GeoVision inc
The Vision of Security

# GV-Storage System

## User's Manual



Every effort has been made to ensure that the information in this manual is accurate. GeoVision is not responsible for printing or clerical errors.

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# Contents

# Regulatory Notice

## FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

**Class A**

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

## CE Notice

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

## RoHS Compliance

The Restriction of Hazardous Substances (RoHS) Directive is to forbid the use of hazardous materials of production. To meet the RoHS Directive requirements, this product is made to be RoHS compliant.

## WEEE Compliance

This product is subject to the Waste Electrical and Electronic Equipment (WEEE) Directive and made compliant with the WEEE requirements.

# Usage Notice

Please pay attention to the following usage notice when you use the storage system.

- **Recommended Hard Drive**

To avoid compatibility issues between the storage system and hard drives, we strongly suggest you use **Seagate Barracuda ES series drives**. For details on drive models, see *Certification list* in Appendix A.

- **Order of Hard Drive Slots**

Remember the order of hard drive slots on the storage system (see Figure 2-1). When you see the warning message *"Error: Disk, <slot> is failed*", remove the failed hard drive in the correct slot. **If you remove the hard drive in the wrong slot, you could suffer data loss.**

- **Replacing Hard Drives**

**Don't turn off the power of the drive bay** when replacing the hard dive, otherwise RAID failure could occur. For the location of Power Switch buttons, see *2.1 Front View*.

- **Before power off**

It is better to execute "Shutdown" through LCD panel menu to flush the data from cache to physical disks before power off. See *2.4.1 LCD Panel Menu.*

- **UDV (User Data Volume) Restriction**

**Don't assign the same UDV to more than one DVR host for recording usage; otherwise you may suffer data lost or corrupt.** See *4.5.4 User Data Volume* and *4.5.6 Logical Unit.*

- **Initiator Node Name Restriction**

The Initiator node name only accepts lower-case letters. Use lower-case letters for **Host** name in the storage system, otherwise you cannot establish the connection between the storage system and DVR. See *4.5.6 Logical Unit.*

# Chapter 1 Introduction

GV-Storage System is a high-performance RAID storage system based on the latest iSCSI technology for users looking for a cost-effective and shared storage solution over the network. Users can use their existing Ethernet infrastructure to implement the GV-Storage System. No specialized adaptors, switches and cables are required for DVR servers. And there are no limitations on the number of GV-Storage Systems implemented in a single application.

GV-Storage System can work in conjunction with these GV products to save data: GV-System version 8.2, GV-Video Server version 1.4, GV-Compact DVR and GV-NVR.

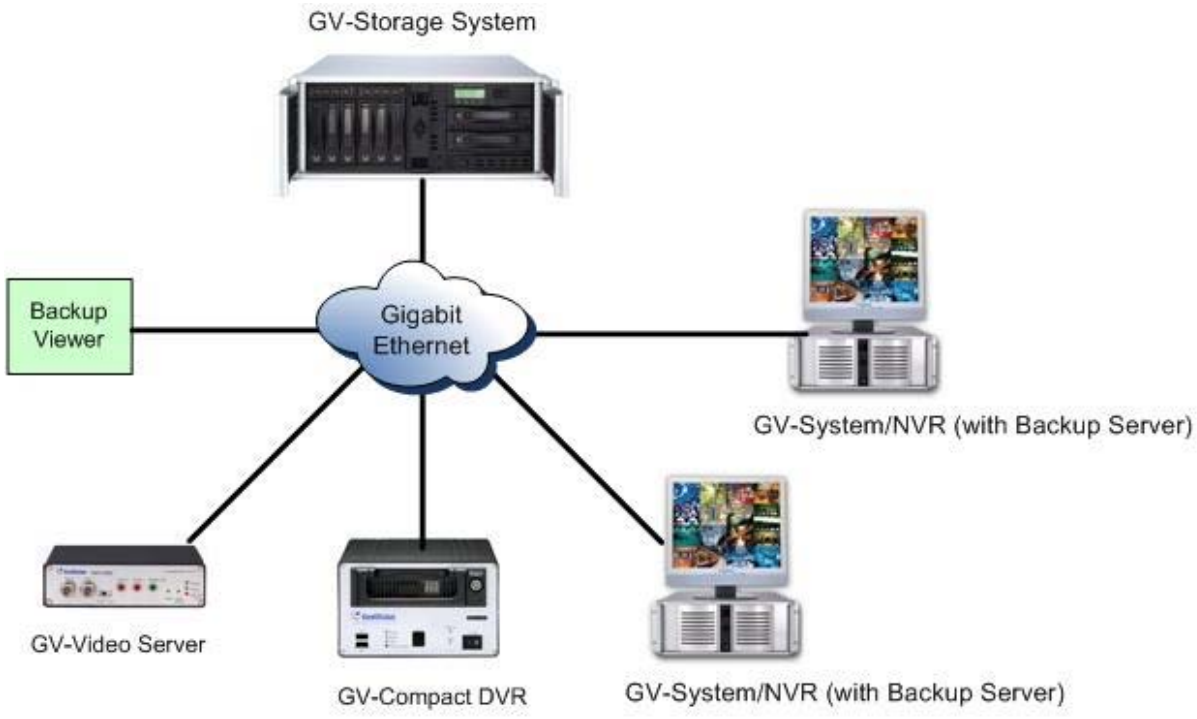


***Figure 1-1 iSCSI Storage Area Networks***

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**Note:** GV-System version 8.2 and GV-NVR provides Backup Server and Backup Viewer functions. Backup Server allows you to back up recording data to GV-Storage System automatically, while Backup Viewer allows you to access the data from any computer. For details see *Surveillance System User's Manual*.

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## 1.1 Key Features

- Up to 8 hot-swappable SATA II hard drives
- RAID 0 / 1 / 5 / 6 / 10 / 50 / 60, JBOD
- Dual Gigabit iSCSI ports
- Online volume expansion and RAID level migration
- Global/dedicated cache configuration by volume
- S.M.A.R.T enabled
- Support for SES (SCSI Enclosure Services)
- Disk roaming
- MPIO and MC/S ready (Initiator drive support needed)
- Data structure and power failure alert buzzer
- Redundant power supplies with load balance sharing
- CHAP Encryption
- Integrating with GV products: GV-System V8.2, GV-Video Server V1.4, GV-Compact DVR and GV-NVR.

## 1.2 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 a few of servers to attach to an infinite number of storage volumes by using iSCSI over TCP/IP networks. 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 side, such as DVR.

The **iSCSI target** is the storage device itself or an appliance, which controls and serves volumes or virtual volumes. The target is the device that performs SCSI commands or bridges it to an attached storage device. Here, iSCSI targets are GV-Storage Systems with RAID arrays.


***Figure 1-2***

The host side needs an iSCSI initiator. The initiator is a driver, which handles the SCSI traffic over iSCSI. For details, see *Chapter 6 About iSCSI Initiator*.

## 1.3 Terminology

The document uses the following terms:

| | |
|---|---|
| **RAID** | RAID is the abbreviation of “Redundant Array of Independent Disks”. There are different RAID levels with different degree of the data protection, data availability, and performance to host environment. |
| **PD** | The Physical Disk belongs to the member disk of one specific volume group. |
| **VG** | Volume Group. A collection of removable media. One VG consists of a set of UDVs and owns one RAID level attribute. |
| **UDV** | User Data Volume. Each VG could be divided into several UDVs. The UDVs from one VG share the same RAID level, but may have different volume capacity. |
| **CV** | Cache Volume. The system uses the on board memory as cache. All RAM (except for the part which is occupied by the controller) can be used as cache. Users can divide the cache for one UDV or sharing among all UDVs. Each UDV will be associated with one CV for data transaction. Each CV could be assigned different cache memory size. |
| **LUN** | Logical Unit Number. LUN is the logical volume, which users could assign by using the SCSI commands. |
| **GUI** | Graphic User Interface. |
| **WT** | Write-Through cache write policy. A caching technique in which the completion of a write request is not signaled until data is safely stored on non-volatile media. Each data is synchronized in both data cache and the accessed physical disks. |
| **WB** | Write-Back 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 Read-Only. |

| | |
|---|---|
| **DS** | Dedicated Spare disks. The spare disks are only used by one specific VG. Others could not use these dedicated spare disks for any rebuilding purpose. |
| **GS** | Global Spare disks. GS is shared for rebuilding purpose. If some VGs 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. |
| **DC** | Dedicated Cache. |
| **GC** | Global Cache. |
| **DG** | Degraded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks. |
| **S.M.A.R.T.** | Self-Monitoring Analysis and Reporting Technology. |
| **WWN** | World Wide Name. |
| **S.E.S** | SCSI Enclosure Services. |
| **NIC** | Network Interface Card. |
| **iSCSI** | Internet Small Computer Systems Interface. |
| **MTU** | Maximum Transmission Unit. |
| **CHAP** | Challenge Handshake Authentication Protocol. An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports. |
| **iSNS** | Internet Storage Name Service. |

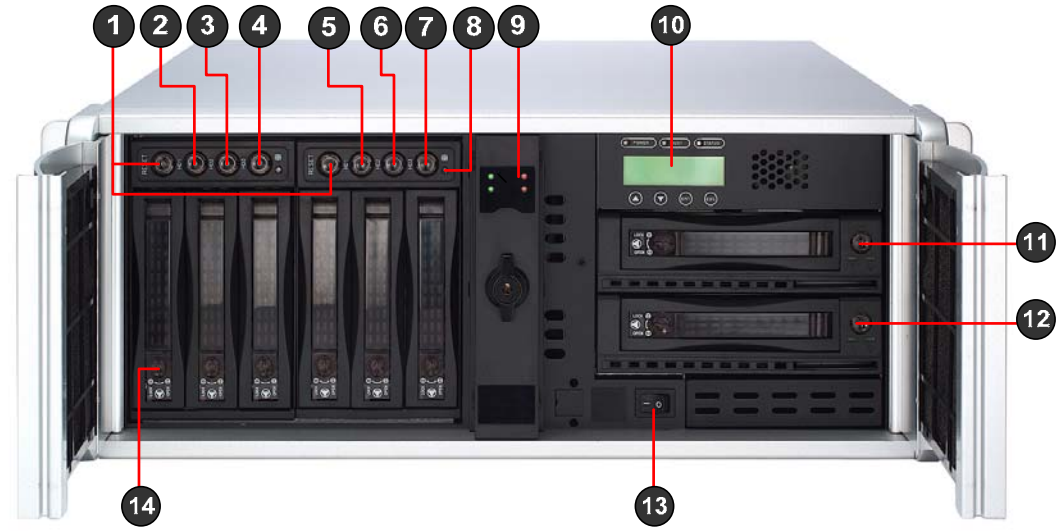
## 1.4 RAID levels

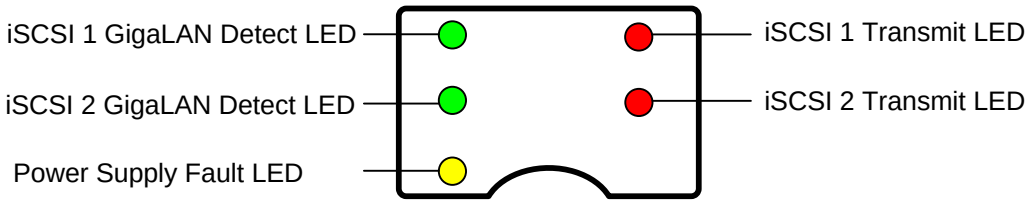
| | |
|---|---|
| **RAID 0** | Disk striping. RAID 0 needs at least one hard drive. |
| **RAID 1** | Disk mirroring over two disks. RAID 1 needs at least two hard drives. |
| **RAID 3** | Striping with parity on the dedicated disk. RAID 3 needs at least three hard drives. |
| **RAID 5** | Striping with interspersed parity over the member disks. RAID 3 needs at least three hard drives. |
| **RAID 6** | 2-dimensional parity protection over the member disks. RAID 6 needs at least four hard drives. |
| **RAID 0+1** | Mirroring of the member RAID 0 volumes. RAID 0+1 needs at least four hard drives. |
| **RAID 10** | Striping over the member RAID 1 volumes. RAID 10 needs at least four hard drives. |
| **RAID 30** | Striping over the member RAID 3 volumes. RAID 30 needs at least six hard drives. |
| **RAID 50** | Striping over the member RAID 5 volumes. RAID 50 needs at least six hard drives. |
| **RAID 60** | Striping over the member RAID 6 volumes. RAID 60 needs at least eight hard drives. |
| **JBOD** | The abbreviation of “Just a Bunch Of Disks”. JBOD needs at least one hard drive. |

# Chapter 2 Identifying Parts of Storage System

The illustrations in this section identify the various features of the storage system. Get yourself familiar with these terms, as it will help you when you read further in the following sections.

## 2.1 Front View




**System Status LEDs**

***Figure 2-1***

| | | | |
|---|---|---|---|
| 1 | SATA Backplane Reset Switch | 8 | Fan Sensor LED |
| 2 | HDD 1 (Power Switch) | 9 | System Status LEDs |
| 3 | HDD 2 (Power Switch) | 10 | LCD Display |
| 4 | HDD 3 (Power Switch) | 11 | HDD 7 (Power Switch) |
| 5 | HDD 4 (Power Switch) | 12 | HDD 8 (Power Switch) |
| 6 | HDD 5 (Power Switch) | 13 | Power Switch |
| 7 | HDD 6 (Power Switch) | 14 | Safety Lock |

## 2.2 Rear View

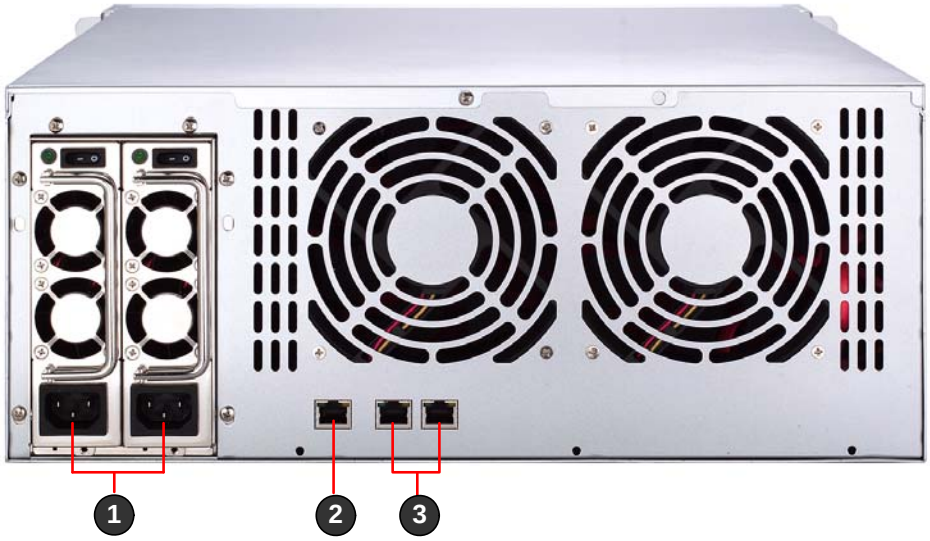



*Figure 2-2*

| | | | |
|---|---|---|---|
| 1 | Redundant Power Supply (Full Range) | 3 | iSCSI Data Port (10/100/1000 Mbps) |
| 2 | Management Port (10/100 Mbps) | | |

## 2.3 Redundant Power Supply

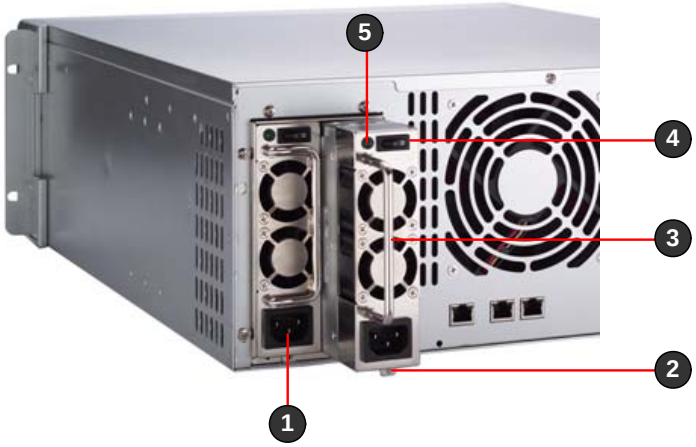



*Figure 2-3*

| | | | |
|---|---|---|---|
| 1 | AC Power Input (Full Range) | 4 | Power Switch |
| 2 | Screw hole to lock with the chassis | 5 | Power Supply LED |
| 3 | Handle | | |

## 2.4 Enclosure


*Figure 2-4*

| | | | |
|---|---|---|---|
| 1 | LED Indicators | 3 | Control Panel |
| 2 | LCD Panel | | |

### 2.4.1 LCD Panel Menu

There are four buttons to configure the LCD panel menu, including: ▲ (up), ▼ (down), **ESC** (Escape), and **ENT** (Enter).

After booting up the system, you will see the following screen:

```
192.168.000.200
GeoVision Inc. GV-Storage System←
```

Press **ENT**. The LCD functions **Alarm Mute**, **Reset/Shutdown**, **Quick Install**, **View IP Setting**, **Change IP Config** and **Reset to Default**. These functions will rotate by pressing ▲ (up) and ▼ (down).

When there is WARNING or ERROR level of event happening, the LCD panel shows the event log to give users more details from front panel too.

