Seagate® Nytro™ XP6500 Flash Accelerator Cards

Software User Guide

Nytro XP6500-8A1536
Nytro XP6500-8A4096

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Seagate Technology Support Services

For Nytro product download, visit: http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/

For information regarding online support and services, visit: http://www.seagate.com/about/contact-us/technical-support/

Available services include:

- Presales & Technical support
- Global Support Services telephone numbers & business hours
- Authorized Service Centers

For information regarding Warranty Support, visit: http://www.seagate.com/support/warranty-and-replacements/

For information regarding data recovery services, visit: http://www.seagate.com/services-software/data-recovery-services/

For Seagate OEM and Distribution partner portal, visit: http://www.seagate.com/partners

For Seagate reseller portal, visit: http://www.seagate.com/partners/my-spp-dashboard/

Chapter 1: Nytro XP6500 Flash Accelerator Card Overview

The Seagate® Nytro™ XP6500 Flash Accelerator card for direct-attached storage (DAS) combines Flash technology with industry leading RAID-on-Chip (ROC) implementation with the advantage of on-board Dynamic Random Access Memory (DRAM). The Nytro XP6500 card improves the IOPS by reducing the command processing overhead that is inherent to the Write Back caching architecture. The Nytro XP6500 card provides shared writes and chaining of I/Os that are queued for back end. This provides benefits of serializing back-to-back writes when the back-end port is busy. The shared writes also permit serving write hits more efficiently by reducing the back-end traffic for updates to same pages.

The Nytro XP6500 card's buffered fast-path provides for ultra low-latency writes through a simple, semi-automatic store (into DRAM) and forward mechanism. The Nytro XP6500 card provides DDR Offload support and DRAM Write Back support. The Nytro XP6500 card comes with a preconfigured virtual drive (VD) that comprises all on-board Nytro XP6500 modules with Write Back, Direct I/O, and efficient read policy (No Read Ahead) properties.

The Nytro XP6500 card is easy to use with transparent access to applications. The application performance improvement from the Nytro XP6500 card requires no modification of files or applications.

The Nytro XP6500 card is based on Avago® LSISAS3108 RAID On-a-Chip (ROC). This device provides an eight-lane, PCI Express® (PCIe) 3.0 interface.

This document describes how to configure, monitor, and maintain the Nytro XP6500 card, by using the Seagate Nytro Storage Manager software, Human Interface Infrastructure (HII) utility (preboot utility) and Ctrl-R utility (BIOS configuration utility), and the Nytro CLI.

The following table provides the convention of usage of important terms throughout this document.

Term	Convention of Usage
XP6500 card	Terms that refer to the Nytro XP6500 card.
Nytro XP6500 Module	On-board Flash modules that work as target storage devices.
Nytro Virtual Drive	A virtual drive (VD) created by using only Nytro XP6500 modules with Write Back mode, with the following policies: ■ Write Back ■ Direct I/O ■ No Read Ahead
Solid-state disks (SSDs)	This term refers to the Nytro XP6500 modules.
SuperCap (external)	During server power failure, a Super Capacitor, which is used to power the Nytro XP6500 card while data (stale data) is flushed from DRAM into non-volatile Flash during power failure. The terms, SuperCap and BBU, are used interchangeably in this document.
Nytrolib Libraries	The Nytrolib application programming interface (API) is a library of storage device-related commands that provide an interface between the user applications and the Nytro XP6500 cards.
Supported RAID levels	RAID 0 with Write Back mode.

1.1 Nytro XP6500 Card Features

The Nytro XP6500 card includes the following features:

- An eight-lane, PCIe 3.0 host interface
- Eight on-board Nytro XP6500 modules of 192-GB variant show up as eight attached 6Gb/s SATA drives
- DDR Offload by using the external SuperCap kit to protect the DRAM content during power failure, if DDR3 Write Back is enabled
- 2-GB DRAM cache offload support onto an on-board Open NAND Flash Interface (ONFi)

1.1.1 Auto Configuration

When you insert the Nytro XP6500 card, during boot up, a single virtual drive (VD) is automatically created. The Auto configuration is created on system initialization by firmware by using the Nytro XP6500 modules that are present on the Nytro XP6500 card.

1.1.2 Write Atomicity

Firmware supports Write Atomicity feature that makes sure that every write is processed as an atomic write when operating in the Write Back mode, regardless of the back-end Flash device's write atomicity capability.

1.1.3 Ultra Low-Latency

The Ultra Low-Latency Driver (ULLD) is a block I/O based driver. The ULLD receives the block I/O requests issued on the ULLD mapped devices.

1.1.4 On-Board Nytro XP6500 Modules

Seagate on-board Nytro XP6500 modules are the on-board Flash modules, which are the target devices. The on-board Nytro XP6500 modules have an advantage over the traditional hard disk drives (HDDs). The cards have the ability to access the data completely electronically instead of electro mechanically. This results in superior transfer speed and mechanical ruggedness. These modules have no moving mechanical components. And they require significantly less power supply.

1.1.5 DDR Offload

Double data rate (DDR) Offloading or Protection is a method to protect the entire content of the Nytro XP6500 card's main memory (DRAM) onto the ONFi Flash at the time of unexpected power failure. This method helps protect the data on RAM, from power failure to save user data and Nytro XP6500 card's metadata onto ONFi Flash, and to restore when the power gets restored. A SuperCap (capacitor) is used to provide power to the Nytro XP6500 card when the system power is lost for a short period required to vault the RAM content. The ONFi Flash on the Nytro XP6500 card has some space reserved for offloading. When the system power is back, the XP6500 card's memory is restored from this offload space on ONFi Flash.

NOTE DDR Offload occurs by using the on-board SuperCap to protect the DRAM content during power failure, if DDR Write Back is enabled.

1.1.6 Detection and Recovery of Nytro XP6500 Module Secured Lock State

The on-board Nytro XP6500 module enters a locked state when data in it becomes unrecoverable. The Nytro XP6500 card firmware discovers the locked Nytro XP6500 module, unlocks it, and performs secure erase of the user data on the drive. This secure erase is a part of lock recovery and without any user intervention, the Nytro XP6500 module that might have gone into a locked state because of various environmental factors is re-enabled. If the drive recovery from the locked state fails, the Nytro XP6500 module is moved into a failed state.

NOTE The Nytro XP6500 card generates an event if Nytro XP6500 module enters a locked state. Nytro XP6500 card moves the Nytro XP6500 module from Online state to configured-shield state, and then recovery is triggered.

CAUTION If any of the Nytro XP6500 modules in a cache configuration goes into a *locked* state, data loss and cache configuration loss occur.

1.1.7 Single-Push On-Board Nytro XP6500 Module and Nytro XP6500 Card Firmware Upgrade

A single Nytro firmware image/package allows you to upgrade the on-board Nytro XP6500 module firmware and Nytro XP6500 card firmware. You can flash the single Nytro firmware image onto the Nytro XP6500 card by using the Nytro CLI commands. (See Section 9.4, Upgrading the Nytro XP6500 Card Firmware and Nytro XP6500 Module Firmware Using the Nytro CLI.)

1.1.8 TRIM Feature

The Nytro XP6500 card supports the TRIM feature for the Nytro VDs. The application marks the data unusable. This enables reduced write amplification. The `TRIM` command provides a streamlined method for reclaiming Flash space, which is typically done by an application or a filesystem.

By default, the TRIM feature is disabled. To enable the feature, see Section 6.3.15, TRIM Commands.

1.1.9 Monitoring and Reporting the Nytro XP6500 Module Temperature

This feature allows monitoring of the Nytro XP6500 module temperature by using the Nytro Storage Manager software and the Nytro CLI. It gives *warning* and *critical* events when the temperature crosses the defined thresholds.

During I/O, if the temperature of at least one of the Nytro XP6500 modules in a Nytro drive group crosses the threshold temperature condition, the Nytro XP6500 module has an in-built feature to throttle I/Os, thereby controlling the temperature within the thresholds. This makes sure that the reliability and life of the Nytro XP6500 module.

Every Nytro XP6500 module has a threshold value of temperature: warning and critical based on the type of Flash media. Based on these values, the following conditions are maintained to route the I/Os:

- **Critical**: Current temperature is greater than critical threshold value.

  In this condition, there will be I/O throttling and significant reduction in IOPs that helps bring down the temperature of the Nytro XP6500 module. User intervention is required to make sure appropriate cooling.
- **Warning**: Current temperature is greater than warning threshold value and less than critical threshold value.

  In this condition, there will be I/O throttling and reduction in IOPs that help bring down the temperature of the Nytro XP6500 module. User intervention is required to make sure appropriate cooling.
- **Normal**: Current temperature is less than or equal to the warning threshold value.

  In this condition, the Nytro XP6500 modules are optimal.

1.1.10 Online Nytro Firmware Upgrade

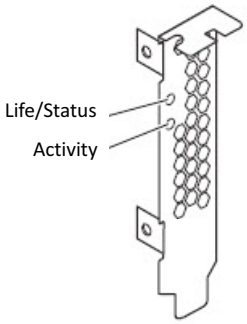
The Nytro XP6500 card firmware supports online firmware upgrade. For more information, see Section 9.4, Upgrading the Nytro XP6500 Card Firmware and Nytro XP6500 Module Firmware Using the Nytro CLI.

1.2 Troubleshooting the Nytro XP6500 Card

1.2.1 LEDs

The Nytro XP6500 card has two visible LEDs through the bracket. These LEDs indicate the card *Life/Status* and *Activity*, and the LEDs provide key status information to diagnose a problem with the Nytro XP6500 card. You can also contact Seagate Technology Support Services. The following figure shows the LED layout.

Figure 1 Nytro XP6500 Card LED Diagram



The following table shows LED Descriptions.

Table 1 Status Indicators on a Running System

Name	Color	LED Description
Activity	Green	**On, steady** – LED stays steady green when there is no activity. This LED blinks off during drive activity.
Life/Status	Green	**On, steady** – Normal. The card has sufficient life remaining for programming and erasing the Flash memory. No action is required.
	Yellow	**On, steady** – Warning. At least one Flash drive is reporting a high temperature warning. **Other component issues:** Run the `show all` and `show health` commands in the command line interface to determine which component has an issue.
	Red	**On, blinking** – Firmware code issue: ■ Run the command line interface utility to determine which component has an issue. ■ If no information appears, power cycle the system and retry. ■ If no information appears, contact Seagate Technology Support Services.
		On, steady – One of the following conditions applies: ■ Card has 10% of life remaining. Backup and copy data into a new card immediately. ■ Either the SuperCap is missing or is in warning. ■ One or more of the SSDs has failed. ■ At least one of the SSDs has reported critical temperature. ■ Back-up power rail monitor failure detected. **Other component issues:** Run the `show all` and `show health` commands in the command line interface to determine which component has an issue. **CAUTION** If the critical temperature warning persists, you might damage your card. Increase cooling speed or shut down your system to prevent damaging the card.

1.2.2 Contacting Support

If you experience a problem with your Nytro XP6500 card that you cannot resolve, report it to your Field Application Engineer or, if you obtained the product from an OEM, report it to the OEM. Keep these tips in mind when reporting a problem:

- Clearly identify and report the part number listed on the label, and clearly identify the board revision.
- Describe the steps leading up to the error.
- Report the operating system version and the host driver version.

1.3 Hardware and Software Requirements

Refer to your server documentation and to the operating system documentation for more information about the following hardware and operating system requirements. The Nytro XP6500 card supports the following utilities:

- Ctrl-R configuration utility
- HII configuration utility
- Nytro Command Line (Nytro CLI) Interface
- Nytro Storage Manager software

  The hardware requirements for the Nytro Storage Manager software are as follows:
  - PC-compatible computer with an IA-32 (32-bit) Intel® Architecture processor or an EM64T (64-bit) processor
  - Minimum 256 MB of system memory (512 MB recommended)
  - A hard drive with at least 400 MB of available free space.

NOTE The Nytro Storage Manager software is also supported in the Network Address Translation (NAT) environment. If the server is installed in a remote machine and you want to connect to that server over a NAT environment, through a remote client, you can connect to the remote server by providing the NAT IP address.

NOTE The Nytro Storage Manager software uses the local IP address in the same subnet as the SMTP server to deliver email notifications to the SMTP server.

You can use the Nytro Storage Manager software to remotely monitor the systems running the VMware® ESXi 5.5 operating system.

1.3.1 Supported Operating Systems

The following operating systems are supported on the 64-bit architecture:

- Windows®
  - Windows 2008 R2 SP1
  - Windows Server® 2012
- Red Hat® Enterprise Linux® (RHEL)
  - RHEL Version 6.4 to 6.6
  - RHEL Version 7.0
- Linux Kernel
  - Version 2.6.32 and 2.6.38
  - Version 3.2, 3.3, and 3.4
- SUSE® Linux® Enterprise Server (SLES)
  - Version 11.0 SP2
- VMware®
  - ESXi Version 5.1
- CentOS®
  - Version 6.4 and 6.5
- Oracle® Enterprise Linux® (OEL®)/UEK
  - Version 6.4 and 6.5

1.3.2 Supported Devices

The following Nytro XP6500 cards are supported.

Table 2 Supported Nytro XP6500 Cards

Nytro XP6500 Card	Raw Capacity
Nytro XP6500-8A1536	1.5 TB
Nytro XP6500-8A4096	4 TB

1.4 SATA III Features

The XP6500 card is connected to the Nytro Flash modules with high-speed SATA III link.

1.5 Fast Path Feature

Fast Path is a high-performance I/O accelerator for the Nytro drive group that is connected to a Nytro XP6500 card. This feature dramatically boosts the storage subsystem bandwidth and overall transactional application performance of a Nytro XP6500 card. The Fast Path feature fully optimizes the Nytro XP6500 card software and Nytro drive group to deliver an improvement in read and write IOPS.

1.6 UEFI 2.0 Support

The Unified Extended Firmware Interface (UEFI)2.0 specification provides the Nytro XP6500 card customers with expanded platform support. The Nytro XP6500 card UEFI 2.0 driver, a boot service device driver, handles the block I/O requests and SCSI pass-through commands, and can start preboot Nytro UEFI HII applications through a driver configuration protocol. The UEFI driver also supports driver diagnostic protocol, which lets you access preboot diagnostics.

1.7 Nytro Command Line Interface Overview

The Nytro Command Line Interface (Nytro CLI) provides a common command line interface to use the Nytro CLI commands.

The Nytro CLI is easy to use, consistent, and easy for scripting. The Nytro CLI lets you manage the Nytro XP6500 cards, physical drives, and virtual drives.

1.8 Ctrl-R Utility Overview

The Ctrl-R utility is a BIOS configuration utility that lets you manage the Nytro XP6500 cards, physical drives, and virtual drives.

1.9 Human Interface Infrastructure Utility Overview

The HII configuration utility helps you manage the XP6500 card, physical disks, and virtual disks, and perform other configuration tasks in a preboot, Unified Extensible Firmware Interface (UEFI) environment.

1.10 Nytro Storage Manager Software Overview

The Nytro Storage Manager software provides a graphical user interface (GUI) that enables you to view, monitor, and maintain the Seagate Nytro XP6500 cards.

1.11 Reference Documents

- *Seagate Nytro XP6500 Flash Accelerator Cards Quick Installation Guide*
- *Seagate Nytro XP6500 Flash Accelerator Cards User Guide*
- *Seagate Nytro XP6500 Flash Accelerator Cards Release Notes*

Chapter 2: Installing the Nytro XP6500 Card Support Software

The installation instructions for the following utilities on the supported operating systems are covered:

- Nytro XP6500 card
  - HII configuration utility
  - Ctrl-R configuration utility
  - Nytro Command Line Interface
  - Nytro Storage Manager software

2.1 First-Time Installation

The XP6500 card is inserted into the PCIe (supports PCIe 2.0 and PCIe 3.0) slot. The driver installation depends upon the installed operating system. The XP6500 card is shipped with preinstalled firmware, which includes the HII and Ctrl-R utilities.

NOTE The XP6500 card has a preconfigured virtual drive (VD). You can use the preconfigured VD to perform the supported operations. Download the latest software and hardware components from the Seagate website: http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/.

NOTE The driver installation conditions differ from operating system to operating system. For more information, refer to the respective operating system documentation.

2.2 Software Installation Instructions

2.2.1 Windows Driver Installation

The Seagate drivers for Windows Server® 2012 and Windows Server 2008 are available online.

Download the latest Windows drivers from the Seagate website:

1. Go to the following Seagate website: http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/
2. Click on **Nytro XP6500 Flash Accelerator Card**.
3. Click **Support**, and click the driver you need.
4. Download the driver files.
5. To install the driver, perform these steps:
   a. Go to **Device Manager** and right-click the Nytro XP6500 card.
   b. Select the **Install/Update Driver Software** option for the XP6500 card.
   c. Click **Browse my computer for driver software** to option.
   d. Select the `nytrowin.inf` file from the downloaded driver folder.
   e. Restart the system.

2.2.2 Linux Driver Installation

Seagate provides Linux drivers as binary and as source code.

- Precompiled binaries to add to an existing installation using driver update disks or RPMs for selected distributions.
- Fusion-MPT™ source to add or update any distribution.

2.2.2.1 Downloading the Drivers

Download the latest Linux® drivers from the Seagate website.

1. Go to the following Seagate website:
   http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/
2. Click on **Nytro XP6500 Flash Accelerator Card**.
3. Click **Support**. Here you can download product documentation, firmware, and host drivers for all supported operating systems.
4. To download Linux drivers, click on the Linux operating system from the list under the Linux/Unix header. For example, to download RHEL 7.0 drivers, click Nytro Driver RHEL7 (version number).
5. Read the release notes and click **I ACCEPT**. Click **DOWNLOAD** to download the drivers.
6. Download the driver files and extract the zipped files. The table below lists the unzipped files:

Table 3 What's in the Zip File

Name	Description

`kmod-nytrolin-<version>_<os>-<tag>.x86_64.rpm`
`kmod-nytrolin-<version>_oel6.<revision>_uek-1.x86_64.rpm`
Example:
`kmod-nytrolin-06.703.11.261_rhel7.0-1.x86_64.rpm`
Oracle example: Oracle Linux 6.5:
`kmod-nytrolin-<version>_oel6.5_uek-1.x86_64.rpm`
	Installable RPM for a specific Linux operating system. For Oracle Linux UEK kernels, use the RPM with `uek` tag.

`nytrolin-<version>_<os>-<tag>.src.rpm`
Example:
`nytrolin-06.703.11.261_rhel7.0-1.src.rpm`
	Nytrolin driver sources compilable on the distro's Kernel.

`nytrolin-<version>_<os>-<tag>.x86_64.iso.gz`
Example:
`nytrolin-06.703.11.261_rhel7.0-1.x86_64.iso.gz`
	Driver update disk.

7. After unzipping, install the driver with this command:
   `# rpm -ivh kmod-nytrolin-<version>_rhel7.1-1.x86_64.rpm`
8. To upgrade a driver, run this command:
   `# rpm -Uvh kmod-nytrolin-<version>_rhel7.1-1.x86_64.rpm`
9. Restart the system.

2.2.2.2 Ultra Low-Latency Driver (ULLD) for Linux

In Linux, the Nytro XP6500 uses an Ultra Low-Latency Driver (ULLD), which is optimized for achieving ultra low-latency and scaling I/OPs. This ULLD exposes a new block device interface (`/dev/nytro-sdX`) in addition to the traditional SCSI block device (`/dev/sdX`).

Both block devices represent the same underlying target, so there is a one-to-one correspondence for both the devices and for partitions created on the devices, if any. You must use the ULLD device (`/dev/nytro-sdX`) for applications and the traditional SCSI block device (`/dev/sdX`) for the Linux operating system installation on the Nytro XP6500 card.

NOTE Make sure you use only one interface at a time.

2.2.2.3 Creating a Driver Update Disk (DUD) on a USB drive

1. Using the extracted files from the zip file from Section 2.2.2.1, Downloading the Drivers extract the driver *iso* from DUD file using the following command:

   ```
   # gunzip nytrolin-<version>_<os>-<tag>.x86_64.iso.gz
   ```

   For example: `# gunzip nytrolin-06.703.11.261_rhel7.0-1.x86_64.iso.gz`
2. Transfer the extracted `iso` file to a USB drive. In the above example, the `iso` file is: `nytrolin-06.703.11.261_rhel7.0-1.x86_64.iso`

2.2.2.4 Installing a Linux Operating System on a Nytro XP6500 Virtual Disk

1. Boot the server with the operating system installation CD or DVD. Refer to your system documentation, if required.
2. Enter the following boot option to load the driver disk during installation: `linux dd`
3. Press **Enter** to continue the install.
4. When prompted, insert the USB containing the DUD created in Section 2.2.2.3, Creating a Driver Update Disk (DUD) on a USB drive. The utility locates and loads the driver for your .
   The ULLD for Nytro XP6500 creates two interfaces to the same block device:
   - ULLD block device (`/dev/nytro-sdX`)
   - SCSI block device (`/dev/sdX`)

     Example: If the SCSI block device is `/dev/sdc`, the ULLD block device is named `/dev/nytro-sdc`
5. At the **Device Selection Screen,** select the SCSI device named SEAGATE XP6500.
6. Partition the boot device as shown in the figures below. You can create additional partitions as required.

   The figures below show device selection for RHEL 7.0, RHEL 6.0, CentOS 6, Oracle Linux 6.0, and SuSE Enterprise Linux 11.0 SP2/SP3.
7. Complete the operating system installation and reboot the server.

2.2.2.4.1 Installing UEK Oracle Linux 6.0 on a Nytro XP6500 Virtual Disk

You must perform the following additional steps for UEK Oracle Linux 6.0 installation on the Nytro XP6500 virtual disk.

1. Restart the server into a Red Hat-compatible kernel (`kernel-2.6.32-xxx.el6`).
2. Install the corresponding UEK RPM of the *nytrolin* driver.

   Example: Oracle Linux 6.5, install `kmod-nytrolin-<version>_oel6.5_uek-1.x86_64.rpm`
3. Restart the server into the UEK Kernel.

Figure 2 Device Selection for RHEL 7.0

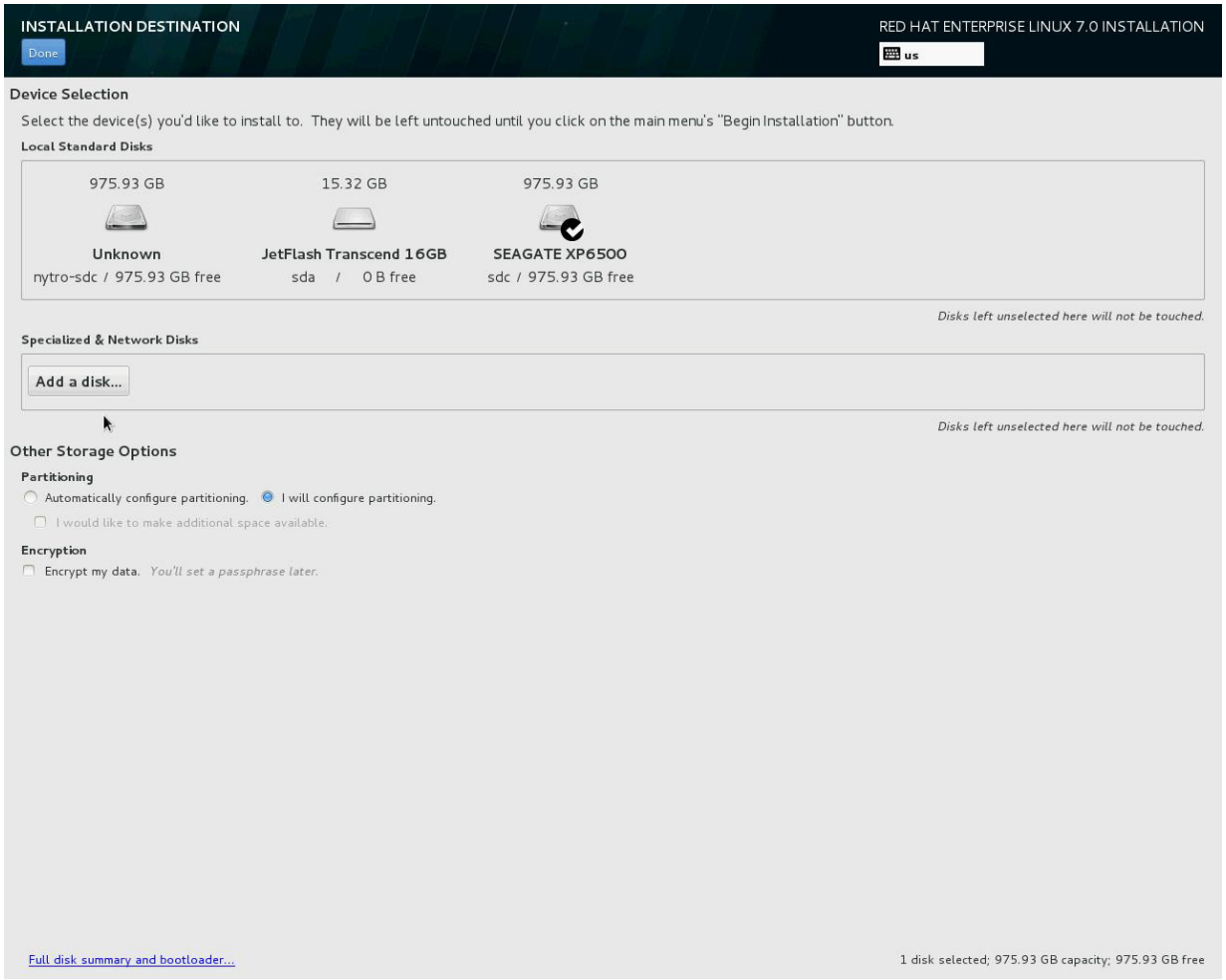


Figure 3 Manual Partitioning for RHEL 7.0

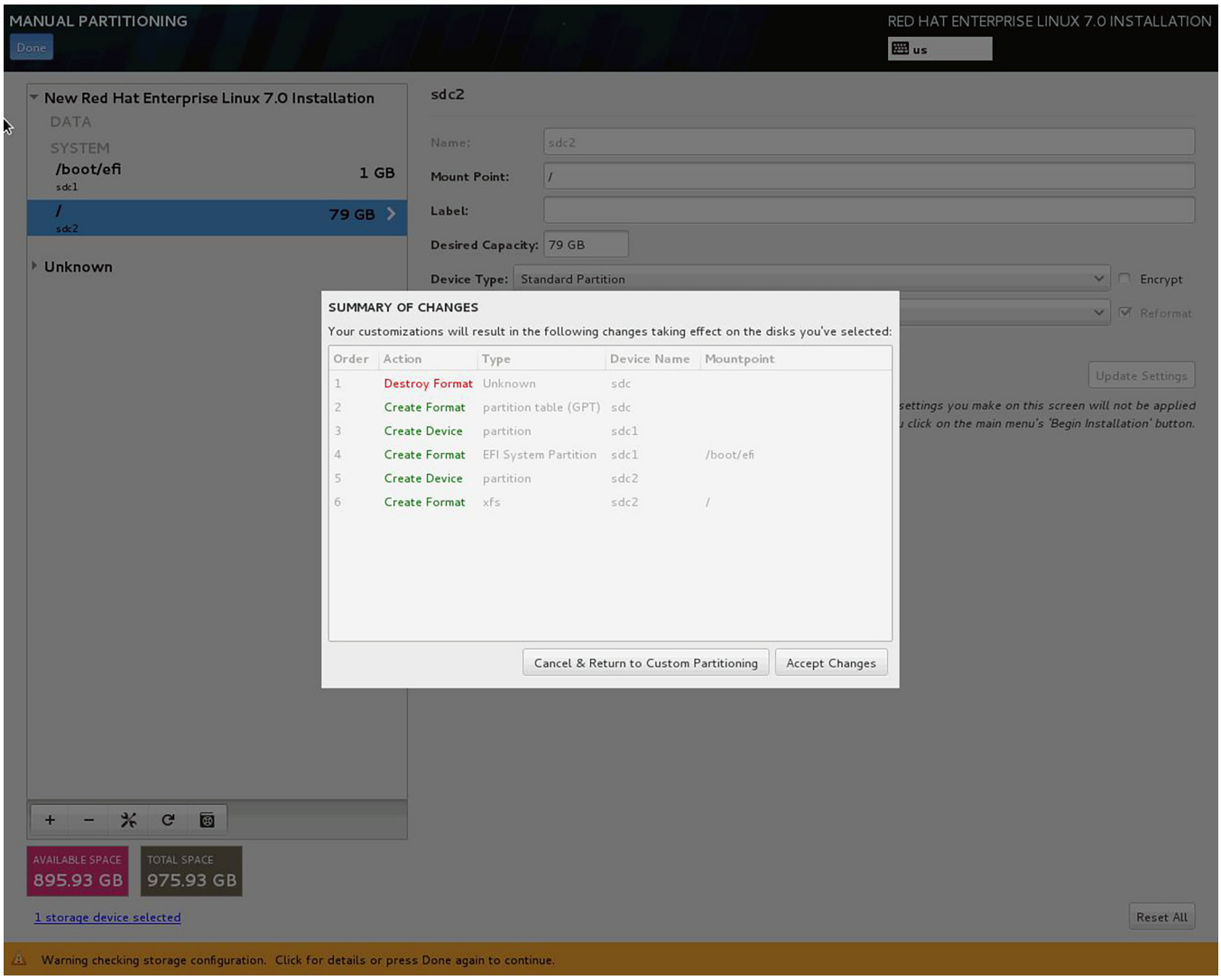


Figure 4 Selecting Installation Devices for RHEL 6.0

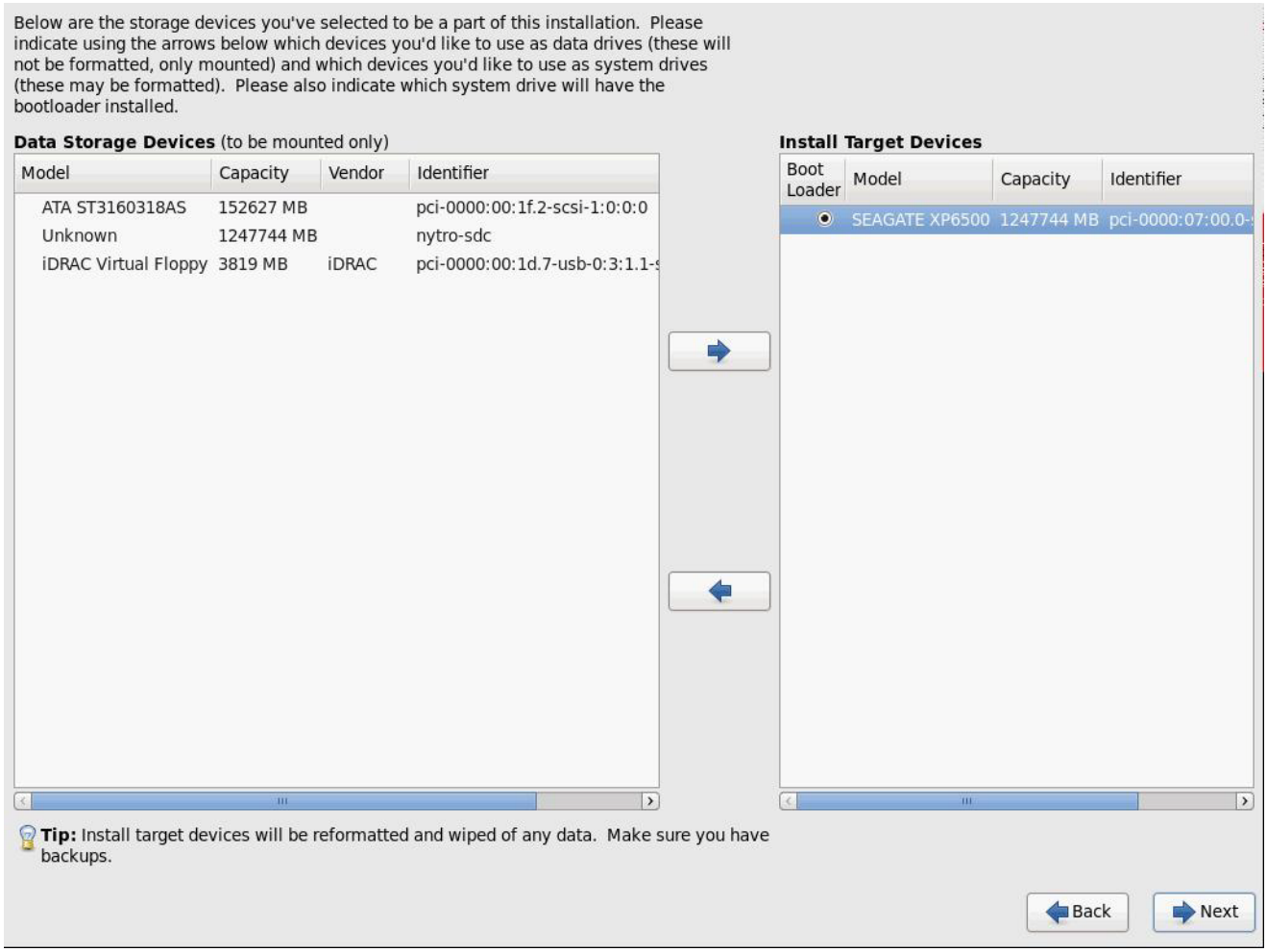


Figure 5 Partitioning Example for RHEL 6.0

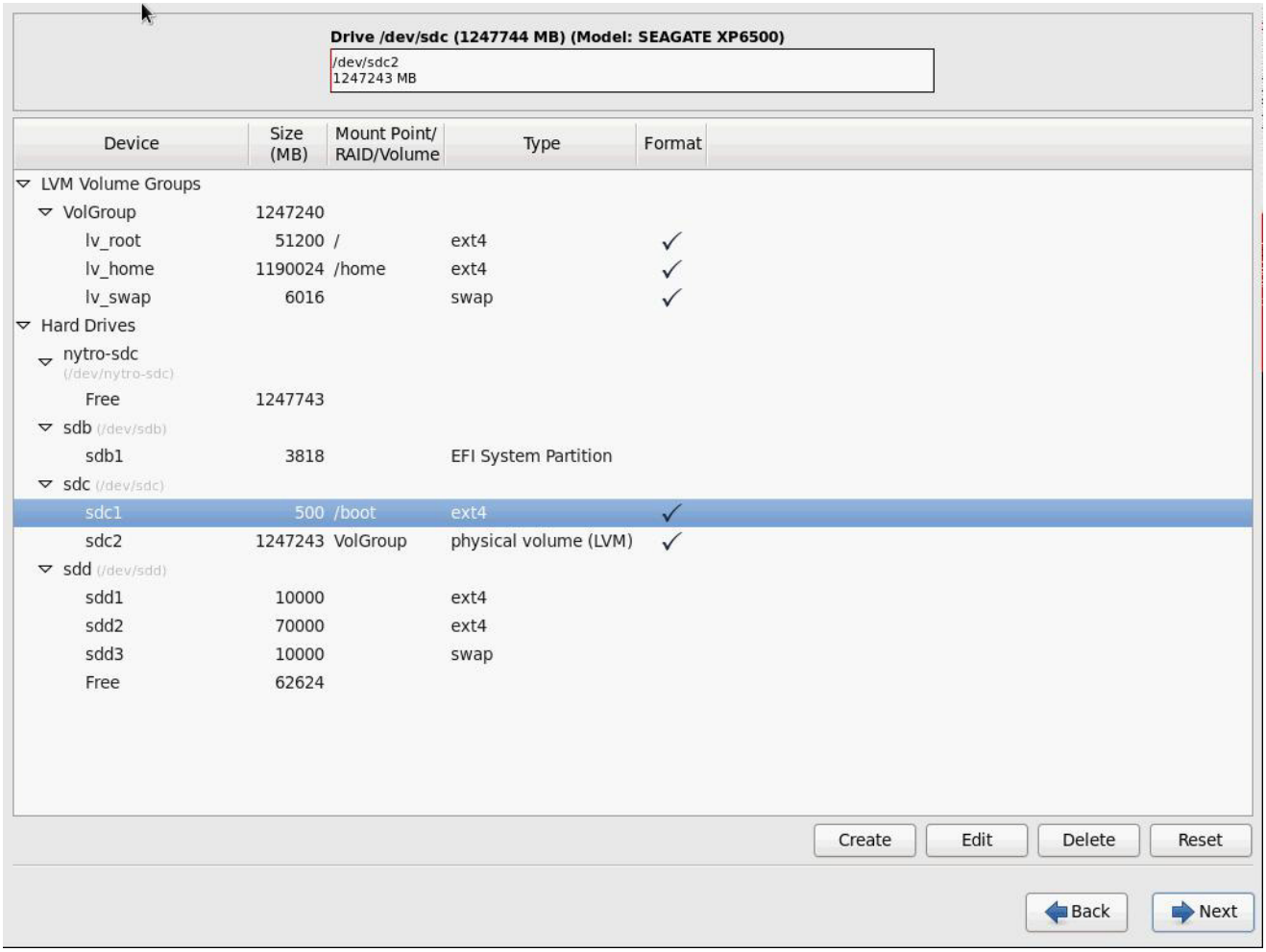
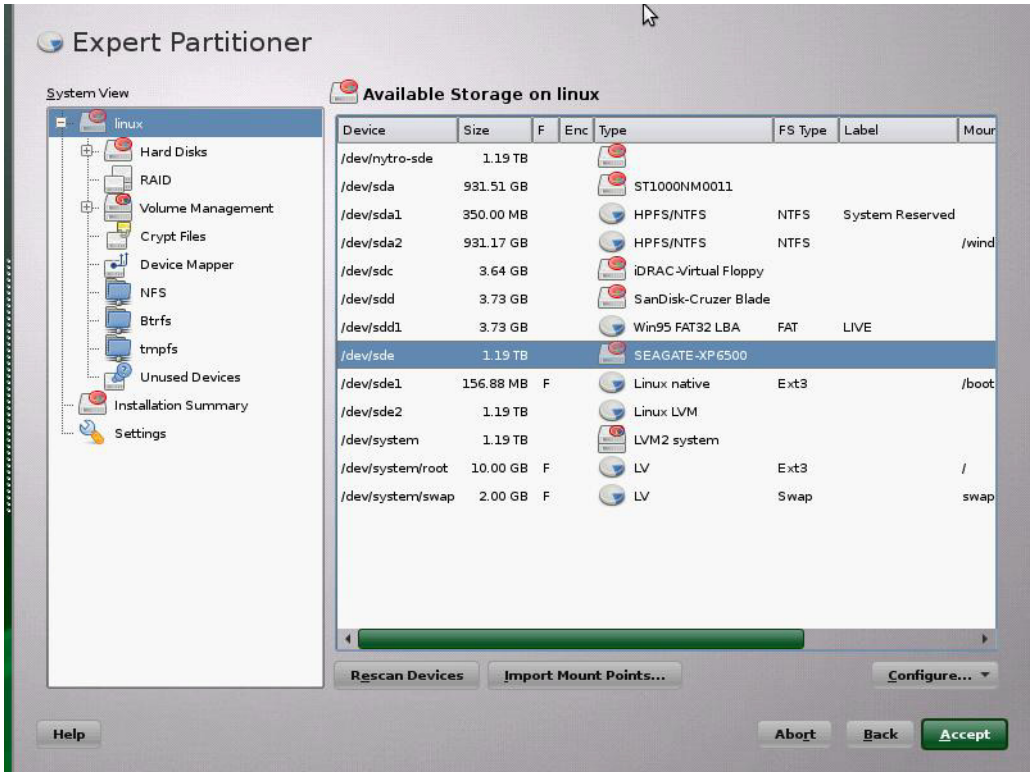


Figure 6 Selecting the Installation Disk for SuSE 11.0

Figure 7 Preparing the Hard Disk for SuSE 11.0

Figure 8 Partitioning for SuSE 11.0



2.2.2.5 Build Driver for Mainline Kernels 2.6.38 and Later Kernels

1. Download drivers Nytro XP6500 for RHEL 6.0 from the following Seagate website: http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/
2. See Section 2.2.2.1, *Downloading the Drivers*.
3. Transfer the RHEL 6.5 source RPM to the Linux server where you will build the drivers.
4. Install the RHEL 6.5 source RPM. The RHEL 6.5 source RPM filename is:

   ```
   # rpm -ivh nytrolin-<version>_rhel6.5-1.src.rpm
   ```

5. The sources are installed at `~/rpmbuild/`

   ```
   # cd ~/rpmbuild/SPECS/
   ```

   ```
   # rpmbuild -bp --target=x86_64 nytrolin.spec
   ```

   NOTE You must resolve all dependencies to complete the preceding step.

