Overland Storage

SnapScale®

Administrator's Guide

For Appliances Running
RAINcloudOS® Version 4.2

overland storage

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Overland Storage, Inc.
9112 Spectrum Center Blvd.
San Diego, CA 92123
U.S.A.

Tel: 1.877.654.3429 (toll-free U.S.)
Tel: +1.858.571.5555, Option 5 (International)
Fax: +1.858.571.0982 (general)
Fax: +1.858.571.3664 (sales)
www.overlandstorage.com

Preface

Audience and Purpose

This guide is intended for system and network administrators charged with installing and maintaining a SnapScale cluster running RAINcloudOS version 4.2 on their network. It provides information on the installation, configuration, security, and maintenance of the SnapScale cluster and nodes. Administrators should be familiar with the basic concepts and tasks of multi-platform network administration.

This guide also provides information on the following utilities and software components:

- The RAINcloudOS 4.2 Web Management Interface
- SnapServer Manager (SSM)

RAINcloudOS version 4.2 comes preinstalled on all new SnapScale X-Series nodes. It can also be upgraded from a previously installed version of RAINcloudOS version 3.0 or later.

Product Documentation & Software Updates

SnapScale product documentation and additional literature are available online, along with the latest release of the RAINcloudOS version 4.2.

Point your browser to:

http://docs.overlandstorage.com/snapscale

Follow the appropriate link on that page to download the **latest** software file or document. For additional assistance, search at http://support.overlandstorage.com.

Overland Technical Support

For help configuring and using your SnapScale cluster, email our technical support staff at:

techsupport@overlandstorage.com.

You can get additional technical support information on the Contact Support web page at:

http://docs.overlandstorage.com/support

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Conventions

This document exercises several alerts and typographical conventions.

Convention	Description & Usage
WARNING WARNUNG ADVERTISSEMENT	A *Warning* contains information concerning personal safety. Failure to follow directions in the Warning could result in bodily harm or death. Eine *Warnung* enthält Informationen zur persönlichen Sicherheit. Das Nichtbeachten der Anweisungen in der Warnung kann zu Verletzungen oder zum Tod führen. Un *avertissement* contient des informations relatives à la sécurité personnelle. Ignorer les instructions dans l'avertissement peut entraîner des lésions corporelles ou la mort.
CAUTION	A *Caution* contains information that the user needs to know to avoid damaging or permanently deleting data or causing physical damage to the hardware or system.
IMPORTANT	An *Important* note is a type of note that provides information essential to the completion of a task or that can impact the product and its function.
Item_name	Words in this special boldface font indicate the names of buttons or page names found in the Web Management Interface.
Ctrl-Alt-r	This type of format details the keys you press simultaneously. In this example, hold down the **Ctrl** and **Alt** keys and press the **r** key.
NOTE	A Note indicates neutral or positive information that emphasizes or supplements important points of the main text. A note supplies information that may apply only in special cases, for example, memory limitations or details that apply to specific program versions.
Menu Flow Indicator (**>**)	Words with a greater than sign between them indicate the flow of actions to accomplish a task. For example, **Setup > User > Password** indicates that you should click the **Setup** tab, then the **User** secondary tab, and finally the **Password** button to accomplish a task.
Courier Italic	A variable for which you must substitute a value.
`Courier Bold`	Commands you enter in a command-line interface (CLI).

Information contained in this guide has been reviewed for accuracy, but not for product warranty because of the various environments, operating systems, or settings involved. Information and specifications may change without notice.

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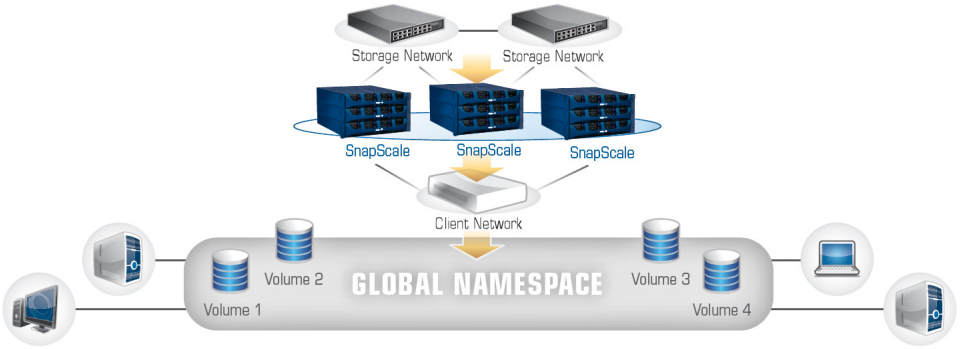
Chapter 1

Overview

SnapScale is a flexible, scalable, low-maintenance network-attached storage cluster composed of a redundant array of independent nodes running RAINcloudOS (ROS). This guide applies to SnapScale nodes running RAINcloudOS version 4.2.

Offering user-selectable levels of data redundancy, SnapScale uses File-level Striping to write data across multiple nodes and drives simultaneously for instant protection and high availability. With a SnapScale cluster, volumes can be configured, created, provisioned, and grown on demand. Special features such as Data Balancer redistributes files to optimize performance and Spare Distributor evenly distributes spare drives across nodes. Files can be accessed either through NFS or CIFS/SMB protocols. SnapScale Flexible Volumes automatically adjust capacity so they only occupy as much space as their data requires.



Topics in Overview:

- SnapScale Conventions
- SnapScale Node Requirements
- RAINcloudOS Specifications
- What's New in RAINcloudOS 4.2
- RAINcloudOS 4.1 Features
- RAINcloudOS 4.0 Features
- Use SnapServer Manager with SnapScale
- Client and Storage Networks
- Node Port Configurations

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SnapScale Conventions

The SnapScale cluster supports three or more nodes hosting redundant sets of data for data protection. An Administrator can configure, add, or remove nodes on demand to change storage requirements. The overall storage system is able to easily grow from three nodes to meet your needs.

Peer sets are created using two or three drives (based on redundancy choices) located on different nodes. Each peer set member has the same data and metadata as its peers.

There are three different states for SnapScale nodes:

- **Uninitialized node** – an independent node that has not yet been joined to a SnapScale cluster.
- **SnapScale node** – a healthy node that is a member of a fully-configured SnapScale cluster. Both 2U nodes with up to 12 drives and 4U nodes with 36 drives are available.
- **Management node** – a SnapScale node with special duties involved in managing the cluster. The Management node is selected automatically by the RAINcloudOS when the cluster boots. Should that management node fail, another currently available node is automatically chosen to become the new Management node. This Management node also hosts peer sets with metadata and data just like all other SnapScale nodes.

Other key concepts include:

- **Management IP** – the IP address through which the administrator accesses the Web Management Interface of the current Management node.
- **Peer set** – a set of two or three disks (each on a separate node) that have mirrored data for redundancy.
- **Cluster Name** – the name visible to network clients and used to connect to the cluster (similar to a server name), and resolvable to node IP addresses via round robin DNS.
- **Cluster Management Name** – the hostname resolvable to the Management IP for Web Management Interface access or Snap EDR configuration.
- **Data Protection Level** – The data protection level specifies how many node failures the cluster can support (1 or 2) without a loss of data. A data protection level of 2 offers higher data protection but uses more disk space.

A SnapScale cluster consists of two separate networks:

- **Client Network** – used exclusively for client access. Clients can connect to any node to access data anywhere on the cluster.
- **Storage Network** – an isolated network used exclusively by the cluster for inter-node communications. This includes:
  - Heartbeat (node health/presence) sensing.
  - Synchronization of peer set members.
  - Data transfer between nodes to facilitate clients reading from and writing to files.

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SnapScale Node Requirements

The following table details the basic requirements for cluster nodes:

Requirement	Detailed Description
Minimum number of nodes	A SnapScale cluster must have a minimum of three (3) nodes to operate normally.
No expansion units	A SnapScale node cannot have any expansion units attached to it.
Minimum number of disks per node	Each node must have a minimum of four disks. Additional disks can be added as needed.
Maximum size of file on cluster	While the system reports total free space across the entire cluster, the maximum file size at any given time is dictated by free space on the least-utilized peer set. This is reported in the Web Management Interface.
Common Storage network	To form or join a SnapScale cluster, each Uninitialized node must be connected to the same Storage network as the other nodes.
Storage network links	To form or join a SnapScale cluster each Uninitialized node must have connectivity (active link) on both Storage network ports.
Storage network usage	Only a single cluster can use a given Storage network.
Client network separate from Storage network	The Client and Storage networks must be on different (independent) networks, and the Storage network must be isolated from all other networks.
Nodes must be running same RAINcloudOS version	To form a SnapScale cluster, all nodes must be running the same version of RAINcloudOS. To join an already configured SnapScale cluster, an Uninitialized node must have the same version of RAINcloudOS as the other SnapScale nodes: • If the Uninitialized node has an **older** version of the RAINcloudOS, the Uninitialized node must be upgraded to the later version. • If the Uninitialized node has a **newer** version of the RAINcloudOS, then all SnapScale nodes must be upgraded to the later version. (The node can be reinstalled with a version matching the cluster if the hardware supports it.)
Adding nodes	When adding nodes to an existing cluster, the number of nodes added at one time should be at least the same number as the Data Protection Level plus one. For example, for a cluster with a Data Protection Level of 1 which uses two drives per peer set, add two nodes. This ensures the new nodes and cluster are efficiently utilizing increased storage space.
Disk requirements	All disks in the cluster must be the same type of disk (such as SAS) and same rotational speed.

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RAINcloudOS Specifications

These specifications apply to SnapScale nodes running RAINcloudOS version 4.2:

Feature	Specification
Network Transport Protocols	• TCP/IP (Transmission Control Protocol/Internet Protocol) • UDP/IP (User Datagram Protocol/Internet Protocol)
Network File Protocols	• Microsoft Networking (CIFS/SMB1/SMB2) • Unix Network Filesystem (NFS) 2.0/3.0/4.0 Hypertext Transfer Protocol (HTTP/HTTPS)
Network Security	• Microsoft Active Directory Service (ADS) (member server) • Unix Network Information Service (NIS) user/group UID/GID translation • LDAP user/group UID/GID translation • File and Folder Access Control List (ACL) Security for Users and Groups • Transport Layer Security (TLS 1.0-1.2) • Target Challenge Handshake Authentication Protocol (CHAP) for iSCSI • SMTP Authentication and support for email encryption (STARTTLS and TLS/SSL encryption protocols)
Network Client Types	• Microsoft Windows 2003/2003 R2/2008 SP2/2008 R2 /XP SP3/ Vista SP2/7/8/2012 • Mac OS X 10.5/10.6/10.7/10.8/10.9 • Sun Solaris 10 and 11 • HP-UX 11 • AIX 5.3/6 • Red Hat Enterprise Linux (RHEL) 4.x/5.x/6.x • Novell SuSE Linux Enterprise Server (SLES) 10.x/11.x
Data Protection	• Snapshots for immediate or scheduled point-in-time images of the cluster filesystem • Support for local backup with Symantec NetBackup/Backup Exec Remote Media Server for Linux • Support for network backup with Symantec NetBackup/Backup Exec, CA ARCserve, or EMC NetWorker • APC® brand Uninterruptible Power Supply (UPS) with Network Management Cards, a USB interface, or a serial interface (with USB-to-Serial adapter) are supported for graceful system shutdown
DHCP Support	• Supports Dynamic Host Configuration Protocol (DHCP) for automatic assignment of IP addresses
System Management	• Browser-based administration tool called the Web Management Interface • SnapServer Manager utility (platform independent) • Read-only CLI support • SNMP (MIB II and Host Resource MIB) • User disk quotas for Windows, Unix/Linux, FTP/FTPS • Group disk quotas for Unix/Linux • Environmental monitoring • Email event notification • Data importation (migration)

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What's New in RAINcloudOS 4.2

NOTE: For details and descriptions of all the new features and a list of other improvements to the operating system, see the Product Release Notes on the Overland SnapScale website.

With the release of the latest version of RAINcloudOS, the following features and functionality are now available:

Feature	New Functionality
Data Replication	Technology that maintains a continuous 1-to-1 replication of data from a volume on one cluster to a volume on another. Users can configure the volumes on a cluster to be either sources or targets (but not both at once on a single volume) so that a cluster can host multiple replication relationships with other clusters. Throughput can be throttled so bandwidth can be conserved during peak network usage time periods. Users can see how much work is in the queue for a particular replication policy using the Web Management Interface.
Improved Data Importing	Data import now runs multiple copy threads in parallel and utilizes all the possible nodes on both the source and destination to parallelize the import thus vastly improving the data import speed.
Phone Home	The cluster can now automatically send alert emails to Technical Support whenever there has been a serious error on the cluster. Each error message is optionally accompanied by a set of logs and configuration files so the support engineers can perform a preliminary evaluation of the problem. This reduces the need to actively contact support, and allows support to proactively investigate issues that might not be apparent. **NOTE:** Email notification must be configured before this feature is available.

RAINcloudOS 4.1 Features

NOTE: For details and descriptions of all the new features of the operating system, see the Product Release Notes on the Overland SnapScale website.

With the release of RAINcloudOS 4.1, the following features and functionality were made available:

Feature	New Functionality
NFSv4 Support	In addition to NFSv3 default support, the option now exists to enable NFSv4.

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Feature	New Functionality
Online/Rolling Updates	Added a new OS update process that allows the cluster to still be online and available during the entire update process. However, performance will be reduced and some administrative features will not be available.
Snapshots Performance Optimization	File write performance is significantly improved when one or more snapshots exist for a volume.
LDAP Integration	Lightweight Directory Access Protocol (LDAP) can be used to look up user/group names and UIDs/GIDs for quota assignment, ID mapping, and home directories.
Windows Security Model	Volumes can be configured with a security model that permits only Windows personality file system permissions (ACLs).
BitTorrent Sync	BitTorrent Sync can be used to replicate data between the SnapScale cluster and other servers or workstations.
Network Monitor	This feature allows for monitoring the network (bandwidth) usage of the server across all network interfaces. Network usage can be monitored both in real-time and historically going back several weeks or months.

RAINcloudOS 4.0 Features

NOTE: For details and descriptions of all the new features of the operating system, see the Product Release Notes on the Overland SnapScale website.

With the release of RAINcloudOS 4.0, the following features and functionality were made available:

Feature	New Functionality
iSCSI Support	SnapScale can now create and host iSCSI disk targets on the cluster file system. These iSCSI disks can register with an iSNS server, and can also be managed by Windows VSS/VDS.
SMB2, FTP/FTPS, and SNMP Support Added	SMB2, FTP/FTPS, and SNMP are all now supported in RAINcloudOS.
Improved Network Monitoring	The **Network Monitor** page provides additional information including high-water marks, network activity for the whole cluster, and clearer labels.
Added User/Group Quotas per Volume	Storage consumption and file count quotas can now be configured for users and NIS groups per volume.
SMB 2.0/2.1	The server supports Server Message Block (SMB) version 2.0/2.1 for improved compatibility and performance for later Windows OS versions.
Data Balancer & Spare Distributor Improved	**Data Balancer** (formerly **Capacity Balancer**) redistributes files to optimize performance. **Spare Distributor** (formerly the **Spare Disk Balancer**) evenly distributes spare drives across nodes. Both have been improved for faster results.

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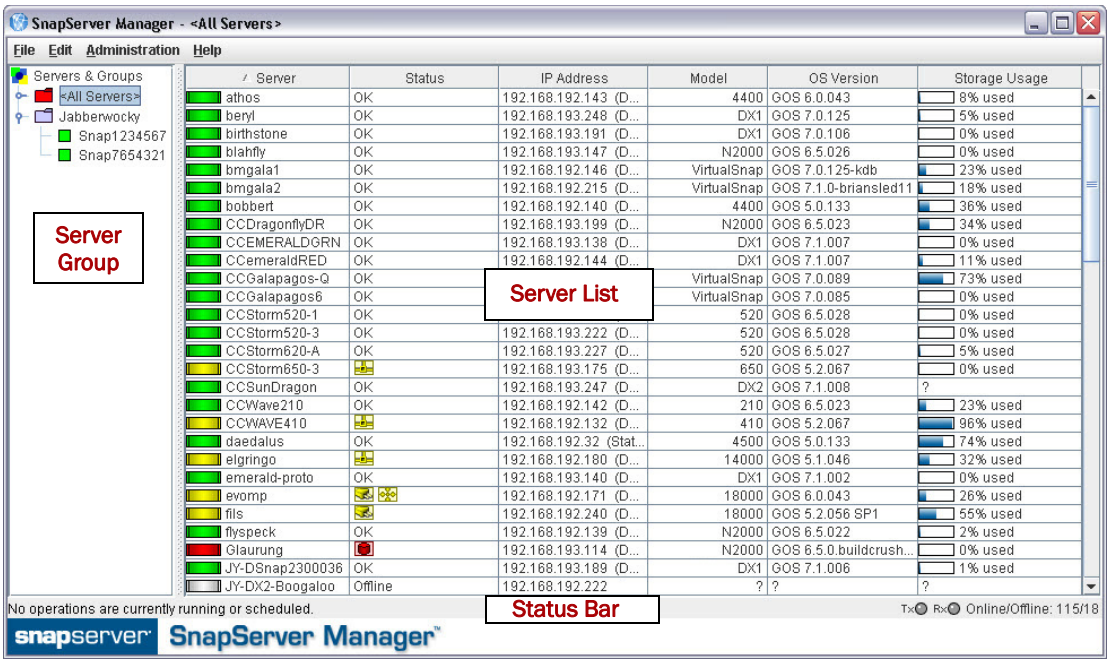
Use SnapServer Manager with SnapScale

SnapServer Manager (SSM) is a Java-based application that runs on all major client systems. SSM provides a single screen from which administrators can discover all SnapServer servers, REO appliances, SnapSAN arrays, SnapScale clusters, and SnapScale Uninitialized nodes (that is, nodes that are not part of a SnapScale cluster) on their network.



SnapServer Manager Installation

You can download and install SSM by navigating to the Overland Storage NAS website and downloading the SnapServer Manager executable file. SSM can be installed to several client platforms, including Windows, Mac OS X, and Linux.

Refer to the *SnapServer Manager User Guide* for details on discovering and configuring SnapScale clusters.

Client and Storage Networks

SnapScale requires two separate networks to function correctly: A public network (Client) and a private network (Storage). To support failover, two Storage network switches must be connected together (using a 1GbE or 10GbE cable between the switches). Each of the two Storage network ports on the node need to be connected to a different Storage switch.

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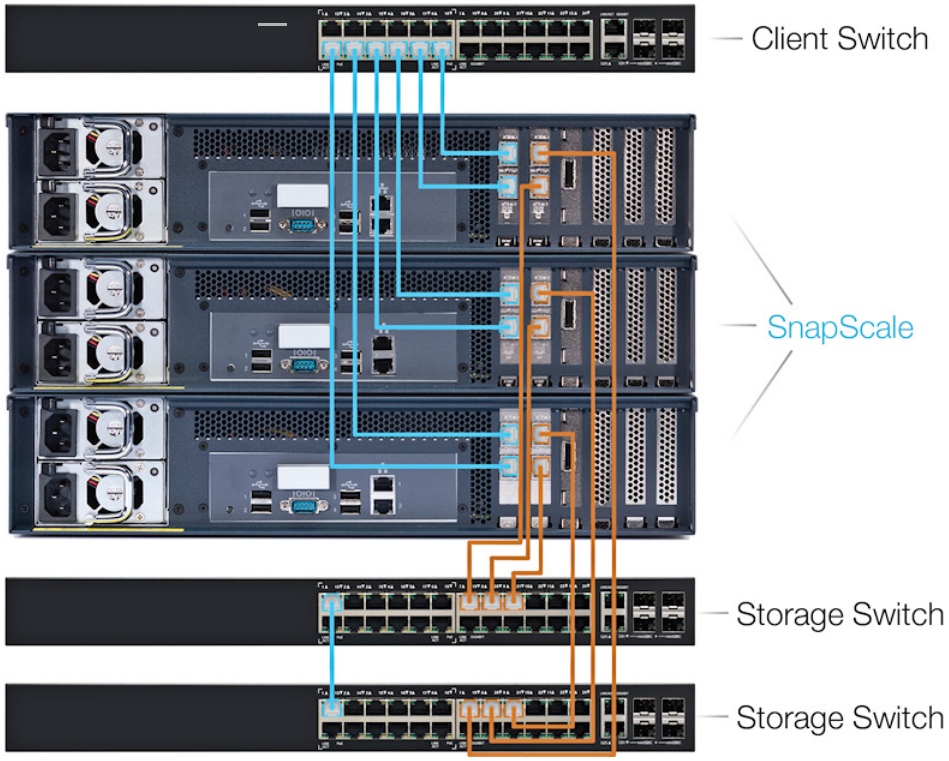
Node/Switch Cabling Example

The following example shows three dual 10GbE card X2 nodes and how to connect them to the network switches. The cables used to connect to the Client side of the network (blue) originate from the Client 10GbE card in slot 1. Two cables are used to connect both ports of each node to the Client switch.



The cables used to connect to the Storage side of the network (orange) originate from the Storage 10GbE card in slot 2. For each node, one cable is used to connect a one Storage port of each note to one of the two Storage switches used for failover.

For connections between 10GbE cards and 10GbE switches, use either direct-attached copper cables or fibre cables with SFP+ modules pre-installed in the card and switch ports.

NOTE: If using fibre cables, you must use Overland-approved SFP+ modules. With the cluster powered OFF, insert the modules into the card and switch ports. Connect the fibre cable between the two SFP+ modules and restore power to the cluster.

Node Port Configurations

Both the X2 and X4 nodes come in three different configurations: 1GbE ports (both Client and Storage ports), a single 10GbE card (with 1GbE Client ports), and dual 10GbE cards.

NOTE: If desired, optional 10GbE cards can be added later to upgrade the node.

X2 Node Configurations

Single 10GbE. The single-card 10GbE configuration uses the two onboard 1GbE ports for the Client connection and the two 10GbE ports on the card for the Storage connections.

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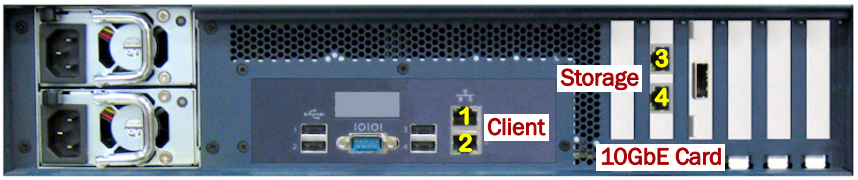

Configuration	Node GbE Ports	Network Switch
Single 10GbE X2	Ports 1 & 2	Client (public)
	Slot 2 10GbE Card (ports 3 & 4)	Storage (private)

Dual 10GbE. The dual-card configuration uses the left 10GbE card ports for the Client connections and the right 10GbE card ports for the Storage connections. The 1GbE ports are not used.

Configuration	Node GbE Ports	Network Switch
Dual 10GbE X2	Slot 1 10GbE Card (ports 1 & 2)	Client (public)
	Slot 2 10GbE Card (ports 3 & 4)	Storage (private)

X4 Node Configurations

Single 10GbE. The single-card 10GbE configuration uses the two onboard 1GbE ports for the Client connection and the two 10GbE ports on the card for the Storage connections.

Configuration	Node GbE Ports	Network Switch
Single 10GbE X4	Ports 1, 2, 3, & 4	Client (public)
	Slot 7 10GbE Card (ports 5 & 6)	Storage (private)

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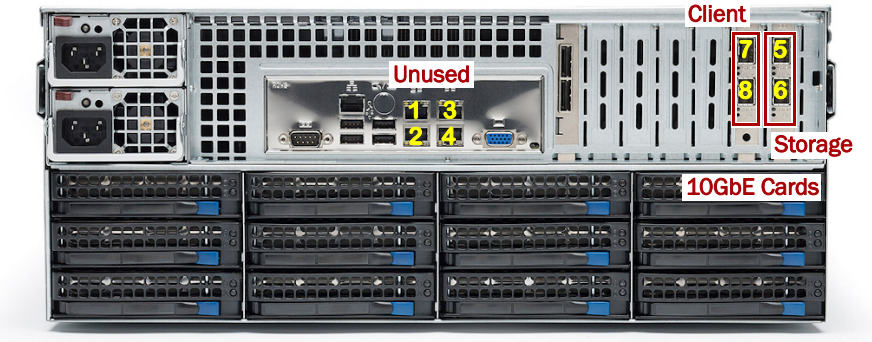
Dual 10GbE. The dual-card configuration uses the left 10GbE card ports for the Client connections and the right 10GbE card ports for the Storage connections. The 1GbE ports are not used.



Configuration	Node GbE Ports	Network Switch
Dual 10GbE X4	Slot 6 10GbE Card (ports 7 & 8)	Client (public)
	Slot 7 10GbE Card (ports 5 & 6)	Storage (private)

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Chapter 2

Initial Setup and Configuration

This section covers the initial setup and configuration of an individual SnapScale node running RAINcloudOS 4.2. It also addresses how to use that node to set up a SnapScale cluster of three or more nodes, or to add the node to an existing SnapScale cluster.

NOTE: For information concerning the installation and wiring of your SnapScale node hardware, refer to the appropriate Quick Start Guide for your product.

Topics in Setup and Configuration:

- Connect for the First Time
- Set Up a New SnapScale Cluster (via Wizard)
- Join an Existing SnapScale Cluster (via Wizard)
- Web Management Interface

Connect for the First Time

Uninitialized nodes are configured to acquire their IP address from a DHCP server. If no DHCP server is found on the network, the node defaults to an IP address in the range of 169.254.xxx.xxx and is labeled as "ZeroConf" in SnapServer Manager (SSM). You may not be able to see Uninitialized nodes on your network until you discover them using either the default node name or the SSM utility and optionally assign them an IP address.

Connect Using the Node Name

This procedure requires that name resolution services (via DNS or an equivalent service) be operational.

NOTE: Any node that is selected to be part of a cluster can be used to create the cluster.

1. Find the **node name** of an Uninitialized node that is to be used to create a new SnapScale cluster.

   A SnapScale node name is of the format "Node*nnnnnnnn*," where *nnnnnnnn* is the node number. The number is a unique, numeric-only string that appears on a label affixed to the bottom of the unit.

2. In a web browser, enter the **URL** to connect to the node.

   For example, enter "http://Node*nnnnnnnn*" (using the node name).

3. Press **Enter** to connect to the Web Management Interface.

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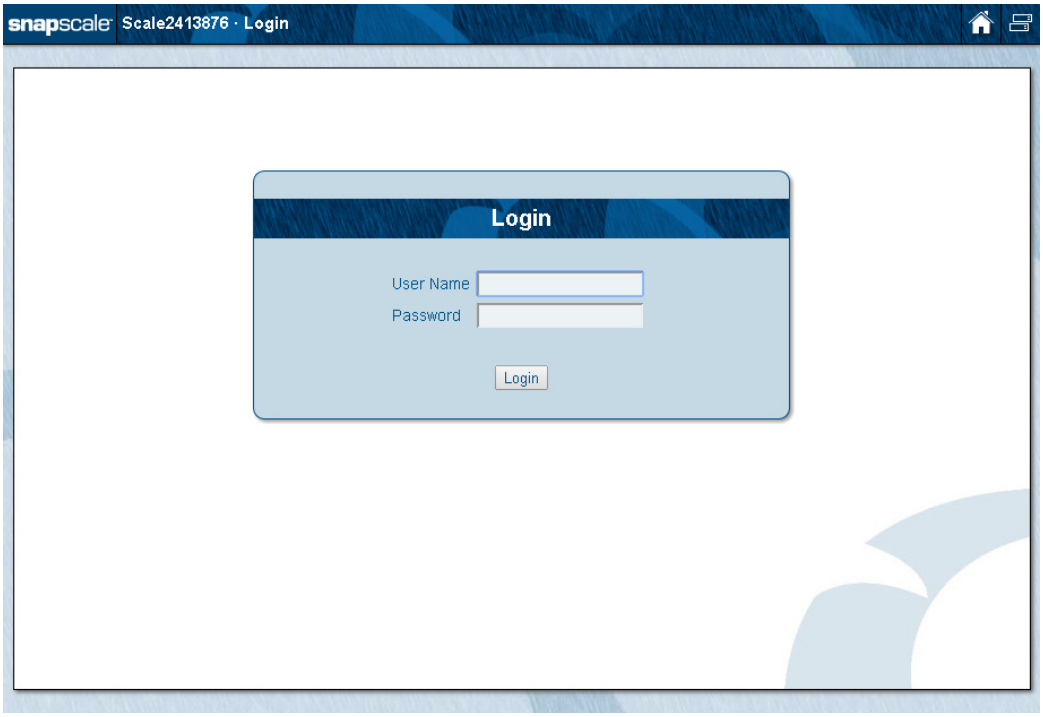

4. In the login dialog box, enter **admin** as the user name and **admin** as the password (the system defaults), then click **Login**.
5. Complete the **Initial Setup Wizard** to either create a new SnapScale cluster or join an existing cluster.

Connect Using SSM

1. Launch **SnapServer Manager (SSM)**.

   SSM discovers all SnapServers, SnapScale clusters, and Uninitialized nodes on its local network segment and displays their Server names, IP addresses, and other information in the main console. If you do not have a DHCP server, there might be a delay before the node appears on the network.

   NOTE: To distinguish multiple SnapServers and SnapScale nodes, you may need to find their default names as explained in Connect Using the Node Name on page 23.

2. If using a DHCP server, proceed to Step 3; otherwise, assign an **IP address** to one of the nodes to be configured in the cluster.

   NOTE: Only one node needs to be configured with an IP address in order to create the cluster.

   a. In SSM, right-click the **node name**.

   b. Select **Set IP Address**.

   c. Enter an IP address and a subnet mask, then click **OK**.

3. In SSM, right-click the node name and select **Launch Web Administration**.
4. Log into the **Web Management Interface**.

   In the login dialog box, enter **admin** as the user name and **admin** as the password (the system defaults), then click **OK**.

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5. Complete the **Initial Setup Wizard** to either create a new SnapScale cluster or join an existing cluster.

Set Up a New SnapScale Cluster (via Wizard)

On a new SnapScale node, once you log in to the Web Management Interface, the Initial Setup Wizard runs displaying the **Welcome** page:

From the Initial Setup Wizard, you can either use this node to create a new SnapScale cluster by connecting it to two or more other nodes or add the node to an existing cluster (see Join an Existing SnapScale Cluster (via Wizard) on page 37). To start the creation of a new cluster, click the **Create a New SnapScale** box. The Initial Setup Wizard consists of several steps:

Step 1 – Select SnapScale Nodes (select the nodes to be included in the cluster)

Step 2 – Client Network Configuration Overview (review the Client network information)

Step 3 – Choose Client Network Static TCP/IP Settings (choose the static TCP/IP settings for the Client network)

Step 4 – Configure Node Static IP Addresses (populate the static IP addresses for the nodes)

Step 5 – Basic SnapScale Properties (enter the basic SnapScale properties)

Step 6 – Set Date and Time (set the date and time)

Step 7 – Summary Verification & Cluster Creation (verify the settings and create a SnapScale cluster)

NOTE: After the cluster is created, you are asked to change the Administrator's password. It is highly recommended for security to set it to something other than the default setting.

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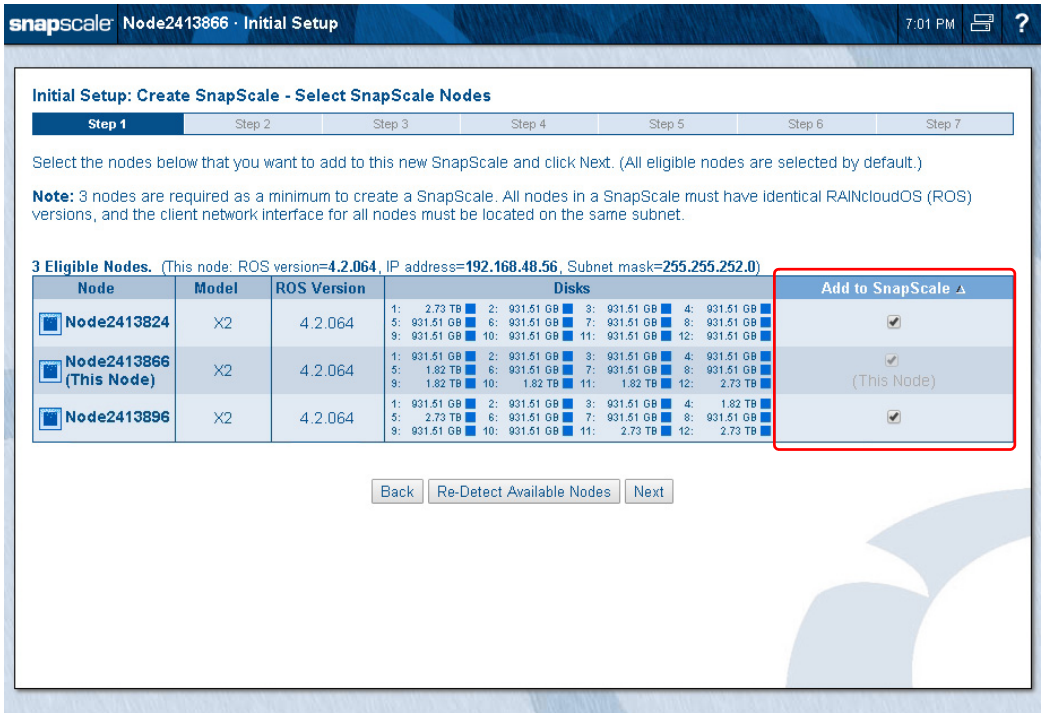
Step 1 – Select SnapScale Nodes

Select the nodes you want to use from the list of eligible nodes.

NOTE: At least three nodes are required to create a SnapScale clustered network. All nodes must have the identical version of RAINcloudOS (ROS) and be on a subnet that does not contain an existing cluster. The Client network interfaces for all the nodes must be located on the same public network subnet, and the Storage network interfaces for all nodes must be located on the same private Storage network subnet. The nodes cannot have any expansion units attached.

Any combination of node types (X4 and X2) can be used to create a cluster.



Verify that the boxes in the Add to SnapScale column for the nodes you want to use are checked. Click **Re-Detect Available Nodes** to refresh the list. When ready, click **Next**.

NOTE: If you deselect one or more of the detected nodes, when you click **Next** a message page is displayed recommending that you add all the nodes at once. You are given the options to either go back and select the other nodes or keep your node selection and continue.

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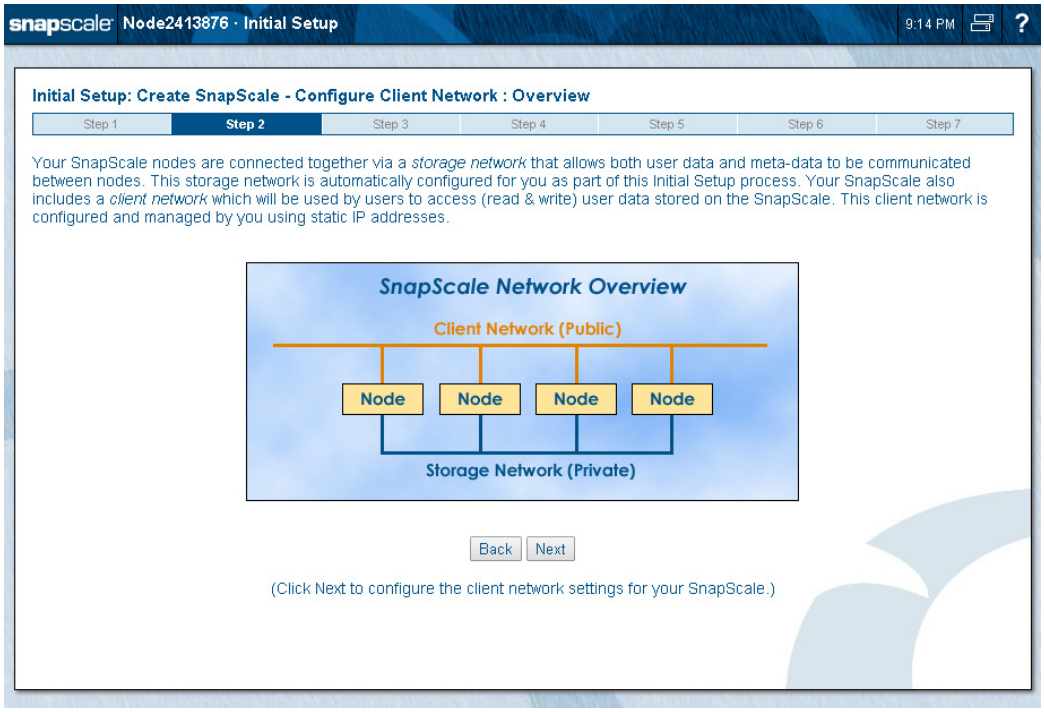
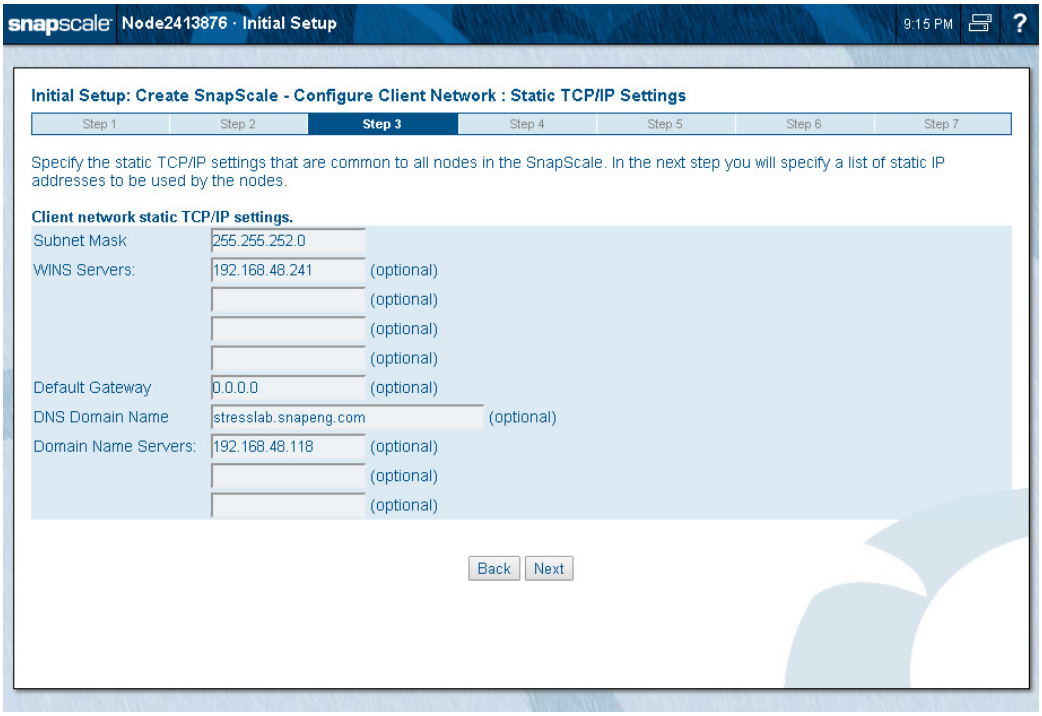
Step 2 – Client Network Configuration Overview

Review the information about setting up your Client network. Click **Next** to continue.



Step 3 – Choose Client Network Static TCP/IP Settings

Use this step to specify the static TCP/IP settings that will be common to all nodes in the cluster. Then click **Next** to continue to the next page to set the actual node static IP addresses.



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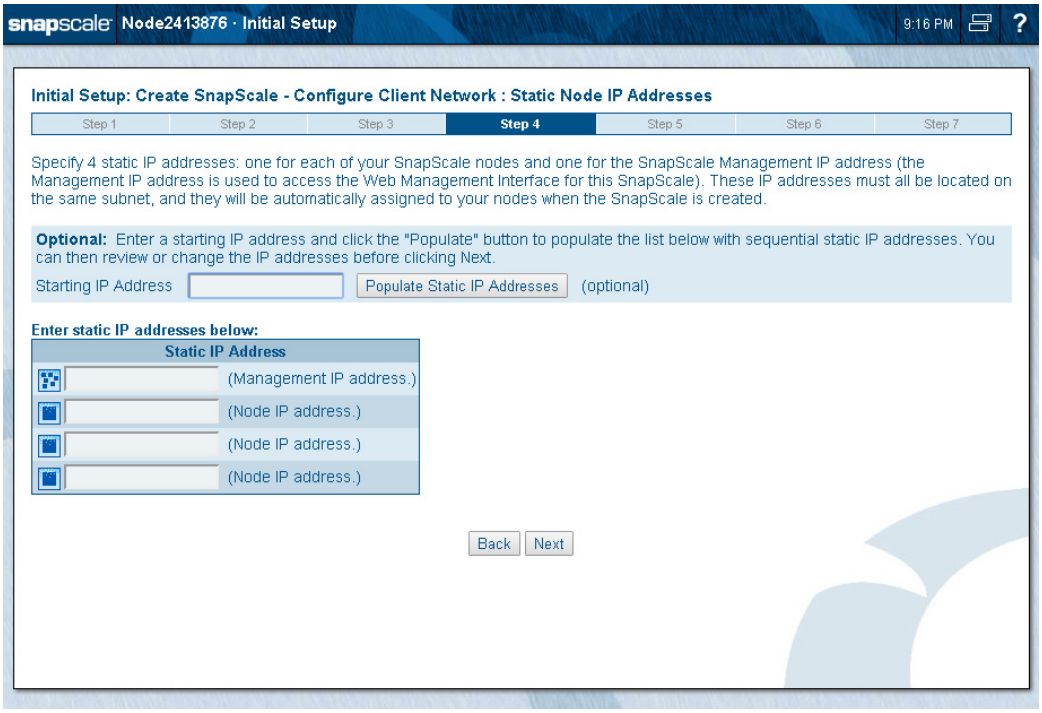
Step 4 – Configure Node Static IP Addresses

A SnapScale cluster requires a set of static IP addresses: one for each node, and one for the Management IP. Use this page to specify the static IP addresses for each of your nodes and for the SnapScale Management IP address used to access the Web Management Interface for this cluster.



These IP addresses must all be located on the same subnet. They are automatically assigned to your nodes when the SnapScale cluster is created.

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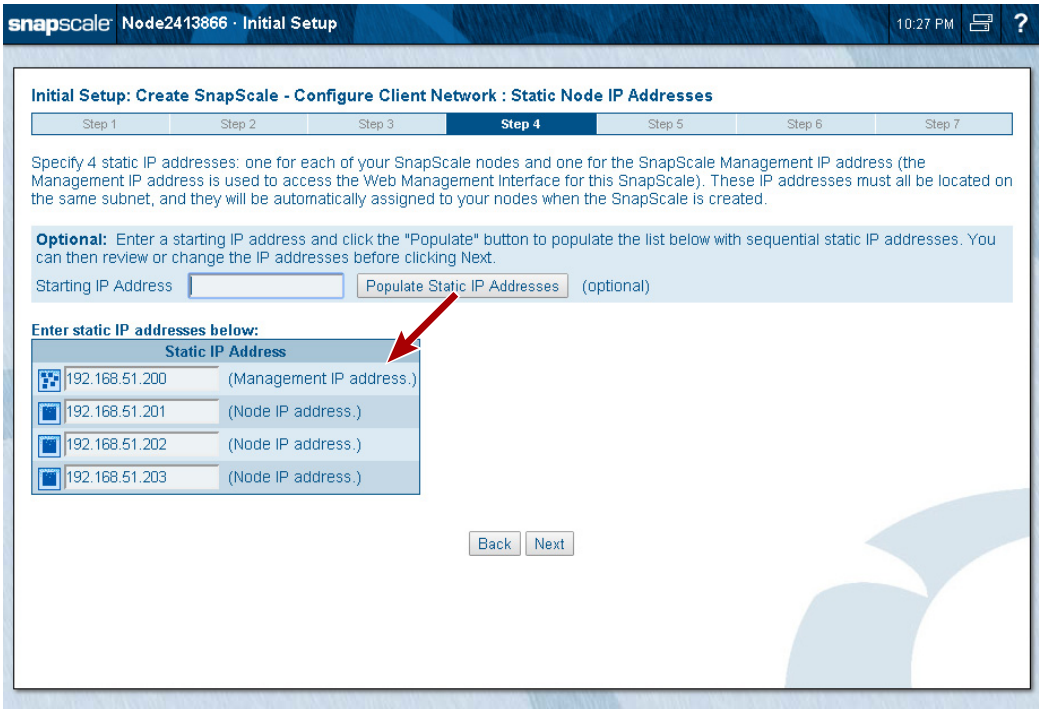
The **Populate Static IP Addresses** button can be used to automatically enter a sequential list of static IP addresses. Just enter an IP address on the subnet and click **Populate Static IP Addresses**. The fields below it are automatically populated.



Click **Next** to continue.

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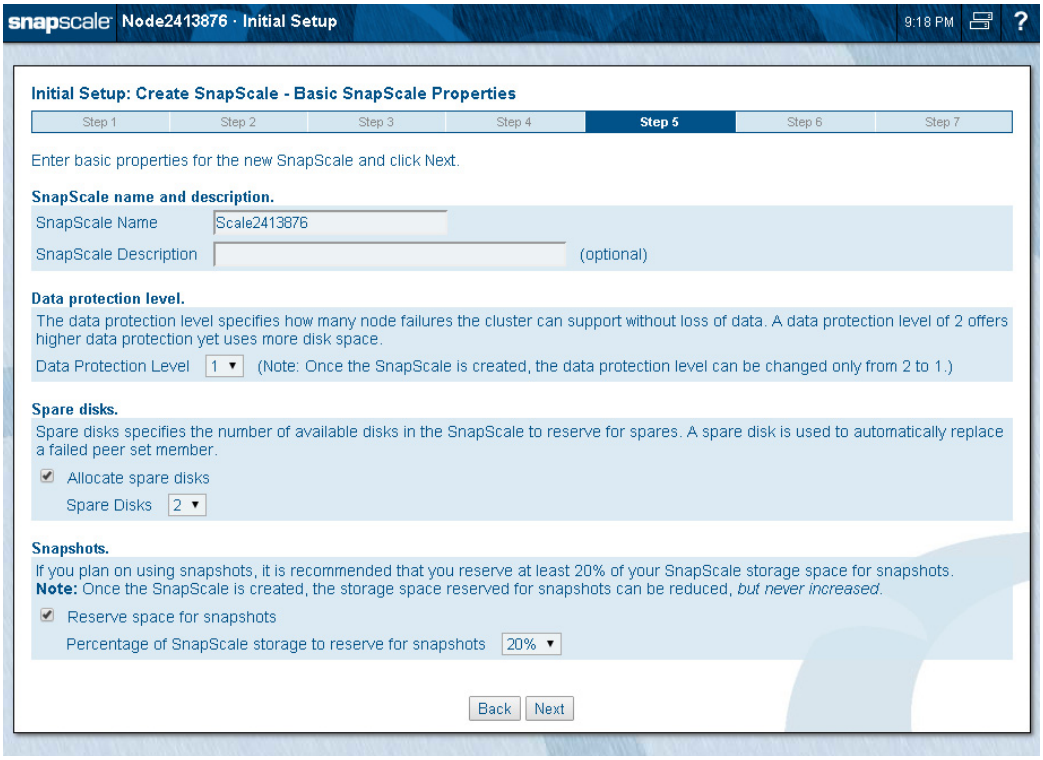
Step 5 – Basic SnapScale Properties

Use this step to enter the basic properties for your new SnapScale cluster, then click **Next**.



This table lists and describes the basic options:

Option	Description
SnapScale Name	Either accept the default name or enter an alphanumeric name up to 15 characters in length. Network clients use this name with round robin DNS name resolution to connect to the cluster. The default name is "Node*nnnnnnn*" (where *nnnnnnn* is the appliance number of the node used to create the cluster).
SnapScale Description	This optional field provides a place to define the cluster in the overall scheme of your network and better identify the cluster on a LAN.
Data Protection Level	The data protection level specifies how many node failures the cluster can support (1 or 2) without a loss of data. A data protection level of 2 offers higher data protection but uses more disk space. **Important:** The cluster must maintain a majority of nodes (for example, 2 of 3 nodes, 3 of 4 nodes, 3 of 5 nodes, 5 of 9 nodes, etc.) in order to continue serving data. Once the SnapScale cluster is created, the data protection level can only be decreased from 2 to 1. It cannot be increased from 1 to 2.

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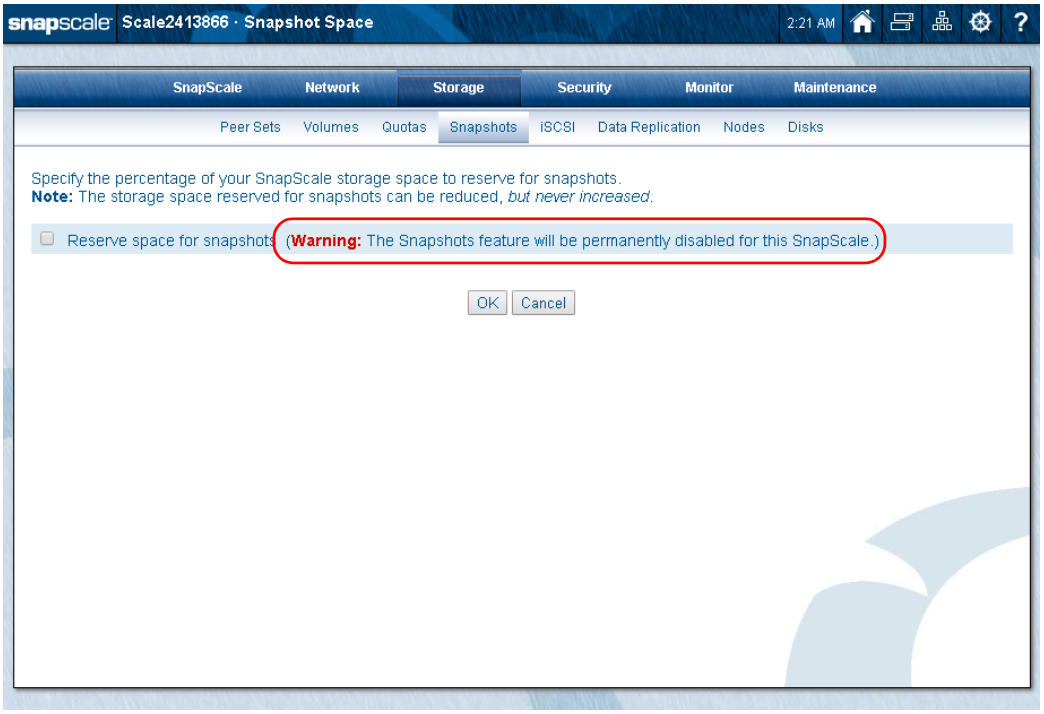
Option	Description
Spare Disks Allocation	Check the box and select the number of spare disks you want to reserve. A spare disk is used to automatically replace a failed Peer Set member. If there are unused drives remaining after allocating the number of spares requested, they are used for other peer sets. If there is an insufficient number of drives left to create a final peer set, the drives are configured as additional spares.
Reserve Space for Snapshots	Check the box and select the percentage of the storage space you want to reserve for snapshots. It is recommended that at least 20% of your SnapScale storage space be set aside for snapshots. **NOTE:** Once the SnapScale cluster is created, the storage space reserved for snapshots can only be decreased. It can never be increased.

NOTE: If you uncheck the box for reserving space for snapshots, an alert is displayed to remind you that the feature will be **permanently disabled** for the cluster. You will also be reminded on the summary page.



Step 6 – Set Date and Time

At the **Registration** page:

1. Enter the **four required items** in the appropriate fields.
2. Click **Download Registration File**.
   The information, including all the node data, is incorporated into a CSV file.

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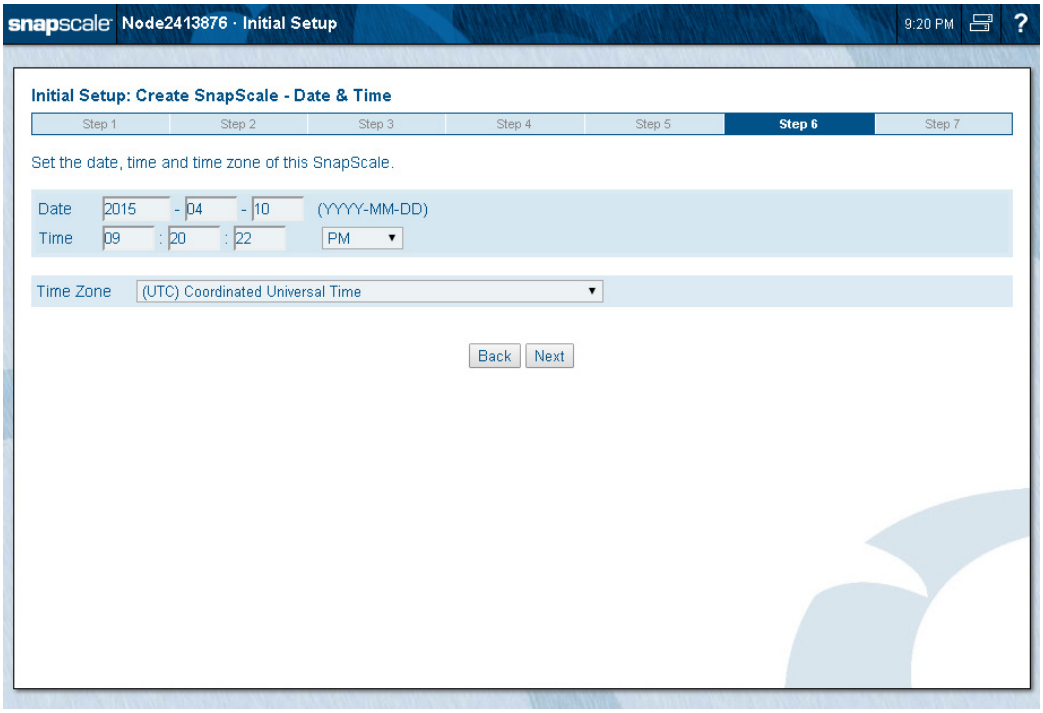
3. Depending on your browser settings, make sure that you **save the CSV file** to your local computer.
4. Email the downloaded CSV file to **warranty@overlandstorage.com**.
   Use the subject line **SnapScale Registration Request** for the email.

Nodes automatically synchronize time with one another. You can either manually set the date and time to specific values, or you can use NTP (Network Time Protocol) servers to automatically synchronize the date and time. Visit www.ntp.org for a list of public NTP primary and secondary servers, or simply use the default NTP servers provided.



If you intend to join the cluster to a Windows domain, configure the cluster using the manual settings to set the date and time. Otherwise, configure the cluster to synchronize with up to two NTP servers.

NOTE: NTP cannot be used if you are joining a Windows Active Directory domain.

Default NTP servers automatically populate the server fields. The Time Zone is set automatically to UTC time but can be changed using the drop-down list.

Click **Next** to continue.

Step 7 – Summary Verification & Cluster Creation

At this step, review the current settings and go back if you need to make changes.

NOTE: Make note of the Management IP address for later use. Also, both the Client and Storage network bond types can be changed after the cluster is created.

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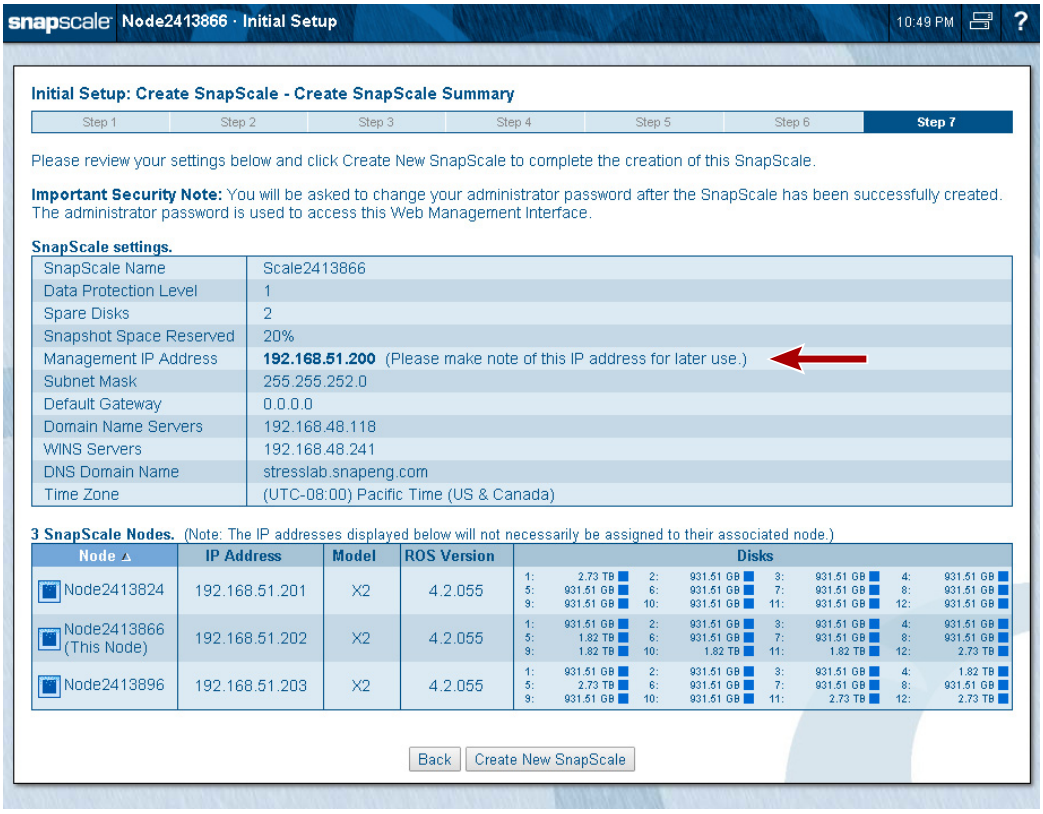
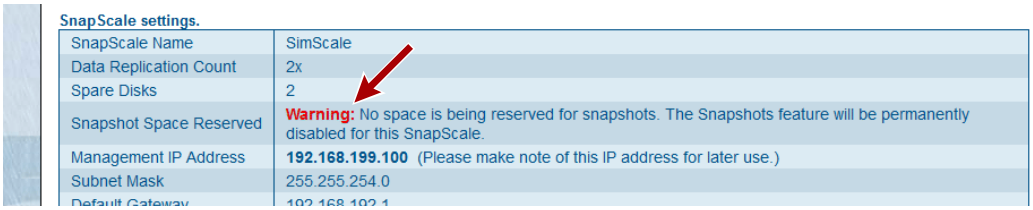


NOTE: If you unchecked the box for reserving space for snapshots, an alert is displayed to remind you that the feature will be **permanently disabled** for the cluster.



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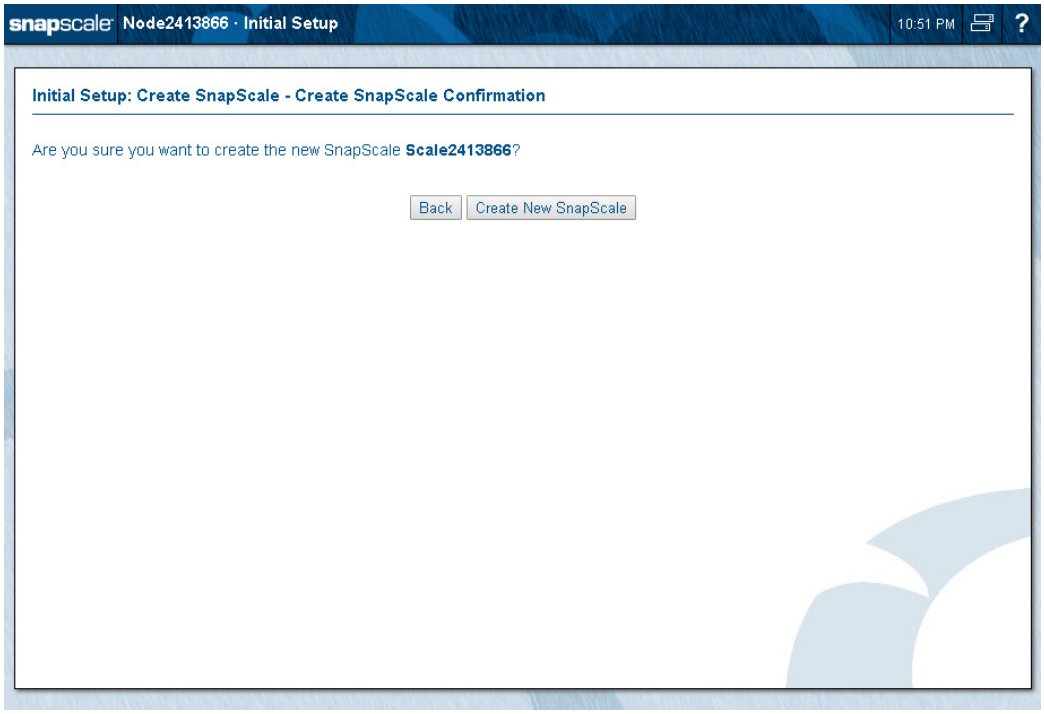
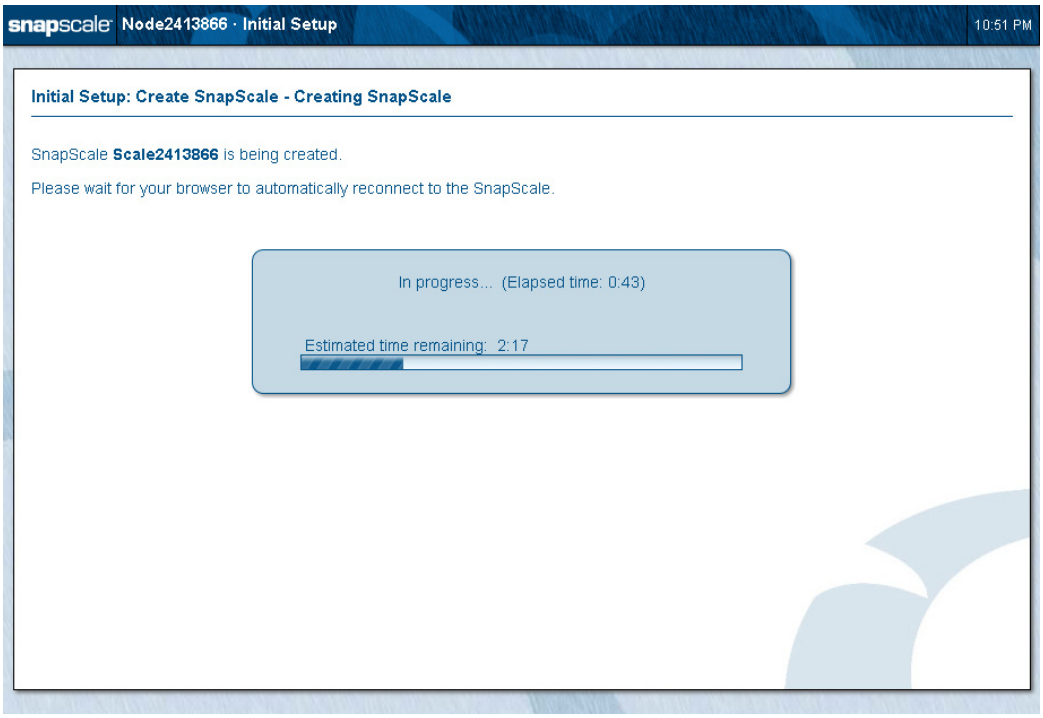
Click **Create New SnapScale** to complete the process. A confirmation page is shown.



Click **Create New SnapScale** again to create the cluster. A progress bar is displayed as the SnapScale cluster is created.



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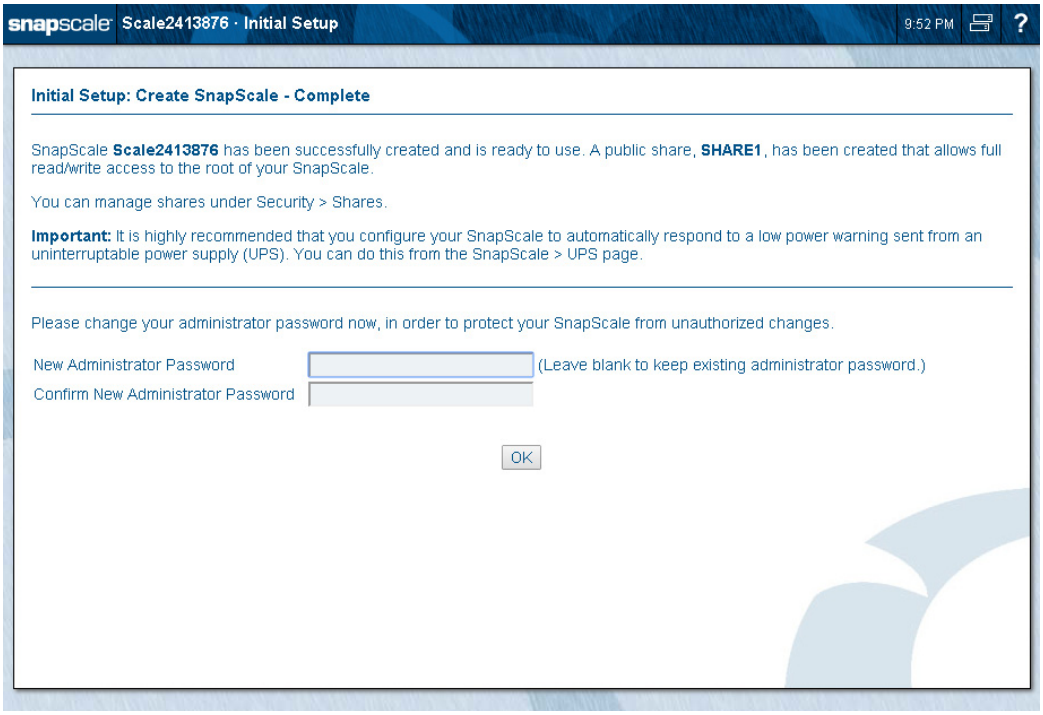
Once the cluster is created and the system changes the uninitialized node IP addresses from DHCP to the configured static IP address, a completion page is displayed stating that a share was created and suggesting UPS units be enabled. To enhance security, you are asked to change the default administrator password after the cluster has been successfully created:



It is highly recommended that you use the password fields at the bottom of the page to change the Administrator's password for the cluster.

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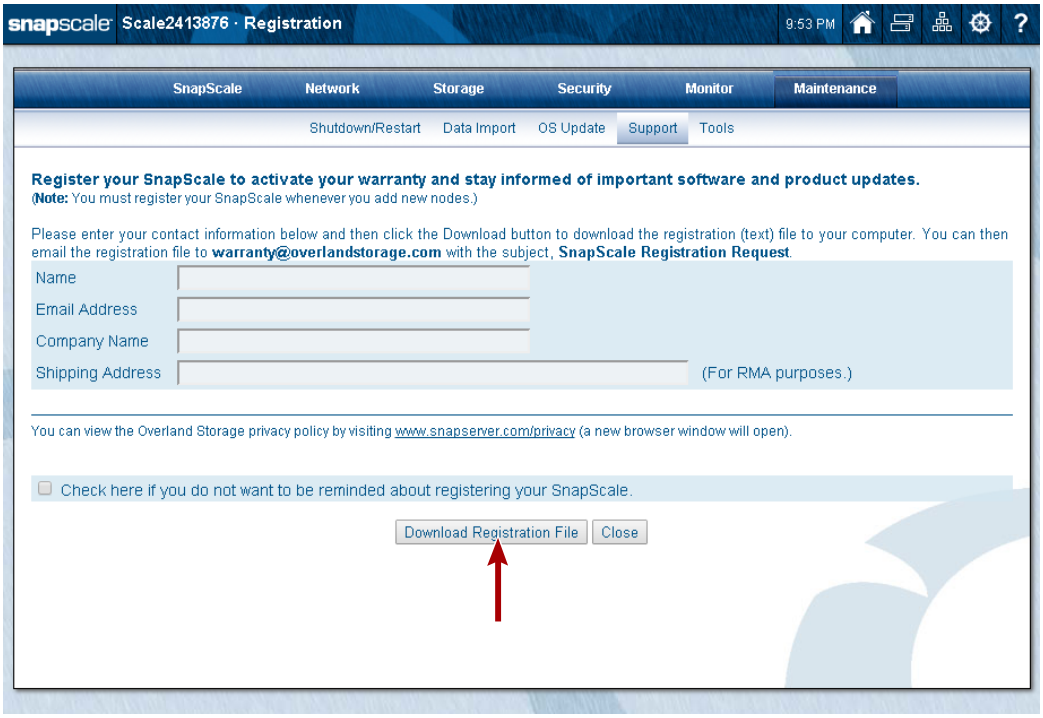
After changing the Administrator's password and clicking **OK**, a success page is displayed. Click **OK** to continue. The **Login** page is shown. Log in using the new password.

After changing the password and logging back in, the **Registration** page is displayed to facilitate activating your warranty:



Complete the registration fields and then click **Download Registration File**. Email that file (SnapScaleRegistration.csv) to Overland Storage Service (warranty@overlandstorage.com) using the subject line "SnapScale Registration Request" to initiate your warranty coverage.

Click **Close**. You will receive a confirmation email to confirm and complete the registration.

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When you close that page, the **Administration** page is displayed:

It is recommended that you configure your DNS in your network so clients can resolve the cluster using round-robin name resolution:

- Add a host record for the cluster management name (<clustername>–mgt) to resolve to the Management IP address.
- Add multiple host records for the cluster name resolving to each of the node IP addresses. The DNS resolves lookups for the cluster name via round robin.

Join an Existing SnapScale Cluster (via Wizard)

IMPORTANT: While the Initial Setup Wizard can be used to add one or more new nodes to an existing cluster, it is recommended that you log into the existing cluster's Web Management Interface and add the nodes using the Add Nodes function (**Storage > Nodes > Add Nodes**). Refer to Add Nodes on page 144 for more information.

At any time, one or more new nodes can be added to the cluster to expand the storage pool.

NOTE: To create new peer sets to expand cluster storage, it is recommended that the number of new nodes you add be equal to the Data Protection Level being used plus one and they all be added at the same time. For example, for Data Protection Level 1 which uses two drives per peer set, add two nodes.

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When you log into any of the new, uninitialized nodes, the Initial Setup Wizard launches displaying the **Welcome** page and its two options. To add this and other nodes to an existing SnapScale cluster, click **Join an Existing SnapScale**.

The Initial Setup Wizard then redirects you to the **Add Nodes** page in the Web Management Interface where this node (and all other discovered/new nodes) can be easily added to the cluster. (See Add Nodes on page 144 for more information.) You are then directed to select the nodes to add, set the static IP addresses, and confirm the settings.

NOTE: If no existing SnapScale cluster is detected, a warning is displayed. Verify that the node is on the same Storage network as the other nodes in the cluster, then click Re-Detect SnapScale.

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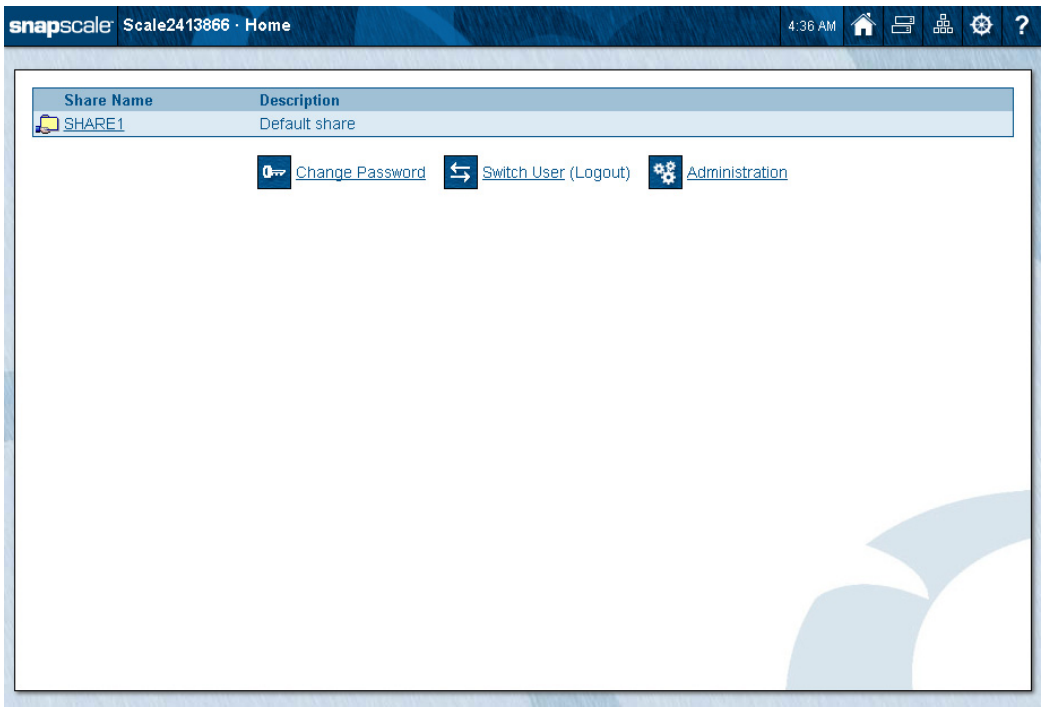
Web Management Interface

SnapScale nodes use a web-based graphical user interface (GUI), called the Web Management Interface, to administer and monitor the cluster. It supports most common web browsers. JavaScript must be enabled in the browser for it to work.

When connecting to the cluster with a web browser, the Home page of the Web Management Interface is displayed. This page shows any shares at the top, three options below the shares list, and has special navigation buttons displayed on the title bar right side (see next table).



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NOTE: If you have not gone through the initial setup or authentication is required, you may be prompted to log in when you first access the Web Management Interface.

The **Home** page displays the following icons and options:

Icons & Options	Description
Change Password	Click this icon to access the password change page. Passwords are case sensitive. Use up to 15 alphanumeric characters.
Switch User	Click this icon to log out and open the login dialog box to log in as a different user.
Administration	Click this icon to administer the node. If you are not yet logged in, you are prompted to do so.
Navigation	The following navigation buttons are present in the upper right on every Web Management Interface page: **Home** – Click this icon to switch between the **Home** page and the **Admin Home** page. If you have not yet logged in to the **Admin Home** page, only the **Home** page is available.
	Snap Finder – Click this icon to view a list of all SnapServers, SnapScale clusters, and Uninitialized nodes on your network, and to specify a list of remote servers that can access these servers, clusters, and nodes on other subnets. You can access these servers, clusters, and nodes by clicking the listed name or IP address.
	SnapExtensions – Click this to view the **SnapExtensions** page, where you can acquire licenses for and configure third-party applications.
	Site Map – Click this icon to view a Site Map of the available options in the Web Management Interface, where you can navigate directly to all the major utility pages. The current page is shown in orange text.
	Help – Click this icon to access the web online help for the Web Management Interface page you are viewing.
UI Appearance	Click the **Mgmt. Interface Settings** link in the Site Map to choose a background for the Web Management Interface. You can select either a solid-colored background or a textured-graphic background.

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When logged in to the **Administration** page, details about the cluster's health are shown:

The same icons are available at the top of this page plus an additional refresh icon ( ) for auto-refreshing pages is located on the tab bar. For more information, see the Home Page section.

Alert Messages

Alert messages are displayed on Administrator-level Web Management Interface pages that display a menu. Some alerts (such as Spare Distributor and Data Balancer) have clickable options:

- **[Later]** - Hides the alert for 24 hours or until after feature is run, whichever is first.
- **[Hide]** - Suppresses the alert. It will not be shown again until after the feature called out in the alert is run and a new alert for that feature is generated.

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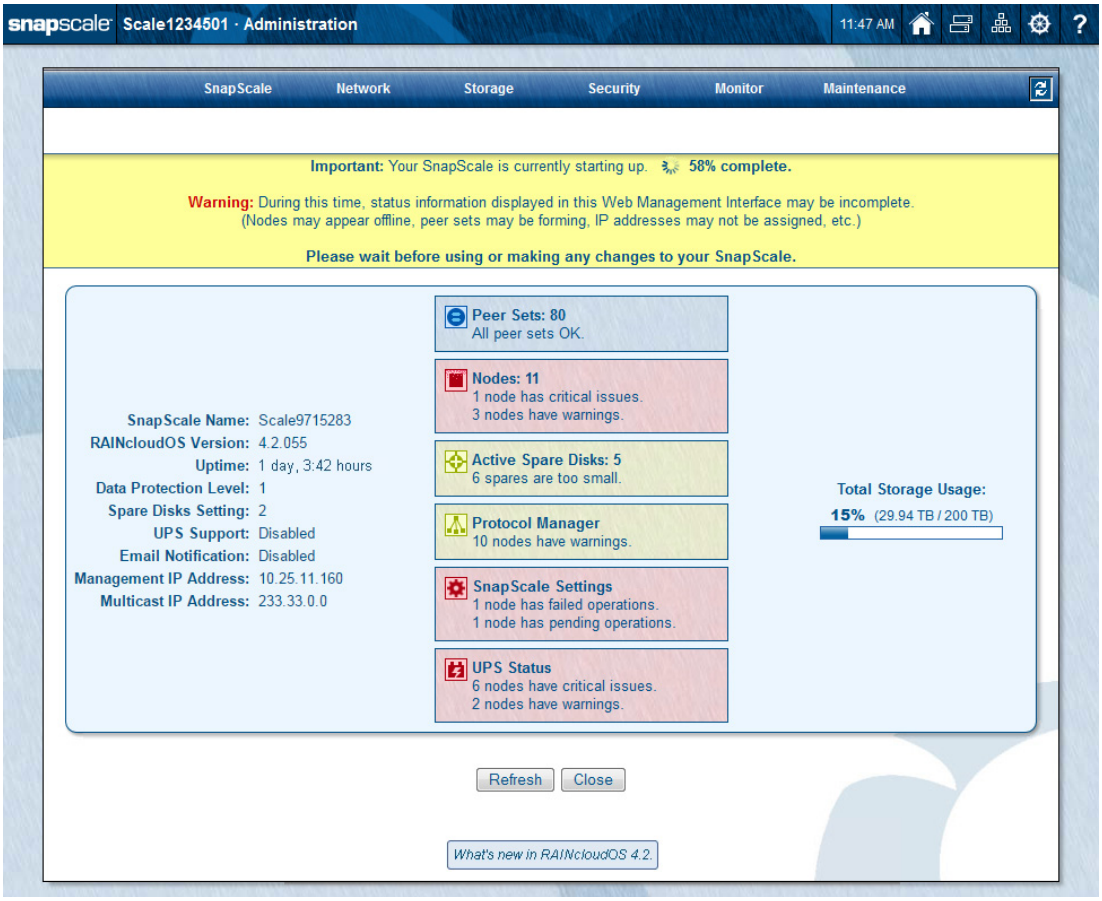
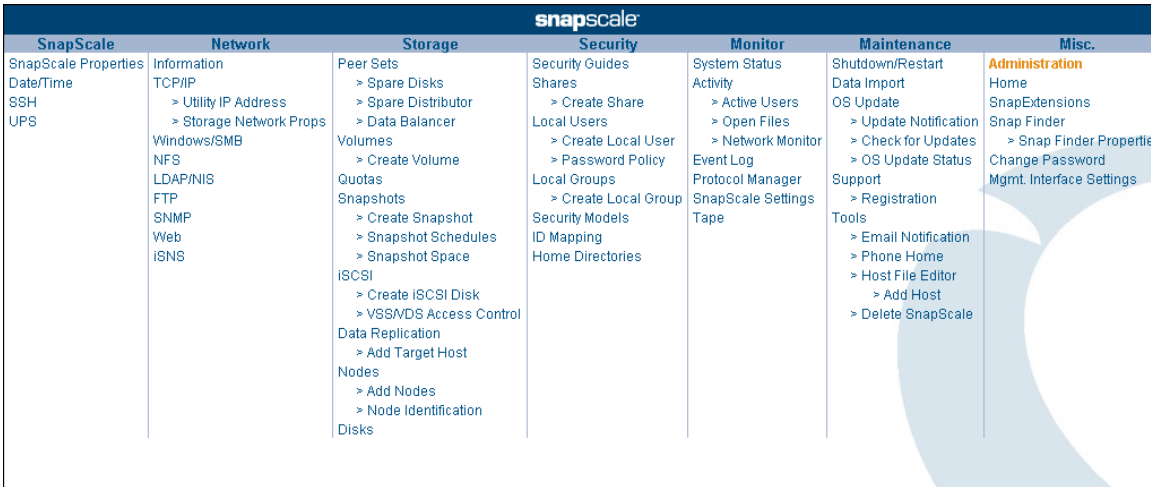
When a cluster is restarted, the Web Management Interface shows the status while the cluster is booting. Because some components are not immediately available, an alert message is displayed showing the percent done and as a reminder that the process is not complete, some nodes may appear offline, and so forth. Some of the status boxes may show warnings.



Site Map

The RAINcloud OS site map ( ) provides links to all the web pages that make up the Web Management Interface. All the pages are each covered in detail in the following chapters.



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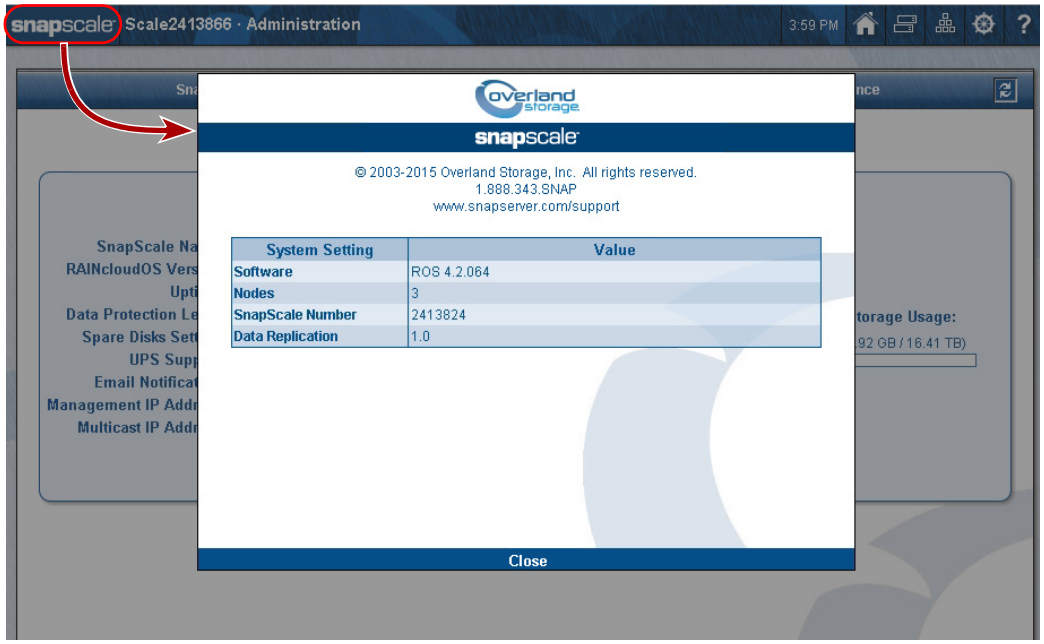
To close the site map, click either **Close** or outside the map.

Contact, Hardware & Software Information

From the Web Management Interface, click the SnapScale logo in the upper left corner of the Web Management Interface to display the pertinent hardware, software, and support contact information.



Scroll down to view additional contact information. Click **Close** (or outside the box) to dismiss.

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SnapScale Settings

This section covers the configuration options for a SnapScale cluster of three or more nodes. The four options for cluster settings are found under the SnapScale tab. They can also be accessed using the site map icon ( ).

Topics in SnapScale Settings:

- SnapScale Properties
- Date/Time
- Secure Shell
- UPS Protection

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SnapScale Properties

These basic options are found under **SnapScale Properties**:

This table details the options on the **SnapScale Properties** page:

Option	Description
SnapScale Name and Description	Either accept the default cluster name or enter an alphanumeric name up to 15 characters in length. Network clients can use this name along with round robin DNS name resolution to connect to the cluster. The default name is "Scale*nnnnnnnn*" (where *nnnnnnnn* is the appliance number of the node used to create the cluster).
Description	This optional field provides a place to define the cluster in the overall scheme of your network and better identify the cluster on a LAN.
Data Protection Level	The data protection level specifies how many node failures the cluster can support (1 or 2) without a loss of data. A data protection level of 2 offers higher data protection but uses more disk space. **Important**: The cluster must maintain a majority of nodes (for example, 2 of 3 nodes, 3 of 4 nodes, 3 of 5 nodes, 5 of 9 nodes, etc.) in order to continue serving data. Once the SnapScale cluster is created, the data protection level can only be decreased from 2 to 1. It cannot be increased from 1 to 2.

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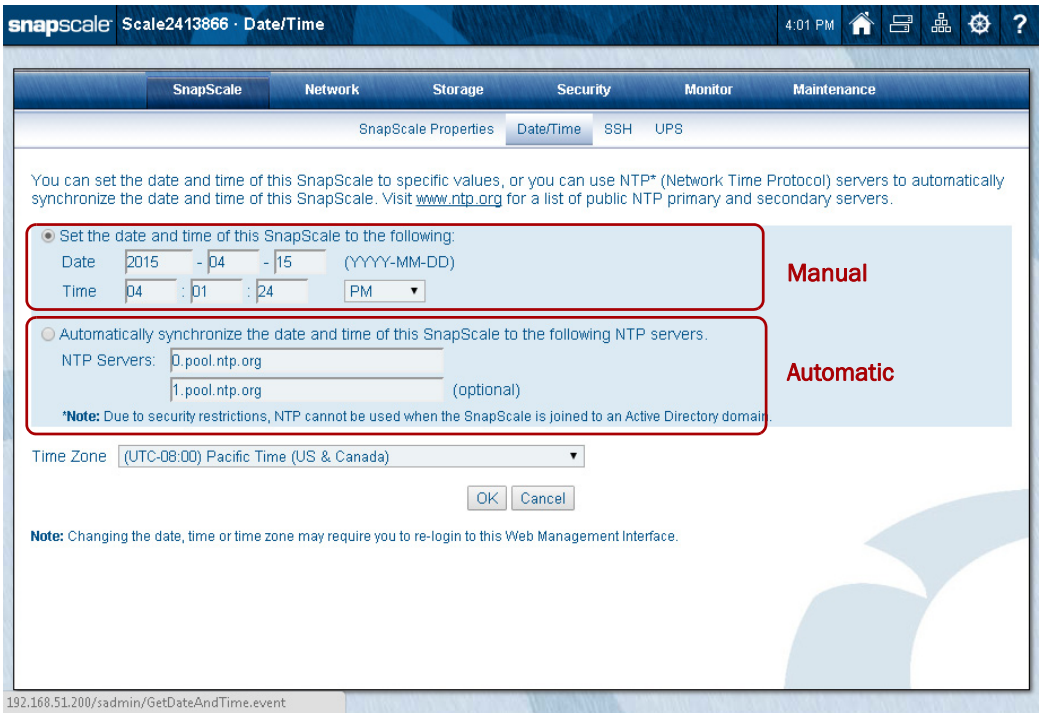
Option	Description
Spare Disks	Check the box and select the number of spare disks you want to reserve. A spare disk is used to automatically replace a failed Peer Set member. If there are unused drives remaining after allocating the number of spares requested, they are used for other peer sets. If there is an insufficient number of drives left to create a final peer set, the drives are configured as additional spares.
Storage Utilization	Use the two drop-down lists to select the percentage of storage used before a warning or critical notice is sent. If not done already, use the link in this section to set up email notification. See Email Notification.

Date/Time

Use this page to configure date and time settings in ISO 8601 formatting. You can set the cluster date and time manually, or have it set automatically via NTP or Windows Active Directory domain membership. Nodes automatically synchronize time with one another.

The time stamp is applied when recording node activity in the Event Log (**Monitor** tab), when creating or modifying files and when scheduling snapshot operations.

CAUTION: If the current date and time are reset to an earlier date and time, the change does not automatically propagate to any scheduled events you have already set up for snapshot, antivirus, or Snap EDR operations. These operations will continue to run based on the previous date and time setting. To synchronize these operations with the new date and time settings, you must reschedule each operation.



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1. Choose to either manually enter or automatically synchronize (using NTP servers) the **date and time**:

   NOTE: For security reasons, NTP cannot be used with Active Directory domains.

   - **Manually** – Select the first option, enter the correct date and time in the appropriate fields, and use the drop-down list to choose either AM or PM.

     Once you join a Windows domain, the settings are automatically adjusted to synchronize with the domain settings.
   - **Automatically** – Select the second option and enter a valid NTP server IP address or host name. Optionally, enter a second address or name for a second server.

     In some cases, this change may require you to log back in to the Web Management Interface when done.
2. To use this SnapScale as an NTP server, check the **enable box**.
3. From the drop-down list, select the **time zone**.

   NOTE: RAINcloudOS automatically adjusts for Daylight Saving Time, depending on your time zone.
4. Click **OK**.

Secure Shell

Secure Shell (SSH) is a service that provides a remote console to access a command line shell that allows the user to perform basic management and update functions outside the Web Management Interface. See Command Line Interface on page 287 for more information. The SSH implementation requires SSH v2.

NOTE: To maintain security, consider disabling SSH when not in use.

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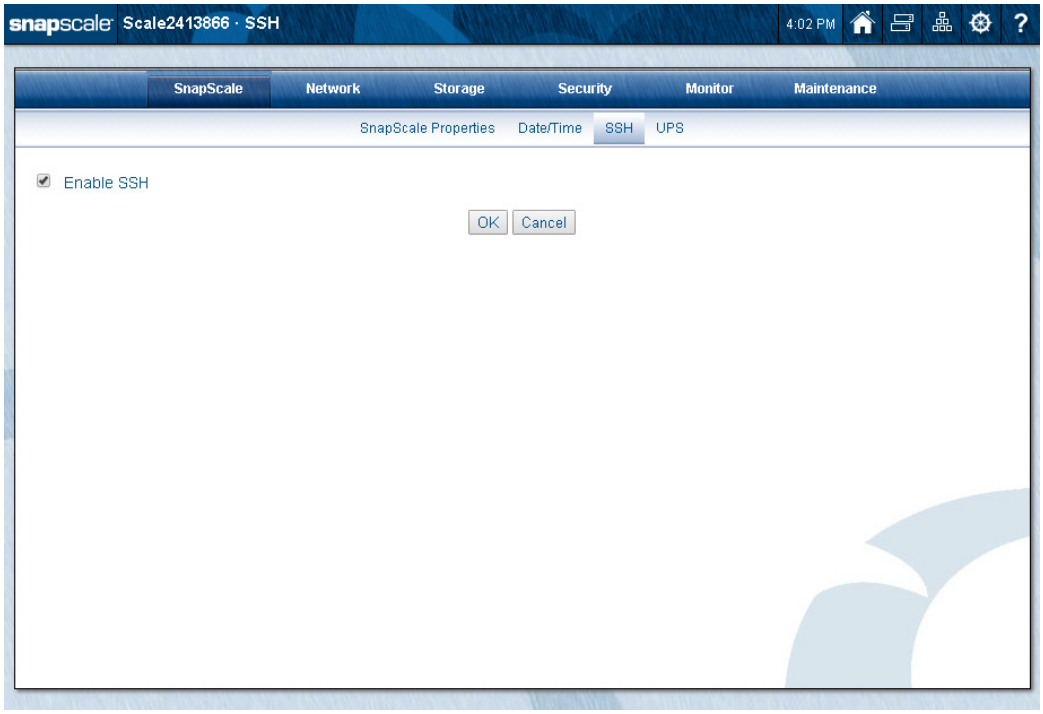
Disable SSH

SSH is enabled by default. To disable SSH, at the **SSH** page, uncheck the **Enable SSH** box and click **OK**.



Connect to the CLI using SSH

1. Verify that your remote machine has an **SSH client application** installed.

   Free or low-cost SSH applications are available from the Internet.

2. Connect to the server using its **IP address**.

   Before the Initial Setup Wizard is completed and storage is configured, SnapCLI disables and hides all standard commands and makes only the system command available.

3. Log in as **admin**.

   NOTE: SSH v2 is required. If you fail to connect to the server, ensure that your SSH client is configured to connect via SSH v2.

   You will automatically be placed in the CLI shell.

UPS Protection

SnapScale supports automatic shutdown when receiving a low-power warning from an APC uninterruptible power supply (UPS). Use **SnapScale > UPS** to manage this feature:

NOTE: If UPS devices have not been configured, the first time you select this option, you are automatically shown the **UPS Properties** page. See Edit UPS Properties on page 49.

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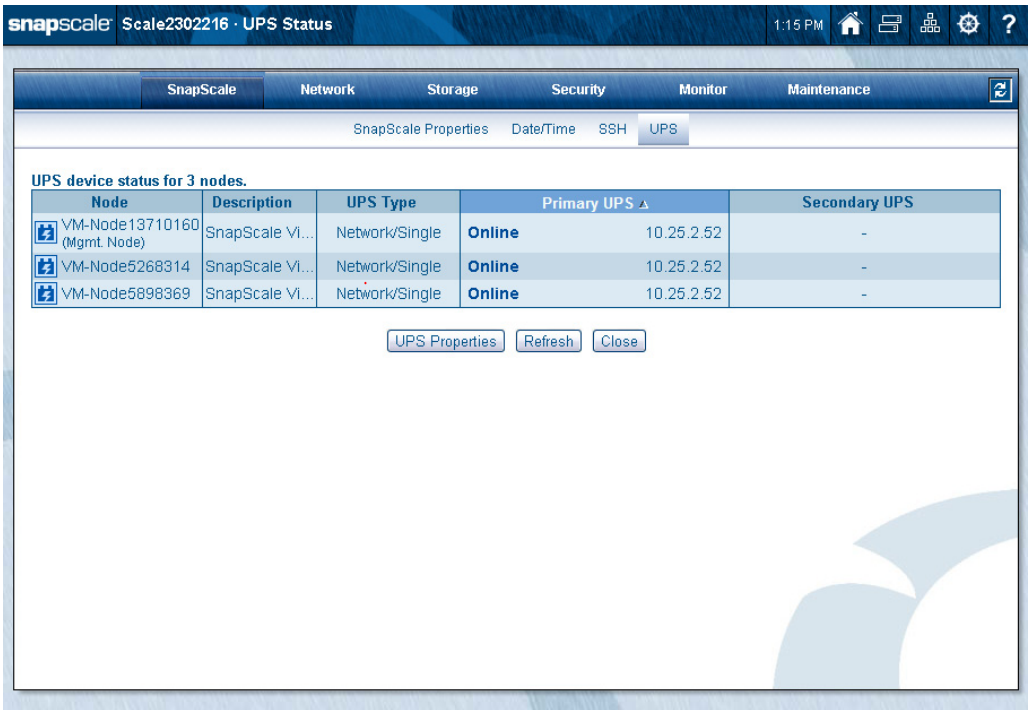

An APC Smart-UPS series device allows the SnapScale cluster to shut down gracefully in the event of an unexpected power interruption. You can configure the cluster to automatically shut down when a low power warning is sent from one or more APC network-enabled or USB-based UPS devices (some serial-only APC UPS devices are also supported by using the IOGear GUC232A USB to Serial Adapter Cable). To do this, you must enable UPS support on the cluster (as described in this section) to listen to the IP address of one or more APC UPS devices and you must supply the proper authentication phrase configured on the UPS devices.

NOTE: Select a UPS capable of providing power to a SnapScale node for at least ten minutes. In addition, in order to allow the cluster sufficient time to shut down cleanly, the UPS must be configured to provide power for at least five minutes after entering a low battery condition.

Edit UPS Properties

To manage the network UPS devices, click **UPS Properties**:

NOTE: If UPS devices have not been configured, the first time you select that option, you are automatically shown the **UPS Properties** page.

