Sending a test event to a system in the notification list

*Modifying a system in the Notification Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode

- ServeRAID Manager as a plug-in application

Use this action to modify a remote system host name, TCP/IP address, or port number:

1. Click the system that you want to modify from the notification list.
2. Click ![](Modify system icon) (Modify system). The "System properties" window opens.
3. Change the system properties in the appropriate entry fields.
4. Click **OK**.

## More information
- Using the Notification Manager
- Adding a system to the notification list
- Deleting a system from the notification list
- Sending a test event to a system in the notification list
- Monitoring events sent from the Notification Manager

*Sending a test event in the Notification Manager:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to send a test event to a remote system:

1. Click the system in the notification list that you want to send a test event.

   **Note:** If you click no system or more than one system, this action is disabled.

2. Click **Actions** → **Send test event**. A window opens to report success or failure. The remote system will respond to the test event with a beep.
3. Click **OK**.

If the test fails, verify the following and try the test send again:

1. You typed the correct TCP/IP information.
2. The ServeRAID Manager is running on the remote system.

## More information
- Using the Notification Manager
- Adding a system to the notification list
- Deleting a system from the notification list
- Modifying system properties in the notification list
- Monitoring events sent from the Notification Manager

*Changing the alarm settings:*

**Note:** This action is not supported in bootable-CD mode.

Warning and Error events cause an audible alarm to sound every five minutes, notifying you of the event. Any Error or Warning event can trigger the alarm if the event causes the system to enter the critical state or the event arrives while the system status is critical. Once triggered, the repeating alarm continues to sound as long as any system in the ServeRAID Manager Enterprise view is critical.

Some events, such as the non-warranted drive event, do not affect the system status in the Enterprise view; if the system status is not critical, these events will not sound the alarm.

You can adjust the alarm settings with the following steps:

1. In the User Preferences window, click the **Alarm settings** tab.
2. Select the check box to enable or disable the repeating alarm.

   **Note:** If you disable the alarm, you will not hear an audible alarm when you receive problem events.

3. If you have enabled the alarm, you can adjust the time interval (in seconds) that you want between each alarm. The default is 300 seconds (5 minutes).
4. If you have enabled the alarm, you can adjust the length of time (in beeps) that you want the alarm to continue. The default is 3 beeps.
5. Click **OK**.
6. Restart the ServeRAID Manager for these settings to take effect.

**Using the Email Notification Manager:**

**Note:** You cannot use the Email Notification Manager when using:
   - ServeRAID Manager in bootable-CD mode
   - ServeRAID Manager as a plug-in application

The Email Notification Manager is a tool that you can use to notify users by e-mail of events that occur on this (that is, the local) system. The user of the system types recipient names and e-mail addresses in the e-mail notification list. Each recipient in the list is notified of all or selected events that occur on the local system.

You can use the Email Notification Manager to:
- Add a recipient to the email notification list
- Delete a recipient from the email notification list
- Modify recipient properties in the email notification list
- Send a test message to a recipient in the email notification list
- Monitor messages sent from the Email Notification Manager
- Configure the Email Notification Manager

The Email Notification Manager is enabled by default. To disable the Email Notification Manager, click **Actions** → **Disable Email Notifications** . If you disable the Email Notification Manager, events are generated but users do not receive e-mail notification when the events occur.

## An example

You install SystemA in a lab with a ServeRAID Manager subsystem. You run the ServeRAID Manager on SystemA to monitor for events and problems. You want to monitor SystemA from your workstation but do not have ServeRAID Manager installed. You open the SystemA Email Notification Manager from the ServeRAID Manager and add your name and e-mail address to the e-mail notification list. You are notified by e-mail of all problems and events that occur on SystemA.

## The Email Notification Manager and its events

Events monitored by the Email Notification Manager include the following:

- Progress information, such as rebuilds, synchronizations, and migrations.
- Problems, such as defunct physical drives and PFA errors.
- Changes to the local configuration, such as creating a hot-spare drive or defining a logical drive.

Each event has an **event type** indicating its severity: error, warning, or informational. You can configure a recipient to be notified of errors, errors and warnings, or errors, warnings, and informational events.

When an event is generated on a system, the Email Notification Manager attempts to send a message to each recipient in the email notification list. If the Email Notification Manager successfully sends the message, it updates the " Last message sent" column in the email notification list. If the Email Notification Manager does not successfully connect or send the message, the Email Notification Manager:

- Updates the "Last message sent" column with a  notifying you of a problem.
- Logs an event in the Email Notification Manager event viewer detailing why the message could not be sent.

## The Email Notification Manager interface

The Email Notification Manager consists of the following:

**Toolbar**
> Provides quick-path icons for common tasks.

**Email notification list**
> Displays the recipients configured to receive e-mail notifications.

**Email notification event viewer**
> Displays status information for the Email Notification Manager.
>
> In addition to displaying the events in the event viewer, the Email Notification Manager appends each event to a logging file, RAIDSMTP.LOG. If this file exceeds 200 KB, the ServeRAID Manager copies the file to RAIDSMTP.OLD and creates a new RAIDSMTP.LOG. If there is a RAIDSMTP.OLD already, the ServeRAID Manager overwrites it. The Email Notification Manager appends SMTP transport errors in a separate log file, SMTPERR.LOG.

## More information
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list
- Monitoring messages sent from the Email Notification Manager
- Configuring the Email Notification Manager
- The Email Notification Manager menubar
- The Email Notification Manager toolbar
- The Email Notification Manager message format
- Using the ServeRAID Manager agent

*About Email Notification Manager:*

*Email Notification Manager menu bar:*  The Email Notification Manager menu bar has the following functions:

**File** →

> **Clear event log**
>> Click Email Notifications from the menu. Clears the current contents of the Email Notification Manager event viewer. This option does not clear or delete the event logging file.
>
> **Close**   Closes the Email Notification Manager.

**View** →

> **Toolbar**
>> Turns the toolbar on and off. The default is on (selected).

**Actions** →

>  **Add email recipient**
>
>  **Delete email recipient**
>
>  **Modify email recipient**
>
> **Send test message**
>
> **SMTP server settings**

**Help** →

>  **Information about this window**
>> View context-sensitive information for the current window.
>
> **Search**
>> Searches for one or more specified words in ServeRAID Manager Assist and displays a list of topics that include the words.
>
> **Contents**
>> Presents the ServeRAID Manager Assist contents. You can use the contents to acquaint yourself with ServeRAID Manager Assist topics.
>
> **About ServeRAID Manager**
>> Reports the ServeRAID Manager version number, copyright, and legal information.

*Email Notification Manager menu bar:*  The Email Notification Manager menu bar has the following functions:

**File >**

> **Close**   Closes the Email Notification Manager.

**View >**

> **Toolbar**
>> Turns the toolbar on and off. The default is on (selected).

**Actions >**

 Add email recipient

 Delete email recipient

 Modify email recipient
Send test message
SMTP server settings

**Help >**

 **Information about this window**
> View context-sensitive information for the current window.

**Search**
> Searches for one or more specified words in ServeRAID Manager Assist and displays a list of topics that include the words.

**Contents**
> Presents the ServeRAID Manager Assist contents. You can use the contents to acquaint yourself with ServeRAID Manager Assist topics.

**About ServeRAID Manager**
> Reports the ServeRAID Manager version number, copyright, and legal information.

*Email Notification Manager toolbar:* The Email Notification Manager toolbar has the following functions:

 Add email recipient

 Delete email recipient

 Modify email recipient

 **Information about this window** View context-sensitive information for the current window.

*Email Notification Manager toolbar:* The Email Notification Manager toolbar has the following functions:

 Add email recipient

 Delete email recipient

 Modify email recipient

 **Information about this window** View context-sensitive information for the current window.

*The Email Notification Manager Message Format:* When an event is generated on a system, the Email Notification Manager sends a message to each recipient in the email notification list. The message format is:

To: <recipient email address>

From: <administrator email adress>

Subject: ServeRAID Manager Event Notification - Event type <event type>

This message was generated by ServeRAID Manager Agent.

Please do not reply to this message.

Event Description: <event description>

Event Type: <event type>

Event Source: <agent domain name>

Date: <date>

Time: <time>

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*The Email Notification Manager Message Format:* When an event is generated on a system, the Email Notification Manager sends a message to each recipient in the email notification list. The message format is:

```
From: <management station email adress>
Sent: <date>
To: <recipient email address>
Subject: <management station> - <Event message>
```

```
This message was generated by the ServeRAID Manager. Please
do not reply to this message.
```

```
Event Description: <event description>
Event Type: <event type>
Event Source: <management station> / <IP address>
Time: <date> <time>
```

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*Adding a recipient to the Email Notification Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to add a recipient to the email notification list. Every recipient that you add to the list is notified of all or selected events that occur on this system.

1. Click ⚡ (Add recipient).
2. Type the name of the recipient that you want to add to the list.
3. Type the recipient's e-mail address. Include the user name and domain, such as jack_smith@synteca.com.
4. Select the type of event you want the recipient to be notified of: error, error and warning, or error, warning, and informational.
5. Click **Add**.
6. Continue to add recipients, or click **Cancel** to close the window.

## More information
- Using the Email Notification Manager
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list
- Monitoring messages sent from the Email Notification Manager

*Deleting a recipient from the Email Notification Manager:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to delete a recipient from the e-mail notification list. After deleting a recipient, the Email Notification Manager no longer notifies the user of events occurring on the local system.

1. Click the recipient you want to delete from the e-mail notification list.
2. Click 🗑 (Delete recipient).
3. Click **Yes** to confirm. The Email Notification Manager deletes the recipient from the e-mail notification list.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list
- Monitoring messages sent from the Email Notification Manager

*Modifying a recipient in the Email Notification Manager:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to modify an e-mail recipient name, address, or event type:
1. Click the recipient that you want to modify in the e-mail notification list.
2. Click ⚡ (Modify email recipient). The "Modify email recipient" window opens.
3. Change the recipient properties in the appropriate fields.

4. Click **OK**.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Sending a test message to a recipient in the email notification list
- Monitoring messages sent from the Email Notification Manager

*Sending a test message in the Email Notification Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to send a test message to a recipient in the e-mail notification list:

1. Click the recipient in the e-mail notification list that you want to send a test message.

   **Note:** If you click no recipient or more than one recipient, this action is disabled.

2. Click **Actions** → **Send test message**. If the Email Notification Manager does not successfully connect or send the message, it:
   - Updates the "Last message sent" column with a ⊗ notifying you of a problem.
   - Logs an event in the Email Notification Manager event viewer detailing why the message could not be sent.

3. Click **OK**.

If the test fails, verify the following and try the test again:

1. You typed the correct e-mail address when you added the recipient to the Email Notification Manager.
2. You typed the correct SMTP server address when you configured the Email Notification Manager.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Monitoring messages sent from the Email Notification Manager

*Monitoring messages sent from the Email Notification Manager:*  For each recipient in the e-mail notification list, you can view details about the last message the Email Notification Manager sent (or tried to send) to that recipient.

In the e-mail notification list, double-click the **Last message sent** column for the recipient in which you are interested. The "Last message detail" window opens. This window contains information about the last message the Email Notification Manager sent (or tried to send) to the recipient. The message information includes the following: status, type, date, time, source, target, and description.

## More information

- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*Configuring the Email Notification Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to specify the SMTP server address and the administrator's "reply to" address. The reply to address typically is the address of the ServeRAID Manager system administrator or IT or network administrator.

1. Click **Actions** → **SMTP server settings**. The SMTP server settings window appears.
2. Type the SMTP server address. You can enter the host name, including domain, or the TCP/IP address.
3. Type the administrator's reply to address. Include the user name and domain, such as jack_smith@syntecha.com.
4. Click **OK**.

## More information

- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list
- Monitoring messages sent from the Email Notification Manager

*Adding a recipient to the Email Notification Manager:* Use this action to add a recipient to the e-mail notification list. You can add **one** recipient only, typically the ServeRAID Manager administrator, or system or network administrator. The recipient is notified of all or selected events that occur on the enclosure(s) connected to the management station.

1. Click  (Add e-mail recipient). The "Add e-mail recipient" window opens.
2. In the To e-mail address field, type the name of the recipient that you want to add to the list. Include the user name and domain, such as jack_smith@synteca.com.
3. Select the type of event(s) you want the recipient to be notified of: error, warning, or informational.
4. Click **Add**.

## More information

- Using the Email Notification Manager
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*Configuring the Email Notification Manager:* Use this action to specify the SMTP server address and the "from" address of the e-mail sender. The default "from" address includes a generalized management station name and a partial e-mail

address of the form <name@%s>. Replace the the partial address with the address
you want to appear in the From field of the e-mail message.

1. Click **Actions** → **SMTP server settings**. The "SMTP server settings" window
   opens.
2. Type the SMTP server address. You can enter the host name, including domain,
   or the TCP/IP address.
3. Type the from address, replacing the general management station name and
   e-mail address with the name and address you want to appear in the From
   field of the e-mail message.
4. Click **Add**.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*Deleting a recipient from the Email Notification Manager:*   Use this action to delete a
recipient from the email notification list. After deleting a recipient, the Email
Notification Manager no longer notifies the user of events occurring on the
enclosure(s) connected to the management station.

1. In the e-mail notification list, click the recipient you want to delete.
2. Click 🗑 (Delete e-mail recipient).
3. Click **Yes** to confirm. The Email Notification Manager deletes the recipient from
   the e-mail notification list.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Modifying recipient properties in the email notification list
- Sending a test message to a recipient in the email notification list

*Modifying a recipient in the Email Notification Manager:*   Use this action to modify the
e-mail recipient's address or monitored event types:

1. In the e-mail notification list, click the recipient that you want to modify.
2. Click 🧑 (Modify email recipient). The "Modify email recipient" window opens.
3. Change the recipient properties in the appropriate fields.
4. Click **Modify**.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Sending a test message to a recipient in the email notification list

*Sending a test message in the Email Notification Manager:*   Use this action to send a
test message to a recipient in the email notification list:

1. Click a recipient in the e-mail notification list.

   **Note:** This action is disabled if you do not click a recipient.
2. Click **Actions** → **Send test message**.

If the test fails, verify the following and try the test again:

1. You typed the correct e-mail address when you added the recipient to the Email Notification Manager.
2. You typed the correct SMTP server address when you configured the Email Notification Manager.

## More information
- Using the Email Notification Manager
- Adding a recipient to the email notification list
- Deleting a recipient from the email notification list
- Modifying recipient properties in the email notification list

**Using the Task Manager:**

**Note:** You cannot use the Task Manager in bootable-CD mode or when using the ServeRAID Manager as a plug-in application.

The Task Manager is a tool that you can use to manage scheduled tasks, such as a logical drive migration or synchronizing a logical drive. For each scheduled task, the Task Manager displays the task start time, status, and description.

You can use the Task Manager to:
- Modify a task's schedule
- Delete a scheduled task
- View task properties

The Task Manager is enabled by default. To disable the Task Manager, click **Actions → Disable Task Scheduler** .

**Note:** If you disable the Task Manager, a task may miss its start time. To run the task, you must reschedule it. See Understanding scheduled tasks for more about missed start times.

## An example

You schedule a synchronization task with an initial start time of Sunday, October 13, 2003 at 2:00 AM. Due to a power outage, the task misses its start time. The Task Manager flags the error. The next day, you modify the task schedule to run on Sunday October 20, 2003 at 2:00 AM.

## The Task Manager status

If a scheduled task runs successfully, the Task Manager updates the ″Status″ column in the task list with Complete. For recurring tasks, an asterisk (*) indicates that the task has completed one cycle and is scheduled to run again at the given interval. If a scheduled task does not run successfully, the Task Manager:
- Updates the ″Status″ column in the task list with Error.
- Updates the first column of the task list with a ⚠ , notifying you of a recoverable error (a warning message); it displays a 🔴 if the error is non-recoverable (a critical error).

To see details about the error, use View task properties. See Understanding scheduled tasks for more about Task Manager status, start time validation, missed start times, and error conditions.

## The Task Manager interface

The Task Manager consists of the following:

**Toolbar**
Provides quick-path icons for common tasks.

**Task list**
Displays the scheduled tasks.

**Task event viewer**
Displays status information for the Task Manager.

## More information
* Understanding scheduled tasks
* Starting the Task Manager
* Deleting a scheduled task
* Modifying a scheduled task
* Viewing task properties
* The Task Manager menubar
* The Task Manager toolbar
* Using the ServeRAID Manager agent

*Task Manager menu bar:* The Task Manager menu bar has the following functions:

**File** →

    **Clear event log**
Click Task from the menu. Clears the current contents of the Task Manager event viewer.

    **Close**   Closes the Task Manager.

**View** →

    **Toolbar**
Turns the toolbar on and off. The default is on (selected).

**Actions** →

     **Delete task**

     **Modify task**

     **View task**

    **"Sending a test message in the Email Notification Manager" on page 156 Disable Task Scheduler**

Turns the Task Scheduler on and off. The default is on.

**Help** →

     **Information about this window**
View context-sensitive information for the current window.

**Search**

Searches for one or more specified words in ServeRAID Manager Assist and displays a list of topics that include the words.

**Contents**

Presents the ServeRAID controller Assist contents. You can use the contents to acquaint yourself with ServeRAID Manager Assist topics.

**About ServeRAID Manager**

Reports the ServeRAID Manager version number, copyright, and legal information.

*Task Manager toolbar:* The Task Manager toolbar has the following functions:

 **Delete task**

 **Modify task**

 **View task**

 **Information about this window**          View context-sensitive information for the current window.

*Starting the Task Manager:* Use this action to start the Task Manager. You must start the Task Manager to manage scheduled tasks.

1. In the Enterprise view, click  (system).
2. From the "Actions" menu, select **Agent actions** → **Configure**. The ServeRAID Manager Agent window opens.
3. Click the **Task** note tab.

## More information
- Using the Task Manager
- Deleting a scheduled task
- Modifying a scheduled task
- Viewing task properties
- The Task Manager menubar
- The Task Manager toolbar
- Using the ServeRAID Manager agent

*Modifying a scheduled task in the Task Manager:*

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to modify a scheduled task's start time and date, description, and recurrence interval (if the task can be recurring):

1. Click the task that you want to modify in the task list.
2. Click  (Modify task). The "Modify task" window opens.
3. Change the task properties in the appropriate fields.
4. Click **OK**.

**More information**
- Using the Task Manager
- Starting the Task Manager
- Understanding scheduled tasks
- Deleting a scheduled task
- Viewing task properties

*Deleting a scheduled task from the Task Manager:*

**Note:** This action is not supported when using the following:

- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to delete a scheduled task from the task list. After deleting a task, the Task Manager no longer attempts to run the task at the scheduled time.

1. Click the task you want to delete from the task list.
2. Click  (Delete task).
3. Click **Yes** to confirm. The Task Manager deletes the task from the task list.

**More information**
- Using the Task Manager
- Starting the Task Manager
- Understanding scheduled tasks
- Modifying a scheduled task
- Viewing task properties

*Viewing task properties from the Task Manager:*  You can view details about each task in the task list.

In the task list, double-click the **task** in which you are interested. The "Task properties" window opens. This window contains information about the task, including the following: description, task ID, start time, recurrence interval, and last time a recurring task started. An error description appears if the Task Manager flagged an error for the task.

**More information**
- Using the Task Manager
- Starting the Task Manager
- Understanding scheduled tasks
- Deleting a scheduled task
- Modifying a scheduled task

**Monitoring storage enclosures on a network:**  You can monitor network-attached storage enclosures from a ServeRAID Manager console running on the local system. The ServeRAID Manager management station software must be installed and running on the system to which the storage enclosure is attached. Then, you can add a management station to your ServeRAID Manager Enterprise view.

You can configure the management station to monitor and manage network-attached storage:

- Use the Security Manager to allow users to configure and view enclosure information from remote systems.

- Use the Email Notification Manager to notify users by email when events occur on the enclosures attached to the management station. You can send email notifications to any user on the network; the recipient does not have to be running ServeRAID Manager.
- Use the SNMP Trap Manager to notify other systems running an SNMP console of all SNMP traps that occur on the enclosures attached to the management station.

## More information

- Adding a management station
- Using the management station agent
- Adding a management station agent

*Using the Security Manager:* Use the Security Manager to give users the ability to connect to a management station from remote systems and configure and view the attached enclosures. You must configure at least one user name and password before any user can connect to the management station.

**Note:** You cannot disable security for a management station.

Use the following actions in the Security Manager to manage users' ability to configure and view network storage from remote systems:

- Add a user
- Delete a user
- Modify a user

The first time you open the Security Manager, the ServeRAID Manager prompts you to type an Admin (administrator) password. Either type a password or click **Cancel** to not have an Admin user.

## The Security Manager interface

The Security Manager consists of the following:

**Toolbar**
    Provides quick-path icons for common tasks.

**Security list**
    Displays the users with access to this management station.

The Security Manager logs events to a logging file, RAIDSEC.LOG. If this file exceeds 200 KB, the ServeRAID Manager copies the file to RAIDSEC.OLD and creates a new RAIDSEC.LOG. If there is a RAIDSEC.OLD already, the ServeRAID Manager overwrites it.

## More information

- The Security Manager menubar
- The Security Manager toolbar
- Using the management station agent

*Using the SNMP Trap Manager:* Use the SNMP Trap Manager to notify other systems running an SNMP console of all SNMP traps that occur on the enclosures connected to a management station. You add system names to the SNMP traps list. Each system in the list is notified of all traps that occur on the enclosure.

You can use the SNMP Trap Manager to:
* Add a system to the SNMP traps list
* Delete a system from the SNMP traps list
* Modify system properties in the SNMP traps list
* Send a test trap to a system in the SNMP traps list

The SNMP Trap Manager is enabled by default. To disable the SNMP Trap Manager, click **Actions** → **Disable SNMP Traps** . If you disable the SNMP Trap Manager, the SNMP traps are generated, but not dispatched to remote systems.

## An example

You install SystemA in a lab with a network-attached storage enclosure. You configure SystemA to send SNMP traps from the enclosure, but you want to monitor the traps from your workstation, not SystemA. You open the SystemA SNMP Trap Manager from the ServeRAID Manager and define your workstation in the SNMP traps list. When running the SNMP console from your workstation, you are notified of all SNMP traps that occur on the enclosures attached to SystemA.

## The SNMP Trap Manager and traps

Traps generated by SNMP include the following:
* Progress information, such as rebuilds, synchronizing, and migrations.
* Problems, such as defunct physical drives and PFA errors.
* Changes to the local configuration, such as adding or replacing a controller.

When an SNMP trap is generated on an enclosure, the SNMP Trap Manager connects with each system in the SNMP traps list and relays the trap to these systems' SNMP consoles.

The SNMP Trap Manager also logs each trap to a logging file, RaidSNMP.log. If this file exceeds 200 KB, the Manager copies the file to RaidSNMP.old and creates a new RaidSNMP.log. If there is a RaidSNMP.old already, the Manager overwrites it.

## The SNMP Trap Manager interface

The SNMP Trap Manager consists of the following:

**Toolbar**
> Provides quick-path icons for common tasks.

**SNMP traps destination list**
> Displays the remote systems configured to receive SNMP traps.

## More information
* The SNMP Trap Manager menubar
* The SNMP Trap Manager toolbar
* Using the management station agent

*Using the Email Notification Manager:* Use the Email Notification Manager to notify users by e-mail of events that occur on enclosures connected to a management station. You type the recipient's name and e-mail address in the e-mail notification list. The recipient is notified of all or selected events that occur on the enclosure.

