NEXSAN

NEXSAN
Storage Tools

Version 1.7.83

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Nexsan Storage Tools

Nexsan Storage Tools provide enhanced functionality for deploying and managing Nexsan RAID systems. Nexsan Storage Tools can be installed either directly onto Windows-based servers, or onto a Windows-based workstation anywhere on the LAN.

Nexsan Storage Tools:

- **Storage Manager** - provides a common management point for all Nexsan RAID systems, either in a standalone window or directly integrated into Computer Management.
- **IP Configuration Tool** - allows the user to easily configure the IP address of any Nexsan RAID system on the local subnet.
- **Host Identification Tool** - displays technical details about local storage adapters (FibreChannel WWPNs, SAS addresses, iSCSI IQNs, etc.).
- **Shell Extensions** - extensions to the Windows shell (Explorer, Disk Management, and Device Manager), providing information about the Nexsan RAID system, array, and volume associated with a particular disk.
- **PowerShell Storage Management** - Monitor and manage Nexsan RAID systems using PowerShell.

Windows Server Features:

- **Multipathing (MPIO)** - enables high-availability and path redundancy between the Windows-based server and Nexsan storage.
- **Provisioning and Snapshots (VDS / VSS)** - provides the ability to provision and manage storage volumes and snapshots directly from the Windows-based server.
- **Windows Server Storage Management** - native support for storage management via the Server Manager UI and PowerShell cmdlets.
- **System Center Integration** - integration with System Center Operations Manager (SCOM) and System Center Virtual Machine Manager (SCVMM) for managing Nexsan RAID storage.

System Requirements

Host PC Requirements

Nexsan Storage Tools can be installed on the following operating systems:

- Windows 10
- Windows 11

- Windows Server 2016
- Windows Server 2019
- Windows Server 2022

For initial IP configuration, the host system must be connected to the same LAN segment as the Nexsan RAID storage system(s).

Some features require access to TCP ports 80, 443, 44844, and UDP port 44844 on the Nexsan RAID storage system(s).

Windows Server: Multipathing (MPIO), Snapshot (VSS), and Provisioning (VDS) features are only available on Windows Server systems, and require the host system and RAID storage system(s) to be connected to the same SAN.

RAID Storage System Requirements

Nexsan Storage Tools can manage the following Nexsan RAID storage systems:

- Nexsan E-Series
- Nexsan BEAST

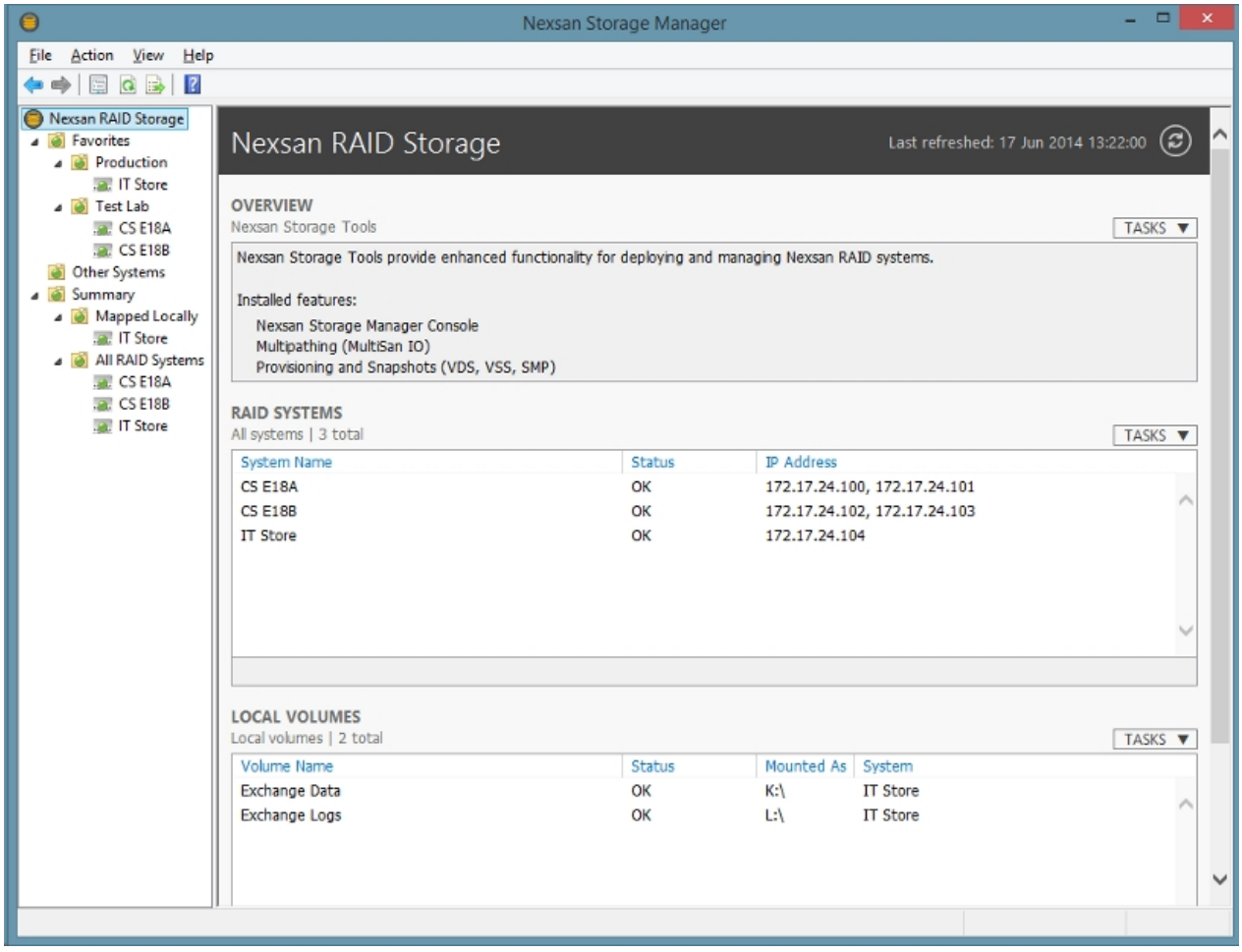
Nexsan Storage Manager

Nexsan Storage Manager provides a common management point for all Nexsan RAID systems, either in a standalone window or directly integrated into Computer Management.

The left-hand pane provides a tree view allowing RAID systems to be organised into Folders and Favorites. Selecting 'Nexsan RAID Storage' will return to the default summary view.

The right-hand pane changes according to the current tree view selection:

- **Summary View** - shows all Nexsan RAID systems and local Nexsan volumes, and provides quick links to access various tools.
- **Folder View** - shows details of all sub-folders and systems.
- **System View** - shows the management UI for the selected system.



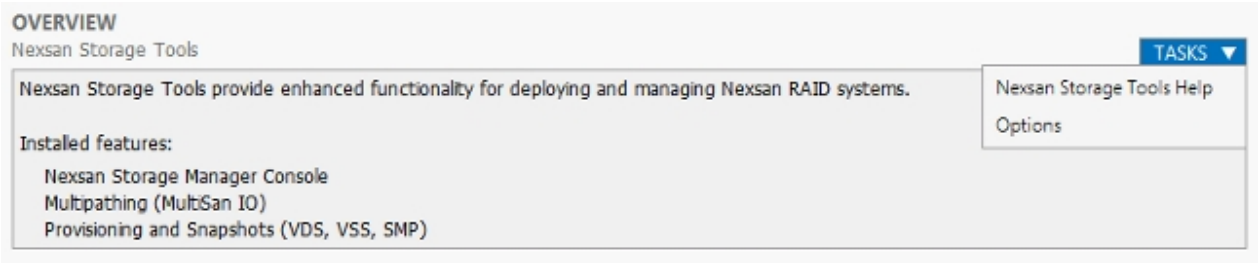
Summary View

The summary view shows all Nexsan RAID systems and local Nexsan volumes, and provides quick links to peform storage-related tasks.

- **Overview** - information about Nexsan Storage Tools and general help/options.
- **RAID Systems** - list of all RAID systems and system-related tasks.
- **Local Volumes** - list of Nexsan volumes mounted on the local host and volume-related tasks.

Overview

The Overview section lists the available Nexsan Storage Tools features.

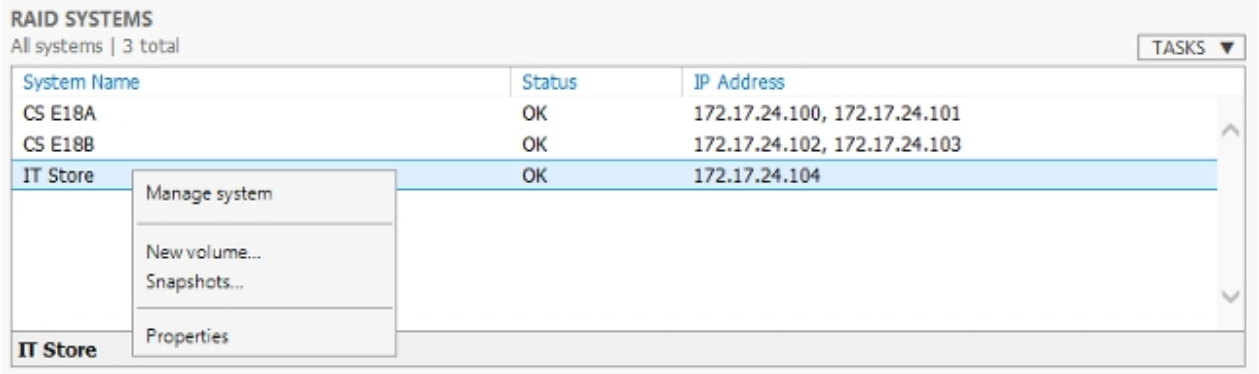


Tasks

- **Nexsan Storage Tools Help** - Displays the online documentation for all Nexsan Storage Tools features.
- **Options** - Opens a dialog for changing the Global Options.

RAID Systems

The Raid Systems section lists all RAID systems that are stored as Favorites or have been discovered automatically. Right-click on a specific system to perform actions on that system.



Tasks

- **Add RAID system** - manually add a RAID system to the Favorites folder if it is not automatically detected by Nexsan Storage Manager (e.g. if it is located on a remote site).
- **Muliple IP configuration** - Opens the IP Configuration Tool which can be used to quickly configure IP settings for multiple systems.

Actions

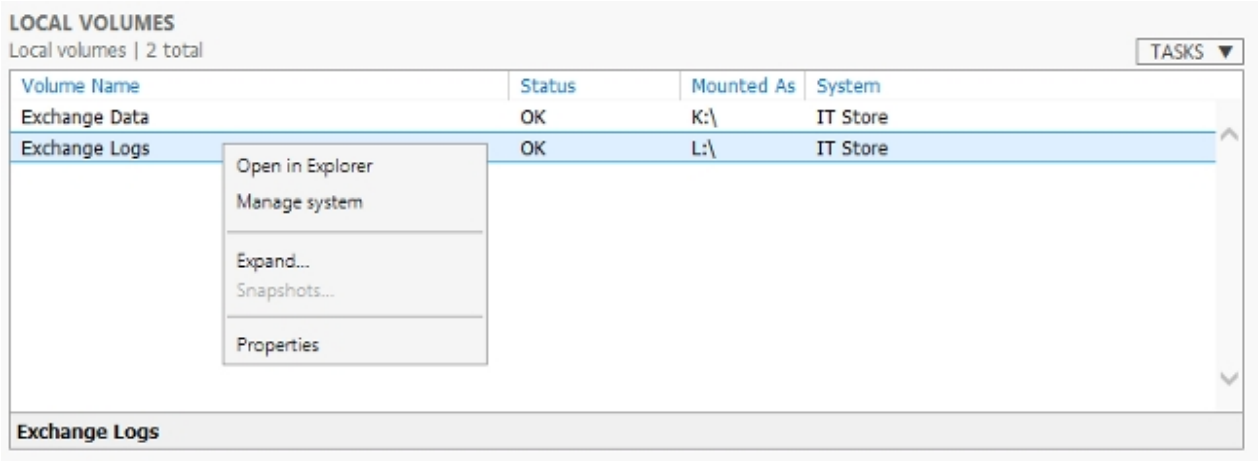
- **Manage system** - Opens the Management UI of the selected system.
- **New volume** - Opens the New Nexsan Volume tool to create a new volume on the selected system.
- **Snapshots** - Opens the Manage Snapshots tool to manage snapshots of volumes on the selected system.
- **Properties** - Displays the Properties of the selected system.

Automatic discovery can be configured via the Global Options. By default, RAID systems will be automatically detected if they are:

- Direct-attached (i.e. connected to the host over Fibre / SAS / iSCSI / etc.).
- On the local Ethernet network segment.
- On a remote subnet that has been explicitly added to the scan list.

Local Volumes

The Local Volumes section lists all Nexsan volumes that are currently mounted on the local host. Right-click on a specific volume to perform actions on that volume.



Tasks

- **View storage adapters** - Opens the Host Identification Tool to view the status and identifiers for local storage interfaces (FibreChannel WWPNs, SAS addresses, iSCSI IQNs, etc.).
- **Configure iSCSI** - Opens the iSCSI Initiator properties dialog for the local host (requires the Microsoft iSCSI Initiator to be installed).
- **Manage multipathing** - Opens the Nexsan Multipathing (MultiSan IO) management tool.
- **Create new volume** - Opens the New Nexsan Volume tool to create a new Nexsan volume

and mount it on the local host.

Actions

- **Open in Explorer** - Opens the selected volume in Explorer.
- **Manage system** - Opens the Management UI of the system containing the selected volume.
- **Expand** - Opens the Expand Volume tool to expand the selected volume.
- **Snapshots** - Opens the Manage Snapshots tool to manage snapshots of the selected volume.
- **Properties** - Displays the Properties of the selected volume.

