FUJITSU

**FUJITSU Software
PRIMECLUSTER GL for Windows**

User's Guide 4.5

Preface

Purpose of this Manual

This manual is intended to explain how to install, operate, and administer PRIMECLUSTER GL for Windows (hereinafter GLS).

Intended Readers

This manual is intended for system administrators responsible for tasks such as installing and administering GLS.

It is assumed that readers of this manual have prior knowledge of the following:

- Operating systems

- Network hardware and software.

Structure of this Manual

This manual is structured as follows:

Related Documentation

- PRIMECLUSTER GL for Windows GLS Setup Guide for Cluster Systems 4.5

- PRIMECLUSTER GL for Windows 4.5 Software Release Guide

- FJQSS (Information Collection Tool) User's Guide

- PRIMEQUEST 2000 Series Administration Manual

- PRIMEQUEST 3000 Series Enterprise Model Administration Manual

GLS Manual Names

The prefix "PRIMECLUSTER GL for Windows" is omitted from GLS manual names when those names are referenced in other GLS manuals, as shown in the table below:

Short Manual Name	Full Manual Name
User's Guide (this manual)	PRIMECLUSTER GL for Windows User's Guide

Conventions

Product Name Abbreviations

The following product name abbreviations are commonly used in GLS manuals:

Abbreviation	Full Name
GLS	PRIMECLUSTER GL for Windows
PRIMEQUEST	PRIMEQUEST 2000/3000 Series
Windows	Windows Server 2016 Standard Windows Server 2016 Datacenter Windows Server 2019 Standard Windows Server 2019 Datacenter

Command Prompts

Command prompts in this manual are indicated by the "greater than" symbol (>) at the beginning of the line, making example commands appear as follows:

```
> strhanet
```

Please note that GLS command paths are omitted here. With GLS installed in the default directory, if necessary, you can run commands by entering the full path, C:\Program Files\Fujitsu\PRIMECLUSTER GL\usr\command, before the command name. For example, for above command, the input would be:

C:\Program Files\Fujitsu\PRIMECLUSTER GL\usr\command\strhanet

Also, when you execute GLS commands by a user other than an Administrator of the Administrators group, click [Run as administrator] to open the command prompt.

Notations

This manual uses the notations shown below:

Note

This box contains information that you should take note of. Make sure that you read this information.

Point

This box contains information that can help you perform a task.

See
....

This box contains a reference to the location of further useful information.
....

Information
....

This box contains useful supplementary information.
....

Export Controls

Exportation/release of this document may require necessary procedures in accordance with the regulations of your resident country and/or US export control laws.

Trademarks

- Microsoft, MS, MS-DOS, Hyper-V, Windows, and Windows Server are trademarks or registered trademarks of Microsoft Corporation in the U.S.A. and other countries.
  All other trademarks are property of their respective owners.

- Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

- Ethernet is a registered trademark of Fuji Xerox Co., Ltd.

- VMware is a registered trademark or trademark of VMware, Inc. in the United States and/or other jurisdictions.

- Other product names are product names, trademarks, or registered trademarks of these companies.

Note that the trademark (TM) and registered trademark (R) symbols are omitted throughout this manual.

Date of publication and edition

April 2019, First edition

High Risk Activity

The Customer acknowledges and agrees that the Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. The Customer shall not use the Product without securing the sufficient safety required for the High Safety Required Use. In addition, Fujitsu (or other affiliate's name) shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product.

Notes

- Do not copy this manual without permission.

- The contents of this manual may be revised without prior notice.

Copyright

Contents

Chapter 1 Overview of GLS

This chapter gives an overview of PRIMECLUSTER GL for Windows (hereinafter GLS).

1.1 What is GLS?

GLS provides software that uses multiple NICs (Network Interface Card) to achieve redundant line control of network transmission paths to which the system is connected, and so improve the overall reliability of the communication infrastructure.

GLS works by bundling multiple network adapters (physical adapters) together to create a single virtual network adapter (virtual adapter). This virtual adapter duplicates network transmission paths using the method described below.

NIC switching mode

In NIC switching mode, network transmission paths are duplicated by using exclusively a pair of NICs connected on the same network. This means that you can communicate with any host that is connected to the network as well as with hosts on networks connecting via the router.