You can use the Email Notification Manager to:

- Add a recipient to the email notification list
- Delete a recipient from the email notification list
- Modify recipient properties in the email notification list
- Send a test message to a recipient in the email notification list
- Configure the Email Notification Manager

The Email Notification Manager is enabled by default. To disable the Email Notification Manager, click **Actions** → **Disable Email Notifications**. If you disable the Email Notification Manager, events are generated but users do not receive e-mail notification when the events occur.

## An example

You install SystemA in a lab with a network-attached storage enclosure. You add a management station agent on SystemA to monitor for events and problems. You want to monitor SystemA from your workstation but do not have ServeRAID Manager installed. You open the SystemA Email Notification Manager from the ServeRAID Manager and add your name and e-mail address to the e-mail notification list. You are notified by e-mail of all problems and events that occur on the enclosure attached to SystemA.

## The Email Notification Manager and its events

Events monitored by the Email Notification Manager include the following:
- Progress information, such as rebuilds, synchronizing, and migrations.
- Problems, such as defunct physical drives and PFA errors.
- Changes to the local configuration, such as creating a hot-spare drive or defining a logical drive.

Each event has an **event type** indicating its severity: error, warning, or informational. You can configure a recipient to be notified of errors, errors and warnings, or errors, warnings, and informational events.

The Email Notification Manager logs events to a logging file, RAIDSMTP.LOG. If this file exceeds 200 KB, the ServeRAID Manager copies the file to RAIDSMTP.OLD and creates a new RAIDSMTP.LOG. If there is a RAIDSMTP.OLD already, the ServeRAID Manager overwrites it. The Email Notification Manager appends SMTP transport errors in a separate log file, SMTPERR.LOG.

## The Email Notification Manager interface

The Email Notification Manager consists of the following:

**Toolbar**
Provides quick-path icons for common tasks.

**Email notification list**
Displays the recipients configured to receive e-mail notifications.

## More information
- The Email Notification Manager menubar
- The Email Notification Manager toolbar
- The Email Notification Manager message format
- Using the management station agent

# Modifying logical drives using the Configuration wizard

### Understanding logical-drive migration

Logical-drive migration is a powerful and flexible feature of ServeRAID controllers. You can use logical-drive migration to:

- Change the RAID level of existing logical drives
- Increase array free space, so you can create additional logical drives
- Increase the size of an existing logical drive

You can migrate a logical drive while the server is running with only minor performance degradation for users during the process. You can start the migration immediately or schedule it for a later date and time.

HostRAID controllers do **not** support logical drive migration.

**Note:** To perform a logical-drive migration, the following must be true:

- For ServeRAID SCSI controllers, no more than seven logical drives currently exist.

  During logical-drive migration, the ServeRAID Manager creates one logical drive for temporary use. (You must have an extra logical drive onto which the data can migrate.) The ServeRAID Manager sets this logical drive to the system state. When migration is complete, this logical drive is removed.

- The logical drive that you have selected to migrate must be in the okay state.

- For ServeRAID SCSI controllers, the logical drive cannot be configured with RAID level-00, 10, 1E0, 50, or 5EE.

If a physical drive fails during a logical-drive migration and you are migrating between RAID levels other than RAID level-0, the migration will continue and complete. Then, you must replace and rebuild the failed physical drive.

Logical-drive migrations also can recover from a power failure. If power is lost to the server during a logical-drive migration, the migration will restart as soon as power is restored, and complete without data corruption.

**Note:** (Cluster and failover configurations only) A logical drive will not failover while undergoing logical-drive migration.

### More information

- Things to consider when changing the RAID level
- Example: Increasing free space
- Example: Increasing logical drive size
- Understanding scheduled tasks
- Using the Task Manager

**Example: Increasing free space:**  Create an array with three physical drives. Then, create two logical drives (labeled 1 and 2) in the array such that you have no available free space. The logical drive stripes look similar to the following.
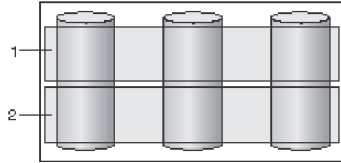
Later, you decide to create another logical drive in the array. First, you must create some free space by adding more physical drives to the array.
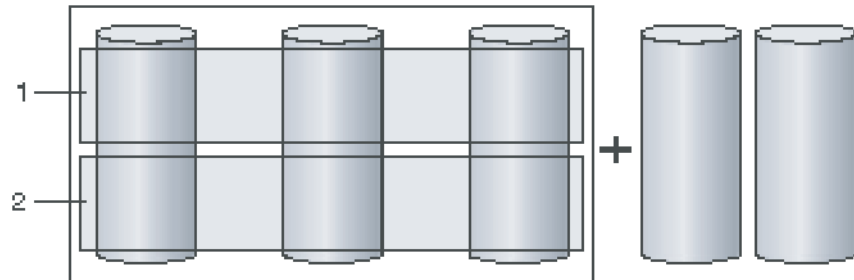


If you add two more physical drives to the array, the logical drives migrate such that they are striped across all five drives. The ServeRAID Manager retains the size of the logical drive by decreasing the size of each block on a physical drive. The space in the logical drives does not increase, so there is free space across the bottom portion of each physical drive (labeled 3).
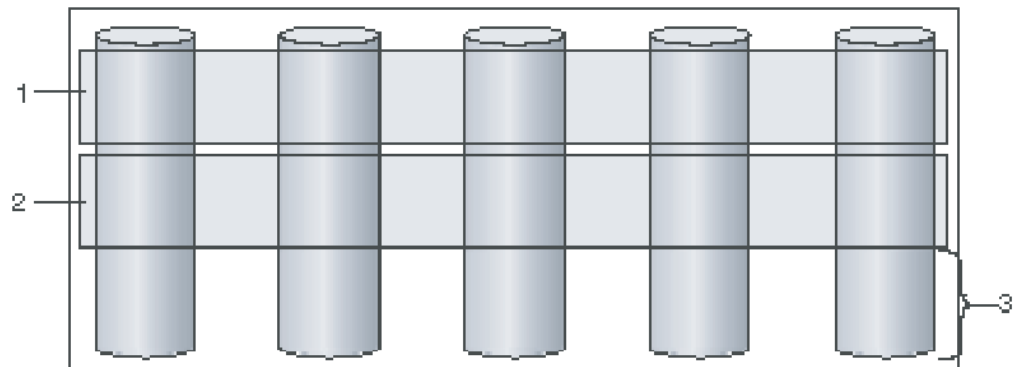


When the operation is complete, use "Create logical drive" to create a new logical drive in the free space.

When increasing free space, you can add up to three physical drives, as long as the sum of the physical drives does not exceed the maximum number of physical drives allowed for the array. The maximum number of physical drives you can have in an array is limited by the controller stripe-unit size.

**Example: Increasing the logical drive size:**

Create an array with three physical drives. Then, create two logical drives (labeled 1 and 2) in the array such that you have no available free space. The logical drive stripes look similar to the following.
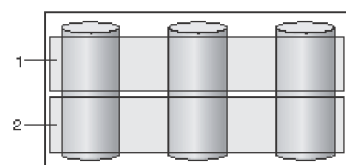
Later, you decide you need additional space in the logical drives in the array. First, you must add more physical drives to the array.

**Note:** Blocks are labeled as **x** and * in these examples. All blocks labeled **x** are the same size in logical drive 1. All blocks labeled * are the same size in logical drive 2.
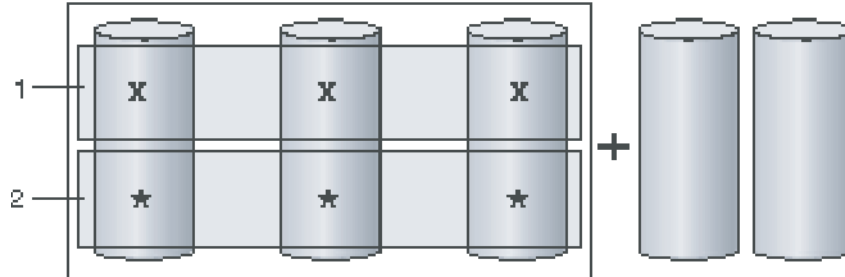
If you add two additional physical drives to the array, the logical drives migrate such that they are striped across all five drives. The ServeRAID Manager expands the size of each logical drive in proportion to the original configuration. If there originally was free space in the array, the free space is increased also.
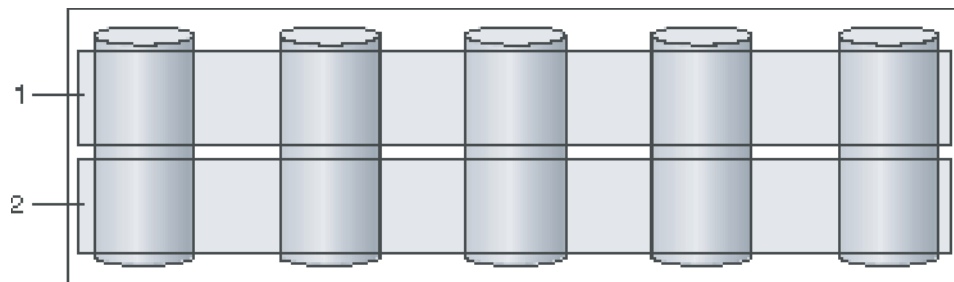
When increasing logical drive space, you can add up to three physical drives, as long as the sum of the physical drives does not exceed the maximum physical drives allowed for the array. The maximum number of physical drives you can have in an array is limited by the controller stripe-unit size.

For the ServeRAID-8i controller and ServeRAID-7t controller, the ServeRAID Manager does not enforce the three physical drive limit when increasing logical drive size.

## More information
- Understanding stripe-unit size
- Understanding creating basic arrays
- Creating logical drives (action)
- Increasing logical drive size (action)
- Increasing logical drive size (SAS, SATA) (action)

**Understanding scheduled tasks:** The ServeRAID Manager Task Scheduler allows you to run lengthy operations at a convenient time, such as a logical drive migration or synchronizing a logical drive. All schedulable tasks work the same way: To schedule a migration, for example, you perform the standard set of steps; then, in the last step, you can choose to run the task immediately or to schedule it for another time.

You can run the task at the given date and time or make it a recurring task. If the task is recurring, it runs on a regular basis according to the interval you choose: the same time each day, the same time each week, or the same time each month. Not all tasks can be recurring tasks. For example, a logical drive migration cannot be a recurring task.

The Task Manager is a tool that you can use to manage scheduled tasks. It allows you to:
- Modify a task's schedule
- Delete a scheduled task
- View task properties

## Start time validation

When you schedule a task, it executes on the agent machine which may be a remote machine in a different time zone. To prevent scheduling problems due to time differences between the agent and client machines, the Task Scheduler performs the following checks:
- To accommodate differences in times zones, you can schedule a task up to 23 hours in the past, pending approval by the agent.
- If the agent determines that the task is scheduled in the past (based on the local time on the agent machine), it will reject the task and you will be prompted to select a different date and time.

## Missed start times

If a non-recurring task misses its start time, the Task Manager flags it with an error. You must modify the task schedule if you want to run it at another time.

If a recurring task misses its start time, it is rescheduled to run at the next scheduled interval. Example: a recurring task runs every Monday at 1:00 AM. The agent machine is powered off at that time. When you restart the agent machine, the missed task is rescheduled to run the following Monday at 1:00 AM.

**Note:** To accommodate temporary or brief interruptions on the agent machine, each task has a 30-minute grace period built into its start time. Example: a task is scheduled to run at 10:00 PM. A power outage lasts 20 minutes, from 9:55 PM to 10:15 PM. The task runs at 10:15 PM.

## Error conditions

When a scheduled task does not run successfully, the Task Manager displays an error icon and updates the "Status" column with an Error. If a task misses its start time, it is flagged with a warning error condition. You must reschedule the task to clear the error. If the error is non-recoverable it is considered critical. You must delete the task from the Task Manager; to reschedule it, you must create a new task. To see details about the error, use View task properties; examine the Error Description field for a description of what went wrong and what caused the task to fail.

## More information
- Synchronize logical drives (action)
- Understanding logical drive migration
- Using the Task Manager

- Starting the Task Manager
- Deleting a scheduled task
- Modifying a scheduled task
- Viewing task properties
- Using the ServeRAID Manager agent

**Extending a partition on a logical drive:** (Microsoft Windows 2000, Windows XP, Windows Server 2003, and Windows NT 4.0 only)

If you have increased the size of a logical drive, you can extend the partition on that logical drive to use the newly added space.

**Notes:**

- To complete this procedure, you must be logged on as one of the following:
    - An administrator
    - A member of the Administrators group
- If your server is connected to a network, network policy settings might prevent you from completing this procedure.

## Windows 2000, Windows XP, Windows Server 2003

1. After completing "Increase logical drive space," shut down and restart the server.
2. In the lower-left corner of the desktop, click **Start** → **Programs** → **Administrative Tools** → **Computer Management**. The Computer Management window opens.
3. Right-mouse click the volume and click **Extend Volume**.
4. Follow the Extend Volume wizard instructions.

**Notes:**

- You **cannot** extend the following types of volumes:
    - Striped
    - Mirrored
    - RAID level-5
    - FAT or FAT32 format
    - System
    - Startup (boot)
    - Simple or extended volumes that were upgraded from basic to dynamic.
- You can extend a volume only if the volume is formatted using NTFS **or** does not contain a file system.
- You can extend a simple or extended volume only if the volume was created as a dynamic volume.
- You can extend a simple volume if the extension will occur within its original physical drive **or** onto additional physical drives.
- After a volume is extended onto multiple drives (spanned), it cannot be mirrored or striped.
- You can extend simple and spanned volumes on dynamic disks onto a maximum of 32 dynamic disks.
- After a spanned volume is extended, you cannot delete any portion of the volume without deleting the entire spanned volume.

### Windows NT 4.0

1. After completing "Increase logical drive space," shut down and restart the server.
2. In the lower-left corner of the desktop, click **Start** → **Programs** → **Administrative Tools (Common)** → **Disk Administrator**. The Disk Administrator window opens.
3. Hold the Ctrl key down and right-click both the old volume and the new free space on the logical drive; then, click **Extend Volume Set**.
4. Type the total size you want for the partition.
5. Click **OK**.
6. Right-mouse click the volume and click **Commit Changes Now**. A confirmation window opens.
7. Click **Yes**. Another confirmation window opens.
8. Click **Yes**.

**Notes:**

- You can extend a volume only if it is formatted using NTFS. You must convert FAT volume sets to NTFS before you can extend them.
- You can extend volume sets onto a maximum of 32 physical drives.
- You cannot extend the volume where the Windows NT 4.0 system files reside.
- After a volume is extended, you cannot delete any portion of the volume without deleting the entire volume.

### More information

- Increasing logical drive size (action)
- Increasing logical drive size (SAS, SATA) (action)

**Configuration wizard notes and attentions:**  While you are creating the configuration, the ServeRAID Manager reports notes and attentions regarding the configuration in the event viewer. These events can help you create a better or more optimized configuration.

### Array storage space still available.

**Explanation:** You can create another logical drive in this array or make a logical drive in this array larger.

### Physical drives contain unusable capacity.

**Explanation:** You could redefine your arrays with the same size drive capacities to avoid wasting space.

### There is(are) *n* ready drive(s) still available. (Where *n* is a number)

**Explanation:** You can create another array, add the remaining ready drives to one of the new arrays, or create a hot-spare drive.

### This hot-spare drive will not work for any defined array.

**Explanation:** This hot-spare drive is not large enough to replace a failed drive in any array, or there are no redundant logical drives.

## Modifying logical drives on ServeRAID SCSI controllers (ServeRAID series 3, 4, 5, 6, and 7K)

**Changing the RAID level:**

**Note:** This action is not supported on the integrated RAID controller.

You can change the RAID levels of currently defined logical drives. To use "Change RAID level," all of the logical drives within the array **must** be the same RAID level.

**Note:**

1. If the logical drive is RAID level-00, 10, 1E0, 50, or 5EE, you cannot change the logical drive to another RAID level. If the logical drive is RAID level-0, 1, 1E, 5, or 5E, you cannot change the logical drive to RAID level-00, 10, 1E0, or 50.
2. You can schedule the logical-drive migration for a later date and time when you review the configuration changes.
3. You cannot change the RAID level while the logical drive is being synchronized.
4. (Cluster and failover configurations only) A logical drive will not failover while undergoing logical-drive migration.

1. In the Physical devices view, click ▦ (array).
2. Right-click **Logical-drive migration** and then the appropriate **Change RAID level**.

   **Note:** If the array already contains the maximum number of physical drives (based on the stripe-unit size), the following actions are not available:
   - **Change RAID level from RAID 0 to RAID 5**
   - **Change RAID level from RAID 1 to RAID 5**

3. If you click one of the following:
   - **Change RAID level from RAID 0 to RAID 5**
   - **Change RAID level from RAID 1 to RAID 5**

   The Configuration wizard opens with the " Create arrays" window. Add the physical drives to the array; then, review and apply your new configuration.

   If you click **Change RAID level from RAID 5 to RAID 0**, the Configuration wizard automatically removes the physical drives and opens the " Configuration summary" window. Review and apply the new configuration.

   If you click **Change RAID level from RAID 5E to RAID 5**, the Configuration wizard does **not** add or remove a physical drive. Instead, the wizard changes the spare space to become free space. Use this free space to create a new logical drive.

### More information
- Things to consider when changing RAID levels
- Understanding scheduled tasks

**Increasing free space:**

**Note:** This action is not supported on the integrated RAID controller.

Using this action you can add one, two, or three physical drives to an existing array so that you can create another logical drive in the array.

When you create an array, logical drives are striped across all physical drives in that array. To create more free space in an existing array, define additional physical drives to add to the array. Then, the ServeRAID Manager migrates the logical drives such that the data is spread across the existing *and* new physical drives.

**Note:**

1. To increase free space in an array, you need at least one ready drive that is *at least* as big as the largest drive in the array.
2. You can schedule the logical-drive migration for a later date and time when you review the configuration changes.
3. (Cluster and failover configurations only) A logical drive will not failover while undergoing logical-drive migration.

1. In the Logical devices view, click ▦ (array).
2. Right-click **Logical-drive migration** → **Increase free space**. The Configuration wizard opens with the "Create arrays" window.
3. Add the physical drives to the array. When complete, click **Next**. The "Configuration summary" window opens.
4. Review and apply your new configuration.
5. After the logical-drive migration is complete, create a new logical drive in the new free space.

## More information
- Example: Increasing free space
- Understanding logical-drive migration
- Understanding scheduled tasks

**Increasing logical-drive size:**

**Note:** This action is not supported on the integrated RAID controller.

Using this action you can add one, two, or three physical drives to an existing array so you can expand the size of the logical drives in the array. When increasing logical drive space, the ServeRAID Manager migrates the logical drives such that the logical drives gain additional space, much like adding paper to a notebook.

When you create an array, logical drives are striped across all of the physical drives in that array. To increase the size of the logical drives in an existing array, define additional physical drives to add to the array. Then, the ServeRAID Manager migrates the logical drives such that the data is spread across the existing **and** new physical drives.

**Note:**

1. To increase the logical drive size, you need at least one ready drive that is **at least** as big as the largest drive in the array.
2. You can schedule the logical-drive migration for a later date and time when you review the configuration changes.
3. (Cluster and failover configurations only) A logical drive will not failover while undergoing logical-drive migration.

1. In the Logical devices view, click ▦ (array).
2. Right-click **Logical-drive migration** → **Increase logical-drive size**. The Configuration wizard opens with the "Create arrays" window.

**Note:** This option is not available if the logical drive exceeds 2 terabytes using any available physical drive.

3. Add the physical drives to the array. When complete, click **Next**. The "Configuration summary" window opens.

4. Review and apply your new configuration.

5. After the logical-drive migration is complete, create additional partitions to use the newly added logical-drive space. If the server is a Microsoft Windows system, you can extend the size of a pre-existing partition with the newly acquired logical-drive space.

## More information
- Example: Increasing logical drive size
- Extending a partition on a logical drive
- Understanding scheduled tasks

**Adding physical drives in an existing configuration:** You can add physical drives (also called logical-drive migration or LDM) to dynamically modify an existing array and its logical drives.

**Note:** You cannot add more than three physical drives. The maximum number of physical drives you can have in an array is still limited by the controller stripe-unit size.

1. Click the appropriate **Array** tab in the right pane:



| Then, from the list of ready drives, select the drives you want to move to the array: | System merlyn, Controller 2 |
|---|---|
| | Ready Ch 1, ID 3 (1000 MB) |
| | Ready Ch 1, ID 4 (1000 MB) |
| | Ready Ch 1, ID 5 (1000 MB) |
| | Ready Ch 1, ID 6 (1000 MB) |
| | Ready Ch 1, ID 8 (1000 MB) |

2. Click



>> (Add selected drives) to add the drives to the array. You can click



>> (Add all drives) to move **all** ready drives to an array.

**Notes:**

a. The list includes only physical drives that are **at least** the size of the smallest physical drive in the selected array. When adding to an existing array, you cannot add physical drives that are smaller than the smallest drive currently in the array.

b. When adding to an existing array, if you add physical drives that are larger than the physical drives currently in the array, you will not be able to use all the space on the new drives.

c. You cannot add a physical drive to the array if the resulting logical drive size will exceed 2 terabytes.

d. Existing physical drives in the selected array are labeled **Online**. Newly added physical drives are labeled **New online**. You cannot remove online drives from an existing array.

3. After you add the physical drives to your arrays, click **Next**. The " Configuration summary" window opens.

To leave the Configuration wizard, click **Cancel**.

## More information

- Understanding logical-drive migration
- Things to consider when changing RAID levels
- Understanding scheduled tasks
- Changing the RAID level of each logical drive in an array (action)
- Increasing the array free space so you can create another logical drive in the array (action)
- Increasing the logical drive space of each logical drive in the array (action)
- Example: Increasing free space
- Example: Increasing logical drive size

**Confirming your logical-drive migration configuration:** Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your modified logical drive configuration. You can start the migration immediately or schedule it for another time.

1. Review the information that is displayed in the "Configuration summary" window. It describes how the new configuration will affect the logical drives and free space. To change the configuration, click **Back**.

2. To start migration now, click **Apply**. Click **Yes** when asked if you want to apply the new configuration.

   Note: Logical-drive migration is a lengthy process. You cannot perform any other actions on the affected controller until the migration is complete. The ServeRAID Manager displays a progress indicator in the status bar while the operation is in progress. When the migration is complete, the configuration is saved in the ServeRAID controller and in the physical drives.

3. To schedule the migration for a later date and time, click **Schedule**. The ServeRAID Manager displays the Scheduler pane:

4.
   - From the calendar display, select the day, month, year, and time you want the task performed.
   - Click **Apply**.
   - Click **Yes** when asked if you want to schedule the migration.

## More information

- Configuration wizard notes and attentions
- Understanding logical-drive migration
- Understanding scheduled tasks
- Using the Task Manager

## Modifying logical drives on ServeRAID SAS and SATA controllers (ServeRAID-7t, ServeRAID-8i)

**Changing the RAID level:** You can change the RAID levels of currently defined logical drives.

1. In the Logical devices view, click  (logical drive).

2. Right-click **Expand or change logical drive**. The Configuration wizard opens with the "Choose RAID level" window.

3. Choose a new RAID level for the logical drive; then, click **Next**. The "Create logical drives" window opens.

   **Note:** Only valid RAID level migrations appear in the list. Migration requirements for each RAID level are described here.

4. Add the physical drives needed to support the new RAID level (if any). Click **Advanced settings** to set the logical drive size; optionally, select a new stripe-unit size. Then, click **Next**. The "Configuration summary" window opens.