Folders and Favorites

Nexsan Storage Manager arranges RAID Systems into folders. There are three main types of folders:

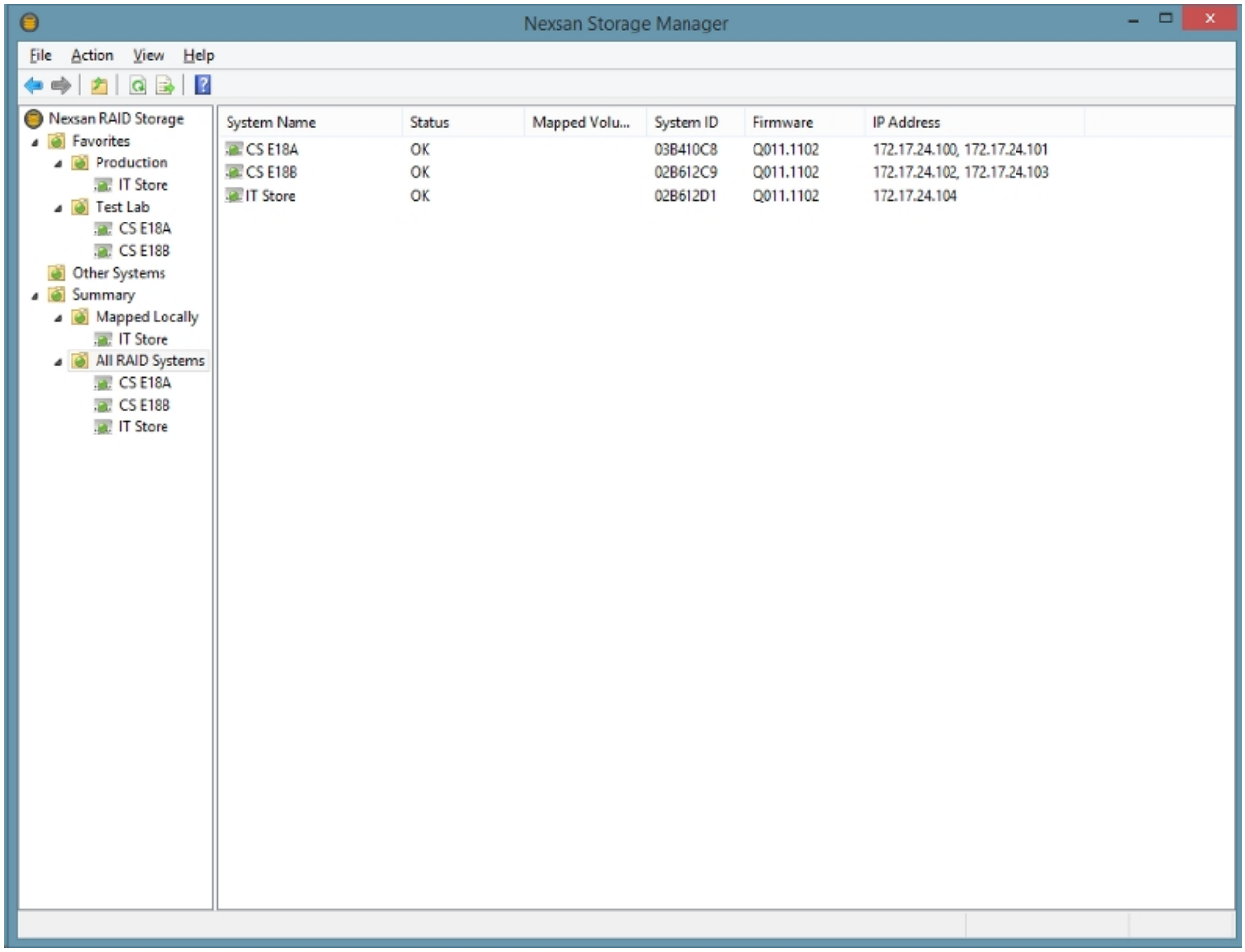
- **Favorites** - used to quickly access specific RAID systems.
- **Other Systems** - contains all RAID systems that are not in your Favorites (such as newly-discovered systems).
- **Summary** - provides access to all RAID systems meeting certain pre-defined search criteria.

The folder icon also includes a status indication:

All systems under the folder (including sub-folders) are OK.
At least one system has a problem or warning.

If a folder is currently selected in the Tree View, the right-hand pane will display a list of systems in that folder, including details about each system (name, status, firmware version, IP address, etc.). The icon next to each RAID system indicates the current status:

System is on-line (All OK).
System is on-line, but the IP/DNS settings do not match the host.
System is on-line but is indicating an ALARM condition.
System is off-line (not detected on the network).



Favorites Folder

The Favorites folder can be used to quickly access specific RAID systems.

RAID systems can be added to the Favorites folder using drag-and-drop. You can also create additional sub-folders under Favorites to classify your systems further (e.g. by site or department) by right-clicking on the Favorites folder and selecting 'New' > 'Folder'.

You can also manually add a RAID system to the Favorites folder if it is not automatically detected by Nexsan Storage Manager (e.g. if it is located on a remote site). To do this, right-click on the Favorites folder, and select 'New' > 'RAID System'.

Other Systems Folder

The Other Systems folder contains all RAID systems that are not in your Favorites (such as newly-discovered systems).

Nexsan Storage Manager automatically scans for new RAID systems. If a new RAID system is detected, it will be added to the 'Other Systems' folder.

Automatic discovery can be configured via the Global Options. By default, RAID systems will be automatically detected if they are:

- Direct-attached (i.e. connected to the host over Fibre / SAS / iSCSI / etc.).
- On the local Ethernet network segment.
- On a remote IPv4 subnet that has been explicitly added to the scan list.

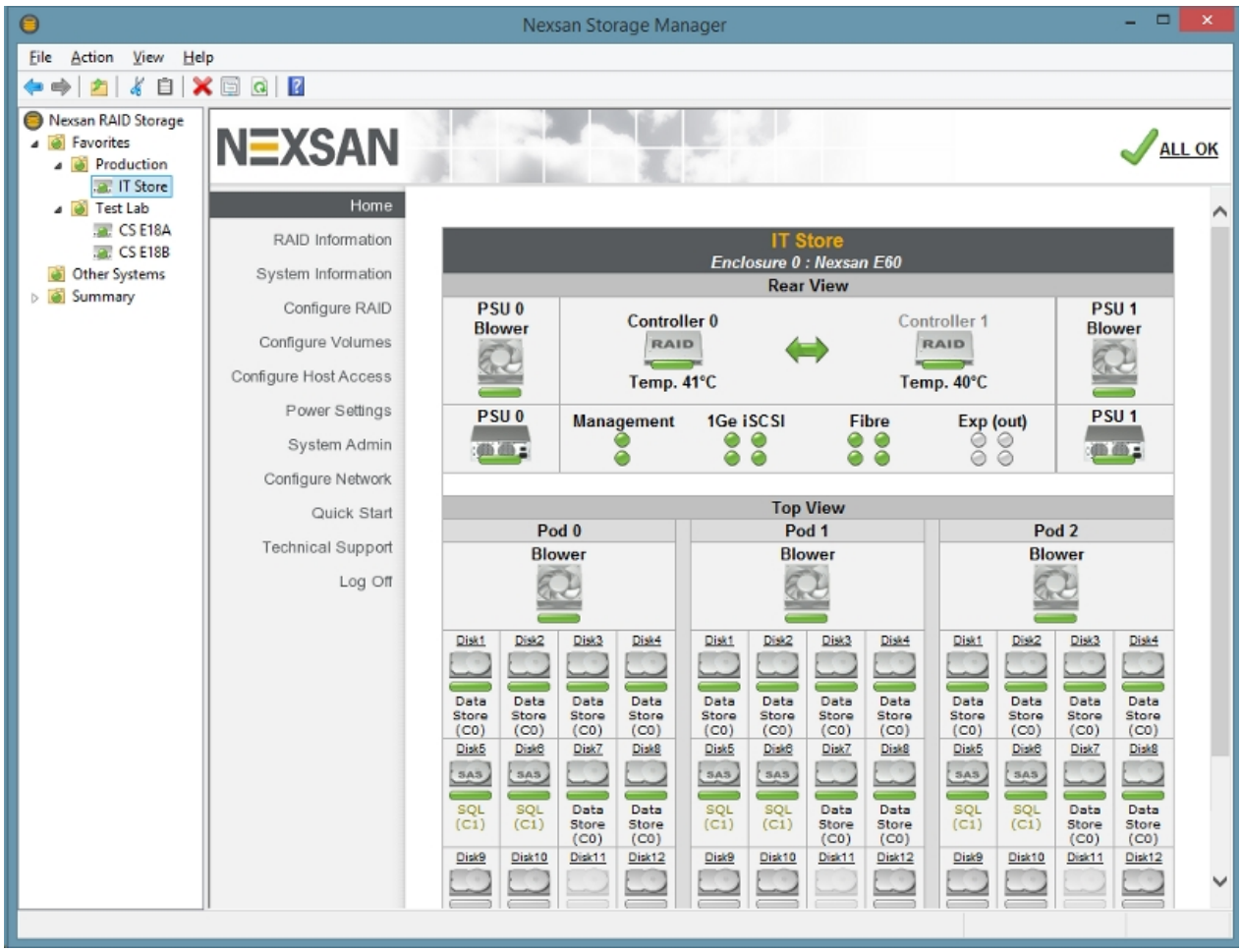
By default, the display is updated automatically every 60 seconds. You can also refresh the view manually by pressing F5 (or right-clicking any folder or system and selecting "Refresh").

Summary Folders

The Summary folders provide access to all RAID systems meeting certain pre-defined search criteria. These views are created automatically and cannot be modified by the user; however RAID systems can be copied from a summary folder to Favorites using drag-and-drop.

Managing Systems

When a system is selected in the tree view, the right-hand pane of Nexsan Storage Manager is used to display the Management UI.



Additional information about each system can be seen by right-clicking the system and selecting 'Properties'. The Properties dialog includes a number of tabs:

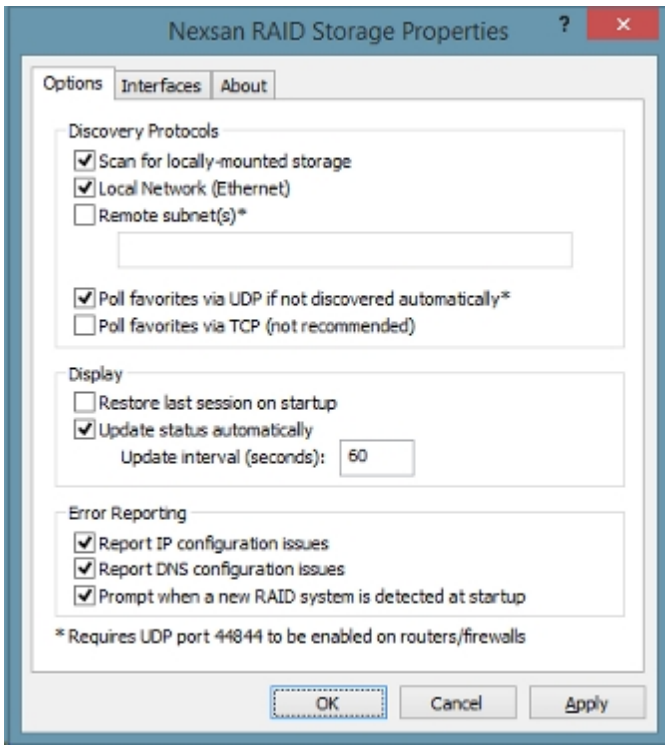
- **General** - General information about the RAID system. This tab can be used to change the display name of the system.
- **IPv4 / IPv6 Settings** - IPv4 settings for the RAID system. The IP settings can be changed using this tab to correct any IP address problems. Tabs are only displayed for systems on the local Ethernet subnet that support the corresponding IP protocol.
- **Volumes** - Volumes that are mapped from the RAID system to the local host. This tab is only displayed if the system is connected to the same SAN as the host.

Windows Server: If Provisioning (VDS) is installed and the system is connected to the same SAN as the host, you can provision storage by right-clicking the system and selecting 'New Volume...'. You can also expand an existing volume via the 'Volumes' tab of the Properties page. If Snapshots (VSS) is also installed, hardware-based snapshots can also be created and managed via the 'Volumes' tab.

A standalone web browser window can also be opened to manage a RAID system by right-clicking the system and selecting 'Open in Browser'.

Global Options

The Global Options for Nexsan Storage Manager are displayed by right-clicking on the 'Nexsan RAID Storage' item in the Tree View and selecting 'Properties'.



Discovery Protocols

- **Scan for locally-mounted storage** - Automatically discover direct-attached systems (i.e. with at least one volume mapped to the host over Fibre / SAS / iSCSI / etc.)
- **Local Network** - Automatically discover systems on the local Ethernet subnet.
- **Remote subnet(s)** - Automatically discover systems on a remote IPv4 subnet. The subnet broadcast address must be entered in the box (multiple subnets can be specified by separating them with semicolons). All routers/firewalls between the host and the remote subnet must allow UDP subnet broadcast and unicast packets on port 44844.
- **Poll favorites via UDP** - If a system in the Favorites folder is not detected by the other scans, discover it using a directed UDP packet. All routers/firewalls between the host and the remote system must allow UDP unicast packets on port 44844.
- **Poll favorites via TCP** - If a system in the Favorites folder is not detected by the other scans, try to connect to it via HTTP (TCP port 80). Each missing system will be scanned in turn, so enabling this option may significantly slow down discovery.

Display

- **Restore last session on startup** - Enabling this option will automatically navigate to the last

selected folder or system when Storage Manager is launched.

- **Update status automatically** - By default, the display is updated automatically every 60 seconds. You can also refresh the view manually by pressing F5 (or right-clicking any folder or system and selecting "Refresh").

Error Reporting

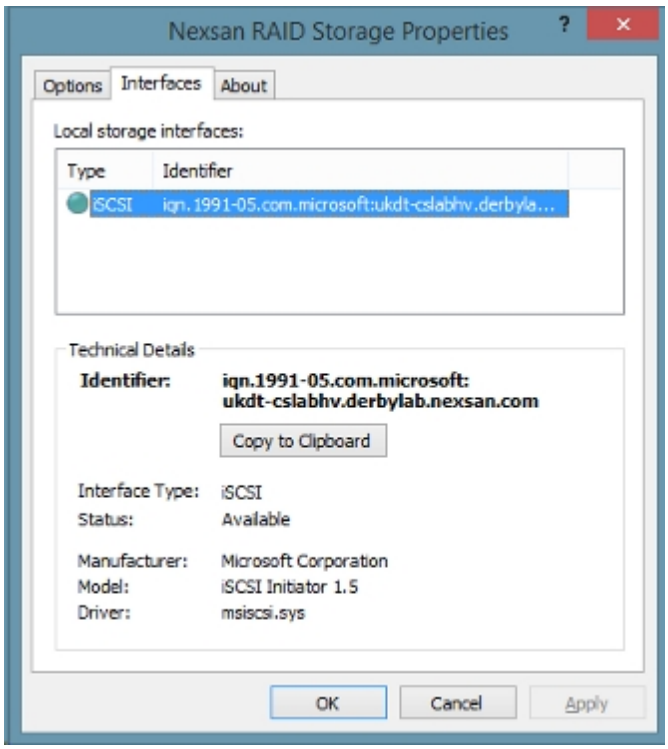
- **Report IP configuration issues** - Disabling this option will ignore possible IP problems (where the IP settings of systems on the local Ethernet subnet are not consistent with the host's network interface).
- **Report DNS configuration issues** - Disabling this option will ignore possible IP problems (where the DNS settings of systems on the local Ethernet subnet are not consistent with the host's network interface).
- **Prompt when a new RAID system is detected at startup** - When this option is enabled, you will automatically be prompted to configure the IP settings if a new RAID system is found on the network.

Advanced Settings

Advanced settings can also be configured via registry settings. Click here for details.

Interfaces

The 'Interfaces' page in Nexsan Storage Manager is displayed by right-clicking on the 'Nexsan RAID Storage' item in the Tree View and selecting 'Properties', then the 'Interfaces' tab.



The 'Interfaces' page allows you to determine the various identifiers for local storage interfaces (FibreChannel WWPNs, SAS addresses, iSCSI IQNs, etc.).

You can copy an identifier to the clipboard by selecting it in the 'Local storage interfaces' list and clicking 'Copy to Clipboard'. The identifier will be placed on the clipboard in a format appropriate for use in the Host Access control section of the Nexsan RAID System UI.

Walkthroughs

The following step-by-step walkthroughs are available for the Nexsan Storage Manager Console:

- Configuring a new RAID system.
- Changing the RAID system name.

Configuring a new RAID system

This walkthrough describes how to set up your new Nexsan RAID system for use on your network, using the Nexsan Storage Manager Console.