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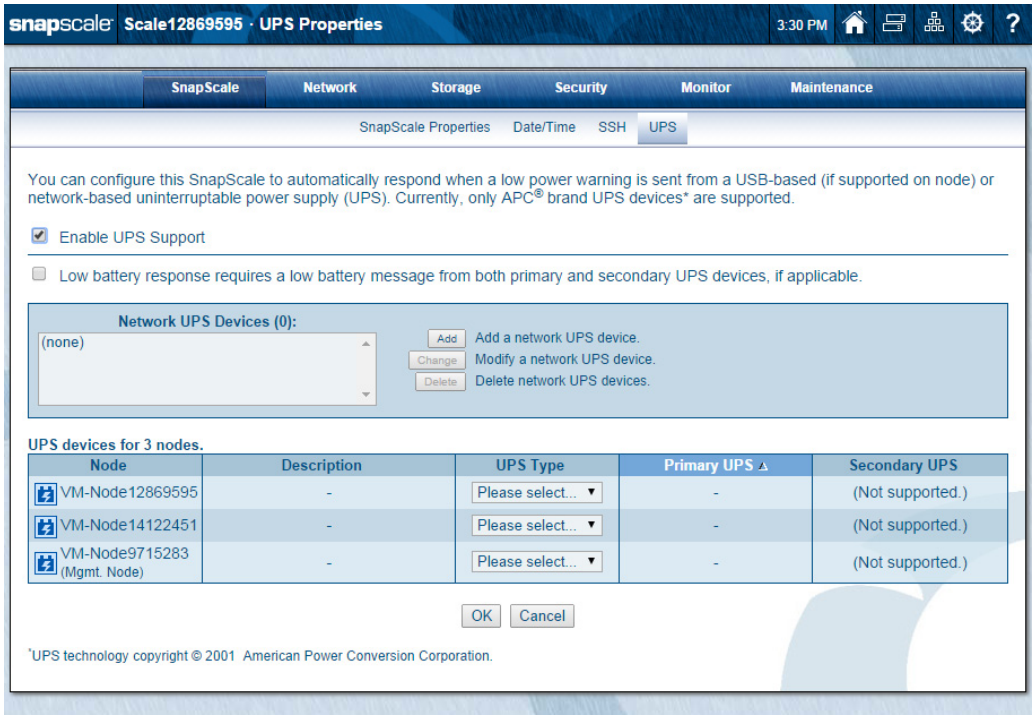

This table describes the options on the **UPS Properties** page:

Option	Description
Enable UPS Support	Check the **Enable UPS Support** box to enable support.
Low battery response message	Check the box to initiate a graceful shutdown only when both the primary and secondary UPS devices for a node send a low battery message.
Network UPS Devices (#)	This field shows a list of UPS devices that are used with the cluster. Use the **Add**, **Change**, and **Delete** buttons to manage the list.
UPS Type **(Third column in Node table)**	Use the drop-down list in the third column of the Node table to select which UPS device is used: • **USB** – Select this option to use a direct-attached (USB) device. • **Network/Single** – Use this option to select a network UPS device. • **Network/Dual** – Use this option to activate the option of a secondary network UPS device.
Primary UPS **(Fourth column in Node table)**	Selecting the Network/Single option under UPS Type causes a drop-down list to be displayed in this column. Select the primary UPS to associate with the node from the list (which is based on the Network UPS Devices table).
Secondary UPS **(Fifth column in Node table)**	If supported, selecting the Network/Dual option (under UPS Type) causes a drop-down list to be displayed in this column. Select the secondary UPS to associate with the node from the list (which is based on the Network UPS Devices table).

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Configure UPS Protection

1. Check **Enable UPS Support**.
2. If desired, check the **low battery message** option.

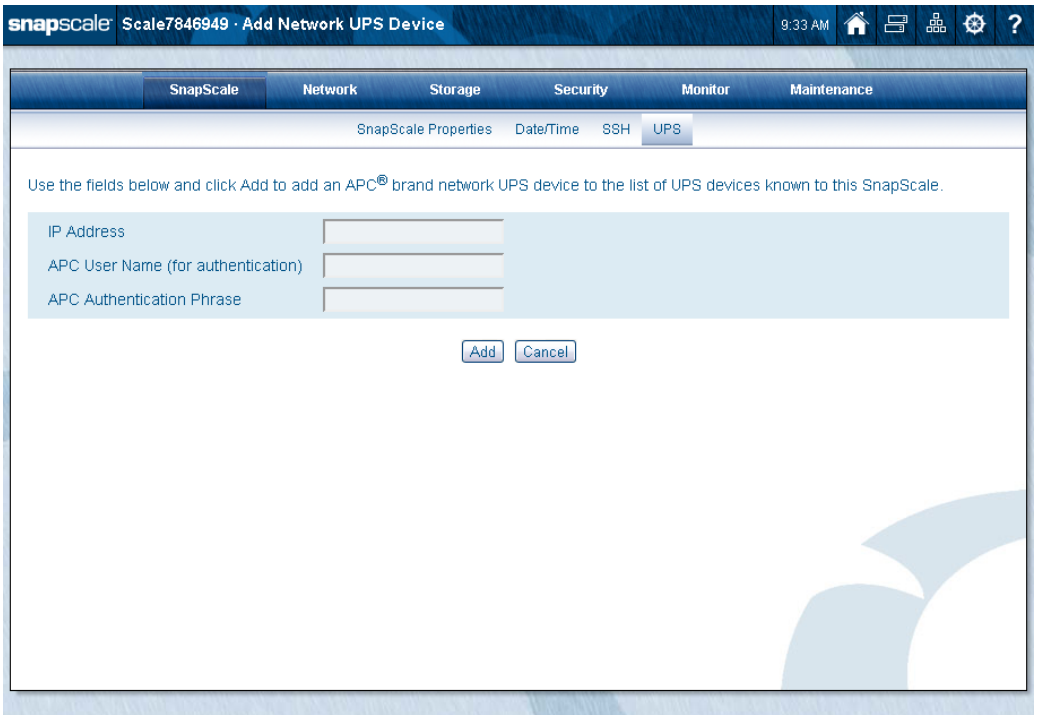
   Both Primary and Secondary UPS devices need to have low battery levels before the notice is sent to initiate a graceful shutdown.
3. If necessary, **add** network UPS devices.

   See Add Network UPS Device.
4. Select or change the following from the drop-down lists in the **UPS device table**:
   - UPS Type
   - Primary UPS
   - Secondary UPS
5. Click **OK** to finish.

Add Network UPS Device

Devices need to be added to the Network UPS Devices table on the **UPS** page for the nodes to be associated with them.

1. To the right of the Network UPS Devices table, click **Add**.
2. At the **Add Network UPS Device** page, enter:
   - IP Address of the device
   - APC User Name (usually the UPS administrator name, default is **apc**)
   - APC Authentication Phrase (found under low battery shutdown configuration in the APC UPS interface; it is **NOT** the Administrator password)



3. Click **Add**.

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You are returned to the **UPS** page and the device is shown in the Network UPS Devices table. The table's UPS count increases by one. Repeat the process for additional devices.

Change Network UPS Device

To change the settings of a network UPS device:

1. Select a **device** in the Network UPS Devices field to change.
2. Click **Change**.
3. Edit any of the **three options** for the device.
4. Click **Change** again.

Any changes you make are applied to all nodes that are currently using this device.

Delete Network UPS Device

To delete a network UPS device:

1. If the device is still connected to **any nodes**, deselect the device from the nodes.
2. Highlight the **device** in the Network UPS Devices field.
3. Click **Delete**.

The device is deleted from the list.

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Network Settings

This chapter addresses the network options for configuring TCP/IP addressing, network bonding, and access protocols.

Network bonding options allow you to configure the SnapScale Client or Storage networks for load balancing, failover, Switch Trunking, and Link Aggregation (802.3ad). Network file protocols control how network clients can access the cluster. Access to the cluster's storage space is provided via Windows (SMB), Unix (NFS), FTP/FTPS, and the Web (HTTP/HTTPS).

NOTE: Uninitialized nodes are configured to use DHCP until they are added to a cluster when they switch to the static IP addresses used by the cluster.

Topics in Network Access:

- Network Information
- TCP/IP Networking
- Windows/SMB Networking
- NFS Access
- LDAP/NIS Domains
- FTP/FTPS Access
- SNMP Configuration

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- Web Access
- iSNS Configuration

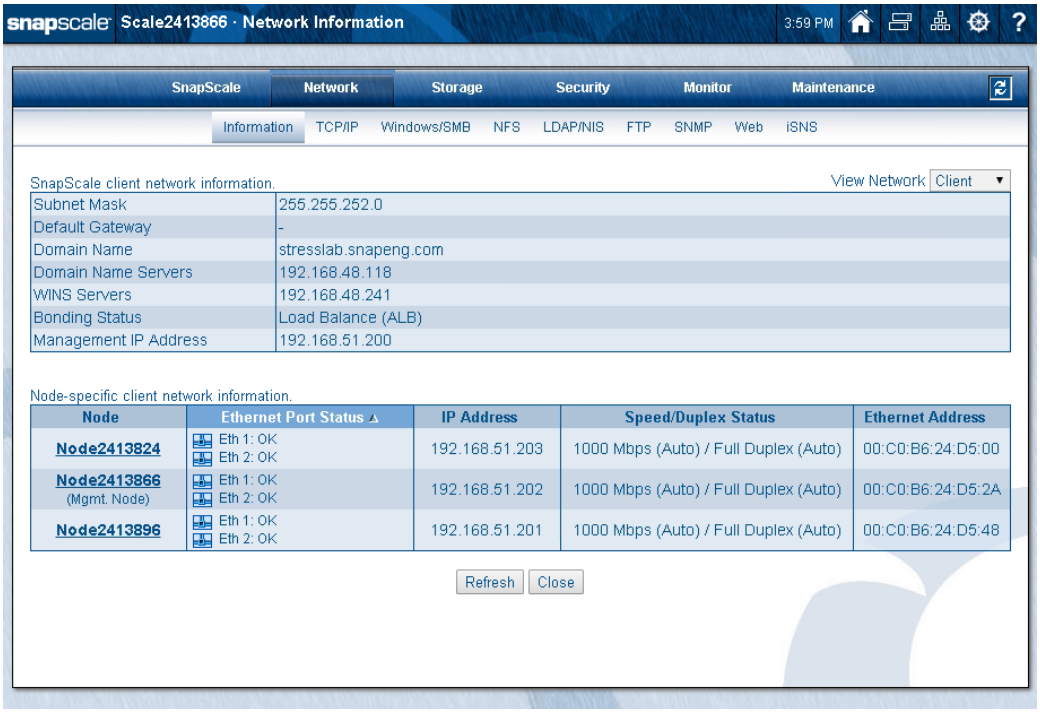
IMPORTANT: The default settings enable access to the SnapScale cluster via all protocols supported by the SnapScale cluster. As a security measure, disable any protocols not in use. For example, if no FTP clients need access to the SnapScale cluster, disable these protocols in the Web Management Interface.

Network Information

Browse to **Network > Information** to access the **Network Information** page that displays either the Client or Storage network settings for SnapScale and identifies the node currently serving as the management node. The information is broken into two parts displaying the common and node-specific network information. Use the **View Network** drop-down menu on the upper right side to select either the Client or Storage network details. Error messages are also shown in this area.

Client Network Information

This page shows the information on the public **Client** network:



These tables detail the items covered in the client **Network Information** page:

SnapScale Client Network Information Section	
Subnet Mask	Combines with the IP address to identify the subnet on which the cluster's Client network interfaces are located.

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SnapScale Client Network Information Section	
Default Gateway	The network address of the gateway is the hardware or software that bridges the gap between two otherwise unroutable networks. It allows data to be transferred among computers that are on different subnets.
Domain Name	The ASCII name that identifies the DNS domain name that is added to the cluster name to form the fully-qualified host name of the cluster. Additional space-separated domain names are added to the cluster's domain search suffix list.
Domain Name Servers	The IP address of up to three servers that maintain a mapping of all host names and IP addresses for translating domain names into IP addresses.
WINS Servers	The IP address of up to four Windows Internet Naming Service (WINS) servers which locate network resources in a TCP/IP-based Windows network by automatically configuring and maintaining name and IP address mapping tables.
Bonding Status	Shows Load Balance (ALB), Failover, Switch Trunking, or Link Aggregation (802.3ad) as the selected bonding.
Management IP Address	The IP address configured to access and manage the SnapScale cluster through the Web Management Interface.

Node-specific Client Network Information Section	
Show/Hide Disabled Ethernet Ports	Use the link on the right above the table to toggle the display of Ethernet ports that have been disabled. **NOTE:** The link is only available when ports have been disabled (such as, by the addition of a 10Gb PCIe card disabling the built-in 1Gb ports).
Node	The name of the specific node. The node designated as the Management node is so noted.
Ethernet Port Status	Shows abbreviated references of the Ethernet ports of the node and their statuses. • **OK** – A blue icon ( ) indicates a healthy connection. • **No Link** – A yellow icon ( ) indicates no link for that port. • **Failed** – A red icon ( ) indicates that the port has failed.
IP Address	The unique 32-bit value that identifies the node on a network subnet. This is automatically assigned to each node from the pool of IP addresses configured on the cluster.
Speed/Duplex Status	**Speed** – Ethernet link speed. **Duplex Status** – Full-duplex; simultaneous two-way data flow.
Ethernet Address	The unique six-digit hexadecimal (0-9, A-F) number that identifies the Ethernet port (xx:xx:xx:xx:xx:xx).

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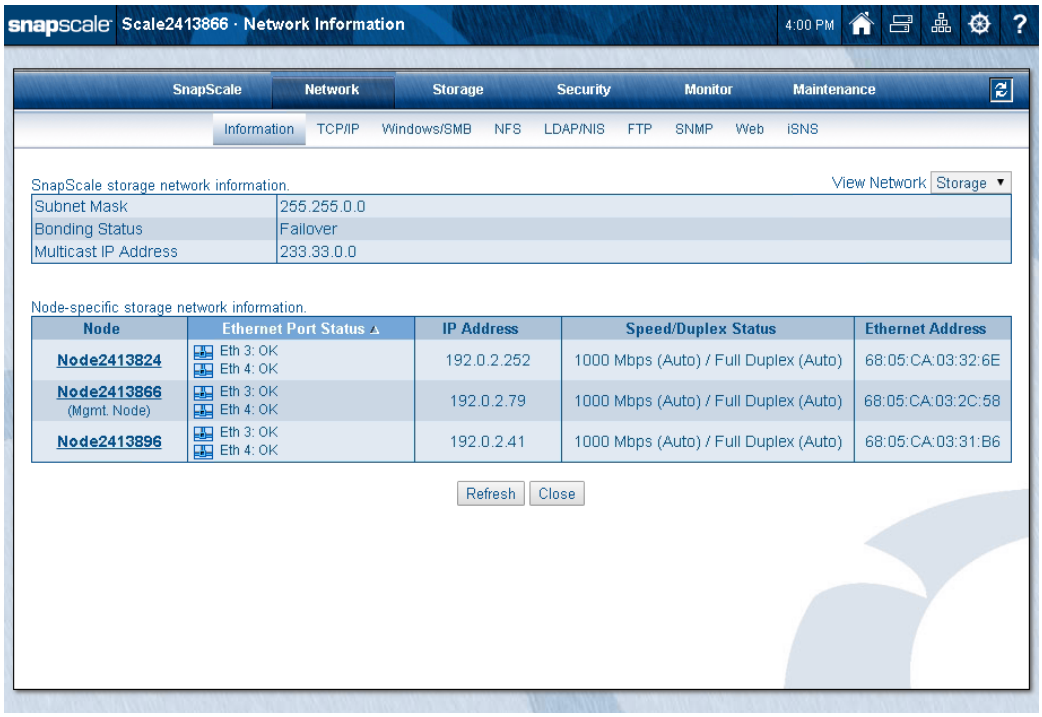
Storage Network Information

This page shows the information on the private **Storage** network:



These tables detail the items covered in the storage **Network Information** page:

SnapScale Storage Network Information	
Subnet Mask	Combines with the IP address to identify the subnet on which the cluster's Storage network interfaces are located.
Bonding Status	Shows Load Balance (ALB), Failover, Switch Trunking, or Link Aggregation (802.3ad) as the selected bonding.
Multicast IP Address	Multicast address used for inter-node cluster messaging.

Node-specific Storage Network Information Section	
Show/Hide Disabled Ethernet Ports	Use the link on the right above the table to toggle the display of Ethernet ports that have been disabled. **NOTE:** The link is only available when ports have been disabled (such as, by the addition of a 10Gb PCIe card disabling the built-in 1Gb ports).
Node	The name of the specific node. The node designated as the Management node is so noted.
Ethernet Port Status	Shows abbreviated references of the Ethernet ports of the node and their statuses. • **OK** – A blue icon ( ) indicates a healthy connection. • **No Link** – A yellow icon ( ) indicates no link for that port. • **Failed** – A red icon ( ) indicates that the port has failed.

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Node-specific Storage Network Information Section	
IP Address	The unique 32-bit value that identifies the node on a network subnet. This is automatically assigned to each node from the pool of IP addresses configured on the cluster.
Speed/Duplex Status	**Speed** – Ethernet link speed. **Duplex Status** – Full-duplex; simultaneous two-way data flow.
Ethernet Address	The unique six-digit hexadecimal (0-9, A-F) number that identifies the Ethernet port (xx:xx:xx:xx:xx:xx).

TCP/IP Networking

SnapScale nodes ship with either four 1GbE or 10GbE ports at the rear for network connections. The Storage network ports are always bonded using Failover mode. The Client network ports are bonded by default using Load Balance (ALB), but can be changed after the cluster is created to one of the other bonding modes:

- Failover
- Switch Trunking
- Link Aggregation (802.3ad)

See Bonding Options on page 57 for descriptions.

The **TCP/IP Networking** page provides configuration of the common cluster network settings, the static Management IP address, and the pool of static IP addresses to automatically assign to cluster nodes.

NOTE: If the Client network runs a DHCP server, be sure the static IP addresses assigned to the nodes and Management IP are excluded from DHCP assignment.

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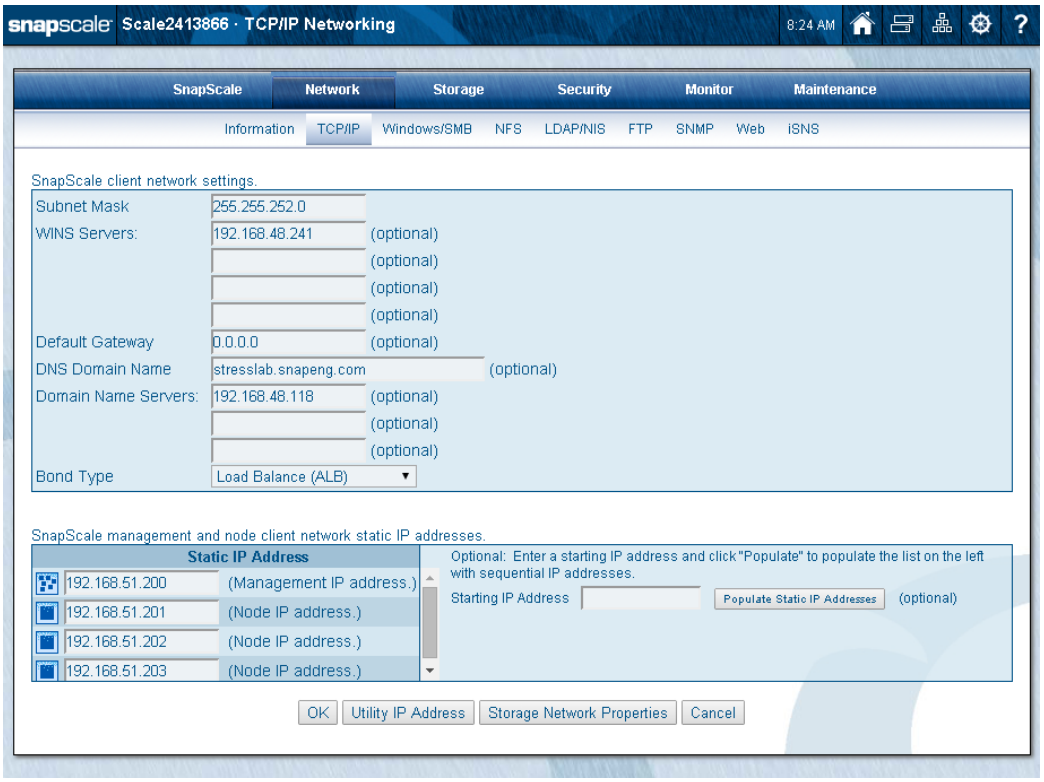

The following table describes the configuration options found on the **TCP/IP Networking** page:

Column	Description
Subnet Mask	Combines with the IP address to identify the subnet on which the cluster's Client network interfaces are located.
WINS Servers	The IP address of up to four Windows Internet Naming Service (WINS) servers which locate network resources in a TCP/IP-based Windows network by automatically configuring and maintaining name and IP address mapping tables.
Default Gateway	The network address of the gateway is the hardware or software that bridges the gap between two otherwise unroutable networks. It allows data to be transferred among computers that are on different subnets.
DNS Domain Name	The ASCII name that identifies the DNS domain name that is added to the cluster name to form the fully-qualified host name of the cluster, and also serves as the primary DNS search suffix. Additional space-separated domain names can be specified to extend the domain search suffix list.
Domain Name Servers	The IP address of up to three servers that maintain a mapping of all host names and IP addresses for translating domain names into IP addresses.
Bond Type	Use the drop-down list to select one of the four bonding modes for the Client network interface on all nodes. See Bonding Options on page 57 for more details.

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Column	Description
Static IP Address	This table shows the SnapScale Management IP address and the pool of Client network static IP addresses to be automatically assigned by the cluster to the different nodes. To change or populate the list with a contiguous range of IP addresses, in the area to the right, enter a starting IP address and click **Populate Static IP Addresses**. NOTE: Be sure to pause all data replication policies before making any changing the Management or node IP addresses.

Bonding Options

The bonding options available for SnapScale nodes:

- **Failover** – This is the default mode for Storage networks. It uses one Ethernet port as the primary network interface and one port held in reserve as the backup interface. Redundant network interfaces ensure that an active port is available at all times. If the primary port fails due to a hardware or cable problem, the second port assumes its network identity. The ports on a node should be connected to different switches (though this is not required).

  NOTE: Failover mode provides switch fault tolerance, as long as ports are connected to different switches.

- **(Automatic) Load Balance (ALB)** – This is the default mode for Client networks. An intelligent software adaptive agent repeatedly analyzes the traffic flow from the node and distributes the packets based on destination addresses, evenly distributing network traffic for optimal network performance. Both ports of the bond need to be connected to the same switch or logical switch.
- **Switch Trunking** – This mode groups multiple physical Ethernet links to create one logical interface. Provides high fault tolerance and fast performance between switches, routers, and servers. Both ports of the bond need to be connected to the same physical or logical switch, and the switch ports must be configured for static link aggregation.
- **Link Aggregation (802.3ad)** – This method of combining or aggregating multiple network connections in parallel is used to increase throughput beyond what a single connection could handle. It also provides a level of redundancy in case one of the links fails. It uses Link Aggregation Control Protocol (LACP), also called dynamic link aggregation, to autonegotiate trunk settings. Both ports of the bond need to be connected to the same switch or logical switch.

Guidelines in TCP/IP Configuration

Consider the following guidelines when connecting a SnapScale cluster to the network.

Configure the DNS for Name Resolution and Round Robin Load Distribution

To evenly distribute client access loads to the cluster nodes, add a DNS A record for the cluster name for each IP in the node IP address pool. The DNS server then rotates through the node IP addresses in a round-robin basis when serving name resolution requests for the cluster name.

Do not add an A record for the cluster name pointing to the Management IP address. If desired, or if using Snap EDR, add an A record for the cluster name followed by "-MGT" for the Management IP address. For example, if the cluster name is Scale1234567, create an A record for hostname "Scale1234567-MGT."

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Make Sure the Switch is Set to Autonegotiate Speed/Duplex Settings

All Ethernet ports on the cluster nodes are set to autonegotiate speed and duplex settings with the Ethernet switch. The switch to which the SnapScale is connected *must* be set to autonegotiate; otherwise, network throughput or connectivity to the node may be seriously impacted.

Cluster Restart Required when Switching to or from Switch Trunking or Link Aggregation

To prevent the interruption of communication on the Storage network during reconfiguration of the Storage switch, the cluster must be shutdown before changing the Storage network bond setting to or from Switch Trunking or Link Aggregation (802.3ad). After all the Storage switches have been reconfigured, restart the cluster normally by turning the nodes back on.

Configure the Client Switch for Load Balancing

If you select either Switch Trunking or Link Aggregation (802.3ad) network bonding configuration for the Client or Storage network bond, be sure the switch is configured correctly for that bonding method **after** configuring the bond on the cluster. No switch configuration is required for Adaptive Load Balancing (ALB).

Edit Storage Network Properties

IMPORTANT: Changing the bond type for your SnapScale's storage network may require changes to your network switch.

The bond type for the Storage network of a SnapScale cluster can be changed as needed.

CAUTION: All cluster nodes must be online when their bond type is changed. After changing the bond type, the cluster must be restarted. If the switch is being reconfigured, the cluster must be shut down completely, the Storage network switches reconfigured to the new bond type, and then all nodes restarted.

The following bond types are supported:

- Failover
- Load Balance (ALB)
- Switch Trunking
- Link Aggregation (802.3ad)

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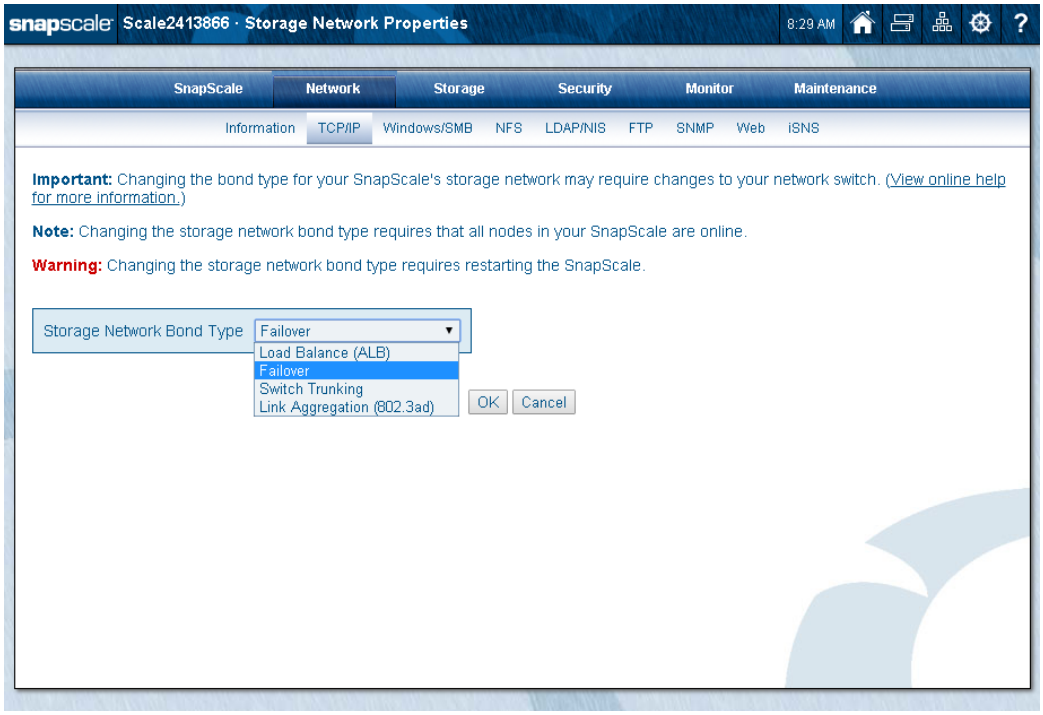
The following page shows the **bonding options** available from the drop-down list:



When changing the bond type, depending on the type of change, the following requirements must be met:

- If changing the Storage network between Failover and ALB, the cluster must reboot.
- If changing the Storage network to or from Switch Trunking or Link Aggregation (802.3ad), the cluster must be shut down completely, the Storage network switches reconfigured to the new bond type, and then all nodes restarted.

CAUTION: If you change the bonding mode from the default Failover to either ALB, Switch Trunking, or Link Aggregation (802.3ad), you MUST re-cable the Storage network ports on each node to the same switch. You CANNOT straddle them across two Storage network switches like you do for Failover.

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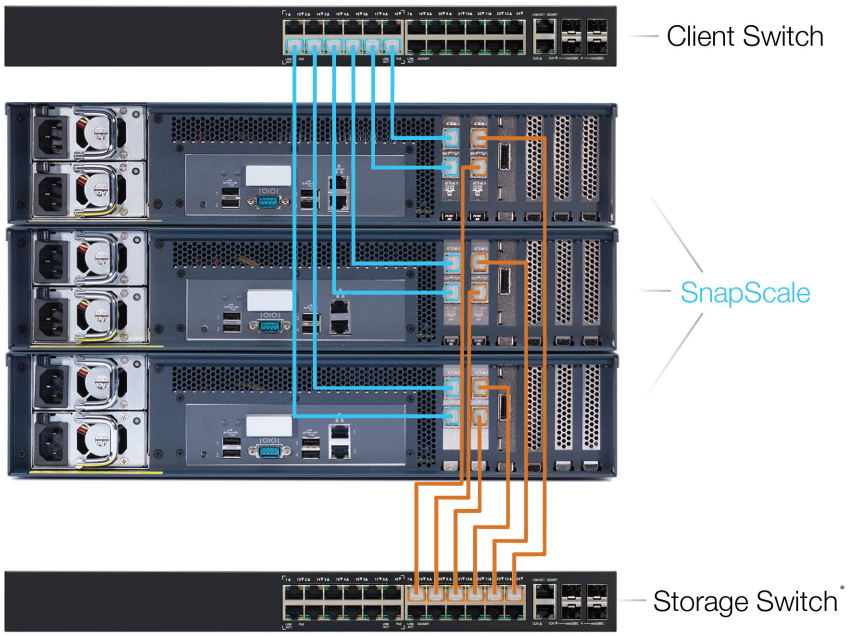
Example of Cabling for ALB, Switch Trunking, or Link Aggregation (802.3ad)



Utility IP Address

To assign an additional static IP address to a specific node, on the **TCP/IP Networking** page, click **Utility IP Address**.The Utility IP address can be used to consistently access a specific node by a known IP address, and is particularly useful for backup agents and media servers.

The Utility IP address assigned to the node is in addition to the static IP address that is automatically assigned from the cluster IP address pool and, if the node serves as the Management node, the Management IP address.

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NOTE: The Utility IP address must be located on the same subnet as the SnapScale Client network. The address should be assigned BEFORE installing a backup agent or media server on a node. Once the Utility IP address has been assigned, you must add a host record to the DNS server for the node name pointing to the Utility IP address (do NOT add it as another host record for the cluster name).

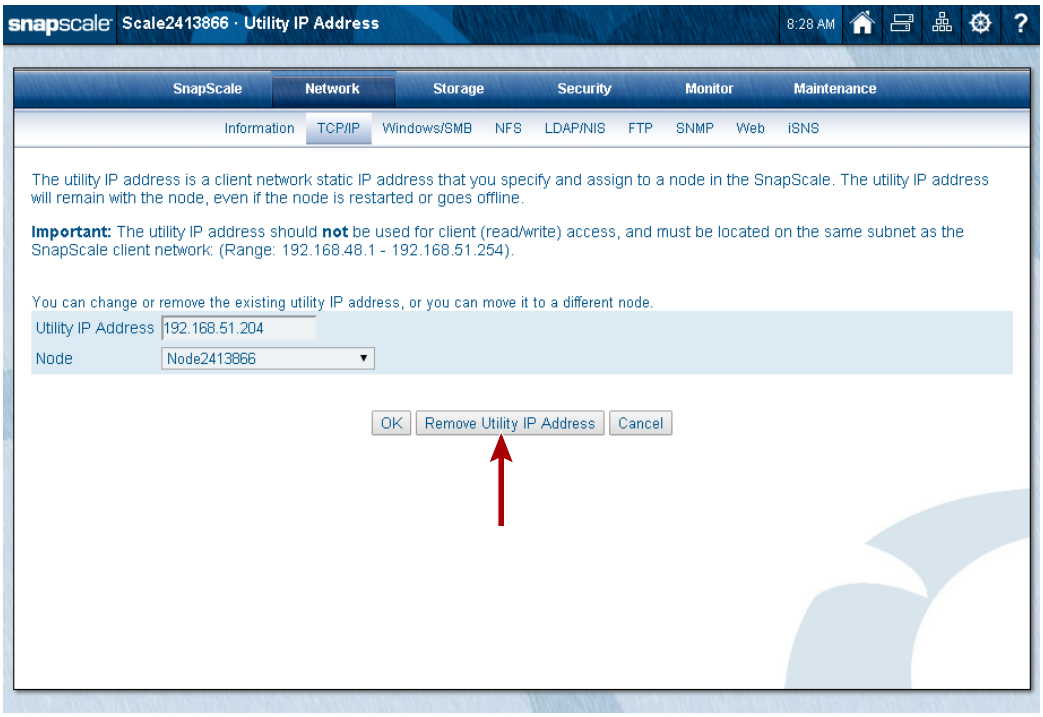
Only one Utility IP address can exist on a cluster. The Web Management Interface will not allow a new Utility IP address to be created if a Utility IP address currently exists, or when an address does not exist but there are one or more offline nodes (which may have an address already configured on them). The Utility IP address also must not be the same as the Management IP address or any existing address in the cluster IP address pool.

Configure a Utility IP Address:

1. On the **Utility IP Address** page, in the empty field, enter a **static IP address** on the same subnet as the IP address pool on the Client network.
2. Using the drop-down list, select the **cluster node** to which the Utility IP address will be assigned.
3. Click **OK**.
4. At the confirmation page, click **Save Changes**.

The Utility address is displayed on the **Network Information** page (**Network > Information**) beneath the static address of the node on which it was configured. The Utility IP address remains with the node, even if the node is restarted or goes offline.

Delete a Utility IP Address:



IMPORTANT: It is highly recommended that you first pause all data replication policies before changing or deleting a Utility IP address. After the Utility IP address has been changed or deleted, you can then resume data replication.

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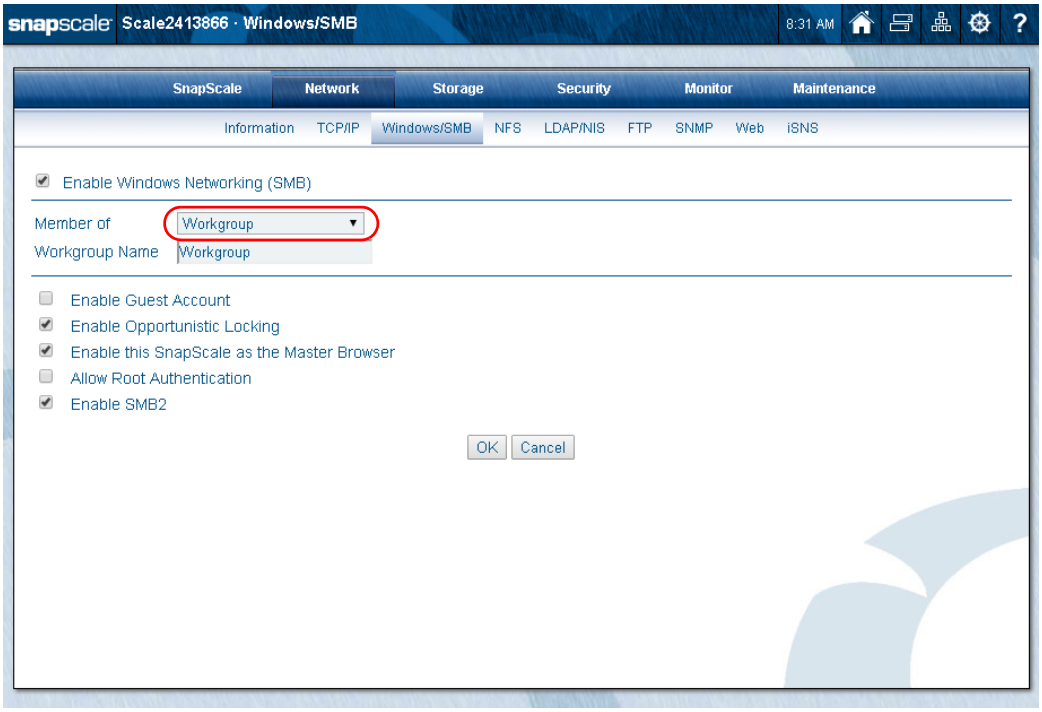
NOTE: To change a Utility IP address, you must first remove the old IP address and then configure the new IP address.

To remove a Utility IP address:

1. If **data replication policies** are running, pause them.
2. Browse to **Network > TCP/IP** and click **Utility IP Address**.
3. At the **Utility IP Address** removal screen, click **Remove Utility IP Address**.
4. At the confirmation screen, click **Remove Utility IP Address** again.
5. If necessary, resume running **data replication policies.**

Windows/SMB Networking

Windows SMB and security settings are configured on the **Network > Windows/SMB** page of the Web Management Interface. You can configure these settings as a member of a **Workgroup** or an **Active Directory Domain**, as shown in these two screens:



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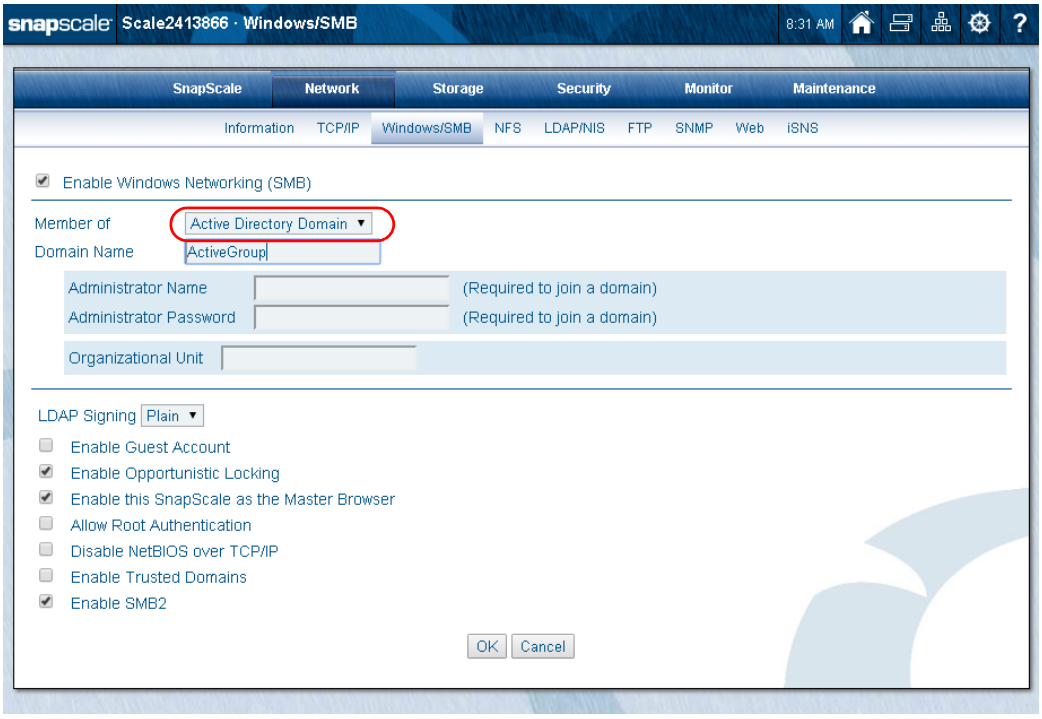

NOTE: To use Active Directory domain mode, you cannot configure Date/Time to synchronize with an NTP server. NTP is not supported in Active Directory.

Support for Windows/SMB Networking

The default settings make the SnapScale cluster available to SMB clients in the workgroup named *Workgroup*. Opportunistic locking is enabled, as is participation in master browser elections.

Consider the following when configuring access for your Windows networking clients.

Support for Microsoft Name Resolution Servers

The SnapScale cluster supports NetBIOS, WINS, and DNS name resolution services. However, when you use a domain name server with a Windows Active Directory (ADS) server, make sure the forward and reverse name lookup are correctly set up. ADS can use a Unix BIND server for DNS as well.

ShareName$ Support

RAINcloudOS supports appending the dollar-sign character ($) to the name of a share in order to hide the share from SMB clients accessing the SnapScale cluster.

NOTE: As with Windows servers, shares ending in '$' are not truly hidden, but rather are filtered out by the Windows client. As a result, some clients and protocols can still see these shares.

To completely hide shares from visibility from any protocols, use the hidden share option under **Advanced Share Properties** when creating a new share or modifying an existing share. This hides a share from SMB, AFP, HTTP, HTTPS, and FTP clients. However, shares are not hidden from NFS, which cannot connect to shares that aren't visible. To hide shares from NFS clients, consider disabling NFS access on hidden shares.

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Support for Windows Network Authentication

This section summarizes important facts regarding the RAINcloudOS implementation of Windows network authentication.

NOTE: When a SnapScale cluster joins a domain, it does so under its cluster name (Scale*nnnnnnn*). When a domain user is authenticated on a node, the cluster name is used. As such, a user can use any node of the cluster to be authenticated and log on.

Windows Networking Options

Windows environments operate in either workgroup mode, where each cluster contains a list of local users it authenticates on its own, or Active Directory (ADS) domain mode, where domain controllers centrally authenticate users for all domain members.

Option	Description
Workgroup	In a workgroup environment, users and groups are stored and managed separately on each cluster in the workgroup.
Active Directory Service (ADS)	When operating in a Windows Active Directory domain environment, the SnapScale is a member of the domain and the domain controller is the repository of all account information. Client machines are also members of the domain and users log into the domain through their Windows-based client machines. Active Directory domains resolve user authentication and group membership through the domain controller. Once joined to a Windows Active Directory domain, the SnapScale cluster imports and then maintains a current list of the users and groups on the domain. Thus, you must use the domain controller to make modifications to user or group accounts. Changes you make on the domain controller appear automatically on the SnapScale cluster. NOTE: Windows 2000 domain controllers must run SP2 or later.

Kerberos Authentication

Kerberos is a secure method for authenticating a request for a service in a network. Kerberos lets a user request an encrypted "ticket" from an authentication process that can then be used to request a service from a server or cluster. The user credentials are always encrypted before they are transmitted over the network.

The SnapScale cluster supports the Microsoft Windows implementation of Kerberos. In Windows ADS, the domain controller is also the directory server, the Kerberos Key Distribution Center (KDC), and the origin of group policies that are applied to the domain.

NOTE: Kerberos requires the cluster's time to be closely synchronized to the domain controller's time. This means that (1) the cluster automatically synchronizes its time to the domain controller's and (2) NTP cannot be enabled when joined to an ADS domain.

Interoperability with Active Directory Authentication

The SnapScale supports the Microsoft Windows family of servers that run in ADS mode. Any SnapScale cluster can join Active Directory domains as a member server. References to the SnapScale shares can be added to organizational units (OU) as shared folder objects.

NOTE: Windows 2000 domain controllers must run SP2 or later.

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Guest Account Access to the SnapScale cluster

The **Network > Windows/SMB** page in the Web Management Interface contains an option that allows unknown users to access the SnapScale cluster using the guest account.

Connect from a Windows Client

Windows clients can connect to the SnapScale using either the cluster name or any IP address in the node IP address pool. However, if possible, clients should use the cluster name to benefit from round robin DNS resolution (see Configure the DNS for Name Resolution and Round Robin Load Distribution on page 59).

To navigate to the cluster using Windows Explorer, use one of these procedures:

- For Microsoft Windows Vista, 2008, and 7 clients, navigate to **Network > *server_name***.
- For Microsoft Windows XP, 2000, or 2003 clients, navigate to **My Network Places > *workgroup_name* > *server_name***.

Connect a Mac OS X Client Using SMB

Mac OS X clients can connect using SMB. Specify the cluster name (or an IP address from the node IP address pool) in the Connect to Server window (from **Finder** press **Cmd + K**, or select **Finder > Go > Connect to Server**) as one of the following:

NOTE: If possible, clients should use the cluster name to benefit from round robin DNS resolution (see Configure the DNS for Name Resolution and Round Robin Load Distribution on page 59).

- `smb://cluster_name`
- `smb://node_ip_address`

Tip: *To disconnect from the SnapScale cluster, drag its icon into the Trash.*

You can also browse the clusters in the Finder file window, under the Shared tab.

Configure Windows/SMB Networking

Windows SMB and security settings are configured from this page. The cluster can be configured as part of a Workgroup or an Active Directory Domain.

Before performing the configuration procedures provided here, be sure you are familiar with the information provided in Support for Windows/SMB Networking on page 65 and Support for Windows Network Authentication on page 66.

Join a Workgroup

1. Go to **Network > Windows/SMB**.

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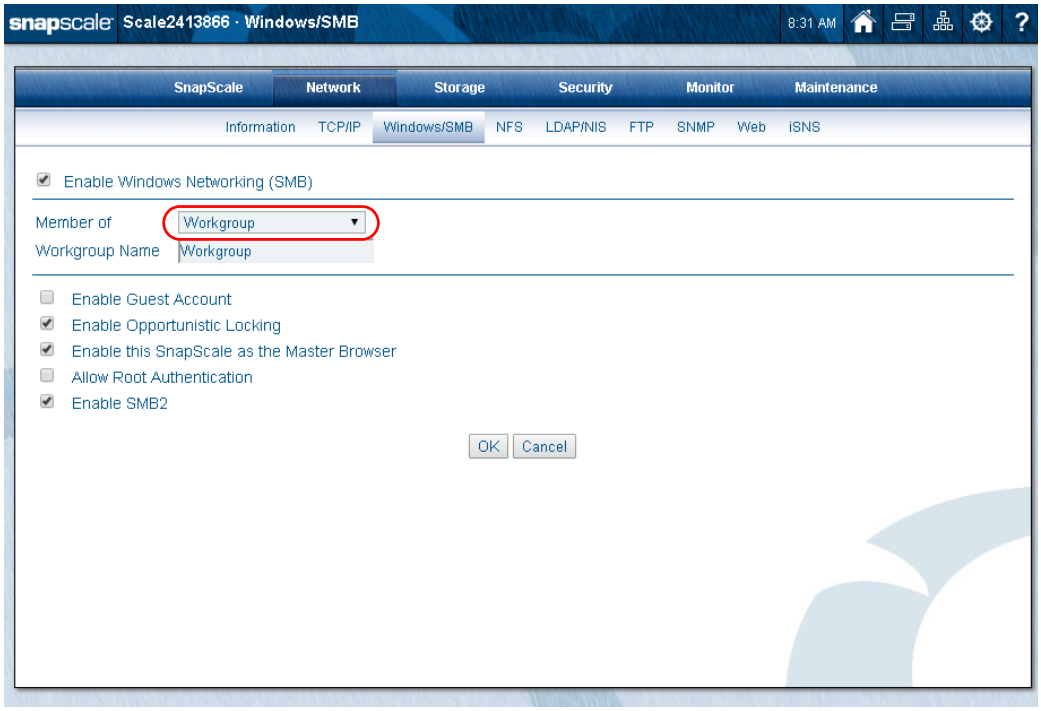
2. At the Member list, verify that the default **Workgroup** is selected.



3. Edit the **fields** shown in the following table:

Option	Settings
Enable Windows Networking (SMB)	Check the box to enable SMB and activate the options. Clear the box to disable.
Member Of	Verify that it is set to **Workgroup**. NOTE: For the Active Directory Domain option, see Join an Active Directory Domain on page 69.
Workgroup Name	The default settings make the SnapScale available in the workgroup named *Workgroup*. Enter the workgroup name to which the cluster belongs.
Enable Guest Account	Check the box to allow unknown users (or users explicitly logging in as `Guest`) to access the SnapScale using the guest account. Clear the box to disable this feature.
Enable Opportunistic Locking	Enabled by default. Opportunistic locking can help performance if the current user has exclusive access to a file. Clear the box to disable this feature.
Enable this SnapScale as the Master Browser	Enabled by default. The SnapScale can maintain the master list of all computers belonging to a specific workgroup. (At least one Master Browser must be active per workgroup.) Check the box if you plan to install this cluster in a Windows environment and you want it to be able to serve as the Master Browser for a workgroup. Clear the box to disable this feature.
Allow Root Authentication	Check the box to allow root login to the cluster; clear the box to disable this feature. NOTE: The root password is synchronized with the cluster's admin password.

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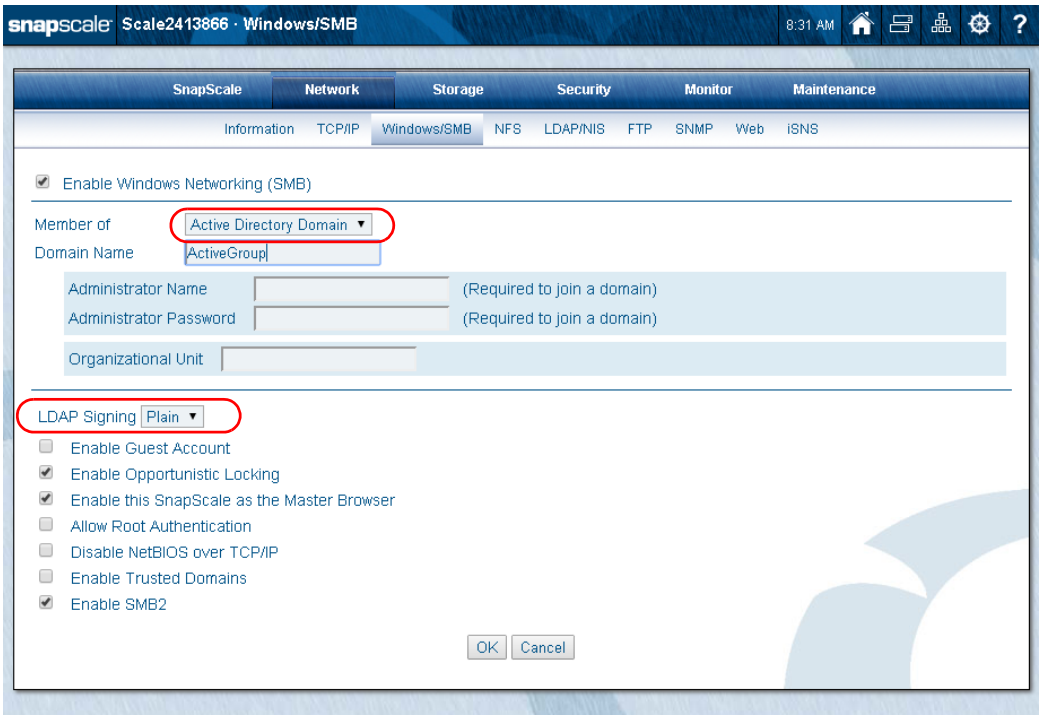
Option	Settings
Enable SMB2	Enabled by default. This more robust version of SMB reduces protocol overhead and is used by default by Windows Vista and later clients. Clear the box to disable this feature (clients that default to SMB2 will automatically connect via SMB1).

4. Click **OK** to update Windows network settings immediately.

Join an Active Directory Domain

When the cluster joins a domain, it does so as a single unit under the cluster name, and all nodes operate equally under the cluster name to authenticate against the domain. This provides multi-point access to the domain through each node.

1. Go to **Network > Windows/SMB**.
2. From the drop-down Member list, select **Active Directory Domain** to view the configuration page.



NOTE: You cannot select Active Directory Domain if NTP is enabled.

3. Edit the **fields** shown in the following table:

Option	Description
Enable Windows Networking (SMB)	Check the box to enable SMB and activate the options. Clear the box to disable.
Member Of	Verify it shows *Active Directory Domain*.

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Option	Description
Domain Name	The default settings make the SnapScale available in the workgroup named *Workgroup*. Enter the domain name to which the cluster belongs. **NOTE:** Windows 2000 domain controllers must run SP2 or later.
Administrator Name / Administrator Password	If joining a domain, enter the user name and password of a user with domain join privileges (typically an administrative user).
Organizational Unit	To create a machine account at a different location than the default, enter a name in the field. By default, this field is blank, signaling the domain controller to use a default defined within the controller. **NOTE:** Sub-organizational units can be specified using Full Distinguished Name LDAP syntax or a simple path ([org_unit]/[sub-unit1]/[sub-unit1a])
LDAP Signing	Use the drop-down list to set ADS domain LDAP signing to **Plain** (no signing), **Sign**, or **Seal**, as appropriate for your domain. Default setting is **Plain**.
Enable Guest Account	Check the box to allow unknown users (or users explicitly logging in as `Guest)` to access the SnapScale using the guest account. Clear the box to disable this feature.
Enable Opportunistic Locking	Enabled by default. Opportunistic locking can help performance if the current user has exclusive access to a file. Clear the box to disable this feature.
Enable this SnapScale as the Master Browser	Enabled by default. The SnapScale can maintain the master list of all computers belonging to a specific workgroup. (At least one Master Browser must be active per workgroup.) Check the box if you plan to install this cluster in a Windows environment and you want it to be able to serve as the Master Browser for a workgroup. Clear the box to disable this feature.
Allow Root Authentication	Check the box to allow root login to the cluster. Clear the box to disable this feature. **NOTE:** The root password is synchronized with the cluster's admin password.
Disable NetBIOS over TCP/IP	Some administrators may wish to disable NetBIOS over TCP/IP. Check the box to disable NetBIOS; clear the box to leave NetBIOS enabled. **NOTE:** If you disable NetBIOS and you are joining a domain, you must enter the domain name as a fully qualified domain name (such as, "actdirdomname.companyname.com"). A short form such as ActDirDomName does not work.
Enable Trusted Domains	SnapScale clusters recognize trust relationships established between the domain to which the SnapScale is joined and other domains in a Windows environment by default. Check the box to enable this feature; clear the box to disable this feature. **NOTE:** SnapScale clusters remember trusted domains. That is, if this feature is disabled and then activated at a later time, the previously downloaded user and group lists, as well as any security permissions assigned to them, is retained.

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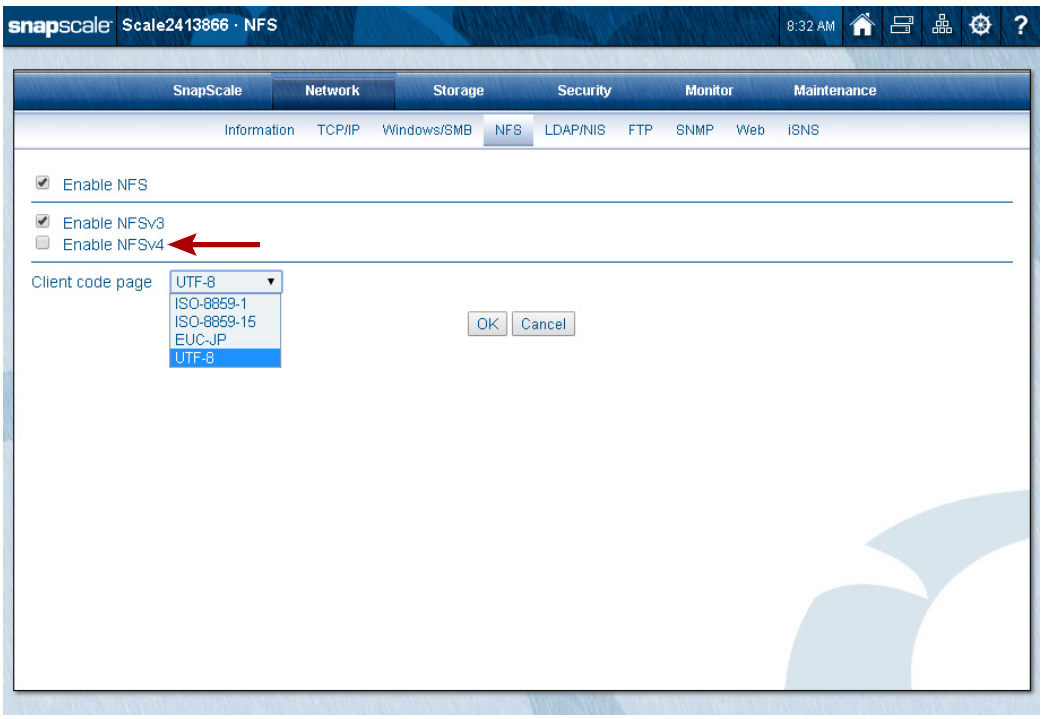
Option	Description
Enable SMB2	Enabled by default. This more robust version of SMB reduces protocol overhead and is used by default by Windows Vista and later clients. Clear the box to disable this feature (clients that default to SMB2 will automatically connect via SMB1).

4. Click **OK** to update Windows network settings immediately.

NFS Access

NFS access to the cluster is enabled on the **Network > NFS** page of the Web Management Interface. By default, most NFS access is enabled and any NFS client can access the SnapScale cluster through the guest account.

NOTE: Only NFSv3 is enabled by default. If you wish to enable NFSv4, check the **Enable NFSv4** box on the **Network > NFS** page to view additional options.



NFS client access to shares can be specified by navigating to the **Security > Shares** page and clicking the **NFS Access** link next to the share. To ensure proper Unicode representation on the file system, set the client code page to indicate the code page used by NFS clients to represent characters in filenames (usually UTF-8 on modern Unix/Linux-based operating systems).

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These versions of the NFS protocol are supported:

Protocol	Version	Source
NFS	3.0, 4.0*	RFC 1094, RFC 1813, RFC 3530
Mount	1.0, 2.0, 3.0	RFC 1094 Appendix A, RFC 1813, RFC 3530
Lockd	1.0, 4.0	RFC 1094, RFC1813, RFC 3530

*NFSv4 ACLs are not supported.

Assign Share Access to NFS Users

The NFSv3 protocol does not support user-level share access control, but rather supports host- and subnet-based access control. NFSv4 supports user-level access control via Kerberos configuration, but otherwise uses the same form of host-based access control. On a standard Unix server, share access is configured in an "exports" file. On SnapScale clusters, the exports for each share are configured on the **NFS Share Access** page independently of user-based share access for other protocols.

Enable NFS Access to the Cluster

1. Go to **Network > NFS**.
2. Check the **Enable NFS** box.
3. Check the **versions** you want to enable.
   Select one or more from **NFSv3** and **NFSv4**.
4. Choose the desired **Client code page** from the drop-down list.
   Select **UTF-8**, **ISO-8859-1**, **ISO-8859-15**, or **EUC-JP**.
5. Click **OK**.

Configure NFSv4 Access

1. Go to **Network > NFS**.
2. Check the **Enable NFS** and **Enable NFSv4** boxes.

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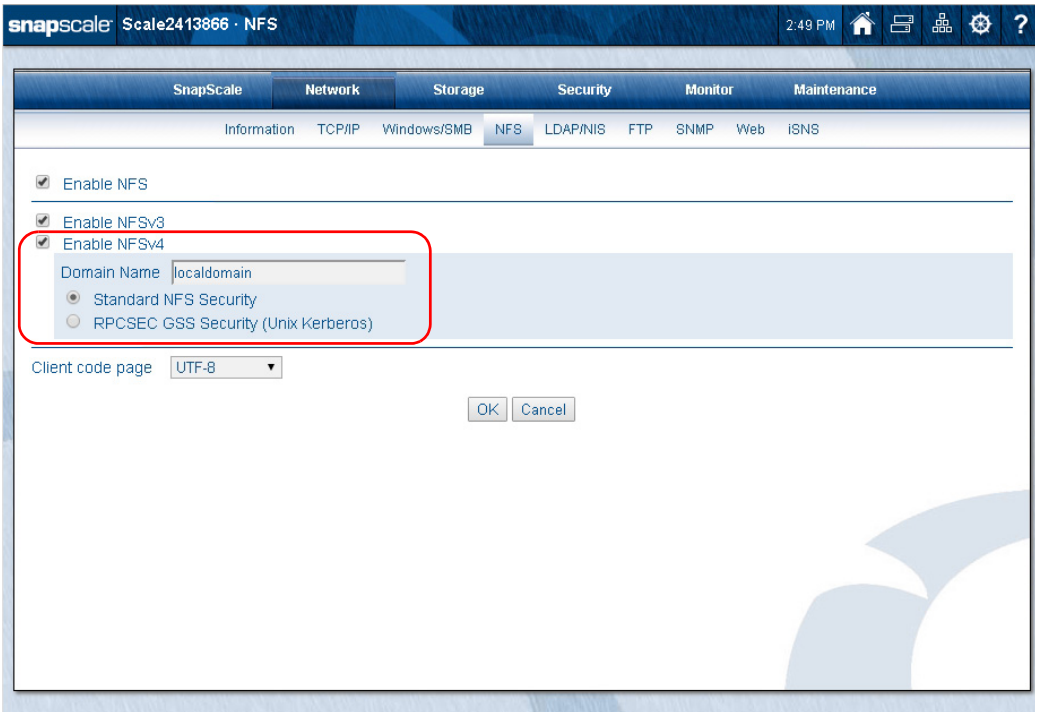
A new set of security options are displayed below the **Enable NFSv4** option.



3. Use this table to select the **level of security** you want to apply:

Option	Description
Domain Name	The default domain name "localdomain" is shown in the field. If necessary, you can change it. **CAUTION:** This setting is used by the NFSv4 IDMAP daemon and must be set to the same value on all NFSv4 clients and servers for proper functionality. If set incorrectly, UID and GID resolution will not work properly.
Security Type	• **Standard NFS Security** – Choose this option if you want to use standard NFS host- and subnet-based security. • **RPSEC GSS Security (Unix Kerberos)** – Choose this option and complete the fields that appear if you want to use Unix Kerberos security to authenticate NFSv4 connections. **NOTE:** Kerberos security can only be configured for Unix-based Kerberos implementations. Windows ADS Kerberos is not supported for NFSv4 authentication.

4. If you selected **RPSEC GSS Security (Unix Kerberos)** security, complete the new options displayed using the table below. Note the following:
   - The service will not start unless the TCP/IP domain name is set up exactly the same as the keytab.
   - You must create the NFS and host service entries in the keytab with the fully qualified domain name of the SnapScale cluster.

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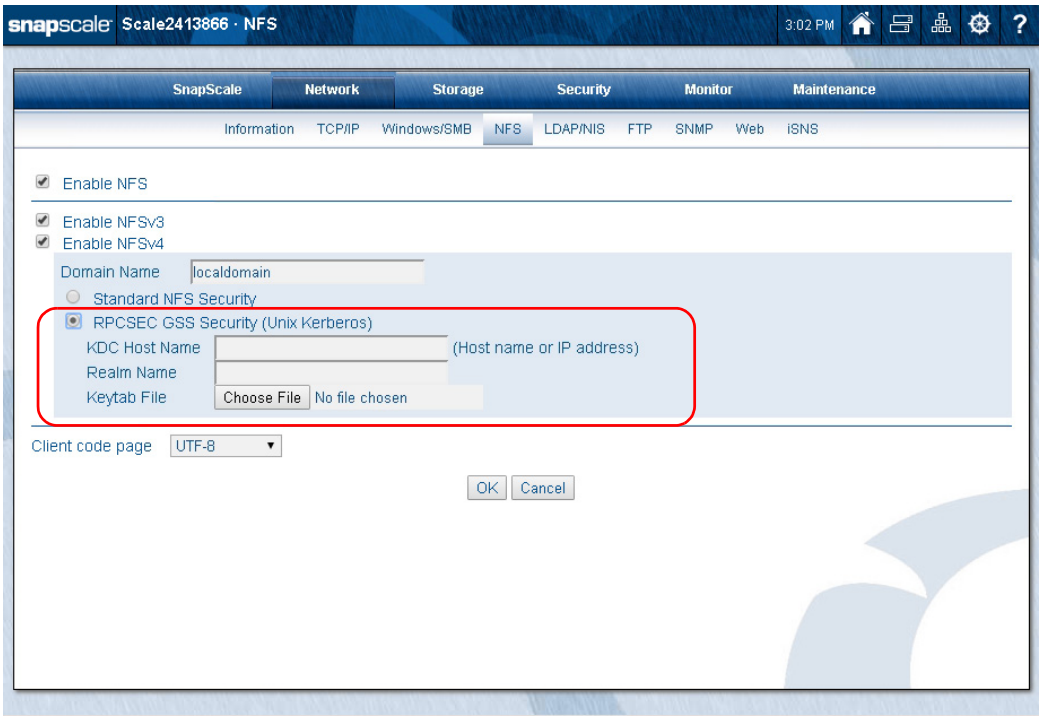

This table details the Unix Kerberos options:

Option	Description
KDC Host Name	Enter the host name of the Kerberos server (for example, "kerberos-2000.mit.edu").
Realm Name	Enter the Kerberos realm name (For example, "ATHENA.MIT.EDU"). **NOTE:** Realm names are conventionally specified in all CAPITAL letters, but this is not required to function correctly.
Key Tab File	Click **Browse** to locate and upload the Kerberos key tab file (for example, "zeus.keytab"). This file can have any name the administrator wishes to give it. If you do not have a keytab file for the SnapScale cluster: • Create a host and NFS principle for the SnapScale cluster on the KDC. • Generate a keytab file. • Save it to a location the client administering the SnapScale cluster can access.

5. Click **OK** to save the configuration.

NOTE: After enabling NFSv4 with Kerberos security, read-write host entries for `gss/krb5`, `gss/krb5i`, and `gss/krb5p` are automatically added to the NFS access entries for each NFS-enabled share.

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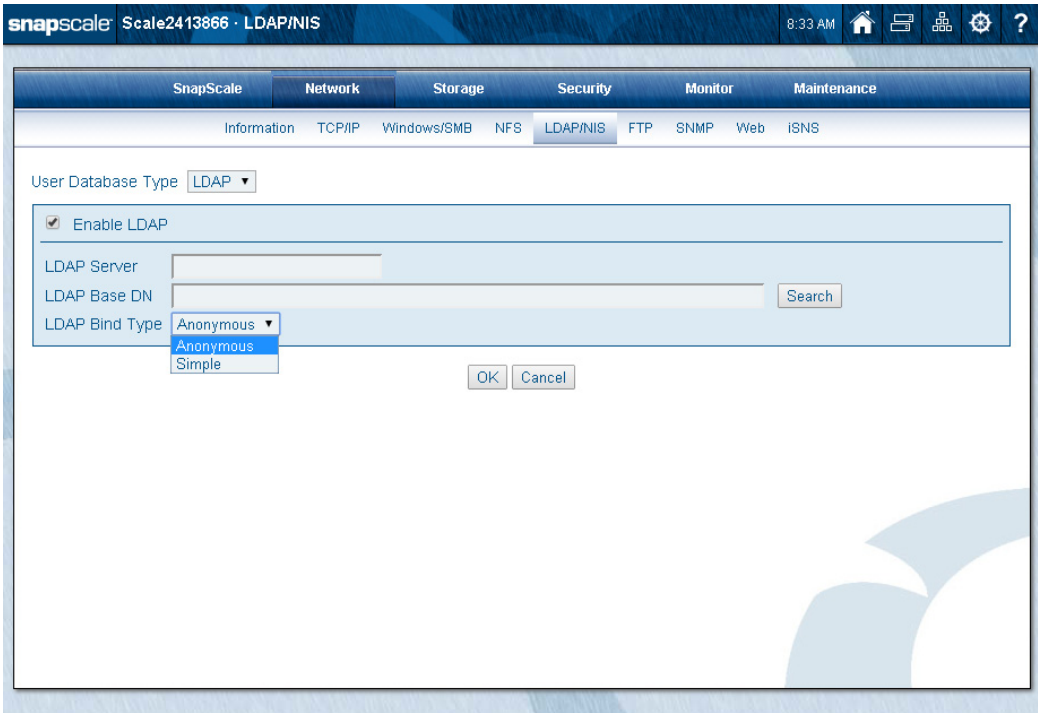
LDAP/NIS Domains

LDAP and NIS domains are configured on the **Network > LDAP/NIS** page of the Web Management Interface. Use the drop-down list to choose either LDAP or NIS as the user database type to be configured.



LDAP vs. NIS Overview

LDAP (Lightweight Directory Access Protocol) is an open, industry standard application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP) network. The SnapScale cluster can be configured to query an LDAP directory for user/group names and UIDs/GIDs for configuration of quotas, ID mapping, and home directories. As such, you must use the LDAP directory to make modifications.

NOTE: A SnapScale cluster currently can't be configured to authenticate users against an LDAP directory.

NIS (Network Information Service) is a client-server directory service protocol for distributing system configuration data such as user and host names between computers on a computer network. The SnapScale cluster can join an NIS domain and function as an NIS client. It can then read the users and groups maintained by the NIS domain to translate user/group names to UIDs/GIDs for configuration of quotas, ID mapping, and home directories. As such, you must use the NIS server to make modifications.

NOTE: Changes you make on the NIS server do not immediately appear on the SnapScale cluster. It may take up to 10 minutes for changes to be replicated.

Configure LDAP

Use this procedure to configure LDAP on your SnapScale cluster:

1. Go to **Network > LDAP/NIS**.

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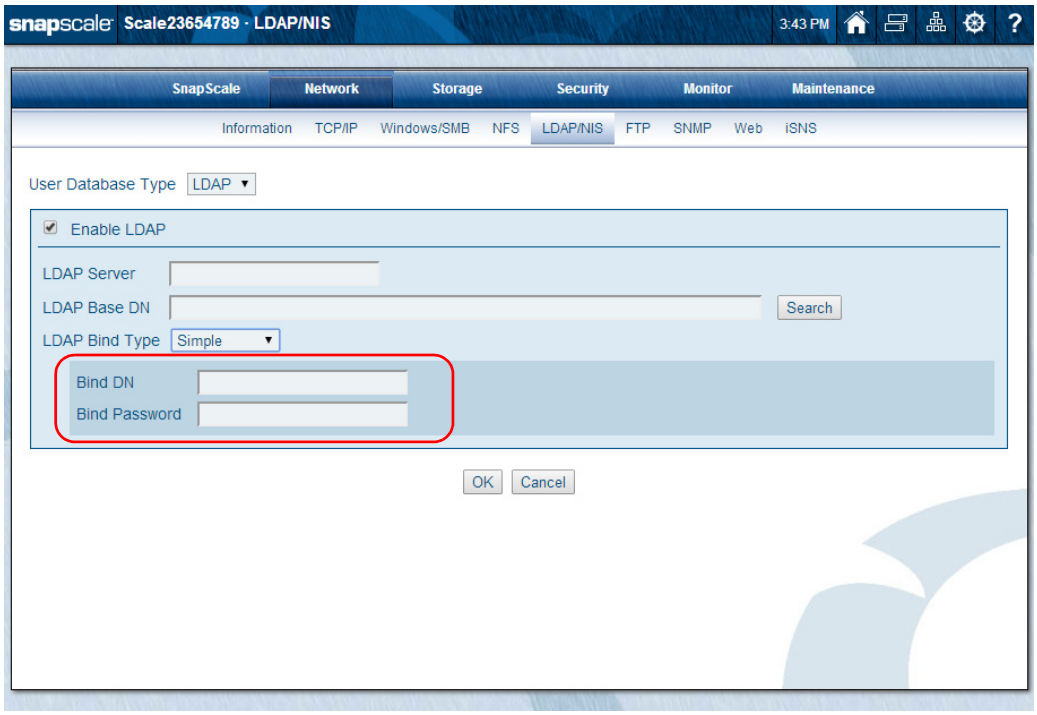
The default LDAP database type page is shown.

2. Verify **LDAP** is displayed in the **User Database Type** drop-down list.
3. Check **Enable LDAP**.
4. Edit the **settings** shown in the following table:

Options	Description
LDAP Server	Enter the host name or IP address for the LDAP server.
LDAP Base DN	Click the **Search** button to locate the Base DN on the LDAP server, or enter the Base DN in LDAP syntax such as: `cn=accounts,dc=mydir,dc=mydomain,dc=com`.
LDAP Bind Type	From the drop-down list, select the LDAP bind type: • **Anonymous** • **Simple** If **Simple** is selected, two new fields are shown: **Bind DN** and **Bind Password**.

5. If you selected **Simple** as the bind type, complete the two new options (**Bind DN** and **Bind Password**).



6. Click **OK** to update the settings immediately.

   If NIS is enabled, you are warned that existing quotas or ID mappings for NIS users will be applied automatically to LDAP users and groups that have the same UID or GID.
7. Click **Enable LDAP** to complete the process.

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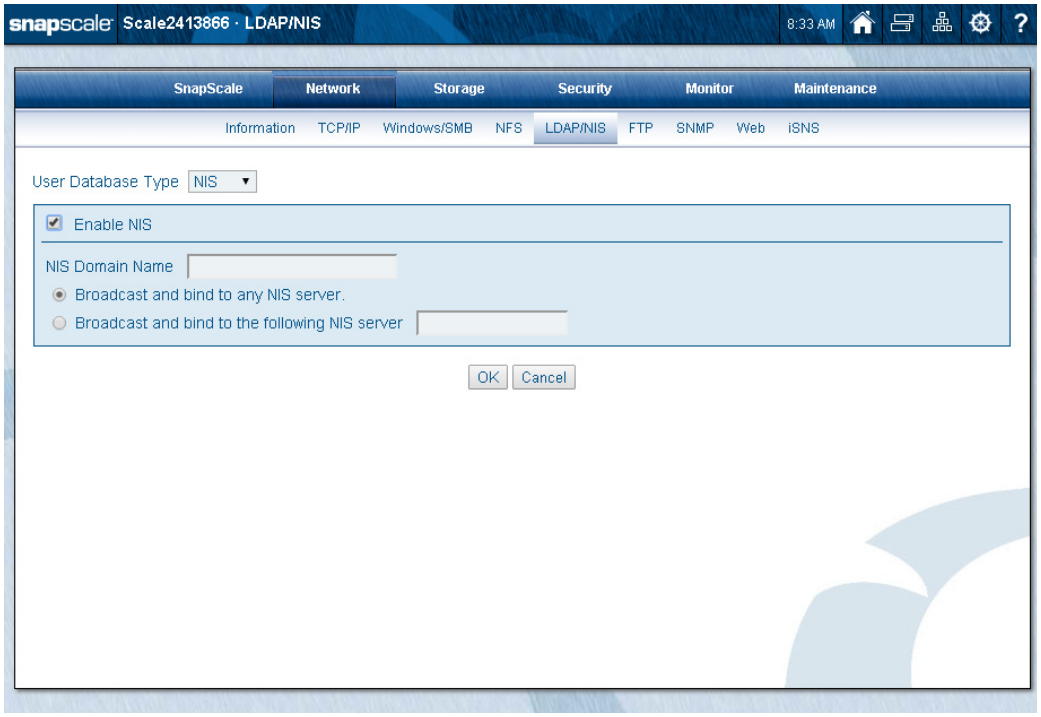
Configure NIS

NOTE: Unless UID/GID assignments are properly handled, NIS users and groups may fail to display properly. For guidelines on integrating compatible SnapScale cluster UIDs, see User and Group ID Assignments on page 160.

NIS uniquely identifies users by UID, not user name, and although it is possible to have duplicate user names, Overland Storage does not support that configuration. To configure NIS on your SnapScale cluster:

1. Go to **Network > LDAP/NIS**.
   The default LDAP database type page is shown.
2. From the **User Database Type** drop-down list, select **NIS**.



3. Check **Enable NIS**.
4. Edit the **settings** shown in the following table:

Options	Description
NIS Domain Name	Enter the NIS domain name.
NIS Server	To bind to an NIS server, select either: • **Broadcast and Bind to Any NIS server** to bind to any available NIS servers. • **Broadcast and Bind to the following NIS server** and enter the IP address for a specific NIS server in the field provided.

5. Click **OK** to update the settings immediately.
   If LDAP is enabled, you are warned that existing quotas or ID mappings for LDAP users will be applied automatically to NIS users and groups that have the same UID or GID.
6. Click **Enable NIS** to complete the process.

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FTP/FTPS Access

FTP and FTPS settings are configured on the **Network > FTP** page of the Web Management Interface. FTPS adds encryption to FTP for increased security. By default, FTP and FTPS clients can access the cluster using the anonymous user account, which is mapped to the SnapScale *guest* user account and *AllUsers* group account. You can set share access and file access for anonymous FTP users by modifying permissions for these accounts. For more granular control over FTP access, you must create local user accounts for FTP users.

For FTPS, it is recommended that your FTPS client application use explicit FTPS (such as, FTPES or Auth TLS).

NOTE: If standard FTP is enabled, only the data channel is encrypted for FTPS connections; the control channel (including user password) is not encrypted. To force FTPS to encrypt the control channel as well, disable standard FTP.

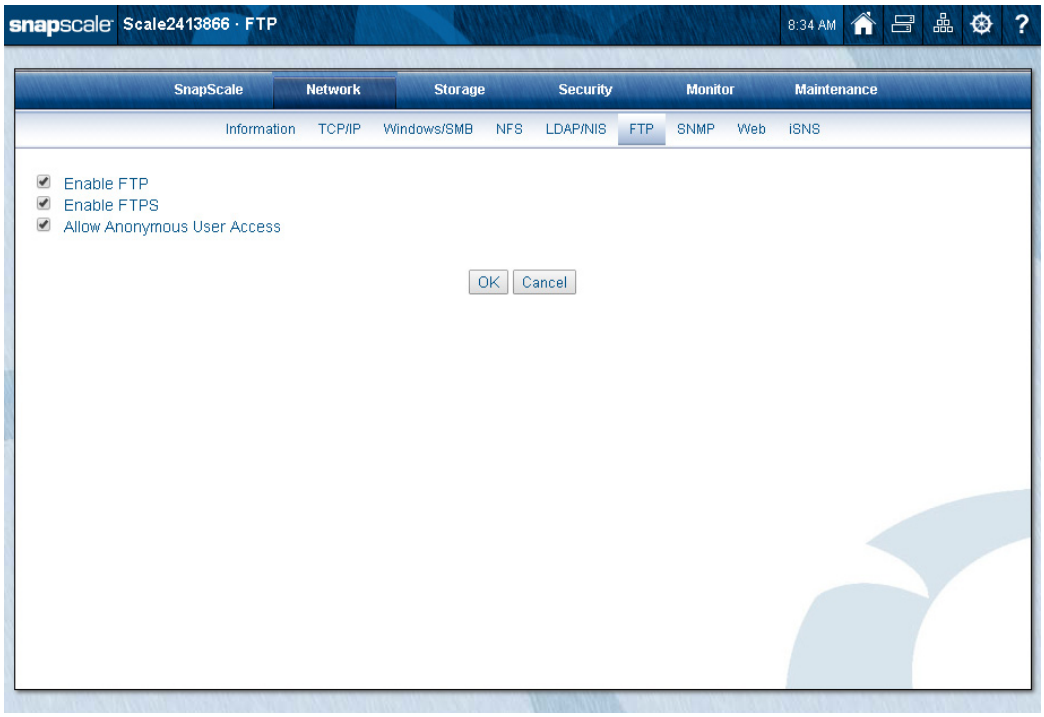
Supported FTP Clients

SnapScale clusters have been tested with the most common FTP clients and work as expected based on the commands required by RFC 959. SnapScale clusters have been proven to work with these products for standard FTP.

NOTE: Most standard FTP clients do not support FTPS. A client designed to support FTPS is required for FTPS connections.

Configure FTP/FTPS Access

1. Go to **Network > FTP**.



2. Edit the **settings** as shown in the following table:

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Option	Settings
Enable FTP	Check the box to enable standard FTP services; leave the box blank to disable access to this cluster via standard FTP.
Enable FTPS	Check the box to enable FTPS services; leave the box blank to disable access to this cluster via FTPS.
Allow Anonymous User Access	When you allow anonymous login, FTP/FTPS users employ an email address as the password. When you disallow anonymous login, only FTP/FTPS users who are configured as local SnapScale users can access the cluster. • **Check the box** to allow users to connect to the cluster using the anonymous user account. The anonymous user is mapped to the local guest user account. You can set share access for anonymous FTP/FTPS users by granting either read-write (the default access) or read-only access to the guest account on a share-by-share basis. • **Leave the box blank** so users cannot log in anonymously but must instead log in via a locally created user name and password.

3. Click **OK** to update the settings immediately.

Connect via FTP/FTPS

1. To connect to the SnapScale cluster:
   - For **standard FTP**, enter the name of the cluster or IP address in the FTP Location or Address box of a web browser or FTP client application.
     - To connect via a **command line**, enter:
       `ftp cluster_name`
     - To connect via a **Web browser**, enter:
       `ftp://cluster_name`

     (where *cluster_name* is the name or IP address of the cluster)
   - For **secure FTPS**, configure your FTPS client application to use explicit FTPS (such as, FTPES or "Auth TLS") and enter the name of the cluster or IP address.

   NOTE: With anonymous login enabled, access to folders is determined by the share access settings for the guest account. With anonymous login disabled, log into the cluster using a valid local user name and password.

2. Press **Enter** to connect to the FTP root directory.
   All shares and subdirectories appear as folders.

   NOTE: FTP users cannot manage files or folders in the FTP root directory.

SNMP Configuration

The SnapScale cluster can act as an SNMP agent. SNMP managers collect data from agents and generate statistics and other monitoring information for administrators. Agents respond to managers and may also send traps, which are alerts that indicate error conditions. The

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cluster communicates with SNMP managers in the same read-only community. A community name is a password that authorizes managers and agents to interact. The cluster only responds to managers that belong to the same read-only community.

Default Traps

A *trap* is a signal from the SnapScale cluster or any individual node informing an SNMP manager program that an event has occurred. SnapScale supports the default traps shown in this table:

Trap	Initiating Action
coldStart	Whenever SNMP is enabled and a node boots.
linkDown	A node's Ethernet interface has gone offline.
linkUp	A node's Ethernet interface has come back online.
authenticationFailure	An attempt to query the SNMP agent using an incorrect read-only community string was made, and resulted in a failure.
enterpriseSpecific	SnapScale-generated traps that correspond to the error-level, warning-level, and fatal-error-level traps of RAINcloudOS. These traps contain a descriptive message that helps to diagnose a problem using the following OIDs: • 1.3.6.1.4.1.6411.2000.1000.1:loglevel 0 syslog messages (*emergency*) • 1.3.6.1.4.1.6411.2000.1001.1:loglevel 1 syslog messages (*alert*) • 1.3.6.1.4.1.6411.2000.1002.1:loglevel 2 syslog messages (*critical*) • 1.3.6.1.4.1.6411.2000.1003.1:loglevel 3 syslog messages (*error*) **NOTE:** There is no specific MIB that defines traps sent by SnapScale clusters or nodes.

Supported Network Manager Applications and MIBs

SnapScale clusters respond to requests for information in MIB-II (RFC 1213) and the Host Resources MIB (RFC 2790 or 1514). You can use any network manager application that adheres to the SNMP V2 protocol with the SnapScale. The following products have been successfully tested with SnapScale clusters: CA Unicenter TNg, HP Open View, and Tivoli NetView.

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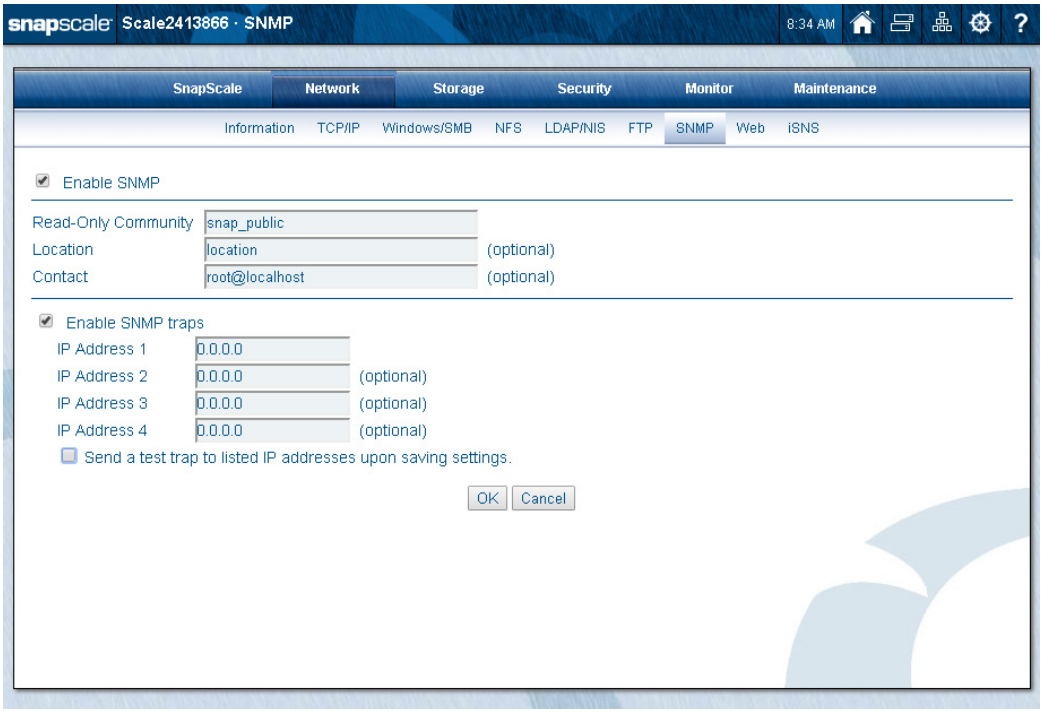
Configure SNMP

The SNMP configuration page can be found at **Network > SNMP**:



Edit the settings as described in the following table, and then click **OK**. Once enabled, SNMP managers can access MIB-II and Host Resources MIBs management data on the cluster.

Option	Description
Enable SNMP	To enable SNMP, check the **Enable SNMP** box. Leave the box blank to disable SNMP.
Read-Only Community	To allow SNMP managers to read data from this cluster, enter a read-only community string or accept the default *snap_public*. **NOTE:** As a precaution against unauthorized access, Overland Storage recommends that you create your own community string.
Location	Optionally enter information that helps a user identify the physical location of the cluster. For example, you might include a street address for a small business, a room location such as *Floor 37, Room 308,* or a position in a rack, such as *rack slot 12*.
Contact	Optionally enter information that helps a user report problems with the cluster. For example, you might include the name and title of the system administrator, a telephone number, pager number, or email address.
Enable SNMP Traps	Check the **Enable SNMP Traps** box to enable traps. Clear the box to disable SNMP traps.

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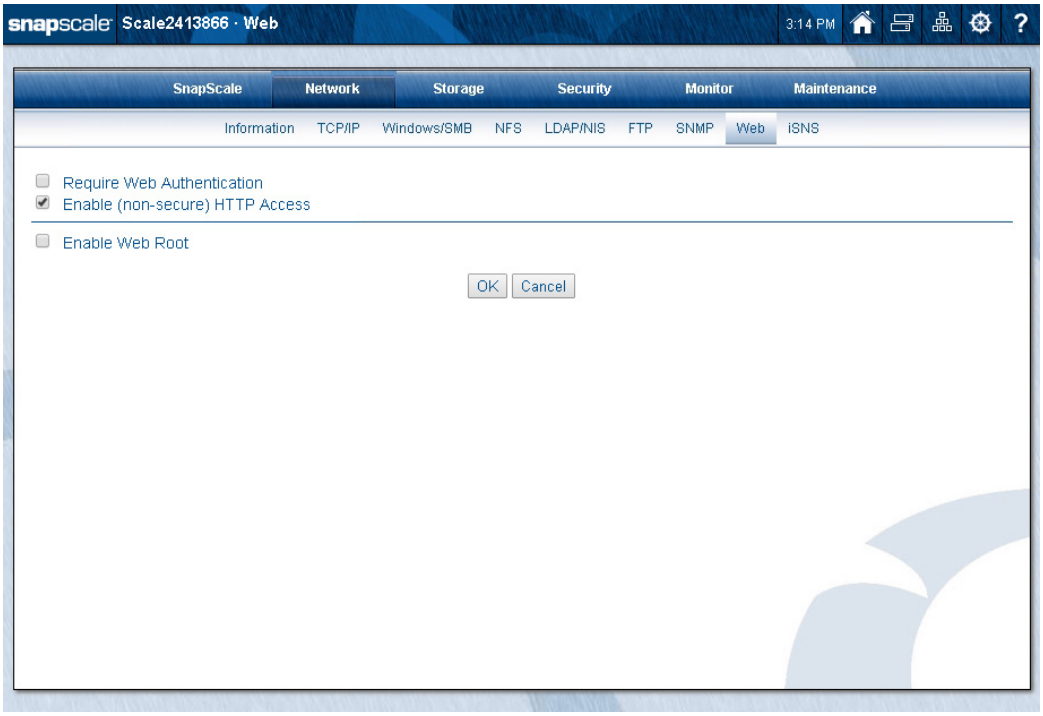
Option	Description
IP Address 1-4	Only available when SNMP traps are enabled. Enter the IP address of at least one SNMP manager in the first field as a trap destination. Optionally, you can enter up to three additional IP addresses in fields 2-4.
Send a Test Trap	Only available when SNMP traps are enabled. To verify your settings, check the **Send a test trap** box, then click **OK**.

Web Access

HTTP and HTTPS are used for browser-based access to the cluster via Web View, Web Root, or the Web Management Interface. HTTPS enhances security by encrypting communications between client and cluster, and cannot be disabled. You can, however, disable HTTP access on this **Web** page. Additionally, you can require browser-based clients to authenticate to the cluster.



Configure HTTP/HTTPS

You can require web authentication, disable HTTP (non-secure) access, and enable the Web Root feature. All HTTP access is made via the root node and the Management IP address.

Require Web Authentication

Edit the following option and click **OK**.

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Option	Description
Require Web Authentication	Check the **Require Web Authentication** box to require clients to enter a valid user name and password in order to access the cluster via HTTP/HTTPS. Leave the box blank to allow all HTTP/HTTPS clients access to the cluster without authentication. **NOTE:** This option applies to both Web View and Web Root modes.

Enable HTTP Access to the SnapScale cluster

Edit the following option and click **OK**.

Option	Description
Enable (non-secure) HTTP Access	Check the **Enable HTTP Access** box to enable non-secure HTTP access. Leave the box blank to disable access to the cluster via HTTP. **NOTE:** This option applies to both Web View and Web Root modes.

Connect via HTTPS or HTTP

1. Enter the **cluster name** (or Management IP address or any IP address from the node IP address pool) in a Web browser.

   Web access is case-sensitive. Capitalization must match exactly for a Web user to gain access. To access a specific share directly, Internet users can append the full path to the SnapScale cluster name or URL, as shown in the following examples:

   ```
   https://SnapNode2302216/Share1/my_files
   https://10.10.5.23/Share1/my_files
   ```

2. Press **Enter**.

   The **Web View** page opens.

Configure the SnapScale Cluster as a Simple Web Server Using Web Root

When you enable the Web Root feature from the **Web** page, you can configure your SnapScale cluster to open automatically to an HTML page of your choice when a user enters the following in the browser field:

`http://[cluster_name]` or `http://[IP address]`

In addition, files and directories underneath the directory you specify as the Web Root can be accessed by reference relative to `http://[cluster_name]` without having to reference a specific share. For example, if the Web Root points to the directory *WebRoot* on share *SHARE1*, the file *SHARE1/WebRoot/photos/slideshow.html* can be accessed from a web browser:

`http://[cluster_name]/photos/slideshow.html`

The Web Root can also be configured to support directory browsing independent of Web View (access through shares).

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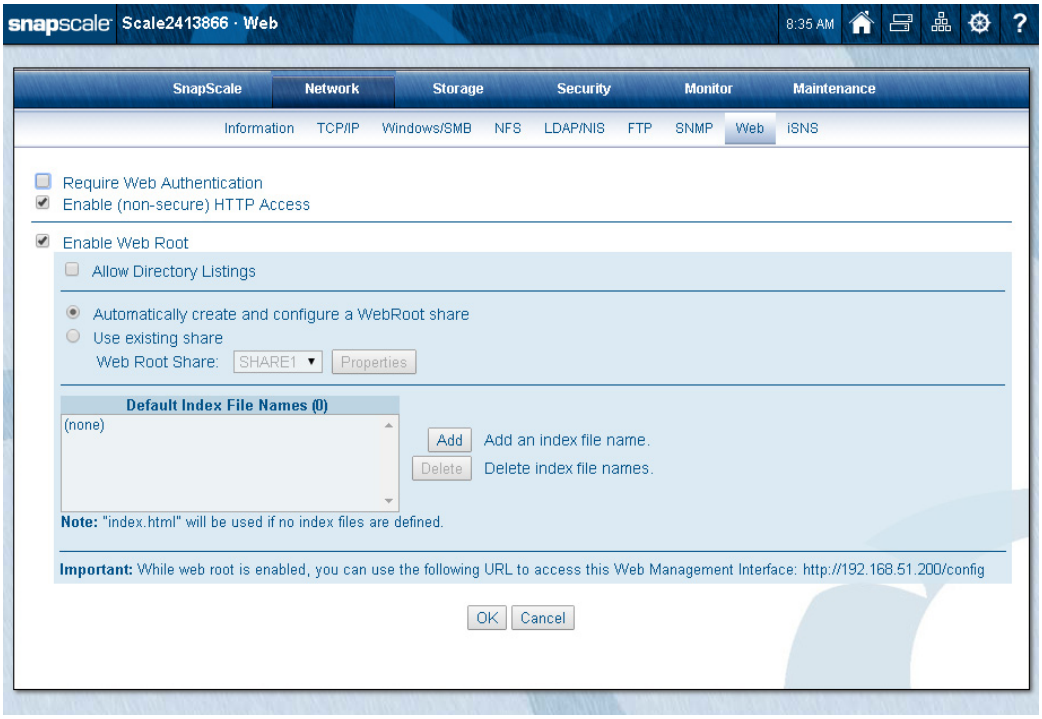
NOTE: SnapScale supports direct read-only web access to files. It is not intended for use as an all-purpose Web Server, as it does not support PERL or Java scripting, animations, streaming video, or anything that would require a special application or service running on the SnapScale cluster.

Configure Web Root Access

Check the **Enable Web Root** box to configure the SnapScale cluster to serve the Web Root directory as the top level web access to the SnapScale cluster, and optionally, automatically serve an HTML file inside. When the box is checked, the options described below appear.



1. Complete the following information, then click **OK**.

Option	Description
Allow Directory Listings	If **Allow Directory Listings** is checked and no user-defined index pages are configured or present, the browser opens to a page allowing browsing of all directories underneath the Web Root. NOTE: Checking or unchecking this option only affects directory browsing in Web Root. It does not affect access to Web View directory browsing.
Web Root share	Select one of the following: • **Automatically create and configure a Web Root share**: A share named "WebRoot" is automatically created. By default, the share is hidden from network browsing and has all network access protocols except HTTP/HTTPS enabled (as such, it can be accessed from a browser as the Web Root but can not be accessed via Web View). You can change these settings at **Security > Shares**. • **Use existing share**: From the drop-down list of existing shares for selection, select a share and click the **Properties** button to edit the selected share's properties (see **Security > Shares**).

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Option	Description
Default Index File Names	Files found underneath the Web Root with names matching those in this list is automatically served to the web browser when present, according to their order in the list. To add a filename, click the **Add** button, enter the name of one or more index HTML files, then click **OK**. The file you entered is shown in the Index Files box. **NOTE:** If no files are specified, index.html is automatically used if found. To delete a name, highlight it and click **Delete**. At the confirmation page, click **Delete** again.

2. Map a drive to the **share** you have designated as the Web Root share and upload your HTML files to the root of the directory, making sure the file names of the HTML files are listed in the Index Files box.

Access the Web Management Interface with Web Root Enabled

By default, when you connect to a SnapScale cluster with Web Root enabled, the browser loads the user-defined HTML page or present a directory listing of the Web Root. To access the Web Management Interface (for example, to perform administrative functions or change a password), enter the following in the browser address field:

`http://`*[node_name or ip address]***`/config`**

You are prompted for your User ID and password, then you are placed into the Web Management Interface.

