iSCSI GbE to SAS/SATA II RAID Subsystem

User Manual

Revision 1.0

Table of Contents

Preface

About this manual

This manual provides information regarding the quick installation and hardware features of the **RAID subsystem**. This document also describes how to use the storage management software. Information contained in the manual has been reviewed for accuracy, but not for product warranty because of the various environment/OS/settings. Information and specifications will be changed without further notice.

This manual uses section numbering for every topics being discussed for easy and convenient way of finding information in accordance with the user's needs. The following icons are being used for some details and information to be considered in going through with this manual:

NOTES:
These are notes that contain useful information and tips that the user must give attention to in going through with the subsystem operation.

IMPORTANT!
These are the important information that the user must remember.

WARNING!
These are the warnings that the user must follow to avoid unnecessary errors and bodily injury during hardware and software operation of the subsystem.

CAUTION:
These are the cautions that user must be aware to prevent damage to the equipment and its components.

Copyright

Trademarks

All products and trade names used in this document are trademarks or registered trademarks of their respective holders.

Changes

The material in this document is for information only and is subject to change without notice.

Before You Begin

Before going through with this manual, you should read and focus to the following safety guidelines. Notes about the subsystem's controller configuration and the product packaging and delivery are also included.

Safety Guidelines

To provide reasonable protection against any harm on the part of the user and to obtain maximum performance, user is advised to be aware of the following safety guidelines particularly in handling hardware components:

Upon receiving of the product:

- Place the product in its proper location.
- To avoid unnecessary dropping out, make sure that somebody is around for immediate assistance.
- It should be handled with care to avoid dropping that may cause damage to the product. Always use the correct lifting procedures.

Upon installing of the product:

- Ambient temperature is very important for the installation site. It must not exceed 30°C. Due to seasonal climate changes; regulate the installation site temperature making it not to exceed the allowed ambient temperature.
- Before plugging-in any power cords, cables and connectors, make sure that the power switches are turned off. Disconnect first any power connection if the power supply module is being removed from the enclosure.
- Outlets must be accessible to the equipment.
- All external connections should be made using shielded cables and as much as possible should not be performed by bare hand. Using anti-static hand gloves is recommended.
- In installing each component, secure all the mounting screws and locks. Make sure that all screws are fully tightened. Follow correctly all the listed procedures in this manual for reliable performance.

Controller Configurations

This RAID subsystem supports dual controller configuration.

Packaging, Shipment and Delivery

- Before removing the subsystem from the shipping carton, you should visually inspect the physical condition of the shipping carton.
- Unpack the subsystem and verify that the contents of the shipping carton are all there and in good condition.
- Exterior damage to the shipping carton may indicate that the contents of the carton are damaged.
- If any damage is found, do not remove the components; contact the dealer where you purchased the subsystem for further instructions.

The shipping package contains the following:

	iSCSI RAID Subsystem Unit
	Two (2) power cords
	Two (2) Ethernet LAN cables
	Four(4) LC-LC Fibre Optical Cables
	Two (2) External null modem cable
	One(1) Controller Module Plate Cover
	One(1) PSFM Plate Cover
	User Manual

NOTE: If any damage is found, contact the dealer or vendor for assistance.

Chapter 1 Introduction

The iSCSI RAID Subsystem

Unparalleled Performance & Reliability

- Front-end 4 x 10Gb iSCSI
- Supports 802.3ad port trunking, Link Aggregation Control Protocol (LACP)
- High data bandwidth of system architecture by powerful 64-bit RAID processor

Unsurpassed Data Availability

- The RAID 6 capability provides the highest level of data protection
- Supports snapshot-on-the-box w/o relying on host software
- Supports Microsoft Windows Volume Shadow Copy Services (VSS)

Exceptional Manageability Menu-driven front panel display

- Management GUI via serial console, SSH telnet, Web and secure web (HTTPS)
- Event notification via Email and SNMP trap
- Menu-driven front panel display

Features

- Front-end 4 x 10Gb ports support independent access, fail-over and load-balancing
- (802.3ad port trunking, LACP)
- Supports iSCSI jumbo frame
- Supports Microsoft Multipath I/O (MPIO)
- Supports RAID levels 0, 1, 0+1, 3, 5, 6, 10, 30, 50, 60 and JBOD
- Local N-way mirror: Extension to RAID 1 level, N copies of the disk
- Global and dedicated hot spare disks
- Write-through or write-back cache policy for different application usage
- Supports greater than 2TB per volume set (64-bit LBA support)
- Supports manual or scheduling volume snapshot (up to 32 snapshots)
- Snapshot rollback mechanism
- On-line volume migration with no system down-time
- Online volume expansion
- Instant RAID volume availability and background initialization
- Supports S.M.A.R.T, NCQ and OOB Staggered Spin-up capable drives

1.1 Technical Specifications

Model	EP-3164D-GAS3
RAID Controller	iSCSI-SAS
Controller	Dual (Redundant)
Host Interface	Four 10Gb/s Ethernet
Disk Interface	SAS 3Gb or SATA II
SAS expansion	4x mini SAS (3Gb/s)
Processor Type	Intel IOP342 64-bit (Chevelon dual core)
Cache Memory	4GB ~ 8GB DDR-II ECC SDRAM
Battery Backup	Optional Hot Pluggable BBM
Management Port support	Yes
Monitor Port support	Yes
UPS connection	Yes
RAID level	0, 1, 0+1, 3, 5, 6, 10, 30, 50, 60 and JBOD
Logical volume	Up to 1024
iSCSI Jumbo frame support	Yes
Supports Microsoft Multipath I/O (MPIO)	Yes
802.3ad Port Trunking, LACP Support	Yes
Host connection	Up to 32
Host clustering	Up to 16 for one logical volume
Manual/scheduling volume snapshot	Up to 32
Hot spare disks	Global and dedicated
Host access control	Read-Write & Read-Only
Online Volume migration	Yes
Online Volume sets expansion	Yes
Configurable stripe size	Yes
Auto volume rebuild	Yes
N-way mirror (N copies of the disk)	Yes
Microsoft Windows Volume Shadow Copy Services (VSS)	Yes
Supports CHAP authentication	Yes
S.M.A.R.T. support	Yes

Snapshot rollback mechanism support	Yes
Platform	Rackmount
Form Factor	3U
# of Hot Swap Trays	16
Tray Lock	Yes
Disk Status Indicator	Access / Fail LED
Backplane	SAS / SATA II Single BP
# of PS/Fan Modules	500W x 2 w/PFC
# of Fans	4
Power requirements	AC 90V ~ 264V Full Range, 10A ~ 5A, 47Hz ~ 63Hz
Relative Humidity	10% ~ 85% Non-condensing
Operating Temperature	10°C ~ 40°C (50°F ~ 104°F)
Physical Dimension	566(L) x 482(W) x 131(H) mm
Weight (Without Disk)	22.5 Kg

1.2 Terminology

The document uses the following terms:

RAID	**R**edundant **A**rray of **I**ndependent **D**isks. There are different RAID levels with different degree of data protection, data availability, and performance to host environment.
PD	The **P**hysical **D**isk belongs to the member disk of one specific RAID group.
RG	**R**aid **G**roup. A collection of removable media. One RG consists of a set of VDs and owns one RAID level attribute.
VD	**V**irtual **D**isk. Each RD could be divided into several VDs. The VDs from one RG have the same RAID level, but may have different volume capacity.
LUN	**L**ogical **U**nit **N**umber. A logical unit number (LUN) is a unique identifier which enables it to differentiate among separate devices (each one is a logical unit).
GUI	**G**raphic **U**ser **I**nterface.
RAID cell	When creating a RAID group with a compound RAID level, such as 10, 30, 50 and 60, this field indicates the number of subgroups in the RAID group. For example, 8 disks can be grouped into a RAID group of RAID 10 with 2 cells, 4 cells. In the 2-cell case, PD {0, 1, 2, 3} forms one RAID 1 subgroup and PD {4, 5, 6, 7} forms another RAID 1 subgroup. In the 4-cells, the 4 subgroups are PD {0, 1}, PD {2, 3}, PD {4, 5} and PD {6,7}.
WT	**W**rite-**T**hrough cache-write policy. A caching technique in which the completion of a write request is not signaled until data is safely stored in non-volatile media. Each data is synchronized in both data cache and accessed physical disks.
WB	**W**rite-**B**ack cache-write policy. A caching technique in which the completion of a write request is signaled as soon as the data is in cache and actual writing to non-volatile media occurs at a later time. It speeds up system write performance but needs to bear the risk where data may be inconsistent between data cache and the physical disks in one short time interval.
RO	Set the volume to be **R**ead-**O**nly.
DS	**D**edicated **S**pare disks. The spare disks are only used by one specific RG. Others could not use these dedicated spare disks for any rebuilding purpose.
GS	**G**lobal **S**pare disks. GS is shared for rebuilding purpose. If some RGs need to use the global spare disks for rebuilding, they could get the spare disks out from the common spare disks pool for such requirement.

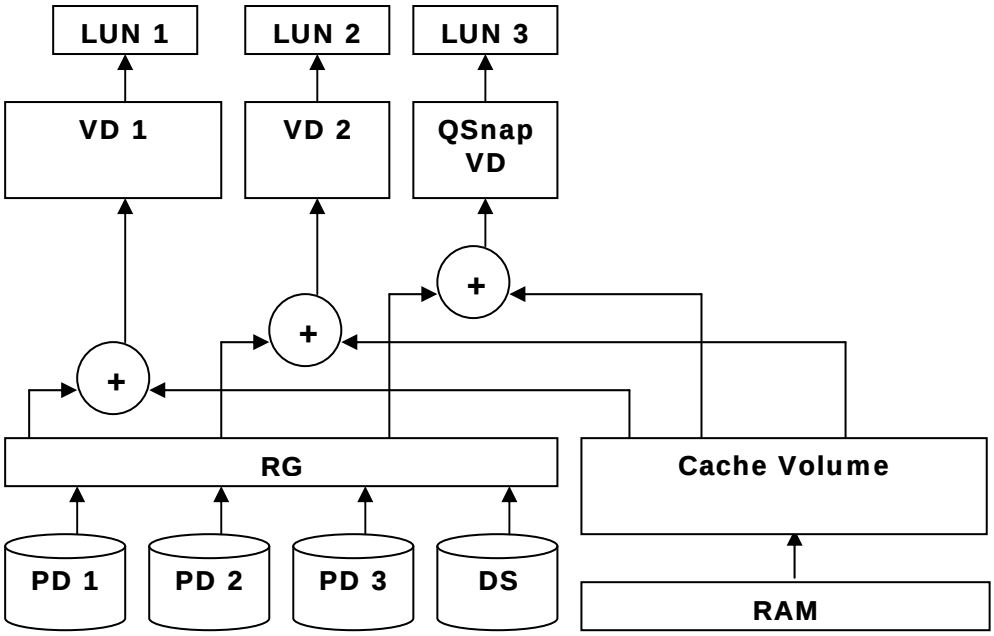
DG	**D**e**G**raded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks.
SCSI	**S**mall **C**omputer **S**ystems **I**nterface.
SAS	**S**erial **A**ttached **S**CSI.
S.M.A.R.T.	**S**elf-**M**onitoring **A**nalysis and **R**eporting **T**echnology.
WWN	**W**orld **W**ide **N**ame.
HBA	**H**ost **B**us **A**dapter.
SES	**S**CSI **E**nclosure **S**ervices.
NIC	**N**etwork **I**nterface **C**ard.
BBM	**B**attery **B**ackup **M**odule
iSCSI	**I**nternet **S**mall **C**omputer **S**ystems **I**nterface.
LACP	**L**ink **A**ggregation **C**ontrol **P**rotocol.
MPIO	**M**ulti-**P**ath **I**nput/**O**utput.
MC/S	**M**ultiple **C**onnections per **S**ession
MTU	**M**aximum **T**ransmission **U**nit.
CHAP	**C**hallenge **H**andshake **A**uthentication **P**rotocol. An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports.
iSNS	**I**nternet **S**torage **N**ame **S**ervice.
SBB	**S**torage **B**ridge **B**ay. The objective of the Storage Bridge Bay Working Group (SBB) is to create a specification that defines mechanical, electrical and low-level enclosure management requirements for an enclosure controller slot that will support a variety of storage controllers from a variety of independent hardware vendors ("IHVs") and system vendors.
Dongle	Dongle board is for SATA II disk connection to the backplane.

1.3 RAID Levels

The subsystem can implement several different levels of RAID technology. RAID levels supported by the subsystem are shown below.

RAID Level	Description	Min. Drives
0	Block striping is provide, which yields higher performance than with individual drives. There is no redundancy.	1
1	Drives are paired and mirrored. All data is 100% duplicated on an equivalent drive. Fully redundant.	2
N-way mirror	Extension to RAID 1 level. It has N copies of the disk.	N
3	Data is striped across several physical drives. Parity protection is used for data redundancy.	3
5	Data is striped across several physical drives. Parity protection is used for data redundancy.	3
6	Data is striped across several physical drives. Parity protection is used for data redundancy. Requires N+2 drives to implement because of two-dimensional parity scheme	4
0 + 1	Mirroring of the two RAID 0 disk arrays. This level provides striping and redundancy through mirroring.	4
10	Striping over the two RAID 1 disk arrays. This level provides mirroring and redundancy through striping.	4
30	Combination of RAID levels 0 and 3. This level is best implemented on two RAID 3 disk arrays with data striped across both disk arrays.	6
50	RAID 50 provides the features of both RAID 0 and RAID 5. RAID 50 includes both parity and disk striping across multiple drives. RAID 50 is best implemented on two RAID 5 disk arrays with data striped across both disk arrays.	6
60	RAID 60 provides the features of both RAID 0 and RAID 6. RAID 60 includes both parity and disk striping across multiple drives. RAID 60 is best implemented on two RAID 6 disk arrays with data striped across both disk arrays.	8
JBOD	The abbreviation of "Just a Bunch Of Disks". JBOD needs at least one hard drive.	1

1.4 Volume Relationship Diagram



This is the design of volume structure of the iSCSI RAID subsystem. It describes the relationship of RAID components. One RG (RAID group) consists of a set of VDs (Virtual Disk) and owns one RAID level attribute. Each RG can be divided into several VDs. The VDs in one RG share the same RAID level, but may have different volume capacity. All VDs share the CV (Cache Volume) to execute the data transaction. LUN (Logical Unit Number) is a unique identifier, in which users can access through SCSI commands.

Chapter 2 Identifying Parts of the RAID Subsystem

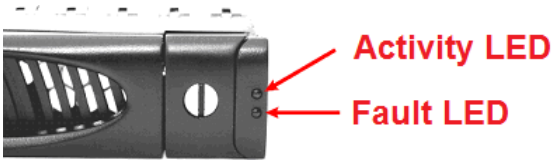
The illustrations below identify the various parts of the subsystem.

2.1 Main Components

2.1.2 Front View

2.1.2.1 Disk Trays

HDD Status Indicator

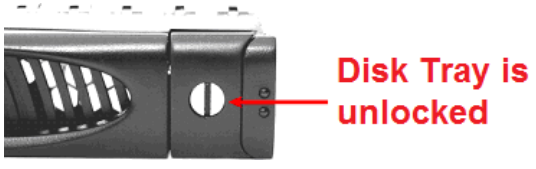


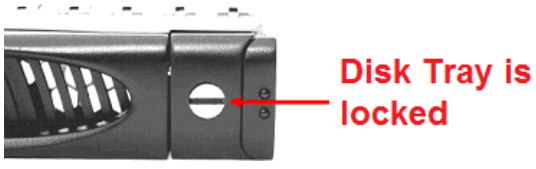
Part	Function
HDD Activity LED	This LED will blink blue when the hard drive is being accessed.
HDD Fault LED	Green LED indicates power is on and hard drive status is good for this slot. If hard drive is defective or failed, the LED is Red. LED is off when there is no hard drive.

Lock Indicator

Every Disk Tray is lockable and is fitted with a lock indicator to indicate whether or not the tray is locked into the chassis or not. Each tray is also fitted with an ergonomic handle for easy tray removal.

When the Lock Groove is horizontal, this indicates that the Disk Tray is locked. When the Lock Groove is vertical, then the Disk Tray is unlocked.





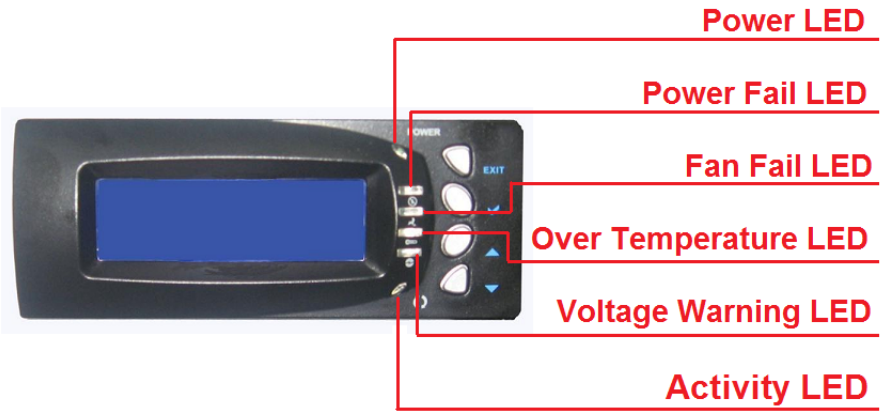
2.1.2.2 LCD Front Panel

Smart Function Front Panel

The smart LCD panel is an option to configure the RAID subsystem. If you are configuring the subsystem using the LCD panel, press the Select button to login and configure the RAID subsystem.

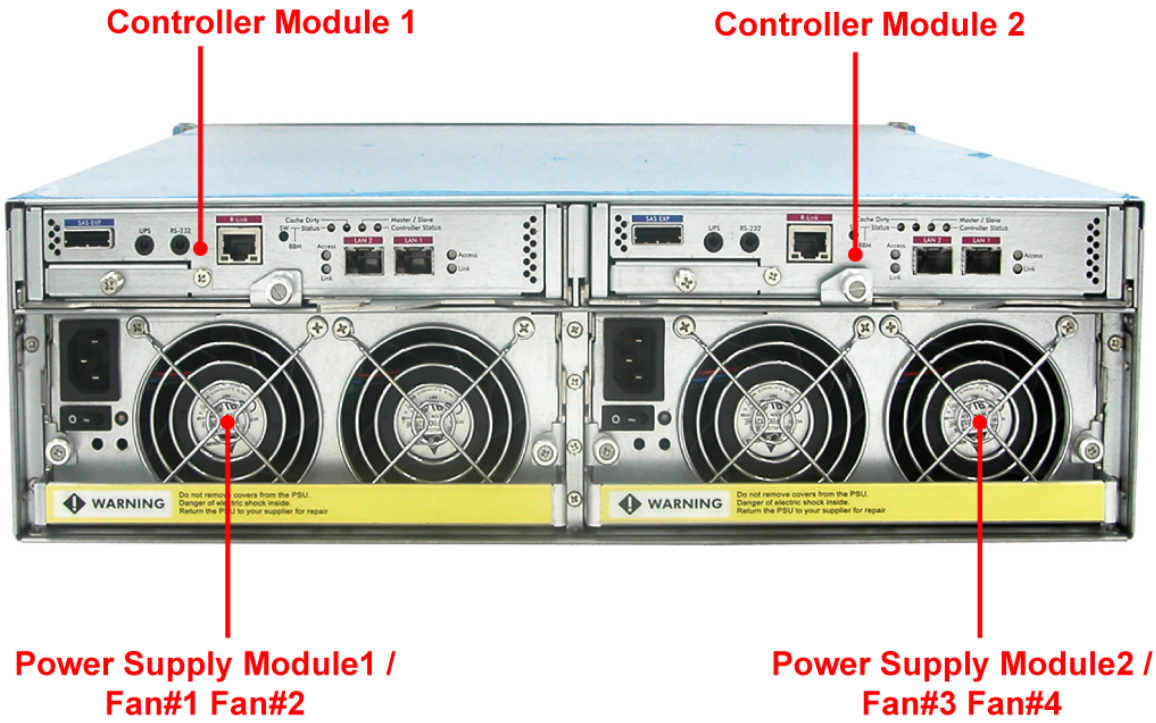
Parts	Function
Up and Down Arrow buttons ▲ ▼	Use the Up or Down arrow keys to go through the information on the LCD screen. This is also used to move between each menu when you configure the subsystem. NOTE: When the Down Arrow button ▼ is pressed 3 times, the LCD control will shift to the other RAID controller (in redundant controller mode) and the other RAID controller's IP address will be shown in LCD.
Select button ✔	This is used to enter the option you have selected.
Exit button **EXIT**	Press this button to return to the previous menu. NOTE: This button can also be used to reset the alarm beeper. For example, if one power supply fails, pressing this button will mute the beeper.

Environment Status LEDs



Parts	Function
Power LED	Green LED indicates power is ON.
Power Fail LED	If a redundant power supply unit fails, this LED will turn to RED and alarm will sound.
Fan Fail LED	When a fan fails or the fan's rotational speed is below 1500RPM, this LED will turn red and an alarm will sound.
Over Temperature LED	If temperature irregularities in the system occurs (HDD slot temperature over 65°C, Controller temperature over 70°C), this LED will turn RED and alarm will sound.
Voltage Warning LED	An alarm will sound warning of a voltage abnormality and this LED will turn red.
Activity LED	This LED will blink blue when the RAID subsystem is busy or active.

2.1.2 Rear View



1. Controller Module

The subsystem has one or two controller modules.

2. Power Supply Unit 1 ~ 2

Two power supplies (power supply 1 and power supply 2) are located at the rear of the subsystem. Each PSFM has one Power Supply and two Fans. The PSFM 1 has Power#1, Fan#1 and Fan#2. The PSFM 2 has Power#2, Fan#3 and Fan#4.

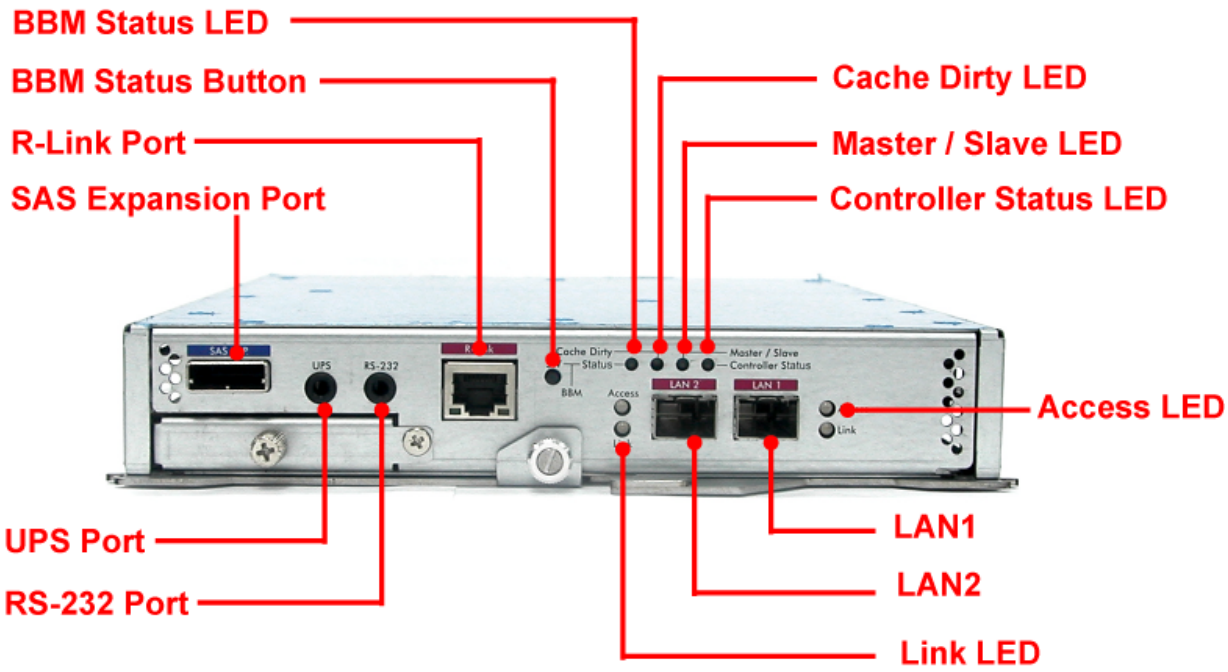
Turn on the power of these power supplies to power-on the subsystem. The "power" LED at the front panel will turn green.

If a power supply fails to function or a power supply was not turned on, the " " Power fail LED will turn red and an alarm will sound.

2.2 Controller Module

RAID Controller Module

2.2.1 Controller Module Panel



1. Uninterrupted Power Supply (UPS) Port (APC Smart UPS only)

The subsystem may come with an optional UPS port allowing you to connect an APC Smart UPS device. Connect the cable from the UPS device to the UPS port located at the rear of the subsystem. This will automatically allow the subsystem to use the functions and features of the UPS.

2. R-Link Port: Remote Link through RJ-45 Ethernet for remote management

The subsystem is equipped with one 10/100 Ethernet RJ45 LAN port for remote configuration and monitoring. You use web browser to manage the RAID subsystem through Ethernet.

3. LAN Ports (Gigabit)

The subsystem is equipped with two LAN data ports LAN1 and LAN2) for iSCSI connection.

- **Link LED:**

  Orange → Asserted when a 1G link is established and maintained.

  Blue → Asserted when a 10G link is establish and maintained.

- **Access / fail LED:**

  Yellow → Asserted when the link is established and packets are being transmitted along with any receive activity.

  Red → Asserted when the link can't establish.

4. Controller Health LED

- Green → Controller status normal or in the booting.
- Red → Other than above status.

5. Master/Slave LED

- Green → Master controller.
- Off → Slave controller.

6. Dirty Cache LED

- Orange → Data on the cache waiting for flush to disks.
- Off → No data on the cache.

7. BBM Status LED

- Green → BBM installed and powered
- Off → No BBM

8. BBM Status Button

When the system power is off, press the BBM status button, if the BBM LED is Green, then the BBM still has power to keep data on the cache. If not, then the BBM power is ran out and cannot keep the data on the cache anymore.

2.3 Power Supply / Fan Module (PSFM)

The RAID subsystem contains **two 500W Power Supply / Fan Modules**. All the Power Supply / Fan Modules (PSFMs) are inserted into the rear of the chassis.

2.3.1 PSFM Panel

The panel of the Power Supply/Fan Module contains: the Power On/Off Switch, the AC Inlet Plug, and a Power On/Fail Indicator showing the Power Status LED, indicating ready or fail.

Each fan within a PSFM is powered independently of the power supply within the same PSFM. So if the power supply of a PSFM fails, the fan associated with that PSFM will continue to operate and cool the enclosure.

When the power cord connected from main power source is inserted to the AC Power Inlet, the power status LED becomes RED. When the switch of the PSFM is turned on, the LED will turn GREEN. When the Power On/Fail LED is GREEN, the PSFM is functioning normally.

NOTE: Each PSFM has one Power Supply and two Fans. The PSFM 1 has Power#1, Fan#1 and Fan#2. The PSFM 2 has Power#2, Fan#3 and Fan#4. When the Power Supply of a PSFM fails, the PSFM need not be removed from the slot if replacement is not yet available. The fan will still work and provide necessary airflow inside the enclosure.

NOTE: After replacing the Power Supply Fan Module and turning on the Power On/Off Switch of the PSFM, the Power Supply will not power on immediately. The Fans in the PSFM will spin-up until the RPM becomes stable. When Fan RPM is already stable, the RAID controller will then power on the Power Supply. This process takes more or less 30 seconds. This safety measure helps prevent possible Power Supply overheating when the Fans cannot work.

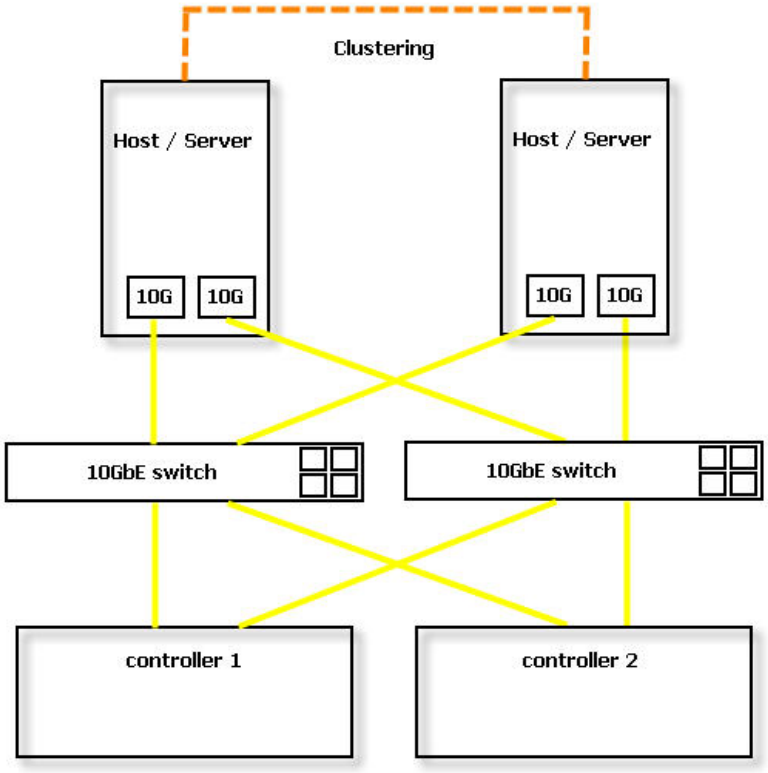
2.4 Checklist before Starting

Before starting, check or prepare the following items.

- ☑ Check **"Certification list"** in Appendix A to confirm the hardware setting is fully supported.
- ☑ Read the latest release note before upgrading. Release note accompanies with its released firmware.
- ☑ A host with a 10GbE NIC or 10GbE iSCSI HBA.
- ☑ CAT 5e, or CAT 6 network cables for management port. FC cable for iSCSI data ports.
- ☑ Prepare storage system configuration plan.
- ☑ Prepare management port and iSCSI data ports network information. When using static IP, please prepare static IP addresses, subnet mask, and default gateway.
- ☑ 10GbE LAN switches (recommended). Or 10GbE LAN switches with VLAN / LCAP / Trunking (optional).
- ☑ CHAP security information, including CHAP username and secret (optional).
- ☑ Setup the hardware connection before power on servers. Connect console cable, management port cable, and iSCSI data port cables in advance.
- ☑ In addition, installing an iSNS server is recommended.
- ☑ Power on first, and then power on hosts and iSNS server.
- ☑ Host server is suggested to logon the target twice (both controller 1 and controller 2), and then MPIO should be setup automatically.

NOTE: iSNS server is recommended for dual controller system.

For better data service availability, all the connections among host servers, GbE switches, and the dual controllers are recommended as redundant as below.



Chapter 3 Getting Started with the Subsystem

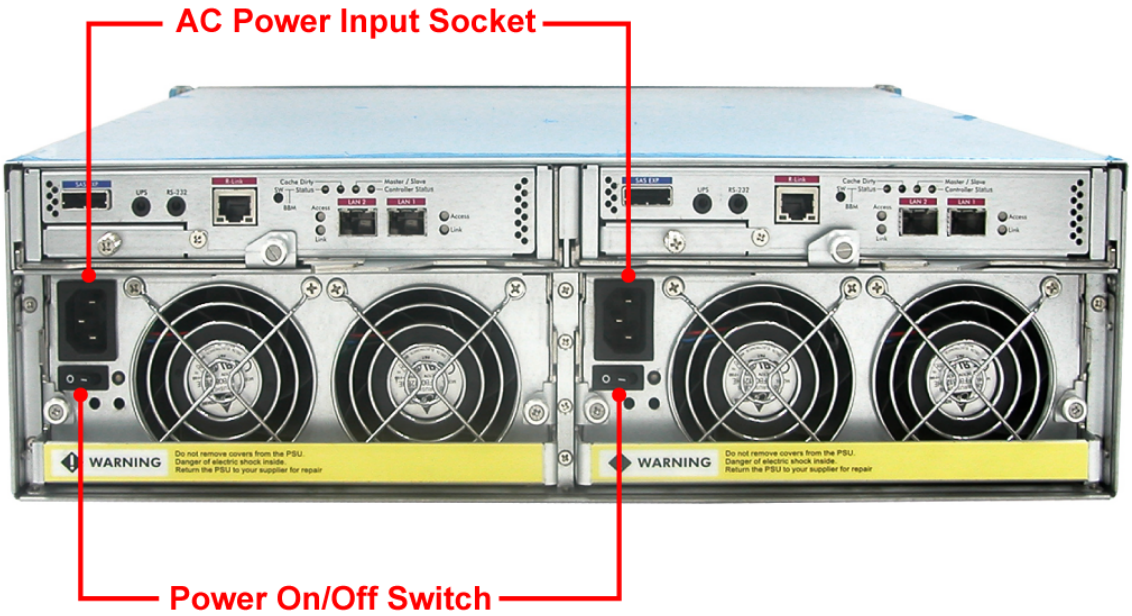
3.1 Connecting the iSCSI RAID Subsystem to the Network

To connect the iSCSI unit to the network, insert the network cable that came with the unit into the network port (LAN1) at the back of iSCSI unit. Insert the other end into a Gigabit BASE-T Ethernet connection on your network hub or switch. You may connect the other network ports if needed.