6. The driver sources are placed at:

   ```
   # ls ../BUILD/nytrolin-<version>_rhel6.5/source/
   ```

7. Refer to the `README` in `nytrolin-<version>_rhel6.5/source/` for the steps to build the driver.

B. VMware ESXi5.1

Download the latest VMware® drivers from the Seagate website.

1. Go to the following Seagate website: http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/
2. Click on **Nytro XP6500 Flash Accelerator Card**.

3. Click **Support**, and click the driver you need.
4. Download and unzip the driver files. Install the drivers.

You have now completed the driver installation for the Nytro XP6500 card.

2.3 Installing the XP6500 Card

The XP6500 card ships with preinstalled firmware and HII and Ctrl-R configuration utilities.

NOTE The driver installation conditions differ from operating system to operating system. For more information, refer to the respective operating system documentation.

Scenario 1: Installing the XP6500 card with an existing operating system on the server

- The server first starts up.
- The XP6500 card firmware gets initialized and the operating system starts up.

On the Windows and Linux operating systems

1. Install the XP6500 driver.
2. Restart the server.
3. Install the Nytro Storage Manager software, the Nytro CLI, or both, based on your requirement.

On the VMware operating system

1. Install the XP6500 card.
2. Install the XP6500 driver (refer to the `Readme.txt`).
3. Restart the server.
4. Install the Nytro Storage Manager software, the Nytro CLI, or both, based on your requirement.

   After you install the Nytro Storage Manager application, open the application, navigate to the **Logical** tab, and verify if the **<XP6500 SKU>** node appears.
5. Install Nytro SMI-S Provider to facilitate the Nytro Storage Manager software to remotely access the VMware host.

NOTE For upgrading firmware, see Section 9.4, Upgrading the Nytro XP6500 Card Firmware and Nytro XP6500 Module Firmware Using the Nytro CLI.

Scenario 2: Clean/fresh installation of the operating system stored on the Nytro XP6500 card

- The server first starts up.
- The XP6500 card firmware gets initialized.
- For the host system BIOS-level configuration:
  - The **<XP6500 SKU>** node must already be automatically created.

1. Install the operating system; when you install the operating system, you must also install the drivers.

NOTE The driver installation conditions differ from operating system to operating system. Refer to the respective operating system documentation.

NOTE The method to view the driver version depends upon the operating system used. This document covers the brief installation instructions for the Linux and Windows operating systems. For detailed information, refer to the respective operating system documentation.

2. After you install the operating system perform the following steps to check the driver version.

On the Windows operating system:

- Go to **My Computer > Manage > Device Manager > Storage controllers**, and select the Seagate Nytro device, and check the driver version.

On the Linux operating system:

- Use the `rpm -qa | grep "kmod-nytrolin"` command.

NOTE The method to view the driver version depends upon the operating system used. This document covers the brief installation instructions for the Linux and Windows operating systems. For detailed information, refer to the respective operating system documentation.

3. Install the Nytro Storage Manager software, the Nytro CLI, or both, based on your requirement.

2.4 Human Interface Infrastructure Utility

The HII utility comes preinstalled, and it resides in the Nytro XP6500 card UEFI, and operates independent of the operating system.The HII utility provides a configuration wizard to guide you through the Nytro XP6500 card operations.

2.5 Prerequisite to Use the Nytro CLI

Perform these steps to use the Nytro CLI:

1. Uninstall any of the existing Nytro CLI packages.
2. Install the latest Nytro CLI packages as mentioned in the following sections.

NOTE The Nytro CLI must be run with administrator or root privileges.

2.6 Installing the Nytro CLI

Copy the latest Nytro CLI packages from the http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/ website.

2.6.1 Installing the Nytro CLI on the Linux Operating System

- Install the latest `nytrocli` binary.
  - Unzip the Nytro CLI RPM package.
  - To install the Nytro CLI RPM, run the `rpm -ivh <nytrocli-x.xx-x.noarch.rpm>` command.
  - To upgrade the Nytro CLI RPM, run the `rpm -Uvh <nytrocli-x.xx-x.noarch.rpm>` command.

2.6.2 Installing the Nytro CLI on the Windows Operating System

Copy the `nytrocli.exe` file into any locations in the system and run the `ytrocli.exe` file.

2.6.3 Installing NytroCLI on the VMWare Operating System

If you have ESXi 5.x, install the respective `vib` file by using the `ESX software vib install` command.

2.7 Installing the Nytro Storage Manager Software

Use the following instructions to install (or reinstall) the Nytro Storage Manager software on your workstation or on your server for the supported operating systems.

CAUTION Do not install the Nytro Storage Manager software on top of the Avago® MegaRAID Storage Manager™ framework.

2.7.1 Installing the Nytro Storage Manager Software on the Windows Operating System

To install the Nytro Storage Manager software on a system running the different Windows operating systems (see Section 1.3.1, Supported Operating Systems), perform the following steps:

1. Copy the Nytro Storage Manager software installation package from the http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/ website.
2. Double-click the `setup.exe` file to start the installation.
3. In the **Welcome** screen that appears, click **Next**.

If the Nytro Storage Manager software is already installed on this system, an upgraded installation occurs.

4. Read and accept the user license and click **Next**.

   The **Customer Information** dialog appears.

5. Enter your user name and your organization name. In the bottom part of the screen, select an installation option:
   - If you select the **All users** radio button, any user with administrative privileges can use this version of the Nytro Storage Manager software to view or change the storage configurations.
   - If you select the **Only for current user** radio button, the Nytro Storage Manager software shortcuts and their associated icons are available only to the user with this user name.
   - Some machines might prompt you to install the `vcredist.rar` file (Visual C++ Redistributable Packages).
6. Click **Next** to continue.
7. In the **Destination Folder** dialog, accept the default destination folder or click **Change**, to select a different destination folder.
8. Click **Next** to continue.

   The **Setup Type** dialog appears.

9. Select one of the setup options. The options are described in the **Setup Type** dialog.
   - Select the **Complete** radio button if you are installing the Nytro Storage Manager software on a server.
   - Select the **Custom Installation** radio button to select individual program components.
10. Click **Next**.

    If you select the **Custom Installation** as your setup option, the second **Setup Type** dialog appears. If you select the **Complete** as your setup option, the **LDAP Logon Information** appears.

2.7.1.1 Specifying the LDAP Configuration

1. To specify the LDAP configuration details, select **Yes**, and perform the following substeps. If you do not want to specify the LDAP configuration details, click **No**, and click **Next**.
   a. Enter the LDAP server's IP address in the **Server IP** field.
   b. Enter the LDAP server's user name in the **User name** field. An example of a user name can be `username@testldap.com`.
   c. Enter the name of the Domain XP6500 in the **Distinguished User name** field. An example, the Domain XP6500 card name can be `dc= TESTLDAP, dc=com`.
   d. Enter the LDAP server's port number in the **Port** field.
   e. Select the **Use LDAP as default Login** check box to always connect to the LDAP server.

      All the values entered in this dialog are saved in the `ldap.properties` file.
   f. Click **Next**.
   g. In the dialog that appears, click **Install** to start the installation.
   h. Select one of the setup options.
   i. Click **Next**.
   j. Click **Install**.
   k. In the **Configuration Wizard** dialog, click **Finish**.

   If you select **Client** installation for a system that monitors the servers, and if no available servers exist with a registered framework on the local subnet (that is, servers with a complete installation of the Nytro Storage Manager software), the server window appears. The **Nytro Storage Manager - Host View** dialog does not list any servers. You can use the **Nytro Storage Manager - Host View** dialog to manage systems remotely.

2.7.2 Setup Options

The Nytro Storage Manager software enables you to select from one of the following setup options when you install it:

- Select the **Client** radio button if you are installing the Nytro Storage Manager software on a computer that is used to view and configure servers over a network. To begin installation, click **Install** on the next dialog.

  In the Client mode of installation, the Nytro Storage Manager software installs only client-related components, such as the Nytro Storage Manager GUI.

  Use this mode to manage and monitor servers remotely. When you install the Nytro Storage Manager software in Client mode on a laptop or a desktop, you can log in to a specific server by providing the IP address.
- Select the **Server** radio button to install only those components required for remote server management. To begin installation, click on **Install** on the next dialog.
- Select the **StandAlone** radio button if you use the Nytro Storage Manager software to create and manage storage configurations on a stand-alone workstation. To start the installation, click **Install** on the next dialog.

  NOTE If you select **Client** or **Standalone** as your setup option, the **LDAP Logon Information** dialog appears.
- Select the **Local** radio button if you want to view only the server that has the Nytro Storage Manager software installed. You cannot discover other remote servers, and other remote servers cannot connect to your workstation. In a local mode installation, use the loopback address instead of the IP address.
- Select the **Custom** radio button if you want to specify individual program features to install.

  If you select **Custom**, a dialog listing the installation features appears. Select the required features on this dialog.

2.7.3 Using the Nytro Storage Manager Software to Manage ESXi Host

The Nytro Storage Manager server cannot be installed directly on the VMware ESXi operating system. You can manage it through the Nytro Storage Manager software installed on a Linux/Windows machine in the same subnet.

NOTE For VMware ESXi 5.x to work with the Nytro Storage Manager software, the SMI-S Provider must be installed.

Remote management of VMware ESXi is supported only in a complete installation of the Nytro Storage Manager on the following operating systems:

- Windows Server
- RHEL
- SUSE Linux

Network communication is a key element for correct communication between the ESXi CIM provider and the Seagate management software. Make sure that the network settings are correct by making the following changes:

- Provide a proper host name and an IP address while doing the initial configurations for the ESXi host.
- For networks that do not have DNS configured, the `hosts` file in the machine on which the Nytro Storage Manager software is installed, must be edited as follows:
  - — Add an entry to map the VMware host's IP address with the host name. This is for the discovery process to happen correctly. In the absence of this entry, the VMware host is discovered as 0.0.0.0.
  - — Add an entry to map the actual IP address of the localhost with its hostname (an entry for the loopback address is present by default in the hosts file and it must not be removed). This is to ensure that the Asynchronous Event Notifications (AENs) are generated correctly.

— For example, if `xx.xx.xx.xx` is the IP of your VMWare host and `yy.yy.yy.yy` is the IP of your Linux host, the following entries must be added in the hosts file:

- `xx.xx.xx.xx <VMWare-host-name>.<domain-name> <VMWare-host-name> #VMWare`
- `yy.yy.yy.yy <Linux-host-name>.<domain-name> <Linux-host-name> #Linux`

2.7.3.1 Limitations

Server health on the server discovery page is not available.

2.7.3.2 Differences in the Nytro Storage Manager Software for the VMware ESXi Operating System

The following are some of the differences in the Nytro Storage Manager software when you manage a VMware server.

- System information limitations:
  - — Only the IP address and the host name appear.
  - — The XP6500 card health information is not supported.
- Authentication support:
  - — The Nytro Storage Manager software permits the CIMOM server authentication with the user ID and the password for the VMware operating system.
  - — Access to the VMware ESXi hosts is controlled based on the user privileges. Only the root users have full access, while the non-root users have the view-only access.
  - — Multiple root users can simultaneously log on by using the Full Access mode to access the VMware ESXi server.
- Event logging:

  Event logging support is available for the VMware ESXi operating system. The event logging feature for the Nytro Storage Manager client connected to a VMware ESXi operating system behaves as follows:
  - — Only up to 30 events of the initial logs can be retrieved. Only those events that occur after a client logs on for the first time to a VMware ESXi operating system appear in the **Event Logger** dialog.
  - — The System logs are not displayed.
  - — The Save log feature is not supported; however, the Save Log in the Text file is supported.
  - — The View Log option lets you view the logs saved in a text file on the **Event Logger** dialog.
  - — Refreshing of the Nytro Storage Manager window after any firmware updates is slower for a client connected to the VMware ESXi operating system, than the one that is connected to a Windows or Linux operating system.
- The VMware ESXi operating system is supported only on a full installation of the Nytro Storage Manager software. Standalone, client-only, server-only, and local modes do not support the VMware ESXi operating system management.

2.7.4 Installing the Nytro Storage Manager Software on the Linux Operating System

Perform these steps to install the Nytro Storage Manager software on the Linux operating system:

1. Copy the `NSM_linux_installer-<version>.tar.gz` file into a temporary folder.
2. Untar the `NSM_linux_installer-<version>.tar.gz` file by using the `tar -zxvf NSM_linux_installer-<version>-...tar.gz` command.

   A new disk directory is created.
3. In the new `disk` directory, read the `readme.txt` file.
4. To start the installation, run the `csh ./install.csh -a` command.

   The preceding command works only if `csh shell` is installed; otherwise, install `csh shell`, and retry.

If you select the **Client** installation for a computer that is used to monitor the servers, and if no available servers exist with a registered framework on the local subnet (that is, servers with a complete installation of the Nytro Storage Manager software), the **Nytro Storage Manager – Host Name** dialog appears. This dialog does not list any servers. You can use this dialog to remotely manage the systems.

To install the software by using an interactive mode, run the `./install.csh` command from the installation disk.

To install the product in a non-interactive or silent mode, use the `./install.csh [-options] [-ru popup]` command from the installation disk.

The installation options are as follows:

- Complete
- Client Component Only
- StandAlone
- Local
- Server

The `-ru popup` command removes the pop-up from the installation list.

You also can run a non-interactive installation using the `RunRPM.sh` command.

The installer offers the following setup options:

- **Complete** – In this option, all of the product features are installed.
- **Client Components Only** – In this option, the Nytrolib feature of the product is not installed. As a result, the resident system can only administer and configure all of the servers in the subnet, but it cannot serve as a server.
- **StandAlone** – In this option, only the networking feature is not installed. But the system can discover other servers in the subnet and can be discovered by the other servers in the subnet.
- **Local** – In this option, you can view only the workstation that has the Nytro Storage Manager software installed. You cannot discover other remote servers, and the other remote servers cannot connect to your workstation. In a local mode installation, use the loopback address instead of the IP address.
- **Server** – In this option, the components required for remote server management are installed.

This installation helps you select any of the setup types, but if you run the `RunRPM.sh` command, it installs the complete feature.

2.7.4.1 Prerequisites for Installing the Nytro Storage Manager Software on the RHEL Operating System

Before you install the Nytro Storage Manager software on the RHEL 6.X x64 operating system, install the following RPMs. Without these RPMs, the Nytro Storage Manager software might not install properly or might not work as expected.

- `libstdc++-4.4.4-13.el6.i686.rpm`
- `compat-libstdc++-33-3.2.3-69.i686.rpm`
- `libXau-1.0.5-1.el6.i686.rpm`
- `libxcb-1.5-1.el6.i686.rpm`
- `libX11-1.3-2.el6.i686.rpm`
- `libXext-1.1-3.el6.i686.rpm`
- `libXi-1.3-3.el6.i686.rpm`
- `libXtst-1.0.99.2-3.el6.i686.rpm`

The RHEL6.X x64 complete operating system installation is required for the Nytro Storage Manager software to work correctly. The above mentioned RPMs are a part of the RHEL6.X x64 operating system DVD. These RPMs might require additional dependent RPMs. Install all of the dependent RPMs on the target system.

NOTE The RPM versions mentioned might change in the future RHEL6.x versions. Install the corresponding RPMs from the operating system installation media.

NOTE The Nytro Storage Manager software now provides an additional binary to run it in a native 64-bit Linux environment.

2.7.4.2 Error Messages

The following messages might appear when installing the Nytro Storage Manager software on the Linux operating system:

- `More than one copy of Nytro Storage Manager software has been installed.`

This message indicates that you have installed more than one copy of the Nytro Storage Manager software (this step can be performed by using the `rpm-force` command to install the `rpm` file directly, which is not recommended, instead of using the `install.sh` file). In such cases, you must uninstall all of the `rpm` files manually, before you install the Nytro Storage Manager software with the preceding procedure.

- `The version is already installed.`

  This message indicates that the version of the Nytro Storage Manager software being installed is already installed on the server.
- `The installed version is newer.`

  This message indicates that a later version of the Nytro Storage Manager software is already installed on the sever.
- `Exiting installation.`

  This message indicates that there is some issue with the installation procedure.
- `RPM installation failed.`

  This message indicates that the installation failed for a particular reason. Additional message text describes the cause of the failure.

2.7.5 Disabling the Pop-Up Notification

The pop-up notification starts automatically when you log on to the operating system. To stop the pop-up notification, you must perform these steps based on your operating system.

- On Linux operating systems

To disable the pop-up notification on the Linux operating systems by using the command prompt, perform these steps:

1. Go to the `</usr/local/Nytro storage Manager/MegaPopup>` folder.
2. Run the `shutdownpopup.sh` script at the console.

   After running either of the preceding command, the pop-up process stops.

- On Windows operating system

To disable the pop-up notification on the Windows operating system by using the command prompt, perform these steps:

1. Go to the `<NSM_Installation_Path>/MegaPopup` folder, where `NSM_Installation_Path` refers to the destination folder, which is selected during installation (see Step 7 of Section 2.7.1, Installing the Nytro Storage Manager Software on the Windows Operating System for more details).
2. Run the `popup -stop` command at the command prompt.

- By using the Nytro Storage Manager window

To stop the pop-up notification process by using the Nytro Storage Manager window, perform these steps:

1. Go to **Tools > Monitor Configure Alerts**.
2. Under the **Alert Settings** tab of **Configure Alerts** dialog, select the `Severity Level`, and click the **Edit** dialog.
3. Unselect the **Pop-up** check box on the **Edit** dialog, and click **OK**.

2.7.6 Re-enabling the Pop-Up Notification

To enable the disabled pop-up notification, perform these steps:

- On the Windows operating system, run the `Popup.exe` command in the same console. The pop-up notification is enabled.
- On the Linux operating system, run the `./popup&` command in the same console. The pop-up notification is enabled.

2.7.7 Prerequisites to Run Nytro Storage Manager Remote Administration

The Nytro Storage Manager software requires ports 3071 and 5571 to be open to function. Perform these steps to prepare to run the **Nytro Storage Manager Remote Administration**.

1. Configure the system with a valid IP address.

   Make sure the IP address does not conflict with another IP address in the subnetwork.

   Ports, such as 3071 and 5571, are open and available for the Nytro Storage Manager framework communication.
2. Disable the security manager and the firewall.
3. Configure the multicasting.

   Make sure Class D multicast IP addresses are registered (at least xxx.xxx.xxx.xx must be registered for the Nytro Storage Manager software to work). If not, create a static route by using this command:

   ```
   Route add xxx.xxx.xxx.xx dev eth1
   ```
4. Install the Nytro Storage Manager software. If the Nytro Storage Manager software is already installed, restart the Nytro Storage Manager Framework.
5. Re-enable the firewall.

2.8 Installing and Configuring SNMP

This section describes how to install and configure SNMP on the Windows and Linux operating systems.

2.8.1 Installing and Configuring SNMP on Windows Operating System

1. Use SNMP Manager to retrieve the data (`mib` files must already be compiled). The `mib` files are available in the same location as `setup.exe` file.
2. Use the Trap utility to get the traps.

NOTE Before you install SNMP Agent, make sure that the SNMP service is installed in the system.

If you do not have SNMP service installed on your system, perform the following steps to install SNMP service:

2.8.2 Installing SNMP Service on Windows Server 2008 Operating System

Before you install the SNMP Agent, make sure that SNMP Service is installed in your system.

If you do not have SNMP Service installed on your system, perform the following steps to install SNMP Service for Windows 2008 System.

1. Go to **Control Panel > Program and Features**.
2. Click **Turn windows feature on/off** to select the windows components to install.
3. Select **Features** in the left side menu.
4. Click **Add Features**.
5. Select **SNMP Services**.
6. Click on **Next**.
7. Click **Install**.

SNMP installation starts. When prompted for the Windows 2008 CD, insert the CD and select **OK**, the installation resumes. SNMP installation resumes and SNMP service is installed in that system. After the installation completes, a confirmation message appears, which indicates that the installation was successful.

2.8.3 Configuring SNMP Service on Windows 2008 Server Operating System

1. Go to **Control Panel > Administrative Tools**.
2. Select **Services** from **Administrative Tools** window.
3. Select SNMP Service in the **Services** window.
4. Open SNMP Service, and right-click **Properties**.
5. Click the **Security** tab, and make sure that the **Accept SNMP Packets from any host** option is selected. Add a community with some keyword, for example, *public*.
6. Click the Traps tab, and the list of host IPs to which you want the traps to be sent with community name shows.

2.8.4 Installing SNMP on the Linux Operating System

Prerequisite for SNMP installation

The SNMP agent application depends upon standard SNMP Utils package. Ensure that the SNMP-Util package is present in the system before installing the SNMP agent `RPM`.

SNMP-Util package includes the RPMs, `net-snmp-libs`, `net-snmp-utils`, and additional dependent RPMs. Make sure that you install these RPMs from the operating system media before you install the SNMP agent RPM.

Before you install SNMP, check if the `libstdc++.so.6 Library` is present in the `/usr/lib` directory, otherwise, install the Linux software component RPM that provides these libraries.

The Net-SNMP RPM installation is required before you install the agent RPMs.The Net-SNMP RPMs are available in the operating system DVD.

- If you are unable to install SNMP agent RPMs, use `rpm -ivh --force *.rpm`, and then uninstall the SNMP RPMs by using `rpm -e *.rpm`.
- If you are unable to install multiple RPMs and if cyclic redundancy issues occur, install all of the RPMs in one command line.

  For example, `rpm -ivh net-snmp-5.4.2.1-8.1.x86_64.rpm perl-snmp-5.4.2.1-8.1.x86_64.rpm`

2.8.4.1 Installing SNMP Agent on RHEL

1. SNMP Agent RPMs install the agents.
2. RPM takes care of the required modifications in the `snmpd.conf` file to run the agent.

   NOTE Before you start installing, check if there is any `pass` command that starts with **1.3.6.1.4.1.3581 OID** in the `snmpd.conf` file, if `pass` commands exist, delete all of the old `pass` commands that start with **1.3.6.1.4.1.3581 OID**. This instruction is valid if a previous SNMP Agent was installed in the system.
3. The `snmpd.conf` file structure must be same as `stx_nytrodsnmpd.conf` file. For reference, a sample `conf` file (`stx_nytrodsnmpd.conf`) will be present in the `/etc/stx_nytrodsnmp` directory.
4. To run the SNMP query from a remote system, add the IP address of that system in the `snmpd.conf` file.

   For example:

   ```
   com2sec     snmpclient  xxx.xx.xxx.xxx    public
   ```

   Here, the IP address of the remote system is, xxx.xx.xxx.xxx.
5. For receiving SNMP trap into a particular system, add the IP address of that system in the **com2sec** section of `snmpd.conf` file.

   For example, to get Trap in 10.0.0.144, add the following line to the `snmpd.conf` file.

   ```
   #        sec.name  source      community
      com2sec  snmpclient  10.0.0.144  public
   ```
6. To start or stop the SNMPD daemon.

   ```
   /etc/init.d/snmpd start/stop
   ```
7. To start/stop the SNMP Agent daemon before issuing any SNMP query.

   ```
   /etc/init.d/stx_nytrodsnmpd start/stop
   ```
8. Check the status of the SNMP Agent daemon by issuing the following command:

   ```
   /etc/init.d/stx_nytrodsnmpd status
   ```
9. Issue an SNMP query, such as following:

   ```
   snmpwalk -v1 -c public localhost .1.3.6.1.4.1.3581
   ```
10. Get the SNMP trap from local system by issuing the following command:

    ```
    snmptrapd -P -F "%02.2h:%02.2j TRAP%w.%q from %A %v\n"
    ```
11. Perform the following steps to configure SNMP traps.
    a. Edit the `/etc/stx_nytrodsnmp/nytro-wd/nytro_wd_TrapDestination.conf` file and add the IP address as shown in the following example:

    ```
    ################################################
    # Agent Service needs the IP addresses to sent trap
    # The trap destination may be specified in this file or
    # using snmpd.conf file. Following indicators can be set
    # on "TrapDestInd" to instruct the agent to pick the IPs
    # as the destination.
    # 1 - IPs only from snmpd.conf
    # 2 - IPs from this file only
    # 3 - IPs from both the files
    ################################################
    TrapDestInd 2
    #############Trap Destination IP#################
    127.0.0.1   public
    xxx.xx.xxx.xxx public
    ################################################
    ```

NOTE If *TrapDestInd* in the preceding snippet is set to a value of 1, the IP addresses can be taken from `/etc/snmp/snmpd.conf` in the following format:
`'com2sec snmpclient xxx.xx.xxx.xxx public'`
'`Trapsink`' and '`TrapCommunity`' tokens are supported for sending customized SNMP traps.
To send SNMP traps to custom ports, in the `nytro-wd_TrapDestination.conf` file, use as shown in the following example:'`xxx.xx.xxx.xxx:aaaa testComm`'
In the preceding case, SNMP trap can be sent to IP, xxx.xx.xxx.xxx, at port number aaaa with community as *testComm*.
If no port number is mentioned, the default SNMP trap port 162 can be used for sending SNMP traps.

NOTE For the SNMP components to work correctly, the Linux system must have `snmp-net packages(rpm).`

It is assumed that `snmpd.conf` is located at `/etc/snmp` for Red Hat. You can change the file location from `/etc/init.d/stx_nytrodsnmpd` file.

Used the `rpm -Uvh <SNMP agent rpm>` command to upgrade the RPM.

This command uninstalls the previous SNMP RPM and installs the latest SNMP RPM.

2.8.4.2 Seagate SAS SNMP MIB Location

After you install the Seagate SAS SNMP Agent package, the MIB file `STX-AdapterNytro.mib` is installed under `/etc/stx_nytrodsnmp/nytro` directory for the Linux operating system. For the Windows operating system, extract the contents of the `zip` file to the desired location.

2.8.4.3 Configuring the snmpd.conf File

By default, you can run the SNMP queries (`walk`, `get`) from any remote machine without any changes to the `snmpd.conf` file. To quickly add a new community and client access, perform these steps:

1. Stop the SMA service by running the following command:

```
# svcadm disable svc:/application/management/sma:default
```

2. Add read-only and read/write community names.
   a. Add a read-only community name and `client/hostname/ipaddress` under `SECTION: Access Control Setup` in the `/etc/sma/snmp/snmpd.conf` file, as shown in the following excerpt.

```
###############################################
# SECTION: Access Control Setup
# This section defines who is allowed to talk to
# your running SNMP Agent.
# rocommunity: a SNMPv1/SNMPv2c read-only access
# community name
# arguments: community
# [default|hostname|network/bits] [oid]
# rocommunity snmpclient xxx.xx.xxx.xxx
###############################################
```

   b. Add a read/write community name and `client/hostname/ipaddress` under `SECTION: Access Control Setup` in `/etc/sma/snmp/snmpd.conf` file, as shown in the following excerpt.

```
###############################################
# SECTION: Access Control Setup
# This section defines who is allowed to talk to your
# running snmp agent.
# rocommunity: a SNMPv1/SNMPv2c read-only access
```

```
# community name
# arguments: community
# [default|hostname|network/bits] [oid]
# rwcommunity snmpclient xxx.xx.xxx.xxx
```

3. Start the SMA service by using the following command:

```
# svcadm enable svc:/application/management/sma:default
```

NOTE Refer to the command `man snmpd.conf` for more information about configuring the `snmpd.conf` file.

2.8.4.4 Configuring SNMP Traps

To receive SNMP traps, perform these steps:

1. Stop the Seagate SAS SNMP Agent by using this command:

```
#/etc/init.d/stx_nytrodsnmpd stop
```

2. Edit the `/etc/stx_nytrodsnmp/nytro/nytro_wd_TrapDestination.conf` file, and add the IP address as shown in the following excerpt.

```
################################################
# Agent Service needs the IP addresses to sent trap
# The trap destination may be specified in this file
# or using snmpd.conf file. Following indicators can
# be set on "TrapDestInd" to instruct the agent to
# pick the IPs as the destination.
# 1 - IPs only from snmpd.conf
# 2 - IPs from this file only
# 3 - IPs from both the files
################################################
TrapDestInd 2
############# Trap Destination IP #################
# add port no after IP address with no
# space after
# colon to send the SNMP trap
# message to custom port.
# Alternatively, you can also use
# trapsink command
# in snmpd.conf to send the SNMP trap
# message to
# custom port, else default SNMP trap
# port 162 shall be used.
127.0.0.1 public
xxx.xxx.xxx.xx:aaaa testComm
################################################
```

3. If `TrapDestInd` in the preceding code snippet is set to 1, IP addresses can be taken from `/etc/sma/snmp/snmpd.conf`file in this format: `'com2sec snmpclient xxx.xx.xxx.xxx public'` `'Trapsink'` and `'TrapCommunity'` tokens are supported for sending the customized SNMP traps.
4. Start the Seagate SAS SNMP Agent by entering this command:

```
#/etc/init.d/stx_nytrodsnmpd start
```

2.9 Uninstalling the Nytro Manager Software

2.9.1 Uninstalling the Nytro Manager Software on the Windows Operating System

You can uninstall the Nytro Storage Manager software through the **Control Panel**, the **Command Prompt**, or the **Nytro Storage Manager Uninstallation Utility**.

Uninstalling the Nytro Storage Manager Software through the Control Panel:

1. Select **Add/Remove Programs** from the **Control Panel**.
2. Select Nytro Storage Manager from the list of the **Add/Remove Programs** dialog.
3. Click **Remove**.

2.9.2 Uninstalling the Nytro Storage Manager Software on the VMware Operating System

To uninstall the *Server Component* of the Nytro Storage Manager software on the VMware operating system, use either the `Uninstall` command in the **Program** menu, or run the `/usr/local/Nytro Storage Manager/uninstaller.sh` script.

Remember these points:

- The Nytro Storage Manager software upgrade is supported in this release. Future releases can update this release.
- The Linux RPM of the Nytro Storage Manager software functions under the console with minimum changes.

2.9.3 Uninstalling the Nytro Storage Manager Software on the Linux Operating System

To uninstall the Nytro Storage Manager software on the Linux operating system, perform these steps:

1. Stop the Nytro Storage Framework Manager by running the `/etc/init.d/nsmframeworkd` command and close the GUI.
2. Go to the `/usr/local/seagate/Nytro Storage Manager/` directory.
3. Run the `./uninstaller.sh` command.

2.9.4 Uninstalling the Nytro CLI on the Linux Operating System

To uninstall the Nytro CLI on the Linux operating system, run the `rpm -e <nytrocli-x.xx-x>` command.

2.9.5 Uninstalling the Nytro CLI on the Windows Operating System

To uninstall the Nytro CLI on the Windows operating system, delete the `nytrocli.exe` file from the location where it was copied.

2.9.6 Uninstalling the Nytro CLI on the VMware Operating System

To uninstall the Nytro CLI on the VMware operating system, use the `vib remove` command.

2.10 Accessing the Support Utilities

The section describes how to access the utilities, such as the Nytro Storage Manager software and the Nytro CLI.

2.10.1 Accessing the Nytro Storage Manager Software

You must have administrative privileges to use the Nytro Storage Manager software in either full access mode or in View Only mode. Perform these steps to start the Nytro Storage Manager software on various platforms.

2.10.1.1 Discovery and Login

You can start the Nytro Storage Manager software from a remote Windows or Linux machine that has the Nytro Storage Manager software installed in complete mode. When the program starts, the **Select Server** dialog appears. The remote servers are displayed with their IP addresses, operating system, and health status.If you do a local mode installation, as shown in section Section 2.7.1, Installing the Nytro Storage Manager Software on the Windows Operating System, the **Select Server** dialog does not show. It directly prompts you to the **Log In** dialog as shown in the **Server Login** dialog.