If you need to access the **Web View** page to browse shares on the cluster independent of Web Root, enter this in the browser address:

`http://`*[node_name or ip address]***`/sadmin/GetWebHome.event`**

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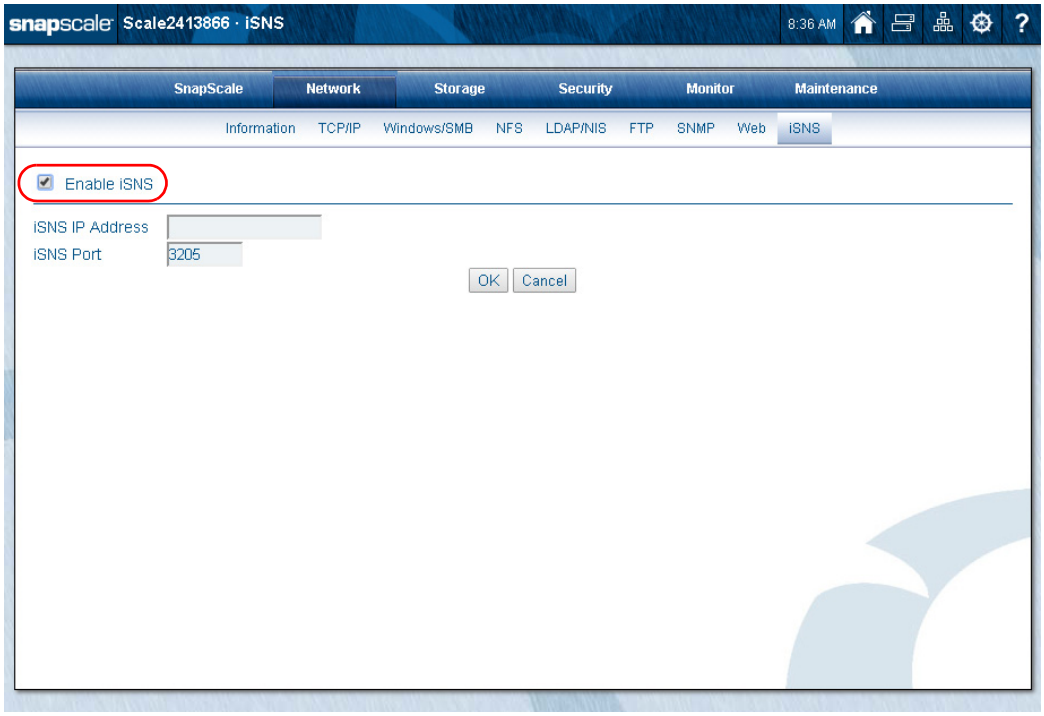
iSNS Configuration

Microsoft iSNS Server can be used for the discovery of SnapScale cluster iSCSI targets on an iSCSI network.



Configure the iSNS Settings

1. If not already installed, install the iSNS service on a **Windows server**.
   Note the IP address of the server or workstation on which the iSNS service is installed.
2. Configure iSNS on the **SnapScale cluster**:
   a. On the **Network > iSNS** page, check the **Enable iSNS** box.
   b. Enter the **IP address** of the iSNS server.
      If the iSNS server does not use the default port, the iSNS port default value of 3205 can be changed on this page as well.
   c. Click **OK**.
      A pop-up window shows the status and success/failure of the process. If there are missed registrations, see Update iSNS Registration on page 87.

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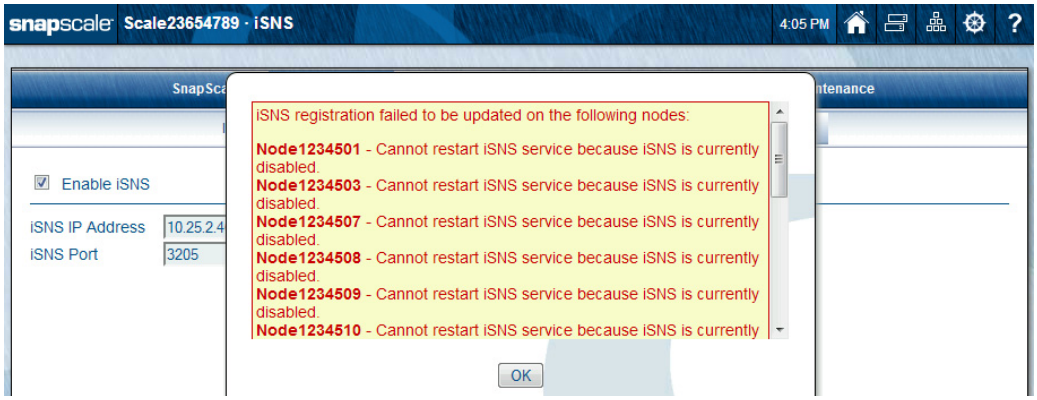
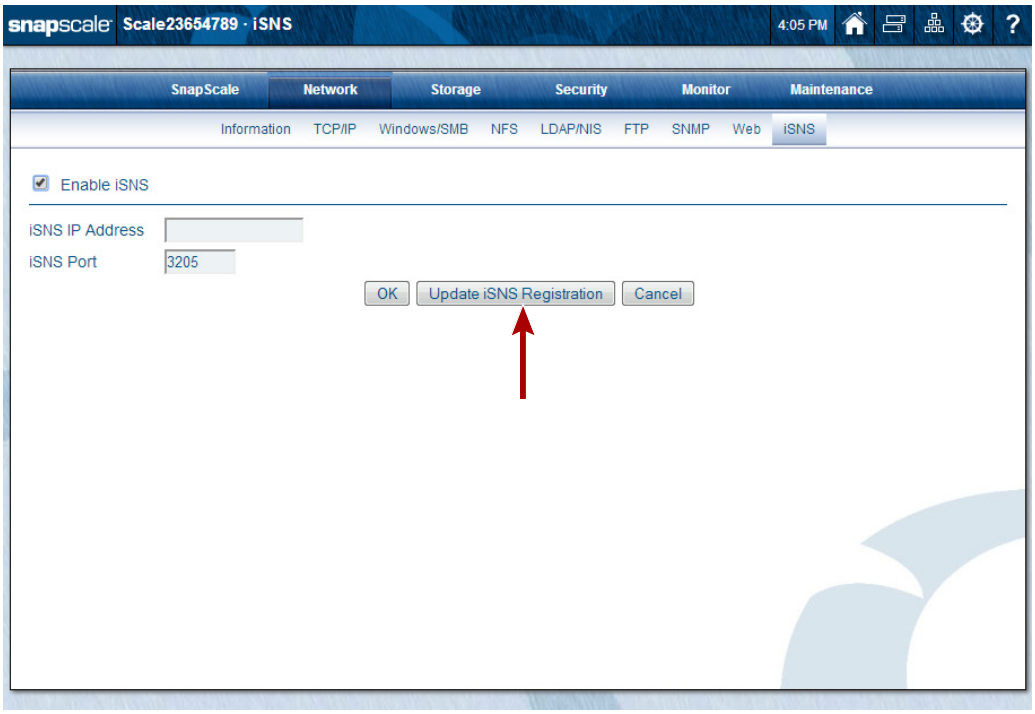


3. Configure the **iSCSI initiator** to discover iSCSI targets via the iSNS server.

NOTE: After you have completed this procedure, all the iSCSI targets on the SnapScale cluster automatically appear in the Microsoft Initiators target list.

Update iSNS Registration

Once iSNS is enabled, the **Update iSNS Registration** button is shown. It can be used to update any missed registrations that might occur.



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Storage Options

From the storage default page (**Storage Settings**), you can access and configure the storage options for your SnapScale cluster including nodes and drives.

Topics in Storage Options:

- Peer Sets
- Volumes
- Quotas
- Snapshots
- iSCSI Disks
- Data Replication
- Nodes
- Disks

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Peer Sets

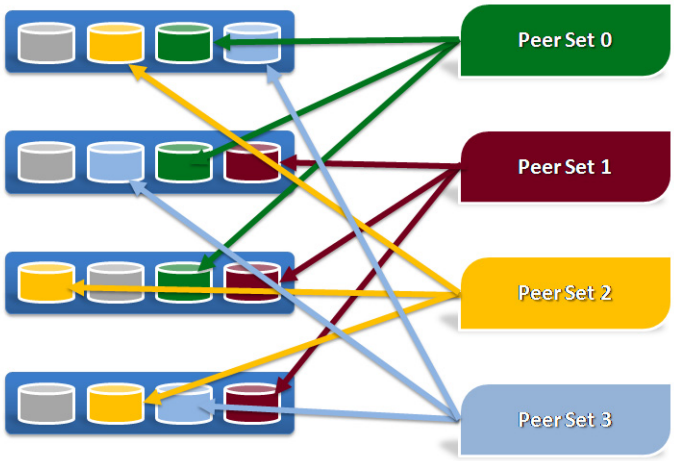
In a cluster, a node is a file server working in tandem with other nodes. The drives on every node are grouped into peer sets or hot spares. Each peer set contains two or three drives, depending on the Data Protection Level selected, that mirror the same data. Data Protection Level 1 uses two drives while Data Protection Level 2 uses three drives. To ensure availability, each drive in a peer set resides in a different node.

SnapScale aggregates all the storage on the peer sets in the cluster to form a unified data storage space for network client access. Data access is transparent between the cluster storage space and the peer sets so that users never directly access the peer sets.

When you create a cluster or add new nodes to an existing cluster, SnapScale automatically creates peer sets with the available drives. By distributing peer set members throughout the cluster, the system ensures that content is protected from failure of either individual drives or entire nodes. When they are created, peer sets are assigned a unique peer set ID.

Nodes can be added to expand cluster storage at any time. Based on the configuration settings, the additional drives are either used to create more peer sets or left as hot spares. Nodes can be removed from a cluster for replacement with a new node, and the drives in the replacement node are automatically synchronized with the existing peer sets.

On a four-node cluster configured for Data Protection Level 2, four hot spares, and four drives per node, the peer set formation might look something like this:



Each peer set has members on three different nodes, shown as peer set 0, 1, 2, and 3. Hot spares are automatically distributed throughout the cluster in order to replace any failed peer set member. When a peer set member fails, a hot spare is assigned from a node on which the peer set does not already have an active member.

The example above uses Data Protection Level 2, which means that each peer set contains three members, and as a result all data is replicated three times. The cluster can also be configured for Data Protection Level 1, in which case the distribution of two-member peer sets would be different. The system automatically determines which drives are used to form each peer set; you cannot choose them.

NOTE: The Data Protection Level can be decreased from 2 to 1 to increase cluster storage, but cannot be increased from 1 to 2 once the cluster is created.

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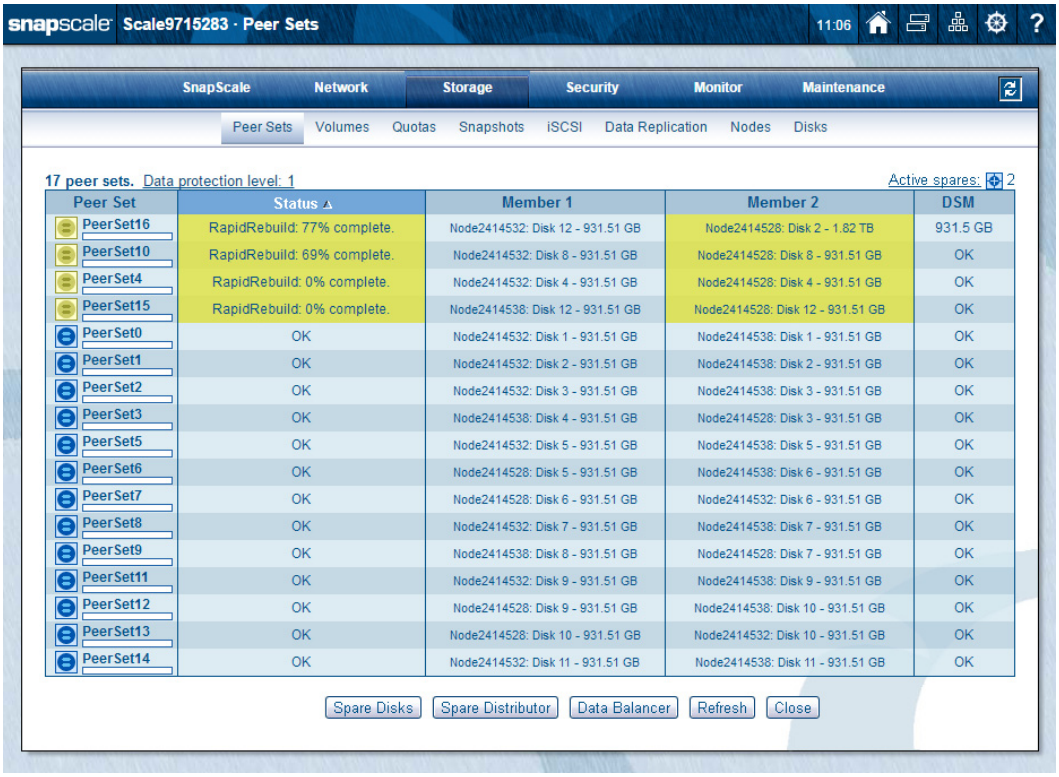
Peer Sets and Recovery

Though data on peer sets is served indirectly by the unified cluster storage space, access to files stored on a given peer set is dependent on the health of that peer set. When a drive in a peer set fails, data is served from the remaining peer set member drives. If there is a spare reserved for the cluster that does not exist on the same node as another active member of the peer set and is not smaller than other members, the peer set can claim the drive and rebuild the data (using the integrated RapidRebuild feature) onto that spare without administrator intervention.



If a peer set is missing a drive (failed or removed) but at least one other drive is available, the peer set continues to be accessible but in degraded mode. This table shows the different peer set statuses:

Peer Set Status	Failure Type	Data Availability
OK	The peer set drives are healthy and connected.	Data is fully available for read and write.
RapidRebuild	Available spare is used to rebuild the peer set using RapidRebuild.	Data is fully available for read and write.
Degraded	One drive missing from the peer set	Data is fully available for read and write.
Degraded – Cannot repair; no spares	The peer set cannot be repaired because there are no spare drives.	Data is fully available for read and write.
Degraded – Cannot repair; spares too small	The peer set cannot be repaired because all eligible spares are too small.	Data is fully available for read and write.

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Peer Set Status	Failure Type	Data Availability
Degraded – Cannot repair; spares on same node	The peer set cannot be repaired because the only eligible spares are located on the same node as the missing member of the peer set.	Data is fully available for read and write.
Failed	All drives in peer set have failed.	No availability. Contact Overland Support.
Initializing	The peer set is being created or initialized.	Data is not yet available.
Inconsistent	The peer set has more members than the Data Protection Level requires.	Contact Overland Support.

Peer Set Utilization

Each file's data is spread across multiple peer sets, and the cluster automatically distributes data for different files throughout the peer sets in the cluster. Metadata for files and directories is independently distributed among different peer sets using a hash algorithm for optimum performance and protection.

Peer Set Basics

New drives are initially configured automatically as spare drives. Subsequently, if enough spare drives exist on different nodes to construct new peer sets but still satisfy the spare count setting, the SnapScale automatically creates new peer sets and expand cluster storage space.

Drives in a cluster do not all need to have the same capacity, but drives in a given peer set should have the same capacity or space is wasted on the larger drives.

The following points must be observed in regards to drives used in the cluster:

- The drives in a cluster must all be the same type of drive (such as SAS) and the same rotational speed.
- The storage capacity of a peer set is limited to the smallest capacity drive in the peer set.

In case of peer set drive failure, RAINcloudOS continues to serve data reads and writes to that peer set from another member of the peer set as long as the peer set is not offline. If clients are currently using data on the peer set, it continues to operate as-is.

Data Protection Level

The Data Protection Level specifies how many node failures the cluster can support (1 or 2) without a loss of data. A Data Protection Level of 2 offers higher data protection but uses more disk space. A Data Protection Level of 1 uses 2 drives per peer set while a Data Protection Level of 2 uses 3 drives per peer set.

IMPORTANT: The cluster must maintain a majority of nodes (for example, 2 of 3 nodes, 3 of 4 nodes, 3 of 5 nodes, 5 of 9 nodes, etc.) in order to continue serving data.

Once the SnapScale cluster is created, the data protection level can only be decreased from 2 to 1. It cannot be increased from 1 to 2.

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Hot Spares

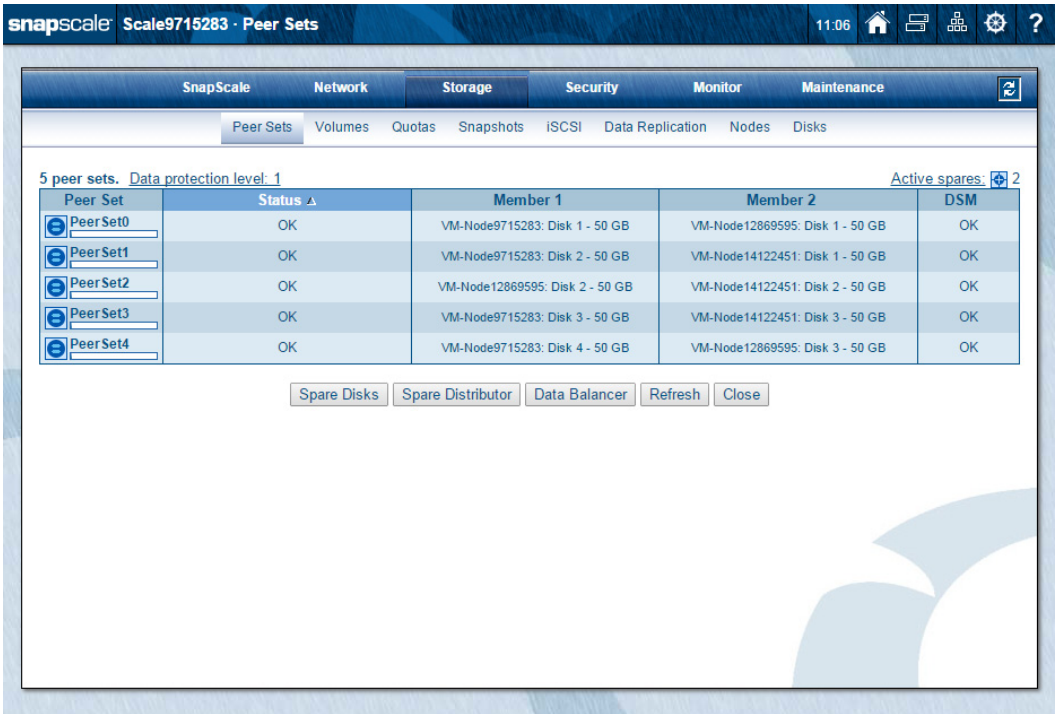
Each node can have a number of hot spares in the event of a drive failure. The total number of hot spares for the cluster is user selectable. A suggested number of hot spares for various node sizes is provided. If a peer set member drive fails, data from a healthy peer set drive on another node is re-synced onto an available spare on any node that doesn't have another active member of that peer set, and the spare then becomes a member of that peer set.

Drives added to nodes as additions or as replacements to failed drives are automatically configured as spares. If enough spares exist across different nodes to satisfy the Data Protection Level and the spare drives count, the cluster automatically creates a new peer set out of available spare drives.

Snapshot Limitations

- All snapshots are deleted when:
  - New peer sets are automatically created when new drives are installed.
  - One or more new nodes are added to a cluster.
  - If a complete peer set fails.
- A Snapshot may be deleted if:
  - Any peer set member drive runs out of snapshot space.
  - A second member of a peer set (containing *unique* snapshot data) fails, even though the main file system data may still be healthy.

Peer Sets Page



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The following table details the items listed on the **Peer Sets** page:

Option	Description
# Peer Sets *(above table, left)*	Displays the total number (#) of peer sets configured and shown in the table.
Data Protection Level *(above table, left)*	Displays the cluster-wide protection level (1 or 2) and links to the **SnapScale Properties** page.
Active Spare Disks *(above table, right)*	Shows the number of drives allocated as spares. They are broken out to show the status of spares and the number of spares with that status. • **OK** – A blue icon ( ) indicates spares are active and available. • **Too Small** – A yellow icon ( ) indicates spares are too small to be used in some of the peer sets. A yellow icon with an "X" ( ) indicates a spare is too small to use with any available peer set. • **Failed** – A red icon ( ) indicates spares have failed. Clicking this link opens the **Spare Disks** page. This is the same as clicking the **Spare Disks** button at the bottom of the page.
Peer Set	Lists the peer set name and shows a usage bar. Position the cursor over a name (or usage bar) to show the percentage and actual amount of storage space used.
Status	Shows the current status. Refer to Peer Sets and Recovery on page 90 for complete details.
Member 1	Shows the node, drive/slot number, and the size of the first member of this peer set. Click to view the **Disks** page and identify the specific disk drive's location.
Member 2	Shows the node, drive/slot number, and the size of the second member of this peer set. Click to view the **Disks** page and identify the specific disk drive's location.
Member 3 *(if shown)*	Shows the node, drive/slot number, and the size of the third member of this peer set when set to **Data Protection Level 2**. Click to view the **Disks** page and identify the specific disk drive's location.
DSM *(Drive Size Mismatch)*	Shows either **OK** or mismatch size difference. If the member drives are not the exact same size, then capacity is limited to the smallest drive in the peer set, and extra space on larger drives is wasted. In this case, the size displayed reflects the unutilized capacity of the peer set. Position the cursor over a name (or usage bar) to show the unutilized capacity of the peer set.
Spare Disks *(button)*	Launches the **Spare Disks** page. See Spare Disks Page on page 94.
Spare Distributor *(button)*	Launches the **Spare Distributor** page. See Spare Distributor on page 95.
Data Balancer *(button)*	Launches the **Data Balancer** page. See Data Balancer on page 97.
Refresh (*button)*	Refreshes the page when clicked.
Close *(button)*	Closes this page and returns to the **Storage Settings** page.

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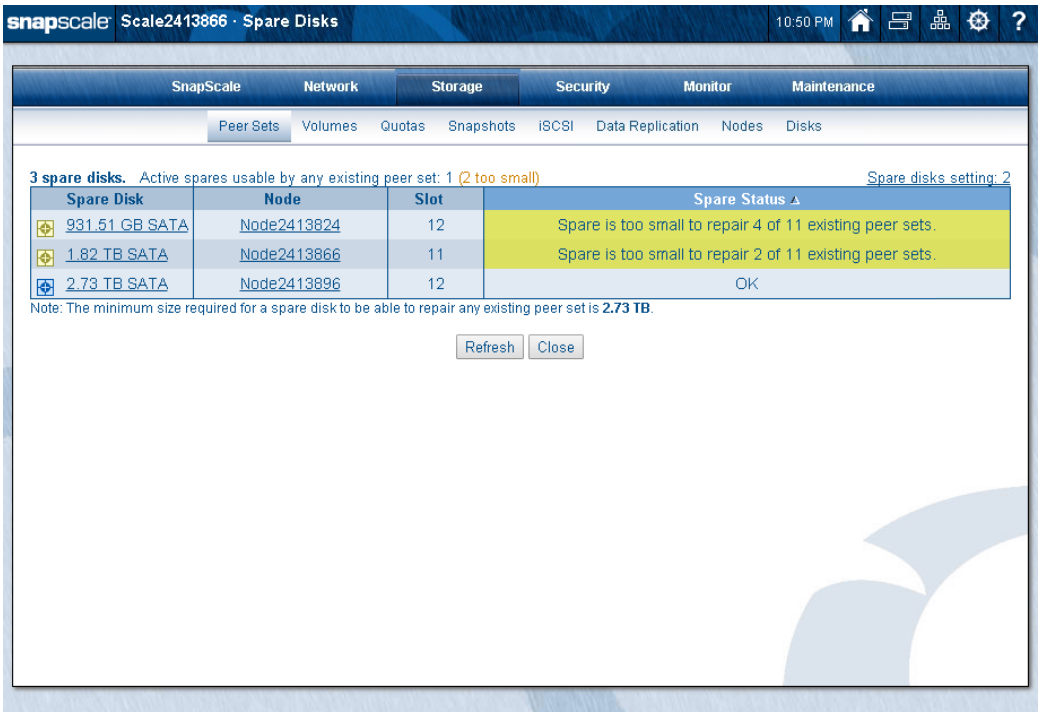
Spare Disks Page

When you click the **Spare Disks** button (or the **Active spares** link on the upper right above the table on the **Peer Sets** page), the **Spare Disks** page opens.



The following table details the items listed on the **Spare Disks** page:

Option	Description
# Spare Disks *(above table, left)*	Displays the total number (#) of spare drives configured and shown in the table.
Active Spares *(above table, left)*	Displays the cluster-wide number of spares usable by all peer sets. If applicable, issues are also noted in parenthesis.
Spare Disks Setting *(above table, right)*	Displays the quantity set for spare drives. Clicking this link takes you to the **SnapScale Properties** page to edit the setting. **NOTE:** This setting may not equal the number of spare drives currently displayed if there are fewer spare drives available than the setting specifies, or if there is an insufficient number of extra drives to automatically create a new peer set.
Spare Disk	Displays disk drive capacity and type. Click a name in the column to open the **Disks** page and identify a specific disk drive's location.
Node	Displays the name of the node in which the drive resides. Click a name in the column to open the **Node Properties** page for the specific node.
Slot	Displays the slot number of the listed node where this spare drive is located.

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Option	Description
Spare Status	Shows the current status: • **OK** – Spare drive is healthy and can be used by all peer sets. • **Spare Too Small** – Spare is too small to either repair any existing peer sets or repair *n* existing peer sets. • **Failed** – Spare drive has failed.
Note *(under table)*	A note under the table details the minimum size for a spare disk to repair ANY existing peer set.
Refresh *(button)*	Refreshes the page when clicked.
Close *(button)*	Closes this page and returns to the main **Peer Sets** page.

Spare Distributor

Spare Distributor (formerly the Spare Disk Balancer) evenly redistributes spares and peer set members across the cluster nodes. Maintaining a balance of spare drives helps ensure that spares are available if a peer set member should fail.

Spare Distributor Usage

When the cluster detects an uneven distribution of spare drives, an alert banner is displayed in the Web Management Interface and the **Spare Distributor** page is enabled.

NOTE: You can click **Later** to turn off the alert for 24 hours or **Hide** to dismiss the alert.

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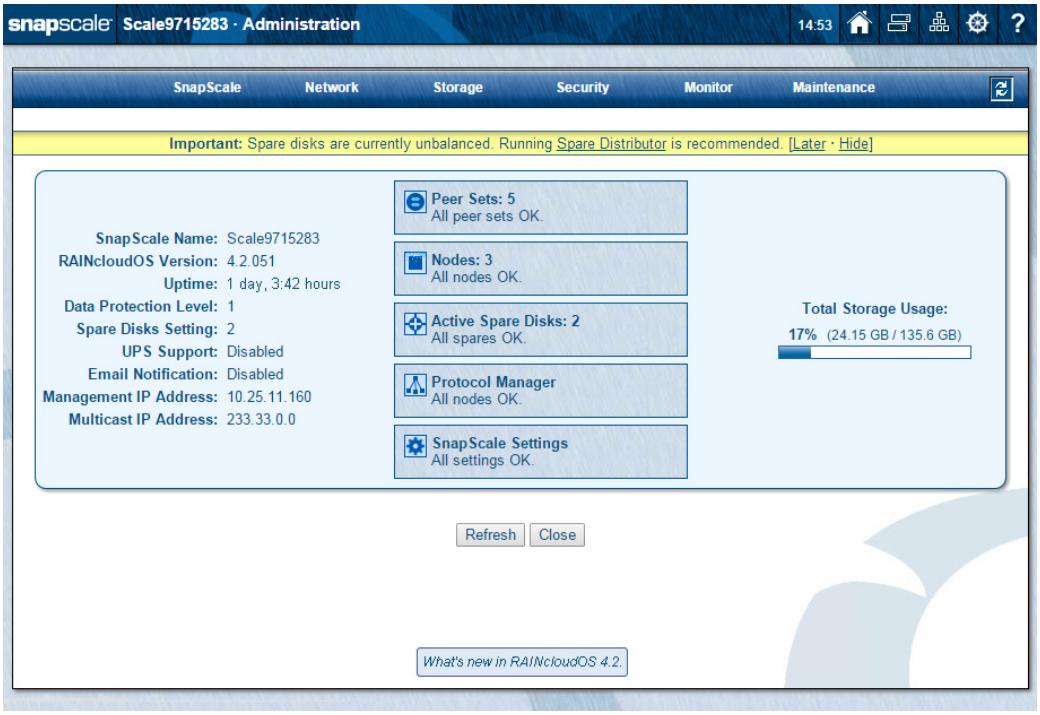
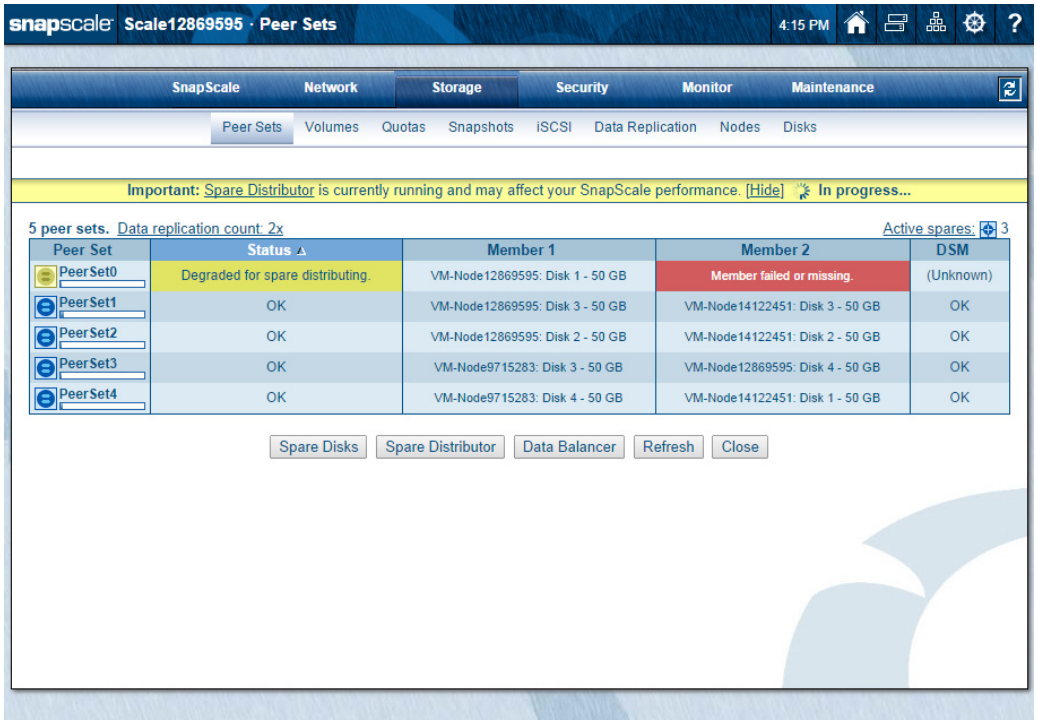


1. Go to **Storage > Peer Sets > Spare Distributor**.

   If responding to an alert, you can click the Spare Distributor link in the alert to go directly to the page.

2. Click the **Start Spare Distributor** button to start the process.

   The Spare Distributor redistributes spares and peer set members across the cluster nodes to provide spares on different nodes for better spare availability. Go to the **Peer Sets** page to view the status of the balancer.



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NOTE: If needed, click **Stop Spare Distributor** on the **Spare Distributor** page to stop the operation. Any peer sets currently degraded and being rebuilt by the Spare Distributor will continue with the rebuilding process until completed.

Data Balancer

Data Balancer (formerly Capacity Balancer) redistributes peer set utilization by moving data from more to less heavily used peer sets. Maintaining a balance of peer set capacity improves performance by assuring a balance of read and write traffic across all peer sets.

Data Balancer Usage

If the peer set data utilization becomes unbalanced, an alert banner is displayed in the Web Management Interface.

NOTE: You can click **Later** to turn off the alert for 24 hours or **Hide** to dismiss the alert.

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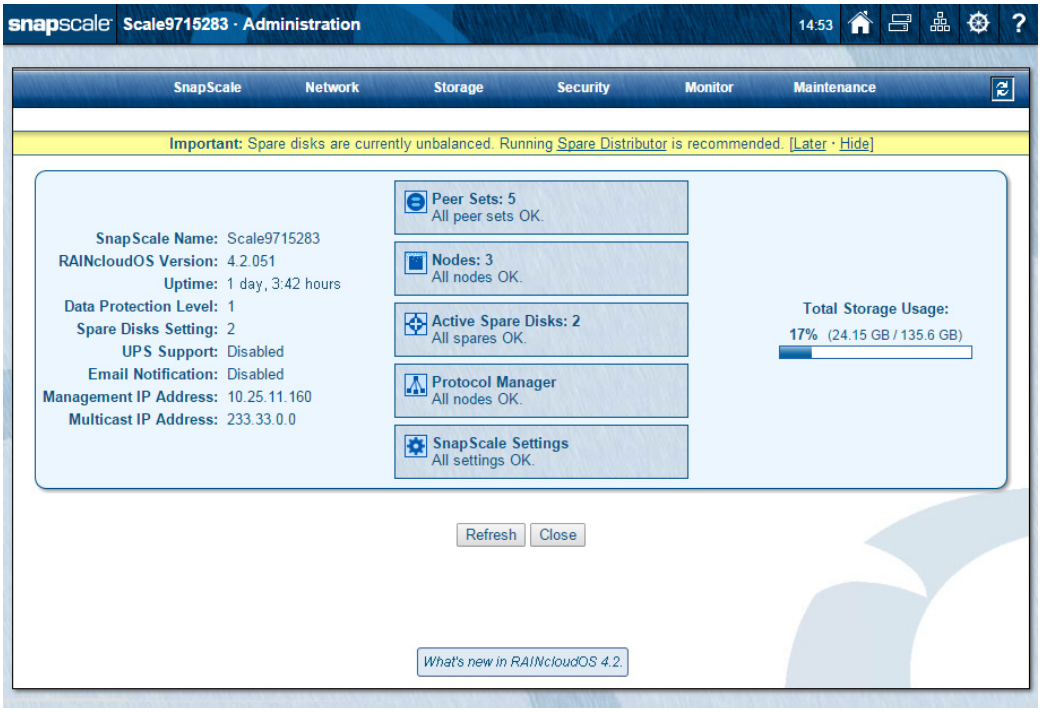
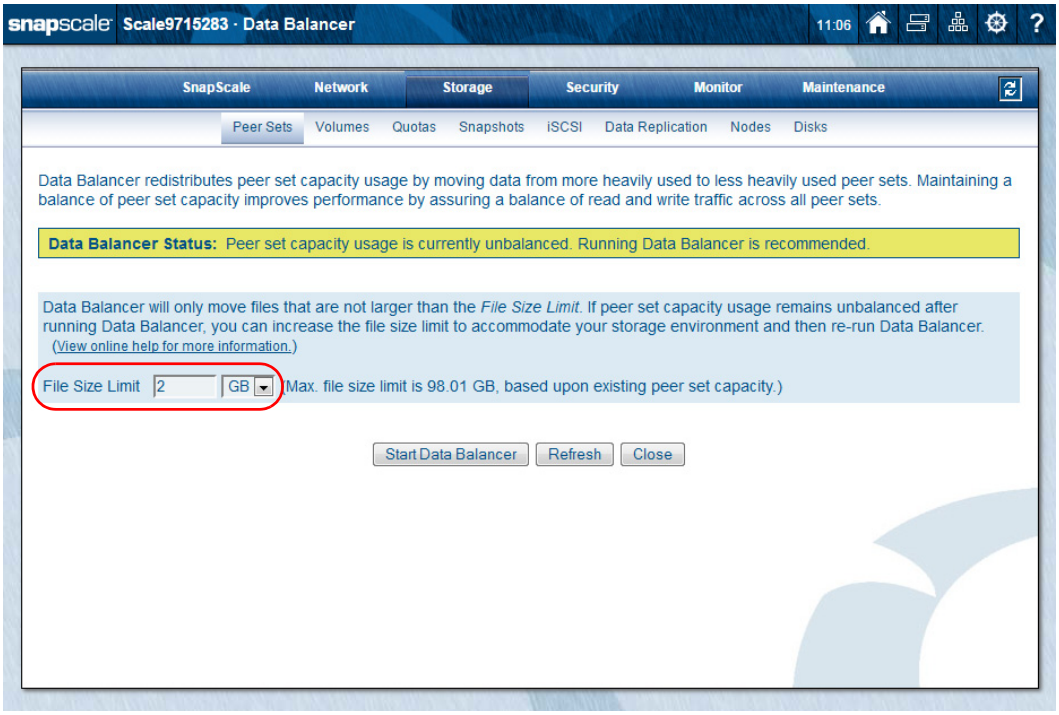


1. Go to **Storage > Peer Sets > Data Balancer**.

   If responding to an alert, you can click the **Data Balancer** link in the alert to go directly to the page.

2. Review the default **File Size Limit** and change it, if needed.



The **File Size Limit** represents the maximum size of a file the Data Balancer will attempt to move to rebalance peer set consumption. The default is 2GB.

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3. Click the **Start Data Balancer** button to start the process.

   The Data Balancer moves files between peer sets to improve performance and usability. A table is displayed showing that the Data Balancer is running and the percent completed. If needed, click **Stop Data Balancer** to end the operation.

NOTE: The cluster continues to be available for client access during the process. The Data Balancer will skip any file that is currently opened by clients, and will abort moving a file if a client opens it during the move.

An alert banner is displayed on any Administration-level page showing the progress.

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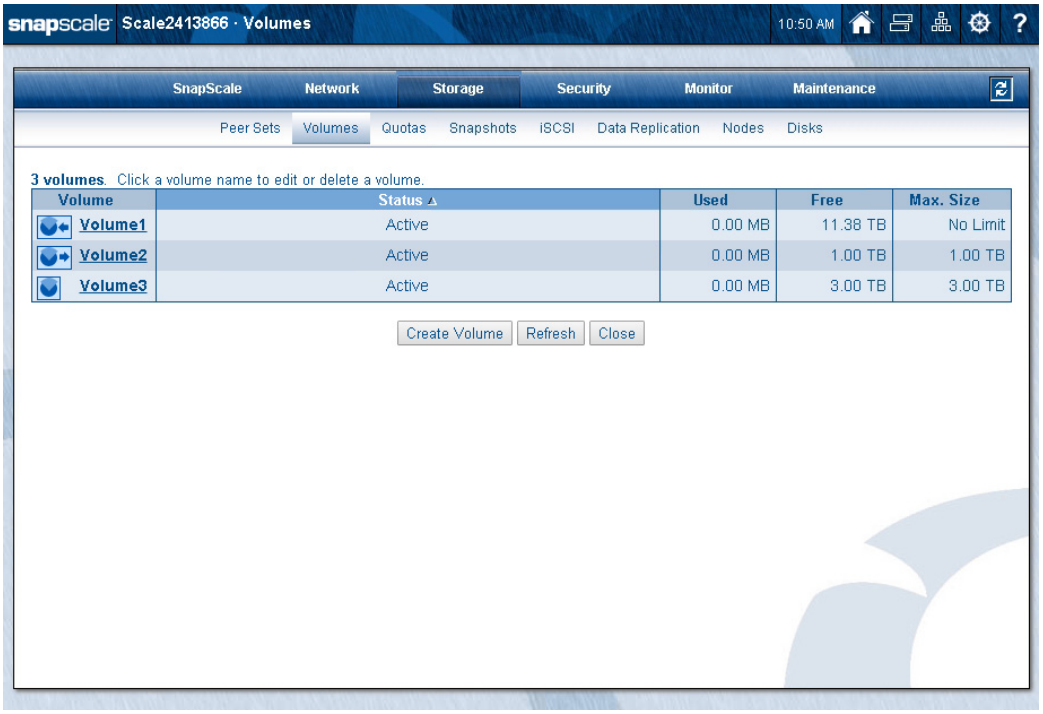
Volumes

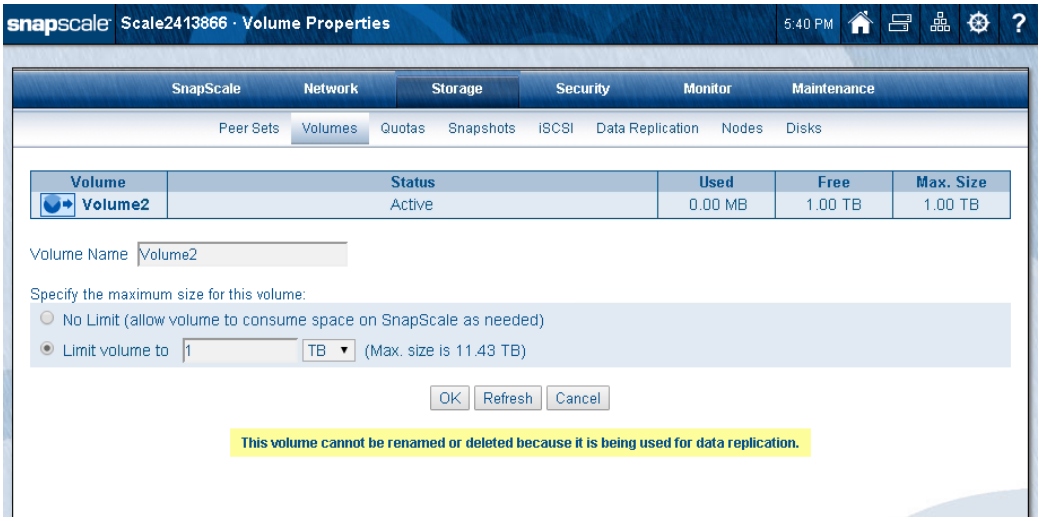
Use the **Volumes** page (**Storage > Volumes**) to manage the volumes that have been created.



From this page, you can:

- Create a new volume.
- Edit or delete an existing volume (by clicking the name to access the **Properties** page).
- Determine which volumes are used as data replication targets ( ), data replication sources ( ), and which are still available for either ( ).

NOTE: Volumes used as data replication sources or targets cannot be edited and cannot be renamed. Volumes used as data replication targets are read-only.



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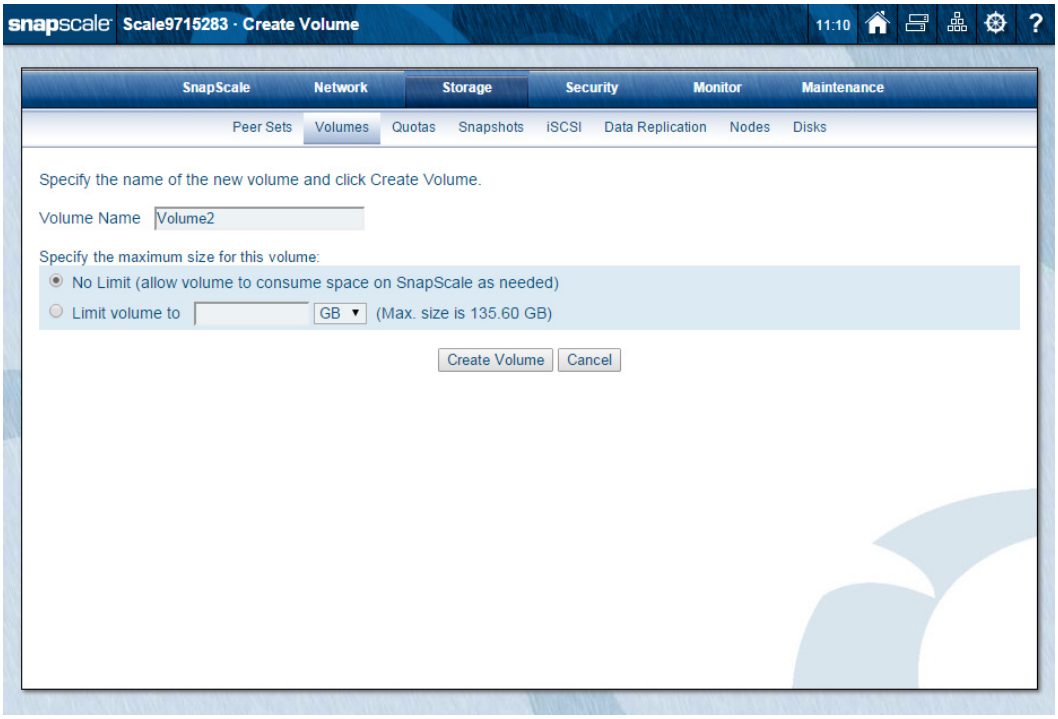
All the peer sets are unified into a single cluster storage space that can be accessed from any node thus providing multiple access points. One or more volumes can be created to provision the cluster storage:

- All volumes share the same cluster storage space and are thinly provisioned to provide better utilization rates of the space.
- Volumes can be configured with a maximum size setting (quota) to prevent one volume from consuming too much shared cluster storage space. See Create Volumes on page 101.

Create Volumes

By default, the full cluster storage space is accessible as one large storage space. However, the storage space can be divided into multiple volumes in order to thinly provision space for specific projects, departments, or roles. Volumes can be constrained to use no more than a certain amount of space available in the clustered storage space.

1. At **Storage > Volumes**, click the **Create Volume** button to open the **Create Volume** page.



2. Make any necessary changes to the **options**.
   - It is recommended to enter a **Volume Name** to easily identify the specific volume.
   - If desired, keep the default of **No Limit** to allow the volume to consume an unlimited amount of cluster storage.
   - Otherwise, enter a **size**, changing the measurement units if needed.

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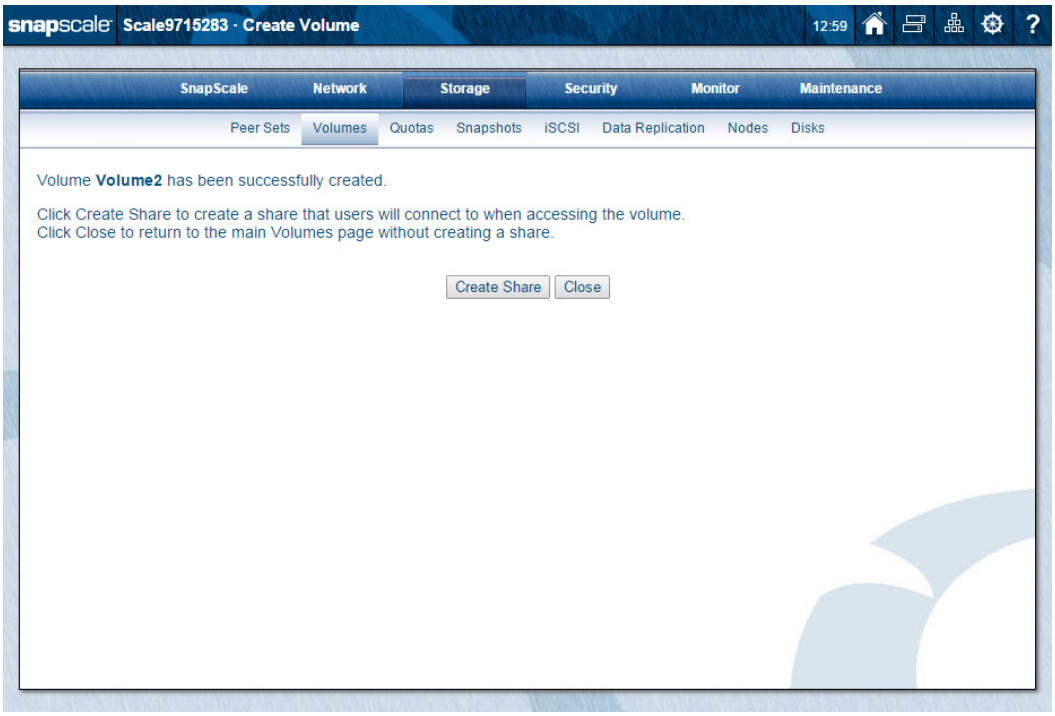
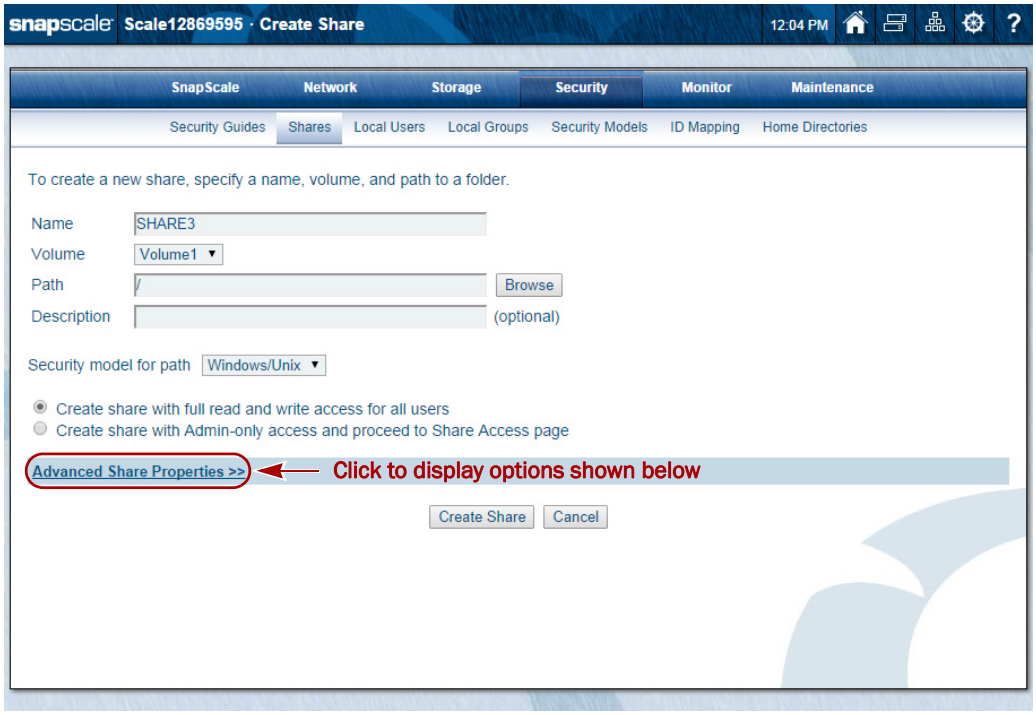
3. Click the **Create Volume** button again.
   After a few moments, a confirmation page is shown:



4. At the confirmation page, click **Create Share** to create a share pointing to this volume (takes you to the **Shares** page).



NOTE: The snapshot options at the bottom are only shown if snapshot space has been reserved.

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5. Enter the appropriate **data** and select the necessary options, then click **Create Share**.

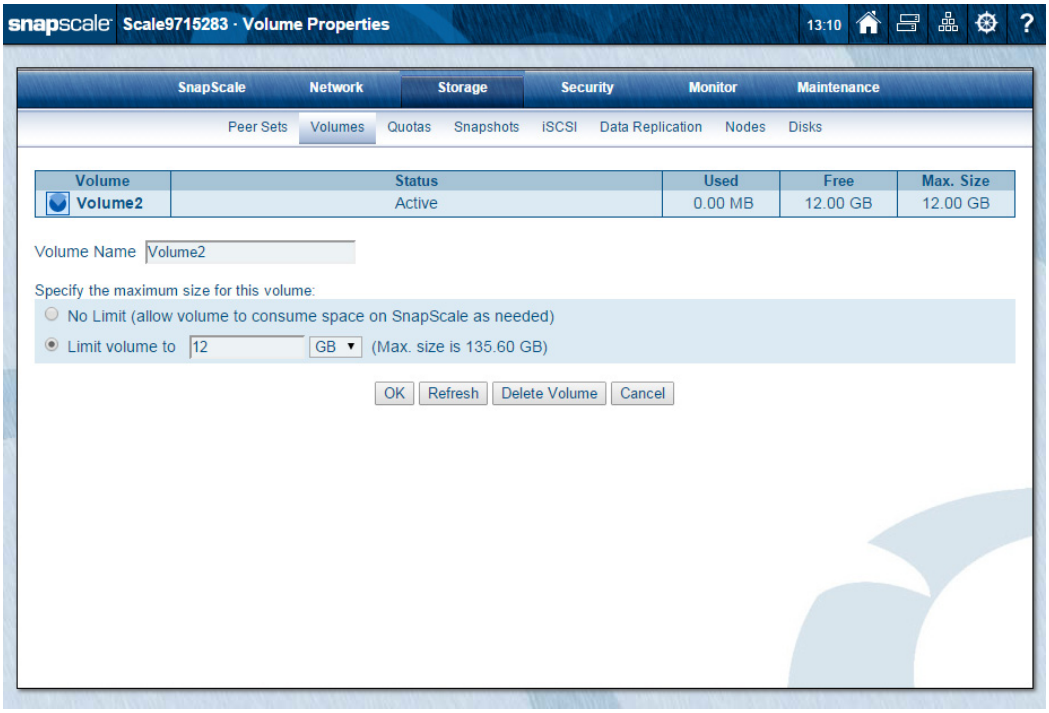
   Additional options can be accessed by clicking the **Advanced Share Properties** link at the bottom. See Shares on page 163 for complete details.

   When share creation is completed, the **Security > Shares** page is shown with the new share listed in the table.

6. Click **Close** to go to the **Security** menu page.

Edit Volume Properties

By clicking a volume's name on the **Storage > Volumes** page, details of that particular volume are shown on the **Volume Properties** page.



From this secondary page, you can:

- Change the volume name.
- Set maximum volume size (specific limit or no limit).
- Delete the entire volume.

NOTE: Volumes used as data replication sources or targets cannot be edited and cannot be renamed. Volumes used as data replication targets are read-only.

Rename a Volume

In the **Volume Name** field, enter a unique volume name of 32 alphanumeric characters and spaces, then click **OK**.

Specify Maximum Volume Size

There are two options controlling the maximum size of a volume:

- **No Limit** – This is the recommended option because it allows the volume to consume space as needed.

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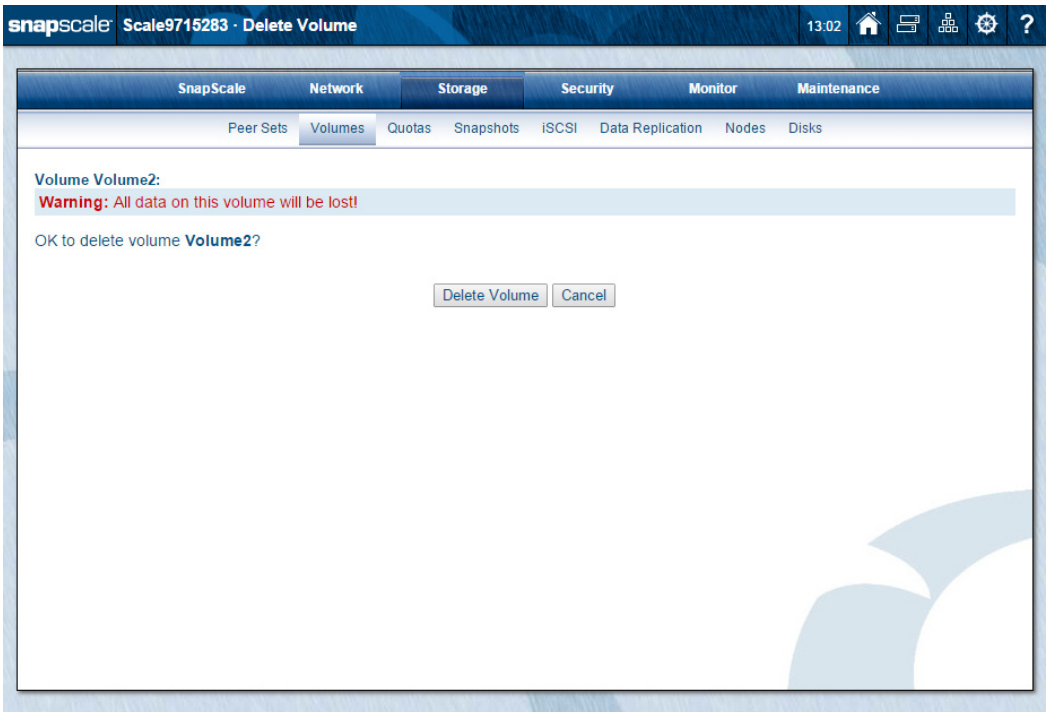
- **Limit Volume to** – Establish a maximum volume size limit by entering the amount and selecting a unit of measure (MB, GB, TB, or PB). The volume then grows in size until it reaches its maximum. If email notification has been enabled, alerts are sent as the maximum is approached. (To enable email notification, see Email Notification on page 244)

  NOTE: If you reset the maximum size of a volume to less than its current size, the volume is treated as full and no more data can be written to it until the actual space consumed drops below the maximum size again. When done, click **OK**.

Delete Volumes

To delete a volume, at the **Volume Properties** page, click the **Delete Volume** button. At the confirmation page, click the **Delete Volume** button again. You are returned to the **Volumes** page and the volume is deleted in the background.

CAUTION: Deleting a volume deletes all the shares and data on the volume.



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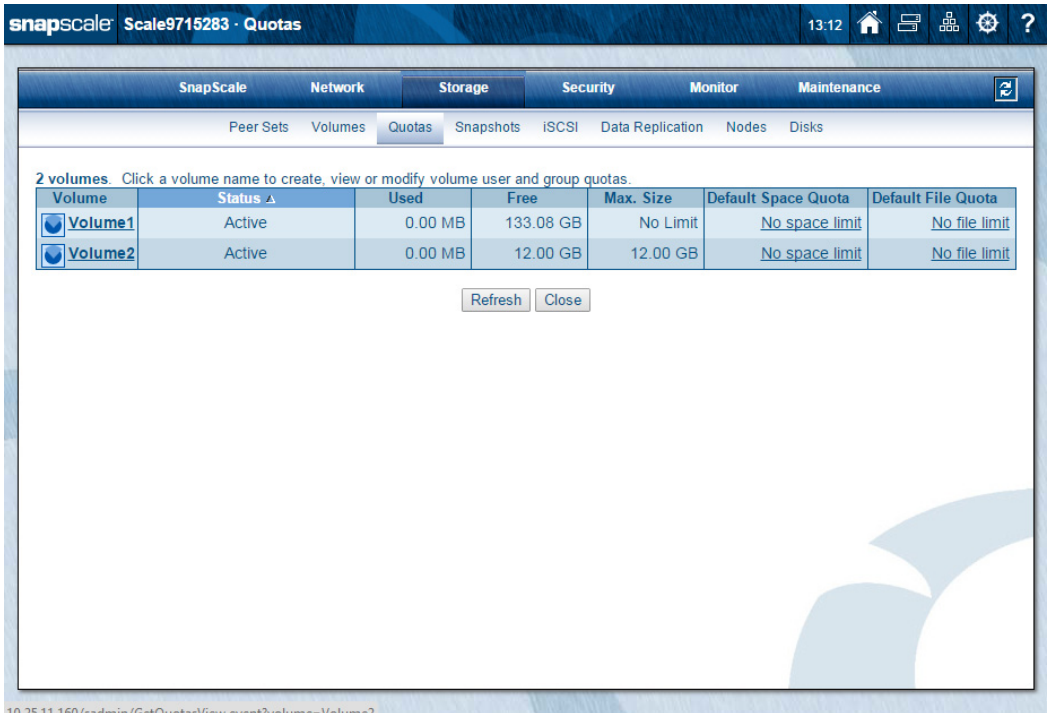
Quotas

Quotas are configured by accessing the **Storage > Quotas** page of the Web Management Interface. This default page shows all volumes on the cluster and their space/file quotas.



Assigning quotas ensures that no one user or group consumes a disproportionate amount of volume capacity measured by either space consumed or number of files created. The **Quotas** page also displays space consumed and files created by each user or LDAP/NIS group regardless of whether a quota is applied to them, allowing for precise tracking of usage patterns. You can set individual quotas for any LDAP, NIS, Windows domain, or local user known to the SnapScale. Group quotas are available only for LDAP/NIS groups.

For users and groups, there are no pre-assigned default quotas on the SnapScale. When quotas are assigned, you can assign a default space or file quota for all users, or allow all users to have unlimited space on the volume. Unless you assign individual user or group quotas, all users and groups will receive the default quota.

In calculating usage, the SnapScale looks at all the files on a volume that are owned by a particular user and adds up the file sizes. Every file is owned by the user who created the file and by the primary group to which the user belongs. When files are copied to the cluster, their size and count are applied against both the applicable user and LDAP/NIS group quotas.

Default Quotas

On the main **Quotas** page (**Storage > Quotas**), the last two columns of the table show the default quotas for disk space and number of files. To change these settings, click the number (or no space/file limit text) in the row under the default space or file quota column. A page is shown for the appropriate quota type options:

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Default Space Quota Page

To make changes, choose to either use the entire disk or a space of a specific size. For a specific size, enter the maximum amount and select the units. Click **OK** to accept.

Default File Quota Page

To make changes, choose either to have no limit or a specific number of files. For a specific limit, enter the maximum number of files. Click **OK** to accept.

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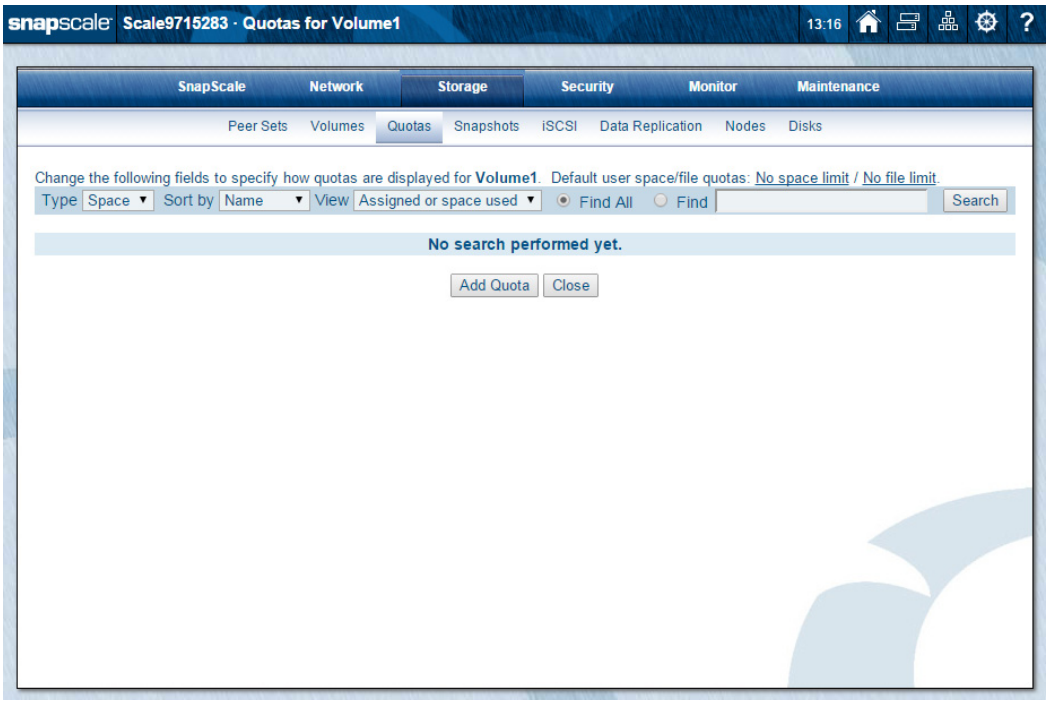
Quotas for Volume Page

From the **Quotas** page, you can create, view, or modify user and group quotas for a volume by clicking the volume's name in the **Volume** column on the far left. The **Quotas for Volume** page is displayed:



The page shows the available search and view options for the selected volume and the **Default user space/file quotas**. The two defaults shown can be either an amount or a text string:

- **An amount** – the default quota size or file count assigned to users in that volume who do not have a specific quota assigned to them.
- **A text string** – the text strings **No space limit** and/or **No file limit** are displayed when quotas are enabled but the default space size and/or file count of no limits are configured for users in that volume. This means the users can consume the entire disk, or as many files as desired, respectively.

The space and file count limits also double as links to access the Web Management Interface pages where default space and file quotas can be configured.

Search for Quotas or Space Consumed by a User or LDAP/NIS Group

To narrow down the list shown on this page or find a specific user or LDAP/NIS group, first use the search bar just under **Default user space/file quotas**.

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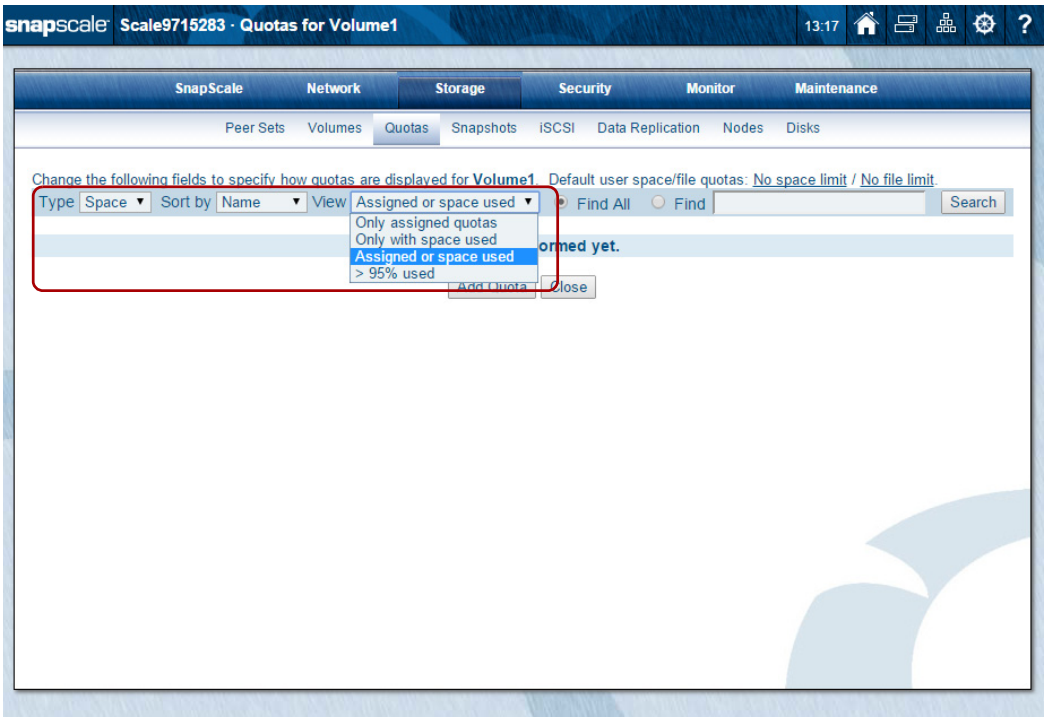
1. Select the **Type**, **Sort By**, and **View** parameters.



- **Type** – Choose **Space** or **File**.
- **Sort by** – Select **Name**, **Limit**, **Used**, or **Used (%)**.
- **View** – Choose one of these view options:
  - **Only assigned quotas**
  - **Only with files used / Only with space used** (depends on Type setting)
  - **Assigned or files used**
  - **> 95% used**

2. Select **Find All** or **Find**.

   When entering a search string for **Find**:

   - Returned results will include all users and groups whose name **contains** the string entered.
   - To search a specific Windows or NIS domain, enter the domain name followed by a slash (/) or backslash (\) before the search string.
   - To search only local users and groups, enter "local" followed by a backslash (\) before the search string.

3. Click **Search**.

   A detailed list of users or LDAP/NIS groups that match the parameters is displayed including the quota and space used numbers:

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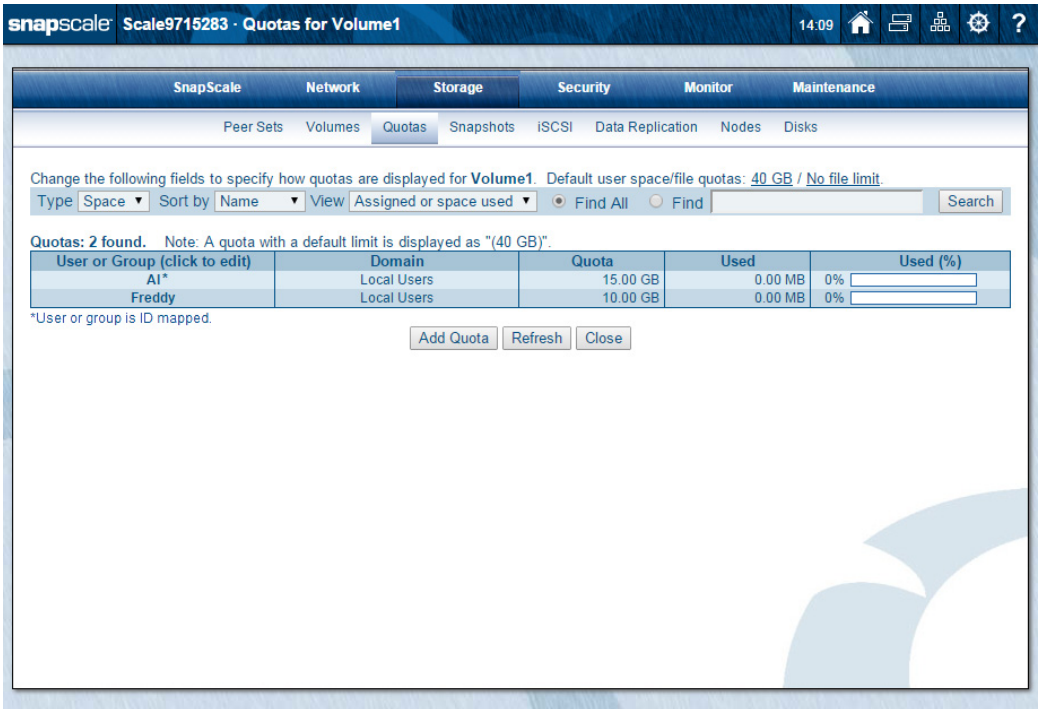

NOTE: The search results returned may be automatically limited. Fine tune your search by using a more specific string to return a shorter list or the name desired.

Parentheses around a quota amount indicates the volume default quota is being used. If the volume's default quota is set to "no limit," then **"(No space limit)"** is displayed. If the volume's default quota is set to an actual value, such as 500GB, then **"(500 GB)"** is displayed.

No parentheses around the quota amount indicates a specific quota has been assigned. If the default quota limit is set to "no limit" but a particular user's or group's quota is set to 750GB, then **"750 GB"** is shown instead of the default **"(no limit)"** quota.

The one exception to this is LDAP/NIS groups. They don't use a volume default quota, so **"no limit"** (without parentheses) is shown.

If Windows domain users or groups have been ID mapped to local, LDAP, or NIS users or groups, the **Quotas** page may display either of the following:

- **ID Mapped User/Group** - The consumption of the current ID-mapped user/group pair is identified by the name of the Windows domain user/group with an asterisk and footnote (for example, a footnote saying ***User or group is ID mapped.**).
- **Unknown UID/GID** - If ID mapping changes are not applied to the file system, consumption (if any) by the former UID/GID of the Windows domain user/group is represented with the UID/GID and the name of the domain user/group in parentheses. Quotas for these unknown UIDs/GIDs cannot be edited.

4. To make **changes**, click the user or LDAP/NIS group name.

   See Edit or Remove Quotas on page 112.

Add Quota Wizard

1. Click the **Volume name** link on the **Quotas** initial page to open the **Quotas for Volume** page for that volume.

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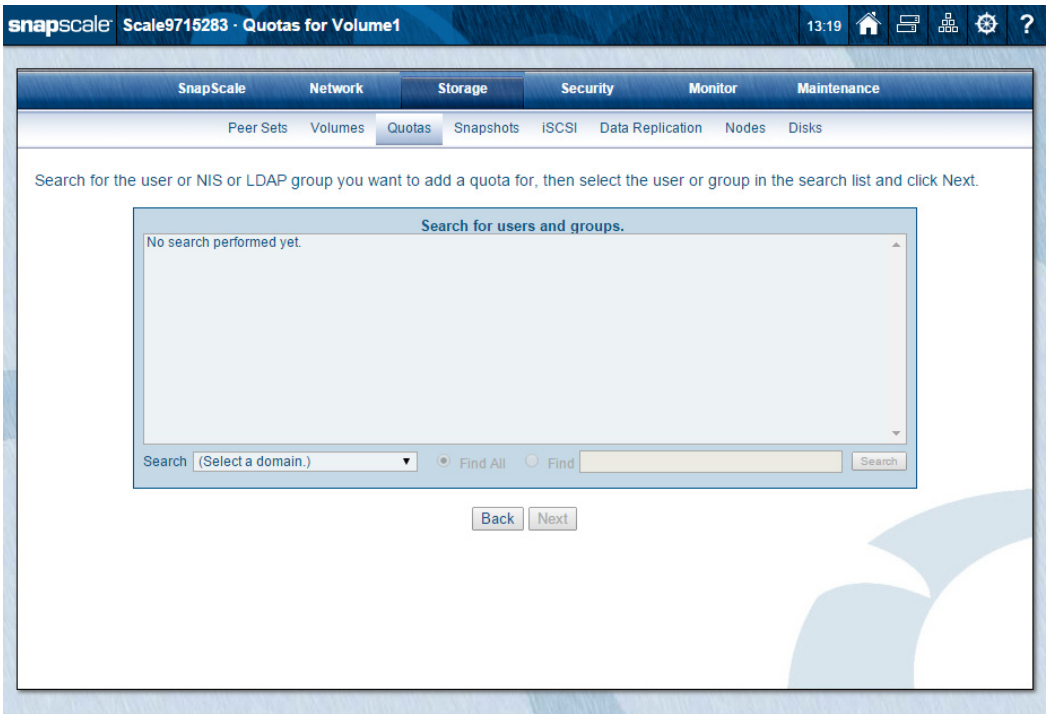
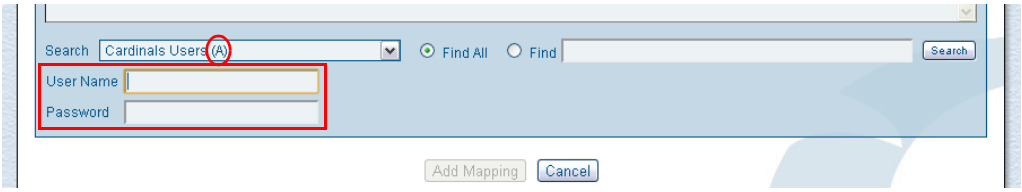
2. Click **Add Quota** to launch the search wizard.



3. To search for a user or LDAP/NIS group, select the local or domain option from the **Search** drop-down list, enter the search string (or select **Find All**), and click **Search**.

NOTE: For domains that require authentication (by showing an "(A)" after the name), after selecting the domain name, enter the User Name and Password for that domain.



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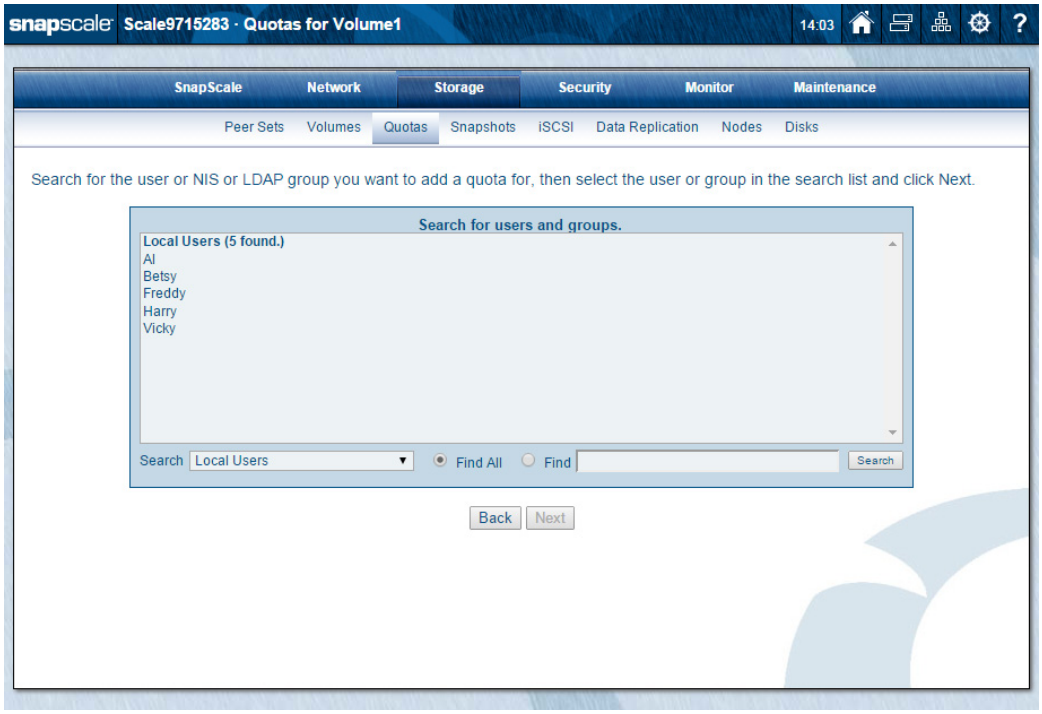
Returned results will include all users and LDAP/NIS groups whose name **begins** with the string entered in the Search field.



Note the following caveats:

- The search results returned may be limited. Fine tune your search by using a more specific string to return the names desired.
- On the rare occasion you need to search for a Windows domain that's not listed ("remote domain"), select a Windows domain from the Search drop-down list through which to search, then enter in the Find box the name of the remote domain, followed by a slash (/) or backslash (\) and the user name for which you are searching (for example, **`remote_domain\user_name`**). After you click Search, another authentication prompt may be presented to authenticate with the remote domain.

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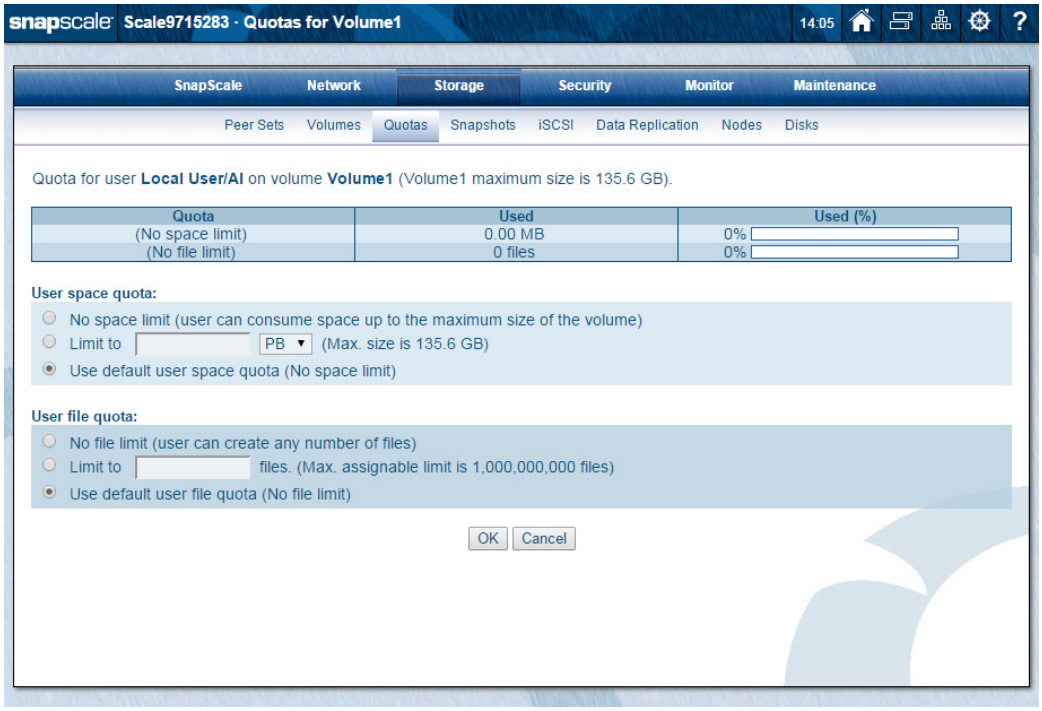
4. From the search results, select the appropriate **user or LDAP/NIS group**, and click **Next** to show the configuration page for that user or group.



5. Select or enter the desired **space and file quota** amounts, and click **OK**.

   NOTE: LDAP/NIS groups do not display the third option for using the default user space or file quota.

Edit or Remove Quotas

NOTE: Any changes override the default volume quota for this user or LDAP/NIS group.

To edit or remove quotas of users or groups that have used space on this volume or have had specific quotas assigned to them from the volume:

1. Click the **Volume name** link on the **Quotas** initial page to open the **Quotas for Volume** page for that volume.
2. If necessary, **search** for a specific user to narrow the list to a more reasonable number.

   See Search for Quotas or Space Consumed by a User or LDAP/NIS Group on page 107.

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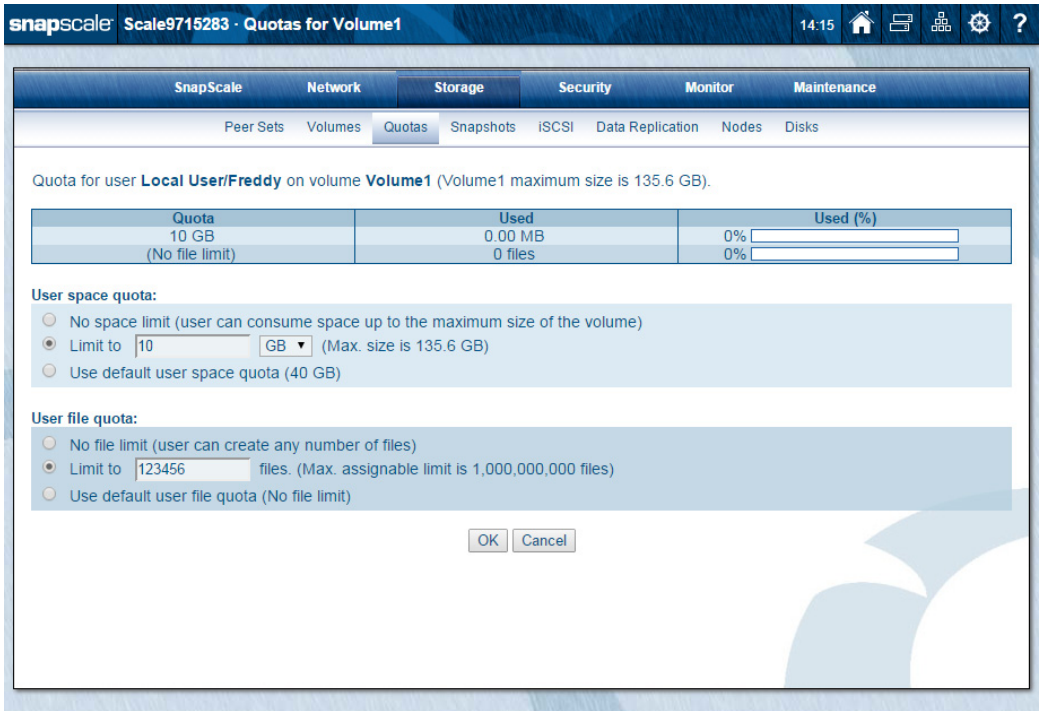
3. To edit or remove the quota, from the search results, select the appropriate **user or LDAP/NIS group** in the left column to open the settings page for that user.



4. Select or enter the new **quota** options:
   - When **editing**, enter a limit or select the default quota options.
   - To **remove** a specific quota limit, set the space or file quotas to no limit.

   NOTE: LDAP/NIS groups do not display the third option for the default space or file quotas.

5. Click **OK**.

Snapshots

A *snapshot* is a consistent, stable, point-in-time image of the cluster storage space that can be backed up independent of activity on the cluster storage. Snapshots can also satisfy short-term backup situations such as recovering a file deleted in error without resorting to tape. Perhaps more importantly, snapshots can be incorporated as a central component of your backup strategy to ensure that all data in every backup operation is internally consistent and that no data is overlooked or skipped.

NOTE: To preserve your cluster configuration and protect your data from loss or corruption, it is critical to schedule backups and snapshots.

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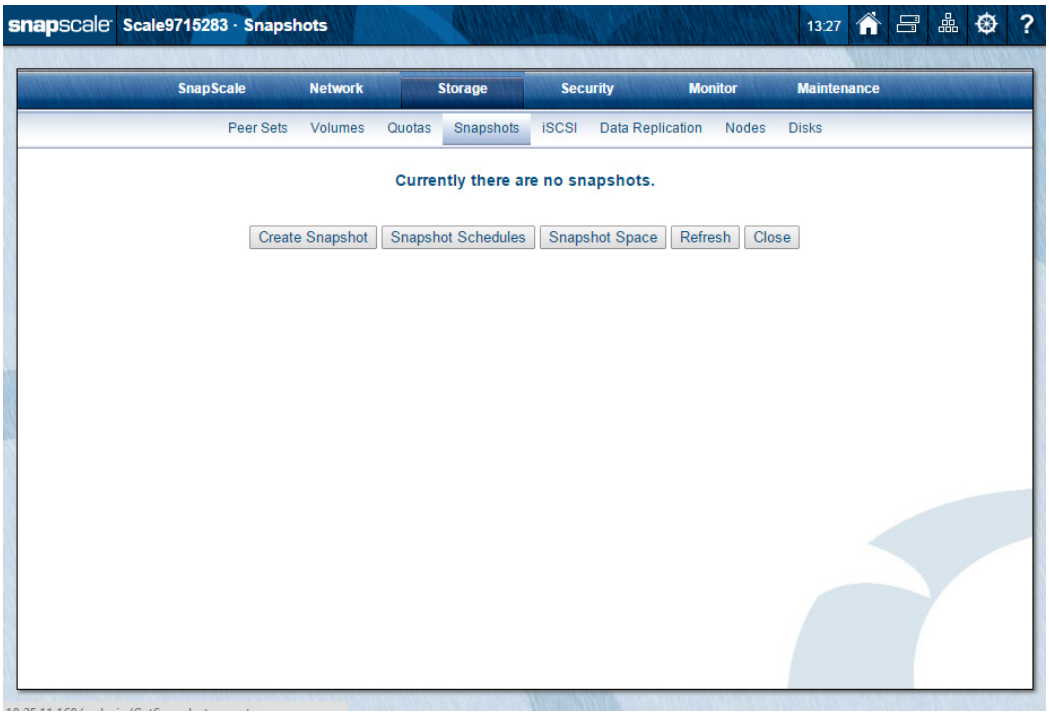
To create or schedule snapshots, navigate to **Storage > Snapshots** in the Web Management Interface:



When working with snapshots, consider the following caveats:

- It is recommended that snapshots be taken when the system is idle or under low data traffic to minimize conflicts.
- Snapshots for the cluster storage space use snapshot space reserved on each peer set member drive. If no space is reserved (by unchecking the option box), snapshots are permanently disabled on the cluster.
- While 1% to 90% of the space can be reserved for snapshots, it is recommended that snapshot space be set to 20% of the cluster storage space during setup. Once set, the snapshot space can only be reduced, never increased.
- Snapshot space reserved from each peer set member drive is not necessarily identical to snapshot space of other drives in the same peer set. (This is most likely to occur if two or more drives in the same peer set have recently failed, even if they've been replaced with spares.) As a result, failure of a drive with unique snapshot data may cause one or more snapshots to be automatically deleted.
- Addition of a peer set to the cluster (including automatic peer set creation using new drives inserted into nodes or the addition of new nodes to the cluster) deletes all existing snapshots.
- Failure of a peer set deletes all snapshots.

Create a Snapshot

Creating a snapshot involves naming, scheduling, and setting the duration of the snapshot. For regular data backup purposes, create a recurring snapshot. A recurring snapshot schedule works like a log file rotation, where a certain number of recent snapshots are automatically generated and retained as long as possible, after which the oldest snapshot is discarded. You can also create individual, one-time-only snapshots as needed.

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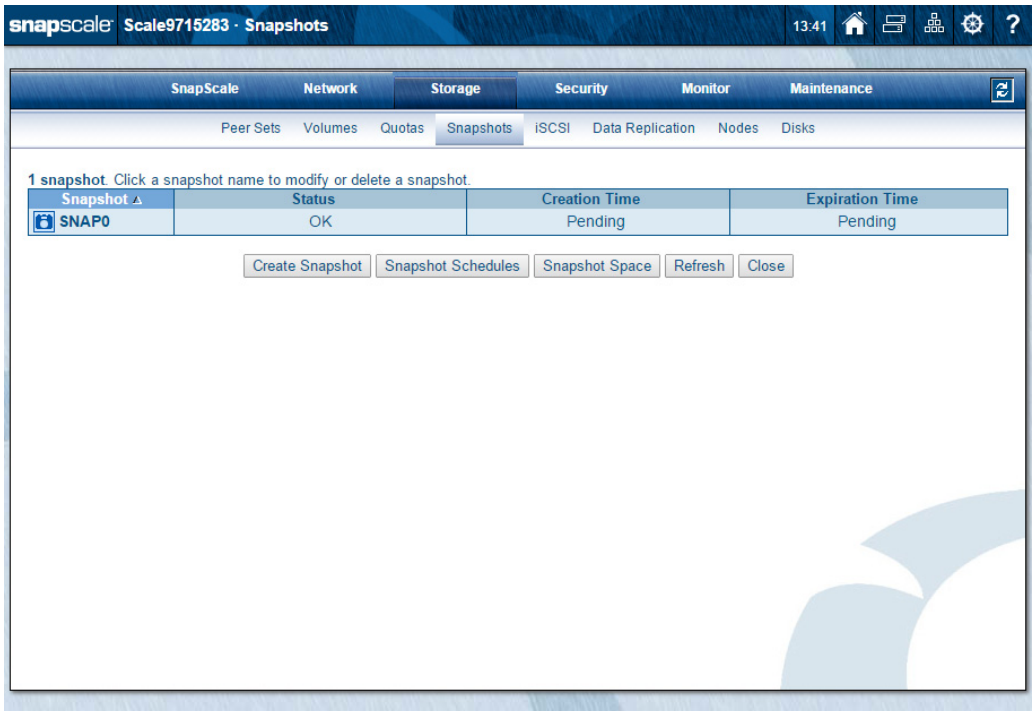
If no snapshots are currently configured, you only see an empty page. Once a snapshot is created, the page displays a table of snapshots:



These options are available for snapshots:

Action	Procedure
Create a New Snapshot	Click **Create Snapshot**. The process involves defining snapshot parameters and scheduling. **NOTE:** Do not take more snapshots than your system can store, or more than 250 snapshots. Under normal circumstances, nine or ten snapshots are sufficient to safely back up any system.
Edit a Snapshot Schedule	Click the **Snapshot Schedules** button, and then click the snapshot name. You can modify all snapshot parameters.
Adjust Snapshot Space	Specify the percentage of your SnapScale storage space to reserve for snapshots. **NOTE:** The storage space reserved for snapshots can be reduced, but it can **never** be increased once it is created.
Edit and Delete	Click the snapshot's name in the **Snapshot** column to open the **Snapshot Properties** page. You can edit the snapshot's name and duration, or delete the snapshot.
Refresh the Page	Clicking the **Refresh** button updates the page. This is helpful when waiting for a snapshot to complete.

When single snapshots are originally created or while recurring snapshots are active, the Refresh icon ( ) is displayed on the right of the tab bar. It indicates that the snapshot data in the table is being refreshed every 5 minutes and can be clicked to manually refresh the data.

Clicking the **Close** button returns you to the **Storage Settings** page.

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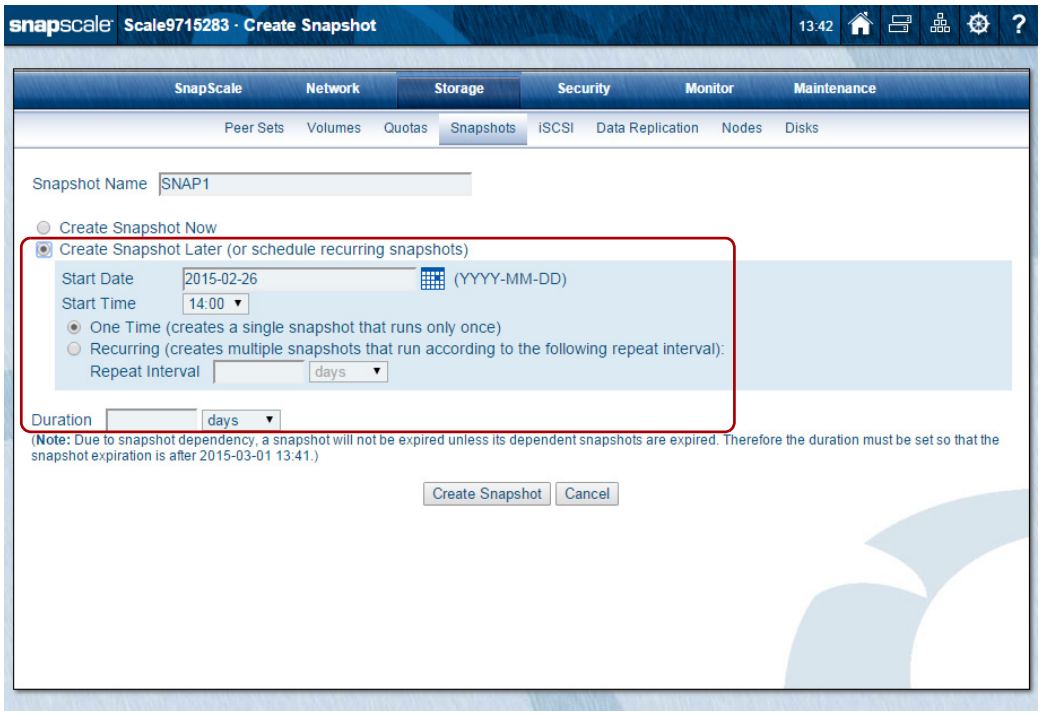
NOTE: The presence of one or more snapshots on a cluster can impact write performance. Additional snapshots do not have additional impact; in other words, the write performance impact of one snapshot on a cluster is the same as the impact of 100 snapshots.

Snapshots and Backup Optimization

When you back up a live volume directly, files that reference other files in the system may become out-of sync in relation to each other. The more data you have to back up, the more time is required for the backup operation, and the more likely these events are to occur. By backing up the snapshot rather than the volume itself, you greatly reduce the risk of archiving inconsistent data.

Create a Snapshot

Using the **Snapshots** page in the Web Management Interface, you can create a snapshot now, later, or on a recurring schedule. When you select the **Create Snapshot Later** option, additional options are displayed.



Follow these steps to create a snapshot:

1. Go to **Storage > Snapshots**, and click **Create Snapshot**.
2. Enter or select the **options** for the snapshot:
   a. Type in the **Snapshot Name** (20 character maximum).
   b. Specify **when** to create the snapshot.
      - Click **Create Snapshot Now** to run the snapshot immediately.
      - Click **Create Snapshot Later** to schedule the snapshot for a later time.

      When you select the **Create Snapshot Later** button, a new input section appears below the option. Enter the Start Date and Start Time. Select either to create the snapshot only once (**One Time**) or to have it recurring periodically (**Recurring**) using an interval in hours, days, weeks, or months.

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c. Specify the **duration** of the snapshot.

NOTE: In the Duration field, specify how long the snapshot is to be active in hours, days, weeks, or months. The SnapScale automatically deletes the snapshot after this period expires, as long as no older unexpired snapshots exist on which it depends. If any such snapshot exists, its termination date is displayed at the bottom of the page. You must set the duration to a date and time after the displayed date.

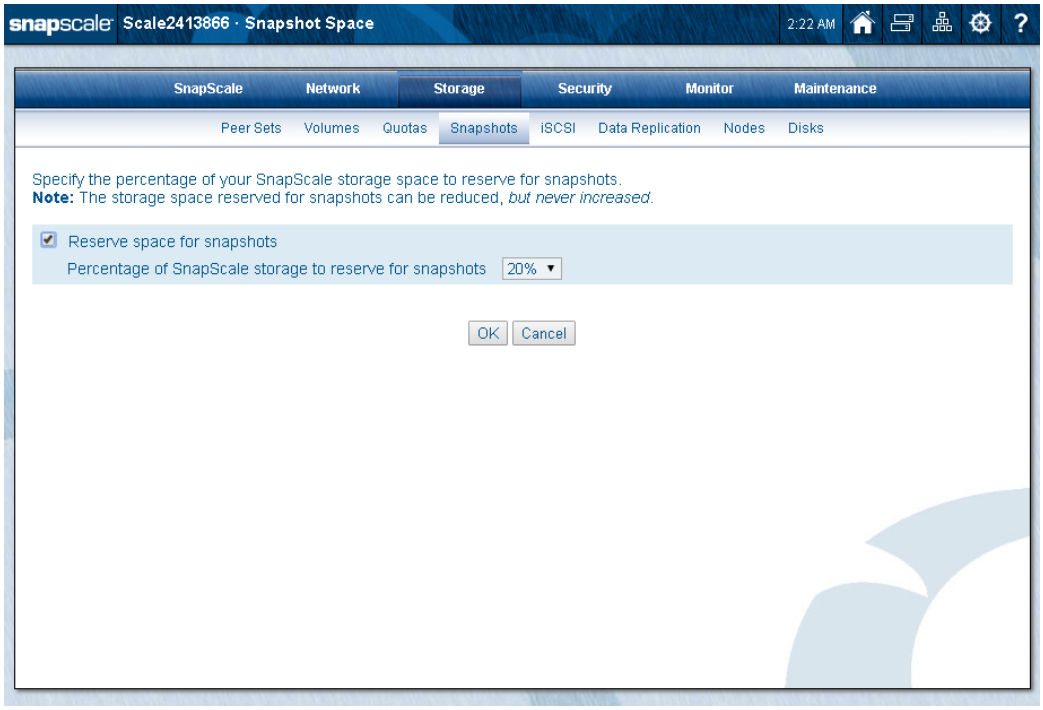
3. Create the snapshot by clicking **Create Snapshot**.