Figure 1.1 Duplicate Control by NIC Switching Mode
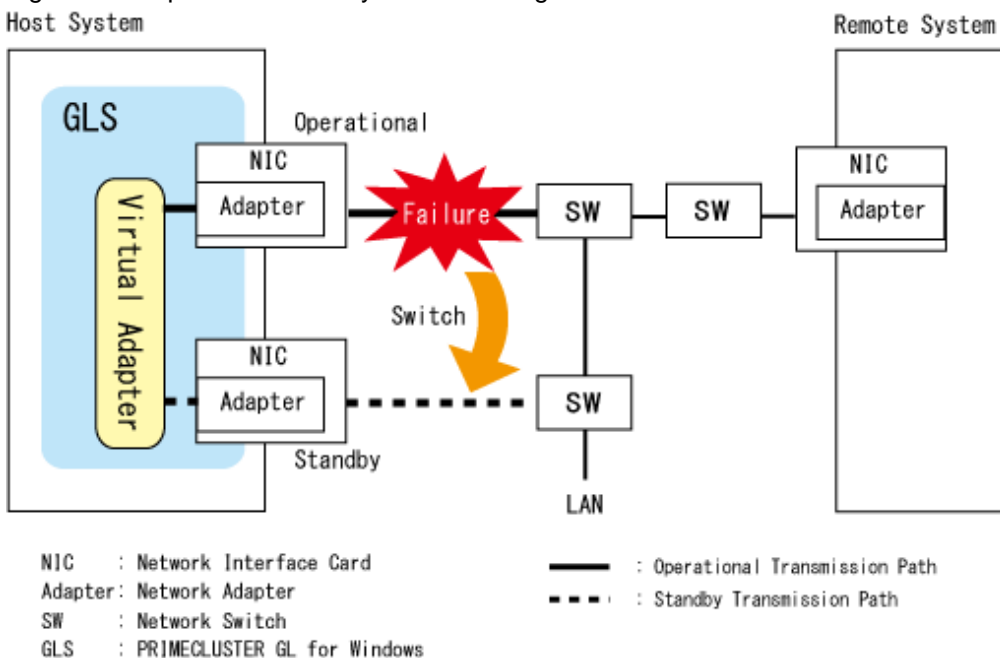
In NIC switching mode, when one of the transmission paths is operational (available for communication), the other is on standby (ready to be switched to in the event of a line failure).

If communication on the operational transmission path is disrupted for any reason, the connection to the corresponding physical adapter is severed, and communications are switched to the "standby" transmission path, which now becomes "operational".

For details on control measures if a failure occurs, refer to "2.2 Duplicate Control."

1.2 Main Functions of GLS

The main functions of GLS are as follows:

- Virtual control (virtual adapter)

- Duplicate control (monitor function, switch function, restore function, disconnect function)

- Communication control (IPv4 and IPv6 communication, communication by VLAN tagging)

- Control of script execution (execution of user scripts)

Table 1.1 Main Functions of GLS

Function		Overview
Virtual control	Virtual adapter	You can create a single virtual network adapter (virtual adapter) to bundle multiple network adapters (physical adapters). You can share NICs with multiple virtual adapters. However, in order to do this, the usage conditions of all of the NICs shared by each virtual adapter must be the same. There is no restriction on destination systems.
Duplicate control		The redundant transmission paths are used exclusively: while one is operational, the other is on standby.
	Monitor	Monitors failures in the NIC, cable, or network switch, as well as faulty network devices. Monitoring starts/stops at the following timing: - Start of monitoring Monitoring starts automatically with Windows. - Stop of monitoring Monitoring stops automatically when Windows shuts down or when the virtual adapter is stopped by command. Details of the monitoring are shown below: - Link status monitoring: Monitors connection status based on notifications from the physical adapter. Detection time: 1 - 2 seconds (including switch time). - Ping monitoring: Monitors the communication status of network devices based on ping responses. Detection time: About 15 seconds (default value). If you use the IPv6 address for the ping target, the following types of IPv6 addresses can be set: - Global Unicast Address - Unique Local Unicast Address You can change the detection time. For more details, refer to "6.2.5 hanetpoll."
	Switching	If a failure occurs in the operational physical adapter, the switch function switches communications from the operational transmission path to the standby transmission path. Switch time: 1 - 2 seconds (including detection time).
	Restoring	The restore function performs the following tasks when a failed transmission path is restored: - If an operational physical adapter exists Connects the corresponding physical adapter as the standby adapter. - If no operational physical adapter exists Connects the corresponding physical adapter as the operational adapter.

Function	Overview	
	Disconnecting	If a failure occurs in the physical adapter on standby, the disconnect function disconnects that physical adapter. Note that, if an NIC is on standby, only failures due to linkdown can be detected in that NIC.
Communication control	IPv4 Communication	The following types of communication are available with IPv4: - Unicast - Broadcast - Multicast
	IPv6 Communication	The following types of communication are available with IPv6: - Unicast - Multicast
	Communication by VLAN tagging	VLAN tagging (IEEE 802.1 Q) allows for setting up multiple virtual networks.
Control of script execution	Execution of user scripts	When monitoring has detected an error, prepared scripts can be executed with the following timing: - When an error has been detected on a transmission path - When an error has been detected in the destination system

1.3 System Requirements for GLS

In order to use GLS functions, your system must satisfy the requirements and conform to the restrictions listed below.

Requirements

Table 1.2 Requirements

Environment	Condition	Comment
Supported OS	- Windows Server 2016 Standard - Windows Server 2016 Datacenter - Windows Server 2019 Standard - Windows Server 2019 Datacenter	Server Core servers are supported.
Supported hardware (NIC)	PRIMERGY PRIMEQUEST	For more details, refer to the GLS Software Release Guide.
Network adapter that can be bundled	- Physical adapter - Network adapter on the virtual machine	-
Compatible protocol	- IP (Internet Protocol) Version 4 - IP (Internet Protocol) Version 6 - FNA (Fujitsu Network Architecture)	-
Compatible network device	Switch with MAC address learning function	For communication by VLAN tagging, must support IEEE802.1Q.
	Switch or network device for which an IP address can be set and that responds to pinging.	Required for ping monitoring.

