# RAIDWatch

**Java GUI Manager for Infortrend Disk Array Subsystems**

# *User's Manual*

Revision 2.1

*Software Revision: 2.1 or above*

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# Part 1: Getting Started With RAID Watch

# User's Guide Overview

Congratulations on your decision to use Infortrend's RAIDWatch disk array management program. This management program allows you to control and monitor disk array subsystems, either from a local host, or from a remote station connected through a local area network (LAN), or the Internet.

This guide discusses how to install and use RAIDWatch to manage disk array systems incorporating Infortrend's SATA-based, Fibre-to-SATA, SCSI-to-SCSI, and Fibre-to-Fibre subsystems, or the EonRAID 2510FS controllers. Please note that RAIDWatch does not support the display of drive enclosures manufactured by other vendors.

In addition to RAIDWatch, you can also use the on-board RS-232C menu interface or LCD keypad panel to manage the EonStor disk array systems or systems that incorporate the EonRAID disk array controllers. For more information about these programs, see the documentation that came with your hardware.

## User Guide Structure and Chapter Overviews

The RAIDWatch User Guide is divided into three separate parts and Appendices.

### Part 1: Getting Started With RAIDWatch

- **Chapter 1, *Introduction***

  *Provides information about RAIDWatch, including a product description, a features summary and highlights, and a section on basic concepts.*

- **Chapter 2, *Installation***

  *Discusses how to install RAIDWatch in your systems. Discussions include system requirements, setting up hardware, software installation, and how to update your software by downloading updates from Infortrend's FTP site.*

- **Chapter 3, *Configuration Client Options***

  *Describes how to configure the RAIDWatch notification function for faxes,e-mail, broadcast, and so on. Other functionality of the utility are also given a full description. Information about the supported notification levels are also provided to aid in the explanation of these functions.*

- **Chapter 4, *RAIDWatch Icons***

  *Describes the icons used in RAIDWatch GUI.*

- **Chapter 5, *Basic Operations***

  *Discusses basic operations at system startup. These include starting RAIDWatch, connecting and disconnecting from a disk array system, setting up system security, display controls, working with various disk array windows, and exiting from the program.*

### Part 2: Using RAIDWatch for System Management

- **Chapter 6, *RAIDWatch Considerations***

  *Provides some background information on RAID and defines some terms that will be used throughout the rest of the manual. Discusses the use of spares and how to replace a drive if no spares were in use. Finally provides a short discussion on RAIDWatch preliminaries.*

- **Chapter 7, *Configuration Parameters***

  *Discusses how to access the controller/subsystem configuration options and the different RAID configuration options that are available. A detailed description of how to set these options is given as well as brief explanations of the different parameters.*

- **Chapter 8, *Channel Configuration***

  *Discusses how to access the channel configuration options and describes in detail the user configurable channel options that can be set. Instructions on setting the configuration of a channel and how to configure host channel IDs are also discussed.*

- **Chapter 9, *Drive Management***

  *This chapter describes the creation, expansion and deletion of both logical drives (LD) and logical volumes (LV). Different LD and LV options are explained and how to set the different options described in detalis. A discussion on partitioning LDs and LVs can also be found in this chapter.*

- **Chapter 10, *LUN Mapping***

  *Discusses how to map complete or separate partitions of LDs and LVs to different LUNs. Detailed description of the mapping procedure is given. A discussion on how to delete LUN mappings is also given and a descritption of the LUN Mapping Table provided. Extended LUN mapping (LUN Masking) and all the associated options are also described in this chapter.*

## Part 3: System Monitoring

- **Chapter 11, *System Monitoring & Management***

  *Discusses how to obtain the current status of SAF-TE, $I^2C$, and S.E.S. monitoring devices and get updates on the status of storage system components. Descriptions of how to access these different monitoring devices is given and the type of information that is offered by these devices shown.*

- **Chapter 12, *Enclosure Display***

  *The Enclosure View customization is discussed fully in this chapter. Detailed instructions on how to access the enclosure view and how to use the enclosure view are given. Examples of status messages are shown and explanations of the status messages provided.*

- **Chapter 13, *NPC Utility***

  *An independent NPC configuration utility is added for use with RAIDWatch installation that comes without the Configuration Client functionality. Although not as powerful as the Configuration Client, NPC provides basic event notifications over Email,LAN broadcast, and SNMP traps.*

## Appendices

- **Appendix A, *Command Summary*.**

  *Summarizes the available commands and command buttons in RAIDWatch and the Configuration Client utility.*

- **Appendix B, *Glossary*.**

*Provides information and definitions of key technology terms used in this guide.*

- **Appendix C, *RAID Levels*.**

  *Provides information about the various RAID levels.*

- **Appendix D, *Additional References.***

  *Provides information about Java Runtime environment, software download, and uninstallation.*

## *Usage Conventions*

Throughout this document, the following terminology usage rules apply:

- **"Controller"** always refers to Infotrend RAID array controllers.
- **"Subsystem"** refers to Infortrend **EonStor** 8-, 12-, or 16-bay RAID array subsystems.
- **"RAIDWatch"** refers to the entire program and all of its modules.
- **"RAIDWatch Manager"** refers only to the management interface, not to any of the other parts of the software.
- **"Root Agent"** is an independant agent of the software which permits one management station to monitor and report the operating status of multiple RAID systems. The Root Agent gets information from and sends commands to one or multiple RAID arrays.
- **"RAID Agent"** is the part of the software which allows the RAID controller/subsystem to talk to the RAIDWatch Manager or Root Agent. A RAID Agent communicates with the RAID array via SCSI bus or Fibre Channel (using the "In-band" protocols), or via an Ethernet port. RAID Agents are the intermediaries between RAID systems and the RAIDWatch program.
- **"Configuration Client"** refers to the software utility that allows an administrator to be notified of system events at any of the RAID systems being managed. The Configuration Client also enables a centralized management of multiple arrays using a single workstation.

# *Revision History*

***October 15, 2003***

***Chapter 13*** and ***Chapter 14*** have been merged into a single chapter, ***Chapter 13: Panel View***. This chapter generically describes the panel view and removes the redundant descriptions that were previously in both ***Chapter 13*** and ***Chapter 14***. ***Part 4*** of the previous edition has also been removed and ***Chapter 13*** has been included in ***Part 3*** of the Manual

***29 September, 2003***

***Figure 1-1*** in ***Chapter 1*** was changed to show a rackmount enclosure. ***Section 3-1*** in ***Chapter 3*** was divided into two sections, the first being "***Using Windows – RAIDWatch Installed as In-Band***" and the second being "***Using Web Browser – RAIDWatch Installed as Applet***" ***Section 3.5***, "***Rebooting the Controller***" was also added. Modifications to ***Table 14-1*** have also been made.

***28 August, 2003***

This manual has been completely revised from previous editions. Previous editions came with six chapters and six appendices; the current revision has fourteen chapters divided into four parts and five appendices. The main changes to this edition are given below.

***Chapter 1*** remains largely unchanged with only minor editorial corrections that do not directly affect the content.

***Chapter 2*** has been separated into two separate chapters. In the previous revision, ***Chapter 2***, ***Installation***, described system and platform requirements, installation, and different configuration options. This chapter has been separated into ***Chapter 2*** (***Installation***), which describes the new RAIDWatch installer, and ***Chapter 3*** (***Configuration Options***) in the new revision.

***Chapter 3*** in the old revision on ***Basic Operations*** now becomes ***Chapter 4*** in the new revision. More detailed instructions of how to use RAIDWatch have been added and new screen captures included.

***Chapter 4*** in the old revision on Array Management has been separated into six new chapters in the new revision. Five of the new chapters, ***Chapter 5*** – ***Chapter 9,*** make up ***Part 2*** of this revision of the user's guide and the sections in ***Chapter 4*** of the previous edition on S.E.S. management and IIC, SAF-TE and Fault bus management have been moved into ***Chapter 10*** of this revision. All these chapters have enhanced descriptions of how to manage an array, and a series of more indicative screen captures have been added.

***Chapter 5*** (***Notification Processing Center***) and ***Chapter 6*** (***Event Monitor***) in the older revisions of the User's Guide have become ***Chapter 11*** and ***Chapter 12*** in the new revision. The content of these chapters remains largely unaltered with only a few minor editorial adjustments.

***Appendix A*** in the previous revision has now moved to ***Chapter 13*** in the current revision and is followed by a completely new chapter, ***Chapter 14*** on ***EonStor Storage Subsystem*** panel view customizations.

The extraction of ***Appendix A*** from the appendices reduces the number of appendices from six to five with the names of each appendix changing to a higher letter, e.g., ***Appendix B*** in the last revision is ***Appendix A***, ***Appendix C*** is now ***Appendix B***, etc. The content of these appendices remains the same.

***20 April, 2004***

Completely revised for RAIDWatch 2.0, but still keep the manual structure. Although software revision 2.0 has a brand new look and feel and a different configuration access, the available configuration options are basically the same. One chapter, ***Event Monitor***, has been removed, for the functionality is now combined with GUI screen interface. The chapter for NPC functionality has also been removed, for the event notifications have been integrated with the Configuration Client utility.

***10 August, 2004***

Revised for RAIDWatch revision 2.1. Added descriptions for new configuration options including the NPC utility for the Applet mode installation. Added ***Chapter 13: NPC Utility***.

# Part 1: Getting Started With RAIDWatch

***Part 1*** *introduces RAIDWatch to users, explains system and platform requirements and installation.* ***Part 1*** *also describes the Configuration Client options and instructs users about the basic operations of RAIDWatch.*

*This section includes the following chapters:*

- **Chapter 1,** ***Introduction***
- **Chapter 2,** ***Installation***
- **Chapter 3,** ***Configuration Client Options***
- **Chapter 4,** ***RAIDWatch Icons***

# Chapter 1: Introduction

This chapter provides information about the RAIDWatch management program. The following topics are discussed in this chapter:

- ***RAIDWatch Overview*** – Section 1.1, page 1-2

  This section describes the following:

  - *1.1.1 Introduction*
  - *1.1.2 Feature Summary*

- ***Featured Highlights*** – Section 1.2, page 1-4

  This section describes the following:

  - *1.2.1 Graphical User Interface*
  - *1.2.2 Enclosure View*
  - *1.2.3 Powerful Event Notification Function*
  - *1.2.4 Java-based Remote Management*

- ***Conceptual Foundation*** – Section 1.3, page 1-10

# 1.1 RAIDWatch Overview

## 1.1.1 Product Description

Infortrend's GUI RAID Manager, "***RAIDWatch***," is a Java-based program specifically designed for use in managing Infortrend's RAID subsystems.

RAIDWatch provides a user-friendly interface that represents disk array elements and simplifies the normally complicated process of array configuration. RAIDWatch also provides real-time reporting on the status of the entire array, thus making the task of monitoring disk arrays virtually effortless. The functionality provided in the Event Monitor sub-module in the previous RAIDWatch versions is now integrated into the main management screen and the Configuration Client.

RAIDWatch complements the on-board console interface found on Infortrend's RAID controllers and a line of host-based, text mode RAID Managers providing the same functionality, but with greater ease of use. The following sections describe the outstanding features of RAIDWatch and introduce its conceptual framework.

## 1.1.2 Feature Summary

The list below summarizes RAIDWatch features:

- User-friendly graphical interface running under Windows or Linux (SuSE 8 and 9; RedHat 8 and 9) operating systems compatible with the Java Run-time Environment
- Internet browser access to full program functionality provides worldwide management capability
- Supports Infortrend's EonStor series RAID subsystems
- Communicates with the subsystems over a LAN (out-of-band) and the Internet, and over the SCSI bus or Fibre Channel using in-band command protocols
- Supports multiple instances of RAID managers over the network, allowing multiple management sessions from a single management station situated at virtually any place in the world
- Illustrates graphically and constantly the operating status of various disk array elements

- *At-a-glance* monitoring of the entire disk array status by RAIDWatch and constant monitoring of multiple systems by the Configuration Client

- Supports remote management over the network of RAID agents running Windows (NT, 2000, XP, and 2003) or Linux (SuSE 8/9 and RedHat 8/9) via the TCP/IP protocol (future versions will support additional protocols)

- Provides standard disk array functions, including examining and modifying controller configuration; viewing and monitoring configuration and status of physical drives; scanning in new physical drives; creating, deleting, and monitoring configuration and status of logical drives; rebuilding logical drives; defining spare drives; creating, deleting, and partitioning logical volumes; and mapping logical drive and volume partitions to specific host channels ID/LUNs

- Enclosure management functions, including displaying multiple enclosures and drives; monitoring physical drive, power supply, fan, and temperature status; displaying the relative locations of failed physical drives for reduced risk of replacing the wrong drives

- Supports redundant configuration of important RAIDWatch modules to avoid single-point-of-failure; RAIDWatch agents come standard with subsystem firmware

- RAID controller real-time event notices provide information about various event occurrences, including the time when an event occurs, event severity, and event description

- Tasks currently being processed by the subsystems are displayed in a separate window with the help of a percentage indicator

- Selectable event notification via SNMP traps, LAN broadcast, email, fax, ICQ, MSN messenger, and SMS short messaging by severity levels; event display by severity level

- Supports statistics monitoring for displaying I/O throughput with performance number and cache hits rate in percentage

- Provides innovative, user-configurable event notification functions (through the Configuration Client utility running on a computer chosen as the management center)

  - Email notification via the MAPI service of Windows NT/2000/XP/2003
  - Broadcast notification over the LAN:
    - Broadcasts user-configurable messages along with the event description
  - Facsimile (fax) notification via a local fax/modem:

- User-configurable fax messages sent along with the event description
- Automatic message retransmission in the event previous transmission attempts failed
- Notifications to be received by contacts via ICQ and MSN messenger
- Notifications to be received by cell phones as SMS messages

♦ Provides password protection to guard against unauthorized modification of disk array configuration; passwords are set for Maintenance (user) and the Configuration (administrator) login access.

## 1.2 Featured Highlights

### 1.2.1 Graphical User Interface

RAIDWatch's graphical interface is designed for ease-of-use. It uses symbolic icons to represent configuration levels, physical and logical drives, and logical volumes on the screen; and to identify the current configuration of a disk array system. Pull-down, right-click, and pop-up menus are used with all command options.

Users need only point and click a mouse button to select an icon or command. The program also displays the current status of various disk drives or enclosure components by changing the color of their respective LED icons.

With an easy-to-use interface, complicated disk array operations such as logical drive and logical volume creation, drive partitioning, and drive partition mapping to host channels/LUNs can be completed with only a few mouse clicks.

## 1.2.2 Enclosure View

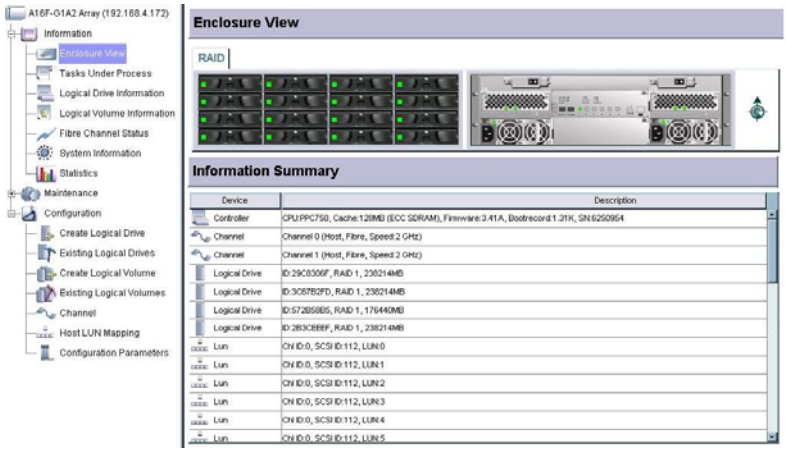



**Figure 1-1: Enclosure View Window**

The enclosure window shown in ***Figure 1-1*** provides real-time reporting of the status of enclosure components, including components that can be accessed through the front or the rear side of an enclosure. When a drive fails, the system highlights the corresponding LED icon of the failed drive by changing its display color; when you remove a drive, its icon is removed from the enclosure window. This feature is particularly useful in cases where a drive fails, and you need to identify its exact location for subsequent replacement.

The enclosure window also appears in other configuration windows showing the logical relationship among the member drives of a logical configuration. Drives belonging to the same logical drive will be displayed in the same color. This allows users to easily identify members of different configurations. To see a cascaded enclosure, single click on the "JBOD" tab on top of the enclosure graphic.

## 1.2.3 Powerful Event Notification Function

RAIDWatch can notify system administrators of event occurrences and status changes in the disk array system. Event notification is managed by another GUI-based utility, Configuration Client, that is installed onto a management station and runs independently from the main manager program. Notifications can be sent via the Internet as email messages, via a local network as a broadcast message, SNMP traps, ICQ or MSN messenger contacts, or via fax/modem as fax messages.

## 1.2.4 Java-based Remote Management

RAIDWatch supports local or remote management of Infortrend EonStor series subsystems over a LAN/WAN or the Internet using the TCP/IP protocol. RAIDWatch's access to a RAID array can be highly flexible. For the ease of installation in different storage environments, we designed three installation schemes

that can be selected in a selection prompt you will encounter using the installation shield programs.

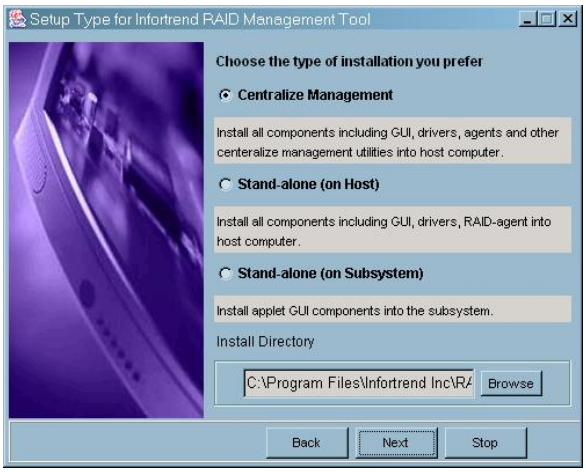



**Figure 1-2: Installation Options**

### Centralized Management: Mode One

For centralized or one-to-many configurations using either the Ethernet or in-band host connection to RAID subsystems. Root agent and the event notification utility, including the Configuration Client, are included. Necessary RAID agents are installed onto the management computer.

### Stand-alone (on Host): Mode Two

For configurations depending on the existing SCSI or Fibre host connection for RAIDWatch-to-RAID communications. Servers in DAS (Direct Attached Storage, e.g., SCSI host models) environments require RAID agents for RAIDWatch commands to pass through and to communicate with RAID arrays. RAID agents are installed onto the servers that are directly attached with a RAID subsystem.

### Stand-alone (on Subsystems): Mode Three

For remote and server-transparent management using the Ethernet connection to the EonStor subsystems or EonRAID controllers. The manager program is installed to the RAID subsystem itself. The RAID subsystem then uses a segregated disk space called “reserved space” to store the program files. Access to the array is made by invoking a Java Applet on a web browser that runs anywhere in the network.

**NOTE**:

*RAID agents are embedded in RAID subsystems firmware. RAID subsystems installed with Mode 2 or Mode 3 RAIDWatch components can be managed by a management station running the Mode 1 components. In this way, multiple and far separated arrays can be managed by a single management station.*

Three installation schemes for different access requirements are shown in the diagrams below. Note that these diagrams do not include all possibilities. RAIDWatch supports various configurations and the combinations of machines running components installed in any of the three different modes:

1. **A RAID Server Chosen as the Centralized Management Station**: Applied in heterogeneous environments where multiple arrays are serving different hosts/applications and scattered in distant locations. Access management over the network is achieved through data exchanges between a local or remote RAIDWatch Manager station (can be a RAID server or not) and RAID agents which are installed on the RAID servers or RAID subsystems themselves. The management center and the RAIDWatch station can be two different machines.

   A Root Agent is installed on a computer chosen to be the management center. ***Figure 1-4*** shows a typical connection and the table below shows the modules installed and the installation mode required:

| Software Modules | Installation |
|---|---|
| Management Center:<br>Root Agent + Configuration Client utility | Mode One |
| RAID Servers (servers A, B, and C) via in-band | Mode Two |
| Independent Array | Mode Three |
| Management Station | Java Runtime |

**Table 1 - 1 Software Modules: Heterogeneous RAIDWatch Connection**

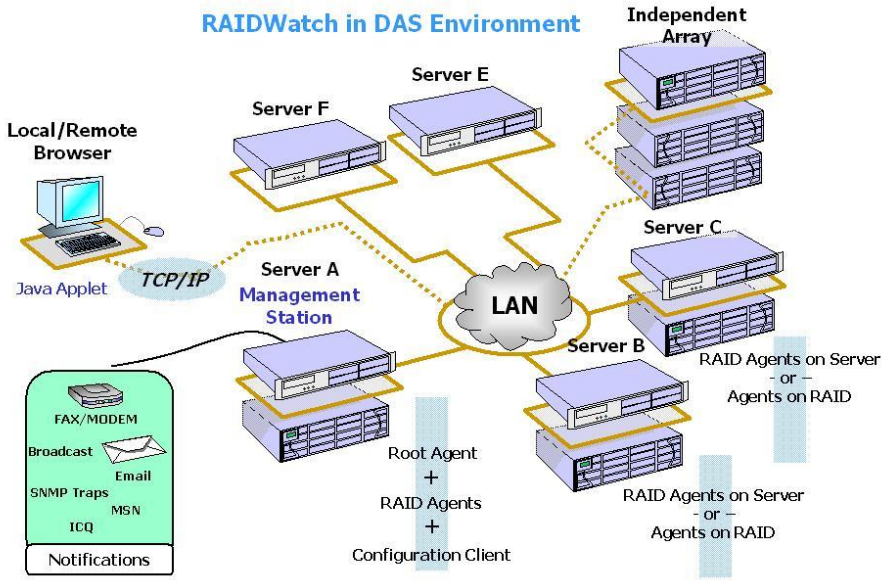



**Figure 1-3: Typical RAIDWatch Connection – Heterogeneous**

2. **Using a Workstation as the Management Center**: Applied in SAN (Storage Area Network) environments. Access management over the network is directed through exchanges between a remote manager station and RAIDWatch programs that exist on array hard drives.

   Event notification is enabled by installing the Configuration Client and Root Agent onto a management station. Redundancy for agents is also supported by installing these modules onto two or more management computers.

   See ***Figure 1-4*** for more details.

| **Software Modules** | **Installation** |
|---|---|
| Management Center:<br>Root Agent + Configuration Client utility | Mode One |
| RAID Arrays | Mode Three |
| Management Station | Java Runtime |

**Table 1 - 2 Software Modules: RAIDWatch Connection over Java Applet**

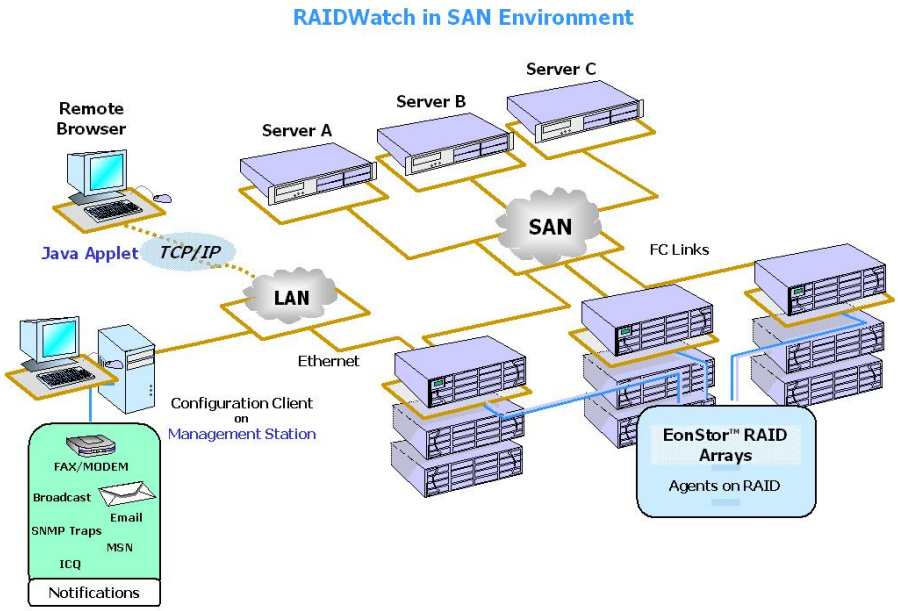



**Figure 1-4: Typical RAIDWatch Connection – Applet Mode**

3. **Stand-alone/Out-of-Band (on Host)** installation: This installation provides management access with no centralized management utility. Event notification is provided through an independent NPC utility. RAIDWatch accesses RAID subsystems over the network through the command exchanges between a manager station and RAIDWatch programs that exist in array hard drives. See ***Figure 1-5*** for more details. The management session and the NPC configuration screen are provoked as Java Applet.

| Software Modules | Installation |
|---|---|
| RAID Arrays | Mode Three |
| Management Station | Java Runtime |

**Table 1 - 3 Software Modules: Management Only**

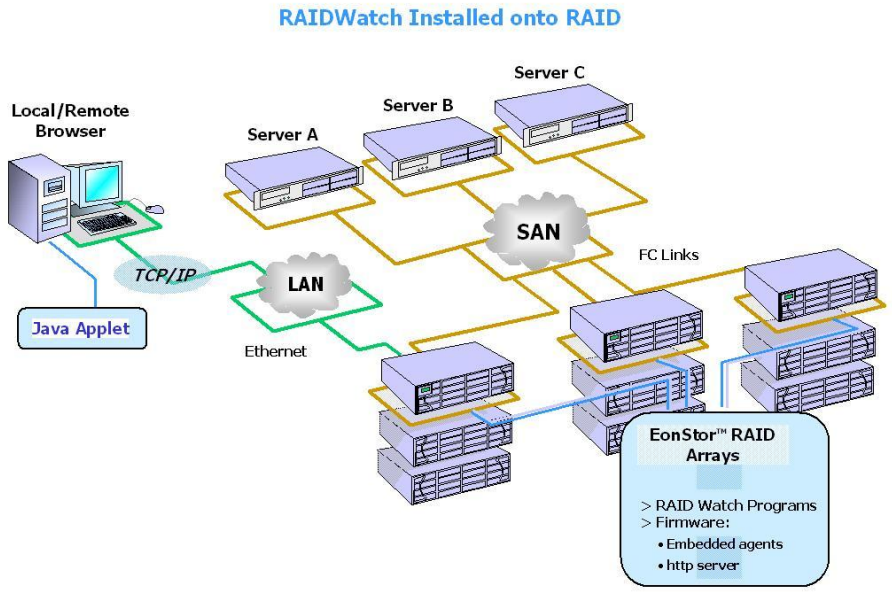



**Figure 1-5: Typical RAIDWatch Connection – Applet Mode**

## 1.2.5 Password Protection

RAIDWatch Manager comes with password protection to prevent unauthorized users from modifying the configuration of the disk array system. With the password security feature, you have control over array settings knowing that the currently managed disk array is safe from unauthorized modifications because the correct password must be entered for each access level.

The RAIDWatch management screen has a navigation tree panel that provides access to functional windows under three (3) major categories: **Information**, **Maintenance**, and **Configuration**. An **Information** login can only access the first level, Information. A **Maintenance** (user) login can access the second level, the Maintenance tasks. And the **Configuration** (administrator) login has access rights to all three levels, Configuration, Maintenance, and Information.

Passwords for access levels can be set in the Configuration category under the "Configuration Parameters" settings.

# 1.3 Conceptual Foundation

## 1.3.1 Centralized Management (Agent-Based) Installation:

In order for RAIDWatch to function properly, different software modules must be correctly installed on different servers and stations in a given LAN or WAN.

1. RAIDWatch communicates with a RAID subsystem either using the firmware-embedded RAID agents or agents manually installed onto a RAID-attached server. Assuming that a given network has multiple RAID systems, RAIDWatch can communicate with RAID arrays through the RAID agents installed on the servers or on the RAID subsystems.

2. A server is chosen as the main management server. When RAIDWatch is installed onto this server using the first installation scheme, two important modules are included, **Configuration Client** and **Root Agent**. The Configuration Client enables automatic notifications of system events, and the Root Agent communicates with multiple RAID subsystems that are not directly attached to this server.

3. The main management server will also need Java Run-time Environment (JRE) installed if a system administrator needs to configure the arrays from it.

4. ***Table 1-1*** on ***page 1-12*** provides a guide to what modules need to be installed on which servers. Note that items in the bottom five rows of the table are not included with RAIDWatch and must be installed or modified by system users.

5. For more information about specific platform requirements, see ***Chapter 2 Section 3 Platform Requirements***.

| | Mode 1 (Centralized Management) | All Modes | Mode 2 (Stand-alone on Host) | Mode 3 (Stand-alone on Subsystem) |
|---|---|---|---|---|
| **Install Elements** | **Centralized Management Server** | **Remote Browser Station** | **Server w/ RAID Directly Attached (in-band)** | **RAID Subsystem (Applet Mode)** |
| **Root Agent** | Yes | | | |
| **RAID Agents** | Yes | | Yes | |
| **RAIDWatch Manager** | Yes | | Yes, if it is used to run RAIDWatch | Yes |
| **Configuration Client** | Yes | | | |
| **JRE** | Yes, if it is used to run RAIDWatch | Yes | Yes | |
| **Web Browser** | Yes | Yes | Yes | |
| **Web Server** | Yes | | | Embedded |

**Table 1-1: RAIDWatch Module Requirements**

## 1.3.2 Stand-alone (on Host) Installation

Main features of the RAID-based installation method are listed below:

- RAIDWatch main programs and the RAID agents used to communicate with a RAID subsystem over in-band connection are installed.
- RAIDWatch runs on the RAID-attached server as a Java program.

## 1.3.3 Stand-alone (on Subsystem) Installation

Main features of the RAID-based installation method are listed below:

- RAIDWatch revision 2.0 and above support installation to array hard drives. A portion of drive capacity (256MB of disk space) is segregated and formatted on each hard drive. This segregated portion is called a reserved space. Once the installation begins, RAIDWatch's main programs are automatically distributed to the reserved space.

- There is no need to install the RAIDWatch program to your management computer.
- If the arrays are managed by dual-redundant controllers, in the event of single controller failure, the manager interface can “failover” to a counterpart controller. Operators’ access to the system will not be interrupted.
- The RAID subsystem can then be accessed from a remote station running a web browser. RAIDWatch now runs in Java Applet mode. Applet is executed when the connection is established between a remote browser and the RAID subsystem. Web browsers, which are often equipped with Java virtual machines, can interpret applets from web servers.
- The controller firmware has an embedded HTTP server. Once properly configured, the controller/subsystem’s Ethernet port behaves like an HTTP server.

# Chapter 2: Installation

This chapter describes RAIDWatch requirements and the installation procedure. The following sections are covered in this chapter:

# 2.1 System Requirements

The minimum hardware and software requirements for RAIDWatch are listed below.

## 2.1.1 Server Running RAIDWatch

- Pentium or above compatible (or equivalent PC) running Windows NT/Windows 2000/XP/2003 or Linux SuSE 8/9 and RedHat 8/9

A server can be chosen as the centralized management center, which uses the Configuration Client utility and can be installed with RAIDWatch manager program using the first installation scheme (Centralized Management)

- At least one available RS-232C port (if network connection, GMS modem, or remote event notification over the telephone line is desired)
- Hayes-compatible modem (if telephone/mobile phone event notification is desired) or fax/modem (if fax event notification is desired). (NOTE: fax command class 2.0 and above)
- SNMP traps service for Windows NT (if SNMP traps notification is desired)
- Windows Messaging (MAPI) for Windows (if support for fax notification is needed)
- Windows NetBEUI support for Windows NT (if network broadcast support notification is needed)

## 2.1.2 Local Client Running RAIDWatch Manager

- Pentium or above compatible (or equivalent PC) running Windows NT/Windows 2000/XP/2003 or Linux SuSE 8/9 and RedHat 8/9
- Windows Messaging (MAPI) for Windows NT/2000/XP/2003 (if support for fax notification is needed)
- Windows NetBEUI support for Windows NT/2000/XP/2003 (if network broadcast support notification is needed) must be enabled. Please refer to your Windows documentation for more information.

## 2.2 RAID Chart

Before installing RAIDWatch and its various agents and modules, it is helpful for users to chart their RAID systems. Users who operate a single RAID from a local or remote workstation may skip this section. For users with multiple RAID systems, the information shown in ***Table 2- 1*** provides guidelines for charting existing RAID systems.

| RAID System | RAID System 1 | RAID System 2 | RAID System 3 |
|---|---|---|---|
| **ID/Name** | *Example* | *Example* | …. |
| **Where** | *HQ* | *Storage* | …. |
| **OS** | *Win 2000* | *N/A* | …. |
| **IP Address** | *205.163.164.111* | *xxx.xxx.xxx.xxx* | …. |
| **Role** | *Centralized Management Center* | *storage pool* | …. |
| **Internet Capable** | *Yes* | *N/A* | …. |

**Table 2- 1: RAID Charting Table**

- **ID/Name** – User designated; an ID or name should be a unique identifying label.
- **Where** – a specific geographic reference (e.g., headquarters, building 3, equipment room 100).
- **OS** – the operating system running on the particular system.
- **IP Address** – if available.
- **Role** – the purpose, relative to RAID operations, fulfilled by the particular system.
- **Internet Capable** – if a server is an Internet server, the answer to this is, "***Yes***." If a workstation will manage RAID systems through a browser, note the particular browser software, its version number, and its support for Java.

# 2.3 Platform Requirements

RAIDWatch 2.1 supports Windows operating systems both for servers (RAID management hosts or web servers) and for client management stations (RAIDWatch Manager workstations). Support for Java, however, depends on the Java Runtime installed from OS to OS. This section explains what steps that need to be taken depending upon which OS will be used.

## 2.3.1 Platform Limitations

Under Windows NT Server 4.0 (Windows 95/98/2000) the Java installation program, installshield.jar, ONLY supports:

- Netscape 4.5 (or above)
- Microsoft Internet Explorer 4.0 (or above)

## 2.3.2 Windows Platforms

RAIDWatch supports Windows NT 4.0 for servers and Windows NT/XP/2000/2003 for workstations.

**Step 1.** In order to use Netscape in Windows, append the string:

append the string:
user_pref("signed.applets.codebase_principal_support", true);
to
C:\Winnt\profiles\<username>
(Windows NT or Windows 2000)
-or-
C:\WINDOWS\Profiles\<username>
(for Windows XP/2003)

**Step 2. SNMP Service**

SNMP service for Windows NT (if the SNMP agent is under a Windows NT environment) must be enabled.

Locate "Services" under the Windows Control Panel. Enable or install SNMP services. Refer to your Windows documentation for more information.

**Step 3. MAPI for Windows**

Windows Messaging (MAPI) for Windows NT (if support for fax or email notification under NT is needed) must be enabled. Refer to your Windows documentation for more information.

**Step 4. NetBEUI Support**

Windows NetBEUI support for Windows NT/2000/XP/2003 (if network broadcast support notification is needed) must be enabled. Refer to your Windows documentation for more information.

# 2.4 Software Setup

This section discusses how to install RAIDWatch in your system. Before proceeding with the setup procedure, read through the *Before You Start* section below.

## 2.4.1 Before You Start

Before starting the installation, read through the notes listed below:

- TCP/IP must be installed and running with a valid IP address assigned to a server. The server can either be used as a centralized management station, a remote client using a browser to access the array, or be directly attached with a RAID system using the in-band protocols.
- Your system display must be running in 256 color or higher mode or some configuration items will not be visible.
- Be certain that your system meets the minimum hardware and software requirements listed in the *System Requirements* section.
- Check to be certain that the RAID disk arrays and controllers are installed properly. For the installation procedure, see the documentation that came with the controller/subsystems.
- Follow the directions provided in the *Platform Requirements* section to prepare for installation and operation under different OS environments.

## 2.4.2 Installing RAIDWatch

Follow these steps to install RAIDWatch on your server(s) and RAID subsystems:

**Step 1.** Insert the Infortrend product CD or RAIDWatch installation CD into your CD-ROM drive.

**Step 2.** If you are currently running other applications, close them before proceeding with the setup process. This will minimize the possibility of encountering system errors during setup.

**Step 3.** The RAIDWatch installer program is included in a CD-ROM that came with your RAID controller or subsystem. An auto-run screen should provide a hot link to the installer program.


**Figure 2-1: Product Utility CD Initial Screen**

**Step 4.** Click the supported platform on the right-hand side to start the installation process.

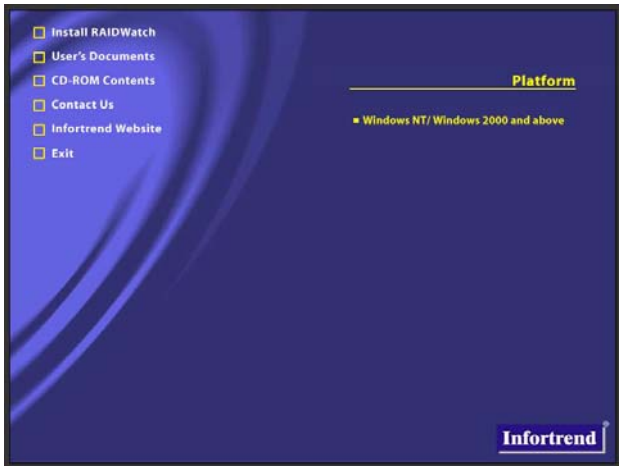



**Figure 2-2: The Platform Window**

**Step 5.** After opening the install shield, the following welcome screen, shown in ***Figure 2-3,*** will appear. If your server or workstation is not ready with Java Runtime (at least version 1.4.2) the install shield will automatically install Java Runtime onto your machine. Please follow the on-screen instructions to proceed.

**Step 6.** To continue installing RAIDWatch, click the "**Next**" button at the bottom of the window. If you do not wish to continue with the installation process, select the "**Stop**" button.

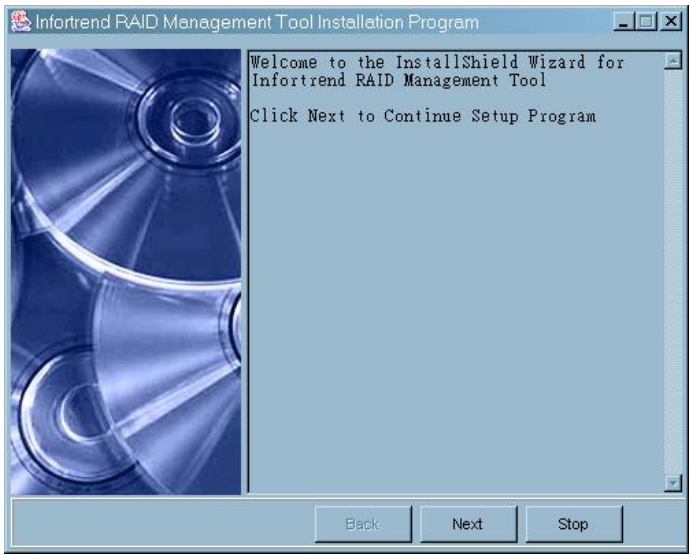



**Figure 2-3: Welcome to the Install Shield Window**

**Step 7.** If you selected the "Next" button on ***Figure 2-3***, the License Agreement window seen in ***Figure 2-4*** will appear. First read through the License Agreement. If you are in agreement with the specified terms and wish to continue installing the RAIDWatch program, select "***Accept***." If you do not wish to continue with the installation process then select the "***Stop***" button.

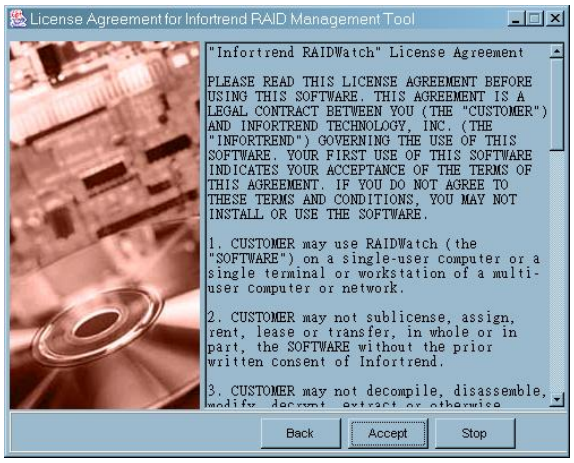



**Figure 2-4: License Agreement**

**Step 8.** If you accepted the License Agreement in ***Figure 2-4***, a new window with three installation options will appear. These options, shown in ***Figure 2-5***, are ***Centralized Management***, ***Stand-alone (on Host)***, and ***Stand-alone (on Subsystem)***.

