
# Qsan Document – Software Manual

**TrioNAS QSM 2.0**

**Version 8.60**
**August 2015**

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# Preface

## About This Manual

This manual is the introduction of Qsan unified storage system and it aims to help users know the operations of the disk array system easily. Information contained in this manual has been reviewed for accuracy, but not for product warranty because of the various environments / OS / settings. Information and specification will be changed without further notice. For any update information, please visit www.qsan.com and your contact windows.

Before reading this manual, it assumes that you are familiar with computer skills such as hardware, storage concepts, and network technology. It also assumes you have basic knowledge of Redundant Array of Independent Disks (RAID), Storage Area Network (SAN), Network-Attached Storage (NAS), Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), technology.

**CAUTION:**
Do not attempt to service, change, disassemble or upgrade the equipment's components by yourself. Doing so may violate your warranty and expose you to electric shock. Refer all servicing to authorized service personnel. Please always follow the instructions in this user's manual.

## Technical Support

Thank you for using Qsan Technology, Inc. products; if you have any question, please e-mail to support@qsan.com. We will answer your question as soon as possible.

## Tips and Cautions

This manual uses the following symbols to draw attention to important safety and operational information.

| Symbol | Meaning | Description |
|---|---|---|
|  | **TIP** | Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively. |

| | | |
|---|---|---|
|  | **CAUTION** | Cautions indicate that failure to take a specified action could result in damage to the software or hardware. |

## Conventions

The following table describes the typographic conventions used in this manual.

| Conventions | Description |
|---|---|
| **Bold** | Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.<br>Example: Click OK button. |
| <*Italic*> | Indicates a variable, which is a placeholder for actual text provided by the user or system.<br>Example: copy <source-file> <target-file>. |
| [ ] square brackets | Indicates optional values.<br>Example: [ a \| b ] indicates that you can choose a, b, or nothing. |
| { } braces | Indicates required or expected values.<br>Example: { a \| b } indicates that you must choose either a or b. |
| \| vertical bar | Indicates that you have a choice between two or more options or arguments. |
| / Slash | Indicates all options or arguments. |
| underline | Indicates the default value.<br>Example: [ a \| b ] |

## Legal Notice

All the features, functionality, and other product specifications are subject to change without prior notice or obligation. Information contained herein is subject to change without notice.

# Contents

# 1 Getting Started

Thank you for using Qsan Technology, Inc. products. This chapter introduces the unified storage system and how to get started with the storage. It includes the following sections:

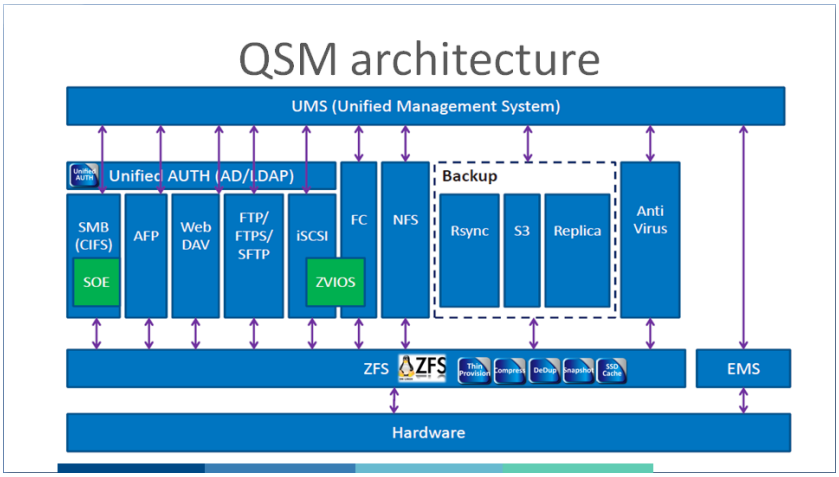


## Introduction

Qsan TrioNAS consolidates NAS, IP-based iSCSI SAN, and allows users to link these to cloud storage. With TrioNAS, organizations can manage files and run applications in one device to reduce hardware requirements. The integration of Amazon S3 storage enables users to easily backup data into the cloud and, with just one click; disaster recovery can be fulfilled effortlessly. TrioNAS supports multiple protocols including SMB, NFS, AFP, FTP, WebDAV as well as iSCSI. The combination delivers storage solutions with great performance, manageability and efficiency.

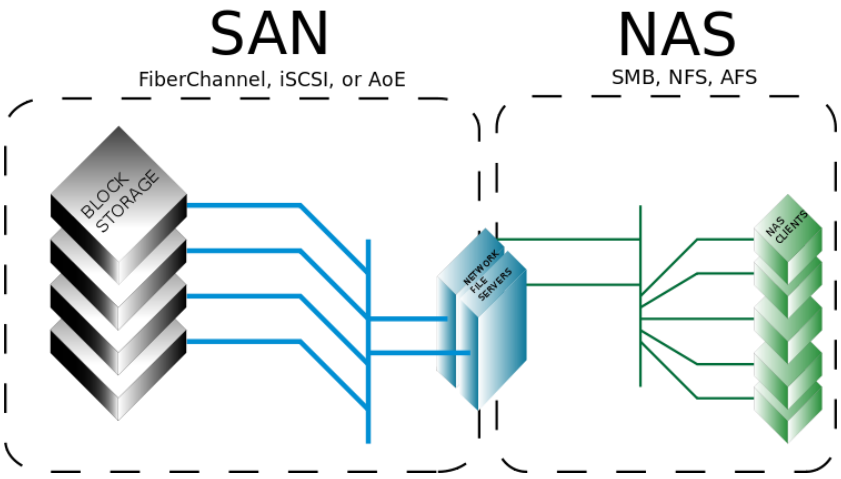

- QSM (Qsan Storage Manager)

  The system software, QSM adopts ZFS file system that employs copy-on-write transactional semantics to validate data stored under its protection to avoid data inconsistencies. The self-healing architecture enables the system to detect silent data corruption and correct error on the fly.




- Unified Storage

  NAS (Network-Attached Storage) is file-level computer data storage connected to a computer network providing data access to heterogeneous clients. NAS uses file-based protocols such as NFS (popular on UNIX systems), SMB/CIFS (Server Message Block/Common Internet File System) (used with MS Windows systems), or AFP (used with Apple Macintosh computers). NAS units rarely limit clients to a single protocol.



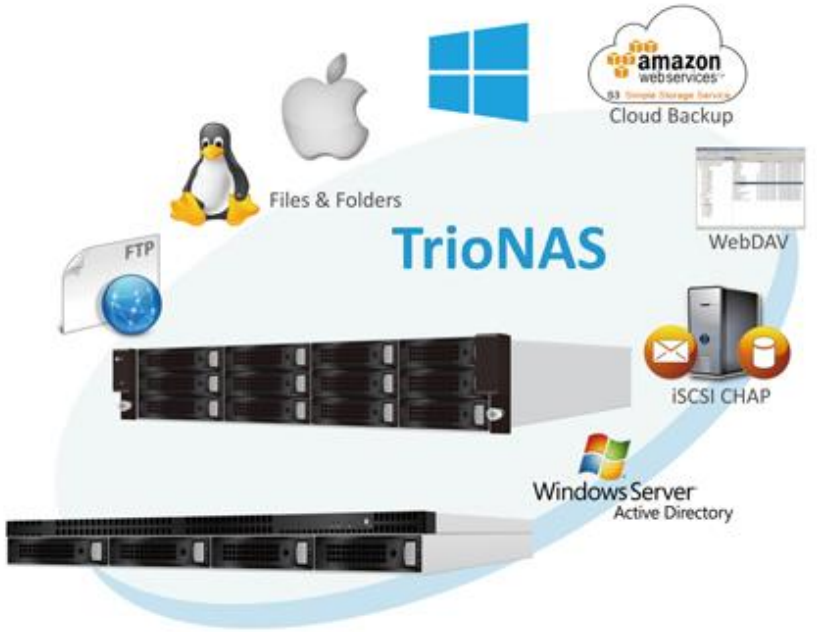

NAS provides both storage and a file system. This is often contrasted with SAN (Storage Area Network), which provides only block-based storage and leaves file system concerns on the "client" side. SAN protocols are SCSI, Fibre Channel, iSCSI, ATA over Ethernet (AoE), or HyperSCSI.

One way to loosely conceptualize the difference between a NAS and a SAN is that a NAS appears to the client OS (operating system) as a file server (the client can map network drives to shares on that server) whereas a disk available through a SAN still appears to the

client OS as a disk, visible in disk and volume management utilities (along with client's local disks), and available to be formatted with a file system and mounted.

- UnifiedAUTH

  QSM delivers outstanding integration of Windows Active Directory and LDAP for IT administrators to easily manage accounts. The supports for multiple domains of Windows Active Directory plus the patent-pending UnifiedAUTH empower TrioNAS to provide superior manageability.




- SSD Caching

  QSM supports SATA and SSD drives. Compared with SAS disk pool, through the hybrid pool of both SATA and SSD disks IT administrators can achieve equal performance at less cost and power consumption. Furthermore, SSD caching allows users to assign SSD as the system's read/write cache to fully utilize the benefits of SSD for business-critical applications that require quick read/write speed and random I/O.

- Local, Remote, and Cloud replications

  To ensure data security, users can back up valuable folders and files to another device through rsync. The integration with Amazon S3 also makes back up more efficiently, and with just one click, disaster recovery can be fulfilled effortlessly.

Qsan for years has won many proven records in enterprise market and now TrioNAS is aimed to bring the enterprise-class features into SMB market at competitive price, helping organizations to manage IT infrastructure at minimum efforts.

## Quick Start Guide

This manual provides conceptual information about storage systems, detailed instructions about using system, and recommendations about configuring, managing, and backing up system. We recommend that you read this manual to make the best use of the storage system. To quickly start using the system, review the following sections in this order.

For beginner:

- Quick Setup Wizard, 4 steps to easy setup the system.

For advanced user:

- System Settings and Network Settings to setup basic system setting.
- Privilege Settings to create users and user groups.
- Storage Settings to create pools and volumes
- Manage Shared Folders to share folders with user permission.
- Manage LUNs to create iSCSI/FC LUNs.
- Backup to replicate the data for protection.

## Additional Documentation

For more information about system hardware, see the hardware manual, which is available at QUM201507-Qsan_TrioNAS_LX_U300_Hardware_Manual

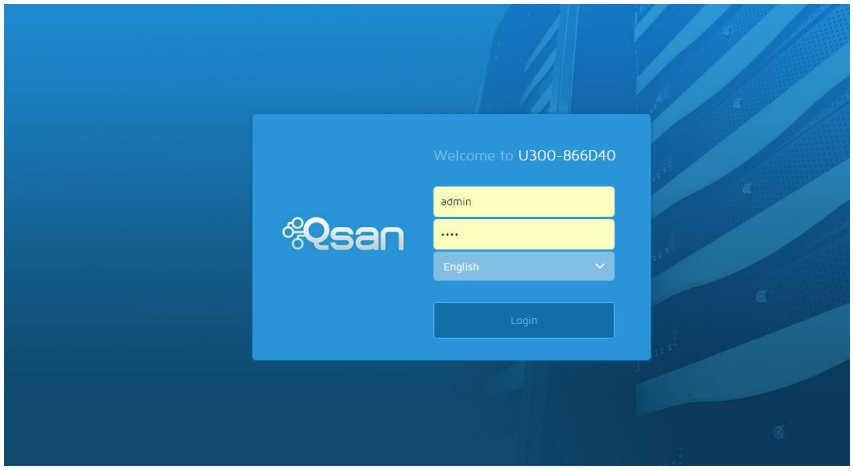
For more information about technical documents, you may surfer our knowledge base.
http://www.qsan.com/en/faq.php

## Access Web UI Admin Page

Qsan storage system uses a web graphic user interface operation. It supports most common web browsers. Be sure to connect the LAN cable to LAN1 of the system.

The web UI can be accessed via every network interface, but we still define management port. The default IP of the management port setting is DHCP; check the LCM to find the IP address. If your network does not have DHCP server, you will need to configure a static IP address.

http://<*IP Address*> (e.g.: http://192.168.1.234)

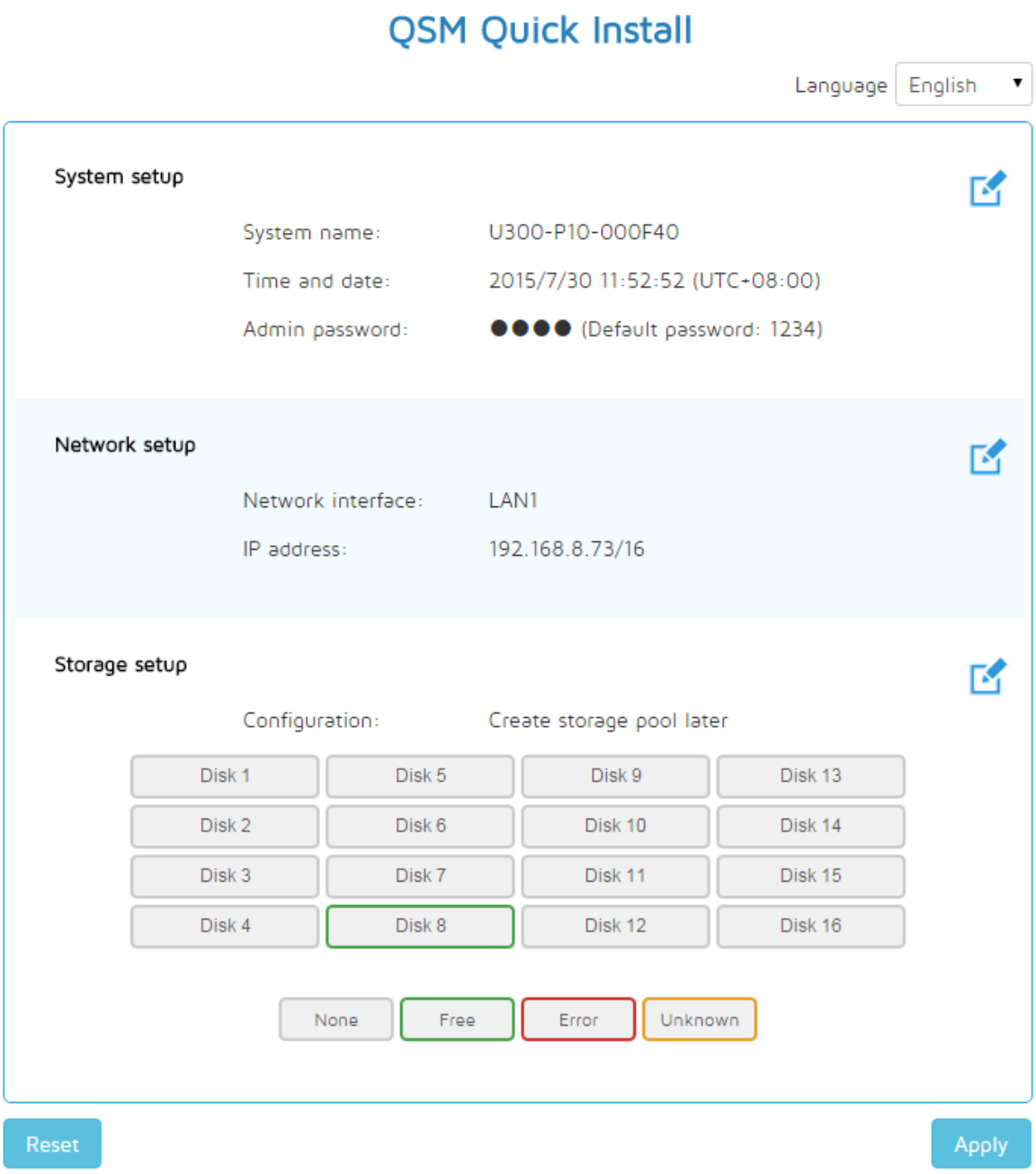



To access the Web UI, you have to enter a user name and password. The initial defaults for administrator login are:

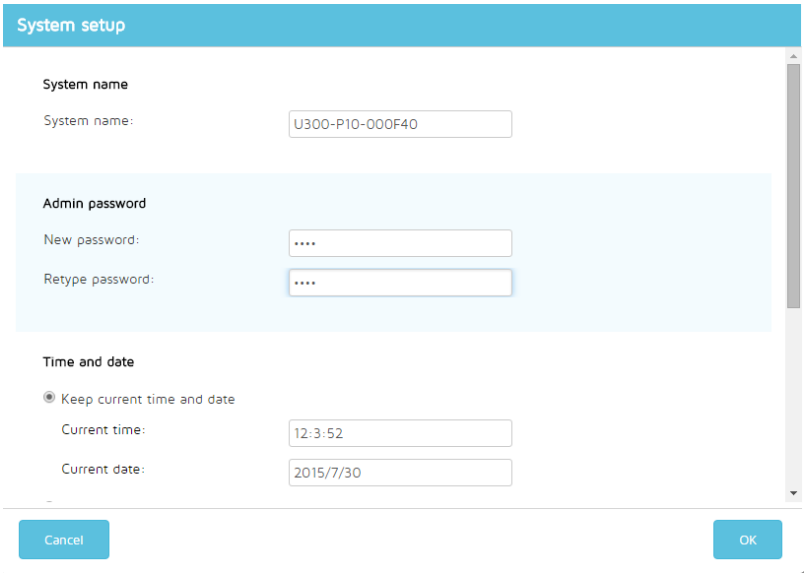
- User Name: admin
- Password: 1234

## Quick Setup Wizard

If you login at the first time, the system will run quick setup wizard. The condition is pure configuration (Reset to factory default) and no pools in the system. Please follow the steps to complete the setup. Click on the upper right corner to enter each setup page for details.



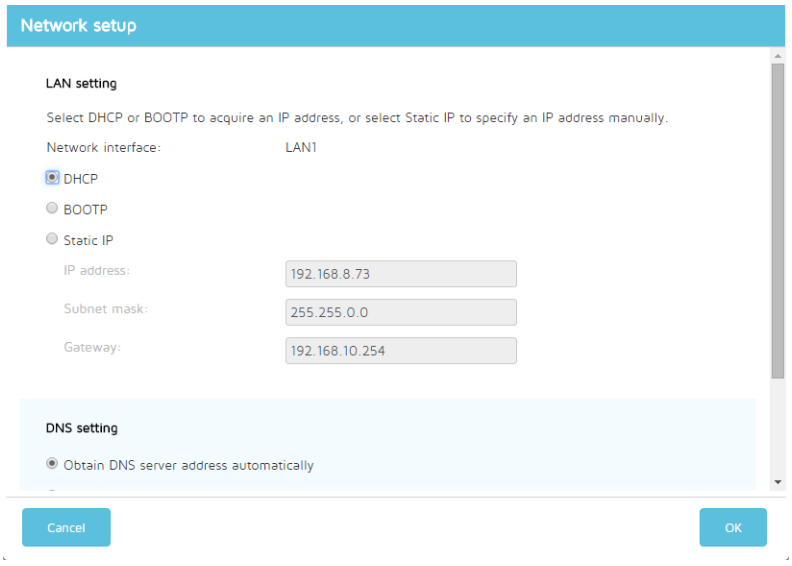
### 1. System setup




- **System name:** To change the **System name**, highlight the old name and type in a new one.
- **Admin password:** Enter a new password and retype it. The maximum length of password is 16 alphanumeric characters.
- **Time and date setup:** Change the current date, time and time zone settings. Click **Manual** radio button and select the current date and time. Or click **Get from time server** radio button and enter the IP address of NTP (Network Time Protocol) server to synchronize the time from a time server.
- **Time zone setup:** To change time zone settings.

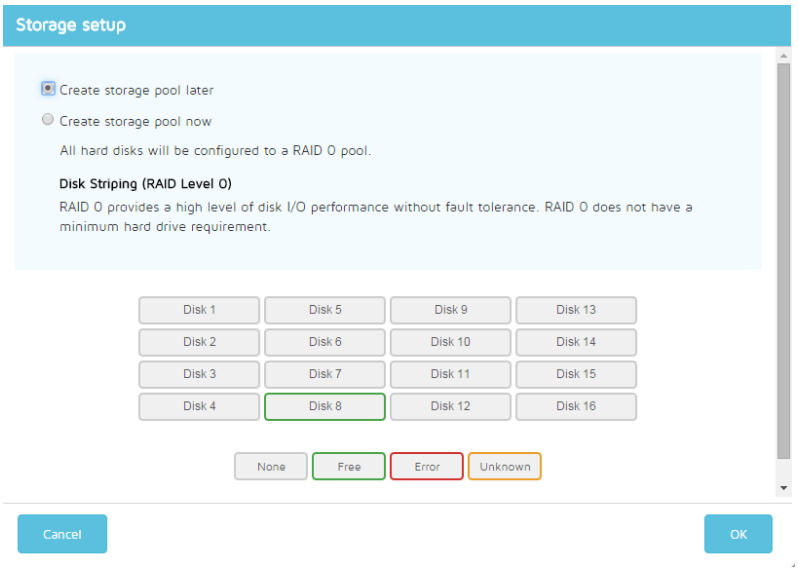
When it is done, click **OK** button.

### 2. Network setup




**LAN1:** There are three options: **DHCP**, **BOOTP** or specify a **Static** IP address. The default LAN1 IP address is 192.168.1.234/255.255.255.0. When it is done, click **OK** button.

### 3. Storage setup




- **Configure later:** If you want to create more than one pool, select this to configure the storage later.
- **Configure now:** The system will detect HDDs automatically to create a proper RAID. RAID 0 for 1 HDD, RAID 1 for 2 HDDs …etc.

When it is done, click **OK** button.

### 4. Confirm

After confirm, click **Apply** button.

After quick setup wizard, the basic configurations are completed. There is a Dashboard page for a whole system view. If you select **Configure now** at **Storage setup**, you can start to access the shared folder now. Please refer to Access Shared Folders section for more detail. If you select **Configure later** , you may jump to Storage Settings to create storage pool.

# 2 System Configurations

This chapter describes how to configure and maintain the system. It includes the following sections:



## System Settings

### Basic System Setting

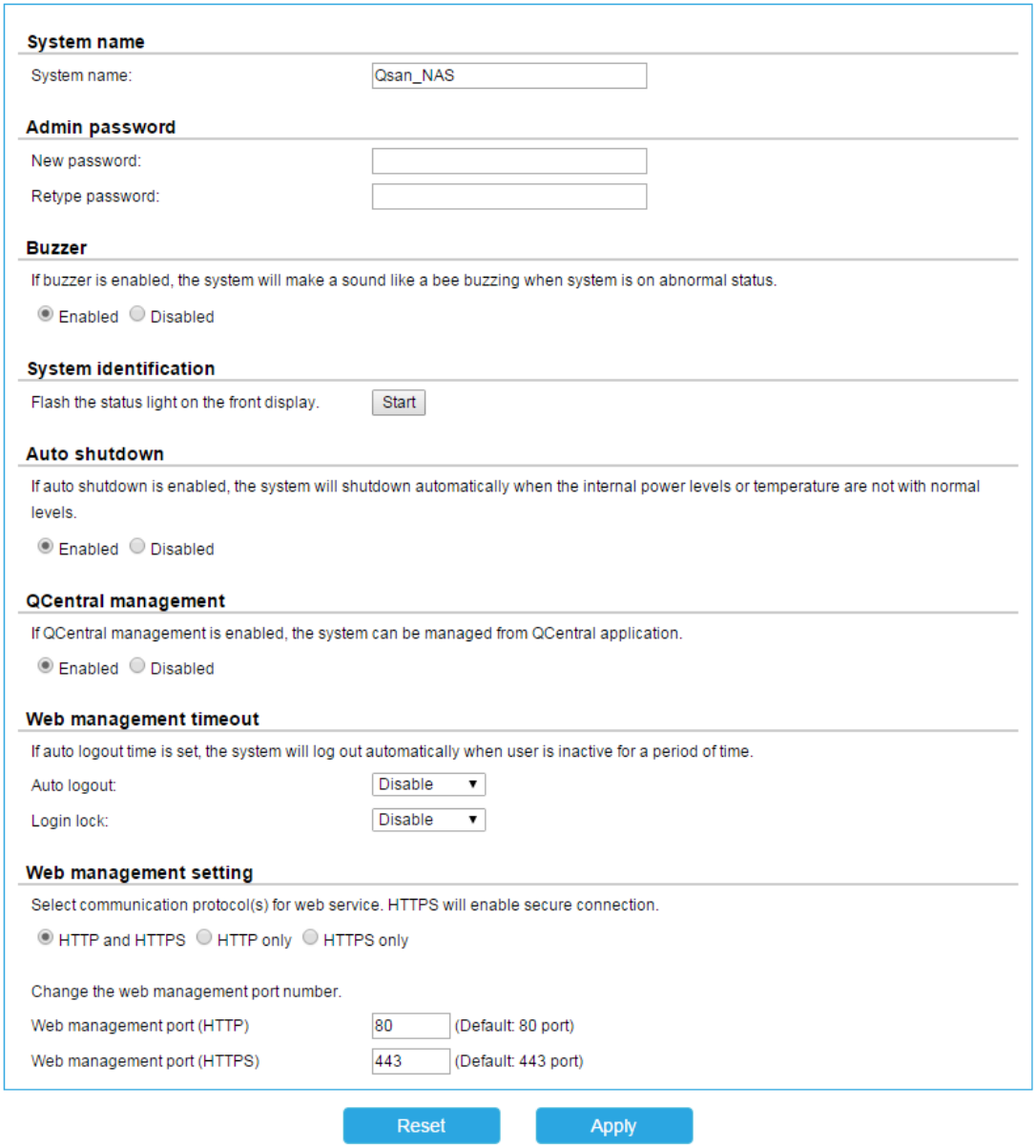
The **System setting -> General setting -> System** option is used to setup the system name, administrator password, system buzzer, system indication, auto shutdown, and management access control. The default system name is composed of the model name and the serial number of this system.

The options are available in this tab:

- **System name:** To change the **System name**, highlight the old name and type in a new one.
- **Admin password:** Enter a new password and retype it. The maximum length of password is 16 alphanumeric characters.
- **Buzzer:** Enable it to let the system make a sound like a bee buzzing when the system is abnormal.
- **System identification:** Click **Start** button to flash the status light on the front display. Click **Stop** button to stop.
- **Auto shutdown:** Enable it to let the system shutdown automatically when the voltage or temperature is out of the normal range. For better data protection, it is recommended to check **Auto Shutdown**.
- **QCentral management:** Enable it to let the system can be managed by QCentral application.

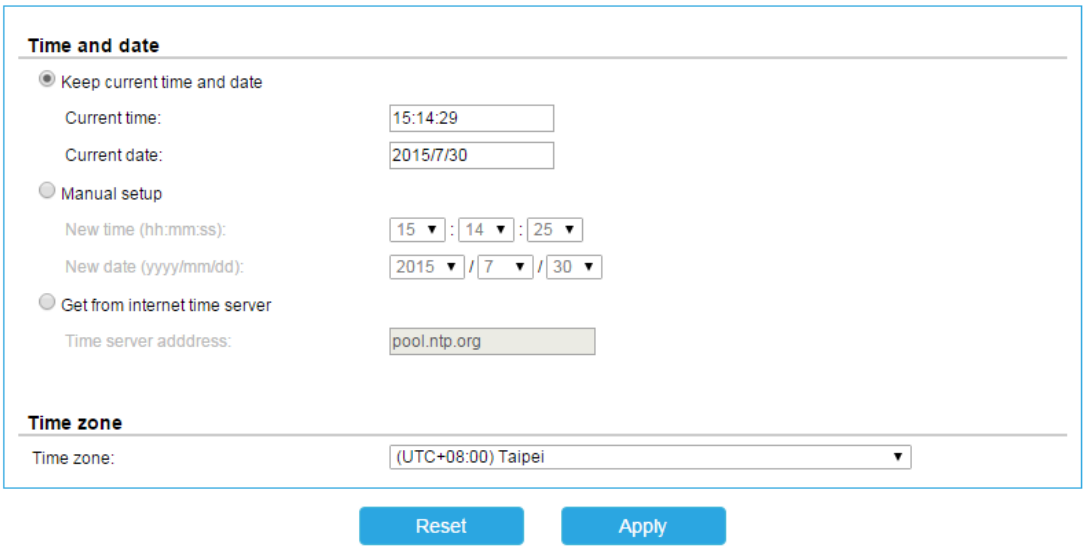
- **Web management timeout:** When the auto logout option is enabled, you will be logged out of the admin interface after the time specified. There are Disable (default), 5 minutes, 30 minutes and 1 hour options. When the login lock is enabled, the system allows only one user to login to the web UI at a time. There are Disable (default) and Enable options.
- **Web management setting:** Select the protocols for the web service, HTTP, HTTPS, or both. If the default port numbers of HTTP and HTTPS are not allowed on the network, they can be changed here.

When it is done, click **Apply** button.



### Time Setting

The **System setting -> General setting -> Time** option is used to setup the system time and NTP (Network Time Protocol) server setting.




The options are available in this tab:

- **Time and date setup:** Change the current date, time and time zone settings. Click **Manual** radio button and select the current date and time. Or click **Get from time server** radio button and enter the IP address of NTP (Network Time Protocol) server to synchronize the time from a time server.
- **Time zone setup:** To change time zone settings.

When it is done, click **Apply** button.

## Network Settings

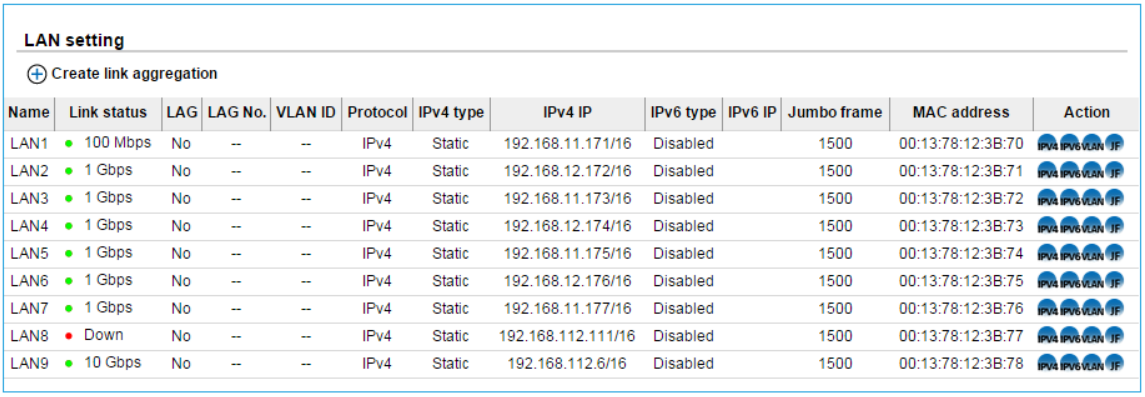
### Basic Network Setting

The **System setting -> Network -> General setting** option is for accessing the LAN ports. It is used to change IP addresses of network ports. The various controllers have different network port configurations:

**TrioNAS LX U300:**

- **U300-P10:** 7 x GbE ports per controller.
- **U300-P20:** 2 x 10GbE ports (SFP+) + 7 x GbE ports per controller.
- **U300-F30:** 2 x 16Gb Fibre Channel ports (SFP+) + 7 x GbE ports per controller.

Each port must be assigned its own IP address via IPv4 or IPv6. It can also be assigned a VLAN ID or changed jumbo frame. The following example shows the U300-P10 series (7 x GbE ports).



LAN setting

Create link aggregation

| Name | Link status | LAG | LAG No. | VLAN ID | Protocol | IPv4 type | IPv4 IP | IPv6 type | IPv6 IP | Jumbo frame | MAC address | Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAN1 | 100 Mbps | No | -- | -- | IPv4 | Static | 192.168.11.171/16 | Disabled | | 1500 | 00:13:78:12:3B:70 | |
| LAN2 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.12.172/16 | Disabled | | 1500 | 00:13:78:12:3B:71 | |
| LAN3 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.11.173/16 | Disabled | | 1500 | 00:13:78:12:3B:72 | |
| LAN4 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.12.174/16 | Disabled | | 1500 | 00:13:78:12:3B:73 | |
| LAN5 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.11.175/16 | Disabled | | 1500 | 00:13:78:12:3B:74 | |
| LAN6 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.12.176/16 | Disabled | | 1500 | 00:13:78:12:3B:75 | |
| LAN7 | 1 Gbps | No | -- | -- | IPv4 | Static | 192.168.11.177/16 | Disabled | | 1500 | 00:13:78:12:3B:76 | |
| LAN8 | Down | No | -- | -- | IPv4 | Static | 192.168.112.111/16 | Disabled | | 1500 | 00:13:78:12:3B:77 | |
| LAN9 | 10 Gbps | No | -- | -- | IPv4 | Static | 192.168.112.6/16 | Disabled | | 1500 | 00:13:78:12:3B:78 | |

They can be configured in a multi-homed mode, or a present link aggregation / trunking mode. When multiple LAN ports are set up in the link aggregation or trunking mode, all the LAN ports share the same IP address. Notice that 1GbE and 10GbE LAN ports cannot be linked aggregation together. The following table describes the relationship with the service and the network ports.

This table shows the column descriptions.

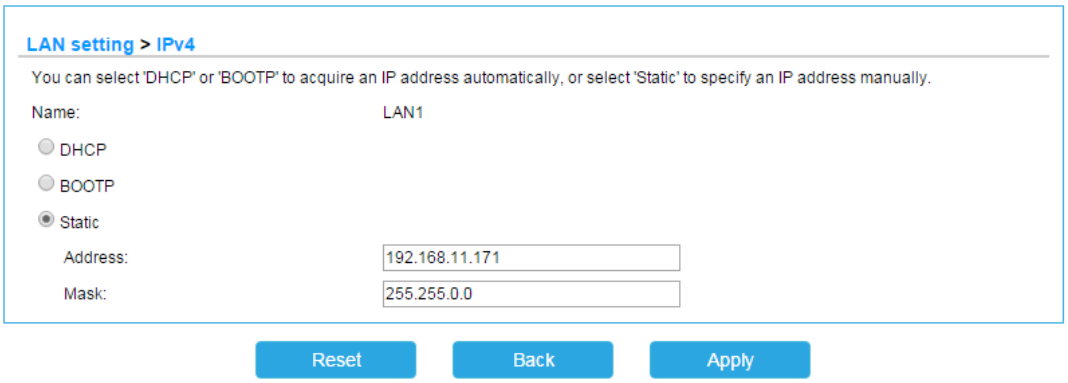
| Column Name | Description |
|---|---|
| Name | Port name. |
| Link status | Link up or down.<br>• Green light: link up.<br>• Red light: link down. |
| LAG | Link aggregation status. |
| LAG No. | Link aggregation number. |
| VLAN ID | VLAN number. |
| Protocol | Use IPv4 or IPv6. |
| IPv4 type | IPv4 address mode:<br>• Static: static address.<br>• DHCP: DHCP assigned address. |
| IPv4 IP | IPv4 address. |
| IPv6 type | IPv6 address mode:<br>• Static: static address.<br>• Auto: RA (router advertisement" calculated address.<br>• DHCP: DHCPv6 assigned address. |
| IPv6 IP | IPv6 address. |
| Jumbo frame | Jumbo frame size |
| MAC Address | MAC address |

The options are available in this tab:

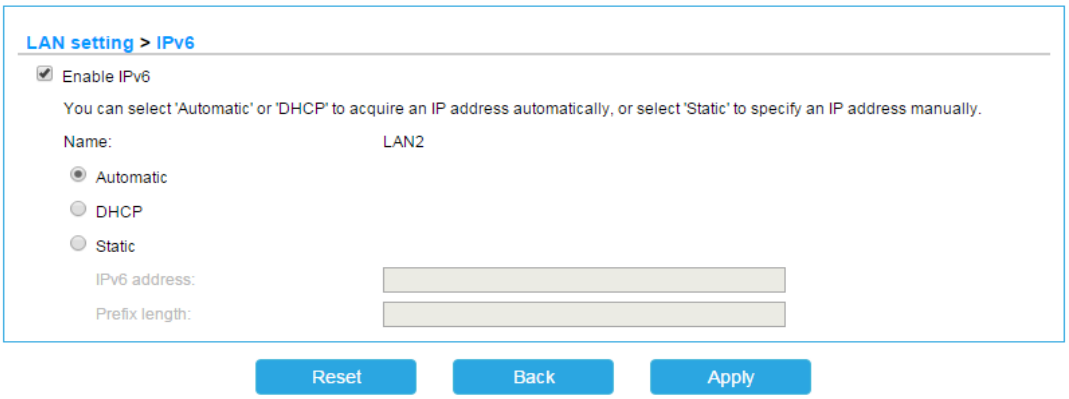
- **Create link aggregation:** Set link aggregation or multi-homed.

The options are available in the **Action** column:

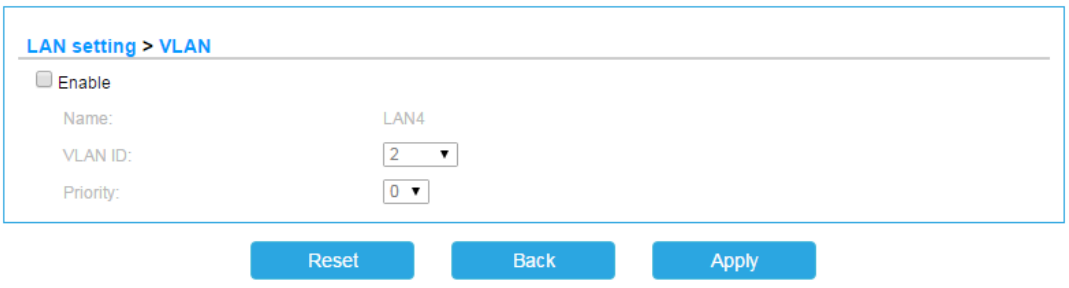
- **IPv4:** There are three options: **DHCP**, **BOOTP** or specify a **Static** IP address. The default LAN1 IP address is 192.168.1.234/255.255.255.0.



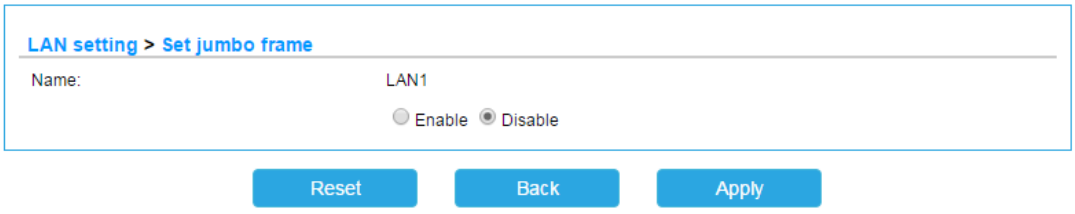

- **IPv6:** There are three options: **Automatic**, **DHCP**, or **Static** for specifying IPv6 address. The default is **Automatic**.




- **VLAN:** Setup VLAN ID and priority if necessary.

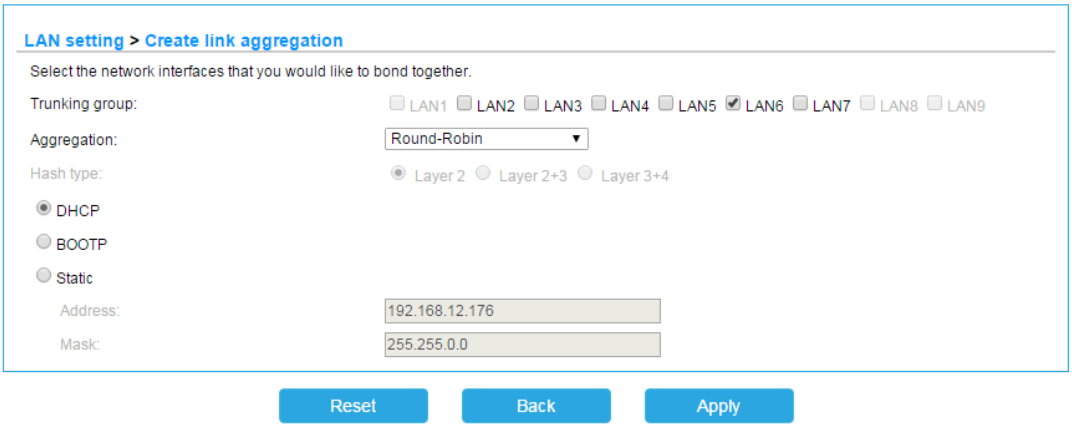



- **Jumbo frame:** Enable or disable jumbo frame on the port.



Take an example of creating link aggregation.

1. Click **Create link aggregation** button.




2. Select the network interfaces which you want to bond together.
3. Select the aggregation mode.
4. Assign an IP address by **DHCP**, **BOOTP** or specify a **Static** IP address.
5. Click **Apply** button to create link aggregation.

**TIP:**

Aggregation mode:

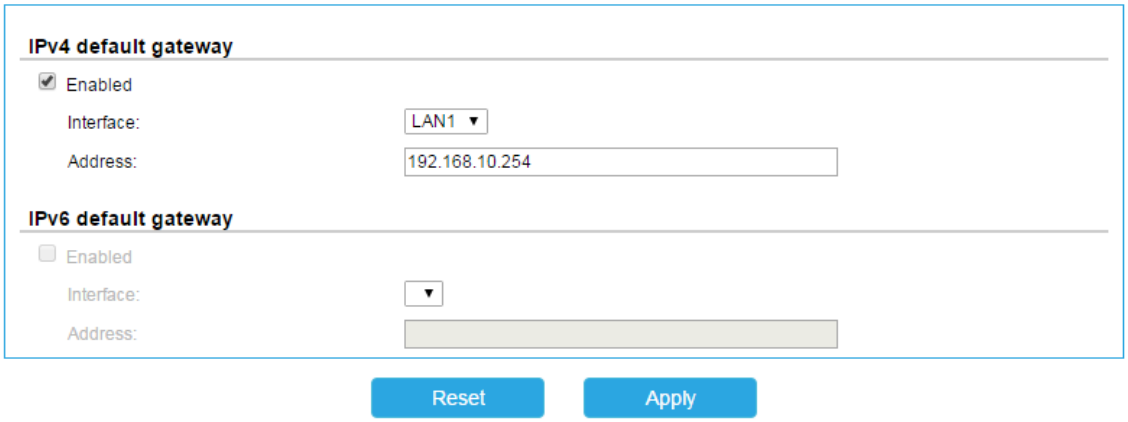
- **Round-Robin:** Transmit network packets in sequential order from the first available network interface (NIC) slave through the last. This mode provides load balancing and fault tolerance.
- **Active Backup:** Only one NIC slave in the bond is active. A different slave becomes active if, and only if, the active slave fails. The single logical bonded interface's MAC address is externally visible on only one NIC (port) to avoid distortion in the network switch. This mode provides fault tolerance.
- **Trunking:** Transmit network packets based on [(source MAC address XOR'd with destination MAC address) modulo NIC slave count]. This selects the same NIC slave for each destination MAC address. This mode provides load balancing and fault tolerance.
- **Broadcast:** Transmit network packets on all slave network interfaces. This mode provides fault tolerance.
- **LACP:** IEEE 802.3ad Dynamic link aggregation (802.3ad) Creates aggregation groups that share the same speed and duplex settings. Utilizes all slave network interfaces in the active aggregator group according to the 802.3ad specification.
- **Transmit Load Balancing:** The bonding driver mode that does not require any special network-switch support. The outgoing network packet traffic is distributed according to the current load (computed relative to the speed) on each network interface slave. Incoming traffic is received by one currently designated slave network interface. If this receiving slave fails, another slave takes over the MAC address of the failed receiving slave.
- **Adaptive Load Balancing:** It includes transmit load balancing plus receive load balancing for IPV4 traffic, and does not require any special network switch support. The receive load balancing is achieved by ARP negotiation. The bonding driver intercepts the ARP Replies sent by the local system on their way out and overwrites the source hardware address with the

| | |
|---|---|
| | unique hardware address of one of the NIC slaves in the single logical bonded interface such that different network-peers use different MAC addresses for their network packet traffic. |

(* Reference from http://en.wikipedia.org/wiki/Link_aggregation)

## Default Gateway Setting

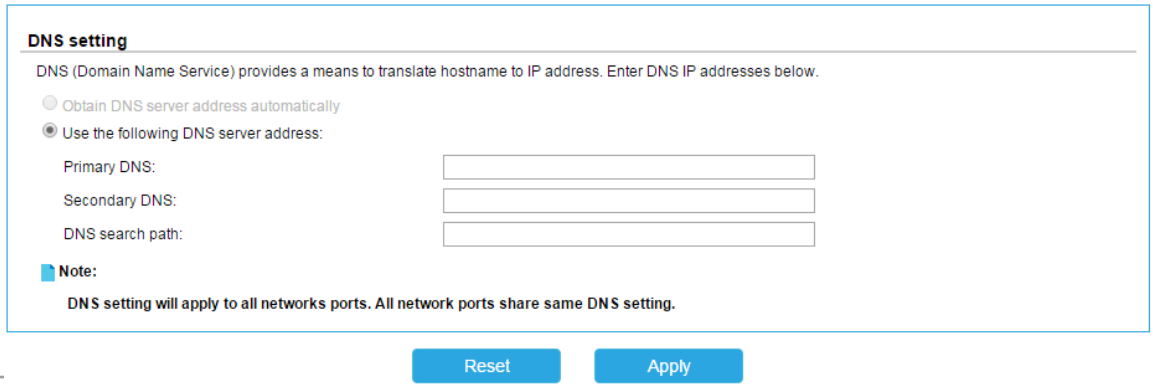
The **System setting -> Network -> Default gateway** option provides the function to enable or disable the port as default gateway.