The following table is function description.

| | |
|---|---|
| **Alarm Mute** | Mute alarm when an error occurs. |
| **Reset/Shutdown** | Reset or shutdown the storage system. |
| **Quick Install** | Quick three steps to create a volume. Please refer to Chapter 4 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 the password to default: **Admin**, and set IP address to default:<br>Default IP address: **192.168.0.200**<br>Default subnet mask: **255.255.255.0**<br>Default gateway: **192.168.0.254** |

The following is the LCD Panel menu hierarchy.

| | | | | |
|---|---|---|---|---|
| GV-Storage System<br>▲▼ | [Alarm Mute] | [▲Yes No▼] | | |
| | [Reset/Shutdown] | [Reset] | [▲Yes No▼] | |
| | | [Shutdown] | [▲Yes No▼] | |
| | [Quick Install] | RAID 0<br>(RAID 1/RAID 3/<br>RAID 5/RAID 6)<br>xxxxxx GB | Volume Size<br>(xxxxxx G) | Adjust Volume Size |
| | | | Apply The Config | [▲Yes No▼] |
| | [View IP Setting] | [IP Config]<br>[Static IP] | | |
| | | [IP Address]<br>[192.168.000.200] | | |
| | | [IP Subnet Mask]<br>[255.255.255.000] | | |
| | | [IP Gateway]<br>[192.168.000.254] | | |
| | [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.

### 2.4.2 Enclosure LED

The features of Enclosure LED are described as follows:

| | |
|---|---|
| **Status LED** | Used to reflect the system status by turn on the LED when an error occurs or RAID malfunctioning happens. |
| **Busy LED** | Hardware activated LED when RAID operation is busy. |
| **Power LED** | Hardware activated LED when the system is powered on. |

### 2.4.3 System Buzzer

The system buzzer features are described as follows:

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

# Chapter 3 Getting Started

## 3.1 Unpacking

The package includes the following items:

- GV-Storage System
- AC Power Cord x 2
- Lock Key x 2
- Self-Stick Rubber Pad x 4
- GV-Storage System User's Manual
- GV-Storage System Quick Start Guide

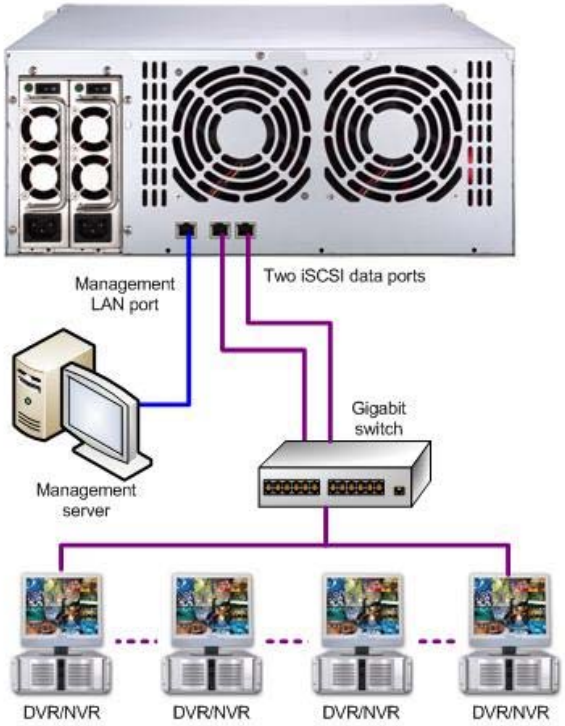
## 3.2 Before You Begin

Before starting, prepare the following items:

- Check *Certification List* in Appendix to confirm the hardware setting is fully supported
- A DVR server of **GV-System version 8.2** with a network interface card (NIC)
- CAT 5e or CAT 6 LAN cables for one management port and two iSCSI data ports (CAT 6 cable is recommended for best performance)
- Prepare storage system configuration plan
- Network information of management and iSCSI data ports, including static IP addresses, subnet mask, and default gateway
- A Gigabit Layer 2 or Layer 3 managed stackable switch (see *Certification List* in Appendix)
- CHAP security information, including CHAP username and secret (Optional)

## 3.3 Installing on a Network

1. Connect the unit's management port to the network on which you will manage the storage system.
2. Using LAN cables, connect the unit's iSCSI data ports to a Gigabit switch.
3. Installing hard drives. For details, see *3.4 Installing Hard Drives*.
4. Using the two provided power cords, connect the unit's two power supplies to a different power source/circuit.




Blue color line=Fast Ethernet ; Purple color line=Gigabit Ethernet

***Figure 3-1***

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**Note:**

- You cannot manage the storage system from the two iSCSI data ports.
- GV-Storage System has a default address of **192.168.0.200**. The server used for managing the system must be on the same IP and subnet sequence assigned to the unit.
- Currently the storage system doesn't support DDNS (Dynamic Domain Name System).

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## 3.4 Turning on the Power

1. Turn on the two power switches located on the rear panel. See No. 4, Figure 2-3.
2. Turn on the main power switch on the front panel. See No. 13, Figure 2-1.
3. Check status of powering on to ensure that everything is running smoothly.
   - **Power Supply LED:** The two LEDs on the rear panel should turn green. See No. 5, Figure 2-3.
   - **GigaLAN Detect LED:** The two LEDs on the front panel should turn green. See Figure 2-1
   - **Drive Tray LED:** Power LEDs for all drive trays containing hard drives should light up, e.g. No. 2, Figure 2-1.

Before using the storage system, configure RAID at first. Without this step, there is no hard drive available for storage. See Chapter 4 for Web GUI Guideline.

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**Note:** Although the power supply units are redundant and a single power supply can provide sufficient power to the system, it is advisable to turn both of the power switches on. If only one power supply unit is operating and fails, the system operation will be terminated.

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## 3.5 Installing Hard Drives

The storage system supports hot-swapping allowing you to install and replace a hard drive while the system is running.

1. If the system is running, do not turn off the power of the drive bay.
2. Turn the safety lock to the OPEN position.
3. Push the safety lock. The drawer handle pops up.
4. Pull out the drive drawer.

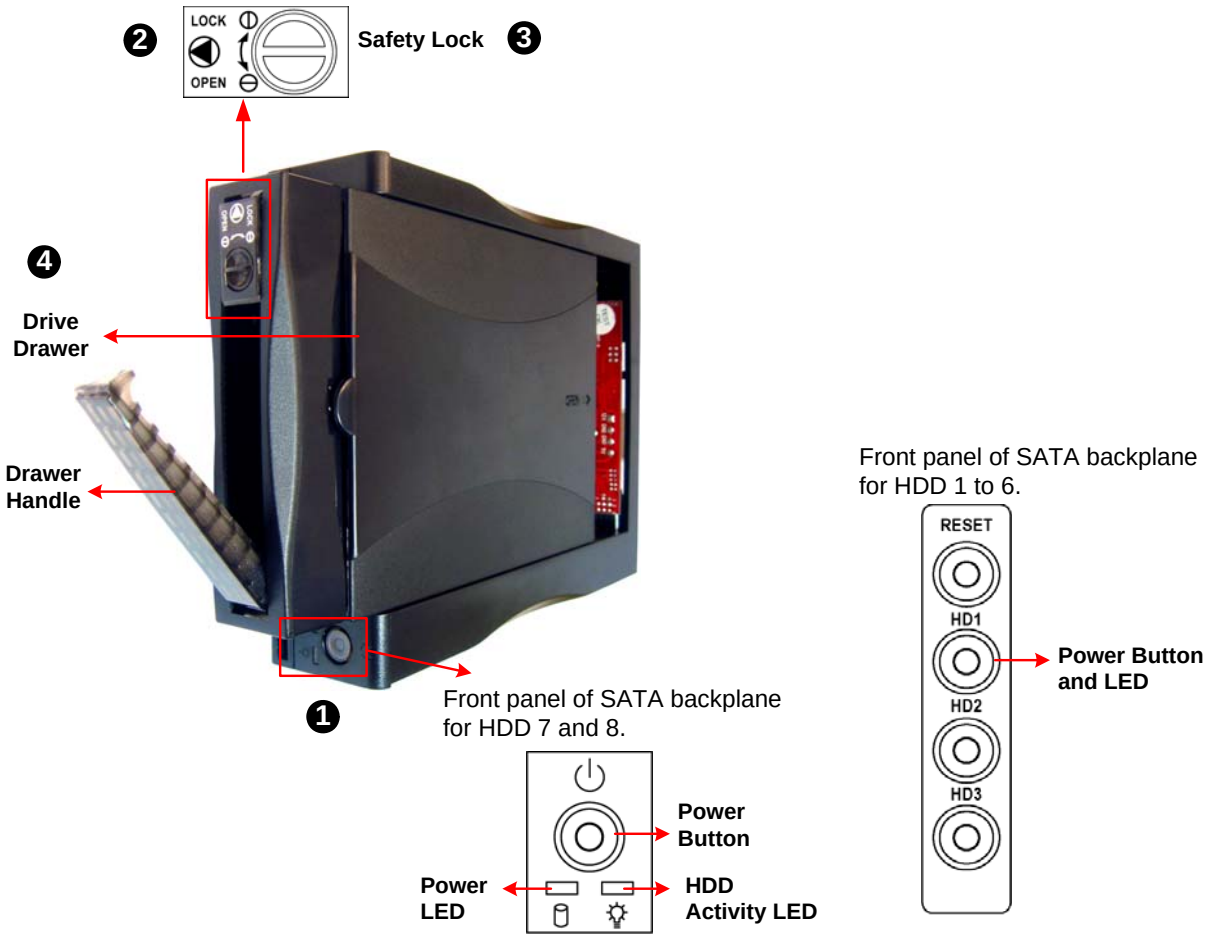


*Figure 3-2*

5. Remove the lid of the drawer.

***Figure 3-3***

6. Place the hard drive in the drawer and slide the lid back on.

***Figure 3-4***

7. Turn over the drawer and secure the hard drive with the 4 supplied screws.

***Figure 3-5***

8. Put the drawer back in the drive bay of the storage system.
9. Push the drawer handle back and turn the safety lock to the LOCK position.

# Chapter 4 Web GUI Guideline

## 4.1 Login

GV-Storage System supports graphic user interface (GUI) to operate the system. Be sure to connect the LAN cable to the management port. Open the browser and enter the default IP: http://192.168.0.200 The following screen will be displayed.


***Figure 4-1***

Click any function at the first time; it will pop up a dialog box for authentication.
Login name: **admin**
Default password: **admin**
After login, you can choose the functions on the left side of window to do configuration.

There are three indicators at the top-right corner.

| | |
|---|---|
| **Voltage light** | Green is normal. Red represents abnormal voltage status. |
| **Temperature light** | Green is normal. Red represents abnormal temperature. |
| **RAID light** | Green means RAID works well. Red represents RAID failure happened. |

The below table is the hierarchy of Web GUI.

**Quick Install** → Step 1 / Step 2 / Step 3 / Confirm

**System Config**

**System name** → System name

**IP address** → DHCP / Static / HTTP port / HTTPS port / SSH port

**Language** → Language

**Login config** → Auto logout / Login lock

**Password** → Old password / Password / Confirm

**Date** → Date / Time / Time zone / Daylight saving / NTP

**Mail** → Mail-from address / Mail-to address / SMTP relay / Authentication / Send test mail / Send events

**SNMP** → SNMP trap address / Community

**Messenger** → Messenger IP/hostname / Send events

**System log server** → Server IP/hostname / Port / Facility / Event level

**Event log** → Filter / Download / Mute / Clear

**iSCSI config**

**Entity Property** → Entity name / iSNS

**NIC** → IP settings / Default gateway / Set MTU / MAC address

**Node** → Node name / CHAP Authentication

**Session** → iSCSI sessions and connections

**CHAP account** → Create / Delete CHAP account

**Volume config**

**Physical disk** → Free disc / Global spares / Dedicated spares / More information / Auto Spindown

**Volume group** → Create / Delete / More information / Rename / Migrate / Expand

**User data Volume** → Create / Delete / Attach LUN / More information / Rename / Extend / Set read/write mode / Set priority

**Cache volume** → Create / Delete / More information / Resize / Dedicated cache

**Logical unit** → Attach / Detach

**Enclosure management**

**SES config** → Enable / Disable

**Hardware monitor** → Status / Auto shutdown

**S.M.A.R.T.** → S.M.A.R.T. for physical disks

**Maintenance**

**Upgrade** → Browse the firmware to upgrade / Export config

**Info** → System information

**Reset to default** → Reset to factory default

**Config import & export** → Controller configuration import and export function

**Shutdown** → Reboot / Shutdown

**Logout**

## 4.2 Quick Install

It is easy to use the **Quick install** function to create a volume. Depend on how many physical disks or how many residual spaces on created VGs are free, the system will calculate maximum spaces on RAID levels 0 / 1 / 3 / 5 / 6. Quick install function will occupy all residual VG space for one UDV, and it has no space and spare.

Quick Install function has a smarter policy. When the system is full inserted with 8 HDD, and all HDD are in the same size, Quick Install function lists all possibilities and sizes among different RAID levels. Quick Install will use all available HDD for the RAID level that you decide. But, when the system is inserted with different sizes of HDD, e.g., 8 x 200G HDD and 8 x 80G, Quick Install also lists all possibilities and combinations of different RAID levels and different sizes. After you choose the RAID level, you may find there are still some HDD are not used (Free Status). The result is from the smarter policy on Quick Install that gives you:

1. Biggest capacity of RAID level which you choose and,
2. The fewest disk number for the RAID level/volume size.

E.g., you choose RAID 5 and the system has 6 x 200G HDD + 2 x 80G HDD inserted. If all 8 HDD are used for a RAID 5, the volume max size is 560G (80G x 7). But in Quick Install, we do smarter check and find out the most efficient use of HDD, which results the system only use the 200G HDD (volume size is 200G x 5=1000G). Then, the volume size is bigger, and full use of HDD capacity.

Three steps for a quick install:

1. Select **Quick install**, and choose **RAID Level** from the drop-down list. Click **Next**.

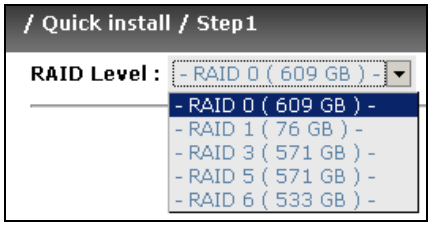


***Figure 4-2***

2. Type **Volume size** and select a **LUN** number. By default, the maximum volume size is shown. To re-enter the size be sure it has to be less or equal to the maximum volume size. Then click **Next**.


***Figure 4-3***

**(Figure 4-3: The maximum volume size is 222GB and 1 LUN (No. 0) is attached.)**

3. Click **Confirm** if all setups are correct. Then a page with the "User data volume" will be shown as below. You can start to use the system now.


***Figure 4-4***

**(Figure 4-4: A RAID 5 user data volume with the UDV name "QUICK40547", named by the system itself, with the total available volume size 222GB and attached with 1 LUN.)**

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**Note:** The UDV created by Quick Install is accessible by every host. Access control of host would show as a wildcard "*". For recording storage, you must create an independent UDV for a specific host. For details on UDV, see *4.5.4 User Data Volume.*

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## 4.3 System Configuration

**System config** selection is for the setup of **System name**, **IP address**, **Language**, **Login config**, **Password**, **Date**, **Mail**, **SNMP, Messenger, System log server** and **Event log**.

### 4.3.1 System Name

Select **System name** to change the system name. Default system name composed by model name and serial number of this system, ex: GV-StorageSystem-A4A04D.


***Figure 4-5***

### 4.3.2 IP Address

Select **IP address** to change IP address for remote administration usage. There are 2 selections, DHCP or static IP. The default setting is **Static** enabled. You can change the HTTP, HTTPS and SSH port number when the default port number is not allowed on the DVR host.

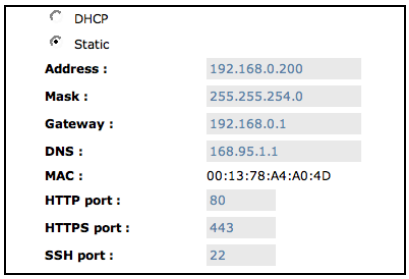



***Figure 4-6***

### 4.3.3 Language

Select **Language** to set the language shown in Web UI. The option **Auto Detect** will be detected by browser language setting.

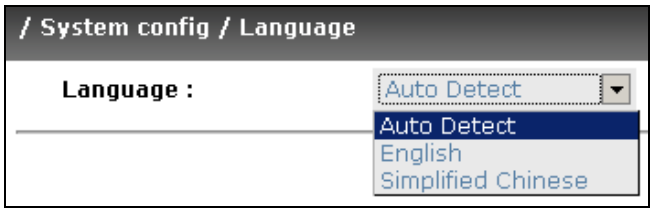



***Figure 4-7***

### 4.3.4 Login Config

Select **Login config** to set only one admin and set the auto logout timing. The only one admin can prevent multiple users access the system at the same time.

1 **Auto logout:** Options are (1) Disable (2) 5 mins (3) 30 mins (4) 1 hour. When the user is no response for a period of time, the system will logout automatically to allow another user to login.

2 **Login block:** Disable/Enable. When the login lock is enabled, the system allows only one user to login/modify the system settings.


***Figure 4-8***

### 4.3.5 Password

Select **Password** to change administrator password. The maximum length of admin password is 12 characters.

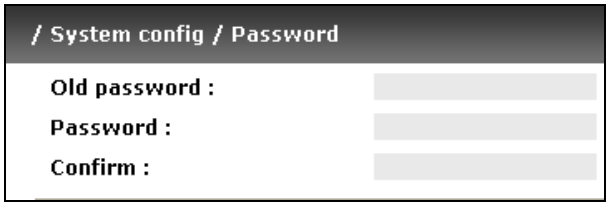



***Figure 4-9***

### 4.3.6 Date

Select **Date** to set up the current date, time, time zone and NTP server before using.