Environment	Condition	Comment
Shared physical adapter between virtual adapters	Use the same adapter.	With Windows TCP/IP, because it is possible to set multiple IP addresses for a single adapter, there is no need to create multiple virtual adapters on the VLAN.

GLS: PRIMECLUSTER GL for Windows

📝 Note

. . . .

- When using Network Load Balancing (NLB), select Multicast with the Network Load Balancing Manager. In addition, restart the system before the operation after setting Network Load Balancing.

- SDN of the Windows Server Software-Defined (WSSD) Solutions cannot be used.

. . . .

Restrictions

Table 1.3 Restrictions

Item		Restriction	Comment
Number of LAN adapters that can be bundled		Up to two per virtual adapter	You cannot specify GLS virtual adapters as adapters to be bundled by GLS.
Number of IP addresses that can be defined		Depends on Windows restrictions	There are no GLS restrictions.
Number of MAC addresses that can be defined	Unicast	One	-
	Multicast	Cannot be set	
	Broadcast		
Number of virtual adapters that can be defined		Up to 16	Use the hanetconfig command to set the number. For more details, refer to "6.2.2 hanetconfig."
Valid range for VLAN ID		1 - 4095	Note that the VLAN IDs of connecting virtual adapters must not be the same. Use the hanetconfig command to set the ID. For more details, refer to "6.2.2 hanetconfig."

GLS: PRIMECLUSTER GL for Windows

1.4 Benefits of Installing GLS

In order to resolve network failures, some sort of facility to handle line redundancy of the transmission paths is required.

However, depending on how a network is used, there are different ways of connecting to networks and simply gathering redundant lines complicates the system itself, which in turn makes operating and managing systems more complicated. In addition to this, program developers must undertake extra work, such as designing and developing methods to detect and resolve network failures.

By installing GLS, you avert such potential problems and can set up a network system characterized by high degrees of fault tolerance, availability, and reliability. You can also ensure that applications communicating through TCP/IP continue to operate smoothly without having to worry about finding redundant transmission paths or network failures in transmission paths.

1.5 Structure of GLS

The structure of the GLS system is illustrated below.

Figure 1.2 Structure of GLS

(1) PRIMERGY (excluding Blade Server series)   (2) PRIMERGY Blade Server series
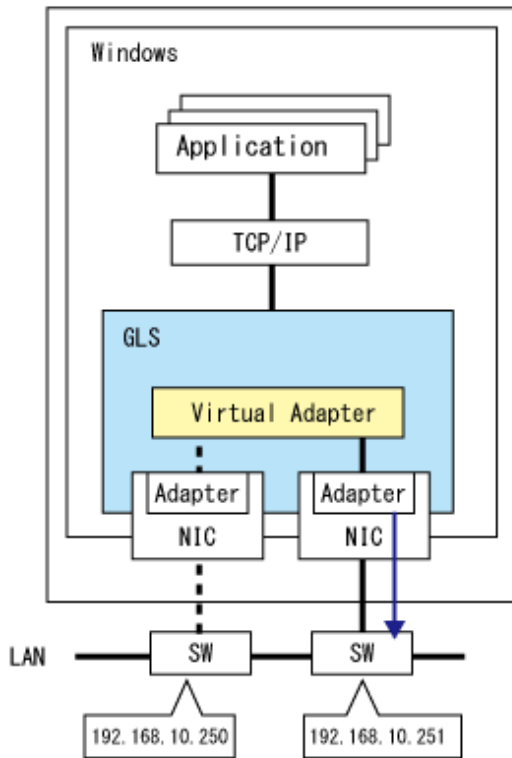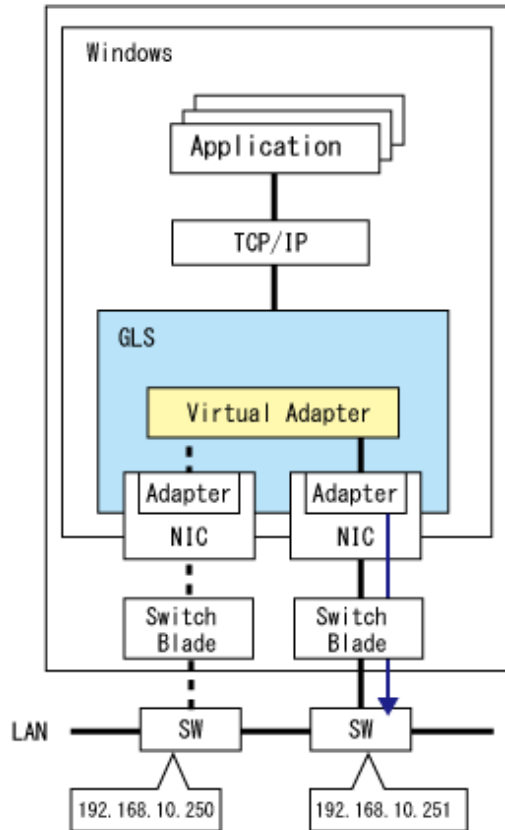
Adapter : Network Adapter
NIC   : Network Interface Card
SW   : Network Switch
GLS   : PRIMECLUSTER GL for Windows

——— : Operational Transmission Path
- - - - : Standby Transmission Path
———▶ : Ping Monitor

GLS uses ping monitoring to monitor the communication status of network devices. GLS also uses link status to monitor transmission paths to neighboring network devices. By using these two functions, GLS guarantees high reliability for the network.