- ***Centralized Management*** – Selecting this option allows you to install the RAIDWatch GUI, a Root Agent, RAID Agents, Configuration Client utility, and necessary drivers on the computer chosen as a management center..

- ***Stand-alone (on Host)*** – Selecting this option will result in the installation of the In-Band driver (RAID agents) for servers that are directly attached to a RAID subsystem, and the RAIDWatch GUI on the local computer.

- ***Stand-alone (on Subsystem)*** – This will install the GUI onto the controller/subsystem itself. The EonStor subsystems come with necessary RAID agents embedded in firmware. A RAID subsystem will use a small section of formatted disk space (called the reserved space) to store GUI files. Installed in this mode, RAIDWatch can be started by a remote browser accessing the IP address assigned to the subsystem's Ethernet port.

  If the ***(on Subsystem)*** installation was selected, a user will have to use a web browser to connect to the RAIDWatch program. To do this, a web browser is opened and the controller/subsystem IP address entered. The RAIDWatch program can then be accessed and used to manage the storage array.

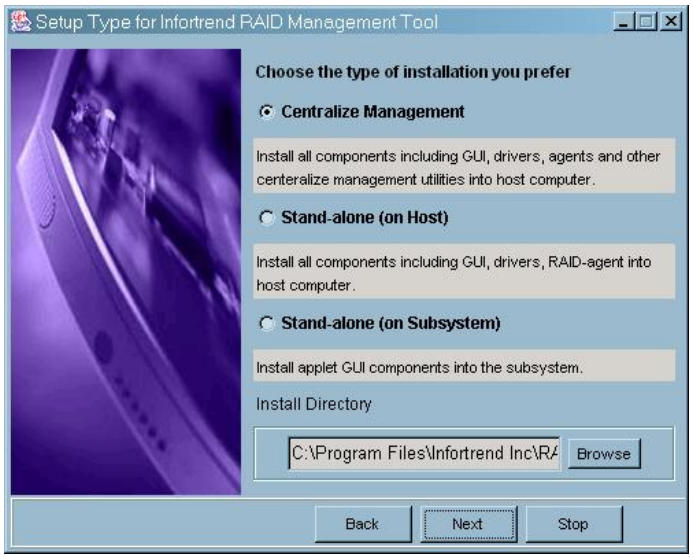



**Figure 2-5: Installation Options**

## 2.4.3 Installing Software Components

RAIDWatch allows you to install its management utility redundantly onto two different servers. This prevents blind time if one server should fail or be powered down for any expected reasons. Note that if a server is chosen as either the Master or Slave host, RAIDWatch must be manually installed on it.

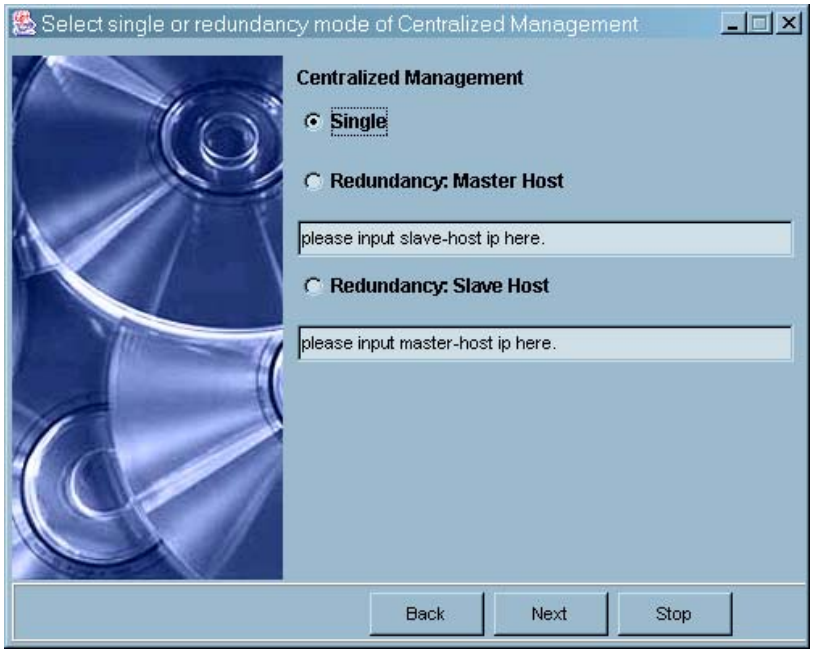



**Figure 2-6: Choice with Software Module Redundancy**

RAIDWatch allows you to choose components during the installation process. However, it is recommended to keep all the default combinations.

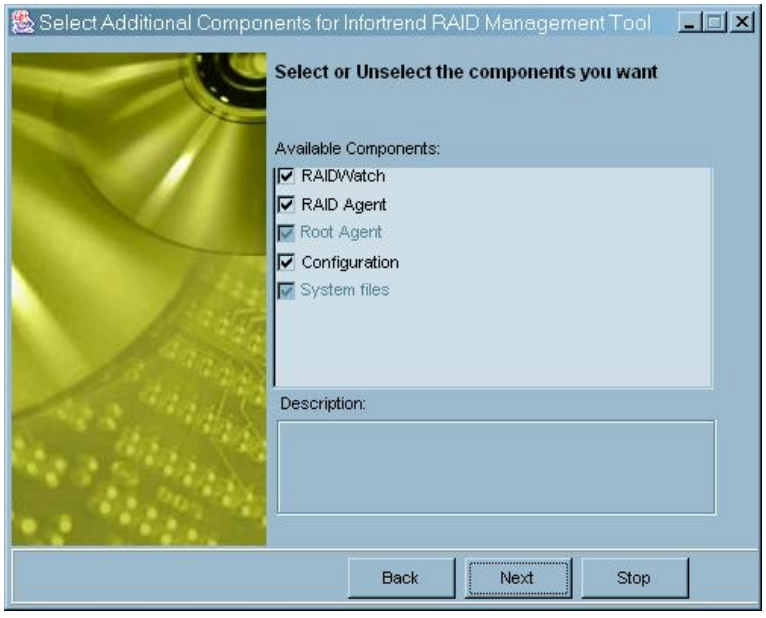



**Figure 2-7: Optional Components**

Once the additional components have been selected, and if you wish to proceed with the installation process, select the "***Next***" button. If you do not wish to proceed with the installation process, select the "***Stop***" button and if you wish to re-select the installation options, then select the "***Back***" button.

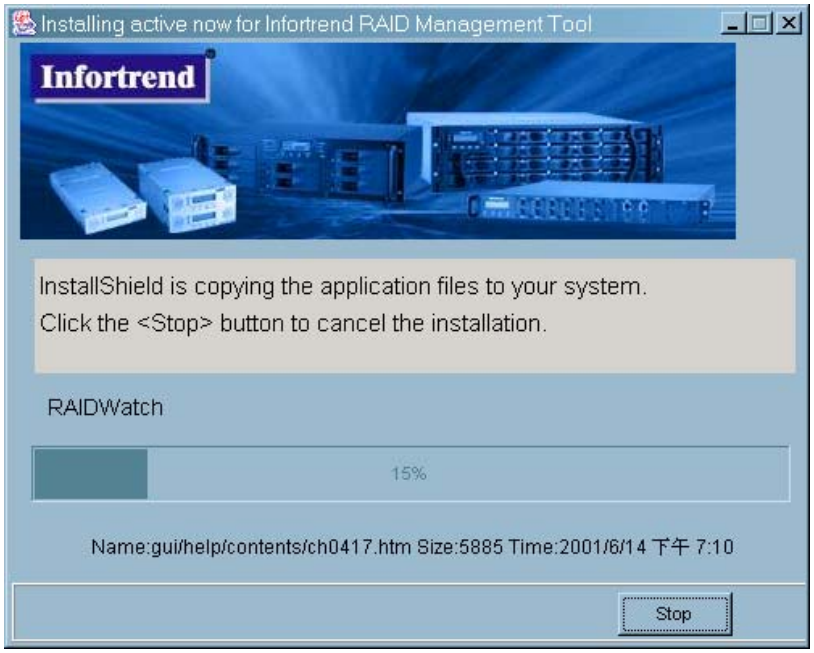



**Figure 2-8: Installing Active**

**Step 5.** If the "***Next***" button from ***Figure 2-7*** was selected, the Install Active window shown in ***Figure 2-8*** will appear. If you wish to stop the installation procedure, then click the "Stop" button.

**Step 6.** Once the software has been successfully installed, a window indicating the successful installation, shown in ***Figure 2-9***, will appear. To complete the process and to make the window disappear, click on the "***OK***" button.

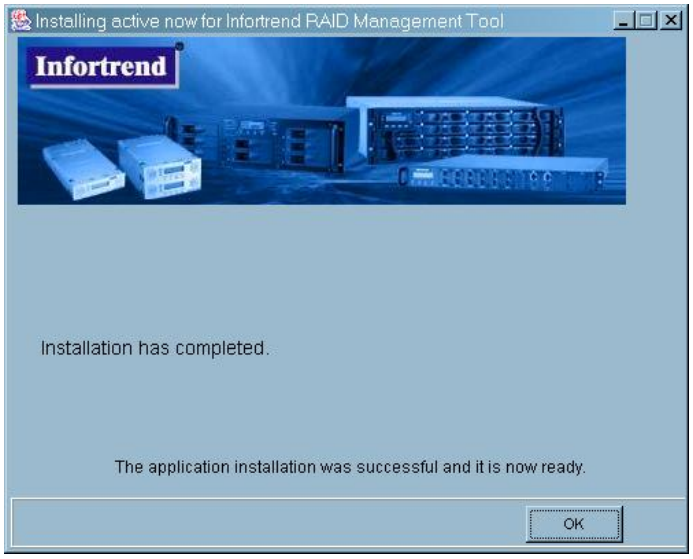



**Figure 2-9: Successful Installation**

## 2.4.4 Stand-Alone (onto Host or Subsystem) Installation

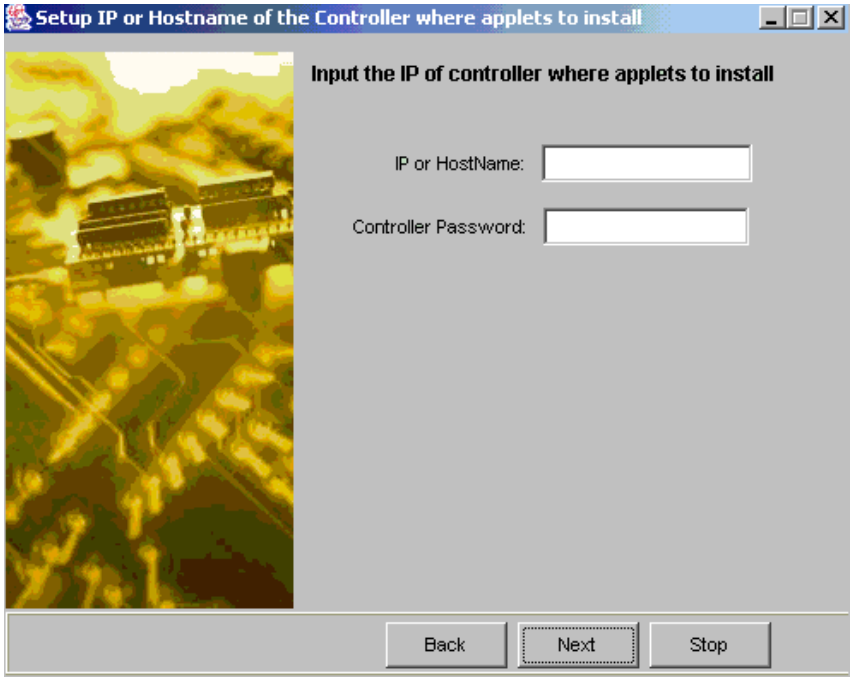



**Figure 2-10: Input IP and Controller Password**

**Step 7.** As shown in ***Figure 2-10*** above, enter the IP address or the host name of the controller/subsystem and the controller password in the respective fields. The default for controller/subsystem IP or password is blank. Preset IP and password should have been configured other configuration utilities before proceeding with RAIDWatch installation.

Once IP (or host name) and the controller password have been entered, and if you wish to proceed with the installation process, select the "***Next***" button. If you do not wish to proceed with the installation process, select the "***Stop***" button and if you wish to re-select the installation options, then select the "***Back***" button.

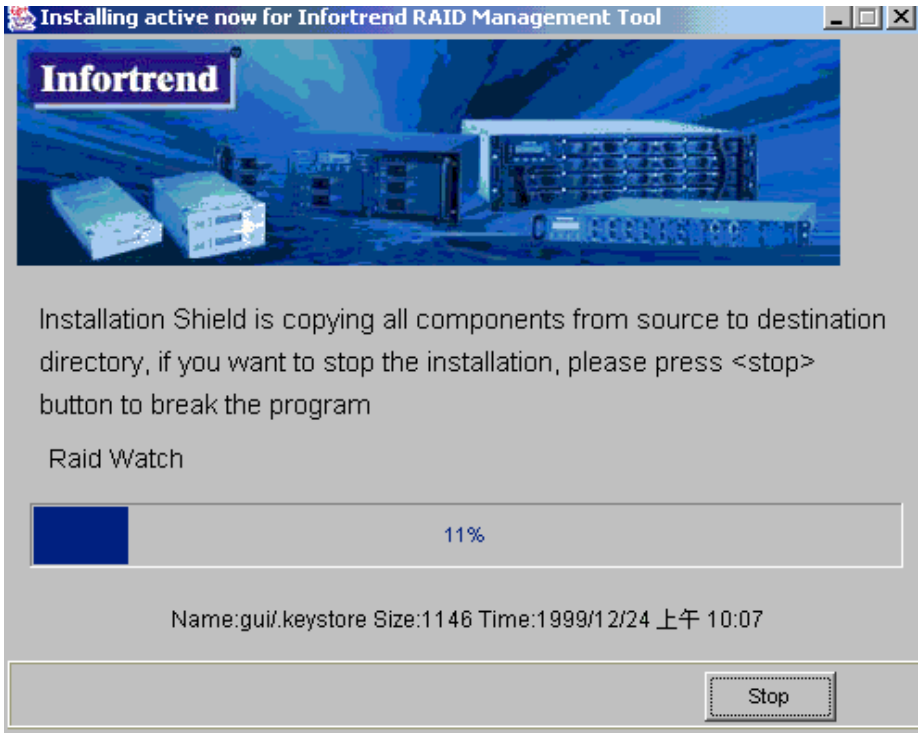



**Figure 2-11: Installing Active**

**Step 8.** If the "***Next***" button from ***Figure 2-11*** was selected, the Install Active window shown in ***Figure 2-12*** will appear. If you wish to stop the installation procedure, then click the "Stop" button. If you wish to continue installing the Applet components, allow the installation shield to continue through the rest of the procedure.

**Step 9.** Once the Applet components have been successfully installed, a window indicating the successful installation, shown in ***Figure 2-12***, will appear. To complete the process and to make the window disappear, click on the "***OK***" button.


**Figure 2-12: Successful Installation**

**Step 10.** If you wish to immediately access the RAIDWatch manager, then open a web browser and type in the IP address that you used in ***Figure 2-10***.

To run the **RAIDWatch Manager** from the controller, enter the following into the address bar of the web browser:

**http://www.xxx.yyy.zzz**

where **www.xxx.yyy.zzz** is the IP address entered in ***Figure 2-10***.

## 2.5 Program Updates

As Infortrend's valued customer, you are entitled to free program updates. You can download the latest version of RAIDWatch from Infortrend's FTP sites at ftp.infortrend.com.tw in Taiwan. For customers granted special access, the update files can also be found in the VIP section of Infortrend's website. For more information about this service, contact Infortrend support or an Infortrend distributor in your area.

# 2.6 In-band SCSI

## 2.6.1 What Is It and What Is It Used for?

*These days more and more external devices require communication with the host computer for device monitoring and administration. This is usually done through out-of-band connection such as RS-232C ports or an Ethernet port.*

*An alternative means of communication is in-band SCSI, which transfers configuration commands into supported SCSI commands and uses them to communicate with RAID arrays over the existing SCSI or Fibre host connections. The traditional way for controllers to communicate with the host computer has been via software (such as RAIDWatch) using an Ethernet connection. With in-band, integrators have more flexibility. They may user the existing host connection instead.*

*There are limitations on the use of in-band protocols. In order for a host to "see" the RAID controller/subsystem, at least one logical drive must exist and has been mapped to host ID/LUN. Otherwise, the RAID controller/subsystem itself must be configured to appear as a peripheral device to the host computers.*

*See the examples below for the procedures of configuring RAID controller/subsystems into a peripheral device.*

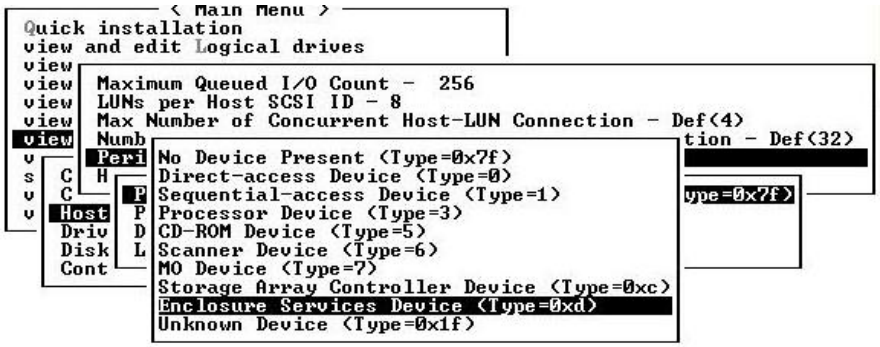
## 2.6.2 Related Configuration on Controller/Subsystem

Some adjustments must be made to the RAID controller or subsystem and to the host computer's SNMP settings before the two can communicate using SCSI commands. The RAID controller settings can be changed using the RS-232C terminal.

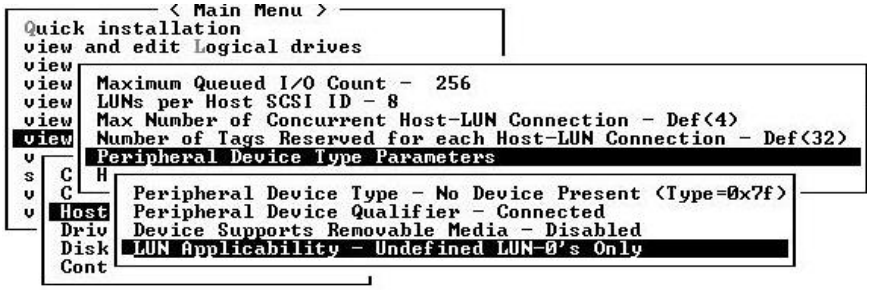
From the Main Menu, press the up or down buttons to select "View and Edit Configuration Parameters."

Press Enter; and then use the up or down buttons to select "Host-side SCSI Parameters." Then press Enter.

You will need to make adjustments in the Peripheral Device Type Parameters submenu. Look at the screens below to set the proper settings for the in-band protocol to work.




First select the "Peripheral Device Type" submenu and then select "Enclosure Services Devices <Type=0xd>."




Select "Undefined LUN-0's Only" for the "LUN Applicability" option.

Leave other options as defaulted. In-band should work fine by setting these two options. The adjustments necessary to use in-band protocols have been completed.

# Chapter 3: Configuration Client Options

This chapter describes the RAIDWatch configuration options. There are a number of different items that users can configure. These include the Root Agent and RAID Agents relationship and the configuration options concerning event notification.

# 3.1 The Configuration Client Utility

## 3.1.1 Using Windows – Configuration Client Installed in a Centralized Management Station

If, during the installation process outlined in ***Chapter 2***, the Centralized Management option was selected, the Root Agent driver, associated agents and Configuration Client utilities will be installed onto your computer. Centralized management in a multi-RAID environment is achieved through the Configuration Client utility.

To access the Configuration Client interface, please do the following:

Open the directory in which the RAIDWatch GUI was installed. This directory was selected during the installation process and the default access route is named as "***Infortrend Inc.***"

If you are using Windows, first select "***Start,***" then open the "***Programs***" menu and finally open the "***Infortrend Inc.***" Once the "***Infortrend Inc***" directory has been successfully opened, select the **Configuration Client** option shown in ***Figure 3-1***.

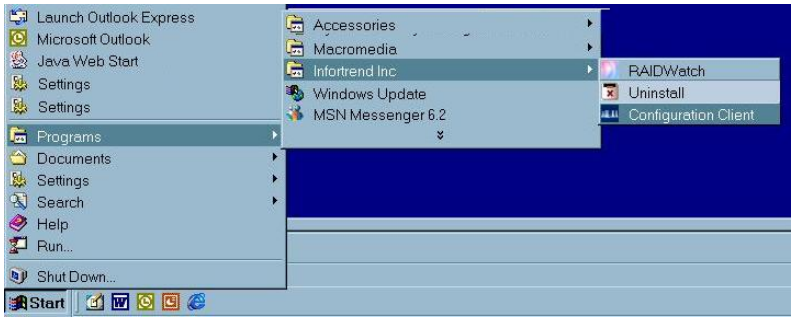



**Figure 3-1: Opening the Infortrend Directory**

**Step 1.** Click on the "***Configuration Client***" shortcut to activate the GUI as shown in ***Figure 3-2.*** Users can configure the following items:

- Root Agent (administrative settings)
- Notification configuration options

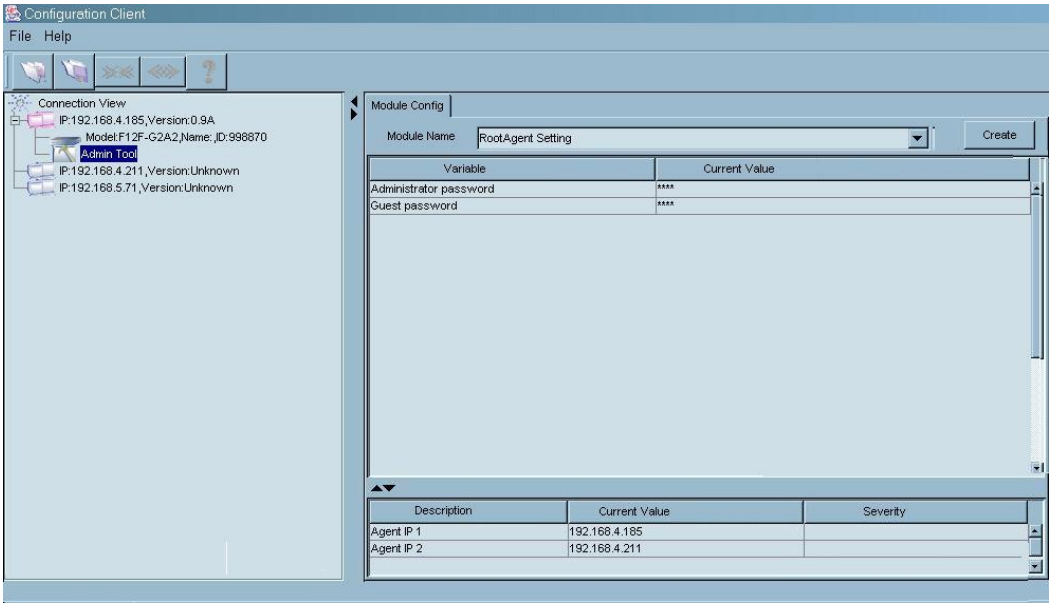



**Figure 3-2: Configuration Client Window**

## 3.1.2 Connecting to a Root Agent

**Step 1.** From the Start menu, select Programs -> Infortrend Inc -> Configuration Client.

**Step 2.** From the command menu, select **File**->**Add Host**, or **right-click** to bring up the **Add Host** command, and enter a **Root Agent** IP (usually the computer IP where the Configuration Client is installed).



**Step 3.** On the Connection View window, the connected IP displays. Right-click to display the **Connect** commands. Click **Connect** and an **access rights selection box** appears. Select to log in either as an **Administrator** or **Guest**.



**Step 4.** Enter "root" as user name at the first time login, and press Enter for Guest login. This password can be changed later in the utility. Only an administrator can access the notification settings.

**Step 5.** Double-click the **Admin Tool** item.


**Step 6.** The **Module Config** window should display on the right. You may now start configuring event receivers under each notification method window. A single click on the pull-down button displays all configuration options.

## 3.2 Configuration Client Functional Panels and GUI Screen

### 3.2.1 The GUI Screen Elements

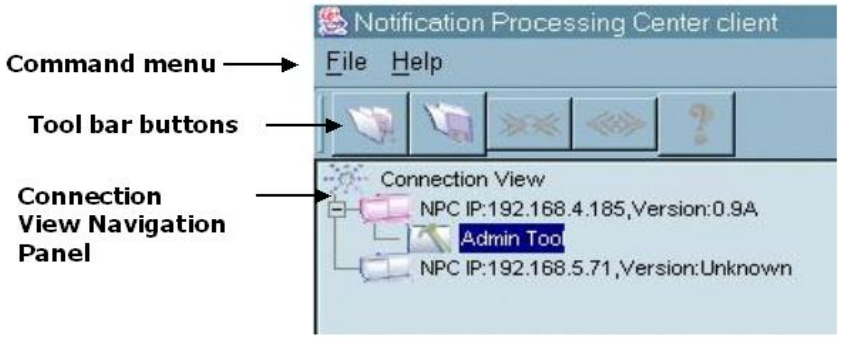



**Figure 3-3: Enable Redundant Options**

**Command Menu**: File commands include **Add Host** and **Exit**. The Add Host command connects you to a Root Agent host. A Root Agent host is one that is chosen as a management center. A Root Agent can manage multiple RAID agents which are, in turn, used to access different arrays. By connecting to a Root Agent IP, all its subsidiary RAIDs are then managed by the management center.

The Help command provides you information about the current software version. The help contents for using the Configuration Client can be accessed in RAIDWatch's main program Help.

## Tool Bar Buttons

Tool bar buttons listed from left to right**:**

***Open Bookmark File***: In the environment where multiple arrays need to be monitored at the same time, this button brings out the previously saved profile of the access to multiple arrays (via Root Agent and RAID Agent IPs).

***Save Bookmark File***: This button allows you to save the current connection profile (as shown in the navigation panel) as a file to your system drive. A file path dialog box displays when selected.

***Connect Root Agent Server***: This button allows you to connect to a Root Agent server to begin monitoring in cases like when it has been manually disconnected.

The Root Agent IP is the IP of the computer where you installed your Configuration Client utility.

***Disconnect Root Agent Server***: This button allows you to disconnect from a Root Agent server.

***Connection View Navigation Panel***: This panel displays the current connections with different RAID Agent servers.

This panel also has a command menu that can be triggered by ***right-clicking*** a Root Agent icon.

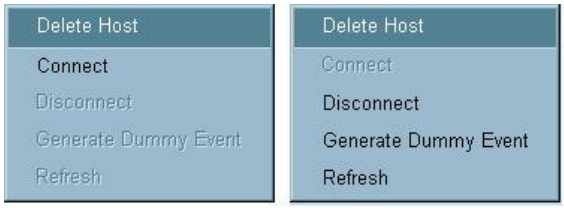



**Figure 3-4: Connection: The Right-Click Menus**

These command buttons allow you to remove a Root Agent entry, to connect, disconnect, or refresh the current connectivity status. The connection view automatically updates when an array is powered on or powered down, and automatically prompts the user for a status change, e.g., a managed array once disconnected is now connected.

***Generate Dummy Event***: You can also generate simulated events to test the notification functions once you have configured any or all of the notification methods.

**Module Configuration**:

The "***Module Config***" panel contains pull-down menus that allow access to create or modify various notification methods. The panel also allows you to setup an administrator's identity and lets an administrator be constantly aware of all arrays' status through notification emails.

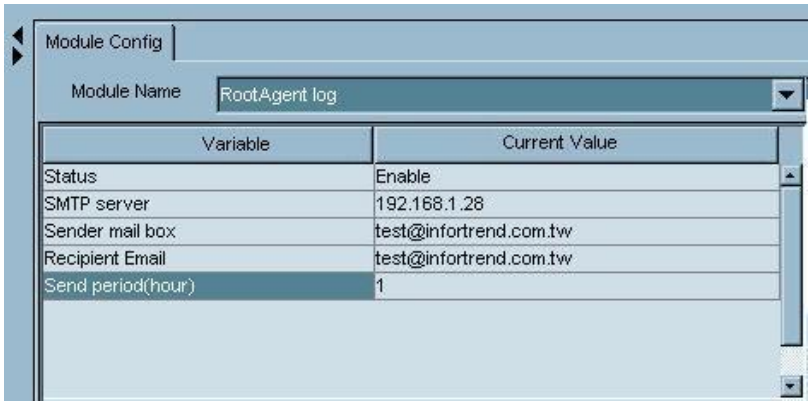



**Figure 3-5: Enable an Administrator's Options**

The Module Config panel provides access to nine (9) configurable items, and each item contains two (2) or more setup options. Seven (7) of them belong to the notification methods (ways you configure to notify a user if event faults should occur) settings.

All configuration options can be modified by double-clicking the Current Value field.

## 3.3 Root Agent Configuration

To configure the Root agent settings, select "***Module Config***" menu on the right of the Configuration Client screen as shown in ***Figure 3-8***. Select a pull-down menu named "***Root Agent Settings***" from the "***Module Name***" section.

### 3.3.1 Root Agent Settings

The "***Root Agent Settings***" option is shown in ***Figure 3-6***.

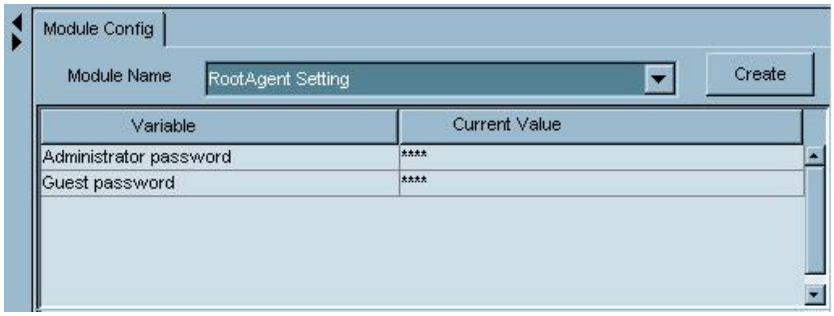



**Figure 3-6: Root Agent Setting**

- ***Administrator Password*** – This allows you to set an administrator's password. This is the port number the RAIDWatch centralized manager station will use to communicate with the Root Agent. The default for "Administrator" is "root". There is no default password for login as "Guest."

  Note that this password is independent from the password set for the "Configuration" login to start the RAIDWatch manager program.

- ***Guest Password*** – This is selected to enable a user logging in as "Guest" to view the status of RAID arrays currently being managed by the Configuration Client utility.

## *Adding RAID Agents IPs (Associating Root Agent with Multiple RAID Arrays)*

RAID Agents are the sub-modules **RAIDWatch** or the **Configuration Client** utility use to communicate with a RAID subsystem. Multiple RAID Agents can be associated with a Root Agent. A Root Agent then summarizes and presents these RAID Agents to the Configuration Client so that system administrators can be notified of system alerts if any faulty conditions happen to these RAID arrays.

**Step 1.** RAID Agents currently being managed by a Root Agent are listed in the lower right corner of the GUI screen.

**Step 2.** To add or delete RAID agents, click the "***Create***" button next to the Root Agent pull-down list to display an "***Edit Monitor Controller***" prompt. The same command prompt can also be activated by right-clicking the agent list.

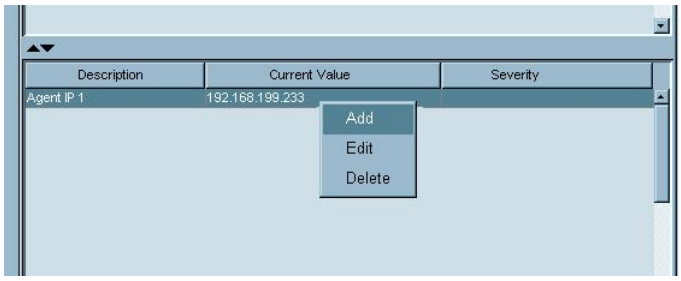



**Figure 3-7: Agent List Right-Click Menu**

**Step 3.** Enter the IP address of the array you wish the Root Agent to manage. Click OK to complete the process.


**Figure 3-8: Adding RAID Agent IP**

## 3.3.2 Root Agent Log Settings

Following are the methods used to keep an administrator constantly notified of the status of managed arrays. As shown in ***Figure 3-9,*** when properly configured, the **Root Agent Log** allows an administrator to receive event logs that happened on all managed arrays for every preset time period.

To configure the ***Root Agent Log*** settings:

**Step 1.** Enable the function by double-clicking the **Current Value** field in the Status field.

**Step 2.** Set an **SMTP** server address so that event log emails can be sent to the administrator.

**Step 3.** Set a valid mail address as the **sender** address and the administrator's email address as the **recipient** mail address.

**Step 4.** The **Send period** (hour) determines how often an administrator receives event log notifications.


**Figure 3-9: Root Agent Log Settings**

## 3.3.3 Create Plug-ins

### *Create Plug-ins with Event Notification*

**Before you begin**

- The Plugin sub-function allows you to add a specific feature or service to RAIDWatch's notification methods.
- The add-ins can be used to process the events received from Configuration Client utility and extend its functionality.

  Prepare your execution file, and place it under the **plugin** sub-folder under the directory where your installed RAIDWatch program. If the default installation path has not been altered, the plugin folder should be similar to the following:

  Program Files -> Infortrend Inc -> RAID GUI Tools -> bin -> plugin.

  Place the execution file that will be implemented as a plug-in in this folder.

The plugin capability provides advanced users the flexibility with customizing and presenting the event messages received from the Configuration Client utility.

### *The Configuration Process*

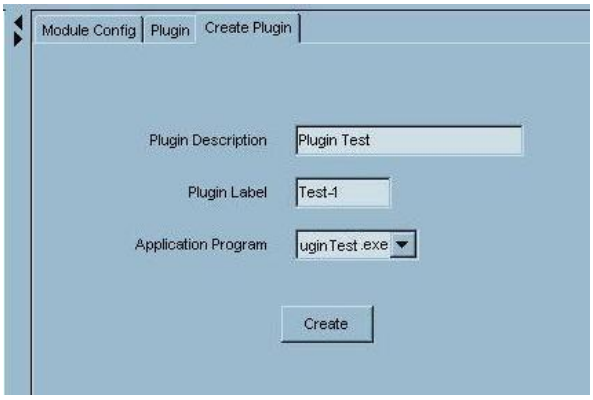



**Figure 3-10: Naming and Associating a Plug-in file**

**Step 1.** Click the **Create Plugin** tab.

**Step 2.** Make sure you have placed the execution file in the plugin folder as described earlier.

**Step 3.** Enter **Plugin Description**, **Plugin Label** and select an execution file from the **Application Program** field if there are more than one.

**Step 4.** Click **Create** to complete the process.

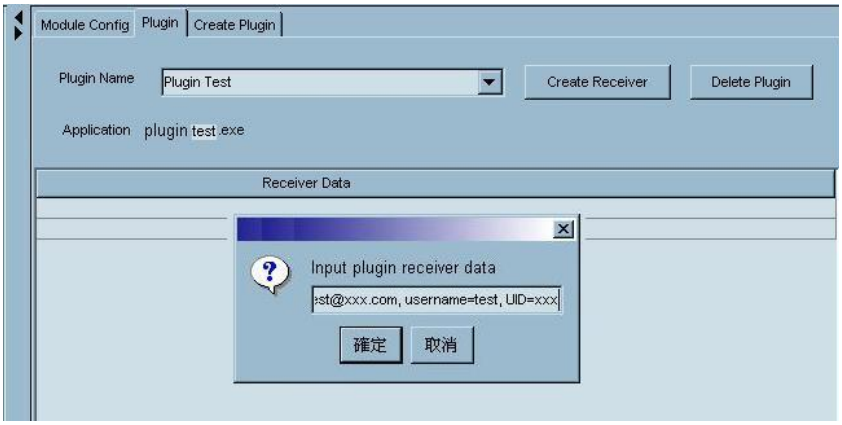



**Figure 3-11: Create Plugin Receiver Profile**

**Step 5.** Select the **Plugin** tab from panel. Click **Create Receiver** to display an input field dialog box.

**Step 6.** Key in the configuration string to be read when the application program starts. A configuration argument may look like this:

"\plugin\userprogram.exe uid=xx model=xxx-xxx ip=xxx.xxx.xxx.xxx ctrlrName=N/A severity=1 evtStr="Evt String" recv="customized string"

An added profile is listed in the **Receiver Data** field.

# 3.4 Event Notification Settings

**Configuration Client's Notification Methods:**

Configuration Client provides the following methods for sending notifications: SNMP Traps, email, LAN broadcast, fax, ICQ, SMS, and MSN Messenger. Some notification methods, such as the connection to a fax machine, require Windows MAPI support on the servers used as the Configuration Client platform.

To configure the Event Notification (previous *NPC*) settings, select "***Module Config***" from the right-hand side of GUI screen. Select by scrolling down the pull-down menus that allow access to create or modify various notification methods.

There are seven notification methods listed in the pull-down menus. Along with six different (fax, broadcast, email, SNMP traps, ICQ, SMS, and MSN messenger) means of informing RAID managers that an event has occurred, the severity level of events to be sent via these notification methods can also be configured by the user.

In order to use fax notification, modem parameters must be properly set on the main management station. For NT servers, Widows MAPI services, modem, and fax must be ready and running for the notification methods to work. If no event notifications will be used, skip these steps.

**Before You Start:** Event Severity Levels

Users may select a severity parameter (1, 2, or 3) with every notification method. The parameter determines events of what severity level(s) are to be sent to a receiver.

| | |
|---|---|
| **1** | All severity levels |
| **2** | Two levels: Warning and Alert |
| **3** | Only the most serious events: Alert messages |

## 3.4.1 Enabling Notification Functions

When all notification settings have been properly configured, remember to enable each notification method by double-clicking the **Current Value** field in "**Status**." Set **Status** to "Enable" if you want the module to be activated every time the Root Agent is loaded. The Root Agent runs as an application and is automatically loaded when the server is powered on.

Note that the On/Off switch of each notification method should also be in the On position before you turn off the server or close the utility.
Otherwise, you will have to manually enable the function after your server is rebooted.

switched ON;


switched OFF

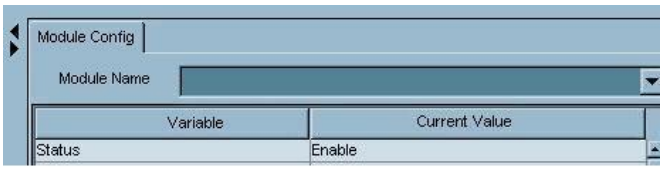



**Figure 3-12: Enabling a Notification Method**

## 3.4.2 SNMP Traps Settings

### *Receiver Side*

To set a Client Listening to SNMP traps:
**Step 1.** Right-click on the lower half of the configuration screen, the **receiver entry** field, to display the add recipient prompt.


**Step 2.** An **Add receiver** prompt displays. Simply enter the IP addresses of SNMP agents that will be listening for trap notification.

**Step 3.** Select the severity level of events that will be sent to the SNMP agent.
**Step 4.** Repeat this process to add more SNMP agents.

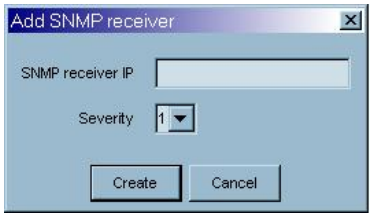



**Figure 3-13: SNMP Traps Settings**

### *Sender Side*

From the Module Config window:
**Step 1**. Find the SNMP settings from the pull-down list.
**Step 2.** Click on the On/Off switch besides the pull-down button to enable SNMP Traps notification.

switched ON;


switched OFF

**Step 3.** Double-click on the Current Value field of the Status row to enable SNMP Traps notification.
**Step 4.** Select the severity level of events to be sent to the receiver station.
**Step 5.** Provide a valid out port IP that will be used for delivering SNMP traps. Usually the default IP detected by the Root Agent will be sufficient. If you have more than one Ethernet ports, double-click to configure it.

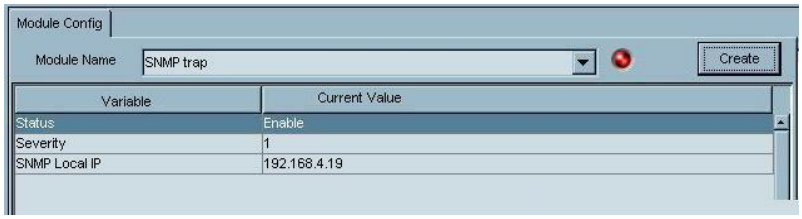



**Figure 3-14: SNMP Traps Settings**

## 3.4.3 Email Settings

### *Receiver Side*

SASL authentication is supported with this revision.