The **Select Server** dialog shows an icon for each server that has the Nytro Storage Manager software is installed. The servers are color coded with the following status indicators:

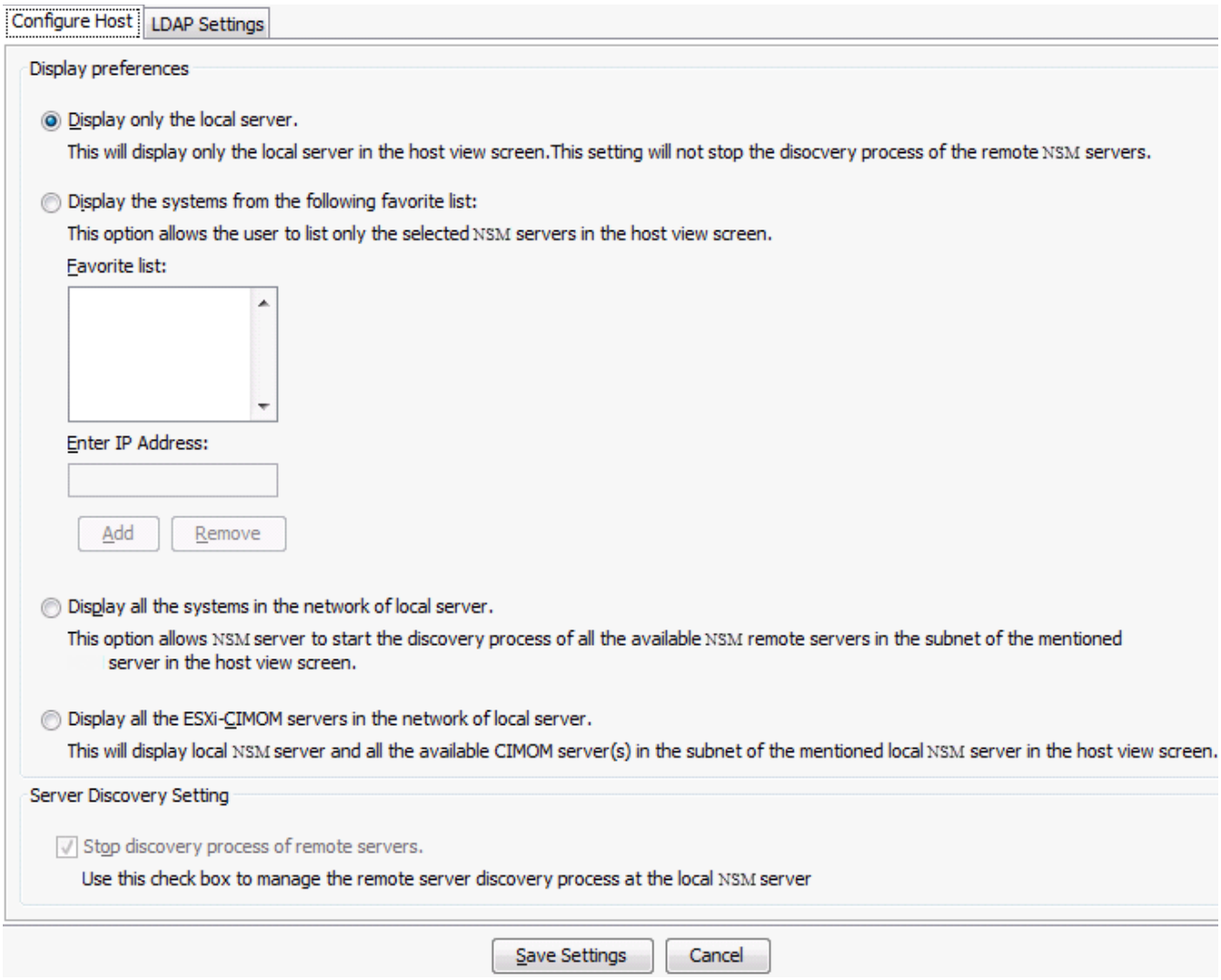
- Green: The server is operating properly.
- Red: The server storage configuration has failed.

NOTE Do not enter the VMware ESXi server's IP address in the **IP Address** field in the previous figure. Instead enter a valid Nytro Storage Manager server's IP address and select the **Display all the systems in the Network of the local server** option in the following figure.

1. Click **Configure Host** to configure the hosts.

The **Configure Host** dialog appear.

Figure 9 Configure Host



The following options can configure the host.

- **Display only the local server** – Select this option to display only the local server or the IP address server that is entered in the **Host View** dialog.
- **Display the systems from the following favorite list** – Permits you to enter IP addresses of the Nytro Storage Manager servers and discovers only those servers. You can enter an IP address in the **Enter IP Address** field and click **Add**. The server corresponding to the IP address appears in the **Favorite list**.
- **Display all of the systems in the network of local server** – Discovers all the Nytro Storage Manager servers available in the network.
- **Display all of the ESXi-CIMOM servers in the network of local server** - Discovers the local Nytro Storage Manager server and all the available ESXi servers in the network.
- Server Discovery Setting

  Select the **Stop the discovery process of the server** check box to manage the discovery of the remote server on local Nytro Storage Manager

NOTE On some Windows machines, the discovery of VMware ESXi servers fail as a result of a bug in the third-party application that is used for discovery. This is caused by one of the Windows servers in the network that contains a service called IBM® SLP SA, which gets installed along with the IBM Director. If we stop this service on all the Windows servers in the network, the Nytro Storage Manager will be able to discover all the ESXi servers.

2. Click **Save Settings** to save your setting, or on **Cancel** to quit without saving.

   If you click **Save Settings**, a confirmation dialog appears prompts you to confirm your settings. Click **OK** in the confirmation dialog to start the discovery process.

3. Select the **Stop discovery process of remote servers** check box and click on **Save Settings** to end the discovery process that has already begun. This check box is enabled only when there is an active discovery process.

   The discovery process might take very long time to complete, you can use this function to end this process.

   NOTE For the VMware ESXi, the server icon does not denote the health of the server. The icon is always green regardless of the health of the system. The VMware server does not show the system health and the operating system labels. It shows only the host name and the IP address of the server. When connecting to a VMware server on a different subnet, one or more frameworks have to be running in the subnet to connect to the CIMOM.

   The ESXi server appears in the list of found hosts in the **Select Server** dialog.

4. Double-click the icon of the server that you want to access.

   The **Server Login** dialog appears.

5. Enter the root account name and password of the host in the **User Name** and **Password** fields, respectively.

   NOTE In the **User Name** field, you can also enter the domain name along with the user name. An example is, `Seagate\abc`, *Seagate* is the domain name and *abc* is the user name.

   The question mark icon opens a dialog box that explains what you need for full access to the server and for view-only access to the server. You are permitted three attempts to Log in.

   NOTE When connected to VMware operating system, the **Server Login** dialog shows only one label for access, Full Access. Multiple users can have full access to the VMware server.

6. Select an access mode from the drop-down menu for **Login Mode**, and click **Login**.

   Select **Full Access** if you want to both view and change the current configuration.

   Select **View Only** if you want to only view and monitor the current configuration.

   NOTE If the computer is networked, this login is for the computer itself, not the network login.

   Enter the root or administrator user name and password to use Full Access mode.

   NOTE In Linux, users belonging to the root group can log in. You do not have to be the user root.

   If your user name and password are correct for the Login mode you have chosen, the Nytro Storage Manager main menu appears.

2.10.1.2 LDAP Support

The Nytro Storage Manager software supports the discovery of remote Nytro Storage Managers servers using LDAP. To enable LDAP support, the Nytro Storage Manager servers must be registered with the LDAP server.

NOTE ESXi servers are not discovered during LDAP discovery.

To register the Nytro Storage Manager servers with the LDAP server, define a new attribute, `ou`, on the machine on which the LDAP server is configured, and give this attribute the value Nytro Storage Manager. This registration enables the discovery of only the Nytro Storage Manager servers that have been registered with the LDAP server.

To use LDAP support, follow these steps:

1. Double-click the Nytro Storage Manager software shortcut icon on your desktop.

   The **Select Server** dialog appears.
2. Select the **Use LDAP Login** check box, and click **Discover Host**.

   All the Nytro Storage Manager servers registered with the LDAP server are displayed in the **Remote servers** box.

   NOTE If the **Use LDAP Login** check box is selected, the **IP Address** field is disabled.
3. Click on a server link to connect to the LDAP server.

   NOTE Based on the privileges allotted to you, the Nytro Storage Manager servers are launched with full access rights or read-only rights.

   If you have selected the **Do not prompt for credentials when connecting to LDAP** check box (in the LDAP **Settings** tab in the **Configure Host** dialog), you are directly connected to the LDAP server; otherwise, the **LDAP Login** dialog appears.

Follow these steps to enter the LDAP login details:

1. Enter the IP address of the LDAP server in the **LDAP Server IP Address** field.
2. Enter the LDAP server's user name and password in the **User Name** and **Password** fields, respectively. An example of a user name can be `username@testldap.com`.
3. Enter the name of the Domain XP6500 card in the **Distinguished Name** field. As an example, the Domain XP6500 card name can be `dc=TESTLDAP, dc=com`.

   NOTE The **LDAP Server IP Address**, **User Name**, **Password**, and **Distinguished Name** fields are already populated if their corresponding values have been stored in the LDAP Settings tab in the **Configure Host** dialog.
4. Perform one of these actions:
   a. To use the default port number, select the **Use Default Port** check box. The default port number, 389, appears in the **Port** field.
   b. To use the default port number, uncheck the **Use Default Port** check box, and enter a port number in the **Port** field.
5. Select the **Remember my Login Details** check box if you want to save all the values entered in this dialog in the LDAP Settings tab in the **Configure Host** dialog.
6. Click **Login** to log in to the LDAP server.

2.10.1.3 Configuring LDAP Support Settings

To configure settings for LDAP support, follow these steps:

1. Navigate to the **Configure Host** dialog, and click the LDAP Settings tab.

   The **Configure Host LDAP** dialog appears.
2. Select the **Use LDAP login as default login mode** check box to always connect to the LDAP server.
3. Select the **Do not prompt for credentials when connecting to LDAP** check box if you do not want the LDAP Login dialog to appear when connecting to the LDAP server.
4. Enter the IP address of the LDAP server in the **IP Address** field.
5. Enter the port number in the **Port** field.
6. Enter the name of the Domain XP6500 card in the **Distinguished Name** field.
7. Enter the user name and password for logging into the LDAP server in the **User Name** and **Password** fields, respectively.
8. Click **Save Settings** to save all the values entered in the fields in the `nsm.properties` file.

2.10.2 Accessing the HII Configuration Utility

To access the HII configuration utility, boot into the EFI BIOS mode.

The main **HII Configuration Utility** dialog appears.

NOTE On systems that do not have the USB PS2 port, you must enable **port 60/64 emulation** in the System BIOS to emulate USB as PS2. If this option is disabled on this system, the HII utility does not work.

2.10.3 Accessing the Ctrl-R Utility

When you boot the system, perform the following steps to access the Ctrl-R utility:

1. When the host computer is booting, press and hold the Ctrl key, and press the R key when the following text appears on the dialog:

   ```
   Copyright© Seagate Technology LLC
   Press <Ctrl><R> for Ctrl-R
   ```
2. Based on the XP6500 cards on the system, one of the two following scenarios occurs:
   - If the system has multiple XP6500 cards, a XP6500 card selection dialog appears. Select a XP6500 card and press **Enter**. The Ctrl-R utility main menu screen appears.
   - If the system has only one XP6500 card, the Ctrl-R utility main menu screen appears.

2.10.4 Exiting the Ctrl-R Utility

To exit the Ctrl-R utility, perform these steps:

1. Perform one of these actions:
   - If you are not in a dialog, press Esc once.
   - If you are in a dialog, press Esc twice (once to exit the dialog, and the second time to exit the utility).

   A confirmation message box appears.
2. Press **OK** to exit the utility.

2.10.5 Accessing the Nytro CLI

2.10.5.1 Accessing the Nytro CLI on the Windows Platform

To access the Nytro CLI on the Windows platform, run the `nytrocli64.exe` file.

2.10.5.2 Accessing the Nytro CLI on the Linux Platform

- To access the Nytro CLI on the Linux platform, copy the `nytrocli64` binary file into any folder, and run the binary file.
- If the Linux RPM is provided, the `nytrocli64` binary file is stalled in the `/opt/seagate/nytrocli64` directory.

Chapter 3: Managing the Nytro XP6500 Card

CAUTION XP6500 card optimizations are not supported on a Write Through VD. To get the XP6500 card optimizations, install the latest version of Nytro driver (visit the http://www.seagate.com/products/solid-state-flash-storage/accelerator-cards/ website). If host is installed with the Nytro driver that does not support the XP6500 card, all of the I/Os operate in a slow mode.

You must be logged on to a server with administrator privileges to create or modify a storage configuration. The XP6500 card supports only RAID 0.

You can manage a storage configuration by using these utilities:

- Chapter 4: Ctrl-R Utility
- Chapter 5: Human Interface Infrastructure Utility
- Chapter 6: Nytro Command Line
- Chapter 7: Nytro Storage Manager Software

3.1 Auto Configuration

When the users buy the Nytro XP6500 card, the Nytro XP6500 Modules have a default configuration that is in one single drive group, and, by default, a single virtual drive is created with RAID 0, from this single drive group. The Nytro drive group (a drive group is a group of physical drives) is created by default when you install a Nytro XP6500 card for the first time.

3.2 Virtual Drive Properties

This section explains the virtual drive properties.

- **RAID 0**
  - **Stripe Size**: The strip size is the portion of a stripe that resides on a single drive in the drive group. The stripe consists of the data segments that the XP6500 card writes across multiple drives, not including parity drives. The strip size is set to 256 KB only.
  - **Access Policy**: Select the type of data access that is allowed for this virtual drive.
    - **RW**: Permit read/write access. This is the default.
    - **Read Only**: Permit read-only access.
    - **Blocked**: Do not permit access.
  - **Read Policy**: Specify the read policy for this virtual drive.
    - **No Read Ahead**: This option disables the read ahead capability. This option is the default.
    - **Write Through**: In Write Through mode, the XP6500 card sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.
    - **Write Back with BBU**: This mode is selected by default if the SuperCap is optimal. The XP6500 card firmware automatically switches over to Write Through mode if it detects a bad or missing SuperCap.
  - **I/O Policy**: The I/O policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.
    - **Direct**: In Direct I/O mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This option is the default setting.

Chapter 4: Ctrl-R Utility

This chapter describes the Ctrl-R utility, a BIOS configuration utility, that lets you manage the RAID configurations on the Seagate XP6500 card. You can configure the drive groups and drives on the system before installing the operating system.

The Ctrl-R utility resides in the XP6500 card BIOS and operates independently of the operating system. You can use the Ctrl-R utility to initialize virtual drives.

NOTE This chapter provides examples of the figures/screen shots that appear in the GUI windows to help you better understand the flow of the operations.

4.1 Ctrl-R Utility Keystrokes

The following table lists the keystrokes that you can use in the Ctrl-R utility to navigate between the screens.

Table 4 Ctrl-R Utility Keystrokes

Keystroke	Action
F1	Displays help for the particular screen that you are in.
F2	Displays a list of commands that can be performed for the selected device. This key stroke is available only in the VD Mgmt. The commands that are enabled are highlighted in white and the disabled commands are highlighted in black. **CAUTION** Based on the configurations that are permitted on your XP6500 card, the commands are enabled or disabled.
F5	Refreshes the screen that you currently are in.
F11	Switches between XP6500 cards.
F12	Displays a list of all the available XP6500 card. You can also scroll to the next XP6500 card.
<Ctrl><N>	Displays the next menu screen.
<Ctrl><P>	Displays the previous menu screen
<Ctrl><S>	Shortcut key for the **Apply** button in the **Card Settings** dialog.
<Tab>	Moves the cursor to the next control.
<Shift><Tab>	Moves the cursor to the previous control on a screen or a dialog.
<Enter>	Lets you to select a menu item, a button, a check box, or values in a list box.
<Esc>	Closes a screen or a window. Press Esc twice to exit from the Ctrl-R utility.
Up Arrow	Moves the cursor to the next menu selection.
Down Arrow	Moves the cursor to the lower menu items or to a lower level menu.
Right Arrow	Opens a submenu, moves from a menu heading to the first submenu, or moves to the first item in a submenu. The right arrow also closes a menu list in a pop-up window.
Left Arrow	Closes a submenu, moves from a menu item to the menu heading or moves from a sub menu to a higher level menu.
Spacebar	Lets you select a menu item, a button, or a check box.

4.2 Ctrl-R Utility Menus

The Ctrl-R utility contains the following menus:

- VD Mgmt (Virtual Drive management)
- PD Mgmt (Physical Drive management)
- Ctrl Mgmt (XP6500 Card management)
- Properties (XP6500 Card properties)

4.3 XP6500 Card Selection

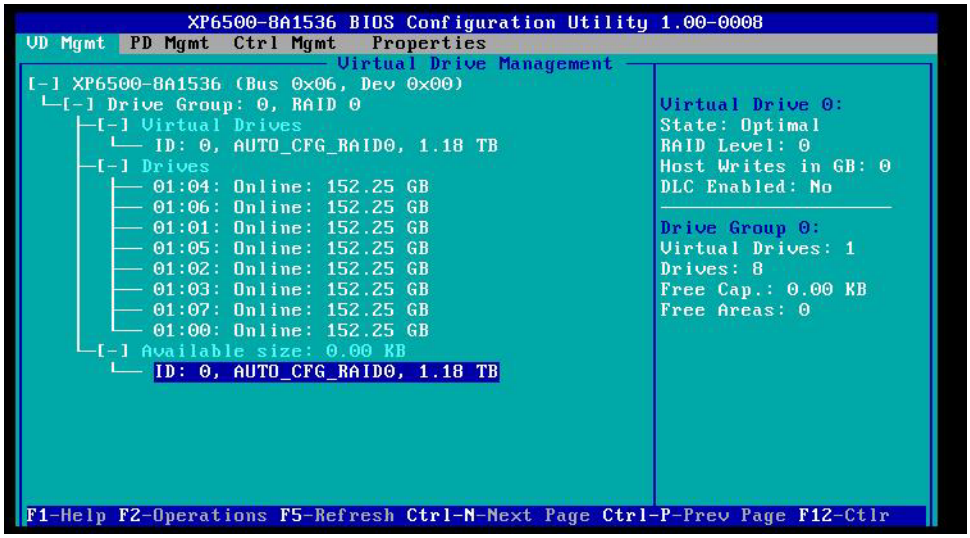
If there is a single XP6500 card in the server, the Ctrl-R utility starts with the **VD Mgmt** screen. If your server has multiple XP6500 cards, the Ctrl-R utility starts with the **XP6500 Card Selection** menu. The Ctrl-R utility shows information for one Seagate XP6500 card at a time. To view the information for a different XP6500 card, press the F12 key, and select a XP6500 card from the list.

The **Card Selection** menu takes you to the VD Mgmt screen.

4.4 Virtual Drive Management Menu

The **VD Mgmt** (virtual drive management) menu is the first menu screen that appears when you start the Ctrl-R utility.

Figure 10 Virtual Drive Management



This screen shows information on the configuration of XP6500 card, drive groups, and virtual drives.

The right panel of the screen shows attributes of the selected device.

You can initialize the virtual drives in the **VD Mgmt** dialog.

NOTE Based on the XP6500 card settings that are configured, options are enabled or disabled.

4.4.1 Viewing and Changing Virtual Drive Properties

This section explains how you can use the Ctrl-R utility to view and change the properties for virtual drives and BBUs.

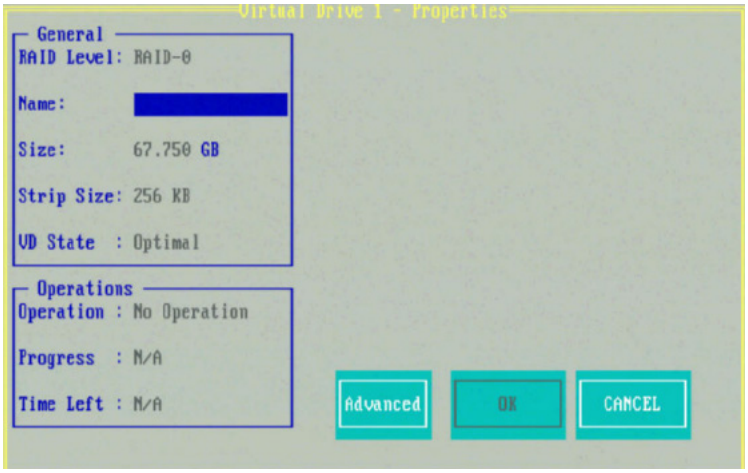
The Ctrl-R Utility shows the properties, policies, and the operations for virtual drives.

To view these items for the currently selected virtual drive and to change some of these settings, perform the following steps:

1. In the **VD Mgmt** dialog, navigate to a virtual drive, and press the F2 key.
2. Navigate to **Virtual Drive Properties** and press **Enter**.

   The **Virtual Drive Properties** dialog appears.

Figure 11 Virtual Drive Properties



The **General** box shows the virtual drive's RAID level, name, state, and strip size.

The **Operations** box lists any operation (performed on the virtual drive) in progress, along with its progress status and the time remaining for the operation to be completed.

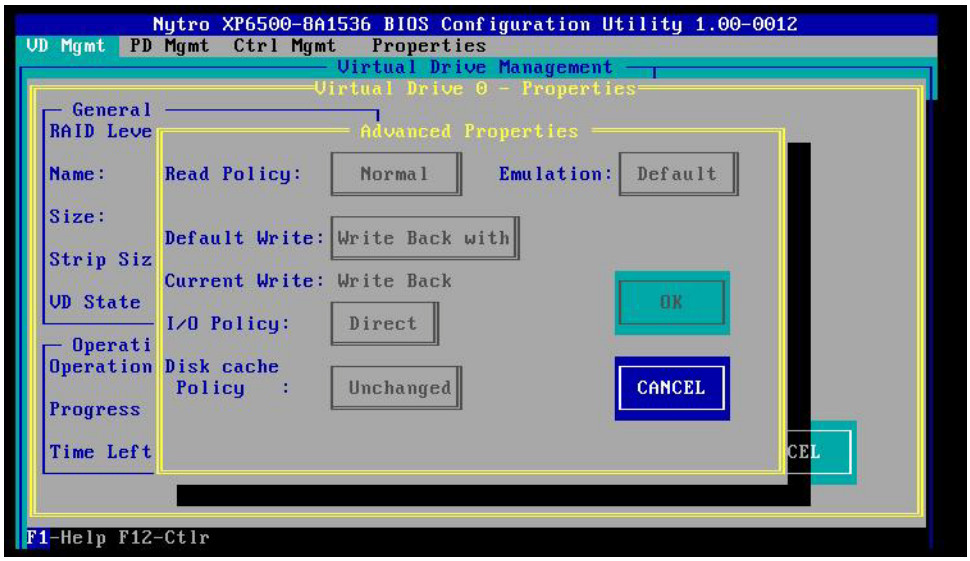
3. Change the settings for the fields that are enabled in this dialog.

   CAUTION Before you change a virtual drive configuration, back up any data on the virtual drive that you want to save, or you might lose access to that data.

4. Press **OK** to save your changes.
5. Press **Advanced** to view additional virtual drive properties.

The **Advanced Properties** dialog appears.

Figure 12 Virtual Drive Management - Advanced Properties



— You can view the virtual drive policies that were defined when the storage configuration was created.

4.4.2 Initializing a Virtual Drive

When you create a new virtual drive, the Ctrl-R utility asks whether you would like to initialize the virtual drive. If you do not want to initialize the virtual drive at that stage, you can initialize the drive later.

CAUTION When you perform a fast initialization operation, firmware deletes the VD and performs a secure erase operation on all of the drives, and then creates a new VD.

Perform the following steps to initialize a virtual drive:

1. Navigate to the **VD Mgmt** screen, navigate to a virtual drive, and press the F2 key.
2. Select **Initialization**, and press **Enter**.
   The two initialization options, **Start FGI** and **Fast Init**, appear.
3. Select one of the two options, and press **Enter**.

A confirmation dialog appears.

Figure 13 Initialize a Virtual Drive

4. Press **Yes** to begin initialization.

CAUTION Initialization erases all data on the virtual drive. Make sure to back up any data you want to keep before you initialize a virtual drive. Make sure the operating system is not installed on the virtual drive you are initializing.

4.4.3 Discarding the Preserved Cache

If the XP6500 card loses access to one or more virtual drives, the XP6500 card preserves the data from the virtual drive. This preserved cache is preserved until the cache is discarded.

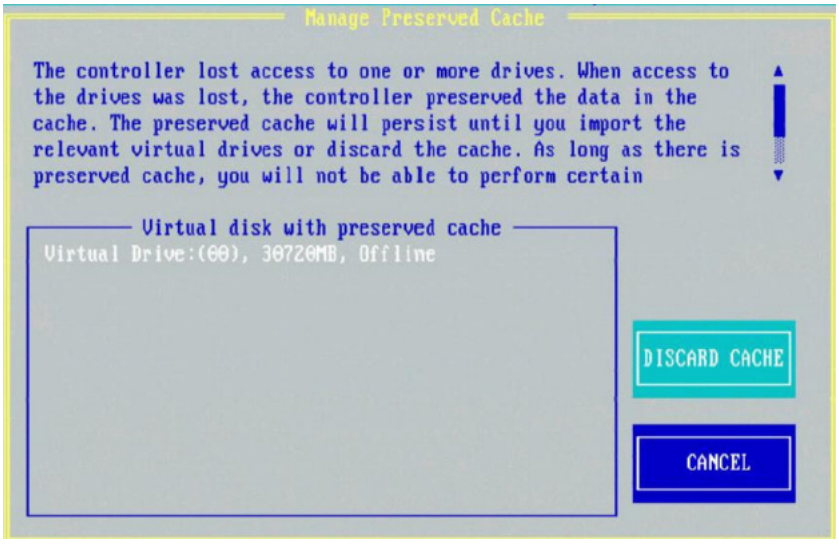
NOTE If preserved cache exists, it means that the virtual drive is offline and data in the virtual drive is no longer recoverable.
If you want to send the card for RMA, remove the cached data to make sure that data is no longer present in the XP6500 card.

Perform the following steps to discard the preserved cache:

1. In the **VD Mgmt** dialog, navigate to the XP6500 card, and press the F2 key.
2. Navigate to **Manage Preserved Cache**, and press **Enter**.

The **Manage Preserved Cache** dialog appears.

Figure 14 Manage Preserved Cache

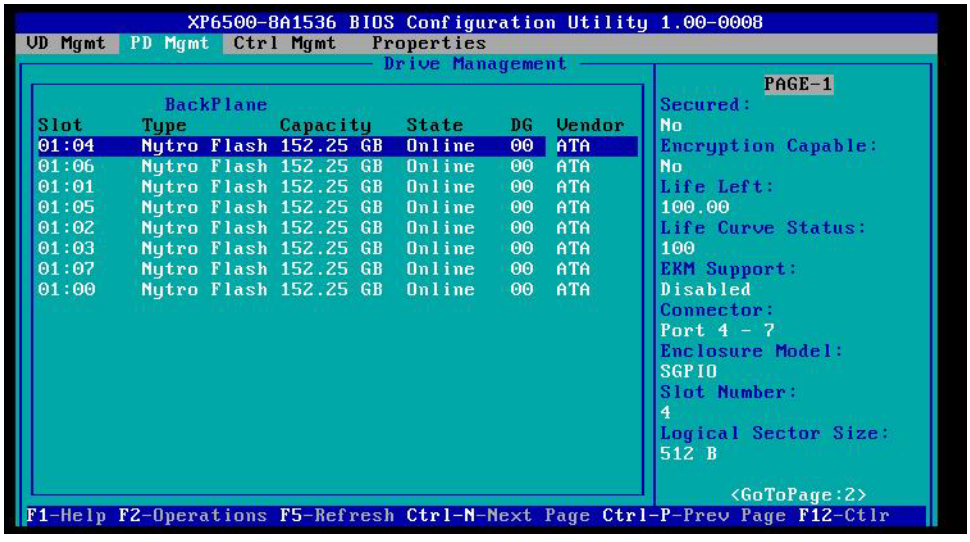


3. Press **Discard Cache** to discard the preserved cache from the virtual drive. A message box appears that prompts you to confirm your selection.
4. Press **OK** to continue.

4.5 Physical Drive Management Menu

The PD Mgmt (physical drive management) menu shows information about all of the Nytro XP6500 modules on the selected XP6500 card.

Figure 15 Physical Drive Management

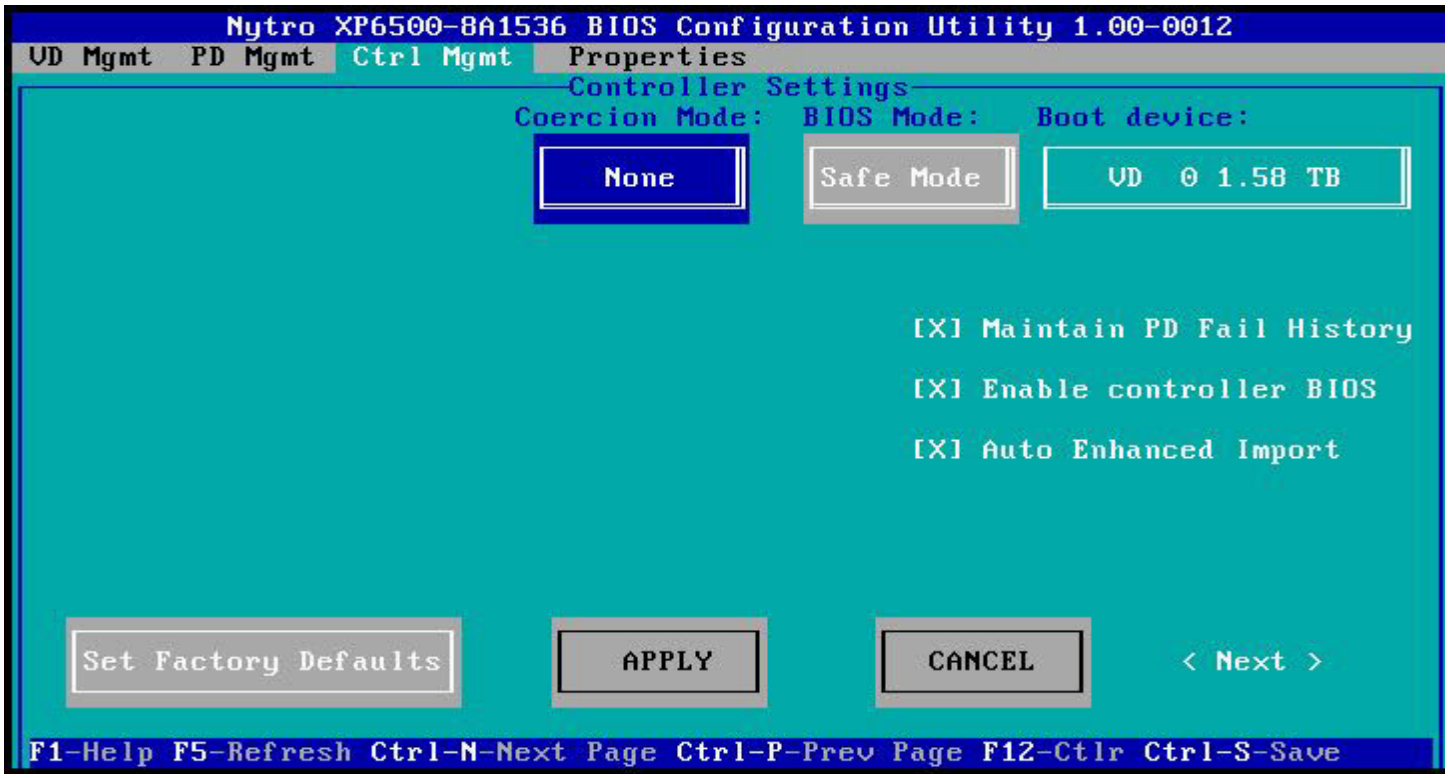


The right panel of the screen shows additional attributes of the selected device.

4.6 XP6500 Card Management Menu

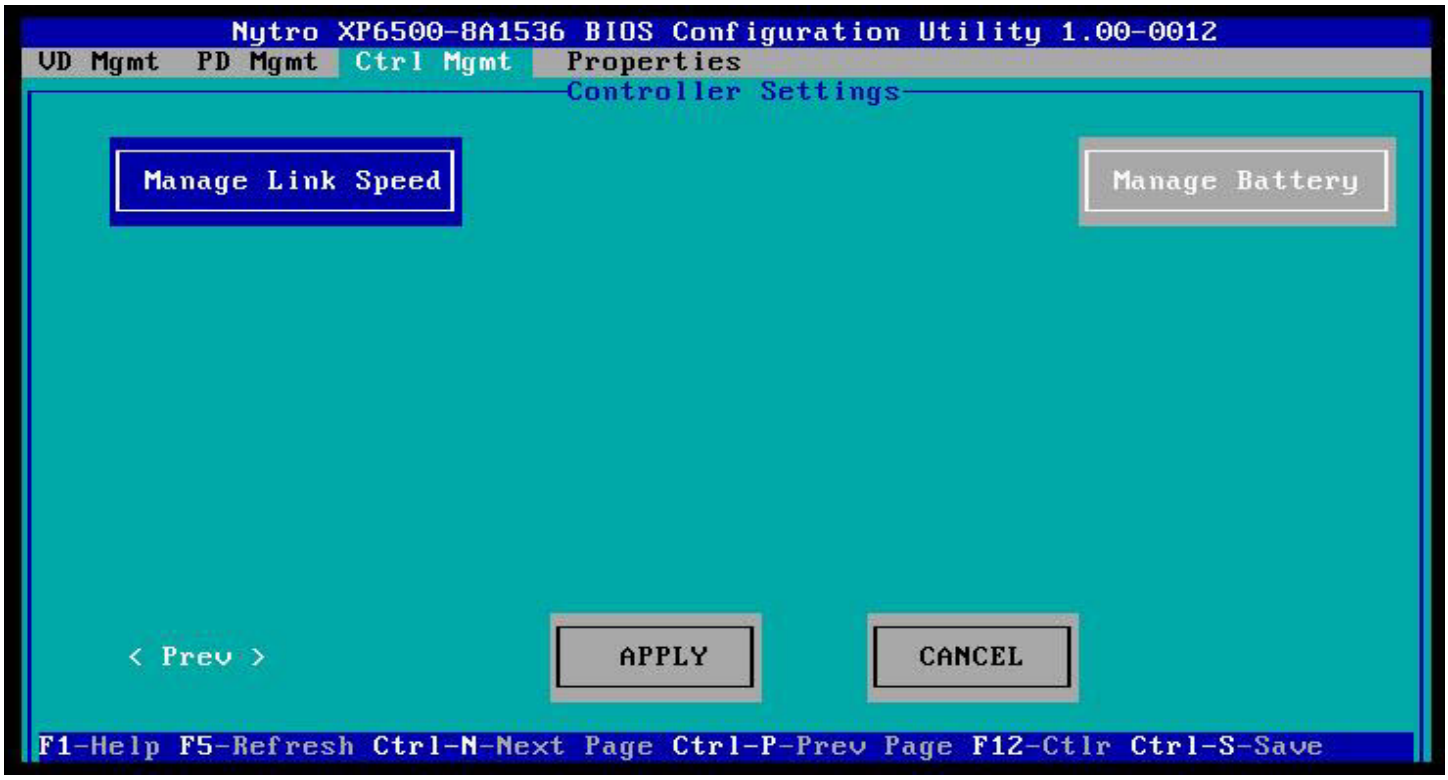
The first screen of the **Ctrl Mgmt** menu dialog, as shown in the following figure, shows the card settings, such as Set Factory Defaults and Safe Mode.

Figure 16 XP6500 Card Management Screen 1



The second screen, as shown in the following figure, shows the additional XP6500 card operations, such as managing the Battery settings.

Figure 17 XP6500 Card Management Screen 2



4.7 XP6500 Flash Card Properties

Navigate to the **Properties** menu to view the properties of the active XP6500 card. The information in the **Properties** screen is read only. Most of this information is self-explanatory. To view additional properties, navigate to **Next**, and press **Enter**.

Figure 18 XP6500 Flash Card Properties-Screen 1

To view additional properties, navigate to **Next** and press **Enter**. To go back to the previous **Properties** screen, navigate to **Prev**, and press **Enter**.

4.7.1 Managing BBU (SuperCap) Information

If your XP6500 card has a BBU (SuperCap), you can view information about it and change some settings.