   If you elected to run the snapshot immediately, it appears in the Current Snapshots table. If you scheduled the snapshot to run at a later time, it appears in the Scheduled Snapshots table.

Adjust Snapshot Space

NOTE: Once the SnapScale cluster is created, the storage space reserved for snapshots can only be decreased. It can never be increased.

If you already reserved storage space for snapshots during the setup of your cluster but now want to decrease the size of that space, use the **Snapshot Space** button to make that change.



1. Go to **Storage > Snapshots**, and click **Snapshot Space**.
2. To reduce or remove the **reserved space**, do one of the following:
   - To decrease the space size, choose a **smaller percentage** of reserved space using the drop-down list.
   - To release all reserved space, uncheck the **reserve space for snapshots** box.

CAUTION: Unchecking the reserve space box causes all the reserved space to be released, deletes all existing snapshots, and, because the space can never be increased (re-added), **permanently** disables snapshots on the cluster.

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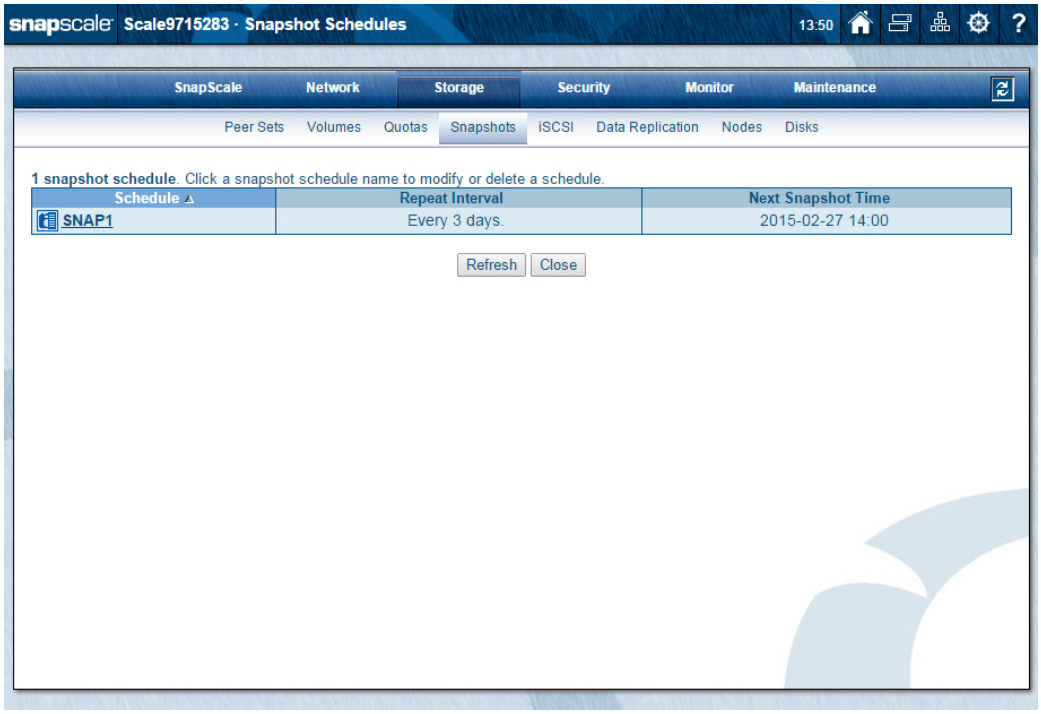
3. Click **OK** to complete the process.

Access a Snapshot

After snapshots are created, they can be accessed via a snapshot share. Just as a share provides access to a portion of a live volume, a snapshot share provides access to the same portion of the filesystem on all current snapshots of the volume. The snapshot share's path into snapshots mimics the original share's path into the live volume. The snapshot share is created in the **Shares** section under the **Security** tab. See Shares on page 163 for details.

Schedule Snapshots

To view when snapshots are currently scheduled to occur, click **Snapshot Schedules**:



The **Snapshot Schedules** page shows a list of any scheduled snapshots pending. **Repeat Interval** and **Next Snapshot Time** shows the details of when snapshots are scheduled to be taken.

Snapshots should ideally be taken when your system is idle. It is recommended that snapshots be taken before a backup is performed. For example, if your backup is scheduled at 4 a.m., schedule the snapshot to be taken at 2 a.m., thereby avoiding system activity and ensuring the snapshot is backed up.

The default snapshot name is SNAP*n* (where *n* is a number starting at 0). If it is a recurring, scheduled snapshot, an "_*n*" is added to the end of the name.

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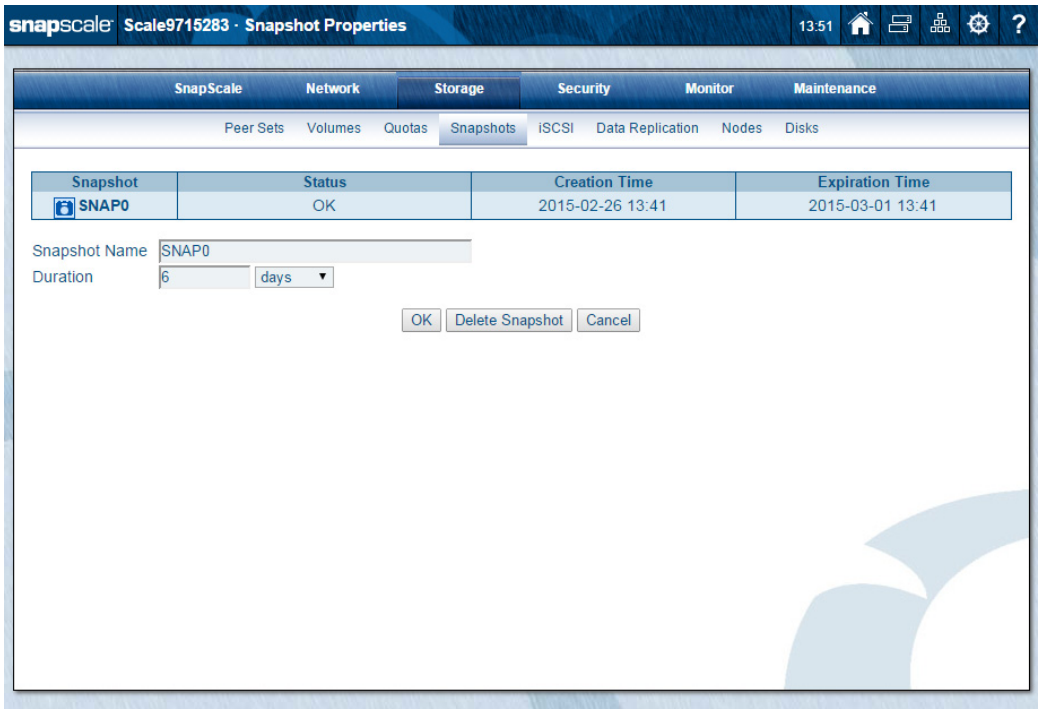
Edit Snapshot Properties

From the **Snapshot** primary page table, you can click a snapshot name to access the **Snapshot Properties** page. There you can edit the name and duration, or delete the snapshot:



Edit a Snapshot

You can edit the name and duration by changing the data in the detail fields, and then clicking **OK**.

Delete a Snapshot

Click **Delete Snapshot** and then click it again on the confirmation page. The snapshot is deleted.

iSCSI Disks

Internet SCSI (iSCSI) is a standard that defines the encapsulation of SCSI packets in Transmission Control Protocol (TCP) and their transmission via IP. On SnapScale clusters, an iSCSI disk consumes cluster storage space as a single large file, but appears to a client machine as a local SCSI drive. This storage virtualization frees the administrator from the physical limitations of direct-attached storage media and allows capacity to be expanded easily as needed. Unlike standard volumes, SnapScale cluster iSCSI disks can be formatted by the iSCSI client to accommodate different application requirements.

Configure iSCSI Initiators

Overland Storage has qualified a number of software initiators, PCI cards, and drivers to interoperate with SnapScale clusters. Refer to the vendor's documentation to properly install and configure you initiator to connect to the SnapScale iSCSI disks.

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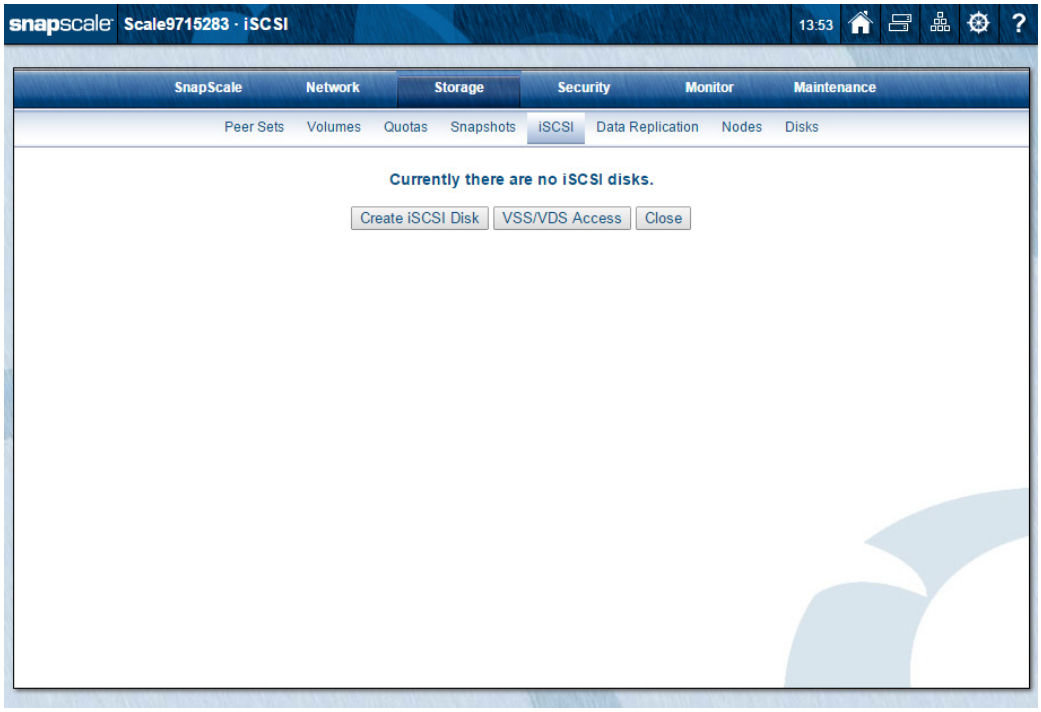
SnapScale iSCSI Configuration

iSCSI disks are created on the **Storage > iSCSI** page of the Web Management Interface.



Before setting up iSCSI disks on your SnapScale cluster, carefully review the following information.

Basic Components of an iSCSI Network

iSCSI is used to facilitate data transfers over intranets and to manage storage over long distances. A basic iSCSI network has two types of devices:

- iSCSI initiators, either software or hardware, resident on hosts (usually servers), that start communications by issuing commands.
- iSCSI targets, resident on storage devices, that respond to the initiators' requests for data.

The interaction between the initiator and target mandates a server-client model where the initiator and the target communicate with each other using the SCSI command and data set encapsulated over TCP/IP.

iSCSI Disk Backup from Client PC, not SnapScale

An iSCSI disk is not accessible from a share and thus cannot be backed up from the SnapScale cluster. The disk can, however, be backed up from the client machine from which the iSCSI disk is managed.

NOTE: While some third-party, agent-based backup packages could *technically* back up an iSCSI disk on the SnapScale cluster, the result would be inconsistent or corrupted backup data if any clients are connected during the operation. Only the client can maintain the filesystem embedded on the iSCSI disk in the consistent state that is required for data integrity.

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iSCSI Multi-Initiator Support

Check the **Support Multiple Initiators** box to allow two or more initiators to simultaneously access a single iSCSI target. Multiple initiator support is designed for use with applications or environments in which clients coordinate with one another to properly write and store data on the target disk. Data corruption becomes possible when multiple initiators write to the same disk in an uncontrolled fashion.

NOTE: RAINcloudOS supports Windows 2003 and Windows 2008 Server failover clustering.

When the box for **Support Multiple Initiators** is checked, a warning message appears:

```
Uncontrolled simultaneous access of multiple initiators to the same
iSCSI target can result in data corruption. Only enable Multi-
Initiator Support if your environment or application supports it.
```

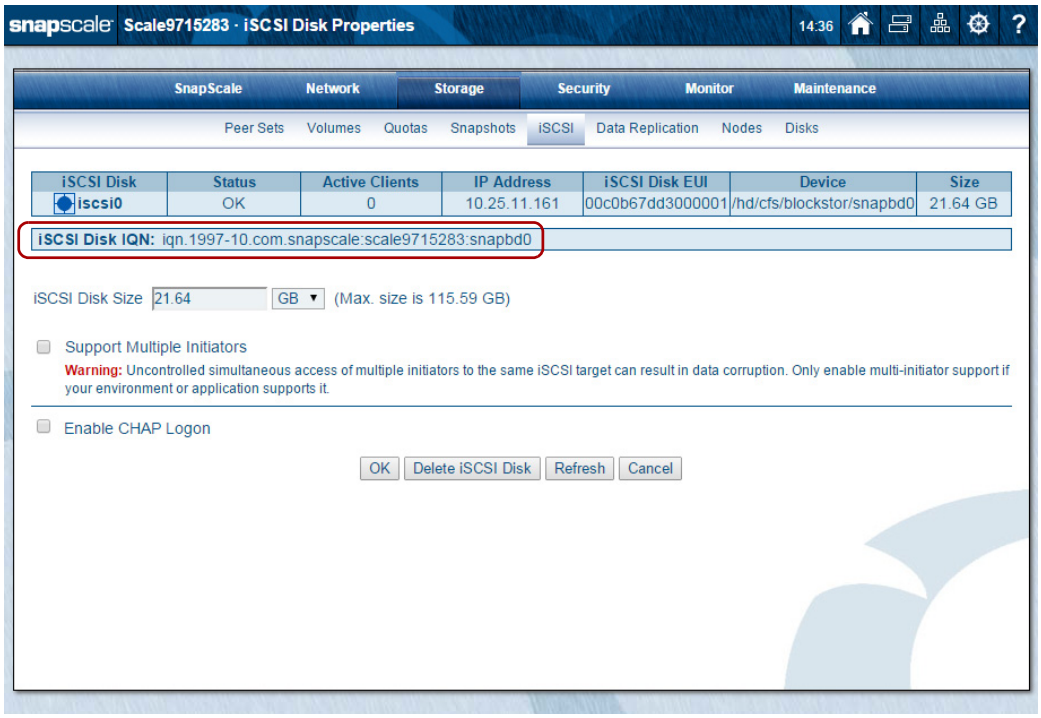
It functions as a reminder that data corruption is possible if this option is used when creating an iSCSI disk.

Disconnect iSCSI Disk Initiators before Shutting Down the Cluster

Shutting down the cluster while a client initiator is connected to an iSCSI disk appears to the client initiator software as a disk failure and may result in data loss or corruption. Make sure any initiators connected to iSCSI disks are disconnected before shutting down the cluster nodes.

iSCSI Disk Naming Conventions

iSCSI disks are assigned formal iSCSI Qualified Names (IQNs). These are used when connecting an initiator to an iSCSI target, and differ from the **iSCSI Disk Name** (alias) assigned when the iSCSI disk is created in the Web Management Interface. The full IQN is displayed for each iSCSI disk on the **iSCSI Disk Properties** page.



The full IQN is also shown when you mouseover the iSCSI name in the disk table.

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The format of IQNs for new SnapScale iSCSI disks is:

iqn.1997-10.com.snapscale:[clustername]:[blockdevice]

where **[clustername]** is the name of the SnapScale cluster, and **[blockdevice]** is the internal identifier of the iSCSI disk on the target SnapScale cluster. All the **[blockdevice]** names are automatically created using the term **snapbd** appended with a sequence number (such as, **snapbd0**, **snapbd1**, and so on).

iqn.1997-10.com.snapscale:Scale1234567:snapbd0

The format of IQNs for **VSS-based iSCSI disks** on the SnapScale cluster is:

iqn.1997-10.com.snapscale:[clustername]:[blockdevice].[nnn]

where **[clustername]** is the name of the SnapScale cluster, **[blockdevice]** is the internal identifier of the iSCSI disk on the target SnapScale cluster, and **[nnn]** is a sequential number starting from 000. For example:

iqn.1997-10.com.snapscale:Scale1234567:snapbd0.000

The format of IQNs for **VDS-based iSCSI disks** on the SnapScale cluster is:

iqn.1997-10.com.snapscale:[clustername]:[blockdevice]

and the format for IQNs for **snapshots of iSCSI disks** on the SnapScale cluster is:

iqn.1997-10.com.snapscale:[clustername]:[blockdevice]-snap[n]

where, in both cases, **[clustername]** is the name of the SnapScale cluster, **[blockdevice]** is the internal identifier of the iSCSI disk on the target SnapScale cluster, and **[n]** is a sequential number starting from 0. For example:

iqn.1997-10.com.snapscale:Scale1234567:snapbd0-snap0

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Create iSCSI Disks

Navigate to **Storage > iSCSI** and click **Create iSCSI Disk** to create iSCSI disks on the SnapScale cluster. Be sure to read SnapScale iSCSI Configuration on page 120 before you begin creating iSCSI Disks.

1. Navigate to **Storage > iSCSI** and click **Create iSCSI Disk.**
2. Enter the **iSCSI settings** for the disk name and size (16GB minimum).

   You can accept the default name or enter a new one using up to 20 alphanumeric, lowercase characters. You can also accept the default size (the remaining cluster space) or enter a specific size.
3. If you want your iSCSI Disk to allow **multiple** initiator connections, check that box.

   NOTE: Data corruption is possible if this option is checked. See iSCSI Multi-Initiator Support on page 121 for more information.

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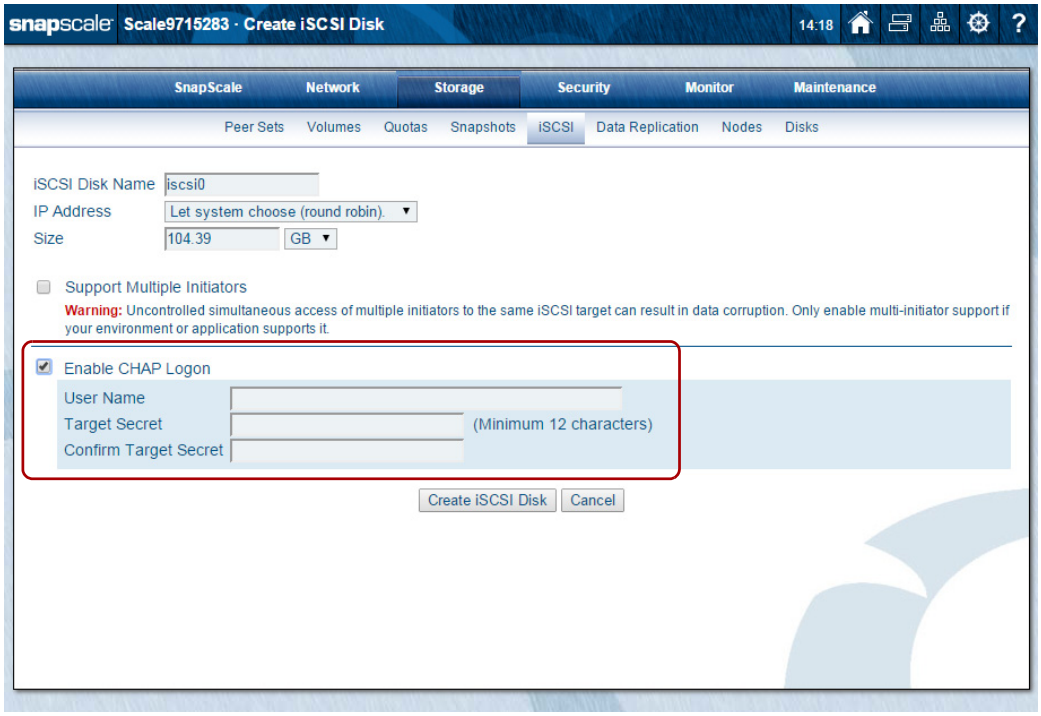
4. If desired, enable CHAP authentication by checking the **Enable CHAP Logon** box to display the hidden options.



Enter a **User Name** and **Target Secret** (password), and then confirm the password. Consider the following:

- Both items are case-sensitive.
- The user name range is 1 to 223 alphanumeric characters.
- The target secret must be a minimum of 12 and a maximum of 16 characters.

5. Click the **Create iSCSI Disk** button.

6. At the confirmation page, verify the settings and click the **Create iSCSI Disk** button again to complete the process.

   You are returned to the **iSCSI** page and the new iSCSI disk is displayed in the table there with the following information:

Label	Description
iSCSI Disk	The name of the iSCSI disk.
Status	Current condition of the iSCSI disk: • **OK** – The iSCSI disk is online and accessible. • **Stopped** – The iSCSI disk is currently stopped. • **Failed** – The iSCSI disk has failed.
Active Clients	The number of current sessions.
IP Address	The IP address used by the iSCSI disk.
Authentication	Either **CHAP** or **None**.
Size	The size of the iSCSI disk.

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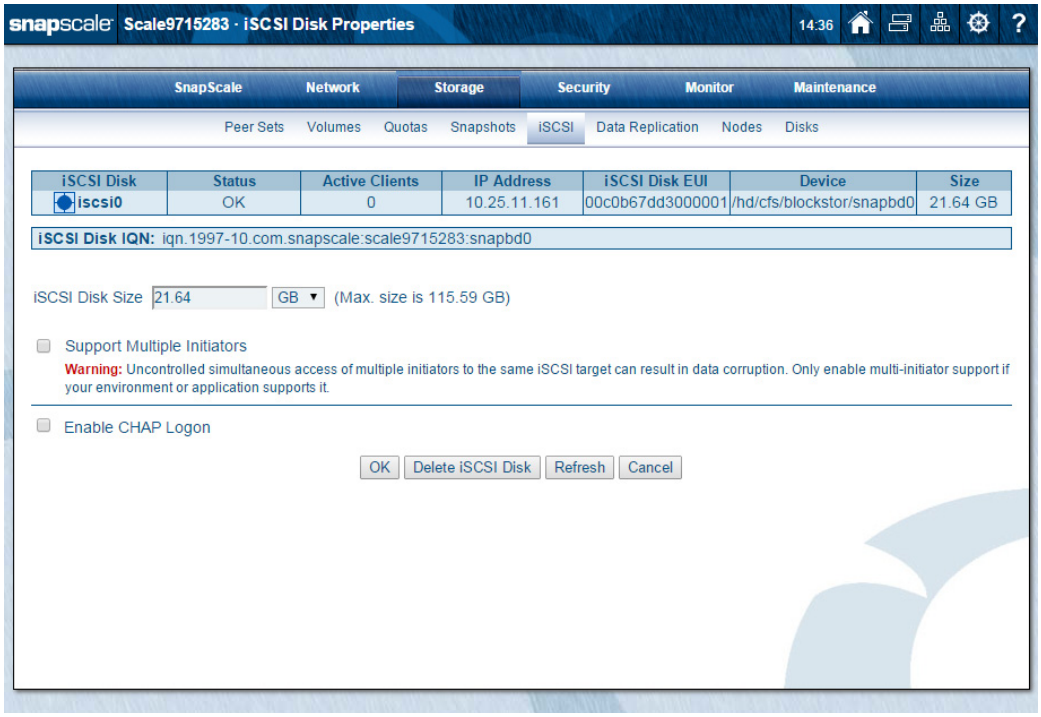
Edit iSCSI Disk Properties

NOTE: You cannot edit an iSCSI disk until all active clients have been disconnected from that disk. The hostname and IQN name of all connected initiators are displayed in the properties table.

After disconnecting all client initiators, go to **Storage > iSCSI** and click the iSCSI disk name in the table to display the **iSCSI Disk Properties** page.



1. On this **page**, you can do the following:
   - View the iSCSI Disk **IQN**.
   - Increase (but not decrease) the **size** of the iSCSI disk (if space is available).
   - Enable or disable support for **multiple initiators**.
   - Enable or disable **CHAP logon**.
2. Click **OK** to accept the changes.

CAUTION: The consistency of the internal filesystem on the iSCSI disk is primarily the responsibility of the file and operating systems on the iSCSI client used to format and manage the disk. Growing an iSCSI disk is handled differently by different operating systems and may lead to unexpected results on some client types.

Delete an iSCSI Disk

NOTE: You cannot delete an iSCSI disk until all active clients have been disconnected.

After disconnecting all client initiators, go to **Storage > iSCSI** and click the iSCSI disk name in the table to display the **iSCSI Disk Properties** page.

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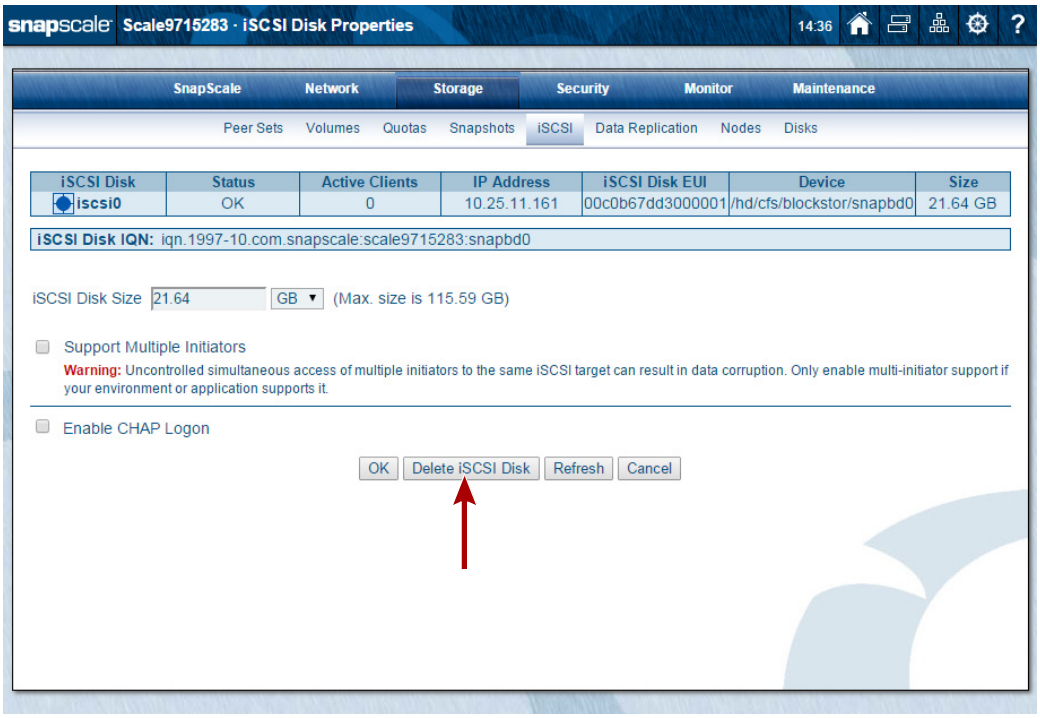

Click **Delete iSCSI Disk** (which is followed by a confirmation page) to delete the iSCSI disk.

Configure VSS/VDS for iSCSI Disks

RAINcloudOS 4.2 provides VSS and VDS hardware providers to support Microsoft Volume Shadow Copy Services (VSS) and Virtual Disk Service (VDS) for iSCSI disks.

- The **VSS** hardware provider provides a mechanism for taking application-consistent Windows-native snapshots of iSCSI disks without performing full application (or system) shutdown. A snapshot of an iSCSI disk can be automatically created by a backup job run by a VSS-compatible backup application on a Windows initiator host, so that the job backs up the snapshot volume rather than the main production volume.

  NOTE: VSS iSCSI snapshots are managed by the Windows client and represent the iSCSI disk, not the Snap volume on which the iSCSI disk resides. They are not related to RAINcloudOS snapshots as described in Snapshots on page 113. The VSS iSCSI snapshot rollback feature is not currently supported.

- The **VDS** hardware provider allows administrators to natively manage SnapScale cluster iSCSI disks, using any VDS-compliant management console application.

iSCSI Disk Backup using VSS Snapshots

Windows VSS-compatible backup applications can create snapshots of SnapScale cluster iSCSI disks to perform consistent backups of application data without stopping the application, using the snapshot instead of the live volume as the backup source.

Each VSS snapshot of an iSCSI target consumes additional cluster storage space. The required space is 10% of the size of the iSCSI disk per snapshot. If this amount of free space is not available on the pool or volume, the VSS snapshot will not be created and an error will be reported by the SnapScale cluster VSS hardware provider to the Windows event log.

When creating iSCSI disks for later VSS snapshot use, be sure to leave at least 10% of the size of the iSCSI target free on the cluster.

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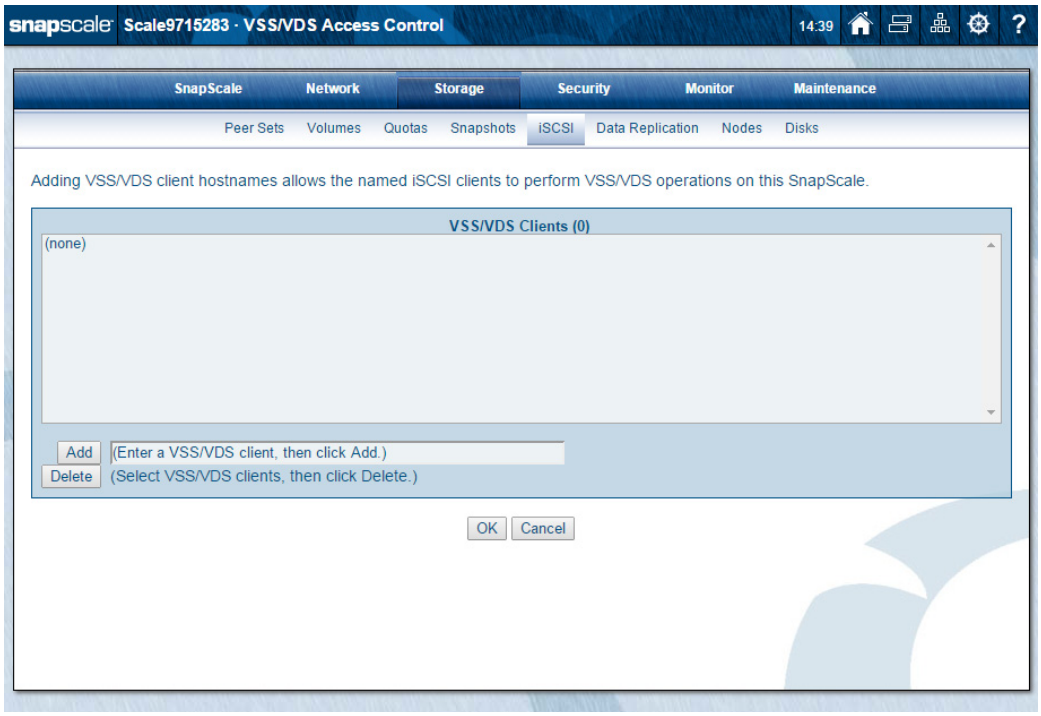
NOTE: VSS snapshots can only be taken of Windows volumes that fully consume the iSCSI disk. Snapshots of iSCSI disks that contain multiple Windows volumes are not supported.

1. Go to **Storage > iSCSI** and click **VSS/VDS Access**.



2. Add **VSS clients** to the SnapScale cluster:

   a. At **VSS/VDS Access Control**, enter the **VSS client hostname** to which you want to grant access, and click **Add**.

      The client hostname is not case-sensitive and should appear in the VSS/VDS Clients box.

      NOTE: Use only the short hostname (*myclientname*) of the client only. Do not use the IP address or fully-qualified name (for example, *myclientname.mydomain.com*).

   b. Repeat Step a for any other hostnames you want to add.

   c. When you have finished adding VSS clients, click **OK**.

3. Install the **VSS hardware** provider on the Windows iSCSI client.

   a. Depending on the Windows client, go to the appropriate heading to locate and download either *SnapServerToolsInstall32.exe* or *SnapServerToolsInstall64.exe* from the Overland website:

      http://docs.overlandstorage.com/ssm

   b. Double-click the **executable** (.exe) to run the Installation Wizard on the VSS client and select the VSS/VDS hardware providers option. This will add the hardware provider to the Windows iSCSI client.

4. Configure VSS-based **backups** of the iSCSI disk.

   a. Connect the client **iSCSI initiator** to the Snap iSCSI disk and create a volume (if necessary). Add data or configure applications to use the iSCSI volume for the data repository.

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b. Configure a VSS-based **backup** of the iSCSI disk. Where applicable, choose to use the SnapScale cluster VSS hardware provider in the backup job configuration. When the backup job is run, the snapshot of the iSCSI disk is automatically created and hosted by the SnapScale cluster as a virtual iSCSI disk (named after the main iSCSI disk with *snap[n]* appended), and the backup application performs the backup using the snapshot iSCSI disk. The snapshot will be deleted after the backup completes.

NOTE: VSS snapshots are not supported on SnapScale cluster iSCSI disks that have been configured into multiple Windows volumes.

Create and Manage iSCSI LUNs using VDS

1. Create the **volume** for the iSCSI disk on the SnapScale cluster using the Web Management Interface (**Storage > Volumes**).

   The volume must be created on the SnapScale cluster before the iSCSI disk can be created using a VDS application such as Microsoft's *Storage Manager for SANs*.

2. Add **VDS clients** to the SnapScale cluster:

   a. Go to **Storage > iSCSI** and click **VSS/VDS Access**.

   b. At **VSS/VDS Access Control**, enter the **VSS client hostname** to which you want to grant access, and click **Add**.

   The client hostname is not case-sensitive and should appear in the VSS/VDS Clients box.

   NOTE: Use only the short hostname (*myclientname*) of the client only. Do not use the IP address or fully-qualified name (for example, *myclientname.mydomain.com*).

   c. Repeat Step b for any other hostnames you want to add.

   d. When you have finished adding VSS clients, click **OK**.

3. Install the **VDS hardware provider** on the Windows client.

   a. Depending on the Windows client, go to the appropriate heading to locate and download either *SnapServerToolsInstall32.exe* or *SnapServerToolsInstall64.exe* from the Overland website:

   http://docs.overlandstorage.com/ssm

   a. Run the **Installation Wizard** on a VDS client and select the VSS/VDS hardware providers option. This will add the hardware provider to the Windows client.

4. Create and configure the **iSCSI disk** using *Storage Manager for SANs* (or other VDS-compliant application).

Delete VSS/VDS Client Access

1. Go to **Storage > iSCSI** and click **VSS/VDS Access**.
2. From the VSS/VDS Clients list, select the **VSS/VDS client** you want to delete and click **Delete**.
3. Click **OK** to save your changes.

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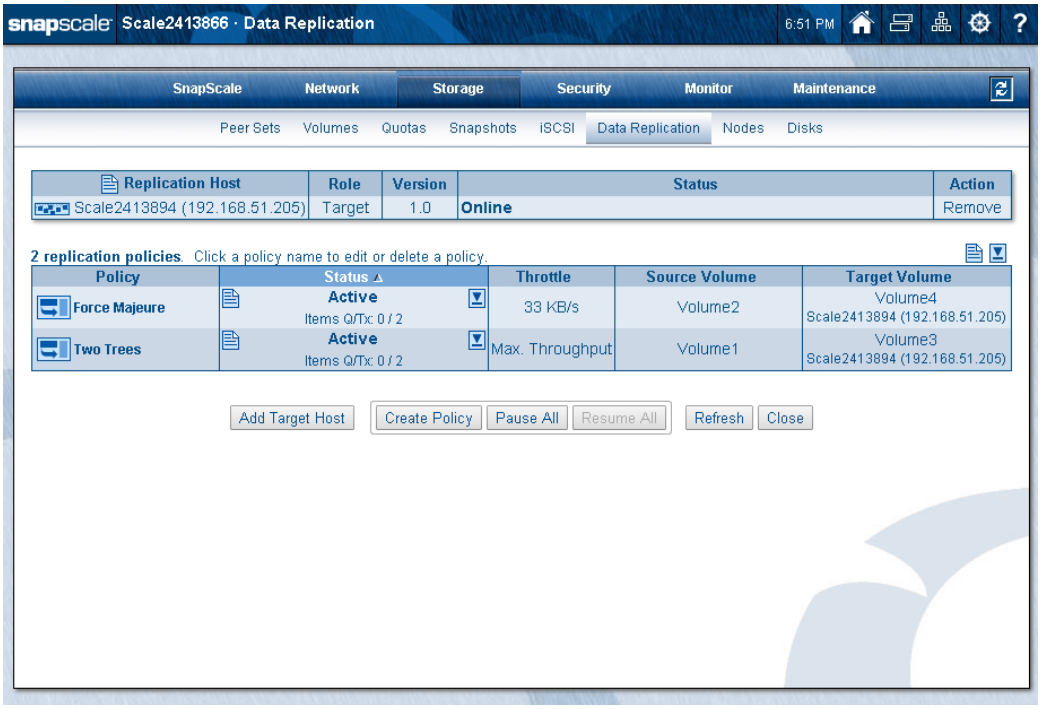
Data Replication

SnapScale data replication is a technology that provides continuous automatic replication of volumes on a source cluster to volumes on one or more target clusters. Throughput can be throttled so bandwidth can be conserved during peak network usage times.



Overview

Data Replication copies data between volumes on different SnapScale clusters to protect the data from failures or disasters that may occur in one location and provide the ability to quickly recover the data.

To use the data replication available on SnapScale clusters, you create policies specifying when to replicate the data on the volumes of a source SnapScale cluster to volumes on other SnapScale clusters (targets). Conversely, the same SnapScale cluster can be used as a replication target for other source SnapScale clusters.

NOTE: Data replication configuration policies can only be configured at the source SnapScale.

Users can see how much work is in the queue for a particular replication job via the Web Management Interface.

When configuring and working with replication between SnapScale clusters, consider the points listed in the following sections.

Volumes

The SnapScale cluster volume containing the original stored data that is to be replicated is considered the source volume. The volume chosen on a different SnapScale cluster where this data will be duplicated is the target volume.

- A volume can be a target for only one source (a volume on another cluster) or a source for only one target.

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- The source and target volumes MUST have the same version of replication code and security model. Use the standard OS update process to update a cluster to the same version as the other.
- Quota settings are not replicated to the new volume, and replication can overflow user quotas on the target volume.
- Target volumes are read-only.
- Some or all data on a volume configured as a target for a replication policy may be deleted in order to make the target a duplicate of the source volume

Policies

A data replication policy defines replication between two volumes on different clusters and an optional bandwidth throttling schedule.

- All replication policies are between volumes and not individual directories.
- Replication policies are defined and monitored only from the source cluster.
- Active replications will automatically restart after reboot without losing any data.
- Replication of data for a given policy is one-way between the source and target cluster.
- All data and security configuration (Windows and Unix permissions and personalities) is replicated where possible (compatible security models).

Throttling Bandwidth

- A throttle is a setting to control the bandwidth used by a policy. This is especially useful during times of high network activity.
- Normally, the throttle is set to maximum bandwidth to facilitate the replication but can be reduced during scheduled time periods. See Add a Policy Throttle on page 141.

Data Replication Page

There are three possible views displayed of the main **Data Replication** page:

- No Replication Hosts or Policies Exist
- Replication Hosts Only Defined (source or target)
- Both Replication Hosts and Policies Exist

The content of the page depends on the items configured.

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No Replication Hosts or Policies Exist

A message to add a target to start the policy creation is displayed. Click **Add Target** to begin the process. See Add a Target Host on page 136.

Replication Hosts Only Defined

Just the replication host table is displayed on the **Data Replication** page. Click either **Add Target** to add more target hosts or **Create Policy** to start creating policies for any target hosts listed.

At any time, you can click **Refresh** to force a refresh of the entire page. The replication host table is automatically refreshed every 10 seconds.

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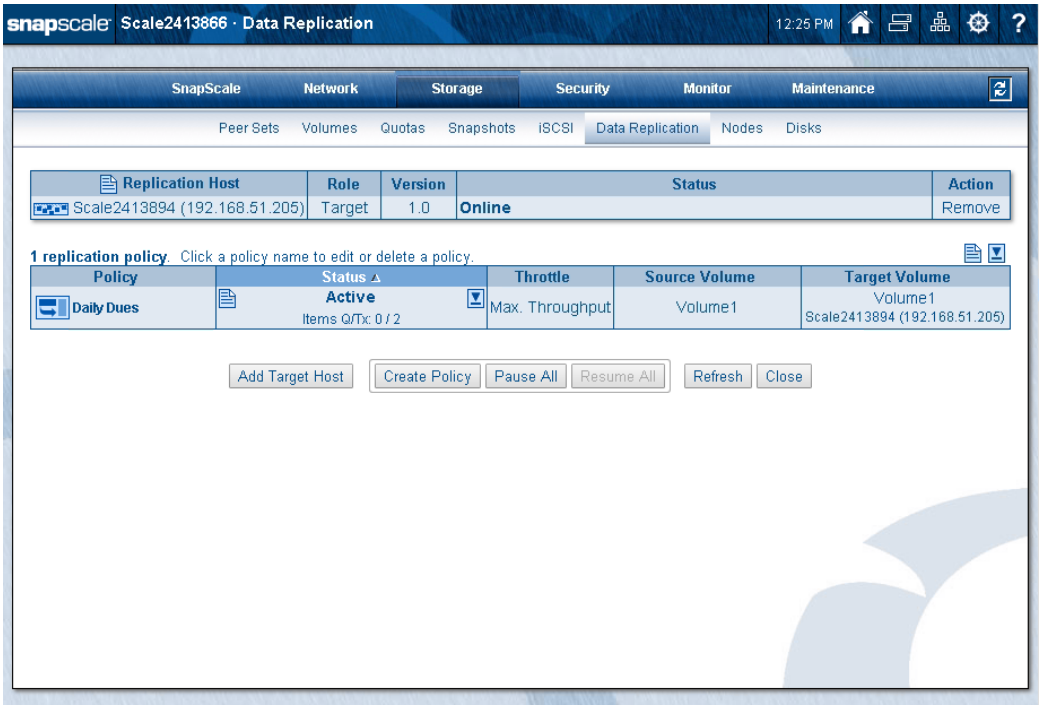
To close this page and return to the **Storage** menu page, click **Close**.

The replication host table shows the following information:

Policy Feature	Description
Symbols Used	
	Generate a report for all replication hosts (icon left of column heading). You can select either of these options: • Click to open a report in a new browser window. • Right-click and select **Save Link As** to download a report.
Replication Host	Displays two types of data: • A list of clusters configured as targets. • A list of source clusters using this cluster as a target.
Role	**Source** – The cluster is a source cluster using this cluster as a target. **Target** – The cluster is configured as a target for this cluster.
Version	The data replication software version. **NOTE:** The source and target clusters MUST always be the same version of data replication software.
Status	Details the current status of the host such as **Online** or **Offline**.
Action	Click **Remove** to disconnect this cluster as a source or target. See Remove a Host on page 137.

Both Replication Hosts and Policies Exist

Both the replication host table and the replication policies table are shown.



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At any time, you can click **Refresh** to force a refresh of the entire page. The replication host table and the replication policy table are automatically refreshed every 10 seconds.

To close this page and return to the **Storage** menu page, click **Close**.

The replication policy table shows the following information:

Policy Feature	Description
Symbols Used	
(Reports)	Reports are available for: • Individual policy status (icon on the left side of the Status table cell) • All replication policies (icon at the top-right of the second table for policies) You can select either of these options: • Click to open a report in a new browser window. • Right-click and select **Save Link As** to download a report.
(Reset)	Click to reset the statuses for policies. The last reset time (if any) is listed in the mouseover text. Choose the reset option: • Reset an individual policy status (icon on the right side of the Status table cell) • Reset all replication policies (icon at the top-right of the second table for policies) Resetting the statuses does the following: • Reset items transferred to 0 (zero). • Reduce errors detected by the number of errors resolved. (Errors outstanding will remain unchanged.) • Reset errors resolved to 0 (zero).
Policy	Data replication policies. Click name to edit or delete. See Data Replication Policy Properties Page on page 139.
Status	Shows the current status of the policy: • **Active** • **Paused** • **Error** (broken policy) This column also shows the current files queued (Q) and files transmitted counts for the policy (Tx). Error counts are shown if any errors were encountered in syncing. The Report and Reset icons are shown in each cell.
Throttle	Shows the bandwidth throttle currently being used (see Add a Policy Throttle on page 141): • **Maximum Throughput** – No throttling used. • **Paused** – Completely throttled and no data moving. • **A specific value** – A specific throughput value set by the user. • **Blank** – Policy is paused and a null character (-) is displayed.
Source Volume	Displays the name of the volume on this cluster that is used as the source.
Target Volume	Displays the name of the volume used as the target along with the name and IP address of the target host.

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Data Replication Reports

There are three different reports available on the **Data Replication** page:

Replication Hosts Report. When you click the reports icon ( ) located to the left of the column header text on the replication hosts table, you have the option to either view or download a report pertaining to all the replication target hosts.

```
Data Replication Hosts Report - 2015-05-12 10:52:25 PM
-------------------------------------------------------------------------
This Host:                          Scale2413866 (192.168.51.200)
Host Type:                          SnapScale (ROS)
Host ID:                            1431457622862
Role:                               Source
Rep. Version:                       1.0
Source Rep. IP Addresses:           192.168.51.200, 192.168.51.201,
                                    192.168.51.202, 192.168.51.203
Target Rep. IP Addresses:           192.168.51.201, 192.168.51.202,
                                    192.168.51.203
Windows/SMB Domain:                 Not joined to a Windows/SMB domain.
NIS Domain:                         Not configured for NIS.
LDAP Directory:                     Not configured for LDAP.

Replication Host:                   Scale2413894 (192.168.51.205)
Host Type:                          SnapScale (ROS)
Host ID:                            1429313909597
Role:                               Target
Rep. Version:                       1.0
Source Rep. IP Addresses:           192.168.51.205, 192.168.51.206,
                                    192.168.51.207, 192.168.51.208
Target Rep. IP Addresses:           192.168.51.206, 192.168.51.207,
                                    192.168.51.208
Windows/SMB Domain:                 Not joined to a Windows/SMB domain.
NIS Domain:                         Not configured for NIS.
LDAP Directory:                     Not configured for LDAP.
```


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Individual Replication Policy Report. When you click the reports icon ( ) located on the left of the Status table cell, you have the option to either view or download a report pertaining to that specific policy.

```
Data Replication Policy Details & Log - 2015-05-12 10:58:38 PM
------------------------------------------------------------------------
This SnapScale:                     Scale2413866 (192.168.51.200)

Policy Name:                        Two Trees
Source Volume:                      Volume1
Target Host:                        Scale2413894 (192.168.51.205)
Target Volume:                      Volume3
Default Throttle:                   Max. Throughput
State:                              Active

Throttle Schedule:                  No throttles scheduled.

Status:
Current throttle:                   Max. Throughput
Items in queue:                     0
Items transferred:                  2
Errors outstanding:                 0
Status last reset:                  Never

Log file: /hd/cfs/system/replication/rsync_.project1.log
------------------------------------------------------------------------
```

All Replication Policies Report. When you click the reports icon ( ) located on the top right just above the replication policies table, you have the option to either view or download a report pertaining to that specific policy. The following is an example of such a report:

```
Data Replication Policies Report - 2015-05-12 11:00:08 PM
------------------------------------------------------------------------
This SnapScale:                     Scale2413866 (192.168.51.200)

Policy Name:                        Two Trees
Source Volume:                      Volume1
Target Host:                        Scale2413894 (192.168.51.205)
Target Volume:                      Volume3
Default Throttle:                   Max. Throughput
State:                              Active
Throttle Schedule:                  No throttles scheduled.
```

Target Host Management

The first step to configuring a source SnapScale cluster to replicate data to another cluster is to add a target host.

NOTE: When a policy has been deleted and the host is no longer needed, the host can be removed from the list freeing it up for other uses.

To access a target host, click its name in the Replication Host column. Its Web Management Interface opens in a new browser window.

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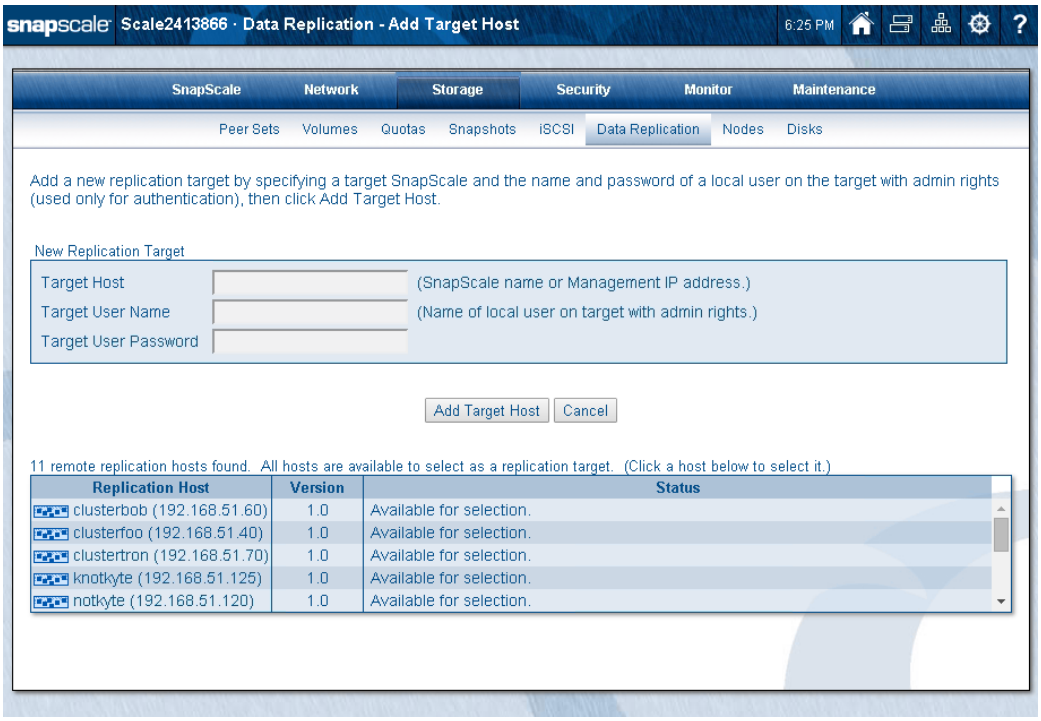
Add a Target Host

1. At **Storage > Data Replication**, click **Add Target Host**.
   The **Data Replication - Add Target Host** page is displayed.



2. Select a **host name** in the bottom table as the replication target.
   The Management IP address of the host is displayed in the **Target Host** field.

   NOTE: If a host is not displayed in the table, verify that it is online. Hosts in other subnets will not be displayed here but can be entered manually by typing the Management IP of the target cluster in the **Target Host** field.

3. In the **Target User Name** field, enter the **name** of a local user with administrator's rights for that host.
4. In the **Target User Password** field, enter that user's **password** for the target host.
5. Click **Add Target Host**.

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6. At the successful addition page, click **OK** to return to the **Data Replication** page.

You are now able to create a data replication policy using this host. Refer to Policy Management on page 137.

Remove a Host

To remove a target host and free it up for other uses:

1. In the replication host table, click the **Remove** option to the far right for the host being deleted.
2. At the warning message page about deleting the replication policies associated with this host, click **Remove Target**.

You are returned to the default **Data Replication** page. The removed target host and its policies are no longer visible.

Policy Management

Policies manage the data replication between the volumes on the source cluster and the target cluster.

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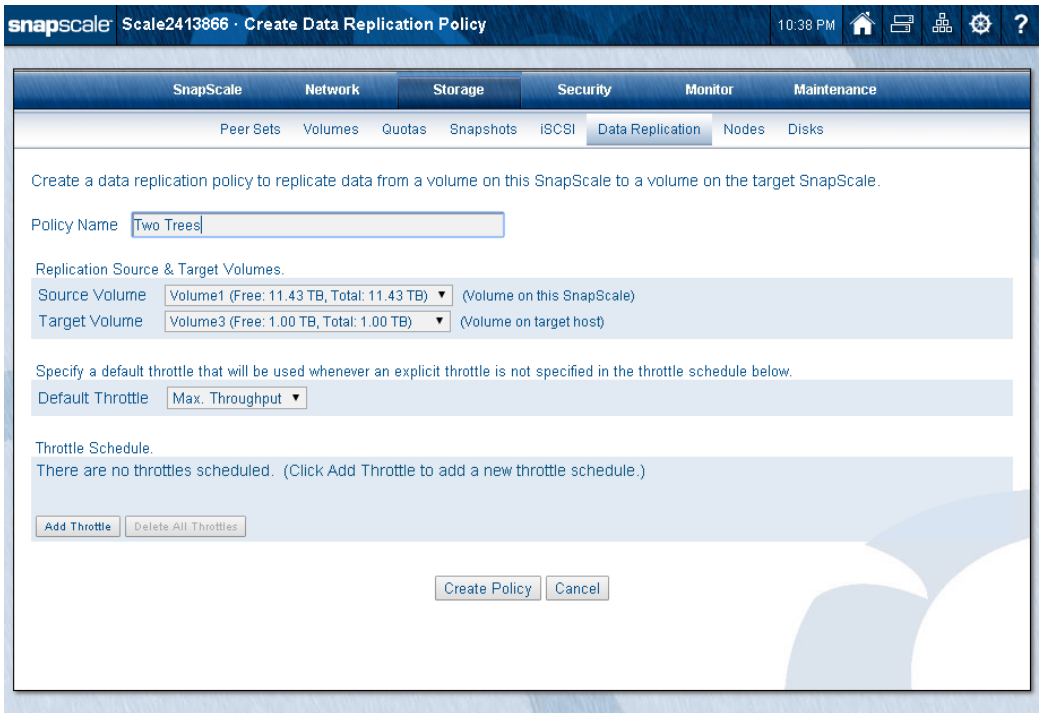
Create a Policy

Use **Create Policy** to configure a new policy to replicate a volume on this cluster to a volume on a target cluster.

1. At **Storage > Data Replication**, click **Create Policy** to open the **Create Data Replication Policy** page.



2. Enter a unique **Policy Name** (64 characters max).
3. Using the drop-down lists, choose the **Source Volume** and **Target Volume**.

   Note that:

   - The source volume is always a volume on the current cluster.
   - All available volumes on all configured target clusters are displayed in the target volume drop-down box. The volumes are grouped underneath the target clusters.
   - Volumes already in use as sources or targets in other policies are not listed.
4. Using the drop-down list, specify the **Default Throttle** value for this policy:

   - Maximum throughput is the default.
   - To specify a specific rate, select **Specific** from the drop-down list, enter a value, and select the rate from the drop-down list.

   - To temporarily stop the replication process, select **Paused**.
5. If desired, in **Throttle Schedule** section:

   - Click **Add Throttle** to schedule a specific throttle of the throughput at a specified time.

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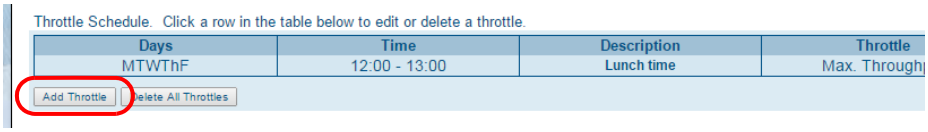


Refer to Add a Policy Throttle on page 141 for details.

- Click **Delete All Throttles** to remove all the throttles you may have created for this policy.

6. Click **Create Policy**.

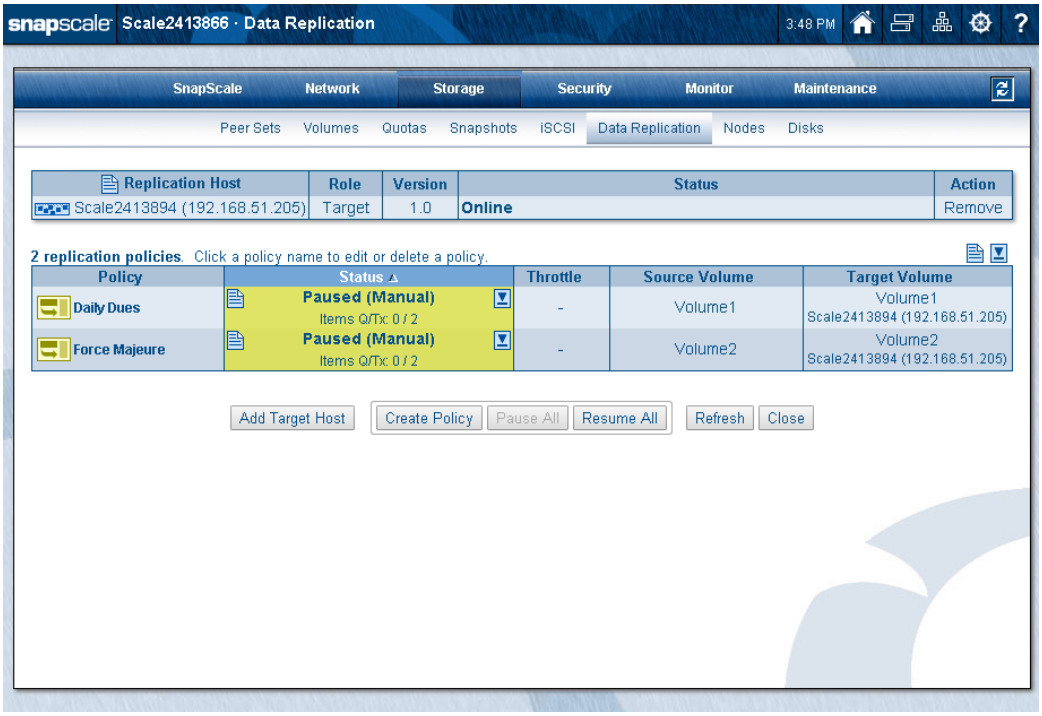
> **CAUTION:** You are prompted for confirmation as some or all the contents of the target volume may be deleted. If the cluster was previously synced, only data no longer on the source will be deleted from the target.

7. At the data deletion warning, click **Create Policy** again.

   The main **Data Replication** page is displayed with the new policy shown in the table.

Pause All/Resume All Policies

Click **Pause All** to pause all policies. At the confirmation page, click **Pause All** again to initiate the pause. (The **Pause All** button is disabled whenever all policies are paused.)



When policies are paused, the Throttle cells show a null character (-) as there is no throughput to throttle when paused.

Click **Resume All** and confirm to restart the previously paused policies.

Data Replication Policy Properties Page

Clicking a policy name in the Policies table on the main **Data Replication** page opens the **Data Replication Policy Properties** page. You use this page to edit, pause, or delete a policy.

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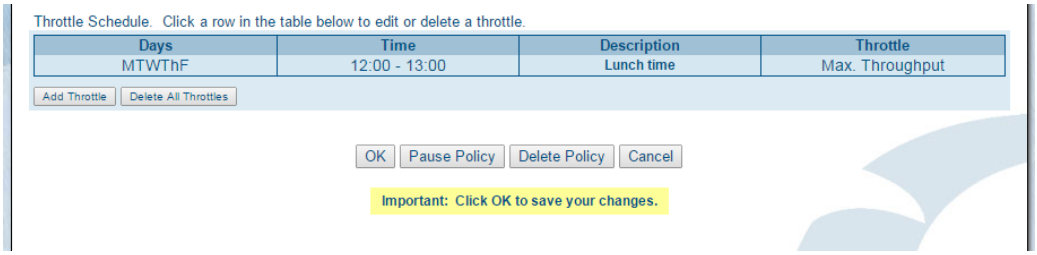
When all changes are made, always click **OK** to save and initiate them.

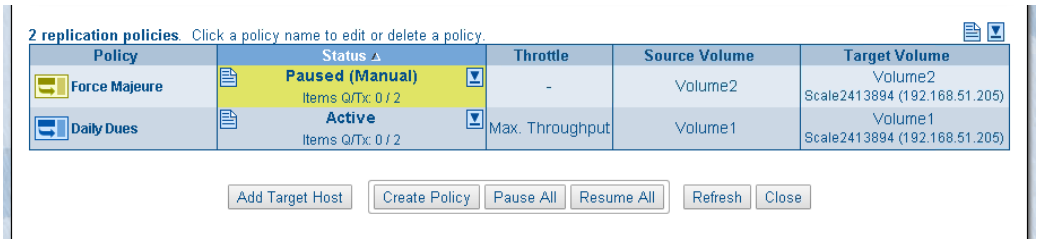


Edit Policy Properties

Using this page, you can change the policy name, default throttle, and add or delete throttle schedules. When done making changes, click **OK** to save them. Refer to Create a Policy on page 138 for details.

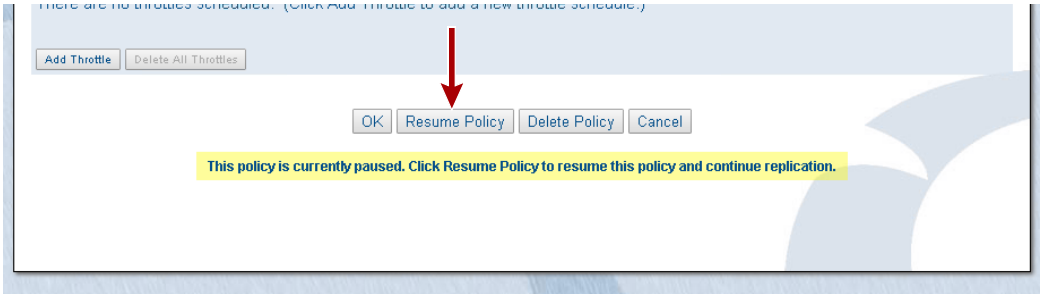
Pause a Policy

Pausing a policy on the properties page pauses all data replication for only that policy. You are returned to the **Data Replication** page and the policy you paused now has a yellow status that says **Paused (Manual)**.



NOTE: A policy's status is displayed as **Paused (Throttle)** when the policy is paused by means of its throttle schedule.

You can resume the policy at any time by clicking the policy name to return to the properties page. Click **Resume Policy** and confirm.



Delete a Policy

To permanently stop all data replication for the policy and delete the policy itself, click **Delete Policy** and confirm.

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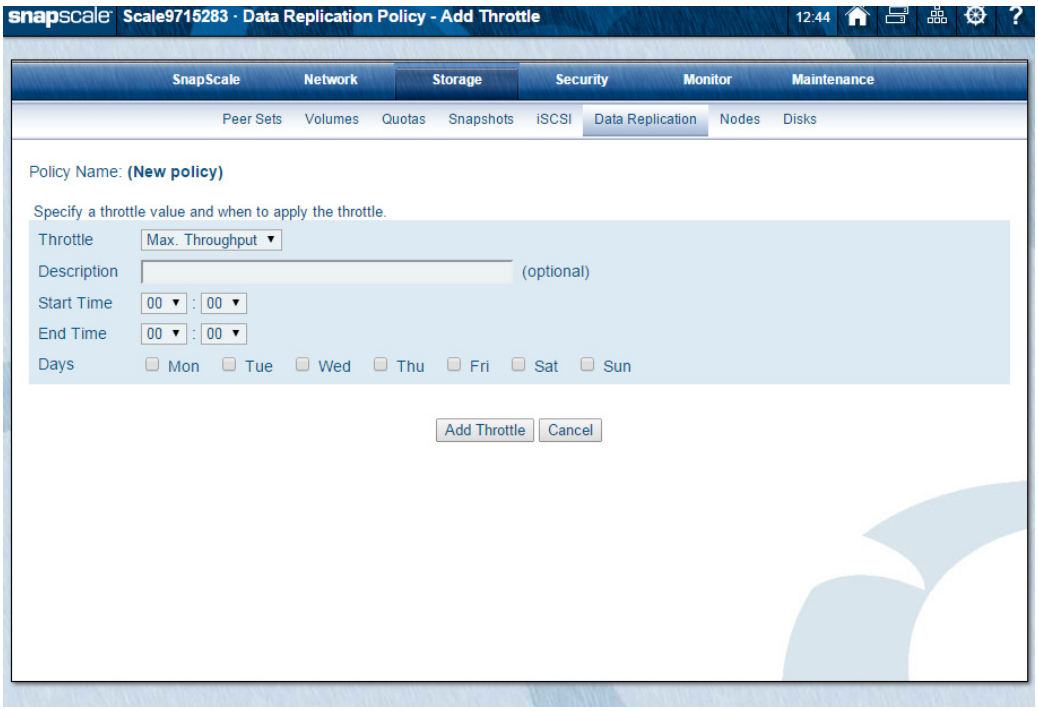
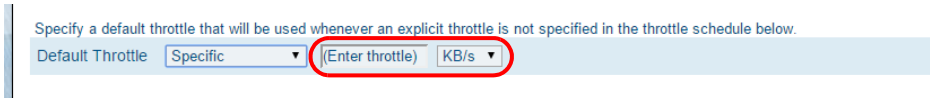
Add a Policy Throttle

Just below the **Throttle Schedule** table on the **Create Data Replication Policy** and **Data Replication Policy Properties** pages, is the **Add Throttle** button. Use it to schedule a throttle of bandwidth during specific periods of high network activity.



1. Below the **Throttle Schedule** table, click **Add Throttle**.
2. Use the **Throttle** drop-down list to choose a throttling **value**:
   - Maximum throughput is the default.
   - To specify a specific rate, select **Specific** from the drop-down list, enter a value, and select the rate from the drop-down list.

   - To temporarily stop the replication process, select **Paused**.
3. Optionally, you can add a **Description** to help you identify the throttle schedule.
4. Use these configuration tools to configure the throttling:
   - Select a **Start Time** from the drop-down list.
   - Select an **End Time** from the drop-down list.
   - Check one or more of the **Days** boxes.
5. Click **Add Throttle** to add this new throttle.
   You will be returned to the **Policy Properties** page.
6. Click **OK** on the **Policy Properties** page to save your policy and throttle changes.

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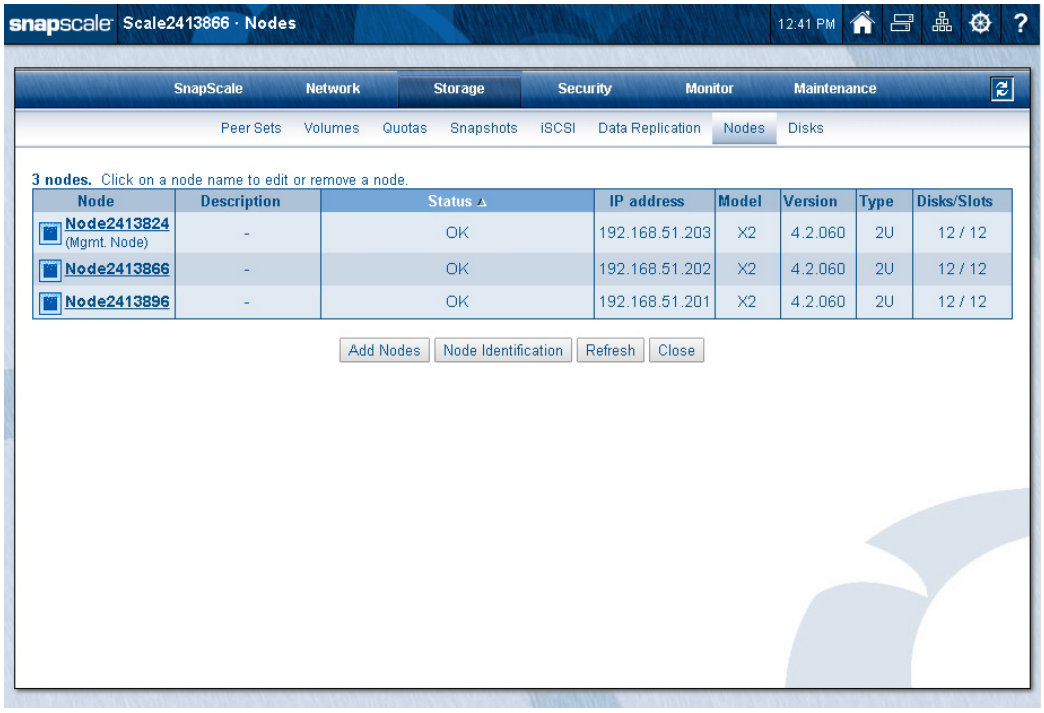
Nodes

Use the **Nodes** page to manage the nodes that make up the cluster.



From this **Nodes** page, you can:

- Add a new node.
- Access the **Node Properties** page to edit or remove a node.
- Identify physical nodes by flashing the node's LEDs.

Some important points about SnapScale nodes:

- Users can access the cluster storage over any of the configured network protocols by connecting to any of the nodes.
- Because the storage space is unified across the cluster, connecting to any of the nodes provides access to the same data as any other cluster node.
- To balance network client access to the nodes, enter an **A** record to the DNS pointing to the cluster name for each IP address in the node IP address range. The DNS then uses round-robin name resolution requests for the cluster name among the node IP addresses. Alternatively, manually distribute clients accessing the cluster to different IP addresses in the node IP address range.
- When a node fails, the IP address it uses is automatically reassigned to another node. Clients connected to that IP address are forwarded to the new node, though this may cause a momentary interruption to storage access.
- Files opened by clients connected to any node are recognized by all nodes, and file locks are respected by all nodes.

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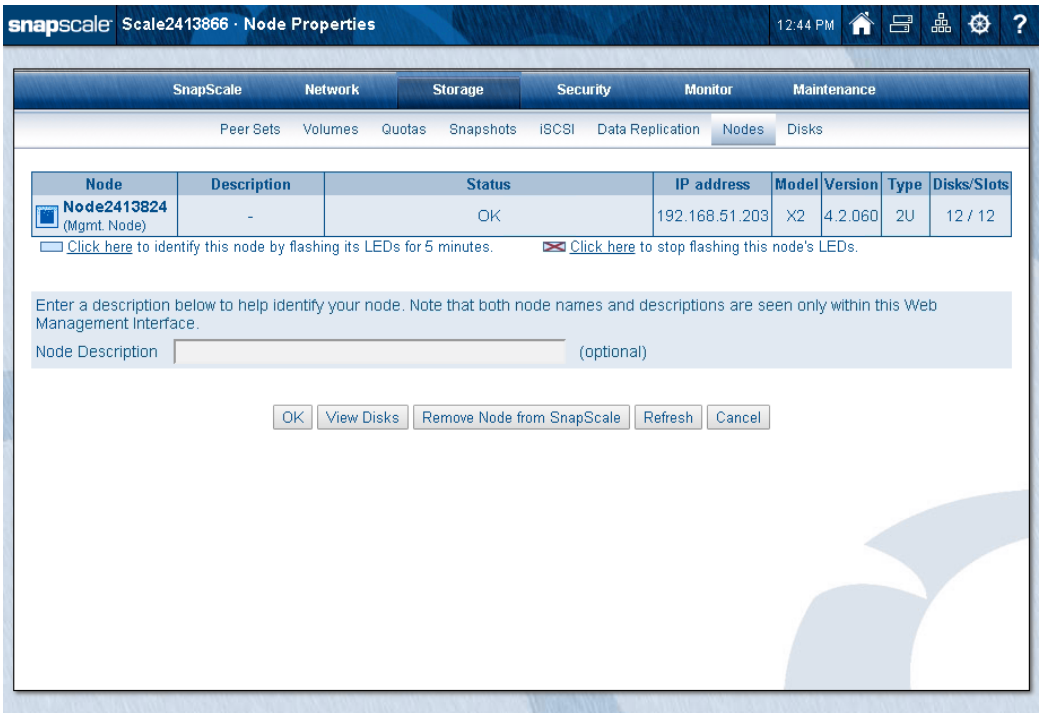
Edit Node Properties

By clicking a node's name in the **Node** column of the table on the **Node** page, the **Node Properties** page is shown with details of that particular node.



From this page, you can:

- Flash the node drive LEDs to help identify the node.
- Change the node description.
- View the drives in the node.
- Remove the node from the SnapScale cluster.

Flash the Node LEDs

Click the light-blue box ( ) under the node name to start the LEDs flashing for up to five minutes. Click the box with the red "X" ( ) to stop flashing the LEDs.

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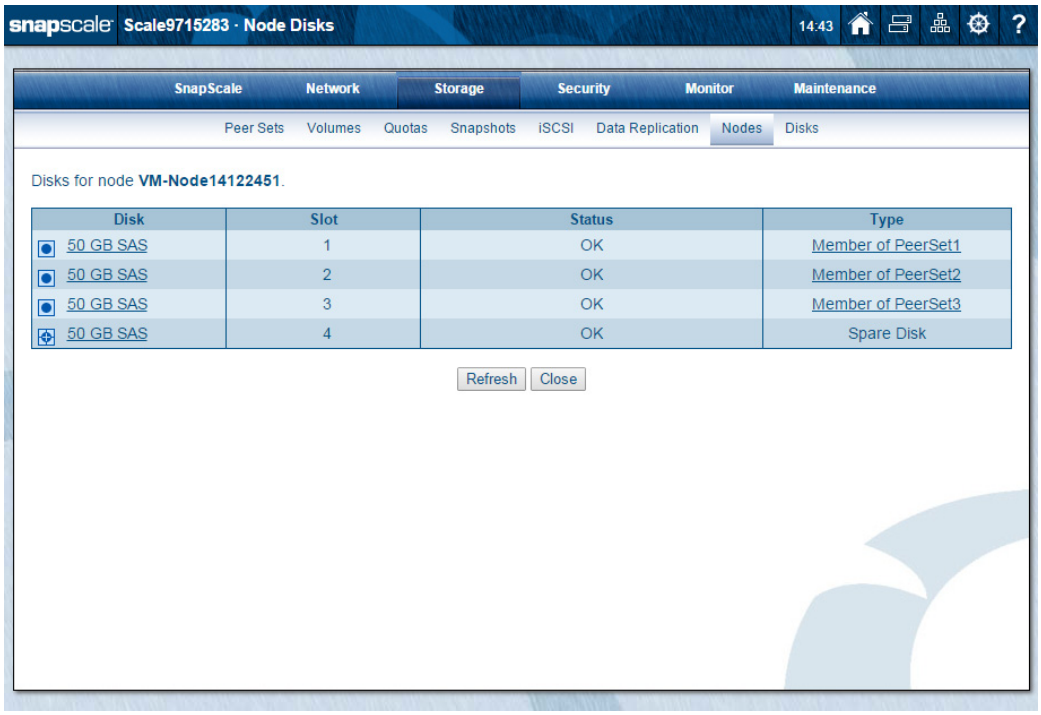
Node Drives

To view the drives that are installed in the node, click the **View Disks** button on the properties page.



When you click the name of the drive in the **Disk** column on the **Node Disks** page, the **Disks** page is displayed with the physical location of the disk drive. See Disks on page 152 for more information.

Clicking the member name in the **Type** column takes you to the **Peer Sets** page with that member highlighted. See Peer Sets Page on page 92 for more information.

When done, click **Close** to return to the **Node Properties** page.

Add Nodes

A SnapScale cluster can also be expanded by adding more nodes. Expansion kits are available that consist of either two or three additional nodes and all the necessary cables. Documentation is included with each node that details how to install, cable, and power up the new node.

Once installed in a rack, clicking the **Add Node** button on the **Nodes** page starts a wizard to add one or more nodes to the cluster to expand the storage space. By default, all eligible nodes are pre-selected.

IMPORTANT: In order to expand storage by adding nodes, the cluster must be able to create peer sets with each member on different nodes. To efficiently increase cluster storage, it is recommended that the number of new nodes you add is equal to or greater than the Data Protection Level plus one. It is highly recommended that these new nodes all be added at the same time in the same operation.

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When adding nodes, **all** the following must be taken into consideration:

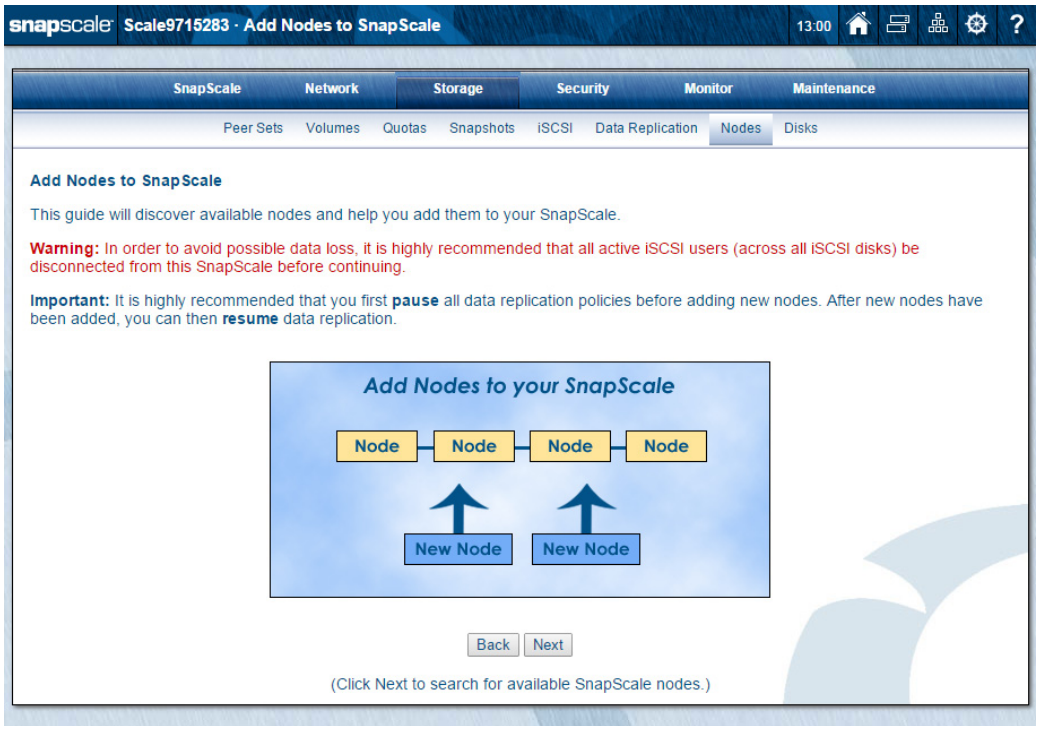
- The nodes must all be running the same version of RAINcloudOS (ROS). See OS Update on page 231.
- All the nodes, those already part of the cluster and those being added, must be attached to the same Client subnet.
- No expansion units can be attached to a node.
- The appropriate ports on the node must be available to create the proper bonding. (See Client and Storage Networks on page 19.)

Using the wizard, follow these steps to add your nodes:

1. At the **Node** page, click **Add Nodes**.

IMPORTANT: It is highly recommended that all active iSCSI users be disconnected before continuing.

If Data Replication is running, to prevent breaking the replication host links (either from this source to other targets or other sources using this cluster as a target), the policies must be paused. After all nodes are added, the policies can manually be resumed.



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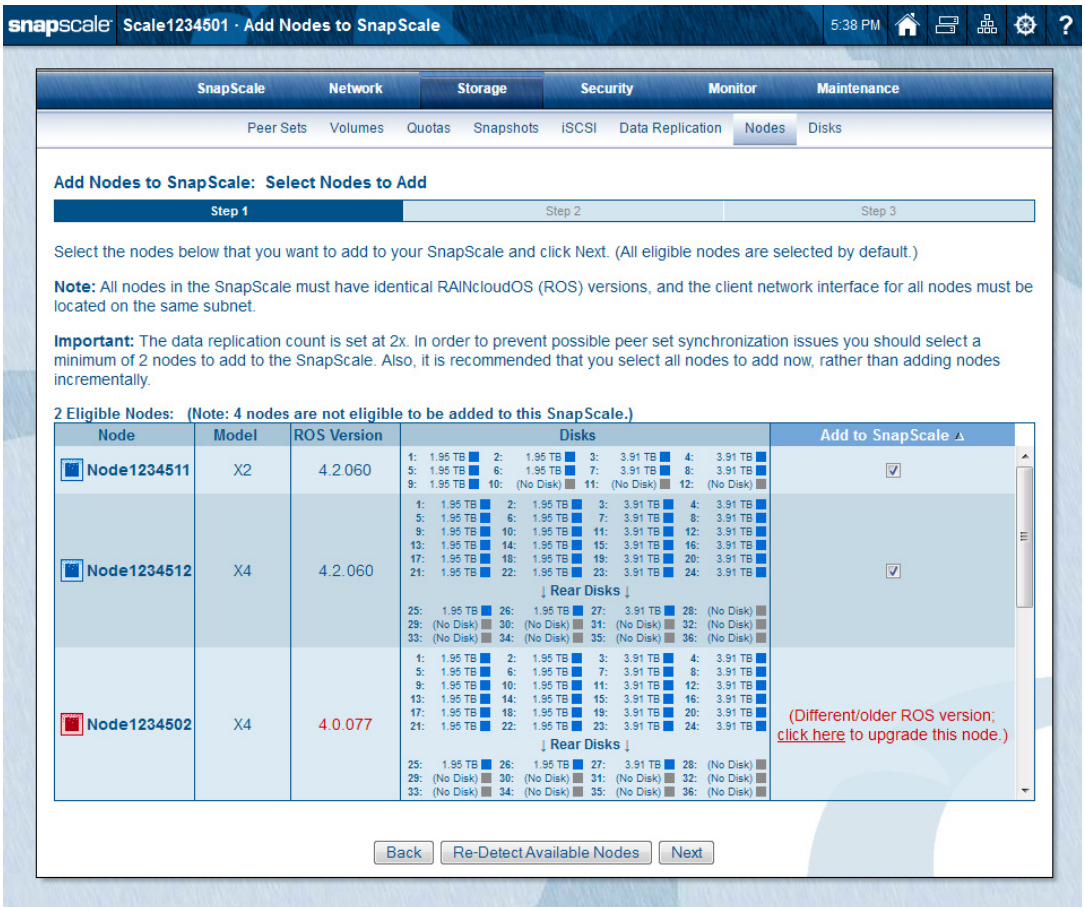
2. Click **Next** to display node choices (Wizard Step 1):



3. Check the boxes for the **nodes** you want to add to the cluster, and click **Next**.

NOTE: By default, all eligible nodes are pre-selected. It is recommended to accept all the nodes to ensure the optimum configuration.

If the node bond type doesn't match the cluster bond type, special informational messages are shown in the wizard based on the existing situation:

- If one or more of the nodes have a different Storage network bond type than the cluster, a note table is displayed in Wizard Step 1 showing the bond issues (or other errors).
- The final wizard page displays a percent completed status while the updated nodes with changed bond types are being rebooted.

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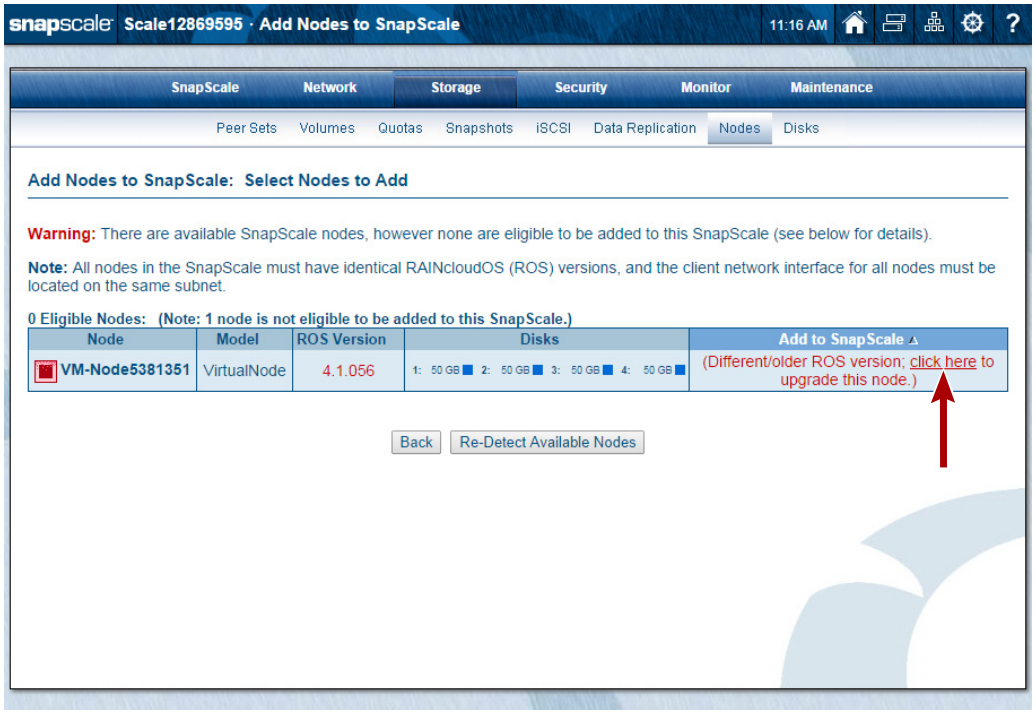
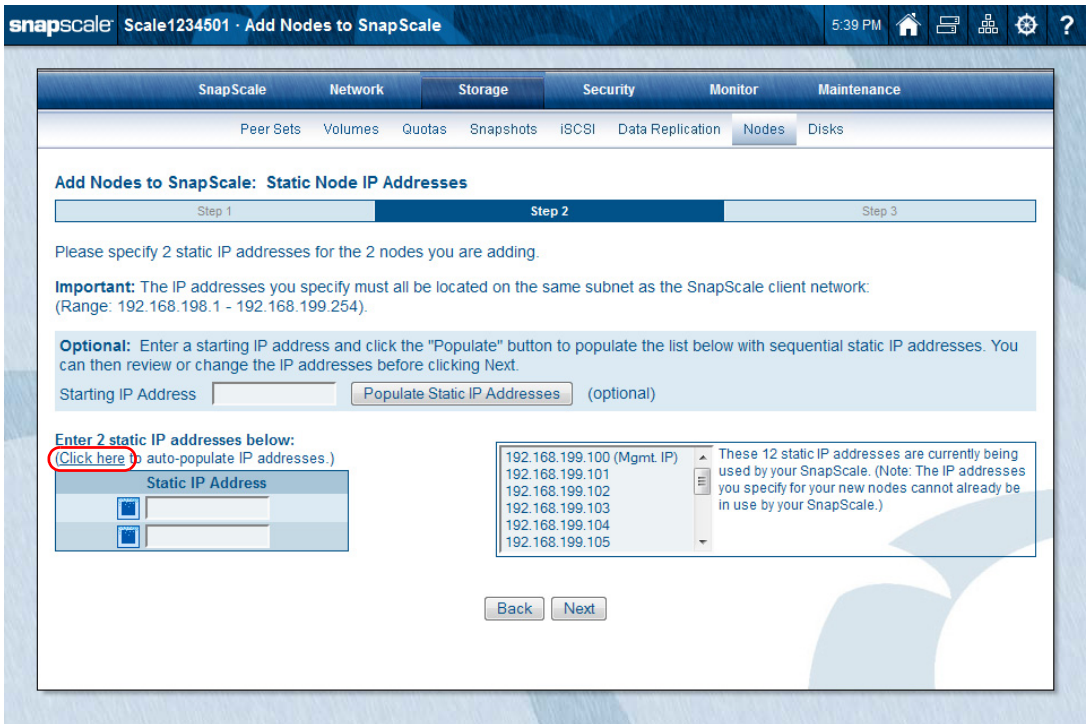
If an available node is not eligible to be added to the cluster due to an OS version mismatch, it can be upgraded to make it eligible.



Click the **click here** link in the **Add to SnapScale** column, then login to the node, and perform an OS update (see OS Update on page 231). When updated, go back to the browser tab showing the cluster and click **Re-Detect Available Nodes**.

4. At Wizard Step 2, configure the **static IP addresses** for the nodes, and click **Next**.



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It is recommended that you click the **Click here** option at the lower left to automatically add IP addresses based on the addresses being currently used.

NOTE: When more new nodes are being added to the cluster than there are unused IP addresses in the node address pool, more IP addresses must be added to the pool.

You can also enter a starting address in the Populate field based on the static IP addresses (in the list on the right) currently being used by your SnapScale cluster, and then click the **Populate Static IP Addresses** button.

5. At Wizard Step 3, verify the data and click **Add Nodes to SnapScale**.

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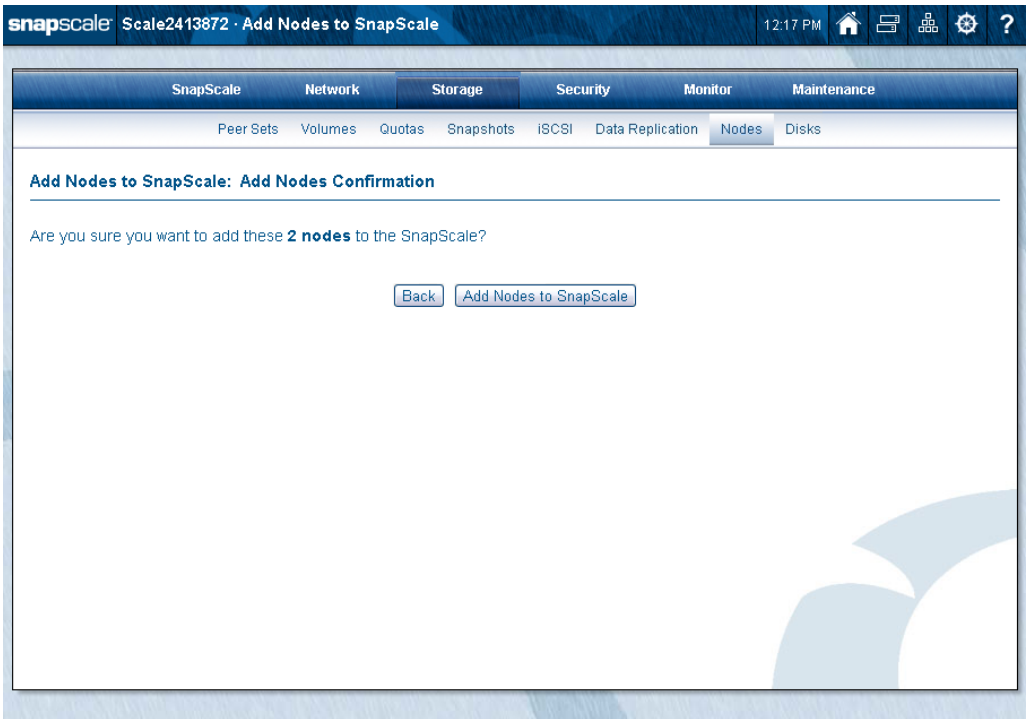
6. At the confirmation page, click **Add Nodes to SnapScale** again.



The new nodes are added to the cluster and the peer sets are built. This process takes several minutes.

IMPORTANT: If the Storage network bond type on the new nodes needs to be changed to or from Switch Trunking or Link Aggregation (802.3ad) to match the cluster bond type, an additional step is shown after shutting down the node so you can reconfigure the network switch and restart the node. You can also cancel the adding of the nodes if desired. However, if no action is taken in the first hour, after that time the adding of the nodes is automatically canceled.

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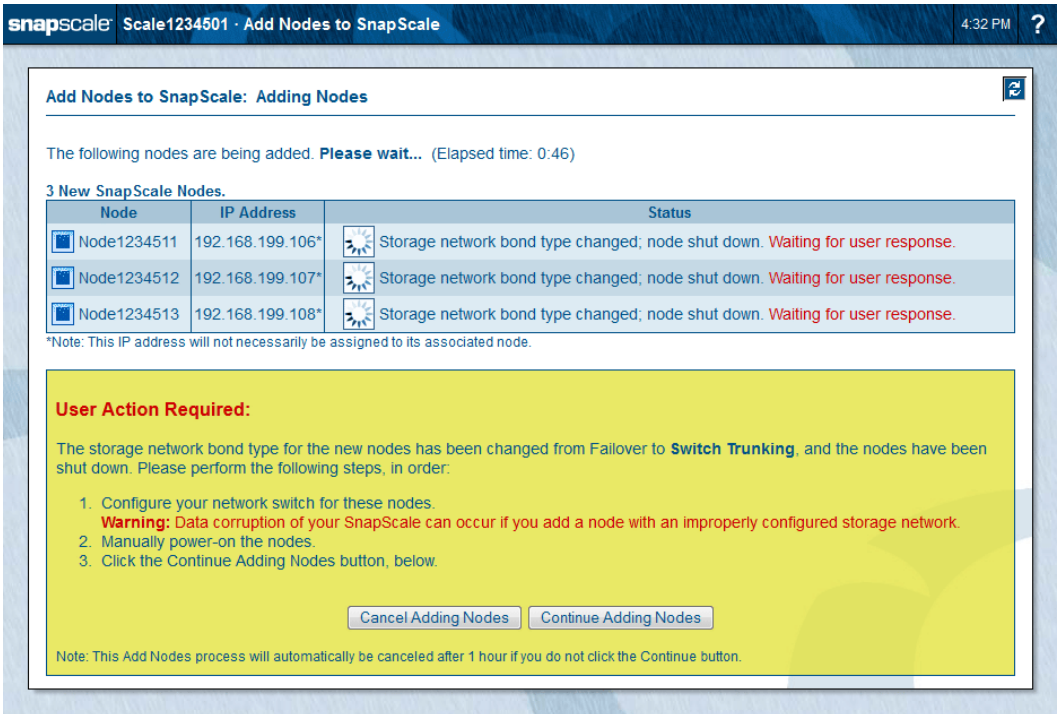
Example of network bond message:



Remove Nodes

IMPORTANT: It is highly recommended that all active iSCSI users be disconnected before continuing. Also, all replication policies need to be paused before removing any nodes.

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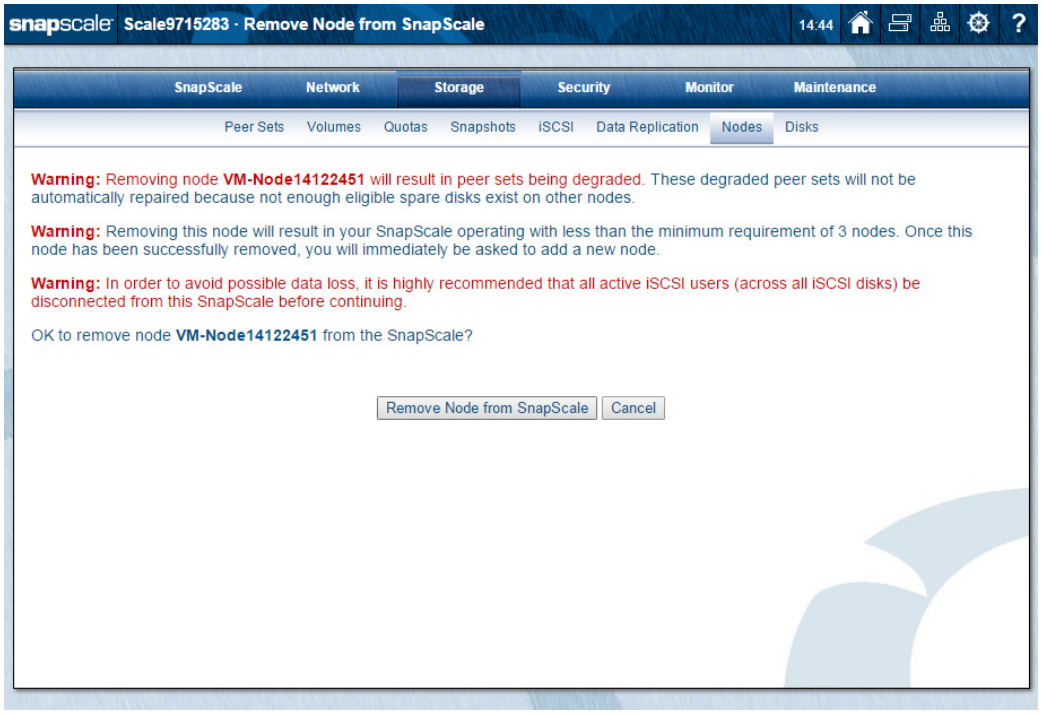
To remove a node from a SnapScale cluster, go to **Storage > Nodes**, click the node name to view the **Node Properties** page, and then click **Remove Node from SnapScale**. At the confirmation page, click **Remove Node from SnapScale** again.



IMPORTANT: Removing a node may result in one or more peer sets becoming degraded. These degraded peer sets may not be automatically repaired if there are not enough eligible spare drives on other nodes. Removing this node may also result in your SnapScale cluster operating with less than the minimum requirement of 3 nodes.