Check **IPv4 default gateway** or **IPv6 default gateway**, select the interface and enter the default IP address. When it is done, click **Apply** button.

## DNS Setting

The **System setting -> Network -> DNS** option is for accessing the **DNS (Domain Name Service) setting**. It is used to change DNS IP addresses.



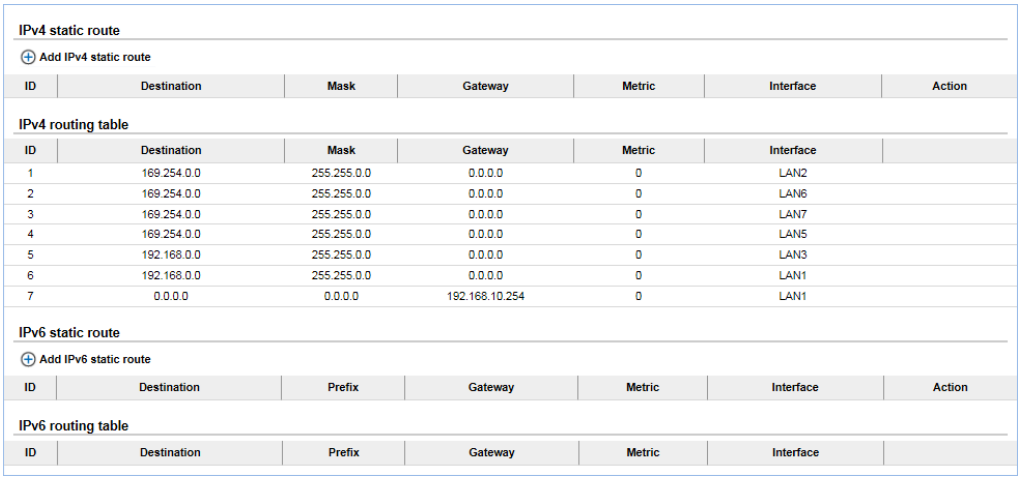
The options are available in this tab:

- **Primary DNS:** The IP address of DNS server can be entered or changed here. The DNS settings will be applied to all network ports, which mean you ONLY need to select one of the network ports and start DNS setting.
- **Secondary DNS:** Optional.
- **DNS search path:** It is a list of domains to try when the system tries to translate a machine name into an IP address. It provides more flexibility than the simple domain statement.

The following sections are advanced network settings, you can skip those and jump to Notification settings.

## Routing Setting

The **System setting -> Network -> Routing** option is for accessing the **IPv4 static route** and **IPv6 static route.**

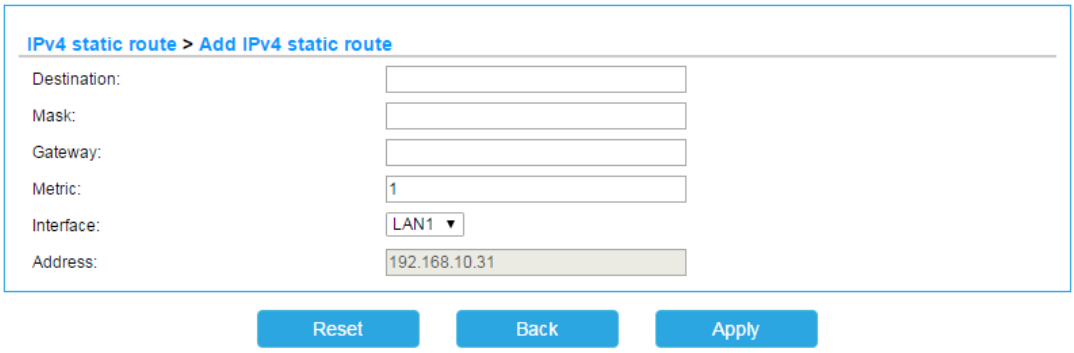



The option is available in this tab:

- **Add IPv4/IPv6 static route:** Enter the IP settings of static route, and then select the network interface. When it is done, click **Apply** button.

Take an example of creating Add IP4v4 static route.

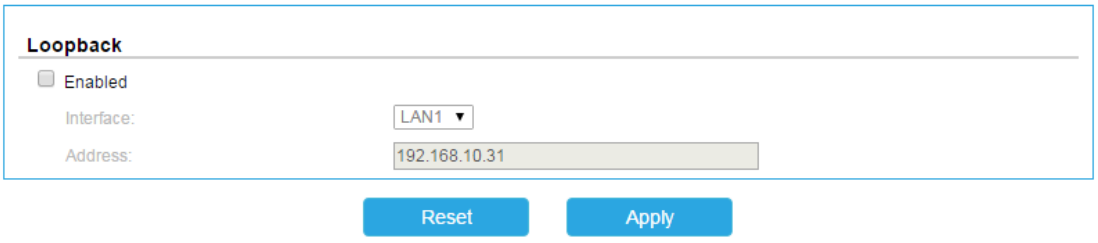
1. Click **Add IPv4 static route** button.




2. Enter the destination IP address, subnet mask, gateway, and metric.
3. Select an interface.
4. Click **Apply** button to add an IPv4 static route.

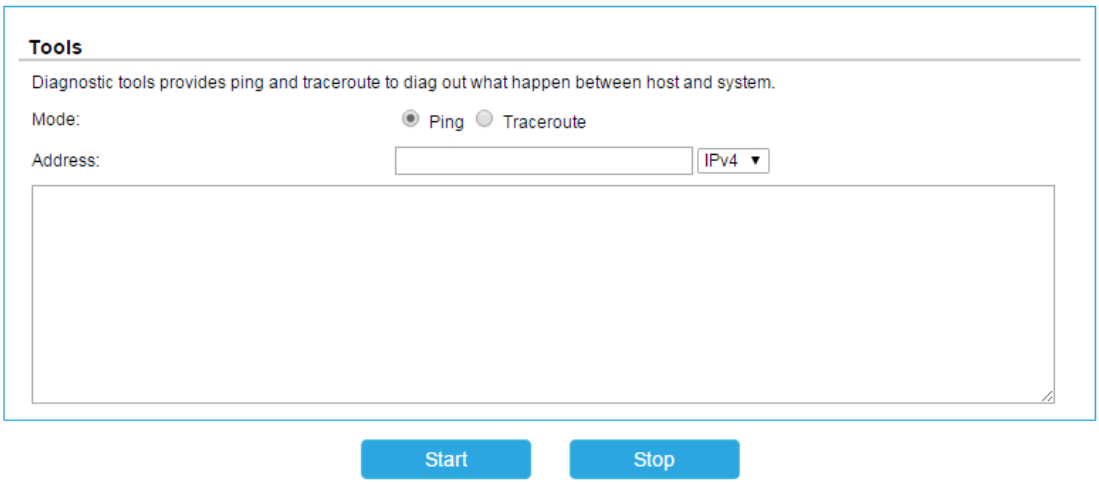
## Loopback Setting

The **System setting -> Network -> Loopback** option provides the function to set lookback interface. If it is enabled, it supports mail, SNMP, and system log server.

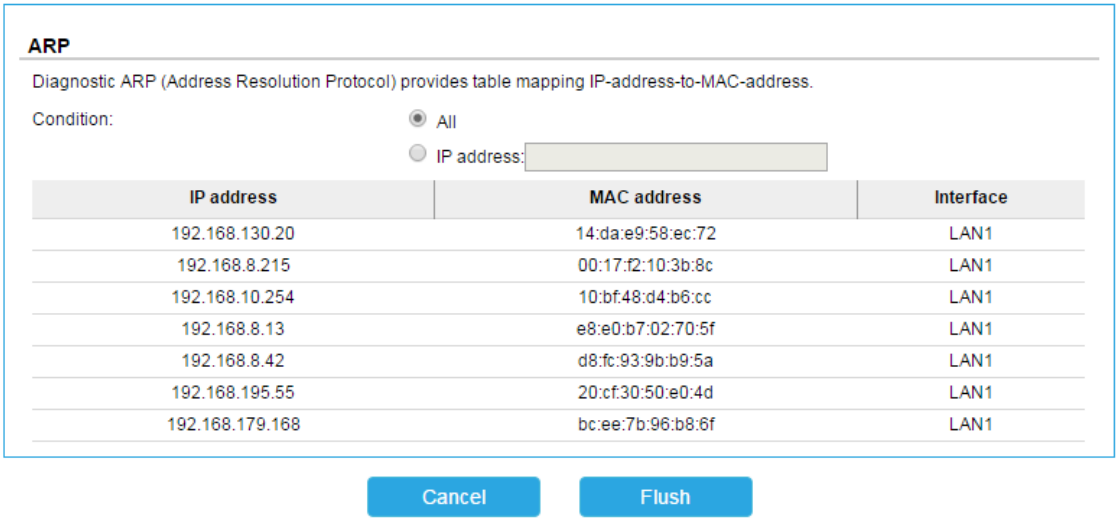



## Network Diagnostic Tools

The **System setting -> Network -> Ping/Traceroute** option provides to ping and traceroute to diag out what happen between the host and the system.

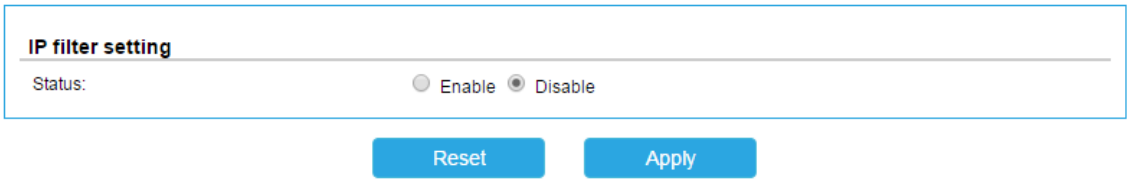


The **System setting -> Network -> ARP** (Address Resolution Protocol) option provides table mapping IP address to MAC address.




## IP Filter Setting

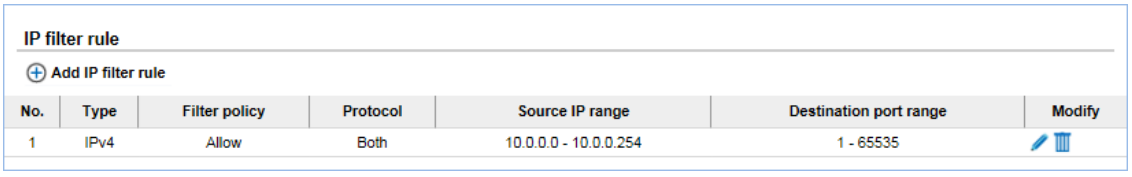
The **Security -> IP Filter** option is for accessing **IP filter setting** and **IP filter rule**. It provides the basic firewall function. Please be aware that IP filter rule cannot be enabled or disabled separately. Once IP filter function is enabled, all rules will be applied.




The options are available on **IP filter setting** tab:

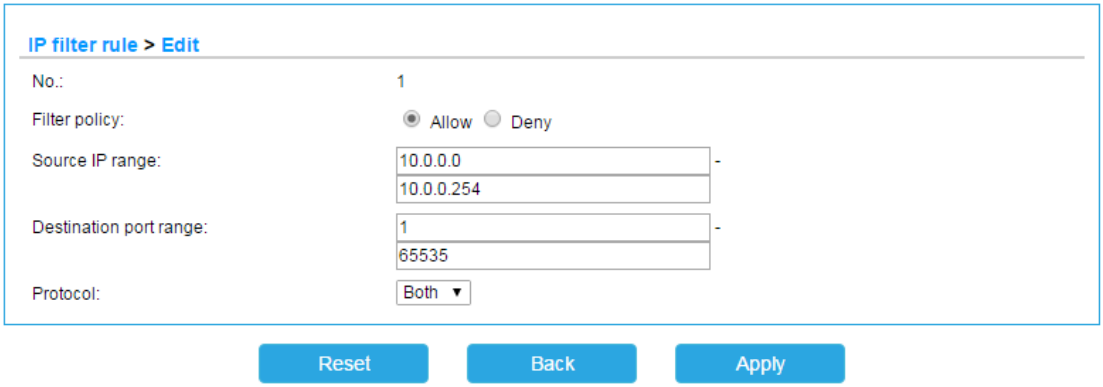
- **Status:** The IP filter function enables or disables.

The **IP filter rule** tab provides the function to set IP filter rules.




The options are available in this tab:

- **Add IP filter rule:** Define filter policy, IP ranges, port ranges and protocol.



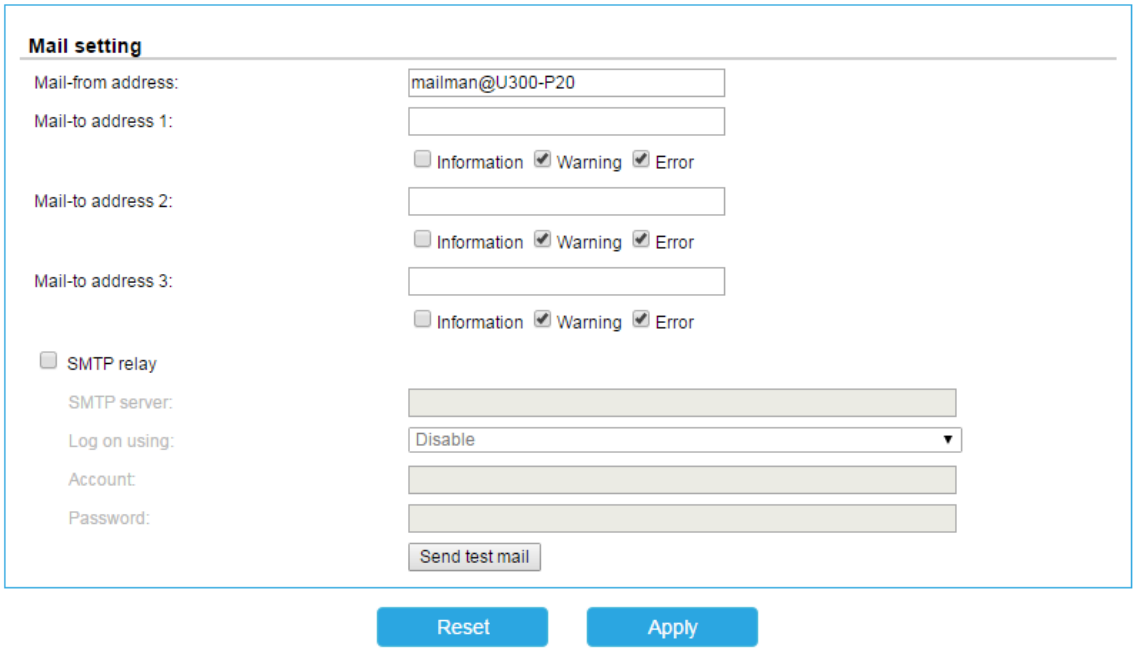

# Notification Settings

## Mail Setting

The **Monitor -> Notification -> Email** option is used to enter mail addresses for receiving the event notifications. Fill in the necessary fields and click **Send test mail** to test whether it is workable. Some mail servers check the **Mail-from address** and need the SMTP relay setting for authentication.

**TIP:**
Please make sure the DNS server IP is well-setup in **System setting -> Network -> DNS**. So the event notification mails can be sent successfully.

You can also select which levels of event logs which you would like to receive. The default setting includes WARNING and ERROR event logs only.

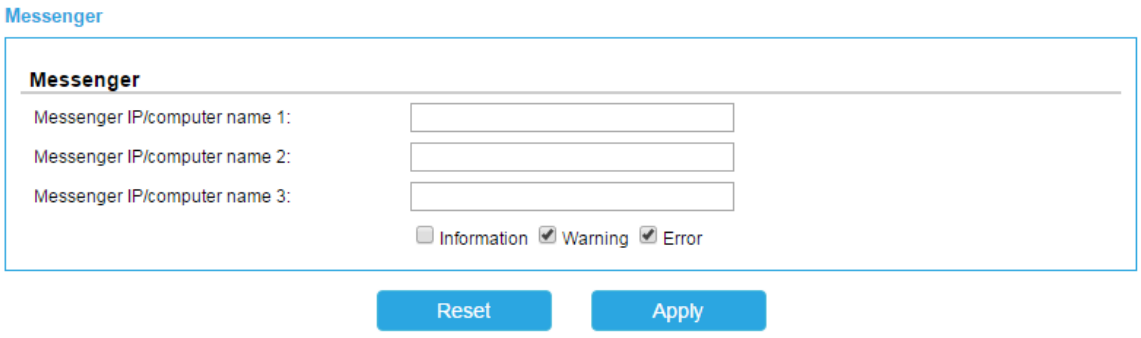



For the security reason, we support the communication of email authentication by SSL and TLS, please select it from **Log on using** combo box. When it is done, click **Apply** button.

The following sections are options for notification; you can skip those and jump to Privilege setting.

## Messenger Setting

The **Monitor -> Notification -> Messenger** option is used to setup pop-up messages via Windows messenger (not MSN).



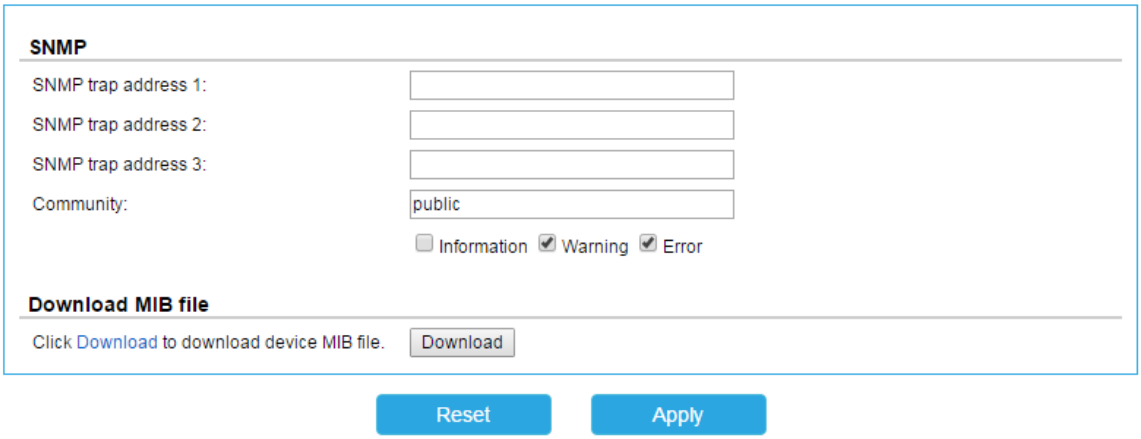

The options are available in this tab:

- **Messenger:** You must enable the Messenger service in Windows (**Start -> Control Panel -> Administrative Tools -> Services -> Messenger**). It allows up to three Messenger addresses. You can choose the alert levels which you would like to receive. The default setting only includes WARNING and ERROR event logs.

When it is done, click **Apply** button.

## SNMP Setting

The **Monitor -> Notification -> SNMP** option is used to setup SNMP traps (for alerting via SNMP).




The options are available in this tab:

- **SNMP trap address:** It allows up to three SNMP trap addresses. The default community setting is public. You can choose the alert levels which you would like to receive. The default setting only includes WARNING and ERROR event logs.

  There are many SNMP tools avaiable on the internet.

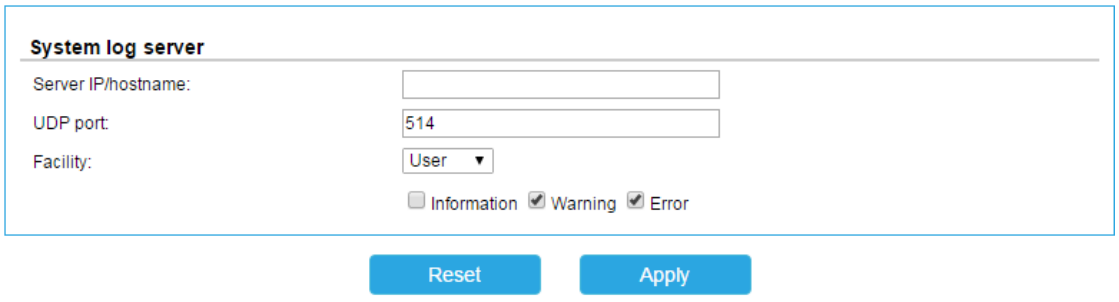
  - SNMPc: http://www.snmpc.com/
  - Net-SNMP: http://net-snmp.sourceforge.net/

- **Download MIB file:** Click **Download** button to download MIB file for SNMP usage.

When it is done, click **Apply** button.

## Log Server Setting

The **Monitor -> Notification -> Log server** option is used to setup alerts via the syslog protocol.




The options are available in this tab:

- **Server IP/hostname:** Fill in the necessary fields for syslog service. The default port is 514. You can choose the alert levels which you would like to receive. The default setting only includes WARNING and ERROR event logs.

There are some syslog server tools available on the internet for Windows.

- WinSyslog: http://www.winsyslog.com/
- Kiwi Syslog Daemon: http://www.kiwisyslog.com/

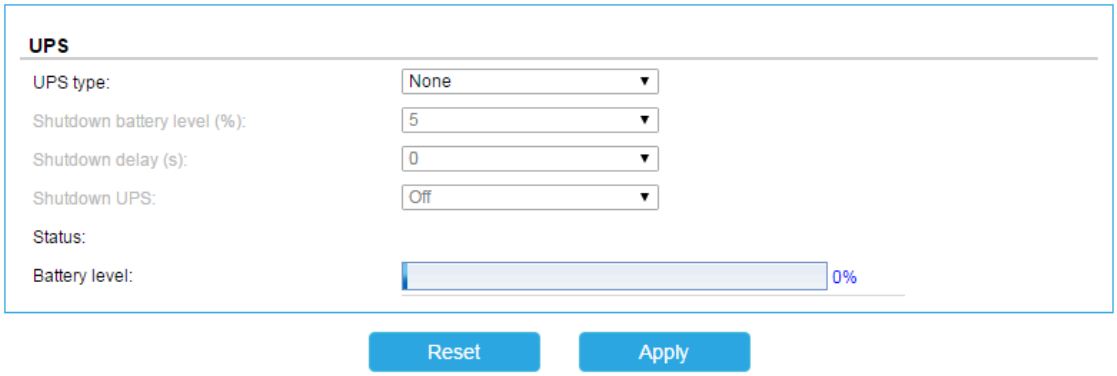
Most UNIX systems have built-in syslog daemon.

When it is done, click **Apply** button.

# Power Management

## UPS Setting

The **System setting -> Power management -> UPS** option is used to set up a UPS (Uninterruptible Power Supply).




The system supports and communicates with Smart-UPS series with network function by APC (American Power Conversion Corp, http://www.apc.com/) and Megatec-UPS (Mega System Technologies Inc, http://www.megatec.com.tw/).

**TIP:**
Connection with other vendors of UPS can work well, but they have no such communication features with the system.

Now we support the network UPS via SNMP. First, connect the network cable to UPS well. And then set up the shutdown values for when the power goes out.

This table shows the available options and their descriptions.

| Options | Description |
|---|---|
| UPS Type | Select UPS Type:<br>• None: No UPS or other vendors.<br>• Smart-UPS (Serial port): APC Smart-UPS with RS-232.<br>• Megatec-UPS: Mega System Technologies Inc UPS. |

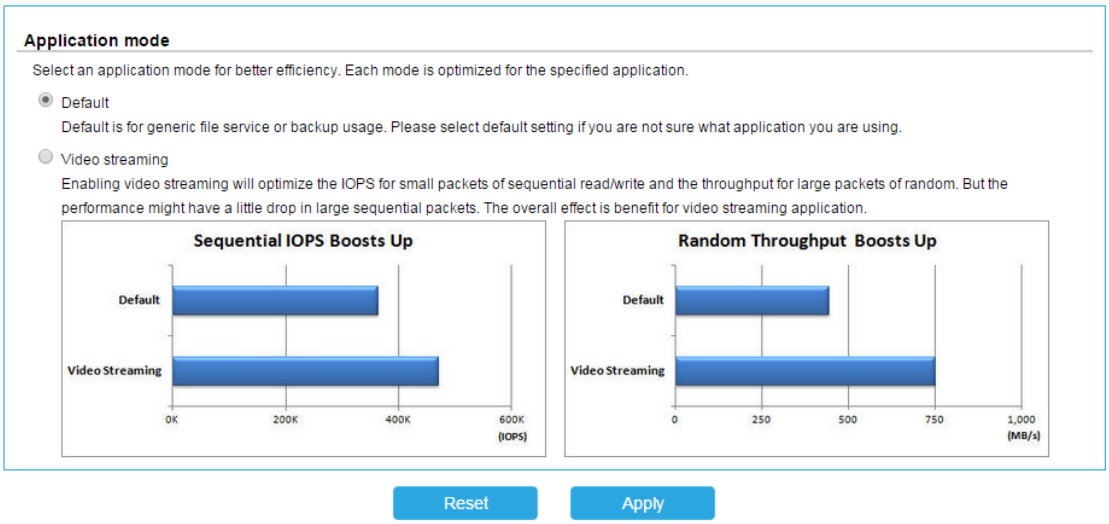
| | |
|---|---|
| | • Smart-UPS (SNMP): APC Smart-UPS with network function. |
| IP address (*This option is only visible when SNMP UPS is selected.*) | The IP address of the network UPS. |
| Community (*This option is only visible when SNMP UPS is selected.*) | The SNMP community of the network UPS. |
| Shutdown battery level (%) | When the battery level goes down and lower than the configured threshold, the system will auto shutdown. This function will be disabled if the configured threshold is set to "0". |
| Shutdown delay (s) | When there is the power outage happening, if the power cannot be recovered within the configured time, such as 30 seconds, the system will auto shutdown at the moment. This function will be disabled if the configured seconds is set to "0". |
| Shutdown UPS | The status of shutdown UPS:<br>• ON: The system will send the command to shutdown the connected UPS if one of the above functions is triggered when the power outage is happening.<br>• OFF: Disable this function. |

The system will shutdown either **Shutdown battery level (%)** or **Shutdown delay (s)** reaches the condition. User should set these values carefully.

# Performance Tuning

## Application Mode

The **System setting -> Performance tuning -> Application mode** option is to enable the **Video streaming** options.



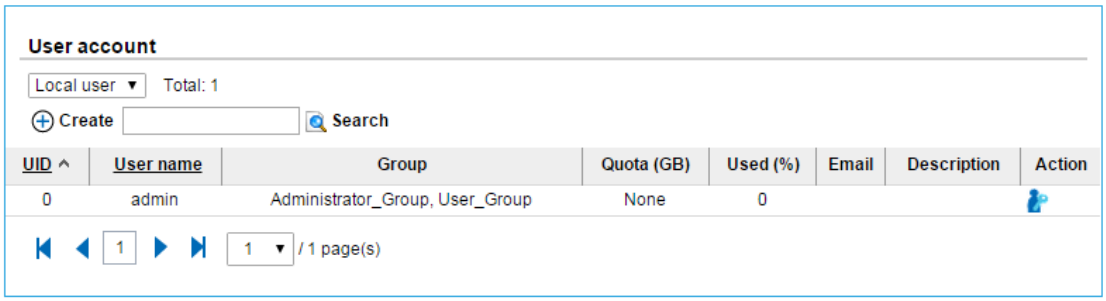

Default is for generic file service or backup usage. Enabling video streaming will optimize the IOPS for small packets of sequential read/write and the throughput for large packets of random. But the performance might have a little drop in large sequential packets. The overall effect is benefit for video streaming application.

# Privilege Settings

## Manage User Accounts

The **Privilege setting -> Accounts -> Users** option provides the function to manage local user accounts such as add, delete, edit, change password or view the status of the users. Local user accounts and domain user accounts are displayed separately by selecting the drop down list.

Domain user accounts are only for display purpose. You cannot edit domain account or change the password of domain account.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| UID | The user ID. |
| User name | The account name. |
| Group | The user belongs to the groups. |
| Quota (GB) | User quota space. |
| Used (%) | The percentage of the quota usage. |
| Email | User's email. |
| Description | User's description. |

The options are available in this tab:

- **Create:** Add a user account.
- **Delete:** Multi select the user accounts to be deleted.
- **Search:** Enter a keyword to search.

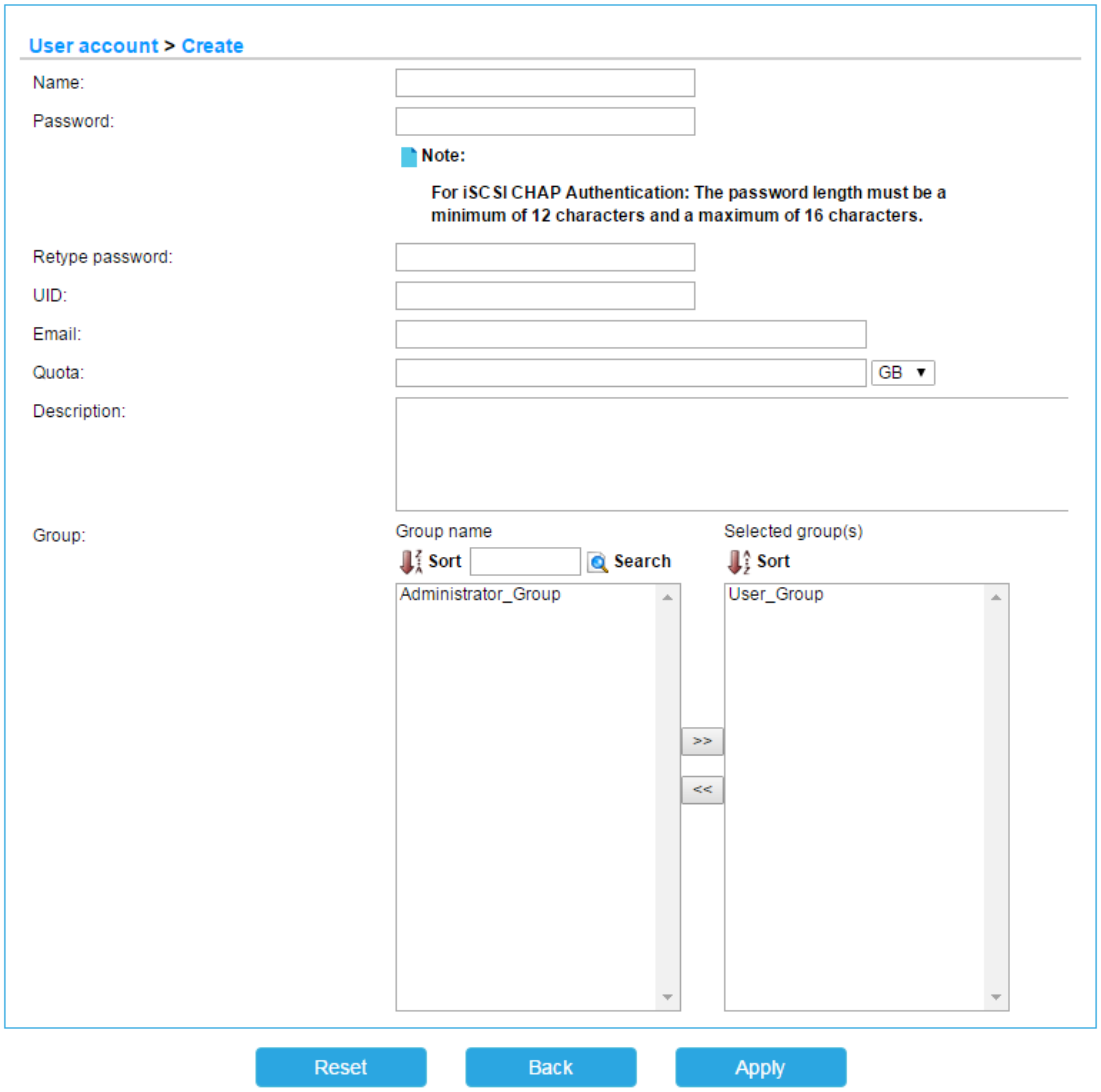
The options are available in the **Action** column:

- **Change password:** Change the user's password.
- **Edit:** Edit the user.
- **Delete:** Delete the user.

Please be aware that before you can create local accounts, a storage pool with home directory function enabled must be created first. Otherwise, you will not be able to create local account and all functions will be grey out. For each local account created, the system will automatically create a personal folder in the home directory with the capacity limit specified in account creation. The user can access his/her home directory right away.

Take an example of creating an account.

1. Click **Create** button.




2. Enter **Name**, **Password**, and **Retype password**. The other fields are optional.
3. Click **Apply** button to create an account.

UID is open for user assignment. If UID input is left blank, the system will assign an ID automatically. User-assigned ID has a range 1000 ~ 60000.

**TIP:**
The password is required to be at least 12 and up to 16 alphanumeric characters. This is because of UnifiedAUTH mechanism that will integrate with iSCSI CHAP account. iSCSI CHAP account requires that the password needs to be 12 to 16 characters.

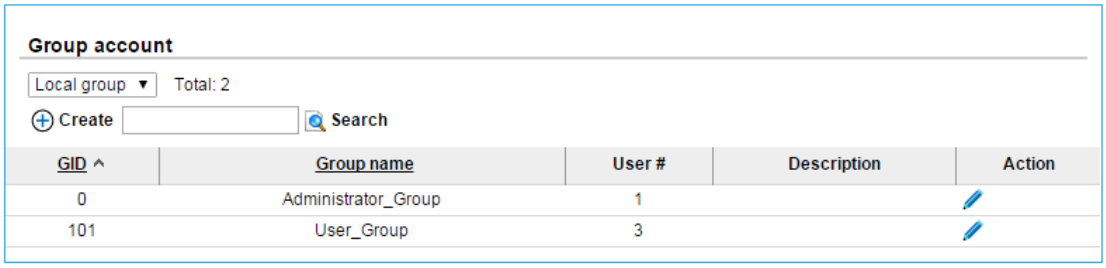
If the system is using Active Directory or LDAP as directory service, you may see the domain users as below. Please be aware that no modification (add, delete, edit, change password) can be made to domain users. This can only be done on the AD server or LDAP server.

The syntax to represent a domain user is :

<domain name>+<user account>

## Manage Group Accounts

The **Privilege setting -> Accounts -> User group** option provides the function to manage local groups such as add, delete, edit, or view the status of the groups. Local groups and domain groups are displayed separately by selecting the drop down list.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| GID | Group ID (user assigned range 1000 ~ 60000). |
| Group name | The group name. |
| #User | The number of users that belong to this group. |
| Description | Group's description. |

The options are available in this tab:

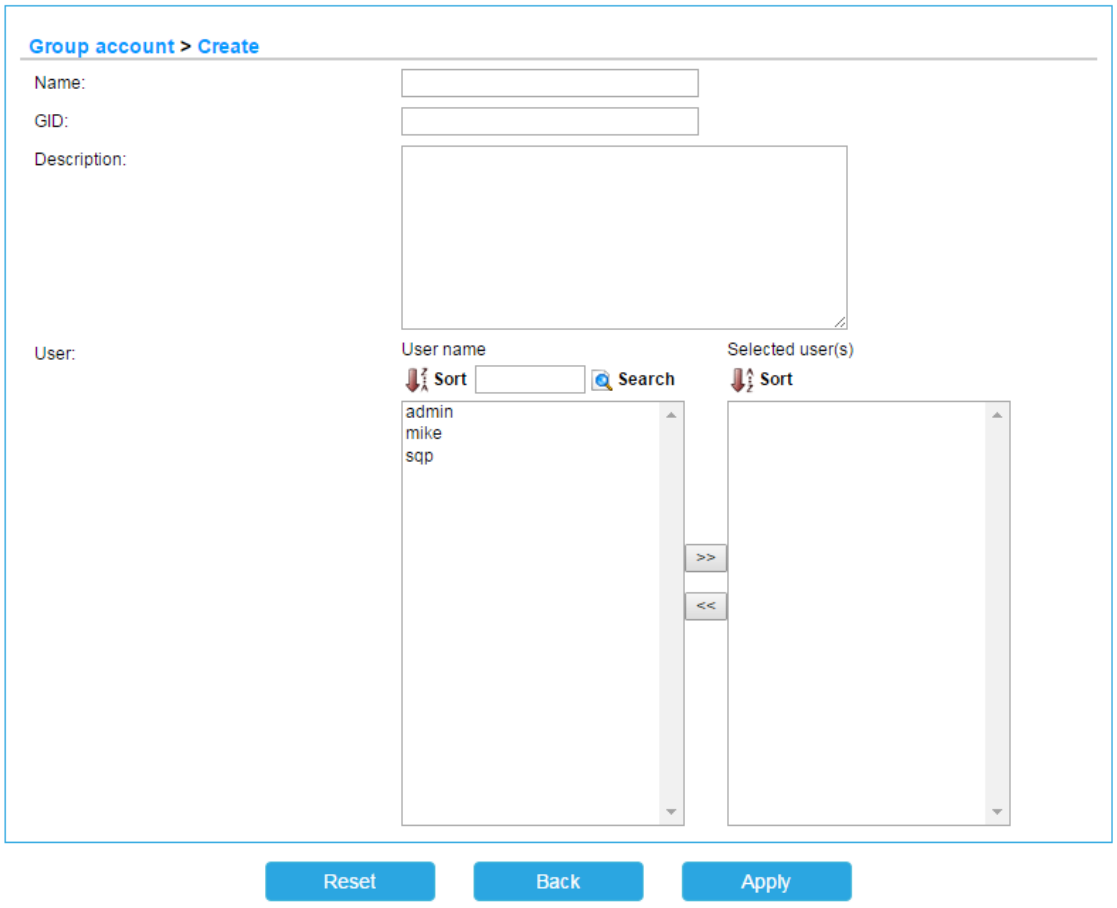
- **Create:** Add a group account.
- **Search:** Enter a keyword to search.

The options are available in the **Action** column:

- **Edit:** Edit the group.
- **Delete:** Delete the group.

Take an example of creating a group.

1. Click **Create** button.




2. Enter the **Name**. The other fields are optional.
3. Click **Apply** button to create a group.

GID is open for user assignment. If GID input is left blank, the system will assign an ID automatically. User-assigned ID has a range 1000 ~ 60000.

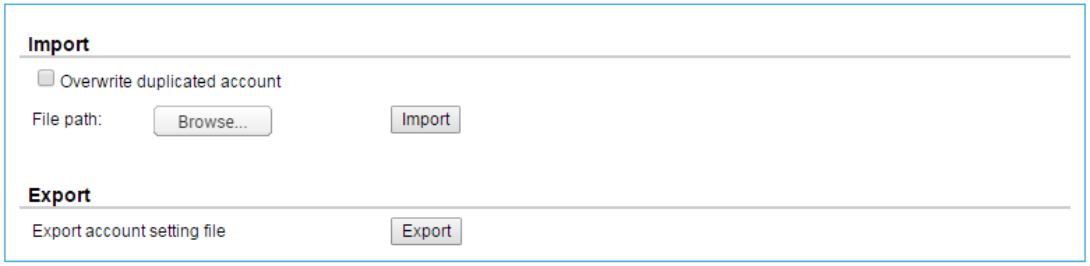
If the system is using Active Directory or LDAP as directory service, you may see the domain groups as below. Please be aware that no modification (add, delete, edit) can be made to domain groups. This can only be done on the AD server or LDAP server.
The syntax to represent a domain user is:

<Domain name>+<group name>

The following sections are options for accounts; you can skip those and jump to Storage configurations.

## Import and Export Accounts

The **Privilege setting -> Accounts -> Import / Export** option provides the function to import/export accounts.




The options are available in this tab:

- **Overwirte duplicated account:** Check this to overwirte duplicated account.
- **Import:** Import all users and groups from a file.
- **Export:** Export all users and groups to a file.

The import/export file is a pure text file with the following format. Each attribute is separated by a colon. For group account between two colons, each user is separated by a comma. Before importing account file, you may create several accounts and export the account file first to get familiar with the format.

[Users]

user name:user password:quota:UID:email:desc

[Groups]

group name:user1,user2...:GID:desc

Please be aware that the actual password will not be exported. In exported file, the password will be replaced with a dummy password 1234. When the same account name (case sensitive) exists during importin, it will not overwrite the existing account information unless “overwrite duplicated account” is checked. When overwriting an user account, UID remains unchanged. When overwriting a group account, GID remains unchanged and the original group members remain plus adding any new group members.

## Directory Services

The **Privilege setting -> Accounts -> Directory services** option provides three directory services. Default is **Standalone**, which supports local account only. The others are **Active Directory** service for Microsoft Windows domain networks and **LDAP** (Lightweight Directory Access Protocol) services.

Qsan **UnifiedAUTH** mechanism is the backbone of all the directory services. It simplifies the use of all the data services (CIFS, NFS, AFP, FTP, WebDAV, iSCSI) and frees the users from memorizing different account/password sets for different data services. The benefits are:

- Easier use of all data services
- Simplified management

Only one directory service can be enabled at all time. No two directory services can be enabled at the same time. Switching directory service will result in losing Access Control List of all shares from the previous directory service.

Select a radio button to change the directory service:

- **Standalone**

  Standalone supports local user/group accounts only. It is the default setting.

  When it is done, click **Apply** button.

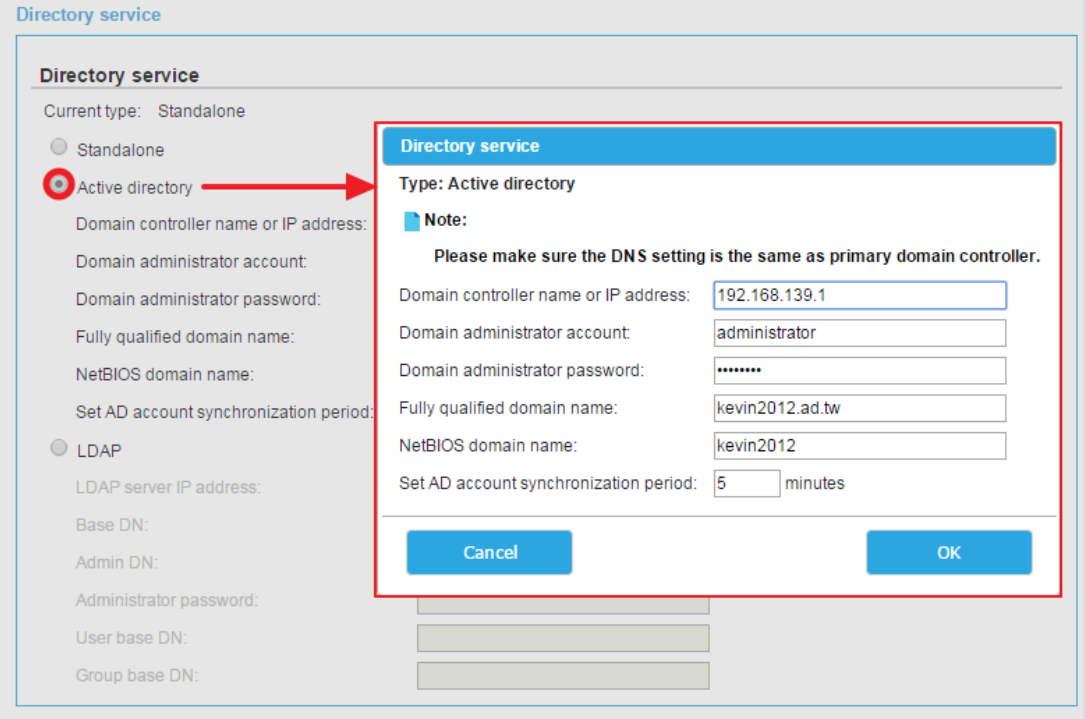
- **Active Directory**

  Active Directory service supports Windows Server 2003 and 2008 Active Directory to manage the accounts. The maximum number of AD users and groups is 65536.