To set an email address to receive notification emails:
**Step 1.** Right-click on the lower half of the configuration screen to display the add recipient prompt.


**Step 2.** An Add recipient prompt displays. Click "Add" to display another prompt and then enter an address for email notification.
**Step 3.** Select the severity level of events to be sent to the receiver's email.
**Step 4.** Repeat this process to add more email addresses.

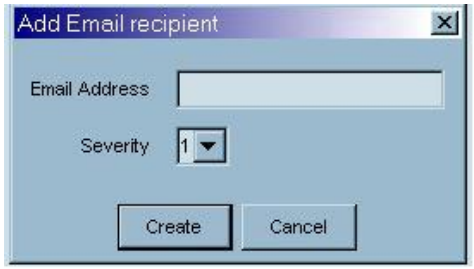



**Figure 3-15: Email Settings**

### *Sender Side*

From the Module Config window:
**Step 1.** Find the email settings from the "**Module Name**" pull-down list.
**Step 2.** Click the **On/Off switch** besides the pull-down list button to enable Email notification.

switched ON;


switched OFF

**Step 3**. Double-click on the Current Value field of the Status row to enable email notification.
**Step 4.** Select the severity level of events to be sent to the receiver station.
**Step 5.** Enter the mail subject by double-clicking the Current Value field.
**Step 6.** Set your SMTP mail server through which emails will be sent.
**Step 7**. Enter **Account** name or **Password** if your mail server requires these two values. SASL is the currently supported mechanism.
**Step 8.** Provide a valid email address as your sender's address.

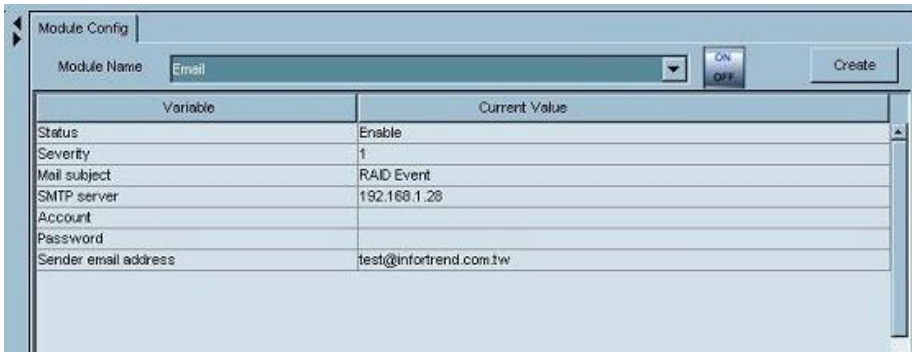



**Figure 3-16: Email Settings**

## 3.4.4 LAN Broadcast Settings

### *Receiver Side*

To set a computer to receive broadcast messages:
**Step 1.** Right-click on the lower half of the configuration screen, the receiver entry field, to display the add recipient prompt.


**Step 2.** An **Add receiver** prompt displays. Simply enter the IP addresses of a station on a network configured.
**Step 3.** Select the severity level of events to be sent to the receiver station.
**Step 4.** Repeat this process to add more receivers.

Note that NETBUES and TCP/IP should be active services on your Centralized Management station for message broadcasting.


**Figure 3-17: Broadcast Settings**

### *Sender Side*

From the Module Config window:
**Step 1.** Find the Broadcast settings from the pull-down list.
**Step 2.** Click on the On/Off switch besides the pull-down button to enable LAN broadcast notification.

switched ON; 

switched OFF

**Step 3.** Double-click on the Current Value field of the Status row to enable LAN broadcast. Set **Status** to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turned off the server or closed the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.
**Step 4.** Select the severity level of events to be sent to the receiver station.

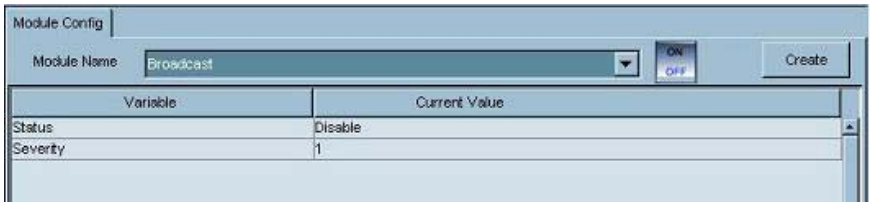



**Figure 3-18: Broadcast Settings**

## 3.4.5 Fax Settings

### *Receiver Side*

To set a fax machine to receive event messages:
**Step 1.** Right-click on the lower half of the configuration screen, the receiver entry field, to display the add recipient prompt.


**Step 2.** An **Add receiver** prompt displays. Enter the phone number of the event notification receiving fax machine.
**Step 3.** Enter the **Outside line** dial-out number if there is any.
**Step 4.** Enter the **Delay Second** number.
**Step 5.** Enter the level of severity of events to be sent via fax.
**Step 6.** Repeat this process to add more receivers.

Note that physical connection and fax service with Windows MAPI should be ready before configuring this function.

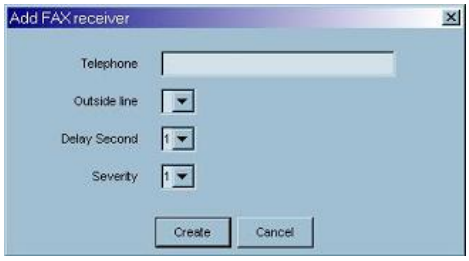



**Figure 3-19: Fax Settings**

### *Sender Side*

From the Module Config window:
**Step 1.** Find the Fax settings from the pull-down list
**Step 2.** Click on the On/Off switch besides the pull-down button to enable Fax notification.

switched ON;


switched OFF

**Step 3.** Double-click on the Current Value field of the Status row to enable fax notification. Set **Status** to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.
**Step 4.** Select the severity level of events to be sent to the receiver station.
**Step 5.** The Fax device row shows the fax machine(s) currently available. Check for appropriate setup in Windows control panel.
**Step 6. Queue size** determines how many events will be accumulated and then sent via single fax transmission.

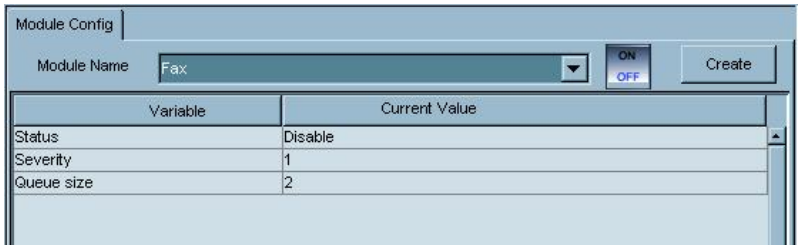



**Figure 3-20: Fax Settings**

## 3.4.6 ICQ Settings

### *Receiver Side*

To set an ICQ contact to receive notification messages:
**Step 1.** Right-click on the lower half of the configuration screen, the receiver entry field, to display the add recipient prompt.


**Step 2.** Enter the **ICQ User Name** of the contact receiving event messages.
**Step 3.** Select the severity level of events to be sent to the receiver.
**Step 4.** Repeat this process to add more receivers.


**Figure 3-21: ICQ settings**

### *Sender Side*

From the Module Config window:
**Step 1.** Find the ICQ settings from the pull-down list.
**Step 2.** Click on the On/Off switch besides the pull-down button to enable ICQ notification.

switched ON; 

switched OFF

**Step 3.** Double-click on the Current Value field of the Status row to enable ICQ notification. Set **Status** to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.
**Step 4.** Select the severity level of events to be sent to the receiver station.
**Step 5.** Enter an ICQ login ID.
**Step 6.** Enter a password for ICQ login.

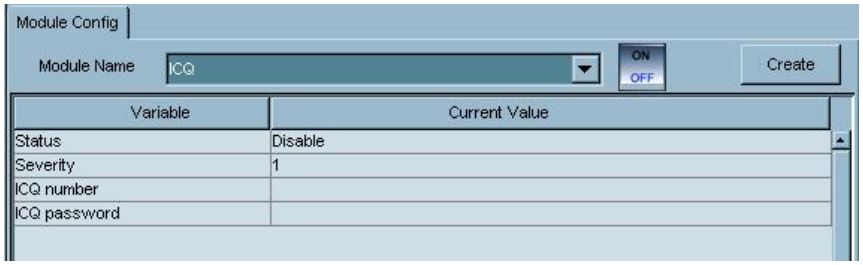



**Figure 3-22: ICQ settings**

## 3.4.7 MSN Settings

### *Receiver Side*

To set an MSN messenger address to receive notification messages:
**Step 1.** Right-click on the lower half of the configuration screen, the receiver entry field, to display the add recipient prompt.


**Step 2.** Enter the **MSN Account** of the contact receiving event messages.
**Step 3.** Select the severity level of events to be sent to the receiver.
**Step 4.** Repeat this process to add more receivers.


**Figure 3-23: MSN Messenger Settings**

### *Sender Side*

From the **Module Config** window:
**Step 1.** Find the MSN settings from the pull-down list.
**Step 2.** Click on the On/Off switch besides the pull-down button to enable MSN notification.

switched ON;


switched OFF

**Step 3.** Double-click on the Current Value field of the Status row to enable MSN notification. Set **Status** to Enable if you want the module to be activated every time the Root Agent is started. Note that the On/Off switch should also be in the On

position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot your server.
**Step 4.** Select the severity level of events to be sent to the receiver station.
**Step 5.** Provide a valid MSN contact by entering its user name.
**Step 6.** Provide the associated password.

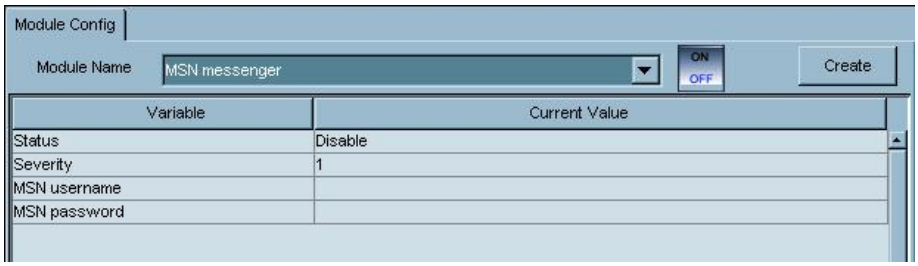



**Figure 3-24: MSN Messenger Settings**

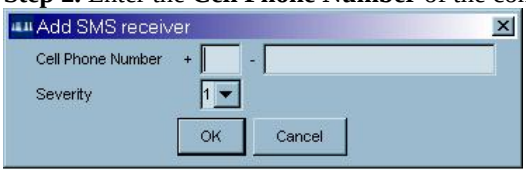
## 3.4.8 SMS Settings

SMS is a short for Short Message Service. Using the notification method requires the use of a GMS modem.

### *Receiver Side*

To set a cell phone to be receiving notification messages:
**Step 1.** Right-click on the lower half of the configuration screen, the receiver entry field, to display the add recipient prompt.


**Step 2.** Enter the **Cell Phone Number** of the contact receiving event message.




**Step 3.** Select the severity level of events to be sent to the receivers.
**Step 4.** Repeat this process to add more receivers.

### *Sender Side*

From the Module Config window:
**Step 1.** Find the **SMS** settings from the pull-down list
**Step 2.** Click on the **On/Off switch** besides the pull-down button to enable SMS notification.

switched ON;


switched OFF

**Step 3.** Set **Status** to Enable if you want the module to be activated every time the

Configuration Client is started. Note that the On/Off switch should also be in the On position before you turn off the server or close the utility. Otherwise, you will have to manually enable the function whenever you reboot the server.

**Step 4.** Select the **severity** level of events to be sent to the receiver station.

**Step 5.** Select the **COM port** where you connect your GMS modem.

**Step 6.** Enter the four-digit identification **Pin Code** required by the modem.

**Step 7.** Provide a **Send Period** in milliseconds for time intervals between messages sent.

**Step 8.** Provide a **retry time** value.

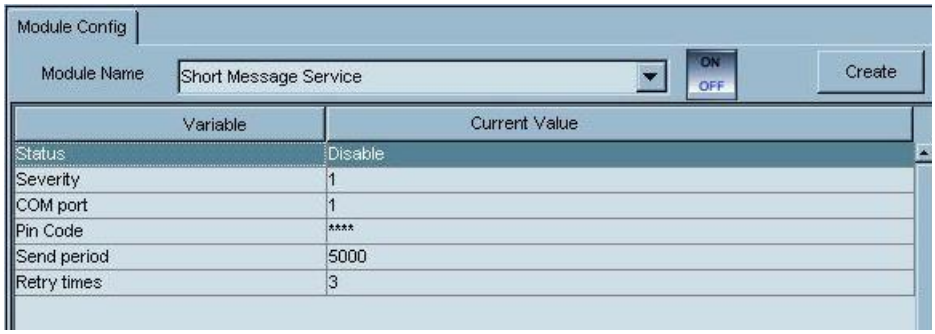



**Figure 3-25: SMS Settings**

## 3.5 Event Severity Levels

RAIDWatch classifies disk array events into three severity levels. The first level includes non-critical information events such as initialization of the controller and initiation of the rebuilding process. Level 2 severity includes events which require the issuance of a warning message. Level 3 severity is the most serious level, and includes events that need immediate attention. Note that the severity levels here are different from the levels used for configuring the notification methods. The following provides example events for each level:

### 3.5.1 Level 1 Severity Events (examples)

- Controller Initialization Complete
- Rebuild Initiated
- Rebuild Complete
- Rebuild Failed
- Logical Drive Initialization Started
- Logical Drive Initialization Complete
- Logical Drive Initialization Failed

### 3.5.2 Level 2 Severity Events (examples)

- SCSI Target Select Timeout
- SCSI Target Phase/Signal Error
- SCSI Target Unexpected Disconnect
- SCSI Target Negotiation Error
- SCSI Target Timed Out
- SCSI Target Parity Error
- SCSI Bus Reset Issued
- SCSI Target Not Ready Error
- SCSI Target Media Error
- SCSI Target Hardware Error
- SCSI Target Unit Attention
- SCSI Target Unexpected Sense Date
- SCSI Target Block Reassignment Failure

- SCSI Target Unexpected Data Over/Underrun
- Drive SCSI Unrecognized Event

### 3.5.3 Level 3 Severity Events (example)

- Drive Failure
- Enclosure Power Supply Failure
- Cooling Fan Module Failure
- RAID Controller Unit Failure

**NOTE***:* The current version includes event notification configuration based on event severity.

## 3.6 Event Log Display

Once RAID Agent IPs are associated with a Root Agent, its icons and names display on the Connect View panel.

To check the events that have happened since the Configuration Client started, single-click on a connected RAID.

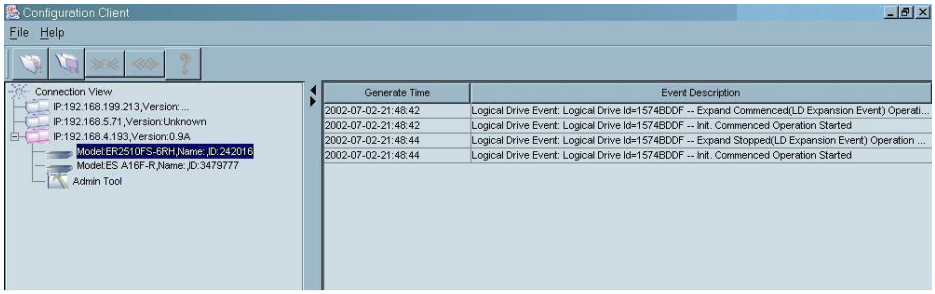



**Figure 3-26: Event Log Display Window**

The event log window displays on the right-hand side of the GUI screen. Note that the utility does not display events that happened before the utility started.

# Chapter 4: RAIDWatch Icons

This chapter introduces icons used in the main configuration access categories:

- ***Navigation Tree Icons*** – Section 4.1
- ***Array Information Icons*** – Section 4.2
- ***Maintenance Icons*** – Section 4.3
- ***Configuration Icons*** – Section 4.4
- ***Event Log Icons*** – Section 4.5

## 4.1 Navigation Tree Icons

| | |
|---|---|
|  | **Connected RAID Array** |

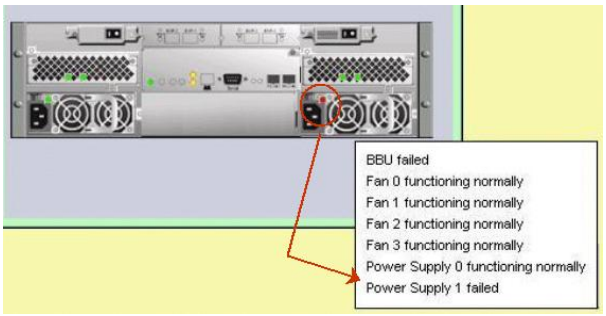
| | | |
|---|---|---|
|  | **Array Information** | |
| |  | Enclosure View |
| |  | Tasks under Process |
| |  | Logical Drive Information |
| |  | Logical Volume Information |
| |  | Fibre Channel Status |
| |  | System Information |
| |  | Statistics |

| | | |
|---|---|---|
|  | **Maintenance** | |
| |  | Logical Drive |

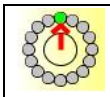
| | | |
|---|---|---|
| |  | Physical Drive |

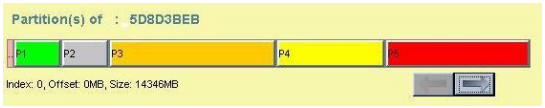
| | | |
|---|---|---|
|  | **Configuration** | |
| |  | Create Logical Drive |
| |  | Existing Logical Drives |
| |  | Create Logical Volume |
| |  | Existing Logical Volumes |
| |  | Host Channel |
| |  | Host LUN Mapping |
| |  | Configuration Parameters |

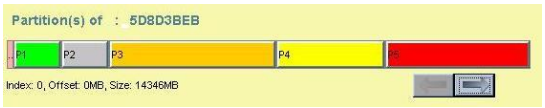
## 4.2 Array Information Icons

| **Enclosure View** | |
|---|---|
|  | Drive in good condition |
|  | Drive missing or bad |
|  | Global spare |
|  | Any drive icon showing a different color from “black” represents a member of a logical drive or a dedicated spare. Black is the default color of a new or used drive. A used drive is a drive that had been used as a member of a logical drive. |
|  | An empty tray; disk drive not installed |
|  | RAIDWatch recognizes each subsystem by its board serial number, and displays an exact replica of it in the panel view.<br><br>LEDs shown on the enclosure view correspond to the real LEDs on the subsystem’s rear panel. |
| | As shown in the diagram, if an LED corresponding to a failed component is lit red, you can move your cursor to the enclosure panel, and after holding the cursor there for a while, a summary of the enclosure status will be displayed. |
|  | This graphic represents a rotation button, each mouse-click on it turns the enclosure graphic 90 degrees clockwise. |

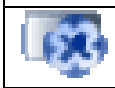
| **Tasks Under Process** | |
|---|---|
|  | Type of tasks being processed by the subsystem. The Task status window displays icons representing specific configurations. |

| | |
|---|---|
|  | Progress indicator |

| **Logical Drive Information** | |
|---|---|
|  | A logical drive |
|   | A partitioned logical drive volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured array. |

| **Logical Volume Information** | |
|---|---|
|  | A logical volume |
|   | A partitioned logical volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured volume. |
|  | A member of a logical volume, representing a logical drive. Different logical drives are presented using icons of different colors. |

| **Fibre Channel Status** | |
|---|---|
|  | A Fibre host channel |

| **System Information** | |
|---|---|
|  | A battery module |
|  | A RAID controller unit |
|  | A current sensor |
|  | A cooling fan |

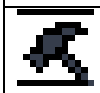
| | |
|---|---|
|  | An enclosure device connected through an I2C bus |
|  | A power supply |
|  | An enclosure device connected through SAF-TE (SCSI bus) |
|  | An enclosure device connected through SES (Fibre link) |
|  | A drive tray slot |
|  | A temperature sensor |
|  | An UPS device |
|  | A voltage sensor |

## 4.3 Maintenance Icons

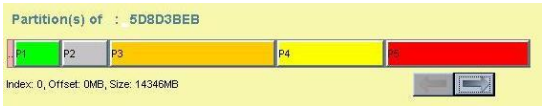
| **Maintenance** |
|---|
| This category uses the same icons as in the Logical Drive Information window. |

## 4.4 Configuration Icons

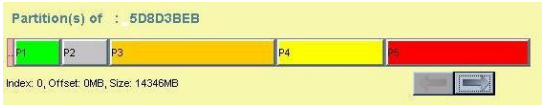
| **Create Logical Drives** |
|---|
| This window uses the same icons as in the Logical Drive Information window. |

| **Existing Logical Drives** | |
|---|---|
|  | A configured array (logical drive) |

| **Create Logical Volume** | |
|---|---|
|  | A member of a logical volume, representing a logical drive. Different logical drives are presented using icons of different colors. |

| Existing Logical Volumes | |
|---|---|
|  | A logical volume |
|  | A partitioned logical volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured array. |
|  | A member of a logical volume, representing a logical drive. Different logical drives are presented using icons of different colors. |
|  | A logical volume |

| Host Channel | |
|---|---|
|  | A Host channel |

| Host LUN Mapping | |
|---|---|
|  | A logical drive. Different logical drives are presented using icons of different colors. |
|  | A logical volume |
|  | A partitioned array volume is represented as a color bar that can be split into many segments. Each color segment indicates a partition of a configured array. |

| Configuration Parameters |
|---|
| No icons used in the window. |

## 4.5 Event Log Icons

| **Event Messages** | |
|---|---|
| Severity Levels | |
|  | An informational message: Command processed message sent from firmware |
|  | A warning message: System faults |
|  | An alert message: Errors that need to attend to immediately |
| Event Type | |
| Type of messages detected by the subsystem. The event view panel displays icons representing specific categories using the same icons as those used in the System Information window. | |

# Part 2: Using RAIDWatch for System Management

***Part 2*** *describes how to use RAIDWatch to manage and configure your system.* ***Part 2*** *explains how to configure both RAID-related and I/O channel configurations and illustrates hard drive management. Hard drive management includes creation, deletion, expansion and partitioning of logical drives and logical volumes. A separate chapter also explains how to map logical drives, volumes and partitions there of to individual LUNs.*

*This section includes the following chapters:*

- **Chapter 5,** ***Basic Operations***
- **Chapter 6,** ***RAIDWatch Considerations***
- **Chapter 7,** ***Configuration Parameters***
- **Chapter 8,** ***Channel Configuration***.
- **Chapter 9,** ***Drive Management***
- **Chapter 10,** ***LUN Mapping***

# Chapter 5: Basic Operations

This chapter describes the RAIDWatch GUI screen elements and basic operations.

# 5.1 Starting RAIDWatch Agents

## 5.1.1 Under Windows (NT/XP/2000/2003) OSes:

Once properly installed, the necessary software agents start automatically under Windows OS each time the host computer is started or reset, e.g., RAID Agents and Root Agents. However, the GUI part of RAID Watch and the Configuration Client utility need to be manually started.

Since the majority of RAID storage applications require non-stop operation, the Configuration Client utility, which is used to monitor and report array conditions, should be installed on a management server installed for 24-7 operation. For a higher level of fault tolerance, because a server can also fail, the Configuration Client can be installed onto more than one server. As shown below, when installing RAIDWatch using the Centralized Management scheme, a pair of redundant servers can be specified in the installation wizard prompt. The configuration is done by specifying IP addresses for a Master Host and a Slave Host.

Note that RAIDWatch must be manually installed (Mode 1 installation: Centralized Management) onto both the Master and Slave hosts. The Configuration Client functionality on the Slave host becomes active only when the Master host fails.

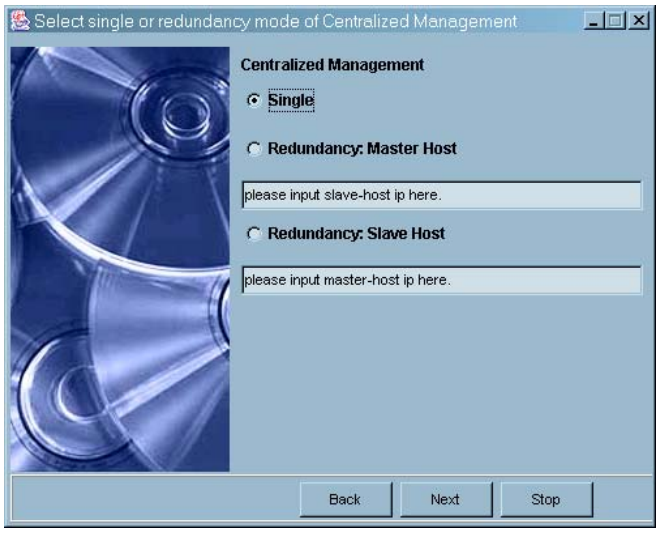



**Figure 4- 1: Installation Wizard Prompt: Redundancy Server**

Before management can be performed on a particular disk array system, you need to first establish a connection from your array to the network or a connection between your array and the directly attached server. Once a connection is established successfully, management can be started.

The following discusses how to connect to a disk array. Information on disconnection is provided at the end of this section.

## 5.2 Starting RAIDWatch Manager

The GUI management interface, RAIDWatch Manager, needs to be started by a network or RAID systems manager regardless of which OS is being used.

Depending on your setup, you can start RAIDWatch Manager in various ways.

For both local and distant management, and under various OSes, starting the program is fairly simple. Please refer to the appropriate sub-section below for information.

**Default Passwords**: a default password is required for the Information login.

| Configuration | Maintenance | Information |
|---|---|---|
| Password previously set for the controller/subsystem; press Enter for none | One you set in the RAIDWatch "Configuration Parameters" window | Default is "1234" |

### 5.2.1 Locally or via LAN under the Windows (NT/2000/XP/2003) Environment:

**NOTE:** If you are using an EonStor subsystem, after connecting to the subsystem, the Enclosure View showing images of both the front and rear view will appear.

**Step 1.** From the Start menu, select Programs → Infortrend Inc. → RAIDWatch Manager.

***-or-***

Double-click the RAIDWatch Manager icon either in the group folder or from the desktop if a shortcut was added during the installation process. The RAIDWatch Manager "**Connect to RAID Agent**" prompt window should appear on the screen.

**Step 2.** Enter the IP address of the disk array system you wish to manage. You may select to check a Root Agent IP by clicking the "***Show Root Agent List***" button and then select to display the RAID arrays managed by Root Agents by clicking the "***Retrieve IP List"*** button. You may then use the IP Address pull-down list to display all available IPs.

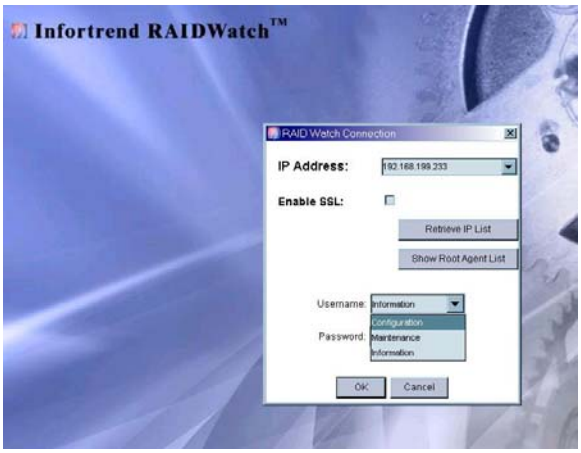
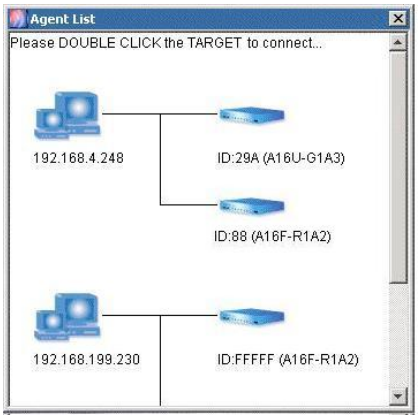



**Figure 4- 2: RAIDWatch Connection Prompt**




*- OR -*


**Figure 4- 3: Retrieve IP List: IPs Managed by Root Agents**

**Step 3.** If you have a specific RAID array's IP address in mind and wish only to manage one array, simply enter the IP address to proceed.

You may select to enable the SSL security option by a single mouse-click on its check box.


**Figure 4-4: Connection Prompt**

**Step 4.** Enter a user name by selecting from the pull-down menu. Each user name represents an authorized access level. Enter a password to proceed. Leave it blank if there is no preset password. Click the "***OK***" button to start the management session.

## 5.2.2 For Remote Management via Web Browser (Any Supported OS)

**Step 1.** Start your web browser and enter the IP address assigned to the RAID subsystem Ethernet port or that of a RAID-attached server as your URL (e.g., 222.212.121.123). The IP of a RAID-attached server is used when the server uses in-band protocols to communicate with the attached RAID array. After a brief delay while the Java Applet starts, the RAIDWatch Manager main connection wizard appears on the screen.

**Step 2.** The RAIDWatch management window should start after a brief moment. Note that, in Applet mode, connecting to the second array requires opening another browser window and entering its IP.

Note that Java Plug-in support is required on browsers used for accessing the array.

### 5.2.3 Disconnecting and Refreshing a Connection

From the **System** menu, select **Logout**.

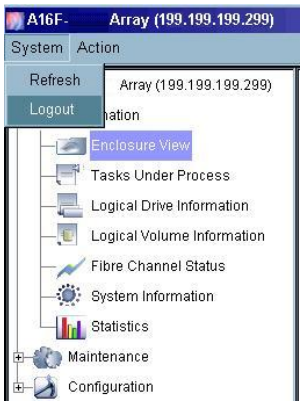



**Figure 4-5: Disconnect from a Connected Array**

Clicking **Logout** closes the current software session and returns you to the **Outer Shell** window. If you wish to connect to another RAID array, enter its IP address and then click "***OK***" to proceed. Click "***Cancel***" to close the connection prompt. RAIDWatch Manager should return to the **Outer Shell** window.

Selecting the **Refresh** button allows you to re-connect with an array if a RAID array has been temporarily disconnected; e.g., the RAID array is being reset, or the host links being disconnected for maintenance reasons.

## 5.3 Security: Authorized Access Levels

Password protection is implemented with the Connection wizard to prevent unauthorized access to configured arrays. This protection, which is implemented along with the security access levels, prompts a user for the station password the first time he or she attempts to connect to a subsystem.

By default, no password is required to access an array using the authorization of the first two of the protection levels, "Configuration" (Administrator) and "Maintenance" (User). It is recommended to configure passwords for these two access levels the first time you successfully connect to an array. A default password is provided with the "Information" login. The Information users can monitor array status and see event messages. A user logging in using the Maintenance access can perform maintenance jobs onto configured arrays, and a user logging in using the Configuration login has full access rights to create, modify, or delete all related array configurations.

Note that some RAID subsystem/controllers may have been configured with a password using terminal or LCD keypad utilities. This preset password can be used for a "Configuration" login. See ***Chapter 7*** for the description of password setup.

## 5.4 Look and Feel

### 5.4.1 Look and Feel Overview

Because RAIDWatch Manager is a Java-based GUI program, it can accommodate the "look-and-feel" standards of various OSes. At present, Windows interface appearance is supported.

RAIDWatch Manager will auto-detect and configure to match the OS where it is currently running.

In the event of a compatibility problem or under unknown OS or OS versions, the program will default to Java look and feel.

Just like other GUI-based applications, RAIDWatch Manager works entirely with windows, buttons, and menus to facilitate various disk array operations. These windows follow the standard Windows "look-and-feel" specifications, thus steps for manipulating elements and windows within any RAIDWatch Manager window generally conform to standard procedures. The management sessions are best displayed in the 1024x768 screen resolution.

*(Screen captures throughout this document show the Windows look and feel.)*

## 5.4.2 Screen Elements

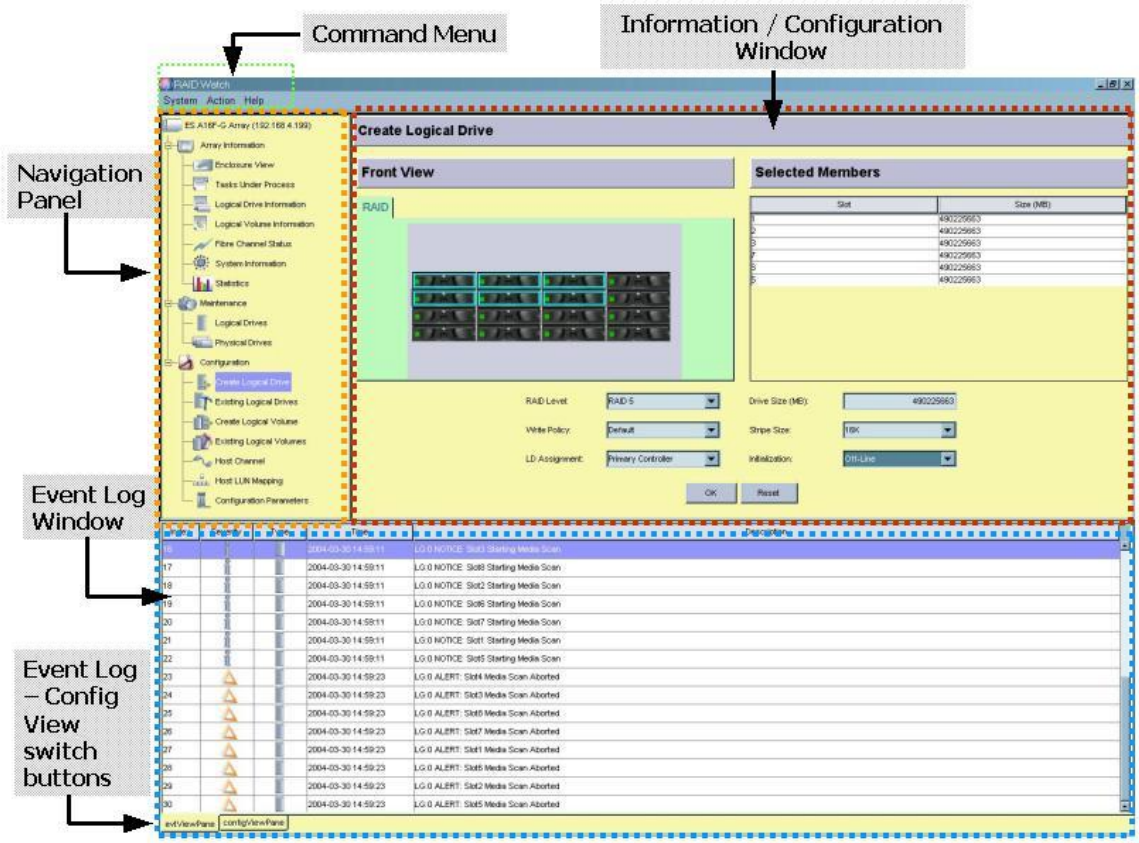



**Figure 4- 6: GUI Screen Elements**

The GUI screen can be divided mainly into three separate windows: a tree-structure **Navigation Panel**, the **Information/Configuration** window, and the **Event Log/Config View** window at the bottom.

Each informational or configuration window can also be accessed through the command menus on the upper left corner of GUI. At the bottom of the Event Log window, tab buttons allow you to switch the view to the Configuration View display.

## 5.4.3 Command Menus

The menu bar shown in ***Figure 4- 7*** displays the available menus on the Outer Shell window. The Outer Shell window contains multiple management windows each providing access to a connected array.

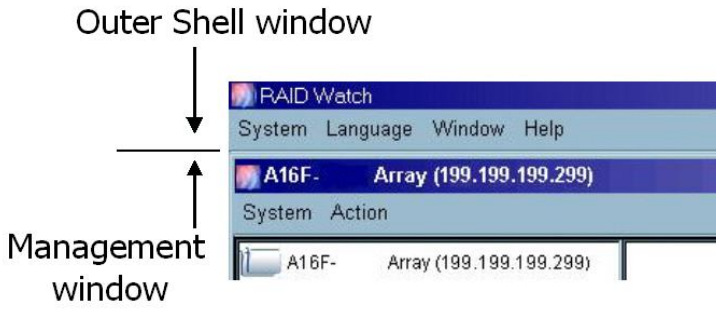



**Figure 4- 7: Command Menu Bar**

All menus provide a list of commands (shown in ***Figure 4- 9***) for invoking various disk array and display-related operations.

Note that the "Command" menu is related to the selected items in each configuration screen and only appears when a specific configuration item, e.g., a RAID partition or host LUN entry, is selected by mouse click. An example is shown below. When a configurable item is selected, the corresponding command menu and the related commands automatically appear on the menu bar.

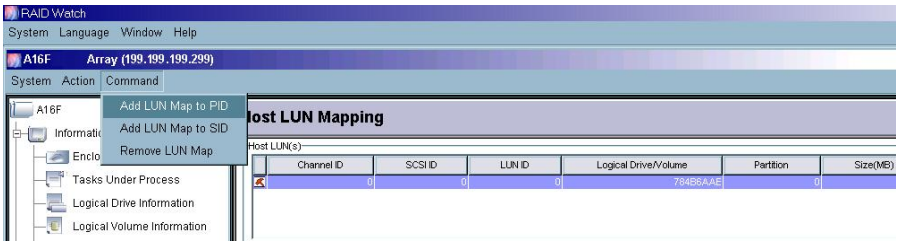



**Figure 4- 8: The Command Menu Column**

For a summary of commands, see ***Appendix A,*** *Command Summary*.

**NOTE:** Multiple simultaneous RAIDWatch Managers can connect to one RAID array.

## 5.4.4 Menu Commands

The following commands are described in ***Section 5.4.2*** and shown in ***Figure 4- 9***.

## Outer Shell Commands:

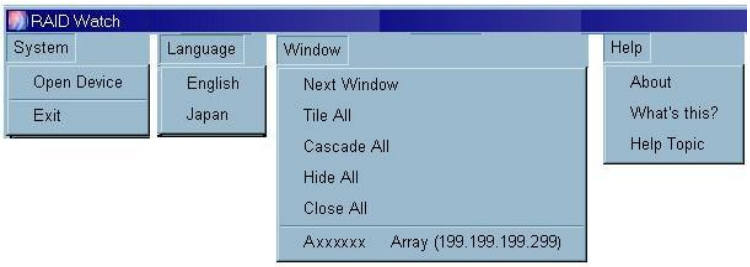



**Figure 4- 9: Menu Commands**

- The **Open Device** command lets you connect to a RAID array. This command triggers the connection prompt. Multiple arrays can be managed each in a separate management window.

- The **Language** items allow you to display on-screen instructions, commands, messages, and explanatory legends in a different language.

- The **Exit** command under the **System** menu is always available and is used to end all RAIDWatch Manager sessions at once.

- Please refer to ***5.8 Arranging Windows*** for details on the use of the Window commands.

- The **Help Topic** commands under the **Help** menu brings up the online help contents which is implemented in Java Help format. You may click the **What's this?** command, move it across the screen, and display related information by a second mouse-click on the screen element you are interested in.

- The **About** command under the **Help** menu brings up a window that provides RAIDWatch version information.

## Management Window Commands:

- The **Refresh** command sends instructions to GUI asking to review the connection status. The **Logout** command under the **System** menu allows you to disconnect from a controller/subsystem and to end the software session. This command is only available when RAIDWatch Manager is currently connected to a RAID array.

- The **Action** menu brings up sub-menus that allow you to access various options under the three configuration categories: **Information**, **Maintenance** and **Configuration**.

- The **Command** menu provides different configuration options only when specific configuration items are selected in a functional display window.

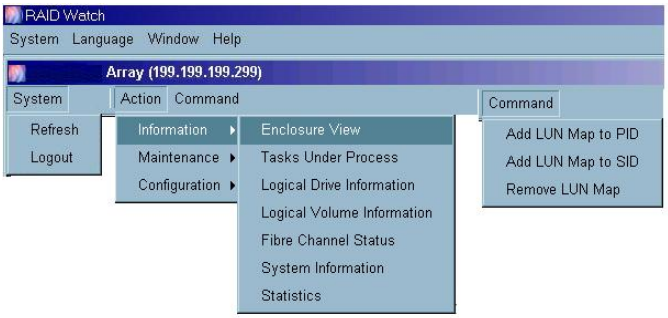



**Figure 4- 10: Menu Commands**

## 5.5 The Array Information Category

The **Array Information** category provides easy access to information about every aspect of system operation.

| | |
|---|---|
| **Enclosure view** | Displays the physical view of all major components, including drive slots and enclosure components. |
| **Tasks under process** | Ongoing tasks being processed by the subsystem, e.g., array initialization. |
| **Logical drive information** | Displays information of all configured arrays, including the RAID levels applied and the graphical display of member drive locations. |
| **Logical volume information** | Displays information on all configured logical volumes. |
| **Fibre Channel status** | Shows information of Fibre host channels, including link status, WWN port names, node names, etc. |
| **System information** | Is a real-time display of the RAID controller/subsystem operation status, including board temperature, voltage, battery, etc. |
| **Statistics** | Graphical and numeric representations of system performance in terms of cache hits and current read/write throughput. |

To access each information window, single-click its corresponding icon on the navigation tree located on the upper left of GUI screen.