For remote management of iSCSI RAID subsystem, use another network cable to connect the R-Link port to your network.

3.2 Powering On

1. Plug in the power cords into the AC Power Input Socket located at the rear of the subsystem.



NOTE: The subsystem is equipped with redundant, full range power supplies with PFC (power factor correction). The system will automatically select voltage.

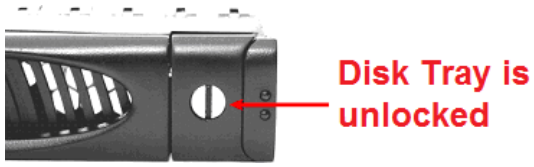
2. Turn on each Power On/Off Switch to power on the subsystem.
3. The Power LED on the front Panel will turn green.

3.3 Disk Drive Installation

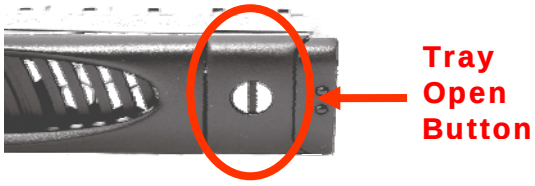
This section describes the physical locations of the hard drives supported by the subsystem and give instructions on installing a hard drive. The subsystem supports hot-swapping allowing you to install or replace a hard drive while the subsystem is running.

3.3.1 Installing a SAS Disk Drive in a Disk Tray

1. Unlock the Disk Trays using a flat-head screw driver by rotating the Lock Groove.



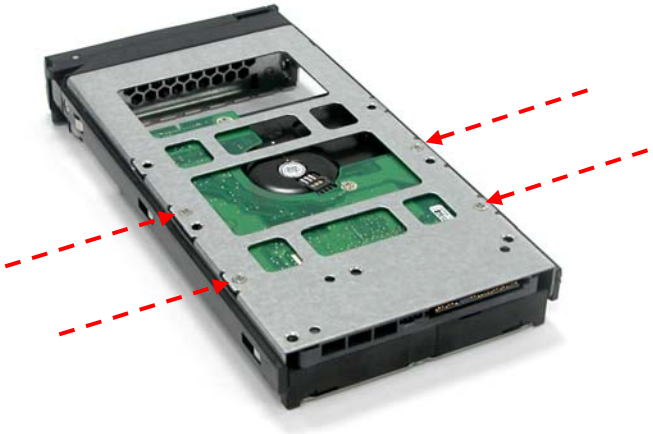
2. Press the Tray Open button and the Disk Tray handle will flip open.



3. Pull out an empty disk tray. Pull the handle outwards to remove the tray from the enclosure.

4. Place the hard drive in the disk tray. Make sure the holes of the disk tray align with the holes of the hard drive.

5. Install the mounting screws on the bottom part to secure the drive in the disk tray.



6. Slide the tray into a slot.

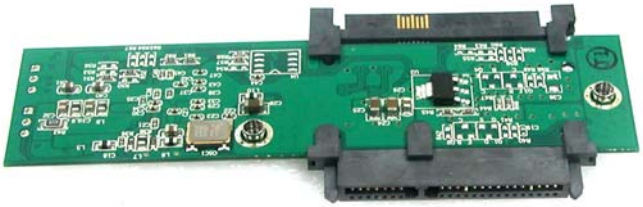
7. Press the lever in until you hear the latch click into place. The HDD Fault LED will turn green when the subsystem is powered on and HDD is good.

8. If necessary, lock the Disk Tray by turning the Lock Groove.

3.3.2 Installing a SATA Disk Drive (Dual Controller Mode) in a Disk Tray

1. Remove an empty disk tray from the subsystem.

2. Prepare the dongle board and two screws.



3. Place the dongle board in the disk tray. Turn the tray upside down. Tighten two screws to secure the dongle board into the disk tray.

4. Place the SATA disk drive into the disk tray. Slide the disk drive towards the dongle board.

5. Turn the disk tray upside down. To secure the disk drive into the disk tray, tighten four screws on the holes of the disk tray. Note in the picture below where the screws should be place in the disk try holes.

6. Insert the disk tray into the subsystem.

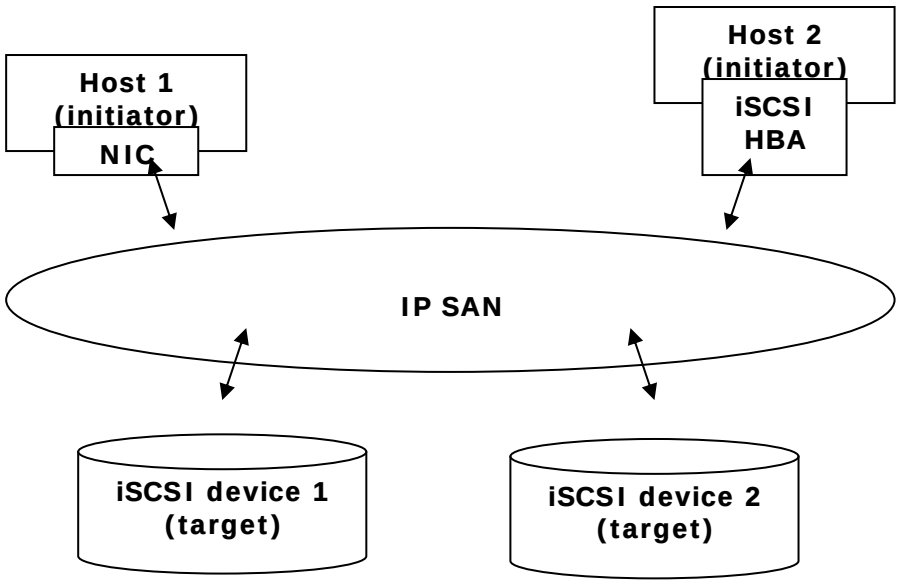
3.4 iSCSI Introduction

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 few of 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, using any type of network (Ethernet, Fast Ethernet, Gigabit Ethernet) and combining operating systems (Microsoft Windows, Linux, Solaris, …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 the initiator and the 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/server side (either an iSCSI HBA or iSCSI SW initiator).

The iSCSI 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 it to an attached storage device. iSCSI targets can be disks, tapes, RAID arrays, tape libraries, and etc.



The host side needs an iSCSI initiator. The initiator is a driver which handles the SCSI traffic over iSCSI. The initiator can be software or hardware (HBA). Please refer to the certification list of iSCSI HBA(s) in Appendix A. OS native initiators or other software initiators use the standard TCP/IP stack and Ethernet hardware, while iSCSI HBA(s) use their own iSCSI and TCP/IP stacks on board.

Hardware iSCSI HBA(s) would provide its initiator tool. Please refer to the vendors' HBA user manual. **Microsoft**, **Linux** and **Mac** provide software iSCSI initiator driver. Below are the available links:

1. Link to download the Microsoft iSCSI software initiator:

   http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en

Please refer to Appendix D for Microsoft iSCSI initiator installation procedure.

2. Linux iSCSI initiator is also available. For different kernels, there are different iSCSI drivers. If you need the latest Linux iSCSI initiator, please visit Open-iSCSI project for most update information. Linux-iSCSI (sfnet) and Open-iSCSI projects merged in April 11, 2005.

Open-iSCSI website: http://www.open-iscsi.org/

Open-iSCSI README: http://www.open-iscsi.org/docs/README

Features: http://www.open-iscsi.org/cgi-bin/wiki.pl/Roadmap

Support Kernels: http://www.open-iscsi.org/cgi-bin/wiki.pl/Supported_Kernels

Google groups: http://groups.google.com/group/open-iscsi/threads?gvc=2

http://groups.google.com/group/open-iscsi/topics

Open-iSCSI Wiki: http://www.open-iscsi.org/cgi-bin/wiki.pl

3. ATTO iSCSI initiator is available for Mac.

   Website: http://www.attotech.com/xtend.html

4. Solaris iSCSI Initiator

   Version: Solaris 10 u6 (10/08)

Chapter 4 Quick Setup

4.1 Management Interfaces

There are three management methods to manage the iSCSI RAID subsystem described as follows:

4.1.1 Serial Console Port

Use NULL modem cable to connect console port.

The console settings are on the following:

Baud rate: **115200**, 8 bits, 1 stop bit, no parity, and no flow control.

Terminal type: **vt100**

Login name: **admin**

Default password: **00000000**

4.1.2 Remote Control – Secure Shell

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

SSHWinClient WWW: http://www.ssh.com/

Putty WWW: http://www.chiark.greenend.org.uk/

Host name: **192.168.10.50 (Please check your DHCP address for this field.)**

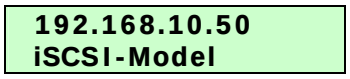
Login name: **admin**

Default password: **00000000**

NOTE: This iSCSI RAID Series only support SSH for remote control. For using SSH, the IP address and the password is required for login.

4.1.3 LCD Control Module (LCM)

After booting up the system, the following screen shows management port IP and model name:



Press **"Enter"** button, the LCM functions **"System Info."**, **"Alarm Mute"**, **"Reset/Shutdown"**, **"Quick Install"**, **"Volume Wizard"**, **"View IP Setting"**, **"Change IP Config"** and **"Reset to Default"** will rotate by pressing ▲ (up) and ▼ (down).

When there is WARNING event or ERROR event occurred (LCM default filter), the LCM shows the event log to give users more detail from front panel.

The following table is the function description of LCM menus.

System Info	Displays System information.
Alarm Mute	Mute alarm when error occurs.
Reset/Shutdown	Reset or shutdown controller.
Quick Install	Quick three steps to create a volume. Please refer to next chapter for operation in web UI.
Volume Wizard	Smart steps to create a volume. Please refer to next chapter for operation in web UI.
View IP Setting	Display current IP address, subnet mask, and gateway.
Change IP Config	Set IP address, subnet mask, and gateway. There are 2 selections, DHCP (Get IP address from DHCP server) or set static IP.
Reset to Default	Reset to default sets password to default: **00000000**, and set IP address to default as DHCP setting. Default IP address: **192.168.10.50 (DHCP)** Default subnet mask: **255.255.255.0** Default gateway: **192.168.10.254**

The following is LCM menu hierarchy.

proIPS ▲▼	[System Info.]	[Firmware Version x.x.x]			
		[RAM Size xxx MB]			
	[Alarm Mute]	[▲Yes No▼]			
	[Reset/Shutdown]	[Reset]	[▲Yes No▼]		
		[Shutdown]	[▲Yes No▼]		
	[Quick Install]	RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1 xxx GB	[Apply The Config]	[▲Yes No▼]	
	[Volume Wizard]	[Local] RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1	[Use default algorithm]	[Volume Size] xxx GB	[Apply The Config] [▲Yes No▼]
		[JBOD x] ▲▼ RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1	[new x disk] ▲▼ xxx BG	Adjust Volume Size	[Apply The Config] [▲Yes No▼]
	[View IP Setting]	[IP Config] [Static IP]			
		[IP Address] [192.168.010.050]			
		[IP Subnet Mask] [255.255.255.0]			
		[IP Gateway] [192.168.010.254]			
	[Change IP Config]	[DHCP]	[▲Yes No▼]		
		[Static IP]	[IP Address]	Adjust IP address	
			[IP Subnet Mask]	Adjust Submask IP	
			[IP Gateway]	Adjust Gateway IP	
			[Apply IP Setting]	[▲Yes No▼]	
	[Reset to Default]	[▲Yes No▼]			

CAUTION! Before power off, it is better to execute "Shutdown" to flush the data from cache to physical disks.

4.1.4 Web GUI

The iSCSI RAID subsystem supports graphical user interface (GUI) to operate the system. Be sure to connect the LAN cable. The default IP setting is **DHCP**; open the browser and enter:

http://192.168.10.50 (Please check the DHCP address first on LCM)

Click any function at the first time; it will pop up a dialog window for authentication.

User name: **admin**
Default password: 00000000

After login, you can choose the function blocks on the left side of window to do configuration.

There are seven indicators at the top-right corner.

	RAID light: • **Green** → RAID works well. • **Red** → RAID fails.
	Temperature light: • **Green** → Temperature is normal. • **Red** → Temperature is abnormal.
	Voltage light: • **Green** → voltage is normal. • **Red** → voltage is abnormal.
	UPS light: • **Green** → UPS works well. • **Red** → UPS fails.
	Fan light: • **Green** → Fan works well. • **Red** → Fan fails.
	Power light: • **Green** → Power works well. • **Red** → Power fails.
	Dual controller light: • **Green** → Both controller1 and controller2 are present and well. • **Orange** → The system is degraded and there is only 1 controller alive and well.
	Return to home page.
	Logout the management web UI.
	Mute alarm beeper.

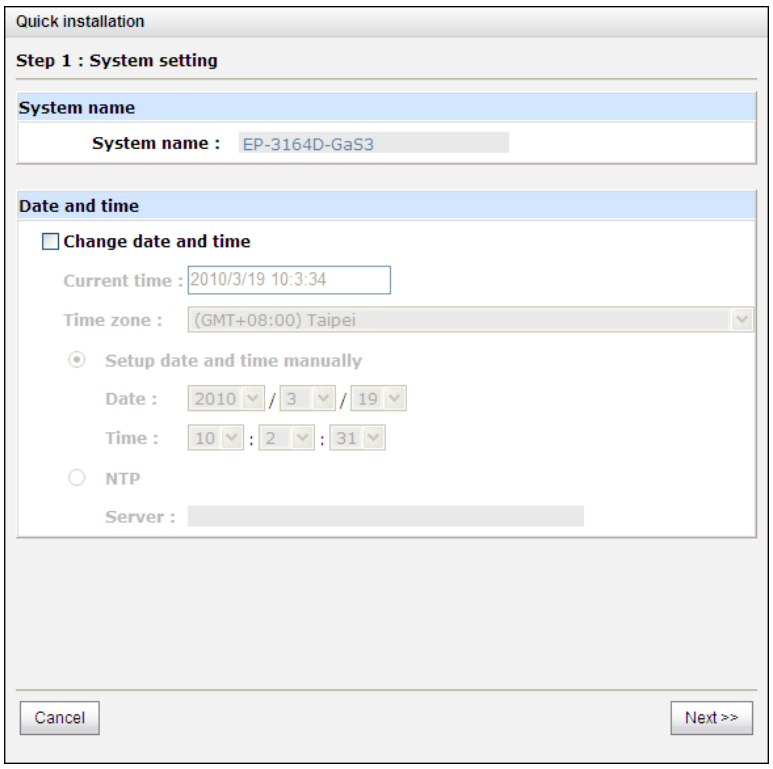
4.2 How to Use the System Quickly

4.2.1 Quick Installation

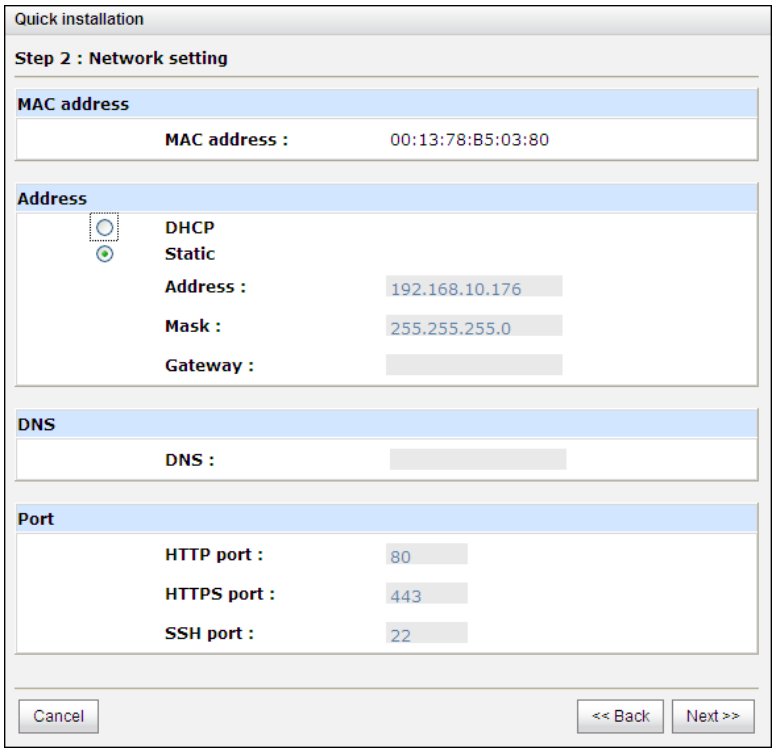
It is easy to use **"Quick installation"** to create a volume. It uses all available physical disks to create a RG; the system will calculate maximum spaces on RAID levels 0/1/3/5/6/0+1. **"Quick installation"** will occupy all residual RG space for one VD, and it has no space for snapshot and spare. If snapshot is needed, please create volumes manually, and refer to Section 4.4 for more detail. If some physical disks are used in other RGs, **"Quick installation"** cannot be run because the operation is valid only when all physical disks in this system are free.

	Slot	Size(GB)	RG	Status	Health	Usage	Vendor	Serial	Type	Write cache	Standby	Readahead	Command queuing
OP	1	279		Online	Good	Free disk	WDC	WD-WXLY08094604	SATA2	Enabled	Disabled	Enabled	Disabled
OP	2	232		Online	Good	Free disk	Seagate	5QE3MPBG	SATA	Enabled	Disabled	Enabled	Disabled
OP	3	76		Online	Good	Free disk	Hitachi	PFDB30S2US713M	SATA2	Enabled	Disabled	Enabled	Disabled
OP	4	232		Online	Good	Free disk	Seagate	9SF0M2FT	SATA2	Enabled	Disabled	Enabled	Disabled
OP	5	232		Online	Good	Free disk	Hitachi	VDK41BT4CBWWUE	SATA2	Enabled	Disabled	Enabled	Disabled
OP	6	279		Online	Good	Free disk	WDC	WD-WXLY08093882	SATA2	Enabled	Disabled	Enabled	Disabled
OP	7	76		Online	Good	Free disk	Hitachi	PFDB30S4R6HVKM	SATA2	Enabled	Disabled	Enabled	Disabled
OP	8	232		Online	Good	Free disk	Seagate	9SF0PBQV	SATA2	Enabled	Disabled	Enabled	Disabled

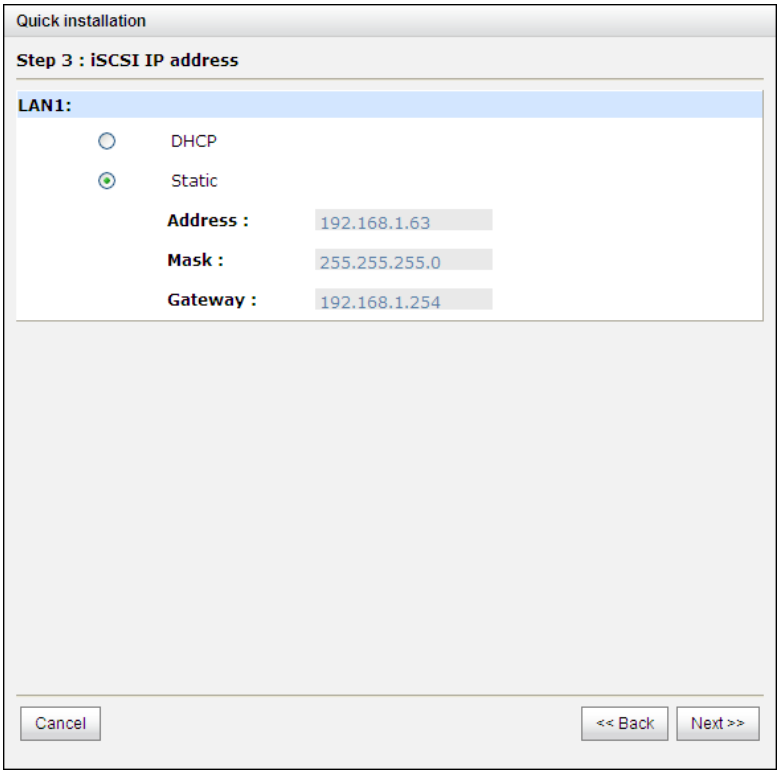
Step 1: Click **"Quick installation"** menu item. Follow the steps to set up system name and date/time.



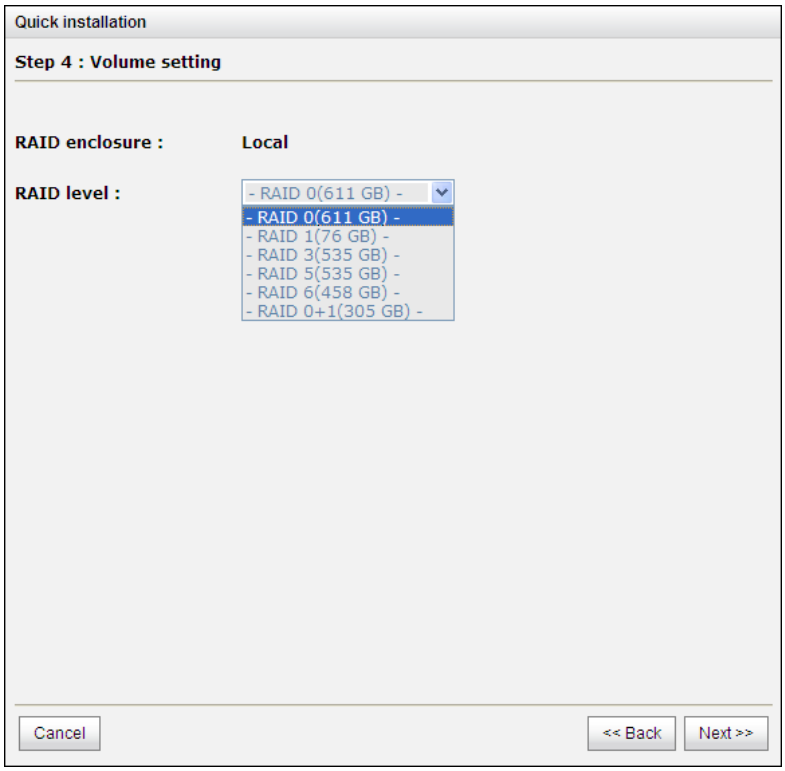
Step2: Confirm the management port IP address and DNS, and then click **"Next"**.



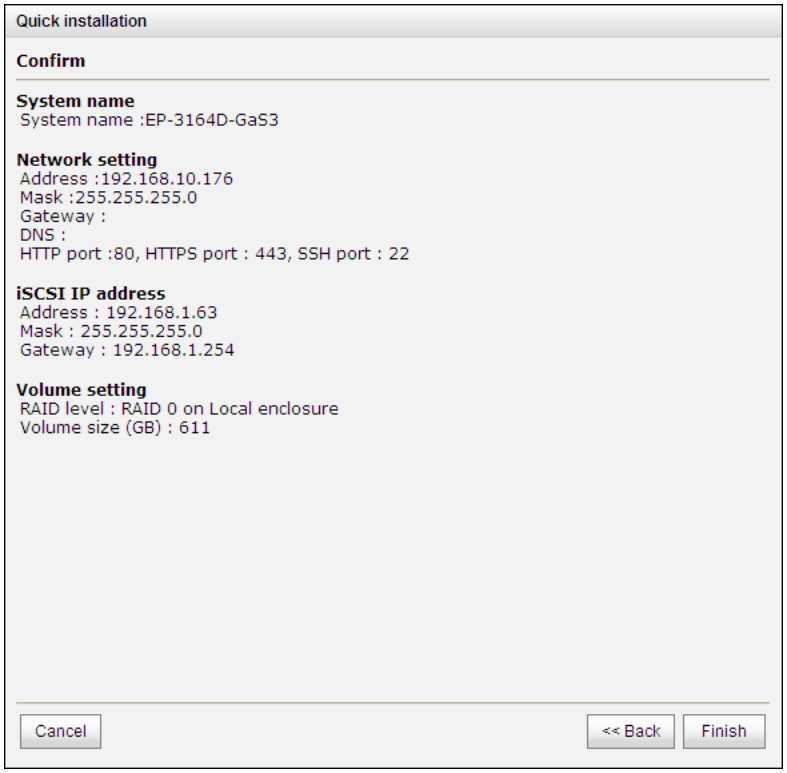
Step 3: Set up the data port IP and click **"Next"**.



Step 4: Set up the RAID level and volume size and click **"Next"**.



Step 5: Check all items, and click **"Finish"**.



Step 6: Done.

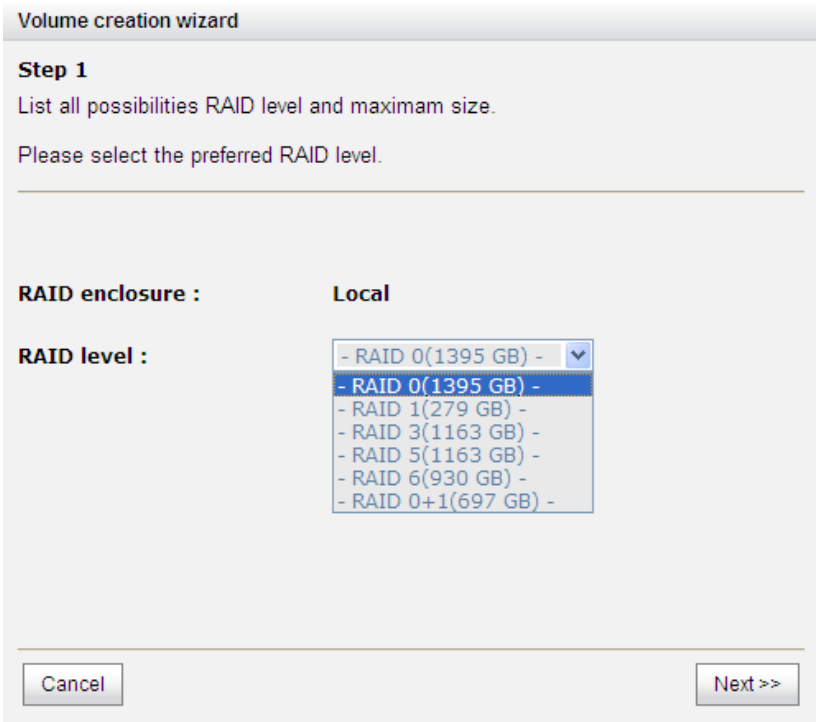
4.2.2 Volume Creation Wizard

"Volume create wizard" has a smarter policy. When the system is inserted with some HDDs. **"Volume create wizard"** lists all possibilities and sizes in different RAID levels, it will use all available HDDs for RAID level depends on which user chooses. When system has different sizes of HDDs, e.g., 8*200G and 8*80G, it lists all possibilities and combination in different RAID level and different sizes. After user chooses RAID level, user may find that some HDDs are available (free status). It gives user:

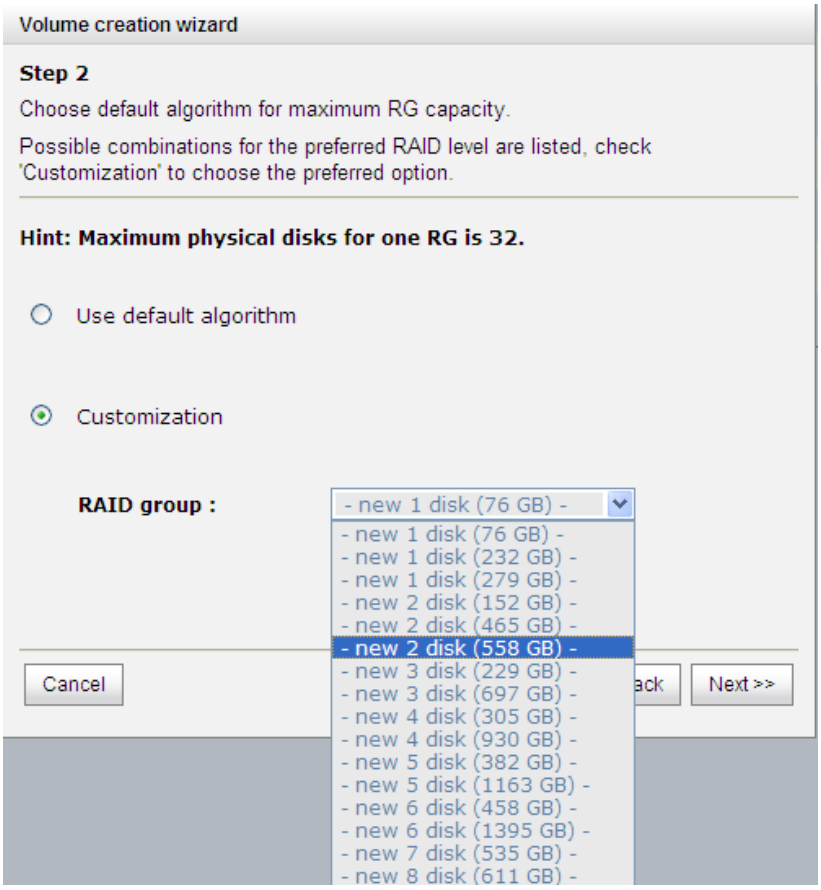
1. Biggest capacity of RAID level for user to choose and,
2. The fewest disk number for RAID level / volume size.

E.g., user chooses RAID 5 and the controller has 12*200G + 4*80G HDDs inserted. If we use all 16 HDDs for a RAID 5, and then the maximum size of volume is 1200G (80G*15). By the wizard, we do smarter check and find out the most efficient way of using HDDs. The wizard only uses 200G HDDs (Volume size is 200G*11=2200G), the volume size is bigger and fully uses HDD capacity.

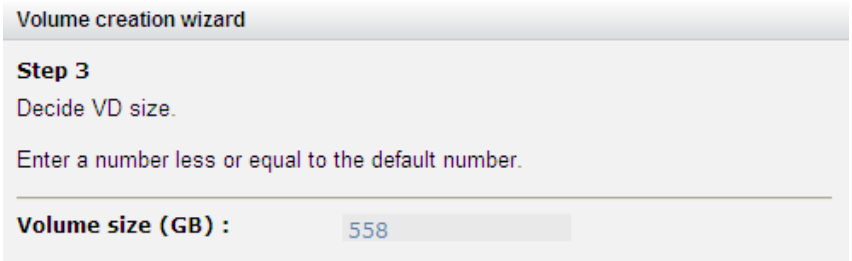
Step 1: Select **"Volume create wizard"** and then choose the RAID level. After the RAID level is chosen, click **"Next"**.



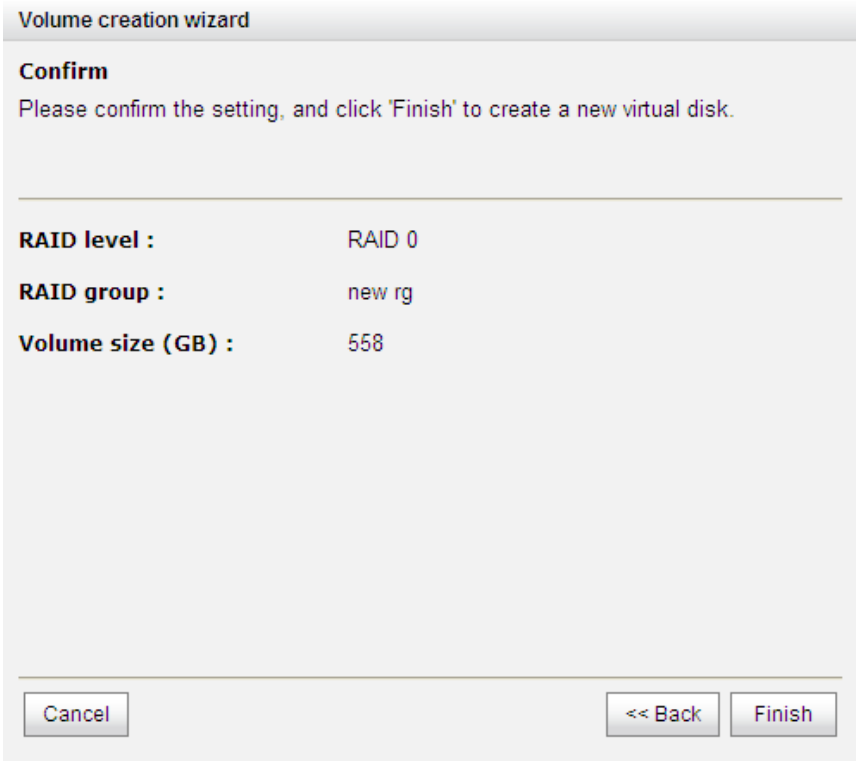
Step 2: Please select the combination of the RG capacity, or **"Use default algorithm"** for maximum RG capacity. After RG size is chosen, click **"Next"**.