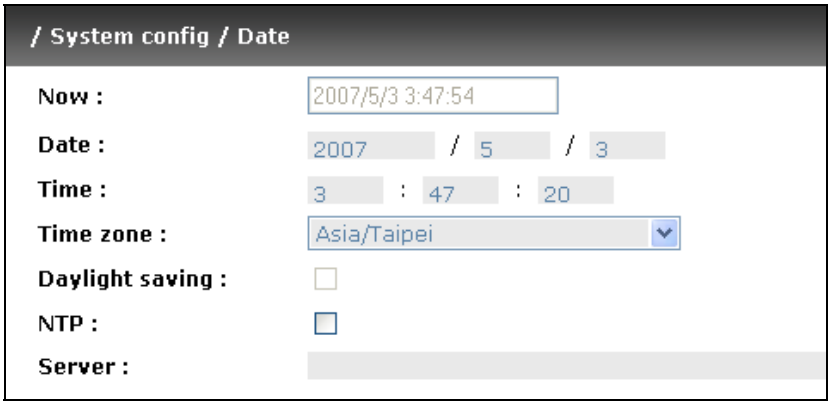



***Figure 4-10***

### 4.3.7 Mail

Select **Mail** to enter at most 3 mail addresses 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 select **Send test mail** to check whether the email works fine. You can also select which levels of event logs are necessary to be sent out by Mail. Default setting is only ERROR and WARNING event logs enabled.

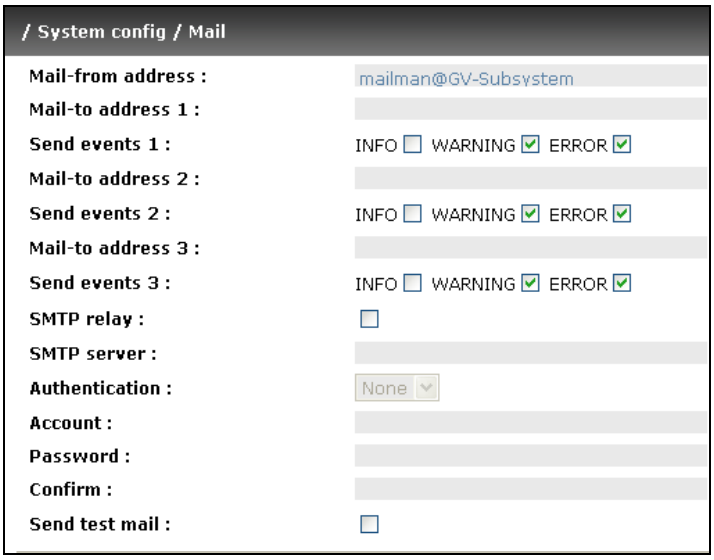



***Figure 4-11***

### 4.3.8 SNMP

Select **SNMP** to set up SNMP trap for alert via SNMP. It allows up to 3 SNMP trap addresses. Default community setting is “public”. You can choose the event log type, and the default value of SNMP is the INFO event log enabled only.

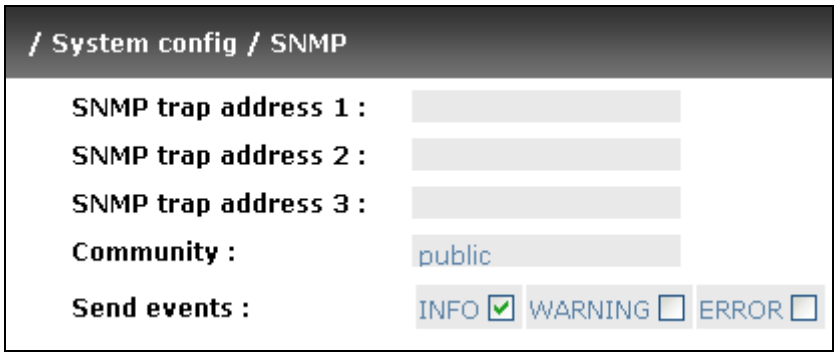



***Figure 4-12***

### 4.3.9 Messenger

Select **Messenger** to set up pop-up message alert via Windows messenger (not MSN). You 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. You can choose the event log levels and the default values are WARNING and ERROR event logs enabled only.

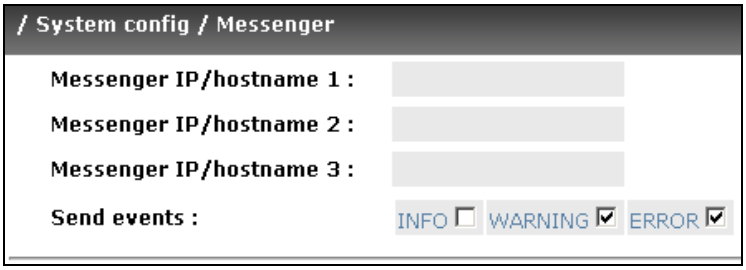



***Figure 4-13***

### 4.3.10 System log server

Select **System log server** to set up alert via syslog protocol. The default port of syslog is 514. You can choose the facility and the event log level. The default values of event level are INFO, WARNING and ERROR event logs enabled.

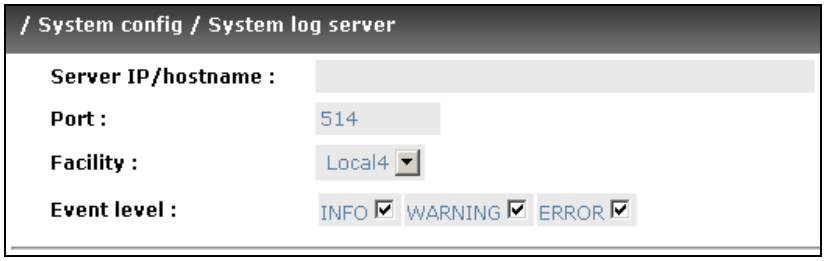



***Figure 4-14***

### 4.3.11 Event log

Select **Event log** to view the event messages.

- **The Filter button:** Choose the display.
- **The Download button**: Save the whole event log as text file with file name "log-ModelName-SerialNumber-Date-Time.txt" (E.g., log-GV-Storage System-A4A05D-20061011-114718.txt).
- **The Clear button:** Clear event log.
- **The Mute button:** Stop alarm if system alerts.

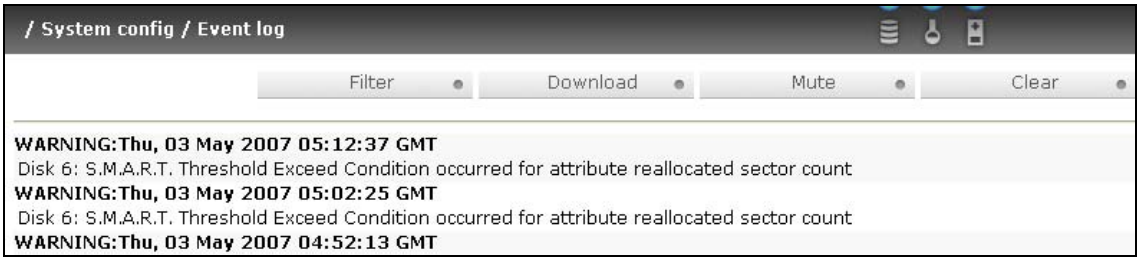



***Figure 4-15***

To customize your own display of event logs, there are total three display methods, on Web UI event log page (Show events), popup windows on Web UI (Pop up events), and on LCD panel menu (Show on LCM). The default setting is WARNING and ERROR event logs enabled on Web UI and LCD panel menu. The popup window is disabled by default.


***Figure 4-16***

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

## 4.4 iSCSI Config

**iSCSI config** selection is for the setup of **Entity Property**, **NIC**, **Node**, **Session**, and **CHAP account**.

### 4.4.1 Entity Property

Select **Entity property** to view the entity name of the system, and set up **iSNS IP** for iSNS service. **iSNS** is the abbreviation of Internet Storage Name Service. Add an iSNS server IP address to the iSNS server list which the iSCSI initiator service can send queries.

For details on iSNS server, please check Microsoft website.

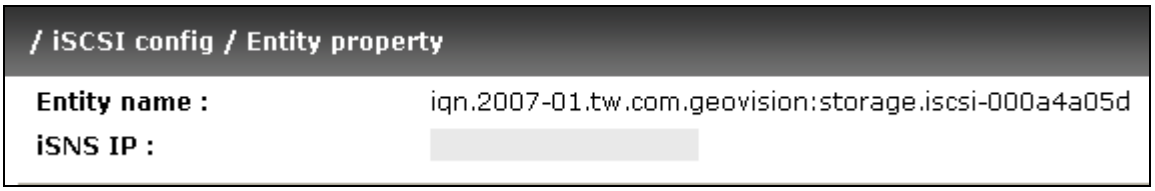
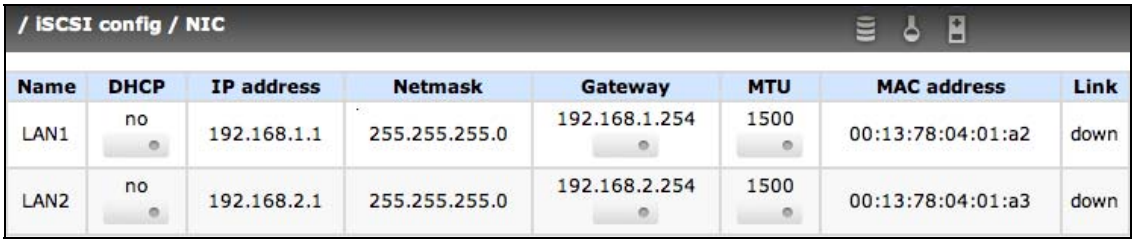



***Figure 4-17***

### 4.4.2 NIC

Select **NIC** to change IP addresses of iSCSI data ports. There are two gigabit LAN ports to transmit data. Each of them must be assigned to one IP address in multihomed mode. The default IP address for data port 1 is 192.168.1.1 and for data port 2 is 192.168.2.1.




| Name | DHCP | IP address | Netmask | Gateway | MTU | MAC address | Link |
|---|---|---|---|---|---|---|---|
| LAN1 | no | 192.168.1.1 | 255.255.255.0 | 192.168.1.254 | 1500 | 00:13:78:04:01:a2 | down |
| LAN2 | no | 192.168.2.1 | 255.255.255.0 | 192.168.2.254 | 1500 | 00:13:78:04:01:a3 | down |

***Figure 4-18***

**(Figure 4-18: Each of iSCSI data ports is set to static IP. MTU is 1500.)**

You can change IP address by clicking the blue square button in the **DHCP** column. There are 2 selections, DHCP (Get IP address from DHCP server) or static IP.

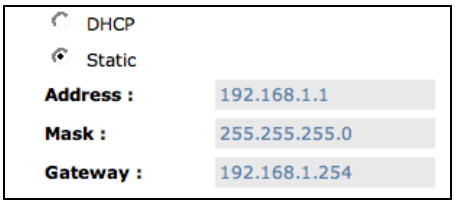



***Figure 4-19***

Default gateway can be changed by clicking the blue square button in the **Gateway** column. There is only one default gateway. The row of **No. 1** would be the default gateway.

MTU (Maximum Transmission Unit) size can be changed by clicking the blue square button in the **MTU** column.


***Figure 4-20***

The range of MTU size is between 1500 and 3900. Default MTU size is **1500**. If it is changed, the setting of MTU size on switching hub and LAN card should be set to the same size. Otherwise, the LAN cannot work properly.

### 4.4.3 Node

Select **Node** to view the target name for iSCSI initiator. Press **Auth** to enable CHAP authentication. **CHAP** is the abbreviation of Challenge Handshake Authorization Protocol. CHAP is a strong authentication method used with point-to-point for user login. It's a type of authentication in which the authentication server sends the client a key to be used for encrypting the username and password. CHAP enables the username and password to transmit in an encrypted form for protection.


***Figure 4-21***

To use CHAP authentication, please follow these steps:

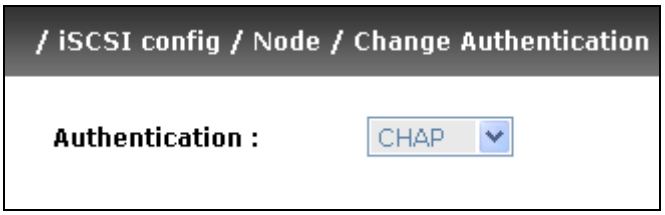



***Figure 4-22***

1. Click the blue square button in the Auth column.
2. Select **CHAP**.
3. Go to **\ iSCSI config\ CHAP account** to create account and password.

---

**Tips:** The initiator in the DVR host should have the same CHAP settings, otherwise you cannot log in the storage system.

---

### 4.4.4 Session

Select **Session** to view iSCSI session and connection information, which includes the following items:

1. Host (Initiator Name)
2. Security Protocol
3. TCP Port Number
4. Error Recovery Level
5. Error Recovery Count
6. Detail of Authentication status and Source IP: port number.

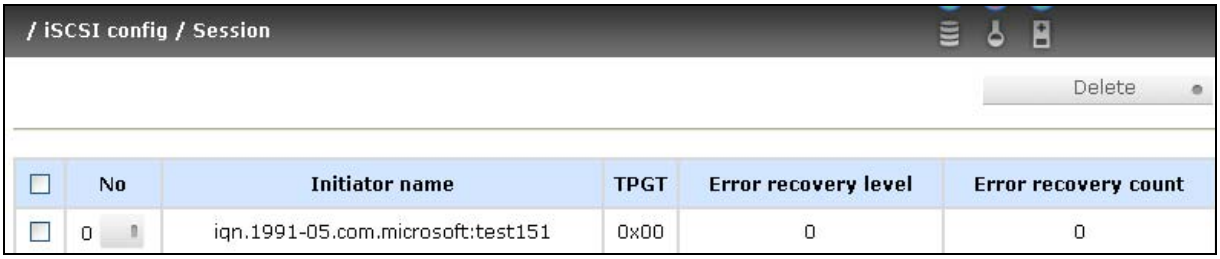



***Figure 4-23***

### 4.4.5 CHAP Account

Select **CHAP account** to create a CHAP account for authentication.

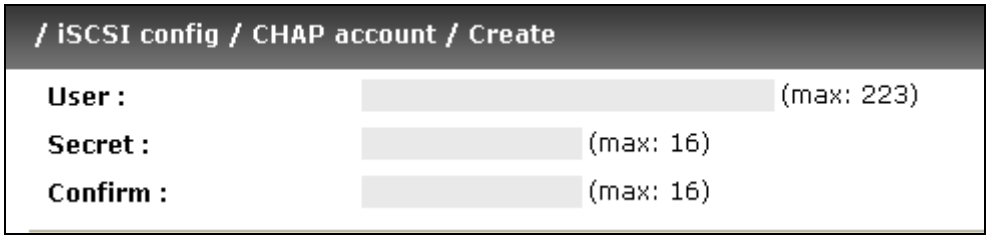



***Figure 4-24***

## 4.5 Volume Configuration

**Volume config** selection is for the setup of volume configurations including **Physical disk**, **Volume group**, **User data volume**, **Cache volume,** and **Logical unit** functions.

### 4.5.1 Volume Relationship Diagram

The below diagram describes the relationship of RAID components. One VG (Volume Group) consists of a set of UDVs (User Data Volume) and owns one RAID level attribute. Each VG can be divided into several UDVs. The UDVs from one VG share the same RAID level, but may have different volume capacity. Each UDV will be associated with one specific CV (Cache Volume) to execute the data transaction. Each CV could have different cache memory size from the user's modification/setting. LUN is the logical volume/unit, which the user could access through SCSI commands.

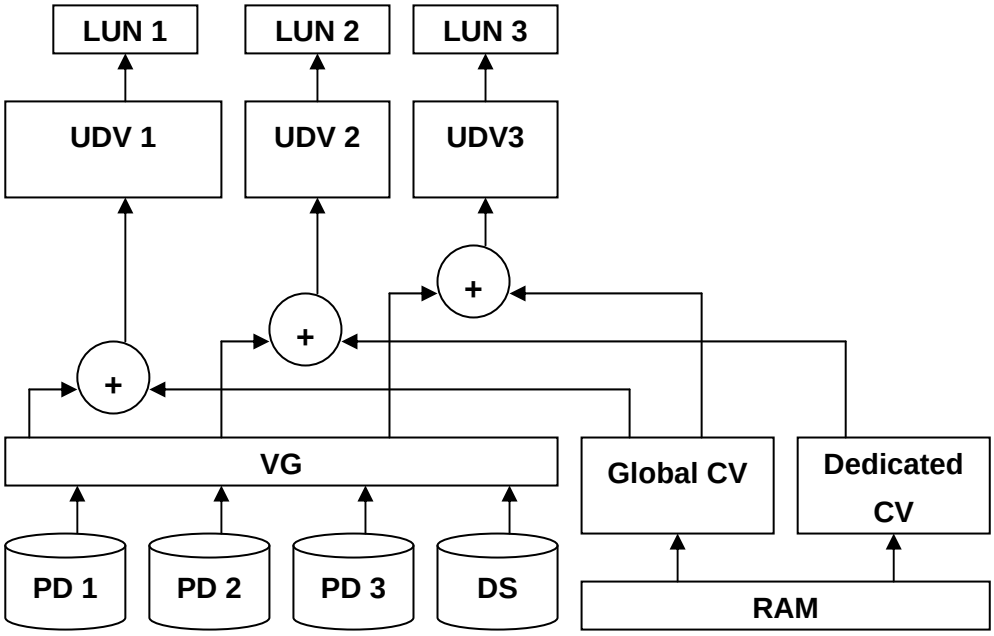



*Figure 4-25*

### 4.5.2 Physical Disk

Select **Physical disk** to view the status of hard drives inserted in the system. The following are operation tips:

1. Multiple select. Select one or more checkboxes in front of the slot number. Or select the checkbox at the top left corner will select all. Check again will select none.
2. The list box will disappear if there is no VG or only VG of RAID 0, JBOD. Because these RAID levels cannot be set as dedicated spare disk.
3. These three functions **Free disc**, **Global spares**, **Dedicated spares** can do multiple selections, too.
4. The operations of the other web pages (e.g.: volume config of VG, UDV, CV, LUN pages) are similar to previous steps.