## 5.5.1 Accessing the Enclosure View

To open the Enclosure View window either select the Enclosure icon from the configuration tree or select the Enclosure command from the Enclosure View as shown in ***Figure 4-*** 11. The command allows you to access the graphical display of the enclosure's front and rear view window. If multiple enclosures have been cascaded, you can select a different enclosure by clicking its tab-like icons as displayed below.

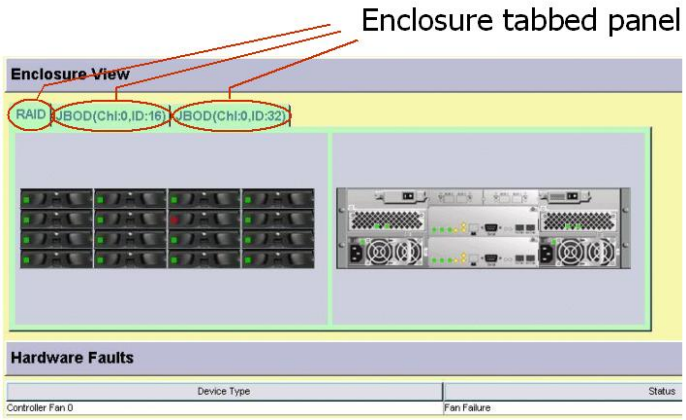



**Figure 4- 11: Enclosure Tabbed Panel**

Select an enclosure and start viewing devices in the enclosure view window.

## 5.5.2 Using the Enclosure View Window

Both enclosure windows present a graphical display of different components. The Enclosure window is particularly useful in monitoring the status of the physical drives. It provides you with a real-time report on the drive status, using LED colors to represent various operating conditions.

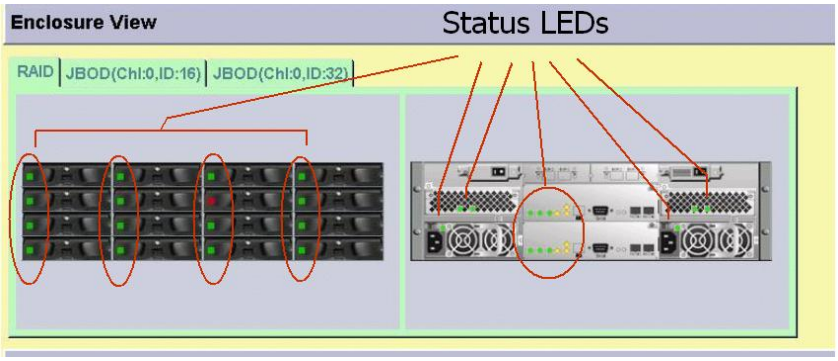



**Figure 4-12: Component LED Display**

You can also display some information about a particular drive or enclosure module by placing the mouse pointer on its respective icon. Message tags, similar to those shown in ***Figure 4-13***, appear.

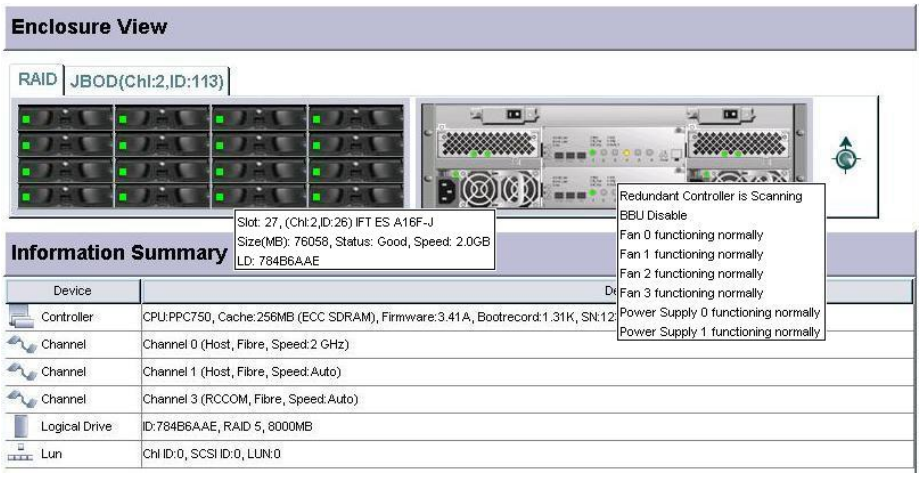



**Figure 4-13: Component Information Message Tags**

This readout displays the current configuration of the drive, including the channel number of the drive slot on the subsystem to which the drives are connected, the drive's capacity, transfer rate, and current status. The message tag for enclosure components displays the operating status.

The **Information Summary** window displays key information of the subsystem currently selected, including the RAID controller(s), I/O channels, and LUN mapping status.

## 5.5.3 Using the Tasks Under Process Window

The **Tasks Under Process** window reminds a user of unfinished tasks being processed by a subsystem. The start time and percentage of progress are also displayed on screen.

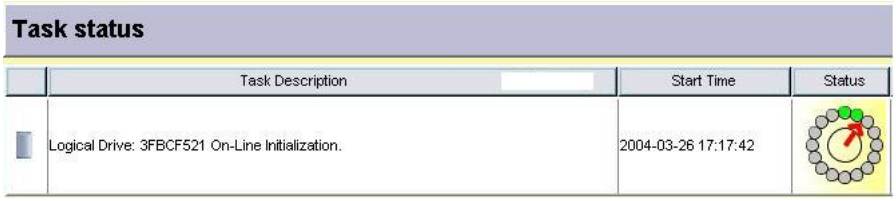



**Figure 4-14: Task Status Window**

## 5.5.4 Using the Logical Drive Information Window

The **Logical Drive Information** window provides the configuration, management, and monitoring functions available in RAIDWatch. The Logical Drive View window includes three sub-windows: Logical Drive Status, Front View, and Logical Drive Message.

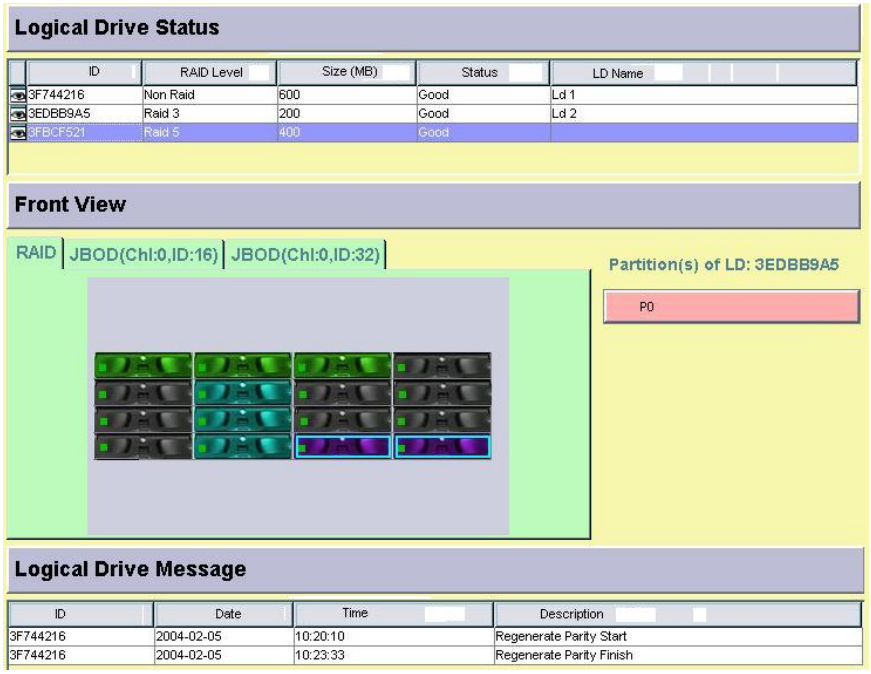



**Figure 4- 15: Logical Drive information**

**Logical Drive Status**: This sub-window displays information on configured arrays (logical drives) showing a unique array ID, RAID level, capacity, array status and a name that can be manually assigned.

**Front View**: This sub-window helps users to quickly identify configured arrays by the physical locations of its members. Different arrays are distinguished by different colors. When any of the member drives is selected by a mouse click, the rest of the members will be highlighted by bright blue lines, indicating they are members of the selected array.

Formation of logical partitions is displayed next to the front view window.

**Logical Drive Message**: Messages related to a selected array are automatically listed at the bottom of the screen.

## 5.5.5 Using the Logical Volume Information Window

The **Logical Volume Information** window provides the configuration of a configured volume. The Logical Volume window includes three sub-windows: Logical Volume Status, Member Logical Drive(s), and Related Information.

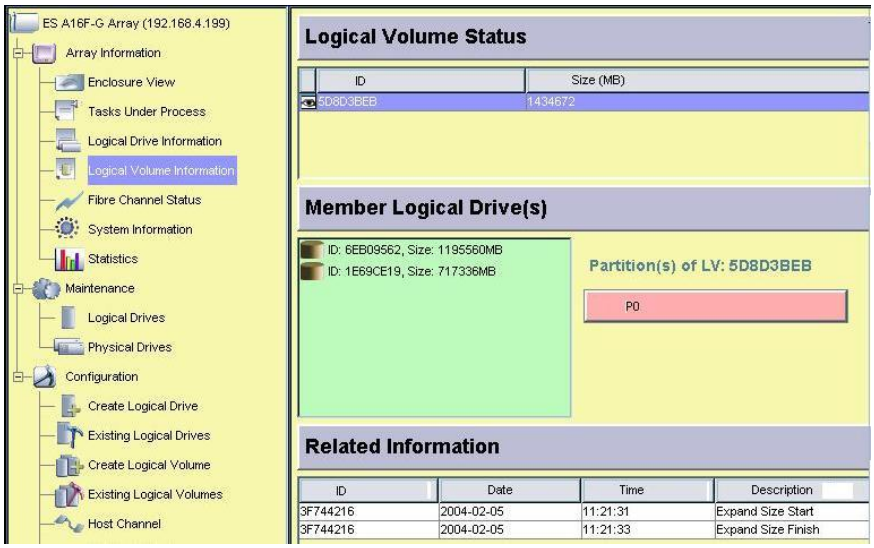



**Figure 4-16: Logical Volume Information**

## 5.5.6 Using the Fibre Channel Status Window

The **Fibre Channel Status** window displays information of Fibre host channel ID, connection speed, host-side connection protocols (topology), link status, WWPN port name and WWNN node name, loop IDs, and Fibre Channel address. The corresponding icon turns gray and is disabled if RAIDWatch operates with a SCSI-host subsystem. These information are useful when configuring a subsystem for a heterogeneous environment such as a storage network operating for multiple hosts and applications.

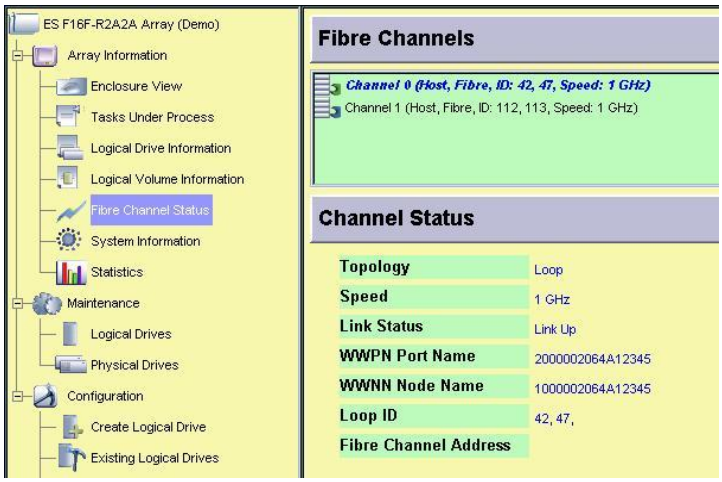



**Figure 4-17: Fibre Channel Status Window**

## 5.5.7 Using the System Information Window

The **System Information** window provides key information about the RAID subsystem and the RAID controller unit that powers the subsystem. Enclosure information includes the operating status of power supply, temperature sensors, and cooling fan units. Controller information includes CPU, firmware/boot record version, serial number, CPU and board temperature, voltage, and status of the battery. This window has no configuration options.

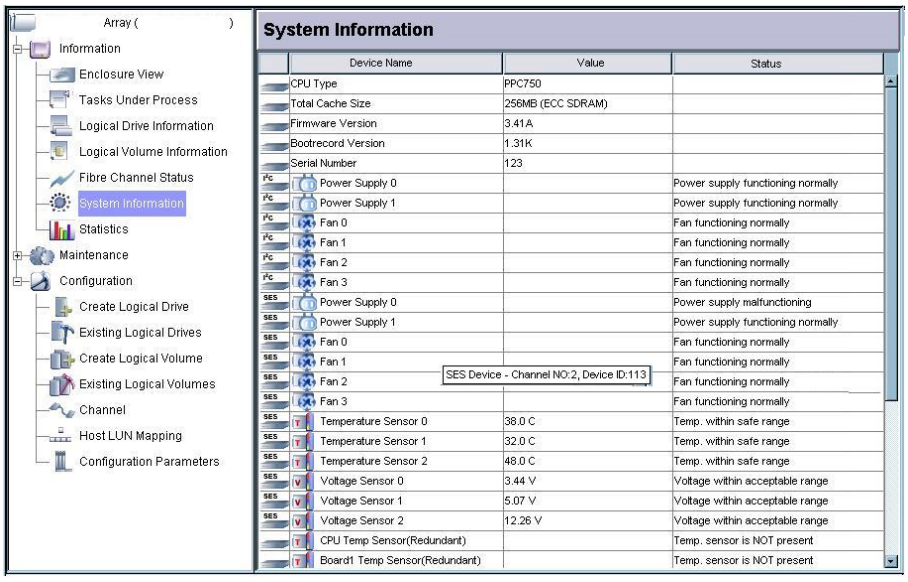



**Figure 4-18: System Information Window**

## 5.5.8 Using the Statistics Window

Select the Statistics window in the configuration tree, and start calculating "Cache Dirty" rate or "Disk Read/Write Performance" by clicking either or both of the check boxes.

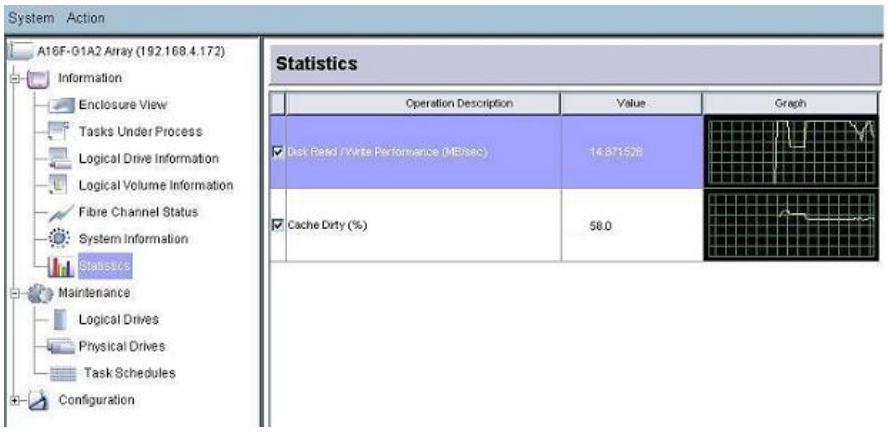



**Figure 4-19: Performance Statistics Window**

### Cache Dirty (%)

If you select Cache Dirty (%), a window similar to the one shown in ***Figure 4-19*** will appear. The percentage of cache block in use is displayed in number and the cache hits average displayed in graph mode. The Cache Dirty rate provides cached writes data over the last few minutes and indicates data caching consistency and frequency.

### Disk Read/Write Performance (MB/s)

If you select Disk R/W, a window similar to the one shown in ***Figure 4-19*** will appear showing the read/write performance. A real-time view of current activity is provided in graph form and the performance data is constantly updated in MB/s.

# 5.6 The Maintenance Category

The **Maintenance** category provides access to logical and physical drives and to perform maintenance functions. These maintenance functions help ensure the integrity of configured arrays. The operation of the Maintenance window also includes access through the navigation panel and a functional window.

## 5.6.1 Accessing the Logical Drives Maintenance Window

To open the Logical Drives Maintenance window, either select the Logical Drives icon from the navigation tree shown in ***Figure 4-21*** or select through the command menus on the top of the screen.

When the Logical Drives window is opened, the screen shown in ***Figure 4-21*** should appear.

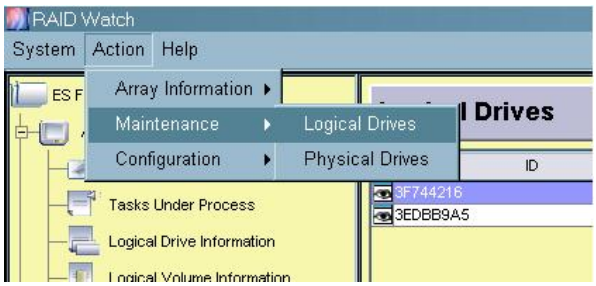



**Figure 4-20: Accessing Maintenance Commands**

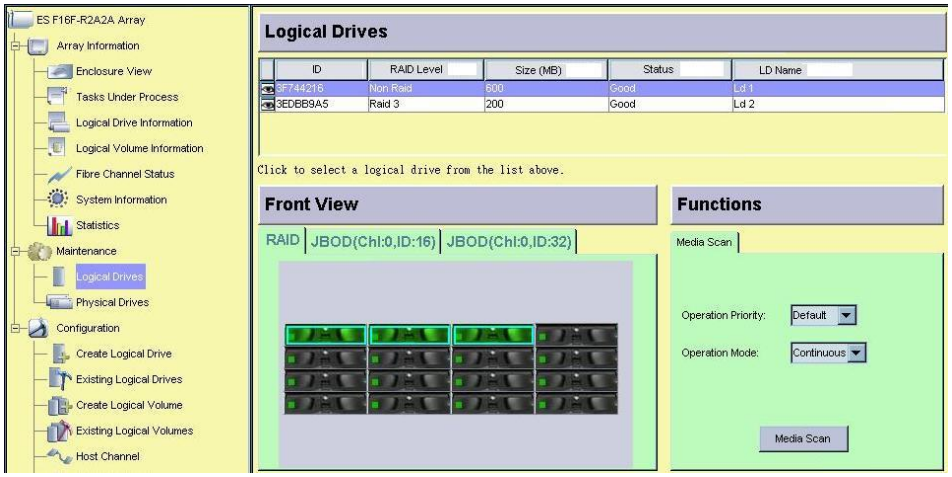



**Figure 4-21: Maintenance - Logical Drives**

In the Logical Drives (Maintenance mode) window you have three sub-windows:

- The **Logical Drives** window provides a list of all configured arrays. Select by a single mouse-click on the logical drive you wish to perform maintenance tasks on.

- The **Front View** window allows you to see the locations of logical drives. Note that a logical drive is selected by a single mouse-click from the list of configured arrays on the upper screen.

- The **Functions** window provides configuration options with maintenance tasks and the buttons to start a maintenance task.

## 5.6.2 Accessing the Physical Drives Maintenance Window

To open the Physical Drives Maintenance window, either select the Physical Drives icon from under the Maintenance category of the navigation panel shown below or select through the command menus on the top of the GUI screen.

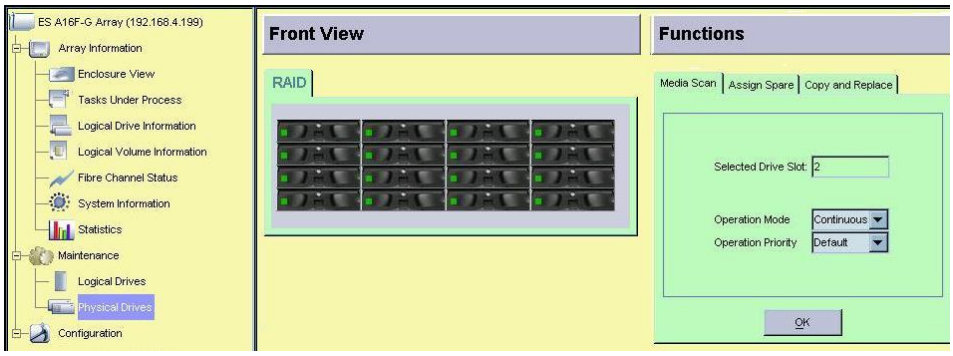



**Figure 4- 22: Maintenance - Physical Drives**

In the Physical Drives (Maintenance mode) window you have two sub-windows:

- The **Front View** window allows you to select a hard drive to perform maintenance tasks on. A drive selected is highlighted by bright blue lines, and its slot number will be shown in the Functions window in the Selected Drive Slot field.

- The **Functions** window provides configuration options with maintenance tasks and a button below to apply the configuration.

### 5.6.3 Accessing the Task Schedules Maintenance Window

To open the Task Schedules Maintenance window, either select the related icon from under the navigation panel or select through the command menus on the top of the GUI screen.

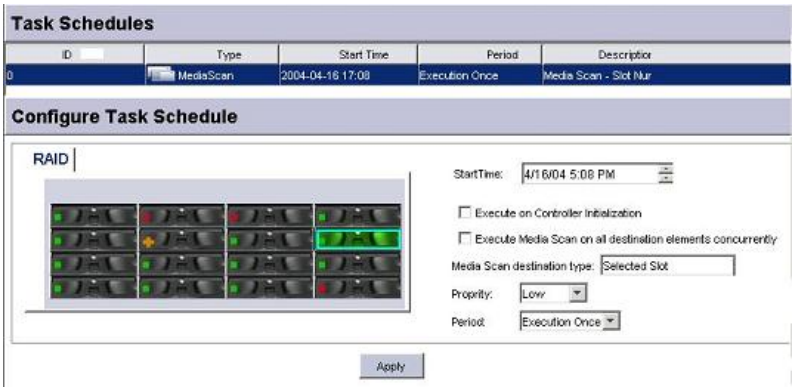



**Figure 4- 23: Task Schedules Window**

To begin using the Task Schedule functionality, ***Right click*** to display the "***Add New Schedule Task***" command.

In the Task Schedules (Maintenance mode) window you have two sub-windows:

- The **Task Schedules** window displays schedules previously configured that are now being held in NVRAM.
- The **Configure Task Schedule** window allows you to select a hard drive or logical drive to perform a scheduled task on. A drive or logical drive selected is highlighted by bright blue lines, and its related configuration options are displayed on the selection boxes to the right of the screen.
- An **Apply** button allows you to complete the process and add the schedule.

## 5.7 The Configuration Category

This category contains functional windows that allow a system administrator to create logical configurations and to set appropriate configuration settings with system operations. This category is available only when logging in using the Configuration access right with correct password.

This category leads to the following seven (7) functional windows:

- Create Logical Drive
- Existing Logical Drives

- Create Logical Drive
- Existing Logical Volumes
- Host Channel
- Host LUN Mapping
- Configuration Parameters

## 5.7.1 Accessing the Create Logical Drive Window

To open the Create Logical Drive window, either select the related icon from under the navigation panel or select through the command menus on top of the GUI screen.

The basic rules for using the functional elements in the create window are:

- This window uses a parallel display principle. To create a logical drive, select its members from the Front View window each by a single mouse-click. The Selected Members window then displays the disk drives' slot IDs and sizes.
- The configuration view also employs an up-then-down pattern with the configuration process. Important Logical Drive characteristics are set each using the pull-down menus at the lower part of the configuration screen. The creation procedure is completed by the "***OK***" button at the bottom of the screen.
- A physical drive selected is highlighted by bright blue lines; a second mouse-click on it deselects the drive.

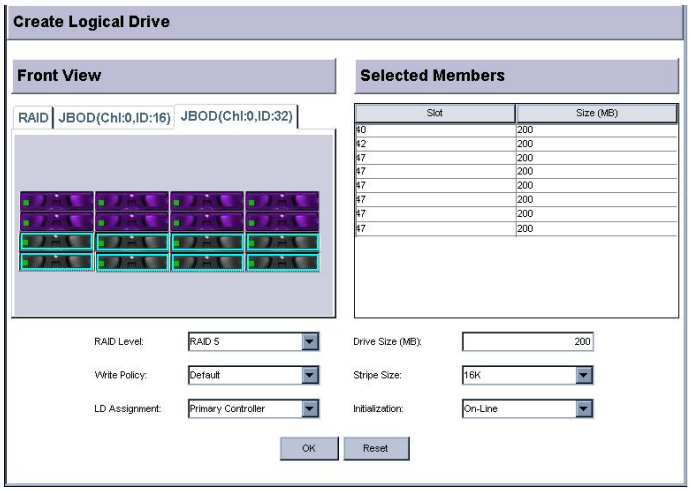



**Figure 4- 24: Selecting Members for a New Logical Drive**

## 5.7.2 Accessing the Existing Logical Drives Window

To open the Existing Logical Drives window, either select the related icon from under the navigation panel or select through the command menus on top of the GUI screen.

The basic rules for using the functional elements in the window are:

- This window also uses a parallel display and the up-then-down principle. To start configuring an existing array, select a configured array from the LD list above. Locations of its members are automatically displayed, and then the available functions are displayed in the Functions window.

- This window contains three edit commands that can be triggered by **Right**-clicking your mouse button.

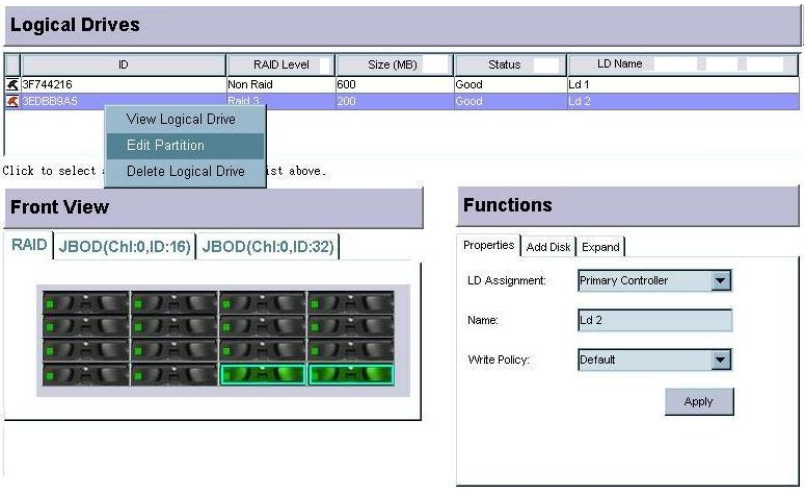



**Figure 5- 25: Existing Logical Drives Window**

## 5.7.3 Accessing the Create Logical Volume Window

This window uses the same operation flow as that applied in the Create Logical Drive window.

## 5.7.4 Accessing the Existing Logical Volumes Window

This window uses the same operation flow as that applied in the Existing Logical Volumes window. Note that this window also contains Edit mode commands that are only accessible by a mouse **Right**-click.

## 5.7.5 Accessing the Channel Window

The Host Channel window allows you to change host or drive port **Data Rate**, **Channel Mode** (EonRAID 2510FS only), and to add or remove **Channel IDs**.


**Figure 4- 26: Channel Window**

**Channel Mode**: Only applicable on the EonRAID 2510FS series. This option allows you to change the I/O channel operating mode. The channel mode selections can be: host, drive, RCC, drive +RCC.

**Default Data Rate**: Should only be applied with limitations on current configuration, e.g., when optical cables and adapters are running on different wavelengths.

**SCSI ID**: Add or remove IDs by selecting or deselecting ID boxes.

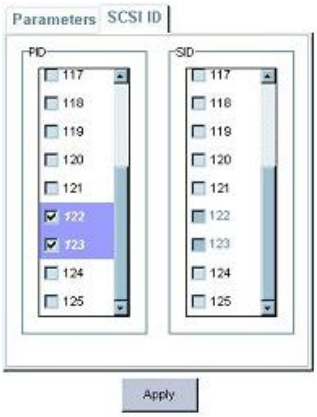



**Figure 5- 27: Host Channel ID Settings**

**Apply**: Click this button for the configuration to take effect. Note that changing the channel mode or adding/removing IDs requires resetting the controller/subsystem.

## 5.7.6 Accessing the Host LUN Mapping Window

The Host LUN Mapping window allows you to associate configured arrays with host channel IDs or LUN numbers. A pop-up window allows you to create LUN masking entries with host LUN mapping when access control over Fibre Channel network is necessary.

- The LUN Mapping window contains four sub-windows: Host LUN(s), Host WWN Filter(s), WWN Names(s), and Logical Drive(s) or Volume(s).
- This window also contains a right-click menu that creates association with either a Primary controller ID or a Secondary controller ID.

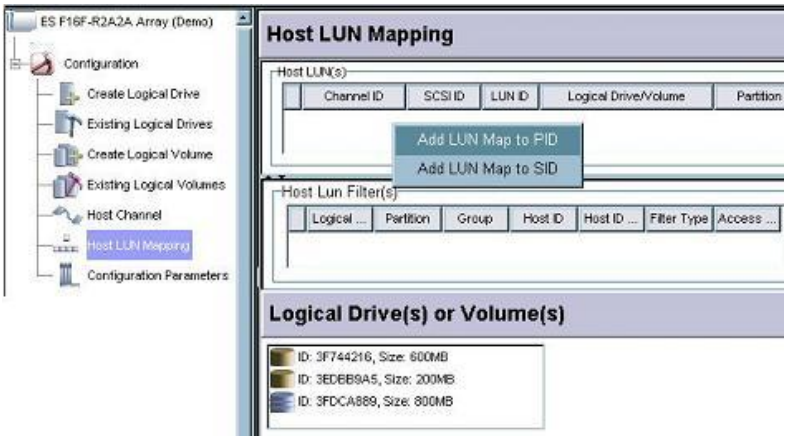



**Figure 5- 28: Host LUN Mapping Right-click Menu**

## 5.7.7 Accessing the Configuration Parameters Window

The Configuration Parameters window allows you to change various system preferences options. This window uses tabbed panels to provide access to the functional sub-windows. Each sub-window provides configurable options using check boxes, check circles, or pull-down menus. The configuration process is completed by clicking the "***Apply***" button. A mixture of message prompts, file path windows, text fields, and confirm boxes ensures ease of use.

## 5.8 Arranging Windows

Each array configuration window is enveloped in a system view window. The top screen **Window** menu provides you with commands for rearranging the currently open RAIDWatch Manager windows. You can manually manipulate the window frames to display them as you like, or use the **Next Window, Tile All, Cascade All, Hide All, Close All** commands under the Window menu to arrange open windows. You may also select each connected array by clicking the listed arrays at the bottom of the Window menu.

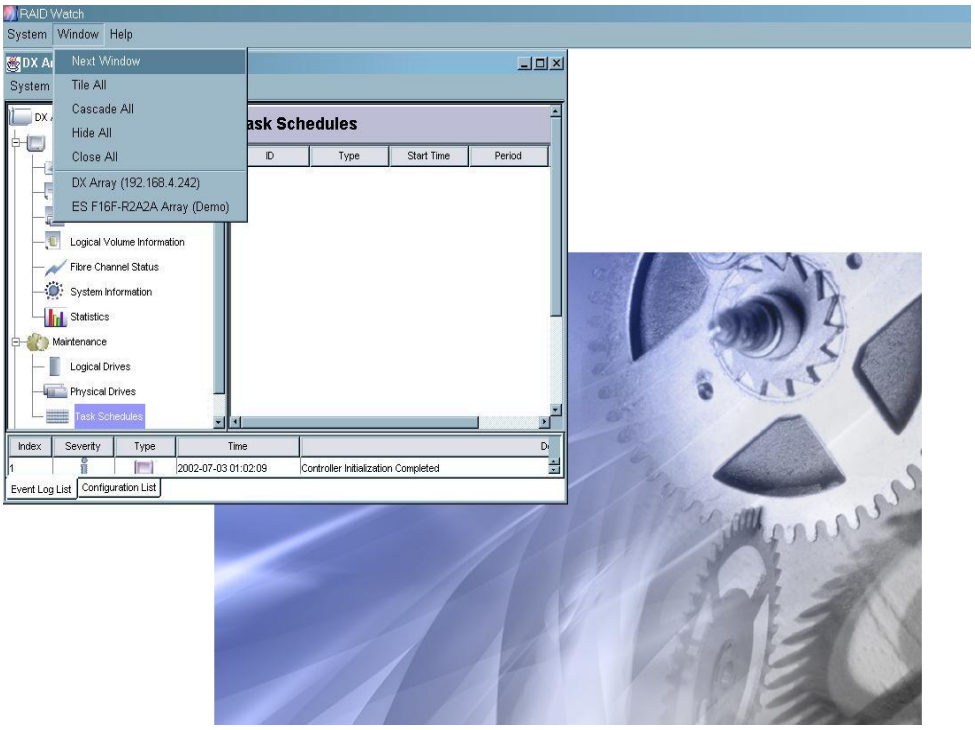



**Figure 5- 29: The "Outer Shell" System View Window**

Management of multiple arrays is allowed by clicking the Open Device command under the System menu. The Exit command ends the RAIDWatch manager session with all configured arrays. Clicking the Open Device command is followed by a connection wizard prompt. Multiple management windows can be opened.

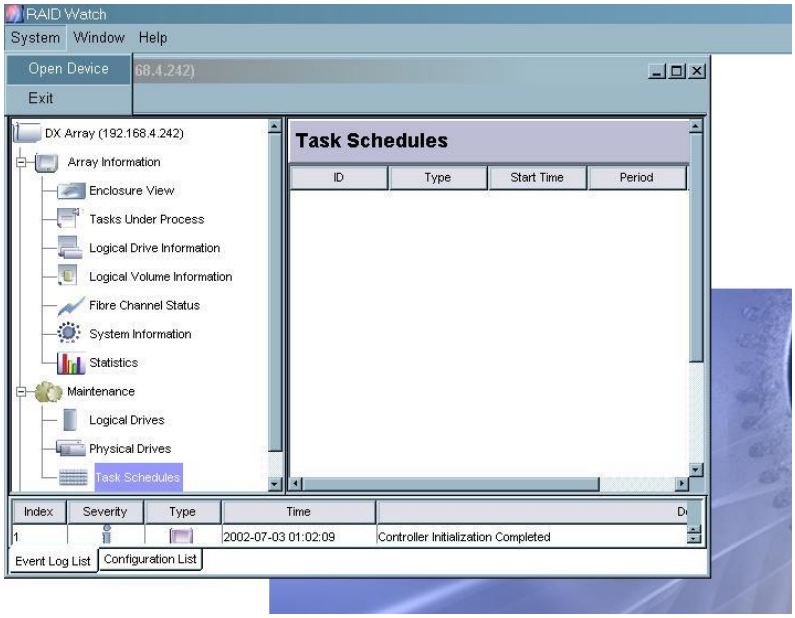



**Figure 5- 30: The "Outer Shell" System View Window**

# Chapter 6: RAIDWatch Considerations

This chapter introduces the following topics:

- ***Background Information*** – Section 6.1
- ***Definition of Terms*** – Section 6.2
- ***Operating With Spare Drives*** – Section 6.3
- ***Operating Without Spare Drives*** – Section 6.4
- ***Before You Start*** – Section 6.5

## 6.1 Background Information

Redundant Arrays of Independent Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability (i.e., "fault tolerance") in disk array systems and to take advantage of the performance gains multiple disks can offer.

RAID comes with a redundancy feature that ensures fault-tolerant, uninterrupted disk storage operations. In the event of a disk failure, disk access will still continue normally with the failure transparent to the host system.

RAID has six levels, RAID0 ~ 5, and multi-level configurations including RAID10, 30, and 50. RAID levels 1, 3 and 5 are the most commonly used levels, while RAID levels 2 and 4 are less popular. ***Appendix C***, *RAID Levels*, gives information about these levels, including the benefits of each.

Infortrend disk array controllers support hot-swapping where a failed drive can be replaced while the disk array system continues to function. Spares can also be assigned so that, as soon as a drive fails, the spare will be automatically configured into the array and reconstruction will commence.

## 6.2 Definition of Terms

This section describes some of the disk array terms used in this documentation.

- **Physical drives**. These are the actual drives installed into enclosure drive slots. These drives are displayed in **Enclosure View** and the **Front View** of different configuration windows.

- **Spare drives**. These are physical drives that serve as backups. When a drive fails, the spare automatically joins the array, and data reconstruction will commence immediately. Dedicated and Global Spares use different colors. A Dedicated Spare appears in the same color as other members of the logical drive it belongs to. A Global Spare uses the default color (black). Both Dedicated and Global Spares have an orange cross superimposed on them.

- **Replacement drives**. These are physical drives that are manually configured into the array to replace failed drives. In the absence of spare drives, you will need to use replacement drives to replace defective drives before rebuilding. If a spare drive has been used to rebuild the array, you will also need to replace the failed drive manually to create another spare in case another drive fails.

- **Failed drives**. These are physical drives that fail due to some type of error. Failed drives appear with red LED marks on their respective icons.

- **Logical drives**. These logical units are the combinations of multiple physical drives. Combining physical drives into logical drives gives you a disk array with a certain RAID level. To view logical drives, use “Existing Logical Drives” under the navigation menu tree.

- **Logical volumes**. These volumes are the combinations of several logical drives. Combining logical drives into logical volumes gives you a single logical unit with even larger capacity. Logical volumes or their partitions are mapped to various host LUNs. To view logical volumes, use “Existing Logical Volumes” under the navigation menu tree.

## 6.3 Operating With Spare Drives

You can assign spare drives to a particular logical drive to serve as backup drives. When a drive fails within the logical drive, one of the spares will be automatically configured into the logical drive, and data reconstruction onto it will immediately commence.

The following are guidelines for disk failure recovery when a spare drive is available:

If a spare drive exists in the same logical drive, the controller will automatically mount the spare drive and start data rebuilding in the background.

Depending on system design, it may be possible to remove a defective drive and replace it with a new drive without shutting down the system (hot-swapping). All EonStor subsystems support drive hot-swapping.

The replacement drive must then be assigned as a new spare drive.

## 6.4 Operating Without Spare Drives

The following are guidelines for disk failure recovery when a spare drive is not available:

Depending on the design of the system, it may be possible to remove a defective drive and replace it with a new drive without shutting down the system (hot-swapping). All EonStor subsystems support drive hot-swapping.

If the replacement drive is installed on the same channel and ID (the original drive slot where the faulty drive was), you can then proceed with data rebuilding.

If the replacement drive is installed on a different channel or ID (different drive slot) or the periodic drive scan function has been disabled, you need to scan in the new drive first then assign it as a spare drive of the logical drive which has had a drive failure. Data rebuilding will have to be manually initiated.

**IMPORTANT!**

*Although the RAID system provides uninterrupted disk access even after a disk failure, do not leave a failed drive unattended. Without replacement, the system will not survive a second physical drive failure on the same logical drive. A defective drive must be promptly replaced and data rebuilt.*

**CAUTION!**

*When performing hot-swapping, be sure to remove only the defective drive. Removing the wrong drive will result in complete, unrecoverable data loss. Use the Enclosure View window or Logical Drive Information window to locate exactly which physical drive has failed.*

## 6.5 Before You Start

RAIDWatch Manager comes with password protection that prevents unauthorized modification of the disk array configuration. During each attempt at modifying the system configuration, the configuration will be password protected.

By default, RAIDWatch Manager station comes with a password for login as an Information viewer. For information on how to set a password and other security features, see the *Setting Up Security* section of ***Chapter 5***, *Basic Operations.*

# Chapter 7: Configuration Parameters

RAIDWatch Manager enables you to modify the configuration of the disk array controller from your manager console. This chapter describes the following subsystem configuration features:

- ***Accessing Configuration Parameters Options*** - Section 7.1
- ***Controller*** – Section 7.2
- ***Communications*** – Section 7.3
- ***System –*** Section 7.4
- ***Password*** – Section 7.5
- ***Threshold*** – Section 7.6
- ***Other -*** Section 7.7
- ***Redundant Controller Settings -*** Section 7.8
- ***Event Triggered Operations*** – Section 7.9
- ***Network Protocols*** – Section 7.10

## 7.1 Accessing Configuration Parameters Options

To be able to access controller configuration options, either use the Configuration category icons on the Navigation Tree or select the Configuration Parameters command from the command menu to open the **Configuration Parameters**. The configuration window contains many options that are directly related to array performance, and should be configured ***before*** creating logical arrays.