Step 3: Decide VD size. User can enter a number less or equal to the default number. Then click **"Next"**.



Step 4: Confirmation page. Click **"Finish"** if all setups are correct. Then a VD will be created.



Step 5: Done. The system is available now.

	Name	Size(GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	Snapshot space(GB)	#Snapshot	RG
OP.	QUICK15834	558	WB	HI	4	Online	Optimal		RAID 0	1	0/0	0	QUICK81737

NOTE: A virtual disk of RAID 0 is created and is named by system itself.

Chapter 5 Configuration

5.1 Web GUI Management Interface Hierarchy

The below table is the hierarchy of the management GUI.

System configuration

System setting →	System name / Date and time
Network setting →	MAC address / Address / DNS / Port
Login setting →	Login configuration / Admin password / User password
Mail setting →	Mail
Notification setting →	SNMP / Messenger / System log server / Event log filter

iSCSI configuration

NIC →	Show information for:(Controller 1/ Controller 2) Aggregation / IP settings for iSCSI ports / Become default gateway / Enable jumbo frame / Ping host
Entity property →	Entity name / iSNS IP
Node →	Show information for:(Controller 1/ Controller 2) Authenticate / Change portal / Rename alias/ User
Session →	Show information for:(Controller 1/ Controller 2) List connection / Delete
CHAP account →	Create / Modify user information / Delete

Volume configuration

Physical disk →	Set Free disk / Set Global spare / Set Dedicated spare / Disk Scrub /Turn Off the Indication LED/ More information
RAID group →	Create / Migrate / Activate / Deactivate / Parity Check / Delete / Set preferred owner /Set disk property / More information
Virtual disk →	Create / Extend / Parity Check / Delete / Set property / Attach LUN / Detach LUN / List LUN / Set snapshot space / Cleanup snapshot / Take snapshot / Auto snapshot / List snapshot / More information
Snapshot →	Set snapshot space / Auto snapshot / Take snapshot / Export / Rollback / Delete/ Cleanup snapshot
Logical unit →	Attach / Detach/ Session

Enclosure management

Hardware monitor →	Controller 1 / BPL / Controller 2 / Auto shutdown
UPS →	UPS Type / Shutdown battery level / Shutdown delay / Shutdown UPS
SES →	Enable / Disable
S.M.A.R.T. →	S.M.A.R.T. information **(Only for SATA hard drives)**

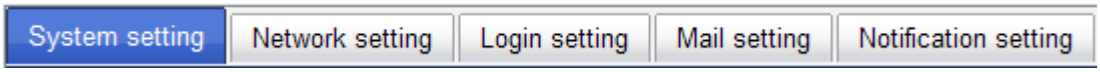
Maintenance

System information →	System information
Event log →	Download / Mute / Clear
Upgrade →	Browse the firmware to upgrade

Firmware synchronization	→	Synchronize the slave controller's firmware version with the master's
Reset to factory default	→	Sure to reset to factory default?
Import and export		Import/Export / Import file
Reboot and shut down	→	Reboot / Shutdown
Quick installation		Step 1 / Step 2 / Step 3 / Step 4 / Confirm
Volume creation wizard		Step 1 / Step 2 / Step 3 / Confirm

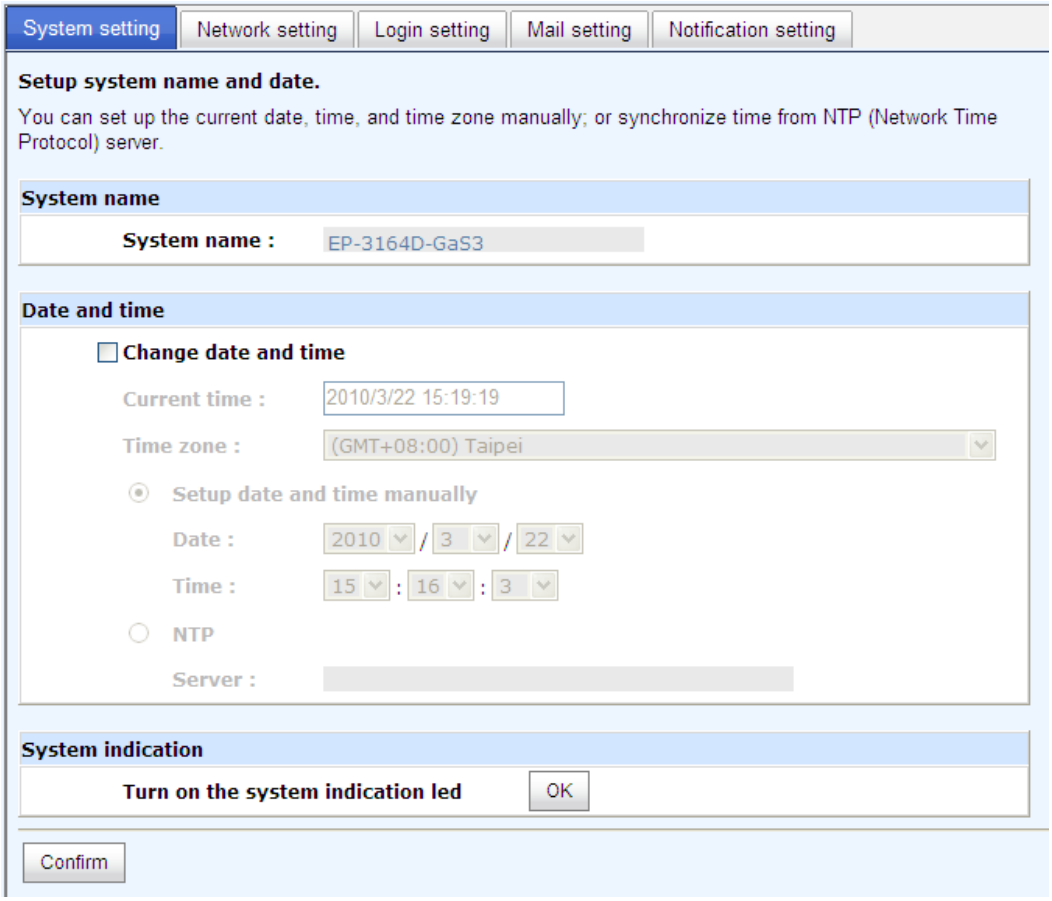
5.2 System Configuration

"System configuration" is designed for setting up the **"System setting"**, **"Network setting"**, **"Login setting"**, **"Mail setting"**, and **"Notification setting"**.



5.2.1 System Setting

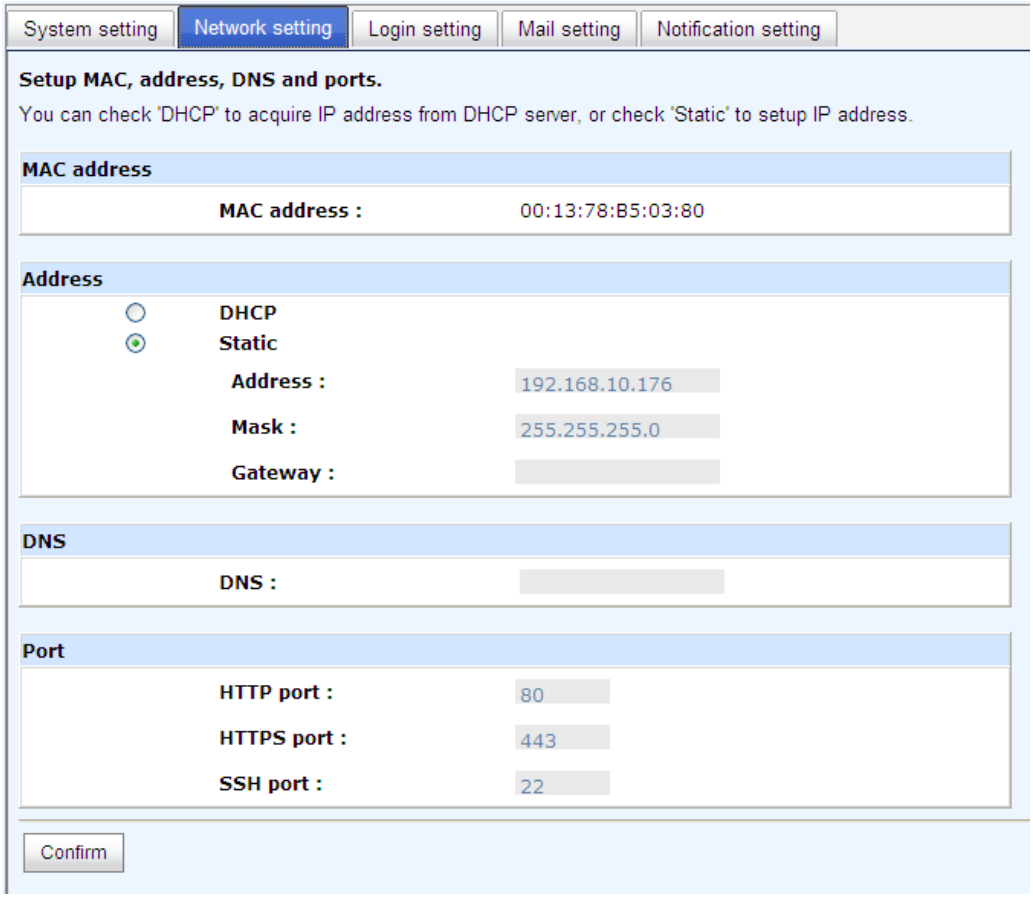
"System setting" can be used to set system name and date. Default **"System name"** is composed of model name and serial number of this system.



Check **"Change date and time"** to set up the current date, time, and time zone before using or synchronize time from NTP (Network Time Protocol) server. Click **"Confirm"** in **System indication** to turn on the system indication LED. Click again to turn off.

5.2.2 Network Setting

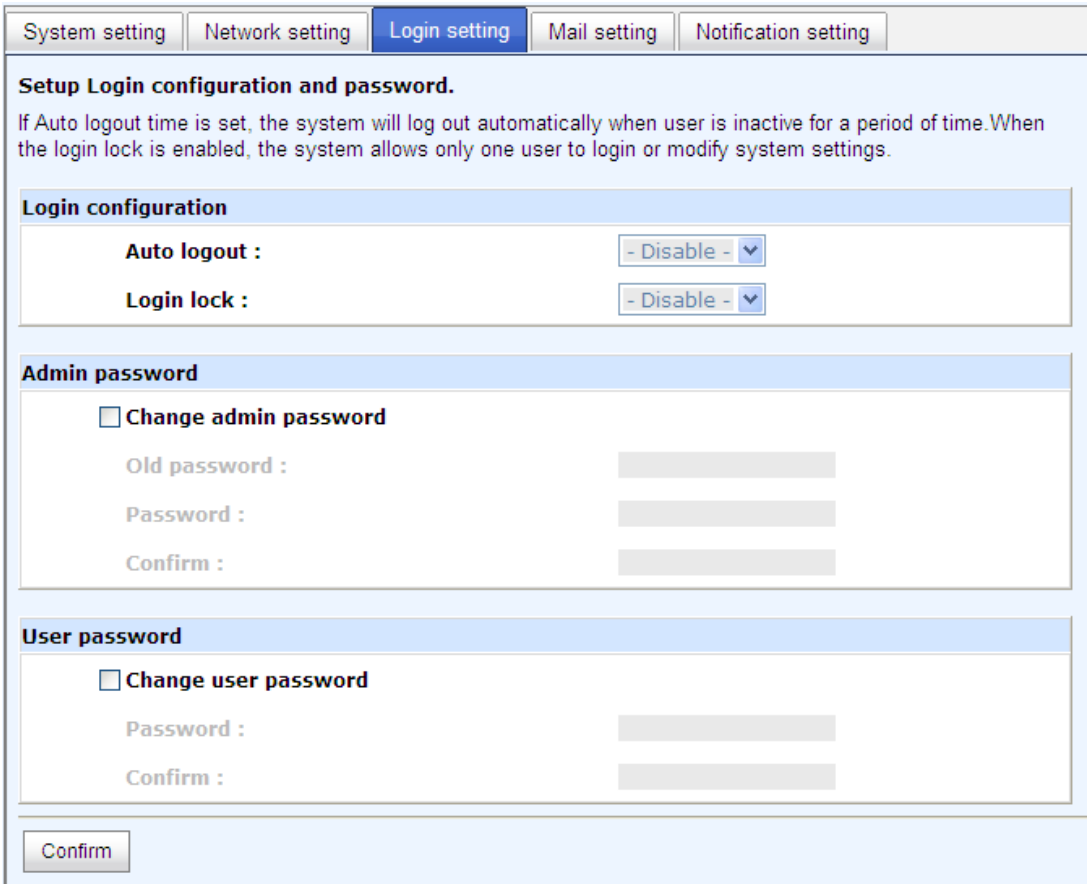
"Network setting" is for changing IP address for remote administration usage. There are 2 options, DHCP (Get IP address from DHCP server) and static IP. The default setting is DHCP. User can change the HTTP, HTTPS, and SSH port number when the default port number is not allowed on host/server.



5.2.3 Login Setting

"Login setting" can set single admin, auto logout time and Admin/User password. The single admin can prevent multiple users access the same controller at the same time.

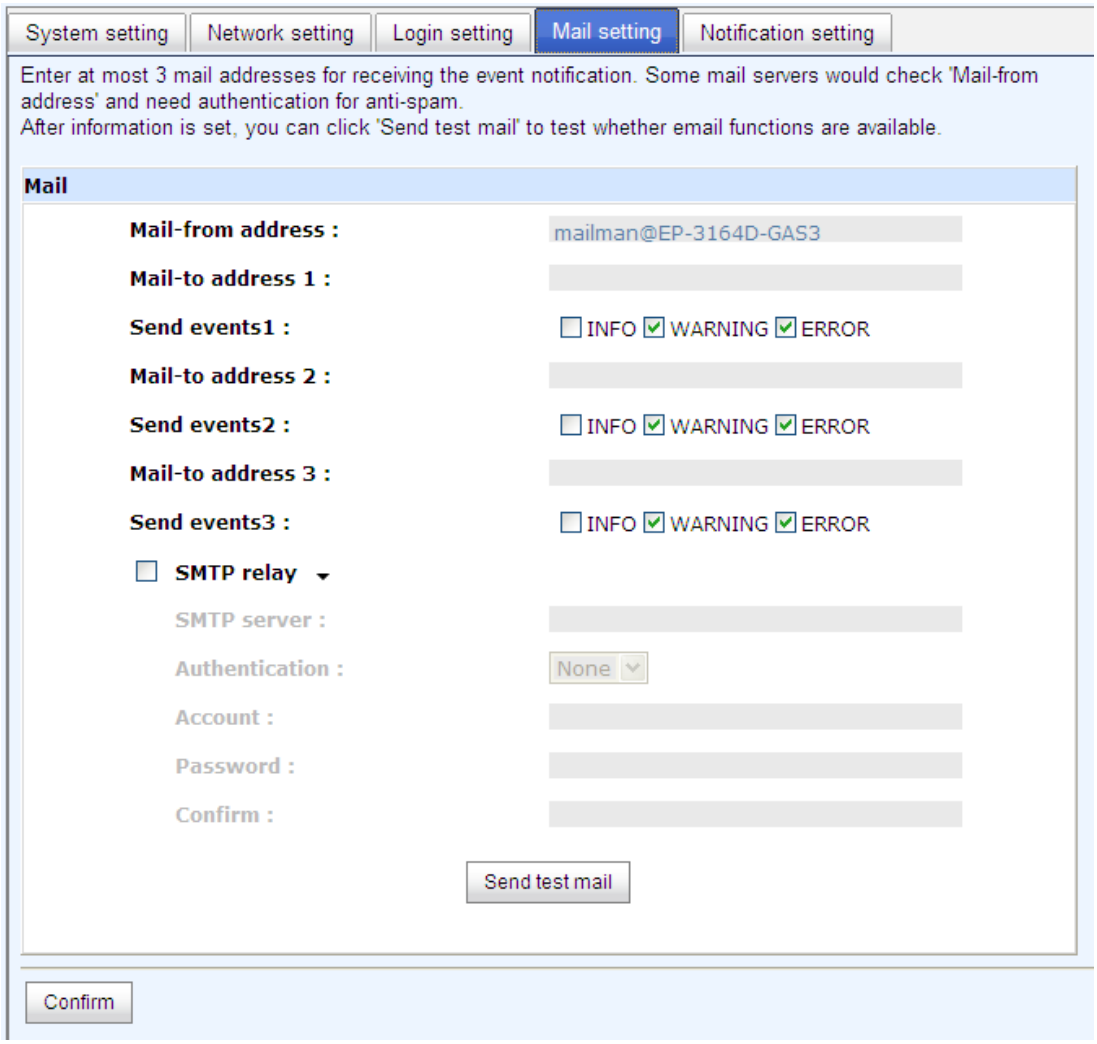
1. **Auto logout:** The options are (1) Disable; (2) 5 minutes; (3) 30 minutes; (4) 1 hour. The system will log out automatically when user is inactive for a period of time.
2. **Login lock:** Disable/Enable. When the login lock is enabled, the system allows only one user to login or modify system settings.



Check **"Change admin password"** or **"Change user password"** to change admin or user password. The maximum length of password is 12 characters.

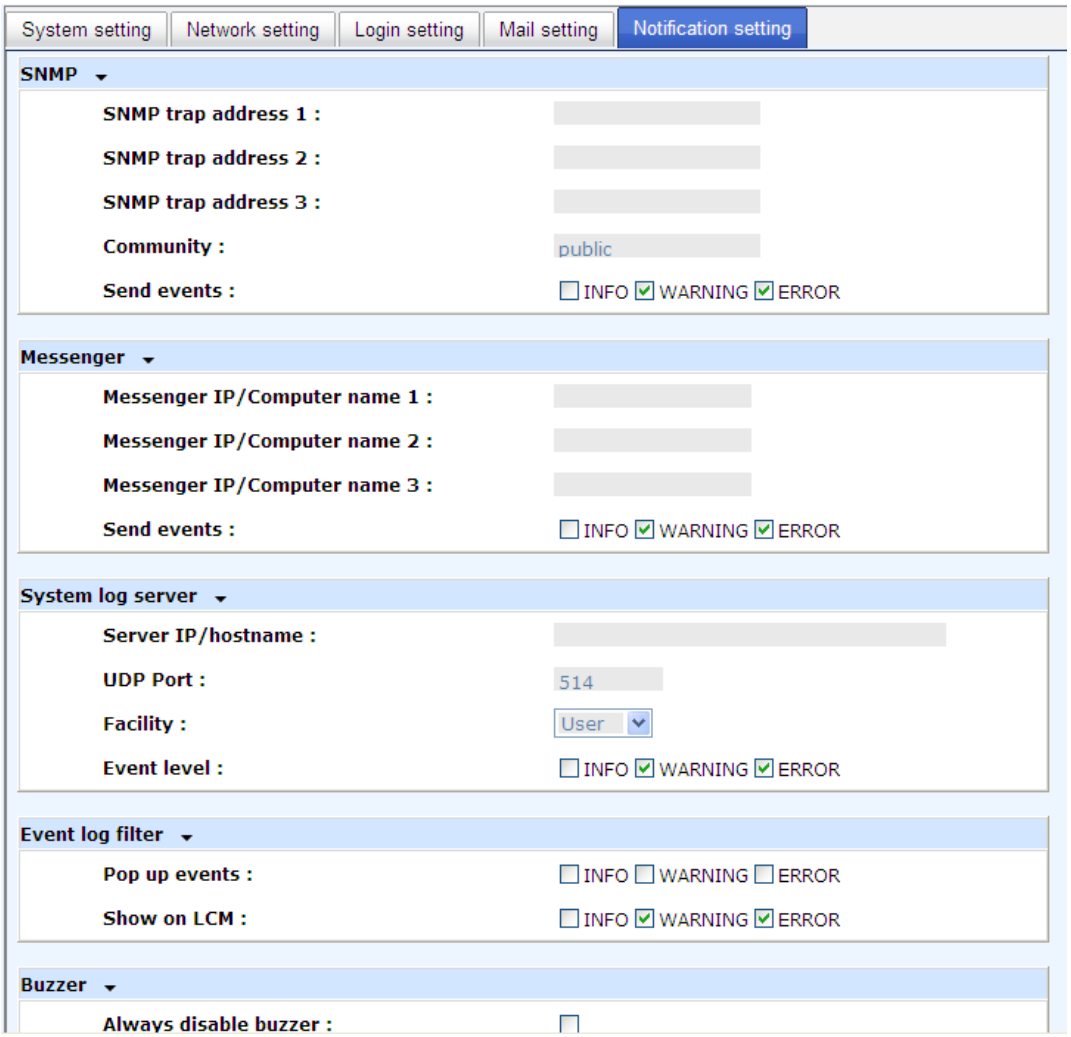
5.2.4 Mail Setting

"Mail setting" can accept at most 3 mail-to address entries for receiving the event notification. Some mail servers would check **"Mail-from address"** and need authentication for anti-spam. Please fill the necessary fields and click **"Send test mail"** to test whether email functions are available or working. User can also select which levels of event logs are needed to be sent via Mail. Default setting only enables ERROR and WARNING event logs. Please also make sure the DNS server IP is well-setup so the event notification mails can be sent successfully.



5.2.5 Notification Setting

"Notification setting" can be used to set up SNMP trap for alerting via SNMP, pop-up message via Windows messenger (not MSN), alert via syslog protocol, and event log filter.



"SNMP" allows up to 3 SNMP trap addresses. Default community name is set as "public". User can choose the event log levels and default setting only enables INFO event log in SNMP. There are many SNMP tools. The following web sites are for your reference:

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

Using **"Messenger"**, user must enable the service "Messenger" in Windows (Start → Control Panel → Administrative Tools → Services → Messenger), and then event logs can be received. It allows up to 3 messenger addresses. User can choose the event log levels and default setting enables the WARNING and ERROR event logs.

Using **"System log server"**, user can choose the facility and the event log level. The default port of syslog is 514. The default setting enables event level: INFO, WARNING and ERROR event logs.

There are some syslog server tools. The following web sites are for your reference:
WinSyslog: http://www.winsyslog.com/
Kiwi Syslog Daemon: http://www.kiwisyslog.com/
Most UNIX systems have built-in syslog daemon.

"Event log filter" setting can enable event level on "Pop up events" and "LCM".

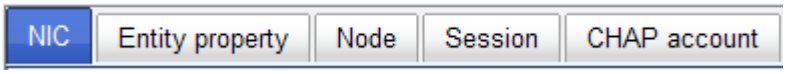
"Buzzer" setting can disable buzzer.

The system buzzer features are described as follows:

1. The system buzzer alarms 1 second when system boots up successfully.
2. The system buzzer alarms continuously when there is error level event happened. The alarm will be stopped after mute.
3. The alarm will be muted automatically when the error situation is resolved. E.g., when RAID 5 is degraded and alarm sounds immediately, after user changes/adds one physical disk for rebuilding, and when the rebuilding is done, the alarm will be muted automatically.

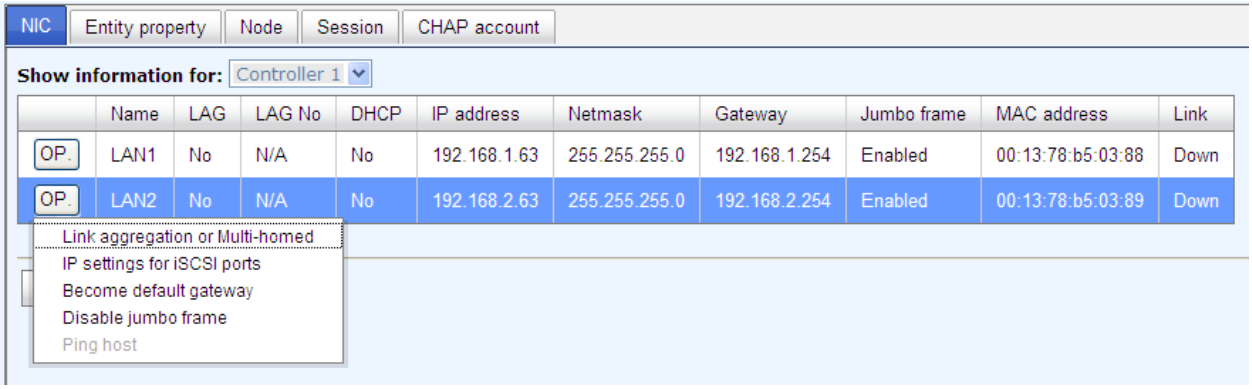
5.3 iSCSI Configuration

"iSCSI configuration" is designed for setting up the **"Entity Property"**, **"NIC"**, **"Node"**, **"Session"**, and **"CHAP account"**.



5.3.1 NIC

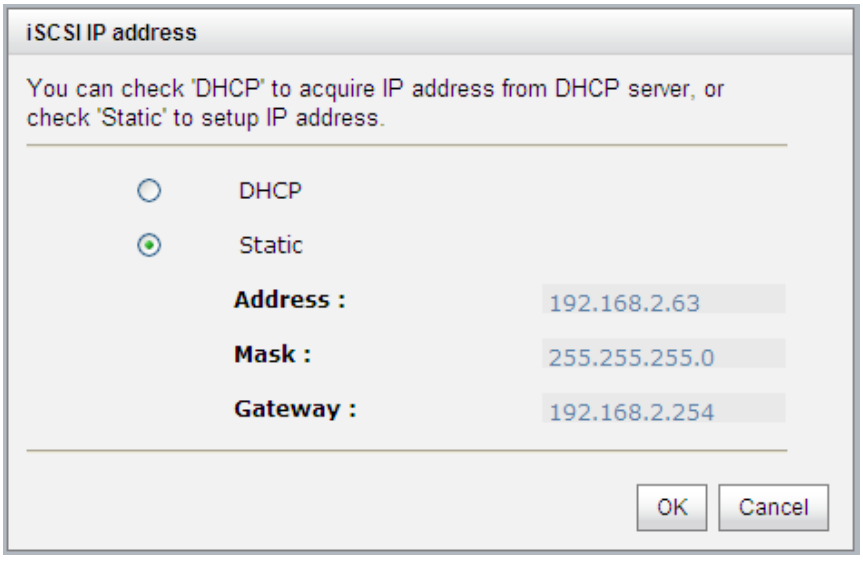
"NIC" function is used to change the IP addresses of iSCSI data ports. The iSCSI RAID subsystem has two 10GbE ports on each controller to transmit data. Each of them must be assigned to one IP address in multi-homed mode unless the link aggregation or trunking mode has been selected. When there are multiple data ports setting up in link aggregation or trunking mode, all the data ports share single address.



There are two iSCSI data ports on each controller. Two data ports are set with static IP.

IP settings:

User can change IP address by moving the mouse to the gray button of LAN port, click **"IP settings for iSCSI ports"**. There are 2 selections, DHCP (Get IP address from DHCP server) or static IP.



Default gateway:

Default gateway can be changed by moving the mouse to the gray button of LAN port, click **"Become default gateway"**. There is only one default gateway.

MTU / Jumbo frame:

MTU (**M**aximum **T**ransmission **U**nit) size can be enabled by moving mouse to the gray button of LAN port, click **"Enable jumbo frame"**. Maximum jumbo frame size is **3900** bytes.

WARNING! The MTU size of network switch and HBA on host must be enabled. Otherwise, the LAN connection will not work properly.

Multi-homed / Trunking / LACP:

The following is the description of multi-homed/trunking/LACP.

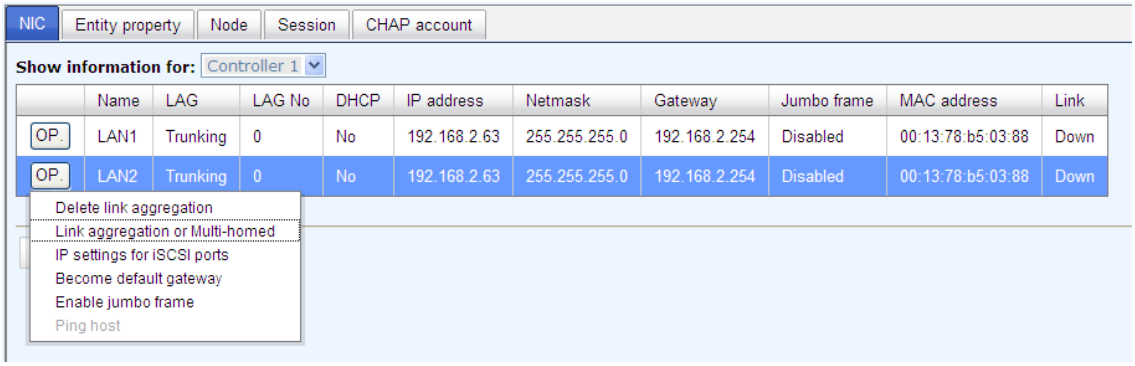
1. **Multi-homed**: Default mode. Each of iSCSI data port is connected by itself and is not set to link aggregation and trunking. This function is also for Multipath functions. Selecting this mode can also remove the setting of Trunking/LACP at the same time.

2. **Trunking**: defines the use of multiple iSCSI data ports in parallel to increase the link speed beyond the limits of any single port.

3. **LACP**: The Link Aggregation Control Protocol (LACP) is part of IEEE specification 802.3ad that allows bundling several physical ports together to form a single logical channel. LACP allows a network switch to negotiate an automatic bundle by sending LACP packets to the peer. The advantages of LACP are: (1) increase in bandwidth, and (2) failover when link status fails on a port.

Trunking/LACP setting can be changed by clicking the button **"Aggregation".**

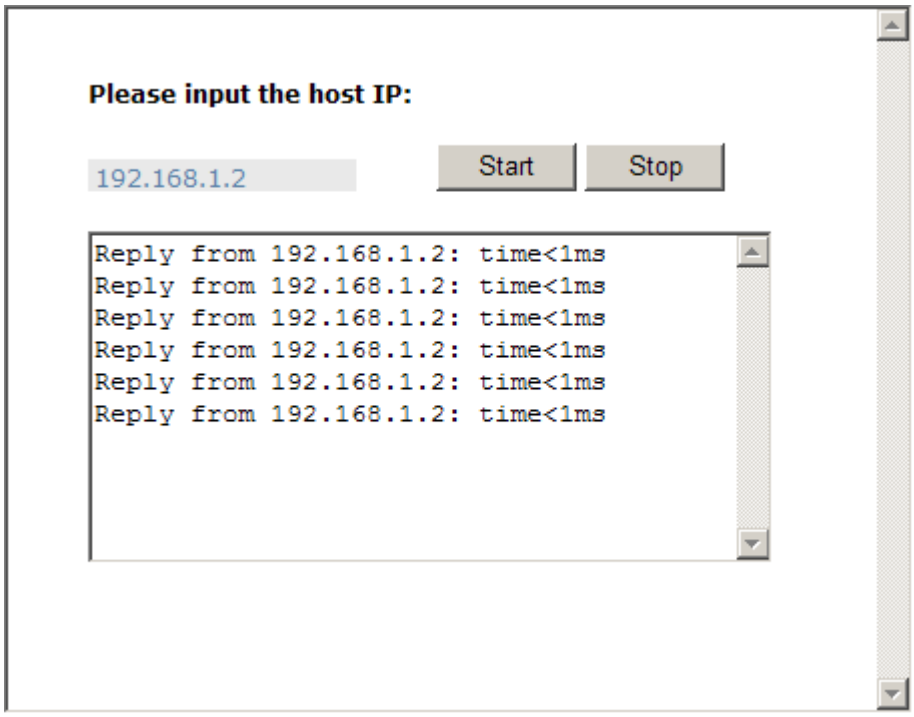
There are 2 iSCSI data ports. Select at least two NICs for link aggregation.



For example, LAN1 and LAN2 are set to Trunking mode. To remove Trunking/LACP setting, check the gray button of LAN port, click **"Delete link aggregation"**. Then it will pop up a message to confirm.

Ping host:

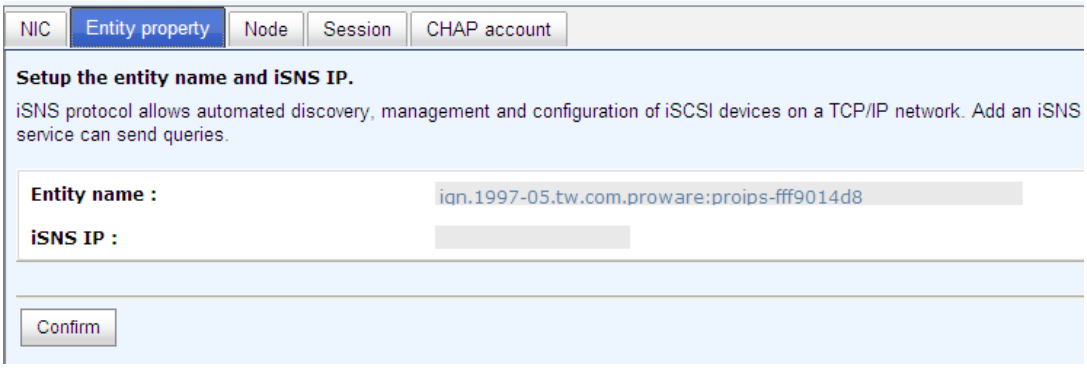
User can ping the corresponding host data port from the target, click **"Ping host"**.