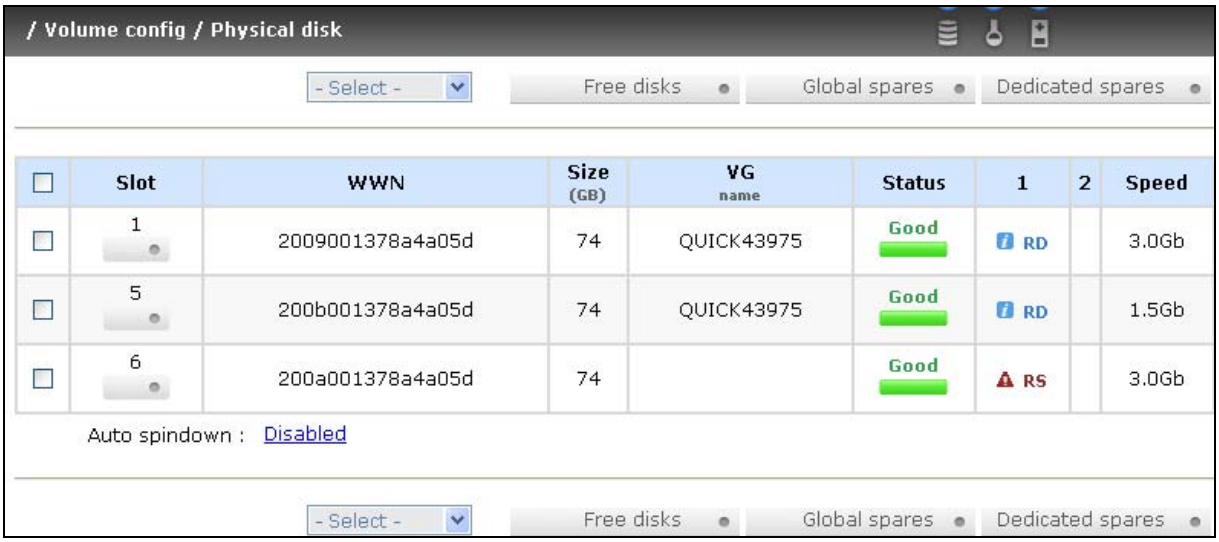



***Figure 4-26***

**(Figure 4-26: Physical disks of slot 1 and 5 are created for a VG named "QUICK43975". Slot 6 is reserved for use.)**

- **PD column description:**

| | |
|---|---|
| **Slot** | The position of hard drives. The blue square button below the number of slot is the **More Information** indication. It shows the details of the hard drive. |
| **WWN** | World Wide Name. |
| **Size (GB)** | Capacity of hard drive. |
| **VG Name** | Related volume group name. |

| | |
|---|---|
| **Status** | The status of hard drive.<br>• **Good:** the hard drive is good.<br>• **Defect:** the hard drive has the bad blocks.<br>• **Fail:** the hard drive cannot work in the respective volume. |
| **Status 1** | • **RD:** RAID Disk. This hard drive has been set to RAID.<br>• **FR:** Free disk. This hard drive is free for use.<br>• **DS:** Dedicated Spare. This hard drive has been set to the dedicated spare of the VG.<br>• **GS:** Global Spare. This hard drive has been set to a global spare of all VGs.<br>• **RS:** Reserve. The hard drive contains the VG information but cannot be used. It may be caused by an uncompleted VG set, or hot-plug of this disk in the running time. In order to protect the data in the disk, the status changes to reserve. It can be reused after setting it to “FR” manually. |
| **Status 2** | • **R:** Rebuild. The hard drive is doing rebuilding.<br>• **M:** Migration. The hard drive is doing migration. |
| **Speed** | • **3.0G:** From SATA ATAPI standard, if the disk can support ATAPI IDENTIFY PACKET DEVICE command, and the speed can achieve Serial ATA Gen-2 signaling speed (3.0Gbps).<br>• **1.5G:** From SATA ATAPI standard, if the disk can support ATAPI IDENTIFY PACKET DEVICE command, and the speed can achieve Serial ATA Gen-1 signaling speed (1.5Gbps).<br>• **Unknown:** The disk doesn’t support above command, so the speed is defined as unknown. |

- **PD operations description:**

| | |
|---|---|
| Free Disc | Make the selected hard drive to be free for use. |
| Global Spares | Set hard drive(s) to be global spare of all VGs. |
| Dedicated Spares | Set hard drive(s) to be dedicated spare of selected VGs. |

- **Auto spindown:**

In the page of Physical disk, the system also provides the HDD auto spindown function to save power. The default value is disabled.

Click **Disable** in the Auto spindown field. Then set the inactive time after which the HDD will spin down.


***Figure 4-27***

## 4.5.3 Volume Group

Select **Volume group** to view the status of each volume group.

- **VG column description:**

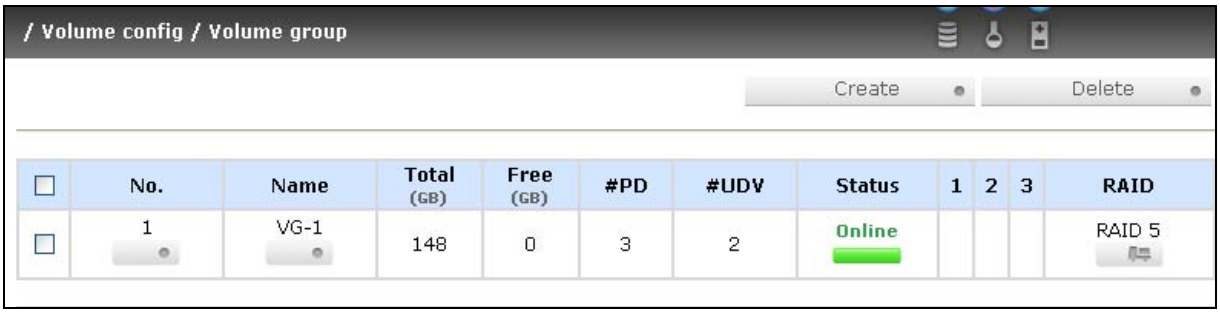



***Figure 4-28***

**(Figure 4-28: There is a RAID 5 with 3 physical disks, named "VG-1", total size is 148GB, free size is 0GB, related to 2 UDV.)**

| | |
|---|---|
| **No.** | Number of volume group. The blue square button below the No. is the **More Information** indication. It shows the details of the volume group. |
| **Name** | Volume group name. The blue square button under the Name is the **Rename** function. |
| **Total (GB)** | Total capacity of this volume group. |
| **Free (GB)** | Free capacity of this volume group. |
| **#PD** | The number of physical disks of the volume group. |
| **#UDV** | The number of user data volumes related to the volume group. |
| **Status** | The status of volume group.<br>• **Online:** volume group is online.<br>• **Fail:** volume group fails. |
| **Status 1** | **DG:** Degraded mode. This volume group is not completed. The reason could be lack of one disk or failure of disk. |
| **Status 2** | **R:** Rebuild. This volume group is doing rebuilding. |
| **Status 3** | **M:** Migration. This volume group is doing migration. |
| **RAID** | The RAID level of the volume group. The blue square button below the RAID level is the **Migrate** function. Clicking **Migrate** can add disk(s) to do expansion or change the RAID level of the volume group. |

- **VG operations description:**

| | |
|---|---|
| **Create** | Create a volume group. |
| **Delete** | Delete a volume group. |

### 4.5.4 User Data Volume

Select **User data volume** to view the status of each user data volume.


***Figure 4-29***

**(Figure 4-29: Create a UDV which name is "UDV-1"; related to "VG-1"; size is 100GB; status is online, write back and high priority; related to 1 LUN; with cache volume 300MB. The other UDV is named "UDV-2", initializing to 2%)**

- **UDV column description:**

| | |
|---|---|
| **No.** | Number of this user data volume. The blue square button below the UDV No. is the **More Information** indication. It shows the details of the User data volume. |
| **Name** | Name of this user data volume. The blue square button below the UDV Name is the **Rename** function. |
| **Size (GB)** | Total capacity of this user data volume. The blue square button below the size is the **Extend** function. |
| **Status** | The status of this user data volume.<br>• **Online:** user data volume is online.<br>• **Fail:** user data volume fails. |
| **Status 1** | • **WT:** Write Through.<br>• **WB:** Write Back.<br>The blue square button below the status1 is the **Set read/write mode** function. |
| **Status 2** | • **HI:** High priority.<br>• **MD:** Mid priority.<br>• **LO:** Low priority. |

| | |
|---|---|
| | The blue square button below the status2 is the **Set Priority** function. |
| **Status 3** | • **I:** user data volume is doing initializing.<br>• **R:** user data volume is doing rebuilding.<br>• **M:** user data volume is doing migration. |
| **R %** | **Ratio** of initializing or rebuilding. |
| **RAID** | The RAID level that user data volume is using. |
| **#LUN** | Number of LUN(s) that data volume is attaching. |
| **VG name** | The VG name of the user data volume. |
| **CV (MB)** | The cache volume of the user data volume. |

- **UDV operations description:**

| | |
|---|---|
| **Attach LUN** | Attach to a LUN. |
| **Create** | Create a user data volume function. |
| **Delete** | Delete a user data volume function. |

### 4.5.5 Cache Volume

Select **Cache volume** to view the status of cache volume.

The global cache volume is the default cache volume, which is created after power on automatically, and cannot be deleted. The size of global cache is based on the RAM size. It is total memory size minus the system usage.

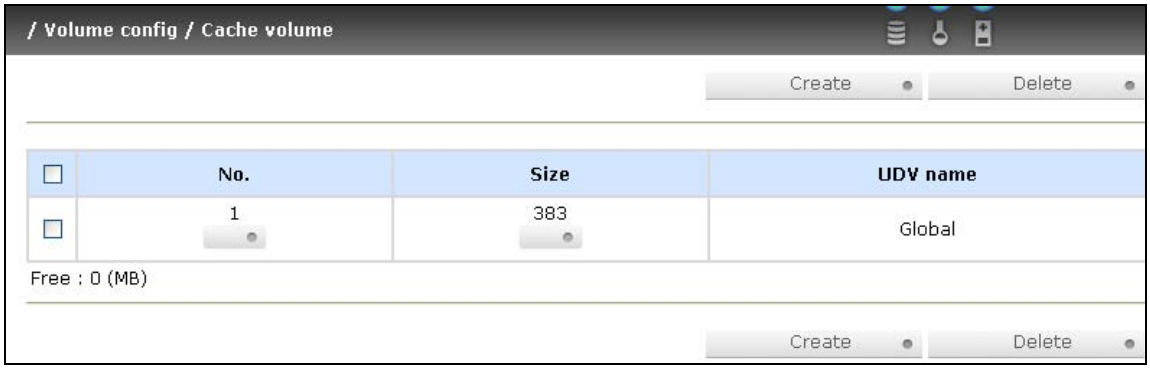



***Figure 4-30***

- **CV column description:**

| | |
|---|---|
| **No.** | Number of the Cache volume. The blue square button below the CV No. is the **More Information** indication**.** It shows the details of the cache volume. |
| **Size (MB)** | Total capacity of the cache volume. The blue square button below the CV size is the **Resize** function. The CV size can be adjusted. |
| **UDV Name** | Name of the UDV. |

- **CV operations description:**

| | |
|---|---|
| **Create** | Create a cache volume function. |
| **Delete** | Delete a cache volume function. |

## 4.5.6 Logical Unit

Select **Logical unit** to view the status of attached logical unit number of each UDV.

You can attach LUN by clicking the **Attach** button. In the Host field, you must enter an initiator node name for access control, or type wildcard **"*",** which means every host can access the volume. Select **LUN** and **Permission**, and then click **Confirm**.


***Figure 4-31***

You can assign up to 256 LUNs per system. For the host connection, the host number limitation is 32 per system at the same time, and 8 for single user data volume (UDV) which means 8 hosts can access the same UDV at the same time.

The matching rules of access control are from top to down by sequence. For example, there are 2 rules for the same UDV, one is "*", LUN 0; the other is "iqn.host1", LUN 1. The host "iqn.host2" can login because it matches the rule 1. The access will be denied when there is no matching rule.

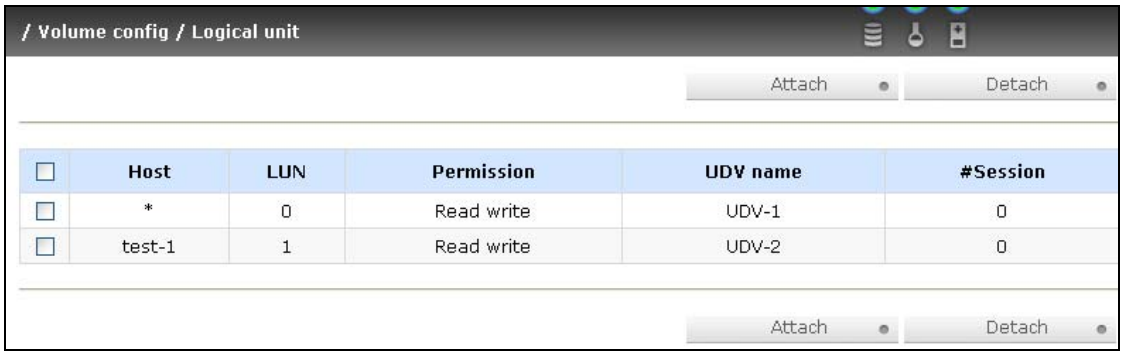



***Figure 4-32***

**(Figure 4-32: UDV-1 is attached to LUN 0 which every host can access. UDV-2 is attached to LUN 1 which only initiator node name "test-1" can access.)**

- **LUN operations description:**

| | |
|---|---|
| **Attach** | Attach a logical unit number to a user data volume. |
| **Detach** | Detach a logical unit number from a user data volume. |

---

**Note:**

- Only lower-case letters are allowed for Host name/imitator node name.
- If the Host is created for recording storage, do not assign the same UDV to other hosts again; otherwise you may suffer data lost or corrupt.
- If the Host is created for Backup Viewer, it is strongly recommended to select Read-only permission. For Backup Viewer function, see *Surveillance System User's Manual*.

---

## 4.6 Enclosure Management

The **Enclosure management** function allows managing enclosure information including **SES config**, **Hardware monitor** and **S.M.A.R.T.** functions. For the enclosure management, there are many sensors for different purposes, such as temperature sensors, voltage sensors and hard disks. And due to the hardware characteristics are different among these sensors, for different sensors, they have different polling intervals. Below are the polling time intervals:

1. Temperature sensors: 1 minute.
2. Voltage sensors: 1 minute.
3. Hard disk sensors: 10 minutes.

### 4.6.1 SES Configuration

**SES** represents SCSI Enclosure Services, one of the enclosure management standards. The initiator can communicate with the enclosure using a specialized set of SCSI commands to access power, cooling and other non-data characteristics.
The SES client software is available at the following web site: http://www.santools.com/

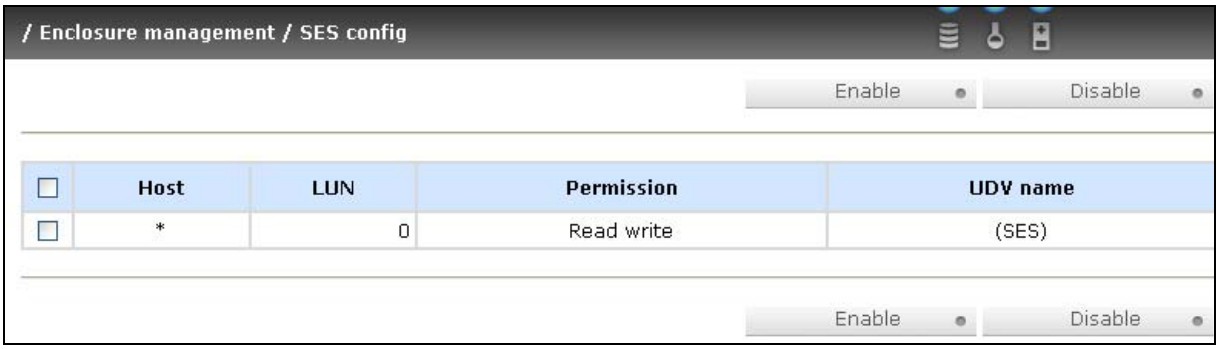



***Figure 4-33***

**(Figure 4-33: LUN 0 is enabled for SES, and can be accessed from every host.)**

## 4.6.2 Hardware Monitor

Select **Hardware monitor** to view the information of current voltage and temperature.