NOTE: If removing the node would destroy one or more peer sets, an error message is returned and the node is not removed.

The node itself is no longer associated with the cluster and becomes an Uninitialized node that can be added to another cluster.

Node Identification

The **Node Identification** page (accessed by the button on the main **Nodes** page) provides a convenient place to check the nodes and optionally change their descriptions for easier identification in the Web Management Interface.

NOTE: These options are also accessible from the **Node Properties** page.

Click a light-blue box ( ) next to the node name to start the node's LEDs flashing for up to five minutes. Click the box with the red "X" ( ) to stop flashing the LEDs or click the link next to the same icon below the nodes table to stop all node LEDs flashing.

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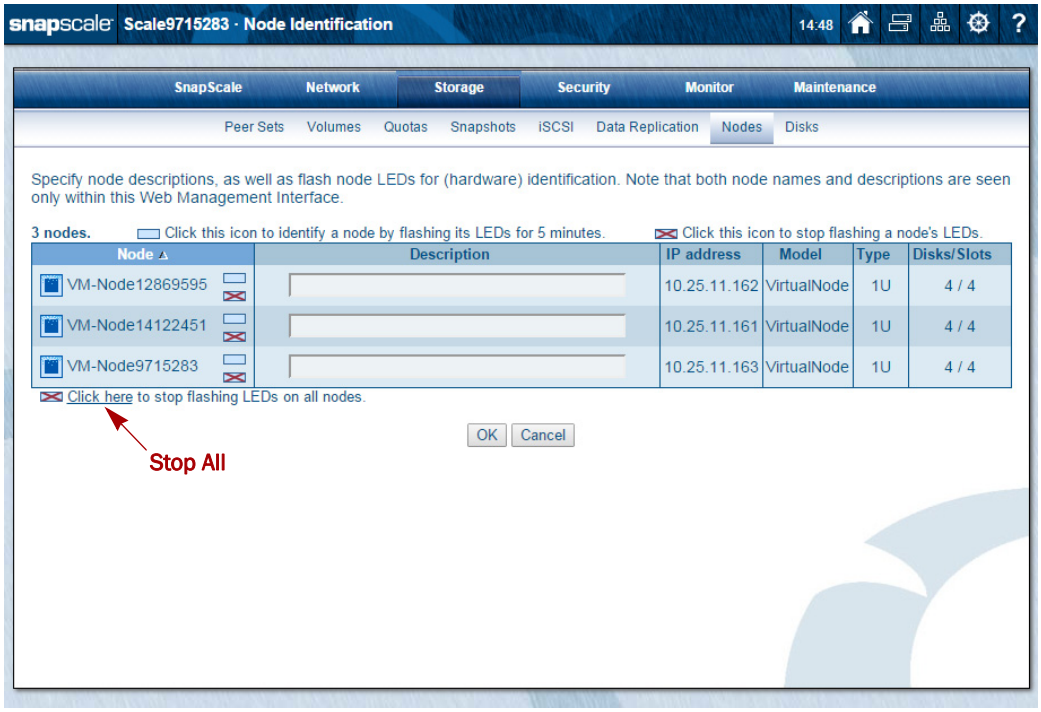
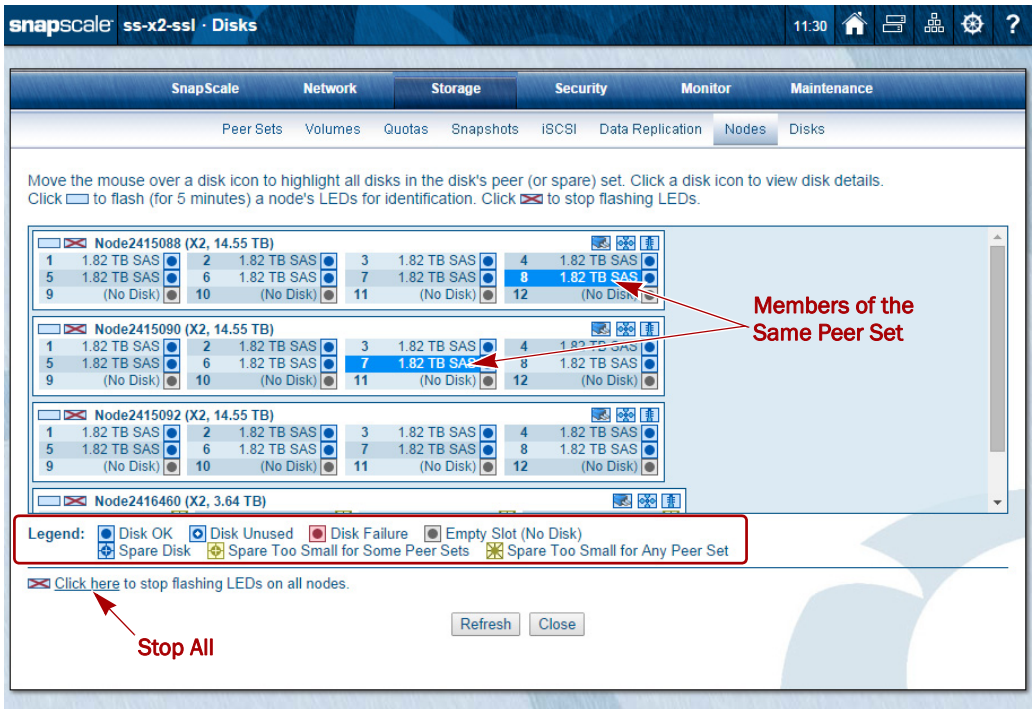


Disks

The **Disks** page is a graphic representation of the peer sets and disk drive status on your cluster. The legend on the page explains the meaning of each icon.



- Click a drive icon ( ) to view drive details.
- Hover over a drive icon ( ) to highlight in blue all the other members of the peer set.

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- Hover over a spare drive icon ( ) to view other spare drives.
- Click a unit's LED icon ( ) to flash the unit's status and drive status LEDs for identification. The LEDs flash amber. Click the LED stop icon ( ) to stop the unit's LEDs from flashing.

NOTE: The LEDs continue to flash for five minutes unless stopped. To stop flashing LEDs for all units, click the link next to the stop icon located below the Legend list.

Replace a Drive

Should a drive fail (solid red LED), it can be replaced (hot-swapped) without shutting down the SnapScale node. If a spare is available on a node that doesn't already have an active member of the failed drive's peer set, the spare automatically replaces the failed drive and the new drive being installed automatically becomes a spare. If no spares are available, the new drive automatically becomes a member of the failed drive's peer set.

A failed drive can be removed and replaced anytime. When hot-swapping multiple drives, it is recommended to swap one drive at a time to avoid timing issues.

NOTE: Hot-removed (non-spare) drives cannot be added directly back into the peer set from which they were removed. When any non-spare drive is physically removed, it is also removed from the peer set to which it belonged. That peer set then becomes degraded and it attempts to incorporate a suitable cluster spare. If the removed drive is reinserted and there is a degraded peer set or not enough spares to satisfy the spare count, the reinserted drive is reconfigured as a spare; otherwise, the reinserted drive becomes unused and available to the user to incorporate manually via the Web Management Interface.

If there are no errors, after the new drive is incorporated, any alert LEDs are turned off and system statuses are updated.

Add a Drive

CAUTION: If new peer sets are created when adding new drives to a node in a SnapScale cluster, all existing snapshots will be deleted.

NOTE: SnapScale only supports SAS (and nearline SAS) drives.

If empty slots are available on one or more nodes, you can add Overland-approved drives to either expand cluster storage space or add hot spares. When adding drives to expand storage space, distribute the new drives evenly across all the cluster nodes.

NOTE: Drives should be added without shutting down the node so that the cluster properly recognizes each drive. Note that drives with different rotational speeds cannot be combined in the same cluster.

In order to properly create peer sets with each member on different nodes, if you have the Data Protection Level set at 1, you must add drives in groups of two, each one in a different node. For a level of 2, add drives in groups of three, each one in a different node.

Once the new drives are added to the nodes, they must be incorporated using the **New Disks Detected** page in the Web Management Interface to enable the cluster to use them properly to create new peer sets and spares.

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Important Considerations

When adding new drives, consider the following:

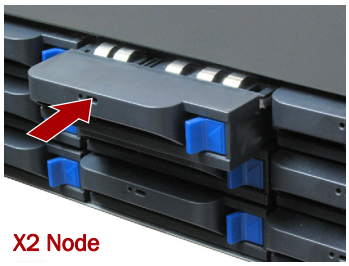
- Only add new drives (hot-insert) when the cluster is up and fully operational. Do not add new drives when the cluster is powered down.
- New drives can be added to Uninitialized nodes either while running or powered down.
- If there are fewer spares in the cluster than the spare count specifies, drives added to any cluster node are automatically configured as hot spares until the spare count is satisfied.
- If there is a degraded peer set on the cluster when adding a new drive and there are no existing spares, the drive will automatically be incorporated into the peer set as long as it is not on one of the nodes containing another active member of the peer set.
- When replacing a failed drive, it is recommended that the new drive be installed in the same slot as the old one to maintain a capacity balance.
- When adding a drive that replaces a failed drive in a peer set, the **Peer Sets** page will display that peer set as rebuilding the new drive into the peer set.

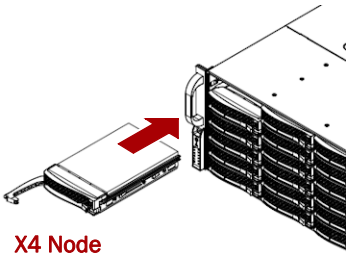
Drive Installation

NOTE: Do not remove the disk drives from their carriers. Doing so voids the drive warranty. Unless adding drives to an Uninitialized nodes, the cluster must be up and fully operational.

Install the drives into the available slots:

1. Remove the **blank drive carriers** from the slots that will be used for the new drives (leaving the remaining blank carriers in place).
2. Positioning a **drive carrier** in front of the appropriate **bay**:
   - For the **X2** node, slide it in until the **latch** clicks, locking the assembly in the bay.
   - For the **X4** node, slide it in until it stops and then close the **latch** to lock it in place.


X2 Node


X4 Node

3. Repeat Step 2 for **each** remaining drive carrier being installed.

IMPORTANT: To maintain proper airflow and cooling, a drive carrier or a blank carrier must be installed in *every* slot. No empty slots are allowed.

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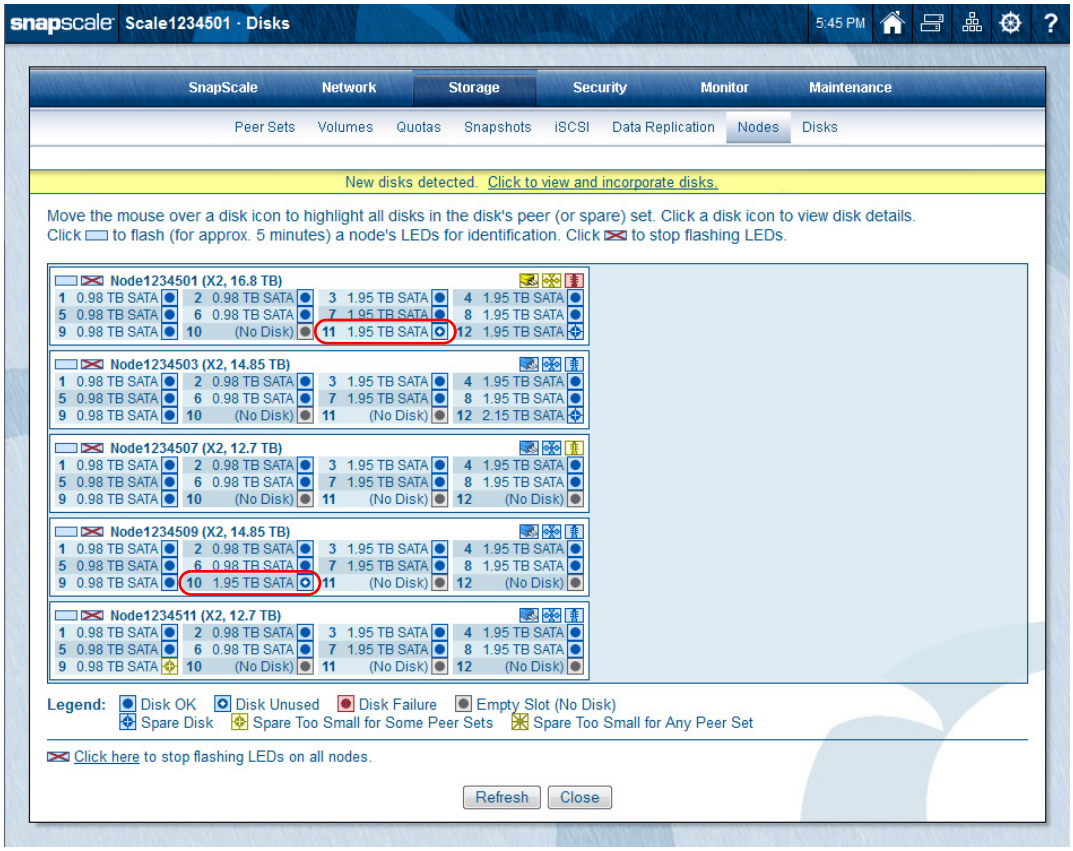
On the **Disks** page, any newly detected drives show a disk unused icon next to the drive. It may take a minute or two before the drives appear as unused and the new disks detected banner is displayed. The alert link in the banner takes you to the **New Disks Detected** page for incorporation.



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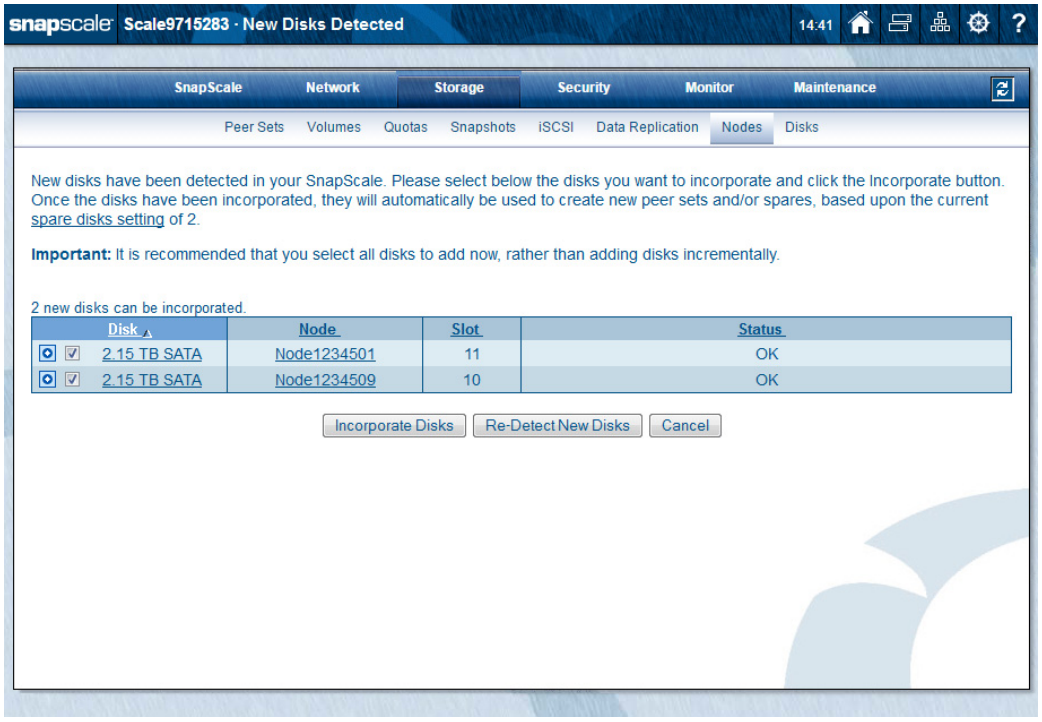
Peer Set/Hot Spare Incorporation

When newly installed drives are detected, SnapScale first auto-incorporates drives to fix any failed peer set and fulfill any reserved spare count. The Web Management Interface then displays an alert banner about the new drives and the **New Disks Detected** page is activated.

Click the link in the alert to go to the **New Disks Detected** page. The page displays all new drives available to be formed into new peer sets or used as new spares.



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The boxes next to the drive name can be unchecked to remove a drive from the incorporation list. However, to balance peer set and spare creation, it is recommended that all drives be incorporated at the same time.

Click **Incorporate Disks** to begin the process.

- If enough new or spare drives exist on different nodes based on your Data Protection Level (1 or 2) plus one, new peer sets are formed as long as the spare count is satisfied.
- If there are not enough drives or they are not on different nodes, the drives are used to create additional hot spares.

After incorporation, the drives are displayed normally as peer sets or hot spares on the **Disks** page.

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Security Options

The Security options control the access to the SnapScale cluster and its data.

SnapScale cluster authentication validates a user's identity by requiring the user to provide a registered login name (User ID) and corresponding password. The node ships with predefined local users and groups that allow administrative (admin) and guest user access to the cluster via all protocols.

Administrators may choose to join the SnapScale cluster to a Windows Active Directory domain, and CIFS/SMB and AFP clients can then authenticate to the cluster using their domain credentials. To accommodate NFS clients, the SnapScale cluster can also join an LDAP or NIS domain, and the SnapScale can look up user IDs (UIDs) and group IDs (GIDs) maintained by the domain for configuration of quotas and ID mapping. For authentication control beyond the guest account, Mac and FTP client login credentials can be created locally on the cluster. See User and Group ID Assignments on page 160.

Topics in Security Options

- Security Considerations
- Security Guides
- Shares
- Local Users

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- Local Groups
- Security Models
- ID Mapping
- Home Directories

Security Considerations

SnapScale cluster default security configuration provides one share to the entire volume. All network protocols for the share are enabled, and all users are granted read-write permission to the share via the guest account. By default, the **guest** user is disabled in SMB but enabled for HTTP and FTP.

Network clients can initially access the cluster using the guest account (where enabled), but if you require a higher degree of control over individual access to the filesystem for these clients, you must create local accounts (or use Windows Active Directory security for CIFS/SMB clients).

Local users or groups are created using **Security > Local Users** or **Security > Local Groups** in the Web Management Interface. Local users are also used for administrative access to the cluster through the Web Management Interface, SSM, or the CLI through SSH.

A local user or group is one that is defined locally on a SnapScale cluster using the Web Management Interface. The default users and groups listed below cannot be modified or deleted.

- **admin** – The local user admin account is used to log into the Web Management Interface. The default password for the admin account is also *admin*.
- **guest** – The local user guest account requires no password.
- **admingrp** – The Admin group account includes the default admin user account. Any local user accounts created with admin rights are also automatically added to this group.

Guidelines for Local Authentication

These password authentication guidelines are for both users and groups.

Duplicating Client Login Credentials for Local Users and Groups. To simplify user access for Windows Workgroup, duplicate their local client logon credentials on the SnapScale cluster by creating local accounts on the cluster that match those used to log on to client workstations. This strategy allows users to bypass the login procedure when accessing the cluster.

CAUTION: This strategy applies only to local users. Do not use duplicate domain user credentials if joined to an Active Directory domain.

Default Local Users and Groups. Default users and groups *admin*, *guest*, and *admingrp* appear on the list of users or groups on the user or group management pages, but they cannot be deleted or modified (although the admin password can be changed).

Changing Local UIDs or GIDs. The SnapScale cluster automatically assigns and manages UIDs and GIDs. Because you may need to assign a specific ID to a local user or group in order to match your existing UID/GID assignments, the cluster makes these fields editable.

Password Policies. To provide additional authentication security, set password character requirements, password expiration dates, and lockout rules for local users.

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Local users can also be individually exempted from password expiration and character requirement policies. The built-in *admin* user is exempt from all password policies.

Local Account Management Tools. The following tools are available for creating, modifying, and editing local user and group accounts:

Function	Navigation Path
Local User Management	Navigate to the **Local Users** page, from which you can create, view, edit, and delete local users. You can also set user password policy, including password character requirements, maximum number of allowed logon failures, and password expiration settings.
Local Group Management	Navigate to the **Local Groups** page, from which you can create, view, edit, and delete local groups.

User and Group ID Assignments

SnapScale uses the POSIX standard to assign UIDs or GIDs, in which each user and group must have a unique ID. This requirement applies to all users and groups on the cluster, including Windows Active Directory, LDAP, NIS, and local users.

If you join the cluster to a Windows, LDAP, or NIS domain, IDs are assigned using available IDs only. Consider the following when creating users and groups:

- UIDs and GIDs from 0 to 100 are unavailable for use. If you try to assign a UID or GID that is less than 101 (or in use by Windows, LDAP, or NIS domain), you will get an error message.
- When the cluster automatically generates UIDs or GIDs for imported Windows domain users or groups, UIDs or GIDs that are already in use by LDAP, NIS, or local users are skipped.
- When LDAP or NIS domain users and groups are imported, the cluster discards any UIDs that are less than 101 or are in conflict with UIDs already in use by local or Windows domain users and groups.

The `nfsnobody` and `nobody` user IDs (UID 65534 and 65535, respectively) and GIDs are reserved. They are not mappable to other IDs, nor is another ID mappable to `nfsnobody` or `nobody`.

Security Guides

Security Guides are special wizards to guide you through:

- Setting up Windows Active Directory security.
- Giving users or groups share-level access to an **entire volume**.
- Giving users or groups share-level access to a **folder on a volume**.

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Security Guide for Windows Active Directory

The **Windows Active Directory Security Guide** wizard guides you through the setup of Windows Active Directory on your cluster.

NOTE: You cannot join an Active Directory domain if NTP is enabled. If you see such a message, click the NTP link to change your settings.

When the cluster joins a domain, it does so as a single unit under the cluster name, and all nodes operate equally under the cluster name to authenticate against the domain. This provides multi-point domain-authenticated access to the cluster through each node.

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Security Guide for Entire Volume Access

This **Share Level Access Security Guide** wizard guides you through the four steps it takes to give share-level access to an **entire volume**.

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Security Guide for Folder Access on Volume

This **Share Level Access Security Guide** wizard guides you through the five steps it takes to give share-level access to a **folder on a volume**.

Shares

NOTE: Shares pointing to data replication target volumes are read-only regardless of the share permissions.

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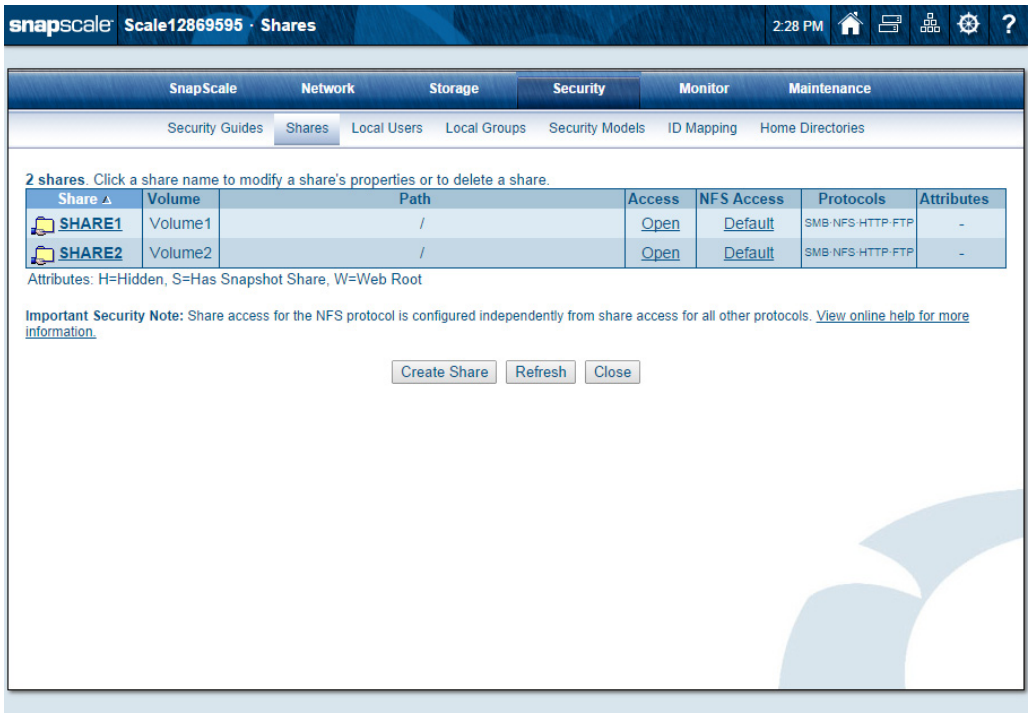
SnapScale provides full integration with existing Windows Active Directory domain or Unix LDAP or NIS user and group databases. At the share level, administrators can assign read-write or read-only share access to individual local and Windows domain users and groups for Windows/SMB, FTP, and HTTP. Administrators can also edit the NFS exports file to control how shares are exported to NFS client machines.



SnapScale supports file access in Windows, and Unix networks, as well as access via HTTP and FTP. New shares are created by default with full read-write access to all users, subject to the filesystem permissions on the share target directory. The first step to securing a cluster is to specify access at the individual share level. Administrators can assign read-write or read-only share access to individual Windows (and local) users and groups.

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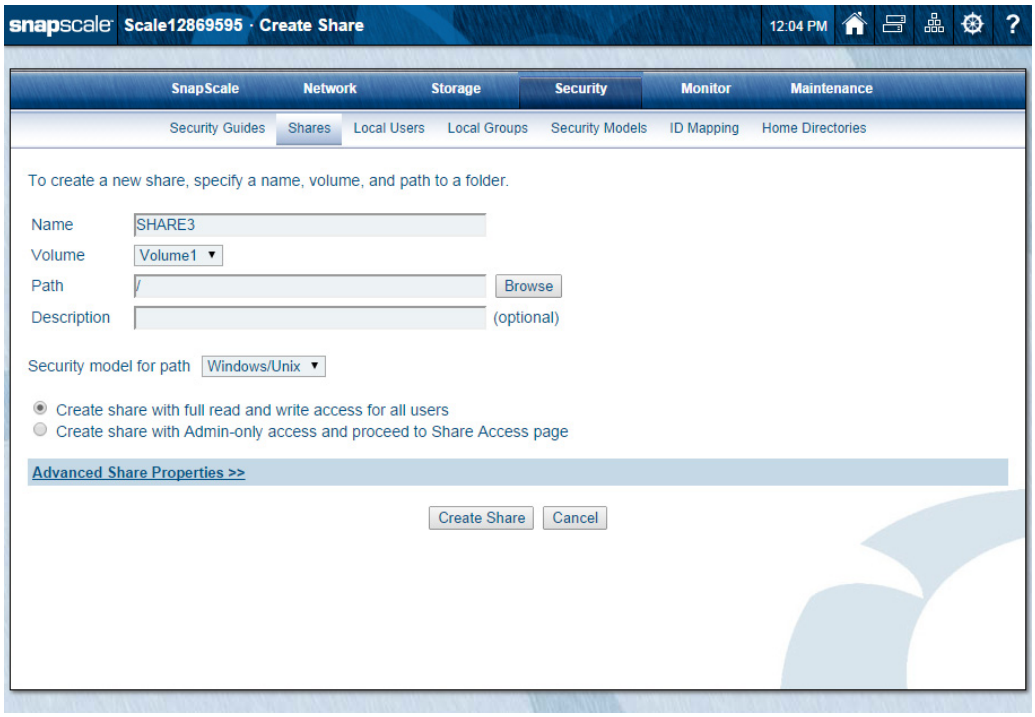
Create Shares

To create a new share, at a minimum you need to specify the share name, volume, and folder path. Click **Create Share** on the default **Shares** page to start the process.



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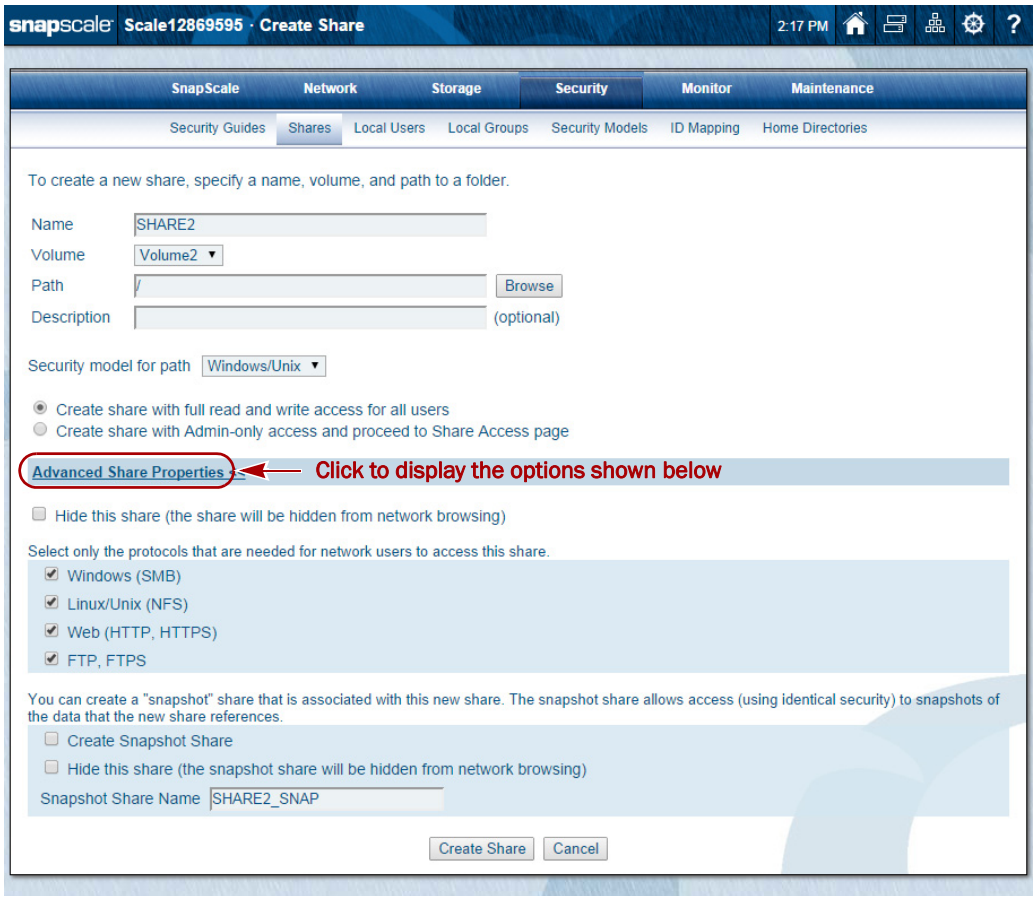
By clicking the **Advanced Share Properties** link, additional options are displayed. Use these options to hide the share from network browsing, select the protocols supported and create a snapshot share associated with this share.



NOTE: The snapshot information at the bottom is only shown if snapshot space has been reserved.

Share Creation

Creating a share includes selecting the volume, security model, and directory path for the share and then defining share attributes and network access protocols.

1. Accept the default **share name** or enter a new one.

   To ensure compatibility with all protocols, share names are limited to 27 alphanumeric characters (including spaces).

2. Choose the **volume** you need from the drop-down menu.

3. Select from the following **path options**:

   - **To create a share to the entire volume** – The current Path field defaults to the root path of the volume. Simply leave it blank if this is the desired configuration.
   - **To create a share to a folder on the volume** – Browse to the folder to which you want to point the share, click the folder name, and click **OK**.

NOTE: If you want to create a new folder inside any other folder, type the folder name into **New Folder Name** and click **Create Folder**.

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4. If desired, enter a **description** to clarify the purpose of the share.
5. Choose a **security model for path** by selecting **Windows/Unix, Windows,** or **Unix** from the drop-down list.

   The option defaults to the current security model at the specified path. If changed to a different security model, the change will propagate to all files and subdirectories underneath. For more information, see Security Models on page 190.
6. Choose the user-based **share access** option desired for Windows/SMB, FTP, and HTTP users:

   Choose either **Create share with full read and write access for all users**, or **Create share with Admin-only access and proceed to Share Access page** to configure the user share access. For more information, see Share Access Behaviors on page 171.

   NOTE: If selecting the share with Admin-only access option and the share has NFS enabled, be sure to configure the NFS access settings afterward.
7. To further configure the share, click **Advanced Share Properties** and enter any of the following:

Option	Description
Hide this Share	Select this option if you want the share to be hidden from network browsing using SMB, HTTP/HTTPS, and FTP protocols (but not NFS).
Protocols	Select the access protocols for the share: Windows (SMB), Linux/Unix (NFS), Web (HTTP/HTTPS), and FTP/FTPS. Check all that apply.
Snapshot Share	To create a snapshot share, check the **Create Snapshot Share** box. Optionally, do either of the following: • To hide the snapshot share from the SMB, HTTP, and FTP protocols, check the **Hide Snapshot Share** box. • If you do not want to accept the default name provided, enter a unique name for the **Snapshot Share Name** field. Use up to 27 alphanumeric characters (including hyphens and spaces).

8. Click **Create Share** to complete the process.

Edit Share Properties

NOTE: You cannot change the volume (or path) of a share once it is created. If you need to change the share's volume, you must delete the share and create a new share on the other volume.

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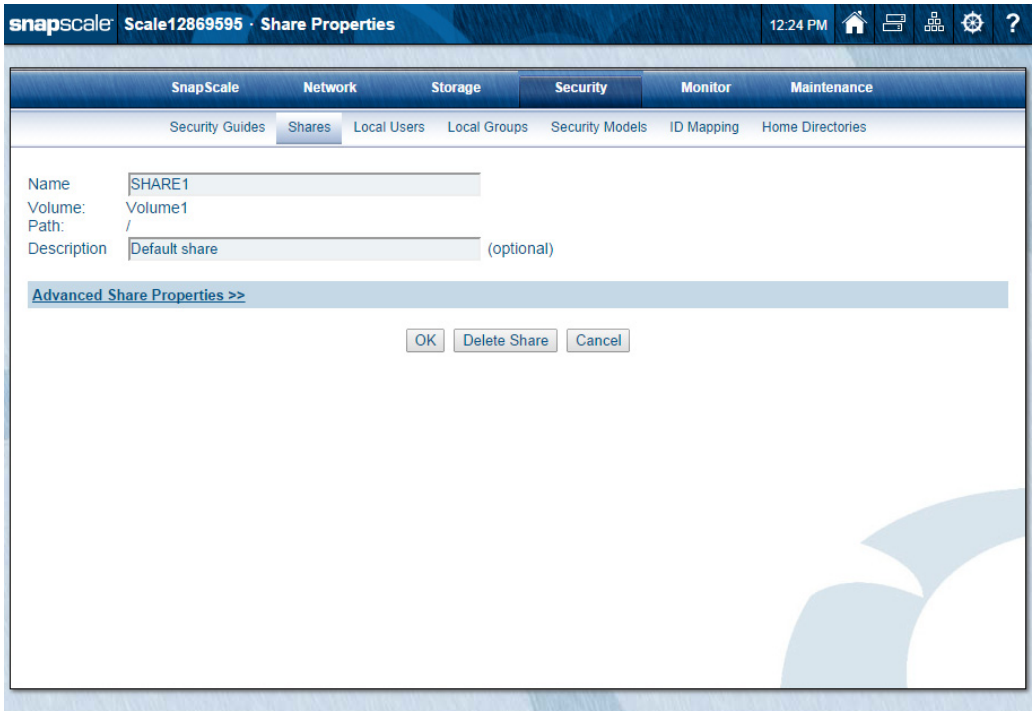
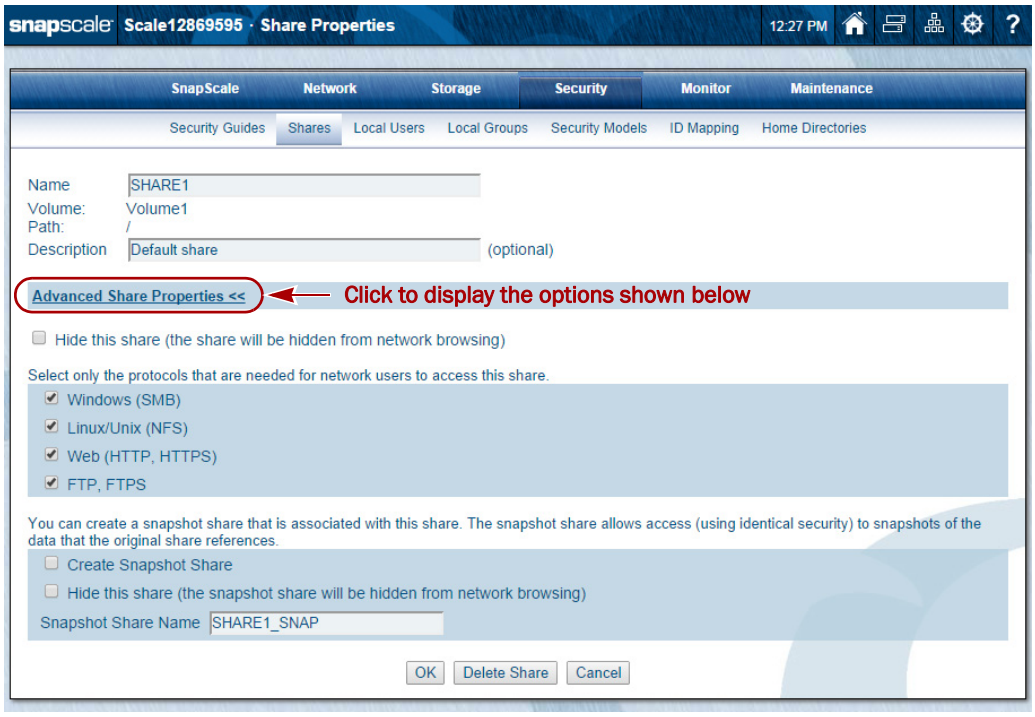
Once a share has been created, you can change its name, description and the advanced properties. To edit the properties, go to **Security > Shares > Share Properties** (displayed by clicking the share name in the table).



By clicking the **Advanced Share Properties** link, additional options are displayed. Use these options to hide the share from network browsing, select the protocols supported, and create a snapshot share associated with this share.

NOTE: The snapshot information at the bottom is only shown if snapshot space has been reserved.



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Option	Description
Name	Accept the default share name or enter a new one. If you change the default, observe the following guidelines: • Make sure the share name is unique on this cluster. • To ensure compatibility with all protocols, share names are limited to 27 alphanumeric characters (including hyphens and spaces).
Description	If desired, enter a description of the share. This is an opportunity to clarify the purpose of the share.
Hide this share	Select this option if you want the share to be hidden from network browsing using SMB, HTTP/HTTPS, and FTP/FTPS (but not NFS) protocols.
Protocols	Select the access protocols for the share: Windows (SMB), Linux/Unix (NFS), Web (HTTP/HTTPS), and FTP/FTPS. Check all that apply.
Snapshot Share	The option that displays depends on whether a snapshot share currently exists. To **create** a snapshot share, check the **Create Snapshot Share** box. Optionally, do either of the following: • To hide the snapshot share from the SMB, HTTP, and FTP protocols (but not NFS), check the **Hide Snapshot Share** box. • If you do not want to accept the default name provided, enter a unique name for the **Snapshot Share Name** field. Use up to 27 alphanumeric characters (including hyphens and spaces). To **remove** an existing snapshot share, check the **Remove Snapshot Share** box.

Delete Shares

To delete a share, go to **Security > Shares > Share Properties** (displayed by clicking the share name in the table).

1. At the **Delete Share** page, click **Delete Share**.

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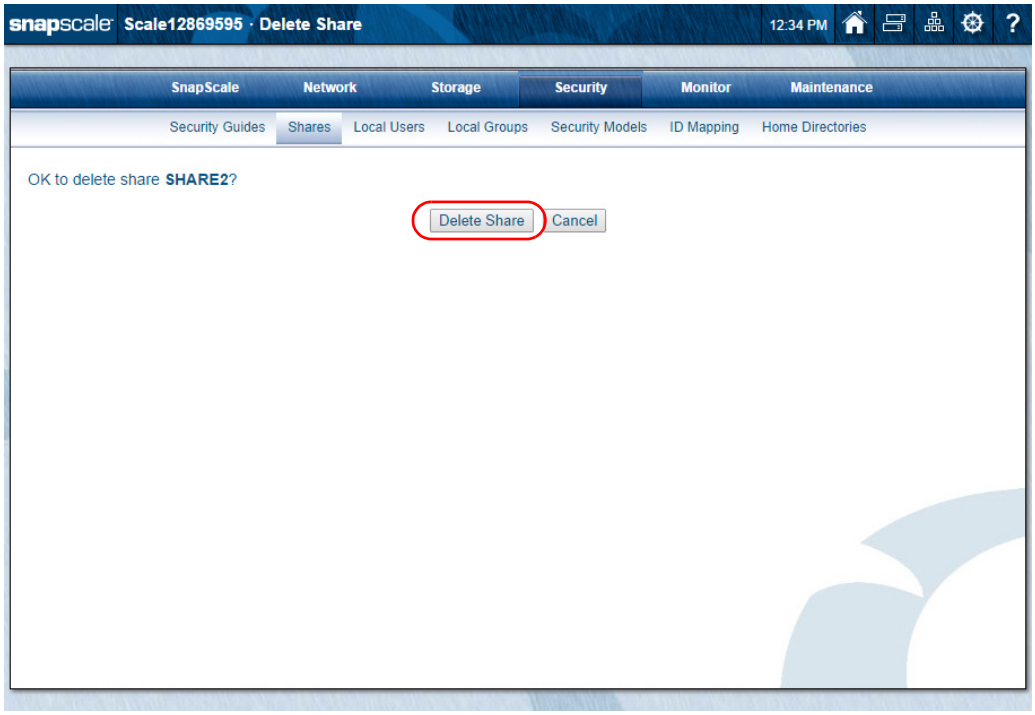
2. At the confirmation page, click **Delete Share** again.



Configure Share Access

In **Security > Shares**, in the **Access** column, click the link next to the share you want to configure. The **Share Access** page is displayed. You can set access levels for the share, as well as grant or deny access to specific users and groups.

NOTE: To add a new user to a share, you must first create the user, then add that user to the share. Please see Local Users on page 178 for information on creating new users.

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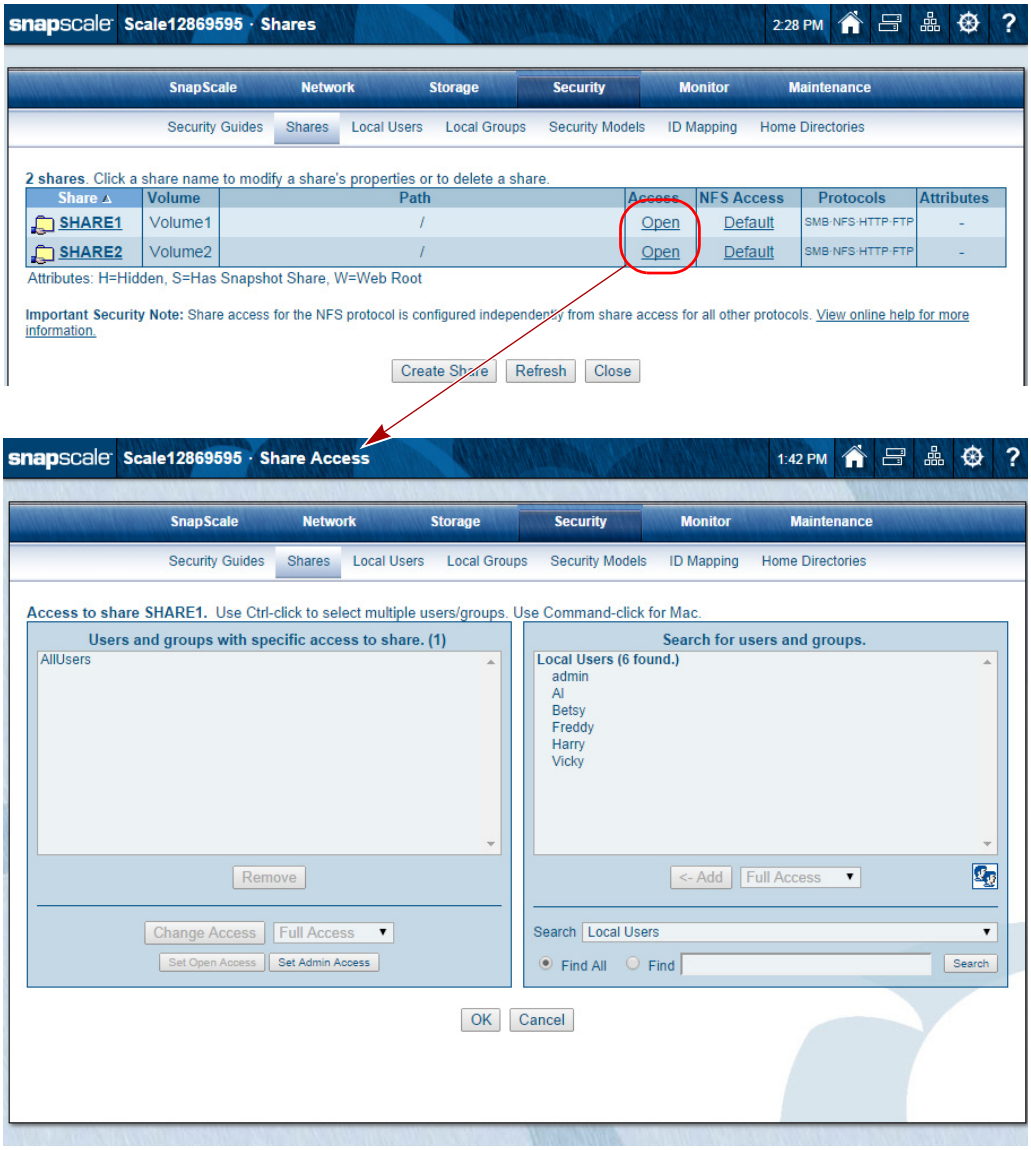

Share Access Behaviors

Administrators tasked with devising security policies for SnapScale cluster will find the following share access behaviors informative:

- **Share access defaults to full control** – The default permission granted to users and groups when they are granted access to the share is full control. You may restrict selected users and groups to read-only access.
- **User-based share access permissions are cumulative** – An SMB, HTTP, and FTP user's effective permissions for a resource are the sum of the permissions that you assign to the individual user account and to all of the groups to which the user belongs in the **Share Access** page. For example, if a user has read-only permission to the share, but is also a member of a group that has been given full-access permission to the share, the user gets full access to the share.

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- **NFS access permissions are not cumulative** – An NFS user's access level is based on the permission in the NFS access list that most specifically applies. For example, if a user connects to a share over NFS from IP address 192.168.0.1, and the NFS access for the share gives both read-write access to "*****" (All NFS clients) and read-only access to 192.168.0.1, the user will get read-only access.
- **Interaction between share-level and file-level access permissions** – When both share-level and file-level permissions apply to a user action, the more restrictive of the two applies. Consider the following examples:

  Example A: More restrictive file-level access is given precedence over more permissive share-level access.

Share Level	File Level	Result
Full control	Read-only to File A	Full control over all directories and files in SHARE1 *except* where a more restrictive file-level permission applies. The user has read-only access to File A.

  Example B: More restrictive share-level access is given precedence over more permissive file-level access.

Share Level	File Level	Result
Read-only	Full control to File B	Read-only access to all directories and files in SHARE1, *including* where a less restrictive file-level permission applies. The user has read-only access to File B.

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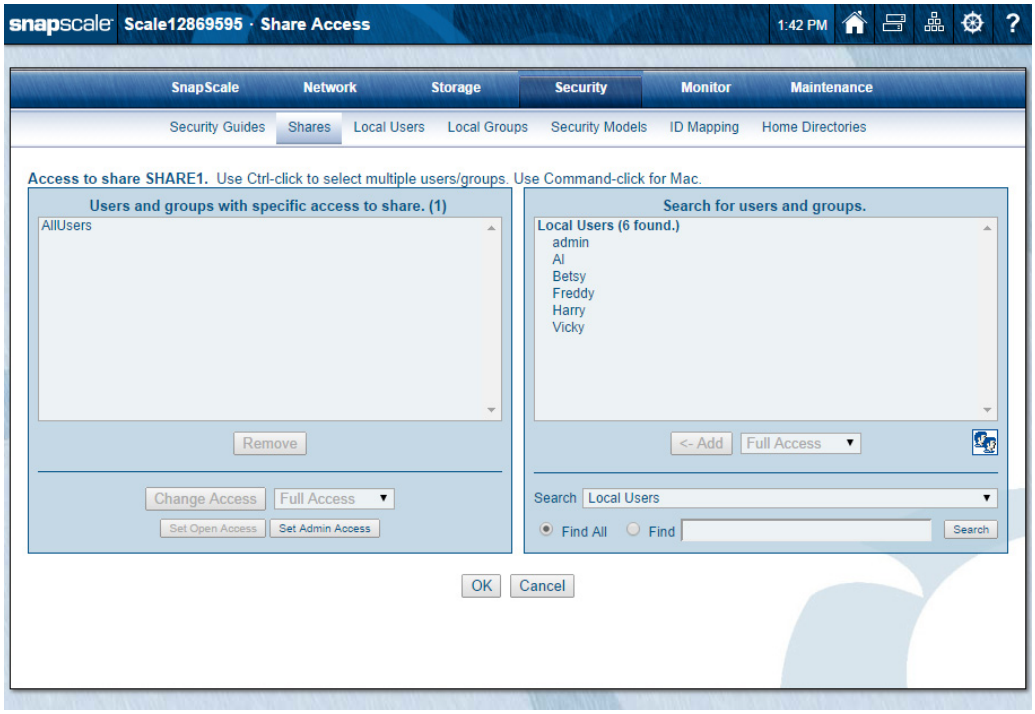
Set User-based Share Access Permissions

Share permissions for Windows, HTTP, and FTP users are configured from **Security > Shares** by clicking the link in the **Access** column of the share you want to configure. Share permissions for NFS are configured and enforced independently. See NFS Access for Shares on page 175 for more information.



User-based share access permissions apply to users connecting over SMB, HTTP, or FTP. Users and groups with assigned share access permissions appear in the list on the left (**Users and groups with specific access to share**). To search for those without assigned access, use the box on the right (**Search for users and groups**).

The default permission granted to users and groups when they are granted access to the share is **Full Access**. You may restrict selected users and groups to **Read-only Access**.

Share-Level Access Permissions	
Full	Users can read, write, modify, create, or delete files and folders within the share.
Read-only	Users can navigate the share directory structure and view files.

1. Display the **Share Access** page (**Security > Shares >** *access_link*).
2. To **add** share access permissions for a user or group:
   a. At the bottom, using the drop-down list, select the **domain** or **local user/group list** to search.

   NOTE: For domains that require authentication (showing an "(A)" after the name), after selecting the domain name, enter the **User Name** and **Password** for that domain. The user name and password can be for any user in the domain and are used to retrieve basic information (like the user and group lists) from the domain.

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b. Enter the **search string** (or select **Find All**).

When entering a search string:

- Returned results will include all users and groups whose name **begins** with the string entered in the Search field.
- The search results returned may be limited. Fine tune your search by using a more specific string to return the names desired.
- On the rare occasion you need to search for a domain that is not listed ("remote domain"), select a domain from the Search drop-down list through which to search, then enter in the Find box the name of the remote domain, followed by a slash (/) or backslash (\) and the user name for which you are searching (for example, **`remote_domain\user_name`**).

c. Click **Search** to display any matches.

After you click **Search**, another authentication prompt may be presented to authenticate with the remote domain.

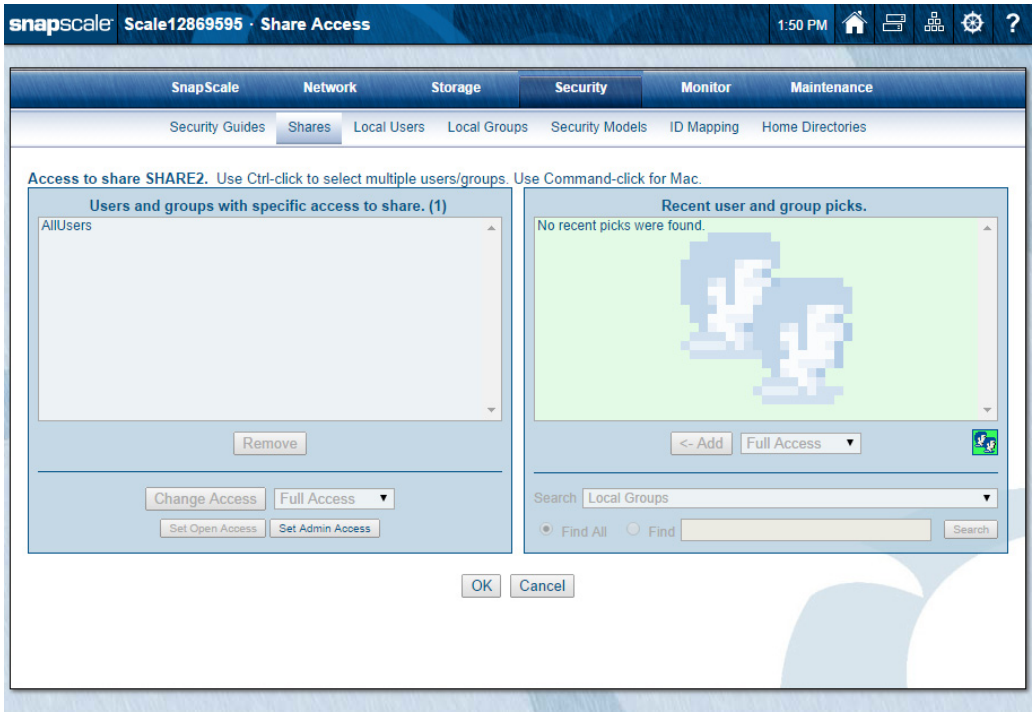
d. Select one or more **names** in the list.

Users that already have access are shown in purple font with a plus sign (+) in front of their name.

e. Choose either **Full Access** or **Read Only** from the drop-down list.

f. Click **Add**.

NOTE: To display recent user or group picks, click the **faces** ( ) icon. A list with a green background is displayed. Click the now green icon again to return to the normal search box.



3. To **remove** share access permissions for a user or group:

a. Select one or more **users or groups** in the left box.

b. Click **Remove**.

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4. To change **access permissions** for a user or group, select one or more users or groups in the left box, then select either **Full Access** or **Read Only** from the drop-down list, and finally click **Change Access**.
5. To quickly specify either Open or Admin-only **access** for the entire share, click either **Set Open Access** or **Set Admin Access**.
6. Click **OK** to save share permissions.

NFS Access for Shares

NOTE: Multiple shares pointing to the same target directory must have the same NFS access settings. The Web Management Interface applies the same NFS access for all shares pointing to the same directory.

To configure NFS access, click the link shown in the **NFS Access** column for the share you want to configure. You can configure NFS access to the share using standard Linux "exports" file syntax.

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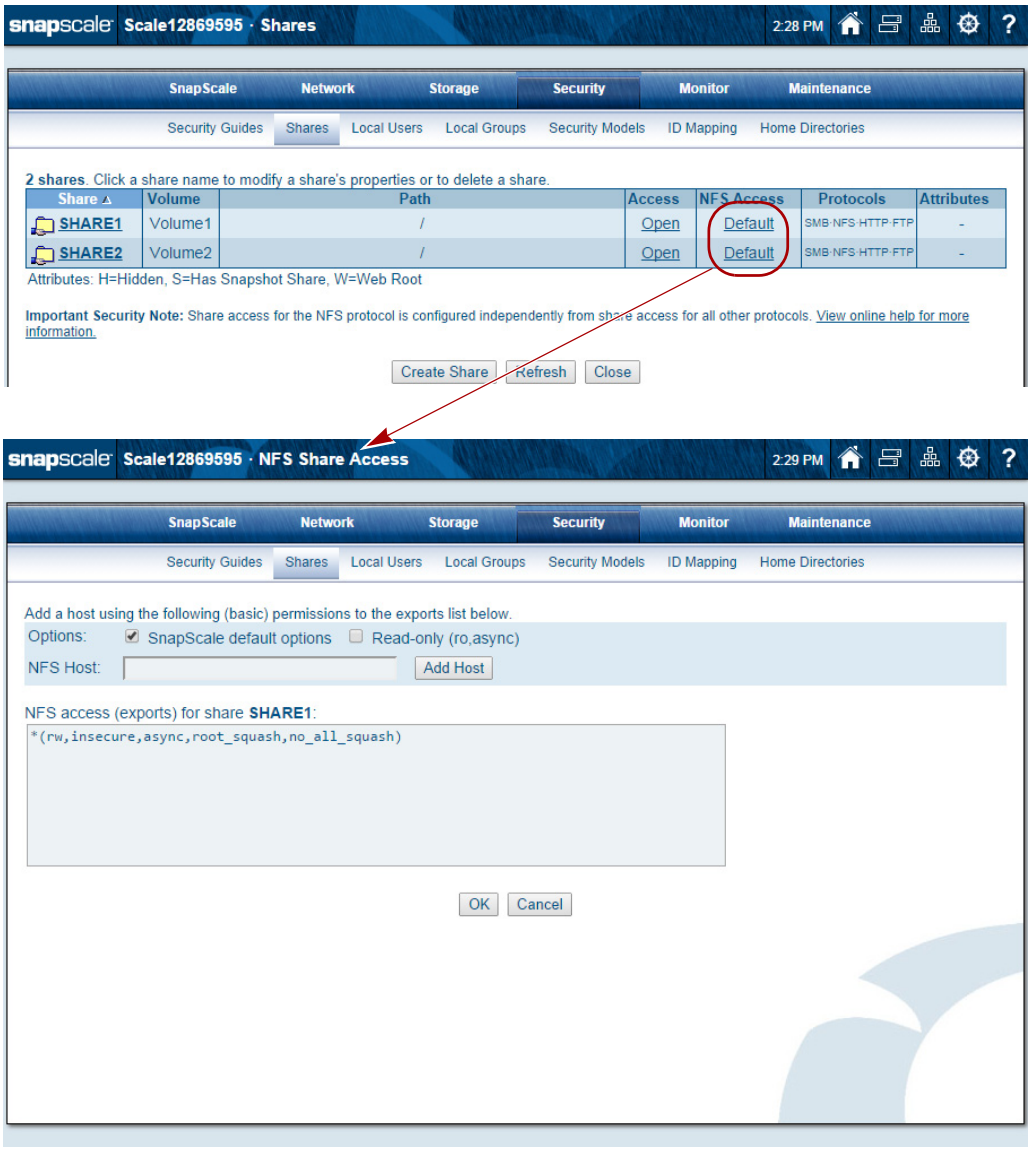
On the **Shares** page, click the name of the access type listed in the **NFS Access** column to open the **NFS Share Access** page.



The NFS access text box is a window into the client access entries in the *exports* file. This file serves as the access control list for filesystems that may be exported to NFS clients. You can use the **Add Host** controls as described below to assist in making entries to the file, or you can directly edit the text box. After all entries are made, click **OK** to return to the **Shares** page.

NOTE: The syntax used in this file is equivalent to standard Linux exports file syntax. If the cluster detects any errors in syntax, a warning message appears. You can choose to correct or ignore the error warning.

The Exports File Default Options. The SnapScale default setting provides read-write access to all NFS clients.

```
*(rw,insecure,async,root_squash,no_all_squash)
```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The entry options are explained in the following table:

Entry Code	Meaning
Asterisk	All NFS clients
ro	The directory is shared read only (ro).
rw	The client machine will have read and write (rw) access to the directory.
insecure	Turns off the options that require requests to originate on an Internet port less than IPPORT_RESERVED (1024).
root_squash	Forces users connected as root to interact as the "nobody" user (UID 65534). This is the SnapScale default.
no_root_squash	no_root_squash means that if root is logged in on your client machine, it will have root privileges over the exported filesystem. By default, any file request made by user root on the client machine is treated as if it is made by user **nobody** on the cluster. (Exactly which UID the request is mapped to depends on the UID of user **nobody** on the cluster, not the client.) If no_root_squash is selected, then root on the client machine will have the same level of access to the files on the system as root on the cluster. This can have serious security implications, although it may be necessary if you want to perform any administrative work on the client machine that involves the exported directories. You should not specify this option without a good reason.
async	Tells a client machine that a file write is complete – that is, has been written to stable storage – when NFS has finished handing the write over to the filesystem.
no_all_squash	Allows non-root users to access the nfs export with their own privileges.

Using the Add Host Option. Follow these steps:

1. Select **one** of the following options:
   - **SnapScale Default Options** – Inserts the default options as described above.
   - **Read Only** – Inserts the read only option only.
   - **Both** – Inserts default options, but substitutes read only for read/write.
2. Do **one** of the following in the NFS host text box:
   - **To apply the options to all NFS hosts** – Leave this field blank.
   - **To apply the options to specific hosts** – Enter one or more IP addresses.
3. Click **Add Host**.

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Local Users

The **Local Users** page provides all the options to manage local users. Local users are users that are known only to the cluster being accessed. Each SnapScale cluster comes with two predefined users: admin and guest. The admin user has full Administrator rights. Go to **Security > Local Users** to view settings or make changes.

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Create a User

Click **Create** to create a new user on this cluster. Enter the user data, select any special options, and click **Create User** again.

Local User Creation

1. On the **Local Users** page, click **Create User**.
2. On the **Create Local User** page that opens, enter the requested **information**:

Option	Description
Name	Use up to 31 alphanumeric characters and the underscore.
Full Name	Use up to 49 alphanumeric characters (includes spaces). Input in this field is optional.
Password	Passwords are case-sensitive. Use up to 15 alphanumeric characters without spaces.
Confirm Password	Type the chosen password again for verification.
User ID (UID)	Displays the user identification number assigned to this user. Alter as necessary. For information on available UID ranges, see User and Group ID Assignments on page 160.

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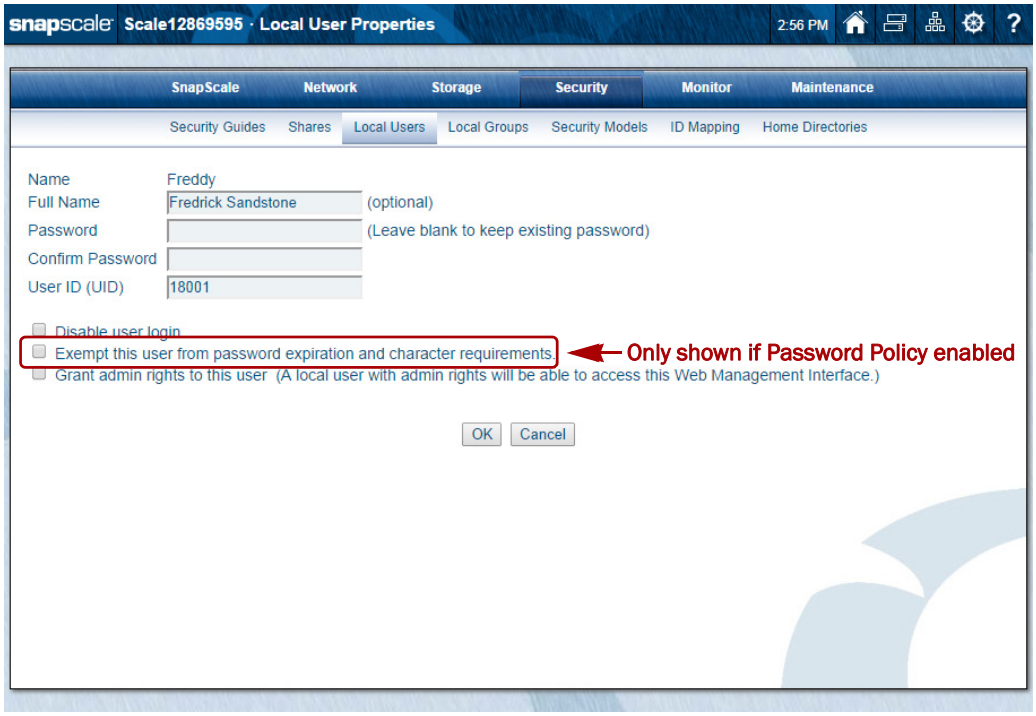
Option	Description
Disable User Login	Check this box to disable the user login. The user's information will remain in the system, but login rights are denied. The user login can be re-enabled by clearing the box. This box can also be used to enable a user locked out by the *Disable login after n attempts* password policy.
Exempt from Password Expiration and Character Requirements	This checkbox is only visible if Password Policy is enabled. Check this box to exempt this user from password expiration and character requirement policies.
Grant Admin Rights To This User	Check this box to allow the user access to the Web Management Interface and SSH (for access to the CLI and backup agent installation.

3. Click **Create User** again to create the user account.

Edit User Properties

Highlight a user and click **Properties** to open the **Local User Properties** page to make changes to the user's full name, password, or user ID (UID). Note that the UID cannot be changed for the built-in admin user.



NOTE: When changing the Admin password, it can take a minute or so to synchronize the new password across all nodes. During this time, a warning message is displayed in the Web Management Interface. While the cluster, all the nodes, and all the data are fully accessible during this synchronization process, you should wait for the message to disappear before making further changes to your SnapScale cluster.

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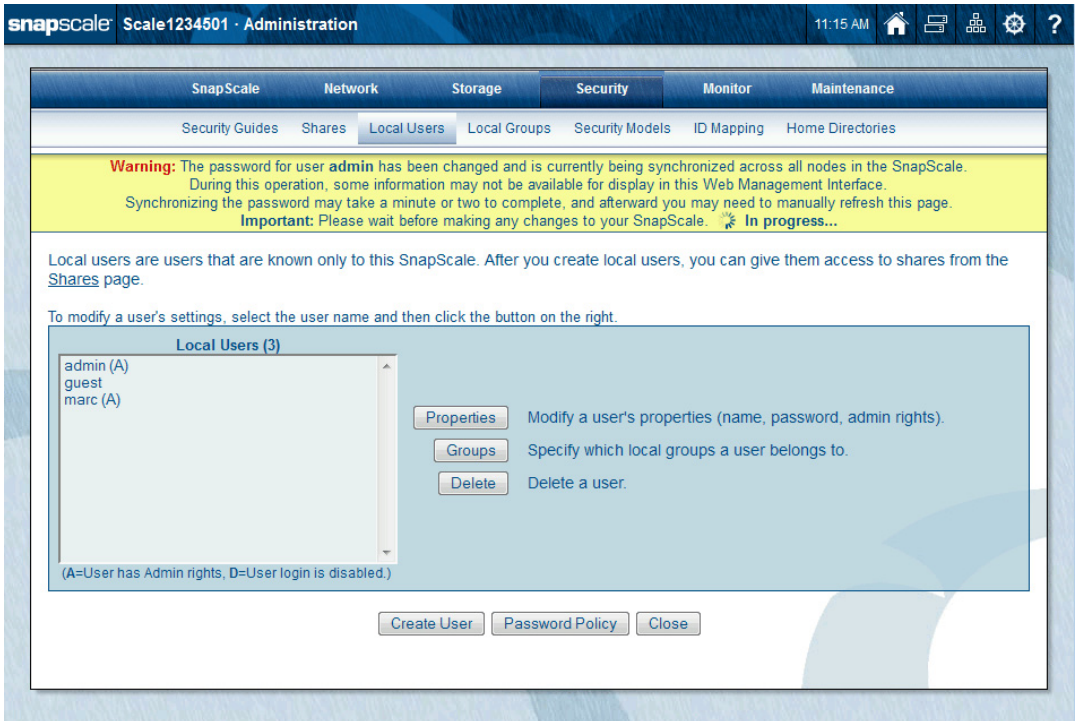

Local User Properties Configuration

1. On the **Local Users** page, highlight the user you want to edit and click **Properties**.
2. On the **Local User Properties** page that opens, enter or change any of the **information**:

Option	Description
Name	NOTE: Cannot be modified. Instead, delete and recreate the user with the same UID if you need to change the user name.
Full Name	Use up to 49 alphanumeric characters (includes spaces). Input in this field is optional.
Password	Passwords are case-sensitive. To keep the existing password, leave this field blank.
Password Verify	Type the chosen password again for verification. To keep the existing password, leave this field blank.
User ID (UID)	Displays the user identification number assigned to this user. Alter as necessary. For information on available UID ranges, see User and Group ID Assignments on page 160. NOTE: Changing a user's UID may alter filesystem access permissions that apply to that UID. In addition, any existing permissions for a UID previously assigned to a user that are changed to a different UID may become active if another user is created with the same UID. Carefully consider security configuration on existing files and directories before changing the UID of a user.

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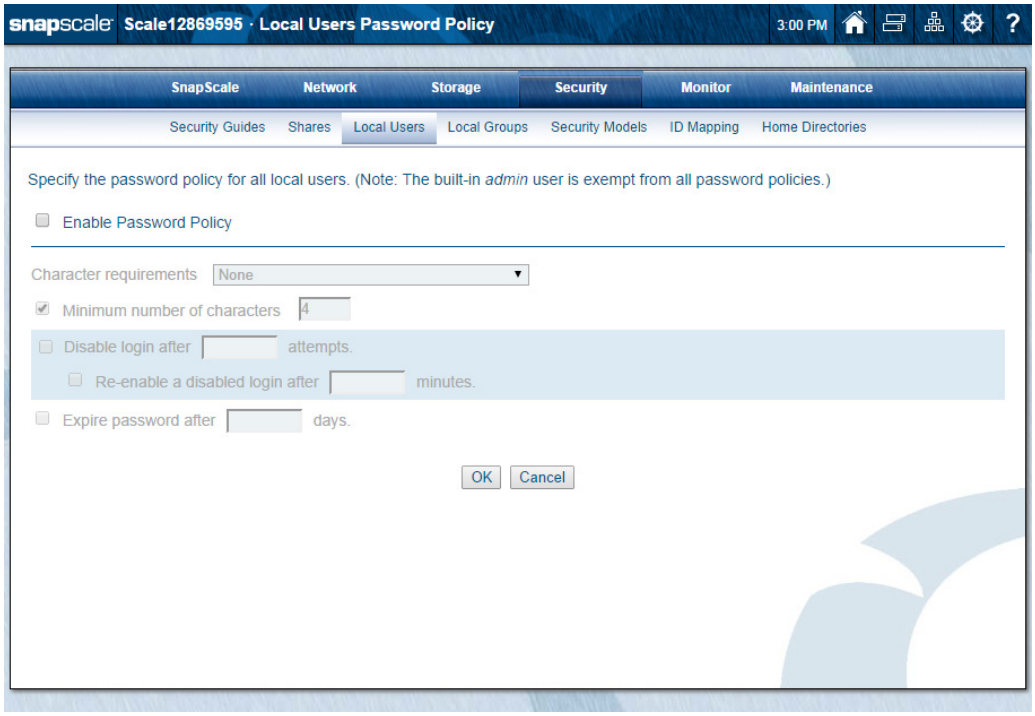
Option	Description
Disable User Login	Check this box to disable the user login. The user's information will remain in the system, but login rights are denied. The user login can be re-enabled by clearing the box. This box can also be used to enable a user locked out by the *Disable login after n attempts* password policy.
Exempt from Password Expiration and Character Requirements	NOTE: This box is only visible if Password Policy is enabled. Check this box to exempt this user from password expiration and character requirement policies.
Grant Admin Rights To This User	Check this box to allow the user access to the Web Management Interface and SSH (for access to the CLI and backup agent installation).

3. Click **OK**.

Manage Local User Password Policies

NOTE: Local users can be individually exempted from password expiration and character requirements. This may be necessary for some special users, such as users configured to perform backups. See Local User Creation on page 179 for procedures to set password policy for local users. Also, the built-in *admin* user is automatically exempt from all password policies.

Use **Password Policy** to make changes to the local user password settings.



Password Policy Management for Local Users

1. On the **Local Users** page, click **Password Policy**.
2. On the **Local Users Password Policy** page, check the **Enable Password Policy** box.

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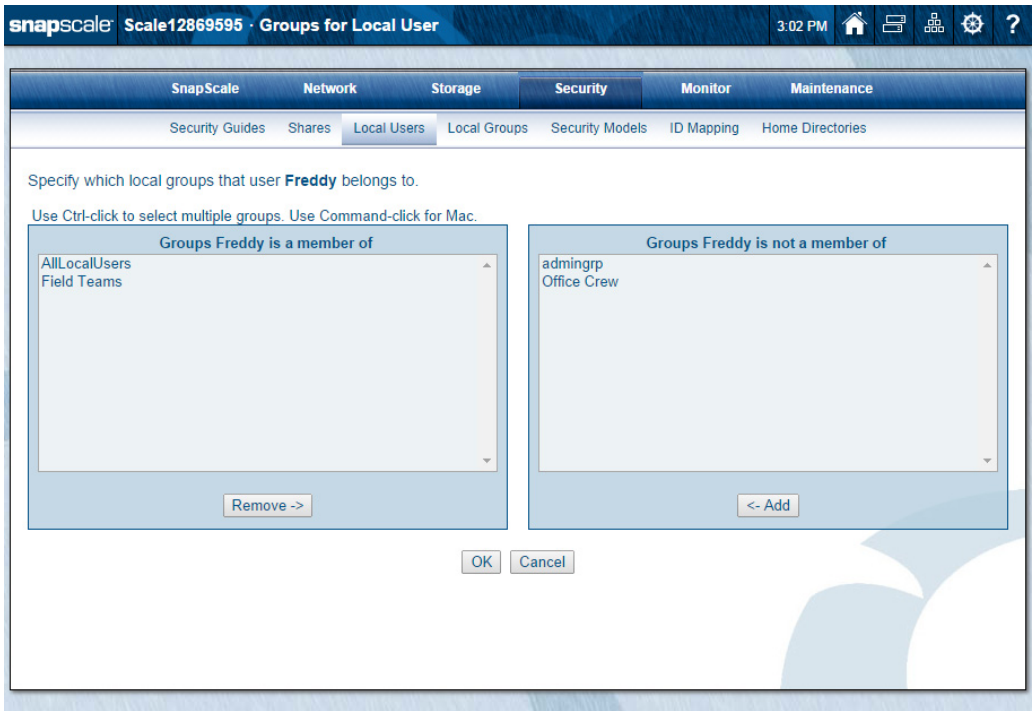
3. Enter the following **information**:

Option	Description
Character Requirements	Select the alpha/numeric/special character requirements for the password from the drop-down list.
Minimum Number of Characters	Check this box to enable the policy, then enter the minimum number of characters required for the password.
Disable Login After *n* Attempts	Check this box to enable the policy, then enter the number of times a user can fail to login before the system locks the user out. This applies to failed logins when connecting to any node in the cluster. **NOTE:** To unlock a user, clear the **Disable User Login** box for the user in the **Local Users** page.
Re-enable a Disabled Login After *n* Minutes	If you have defined a limit to the number of times a user can fail to log in, you can also check this box and enter a time period after which the system will allow the user to log in again. This saves the administrator from having to manually re-enable the user.
Expire Password After *n* Days	Check this box to enable the policy, then enter the number of days before the password must be changed. **NOTE:** Local users with expired passwords can change their passwords at: http://<cluster_name>/changepassword.

4. Click **OK** to save the settings.

Assign User to Group

Use the **Groups for Local User** page (**Security > Local Users > Groups**) to make changes to a local group membership.



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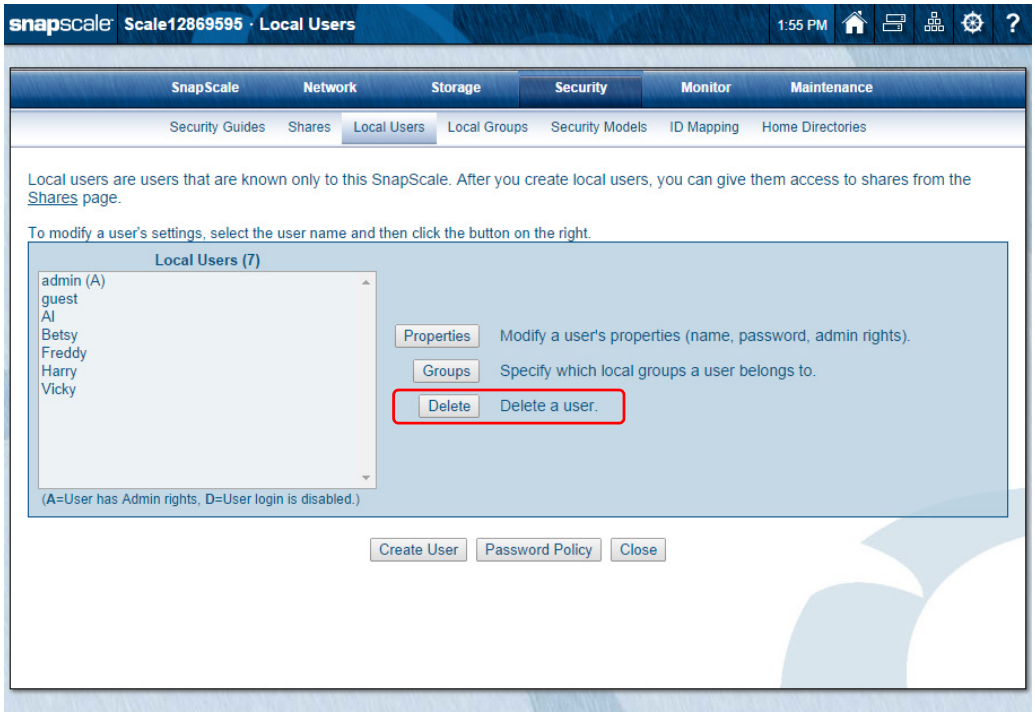
Add or Remove Users from Groups

1. On the **Local User** page, select a **user**.
2. Click **Groups**.
   The group settings for the selected user are shown.
3. To make a **change**:
   - To add the user to a group, from the list on the **right**, select a **group name** and click **<-Add**.
   - To remove the user from a group, from the list on the **left**, select the **group name** and click **Remove->**.
4. Click **OK** to save your changes.

Delete Local User

On the **Local Users** page, use the following process to remove a user.



Local User Deletion

1. On the **Local Users** page, select the user to be deleted.
2. Click **Delete**.
   The confirmation page is displayed.

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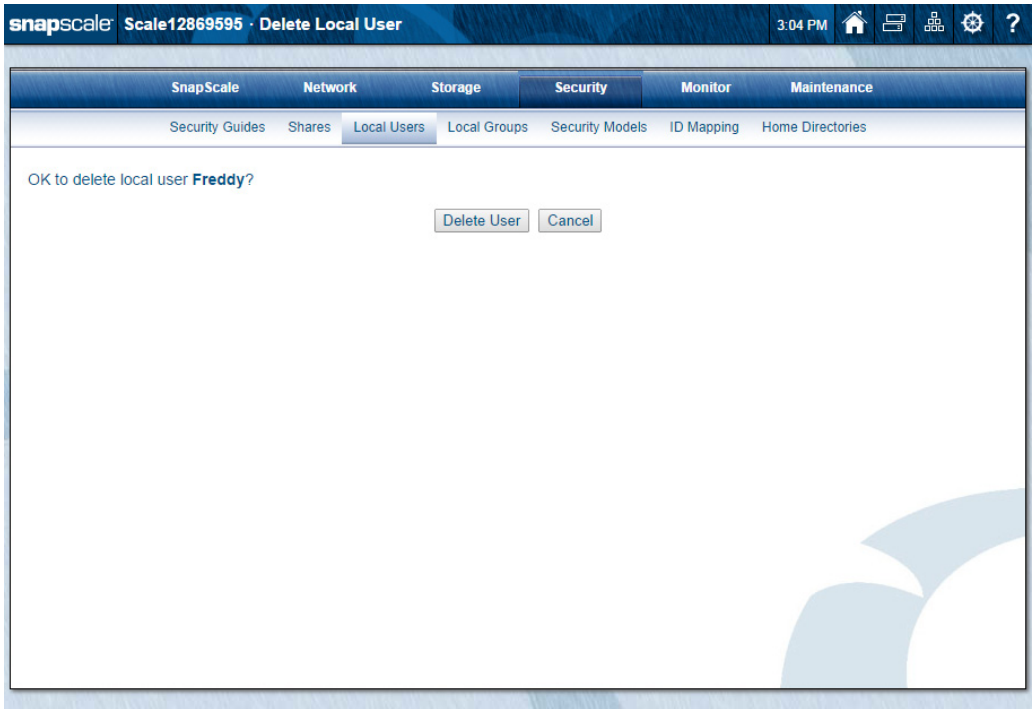
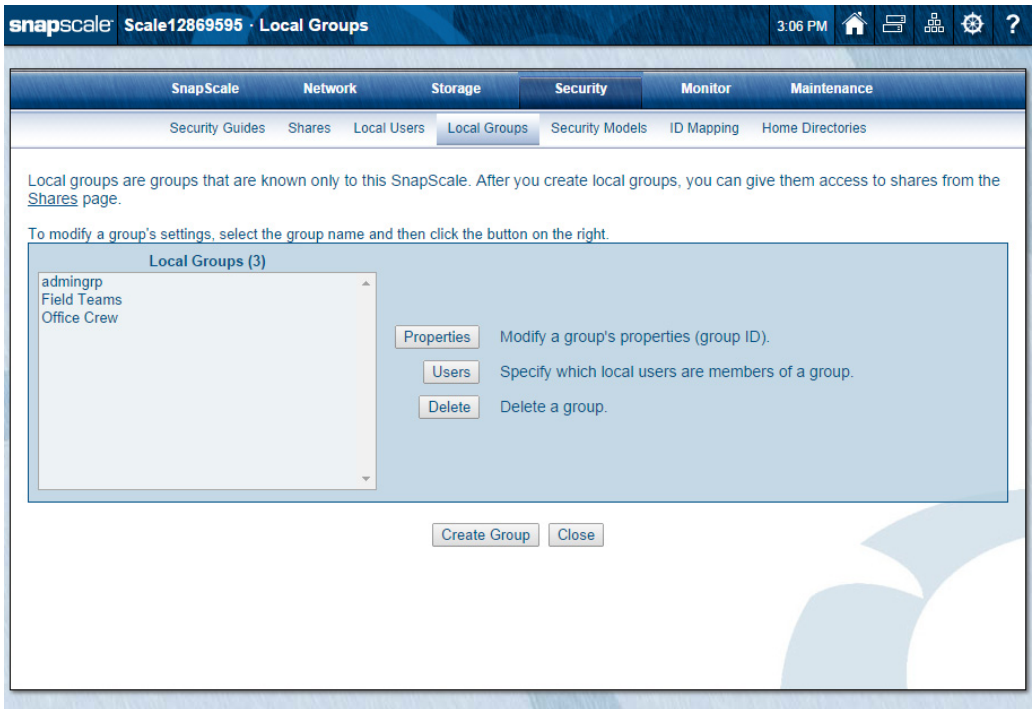


3. Click **Delete User** to delete the selected user.

Local Groups

The **Local Groups** page (**Security > Local Groups**) provides all the options to manage local groups. Local groups are groups of local users that are known only to the cluster being accessed. Each SnapScale cluster comes with one predefined group (**`admingrp`**).



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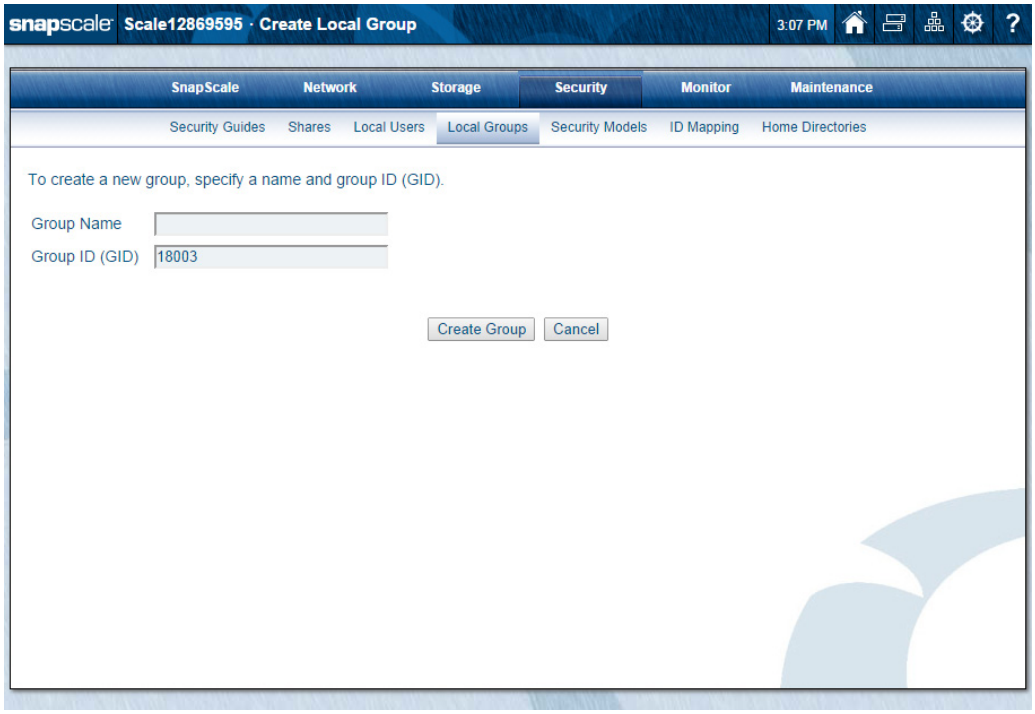
Create New Group

Use **Create** to create a new group on this cluster. Options include the group name and changing the Group ID (GID).

New Local Group Creation

1. On the **Local Groups** page, click **Create Group** to access the **Create Local Group** page.



2. Enter the following **information**:

Option	Description
Group Name	Use up to 31 characters (alphanumeric and the underscore only).
Group ID (GID)	Displays the user identification number assigned to this user. Alter as necessary. For information on available UID ranges, see User and Group ID Assignments on page 160.

3. Click **Create Group** when finished.
4. The **Users for Local Group** page is displayed, allowing you to immediately add users to your new group.
5. Click **OK** when you are finished adding users.

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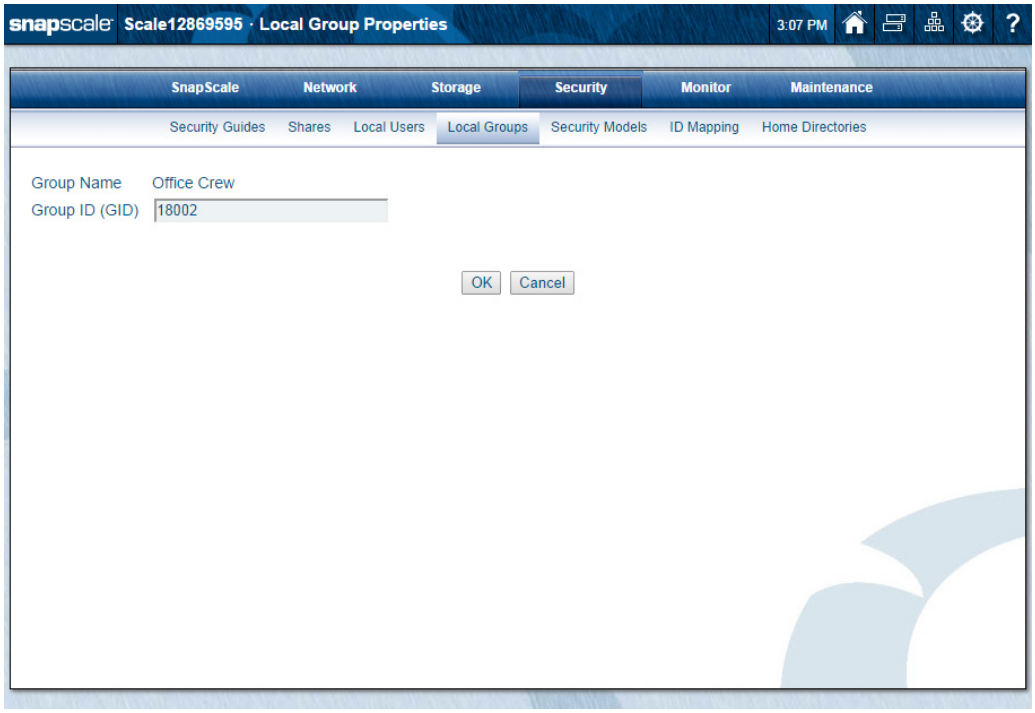
Edit Group Properties

Use **Properties** to open the **Local Group Properties** page to make changes to the options there.



Local Group Properties Editing

1. On the **Local Groups** page, select the group you want to edit and click **Properties**.
2. On the **Local Groups Properties** page that opens, you can change the **GID**. For information on available UID ranges, see User and Group ID Assignments on page 160.

   NOTE: Changing a group's GID may alter filesystem access permissions that apply to that GID. In addition, any existing permissions for a GID previously assigned to a group that are changed to a different GID may become active if another group is created with the same GID. Carefully consider security configuration on existing files and directories before changing the GID of a group.

3. Click **OK**.

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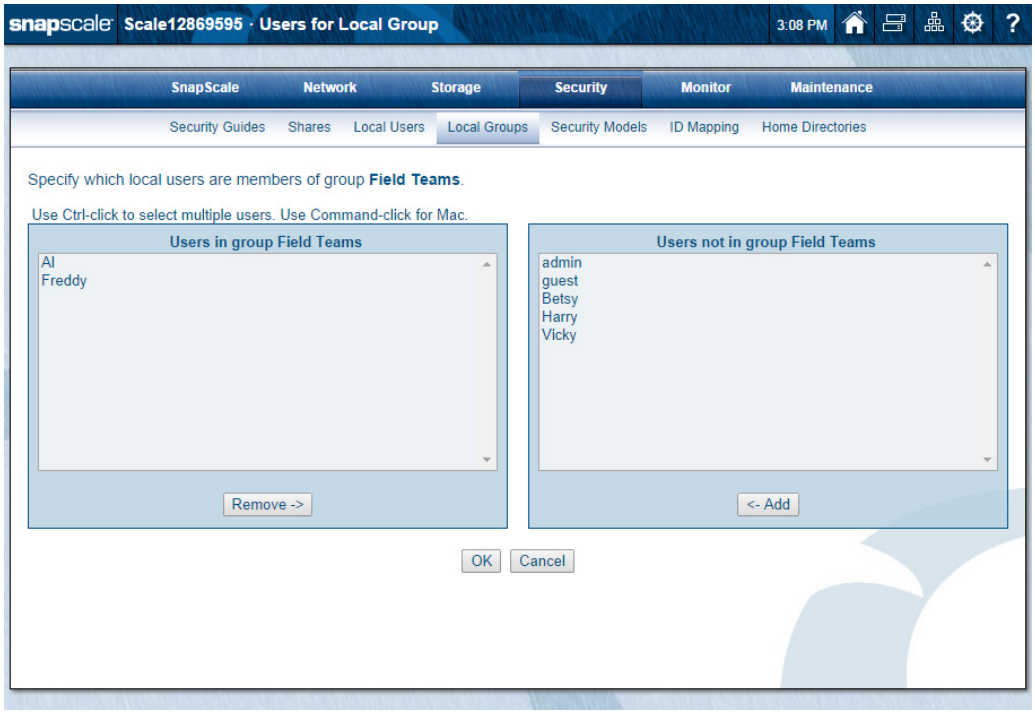
Specify Users in Group

Use the **Users for Local Group** page (**Security > Local Groups > Users**) to make changes to the membership of a local group.



Add or Remove Group Users

1. On the **Local Groups** page, select a group name and click **Users**.
2. To make a **change**:
   - To add the user to a group, from the list on the **right**, select a **user name** and click **<-Add**.
   - To delete the user from a group, from the list on the **left**, select the **user name** and click **Remove->**.
3. Click **OK** when finished.

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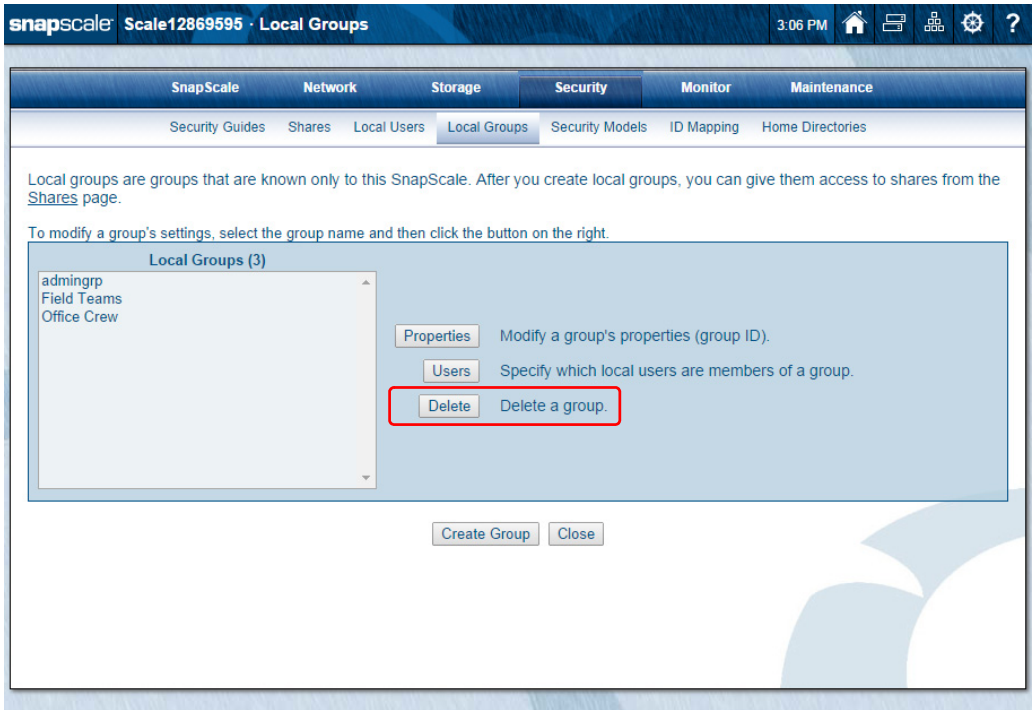
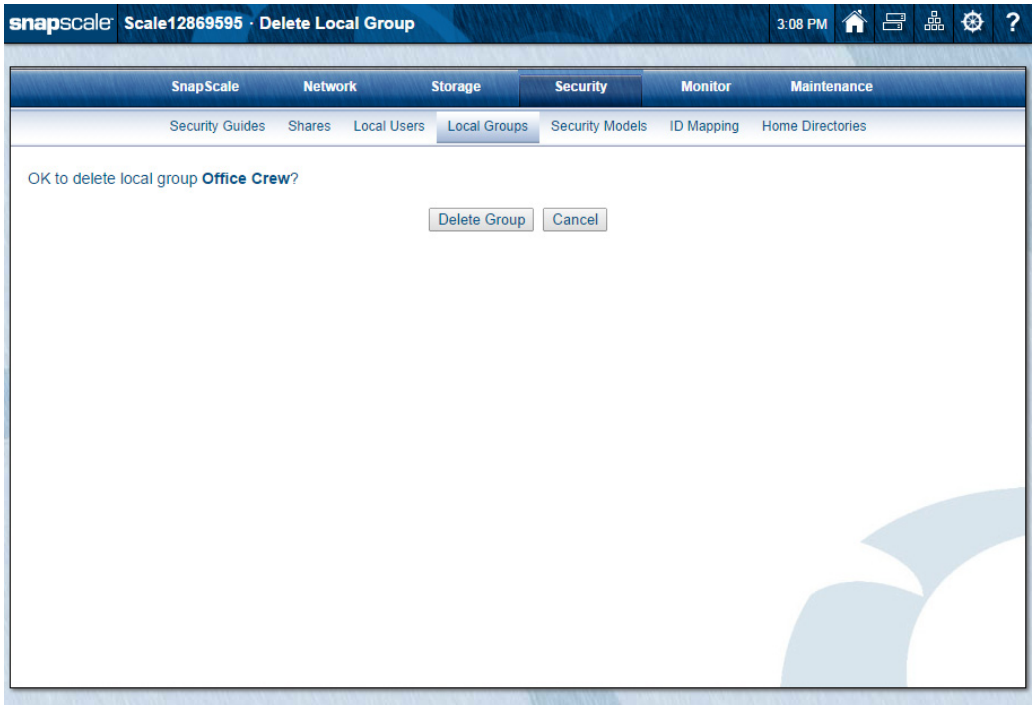
Delete Group

On the **Local Groups** page, use the following process to remove a group.



Local Group Deletion

1. On the **Local Groups** page, select the **group** to be deleted and click **Delete**. The delete confirmation page is displayed.



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2. Click **Delete Group** to delete the selected group (or **Cancel** to cancel the deletion).