Note that, for ping monitoring to function successfully, you must use network devices for which an IP address can be set.

🅿 Point
....
When using an internal NIC in an environment in which IP addresses cannot be assigned for network devices that are neighboring blade servers, using a link-state-group compatible switch blade allows you to monitor link statuses of neighboring devices.
....

Chapter 2 GLS Functions

This chapter describes how to use the various functions of GLS.

2.1 Virtual Control

This section describes the virtual adapter functions provided by GLS.

2.1.1 Virtual Adapter

GLS bundles multiple network adapters (physical adapters) to create a single virtual network adapter (virtual adapter). GLS then duplicates the network transmission paths by using the physical adapters exclusively.

Using the Virtual Adapter

Within the virtual adapter, one of the physical adapters is maintained as the operational adapter, while the other is kept on standby.

Figure 2.1 Using the Virtual Adapter
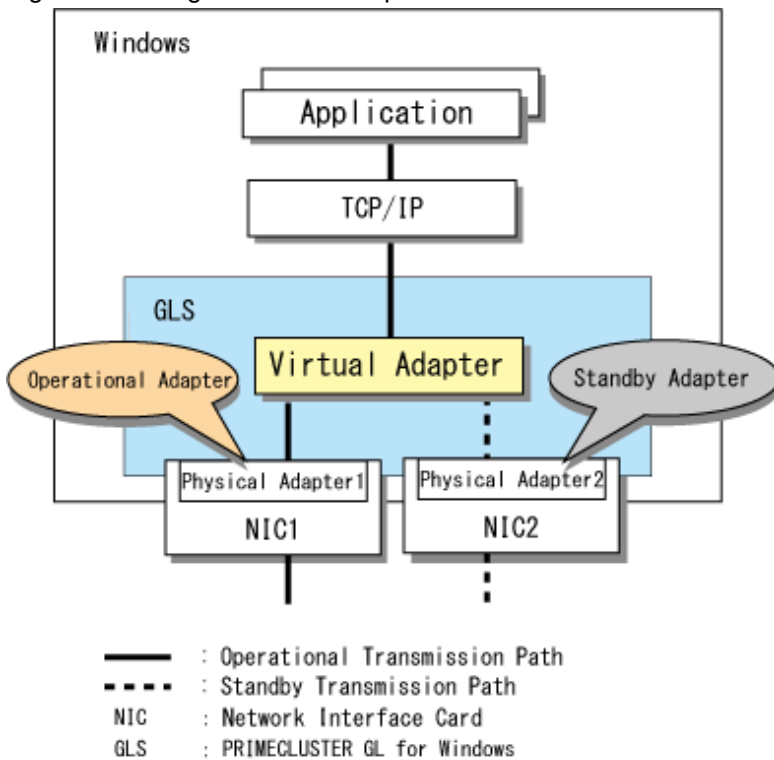
NIC Sharing

When you use multiple virtual adapters, you can share NICs.
However, a shared NIC must have the same conditions of use for each virtual adapter.

Note that, because you can set multiple IP addresses for a single adapter, you can assign different IP addresses for different purposes.

Assigning MAC Addresses and IP Addresses

When you have created a virtual adapter, assign MAC addresses and IP addresses as illustrated below.

Figure 2.2 Assigning MAC Addresses and IP Addresses

Table 2.1 Assigning MAC Addresses and IP Addresses

Adapter	MAC Address	IP Address
Virtual	(Referred to hereafter as the "virtual MAC address".) A unique address is generated and set automatically. You can manually set an optional address later.	(Referred to hereafter as the "virtual IP address".) Set an optional address. You can set more than one address.
Physical	(Referred to hereafter as the "real MAC address".) An address is set specifically for the physical adapter.	(Referred to hereafter as the "real IP address".) Not set.

MAC Addresses and IP Addresses for Packets

Addresses set for packets during communication are as follows:

Table 2.2 MAC Addresses and IP Addresses for Packets

Packet Type	MAC Address		IP Address	
	Recipient	Sender	Recipient	Sender
Send	Optional	Virtual MAC address	Optional	Virtual IP address
Receive	Virtual MAC address	Optional	Virtual IP address	Optional

Note that addresses set for packets are valid only for virtual adapters. No MAC address is set for packets for a physical adapter.

2.2 Duplicate Control

This section describes the following duplicate control functions provided by GLS:

- Monitor function

- Switch function

- Restore function

- Disconnect function

2.2.1 Monitor Function

GLS can monitor failures in transmission paths and restored transmission paths.

Monitor Range

You can monitor NICs, cables, and neighboring network devices, as well as communication through those network devices.