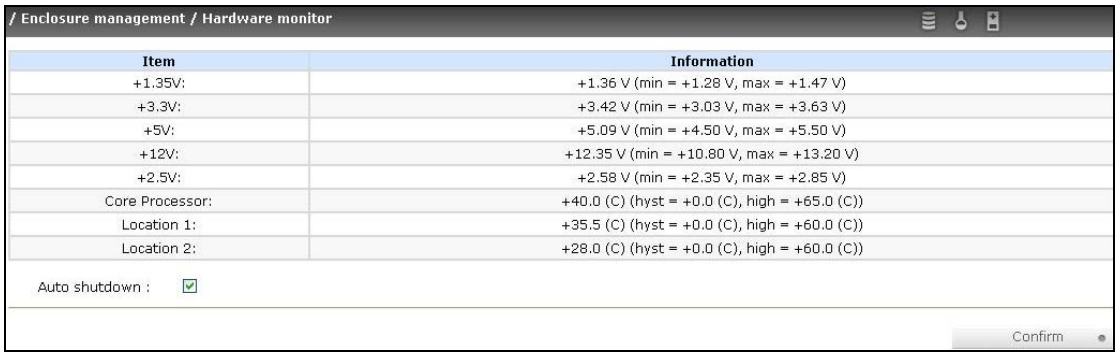



***Figure 4-34***

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 to avoid single short period of high temperature triggering auto shutdown, the system uses multiple condition judgments for auto shutdown. Below is the detail of when the auto shutdown will be triggered.

1 There are 3 sensors placed on the enclosure for temperature checking: on core processor, on PCI-X bridge (location 1), and on daughter board (location 2). The system will check each sensor every 30 seconds. When one of these sensors is over the high temperature value for continuous 3 minutes, the auto shutdown will be triggered immediately.

2 **The "Temperature light" indicator** on the window will turn red when one of 3 sensors reaches the abnormal temperature: the core processor temperature reaches 65℃, PCI-X bridge (location 1) temperature reaches 60 ℃ and daughter board (location 2) temperature reaches 60 ℃.

3 **The system buzzer will alarm and the system will shut down automatically** when one of 3 sensors reaches the temperature limit for continuous 3 minutes: the temperature limit of core processor is 70℃, PCI-X bridge (location 1) is 65 ℃ and daughter board (location 2) is 65 ℃.

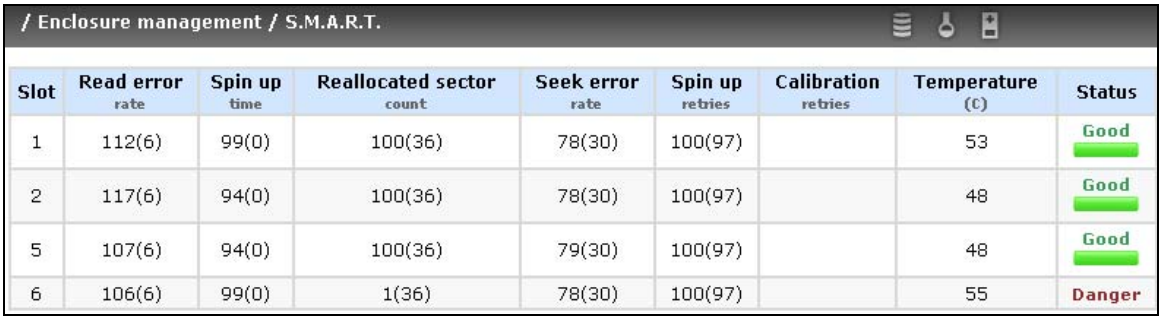
4 If the high temperature situation doesn't last for 3 minutes, the system will not do auto shutdown.

### 4.6.3 Hard Drive S.M.A.R.T. Function Support

**S.M.A.R.T.** (Self-Monitoring Analysis and Reporting Technology) is a diagnostic tool for hard drives to give advanced warning of drive failures. **S.M.A.R.T.** provides you chances to take actions before possible drive failure.

S.M.A.R.T. measures many attributes of the hard drive all the time and decides the hard drives which are close to out of tolerance. The advanced notice of possible hard drive failure can allow you 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.

Select **S.M.A.R.T.** to 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.




| Slot | Read error rate | Spin up time | Reallocated sector count | Seek error rate | Spin up retries | Calibration retries | Temperature (C) | Status |
|---|---|---|---|---|---|---|---|---|
| 1 | 112(6) | 99(0) | 100(36) | 78(30) | 100(97) | | 53 | Good |
| 2 | 117(6) | 94(0) | 100(36) | 78(30) | 100(97) | | 48 | Good |
| 5 | 107(6) | 94(0) | 100(36) | 79(30) | 100(97) | | 48 | Good |
| 6 | 106(6) | 99(0) | 1(36) | 78(30) | 100(97) | | 55 | Danger |

***Figure 4-35***

## 4.7 System Maintenance

The **Maintenance** function allows operation of the system functions including **Upgrade** to the latest firmware, **Info** to show the system version, **Reset to default** to reset all configuration values to origin settings, **Config import & export** to export and import all configurations except for VG/UDV setting and LUN setting, and **Shutdown** to either reboot or shutdown the system.

### 4.7.1 Upgrade

Select **Upgrade** to upgrade firmware. Please prepare the new firmware file named **xxxx.bin** in local hard drive, and then press **Browse** to select the file. Click **Confirm**, and it will pop up a message "*Upgrade system now? If you want to downgrade to the previous FW later, please export your system config first*". Click **Cancel** to export system config first, and then click **OK** to start to upgrade firmware.
After finished upgrading, the system must reboot manually.


***Figure 4-36***

---

**Note:** Please contact with dvrsysstem@geovision.com.tw for latest firmware.

---

### 4.7.2 Info

Select **Info** to display system type, FW number, CPU type, RAM size, and serial number.

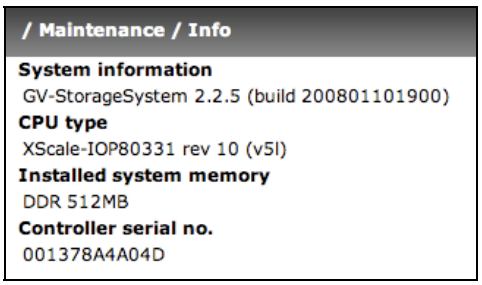



***Figure 4-37***

### 4.7.3 Reset to Default

The **Reset to default** function allows you to reset the system to factory default settings.


***Figure 4-38***

### 4.7.4 Config Import & Export

The **Config import & export** function allows you to save configurable values, and to apply all configurations to the current or another system. For the volume config setting, the values are available in the export function and not available in the import function which can avoid confliction/date-deleting between two systems. That says if one system already has valuable data on the disks and you may forget it and use the import function. If the volume setting was also imported, your current data will be cleared. Below is the table of available configurations in import & export functions.


***Figure 4-39***

| | |
|---|---|
| **System name** | System name |
| **IP address** | Web UI IP address with (1) DHCP enabled, (2) IP, (3) Subnet mask, (4) Gateway, (5) DNS |
| **iSCSI** | iSCSI data port address with (1) iSNS, (2) CHAP, (3) LAN 1 and LAN 2 IP, Subnet mask, Gateway, MTU |
| **Login config** | Admin account login config with (1) Auto logout setting, (2) Admin login lock |
| **Password** | Admin password value with (1) Current password, (2) Old password |
| **Date** | Time Zone setting |

| | |
|---|---|
| **Mail** | Event log mail setting with (1) Mail_from address, (2) SMTP server, (3) Authentication, (4) Mail account ID, (5) Mail password, (6) Mail_To_1 address, (7) Mail_To_2 address, (8) Mailt_To_3 address, (9) Event log filter setting |
| **SNMP** | SNMP setting with (1) SNMP trap address 1, (2) SNMP trap address 2, (3) SNMP trap address 3, (4) Community setting, (5) Event log filter function |
| **Event log** | Event log filter setting with (1) Web UI setting, (2) LCM setting, (3) Web UI pop up event setting |
| **SES config** | SES management setting |
| **vol_temp** | Auto shutdown setting |
| **Physical disk** | **Not available in the import function.**<br>Current hard disk status with (1) size, (2) block size, (3) VG, (4) hard status |
| **Physical disk spindown** | **Not available in the import function.**<br>Hard disk auto spindown setting |
| **Volume group** | **Not available in the import function.**<br>VG setting with (1) VG name, (2) size, (3) number of physical disks, (4) number of UDVs, (5) RAID level |
| **Cache volume** | **Not available in the import function.**<br>Cache volume setting with (1) size, (2) percentage |
| **User data volume** | **Not available in the import function.**<br>UDV setting with (1) UDV name, (2) size, (3) VG name, (4) cache volume, (5) stripe height, (6) block size, (7) write through or write back, (8) priority |
| **Logical unit** | **Not available in the import function.**<br>LUN setting with (1) host name, (2) target name, (3) UDV name, (4) LUN number, (5) permission |

## 4.7.5 Shutdown

Select **Shutdown** to display the **Reboot** and **Shutdown** buttons. Before power off, it's better to press Shutdown to flush the data from cache to physical disks. The step is better for the data protection.

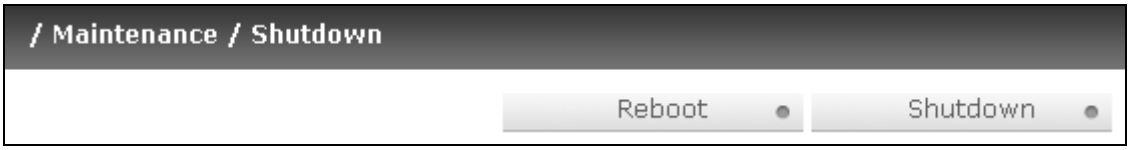



***Figure 4-40***

## 4.8 Logout

For security reason, the **Logout** function will allow logout while no user is operating the system. To re-login the system, please enter username and password again.

# Chapter 5 Examples of Creating Volumes

The followings are examples for creating volumes. Example 1 is to create two UDVs sharing the same CV (global cache volume) and set a global spare disk. Example 2 is to create two UDVs. One shares global cache volume; the other uses dedicated cache volume. Then, set a dedicated spare disk.

## 5.1 Example 1

Example 1 is to create two UDVs in one VG, each UDV 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. The last, delete all of them.

**Step 1:** Create VG (Volume Group).

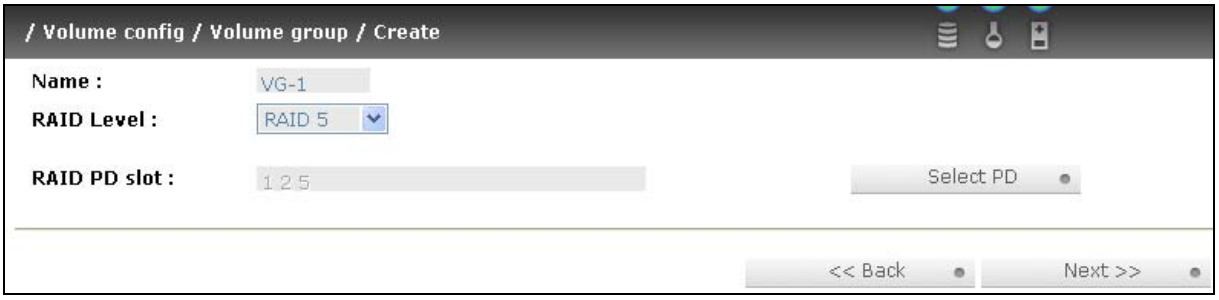



***Figure 5-1***

a. Select **/ Volume config / Volume group**.

b. Click **Create**.

c. Type a VG Name, select a RAID level, press **Select PD** to choose the RAID PD slot(s), and then press **Next**.

d. Check the outcome. Press **Confirm** if all setups are correct.

e. A VG has been created.

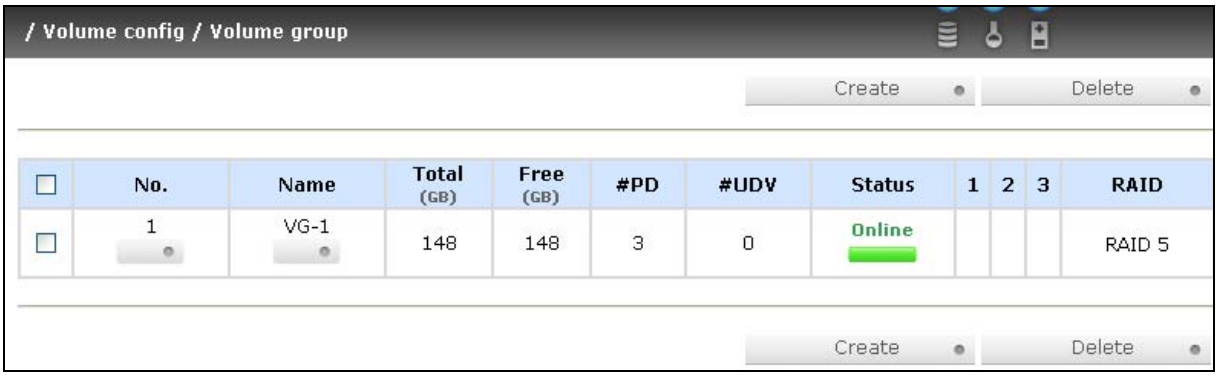



***Figure 5-2***

**(Figure 5-2: Creating a RAID 5 with 3 physical disks, named "VG-1". The total size is 148GB. Because of no related UDV there, free size still remains 148GB.)**

**Step 2:** Create UDV (User Data Volume).

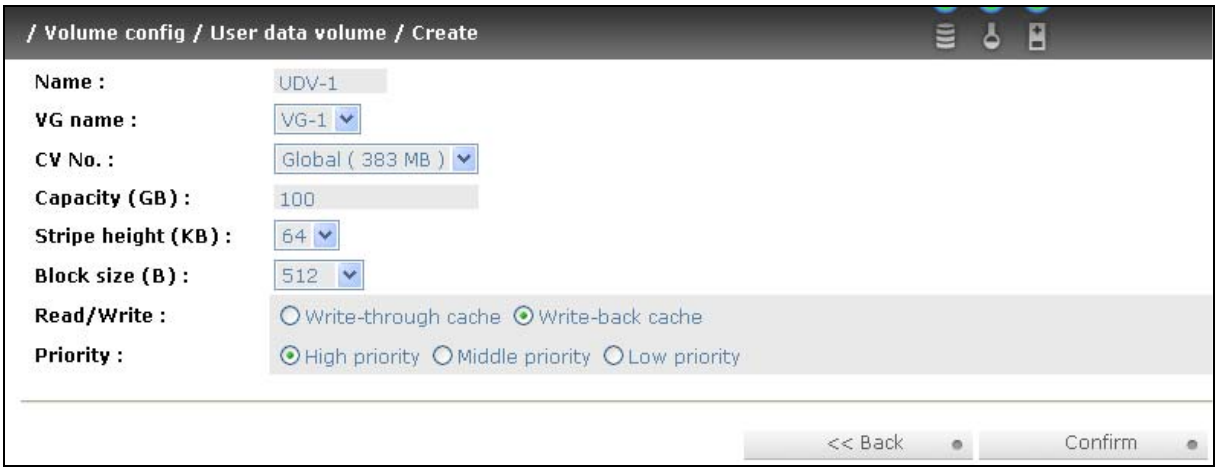



***Figure 5-3***

a. Select **/ Volume config / User data volume**.

b. Click **Create**.

c. Type a UDV name, choose a VG Name and enter a size to the UDV. Decide the stripe height, block size, read/write mode and set priority. Finally click **Confirm**.

d. A UDV has been created.

e. Do one more time to create another UDV.


***Figure 5-4***

**(Figure 5-4: Create UDVs named "UDV-1" and "UDV-2", related to "VG-1". The size of "UDV-1" is 100GB, and the size of "UDV-2" is 48GB. The status of these UDVs are online, write back, high priority with cache volume 383MB. "UDV-2" is initialing about 32%. There is no LUN attached.)**

**Step 3:** Attach LUN to UDV.

There are 2 methods to attach LUN to UDV.

1. In / Volume config / User data volume, press **Attach**.
2. In / Volume config / Logical unit, press **Attach**.

The procedures are as follows:


***Figure 5-5***

a. In / Volume config / User data volume, select a UDV and press **Attach**.

b. Enter **Host**, which is an initiator node name for access control, or type wildcard **"*",** which means every host can access this volume. Choose LUN and permission, and then click **Confirm**.

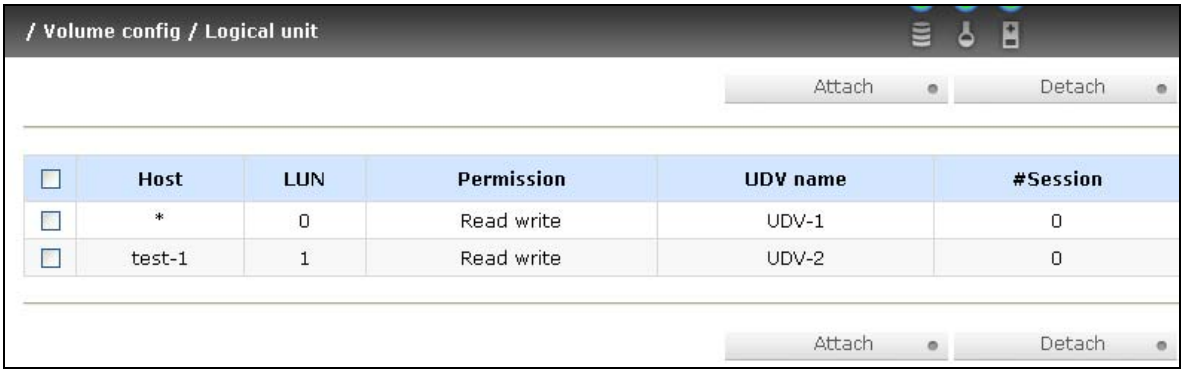



***Figure 5-6***

**(Figure 5-6: UDV-1 is attached to LUN 0 which any host can access. UDV-2 is attached to LUN 1 which only initiator node named "test-1" can access.)**

**Step 4:** Set global spare disk.

a. Select **/ Volume config / Physical disk**.

b. Select the free disk(s) by clicking the checkbox of the row, and then click **Global Spare** to set as global spares.

c. There is a **GS** icon shown up at Status 1 column.