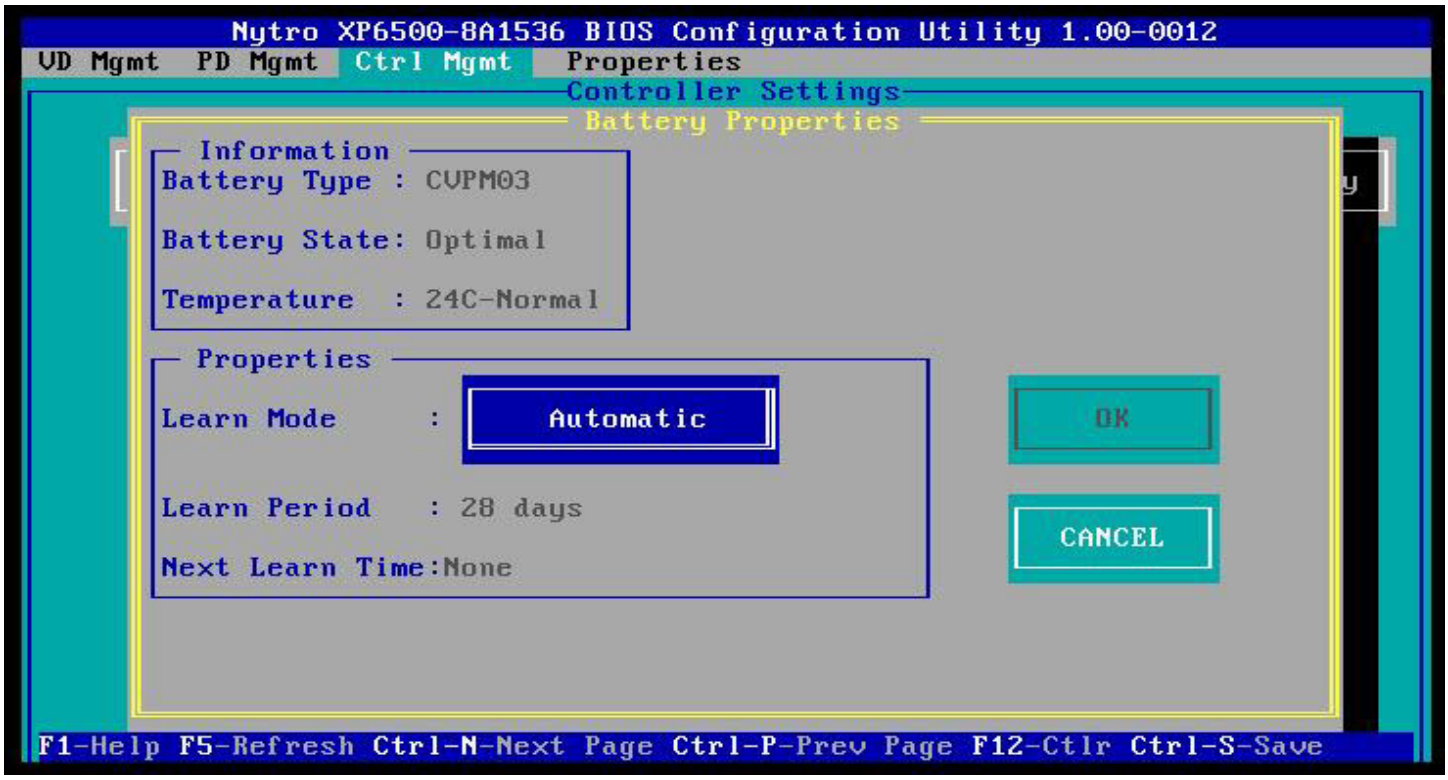
NOTE In this document, the words BBU, battery and SuperCap are used interchangeably.

A learning cycle is a battery calibration operation that the XP6500 card performs periodically to determine the condition of the battery. Perform the following steps to view and change the SuperCap settings:

1. Navigate to the second **Settings** screen and select **Manage Battery**.

The **Battery Properties** dialog appears. Most of the battery properties are read only.

Figure 19 Battery Properties



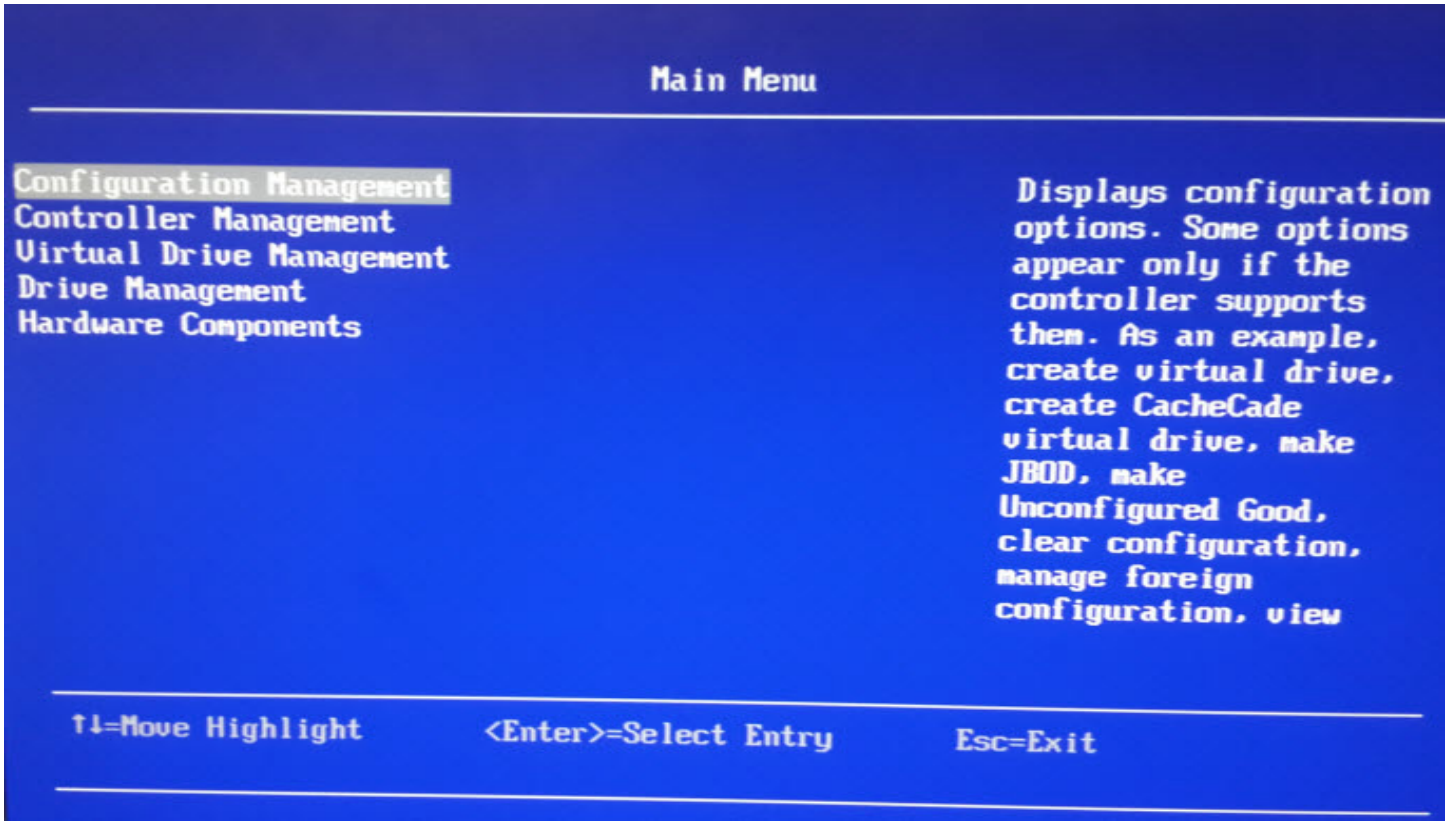
— If the **Battery State** field has a value other than **Optimal**, the **Non-Optimal Reason** field appears at the bottom of the **Battery Properties** dialog. The **Non-Optimal Reason** field is a read-only field and states a reason for the non optimal state of the battery.

2. The battery learn mode is **Automatic**, that is, firmware tracks the time since the last learning cycle and performs a learn cycle when it is due.
3. Press **OK** to accept the learn mode.

Chapter 5: Human Interface Infrastructure Utility

The HII configuration utility helps you manage XP6500 card, physical disks, and virtual disks, and perform other configuration tasks in a Preboot, Unified Extensible Firmware Interface (UEFI) environment. The Main Menu dialog lists the configuration options available as shown in the following figure.

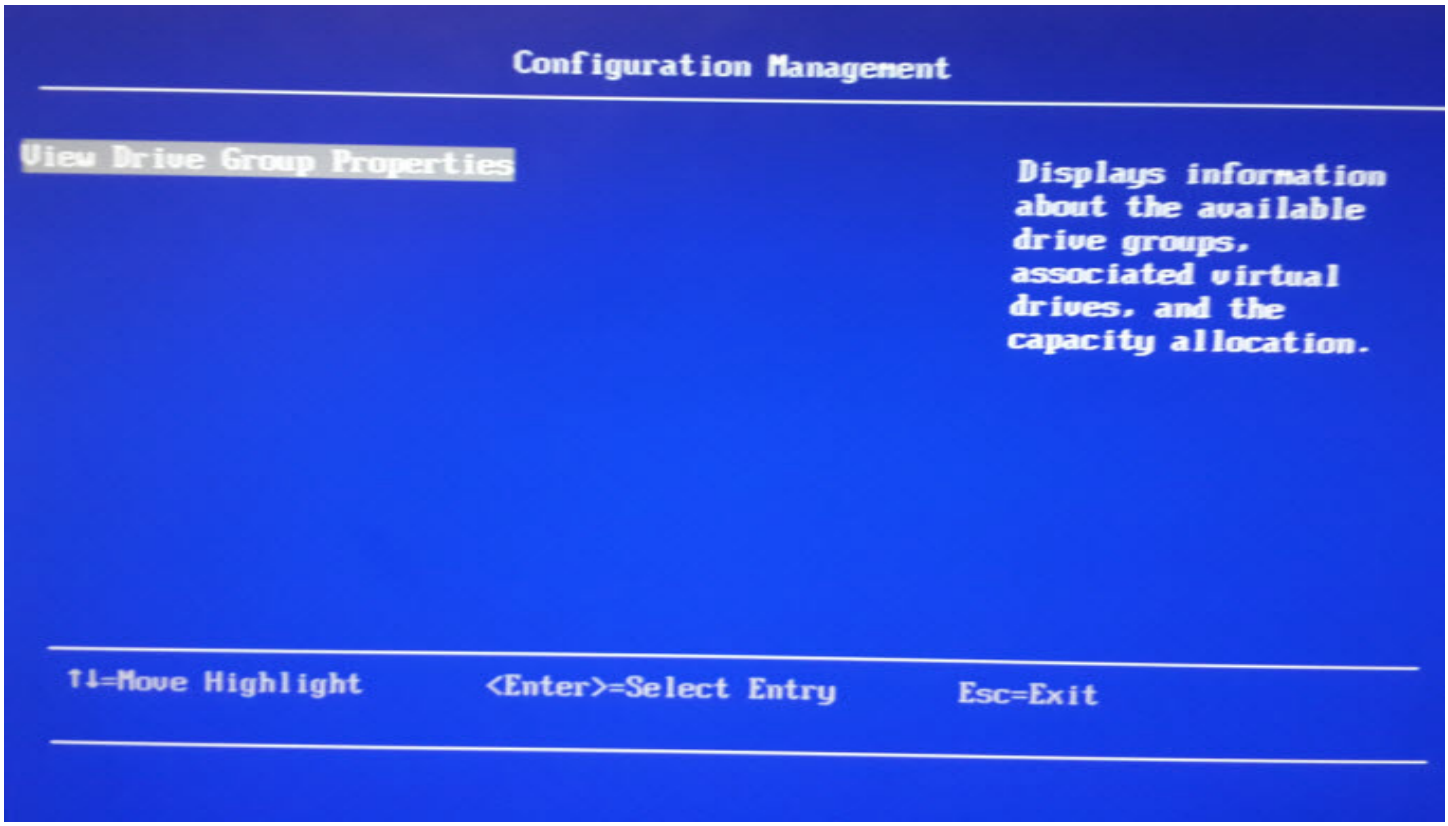
Figure 20 Main Menu



5.1 Configuration Management

When you select **Configuration Management** on the **Main Menu**, the **Configuration Management** menu appears.

Figure 21 Configuration Management



The following sections describe each of the configuration management options.

RAID 0 uses data striping on two or more drives to provide high data throughput, especially for large files in an environment that requires no data redundancy.

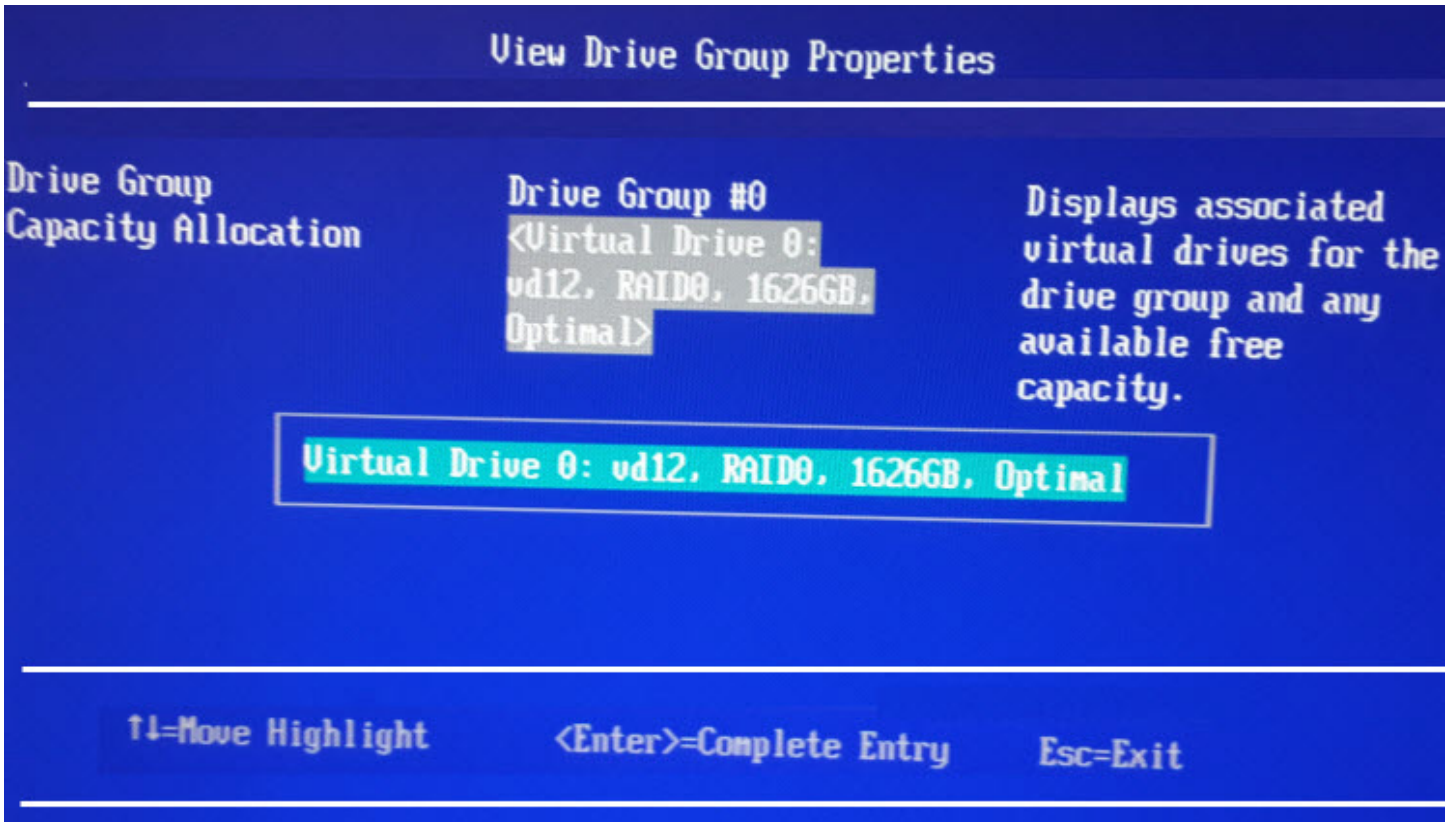
5.1.1 Viewing the Drive Group Properties

The **View Drive Group Properties** dialog appears when you select **View Drive Group Properties** from the **Configuration Management** menu.

For the XP6500 card, you can create only one virtual drive. So the drive group is a group of one virtual drive. The drive group for the XP6500 is a logical grouping of drives attached to a XP6500 card on which one virtual drive can be created. This virtual drive must be configured with the same RAID level.

The following figure shows information for one drive group.

Figure 22 Drive Group Properties



In this dialog, the Capacity Allocation entry for each drive group displays associated virtual drives for the drive group. The dialog also indicates whether the drive group is secured and protected. To see how much free space is available in the drive group, highlight a **Capacity Allocation** field, and press **Enter**. The information appears in a pop-up window.

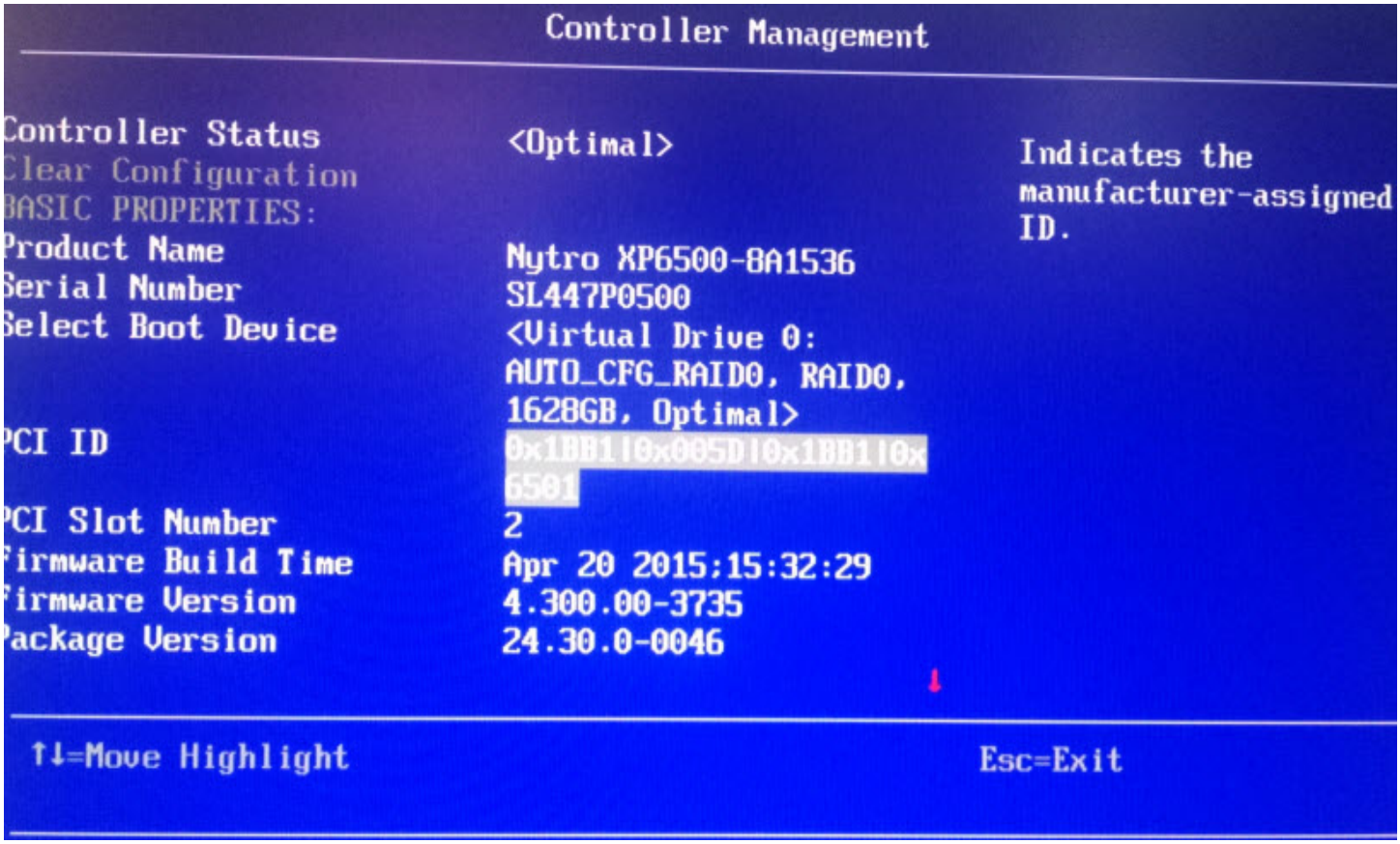
5.2 XP6500 Card Management

When you select **Controller Management** on the **Main Menu**, the following dialog appears.

The top-level **Controller Management** dialog lists the basic information about the attributes and condition of the XP6500 card.

- To reset the card to its factory settings, highlight **Set Factory Defaults** and press **Enter**.
- To select a boot device, highlight **Select Boot Device**, press **Enter**, and select the boot device from the pop-up menu.
- To view advanced card properties, highlight **Advanced** and press **Enter**.

Figure 23 XP6500 Card Management



The **Controller Management** dialog lists the following basic XP6500 card properties.

Table 5 Basic XP6500 Card Properties

Property	Description
Controller Status	The cumulative status of virtual drives and physical drives connected to the card, plus the backup battery, the enclosure and the NVDATA. The status is one of the following: ■ **Optimal**, if all components are operating normally. ■ **Needs Attention**, if any component needs attention. ■ **Safe Mode**, if the card encountered critical errors. Most features are disabled and the card requires user attention.
Product Name	The marketing name of the card.
Serial Number	The serial number of the card.
Select Boot Device	This field selects the primary boot device.
PCI ID	The PCI ID of the card.
PCI Slot Number	The slot ID number of the PCI slot where the card is installed.
Firmware Build Time	The build time of the card firmware.
Firmware Version	The version number of the card firmware.
NVDATA Version	The version number of the card NVDATA.

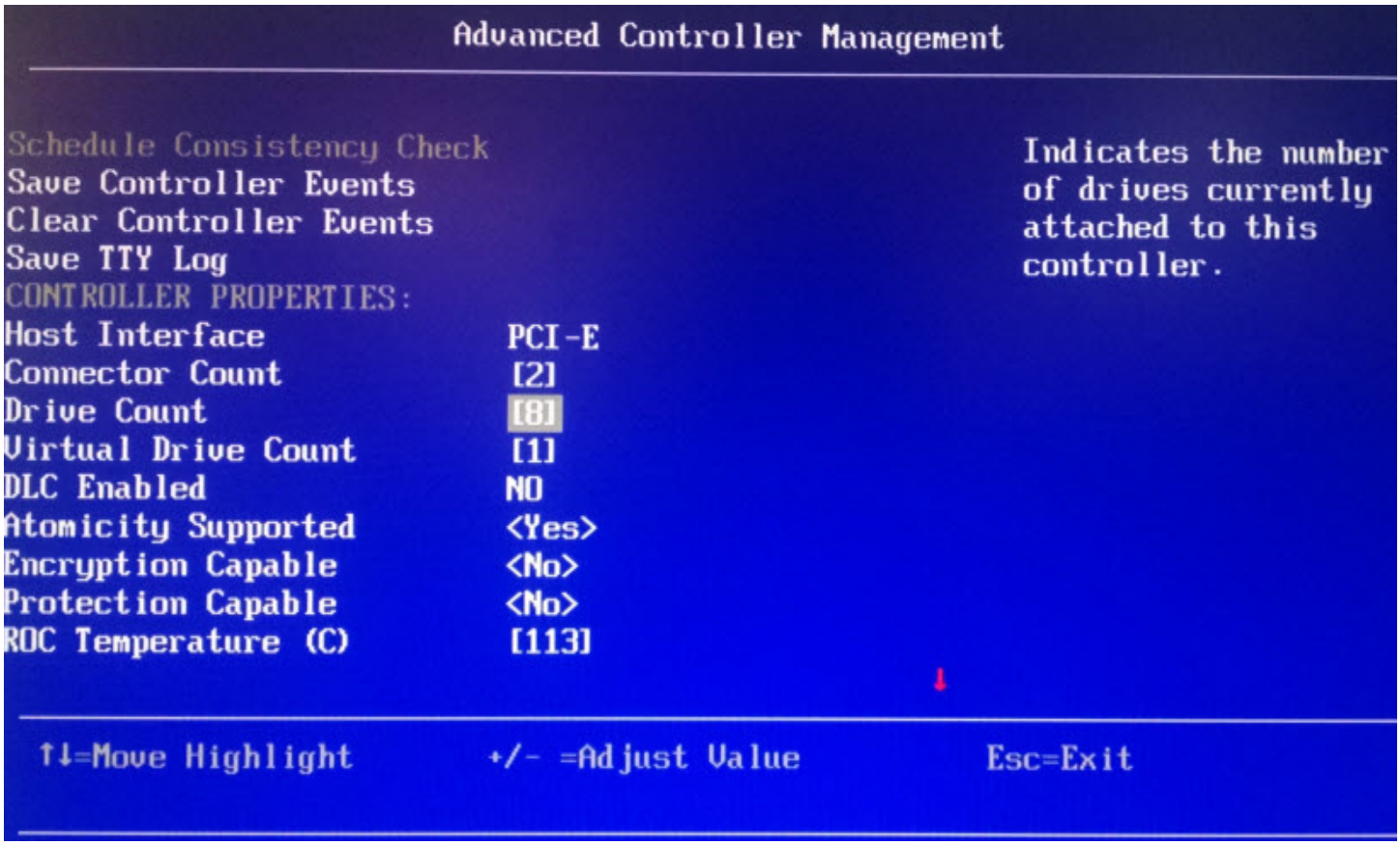
A small red arrow at the bottom of the dialog indicates that you can scroll down to view more information.

NOTE The red arrow appears when there is too much information to display in one dialog. The amount of information that can be displayed in one dialog depends upon the capabilities of the HII browser.

5.2.1 Viewing Advanced XP6500 Card Management Options

The **Advanced Controller Management** dialog lists the card properties and includes the options for performing various actions on the card.

Figure 24 Advanced XP6500 Card Management



This dialog lists numerous properties that cannot all be shown in one dialog. Scroll down to view all of the options.

NOTE The red arrow appears when there is too much information to display in one dialog. The amount of information that can be displayed in one dialog depends on the capabilities of the HII browser.

Many of the entries in this dialog are view-only, but some are selectable and configurable. Perform these steps to change any user-configurable option on this dialog.

1. Move the highlight to the value for any option and press **Enter**.

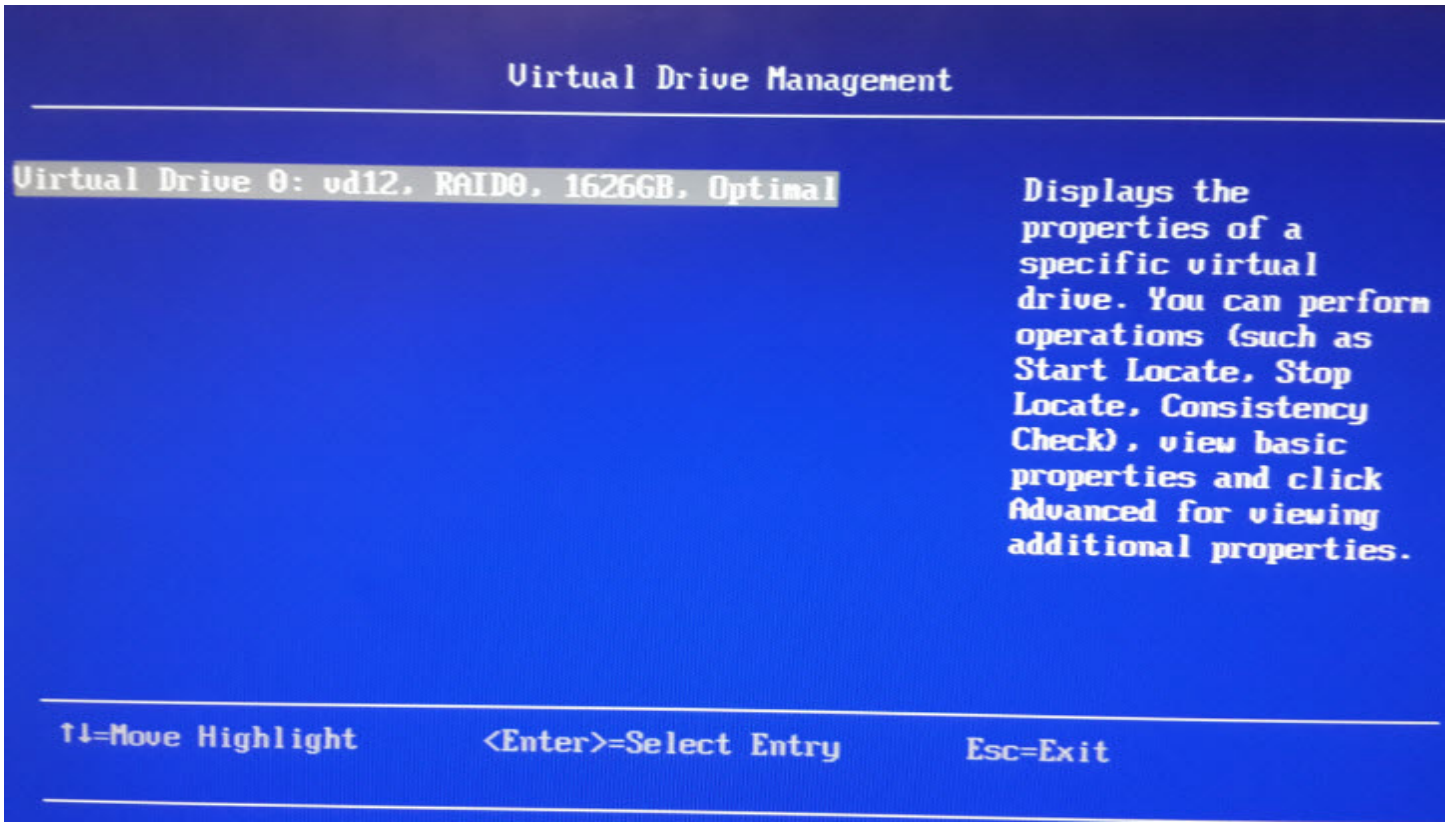
   A pop-up menu of the available options appears.
2. Highlight the value you want and press **Enter**.
3. When you finish changing the XP6500 card properties, scroll up and down on the menu as required, move the highlight to **Apply Changes** (at the bottom of the list of options), and press **Enter**.

   The changes to XP6500 card properties are applied, and a success message appears.

5.3 Virtual Drive Management

When you select **Virtual Drive Management** on the **Main Menu**. The following dialog appears.

Figure 25 Virtual Drive Management



The menu lists all the virtual drives that currently exist on the XP6500 card.

This following table lists the basic virtual drive properties listed in the dialog.

Table 6 Basic Virtual Drive Properties

Property	Description
Name	The name assigned to the virtual drive. To assign a name or to change the name, highlight the field, press **Enter**, and type the new name in the pop-up window.
RAID Level	The RAID level of the virtual drive.
Status	The current status of the virtual drive.
Size	The capacity of the virtual drive, in MB or GB.

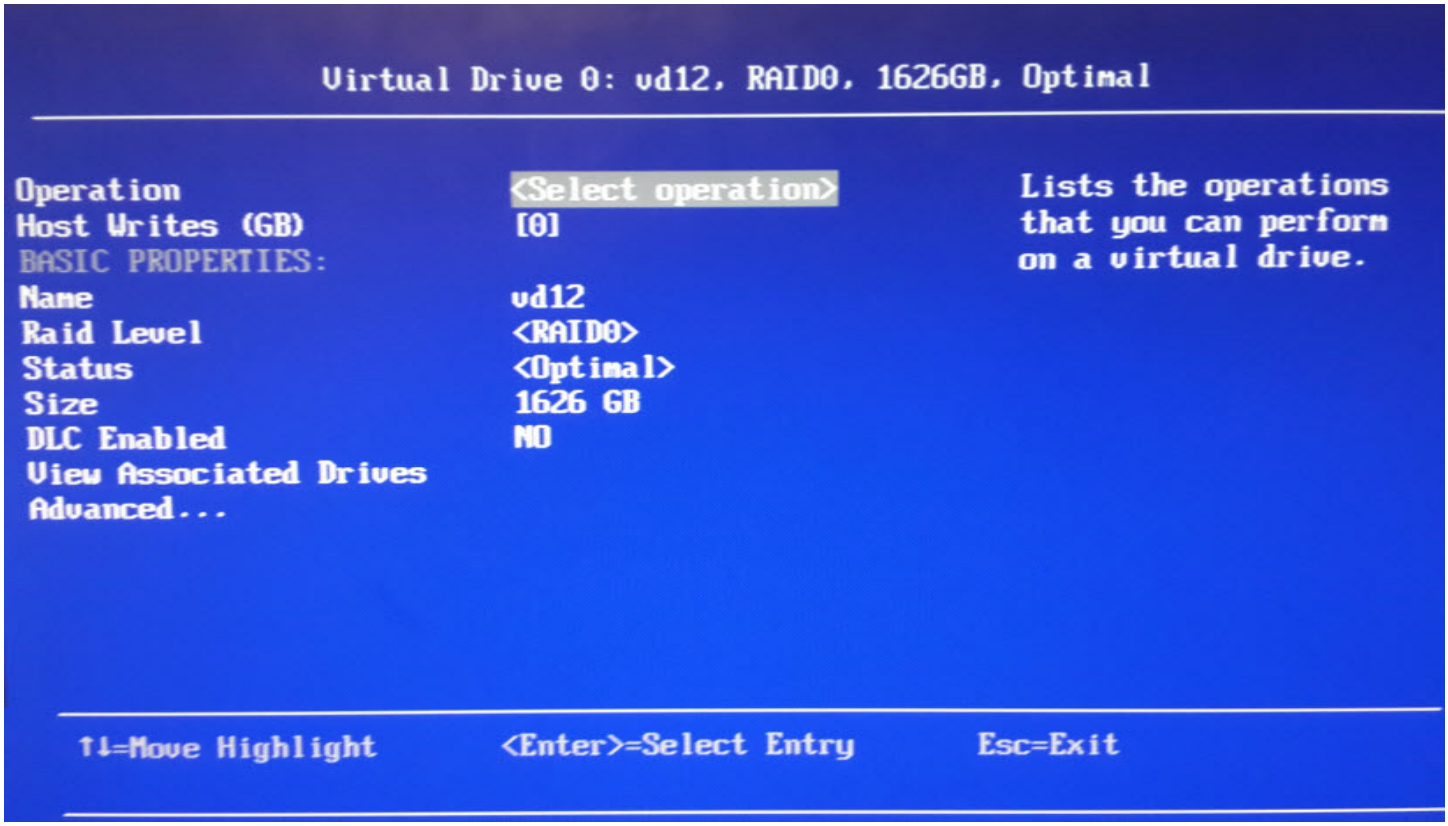
5.3.1 Virtual Drive Operations

This section describes the virtual drive operations supported.

5.3.1.1 Viewing the Virtual Drive Properties

Highlight the virtual drive you want to manage and press **Enter**. The VD properties for the selected VD appears.

Figure 26 Virtual Drive Properties



5.3.1.2 Initializing a Virtual Drive

NOTE When you perform a fast initialization operation, firmware deletes the VD and performs a secure erase operation on all of the drives, and then creates a new VD.

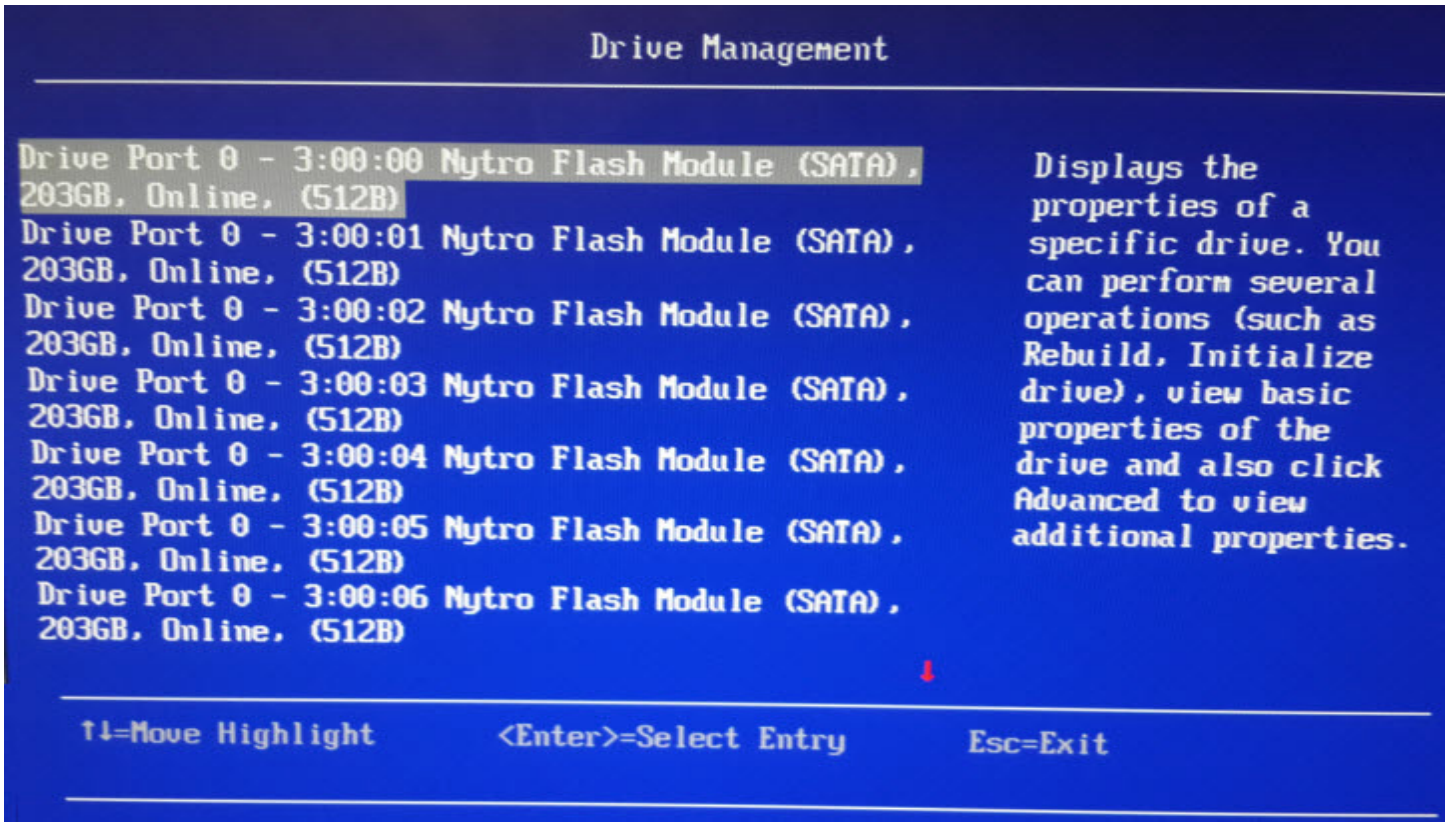
NOTE All data on the virtual drive is lost when you initialize it. Before you start this operation, back up any data that you want to keep.