   **Note:** When you add drives, the migration wizard shows the current layout of the data, including the current logical drive size. For most migrations, you will need to increase the logical drive size setting; the default size is not generally adequate once you add drives or segments.

5. Review and apply the new configuration.
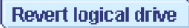
### More information
- Things to consider when changing RAID levels
- Increasing logical-drive size (SAS, SATA) (action)
- Understanding scheduled tasks

**Increasing logical-drive size:** Use this action to add space to an existing logical drive so you can increase its size.

When you create a logical drive, it is striped across all of the physical drives used by the logical drive. To increase the size of an existing logical drive, you add segments to the logical drive, which can be on the same or different disks. Then, the ServeRAID Manager migrates the logical drive such that the data is spread across the existing **and** new physical drives.

**Note:**

1. The capacity of the modified logical drive must match or exceed its current capacity.
2. The maximum size of a logical drive is 2 terabytes.

1. In the Logical devices view, click  (logical drive).

2. Right-click **Expand or change logical drive**. The Configuration wizard opens with the "Choose RAID level" window. Click **Next**. The "Create logical drives" window opens.

3. Add segments to the logical drive. Optionally, click **Advanced** to select a new stripe-unit size for the logical drive.

   **Note:** To remove or replace a physical drive, click the drive you want to remove (indicated by  ); then, click the drive you want to replace it with. To cancel your changes and start over, click  .

When you are ready to continue, click **Next**. The ″Configuration summary″ window opens.

4. Review and apply your new configuration or schedule the migration for another time.

5. After the logical-drive migration is complete, create additional partitions to use the expanded logical-drive space. If the server is a Microsoft Windows system, you can extend the size of a pre-existing partition with the newly acquired logical-drive space.

## More information

- Example: Increasing logical drive size
- Extending a partition on a logical drive
- Changing the RAID level (SAS, SATA) (action)
- Understanding scheduled tasks

**Confirming your logical-drive migration configuration:** Use the configuration summary to review all the changes that the ServeRAID Manager will apply to your modified logical drive configuration. You can start the migration immediately or schedule it for another time.

1.

Review the information that is displayed in the ″Configuration summary″ window. It describes how the new configuration will affect the logical drives and free space. To change the configuration, click **Back**.

2. To start the migration now, click **Apply**. Click **Yes** when asked if you want to apply the new configuration.

> **Note:** Logical-drive migration is a lengthy process. The ServeRAID Manager displays
>
> 
>
> (in animation) in the Logical devices view while the operation is in progress. When the migration is complete, the configuration is saved in the ServeRAID controller and in the physical drives.

3. To schedule the migration for a later date and time, click **Schedule**. The ServeRAID Manager displays the Scheduler pane:
   - From the calendar display, select the day, month, year, and time you want the task performed.
   - Click **Apply**.
   - Click **Yes** when asked if you want to schedule the migration.

## More information

- Configuration wizard notes and attentions
- Understanding logical-drive migration
- Understanding scheduled tasks
- Using the Task Manager

## Modifying logical drives on ServeRAID enclosures

**Changing the RAID level:** You can change the RAID level of currently defined logical drives in an array.

1. In the Logical devices view, click  (array).

2. Right-click **Expand or migrate array**. The Configuration wizard opens with the "Choose RAID level" window.

3. Choose a new RAID level for the array; then, click **Next**. The "Modify array" window opens.

   **Note:** Only valid RAID level migrations appear in the list. Migration requirements for each RAID level are described here.

4. Add the physical drives needed to support the new RAID level (if any). Optionally, click **Advanced settings** to set the drive capacity display units (MB, GB, TB). Then, click **Next**. The "Configuration summary" window opens.

5. Review and apply the new configuration.

### More information

- Things to consider when changing RAID levels
- Increasing logical-drive capacity (enclosure)

**Increasing logical drive capacity:** Use this action to increase the size of logical drives in an enclosure. To increase the size of one or more drives in an enclosure, use the Configuration wizard. To increase the size of a specific logical drive, use the Increase logical drive capacity action on the logical drive object.

### Increasing logical drive size with the Configuration wizard

1. In the Enterprise view, click ▦ (enclosure).

2. Right-click **Configure storage**. The Configuration wizard opens with the "Configuration path" window.

3. Click **Advanced options**; then, select **Increase logical drive capacity**.

   

4. Click **Next**. The "Increase logical drive capacity" window opens.

5. Click the appropriate array tab. 

6. For each logical drive in the array, type amount space you want to add to the

   

   logical drive in the **Additional (MB)** field.

7. Repeat steps 5 and 6 to increase logical drive capacity for other arrays.

8. When you are ready to continue, click **Next**.

9. Review the configuration summary and apply the changes.

### Increasing the size of a single logical drive

1. In the Logical devices view, click ▢ (logical drive).

2. Right-click **Increase logical drive capacity**. The Configuration wizard opens with the "Increase logical drive capacity" window.

3. Type amount space you want to add to the logical drive in the **Additional (MB)** field.
4. When you are ready to continue, click **Next**.
5. Review the configuration summary and apply the changes.

## More information
- Changing authentication settings
- Changing access control settings

**Adding drives to an existing array:**   Use this action to add physical drives to an existing array without changing the RAID level.

When you create an array, it is striped across all the physical drives used by the array. To increase the size of an existing array, you add segments to the array, which can be on the same or different disks. Then, the ServeRAID Manager migrates the array such that the data is spread across the existing **and** new physical drives.

**Note:**

1. The capacity of the modified array must match or exceed its current capacity.
2. The maximum size of an array is 2 terabytes.
3. This action is not supported for all RAID levels.

1. In the Logical devices view, click ▤   (array).
2. Right-click **Expand or migrate array**. The Configuration wizard opens with the "Choose RAID level" window.
3. Click **Next**. (Do **not** change the RAID level!) The "Modify array" window opens.
4. Add segments to the array. Optionally, click **Advanced settings** to set the drive capacity display units (MB, GB, TB).
5. When you are ready to continue, click **Next**. The "Configuration summary" window opens.
6. Review and apply your new configuration.

## More information
- Extending a partition on a logical drive

**Changing the authentication settings:**

**Note:** The ServeRAID Manager supports authentication for iSCSI initiators only.

Use this action to modify the authentication method, user list, and advanced settings for each logical drive in the enclosure.

1. In the Logical devices view, click ▤   (logical drive).
2. Right-click **Configure target information**. The Configuration wizard opens with the "Define authentication method" window.
3. Update the authentication settings for each logical drive.
4. If you enabled authentication (by choosing CHAP or SRP), click [Add User] ; then, add or remove users in the user list.
5. When you are ready to continue, click **Next**.

6. Review the configuration summary and apply the changes.

## More information
- Adding users to the user list
- Changing access control settings

**Defining the authentication method:**

**Note:** The ServeRAID Manager supports authentication for iSCSI initiators only.

Use the Authentication information window to define the authentication method (if any) for each user permitted to use the logical drives in the array. Optionally, you can enable Radius authentication (an external authentication service) and define the SLP (Service Location Protocol) Scope name.

1. Select a logical drive from the list on the left.
2. From the **Authentication type** list, select the method used to authenticate users of this logical drive. You can choose:
   - **None** - Do not authenticate users
   - **CHAP** - Challenge Handshake Authentication Protocol
   - **SRP** - Secure Remote Password

3. If you enabled authentication (by choosing CHAP or SRP), click [Add User] ; the "Global user name and password management" window opens. Then, add users to the user list.
4. To enable Radius authentication for the CHAP authentication method, click **Radius authentication**; then, enter the following:
   - In the Primary server field, enter the host name or TCP/IP address of the authentication service; then, in the Port field, enter the server's startup port.
   - In the Secondary server field, enter the host name or TCP/IP address of the authentication service; then, in the Port field, enter the server's startup port.

   **Note:** Radius authentication is supported by the CHAP authentication method only.
5. To modify the default SLP Scope name, click **Advanced settings**; then, in the SLP Scope Name field, type a unique scope name or choose an existing name from the drop-down list.
6. Repeat steps 1 through 5 to enable authentication for additional logical drives.
   To replicate the settings for all logical drives, click [Replicate settings] .
7. When you are ready to continue, click **Next**. The " Define initiators" window opens.

To return to the " Create logical drives" window, click **Back**. To leave the Configuration wizard, click **Cancel**.

## More information
- Adding users to the user list

*Changing the rebuild rate:*

**Note:**

   1. This action is supported in bootable-CD mode only.
   2. This action is not supported on the integrated RAID controller.

Use this action to change the rebuild rate. The rebuild rate determines the rate that the data from a failed physical drive is rebuilt to a new or hot-spare drive.

1. In the Enterprise view, click  (controller).
2. Right-click **Change rebuild rate** and then click a rebuild rate. The following choices are available:
   - High
   - Medium
   - Low

When the rebuild rate is High, the rebuild I/O request gets high priority in the controller execution order.

If you change the rebuild rate from High to Medium in a heavily loaded system, the rebuild time can increase but provide better system performance.

If you change the rebuild rate from High or Medium to Low in a moderate to heavily loaded system, the rebuild time can increase, but provide better system performance.

**Changing access control settings:** Use this action to add, modify, and delete initiators that are permitted to access an enclosure. You can also change the logical drive assignments for an initiator.

1. In the Logical devices view, click  (logical drive).
2. Right-click **Configure access control list**. The Configuration wizard opens with the ″Define initiators″ window.
3. Add, delete, or modify an initiator. When you are ready to continue, click **Next**.
4. Update logical drive assignments; then, click **Next**.
5. Review the Configuration summary and apply the changes.

### Adding an initiator

To add an initiator:

1. Click **Add** . Depending on the initiator type, the ″Add iSCSI initiator″ window opens or the ″Add Port Name″ window opens.
2. Define the initiator alias, IQN or port name, and optional advanced settings.

### Deleting an initiator

To delete an initiator:

1. Select an initiator from the list: simply point to the initiator and click left.
2. Click **Delete** .

### Modifying an initiator

To modify an initiator:

1. Select an initiator from the list.
2. Click **Modify** . The ″Modify initiator″ window opens.
3. Type a new initiator alias.

   **Note:** You cannot change the initiator IQN or port name. The ServeRAID Manager updates the IQN and port name from the initiator alias.

4. (iSCSI initiators only) Optionally, change the advanced settings.
5. Click **OK**.

### More information
- Modifying the authentication method

**Defining the user list:** You can define a user list for each logical drive. You must add at least one user to the list if you enabled authentication for the logical drive.

1. In the **User name** field, enter a user name.
2. In the **Password** field, enter the user's password.
3. In the **Confirm password** field, enter the password again.
4. Click **Add**.
5. Repeat steps 1-4 to add additional users.

  **Note:** To remove a user from the list, select the user; then, click **Delete**.
6. When you are finished adding and deleting users, click **Cancel**.

## Tuning your system for optimal performance

### Fine-tuning your system
When fine-tuning your controller settings for optimal performance, consider the applications that you intend to run on your server. Controller settings are usually sensitive to the **types** of applications running on the server, not the server workload or the number of users using the server. You must investigate your application's design, especially its input/output behavior, to make your decision.

When configuring your controller, your server application environment can influence the following:
- The RAID level you select for your server
- The controller stripe-unit size setting
- The write-back cache mode setting

### More information
- Selecting a RAID level
- Application environment groups reference
- Understanding write-cache mode for logical drives
- Changing the write-cache mode on a logical drive (action)
- Understanding write-cache mode for physical drives
- Changing the write-cache mode on a physical drive (action)
- Understanding stripe-unit size
- Changing the stripe-unit size (action)
- Understanding adaptive read-ahead cache mode
- Understanding enabled and disabled read-ahead cache mode
- Enabling and disabling read-ahead cache mode (action)

**Fine-tuning the stripe-unit size:** A new controller stripe-unit size is set at the factory to 8 KB. If you need to change this setting, you **must** change the stripe-unit size before you store data in the logical drives. After you store data in the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

 The ServeRAID-8i, ServeRAID-7t, and HostRAID controllers do not support 8 KB stripe-unit size.

**Note:** You must use the ServeRAID Manager in bootable-CD mode to change the stripe-unit size setting.

| Environment | stripe-unit size |
|---|---|
| Groupware (such as Lotus Notes or Exchange) | 16 KB |
| Transaction processing database | 16 KB |
| Decision support database | 16 KB |
| Thin client environments | 8 KB |
| File server (Microsoft Windows NT, Windows 2000, Windows Server 2003, Novell NetWare) | 16 KB |
| File server (Other) | 8 KB |
| Web server | 8 KB |
| Other | 8 KB |

## More information
- Changing the stripe-unit size (action)
- Fine-tuning your system

**Fine-tuning the write-cache mode:**   (Novell NetWare only)

If you are preparing to install Novell NetWare 5.x from the startable *Novell NetWare 5.x* CD, you must set the write-cache mode for all logical drives to write through. Complete the following steps to accomplish this:

1. In the Logical devices view, right-click  (logical drive).
2. Click **Change write-cache mode to write-through**.
3. Repeat steps 1 and 2 for each logical drive.

## Selecting a RAID level and tuning performance
Disk arrays are used to improve performance and reliability. The amount of improvement depends on the application programs that you run on the server and the RAID levels that you assign to the logical drive.

Each RAID level provides different levels of fault-tolerance (data redundancy), utilization of physical drive capacity, and read and write performance. In addition, the RAID levels differ in regard to the minimum and maximum number of physical drives that are supported.

When selecting a RAID level for your system, consider the following factors.

**Note:** Not all RAID levels are supported by all ServeRAID controllers.

| RAID level | Data redun-dancy | Physical drive capacity utili- zation | Read perfor-mance | Write perfor-mance | Built-in spare drive | Min. number of drives | Max. number of drives |
|---|---|---|---|---|---|---|---|
| RAID level-0 | No | 100% | Superior | Superior | No | 1 | 16 |
| RAID level-1 | Yes | 50% | Very high | Very high | No | 2 | 2 |
| RAID level-1E | Yes | 50% | Very high | Very high | No | 3 | 16 |

| RAID level | Data redun- dancy | Physical drive capacity utili- zation | Read perfor- mance | Write perfor- mance | Built-in spare drive | Min. number of drives | Max. number of drives |
|---|---|---|---|---|---|---|---|
| RAID level-5 | Yes | 67% to 94% | Superior | High | No | 3 | 16 |
| RAID level-5E | Yes | 50% to 88% | Superior | High | Yes | 4 | 16 |
| RAID level-5EE | Yes | 50% to 88% | Superior | High | Yes | 4 | 16 |
| RAID level-6 | Yes | 50% to 88% | Very High | High | No | 4 | 16 |
| RAID level-00 | No | 100% | Superior | Superior | No | 2 | 60 |
| RAID level-10 | Yes | 50% | Very high | Very high | No | 4 | 16 |
| RAID level-1E0 | Yes | 50% | Very high | Very high | No | 6 | 60 |
| RAID level-50 | Yes | 67% to 94% | Superior | High | No | 6 | 60 (SCSI) 128 (SAS, SATA) |
| RAID level-60 | Yes | 50% to 88% | Very High | High | No | 8 | 128 |
| Spanned Volume | No | 100% | Superior | Superior | No | 2 | 48 |
| RAID Volume | No | 50% to 100% | Superior | Superior | No | 4 | 48 |

Physical drive utilization, read performance, and write performance depend on the number of drives in the array. Generally, the more drives in the array, the better the performance.

## More information
- Understanding RAID technology
- Selecting the logical drive size
- Selecting the RAID level by array capacity
- Creating logical drives (action)
- Configuring RAID and creating arrays (action)
- Creating logical drives in the wizard
- Things to consider when changing the RAID level

**Things to consider when changing the RAID level:**

**SR-SCSI**  **ServeRAID SCSI controllers**

| If you have a... | And you want... | Then... |
|---|---|---|
| RAID level-0 array with two or more drives | RAID level-5 | Add one and **only** one drive |
| RAID level-1 array with two and **only** two drives | RAID level-5 | Add one and **only** one drive |
| RAID level-5 array | RAID level-0 | The ServeRAID Manager removes the **last** drive in the array |

| If you have a... | And you want... | Then... |
|---|---|---|
| RAID level-5 Enhanced array | RAID level-5 | The ServeRAID Manager does not add or remove a drive |

  **ServeRAID SATA and SAS controllers**

| If you have a... | And you want... | Then... |
|---|---|---|
| RAID level-0 logical drive with two or more drives | RAID level-5 | Add at least one drive |
| RAID level-5 logical drive | RAID level-0 | Optionally, remove one drive |
| RAID level-0 logical drive | RAID level-10 | **Double** (at least) the drive count |
| RAID level-6 logical drive | RAID level-5 | Optionally, remove one or two drives |
| RAID level-5 logical drive | RAID level-5EE | Add at least one drive |
| RAID level-5EE logical drive | RAID level-5 | Optionally, remove one drive |
| RAID level-5 logical drive | RAID level-10 | Make sure you have (source-1)*2 drives total |
| RAID level-1 logical drive | RAID level-5 | Add at least one drive |
| RAID level-1 logical drive | RAID level-10 | Add at least two drives |

 **ServeRAID Enclosures (networked storage)**

| If you have a... | And you want... | Then... |
|---|---|---|
| RAID level-0 logical drive with two or more drives | RAID level-5 | Add at least one drive |
| RAID level-1 logical drive | RAID level-5 | Add at least one drive |
| RAID level-1 logical drive | RAID level-10 | Add at least two drives in multiples of two |

## More information
- Changing the RAID level (action)
- Changing the RAID level (SAS, SATA, HostRAID) (action)
- Changing the RAID level (enclosures) (action)
- Understanding logical-drive migration

## Application environment groups reference

| Environment | Applications |
|---|---|
| Groupware | Lotus Notes<br>Microsoft Exchange<br>Other |

| Environment | Applications |
|---|---|
| Transaction processing | DB2<br>Informix<br>Oracle<br>SQLServer<br>Sybase<br>Other |
| Decision support or data warehousing | DB2 Informix Oracle SQLServer Sybase Other |
| Thin client environments | Citrix WinFrame or MetaFrame<br>Microsoft Terminal Server<br>Other |
| File server | Novell NetWare<br>Microsoft Windows 2000<br>Microsoft Server 2003<br>Other network operating systems (for example, OpenServer, Linux) |
| Web server | Apache<br>Microsoft IIS<br>Netscape Commerce Server<br>Other |

## Understanding write-cache mode for physical drives

When using the write-cache-mode option, you can choose from two available settings.

## Write back

For the write back setting, the controller sends data to the physical drive for storage. Subsequently, the physical drive sends a confirmation to the controller **before** actually storing the data. Doing so increases performance, but also contains an element of risk.

**Attention:**

1. It is possible to lose data if a power outage occurs while using the write back setting. Consider carefully whether to enable write back on a physical drive. Depending on how you use the system, write back might be undesirable.

2. If you set this feature to write back, wait at least 10 seconds after your last operation before you turn off your system. Failure to follow this practice might result in lost data.

## Write through

For the write-through setting, the controller sends data to the physical drive for storage. Subsequently, the physical drive stores the data; then, sends a confirmation to the controller. Using write through can decrease performance, but has no risk of losing data.

## More information

- Changing the write-cache mode on a physical drive (action)
- Fine-tuning your system

## Understanding write-cache mode for logical drives

When using the write-cache-mode option, you can choose from two available settings.

## Write back

For the write-back setting, the operating system sends data to the controller to write to a storage device. Subsequently, the controller sends a confirmation to the operating system *before* actually writing the data to the storage device. Doing so increases performance, but also contains an element of risk. For example, if there is a power failure, the data currently in the controller cache is lost. This is no risk when using a controller with a battery-backup cache. The battery preserves the data in the controller cache in the event of a power failure.

**Attention:**

1. It is possible to lose data if a power outage occurs while using the write back setting without a battery-backup cache device. If your controller does not have a battery-backup cache installed and enabled, consider carefully whether to enable write back on a logical drive. Depending on how you use the system, write back might be undesirable.

2. If you do not have a battery-backup cache installed and enabled and you set this feature to write back, wait at least 10 seconds after your last operation before you turn off your system. Failure to follow this practice might result in lost data.

## Write through

For the write-through setting, the operating system sends data to the controller to write to a storage device. Subsequently, the controller writes the data to the storage device; then, sends a confirmation to the operating system. This setting can decrease performance, but contains no risk of losing data.

## More information

- Changing the write-cache mode on a logical drive (action)
- Fine-tuning your system

## Understanding stripe-unit size

With RAID technology, data is **striped** across an array of physical drives. This data-distribution scheme complements the way the operating system requests data.

The granularity at which data is stored on one drive of the array before subsequent data is stored on the next drive of the array is called the **stripe-unit size** .

You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. You can maximize the performance of your ServeRAID controller by setting the stripe-unit size to a value that is close to the size of the system I/O requests. For example, performance in transaction-based environments, which typically involve large blocks of data, might be optimal when the stripe-unit size is set to 32 KB or 64 KB. However, performance in file and print environments, which typically involve multiple small blocks of data, might be optimal when the stripe-unit size is set to 8 KB or 16 KB.

The ServeRAID-7t, ServeRAID-8i, and HostRAID controllers do not support an 8 KB stripe-unit size. The ServeRAID-7t and ServeRAID-8i controllers support these additional stripe-unit sizes: 128 KB, 256 KB, 512 KB, and 1024 KB.

The collection of stripe units, from the first drive of the array to the last drive of the array, is called a *stripe*.

After you configure an array and store data on the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. The default setting is 8 KB data bytes.
- When the stripe-unit size is 8 KB or 16 KB, the maximum number of physical drives in an array is 16.
- If you have a ServeRAID-3H or ServeRAID-3HB controller using ServeRAID firmware (version 4.0, or later) and the stripe-unit size is 32 KB or 64 KB, the maximum number of physical drives in an array is 16. Otherwise, when the stripe-unit size is 32 KB or 64 KB, the maximum number of physical drives in an array is 8.
- If you have a ServeRAID-4 controller and the stripe-unit size is set to 32 KB or 64 KB, the maximum number of physical drives in an array is 16.

## More information
- Changing the stripe-unit size (action)
- Application environment groups reference

## Understanding enabled and disabled read-ahead cache mode for logical drives

**Note:** You can enable and disable the read-ahead setting without destroying data in a logical drive by using the ServeRAID Manager in bootable-CD mode.

### Enabled read-ahead cache mode

The controller transfers data from the logical drive to its local cache in increments equal to the stripe-unit size. This provides excellent overall performance when workloads are steady and sequential. However, if the workload is random or the system I/O requests are smaller than the stripe-unit size, reading ahead to the end of the stripe might degrade performance.

### Disabled read-ahead cache mode

The controller transfers data from the logical drive to its local cache in increments equal to the system I/O request size, without reading ahead to the end of the stripe. This provides excellent overall performance when the workload is random or the system I/O requests are smaller than the stripe-unit size.

### More information
- Enabling and disabling read-ahead cache mode (action)
- Changing the stripe-unit size (action)
- Understanding stripe-unit size

## Understanding adaptive read-ahead cache mode

The ServeRAID controller continually reevaluates whether to transfer data from disk to its local cache in increments equal to the stripe-unit size *or* in increments equal to the system I/O request size.

The ServeRAID-4 controllers and the ServeRAID-3HB controller come with the adaptive read-ahead mode as a standard feature. The ServeRAID-3H and ServeRAID-3L controllers must use new ServeRAID firmware (version 3.50, or later) to implement adaptive read-ahead cache mode. You can download and install the new firmware for the ServeRAID-3H and ServeRAID-3L controllers.

If you have the controller and firmware for adaptive read-ahead mode installed, the ServeRAID Manager reports Adaptive on the controller properties pane. Otherwise, the properties pane states either Enabled or Disabled.