  Enter the settings of Active Directory above. When it is done, click **Apply** button. If the information is correct, the AD accounts will be added in **Privilege setting -> Accounts -> Users -> Domain user** and **User groups -> Domain group**. It will take some time to download the accounts at the first time. And then it will synchronize with the server automatically. Or you may set the duration in minutes for how often the system should synchronize with the AD server.

**TIP:**
In order to make sure you can successfully login Active Directory server, please make sure the following two requirements are met.

1. Primary DNS (Domain Name Server) setting is identical to that of the Active Directory server.
2. The system time is synchronous with that of the Active Directory server with less than 1 minute tolerance.




- **LDAP**

  LDAP (Light-weighted Directory Access Protocol) service supports LDAP version3 to manage the accounts. The maximum number of LDAP users and groups is 65536.

  Enter the settings of LDAP above. When it is done, click **Apply** button. If the information is correct, the accounts will be added to **System configuration -> Account -> User account -> Domain user** and **Group account -> Domain group**.

  Base DN: The base distinguished name (DN) indicates where in the LDAP directory you wish to load users and groups. It is the top level of the LDAP directory tree to be used when searching for resources. Suppose that all user accounts and groups are located in the "Users" folder under your domain. In LDAP form, it is **cn=Users,dc=<your domain>**. Let's say your domain is **aaa.bbb.com.** The Base DN you should put in is **cn=Users,dc=aaa,dc=bbb,dc=com**.

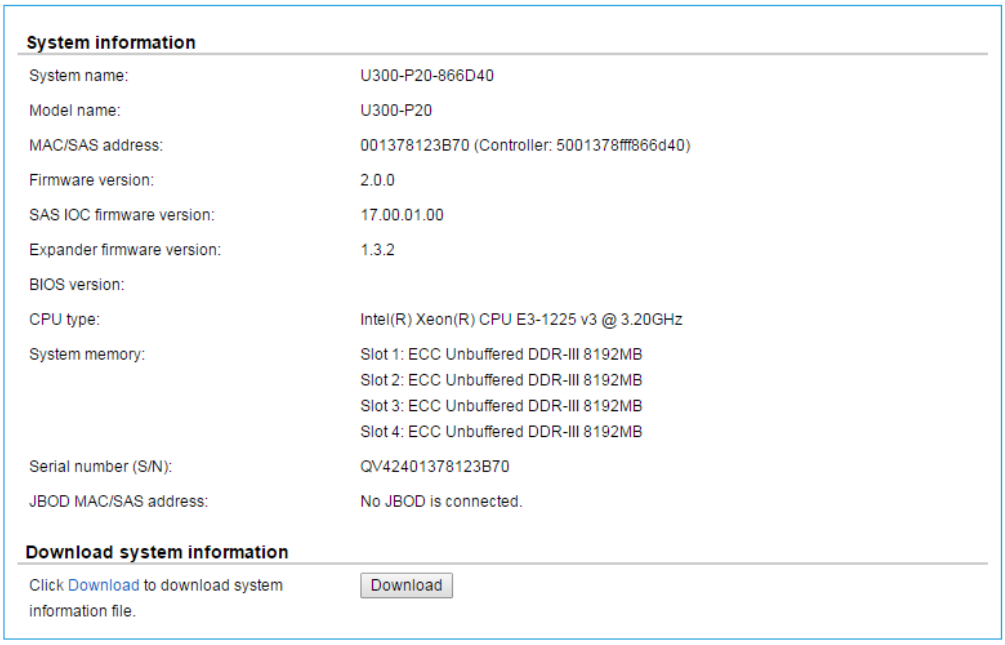
  Admin DN: By default, the administrator DN is in the form **cn=Administrator,dc=<your domain>**. Using previous example, The Admin DN should be put in is **cn=Administrator,dc=aaa, dc=bbb,dc=com**.

**TIP:**
Please contact your LDAP server administrator for the correct login parameters for Base DN, Admin DN, User base DN, and Group base DN.

# System Maintenance

## System Information

The **System setting -> Maintenance -> System Information** provides to display system information. It includes MAC/SAS Address, SAS IOC Firmware version, SAS Expander Firmware version, BIOS version, CPU type, memory, serial number, and JBOD MAC/SAS Address.

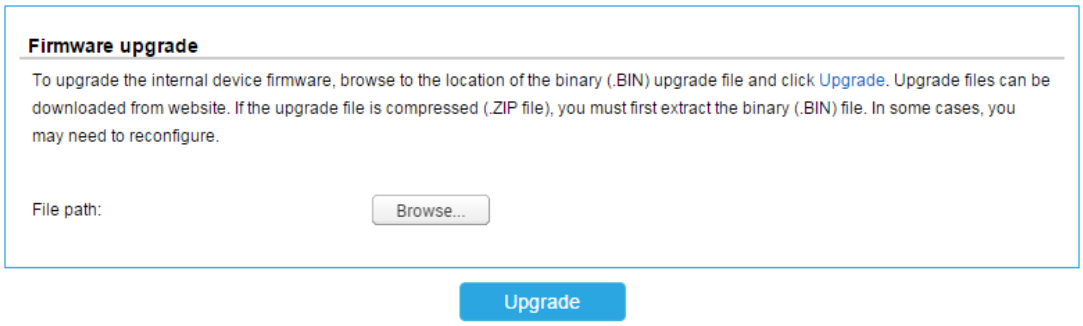



The options are available in this tab:

- **Download System Information:** Click **Download** button to download the system information for debug. The **Download system** tab will download a compressed file to your local drive. It contains event logs, debug information, and system configuration data. Please send this compressed file to us when you need technical assistance.

## Firmware Upgrade

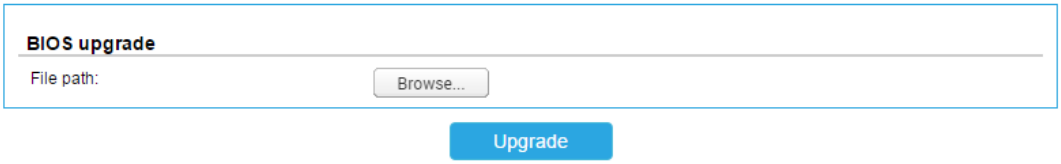
The **System setting -> Maintenance -> Firmware upgrade** option is used to upgrade controller firmware.



Please prepare new controller firmware file named "xxxx.bin" in local hard drive, then click **Browse** to select the file. Click **Upgrade** button to start upgrading the firmware. When upgrading, there is a percentage displayed. After finished upgrading, the system must reboot manually to make the new firmware took effect.

## BIOS Upgrade

The **System setting -> Maintenance -> BIOS upgrade** option is used to upgrade controller BIOS.




Please prepare new controller BIOS file in local hard drive, then click **Browse** to select the file. Click **Upgrade** button to start upgrading the BIOS. When upgrading, there is a percentage displayed. After finished upgrading, the system must reboot manually to make the new firmware took effect.

## Firmware Upgrade via USB

Starting from FW1.2.0 in TrioNAS and TrioNAS LX series, upgrading firmware using USB flash drive is supported. Below are the instructions of how to use this function and some requirements.

1. Copy the checksum file (md5sum.txt) and firmware file (*.bin or *.flash) to the root of USB drive.
2. In the root of USB drive, create a pure text file named AutoRun.ini with the following content.
   [upgrade]
   upgrade_md5file = md5sum.txt
3. Insert USB drive to the USB port shown below in different models.
4. The system will detect USB drive and the firmware. If the setting is correct, firmware upgrading will start automatically. The web UI does not have a progress meter.
5. If upgrading is successful, the hard drive LED will blink for 10 seconds and the buzzer will be on for 10 seconds. If upgrading fails, the hard drive LED and the buzzer will be on for 2 seconds and off for 2 seconds for 3 times.

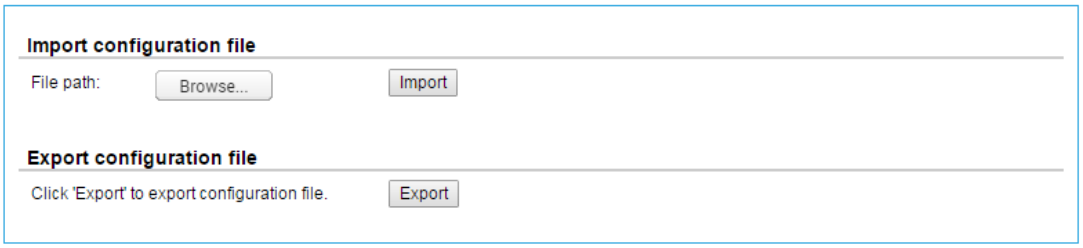
Some requirements:

- USB drive file system supports NTFS and FAT32 only.
- Firmware file name cannot be renamed.

- During firmware upgrading, USB drive cannot be plugged out.
- If firmware version is the same, upgrading will not start.

## Import and Export System Configurations

The **System setting -> Maintenance -> Import / Export** option provides to import or export the configuration file.

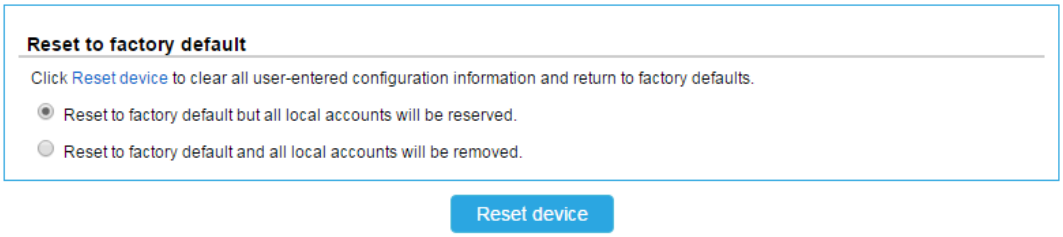



The options are available in this tab:

- **Import Configuration File:** Please prepare configuration file in local hard drive, then click **Browse** to select the file. Click **Import** button to import the configuration file.
- **Export Configuration File:** Click **Export** button to export the configuration file.

## Reset to Factory Default

The **System setting -> Maintenance -> Reset to factory default** option allows users to reset the system configurations back to the factory default settings.



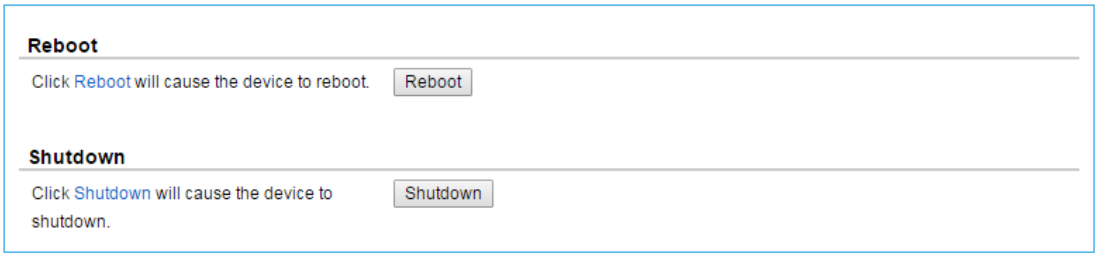

Select the options which all local accounts are reserved, and then click **Reset device** button. It will reset the following settings.

- LAN1 IP Address: 192.168.1.234
- User Name: admin
- Password: 1234
- Set default directory service to Standalone.
- Clear all access right settings for shares.
- Clear all snapshot, replication, backup tasks.
- Clear all users/user groups by option.

Please be aware that “Reset to factory defaults” will not delete the user data in UserHome file system. If you create a local user account with the same name, the system will see it as the same user and use the original user account folder.

## Reboot and Shutdown System

The **System setting -> Maintenance -> Reboot / Shutdown** option is used to reboot or shutdown the system.




The **Shutdown** option is used to shutdown the system. Before powering off the system, it is highly recommended to execute **Shutdown** function to flush the data from cache onto the physical disks. The step is important for data protection.

# 3 Storage Configurations

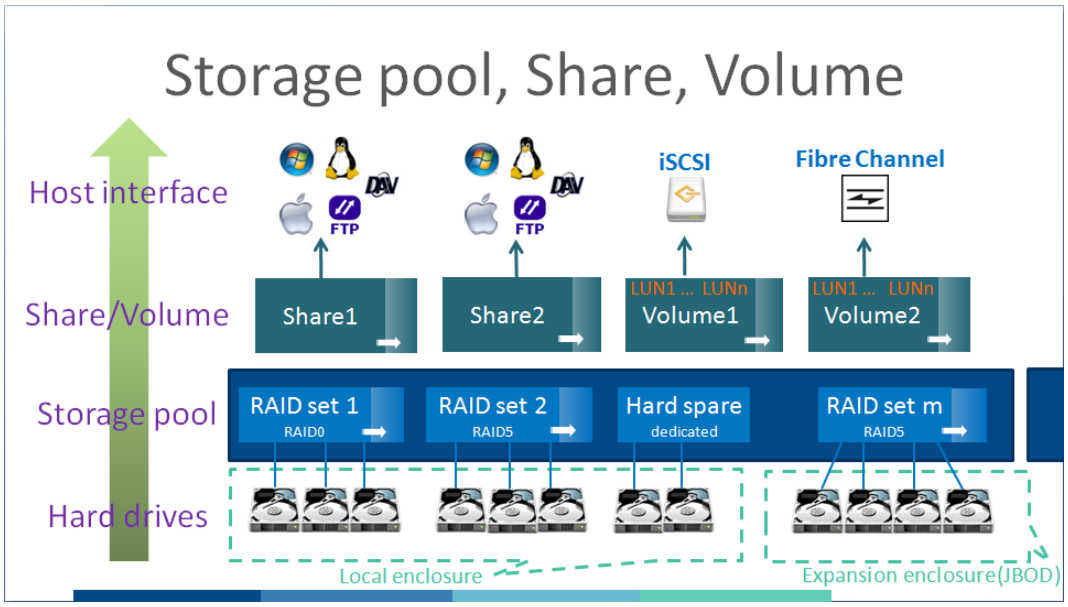
This chapter describes the storage configurations. It includes the following sections:

- Storage Concepts
- Storage Settings
- Advanced Storage Technology

## Storage Concepts

### Pool Concept and its Relationship

The following graphic is the pool structure. It describes the relationship of HDD, storage pool, share, and volume.




A group of HDDs make up a RAID set. A pool consists of RAID sets and owns one RAID level attribute. Each pool can be divided into several shares or volumes. The shared file system can be accessed by Windows, Linux, Mac OS. For block level service, a LUN (Logical Unit Number) needs to be attached to the volume to be accessed by either iSCSI or Fibre Channel.

### RAID Concept

RAID is the abbreviation of Redundant Array of Independent Disks. The basic idea of RAID is to combine multiple drives together to form one large logical drive. This RAID drive obtains performance, capacity and reliability than a single drive. The operating system detects the RAID drive as a single storage device.

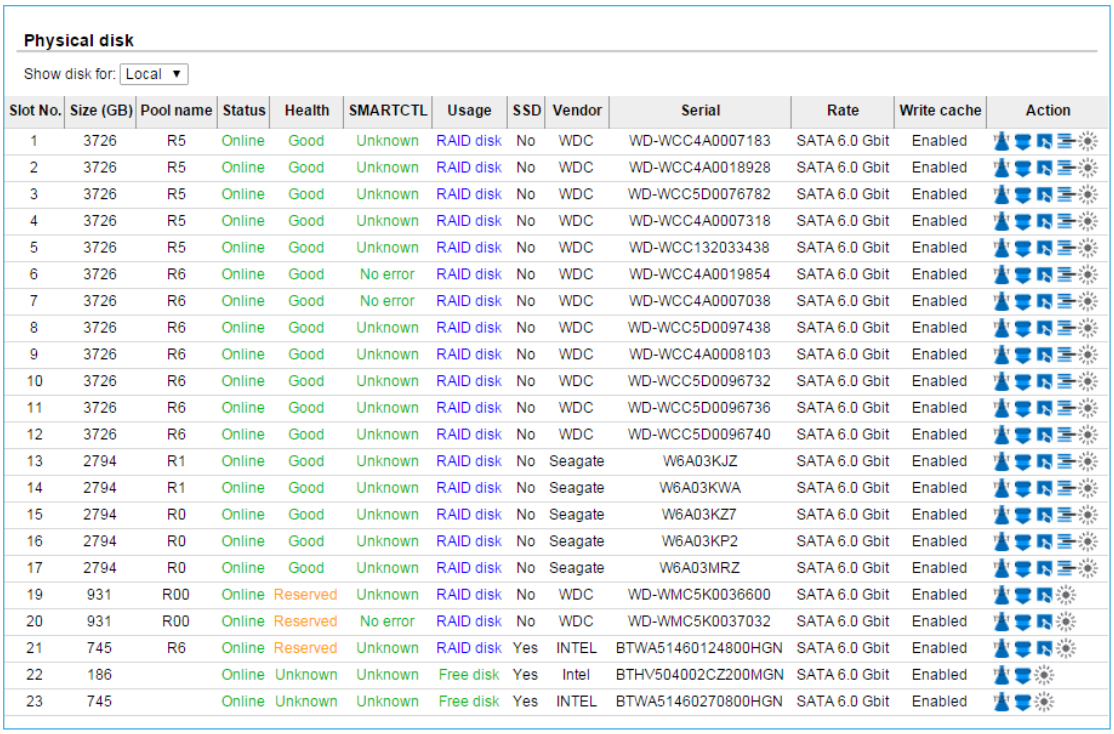
There are various RAID levels with different degrees of data protection, data availability, and performance. A description of supported RAID levels follow:

| Type | Description | Min. No. of Drives |
|---|---|---|
| RAID 0 | Disk striping. | 1 |
| RAID 1 | Disk mirroring over two disks. | 2 |
| RAID 5 | Striping with interspersed parity over the member disks. | 3 |
| RAID 6 | 2-dimensional parity protection over the member disks. | 4 |
| RAID 10 | Striping over the member RAID 1 volumes. | 4 |
| RAID 50 | Striping over the member RAID 5 volumes. | 6 |
| RAID 60 | Striping over the member RAID 6 volumes. | 8 |

## Storage Setting

### Physical Disks

The **Storage management -> Physical disks** option provides the hard drive status.



**Physical disk**

Show disk for: Local

| Slot No. | Size (GB) | Pool name | Status | Health | SMARTCTL | Usage | SSD | Vendor | Serial | Rate | Write cache | Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3726 | R5 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC4A0007183 | SATA 6.0 Gbit | Enabled | |
| 2 | 3726 | R5 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC4A0018928 | SATA 6.0 Gbit | Enabled | |
| 3 | 3726 | R5 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC5D0076782 | SATA 6.0 Gbit | Enabled | |
| 4 | 3726 | R5 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC4A0007318 | SATA 6.0 Gbit | Enabled | |
| 5 | 3726 | R5 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC132033438 | SATA 6.0 Gbit | Enabled | |
| 6 | 3726 | R6 | Online | Good | No error | RAID disk | No | WDC | WD-WCC4A0019854 | SATA 6.0 Gbit | Enabled | |
| 7 | 3726 | R6 | Online | Good | No error | RAID disk | No | WDC | WD-WCC4A0007038 | SATA 6.0 Gbit | Enabled | |
| 8 | 3726 | R6 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC5D0097438 | SATA 6.0 Gbit | Enabled | |
| 9 | 3726 | R6 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC4A0008103 | SATA 6.0 Gbit | Enabled | |
| 10 | 3726 | R6 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC5D0096732 | SATA 6.0 Gbit | Enabled | |
| 11 | 3726 | R6 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC5D0096736 | SATA 6.0 Gbit | Enabled | |
| 12 | 3726 | R6 | Online | Good | Unknown | RAID disk | No | WDC | WD-WCC5D0096740 | SATA 6.0 Gbit | Enabled | |
| 13 | 2794 | R1 | Online | Good | Unknown | RAID disk | No | Seagate | W6A03KJZ | SATA 6.0 Gbit | Enabled | |
| 14 | 2794 | R1 | Online | Good | Unknown | RAID disk | No | Seagate | W6A03KWA | SATA 6.0 Gbit | Enabled | |
| 15 | 2794 | R0 | Online | Good | Unknown | RAID disk | No | Seagate | W6A03KZ7 | SATA 6.0 Gbit | Enabled | |
| 16 | 2794 | R0 | Online | Good | Unknown | RAID disk | No | Seagate | W6A03KP2 | SATA 6.0 Gbit | Enabled | |
| 17 | 2794 | R0 | Online | Good | Unknown | RAID disk | No | Seagate | W6A03MRZ | SATA 6.0 Gbit | Enabled | |
| 19 | 931 | R00 | Online | Reserved | Unknown | RAID disk | No | WDC | WD-WMC5K0036600 | SATA 6.0 Gbit | Enabled | |
| 20 | 931 | R00 | Online | Reserved | No error | RAID disk | No | WDC | WD-WMC5K0037032 | SATA 6.0 Gbit | Enabled | |
| 21 | 745 | R6 | Online | Reserved | Unknown | RAID disk | Yes | INTEL | BTWA51460124800HGN | SATA 6.0 Gbit | Enabled | |
| 22 | 186 | | Online | Unknown | Unknown | Free disk | Yes | Intel | BTHV504002CZ200MGN | SATA 6.0 Gbit | Enabled | |
| 23 | 745 | | Online | Unknown | Unknown | Free disk | Yes | INTEL | BTWA51460270800HGN | SATA 6.0 Gbit | Enabled | |

This table shows the column descriptions.

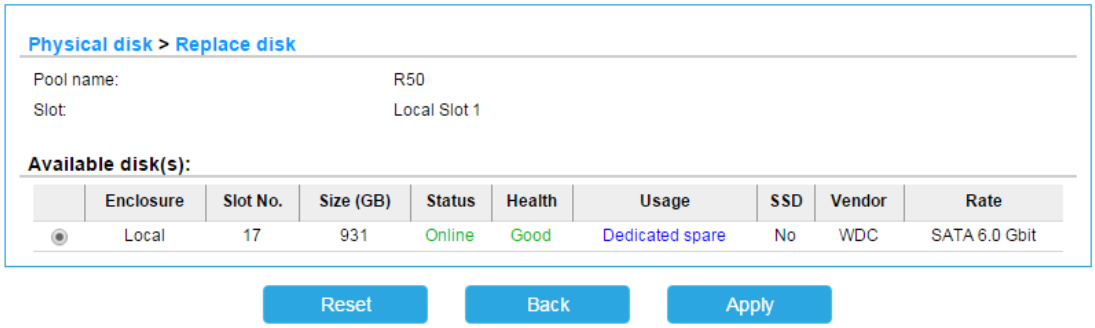
| Column Name | Description |
|---|---|
| Slot No. | The position of a hard drive. |
| Size (GB) | Capacity of hard drive. |
| Pool Name | Pool name. |
| Status | The status of the hard drive:<br>• Online: the hard drive is online.<br>• Rebuilding: the hard drive is being rebuilt.<br>• Degraded: one of the RAID set is at degraded mode.<br>• Failed: one of the RAID set is at failed mode.<br>• Importing: the system is loading data from the disks, which means the pool is not ready for use yet. |
| Health | The health of the hard drive:<br>• Good: the hard drive is good.<br>• Failed: the hard drive is failed.<br>• Error alert: S.M.A.R.T. error alert.<br>• Read errors: the hard drive has unrecoverable read errors.<br>• Reserved: the disk is one of the member disks of a RAID group. It contains RAID group and pool information, but the original RAID group and pool can't be found. Either you put this disk at its original slot or set this disk as a free disk. |
| SMARTCTL | The SMART of the hard drive:<br>• Unknown: the SMART of the hard drive is unknown.<br>• NoError: the SMART of the hard drive has no error.<br>• HasError: the SMART of the hard drive has error. |
| Usage | The usage of the hard drive:<br>• RAID disk: This hard drive has been set to a RAID group.<br>• Free disk: This hard drive is free for use.<br>• Dedicated spare: This hard drive has been set as dedicated spare of a pool. |
| SSD | HDD or SSD. |
| Vendor | Hard drive vendor. |
| Serial | Hard drive serial number. |
| Rate | Hard drive rate:<br>• SAS 6Gb/s.<br>• SAS 3Gb/s.<br>• SATA 6Gb/s.<br>• SATA 3Gb/s.<br>• SATA 1.5Gb/s. |
| Write cache | Hard drive write cache is enabled or disabled. The default value is Enabled. |

The options are available in the Modify column:

- **Start / Stop SMARTCTL self-test:** Start or stop SMART self-test.
- **Download SMARTCTL log:** Download SMART self-test log.
- **Set free disk:** Set the hard drive be free for use.
- **Replace disk:** Replace the hard drive of the pool to another free hard drive.
- **Turn on / off the indication LED:** Turn on or off the HDD LED for identify.

Take an example of replacing a disk in pool.

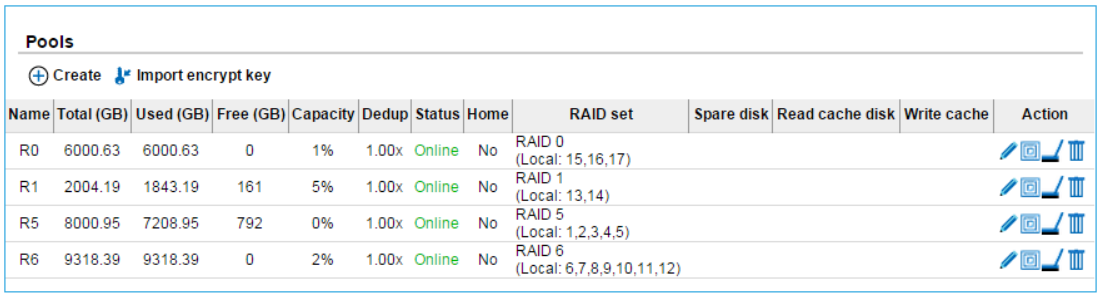
1. Click **Replace disk** icon.




2. Select a free disk.
3. Click **Apply** button to replace.

## Manage Pools

The **Storage management -> Pools -> General setting** option provides various functions to manage storage pool such as create, expand, and set home directory, delete, or view the status of the pools.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | Pool name. |
| Total (GB) | Total capacity of this pool. |
| Used (GB) | Used capacity of this pool. |
| Free (GB) | Free capacity of this pool. |
| Capacity | The percentage or the capacity. |
| Dedup (*This option is only visible when it supports deduplication.*) | The status of the deduplication. |
| Status | The status of the pool:<br>• Online: the pool is good.<br>• Failed: the pool fails.<br>• Rebuild: the pool is being rebuilt. |
| Home | The home directory is in the pool.<br>• Yes: the home directory is in the pool. |

| | |
|---|---|
| | • No: the home directory is not in the pool |
| RAID set | The physical disk slots of the RAID set. |
| Spare disk | The spare physical disk slot. |
| Read cache disk | The SSD drives that are used as read cache (L2ARC). |
| Write cache | The SSD drives that are used as write cache (ZIL). |

The options are available in this tab:

- **Create:** Create a pool.
- **Import encrypt key:** Import encrypt key file for security. (*This option is only visible when it supports pool encrypt.*)

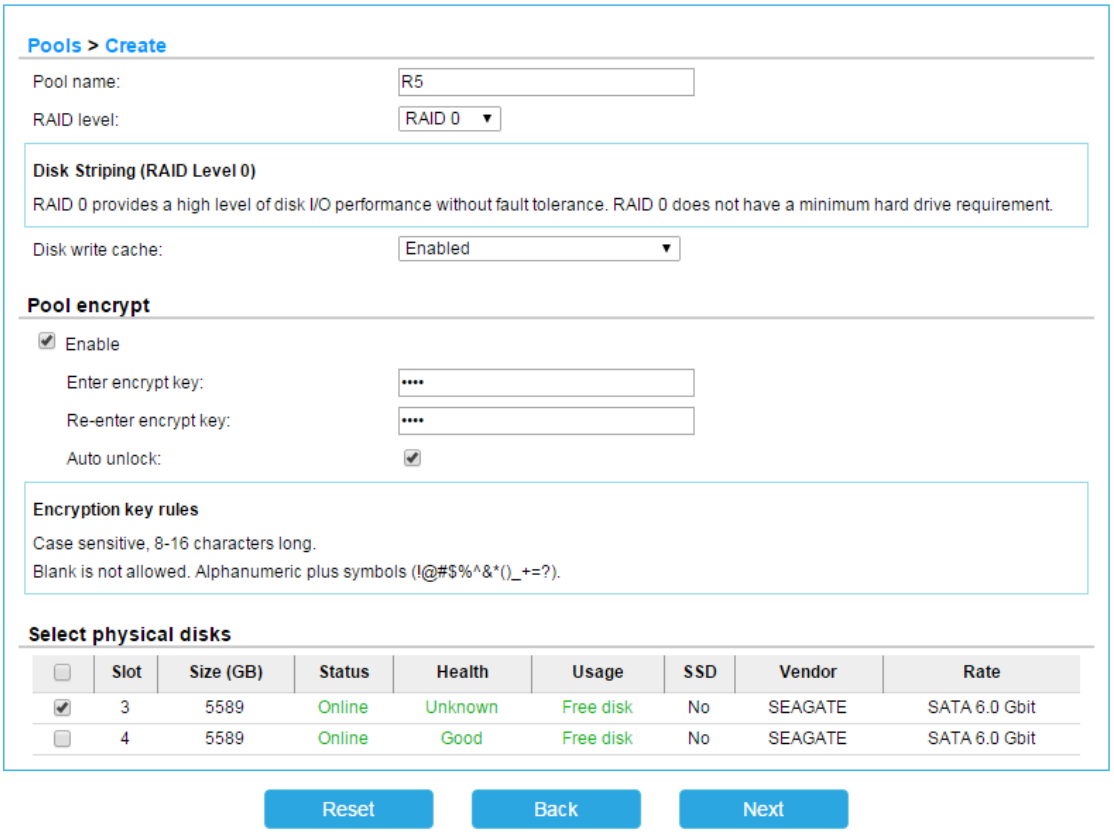
The options are available in the **Action** column:

- **Edit:** Edit the pool settings.
- **Expand:** Add more RAID sets to the same pool to expand the capacity.
- **Scrub:** Perform pool scrubbing manually to make sure there is no defect in the hard drive.
- **Export encrypt key:** Export encrypt key file. (*This icon is only visible when it supports pool encrypt and is enabled.*)
- **Delete:** Delete the pool. The pool can be deleted when there is no file system or volume in it except UserHome directory.

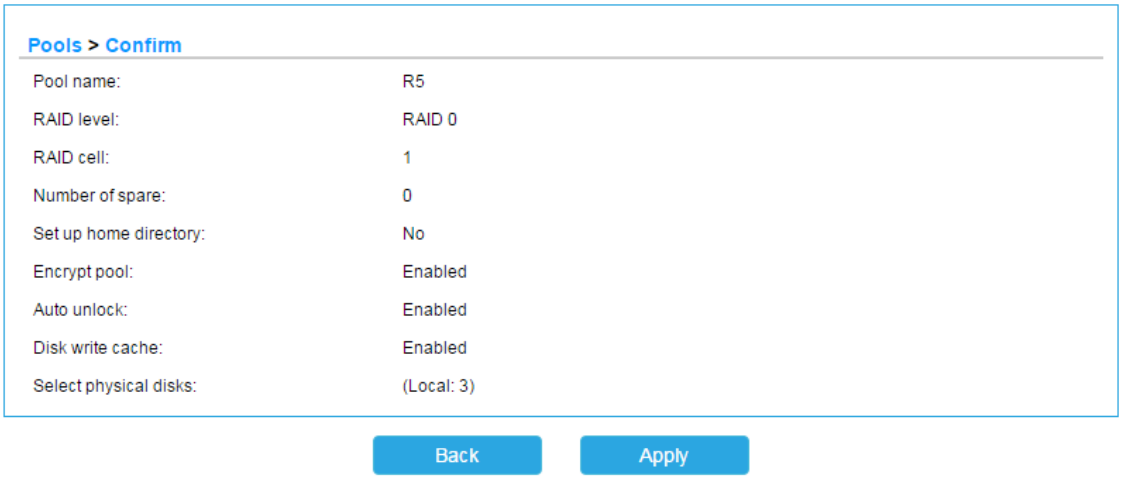
Take an example of creating a pool**.**

1. Click **Create** button.


2. Enter a **Pool Name**.
3. Use the drop-down list to select a **RAID level**.
4. Check the **Set up Home Directory** if the pool contains home directory.
5. Optionally, configure the following:
   - **Write Cache:** It's to enable or disable the write cache option of hard drives.
6. Check Enable for **Pool encrypt** and enter the encrypt key if necessary. Check **Auto unlock** will unlock the pool when next reboot. Otherwise, it cannot be used except entering the encrypt key on every reboot.
7. Select disks from below, and then click **Next** button.

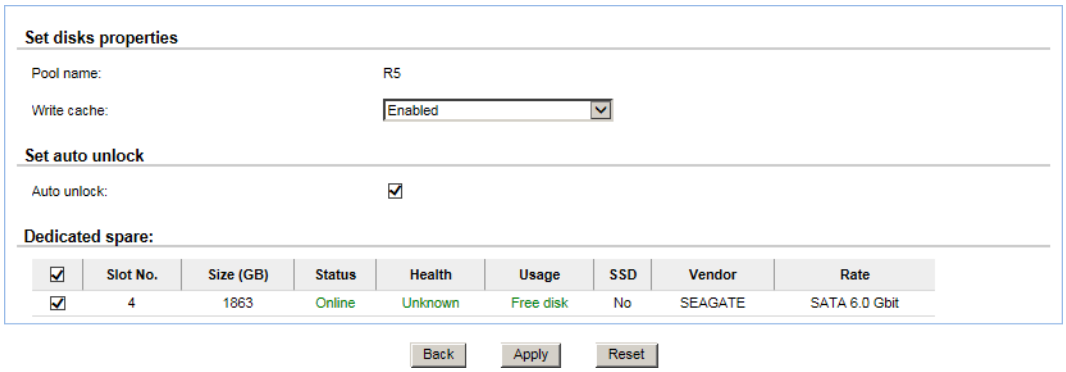



8. At the confirmation message, click **Apply** button.




Take an example of set the disk properties and dedicated spare disk.

1. Dedicated spare disk is applied to specific storage pool. Make sure you have free hard drives for this. Click **Edit** icon in **Action** column.




2. Enable or disable the properties of write cache.
3. Select the free disk to use as dedicated spare disk for this pool.
4. Click **Apply** button.

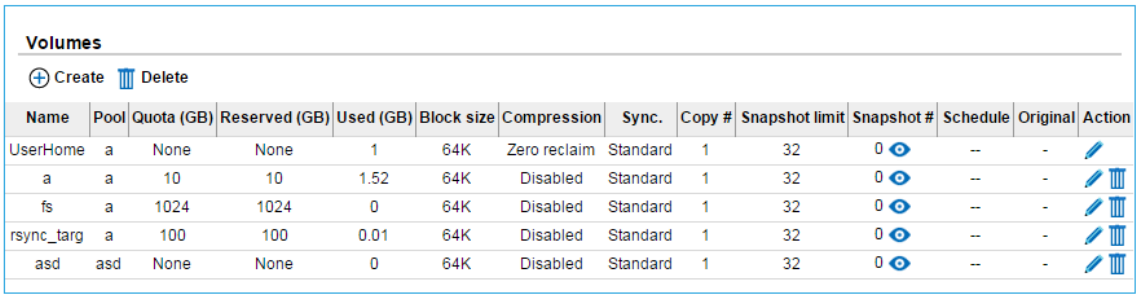
Take an example of expand the pool**.**

1. Make sure you have free hard drives for this. Click **Expand** icon in **Action** column.
2. Pool name can't be changed since this is to expand the current pool, not creating a new pool. Select the RAID level and physical disks, and the click **Next** button.
3. At the confirmation message, click **Apply** button.
4. You may see that the capacity of Pool becomes larger. In the RAID set slot column, it shows the RAID set members of the pool.

The following sections are to manage volumes for file system, if you want to start to use block service, you can skip those and jump to Block Services and Configurations.

## Manage Volumes

The **Storage management -> Volumes** option provides various functions to manage storage volumes. This is for file level access and folder sharing which is used with data services such as CIFS, NFS, AFP, FTP, and WebDAV.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The volume name of the file system. |
| Pool | The pool name of the volume. |
| Quota (GB) | The quota of the volume. |
| Reserved (GB) | Reserved capacity of the volume. |
| Used (GB) | Used capacity of the volume. |
| Block size | The block size of the volume. |
| Dedup (*This option is only visible when it supports deduplication.*) | The status of the deduplication. |
| Compression | The status of the compression. |
| Sync. | The status of the sync. |
| Copy # | The number of the copies. |
| Snapshot limit | The number of the maximum snapshots. |
| Snapshot # | The number of the snapshots |
| Schedule | The status of the schedule. |
| Original | The original volume of the clone. |

The options are available in this tab:

- **Create:** Create a volume.
- **Delete:** Delete the selected volumes.

The option is available in the **Snapshot#** column:

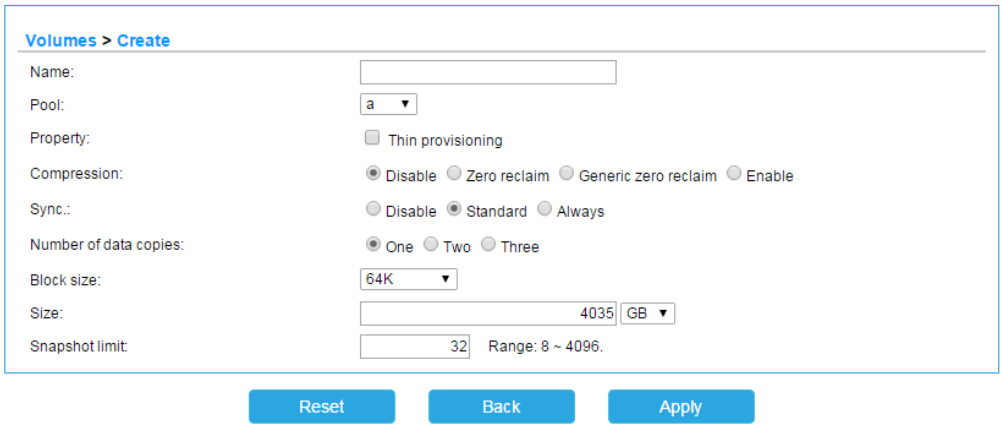
- **View snapshot:** list all the snapshots of the volume.

The options are available in the **Action** column:

- **Edit:** Edit the volume settings.
- **Delete:** Delete the volume.

Take an example of creating a volume.

1. Click **Create** button.




2. Enter a **Name** for the volume.
3. Use the drop-down list to select a **Pool**.
4. Select **Property**, **Compression type**, **Sync**, and **Number of data copies**.
5. Use the drop-down list to select a **Block size**.
6. Enter the **Size** for the volume.
7. Enter a **Snapshot limit** for snapshot usage.
8. Click **Apply** button.

**TIP:**
"Compression" options:

- **Disabled:** No compression at all. Default value.
- **Zero Reclaim:** When the data block contains all zeros, no physical space will be consumed. The block will be marked specifically.
- **Generic Zero Reclaim:** This is Qsan patent filing technology that will reclaim data blocks with special patterns such as all 0's, all 1's. Theoretically, it will have better storage efficiency.
- **Enabled:** This will always enable lossless data compression function using LZJB algorithm.

**TIP:**
"Sync" means synchronous I/O, which is similar to the definition of write-through. Synchronous I/O is that every file system transaction is written and flushed to stable storage devices by a system call return. The application needs to wait for the physical data update completion before it could issue another command. Latency will be longer and performance will suffer.

If you don't know how to use this setting, please leave it as default.

- **Disabled:** All write commands become asynchronous. It will ignore the synchronous transaction demands of applications such as database or NFS.
- **Standard:** The default value. It depends on the applications.
- **Always:** All write commands become synchronous even if the application

issues asynchronous transactions.

The “Sync” option will be grey out if “volume” is selected instead of file system. This is because synchronous write function is not supported in iSCSI block access for the time being.

**TIP:**
“Number of data copies” in Create File System or Volume UI is used to create mirroring of data to avoid data corruption. When the original file corrupts, the system will use the extra “copy” to recover the corrupt file.

The value of two means that when you copy a 10MB file, it will take up 20MB space. The value of three means that it will take up extra double space to store the same data in the same storage pool.

Users will not be able to see the actual extra copies. They are controlled by the file system.

The following sections are advanced storage options, if you want to start to use file service, you can skip those and jump to File Services and Configurations.

## Advanced Storage Technologies

Advanced storage technologies include:

- SSD Caching
- Thin Provisioning
- Deduplication
- Compression

### SSD Caching

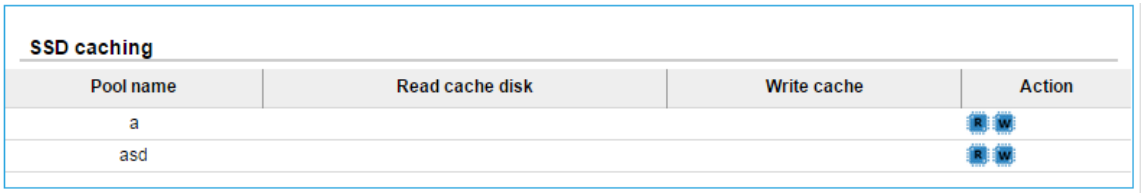
Traditionally, data are stored on the HDDs (Hard Disk Drives) and SSDs (Solid-State Drives) are mainly used for mission-critical applications that demand high-speed storage systems. In recent years, the capacity of HDDs has increased, but their random input/output (I/O) has not kept pace. For some applications such as web commerce, clouds, and virtualization that require both high capacity and performance, HDDs, though capacious, simply are not fast enough.

SSD caching technology leverages the strengths of both HDDs and SSDs, to cost-effectively meet the capacity and performance requirements of enterprise applications. Data are stored on HDDs while SSDs serve as an extended cache for many I/O operations. A single chassis, therefore, can provide both the capacity and economy of HDDs and the blistering performance of SSDs.

Generally, SSD caching is particularly effective when:

1. Reads are far more common than writes in the production environment.
2. The inferior speeds of HDD reads cause performance bottlenecks.
3. The size of repeatedly accessed data is smaller than the capacity of the SSD cache.

The **Storage management -> Pools -> SSD caching** option provides functions to manage SSD caching disks of the pool.




This table shows the column descriptions.