Figure 2.3 Monitor Range
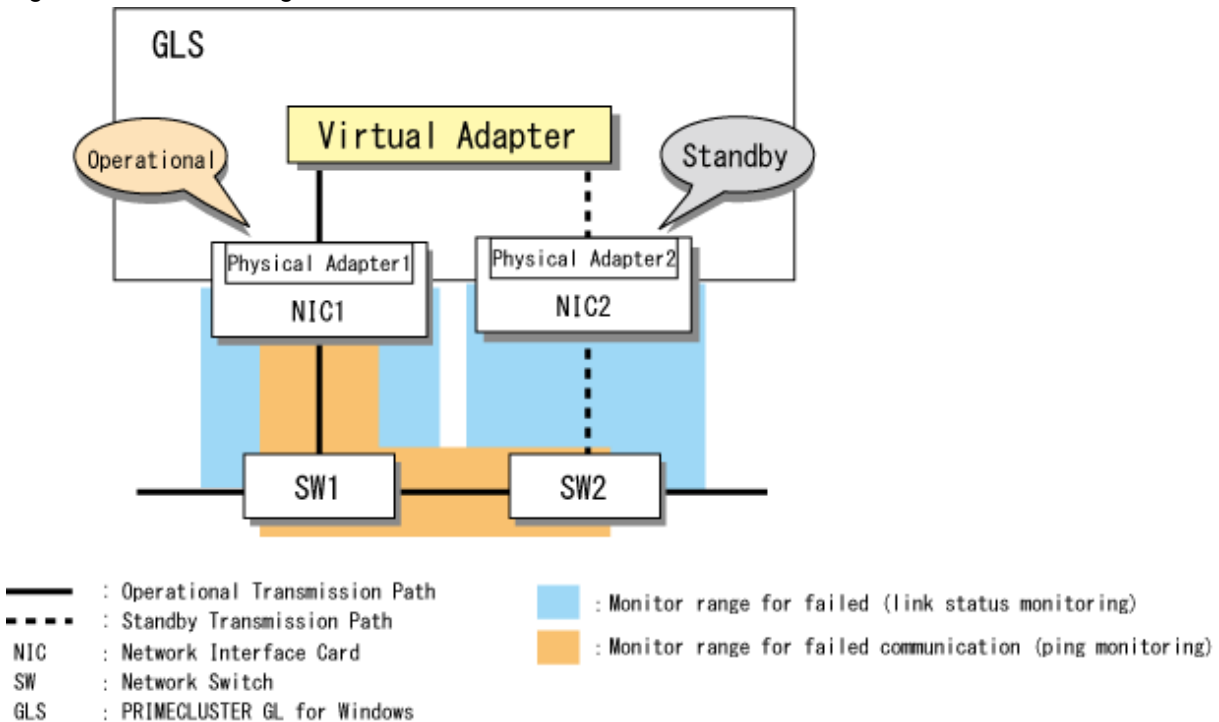
Note

. . . .

In Figure 2.3, the ping monitoring range depends on the IP addresses of SW1 and SW2 being set as the ping monitoring target and Physical Adapter 1 being the operational adapter.

. . . .

Monitored Items

The items below are monitored based on notifications of their connection status from the physical adapter and on network device communication status.

Failure Monitoring

The following failures can be detected:

- Server adapter failure

- Cable failure

- Failure of network devices that connect to the server

- Communication statuses of network devices

If a failure is detected, the switch function automatically switches from the operational transmission path to the standby transmission path.

Restore Monitoring

GLS can detect when the link status or communication status of a failed physical adapter is restored.

When the restored physical adapter is detected, the switch function automatically makes that adapter available for use.

Table 2.3 details when a failure or restore is detected.

Table 2.3 Detection of Failure or Restore

Physical Adapter Status	Failure Detected	Restore Detected
Operational	When the link status of a physical adapter fails or when the ping monitor has detected a network device communication failure.	When the link status of a physical adapter is restored or when communication is restored after the ping monitor has detected a network device communication failure.
Standby	When the link status of a physical adapter fails.	When the link status of a physical adapter is restored.

2.2.2 Switch Function

When the GLS monitor function detects a failure in a transmission path, the switch function automatically switches the operational adapter and continues communication.

Switching

If a failure that causes a linkdown occurs in an adapter or network device, GLS disconnects the relevant physical adapter, and switches operations to the standby physical adapter. If a failure that does not cause a linkdown occurs in a network device, GLS switches operations to another route after the failure is detected by the ping monitor function.

Note that, if a failure occurs in every physical adapter, all communication is ended.

Figure 2.4 Switching the Physical Adapter when a Failure is Detected

Switch Time

When a failure is detected, it takes one or two seconds to switch the operational transmission path.

When the ping monitor function detects a communication failure, it takes 15 seconds (the default value) to switch the operational transmission path. You can change this value. For more details, refer to "6.2.5.4 param."

2.2.3 Restore Function

When the GLS monitor function detects a successful restore after a failure, the restore function automatically re-establishes the connection.