A user can ping host from the target to make sure the data port connection is well.

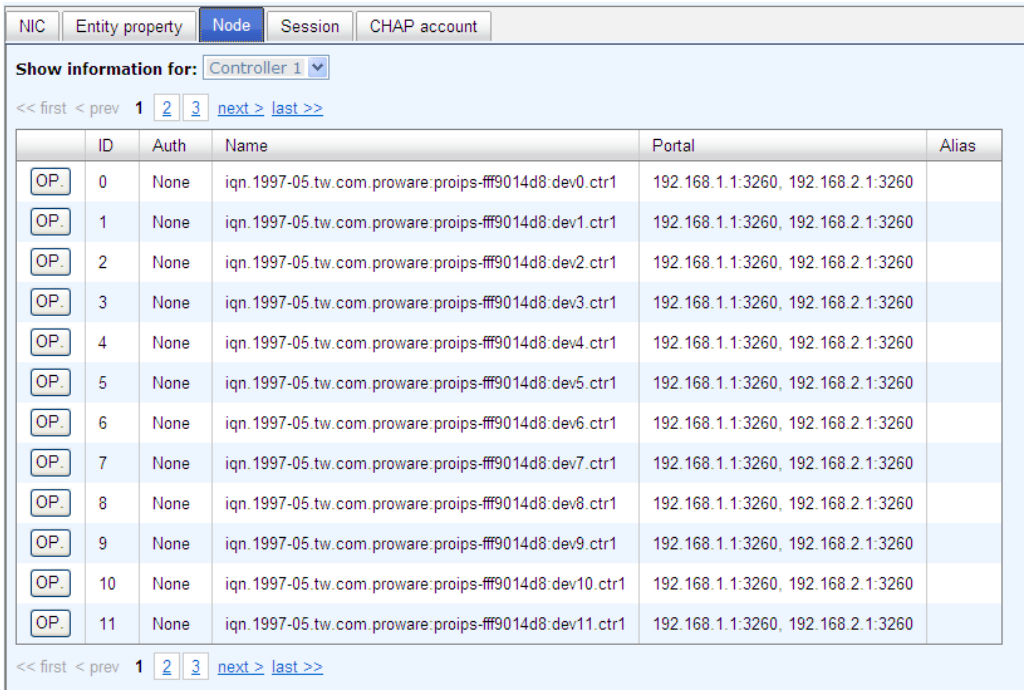
5.3.2 Entity Property

"Entity property" is used to view the entity name of the iSCSI RAID subsystem, and setup **"iSNS IP"** for iSNS (Internet Storage Name Service). iSNS protocol allows automated discovery, management and configuration of iSCSI devices on a TCP/IP network. Using iSNS, it requires that an iSNS server be setup in the SAN. Add an iSNS server IP address into iSNS server lists in order that iSCSI initiator service can send queries.



5.3.3 Node

"Node" can be used to view the target name for iSCSI initiator. The iSCSI RAID subsystem supports up to 32 multinodes. There are 32 default nodes created for each controller.



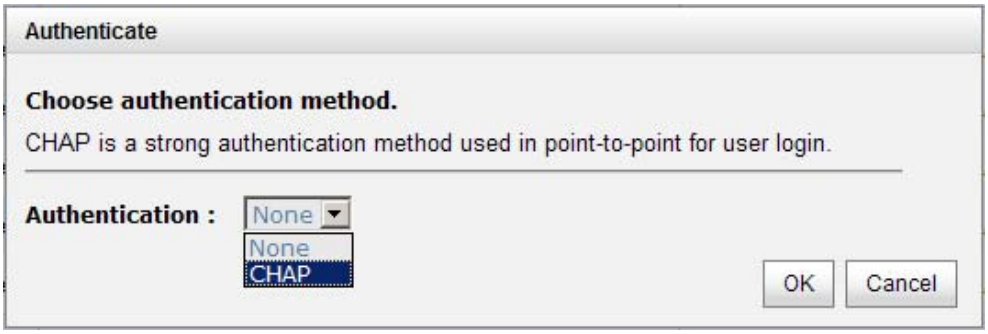
	ID	Auth	Name	Portal	Alias
OP.	0	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev0.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	1	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev1.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	2	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev2.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	3	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev3.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	4	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev4.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	5	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev5.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	6	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev6.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	7	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev7.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	8	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev8.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	9	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev9.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	10	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev10.ctr1	192.168.1.1:3260, 192.168.2.1:3260	
OP.	11	None	iqn.1997-05.tw.com.proware:proips-fff9014d8:dev11.ctr1	192.168.1.1:3260, 192.168.2.1:3260	

CHAP:

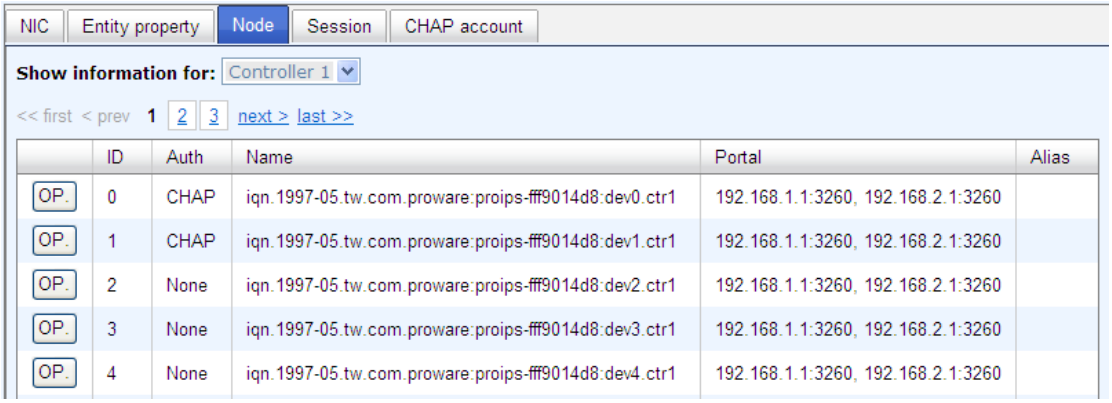
CHAP is the abbreviation of **C**hallenge **H**andshake **A**uthorization **P**rotocol. CHAP is a strong authentication method used in point-to-point for user login. It's a type of authentication in which the authentication server sends the client a key to be used for encrypting the username and password. CHAP enables the username and password to transmitting in an encrypted form for protection.

To use CHAP authentication, please follow these steps:

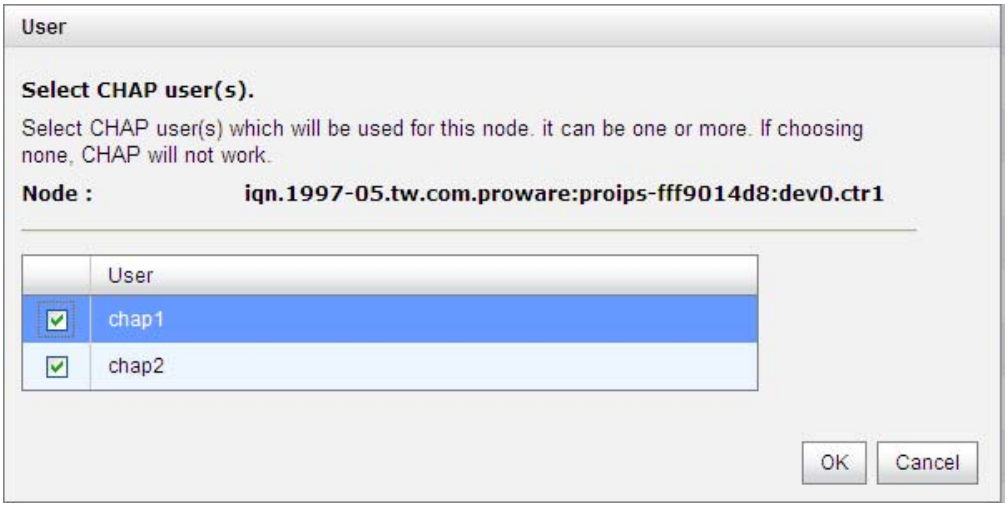
1. Select one of 32 default nodes from one controller.
2. Check the gray button of **"OP."** column, click **"Authenticate"**.
3. Select **"CHAP"**.



4. Click **"OK"**.



5. Go to **"/ iSCSI configuration / CHAP account"** page to create CHAP account. Please refer to next section for more detail.
6. Check the gray button of **"OP."** column, click **"User"**.
7. Select CHAP user(s) which will be used. It's a multi option; it can be one or more. If choosing none, CHAP cannot work.

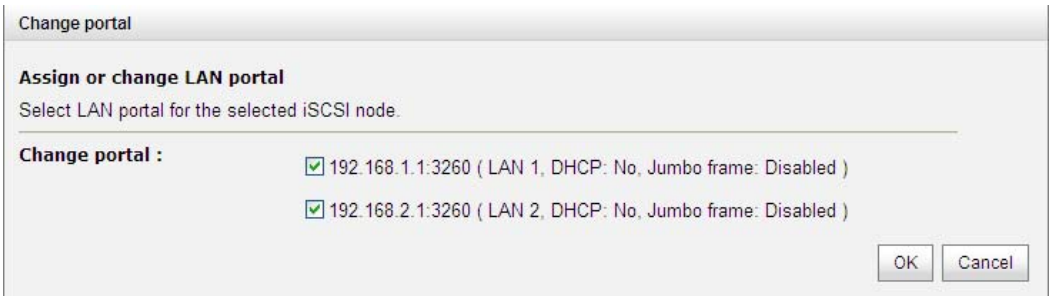


8. Click **"OK"**.
9. In **"Authenticate"** of **"OP"** page, select **"None"** to disable CHAP.

Change portal:

Users can change the portals belonging to the device node of each controller.

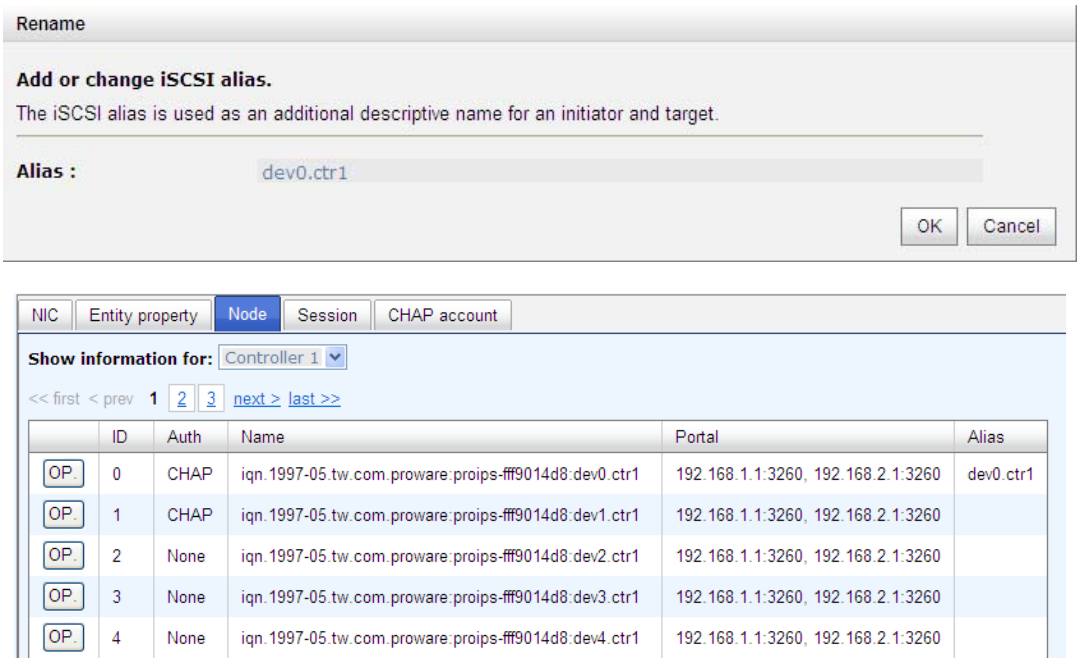
1. Check the gray button of **"OP."** column next to one device node.
2. Select **"Change portal"**.
3. Choose the portals for the controller.
4. Click **"OK"** to confirm.



Rename alias:

User can create an alias to one device node.

1. Check the gray button of **"OP."** column next to one device node.
2. Select **"Rename alias"**.
3. Create an alias for that device node.
4. Click **"OK"** to confirm.
5. An alias appears at the end of that device node.

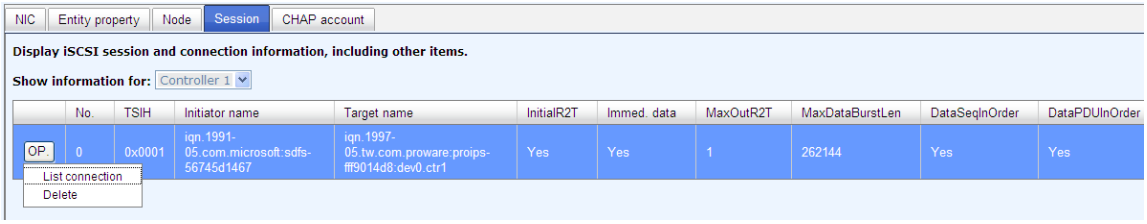


NOTE: After setting CHAP, the initiator in host/server should be set the same CHAP account. Otherwise, user cannot login.

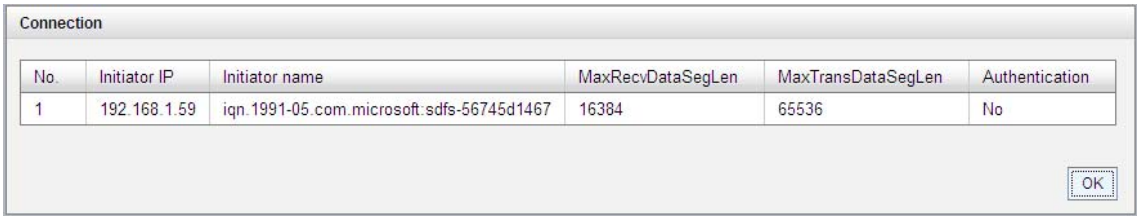
5.3.4 Session

"Session" can display iSCSI session and connection information, including the following items:

1. TSIH (target session identifying handle)
2. Host (Initiator Name)
3. Controller (Target Name)
4. InitialR2T(Initial Ready to Transfer)
5. Immed. data(Immediate data)
6. MaxDataOutR2T(Maximum Data Outstanding Ready to Transfer)
7. MaxDataBurstLen(Maximum Data Burst Length)
8. DataSeginOrder(Data Sequence in Order)
9. DataPDUInOrder(Data PDU in Order)
10. Detail of Authentication status and Source IP: port number.



Check the gray button of session number, click **"List connection"**. It will list all connection(s) of the session.

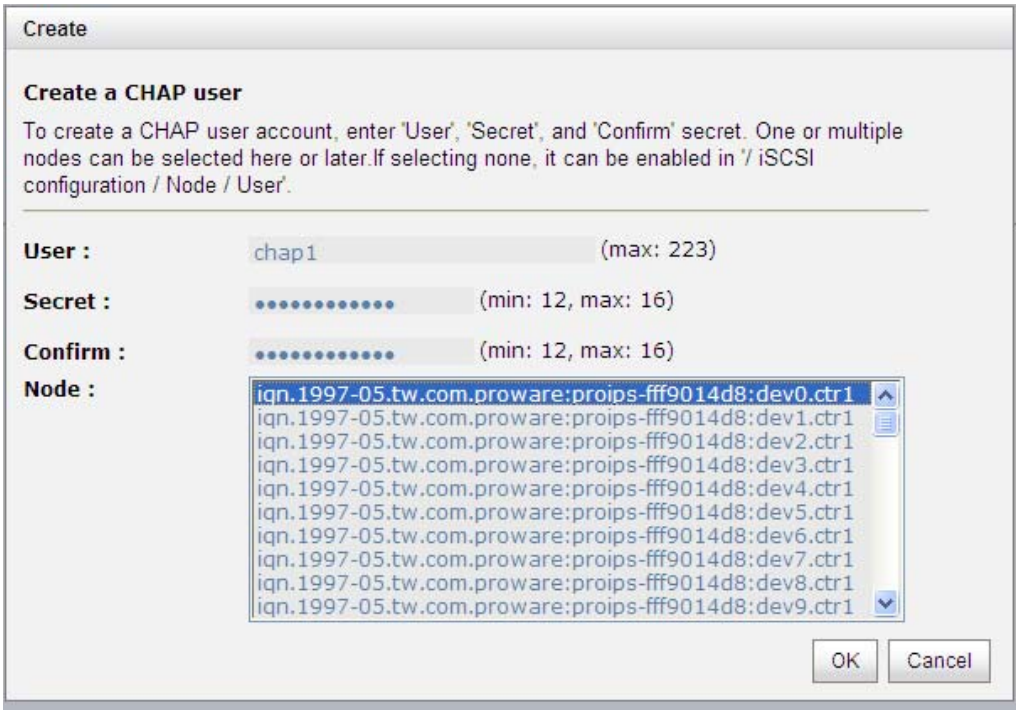


5.3.5 CHAP Account

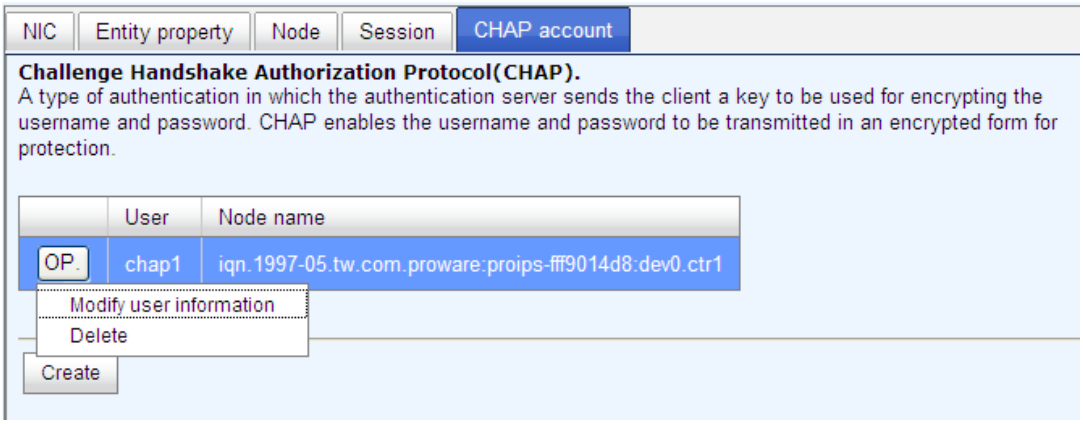
"CHAP account" is used to manage CHAP accounts for authentication. This iSCSI RAID subsystem allows creation of many CHAP accounts.

To setup CHAP account, please follow these steps:

1. Click **"Create"**.
2. Enter **"User"**, **"Secret"**, and **"Confirm"** secret again. **"Node"** can be selected here or later. If selecting none, it can be enabled later in **"/ iSCSI configuration / Node / User"**.



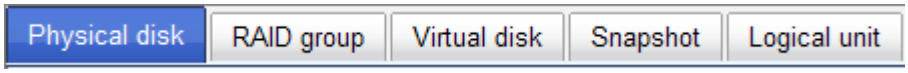
3. Click **"OK"**.



4. Click **"Delete"** to delete CHAP account.

5.4 Volume Configuration

"Volume configuration" is designed for setting up the volume configuration which includes **"Physical disk"**, **"RAID group"**, **"Virtual disk"**, **"Snapshot",** and **"Logical unit"**.



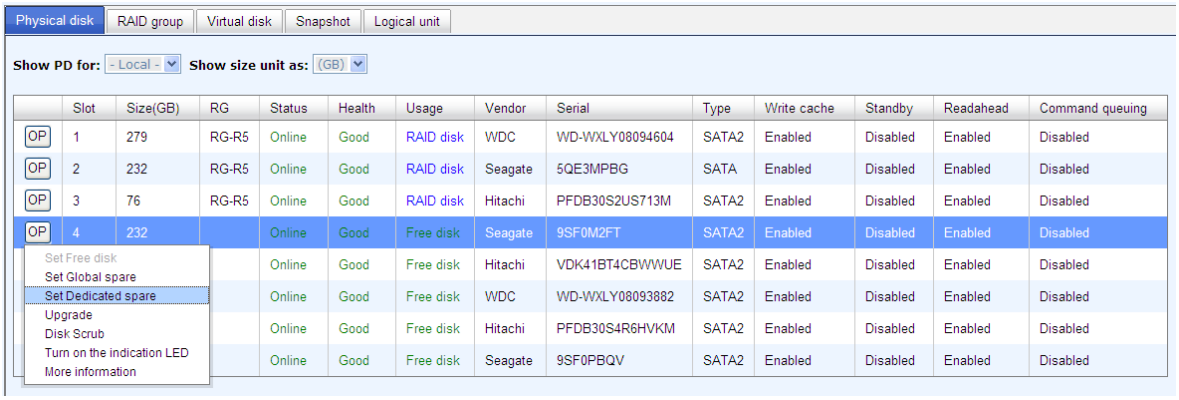
5.4.1 Physical Disk

"Physical disk" can be used to view the status of hard drives in the system. The following are operational tips:

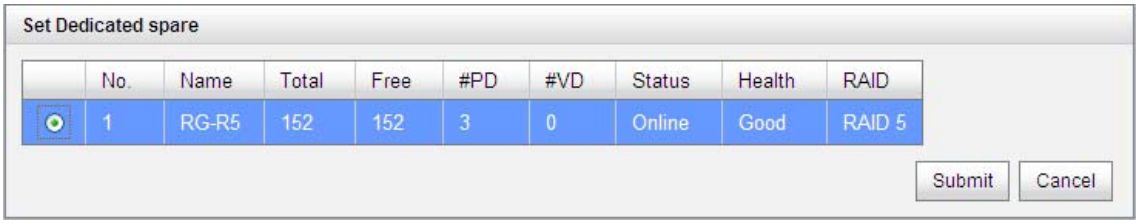
1. Check the gray button next to the number of slot, it will show the functions which can be executed.
2. Active function can be selected, and inactive functions show up in gray color and cannot be selected.

For example, set PD slot number 8 to dedicated spare disk.

Step 1: Check the gray button of PD 8, select **"Set Dedicated spare"**, it will link to next page.

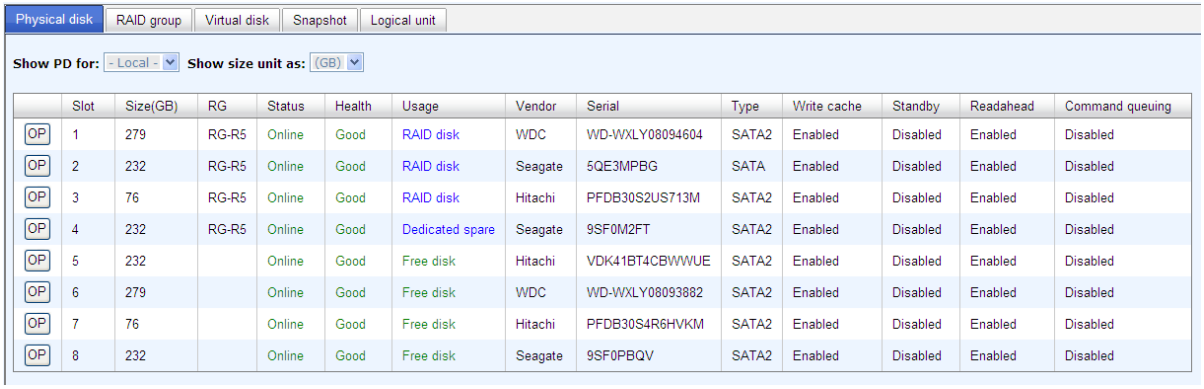


Step 2: Maybe there are some existing RGs which can be assigned dedicate spare disk. Select which RG will be assigned, then click "**Submit**".



Step 3: Done. View **"Physical disk"** page.

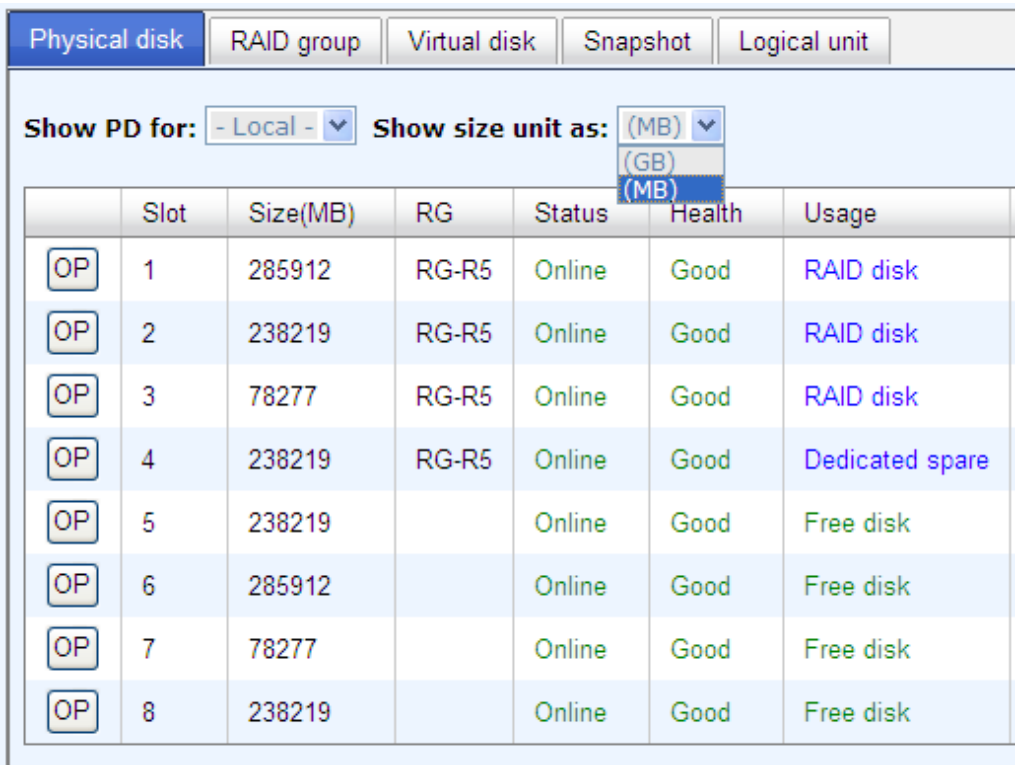
Physical Disk:



	Slot	Size(GB)	RG	Status	Health	Usage	Vendor	Serial	Type	Write cache	Standby	Readahead	Command queuing
OP	1	279	RG-R5	Online	Good	RAID disk	WDC	WD-WXLY08094604	SATA2	Enabled	Disabled	Enabled	Disabled
OP	2	232	RG-R5	Online	Good	RAID disk	Seagate	5QE3MPBG	SATA	Enabled	Disabled	Enabled	Disabled
OP	3	76	RG-R5	Online	Good	RAID disk	Hitachi	PFDB30S2US713M	SATA2	Enabled	Disabled	Enabled	Disabled
OP	4	232	RG-R5	Online	Good	Dedicated spare	Seagate	9SF0M2FT	SATA2	Enabled	Disabled	Enabled	Disabled
OP	5	232		Online	Good	Free disk	Hitachi	VDK41BT4CBWWUE	SATA2	Enabled	Disabled	Enabled	Disabled
OP	6	279		Online	Good	Free disk	WDC	WD-WXLY08093882	SATA2	Enabled	Disabled	Enabled	Disabled
OP	7	76		Online	Good	Free disk	Hitachi	PFDB30S4R6HVKM	SATA2	Enabled	Disabled	Enabled	Disabled
OP	8	232		Online	Good	Free disk	Seagate	9SF0PBQV	SATA2	Enabled	Disabled	Enabled	Disabled

Physical disks in slot 1, 2, 3 are created for a RG named "RG-R5". Slot 4 is set as dedicated spare disk of the RG named "RG-R5". The others are free disks.)

Step 4: The unit of size can be changed from (GB) to (MB). It will display the capacity of hard drive in MB.



	Slot	Size(MB)	RG	Status	Health	Usage
OP	1	285912	RG-R5	Online	Good	RAID disk
OP	2	238219	RG-R5	Online	Good	RAID disk
OP	3	78277	RG-R5	Online	Good	RAID disk
OP	4	238219	RG-R5	Online	Good	Dedicated spare
OP	5	238219		Online	Good	Free disk
OP	6	285912		Online	Good	Free disk
OP	7	78277		Online	Good	Free disk
OP	8	238219		Online	Good	Free disk

PD column description:

Slot	The position of hard drives. The button next to the number of slot shows the functions which can be executed.
Size (GB) (MB)	Capacity of hard drive.
RG Name	Related RAID group name.

Status	The status of hard drive. **"Online"** → the hard drive is online. **"Rebuilding"** → the hard drive is being rebuilt. **"Transition"** → the hard drive is being migrated or is replaced by another disk when rebuilding occurs. **"Scrubbing"** → if the hard drive is being scrubbed.
Health	The health of hard drive. **"Good"** → the hard drive is good. **"Failed"** → the hard drive is failed. **"Error Alert"** → S.M.A.R.T. error alert. **"Read Errors"** → the hard drive has unrecoverable read errors.
Usage	**RAID Disk**. This hard drive has been set to RAID. **Free disk**. This hard drive is free for use. **Dedicated Spare**. This hard drive has been set to the dedicated spare of the RG. **Global Spare**. This hard drive has been set to a global spare of all RGs.
Vendor	Hard drive vendor.
Serial	Hard drive serial number.
Type	Hard drive type. **"SATA"** → SATA disk. **"SATA2"** → SATA II disk. **"SAS"** → SAS disk.
Write cache	Hard drive write cache is enabled or disabled. The default is enabled.
Standby	HDD auto spindown function to save power. The default value is disabled.
Readahead	Readahead function of HDD. Default value is enabled
Command Queuing	Command Queue function of HDD. Default value is enabled.

PD operations description:

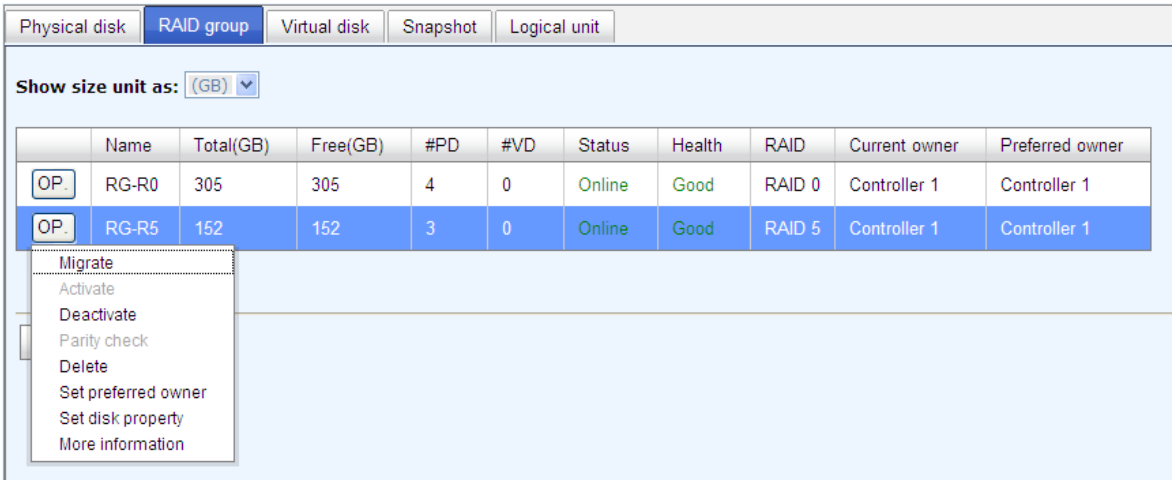
Set Free disk	Make the selected hard drive to be free for use.
Set Global spare	Set the selected hard drive to global spare of all RGs.
Set Dedicated spares	Set hard drive to dedicated spare of selected RGs.
Disk Scrub	Scrub the hard drive.
Turn on/off the indication LED	Turn on the indication LED of the hard drive. Click again to turn off.
More information	Show hard drive detail information.