Security Models

There are three file-level security models that can be used by a SnapScale cluster:

- **Windows/Unix**
- **Windows**
- **Unix**.

The security model determines the rules regarding which security personality is present on files and folders created by the various protocols and clients, and whether the personality of files and folders can be changed by changing permissions.

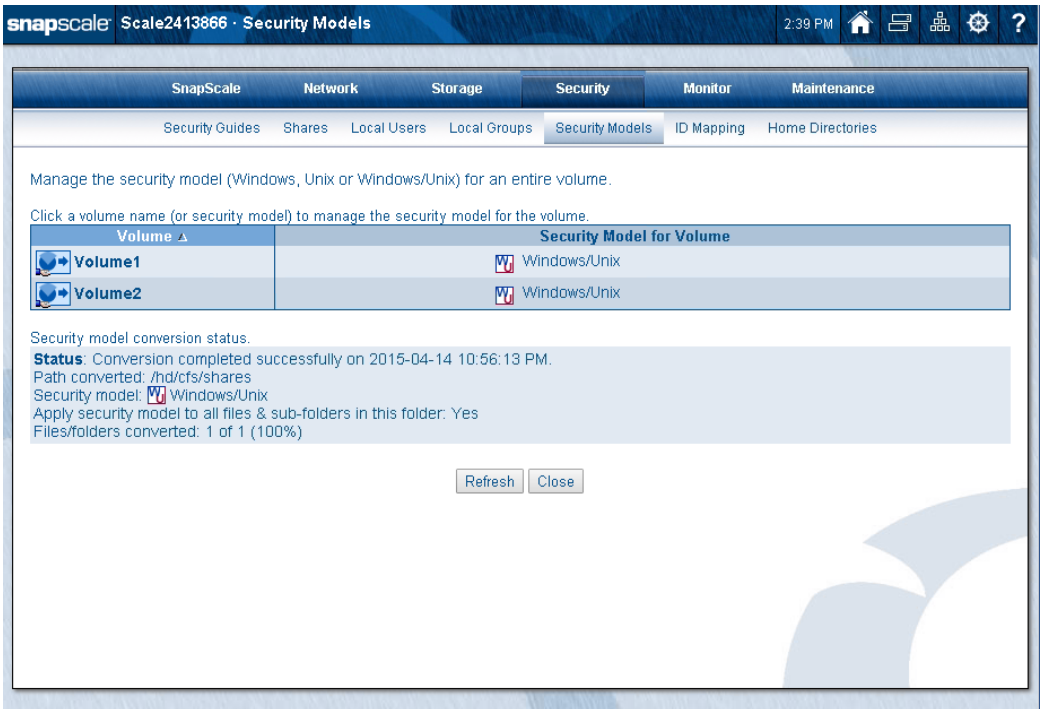
NOTE: Folders created in a volume default to the security model of that volume. The folder's security model may differ from the personality of the folders (for example, folders with a **Windows/Unix** security may have a Unix personality).

For more information about security models, see Appendix B, Security and Access.

Volume Security Models Management

NOTE: A security model cannot be changed for a volume if it is in use a data replication source or target.

1. Select **Security > Security Models**.



2. Click the **Security Model for Volume** name (**Windows/Unix**, **Windows**, or **Unix**). Clicking the **Volume** name does the same thing.
3. From the drop-down list, select the **security model type** desired and click **OK**.

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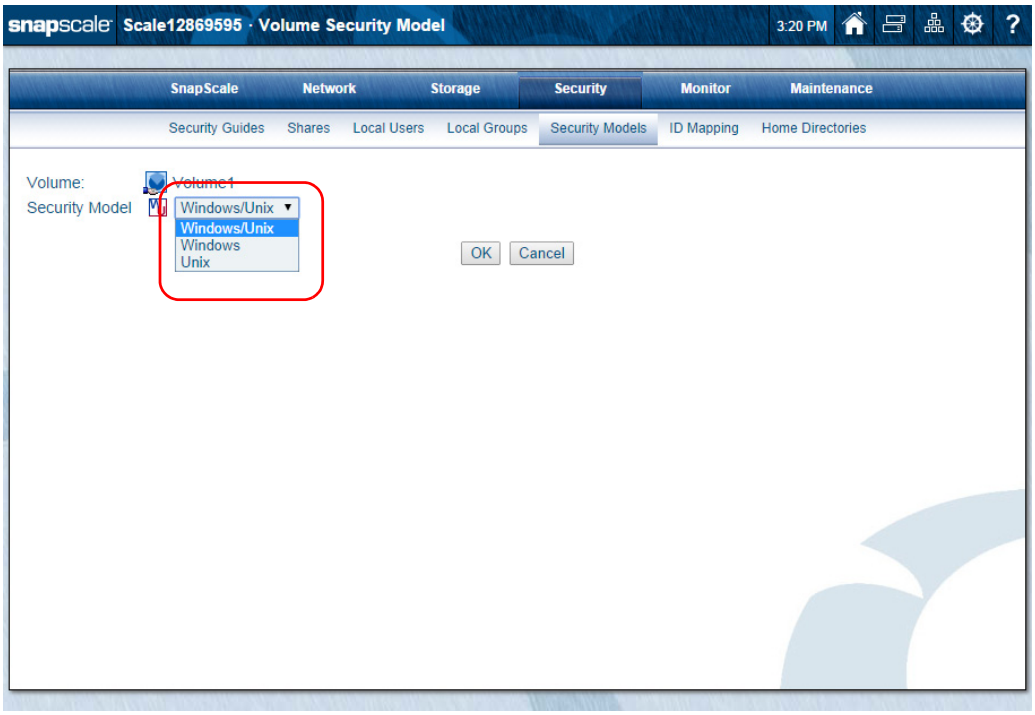

4. At the confirmation message, click **Apply Security Model**.

   If there are files and directories under the volume, you are prompted whether you want to recursively apply the change. This resets permissions on all files and directories to make them accessible by all users, and configured for the Windows personality (Windows and Windows/UNIX security models) or UNIX personality (UNIX security model). When done, the main page displays a conversion status.

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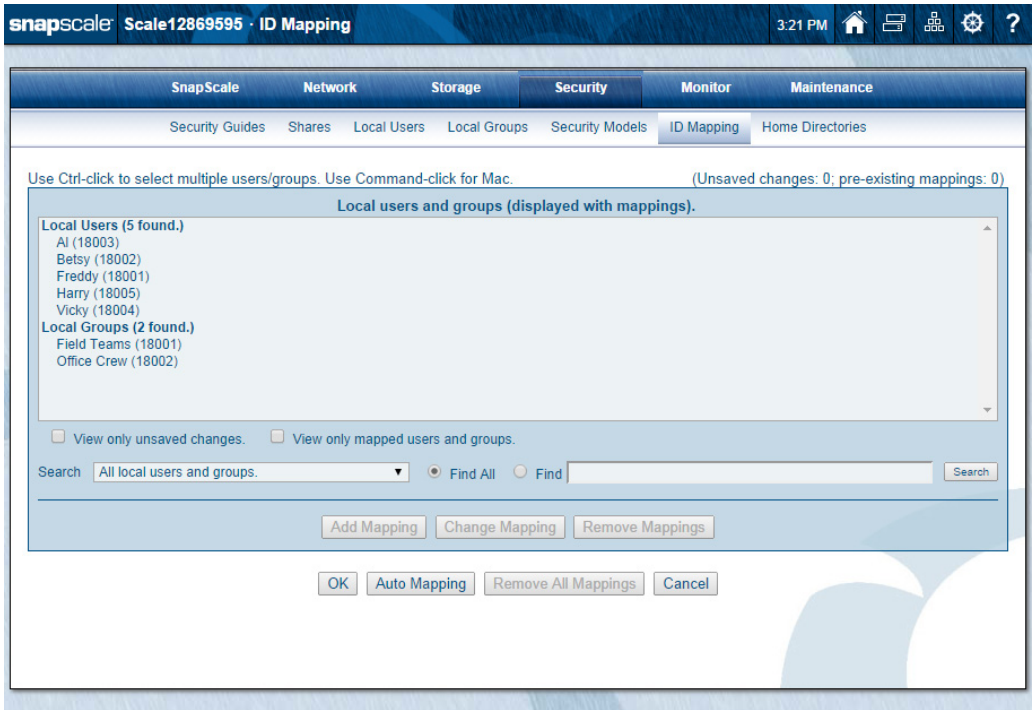
ID Mapping

ID mapping allows users and groups that exist on Windows domains to share user and group IDs with local, LDAP, or NIS users and groups. This results in the same permissions and quota consumption applying to both users and groups in an ID-mapped pair.



Select a local, LDAP, or NIS user or group from the displayed list on the default page. You can then use **Add Mapping** to map the user's UID or group's GID to that of a Windows domain user or group. **Change Mapping** is used to change existing mappings. **Remove Mappings** removes one or more mappings while **Remove All Mappings** removes all mappings that had been previously established.

Options to simplify the discovery of a desired user or group to manage their ID mapping search options are presented at the bottom of the selection pages:

- Check **View only unsaved changes** to display only mapping changes that have not yet been applied.
- Check **View only mapped users and groups** to display only local, LDAP, or NIS users and groups that have been mapped to a Windows domain user or group.

Add Mapping

NOTE: Adding or changing an ID mapping requires that the cluster be joined to a Windows Active Directory domain.

Follow this procedure to map a user or group:

1. If the desired user or group to be mapped to does not appear in the **ID Mapping** page list, use the **search option** to locate it.

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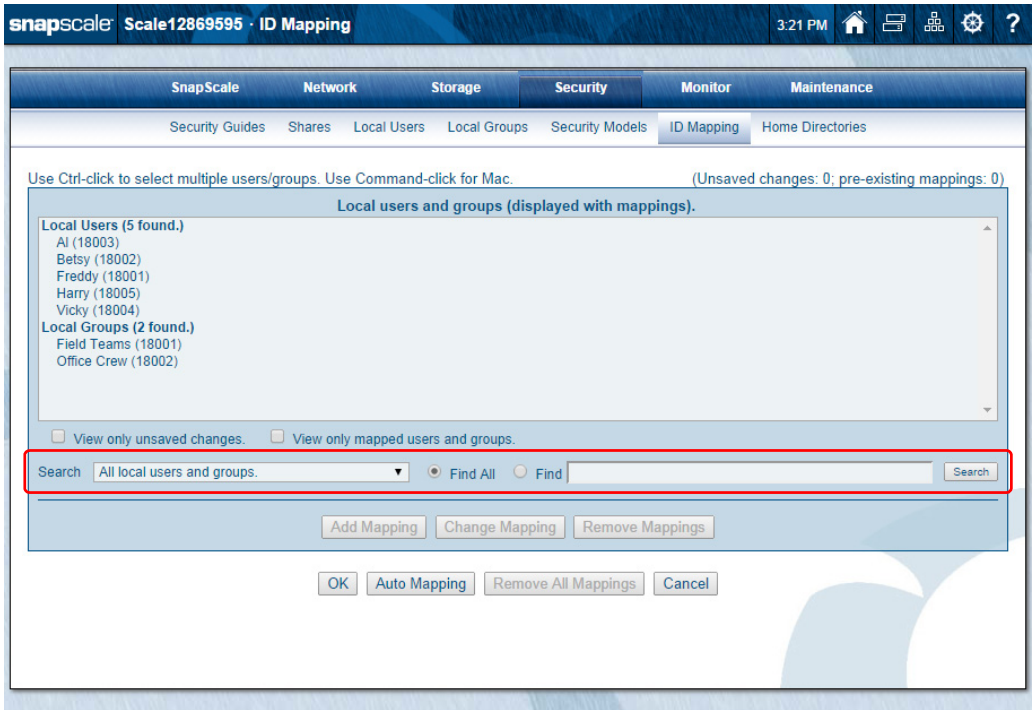


a. At the bottom of the list, using the **Search** drop-down list, select the local, LDAP, or NIS user or group **list** to be searched.

b. Select **Find** and enter the **search string** (or select **Find All**).

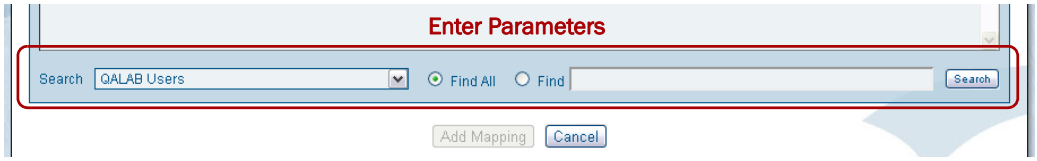
Enter the exact **name** (or a string with a wild card "*" before or after) as the search string.

c. Click **Search** to display any matches.

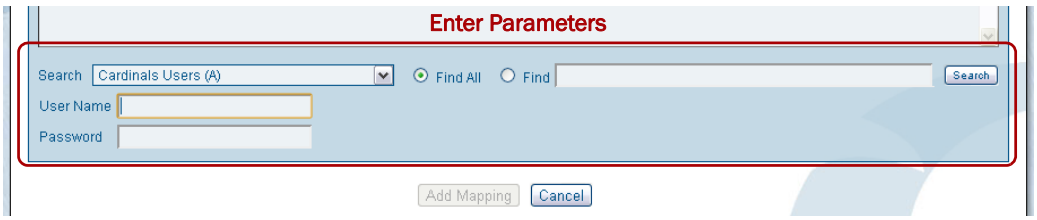
2. Select a **user or group** from the results list and click **Add Mapping**.

3. At the **Add Mapping** page, to find the user/group you want to map to, select the Windows domain **user or group list**, the scope of the search, enter a search string if needed, and click **Search**.

- To search for a specific user or group, use either **Find All** or a **Find** search string (wild card "*" before or after is allowed).



- For domains that REQUIRE authentication (showing an **(A)** after the name), select the domain name, enter the user name and password for that domain, and use either **Find All** or a **Find** search string (using the first few letters of the user/group name).



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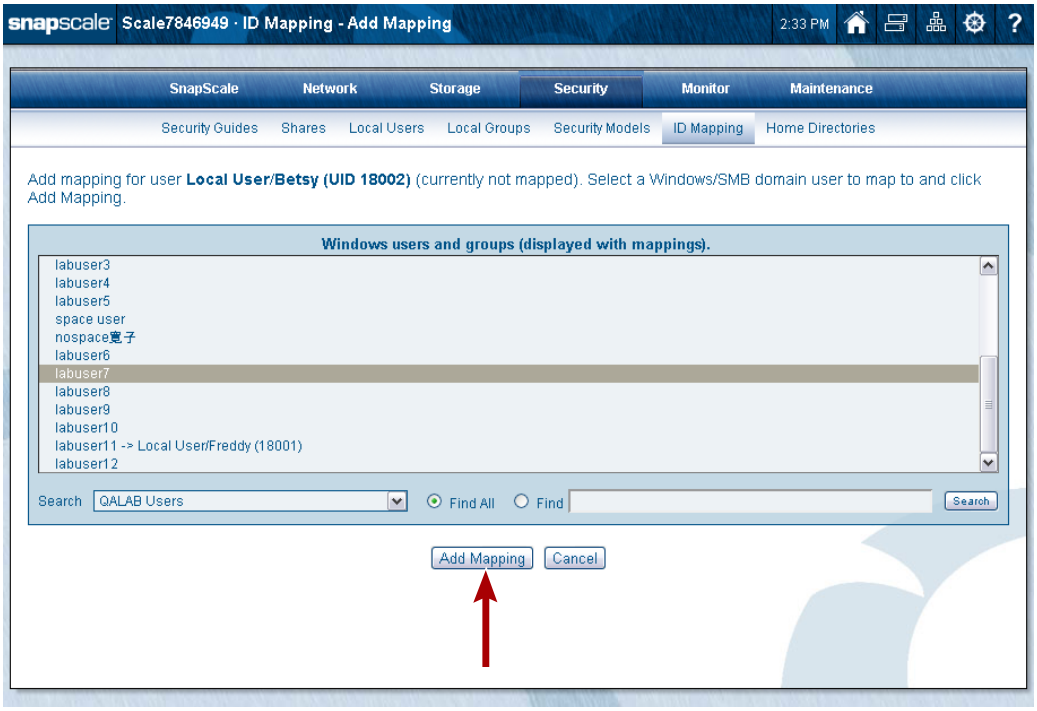
- On the rare occasion you need to search for a Windows domain that's not listed (remote domain), select a Windows domain from the **Search** drop-down list through which to search, then enter in the **Find** box the name of the remote domain, followed by a slash (/) or backslash (\) and the user name for which you are searching (for example, **`remote_domain\user_name`**). After you click **Search**, another authentication prompt may be presented to authenticate with the remote domain.

4. From the search results, select the Windows domain **user/group** to which you want to map the local, LDAP, or NIS user, and click **Add Mapping**.



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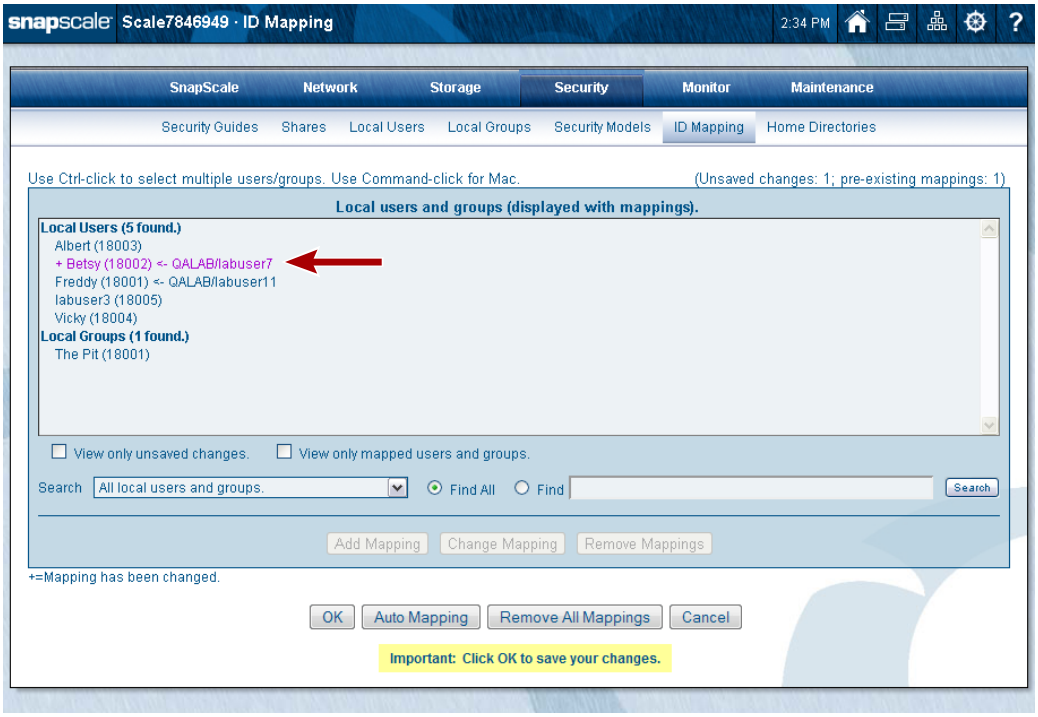
The mapping result is shown on the default page with the users/groups that were mapped in purple with a plus (+) in front of their name.



NOTE: To display only changes that have not yet been applied, check the **View only unsaved changes** box. To display only local or NIS users/groups that have been mapped to a Windows domain user or group, check **View only mapped users and groups** box.

5. Repeat Steps 1–4 to add **additional mappings**.
6. Click **OK** to save changes (or **Cancel** to reset).
7. When done with all your mappings, click **OK** to activate them.
8. At the confirmation page, click **Save Changes**.
9. At the filesystem update option page, choose either **Update Filesystem** or **Do Not Update Filesystem**.

IMPORTANT: Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

See Update Filesystem on page 204 for more details.

Change Mapping

To map an already mapped local, LDAP, or NIS user or group to a different Windows domain user or group, follow these steps:

1. If the desired user or group to be changed does not appear in the default page list, use the **search option** to locate them.

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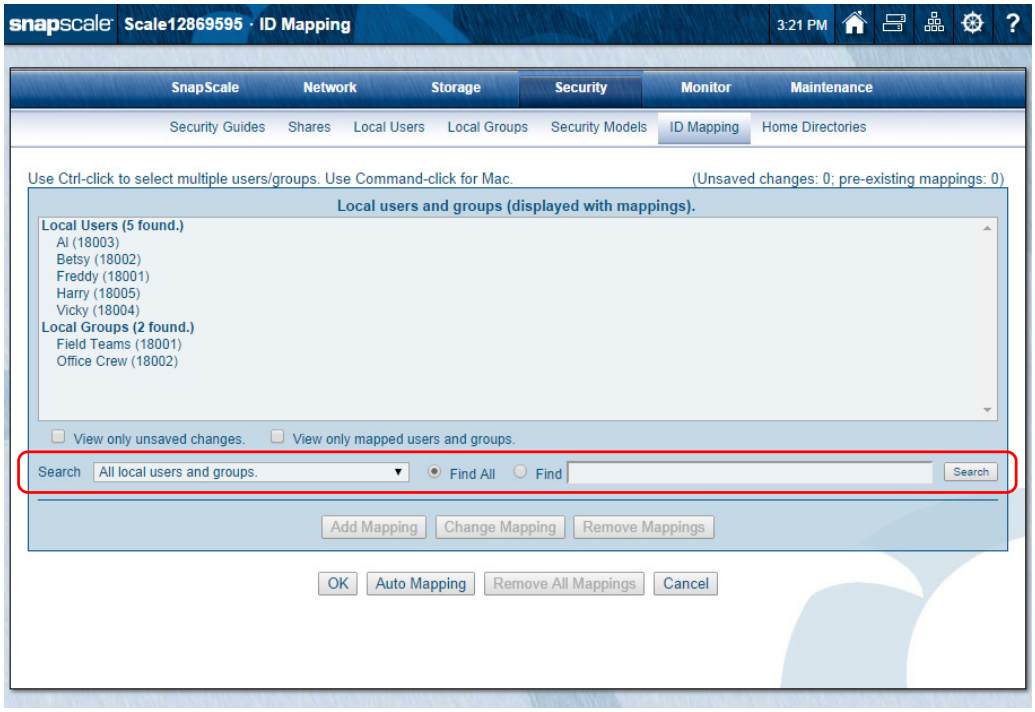


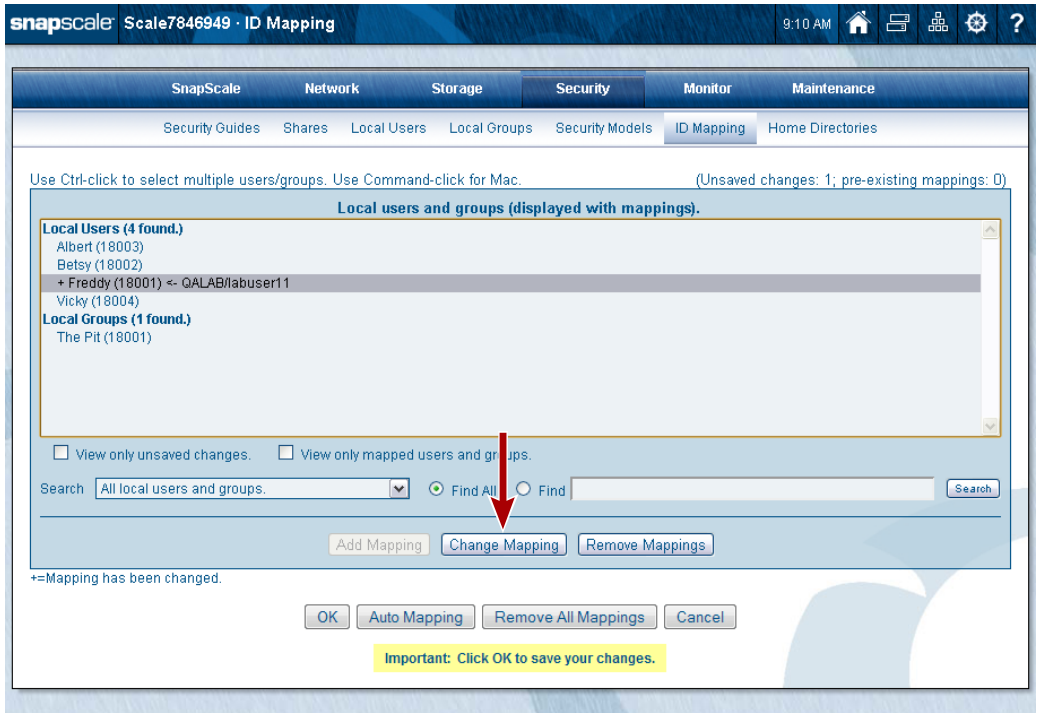
a. At the bottom of the list, using the **Search** drop-down list, select the local, LDAP, or NIS user or group **list** to be searched.

b. Select **Find** and enter the **search string** (or select **Find All**).

Enter the exact **name** (or a string with a wild card "*" before or after) as the search string.

c. Click **Search** to display any matches.

2. Select a mapped **user/group** to be changed and click **Change Mapping**.



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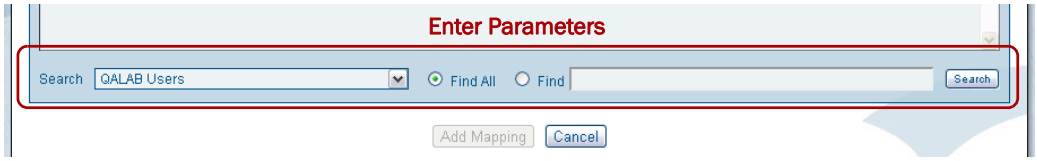
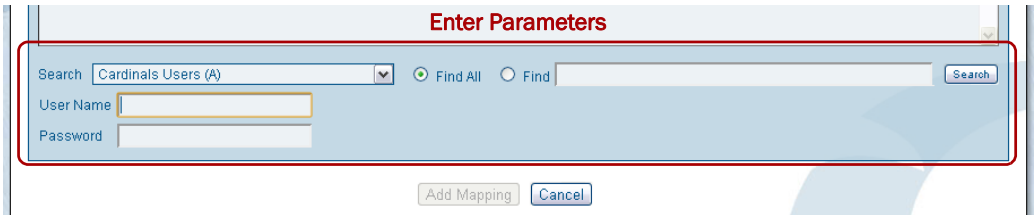
3. At the **Change Mapping** page, to find the user/group you want to map to, select the Windows domain **user or group list**, the scope of the search, enter a search string if needed, and click **Search**.
   - To search for a specific user or group, use either **Find All** or a **Find** search string (wild card "*" before or after is allowed).

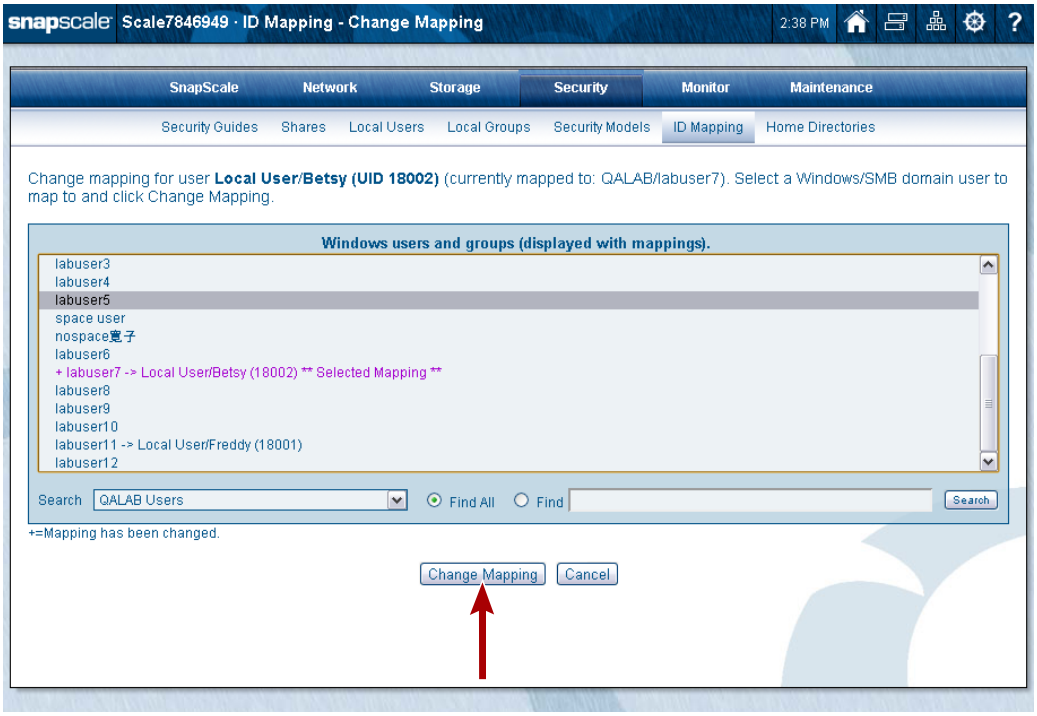


   - For domains that REQUIRE authentication (showing an **(A)** after the name), select the domain name, enter the user name and password for that domain, and use either **Find All** or a **Find** search string (using the first few letters of the user/group name).



   - On the rare occasion you need to search for a Windows domain that's not listed (remote domain), select a Windows domain from the **Search** drop-down list through which to search, then enter in the **Find** box the name of the remote domain, followed by a slash (/) or backslash (\) and the user name for which you are searching (for example, **`remote_domain\user_name`**). After you click **Search**, another authentication prompt may be presented to authenticate with the remote domain.

4. From the search results, select the Windows domain **user/group** you want to re-map the local, LDAP, or NIS user to and click **Change Mapping**.



5. Repeat Steps 1–4 until all **changes** are made.

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6. Click **OK** to save changes (or **Cancel** to reset).
7. When done with all your mappings, click **OK** to activate them.
8. At the confirmation page, click **Save Changes**.
9. At the filesystem update option page, choose either **Update Filesystem** or **Do Not Update Filesystem**.

> **IMPORTANT:** Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

See Update Filesystem on page 204 for more details.

Use Auto Mapping

Auto mapping generates a list of ID mappings for Windows users and groups that have the same name as your local, LDAP, or NIS users and groups (local has precedence over LDAP and NIS).

1. Click **Auto Mapping** to generate a **list** of Windows domain users/groups that have the same name as your local, LDAP, or NIS users and groups.

   Domain, local, LDAP, and NIS user/group lists are compared. The matches are automatically queued. Users and groups already mapped are not affected.
2. At the **Auto Mapping** confirmation page, click **View Auto Mappings** to display a page summarizing your changes.

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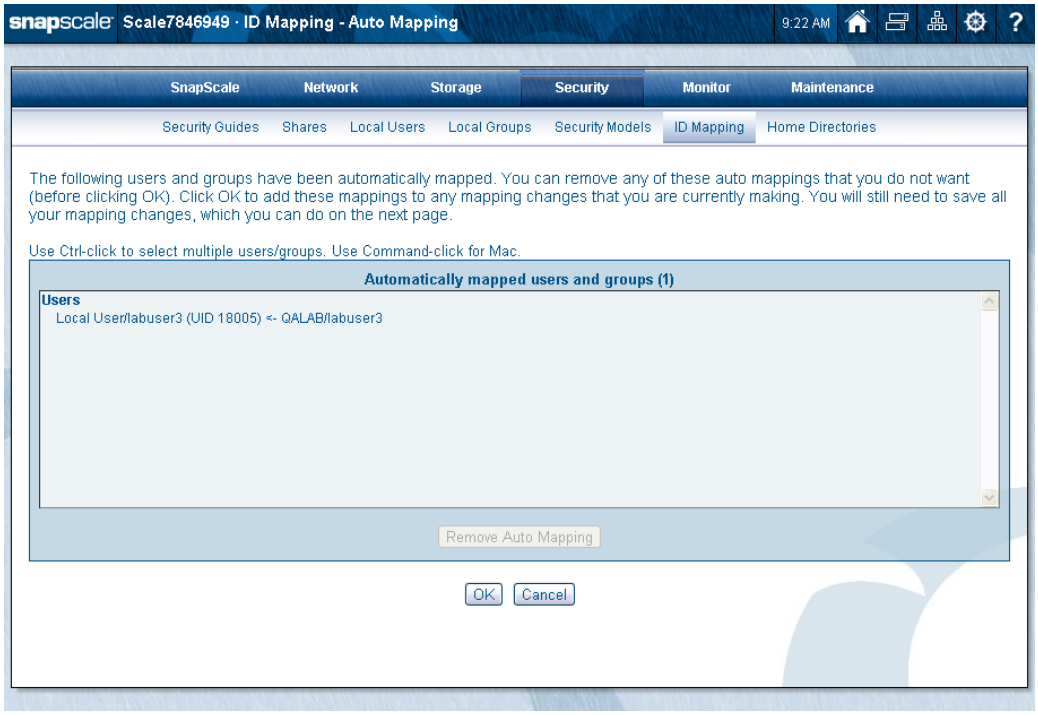
3. At the summary page, verify the **mappings** and remove (**Remove Auto Mapping**) any users or groups you do not want to map.



4. When the list is correct, click **OK** to save changes (or **Cancel** to reset).
5. When done with all your mappings, click **OK** to activate them.
6. At the confirmation page, click **Save Changes**.
7. At the filesystem update option page, choose either **Update Filesystem** or **Do Not Update Filesystem**.

> **IMPORTANT:** Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

See Update Filesystem on page 204 for more details.

Remove Mappings

User mappings can be removed individually or all at once. Once removed, they can not be restored but must be added back using Add Mapping on page 192. You also have the option to update the filesystem after removing the ID mappings.

Remove Individual Mappings

1. At the default **ID Mapping** page, select one or more **users/groups** you wish to unmap.

   To make it easier to find mappings for removal, check **View only mapped users and groups** to display only local, LDAP, or NIS users or groups that have been mapped.

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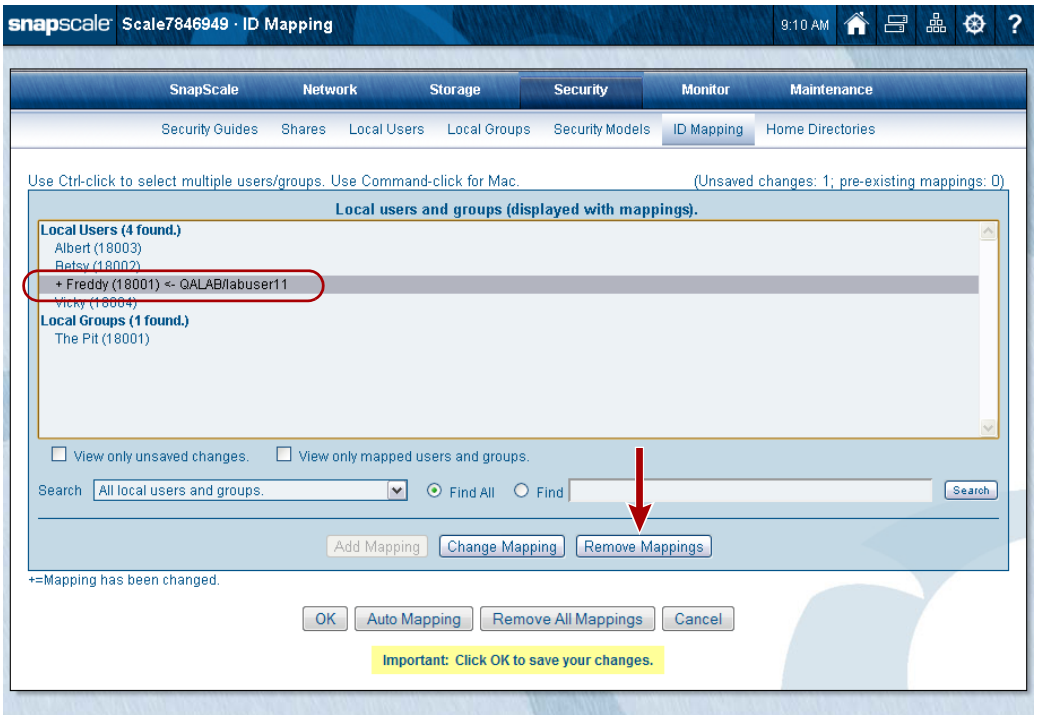
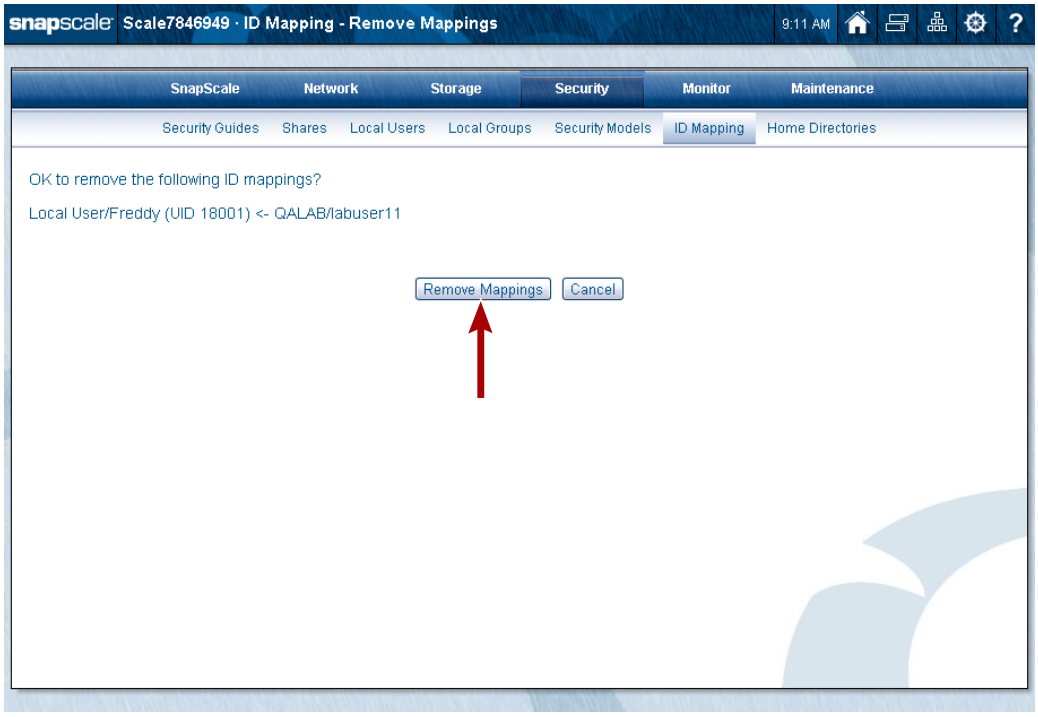
2. Click **Remove Mappings.**



3. At the confirmation page, verify the **users/groups** listed and click **Remove Mappings**.



The selected mappings are removed and the default page is displayed with the users/groups that were unmapped in purple with a plus (+) in front of their name.

4. Click **OK** to save changes (or **Cancel** to reset).
5. When done with all your mappings, click **OK** to activate them.

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6. At the confirmation page, click **Save Changes**.
7. At the filesystem update option page, choose either **Update Filesystem** or **Do Not Update Filesystem**.

> **IMPORTANT:** Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

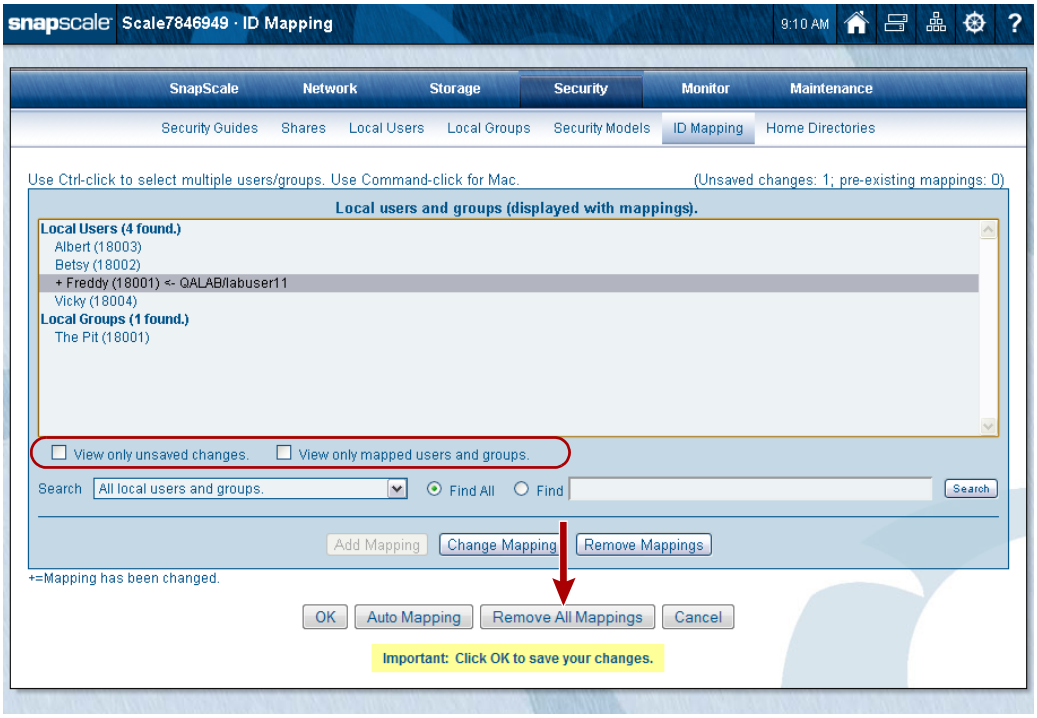
See Update Filesystem on page 204 for more details.

Remove All Mappings

The **Remove All Mappings** option allows you to remove **all** ID mappings on the cluster. If there are no mappings, the button is grayed out.

1. At the default **ID Mapping** page, click **Remove All Mappings**.

   If needed, check **View only unsaved changes** to display only mapping changes that have not yet been applied. Check **View only mapped users and groups** to display only local, LDAP, or NIS users/groups that have been mapped to a Windows domain user or group.



2. At the confirmation page, click **Remove Mappings**.

   All the mappings are removed and the default page is displayed with the users/groups that were unmapped in purple with a plus (+) in front of the names.
3. Click **OK** to save changes (or **Cancel** to reset).
4. When done with all your mappings, click **OK** to activate them.
5. At the confirmation page, click **Save Changes**.
6. At the filesystem update option page, choose either **Update Filesystem** or **Do Not Update Filesystem**.

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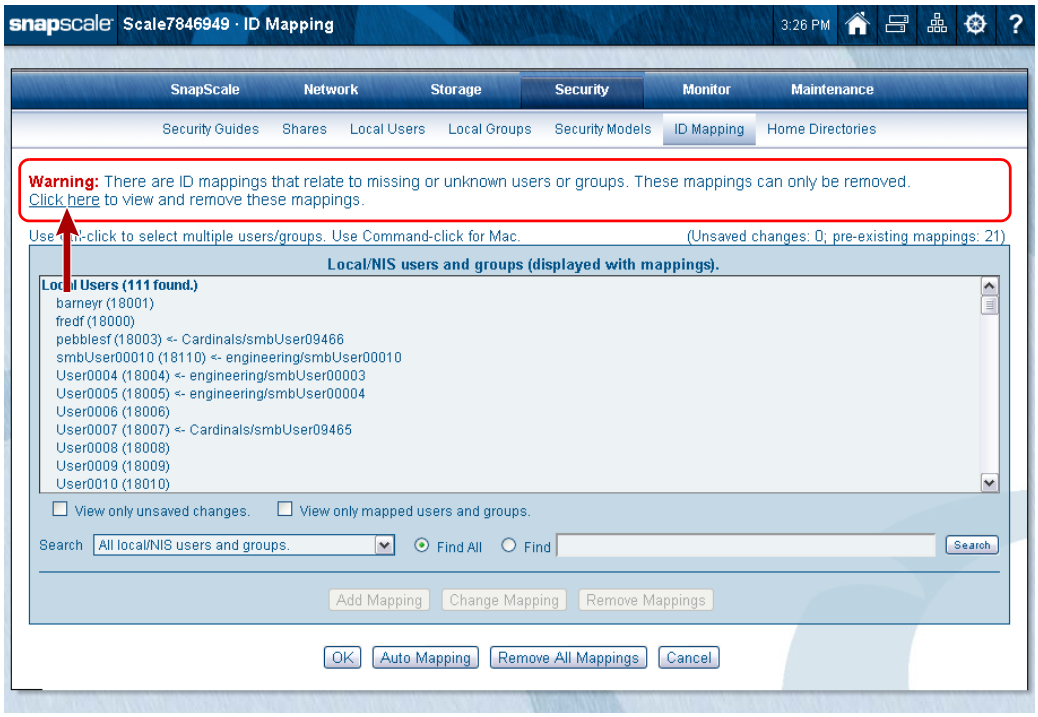
IMPORTANT: Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

See Update Filesystem on page 204 for more details.

Remove Missing ID Mappings

If the cluster has mappings for users or groups that no longer exist, the following warning message may be displayed at the top of the main **ID Mappings** page:



1. Click the **Click here** link in the warning message to display the **Remove Missing Mappings** page.

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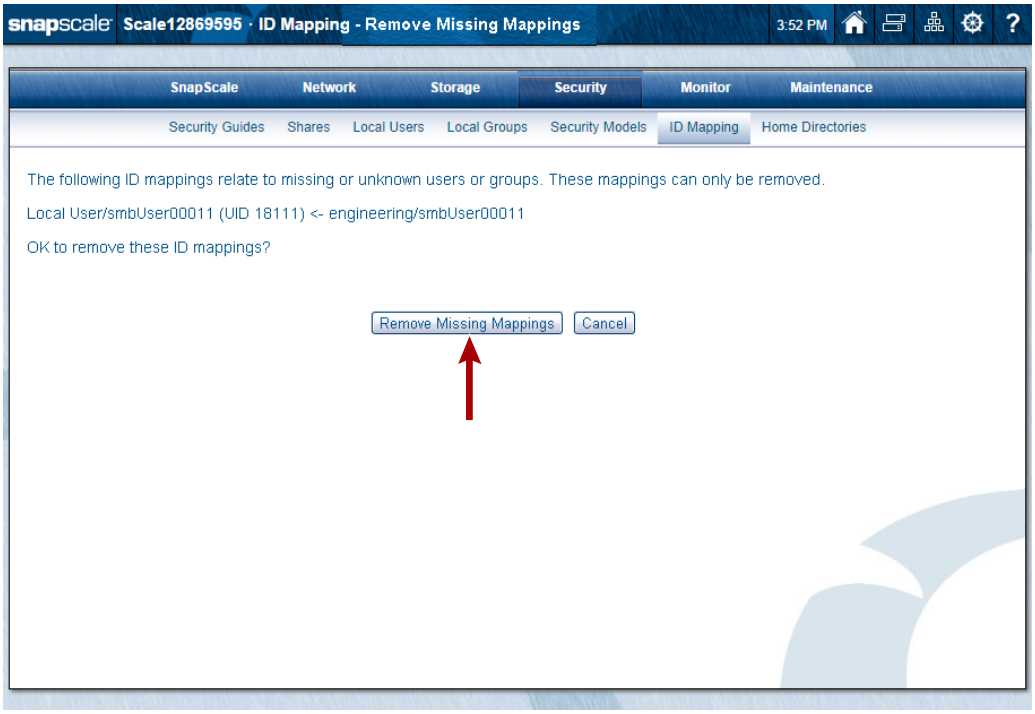
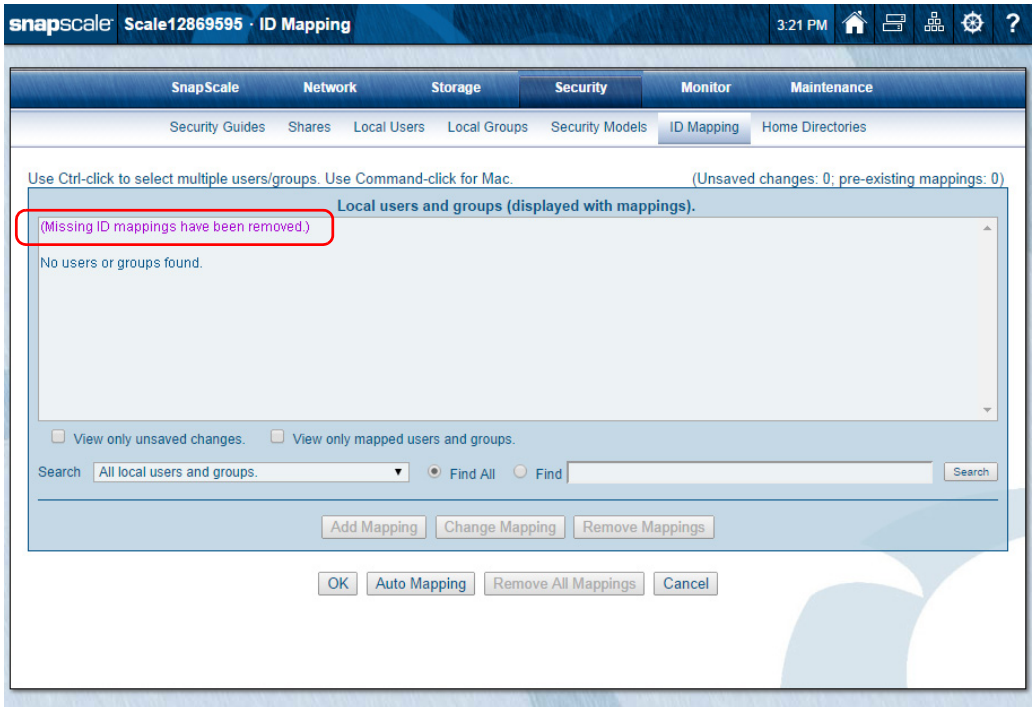


2. Click **Remove Missing Mappings** to clear the missing mappings from the system. A confirmation is shown on the **ID Mapping** main page.



3. Click **OK** to save changes.

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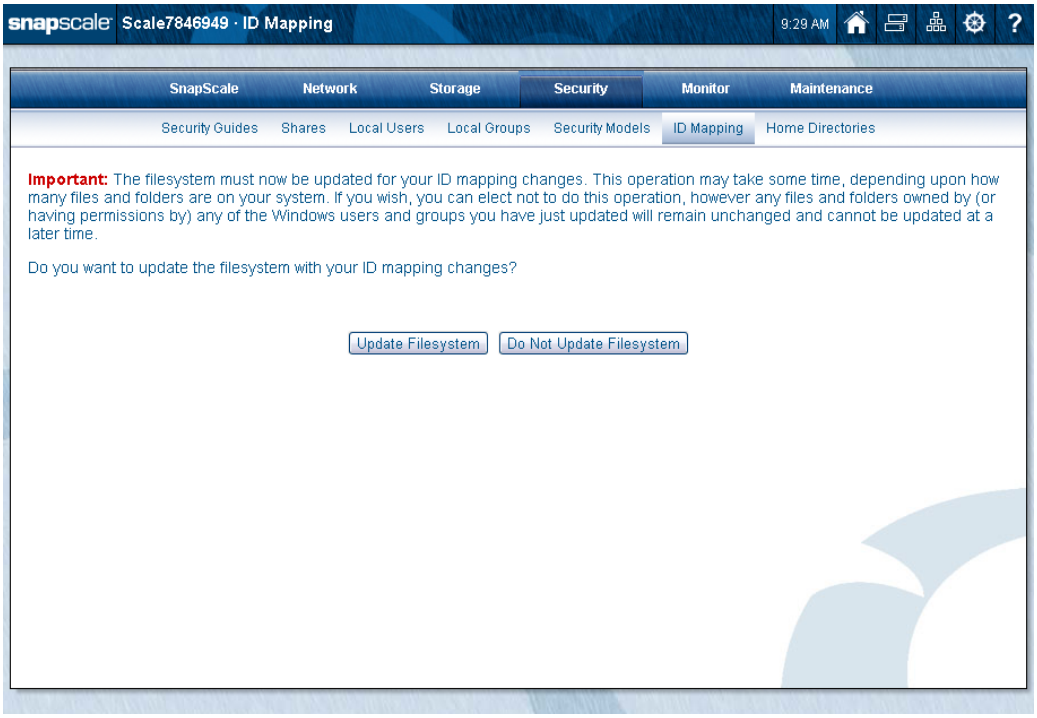
Update Filesystem

After making any changes to ID mappings, you are presented with a filesystem update option page, where you can choose either **Update Filesystem** or **Do Not Update Filesystem** options.



If you choose **Update Filesystem**, UID and GID ownership on files and SIDs in ACLs are updated to reflect the ID mapping operation.

IMPORTANT: Updating may take some time, depending upon how many files and folders are on your system. If you elect not to do this operation, any files and folders owned by (or having permissions by) any of the Windows users and groups you have just updated will remain unchanged and cannot be updated at a later time.

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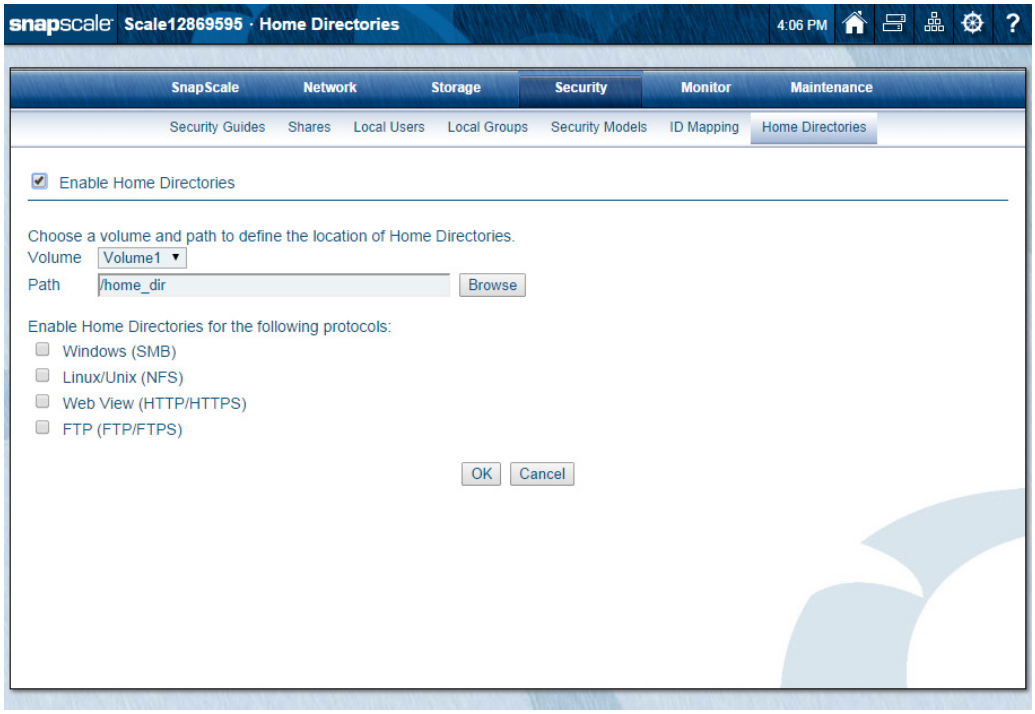
Home Directories

To enable Home Directories, go to **Security > Home Directories** and check **Enable Home Directories**. Choose the volume, path, and protocols you want.



The Home Directories feature creates a private directory for every local or Windows domain user that accesses the system. When enabling Home Directories (from **Security > Home Directories**), the administrator creates or selects a directory to serve as the home directory root. When a user logs in to the cluster for the first time after the administrator has enabled Home Directories, a new directory named after the user is automatically created inside the home directory root, and is configured to be accessible only to the specific user and the administrator.

Depending on the protocol, home directories are accessed by users either via a user-specific share, or via a common share pointing to the home directory root.

Home directories are supported for SMB, NFS, HTTP/HTTPS, and FTP/FTPS. They are accessed by clients in the following manner:

- For SMB and HTTP/HTTPS, users are presented with a virtual share named after the user name. The virtual share is visible and accessible only to the user. Users are not limited only to their virtual shares; all other shares on the cluster continue to be accessible in the usual fashion.
- For NFS, the home directory is exported. When a user mounts the home directory root, all home directories are visible inside the root, but the user's home directory is accessible only by the user and the administrator.

NOTE: If desired, Unix clients can be configured to use a Snap Home Directory as the local user's system home directory. Configure the client to mount the home directory root for all users, and then configure each user account on the client to use the user-specific directory on the SnapScale cluster as the user's home directory.

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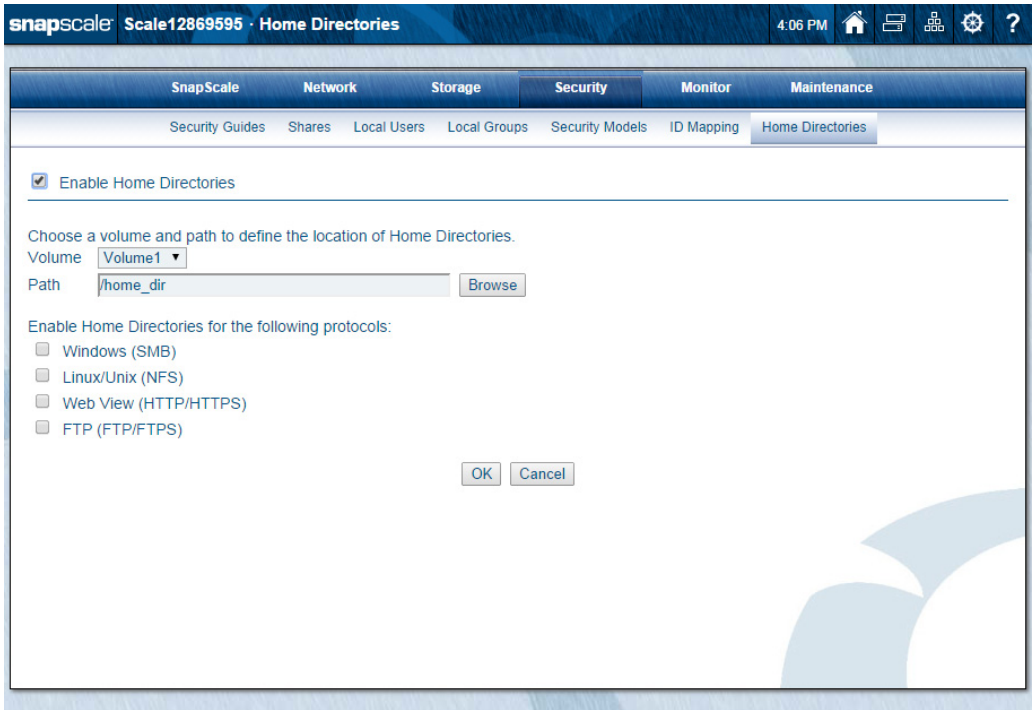
- For FTP/FTPS, local users will automatically be placed in their private home directory when they log in. Access to the home directory is facilitated through a share pointing to a parent directory of the home directory, so users can still change to the top-level directory to access other shares.

If ID Mapping is enabled, domain users and local users mapped to the same user are directed to the domain user's home directory. In some cases, data in the local user's home directory is copied to the domain user's home directory:

- If a local user home directory accumulates files before the local and domain users are mapped and if the domain user's home directory is empty, the local user's files are copied to the domain user's home directory the first time the local user connects after the users are mapped.
- If both the local and domain user home directories accumulate files before the local and domain users are mapped, the files in the local user's home directory are not copied to the domain user's home directory.

Configure Home Directories

Check or complete the following fields and click **OK**.



Field	Description
Enable Home Directories	Check to enable Home Directories for local users and activate the options. Remove the check to disable.
Volume	Select the volume where the Home Directories will be located. **NOTE:** Be sure the volume you select has enough disk space. Once Home Directories are placed, they cannot be moved. Also, volumes used as data replication targets cannot be used for data import.
Path	Provide the path to the Home Directories or click **Browse** to create a new folder. The default path is **`/home_dir/`**.

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Field	Description
Protocols	Check each of the protocols where Home Directories will be enabled.

NOTE: Do not put Home Directories on a volume that might be deleted. If you delete the volume, you will also delete the Home Directories.

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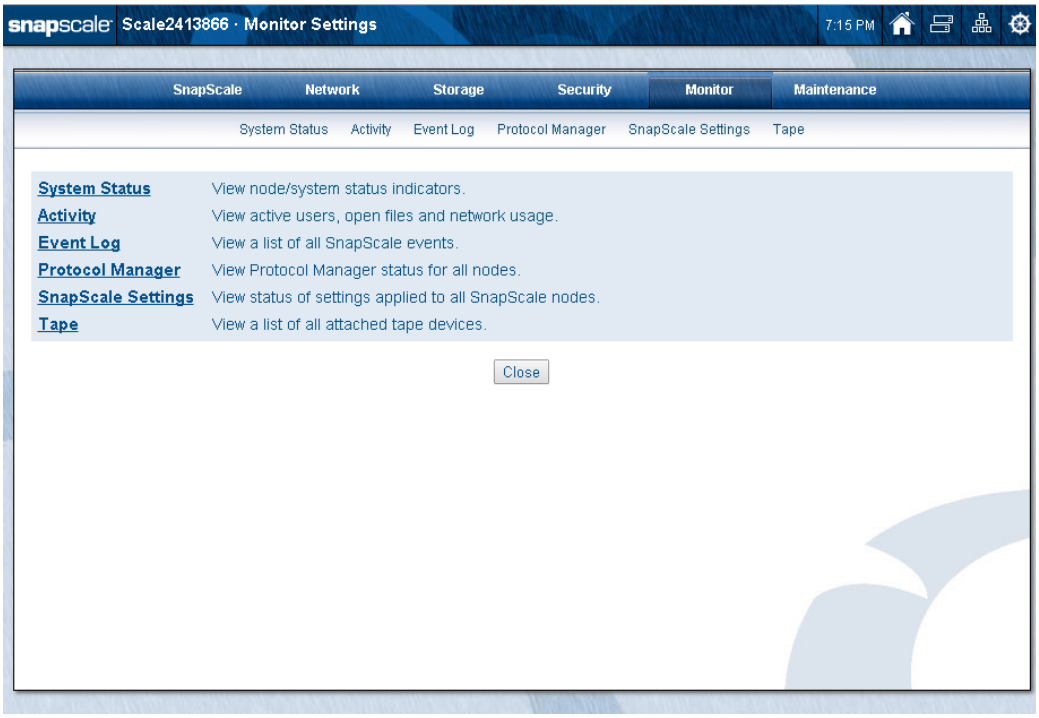
System Monitoring

This chapter addresses the options for monitoring the SnapScale cluster.



Topics in System Monitoring:

- System Status
- Activity Options Submenus:
  - Active Users
  - Open Files
  - Network Monitor
- Event Log
- Protocol Manager
- SnapScale Settings
- Tape

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System Status

Use the **System Status** page (**Monitor > System Status**) to assess the hardware status and key information of the cluster member nodes.

The following status fields are displayed for each node that is part of the SnapScale cluster. Any critical messages are displayed in a **red** font.

Field	Description
Node Name	Name of the node. The default node name is Node*nnnnnnn*, where *nnnnnnn* is your node number (for example, Node1123578).
Node Model	Node model name/number.
OS Version	The version of RAINcloudOS currently loaded on the SnapScale node.
Hardware	The node's hardware platform ID.
Node Number	Number derived from the MAC address of the Ethernet 1 port, used as part of the default node name.
BIOS	The BIOS version for the node.
Serial Number	Unique number assigned to the node.
JVM	The Java Virtual Machine version.
Uptime	The amount of time the node has been up (since the last reboot) in a user readable format.
Memory	Amount of system RAM.
CPU	The type of central processing unit (CPU). If more than one CPU exists, each is listed separately.
Client Network	Provides details on the client-side network.

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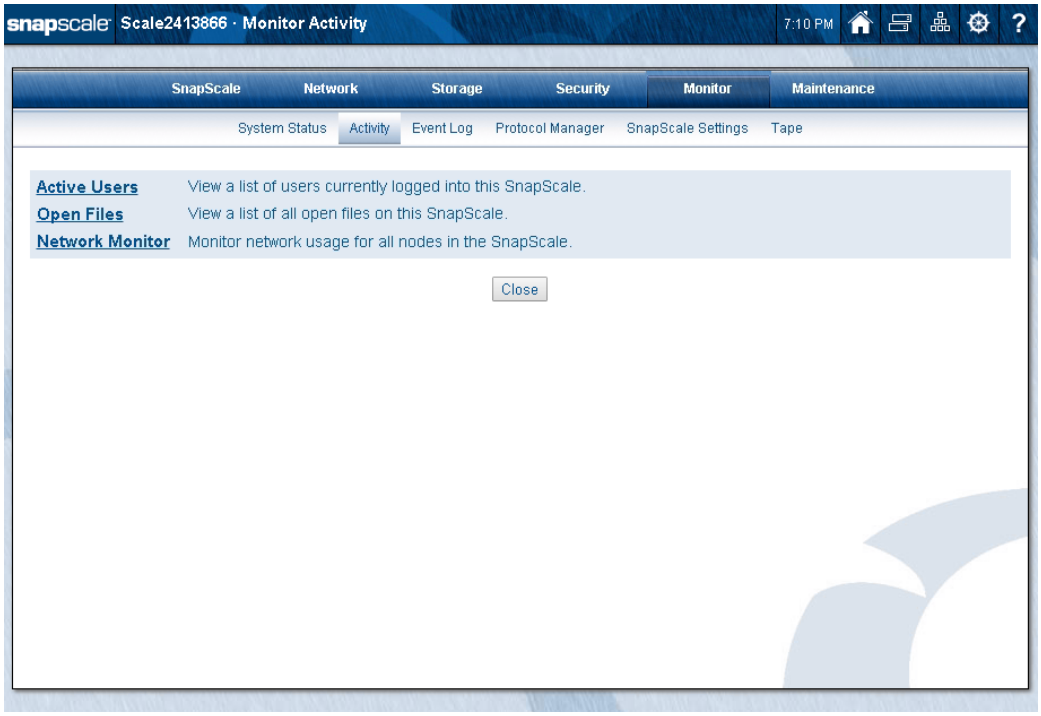
Field	Description
Storage Network	Provides details on the storage-side network.
Ambient Temp.	The temperature of the space inside the chassis.
CPU Temp.	Current CPU temperature.
Power Supply	The status of power supply modules
Fan Status	The status of fan modules.

Activity Options

The **Activity** tab provides access to a submenu of options and features for monitoring activity on the cluster.



This submenu is used to access three other pages:

- Active Users
- Open Files
- Network Monitor

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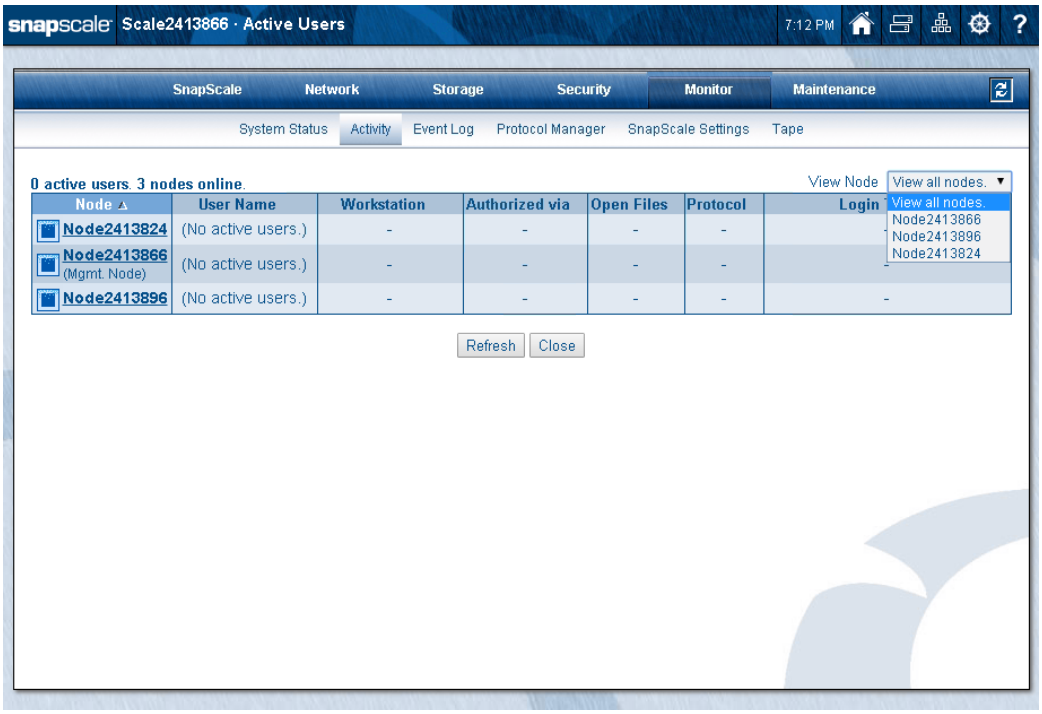
Active Users

This option is used to view read-only details on the active users logged on to each of the nodes on the cluster.



Information available on this page includes user names of all active users, their workstation names, authorization, the number of open files they have on the node, the protocol, and when they logged on. Columns can be sorted in ascending or descending order by clicking the column head.

Use the drop-down list on the upper right to select whether to view all the nodes or individual nodes. Close the page to return to the **Activity** tab.

NOTE: Active users are not displayed for HTTP or NFS.

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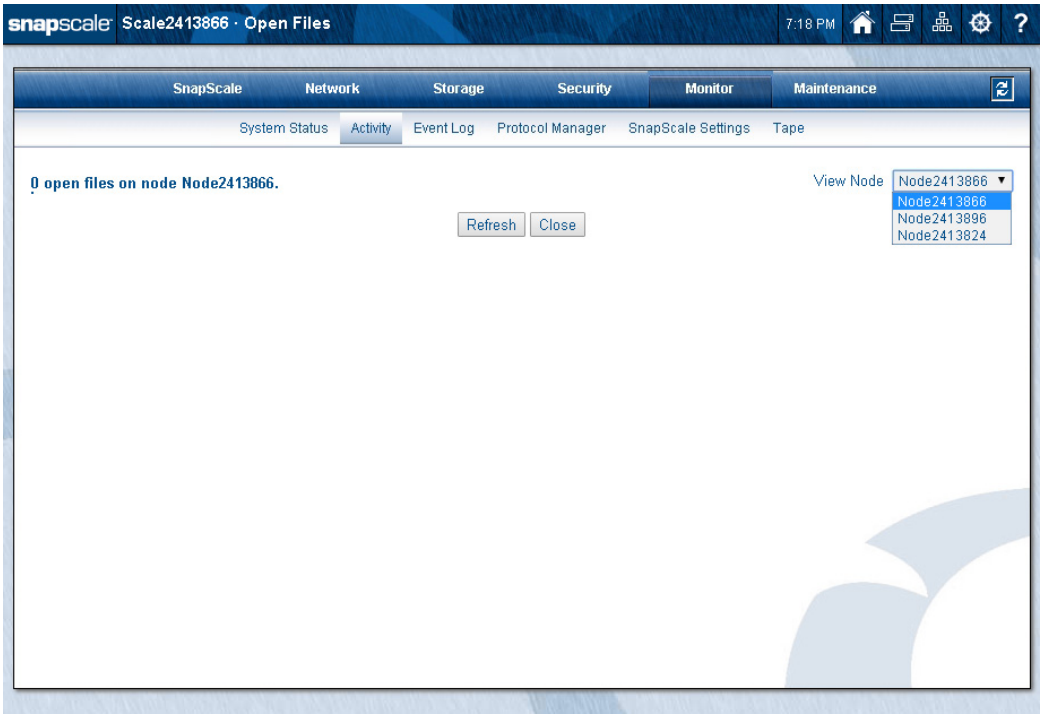
Open Files

Use this option to view read-only details on the open files on a specific node.



Use the drop-down list on the upper right to choose a different node to view. Click **Close** to return to the **Activity** tab.

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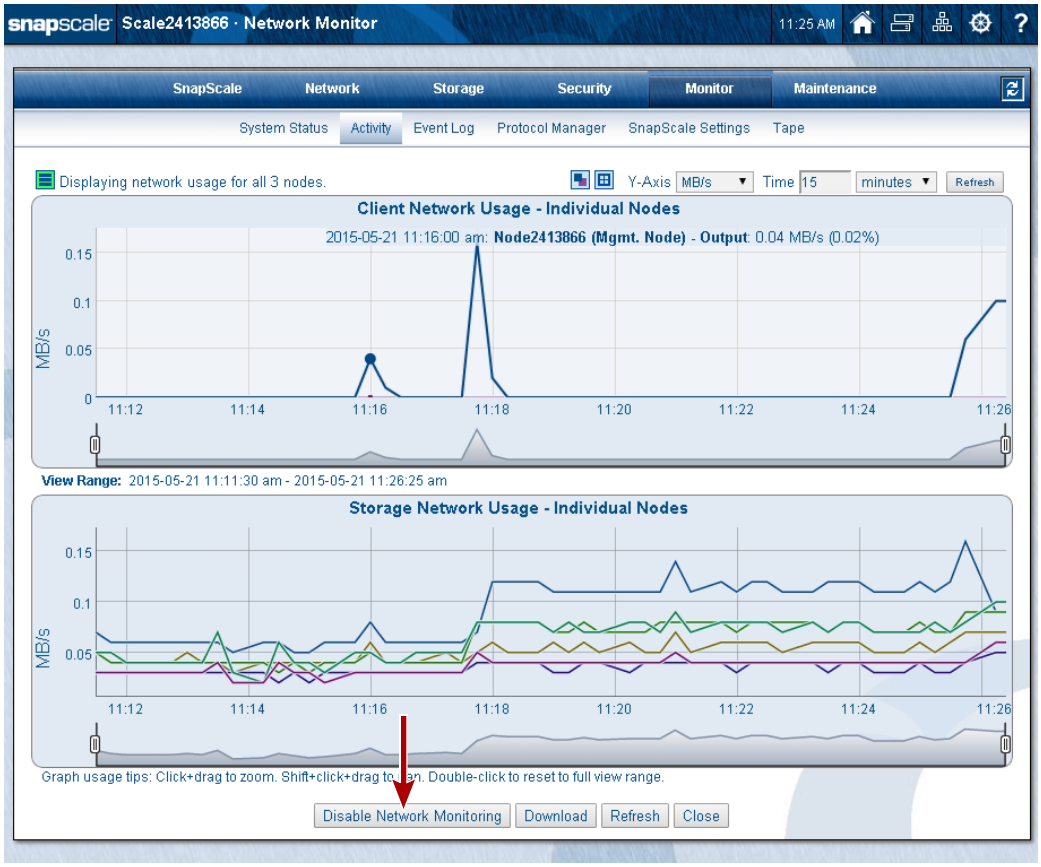
Network Monitor

This feature can be used to monitor network utilization on both the Client and Storage networks. Monitoring is enabled by default. Go to **Monitor > Activity > Network Monitor** and click **Disable Network Monitoring** to turn it off.



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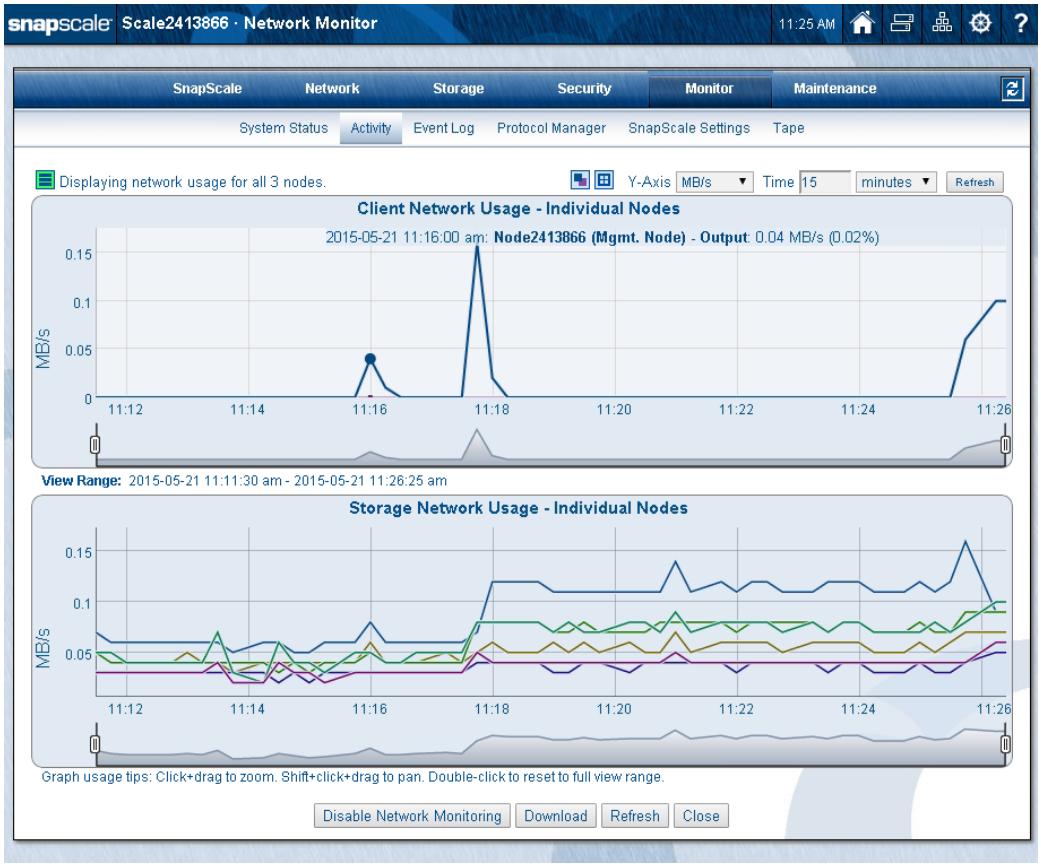
View Usage

You can go to **Monitor > Activity > Network Monitor** to view graphs showing current usage, total throughput, or combined usage for a user-configurable time period. The data is refreshed every 15 seconds.



NOTE: You can manually refresh the data by using the **Refresh** button above the graphs, the **Refresh** button at the bottom of the page, or the **Refresh** icon ( ) at the right corner of the tab bar.

Icons and options are located above the graphs to modify the views:

- The three icons are used to change the information presented in the graphs:
  - or – Nodes (Selected Units or All) selected for graphing.
  - or – Throughput (Individual or Total) of input and output for the selected nodes.
  - or – Network activity (Individual Node or All Nodes).
- Units of measure for the Y-axis are selectable (**Percent, MB/s,** or **GB/s**).
- Time interval of the data can be adjusted to be shown as a period of time (1 to 999 **minutes, hours,** or **days**).

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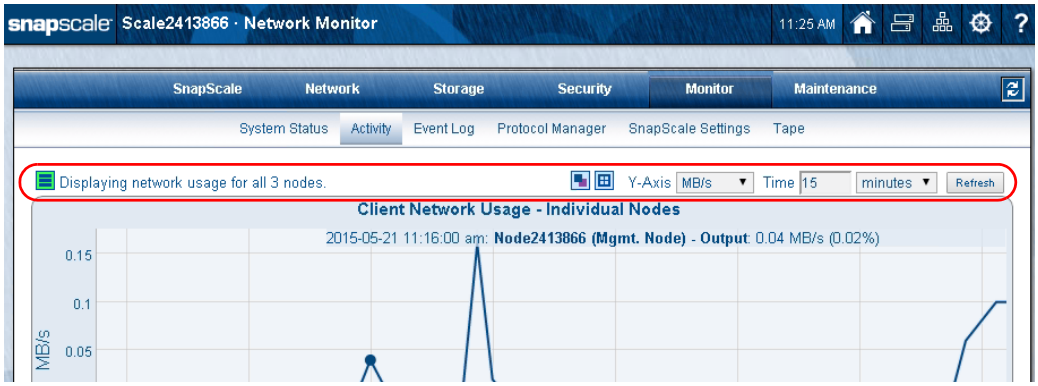

Icons / Options	Description
Select Nodes Ind All	Click this icon to select the nodes. Choose either individual nodes or **Select All Nodes**. You can select multiple nodes by using Ctrl+Click. • When blue, individual nodes are selected. • When green, all nodes are selected. Node selection is not available when **Combined Usage** ( ) is enabled. To display the **Select Nodes** icon, turn **Combined Usage** off.
Total Throughput Off On	This icon controls whether the graphs represent individual (separate input and output) throughput or total combined (input plus output) throughput. • When blue, the option is not active and the numbers reflect the individual input and output usage. • When green, the option is active and the numbers reflect the total throughput (combined input and output). Click the icon to enable the option (green) or disable it (blue).
Combined Usage Off On	This icon controls whether the graphs represent network usage for individual nodes or combined network usage of the cluster: • When blue, the option is not active and the numbers shown reflect network activity for individual nodes. • When green, the option is active and the numbers shown reflect network activity for combined nodes and the **Select Nodes** icon disappears. Click the icon to enable the option (green) or disable it (blue).
Y-Axis Display Options	Use this drop-down menu to set the unit of measurement of the Y-Axis to be either **Percent** of network usage, **MB/s** (megabytes per second), or **GB/s** (gigabytes per second).
Time Options	Controls the overall time range represented in the graphs. Enter a value from 1 to 999 and use the drop-down menu to select the time interval of **minutes**, **hours**, or **days**.

When you mouseover the usage bars, tool tip messages are displayed under the graph titles for that bar. Depending on the type of bar (Combined, Input, or Output), the message shows information about the network usage.

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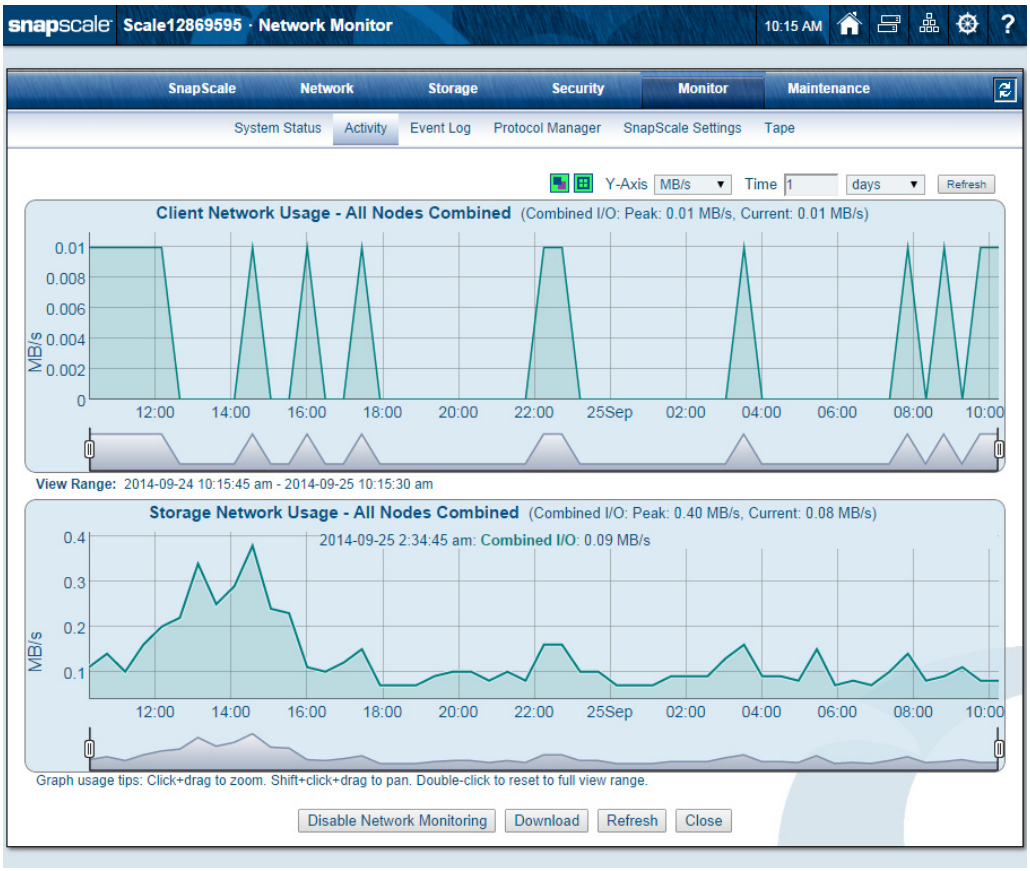
The buttons at the bottom of the page let you disable network monitoring, download the client and storage network usage logs, manually refresh the data, or close the page.



Graph Options

Below each graph is a gray Zoom Bar that can be used to show a specific time range. When zoomed in, the graphs are frozen and not updated.

- You can scale the magnification of the graph by either clicking and dragging horizontally within the graph area or using the handles at the sides of the Zoom Bar.
- To pan and view any time period within the specified overall time range in more detail, Shift-click and drag the graph or click and drag the ends of the Zoom bar horizontally.
- To reset the zoom level and restore automatic updates, double-click within the graph area.

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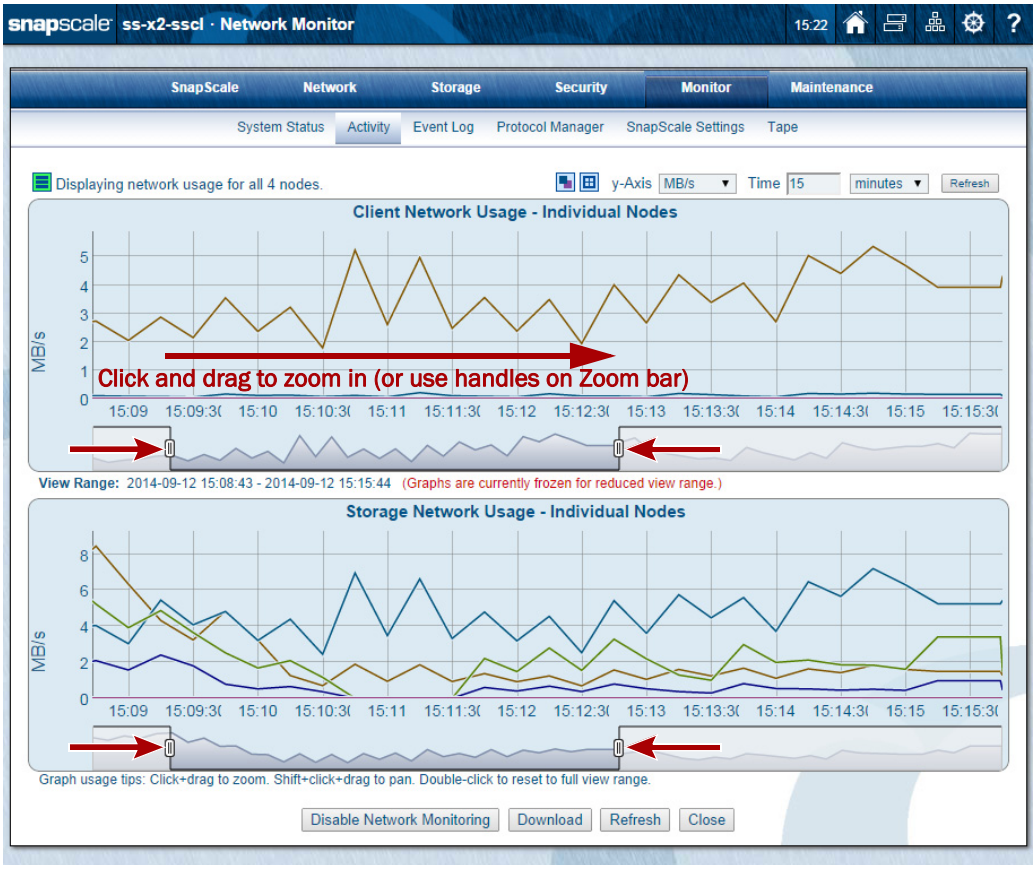

Download Usage Records

To download the record displayed as a CSV file, click **Download**. Depending on your browser, the file is saved or a dialog box asks you to determine the location of the downloaded file.

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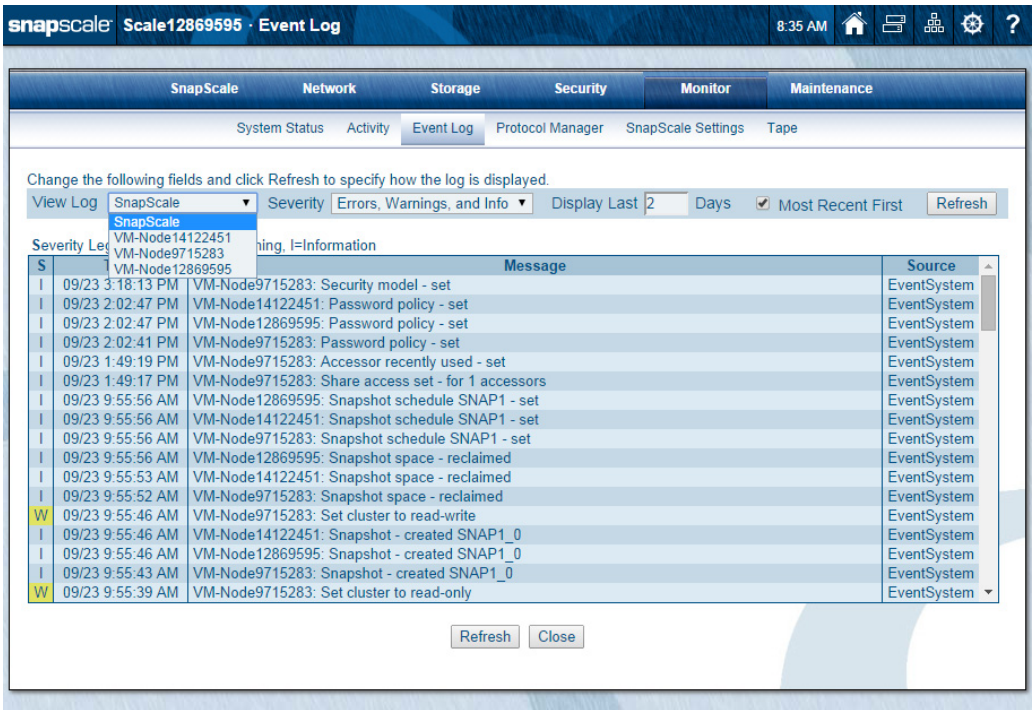
Event Log

Use the **Event Log** page to view a log of operations performed on the cluster.



Entries are color coded according to severity as described in the following table:

Color	Icon	Entry Type
Red	E	Error (E)
Yellow	W	Warning (W)
(no color)	I	Informational or Unclassified (I)

Filter the Log

Edit the following fields as appropriate, then click **Refresh**.

Option	Description
View Log	Select to view either the SnapScale cluster-wide or node-specific logs. The SnapScale option shows general cluster-related log messages while the node-specific options show log messages specific to the selected node.
Severity	Select the type of alerts and information you want to view.
Display Last *n* Days	Enter the number of days' worth of entries you want to view.
Most Recent First	Check this box to start the list with the most recent entry; deselect to start the list with the oldest entry.

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Protocol Manager

Protocol Manager manages networking protocols and IP address assignment across the entire SnapScale. If a node fails or is removed from the SnapScale, Protocol Manager handles automatic IP address reassignment to maintain client access to data.

The following table addresses the possible status:

Status	Description
OK	This node is fully functional.
Disconnected	This node could not be connected through the Storage network and is currently not participating in the cluster. If there is a public IP address associated with this node it should have been taken over by a different node. No services are running on this node.
Banned	This node failed too many recovery attempts and has been banned from participating in the cluster temporarily. Any public IP addresses have been taken over by other nodes.
Disabled	This node has been administratively disabled. This node is still functional and participates in the cluster but its IP addresses have been taken over by a different node and no services are currently being hosted.
Unhealthy	A service provided by this node is malfunctioning. The node itself is operational and participates in the cluster, however its public IP addresses have been taken over by a different node and no services are currently being hosted.
Stopped	A node that is stopped does not host any public IP addresses, and does not participate in the cluster.

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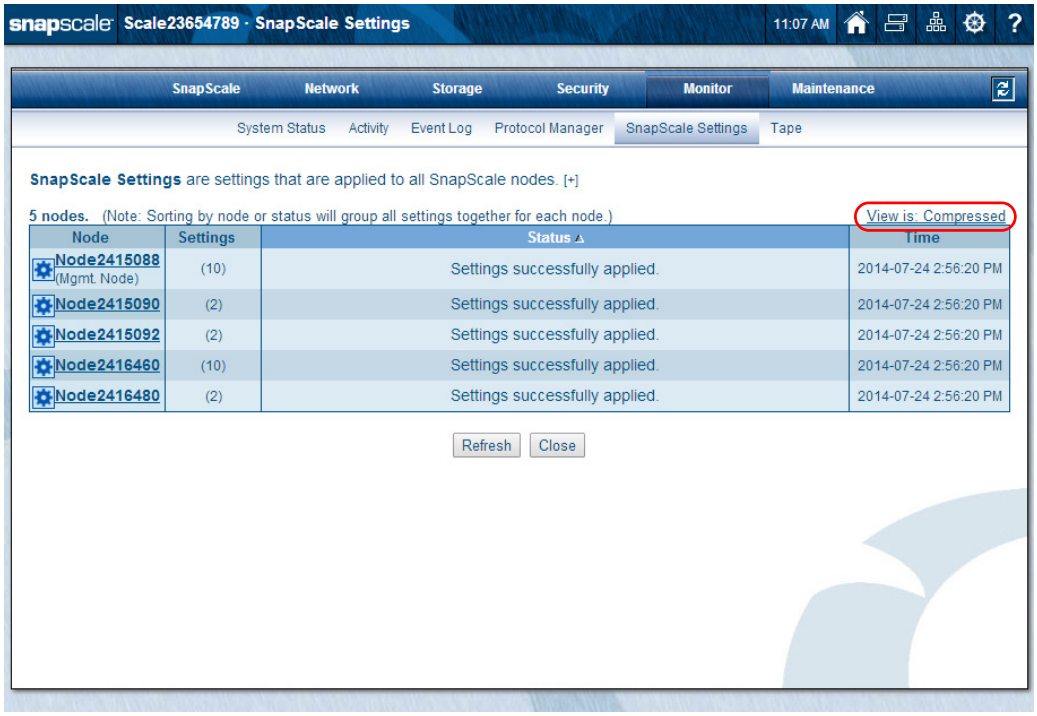
Status	Description
PartiallyOnline	A node that is partially online participates in the cluster like a node that is OK. Some network interfaces which serve public IP addresses are down, but at least one interface is up.

SnapScale Settings

When cluster settings are configured in the Web Management Interface, success or failure of the operation is determined by the attempt to perform it on the Management node. If successful, the same configuration operation is pushed to all member nodes in the background.

The **SnapScale Settings** page displays a list of settings that have been applied to the nodes in the cluster and the status of each setting. When you make changes to your SnapScale via the Web Management Interface, the settings are applied to the Management node first to determine success or failure of the configuration, then the settings are applied to the other nodes in the background. When a SnapScale setting has not been applied yet, its status is displayed as **Pending**. When a SnapScale setting fails to be applied, its status is displayed in detail and the failed settings are automatically re-applied until they are successful.

The initial view is compressed to show all nodes and a count of the settings:



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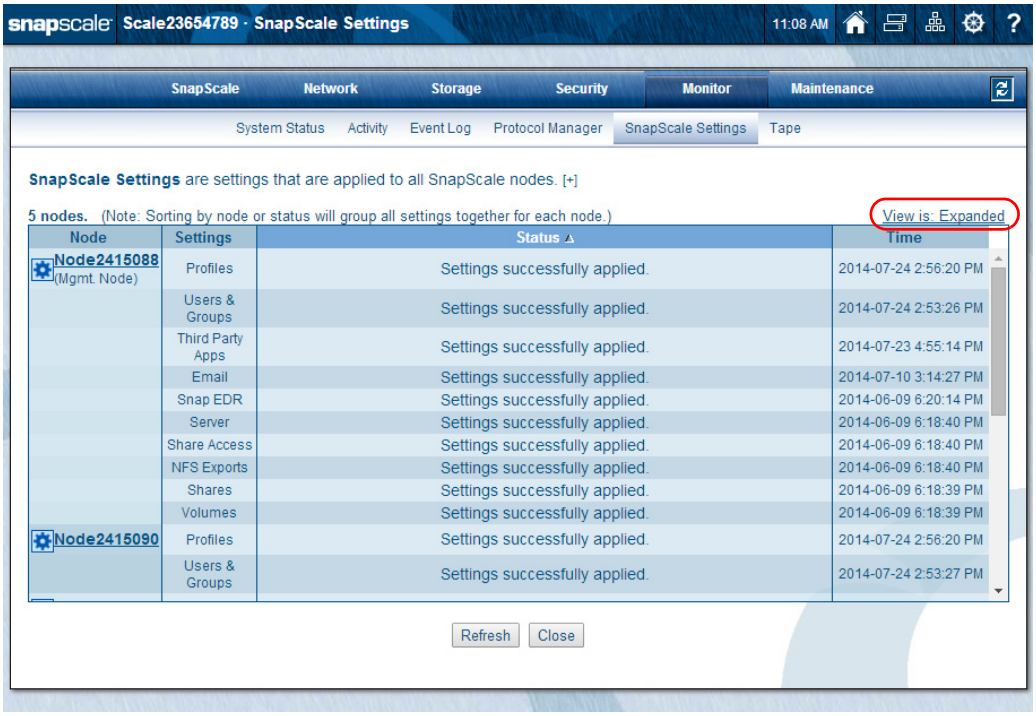
Click the upper right text that says **View is: Compressed** to switch to the expanded view:



Use the scroll bar on the right side to view all the data. In expanded mode, detailed information on each node is available:

- Each line reports the setting category, status, and date/time the setting was applied.
- If an operation is still in progress on a node, the **Status** will be set to **Pending** with a yellow background.
- If an operation failed on a node, the **Status** will have an error message and a red background.
- Column headers can be clicked to sort by **Node**, **Settings**, **Status**, or **Time**.
- When sorting by **Status** or **Node**, settings are grouped by node.