The following is a complete list of configuration controls and optional menus that users will have available once the Configuration Parameters option has been selected.

More information about many of these variables is available in the controller hardware and firmware documentation.

## 7.2 Controller

"Controller" here refers to the RAID controller unit, which is the main processing unit of a RAID subsystem. The configuration window contains two sub-windows: "Caching" and "Controller Parameters." To configure the controller's caching behaviors, select an appropriate value from each of the pull-down menus, as shown in ***Figure 7-1***.

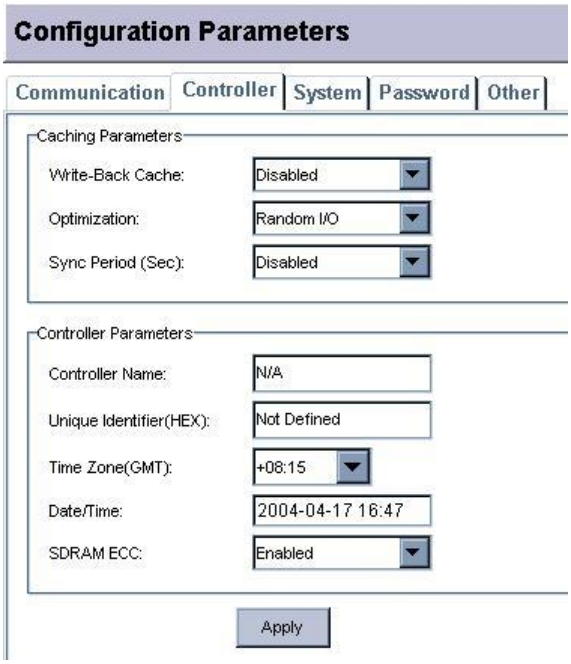



**Figure 7-1: Select the Controller Tab**

The data cache can be configured for optimal I/O performance using the following variables:

### Caching Parameters

- ***Write-Back Cache***:
  - ***Enabled, Host Writes are cached before being distributed to hard drives***. Improves write performance, but may require battery backup support for data integrity in a case power outage occurs.
  - ***Disabled, Cache Write Through.*** Used primarily if no cache battery backup is installed and there is increased likelihood of a power failure.
- ***Optimization Policy***:
  - ***Optimization for Random I/O***. More common setting. Use this option for environments (e.g., database maintenance) with smaller I/O transactions.

- ***Optimization for Sequential I/O***. Used for large I/O environments such as video recording and editing. Particularly useful where I/O read/write must be in sequential order.

♦ ***Sync. Period***:

This option allows you to select a desirable interval for the partner controllers in a dual-controller configuration to synchronize (mirror-copy) their cached data. RAID controllers have defaults for this; however, this option provides more choices with the sync. period.

## Controller Parameters

♦ ***Controller Name***

A manually entered nickname for the RAID controller. This name can also be used to recognize a RAID subsystem in the environment where multiple RAID subsystems reside.

♦ ***Unique Identifier***

This is a ***MUST*** for subsystem configuration especially for those with dual-controllers or Fibre host ports. The unique ID is integrated as unique Fibre Channel node name and port names. In the event of controller failover and failback, this ID helps host-side initiators to identify a RAID subsystem.

♦ ***Time Zone***

GMT (Greenwich Mean Time) is used here, a 24-hours clock. To change the clock to your local time zone, select a time from the drop-down menu. Choose the hour later than the Greenwich mean time following a plus (+) sign. For example, enter "+9" for Japanese time zone.

♦ ***Date/Time***

Enter time and date in its numeric representatives in the following order: month, day, hour, minute, and the year.

♦ ***SDRAM DCC***

If the DIMM module installed for data caching supports ECC, you may select to enable or disable the error check function here.

***Apply***

When preferences have been set with the configurations above, click this button to apply changes.

## 7.3 Communications

To be able to configure the Communications options, select the "***Communications***" tab, as shown in ***Figure 7-2***, from the Configuration Parameters window Tabs.

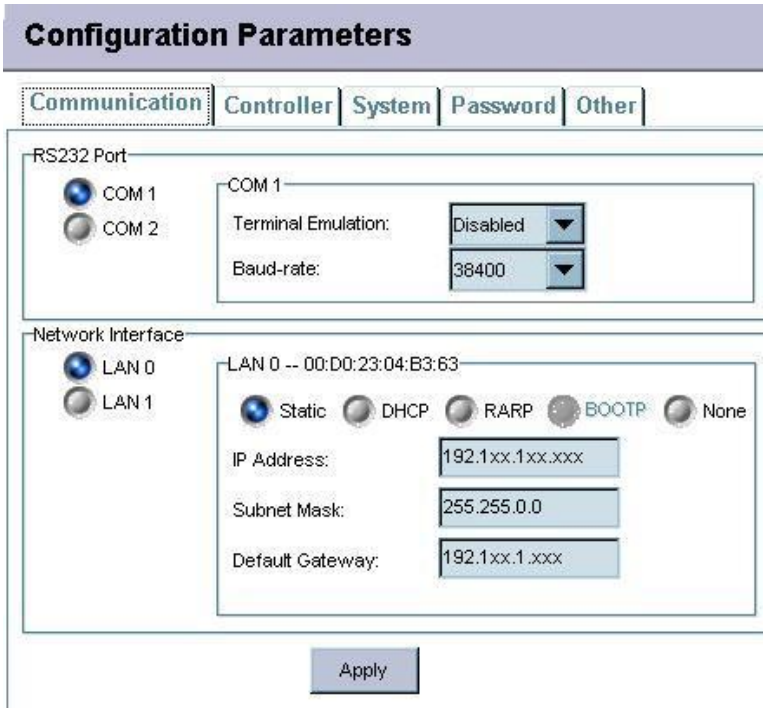



**Figure 7-2: Select the Communications Tab**

- ***RS-232C Port***

  Infortrend RAID subsystems/controllers come with two serial ports. Before proceeding with configuration, first select COM1 or COM2 by a single mouse click.

  - ***Terminal Emulation.*** Allows you to enable or disable the terminal emulation option. If you want to connect the COM port to a computer running terminal emulation, enable the option and set the identical baud rate to the computer COM port.
  - ***Baud-Rate***. Allows you to control the serial port baud rate. Select an appropriate value from the pull-down menu.

- ***Network Interface***:

  Depending on your network setting, select a protocol selection circle to obtain adequate TCP/IP support. This column is used to configure the subsystem's Ethernet port. If the **Static** box is selected, consult your network administrator for appropriate **IP address**, **subnet mask** and **gateway** values.

**Apply**: Click this button for the configuration to take effect.

## 7.4 System

To access the System-specific functions, select the "***System***" tab, as shown in ***Figure 7-3***,from the Configuration Parameters window tabs.

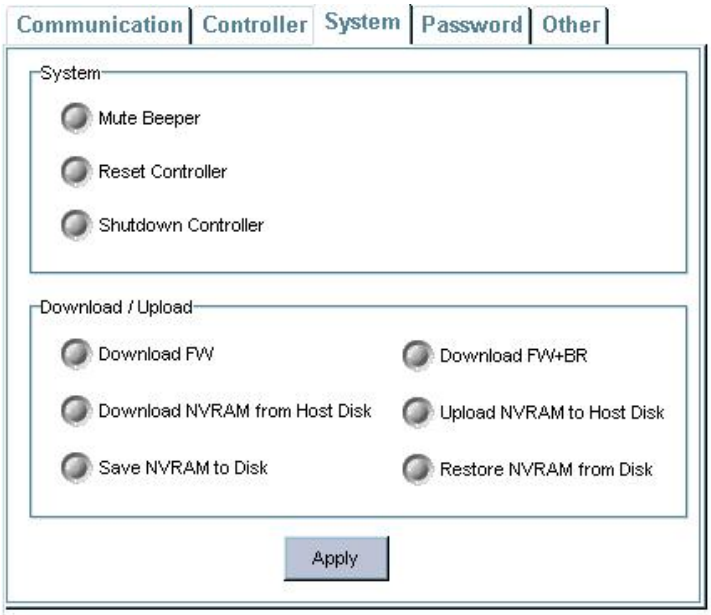



**Figure 7-3: Select the System Tab**

Each function is executed by a two-step procedure: Click the select button of the function you wish to perform and click the "***Apply***" button for the configuration to take effect.

**- System Functions -**

- ***Mute Beeper.*** Turns beeper off temporarily for the current event. The beeper will still be activated by the next event. Be sure that you have checked carefully the cause of the event.
- ***Reset Controller.*** Resets the subsystem without powering off.
- ***Shutdown Controller***. This prepares the subsystem to be powered off. This function flushes the unfinished writes still cached in controller memory making it safe to turn off the subsystem.

**- Download/Upload -**

- ***Download FW***. Subsystem firmware can be upgraded using the existing management connection (whether Ethernet or in-band). Provide the firmware filename using the file location prompt. RAIDWatch will start to download the firmware. Find appropriate time to temporarily stop the access from host systems, then reset the controller in order to use the new downloaded firmware.
- ***Download FW+BR.*** This allows you to download firmware and boot record together. It may not be necessary to upgrade the boot record each time you update your firmware binaries. Please refer to the readme text file that came with each firmware version.
- ***Download NVRAM from Host Disk.*** The subsystem configuration is saved in NVRAM and can be saved to a system drive. This function allows you to retrieve a previously saved configuration profile from a system disk.
- ***Upload NVRAM to Host Disk***: This allows you to backup your controller-dependent configuration information to a system drive. We strongly recommend using this function to save the configuration profile whenever a configuration change is made.
- ***Save NVRAM to Disk***. The configuration profile can also be saved to array hard drives. Each array hard drive will have a replica of NVRAM backup in its reserved space so that when a drive fails or is being regrouped, the backup remains intact.
- ***Restore NVRAM from Disk***. Retrieve the previously saved NVRAM backup from array hard drives.

**Apply**: Click this button for the configuration to take effect.

All of the Download functions will prompt for a file source from the current workstation. **Upload NVRAM** will prompt for a file destination at the current workstation.

## 7.5 Password

To be able to configure different levels of the Access authorization **Password**, select the "***Password***" tab, as shown in ***Figure 7-4***, from the Configuration Parameter window tabs.

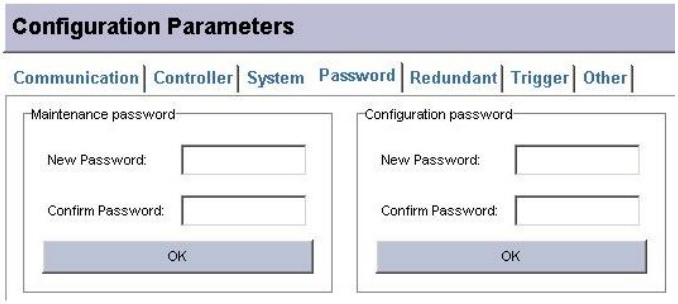
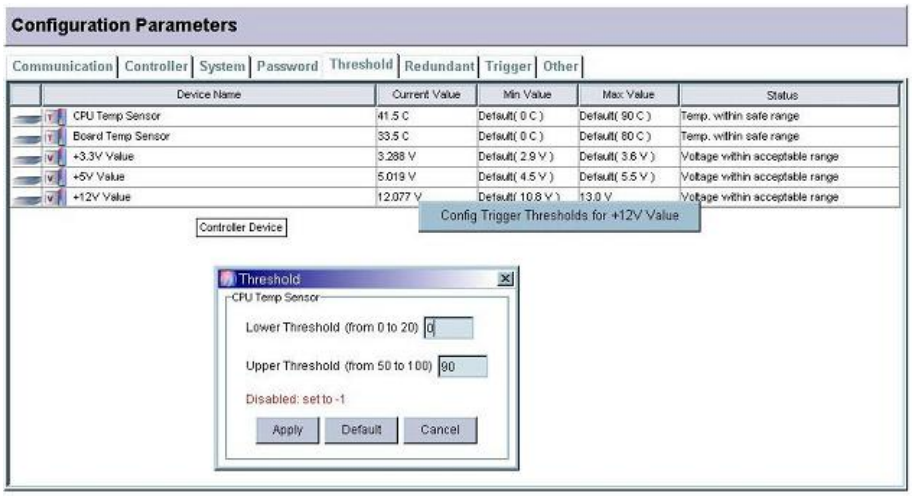



**Figure 7-4: Select the Password Tab**

- ***Maintenance Password.*** Users logging in using the Maintainer's password can access the first two configuration categories, Information and Maintenance.
- ***Configuration Password.*** Users logging in using the Configuration password have full access rights to all configuration options. A super-user can access all three configuration categories on the navigation tree.

## 7.6 Threshold

To access the event threshold options, click the **Threshold** tab under the **Configuration Parameters** panel.



This window allows you to change the preset values on thresholds that are used to monitor the condition of the RAID controller unit(s) in your subsystem. For example, these threshold values can be changed if the controller operates in a system enclosure where the upper or lower limit on ambient temperature is much higher or lower than that on the RAID controller. Adjusting the default thresholds can coordinate the controller status monitoring with that of the system enclosure.

It is not recommended to change the threshold values unless out-of-normal conditions are expected on the installation site.

To change the threshold values on a specific monitored item, for example, the **CPU Temp Sensor**, **Right-click** on the item. The Configuration button will prompt. Left-click to bring up the configuration menus.

**WARNING!**

The upper or lower thresholds can also be disabled by entering "-1" in the threshold field. However, users who disable the thresholds do this at their own risk. The controller(s) will not report condition warning when the original thresholds are exceeded.

You may then enter a value in either the lower or upper threshold field. Note that if a value exceeding the safety range is entered, an error message will prompt and the new parameter will be ignored.

Click **Apply** for the configuration change to take effect.

Click **Default** to restore the default values for both thresholds.

## 7.7 Other

I/O channel host-side, drive-side, and rebuild priority options are included in the **Other** sub-window. To configure these configuration options, select the "***Other***" tab, as shown in ***Figure 7-5***, from the Configuration Parameters window tabs.

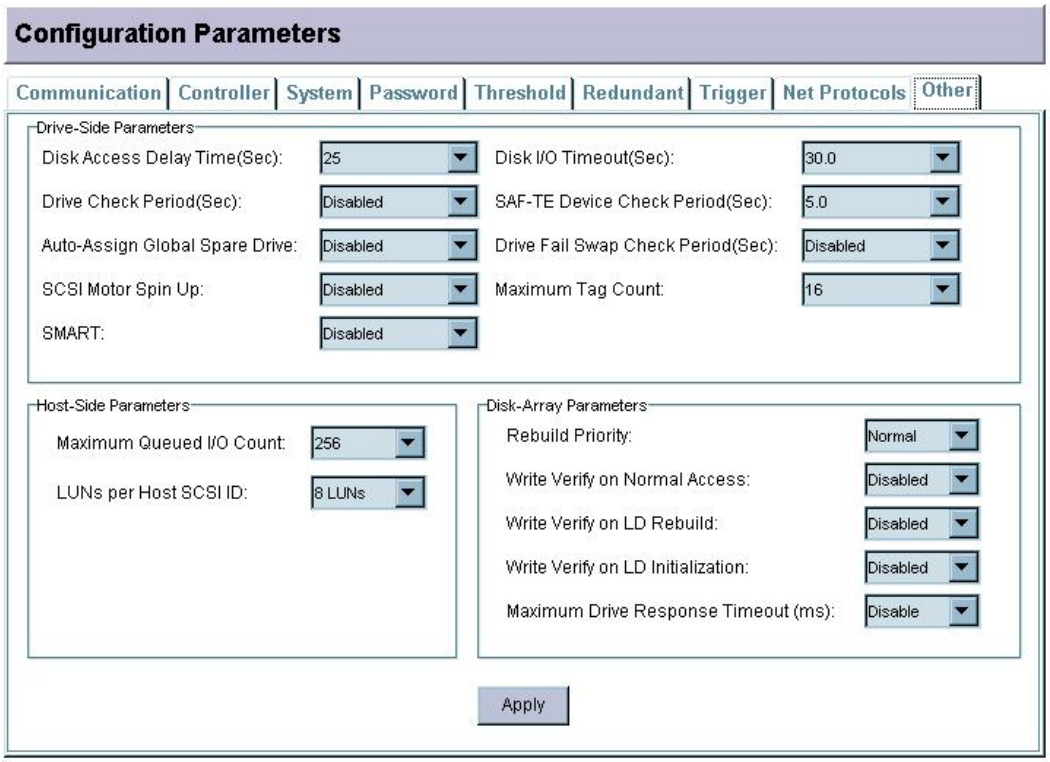



**Figure 7-5: Select the Other Tab**

Each function is executed by a two-step procedure: Click to select a desired value from the pull-down menu and click the **Apply** button for the configuration to take effect. Some configuration changes may only take effect after resetting the subsystem.

- **Drive-Side Parameters**
  - ***SCSI Motor Spin Up.*** Selected when hard drives need to "Spin-up by SCSI command." By default, all hard drives will start spinning up when powered-on. Also refer to the documentation that came with your hard drives.
  - ***Maximum Tag Count*****:** The subsystem supports tag command queuing with an adjustable maximum tag count from 1 to 128. The default setting is "Enabled" with a maximum tag count of 32.
  - ***Disk Access Delay Time (Sec)***: Sets the delay time before the subsystem tries to access the hard drives after power-on. Default is 15 seconds.

- ***Disk I/O Timeout (Sec)***: Is the time interval for the subsystem to wait for a drive to respond to I/O requests. Selectable intervals range from 1 to 10 seconds.
- ***Drive Check Period (Sec)****:* is the time interval for the controller to check all disk drives that were on the drive busses at controller startup. The default value is "Disabled." "Disabled" means that if a drive is removed from the bus, the controller will not be able to know – as long as no host accesses that drive. Changing the check time to any other value allows the controller to check – at the selected time interval – all array hard drives. If any drive is then removed, the controller will be able to know – even if no host accesses that drive.
- ***SAF-TE/SES Device Check Period (Sec)***: If enclosure devices in your RAID enclosure being monitored via SAF-TE/SES, use this function to decide at what interval the subsystem will check the status of these devices.
- ***SMART***: This allows you to configure SMART-related functionality. SMART is short for Self-Monitoring, Analysis and Reporting Technology. Options provided in the pull-down menu are the actions to be taken if the SMART function detects an unsteady drive.
- ***Drive Fail Swap Check Period (Sec)****:* The subsystem scans drive buses at this interval to check if a failed drive has been replaced.
- ***Maximum Drive Response Timeout (ms):*** This option prepares the array for applications featuring "no drop-frame" operations and continuous reading such as video streaming.

  In situations such as swapping a failed drive or the occurrence of bad blocks, a read returned after 30 or 50ms would prove too long and cause choppy audio or dropped video frames.

  To ensure a response before guaranteed latency, a timeout value is provided for processing read requests. If timeout is reported on a specific member of an array, the subsystem immediately retrieves data from the parity data and other members. In this way, causes of delay can be eliminated.

  To prepare the array for AV applications, the following are recommended:

  1. Performance with the write-through caching mode is better than that with the write-back mode on subsystems equipped with redundant RAID controllers.
  2. Arrays should not be partitioned.
  3. The priorities for Rebuild or Add-drive expansion should be set to "low."
  4. A maximum latency, the "Drive I/O Timeout" which determines whether a drive has failed to respond to I/O requests, is required as the first-level timeout.

The option comes available with an OEM append file. The following options in the internal settings are pre-adjusted:

1. Reads have higher priority.

2. The Smart Sorting algorithm is disabled to avoid latency that may arise due to sorting. The firmware is forced to receive ordered read requests, the original receiving order.

- **Host-Side Parameters**

  - ***Maximum Queued I/O Count:*** This is the arrangement of the controller internal resources for use with a number of the current host nexus. It is "concurrent" nexus, so if the cache is cleared up, it will accept a different nexus again. Many I/Os can be accessed via the same nexus.

    This function allows you to configure the maximum number of I/O queues the controller can accept from the host computer.

  - ***LUNs per Host ID:*** Each SCSI ID can have up to 32 LUNs (Logical Unit). A logical configuration of array capacity can be presented through one of the LUN numbers under each host channel ID. Most SCSI host adapters treat a LUN like another SCSI device.

- **Disk-Array Parameters**

  - ***Rebuild Priority:*** The rebuild priority determines how much of the system resources are applied when rebuilding a logical drive. Available options are Low, Normal, Improved, and High. The higher priority takes up more system resources and the rebuild process completes more rapidly. However, I/O performance in the meantime is inevitably lower due to the resource consumed.

  - ***Write-Verify Options:*** Errors may occur when a hard drive writes data. In order to avoid write errors, the controller can force the hard drives to verify the written data. There are three selectable methods:

    > Verification on LD Initialization Writes
    Performs Verify-after-Write while initializing the logical drive.
    > Verification on LD Rebuild Writes
    Performs Verify-after-Write during the rebuilding process.
    > Verification on LD Normal Drive Writes
    Performs Verify-after-Write during normal I/O requests.

# 7.8 Redundant Controller Settings

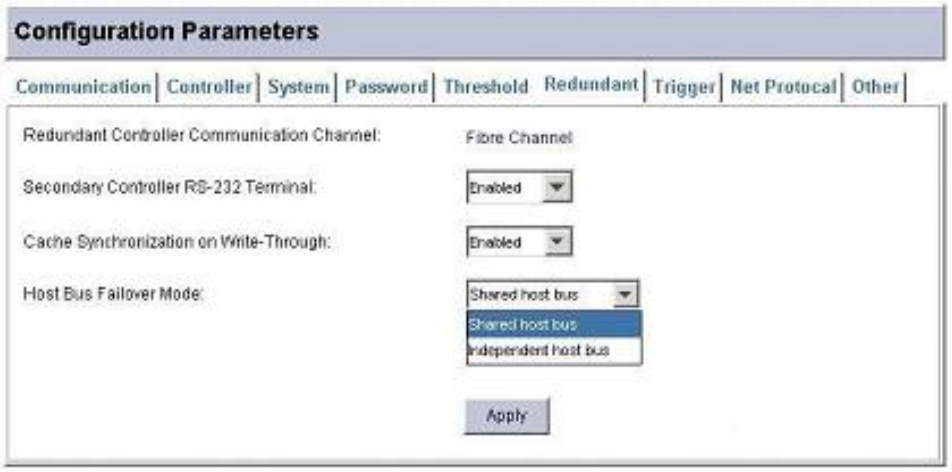



**Figure 7-6: Select the Redundant Tab**

This sub-window contains configuration options related to redundant controller configurations. This "Redundant" window tab only displays if your controller/subsystem comes with dual-redundant RAID controllers.

- **Redundant Controller Communication Channel:** A display-only field. Shows how partner controllers communicate with each other.

- **Secondary Controller RS-232 Terminal:** In a redundant controller configuration, the RS-232C port on the secondary controller is normally nonfunctional. Enable this function if you wish to use the port for debugging purposes. Note that access to the secondary controller only allows you to see controller settings. In a redundant configuration, configuration changes have to be made through the Primary controller.

- **Cache Synchronization on Write-Through:** If redundant controllers work with Write-Back caching, it is necessary to synchronize the unfinished writes in both controllers' memory. Cache synchronization lets each controller keep a replica of the unfinished writes on its partner, so that if one of the controllers fails, the surviving controller can finish the writes.

  If controllers are operating using the Write-Through caching mode, the synchronized cache operation can be manually disabled to save system resources and to achieve better performance.

  Note that if sync. cache is disabled, the configuration changes made through the primary controller is still communicated to the secondary controller.

- **Host Bus Failover Mode**: Default setting is "Shared." The "**Independent**" mode is often applied in situations such as cascaded SATA JBODs using redundant controller units. The Independent option allows logical drives to be presented through channel/IDs on all host ports to avoid the situation when IDs on a disconnected host link can not failover to the surviving host link.

This option allows logical drives assigned to one controller in a redundant controller pair to be mapped to channel/IDs that are owned by the alternate controller. For more details, please refer to the ***Generic Operation Manual*** that came with your subsystem.

## 7.9 Event Triggered Operations

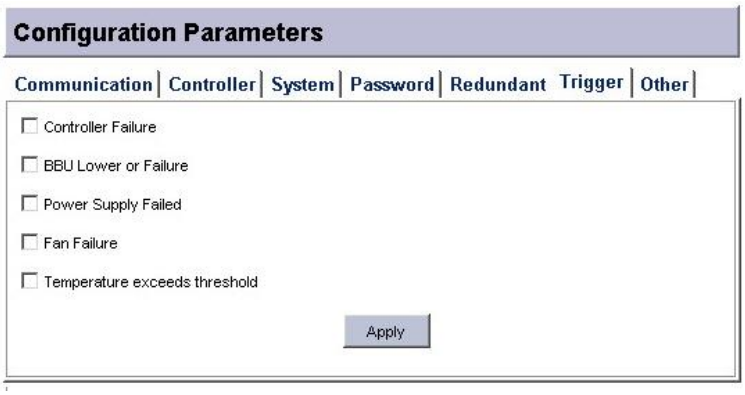



**Figure 7-7: Select the Trigger Tab**

To reduce the chance of data loss caused by hardware failure, the controller/subsystem can automatically commence an auto cache flush upon the detection of the following conditions. When cache contents are forced to be distributed to hard drives, Write-back caching mode is also switched to the Write-through mode.

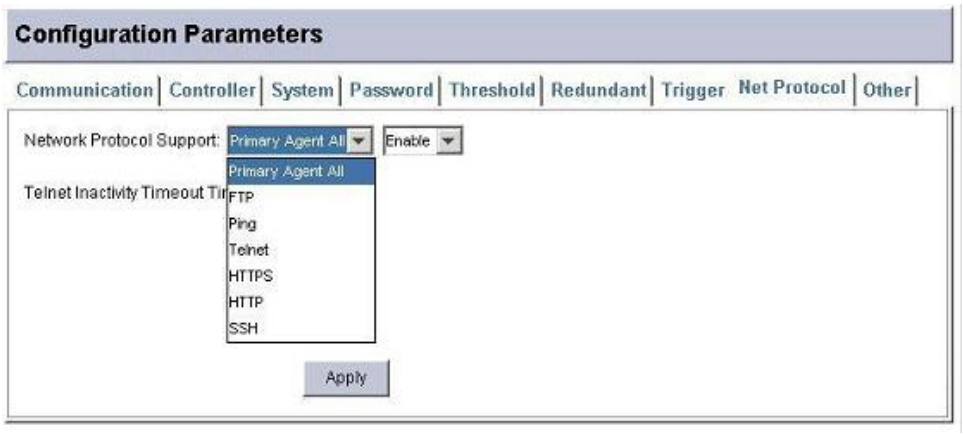
1. Controller Failure
2. BBU Low or Failed
3. Power Supply Failure (Single PSU Failure)
4. Fan Failure
5. Temperature Exceeds Preset Thresholds

Select the check box(es) of events you wish the controller/subsystem to commence the cache flush for.

**NOTE** *the thresholds on temperature refer to the defaults set for "RAID controller board temperature."*

## 7.10 Network Protocols

To access the network protocols options, click the **Net Protocol** tab under the **Configuration Parameters** panel.

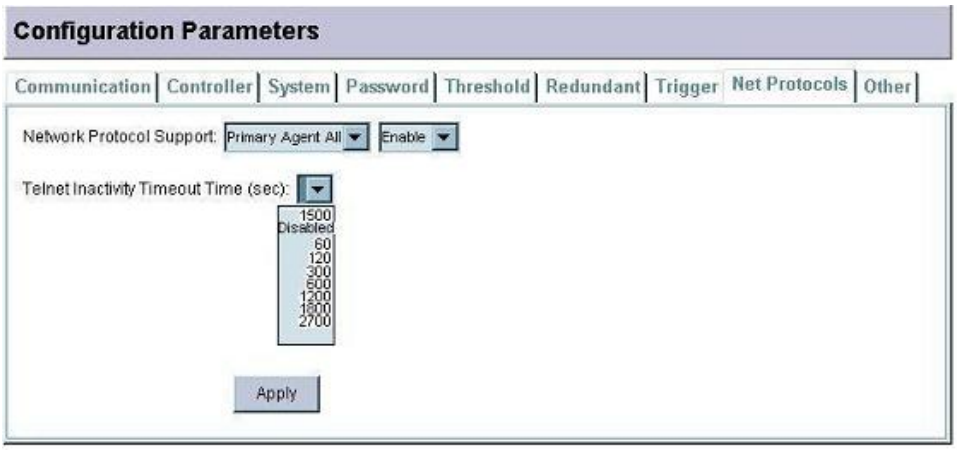



Disable the network access options that will not be used, either local or remote, for accessing the RAID subsystem. Doing so can minimize the chance of unauthorized network access.

Note that the **Primary Agent All** option allows you to disable access to an array by RAIDWatch's RAID agents.

Please refer to the ***Generic Operation Manual*** that came with your controller/subsystems for details on remote access using the SSH connection.

### Telnet Inactivity Timeout




Select a timeout value for the Telnet connection. The configurable range starts from 60 to 2700 seconds. Set a value if the possibility exists that your management session is going to be left unattended for certain time period.

Click **Apply** for the configuration change to take effect.

# Chapter 8: Channel Configuration

Using RAIDWatch Manager, you can modify the configuration of any channel on the controller. With RAID controllers like the EonRAID 2510FS, you can set the channel operation mode to host or drive, enable or disable channel termination, set IDs, set the transfer clock rate for synchronous communication, and select the transfer width.

Channel configuration settings are available under **Physical View** in the RAID View window. This chapter describes the following Channel Configuration features:

## 8.1 Accessing Channel Configuration Window

I/O Channel configuration options are available under the **Configuration** category, which is found in the lower section of the navigation panel.

To be able to access the **Channel** window, use either the command from the "Action" menu or select the **Channel** icon from the navigation panel. (See ***Figure 8-1***).

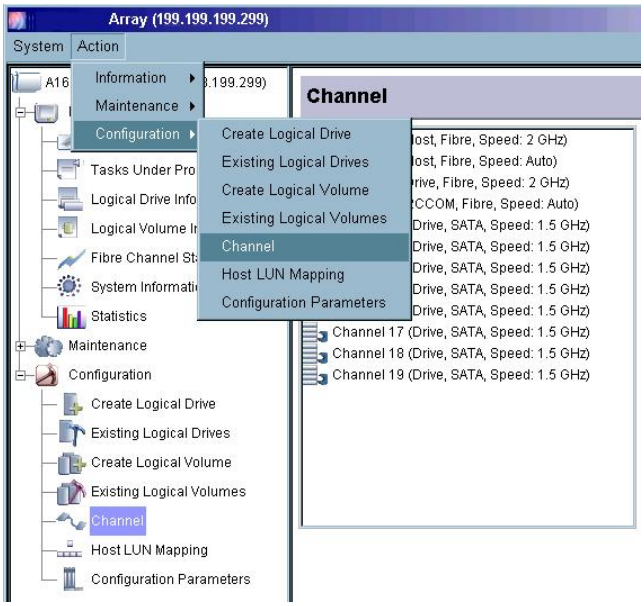



**Figure 8-1: Accessing Channel Configuration Window**

Once the **Channel** window has been opened and channel items have appeared under the left-hand side column of the Configuration window, select the channel that needs to be configured.

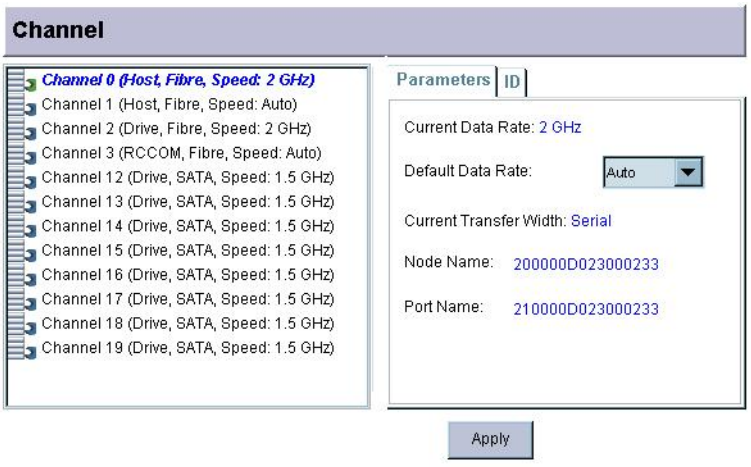



**Figure 8-2: Selecting a Channel: Fibre Host**

The following sections describe user-configurable channel parameters.

## 8.2 User-Configurable Channel Parameters

Once the channel has been selected, the screen shown in ***Figure 8-3*** will appear in the content window. Note that SCSI host channels are used as an example in Figure 8-3. The different options are discussed below.

Once the **Channel** window has been opened and channel items have appeared under the left-hand side column of the configuration window, select the channel that needs to be configured.

### *Channel Parameters: EonStor Series*

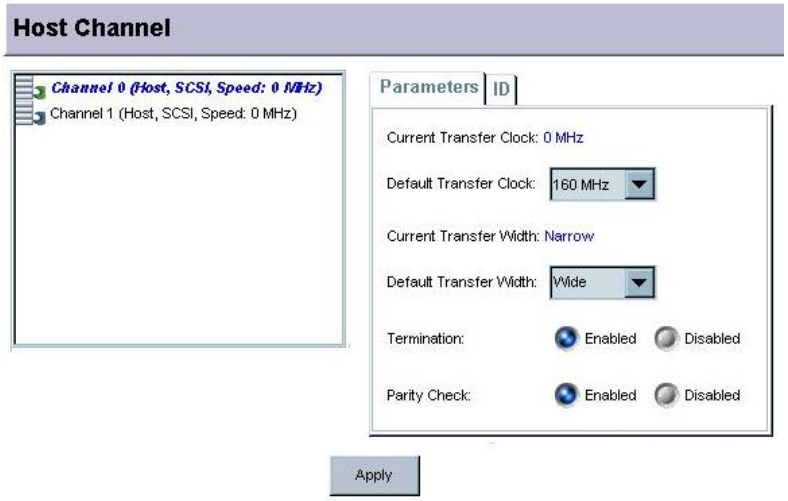



**Figure 8-3: Selecting a Host Channel: SCSI Host**

### *Channel Parameters: EonRAID 2510FS Series*

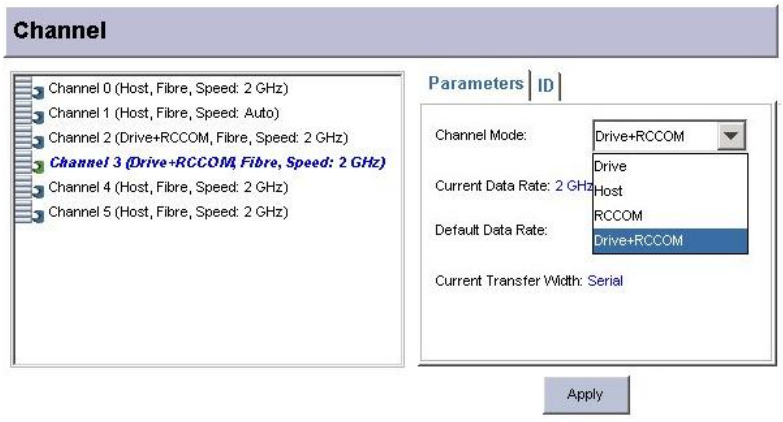



**Figure 8-4: Selecting a Drive Channel: EonRAID 2510FS**

### 8.2.1. Channel Mode

This configuration option is exclusively available with the EonRAID 2510FS series.

The EonRAID series controllers allows flexible reconfigurations of its I/O channels. An I/O channel can be assigned as **Host**, **Drive**, dedicated **RCC** (**RCCOM**), or **Drive+RCCOM** channels. For example, the combination of I/O channels may look like the following:

| | |
|---|---|
| Dual-redundant Controller Models: | |
| EonRAID 2510FS-4RH: | 2 host and 2 drive+RCCOM; a total of 4 I/O channels |
| EonRAID 2510FS-6RH: | 2 host, 2 dedicated RCCOM, and 2 drive; a total of 6 I/O channels |
| Dual-single Controller Models: | |
| EonRAID 2510FS-4D: | 2 host and 2 drive per controller; a total of 8 I/O channels |
| EonRAID 2510FS-6D: | 2 host and 4 drive – or – 4 host and 2 drive per controller; a total of 12 I/O channels |

For more information about all possible combinations, please refer to the ***Installation and Hardware Reference Guide*** that came with your controller.

### 8.2.2. Termination

This parameter enables or disables channel SCSI termination on subsystems featuring SCSI host channels. SCSI buses must be properly terminated at both ends; that is, when connecting one end of a SCSI cable to a host HBA, the termination of the channel must be enabled on the subsystem side. An alternate configuration should be applied when multiple enclosures are being cascaded on the host buses. An enclosure situated at the middle of a SCSI bus should have its termination set to disabled.

### 8.2.3. Default Transfer Clock (in MHz)

These parameters set the data transfer clock rate for synchronous communication over the SCSI bus, and enable or disable wide transfer, respectively.

Data that is transferred across the bus in synchronous transfer mode is clocked using a synchronous transfer clock signal. The frequency of this signal determines the rate at which data is transferred. If, for example, the synchronous transfer clock is 10 MHz, data transfer rate will be 10 million bytes per second (assuming narrow transfer).

Data transfer across the SCSI bus can be either 8 bits or 16 bits at a time. The former is referred to as *narrow* transfer, while the latter is referred to as *wide* transfer. At the same synchronous transfer clock rate, data transfer using *wide* transfer will be double that of

*narrow*. With a transfer clock of 10MHz, the data transfer rate will be 10 Mbytes/second under *narrow* transfer, and 20Mbytes/second using *wide*.

Occasionally, under conditions in which SCSI signal quality is poor, such as with extremely long cables, poor connections, or bad termination, it may be necessary to reduce the synchronous transfer clock to allow the SCSI channel to function normally. Worst case, it may be necessary to switch to asynchronous communication mode.

Furthermore, certain older SCSI devices may only support *narrow* transfer and behave abnormally when attempting to negotiate *wide* transfer. Under such conditions, *wide* transfer may need to be disabled, forcing the controller to use *narrow* transfer mode with that device.

### 8.2.4. ID Pool / PID / SID

The selection with PID (Primary ID) and SID (Secondary ID) only appears with controller/subsystems that come with dual-redundant RAID controllers.

This parameter sets the IDs to appear on the host channels. Each channel must have a unique ID in order to work properly. For a SCSI-host subsystem, ID ranges from 0 to 15. For a Fibre-host controller/subsystem, ID ranges from 0 to 125. ID 0 is assigned to SCSI-host subsystems and ID 112/113 to Fibre-host controller/subsystems as the default value for host channels. Preset IDs are available with drive channels and it is recommended to keep the defaults.

For more information on host channel and drive channel IDs, please refer to the ***Generic Operation manual*** and the hardware documentation that came with your controller/subsystems.

## 8.3 Setting the Configurations for a Channel

**Step 1.** Single-click under the **Channel** window to select a corresponding channel. Channel icons are displayed in the left-hand side panel of the configuration window. The Channel Settings configuration will appear as two separate tabbed panels on the right-hand side: "***Parameters***" and "***ID***." (See ***Figure 8-1***).

**Step 2.** From the **Parameters** panel, specify a preferred value with configurable item either by checking the pull-down menus or check circles of the **transfer clock**, **transfer width**, **termination**, and/or **parity check**. You should then click the **Apply** button for the change to take effect.

**Step 3.** If you want to assign a different ID to the selected channel, choose the "ID" panel, an **ID pool** scroll menu should appear as shown in ***Figure 8-5***.

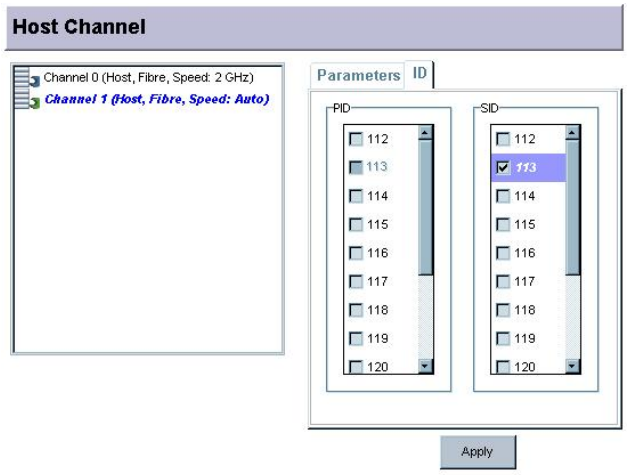



**Figure 8-5: ID Pool Menu**

When selecting an ID, be sure that it does not conflict with the other devices on the channel. Preset IDs should have been grayed out and excluded from selection. The ID pool lists all IDs available for current selection. Highlight the IDs you want to use by selecting its check boxes and click **Apply** to create either the **PIDs** (Primary ID) or **SIDs** (Secondary ID) for the channel.