**Note:** With this new firmware, the non-Adaptive read-ahead modes are no longer available in the ServeRAID Manager. You *can* override Adaptive read-ahead, but not through the ServeRAID Manager. Instead, use the IPSSEND command-line program. This program comes with the device option and is on the *IBM ServeRAID Support* CD. For more information, refer to the *IBM ServeRAID User's Reference*.

**Read-ahead cache mode settings:** Depending on your controller's level of firmware, there are three settings for read-ahead cache mode:

- Enabled or Disabled
- Adaptive

You can change the read-ahead setting without destroying data in a logical drive using the ServeRAID Manager in bootable-CD mode.

## Changing the stripe-unit size

**Note:**

1. This action is supported in bootable-CD mode only.
2. This action is not supported on the ServeRAID-7t controller, the ServeRAID-8i conroller, and the integrated RAID controller.
3. On ServeRAID-7t controller and ServeRAID-8i controller, use the configuration wizard to change the stripe-unit size.

Use this action to set the size of the chunk of data that the controller reads from each physical drive at a time. To maximize overall performance, choose a stripe-unit size that is close to the size of the system I/O request.

**Attention:** After you configure an array and store data on the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

1. In the Enterprise view, click  (controller).
2. Right-click **Change stripe-unit size** and then click a stripe-unit size. The following choices are available:

   **8 KB** With this stripe-unit size, an array can have a maximum of 16 physical drives.

   **16 KB** With this stripe-unit size, an array can have a maximum of 16 physical drives.

   **32 KB** This setting is available if the controller supports an array with 16

physical drives using a 32 KB stripe-unit size, or the controller contains no arrays with more than 8 physical drives. Otherwise, this setting is unavailable.

**64 KB** This setting is available if the controller supports an array with 16 physical drives using a 64 KB stripe-unit size, or the controller contains no arrays with more than 8 physical drives. Otherwise, this setting is unavailable.

### More information
- Fine-tuning your system
- Understanding stripe-unit size
- Understanding enabled and disabled read-ahead cache mode

## Changing the write-cache mode on a logical drive

**Note:**

1. This action is supported in bootable-CD mode for ServeRAID SCSI controllers.
2. This action is supported in interactive mode only for the ServeRAID-8i controller and ServeRAID-7t controller.
3. This action is not supported on the integrated RAID controller.

Use this action to change the write-cache mode setting of a logical drive to write through or write back. The write-cache mode determines if the controller writes data to the drive before or after sending a confirmation to the operating system.

**Note:**

1. (RAID level-x0 only) All logical drives in a spanned array must be either write back or write through. That is, the write-cache mode settings for the logical drives in the spanned array *cannot* be a mixture of write back and write through.
2. (Failover environment only) A fault-tolerant controller pairing must be configured as write through. This is because the logical drives are configured as "Shared." For more information, refer to the *IBM ServeRAID User's Reference* .
3. (Cluster environment only) If the logical drives are configured as "Shared," the controllers must be configured as write through. For more information, refer to the *IBM ServeRAID User's Reference* .

1. In the Logical devices view, click  (logical drive).
2. Right-click **Change write-cache mode to write back or write through**.
3. If you click write back and you do **not** have a battery-backup cache, click **Yes** to confirm your choice because there is a risk of losing data.

   If you click **write back** and you do have a battery-backup cache, the ServeRAID Manager changes the mode.

   If you click **write through**, the ServeRAID Manager changes the mode.

### More information
- Understanding write-cache mode for logical drives

## Changing the write-cache mode

**Note:** This action is not supported on enclosures with a dual controller configuration.

Use this action to change the write-cache mode setting of all the physical drives in an array. The write-cache mode determines if a physical drive stores data before or after sending a confirmation to the controller.

**Note:** It is possible to lose data if a power outage occurs while using the write-back setting. Consider carefully whether to use the write-back setting on a physical drive. Depending on how you use the system, the write-back setting might be undesirable.

1. In the Logical devices view, click  ![array icon] (array).
2. Right-click **Configure write cache** → **write back or write through**.
3. Click **Yes** to confirm.

### More information
- Understanding write-cache mode for physical drives

### Enabling and disabling read-ahead cache mode
Use this action to set the read-ahead cache mode to Enabled or Disabled. If the read-ahead cache mode is set to Adaptive, you cannot use this action.

**Note:** You **can** override the Adaptive setting, but not through the ServeRAID Manager. Instead, use the IPSSEND command-line program. This program is on the *IBM ServeRAID Support* CD.

1. In the Logical devices view, click  ![array icon] (array).
2. Right-click **Configure read cache** → **enabled** or **Configure read cache** → **disabled**.
3. Click **Yes** to confirm.

### More information
- Understanding read-ahead cache mode
- Understanding adaptive read-ahead cache mode

## Managing storage devices

### Managing direct attached storage devices

**Understanding FlashCopy backup:** The FlashCopy function creates a quick backup copy of data. It sets up a link between the source and target logical drives; then, it creates a backup of the source data on the target drive. Any changes made to the source drive after you create a FlashCopy backup are not reflected on the target drive. You can use the backup copy of data for tape backup, drive cloning, and multi-server rollout.

There are two primary FlashCopy functions: backup and nobackup. The FlashCopy backup function copies the entire contents of the source drive to the target drive so that entire logical drives can be moved from one server to another. The FlashCopy nobackup function creates a temporary copy of a drive for tape drive backup and reference purposes. The FlashCopy nobackup function is less I/O-intensive than the FlashCopy backup function.

Before using FlashCopy, consider the following requirements:
- You can perform a FlashCopy backup operation on only one controller at a time.
- The source and target logical drives can have the same or different RAID level (they do not have to match).

- The source and target logical drives must be on the same controller.
- You can create a maximum of four independent FlashCopy backups per controller.
- There is no limit on the size of the source and target logical drive. However, for both FlashCopy backup and nobackup operations, the size of the target drive must be greater than or equal to the source drive.
- You cannot perform any action on a FlashCopy source or target logical drive (such as synchronizing the drive). You can only delete a FlashCopy backup.

## More information
- Creating a FlashCopy backup
- Removing a FlashCopy backup

**Understanding copy back mode:**

**Note:** Copy back is supported on the ServeRAID-8i, ServeRAID-7k, ServeRAID-6M, and ServeRAID-6i/6i+ controllers only. It is not supported in cluster or failover pair configurations.

Copy back is a method of restoring a logical drive's original configuration after you replace a failed drive in an array. It allows you to restore the data to its prior location, before the logical drive was rebuilt from its spare.

## An example

A RAID Level-5 logical drive consists of three physical drives and a spare. When a drive in the array fails, the spare drive is used to rebuild the logical drive. When you replace the failed drive, copy back moves the data from the former spare to the newly replaced drive. Then, the former spare resumes its original role as the spare drive.

Copy back is enabled by default; it starts automatically when the ServeRAID controller detects that a failed drive is replaced. The ServeRAID Manager displays a progress indicator in the status bar while the operation is in progress. To disable copy back, choose Disable copy back mode from the controller object Action menu.

You cannot perform any other actions on the controller until copy back is completed.

**Note:** Copy back is disabled by default when you upgrade the ServeRAID software from a previous release.

## More information
- Enabling and disabling copy back mode (action)

**Enabling and disabling copy back mode:**

**Note:** Copy back is supported on the ServeRAID-8i, ServeRAID-7k, ServeRAID-6M, and ServeRAID-6i/6i+ controllers only. It is not supported in cluster or failover pair configurations.

Use this action to change the copy back-mode setting. This setting determines if the ServeRAID Manager restores a logical drive's original configuration after you replace a failed drive in an array.

Copy back is enabled by default except when you upgrade the ServeRAID software from a previous release; then, copy back mode is disabled by default.

1. In the Enterprise view, click ![icon] (controller).
2. Right-click **Enable or Disable copy back mode.**

## More information
- Understanding copy back mode

**Creating a FlashCopy backup:** Use this action to create a FlashCopy backup of data on a logical drive. You can create a FlashCopy with backup (full copy) or without backup (temporary copy).

1. In the Logical devices view, click ![icon] (Logical drive).
2. Right click **Create FlashCopy → with backup to → the logical drive name** or **Create FlashCopy → without backup to → the logical drive name**.

## More information
- Understanding FlashCopy backup
- Removing a FlashCopy backup

**Removing a FlashCopy backup:** Use this action to remove a FlashCopy backup of a logical drive.

1. In the Logical devices view, click ![icon] (FlashCopy).
2. Right click **Remove FlashCopy**.

## More information
- Understanding FlashCopy backup
- Creating a FlashCopy backup

## Managing networked storage devices (enclosures)

**Shutting down an enclosure:** Use this action to shut down the controllers in an enclosure.

**Attention:** Use care when you shut down an enclosure. Users cannot access the data on the arrays and logical drives until the enclosure is restarted.

Follow these steps to shut down an enclosure:

1. In the Enterprise view, click ![icon] (enclosure) that you want to shut down.
2. Right-click **Shut down enclosure.**.
3. Click **Yes** when asked to confirm that you want to shut down the enclosure.

## More information
- Updating enclosure software
- Restarting an enclosure

**Restarting an enclosure:** Use this action to restart the controllers in an enclosure.

1. In the Enterprise view, click ![icon] (enclosure) that you want to restart.
2. Right-click **Restart enclosure**.
3. Click **Yes** when asked to confirm that you want to restart the enclosure.

   **Attention:** Restarting the enclosure may take several minutes. Data on the controller(s) are unavailable during that time.

## More information
- Updating enclosure software
- Shutting down an enclosure

**Changing controller date and time:**  Follow these steps to change the controller date and time:

1. In the Enterprise view, click &#9635; (enclosure).
2. Right-click **Change controller date and time**. The " Change controller date and time" window opens.
3. Select the new date, time, and time zone from the calendar and time controls.
4. Click **OK**. The ServeRAID Manager will apply the update to the controller.

## More information
- Updating enclosure software
- Shutting down a controller

**Configuring host information:**  Use this action to configure the network settings for an external storage enclosure. You can set the host name, domain, primary and secondary DNS servers, and the default gateway for network access.

1. In the Enterprise view, click &#9635; (enclosure).
2. Right-click **Configure network details**. The "Configure Host Information" window opens
3. In the **Host name** field, type the enclosure's host name.
4. In the **Domain name** field, type the enclosure's network domain; for example, `mydomain.com`.
5. In the **Primary Domain Name Server** field, type the TCP/IP address of the enclosure's primary DNS.
6. (optional) In the **Secondary Domain Name Server** field, type the TCP/IP address of enclosure's secondary DNS.
7. In the **Default Gateway** field, type the TCP/IP address of the default gateway for network access.
8. Click **OK**.

## More information
- Configuring Ethernet ports

**Configuring Ethernet ports:**  Use this action to configure the Ethernet settings for the controllers in an enclosure. For iSCSI initiators, you can configure three ports per controller: the management port and two iSCSI ports. For fibre channel initiators, you can configure the management port for each controller.

For the management port (iSCSI or fibre channel), you can configure the port link speed. For iSCSI ports, you can configure network settings, such as Maximum Transfer Unit (MTU), TCP/IP address, and subnet mask. If your network uses dynamic IP addresses, you can enable DHCP.

## Configuring the management port

To configure the management port:

1. In the Physical devices view, click a controller in the enclosure.

   **Attention:**  Be sure to switch to enclosure view first.

2. Right click **Configure Ethernet port** → **ETH 0 (management)**. The Configure Ethernet port window opens.
3. From the **Link speed** drop-down list, select the port link speed, in megabytes. To automatically detect the link speed (1 GB or less), select **AUTO**.
4. Click **OK**.

### Configuring iSCSI ports (iSCSI initiators only)

To configure the iSCSI ports:
1. In the Physical devices view, click a controller in the enclosure.

   **Attention:** Be sure to switch to enclosure view first.
2. Right-click **Configure Ethernet port** → **ETH 2 (iscsi)** or **Configure Ethernet port** → **ETH 3 (iscsi)**. The Configure Ethernet port window opens.
3. From the **Link speed** drop-down list, select the port link speed, in megabytes, as described above.
4. From the **Maximum transmission unit** drop-down list, select the MTU packet size, in megabytes; either 1500 MB or 9000 MB.
5. If your network uses dynamic IP addresses, click **DHCP**; then, skip to step 9.
6. In the **IP address** field, enter the iSCSI port's TCP/IP address.
7. In the **Subnet mask** field, enter the TCP/IP number of the device's TCP/IP subnet.
8. (optional) In the **Broadcast address** field, enter the TCP/IP address for sending messages to machines on the network.
9. Click **OK**.

### More information
- Configuring host information

   **Updating controller and enclosure software:** The ROM Update wizard guides you through the process of updating the software for your direct-attached and network-attached storage devices:
- For direct-attached storage devices, the wizard updates the BIOS software for all ServeRAID controllers of the same type on the local and remote systems. You can update only one type of controller at a time.
- For external (network-attached) storage devices, the wizard updates the enclosure and controller software for all controllers in the enclosure (single or dual controller configurations).

Before you can use the ROM update wizard, you must download the latest software images from your vendor's software support site on the World Wide Web. For direct-attachd storage devices, the image upgrade files typically come in sets of two or more and have a `.ufi` file extension. For external storage enclosures, the (single) image upgrade file has a `.upgrade` file extension.

To update the controller software for direct-attached or network-attached storage devices:
1. In the Enterprise view, click  (Direct attached storage object) or  (Networked storage object)
2. Right-click **Update controller images**. The ROM Update wizard opens.
3. Click **Next**.
4. Choose the ROM image update files.

5. Click **Next**; then, select the controllers or enclosures you want to update.
6. Click **Next**; then, review the update summary.
7. Click **Apply**. The ServeRAID Manager applies the software update to the selected controllers or enclosures.
8. Restart the server(s) or enclosures to activate the new ROM image.

 **Recovering storage with fail back:**

**Note:** This action is not supported on enclosures with a single controller configuration.

For enclosures with a dual controller configuration, use this action to restore an array to its preferred owner. When a controller fails in an enclosure (or is intentionally removed), its arrays and logical drives automatically fail over to the other controller. This action moves the arrays and logical drives back to the controller to which they were originally assigned.

**Note:** You cannot use fail back until the failed controller is replaced or repaired.

To fail back storage in an enclosure:

1. In the Enterprise view, click ▦ (enclosure).
2. Right-click **Fail back storage**.
3. Click **Yes** when prompted to confirm the action.

## More information
• Moving an array to a different controller

**Managing Foreign arrays and Alien arrays:**
## Foreign arrays

You can export RAID data and transfer the drives and RAID configuration to another enclosure. When you export an array, it is called a

*foreign array*

. The array icon is grayed out in the Logical devices view. You cannot perform any action on a foreign array, except view array components.

When you physically remove the component drives from the enclosure, the ServeRAID Manager removes the foreign array icon from the console. When you insert the drives in another enclosure, the ServeRAID Manager displays a foreign array icon in the Logical devices view. You must then import the RAID data to complete the transfer. You may then use the array to store and manage data.

## Alien arrays

If the ServeRAID Manager only partially completes the array configuration process, the resulting array is called an

*alien array*

. For example, an alien array might be created if power is interrupted during array creation. You cannot use an alien array to store or manage data. The array icon is

grayed out in the Logical devices view. The only action you can perform on an alien array is to delete it.

## More information

- Exporting an array
- Importing an array
- Deleting an array

**Managing FlashCopy backups:**

**Note:** You cannot use the ServeRAID Manager console create a FlashCopy for an enclosure-based logical device. To create a FlashCopy backup, you must use the command line interface provided with your IBM DS300 or DS400 storage enclosure. Or you can use the `sstool` command provided with the FlashCopy agent.

A FlashCopy backup creates a point-in-time backup of logical drive data. It sets up a link between the source and target logical drives. When data on the source drive changes, the differences are captured on the target drive, maintaining the data as it looked at the time the backup was created. You can use the backup copy of data for tape backup, drive cloning, and multi-server rollout.

Initially, a FlashCopy backup starts at 10% the size of the FlashCopy source. As new data are written to the source drive, the FlashCopy backup grows to the size of FlashCopy source. This is known as the FlashCopy virtual size.

The ServeRAID Manager displays both the virtual size and actual size of a FlashCopy backup, depending on the situation:

Logical drives (2)
▽ 🗄 ld1 - Okay (275 GB)
🗄 snap1 - Okay (275 GB)
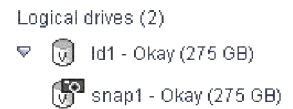
- In the Logical devices view, it displays the virtual size:
- In the Configuration wizard, it displays the actual size of the *first* FlashCopy backup. It displays 0 for all other FlashCopy backups.
- In the logical drive Properties panel, it displays both the virtual size and actual size.

You cannot perform any action on a FlashCopy target. You can only delete a FlashCopy target, using the Delete logical drive action.

## More information

- Deleting a logical drive

**Updating the software license key:** Use this action to enable new features on the specified enclosure. To enable new features, you must obtain a feature key from your ServeRAID Manager sales or support representative.

To update the software license key:

1. In the Enterprise view, click 🖿 (enclosure).
2. Right-click **Enter software key**. The "Enter software key" window opens.
3. In the Feature key field, enter the feature key.
4. Click **OK**. A confirmation window opens.
5. Click **OK** to confirm.

## More information

- Updating enclosure software

*Updating controller and enclosure software:*  The ROM Update wizard guides you through the process of updating the software for your direct-attached and network-attached storage devices:

- For direct-attached storage devices, the wizard updates the BIOS software for all ServeRAID controllers of the same type on the local and remote systems. You can update only one type of controller at a time.
- For external (network-attached) storage devices, the wizard updates the enclosure and controller software for all controllers in the enclosure (single or dual controller configurations).

Before you can use the ROM update wizard, you must download the latest software images from your vendor's software support site on the World Wide Web. For direct-attachd storage devices, the image upgrade files typically come in sets of two or more and have a `.ufi` file extension. For external storage enclosures, the (single) image upgrade file has a `.upgrade` file extension.

To update the controller software for direct-attached or network-attached storage devices:

1. In the Enterprise view, click ![icon] (Direct attached storage object) or ![icon] (Networked storage object)
2. Right-click **Update controller images**. The ROM Update wizard opens.
3. Click **Next**.
4. Choose the ROM image update files.
5. Click **Next**; then, select the controllers or enclosures you want to update.
6. Click **Next**; then, review the update summary.
7. Click **Apply**. The ServeRAID Manager applies the software update to the selected controllers or enclosures.
8. Restart the server(s) or enclosures to activate the new ROM image.

# Adding a remote system

**Note:** This action is not supported when using the following:
- ServeRAID Manager in bootable-CD mode
- ServeRAID Manager as a plug-in application

Use this action to connect to a remote system or management station and add it to the Enterprise view.

**Tip:** Before adding a remote system, verify that the system is running the required software. To add a remote system with direct-attached storage, the ServeRAID Manager must be running on that system. To add a management station with a network-attached storage enclosure, the ServeRAID Manager management station software must be running on that system.

1. From the Remote menu, select **Remote** → **Add** or click ![icon] (Add) on the toolbar. The Add managed system window opens.
2. From the Type drop-down list, select:
   - **Managed System**, to add a remote system with direct-attached storage

- **Management Station**, to add a remote management station with a network-attached storage enclosure
3. Type the remote host name or TCP/IP address.
4. (Managed system only) Type the remote system startup port number. The default port number is 34571.
5. Type your user name and password.

   **Note:** The password is case sensitive.
6. If you want to save the user name and password, select the **Save user name/Password** box. Once you successfully connect to the remote system, the ServeRAID Manager stores this information in a file along with the host name so you do not have to type your user name and password every time you run the ServeRAID Manager.
7. Click **Connect**.

### More information
- Failing to add a remote system
- Successfully adding a remote system
- Specifying remote access settings
- Removing a remote system

## Viewing the ServeRAID Manager event log

**Note:** This action is not supported in bootable-CD mode.

Use this action to view events in the ServeRAID Manager agent event log.
1. From the Actions menu, click **Agent actions** › **View agent event log**. The Agent event log window opens.
2. If you want to save the event log to a file, click **File** › **Save As**. The default is Events.txt.
3. Click **File** › **Close** to close event log window.

### More information
- Configuring the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent general settings
- Using the ServeRAID Manager agent

## Using the ServeRAID Manager agent

### Starting the ServeRAID Manager agent

The ServeRAID Manager agent is a monitoring agent for ServeRAID controllers that uses less memory than the ServeRAID Manager graphical user interface (that is, the console). You can manage and configure a server running the agent through a ServeRAID Manager console running on another system.

**Note:** If the system administrator chose during installation to start the agent as a background service (daemon), the agent is already running. Verify that the agent is not running before performing this procedure.

Use the following procedure to start the ServeRAID Manager agent on your system.

### Windows

On Windows systems, the ServeRAID Manager agent is installed as a background service. It starts automatically when the system is started. To start the agent manually, use the Windows Administrative tools. See Verifying that the agent is running.

### OS/2

To start the ServeRAID Manager agent on a Windows or OS/2 system:

1. Change to the directory where you installed the ServeRAID Manager program by typing:

   cd \RaidMan
2. Press Enter.
3. Type the following:

   RaidAgnt
4. Press Enter.

### NetWare

To start the ServeRAID Manager agent on NetWare:

1. From the NetWare console, type the following:

   LOAD RaidAgnt
2. Press Enter.

### OpenServer, UnixWare, and Open UNIX

To start the ServeRAID Manager agent on OpenServer, UnixWare, and Open UNIX:

1. Change to the directory where you installed the ServeRAID Manager program by typing one of the following:

| | |
|---|---|
| **For OpenServer** | cd /opt/RaidMan |
| **For UnixWare or Open UNIX** | cd /opt/RaidMan |

2. Press Enter.
3. Type the following:

   sh RaidAgnt.sh
4. Press Enter.

### Linux

On Linux systems, the ServeRAID Manager agent runs as a background process (daemon). It starts automatically when the system is started. It is loaded from the following location:

/etc/init.d/raid_agent

### More information
- Using the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent

- Verifying that the ServeRAID Manager agent is running

## Viewing the ServeRAID Manager event log

**Note:** This action is not supported in bootable-CD mode.

Use this action to view events in the ServeRAID Manager agent event log.

1. From the Actions menu, click **Agent actions** ֲ **View agent event log**. The Agent event log window opens.
2. If you want to save the event log to a file, click **File** ֲ **Save As**. The default is Events.txt.
3. Click **File** ֲ **Close** to close event log window.

### More information

- Configuring the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent general settings
- Using the ServeRAID Manager agent

### Receiving events from a removed system

When a remote system is in the Enterprise view, you always receive events that occur on that remote system. With the Remove remote system action, you can choose between "Continue to receive events from remote system" or "Do not continue to receive events from remote system." If you choose the first option, you can monitor for problems on remote systems without having the system in your Enterprise view.

The default is to continue receiving events.

If you choose **not** to continue receiving events, the ServeRAID Manager on your local system must connect to the remote system. If the ServeRAID Manager successfully connects, it removes your local system from the remote system notification list. Because the notification list determines what systems receive events from that remote system, your local system stops receiving events.

If the ServeRAID Manager cannot connect to the remote system and is therefore unable to remove your system from the notification list, another window opens asking if you want to remove the system from the Enterprise view even though you will continue receiving events.

- If you click **Yes**, the ServeRAID Manager removes the remote system from the Enterprise view tree and you continue receiving events.
- If you click **No**, the remote system remains in the Enterprise view tree and you continue receiving events. You can reattempt removing your system from the notification list at a later time.