Click the **View is: Expanded** text to revert back to the compressed view. The displayed view from that point on will be the last view selected. Clicking the column heading resorts the table on that function.

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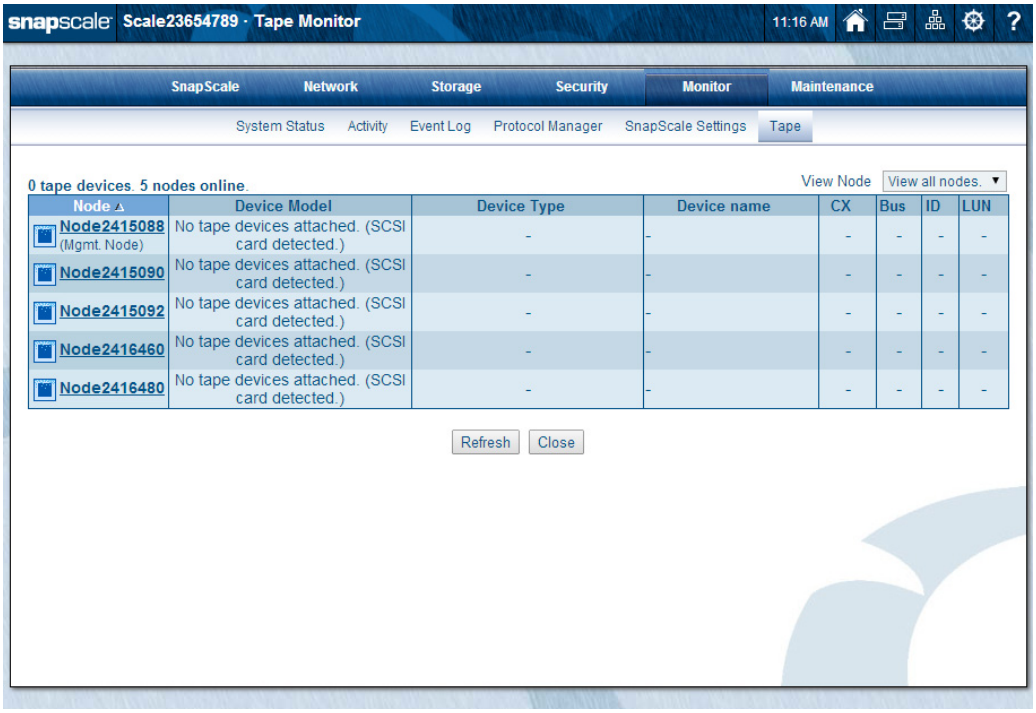
Tape

Use the **Tape Monitor** page (**Monitor > Tape**) to view read-only details on the SCSI and USB tape devices attached to each node.



Use the drop-down list on the upper right to select whether to view all the nodes or individual nodes. Close the page to return to the **Monitor** page.

The following table describes the fields:

Field	Description
Device Model	The manufacturer's model for the device.
Device Type	Type of tape device: either Sequential-Access (tape drive) or Medium-Changer (for example, robotic arm for a tape library).
Device Name	Name of the node to which the device is bound.
Connection	Identifies the connection type: SCSI or USB.
Bus	Bus number indicating which physical interface (for example, SCSI card) the device is connected to.
ID	ID number (SCSI only)
LUN	LUN identifier (SCSI only)

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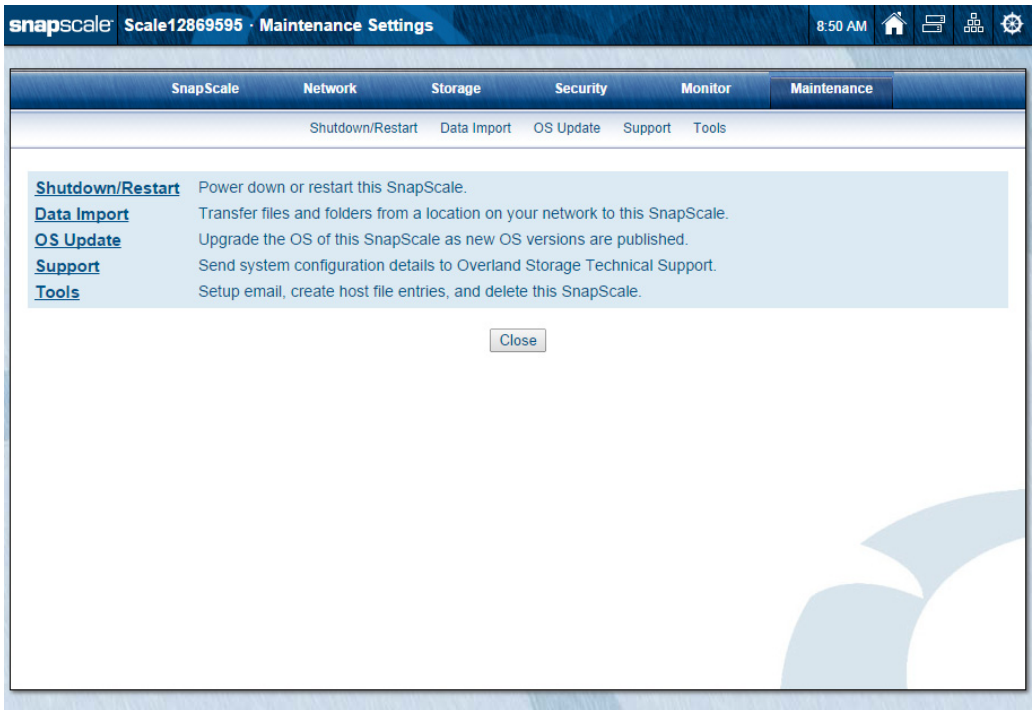
Maintenance

Clicking the **Maintenance** tab on the Web Management Interface displays options used to maintain this SnapScale cluster. There is also a **Tools** submenu of special, related options.



Topics in Maintenance

- Shutdown and Restart
- Data Import
- OS Update
- Support
- Maintenance Tools:
  - Email Notification
  - Phone Home
  - Host File Editor
  - Delete SnapScale Cluster

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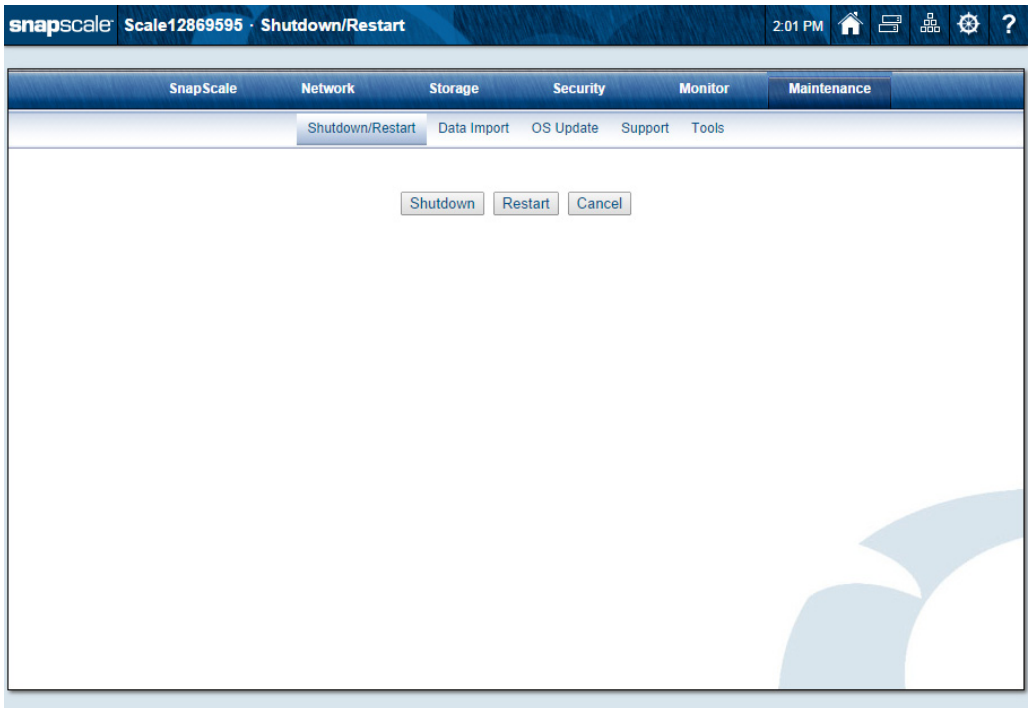
Shutdown and Restart

Use the **Shutdown/Restart** page to reboot or shut down the cluster.



Click one of the following buttons:

- **Shutdown** – Shuts down and powers off all nodes in the cluster.
- **Restart** – Reboots the cluster via a controlled shutdown and restart.

Manually Power SnapScale Nodes On and Off

CAUTION: To prevent possible data corruption or loss, it is NOT recommended to directly power down any nodes that are part of a SnapScale cluster. When powering down a cluster, always use the **Shutdown** button that can be found under **Maintenance > Shutdown/Restart** in the Web Management Interface.

The Power button on the front of the node can be used to power on or power off (in an emergency) a node:

- To turn the node on, press the Power button on the front of the node.

  The node takes a few minutes to initialize. A green system/status LED indicates that the system is up and running.
- To turn the node off, press and release the Power button to begin the shutdown process. Do not depress this button for more than four seconds.

NOTE: SnapScale nodes have a persistent power state. When a physical loss of power occurs, the node returns to the same state it was in when the power went out. Therefore, if the node is powered down prior to a power loss, it will remain powered down when the power is restored, and if it was powered up prior to a power loss, it will power back on when power is restored.

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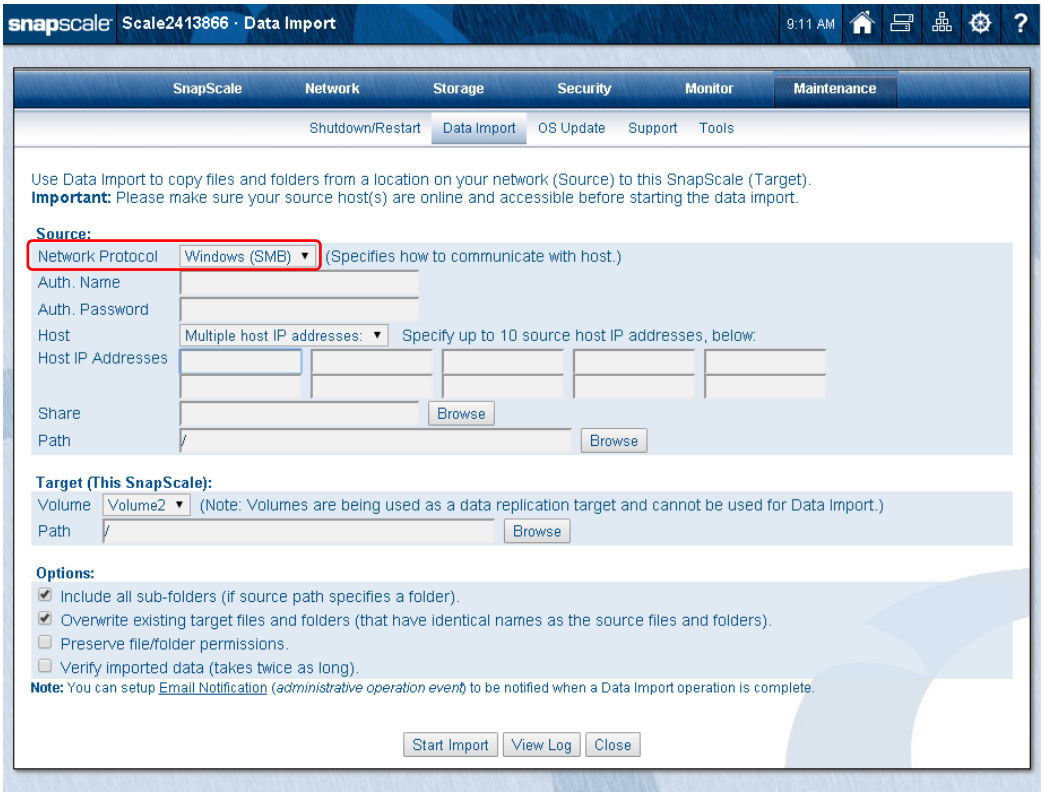
Data Import

Use the **Data Import** page (**Maintenance > Data Import**) to import (migrate) data from another SnapScale cluster, SnapServer, or other computer that supports CIFS or NFS (v2 or v3) to this cluster.

To enhance performance:

- All nodes in this cluster connect to the source cluster to import data in parallel.
- Each node in this cluster makes multiple parallel connections to the source to import data.

Windows/SMB Page:



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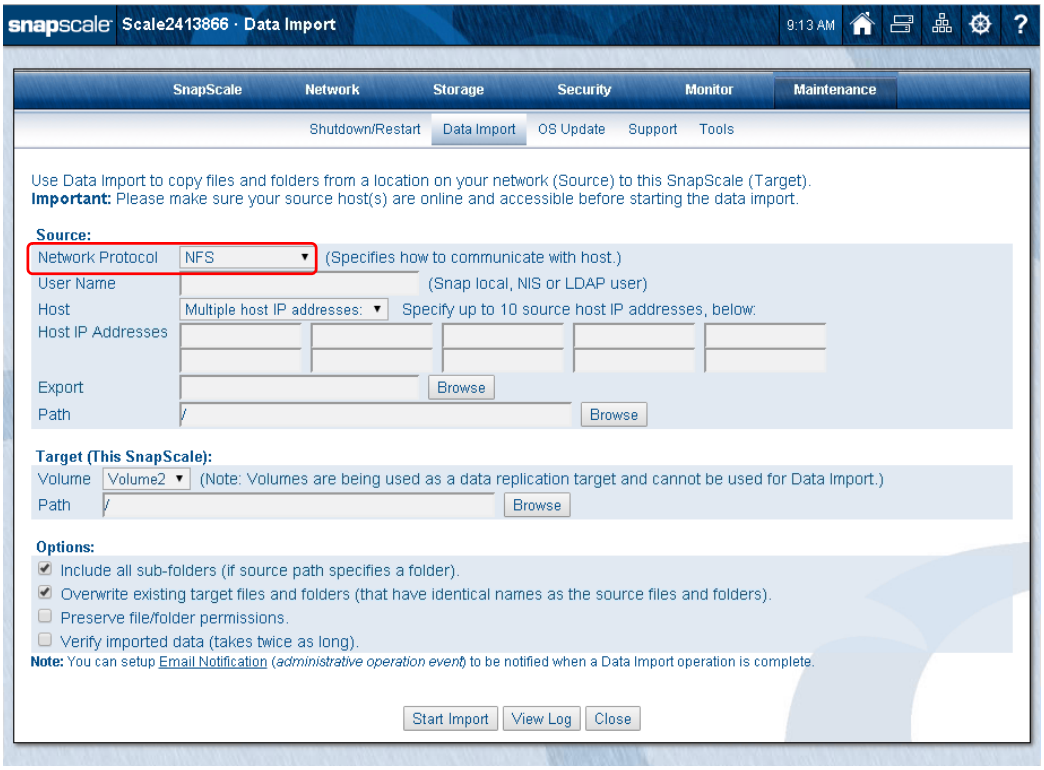
NFS Page:



If an error is encountered during the import (for example, a file or folder is locked and cannot be imported), the utility records the error in a log, and continues the operation. When the import is completed, the administrator can view the log of import errors. Once the errors have been corrected, the administrator returns to the main page and recreates the import. With the exception of the password, all fields will still be populated with the specifications of the last import job.

The following import options can be specified:

- Include subfolders
- Overwrite existing files
- Preserve the original permissions settings

  NOTE: If you elect to preserve original permissions settings, review Preserve Permissions on page 229.

- Verify imported data

  NOTE: If you elect to verify imported data, all data is read twice, once for import and once for comparison to the copied data. This will take twice as long.

Set Up a Data Import Job

Before setting up a data import job, be sure to specify a user identity for the operation that has full access to all files on the source, regardless of permissions set:

- For Windows import, specify an administrator or member of the Windows server/domain administrators group.

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- For NFS v2/v3 import, consider using the user root and configuring the NFS export on the source to `no_root_squash` for the IP Address of the node for the duration of the import.

NOTE: Only one import job can run at a time.

To create a data import job, perform the following procedure:

1. On the **Data Import** page, complete the required **information** for both the source and target.

Option	Description
Source	
Network Protocol	Protocol that the cluster uses to connect to the source server. Use the drop-down list to select: • **Windows (SMB)** – Uses SMB for Windows with the source data on a Windows root directory (default option). • **NFS** – Uses NFS v2/v3 for Unix/Linux-based servers with source data on a Unix root directory.
Auth. Name & Auth. Password / User Name	• For the **Windows (SMB)** network protocol, enter both the **Auth. Name** and **Auth. Password** (Windows user name and password to log in to the source server over SMB). • For the **NFS** network protocol, enter the **User Name** (node local user name or NIS/LDAP user, representing the UID used to perform the operation over NFS).
Host	From the **Host** drop-down list, you can select one of two possible options: • **Host Name or IP Address** • **Multiple Host IP Addresses** When the multiple host option is chosen, 10 new fields are shown for the multiple addresses. Enter either host names or IP addresses.
Share/Export	Specify the share (Windows) or export (NFS) on the source server containing the data you want to import. NOTE: Wildcards are not supported when specifying the source share to import.
Path	Enter the path to the file or folder you want to import. If you are importing the entire share, you can leave the Path field blank. NOTE: Wildcards are not supported when specifying the path to import.
Target (This SnapScale)	
Volume	Specify the volume where you want the data imported. NOTE: Volumes used as data replication targets cannot be used for data import.
Path	Specify the path to the directory where you want the data imported.
Options	
Include All Sub-folders	If the folder you select for import contains subfolders, selecting this option imports all files and folders underneath this folder (default is checked). NOTE: If disabled, *only* the files in this folder are imported.

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Option	Description
Overwrite Existing Target Files & Folders	If any files/folders on the target have identical names with files/folders on the source, checking this option overwrites those files/folders during import (default is checked).
Preserve File/Folder Permissions	Selecting this option retains the source permissions when the files/folders are imported to the target (unchecked by default). **NOTE:** Before selecting this option, review Preserve Permissions on page 229.
Verify Imported Data	Selecting this option causes all source data to be read twice, once to write to the target and once to perform a binary comparison with the data written (default is unchecked). If a file mismatch occurs during verification, an error is written to the data import log identifying the file. **NOTE:** Depending upon how much data is being imported, verifying imported data can be a lengthy process.
Email Notification	Clicking the email notification link takes you to the **Email Notification** page (for more information, see Email Notification on page 244). Fill in notification information and check the box next to **Administrative Operation Event** in order to receive an email when the import operation is complete.

2. Once you have completed the import information, click **Start Import** to begin the import. You can see the progress of the import, the estimated time until completion, and the import log on the secondary **Data Import** page.
3. When the import is complete, click **View Log** to see details of all errors. Click the **Data Import Error Log** link to download the entire log.

Use Multiple Sources

Using the **Host** drop-down list, you can choose **Multiple Host IP Addresses** and enter up to 10 source host names or IP addresses. This enables you to import from multiple nodes of a source cluster simultaneously.

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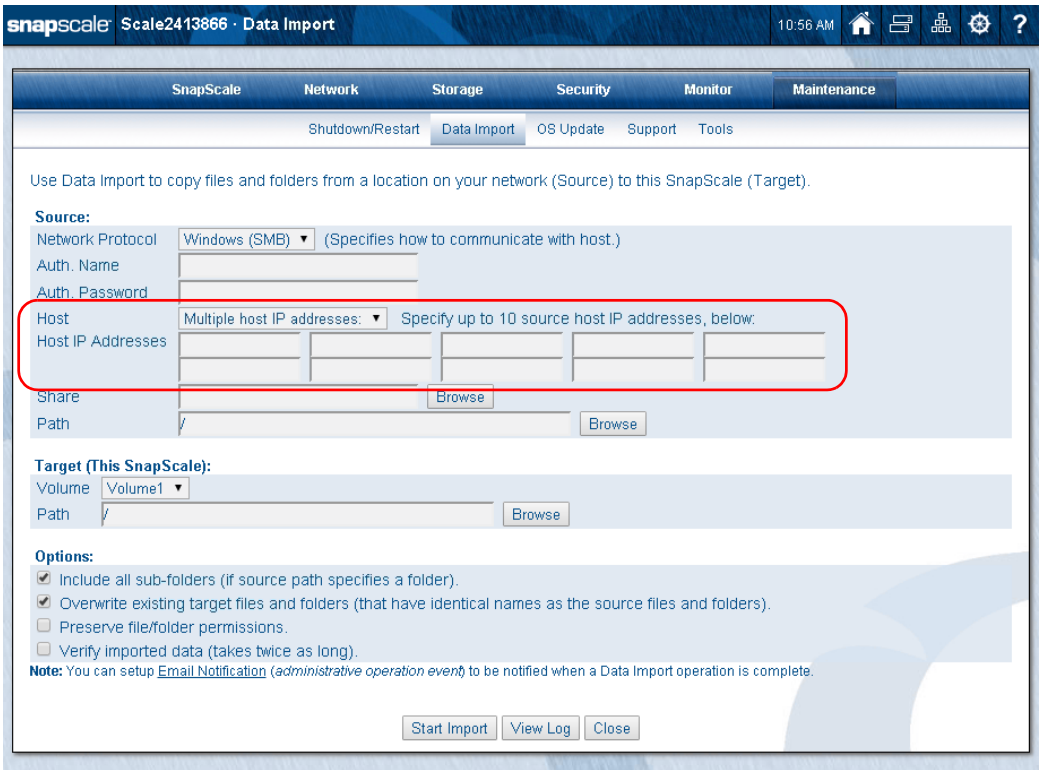

Stop an Import Job

To stop the import at any time, click **Stop Import** on the **Data Import** secondary page. If a file was in the process of being copied, the partially-copied file on the target is removed.

Recreate an Import Job

The **Data Import** log records all errors that occurred during import. You can import just the files and folders that were not imported during the original job due to an error condition (for example, the file was locked).

1. Review the **Data Import errors log** and correct all error conditions (such as unlocking a locked file).
2. Reopen the **Data Import** page. All fields (except the password) from the last import will still be visible on the page.

   By default, all files will be re-imported. If you want only to import those files that did not exist at the target, you can disable the **Overwrite Existing Target Files** option. However, make sure that all problematic files from the first import are deleted from the target so they can be re-imported.

   NOTE: If an import failed, it is strongly recommended that you enable the **Verify imported data** option for the re-importation.

3. Enter your password and click **Start Import** to run the import again.

Preserve Permissions

The types of permissions retained will differ, depending on which import scenario is applied.

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Import from an SMB Source to a Windows or Mixed Security Model

If you are importing from an SMB server to a Windows personality directory, permissions are retained exactly as they exist on the source. However, as is the case when moving files with permissions between Windows servers, permissions for users who are unknown on the target are retained but not enforced. This includes permissions for:

- Local users on the source machine.
- Domain users for domains unknown to the cluster (for example, trusted domains, if the cluster is not configured to support trusted domains).
- Certain built-in Windows users and groups.

Import from an NFS Source to a Unix or Mixed Security Model

If you are importing from an NFS server to a Unix personality directory, Unix permissions for UIDs/GIDs are copied exactly from source to target; thus, identities of the users and groups are best retained if the SnapScale cluster belongs to the same NIS domain or LDAP directory as the Unix server.

Import Between Conflicting Security Models

When importing from an NFS source to a Mixed security model target, Unix permissions are retained and the security personality on the resulting files and directories will be Unix.

However, when importing from an SMB source to a Unix security model target or from an NFS server to a Windows security model target, permissions cannot be retained. Files and directories will inherit the Unix or Windows personality of the target volume and will have a set of default permissions.

Import from a SnapServer or SnapScale Cluster

When importing from a different SnapServer or SnapScale cluster, it is recommended that you maintain the same security model on the target that you have on the source.

- If your source uses a Windows security model and has permissions assigned to Windows domain users, use a Windows (SMB) connection for import. Windows permissions are retained exactly as they are on the source, with the same enforcement limitations for unknown users as for importing from Windows servers (see Import from an SMB Source to a Windows or Mixed Security Model on page 230).
- If your source server or cluster uses a Unix security model and has permissions assigned to local, LDAP, or NIS users, use an NFS connection for import.

  NOTE: Local users who have Unix permissions on the source are not created on the target with the same UIDs.

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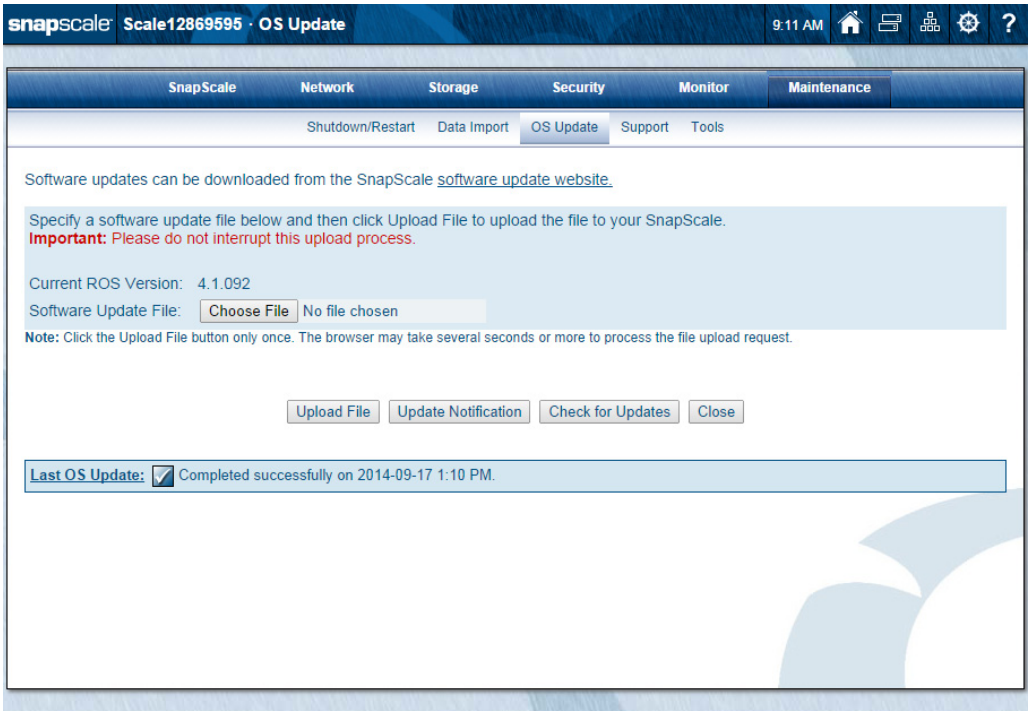
OS Update

Use this page to install updates to RAINcloudOS and other installed software, and to configure your system to automatically check for updates.



Information about the last RAINcloudOS update is listed at the bottom of the page and shows the basic information about the update.

CAUTION: Do not interrupt the update process. You may severely damage the cluster if you interrupt a software update operation before it is complete.

NOTE: While interrupting an update is not recommended, the **Abort** button provided on the Online/Rolling Update status page can be used to stop the update should there be no alternative. After an abort of a Online/Rolling Update, the user must then complete the update using the Offline method (all nodes restarting).

Update the RAINcloudOS

IMPORTANT: It is highly recommended that all active iSCSI users be disconnected before continuing.

NOTE: Snap EDR cannot be installed on a SnapScale cluster using the **OS Update** page (see Snap EDR on page 258).

1. Click **Check for Updates**.
   If an update is available, follow the instructions on the page to download it.

   NOTE: If the cluster does not have access to the Internet, download the latest RAINcloudOS image (.gsu) or other software package from the Overland Storage website to a computer on the same network that the cluster can access.

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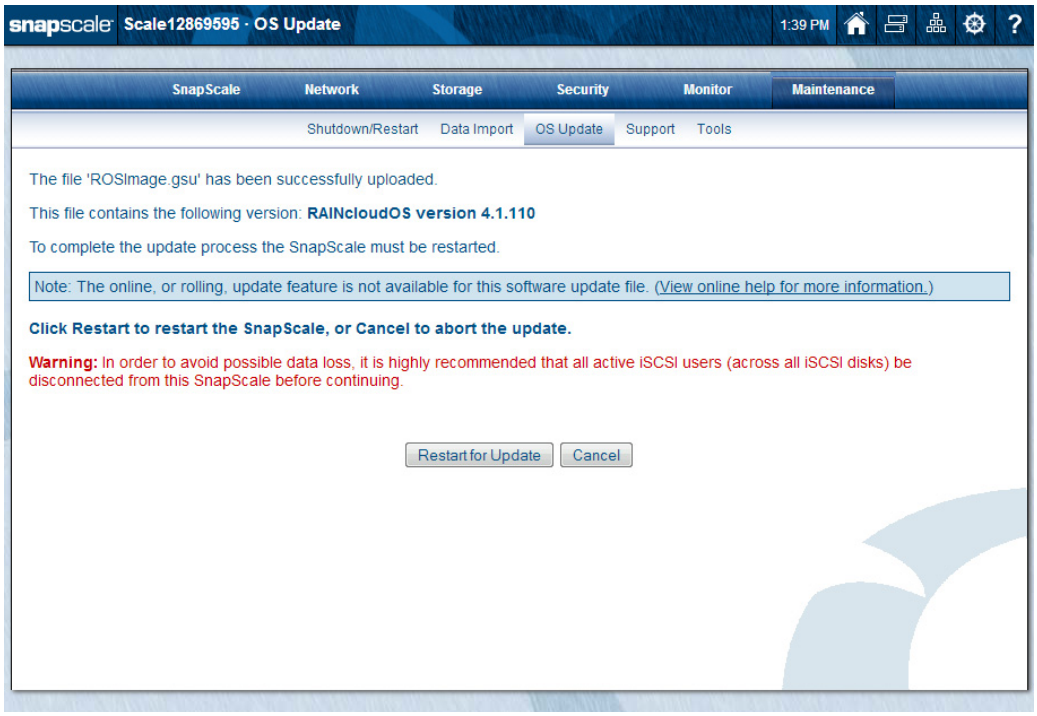
2. On the **OS Update** page, click **Browse** (or **Choose File**, depending upon your browser), locate the file to be uploaded, and select it.
3. Click **Upload File** to start the upload to the cluster.

   Only click the button once. Some browsers show the percent of the upload progress in their bottom status bar. The SnapScale cluster uploads the software package. An update option page is shown.

   Under some circumstances, an online/rolling upgrade is not available. You are given the opportunity to either cancel or use the offline upgrade option:



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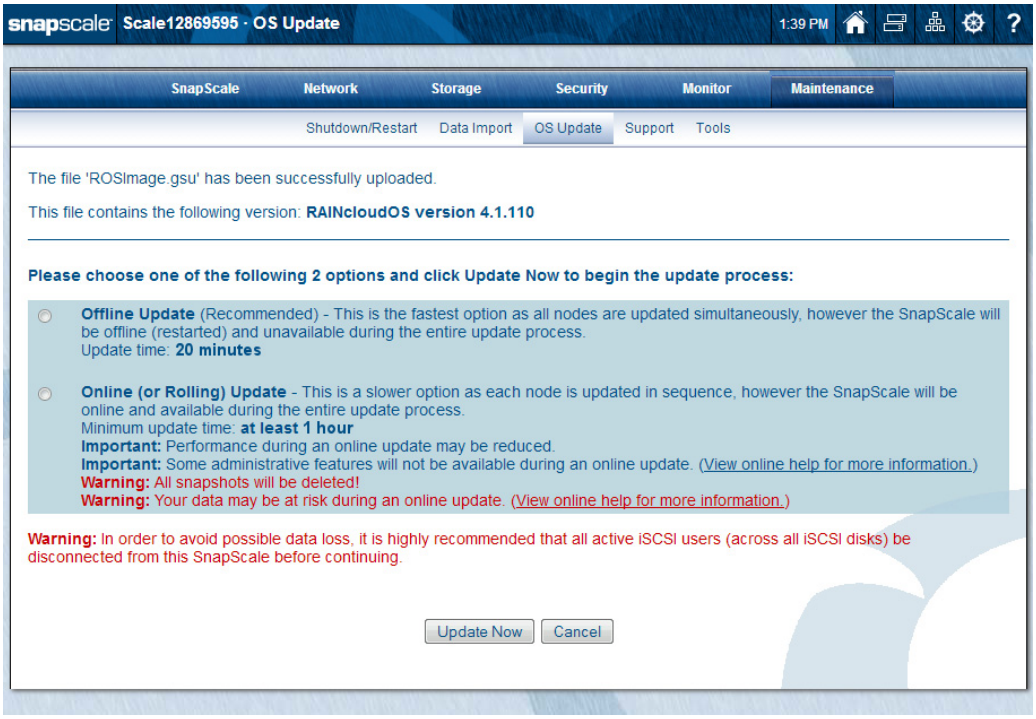
4. Choose the update option you want to use and click **Update Now**.



- **Offline Update (Recommended)** – This is the fastest option as all nodes are updated simultaneously. The SnapScale will be offline (restarted) and unavailable during the entire update process.
- **Online (or Rolling) Update** – This is a slower option as each node is updated in sequence. The SnapScale will still be online and available during the entire update process. However, performance will be reduced and some administrative features will not be available. See Online/Rolling Updates Notes on page 234 for caveats.

> **CAUTION:** With an Online/Rolling Update, all snapshots are deleted and your data has reduced redundancy during the update.

After an upgrade and reboot, the **OS Update Status** page displays the success or failure of the last update performed for each node.

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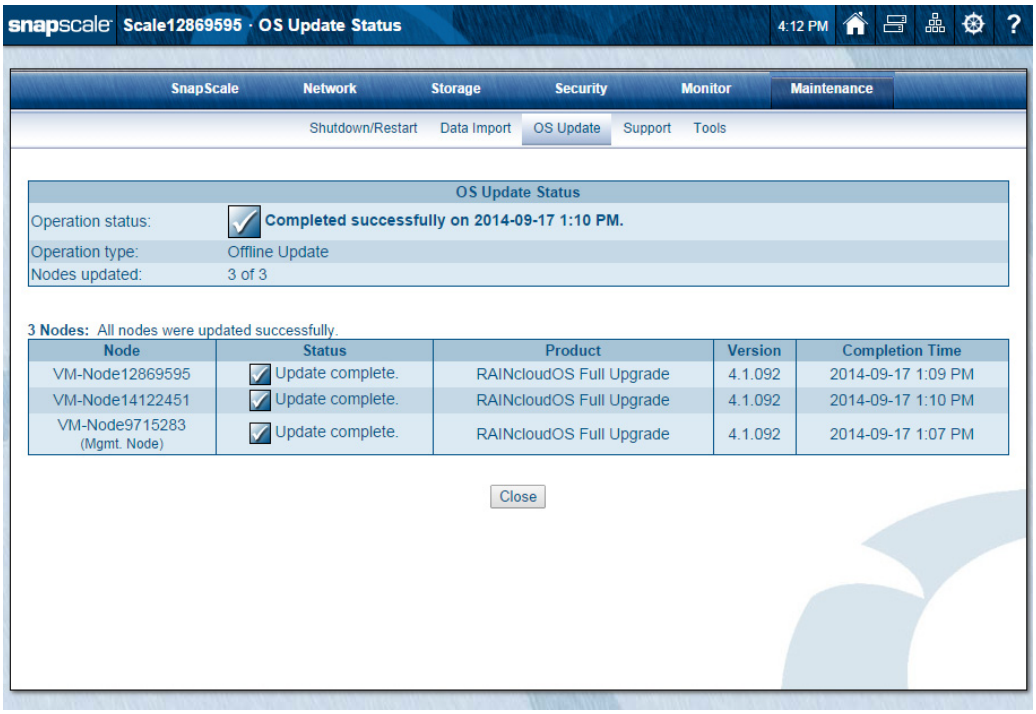

Online/Rolling Updates Notes

The Online/Rolling Update option allows you to update the RAINcloudOS while leaving the SnapScale cluster online and active. Each node is upgraded and rebooted one at a time, and as a result, degrades the peer sets with members in that node during that process. After upgrade/reboot, each node rejoins the cluster and all peer sets are fully rebuilt before the rolling update proceeds to the next node. This repeats until all nodes have been upgraded (or a failure is encountered).

To prevent problems and data loss, consider the following caveats:

- To avoid possible data loss, it is highly recommended that all active iSCSI users (across all iSCSI disks) be disconnected from this SnapScale cluster before updating the OS.
- If upload fails on one or more nodes, the upgrade will abort with an error and list the nodes that had problems.In such a case, an Offline Update is required.
- If you abort the Online/Rolling Update during the update process, the process stops where it is resulting in a mixed-OS state which needs to be resolved immediately. Then proceed using the Offline Update to complete the update of the cluster.
- All nodes must be in a healthy state to perform Online/Rolling Updates (**Storage > Nodes**). If they are not healthy, they need to have any issues addressed before continuing:
  - Using Offline Updates, update the OS on nodes with different OS versions. After updating, verify the node is now healthy, resolving any remaining issues.
  - Replace any unhealthy drives on nodes.
  - Replace any unhealthy nodes.

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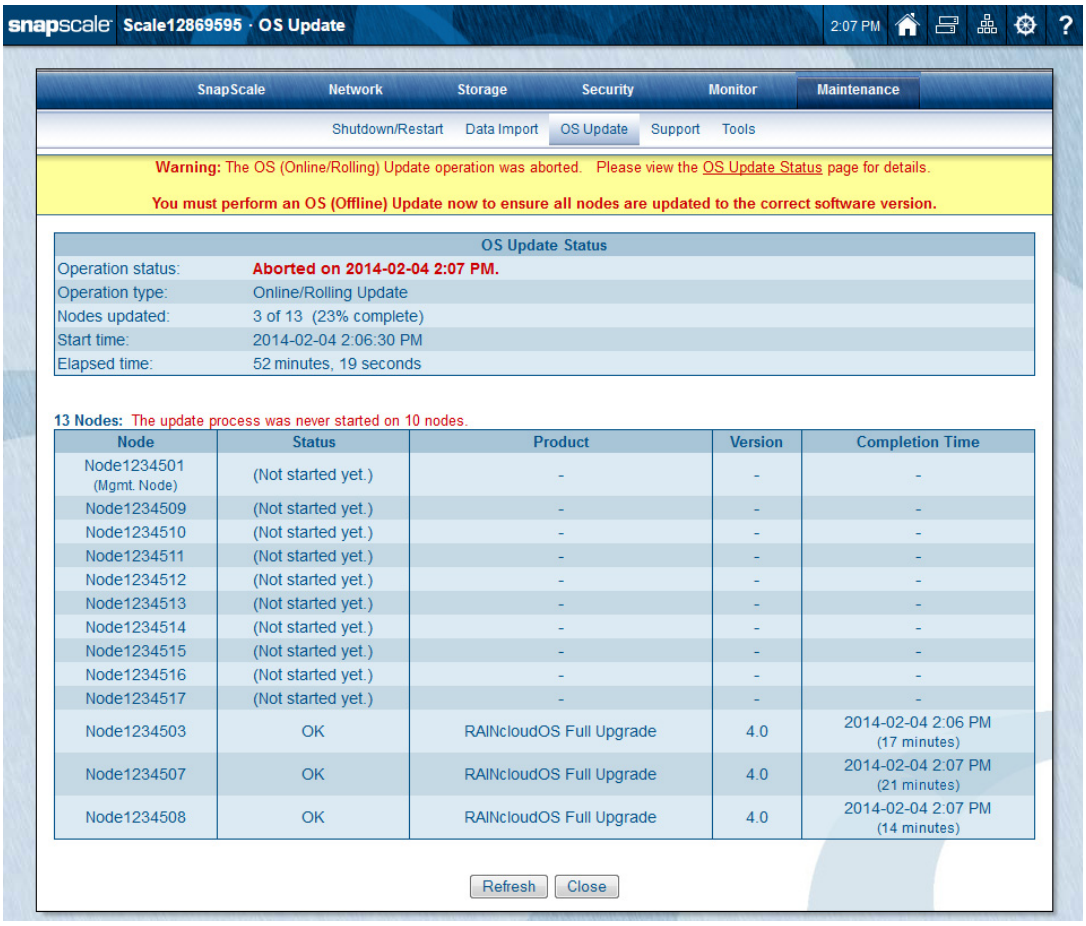

To minimize possible conflicts, the following Web Management Interface features are blocked during an Online/Rolling Update:

- **Delete SnapScale**
- **Add Nodes**
- **Remove Node**
- **Data Balancer**
- **Spare Distributor**
- **Update Notification**
- **Check for Updates**
- Certain **SnapScale Properties:**
  - Changing **Data Protection Level**
  - **Decreasing Spare Count**
- **Date/Time**
- **Create Snapshot**
- **Snapshot Space**
- **Snapshot Properties**
- **Delete Snapshot**
- **Snapshot Schedule Properties**
- **Delete Snapshot Schedule**

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- **SnapExtensions – SnapEDR**
- **Shutdown/Restart SnapScale**
- **TCP/IP**
- **Utility IP Address**
- **Storage Network Properties**
- **Change Password** (for a user with Admin rights)
- **Create iSCSI Disk**
- **Delete iSCSI Disk**
- **iSCSI Disk Properties** (properties & active clients can still be viewed)
- **VSS/VDS**

Under certain circumstances, the Online/Rolling Update feature is not available:

Reason	Solution
Peer sets are degraded or rebuilding.	Address degraded issue and allow peer sets to rebuild before updating.
OS versions are not consistent across all SnapScale nodes.	Update the RAINcloudOS on the nodes individually (using the Offline Update option) so they are all the same.
Peer sets contain disk size mismatches.	Replace the smaller drives in a peer set with ones that match the size of the larger drives in that peer set.
Not supported for this software update file.	Contact Technical Support.
The previously run Online/Rolling Update failed or was aborted.	Contact Technical Support.
Due to an unknown reason.	Contact Technical Support.

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Update Notification Option

You can configure RAINcloudOS to display an alert when updates are available for the cluster.

When enabled, **Update Notification** checks weekly for updates that are applicable to the cluster. If updates are available, a banner alert is displayed just below the menu bar on all Web Management Interface pages.

NOTE: You can choose to hide the banner by clicking either the *Remind me later* or *Hide this message* link on the banner. For *Remind me later*, the Web Management Interface displays the banner after the next check for updates; for *Hide this message*, the banner is hidden for the update in question until a later version is released.

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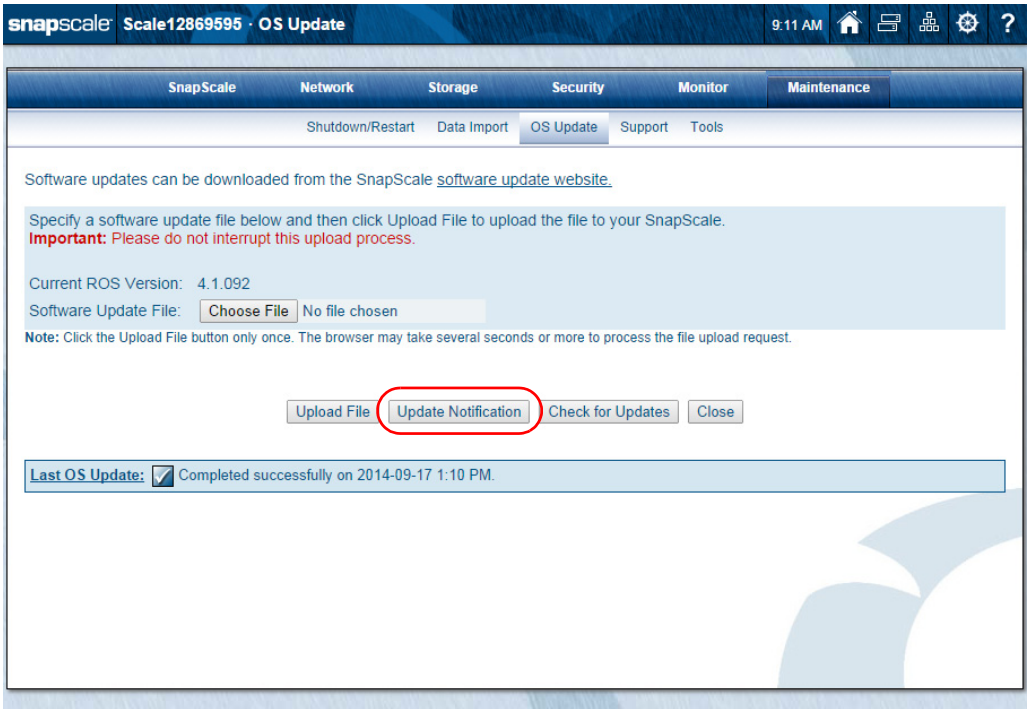
Configuring Update Notification

1. Go to **Maintenance > OS Update** and click **Update Notification**:



2. Check the **Enable Automatic Update Notification** box.

3. If your environment requires using a **proxy server** for external web-based communication:

   a. Check the **Use a proxy server for HTTP communication** box.
   Additional proxy options are displayed.

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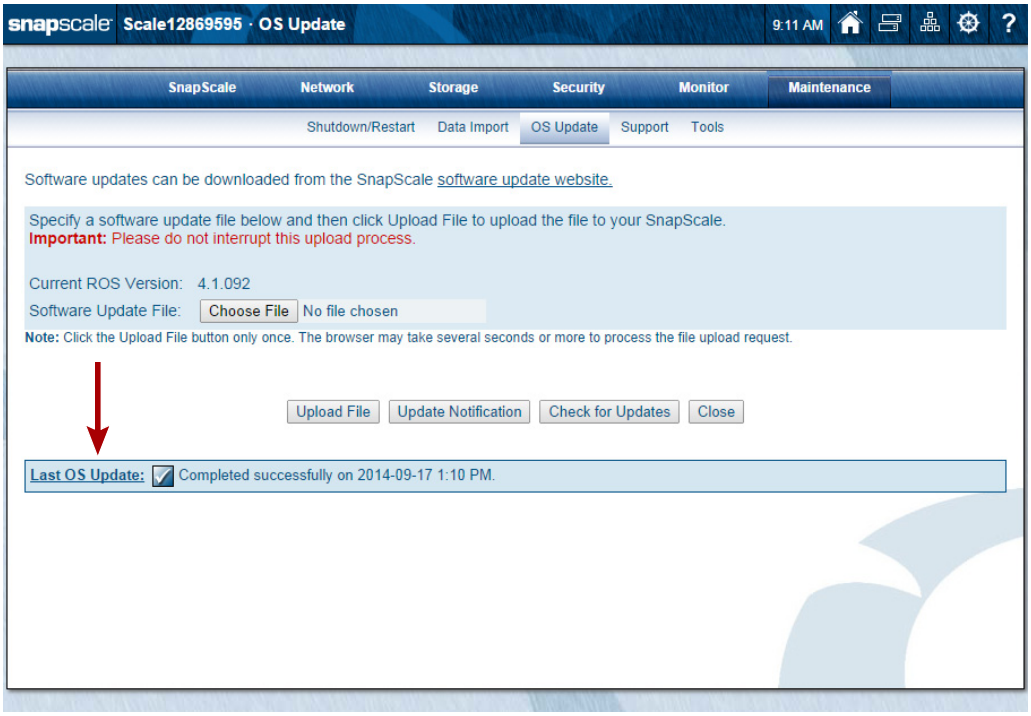
b. Complete the **Proxy Host** and **Proxy Port** fields.

4. Click **OK**.

Last OS Update

At the bottom of the **OS Update** page is a **Last OS Update** link and information. Click this link to view a detailed status of the last update applied to the cluster.



Support

The **Support** page provides an easy way to contact Overland Technical Support, and transmit system logs and files that contain information useful for troubleshooting purposes.

IMPORTANT: The **Support** page is not accessible until you have configured **Email Notification** in the **Tools** submenu.

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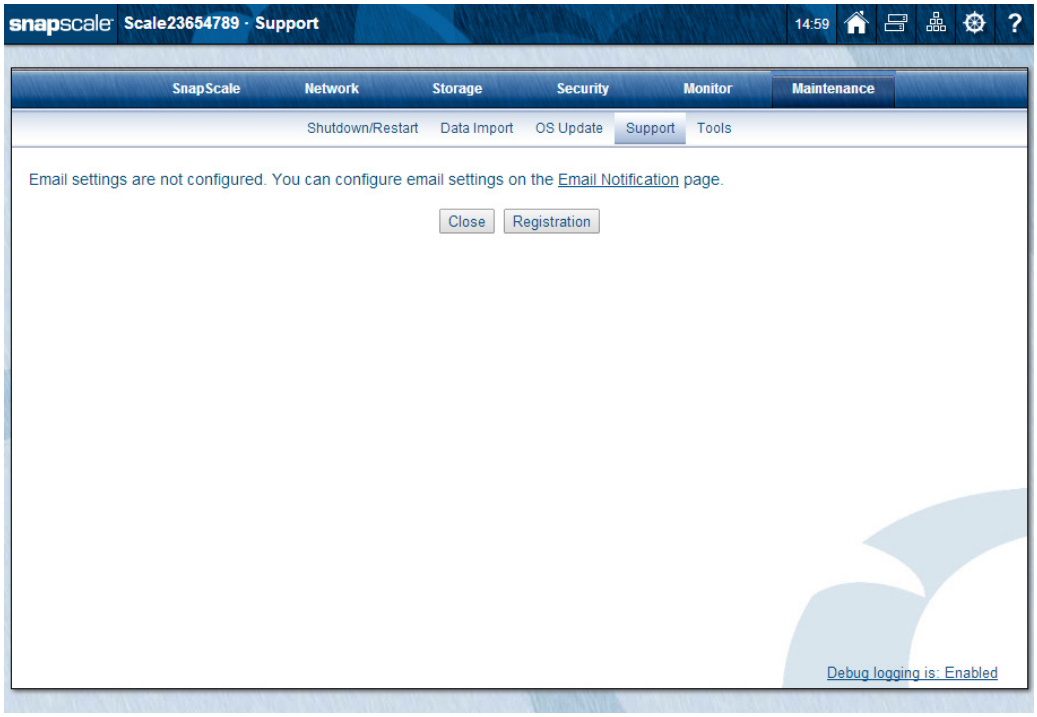
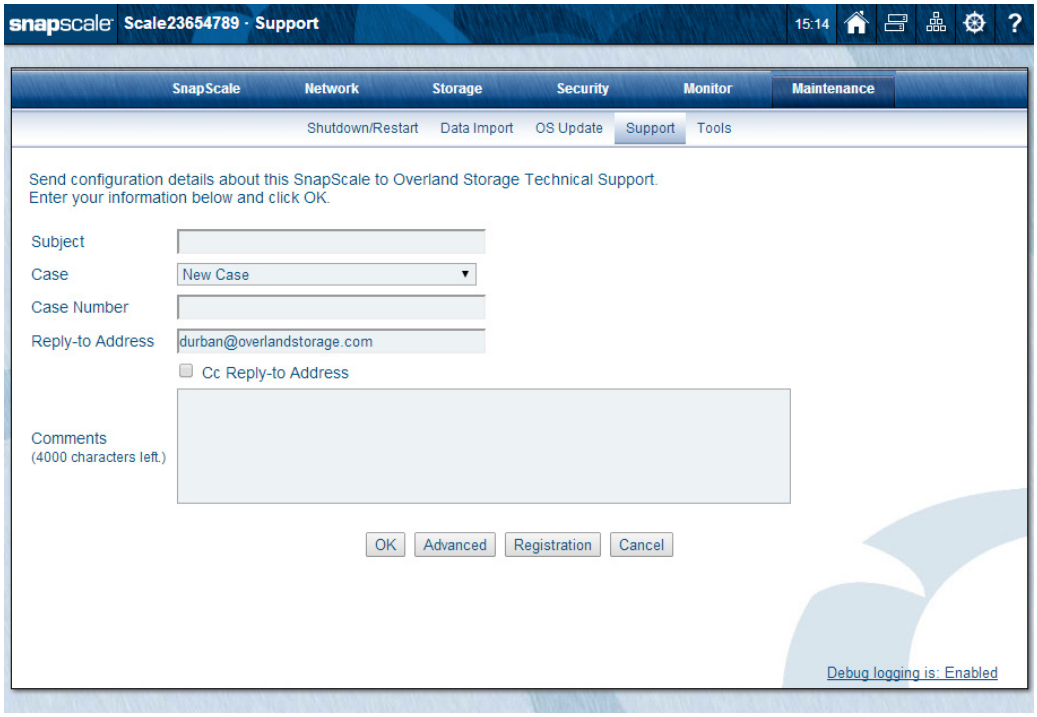


Once email is configured, the **Support** page is available with your contact information entered:



Register Your Cluster

The very first time you start your cluster, a **Registration Reminder** page appears. Registering your cluster activates your warranty and allows you to create and track service requests. Registration also provides access to RAINcloudOS upgrades, third-party software, and exclusive promotional offers.

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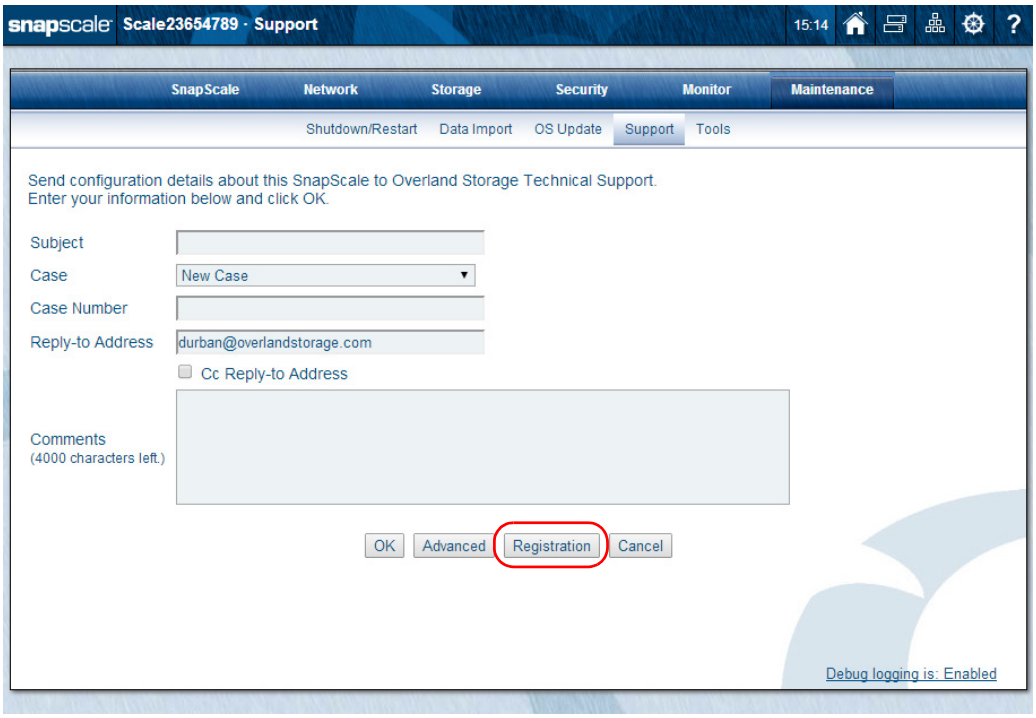
NOTE: Warranty information is available at http://docs.overlandstorage.com/support.

If you skipped the registration during setup, to register the cluster now, click **Registration** on the **Maintenance > Support** page:



Cluster Registration

NOTE: To use this feature, access to the Internet is required.

To register your cluster to activate its warranty support, you can either:

- Click the link on the initial **Registration Reminder** page.
- Go to **Maintenance > Support** and click **Registration**.

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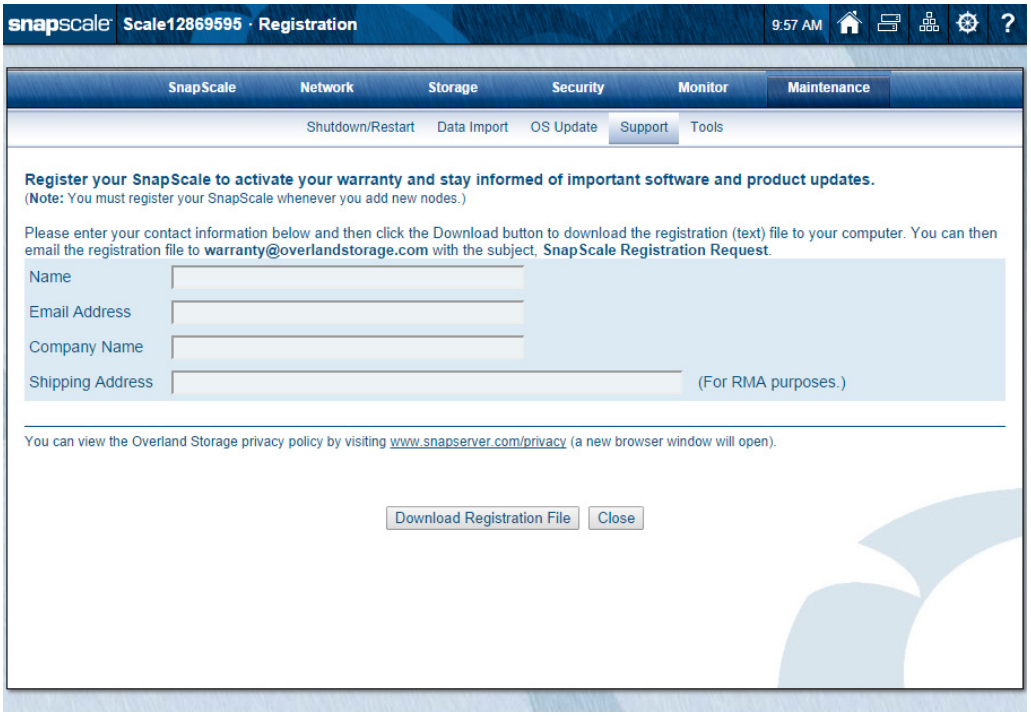
At the **Registration** page:



1. Enter the **four required items** in the appropriate fields.
2. Click **Download Registration File**.
   The information, including all the node data, is incorporated into a CSV file.
3. Depending on your browser settings, make sure that you **save the CSV file** to your local computer.
4. Email the downloaded CSV file to **warranty@overlandstorage.com**.
   Use the subject line **SnapScale Registration Request** for the email.

NOTE: The same page can also be used to **update** your registration information. For example, when you add new nodes to your cluster, they need to be added to the cluster registration so that they are also covered. Just repeat the steps above.

Once you have registered, you will receive a confirmation email to complete the registration.

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Maintenance Tools

The **Tools** option provides a submenu of general-purpose maintenance options and features.

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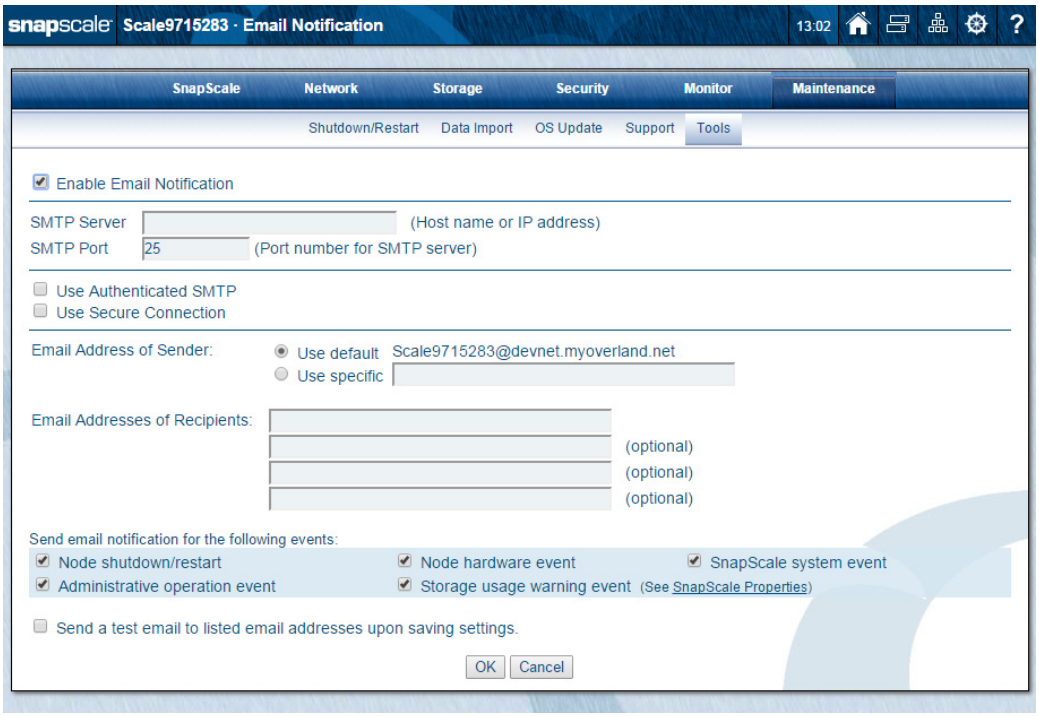
Email Notification

To configure the cluster to send email alerts in response to system events or activate Overland support, navigate to **Maintenance > Tools > Email Notification**.



To set up email alerts, you need the SMTP server's IP address and the email address of each recipient (up to four) who is to receive the alert.

Configure Email Notification

Edit settings as described in the following table and then click **OK**.

Option	Description
Enable Email Notification	To enable email notification, check the **Enable Email Notification** box.
SMTP Server	Enter a valid SMTP server IP address or host name.
SMTP Port	Enter a port number for the SMTP server or accept the default. The default is 25.
Use Authenticated SMTP	Check this box to authenticate when an email is sent to the SMTP server by the SnapScale. Provide an authentication User Name and Password in the fields that appear when the feature is enabled. The types of methods supported (in order) are CRAM-MD5, LOGIN, and PLAIN.
Use Secure Connection	Check this box to encrypt emails from the cluster. STARTTLS and TLS/SSL encryption protocols are supported.

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Option	Description
Email Address of Sender:	Choose one: • The default address (*cluster_name@domain*) where the *domain* is the DNS domain name. If there is no DNS domain name, then the server's IP address for Eth0 will be used (*cluster_name@ipaddress*). • Specify a specific sender.
Email Addresses of Recipients	Enter the email addresses to receive the notifications. One address is required but as many as four email addresses can be entered.
Send Email Notification	Check the boxes next to the events you wish to be notified about: • Node **shutdown/restart** – The node shuts down or reboots due to an automatic or manual process. • **Node hardware event** – The internal temperature for a node exceeds its maximum operating temperature or other hardware problems. • **SnapScale system event** – A change or error occurs that impacts the entire cluster. • **Administrative operation event** – A Data Import operation has finished or experienced an error. • **Storage usage warning event** – Storage space usage on a volume reaches either the maximum utilization or the critical utilization setting. See SnapScale Properties on page 45.
Send a Test Email	To verify your settings, check **Send a test email to listed email addresses upon saving settings**, then click **OK**.

If **Send a Test Email** is checked, when you save your changes, an email is sent to all configured email recipients.

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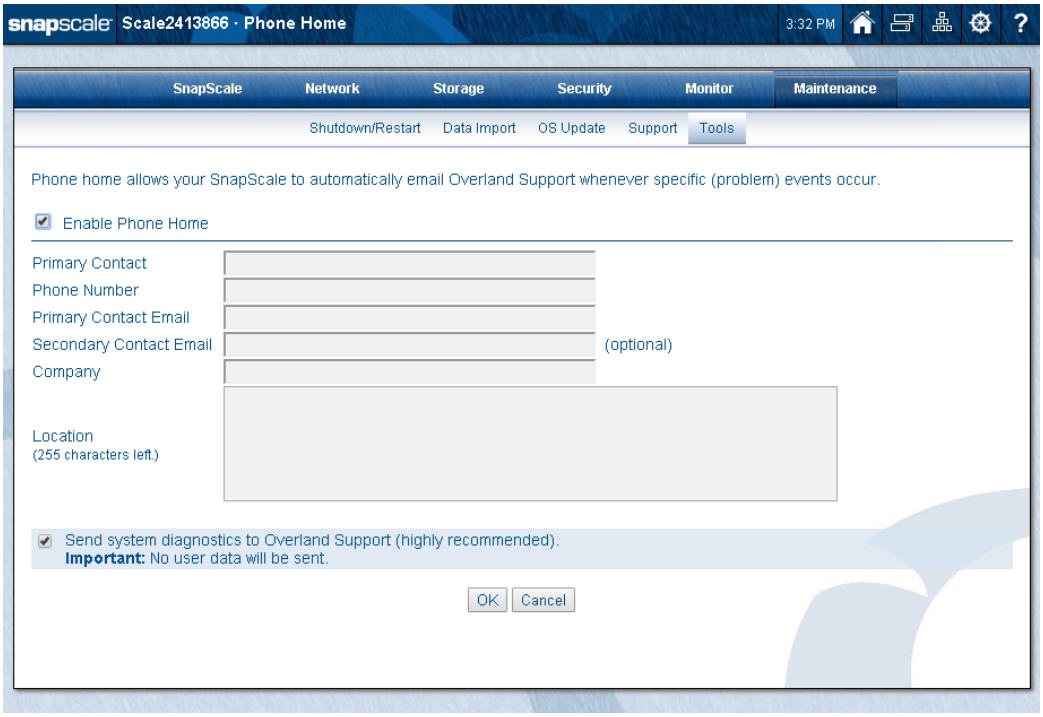
Phone Home

Phone home allows your SnapScale to automatically email Overland Support and optionally upload diagnostic information whenever specific problem events occur.



IMPORTANT: Email settings must first be configured on the **Email Notification** page before you can use the **Phone Home** feature.

Once enabled, an email is sent to Overland Support who will confirm your configuration with a Primary Contact email in approximately one business day. If you do not receive this email, please contact Overland Support directly (see Preface for options).

System Diagnostics

When you check the option to send system diagnostics to Overland Support, when an event occurs, a diagnostics file is email to them consisting of the system configuration files, logs, and other diagnostic output.

NOTE: For privacy purposes, no user data that is stored on the volumes is sent.

Note the following:

- Diagnostics can be very large, over 100MB.
- Diagnostics are uploaded by each node via FTP to an Overland server, so all cluster nodes must be able to access the Internet via FTP.

Overland will contact you to discuss the problem and help find a solution.

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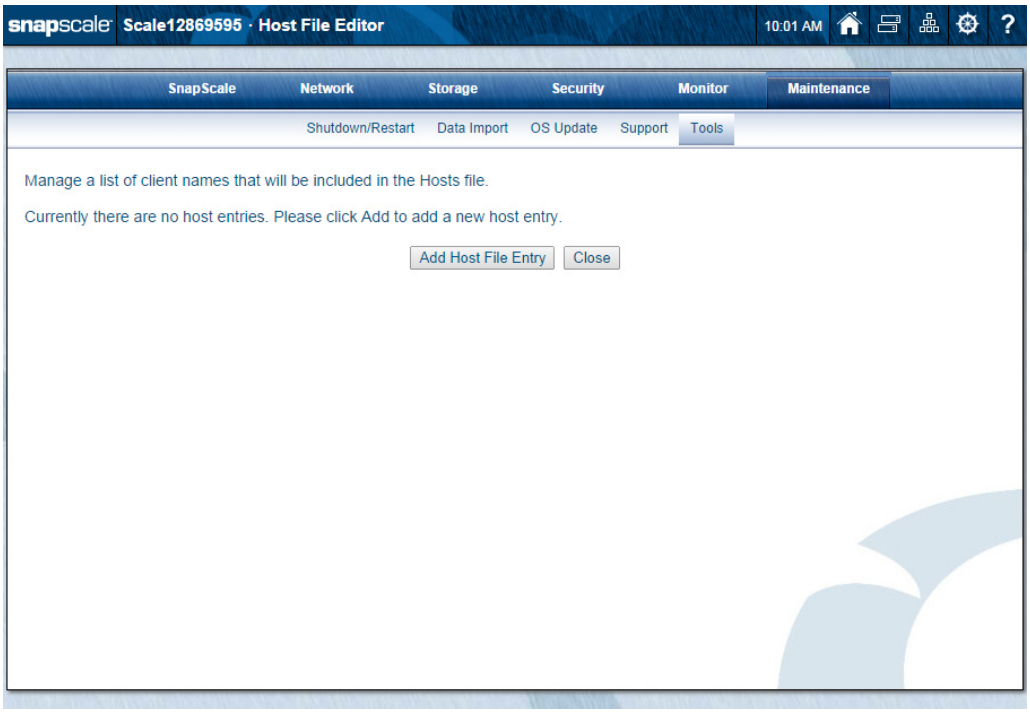
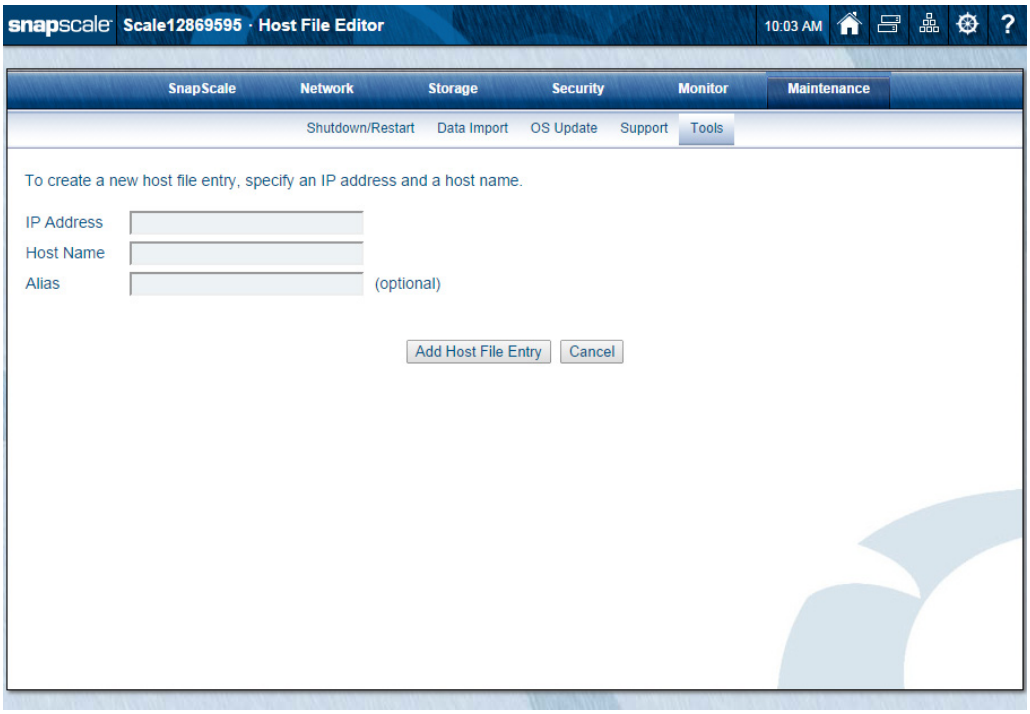
Host File Editor

Use this page to identify external hosts in the hosts file for the SnapScale cluster. This page allows you to supply a hostname-to-IP address mapping that persists across system reboots.



Click **Add Host File Entry**, complete the fields as described on the table below, and then click **Add Host File Entry** again.



Use this table to complete the options shown:

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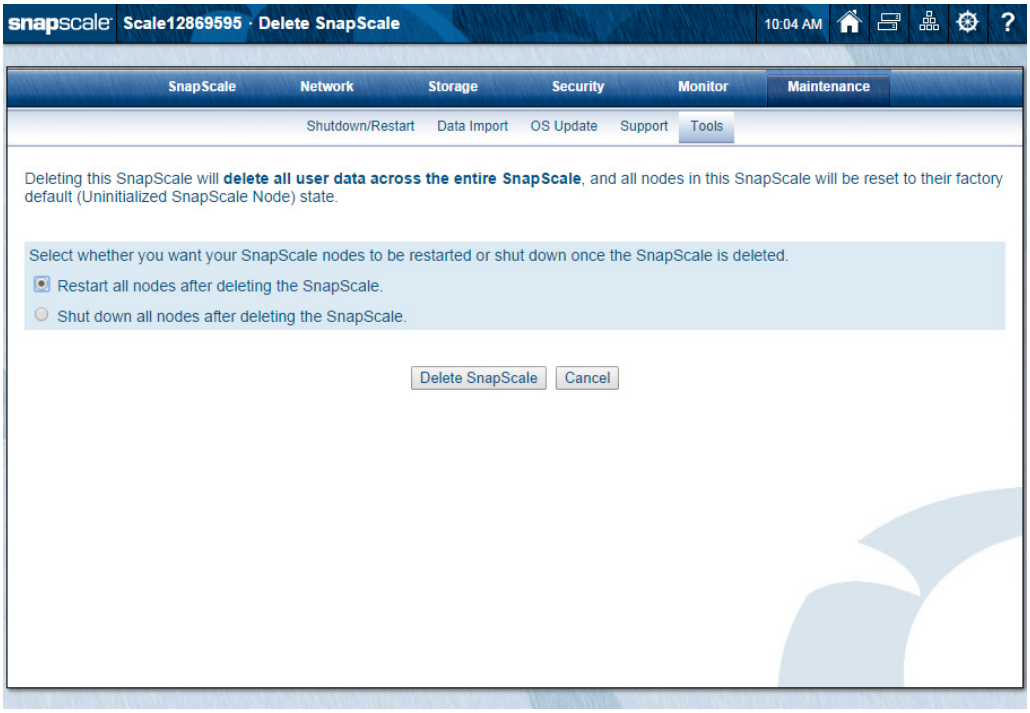
Option	Description
IP Address	The IP address of the external host.
Host Name	Enter the fully qualified hostname for the external host, using the format: *myserver.mydomain.com*. NOTE: Some applications may require that you enter either one or both of these fields. See the OEM documentation to determine requirements.
Alias (optional)	Enter an optional abbreviated address for the external host, using the format: *myserver*. NOTE: Some applications may require that you enter either one or both of these fields. See the OEM documentation to determine requirements.

Delete SnapScale Cluster

This page is used to delete a SnapScale cluster and all its data.

CAUTION: All data on all the nodes will be lost and all the nodes will be reset to their original factory default settings. No recovery is possible.

1. Select whether to restart or shut down all the nodes after the cluster is deleted.
   - **Restart all nodes** – After deleting the SnapScale cluster, the nodes reboot, they automatically perform a fresh install, and then they reboot as Uninitialized nodes.
   - **Shut down all nodes** – After deleting the SnapScale cluster, the nodes shut down. The next time the nodes are powered on, they automatically perform a fresh install and then reboot as Uninitialized nodes.



2. Click **Delete SnapScale.**

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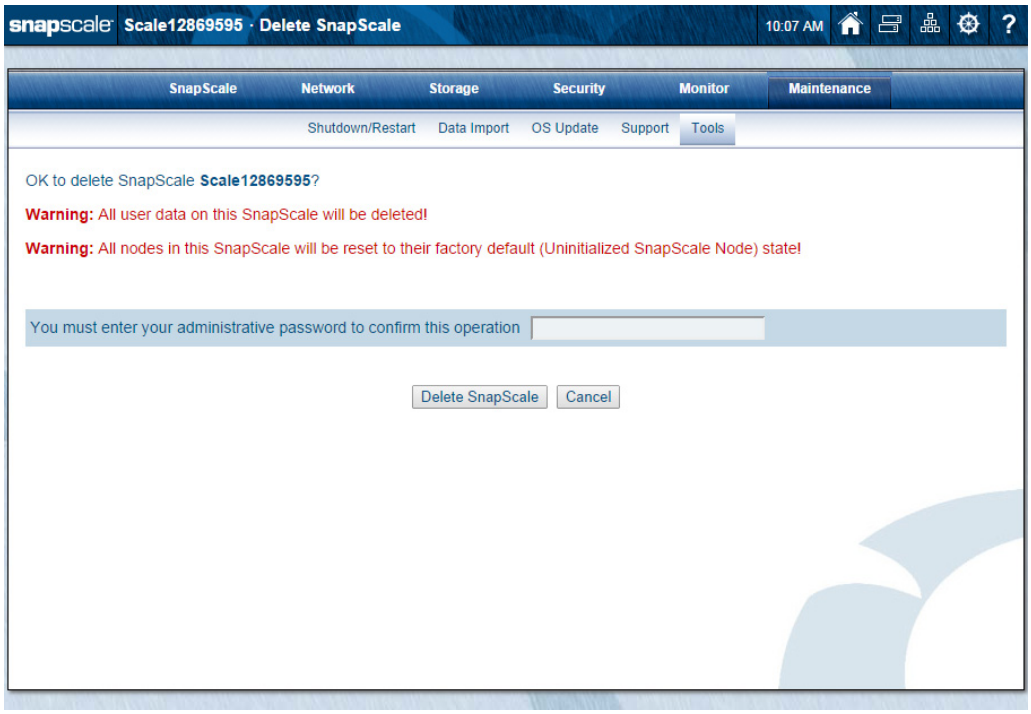
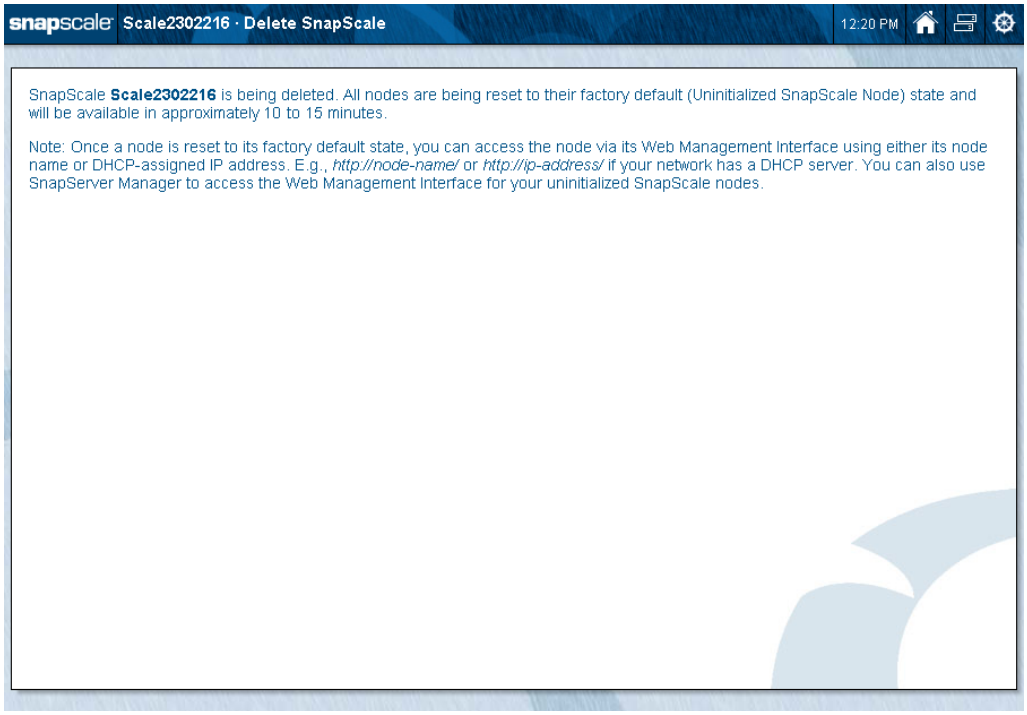
3. At the confirmation page, enter your **Admin password** and click **Delete SnapScale** again to start the process.



During the cluster deletion, an information page is shown (such as this one for the Restart option).



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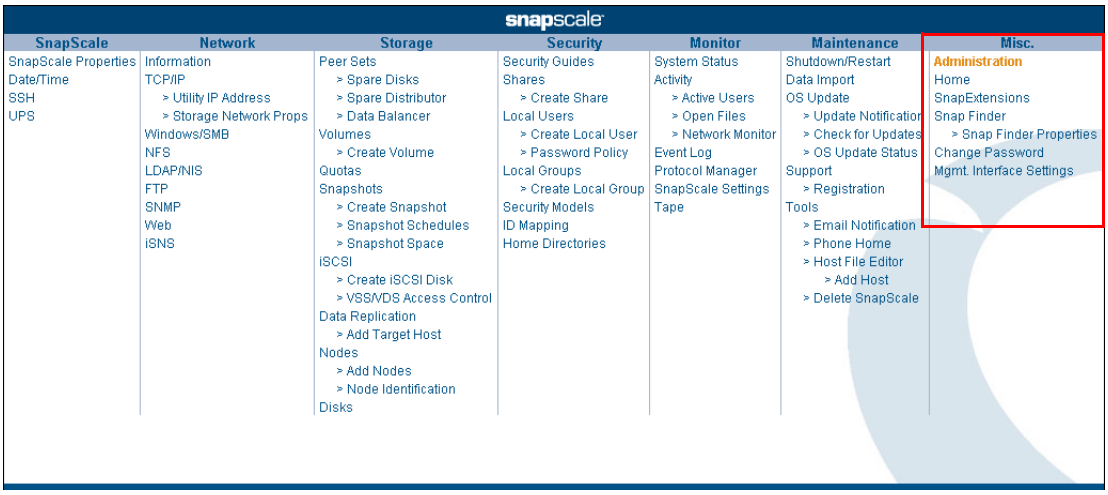
Misc. Options

The RAINcloudOS site map ( ) provides links to a majority of the web pages that make up the Web Management Interface. It also provides, in the last column, special links to higher level options and processes which are the focus of this chapter.

With the exception of **Mgmt. Interface Settings**, these options are also directly navigable from the various menus in the Web Management Interface. Also the **Home**, **Snap Finder**, **SnapExtensions**, **Site Map**, and **Help** options are accessible from any page by clicking their respective icon in the top right corner of the page (see the table in Web Management Interface on page 39).



Topics in Misc. Options

- Home Pages
  - Home Page
  - Administration Page
- SnapExtensions
  - BitTorrent Sync
  - Snap EDR
- Snap Finder
  - Edit Snap Finder Properties
- Change Password
- Management Interface Settings

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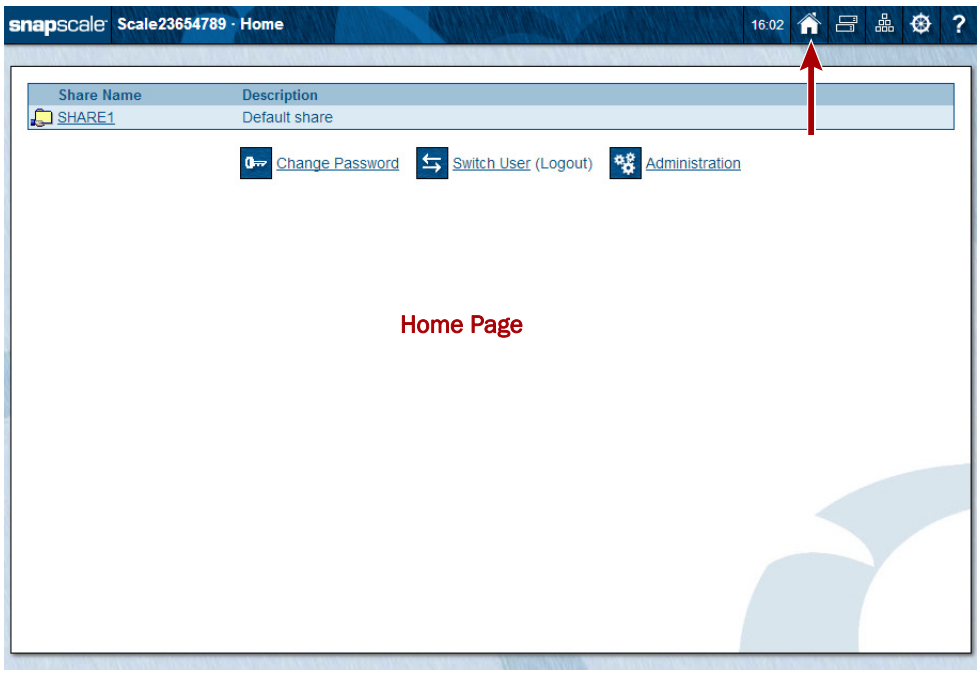
Home Pages

When you first launch the Web Management Interface, the **Home** page is displayed showing any existing shares and three options. Once logged in using the **Administration** link, you can switch between the **Home** page and the **Administration** page using the Home page ( ) icon on the button bar.



Home Page

The Web Management Interface **Home** page displays a list of all shares and three basic options. Users can navigate the share structure to locate and view or download files without logging in but they cannot modify or upload files.

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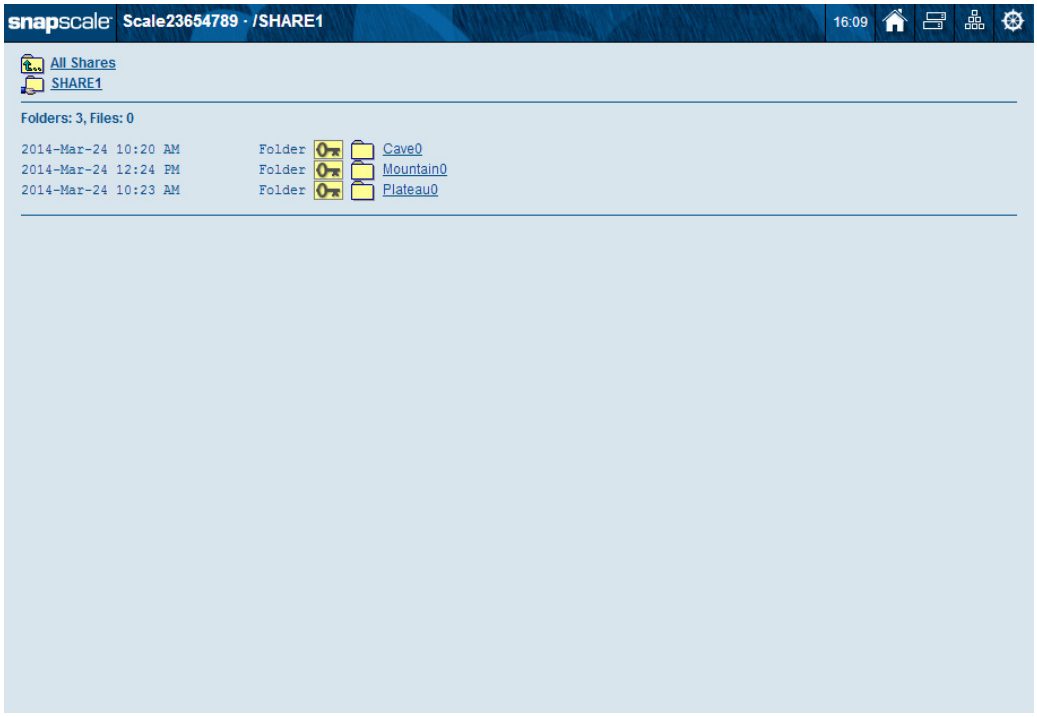
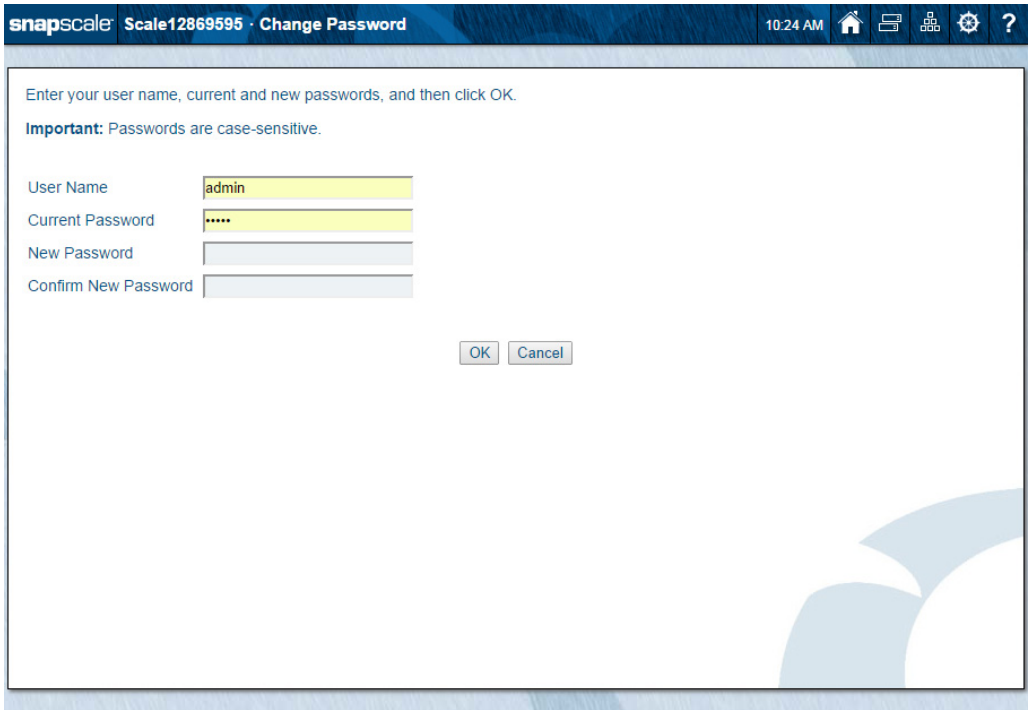
Click a share name to see a list of files:



For users with admin rights, a key icon ( ) appears next to the file/folder on the share. Clicking this icon displays a popup box with security information about the file/folder.

This page also provides three key administrative function links:

- **Change Password** ( ) – Takes you to the **Change Password** page where you can change your administration password. Enter your **User Name** and **Current Password** for access. See Change Password on page 261.



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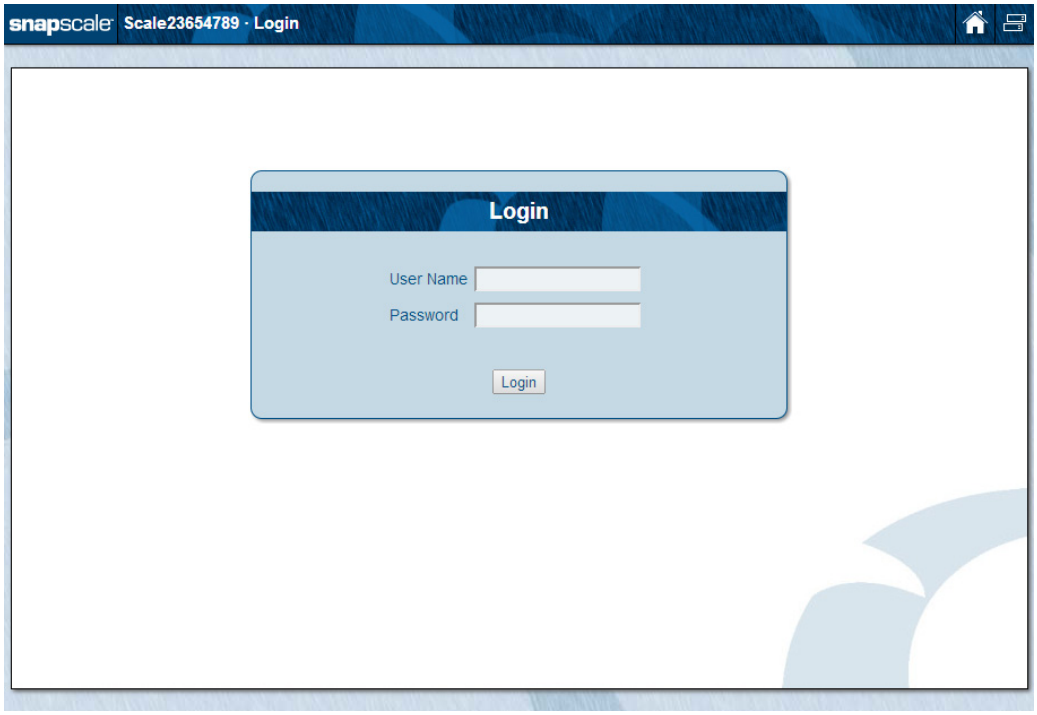
- **Switch User (Logout)** ( ) – Automatically logs out the current user and displays the **Login** page for the new user to gain access to the SnapScale cluster.



- **Administration** ( ) – Displays the **Administration** page (see Administration Page on page 253). You will be prompted to log in if you have not already done so.

If any of the following conditions are present, you may not be able to access the Home page:

- **Require Web Authentication** is enabled (via **Network > Web > Require Web Authentication**) and you do not have a valid user name and password on the cluster.
- The cluster has not completed the **Initial Setup Wizard** (if this is the case, you will not be able to access the **Administration** page of the Web Management Interface either).
- **Web Root** is enabled (via **Network > Web > Enable Web Root**).

Administration Page

The **Administration** page is accessible by clicking either the **Administration** link in the Site Map or the Administration ( ) or Home page ( ) icons on the **Home** page. If web root is enabled, it can also be accessed directly by entering the address:

http://<*node_name*>/sadmin

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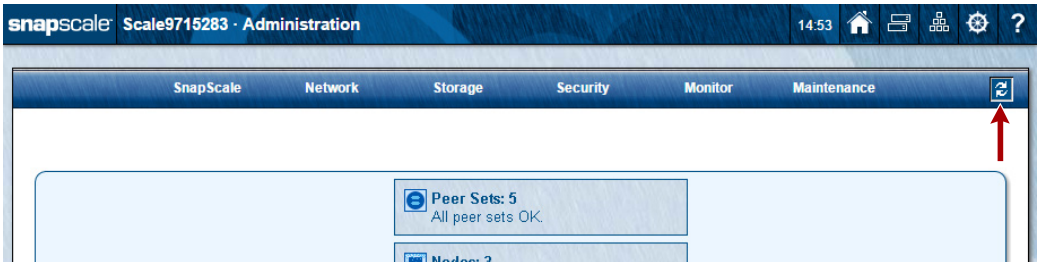
in a web browser where <*node_name*> is the unique node name in the format Node*nnnnnnnn*. It provides a high-level view of the SnapScale status, the amount of total storage being used, and a link to find out what's new in RAINcloudOS by accessing online help. The tabs at the top provide access to the various functions and features of the RAINcloudOS.

The **Auto-refresh** icon ( ) is displayed on the right corner just above the Cluster Status Box. Click the icon (or **Refresh** below the Cluster Status Box) to manually refresh the information.



From the **Administration** page, clicking takes you to the **Home** page.

SnapExtensions

The SnapExtensions icon ( ) opens the SnapExtensions page. This page is used to manage the SnapExtensions installed on your SnapScale cluster.

NOTE: Mouseover the icon to display a popup menu with direct access to SnapExtensions that are both installed and enabled.