# Chapter 9: Drive Management

Using RAIDWatch Manager, you can make and delete Logical Drives (LDs) and Logical Volumes (LVs). Both LDs and LVs can be partitioned. This chapter describes the following drive management features:

# 9.1. Locating Drives

RAIDWatch uses visualized icons to represent subsystem drive trays. In many configuration windows, a single click on a drive tray icon selects a hard drive. Drive status is indicated and automatically refreshed using the display of different icons. See below for the drive tray icons used in the Front View window, which instantly displays drive status. By referring to the drive status in the Front View window, you can start to create or configure a logical array.

New or Healthy Used Drive

Bad or Missing Drive

Spare Drive

Following are the things you should know before configuring a logical array:

- All members in a logical configuration are displayed in a unique color.
- Whenever a disk drive is selected by a single mouse click on the visualized icon, its status is displayed on the associated configuration window. For example, when a drive is selected by clicking its icon, it automatically appears in the Selected Members column. In this way, mistakes can be avoided by double-checking the information related to specific disk drive.

# 9.2. Logical Drive Management

This section describes how to:

- Access the Logical Drive (LD) Creation and Management Windows
- Create LDs
- Expand LDs
- Delete LDs

**NOTE:** *When you delete a logical drive, all physical drives assigned to the logical drive will be released, making them available for creation or expansion of logical drives.*

## 9.2.1 Accessing the "Create Logical Drive" Window

LDs are created in the **Create Logical Drive** window and managed in the **Existing Logical Drives** window. These functional windows are accessed from RAIDWatch's navigation panel on the left of the GUI screen.

**Step 1.** To manage LDs, i.e. to create and set related parameters, display the LDs creation window by clicking on the **Create Logical Drive** icon in the functional navigation panel or clicking on the **Action** menu items located on top of the GUI screen.

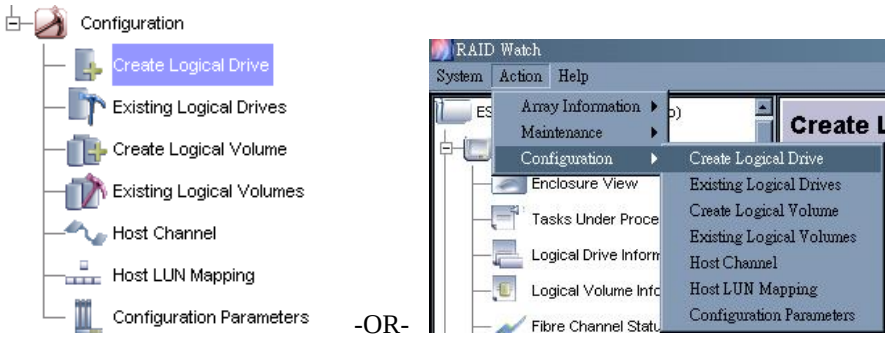



**Figure 9-1: Accessing the Create Logical Drive Window**

**Step 2.** The configuration screen shown in ***Figure 9-2*** should appear.

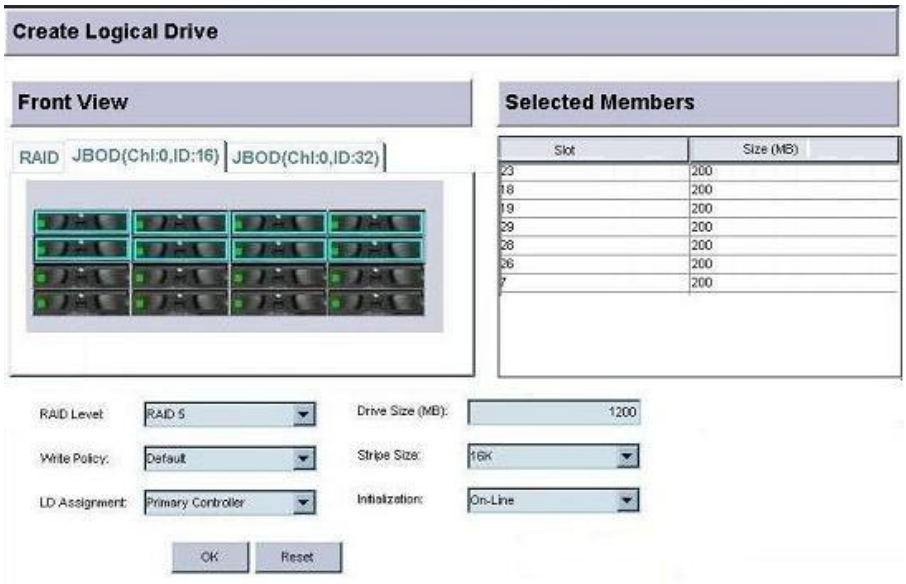



**Figure 9-2: The Create Logical Drive Window**

## 9.2.2 Creating Logical Drives

### 9.2.2.1. LD Creation

To create a logical drive:

**Step 1.** Select the physical drives that will be used in the LD. (See ***Section 9.2.2.2***.)

**Step 2.** Select the following RAID parameters (See ***Section 9.2.2.3***):

- ♦ RAID Level
- ♦ Write Policy
- ♦ LD Assignment
- ♦ Drive Size
- ♦ Stripe Size
- ♦ Initialization Mode

**Step 3.** Click the "OK" button. (See ***Section 9.2.2.4***).

### 9.2.2.2. Selecting Drives

**Step 1.** Select members for the new logical drive by clicking drive icons in the **Front View** window. Bad drives or drives being used by another logical drive are unavailable for the creation process.

**Step 2.** Drives selected for a new logical drive will be listed in the **Selected Members** sub-window on the right hand side of the screen.

**Step 3.** Continue to set appropriate RAID parameters in the select menu at the lower part of the configuration screen.

### 9.2.2.3. Setting RAID Parameters

After the physical drives that will be used in the LD have been selected, the RAID parameters for the LD must be selected. RAID parameter options that are available can be accessed at the bottom of the configuration screen.

#### *Select RAID Level*

From the "RAID Level" pull-down menu shown, select the RAID level you wish to use when creating the LD.

#### *Write Policy*

Define the write policy that will be applied to this array. "Default" means identical to the subsystem's overall setting. The overall setting can be accessed in the Caching Parameters section of the Configuration Parameters sub-window.

#### *LD Assignment*

Choose "Primary Controller" or "Secondary Controller" from the "LD Assignment" menu. Select the RAID controller that will manage the logical drive in a dual-controller configuration.

#### *Drive Size*

The value entered in the "***Drive Size***" field determines how much capacity from each drive will be used in the logical drive.

**NOTE:**

*Enter a smaller number if you do not want to use up all of the capacity at this time. The unused capacity can be utilized later using the Expand Logical Drive function.*

### *Initialization Options*

This allows you immediate availability of the array. "Online" means the logical drive is immediately available for I/Os and the initialization process can be automatically completed some time later.

### *Selecting Stripe Size*

The stripe size that is used when the LD is created can be selected from the "***Stripe Size***" pull down menu. As can be seen, the following stripe sizes are available: 16KB, 32KB, 64KB, 128KB (Default), or 256KB.

Select a stripe size, but note that stripe size arrangement has a tremendous effect on array performance. It is only recommended for experienced users. Stripe size defaulted to this menu is determined by the subsystem Optimization mode and the RAID level selected.

**NOTE:**

*If the redundant controller function has not been enabled or the SID's are not assigned on drive channels, the "LD Assignment" pull down menu will not be available.*

## 9.2.2.4. Click "OK" to Create LD

Once the physical drives that will be used in the LD have been selected and all the desired LD parameters have been selected:

**Step 1.** Click the "***OK***" button at the bottom of the LD management window.

**Step 2.** A confirmation window will appear. If you are certain that you want to create the LD with the settings you have selected, click the "***OK***" button.

**Step 4.** If you selected the "***OK***" button in the "***Please Confirm***" window, the "***Create In Progress*****"** content window will display the logical drive creation progress.

**Step 5.** Click the **Reset** button to redo or abort the process. When the initialization process begins, you can check the **Tasks Under Process** window to view the progress.

## 9.2.3 Accessing the Logical Drive Configuration Window

Various functions can be performed on configured arrays in the **Existing Logical Drives** window.

### 9.2.3.1. Opening the "Existing Logical Drives" Window

**Step 1.** Select the "**Existing Logical Drives**" icon from the GUI navigation panel as shown in ***Figure 9-3.*** All the LDs that have been created will appear in the "Logical Drives" panel.

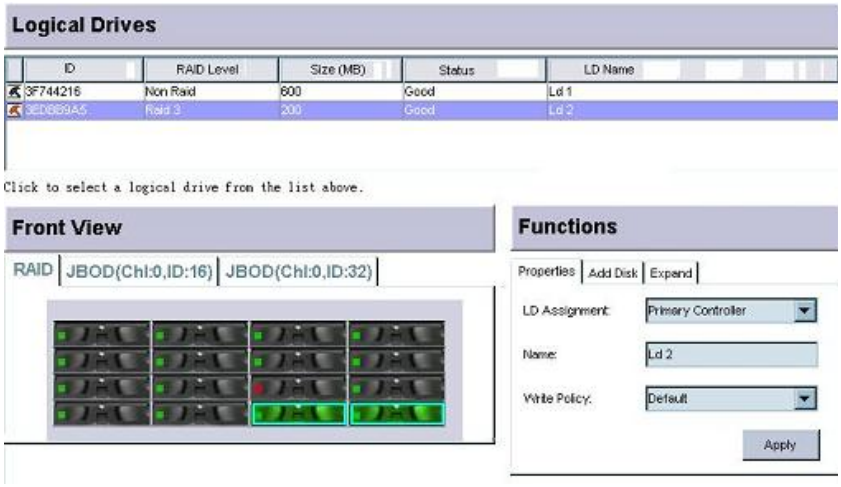



**Figure 9-3: List of LDs**

**Step 2.** From the list shown in ***Figure 9-3,*** select the LD that you wish to change its characteristics or configure. Once this LD has been selected, its members will appear in the Front View sub-window. At the top of the "**Functions**" window, three tabs ("**Properties**", "**Add Disk**" and "**Expand**") will appear.

### 9.2.3.2. To Expand by Adding Drives

**Step 1.** Select the logical drive you wish to expand from the LD list on top of the GUI screen.

**Step 2.** Select the "**Add Disk**" tab to display the content panel.

**Step 3.** Select by single mouse-click from the **Front View** window one or more drives you wish to add to the logical drive. Once one or more drives are selected, its status is displayed in the "**Add Disk**" content panel.

**Step 4.** The Add Disk panel has two functional buttons: "**Add Disk**" and "**Add Spare Drive**." Click on the "**Add Disk**" button to include new members into the array.

**Step 5.** The Add Disk process should immediately begin. You may check the add drive progress in the **Tasks Under Process** window.

### 9.2.3.3. Accessing the Expand Command Sub-window

The Expand command sub-window is accessed by selecting a logical drive and clicking on the Expand tab under the **Functions** window.

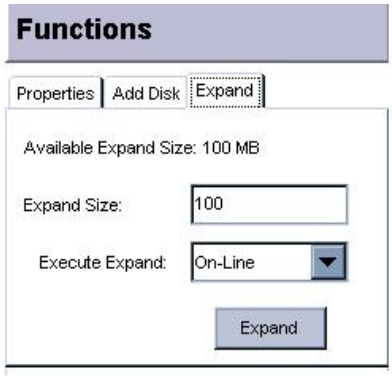



**Figure 9-4: The Expand Command Sub-window**

#### *Available Expand Size (MB)*

If there is an amount of unused capacity in a logical drive, the LD may be expanded. If there is no amount present in the text box, then the LD cannot be expanded.

#### *Set Expansion Size*

A value can be entered in this text box if and only if an amount is shown in the ***Available Expand Size*** text box. The value entered into the ***Expansion Size*** text box cannot exceed the amount shown above. The value entered here specifies the size of the LD expansion.

#### *Execute Expand*

"***Execute Expand***" allows the user to determine whether or not the expansion will be done online or offline. If the user wishes to do an online expansion, then the expand process will be completed once the subsystem finds I/O requests from the host are comparatively low and allows the expand operation. If the user wishes to do an offline expansion, then the OFFLINE menu item will begin immediately.

### 9.2.3.4. Click "Expand" to Initiate LD expansion

To initiate the LD expansion, follow these steps:

**Step 1.** Once the LD expansion parameters have been selected, click the "Expand" button at the bottom of the Expand window.

**Step 2.** The expand process begins and you may check the progress in the **Tasks Under Process** window.

**Step 3.** The logical drive will now have a new last partition the same size as the expansion. You may right-click the logical drive field listed above to display the "**Edit Partition**" command to verify this.

## 9.2.4 Dynamic Logical Drive Expansion

### 9.2.4.1. What Is It and How Does It Work?

Before Dynamic Logical Drive Expansion, increasing the capacity of a RAID system using traditional methods meant backing up, re-creating and then restoring. Dynamic Logical Drive Expansion (a new feature in controller firmware versions 2.11 and later) allows users to add new hard disk drives and expand a RAID 0, 3 or 5 Logical Drive without powering down the system.

### 9.2.4.2. Two Modes of Dynamic LD Expansion

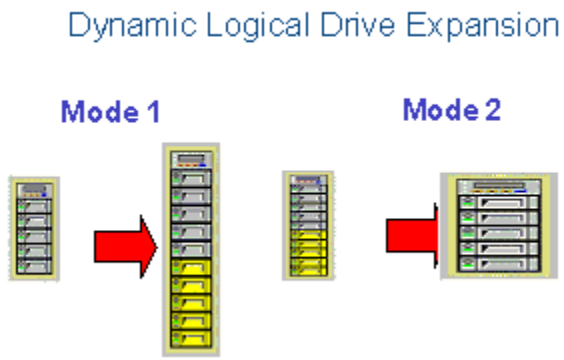



**Figure 9-5: Dynamic Logical Drive Expansion**

There are two modes of Dynamic Logical Drive Expansion.

Mode 1 Expansion is illustrated in ***Figure 9-6*** and involves adding more hard disk drives to a logical drive, which may require that the user obtain an enclosure with more drive bays. The data will be re-striped onto the original and newly added disks.

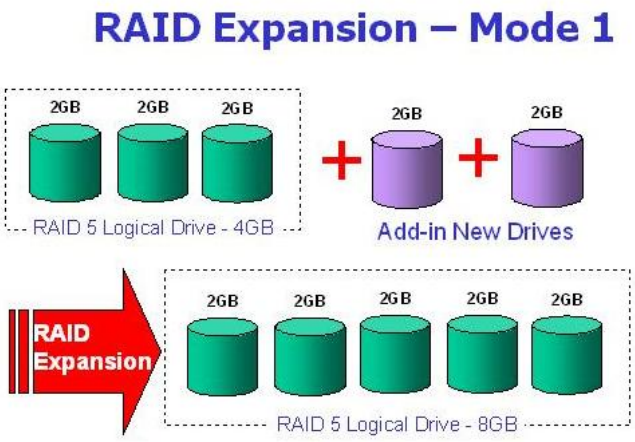



**Figure 9-6: RAID Expansion Mode 1**

In the ***Figure 9-6*** above, new drives are added to increase the capacity of a 4-Gigabyte RAID 5 logical drive. The two new drives increase the capacity to 8 Gigabytes.

Mode 2 Expansion, on the other hand, requires the same number of higher-capacity hard disk drives for a given logical drive.

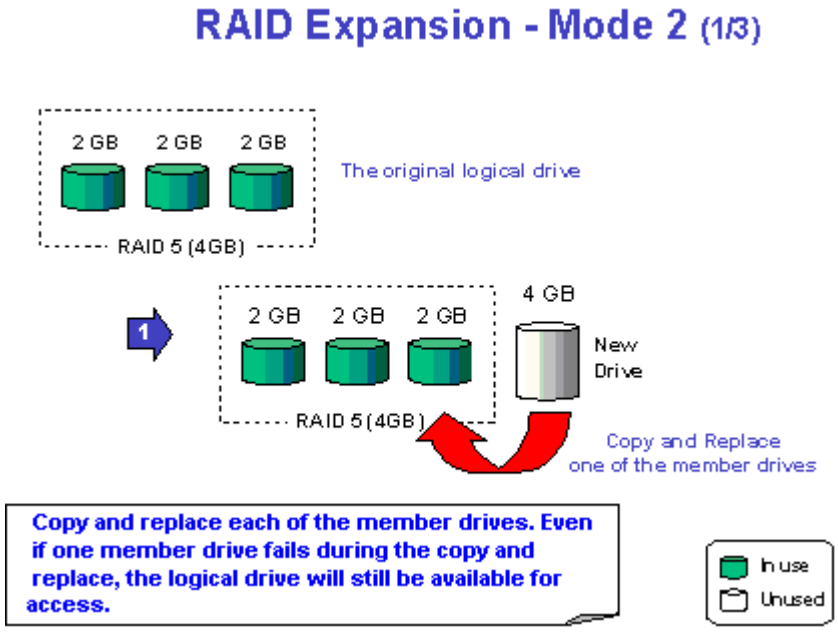



**Figure 9-7: RAID Expansion Mode 2 (1/3)**

***Figure 9-7*** above illustrates expansion of the same 4-Gigabyte RAID 5 logical drive using Mode 2 Expansion. Drives are copied and replaced, one by one, onto three higher-capacity drives.

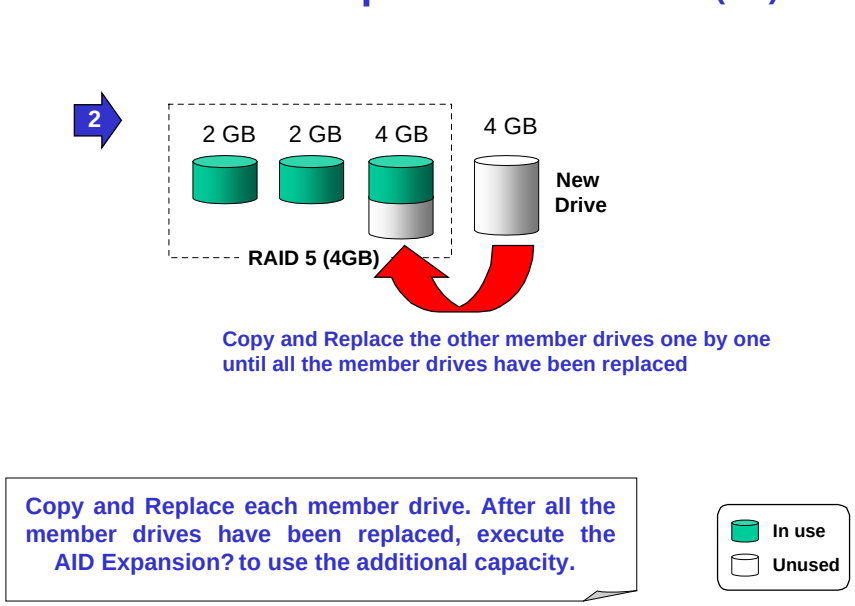



**Figure 9-8: RAID Expansion Mode 2 (2/3)**

This results in a new 4-Gigabyte, RAID 5 logical drive composed of three physical drives. The 4 Gigabytes of increased capacity is in a new partition.

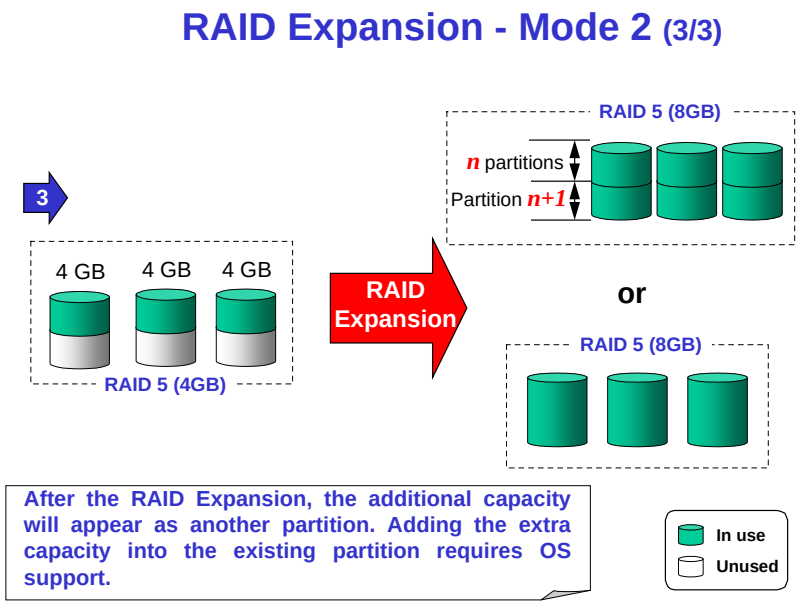



**Figure 9-9: RAID Expansion Mode 2 (3/3)**

**IMPORTANT!**

*The increased capacity from either expansion type will be listed as a new partition.*

Three new drives are scanned in. To add the drives to the logical drive, select the logical drive where they will be added, then choose the **Add Disk** tab to begin the process described above. Select one or more drives to add and click the **Add Disk** button. When you have selected all of the new drives you want to add, click **OK**.

When you return to the partition table, you will notice that either partition 0 or the last partition will now be larger than before.

Follow the directions in the next chapter to map the new partition to a host LUN. The new partition must be mapped to a host LUN in order for the HBA (host-bus adapter) to see it.

## 9.2.5 Adding Spare Drive Assignments

You can assign spare drives to a logical drive to serve as backups for failed drives. In the event of a drive failure, the spare drive will be automatically configured into the array and reconstruction (or rebuilding) will immediately commence.

Logical drives can support multiple spare drives; however, this configuration is rarely used due to its high cost and uncommon occurrences of drive failures. A practical configuration calls for one spare drive per logical drive – after rebuilding on this drive, just replace the failed drive and then configure the replacement as the new spare drive.

**NOTE:**

*Adding a spare drive can be done automatically by selecting the RAID 1+Spare, RAID 3+Spare or RAID 5+Spare option from the logical drive RAID Level selection dialog box when creating a logical drive. These options apply to RAID 1, RAID 3, and RAID 5 levels respectively.*

### 9.2.5.1. Accessing the Spare Drive Management Screen

***To open the spare drive management screen, please follow these steps:***

**Step 1.** Select the logical drive you wish to add a dedicated spare to from the list of the logical drives above. In the Functions window, click the Add Disk tab. The functional window is accessed from the "Existing Logical Drives" window as

shown in ***Figure 9-3***. As shown in ***Figure 9-10***, the Add Spare button appears next to the Add Disk button.

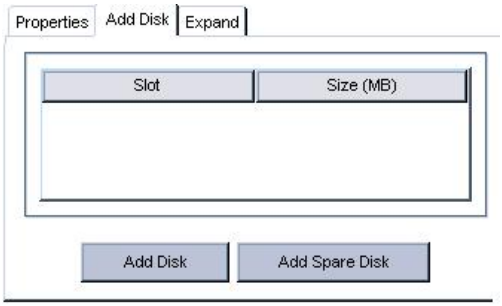



**Figure 9-10: The "Add Spare Drive" Button**

**Step 2.** From the Front View window, select the disk drive you want to use as a dedicated spare with a single mouse-click.

**Step 3.** After selecting the drive that will be used as a spare, the selected drive's status will be displayed and you may click the **Add Spare** button to complete the process.

**NOTE:**

*Spare drive assignments can also be made in the **Maintenanc**e mode window. Note that a Global Spare cannot be added in the **Existing Logical Drives** window.*

## 9.2.6 Rebuilding Logical Drives

Depending on whether or not there is a spare drive, rebuilding is initiated automatically or must be started manually. In the presence of a spare drive, the system automatically rebuilds onto the spare drive. This process is done in the background, thus it is transparent to users. However, you should replace the failed drive as soon as possible and insert a new drive and set it as a spare just in case another drive fails and you will need a backup drive.

In the absence of a spare drive, rebuilding must be initiated manually. Before initiating a manual rebuild, you must first replace the failed drive. If you install the replacement drive on the same drive slot (that is, the same channel and ID), then you can proceed with the rebuilding process by clicking on the rebuild button; otherwise, you need to scan in the drive first.

A failed drive should be replaced as soon as possible. For a RAID 3 or RAID 5 array, two failed members will cause an irrecoverable loss of data.

The controller/subsystem can be set to rescan the drive bus for a replacement drive at the preset intervals. The related setting can be found in Configuration Parameters -> Other -> Drive Side Parameters -> Drive Fail Swap Check Period(Sec).

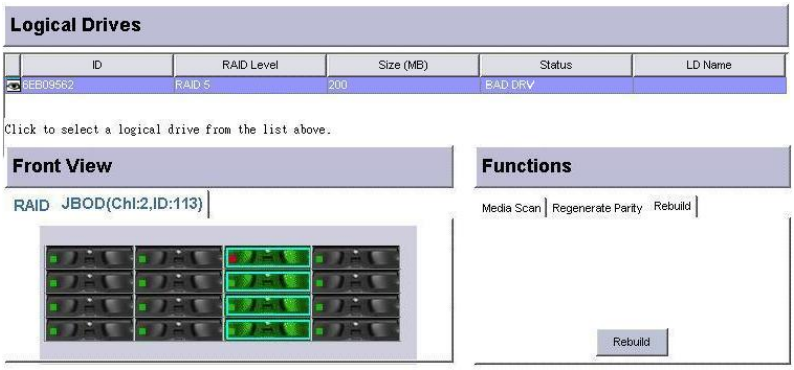



**Figure 9-11: Displaying the "Rebuild" Command Menu**

## 9.2.7 Deleting an LD

If you want to delete an LD from your RAID subsystem, follow the steps outlined below. Remember that deleting an LD results in all the data on the LD being deleted and any data that was previously stored on the LD will be irretrievable.

**IMPORTANT!**

*Deleting a logical drive irretrievably wipes all data currently stored on the logical drive.*

***To delete an LD:***

**Step 1.** Select the logical drive you wish to remove with a single mouse-click. **Right click** on the adjacent screen area. A command menu will prompt as shown in ***Figure 9-12.***

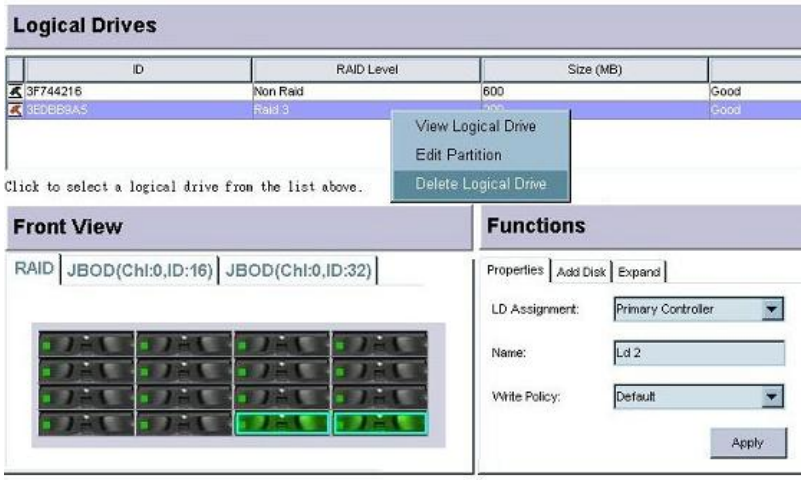



**Figure 9-12: Displaying the "Logical Drive" Command Menu**

**Step 2.** Select the Delete Logical Drive command. The delete process is completed almost immediately.

**Step 3.** Once the "***Delete***" command has been selected, a confirm box will prompt asking you whether to proceed or not.

**Step 4.** If you are certain that you wish to delete the LD, press the "OK" button. If you are not sure, click the "Cancel" button.

## 9.2.8 Shutting Down an LD

***To shutdown an LD:***

LD shutdown is used when access to certain LD configurations has to be manually stopped. This function is restricted to factory test and debug purposes and should not be performed under normal operating conditions. Select the logical drive you wish to shutdown with a single mouse click. **Right click** on the adjacent screen area. A command menu will prompt as shown in ***Figure 9-13: Displaying the "Shutdown Logical Drive" Command.***

You can bring the LD online again, and you need to reset the controller for the LD to be ready for I/Os.

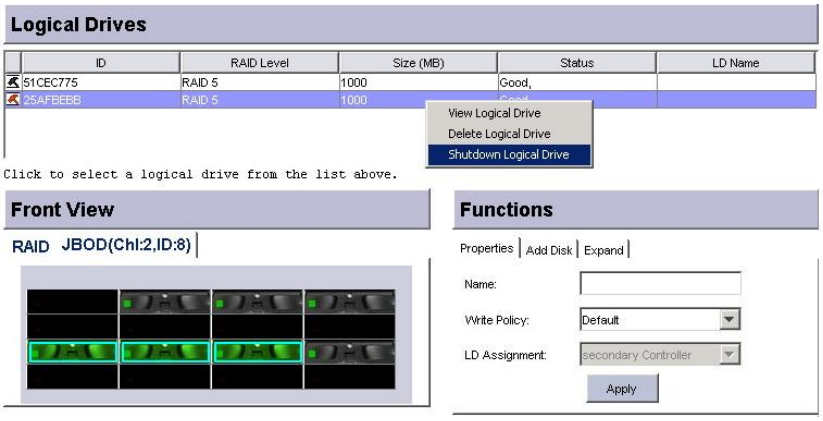



**Figure 9-13: Displaying the "Shutdown Logical Drive" Command**

## 9.3. Creating and Deleting Logical Volumes

You can create and delete logical volumes using RAIDWatch Manager. Logical volumes are created by combining logical drives together. You can combine logical drives with different capacities and RAID levels into a single logical volume. You can also delete existing logical volumes. Before deleting, make certain that the data stored in the logical volume is no longer needed. Deleting a logical volume erases all information stored on that logical volume.

**NOTE:**

*When you delete a logical volume, all logical drives assigned to it will be released, making them available for new logical volume creation.*

### 9.3.1 Accessing the "Create Logical Volume" Window

LVs are created in the **Create Logical View** window which can be accessed either from the navigation panel icon or the command menu on top of the GUI screen.

**Step 1.** To create LVs; display the **Create Logical Volume** window by clicking on the associated icon button in the GUI's navigation panel or the command in the **Action** menu bar.

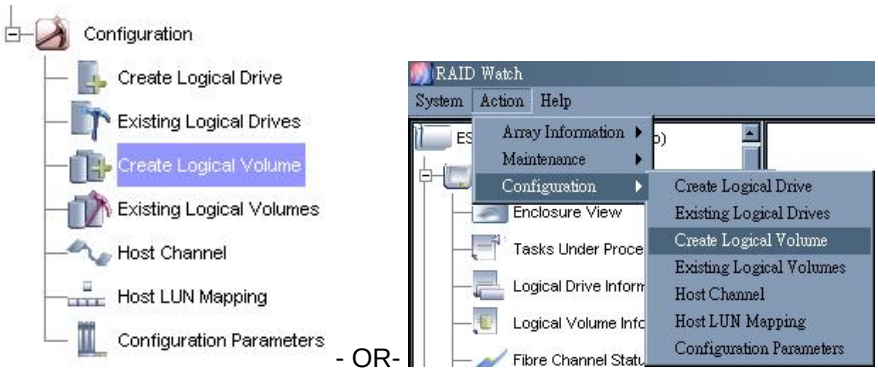



**Figure 9-14: Accessing the Create Logical Volume Window**

**Step 2.** The Create LV window should appear.

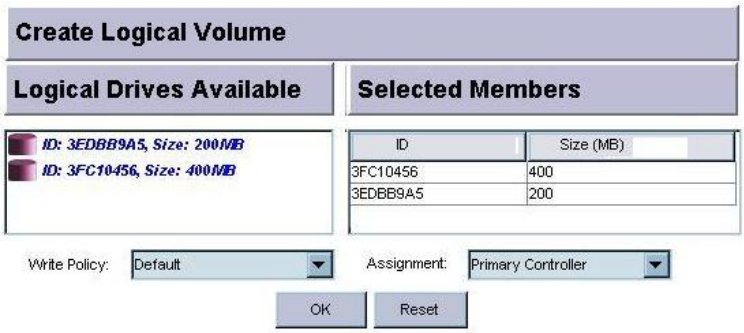



**Figure 9-15: The Create Logical Volume Window**

## 9.3.2 Creating Logical Volumes

### 9.3.2.1. LV Creation

***To create a logical volume:***

**Step 1.** Select the LDs that will be used in the LV from the "**Logical Drives Available**" panel.

**Step 2.** Select the following RAID parameters:

- ♦ Write Policy
- ♦ Assignment

**Step 3.** Information about the selected LDs will appear on the "Selected Members" panel. Click the "OK" button.

#### 9.3.2.2. Selecting LDs

**Step 1.** Select each logical drive you wish to include in the new logical volume with a single mouse-click. Select the LDs you wish to incorporate into a LV and click the "***Add***" button beneath the "***Available***" menu.

**Step 2.** All available logical drives are listed on the left. There are no limitations as to the number of logical drives that can be included in a logical volume. Double-check to ensure that you have selected the appropriate members.

#### 9.3.2.3. Setting Logical Volume Parameters

After the LDs that will be used in the LV have been selected, the LV parameters for the LV must be selected. LV parameter options can be accessed at the bottom of the LV creation window as shown in ***Figure 9-15***.

***LV Assignment***

Choose "Primary Controller" or "Secondary Controller" from the "LV Assignment" menu.

**NOTE:**

*If the redundant controller function has not been enabled or the SID's are not assigned on drive channels, the "LD Assignment" pull-down menu will not be available.*

***Select Write Policy***

Use the "***Write Policy***" menu to select either Default (Global Setting), Write Through, or Write Back. The same policy will automatically apply to all logical drives (members) included in the logical volume.

#### 9.3.2.4. Click "OK" to Create LV

Once the logical drives that will be used in the LV have been selected and all the desired LV parameters have been selected:

**Step 1.** Click the "***OK***" button at the bottom of the LV creation window.

**Step 2.** The creation is completed almost immediately.

## 9.3.3 To Access the Existing Logical Volumes Window

The Existing Logical Volumes window allows you to perform LV expansion and to change related configuration options. As shown below, the configuration window can be accessed either from the functional navigation panel or from the command menu on the top of the GUI screen.

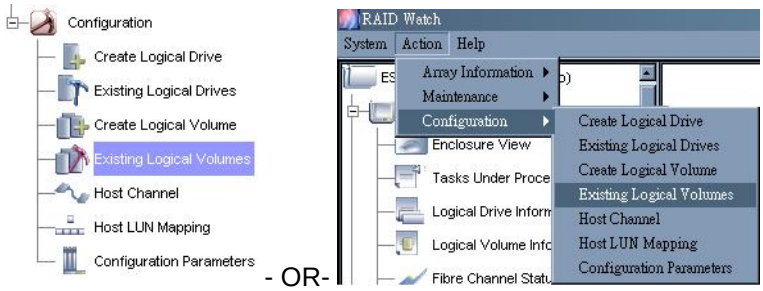



**Figure 9-16: Accessing Create Logical Volume Window**

## 9.3.4 To Expand a Logical Volume

When members of a logical volume have free and unused capacity, the additional capacity can be added to existing logical volumes. The unused capacity can result from the following situations:

- Certain amount of capacity has been intentionally left unused when the logical drives were created (configurable with maximum array capacity).
- Some or all of the members of a logical volume have been expanded, either by adding new drives or copying and replacing original drives with drives of larger capacity.

### 9.3.4.1. Opening the "Expand" Logical Volume Window

**Step 3.** Select a configured LV from the Existing Logical Volumes window shown in ***Figure 9-17***. As shown below, all the LVs that have been created will appear below the "**Logical Volume Status**" panel.

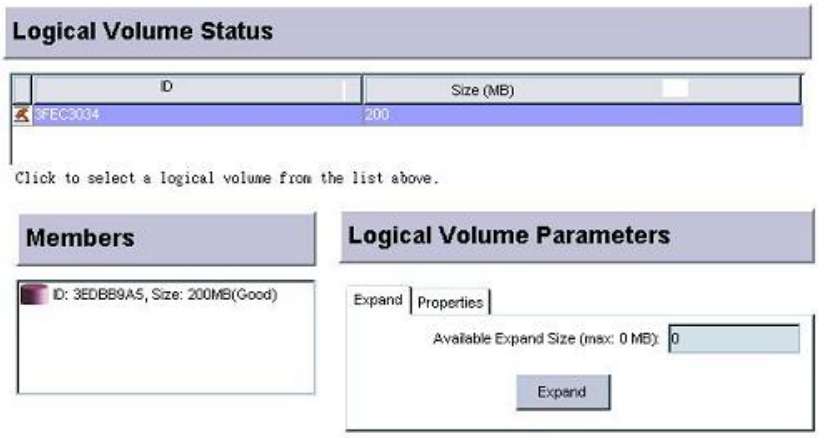



**Figure 9-17: Existing Logical Volumes Window**

**Step 4.** The expand command can be found by clicking the "**Expand**" tab under the LV Parameters panel.

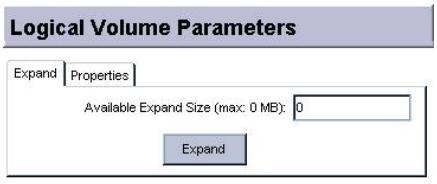



**Figure 9-18: Logical Volume Parameters**

**Step 5.** Available expansion size displays in a text box if there is any amount of unused capacity.

**Step 6.** Click the **Expand** button at the bottom of the configuration panel. The expand process should be completed in a short while because all unused capacity in the members of a logical volume must has been made useful by the same expansion process. The expansion process on a logical volume simply lets subsystem firmware recognize the change in the arrangement of free capacity.

## NOTE:

You may combine partitions under **View and Edit LV Partition Table** by expanding the size of earlier partitions (such as increasing the size of partition 0 so that it is as large as all partitions combined to make one partition).

## WARNING!

Combining partitions destroys existing data on all drive partitions.

**Step 7.** The logical volume will now have a new last partition the same size as the expansion. Look at the partition by **Right-clicking** the expanded volume and select the "**Edit Partition**" command to verify this.

### 9.3.5 Delete a Logical Volume

**Step 1.** Select the configured volume you wish to remove with a single mouse-click. **Right-click** the adjacent area to display a command menu. As shown in ***Figure 9-19***, all the LVs that have been created will appear below the "**Logical Volume Status**" panel.

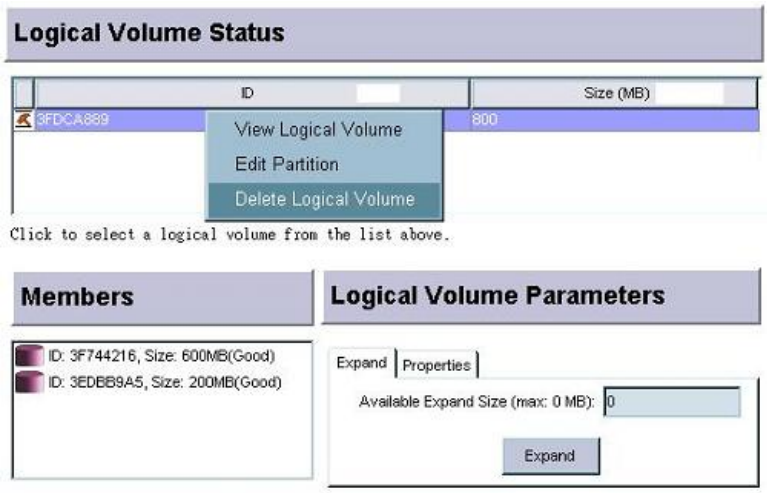



**Figure 9-19: Displaying Logical Volume Edit Mode Menu**

**Step 2.** You will be asked to confirm that you wish to delete the LV in question. If you are certain that you want to delete the LV then select OK. The logical volume will be deleted and removed from the logical volumes list.

# 9.4. Partitioning a Logical Configuration

## 9.4.1 Overview

Partitions can be created in both logical drives (LD) and logical volumes (LV). Depending on your specific needs, you can partition an LD or LV into smaller sizes or just leave it at its default size (that is, one large partition covering the entire LD or LV).

If you intend to map an entire LD or LV to a single host LUN, then partitioning becomes irrelevant. Partitioning can be helpful when dealing with arrays of massive capacities and when re-arranging capacities for applications that need to be accessed by many hosts running heterogeneous OSes.