1. Ensure that you know the network settings that you intend to use for the RAID system. A dual-controller system requires two management IP addresses (one for each controller). At a minimum, you should know whether the network uses IPv4 and/or IPv6, and Automatic or Static IP addressing. If Static IPs are used, an available IP address for each controller is required. Contact your network administrator if you are unsure where to get this information.
2. Ensure that the host workstation running Nexsan Storage Manager is connected to the same LAN segment and subnet that will be used for the RAID system.
3. Unpack the Nexsan RAID system and install it in your rack according to the instructions in the User Manual.
4. Connect the "Mgmt" port from each controller in the RAID system to a network switch.
5. Switch on the RAID system (for systems with redundant power supplies, ensure that all power supplies are turned on).
6. Wait a short while (approximately 1 minute) for the RAID system to boot. The new RAID system should appear under "Other Systems" in the tree view (left-hand pane) of Nexsan Storage Manager. If not, press F5 (or right-click "Nexsan RAID Storage" and select "Refresh") to add the new RAID system to the list.
7. Right-click the new RAID system in the tree view (left-hand pane), and select "Properties".
8. To ensure the correct RAID system has been selected, click "Beacon" - the system LEDs on the front of the chassis should flash. Once you have confirmed that the correct RAID system is selected, click the "IPv4 Settings" or "IPv6 Settings" tab.

If using Automatic IP addresses (DHCP / SLAAC):

9. Select "Automatic". If you have a dual-controller system, ensure that "Automatic" mode is selected for both controllers. Then proceed to **step 14**.

If using Static IP:

10. Select "Static IP" mode. If you have a dual-controller system, ensure that "Static IP" mode is selected for both controllers.
11. Click "Copy Host Settings" to copy the Subnet Mask, Gateway and DNS settings from your host, or enter the correct addresses in the corresponding boxes.
12. Enter the first IP address (for controller 0) into the left-hand "IP Address" box. If you have a dual-controller system, enter the second IP address (for controller 1) into the right-hand "IP Address" box.

13. Review all of the network settings against those determined in step 1 to ensure that they are correct.

14. Click "OK" to change the network settings on the RAID system.
15. Wait 30 seconds for the changes to be applied.
16. Select "Nexsan RAID Storage" in the tree view, then click back to the new RAID system. The management GUI should appear in the right-hand pane. If the GUI does not open, repeat steps 6-16 ensuring that the correct values have been entered.
17. Continue to configure your RAID system via the management GUI according to the User Manual.

Changing the RAID system name

This walkthrough describes how to change the name of your Nexsan RAID system, using the Nexsan Storage Manager Console. The name helps to identify a specific system, and is shown on the management GUI and in any E-alert messages.

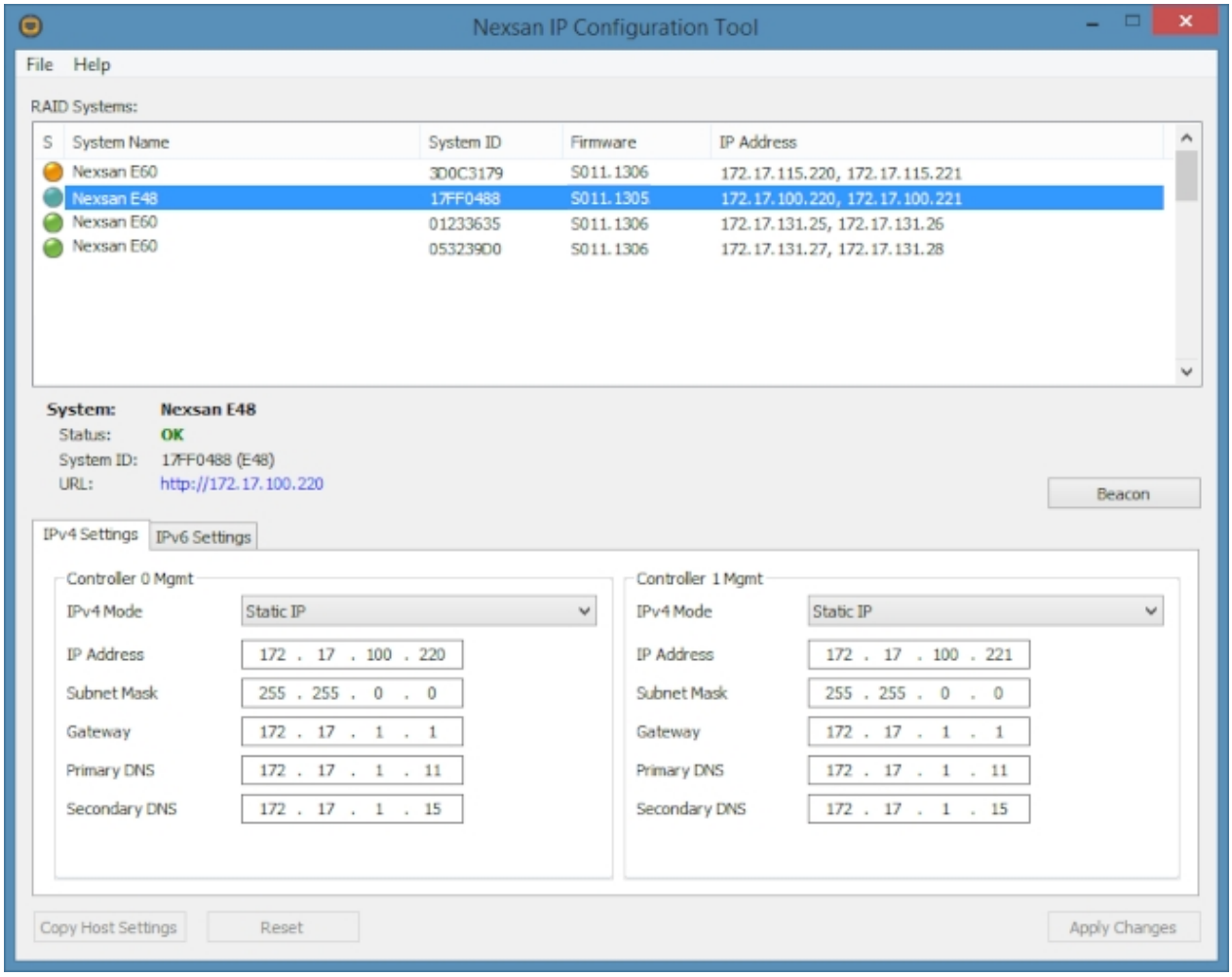
1. Ensure that the network IP settings of the system are correctly configured (see the "configuring a new RAID system" walkthrough).
2. Locate the Nexsan RAID system in the tree view (left-hand pane), right-click it, and select "Properties".
3. If your RAID system has an Administrator password assigned, click "Log In" button and enter the password in the box provided.
4. Change the name shown in the box and click "Apply".

Nexsan IP Configuration Tool

The Nexsan IP Configuration Tool allows you to configure Nexsan RAID storage systems for use on your network. It will automatically detect all systems connected to the local LAN segment and display their status and IP settings.

The main window is divided into three sections:

- **RAID Systems List**, showing all Nexsan RAID systems on the local subnet(s).
- **RAID System Details**, showing information about the currently-selected RAID system.
- **Network Settings**, showing IPv4/IPv6 settings for the currently-selected RAID system.



You can refresh the view by pressing F5 (or selecting "Rescan network" from the File menu).

RAID Systems List

The RAID systems list shows all Nexsan RAID systems connected to the local subnet(s) that meet the system requirements. The view is divided into a number of columns:

- **System Status** - overview of the current RAID system status:
  - System is on-line (All OK).


System is on-line, but the IP/DNS settings do not match the host.
System is on-line but is indicating an ALARM condition.
System is off-line (not detected on the network).

- **System Name** - display name of the RAID system. This defaults to the name of the product, but can be changed via the GUI - see changing the RAID system name.
- **System ID** - unique identifier for the RAID system.
- **Firmware** - current firmware version of the RAID system.
- **IP Address** - current IP address of the RAID system. For dual-controller systems, two IP addresses will be shown (one for each controller).

The RAID systems list can be sorted by any of the columns in ascending/descending order by clicking on the column header. Clicking on an entry in the list will display the details of a specific RAID system in the lower part of the window.

RAID System Details

The middle part of the screen displays details about the selected RAID system:

- **System** - display name of the RAID system. This defaults to the name of the product, but can be changed via the GUI - see changing the RAID system name.
- **System Status** - overview of the current RAID system status.
- **System ID** - product type and unique identifier for the RAID system.
- **URL** - URL used to access the management GUI for this RAID system. Clicking the URL will open the management GUI using the default web browser.
- **Beacon** - the Beacon button will cause the system LEDs on the front of the chassis to flash green for 1 minute, so that the physical location of the system can be identified.

Network Settings

The lower part of the screen displays the network IPv4 and IPv6 settings of the management network port for each controller in the RAID system.
Network settings that are inconsistent with the host's network interface will be highlighted in yellow. If a setting is illegal, it will be highlighted in red.

IPv4 Settings:

- **IPv4 mode** - specifies whether IPv4 is enabled on the controller, and whether the IPv4 address is assigned automatically (DHCP) or manually (static IP).
- **IP Address** - current IPv4 address for the controller.
- **Subnet Mask** - current subnet mask for the controller.
- **Gateway** - current default gateway for the controller.
- **Primary/Secondary DNS** - current DNS server for the controller.

IPv6 Settings:

- **IPv6 mode** - specifies whether IPv6 is enabled on the controller, and whether the IPv6 address is assigned automatically (SLAAC) or manually (static IP).
- **IPv6 Address** - current IPv6 address for the controller.
- **Prefix Length** - current prefix length for the controller.
- **Gateway** - current default gateway for the controller.
- **Primary/Secondary DNS** - current DNS server for the controller.

- **IPv6 Address (local)** - the fixed link-local IPv6 address for the controller.

Actions:

- **Copy Host Settings** - this button will set default values for current tab's settings from the host's network interface, allowing common configuration errors to be corrected quickly.
- **Reset** - this button will discard any changes on the current tab that have not yet been applied.
- **Apply Changes** - this button will apply any changes that been made to the network settings. Note that the new settings will be displayed immediately, but it may take a short while for the settings to change on the RAID system. You can refresh the view to see when the settings have been applied by pressing F5 (or selecting "Rescan network" from the File menu).

Walkthroughs

The following step-by-step walkthroughs are available for the Nexsan IP Configuration Tool:

- Configuring a new RAID system.
- Changing the RAID system name.

Configuring a new RAID system

This walkthrough describes how to set up your new Nexsan RAID system for use on your network, using the Nexsan IP Configuration Tool.

1. Ensure that you know the network settings that you intend to use for the RAID system. A dual-controller system requires two management IP addresses (one for each controller). At a minimum, you should know whether the network uses IPv4 and/or IPv6, and Automatic or Static IP addressing. If Static IPs are used, an available IP address for each controller is required. Contact your network administrator if you are unsure where to get this information.
2. Ensure that the host workstation running the Nexsan IP Configuration Tool is connected to the same LAN segment and subnet that will be used for the RAID system.
3. Unpack the Nexsan RAID system and install it in your rack according to the instructions in the User Manual.
4. Connect the "Mgmt" port from each controller in the RAID system to a network switch.
5. Switch on the RAID system (for systems with redundant power supplies, ensure that all power supplies are turned on).
6. Wait a short while (approximately 1 minute) for the RAID system to boot.
7. Start the IP Configuration Tool on the host workstation. If it is already running, press F5 (or select "Rescan Network" from the File menu) to add the new RAID system to the list.
8. Select the new RAID system from the list. To ensure the correct RAID system has been selected, click "Beacon" - the system LEDs on the front of the chassis should flash. Once you have confirmed that the correct RAID system is selected, click the "IPv4 Settings" or "IPv6 Settings" tab.

If using Automatic IP addresses (DHCP / SLAAC):

9. Select "Automatic". If you have a dual-controller system, ensure that "Automatic" mode is selected for both controllers. Then proceed to **step 14**.

If using Static IP:

10. Select "Static IP" mode. If you have a dual-controller system, ensure that "Static IP" mode is selected for both controllers.
11. Click "Copy Host Settings" to copy the Subnet Mask, Gateway and DNS settings from your host, or enter the correct addresses in the corresponding boxes.
12. Enter the first IP address (for controller 0) into the left-hand "IP Address" box. If you have a dual-controller system, enter the second IP address (for controller 1) into the right-hand "IP Address" box.
13. Review all of the network settings against those determined in step 1 to ensure that they are correct.

14. Click "Apply Changes" to change the network settings on the RAID system.
15. Wait 30 seconds for the changes to be applied.
16. Click the URL to open the management GUI in your default web browser. If the GUI does not open, repeat steps 7-16 ensuring that the correct values have been entered.
17. Continue to configure your RAID system via the management GUI according to the User Manual.

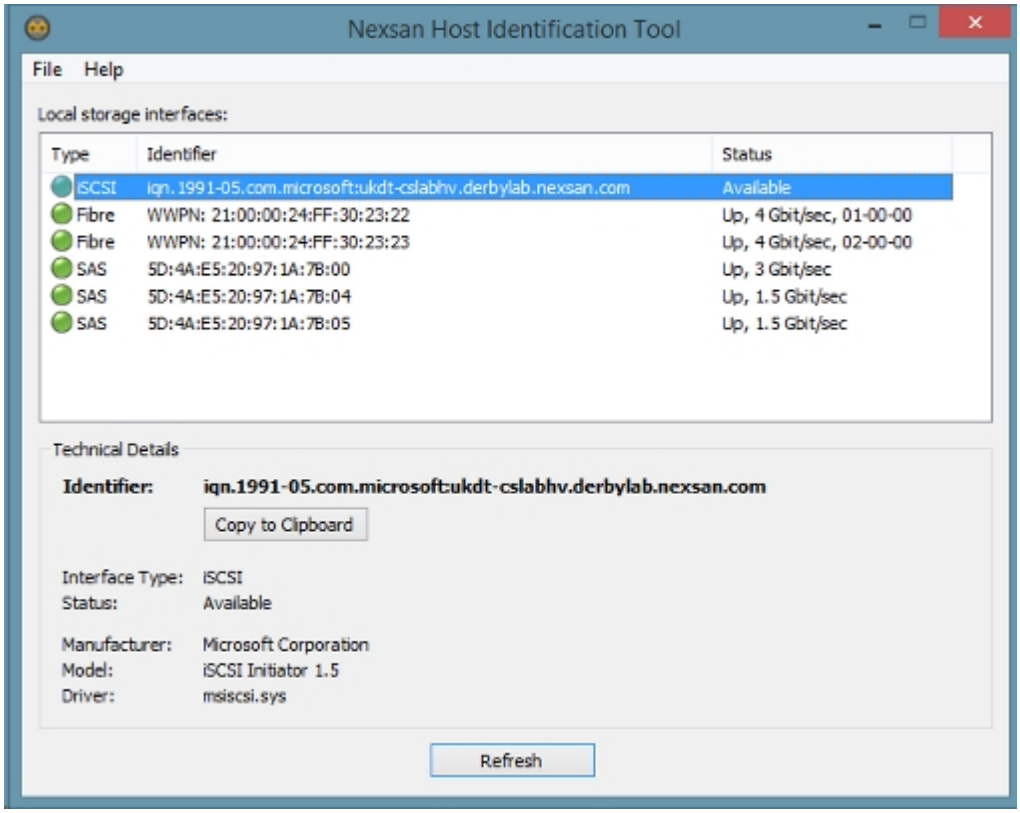
Changing the RAID system name

This walkthrough describes how to change the name of your Nexsan RAID system using the Nexsan IP Configuration Tool. The name helps to identify a specific system, and is shown on the management GUI and in any E-alert messages.

1. Ensure that the network IP settings of the system are correctly configured (see the "configuring a new RAID system" walkthrough).
2. Go to the management GUI for the RAID system, either by clicking on the URL or via your web browser.
3. Log in to the management GUI, and select "System Admin" from the left-hand menu.
4. Click the "Enclosure Config" tab.
5. In the "Friendly name" box, type in the name you would like to use to refer to this RAID system.
6. Click the "Submit" button.
7. In the IP Configuration Tool, press F5 (or select "Rescan Network" from the File menu) to see the new RAID system name.