5.4.2 RAID Group

"RAID group" can view the status of each RAID group, create, and modify RAID groups. The following is an example to create a RG.

Step 1: Click **"Create"**, enter **"Name"**, choose **"RAID level"**, click **"Select PD"** to select PD, assign the RG's **"Preferred owner"**. Then click **"OK"**. The **"Write Cache"** option is to enable or disable the hard drives' write cache option. The **"Standby"** option is to enable or disable the hard drives' auto spindown function, when this option is enabled and hard drives have no access after certain period of time, the hard drives automatically spin down. The **"Readahead"** option is to enable or disable the read ahead function. The **"Command queuing"** option is to enable or disable the hard drives' command queue function.

Step 2: Confirm page. Click **"OK"** if all setups are correct.



There is a RAID 0 with 4 physical disks, named "RG-R0". The second RAID group is a RAID 5 with 3 physical disks, named "RG-R5"

Step 3: Done. View **"RAID group"** page.

RG column description:

	The button includes the function which can be executed.
Name	RAID group name.
Total(GB)(MB)	Total capacity of this RAID group. This unit can be displayed in GB or MB.
Free(GB)(MB)	Free capacity of this RAID group. This unit can be displayed in GB or MB.
#PD	The number of physical disks in RAID group.

#VD	The number of virtual disks in RAID group.
Status	The status of RAID group. **"Online"** → the RAID group is online. **"Offline"** → the RAID group is offline. **"Rebuild"** → the RAID group is being rebuilt. **"Migrate"** → the RAID group is being migrated. **"Scrubbing"** → the RAID group is being scrubbed.
Health	The health of RAID group. **"Good"** → the RAID group is good. **"Failed"** → the hard drive is failed. **"Degraded"** → the RAID group is not completed. The reason could be lack of one disk or disk failure.
RAID	The RAID level of the RAID group.
Current Owner	The owner of the RAID group. The default owner is controller 1.
Preferred owner	The preferred owner of the RAID group. The default owner is controller 1.
Enclosure	The enclosure which a RG locates, e.g., in the local enclosure or in the JBOD enclosure.

RG operations description:

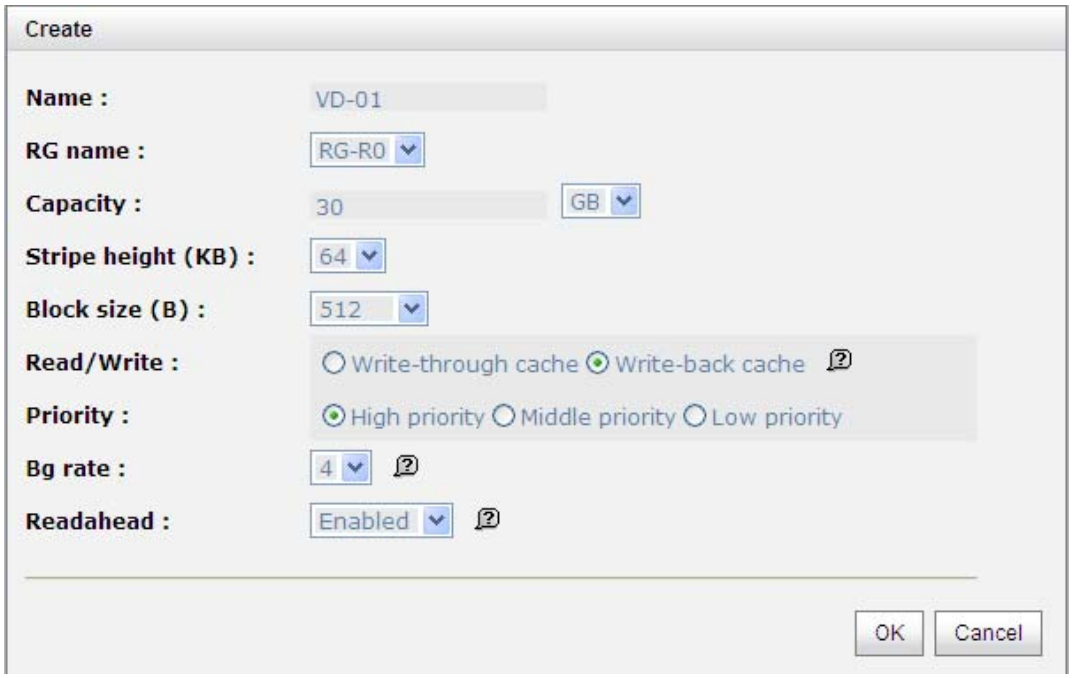
Create	Create a RAID group.
Migrate	Migrate a RAID group. Please refer to next chapter for more detail.
Activate	Activate a RAID group; it can be executed when RG status is offline. This is for online roaming purpose.
Deactivate	Deactivate a RAID group; it can be executed when RG status is online. This is for online roaming purpose.
Parity check	Regenerate parity for the RAID group. It supports RAID 3 / 5 / 6 / 30 / 50 / 60.
Delete	Delete a RAID group.
Set preferred owner	Set the RG ownership to the other controller.
Set disk property	Change the disk status of write cache and standby. **Write Cache** options: **"Enabled"** → Enable disk write cache.

	"Disabled" → Disable disk write cache. **Standby** options: **"Disabled"** → Disable spindown. **"30 sec / 1 min / 5 min / 30 min"** → Enable hard drive auto spindown to save power in the period of time. **Read ahead:** **"Enabled"** → Enable disk read ahead. (Default) **"Disabled"** → Disable disk read ahead. **Command queuing:** **"Enabled"** → Enable disk command queue. (Default) **"Disabled"** → Disable disk command queue.
More information	Show RAID group detail information.

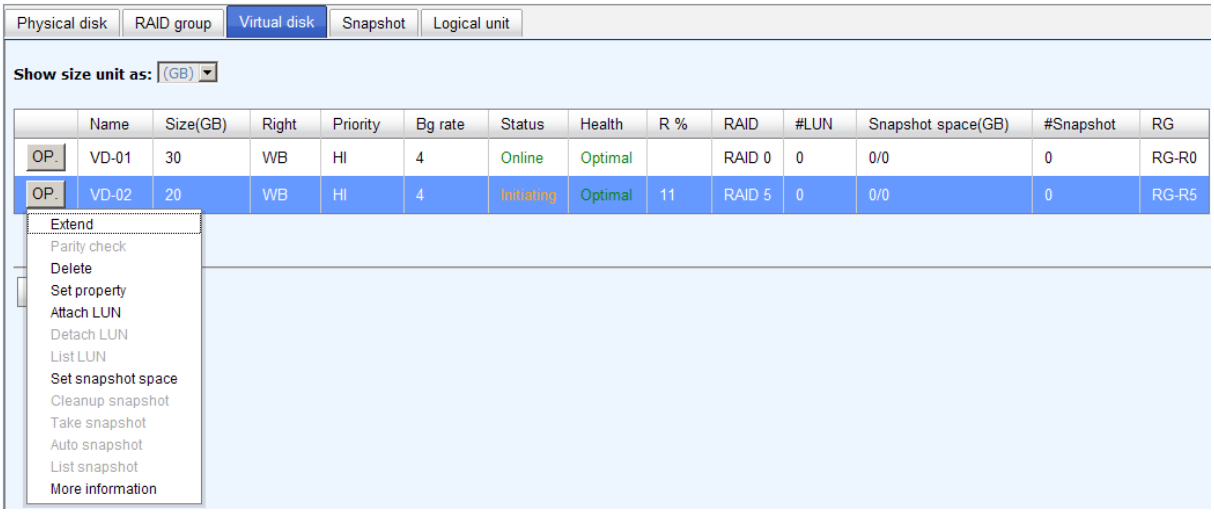
5.4.3 Virtual Disk

"Virtual disk" can view the status of each Virtual disk, create, and modify virtual disks. The following is an example to create a VD.

Step 1: Click **"Create"**, enter **"Name"**, select RAID group from **"RG name"**, enter required **"Capacity (GB) / (MB)", change "Stripe height (KB)"**, change **"Block size (B)"**, change **"Read / Write"** mode, set virtual disk **"Priority"**, select **"Bg rate"** (Background task priority), and change **"Readahead"** option if necessary. Then click **"OK"**.



Step 2: Confirm page. Click **"OK"** if all setups are correct.



Create a VD named "VD-01", from "RG-R0". The second VD is named "VD-02", it's initializing.

Step 3: Done. View **"Virtual disk"** page.

VD column description:

	The button includes the functions which can be executed.
Name	Virtual disk name.
Size (GB) (MB)	Total capacity of the virtual disk. The unit can be displayed in GB or MB.
Right	The right of virtual disk: • **"WT"** → **W**rite **T**hrough. • **"WB"** → **W**rite **B**ack. • **"RO"** → **R**ead **O**nly.
Priority	The priority of virtual disk: • **"HI"** → **HI**gh priority. • **"MD"** → **MiD**dle priority. • **"LO"** → **LO**w priority.
Bg rate	Background task priority: • **"4 / 3 / 2 / 1 / 0"** → Default value is 4. The higher number the background priority of a VD is, the more background I/O will be scheduled to execute.
Status	The status of virtual disk: • **"Online"** → The virtual disk is online.

	• **"Offline"** → The virtual disk is offline. • **"Initiating"** → The virtual disk is being initialized. • **"Rebuild"** → The virtual disk is being rebuilt. • **"Migrate"** → The virtual disk is being migrated. • **"Rollback"** → The virtual disk is being rolled back. • **"Scrubbing"** → The virtual disk is being scrubbed. • **"Parity checking"** → The virtual disk is being parity check.
Health	The health of virtual disk: • **"Optimal"** → the virtual disk is working well and there is no failed disk in the RG. • **"Degraded"** → At least one disk from the RG of the Virtual disk is failed or plugged out. • **"Failed"** → the RAID group disk of the VD has single or multiple failed disks than its RAID level can recover from data loss. • **"Partially optimal"** → the virtual disk has experienced recoverable read errors.
R %	Ratio (%) of initializing or rebuilding.
RAID	RAID level.
#LUN	Number of LUN(s) that virtual disk is attached to.
Snapshot (GB) (MB)	The virtual disk size that is used for snapshot. The number means **"Used snapshot space" / "Total snapshot space"**. The unit can be displayed in GB or MB.
#Snapshot	Number of snapshot(s) that have been taken.
RG name	The RG name of the virtual disk

VD operations description:

Create	Create a virtual disk.
Extend	Extend a Virtual disk capacity.
Parity check	Execute parity check for the virtual disk. It supports RAID 3 / 5 / 6 / 30 / 50 / 60. Regenerate parity: **"Yes"** → Regenerate RAID parity and write. **"No"** → Execute parity check only and find mismatches. It will stop checking when mismatches count to 1 / 10 / 20 / … / 100.

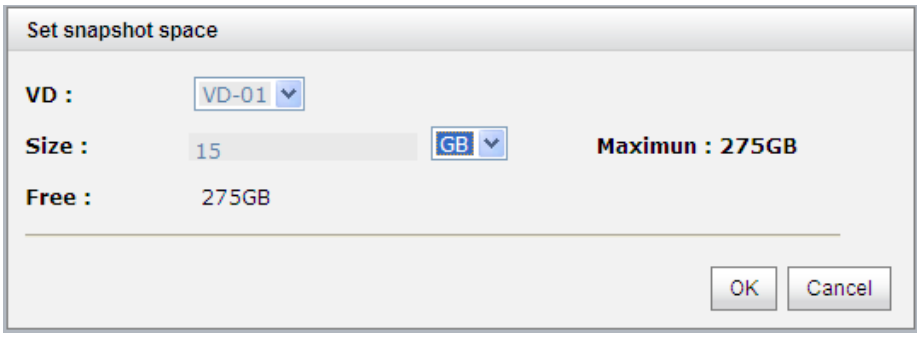
Delete	Delete a Virtual disk.
Set property	Change the VD name, Right, Priority and Bg rate. Right options: **"WT"** → **W**rite **T**hrough. **"WB"** → **W**rite **B**ack. **"RO"** → **R**ead **O**nly. Priority options: **"HI"** → **HI**gh priority. **"MD"** → **M**i**D** priority. **"LO"** → **LO**w priority. Bg rate options: **"4 / 3 / 2 / 1 / 0"** → Default value is 4. The higher number the background priority of a VD has, the more background I/O will be scheduled to execute. Read ahead: **"Enabled"** → Enable disk read ahead. (Default) **"Disabled"** → Disable disk read ahead.
Attach LUN	Attach to a LUN.
Detach LUN	Detach to a LUN.
List LUN	List attached LUN(s).
Set snapshot space	Set snapshot space for executing snapshot. Please refer to next chapter for more detail.
Cleanup snapshot	Clean all snapshot VD related to the Virtual disk and release snapshot space.
Take snapshot	Take a snapshot on the Virtual disk.
Auto snapshot	Set auto snapshot on the Virtual disk.
List snapshot	List all snapshot VD related to the Virtual disk.
More information	Show Virtual disk detail information.

5.4.4 Snapshot

"Snapshot" can view the status of snapshot, create and modify snapshots. Please refer to next chapter for more detail about snapshot concept. The following is an example to take a snapshot.

Step 1: Create snapshot space. In **"/ Volume configuration / Virtual disk"**, move the mouse pointer to the gray button next to the VD number; click **"Set snapshot space"**.

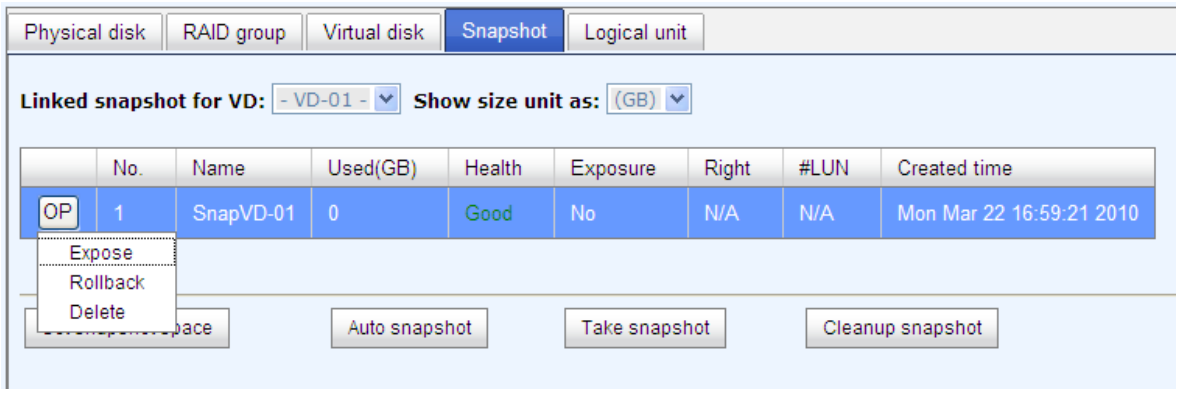
Step 2: Set snapshot space. Then click "**OK**". The snapshot space is created.



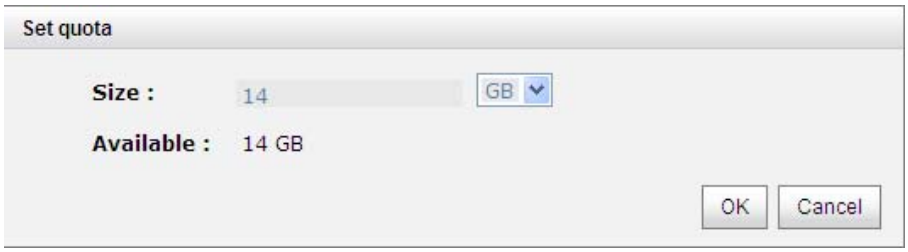
	Name	Size(GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	Snapshot space(GB)	#Snapshot	RG
OP.	VD-01	30	WB	HI	4	Online	Optimal		RAID 0	0	1/15	0	RG-R0
OP.	VD-02	20	WB	HI	4	Online	Optimal		RAID 5	0	0/0	0	RG-R5

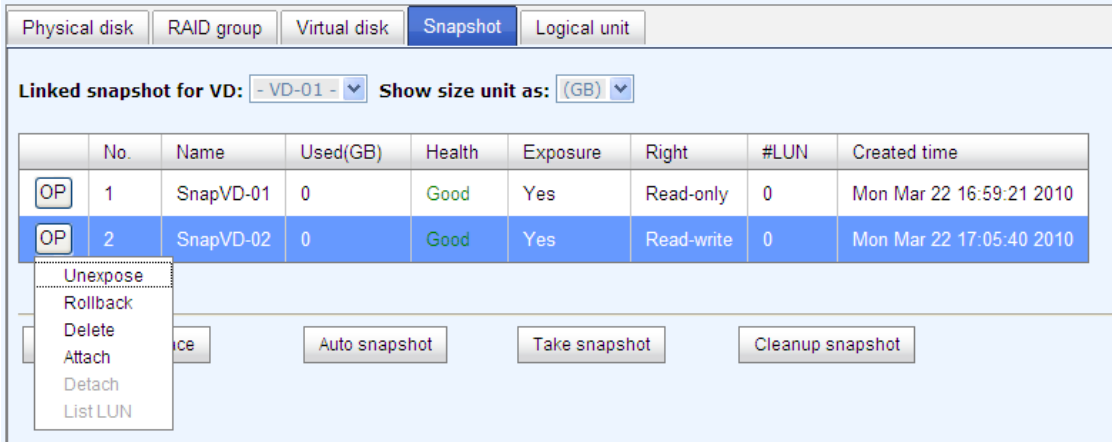
"VD-01" snapshot space has been created, snapshot space is 15GB, and used 1GB for saving snapshot index.

Step 3: Take a snapshot. In **"/ Volume configuration / Snapshot"**, click "**Take snapshot**". It will link to next page. Enter a snapshot name.



Step 4: Expose the snapshot VD. Move the mouse pointer to the gray button next to the Snapshot VD number; click **"Expose"**. Enter a capacity for snapshot VD. If size is zero, the exported snapshot VD will be read only. Otherwise, the exported snapshot VD can be read / written, and the size will be the maximum capacity to read/write.





This is the list of snapshots in "VD-01". There are two snapshots in "VD-01". Snapshot VD "SnapVD-01" is exported as read only, "SnapVD-02" is exported as read/write.

Step 5: Attach a LUN for snapshot VD. Please refer to the next section for attaching a LUN.

Step 6: Done. Snapshot VD can be used.

Snapshot column description:

	The button includes the functions which can be executed.
Name	Snapshot VD name.
Used (GB) (MB)	The amount of snapshot space that has been used. The unit can be displayed in GB or MB.
Health	The health of snapshot: · **"Good"** → The snapshot is good. · **"Failed"** → The snapshot fails.
Exposure	Snapshot VD is exposed or not.

Right	The right of snapshot: • **"RW"** → **R**ead **/ W**rite. The snapshot VD can be read / write. • **"RO"** → **R**ead **O**nly. The snapshot VD is read only.
#LUN	Number of LUN(s) that snapshot VD is attached.
Created time	Snapshot VD created time.

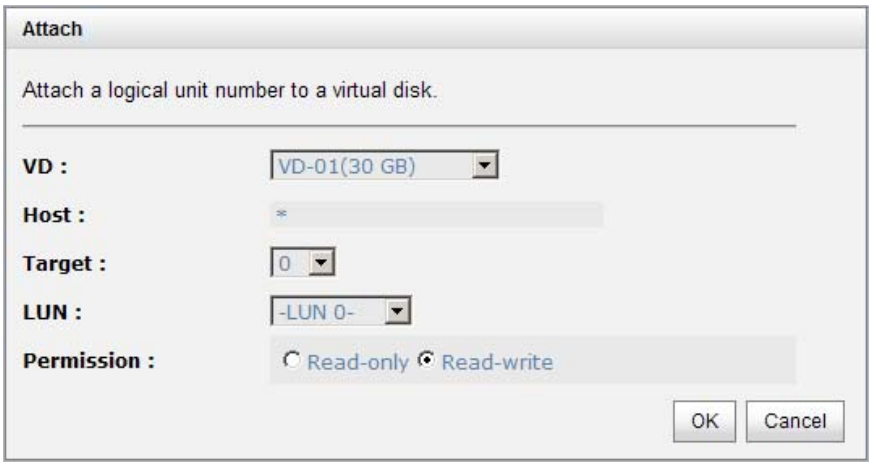
Snapshot operation description:

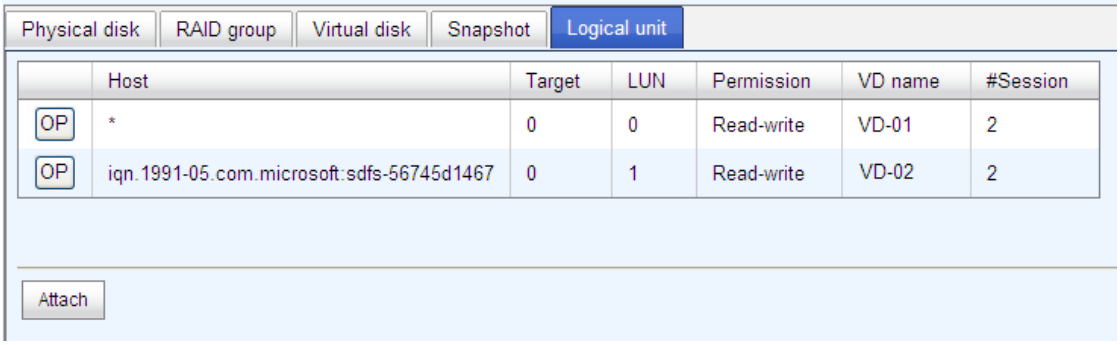
Expose / Unexpose	Expose / unexpose the snapshot VD.
Rollback	Rollback the snapshot VD.
Delete	Delete the snapshot VD.
Attach	Attach a LUN.
Detach	Detach a LUN.
List LUN	List attached LUN(s).

5.4.5 Logical Unit

"Logical unit" can view, create, and modify the status of attached logical unit number(s) of each VD.

User can attach LUN by clicking the **"Attach"**. **"Host"** must enter with an iSCSI node name for access control, or fill-in wildcard **"*",** which means every host can access the volume. Choose LUN number and permission, and then click **"OK"**.





VD-01 is attached to LUN 0 and every host can access. VD-02 is attached to LUN 1 and only initiator node which is named "iqn.1991-05.com.microsoft:win-r6qrvqjd5m7" can access.

LUN operations description:

Attach	Attach a logical unit number to a Virtual disk.
Detach	Detach a logical unit number from a Virtual disk.

The matching rules of access control are inspected from top to bottom in sequence. For example: there are 2 rules for the same VD, one is "*", LUN 0; and the other is "iqn.host1", LUN 1. The other host "iqn.host2" can login successfully because it matches rule 1.

The access will be denied when there is no matching rule.

5.4.6 Example

The following is an example for creating volumes. Example 1 is to create two VDs and set a global spare disk.

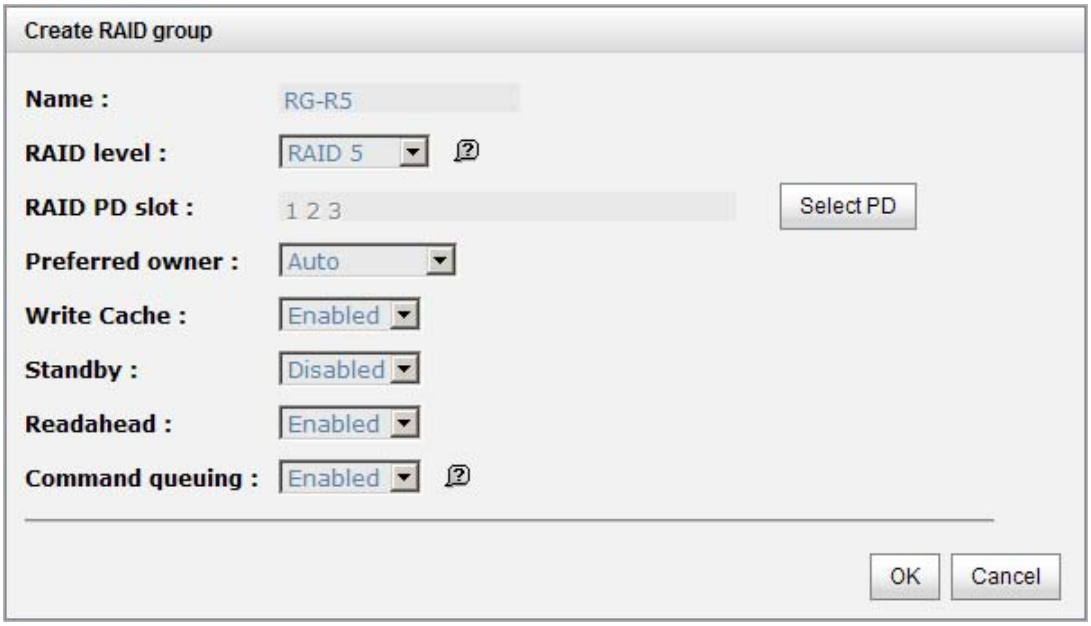
- **Example 1**

Example 1 is to create two VDs in one RG, each VD uses global cache volume. Global cache volume is created after system boots up automatically. So, no action is needed to set CV. Then set a global spare disk. Eventually, delete all of them.

Step 1: Create RG (RAID group).

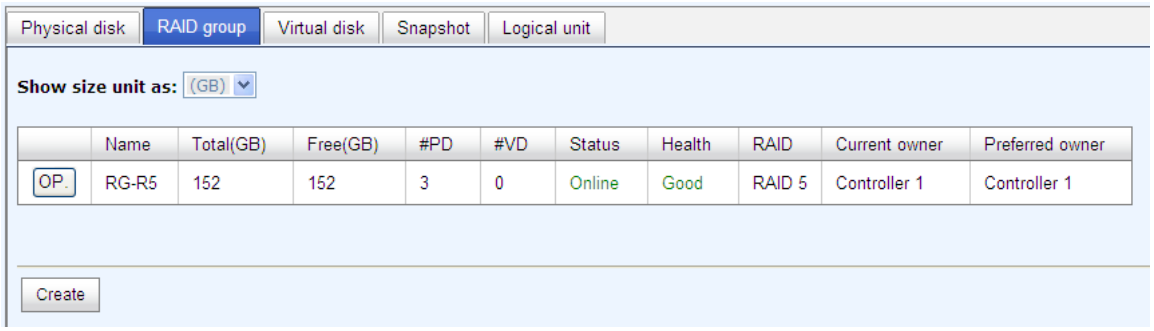
To create the RAID group, please follow these steps:

1. Select **"/ Volume configuration / RAID group"**.
2. Click "**Create**".
3. Input an RG Name, choose a RAID level from the list, click "**Select PD**" to choose the RAID PD slot(s), then click "**OK**".



4. Check the outcome. Click "**OK**" if all setups are correct.

5. Done. An RG has been created.

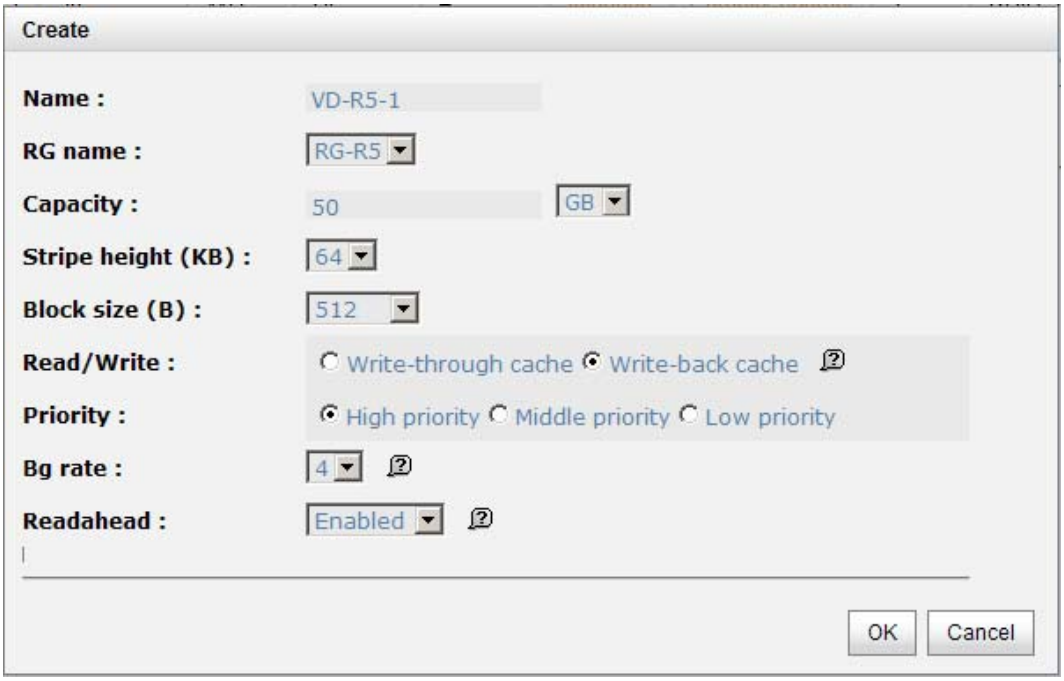


A RAID 5 RG named "RG-R5" with 3 physical disks is created. The total size is 152GB. Because there is no related VD, free size still remains 152GB.

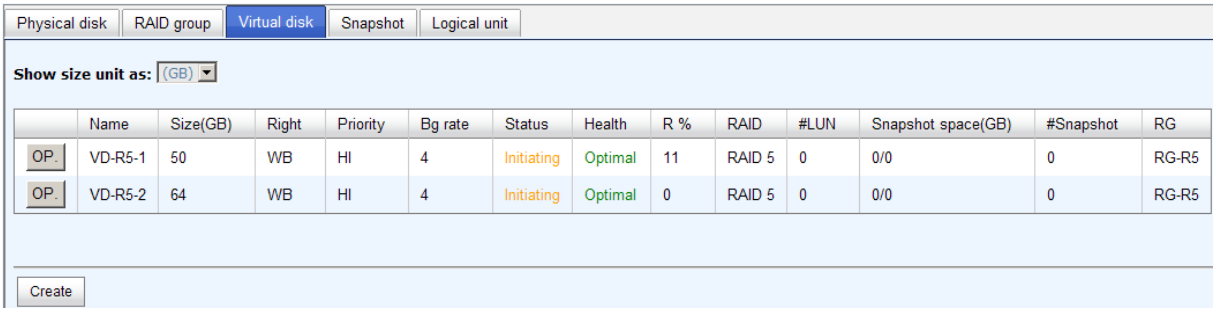
Step 2: Create VD (Virtual disk).

To create a data user volume, please follow these steps.

1. Select **"/ Volume configuration / Virtual disk"**.
2. Click "**Create**".
3. Input a VD name, choose the RG when VD will be created, enter the VD capacity, select the stripe height, block size, read/write mode, set priority, modify Bg rate if necessary, and finally click "**OK**".



4. Done. A VD has been created.
5. Repeat steps 1 to 4 to create another VD.



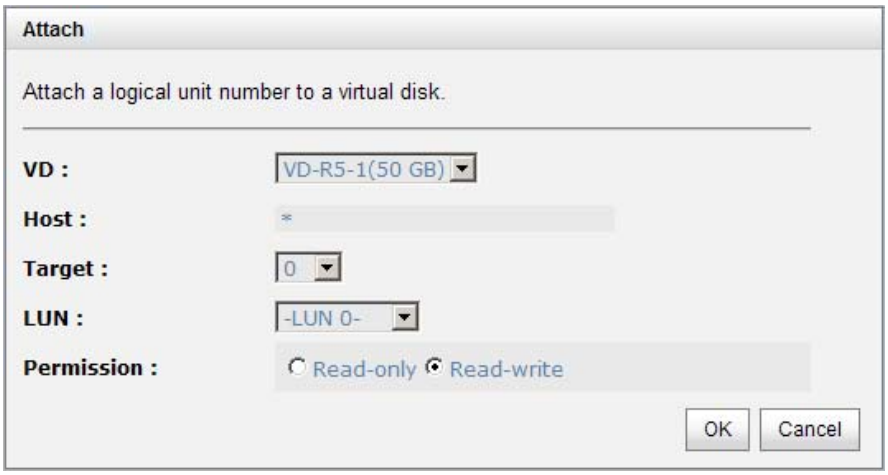
Two VDs, "VD-R5-1" and "VD-R5-2", were created from RG "RG-R5". The size of "VD-R5-1" is 50GB, and the size of "VD-R5-2" is 64GB. "VD-R5-1" is initializing about 11%. There is no LUN attached.

Step 3: Attach LUN to VD.