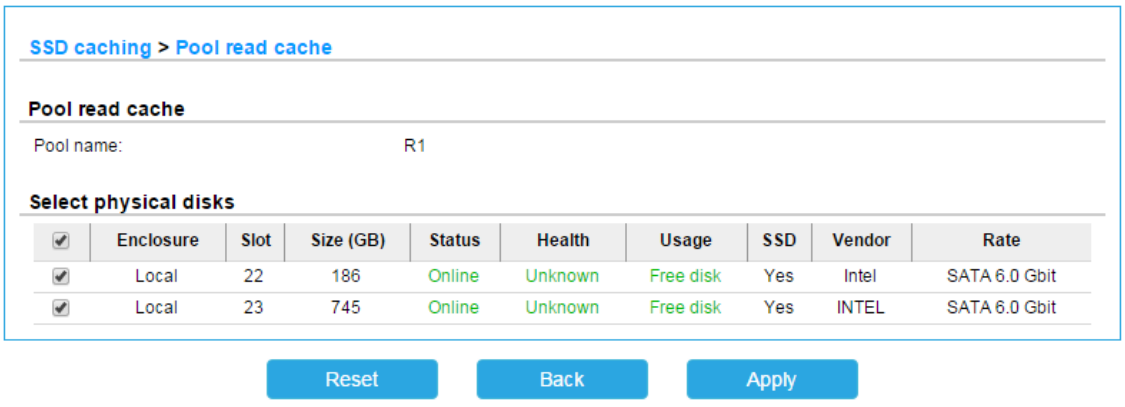
| Column Name | Description |
|---|---|
| Pool name | The pool name. |
| Read cache disk | The slots of read cache disks. |
| Write cache | The slots of write cache disks. |

The options are available in the **Action** column:

- **Pool read cache:** Manage read cache disks.
- **Pool write cache:** Manage write cache disks.

Take an example to set **read cache**.

1. Make sure you have added proper SSD drives to the system.
2. Click **Pool read cache** icon.
3. Select the SSD drive(s) you want to use for read cache.
4. Click **Apply** button.



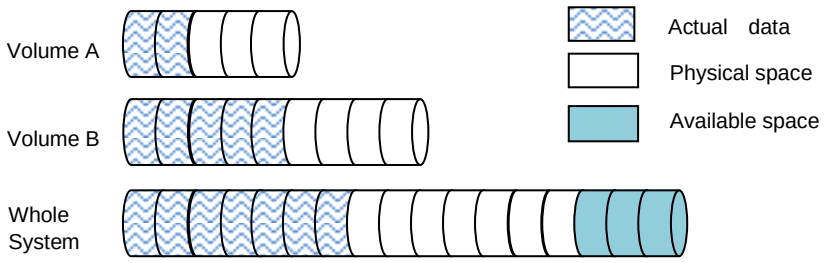
5. Repeat step 1~4 to set the write cache. The write cache can be set as RAID 0 or RAID 1.

**TIP:**
Only SSD drives can be used as SSD cache, which includes read cache (L2ARC) and write cache (ZIL, ZFS Intent Log).

**TIP:**
All the file systems and volumes created inside the pool can benefit from the addition of SSD cache.

## Thin Provisioning

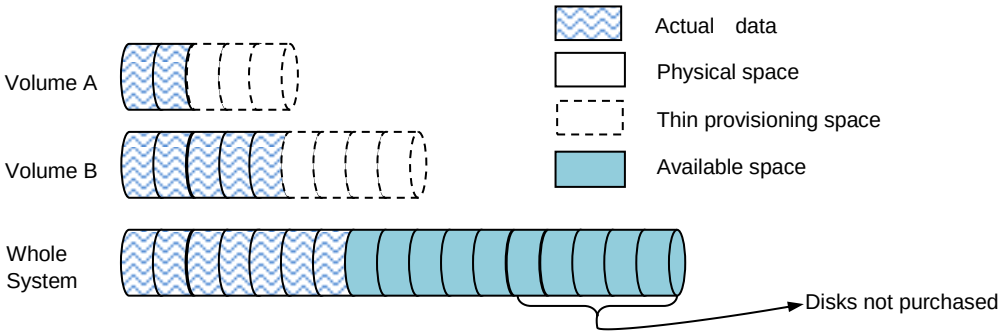
Nowadays thin provisioning is a hot topic people talk about in IT management and storage industry. To make contrast to thin provisioning, it naturally brings to our minds with the opposite term - fat provisioning, which is the traditional way IT administrators allocate storage space to each logical volume that is used by an application or a group of users. When it comes to the point to decide how much space a logical volume requires for three years or for the lifetime of an application, it's really hard to make the prediction correctly and precisely. To avoid the complexity of adding more space to the volumes frequently, IT administrators might as well allocate more storage space to each logical volume than it needs in the beginning. This is why it's called "fat" provisioning. Usually it turns out that a lot of free space is sitting around idle. This stranded capacity is wasted, which equals to waste of investment and inefficiency. Various studies indicate that as much as 75% of the storage capacity in small and medium enterprises or large data centers is allocated but unused. And this is where thin provisioning kicks in.




**Traditional Fat Provisioning**

Thin provisioning sometimes is known as just-in-time capacity or over allocation. As the term explains itself, it provides storage space by requests dynamically. Thin provisioning presents more storage space to the hosts or servers connecting to the storage system than is actually available on the storage system. Put it in another way. Thin provisioning allocates storage space that may or may not exist. The whole idea is actually another way of virtualization. Virtualization is always

about a logical pool of physical assets and provides better utilization over those assets. Here the virtualization mechanism behind thin provisioning is storage pool. The capacity of the storage pool is shared by all volumes. When write requests come in, the space will be drawn dynamically from this storage pool to meet the needs.




**Qsan Thin Provisioning**

The following are the thin provision features:

- Dynamic allocating space to store user data.
- Applied to both volume and iSCSI LUN.
- Remove stranded or reserved-but-unused capacity. Improve storage efficiency.

The **Storage management -> Thin provisioning** option provides to list status of thin provisioning.

**Thin provisioning**

| Name | Type | Pool | Thin provisioning | Quota (GB) | Action |
|---|---|---|---|---|---|
| R0-1 | Volume | R0 | Off | 1000 | |
| R0-2 | Volume | R0 | Off | 1000 | |
| R0-3 | iSCSI LUN | R0 | Off | 1000 | |
| R0-4 | iSCSI LUN | R0 | Off | 300 | |
| R1-1 | Volume | R1 | Off | 400 | |
| R1-2 | Volume | R1 | Off | 420 | |
| R1-3 | iSCSI LUN | R1 | Off | 200 | |
| R1-4 | iSCSI LUN | R1 | Off | 100 | |
| R5-1 | Volume | R5 | Off | 1495.03 | |
| R5-2 | Volume | R5 | Off | 1495.03 | |
| R5-3 | iSCSI LUN | R5 | Off | 700 | |
| R5-4 | iSCSI LUN | R5 | Off | 700 | |
| R6-1 | Volume | R6 | Off | 1996.79 | |
| R6-2 | Volume | R6 | Off | 1996.79 | |
| R6-3 | iSCSI LUN | R6 | Off | 1000 | |
| R6-4 | iSCSI LUN | R6 | Off | 700 | |

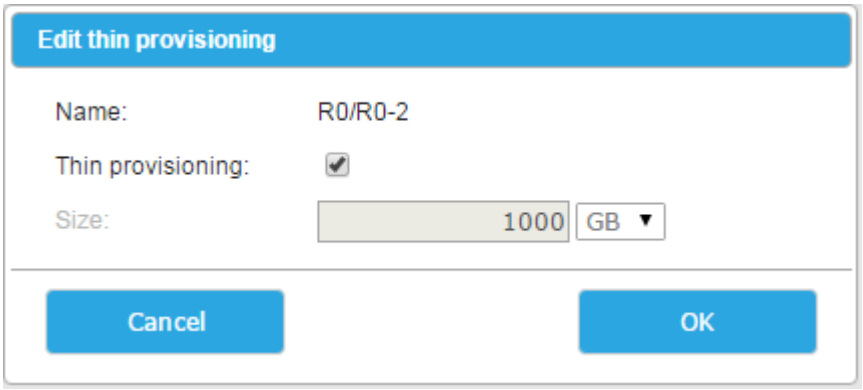
This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The volume name or LUN name. |

| | |
|---|---|
| Type | Volume or iSCSI LUN. |
| Pool | The pool name. |
| Thin provisioning | The status of thin provisioning:<br>• On: enable thin provisioning.<br>• Off: disable thin provisioning. |
| Quota (GB) | Volume of iSCSI LUN quota space. If thin provisioning is enabled, it displays None. |

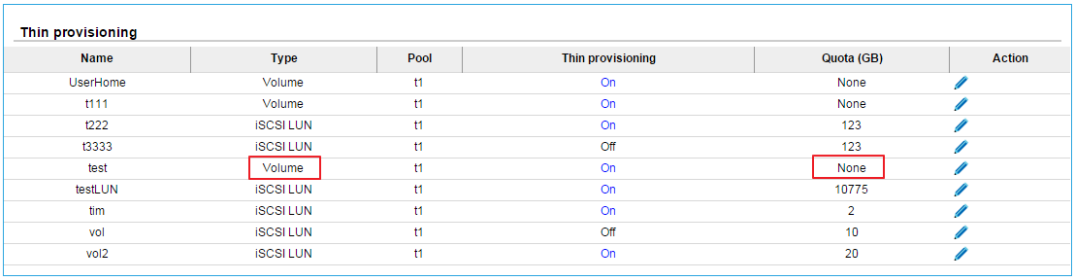
The options are available in the **Action** column:

- **Edit:** Edit thin provisioning setting.



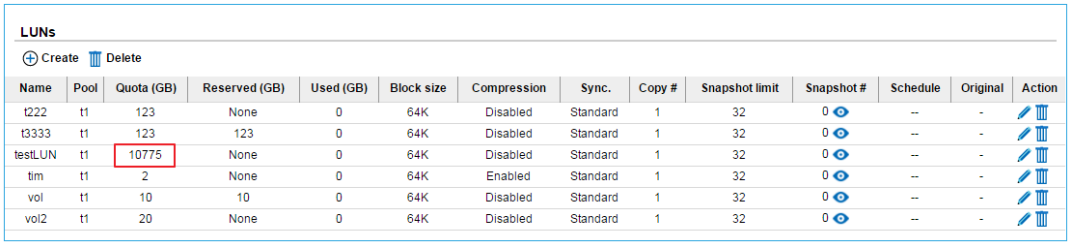

How to use thin provisioning?

1. Create a volume or iSCSI LUN with thin provisioning turned ON. The **Volume Size** (Quota) option will be grey out. Because the upper size limit is the available size of the storage pool, there is no quota size or reserved size.



Thin provisioning

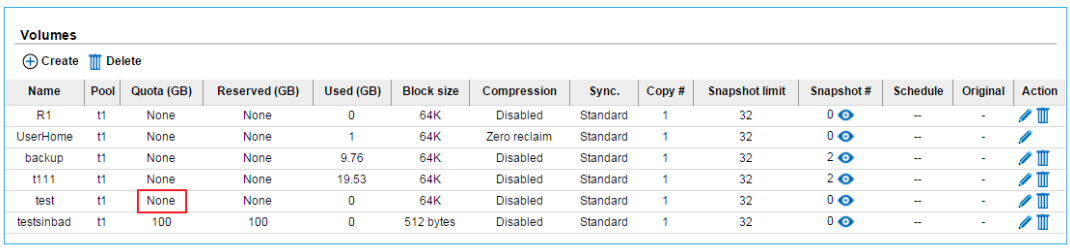
| Name | Type | Pool | Thin provisioning | Quota (GB) | Action |
|---|---|---|---|---|---|
| UserHome | Volume | t1 | On | None | |
| t111 | Volume | t1 | On | None | |
| t222 | iSCSI LUN | t1 | On | 123 | |
| t3333 | iSCSI LUN | t1 | Off | 123 | |
| test | Volume | t1 | On | None | |
| testLUN | iSCSI LUN | t1 | On | 10775 | |
| tim | iSCSI LUN | t1 | On | 2 | |
| vol | iSCSI LUN | t1 | Off | 10 | |
| vol2 | iSCSI LUN | t1 | On | 20 | |



LUNs

Create Delete

| Name | Pool | Quota (GB) | Reserved (GB) | Used (GB) | Block size | Compression | Sync. | Copy # | Snapshot limit | Snapshot # | Schedule | Original | Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| t222 | t1 | 123 | None | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| t3333 | t1 | 123 | 123 | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| testLUN | t1 | 10775 | None | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| tim | t1 | 2 | None | 0 | 64K | Enabled | Standard | 1 | 32 | 0 | -- | - | |
| vol | t1 | 10 | 10 | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| vol2 | t1 | 20 | None | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |



Volumes

Create Delete

| Name | Pool | Quota (GB) | Reserved (GB) | Used (GB) | Block size | Compression | Sync. | Copy # | Snapshot limit | Snapshot # | Schedule | Original | Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R1 | t1 | None | None | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| UserHome | t1 | None | None | 1 | 64K | Zero reclaim | Standard | 1 | 32 | 0 | -- | - | |
| backup | t1 | None | None | 9.76 | 64K | Disabled | Standard | 1 | 32 | 2 | -- | - | |
| t111 | t1 | None | None | 19.53 | 64K | Disabled | Standard | 1 | 32 | 2 | -- | - | |
| test | t1 | None | None | 0 | 64K | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| testsinbad | t1 | 100 | 100 | 0 | 512 bytes | Disabled | Standard | 1 | 32 | 0 | -- | - | |

2. Check the network drive property. The size is the remaining pool size. So it's dynamic.
3. Copy some files to the share. There is no pre-allocated space (reserved size). The used size reflects just the exact amount of the files being copied.

## Deduplication

Data deduplication is a specialized data technique for eliminating duplicate copies of repeating data. This technique is used to improve storage utilization.

The following are the deduplication features:

- Inline, block level redundancy remover.
- Applied to both volume and iSCSI LUN.
- Dedup function can be turned on and off on the fly during I/O.
- Deduplication size limit: dedup performance is highly dependent on the size of memory. When the size limit has reached, deduplication function on all storage pools will be disabled automatically and grey out.

| Memory size | Deduplication size limit |
|---|---|
| 4GB | 87GB |
| 8GB | 137GB |
| 16GB | 371GB |

- Deduplication size limit can be removed by the following means:
  - **Per pool basis:** Add read cache (L2ARC) using SSD drives.
  - **Per system basis:** Add more memory to the system or delete deduplicated data to release space.

The **Storage management -> Deduplication** option provides to list status of data deduplication.

**Deduplication**

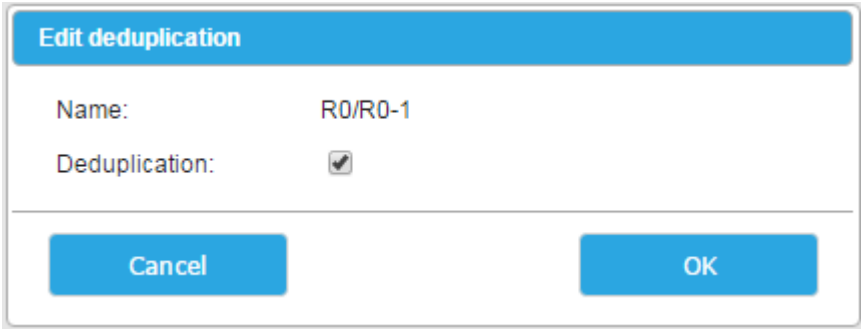
| Name | Type | Pool | Dedup | Action |
|---|---|---|---|---|
| R0-1 | Volume | R0 | On | |
| R0-2 | Volume | R0 | On | |
| R0-3 | iSCSI LUN | R0 | On | |
| R0-4 | iSCSI LUN | R0 | On | |
| R1-1 | Volume | R1 | On | |
| R1-2 | Volume | R1 | On | |
| R1-3 | iSCSI LUN | R1 | On | |
| R1-4 | iSCSI LUN | R1 | On | |
| R5-1 | Volume | R5 | On | |
| R5-2 | Volume | R5 | On | |
| R5-3 | iSCSI LUN | R5 | On | |
| R5-4 | iSCSI LUN | R5 | On | |
| R6-1 | Volume | R6 | On | |
| R6-2 | Volume | R6 | On | |
| R6-3 | iSCSI LUN | R6 | On | |
| R6-4 | iSCSI LUN | R6 | On | |

This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The volume name or LUN name. |
| Type | Volume or iSCSI LUN. |
| Pool | The pool name. |
| Dedup | The status of deduplication:<br>• On: enable deduplication.<br>• Off: disable deduplication. |

The options are available in the **Action** column:

- **Edit:** Edit deduplication setting.



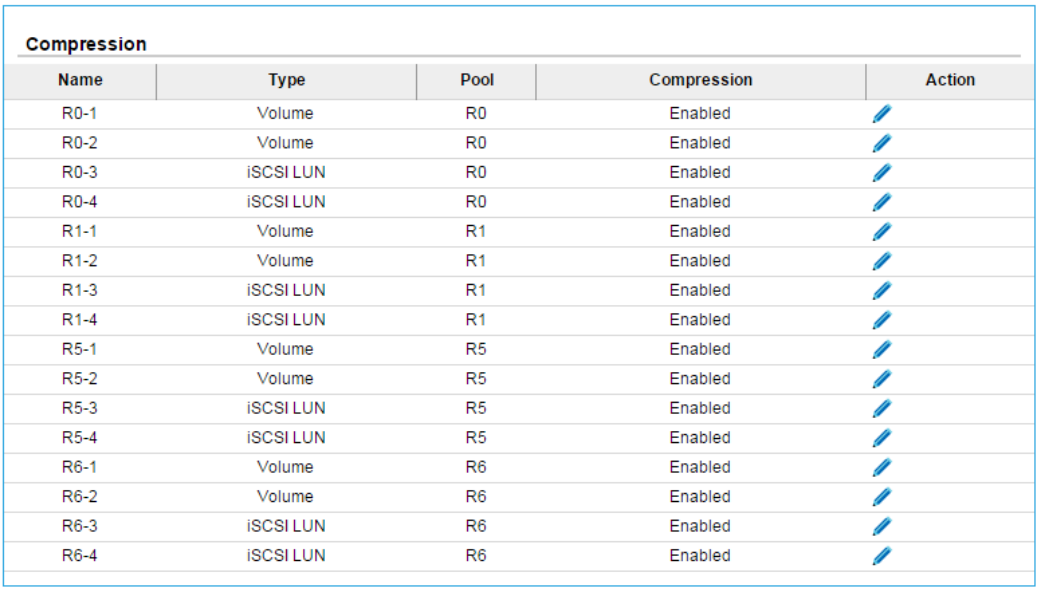
## Compression

Compression is useful because it helps reduce data storage space. Because compressed data must be decompressed to use, this extra processing imposes computational or other costs through decompression.

The following are the compression features:

- Compression algorithm adopts LZJB.
- Applied to both volume and iSCSI LUN.
- Compression can be turned ON and OFF on the fly during I/O.

The **Storage management -> Compression** option provides to list status of data compression.



Compression

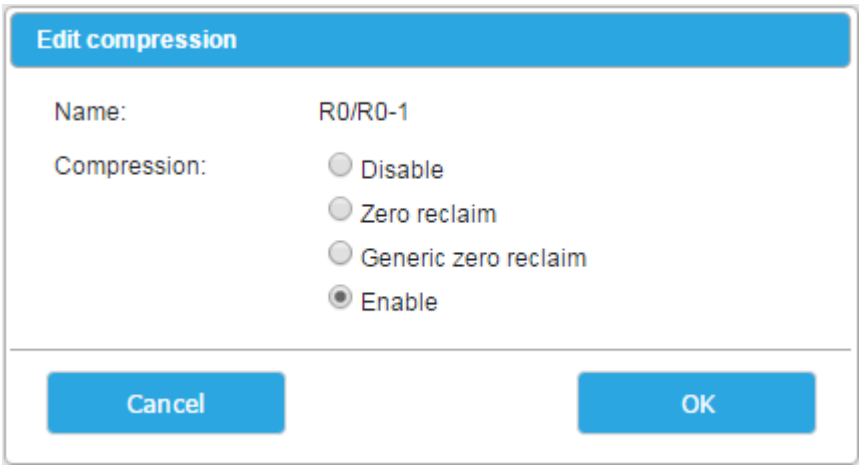
| Name | Type | Pool | Compression | Action |
|---|---|---|---|---|
| R0-1 | Volume | R0 | Enabled | |
| R0-2 | Volume | R0 | Enabled | |
| R0-3 | iSCSI LUN | R0 | Enabled | |
| R0-4 | iSCSI LUN | R0 | Enabled | |
| R1-1 | Volume | R1 | Enabled | |
| R1-2 | Volume | R1 | Enabled | |
| R1-3 | iSCSI LUN | R1 | Enabled | |
| R1-4 | iSCSI LUN | R1 | Enabled | |
| R5-1 | Volume | R5 | Enabled | |
| R5-2 | Volume | R5 | Enabled | |
| R5-3 | iSCSI LUN | R5 | Enabled | |
| R5-4 | iSCSI LUN | R5 | Enabled | |
| R6-1 | Volume | R6 | Enabled | |
| R6-2 | Volume | R6 | Enabled | |
| R6-3 | iSCSI LUN | R6 | Enabled | |
| R6-4 | iSCSI LUN | R6 | Enabled | |

table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The volume name or LUN name. |
| Type | Volume or iSCSI LUN. |
| Pool | The pool name. |
| Compression | The status of compression:<br>• Disabled: No compression at all. Default value.<br>• Zero Reclaim: When the data block contains all zeros, no physical space will be consumed. The block will be marked specifically.<br>• Generic Zero Reclaim: This is Qsan patent filing technology that will reclaim data blocks with special patterns such as all 0's, all 1's. Theoretically, it will have better storage efficiency.<br>• Enabled: This will always enable lossless data compression function using LZJB algorithm.On: enable deduplication. |

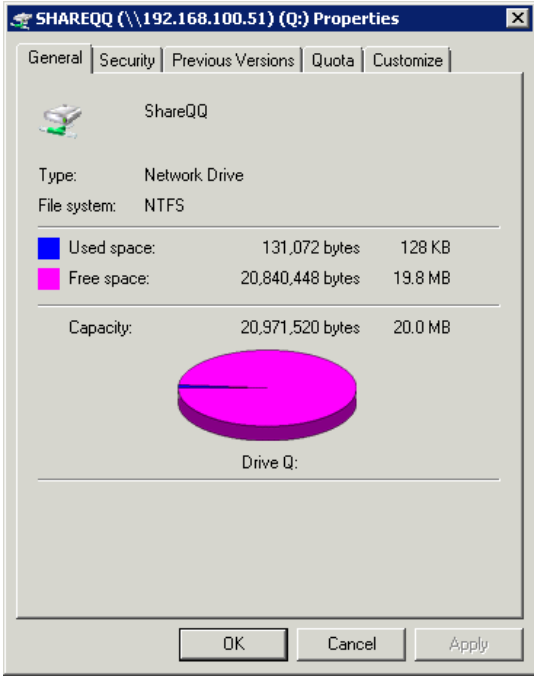
The options are available in the **Action** column:

- **Edit:** Edit compression setting.

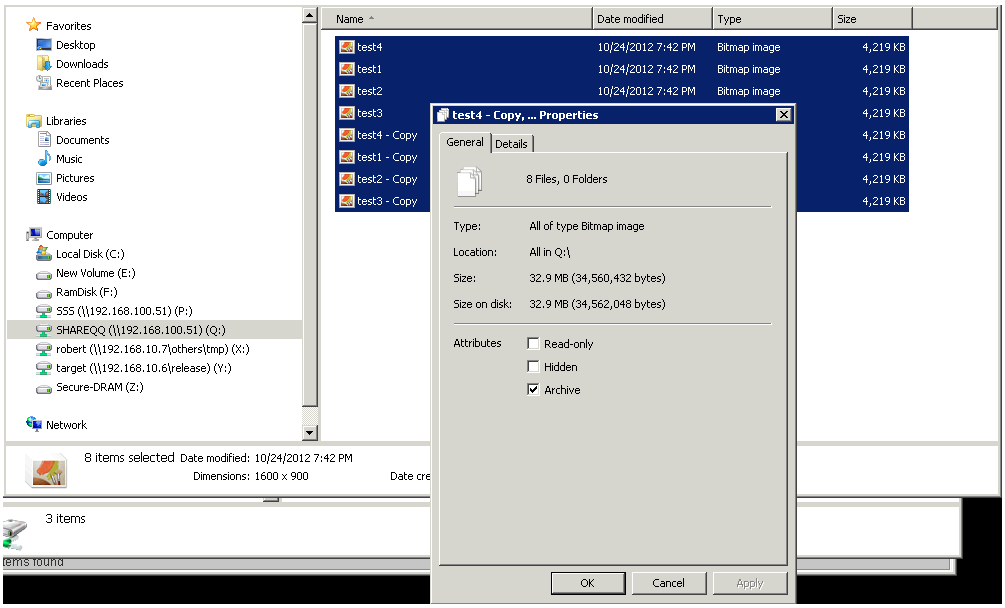



How to use compression with shares?

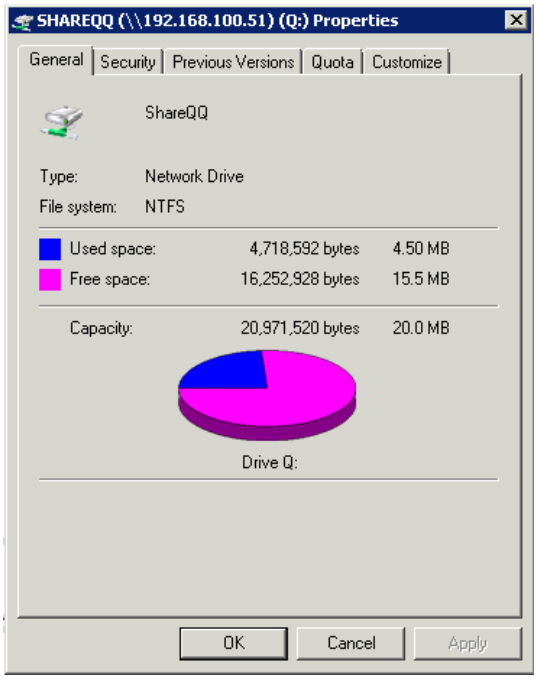
1. For example, create a file system of 20MB with compression turned ON.
2. Map the share in Windows as a network drive. And check the drive property.




3. Copy several bitmap files that are over the size of 20MB.




4. Check the network drive property again. The actual space taken is less than 20MB, which means **Compression** is functioning.



# 4 Data Services and Configurations

This chapter describes the data services. It includes the following sections:



## File Services and Configurations

File services include:

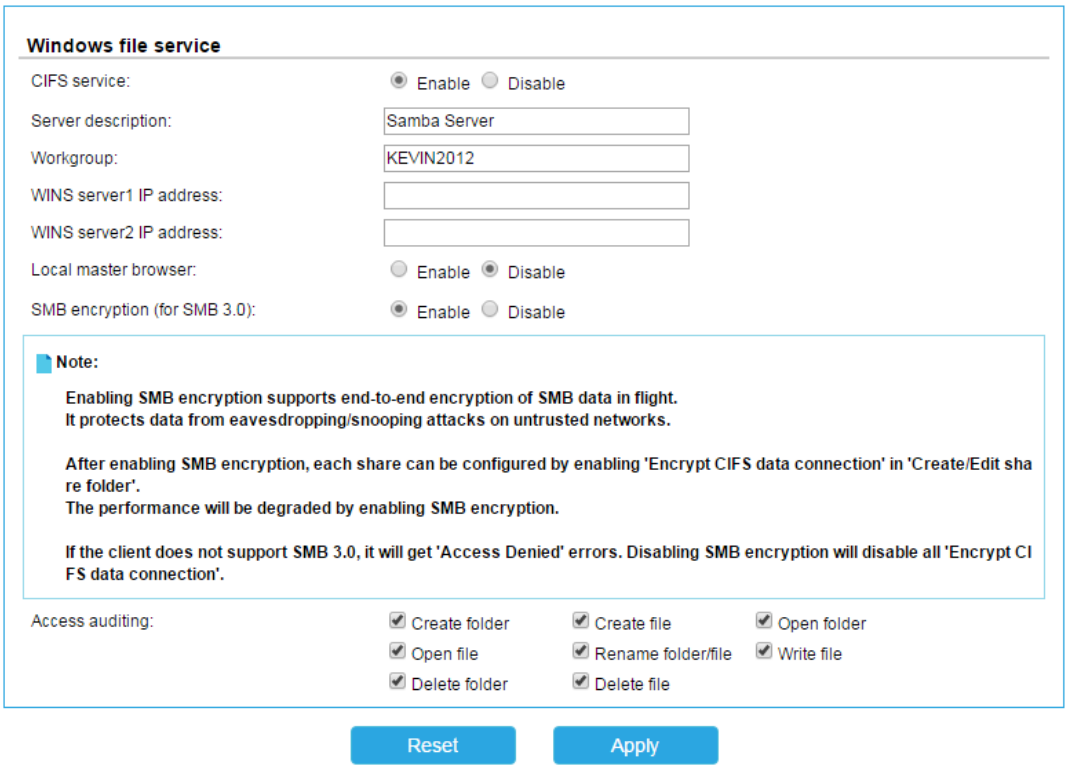


### Windows File Service (CIFS Service)

The **CIFS** (Common Internet File System) option is used to setup CIFS protocol. The CIFS is a network protocol that offers file services for Windows computers. We provide CIFS capability without the need for a Windows server in the network. Starting this service will open the following ports on the system:

- TCP 139 (smbd)
- TCP 445 (smbd)
- UDP 137 (nmbd)
- UDP 138 (nmbd)

The **Privilege setting -> File services -> Windows** option provides to enable CIFS service and the configurations.




The options are available in this tab:

- **CIFS service:** Enable or disable CIFS service.
- **Server description:** Enter the description for the service. Maximum length is 256 characters..
- **Workgroup:** Enter the workgroup name. Maximum length is 16 characters.
- **WINS server1/2 IP address:** WINS Server IP Address. Default is empty. If it's empty, the name resolution priority is DNS only. Otherwise, the name resolution priority is WINS server first, and then DNS.
- **Local Master Browser:** Enable local master browser if you cannot see the server via network neighborhood.
- **SMB Encryption (for SMB 3.0):** Enabling SMB Encryption supports end-to-end encryption of SMB data in flight. It protects data from eavesdropping/snooping attacks on untrusted networks. After enabling SMB Encryption, each share can be configured by enabling 'Encrypt CIFS data connection' in 'Create/Edit share folder'. The performance will be degraded by enabling SMB Encryption. If the client does not support SMB 3.0, it will get 'Access Denied' errors. Disabling SMB Encryption will disable all 'Encrypt CIFS data connection'..
- **Access auditing:** Check the boxes to log the user behaviors. They can be monitored in **Monitor -> Log center -> Service logs** page.

When it is done, click **Apply** button.

**CAUTION:**
Enabling access auditing may reduce the performance.

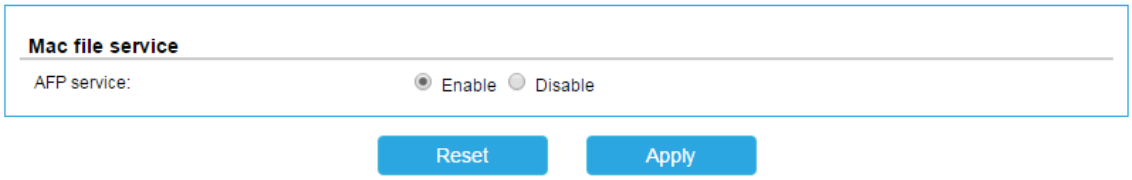
## Mac OS File Service (AFP Service)

The **AFP** (Apple Filing Protocol) option is used to setup AFP protocol. The AFP is a network protocol that offers file sharing services for Mac computers.

Starting this service will open the following ports on the system:

- TCP 548 (afpd)
- TCP 4799 (cnid_metadata)
- UDP 5353 and a random UDP port (avahi).

The **Privilege setting -> File services -> Mac OS** option provides to enable AFT service and the configurations.




The options are available in this tab:

- **AFP service:** Enable or disable AFP service.

Enable or Disable the AFP protocol, and then click **Apply** button.

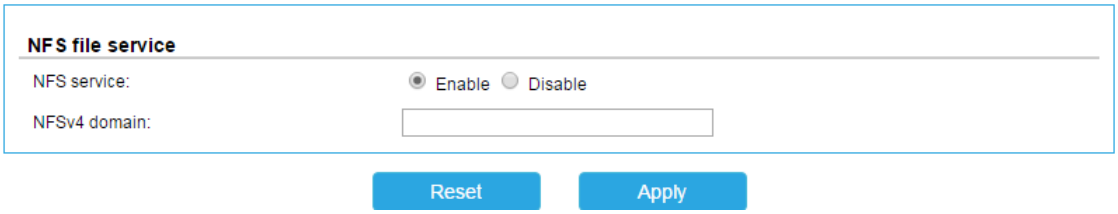
## NFS Service

The **NFS** (Network File System) option is used to setup NFS protocol. NFS is a protocol for sharing files and directories on a network among Linux machines and Unix machines.

Starting this service will open the following ports on the system:

- TCP 111 (rpcbind)
- TCP 2049 (nfsd)
- UDP 111 (rpcbind)
- Additionally, mountd and rpcbind will each bind to a randomly available UDP port.

The **Privilege setting -> File services -> NFS** option provides to enable NFS service and the configurations.




The options are available in this tab:

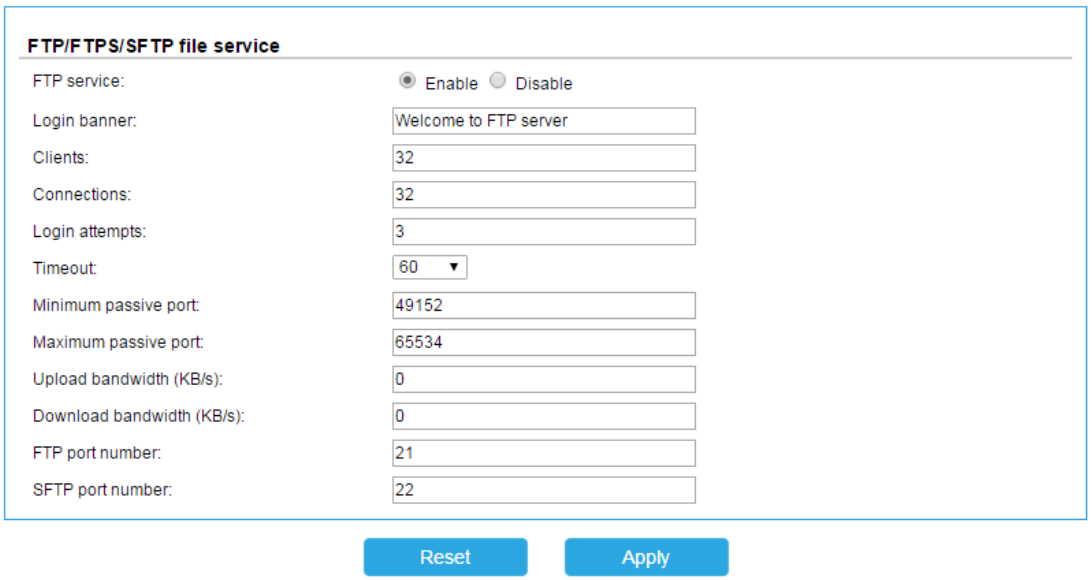
- **NFS service:** Enable or disable NFS service.
- **NFSv4 domain:** Enter the NFS domain. Maximum length is 32 characters. If you are using NFSv4 protocol, please make sure NFSv4 domain is provided in order to have ID mapping function working correctly.

When it is done, click **Apply** button.

## FTP Service

The **FTP** (File Transfer Protocol) option is used to setup FTP protocol. It allows you to configure the FTP server so that users can browse and download data using their web browser or FTP client software. FTP is easy to use and it is cross-platform. All major operating systems have FTP client function.

The **Privilege setting -> File services -> FTP** option provides to enable FTP service and the configurations.




The options are available in this tab:

- **FTP service:** Enable or disable FTP service.
- **Login banner:** Enter the login banner for the service. Maximum length is 256 characters..

- **Clients:** The maximum number of simultaneous clients, range is 1 ~ 4096.
- **Connections:** The maximum number of connections per IP address, range is 1 ~ 32.
- **Login attempts:** The maximum number of attempts before client is disconnected, range is 3 ~ 32.
- **Timeout:** The maximum client idle time in seconds before client is disconnected, valid values are 30, 60, 300, 600, 1800, 3600 seconds.
- **Minimum passive port:** The minimum passive port, range is 1024 ~ 65535.
- **Maximum passive port:** The minimum passive port, range is 1024 ~ 65535.
- **Upload bandwidth (KB/s):** The upload bandwidth, in KB/s, 0 is unlimited.
- **Download bandwidth (KB/s):** The download bandwidth, in KB/s, 0 is unlimited.
- **FTP port number:** The port number of FTP.
- **SFTP port number:** The port number of Secure FTP.

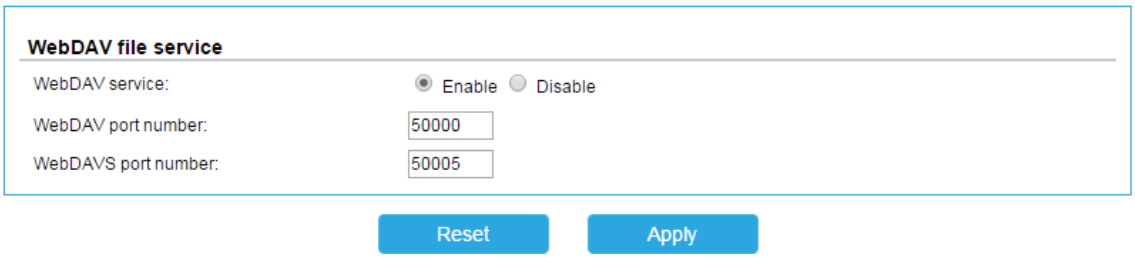
When it is done, click **Apply** button.

## WebDAV Service

The **WebDAV** (Web Distributed Authoring and Versioning) option is used to setup WebDAV protocol. It is an extension of HTTP v1.1 protocol that allows users to manage files across different operating system platforms. Starting this service will open the following ports on the Qsan unified storage system:

- TCP 80 (http)
- TCP 443 (https)

The **Privilege setting -> File services -> WebDAV** option provides to enable WebDAV service and the configurations.



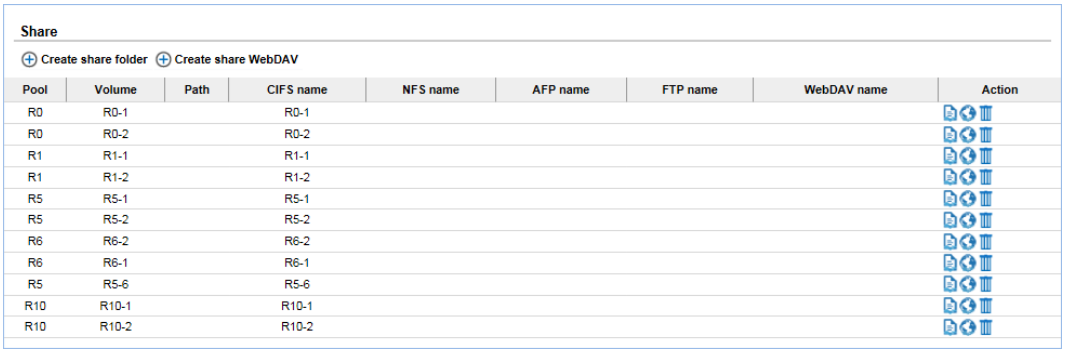

The options are available in this tab:

- **WebDAV service:** Enable or disable WebDAV service.
- **WebDAV port number:** The port number of WebDA, range is 1 ~ 65535.
- **WebDAVS port number:** The port number of WebDAVS, range is 1 ~ 65535.

When it is done, click **Apply** button.

## Manage Shared Folders

The **Privilege setting -> Share folders** option provides to manage the permission of the shared file systems.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Pool | The pool name of the shared folder. |
| Volume | The volume name of the shared folder. |
| Path | Share directory. |
| CIFS name | Share name for CIFS. |
| NFS name | Share name for NFS. |
| AFP name | Share name for AFP. |
| FTP name | Share name for FTP. |
| WebDAV name | Share name for WebDAV. |

The options are available in this tab:

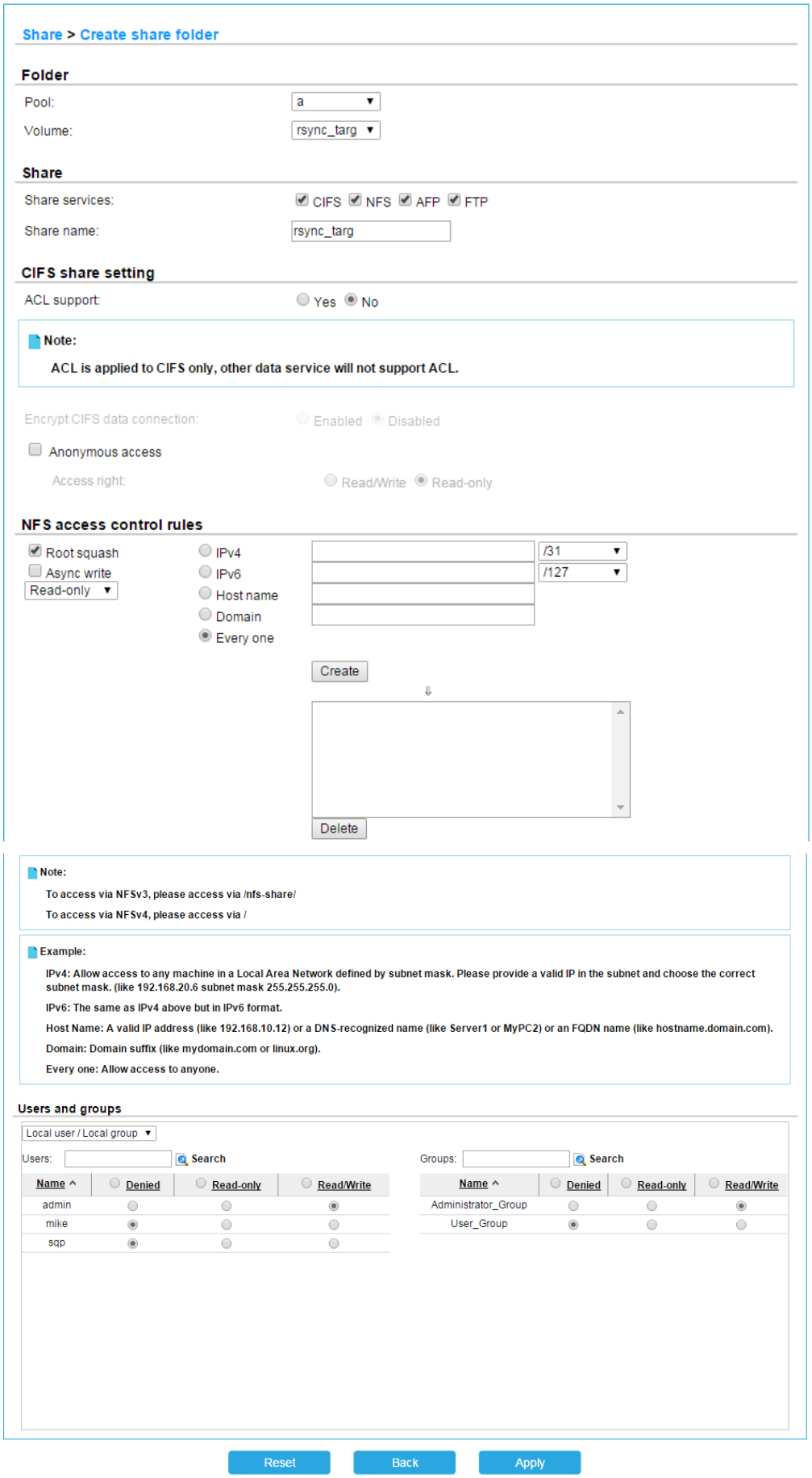
- **Create share folder:** Create a share folder for CIFS, NFS, AFP, and FTP.
- **Create share WebDAV:** Create a share folder for WebDAV.

The options are available in the **Action** column:

- **Edit share folder:** Edit the shared folder for CIFS, NFS, AFP, and FTP.
- **Edit share WebDAV:** Edit the shared folder for WebDAV.
- **Delete:** Delete the shared folder.

Take an example of creating a share folder.

1. Click **Create share folder** button.



2. Use the drop-down list to select a **Pool** and **Volume**.
3. Click the check box to share the folder by **CIFS, NFS, AFP, FTP** protocols.
4. If select CIFS protocol, it can enable **ACL support** (Access Control List), **Encrypt CIFS data connection**, and **Anonymous access**.
5. If select NFS protocol, it has to set the **NFS access control rules**. Use **Create** button to add the rules and **Delete** button to delete them.