Nexsan Host Identification Tool

The Nexsan Host Identification Tool allows you to view the status and identifiers for local storage interfaces (FibreChannel WWPNs, SAS addresses, iSCSI IQNs, etc.).



You must have Administrator privileges on the local machine for all adapters to be listed. Click here to see a list of supported adapter types.

You can copy an identifier to the clipboard by selecting it in the 'Local storage interfaces' list and clicking 'Copy to Clipboard'. The identifier will be placed on the clipboard in a format appropriate for use in the Host Access control section of the Nexsan RAID System UI.

Initiator Types

The Nexsan Host Identification Tool currently supports the following initiator types:

- **FibreChannel HBAs** - FibreChannel HBAs will display the WWPN of each port, along with the link state, port speed, and FC port/domain ID if available.
- **SAS HBAs** - SAS HBAs will will display the SAS address of each port, along with the link state, port speed, and number of connected lanes.
- **iSCSI** - If an iSCSI initiator is installed, the IQN of the initiator will be displayed. Hardware initiators will also display the link state, port speed, and IP address for each physical port.

Explorer / Computer Management Extensions

Nexsan Storage Manager adds several additional elements to the Windows Shell. These are primarily intended for use when Nexsan Storage Manager is installed directly onto a Windows server or workstation using Nexsan as direct-attached storage via SCSI, FibreChannel, SAS, or iSCSI.

The following shell extensions are available:

- **Explorer Disk Extension** - displays information about the Nexsan RAID volume(s) on the right-click Properties page in Windows Explorer.
- **Disk Management Extension** - displays information about the Nexsan RAID volume on the right- click Properties page in Disk Management (under Computer Management, Storage).
- **Computer Management Extension** - integrates the RAID Storage Console under Computer Management, Storage for convenient access.

Advanced Settings

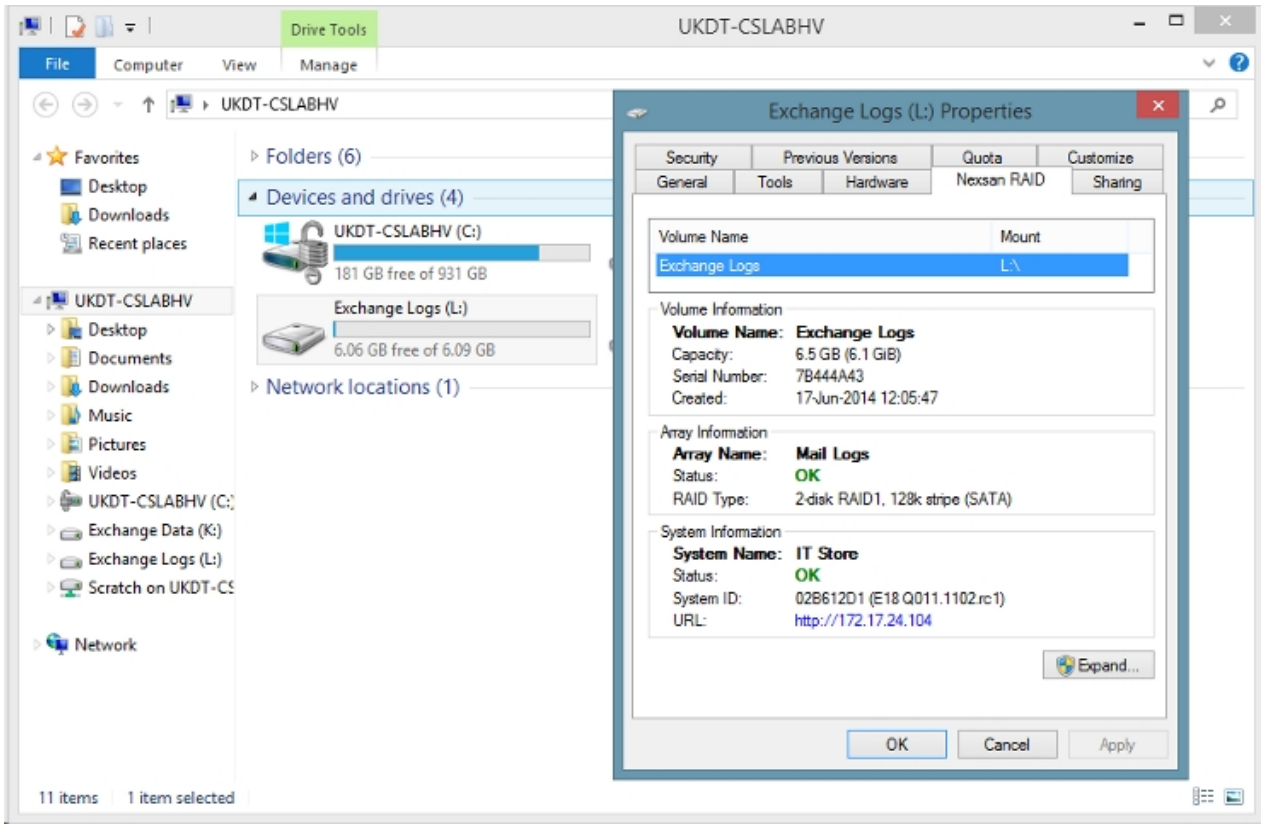
Advanced settings can also be configured via registry settings. Click here for details.

Explorer Disk Extension

To display the Explorer Disk Extension, simply right-click on a disk drive letter in windows Explorer and select 'Properties'. If data for the drive is stored on Nexsan RAID storage, an additional tab will appear on the property page titled 'Nexsan RAID'. Click this tab to see information about the volume, array, and system that contain data for that drive.

Note that the 'Nexsan RAID' tab will only appear if the user has Administrator privileges.

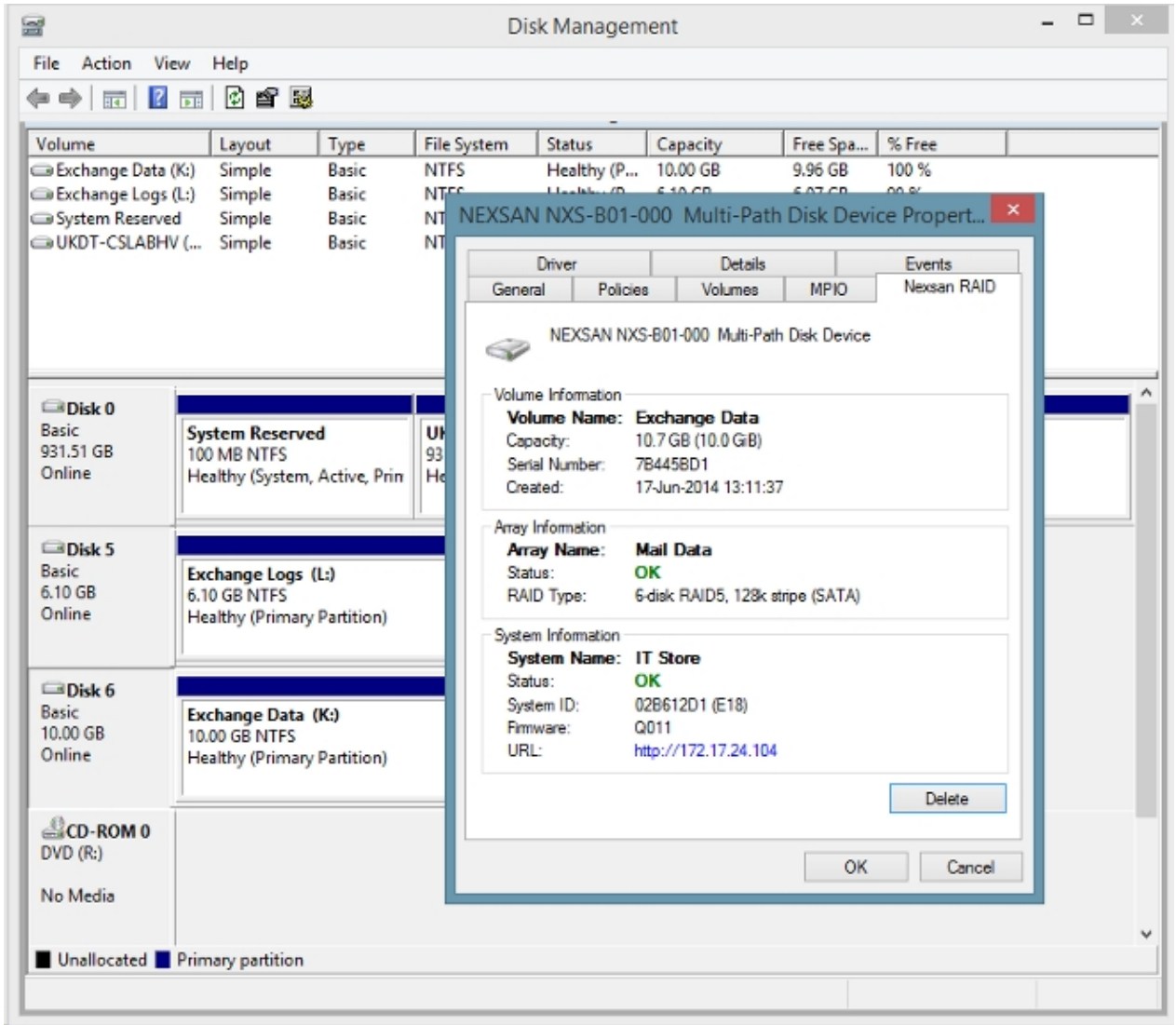
Windows Server: If Nexsan Storage Provisioning is installed and the system is connected to the same SAN as the host, you can expand or migrate the volume via the 'Expand' button on the 'Nexsan RAID' tab.



Disk Management Extension

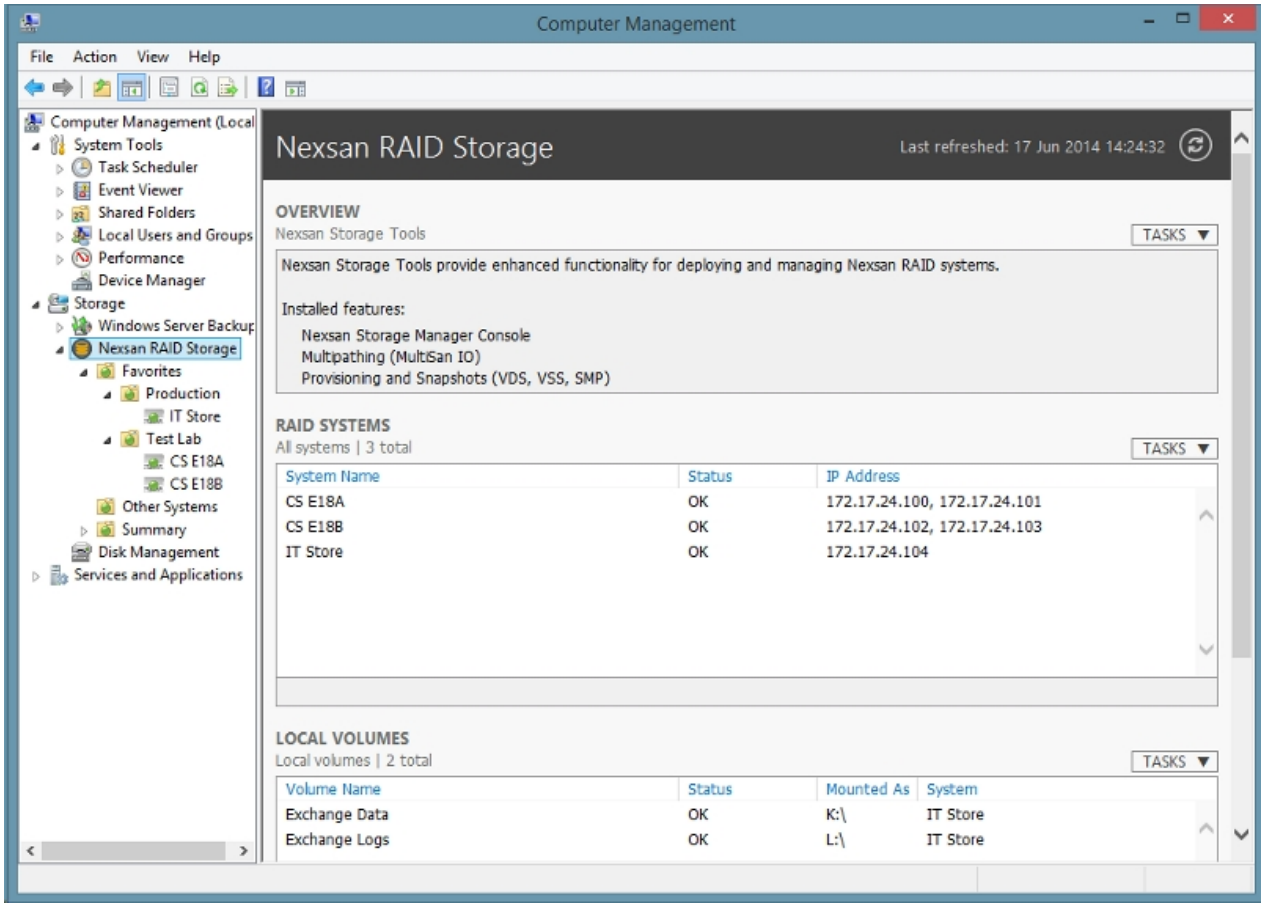
To display the Disk Management, simply right-click on "Disk X" in Disk Management (under Computer Management, Storage), and select 'Properties'. If disk is a Nexsan RAID storage volume, an additional tab will appear on the property page titled 'Nexsan RAID'. Click this tab to see information about the volume, array, and system.

Windows Server: If Nexsan Storage Provisioning is installed and the system is connected to the same SAN as the host, you can delete an empty volume via the 'Delete' button on the 'Nexsan RAID' tab.



Computer Management Extension

To display the Nexsan RAID Storage Extension, start Computer Management, then expand the Storage node and click 'Nexsan RAID Storage'. This will open an integrated version of the RAID Storage Console.



PowerShell Storage Management

PowerShell cmdlets can be used to manage Nexsan RAID storage. In Windows Server environments, Nexsan RAID storage can also be managed within Windows Server Manager, including monitoring and end-to-end provisioning workflows. See Windows Server Storage Management for details.

PowerShell Storage Management requires Windows 8.1 or later, or Windows Server 2012 or later. The PowerShell session must have Administrator privileges to manage Nexsan RAID storage.

- **Windows Storage PowerShell Cmdlets** - included with Windows for storage management.
- **Nexsan PowerShell Cmdlets** - Nexsan-specific cmdlets for enhanced management of Nexsan RAID systems.