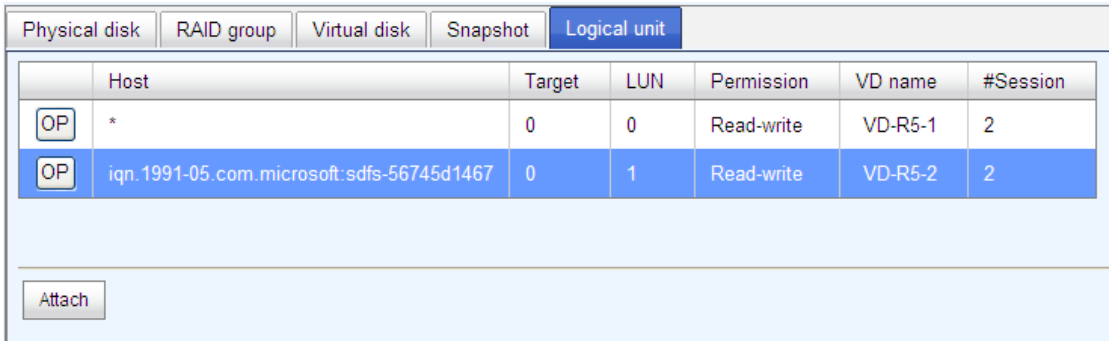
There are 2 methods to attach LUN to VD.

1. In **"/ Volume configuration / Virtual disk"**, move the mouse pointer to the gray button next to the VD number; click "Attach LUN".
2. In **"/ Volume configuration / Logical unit"**, click "**Attach**".

The steps are as follows:



1. Select a VD.
2. Input **"Host"** name, which is a FC node name for access control, or fill-in wildcard **"*",** which means every host can access to this volume. Choose LUN and permission, and then click "**OK**".
3. Done.



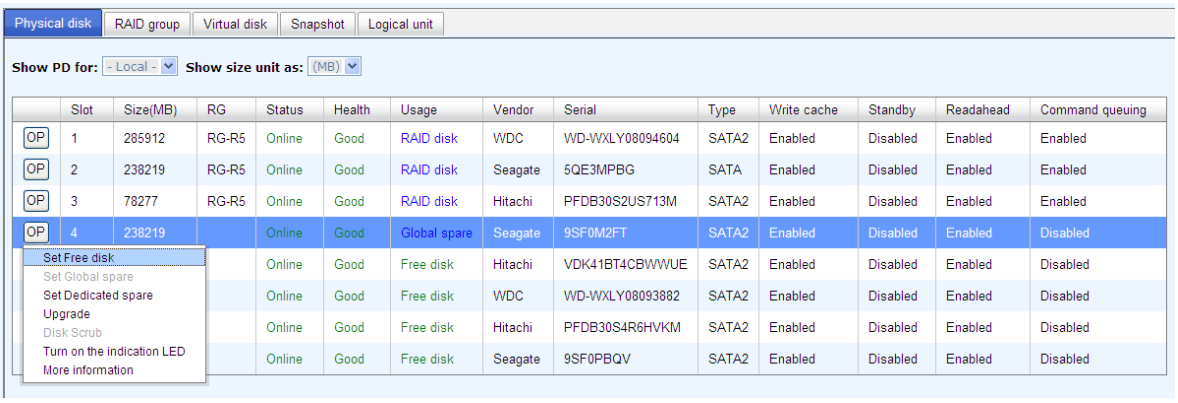
VD-R5-1 is attached to LUN 0. VD-R5-2 is attached LUN 1.

NOTE: The matching rules of access control are from top to bottom in sequence.

Step 4: Set global spare disk.

To set global spare disks, please follow the procedures.

1. Select **"/ Volume configuration / Physical disk"**.
2. Move the mouse pointer to the gray button next to the PD slot; click **"Set Global spare"**.
3. **"Global spare"** icon is shown in **"Usage"** column.



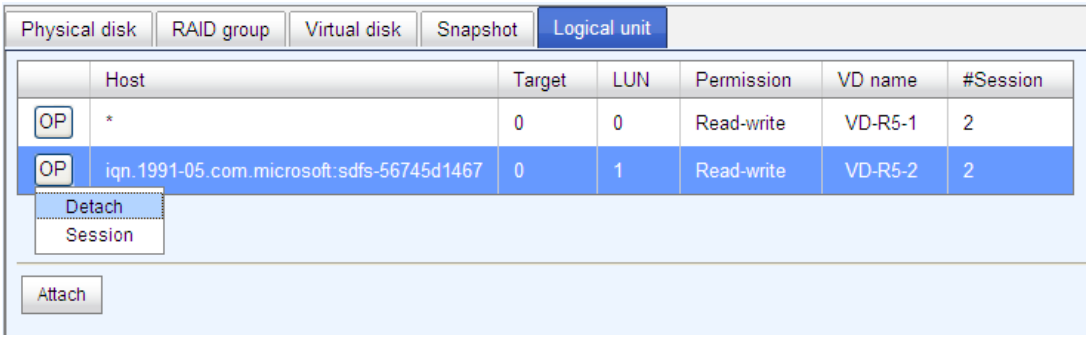
Slot 4 is set as global spare disk (GS).

Step 5: Done. LUNs can be used as disks.

To delete VDs, RG, please follow the steps listed below.

Step 6: Detach LUN from VD.

In **"/ Volume configuration / Logical unit"**,



1. Move the mouse pointer to the gray button next to the LUN; click **"Detach"**. There will pop up a confirmation page.
2. Choose "OK".
3. Done.

Step 7: Delete VD (Virtual disk).

To delete the Virtual disk, please follow the procedures:

1. Select **"/ Volume configuration / Virtual disk"**.
2. Move the mouse pointer to the gray button next to the VD number; click **"Delete"**. There will pop up a confirmation page, click **"OK"**.
3. Done. Then, the VDs are deleted.

NOTE: When deleting VD, the attached LUN(s) related to this VD will be detached automatically.

Step 8: Delete RG (RAID group).

To delete the RAID group, please follow the procedures:

1. Select **"/ Volume configuration / RAID group"**.
2. Select a RG which is no VD related on this RG, otherwise the VD(s) on this RG must be deleted first.
3. Move the mouse pointer to the gray button next to the RG number click **"Delete"**.
4. There will pop up a confirmation page, click **"OK"**.
5. Done. The RG has been deleted.

NOTE: The action of deleting one RG will succeed only when all of the related VD(s) are deleted in this RG. Otherwise, it will have an error when deleting this RG.

Step 9: Free global spare disk.

To free global spare disks, please follow the procedures.

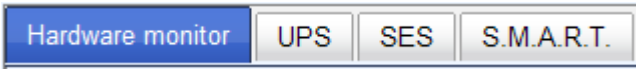
1. Select **"/ Volume configuration / Physical disk"**.
2. Move the mouse pointer to the gray button next to the PD slot; click **"Set Free disk"**.

Step 10: Done, all volumes have been deleted.

5.5 Enclosure Management

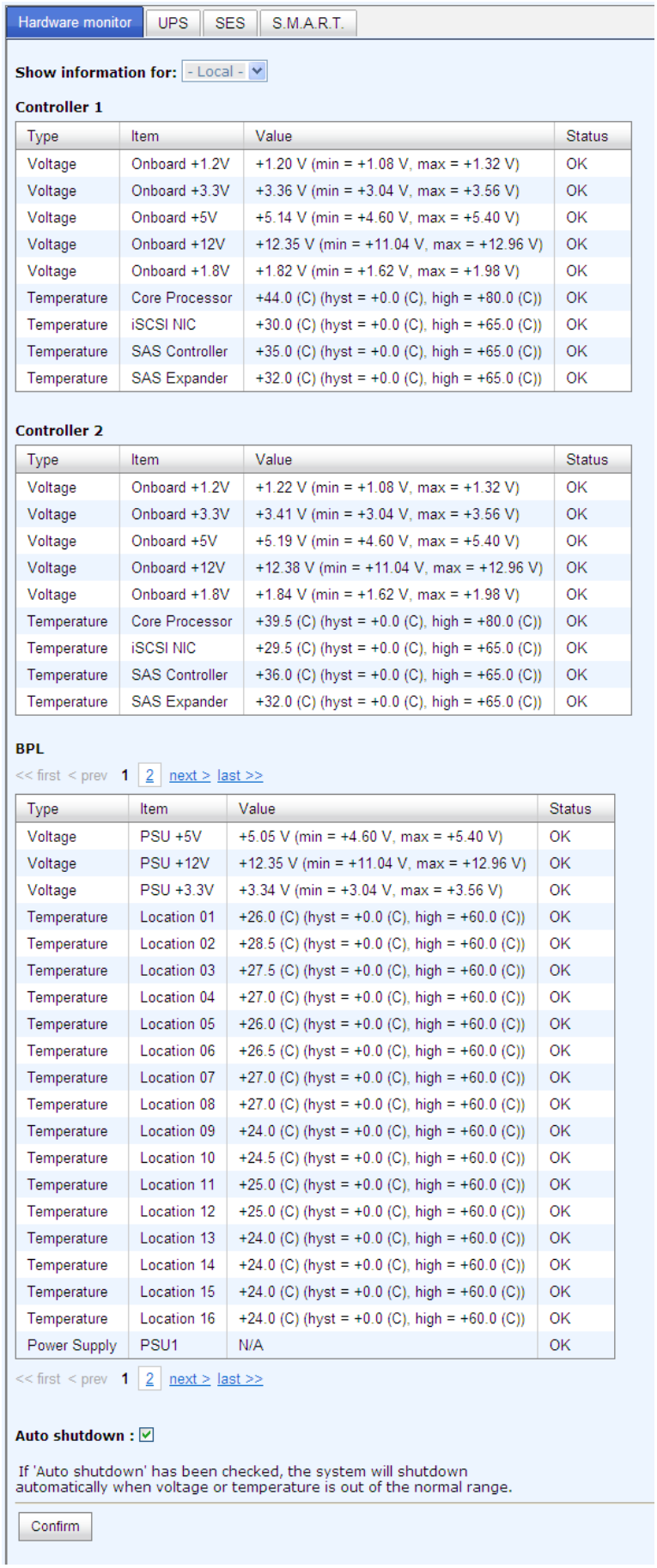
"Enclosure management" allows managing enclosure information including **"SES configuration"**, **"Hardware monitor"**, **"S.M.A.R.T."** and **"UPS"**. For the enclosure management, there are many sensors for different purposes, such as temperature sensors, voltage sensors, hard disks, fan sensors, power sensors, and LED status. Due to the different hardware characteristics among these sensors, they have different polling intervals. Below are the details of polling time intervals:

1. Temperature sensors: 1 minute.
2. Voltage sensors: 1 minute.
3. Hard disk sensors: 10 minutes.
4. Fan sensors: 10 seconds . When there are 3 errors consecutively, controller sends ERROR event log.
5. Power sensors: 10 seconds, when there are 3 errors consecutively, controller sends ERROR event log.
6. LED status: 10 seconds.



5.5.1 Hardware Monitor

"Hardware monitor" can view the information of current voltages and temperatures.



Hardware monitor | UPS | SES | S.M.A.R.T.

Show information for: - Local -

Controller 1

Type	Item	Value	Status
Voltage	Onboard +1.2V	+1.20 V (min = +1.08 V, max = +1.32 V)	OK
Voltage	Onboard +3.3V	+3.36 V (min = +3.04 V, max = +3.56 V)	OK
Voltage	Onboard +5V	+5.14 V (min = +4.60 V, max = +5.40 V)	OK
Voltage	Onboard +12V	+12.35 V (min = +11.04 V, max = +12.96 V)	OK
Voltage	Onboard +1.8V	+1.82 V (min = +1.62 V, max = +1.98 V)	OK
Temperature	Core Processor	+44.0 (C) (hyst = +0.0 (C), high = +80.0 (C))	OK
Temperature	iSCSI NIC	+30.0 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK
Temperature	SAS Controller	+35.0 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK
Temperature	SAS Expander	+32.0 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK

Controller 2

Type	Item	Value	Status
Voltage	Onboard +1.2V	+1.22 V (min = +1.08 V, max = +1.32 V)	OK
Voltage	Onboard +3.3V	+3.41 V (min = +3.04 V, max = +3.56 V)	OK
Voltage	Onboard +5V	+5.19 V (min = +4.60 V, max = +5.40 V)	OK
Voltage	Onboard +12V	+12.38 V (min = +11.04 V, max = +12.96 V)	OK
Voltage	Onboard +1.8V	+1.84 V (min = +1.62 V, max = +1.98 V)	OK
Temperature	Core Processor	+39.5 (C) (hyst = +0.0 (C), high = +80.0 (C))	OK
Temperature	iSCSI NIC	+29.5 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK
Temperature	SAS Controller	+36.0 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK
Temperature	SAS Expander	+32.0 (C) (hyst = +0.0 (C), high = +65.0 (C))	OK

BPL

<< first < prev 1 2 next > last >>

Type	Item	Value	Status
Voltage	PSU +5V	+5.05 V (min = +4.60 V, max = +5.40 V)	OK
Voltage	PSU +12V	+12.35 V (min = +11.04 V, max = +12.96 V)	OK
Voltage	PSU +3.3V	+3.34 V (min = +3.04 V, max = +3.56 V)	OK
Temperature	Location 01	+26.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 02	+28.5 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 03	+27.5 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 04	+27.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 05	+26.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 06	+26.5 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 07	+27.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 08	+27.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 09	+24.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 10	+24.5 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 11	+25.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 12	+25.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 13	+24.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 14	+24.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 15	+24.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Temperature	Location 16	+24.0 (C) (hyst = +0.0 (C), high = +60.0 (C))	OK
Power Supply	PSU1	N/A	OK

<< first < prev 1 2 next > last >>

Auto shutdown : ☑

If 'Auto shutdown' has been checked, the system will shutdown automatically when voltage or temperature is out of the normal range.

Confirm

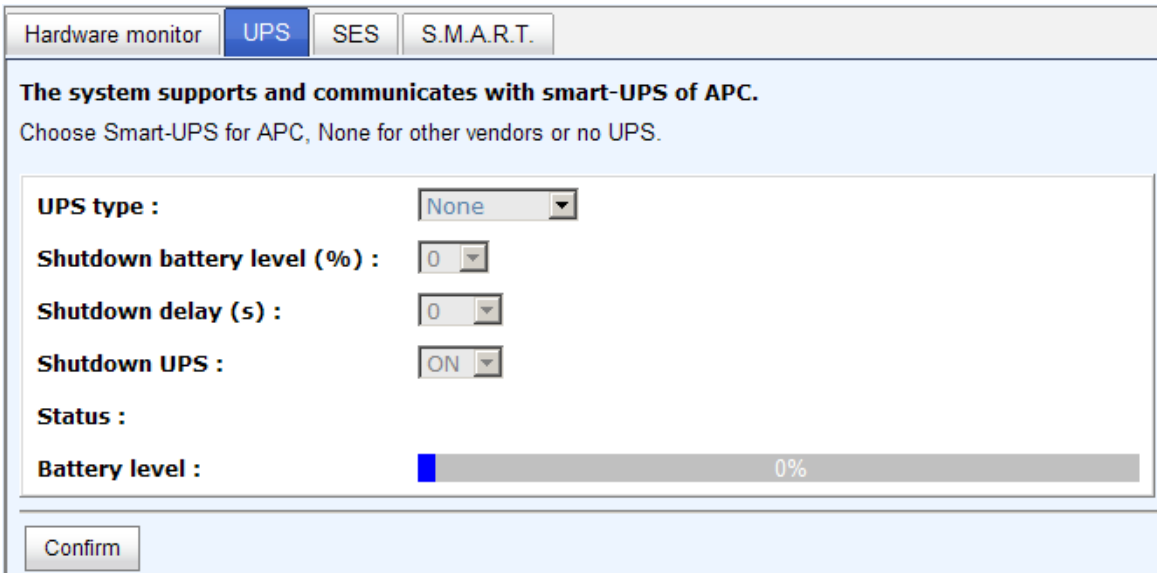
If **"Auto shutdown"** has been checked, the system will shutdown automatically when voltage or temperature is out of the normal range. For better data protection, please check **"Auto Shutdown"**.

For better protection and avoiding single short period of high temperature triggering auto shutdown, the RAID controller evaluates multiple conditions for triggering auto shutdown. Below are the details of when the Auto shutdown will be triggered.

1. There are several sensors placed on systems for temperature checking. System will check each sensor for every 30 seconds. When one of these sensor is over high temperature threshold for continuous 3 minutes, auto shutdown will be triggered immediately.
2. The core processor temperature limit is 80℃. The iSCSI NIC temperature limit is 65℃. The SAS expandor and SAS controller temperature limit is 65℃.
3. If the high temperature situation doesn't last for 3 minutes, system will not trigger auto shutdown.

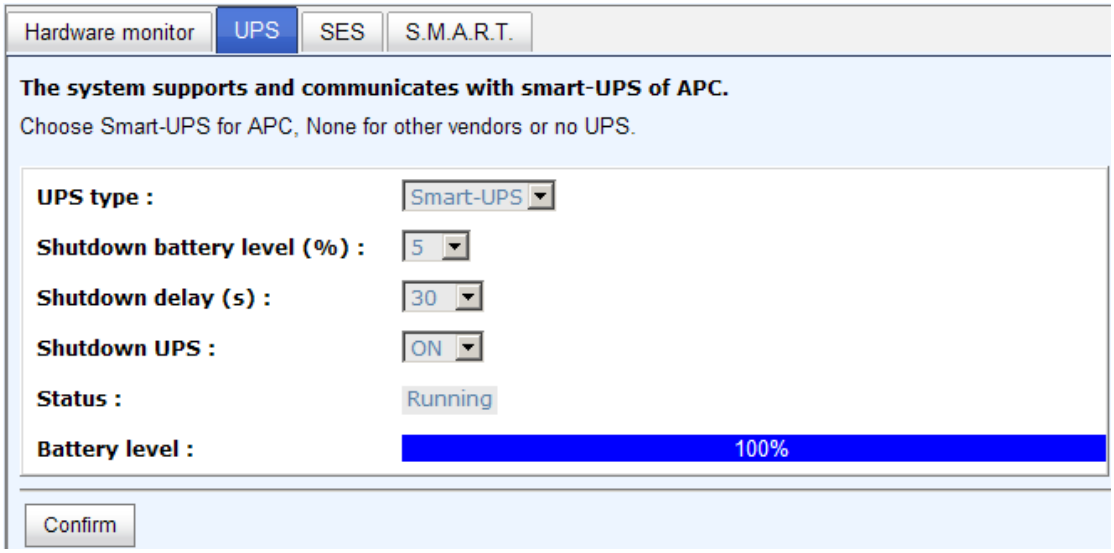
5.5.2 UPS

"UPS" is used to set up UPS (**U**ninterruptible **P**ower **S**upply).



Currently, the system only supports and communicates with APC (American Power Conversion Corp.) smart UPS. Please review the details from the website: http://www.apc.com/.

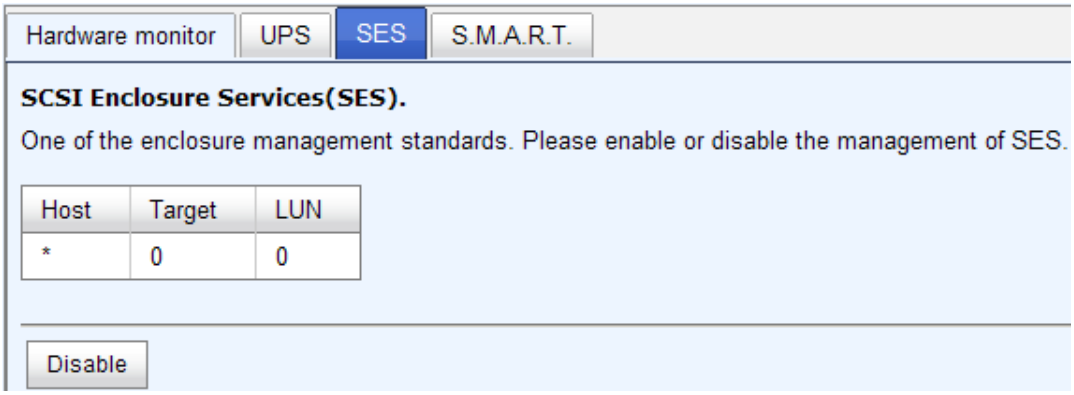
First, connect the system and APC UPS via RS-232 for communication. Then set up the shutdown values (shutdown battery level %) when power is failed. UPS in other companies can work well, but they have no such communication feature with the system.



UPS Type	Select UPS Type. Choose Smart-UPS for APC, None for other vendors or no UPS.
Shutdown Battery Level (%)	When below the setting level, system will shutdown. Setting level to **"0"** will disable UPS.
Shutdown Delay (s)	If power failure occurred, and system cannot return to value setting status, the system will shutdown. Setting delay to **"0"** will disable the function.
Shutdown UPS	Select ON, when power is gone, UPS will shut down by itself after the system shutdown successfully. After power comes back, UPS will start working and notify system to boot up. OFF will not.
Status	The status of UPS. **"Detecting…"** **"Running"** **"Unable to detect UPS"** **"Communication lost"** **"UPS reboot in progress"** **"UPS shutdown in progress"** **"Batteries failed. Please change them NOW!"**
Battery Level (%)	Current percentage of battery level.

5.5.3 SES

SES represents **S**CSI **E**nclosure **S**ervices, one of the enclosure management standards. **"SES configuration"** can enable or disable the management of SES.



Enable SES in LUN 0, and can be accessed from every host

The SES client software is available at the following web site:

SANtools: http://www.santools.com/

5.5.4 Hard Drive S.M.A.R.T. Support

S.M.A.R.T. (**S**elf-**M**onitoring **A**nalysis and **R**eporting **T**echnology) is a diagnostic tool for hard drives to deliver warning of drive failures in advance. S.M.A.R.T. provides users chances to take actions before possible drive failure.

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 can allow users 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.

"S.M.A.R.T." can display S.M.A.R.T. information of hard drives. The number is the current value; the number in parenthesis is the threshold value. The threshold values of hard drive vendors are different; please refer to vendors' specification for details.

S.M.A.R.T. only supports SATA drive. SAS drive does not have. It will show N/A in this web page.

Hardware monitor | UPS | SES | S.M.A.R.T.

Self-Monitoring Analysis and Reporting Technology(S.M.A.R.T).

A diagnostic tool for hard drives to deliver warning of drive failures in advance.
S.M.A.R.T. provides users chances to take actions before possible drive failure.

Show information for: - Local -

Slot	HDD type	Read error	Spin up	Reallocated sector	Seek error	Spin up	Calibration	Temperature
1	SAS	N/A	N/A	N/A	N/A	N/A	N/A	38
2	SAS	N/A	N/A	N/A	N/A	N/A	N/A	39
3	SAS	N/A	N/A	N/A	N/A	N/A	N/A	38
4	SAS	N/A	N/A	N/A	N/A	N/A	N/A	39
5	SAS	N/A	N/A	N/A	N/A	N/A	N/A	38
6	SAS	N/A	N/A	N/A	N/A	N/A	N/A	38
7	SAS	N/A	N/A	N/A	N/A	N/A	N/A	35
8	SAS	N/A	N/A	N/A	N/A	N/A	N/A	33

Hardware monitor | UPS | SES | S.M.A.R.T.

Self-Monitoring Analysis and Reporting Technology(S.M.A.R.T).

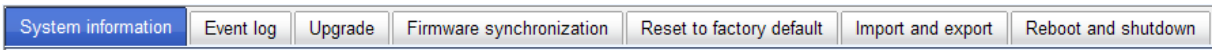
A diagnostic tool for hard drives to deliver warning of drive failures in advance.
S.M.A.R.T. provides users chances to take actions before possible drive failure.

Show information for: - Local -

Slot	HDD type	Read error	Spin up	Reallocated sector	Seek error	Spin up	Calibration	Temperature
1	SATA	100(16)	101(24)	100(5)	100(67)	100(60)	N/A	28
2	SATA	100(16)	104(24)	100(5)	100(67)	100(60)	N/A	28
3	SATA	100(16)	98(24)	100(5)	100(67)	100(60)	N/A	27
4	SATA	100(16)	97(24)	100(5)	100(67)	100(60)	N/A	27
5	SATA	100(16)	104(24)	100(5)	100(67)	100(60)	N/A	28
6	SATA	100(16)	100(24)	100(5)	100(67)	100(60)	N/A	27
7	SATA	100(16)	99(24)	100(5)	100(67)	100(60)	N/A	27
8	SATA	100(16)	103(24)	100(5)	100(67)	100(60)	N/A	26

5.6 System Maintenance

"Maintenance" allows the operations of system functions which include **"System information"** to show the system version and details, **"Event log"** to view system event logs to record critical events, **"Upgrade"** to the latest firmware, **"Firmware synchronization"** to synchronized firmware versions on both controllers, **"Reset to factory default"** to reset all controller configuration values to factory settings, **"Import and export"** to import and export all controller configuration to a file, and **"Reboot and shutdown"** to reboot or shutdown the system.



5.6.1 System Information

"System information" can display system information, including CPU type, installed system memory, firmware version, serial numbers of dual controllers, backplane ID, and system status.

Item	Information
CPU type	XSC3-IOP8134x Family rev 9 (v5l)
System memory	ECC Unbuffered DDR-II 2048MB
Firmware version	EP-3164D-GAS3 1.0.2 (build 201003091700)
Serial number	001378B50380 (Controller 1 : 50013780039014D8 , Controller 2 : 5001378003901798)
Backplane ID	R6R
Status	Normal

Status description:

Normal	Dual controllers are in normal stage.
Degraded	One controller fails or has been plugged out..
Lockdown	The firmware of two controllers is different or the size of memory of two controllers is different.
Single	Single controller mode.

5.6.2 Event Log

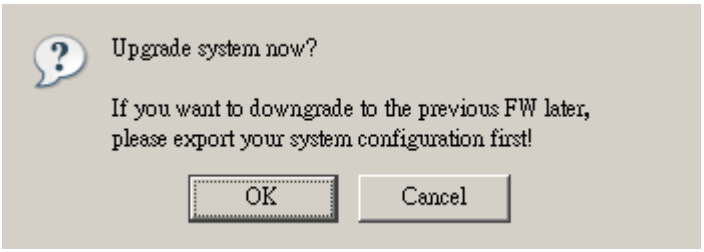
"Event log" can view the event messages. Check the checkbox of INFO, WARNING, and ERROR to choose the level of event log display. Click **"Download"** button to save the whole event log as a text file with file name "log-ModelName-SerialNumber-Date-Time.txt". Click **"Clear"** button to clear all event logs. Click **"Mute"** button to stop alarm if system alerts.

The event log is displayed in reverse order which means the latest event log is on the first page. The event logs are actually saved in the first four hard drives; each hard drive has one copy of event log. For one controller, there are four copies of event logs to make sure users can check event log any time when there is/are failed disk(s).

NOTE: Please plug-in any of the first four hard drives, then event logs can be saved and displayed in next system boot up. Otherwise, the event logs would disappear.

5.6.3 Upgrade

"Upgrade" can upgrade firmware. Please prepare new firmware file named **"xxxx.bin"** in local hard drive, then click **"Browse"** to select the file. Click **"Confirm"**, it will pop up a message "Upgrade system now? If you want to downgrade to the previous FW later (not recommend), please export your system configuration in advance", click **"Cancel"** to export system configuration in advance, then click **"OK"** to start to upgrade firmware.

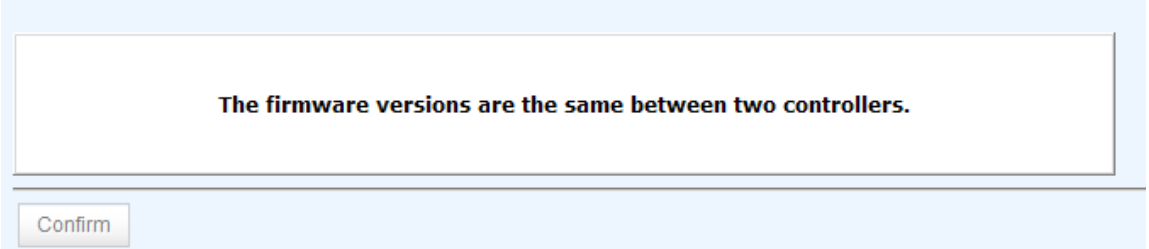


When upgrading, there is a progress bar running. After finished upgrading, the system must reboot manually to make the new firmware took effect.

NOTE: Please contact your vendor for the latest firmware.

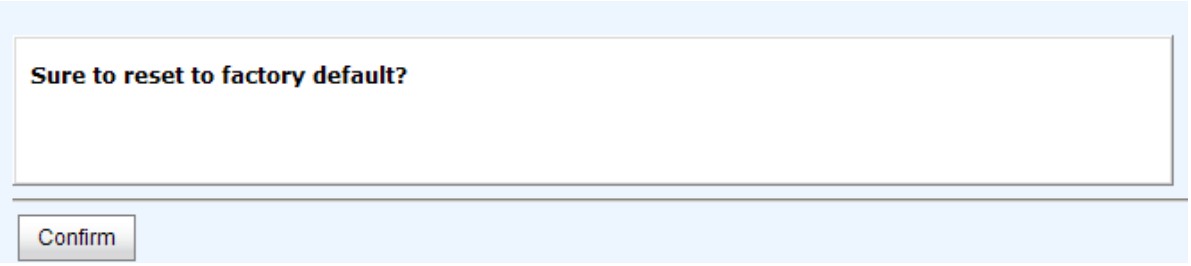
5.6.4 Firmware Synchronization

"Firmware synchronization" can synchronize the firmware version when controller 1 and controller 2's firmware are different. It will upgrade the firmware of slave controller to master ones no matter what the firmware version of slave controller is newer or older than master. In normal status, the firmware versions in controller 1 and 2 are the same as below figure.



5.6.5 Reset to Factory Default

"Reset to factory default" allows user to reset controller to factory default setting.



Reset to default value, the password is: **1234**, and IP address to default DHCP.
Default IP address: **192.168.10.50** (DHCP)
Default subnet mask: **255.255.255.0**
Default gateway: **192.168.10.254**

5.6.6 Import and Export

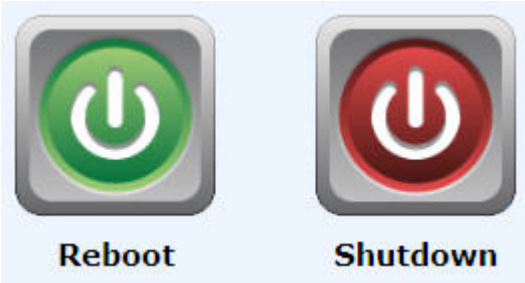
"Import and export" allows user to save system configuration values: export, and apply all configuration: import. For the volume configuration setting, the values are available in export and not available in import which can avoid confliction / date-deleting between two controllers which mean if one system already has valuable volumes in the disks and user may forget and overwrite it. Use import could return to original configuration. If the volume setting was also imported, user's current volumes will be overwritten with different configuration.

1. **Import:** Import all system configurations excluding volume configuration.
2. **Export:** Export all configurations to a file.

WARNING: "Import" will import all system configurations excluding volume configuration; the current configurations will be replaced.

5.6.7 Reboot and Shutdown

"Reboot and shutdown" displays **"Reboot"** and **"Shutdown"** buttons. Before power off, it's better to execute **"Shutdown"** to flush the data from cache to physical disks. The step is necessary for data protection.



5.7 Home/Logout/Mute

In the right-upper corner of web UI, there are 3 individual icons, **"Home"**, **"Logout"**, and **"Mute"**.

5.7.1 Home

Click **"Home"** to return to home page

5.7.2 Logout

For security reason, please use **"Logout"** to exit the web UI. To re-login the system, please enter username and password again.

5.7.3 Mute

Click **"Mute"** to stop the alarm when error occurs.

Chapter 6 Advanced Operations

6.1 Volume Rebuild

If one physical disk from a RG, which is set to a protected RAID level (e.g. RAID 3, RAID 5, or RAID 6), failed or has been unplugged/removed, the status of RG is changed to degraded mode. The system will search/detect spare disk to rebuild the degraded RG to become normal/complete. It will detect dedicated spare disk as rebuild disk first, then global spare disk.

The iSCSI RAID subsystem supports Auto-Rebuild. The following is the scenario:

Take RAID 6 for example:

1. When there is no global spare disk or dedicated spare disk in the system, controller will be in degraded mode and wait until (A) there is one disk assigned as spare disk, or (B) the failed disk is removed and replaced with new clean disk, then the Auto-Rebuild starts. The new disk will be a spare disk to the original RG automatically.

   If the new added disk is not clean (with other RG information), it would be marked as RS (reserved) and the system will not start "auto-rebuild".

   If this disk is not belonging to any existing RG, it would be FR (Free) disk and the system will start Auto-Rebuild.

   If user only removes the failed disk and plugs the same failed disk in the same slot again, the auto-rebuild will start running. But rebuilding in the same failed disk may impact customer data if the status of disk is unstable. It is recommended for users not to rebuild in the failed disk for better data protection.