**TIP:**
NFS access control rules:

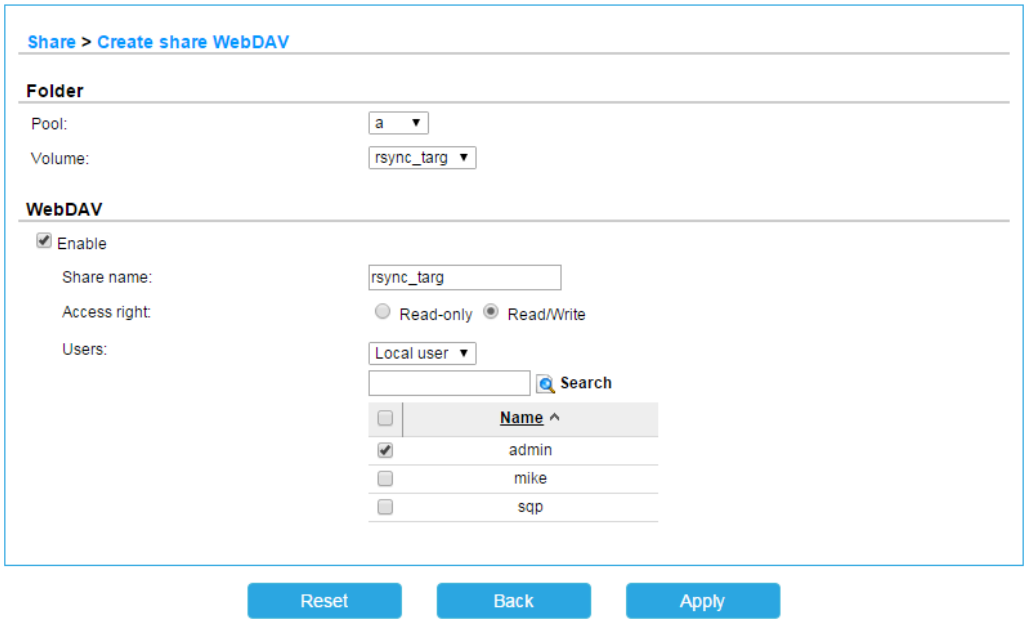
- **Root squash:** Uncheck this to use no_root_squash setting.
- **Async write:** Check this to use asynchronous write function. The performance will be better than synchronous write.
- **Read only and Read/Write:** Set the read/write permission.
- **IPv4:** Allow a group of computers that are in a certain IP range to access the share.
  - The number (1~31) in the drop down list represent the network mask value. It stands for the total number of binary "1" in the network mask. For example, a network mask of 255.255.0.0 in binary form will become 11111111.11111111.0.0. So number 16 will stand for a network mask of 255.255.0.0.
  - Simply provide a valid IP address within your destination range.
- **IPv6:** Same meaning as IPv4 above. Instead it accepts IPv6 address only.
- **Hostname:** Use this option to specify a specific computer for access. There are 3 forms allowed. Putting in an invalid form or value will cause IO error or inability to access the share. Please be careful.
  - A valid IP address
  - A DNS recognized name : the system name or machine name
  - FQDN name : Fully Qualified Domain Name
- **Domain:** Use this option if you want to allow all the computers in a certain network domain to have access to the share.
- **Everyone:** Allow access to computers from all kinds of IP addresses.

**CAUTION:**
Please be aware that users will have only read permission to their own home directory shares using NFS service. This is due to security purpose and the nature of NFS protocol. This is to avoid that a user uses a matching UID to access someone else home directory.

6. Select the permission of the **Users and groups**. And check the radio box for **Denied**, **Read-only** or **Read/Write**.
7. Click **Apply** button.

Take an example of creating a share folder.

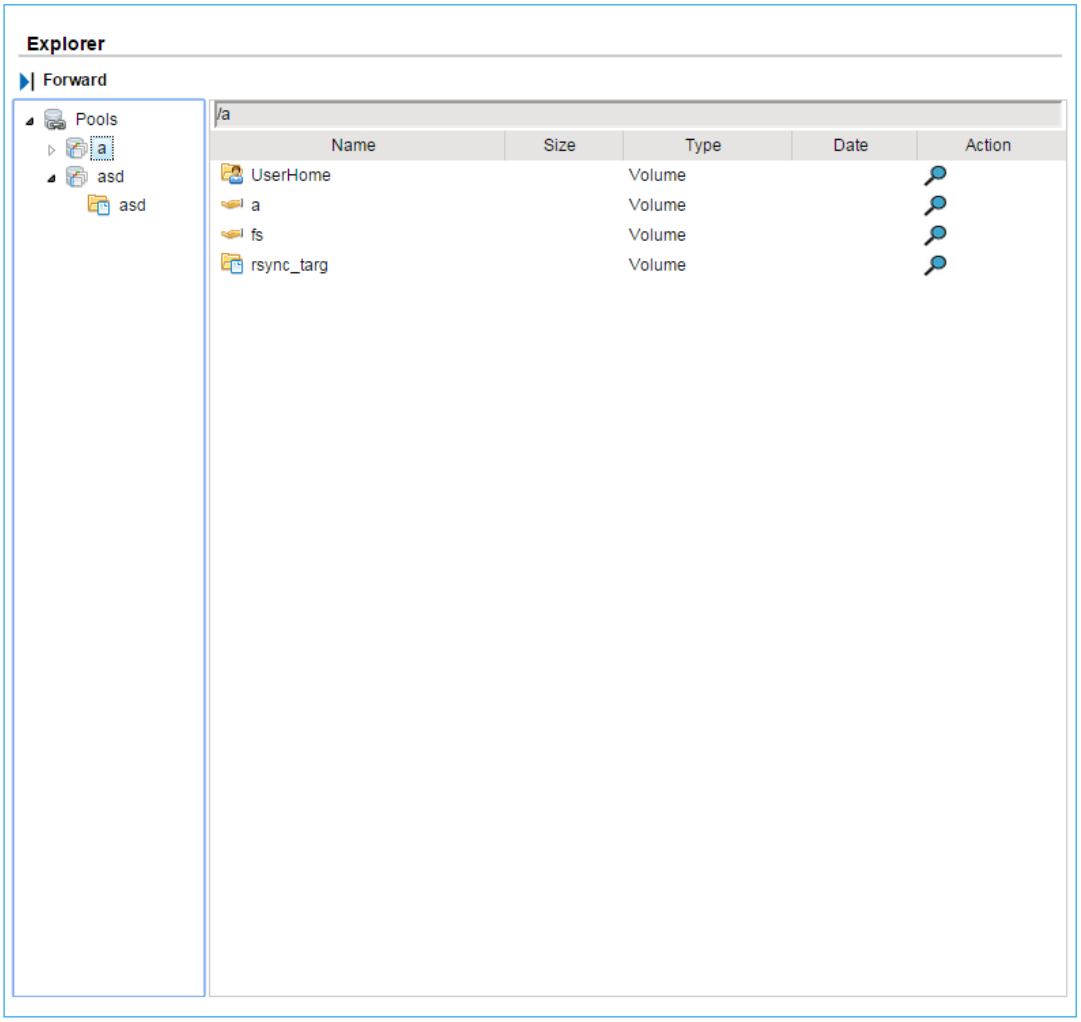
1. Click **Create share WebDAV** button.




2. Use the drop-down list to select a **Pool** and **Volume**.
3. Click the check box to share the folder by **WebDAV** protocol.
4. Enter a share name.
5. Select the **Access right** for **Read-only** or **Read/Write**. And then select the users.
6. Click **Apply** button.

## Explorer

The **Privilege setting -> Explorer** option provides a simple file explorer to browse the whole storage pool structure.




The options are available in this tab:

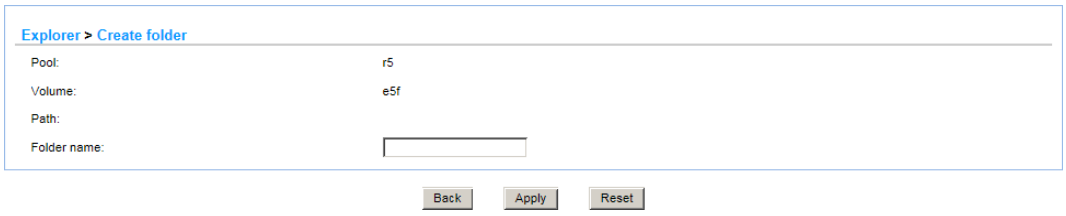
- **Forward:** Forward to the previous folder.
- **Create folder:** Create a folder on the volume.

The option is available in the **Action** column:

- **Search files:** Search the user-specified file in the pool. If it is found, the path will be displayed. So user can locate the file more easily.

Take an example of creating a folder.

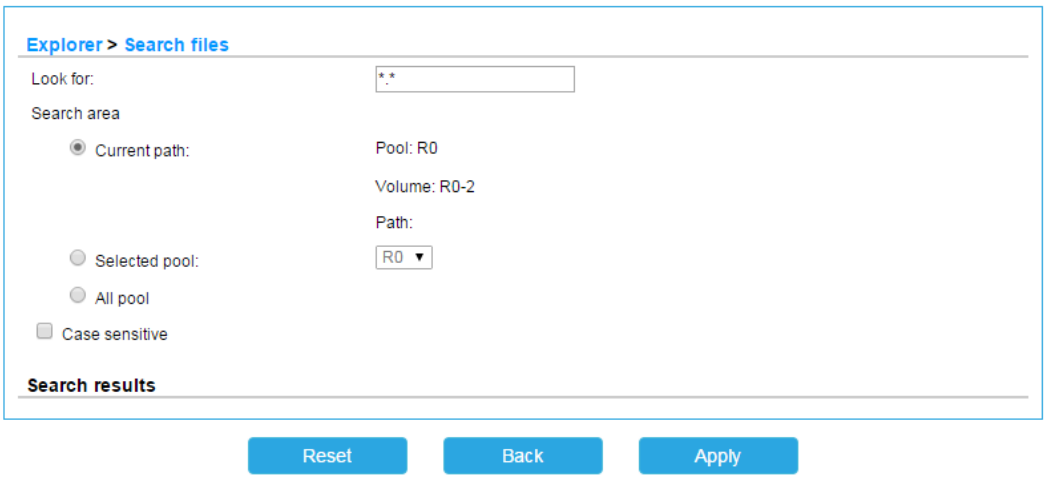
1. Click **Create folder** button.



2. Enter a folder name.
3. Click **Apply** button.

Take an example of searching the files.

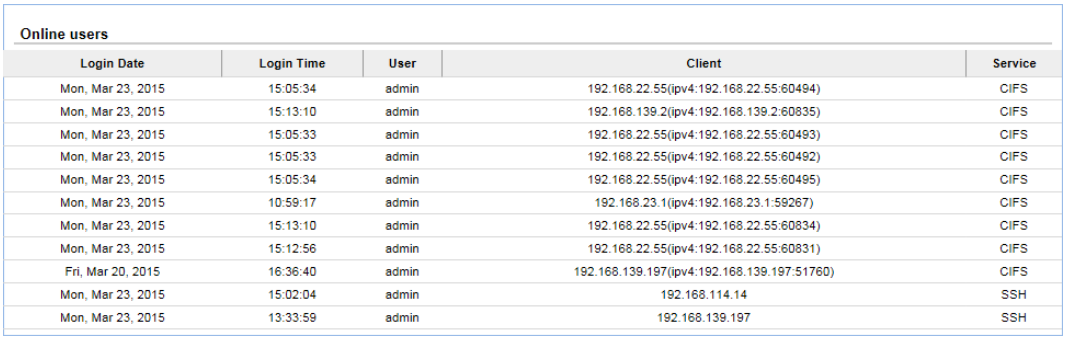
1. Click **Search** icon.




2. Enter a file name which wants to be searched. It can use wildcard "*".
3. Select the **Search area**, current path, selected pool, or all pool.
4. Check the **Case sensitive** box if case sensitive.
5. Click **Apply** button.
6. The results will be displayed in the **Search results** area.

## Online Connections for File Service

The **Dashboard -> Online connections -> File service** option provides the current connections of the file service.



Online users

| Login Date | Login Time | User | Client | Service |
|---|---|---|---|---|
| Mon, Mar 23, 2015 | 15:05:34 | admin | 192.168.22.55(ipv4:192.168.22.55:60494) | CIFS |
| Mon, Mar 23, 2015 | 15:13:10 | admin | 192.168.139.2(ipv4:192.168.139.2:60835) | CIFS |
| Mon, Mar 23, 2015 | 15:05:33 | admin | 192.168.22.55(ipv4:192.168.22.55:60493) | CIFS |
| Mon, Mar 23, 2015 | 15:05:33 | admin | 192.168.22.55(ipv4:192.168.22.55:60492) | CIFS |
| Mon, Mar 23, 2015 | 15:05:34 | admin | 192.168.22.55(ipv4:192.168.22.55:60495) | CIFS |
| Mon, Mar 23, 2015 | 10:59:17 | admin | 192.168.23.1(ipv4:192.168.23.1:59267) | CIFS |
| Mon, Mar 23, 2015 | 15:13:10 | admin | 192.168.22.55(ipv4:192.168.22.55:60834) | CIFS |
| Mon, Mar 23, 2015 | 15:12:56 | admin | 192.168.22.55(ipv4:192.168.22.55:60831) | CIFS |
| Fri, Mar 20, 2015 | 16:36:40 | admin | 192.168.139.197(ipv4:192.168.139.197:51760) | CIFS |
| Mon, Mar 23, 2015 | 15:02:04 | admin | 192.168.114.14 | SSH |
| Mon, Mar 23, 2015 | 13:33:59 | admin | 192.168.139.197 | SSH |

This table shows the available options and their descriptions.

| Column Name | Description |
|---|---|
| Login Date | The login date of the connection. |
| Login Time | The login time of the connection. |
| User | The connection user. |
| Client | The client information of the connection. |
| Service | The connection service. |

## Block Services and Configurations

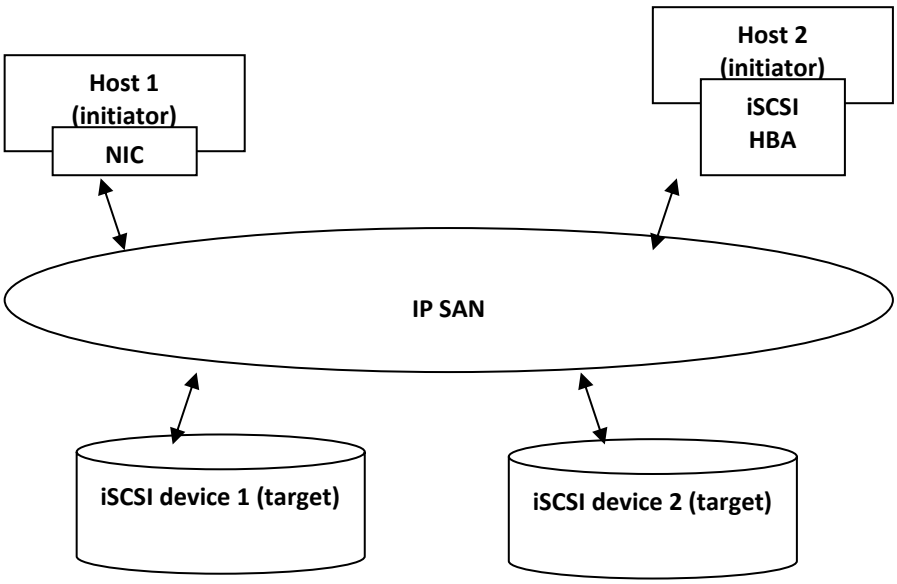
Block services include:

- iSCSI Service
- Fibre Channel Service (U300-F30 series)

### iSCSI Concept

iSCSI (Internet SCSI) is a protocol which encapsulates SCSI (Small Computer System Interface) commands and data in TCP/IP packets for linking storage devices with servers over common IP infrastructures. iSCSI provides high performance SANs over standard IP networks like LAN, WAN or the Internet.

IP SANs are true SANs (Storage Area Networks) which allow several servers to attach to an infinite number of storage volumes by using iSCSI over TCP/IP networks. IP SANs can scale the storage capacity with any type and brand of storage system. In addition, it can be used by any type of network (Ethernet, Fast Ethernet, Gigabit Ethernet, and 10 Gigabit Ethernet) and combination of operating systems (Microsoft Windows, Linux, Solaris, Mac, etc.) within the SAN network. IP-SANs also include mechanisms for security, data replication, multi-path and high availability.

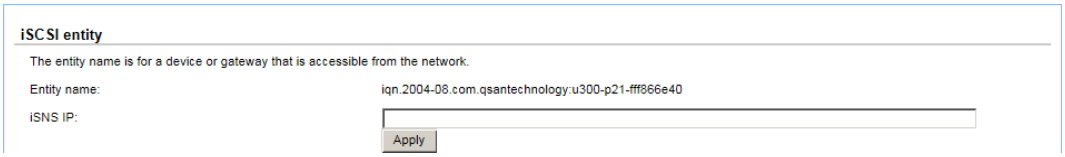



Storage protocol, such as iSCSI, has “two ends” in the connection. These ends are initiator and target. In iSCSI, we call them iSCSI initiator and iSCSI target. The iSCSI initiator requests or initiates any iSCSI communication. It requests all SCSI operations like read or write. An initiator is usually located on the host side (either an iSCSI HBA or iSCSI SW initiator).

The target is the storage device itself or an appliance which controls and serves volumes or virtual volumes. The target is the device which performs SCSI command or bridge to an attached storage device.

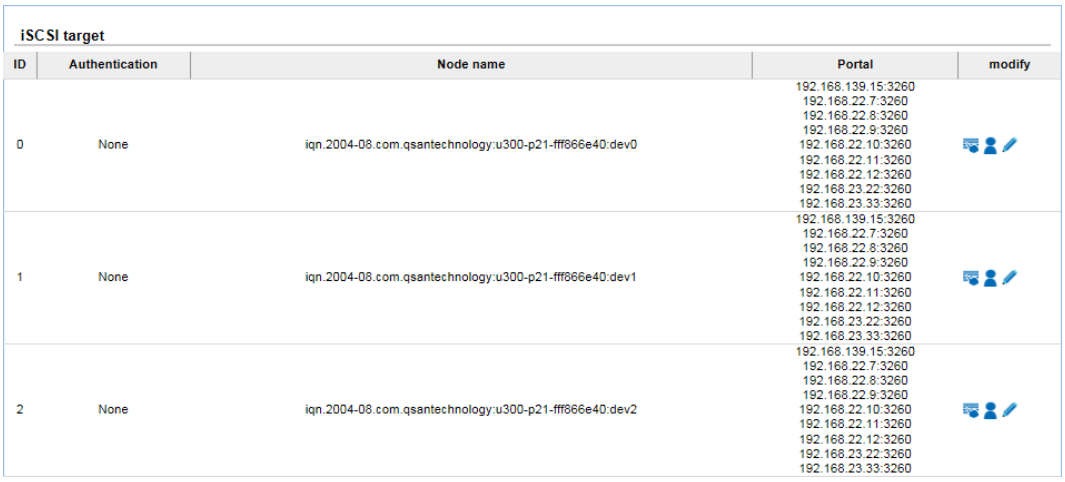
## iSCSI Entity and iSCSI target

The **Storage management -> iSCSI -> General setting** option provides to setup iSCSI entity, iSNS (Internet Storage Name Service) IP address, and iSCSI target. iSCSI is a protocol standard that allows the consolidation of storage data. iSCSI allows the system to act like a storage area network (SAN) over an existing Ethernet network. Specifically, it exports disk devices over an Ethernet network that iSCSI clients (called initiators) can attach to and mount.



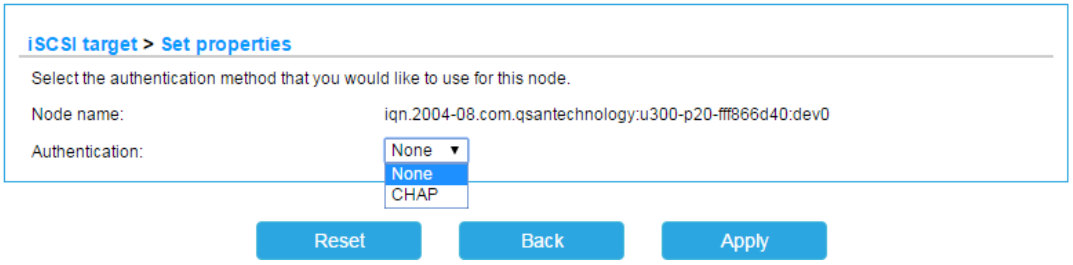

Enter the iSNS IP if necessary, and then click **Apply** button.

The following displays the iSCSI targets.




The options are available in the **Action** column:

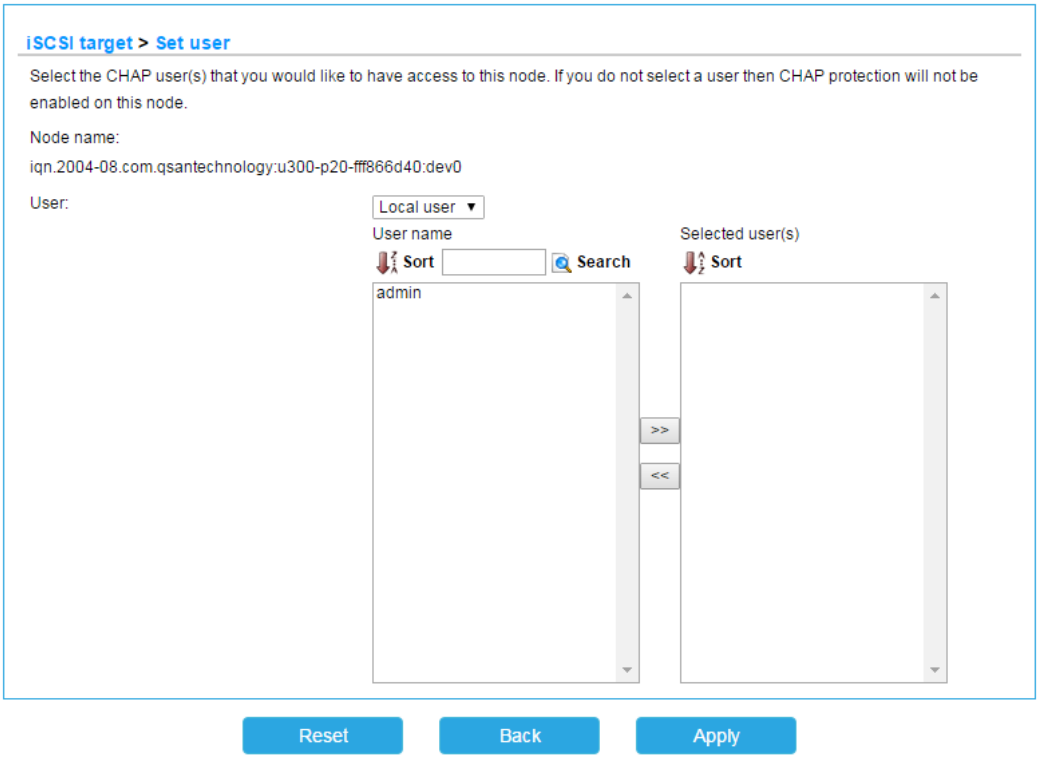
- **Set properties:** Set the authentication method of the iSCSI node.




CHAP (Challenge Handshake Authentication Protocol) is a strong authentication method used in point-to-point for user login. It's a type of authentication in which the authentication server sends the client a key to be used for encrypting the username and password. CHAP enables the username and password to transmit in an encrypted form for protection.

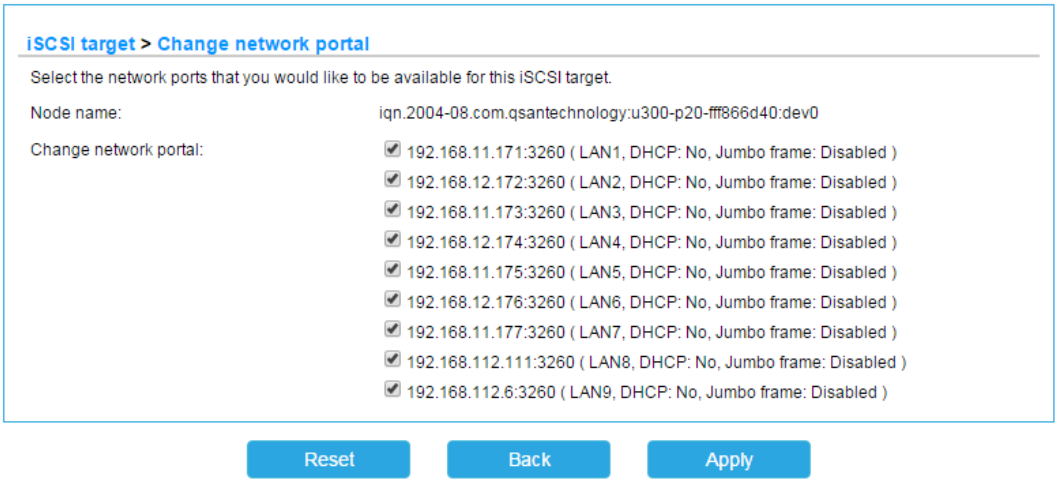
If you want to use CHAP authentication, select **CHAP** from the drop-down list, and then click **Apply** button.

- **Set user:** Set the iSCSI CHAP users.




Select the CHAP user(s) which will be used and click **>>** button. It can be more than one, but it must be at least one for CHAP to work. When it's done, click **Apply** button.

- **Change network portal:** Change the network portal of the iSCSI node.

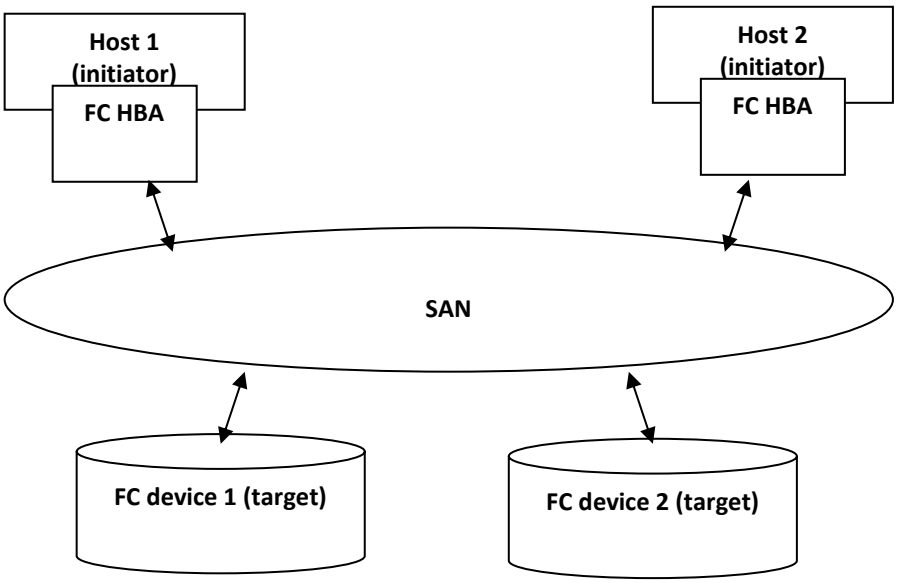



Check or uncheck the ports to enable or disable the network portals. When it's done, click **Apply** button.

The following sections are to introduce fibre channel, if you want to start to use block service, you can skip those and jump to Manage LUNs.

## Fibre Channel Concept

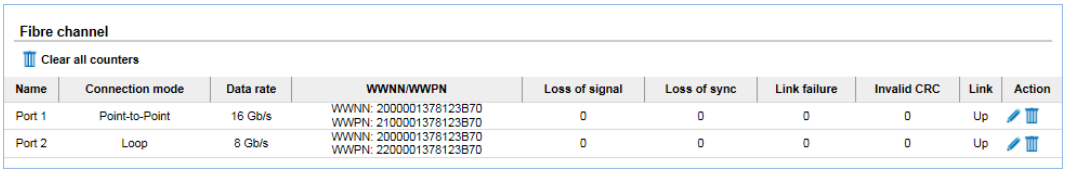
Fibre channe started use primarily in the supercomputer field, but has become the standard connection type for storage area networks (SAN) in enterprise storage.




The target is the storage device itself or an appliance which controls and serves volumes or virtual volumes. The target is the device which performs SCSI commands or bridges to an attached storage device.

## Fibre Channel Setting

The **Storage management -> FC -> General setting** option is used to view the fibre channel information, and change the connection mode and link speed of FC.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | Fibre channel port name. |
| Connection mode | Point-to-Point or Loop mode. |
| Data rate | 4 Gb/s, 8 Gb/s, or 16 Gb/s. |
| WWNN/WWPN | World Wide Node Name / World Wide Port Name. |
| Loss of signal | Loss of signal number. |

| | |
|---|---|
| Loss of sync | Loss of sync number. |
| Link failure | Link failure number. |
| Invalid CRC | The status of the sync. |
| Link | Link up or link down. |

The options are available in this tab:

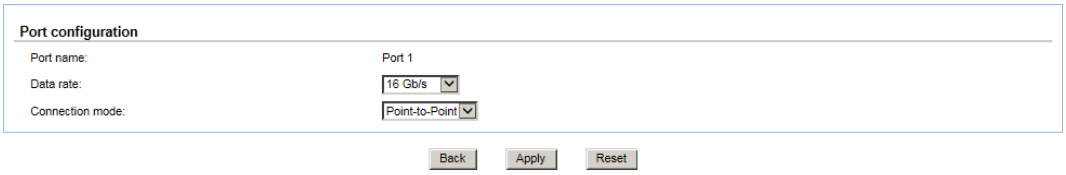
- **Clear all counters:** Clear all counters of all fibre channels.

The options are available in the **Action** column:

- **Configure port:** Edit the LUN settings.
- **Clear counters:** Clear the counters of the selected fibre channel.

Take an example of configure port.

1. Click **Configure port** icon.




2. Select the **Data rate** and **Connection mode**.
3. Click **Apply** button.

**TIP:**
Connection mode:

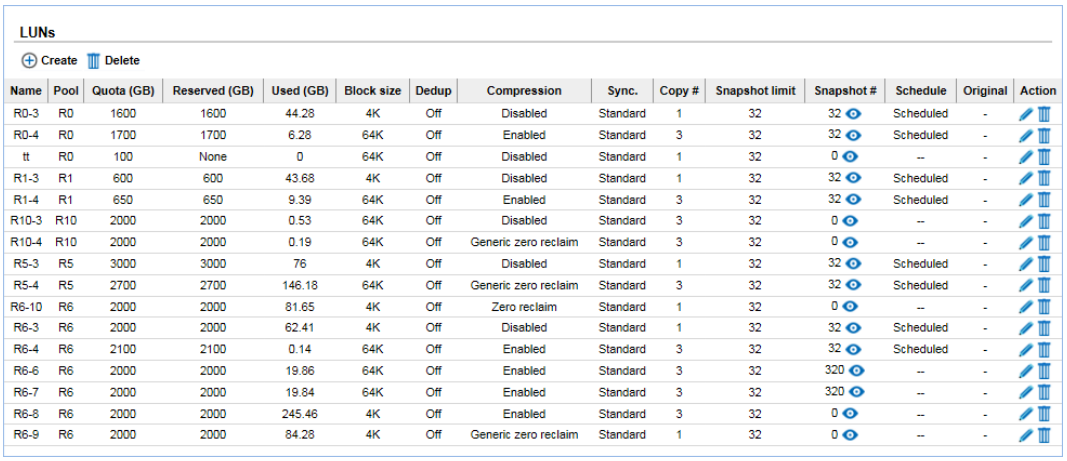
- **Point-to-Point (FC-P2P):** Two devices are connected directly to each other. This is the simplest topology, with limited connectivity.
- **Loop (Arbitrated Loop)(FC-AL):** In this design, all devices are in a loop or ring, similar to token ring networking. Adding or removing a device from the loop causes all activity on the loop to be interrupted. The failure of one device causes a break in the ring. Fibre Channel hubs exist to connect multiple devices together and may bypass failed ports. A loop may also be made by cabling each port to the next in a ring.

(* Reference from http://en.wikipedia.org/wiki/Fibre_Channel)

## Manage LUNs

The **Storage management -> iSCSI /FC -> LUNs** option provides various functions to manage LUNs.

This is for block level access which is used with iSCSI or FC target function.




| Name | Pool | Quota (GB) | Reserved (GB) | Used (GB) | Block size | Dedup | Compression | Sync. | Copy # | Snapshot limit | Snapshot # | Schedule | Original | Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R0-3 | R0 | 1600 | 1600 | 44.28 | 4K | Off | Disabled | Standard | 1 | 32 | 32 | Scheduled | - | |
| R0-4 | R0 | 1700 | 1700 | 6.28 | 64K | Off | Enabled | Standard | 3 | 32 | 32 | Scheduled | - | |
| tt | R0 | 100 | None | 0 | 64K | Off | Disabled | Standard | 1 | 32 | 0 | -- | - | |
| R1-3 | R1 | 600 | 600 | 43.68 | 4K | Off | Disabled | Standard | 1 | 32 | 32 | Scheduled | - | |
| R1-4 | R1 | 650 | 650 | 9.39 | 64K | Off | Enabled | Standard | 3 | 32 | 32 | Scheduled | - | |
| R10-3 | R10 | 2000 | 2000 | 0.53 | 64K | Off | Disabled | Standard | 3 | 32 | 0 | -- | - | |
| R10-4 | R10 | 2000 | 2000 | 0.19 | 64K | Off | Generic zero reclaim | Standard | 3 | 32 | 0 | -- | - | |
| R5-3 | R5 | 3000 | 3000 | 76 | 4K | Off | Disabled | Standard | 1 | 32 | 32 | Scheduled | - | |
| R5-4 | R5 | 2700 | 2700 | 146.18 | 64K | Off | Generic zero reclaim | Standard | 3 | 32 | 32 | Scheduled | - | |
| R6-10 | R6 | 2000 | 2000 | 81.65 | 4K | Off | Zero reclaim | Standard | 1 | 32 | 0 | -- | - | |
| R6-3 | R6 | 2000 | 2000 | 62.41 | 4K | Off | Disabled | Standard | 1 | 32 | 32 | Scheduled | - | |
| R6-4 | R6 | 2100 | 2100 | 0.14 | 64K | Off | Enabled | Standard | 3 | 32 | 32 | Scheduled | - | |
| R6-6 | R6 | 2000 | 2000 | 19.86 | 64K | Off | Enabled | Standard | 3 | 32 | 320 | -- | - | |
| R6-7 | R6 | 2000 | 2000 | 19.84 | 64K | Off | Enabled | Standard | 3 | 32 | 320 | -- | - | |
| R6-8 | R6 | 2000 | 2000 | 245.46 | 4K | Off | Enabled | Standard | 3 | 32 | 0 | -- | - | |
| R6-9 | R6 | 2000 | 2000 | 84.28 | 4K | Off | Generic zero reclaim | Standard | 1 | 32 | 0 | -- | - | |

This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The LUN name. |
| Pool | The pool name of the LUN. |
| Quota (GB) | The quota of the LUN. |
| Reserved (GB) | Reserved capacity of the LUN. |
| Used (GB) | Used capacity of the LUN. |
| Block size | The block size of the LUN. |
| Dedup (*This option is only visible when it supports deduplication.*) | The status of the deduplication. |
| Compression | The status of the compression. |
| Sync. | The status of the sync. |
| Copy # | The number of the copies. |
| Snapshot limit | The number of the maximum snapshots. |
| Snapshot # | The number of the snapshots |
| Schedule | The status of the schedule. |
| Original | The original LUN of the clone. |

The options are available in this tab:

- **Create:** Create a LUN.
- **Delete:** Delete the selected LUNs.

The option is available in the **Snapshot#** column:

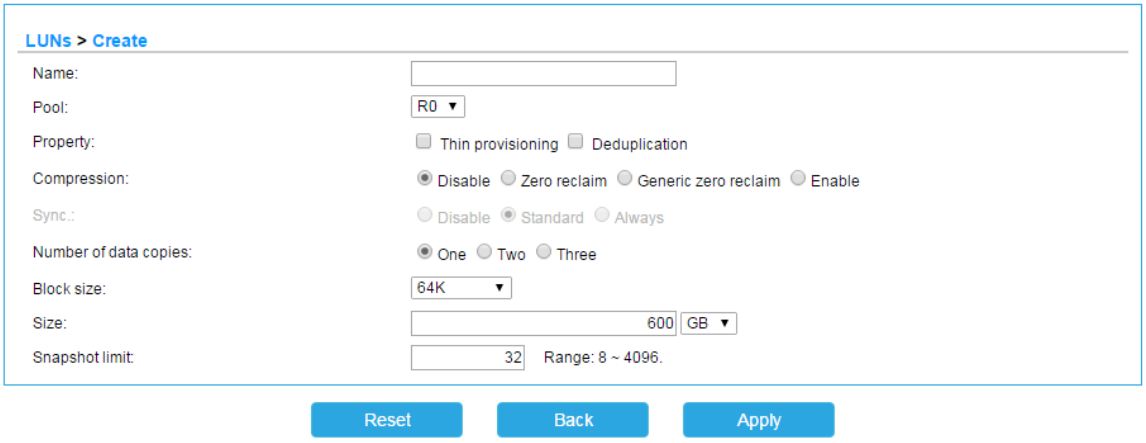
- **View snapshot:** list all the snapshots of the LUN.

The options are available in the **Action** column:

- **Edit:** Edit the LUN settings.
- **Delete:** Delete the LUN.

Take an example of creating a LUN.

1. Click **Create** button.




2. Enter a **Name** for the LUN.
3. Use the drop-down list to select a **Pool**.
4. Select **Property**, **Compression type**, **Sync**, and **Number of data copies**.
5. Use the drop-down list to select a **Block size**.
6. Enter the **Size** for the LUN.
7. Enter a **Snapshot limit** for snapshot usage.
8. Click **Apply** button.

**TIP:**
"Compression" options:

- **Disabled:** No compression at all. Default value.
- **Zero Reclaim:** When the data block contains all zeros, no physical space will be consumed. The block will be marked specifically.
- **Generic Zero Reclaim:** This is Qsan patent filing technology that will reclaim data blocks with special patterns such as all 0's, all 1's. Theoretically, it will have better storage efficiency.
- **Enabled:** This will always enable lossless data compression function using LZJB algorithm.

**TIP:**
"Sync" means synchronous I/O, which is similar to the definition of write-through. Synchronous I/O is that every file system transaction is written and flushed to stable storage devices by a system call return. The application needs to wait for the physical data update completion before it could issue another command. Latency will be longer and performance will suffer.

If you don't know how to use this setting, please leave it as default.

- **Disabled:** All write commands become asynchronous. It will ignore the

synchronous transaction demands of applications such as database or NFS.

- **Standard:** The default value. It depends on the applications.
- **Always:** All write commands become synchronous even if the application issues asynchronous transactions.

The "Sync" option will be grey out if "volume" is selected instead of file system. This is because synchronous write function is not supported in iSCSI block access for the time being.

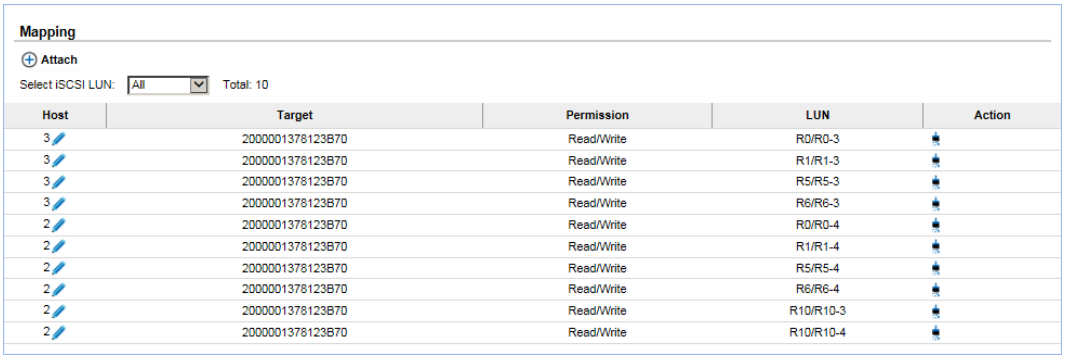
**TIP:**
"Number of data copies" in Create File System or Volume UI is used to create mirroring of data to avoid data corruption. When the original file corrupts, the system will use the extra "copy" to recover the corrupt file.

The value of two means that when you copy a 10MB file, it will take up 20MB space. The value of three means that it will take up extra double space to store the same data in the same storage pool.

Users will not be able to see the actual extra copies. They are controlled by the file system.

## LUN Mapping Configuration

The **Storage management -> iSCSI /FC -> LUN** option provide functions to setup LUN attach, detach, or view the status of logical unit numbers.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Host | Host summary. |
| Target | The number of the target. |
| Permission | The permission level:<br>• Read/Write.<br>• Read-only. |
| LUN | The pool name/LUN name mapping to this. |

The option is available in this tab:

- **Attach:** Attach a logical unit number.

The option is available in the **Host** column:

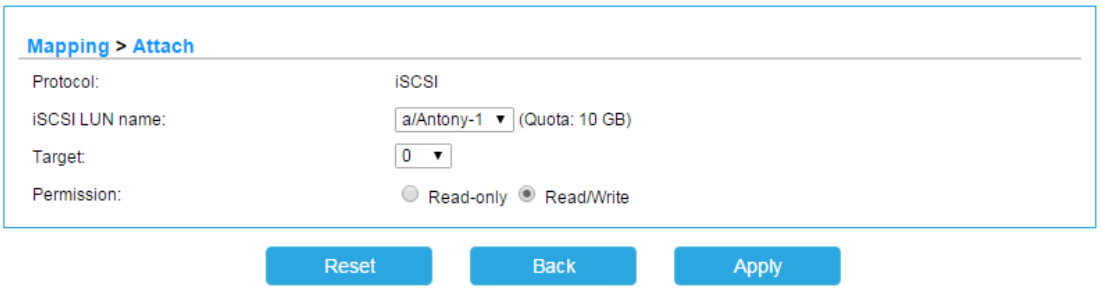
- **Host summary:** Host summary for fibre channel.

The option is available in the **Action** column:

- **LUN Detach:** Detach a logical unit number.

Take an example of attaching an iSCSI LUN.

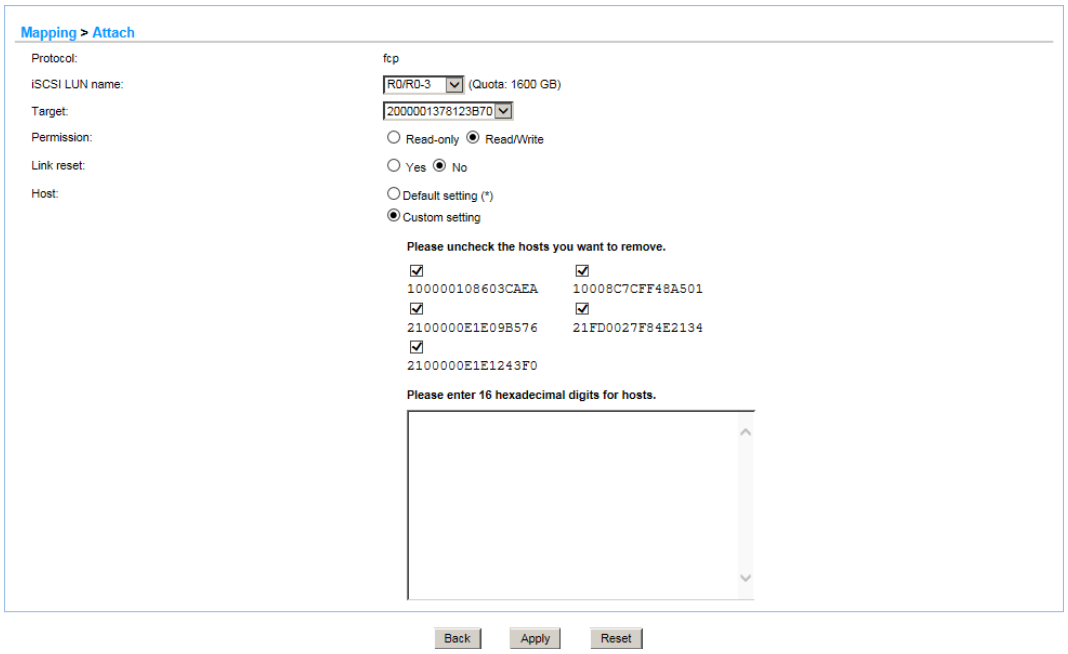
1. Click the **Attach** button.