### Event viewer description of events

The event viewer description of events can inform you of the following:

- A rebuild is started
- A configuration is applied
- A failed drive is detected
- Other potential problems that might occur to your managed systems.

Events for remote systems display in the event viewer when the following occurs:

1. Your local system is defined in a remote system's notification list.

2. You have added the remote system to your Enterprise view using " Add remote system."

**More information**

- Using the ServeRAID Manager interface > Event viewer
- Using the Notification Manager

# Configuring the ServeRAID Manager agent

You can configure the ServeRAID Manager agent port number and alarm. You can also configure the ServeRAID Manager agent to log events to the operating system event log. To configure the agent, edit the file RaidAgnt.pps or adjust the General settings in the ServeRAID Manager agent console. RaidAgnt.pps is located in the same directory where you installed the ServeRAID Manager. If the RaidAgnt.pps file does not exist when you start the ServeRAID Manager agent, a new file is created with the default settings.

**Note:**

1. The RaidAgnt.pps file is preserved during a ServeRAID Manager upgrade.
2. If you change settings while the ServeRAID Manager agent is running, you must stop and restart the agent to make the changes take effect.
3. The ServeRAID Manager agent alarm is not supported by the ServeRAID Manager in bootable-CD mode.

## Configuring the port number

The default port number for the ServeRAID Manager agent and console (client) is 34571. To change the port number, edit the following line in the file RaidAgnt.pps:

**agent.startupPortNum**=34571

For accessing remote systems, the ServeRAID Manager uses four consecutive ports starting from the startup port: 34571, 34572, 34573, and 34574. If your system has a conflict with these ports, change the startup port to a different port number.

## Configuring the alarm

When the ServeRAID Manager agent is started, it reads the alarm settings. When a critical or fatal event occurs in the RAID subsystem, the ServeRAID Manager agent triggers its alarm, if enabled. The alarm continues at the specified interval until you either:

- Correct all the critical and fatal problems (if agent.auto.off.alarm is set to true).
- Delete the file alarm.on. This file is located in the same directory where you installed the ServeRAID Manager. When you delete this file, the alarm stops until the next critical or fatal event occurs. The alarm.on file is automatically created each time the alarm starts.

You can configure the following alarm settings:

- **agent.enable.alarm** Specifies whether the agent alarm is enabled or disabled. Set this value to true to enable the alarm or false to disable the alarm. The default value is false.
- **agent.interval.alarm** Specifies the interval (in seconds) between audible alarms. The default is 300 seconds (5 minutes).

- **agent.auto.off.alarm** Specifies whether the alarm should turn off automatically when no more problems are detected. Set this value to true to cause the alarm to turn off automatically, or false to manually turn the alarm off. If you set this value to false, you must delete the file alarm.on to turn off the alarm. The default is true.

### Configuring event logging

The ServeRAID Manager agent logs warning and fatal events to the operating system event log. You can view the event log from the ServeRAID Manager console. For Windows systems, you can also view the event log with the Windows Event Viewer. For Unix systems, events are logged according to the /etc/syslog.conf settings. (For more information, see the syslogd(8) man page.)

You can enable and disable event logging by editing the following line in the file RaidAgnt.pps. Set the value to true to enable event logging (the default) or false to disable event logging.

**agent.enable.logEventsWithOS** = true

#### More information
- Using the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent general settings
- Configuring NetWare user authentication
- Verifying that the ServeRAID Manager agent is running
- Starting the ServeRAID Manager agent
- Specifying remote access settings
- Viewing the ServeRAID Manager agent event log

## Configuring the ServeRAID Manager agent > general settings

**Note:** This action is not supported in bootable-CD mode.

Use this action to configure The ServeRAID Manager agent general settings, including the base port for the agent and console. The agent can log events to the operating system event log, sound an alarm when an event occurs, and broadcast events to users. If you enable event broadcasting, agents on Windows machines will display pop-up alert dialogs when events occur. On Linux machines, a message will be broadcast to all connected console processes using the 'wall' command.

You can adjust the agent general settings with the following steps:
1. In the "ServeRAID Manager Agent" window, click the **General settings** tab.
2. In the Agent base port number field, enter the port number for the ServeRAID Manager agent and console. The default port is 34571.

   **Note:** For accessing remote systems, the ServeRAID Manager uses four consecutive ports starting from the base port: 34571, 34572, 34573, and 34574. If your system has a conflict with these ports, change the base port to a different port number.
3. To log events to the operating system event log, click **Save events in OS event log**.

   **Note:** You can use the View agent event log option to view the event log. You can also use operating system administration tools to view the event log.

4. To broadcast events to users, click **Broadcast events to logged-in users**.

5. Select the check box to enable or disable the alarm. When a critical or fatal event occurs in the RAID subsystem, the ServeRAID Manager agent triggers an alarm, if enabled.

6. If you enabled the alarm, adjust the length of time (in seconds) between alarms. The default is 300 seconds (5 minutes).

7. Click **Save changes**.

8. Restart the ServeRAID Manager for the settings to take effect.

**Note:** To load settings from the ServeRAID Manager agent configuration file, click Refresh from agent . Use this option if you change settings in the configuration file while the agent is running. If you change the port number, you must stop and restart the agent for the change to take effect.

### More information

- Configuring the ServeRAID Manager agent
- Starting the ServeRAID Manager agent
- Verifying that the ServeRAID Manager agent is running
- Viewing the ServeRAID Manager agent event log

## Using the ServeRAID Manager agent

The ServeRAID Manager agent includes the following components:

- Notification Manager
- Email Notification Manager
- Task Manager
- General settings

Because the agent runs as a background process, it uses less memory resources than the ServeRAID Manager console. However, the ServeRAID Manager agent is useful in the following situations:

- The agent can relay events to any ServeRAID Manager console installed on the local system or on a remote system. As events occur, the agent sends the events to each remote system. Use the Notification Manager from the agent console to add systems to the agent destination list.
- The agent can notify users by email when events occur on the local system. Use the Email Notification Manager to add recipients to the email notification list.
- The agent can run maintenance tasks on a regular basis, such as a logical drive migration or synchronization. Use the Task Manager to manage scheduled tasks.
- The agent can log events to the operating system event log, sound an alarm when an event occurs, and broadcast critical or fatal events to users. Use the General settings from the agent console to configure these settings.

  **Note:** ServeRAID Manager also logs events to a log file. Each component of the agent (except for the Task Manager) has its own log file.

The ServeRAID Manager agent monitors and generates events for critical or fatal problems in the ServeRAID Manager configuration every 5 seconds. These changes include, but are not limited to:

- defunct drives
- PFA drives
- Failed battery

- Offline or critical logical drives
- Failed controllers
- Enclosure problems
- Non-warranted drives. An event is sent at startup, console connection, and every 30 days

### More information
- Configuring the ServeRAID Manager agent
- Configuring the ServeRAID Manager agent general settings
- Starting the ServeRAID Manager agent
- Verifying that the ServeRAID Manager agent is running
- Using the Notification Manager
- Using the Email Notification Manager
- Using the Task Manager
- Viewing the ServeRAID Manager agent event log (action)

# Using Security Manager

## Security Manager menu bar

The Security Manager menu bar has the following functions:

**File** →

    **Close**   Closes the Security Manager.

**View** →

    **Toolbar**
          Turns the toolbar on and off. The default is on (that is, selected).

**Actions** →

     **Add user**

     **Delete user**

     **Modify user**

**Help** →

     **Information about this window**
          View context-sensitive information for the current window.

    **Search**
          Searches for one or more specified words in ServeRAID Manager Assist and displays a list of topics that include the words.

    **Contents**
          Presents the ServeRAID Manager Assist contents. You can use the contents to acquaint yourself with ServeRAID Manager Assist topics.

    **About ServeRAID Manager**
          Reports the ServeRAID Manager version number, copyright, and legal information.

## Security Manager toolbar

The Security Manager toolbar has the following functions:

 Add user

 Delete user

 Modify user

 **Information about this window** View context-sensitive information for the current window.

## Adding a user in the Security Manager

Use this action to permit a user access to the management station.

1. Click  (Add user). The "Add user" window opens.
2.

   Fill in all the entry fields for the user you want to add. **User name**, **Password**, and **Confirm password** are required fields.

   **Note:** The password is case sensitive.
   .
3. Click **Add**.

### More information
- Using the Security Manager
- Deleting a user in the Security Manager
- Modifying a user in the Security Manager

## Deleting a user in the Security Manager

Use this action to revoke access to the management stations for a selected user.

1. Click the user that you want to delete from the security list.
2. Click  (Delete user).
3. Click **Yes** to confirm. The ServeRAID Manager deletes the user from the security list.

### More information
- Using the Security Manager
- Adding a user in the Security Manager
- Modifying a user in the Security Manager

## Modifying a user in the Security Manager

Use this action to modify a user's password.

1. Click the user you want to modify in the security list.
2. Click  (Modify user). The "User properties" window opens.
3. Enter a new password; then, enter it again to confirm.
4. Click **Modify**.

**More information**
- Using the Security Manager
- Adding a user in the Security Manager
- Deleting a user in the Security Manager

# Using SNMP Trap Manager

## SNMP Trap Manager menu bar

The SNMP Trap Manager menu bar has the following functions:

**File** →

    **Close**   Closes the SNMP Trap Manager.

**View** →

    **Toolbar**
           Turns the toolbar on and off. The default is on (selected).

**Actions** →

     **Add system**

     **Delete system**

     **Modify system**

    **Send test trap**

**Help** →

     **Information about this window**
           View context-sensitive information for the current window.

    **Search**
           Searches for one or more specified words in ServeRAID Manager
           Assist and displays a list of topics that include the words.

    **Contents**
           Presents the ServeRAID Manager Assist contents. You can use the
           contents to acquaint yourself with ServeRAID Manager Assist topics.

    **About ServeRAID Manager**
           Reports the ServeRAID Manager version number, copyright, and legal
           information.

## SNMP Trap Manager toolbar

The SNMP Trap Manager toolbar has the following functions:

 Add system

 Delete system

 Modify system

 **Information about this window** View context-sensitive information for the current window.

## Adding a system in the SNMP Trap Manager

Use this action to add a system to the SNMP traps list. You can add *one* system only, such as an administrator's workstation. The system is notified of the traps that occur on the enclosures attached to the management station.

1. Click  (Add system). The "Add system" window opens.
2. Type the host name or TCP/IP address of the system you want to add.
3. Type the remote system SNMP trap port number. The default port is 162.
4. Type the Community for the system.
5. From the Version drop-down list, select the SNMP version number. The default is SNMPv1.
6. Select the type of events you want to be notified of: error, warning, or informational.
7. Click **Add**.

### More information
- Using the SNMP Trap Manager
- Deleting a system from the SNMP traps list
- Modifying system properties in the SNMP traps list
- Sending a test trap to a system in the SNMP traps list

## Deleting a system in the SNMP Trap Manager

Use this action to delete a system from the SNMP traps list. After deleting the remote system, the SNMP Trap Manager no longer notifies the remote system of traps occurring on the enclosures connected to the management station.

1. In the SNMP traps list, click the system you want to delete.
2. Click  (Delete system).
3. Click **Yes** to confirm. The SMNP Trap Manager deletes the system from the SNMP traps list.

### More information
- Using the SNMP Trap Manager
- Adding a system to the SNMP traps list
- Modifying system properties in the SNMP traps list
- Sending a test trap to a system in the SNMP traps list

## Modifying a system in the SNMP Trap Manager

Use this action to modify system properties in the SNMP trap list, such as the host name, TCP/IP address, or port number.

1. In the SNMP traps list, click the system that you want to modify.
2. Click  (Modify system). The "System properties" window opens.
3. Change the system properties in the appropriate fields.
4. Click **Modify**.

**More information**
- Using the SNMP Trap Manager
- Adding a system to the SNMP traps list
- Deleting a system from the SNMP traps list
- Sending a test trap to a system in the SNMP traps list

## Managing software and firmware

### Confirming your software update

Use the software update summary to review all the changes that the ServeRAID Manager will apply to your controllers or enclosures:

1.
    Review the information displayed in the "Update summary" window.
2. When you are ready to continue, click **Apply**; then, click **Yes** when asked if you want to apply the software update.
3. When the update is complete, click **OK**.
4. Restart your server(s) or enclosures to activate the new software.

### Changing BIOS-compatibility mapping

**Note:**

1. This action is supported in bootable-CD mode only.
2. This action is not supported on the integrated RAID controller.

Use this action to change BIOS-compatibility mapping. **Extended** indicates 8 GB Extended; **Limited** indicates 2 GB Limited.

The ServeRAID controller allows the migration of drives from the PCI RAID Adapter or Streaming RAID Adapter/A configurations. Using "Change BIOS-compatibility mapping," you can set your ServeRAID controller to be compatible with these older drive configurations by selecting either 2 GB or 8 GB mapping. The default is 8 GB.

1. In the Enterprise view, click (controller).
2. Right-click either **Change BIOS-compatibility mapping** → **Extended** either or **Change BIOS-compatibility mapping** → **Limited**.
3. Click **Yes** to confirm the setting.

### Updating BIOS and firmware code

Before configuring the controller, you must have the latest BIOS and firmware code installed on your server. Complete the following steps to update the levels of BIOS and firmware code:

1. Insert the *IBM ServeRAID Support* CD into the server CD-ROM drive, and turn on the server.

   The ROM Update Wizard automatically starts. The ROM (read-only memory) Update Wizard is a program that updates the BIOS and firmware code on your ServeRAID controllers. The wizard automatically identifies and scans each controller.

   If the BIOS and firmware code do not require updating, the wizard automatically stops and the ServeRAID Manager program starts. Use the ServeRAID Manager program to continue with configuring the controller.

If the BIOS and firmware code require updating, a report screen opens with the following information:
- Controller types found.
- Controller slot number, if known.
- Firmware version.
- BIOS version.
- Update status. If a controller has outdated BIOS or firmware code, the ROM Update Wizard marks the controller as a candidate for update.

The ROM Update Wizard asks if you want to update. You decide whether to update, but you must update all or none of the controllers in your server; you cannot selectively update.

2. If you want to update your controllers, click **Update**. If the wizard detects an error, an error message appears and you are prompted to insert a diskette into your diskette drive. The wizard saves details about the error to a file on the diskette.

If you do not want to update your controllers, click **Cancel**.

3. When all updates are completed, scroll through the Features window. This window reports the changes that the ROM Update Wizard applied to your controllers.

4. Leave the  *ServeRAID Manager Support* CD in the CD-ROM drive; shut down and restart the server.

## Selecting ROM update images

To select ROM update image files:

1. Click [ **Add** ] ; then, select the software image files from the file system.

   **Note:** To remove an image from the file list, select the file, then click [ **Remove** ] .

2. When you are ready to continue, click **Next**; the ″ Select controller″ window opens.

# Chapter 5. Troubleshooting ServeRAID Manager

## Could not copy the configuration from the drives: controller [number]

### Explanation:

- There is no configuration on any of the physical drives that are attached to the controller.
- There are no physical drives attached to the controller.
- The controller does not support one or more features of the drive configuration.

### Action:

If you have physical drives attached to the controller and the physical drives contain a valid controller configuration, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, the configuration data has been lost. Reconfigure the controller using the ServeRAID Manager.

## Could not restore the configuration to the factory-default settings: controller [number]

### Explanation:

The ServeRAID Manager could not restore the factory-default settings because of one of the following:

- Your configuration contains a large number of drives (10 or more).
- A hardware error occurred.

### Action:

- If your configuration contains a large number of drives and all the logical drives were deleted, ignore this error. If all the logical drives were not deleted, follow the actions listed for the following list item.
- If your configuration does **not** contain a large number of drives:
  1. Verify that the controller, cables, and physical drives are installed properly.
  2. Retry the command.
  3. If the command still fails, restart the server and retry the command.

If the problem persists, complete the following steps:

1. Disconnect all the SCSI cables from controller.
2. Restore to the factory-default settings. If this does not work, contact your service representative.
3. Connect the SCSI cables to the controller.
4. If step 2 was successful, restore to the factory-default settings.

# Could not unblock logical drive [number]: controller [number]

### Explanation:

The specified logical drive could not be unblocked because of one of the following:

- The rebuild operation was not completed successfully.
- A hardware error occurred.

### Action:

Verify that the rebuild operation was completed successfully. If it did, then complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. 

   If the problem persists, contact your service representative.

# Could not create a hot-spare drive: controller [number], < drive location> Could not create a standby hot-spare drive: controller [number], < drive location>

### Explanation:

The hot-spare drive or standby hot-spare drive could not be defined because a hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Could not delete array: controller [number], array [letter]

### Explanation:

The array could not be deleted because a hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not delete all of the arrays: controller [number]

### Explanation:

A hardware error occurred.

### Action:

Delete the arrays by using Restore to factory-default settings.

If the problem persists, contact your service representative.

# Could not delete logical drive: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Logical drive was not initialized: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Verify that the specified logical drive is not offline. If the logical drive **is** offline, replace the failed physical drives and restore the data from tape backup.

If the specified logical drive is **not** offline, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, contact your service representative.

# Could not start the logical drive synchronization: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

**Action:**

Verify that the specified logical drive is not offline or critical (that is, one physical drive that is offline in a RAID level-1, 1E, 5, 5E, 10, 1E0, or 50 logical drive). If the logical drive **is** critical, replace the failed physical drive. If the logical drive **is** offline, replace the failed physical drives and restore the data from tape backup.

If the specified logical drive is **not** offline or critical, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, contact your service representative.

# Could not set the drive to online: controller [number], < drive location>

### Explanation:

The specified drive could not be brought online because a hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, replace the specified drive.

# Could not remove the defunct drive: controller [number], < drive location>

### Explanation:

The defunct drive could not be removed because a hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Retry the command.
3. If the command still fails, restart the server and retry the command.

# Could not replace the defunct drive: controller [number], < drive location>

### Explanation:

The defunct drive could not be replaced because a hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.

3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Could not delete the hot-spare drive: controller [number], < drive location> Could not delete the standby hot-spare drive: controller [number], < drive location>

### Explanation:

The hot-spare drive or standby hot-spare drive could not be deleted because a hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, replace the specified drive.

# Could not set the merge-group number: controller [number], logical drive [number]

### Explanation:

The specified merge-group number could not be set because a hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5.
   If the problem persists, contact your service representative.

# Could not blink the device lights

### Explanation:

The device lights could not flash because of one of the following:
- The physical drives are not managed by an enclosure.
- A hardware error occurred.

### Action:

Verify that the device is managed by an enclosure (SAF-TE) device on the SCSI drive channel. If it is, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.

3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. 

   If the problem persists, contact your service representative.

# The battery-backup cache device needs a new battery: controller [number]

### Explanation:

The battery and battery-backup cache are malfunctioning because of one of the following:
- The battery and battery-backup cache device are installed improperly.
- The battery is low, and the battery-backup cache device must be replaced.

### Action:

Verify that the battery and battery-backup cache device are installed properly. If they are installed properly, contact your service representative.

# The battery-backup cache device is defective: controller [number]

### Explanation:

The battery-backup cache device is installed improperly or is defective.

### Action:

1. Verify that the battery-backup cache device is installed properly.
2. If the battery-backup cache device **is** installed properly but is defective, contact your service representative.

# Background polling commands are not responding: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the drives.
3. Restart the server.
4. 

   If the problem persists, contact your service representative.

# Commands are not responding: controller [number]

### Explanation:

- If the controller status displays "Not responding," a hardware error occurred.
- If the controller status displays "Bad configuration," a configuration error occurred.

**Action:**

- If the controller status displays "Not responding," complete the following steps:

  1. Verify that the controller, cables, and physical drives are installed properly.
  2. Verify that there is power to the physical drives.
  3. Restart the server.

  If the problem persists, contact your service representative.

- If the controller status displays "Bad configuration," complete the following steps:

  1. In the Enterprise view, click the specified ![icon] (controller).
  2. If the controller is *not* configured, click **Actions → Restore to factory-default settings**. If the controller *is* configured, click **Actions → Copy configuration from drives**. If "Copy configuration from drives" does not correct the problem, click **Actions → Restore to factory-default settings**; then, recreate the configuration using the ServeRAID Manager.

# Rebuild failed: controller [number], logical drive [number]

## Explanation:

A hardware error occurred.

## Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. If the command still fails, restart the server and retry the command.
4. If the problem persists, replace the specified drive.

# Synchronization failed: controller [number], logical drive [number]

## Explanation:

A hardware error occurred.

## Action:

Verify that the specified logical drive is not offline or critical (that is, one physical drive that is offline in a RAID level-1, 1E, 5, 5E, 10, 1E0, or 50 logical drive). If the logical drive **is** critical, replace the failed physical drive. If the logical drive **is** offline, replace the failed physical drives and restore the data from tape backup.

If the specified logical drive is **not** offline or critical, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, contact your service representative.

# Migration [logical-drive migration type] failed: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Determine if one or more physical drives that are part of the specified logical drive have failed. If such a failure has occurred, restore the data from a tape backup. Otherwise, do the following:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Compression failed: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Determine if one or more physical drives that are part of the specified logical drive have failed. If such a failure has occurred, restore the data from a tape backup. Otherwise, do the following:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Decompression failed: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Determine if one or more physical drives that are part of the specified logical drive have failed. If such a failure has occurred, restore the data from a tape backup. Otherwise, do the following:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# defunct drive: controller [number], < drive location>

### Explanation:

A hardware error occurred.

### Action:
- If the specified physical drive is part of an array, refer to the event pertaining to the logical drives in that array for additional information.
- If the specified physical drive is **not** part of an array, contact your service representative.

# PFA detected for drive: controller [number], < drive location>

### Explanation:

The physical drive is going to fail.

### Action:

Contact your service representative.

# Logical drive is offline: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Contact your service representative.

# Logical drive is critical: controller [number], logical drive [number]

### Explanation:

A physical drive is defunct in the specified logical drive. The data on this logical drive is at risk. If another physical drive fails, the data might be lost.

### Action:
- If a rebuild operation is in progress, wait until the rebuild is complete.
- If a rebuild operation is **not** in progress, replace the failed physical drive with a new physical drive. After the physical drive is replaced, a rebuild operation will start automatically. Refer to the troubleshooting chapter of the *IBM ServeRAID User's Reference.* .

# Logical drive is blocked: controller [number], controller [number] [number]

### Explanation:

When the ServeRAID controller performs a rebuild operation on an array, it reconstructs the data that was stored in RAID level-1 and RAID level-5 logical drives. However, the ServeRAID controller cannot reconstruct the data that was

stored in any RAID level-0 logical drives in that array. The data in the RAID level-0 logical drives is blocked when the ServeRAID controller detects that the array is valid, but the data might be damaged.

### Action:

Restore the data from tape.

# Could not communicate with controller: controller [number]

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. 
   If the problem persists, contact your service representative.

# User name or password is not valid

### Explanation:

An incorrect or undefined user name or password was typed.

### Action:
- Verify that you specified a valid user name and password for the remote system. Passwords are case sensitive.
- If you do not require security, you can disable security on the remote system. In this case, a user name and password are not required to access the system remotely.

# ServeRAID Manager failed to start at port number [number]

### Explanation:

The ServeRAID Manager was unable to use the specified port number on the local system. Another session of the ServeRAID Manager or another application is currently using the port.

### Action:

Change the port number for the system by doing the following:
1. Click **Agent actions** ⟶ Configure.
2. Click the **General settings** tab.
3. In the Agent base port number field, type a new value for the port number. The default port number for local access is 34571. **Note:** When changing the port number, consider the following:
   - This change does not take effect until you restart the ServeRAID Manager.