The terminology used in Windows differs from that used in Nexsan RAID storage products, as described in the following table:

Windows	Nexsan RAID Storage
Subsystem	RAID system
Physical Disk	Disk
Storage Pool	Array
Available Disks	Unused Disks
Primordial Storage Pool	All disks of a specific type and enclosure
Virtual Disk	Volume
Initiator Id	Host
Masking Set	Host Access

If the Nexsan RAID system is not connected to the local computer as a storage device, you must register it using its management IP address before it can be managed:

```
Register-NexsanRaidSubSystem -IPAddress <ipaddress> -UserName <user> -
Password <password>

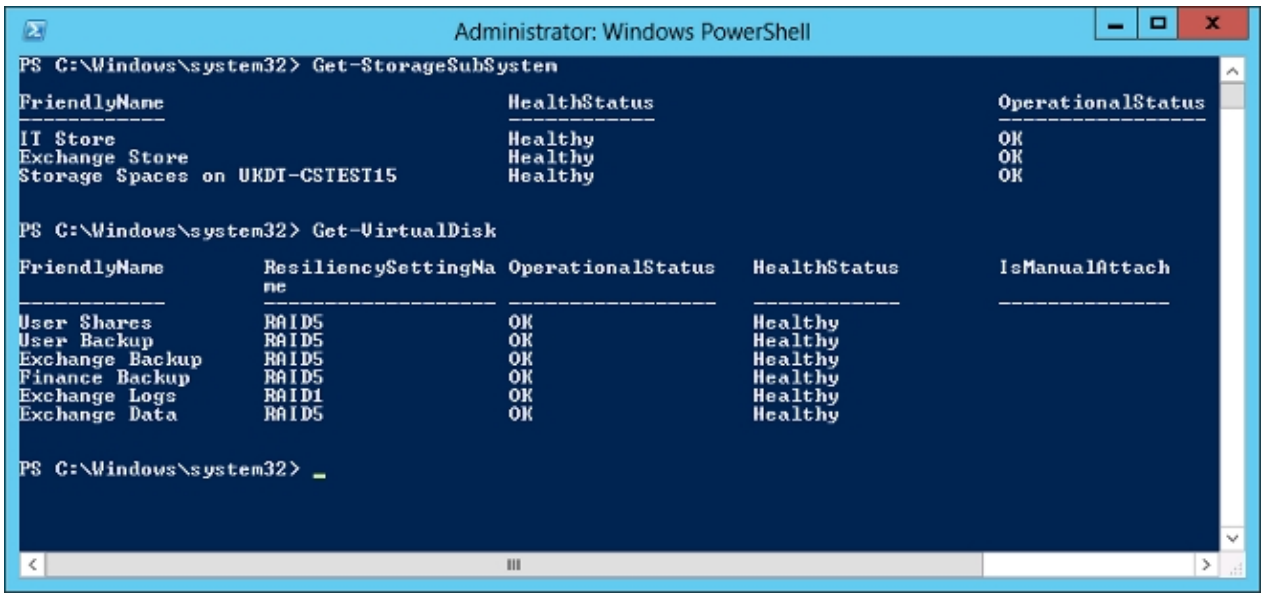
Get-StorageSubSystem
```

For additional help, see Troubleshooting PowerShell Storage Management.

Windows Storage PowerShell Cmdlets

Windows includes a set of PowerShell cmdlets for storage management. To display a list of the Windows storage management cmdlets, use the following PowerShell command:

```
Get-Command -Module Storage
```



For details of the Windows Storage cmdlets, see:

Storage Cmdlets in Windows PowerShell
http://technet.microsoft.com/en-gb/library/hh848705.aspx

Commonly-used Windows Storage PowerShell commands include:

cmdlet	Description
`Get-StorageSubSystem`	Gets properties for storage subsystems.
`Get-StoragePool`	Gets properties for storage pools (Nexsan arrays).
`Get-VirtualDisk`	Gets properties for virtual disks (Nexsan volumes).
`Get-PhysicalDisk`	Gets properties for physical disks.

Nexsan PowerShell Cmdlets

Nexsan Storage Tools includes a set of PowerShell cmdlets to manage Nexsan RAID systems through the Storage Management API. These cmdlets are designed to be used in conjunction with the Windows Storage cmdlets.

To display a list of all available Nexsan PowerShell cmdlets, use the following PowerShell command:

```
Get-Command -Module NexsanRaid
```

To get help and syntax information about a specific Nexsan PowerShell cmdlet, use one of the following PowerShell commands:

```
Get-Help <cmdletname>
Get-Help <cmdletname> -examples
Get-Help <cmdletname> -detailed
Get-Help <cmdletname> -full
```

Commonly-used Nexsan PowerShell commands include:

cmdlet	Description
Register-NexsanRaidSubSystem	Register a specific Nexsan RAID system or update security credentials. The credentials will be stored for the local computer (i.e. any local administrator will also be able to administer the RAID system).
Unregister-NexsanRaidSubSystem	Unregister a specific Nexsan RAID system from the local computer.
Get-NexsanRaidProvider	Gets properties for the Nexsan RAID SMP provider.
Set-NexsanRaidProviderAttributes	Sets attributes for the Nexsan RAID SMP provider. The new attributes will be stored for the local computer.
Get-NexsanRaidVirtualDisk	Gets properties for virtual disks managed by the Nexsan RAID SMP provider.
Set-NexsanRaidVirtualDisk	Sets properties for virtual disks managed by the Nexsan RAID SMP provider.

Troubleshooting PowerShell Storage Management

The following troubleshooting steps can be used to diagnose common problems with using the Nexsan RAID PowerShell support. For initial setup in Windows Server environments, refer to the Managing a Standalone Server or Managing Multiple Servers guide.

The Nexsan RAID system is not reported by `Get-StorageSubSystem`

1. Ensure the PowerShell session is running with Administrator privileges.
2. If using auto-discovery, check that the RAID system is connected to the same SAN as the server (or an iSCSI session has been established between the server and the storage), and that SAN discovery has not been disabled:

```
Get-NexsanRaidProvider | fl Nexsan*
```

3. If using manual discovery, ensure that the RAID system has been registered with the SMP provider:

```
Register-NexsanRaidSubSystem -IPAddress <ipaddress> -UserName <user> -
Password <password>
Get-StorageSubSystem
```

4. Check that the RAID system is online, and can be contacted via **`ping <ipaddress>`**.
5. Update the storage management cache:

```
Update-StorageProviderCache
Get-StorageSubSystem
```

6. For multiple servers, check that credentials have been set for the RAID system on all management servers via the **`Register-NexsanRaidSubSystem`** command. See Managing Multiple Servers for detailed steps.

The Nexsan RAID system is reported as "Lost Communication" by `Get-StorageSubSystem`

1. Check that the RAID system is online, and can be contacted via **`ping <ipaddress>`**.
2. If you are managing a standalone server and have not configured credentials to connect to the RAID system, check the "Host Trust" security setting on the RAID system. If the "Host Trust" setting is "None", add credentials for the RAID system via the **`Set-NexsanRaidCredentials`** command. See Managing a Standalone Server for detailed steps.
3. Check that the credentials used to connect to the RAID system are correct by updating them with the **`Set-NexsanRaidCredentials`** command.

The Nexsan RAID system is reported as "Supporting Entity In Error" by `Get-StorageSubSystem`

1. The firmware on the RAID system is not compatible with Windows Server Storage Management. Contact Nexsan Support to obtain updated firmware for your product.

Deleting or modifying an existing virtual disk fails.

1. If you are managing multiple servers or a server cluster, you must disable SAN discovery and use credentials-based authentication to connect to the RAID system. See Managing Multiple Servers for detailed steps.
2. The virtual disk is not currently owned or accessible to the server, or the "Host Trust" security setting on the storage is set to read-only. By default, servers using host-trust authentication can only create new virtual disks and modify virtual disks that they own or to which they have read/write access. To manage RAID systems used by multiple servers, it is recommended that credentials-based authentication is used. See Managing Multiple Servers for detailed steps to configure credentials-based authentication.
3. The host Fibre/SAS card has been replaced or the iSCSI initiator name has changed. Change permissions for the virtual disk via the RAID system web UI or use credential-based authentication to connect to the RAID system.

Multipathing (MPIO)

This feature is only available on Windows Server.

The **Multipathing (MPIO)** component installs the Microsoft DSM and configures it for Nexsan RAID storage. Multipathing is managed using the tools provided with the operating system.

Multipathing provides improved high-availability and fault-tolerance by routing I/O commands over multiple connections between the host and the RAID storage.

- **Hardware Setup** - Before using multipathing, it is important to ensure that your hardware is correctly configured.

Hardware Setup

Before using multipathing, it is important to ensure that your hardware is correctly configured.

- **Quick Start (No Single Point Of Failure)** - For optimal protection, Nexsan recommends that you use the correct hardware to ensure that there is no single point of failure. The Quick Start section will guide you through the steps for this configuration.

If you are unable to use the quick start setup, or have additional requirements, please review the following guides:

- **Example Topologies** - Provides examples of different setups for various hardware configurations ranging from simple (single host connected to a single-controller RAID unit) to complex (fully redundant servers/switches/controllers).
- **RAID Controller Redundancy Modes** - Details the various modes available on Nexsan RAID controllers to provide different multipathing and redundancy characteristics.

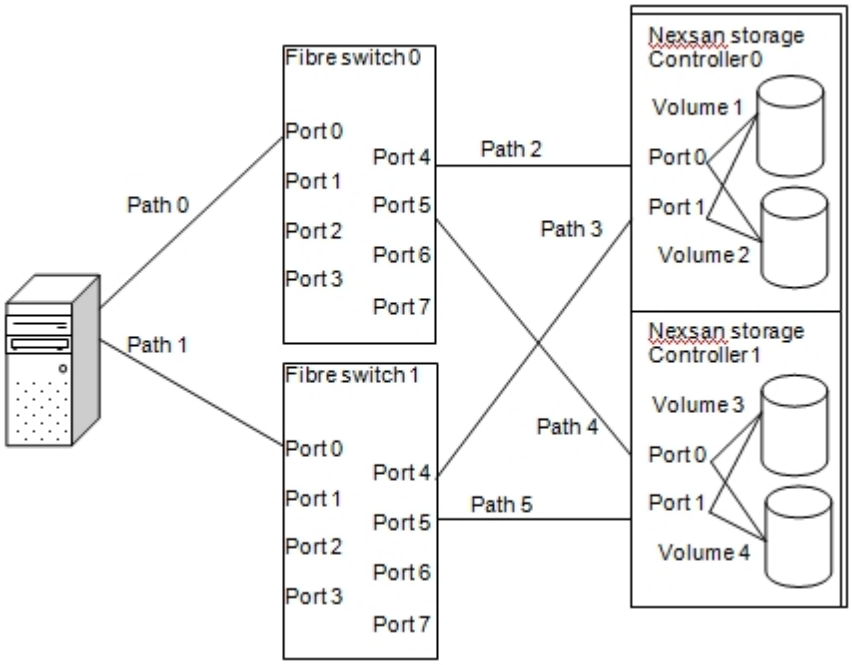
Quick Start (No Single Point Of Failure)

This section will outline the components and interconnections needed for creating a SAN using multipathing that has no single point of failure.

Main components required:

- At least 1 Windows host server machine running Windows Server with dual HBAs or a dual port HBA. More host machines can be added at any time.
- 2 fibre channel switches.
- 1 dual controller Nexsan storage solution.

The below diagram shows the fibre channel interconnects:



What failures will the above configuration tolerate?

- Failure of either fibre channel switch.
- Failure of either host path 0 or path 1.
- Failure of either path to RAID controller 0 or controller 1.
- Failure of either RAID controller 0 or controller 1.

Configuration Steps

1. Install Windows Server on the physical host.
2. Download and apply all the Microsoft updates and the latest service pack where applicable.
3. Install your HBA drivers onto your Windows server(s).
4. Install Nexsan Storage Tools on your Windows server(s), ensuring the "Multipathing (MPIO)" component is enabled.
5. Connect your fibre channel cables as per the above diagram, and if more than one host server is being configured then make sure one port of the HBA connects to fibre switch 0 and the other port connects to fibre switch 1.
6. Configure the RAID system mode to “APAL – all ports all LUNs” on your Nexsan RAID system. This mode allows four paths to be active to each configured volume. Restart the Nexsan RAID system.
7. Create the desired number of arrays and volumes on your Nexsan RAID system. Try to divide the arrays between the controllers (where possible), so that controller 0 “owns” the same number of arrays as controller 1, this will give the best performance and ensures both controllers are active. You may want to spend more time considering what arrays to put on which controller so that both controllers share 50% of the IO load.
8. Map all volumes to all 4 host ports, configure the access rights for all discovered hosts.
9. Using the operating system “Disk Management” tool to make sure all the newly created volumes on your Nexsan RAID system are present. These new disks can now be formatted and used as available

storage.

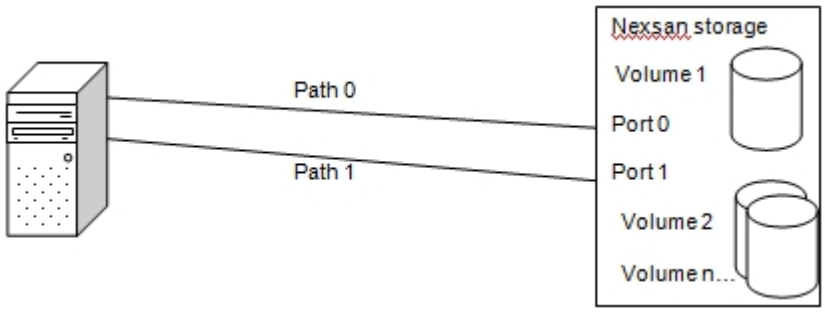
10. For increased performance you may want to select a different load balancing mode using the Nexsan MultiSan IO Windows application, see the Configuring The Load Balancing Policy section of this user guide.
11. Once everything is configured and running to your satisfaction you may want to create deliberate failure scenarios to test that host IO continues after the failure and that paths return after the failure is reversed. For example you could remove power to one of the fibre switches, remove a fibre cable, and fail a RAID controller and so on. In each failure case, carefully work out that at least one path to your configured target(s) will remain.

Multipathing Example Topologies

For simplicity, the number of hosts, switches and storage systems in the below examples have been kept to a minimum.

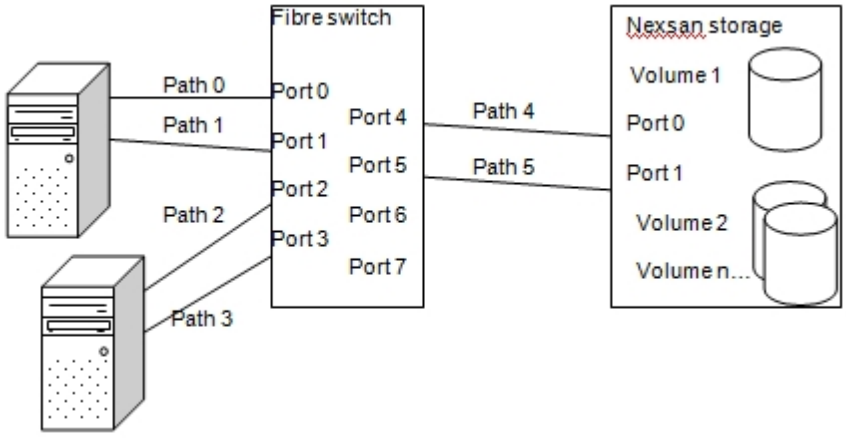
Single Host System With A Dual Port HBA Or Dual HBAs

Two paths directly connected to the Nexsan RAID system. This configuration will tolerate failure of either path 0 or path 1.