1. Highlight **Fast Initialization** on the pop-up menu and press **Enter**.
   A fast initialization overwrites the first and last 8 MB of the virtual drive, clearing any boot records or partition information.
2. Highlight the word **Go** that appears beneath **Operation** and press **Enter**.
   The **Initialize Virtual Drive Warning** dialog appears.
3. Highlight **Confirm** and press the spacebar to confirm the operation, then highlight **Yes** and press **Enter**.
   The initialization process begins on the virtual drive.

5.4 Drive Management

When you select **Drive Management** on the **Main Menu**, the **Drive Management** dialog appears.

Figure 27 Drive Management



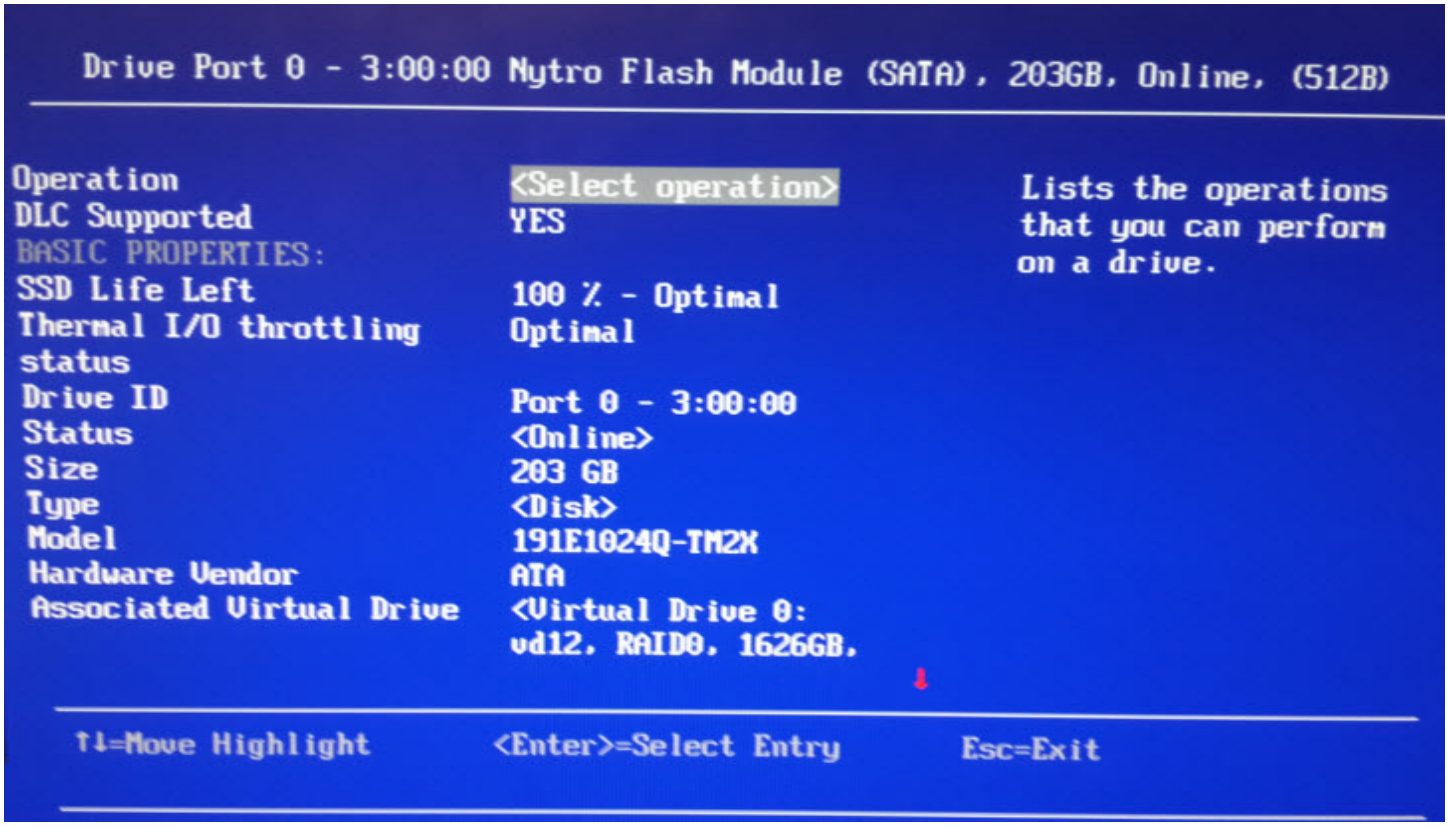
The menu lists all the physical drives that are connected to the XP6500 card. Highlight the drive you want to manage and press **Enter**.

The following table provides the basic drive properties for the selected drive, as shown in the following figure.

Table 7 Basic Physical Drive Properties

Property	Description
Drive ID	The ID of the currently selected drive. The format of the ID is **Connector: Port wired order: Slot**.
Status	The status of the drive, such as **Online**, **Ready**, **Available**, or **Failed**.
Size	The drive capacity, in GB.
Type	The device type of the drive, which is normally **Disk**.
Model	The model number of the drive.
Hardware Vendor	The hardware vendor of the drive.
Associated Virtual Drive	If this physical drive is currently used in a VD, this field lists information about the VD. Highlight this field and press **Enter** to view a pop-up window with additional VD information.

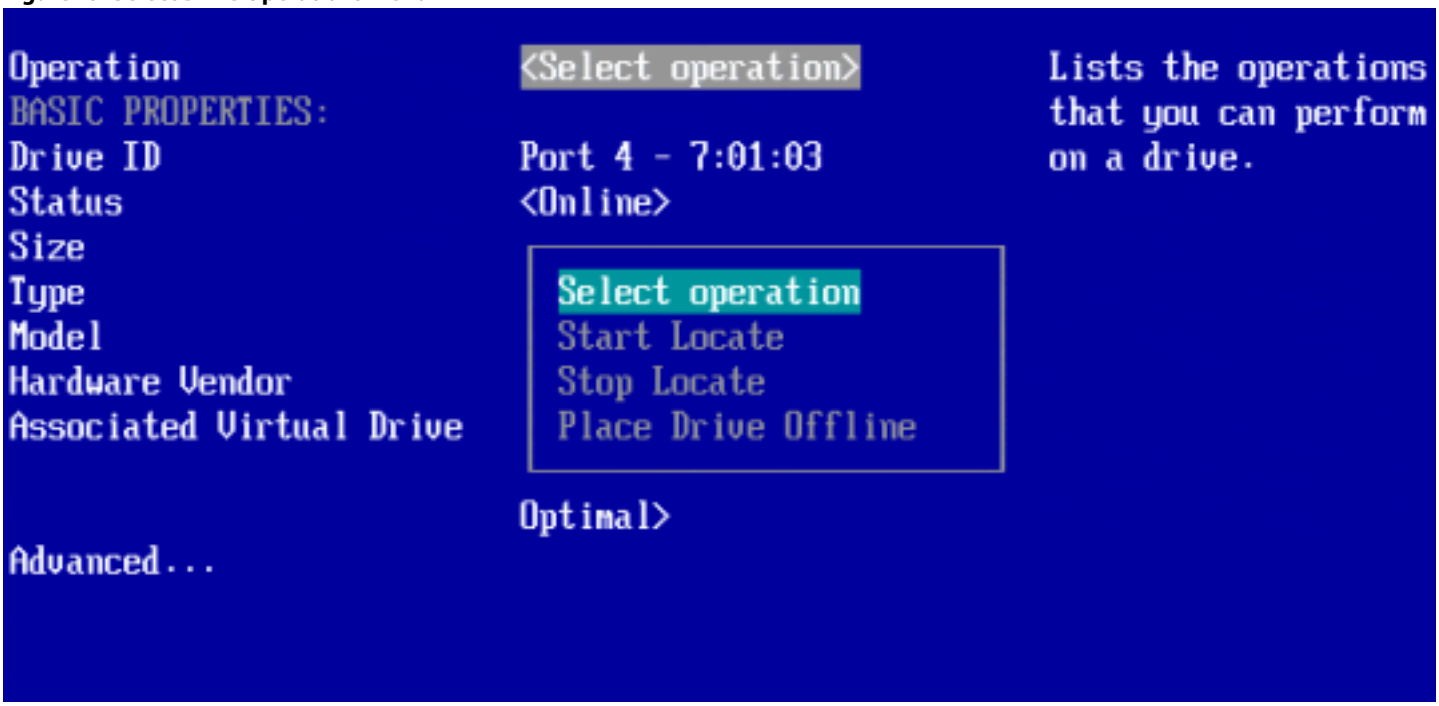
Figure 28 Drive Properties



5.4.1 Performing the Drive Operations

When you highlight the **Select operations** field, a pop-up drive operations menu appears; press **Enter**.

Figure 29 Select Drive Operations Menu



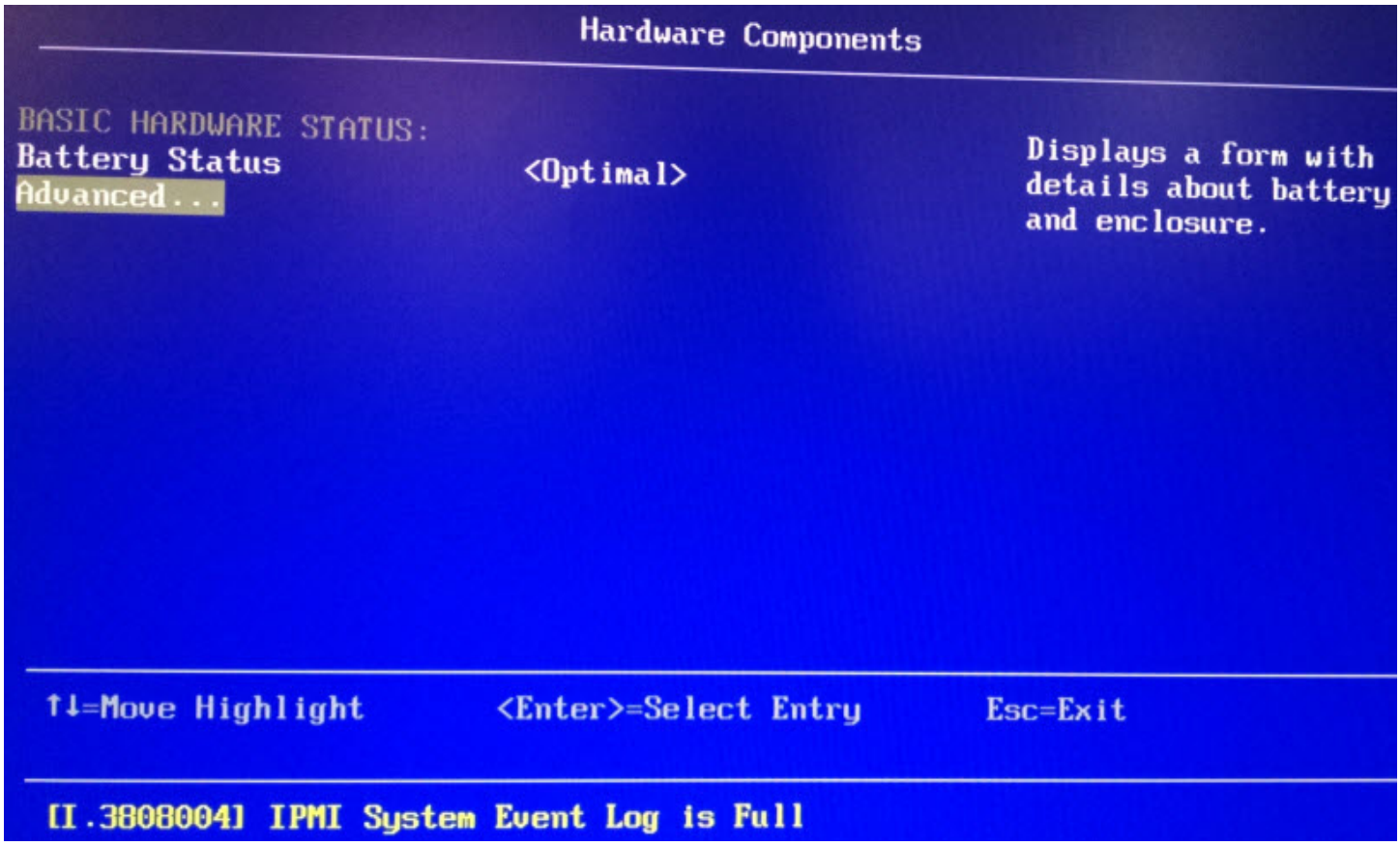
The menu options vary depending on the status of the drive, which can be Online, Offline, Unconfigured Good, and Unconfigured Bad.

NOTE The drive operations run on the currently selected drive. To run an operation on a different drive, press Esc to return to the **Drive Selection** menu, highlight the drive you that want to select, and press **Enter** to select it and return to this dialog.

5.5 Hardware Components

When you select **Hardware Components** on the **Main Menu**, the **Hardware Components** menu appears.

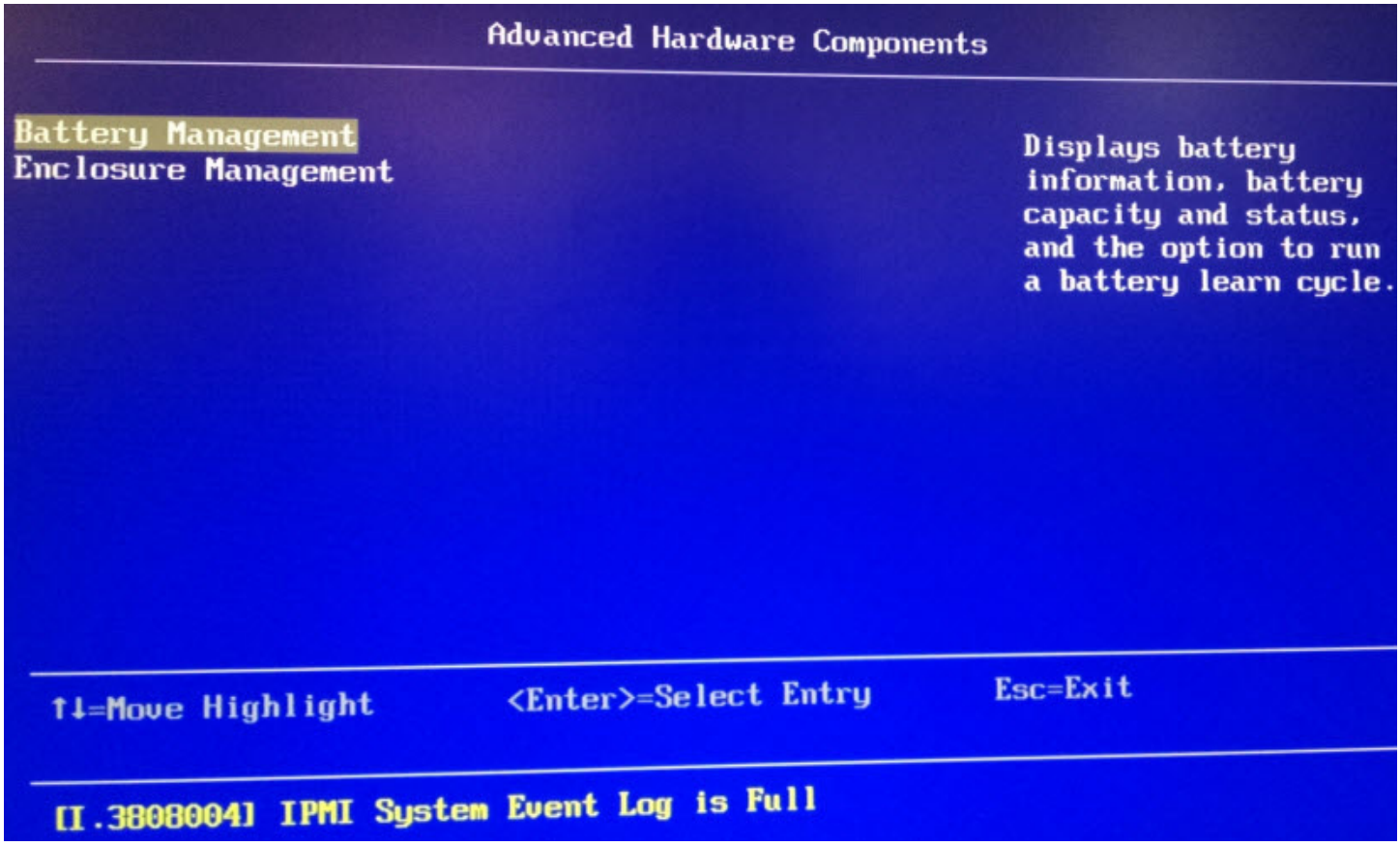
Figure 30 Hardware Components Menu



The dialog lists the status of the temperature sensors, fans, power supplies, and other hardware components, such as batteries installed in the system.

1. Select **Advanced** and press **Enter** to view more detailed information about the installed hardware components.

Figure 31 Advanced Hardware Components



2. Select **Battery Management** to view more detailed information.

5.5.1 Managing the Batteries

1. Select **Battery Management** on the **Advanced Hardware Components** menu.

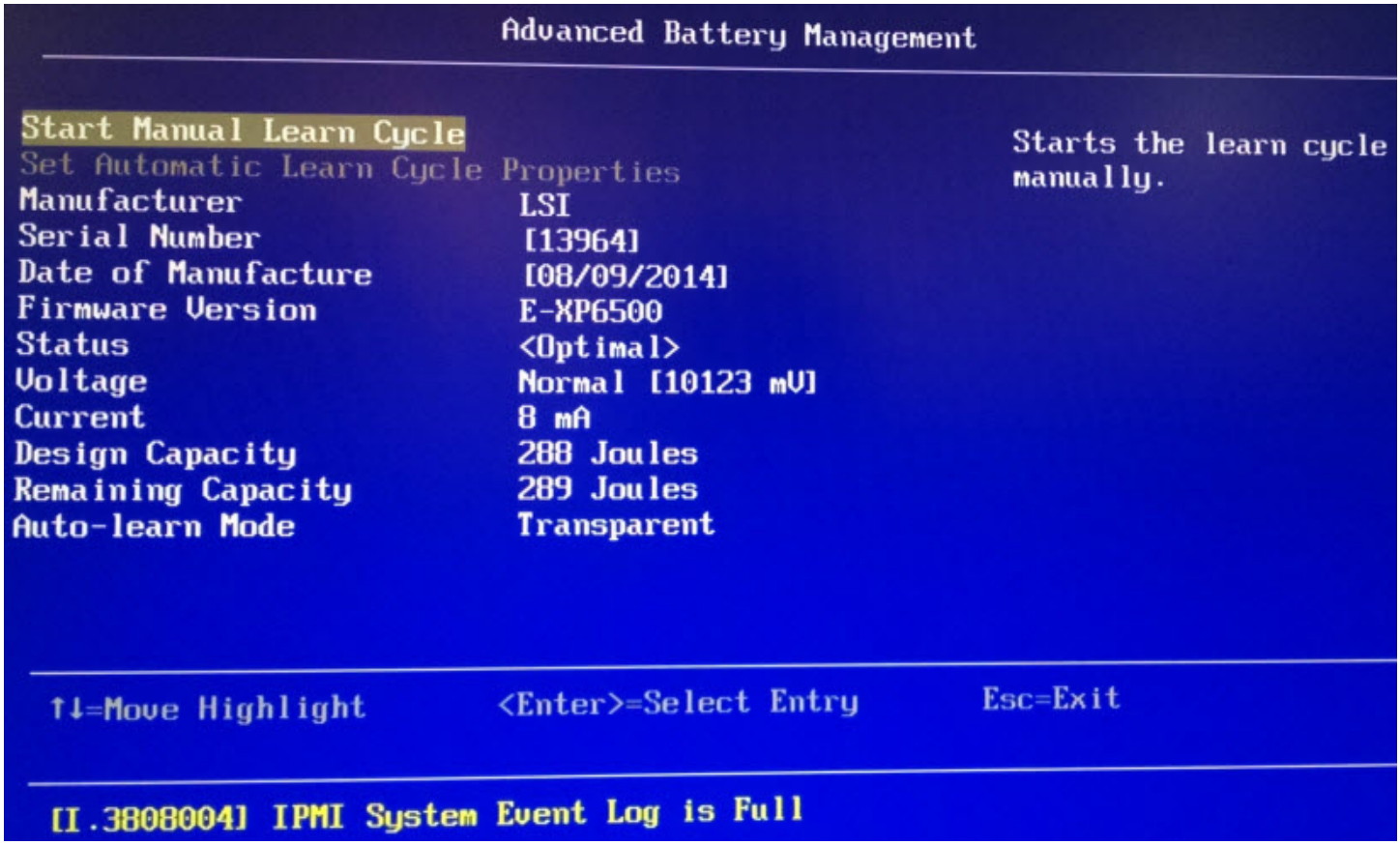
The **Advanced Battery Management** dialog appears. The following **Basic Battery Management Properties** table describes the basic battery properties.

Table 8 Basic Battery Management Properties

Property	Description
Type	Type of the battery, such as SuperCap.
Battery Status	Current status of the battery, such as **Optimal**.
Temperature	Indicates the current temperature of the battery. Also indicates whether the current temperature of the battery is normal or high.
Retention Time	This is the number of hours that the battery can support retention of data.
Capacitance	Available capacitance of the battery, stated as a percentage.

To view advanced battery properties, highlight **Advanced** and press **Enter**. The following dialog appears.

Figure 32 Advanced Battery Management



A small red arrow at the bottom of the dialog indicates that you can scroll down to view more advanced battery management properties.

NOTE The red arrow appears only when there is too much information to display in one dialog. The amount of information that can be displayed in one dialog depends on the capabilities of the HII window.

The following table describes the advanced battery properties and the other options on this dialog. Properties marked with an asterisk are user-selectable. All other properties are view only.

Table 9 Advanced Battery Properties

Property	Description
Manufacturer	Manufacturer of the battery.
Serial Number	Serial number of the battery.
Date of Manufacture	Manufacturing date of the battery.
Firmware Version	Firmware version of the battery.
Status	Status of the battery. If the status is Learning, Degraded, or Failed, a reason is listed for the status.
Voltage	Voltage level of the battery, in mV. Also indicates if the current battery voltage is normal or low.
Current	Current of the battery, in mA.
Design Capacity	Theoretical capacity of the battery.

Table 9 Advanced Battery Properties (Continued)

Property	Description
Full Capacity	Full charge capacity of the battery.
Remaining Capacity	Remaining capacity of the battery.
Auto-learn Mode	Indicates whether auto-learn mode is enabled. By default, the learn mode is Automatic.

Chapter 6: Nytro Command Line

The Nytro Command Line Interface (Nytro CLI) provides a common command line interface to use the Nytro CLI commands.

The Nytro CLI is easy to use, consistent, and easy for scripting. You can perform all of the XP6500 card and drive related operations by using the Nytro CLI commands.

- The Nytro CLI commands are not case sensitive.
- The order in which you specify the command options must be the same as provided in the user guide; otherwise, the command fails.
- The Nytro CLI must be run with administrator privileges.
- For Windows, operating systems, the Nytro CLI (`nytrocli.exe`) is an executable file and can be placed in any location and execute the same.
- For Linux, the Nytro CLI is installed at the `/opt/seagate/nytrocli` directory. You can execute the Nytro CLI commands by navigating to this installation directory.

NOTE The Nytro CLI prototypes/outputs provided in this chapter are examples to help understand the flow of the operations.

CAUTION The Nytro CLI help commands provided are generic, and show the commands for the unsupported features also. If used, firmware treats the unsupported command as invalid commands and the operations performed by using these commands fail.

6.1 Nytro CLI Command Syntax

This section describes the Nytro CLI command syntax and the valid values for each parameter in the general command syntax.

NOTE To get the output in the `JSON` format, add `J`, at the end of the command syntax.
For example: `nytrocli /cx show <property1>|<property2> J`

The Nytro CLI syntax uses the following general format:

[value] means the user can choose to enter a value.

<value> means the user must enter a value here.

"|" means "or."

For example:

```
<[object identifier]> <command> <[adcommand | attributes | properties] >
<[key=value]>
```

The Nytro CLI supports the object identifiers listed in the following table.

Table 10 Object Identifier

Object Identifier	Description
No object identifier specified	If there is no object identifier, the command is a system command.
`/cx`	This object identifier is for XP6500 card *x*.
`/cx/vx`	This object identifier is for a virtual drive *x* on XP6500 card *x*.
`/cx/vall`	This object identifier is for all virtual drives on XP6500 card *x*.
`/cx/sx`	This object identifier represents the drives that are directly attached to XP6500 card *x*.

The Nytro CLI supports the following commands.

Table 11 Commands in the Nytro CLI Command Syntax

Commands	Description
`add`	This command adds virtual drives, and other components into the object identifier.
`del`	This command deletes a drive.
`download`	This command downloads and flashes a file into the target.
`force`	This command specifies that the Nytro CLI does not ask you for confirmation before it performs this operation. You might lose data if you use this option with some commands.
`expand`	This command expands the size of the virtual drive.
`flasherase`	This is a Flash card firmware Flash erase command. This command erases the physical drive.
`import`	This command imports the foreign configuration into the drive.
`pause`	This command pauses an ongoing operation.
`restart`	This command restarts the Flash card.
`resume`	This command resumes paused operation.
`set`	This command sets a value of the object identifier.
`show`	This command shows the value and properties of the object identifier.
`start`	This command starts an operation.
`stop`	This command stops an operation that is in progress. A stopped process cannot be resumed.
`suspend`	This command suspends an ongoing operation. A suspended operation cannot be resumed.
`unlock`	This command performs diagnostic unlock of a physical drive.

6.2 Frequently Used Tasks

NOTE The pipe symbols (|) are not literal in the command line syntax.

6.2.1 Nytro Help Commands

Use the commands provided in the following sections to perform the XP6500 card-related operations.

- `nytrocli -v`
- `nytrocli -h| -help| ?`
- `nytrocli -h| -help| ? legacy`
- `nytrocli show`
- `nytrocli show all`
- `nytrocli show ctrlcount`

The preceding commands list all of the commands supported in the Nytro CLI syntax.

For specific command help, use the **?** symbol.

Input example:

```
nytrocli /cx show ?
```

This command lists the help information for all of the `show` commands.

6.2.2 Show Version of the Nytro CLI Command

Use the following command to show the version of the Nytro CLI:

```
nytrocli -v
```

6.2.3 Show Nytro CLI Help Information Command

Use the following command to show the Nytro CLI help information:

```
nytrocli -h| -help| ?
```

The help information appears for all of the Nytro CLI commands.

```
nytrocli -h| -help| ? legacy
```

The help information appears for all of the legacy Nytro CLI commands.

6.2.4 Show System Summary Information Command

Use the following command to show the complete summary of the XP6500 card:

```
nytrocli show
nytrocli show ctrlcount
```

6.2.5 Show Virtual Drive Information Command

Use the following command to show the VD information for all of the VDs in the XP6500 card:

```
nytrocli /cx/vx show
nytrocli /cx/vx show all
```

6.2.6 Flash the XP6500 Card Firmware Command

Use the following command to flash the XP6500 card firmware:

```
nytrocli /cx download file=<filepath> [fwtype=<val>] [ResetNow] [nosigchk]
[noverchk]
```

6.3 Working with the Nytro CLI Commands

This chapter describes the commands supported on the Nytro CLI.

NOTE The Nytro CLI commands are not case sensitive.

NOTE The order in which you specify the command options must be the same as provided in the user guide; otherwise, the command fails.

6.3.1 System Commands

6.3.1.1 System Show Commands

The Nytro CLI supports the following system show commands:

```
nytrocli show
nytrocli show all
nytrocli show ctrlcount
nytrocli show help
nytrocli -v
```

View Summary of the XP6500 Card Information in the System

```
nytrocli show
```

This command shows a summary of XP6500 card and its associated information for the system. The summary includes the number of XP6500 card, the host name, the operating system information, and the overview of existing configuration.

View all of the XP6500 Card-Associated Information

```
nytrocli show all
```

This command shows the list of XP6500 card and XP6500 card-associated information, and information about the drives that need attention.

View XP6500 Card Count

```
nytrocli show ctrlcount
```

This command shows the number of XP6500 card detected in the server.

View Command Help

```
nytrocli show help
```

This command shows help for all commands at the server level.

View Nytro CLI Version

```
nytrocli -v
```

This command shows the version of the Nytro CLI.

6.3.2 XP6500 Card Commands

The XP6500 card commands provide information and perform actions related to the specified XP6500 card, such as the `/c0` XP6500 card. The Nytro CLI supports the XP6500 card commands described in this section.

6.3.2.1 Show and Set XP6500 Card Properties Commands

Table 12 Show and Set Commands

Commands	Value Range	Description
`show <properties>`	—	Shows specific XP6500 card properties.
`set <properties>`	—	Sets XP6500 card properties.
`show`	`all`: Shows all properties of the XP6500 card.	Shows physical drive information.

This section provides command information to show and set XP6500 card properties.

NOTE You cannot set multiple properties with a single command.

View Current XP6500 Card Property

```
nytrocli /cx show <property>
```

This command shows the current value of the specified property on the specified XP6500 card.

General example output:

```
Status Code = 0
Status = Success
Description = None
: 0
Property_name = Property_value
```

You can show the following properties using the `nytrocli /cx show <property1>|<property2>` command.

```
nytrocli /cx show  backplane [mode=<0-3>][expose=<on|off>]
nytrocli /cx show batterywarning
nytrocli /cx show bootwithpinnedcache
nytrocli /cx show clusterenable
nytrocli /cx show coercion
nytrocli /cx show directpdmapping
nytrocli /cx show eccbucketleakrate
nytrocli /cx show eccbucketsize
nytrocli /cx show enableeghsp
nytrocli /cx show enableesmarter
nytrocli /cx show enableeug
```

```
nytrocli /cx show exposeencldevice
nytrocli /cx show maintainpdfailhistory
nytrocli /cx show ncq
nytrocli /cx show perfmode
nytrocli /cx show pi
nytrocli /cx show time
nytrocli /cx show memscrubpatterns
nytrocli /cx show badblocks
nytrocli /cx(x|all) show PI
nytrocli /cx(x|all) show preventpiimport
nytrocli /cx set <property> = <value>
```

General example output:

```
Status Code = 0?
Status = Success?
Description = None?

 0, new Property_name = Property_value?
```

The following commands are examples of the properties that can be set using the `nytrocli /cx set <property>=<value>` command:

```
nytrocli /cx set  termlog[=on|off|offthisboot]
nytrocli /cx set  backplane [mode=<0-3>][expose=<on|off>]
nytrocli /cx set  batterywarning=<on|off>
nytrocli /cx set  bootwithpinnedcache=<on|off>
nytrocli /cx set  coercion=<value>
nytrocli /cx set  directpdmapping=<on|off>
nytrocli /cx set  eccbucketleakrate=<value>
nytrocli /cx set  eccbucketsize=<value>
nytrocli /cx set  enableeghsp=<on|off>
nytrocli /cx set  enableesmarter=<value>
nytrocli /cx set  enableeug=<on|off>
nytrocli /cx set  exposeencldevice=<on|off>
nytrocli /cx set  maintainpdfailhistory=<on|off>
nytrocli /cx set  ncq=<on|off>
nytrocli /cx set  perfmode=<value>
nytrocli /cx set  pi [state=<on|off>][import=<on|off>]
nytrocli /cx set  preventpiimport=<on|off>
nytrocli /cx set  prcorrectunconfiguredareas=<on|off>
nytrocli /cx set  stoponerror=<on|off>
nytrocli /cx set  time=yyyymmdd hh:mm:ss|systemtime
```

The following table lists and describes the properties for the `show` and `set` commands.

Table 13 Show and Set Commands Properties

Property Name	Set Command Range	Description
`backplane`	`0`: Use auto detect logic of backplanes, such as SGPIO and I^2C SEP using GPIO pins. `1`: Disable autodetect SGPIO. `2`: Disable I^2C SEP auto detect. `3`: Disable both the auto detects.	
`batterywarning`	on|off	Enables/disables the battery warnings.
`maintainpdfailhistory`	on|off	Maintains the physical drive fail history.
`perfmode`	`0`: Tuned to provide best IOPS, currently applicable to non-FastPath `1`: Tuned to provide least latency, currently applicable to non-FastPath	Performance tuning setting for the XP6500 card.
`pi`	on|off	Enables/disables data protection on the XP6500 card.
`pi import`	on|off	Enables/disables import data protection drives on the XP6500 card.
`prcorrectunconfiguredareas`	on|off	Correct media errors during patrol read by writing 0s to unconfigured areas of the disk.
`stoponerror`	on|off	Stops the Nytro BIOS during POST, if any errors are encountered.
`time`	Valid time in *`yymmdd hh:mm:ss`* format or `systemtime`	Sets the XP6500 card time to your input value or the system time (local time in 24-hour format).

6.3.2.2 XP6500 Card Show Commands

The Nytro CLI supports the following show commands:

```
nytrocli /cx show
nytrocli /cx show all
nytrocli /cx show freespace
```

View XP6500 Card Summary

```
nytrocli /cx show
```

This command shows the summary of the XP6500 card. The summary includes basic XP6500 card information, drive groups, virtual drives, and physical drives.

Input example:

```
nytrocli /c1 show
```

View XP6500 Card Properties

```
nytrocli /cx show all
```

This command shows the XP6500 card information, which includes basic XP6500 card information, bus information, XP6500 card status, XP6500 card policies, XP6500 card defaults, XP6500 card capabilities, scheduled tasks, miscellaneous properties, drive groups, virtual drives, and physical drives.

Input example:

```
nytrocli /c0 show all
```

NOTE The PCI information displayed as a part of `nytrocli /cx show` and `nytrocli /cx show all` commands is not applicable for the FreeBSD operating system. Therefore, the PCI information fields are displayed as N/A.

View Usable Free Space

```
nytrocli /cx show freespace
```

This command shows the usable free space in the XP6500 card.

Input example:

```
nytrocli /c0 show freespace
```

6.3.2.3 XP6500 Card Firmware Command

Use the following command to flash firmware into the specified adapter from the given file location (`filepath`, is the absolute file path).

```
nytrocli /cx download file=filepath [fwtype=<value>] [nosigchk] [noverchk]
[resetnow]
```

You can use the following options when you flash firmware.

Table 14 Firmware Command Options

Option	Value Range	Description
`nosigchk`	—	The application flashes firmware even if the check word on the file does not match the required check word for the XP6500 card. **CAUTION** You can damage the XP6500 card if a corrupted image is flashed using this option.
`noverchk`	—	The application flashes the XP6500 card firmware without checking the version of the firmware image.
`resetnow`	—	Invokes online firmware update on the XP6500 card; you do not need to restart the XP6500 card to make the update effective.

6.3.3 Drive Commands

This section describes the drive commands that provide information and perform actions related to physical drives.

The following table describes frequently used virtual drive commands.