- Any system that is accessing this system remotely must have the port number changed to match the value you type. On the remote system, you can change this value in the " Add remote system" window.
- Any system that contains this system in its Notification list must change the port number to the new port number. On the remote system, you can change the port number in the Notification Manager by clicking **Modify system**.

# No controllers were found in this system.

### Explanation:

The ServeRAID Manager did not detect any controllers in the system.

### Action:

If you know there are controllers in the system, the ServeRAID Manager might not identify the controllers because of the following:

- The device driver is not loaded.
- (Linux, UnixWare, and OpenServer only) You are not running the ServeRAID Manager as "root." The ServeRAID Manager cannot access the device driver unless it is run with root authority. Without access to the device driver, the ServeRAID Manager cannot identify any controllers.

If the problem persists, contact your service representative.

# Host name [ID] is unknown or the network is down

### Explanation:

The ServeRAID Manager could not access the remote system.

### Action:

Verify the following:
1. The remote system is on.
2. Both the local and remote systems are connected to the network.
3. TCP/IP networking support is configured on both the local and remote systems.
4. The network is functioning. Verify that you can ping the remote system.

# Failed to connect to host name [ID] due to incompatible versions [Local=number Remote=number]

### Explanation:

The local and remote versions of the ServeRAID Manager are incompatible versions.

### Action:

Upgrade the older version of the ServeRAID Manager to the newer version.

# Unable to connect to the remote system

### Explanation:

The ServeRAID Manager could not communicate with the ServeRAID Manager agent on the remote system.

### Action:

1. Verify that the ServeRAID Manager agent or console is running on the remote system.
2. Verify that the port number specified for the remote system in the ″ Add remote system″ window matches the value on the remote system. You can verify the port number on the remote system by going to the ServeRAID Manager running on that system and doing the following:
   a. Click **Agent actions** → **Configure**.
   b. Click the **General settings** tab.
   c. Verify the value for the port number. The default port numbers for remote access are 34571-34574.
3. Verify the following:
   a. The remote system is on.
   b. Both the local and remote systems are connected to the network.
   c. TCP/IP networking support is configured on both the local and remote systems.
   d. The host name of the remote system is defined in the Domain Name Server or a Hosts file, if you are trying to connect using a host name.
   e. The network is functioning.

# Array [letter] storage space still available.

### Explanation:

You have configured an array that still contains free space.

### Action:

Before you apply this configuration, you can do either of the following:
- Increase the size of the new logical drives.
- If there is enough free space, create more logical drives in this array by returning to the ″Configure logical drive″ window in the Configuration wizard.

# Physical drives in array [letter] contain unusable space

### Explanation:

You have configured an array using physical drives of different sizes. If you configure an array using physical drives of different sizes, you cannot use all the physical drive space.

### Action:

To create optimal array configurations, include only physical drives of the same size in any one array.

## Hot spare is too small for use by at least one array.

### None of the logical drives in the specified array support hot-spare drives.

### At least one array is too large to use the hot spare drive [number]. Replace the specified drive with a larger drive.

### Explanation:

This hot-spare drive will not work for any defined array because of one of the following:

- None of the existing array support hot-spare drives.
- The hot-spare drive must have the same capacity as or larger capacity than the smallest physical drive in the array.
- If any of the physical drives in your arrays fail, the specified hot-spare drive cannot replace the failed drive.

### Action:

Remove the specified hot-spare drive and add a drive of the appropriate size.

## Could not start logical drive migration: controller [number] logical drive [number]

### Explanation:

The logical-drive migration could not start because of one of the following:

- A rebuild, synchronization, or migration operation is currently in progress on the specified controller.
- A hardware error occurred.

### Action:

Verify that there is no rebuild, synchronization, or migration operation currently in progress on this controller. If you see a progress indicator in the status bar or

![icon] (in animation) in the Logical devices view, one of these operations is in progress and you must wait for the operation to be completed. Otherwise, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not enable the hot-swap rebuild operation: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5.
   If the problem persists, contact your service representative.

## Could not create logical drive: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Verify that none of the physical drives are defunct.
4. Retry the command.
5. If the command still fails, restart the server and retry the command.
6.
   If the problem persists, contact your service representative.

## Logical drive was not initialized: controller [number], logical drive [number]

### Explanation:

The logical drive has not been initialized.

### Action:

Do not store data on this logical drive until you initialize the logical drive. Initialize the logical drive by doing the following:

1. In the Logical devices view, click the specified logical drive.
2. Click **Actions** → **Initialize**; or, for the ServeRAID-7t or ServeRAID-8i controller, click, **Actions** → **Clear**.

## Logical drive must be synchronized: controller [number], logical drive [number]

### Explanation:

You must synchronize the specified logical drive before storing data on it.

### Action:

Synchronize the logical drive by doing the following:

1. In the Logical devices view, click the specified logical drive.

2. Click **Actions** → **Synchronize**.

# [Number] ready drives still available.

### Explanation:

You have ready drives still available for configuration.

### Action:

You can configure these drives as new arrays, add them to other new arrays, or define them as hot-spare drives.

# Cannot communicate with the remote system

### Explanation:
1. The local ServeRAID Manager has lost communication with the ServeRAID Manager on the remote system.
2. The local ServeRAID Manager has lost communication with the server on which it is installed. The ServeRAID Manager agent might fail leaving the ServeRAID Manager console available, but unable to communicate with the server.

### Action:

For explanation 1, use the following actions:
- If the ServeRAID Manager is running in network mode, use the following actions:
  1. Verify that the ServeRAID Manager agent or console is running on the remote system.
  2. Verify that the port number specified for the remote system in the ″ Add remote system″ window matches the value on the remote system. You can verify the port number on the remote system by going to the ServeRAID Manager running on that system and doing the following:
     a. Click **Agent actions** → **Configure ServeRAID Manager agent**.
     b. Click the **General settings** tab.
     c. Verify the value for the port number. The default port numbers for remote access are 34571-34574.
  3. Verify the following:
     a. The remote system is on.
     b. Both the local and remote systems are connected to the network.
     c. TCP/IP networking support is configured on both the local and remote systems.
     d. The host name of the remote system is defined in the Domain Name Server or a Hosts file, if you are trying to connect using a host name.
     e. The network is functioning.
- If the ServeRAID Manager is running as a plug-in to another program, use the following actions:
  1. If the connection fails but has worked before, re-initiate the ServeRAID Manager task by closing the current ServeRAID Manager window and then dragging the RAID task icon onto the appropriate system.
  2. If the connection fails and has **not** worked before, verify the following:

a. The remote system is on.

b. The program using the ServeRAID Manager agent as a plug-in is installed on the remote system.

c. Both the local and remote systems are connected to the network.

d. TCP/IP networking support is configured on both the local and remote systems.

e. The network is functioning.

**Note:**

a. If you install a program that uses the ServeRAID Manager, the ServeRAID Manager agent is installed also. The ServeRAID Manager agent is started automatically by the program using it.

b. When using the ServeRAID Manager agent as a plug-in to another program, the ServeRAID Manager does not recognize port numbers.

For explanation 2, use the following actions:

1. Verify that the ServeRAID Manager agent or console is running on the local system. View processes or services to verify that the agent is running.

2. Restart the ServeRAID Manager console.

3. Verify that TCP/IP networking support is configured on the local system.

4. Verify that the network is functioning.

5. Restart the server.

# Error getting controller configuration.

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.

2. Verify that there is power to the physical drives.

3. Retry the command.

4. If the command still fails, restart the server and retry the command.

If the problem persists, complete the following steps:

1. Restore to factory-default settings.

2. Recreate the configuration.

# Agent is running in local only mode.

### Explanation:

- If you specified **-l** (that is, minus and a lowercase letter L) as a command-line parameter, the ServeRAID Manager starts in local-only mode. The ServeRAID Manager is not network-enabled. In this mode, you can configure and monitor the local system only. You cannot configure or monitor remote systems. If you added remote systems to your Enterprise view, they are not visible in this mode. They will be visible in the tree when you start the ServeRAID Manager in non-local-only mode.

- If the network is unreachable, the ServeRAID Manager starts in local-only mode. An additional event is displayed in the event viewer indicating that the network is unreachable.
- If the port number is in use on the local system, the ServeRAID Manager starts in local-only mode. An additional event is displayed in the event viewer indicating that the network is unreachable.

### Action:

- If the network is unreachable, check the event viewer for details on any networking errors.
- If the port number is in use, exit from the application using the port number, or specify a different port number. Complete the following steps to specify a different port number:
  1. Click **Agent actions** → **Configure**.
  2. Click the **General settings** tab.
  3. In the Agent base port number field, type a new value for the port number. The default port number for local access is 34571. **Note:** When changing the port number, consider the following:
     - This change does not take effect until you restart the ServeRAID Manager.
     - Any system that is accessing this system remotely must have the port number changed to match the value you type. On the remote system, you can change this value in the ″ Add remote system″ window.
     - Any system that contains this system in its Notification list must change the port number to the new port number. On the remote system, you can change the port number in the Notification Manager by clicking **Modify system**.

## Networking support is not available.

### Explanation:

The network is unreachable.

### Action:

Verify the following:
1. The local system is connected to the network.
2. The TCP/IP networking support is configured.
3. The network is functioning.

## Could not send the event to the system.

### Explanation:

An event could not be sent to the remote system.

### Action:

1. Verify that the ServeRAID Manager is running on the remote system.
2. Verify that the port number specified in the Notification list matches the value for the start-up port number on the remote system.
   - You can verify the port number for this event in the Notification Manager by using the ″ System properties″ window for this system.

- You can verify the port number on the remote system by going to the ServeRAID Manager running on that system and doing the following:
    a. Click **Agent actions** → **Configure**.
    b. Click the **General settings** tab.
    c. Verify the value for the port number.
3. Verify the following:
    a. The remote system is on.
    b. Both the local and remote systems are connected to the network.
    c. TCP/IP networking support is configured on both the local and remote systems.
    d. The network is functioning.
4. Verify that the local and remote systems are using compatible versions of the ServeRAID Manager. If they are not, upgrade to the latest version of the ServeRAID Manager.

# Failed to connect to host name [ID] at port number [number].

### Explanation:

The ServeRAID Manager could not communicate with the ServeRAID Manager client on the remote system.

### Action:

1. Verify that the ServeRAID Manager agent or console is running on the remote system.
2. Verify that the port number specified for the remote system in the ″ Add remote system″ window matches the value on the remote system. You can verify the port number on the remote system by going to the ServeRAID Manager running on that system and doing the following:
    a. Click **Agent actions** → **Configure**.
    b. Click the **General settings** tab.
    c. Verify the value for the port number. The default port numbers for remote access are 34571-34574.
3. Verify the following:
    a. The remote system is on.
    b. Both the local and remote systems are connected to the network.
    c. TCP/IP networking support is configured on both the local and remote systems.
    d. The host name of the remote system is defined in the Domain Name Server or a Hosts file, if you are trying to connect using a host name.
    e. The network is functioning.

**Note:** If the local ServeRAID Manager is trying to connect to a remote system that has multiple network adapters, the local ServeRAID Manager must use a host name to connect to the remote system.

# Failed to connect to host name [ID] due to incompatible versions [Local=id Remote=id].

### Explanation:

The local and remote versions of the ServeRAID Manager are incompatible versions.

### Action:

Upgrade the older version of the ServeRAID Manager to the newer version.

# ServeRAID Manager failed to start at port number [number].

### Explanation:

The ServeRAID Manager was unable to use the specified port number. The port is currently in use.

### Action:

Change the port number for the system by doing the following:

1. Click **Agent actions** → **Configure**.
2. Click the **General settings** tab.
3. In the Agent base port number field, type a new value for the port number. The default port number for local access is 34571. **Note:** When changing the port number, consider the following:
   - This change does not take effect until you restart the ServeRAID Manager.
   - Any system that is accessing this system remotely must have the port number changed to match the value you type. On the remote system, you can change this value in the ″ Add remote system″ window.
   - Any system that contains this system in its Notification list must change the port number to the new port number. On the remote system, you can change the port number in the Notification Manager by clicking **Modify system**.

# Refused connection from [remote system ID].

### Explanation:

Security is enabled on this system, and the ServeRAID Manager received a remote log-in request containing an incorrect user ID or password.

### Action:

The remote system requesting a log-in to this system must specify a valid user ID and password. Be sure the remote system issuing the log-in request specifies a valid user ID and password.

# FlashCopy with backup failed: controller [number], logical drive [number]

### Explanation:

The FlashCopy failed because a hardware error occurred. The specified logical drive might be offline.

### Action:

If the source logical drive is offline, replace the failed physical drives and restore the data from tape backup. If the target logical drive is offline, replace the failed physical drives. FlashCopy will not work when the source or target logical drives are offline.

If the source or target logical drives are *not* offline, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5.

   If the problem persists, contact your service representative.

# Could not import configuration with more than eight drives into a ServeRAID-3L controller.

### Explanation:

The ServeRAID-3L controller does not support more than eight drives in an array when the stripe-unit size is 32 KB or 64 KB.

### Action:

Do **one** of the following:
- Replace the ServeRAID-3L controller with a ServeRAID-3H controller. The configuration stored on the physical drives is supported only on a ServeRAID-3H controller or later hardware. *or*
- Create a new configuration that does not contain more than eight drives in an array with the stripe-unit size being 32 KB or 64 KB.

  **Attention:** ⊙ When creating a new configuration, you will destroy the data currently on the physical drives.

# Could not copy the configuration from the drives: controller [number], < drive location>

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.

3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Possible non-warranted physical drive found: controller [number], < device location>

### Explanation:

The ServeRAID Manager has detected that the specified physical drive might not be a qualified and warranted part.

### Action:

This message is an alert only. The physical drive will continue to function and the ServeRAID Manager will not make any changes or modifications to the configuration.

For further assistance, contact the source from which you obtained the specified physical drive.

# Could not set the host name: controller [number]

### Explanation:

A hardware error occurred.

### Action:

Verify that the cluster partner system is turned off. If it is, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Could not set the partner host name: controller [number]

### Explanation:

A hardware error occurred.

### Action:

Verify that the cluster partner system is turned off. If it is, complete the following steps:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not change the rebuild rate: controller [number], < device location>

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not change the stripe-unit size: controller [number], < device location>

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Could not change the write-cache mode: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:
1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not change the SCSI transfer speed: controller [number], channel [number]

### Explanation:

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not enable unattended mode: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not disable unattended mode: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not enable read cache: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not disable read cache: controller [number]

### Explanation:

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not set the SCSI initiator ID: controller [number]

**Explanation:**

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

**Note:** (Cluster and failover environment only) Verify that the cable from the second system (for clustering) or controller (for failover) is disconnected from the SCSI backplane.

## Could not switch the active and passive controllers.

**Explanation:**

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

## Could not clear the controller event logs for system [number].

**Explanation:**

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not copy the configuration from the non-shared logical drives (merge group [number]): controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Delete the arrays by using Restore to factory-default settings.
2. Set the controller name, the partner controller name, and the SCSI initiator IDs.
3. Retry the command.

If the problem persists, contact your service representative.

# Could not change the BIOS-compatibility mapping to [Extended or Limited]: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Could not change the write-cache mode: controller [number], channel [number], SCSI ID [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, replace the specified drive.

# Enclosure device is not responding: controller [number], channel [number]

### Explanation:

A hardware error occurred.

**Action:**

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Enclosure fan [number] is malfunctioning: controller [number], channel [number]

### Explanation:

A hardware error occurred.

### Action:

Verify that the fan in the enclosure device is installed properly. If it is, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, replace the specified fan.

# Enclosure power supply [number] is malfunctioning: controller [number], channel [number]

### Explanation:

A hardware error occurred.

### Action:

Verify that the power supply in the enclosure device is installed properly. If it is, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, replace the specified power supply.

# Enclosure temperature is out of normal range: controller [number], channel [number]

### Explanation:

A hardware error occurred.

**Action:**

Verify that the fans in the enclosure device are installed properly and working. If they are, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Retry the command.
3. If the command still fails, restart the server and retry the command.
4. If the problem persists, contact your service representative.

# Could not save the event logs: controller [number]

### Explanation:

A hardware error occurred.

### Action:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.
5. If the problem persists, contact your service representative.

# Version mismatch detected: controller [number]

### Explanation:

The version of the BIOS, firmware, and device driver are not compatible.

### Action:

Install a compatible version of the BIOS, firmware, and driver for this controller. You can download the latest version from the

IBM Support Web site

# Compaction failed: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Determine if one or more physical drives that are part of the specified logical drive have failed. If such a failure has occurred, restore the data from a tape backup. Otherwise, do the following:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Expansion failed: controller [number], logical drive [number]

### Explanation:

A hardware error occurred.

### Action:

Determine if one or more physical drives that are part of the specified logical drive have failed. If such a failure has occurred, restore the data from a tape backup. Otherwise, do the following:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

# Battery has exceeded normal operating temperature: battery controller [number]

### Explanation:

Battery temperature has exceeded 50 degrees Celsius.

### Action:

Check operating environment: verify that the controller is installed properly, that the server has adequate ventilation, and so on. If the problem persists, the battery may be bad or the server may have a problem. Contact your service representative.

# Network connection was not found and/or host name was not resolved.

### Explanation:

The ServeRAID Manager could not communicate with the network or establish a network connection.

### Action:

- If your workstation is not connected to the network, change your workstation name to "localhost" or add an entry for your workstation to your local host file.
- If your workstation is connected to the network, make sure that your host name is resolvable over DNS; for more information, contact your network administrator.

# One or more logical drives contain a bad stripe: controller [number], logical drive [number]

### Explanation:

The Bad Stripe Table (BST) provides a means of recovering most data on a logical drive after multiple hardware errors prevent access to a logical drive stripe. An entry in the BST indicates that the data contained in a stripe has been lost.

While many conditions can produce a Bad Stripe Table entry, the most common cause is an error accessing one of the stripe units within a stripe of a critical logical drive. A single stripe unit failure is correctable and recoverable but two or more failures within the same redundant RAID stripe are not.

For example, in a critical RAID-5 array, in which one of the drives in the array is defunct, a stripe will be marked bad with an entry in the BST if a non-recoverable media error occurs when accessing one of the other drives of the array.

Once an entry is logged in the BST, the controller will return an error code to the driver whenever the host system tries to access a Logical Block Address (LBA) within the affected stripe. This is one immediate indication that some part of the logical drive is unusable.

**Note:** It is not possible to correlate the bad stripe with a specific file in the operating system.

### Action:
* Check the ServeRAID Manager event logs to identify the affected logical drive(s).
* Because the data has been lost, the only way to recover from this condition is to do the following:
  1. Delete the array.
  2. Recreate the array and its logical drives.
  3. Restore the data from backup media.
* The alternative is to take the entire logical drive offline, thus resulting in the loss of all data contained on that logical drive.
* To minimize the risk of lost data, be sure to schedule frequent periodic backups.

## Exception removing timer from active queue

### Explanation:
* There is no configuration on any of the physical drives that are attached to the controller.
* There are no physical drives attached to the controller.
* The controller does not support one or more features of the drive configuration.

### Action:

If you have physical drives attached to the controller and the physical drives contain a valid controller configuration, complete the following steps:

1. Verify that the controller, cables, and physical drives are installed properly.
2. Verify that there is power to the physical drives.
3. Retry the command.
4. If the command still fails, restart the server and retry the command.

If the problem persists, the configuration data has been lost. Reconfigure the controller using the ServeRAID Manager.

# Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive reported an unrecoverable media error.

### Action:

Replace the specified physical drive.

# Set drive to defunct: controller [number], < device location>

### Explanation:

There was an error in communication between the physical drive and the controller.

### Action:
1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.
3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:
1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

# Set drive to defunct: controller [number], < device location>

### Explanation:

One of the following occurred:
- The user has removed or rearranged the specified physical drive.
- There was an error in communication between the physical drive and the controller.

### Action:
1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.

3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:

1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

## Set drive to defunct: controller [number], < device location>

### Explanation:

One of the following occurred:
- The user has removed or rearranged the specified physical drive.
- A controller might be configured with unattended mode. Changes to the RAID configuration are accepted automatically in unattended mode.
- There was an error in communication between the physical drive and the controller.

**Note:** (Clustering and failover environments only) If you move a logical drive to another controller, these entries might be normal.

### Action:

1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.
3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:

1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

# Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive reported an unrecoverable hardware error.

### Action:

Replace the specified physical drive.

# Set drive to defunct: controller [number], < device location>

### Explanation:

The controller failed.

### Action:

Update the controller with the latest firmware (microcode). If the problem persists, replace the controller.

# Set drive to defunct: controller [number], < device location>

### Explanation:
- There was an error in communication between the physical drive and the controller.
- The controller failed.

### Action:
1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.
3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:
1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

## Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive does not match the valid configuration signature after the configuration was imported from the physical drives.

### Action:

Do one of the following:
- Rebuild the critical array.
- Remove the specified physical drive.

## Set drive to defunct: controller [number], < device location>

### Explanation:

There was an error in communication between the physical drive and the controller while the controller was attempting to validate the RAID configuration of the physical drive.

### Action:
1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.
3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:
1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

## Set drive to defunct: controller [number], < device location>

### Explanation:

A user used the operating-system utilities to mark the specified physical drive defunct.

### Action:

Rebuild the critical array.

## Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive is not part of a valid configuration but was found in a cluster setup.

### Action:

Rebuild the specified physical drive into an array. If you cannot rebuild the physical drive, replace or remove the physical drive.

## Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive is not part of a valid configuration but was found in a cluster setup.

### Action:

Rebuild the specified physical drive into an array. If you cannot rebuild the physical drive, replace or remove the physical drive.

## Set drive to defunct: controller [number], < device location>

### Explanation:

The specified physical drive is configured as part of another system.

### Action:

Rebuild the specified physical drive into an array on this system. If you cannot rebuild the physical drive, replace the physical drive.

## Set drive to defunct: controller [number], < device location>

### Explanation:

The specified channel or port is not working.

### Action:
1. Verify that there is power to external enclosures and connections.
2. Verify that cables are properly seated.

3. Check for damaged, bent, or pushed pins on the following:
   - Termination (for non-backplane systems)
   - Backplanes
   - Physical drives
   - Controller

If you cannot identify a connection problem, the replacement order for parts is the following:
1. Termination (for non-backplane systems)
2. Cables
3. Physical drives
4. Backplanes
5. Controller

Before replacing a physical drive or controller, verify that it is updated with the latest firmware (microcode) and that they still fail.

**Note:** If multiple physical drives are marked defunct within the same time period, check the cables and backplanes.

## This event log entry is informational.

### Explanation:

None required.

### Action:

None required.

# Appendix A. Operating systems supported by ServeRAID Manager

This topic provides information about the operating systems supported by the ServeRAID Manager task.

## Management-server support

This task is supported by IBM Director Server when installed on servers running the following operating systems:
- Linux on xSeries
- Windows

## Managed-object support

The following tables list the operating systems that this task supports for managed objects. Managed objects can include IBM xSeries, iSeries™, System p5 and pSeries, and System z9 and zSeries hardware. Managed systems are a subset of managed objects that use different levels of IBM Director support. This task can be used on Level-2 managed systems only. These systems must be xSeries and Netfinity® servers.