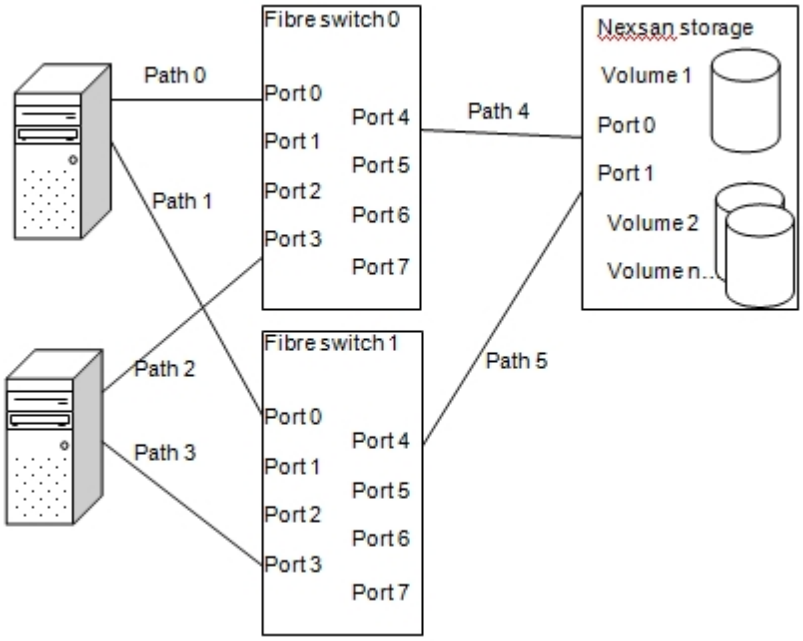
Dual Host Systems Connected Via A Fibre Switch

This configuration will tolerate path 4 or 5 failure and / or path 0 or 1 failure and / or path 2 or 3 failure.



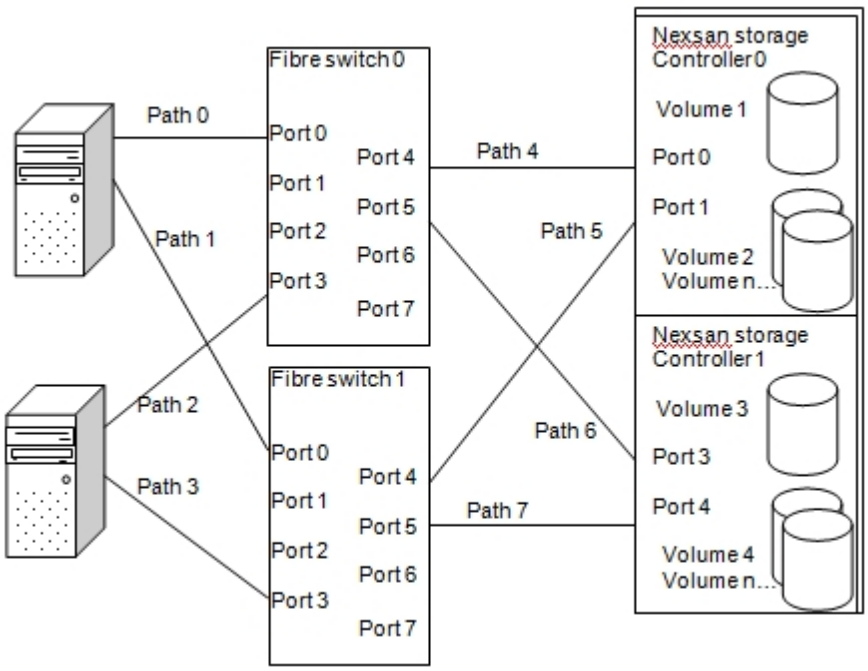
Dual Host Systems Connected Via Two Fibre Switches

This will tolerate path 4 or 5 failure and / or path 0 or 1 failure and / or path 2 or 3 failure. This will also tolerate failure of fibre switch 0 or 1, for example, if fibre switch 1 failed this would effectively fail path1, path 3 and path 5.



Dual Host Systems Connected Via Two Fibre Switches (Dual Controller)

This will tolerate path 4 or 5 failure, path 6 or 7 failure and / or path 0 or 1 failure and / or path 2 or 3 failure. This will also tolerate failure of fibre switch 0 or 1, for example, if fibre switch 1 failed this would effectively fail path1, path 3, path 5 and path 7. Here the Nexsan RAID system is configured in dual controller 4 port active-active, and this configuration will also tolerate either controller 0 or controller 1 failure. The advantage of this controller mode is when there are no failures, all 4 paths will be active to the Nexsan RAID system.



RAID Controller Redundancy Modes

When in a dual controller mode (2PAA, 4PAA, APAL) and you've mapped and masked your volumes correctly then host IO should continue when a controller is killed, rebooted or when rolling restart is initiated. For reboot and rolling restart MPIO installs a long disk timeout of 150 seconds by default, due to these operations typically approaching 120 seconds to complete, this will also mean when a disk is deleted from the RAID system or unmapped / masked it will take Windows a while before the disk times out and is removed from Windows.

APAL (All Ports All LUNs) is the recommended mode for multipathing.

Single Controller Mode (Single RAID Controller Installed In The Nexsan RAID Chassis)

RAID arrays / volumes can be mapped to all Nexsan RAID controller ports so a failed path can be tolerated between the Nexsan RAID controller and your host or a fibre switch. The disadvantage of this mode is that a RAID controller failure cannot be tolerated, if the controller fails then all paths are lost to your storage resulting in your storage going offline.

DCNR (Dual Controller Non-Redundant)

Extra performance could be achieved by mapping volumes to all host ports and using MPIO to issue host IO to all ports on each controller. The disadvantage of using this mode is that controller failure will result in the loss of all paths to the configured arrays / volumes owned by the failed controller. In other words, DCNR does not support controller failover. Nexsan has provided this mode mainly for backward compatibility with earlier firmware versions.

APPA (Active-Passive, Passive-Active)

The APPA mode is designed to work without any multi-pathing software installed and provides seamless controller failover to the attached host systems. This mode isn't ideal for MPIO as at any given time there is only one path to a volume (a single point of failure). This is because the other RAID controller path is in a passive state. Note that both passive and active paths must be available to your host system. MPIO could

offer some additional path redundancy, for example protect against path failure between the host and a fibre switch assuming at least two paths exist between the host and the switch. So in summary, the APPA RAID controller mode is not recommended for MPIO.

4PAA (4 Port Active-Active)

This RAID controller mode needs multipathing software (for controller failover to work) and a mode where extra performance could be achieved by a volume being mapped to both host ports. When a controller fails the volumes on the failed controller are moved to the surviving controller and one path is removed to the existing volumes and assigned to the failed over volumes, host IO will continue. So to achieve a no single point of failure configuration 4PAA is a valid mode to use.

APAL (All Ports All LUNs)

This RAID controller mode will provide the maximum amount of path redundancy, as a single volume can be mapped to all host ports on both controllers. This will also protect against controller failure, when a controller fails only half of the paths will be failed. APAL is the recommended mode for MPIO.

Provisioning and Snapshots (VDS / VSS)

This feature is only available on Windows Server.

Nexsan Storage Provisioning allows you to create and manage storage volumes and snapshots on connected Nexsan RAID systems directly from a Windows-based server.

- **Creating Volumes** - Provision new storage volumes using unallocated capacity on existing RAID systems.
- **Expanding / Migrating Volumes** - Expand existing storage volumes using free space on the same RAID system, move them between RAID systems or RAID levels, or from non-Nexsan storage to a Nexsan RAID system.
- **Deleting Volumes** - Remove existing storage volumes, making the space available for other uses.
- **Snapshots** - Create and manage hardware-based snapshots of storage volumes.
- **Advanced Provisioning** - Perform advanced storage configuration tasks including managing hot-spares and setting up clustered storage.

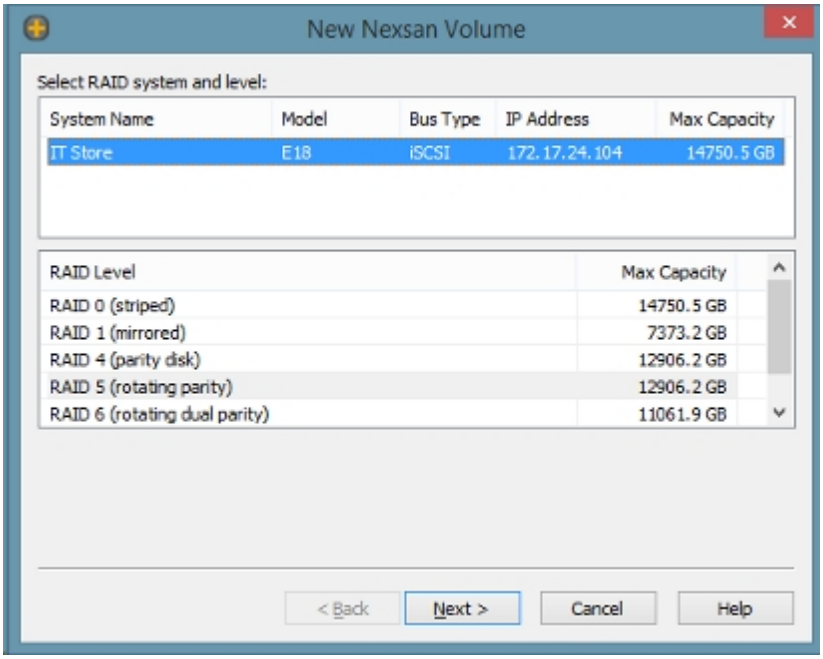
Creating Volumes

New storage volumes can be provisioned on any Nexsan RAID storage system that has free capacity available and is connected to the same SAN as the host.

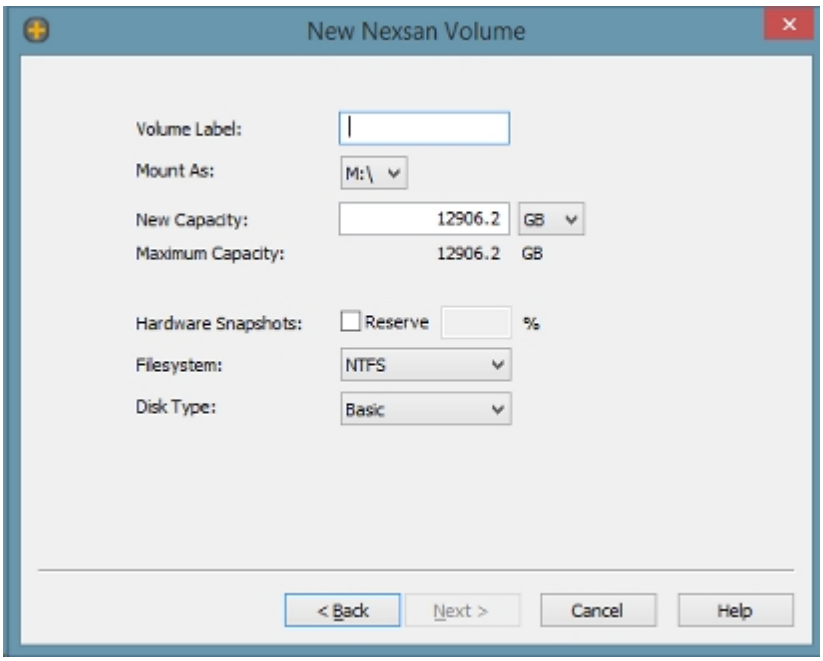
To create a new volume, launch the Nexsan Provisioning wizard in either of the following ways:

- From the Start Menu, select 'All Programs', 'Nexsan', 'Create New Nexsan Volume'.
- In Nexsan Storage Manager, right-click a system and select 'New Volume...'.

The wizard will automatically scan the SAN for available Nexsan RAID storage, and will then present a list of systems and RAID levels that are available, including the maximum storage capacity for each. Simply select a system and RAID level from the list and click 'Next'.



The wizard will then ask you to provide some basic information about the volume you would like to create, such as the name and drive letter that you would like it to be assigned.



Once you have entered the requested information, the wizard will ask you to confirm your selection, and will then automatically allocate a suitable storage volume according to your selection, associate it to the current host, assign it a drive letter and format it. This process may take several minutes, after which the volume will be visible in Windows and is ready to use.

Expanding / Migrating Volumes

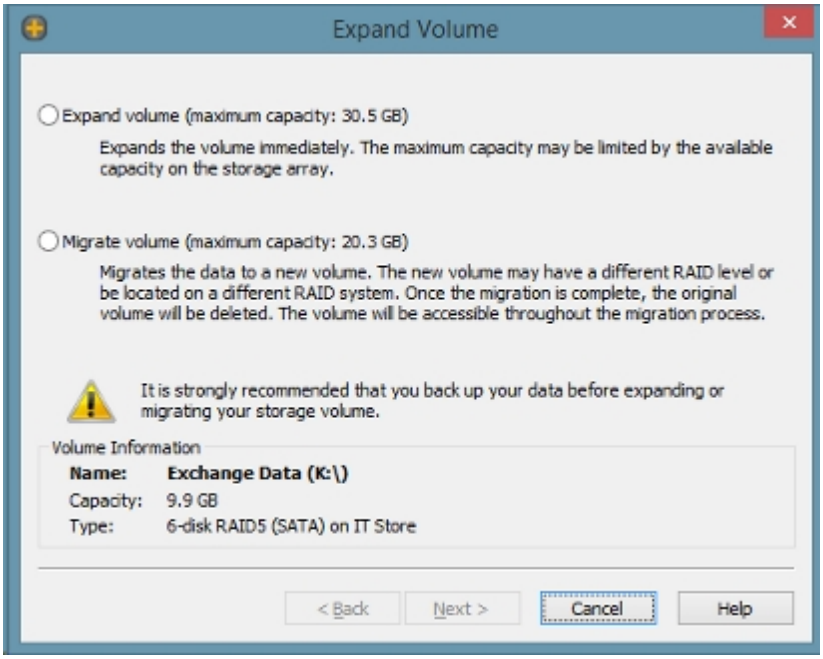
Existing storage volumes on Nexsan RAID storage systems with suitable free space can be expanded to provide additional capacity. Storage volumes on RAID systems with no suitable free space or on non-Nexsan storage can be migrated to any connected Nexsan RAID system which does have free space avalable.

To expand or migrate an existing volume, launch the Nexsan Provisioning wizard in any of the following ways:

- In Explorer, right-click the disk to expand, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Expand'.
- In Disk Management, right-click the logical volume/partition to expand, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Expand'.
- In Nexsan Storage Manager, right-click a system and select 'Properties'. Select the 'Volumes' tab, highlight the volume to expand, and click 'Expand'.

The wizard will automatically scan the SAN for available Nexsan RAID storage, and will then ask whether you wish to expand or migrate the volume.

- **Expand volume** - This option will expand the volume immediately using available free space on the RAID array. Expansion is supported for both basic disks and simple dynamic volumes, and the additional capacity will be available within a few minutes.
- **Migrate volume** - This option will migrate the data to a new Nexsan RAID storage volume. The new volume may have a different RAID level or be located on a different RAID system. The migration may take a number of hours depending upon the size of the volume. Once the migration is complete, the original volume will be deleted. Migration is supported only for simple dynamic volumes.



Once you have selected whether you wish to migrate or expand the volume, you will be prompted to select the target RAID system and RAID level (for migration only), and the new volume size.

Once you have entered the requested information, the wizard will ask you to confirm your selection, and will then automatically allocate the requested storage, associate it to the current host. Expansion may take

several minutes, after which the additional capacity will be visible in Windows. Migration will take a number of hours depending upon the size of the volume, and the additional capacity will only become available once the process is complete (the progress can be monitored in Disk Management). In both cases, the existing volume will remain accessible throughout the expansion process.

Deleting Volumes

If an existing Nexsan RAID storage volume is no longer required, it can be deleted directly from the host.

To delete an existing volume, start Disk Management, and delete any existing partitions/volumes on the disk. Then, right-click the disk, and select 'Properties'. Select the 'Nexsan RAID' tab, and click 'Delete' to remove the volume from the Nexsan RAID system and make the space available for other uses.

Snapshots

This feature is only available on Windows Server.

Volumes on Nexsan RAID storage systems that support hardware snapshots may be managed through this tool. Supported operations include creating, mounting, rewinding and deleting hardware snapshots.