Table 15 Frequently Used Virtual Drive Commands

Commands	Value Range	Description
`set`	`missing`: Sets the drive status as missing. `good`: Sets the drive status to unconfigured good. `offline`: Sets the drive status to offline. `online`: Sets the drive status to online.	Sets physical drive properties.
show	`all`: Shows all properties of the physical drive.	Shows virtual drive information.

6.3.3.1 Drive Show Commands

The Nytro CLI supports the following drive show commands:

```
nytrocli /cx[/ex]/sx show
nytrocli /cx[/eall]/sall show
nytrocli /cx[/ex]/sx|sall show all
```

View Summary of the Physical Drive

```
nytrocli /cx[/ex]/sx show
```

This command shows the summary of the physical drive for a specified slot in the XP6500 card.

Input example:

```
nytrocli /c0/e0/s4,5 show
```

View Physical Drive Information

```
nytrocli /cx[/ex]/sx|sall show all
```

This command shows all information of a physical drive for the specified slot in the XP6500 card. If you use the `all` option, the command shows information for all slots on the XP6500 card. *x* stands for a number, a list of numbers, a range of numbers, or all numbers **.**

Input examples:

```
nytrocli /c0/e3/s0-3 show all
nytrocli /c0/e35/sall show all
```

Show Drive Health Command

Use the following commands to view the health of a drive.

```
nytrocli /cx[/ex]/sx show health
```

Where, *x* is **all** or a specific ID.

View Overall Health Command

Use the following command to view the overall health of the XP6500 card.

```
nytrocli /cx show health
```

6.3.4 View Nytro XP6500 Module Health

Use the following command to view the health of the Nytro XP6500 module.

```
nytrocli /cx/[ex]/sx show health
```

6.3.5 Download Drive Firmware

Use the following Nytro CLI command to download drive firmware.

```
nytrocli /cx[/ex]/sx download src=<filepath> [satabridge] [mode= 5|7]
```

This command flashes firmware with the specified file. The `satabridge` option lets you download the SATA bridge firmware in online mode.

Input example:

```
nytrocli /cx/e57/s1 download src=c:\file1.bin
```

NOTE This command takes mode 7 as default. For Nytro XP6500 modules, use mode 5.

6.3.6 Virtual Drive Commands

The Nytro CLI supports the following virtual drive commands. The following table describes frequently used virtual drive commands.

6.3.6.1 Virtual Drive Show Commands

The Nytro CLI supports the following virtual drive show commands:

```
nytrocli /cx/vx show
nytrocli /cx/v[x|all] show [all]
```

Summary of the Virtual Drive

```
nytrocli /c0/v0 show
```

This command shows the summary of the virtual drive information.

Input example:

```
nytrocli /c0/v0 show
```

View Virtual Drive Information

```
nytrocli /cx/v[x|all] show [all]
```

This command shows all virtual drive information that includes virtual drive information, physical drives used for the virtual drives, and virtual drive properties.

Input example:

```
nytrocli /c0/v0 show all
```

6.3.6.2 Virtual Drive Initialization Commands

The Nytro CLI supports the following commands to initialize virtual drives:

```
nytrocli /cx/vx show init
nytrocli /cx/vx start init [full][Force]
nytrocli /cx/vx stop init
```

NOTE If the virtual drive has user data, you must use the `force` option to initialize the virtual drive.

A virtual drive with a valid MBR and partition table is considered to contain user data.

View Initialization Progress of a Virtual Drive

```
nytrocli /cx/vx show init
```

This command shows the initialization progress of a virtual drive in percentage.

The estimated time (in minutes) left to complete the operation is also shown.

Input example:

```
nytrocli /c0/vall show init
```

Start Virtual Drive Initialization

```
nytrocli /cx/vx start init [full]
```

This command starts the initialization of a virtual drive. The default initialization type is fast initialization. If the `full` option is specified, full initialization of the virtual drive starts.

Input example:

```
nytrocli /c0/v0 start init [full]
```

Stop Virtual Drive Initialization

```
nytrocli /cx/vx stop init
```

This command stops the initialization of a virtual drive.

NOTE A stopped initialization cannot be resumed.

Input example:

```
nytrocli /c0/v0 stop init
```

6.3.6.3 Preserved Cache Commands

If a virtual drive becomes offline or is deleted because of missing physical drives, the Flash card preserves the dirty cache from the virtual disk. This is called as Preserved Cache.

The Nytro CLI supports the following commands for preserved cache:

```
nytrocli /cx/vx delete preservedCache [force]
nytrocli /cx show preservedCache
```

6.3.6.3.1 Delete Preserved Cache for a Particular Virtual Drive

Use the following command to delete the preserved cache for a particular virtual drive on the Flash card that is in a missing state. Use the `force` option to delete the preserved cache of a virtual drive in an offline state.

```
nytrocli /cx/vx delete preservedcache
```

Input example:

```
nytrocli /c0/v0 delete preservedcache
```

6.3.6.3.2 Viewing Virtual Drive that has Preserved Cache

Use the following command to show the virtual drive that has preserved cache and to show if the virtual drive is offline or missing.

```
nytrocli /cx show preservedCache
```

Input example:

```
nytrocli /c0 show preservedCache
```

6.3.7 BIOS-Related Commands

The Storage Command Line Tool supports the following BIOS commands:

```
nytrocli /cx set bios[state<on|off>[mode=soe|be|hcoe|hsm][abs=on|off]
```

Enable or Disable Nytro XP6500 Card BIOS

```
nytrocli /cx set bios [state=<on|off>][mode=soe|be|hcoe|hsm][abs=on|off]
```

This command enables or disables the Nytro XP6500 card's BIOS, sets the BIOS boot mode, and enables the BIOS to select the best logical drive as the boot drive.

NOTE The server legacy BIOS can load a limited number of the PCI device's BIOS. Disable the Nytro BIOS to avoid issues during POST.

Input example:

```
nytrocli /c0 set bios[state=on][mode=soe][abs=on]
```

6.3.8 Drive Group Commands

This section describes the drive group commands.

6.3.8.1 Drive Group Show Commands

The Nytro CLI supports the following drive group commands:

```
nytrocli /cx/dall show
nytrocli /cx/dall show all
```

View Topology Information

```
nytrocli /cx/dall show
```

This command shows the topology information of the drive group.

Input example:

```
nytrocli /c0/dall show
```

View Available Configurations

```
nytrocli /cx/dall show all
```

This command shows all available configurations in the XP6500 card, which includes topology information, virtual drive information, physical drive information, free space, and free slot information.

Input example:

```
nytrocli /c0/dall show all
```

View Virtual Drive Information

```
nytrocli /cx/dall show
```

This command shows all the virtual drive information.

Input example:

```
nytrocli /c0/dall show
```

6.3.9 SuperCap Commands

The Nytro CLI supports the following SuperCap commands:

```
nytrocli /cx/cv show
nytrocli /cx/cv show all
nytrocli /cx/cv show status
nytrocli /cx/cv show learn
nytrocli /cx/cv start learn
```

6.3.9.1 Show SuperCap Status

```
nytrocli /cx/cv show
```

This command shows the summary information of a SuperCap that is connected to the XP6500 card.

- `/cx`: This parameter specifies a where, *X* is the XP6500 card index.
- `/cv`: This parameter specifies the SuperCap.

```
nytrocli /cx/cv show status
```

This command shows the SuperCap information, firmware status, and the Gas Gauge status.

NOTE Whenever you upgrade the Gas Gauge firmware, perform a manual learn operation to view the correct capacitance values.

6.3.9.2 Show SuperCap Learn

```
nytrocli /cx/cv show learn
```

This command shows the SuperCap learn information.

- `/cx`: This parameter specifies a where, *X* is the XP6500 card index.
- `/cv`: This parameter specifies the SuperCap.

6.3.9.3 View SuperCap Information

```
nytrocli /cx/cv show all
```

This command shows all the information of a SuperCap that is connected to the XP6500 card.

NOTE This command works only when a SuperCap is connected to the XP6500 card, otherwise, an error message appears.

Input example:

```
nytrocli /c0/cv show all
```

6.3.10 Event Log Commands

Use the following commands to generate and maintain log files.

```
nytrocli /cx clear events
nytrocli /cx delete termlog
nytrocli /cx show events
nytrocli /cx show eventloginfo
nytrocli /cx show termlog type=config|contents
```

- — `config`: This parameter indicates whether termlog is enabled or not.
- — `contents`: This parameter shows termlog.

Delete All the Event Log Records

```
nytrocli /cx delete events
```

This command deletes all records in the event log.

Input example:

```
nytrocli /c0 delete events
```

Print System Log

```
nytrocli /cx show events [[type= <sincereboot| sinceshutdown| includedeleted|
latest=x| ccincon vd=<0,1,...>] filter=<info|warning|critical|fatal>]
file=<filepath>
```

This command prints the system log to a text file and saves the file in the specified location.

Input example:

```
nytrocli /c0 show events file=C:\Users\visweswa\test\eventreports
```

View Log File History

```
nytrocli /cx show eventloginfo
```

This command shows the history of log files generated.

Input example:

```
nytrocli /c0 show eventloginfo type=config
```

6.3.11 SMART Logs Command

Load Diagnostics Pages

```
nytrocli /cx[/ex]/sx show diag smartlog [file=filepath]
```

This command loads the supported diagnostic SMART pages of the Nytro XP6500 module onto a console or into a file. Without any file option, this loads the smart log onto the console.

6.3.12 Panic Logs Command

Load Panic Log Page

```
nytrocli /cx[/ex]/sx show diag paniclog [Query | [ExtractSlot=x] | [EraseSlot=x] ]
[file=filepath]
```

This command loads the supported panic log pages of the Nytro XP6500 module into a console or a file.

- With a query, you can query a panic log from the Nytro XP6500 module.
- `ExtractSlot`: To extract panic logs from the Nytro XP6500 module onto the panic slot provided.
- `EraseSlot`: To erase the panic logs from the Nytro XP6500 module from the panic log slot provided.
- `File`: Filename/filename along with the path to log the output.

NOTE To extract the panic logs, the output file name is mandatory and must be specified in the file option. The panic logs are extracted into the output file in the binary format.

6.3.13 Show Physical Properties Command

```
nytrocli /cx/ex/sx show all
```

Use this command to show the information about a VD for a specified slot in the XP6500 card. This information includes the SSD Flash type, ThermalIOThrottleStatus, Life Curve status, SSD life left, and Drive temperature warning/error threshold. If you use the `all` option, the command shows the information about all of the slots on the XP6500 card.

- `x`: A number, a list of numbers, a range of numbers, or all the numbers.
- `/cx`: This parameter specifies a XP6500 card where, *x* is the XP6500 card index.
- `/sx`: This parameter specifies a VD where, *x* is the slot number.

6.3.14 Extract the SMART Logs Command

Use the following command to extract the SMART logs.

```
nytrocli /cx[/ex]/sx show diag smartlog [file=filepath]
```

6.3.15 TRIM Commands

Use the following commands to know if the XP6500 card supports SCSI UNMAP, if the SCSI UNMAP is supported, and also how to enable or disable the TRIM feature.

Enable or Disable TRIM

```
nytrocli /cx/vx set trim=on | off
```

View TRIM

```
nytrocli /cx/v0 show trim
```

6.3.16 SCSI UNMAP Commands

XP6500 card support for SCSI UNMAP

```
nytrocli /cx show all
```

You can view the details under the supported VD operations.

View PD properties for SCSI UNMAP support

```
nytrocli /cx[/ex]/sx show all
```

View LD properties for SCSI UNMAP support

```
nytrocli /cx/vx show all
```

6.3.17 NCQ Commands

Use the following command to set NCQ.

```
nytrocli /cx set ncq=<on|off>
```

Use the following command to view the NCQ status.

```
nytrocli /cx show ncq
```

Chapter 7: Nytro Storage Manager Software

You can use the Nytro Storage Manager software to manage a configuration on systems that have the Seagate XP6500 card.

NOTE This chapter provides examples of the figures/screen shots that appear in the GUI windows to help you better understand the flow of the operations.

7.1 GUI Elements and Menus in the Nytro Storage Manager Window

Use the Nytro Storage Manager graphical user interface (GUI) elements to create, manage, monitor, and maintain the XP6500 card activities.

7.1.1 Icons

The following icons in the left panel represent the XP6500 card, drives, and other devices.

Figure 33 Icons – Part 1

Icon	Description
	System
	Controller
	Port
	Drive group
	Virtual drive
	Online drive
	SuperCap

Figure 34 Icons – Part 2

	CD-ROM
	Unconfigured drive
	Need attention
	Orphan drive
	Unsupported Drive
	Not Available
	Optimal

Figure 35 Icons – Part 3

	Physical Drive
	Progress
	RAID 0

Figure 36 Icons – Part 4

	Refresh
	Server
	Server Tool
	Unconfigured Drives Container Node
	Virtual Drive (No Import)

Figure 37 Icons – Part 5

	Capacity
	Error
	Exit
	Expired
	Failed
	Fatal

Figure 38 Icons – Part 6

	Free Capacity
	Total free capacity
	Info

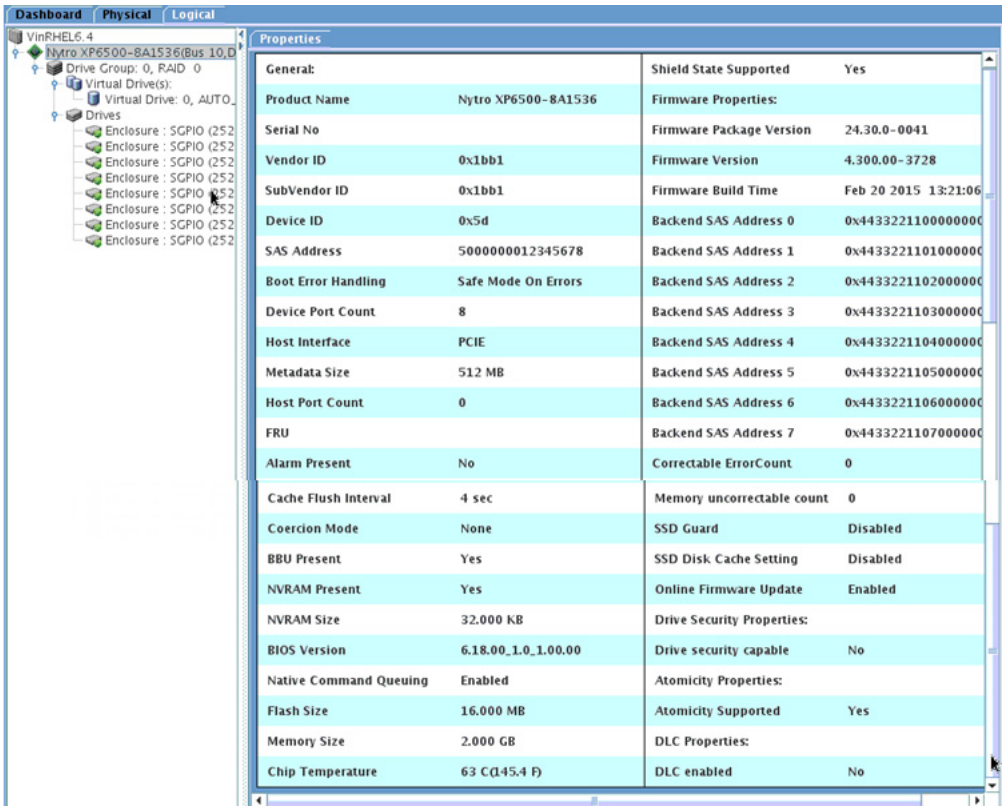
A red circle to the right of an icon indicates that the device has failed. For example, this icon indicates that a drive has failed: .

7.1.2 Properties View Tab

The right panel of the Nytro Storage Manager window has one tab or two tabs, depending on which type of device you select in the left pane.

The **Properties** tab shows information about the selected device. For example, if you select a XP6500 card icon in the left panel, the **Properties** tab lists the selected XP6500 card-related information.

Figure 39 Properties Tab



7.1.3 Event Log Panel

The lower part of the **Nytro Storage Manager** window displays the system event log entries. New event log entries appear during the session. Each entry has an ID, an error level indicating the severity of the event, the timestamp and date, and a brief description of the event.

NOTE The figures provided in this document are meant as examples only.

7.1.4 Menu Bar

The Nytro Storage Manager menu bar has the following options.

Manage Menu

The Manage menu has a **Refresh** option for updating the display in the **Nytro Storage Manager** window (refresh is seldom required; the display usually updates automatically) and an **Exit** option to end your session on Nytro Storage Manager. The **Server** option shows all of the servers that were discovered by a scan.

Go To Menu

The **Go To** menu is available when you select a XP6500 card, drive group, physical drive, virtual drive, or battery backup unit in the main menu screen. The menu options vary based on the type of device selected in the left panel of the Nytro Storage Manager main menu. The options also vary based on the current state of the selected device. For example, if you select an offline drive, the **Make Drive Online** option appears in the **Physical Drive** menu.

Configuration options are also available. This is where you access the Configuration Wizard that you use to configure the drive groups and virtual drives. To access the **Configuration Wizard**, select the XP6500 card in the left panel.

Log Menu

The **Log** menu includes options for saving and clearing the message log.

Tools Menu

On the **Tools** menu, go to **Tools** > **Configure Alerts** to access the **Configure Alerts** dialog and to set the alert delivery rules, event severity levels, exceptions, and e-mail settings.

7.1.5 Dashboard View, Physical View, and Logical View

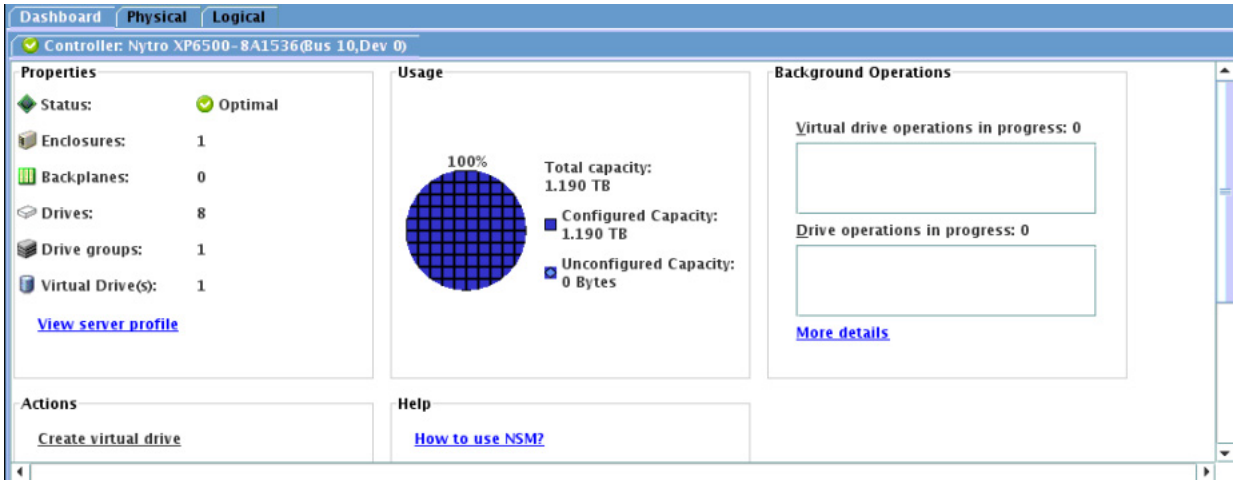
The left panel of the **Nytro Storage Manager** window displays the **Dashboard** view, the **Physical** view, and the **Logical** view of the system and the attached devices, based on which tab is selected.

Dashboard View

The **Dashboard** view shows an overview of the system and covers the following features:

- Properties of the virtual drives and the physical drives
- Total capacity, configured capacity, and unconfigured capacity
- Background operations in progress
- The Nytro Storage Manager software features and their status (enabled or disabled)
- You can update firmware

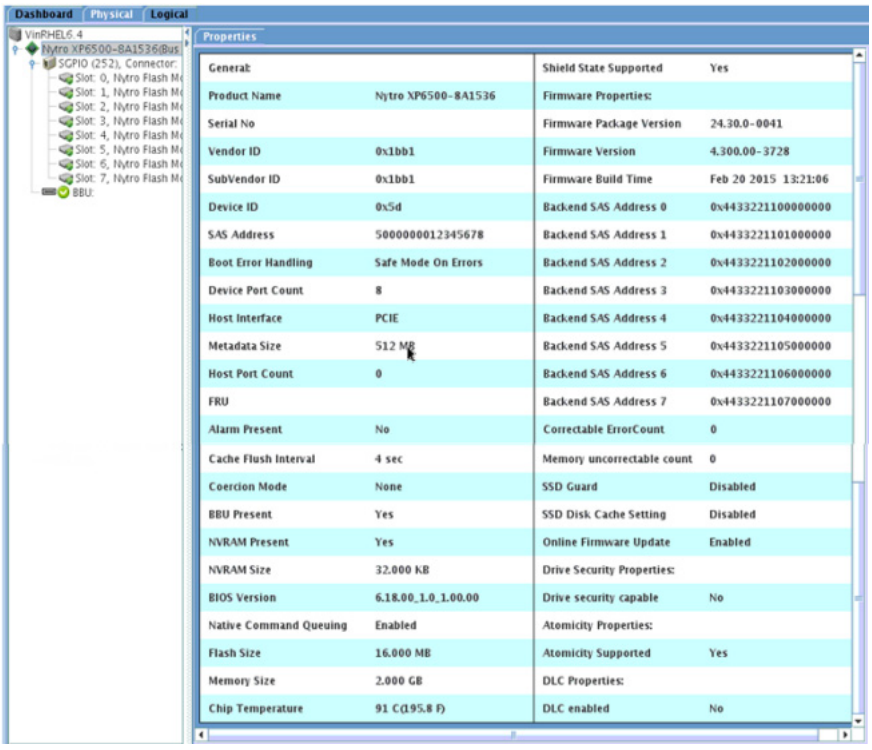
Figure 40 Dashboard View



Physical View

The **Physical** view shows the hierarchy of physical devices in the system. At the top of the hierarchy is the system itself, followed by the XP6500 card and the backplane. One or more XP6500 card can be installed in the system. The XP6500 card is identified by its label, so that you can easily differentiate between multiple XP6500 card. Each XP6500 card has one or more ports. Drives and other devices are attached to the ports. The properties for each item appear in the right panel of the screen.

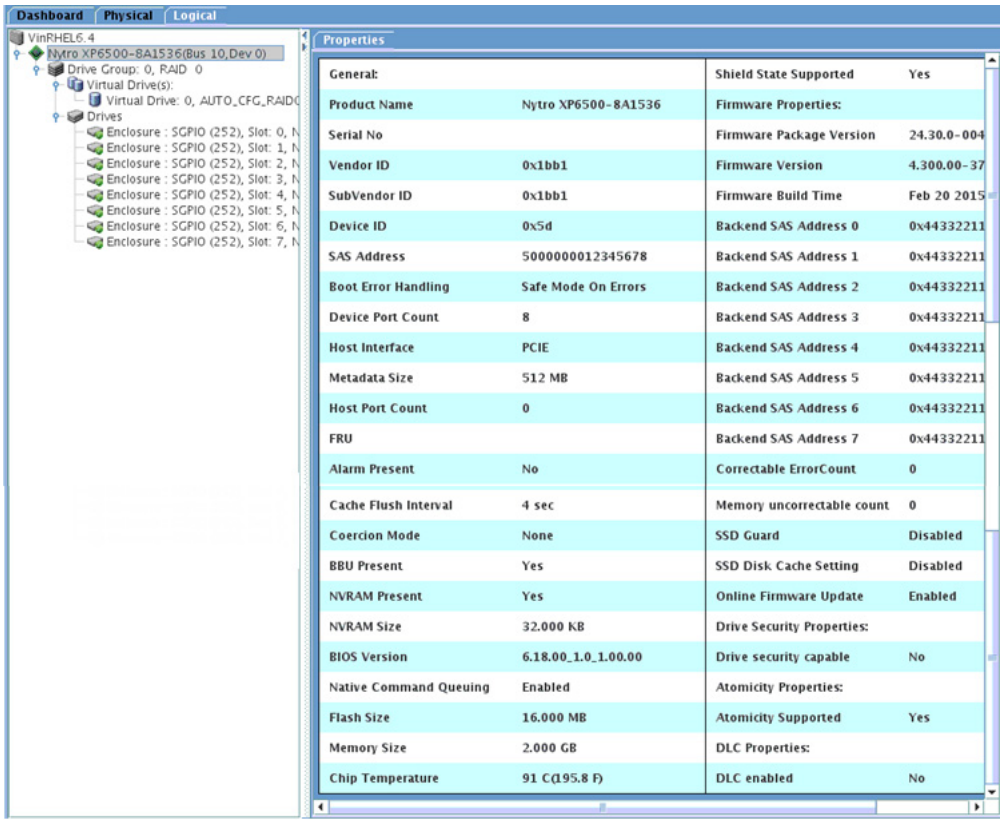
Figure 41 Physical View



Logical View

The **Logical** view shows the hierarchy of XP6500 card, virtual drives, and the drives and drive groups that make up the virtual drives. The properties for these components appear in the right panel.

Figure 42 Logical View



7.1.6 Viewing the XP6500 Card Properties

If you select the XP6500 card node, you can view the XP6500 card property on the right pane.

- Nytro XP6500 module Life Left values (based on the Nytro XP6500 module life)
- Percentage of Nytro XP6500 module Life Left
  - Optimal
  - Warning
  - Critical
- Nytro XP6500 module temperature:
  - Optimal: No user intervention is required.
  - Warning: Check the server environment.
  - Critical: Reduce the I/O load and monitor the server environment.

Figure 43 Nytro XP6500 Card Properties

NOTE The figures provided in this document are meant as examples only.

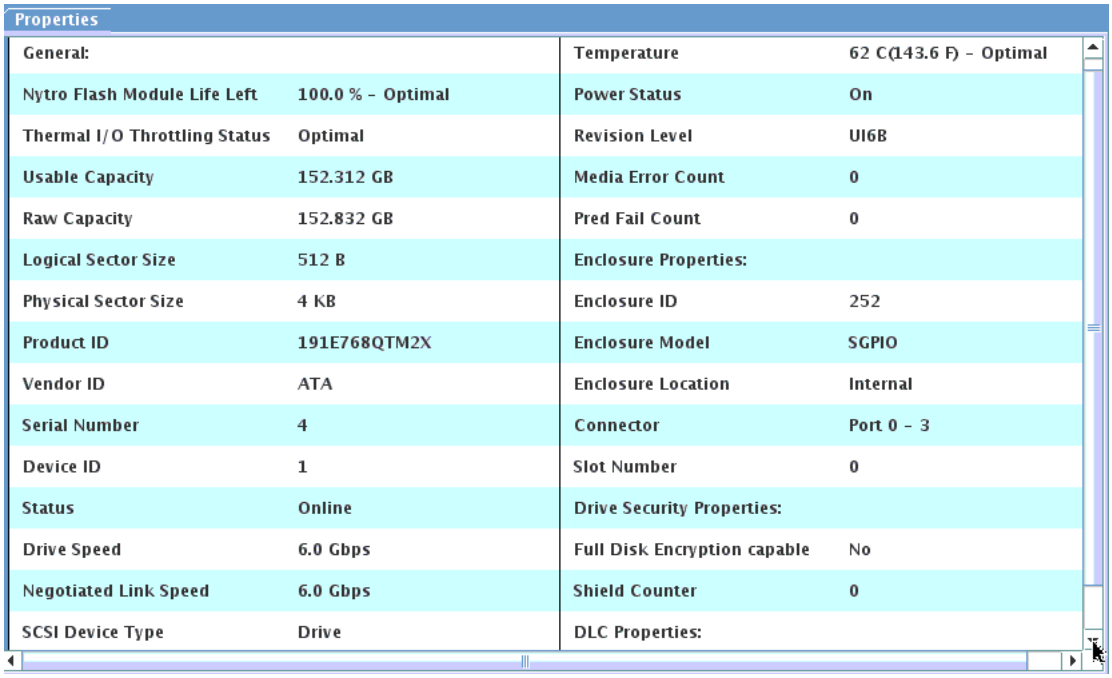
NOTE All of the Nytro Storage Manager menu options can also be accessed by using the **Go To** menu or **Right-click** > **XP6500 Card**.

7.1.7 Viewing the Physical Drive Properties

Follow these steps to view the physical properties of the drive in the Shield state.

1. Click the **Physical** tab or **Logical** tab in the device tree.
2. Click the physical drive icon to view its properties as shown in the following figure.

Figure 44 Physical Drive Properties

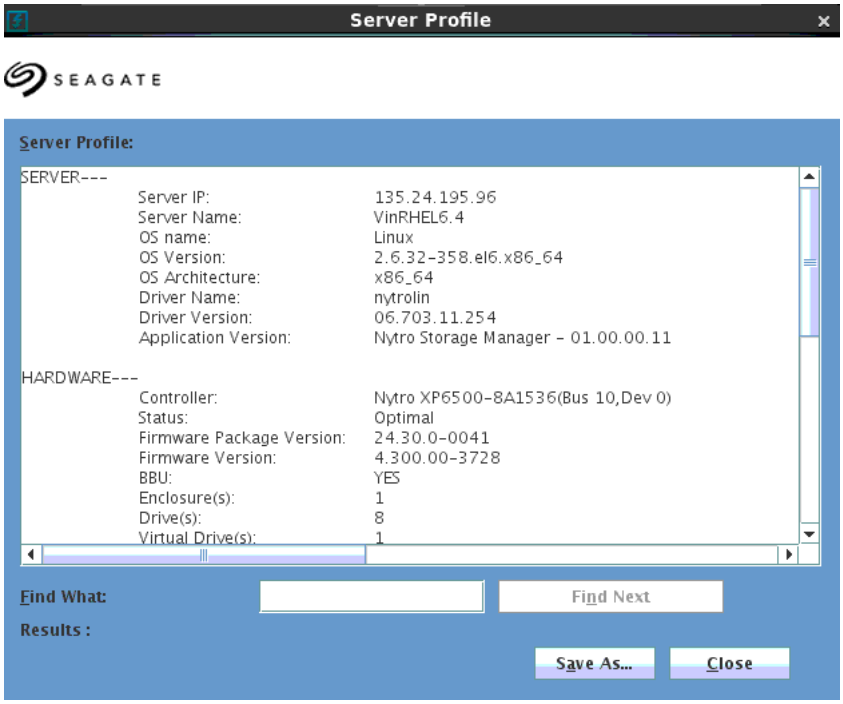


7.1.8 Viewing the Server Profile of Physical Drive

Perform these steps to view the server properties of the physical drive.

1. Click the **Dashboard** tab in the device tree.
2. Click the **View Server Profile** link in the dashboard view.
   The Server Profile information appears.

Figure 45 Server Profile View of the Physical Drive



7.1.8.1 Physical Drive Shield State

This section describes the Shield state in the Nytro Storage Manager software.

The physical devices in the XP6500 card firmware move between different states. If firmware detects a problem or a communication loss for a physical drive, it moves the physical drive to a bad (FAILED/UNCONF BAD) state. To avoid transient failures, an interim state called the Shield state appears before marking the physical drive as bad state.

The Shield state is an interim state of a physical drive for diagnostic operations. The results of the diagnostic tests determine if the physical drive is good or bad.
If any of the diagnostics tests fail, the physical drive transitions to BAD state (FAILED or UNCONF BAD).

Click the physical drive in Shield state on the Physical view or Logical view of the device tree to view the properties.

The icon indicates the physical drive Shield state in the **Logical** or **Physical** view.

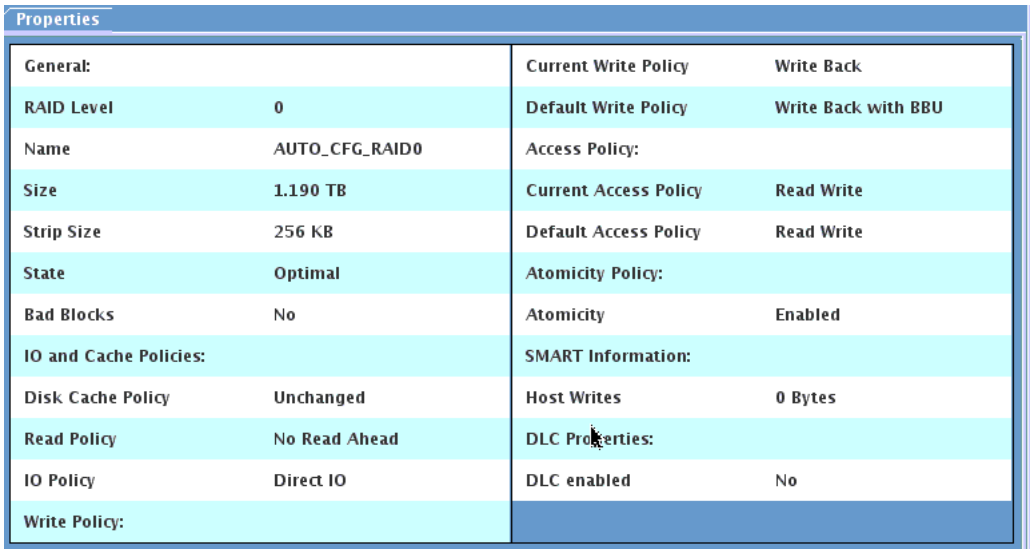
NOTE The Status of the drive must be of the Shield type.

7.1.9 Viewing the Virtual Drive Properties

The Nytro Storage Manager software shows the additional virtual drive statistics, under the XP6500 card properties. In the **Physical View** or **Logical View** of the Nytro Storage Manager window, expand the XP6500 card node in the device tree, select the **Nytro Virtual Drive** node.

Click the VD node to view the VD properties on the right pane.

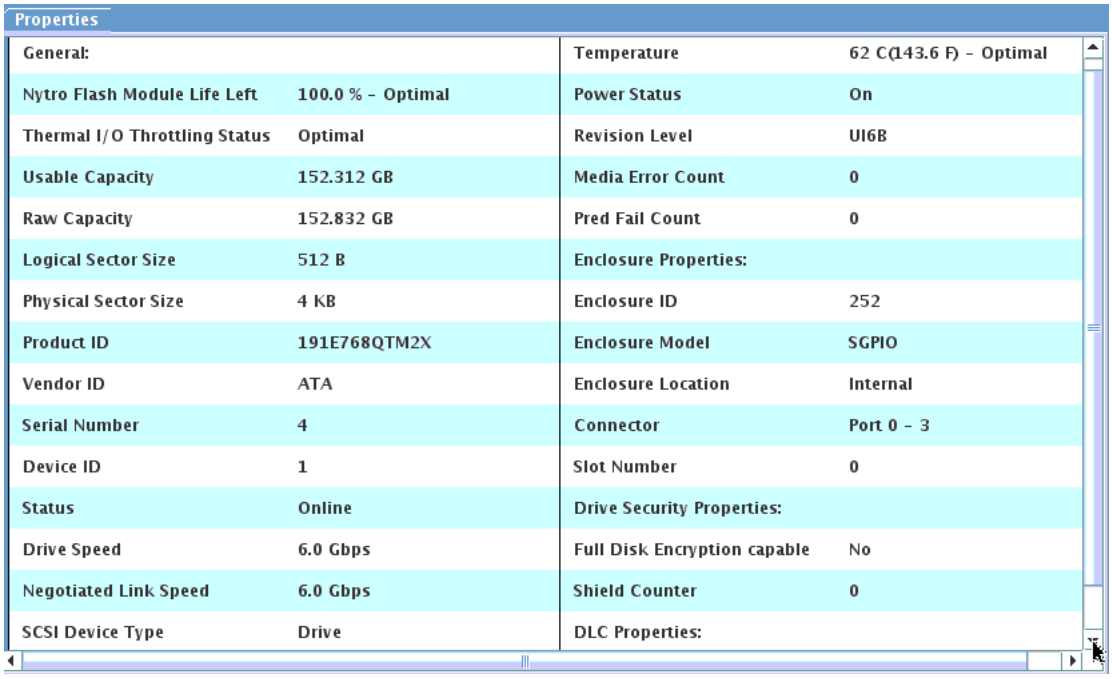
Figure 46 Virtual Drive Properties



7.1.10 Physical Drive Temperature

To view the physical drive temperature, click the physical drive icon under the XP6500 card tree. The temperature for the physical drive is displayed in the right pane as shown in the following figure.

Figure 47 Physical Drive Temperature



7.1.11 Metadata Size

The Metadata size field displays the total space used for metadata.

To view the metadata size of the XP6500 card, in the **Logical** view or the **Physical** view, click the Nytro XP6500 card. The total space used for metadata is displayed in the properties that appears in right pane as shown in the following figure.