2. When there is enough global spare disk(s) or dedicated spare disk(s) for the degraded array, the system starts Auto-Rebuild immediately. And in RAID 6, if another disk failure occurs during rebuilding, the system will start the above Auto-Rebuild process as well. Auto-Rebuild feature only works when the status of RG is **"Online"**. It will not work at **"Offline"** status. Thus, it will not conflict with the **"Roaming"**.

3. In degraded mode, the status of RG is **"Degraded"**. When rebuilding, the status of RG/VD will be **"Rebuild"**, the column **"R%"** in VD will display the ratio in percentage. After completing the rebuilding process, the status will become "Online". RG will become complete or normal.

NOTE: "Set dedicated spare" is not available if there is no RG, or if RG is set to RAID 0 or JBOD, because user can not set dedicated spare disk to RAID 0 & JBOD.

Sometimes, rebuild is called recover; they are the same meaning. The following table is the relationship between RAID levels and rebuild.

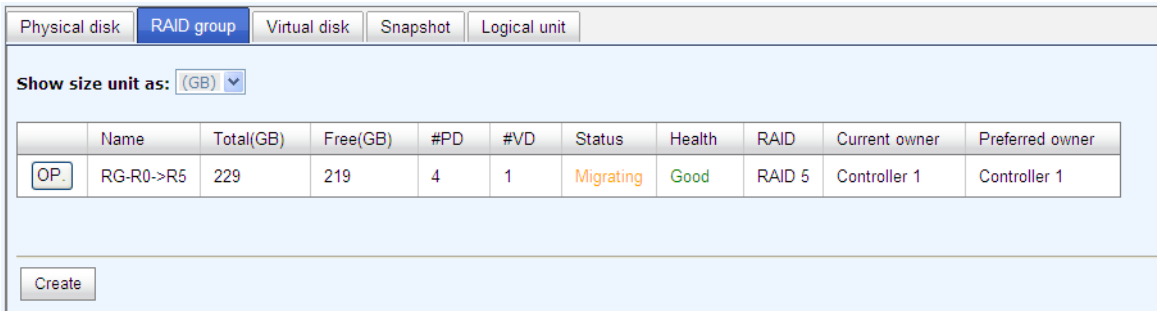
RAID 0	Disk striping. No protection for data. RG fails if any hard drive fails or unplugs.
RAID 1	Disk mirroring over 2 disks. RAID 1 allows one hard drive fails or unplugging. Need one new hard drive to insert to the system and rebuild to be completed.
N-way mirror	Extension to RAID 1 level. It has N copies of the disk. N-way mirror allows N-1 hard drives failure or unplugging.
RAID 3	Striping with parity on the dedicated disk. RAID 3 allows one hard drive failure or unplugging.
RAID 5	Striping with interspersed parity over the member disks. RAID 5 allows one hard drive failure or unplugging.
RAID 6	2-dimensional parity protection over the member disks. RAID 6 allows two hard drives failure or unplugging. If it needs to rebuild two hard drives at the same time, it will rebuild the first one, then the other in sequence.
RAID 0+1	Mirroring of RAID 0 volumes. RAID 0+1 allows two hard drive failures or unplugging, but at the same array.
RAID 10	Striping over the member of RAID 1 volumes. RAID 10 allows two hard drive failure or unplugging, but in different arrays.
RAID 30	Striping over the member of RAID 3 volumes. RAID 30 allows two hard drive failure or unplugging, but in different arrays.
RAID 50	Striping over the member of RAID 5 volumes. RAID 50 allows two hard drive failures or unplugging, but in different arrays.
RAID 60	Striping over the member of RAID 6 volumes. RAID 40 allows four hard drive failures or unplugging, every two in different arrays.
JBOD	The abbreviation of **"J**ust a **B**unch **O**f **D**isks**"**. No data protection. RG fails if any hard drive failures or unplugs.

6.2 RG Migration

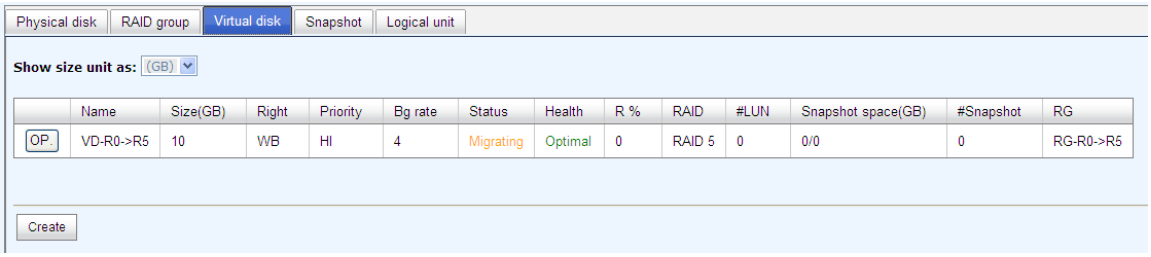
To migrate the RAID level, please follow the steps below.

1. Select **"/ Volume configuration / RAID group"**.
2. Move the mouse pointer to the gray button next to the RG number; click **"Migrate"**.
3. Change the RAID level by clicking the down arrow to **"RAID 5"**. There will be a pup-up which indicates that HDD is not enough to support the new setting of RAID level, click "**Select PD**" to increase hard drives, then click "**OK** " to go back to setup page. When doing migration to lower RAID level, such as the original RAID level is RAID 6 and user wants to migrate to RAID 0, system will evaluate whether this operation is safe or not, and appear a message of **"Sure to migrate to a lower protection array?"** to give user warning.

4. Double check the setting of RAID level and RAID PD slot. If there is no problem, click "**OK**".
5. Finally a confirmation page shows the detail of RAID information. If there is no problem, click "**OK**" to start migration. System also pops up a message of **"Warning: power lost during migration may cause damage of data!"** to give user warning. When the power is abnormally off during the migration, the data is in high risk.
6. Migration starts and it can be seen from the **"status"** of a RG with **"Migrating"**. In **"/ Volume configuration / Virtual disk"**, it displays a **"Migrating"** in **"Status"** and complete percentage of migration in **"R%"**.



A RAID 0 with 3 physical disks migrates to RAID 5 with 4 physical disks.



To do migration, the total size of RG must be larger or equal to the original RG. It does not allow expanding the same RAID level with the same hard disks of original RG.

The operation is not allowed when RG is being migrated. System would reject following operations:

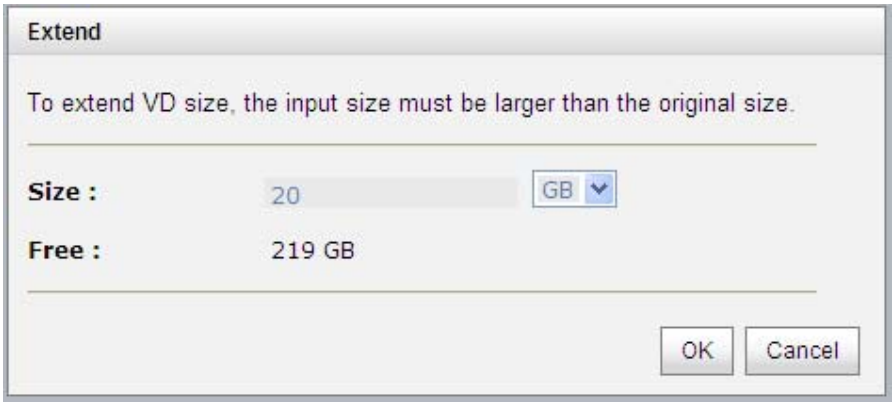
1. Add dedicated spare.
2. Remove a dedicated spare.
3. Create a new VD.
4. Delete a VD.
5. Extend a VD.
6. Scrub a VD.
7. Perform yet another migration operation.
8. Scrub entire RG.
9. Take a new snapshot.
10. Delete an existing snapshot.
11. Export a snapshot.
12. Rollback to a snapshot.

IMPORTANT! RG Migration cannot be executed during rebuild or VD extension.

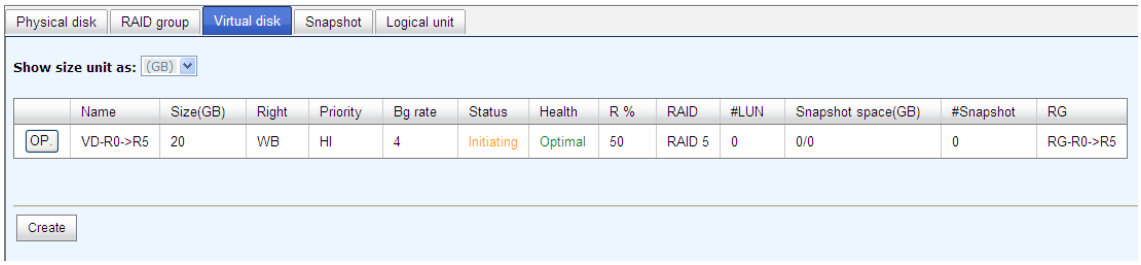
6.3 VD Extension

To extend VD size, please follow the procedures.

1. Select **"/ Volume configuration / Virtual disk"**.
2. Move the mouse pointer to the gray button next to the VD number; click **"Extend"**.
3. Change the size. The size must be larger than the original, and then click "**OK**" to start extension.



4. Extension starts. If VD needs initialization, it will display **"Initiating"** in **"Status"** and the completed percentage of initialization in **"R%"** column.

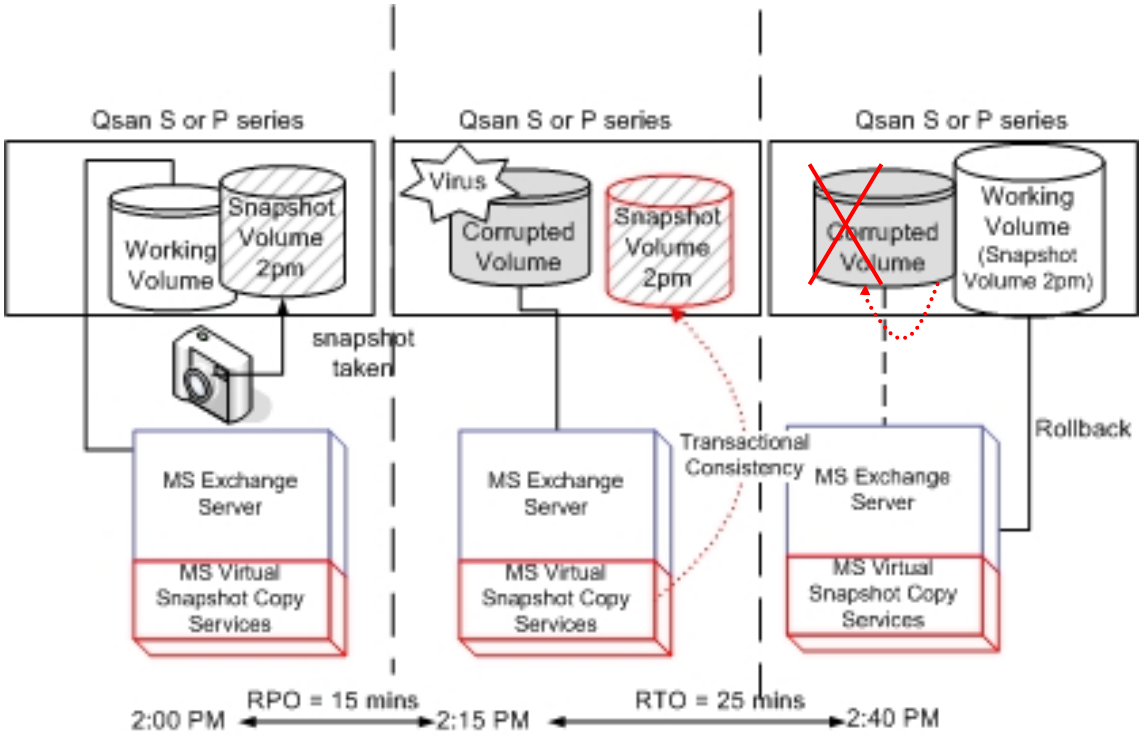


NOTE: The size of VD extension must be larger than original.

IMPORTANT! VD Extension cannot be executed during rebuild or migration.

6.4 Snapshot / Rollback

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. The certain location, named as "Snap VD", is essentially a new VD.which can be attached to a LUN provisioned to a host as a disk like other ordinary VDs in the system. 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). Snap VD is allocated within the same RG in which the snapshot is taken, we suggest to reserve 20% of RG size or more for snapshot space. Please refer to the figure below for the snapshot concept.

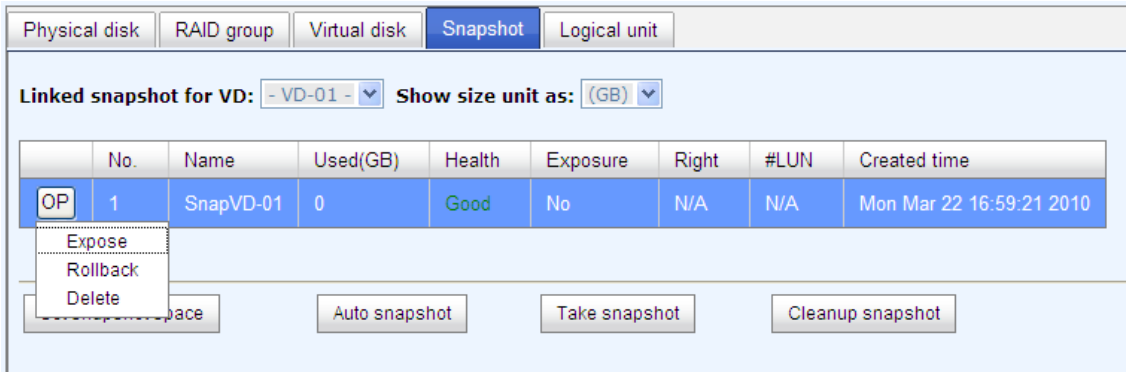


IMPORTANT! Snapshot / rollback features need at least 1 GB controller cache RAM. Please also refer to RAM certification list in Appendix A.

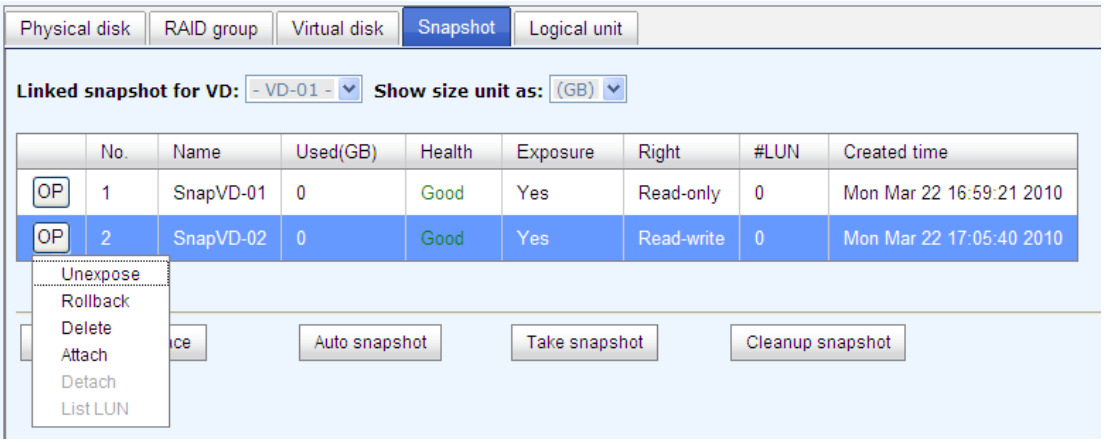
6.4.1 Create Snapshot Volume

To take a snapshot of the data, please follow the procedures.

1. Select **"/ Volume configuration / Virtual disk"**.
2. Move the mouse pointer to the gray button next to the VD number; click **"Set snapshot space"**.
3. Set up the size for snapshot. The minimum size is suggested to be **20%** of VD size, then click "**OK**". It will go back to the VD page and the size will show in snapshot column. It may not be the same as the number entered because some size is reserved for snapshot internal usage. There will be 2 numbers in **"Snapshot (MB)"** column. These numbers are **"Used snapshot space"** and **"Total snapshot space"**.
4. There are two methods to take snapshot. In **"/ Volume configuration / Virtual disk"**, move the mouse pointer to the gray button next to the VD number; click **"Take snapshot"**. Or in **"/ Volume configuration / Snapshot"**, click "**Take snapshot**".
5. Enter a snapshot name, then click "**OK**". A snapshot VD is created.
6. Select **"/ Volume configuration / Snapshot"** to display all snapshot VDs related to the VD



7. Move the mouse pointer to the gray button next to the Snapshot VD number; click **"Expose"**. Enter a capacity for snapshot VD. If size is zero, the exposed snapshot VD will be read only. Otherwise, the exposed snapshot VD can be read / written, and the size will be the maximum capacity to read/write.
8. Attach a LUN for snapshot VD. Please refer to the previous chapter for attaching a LUN.
9. Done. It can be used as a disk.



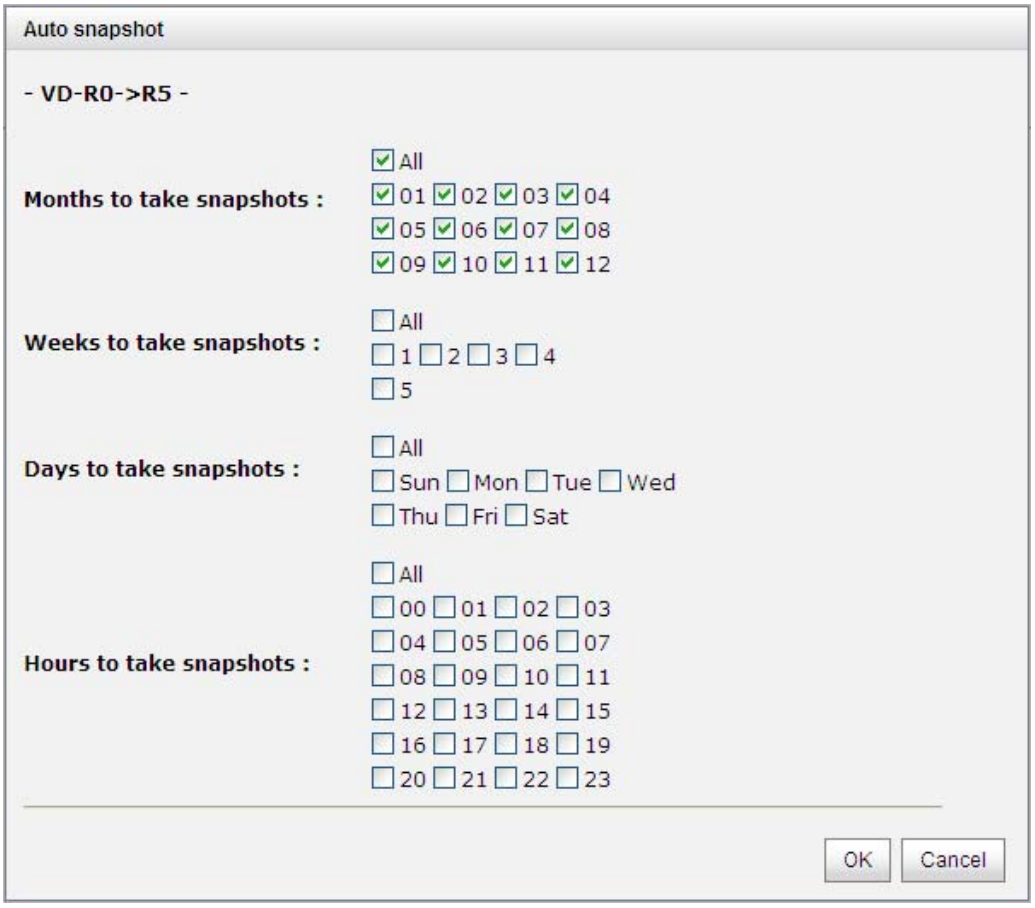
This is the snapshot list of "VD-01". There are two snapshots. Snapshot VD "SnapVD-01" is exposed as read-only, "SnapVD-02" is exposed as read-write.

10. There are two methods to clean all snapshots. In **"/ Volume configuration / Virtual disk"**, move the mouse pointer to the gray button next to the VD number; click **"Cleanup snapshot"**. Or in **"/ Volume configuration / Snapshot"**, click "**Cleanup**".
11. "**Cleanup snapshot**" will delete all snapshots related to the VD and release snapshot space.

6.4.2 Auto Snapshot

The snapshot copies can be taken manually or by schedule such as hourly or daily. Please follow the procedures.

1. There are two methods to set auto snapshot. In **"/ Volume configuration / Virtual disk"**, move the mouse pointer to the gray button next to the VD number; click **"Auto snapshot"**. Or in **"/ Volume configuration / Snapshot"**, click "**Auto snapshot**".
2. The auto snapshot can be set monthly, weekly, daily, or hourly.
3. Done. It will take snapshots automatically.



It will take snapshots every month, and keep the last 32 snapshot copies.

NOTE: Daily snapshot will be taken every 00:00. Weekly snapshot will be taken every Sunday 00:00. Monthly snapshot will be taken every first day of month 00:00.

6.4.3 Rollback

The data in snapshot VD can rollback to original VD. Please follow the steps.

1. Select **"/ Volume configuration / Snapshot"**.
2. Mouse moves to the gray button next to the Snap VD number which user wants to rollback the data; click **"Rollback"**.
3. Done, the data in snapshot VD will rollback to original VD.

Rollback has some constraints as described in the following:

1. Minimum RAM size required for enabling rollback is **1GB**.
2. When making a rollback, the original VD cannot be accessed for a while. At the same time, the system connects to original VD and snapshot VD, and then starts rollback.

3. During rollback, data from snapshot VD to original VD, the original VD can be accessed and the data in VD just like it has finished rollback. At the same time, the other related snap VD(s) cannot be accessed.
4. After rollback, the other snapshot VD(s) after the VD which is doing rollback will be deleted.

IMPORTANT! Before executing rollback, it is better to dismount the file system for flushing data from cache to disks in OS first. System sends pop-up message when user executes rollback function.

6.5 Disk Roaming

Physical disks can be re-sequenced in the same system or move all physical disks from system-1 to system-2. This is called disk roaming. System can execute disk roaming online. Please follow these steps:

1. Select **"/ Volume configuration / RAID group"**.
2. Move the mouse pointer to the gray button next to the RG number; click **"Deactivate"**.
3. Move all PDs related to the RG to another system.
4. In the web GUI of the other system, move the mouse pointer to the gray button next to the RG number; click **"Activate"**.
5. Done.

Disk roaming has some constraints as described in the following:

1. Check the firmware of two systems first. It is better that both systems have the same firmware version or newer.
2. All physical disks of related RG should be moved from system-1 to system-2 together. The configuration of both RG and VD will be kept but LUN configuration will be cleared in order to avoid conflict with system-2.

6.6 MPIO and MC/S

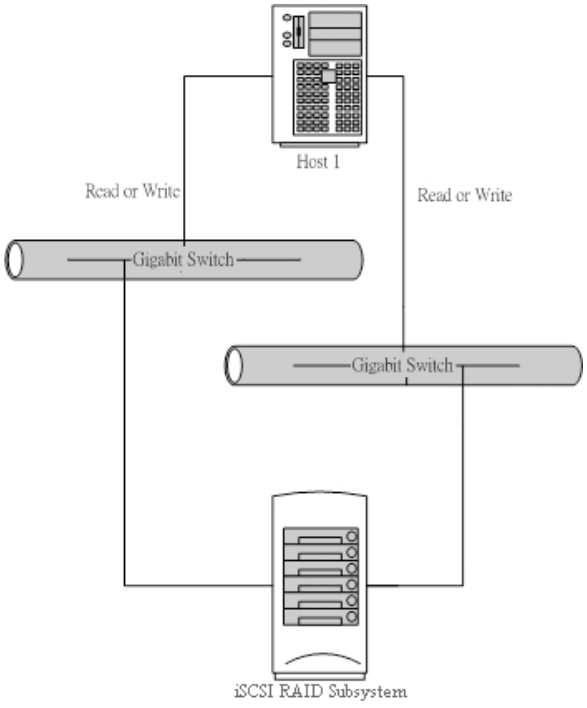
MPIO (Multi-Path Input/Output) and **MC/S** (Multiple Connections per Session) use multiple physical paths to create logical "paths" between the server and the storage device. In the case which one or more of these components fails, causing the path to fail, multi-path logic uses an alternate path for I/O. So applications can still access their data.

Microsoft iSCSI initiator supports multi-path. Please follow the procedures to use MPIO feature.

1. A host with dual or more LAN ports connects cables to controller.
2. Create a RG / VD and attach this VD to the host.
3. When installing **"Microsoft iSCSI initiator"**, please install MPIO driver at the same time.
4. Logon to target separately on each port. When logon to target, check **"Enable multi-path"**.
5. MPIO mode can be selected on Targets → Details → Devices → Advanced in Microsoft iSCSI initiator.
6. Rescan disk.
7. There will be one disk running MPIO.

Here is the instruction to setup MPIO or MC/S. The following network diagrams are the examples. Please follow them to setup the environment. Remind that host must have multi NICs which are set up as different IPs.

1. Dual ports with MPIO (Direct connect, host has 2 LAN ports, read or write in one UDV)



2. Dual ports with MPIO (Via switches, host has 2 LAN ports, read or write in one UDV)

The MPIO setup instructions are in the following:

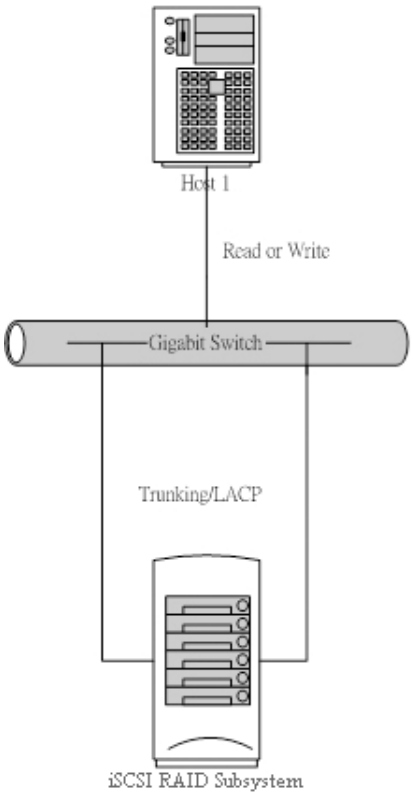
1. Create a RG and VD, and then attach LUN.
2. Add the first "Target Portal" on Microsoft iSCSI initiator.
3. Add the second "Target Portal" on Microsoft iSCSI initiator.
4. Logon.
5. Enable **"Enable multi-path"** checkbox. Then click **"Advanced…"**
6. Select the first "Source IP" and "Target Portal" to iSCSI data port 1. Then click **"OK"**.
7. Logon again.
8. Enable **"Enable multi-path"** checkbox. Then click **"Advanced…"**
9. Select the second "Source IP" and "Target Portal" to iSCSI data port 2. Then click **"OK"**.
10. iSCSI device is connected. Click **"Details"**.
11. Click **"Device"** tab, then click **"Advanced"**.
12. Click **"MPIO"** tab, select **"Load Balance Policy"** to **"Round Robin"**.
13. Click **"Apply"**.
14. Run **"Device Manage"** in Windows. Make sure MPIO device is available.
15. Done.

The MC/S setup instructions are in the following:

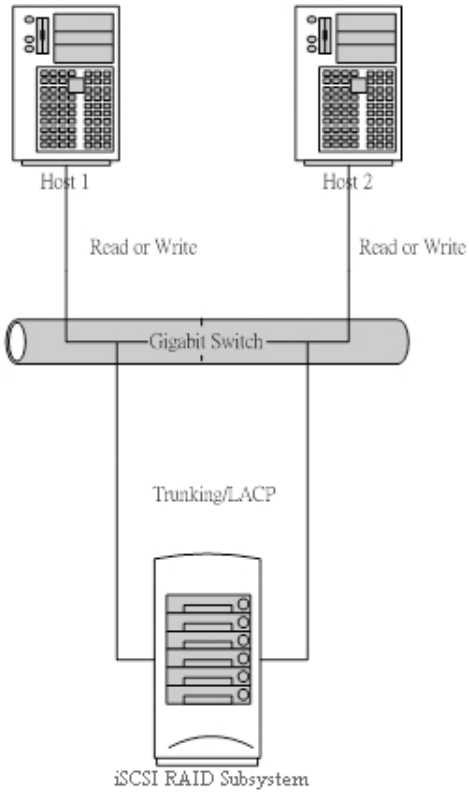
1. Create RG / VD, and then attach LUN.
2. Add the first "Target Portal" on Microsoft iSCSI initiator, For MC/S, there is only ONE **"Target Portals"** in the **"Discovery"** tab.
3. Logon.
4. Then click **"Advanced…"**
5. Select the first "Source IP" and "Target Portal" to iSCSI data port 1. Then click **"OK"**.
6. After connected, click **"Details"**, then in the **"Session"** tab, click **"Connections"**.
7. Choose **"Round Robin"** in **"Load Balance Policy"**.
8. **"Add"** Source Portal for the iSCSI data port 2.
9. Select the second "Source IP" and "Target Portal" to iSCSI data port 2. Then select **"OK"**.
10. Done.

6.7 Trunking and LACP

Here is the instruction to setup Trunking and LACP. The following network diagrams are the examples. Please follow them to setup the environment. Remind that gigabit switch must support trunking or LACP; otherwise these functions cannot work. The running path in trunking or LACP mode is decided by an operation of MAC addresses of host and target. It's better to prepare two or more hosts. Fortunately the performance can be increased obviously.



1. Dual ports with Trunking/LACP (Via switch, read or write in one UDV)



2. Dual ports with Trunking/LACP (With 2 hosts, one read, one write in 2 UDVs at the same time)

The setup instructions are in the following:

1. In **"/ iSCSI configuration / NIC"**, click the button **"Aggregation"**.
2. Decide to use Trunking or LACP, and then select at least two NICs for link aggregation.

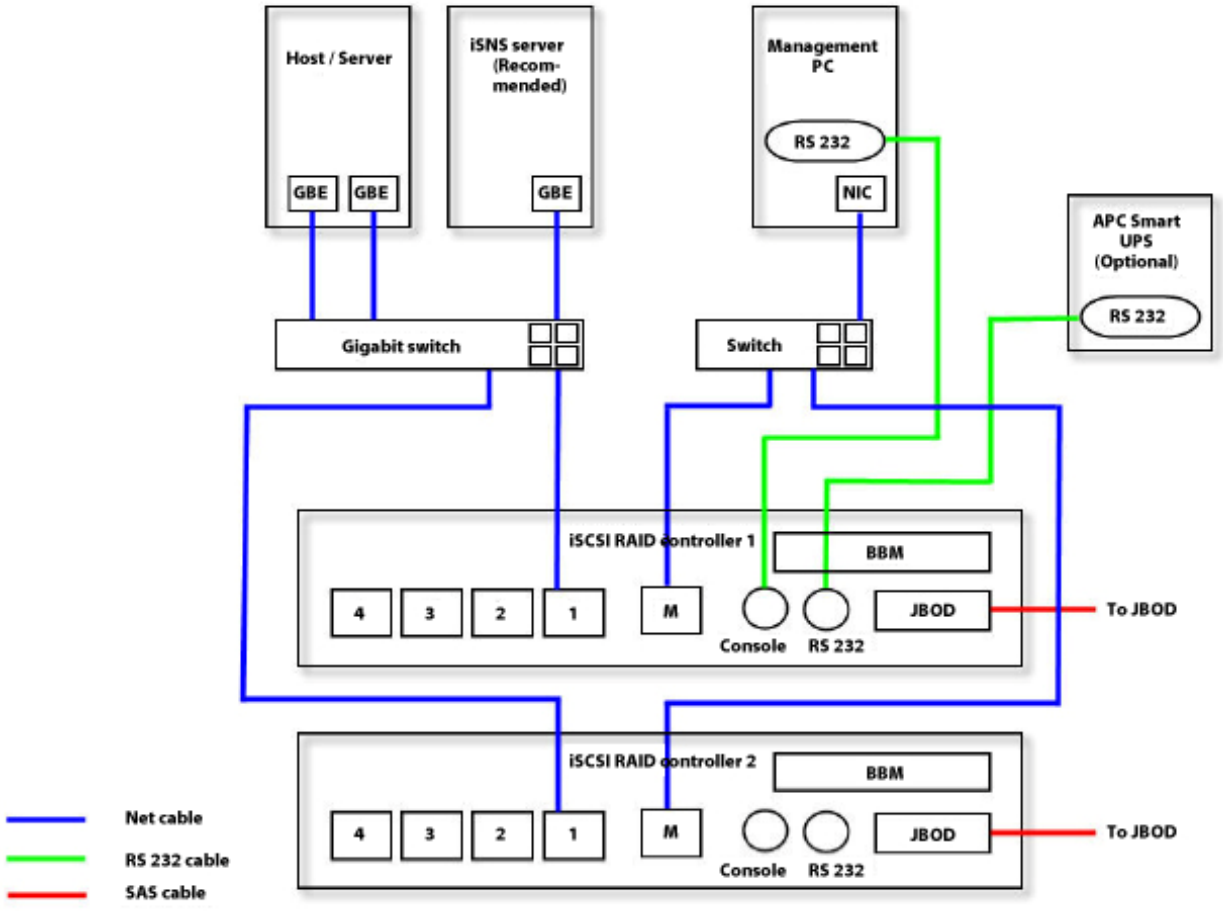
3. Enable Trunking or LACP of ports which are connected to target iSCSI ports in gigabit switch.
4. Create a RG and VD, and then attach LUN. Logon by Microsoft iSCSI initiator.
5. Done.