2. Select the **iSCSI LUN name** from the drop-down list.
3. Select the **Target** number from the drop-down list.
4. Select the **Permission level**.
5. Click **Apply** button.

Take an example of attaching a FC LUN.

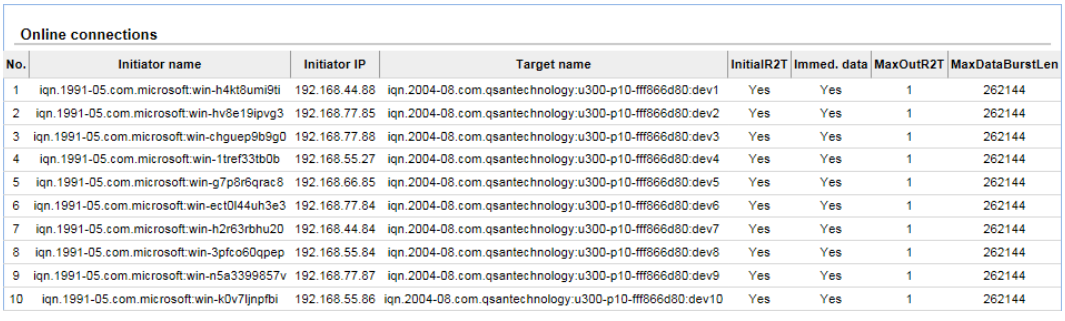
1. Click the **Attach** button.




2. Select the **FC LUN name** from the drop-down list.
3. Select the **Target** number from the drop-down list.
4. Select the **Permission level** and **Link reset**.
5. Select the **Host** access control with Default setting (*) or Custom setting which can be checked by the system detected or enter by manually.
6. Click **Apply** button.

## Online Connections for iSCSI Service

The **Dashboard -> Online connections -> iSCSI service** option provides the current connections of the iSCSI service.



Online connections

| No. | Initiator name | Initiator IP | Target name | InitialR2T | Immed. data | MaxOutR2T | MaxDataBurstLen |
|---|---|---|---|---|---|---|---|
| 1 | iqn.1991-05.com.microsoft:win-h4kt8umi9ti | 192.168.44.88 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev1 | Yes | Yes | 1 | 262144 |
| 2 | iqn.1991-05.com.microsoft:win-hv8e19ipvg3 | 192.168.77.85 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev2 | Yes | Yes | 1 | 262144 |
| 3 | iqn.1991-05.com.microsoft:win-chguep9b9g0 | 192.168.77.88 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev3 | Yes | Yes | 1 | 262144 |
| 4 | iqn.1991-05.com.microsoft:win-1tref33tb0b | 192.168.55.27 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev4 | Yes | Yes | 1 | 262144 |
| 5 | iqn.1991-05.com.microsoft:win-g7p8r6qrac8 | 192.168.66.85 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev5 | Yes | Yes | 1 | 262144 |
| 6 | iqn.1991-05.com.microsoft:win-ect0l44uh3e3 | 192.168.77.84 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev6 | Yes | Yes | 1 | 262144 |
| 7 | iqn.1991-05.com.microsoft:win-h2r63rbhu20 | 192.168.44.84 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev7 | Yes | Yes | 1 | 262144 |
| 8 | iqn.1991-05.com.microsoft:win-3pfco60qpep | 192.168.55.84 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev8 | Yes | Yes | 1 | 262144 |
| 9 | iqn.1991-05.com.microsoft:win-n5a3399857v | 192.168.77.87 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev9 | Yes | Yes | 1 | 262144 |
| 10 | iqn.1991-05.com.microsoft:win-k0v7ljnpfbi | 192.168.55.86 | iqn.2004-08.com.qsantechnology:u300-p10-fff866d80:dev10 | Yes | Yes | 1 | 262144 |

This table shows the available options and their descriptions.

| Column Name | Description |
|---|---|
| No. | |

| | |
|---|---|
| Initiator name | It displays the host computer name. |
| Initiator IP | It displays the IP address of the host computer. |
| Target name | It displays the controller name. |
| InitialR2T | InitialR2T (Initial Ready to Transfer) is used to turn off either the use of a unidirectional R2T command or the output part of a bidirectional command. The default value is Yes. |
| Immed.data | Immed. data (Immediate Data) sets the support for immediate data between the initiator and the target. Both must be set to the same setting. The default value is Yes. |
| MaxOutR2T | MaxDataOutR2T (Maximum Data Outstanding Ready to Transfer) determines the maximum number of outstanding ready to transfer per task. The default value is 1. |
| MaxDataBurstLen | MaxDataBurstLen (Maximum Data Burst Length) determines the maximum SCSI data payload. The default value is 256kb. |

# 5 Data Protections

This chapter describes the data protection methods. It includes the following sections:

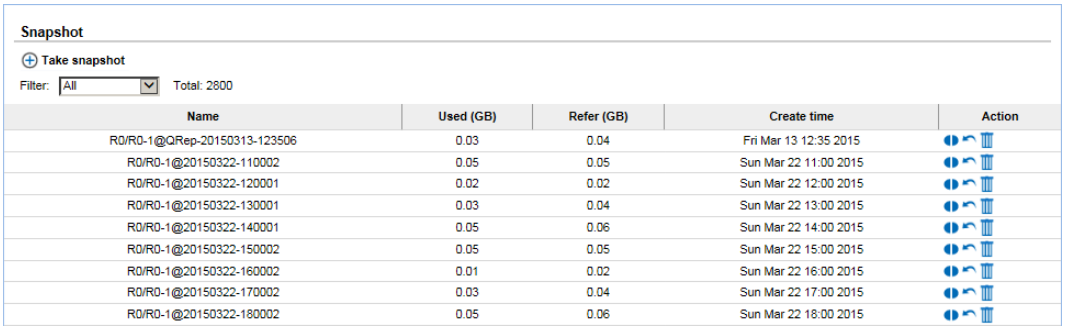
- Snapshot
- Backup
- AntiVirus

## Snapshot

Snapshot-on-the-box captures the instant state of data in the target volume in a logical sense. The underlying logic is Copy-on-Write, moving out the data which would be written to certain location where a write action occurs since the time of data capture. Rollback restores the data back to the state of any time which was previously captured in case for any unfortunate reason it might be (e.g. virus attack, data corruption, human errors and so on). Snapshot can only be applied to the whole volume or LUN. It cannot be applied to specific shared folders.

### Snapshot management

The **Storage management -> Snapshots -> Snapshot management** option provides functions to manage snapshot activities such as take snapshot, rollback, clone, delete, or view the status of the snapshots.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The snapshot name. |

| | |
|---|---|
| Used (MB) | The amount of snapshot space that has been used. |
| Refer (GB) | The refer capacity of the volume or LUN. |
| Created time | The time the snapshot is created. |

The option is available in this tab:

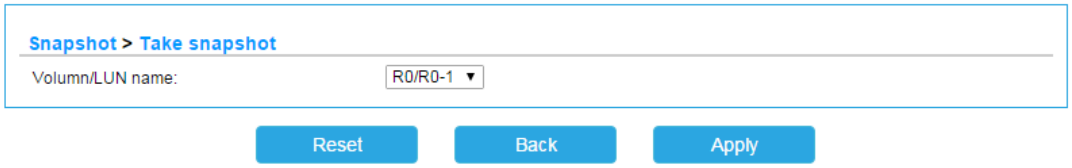
- **Take Snapshot:** Take a snapshot.

The options are available in the **Action** column:

- **Clone:** Clone the volume or LUN.
- **Rollback:** Rollback the snapshot volume or LUN.
- **Delete:** Delete the snapshot volume or LUN.

Take an example of taking a snapshot.

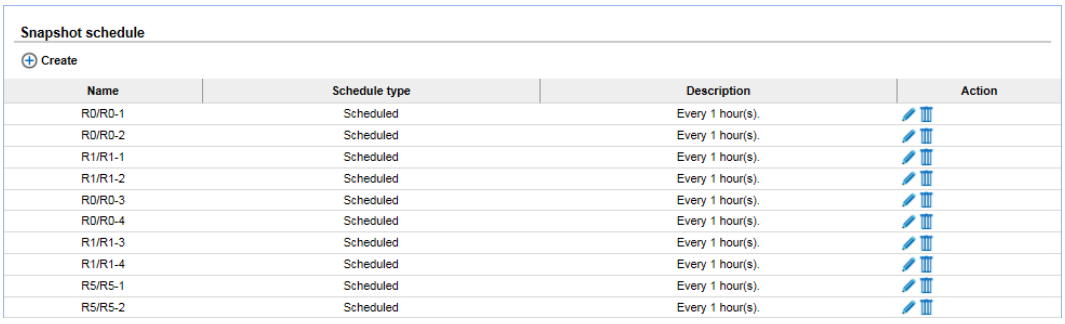
1. Click the **Take snapshot** button.




2. Use the drop-down list to select a **Volume/LUN name**.
3. Click **Apply** button.

## Snapshot Schedule

The **Storage management -> Snapshots -> Snapshot schedule** option provides the functions to set schedule snapshots.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Name | The snapshot name. |
| Schedule type | Disabled or Scheduled. |
| Description | Schedule details. |

The option is available in this tab:

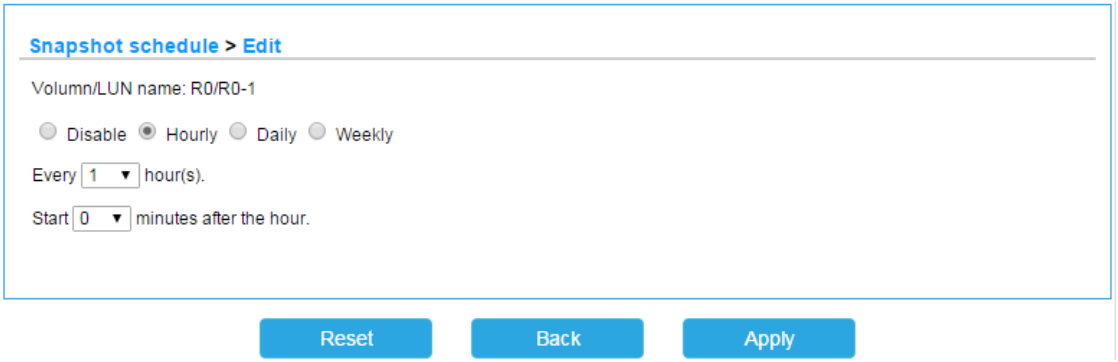
- **Create:** Set the snapshot schedule.

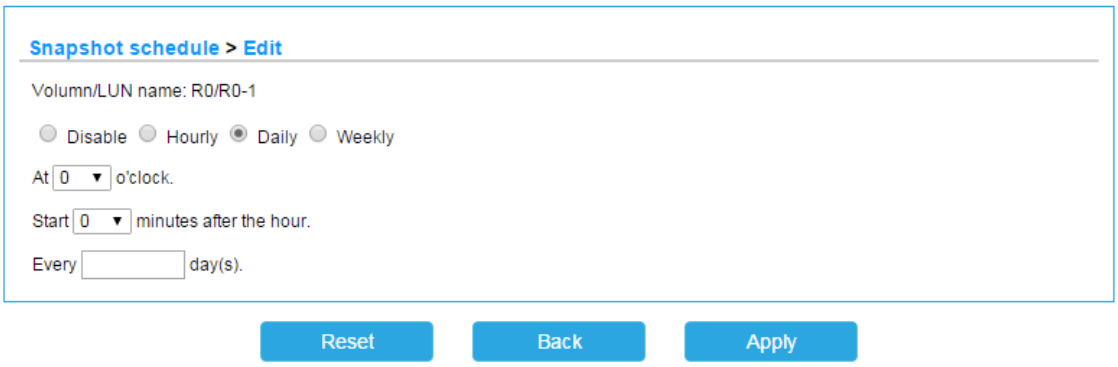
The options are available in the **Action** column:

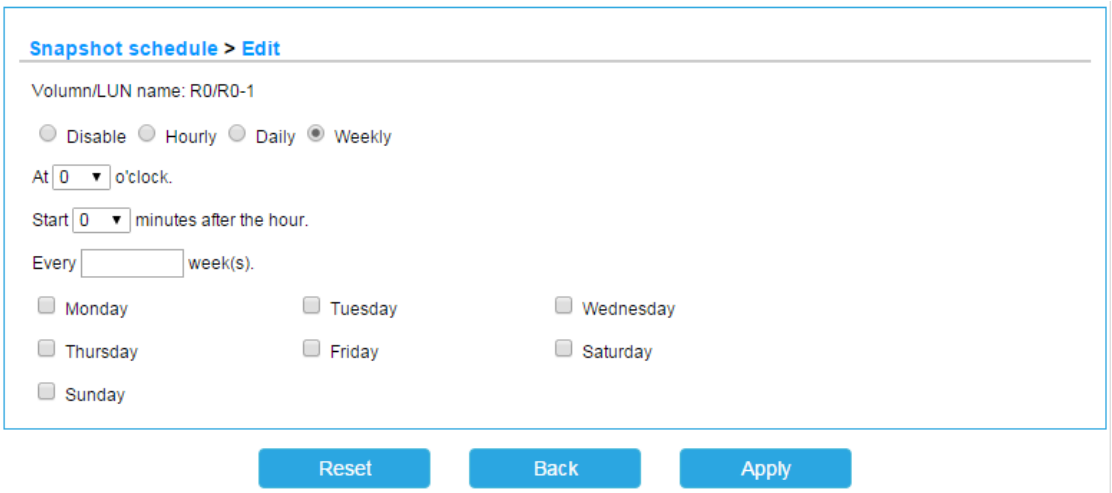
- **Edit:** Modify the schedule settings.
- **Delete:** Delete the schedule snapshot.

Take an example of setting a schedule snapshot.

1. Click the **Create** button.



2. Select the radio box for **Hourly**, **Daily** or **Weekly**. According to the different schedule type, input the proper parameters.

## Backup

Backup services include:

- Rsync Service
- Replications
- Cloud Backup

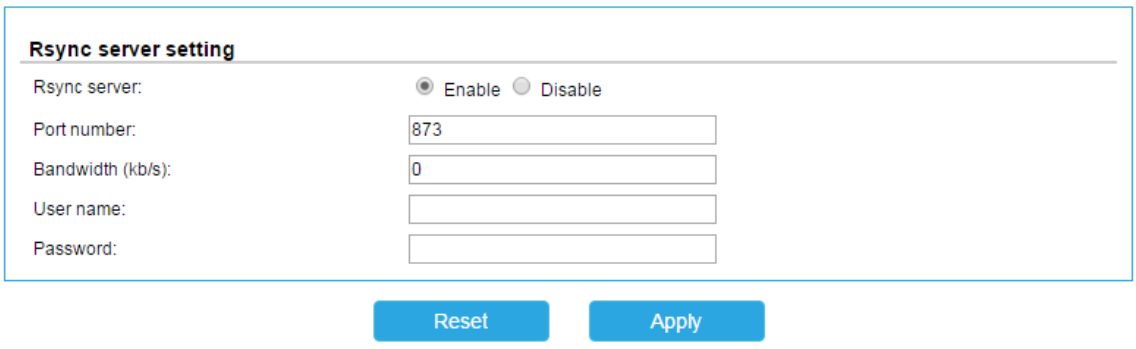
Both replication service and cloud backup, Amazon S3 are applied to the whole volume or LUN, which is the right next level to the storage pool. These services cannot be applied to a specific shared folder, but rsync service can.

### Rsync Service

Rsync is a famous file synchronization tool and file transfer program for Unix-like systems that minimizes network data transfer by using a form of delta encoding. Starting this service will open the following ports on the system:

- TCP 873 (rsync)

The **Applications -> Backup server -> Rsync server** option is used to setup rsync server.



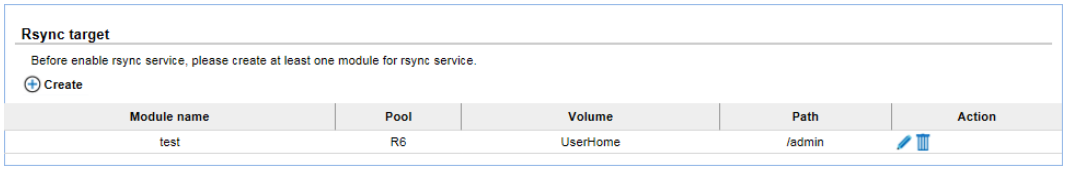

The options are available in this tab:

- **Rsync server:** Enable or disable rsync server.
- **Port number:** The port number of rsync. Default is 873, range is 1 ~ 65535.
- **Bandwidth (KB/s):** The bandwidth of rsync service, in KB/s, default is 0 is unlimited.
- **User name:** The username of rsync service.

- **Password:** The password of rsync service.

When it is done, click **Apply** button.

The **Applications -> Backup server -> Rsync targets** option is used to setup rsync targets.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Module name | The name of the rsync target. |
| Pool | The pool name. |
| Volume | The volume name. |
| Path | The volume path. |

The option is available in this tab:

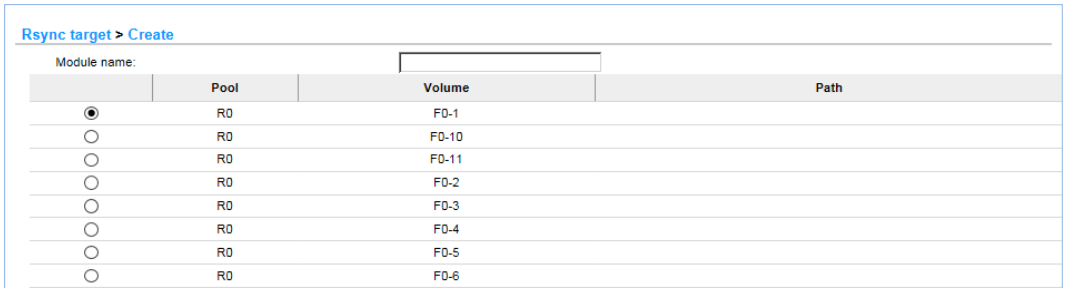
- **Create:** Add an rsync target module.

The options are available in the **Action** column:

- **Edit:** Edit the target module.
- **Delete:** Delete the target module.

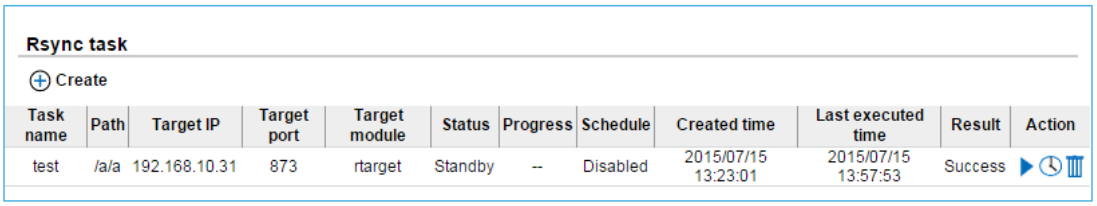
Take an example of adding an rsync target module.

1. Click the **Create** button.




2. Enter a **Module name** for the rsync target module.
3. Select a volume which the data stores.
4. Click **Apply** button.

The **Applications -> Backup -> Rsync** option is used to setup rsync client.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Task name | The task name. |
| Path | The source path of volume. |
| Target IP | The target IP. |
| Target port | The target port number. |
| Target module | The target rsync module. |
| Status | Standby, Running, Inactive or Disconnected. |
| Progress | Progress ratio (%). |
| Schedule | Disabled or scheduled. |
| Created time | The created time of the task. |
| Last executed time | The last executed time. |
| Result | Success or Fail. |

The option is available in this tab:

- **Create:** Add a rsync task.

The options are available in the **Action** column:

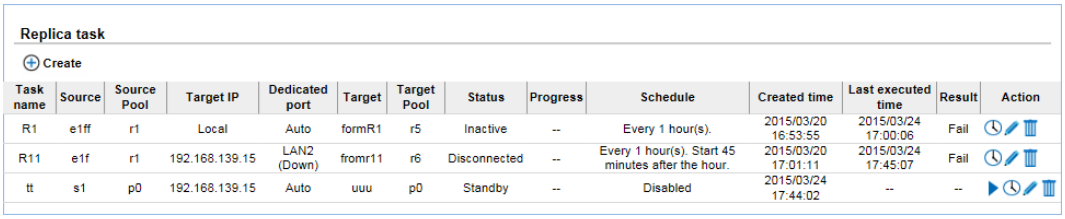
- **Start / Stop:** Start or stop the task.
- **Schedule:** Schedule the task.
- **Delete:** Delete the task.

Take an example of adding a task.

1. Click **Create** button.
2. Enter the **Task name**, and select a folder to rsync. Then click **Next** button.
3. Enter the target IP **Address**, modify the **Port number** if needed, select **Target module**, and enter **Username** and **Password**.
4. Check the **Property** if needed, and then click **Next** button.
5. At the confirmation message, click **Apply** button.

## Replications

The **Applications -> Backup -> Replications** option is used to setup the replication service. It supports local cloning and remote replication to other system. There is no limit to the number of how many local cloning and remote replication tasks can be created. If you experience slow system performance, please reduce the replication tasks. It supports one-to-one replication task but not one-to-many. The same replication source cannot coexist in different tasks. The max task number is limited as 16 tasks.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Task name | The task name. |
| Source | The source volume or LUN name. |
| Source Pool | The source pool name. |
| Target IP | Local or the remote target IP. |
| Dedicated port | The dedicated port to transmit. |
| Target | The target volume or LUN name. |
| Target Pool | The target pool name. |
| Status | Standby, Running, Inactive or Disconnected. |
| Progress | Progress ratio (%). |
| Schedule | Disabled or scheduled. |
| Created time | The created time of the task. |
| Last executed time | The last executed time. |
| Result | Success or Fail. |

The option is available in this tab:

- **Create:** Add a replication task.

The options are available in the **Action** column:

- **Start / Stop:** Start or stop the task.
- **Schedule:** Schedule the task.
- **Edit:** Edit the task.
- **Delete:** Delete the task.

Take an example of adding a task.

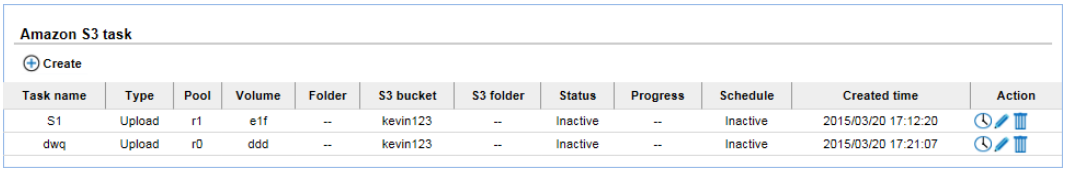
1. Click **Create** button.
2. Enter the **Task name**, and select a volume or LUN to replicate. Then click **Next** button.
3. Select **Local system** or **Remote system**. Remote replication needs to enter the target IP, username and password. Select a dedicated port to transmit. And then click **Next** button.
4. Select the target pool and enter a name. And then click **Next** button.
5. At the confirmation message, click **Apply** button.

**TIP:**
If you want to use replication via internet, please make sure **TCP port "2222"** is opened both way on the NAT traversal and Router.

## Could Backup

The **Applications -> Backup -> Cloud** option is used to setup the popular cloud backup service provided by Amazon. Before using the service, you must register an Amazon S3 account first at http://aws.amazon.com/s3/.

There is no limit to the number of how many Amazon S3 tasks can be created. If you experience slow system performance, please reduce the Amazon S3 tasks.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Task name | The task name. |
| Type | Upload or download. |
| Pool | The source pool name. |
| Folder | The folder name. |
| S3 bucket | The S3 bucket name. |
| S3 folder | The S3 folder name. |
| Status | Standby, Running, Inactive or Disconnected. |
| Schedule | Disabled or scheduled. |
| Created time | The created time of the task. |

The option is available in this tab:

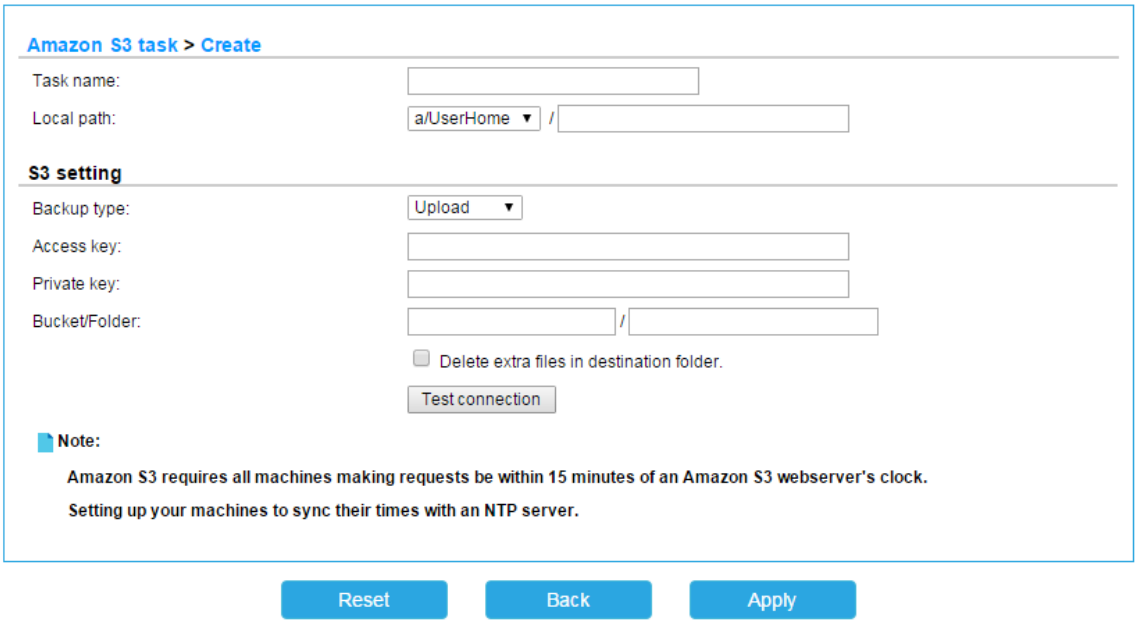
- **Create:** Add a backup task to Amazon S3 service.

The options are available in the **Action** column:

- **Start / Stop:** Start or stop the task.
- **Schedule:** Schedule the task.
- **Edit:** Edit the task.
- **Delete:** Delete the task.

Take an example of adding a task.

1. Click **Create** button.



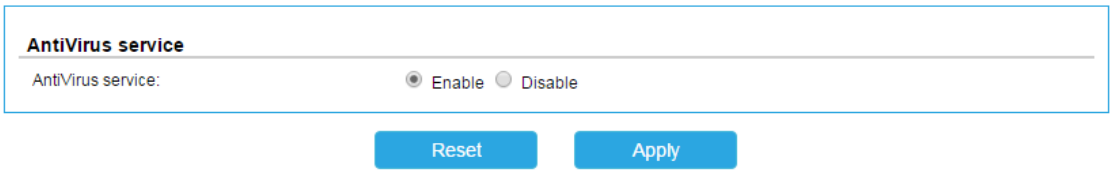

2. Enter the **Task name**, select a **Local path**, and enter the folder.
3. Select a **Backup type**, Upload or Download, enter the **Access key**, **Private Key** and the **Bucket/Folder** for Amazon S3 settings. Check the box when you need to delete extra files in the destination folder.
4. Click **Test connection** button to test the connection if necessary.
5. Click **Apply** button to create a task.

# AntiVirus

The **Security -> AntiVirus** option is for accessing the **AntiVirus service**, **AntiVirus scan filter**, **AntiVirus tasks**, **AntiVirus update**, and **AntiVirus reports** option tabs. It uses McAfee antivirus engine which is an American global computer security software company.

## AntiVirus Service

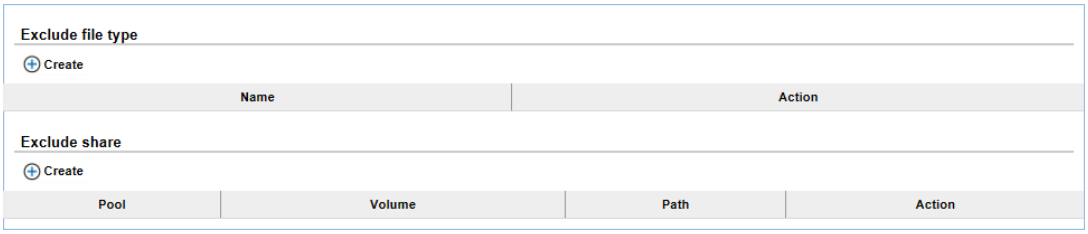
The **Security -> AntiVirus -> AntiVirus service** option can enable or disable antivirus service.




Check Enable or Disable radio button, and then click **Apply** button.

## AntiVirus Scan Filter

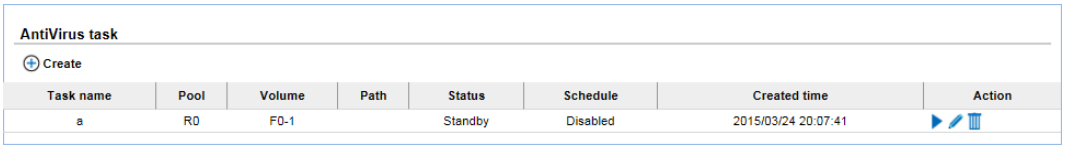
The **Security -> AntiVirus -> AntiVirus scan filter** option manages what files exclude to be scanned.




Click **Add** button of the **Exclude file type**, add a text for file extension, then click **Add** button. These file extension will be skipped when executing antivirus scanning. So does **Exclude share**.

## AntiVirus Tasks

The **Security -> AntiVirus -> AntiVirus tasks** option manages the antivirus tasks.




This table shows the column descriptions.

| Column Name | Description |
|---|---|
| Task name | The task name. |
| Pool | The pool name. |
| Volume | The volume name. |
| Path | The path of the file system. |
| Status | Standby or Running. |
| Schedule | Disabled or scheduled. |
| Created time | The created time of the task. |

The option is available in this tab:

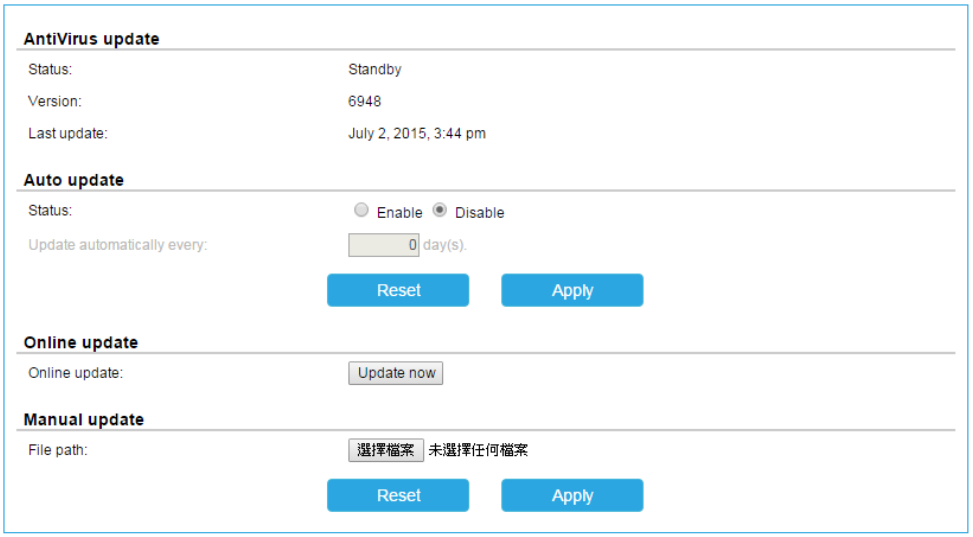
- **Create:** Add an antivirus task.

The options are available in the **Action** column:

- **Start / Stop:** Start or stop the task.
- **Edit:** Edit the task.
- **Delete:** Delete the task.

## AntiVirus Update

The **Security -> AntiVirus -> AntiVirus tasks** option manages the update of virus pattern files.




Click **Enable** radio button to enable **Auto update**, enter a number for how many days the update execute automatically. Click **Apply** button to take effect.

Or click **Update Now** button for update immediately. If you get the update file, it also can be updated manually.

## AntiVirus Reports

The **Security -> AntiVirus -> AntiVirus Reports** option displays the report of the infected files.


Click **Download** button to save the report.

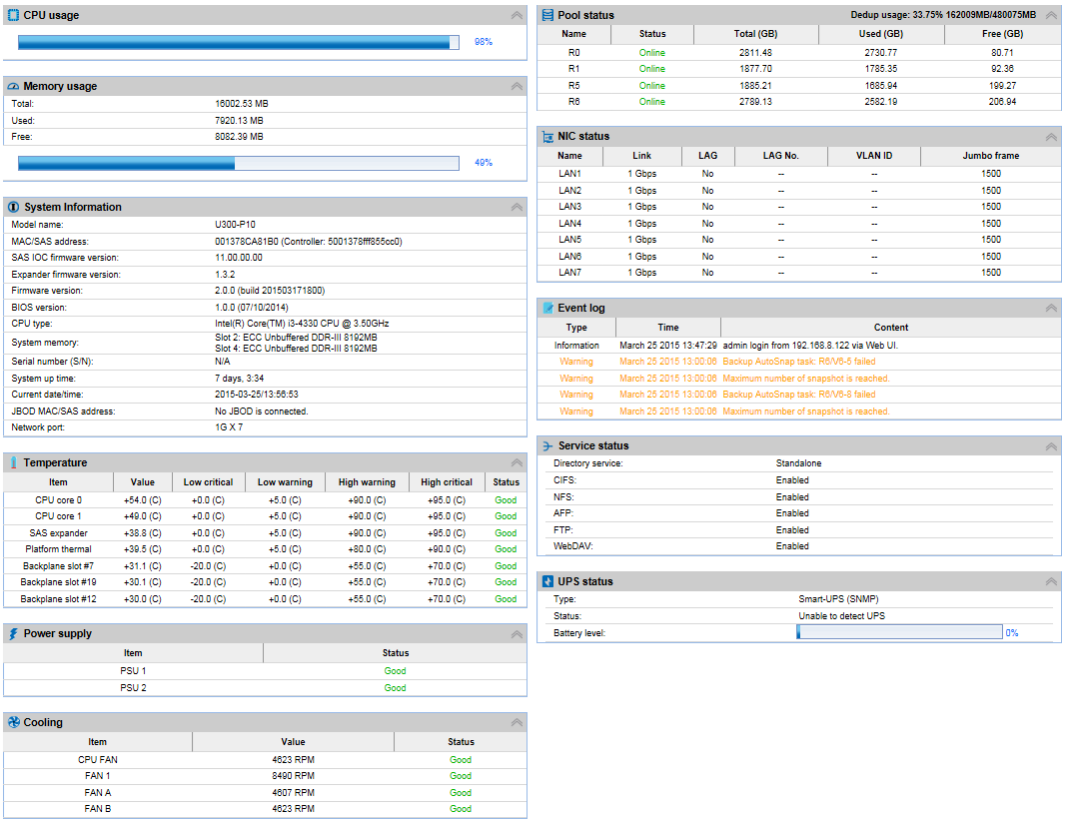
# 6 System Healthy

This chapter describes the system healthy. It includes the following sections:

- Dashboard
- S.M.A.R.T.
- Log Center
- Hardware Monitor

## Dashboard

The **Dashboard -> Dashboard** option displays a whole picture of the system. The tables include **Disk throughput**, **Network flow**, **System information**, **CPU usage**, **Memory usage**, **Temperature**, **Power supply**, **Cooling, Pool status**, **NIC status**, **Event log**, **Service status**, and **UPS status**. They can be displayed or hidden at the drop down **Display list**. Check or uncheck the items which you want. The refresh interval can be changed in the right-top corner. Choose an interval by seconds and then click **Refresh Now** button. It will be active right now.

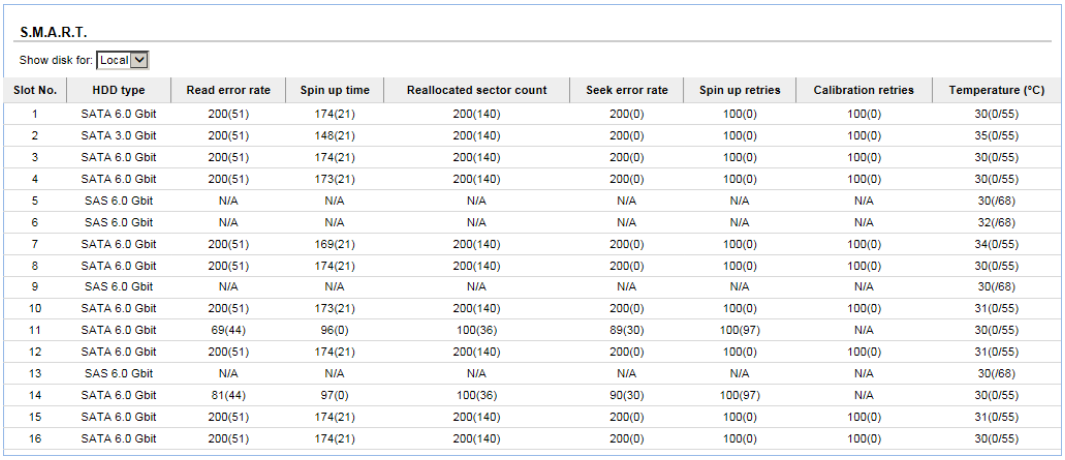



The options are available in this tab:

- **Disk throughput (Kbyte/s):** Display disk throughput by different color of each pool.
- **Network flow (Mbit/s):** Display network flow by each port. Transmit data displays as green color and receive data as orange.
- **System information:** Display system information includes model name, firmware version, serial number …etc.
- **CPU usage:** Display current CPU usage as ratio (%).
- **Memory usage:** Display current memory usage as number and ratio (%).
- **Temperature:** Display the system temperature. Status displays good as green color and fail as red.
- **Power supply:** Display the power supply status. Status displays good as green color and fail as red.
- **Cooling:** Display the fan status. Status displays good as green color and fail as red.
- **Pool status:** Display the pool status. Status displays online as green color and failed as red.
- **NIC status:** Display the network interface status.
- **Event log:** Display the warning and error logs. Warning event displays as orange color and error as red.
- **Service status:** Display the data service status.
- **UPS status:** Display the UPS status and UPS battery lever as ratio (%).

## S.M.A.R.T.

S.M.A.R.T. (Self-Monitoring Analysis and Reporting Technology) is a diagnostic tool for hard drives to deliver warning of drive failures in advance. The **Monitor -> S.M.A.R.T.** option provides users a chance to take actions before a possible drive failure.



S.M.A.R.T.

Show disk for: Local

| Slot No. | HDD type | Read error rate | Spin up time | Reallocated sector count | Seek error rate | Spin up retries | Calibration retries | Temperature (°C) |
|---|---|---|---|---|---|---|---|---|
| 1 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 30(0/55) |
| 2 | SATA 3.0 Gbit | 200(51) | 148(21) | 200(140) | 200(0) | 100(0) | 100(0) | 35(0/55) |
| 3 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 30(0/55) |
| 4 | SATA 6.0 Gbit | 200(51) | 173(21) | 200(140) | 200(0) | 100(0) | 100(0) | 30(0/55) |
| 5 | SAS 6.0 Gbit | N/A | N/A | N/A | N/A | N/A | N/A | 30(/68) |
| 6 | SAS 6.0 Gbit | N/A | N/A | N/A | N/A | N/A | N/A | 32(/68) |
| 7 | SATA 6.0 Gbit | 200(51) | 169(21) | 200(140) | 200(0) | 100(0) | 100(0) | 34(0/55) |
| 8 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 30(0/55) |
| 9 | SAS 6.0 Gbit | N/A | N/A | N/A | N/A | N/A | N/A | 30(/68) |
| 10 | SATA 6.0 Gbit | 200(51) | 173(21) | 200(140) | 200(0) | 100(0) | 100(0) | 31(0/55) |
| 11 | SATA 6.0 Gbit | 69(44) | 96(0) | 100(36) | 89(30) | 100(97) | N/A | 30(0/55) |
| 12 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 31(0/55) |
| 13 | SAS 6.0 Gbit | N/A | N/A | N/A | N/A | N/A | N/A | 30(/68) |
| 14 | SATA 6.0 Gbit | 81(44) | 97(0) | 100(36) | 90(30) | 100(97) | N/A | 30(0/55) |
| 15 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 31(0/55) |
| 16 | SATA 6.0 Gbit | 200(51) | 174(21) | 200(140) | 200(0) | 100(0) | 100(0) | 30(0/55) |

S.M.A.R.T. measures many attributes of the hard drive all the time and inspects the properties of hard drives which are close to be out of tolerance. The advanced notice of possible hard drive failure gives users precautions to back up hard drive or replace the hard drive. This is much better than hard drive crash when it is writing data or rebuilding a failed hard drive.

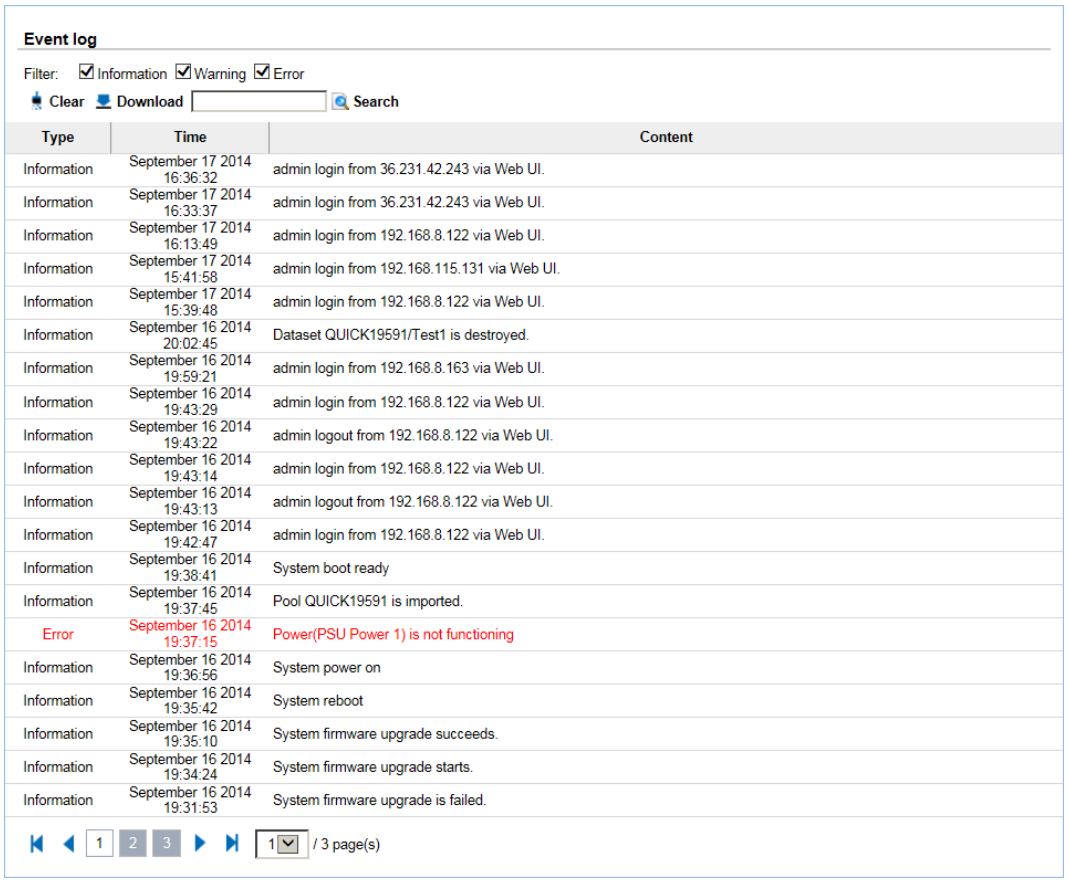
The numbers displayed are real-time value. The number in parenthesis is the threshold value. The threshold values from different hard drive vendors are different; please refer to hard drive vendors' specification for details.