Figure 48 Meatadata Size

NOTE The size units shown are: if the size is less than 1 MB (1024 KB), the size is shown in KB. If the size is greater than or equal to 1 MB, but less than 1 GB (1024 MB), the size is shown in MB. If the size is greater than or equal to 1 GB, but less than 1 TB (1024 GB), the size is shown in GB.

Chapter 8: Monitoring the XP6500 Card and The Attached Devices

This chapter explains how to use the Nytro Storage Manager software to monitor the XP6500 card, drive status, virtual drives, and other storage devices.

The Nytro Storage Manager software enables you to monitor the activity of all the XP6500 card present in the system and the devices attached to them.

The Nytro Storage Manager software does a background check every one hour to verify if the XP6500 card and the system time are in sync. If the time difference between the XP6500 card and the system is more than 90 seconds, the Nytro Storage Manager software synchronizes the time so that the XP6500 card time and the system time are in synchronization.

When you perform an operation on devices (such as the creation of a new virtual drive) or when devices automatically go from an optimal state to a different state (such as a created virtual drive goes to a degraded state or a SuperCap goes bad), the Nytro Storage Manager software obtains those events from the XP6500 card and gives a notification to you, by using different alert delivery methods.

NOTE The example figures provided in this chapter help understand the supported XP6500 card operations.

8.1 Alert Delivery Methods

Alerts are delivered by various methods based on the severity level (Information, Warning, Critical, and Fatal). Alerts of particular severity level have one or more default delivery methods configured, as shown in the following table. The alert delivery methods are as follows:

- Nytro Storage Manager Log
- System Log
- Pop-up Notification
- Email Notification

Table 16 Severity Levels of Alerts and Default delivery Methods

Severity Level	Default Alert Delivery Method	Meaning
Information	Nytro Storage Manager log and System log	Informational message. No user action is necessary.
Warning	Nytro Storage Manager log and System log	Some component might be close to a failure point.
Critical	Nytro Storage Manager log, System log, and Pop-up Notification	A component failed, but the system has not lost data.
Fatal	Nytro Storage Manager log, System log, Pop-up Notification, and Email Notification	A component failed, and data loss has occurred or might occur.

8.2 Monitoring User Events

The Nytro Storage Manager software enables you to monitor the activity of the Nytro Storage Manager users in the network.

When a user logs on/logs off from the application, the event message appears in the log displayed at the bottom of the Nytro Storage Manager screen (Nytro Storage Manager Log). These event messages have a severity level, a date and timestamp (User logon / logoff time), and a brief description that contains a user name, client IP address, an access mode (full/view only) and a client system time.

8.2.1 Nytro Storage Manager Log

By default, all of the severity events appear in the Nytro Storage Manager log and are displayed at the bottom of the Nytro Storage Manager main menu window. Each message that appears in this log has a severity level that indicates the importance of the event (severity), a date and timestamp (when it occurred), and a brief description.

The following events appear in the log when the Nytro Storage Manager software is connected to the server.

- Successful logon to the server.
- Successful logoff from the server.
- Server log cleared.
- Full access denied on the server.

You can double click on an event to display the same information in a separate window. The status bar at the bottom of the screen indicates whether the log is a Nytro Storage Manager server log or a locally stored log file.

When a Nytro Storage Manager log appears, the **Log** menu has the following options:

- **Save**: Saves the current log to a `.log` file.
- **Save As Text**: Saves the current log in `.txt` format.
- **Load**: Enables you to load a local `.log` file in the bottom of the Nytro Storage Manager main menu window. If you select the **Load** menu, you will not be able to view the current log.
- **Clear**: Clears the current log information, if you have full access (versus view-only access). You have the option to save the log first.

8.2.1.1 System Log

By default, all the severity events are logged in the local `syslog`. Based on the operating system you are using, the system log is logged in the following `syslog` locations:

- In Windows, the system log is logged in **Event Viewer > Application**.
- In Linux, the system log is logged in `/var/log/messages`.

8.2.1.2 Pop-up Notification

By default, fatal and critical events are displaying in a pop-up notification. Pop-up notification is started automatically when you are login in to the operating system. Through this feature, you can view multiple events in a single pop-up dialog.

If the Nytro Storage Manager Framework connects to a VMware ESXi server, an additional read only field **Event From** appears in the following dialog (next to the **ID** field) showing the IP address of the VMware ESXi server.

8.2.1.3 Email Notification

By default, fatal events are displayed as email notifications. Based on your configuration, the email notifications are delivered to you.

In the email notification, besides the event's description, the email also contains system information and the XP6500 card's image details. Using this additional information, you can find out the system and the XP6500 card on which the fatal error occurred.

8.3 Monitoring Configure Alerts

You can perform operations, such as editing the alert delivery methods, editing the severity levels, changing the individual events, and so on. To access the Monitor Configure Alerts menu, go to **Tools > Monitor Configure Alerts**.

NOTE The **Configure Alerts** option differs based on your configuration. If the Nytro Storage Manager Framework connects to a Linux or a Windows server, the **Tools** menu shows the **Configure Alerts** option. If Monitor Plugin is configured on the server, the Tools menu shows the **Monitor Configure Alerts** option. If the Nytro Storage Manager Framework connects to a VMware ESXi server, the Tools menu shows the **CIMOM Configure Alerts** option.

8.3.1 Configuring Alert Notifications

The Alert Notification Configuration feature allows you to control and configure the alerts that the Nytro Storage Manager software sends when various system events occur.

The **Configure Alerts** dialog appears. This dialog contains three tabs: **Alert Settings**, **Mail Server**, and **Email**.

You can select the **Alert Settings** tab to perform the following actions:

- Edit the alert delivery method for different severity levels.
- Change the method of delivery for each individual event.
- Change the severity level of each individual event.
- Save an `.xml` backup file of the entire alert configuration.
- Load all the values from a previously saved backup into the dialog to edit or save these values as the current alert notification configuration.

You can select the **Mail Server** tab to perform the following actions:

- Enter or edit the sender email address.
- Enter the SMTP server name or the IP address.
- Enter the SMTP server authentication related information (user name and password).

  NOTE These fields are optional and are filled only when the SMTP server requires authentication.
- Save an `.xml` backup file of the entire alert configuration.
- Load all of the values from a previously saved backup into the dialog to edit or save these values as the current alert notification configuration.

You can select the **Email** tab to perform the following actions:

- Add new email addresses for recipients of alert notifications.
- Send test messages to the recipient email addresses.
- Remove email addresses of recipients of alert notifications.
- Save an `.xml` backup file of the entire alert configuration.
- Load all of the values from a previously saved backup into the dialog to edit or save these values as the current alert notification configuration.

  NOTE When you load a saved back-up file, all unsaved changes made in the current session are lost.

8.3.2 Editing Alert Delivery Methods

You can edit the default alert delivery methods, such as pop-up, email, system log, or the Nytro Storage Manager log to different severity level (Information, Warning, Critical, and Fatal).

Perform the following steps to edit the alert delivery methods:

1. On the **Configure Alerts** dialog, click the **Alerts Setting** tab.
2. Under the **Alerts Delivery Methods** heading, select one of the severity levels.
3. Click **Edit**.

   The **Edit** dialog appears.
4. Select the desired alert delivery methods for alert notifications at the event severity level.
5. Click **OK** to set the delivery methods used for the severity level that you selected.

8.3.3 Changing Alert Delivery Methods for Individual Events

You can change the alert delivery options for an event without changing the severity level.

1. On the **Configure Alerts** dialog, click the **Alerts Setting** tab.

   The **Alerts Setting** portion of the dialog appears.
2. Click **Change Individual Events**.

   The **Change Individual Events** dialog appears. The dialog shows the events by their ID number, description, and the severity level.
3. Click an event in the list to select it.

   The current alert delivery methods appear for the selected event in the **Alert Delivery Methods** frame.
4. Select the desired alert delivery methods for the event.
5. Click **OK** to return to the **Configure Alerts** dialog.
6. You might click **Cancel** to discard your current changes and to go back to the **Configure Alerts** dialog.
7. In the **Configure Alerts** dialog, click **OK**.

NOTE You can click **Restore Defaults** to revert back to the default alert delivery method and the default severity level of an individual event. For more information, see Section 8.3.5, Roll Back to Default Individual Event Configuration.

8.3.4 Changing the Severity Level for Individual Events

To change the event severity level for a specific event, perform the following steps:

1. On the **Configure Alerts** window, click the **Alerts Setting** tab.

   The **Alerts Setting** portion of the dialog appears.
2. Click **Change Individual Events**.

   The **Change Individual Events** dialog appears. The dialog shows the events by their ID number, description, and severity level.
3. Click an event in the list to select it.

   The current severity appears in the **Severity** cell for the selected event.
4. Click the **Severity** cell for the event.

   The **Event Severity** drop-down menu appears for that event.

5. Select a different severity level for the event from the menu.
6. Click **OK** to return to the **Configure Alerts** window.
7. You might click **Cancel** to discard your current changes and to go back to the **Configure Alerts** window.
8. In the **Configure Alerts** window, click **OK** to save all of the changes made to the events.

8.3.5 Roll Back to Default Individual Event Configuration

To revert back to the default alert delivery method and the default severity level of an individual event, perform the following steps:

1. On the **Configure Alerts** dialog, click the **Alerts Setting** tab.

   The **Alerts Setting** portion of the dialog appears.
2. Click **Change Individual Events**.

   The **Change Individual Events** dialog appears. The dialog shows the events by their ID number, description, and the severity level.
3. Click **Restore Defaults**.

   The **Change Individual Events** dialog appears with the default alert delivery method and the default severity level of all individual events.
4. Click **OK** to return to the **Configure Alerts** dialog.
5. In the **Configure Alerts** dialog, click **OK** to save all the changes made to the events.

8.3.6 Entering or Editing the Sender Email Address and SMTP Server

You can use the **Configure Alerts** dialog to enter or edit the sender email address and the SMTP server.

1. On the **Configure Alerts** dialog, click the **Mail Server** tab.

   The **Mail Server options** dialog appears.
2. Enter a sender's email address in the **Sender email address** field, or edit the existing sender email address.
3. Enter your SMTP server name/IP Address in the **SMTP Server** field, or edit the existing details.
4. Click **OK**.

8.3.7 Authenticating the SMTP Server

The Nytro Storage Manager software supports a SMTP authentication mechanism called *Login*. This feature provides an extra level of security, while sending an email from the Nytro Storage Manager server.

To enter or modify the SMTP server authentication information, perform the following steps:

1. On the **Configure Alerts** window, click the **Mail Server** tab.
2. If on your SMTP server, the authentication mechanism is enabled and if you want to enable this feature on the Nytro Storage Manager software, then you need to select the **This Server requires authentication** check box and enter the authentication details in the corresponding fields (**User name** and **Password**).

   If you do not want to enable this feature on the Nytro Storage Manager software or if you know that your SMTP server does not support the *Login* mechanism, then deselect the **This Server requires authentication** check box.

   NOTE The **This Server requires authentication** check box is selected by default.
3. Enter a user name in the **User name** field.

   This step is optional if **This Server requires authentication** check box is selected.

4. Enter the password in the **Password** field.
   This step is optional if **This Server requires authentication** check box is selected.
5. Click **OK**.

8.3.8 Adding Email Addresses of Recipients of Alert Notifications

The **Email** tab in the **Configure Alerts** window shows the email addresses of the recipients of the alert notifications. The Nytro Storage Manager software sends alert notifications to those email addresses. Use the **Configure Alerts** window to add or remove email addresses of recipients and to send test messages to recipients that you add.

To add email addresses of recipients of the alert notifications, perform the following steps:

1. Click the **Email** tab in the **Configure Alerts** window.
2. Enter the email address you want to add in the **New recipient email address** field.
3. Click **Add**.
   The new email address appears in the **Recipient email addresses** field.

8.3.9 Testing Email Addresses of Recipients of Alert Notifications

Use the **Email** tab in the **Configure Alerts** window to send test messages to the email addresses that you added for the recipients of alert notifications.

1. Click the **Email** tab on the **Configure Alerts** window.
   The **Email** section of the window appears.
2. Click an email address in the **Recipient email addresses** field.
3. Click **Test**.
4. Confirm whether the test message was sent to the email address.
   A pop-up message indicates if the test message sent to the email address was successful. If the Nytro Storage Manager software cannot send an email message to the email address, an error message appears.

8.3.10 Removing Email Addresses of Recipients of Alert Notifications

Use the **Email** tab in the **Configure Alerts** dialog to remove email addresses of the recipients of alert notifications.

1. Click the **Email** tab on the **Configure Alerts** dialog.
   The **Email** section of the dialog appears.
2. Click an email address in the **Recipient email addresses** field.
   The **Remove** button, which was grayed out, is now active.
3. Click **Remove**.
   The email address is deleted from the list.

8.4 Monitoring the XP6500 Card

When the Nytro Storage Manager software is running, you can see the status of all the XP6500 card in the left panel. If a XP6500 card is operating normally, the XP6500 card icon looks like this: If a XP6500 card has failed, a small red circle appears next to the icon.

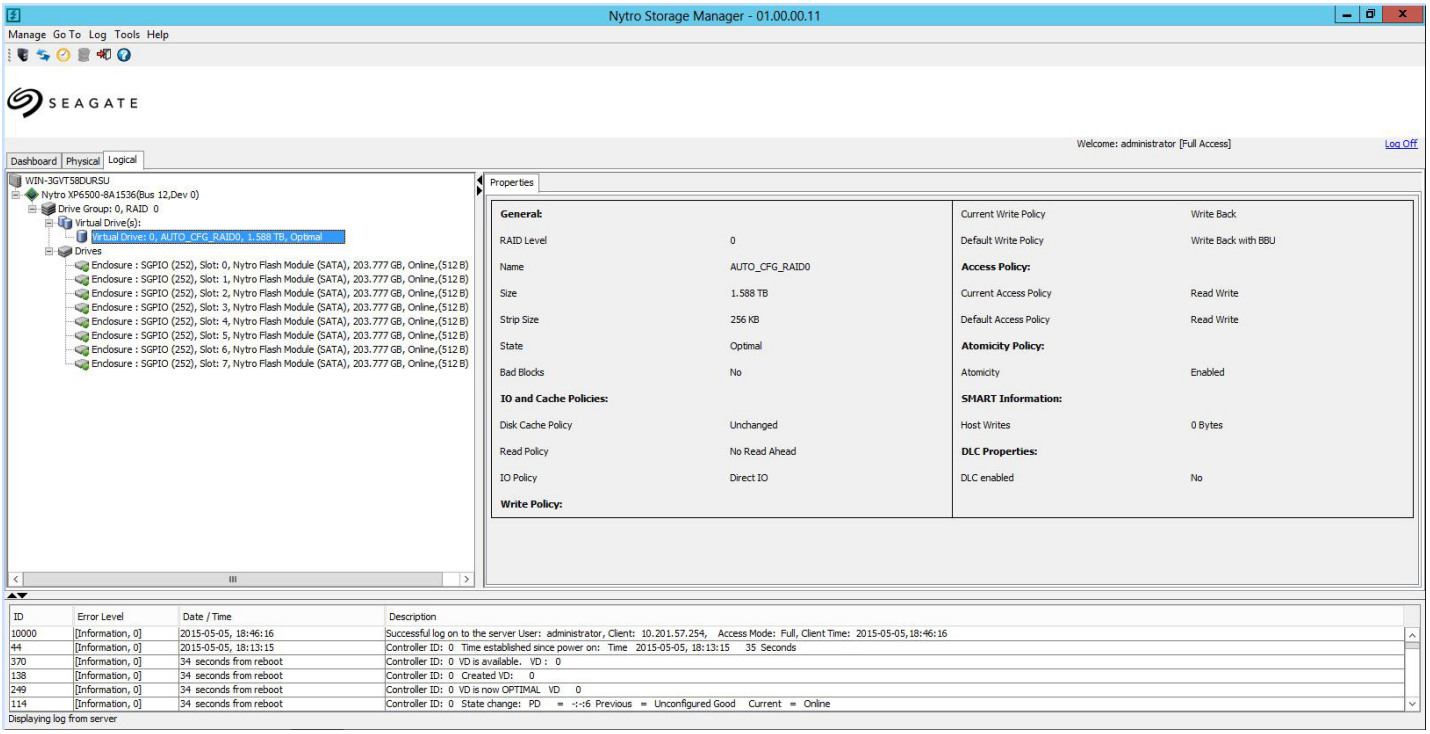
To display the complete XP6500 card information, click on a XP6500 card icon in the left panel of the Nytro Storage Manager main menu. The XP6500 card properties appear in the right pane. Most of the information on this tab is self-explanatory.

The **SuperCap Present** field indicates if there is a SuperCap back-up unit.

8.5 Monitoring Virtual Drives

When the Nytro Storage Manager software is running, you can see the status of all virtual drives. The figure below shows the Nytro Storage Manager screen.

Figure 49 Nytro Storage Manager Showing the Status of a Virtual Drive



If a virtual drive is operating normally, the icon looks like this: icon. Color-coded circles appear next to the icon to indicate the following:

- Green: The virtual drive is operating correctly.
- Red: The virtual drive storage configuration has failed.

To display complete virtual drive information, click the **Logical** tab in the left panel, and click on a virtual drive icon in the left panel. The properties appear in the right panel. The RAID level, strip size, and access policy of the virtual drive are set when the virtual drive is configured.

You can change the read policy, write policy, and other virtual drive properties.

NOTE You can change the Read Policy, Write Policy, and other virtual drive properties by selecting the virtual drive icon and then selecting **Go To > Virtual Drive > Set Virtual Drive Properties** in the menu bar.

8.6 Monitoring the SuperCap Unit

When the Nytro Storage Manager software is running, you can monitor the status of all of the SuperCap connected to the XP6500 card in the server. If a SuperCap is operating normally, the icon appears green. If it fails, a red dot appears next to the icon.

To show the properties for a SuperCap, perform the following steps.

1. On the main menu screen, click the **Physical** tab to open the physical view.
2. Select the BBU icon in the left panel.

The SuperCap properties appear in the right panel. The SuperCap properties include the following:

- The number of times the SuperCap is recharged (cycle count).
- The full capacity of the SuperCap, plus the percentage of its current state of charge, and the estimated time until it is depleted.
- The current SuperCap temperature, voltage, current, and remaining capacity.
- If the SuperCap is charging, the estimated time until it is fully charged.
- The SuperCap state, which says if it is in operational state.
- If SuperCap replacement is required.
- The SuperCap retention time, which gives the total number of hours SuperCap can support the current capacity reserve.

Chapter 9: Maintaining and Managing the XP6500 Card

This chapter explains how to use the Nytro Storage Manager software and the Nytro CLI to maintain and manage storage configurations. Log on to the server in Full Access mode to perform the maintenance and management tasks.

NOTE The example figures and Nytro CLI prototypes provided in this chapter help understand the supported XP6500 card operations.

9.1 Initializing a Virtual Drive

You can initialize a VD, which is automatically created. Select the Fast Initialization or Full Initialization option to initialize the disk immediately. However, you can select No Initialization if you want to initialize the virtual drive later.

CAUTION When you perform a fast initialization operation, firmware deletes the VD and performs a secure erase operation on all of the drives, and then creates a new VD.

To initialize a virtual drive after completing the configuration process, perform these steps:

1. Select the **Logical** tab in the left panel of the **Nytro Storage Manager** window, and click the icon of the virtual drive that you want to initialize.
2. Select **Go To > Virtual Drive > Start Initialization**.
   The **Initialize** dialog appears.
3. Select the virtual drives to initialize.

   CAUTION Initialization erases all data on the virtual drive. Make sure to back up any data you want to keep before you initialize a virtual drive. Make sure the operating system is not installed on the virtual drive you are initializing.
4. Select the **Fast Initialization** check box if you want to use this option.
   If you do not select the box, the Nytro Storage Manager software runs a Full Initialization on the virtual drive.
5. Click **Start** to begin the initialization.
   You can monitor the progress of the initialization.

9.2 Saving the Back-Up Configurations

You can save the `.cfg` back-up file of the entire XP6500 card configuration.

1. Right-click the XP6500 card on the **Logical** tab in the left panel of the **Nytro Storage Manager** window.
2. Click **Save Configuration**, and select the desired folder location to save the configuration file.
   By default, configuration file is saved with a `.cfg` extension.

9.3 Upgrading XP6500 Card Firmware Using the Nytro Storage Manager Software

The Nytro Storage Manager software enables you to easily upgrade the XP6500 card firmware.

To avoid data loss because of dirty cache on the XP6500 card, the utility forces the virtual disks into Write Through mode after a firmware upgrade. It is in this mode until the server reboots. In Write Through mode, the XP6500 card sends a data transfer completion signal to the host when the disk subsystem has received all of the data in a transaction. This way, in case of a power outage, the XP6500 card does not discard any dirty cache.

Follow these steps to upgrade the firmware:

1. In the left panel of the **Nytro Storage Manager** window, click the icon of the XP6500 card you want to upgrade.
2. In the **Nytro Storage Manager** window, select **Go To > XP6500 Card > Update Firmware**.
3. Click **Browse** to locate the `.rom` update file.

Figure 50 Update Firmware Dialog

4. After you locate the file, click **OK**.

   The Nytro Storage Manager software displays the version of the existing firmware and the version of the new firmware file.
5. When you are prompted to indicate whether you want to upgrade firmware, click **Yes**.

   The XP6500 card is updated with the new firmware code contained in the `.rom` file.

You can also select the online firmware upgrade option. In the online firmware upgrade operation, the server restart is not required for new firmware to take effect.

NOTE You cannot downgrade from the current XP6500 card firmware version.

9.4 Upgrading the Nytro XP6500 Card Firmware and Nytro XP6500 Module Firmware Using the Nytro CLI

Upgrading firmware on the Nytro XP6500 card involves the following procedures:

- Upgrading the Nytro XP6500 card firmware (this is usually a `.rom` file).
- Upgrading by single pushing the XP6500 card firmware and XP6500 module firmware by using a larger `.rom` file.

The Nytro XP6500 card supports online firmware upgrade. You can upgrade the XP6500 card firmware by using one of the following methods:

Online firmware upgrade

1. Flash the XP6500 card firmware in the online upgrade mode by using the `resetnow` option.

   NOTE The online firmware upgrade procedure does not require you to restart the server.

2. Verify the new firmware version in the **property** list and continue to use the card.

Regular firmware upgrade:

1. Flash the XP6500 card firmware.
2. Restart the server.
3. Verify the new firmware version in the **property** list and continue to use the card.

   NOTE After upgrading the XP6500 card cache, the XP6500 card cache is in the Write Through mode (that is, write caching is disabled) until the system is restarted.

   NOTE Whenever you upgrade the SuperCap Gas Gauge firmware, perform a manual learn operation to view the correct capacitance values.

9.4.1 Upgrading the Nytro XP6500 Card Firmware Using the Nytro CLI

Perform the following steps to flash the Nytro XP6500 card firmware:

1. Upgrade the Nytro XP6500 card firmware by using the `/cx download file=<filepath> [fwtype=<val>] [ResetNow] [nosigchk] [noverchk]` command.

For example:

```
nytrocli /c0 download file=ASD_FW_XP6500_7MB
```

Sample output:

```
C:\nytrocli>nytrocli /c0 download file=ASD_FW_XP6500_7MB.rom
Download Completed.
Flashing image to adapter...
 = 0
Status = Success
Description = F/W Flash Completed.
```

2. Restart the system after you flash the new firmware. The new firmware upgrade does not take effect until you restart the system.

   NOTE If you use the `ResetNow` option, it is not required to restart the server.

3. (Optional) Verify if the upgrade was successful by using the `nytrocli /cx show` command (for example: `nytrocli /c0 show`).

9.4.2 Upgrading the Nytro XP6500 Module Firmware Using the Nytro CLI

Upgrade the Nytro XP6500 modules on the XP6500 card firmware by using the `nytrocli /cx/e252/sx download src=<filepath> mode=5` command. Use the specific Nytro XP6500 module firmware for your Nytro XP6500 card model.

For example, for the first Nytro XP6500 module, use the following command:

```
nytrocli /c0/e252/s1 download src=8110_I5R.vic mode=5
```

For the second Nytro XP6500 module, use the following command:

```
nytrocli /c0/e252/s2 download src=8110_I5R.vic mode=5
```

NOTE The Nytro XP6500 module must be upgraded in a sequential manner and must not have background I/Os running.

9.4.3 Verifying the Firmware Upgrade

9.4.3.1 Verifying the Nytro XP6500 module firmware upgrade

1. Run the `nytrocli /cx/e252/sx show all` command at the command prompt to verify the Nytro XP6500 module version.

   For example: `nytrocli /c0/e252/s4 show all`

   The output from this command includes the firmware revision of the Nytro VD:

   ```
   Drive /c0/e252/sx Device attributes:
   ====================================
   Firmware Revision = UI5Y
   ```

9.4.3.2 Verifying the Nytro XP6500 card firmware upgrade

1. Run the `nytrocli /cx show` command at the command prompt to verify the Nytro XP6500 card firmware version.

   For example: `nytrocli /c0 show`

   The output from this command includes the firmware revision of the Nytro XP6500 card:

   ```
   nytrocli /c0 show
    = 0
   Status = Success
   Description = None
   ...
   Product Name = XP6500-8A1536
   ...
   FW Package Build = 23.19.0-29
   ...
   FW Version = 3.300.35-2481
   ```

9.5 Saving the TTY Log

You can save the TTY log events of the XP6500 card by using the Nytro Storage Manager software.

1. Right-click the XP6500 card.
2. Click **Save TTY Log**, and select the desired folder location to save the file in the `.txt` format.

You also can save the TTY log events of the XP6500 card by using the `nytrocli /cx show termlog type=contents` command.
For example, `nytrocli /c0 show termlog type=contents > termlog.txt`.

Appendix A: Events and Messages

This appendix lists the Nytro Storage Manager events that can appear in the event log.

The Nytro Storage Manager software monitors the activity and performance of all XP6500 card in the workstation and the devices attached to them. When an event occurs, such as the start of an initialization, an event message appears in the log at the bottom of the Nytro Storage Manager main menu window. The messages are also logged in the event log viewer.

A.1 Event Error Levels

Each message that appears in the event log has a Severity level that indicates the severity of the event, as shown in the following table.

Table 17 Event Error Levels

Severity Level	Meaning
Information	Informational message. No user action is necessary.
Warning	Some component might be close to a failure point.
Critical	A component has failed, but the system has not lost data.
Fatal	A component has failed, and data loss has occurred or might occur.

A.2 Event Messages

The following table lists all of the Nytro Storage Manager event messages. The event message descriptions include placeholders for specific values that are determined when the event is generated. For example, in message No. 1 in the Event Messages table, "%s" is replaced by firmware version, which is read from firmware when the event is generated.