*Table 1. Operating systems supported by xSeries servers and third-party Intel-based systems*

| Operating system | Level 2 |
|---|---|
| **Editions of Windows for 32-bit systems:** | |
| • Windows 2000, Advanced Server and Server Editions<br>• Windows Server 2003 Standard Edition<br>• Windows Server 2003 Enterprise Edition | Yes |
| • Windows 2000 Professional Edition<br>• Windows 2000 Datacenter Edition<br>• Windows XP Professional Edition<br>• Windows Server 2003 Web Edition<br>• Windows Server 2003 Datacenter Edition | No |
| **Editions of Windows for 64-bit systems:** | |
| • Windows Server 2003 Standard x64 Edition<br>• Windows Server 2003 Enterprise x64 Edition | Yes |
| • Windows XP Professional x64 Edition<br>• Windows Server 2003 Web x64 Edition<br>• Windows Server 2003 Datacenter x64 Edition<br>• Windows Server 2003, Datacenter and Enterprise 64-bit Itanium Editions | No |
| **Versions of Linux for 32-bit systems:** | |
| • Red Hat Enterprise Linux AS, ES, and WS, version 3.0<br>• Red Hat Enterprise Linux AS, ES, and WS, version 4.0<br>• SUSE LINUX Enterprise Server 8 for x86<br>• SUSE LINUX Enterprise Server 9 for x86<br>• VMware ESX Server, versions 2.1, 2.5, and 2.51, Console<br>• VMware ESX Server, versions 2.1, 2.5, and 2.51, guest operating systems | Yes |
| • VMware GSX Server, versions 3.1 and 3.2, Console<br>• VMware GSX Server, versions 3.1 and 3.2, guest operating systems | No |

*Table 1. Operating systems supported by xSeries servers and third-party Intel-based systems  (continued)*

| Operating system | Level 2 |
| --- | --- |
| **Versions of Linux for 64-bit systems:** | |
| • Red Hat Enterprise Linux AS, ES, and WS, version 3.0, for AMD64 and EM64T<br>• Red Hat Enterprise Linux AS, ES, and WS, version 4.0, for AMD64 and EM64T<br>• SUSE LINUX Enterprise Server 8 for AMD64<br>• SUSE LINUX Enterprise Server 9 for AMD64 and EM64T | Yes |
| • Red Hat Enterprise Linux AS, version 3.0, for Intel Itanium<br>• Red Hat Enterprise Linux AS, version 4.0, for Intel Itanium<br>• SUSE LINUX Enterprise Server 8 for Itanium Processor Family<br>• SUSE LINUX Enterprise Server 9 for Itanium Processor Family | No |
| **Other operating systems supported by xSeries servers:** | |
| Microsoft Virtual Server (guest operating system) | No |
| NetWare, version 6.5 | Yes |

*Table 2. Operating systems supported by iSeries servers and System p5 and pSeries servers*

| Operating system | Level 2 |
| --- | --- |
| • AIX 5L, Version 5.2<br>• AIX 5L, Version 5.3<br>• i5/OS, Version 5 Release 3<br>• Red Hat Enterprise Linux AS, version 3.0, for IBM POWER<br>  **Note:** System p5 and pSeries servers require Red Hat Enterprise Linux AS, version 3.3 or later, for IBM POWER<br>• Red Hat Enterprise Linux AS, version 4.0, for IBM POWER<br>• SUSE LINUX Enterprise Server 8 for IBM POWER<br>• SUSE LINUX Enterprise Server 9 for IBM POWER | No |

*Table 3. Operating systems supported by System z9 and zSeries servers*

| Operating system | Level 2 |
| --- | --- |
| • Red Hat Enterprise Linux AS, version 4.0, for IBM System z9, zSeries and S/390<br>• SUSE LINUX Enterprise Server 9 for IBM System z9, zSeries and S/390 | No |

# Appendix B. Glossary

## A

### alien array

A partially configured array, usually created as a result of an error during the array creation process, such as a power failure.

### array

Two or more physical drives combined for increased capacity, speed, or fault tolerance. Once created, an array is configured as one or more logical drives. The operating system in the server recognizes a logical drive as a single drive.

### auto-synchronization

Synchronization on RAID level-6, level-5, level-5E, level-50, and level-60 drives that is automatically initiated when the logical drives are created. This type of synchronization works in the background. The ServeRAID-8i controller and ServeRAID-7t controller also support auto-synchronization on RAID level-1 and level-10 logical drives.

## B

### battery-backup cache

Buffer storage that protects data during write-back operations; in the event of a power failure, it preserves the data in the controller cache.

### BIOS-compatibility mapping - Extended

An option of BIOS compatibility mapping. When the BIOS compatibility mapping is set to **Extended**, the ServeRAID controller BIOS is aware that the operating system supports 8 GB or smaller physical drives.

### BIOS-compatibility mapping - Limited

An option of BIOS compatibility mapping. When the BIOS compatibility mapping is set to **Limited**, the ServeRAID controller BIOS is aware that the operating system supports 2 GB or smaller physical drives. This enables the user to migrate data from older PCI or Micro Channel adapters.

### BIOS-compatibility mapping

A ServeRAID controller setting with two options: **Limited** and **Extended**. The default value is **Extended**.

### block

A data unit created when data is striped across physical drives.

### blocked

The blocked state is reserved for RAID level-0 logical drives that are part of the same array as one or more of the following:

- A RAID level-1 logical drive
- A RAID level-1E logical drive
- A RAID level-5 llogical drive

If a physical drive in such an array fails, the RAID level-0 logical drives enter the offline state, while the other logical drives enter the critical state.

After you replace the failed physical drive, a rebuild operation starts and reconstructs the data stored in any RAID level-1, level-1E, or level-5 logical drives; at the same time, the RAID level-0 logical drives enter the blocked state. RAID level-0 logical drives cannot be rebuilt, since they do not contain redundant data.

After the rebuild operation is completed, you can unblock the RAID level-0 logical drives and access them once again. However, the logical drive might contain damaged data. You must re-create, reinstall, or restore the data from the most recent backup disk or tape to the RAID level-0 logical drive.

## C

### cluster

In ServeRAID Manager technology, two independent computer systems organized into a network for the purpose of sharing resources and communicating with each other. A cluster provides fault-tolerance at the server level.

### compaction

The process by which a RAID level-5EE logical driveutilizes the distributed spare drive in the event of a physical drive failure. After the data is reconstructed, the original array undergoes compaction and the distributed spare drive becomes part of the new array.

### compression

The process by which a RAID level-5E logical drive utilizes the distributed spare drive in the event of a physical drive failure. After the data is reconstructed, the original array undergoes compression and the distributed spare drive becomes part of the new array.

### controller

A device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole.

### controller names

In a cluster or failover pair, the unique names that identify the members of the pair to one another.

### copy back

A method of restoring a logical drive's original configuration after replacing a failed drive in an array. Copy back restores the data to its original location, before the logical drive was rebuilt from its spare.

## critical

The state of a RAID level-1, level-1E, level-5, level-5E, level-5EE, level-10, level-1E0, or level-50 logical drive that contains a defunct drive. A RAID level-6 or level-60 logical drive with two defunct drives is also in the critical state. If a critical logical drive sustains another drive failure the data cannot be recovered.

# D

## data mirroring

A technique that creates a single logical drive from two physical drives. All data written to the logical drive is written to both physical drives, creating a pair of physical drives containing exactly the same data.

## data scrubbing

A feature that provides automatic, continuous synchronization during system use. This features works in the background, and ensures that the redundant data and/or parity is correct.

## data striping

A technique that divides a logical drive into data blocks, called stripes, which are then distributed over the physical drives. The layout is such that a sequential read of data on the logical drive results in parallel reads to each of the physical drives, resulting in improved performance.

## decompression

The process by which a compressed array returns to its original striping scheme, after a failed drive is replaced in a RAID level-5E logical drive. Contrast with compression.

## defunct

A physical-drive state in which the ServeRAID controller cannot communicate properly with the drive.

## distributed spare drive

In the RAID level-5E, the logical drive designated as a spare drive. Because this spare drive is spread over several physical drives, it is described as distributed.

# E

## enclosure

A direct-attached or network-attached storage expansion unit, such as the IBM Netfinity EXP300 or IBM TotalStorage DS300, that contains disk drives.

## expansion

The process by which a compacted array returns to its original striping scheme, after a failed drive is replaced in a RAID level-5EE logical drive. Contrast with compaction.

# F

### fault tolerance

The ability of a computer system to operate correctly even though one or more of its component parts are malfunctioning.

### firmware

Proprietary code that is usually delivered as microcode as part of an operating system. Firmware is more efficient than software loaded from an alterable medium and more adaptable to change than pure hardware circuitry. An example of firmware is the Basic Input/Output System (BIOS) in read-only memory (ROM) on a PC motherboard.

### FlashCopy

A point-in-time capture of logical drive data on a networked storage device. As new data are written to the original logical drive, the FlashCopy view captures the changes. If an error occurs in the original logical drive, you can roll-back the logical drive to the point when the FlashCopy was created.

### FlashCopy virtual size

For a FlashCopy backup of logical drive data, the virtual size is the maximum size that the FlashCopy can grow to. The virtual size equals the size of the FlashCopy source drive. The actual size of a FlashCopy backup starts at 10% of the FlashCopy source. As new data are written to the source drive, the FlashCopy backup grows to the size of FlashCopy source.

### foreign array

An array with exported data, allowing the drives and RAID configuration to be transferred to another enclosure.

### free space

The space in an array currently not assigned to a logical drive.

# G

### GB

When referring to hard-disk-drive capacity, GB means 1 000 000 000 bytes, or 1000 MB. Total user-accessible capacity may vary depending on operating environment.

# H

### high availability

A system designed and implemented with components that satisfy the system functional requirements, but also has hardware and software component redundancy to eliminate any unexpected behavior.

### hot add

To add and configure a new ServeRAID controller while the server is operational.

## hot-pluggable

Pertaining to a system in which components can be added while the system is running.

## hot-spare drive

A physical drive that is defined for automatic use when a similar drive fails.

## hot-swap rebuild

An operation that is started by the ServeRAID controller when it detects that a physical drive that is part of an array and in the defunct state has been removed and replaced on a SCSI cable or backplane.

## hot-swappable

Pertaining to a component that can be removed and/or replaced while the system is running.

---

# I

## Impacted

A RAID level-6, level-5, level-5EE, level-50, or level-60 logical drive moves to the Impacted state if a drive fails during initialization or the initialization process is stopped before it completes. This may occur during auto-synchronization or data scrubbing (with background synchronization). In an Impacted drive, the striping/synchronization process has not completed and you need to resynchronize.

**Note:** A RAID level-1, level-1E, or level-10 logical drive moves to the Impacted state during its initial build. When the build is complete, it returns to the okay state.

## integrated RAID controller

An integrated SCSI controller with RAID capabilities, such as the LSI 1020 and LSI 1030. Integrated RAID controllers are standard features on some IBM xSeries servers. They can be used to create a RAID level-1 logical drive from two physical drives. You can configure one additional physical drive as a hot spare drive.

## initialize logical drive

To prepare a logical drive for use by erasing the first 1024 sectors on a drive. For the ServeRAID-7t and ServeRAID-8i controllers, initialization clears the entire drive. Initialization prevents access to any data previously stored on the drive.

## initiator identifiers

The SCSI initiator IDs assigned to a cluster or failover pair.

## IPSSEND command-line program

An advanced command-line program that can be used to manage your ServeRAID controllers. It can be used to configure your controller, isolate and debug problems, recover from errors, and to copy controller configurations from one server to another.

## L

### logical drive

A grouping of physical drives that the operating system recognizes as a single drive.

### logical-drive migration

To add or remove physical drives from an existing array, to change RAID levels, change logical-drive size, or effect an increase in free space.

### LSI 1030 controller

See integrated RAID controller.

## M

### management station

A system or server with a network-attached storage enclosure. After you install the management station software on that system, you can monitor and configure the enclosure from a ServeRAID Manager console.

### MB

When referring to physical-drive capacity, MB means 1 000 000 bytes. Total user-accessible capacity may vary depending on operating environment.

### merge-group number

In a clustering configuration, the numbers that identify each logical drive. Non-shared logical drives are assigned merge-group numbers of either 206 or 207; shared logical drives need unique merge-group numbers, so that they can be identified even if they move to the other server.

### merge-group state

In a clustering environment, whether or not a logical drive is shared.

### migrating

The state of a logical drive undergoing a logical-drive migration.

### mirror role

The role assigned to the two physical drives that an integrated RAID controller uses to create a RAID level-1 logical drive. When the logical drive is created, data is copied from the primary physical drive to the secondary physical drive. Any data on the secondary drive is destroyed.

## N

### network-attached storage

An external storage enclosure with an embedded RAID controller, such as the IBM DS400. You can monitor and configure network-attached storage from a ServeRAID Manager console if the enclosure is connected to a management station.

### Notification Manager

A tool used to notify remote systems of events, problems, and configuration changes occurring on a local system.

## O

### offline

A logical drive state in which the logical drive is inaccessible.

### okay

A logical drive state in which the logical drive is functional.

### online

A physical-drive state in which the physical drive is functioning properly and is part of an array.

## P

### parity

The data stored on a RAID level-5, level-5E, level-5EE, or level-50 logical drive that can be used, in conjunction with the data on the remaining drives, to recreate a failed physical drive's data.

### parity block

In a RAID level-5, level-5E, or level-50 logical drive, a data unit that contains a representation of the data from other blocks in the same stripe.

### partner name

In a cluster or failover pair, one of the two controller names entered during configuration.

### physical drive

A hard disk drive.

### PFA

Predictive Failure Analysis event that announces the physical drive is about to fail.

### plug-in

A "plug-in," as referred to in ServeRAID Manager Assist, specifically refers to IBM Director.

### POST

Power-on self-test. During POST, the ServeRAID controller compares the stored configuration information to the configuration that is actually present. If a discrepancy exists, one or more status messages appear after the POST completes but before the operating system loads.

## preferred owner

In a dual controller enclosure, the controller to which an array is originally assigned. If the preferred owner fails (due to a hardware problem, for example), the array automatically moves to the other controller (fail over). The ServeRAID Manager allows you to restore the array to its preferred owner with fail back. Intentionally moving an array to different controller in the enclosure changes its preferred owner.

## Q

### quorum drive

In the Microsoft Clustering Solution, a logical drive that stores the quorum resource information.

## R

### restore to factory-default settings

An action that restores all parameters in the controller to the factory-default settings. If logical drives are defined, the data stored on them will be lost.

### rack enclosure

See enclosure.

### RAID

A technology of grouping several physical drives in a computer into an array that you can define as one or more logical drives. Each logical drive appears to the operating system as a single drive. This grouping technique greatly enhances logical-drive capacity and performance beyond the physical limitations of a single physical drive.

### RAID level-0

A RAID level that uses data striping to distribute data evenly across physical drives. While it enables full utilization of physical drive capacity and performance acceleration, RAID level- 0 provides neither fault tolerance nor redundancy.

### RAID level-1

A RAID level that uses data mirroring to distribute data across two physical drives. It provides data redundancy and performance acceleration, although the usable physical drive space is reduced by 50 percent.

### RAID level-1E

A RAID level that uses both data striping and data mirroring to distribute data across three or more physical drives. Data is striped across each disk in the array; the first set of stripes are the data stripes, and the second sets of stripes are mirror copies of the first stripe, shifted one drive. It provides data redundancy and performance acceleration, although the usable physical drive space is reduced by 50 percent.

## RAID level-5

A RAID level that uses data striping and block interweaving to distribute data across three or more physical drives. It provides full data protection and performance acceleration, although only 67-94% of physical drive storage capacity can be used.

## RAID level-5E

A RAID level that uses data striping and block interweaving to distribute data across four or more physical drives; it uses some space on each physical drive as a distributed hot-spare. It provides full data protection and performance acceleration, although only 50-88% of physical drive storage capacity can be used.

## RAID level-5EE

A RAID level that uses data striping and block interweaving to distribute data across four or more physical drives. Like RAID level-5E, it uses a distributed hot-spare but offers faster rebuild times. It provides full data protection and performance acceleration, although only 50-88% of physical drive storage capacity can be used.

## RAID level-6

A RAID level that uses data striping and block interweaving to distribute data across four or more physical drives. It is similar to RAID level-5 but with two sets of parity instead of one. The second set of parity information improves fault tolerance. RAID level-6 can handle two simultaneous drive failures, where other single RAID levels can handle, at most, only one.

## RAID level-x0

Refers to RAID level-00, level-10, level-1E0, and level-50. These RAID levels use spanned arrays (array of arrays) to enable the use of up to 60 physical drives. RAID level-00 provides no data redundancy, but provides performance acceleration and allows 100% of the physical drive storage capacity to be used. RAID levels -10, -1E, and -50 provide full data protection, performance acceleration, and greater reliability, although only 67-94% of physical drive storage capacity can be used.

## RAID signature

A small segment on each physical disk in a RAID configuration that stores information about drives and arrays.

## read-ahead cache mode

A ServeRAID controller setting that determines whether the ServeRAID controller transfers data from disk to its local cache in increments equal to the stripe-unit size or the system I/O requests. The options are **enabled**, **disabled**, and **adaptive**; the default value is **adaptive**.

## read-ahead cache mode - Adaptive

The default value of the read-ahead cache mode. When the read-ahead cache mode is set to adaptive, the ServeRAID controller continually reevaluates whether to set the read-ahead cache mode to **enabled** or **disabled**.

### read-ahead cache mode - Disabled

An option of the read-ahead cache mode. When the read-ahead cache mode is disabled, the ServeRAID controller transfers data from the logical drive to its local cache in increments equal to the system I/O request size. This optimizes performance when the workload is random or the system I/O requests are smaller than the stripe-unit size.

### read-ahead cache mode - Enabled

An option of the read-ahead cache mode. When the read-ahead cache mode is enabled, the ServeRAID controller transfers data from the logical drive to its local cache in increments equal to the stripe-unit size. This optimizes performance when workloads are steady and sequential.

### ready

A physical-drive state in which the drive is available for definition.

### rebuild

An operation to reconstruct data after the problem that caused a physical drive to become defunct has been resolved.

### rebuild rate

The speed (high, medium, or low) at which a rebuild operation will occur.

### rebuilding

The state of a physical drive undergoing a rebuild operation.

### recurring task

A scheduled task that runs periodically according to the interval you choose: the same time each day, each week, or each month.

### ROM Update wizard

A program that updates the BIOS and firmware codes on ServeRAID controller.

---

## S

### ServeRAID Manager Mini-configuration program

A program that allows the user to display the ServeRAID controller settings, and to perform a limited set of configuration functions without using the *IBM ServeRAID Support* CD.

### SAF-TE

A processor that manages small computer system interface (SCSI) accessed fault-tolerant enclosures (SAF-TE). An example of such an enclosure is the IBM Netfinity EXP15.

### scheduled task

A technique that allows you to start a lengthy operation at a convenient time, such as a logical drive migration or synchronizing a logical drive.

## SCSI

See small computer system interface.

## SCSI initiator ID

In a failover or clustering environment, the ID assigned to a SCSI controller. Each ServeRAID controller and its partner must have different SCSI initiator IDS; one must be 6 and the other 7.

## SCSI-transfer speed

The speed at which data can be transferred between a physical drive and the ServeRAID controller.

## segment

Disk drive or portion of a disk drive used to create a logical drive. A disk can include RAID segments and available segments. A RAID segment is part of a logical drive; it can be used by only one logical drive at a time. Available segments can be used to define a new logical drive. If the disk is not part of any logical drive, the entire disk is an available segment.

## ServeRAID Manager

A program used to configure ServeRAID controllers, view the ServeRAID Manager configuration, create arrays and logical drives, delete arrays, dynamically increase the logical-drive size, change RAID levels, and more.

## shared drives

The physical drives controlled by a cluster or failover pair.

## small computer system interface

A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

## spanned array

An array of arrays. Used in RAID level-00, level-10, level-1E0, and level-50 to permit the use of larger numbers of physical drives. The spanned array contains arrays, each of which contains a sub-logical drive, which can be RAID level-0, level-1, level-1E, or level-5. The RAID-level for the logical drive contained within the spanned array is 0.

## standby hot spare

A hot-spare physical drive that the ServeRAID controller has spun down. If an online drive becomes defunct and no suitable hot-spare drive is available, a standby drive of the appropriate size automatically spins up and enters the rebuild state.

## stripe-unit size

The granularity at which data is stored on one drive of the array before subsequent data is stored on the next drive of the array. The performance of a ServeRAID controller is maximized if the stripe-unit size is close to the size of the system input/output requests.

## stripes

The collection of stripe units, from the first to last drive of the array.

## sub-logical drive

In a RAID level-x0 configuration, a logical drive contained within each array of the spanned array. A sub-logical drive can be RAID level-0, level-1, level-1E, or level 5.

## Synchronize

The process of recalculating and rewriting either redundant data (RAID level-1, level-1E, level-10, and level-1E0 logical drives) or parity (RAID level-5, level-5E, and level-50 logical drives).

# T

## throughput

The speed at which data can be moved from one place to another, usually expressed in MB per second.

# U

## unattended mode

A ServeRAID controller setting that determines how the BIOS handles failures during system startup. The settings are **enabled** and **disabled**; the default value is **disabled**.

## unattended mode -- Disabled

A setting of the unattended mode. When the unattended mode is disabled and the BIOS detects a failure, the system stops at the recovery option screen and waits for the user to respond.

## unattended mode -- Enabled

A setting of the unattended mode. When the unattended mode is enabled and the BIOS detects a failure, the system waits for 30 seconds for the user to respond to the recovery options screen. Then, the BIOS automatically selects an appropriate option and continues the system startup process. Unattended mode must be enabled in a clustering environment.

# W

## write-cache mode

A ServeRAID controller setting that determines whether the controller writes data to the physical drive before or after sending a confirmation to the operating system. The settings are **write back** and **write through**.

## write-cache mode -- Write-back

A setting of the write-cache mode. When the write-cache mode is set to write back and the operating system sends data to the controller, the controller sends a confirmation back to the operating system before actually writing the data to a

storage device. This increases performance, but, if a battery-backup cache is not used, increases the risk of data loss in the event of a power failure.

## write-cache mode -- Write-through

A setting of the write-cache mode. When the write-cache mode is set to write through and the operating system sends data to the controller, the controller writes the data to a storage device before sending a confirmation to the operating system. This mode decreases performance, but does not risk data loss.

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# Abbreviations, Acronyms, and Glossary

## Abbreviation and acronym list

This topic lists abbreviations and acronyms used in the IBM Director documentation.