S.M.A.R.T. only supports SATA drives. SAS drives do not have this function and will show N/A in the table. These values are for reference only. The system will send a warning if the S.M.A.R.T. value is higher or lower than the threshold. But it will not be the criteria for judging the HDD/SSD.

## Log Center

### Event Logs

The **Monitor -> Log center -> Event logs** option provides event messages. Check INFO, WARNING, or ERROR to display those particular events. The event log is displayed in reverse order which means the latest event log is on the first / top page.

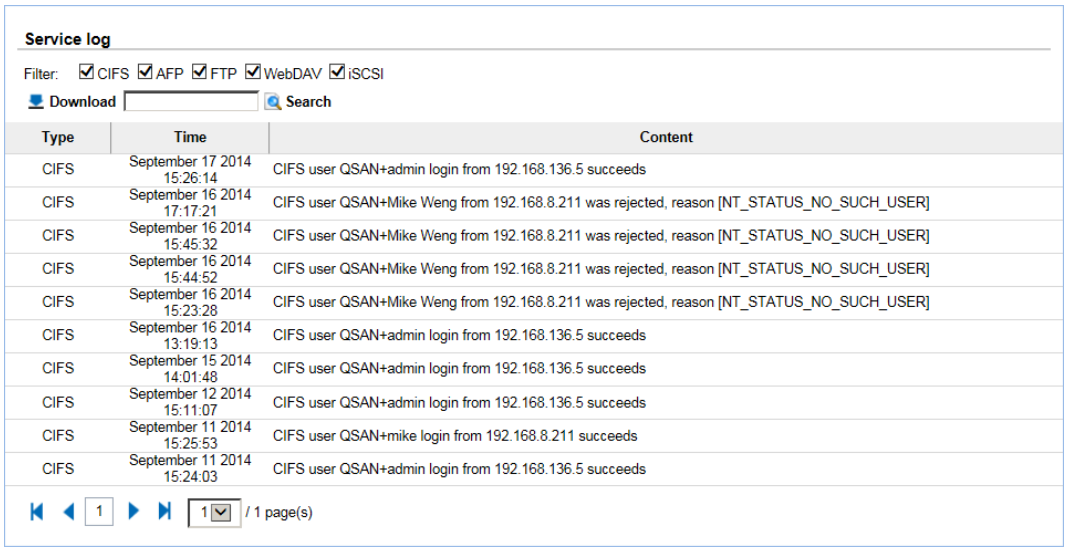



The options are available in this tab:

- **Clear:** Click **Clear** button to clear all event logs.
- **Download:** Click **Download** button to save the whole event log as a text file with file name "LOG-SystemName-Date-Time.log".
- **Search:** Enter a keyword and then click **Search** button to search the event logs which contents the keyword.

## Service Logs

The **Monitor -> Log center -> Service logs** option provides data service messages. Check CIFS, AFTP, FTP, WEbDAV, or iSCSI to display those particular events.



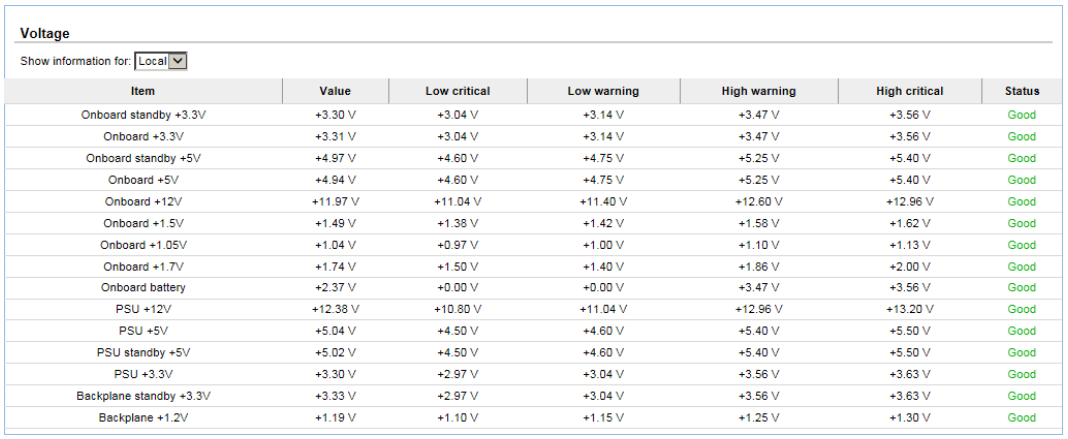

The options are available in this tab:

- **Download:** Click **Download** button to save the whole event log as a text file with file name "LOG-SystemName-Date-Time.log".
- **Search:** Enter a keyword and then click **Search** button to search the event logs which contents the keyword.

# Hardware Monitor

## Voltage

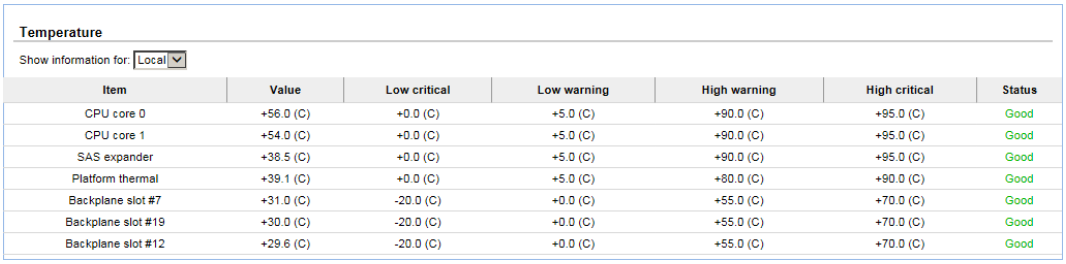
The **Monitor -> Hardware monitor -> Voltage** option provides the status of system voltage. Status displays good as green color and fail as red.




| Item | Value | Low critical | Low warning | High warning | High critical | Status |
|---|---|---|---|---|---|---|
| Onboard standby +3.3V | +3.30 V | +3.04 V | +3.14 V | +3.47 V | +3.56 V | Good |
| Onboard +3.3V | +3.31 V | +3.04 V | +3.14 V | +3.47 V | +3.56 V | Good |
| Onboard standby +5V | +4.97 V | +4.60 V | +4.75 V | +5.25 V | +5.40 V | Good |
| Onboard +5V | +4.94 V | +4.60 V | +4.75 V | +5.25 V | +5.40 V | Good |
| Onboard +12V | +11.97 V | +11.04 V | +11.40 V | +12.60 V | +12.96 V | Good |
| Onboard +1.5V | +1.49 V | +1.38 V | +1.42 V | +1.58 V | +1.62 V | Good |
| Onboard +1.05V | +1.04 V | +0.97 V | +1.00 V | +1.10 V | +1.13 V | Good |
| Onboard +1.7V | +1.74 V | +1.50 V | +1.40 V | +1.86 V | +2.00 V | Good |
| Onboard battery | +2.37 V | +0.00 V | +0.00 V | +3.47 V | +3.56 V | Good |
| PSU +12V | +12.38 V | +10.80 V | +11.04 V | +12.96 V | +13.20 V | Good |
| PSU +5V | +5.04 V | +4.50 V | +4.60 V | +5.40 V | +5.50 V | Good |
| PSU standby +5V | +5.02 V | +4.50 V | +4.60 V | +5.40 V | +5.50 V | Good |
| PSU +3.3V | +3.30 V | +2.97 V | +3.04 V | +3.56 V | +3.63 V | Good |
| Backplane standby +3.3V | +3.33 V | +2.97 V | +3.04 V | +3.56 V | +3.63 V | Good |
| Backplane +1.2V | +1.19 V | +1.10 V | +1.15 V | +1.25 V | +1.30 V | Good |

## Temperature

The **Monitor -> Hardware monitor -> Temperature** option provides the status of system temperature. Status displays good as green color and fail as red.



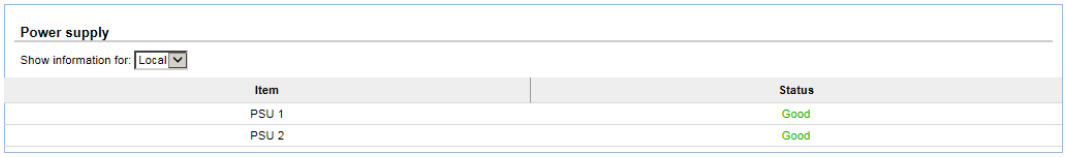
Temperature

Show information for: Local

| Item | Value | Low critical | Low warning | High warning | High critical | Status |
|---|---|---|---|---|---|---|
| CPU core 0 | +56.0 (C) | +0.0 (C) | +5.0 (C) | +90.0 (C) | +95.0 (C) | Good |
| CPU core 1 | +54.0 (C) | +0.0 (C) | +5.0 (C) | +90.0 (C) | +95.0 (C) | Good |
| SAS expander | +38.5 (C) | +0.0 (C) | +5.0 (C) | +90.0 (C) | +95.0 (C) | Good |
| Platform thermal | +39.1 (C) | +0.0 (C) | +5.0 (C) | +80.0 (C) | +90.0 (C) | Good |
| Backplane slot #7 | +31.0 (C) | -20.0 (C) | +0.0 (C) | +55.0 (C) | +70.0 (C) | Good |
| Backplane slot #19 | +30.0 (C) | -20.0 (C) | +0.0 (C) | +55.0 (C) | +70.0 (C) | Good |
| Backplane slot #12 | +29.6 (C) | -20.0 (C) | +0.0 (C) | +55.0 (C) | +70.0 (C) | Good |

## Power Supply

The **Monitor -> Hardware monitor -> Power supply** option provides the status of power supply. Status displays good as green color and fail as red.



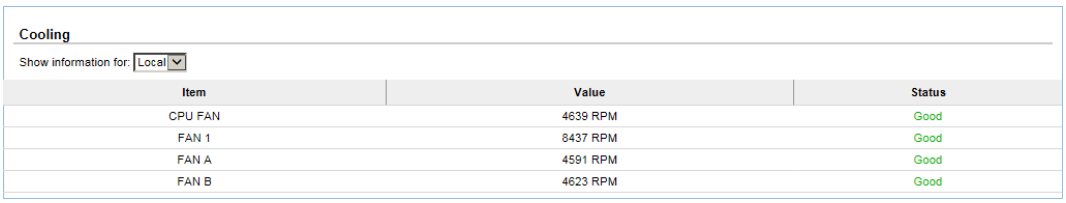
Power supply

Show information for: Local

| Item | Status |
|---|---|
| PSU 1 | Good |
| PSU 2 | Good |

## Cooling

The **Monitor -> Hardware monitor -> Temperature** option provides the status of system. Status displays good as green color and fail as red.



Cooling

Show information for: Local

| Item | Value | Status |
|---|---|---|
| CPU FAN | 4639 RPM | Good |
| FAN 1 | 8437 RPM | Good |
| FAN A | 4591 RPM | Good |
| FAN B | 4623 RPM | Good |

# A Access Shared Folders

This chapter describes how to access shared folders from different operating systems. We will introduce:

- CIFS and Windows
- AFP and Mac OS
- NFS and UNIX
- NFS and vSphere5
- FTP
- WebDAV

Before you access the shared folders, please make sure that you have enabled data services and settings in File Services and Configurations.

## CIFS and Windows

There are several ways to access a network share in Microsoft Windows operating systems. It all follows Windows UNC (Universal Naming Convention) format.

Syntax:

\\<NAS system name>\<share name>

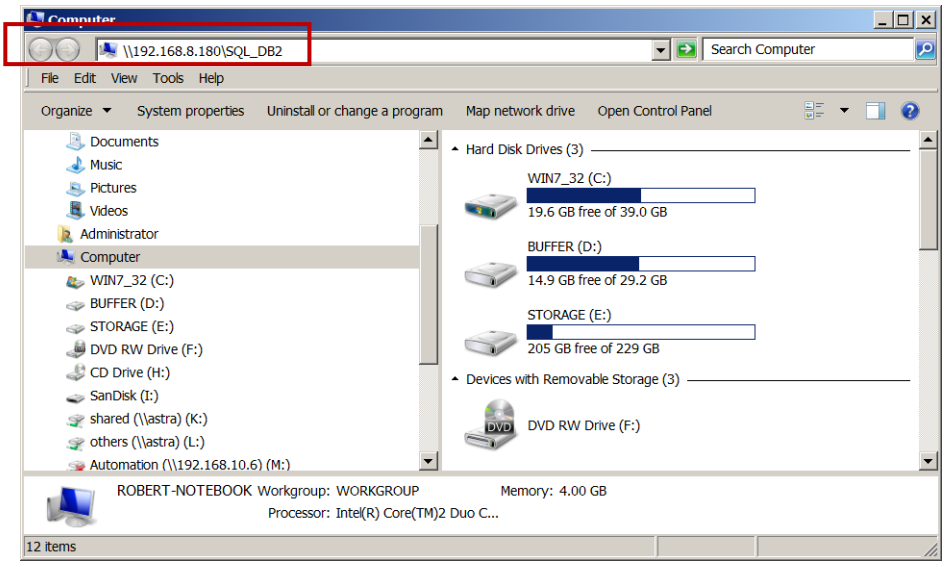
\\<IP address of NAS>\<share name>

<NAS system name> can be found from menu bar **System Configuration -> System**.

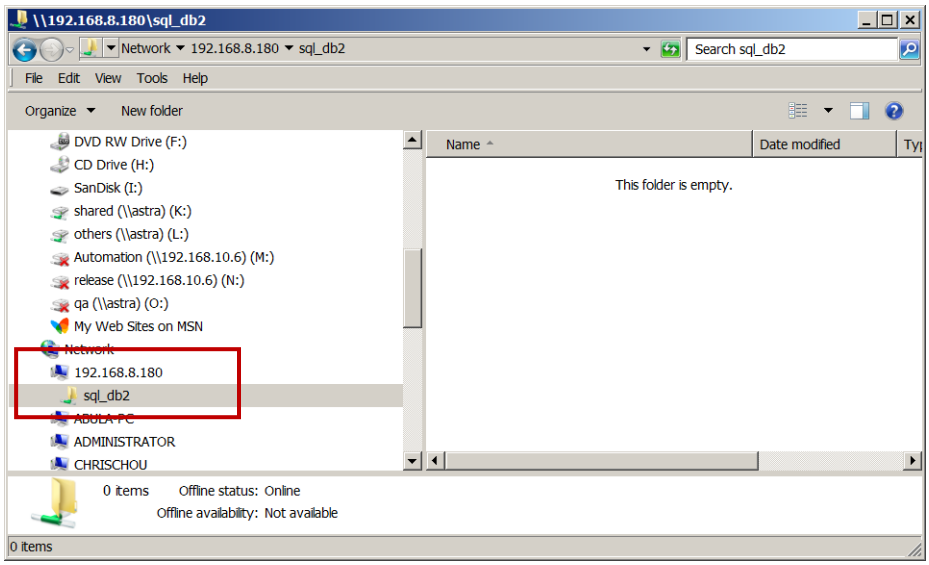
<IP address of NAS> is the IP address of one of the network ports. It can be found from menu bar **Network Configuration -> Network Setting**.

### Method 1: The Address Input in Explorer

Open a Windows Explorer from **Start** button or by pressing **Start key + E**. In the address input, put in the share path and press Enter. Please refer to the screenshot below.

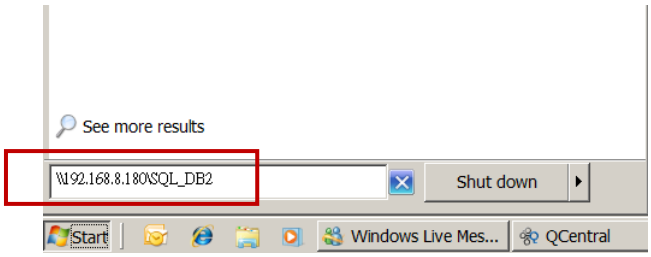



Windows will pop up a dialog requesting for account and password. Please put in your account and password. When the authentication is clear, the share is ready for you to use as follows:




## Method 2: The Command Line Input from Start Button

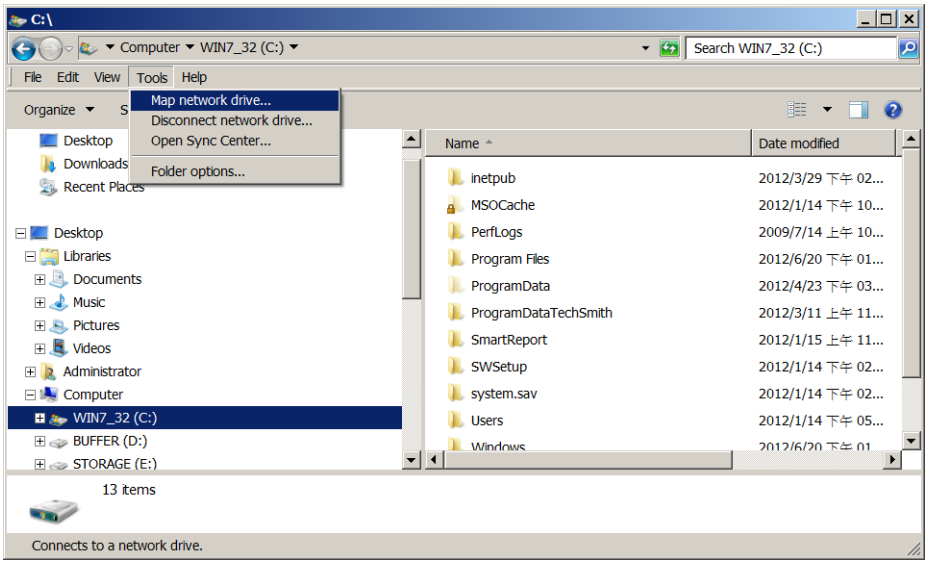
Click **Start** button to bring up the start menu. In the command line input, put in the share path and press **Enter**. The rest is the same as described in Option 1.



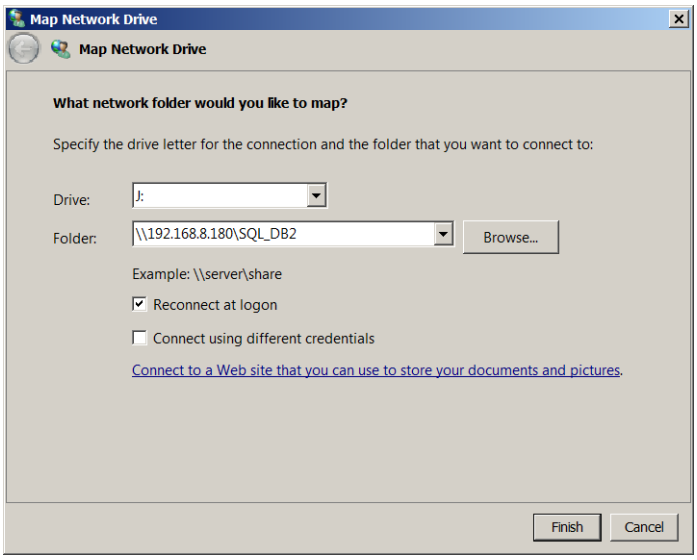

## Method 3: Map a Network Drive in Explorer

Please follow the steps below to map a network share from Qsan unified storage to a drive letter. The network share will be automatically mapped the next time you boot your Windows.

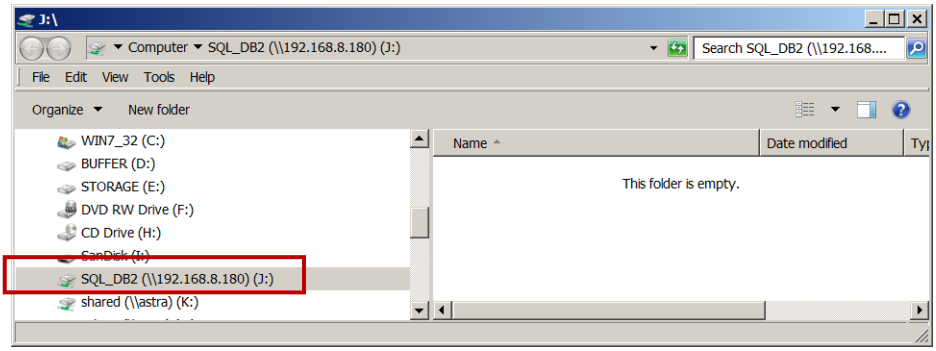
1. Open a Windows Explorer from **Start** button or by pressing **Start key + E**. Go to **Tools** and select **Map network drive**.




2. Select the drive letter you like. Put in the share path in **Folder**. Make sure you check **Reconnect at logon**. Click **Finish**.

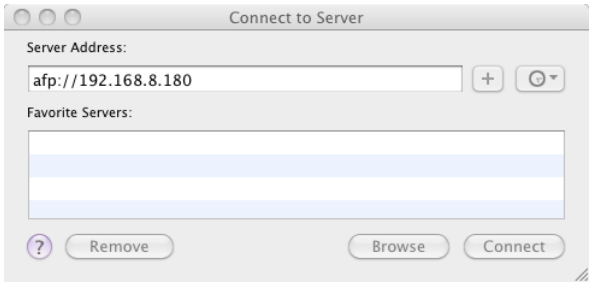



3. You may find a new drive with the letter you just selected in Explorer. You may start using the new drive then.

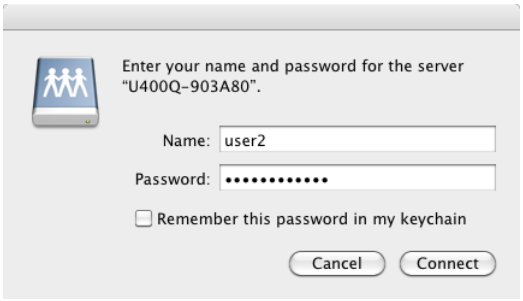



## AFP and Mac OS

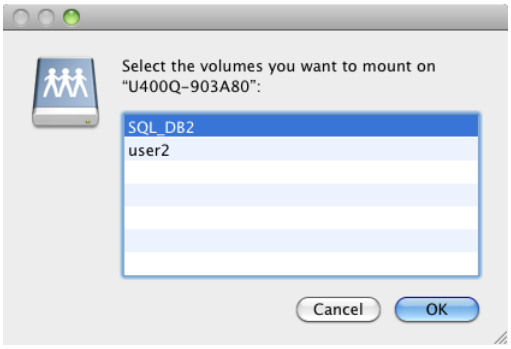
In **Finder** of Mac OS, go to **Go** and select **Connect to Server**. Put in the network port IP address that you want to access. Click **Connect**.




It will bring up a window requesting account and password. Please put in your account and password. Click **Connect**.




A window with all accessible shares for AFP protocol will pop up for you to select the share you want to connect to. Click **OK**.

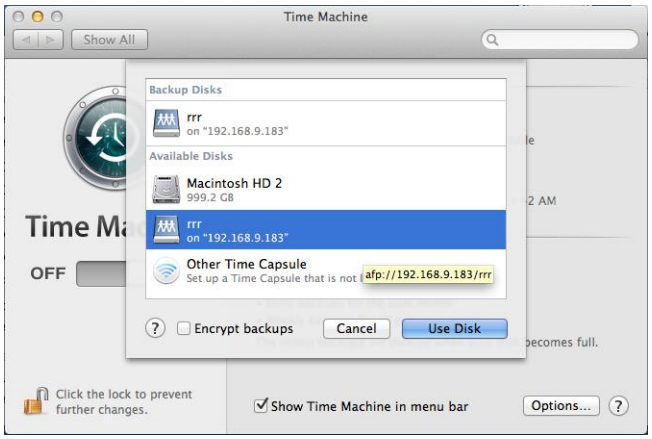



There you go. The share is ready for you to access.

## Apple Time Machine Support

It's very easy and straight forward to use Apple Time Machine with Qsan unified storage. Simply follow the same instructions above to create AFP shares on the Mac machine and do the steps below.

1. Go to Time Machine function.
2. Turn on Time Machine. Click **Select Disk**.
3. Select the share and put in account and password again.
4. Start Time Machine operation.




## NFS and UNIX

The system supports NFS version 3 and version 4. If version 4 connections cannot be established, the system will automatically try to establish the connection using version 3 protocols. Before using the NFS shares, please make sure the NFS settings of the shares are properly configured.

### Redhat Linux 5

When mounting a file system in Redhat Linux 5, Redhat Linux 5 uses NFS version 3 by default. Use the following syntax to mount an NFS share. Please make sure you add the keyword – **nfs-share** before the share name. It represents the absolute path that the end user doesn't need to know.

***# mount <IP address of NAS>:/nfs-share/<share name>  <mount point>***

For example:

# mount 192.168.8.180:/**nfs-share**/SQL_DB2  /mnt/nas

### Redhat Linux 6

The default attempt will try to use NFS version 4 protocol to set up connection in Redhat Linux 6. Use the following syntax to mount an NFS share.

***# mount <IP address of NAS>:/<share name>  <mount point>***

For example:

# mount 192.168.8.180:/SQL_DB2  /mnt/nas

### Open Solaris 10/11

Open Solaris 10/11 will use NFS version 4 as default. Use the following syntax to mount an NFS share.

***# mount -F nfs -o rw <IP address of NAS>:/<share name> <mount point>***

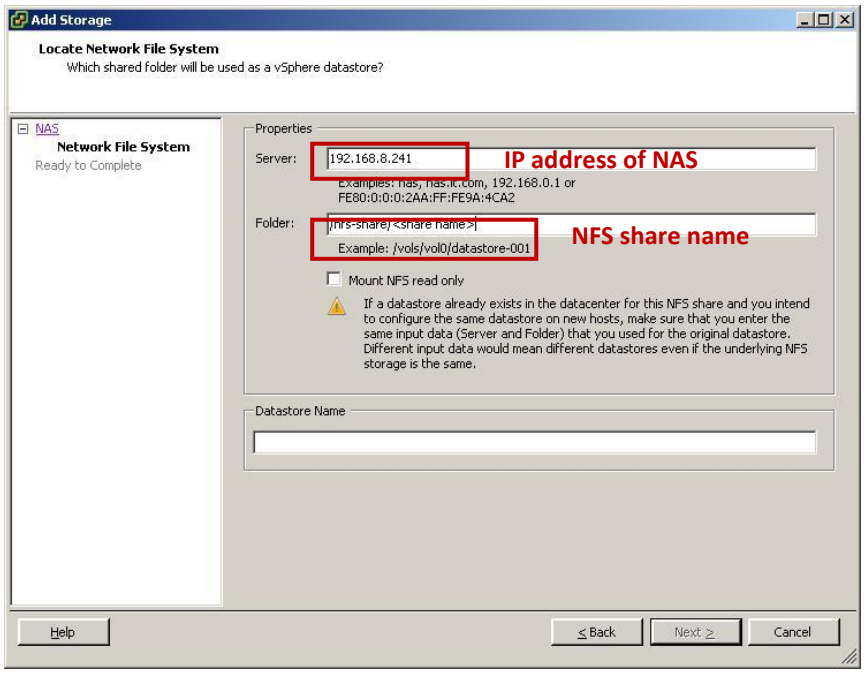
For example:

# mount -F nfs -o rw 192.168.8.180:/SQL_DB2 /mnt/nas

## NFS and vShpere5

If you want to use the system as vSphere 5 storage through NFS connection, please make sure you export the NFS share with read/write access rights. In the vSphere 5 UI setting for NFS share, please use the following syntax as shown in the screenshot below.

**/nfs-share/<share name>**

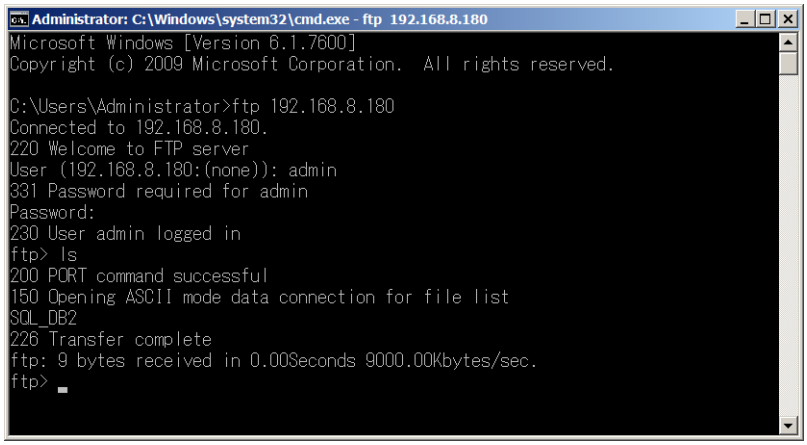



## FTP

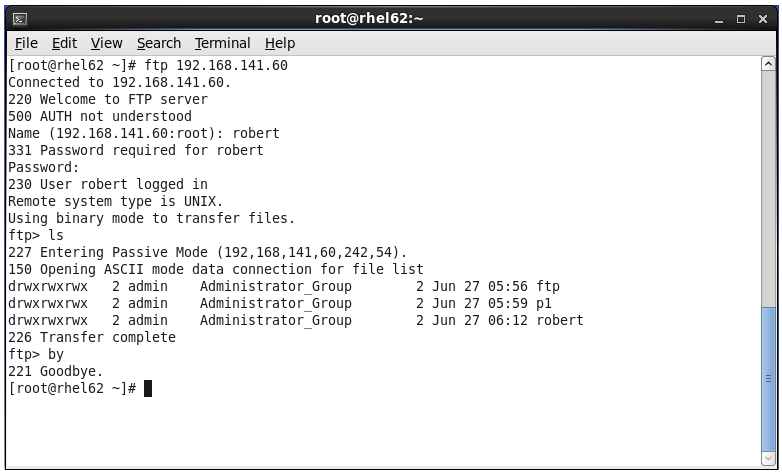
FTP is the basic file transfer tool provided in almost all operating systems. You may use FTP function through command line shell, FTP client, or web browsers.

## Method 1: Using Command Line Shell

In Windows XP or Windows 7, open a command line window and use FTP command – “ftp”. Enter your account and password. The share is available for you to access.



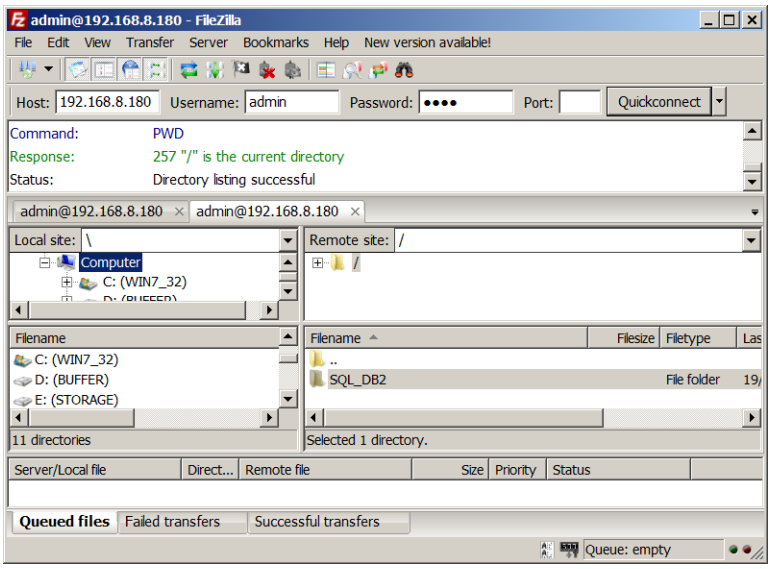

In Redhad Linux, it looks like the screenshot below.




## Method 2: Using FTP Client Application

There are a lot of FTP client tools in Windows platform such as WSFTP, FileZilla. In Linux X-Window environment, there are gFTP, WXftp, and LLNL XFTP.

For example, using FileZilla in Windows looks like the screenshot below.




## WebDAV

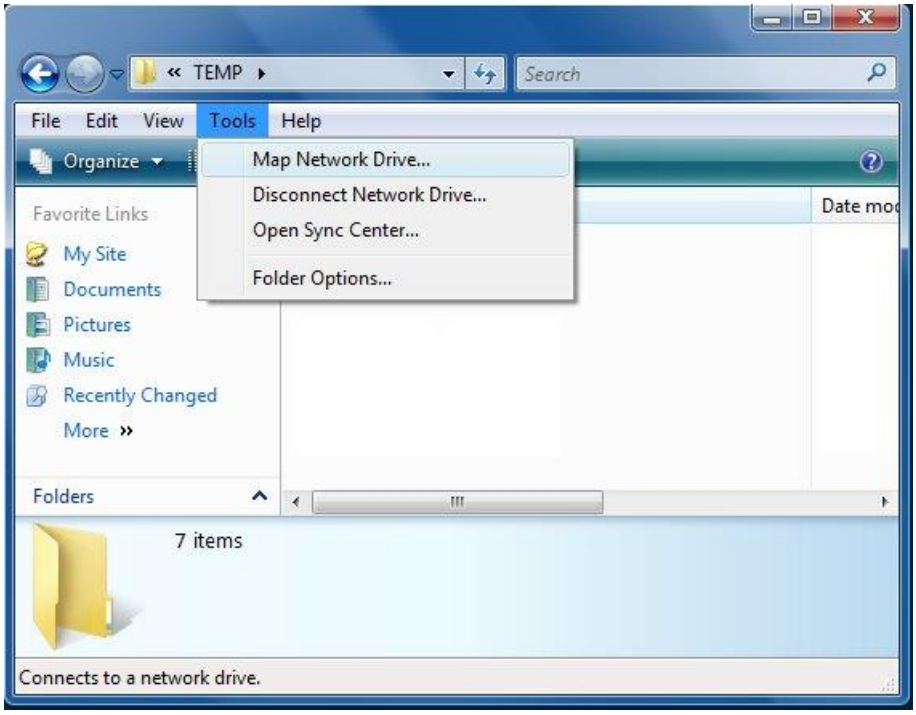
WebDAV service supports the following operating systems:

- 32bit Windows : Windows XP SP2, Windows 7 SP1, Windows Server 2008 SP1
- 64bit Windows operating systems have issues to support WebDAV service. We recommend using 3rd party WebDAV client applications.
- 32bit Redhat Linux 5 and 6
- 64bit Redhat Linux 6

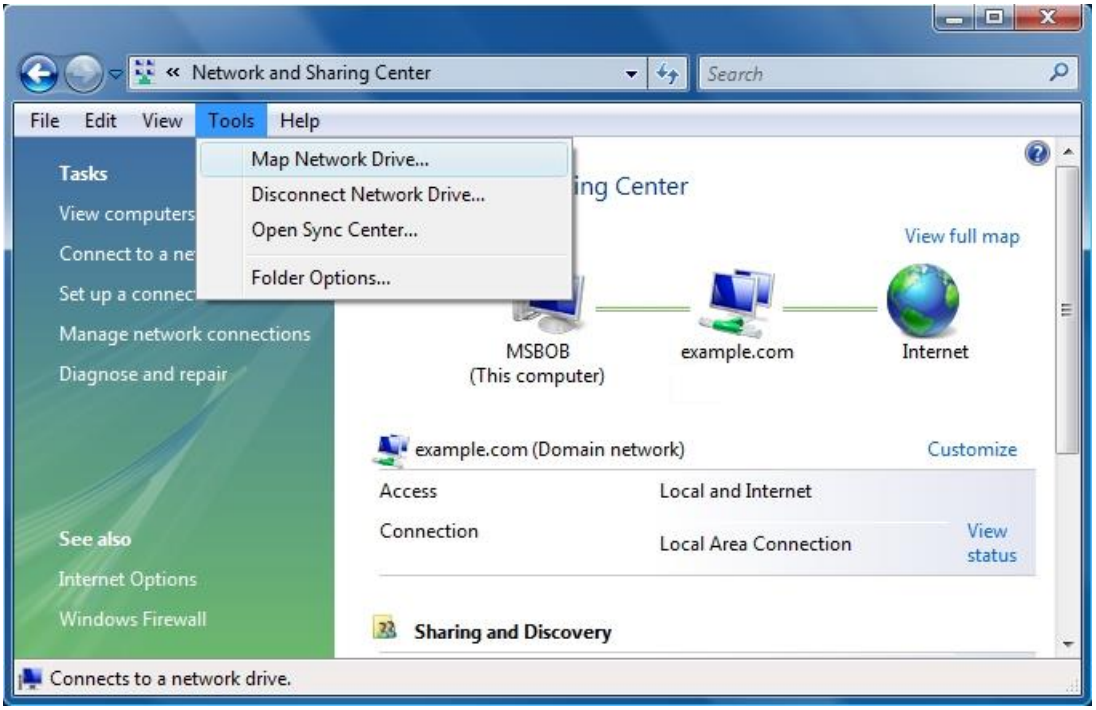
If you are using Windows XP or Vista, you may need to install a Windows update KB907306. If you are using Windows 7, please make sure **WebClient** service is enabled through **Component Services**. For more related information, please check WebDAV client interoperability at http://svnbook.red-bean.com/en/1.6/svn.webdav.clients.html

## Take an example of windows 7 using map network drive wizard

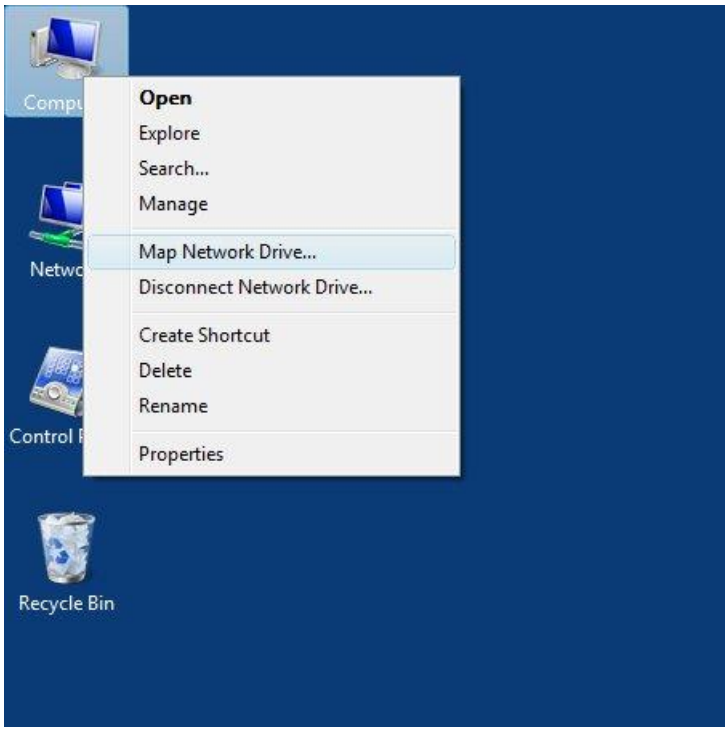
From Windows Explorer, go to **Tools** and select **Map Network Drive**.



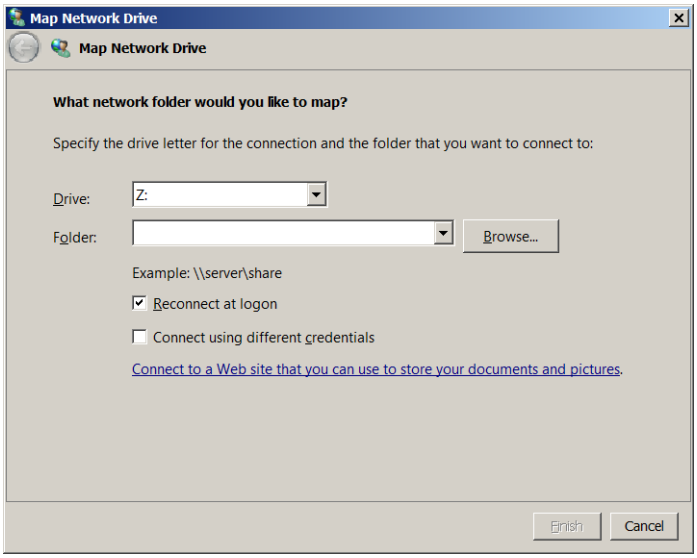

From Network and Sharing Center in the Control Panel, go to **Tools** and select **Map Network Drive**.



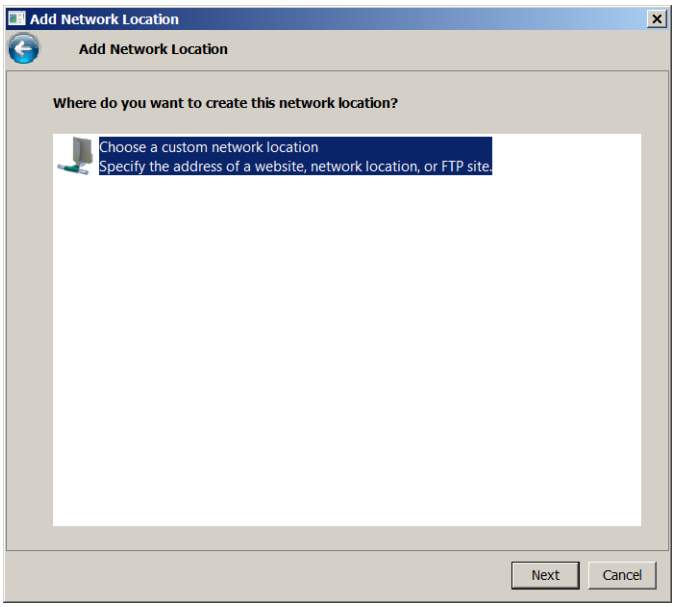
From the **Computer** icon on **Desktop**, right click on **Computer** icon and select **Map Network Drive**.




When the wizard appears, click **Connect to a Web site that you can use to store your documents and pictures**.



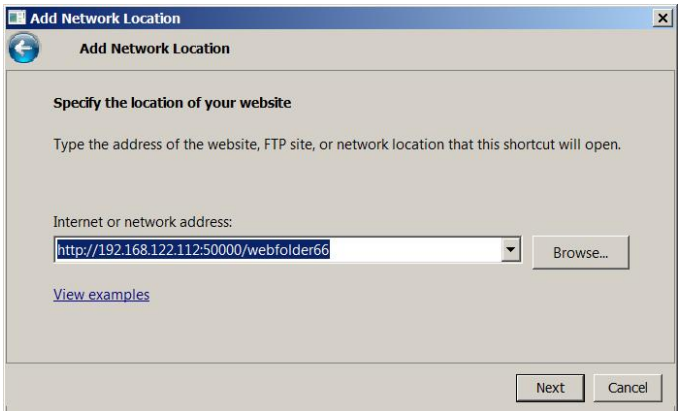
Follow the instructions and click **Next** button. Select **Choose a custom network location** and then click **Next** button again.