**NOTE:**

*You can create a maximum of eight partitions per logical drive or logical volume. Also, partitioned logical drives cannot be included in a logical volume.*

## 9.4.2 Partitioning a Logical Drive (LD)

**WARNING!**

*Partitioning a configured array destroys the data already stored on it.*

**Step 1**: Select the logical drive you want to partition. Move your cursor to the **Logical Drives** window. **Right-click** to display the edit mode command menu.

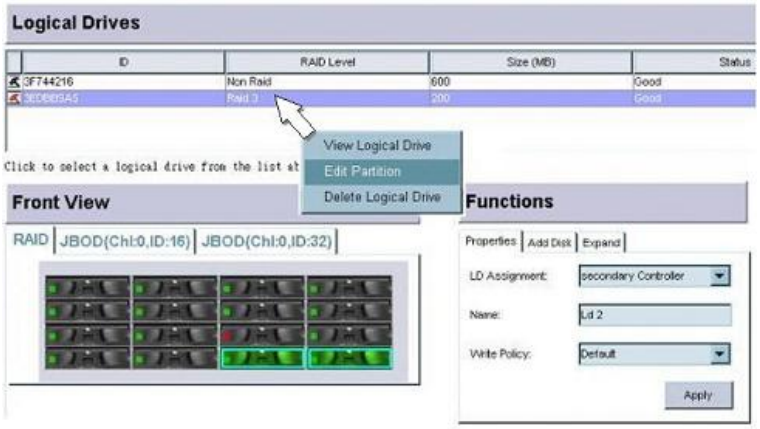



**Figure 9-20: The "Edit Partition" Command**

**Step 2**: Select **Edit Partition** from the menu.

**Step 3**: The **Edit Partition** window displays.


**Figure 9-21: The "Edit Partition" Command Window**

**Step 4**: If the array has not been partitioned, all of its capacity appears as one single partition. Single-click to select the partition (the color bar).

**Step 5**: **Right-click** or select the **Edit** command to display the **Add Partition** command. Click to proceed.


**Step 6:** The **Partition Size** window displays. Enter the desired capacity and press OK to proceed.


**Step 7**: Shown below is a capacity partitioned into two. Each partition is displayed in a different color. Repeat the above process to create more partitions or click to view its information. A new partition is created from the existing partition.

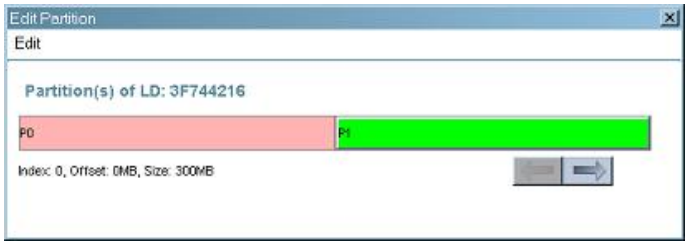



**Figure 9-22: The "Edit Partition" Command Window**

The **arrow** buttons help you travel from one partition to another.

## 9.4.3 Partitioning a logical volume (LV)

**Step 1**: Select the logical volume you wish to partition. Move your cursor on to the

**Logical Volume Status** window. **Right-click** to display the edit mode command menu.

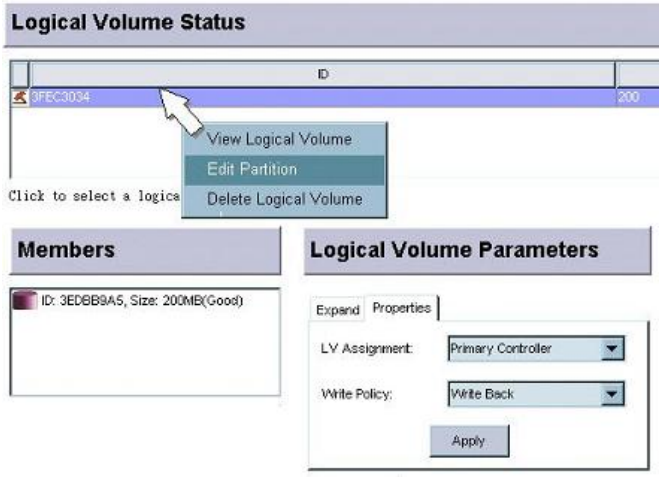



**Figure 9-23: The "Edit Partition" Command**

**Step 2**: Select **Edit Partition** from the menu.

**Step 3**: The Edit Partition mode window displays as shown below.

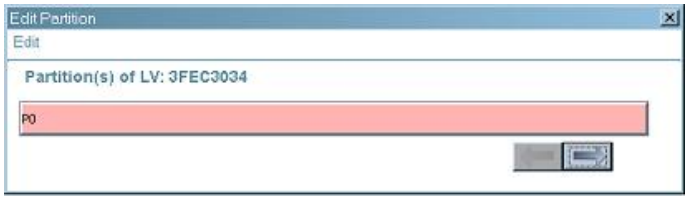



**Figure 9-24: The "Edit Partition" Window**

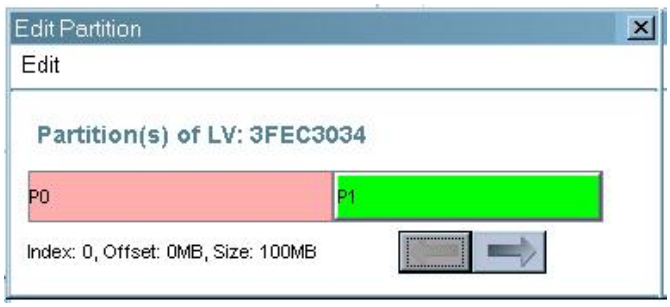
**Step 4**: If the volume has not been partitioned, all of its capacity appears as one single partition. Single-click to select the partition (the color bar).

**Step 5**: **Right-click** or select the **Edit** command to display the **Add Partition** command. Click to proceed.


**Step 6**: The **Partition Size** window displays. Enter the desired capacity and press **OK** to proceed.


**Step 7**: Shown below is a capacity partitioned into two. Each partition is displayed in a different color. Repeat the above process to create more partitions or click to view its

information.




The **arrow** buttons help you travel from one partition to another.

# Chapter 10: LUN Mapping

After creating a logical drive (LD) or logical volume (LV), you can map it as is to a host LUN; or, if partitions are set, you can map each partition to a specific host LUN. RAIDWatch supports 8 LUNs per host channel (numbered 0 - 7), each of which appears as a single drive letter to the host if mapped to an LD, LV, or a partition of either. Existing host LUN mappings can also be deleted. In cases where certain mappings are found to be useless, or disk array reconfiguration is needed, you can delete unwanted mappings in your system.

This chapter explains the following LUN Mapping features:

# 10.1.Accessing the LUN Map Table

When you want to either create or delete a LUN mapping or an extended LUN mapping, it is necessary to access the **LUN Map Table**. The **LUN Map Table** lists the LDs, LVs and partitions that have previously been mapped. To access the LUN Map Table, please follow these steps:

**Step 1.** In the navigation panel under the **Configuration** category, click on the **Host LUN Mapping** where you can find the configuration options with the mapping operation. (See ***Figure 10-1***).

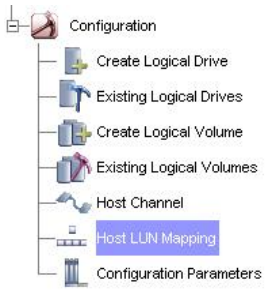



**Figure 10-1: Select the Host LUN Mapping Window**

**Step 2.** The LUN mapping window should appear on the right. Right-click on the Host LUN(s) sub-window to display **PID** (Primary controller ID)/**SID** (Secondary controller ID) command menu as shown in ***Figure 10-2***. Infortrends' controllers or subsystems always come with pre-configured IDs. If it is necessary to add alternative IDs, please select the **Channel** window from the navigation panel.

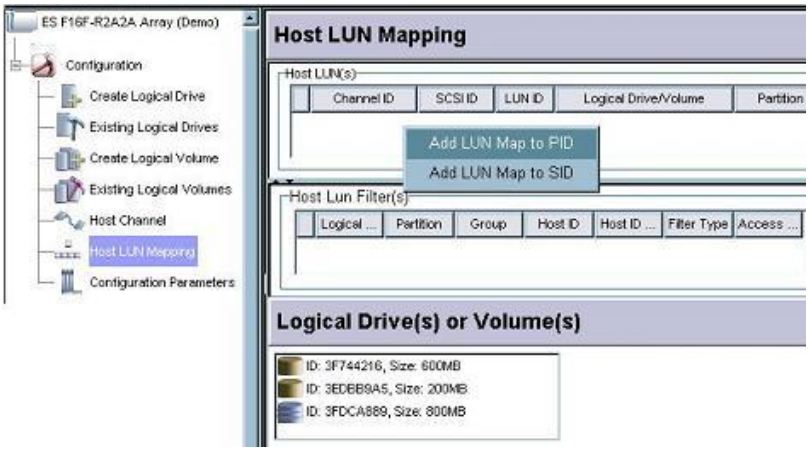



**Figure 10-2: Selecting the Host Channel ID Number**

**Step 3.** After selecting the ID, the **LUN Map Setting** window appears as shown in ***Figure 10-3***.


**Figure 10-3: LUN Map Setting Window**

# 10.2.LUN Mapping

## 10.2.1. Mapping a Complete LD or LV

**Step 1.** If you want to map a complete LD or LV, make sure that the LD or LV has not been partitioned.

**Step 2.** Follow the steps listed in ***Section 10.1*** above to access the ***Host LUN Mapping*** window shown in ***Figure 10-3***.

**Step 3.** Select the appropriate **Channel**, **SCSI ID**, and **LUN** numbers from the separate pull-down lists above.

**Step 4.** Select a Logical Drive or Logical Volume and then select the Partition color bar with a single mouse-click. The partition bar appears on the right-hand side of the screen. An LD or LV not yet been partitioned should have only one partition.

**Step 5.** Click on the **Map LUN** button to complete the process. (See ***Figure 10-4***)

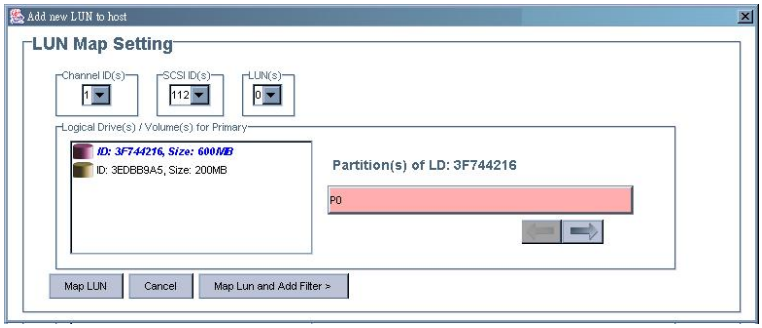



**Figure 10-4: LUN Map Setting Window: Single Partition**

**Step 6.** If your RAID subsystem comes with Fibre channel host interface, you may select the **Map LUN and Add Filter** button to continue with another process. See ***Extended LUN Mapping*** for more details.

## 10.2.2. Map a Logical Drive or Volume Partition to a Host LUN

**Step 1.** First, partition the logical drive or logical volume.

**Step 2.** Follow the steps listed in ***Section 10.1*** above to access the ***LUN Map Setting*** window shown in ***Figure 10-3***.

**Step 3.** When the LUN Map window appears, select the appropriate **Channel**, **SCSI ID**, and **LUN** numbers from the separate pull-down lists above.

**Step 4.** Select a Logical Drive or Logical Volume with a single mouse click. With a single mouse click on the partition color bar, select one of the partitions that you wish to associate with the selected channel ID/LUN number.

**Step 5.** If your RAID subsystem comes with a Fibre Channel host interface, you may select the **Map LUN and Add Filter** button to continue with another process. See ***Extended LUN Mapping*** for more details. See ***Figure 10-5*** for the configuration screen.

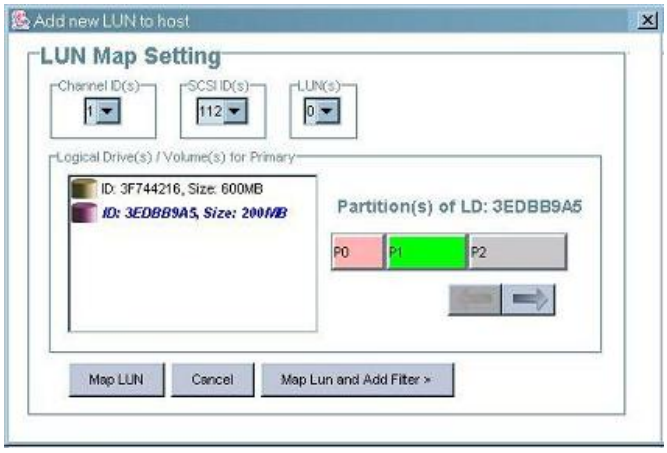



**Figure 10-5: Select Add New LUN to Host**

**Step 6.** Click on the **Map LUN** button to complete the process if no LUN Filtering setting is required.

## 10.2.3. Deleting a Host LUN Mapping

**Step 1.** Follow the steps listed in ***Section 10.1*** above to access the **LUN Map Setting** window shown in ***Figure 10-2***.

**Step 2.** **Left-click** on a configured LUN and then **Right-click** on the adjacent area. A command menu displays as shown in ***Figure 10-6.*** Select the ***Remove LUN Map*** to complete the process.

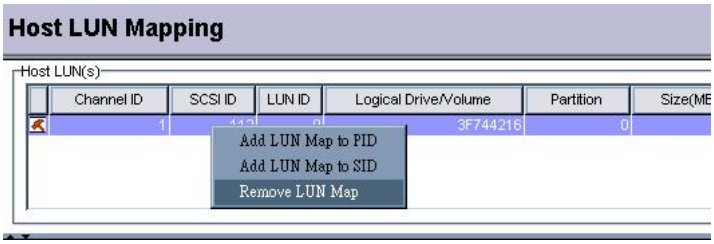



**Figure 10-6: Delete LUN Command**

**Step 3.** When prompted for a password or an answer, enter it and click **OK**. The LUN mapping should no longer be listed in the **LUN Map** table. After deleting the LUN mapping it no longer appears in the host LUN(s).

**Step 4.** To remove additional LUN mappings, repeat ***Step 2***.

# 10.3.Extended LUN Mapping

**Extended LUN mapping** adds extra functionality to the normal LUN mapping, which only allows you to assign LUNs. Extended LUN mapping provides users with added masking and filtering features. This enables users to restrict access to specified LUNs. It also enables users to assign different access modes (Read and Write or Read only) to pre-specified LUNs.

## 10.3.1. Preliminaries

- Before you can use the Extended LUN Mapping feature you must first create the logical drives and logical volumes.
- If you want to use **Extended LUN** Mapping to map an entire logical drive or logical volume, make sure that the logical drive or volume is **NOT** partitioned.
- If you want to use the **Extended LUN** Mapping to map a logical drive partition or logical volume partition, make sure that the logical drives and volumes are partitioned **before** accessing the Extended LUN Mapping feature.

## 10.3.2. Extended LUN Mapping

**Step 1.** Follow the steps listed in ***Section 10.1*** above to access the ***LUN Map Setting*** shown in ***Figure 10-2***. Repeat the process described in ***LUN Mapping*** to select a Logical Drive, Logical Volume, or a logical partition.

**Step 2.** Select the **Map LUN and Add Filter** button shown at the bottom of ***LUN Map Setting*** window. A new screen will appear (see ***Figure 10-7***) in the content window. From this screen you can enter appropriate values for the following:

- ***Group Name***: Multiple host HBAs can be configured to have the same access rights to a configured array. Giving a name can help with the ease of management.
- ***Host ID***: A host HBA card's WWPN port name can be used as the basis ID. Check all the port names of all HBA cards. You may set an ID range that includes or excludes more than one port name or from accessing the storage capacity you specified in the previous process.

  If multiple HBA port names need to be included in an access range (that access may be configured to include or exclude a certain number of HBAs from accessing an array); a wider range can be set to include more port names. For instance, a value "0xFFFFFFFFFFFFF**C**" is selected, and the basic ID is "0x11111111111111," port name IDs ranging from "0x….1110" to "0x….1113" will fall in the ID range.

- ***Access Mode*:** This field enables the user to select what access rights the HBA will have. If you select "**Read and Write,**" then the HBA will be able to both read and write information to the selected LD, LV or partition. If you select "**Read Only,**" the HBA will only be able to read the contents stored on the selected LD, LV or partition. It will not be able to store any information.

- ***Host ID Mask***: The ID Mask is a 16-bit hexadecimal number and can be changed by the user. LUN masking is done by combining the basis ID with a mask similar to the way routing table entries are set up on a LAN/WAN. If a particular HBA port name ID "AND'ed" with the mask equals the basis ID AND'ed with the mask, then the HBA's port name ID is considered to fall within the range.

  Any HBA having a port name fitting the range will be given the access right thus configured. If an HBA's port name fits an ID range that is specified as "Exclude," then the HBA is forbidden from access to the storage capacity mapped with this entry.

- ***Filter Type***: Filter entry can serve both ends: to include or exclude certain adapters from data access.

  Multiple ranges, or filter entries, can be established for a single channel, target-ID, and LUN combination. Each range can have its own Exclude/Include attributes. The rules for determining whether a particular ID is considered as "included" or "excluded" are listed below:

  1. If an ID falls within one or more Include ranges and does not fall in any Exclude range, then it is included.
  2. If an ID falls within ANY Exclude range no matter if it also falls in another Include range, then it is excluded.
  3. If the ID falls in none of the ranges and there is at least one Include range specified, then the ID should be considered as excluded.
  4. If the ID falls in none of the ranges and only Exclude ranges are specified, then the ID is considered as included.

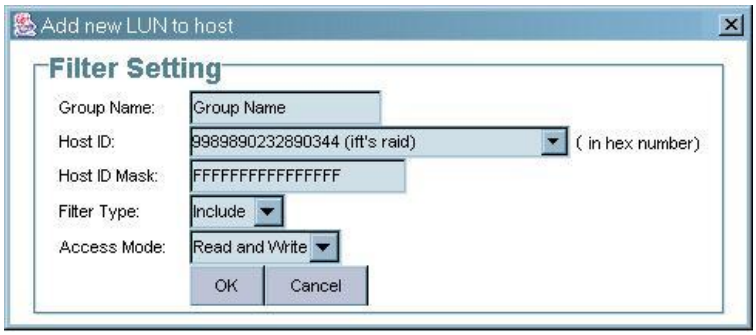



**Figure 10-7: LUN Filter Mapping Window**

You may refer to the ***Generic Operation Manual*** that came with your controller/subsystem for more details about LUN filtering access control.

**Step 3.** Once all of the extended LUN mapping parameters have been selected, click "**OK**" to complete the process.

## 10.3.3. Adding/Deleting a New Filter

**Adding a New Filter**

**Step 1.** Multiple filter entries can be added to a configured array. To manually add a filter setting, **left-click** to select and **right-click** on one of the existing host LUN(s). This applies when a newly added server needs to access a previously mapped capacity, or when a server needs to be removed from the list of servers that can access the array. A command menu displays as shown in ***Figure 10-8: Add LUN Filter***.


**Figure 10-8: Add LUN Filter**

**Step 2.** Select the **Add LUN Filter** command.

**Step 3.** Select a logical capacity you wish to add a new filtering entry. Click the **Map LUN and Add Filter** button.

**Step 4.** A new screen will appear in the content window. From this screen, first select appropriate values for each LUN filtering setting text field. Host HBA port names that are seen by the controller/subsystem should appear in the **Host ID** pull-down menu. (See ***Figure 10-9***)

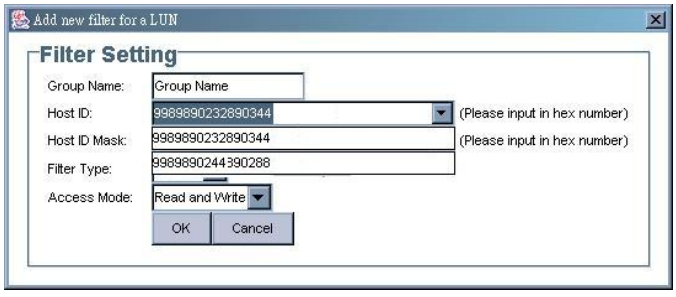



**Figure 10-9: Host ID Menu**

**Step 5.** Complete the process by clicking **OK**.

**Removing a Filter**

**Step 1.** To manually remove a filter setting, **left-click** to select and **right-click** on one of the existing host LUN filter(s). A command menu displays as shown in ***Figure 10-10: Remove LUN Filter***.

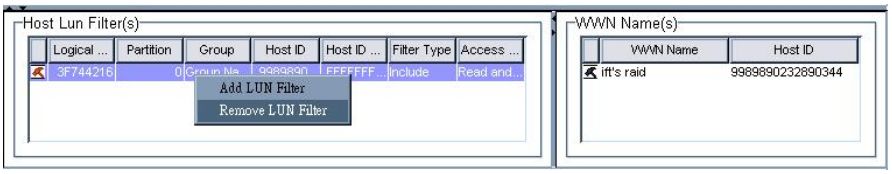



**Figure 10-10: Remove LUN Filter**

**Step 2.** Click on the command to remove an existing filter entry. A confirm box appears. Click **OK** to delete the selected filter entry.

# Part 3: System Monitoring and Management

***Part 3*** explains how to monitor and manage your storage arrays. Descriptions on how to identify the source of faulty components are described. Full descriptions of the notification methods are included in ***Chapter 3***, enabling users to constantly monitor the status of their storage array. The Enclosure View is also described.

*This section includes the following chapters:*

- **Chapter 11, S*ystem Monitoring & Management*.**
- **Chapter 12, *Enclocure Display***
- **Chapter 13, *NPC Utility***

# Chapter 11: System Monitoring and Management

# 11.1 Array Information

Unlike its predecessor, RAIDWatch presents access to all informational services under one "Array Status" category. Users logged in using the "Information" authorization will be allowed to access the information windows while being excluded from other configuration options.

Support for device monitoring via SAF-TE, SES, and $I^2C$ data busses is the same. However, RAIDWatch now uses a more object-oriented approach by showing the enclosure graphics which are exactly identical to your EonRAID or EonStor enclosures. RAIDWatch reads identification data from connected arrays and presents a correct display as an enclosure graphic. This process is automatically completed without user's setup. Note that RAIDWatch does not support the display of drive enclosures provided by other vendors.

## 11.1.1 The Array Information Category

Once properly setup and connected with a RAID array, a navigation panel displays on the upper left of the GUI screen. RAIDWatch defaults to the Enclosure View window at startup.

To access each informational window, single-click a display icon on the navigation panel. You may also access each window by selecting from the **Action** menu on the menu bar at the top of the GUI screen. See ***Figure 11-1*** for access routes.

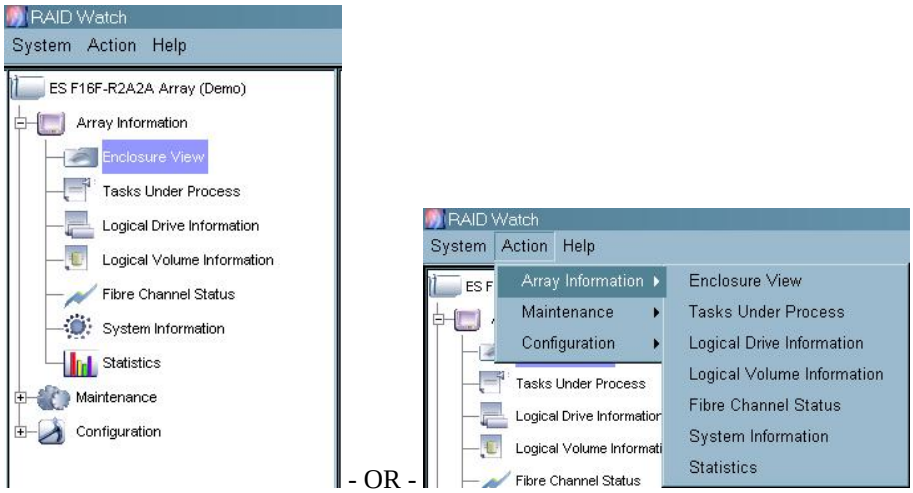



**Figure 11-1: Selecting Information Windows**

The Array Information category provides access to seven (7) display windows as listed below:

| | |
|---|---|
| | Icon for the Array Information category |
| | Opens the **Enclosure View** window |
| | Displays the **Configuration Tasks** currently being processed by the subsystem |
| | Opens the **Logical Drive** information window |
| | Opens the **Logical Volume** information window |
| | Opens the **Fibre Channel Status** window |
| | Opens the **System View** window |
| | Opens the **Statistics** window |

## 11.1.2 Date and Time

Once date and time has been configured on your subsystem, they are displayed on the bottom right corner of the manager's screen.

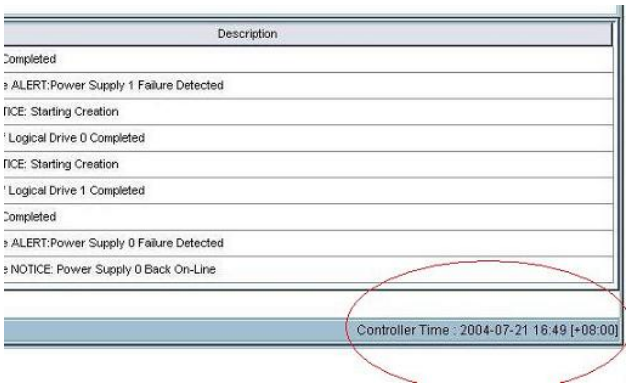



**Figure 11-2: Selecting Information Windows**

Maintaining the system date and time is important, because it is used for tracking a pending task, past events, configuring a maintenance task schedule, etc. Date and time is generated by the real-time clock on the RAID controller/subsystems.

## 11.1.3 Enclosure View

The enclosure view window displays both the front and the rear views of connected enclosures. For the EonStor subsystems, RAIDWatch displays drive trays in the front view, and system modules (power supplies, cooling fans, etc.) in the rear view. For the EonRAID controllers, RAIDWatch displays FC port modules and LEDs in the front view; powers supplies, cooling fans, and controller modules in the rear view.

If multiple enclosures are cascaded and managed by a RAID subsystem, RAIDWatch defaults to the display of RAID enclosures and the graphics of the cascaded JBODs can be accessed by clicking the tab buttons.

RAIDWatch is capable of displaying any information provided by an SES, SAF-TE or $I^2C$ data bus. Included among various kinds of information typically provided is status for:

- Power supplies
- Fans
- Ambient temperature
- Voltage
- UPS
- Disk drives
- System module LEDs

To read more information about enclosure devices, place your cursor either over the front view or rear view graphic. An information text field displays as shown below.

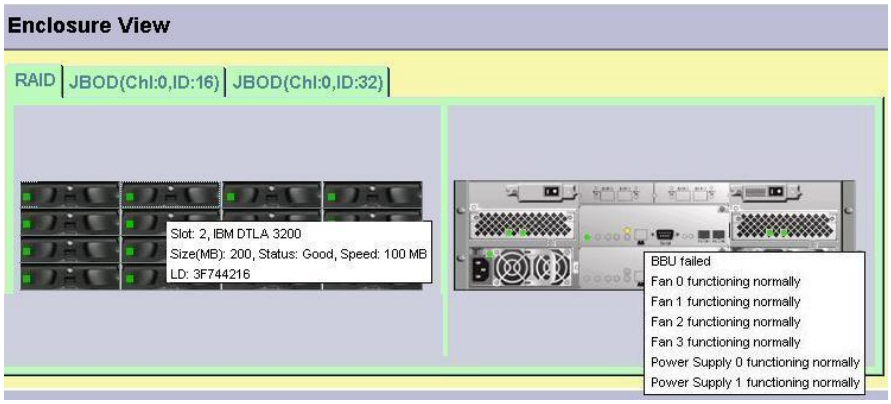



**Figure 11-3: Displaying Enclosure Device Information**

More information about each enclosure device can also be found in the System Information window.

## 11.1.4 Task Under Process

Access the Task Under Process window by clicking on the display icon in the RAIDWatch navigation panel.

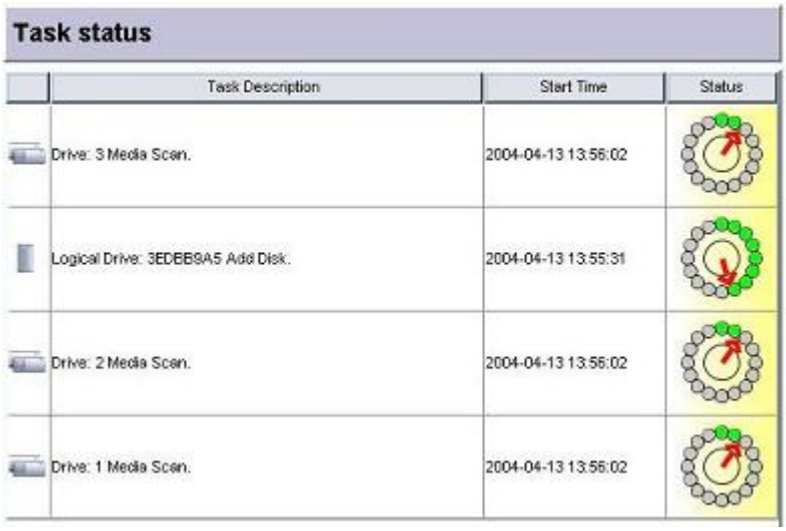



**Figure 11-4: Tasks Currently Being Processed**

- This window helps users to understand how many unfinished tasks are currently being processed by the subsystem. The task status display includes disk drive maintenance tasks as Media Scan or Regenerate Parity; and array configuration processes such as logical drive initialization and capacity expansion.

- If you happen to find that you have made the wrong configuration choice, you may also left-click and then right-click on the task information to display the Abort command. 


- A brief task description, start time, and a percentage indicator are available with each processing task.

## 11.2 Logical Drive Information

Logical Drive Information helps you to identify the physical locations and logical relationship among disk drive members. In a massive storage application, a logical array may consist of disk drives installed in different drive enclosures.

The Logical Drive information is designed for today's complicated configurations of RAID arrays. The information window helps to achieve the following:

- Having a clear idea of the relationship can help avoid removing the wrong drive in the event of drive failure. A logical drive (RAID) configuration of disk drives cannot afford two failed disk drives.

- A logical drive may include members which reside on different enclosures or different drive channels. Doing so can help reduce the chance of downtime if a hardware failure should occur.

- With operations such as manual rebuild or capacity expansion using the "Copy and Replace" methodology, it is crucial to correctly identify an original member and a replacement drive.

### 11.2.1 Accessing Logical Drive Information

**Step 1.** To access the ***Logical Drive Information***, single-click its display icon on the GUI navigation panel or select the command from the "***Action***" command menu. After opening the information window, select the logical drive with a single mouse-click. A display window as shown in ***Figure 11-5*** should appear.

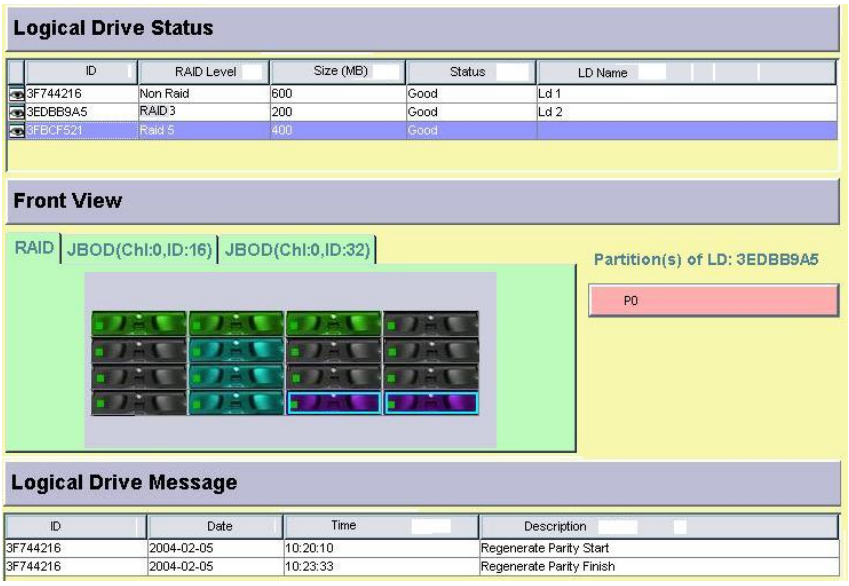



**Figure 11-5: Opening Logical Drive Information Display**

**Step 2.** As shown above, once a configured array is selected, its members will be displayed as highlighted drive trays in the Front View window. The array's logical partition is displayed on the right. Each logical configuration of drives is displayed in a different color. If a selected array includes members on different enclosures, click the JBOD tab button on top of the enclosure graphic to locate its positions.

Note that the **Logical Drive Messages** column only displays messages that are related to a selected array.

# 11.3 Logical Volume Information

A logical volume consists of one or many logical drives. Data written onto the logical volume is striped across the members.

## 11.3.1 Accessing Logical Volume Information

**Step 1.** To access the ***Logical Volume Information***, single-click its display icon on the GUI navigation panel or select the command from the "***Action***" command menu. After opening the information window, select a logical volume by single mouse-click. The window defaults to the first volume on the list. A display window as shown in ***Figure 11-6*** should appear.

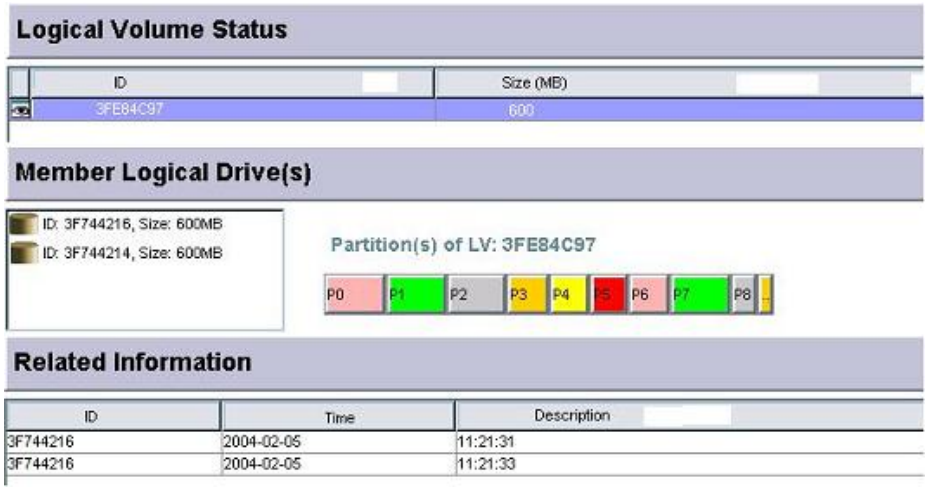



**Figure 11-6: Opening Logical Volume Information Display**

**Step 2.** As shown above, once a configured volume is selected, its members will be displayed in the Members column. The volume's logical partition(s) are displayed on the right as a segmented color bar. Each segment represents a partition of the volume capacity.

Note that the **Related Information** column only displays messages that are related to the selected volume.

## 11.4 Fibre Channel Status

This window is automatically grayed out on subsystems featuring SCSI host channels. The Fibre Channel Status window displays information such as WWN port name and node name. In storage applications managed by SAN management software or failover drivers, this information is necessary.

**Step 1.** To access the window, click on the **Fibre Channel Status** icon on the GUI navigation panel or select the command from the "***Action***" command menu.

The events in the window are listed according to the date and time they occurred with the most recent event at the bottom. A description of each event is provided.

**Step 2.** A Refresh button allows you to renew the information in cases when loop IDs are changed or an LIP has been issued.

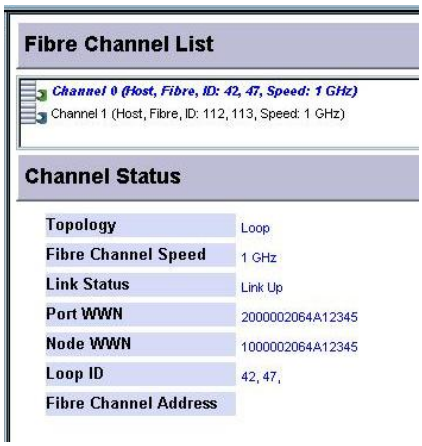



**Figure 11-7: Fibre Channel Status Window**

## 11.5 System Information

This is a view-only window. This window contains information about the operating status of major components including CPU, board temperature, and enclosure modules like cooling fan and power supply units.

If the application includes multiple cascaded enclosures, you may also refer to the enclosure view window where a faulty unit is indicated by the lit red LED. The color display of the LEDs shown on enclosure graphics correspond to the real situation on the enclosure modules.

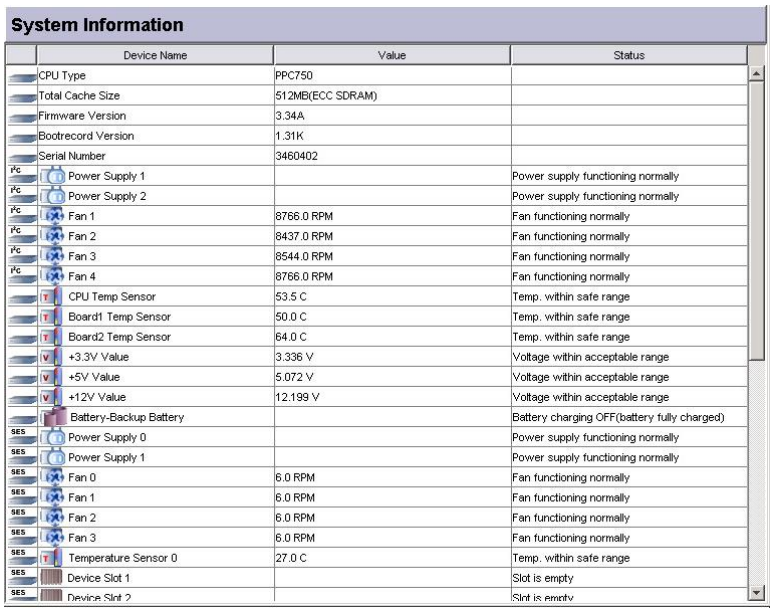



**Figure 11-8: System Information Window**

**Step 1.** To access the window, click on the **System Information** icon on the GUI navigation panel or select the command from the "***Action***" command menu.

**Step 2.** Carefully check the display icons in front of the Device Name. Devices are categorized by the data bus by which they are connected. See the icon list below for more information:

| | |
|---|---|
|  | RAID controller status |
|  | Status of I2C bus devices |
|  | Status of SAF-TE devices |
|  | Status of SES devices |

| | |
|---|---|
|  | Temperature sensors |

A Refresh button allows you to renew the information in cases when loop IDs are changed or when an LIP has been issued.

Note that by placing your cursor on a specific item, its device category is displayed.

Component status is constantly refreshed, yet the refresh time depends on the value set for device bus polling intervals, e.g., polling period set for SAF-TE or SES devices.

The EonStor subsystem series supports auto-polling of cascaded enclosures, meaning the status of a connected enclosure is automatically added to the System Information window without the user's intervention.

## 11.6 Statistics

RAIDWatch Manager includes a statistics monitoring feature to report the overall performance of the disk array system. This feature provides a continually updated real-time report on the current throughput of the system, displaying the number of bytes being read and written per second, and the percentage of data access being cached in memory. These values are displayed by numbers and also in a graphical format.

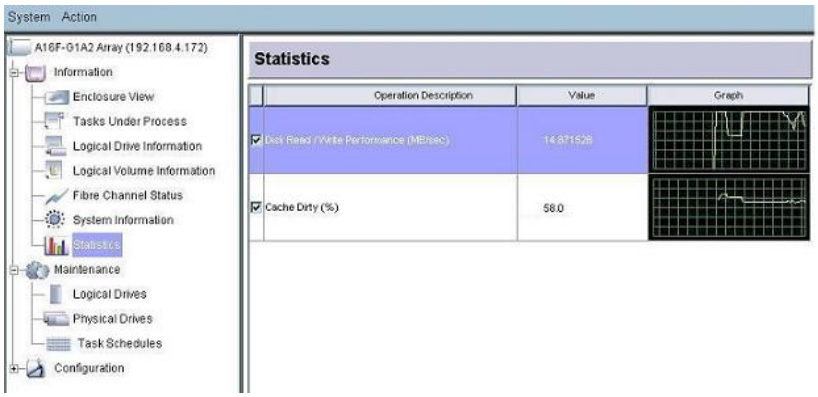



**Figure 11-9: Statistics Display Window**

To access the statistics window, click on the **Statistics** icon on the GUI navigation panel or select the **Statistics** command from the **Action** menu. Then choose either **Cache Dirty (%)** or **Disk Read/Write Performance (MB/s)** by checking the respective select box.