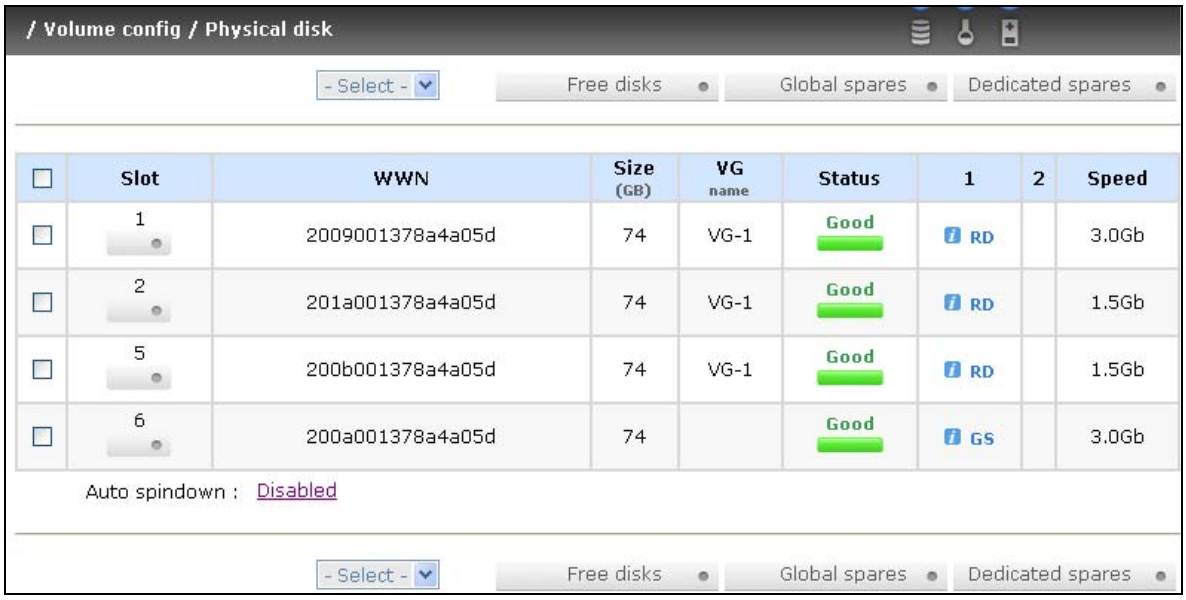



***Figure 5-7***

**(Figure 5-7: Slot 6 is set as global spare disk.)**

**Step 5:** Done. They can be used as iSCSI disks.

To delete UDVs and VG, please follow the steps below.

**Note:** If the storage system is connecting to any DVR host, please log off the iSCSI device from the host before deleting any volumes.

**Step 6:** Detach LUN from UDV.

a. In / Volume config / Logical unit, select LUNs by clicking the checkbox of the row, then click **Detach**. There will pop up a confirm page.

b. Choose **OK**.

**Step 7:** Delete UDV (User Data Volume).

a. Select **/ Volume config / User data volume**.

b. Select UDVs by clicking the checkbox of the row.

c. Click **Delete**. There will pop up a confirm page.

d. Choose **OK**. The UDVs have been deleted.

**Note:** When you delete UDV, the attached LUN(s) related to this UDV will be detached automatically, too.

**Step 8:** Delete VG (Volume Group).

a. Select **/ Volume config / Volume group**.

b. Select a VG by clicking the checkbox of the row. Make sure that there is no UDV on this VG, or the UDV(s) on this VG must be deleted first.

c. Click **Delete**. There will pop up a confirmation page.

d. Choose **OK.** The VG has been deleted.

**Note:** The action of deleting one VG will succeed only when all of the related UDV(s) are deleted in this VG. Otherwise, it will have an error when deleting this VG.

**Step 9:** Free global spare disk.

a. Select **/ Volume config / Physical disk**.

b. Select the global spare disk by clicking the checkbox of the row, then click **Free Disks** to free disk.

**Step 10:** All volumes have been deleted.

## 5.2 Example 2

Example 2 is to create two UDVs in one VG. One UDV shares the global cache volume, and the other uses the dedicated cache volume. First, the dedicated cache volume should be created; it can be used in creating UDV. The last, delete them.

Each UDV is associated with one specific CV (cache volume) to execute the data transaction. Each CV could have different cache memory size. If there is no special request in UDVs, it uses global cache volume. Or you can create a dedicated cache for indivifual UDV manually. Using dedicated cache volume, the performance would not be affected by the other UDV's data access.

The total cache size depends on the RAM size and set all to global cache automatically. To create a dedicated cache volume, first step is to cut down global cache size for the dedicated cache volume. Please follow the procedures.

---

**Note:** If there is no special requirement, it is strongly recommended not to modify global catch volume and create dedicated cache volume, but keep default settings.

---

**Step 1:** Create dedicated cache volume.


***Figure 5-8***

a. Select **/ Volume config / Cache volume**.

b. If there is no free space for creating a new dedicated cache volume, cut down the global cache size first by clicking the blue square button in the Size column. After resizing the global cache volume, click **Confirm** to return to the cache volume page.

c. Click **Create** to enter the setup page.

d. Fill in the size and click **Confirm**. A new dedicated cache volume has been set.

---

**Note:** The minimum size of dedicated cache volume is **20MB**.

---

**Step 2:** Create VG (Volume Group).

Please refer to Step 1 of Example 1 to create VG.

**Step 3:** Create UDV (User Data Volume).

Please refer to Step 2 of Example 1 to create UDV. To create a data user volume with dedicated cache volume, please follow the below procedures.

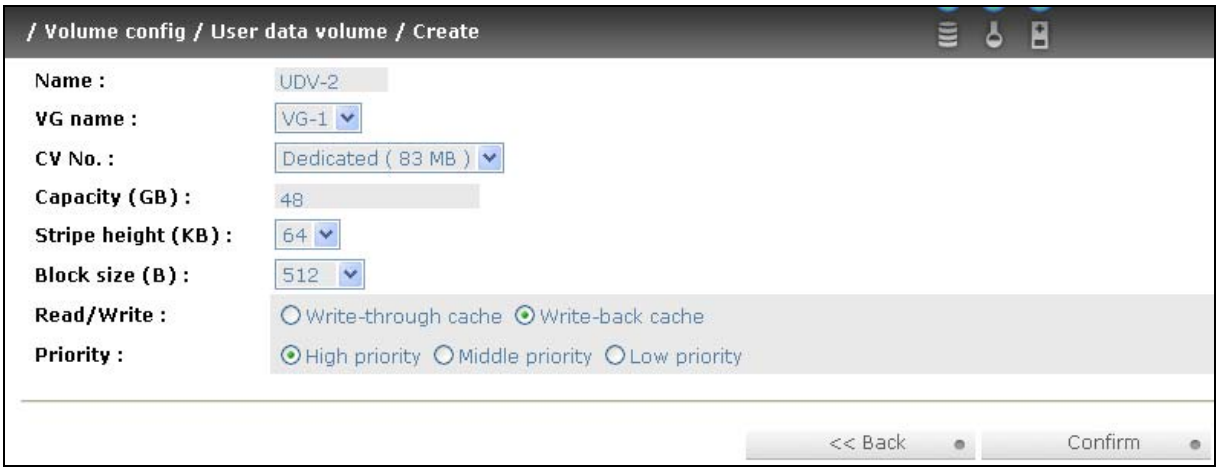



***Figure 5-9***

a. Select **/ Volume config / User data volume**.

b. Click **Create**.

c. Type a UDV name, choose a VG Name, and select **Dedicated** cache which is created at Step 1. Enter the size for the UDV, decide the stripe height, block size, read/write mode and set priority. Finally click **Confirm**.

d. A UDV using dedicated cache has been created.


*Figure 5-10*

**(Figure 5-10: UDV named "UDV-1" uses global cache volume 300MB, and "UDV-2" uses dedicated cache volume 83MB. "UDV-2" is initialing about 2%.)**


*Figure 5-11*

**(Figure 5-11: In / Volume config / Cache volume, UDV named "UDV-2" uses dedicated cache volume 83MB.)**

**Step 4:** Attach LUN to UDV.

Please refer to Step 3 of Example 1 to attach LUN.

**Step 5:** Set dedicated spare disk.

a. Select **/ Volume config / Physical disk**.

b. Select a VG from the list box, then select the free disk(s), and click **Dedicated spares** to set as dedicated spare for the selected VG.

c. There is a **DS** icon shown up at the Status 1 column.


***Figure 5-12***

**(Figure 5-12: Slot 6 has been set as dedicated spare disk of VG named "VG-1".)**

**Step 6:** Done. The PDs can be used as iSCSI disks.

To delete UDVs and VG, please follow the steps.

**Step 7:** Detach LUN from UDV.

Please refer to Step 6 of Example 1 to detach LUN.

**Step 8:** Delete UDV (User Data Volume).

Please refer to Step 7 of Example 1 to delete UDV.

**Step 9:** Delete VG (User Data Volume).

Please refer to Step 8 of Example 1 to delete VG.

**Step 10:** Free dedicated spare disk.

a. Select **/ Volume config / Physical disk**.

b. Select the dedicated spare disk by clicking the checkbox of the row, then click **Free Disks** to free disk.

**Step 11:** Delete dedicated cache volume.

a. Select **/ Volume config / Cache volume**.

b. Select a CV by clicking the checkbox of the row.

c. Click **Delete**. There will pop up a confirmation page.

d. Choose **OK**. The CV has been deleted.

---

**Caution:** Global cache volume cannot be deleted.

---

**Step 12:** Done. All volumes have been deleted.

# Chapter 6 Advanced operation

## 6.1 Rebuild

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

The system supports the **Auto-Rebuild** function. When the RAID level allows disk failures which the VG is protected, such as RAID 3, RAID 5, RAID 6, and etc, the system starts Auto-Rebuild as below scenario:

**Take RAID 6 for example:**

1. When there is no global spare disk or dedicated spare disk on the system, the system 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 VG automatically.
    a. If the new added disk is not clean (with other VG information), it would be marked as RS (reserved) and the system will not start the auto-rebuild.
    b. If this disk is not belonging to any existing VG, it would be FR (Free) disk and the system will start the auto-rebuild.
    c. If you only removes the failed disk and plugs the same failed disk in the same slot again, the auto-rebuild will start by this case. But rebuilding in the same failed disk may impact customer data later from the unstable disk status. We suggest all customers not to rebuild in the same 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 the auto-rebuild immediately. And in RAID 6, if there is another disk failure happening during the time of rebuilding, the system will start the above auto-rebuild scenario as well. And the auto-rebuild feature only works at "RUNTIME". It will not work at the downtime. Thus, it will not conflict with the “Roaming” function.

In degraded mode, the status of VG is **“DG”**.

When rebuilding, the status of PD/VG/UDV is **"R"**; and **"R%"** in UDV will display the ratio in percentage. After rebuilding is complete, **"R"** and **"DG"** will disappear. VG will become complete one.

---

**Note:** The list box doesn't exist if there is no VG or only VG of RAID 0, JBOD, because you cannot set dedicated spare disk for these RAID levels.

---

Sometimes, rebuild is called recover; these two have the same meaning. The following table is the relationship between RAID levels and rebuild.

| | |
|---|---|
| **RAID 0** | Disk striping. No protection of data. VG fails if any hard drive fails or unplugs. |
| **RAID 1** | Disk mirroring over 2 disks. RAID 1 allows one hard drive fail or unplugging. Need one new hard drive to insert to the system and rebuild to be completed. |
| **RAID 3** | Striping with parity on the dedicated disk. RAID 3 allows one hard drive fail or unplugging. |
| **RAID 5** | Striping with interspersed parity over the member disks. RAID 5 allows one hard drive fail or unplugging. |
| **RAID 6** | 2-dimensional parity protection over the member disks. RAID 6 allows two hard drives fail or unplugging. If it needs to rebuild two hard drives at the same time, it will rebuild the first one, then the other by sequence. |
| **RAID 0+1** | Mirroring of the member RAID 0 volumes. RAID 0+1 allows two hard drives fail or unplugging, but at the same array. |
| **RAID 10** | Striping over the member RAID 1 volumes. RAID 10 allows two hard drives fail or unplugging, but at different arrays. |
| **RAID 30** | Striping over the member RAID 3 volumes. RAID 30 allows two hard drives fail or unplugging, but at different arrays. |
| **RAID 50** | Striping over the member RAID 5 volumes. RAID 50 allows two hard drives fail or unplugging, but at different arrays. |
| **RAID 60** | Striping over the member RAID 6 volumes. RAID 40 allows four hard drives fail or unplugging, but each two at different arrays. |
| **JBOD** | The abbreviation of "Just a Bunch Of Disks". No protection of data. VG fails if any hard drive fails or unplugs. |

## 6.2 VG Migration and Extension

To migrate the RAID level, please follow the below procedures. If the VG migrates to the same RAID level of the original VG, it is extension.

1. Select **/ Volume config / Volume group**.
2. Decide which VG to be migrated, click the blue square button in the RAID column.
3. Change the RAID level by clicking the drop-down list of RAID Level. There will be a pup-up which shows if the HDD is not enough to support the new RAID level. Click **Select PD** to increase hard drives, and then click **Confirm** to go back to the setup page. When doing migration to lower RAID level, such as the original RAID level is RAID 6 and you want to migrate to RAID 0, the controller will evaluate this operation is safe or not, and display **"Sure to migrate to a lower protection array?"** to give user warning.
4. Double check the settings of RAID level and RAID PD slot. If no problem, click **Next**.
5. A confirmation page shows the detailed RAID info. If no problem, click **Confirm** to start migration. The system also pops up a message of **"Warning: power lost during migration may cause damage of data!"** to give you warning. When the power is abnormally off during migration, the data is in high risk.
6. Migration starts and it can be seen from the "Status 3" of a VG with a running square and an **"M"**. In / Volume config / User data volume, it displays an **"M"** in "Status 3" and complete percentage of migration in **"R%"**.

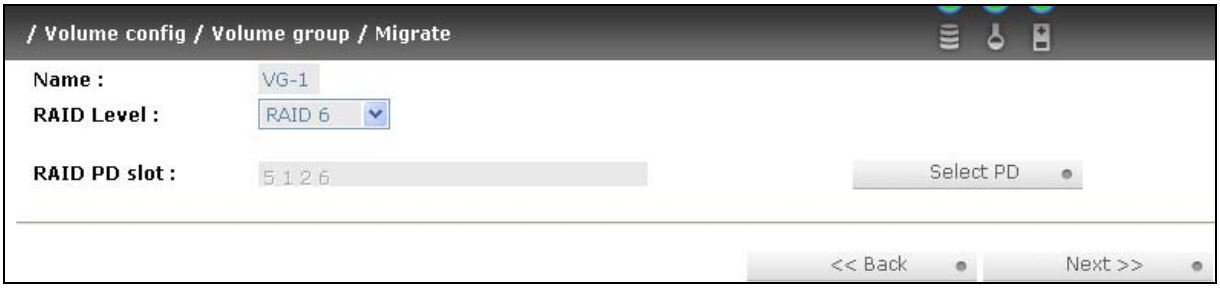



*Figure 6-1*


*Figure 6-2*

**(Figure 6-2: A RAID 5 with 3 physical disks migrates to RAID 6 with 4 physical disks.)**


***Figure 6-3***

**(Figure 6-3: A RAID 5 migrates to RAID 6. The complete percentage of two related UDVs is 1% and 0%.)**

---

**Note:** To do migration/extension, the total size of VG must be larger or equal to the original VG. It does not allow expanding the same RAID level with the same hard disks of original VG. During setting migration, if you do not setup properly, the system will pop up warning messages. Below is the detail of messages:

- ***"Invalid VG ID"***: Source VG is invalid.
- ***"Degrade VG not allowed"***: Source VG is degraded.
- ***"Initializing/rebuilding operation's going"***: Source VG is initializing or rebuilding.
- ***"Migration operation's going"***: Source VG is already in migration.
- ***"Invalid VG raidcell parameter"***: Invalid configuration. E.g., New VG's capacity < Old VG's capacity, New VG's stripe size < Old VG's stripe size. Or New VG's configuration == Old VG's configuration.
- ***"Invalid PD capacity"***: New VG's minimum PD capacity < Old VG's minimum PD capacity.

---

**Caution:** VG Migration cannot be executed during rebuild or UDV extension. The recording performance will be affected during migration.

---

## 6.3 UDV Extension

To extend UDV size, please follow the procedures.

1. Select **/ Volume config / User data volume**.
2. Decide which UDV to be extended, and click the blue square button in the Size column.
3. Change the size. The size must be larger than the original. Then click **Confirm** to start extension.
4. Extension starts. If UDV needs initialization, it will display an **"I"** in **"Status 3"** and complete percentage of initialization in "**R%**".


***Figure 6-4***


***Figure 6-5***

**(Figure 6-5: Extend UDV-R1 from 50GB to 108GB.)**

**Note:** If the storage system is connecting to any DVR host, please log off the iSCSI device from the host before the extension. After the extension, the new iSCSI disk will appear as an unformatted drive. Format the drive before usage.

**Caution:** UDV Extension cannot be executed during rebuild or migration.

## 6.4 Disk Roaming

Physical disks can be re-sequenced in the same system or move whole physical disks from system-1 to system-2. This is called disk roaming. Disk roaming has some constraints as described in the following:

1. Check the firmware of two systems first. It's better that both have the same firmware version or newer.
2. Whole physical disks of related VG should be moved from system-1 to system-2 together. The configuration of both VG and UDV will be kept but LUN configuration will be cleared to avoid conflict with system-2.