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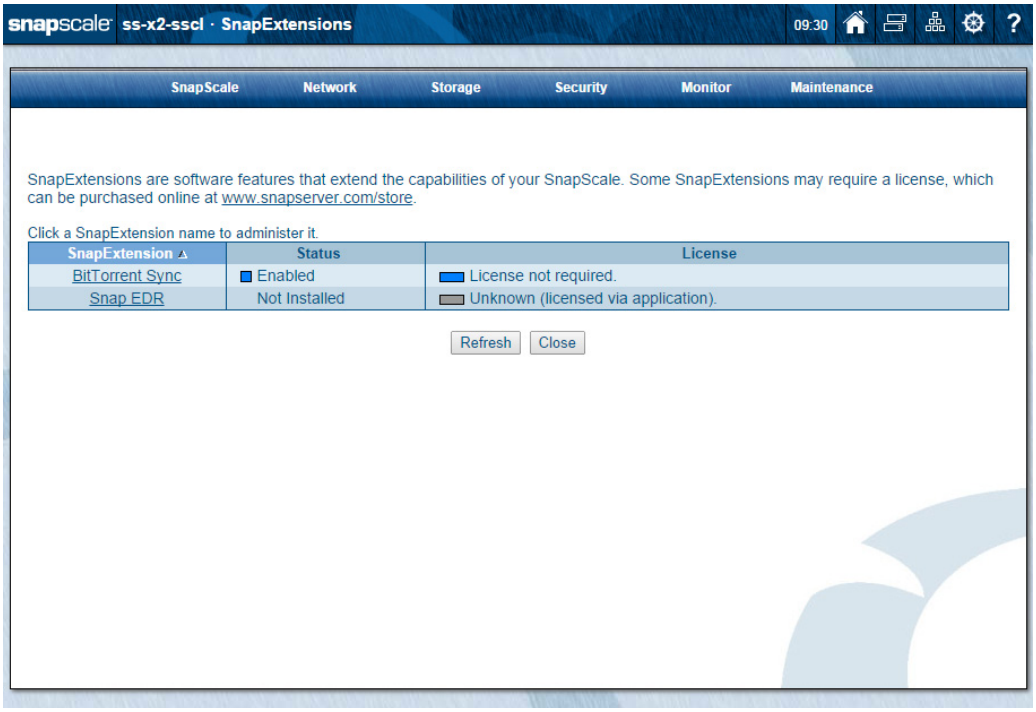

If any SnapExtensions are installed, you can click the SnapExtension name in the left column of the table to display the management page for that extension. Mousing over this icon shows all active extensions and provides a direct access link to them.

BitTorrent Sync

CAUTION: BitTorrent Sync bypasses share and file security. Be sure to only share data that is intended to be accessible by any user with the folder secret.

NOTE: Cookies must be enabled on your browser for BitTorrent Sync to work.

BitTorrent Sync (BTSync) is a SnapExtension that is preloaded on SnapScale. It lets you share and sync an unlimited number of files and folders of any size across multiple platforms. For more information, visit http://www.bittorrent.com/sync.

To use BitTorrent Sync, it must first be enabled:

1. On the **SnapExtensions** page, click the **BitTorrent Sync** name in the table to access the configuration page.

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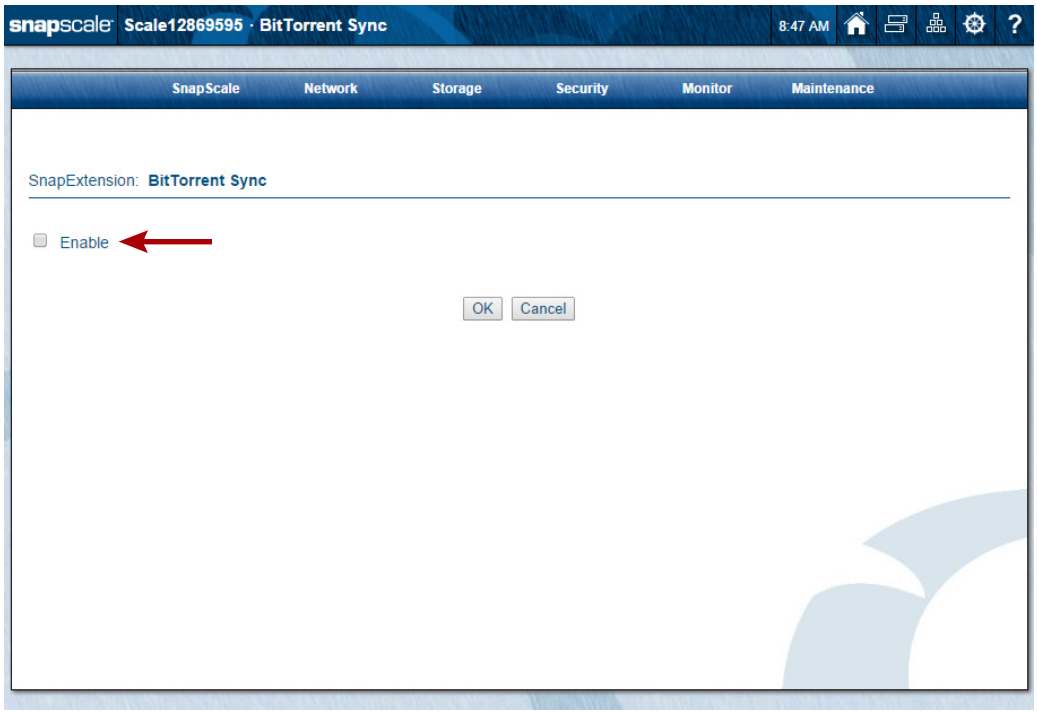
2. At the configuration page, check **Enable** and click **OK**.



3. At the following page, accept the BitTorrent Privacy Policy, Terms of Use, and End User License Agreement by clicking **I Accept** so you can run BitTorrent Sync.

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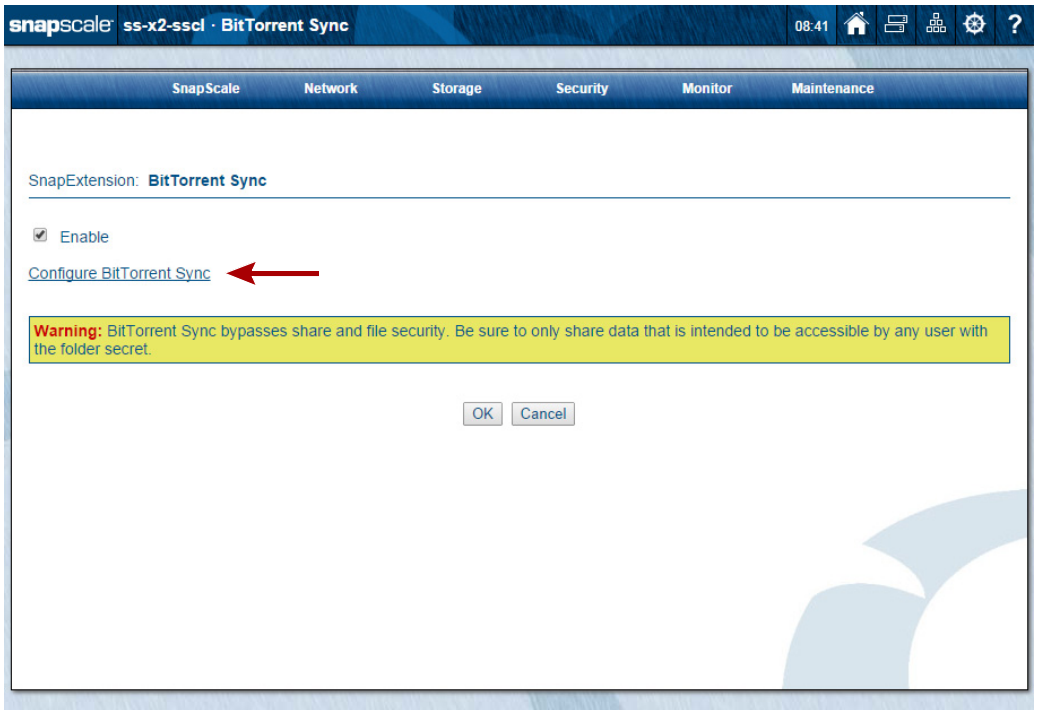
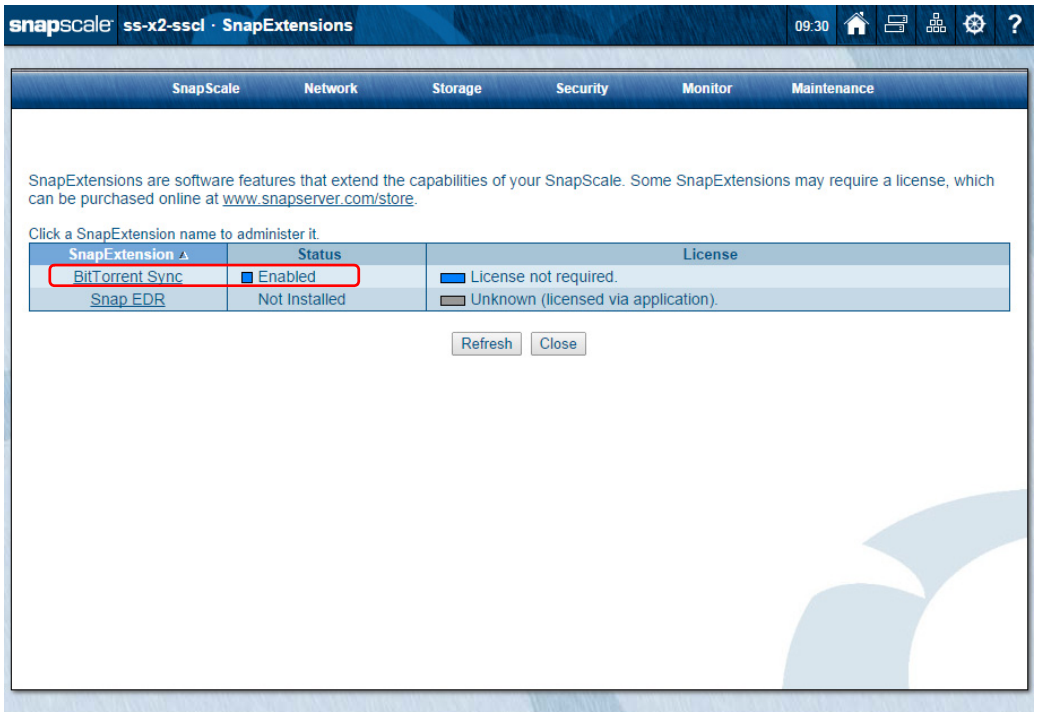
4. When returned to the SnapScale **BitTorrent Sync** page, use the new **Configure BitTorrent Sync** link to configure it for your use.



NOTE: Once enabled, you can return at any later time to configure or reconfigure BitTorrent Sync by clicking **BitTorrent Sync** on the **SnapExtensions** page or the **Site Map,** or the drop-down menu displayed on a mouse-over of the **SnapExtensions** icon located at the top right of the page.

5. When configuration is complete, click **OK**.
   You are returned to the **SnapExtensions** page. **BitTorrent Sync** shows **Enabled**.



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NOTE: To turn off (disable) the BitTorrent Sync feature, uncheck the BitTorrent Sync box and click OK.

BitTorrent Considerations

- For the most recent information and details on BitTorrent Sync configuration and use, refer to the documentation available on their web site.
- For sync destinations under a Unix or Mixed security model, BitTorrent Sync creates Unix personality files and directories, and sets the permissions to 644 (files) or 755 (directories) for Unix owner root/admingrp. As a result, all users and groups can read the files but only root can modify them. It is recommended that Windows-only security models are used at the destination, and that Windows permissions are set at the top level destination directory to apply the desired permissions to all files and subdirectories created by BitTorrent Sync.
- BitTorrent Sync cannot be used to replicate snapshots because it requires the ability to write to the sync location and snapshots are read only.
- BitTorrent Sync installs as a hidden directory on a volume. If the volume is deleted or rolled back from a snapshot, the SnapScale attempts to automatically relocate the BitTorrent Sync hidden directory to another volume. If there are no more volumes, or if none can be found that are large enough, BitTorrent Sync is disabled and cannot be re-enabled until a suitable volume becomes available. Once re-enabled, BitTorrent Sync must be completely reconfigured again.
- There are BitTorrent Sync mobile apps that make synced documents available on iOS, Android, Windows Phone 8, and Kindle Fire systems. Refer to their web site for details on configuration and use of BitTorrent Sync on mobile apps.

Snap EDR

For **SnapEDR**, at the **Configuration** page, select either to configure it as the Management Console or as an agent of another Management Console. If configuring it as an agent, enter the **Name or IP of the Management Console**.

After SnapEDR finishes its configuration, the Management Console screen is shown on the **Configuration** page:

Snap Finder

Snap Finder ( ) is a powerful tool that lists all the SnapServer appliances, SnapScale clusters, and Uninitialized nodes on your network (and on a remote network segment if so configured), and shows the current status of each. Click the unit name (if you have name resolution) or IP address of a cluster, node, or server to access it through the Web Management Interface.

NOTE: You can sort the columns (ascending or descending order) by clicking the column heading.

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The following table describes the columns in the table:

Identification	Description
Server	Name of the SnapServer appliance, SnapScale cluster, or Uninitialized node. The default name is Snap*nnnnnnnn,* Scale*nnnnnnnn, or Node*nnnnnnnn, where *nnnnnnnn* is the number of the server, node originally used to create the cluster, or the Uninitialized node. For example, "Scale23022161."
Status	• The status of the SnapServer or Uninitialized node (for example, **OK** or **Fan Failure**). • The status of a SnapScale cluster is always **Online**.
IP Address	The IP address of the SnapServer, Uninitialized node, or the Management IP address of the SnapScale cluster.
OS Version	The OS version currently installed on the SnapServer, Uninitialized node, or SnapScale cluster.
Model	The hardware model number of the SnapServer or Uninitialized node. This field is not applicable to a SnapScale cluster.
Number	The server or node number derived from the MAC address of the primary Ethernet port, used as part of the default name. This field is not applicable to a SnapScale cluster.
Avail Cap.	The available capacity on the SnapServer or SnapScale cluster. This field is not applicable to an Uninitialized node.
Total Cap.	The total capacity on the SnapServer or SnapScale cluster. This field is not applicable to an Uninitialized node.

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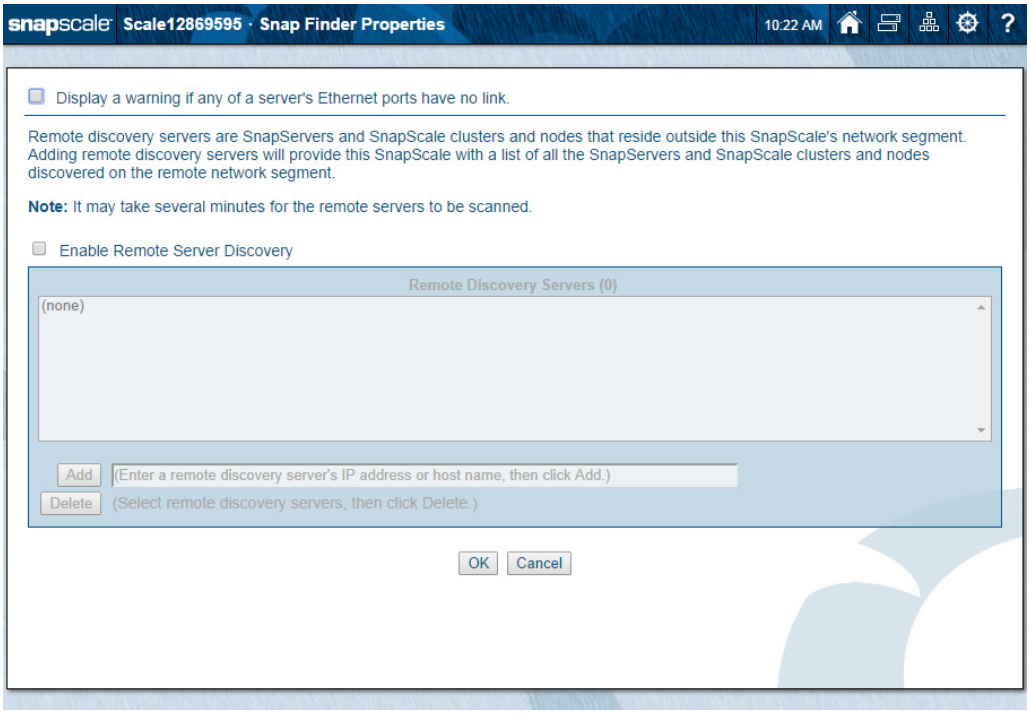
To enable remote discovery of clusters, nodes, or servers on a different subnet or to display a warning icon for SnapServers or Uninitialized nodes with an enabled Ethernet port that has no link, click **Properties** at the bottom of the page to open the **Snap Finder Properties** page.

Edit Snap Finder Properties

Anyone with administrative privileges can view or edit the Snap Finder properties. Click **Properties** to access the page.



From this page you can choose to display a warning icon for Uninitialized nodes or SnapServers with an enabled Ethernet port that has no link and enable remote discovery of units on a different subnet. Complete the following fields and then click **OK** to return to the **Snap Finder** page:

Option	Description
Display warning if any of a server's Ethernet ports have no link	Check to display a warning icon in the **Status** column for any nodes or SnapServers that have an enabled Ethernet port with no link. By default, this box is unchecked.
Enable Remote Server Discovery	Check to enable remote discovery of clusters, nodes, or SnapServers on a different subnet.
Add Server	Enter the host name or IP Address of a cluster, node, or server in the field to the right of the **Add** button, and click **Add** to incorporate it into the list of Remote Discovery Servers. Remote Discovery Servers send information about themselves as well as all other servers they've discovered on the remote network.
Delete Server	Select a cluster, node, or server, in the Remote Discovery Servers field and click **Delete**. When asked to confirm the deletion, click **Delete** again.

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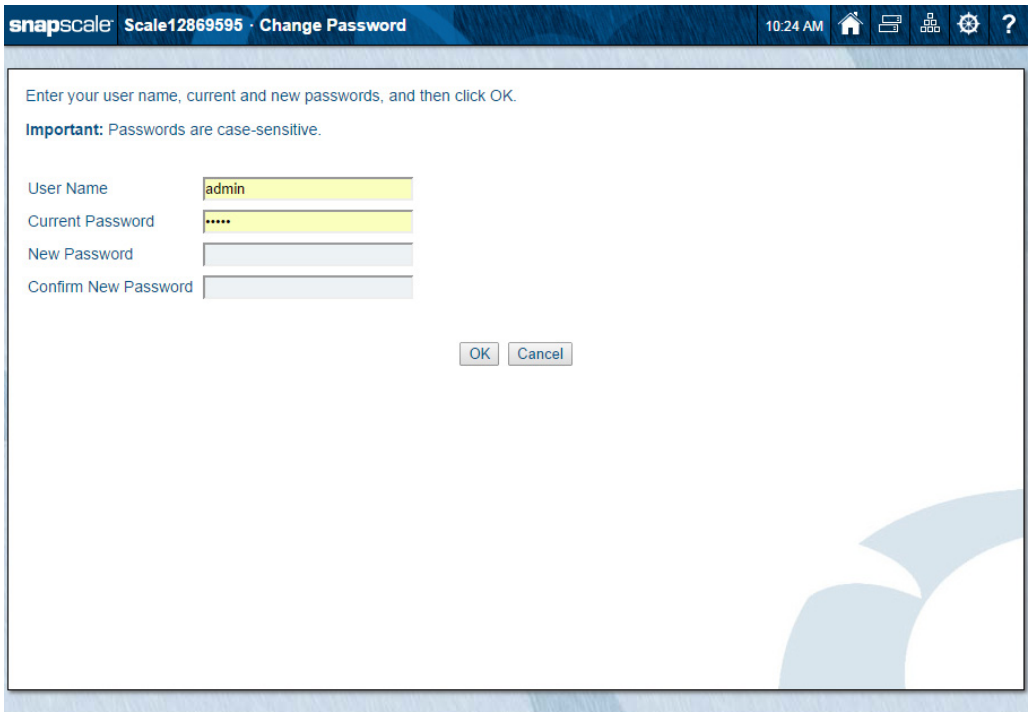
Finder Icons

The icons used in Snap Finder give a quick visual cue to the current status of the item.

Description	Node	Cluster	Server	Disk	Fan	NIC	Power	Temp.
Item is OK and functioning.								
Item has a warning.								
Item has experienced an error.								
Item is offline.								

Change Password

To enhance the security of your SnapScale cluster, it is recommended that users change their passwords regularly. This is done using the **Change Password** page.



Change Password Procedure

1. On the **Home** page, click the **Change Password** link ( ).
2. At the **Change Password** page, enter your **User Name** and **Current Password**.
3. Enter and confirm your **new password**.
   Passwords are case-sensitive. Use up to 15 alphanumeric characters without spaces.
4. Click **OK**.
5. At the confirmation page, click **OK** again.
   You are returned to the **Home** page.

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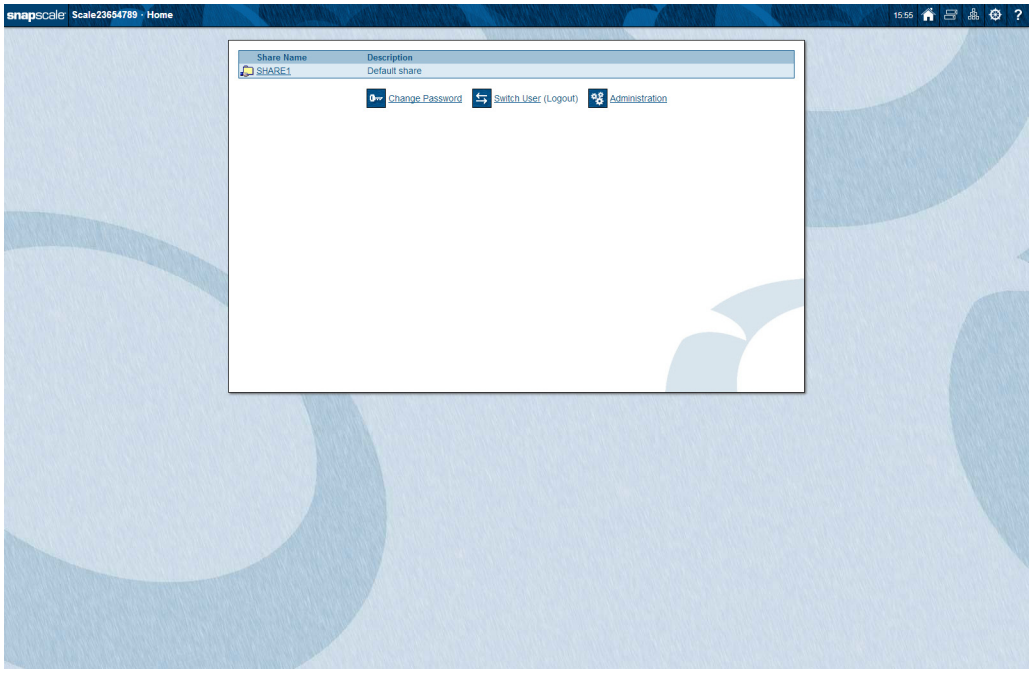
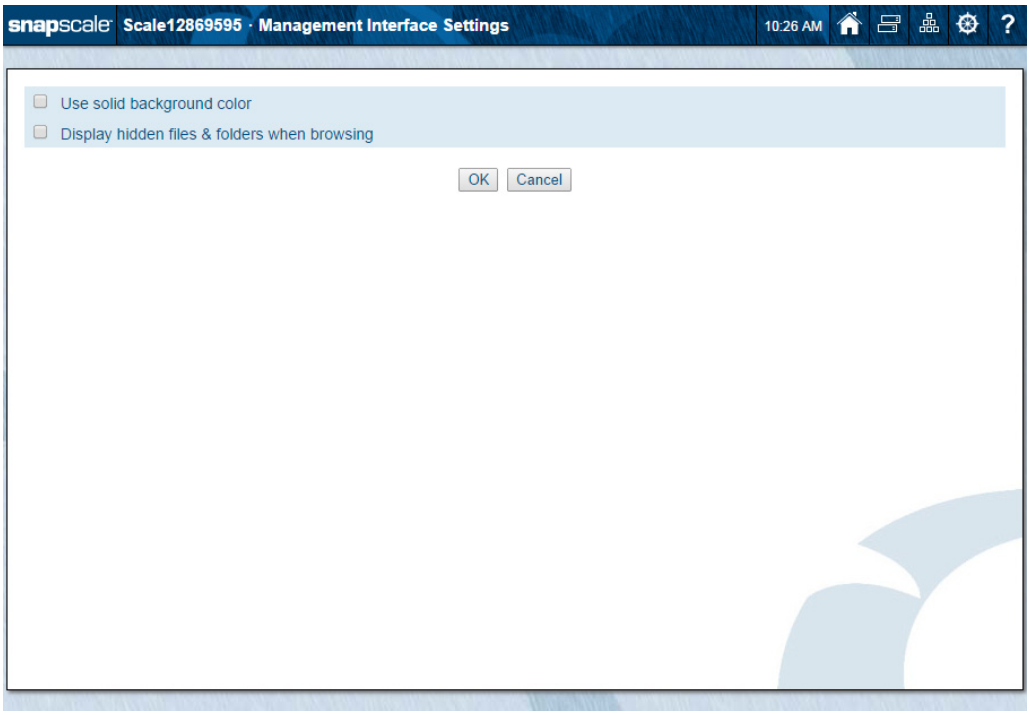
Management Interface Settings

The Web Management Interface default background is light blue with the stylized "O" symbols on a textured blue background:



This can be changed to a solid blue background on the Web Management Interface Settings page by clicking the Site Map icon ( ) to access **Management Interface Settings**.



Check the first box to use a solid color background (or clear the box to return to the standard background). Check the second box if you want to display hidden files and folders when browsing volumes for administrative configuration in the Web Management Interface.

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Appendix A

Backup Solutions

This appendix provides a brief description of the supported backup solutions and the Snap Enterprise Data Replicator (Snap EDR) software.

Topics in Backup Solutions:

- Backup and Replication Solutions
- Snap Enterprise Data Replicator
- Backup via SMB or NFS
- Off-the-Shelf Backup Solutions

Backup and Replication Solutions

RAINcloudOS supports several backup methods, including third-party off-the-shelf backup applications and applications that have been customized and integrated with RAINcloudOS on the SnapScale cluster:

- Data and security metadata backup and replication can be performed using the built-in Snap EDR.
- Backup over network file protocols can be performed using various backup packages that can access the cluster via SMB or NFS.
- Backup from the cluster or to a tape attached to a node can be performed using supported backup agents and media libraries installed on a node.

Snap Enterprise Data Replicator

Snap EDR provides server-to-server synchronization by moving, copying, or replicating the contents of a share from one cluster or server to another share on one or more different clusters or servers. It comes preinstalled on SnapScale clusters and activates a 45-day free trial if configured as a Management Console.

Snap EDR consists of a Management Console and a collection of Agents. The Management Console is installed on a central system. It coordinates and logs the following data transfer activities carried out by the distributed Agents:

- Replicates files between any two systems including SnapServers, SnapScale clusters, and Windows, Linux, or Mac Agents.
- Transfers files from one source host to one or more target hosts
- Transfers files from multiple hosts to a single target host, and stores the files on a local disk or locally attached storage device.
- Backs up data from remote hosts to a central host with locally-attached storage.

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- Restores data from a central storage location to the remote hosts from which the data was originally retrieved.

Snap EDR Usage

The Snap Enterprise Data Replicator software distribution comes preinstalled on the SnapScale but must first be installed in SnapExtensions and then configured before it's available for use. It operates under the cluster management name (in the style of <*clustername*>–mgt) and the Management IP address.

All other Snap EDR installations (including another machine running as the Management Console that the server registers to, other Agents that register to a Snap EDR Management Console running on the server, or other Agents replicating to/from the server) need to be able to resolve the SnapScale cluster name to its IP address in order to interoperate properly with the cluster. This can be accomplished via a DNS host record, local hosts file entries, or other name resolution services in the environment.

When installing EDR to the cluster for the first time, it installs to all nodes and runs on whichever node currently serves as the Management node. When adding a node to an existing cluster with Snap EDR installed, it is automatically installed on that node.

Configure Snap EDR

To configure the cluster as a Snap EDR Management Console or an Agent:

1. Click the **SnapExtensions icon** located in the upper right corner of the Web Management Interface.
2. If necessary, install the **software package**:
   a. Run the **installation routine** from SnapExtensions.
      SnapExtensions displays a Snap EDR link and the status **Not Installed**.
   b. Click the **Snap EDR link** and confirm the installation.
      Wait for the installation to complete. The **SnapExtensions** page then displays the **Snap EDR Configuration** link.
3. Click the **link** to launch the **Management Console/Agent** configuration page.
4. Select either **Configure as the Management Console** or **Configure as the Agent**.

   NOTE: If you are configuring a cluster as an Agent, you must provide the server name (for a SnapServer) or cluster management name (for a SnapScale) of the Management Console. The cluster must be able to resolve the Management Console server name to the correct IP address.

5. Once the cluster is configured, select the following **options** from the page that appears:

Option	Description
Click here to configure jobs	Opens the Management Console where jobs can be scheduled.
Stop Service	Stops all services.
Restart Service	Restarts all services. ⚠ CAUTION: Use only if you have encountered a problem and customer support advises you to restart the service. Any jobs currently running will stop and will not resume when you restart the service.

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Schedule Jobs in Snap EDR

To schedule jobs, click the **Snap EDR** link in the **Site Map** (under **Misc.**).

For complete information on scheduling jobs in Snap EDR, see the *Snap EDR Administrator's Guide*.

Backup via SMB or NFS

A SnapScale cluster can be backed up via standard file server access.

In this configuration, the backup server is set up to use SMB or NFS to connect to the cluster, examine the file system, and then back up the data onto itself. No special agents or media servers are needed.

Off-the-Shelf Backup Solutions

Special Application Notes for installing the backup agent or media servers can be found on the Overland SnapScale Support website (http://docs.overlandstorage.com/snapscale).

NOTE: The backup packages shown in the Application Notes do not support the backup of Windows ACLs. If Windows ACL backup is critical, Overland Storage strongly recommends you create a disaster recovery image before you perform a backup.

A SnapScale can be backed up using a third-party Linux agent or media server installed on one cluster node. A tape drive or library can be attached to the node to provide local backup of the cluster.

Utility IP Address

To provide continuous access to a specific cluster node with a backup agent or media server installed even when a public IP address changes, a special Utility IP address can be assigned that operates in addition to other cluster-assigned IP addresses and is always associated with the specific node. Then, if the public IP address of that node changes, backups continue to function without the need for the administrator to take action.

This IP address setting works for both the node as a backup source (backup from the node to the backup server) and the node as a backup target (backup from any machine including the node to an attached tape drive).

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Appendix B

Security and Access

This appendix provides additional information and configuration options about securing and accessing shares and files on the SnapScale. The RAINcloudOS supports share-, file-, and directory-level permissions for all local and Windows domain users and groups.

File and directory security can be configured using either Windows NTFS-style security or classic Unix-style security. The type of security present on a file or directory is its *security personality*.

Files and directories are stored on the cluster on volumes (or the directories underneath) with a configured *security model*. The security model on the volume governs the permitted security personalities, the default personalities, and the ability to change personalities on child files and directories.

The default security model on newly-created volumes is always Windows/Unix. It can be changed to either a Windows or Unix security model.

Topics in Shares and File Access:

- Security Model Rules
- Security Model Management
- Special Share Options
- File and Share Access
- File-level Security

Security Model Rules

Files and directories created inside security models acquire the security personality and permissions according to the rules of the chosen security model.

Windows/Unix Security Model:

- Files and directories created by SMB clients will have the Windows security personality. Permissions will either be inherited according to the ACL of the parent directory (if Windows) or will receive a default ACL that grants the user full access only (if the parent is Unix or has no inheritable permissions).
- Files and directories created by non-SMB clients will have the Unix personality. Unix permissions will be as set by the client (per the user's local umask on the client).
- The security personality of a file or directory can be changed by any user with sufficient rights to change permissions or ownership. If a client of one security personality changes permissions or ownership of a file or directory of a different personality, the personality will change to match the personality of the client protocol (for example, if an NFS client changes Unix permissions on a Windows file, the file will change to the Unix personality).

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Windows Security Model:

- All files and directories will have the Windows security personality. Permissions will be inherited according to the ACL of the parent directory.
- The permissions of a file or directory can be changed by any Windows SMB user with sufficient rights to change permissions or ownership. Permissions cannot be changed by NFS or FTP clients.
- The personality of files and directories cannot be changed on a Windows security model. All files and directories always have the Windows personality with a Windows ACL. Standard Unix permissions will appear as 777 (rwxrwxrwx), but only the permissions in the Windows ACL will be enforced.

Unix Security Model:

- Files and directories created by non-SMB clients will have the Unix personality. Unix permissions will be as set by the client (per the user's local umask on the client).
- Files and directories created by SMB clients will have the Unix personality. Unix permissions will be set to a default.
- The personality of files and directories cannot be changed on a Unix security model. All files and directories always have the Unix personality.

Security Model Management

Changes to a security model can optionally be propagated with the corresponding personality and default permission to all files and directories underneath the security model.

When **setting** the security model, only a single security model can be set on the entire volume at the root level but not the directories immediately underneath the volume as they inherit the security model from the top level.

When **changing** the security model:

- If changing from Windows to Unix, all files and directories will be changed to be owned by *admin* and *admingrp*, with Unix permissions of 777(rwxrwxrwx).
- If changing from Unix to Windows, files and directories will be changed to default permissions that allow all users the ability to create and manage their own files and directories and to access other users' files and directories.

Special Share Options

The basic setup and configuration of shares on a SnapScale cluster is handled on the **Security > Shares** page. This section covers more details about the special options and features of share security.

Hide Shares

There are three ways a share can be hidden in RAINcloudOS:

- Name the share with a dollar-sign ($) at the end. This is the traditional Windows method of hiding shares; however, it does not truly hide the share since Windows clients themselves filter the shares from share lists. Other protocols can still see dollar-sign shares.
- Hide the share from all protocols (except NFS) by one of these two procedures:

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- While creating a share, navigate to **Security > Shares > Create Share > Advanced Share Properties** and check the **Hide this Share** box.
- Edit a share by selecting the share, clicking to expand **Advanced Share Properties**, and checking the **Hide this Share** box.

When a share is hidden this way, the share is invisible to clients and must be explicitly specified to gain access.

NOTE: Hidden shares are not hidden from NFS, which cannot access invisible shares. To hide shares from NFS, consider disabling NFS access to the hidden shares.

- Disable individual protocol access to certain shares by:
  - While creating a share, navigating to **Security > Shares > Create Share > Advanced Share Properties** and enabling/disabling specific protocols.
  - Edit a share by selecting a share, clicking to expand **Advanced Share Properties**, and enabling or disabling specific protocols.

Share Level Permissions

Share-level permissions on GuardianOS are applied cumulatively. For example, if the user *jdoe* has Read-Only share access and belongs to the group *sales*, which has Read/Write share access, the result is that the user *jdoe* will have Read/Write share access.

NOTE: Share-level permissions only apply to non-NFS protocols. NFS access is configured independently by navigating to the Security > Shares page, selecting from the table the NFS Access level for the share, and modifying the client access as desired. See NFS Share Access.

Where to Place Shares

For security and backup purposes, it is recommended that administrators restrict access to shares at the root of a volume to administrators only. After initialization, all SnapScale clusters have a default share named *SHARE1* that points to the root of the default volume *Volume1*. The share to the root of the volume should only be used by administrators as a "door" into the rest of the directory structure so that, in the event that permissions on a child directory are inadvertently altered to disallow administrative access, access from the root share is not affected. This also allows one root share to be targeted when performing backups. If it is necessary to have the root of the volume accessible, using the Hidden option helps ensure only those that need access to that share can access it.

File and Share Access

The shares feature also controls access by other users and groups. This section provides information on setting up the shares options to allow proper access to the files.

NFS Share Access

When controlling share access for NFS clients, administrators limit client access to the shares independently of share level permissions that apply to other protocols. Access is controlled on a per-share basis. To set the NFS access, navigate to **Security > Shares**. In the Shares table, click in the **NFS Access** column of the share you want to modify. Changes made on this page affect the NFS "exports" file within RAINcloudOS.

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CAUTION: If there are multiple shares to the same directory on the disk, and those shares permit access via NFS, they must all have the same NFS export configuration. This is enforced when configuring NFS access to the overlapping shares.

Snapshot Access

Snapshots are accessed via a snapshot share. Just as a share provides access to a portion of a live volume (or filesystem), a snapshot share provides access to the same portion of the filesystem on all current snapshots of the volume. The snapshot share's path into snapshots mimics the original share's path into the live volume.

Snapshot Shares and On Demand File Recovery

A *snapshot share* is a read-only copy of a live share that provides users with direct access to versions of their files archived locally on the SnapScale cluster via a snapshot. Users who wish to view or recover an earlier version of a file can retrieve it on demand without administrator intervention.

Snapshot shares are created during the course of creating a share, or thereafter by navigating to the Snapshots page and clicking the name of a snapshot. For instructions an accessing snapshot shares, see Chapter 6, "Security Options".

Create a Snapshot Share

You create a snapshot share by selecting the **Create Snapshot Share** option on the **Security > Shares > (share_name) > Share Properties** page, under the **Advanced Share Properties** link.

For example, assume you create a share to a directory called *sales* and you select the **Create Snapshot Share** option. When you connect to the cluster via a file browser or use the **Misc. > Home** link in the Site Map, two shares are displayed:

```
SALES
SALES_SNAP
```

The first share provides access to the live volume and the second share provides access to any archived snapshots. Other than read-write settings (snapshots are read-only), a snapshot share inherits access privileges from its associated live-volume share.

NOTE: The same share folders appear on the Home page when you connect to the SnapScale cluster using a Web browser. However, the snapshot share folder does not provide access to the snapshot; it always appears to be empty. You can prevent the snapshot share from displaying on this Home page by selecting the **Hide Snapshot Share** option when creating or editing a share.

Access Snapshots Within the Snapshot Share

A snapshot share contains a series of directories. Each directory inside the snapshot share represents a different snapshot. The directory names reflect the date and time the snapshot was created.

For example, assume the snapshot share named *Sales_SNAP* contains the following four directories:

```
latest
2014-02-25.120000
2014-03-01.000100
2014-03-07.020200
```


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The *latest* directory always points to the most recent snapshot (in this case, **2014-03-07.020200**, or March 7th, 2014, at 2:02 a.m.). A user may view an individual file as it existed at a previous point in time or even roll back to a previous version of the file by creating a file copy to the current live volume.

NOTE: The latest subdirectory is very useful for setting up backup jobs, as the name of the directory is always the same and always points to the latest available snapshot.

Depending on their ability to cross bind mounts, locally-installed backup agents can access the snapshot share in one of two ways:

- via **/shares** (for example, **/shares/SHARE1_SNAP/latest**)
- via **/links** (for example, **/links/SHARE1_SNAP/latest**)

File-level Security

RAINcloudOS supports two "personalities" of filesystem security on files and directories:

- **Windows ACLs**: Windows NTFS-style filesystem permissions. Windows ACLs fully support the semantics of NTFS ACLs, including configuration, enforcement, and inheritance models (not including the behavior of some built-in Windows users and groups).
- **Unix**: Traditional Unix permissions (rwx) for owner, group owner, and other.

By default, volumes are created with the Windows/Unix security model (Windows-style ACLs for files created by SMB clients and Unix-style permissions for files created by other protocols and processes), and allow all users to create, delete, and configure permissions on their own files and to access files and directories created by other users.

Security Personalities and Security Models

The security personality of a file or directory is dependent on the security model of the root directory or volume in which the file or directory exists.

Files and directories in a Windows/Unix security model can have either a Windows or Unix security personality, depending on the network protocol used to create the file or change permissions on it. Files in a Windows security model always have the Windows security personality and permissions can only be set by Windows SMB clients. Files in a Unix security model always have the Unix security personality and permissions can only be set by non-SMB clients.

Windows ACLs

RAINcloudOS fully supports Windows NTFS-style filesystem ACLs, including configuration, enforcement, and inheritance models. Inside Windows/Unix and Windows security models, files created and managed by Windows clients have the Windows security personality and behave just as they would on a Windows server. Clients can use the standard Windows Explorer interface to set directory and file permissions for local and Windows domain users and groups on the SnapScale.

Permissions are enforced for the specified users in the same manner for all client protocols, including non-SMB clients that normally have the Unix security personality. However, if a non-SMB client changes permissions or ownership on a Windows personality file or directory (or deletes and recreates it) inside a Windows/Unix security model, the personality will change to Unix with the Unix permissions specified by the client.

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NOTE: Group membership of NFS clients is established by configuring the local client's user account or the LDAP or NIS domain. Group membership of RAINcloudOS local users or users ID-mapped to domain users is not observed by NFS clients. Therefore, ACL permissions applied to groups may not apply as expected to NFS clients.

Default File and Folder Permissions

When a file or directory is created by an SMB client, the owner of the file is the user who created the file (except for files created by local or domain administrators, in which case the owner will be the **Administrators** group, mapped to the local **admingrp**). The ACL is inherited per the inheritance ACEs on the parent directory's ACL. The owner of a file or directory always implicitly has the ability to change permissions, regardless of the permissions established in the ACL. In addition, members of the SnapScale local admin group, as well as members of Domain Admins (if the cluster is configured to belong to a domain) always implicitly have *take ownership* and *change ownership* permissions.

Set File and Directory Access Permissions and Inheritance (Windows)

Access permissions for files and directories with the Windows security personality are set using the standard Windows Explorer interface. RAINcloudOS supports:

- All standard generic and advanced access permissions that can be assigned by Windows clients.
- All levels of inheritance that can be assigned to an ACE in a directory ACL from a Windows client.
- Automatic inheritance from parent directories, as well as the ability to disable automatic inheritance from parents.
- Special assignment and inheritance of the CREATOR OWNER, CREATOR GROUP, Users, Authenticated Users, and Administrators built-in users and groups.

Procedure to set file and directory access permissions and inheritance in Windows:

1. Using a Windows client, **map a drive** to the SnapScale cluster, logging in as a user with change permissions for the target file or directory.
2. Right-click the file or directory, choose **Properties** and then select the **Security** tab.
3. Use the **Windows security tools** to add or delete users and groups, to modify their permissions, and to set inheritance rules.

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Appendix C

Troubleshooting

Basic techniques for identifying and resolving common hardware and networking issues are described here.

Topics in Troubleshooting SnapScale Nodes

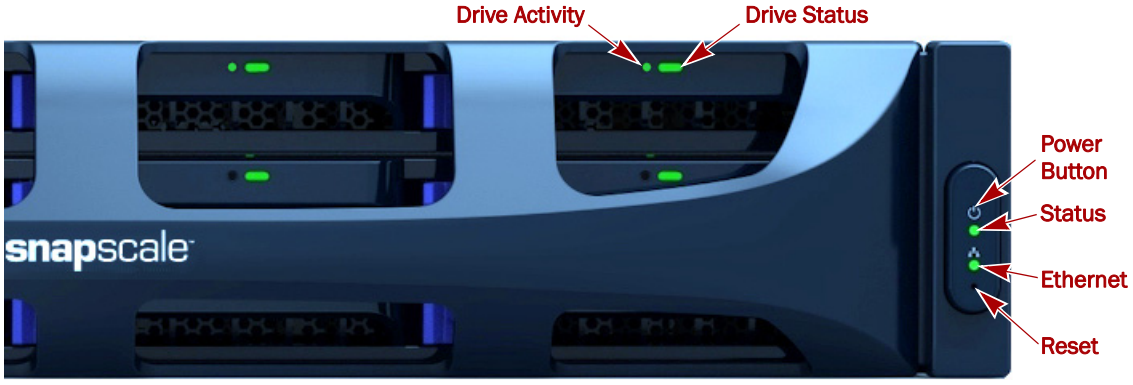
- LED Indicators
- Network Reset
- Networking Issues
- Miscellaneous Issues
- Support Page

LED Indicators

LED indicators provide information on the status of basic connectivity, disk drives, fan modules, and power supply modules.

SnapScale X2 Node LEDs

The SnapScale X2 has one network LED (Ethernet) and one system status LED on the Power Panel located on the right flange, along with a Power button and a Reset button. Each drive has two disk LEDs (Drive Activity and Drive Status) as shown in the following illustration:



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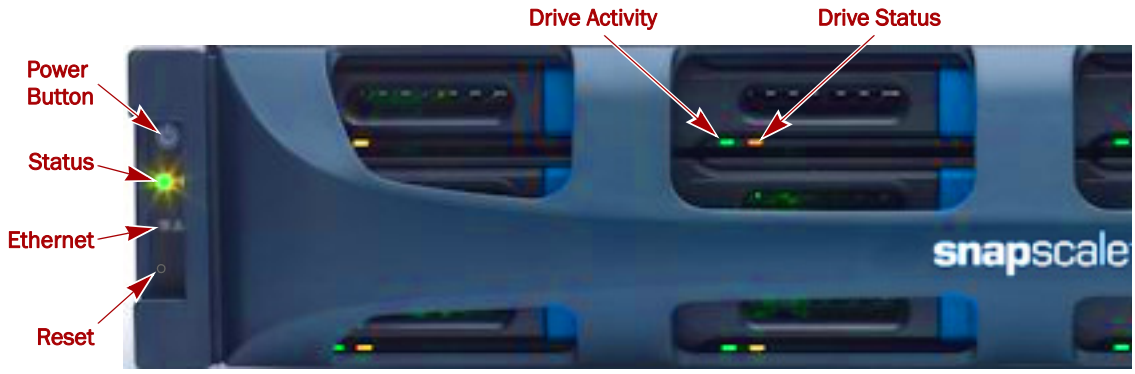

The following tables describe the various states that may occur.

X2 LED States

Drive Status LED

This is the oblong LED located on the center-right of each disk carrier.

Device State	LED State
No Disk Drive in Carrier	Off
Normal Operation	Solid **green**
Unit Identification Indicator	Flashing **amber**
Failed	Flashing **red**

Drive Activity LED

This is the round LED located on the center-left of each disk carrier.

Device State	LED State
Powered OFF / No Activity	Off
Drive Activity	Flashing **green**

Node Status LED

This is the round LED located just below the Power button on the right flange.

Device State	LED State
Powered OFF	Off
Booting	Solid **amber**
Normal Operation	Solid **green**
Shutting down	Flashing **green**
Maintenance Mode	Flashing **green**/**amber**

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Client Network LED

This is the round LED located just below the Status LED on the right flange.

Device State	LED State
Powered OFF	Off
Link Up (SnapScale Powered ON)	Solid **green**
Link Down	Off

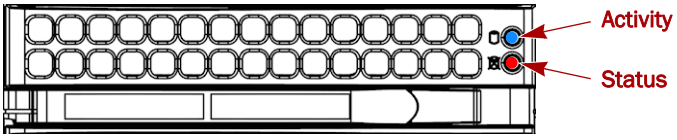
Power Supply Status LED

This is the LED located just above and to the right of the socket.

Device State	LED State
Normal Operation	Solid **green**
Standby	Solid **red**
Power Failure	Off
Fan Failure	Blinking **red**

SnapScale X4 Node LEDs

Each drive has two disk LEDs (top is Drive Activity and bottom is Drive Status):



LED	Description
Activity	Solid **blue** when a drive is present in the carrier. Blinks when there is drive activity.
Status	Red LED that: • Solid **red** when a drive fails. • Blinks **red** with all the other drive Status LEDs when node ID is activated. • Off if drive is OK or not present.

The Control Panel on the left flange has a series of LEDs as shown here:

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Control Panel	Icon & Name	Description
	Power Button	This is the main power button. Turning off system power with this button removes the main power but keeps standby power supplied to the system. The power cords should be unplugged before service.
	Status	Used as follows: • Off when the node is off. • Double flashing **green** when booting. • Solid **green** during normal operation. • Flashing **green** when powering down. • Alternating blink/double blink **green** in maintenance mode.
	HDD	Always off.
	NIC 1	Indicates network link on the Ethernet 1 port when **green**.
	NIC 2	Indicates network link on the Ethernet 2 port when **green**.
	Overheat/ Fan Fail	When this LED flashes, it indicates a fan failure. When on continuously, it indicates an overheat condition.
	Power Supply	Used as follows: • Solid **green** during normal operation. • Solid **amber** or off if a module has failed, is not connected, or the node has been turned off.

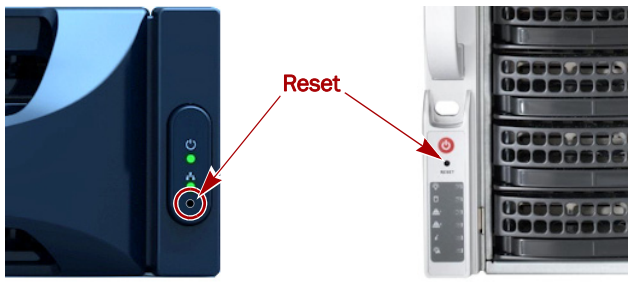
Network Reset

NOTE: The reset button is only operational for Uninitialized SnapScale nodes (not part of a cluster).

If an Uninitialized SnapScale node has been configured with incorrect network settings, the settings can be reset to the default values via the reset button. See Delete SnapScale Cluster on page 248.

The **Reset** button is accessed via a small hole on the side flanges:

- On the **X2** node, it is just below the Network LED on the Power panel located on the right flange.
- On the **X4**, the hole is located just below the Power button on the Power panel located on the left flange.



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Perform System Resets Without Network Access

Should Web Management Interface access to the cluster be lost, the **Reset** button can be used to reset cluster settings and reestablish connectivity. This option is also useful should you forget the admin password.

Verify that the cluster is fully booted (as indicated by the system/status LED). Using the end of a straightened paper clip or the fine point of an instrument, press the **Reset** button.

The system will go through a normal shutdown process and then reboot. As a part of the reset and reboot process, the SnapScale does the following:

- Clears user-defined TCP/IP settings such as DHCP configuration.
- Resets the cluster name to its default setting (**Scale**<server_number>).
- Resets network speed and bonding settings to their defaults.
- Resets the Administrator password to the default (**admin**).
- Resets the web server to allow HTTP access.

Networking Issues

These are some of the networking issues you may encounter when using your SnapScale cluster.

The Server Cannot Be Accessed Over Network

Inaccessibility may be caused by a number of reasons. To resolve this issue, use one of the following methods:

- Verify that you have the correct IP address of the cluster and try to connect again.
- Verify that the LED for the primary Ethernet port is lit. (This light indicates network connectivity.) If the light is not lit, perform the following:
  - The most likely cause is the physical connection. Check for a loose or damaged cable, or poor connections in the port connector.
  - This problem may also be caused by a mismatch between the settings on the switch or hub and the settings on the SnapScale Ethernet port. These settings must match. To resolve the problem, make sure the port settings on the hub or switch match the settings for the primary port as configured on the **Network > TCP/IP** page of the Web Management Interface. Use the autonegotiate setting on both the switch and the server port.

You Have No Access to SnapScale via HTTP

When trying to access the SnapScale via HTTP, the Web browser times out. However, the cluster can be accessed using the ping command or Windows Explorer.

- HTTP and HTTPS are both enabled by default. Try typing HTTPS in the Web address rather than HTTP. If you are able to access the cluster via HTTPS, you can re-enable HTTP on the **Network > Web** page.
- If you cannot access the cluster via HTTPS, try resetting the cluster as described on Perform System Resets Without Network Access on page 277.

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Access Denied Message Appears after Configuring Microsoft Domain Security

Customers who have configured local users and local groups with the same name as their domain users and groups can have security conflicts if they integrate with Microsoft Domain Security. The SnapScale will authenticate the users as local SnapScale users before authenticating through the Domain. However, the Domain users/groups may be the ones that had been granted access to the shares.

Be careful not to add local users or groups that are duplicates of those that are found on the Windows domain controller.

The SnapScale Does Not Operate Properly on a Network Running Gigabit-Full-Duplex

For Gigabit Ethernet to operate properly, both the switch and the SnapScale primary Ethernet port must be set to **Auto** (autonegotiate). Any other setting will result in unexpected behavior and reduced performance.

The Network Does Not Have a DHCP Server and SnapScale IP Address Is Unknown

Install SnapServer Manager (available from the Overland Storage website) onto a client workstation on the same subnet as the SnapScale. You can then use the utility to discover all SnapServers, SnapScale clusters, and Uninitialized nodes on that network segment, and to assign static IP addresses as necessary.

Problems Occur with Domain Controller Authentication

You are receiving the following errors in your error log:

```
SMB: Domain Controller unavailable
SMB: Username not connected to Domain Controller
```

This means that either your Domain Controller is down, or the SnapScale is unable to reach it. Because it cannot communicate with the Domain Controller, it is not able to authenticate the user. Check to make sure the Domain Controller is online, is consistently reachable via the network, and that users can authenticate to the Domain Controller.

You Start Your SnapScale but Cannot See It on Network

Ensure that the Ethernet cable is connected securely to both the network port and the primary Ethernet port. Also, check to see that the Link light on the front of the SnapScale is lit (solid green). If the Link light is off, this is normally caused by a mismatch between the switch/hub and the Ethernet port on the SnapScale. To resolve this problem, verify that all settings (if using multiple Ethernet ports) on the switch/hub match the setting on the cluster. When a node is shipped from the factory, both ports are set to autonegotiate. Therefore, the switch/hub ***must*** be set to autonegotiate to initially connect to the cluster.

A SnapScale cluster is configured by default to acquire an IP address from a DHCP server. If no DHCP server is found on the network, the SnapScale defaults to an IP address in the range of 169.254.xxx.xxx and is labeled ZeroConf in SSM. While you may not be able to see the server on your network, you can discover the SnapScale using either the default cluster name or running the SSM utility.

You Try to Mount to a Share on Your SnapScale from Your Linux Workstation and You Receive an RPC Timeout Message

Check the firewall configuration to your Linux workstation. Be sure you have not blocked the ability to receive TCP or User Datagram Protocol (UDP) communications. If problems persist, contact Overland Storage Technical Support.

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You Receive an Access Denied Message When Attempting to Mount a Share on Your SnapScale from a Linux Workstation

If you are logged in as **root** on your workstation and NFS is enabled on your SnapScale, this message can be misleading, causing you to look for security issues, when in fact it could be a command syntax issue. For example, the common Linux mount command:

```
mount 192.168.32.124:SHARE1 /mnt
```

is missing a forward slash (/) in the command following the IP address before the share. This returns an Access Denied message. The correct syntax should be the following (added slash shown in red):

```
mount 192.168.32.124:/SHARE1 /mnt
```

NOTE: The share name is case-sensitive.

You Cannot Log in as Root to SnapScale

RAINcloudOS allows you to log in as root over SMB. If this operation has failed or you have trouble logging in, be sure that you have enabled root login in the **Network > Windows/SMB** page. Also note that the root account password is tied to the admin account password. If you cannot log in as root, change the password for the admin account on the **Network > Windows/SMB** page. Use the admin password to log in as root.

You Are Unable to See Your Domain Users When Trying to Set Up Windows Security Permissions on File Folders

The SnapScale has joined the Active Directory domain properly but you cannot see the domain users when you set share permissions from the Web Management Interface.

Make sure the Windows client (PC) you are trying to set permissions from is assigned a valid DNS server. You can check your Windows client using the `ipconfig` command from a command prompt.

Miscellaneous Issues

These are some miscellaneous issues you may encounter when using your SnapScale.

You Backed Up Your Snapshot Share, Are Now Attempting to Restore It, and Operation Fails

A snapshot share is read-only. You can only restore the data to a read-write accessible share.

Power to the SnapScale Is Unexpectedly Cut Off Due to a Power Outage

Overland Storage recommends that you use an uninterruptible power supply (UPS) with the SnapScale. If you did not have a UPS attached to the cluster at the time of the power outage, do the following:

1. Remove the power cables.
2. Once the power is restored and stabilized, turn the power supplies back on and reboot the cluster.

   Once the SnapScale boots, it begins resynchronizing the Peer Sets if necessary. You can use the cluster during the resynchronization, but performance will be a little slower than normal. Do not remove drives, however, while the cluster is resynchronizing the Peer Sets.

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The Server Is Not Responding to File Requests or Configuration Commands

Call your technical support representative.

You Have Problems Seeing the Tape Library Tape Device, Not the Robotic Arm

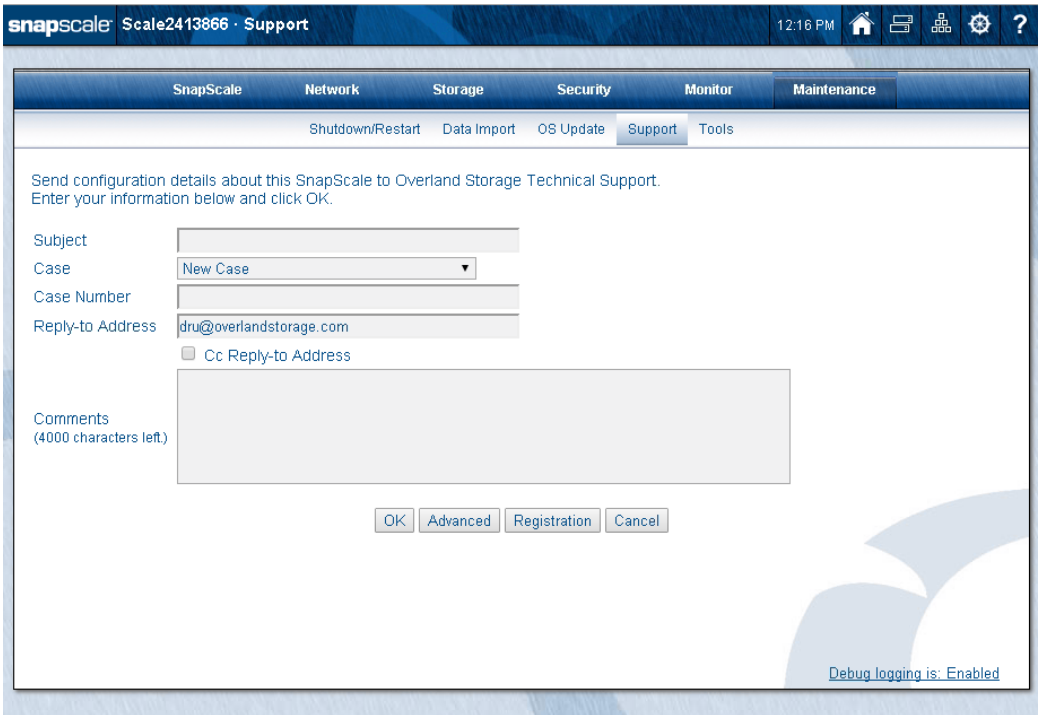
When you have problems seeing the actual tape device rather than the robotic arm, it is most likely due to the Tape Loader being configured for Sequential Access. Change the Tape Loader to Random or Mixed Mode.

The Admin Password to the Web Management Interface Is Not Available

You can perform a limited reset to defaults, which includes the admin password, then use the Web Management Interface to set a new password. See Perform System Resets Without Network Access on page 277.

Support Page

Once your SnapScale has been registered, technical support page becomes available for use.



Use the **Support** page to email system logs and files that contain information useful for troubleshooting purposes to Overland Storage Technical Support. You can use the **Maintenance > Support** page to open a new case with technical support; or, in the course of working to resolve an issue, a technical support representative may ask you to fill out and submit this page. If a case is already in progress, you will need to enter the case number provided by the technical support representative.

NOTE: Support interacts with two fields on the **Maintenance > Tools > Email Notification** page. To use this **Support** feature, you must first enter a valid SMTP server IP address on the **Email Notification** page. The first email address listed in the **Recipients** field automatically populates the **Reply-to Address** field on the **Support** page.

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Complete the following fields as appropriate, then click **OK**:

Text Field	Description
Subject*	Enter a concise description that identifies the issue.
Case*	• Select **New Case** if you are emailing technical support for the first time. • Select **Existing Case** if you have previously contacted technical support concerning the issue.
Case Number	If you selected **Existing Case** above, enter the case number provided by technical support.
Reply-to Address*	This field defaults to the first email address entered as a recipient on the **Maintenance > Tools > Email Notification** page. If necessary, enter at least one email address that will serve as the contact email address for this issue. To receive a copy of the email and system information attachment, check the **Cc Reply-to Address** box.
Comments*	Enter additional information that will assist in the resolution of the problem.

*Required option.

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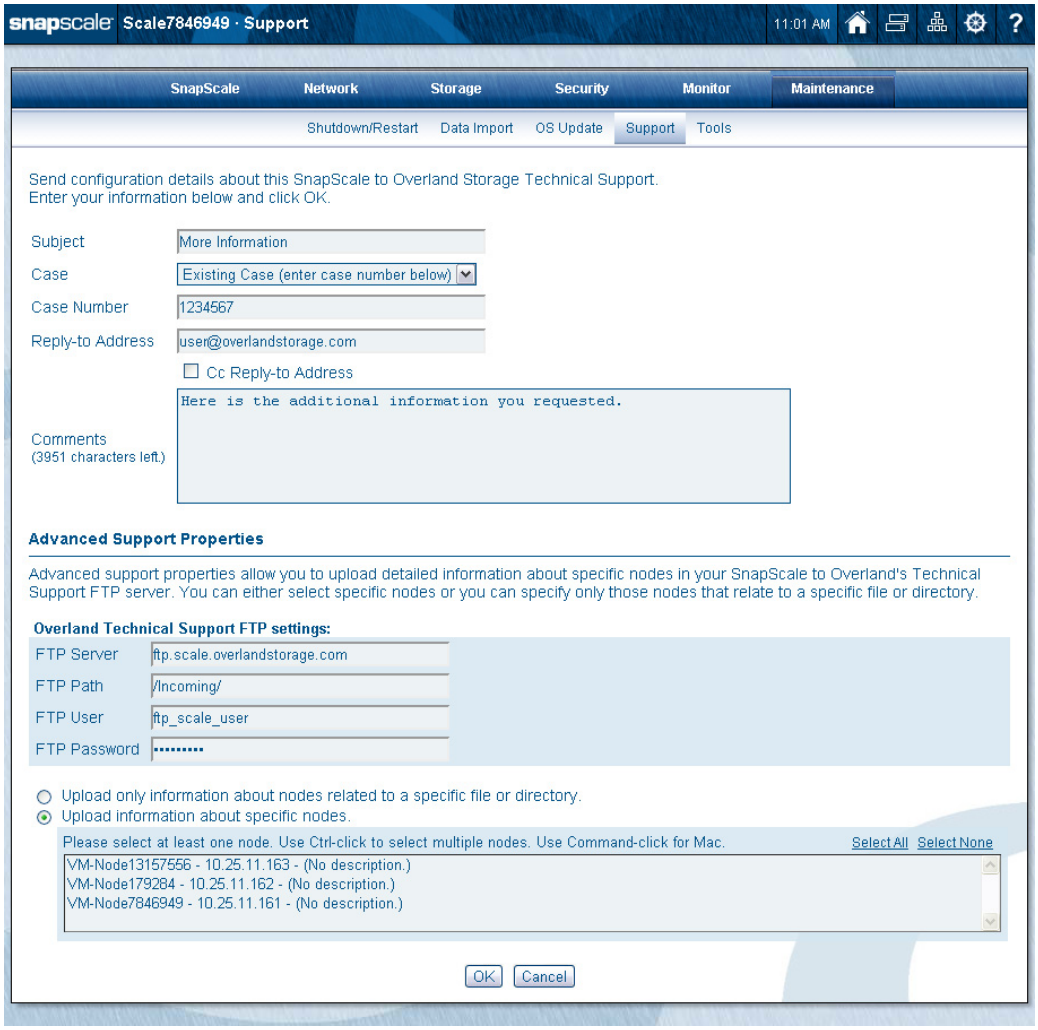
Advanced Help

If you have an open case and have entered the **Case Number**, clicking **Advanced Support Properties** opens additional options for the **Support** feature. These options provide the ability to upload specific log files via FTP, which is sometimes necessary for the large logs the cluster can generate, and tech support may direct a user to use this for a particular case.



The additional options include:

- **FTP Server** – Name of the server to upload to.
- **FTP Path** – FTP server path used to upload to.
- **FTP User** – Name of the user to log in to the FTP server.
- **FTP Password** – FTP user's password.
- Click an **upload option**:
  - **Upload only information about nodes related to a specific file or directory**

    Use the **Share** drop-down list to select the share and **File or Directory** path field to enter the path to a file or directory to gather logs. Only select **(Use absolute path.)** from the drop-down list when directed by Overland Support.

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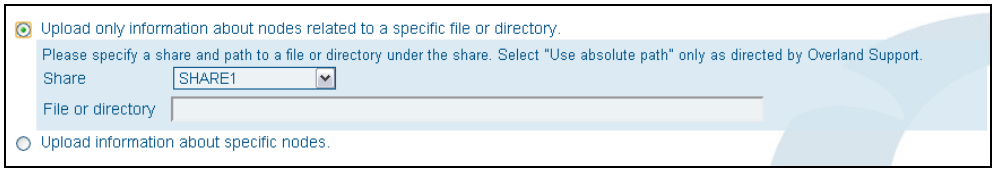
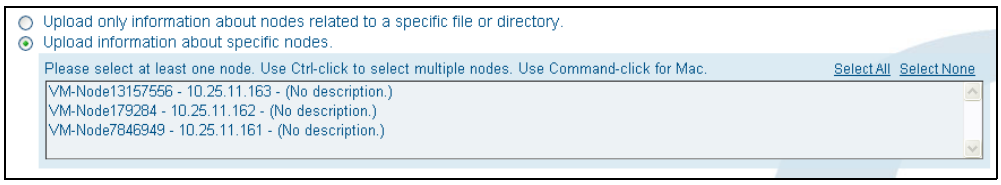


- **Upload information about specific nodes**

  Select one or more nodes to upload logs from them. Use the **Select All** and **Select None** options on the right as needed.



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Appendix D

RAINcloudOS Ports

The following table lists the ports used by RAINcloudOS. The **ROS Feature** column lists access to the feature such as **Storage > iSCSI** (which you can access under the **Storage** tab in the **iSCSI** subsection of the Web Management Interface).

Port #	Layer	ROS Feature	Name	Comment
1	DDP		rtmp	Routing Table Management Protocol
1	TCP & UDP		tcpmux	TCP port service multiplexer
2	DDP		nbp	Name Binding Protocol
22	TCP & UDP	SnapScale > SSH	ssh	Secure Shell (SSH) service
25	TCP & UDP	SnapScale > Email Notification	smtp	Simple Mail Transfer Protocol (SMTP)
67	TCP & UDP	Network > TCP/IP	bootps	Bootstrap Protocol (BOOTP) services; also used by Dynamic Host Configuration Protocol (DHCP) services
68	TCP & UDP	Network > TCP/IP	bootpc	Bootstrap (BOOTP) client; also used by Dynamic Host Control Protocol (DHCP) clients
80	TCP & UDP	Web Management Interface	http	HyperText Transfer Protocol (HTTP) for World Wide Web (WWW) services
81	TCP	Web Management Interface	HTTP	Hypertext Transport Protocol
111	TCP & UDP	• Networking > NFS • Assist • SnapServer Manager	sunrpc	Remote Procedure Call (RPC) Protocol for remote command execution, used by Network Filesystem (NFS) and SnapServer Manager
123	TCP & UDP	SnapScale > Date/Time > Advanced	ntp	Network Time Protocol (NTP)
137	TCP & UDP	Network > Windows/SMB	netbios-ns	NETBIOS Name Services used in Red Hat Enterprise Linux by Samba
138	TCP & UDP	Network > Windows/SMB	netbios-dgm	NETBIOS Datagram Services used in Red Hat Enterprise Linux by Samba
139	TCP & UDP	Network > Windows/SMB	netbios-ssn	NETBIOS Session Services used in Red Hat Enterprise Linux by Samba
161	TCP & UDP	Network > Windows/SMB	snmp	Simple Network Management Protocol (SNMP)
162	TCP & UDP	Network > Windows/SMB	snmptrap	Traps for SNMP
389	TCP & UDP	Network > Windows/SMB	ldap	Lightweight Directory Access Protocol (LDAP)

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Port #	Layer	ROS Feature	Name	Comment
443	TCP & UDP	• Web Management Interface • SnapServer Manager • SnapExtensions > Snap EDR	https	Secure Hypertext Transfer Protocol (HTTP).
445	TCP & UDP	Network > Windows/SMB	microsoft-ds	Server Message Block (SMB) over TCP/IP
852	TCP	Network > NFS		Used by rpc.mountd
882	UDP	• Snap Finder • SnapServer Manager	Sysbroker	Broadcast Discovery
933	UDP	Network > NFS		Used by rpc.statd
936	UDP	Network > NFS		Used by rpc.statd
939	TCP	Network > NFS		Used by rpc.statd
2005	TCP	SnapExtensions	SnapExtensions	Bridge from Servlet to Snap Extension framework
2049	TCP & UDP	Network > NFS	nfs [nfsd]	Network Filesystem (NFS)
2050	UDP	Network > NFS	mountd	
2051	UDP	Network > NFS	lockd	
2599	UDP	• Snap Finder • SnapServer Manager	Sysbroker	Multicast Discovery
3052	TCP	SnapScale > UPS		Port for monitoring UPS status
3205	TCP	Network > iSNS	iSNS	iSNS port
3260	TCP	Storage > iSCSI	iSCSI	iSCSI port
8001	TCP	SnapExtensions > SnapEDR	SnapEDR	External Communications
8002	TCP	SnapExtensions > SnapEDR	SnapEDR	External Communications
8003	TCP	SnapExtensions > SnapEDR	SnapEDR	External Communications
8005	TCP	Web Management Interface	tomcat	Tomcat Shutdown port
8008	TCP & UDP	Web Management Interface	http-alt	Tomcat - Apache Bridge
9049	TCP	Sysbroker		Sysbroker Shutdown Port
9050	TCP	Sysbroker		Sysbroker RPC Port
10001	TCP	Snap Extension	Snap Extension	Shutdown Port
32780	TCP	Web Management Interface	tomcat	Random Port
32781	TCP	Web Management Interface	tomcat	Random Port
49221	TCP	SnapExtensions > SnapEDR	SnapEDR	External Communications Port
49229	TCP	SnapExtensions > SnapEDR	SnapEDR	External Communications Port

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Port #	Layer	ROS Feature	Name	Comment
1024 - 65535	TCP & UDP	Network > NFS Network > FTP	NFS FTP (Passive)	Dynamically allocated in runtime for user connections

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Appendix E

Command Line Interface

RAINcloudOS includes a command line interface (SnapCLI) that is accessible through SSH. Using the CLI, users can access information about most of the SnapScale configuration parameters and perform configuration and maintenance functions without using the Web Management Interface or SSM.

IMPORTANT: Some administrative tasks must still be performed using the Web Management Interface. The CLI is intended as a convenient way to perform some functions; it is not intended as an alternative to using the Web Management Interface.

Topics in Command Line Interface

- SnapCLI Syntax
- Scripts in SnapCLI

SnapCLI Syntax

SnapCLI command syntax uses three parameters: **COMMANDS**, **ARGUMENTS**, and **OPTIONS**. To generate commands in SnapCLI, use the following syntax:

```
COMMAND [ARGUMENT] [OPTIONS]
```

where **COMMAND** is the name of one of the SnapCLI commands, **ARGUMENT** is an action available for that command, and **OPTIONS** are additional parameters for the command.

Once logged into the CLI, there are several ways of displaying information about available parameters.

Type	Result
?	See an overview of the CLI, with a list of available commands and a description of command syntax.
{command} **help**	See a description of that particular command's function and a list of options available for the command.
tab	Finish the command you have started to type (such as, tab-complete).
{command} **tab**	List any arguments and/or options available for that command.

For example, to see a list of available commands once you have logged into SnapCLI, type "**?**" at the prompt.

To see a description of a specific command, type the command name (for example, **date**) + "**help**" or "**?**":

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Command	Arguments and Options	Descriptions
date	timezones	- list available time zones
	get	- get server date/time
	set [OPTIONS} - [day=1-31] - [month=1-12] - [year=1900-current] - [hour=0-23] - [minute=0-59] - [second=0-59] - [timezone=1- 40]	- set server date/time - day of month - month of year - year - hour - minutes - seconds - timezone (use the command date timezones to get a list of timezones)

In this instance, to set the date to October 27, 2011, enter:

```
date set day=27 month=10 year=2011
```

NOTE: If, instead of typing the word **date**, you had typed **d + [tab]**, the word would have been completed for you. If you entered **d + [tab] + [tab]**, the word would have been completed and the available options displayed.

Suppose, instead of **date**, you typed the command **web**. Two arguments would be available, one with options:

Command	Arguments and Options	Descriptions
web	get	- get WEB properties
	set [OPTIONS] - require-webview-auth=(yes|no) - non-secure-http=(yes|no)	- set WEB properties - require HTTP/HTTPS clients to authenticate in order to access the server -enable/disable non-secure HTTP access

Thus, the following command string:

```
web set require-webview-auth=yes non-secure-http=no
```

sets HTTP/HTTPS properties on the SnapScale cluster to require clients to authenticate in order to access the cluster and to disable non-secure HTTP access.

SnapCLI Procedures

Use these procedures to access and exit SnapCLI.

Log into SnapCLI

1. Make sure your client has an SSH v2 client application installed.

   NOTE: Free or low-cost SSH applications are available from the Internet.

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2. Connect to a node using its IP address and log in as *admin* (or any other member of *admingrp*).

   You will automatically be placed in the CLI shell.

   NOTE: SSH v2 is required. If you fail to connect to the node, ensure that your SSH client is configured to connect via SSH v2.

Exiting SnapCLI

To exit SnapCLI, type **exit**. The SSH session will close.

Scripts in SnapCLI

Administrative tasks can be automated with shell scripts that call SnapCLI commands.

Run a SnapCLI Script

1. Create the script and put it in a share on the local server.
   - Be sure to use an application that is compatible with the standard Unix text file format (for example, vi). Avoid using Windows clients to create or edit scripts.
   - Place the script in a share that will never be part of a delete script.
2. Log in to the SnapCLI (see Log into SnapCLI on page 288 for instructions).
3. Type **osshell** to get a bash prompt (**#**).
4. At the prompt, make sure the script is executable by typing the following and pressing **Enter**:

   chmod +x/shares/[sharename]/[scriptname]

   where **sharename** is the name of the share where you put the script and **scriptname** is the name of the script.
5. To run the script, type the path again and press **Enter**:

   /shares/[sharename]/[scriptname]

Sample Script

Following is an example script that can be used to create and remove users, groups, and shares:

```
#!/bin/sh

######################################################################
# Copyright 2003-2015 Overland Storage, Inc. All rights reserved. #
# Permission is granted to use this code provided that it         #
# retains the above copyright notice.                             #
######################################################################
CLI=/bin/cli
USER=myuser
PASSWORD=myuserpass
GROUP=mygroup
SHARE=myshare
VOLUME=VOL0

# usage: 'mkuser <user_name> <password>'
mkuser()
{
```


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Create a User

```
# if the user does not exist then create it
if ! $CLI user get user-name="$1" > /dev/null 2>&1; then
echo "Creating user '$1' ..."
$CLI user create user-name="$1" password="$2" > /dev/null 2>&1
if [ $? -ne 0 ]; then
echo "Creation of user '$1' failed."
return 1
fi
else
echo "User '$1' already exists."
fi

return 0
}


# usage: 'mgroup <group_name>'
mkgroup()
{
```


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Create a Group

```
# if the group does not exist then create it
if ! $CLI group get group-name="$1" > /dev/null 2>&1; then
                echo "Creating group '$1' ..."
        $CLI group create group-name="$1" > /dev/null 2>&1
        if [ $? -ne 0 ]; then
                echo "Creation of group '$1' failed."
return 1
        fi
else
echo "Group '$1' already exists."
fi

return 0
}


# usage: 'adduser2group <user_name> <group_name>'
adduser2group()
{
```

Add the User to the Group

```
# if both the user and the group exist add the user as a member of this group
if $CLI user get user-name="$1" > /dev/null 2>&1; then
if $CLI group get group-name="$2" > /dev/null 2>&1; then
echo "Adding user '$1' to group '$2' ..."
$CLI group member add user-name="$1" group-name="$2" > /dev/null 2>&1
        if [ $? -ne 0 ]; then
                echo "Adding user '$1' to group '$2' failed."
return 1
        fi
fi
fi

return 0
}


# usage: 'mkshare <share_name> <share_volume>'
mkshare()
{
```

Create a Share

```
# if the share does not exist create it
if ! $CLI share get share-name="$1" > /dev/null 2>&1; then
echo "Creating share '$1' ..."
$CLI share create share-name="$1" share-volume="$2" > /dev/null 2>&1
       if [ $? -ne 0 ]; then
                echo "Creating share '$1' failed."
return 1
        fi
else
echo "Share '$1' already exists."
fi

return 0
}


# usage: 'rmuser <user_name>'
rmuser()
{
```

Delete the User

```
# if the user exists then delete it
if $CLI user get user-name="$1" > /dev/null 2>&1; then
echo "Deleting user '$1' ..."
        $CLI user delete user-name="$1" > /dev/null 2>&1
```


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```
        if [ $? -ne 0 ]; then
                echo "Deletion of user '$1' failed."
return 1
        fi
else
        echo "User '$1' does not exist."
fi

return 0
}

# usage: 'rmgroup <group_name>'
rmgroup()
{
```

Delete the Group

```
# if the group exists then delete it
if $CLI group get group-name="$1" > /dev/null 2>&1; then
echo "Deleting group '$1' ..."
        $CLI group delete group-name="$1" > /dev/null 2>&1
        if [ $? -ne 0 ]; then
                echo "Deletion of group '$1' failed."
return 1
        fi
else
        echo "Group '$1P' does not exist."
fi

return 0
}


# usage: 'rmshare <share_name>'
rmshare()
{
```

Delete the Share

```
# if the share exists delete it
if $CLI share get share-name="$1" > /dev/null 2>&1; then
echo "Deleting share '$1' ..."
        $CLI share delete share-name="$1" > /dev/null 2>&1
        if [ $? -ne 0 ]; then
                echo "Deletion of share '$1' failed."
return 1
       fi
else
        echo "Share '$1' does not exist."
fi

return 0
}
```

Create a User, Group, and Share; Then Add the User to the Group

```
###############
#    Main     #
###############

# create a user, a group and a share and add the user to the group
mkuser "$USER" "$PASSWORD"
mkgroup "$GROUP"
adduser2group "$USER" "$GROUP"
mkshare "$SHARE" "$VOLUME"

#remove the group, the user and the share
rmgroup "$GROUP"
rmuser "$USER"

rmshare "$SHARE"
```


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Master Glossary & Acronym List

NOTE: This is a general Overland Storage glossary and acronym list. Not all items may be found in this document or be used by this product.

1000BASE-T

1000BASE-T (also known as IEEE 802.3ab) is a standard for gigabit Ethernet over copper wiring. It requires, at a minimum, Category 5 cable (the same as 100BASE-TX), but Category 5e (Category 5 enhanced) and Category 6 cable may also be used and are often recommended. 1000BASE-T requires all four pairs to be present and is far less tolerant of poorly installed wiring than 100BASE-TX.

Address

An address is a data structure or logical convention used to identify a unique entity, such as a particular process or network device.

Algorithm

A sequence of steps designed to solve a problem or execute a process.

ATA

Short for *Advanced Technology Attachment*. A standard interface for connecting storage devices to a PC.

Authentication

The validation of a user's identity by requiring the user to provide a registered login name and corresponding password.

Autonegotiation

An Ethernet feature that automatically negotiates the fastest Ethernet speed and duplex setting between a port and a hub or switch. This is the default setting and is recommended.

Autosensing

An Ethernet feature that automatically senses the current Ethernet speed setting.

Bar Code

The machine-readable representation of a product code. Bar codes are read by a scanner that passes over the code and registers the product code. The width of black lines and white spaces between varies. Combinations of lines and spaces represent characters. Overland uses 3-of-9 code (Code 39) where each character is represented by 9 bars, 3 of which are wide.

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Bus or Channel

A common physical path composed of wires or other media, across which signals are sent from one part of a computer to another. A channel is a means of transferring data between modules and adapters, or between an adapter and SCSI devices. A channel topology network consists of a single cable trunk that connects one workstation to the next in a daisy-chain configuration. All nodes share the same medium, and only one node can broadcast messages at a time.

CA

Short for *Certificate Authority*. A trusted third-party in a network that issues and manages security credentials.

Cat 5 Cable

Short for *Category 5*, it is network cabling that consists of four twisted pairs of copper wire terminated by 8P8C modular connectors. CAT 5 cabling supports frequencies up to 100 MHz and speeds up to 100 Mbps. It can be used for ATM, token ring, 100BASE-T, and 10BASE-T networking.

Cat 5 is based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard developed by the Electronics Industries Association as requested by the Computer Communications Industry Association in 1985.

Cat 6 Cable

Short for *Category 6*, it is network cabling that consists of four twisted pairs of copper wire terminated by 8P8C modular connectors made to higher standards that help reduce noise caused by crosstalk and system noise. The ANSI/TIA-568-B.2-1 specification states the cable may be made with 22 to 24 AWG gauge wire, so long as the cable meets the specified testing standards.

It is designed for Gigabit Ethernet that is backward compatible with the Category 5/5e and Category 3 cable standards. Cat 6 features more stringent specifications for crosstalk and system noise. The cable standard provides performance of up to 250 MHz and is suitable for 10BASE-T, 100BASE-TX, and 1000BASE-T (Gigabit Ethernet).

Channel

A communications path between two computers or devices.

Checksum

The result of adding a group of data items that are used for checking the group. The data items can be either numerals or other character strings treated as numerals during the checksum calculation. The checksum value verifies that communication between two devices is successful.

CIFS

Short for *Common Internet Filesystem*. Also known as SMB. The default Windows protocol for communication between computers. A specification for an Internet file access protocol that complements HTTP and FTP.

daemon

A process that runs in the background.

data replication

See Replication.

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default gateway

The router used when there is otherwise no known route to a given subnet.

DHCP

Short for *Dynamic Host Configuration Protocol*. A communications protocol that lets network administrators centrally manage and automate the assignment of IP addresses on a computer network. Each system that connects to the Internet/intranet needs a unique IP address.

Disaster Recovery

A strategy that allows a company to return to normal activities after a catastrophic interruption. Through failover to a parallel system or by restoration of the failed system, disaster recovery restores the system to its normal operating mode.

DNS

Short for *Domain Name Service*. A network service that translates domain names into IP addresses using a server that maintains a mapping of all host names and IP addresses. Normally, this mapping is maintained by the system administrator, but some servers support dynamic mappings.

Domain

A set of network resources in Windows 2000/2003/2008, such as users and groups of users. A domain may also include multiple servers on the network. To gain access to these network resources, the user logs into the domain.

Domain Name

The ASCII name that identifies the domain for a group of computers within a network.

Ethernet

The most widely installed LAN technology. 100BASE-T Ethernet provides transmission speeds of up to 100 Mbps. Fast Ethernet or 1000BASE-T provides transmission speeds up to 1000 Mbps and is typically used for LAN backbone systems, supporting workstations with 100BASE-T cards. Gigabit Ethernet (GbE) provides an even higher level of backbone support at 1000 Mbps (one Gigabit or one billion bits per second).

Ethernet Address

The unique six-digit hexadecimal (0-9, A-F) number that identifies the Ethernet interface.

Ethernet Port

The port on a network card to provide Ethernet access to the computer.

Event

Any significant occurrence or error in the system that may require notifying a system administrator or adding an entry to a log.

Expansion Slot

Area in a computer that accepts additional input/output boards to increase the capability of the computer.

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Failover

A strategy that enables one Ethernet port to assume the role of another port if the first port fails. When the port comes back online, the original identities are restored. Failover is possible only in a multi-Ethernet configuration.

Failover/Failback

A combination of Failover and Failback. When a preferred path becomes unavailable, another path is used to route I/O until the preferred path is restored. In this case I/O will "fail back" to the preferred path once it is available again.

Fibre Channel

Fibre Channel (FC) is a gigabit-speed network technology which transports SCSI commands over Fibre Channel networks. Fibre Channel was primarily concerned with simplifying the connections and increasing distances, but later designers added the goals of connecting SCSI disk storage, providing higher speeds and far greater numbers of connected devices.

Firmware

Software stored in read-only memory (ROM) or programmable ROM (PROM). Firmware is often responsible for the behavior of a system when it is first switched on.

FTP

Short for *File Transfer Protocol*. A standard Internet protocol that provides a way to exchange files between computers on the Internet.

Full-duplex

A type of transmission that allows communicating systems to both transmit and receive data simultaneously.

Gateway

The hardware or software that bridges the gap between two network subnets. It allows data to be transferred among computers that are on different subnets.

Gigabit Ethernet

Also known as GigE or GbE, this Ethernet standard uses a one Gigahertz (1000 Hz) clock rate to move data.

HBA

Short for *Host Bus Adapter*. An HBA is an I/O adapter that sits between the host computer's bus and the Fibre Channel loop and manages the transfer of information between the two channels. In order to minimize the impact on host processor performance, the HBA performs many low-level interface functions automatically or with minimal processor involvement.

Half-duplex

A type of transmission that transfers data in one way at a time.

Hidden Share

A share that restricts the display of the share via the Windows (SMB), Web Home (HTTP/HTTPS), FTP, and AFP protocols. See also SMB.

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Host Name

The unique name by which a computer is known on a network. It is used to identify the computer in electronic information interchange.

Hot Swapping

The ability to remove and add disk drives to a system without the need to power down or interrupt client access to filesystems. Not all components are hot-swappable. Please read installation and maintenance instructions carefully.

HTTP

Short for *Hypertext Transfer Protocol*. An application protocol for transferring files (text, graphic images, sound, video, and other multimedia files) over TCP/IP on the World Wide Web.

HTTPS

Short for *Hypertext Transfer Protocol Secure*. The HTTP protocol using a Secure Sockets Layer (SSL). SSL provides data encryption, server authentication, message integrity, and client authentication for any TCP/IP connection.

Inheritance

In Windows permissions, inheritance is the concept that when permissions for a folder are defined, any subfolders within the defined folder inherit its permissions. This means an administrator need not assign permissions for subfolders as long as identical permissions are desired. Inheritance greatly reduces administrative overhead and also results in greater consistency in access permission management.

Initiator Device

An iSCSI system component that originates an I/O command over an I/O bus or network. An initiator issues the commands; a *target* receives them.

An initiator normally runs on a host computer. It may be either a software driver or a hardware plug-in card, often called a Host Bus Adapter (HBA). A software initiator uses one of the computer's Ethernet ports for its physical connection, whereas the HBA will have its own dedicated port.

Software initiators are readily available for most host operating systems. Hardware initiators are not widely used, although they may be useful in very high performance applications or if 10 Gigabit Ethernet support is required.

I/O (Input/Output)

The operation of transferring data to or from a device, typically through an interface protocol like CIFS, NFS, or HTTP.

IP

Short for *Internet Protocol*. The unique 32-bit value that identifies the location of the server. This address consists of a network address, optional subnetwork address, and host address. It displays as four addresses ranging from 1 to 255 separated by periods.

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IQN

Short for *iSCSI Qualified Name*. A name format used in the iSCSI protocol. Initiators and targets have IP addresses, just like any other network entity. They are also identified using an iSCSI name, called the iSCSI Qualified Name (IQN). The IQN should be unique worldwide. It is made up of a number of components, specifying the date, identifying the vendor in reverse format, and then uniquely identifying the initiator or target. An example of an IQN is:

```
iqn.2001-04.com.example:storage:diskarray-sn-123456789
```

Since these IQNs are rather unwieldy, initiators and targets also use short, user friendly names (sometimes called alias names or just aliases).

iSCSI

Short for *Internet SCSI*. iSCSI is an IP-based storage networking standard for linking data storage facilities. iSCSI is a standard that defines the encapsulation of SCSI packets in TCP and then routing it using IP. It allows block-level storage data to be transported over widely used IP networks.

iSNS Server

Short for *Internet Storage Name Service* Server. A protocol enabling the automatic discovery, configuration, and management of iSCSI devices on a TCP/IP network.

Kerberos

A secure method for authenticating a request for a service used by ADS. Kerberos lets a user request an encrypted "ticket" from an authentication process that can then be used to request a service from a server. The user credentials are always encrypted before they are transmitted over the network.

In Windows 2000/XP, the domain controller is the Kerberos server. The Kerberos key distribution center (KDC) and the origin of group policies are applied to the domain.

LAN

Short for *Local Area Network***.** A network connecting computers in a relatively small area such as a building.

LCD

Short for *Liquid Crystal Display*. An electronic device that uses liquid crystal to display messages.

LED

Short for *Light-Emitting Diode*. An LED is a type of diode that emits light when current passes through it. Visible LEDs are used as indicator lights on electronic devices.

Linux

A UNIX-like operating system that was designed to provide personal computer users a free or very low-cost operating system comparable to traditional and usually more expensive UNIX systems.

Load Balancing

A process available only in multi-Ethernet configurations. The Ethernet port transmission load is distributed among two or more network ports (assuming the cards are configured for load balancing). An intelligent software adaptive agent repeatedly analyzes the traffic flow from the server and distributes the packets based on destination addresses.

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MAC Address

Short for *Media Access Control address*, a hardware address that uniquely identifies each node of a network. In the Open Systems Interconnection (OSI) model, one of two sublayers of the Data Link Control layer concerned with sharing the physical connection to the network among several computers. Each Ethernet port has a unique MAC address.

MD5 Algorithm

MD5 is a way to verify data integrity, and is much more reliable than checksum and many other commonly used methods.

MIB

Short for *Management Information Base*. A formal description of a set of network objects that can be managed using the Simple Network Management Protocol (SNMP). The format of the MIB is defined as part of SNMP.

Mirroring

Used in RAID 1 and 10, a process of storing data on one disk and copying it to one or more disks, creating a redundant storage solution. RAID 1 is the most secure method of storing mission-critical data.

Mounted

A filesystem that is available.

MPIO

Short for *Multipath Input/Output*. A multipath solution built into Microsoft server-grade iSCSI operating systems.

MTU

Short for *Maximum Transfer Unit*. It is the largest size packet or frame, specified in octets (eight-bit bytes), that can be sent in a packet- or frame-based network.

NIC

Short for *Network Interface Card*. A board that provides network communication capabilities to and from a computer.

NIS

Short for *Network Information Service*. It is a client–server directory service protocol for distributing system configuration data such as user and host names between computers on a computer network. Sun Microsystems developed the NIS; the technology is licensed to virtually all other Unix vendors.

NTFS

Short for *New Technology File System*. The standard file system used by Windows NT and later versions of the Windows operating system.

NTP

Short for *Network Time Protocol*. A protocol for synchronizing the system clocks of computers over a packet-switched network.

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NVRAM

Abbreviation of *Non-Volatile Random Access Memory*, a type of memory that retains its contents when power is turned off.

5 and 6**Permissions**

A security category, such as no access, read-only, or read-write, that determines what operations a user or group can perform on folders or files.

PoP

Short for *Proof of Purchase*. The number used to obtain a license key for an upgrade to third-party applications.

Portal

A target's IP address together with its TCP port number used in iSCSI systems.

POSIX

Short for *Portable Operating System Interface***.** A set of standard operating system interfaces based on the UNIX operating system. The need for standardization arose because enterprises using computers wanted to develop programs that could run on multiple platforms without the need to recode.

Protocol

A standardized set of rules that specifies the format, timing, sequencing, and/or error checking for data transmissions.

PTP

Short for *Point-to-Point*. PTP is the common mode of attachment to a single host. PTP is sometimes used to attach to a Fibre Channel switch for SAN connectivity.

Quota

A limit on the amount of storage space on a volume that a specific user or NIS group can consume.

Replication

Replication involves sharing information so that the same data that is stored multiple storage devices to improve reliability, fault-tolerance, or accessibility.

Router

A router is a device that enables connectivity between Ethernet network segments.

SAN

Short for *Storage Area Network*. Data storage connected to a network that provides network clients access to data using block level protocols. To the clients, the data storage devices appear local rather than remote. An iSCSI SAN is sometimes referred to as an IP-SAN.

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SAS

Short for *Serial Attached SCSI*. It is a point-to-point serial protocol that replaces parallel SCSI bus technology (multidrop) and uses the standard SCSI command set. It has no termination issues, supports up to 16,384 devices (using expanders), and eliminates clock skew. It consists of an Initiator that originates device service requests, a Target containing logical units that receives device service requests, and a Service Delivery Subsystem that transmits information between the Initiator and the Target.

Session

When an initiator wants to establish a connection with a target, it establishes what is known as an iSCSI session. A session consists of one or more TCP/IP connections between an initiator and a target. Sessions are normally established (or re-established) automatically when the host computer starts up, although they also can be established (and broken) manually.

Share

A virtual folder that maps to the root of a volume or a directory on the volume. Permissions are assigned to a share that determine access for specific users and groups.

Share Access

Permissions granted or denied to users and groups that control user and group access to the files.

SMB

Short for *Server Message Block*. A protocol for Windows clients. SMB uses the TCP/IP protocol. It is viewed as a complement to the existing Internet application protocols such as FTP and HTTP. With SMB, you can access local server files, obtain read-write privileges to local server files, share files with other clients, and restore connections automatically if the network fails.

SMTP

Short for *Simple Mail Transfer Protocol*. A TCP/IP protocol used for sending and receiving email.

Snap EDR

A SnapExtension that copies the contents of a share from one SnapServer to another share on one or more SnapServers. Snap EDR is designed to work with SnapServers and other SnapServer Storage Solutions.

SnapExtension

An application that extends the functionality of a SnapServer or SnapScale cluster.

SnapServer Manager

The SnapServer Manager (SSM) is a Java-based utility for discovering and monitoring SnapServers and SnapScale clusters.

Snapshot Chaining

A native technology in which all snapshots of a volume depend on successive snapshots for part of their content.

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SNMP

Short for *Simple Network Management Protocol*. A system to monitor and manage network devices such as computers, routers, bridges, and hubs. SNMP views a network as a collection of cooperating, communicating devices, consisting of managers and agents.

SSH

Short for *Secure Shell*. A service that provides a remote console for special system administration and customer support access to the server. SSH is similar to telnet but more secure, providing strong encryption so that no passwords cross the network in clear text.

SSL

Short for *Secure Sockets Layer*. A protocol for managing the security of a message sent on the Internet. It is a type of technology that provides data encryption, server authentication, message integrity, and client authentication for any TCP/IP connection.

Standalone

A network bonding mode which treats each port as a separate interface. This configuration should be used only in multihomed environments in which network storage resources must reside on two separate subnets.

Static IP Address

An IP address defined by the system administrator rather than by an automated system, such as DHCP.

Storage Area Network

See SAN.

Subnet Mask

A portion of a network that shares a common address component. On TCP/IP networks, subnets are all devices with IP addresses that have the same prefix.

Target

A target is a device (peripheral) that responds to an operation requested by an initiator (host system). Although peripherals are generally targets, a peripheral may be required to act temporarily as an initiator for some commands (for example, SCSI COPY command).

Targets are embedded in iSCSI storage controllers. They are the software that makes the RAID storage available to host computers, making it appear just like any other sort of disk drive.

TCP/IP

Short for *Transmission Control Protocol/Internet Protocol*. The basic protocol used for data transmission over the Internet.

Trap

A signal from a device informing an SNMP management program that an event has occurred.

U

A standard unit of measure for designating the height in computer enclosures and rack cabinets. One U equals 1.75 inches. For example, a 3U server chassis is 5.25 inches high.

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UDP

Short for *User Datagram Protocol*. A communications protocol for sending messages between computers in a network that uses the Internet Protocol (IP). UDP is an alternative to the Transmission Control Protocol but, unlike TCP, does not guarantee reliability or ordering of data packets.

UNC

Short for *Universal Naming Convention*. In a network, a way to identify a shared file in a computer without having to specify (or know) the storage device it is on. In the Windows OS, the UNC name format is as follows:

```
\\server_name\share_name\path\file_name
```

UPS

Short for *Uninterruptible Power Supply*. A device that allows a computer to keep running for a short time when the primary power source is lost. It also provides protection from power surges. A UPS device contains a battery that starts when the device senses a loss of power from the primary source.

URL

Short for *Uniform Resource Locator*. A Web address.

USB Port

USB is short for *Universal Serial Bus*. A USB port is a hardware interface for low-speed peripherals such as the keyboard, mouse, joystick, scanner, printer, and telephony devices.

Web Management Interface

A Web-based utility used for configuration and ongoing maintenance, such as monitoring server conditions, configuring email alerts for key events, or for SNMP management.

Windows Domain Authentication

Windows-based networks use a domain controller to store user credentials. The domain controller can validate all authentication requests on behalf of other systems in the domain. The domain controller can also generate encrypted challenges to test the validity of user credentials. Other systems use encrypted challenges to respond to CIFS/SMB clients that request access to a share.

WINS

Short for *Windows Internet Naming Service*. The server that locates network resources in a TCP/IP-based Windows network by automatically configuring and maintaining the name and IP address mapping tables.

Workgroup

A collection of computers that are grouped for sharing resources such as data and peripherals over a LAN. Each workgroup is identified by a unique name.

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