Restoring

When a transmission path in which a failure occurred is restored, GLS automatically performs the following tasks:

When an Operational Physical Adapter Exists

When an operational physical adapter exists, the physical adapter on the restored transmission path becomes available as the standby adapter.

Figure 2.5 Restoring (When an Operational Physical Adapter Exists)
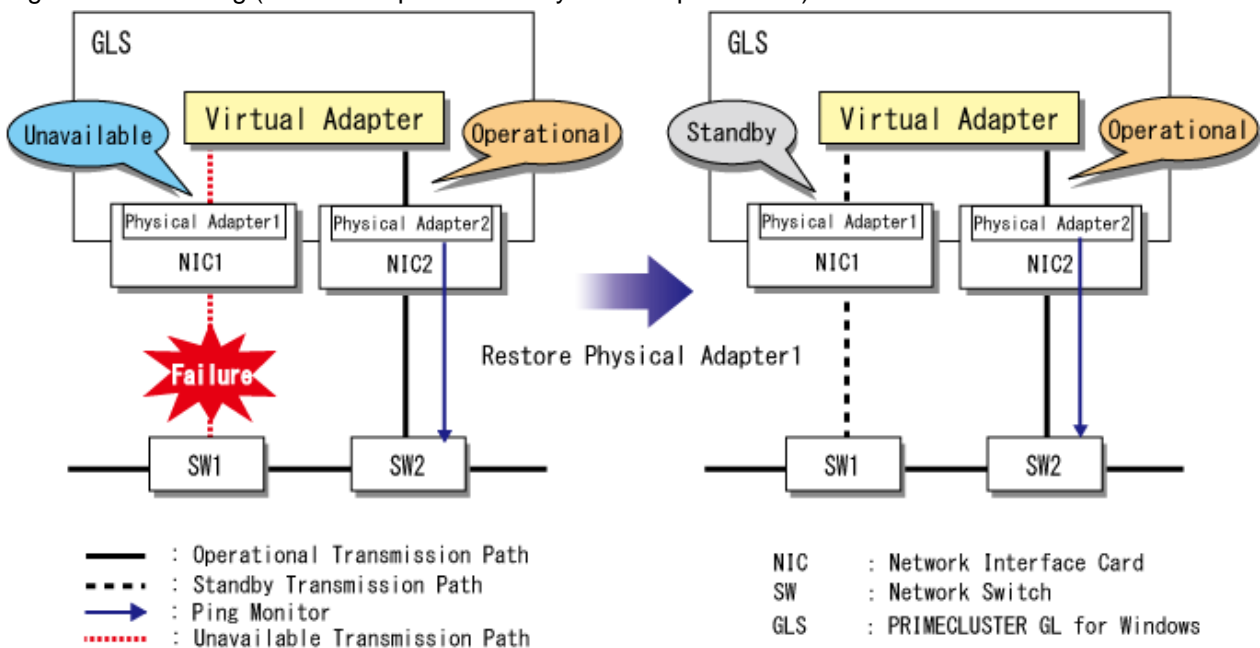
When No Operational Physical Adapter Exists

When no operational physical adapter exists, the physical adapter on the restored transmission path is connected as the operational adapter and communication is resumed.

Figure 2.6 Restoring (When No Operational Physical Adapter Exists)
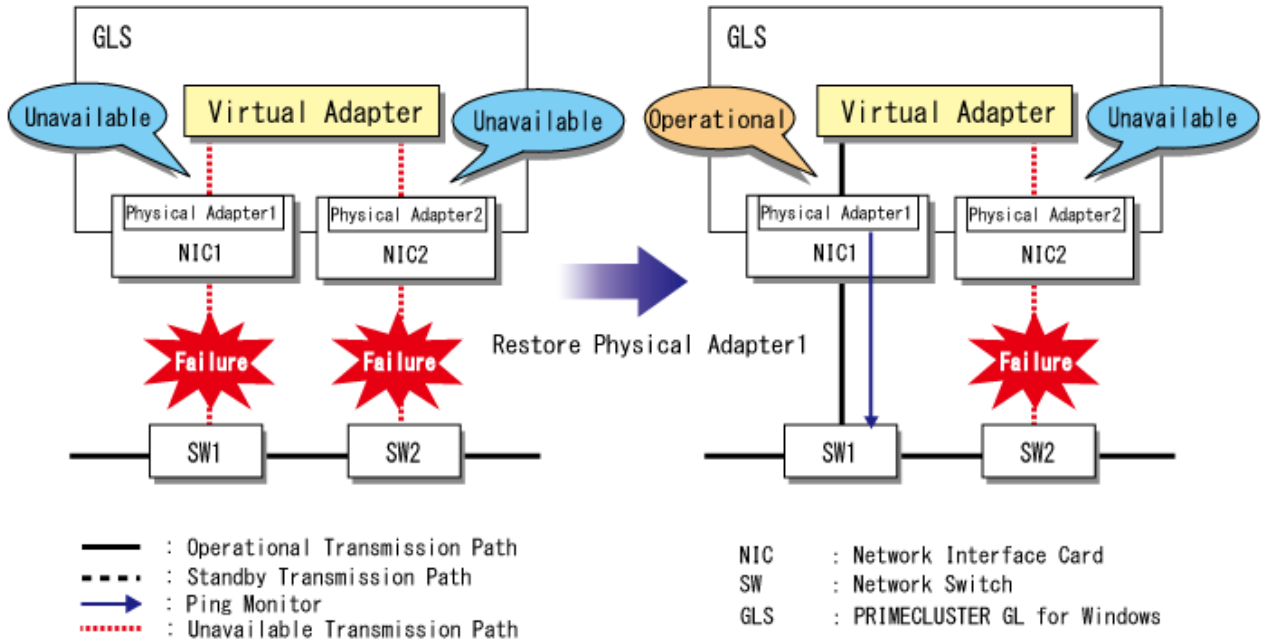
2.2.4 Disconnect Function