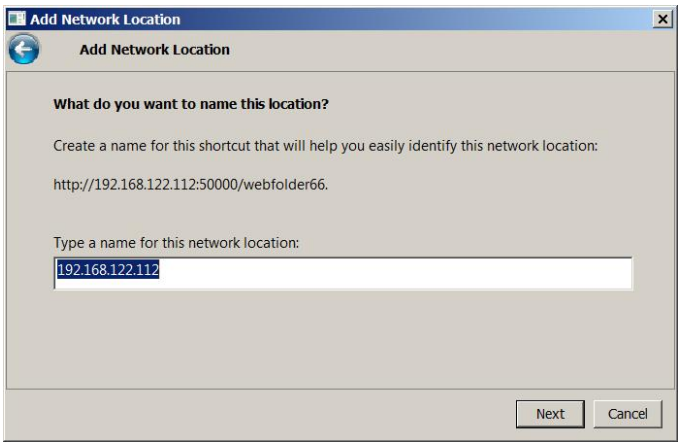

In **Internet or network address** input, put in the WebDAV share in the following syntax.

http://<IP address>: 50000/<WebDAV share>

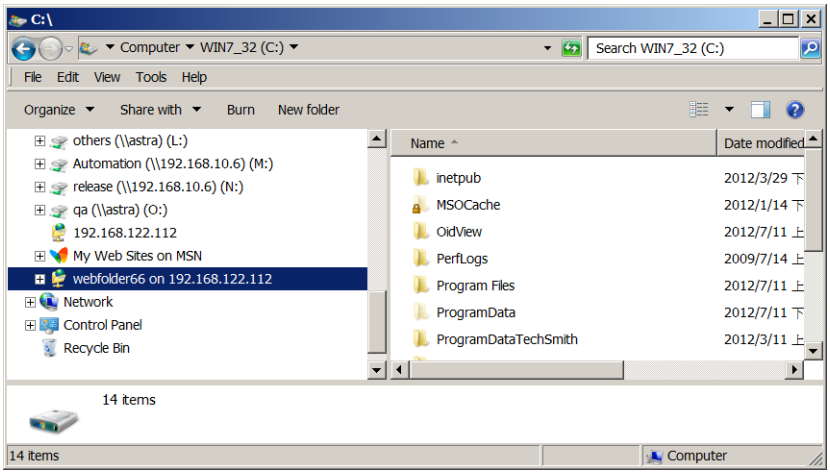
Please make sure you put in the port number **50000**.



Put in the required account and password information. You may name the network location. Here we simply use the default as 192.168.122.112.




You may access the web folder now.



# B

# Access iSCSI LUNs

This chapter describes how to access iSCSI LUNs. We will introduce:

- Using Microsoft iSCSI Initiator to logon iSCSI LUNs in Windows
- Using Linux iSCSI Initiator to logon iSCSI LUNs in RHEL (Red Hat Enterprise Linux).

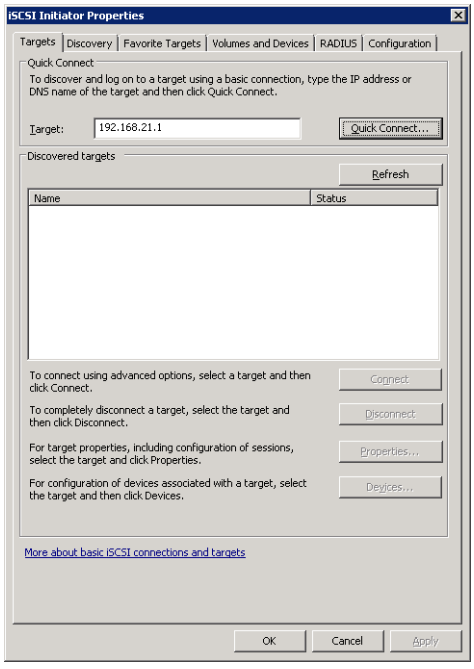
Before you access the iSCSI LUNs, please make sure that you have setup iSCSI LUN in Block Services and Configurations.

## Microsoft iSCSI Initiator

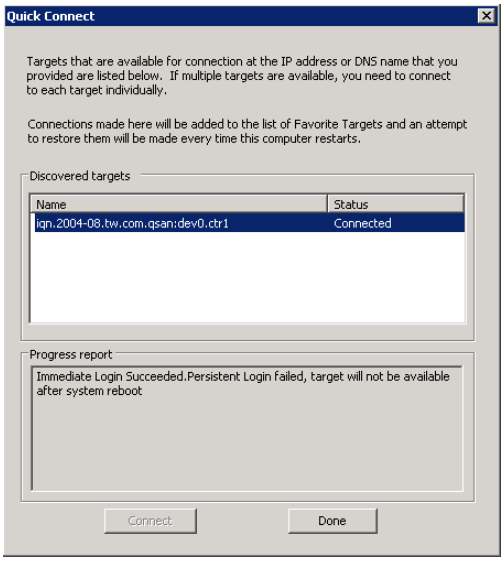
Here are the step by step instructions of how to setup Microsoft iSCSI Initiator. Please visit Microsoft website for latest iSCSI initiator. This example is based on Microsoft Windows Server 2008 R2.

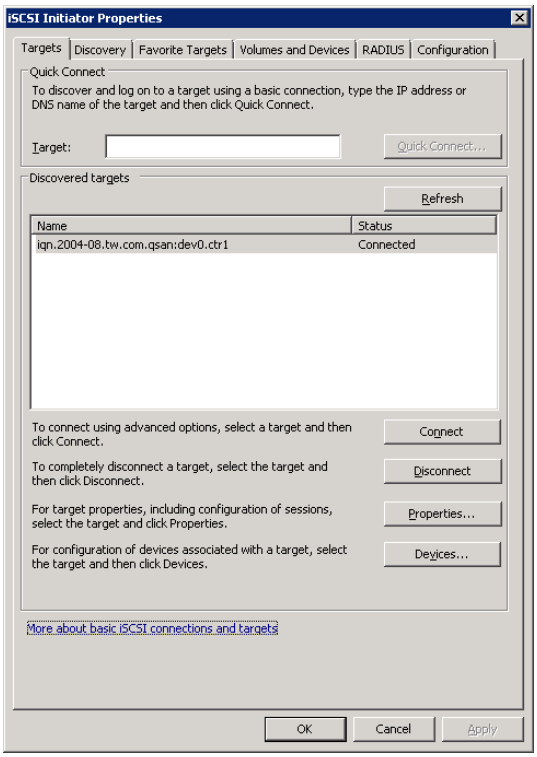
### Connect to iSCSI Target

1. Run Microsoft iSCSI Initiator.
2. Input IP address or DNS name of the target. And then click **Quick Connect** button.



3. Select the target name, and then click **Done** button.



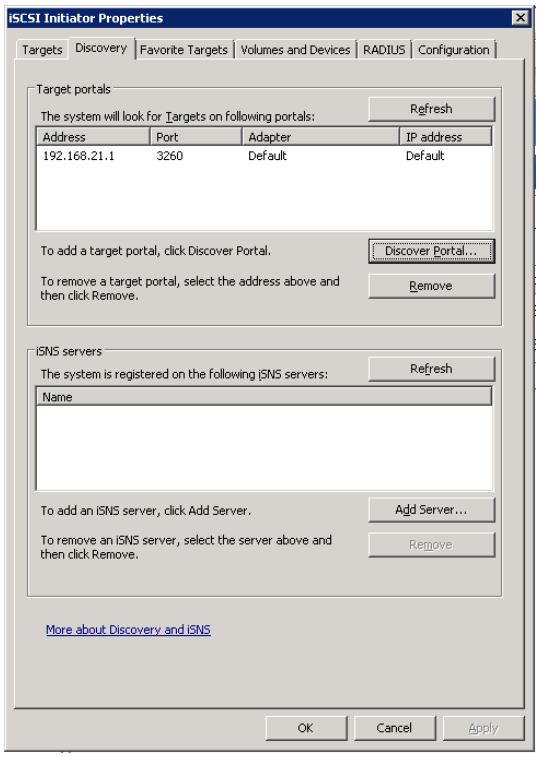



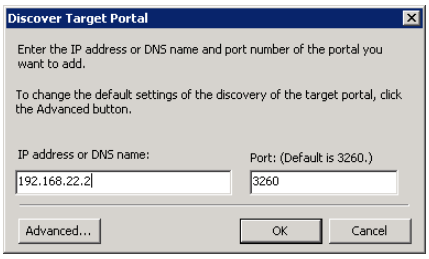

4. It can connect to an iSCSI disk now.

## Setup MPIO

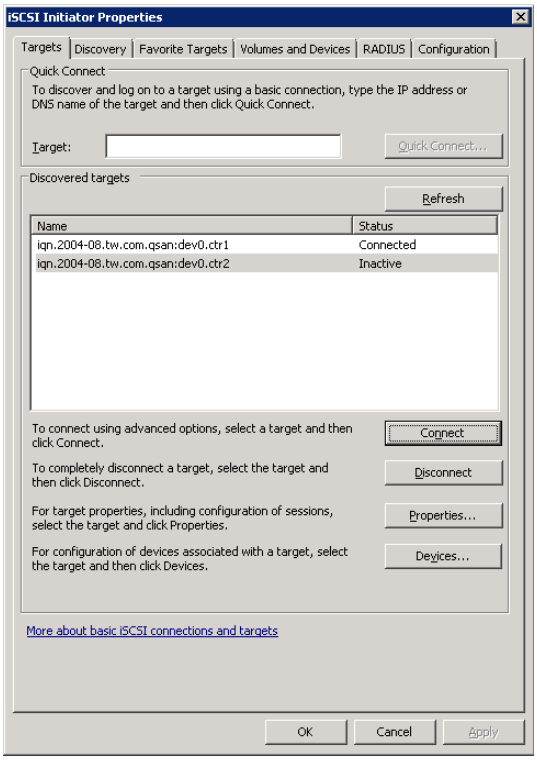
1. If running MPIO, please continue.
2. Click **Discovery** tab to connect the second path.

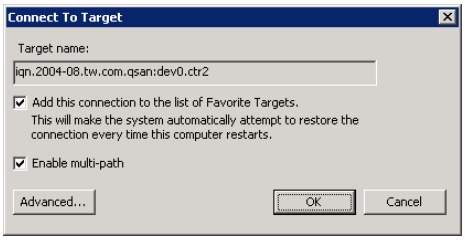
3. Click **Discover Portal** button. Enter the IP address or DNS name of the target.




4. Click **OK** button.

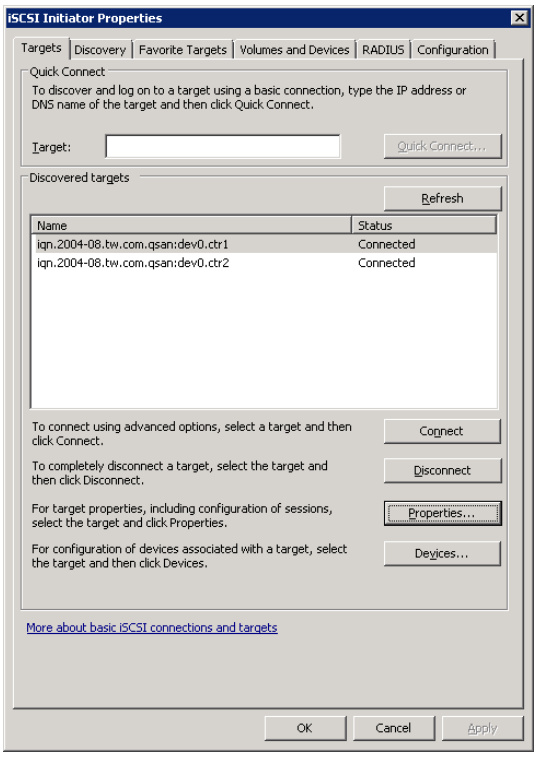


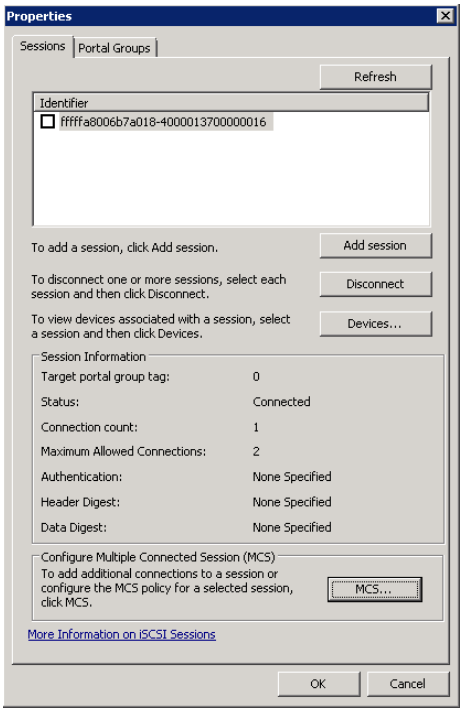



5. Click **Targets** tab, select the second path, and then click **Connect** button.
6. Enable **Enable multi-path** checkbox. Then click **OK** button.
7. Done, it can connect to an iSCSI disk with MPIO.

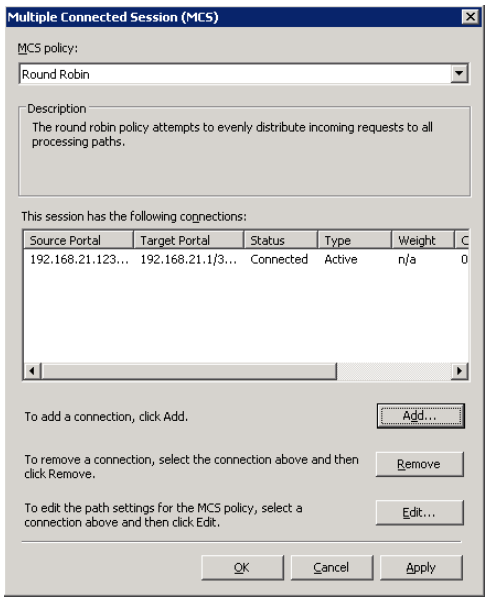
## Setup MC/S

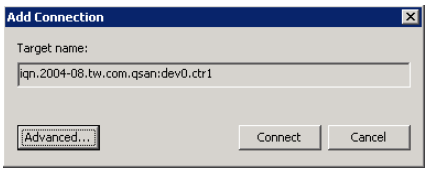
1. If running MC/S, please continue.
2. Select one target name, click **Properties** button.
3. Click **MCS** button to add additional connections.



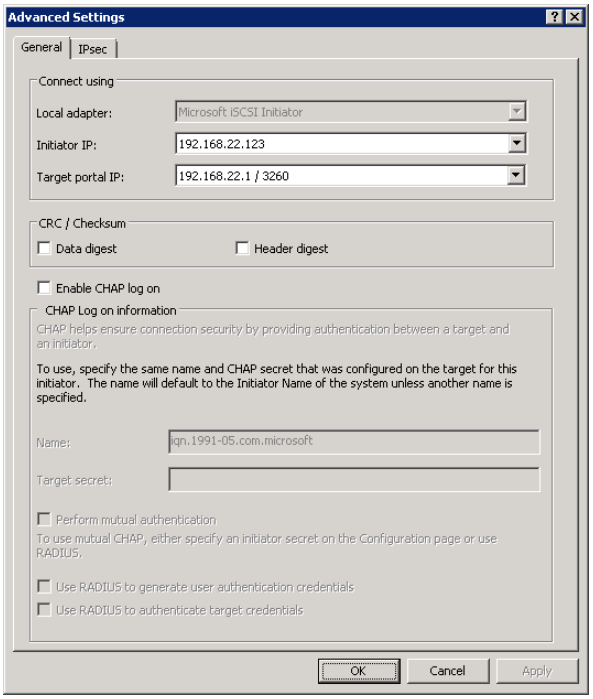



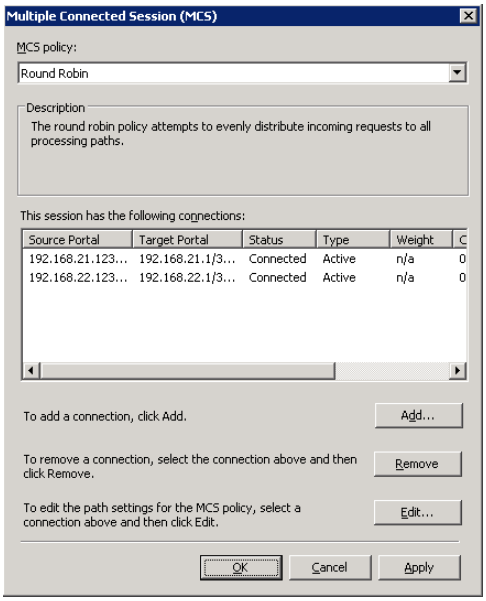

4. Click **Add** button.
5. Click **Advanced** button.




6. Select Initiator IP and Target portal IP, and then click **OK** button.
7. Click **Connect** button.
8. Click **OK** button.

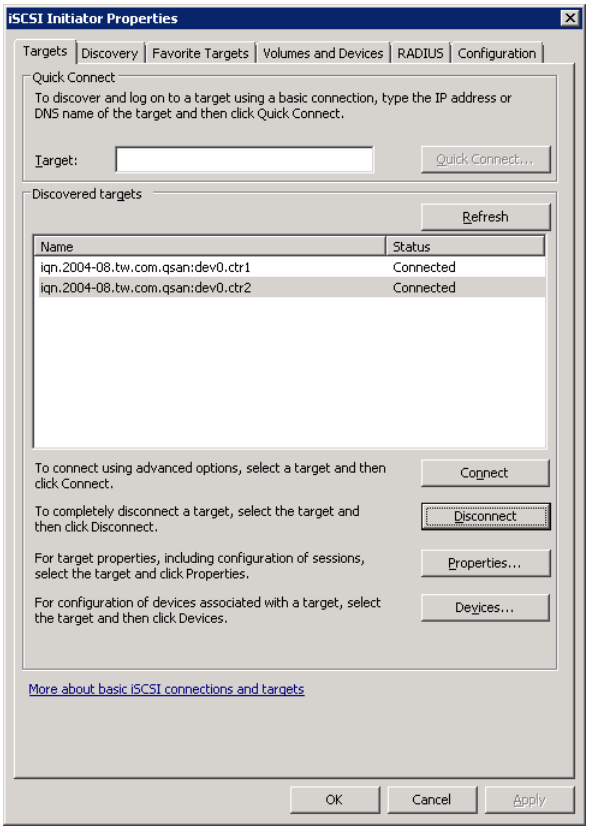



9. Done.

### Disconnect

1. Select the target name, click **Disconnect** button, and then click **Yes** button.




2. Done, the iSCSI device disconnect successfully.

## Linux iSCSI Initiator

### Installation

Before configuring the iSCSI multipath, you have to install the following rpm packages and source files (.tar.gz), so that the iSCSI service could run smoothly and without any compatible issues. Here is the order to install the packages we need:

- iscsi-initiator-utils-6.2.0.873-10.el6.x86_64.rpm
- device-mapper-1.02.79-8.el6.x86_64.rpm
- device-mapper-multipath-0.4.9-72.el6.x86_64.rpm

All the necessary rpm packages can be found in the RHEL6.5 DVD, Install them as follows:

```
# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/iscsi-initiator-utils-6.2.0.873-10.el6.x86_64.rpm
]# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/device-mapper-1.02.79-8.el6.x86_64.rpm
# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/device-mapper-multipath-0.4.9-72.el6.x86_64.rpm
```

## Usage of iSCSI initiator

The iSCSI initiator name can be specified in the configuration file /etc/iscsi/initiatorname.iscsi.

```
# vi /etc/iscsi/initiatorname.iscsi
InitiatorName = Your_initiator_name
```

Edit the configuration file of iSCSI initiator in /etc/iscsi/iscsid.conf, the iscsi session timeout value has to be changed to a proper value. The default value is 120 seconds, but it is too long to keep the I/O wait before the path is judged as fail and it may cause the I/O failure. Please set a shorter and proper timeout value in this configuration file.

```
# vi /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 30
(Please set a proper timeout value)
```

In /etc/iscsi/iscsid.conf, it also provides others settings, such as:

```
# vi /etc/iscsi/iscsid.conf
node.startup = Automatic
(Set auto-login when discover target)
node.session.auth.authmethod = CHAP
(Enable CHAP auth)
node.session.auth.username = username
(Set CHAP username)
node.session.auth.password = password
(Set CHAP password)
```

Please restart the iSCSI service to make these changes work.

```
# service iscsi restart
```

The rpm package iscsi-initiator-utils provides a command line tool called iscsiadm. It can manage the connections to iSCSI target. The iscsiadm tool has three operational modes - discovery, node, and session. The following will introduce these modes.

1. Discovery the all port and target name by # iscsiadm -m discovery.
   Operational mode -discovery is used to discover the target, the usage is
   **# iscsiadm -m discovery -t st -p target_ip**

```
# iscsiadm -m discovery -t st -p 10.10.10.100
192.168.1.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.2.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.4.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
# iscsiadm -m discovery -t st -p 192.168.195.22
192.168.5.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.6.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.8.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
```

2. Users can login and logout by # iscsiadm -m node with the ip and target name.
   Operational mode -node is used to login/logout, the usage is
   **# iscsiadm -m node -T target_iqn -p target_ip -l**
   **# iscsiadm -m node -T target_iqn -p target_ip –u**

```
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1 -p
10.10.10.100 -l
(login 10.10.10.100)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2 -p
192.168.195.22 -l
(login 192.68.195.22)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1 -p
10.10.10.100 -u
(logout 10.10.10.100)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2 -p
192.168.195.22 -u
```

```
(logout 192.168.195.22)
```

3. Query the list of nodes, the usage is

   **# iscsiadm -m node**

```
# iscsiadm -m node
192.168.1.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.2.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.4.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.5.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.6.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.8.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
```

4. If users want to clear the node list, the usage is

   **# iscsiadm -m node -0 delete**

5. This command will list the connected iSCSI session, it can be expressed as

   **# iscsiadm -m session**

```
# iscsiadm -m session
tcp: [3] 10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.c
tr1
tcp: [4] 192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev
0.ctr2
```

6. In session mode, the iSCSI session can be logout, the usage is

   **# iscsiadm -m session -r session_id –u**

```
# iscsiadm -m session -r 3 -u
Logging out of session [sid: 3, target: iqn.2004-08.com.qsantechnology:p600q-d316-000901d0
0:dev0.ctr1, portal: 10.10.10.100]
Logout of [sid: 3 target: iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1, p
ortal: 10.10.10.100,3260]: successful
```

7. To log out all sessions, the usage is

   **# iscsiadm -m session –u**

## How to setup DM-Multipath

The procedures of setup a multipath DM-Multipath are on the following.

1. To enable mpathconf, and then enable multipath support.

```
# mpathconf -h
usage: /sbin/mpathconf <command>

Commands:
Enable: --enable
Disable: --disable
Set user_friendly_names (Default n): --user_friendly_names <y|n>
Set find_multipaths (Default n): --find_multipaths <y|n>
Load the dm-multipath modules on enable (Default y): --with_module <y|n>
start/stop/reload multipathd (Default n): --with_multipathd <y|n>
chkconfig on/off multipathd (Default y): --with_chkconfig <y|n>
# mpathconf --enable
(It will create multipath.conf file as the configuration of multipath)
# service multipthd start
(To enable multipath)
```

## How to exclude local disks

There are two ways that the local disks can be excluded when generating multipath devices.

1. Determine which WWN of local disks will be ignored. In this example, using the command multipath can find out the WWN of local disk /dev/sda

```
# multipath -F
(Clear all multipath device maps)
# multipath
(Create multipath)
create: mpatha(1ATA    ST31000528AS                    9V)undef ATA,ST31000528A
[size=932G feature='0' hwhandler='0' wp=undef
'-+- policy='round-robin 0' prio=1 status=undef
'- 2:0:0:0  sda8:0   undef ready running
create: mpathb (3203300137890ad00) undef Qsan,p600-d316
[size=500g feature='0' hwhandler='0' wp=undef
|-+- policy='round-robin 0' prio=1 status=undef
| '- 12:0:0:0 sdb 8:16 undef ready running
```

```
‘-+- policy=’round-robin 0’ prio=1 status=undef
‘- 13:0:0:0 sdc 8:32 undef ready running
```

**TIP:** The device A as follow means failover. And another one means round-robin.

A. |-+- policy=’round-robin 0’ prio=1 status=undef
   | ‘- 12:0:0:0 sdb 8:16 undef ready running
   ‘-+- policy=’round-robin 0’ prio=1 status=undef
   ‘- 13:0:0:0 sdc 8:32 undef ready running
B. |-+- policy=’round-robin 0’ prio=1 status=active
   ‘- 12:0:0:0 sdb 8:16 active ready running
   ‘- 13:0:0:0 sdc 8:32 active ready running

The WWN of local disk /dev/sda is in the parenthesis followed by the word “mpatha”.

2. Edit /etc/multipath.conf, and insert the WWN of local disk into the blacklist.

```
# vi /etc/multipath.conf
blacklist {
wwid 1ATA    ST31000528AS                    9V
}
```

**TIP:** If you change the value of multipath.conf, you must restart multipath to take effect.

```
# service multipthd restart
```

3. User can also change the find_multipths to block the local disk

```
# multipath -find_multipaths y

OR
# vi /etc/multipath.conf
defaults{
find_multipaths yes
}
```

Next, the alias of iSCSI device will be created. The alias name will help iSCSI device to be identified easily. Find the UUID of iSCSI device in Red below:

```
# multipath -ll
mpathb (32033001378901d00) dm-3 Qsan,p600-d316
[size=500g feature='0' hwhandler='0' wp=rw
|-+- policy='round-robin 0' prio=1 status=active
| '- 12:0:0:0 sdb 8:16 active ready running
'-+- policy='round-robin 0' prio=1 status=enabled
'- 13:0:0:0 sdc 8:32 active ready running
```

1. Edit the /etc/multipath.conf again:

```
# vi /etc/multipath.conf
multipaths {
        multipath {
                wwid 32033001378901d00
                alias qsan
                path_grouping_policy multibus
#                path_checker direction
                (This line may cause multipath be invalid in different device)
                path_selector "round-robin 0"
                failback manual
                rr_weight priorities
                no_path_retry 5
}
```

2. Save the configuration file, and confirm that the persistent name to iSCSI device has been created.

```
# multipath -ll
qsan (32033001378901d00) dm-3 Qsan,p600-d316
[size=500g feature='1 queue_if_no_path' hwhandler='0' wp=ro
|-+- policy='round-robin 0' prio=1 status=active
'- 12:0:0:0 sdb 8:16 active ready running
'- 13:0:0:0 sdc 8:32 active ready running
# ls -l /dev/mapper
total 0
crw-rw---- 1 root root  10, 58 jul 28 18:34 control
```

```
lrwxrwxrwx 1 root root      7 jul 28 18:34 qsan -> ../dm-3
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_home -> ../dm-2
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_root -> ../dm-0
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_swap -> ../dm-1
```

**TIP:** Usually it uses the command multipath to manage the multipath devices. Here is the parameter manual.

| | |
|---|---|
| **multipath** | Without parameters, create the devmaps for the multipath devices. |
| **-h** | Print this usage text. |
| **-l** | Show multipath topology. (sysfs and DM info) |
| **-ll** | Show multipath topology. (maximum info) |
| **-f** | Flush a multipath device map. |
| **-F** | Flush all multipath device maps. |
| **-c** | Check if advice should be a path in a multipath device. |
| **-q** | Allow queue_if_no_path whenmultipathd is not running. |
| **-d** | Dry run, do not creat or update devmaps. |
| **-r** | Force devmap reload. |
| **-p** | Policy failover\|multibus\|group_by_serial\|group_by_prio. |
| **-b fil** | Bindings file location. |
| **-p pol** | Force all maps to specified path grouping policy:<br>failover 1 path per priority group<br>multibus all paths in 1 priority group<br>group_by_serial 1 priority group per serial<br>group_by_prio 1 priority group per priority level<br>group_by_node_name 1 priority group per target node |
| **-v lvl** | Verbosity level:<br>0 no output<br>1 print created devmap names only<br>2 default verbosity<br>3 print debug information |
| **Dev** | Action limited to:<br>Multipath named 'dev' (ex: mpath0) or<br>Multipath whose wwidis 'dev' (ex:60051..)<br>Multipath including the path named 'dev' (ex: /dev/sda)<br>Multipath including the path with maj:min 'dev' (ex:8:0) |

# C

# Advanced Operation

## Terminal Operation

There are two terminal operations to manage and debug the storage system, described on the following.

### Serial Console

**TrioNAS U1XX and U2XX:**

At the rear of the storage system, connect a monitor via the VGA port and connect a USB keyboard via the USB port.

The initial defaults for administrator login are:

- User name: admin
- Password: 1234

**TrioNAS U300 Series and TrioNAS LX Series:**

Use console cable (NULL modem cable) to connect from console port of the storage system to RS 232 port of the management PC. The console settings are on the following:

- Baud rate: 115200, 8 data bit, no parity, 1 stop bit, and no flow control.
- Terminal type: vt100

The initial defaults for administrator login are:

- User name: admin
- Password: 1234

### Secure Shell Remote Access

SSH (secure shell) software is required for remote login. The SSH client software is available at the following web site:

- SSH Tectia Client: http://www.ssh.com/
- PuTTY: http://www.chiark.greenend.org.uk/

The default management IP address is 192.168.1.234/255.255.255.0, please configure your computer IP address at the same subnet of the system (e.g.: 192.168.1.1/255.255.255.0). The remote control settings are on the following:

- Host IP: <*IP Address*> (e.g.: 192.168.1.234)
- Port: 2222
- User Name: admin
- Password: 1234

**TIP:**
Qsan system supports SSH for remote access only. When using SSH, the IP address and password are required for login.

## Console UI

When login to the system, there is a prompt, type **help** and press **Enter** button. It will display help description.

```
console> help
  info           Print system information
  ifconfig       Setting eth0 IP address
  reset_network  Reset all of network port to Manufactory setting
  restart_http   Restart HTTP service for management
  list_port      List the port number of service used
  dump_sysinfo   Dump system information to USB
  diag           Print diagnostic message
  reboot         Reboot system
  shutdown       Shutdown system
  exit           Exit
  help           Help description
console>
```

The options are available on the console UI:

- info: Print the system information.

```
console> info
  [System]
    Product:        U221
    Name:           U221-xxxxxx
    Version:        1.2.3
  [Network]
    LAN0 => MAC 00:13:78:xx:xx:xx  Addr:192.168.x.x  Mask:255.255.0.0
    LAN1 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
```

```
LAN2 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
LAN3 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
```

- ifconfig: Setup the IP address of the management port.

```
console> ifconfig
  Setting eth0 IP address usage:
        ifconfig IP MASK [GATEWAY]
        ifconfig DHCP
```

- reset_network: Reset all of network ports to factory default setting.
- restart_http: If the web UI is abnormal, restart HTTP service for management.
- list_port: List the port number of the services.

```
console> list_port
  [Service]             [Port]
    http                => 80
    https               => 443
    ssh                 => 2222
    ftp                 => 21
    sftp                => 22
    webdav              => 50000
    webdavs             => 8888
```

- dump_sysinfo: Connect a USB flash via USB port at the rear of the system; use this command to dump the system information to USB device. If there is no USB device found, it will display the warning message.

```
console> dump_sysinfo
No USB found,please insert USB
```

- diag: Print the diagnostic messages.
- reboot: Reboot the system.
- shutdown: Shutdown the system.
- exit: Exit the console UI.
- help: Display the help description.

# D

# Glossary and Acronym List

**Common Terminology**

| Item | Description |
|---|---|
| RAID | Redundant Array of Independent Disks. There are different RAID levels with different degree of data protection, data availability, and performance to host environment. |
| PD | The Physical Disk belongs to the member disk of one specific RAID group. |
| Pool | A collection of removable media. One pool consists of one or several RAID sets. |
| ZFS | ZFS is a combined file system and logical volume manager designed by Sun Microsystems. The features of ZFS include data integrity verification against data corruption modes, support for high storage capacities, integration of the concepts of file system and volume management, snapshots and copy-on-write clones, continuous integrity checking. |
| LUN | Logical Unit Number. A logical unit number (LUN) is a unique identifier which enables it to differentiate among separate devices (each one is a logical unit). |
| GUI | Graphic User Interface. |
| RO | Set the volume to be Read-Only. |
| DS | Dedicated Spare disks. The spare disks are only used by one specific RG. Others could not use these dedicated spare disks for any rebuilding purpose. |
| DG | DeGraded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks. |
| SCSI | Small Computer Systems Interface. |
| SAS | Serial Attached SCSI. |
| S.M.A.R.T. | Self-Monitoring Analysis and Reporting Technology. |
| WWN | World Wide Name. |
| HBA | Host Bus Adapter. |
| NIC | Network Interface Card. |
| BBM | Battery Backup Module |

**Data Service Terminology**

| Item | Description |
|---|---|
| CIFS | Common Internet File System. CIFS operates as an application-layer network protocol mainly used for providing shared access to files, printers, serial ports, and miscellaneous communications between nodes on a network. |
| SMB | Server Message Block. Same as CIFS. |
| NFS | Network File System. NFS is a distributed file system protocol originally, allowing a user on a client computer to access files over a network in a |

| | |
|---|---|
| | manner similar to how local storage is accessed. |
| AFP | Apple Filing Protocol, formerly AppleTalk Filing Protocol. AFP is a proprietary network protocol that offers file services for Mac OS X and original Mac OS. In Mac OS X, AFP is one of several file services supported including Server Message Block (SMB), Network File System (NFS), File Transfer Protocol (FTP), and WebDAV. AFP currently supports Unicode file names, POSIX and access control list permissions, resource forks, named extended attributes, and advanced file locking. In Mac OS 9 and earlier, AFP was the primary protocol for file services. |
| FTP | File Transfer Protocol. FTP is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet. |
| WebDAV | Web Distributed Authoring and Versioning. WebDAV is an extension of the Hypertext Transfer Protocol (HTTP) that facilitates collaboration between users in editing and managing documents and files stored on World Wide Web servers. |
| Deduplication | Data deduplication is a specialized data compression technique for eliminating duplicate copies of repeating data. |
| Thin Provisioning | Thin provisioning is the act of using virtualization technology to give the appearance of having more physical resources than are actually available. The term thin provisioning is applied to disk later in this article, but could refer to an allocation scheme for any resource. |

**iSCSI Terminology**

| Item | Description |
|---|---|
| iSCSI | Internet Small Computer Systems Interface. |
| LACP | Link Aggregation Control Protocol. |
| MPIO | Multi-Path Input/Output. |
| MC/S | Multiple Connections per Session |
| MTU | Maximum Transmission Unit. |
| CHAP | Challenge Handshake Authentication Protocol. An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports. |
| iSNS | Internet Storage Name Service. |

# E

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F

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Version 3, 29 June 2007



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## Revision History

| Date | Version | Owner | Description |
|---|---|---|---|
| 2013/1/14 | 8.17 | Wilson Fang | Apply 2013 template.<br>Add TrioNAS.<br>Apply TrioNAS LX. |
| 2013/1/31 | 8.18 | Wilson Fang | Add U200.<br>FW changes to 1.1.0.<br>Correct dedicated spare setting. |
| 2013/2/18 | 8.19 | Wilson Fang | Add health “Reserved” descriptions in “Physical Disk”. |
| 2013/2/18 | 8.20 | Wilson Fang | Change U210/U220 Memory to 16GB. |
| 2013/2/20 | 8.20 | Robert Lin | Add FW 1.1.0 features.<br>P36, Change screenshot.<br>P54, Add import/export account.<br>P61, P62, P64, Add IPv6.<br>P63, P66, Dedicated spare function moves to Pool tab, not Physical disk tab.<br>P66, Add "Reserved" description.<br>P68, Add “Scrub” description.<br>P71, Add how to set dedicated spare disk.<br>P74, Update create ZFS UI (generic zero reclaim).<br>P84 ~ P86, Add UID/GID description.<br>P87, Add search file description, updates UI.<br>P89, Update NFS UI.<br>P92, Add NFSv4 domain support for ID mapping.<br>P93, P94, Update FTP spec and UI, max connections 256, default 32.<br>P101, Update replication task limit. 16 tasks max.<br>P116, Add Apple Time Machine support. |
| 2013/3/12 | 8.21 | Wilson Fang | P26, Add “Rack Mount Installation”. |
| 2013/3/14 | 8.21 | Wilson Fang | P133 ~ P134, Add data service terminologies. |
| 2013/3/16 | 8.30 | Wilson Fang | Apply WebUI version. |
| 2013/7/11 | 8.32 | Wilson Fang | All, Remove U200.<br>P15, Add Power button description.<br>P14 ~ P22, Modify LED descriptions.<br>P19, Remove TrioNAS LX BBM descriptions.<br>P21, Modify LAN port descriptions.<br>P27 ~ P28, Modify rack mount installation.<br>P34 ~ P35, Correct shutdown descriptions.<br>P38 ~ P39, Modify Web UI screen shot.<br>P40, Add setup wizard.<br>P42, Modify interface hierarchy. |
| 2013/7/15 | 8.32 | Wilson Fang | P42, Add Dashboard description.<br>P43 ~ P48, Add the descriptions of all options in Monitor.<br>P48 ~ P57, Modify System configuration descriptions. |
| 2013/7/17 | 8.32 | Wilson Fang | P57 ~ P61, Modify Network setting descriptions.<br>P61 ~ P62, Modify Physical disk descriptions. |
| 2013/7/18 | 8.32 | Wilson Fang | P64 ~ P71, Modify Pool, ZFS descriptions. |
| 2013/7/23 | 8.32 | Wilson Fang | P78 ~ P91, Modify LUN, Snapshot and Application configuration descriptions. |

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| 2013/7/25 | 8.32 | Wilson Fang | P73 ~ P78, Modify Share descriptions.<br>P92 ~ P94, Modify Maintenance configuration descriptions. |
| 2013/7/26 | 8.33 | Wilson Fang | P74 ~ P76, Modify Share descriptions and add WebDAV setting. |
| 2013/8/8 | 8.33 | Wilson Fang | P21, Modify LAN1 as management port.<br>P37, Add description for access web UI. |
| 2013/9/17 | 8.33 | Robert Lin | P46 ~ P47, Add description for event log behavior.<br>P54, Add description for import/export account.<br>P59, Add description for DHCP behavior.<br>P62, Add description for IP filter setting.<br>P76, Add a caution for home directory shares using NFS.<br>P95, Add description for “Reset to factory defaults”.<br>P95 ~ P96, Add “Firmware Upgrade via USB”. |
| 2013/9/17 | 8.33 | Wilson Fang | P6, Add more battery description for BSMI. |
| 2013/10/18 | 8.34 | Wilson Fang | P6, Add warning message for battery in French, German, Spanish and Simplified Chinese. |
| 2013/11/1 | 8.35 | Wilson Fang | All, Review CAUTION and TIP.<br>P72, Move * descriptions to TIP.<br>P2, Add login information. |
| 2014/4/24 | 8.41 | Wilson Fang | P117 ~ P118, Add chapter 7. |
| 2014/5/12 | 8.41 | Wilson Fang | All, Apply new Qsan CI.<br>P1 ~ P42, Add TrioNAS U120, TrioNAS U300. |
| 2014/5/13 | 8.41 | Wilson Fang | P11 ~ P38, Rewrite Chapter 1 and 2. |
| 2014/5/15 | 8.41 | Wilson Fang | P95, Remove volumes in Amazon S3. |
| 2014/5/20 | 8.41 | Wilson Fang | P11 ~ P45, Update TrioNAS U120, TrioNAS U300 photos. |
| 2014/5/21 | 8.41 | Wilson Fang | P20, Update U110 and U120.<br>P127 ~ P129, Update Chapter 7. |
| 2014/5/22 | 8.41 | Wilson Fang | P20, Add descriptions in USB ports. |
| 2014/6/19 | 8.50 | Wilson Fang | P2, P16 ~ P17, P46 ~ P48, P69, P104 ~ P105, P128, Modify default IP as 192.168.1.234.<br>P69, P71, Update screenshot. |
| 2014/6/30 | 8.50 | Wilson Fang | P13, Modify U300 model names.<br>P16 ~ P17, Add JBOD J100.<br>P18, Update U300 tray picture.<br>P24 ~ P26, Update U300 pictures of systems and controllers.<br>P37 ~ P38, Update U300 topologys. |
| 2014/7/2 | 8.50 | Wilson Fang | P11, P15, Update U300 pictures. |
| 2014/7/17 | 8.50 | Wilson Fang | P27, Add RAID 10 description. |
| 2014/9/2 | 8.50 | Wilson Fang | P11 ~ P42, Rename TrioNAS LX U300. |
| 2014/9/3 | 8.50 | Wilson Fang | P11 ~ P42, U300 re-sorts by P10, P20, F20. |
| 2014/9/5 | 8.50 | Wilson Fang | P13, Remove Celeron model.<br>P48 ~ P50, Rewrite Setup wizard contents.<br>P51, Update Interface hierarchy.<br>P52, Update Dashboard screenshot and add Refresh interval contents.<br>P53, Update S.M.A.R.T. screenshot.<br>P55, Update Snapshot screenshot.<br>P56, Add Hardware monitor screenshots. |
| 2014/9/17 | 8.50 | Wilson Fang | P47, Update screenshots. |

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| | | | P57, Update Event log screenshot.<br>P58, Add Service log description.<br>P59 ~ P60, Add iSCSI service description.<br>P60 ~ P61, Update System screenshot. Add Web management timeout and port number descriptions.<br>P61, Update Time screenshot. Update Time and date setup descriptions.<br>P62 ~ P65, Update user and group screenshots. Modify user and group description. |
| 2014/9/19 | 8.50 | Wilson Fang | P59, P70, Modify UPS screenshots and descriptions.<br>P12, P71, Modify network descriptions.<br>P74 ~ P75, Modify link aggregation descriptions.<br>P77, Modify Physical disk descriptions. |
| 2014/9/22 | 8.50 | Wilson Fang | P75, Add default gateway and loopback.<br>P76, Add IP filter rule and modify IP filter setting descriptions.<br>P78, Modify replace disk screenshot.<br>P79 ~ P80, Modify pool screenshots and descriptions.<br>P84 ~ P85, Modify ZFS screenshots and descriptions.<br>P89 ~ P92, Modify Share screenshots and descriptions.<br>P94 ~ P95, Modify LUN screenshots and descriptions.<br>P95 ~ P97, Modify Snapshot screenshots and descriptions.<br>P97, Rename Service configuration. |
| 2014/9/25 | 8.50 | Wilson Fang | P46, Add Update admin password screenshot and description.<br>P99, Add Access auditing screenshot and description.<br>P101, Add FTP, SFTP port numbers.<br>P102, Add WebDAV port numbers.<br>P102 ~ P104, Modify iSCSI screenshots and add Change network portal. |
| 2014/9/26 | 8.50 | Wilson Fang | P104 ~ P106, Add Rsync.<br>P106 ~ P107, Modify Replication screenshot and description.<br>P111, Add Application.<br>P112, Add Diagnostic, Tools and ARP.<br>P113, Modify Reset to factory default screenshot and description.<br>P115, Add Import and export. |
| 2014/9/30 | 8.51 | Wilson Fang | P117, P122, Review contents. |
| 2014/10/16 | 8.51 | Wilson Fang | P2, Update FW version. |
| 2014/12/11 | 8.60 | Wilson Fang | Separate HW and SW manual. |
| 2015/2/2 | 8.60 | Wilson Fang | Add GPL. |
| 2015/3/5 | 8.60 | Wilson Fang | Add EULA. |
| 2015/3/6 | 8.60 | Wilson Fang | Regroup all contents to FW 2.0.0. |
| 2015/3/10 | 8.60 | Wilson Fang | P16 ~ P36, Review and capture screenshots. |
| 2015/3/12 | 8.60 | Wilson Fang | P29, P37 ~ P39, Review and capture screenshots. |
| 2015/3/17 | 8.60 | Wilson Fang | P40, Add a pool relationship diagram. |

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| 2015/3/19 | 8.60 | Wilson Fang | P23, Add IPv4 static route.<br>P41 ~ P57, Rewrite Storage Configuration. |
| 2015/3/20 | 8.60 | Wilson Fang | P58 ~ P62, Rewrite Data Service. |
| 2015/3/23 | 8.60 | Wilson Fang | P63 ~ P75, Rewrite Data Service. |
| 2015/3/24 | 8.60 | Wilson Fang | P69 ~ P79, Add FC.<br>P80 ~ P90, Rewrite Data Protection. |
| 2015/3/25 | 8.60 | Wilson Fang | P91 ~ P96, Rewrite System Healthy.<br>P97 ~ P144, Rewrite Appendix A, B, C, D, E, F. |
| 2015/3/26 | 8.60 | Wilson Fang | P10 ~ P18, Rewrite Getting Started. |
| 2015/3/27 | 8.60 | Wilson Fang | P10 ~ P18, Review. |
| 2015/8/29 | 8.60 | Grace Chen | P1 ~ P150, Review.<br>Update UI Screenshot.<br>Add Replication via internet TIP. |