# Chapter 7 About iSCSI Initiator

The DVR host needs the iSCSI initiator to request access for storage. The iSCSI initiator is a driver handling the traffic in an iSCSI SAN.

## 7.1 Microsoft iSCSI Initiator

The Microsoft iSCSI Software Initiator is available as a free download from Microsoft Download Center.

### 7.1.1 System Requirements

The DVR host should run on one of these supported operating systems:

- Windows XP Pro SP1 or later
- Windows Server 2003 or later
- Windows 2000 SP3 or later
- Windows Vista

---

**Caution:** The iSCSI initiator is integrated into Windows Vista, therefore there is no need to install the initiator on Windows Vista.

---

## 7.1.2 Setting up Windows iSCSI Initiator

1. Run **Microsoft iSCSI Initiator.**

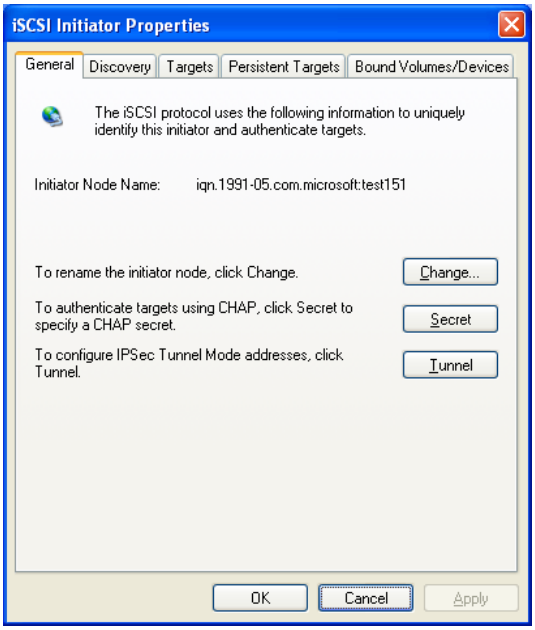



***Figure 7-1***

2. Click the **Discovery** tab, and click **Add** to add target portals.

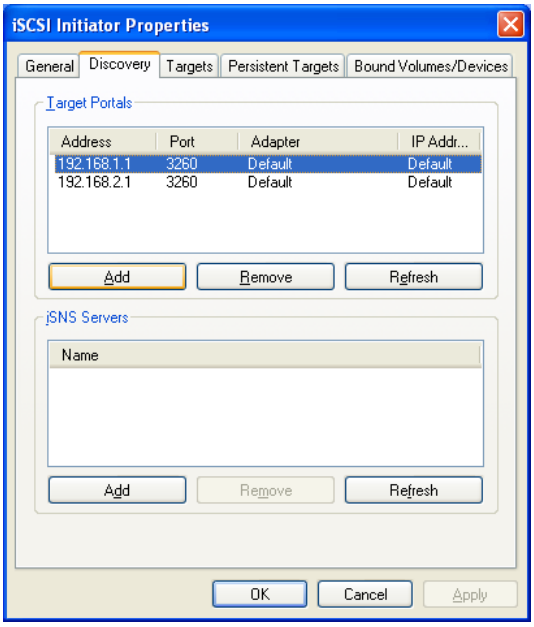



***Figure 7-2***

3. Type the IP of GV-Storage System. Click **OK**.

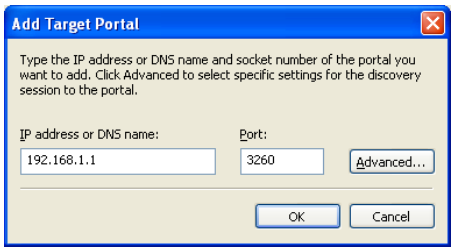



***Figure 7-3***

---

**Note:** By default, the IP of iSCSI data port 1 is **192.168.1.1**, and iSCSI data port 2 is **192.168.2.1**. If both data ports are used for connection to the DVR host, add both data port IPs respectively. The information of two data ports can be found in / iSCSI config / NIC.

---

4. Click the **Targets** tab, and click **Log On**.

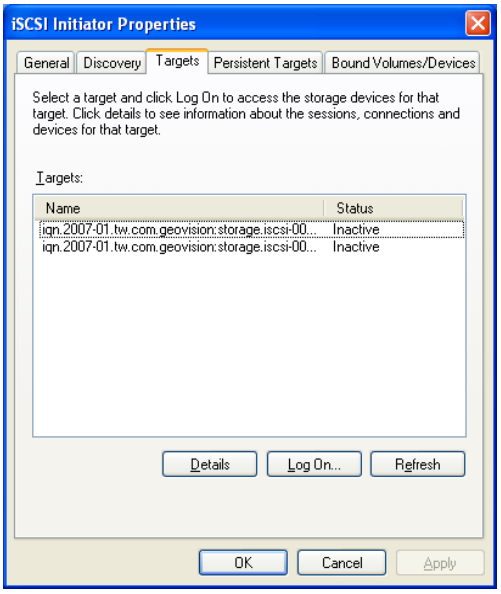



***Figure 7-4***

5. Select **Automatically restore this connection when the system boots**, and click **Advanced**.

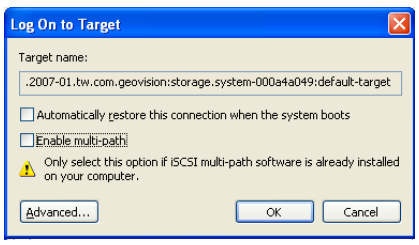



***Figure 7-5***

6. Select **Local Adaptor** to Microsoft iSCSI Initiator. Select **Source IP** to the host IP. Select **Target Portal** to iSCSI data port 1. If the CHAP authentication is enabled at the storage system, select **CHAP logon information** and type a valid username and target secret (password). Click **OK**.

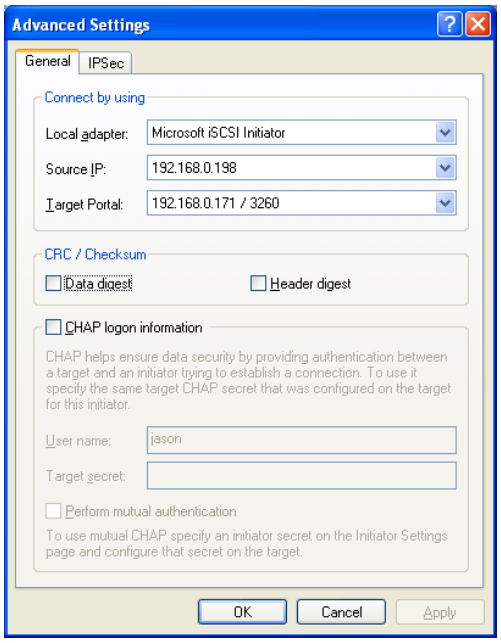



***Figure 7-6***

7. If the connection with the storage system is established, the status changes into “Connected”. At this step, you can already use the iSCSI disk by the operation similar to the case to increase a local disk. When connecting to the iSCSI disk at the first time, it is necessary to format it as well as a local disk.

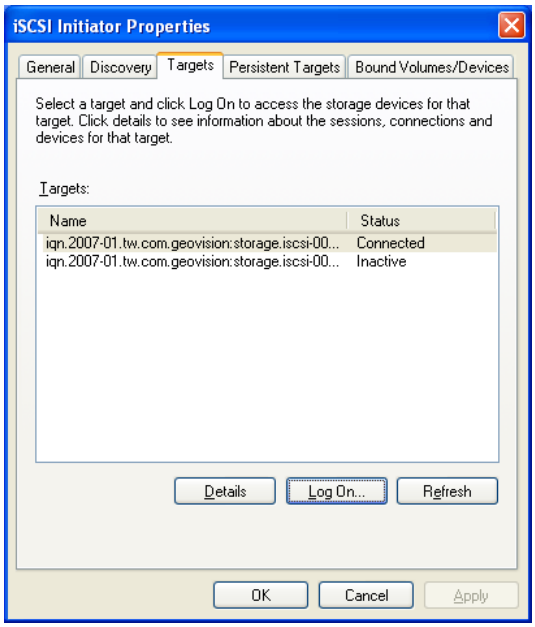



***Figure 7-7***

8. To add the iSCSI data port 2 for connection, click **Details** in Figure 7-7.

9. In the Target Properties dialog box, click **Connections**.

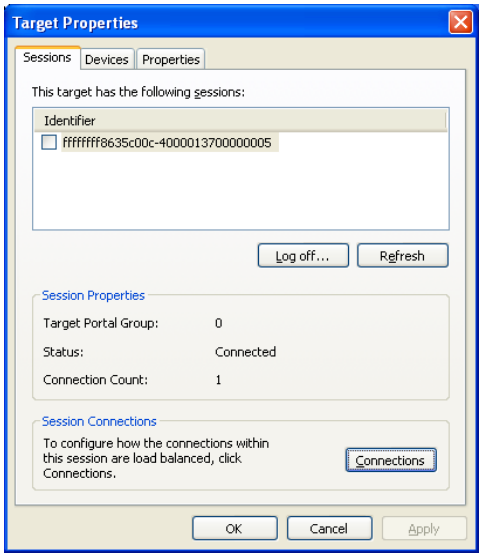



***Figure 7-8***

10. In the Session Connections dialog box, click **Add**.

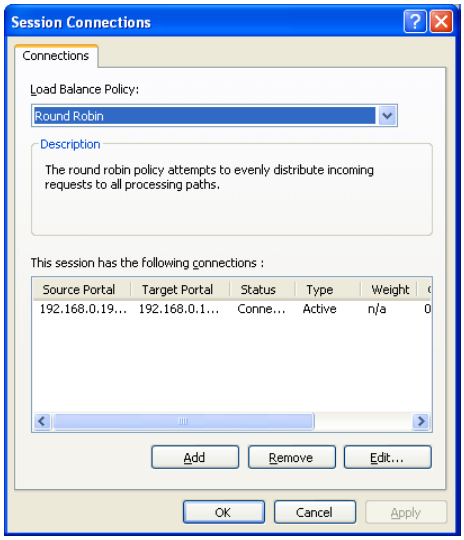



***Figure 7-9***

11. In the Add Connection dialog box, click **Advanced.**

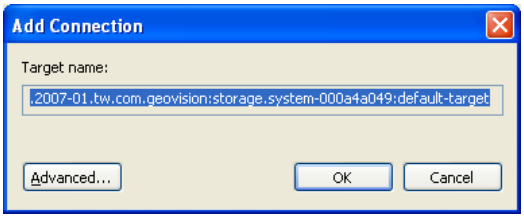



***Figure 7-10***

12. In the Advanced Settings dialog box, select **Target Portal** to the iSCSI data port 2. Set up the CHAP authentication if necessary. Click **OK**.

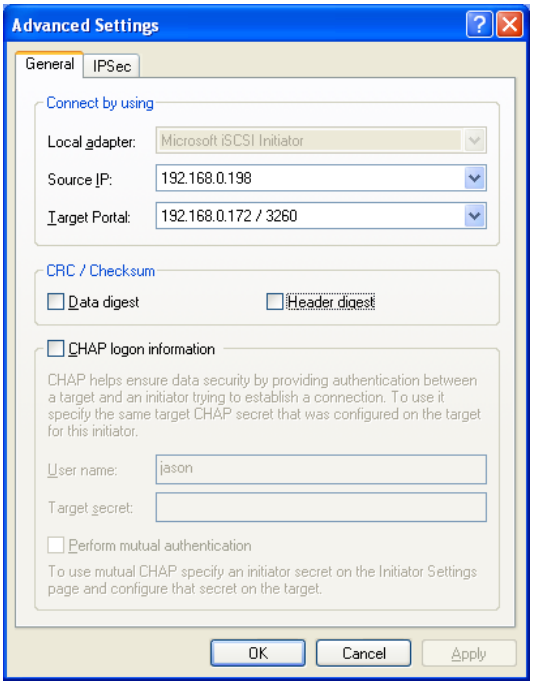



***Figure 7-11***

13. Now you can see the status of both Source Portals display “Connected”. Click **Apply**.

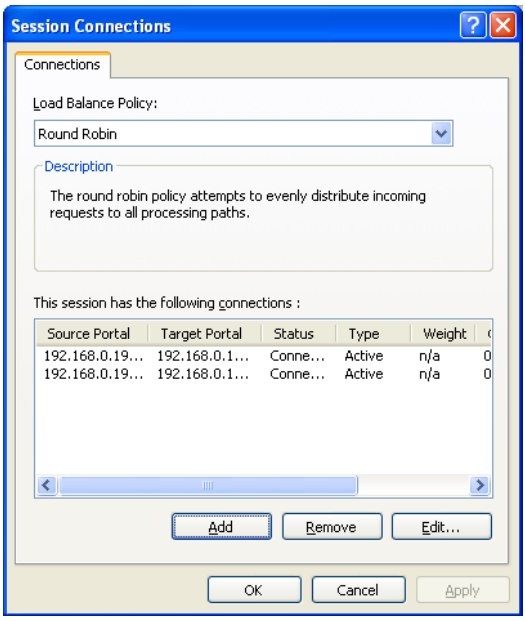



***Figure 7-12***

### 7.1.3 Logging off the iSCSI device

1. Click **Details** in Figure 7-7.

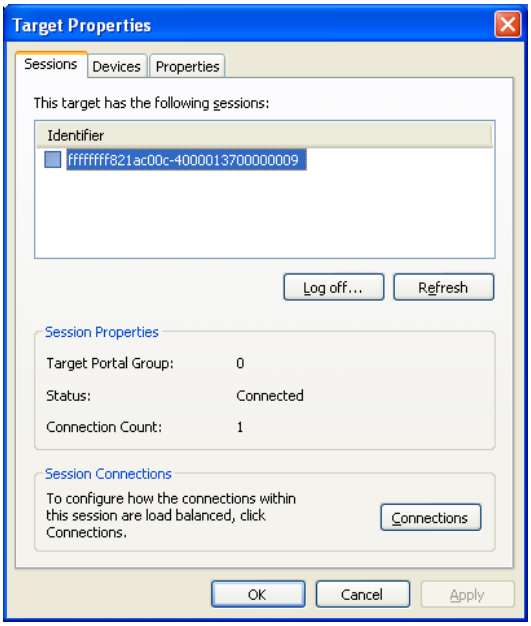



***Figure 7-13***

2. Select the identifier that will be deleted.
3. Click **Log off**. The iSCSI device is logged off successfully.

---

**Note:** If you cannot log off the iSCSI device, please check if any programs are accessing the iSCSI drive.

---

## 7.2 Support Microsoft MPIO and MC/S

Microsoft iSCSI Initiator supports the multi-path function. MPIO (Multi-Path Input/Output) and MC/S (Multiple Connections per Session) both use multiple physical paths to create logical "paths" between the DVR host 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 that applications can still access their data.

---

**Note:** With the MPIO function, one DVR host can connect up to 16 GV-Storage Systems at the same time; With the MC/S function, one DVR host can connect up to 32 GV-Storage Systems at the same time.

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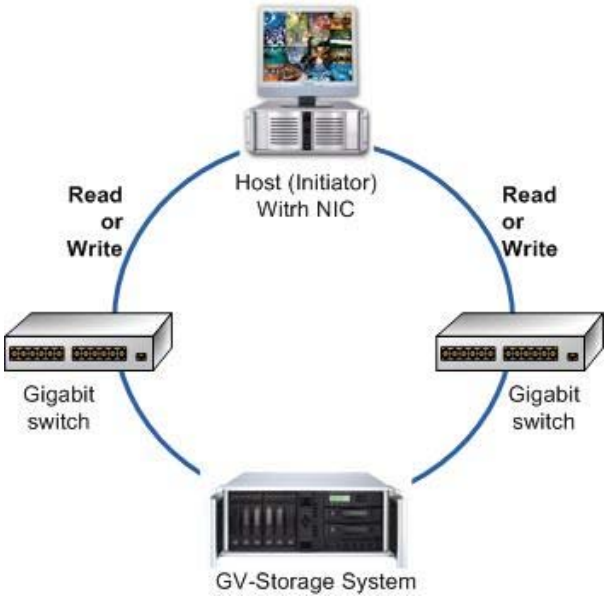



***Figure 7-14 Dual ports with MPIO***

### 7.2.1 System Requrirements

The DVR host needs to run on one of these supported operating systems:

- Windows Server 2002
- Windows Server 2003
- Windows Server 2003 R2

### 7.2.2 Seting up the MPIO & MC/S

To configure the MPIO and MC/S feature on the DVR host, please see Microsoft iSCSI Software Initiator 2.x User Guide.

# Chapter 8 Troubleshooting

## Why does the connectivity between DVR and GV-Storage System get disrupted?

Follow these steps to check your network connection:

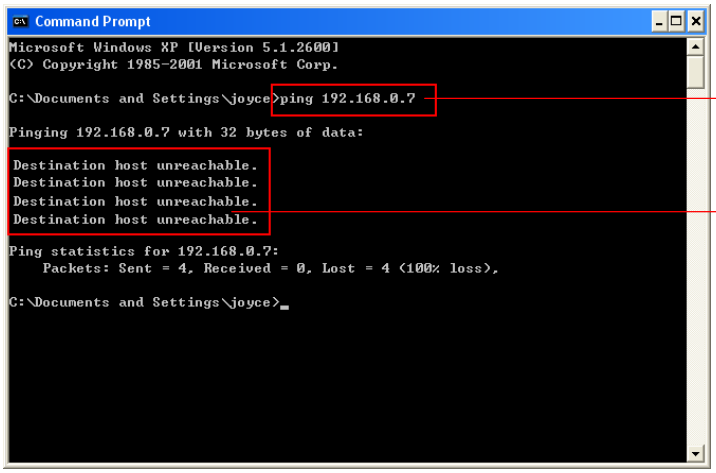
1. Run Windows **Command Prompt**. Take Classic Windows Start Menu for example, click **Start**, select **Accessories** and click **Command Prompt**.
2. Type “ping 192.168.0.X”, and press **Enter**.