When the GLS monitor function detects a failure in the standby adapter, the disconnect function automatically disconnects the standby adapter.

Disconnecting

If a failure is detected in a standby transmission path, GLS disconnects the relevant standby physical adapter.

Figure 2.7 Disconnecting the Standby Adapter When a Failure is Detected
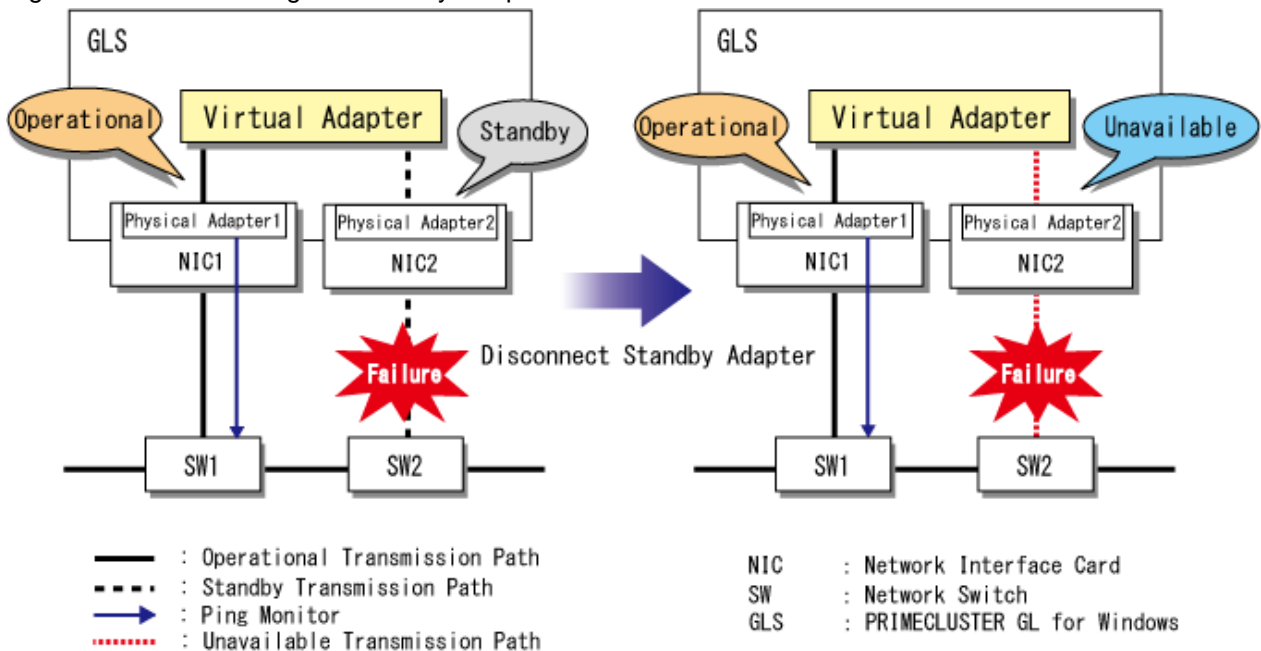
2.3 Communication Control

This section describes the following communication control functions provided by GLS:

- IPv4 Communication

- IPv6 Communication

- Communication by VLAN Tagging

2.3.1 IPv4 Communication

Using a physical adapter, a GLS virtual adapter can carry out the following IPv4 communication types:

- Unicast

- Broadcast

- Multicast

Note

When using the VLAN tagging of GLS for a virtual adapter that is bundling adapters other than physical adapters, communication runs via unicast only by using static IP addresses.

2.3.2 IPv6 Communication

Using a physical adapter, a GLS virtual adapter can carry out the following IPv6 communication types:

- Unicast

- Multicast

Note

When using the VLAN tagging of GLS for a virtual adapter that is bundling adapters other than physical adapters, communication runs via unicast only by using static IP addresses.

2.3.3 Communication by VLAN Tagging

GLS virtual adapters can also use VLAN (IEEE802.1Q) tagging for communication.

By using VLAN tagging, you can build a system on multiple networks without being affected by hardware restrictions such as a limit on the number of internal NICs in the server.

Note

In order to use VLAN tagging, you must use network switches compatible with VLAN (IEEE802.1Q) tagging.

GLS data communication with VLAN tagging becomes available by using that function from either a physical adapter or from GLS. This allows you to set up multiple virtual networks on network devices connected to the same segment.