*Table 4. Abbreviations and acronyms used in IBM Director documentation*

| Abbreviation or acronym | Definition |
| --- | --- |
| AES | advanced encryption standard |
| APAR | authorized program analysis report |
| ASF | Alert Standard Format |
| ASM | Advanced System Management |
| ASM PCI Adapter | Advanced System Management PCI Adapter |
| BIOS | basic input/output system |
| CEC | Central Electronics Complex |
| CIM | Common Information Model |
| CIMOM | Common Information Model Object Manager |
| CP | control program |
| CRC | cyclic redundancy check |
| CSM | IBM Cluster Systems Management |
| CSV | comma-separated value |
| DASD | direct access storage device |
| DBCS | double-byte character set |
| DES | data encryption standard |
| DHCP | Dynamic Host Configuration Protocol |
| DIMM | dual inline memory module |
| DMI | Desktop Management Interface |
| DMTF | Distributed Management Task Force |
| DNS | Domain Name System |
| DSA | Digital Signature Algorithm |
| EEPROM | electrically erasable programmable read-only memory |
| FRU | field-replaceable unit |

*Table 4. Abbreviations and acronyms used in IBM Director documentation (continued)*

| Abbreviation or acronym | Definition |
| --- | --- |
| FTMI | fault tolerant management interface |
| FTP | file transfer protocol |
| GB | gigabyte |
| Gb | gigabit |
| GMT | Greenwich Mean Time |
| GUI | graphical user interface |
| GUID | globally unique identifier |
| HMC | Hardware Management Console |
| HTML | hypertext markup language |
| IIS | Microsoft Internet Information Server |
| I/O | input/output |
| IP | Internet protocol |
| IPC | interprocess communication |
| IPMI | Intelligent Platform Management Interface |
| IPX | internetwork packet exchange |
| ISDN | integrated services digital network |
| ISMP | integrated system management processor |
| JVM | Java™ Virtual Machine |
| JCE | Java Cryptography Extension |
| JDBC | Java Database Connectivity |
| JFC | Java Foundation Classes |
| JRE | Java Runtime Environment |
| KB | kilobyte |
| Kb | kilobit |
| kpbs | kilobits per second |
| KVM | keyboard/video/mouse |
| LAN | local area network |
| LED | light-emitting diode |
| LPAR | logical partition |
| MAC | media access control |

| Abbreviation or acronym | Definition |
|---|---|
| MB | megabyte |
| Mb | megabit |
| Mbps | megabits per second |
| MD5 | message digest 5 |
| MDAC | Microsoft Data Access Control |
| MHz | megahertz |
| MIB | Management Information Base |
| MIF | Management Information Format |
| MMC | Microsoft Management Console |
| MPA | Management Processor Assistant |
| MPCLI | Management Processor Command-Line Interface |
| MSCS | Microsoft Cluster Server |
| MST | Microsoft software transformation |
| NIC | network interface card |
| NNTP | Network News Transfer Protocol |
| NTP | network time protocol |
| NVRAM | nonvolatile random access memory |
| ODBC | Open DataBase Connectivity |
| OID | object ID |
| PCI | peripheral component interconnect |
| OSA | Open Systems Adapter |
| PCI-X | peripheral component interconnect-extended |
| PDF | Portable Document Format |
| PFA | Predictive Failure Analysis® |
| POST | power-on self-test |
| PTF | program temporary fix |
| RAM | random access memory |
| RDM | Remote Deployment Manager |
| RPM | (1) Red Hat Package Manager (2) revolutions per minute |
| RSA | Rivest-Shamir-Adleman |
| RXE | Remote Expansion Enclosure |

*Table 4. Abbreviations and acronyms used in IBM Director documentation  (continued)*

| Abbreviation or acronym | Definition |
|---|---|
| SAS | Serial Attached SCSI |
| SATA | Serial ATA |
| SCSI | Small Computer System Interface |
| SFS | shared file system |
| SHA | Secure Hash Algorithm |
| SI | Solution Install |
| SID | (1) security identifier (2) Oracle system identifier |
| SLP | service location protocol |
| SLPD | service location protocol daemon |
| SMBIOS | System Management BIOS |
| SMI | System Management Information |
| SMP | symmetric multiprocessor |
| SMS | Systems Management Server |
| SMTP | Simple Mail Transfer Protocol |
| SMART | Self-Monitoring, Analysis, and Reporting Technology |
| SMI-S | Storage Management Initiative Specification |
| SNMP | Simple Network Management Protocol |
| SPB | software package block |
| SQL | Structured Query Language |
| SSH | Secure Shell |
| SSL | Secure Sockets Layer |
| TAP | Telocator Alphanumeric Protocol |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| TTL | time to live |
| UDP | User Datagram Protocol |
| UID | unique ID |
| UIM | upward integration module |
| UNC | universal naming convention |
| USB | Universal Serial Bus |
| UUID | universal unique identifier |
| VPD | vital product data |

| Abbreviation or acronym | Definition |
|---|---|
| VMRM | Virtual Machine Resource Manager |
| VRM | voltage regulator module |
| WAN | wide area network |
| WfM | Wired for Management |
| WINS | Windows Internet Naming Service |
| WMI | Windows Management Instrumentation |
| WQL | Windows Management Instrumentation Query Language |
| XML | extensible markup language |

# Glossary

This glossary includes terms and definitions from:

- The *American National Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.

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- The *IBM Dictionary of Computing*, New York: McGraw-Hill, 1994.

- The *IBM Glossary of Computing Terms*, 1999.

To view other IBM glossary sources, see IBM Terminology at www.ibm.com/ibm/terminology.

## A

**Advanced Encryption Setting (AES)**
> A block cipher algorithm, also known as Rijndael, used to encrypt data transmitted between managed systems and the management server, which employs a key of 128, 192, or 256 bits. AES was developed as a replacement for DES.

**Advanced System Management (ASM) interconnect**
> A feature of IBM service processors that enables users to connect up to 24 servers to one service processor, thus eliminating the need for multiple modems, telephones, and LAN ports. It provides such out-of-band management functions as system power control, service-processor event-log management, firmware updates, alert notification, and user profile configuration.

**Advanced System Management (ASM) interconnect network**
> A network of IBM servers created by using the ASM interconnect feature. The servers are connected through RS-485 ports. When servers containing integrated system management processors (ISMPs) and ASM processors are connected to an ASM interconnect network, IBM Director can manage them out-of-band.

**Advanced System Management (ASM) PCI adapter**
> An IBM service processor that is built into the Netfinity 7000 M10 and 8500R servers. It also was available as an option that could be installed in a server that contained an ASM processor. When an ASM PCI adapter is used with an ASM processor, the ASM PCI adapter acts as an Ethernet gateway, while the ASM processor retains control of the server. When used as a gateway service processor, the ASM PCI adapter can communicate with other ASM PCI adapters and ASM processors only.

**Advanced System Management (ASM) processor**
> A service processor built into the mid-range Netfinity and early xSeries servers. IBM Director can connect out-of-band to an ASM processor located on an ASM interconnect; an ASM PCI adapter, a Remote Supervisor Adapter, or

a Remote Supervisor II must serve as the gateway service processor.

**alert**  A message or other indication that identifies a problem or an impending problem.

**alert forwarding**
Alert forwarding can ensure that alerts are sent, even if a managed system experiences a catastrophic failure, such as an operating-system failure.

**alert-forwarding profile**
A profile that specifies where remote alerts for the service processor should be sent.

**alert standard format (ASF)**
A specification created by the Distributed Management Task Force (DMTF) that defines remote-control and alerting interfaces that can best serve a client system in an environment that does not have an operating system.

**anonymous command execution**
Execution of commands on a target system as either *system account* (for managed systems running Windows) or *root* (for managed systems running Linux). To restrict anonymous command execution, disable this feature and always require a user ID and password.

**ASF**  See *alert standard format*.

**ASM interconnect gateway**
See *gateway service processor*.

**association**
(1) A way of displaying the members of a group in a logical ordering. For example, the Object Type association displays the managed objects in a group in folders based on their type. (2) A way to display additional information about the members of the group. For example, the Event Action Plans association displays any event action plans applied to the managed objects in the group in an Event Action Plan folder.

## B

**basic input/output system (BIOS)**
The code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

**BIOS**  See *Basic Input/Output System*.

**blade server**
An IBM @server BladeCenter server. A high-throughput, two-way, Intel Xeon-based server on a card that supports symmetric multiprocessors {SMP}.

**BladeCenter chassis**
A BladeCenter unit that acts as an enclosure. This 7-U modular chassis can contain up to 14 blade servers. It enables the individual blade servers to share resources, such as the management, switch, power, and blower modules.

**bottleneck**
A place in the system where contention for a resource is affecting performance.

## C

**chassis**
The metal frame in which various electronic components are mounted.

**chassis detect-and-deploy profile**
A profile that IBM Director automatically applies to all new BladeCenter chassis when they are discovered. The profile settings include management module name, network protocols, and static IP addresses. If Remote Deployment Manager (RDM) is installed on the management server, the chassis detect-and-deploy profile also can include deployment policies.

**CIM**  See *Common Information Model*.

**Common Information Model (CIM)**
An implementation-neutral, object-oriented schema for describing network management information. The Distributed Management Task Force (DMTF) develops and maintains CIM specifications.

**component association**
In the IBM Director Rack Manager task, a function that can make a managed system or device rack-mountable when the inventory collection feature of IBM Director does not recognize the managed system or device. The function associates the system or device with a predefined component.

## D

**Data Encryption Standard (DES)**
A cryptographic algorithm designed to encrypt and decrypt data using a private key.

**database server**
The server on which the database application and database used with IBM Director Server are installed.

**deployment policy**
A policy that associates a specific bay in a BladeCenter chassis with an RDM noninteractive task. When a blade server is added to or replaced in the bay, IBM Director automatically runs the RDM task.

**DES** See *Data Encryption Standard*.

**Desktop Management Interface (DMI)**
A protocol-independent set of application programming interfaces (APIs) that were defined by the Distributed Management Task Force (DMTF). These interfaces give management application programs standardized access to information about hardware and software in a system.

**Diffie-Hellman key exchange**
A public, key-exchange algorithm that is used for securely establishing a shared secret over an insecure channel. During Phase II negotiations, the Diffie-Hellman group prevents someone who intercepts your key from deducing future keys that are based on the one they have.

**digital signature algorithm (DSA)**
A security protocol that uses a pair of keys (one public and one private) and a one-way encryption algorithm to provide a robust way of authenticating users and systems. If a public key can successfully decrypt a digital signature, a user can be sure that the signature was encrypted using the private key.

**discovery**
The process of finding resources within an enterprise, including finding the new location of monitored resources that were moved.

**DMI** See *Desktop Management Interface*.

## E

**enclosure**
A unit that houses the components of a

storage subsystem, such as a control unit, disk drives, and power source.

**event** An occurrence of significance to a task or system, such as the completion or failure of an operation. There are two types of events: alert and resolution.

**event action**
The action that IBM Director takes in response to a specific event or events.

**event-action plan**
A user-defined plan that determines how IBM Director will manage certain events. An event action plan comprises one or more event filters and one or more customized event actions.

**event-data substitution variable**
A variable that can be used to customize event-specific text messages for certain event actions.

**event filter**
A filter that specifies the event criteria for an event action plan. Events must meet the criteria specified in the event filter in order to be processed by the event action plan to which the filter is assigned.

**extension**
See *IBM Director extension*.

## F

**field-replaceable unit (FRU)**
An assembly that is replaced in its entirety when any one of its components fails. In some cases, a FRU may contain other FRUs.

**file-distribution server**
In the Software Distribution task, an intermediate server that is used to distribute a software package when the redirected-distribution method is used.

**forecast**
A function that can provide a prediction of future performance of a managed system using past data collected on that managed system.

**FRU** See *field-replaceable unit*.

## G

**gateway service processor**
A service processor that relays alerts from service processors on an Advanced

System Management (ASM) interconnect network to IBM Director Server.

**group** A logical set of managed objects. Groups can be dynamic, static, or task-based.

**GUID** See *Universal Unique Identifier*.

# I

**IBM Director Agent**

A component of IBM Director software. When IBM Director Agent is installed on a system, the system can be managed by IBM Director. IBM Director Agent transfers data to the management server using several network protocols, including TCP/IP, NetBIOS, and IPX.

**IBM Director Console**

A component of IBM Director software. When installed on a system, it provides a graphical user interface (GUI) for accessing IBM Director Server. IBM Director Console transfers data to and from the management server using TCP/IP.

**IBM Director database**

The database that contains the data stored by IBM Director Server.

**IBM Director environment**

The complex, heterogeneous environment managed by IBM Director. It includes systems, BladeCenter chassis, software, SNMP devices.

**IBM Director extension**

A tool that extends the functionality of IBM Director. Some of the IBM Director extensions are Capacity Manager, ServeRAID Manager, Remote Deployment Manager, Software Distribution.

**IBM Director Server**

The main component of IBM Director software. When installed on the management server, it provides basic functions such as discovery of the managed systems, persistent storage of configuration and management data, an inventory database, event listening, security and authentication, management console support, and administrative tasks.

**IBM Director Server service**

A service that runs automatically on the management server, and provides the server engine and application logic for IBM Director.

**IBM Director service account**

The Windows operating-system account associated with the IBM Director Server service.

**in-band communication**

Communication that occurs through the same channels as data transmissions. An example of in-band communication is the interprocess communication that occurs between IBM Director Server, IBM Director Agent, and IBM Director Console.

**integrated system management processor (ISMP)**

A service processor built into the some xSeries servers. The successor to the Advanced System Management (ASM) processor, the ISMP does not support in-band communication in systems running NetWare. For IBM Director Server to connect out-of-band to an ISMP, the server containing the ISMP must be installed on an ASM interconnect network. A Remote Supervisor Adapter or a Remote Supervisor Adapter II must serve as the gateway service processor.

**interprocess communication (IPC)**

1) The process by which programs communicate data to each other and synchronize their activities. Semaphores, signals, and internal message queues are common methods of interprocess communication. 2) A mechanism of an operating system that allows processes to communicate with each other within the same computer or over a network. It also is called in-band communication

**inventory-software dictionary**

A file that tracks the software installed on managed systems in a network.

**IPC** See *interprocess communication*.

**ISMP** See *integrated system management processor*.

# J

**job** A separately executable unit of work defined by a user, and run by a computer.

## L

**Level-0 managed system**
An IBM or non-IBM server, desktop computer, workstation, or mobile computer, that can be managed by IBM Director but does not have any IBM Director software installed on it.

**Level-1 managed system**
An IBM or non-IBM server, desktop computer, workstation, and mobile computer that has IBM Director Core Services installed. IBM Director uses IBM Director Core Services to communicate with and administer the Level-2 managed system. IBM Director Core Services includes the SLP instrumentation, the IBM Director Agent SLP service type, and Common Information Model (CIM).

**Level-2 managed system**
An IBM or non-IBM server, desktop computer, workstation, or mobile computer that has IBM Director Agent installed. IBM Director Agent provides managed systems with the full complement of IBM Director Agent function that is used to communicate with and administer the Level-2 managed system. The function of a Level-2 managed system varies depending on the operating system and platform.

**light path diagnostics**
A technology that provides a lighted path to failed or failing components to expedite hardware repairs.

## M

**MAC address**
See media access control (MAC) address.

**managed group**
A group of systems or objects managed by IBM Director.

**managed object**
An item managed by IBM Director. In IBM Director Console, a managed object is represented by an icon that shows its type (such as chassis, cluster, system, or scalable system, for example).

**managed object ID**
A unique identifier for each managed object. It is the key value used by IBM Director database tables.

**managed system**
A system that is being controlled by a given system management application, for example, a system managed by IBM Director.

**management console**
A system (server, desktop computer, workstation, or mobile computer) on which IBM Director Console is installed.

**management module**
The BladeCenter component that handles system-management functions. It configures the chassis and switch modules, communicates with the blade servers and all I/O modules, multiplexes the keyboard/video/mouse (KVM), and monitors critical information about the chassis and blade servers.

**management server**
The server on which IBM Director Server is installed.

**media access control (MAC) address**
In a local area network, the protocol that determines which device has access to the transmission medium at a given time.

## N

**nonvolatile random-access memory (NVRAM)**
Random access memory (storage) that retains its contents after the electrical power to the machine is shut off.

**notification**
See *alert*.

**NVRAM**
See *nonvolatile random-access memory*.

## O

**out-of-band communication**
Communication that occurs through a modem or other asynchronous connection, for example, service processor alerts sent through a modem or over a LAN. In an IBM Director environment, such communication is independent of the operating system and interprocess communication (IPC).

## P

**partition**
See *scalable partition*.

**PCI**    See *Peripheral Component Interconnect*.

**PCI-X**  See *Peripheral Component Interconnect-X.*

**Peripheral Component Interconnect (PCI)**
A standard for connecting attached devices to a computer.

**Peripheral Component Interconnect-X (PCI-X)**
An enhancement to the Peripheral Component Interconnect (PCI) architecture. PCI-X enhances the Peripheral Component Interconnect (PCI) standard by doubling the throughput capability and providing additional adapter-performance options while maintaining backward compatibility with PCI adapters.

**PFA**  See *Predictive Failure Analysis.*

**physical platform**
An IBM Director managed object that represents a single physical chassis or server that has been discovered through the use of the Service Location Protocol (SLP).

**plug-in**
A software module, often written by a third party, that adds function to an existing program or application such as a Web browser. See *IBM Director extension.*

**POST**  See *power-on self-test.*

**power-on self-test**
A series of internal diagnostic tests activated each time the system power is turned on.

**Predictive Failure Analysis (PFA)**
A scheduled evaluation of system data that detects and signals parametric degradation that might lead to functional failures.

**private key**
1) In secure communication, an algorithmic pattern used to encrypt messages that only the corresponding public key can decrypt. The private key is also used to decrypt messages that were encrypted by the corresponding public key. The private key is kept on the user's system and is protected by a password. 2) The secret half of a cryptographic key pair that is used with a public key algorithm. Private keys are typically used to digitally sign data and to decrypt data that has been encrypted with the corresponding public key.

**public key**
1) In secure communication, an algorithmic pattern used to decrypt messages that were encrypted by the corresponding private key. A public key is also used to encrypt messages that can be decrypted only by the corresponding private key. Users broadcast their public keys to everyone with whom they must exchange encrypted messages. 2) The non-secret half of a cryptographic key pair that is used with a public key algorithm. Public keys are typically used to verify digital signatures or decrypt data that has been encrypted with the corresponding private key.

# R

**redirected distribution**
A method of software distribution that uses a file-distribution server.

**remote I/O enclosure**
An IBM Director managed object that represents an expansion enclosure of Peripheral Component Interconnect-X (PCI-X) slots, for example, an RXE-100 Remote Expansion Enclosure. The enclosure consists of one or two expansion kits.

**Remote Supervisor Adapter**
An IBM service processor. It is built into some xSeries servers and available as an optional adapter for use with others. When used as a gateway service processor, the Remote Supervisor Adapter can communicate with all service processors on the Advanced System Management (ASM) interconnect.

**resolution**
The occurrence of a correction or solution to a problem.

**resource-monitor threshold**
The point at which a resource monitor generates an event.

**RXE Expansion Port**
The dedicated high-speed port used to connect a remote I/O expansion unit, such as the RXE-100 Remote Expansion Enclosure, to a server.

# S

**scalable node**

A physical platform that has at least one SMP Expansion Module. Additional attributes are assigned to a physical platform when it is a scalable node. These additional attributes record the number of SMP Expansion Modules, SMP Expansion Ports, and RXE Expansion ports on the physical chassis.

**scalable object**

An IBM Director managed object that is used with Scalable Systems Manager. Scalable objects include scalable nodes, scalable systems, scalable partitions, and remote I/O enclosures that are attached to scalable nodes.

**scalable partition**

An IBM Director managed object that defines the scalable nodes that can run a single image of the operating system. A scalable partition has a single, continuous memory space and access to all associated adapters. A scalable partition is the logical equivalent of a physical platform. Scalable partitions are associated with scalable systems and comprise only the scalable nodes from their associated scalable systems.

**scalable system**

An IBM Director managed object that consists of scalable nodes and the scalable partitions that are composed of the scalable nodes in the scalable system. When a scalable system contains two or more scalable nodes, the servers that they represent must be interconnected through their SMP Expansion Modules to make a multinode configuration, for example, a 16-way xSeries 455 server made from four scalable nodes.

**Secure Sockets Layer (SSL)**

A security protocol that provides communication privacy. SSL enables client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

**Service Location Protocol (SLP)**

In the Internet suite of protocols, a protocol that identifies and uses network hosts without having to designate a specific network host name.

**service processor**

A generic term for Remote Supervisor Adapters, Advanced System Management processors, Advanced System Management PCI adapters, and integrated system management processors (ISMPs). These hardware-based management processors used in IBM Netfinity and xSeries servers work with IBM Director to provide hardware status and alert notification.

**SLP**   See *Service Location Protocol*.

**SMBIOS**

See *systems management BIOS*.

**SMP Expansion Module**

An IBM xSeries hardware option. It is a single module that contains microprocessors, disk cache, random access memory, and three SMP Expansion Port connections. Two SMP Expansion Modules can fit in a chassis.

**SNMP Access and Trap Forwarding**

An IBM Director Agent feature that enables SNMP to access managed-system data. When installed on a managed system, this feature enables SNMP-based managers to poll the managed system and receive its alerts. If System Health Monitoring is installed on the managed system also, hardware alerts can be forwarded as SNMP traps.

**SNMP device**

A network device, printer, or computer that has an SNMP device installed or embedded.

**SQL**   See *Structured Query Language*

**SSL**   See *Secure Sockets Layer*.

**static partition**

A view-only scalable partition.

**sticky key**

An input method that enables the user to press and release a series of keys sequentially (for example, Ctrl+Alt+Del), yet have the keys behave as if they were pressed and released at the same time. This method can be used for those who require special-needs settings to make the keyboard easier to use.

**Structured Query Language (SQL)**
A standardized language for defining and manipulating data in a relational database.

**switch module**
The BladeCenter component that provides network connectivity for the BladeCenter chassis and blade servers. It also provides interconnectivity between the management module and blade servers.

**system**
The computer and its associated devices and programs.

**System Health Monitoring**
An IBM Director Agent feature that provides active monitoring of critical system functions, including system temperatures, voltages, and fan speeds. It also handles in-band alert notification for managed systems running Windows and some managed systems running Linux.

**system variable**
A user-defined keyword and value pair that can be used to test and track the status of network resources. System variables can be referred to wherever event-data substitution is allowed.

**systems management BIOS (SMBIOS)**
A key requirement of the Wired for Management (WfM) 2.0 specification. SMBIOS extends the system BIOS to support the retrieval of management data required by the WfM specification. To run IBM Director Agent, a system must support SMBIOS, version 2.2 or later.

## T

**target system**
A managed system on which an IBM Director task is performed.

**time to live (TTL)**
A technique used by best-effort delivery protocols to inhibit endlessly looping packets. The packet is discarded if the TTL counter reaches 0.

**triple data encryption standard (DES)**
A block cipher algorithm that can be used to encrypt data transmitted between managed systems and the management server. Triple DES is a security enhancement of DES that employs three successive DES block operations.

**TTL**    See *time to live*.

## U

**universal unique identifier (UUID)**
A 128-bit character string guaranteed to be globally unique and used to identify components under management.

**uptime**
The time during which a system is working without failure.

**upward integration**
The methods, processes and procedures that enable lower-level systems-management software, such as IBM Director Agent, to work with higher-level systems-management software, such as Tivoli Enterprise™ or Microsoft SMS.

**upward integration module**
Software that enables higher-level systems-management software, such as Tivoli Enterprise or Microsoft Systems Manager Server (SMS), to interpret and display data provided by IBM Director Agent. This module also can provide enhancements that start IBM Director Agent from within the higher-level systems-management console, as well as collect IBM Director inventory data and view IBM Director alerts.

**UUID**    See *universal unique identifier*.

## V

**vital product data (VPD)**
Information that uniquely defines the system, hardware, software, and microcode elements of a processing system.

**VPD**    See *vital product data*.

## W

**Wake on LAN®**
A technology that enables a user to remotely turn on systems for off-hours maintenance. A result of the Intel-IBM Advanced Manageability Alliance and part of the Wired for Management Baseline Specification, users of this technology can remotely turn on a server and control it across the network, thus

saving time on automated software installations, upgrades, disk backups, and virus scans.

**walk**   An SNMP operation that is used to discover all object instances of management information implemented in the SNMP agent that can be accessed by the SNMP manager.

**Windows Management Instrumentation (WMI)**
An application programming interface (API) in the Windows operating system that enables devices and systems in a network to be configured and managed. WMI uses the Common Information Model (CIM) to enable network administrators to access and share management information.

**WMI**   See *Windows Management Instrumentation*.

**WMI Query Language (WQL)**
A subset of the Structured Query Language with minor semantic changes to support Windows Management Instrumentation.

**WQL**   See *WMI Query Language*.

# Index

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