---

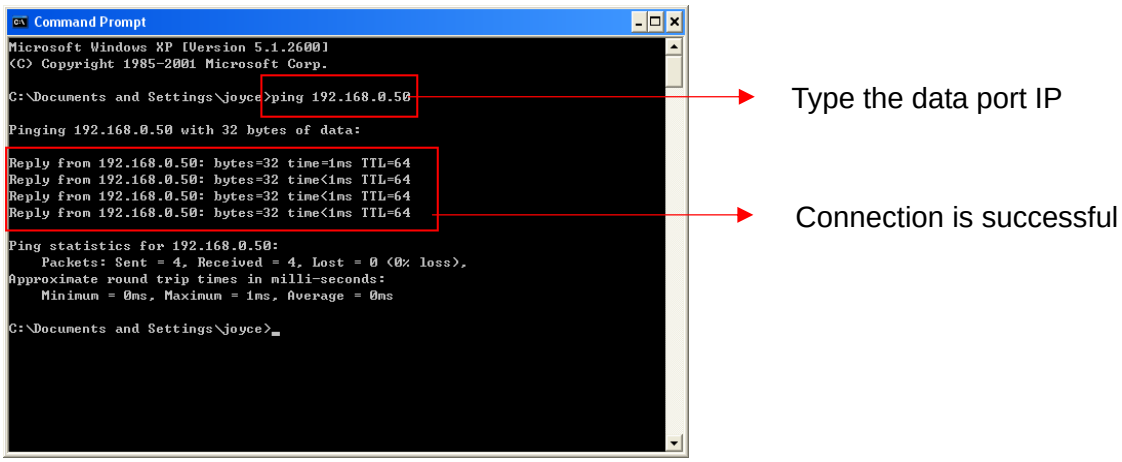
**Note:** The IP you type here is the IP address of GV-Storage System. That may be one or both of data port IPs. If two data ports are used in connection with GV-Storage System, you need to ping both data port IPs for testing.

---

3. If you receive a response as the following sample screen, the connection to GV-Storage System hasn’t been successfully established. Check the related network settings of the DVR or contact your network administrator.



4. If you receive a response as the following sample screen, the connection to GV-Storage System is still established. Then it could be the network bandwidth or stability problem. It is recommended to use gigabit LAN to solve the problem.




## Why is DVR restarted by software watchdog during recording?

1. Ensure that each UDV (user data volume) is assigned only to one DVR host for recording usage. See *4.5.4 User Data Volume* and *4.5.6 Logical Unit.*
2. Ensure network stability.
3. Check the event log of GV-Storage System for any warning and error messages. See *4.3.11 Event Log*.

## Why can't I see the assigned iSCSI drive after logging on GV-Storage System?

1. Ensure that each UDV (user data volume) is assigned only to one DVR host for recording usage. See *4.5.4 User Data Volume* and *4.5.6 Logical Unit.*
2. Ensure that the initiator node name entered on the DVR matches the host name assigned on the storage system. See *4.5.6 Logical Unit.*

## Why is the volume size displayed on DVR different from the assigned size on GV-Storage System?

This could be because the iSCSI initiator memorizes the previous partition information even though the iSCSI drive has been reallocated. To solve the problem, you need to delete the old partition(s) and format the iSCSI drive again. Please note the settings of the formatted partition should be **Basic disk storage** and **NTFS file system**.

### Why has the frame rate of DVR been low?

1. Ensure that the RAID is not initializing or rebuilding.
2. Ensure that no ERROR level of events occurred. To check event log, see *4.3.11 Event Log*.
3. Ensure that the storage system has enough bandwidth to handle the iSCSI communication. For the recommended network specifications, see *3.2 Before You Begin*.
4. The storage system may reach the Read/Write limit of RAID. For the limit on the number of connected channels, refer to *Performance Test Results* in Appendix.

### Why does my storage system shut down automatically?

This may be that the storage system has reached the temperature or voltage limit. To view the information of current temperature and voltage, see *4.6.2 Hardware Monitor*.

### Why can't I open the folder created on the iSCSI drive?

1. Ensure that each UDV (user data volume) is assigned only to one DVR host for recording usage. See See *4.5.4 User Data Volume* and *4.5.6 Logical Unit.*
2. Ensure that the iSCSI drive is formatted and written data by the same DVR host. If you use one DVR to format the iSCSI drive and use another DVR to write data to the drive, the file may be missing or corrupt. When this problem occurs, try to use Windows ScanDisk tool to repair the error.

### Why has RAID failure occurred?

Please use the recommended SATA hard drives. See *Certification list* in Appendix A.

### How to stop system buzzer?

1. Select **Alarm Mute** from LCD panel menu. See *2.4.1 LCD Panel Menu*.
2. Click the **Mute** button in Event Log from Web GUI. See *4.3.11 Event log*.

### Why can't I connect to Internet using DDNS?

Currently the storage system doesn't support DDNS (Dynamic Domain Name System). VPN (Virtual Private Network) or a static IP is required.

# Specifications

**System**

| | |
|---|---|
| CPU | Intel IOP processor |
| RAM | 512 MB |
| Power | Two (2) Redundant, hot-swappable 420 W, full-range power supplies |
| ISCSI Port | Two (2) 10/100/1000 Mbps Ethernet |
| Ethernet Port | One (1) 10/100 Mbps Ethernet |
| Hot Swap Tray | Eight (8) Serial ATA trays |
| Fan | Two (2) rear fans |

**Management**

| | |
|---|---|
| Management Method | Web GUI, LCD Panel Menu |
| Alert | Email, System Buzzer |
| Temperature Control | Hard Disks, Enclosure |

**Environmental**

| | |
|---|---|
| **Operating Temp.** | 0 ~ 50 °C (32 ~ 104 °F) |
| **Humidity** | 0 ~ 80% RH (non-condensing) |

**Physical**

| | |
|---|---|
| IPC Case | 4U Rackmount |
| Color | Silver |
| Dimensions | 483 (W) x 178 (H) x 528 (D) mm (19 x 7 x21 inch) |
| Weight | 18.1 Kg (Net), 22.1 Kg (Gross) |

# Appendix

## A. Certification List

- **Network Interface Card**

| Vendor | Model |
|---|---|
| Intel | PWLA8490MT (Gigabit, 1 port, TCP/IP offload) |
| Intel | PWLA8492MT (Gigabit, 2 ports, TCP/IP offload) |
| Intel | PWLA8494MT (Gigabit, 4 ports, TCP/IP offload) |
| D-Link | DGE-530T (PCI, Gigabit, 1 port) |
| HP | NC7170 (PCI-X, Gigabit, 2 ports) |
| HP | NC360T (PCI-Express, Gigabit, 2 ports, TCP/IP offload) |
| IBM | NetXtreme 1000 T (73P4201) (PCI-X, Gigabit, 2 ports, TCP/IP offload) |

- **Gigabit Switch**

| Vendor | Model |
|---|---|
| ZyXEL | GS-2024 (2 Gigabit, 24 ports, 2 SPF slots) |
| Dell | PowerConnect 5324 |
| Dell | PowerConnect 2724 |
| Dell | PowerConnect 2708 |
| HP | ProCurve 1800-24G |
| D-Link | DGS-3024 |

- **SATA Hard Drive**

| Vendor | Model |
|---|---|
| Seagate | Barracuda ES drives, ST3250620NS, 250GB. 7200RPM, SATA 3.0Gb/s, 16M |
| Seagate | Barracuda ES drives, ST3320620NS, 320GB. 7200RPM, SATA 3.0Gb/s, 16M |
| Seagate | Barracuda ES drives, ST3400620NS, 400GB. 7200RPM, SATA 3.0Gb/s, 16M |
| Seagate | Barracuda ES drives, ST3500630NS, 500GB. 7200RPM, SATA 3.0Gb/s, 16M |
| Seagate | Barracuda ES drives, ST3750640NS, 750GB. 7200RPM, SATA 3.0Gb/s, 16M |
| Seagate | Barracuda ES.2, ST31000340NS, 1000G, 7200RPM, SATA 3.0Gb/s, 32M |

# B. Event Notifications

- **PD/S.M.A.R.T. events**

| Level | Type | Description |
|---|---|---|
| **Info** | Disk inserted | Info: Disk <slot> is inserted. |
| **Info** | Disk removed | Info: Disk <slot> is removed. |
| **Warning** | S.M.A.R.T. threshold exceed condition | Warning: Disk <slot> S.M.A.R.T. threshold exceed condition occurred for attribute of<br>1. read error rate<br>2. spin up time<br>3. reallocated sector count<br>4. seek error rate<br>5. spin up retries<br>6. calibration retries |
| **Warning** | S.M.A.R.T. information | Warning: Disk <slot>: Failure to get S.M.A.R.T information |

- **Physical HW events**

| Level | Type | Description |
|---|---|---|
| **Warning** | ECC error | Warning: Single-bit ECC error is detected. |
| **Error** | ECC error | Error: Multi-bit ECC error is detected. |
| **Info** | ECC DIMM Installed | Info: ECC Memory is installed. |
| **Info** | Non-ECC installed | Info: Non-ECC Memory is installed. |
| **Error** | Host chip failure | Error: Host channel chip failed. |
| **Error** | Drive chip failure | Error: Drive channel chip failed. |
| **Warning** | Ethernet port failure | Warning: GUI Ethernet port failed. |

- **HDD IO events**

| Level | Type | Description |
|---|---|---|
| **Warning** | Disk error | Error: Disk <slot> read block error. |
| **Warning** | Disk error | Error: Disk <slot> writes block error. |
| **Warning** | HDD failure | Error: Disk <slot> is failed. |
| **Warning** | Channel error | Error: Disk <slot> IO incomplete. |

- **SES events**

| Level | Type | Description |
|---|---|---|
| **Info** | SES load conf. OK | Info: SES configuration has been loaded. |
| **Warning** | SES Load Conf. Failure | Error: Failed to load SES configuration. The SES device is disabled. |
| **Info** | SES is disabled | Info: The SES device is disabled. |
| **Info** | SES is enabled | Info: The SES device is enabled |

- **Environmental events**

| Level | Type | Description |
|---|---|---|
| **Info** | Admin Login OK | Info: Admin login from <IP or serial console> via <Web UI or Console UI>. |
| **Info** | Admin Logout OK | Info: Admin logout from <IP or serial console> via <Web UI or Console UI>. |
| **Info** | iSCSI data port login | Info: iSCSI login from <IQN> (<IP:Port Number>) succeeds. |
| **Warning** | iSCSI data port login reject | Warning: iSCSI login from <IQN> (<IP:Port Number>) was rejected, reason of<br>1. initiator error<br>2. authentication failure<br>3. authorization failure<br>4. target not found<br>5. unsupported version<br>6. too many connections<br>7. missing parameter<br>8. session does not exist<br>9. target error<br>10. out of resources<br>11. unknown |
| **Error** | Thermal critical | Error: System Overheated!!! The system will do the auto shutdown immediately. |
| **Warning** | Thermal warning | Warning: System temperature is a little bit higher. |

| | | |
|---|---|---|
| **Error** | Voltage critical | Error: System voltages failed!!! The system will do the auto shutdown immediately |
| **Warning** | Voltage warning | Warning: System voltage is a little bit higher/lower. |
| **Info** | Mgmt Lan Port Active | Info: Management LAN Port is active. |
| **Warning** | Mgmt Lan Port Failed | Warning: Fail to manage the system via the LAN Port. |
| **Info** | RTC Device OK | Info: RTC device is active. |
| **Warning** | RTC Access Failed | Warning: Fail to access RTC device |
| **Info** | Reset Password | Info: Reset Admin Password to default. |
| **Info** | Reset IP | Info: Reset network settings set to default. |

- **System config events**

| Level | Type | Description |
|---|---|---|
| **Info** | Sys Config. Defaults Restored | Info: Default system configurations restored. |
| **Info** | Sys NVRAM OK | Info: The system NVRAM is active. |
| **Error** | Sys NVRAM IO Failed | Error: Can't access the system NVRAM. |
| **Warning** | Sys NVRAM is full | Warning: The system NVRAM is full. |

- **System maintenance events**

| Level | Type | Description |
|---|---|---|
| **Info** | Firmware Upgraded | Info: System firmware has been upgraded |
| **Error** | Firmware Upgraded Failed | Error: System firmware upgrade failed. |
| **Info** | System reboot | Info: System has been rebooted |
| **Info** | System shutdown | Info: System has been shutdown. |
| **Info** | System Init OK | Info: System has been initialized OK. |
| **Error** | System Init Failed | Error: System cannot be initialized in the last boot up. |

- **LVM events**

| Level | Type | Description |
|---|---|---|
| **Info** | VG Created OK | Info: VG <name> has been created. |
| **Warning** | VG Created Fail | Warning: Fail to create VG <name>. |
| **Info** | VG Deleted | Info: VG <name> has been deleted. |
| **Info** | UDV Created OK | Info: UDV <name> has been created. |
| **Warning** | UDV Created Fail | Warning: Fail to create UDV <name>. |
| **Info** | UDV Deleted | Info: UDV <name> has been deleted. |
| **Info** | UDV Attached OK | Info: UDV <name> has been LUN-attached. |
| **Warning** | UDV Attached Fail | Warning: Fail to attach LUN to UDV <name>. |
| **Info** | UDV Detached OK | Info: UDV <name> has been detached. |
| **Warning** | UDV Detached Fail | Warning: Fail to detach LUN from Bus <number> SCSI_ID <number> LUN <number>. |
| **Info** | UDV_OP Rebuild Started | Info: UDV <name> starts rebuilding. |
| **Info** | UDV_OP Rebuild Finished | Info: UDV <name> completes rebuilding. |
| **Warning** | UDV_OP Rebuild Fail | Warning: Fail to complete UDV <name> rebuilding. |
| **Info** | UDV_OP Migrate Started | Info: UDV <name> starts migration. |
| **Info** | UDV_OP Migrate Finished | Info: UDV <name> completes migration. |
| **Warning** | UDV_OP Migrate Failed | Warning: Fail to complete UDV <name> migration. |
| **Warning** | VG Degraded | Warning: VG <name> is under degraded mode. |
| **Warning** | UDV Degraded | Warning: UDV <name> is under degraded mode. |
| **Info** | UDV Init OK | Info: UDV <name> completes the initialization. |
| **Warning** | UDV_OP Stop Initialization | Warning: Fail to complete UDV <name> initialization. |
| **Warning** | UDV IO Fault | Error: IO failure for stripe number <number> in UDV <name>. |

| | | |
|---|---|---|
| **Warning** | VG Failed | Error: Fail to access VG <name>. |
| **Warning** | UDV Failed | Error: Fail to access UDV <name>. |
| **Warning** | Global CV Adjustment Failed | Error: Fail to adjust the size of the global cache. |
| **Info** | Global Cache | Info: The global cache is OK. |
| **Error** | Global CV Creation Failed | Error: Fail to create the global cache. |
| **Info** | UDV Rename | Info: UDV <name> has been renamed as <name>. |
| **Info** | VG Rename | Info: VG <name> has been renamed as <name>. |
| **Info** | Set VG Dedicated Spare Disks | Info: Assign Disk <slot> to be VG <name> dedicated spare disk. |
| **Info** | Set Global Disks | Info: Assign Disk <slot> to the Global Spare Disks. |
| **Info** | UDV Read-Only | Info: UDV <name> is a read-only volume. |
| **Info** | WRBK Cache Policy | Info: Use the write-back cache policy for UDV <name>. |
| **Info** | WRTHRU Cache Policy | Info: Use the write-through cache policy for UDV <name>. |
| **Info** | High priority UDV | Info: UDV <name> is set to high priority. |
| **Info** | Mid Priority UDV | Info: UDV <name> is set to mid priority. |
| **Info** | Low Priority UDV | Info: UDV <name> is set to low priority. |
| **Error** | PD configuration read/write error | Error: PD <slot> lba <#> length <#> config <read \| write> failed. |
| **Error** | PD read/write error | Error: PD <#> lba <#> length <#> <read \| write> error. |
| **Error** | UDV recoverable read/write error | Error: UDV <name> stripe <#> PD <#> lba <#> length <#> <read \| write> recoverable |
| **Error** | UDV unrecoverable read/write error | Error: UDV <#> stripe <#> PD <#> lba <#> length <#> <read \| write> unrecoverable |
| **Info** | UDV stripe rewrite start/fail/succeed | Info: UDV <name> stripe <#> rewrite column bitmap <BITMAP> <started \| failed \| finished>. |

# C. Performance Test Results

| DVR | Number of Channel | Resolution | Recording Rate (NTSC/PAL) |
|---|---|---|---|
| GV-1480 | 128 | CIF | 30/25 FPS (software compression) |
| GV-2016 | 48 | Full D1 | 30/25 FPS (hardware compression) |

Above data are two test results of the storage system. The storage system was set to RAID 5 and installed with 8 physical disks, totaling 2.6 TB.

The first test is that 8 DVRs, installed with GV-1480 cards, totaling 128 channels, are connected to the storage system. Each DVR can record up 30 (NTSC)/ 25 (PAL) fps with software compression at CIF resolution.

The second test is that 3 DVRs, installed with GV-2016 cards, totaling 48 channels, are connected to the storage system. Each DVR can record up to 30 (NTSC)/ 25 (PAL) fps with hardware compression at Full D1 resolution.