To create or manage snapshots for an existing volume, launch Nexsan Snapshot Management in any of the following ways:

- In Explorer, right-click the volume to manage, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Snapshots...'. Alternatively, you can create a new hardware snapshot immediately by clicking the 'Create Snapshot' button.
- In Disk Management, right-click the disk or logical volume to manage, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Snapshots...'. Alternatively, you can create a new hardware snapshot immediately by clicking the 'Create Snapshot' button.
- In Nexsan Storage Manager, right-click a system and select 'Snapshots...'.

You can also manage a locally-mounted snapshot in any of the following ways:

- In Explorer, right-click the snapshot to manage, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Delete...' to permanently delete the snapshot, or 'Rewind...' to return it to its original state.
- In Disk Management, right-click the snapshot disk or logical volume to manage, and select 'Properties'. Select the 'Nexsan RAID' tab and click 'Delete...' to permanently delete the snapshot, or 'Rewind...' to return it to its original state.
- In Nexsan Storage Manager, right-click a system and select 'Snapshots...'.

Advanced Provisioning

Nexsan Provisioning supports the VDS (Virtual Disk Service) and VSS (Virtual Shadow Copy Service) interfaces, and is compatible with third-party storage management tools that use VDS or VSS, such as Microsoft's 'DISKRAID' command-line tool and 'Storage Manager for SANs' GUI application. These tools can be used to perform advanced storage configuration tasks including managing hot-spares and setting up clustered storage on Nexsan RAID storage.

Nexsan RAID storage can be managed directly using the Windows Server Manager UI and PowerShell cmdlets, and other applications that use the Storage Management API. For details of Storage Management API support, see the Windows Server Storage Management section.

Windows Server Storage Management

This feature is only available on **Windows Server 2012** or later. The PowerShell cmdlets can be installed on Windows clients and used to remotely manage Windows servers.

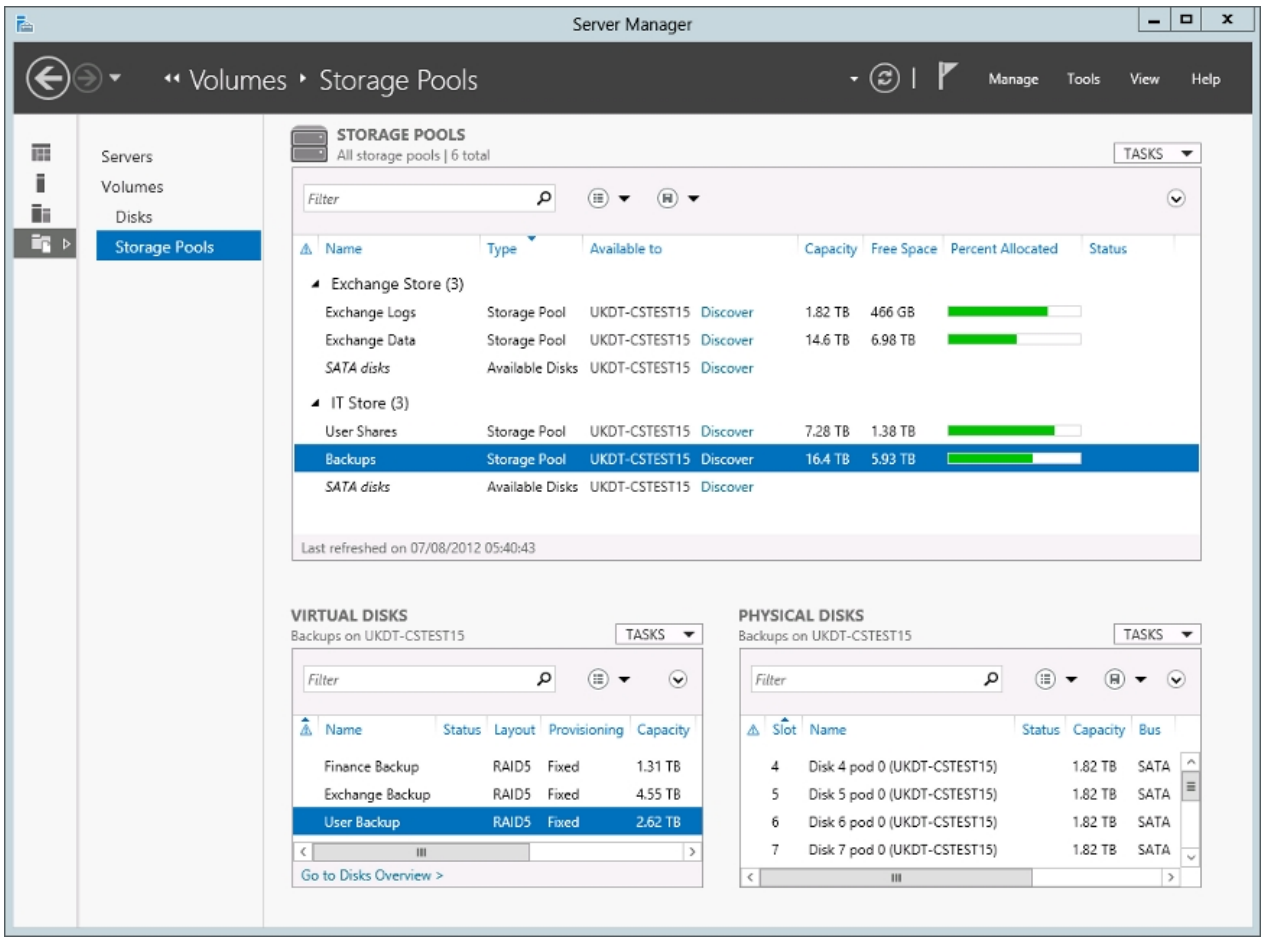
Nexsan Storage Tools integrates with the native storage management features of Windows Server, allowing Nexsan RAID systems to be managed through the Server Manager console, PowerShell cmdlets, and third-party applications and tools that use the Storage Management API, such as System Center Virtual Machine Manager.

Nexsan RAID systems will be discovered and authenticated automatically and appear in the Server Manager console for standalone servers and storage using the default settings, but additional configuration may be needed if non-default security settings have been chosen. Managing clusters and multiple servers requires additional configuration.

- **Managing a Standalone Server** - configure a single server to manage direct-attached Nexsan RAID systems using automatic or credential-based authentication.
- **Managing Multiple Servers** - manage multiple servers or clusters from a single client with high-availability.

- **PowerShell Storage Management** - use PowerShell cmdlets to manage Nexsan RAID storage.

- **Troubleshooting PowerShell Storage Management** - diagnose common problems with Storage Management in Windows Server Manager / PowerShell.



The terminology used in Windows differs from that used in Nexsan RAID storage products, as described in the following table:

Windows Server	Nexsan RAID Storage
Subsystem	RAID system
Physical Disk	Disk
Storage Pool	Array
Available Disks	Unused Disks
Primordial Storage Pool	All disks of a specific type and enclosure
Virtual Disk	Volume
Initiator Id	Host
Masking Set	Host Access

Managing a Standalone Server

Nexsan RAID systems will be discovered and authenticated automatically and appear in the Server Manager console for standalone servers and storage using the default settings, but additional configuration may be needed if non-default security settings have been chosen.

Your server and storage should meet the following requirements:

- The Server Manager UI will run either directly on the server, or on a remote Windows 8 client used to manage only one server.
- The Nexsan RAID system is connected to the same SAN as the server (or via an iSCSI connection).
- The server is not a member of a cluster.
- Nexsan Storage Tools is installed on the server.

If your setup does not meet these requirements, see Managing Multiple Servers.

Manual Discovery

If the Nexsan RAID system is not connected to the local server, you must register it using its management IP address:

```
Register-NexsanRaidSubSystem -IPAddress <ipaddress> -UserName <user> -
Password <password>
```

Automatic Discovery and Authentication

If your Nexsan RAID system is using the default "host trust" security setting ("Limited"), it will be discovered and authenticated automatically, and will appear in the Server Manager UI and PowerShell cmdlets (e.g. **`Get-StorageSubSystem`**). If "host trust" is disabled, see Credentials-based Authentication to set the credentials used to connect to the RAID system.

Re-enabling Automatic Discovery and Authentication

If you have previously changed the default discovery settings on your server, you can re-enable automatic discovery and authentication using an Administrative PowerShell session. If you are using a remote Windows 8 client, ensure that Nexsan Storage Tools is installed and add the "**`-CimSession <servername>`**" parameter to each command.

- Unregister a RAID system and clear any stored credentials:

```
Get-StorageSubSystem -Manufacturer Nexsan | Unregister-NexsanRaidSubSystem
```

- Re-enable SAN auto-discovery:

```
Set-NexsanRaidProviderAttributes -SanDiscoveryDisabled $False
```

Credentials-based Authentication

If "host trust" is disabled on your Nexsan RAID system, credentials must be set on the server to allow it to authenticate with the storage. Credentials must be stored for each RAID system to which the server is connected, and updated if the password is changed on the RAID system.

If the stored credentials are incorrect, the RAID system will not appear in the Server Manager UI, and will be listed from "**`Get-StorageSubSystem`**" with an OperationalStatus of "Lost Communication".

Setting Credentials

1. Check that the RAID system has been detected on the SAN:

```
Get-StorageSubSystem
```

2. Store the credentials for a specific Nexsan RAID system:

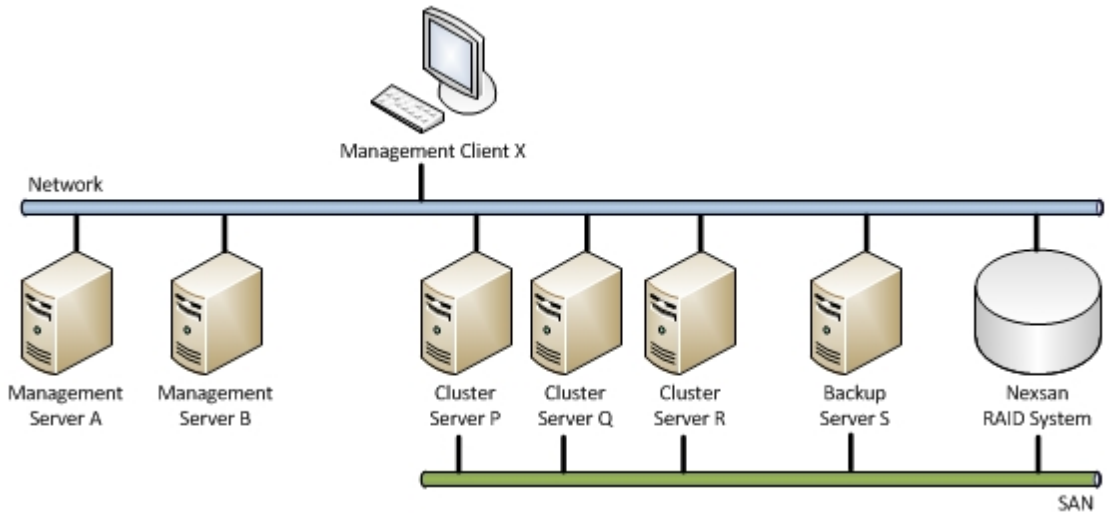
```
Get-StorageSubSystem -FriendlyName <friendlyname> | Register-
NexsanRaidSubSystem -UserName <user> -Password <password>
```

3. If you use the same password for all Nexsan RAID systems, you can set or update the password via a single command:

```
Get-StorageSubSystem -Manufacturer Nexsan | Register-NexsanRaidSubSystem -
UserName <user> -Password <password>
```

Managing Multiple Servers

Windows Server allows multiple servers and clusters to be managed from a single Server Manager client. In a multi-server environment, some additional configuration is required to correctly manage Nexsan RAID systems.



An example multi-server management model with high-availability is shown above. In this example, each server has a separate role, but roles may be combined onto a single server (e.g. the connected servers may also be used for management instead of using separate servers). The three roles are:

- **Management Client** ("X") - Windows Client or Server running the Server Manager UI and PowerShell cmdlets.
- **Management Server** ("A", "B") - Windows Server running the Nexsan SMP provider. The management server does not need to be connected to the SAN, but must be able to contact the Nexsan RAID system management IP addresses.
- **Connected Server** ("P", "Q", "R", and "S") - Windows Server connected to the same SAN as the Nexsan RAID system, or connected to the Nexsan RAID system via iSCSI.

Configuring Storage Management for Multiple Servers

The typical process to configure multiple servers and RAID systems for storage management is detailed below. All actions should be performed on the management client ("X") unless otherwise indicated.

1. Install the Nexsan Storage Tools **Server Storage Management** component on the management servers.
2. Install the Nexsan Storage Tools **PowerShell** component on the management client.
3. Install the Nexsan Storage Tools **Server Features** components on the connected servers (optional but recommended).
4. Set the "Host Trust" security option to "None" on the Nexsan RAID systems (optional). This is recommended to ensure that only servers with correct credentials will attempt to manage the Nexsan RAID system.
5. In the Server Manager UI, add all management servers and connected servers.
6. In the Server Manager UI, create one or more server groups for the connected servers, and add all of the connected servers to the appropriate groups.

7. In the Server Manager UI, create a server group for the management servers, and add all of the management servers to the group.
8. If any changes were made in steps 3-5, close the Server Manager UI to ensure that the changes have been saved.
9. In an Administrative PowerShell, disable SAN auto-discovery for all servers:

```
Set-NexsanRaidProviderAttributes -SanDiscoveryDisabled $True -ServerGroup *
```

10. In an Administrative PowerShell, add credentials for the Nexsan RAID system(s) to all management servers:

```
Register-NexsanRaidSubSystem -IPAddress <ipaddress> -UserName <user> -
Password <password> -ServerGroup <groupname>
```

If servers are added or changed, or the Nexsan RAID system password is updated, repeat the appropriate steps to ensure that the storage is correctly managed.