- The **Cache Dirty** statistics window displays what percentage of data is being accessed via cache memory.

- The **Read/Write Performance** window displays the amount of data being read from or written to the disk array system, in MB per second.

# Chapter 12: Enclosure Display

This chapter introduces the Enclosure View. The following topics are discussed:

# 12.1. About The Enclosure View

## 12.1.1 Introduction

The RAIDWatch Enclosure View is a specialized customization that shows a visualized representation of physical RAID controller/subsystem components in the enclosure view window of the RAIDWatch screen. The Enclosure View allows users to quickly determine the operational status of critical RAID device components.

The Enclosure View shows both the front and rear panel (e.g., the EonRAID 2510FS controller head series, see ***Figure 12-1***). The Enclosure View of each RAIDWatch session defaults to the display of the connected RAID controller or RAID subsystem. Buttons on a tabbed panel provide access to other cascaded enclosures (e.g., JBODs, the EonStor series, see ***Figure 12-2***).

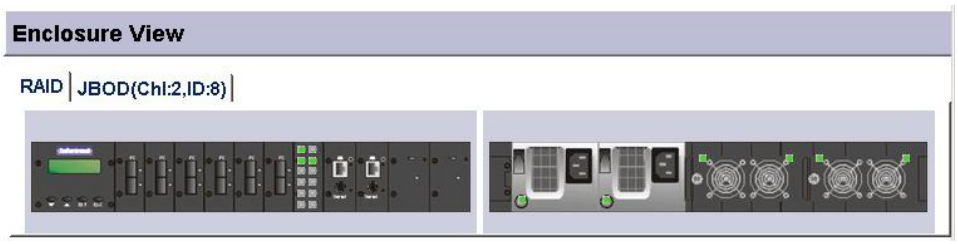



**Figure 12-1: EonRAID 2510FS Enclosure View**

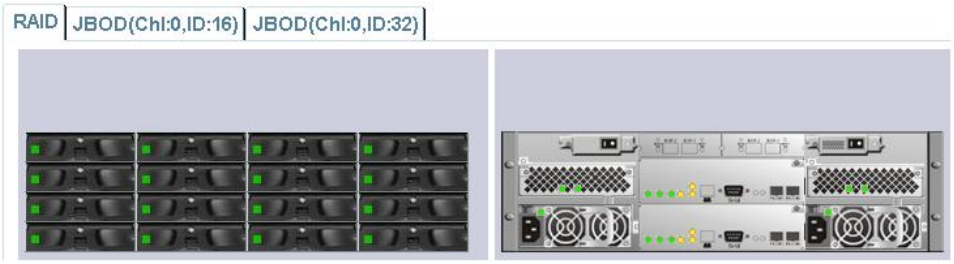



**Figure 12-2: EonStor F16F Enclosure View**

## 12.1.2 Component Information

Using the RAIDWatch Enclosure View, it is possible to obtain information and status information about the following RAID device components:

- ***RAID Controller*** – The RAID controller is the heart of any RAID device and controls the flow of data to and from the storage devices.

- ***I/O Channels*** – An I/O channel is the channel through which data flows to and from the RAID controller.

- ***Battery Backup Unit (BBU)*** – The BBU provides power to the memory cache when there has been a power outage or the power supply units have failed. Note that for some subsystem models this is an optional item.

- ***Power Supply Unit (PSU)*** – All RAID devices should come with at least one PSU that provides power to the RAID device from the mains.

- ***Cooling Fan module*** – All RAID devices should come with at least one cooling Fan module. The cooling Fan modules serve to keep the RAID device temperature down and to prevent the RAID device from overheating.

# 12.2. Accessing the Enclosure View

## 12.2.1 Connecting to the RAID Agent

To open the enclosure view, it is necessary to access the RAIDWatch program. Connecting to the RAID Agent has been fully described in ***Chapter 3*** of this manual. Please refer to this chapter for further instructions on how to open the RAIDWatch program.

## 12.2.2 Opening the Enclosure View

Once RAIDWatch is successfully connected to a RAID device, the enclosure view of the device you are using will appear immediately. If it doesn't appear or if you have closed the "**Enclosure View**" window but wish to re-access the Enclosure View, you can select "**Enclosure View**" from the navigation panel menu as shown in ***Figure 12-3***.

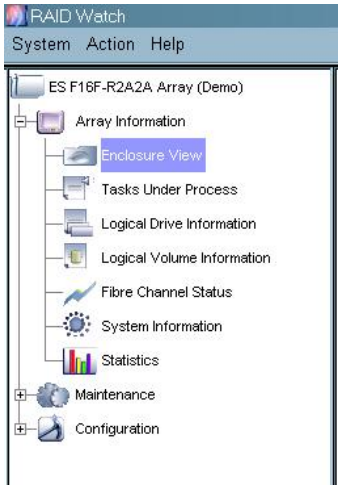



**Figure 12-3: Accessing the Enclosure View with the Navigation Panel**

Alternatively selecting the **Enclosure View** command from the top screen menu bar, as shown in ***Figure 12-4*** below, will also open the **Enclosure View** of your RAID device.

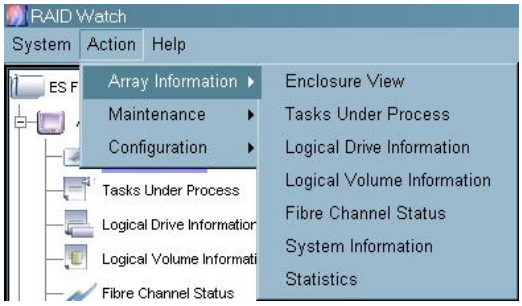



**Figure 12-4: Accessing the Enclosure View Using the Command Menu**

# 12.3. Enclosure View Messages

The messages shown in the Enclosure View window provide easy access to information about components on the RAID device that is being monitored. When the cursor on the screen is moved over the front or rear panel representation, a message tag, that reports the status of major devices, will appear. These status messages are described below.

## 12.3.1 Generating Message Tags

Using the mouse to move the cursor onto the relevant RAID device component generates component message tags. For example, if a user wishes to determine the operational status of a RAID subsystem, the cursor is moved onto the enclosure graphic and the corresponding message tag will appear.

The Enclosure View is closely related to System Information. More device-dependent information is provided in the System Information window.

The message tag displays as a summary of module operating status. The operating status of each module is shown either as operating normally or failed.

**NOTE:** *Messages do not always appear instantaneously. After the cursor has been moved onto the component, there is usually a delay of a second before the message tag appears.*

## 12.4. LED Representations

As has been described earlier (see ***Section 12.1***) the Enclosure View is a direct representation of the physical device. RAID devices generally have an array of status indicating LEDs. When a component represented by the LED fails (or some other event occurs), the display color of related LEDs will also change. The physical status of the LEDs will be reflected directly by the LEDs shown in the enclosure view. That is, if a LED on the physical device changes its display color, then the display color of the corresponding LED in the Enclosure View will also change.

The definition for each LED has been completely described in the hardware manual/installation guide that came with your RAID controller/subsystem. Please refer to this manual to determine what the different LEDs represent.

# Chapter 13: NPC Utility Coupled with Mode Three Installation

This chapter introduces the NPC utility. The following topics are discussed:

# 13.1. The NPC Utility

## 13.1.1 Introduction

NPC is short for Notification Processing Center. The utility is used for sending event messages when the main RAIDWatch modules are installed to a RAID subsystem's segregated disk capacity, the reserved space. NPC is implemented to manage the event notification functions since the Configuration Client utility is not available with the mode 3 installation scheme. With mode 3 installation, arrays are accessed directly through network connections without installing the manager software and utilities onto a server. The NPC utility is automatically distributed to a disk array's reserved space when installing RAIDWatch using the mode 3 scheme.

## 13.1.2 To Access the Utility

The NPC utility is easily accessed using a web browser over the network.

1. Open a web browser program.
2. Enter "**http://<controller IP>/configure.htm**" in the web browser's URL field.
3. A safe content warning message might prompt. Click Yes to proceed.


**Figure 13-1: Security Warning**

4. The configuration utility starts as a Java Applet.

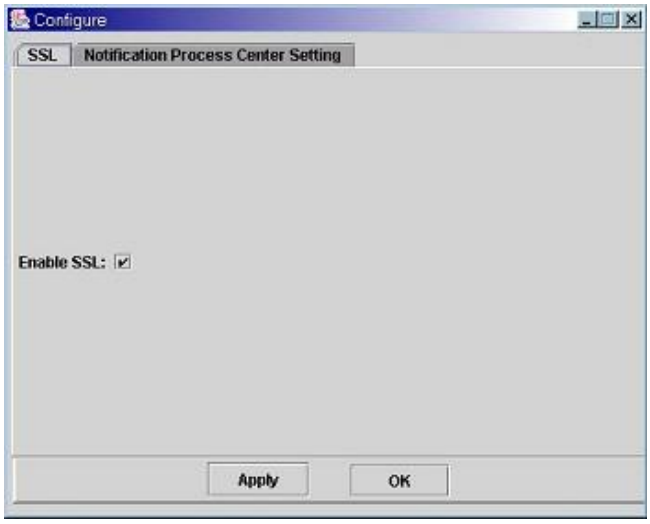



**Figure 13-2: The NPC Initial Screen**

## 13.2. Configuring the Utility Options

### 13.2.1 SSL

SSL stands for Secure Sockets Layer Handshake Protocol. See Figure 13-2 above, the initial screen defaults to the SSL option. Select the check box if you want to enable SSL connection for the management session with the array. Note that the configuration takes effect after you restart the network connection or reset the management station.

### 13.2.2 Email Notification

Follow the steps below to configure email notification:

1. Click on the "**Notification Process Center Setting**" tab. The **Base Setting** screen should appear.

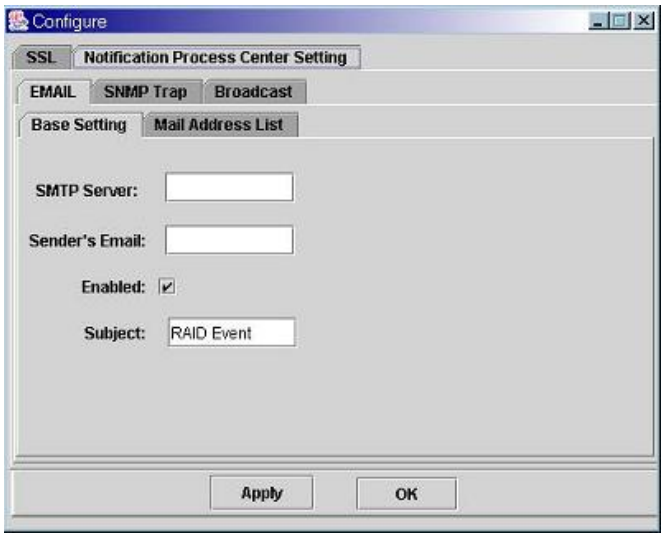



**Figure 13-3: Email Notification – Sender Side Settings**

2. Fill in or select the following configuration fields:

   **SMTP Server**: The Internet mail server used to send event notification.

   **Sender's Email**: A valid mail address, the "From" part of email notification functionality.

   **Enabled**: Select this check box to enable Email notification.

   **Subject**: Allows you to append a subject matter to event notification emails; e.g., "Events from RAID 3 array."

3. Click **Apply** or **OK** to proceed with configuration. Note that configuration will be saved to the reserved space on the array and may cause a short delay.

4. Click **Mail Address List** from the tabbed panel above.

   Fill in or select the following configuration fields:

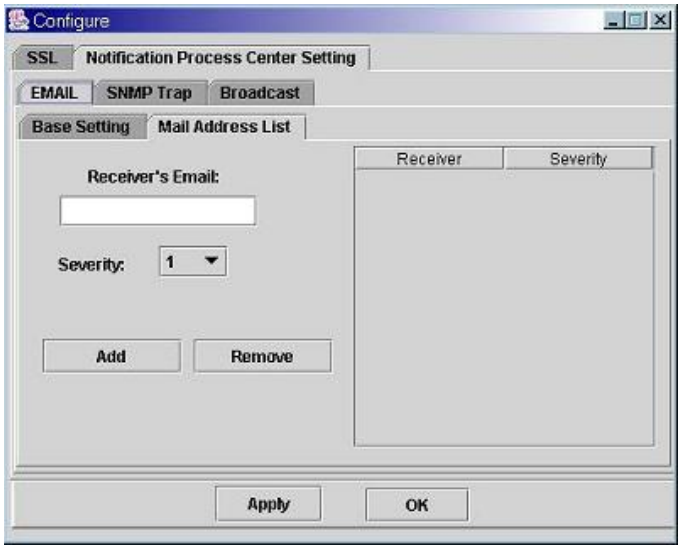



**Figure 13-4: Email Notification – Receiver Side Settings**

**Receiver's Email**: Shows a list of all the email addresses that the NPC will use to send a message to. Addresses added will be listed on the right.

**Severity**: Select the severity level of events to be sent to the receiver station.

5. Click **Apply** or **OK** to complete the configuration.

## 13.2.3 SNMP Traps

1. Click on the "Notification Process Center Setting" tab and **SNMP Trap** to display SNMP settings.

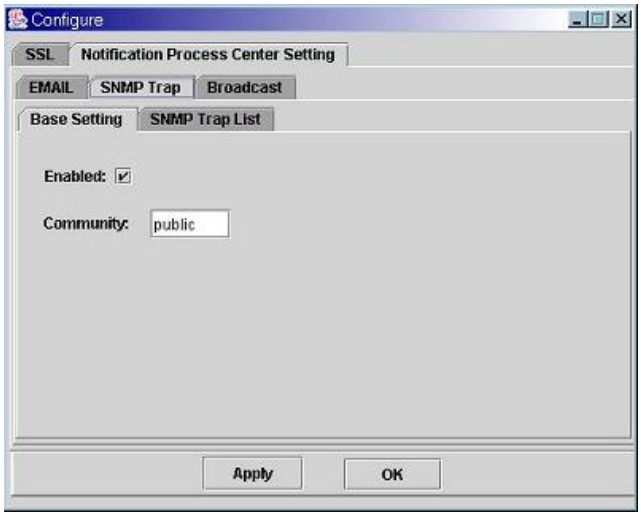



**Figure 13-5: SNMP Traps – Sender Side Settings**

2. Fill in or select the following configuration fields:

   **Enabled**: Select this check box to enable the notification.

   **Community**: This is just a string authentication and can be seen as a plain text password.

3. Click **Apply** or **OK** to proceed with configuration. Note that configuration will be saved to the reserved space on the array and may cause a short delay.

4. Click **SNMP Trap List** from the tabbed panel above.

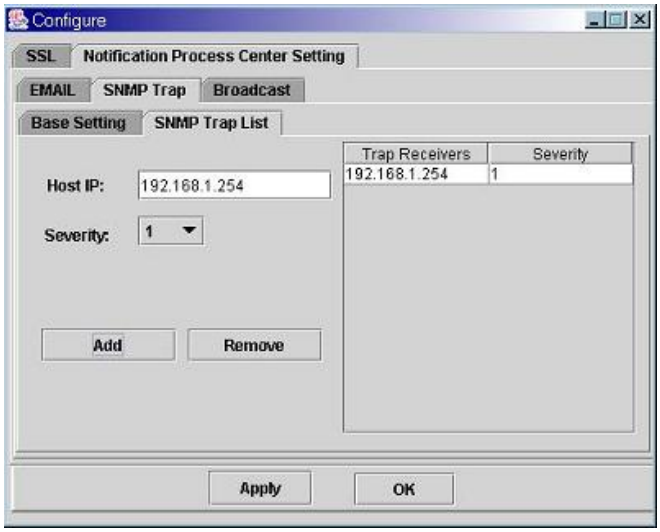



**Figure 13-6: SNMP Traps – Receiver Side Settings**

**Host IP**: The port number of the agents listening for traps.

**Severity**: Select the severity level of events to be sent to the receiver station. Trap receivers will be added to the **Trap Receivers** list on the right.

5. Click **Apply** or **OK** to complete the configuration.

## 13.2.4 Broadcast Notification

1. Click on the "**Notification Process Center Setting**" tab and **Broadcast** to display Broadcast settings.

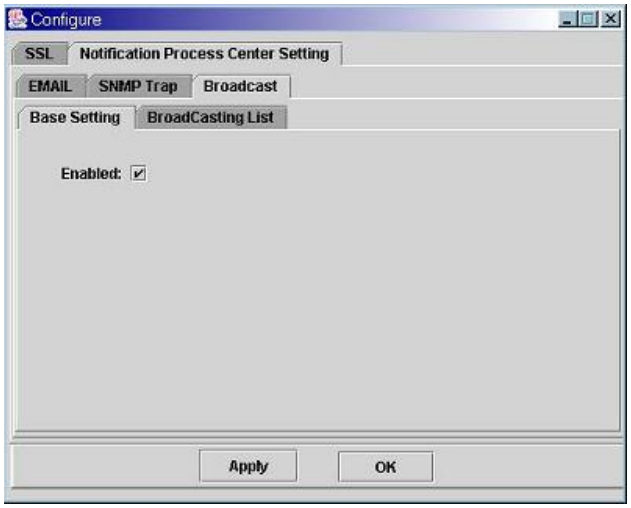



**Figure 13-7: Broadcast – Sender Side Settings**

2. Fill in or select the following configuration fields:

   **Enabled**: Select this check box to enable the notification.

3. Click **Apply** or **OK** to proceed with configuration. Note that configuration will be saved to the reserved space on the array and may cause a short delay.

4. Click **Broadcasting List** from the tabbed panel above.

   **Host IP**: The IP address a broadcast message will be sent to.

   **Severity**: Select the severity level of events to be sent to the receiver station. Computers receiving broadcast messages will be added to the **Host Name** list on the right.

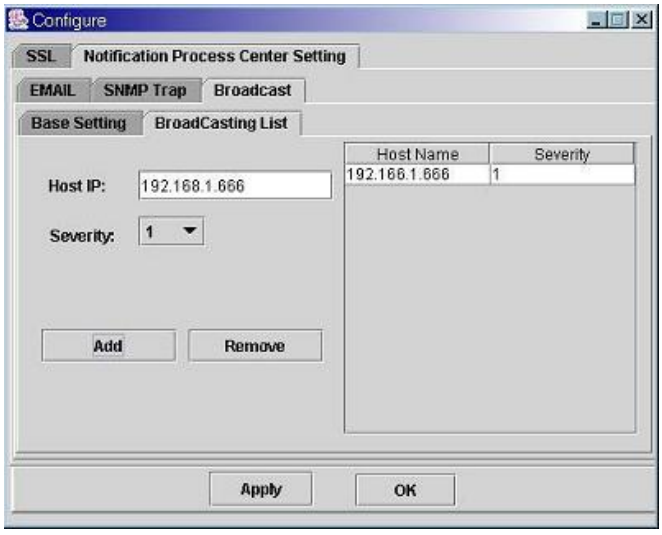



**Figure 13-8: Broadcast – Receiver Side Settings**

5. Click **Apply** or **OK** to complete the configuration.

IMPORTANT!

*In a massive capacity configuration, it takes a while for the RAID subsystem to write the NPC configuration profile to every disk members. DO NOT reset or power down the subsystem before the configuration can be safely distributed to the array.*

*Also make sure the subsystem's Ethernet port and related TCP/IP settings have been properly configured for the NPC functionality to take effect.*

# Appendices

The following Appendices are provided:

# Appendix A. Command Summary

This appendix describes the commands available in RAIDWatch Manager. These commands are presented either in each configuration window, as command buttons on the pull-down menus, or on pop-up menus triggered by mouse right-click.

## A.1. Menu Commands

This section lists and explains the commands available from the menus in the menu bar.

### A.1.1 RAID Watch Program Commands

#### *RAIDWatch System Menu Commands (Base-Level Window)*

| Command | Description |
|---|---|
| Open Device | Connects RAIDWatch Manager to a particular disk array system for management. |
| Exit <X> | Closes the RAIDWatch Manager application. |

#### *RAIDWatch Window Menu Commands (Base-Level Window)*

| Command | Description |
|---|---|
| Next Window | This command allows you to switch to the display of the next array being connected. |
| Tile All | This command arranges currently open windows so that they are all visible and occupy an equal part of the RAIDWatch application window. |
| Cascade All | This command arranges currently open windows so that one is placed over the other but every window is still visible. |
| Hide All | This command functions like the minimize caption button. |
| Close All | (This command closes all currently open windows and ends all software connections. |

#### *RAIDWatch Help Menu Commands (Base-Level Window)*

| Command | Description |
|---|---|
| About <A> | Displays information about the RAIDWatch Manager program. |

| | |
|---|---|
| What's this? | Produces an inter-active arrow mark. By placing the arrow mark over and clicking on a functional menu or push button, the related help content page displays. |
| Help Topic | Displays RAIDWatch Manager on-line help. |

### *RAIDWatch System Menu Commands (Each Connection Window)*

| Command | Description |
|---|---|
| Refresh | Refreshes the status display of current connection in cases when configuration changes are made through a terminal connection to the same array. |
| Logout | Closes the currently open window and ends the software's connection with the array |

### *RAIDWatch Action Menu Commands (Each Connection Window)*

| Command | Description |
|---|---|
| Array Information | Displays the second-level menu which provides access to all information windows. Access to the information windows can also be found on the navigation panel. |
| Maintenance | Displays the second-level menu which provides access to all maintenance tasks windows. Access to the maintenance task windows can also be found on the navigation panel. |
| Configuration | Displays the second-level menu which provides access to all configuration windows. Access to the configuration windows can also be found on the navigation panel. |

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## A.2. Configuration Client Utility Commands

### *File Menu Commands*

| Command | Description |
|---|---|
| Add Host | Creates a new entry by entering Root Agent server IP. |
| Exit | Closes the Configuration Client application. |

### *Tool Bar Commands*

| | |
|---|---|
| Open Bookmark File | Opens a previously saved connection view profile. This profile contains information about Root Agent server and the RAID arrays being managed by a Root Agent. |
| Save Bookmark File | Saves current connection view profile onto your system drive. The default file name is default.npc. |
| Connect RootAgent Server | Connects to a Root Agent server, usually the one that you choose as a management and install the Configuration Client utility. However, you may connect to multiple Root Agent server from a single workstation. |
| Disconnect RootAgent | Disconnects from a currently connected Root Agent server. |
| Help Cursor | The Help Cursor helps linking and displaying the associative help topics with a screen element. |
| Help | Displays RAIDWatch Manager on-line help. Details about the Configuration Client utility are also included. |

### *Help Menu Commands*

| Command | Description |
|---|---|
| About | Displays information about the Configuration Client program. |

### *Root Agent Right-click Menu Commands*

| Command | Description |
|---|---|
| Add Host | Connects to a Root Agent server, usually the one that you choose as a management and install the Configuration Client utility. However, you may connect to multiple Root Agent server from a single workstation. |
| Delete Host | Deletes a Root Agent entry from the connection view |
| Disconnect | Disconnects from a currently connected Root Agent server. |
| Generate Dummy Events | Creates dummy events for testing the notification functions. |
| Refresh | Refreshes the connection view status. Updates the connection information about Root Agent(s) and the RAID arrays being managed. |

# Appendix B. Glossary

**Fibre**

(Also known as "fibre channel.") A device (in the case of RAID, a data storage device) protocol capable of high data transfer rates. Fibre channel simplifies data bus sharing and supports not only greater speed, but also more devices on the same bus. Fibre channel can be used over both copper wire and optical cable.

**Fiber**

An optical network data transmission cable type which is unrelated to fibre channel (above).

**HBA**

**H**ost-**B**us **A**dapter – an HBA is a device that permits a PC bus to pass data to and receive data from a storage bus (such as SCSI or fibre channel).

**Host**

A computer, typically a server, which uses a RAID system (internal or external) for data storage.

**Host LUN**

(See Host and LUN). "Host LUN" is another term for a LUN.

**$I^2C$**

**I**nter-**IC** – a type of bus designed by Philips Semiconductors which is used to connect integrated circuits. $I^2C$ is a *multi-master bus*, which means that multiple chips can be connected to the same bus and each one can act as a master by initiating a data transfer.

**In-Band SCSI**

(sometimes "in-band" or "In-band") A means whereby RAID management software can use SCSI cabling and protocols to manage a controller. (Note: in-band SCSI is typically used in place of RS-232 for controller management.)

In-band is also implemented with Fibre channel host connection.

**ISEMS**

**I**nfortrend **S**imple **E**nclosure **M**anagement **S**ystem – an $I^2C$-based enclosure monitoring standard developed by Infortrend Technologies, Inc.

**JBOD**

**J**ust a **B**unch **o**f **D**rives – non-RAID use of multiple hard disks for data storage.

**JRE**

**J**ava **R**untime **E**nvironment – the Solaris Java program used to run .JAR applications locally or over a network or the internet.

**Logical Drive**

Typically, a group of hard disks logically combined to form a single large storage unit. More broadly, the assignment of an ID to a drive or drives for use in storage management. Often abbreviated, "LD."

**Logical Volume**

A group of logical drives logically combined to form a single large storage unit. Often abbreviated, "LV."

**LUN**

**L**ogical **U**nit **N**umber **–** A 3-bit identifier used on a bus to distinguish between up to eight devices (logical units) with the same ID.

**Mapping**

The assignment of a protocol or logical ID to a device for purposes of data storage, data transfer, or device management.

**Mirroring**

A form of RAID where two or more identical copies of data are kept on separate disks. Used in RAID 1.

**Configuration Client**

An independently run software application included with RAIDWatch which permits centralized management using the Root Agent as the bridging element and event notification via various methods including e-mail and fax.

**NRAID**

***Non RAID***

**Parity**

Parity checking is used to detect errors in binary-coded data. The fact that all numbers have parity is commonly used in data communications to ensure the validity of data. This is called parity checking.

**RAID**

Redundant Arrays of Independent Disks (Originally "Redundant Arrays of Inexpensive Disks"). The use of two or more disk drives instead of one disk, which provides better disk performance, error recovery, and fault tolerance, and includes interleaved storage techniques and mirroring of important data. See Appendix C.

**RAID Agent**

The RAIDWatch module which manages and monitors a RAID controller and receives RAIDWatch Manager commands via the RAID agent.

RAID agent comes embedded with RAID array firmware. RAID agent can also be manually installed onto a server which is directly-attached with a RAID array and communicates with it using the in-band protocols. See description of in-band.

**RAIDWatch Manager**

The GUI RAID interface part of RAIDWatch.

**SAF-TE**

**S**CSI **A**ccessed **F**ault-**T**olerant **E**nclosures – an evolving enclosure monitoring device type used as a simple real-time check on the go/no-go status of enclosure UPS, fans, and other items.

**SAN**

**S**torage **A**rea **N**etwork – is a high-speed subnetwork of shared storage devices. A storage device is a machine that contains nothing but a disk or disks for storing data. A SAN's architecture works in a way that makes all storage devices available to all servers on a LAN or WAN. Because stored data does not reside directly on the network's servers, server power is utilized for applications rather than for data passing.

**SASL**

SASL is the **S**imple **A**uthentication and **S**ecurity **L**ayer, a mechanism for identifying and authenticating a user login to a server and for providing negotiating protection with protocol interactions.

**SCSI**

**S**mall **C**omputer **S**ystems **I**nterface (pronounced "scuzzy") – a high-speed interface for mass storage that can connect computer devices such as hard drives, CD-ROM drives, floppy drives, and tape drives. SCSI can connect up to sixteen devices.

**S.E.S.**

**S**CSI **E**nclosure **S**ervices is a protocol that is used to manage and sense the state of the power supplies, cooling devices, temperature sensors, individual drives, and other non-SCSI elements installed in a fibre channel JBOD enclosure.

**S.M.A.R.T.**

**S**elf-**M**onitoring, **A**nalysis and **R**eporting **T**echnology – an open standard for developing disk drives and software systems that automatically monitor a disk drive's health and report potential problems. Ideally, this should allow users to take proactive actions to prevent impending disk crashes.

**SMS**

The **S**hort **M**essage **S**ervice (SMS) is the ability to send and receive text messages to and from mobile telephones. SMS was created and incorporated into the Global System for Mobiles (GSM) digital standard.

**Spare**

Spares are defined as dedicated (Local) or Global. A drive designation used in RAID systems for drives that are not used but are instead "hot-ready" and used to automatically replace a failed drive. RAIDs generally support two types of spare, Local and Global. Local spares only replace drives that fail in the same logical drive. Global spares replace any drive in the RAID that fails.

**Stripe**

A contiguous region of disk space. Stripes may be as small as one sector or may be composed of many contiguous sectors.

**Striping**

Also called RAID-0. A method of distributing data evenly across all drives in an array by concatenating interleaved stripes from each drive.

**Stripe Size**

(A.k.a., "chunk size.") The smallest block of data read from or written to a physical drive. Modern hardware implementations let users to tune this block to the typical access patterns of the most common system applications.

**Stripe Width**

The number of physical drives used for a stripe. As a rule, the wider the stripe, the better the performance.

**Write-back Cache**

Many modern disk controllers have several megabytes of cache on board. Onboard cache gives the controller greater freedom in scheduling reads and writes to disks attached to the controller. In write-back mode, the controller reports a write operation as complete as soon as the data is in the cache. This sequence improves write performance at the expense of reliability. Power

failures or system crashes can result in lost data in the cache, possibly corrupting the file system.

**Write-through Cache**

The opposite of write-back. When running in a write-through mode, the controller will not report a write as complete until it is written to the disk drives. This sequence reduces read/write performance by forcing the controller to suspend an operation while it satisfies the write request.

# Appendix C. RAID Levels

This appendix provides a functional description of Redundant Array of Independent Disks (RAID). This includes information about RAID and available RAID levels.

## C.1. RAID Description

Redundant Array of Independent Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability in disk array systems and to take advantage of the performance gains multiple disks can offer.

RAID comes with a redundancy feature that ensures fault-tolerant, uninterrupted disk storage operations. In the event of a disk failure, disk access will still continue normally with the failure transparent to the host system.

RAID has six levels: RAID 0 ~ 5. RAID levels 1, 3 and 5 are the most commonly used levels, while RAID levels 2 and 4 are rarely implemented. The following sections described in detail each of the commonly used RAID levels.

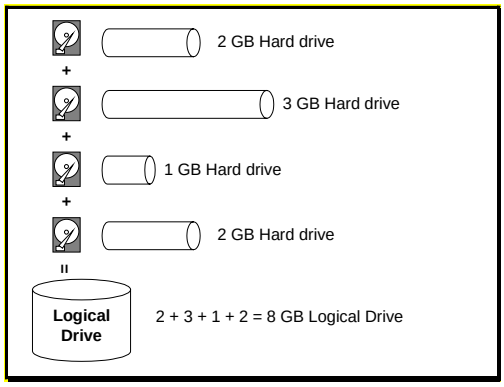
## C.2. Non-RAID Storage

One common option for expanding disk storage capacity is simply to install multiple disk drives into the system and then combine them end to end. This method is called *disk spanning*.

In disk spanning, the total disk capacity is equivalent to the sum of the capacities of all SCSI drives in the combination. This combination appears to the system as a single logical drive. Thus, combining four 1GB drives in this way, for example, would create a single logical drive with a total disk capacity of 4GB.

Disk spanning is considered non-RAID due to the fact that it provides neither redundancy nor improved performance. Disk spanning is inexpensive, flexible, and easy to

implement; however, it does not improve the performance of the drives and any single disk failure will result in total data loss.

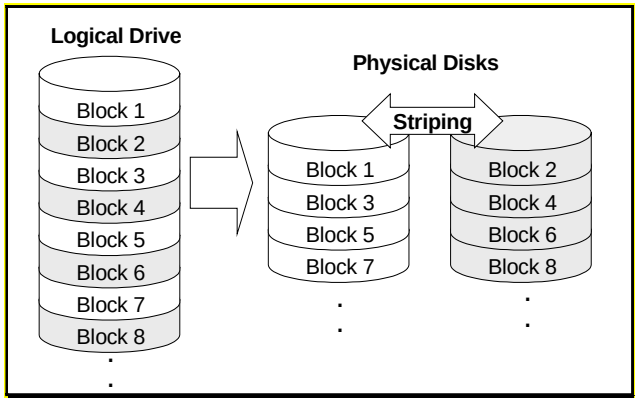



## C.3. RAID 0

RAID 0 implements *block striping* where data is broken into logical blocks and striped across several drives. Although called RAID 0, this is not a true implementation of RAID because there is no facility for redundancy. In the event of a disk failure, data is lost.

In block striping, the total disk capacity is equivalent to the sum of the capacities of all drives in the array. This combination of drives appears to the system as a single logical drive.

RAID 0 provides the highest performance without redundancy. It is fast because data can be simultaneously transferred to/from multiple disks. Furthermore, read/writes to different drives can be processed concurrently.

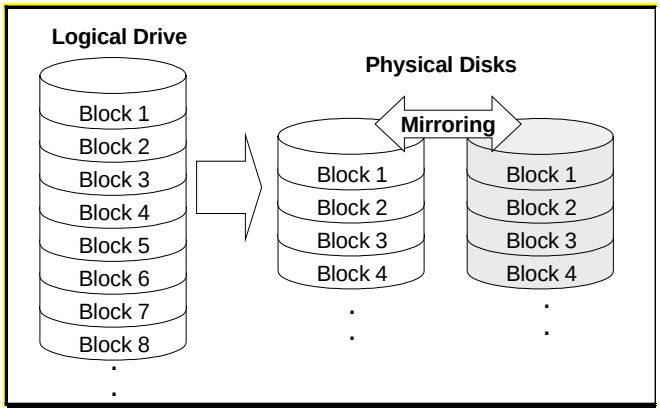



## C.4. RAID 1

RAID 1 implements *disk mirroring* where a copy of the same data is recorded onto two sets of striped drives. By keeping two copies of data on separate disks or arrays, data is protected against a disk failure. If, at any time, a disk on either side fails, the good disks can provide all of the data needed, thus preventing downtime.

In disk mirroring, the total disk capacity is equivalent to half the sum of the capacities of all drives in the combination. Thus, combining four 1GB drives, for example, would create a single logical drive with a total disk capacity of 2GB. This combination of drives appears to the system as a single logical drive.

RAID 1 is simple and easy to implement; however, it is more expensive as it doubles the investment required for a non-redundant disk array implementation.

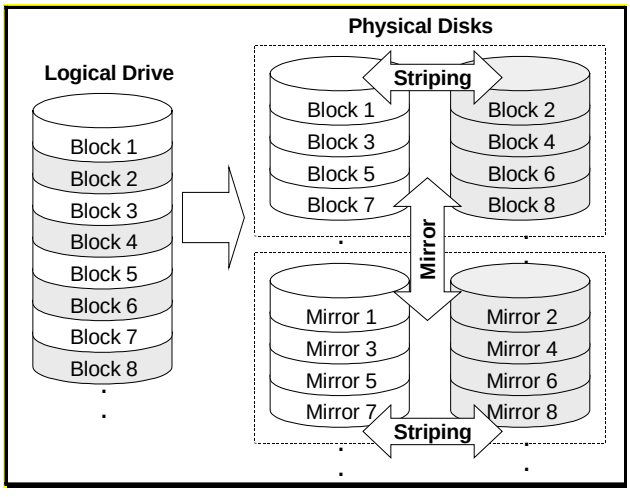



In addition to the data protection RAID 1 provides, this RAID level also improves performance. In cases where multiple concurrent I/Os are occurring, these I/Os can be distributed between two disk copies, thus reducing total effective data access time.

## C.5. RAID 1(0+1)

RAID 1(0+1) combines RAID 0 and RAID 1 – *Mirroring and Disk Striping*. RAID (0+1) allows multiple drive failure because of the full redundancy of the hard disk drives. If more than two hard disk drives are chosen for RAID 1, RAID (0+1) will be performed automatically.

***IMPORTANT:*** *RAID (0+1) will not appear in the list of RAID levels supported by the controller. If you wish to perform RAID 1, the controller will determine whether to perform RAID 1 or RAID (0+1). This will depend on the drive number that has been selected for the logical drive.*



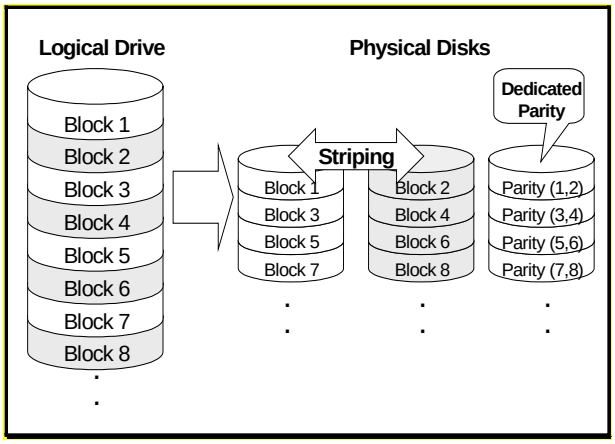
## C.6. RAID 3

RAID 3 implements *block striping with dedicated parity*. This RAID level breaks data into logical blocks, the size of a disk block, and then stripes these blocks across several drives. One drive is dedicated to parity. In the event a disk fails, the original data can be reconstructed from the parity information.

In RAID 3, the total disk capacity is equivalent to the sum of the capacities of all drives in the combination, excluding the parity drive. Thus, combining four 1GB drives, for example, would create a single logical drive with a total disk capacity of 3GB. This combination appears to the system as a single logical drive.

RAID 3 provides increased data transfer rates when data is being accessed in large chunks or sequentially.

However, in write operations that do not span multiple drives, performance is reduced since the information stored in the parity drive needs to be re-calculated and re-written every time new data is written to any of the data disks.

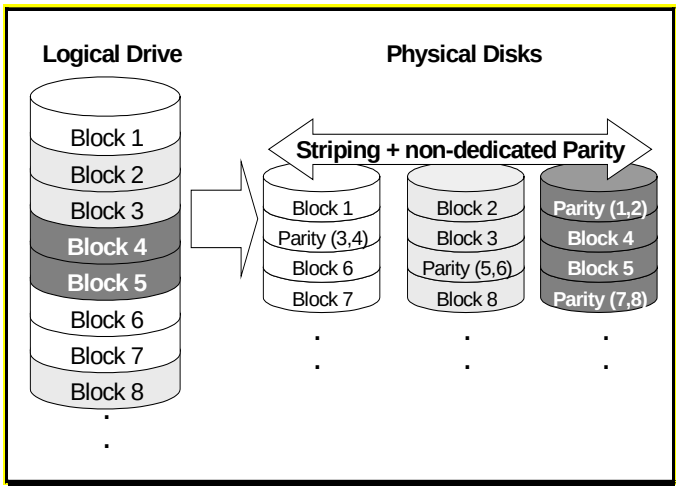



## C.7. RAID 5

RAID 5 implements *multiple-block striping with distributed parity*. This RAID level offers the same redundancy available in RAID 3; though the parity information this time is distributed across all disks in the array. Data and relative parity are never stored on the same disk. In the event a disk fails, original data can be reconstructed using the available parity information.

For small I/Os, as few as one disk may be activated for improved access speed.

RAID 5 offers both increased data transfer rates when data is being accessed in large chunks or sequentially and reduced total effective data access time for multiple concurrent I/O's that do not span multiple drives.




## C.8. RAID 10, 30, and 50

Infortrend implements RAID 10, 30, 50 in the form of Logical Volumes. Each logical volume consists of one or more logical drives. Each member logical drive can be composed of in a different RAID level. Members of a logical volume are striped together (RAID 0); therefore, if all members are RAID 3 logical drives, the logical volume can be called a RAID 30 storage configuration.

Using Logical Volumes to contain multiple logical drives can help managing arrays of large capacity. It is, however, difficult to define the RAID level of a logical volume when it includes members each composed of a different RAID level.

# Appendix D. Additional References

This appendix provides direction to additional references that may be useful in creating and operating a RAID, and in using RAIDWatch and RAIDWatch Manager.

## D.1. Java Runtime Environment

JRE (Java Runtime Environment) is a shareware product from Sun/Solaris. Two websites that may be of use relative to JRE are:

The main Java website URL: **java.sun.com**

The JRE download website URL: **www.sun.com/software/solaris/jre/download.html**

## D.2. RAIDWatch Update Downloads & Upgrading

Infortrend will provide RAIDWatch agent and RAIDWatch Manager updates periodically both via our ftp server and as new CD releases. Our FTP site can be accessed via our websites at:

**ftp.infortrend.com.tw**

## D.3. Uninstalling RAIDWatch

RAIDWatch agents and RAIDWatch Manager can be uninstalled. Choose the Uninstall icon in the RAIDWatch group.

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