IMPORTANT! Before using trunking or LACP, he gigabit switch must support trunking or LACP and enabled. Otherwise, host cannot connect the link with storage device.

6.8 Dual Controllers

6.8.1 Perform I/O

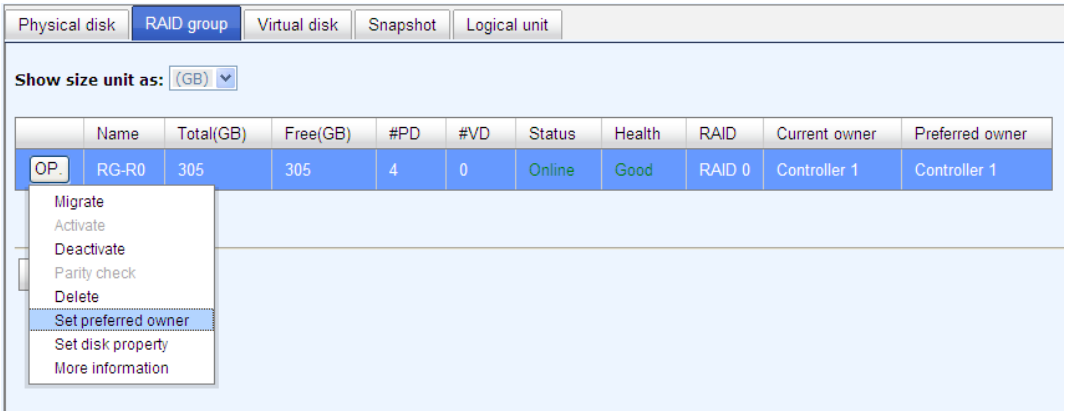
Please refer to the following topology and have all the connections ready. To perform I/O on dual controllers, server/host should setup MPIO. MPIO policy will keep I/O running and prevent fail connection with single controller failure.

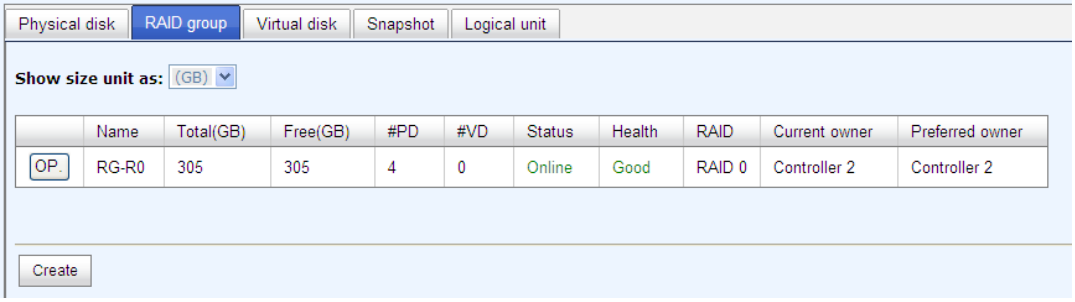


6.8.2 Ownership

When creating RG, it will be assigned with a prefered owner, the default owner is controller 1. To change the RG ownership, please follow the procedures.

1. Select **"/ Volume configuration / RAID group"**.
2. Check the gray button next to the RG name; click **"Set preferred owner"**.
3. The ownership of the RG will be switched to the other controller.





The RG ownership is changed to the other controller.

6.8.3 Controller Status

There are four statuses described on the following. It can be found in **"/ System maintenance / System information"**.

1. **Normal:** Dual controller mode. Both of controllers are functional.

2. **Degraded:** Dual controller mode. When one controller fails or has been plugged out, the system will turn to degraded. In this stage, I/O will force to write through for protecting data and the ownership of RG will switch to good one. For example: if controller 1 which owns the RG1 fails accidently, the ownership of RG1 will be switched to controller 2 automatically. And the system and data can keep working well. After controller 1 is fixed or replaced, The current owner of all RGs will be asigned back to their prefered owner.

3. **Lockdown:** Dual controller mode. The firmware of two controllers is different or the size of memory of two controllers is different. In this stage, only master controller can work and I/O will force to write through for protecting data.

4. **Single:** Single controller mode. In the stage, the controller must stay in slot A. Dongle boards for SATA drives are not necessary. The differences between single and degraded are described on the following. There is no error message for inserted one controller only. I/O will not force to write through. And there is no ownership of RG. Single controller mode can be upgraded to dual controller mode, please contact the distributor for upgradable.

In addition, iSNS server is recommended. It's important for keeping I/O running smoothly when RG ownership is switching or single controller is failed. Without iSNS server, when controller 1 fails, the running I/O from host to controller 1 may fail because the time which host switches to the new portal is slower than I/O time out. With iSNS server, this case would not happen.

NOTE: iSNS server is recommended for dual controller system.

Chapter 7 Troubleshooting

7.1 System Buzzer

The system buzzer features are listed below:

1. The system buzzer alarms 1 second when system boots up successfully.
2. The system buzzer alarms continuously when there is error occurred. The alarm will be stopped after error resolved or be muted.
3. The alarm will be muted automatically when the error is resolved. E.g., when RAID 5 is degraded and alarm rings immediately, user changes / adds one physical disk for rebuilding. When the rebuilding is done, the alarm will be muted automatically.

7.2 Event Notifications

- **PD events**

Level	Type	Description
INFO	Disk inserted	Disk <slot> is inserted into system.
WARNING	Disk removed	Disk <slot> is removed from system.
ERROR	Disk read error	Disk <slot> read block error
ERROR	Disk write error	Disk <slot> write block error
ERROR	HDD failure	Disk <slot> is disabled.
ERROR	HDD failure	Disk <slot> gets no response

- **HW events**

Level	Type	Description
WARNING	ECC error	Single-bit ECC error is detected at <address>.
ERROR	ECC error	Multi-bit ECC error is detected at <address>.
INFO	ECC info	ECC memory is installed.
INFO	ECC info	Non-ECC memory is installed.
INFO	SCSI info	Received SCSI Bus Reset event at the SCSI Bus <number>.

- **EMS events**

Level	Type	Description
INFO	Power installed	Power <item> is installed.
ERROR	Power absent	Power <item> is absent.
INFO	Power work	Power <item> function is restored.
ERROR	Power warning	Power <item> is not functioning.
WARNING	Power detect	PSU signal detection <item>.

INFO	Fan work	Fan <item> function is restored.
ERROR	Fan warning	Fan <item> is not functioning.
INFO	Fan installed	Fan <item> is installed.
ERROR	Fan not present	Fan <item> is not present.
WARNING	Thermal warning	System temperature <item> is above normal range.
ERROR	Thermal critical	System Overheated <item>!!!
ERROR	Thermal critical shutdown	System Overheated <item>!!! The system will auto-shutdown immediately.
WARNING	Thermal ignore value	Unable to update thermal value on <item>.
WARNING	Voltage warning	System voltage <item> is outside normal range.
ERROR	Voltage critical	System voltages <item> failed!!!
ERROR	Voltage critical shutdown	System voltages <item> failed!!! The system will auto-shutdown immediately.
INFO	UPS info	UPS detection succeeded.
WARNING	UPS error	UPS detection failed.
ERROR	UPS error	UPS AC loss for the system is detected.
ERROR	UPS error	UPS Power Low!!! The system will auto-shutdown immediately.
WARNING	SMART T.E.C.	Disk <slot> S.M.A.R.T. Threshold Exceed Condition occurred for attribute <item>.
WARNING	SMART failure	Disk <slot>: Failure to get S.M.A.R.T information.

- **RMS events**

Level	Type	Description
INFO	Console Login	<username> login from <IP or serial console> via Console UI.
INFO	Console Logout	<username> logout from <IP or serial console> via Console UI.
INFO	Web Login	<username> login from <IP> via Web UI.
INFO	Web Logout	<username> logout from <IP> via Web UI.

- **LVM3 events**

Level	Type	Description
INFO	RG created	RG <name> has been created.
INFO	RG creation failed	Failed to create RG <name>.
INFO	RG deleted	RG <name> has been deleted.
INFO	VD created	VD <name> has been created.
INFO	VD creation failed	Failed to create VD <name>.
INFO	VD deleted	VD <name> has been deleted.
INFO	VD renamed	Name of VD <name> has been renamed to <name>.
INFO	Read-only caching	Cache policy of VD <name> has been set as read only.

	enabled	
INFO	Writeback caching enabled	Cache policy of VD <name> has been set as write-back.
INFO	Write-through caching enabled	Cache policy of VD <name> has been set as write-through.
INFO	VD extended	Size of VD <name> extends.
INFO	VD initialization started	VD <name> starts initialization.
INFO	VD initialization finished	VD <name> completes the initialization.
WARNING	VD initialization failed	Failed to complete initialization of VD <name>.
INFO	VD rebuild started	VD <name> starts rebuilding.
INFO	VD rebuild finished	VD <name> completes rebuilding.
WARNING	VD rebuild failed	Failed to complete rebuild of VD <name>.
INFO	VD migration started	VD <name> starts migration.
INFO	VD migration finished	VD <name> completes migration.
ERROR	VD migration failed	Failed to complete migration of VD <name>.
INFO	VD scrubbing started	VD <name> starts scrubbing.
INFO	VD scrubbing finished	VD <name> completes scrubbing.
INFO	RG migration started	RG <name> starts migration.
INFO	RG migration finished	RG <name> completes migration.
INFO	RG activated	RG <name> has been manually activated.
INFO	RG deactivated	RG <name> has been manually deactivated.
INFO	VD rewrite started	Rewrite at LBA <address> of VD %s starts.
INFO	VD rewrite finished	Rewrite at LBA <address> of VD %s completes.
WARNING	VD rewrite failed	Rewrite at LBA <address> of VD %s failed.
WARNING	RG degraded	RG <name> is in degraded mode.
WARNING	VD degraded	VD <name> is in degraded mode.
ERROR	RG failed	RG <name> is failed.
ERROR	VD failed	VD <name> is failed.
WARNING	Recoverable read error occurred	Recoverable read error occurred at LBA <address>-<address> of VD <name>.
WARNING	Recoverable write error occurred	Recoverable write error occurred at LBA <address>-<address> of VD <name>.
ERROR	Unrecoverable read error occurred	Unrecoverable read error occurred at LBA <address>-<address> of VD <name>.
ERROR	Unrecoverable	Unrecoverable write error occurred at LBA

	write error occurred	<address>-<address> of VD <name>.
INFO	Dedicated spare configured	PD <slot> has been configured to RG <name> as a dedicated spare disk.
INFO	Global spare configured	PD <slot> has been configured as a global spare disk.
WARNING	PD read error occurred	Read error occurred at LBA <address>-<address> of PD <slot>.
WARNING	PD write error occurred	Write error occurred at LBA <address>-<address> of PD <slot>.
WARNING	Parity wrong when scrubbing	The parity data is wrong at LBA <address>-<address> when scrubbing VD <name>.
WARNING	Data recovered when scrubbing	Data at LBA <address>-<address> has been recovered when scrubbing VD <name>.
INFO	PD freed	PD <slot> has been removed from RG <name>.
INFO	RG imported	Configuration of RG<name> has been imported.
INFO	RG restored	Configuration of RG <name> has been restored.
INFO	VD restored	Configuration of VD <name> has been restored.
INFO	RG owner changed	The preferred owner of RG <name> has been changed to controller <number>.
INFO	Controller failover	Controller <number> forced to adopt write-through mode on failover.
INFO	Controller failback	Controller <number> restored to previous caching mode on failback.
INFO	Controller failover	All volumes in controller <number> completed failover process.
INFO	Controller failback	All volumes in controller <number> completed failback process.
INFO	Disk scrubbing started	PD <slot> starts disk scrubbing process.
INFO	Disk scrubbing finished	PD <slot> completed disk scrubbing process.

- **Snapshot events**

Level	Type	Description
INFO	Snapshot deleted	The snapshot VD <name> has been deleted.
INFO	Snapshot auto deleted	The oldest snapshot VD <name> has been deleted to obtain extra snapshot space.
INFO	Snapshot taken	A snapshot on VD <name> has been taken.
INFO	Snapshot space configured	Set the snapshot space of VD <name> to <number> MB.
INFO	Snapshot rollback started	Snapshot rollback of VD <name> has been started.
INFO	Snapshot rollback finished	Snapshot rollback of VD <name> has been finished.
WARNING	Snapshot quota	The quota assigned to snapshot <name> is

	reached	reached.

- **iSCSI events**

Level	Type	Description
INFO	iSCSI login succeeds	iSCSI login from <IP> succeeds.
INFO	iSCSI login rejected	iSCSI login from <IP> was rejected, reason [<string>]
INFO	iSCSI logout	iSCSI logout from <IP> was received, reason [<string>].

- **Battery backup events**

Level	Type	Description
INFO	BBM sync data	Abnormal shutdown detected, start flushing battery-backed data (<number> KB).
INFO	BBM sync data	Abnormal shutdown detected, flushing battery-backed data finished.
INFO	BBM detected	Battery backup module is detected.
INFO	BBM is good	Battery backup module is good.
INFO	BBM is charging	Battery backup module is charging.
WARNING	BBM is failed	Battery backup module is failed.
INFO	BBM	Battery backup feature is <item>.

- **JBOD events**

Level	Type	Description
INFO	Disk inserted	JBOD <number> disk <slot> is inserted into system.
Warning	Disk removed	JBOD <number> disk <slot> is removed from system.
ERROR	Disk read error	JBOD <number> disk <slot> read block error
ERROR	Disk write error	JBOD <number> disk <slot> write block error
ERROR	HDD failure	JBOD <number> disk <slot> is disabled.
ERROR	HDD failure	JBOD <number> disk <slot> gets no response
INFO	JBOD inserted	JBOD <number> is inserted into system
WARNING	JBOD removed	JBOD <number> is removed from system
WARNING	SMART T.E.C	JBOD <number> disk <slot>: S.M.A.R.T. Threshold Exceed Condition occurred for attribute %s
WARNING	SMART Failure	JBOD <number> disk <slot>: Failure to get S.M.A.R.T information
INFO	Dedicated spare configured	JBOD <number> PD <slot> has been configured to RG <name> as a dedicated spare disk.
INFO	Global spare configured	JBOD <number> PD <slot>d has been configured as a global spare disk.
WARNING	PD read error occurred	Read error occurred at LBA <address>-<address> of JBOD <number> PD <slot>.

WARNING	PD write error occurred	Write error occurred at LBA <address>-<address> of JBOD <number> PD <slot>.
INFO	PD freed	JBOD <number> PD <slot> has been removed from RG <name>.
INFO	PD scrubbing started	JBOD <number> PD <slot> starts disk scrubbing process.
INFO	PD scrubbing finished	JBOD <number> PD <slot> completed disk scrubbing process.
WARNING	PS failure	Power Supply of <item> in JBOD <name> is FAIL
INFO	PS normal	Power Supply of <item> in JBOD <name> is NORMAL
WARNING	FAN failure	Cooling fan of <item> in JBOD <name> is FAIL
INFO	FAN normal	Cooling fan of <item> in JBOD <name> is NORMAL
WARNING	Volt warn OV	Voltage of <item> read as <value> in JBOD <name> is WARN OVER
WARNING	Volt warn UV	Voltage of <item> read as <value> in JBOD <name> is WARN UNDER
WARNING	Volt crit OV	Voltage of <item> read as <value> in JBOD <name> is CRIT OVER
WARNING	Volt crit UV	Voltage of <item> read as <value> in JBOD <name> is CRIT UNDER
INFO	Volt recovery	Voltage of <item> in JBOD <name> is NORMAL
WARNING	Therm warn OT	Temperature of <item> read as <value> in JBOD <name> is OT WARNING
WARNING	Therm warn UT	Temperature of <item>read as <value> in JBOD <name> is UT WARNING
WARNING	Therm fail OT	Temperature of <item> read as <value> in JBOD <name> is OT FAILURE
WARNING	Therm fail UT	Temperature of <item> read as <value> in JBOD <name> is UT FAILURE
INFO	Therm recovery	Temperature of <item> in JBOD <name> is NORMAL

- **System maintenance events**

Level	Type	Description
INFO	System shutdown	System shutdown.
INFO	System reboot	System reboot.
INFO	FW upgrade start	Firmware upgrade start.
INFO	FW upgrade success	Firmware upgrade success.
WARNING	FW upgrade failure	Firmware upgrade failure.
ERROR	IPC FW upgrade timeout	Firmware upgrade timeout on another controller.

- **HAC events**

Level	Type	Description
INFO	Controller inserted	Controller <number> is inserted into system.
ERROR	Controller removed	Controller <number> is removed from system.
ERROR	Controller timeout	Controller <number> gets no response.
ERROR	Controller lockdown	Controller <number> is locked down.
ERROR	Memory NG	Memory size mismatch.
ERROR	Firmware NG	Firmware version mismatch.
ERROR	Low IPC NG	Low speed inter link is down.
ERROR	High IPC NG	High speed inter link is down.
ERROR	Backend NG	Disk connection loss is detected

Appendix

A. Certification list

- **RAM**

RAM Spec: 240-pin, DDR2-533(PC4300), Reg.(register) or UB(Unbufferred), ECC, up to 4GB, 64-bit data bus width (and also 32-bit memory), x8 or x16 devices, 36-bit addressable, up to 14-bit row address and 10-bit column address.

Vendor	Model
ATP	AJ56K72G8BJE6S, 2GB DDR2-667 (Unbuffered, ECC) with Samsung
Unigen	UG25T7200M8DU-5AM, 2GB DDR2-533 (Unbuffered, ECC) with Micron
Unigen	UG25T7200M8DU-6AMe, 2GB DDR2-667 (Unbuffered, ECC) with Hynix
Unigen	UG25T7200M8DU-6AK, 2GB DDR2-667 (Unbuffered, ECC, Low profile) with Hynix

- **iSCSI Initiator (Software)s**

OS	Software/Release Number
Microsoft Windows	Microsoft iSCSI Software Initiator Release v2.08 System Requirements: 1. Windows 2000 Server with SP4 2. Windows Server 2003 with SP2 3. Windows Server 2008 with SP2
Linux	The iSCSI Initiators are different for different Linux Kernels. 1. For Red Hat Enterprise Linux 3 (Kernel 2.4), install linux-iscsi-3.6.3.tar 2. For Red Hat Enterprise Linux 4 (Kernel 2.6), use the build-in iSCSI initiator iscsi-initiator-utils-4.0.3.0-4 in kernel 2.6.9 3. For Red Hat Enterprise Linux 5 (Kernel 2.6), use the build-in iSCSI initiator iscsi-initiator-utils-6.2.0.742-0.5.el5 in kernel 2.6.18
Mac	ATTO Xtend SAN iSCSI initiator v3.10 System Requirements: 1. Mac OS X v10.5 or later

For ATTO Xtend SAN iSCSI initiator, it is not free. Please contact your local distributor.

- **10GbE iSCSI HBA card**

Vendor	Model
Chelsio	S320E-SR-XFP (PCI-Express, 10GbE, 2 ports, TCP/IP offload, iSCSI offload)

- **10GbE NIC**

Vendor	Model
Intel	E10G42AFDA (10 Gigabit AF DA Dual Port Server Adapter) (PCI-Express, 10GbE, 2 ports, TCP/IP offload)
Intel	E10G42BFSR (Ethernet Server Adapter X520-SR2) (PCI-Express, 10GbE, 2 ports, TCP/IP offload)

- **10GbE GBIC**

Vendor	Model
Avago	AFBR-703SDZ (10 Gb/s SFP transceiver, 850nm)
Finisar	FTLX8571D3BCV (10 Gb/s SFP transceiver, 850nm)

- **10GbE Switch**

Vendor	Model

- **Hard drive**

  SAS drives are recommanded on dual controller system. For SATA drivers, QMUX boards are required.

  SAS 3.5”

Vendor	Model
Hitachi	Ultrastar 15K147, HUS151436VLS300, 36GB, 15000RPM, SAS 3.0Gb/s, 16M
Hitachi	Ultrastar 15K300, HUS153073VLS300, 73GB, 15000RPM, SAS 3.0Gb/s, 16M (F/W: A410)
Seagate	Cheetah 15K.4, ST336754SS, 36.7GB, 15000RPM, SAS 3.0Gb/s, 8M
Seagate	Cheetah 15K.5, ST373455SS, 73.4GB, 15000RPM, SAS 3.0Gb/s, 16M
Seagate	Cheetah 15K.5, ST3146855SS, 146.8GB, 15000RPM, SAS 3.0Gb/s, 16M
Seagate	Cheetah 15K.6, ST3450856SS, 450GB, 15000RPM, SAS 3.0Gb/s, 16M (F/W: 003)
Seagate	Cheetah NS, ST3400755SS, 400GB, 10000RPM, SAS 3.0Gb/s, 16M
Seagate	Barracuda ES.2, ST31000640SS, 1TB, 7200RPM, SAS 3.0Gb/s, 16M (F/W: 0002)

Seagate	Cheetah NS.2, ST3600002SS, 600GB, 10000RPM, SAS 2.0, 6.0Gb/s, 16M (F/W: 0004)
Seagate	Cheetah 15K.7, ST3600057SS, 600GB, 15000RPM, SAS 2.0, 6.0Gb/s, 16MB (F/W: 0004)

SAS 2.5”

Vendor	Model
Seagate	Savvio 10K.3, ST9300603SS, 300GB, 10000RPM, SAS 2.0, 6.0Gb/s, 16M (F/W: 0003)
Seagate	Savvio 15K.2, ST9146852SS, 147GB, 15000RPM, SAS 2.0, 6.0Gb/s, 16M (F/W: 0002)
Seagate	Constellation, ST9500430SS, 500GB, 7200RPM, SAS 2.0, 6.0Gb/s, 16M (F/W: 0001)

SATA 3.5”

Vendor	Model
Hitachi	Deskstar 7K250, HDS722580VLSA80, 80GB, 7200RPM, SATA, 8M
Hitachi	Deskstar E7K500, HDS725050KLA360, 500GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar 7K80, HDS728040PLA320, 40GB, 7200RPM, SATA II, 2M
Hitachi	Deskstar T7K500, HDT725032VLA360, 320GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar P7K500, HDP725050GLA360, 500GB, 7200RPM, SATA II, 16M (F/W: K2A0AD1A)
Hitachi	Deskstar E7K1000, HDE721010SLA330, 1TB, 7200RPM, SATA 3.0Gb/s, 32MB, NCQ (F/W: ST60A3AA)
Hitachi	UltraStar A7K2000, HUA722020ALA330, 2TB, 7200RPM, SATA 3.0Gb/s, 32MB, NCQ (F/W: JKAOA20N)
Maxtor	DiamondMax Plus 9, 6Y080M0, 80GB, 7200RPM, SATA, 8M
Maxtor	DiamondMax 11, 6H500F0, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Samsung	SpinPoint P80, HDSASP0812C, 80GB, 7200RPM, SATA, 8M
Seagate	Barracuda 7200.7, ST380013AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M
Seagate	Barracuda 7200.7, ST380817AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.8, ST3400832AS, 400GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.9, ST3500641AS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ
Seagate	Barracuda 7200.11, ST3500320AS, 500GB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ
Seagate	Barracuda 7200.11, ST31000340AS, 1TB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ
Seagate	Barracuda 7200.11, ST31500341AS, 1.5TB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ (F/W: SD17)
Seagate	NL35.2, ST3400633NS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	NL35.2, ST3500641NS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES, ST3500630NS, 500GB, 7200RPM, SATA 3.0Gb/s,

	16M
Seagate	Barracuda ES, ST3750640NS, 750GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES.2, ST31000340NS, 1TB, 7200RPM, SATA 3.0Gb/s, 32M (F/W: SN06)
Seagate	SV35.5, ST3500410SV, 500GB, 7200 RPM, SATA 3.0Gb/s, 16M, NCQ (F/W: CV11)
Seagate	Constellation ES, ST31000524NS, 1TB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ (F/W: SN11)
Westem Digital	Caviar SE, WD800JD, 80GB, 7200RPM, SATA 3.0Gb/s, 8M
Westem Digital	Caviar SE, WD1600JD, 160GB, 7200RPM, SATA 1.5G/s , 8M
Westem Digital	Caviar RE2, WD4000YR, 400GB, 7200RPM, SATA 1.5Gb/s, 16M, NCQ
Westem Digital	Caviar RE16, WD5000AAKS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Westem Digital	RE2, WD4000YS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Westem Digital	RE2, WD5000ABYS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ
Westem Digital	RE2-GP, WD1000FYPS, 1TB, 7200RPM, SATA 3.0Gb/s, 16M
Westem Digital	RE3, WD1002FBYS, 1000GB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ (F/W: 03.00C05)
Westem Digital	RE4, WD2002FYPS, 2TB, IntelliPower, SATA 3.0Gb/s, 64M, NCQ (F/W: 04.05G04)
Westem Digital	Raptor, WD360GD, 36.7GB, 10000RPM, SATA 1.5Gb/s, 8M
Westem Digital	VelcoiRaptor, WD3000HLFS, 300GB, 10000RPM, SATA 3.0Gb/s, 16M (F/W: 04.04V01)

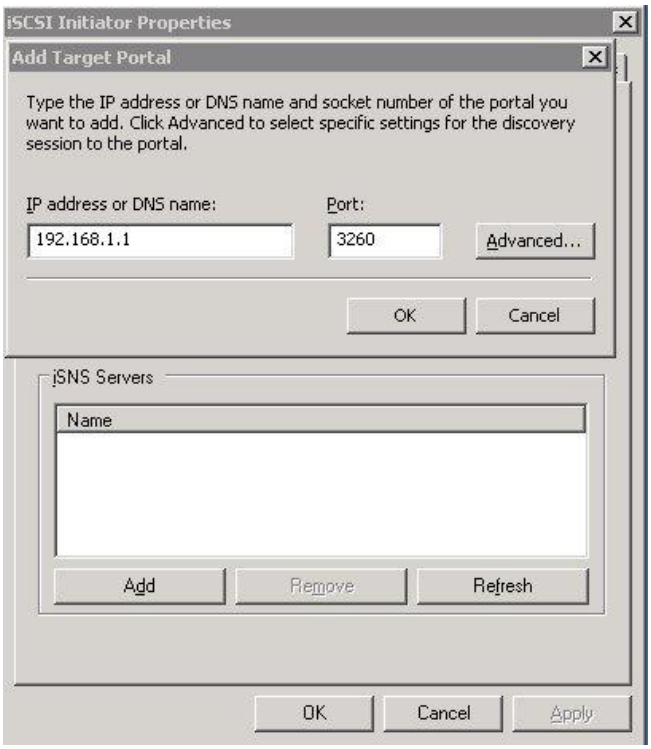
SATA 2.5”

Vendor	Model
Seagate	Constellation, ST9500530NS, 500GB, 7200RPM, SATA 3.0Gb/s, 32M (F/W: SN02)

B. Microsoft iSCSI initiator

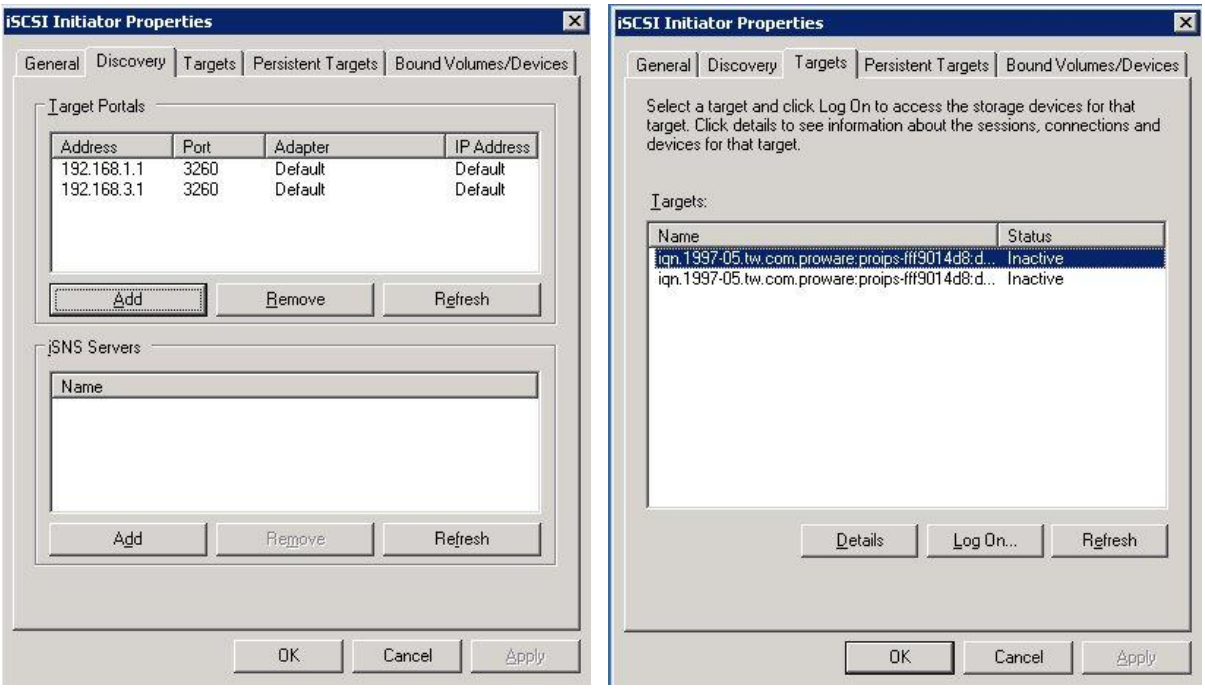
Here is the step by step to setup Microsoft iSCSI Initiator. Please visit Microsoft website for latest iSCSI initiator. The following setup may not use the latest Microsoft iSCSI initiator.

1. Run Microsoft iSCSI Initiator.
2. Click **"Discovery"**.
3. Click **"Add"**. Input IP address or DNS name of iSCSI storage device.

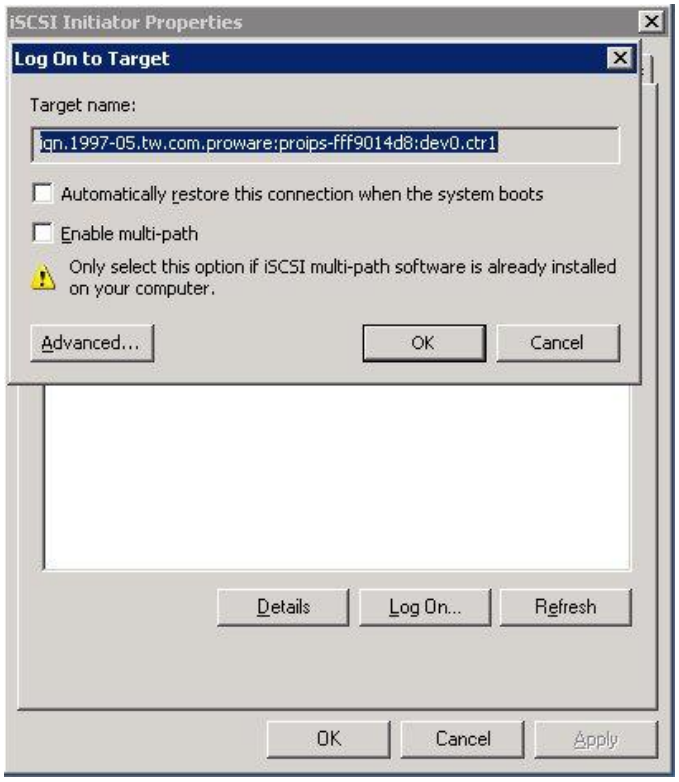


4. Click **"OK"**.

5. Click **"Targets"**.



6. Click **"Log On"**. Check **"Enable multi-path"** if running MPIO.



7. Click **"Advance…"** if CHAP information is needed.
8. Click **"OK"**. The status would be **"Connected"**.
9. Done, it can connect to an iSCSI disk.

The following procedure is to log off iSCSI device.

1. Click **"Details"** in **"Targets"**.
2. Check the Identifier, which will be deleted.
3. Click **"Log off"**.
4. Done, the iSCSI device log off successfully.