System Center Integration

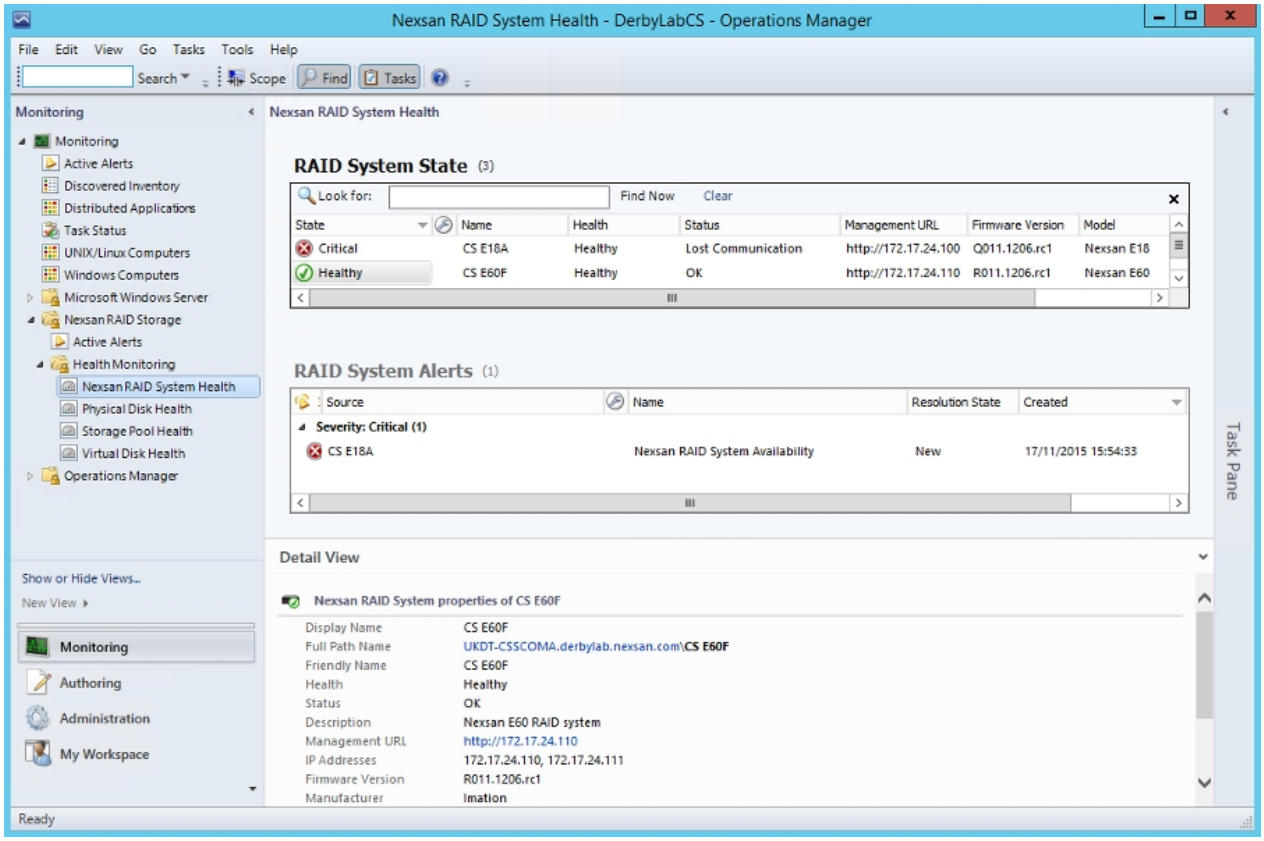
Nexsan Storage Tools integrates with Microsoft's System Center products, allowing Nexsan RAID systems to be managed natively by the System Center applications. These features require System Center 2012 or later.

System Center integration uses the Windows Storage Management API, and requires the Windows Server Storage Management (SMP) feature.

- **System Center Operations Manager (SCOM)** - Allows health monitoring and reporting of multiple Nexsan RAID systems.
- **System Center Virtual Machine Manager (SCVMM)** - Allows the provisioning of Nexsan RAID storage on a per-VM basis, health and reporting of VM storage, and hardware-assisted rapid deployment, cloning, and migration of VMs.

System Center Operations Manager (SCOM)

Nexsan Storage Tools integrates with Microsoft's System Center Operations Manager (SCOM), allowing health monitoring and reporting of multiple Nexsan RAID systems. This feature requires System Center Operations Manager 2012 or later.



To integrate Nexsan Storage Tools with System Center Operations Manager:

1. Configure the management servers and Nexsan system according to the **Managing multiple servers** section. The **Server Storage Management** component should be installed on each SCOM Management Server.
2. Copy the **SCOM** directory from the Nexsan Storage Tools installation folder on the management server to a location accessible by the SCOM management client.
3. On the management client, start the Operations Manager console and connect to the management server.
4. Select the **Administration** workspace.
5. Under **Actions**, select **Import management packs**.
6. Click **Add**, **Add from disk**. If prompted to search the online catalog for dependencies, select **Yes**.
7. Browse to the **SCOM** directory copied earlier, and select the **Nexsan.NexsanRaidMP_x.x.x.x.mpb** file.
8. Click **Import** to import the management pack.
9. If the SCOM default action account does not have Administrative rights on the SCOM management server(s), a RunAs account must be configured. Select the **Administration** workspace, **Run As Configuration**, **Profiles**. Select the **Nexsan RAID Monitoring Account** and assign it to an

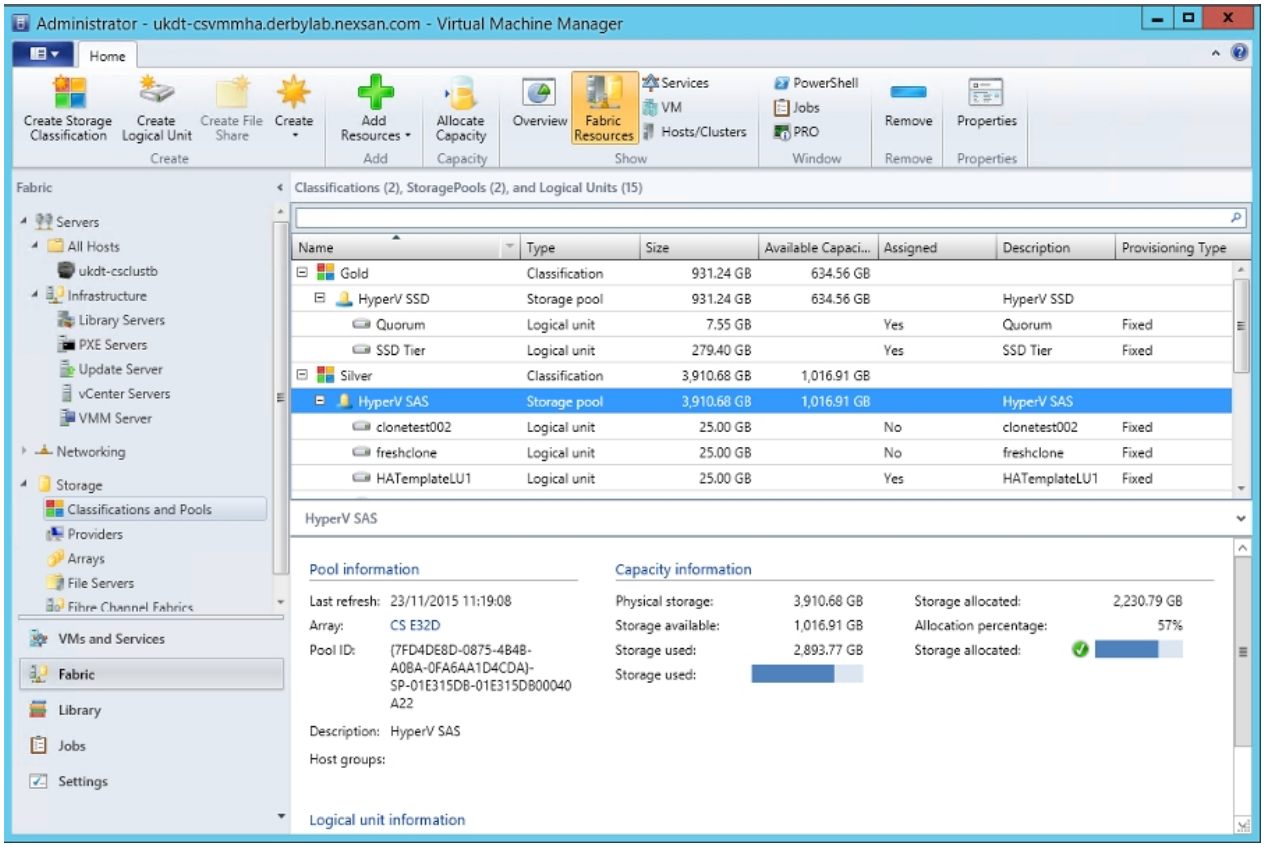
appropriate RunAs account with administrative privileges on the management server.

10. Select the **Monitoring** workspace, and expand the **Nexsan RAID Storage** view to access alert and health status reports for Nexsan systems. It may take up to 30 minutes for the RAID storage to be discovered and reported.
11. If the RAID system(s) have already been registered with the management server using the **Set-NexsanRaidCredentials** cmdlet, they should be listed automatically.
12. If required, use the **Set-NexsanRaidCredentials** cmdlet to register additional RAID system(s). Additional RAID systems may take up to 30 minutes to be discovered and reported in SCOM. If at least one RAID system has already been discovered, a rescan can be triggered by selecting any Nexsan RAID object, selecting **Tasks** on the menu, **Nexsan RAID System Tasks**, **Rescan RAID Systems**.

If servers are added or changed, or the Nexsan RAID system password is updated, repeat the appropriate steps to ensure that the storage is correctly managed.

System Center Virtual Machine Manager (SCVMM)

Nexsan Storage Tools integrates with Microsoft's System Center Virtual Machine Manager (SCVMM), allowing the provisioning of Nexsan RAID storage on a per-VM basis, health and reporting of VM storage, and hardware-assisted rapid deployment, cloning, and migration of VMs. This feature requires System Center Virtual Machine Manager 2012 or later.



To integrate Nexsan Storage Tools with System Center Virtual Machine Manager:

1. Configure the management servers and Nexsan system according to the **Managing multiple servers** section. The **Server Storage Management** component should be installed on each SCVMM Management Server.
2. On the management client, start the Virtual Machine Manager console and connect to the management server.
3. Select the **Fabric** workspace.
4. Select **Storage - Arrays** in the Fabric workspace.
5. Select **Add Resources** on the toolbar, then **Storage Devices**.
6. Select **SAN devices managed by a native SMP provider** as the provider type.
7. Click the **Import** button, then select **Nexsan RAID Storage Management Provider**.
8. If the RAID system(s) have already been registered with the management server using the **Set-NexsanRaidCredentials** cmdlet, they should be listed automatically. If not, use the **Set-NexsanRaidCredentials** cmdlet to register the RAID system(s) and then click **Scan Provider** to refresh the list.
9. Select the storage pools (arrays) that should be managed by SCVMM, and assign appropriate

classifications.

10. Click **Finish** to complete the wizard.

For more information, see **Configuring Storage in VMM** in the System Center 2012 documentation: https://technet.microsoft.com/en-us/library/gg610600(v=sc.12).aspx

If servers are added or changed, or the Nexsan RAID system password is updated, repeat the appropriate steps to ensure that the storage is correctly managed.

Advanced Settings

Advanced Settings for Nexsan Storage Tools can be configured via the Registry. These options are provided for advanced users only.

Most settings can be configured on either a global or per-user basis (per-user settings take priority over global settings).

Security Settings

Value:	**SecurityMode**
Key:	HKEY_LOCAL_MACHINE\Software\Nexsan \ManagementService
Type:	REG_DWORD
Default:	0x0

Configures the security mode for Nexsan Storage Tools on the local computer. The security mode allows access to the Nexsan Storage Tools features to be adjusted according to your environment. Note that this is a global setting only.

SecurityMode	Standard Access	Provisioning Access (Windows Server)
0x00 (Default)	Authenticated Users	Administrators (elevation required)
0x01	Administrators	Administrators (elevation required)
0x02	Administrators (elevation required)	Administrators (elevation required)
0x03	Authenticated Users	Administrators
0x04	Administrators	Administrators

Value:	**ConnectionSecurity**
Key:	HKEY_LOCAL_MACHINE\Software\Nexsan \Provisioning
Type:	REG_DWORD
Default:	0x1

Configures the connection security requirements between the server and the storage system for provisioning operations (including operations through the VDS, VSS, and SMP APIs). Note that this is a global setting only.

If secure encrypted connections are required, the SSL certificate for the system or issuer should be added to the local machine 'Nexsan RAID Storage' certificate store using the command below. Certificates must have a Common Name set to the IP address of the controller's management port if the security setting includes 'Verify IP Address'. Once certificates have been installed they may be managed using the

'Certificates' MMC snap-in.

```
certutil -addstore -f "Nexsan RAID Storage" <certificate.cer>
```

ConnectionSecurity	Encryption	Certificate Location	Verify IP Address
0x00	Disabled (plaintext)	-	-
0x01 (Default)	Preferred	-	No
0x02	Required	-	No
0x03	Required	Default or Nexsan	No
0x04	Required	Default or Nexsan	Yes
0x05	Required	Nexsan	No
0x06	Required	Nexsan	Yes

Provisioning Settings

Value: **SnapshotMgmtAccess**

Key: HKEY_LOCAL_MACHINE\Software\Nexsan\Provisioning

Type: REG_DWORD

Default: 0x7

Configures the default host-trust management access permissions when mounting snapshots. Note that this is a global setting only.

The value is a combination of zero or more of the following flags:

SnapshotMgmtAccess	Description
0x01	Allow management by any initiator on the local server, including those currently offline/disconnected (applies only when authenticated via host-trust).
0x02	Allow management by any initiator that has been granted read/write access to the primary volume.
0x04	Allow management by any initiator that has been granted management access to the primary volume.

Storage Manager Settings

Value: **BrowserSessionsMax**

Global Key: HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager\Advanced

Per-User Key: HKEY_CURRENT_USER\Software\Nexsan\Storage

	Manager\Advanced
Type:	REG_DWORD
Default:	0x0 (Application-defined)

Limits the number of Browser sessions within Storage Manager. Setting this value to 0 will use the application-defined default.

Value:	**RemoteDesktopEmbedded**
Global Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager\Advanced
Per-User Key:	HKEY_CURRENT_USER\Software\Nexsan\Storage Manager\Advanced
Type:	REG_DWORD
Default:	0x1 (Enabled)

Enables in-place Remote Desktop sessions within Storage Manager. Setting this value to 0 will display an HTML status page for Remote Desktop-enabled systems in the RAID Storage Console, instead of opening a Remote Desktop console.

Values:	**RemoteDesktopWidth**, **RemoteDesktopHeight**
Global Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager\Advanced
Per-User Key:	HKEY_CURRENT_USER\Software\Nexsan\Storage Manager\Advanced
Type:	REG_DWORD
Default:	1024, 768

Specifies the default width and height for Remote Desktop sessions.

Value:	**RemoteDesktopSmartSizing**
Global Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager\Advanced
Per-User Key:	HKEY_CURRENT_USER\Software\Nexsan\Storage Manager\Advanced
Type:	REG_DWORD
Default:	0x1 (Enabled)

Enables smart sizing for in-place Remote Desktop sessions. Smart sizing scales the Remote Desktop image when the window is smaller than the remote desktop size. Setting this value to 0 will disable smart sizing (scrollbars will appear when the window is smaller than the remote desktop size).

Value:	**RemoteDesktopAdminConsole**
Global Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager\Advanced
Per-User Key:	HKEY_CURRENT_USER\Software\Nexsan\Storage Manager\Advanced
Type:	REG_DWORD

Default:	0x1 (Enabled)

Enables Administrative connections for Remote Desktop sessions. Setting this value to 0 will connect via a normal user session.

Value:	**DisableSessionCookieCheck**
Per-User Key:	HKEY_CURRENT_USER\Software\Nexsan\Storage Manager
Type:	REG_DWORD
Default:	0x0 (Checks enabled)

Disables checks for internet options that block session cookies when authentication requires them. Setting this value to 1 will prevent a warning message appearing during authentication if cookies are blocked.

Explorer / Computer Management Extension Settings

Value:	**ShellExtensionsEnabled**
Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager
Type:	REG_DWORD
Default:	0x0 (Disabled)

Enables the Explorer / Computer Management Extensions. Setting this value to 0 disables all Nexsan shell extensions. This value is set to 1 during installation if the Shell Extensions component is selected. Note that this is a global setting only.

Value:	**SMBShellExtensionsEnabled**
Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager
Type:	REG_DWORD
Default:	0x1 (Enabled)

Enables the Explorer / Computer Management Extensions for SMB shares. Setting this value to 0 disables the Nexsan shell extensions for SMB shares. Note that this is a global setting only.

Value:	**MigrateShellExtensionsEnabled**
Key:	HKEY_LOCAL_MACHINE\Software\Nexsan\Storage Manager
Type:	REG_DWORD
Default:	0x1 (Enabled)

Windows Server: Enables the 'Nexsan RAID' tab on non-Nexsan dynamic volumes to allow volume migration. If this value is set to 0 the tab will not be shown. Note that this is a global setting only.

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