Table 18 Event Messages

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x0000	Information	firmware initialization started (PCI ID %04x/%04x/%04x/%04x)	Logged at firmware initialization.
0x0001	Information	firmware version %s	Logged at firmware initialization to display firmware version.
0x0002	Fatal	Unable to recover VD data from SuperCap	Currently not logged.
0x0003	Information	Cache data recovered from SuperCap successfully	Currently not logged.
0x0004	Information	Configuration cleared	Logged when card configuration is cleared.
0x0005	Warning	Cluster down; communication with peer lost	Currently not logged.
0x0006	Information	Virtual drive %s ownership changed from %02x to %02x	Currently not logged.
0x000a	Fatal	cache discarded due to memory/SuperCap problems	Logged on cache discard due to hardware problems.
0x000b	Fatal	Unable to recover cache data due to configuration mismatch	Currently not logged.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x000c	Information	Cache data recovered successfully	Logged when cache data is successfully recovered after reboot.
0x000d	Fatal	cache discarded due to firmware version incompatibility	Logged when cache data discarded because of firmware version mismatch.
0x000f	Fatal	Fatal firmware error: %s	Logged in case of fatal errors and also while entering debug monitor.
0x0010	Information	Factory defaults restored	Logged while card is reset to factory defaults.
0x0011	Information	Flash downloaded image corrupt	Logged to inform downloaded Flash image is corrupt.
0x0012	Critical	Flash erase error	Logged in case of Flash erase failure, generally after Flash update.
0x0013	Critical	Flash timeout during erase	Logged to indicate Flash erase operation timed out.
0x0014	Critical	Flash error	Generic unknown internal error during Flash update Flash.
0x0015	Information	Flashing image: %s	Logged to display Flash image name string before getting updated to card.
0x0016	Information	Flash of new firmware images complete	Logged to inform successful updation of Flash image.
0x0017	Critical	Flash programming error	Logged to notify, write failure during Flash update, not being allowed usually due to internal card settings.
0x0018	Critical	Flash timeout during programming	Logged to indicate Flash write operation timed out.
0x0019	Critical	Flash chip type unknown	Logged during Flash update tried with unsupported Flash chip type.
0x001a	Critical	Flash command set unknown	Logged while unsupported Flash command set detected, most likely because of unsupported Flash chip.
0x001b	Critical	Flash verify failure	Logged when compare operation fails between written Flash data and original data.
0x001c	Information	Flush rate changed to %d seconds	Logged to notify modified cache flush frequency in seconds.
0x001d	Information	Hibernate command received from host	Logged to inform about reception of hibernation command from host to card, generally during host shutdown.
0x001e	Information	Event log cleared	Logged when card log has been cleared.
0x001f	Information	Event log wrapped	Logged when card log has been wrapped around, when the maximum logs are written.
0x0022	Fatal	Not enough memory	Logged to notify fatal card condition, when you run out of memory to allocate.
0x0023	Information	Patrol Read complete	Logged when patrol read completes.
0x0024	Information	Patrol Read paused	Logged when patrol read is paused.
0x0025	Information	Patrol Read Rate changed to %d%%	Logged to indicate progress of patrol read in percentage.
0x0026	Information	Patrol Read resumed	Logged when patrol read is resumed.
0x0027	Information	Patrol Read started	Logged when patrol read is started.
0x002a	Information	Shutdown command received from host	Logged when shutdown command is received from host to card.
0x002b	Information	Test event: %s	General card event, with a generic string.
0x002c	Information	Time established as %s; (%d seconds since power on)	Logged when card time was set form host, also displaying time since power on in seconds.
0x002d	Information	User entered firmware debugger	Logged when user enters card debug shell.
0x0036	Information	Policy change on %s from %s to %s	Logged to inform the changed policy for displayed VD with old and new policies.
0x0043	Warning	Initialization aborted on %s	Logged when Consistency check is aborted by you or for some other reason.
0x0044	Critical	Initialization failed on %s	Logged when initialization has failed.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x0045	Progress	Initialization progress on %s is %s	Logs initialization progress, the progress is logged only if the progress is greater than 1% at an interval of every 15 seconds
0x0046	Information	Fast initialization started on %s	Logged when quick initialization has started on a VD. The parameter to decide Quick init or Full init is passed by you.
0x0047	Information	Full initialization started on %s	Logged when full initialization has started.
0x0048	Information	Initialization complete on %s	Logged when initialization has completed successfully.
0x0049	Information	VD Properties updated to %s (from %s)	Logged when VD properties has been changed.
0x0051	Information	State change on %s from %s to %s	Logged when there is change in VD state. The event gives the new and old state. The state could be one of the following, LDS_OFFLINE, LDS_PARTIALLY_DEGRADED, LDS_DEGRADED, LDS_OPTIMAL.
0x0052	Information	Drive Clear aborted on %s	Logged when PD clear is aborted.
0x0053	Critical	Drive Clear failed on %s (Error %02x)	Logged when drive clear is failed and the even is logged along with error code.
0x0054	Progress	Drive Clear progress on %s is %s	Logs drive clear progress, the progress is logged only if the progress is greater than 1% at an interval of every 15 seconds.
0x0055	Information	Drive Clear started on %s	Logged when drive clear started on a PD.
0x0056	Information	Drive Clear completed on %s	Logged when PD clear task is completed successfully on a PD.
0x0057	Warning	Error on %s (Error %02x)	Logged if Read returns with Uncorrectable error or same errors on both the drives or write long returns with an error (ie. puncture operation could failed).
0x0058	Information	Format complete on %s	Logged when Format has completed.
0x0059	Information	Format started on %s	Logged when format unit is started on a PD.
0x005b	Information	Drive inserted: %s	Logged when drive is inserted and slot fields of PD are updated.
0x005c	Warning	Drive %s is not supported	Logged when the drive is not supported; reason could be the number of drive has exceeded the MAX supported drives or could be an unsupported drive type.
0x005d	Warning	Patrol Read corrected medium error on %s at %lx	Logged when Patrol read has successfully completed recovery read and recovered data.
0x005e	Progress	Patrol Read progress on %s is %s	Logs patrol read progress, the progress is logged only if the progress is greater than 1% at an interval of every 15 seconds.
0x005f	Fatal	Patrol Read found an uncorrectable medium error on %s at %lx	Logged when Patrol read is unable to recover data.
0x0060	Critical	Predictive failure: CDB: %s	Logged when a failure is found during SMART (predictive failure) poll.
0x0061	Fatal	Patrol Read puncturing bad block on %s at %lx	Logged when patrol read punctures a block due to unrecoverable medium error.
0x006c	Fatal	Reassign write operation failed on %s at %lx	Logged when a check condition or medium error is encountered for a reassigned write.
0x006d	Fatal	Unrecoverable medium error during rebuild on %s at %lx	Logged when the rebuild I/O encounters an unrecoverable medium error.
0x006e	Information	Corrected medium error during recovery on %s at %lx	Logged when recovery completed successfully and fixed a medium error.
0x006f	Fatal	Unrecoverable medium error during recovery on %s at %lx	Logged when the recovery for a failed I/O encounters a medium error.
0x0070	Information	Drive removed: %s	Logged when a drive is removed from the card.
0x0071	Warning	Unexpected sense: %s, CDB%s, Sense: %s	Logged when an I/O fails due to unexpected reasons and sense data needs to be logged.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x0072	Information	State change on %s from %s to %s	Logged when the state of a drive is changed by firmware or by you.
0x0073	Information	State change by user on %s from %s to %s	Not logged by firmware.
0x0074	Warning	Redundant path to %s broken	Not logged by firmware.
0x0075	Information	Redundant path to %s restored	Not logged by firmware
0x0083	Fatal	Unable to access device %s	Logged when the inserted drive is bad and unusable.
0x008a	Information	Created %s}	Logged as soon as the new virtual drive created is added to the firmware configuration.
0x008b	Information	Deleted %s}	Logged when firmware removes an VD from it's configuration upon a user request from the applications.
0x008c	Information	Marking LD %s inconsistent due to active writes at shutdown	Logged when we have active writes on one of the target disks of a RAID 5 VD at the time of shutdown.
0x008d	Information	SuperCap Present	Logged during firmware initialization when we check if there is a SuperCap present and the check turns out true. This event is also logged when a SuperCap is inserted or replaced with a new one and the SuperCap present check returns true.
0x008e	Warning	SuperCap Not Present	Logged if the user has not disabled "SuperCap Not Present" warning at system start time or if a SuperCap is removed.
0x008f	Information	New SuperCap Detected	Logged when there is a subsequent system start time after a new SuperCap is inserted.
0x0090	Information	SuperCap is replaced	Logged when a new SuperCap is replaced with an old SuperCap.
0x0091	Critical	SuperCap temperature is high	Logged when a SuperCap temperature is high during the periodic SuperCap status check.
0x0092	Warning	SuperCap voltage low	Not logged by firmware.
0x0093	Information	SuperCap started charging	Logged as part of monitoring the SuperCap status when the SuperCap is getting charged.
0x0094	Information	SuperCap is discharging	Logged as part of monitoring the SuperCap status when the SuperCap is getting discharged.
0x0095	Information	SuperCap temperature is normal	Logged as part of monitoring the SuperCap status when the temperature of the SuperCap is normal.
0x0096	Fatal	SuperCap has failed and cannot support data retention. Please replace the SuperCap.	Logged when there is not enough capacity left in SuperCap for expected data retention time. SuperCap has to be replaced.
0x0097	Information	SuperCap relearn started	logged when the SuperCap relearn started, initiated either by the user or automatically.
0x0098	Information	SuperCap relearn in progress	Logged as part of monitoring the SuperCap status when the SuperCap relearn is in progress.
0x0099	Information	SuperCap relearn completed	Logged as part of monitoring the SuperCap status when the SuperCap relearn is complete.
0x009a	Critical	SuperCap relearn timed out	Not logged by firmware.
0x009b	Information	SuperCap relearn pending: Battery is under charge	Logged as part of monitoring the SuperCap status when the SuperCap relearn is requested, but yet to start.
0x009c	Information	SuperCap relearn postponed	Logged as part of monitoring the SuperCap status when the SuperCap relearn is requested but postponed as there is valid pinned cache present. This event can also be logged when learn delay interval is explicitly set.
0x009d	Information	SuperCap relearn starts in 4 days	Logged as part of providing SuperCap learn cycle information when auto learn is enabled.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x009e	Information	SuperCap relearn starts in 2 day	Logged as part of providing SuperCap learn cycle information when auto learn is enabled.
0x009f	Information	SuperCap relearn starts in 1 day	Logged as part of providing SuperCap learn cycle information when auto learn is enabled.
0x00a0	Information	SuperCap relearn starts in 5 hours	Logged as part of providing SuperCap learn cycle information when auto learn is enabled.
0x00a1	Information	SuperCap removed	Logged as part of periodic monitoring of the SuperCap status when a SuperCap is removed.
0x00a2	Information	Current capacity of the SuperCap is below threshold	Logged as part of monitoring the SuperCap status when the capacity of the SuperCap is below threshold.
0x00a3	Information	Current capacity of the SuperCap is above threshold	Logged as part of monitoring the SuperCap status when the capacity of the SuperCap is above threshold.
0x00bf	Information	Clustering enabled	Logged when the clustering is enabled in the card properties.
0x00c0	Information	Clustering disabled	Logged when the clustering is disabled in the card properties.
0x00c1	Information	Drive too small to be used for auto-rebuild on %s	Logged when the size of the drive is not sufficient for auto-rebuild.
0x00c2	Information	SuperCap enabled; changing WT virtual drives to WB	Logged when changing WT virtual drives to WB and the SuperCap status is good.
0x00c3	Warning	SuperCap disabled; changing WB virtual drives to WT	Logged when changing WB virtual drives to WT and the SuperCap status is bad.
0x00c4	Warning	Bad block table on drive %s is 80% full	Logged when the Bad block table on a drive is 80% full.
0x00c5	Fatal	Bad block table on drive %s is full; unable to log block %lx	Logged when the Bad block table on a drive is full and not able to add the bad block in the Bad block table.
0x00c8	Critical	SuperCap/charger problems detected; SOH Bad	Logged when the battery is not presented or removed and SOH is bad.
0x00d1	Information	SuperCap Retention test was initiated on previous boot	Logged when the SuperCap Retention test was initiated on previous boot.
0x00d2	Information	SuperCap Retention test passed	Logged when the SuperCap Retention test passed successfully.
0x00d3	Critical	SuperCap Retention test failed!	Logged when the SuperCap Retention test failed.
0x00d4	Information	NVRAM Retention test was initiated on previous boot	Logged when the NVRAM Retention test was initiated on previous boot.
0x00d5	Information	NVRAM Retention test passed	Logged when the NVRAM Retention test passed successfully.
0x00d6	Critical	NVRAM Retention test failed!	Logged when the NVRAM Retention test failed.
0x00d7	Information	%s test completed %d passes successfully	Logged when the card diagnostics test passes successfully.
0x00d8	Critical	%s test FAILED on %d pass. Fail data: errorOffset=%x goodData=%x badData=%x	Logged when the card diagnostics test fails.
0x00d9	Information	Self check diagnostics completed	Logged when Self check diagnostics is completed.
0x00dd	Warning	NVRAM is corrupt; reinitializing	Logged when NVRAM is corrupt and reinitialized.
0x00de	Warning	NVRAM mismatch occurred	Logged when NVRAM mismatch occurs.
0x00e2	Warning	Bad block reassigned on %s at %lx to %lx	Logged when a Bad block is reassigned on a drive from a error sector to a new sector.
0x00e3	Information	Hot Plug detected	Logged when a Hot Plug is detected.
0x00e5	Information	Drive test cannot start. No qualifying drives found	Logged when Disk test cannot start. No qualifying disks found.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x00e6	Information	Time duration provided by host is not sufficient for self check	Logged when Time duration provided by the host is not sufficient for self check.
0x00e7	Information	Marked Missing for %s on drive group %d row %d	Logged when a physical drive is Marked Missing on an array at a particular row.
0x00e8	Information	Replaced Missing as %s on drive group %d row %d	Logged when a physical drive is Replaced Missing on an array at a particular row.
0x00ec	Warning	%s is not a certified drive	Logged if the drive is not certified.
0x00ed	Information	Dirty cache data discarded by user	Logged when Dirty cache data is discarded by the user.
0x00ee	Information	Drives missing from configuration at system start	Logged when physical drives are missing from configuration at system start.
0x00ef	Information	Virtual drives (VDs) missing drives and go offline at system start: %s	Logged when virtual drives missing drives and go offline at system start.
0x00f0	Information	VDs missing at system start: %s	Logged when virtual drives missing at system start.
0x00f1	Information	Previous configuration completely missing at system start	Logged when Previous configuration completely missing at system start.
0x00f2	Information	SuperCap charge complete	Logged when SuperCap charge is completed.
0x00f7	Information	Inserted PD: %s Info: %s	Logged when a physical drive is inserted.
0x00f8	Information	Removed PD: %s Info: %s	Logged when a physical drive is removed.
0x00f9	Information	VD %s is now OPTIMAL	Logged when a virtual drive state changes to OPTIMAL.
0x00fc	Fatal	VD %s is now OFFLINE	Logged when a virtual drive state changes to offline state.
0x00fd	Warning	SuperCap requires reconditioning; please initiate a LEARN cycle	Logged when a SuperCap requires reconditioning; please initiate a LEARN cycle.
0x00fe	Warning	VD %s disabled because RAID 5 is not supported by this RAID key	Logged when a virtual drive is disabled because RAID 5 is not supported by this RAID key.
0x0101	Warning	PD missing: %s	Logged to provide information about the missing drive during system start.
0x0102	Warning	Puncturing of LBAs enabled	Currently not logged in firmware.
0x0103	Warning	Puncturing of LBAs disabled	Currently not logged in firmware.
0x0105	Information	Package version %s	Prints the Package version number.
0x010a	Information	Board Revision %s	Logged during system start.
0x010b	Warning	Command timeout on PD %s, CDB:%s	Logged when command to a PD Timesout.
0x010c	Warning	PD %s reset (Type %02x)	Logged when PD is reset.
0x010d	Warning	VD bad block table on %s is 80% full	Logged when number of Bad Blocks entries is at 80 % of what can be supported in firmware.
0x010e	Fatal	VD bad block table on %s is full; unable to log block %lx (on %s at %lx)	Logged when number of Bad Blocks exceed what can be supported in firmware.
0x010f	Fatal	Uncorrectable medium error logged for %s at %lx (on %s at %lx)	Logged when an uncorrectable medium error is detected.
0x0110	Information	VD medium error corrected on %s at %lx	Logged on the corrected medium error.
0x0111	Warning	Bad block table on PD %s is 100% full	Logged when Bad block table is 100 % Full. Any more media errors on this physical drive will not be logged in the bad block table.
0x0112	Warning	VD bad block table on PD %s is 100%	Logged when Bad block table is 100 % Full. Any more media errors on this virtual drive will not be logged in the bad block table.
0x0113	Fatal	needs replacement, IOP is faulty	Currently not logged in firmware.
0x011c	Information	SuperCap FRU is %s	Logged only for IBM.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x011d	Information	%s FRU is %s	Logged if FRU data is present. Logged only for IBM.
0x011e	Information	hardware revision ID %s	Currently not used in firmware.
0x0120	Information	Redundant path restored for PD %s	Logged when new path is added for the physical drives.
0x0121	Warning	Redundant path broken for PD %s	Logged when one path is removed.
0x0124	Warning	Patrol Read cannot be started, as PDs are either not ONLINE, or are in a VD with an active process, or are in an excluded VD	Logged when none of the disks can start PR.
0x0128	Fatal	cache discarded for missing or offline VD %s When a VD with cached data goes offline or missing during runtime, the cache for the VD is discarded. Because the VD is offline, the cache cannot be saved.	Logged when pinned cache lines are discarded for a VD.
0x012b	Information	Microcode update started on PD %s	Logged when PD Firmware download starts.
0x012c	Information	Microcode update completed on PD %s	Logged when PD Firmware download completes.
0x012d	Warning	Microcode update timeout on PD %s	Logged when PD Firmware download does not complete and times out.
0x012e	Warning	Microcode update failed on PD %s	Logged when PD Firmware download fails.
0x012f	Information	properties changed	Logged when any of the card properties has changed.
0x0130	Information	Patrol Read properties changed	Currently not logged in firmware.
0x0132	Information	SuperCap properties changed	Logged when any of the SuperCap properties has changed.
0x0133	Warning	Periodic SuperCap Relearn is pending. Please initiate manual learn cycle as Automatic learn is not enabled	Logged when SuperCap periodic relearn is pending.
0x013c	Information	VD %s is now secured	Logged when secure VD is created.
0x013d	Warning	VD %s is partially secured	Logged when all the drives in the array are not secure.
0x013e	Information	PD %s security activated	Logged when PD security key is set.
0x013f	Information	PD %s security disabled	Logged when security key is removed from an FDE drive.
0x0140	Information	PD %s is reprovisioned	Logged when PD security is cleared.
0x0141	Information	PD %s security key changed	Logged when PD lock key is re-keyed.
0x0142	Fatal	Security subsystem problems detected for PD %s	Logged when PD security cannot be set.
0x0143	Fatal	cache pinned for missing or offline VD %s	Logged when VD cache is pinned.
0x0144	Fatal	cache pinned for missing or offline VDs: %s	Logged when pinned cache is found during OCR.
0x0145	Information	cache discarded by user for VDs: %s	Logged when VD pinned cache is discarded by the user.
0x0146	Information	cache destaged for VD %s	Logged when VD pinned cache is recovered.
0x0148	Warning	Drive security key failure, cannot access secured configuration	Logged when an invalid lock key is detected.
0x0149	Warning	Drive security password from user is invalid	Not logged.
0x014a	Warning	Detected error with the remote SuperCap connector cable	Not logged.
0x014f	Information	VD bad block table on %s is cleared	Logged when a VD bad block table was cleared.
0x0151	Information	VD cluster of medium errors corrected for %s at %lx (on %s at %lx)	Logged when medium errors were corrected for a PD for a VD.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x0152	Information	requests a host bus rescan	Logged when card requested a host bus rescan.
0x0153	Information	repurposed and factory defaults restored	Logged when card repurposed and factory defaults were restored.
0x0154	Information	Drive security key binding updated	Logged when drive security key binding was updated.
0x0159	Critical	encountered a fatal error and was reset	Logged when a card encountered a fatal error and was reset.
0x016e	Critical	Configuration command could not be committed to disk, please retry	Logged when configuration command could not be committed to disk and was asked to retry.
0x016f	Information	COD on %s updated as it was stale	Logged when COD in Flash module is updated due to various reasons.
0x0171	Warning	%s is not available	Logged when a VD was not available.
0x0172	Information	%s is available	Logged when a VD was available.
0x0173	Information	%s is used for Nytro VD with capacity 0x%lx logical blocks	Logged when a VD was used for Nytro VD with the indicated capacity in virtual blocks.
0x0174	Information	%s is using Nytro VD %s	Logged when a VD was using Nytro VD.
0x0175	Information	%s is no longer using Nytro VD %s	Logged when a VD was no longer using Nytro VD.
0x0179	Warning	Nytro VD (%s) capacity changed and is now 0x%lx logical blocks	Logged when the Nytro VD capacity is changed along with the current capacity.
0x017a	Warning	SuperCap cannot initiate transparent learn cycles	Logged when the SuperCap cannot initiate transparent learn cycles.
0x0182	Warning	SuperCap cannot support data retention for more than %d hours. Please replace the SuperCap	Logged during the SuperCap monitoring and it displays the remaining data retention time of the SuperCap.
0x0185	Information	Host driver is loaded and operational	This event is not reported to the user.
0x0188	Warning	%s link %d failure in wide port	This event is not reported to the user.
0x0189	Information	%s link %d restored in wide port	This event is not reported to the user.
0x018a	Information	Memory module FRU is %s	This event is not reported to the user.
0x018b	Warning	Cache offload power pack is sub-optimal, replace the pack	This event is not reported to the user.
0x018d	Warning	Cache offload microcode update required	Logged when the BMU is not in Normal mode and Cache offload microcode update required.
0x018e	Warning	Nytro VD (%s) capacity exceeds maximum permitted size, extra capacity is not used	Logged when Nytro VD capacity exceeds maximum allowed size, extra capacity is not used.
0x018f	Warning	LD (%s) protection information lost	Logged when the protection information is lost for an VD.
0x0190	Information	Diagnostics passed for %s	Logged when the SHIELD™ Diagnostics passed for a PD.
0x0191	Critical	Diagnostics failed for %s	Logged when the SHIELD Diagnostics failed for a PD.
0x01a3	Information	Reminder: Patrol Read suspended	Logged as a reminder when the Patrol Read is suspended.
0x01a4	Information	Erase aborted on %s	Logged when the Erase is aborted on a PD.
0x01a5	Critical	Erase failed on %s (Error %02x)	Logged when the Erase is failed on a PD along with the error.
0x01a6	Progress	Erase progress on %s is %s	Logged to display the Erase progress on a PD along with its current progress.
0x01a7	Information	Erase started on %s	Logged when Erase is started on a PD.
0x01a8	Information	Erase completed on %s	Logged when the Erase is completed on a PD.
0x01a9	Information	Erase aborted on %s	Logged when the Erase is aborted on an VD.
0x01aa	Critical	Erase failed on %s	Logged when the Erase is failed on an VD.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x01ab	Progress	Erase progress on %s is %s	Logged to display the Erase progress on an VD along with its current progress.
0x01ac	Information	Erase started on %s	Logged when the Erase is started on an VD.
0x01ad	Information	Erase complete on %s	Logged when the Erase is complete on an VD.
0x01ae	Warning	Potential leakage during erase on %s	Logged to inform the Potential leakage during erase on an VD.
0x01af	Warning	SuperCap charging was suspended due to high SuperCap temperature	Logged when the SuperCap charging was suspended due to high SuperCap temperature.
0x01b0	Information	NVCache firmware update was successful	This event is not reported to the user.
0x01b1	Warning	NVCache firmware update failed	This event is not reported to the user.
0x01b2	Fatal	%s access blocked as cached data in Nytro VD is unavailable	This event is not reported to the user.
0x01ba	Information	%s is now accessible	This event is not reported to the user.
0x01bb	Information	%s is using Nytro VD	This event is not reported to the user.
0x01bc	Information	%s is no longer using Nytro VD	This event is not reported to the user.
0x01bd	Information	Patrol Read aborted on %s	Logged when the Patrol Read is aborted on a PD.
0x01c2	Information	Periodic Battery Relearn was missed, and rescheduled to %s	Logged if Battery Relearn was missed at the scheduled time due to a system power off then the card will reschedule automatically when you power on the system.
0x01c3	Information	reset requested by host	Logged when the Reset process started on the corresponding card.
0x01c4	Information	reset requested by host, completed	Logged when the Reset process completed on the corresponding card.
0x01c7	Warning	booted in headless mode with errors	Logged when the card is booted in safe mode because of warning errors.
0x01c8	Critical	booted to safe mode, because of critical errors	Logged when the card is booted in safe mode because of critical errors.
0x01c9	Warning	Warning Error during boot - %s	Logged when a warning error occurs during booting the card to safe mode.
0x01ca	Critical	Critical Error during boot - %s	Logged when a critical error occurs during booting the card in safe mode.
0x01cb	Fatal	Fatal Error during boot - %s	Logged when a fatal error occurs during booting the card in safe mode.
0x01df	Warning	%s temperature (%d C) is above warning threshold	Logged when the temperature of the Nytro XP6500 module is above warning threshold.
0x01e0	Critical	%s temperature (%d C) is above critical threshold	Logged when the temperature of the Nytro XP6500 module is above critical threshold.
0x01e1	Information	%s temperature (%d C) is normal	Logged when the temperature of the Nytro XP6500 module comes back to normal.
0x01e2	Warning	%s IOs are being throttled	Logged when the I/Os to the Nytro XP6500 module are being throttled.
0x01e3	Information	%s IOs are normal. (No throttling)	Logged when the I/Os become normal.
0x01e4	Information	%s has %d%% life left. Life left thresholds - warning:%d%%, critical:%d%%	Logged to indicate the life left for the Nytro XP6500 module.

Table 18 Event Messages (Continued)

Number	Severity Level	Event Text	Generic Conditions when each event occurs
0x01e5	Warning	%s life left (%d%%) is below optimal. Life left thresholds - warning:%d%%, critical:%d%%	Logged when the life left for the Nytro XP6500 module falls below optimal threshold.
0x01e6	Critical	%s life left (%d%%) is critical. Life left thresholds - warning:%d%%, critical:%d%%	Logged when the Life left for the Nytro XP6500 module falls below critical threshold.
0x01e7	Critical	%s failure, device locked-up	Logged when the Nytro XP6500 module fails and the goes to locked up state

Appendix B: Error Messages and Descriptions

Each message that appears in the event log has an error level that indicates the severity of the event, as shown in the following table.

Table 19 Error Messages

Number	Error Message
0x00	Command completed successfully
0x01	Invalid command
0x02	DCMD Opcode is invalid
0x03	Input parameters are invalid
0x04	Invalid sequence number
0x05	Abort is not possible for the requested command
0x06	Application *host* code not found
0x07	Application already in use - try later
0x08	Application not initialized
0x09	Given array index is invalid
0x0a	Unable to add missing drive to array because the row has no empty slots
0x0b	Some of the `CFG` resources conflict with each other or with the current configuration
0x0c	Invalid device ID/select-timeout
0x0d	Drive is too small for requested operation
0x0e	Flash memory allocation failed
0x0f	Flash download already in progress
0x10	Flash operation failed
0x11	Flash image was bad
0x12	Downloaded Flash image is incomplete
0x13	Flash OPEN was not done
0x14	Flash sequence is not active
0x15	Flush command failed
0x16	Specified application does not have host-resident code
0x18	LD initialization in progress
0x19	LBA is out of range
0x1a	Maximum allowed LDs are already configured
0x1b	LD is not OPTIMAL
0x1e	LD RAID level is wrong for requested operation
0x1f	Too many spares assigned
0x20	Scratch memory not available - try command again later
0x21	Error writing MFC data to SEEPROM
0x22	SuperCap is missing **CAUTION** Do not hot plug the SuperCap when power is supplied to it or if there is residual charge on the SuperCap; doing so might damage both the SuperCap and the board.

Table 19 Error Messages (Continued)

Number	Error Message
0x23	Item not found
0x25	PD CLEAR operation is in progress
0x27	Patrol Read is disabled
0x28	Given row index is invalid
0x2d	SCSI command done, but non-GOOD status was received - see *mf.hdr.extStatus* for SCSI_STATUS
0x2e	I/O request for `MFI_CMD_OP_PD_SCSI` failed
0x2f	Matches SCSI `RESERVATION_CONFLICT`
0x30	One or more of the flush operations failed
0x31	Firmware real-time currently not set
0x32	Command issues while firmware in wrong state (that is, GET RECON when op not active)
0x33	LD is not OFFLINE - I/O not possible
0x34	Peer Controller rejected request (possibly due to resource conflict)
0x35	Unable to inform peer of communication changes (retry might be appropriate)
0x36	LD reservation already in progress
0x37	I^2C errors were detected
0x38	PCI errors occurred during XOR/DMA operation
0x39	Diagnostics failed - see event log for details
0x3a	Unable to process command as boot messages are pending
0x3b	Returned if foreign configurations are incomplete
0x3d	Returned if a command is tried on unsupported hardware
0x3e	CC scheduling is disabled
0x40	Selected more than one PD per array
0x41	Microcode update operation failed
0x42	Unable to process command as drive security feature is not enabled
0x43	Controller already has a lock key
0x44	Lock key cannot be backed-up
0x45	Lock key backup cannot be verified
0x46	Lock key from backup failed verification
0x47	Rekey operation not allowed unless the Controller already has a lock key
0x48	Lock key is not valid, cannot authenticate
0x49	Lock key from escrow cannot be used
0x4a	Lock key backup (pass-phrase) is required
0x4b	Secure LD exists
0x4c	LD secure operation is not allowed
0x4d	Reprovisioning is not allowed
0x4e	Drive security type (FDE or non-FDE) is not appropriate for requested operation
0x4f	LD encryption type is not supported
0x50	Cannot mix FDE and non-FDE drives in same array

Table 19 Error Messages (Continued)

Number	Error Message
0x51	Cannot mix secure and unsecured LD in same array
0x53	Physical device errors were detected
0x54	Controller has LD cache pinned
0x55	Requested operation is already in progress
0x58	No PD is available for patrol read
0x59	Controller reset is required
0x5a	No EKM boot agent detected
0x5c	For consistency SET PiTs, some PiT creations might fail
0xFF	Invalid status - used for polling command completion
0x5f	Maximum allowed unconfigured (configurable) PDs exist
0x60	I/O metrics are not being collected
0x61	AEC capture needs to be stopped before proceeding
0x62	Unsupported level of protection information
0x63	PDs in LD have incompatible EEDP types
0x64	Request cannot be completed because protection information is not enabled
0x65	PDs in LD have different block sizes
0x66	LD Cached data is present on a (this) SSCD
0x67	Config sequence number mismatch
0x68	Flash image is not supported
0x69	Controller cannot be online-reset
0x6a	Controller booted to safe mode, command is not supported in this mode
0x6b	SSC memory is unavailable to complete the operation
0x6c	Peer node is incompatible
0x6e	Signed component is not part of the image
0x6f	Authentication failure of the signed firmware image
0x70	Flashing was okay but FW restart is not required, example: No change in FW from current
0x71	FW is in some form of restricted mode, example: passive in A/P HA mode

Appendix C: Other Types of Installation

This appendix provides different methods for installing the XP6500 card.

C.1 Installing a New Nytro XP6500 Card with an Existing Nytro XP6500 Card

To install a new Nytro card with an existing Nytro card, perform these steps:

1. Power down and disconnect the Server/Computer from its power source.
2. Insert the XP6500 Card in a x8 PCIe Slot.
3. Reconnect server/computer to power source and power on.

The existing Nytro drivers, firmware, applications, operating system, and configurations are detected and used for the XP6500 card. If the existing XP6500 card is not supported, you must install new/latest drivers, firmware, applications, and operating systems, and then configure the virtual drive.

Appendix D: UEFI Driver Policy

If the platform loads the UEFI driver first, the non-critical boot messages are discarded. To show the critical boot message (a message with infinite delay), you require the support of the respective platform (system BIOS).

For example:

- Some platforms load both the OpROMs (legacy and UEFI)
- Some platforms might load legacy first and then the UEFI driver, or vice versa
- Some platforms might load only one OpROM depending upon the system boot mode (legacy versus UEFI)

This might result in the following behavioral differences based on the XP6500 card boot mode and system boot mode (legacy or UEFI).

On a hybrid system that loads the UEFI driver first, you cannot view the informational messages, such as firmware package version, when the legacy OpROM loads.

Some platforms might have the option to turn the support option on (enabled), in the BIOS setup. For some platforms this option might be turned on by default.

You can turn this option on (enabled) during the system boot up in the system BIOS setup screen. When this option is turned on (enabled), the platform will launch the HII form to show critical boot messages, if any. If it is off (disabled), the platform will not launch the HII form (driver health form set).

For example:

- To turn the option on (enable) on an IBM server, go to `Boot Manager > Boot mode > Driver health check`.
- To turn the option on (enable) on an SMC system, go to `Boot > Check s health status > ENABLE`.

NOTE The options might differ from platform to platform. Select the options based on your platform.

The Nytro Storage Manager generates critical boot messages. For a complete list of the error messages and their descriptions, see Appendix A: Events and Messages.

Appendix E: Storing Panic Log

The application issues a `SATA passthrough` command to store the panic log (protocol and procedure) of the Nytro XP6500 modules in the Nytro XP6500 card onto the existing firmware log. During a Nytro XP6500 module firmware panic condition, Nytro XP6500 module firmware saves the panic information onto Flash memory. There are four panic log slots available inside the Nytro XP6500 module. A panic log is a system snapshot of Nytro XP6500 module relevant to the error incurred. This log extraction is useful to debug firmware behavior for the error occurred.

NOTE This feature is supported only on the Nytro CLI.

Glossary

This appendix provides a glossary for terms used in this document.

	A
Absolute state of charge	Predicted remaining SuperCap capacity expressed as a percentage of Design Capacity. The Absolute State-of-Charge operation can return values greater than 100 percent.
Access policy	A virtual drive property indicating what kind of access is permitted for a particular virtual drive. The possible values are *Read/Write*, *Read Only*, or *Blocked*.
Array	See *drive group*.
Array Hole	See the definition of *hole*.
Average time to empty	One-minute rolling average of the predicted remaining SuperCap life.
Average time to full	Predicted time to charge the SuperCap to a fully charged state based on the one minute rolling average of the charge current.
	B
BIOS	Basic Input/Output System. The computer BIOS is stored on a Flash memory card. The BIOS controls communications between the microprocessor and peripheral devices, such as the keyboard and the video XP6500 card, and miscellaneous functions, such as system messages.
	C
Cache	Fast memory that holds recently accessed data. Use of cache memory speeds subsequent access to the same data. When data is read from or written to main memory, a copy is also saved in cache memory with the associated main memory address. The cache memory software monitors the addresses of subsequent reads to see if the required data is already stored in cache memory. If it is already in cache memory (a cache hit), it is read from cache memory immediately and the main memory read is aborted (or not started). If the data is not cached (a cache miss), it is fetched from main memory and saved in cache memory.
Cache flush interval	A XP6500 card property that indicates how often the data cache is flushed.
Caching	Provides an economical solution for accelerating applications – by storing frequently accessed data on low-latency Nytro XP6500 modules while existing SATA connected hard drives to achieve a balance of performance and cost savings.
Capacity	A property that indicates the amount of storage space on a drive or virtual drive.
Coerced capacity	A drive property indicating the capacity to which a drive has been coerced (forced) to make it compatible with other drives that are nominally the same capacity. For example, a 4-GB drive from one manufacturer might be 4,196 MB, and a 4-GB from another manufacturer might be 4,128 MB. These drives could be coerced to a usable capacity of 4,088 MB each for use in a drive group in a storage configuration.
Coercion mode	A XP6500 card property indicating the capacity to which drives of nominally identical capacity are coerced (forced) to make them usable in a storage configuration.
Current	Measure of the current flowing to (+) or from (-) SuperCap, reported in milliamperes.

Current write policy	A virtual drive property that indicates whether the virtual drive currently supports Write Back mode or Write Through mode. ■ In Write Back mode the XP6500 card sends a data transfer completion signal to the host when the XP6500 card cache has received all of the data in a transaction. ■ In Write Through mode the XP6500 card sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.
Cycle count	The count is based on the number of times the near fully charged SuperCap is discharged to a level below the cycle count threshold.
D	
Default write policy	A virtual drive property indicating whether the default write policy is Write Through or Write Back. In Write Back mode the XP6500 card sends a data transfer completion signal to the host when the XP6500 card cache has received all of the data in a transaction. In Write Through mode the XP6500 card sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction.
Design capacity	Designed charge capacity of the SuperCap, measured in milliampere-hour units (mAh).
Design charge capacity remaining	Amount of the charge capacity remaining, relative to the SuperCap pack design capacity.
Design voltage	Designed voltage capacity of the SuperCap, measured in millivolts (mV).
Device chemistry	Possible values are nickel metal hydride (NiMH) and lithium ion (LiON).
Device ID	A XP6500 card or drive property indicating the manufacturer-assigned device ID.
Device port count	A XP6500 card property indicating the number of ports on the XP6500 card.
Drive cache policy	A virtual drive property indicating whether the virtual drive cache is enabled, disabled, or unchanged from its previous setting.
Drive group	A drive group is a group of physical drives. These drives are managed in partitions known as virtual drives. A group of drives attached to a XP6500 card on which one or more virtual drives can be created. All virtual drives in the drive group use all of the drives in the drive group.
Drive state	A drive property indicating the status of the drive. A drive can be in one of the following states: ■ **Unconfigured Good** – A drive accessible to the XP6500 card but not configured as a part of a virtual drive. ■ **Online** – A drive that can be accessed by the XP6500 card and is part of the virtual drive. ■ **Failed** – A drive that was originally configured as Online, but on which the firmware detects an unrecoverable error. ■ **Unconfigured Bad** – A drive on which the firmware detects an unrecoverable error; the drive was Unconfigured Good or the drive could not be initialized. ■ **Missing** – A drive that was Online, but which has been removed from its location. ■ **Offline** – A drive that is part of a virtual drive but which has invalid data as far as the RAID configuration is concerned. ■ **None** – A drive with an unsupported flag set.
Drive state drive subsystem	A collection of drives and the hardware that controls them and connects them to one or more XP6500 card. The hardware can include an intelligent XP6500 card, or the drives can attach directly to a system I/O bus XP6500 card.
Drive type	A drive property indicating the characteristics of the drive.

E

Estimated time to recharge	Estimated time necessary to complete recharge of the SuperCap at the current charge rate.
Expected margin of error	Indicates how accurate the reported SuperCap capacity is in terms of percentage.

F

Fast initialization	A mode of initialization that quickly writes zeroes to the first and last sectors of the virtual drive. This permits you to immediately start writing data to the virtual drive while the initialization is running in the background.
XP6500 card	A card that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a drive. The XP6500 card perform RAID functions such as striping and mirroring to provide data protection.
Formatting	The process of writing a specific value to all data fields on a drive, to map out unreadable or bad sectors. Because most drives are formatted when manufactured, formatting is usually done only if a drive generates many media errors.
Full charge capacity	The amount of charge that can be placed in the SuperCap. This value represents the last measured full discharge of the SuperCap. This value is updated on each learn cycle when the SuperCap undergoes a qualified discharge from nearly full to a low SuperCap level.

G

Gas gauge status	Hexadecimal value that represents the status flag bits in the gas gauge status register.

H

Hole	A *hole* (the terms, *hole* and *Array hole* are synonymous and are used interchangeably) is a block of empty space in a drive group that can be used to define a virtual drive.
Host interface	A XP6500 card property indicating the type of interface used by the computer host system: for example, *PCIe*.
Host port count	A XP6500 card property indicating the number of host data ports currently in use.
Host system	Any computer system on which the XP6500 card is installed. Mainframes, workstations, and standalone desktop systems can all be considered host systems.

I

Initialization	The process of writing zeros to the data fields of a virtual drive. Initialization erases all previous data on the drives.
I/O policy	A virtual drive property indicating whether Write Back, Direct I/O, or No Read Ahead is being used. In Direct I/O mode, reads are not buffered in cache memory. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory. (The I/O Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.)

L

Learn mode	Mode for the SuperCap auto learn cycle. Possible values are Auto, Disabled, and Warning.
Learn state	Indicates that a learn cycle is in progress.
LKM	Local Key Management
Load-balancing	A method of spreading work between two or more computers, network links, CPUs, drives, or other resources. Load balancing is used to maximize resource use, throughput, or response time.

M

Manufacturing date	Date on which the SuperCap pack assembly was manufactured.
Manufacturing name	Device code that indicates the manufacturer of the components used to make the SuperCap assembly.
Max error	Expected margin of error (percentage) in the state of charge calculation. For example, when Max Error returns 10 percent and Relative State of Charge returns 50 percent, the Relative State of charge is more likely between 50 percent and 60 percent. The gas gauge sets Max Error to 100 percent on a full reset. The gas gauge sets Max Error to 2 percent on completion of a learn cycle, unless the gas gauge limits the learn cycle to the +512/–256-mAh maximum adjustment values. If the learn cycle is limited, the gas gauge sets Max Error to 8 percent unless Max Error was already below 8 percent. In this case Max Error does not change. The gas gauge increments Max Error by 1 percent after four increments of Cycle Count without a learn cycle.
Media error count	A drive property indicating the number of errors that have been detected on the drive media.
N	
Name	A virtual drive property indicating the user-assigned name of the virtual drive.
Next learn time	Time at which the next learn cycle starts.
Non-redundant configuration	A RAID 0 virtual drive with data striped across two or more drives but without drive mirroring or parity. This provides for high data throughput but offers no protection in case of a drive failure.
NVRAM	Acronym for nonvolatile random access memory. A storage system that does not lose the data stored on it when power is removed. NVRAM is used to store firmware and configuration data on the XP6500 card.
NVRAM present	A XP6500 card property indicating whether an NVRAM is present on the XP6500 card.
NVRAM size	A XP6500 card property indicating the capacity of the XP6500 card's NVRAM.
Nytro VD	A virtual drive (VD) created by using the on-board Nytro XP6500 modules. In this document, the term, virtual drive (VD) indicates a logical drive.
O	
Offline	A drive is offline when it is part of a virtual drive but its data is not accessible to the virtual drive.
ONFi	This interface initializes the ONFi Flash and performs DRAM offload to restore functions during power failure.
P	
PDM	Product Data Management File, a software, which collects profile information from a system.
Predicted SuperCap capacity status (hold 24hr charge)	Indicates whether the SuperCap capacity is capable of supporting a 24-hour data retention time.
Product info	A drive property indicating the vendor-assigned model number of the drive.
Product name	A XP6500 card property indicating the manufacturing name of the XP6500 card.
R	
RAID 0	Uses data striping on two or more drives to provide high data throughput, especially for large files in an environment that requires no data redundancy.
RAID level	A virtual drive property indicating the RAID level of the virtual drive.

Raw capacity	A drive property indicating the actual full capacity of the drive before any coercion mode is applied to reduce the capacity.
Read policy	A XP6500 card attribute indicating the current Read Policy mode.
Relative state of charge	Predicted remaining SuperCap capacity expressed as a percentage of Full Charge Capacity.
Remaining capacity	Amount of remaining charge capacity of the SuperCap as stated in milliamp hours. This value represents the available capacity or energy in the SuperCap at any given time. The gas gauge adjusts this value for charge, self-discharge, and leakage compensation factors.
Revision level	A drive property that indicates the revision level of the drive's firmware.
Run time to empty	Predicted remaining SuperCap life at the present rate of discharge in minutes.
S	
Serial no.	A XP6500 card property indicating the manufacturer-assigned serial number.
Stripe size	A virtual drive property indicating the length of the interleaved data segments that the XP6500 card writes across multiple drives, not including parity drives. For example, consider a stripe that contains 64 KB of drive space and has 16 KB of data residing on each drive in the stripe. In this case, the stripe size is 64 KB and the strip size is 16 KB. You can select the stripe size.
Striping	A technique used to write data across all drives in a virtual drive. Each stripe consists of consecutive virtual drive data addresses that are mapped in fixed-size units to each drive in the virtual drive using a sequential pattern. For example, if the virtual drive includes five drives, the stripe writes data to drives one through five without repeating any of the drives. The amount of space consumed by a stripe is the same on each drive. Striping by itself does not provide data redundancy. Striping in combination with parity does provide data redundancy.
Strip size	The portion of a stripe that resides on a single drive in the drive group.
Subvendor ID	A XP6500 card property that lists additional vendor ID information about the XP6500 card.
SuperCap module version	Current revision of the SuperCap pack module.
SuperCap present	A XP6500 card property that indicates whether the XP6500 card has an on-board SuperCap backup unit to provide power in case of a power failure.
SuperCap replacement	Warning issued by firmware that the SuperCap can no longer support the required data retention time.
SuperCap retention time	Time, in hours, that the SuperCap can maintain the contents of the cache memory.
SuperCap status	Operating status of the SuperCap. Possible values are Missing, Optimal, Failed, and Unknown.
SuperCap type	Possible values are SuperCap.
T	
Temperature	Temperature of the SuperCap pack, measured in Celsius.
U	
Uncorrectable error count	A XP6500 card property that lists the number of uncorrectable errors detected on drives connected to the XP6500 card. If the error count reaches a certain level, a drive is marked as failed.

V

Vendor ID	A XP6500 card property indicating the vendor-assigned ID number of the XP6500 card.
Vendor info	A drive property listing the name of the vendor of the drive.
Virtual drive	A storage unit created by a XP6500 card from one or more drives. Although a virtual drive can be created from several drives, it is seen by the operating system as a single drive.
Virtual drive state	A virtual drive property indicating the condition of the virtual drive. For example, Optimal.

W

Write-back	In Write-Back Caching mode, the XP6500 card sends a data transfer completion signal to the host when the XP6500 card cache has received all of the data in a drive write transaction. Data is written to the drive subsystem in accordance with policies set up by the XP6500 card. These policies include the amount of dirty/clean cache lines, the number of cache lines available, and elapsed time from the last cache flush.
Write policy	See *Default Write Policy*.
Write-through	In Write-Through Caching mode, the XP6500 card sends a data transfer completion signal to the host when the drive subsystem has received all of the data and has completed the write transaction to the drive.

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