The diagram below illustrates the configuration of a system communicating by VLAN tagging.

Using the VLAN Tagging Function of a Physical Adapter

In the example below, redundant virtual adapters 1 and 2 are configured for VLAN tagging adapter pairs 1 & 2 and 3 & 4, which have been created in physical adapters 1 and 2, respectively. With VLAN tagging set for network switches 1 and 2, two networks are set up, using VLAN ID=2 and VLAN ID=3.

This configuration can be used if the NIC supports VLAN tagging and if VLAN tagging adapters can be created. For further details on VLAN tagging adapters, refer to the manual of each NIC.

Figure 2.8 Using the VLAN Tagging Function of a Physical Adapter (Sample Setup)
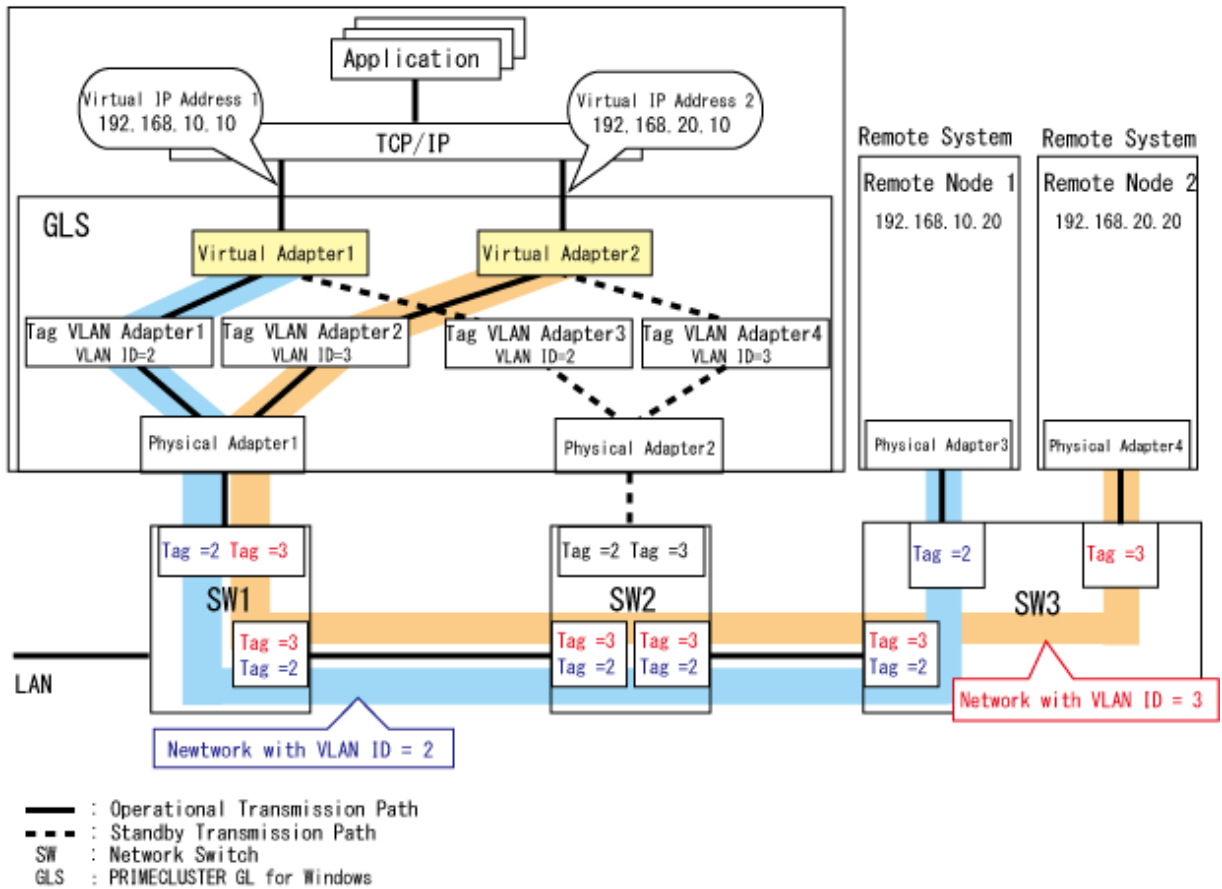
Virtual adapter 1 and virtual adapter 2 share a single physical line, but each adapter is assigned its own MAC address and IP address.

Virtual adapter 1 controls traffic on VLAN ID=2 and communicates with remote node 1.

Virtual adapter 2 controls traffic on VLAN ID=3 and communicates with remote node 2.

Using the VLAN Tagging Function of GLS

In the example below, redundant virtual adapters 1 and 2 are configured for physical adapters 1 and 2. With VLAN tagging set for network switches 1 and 2, two networks are set up, using VLAN ID=2 and VLAN ID=3.

When adapters other than physical adapters are bundled with this configuration, communication runs via unicast only by using static IPv4/IPv6 addresses.

For other types of communication, use a configuration that bundles the VLAN tagging adapters of the physical adapters.

Figure 2.9 Using the VLAN Tagging Function of GLS (Sample Setup)
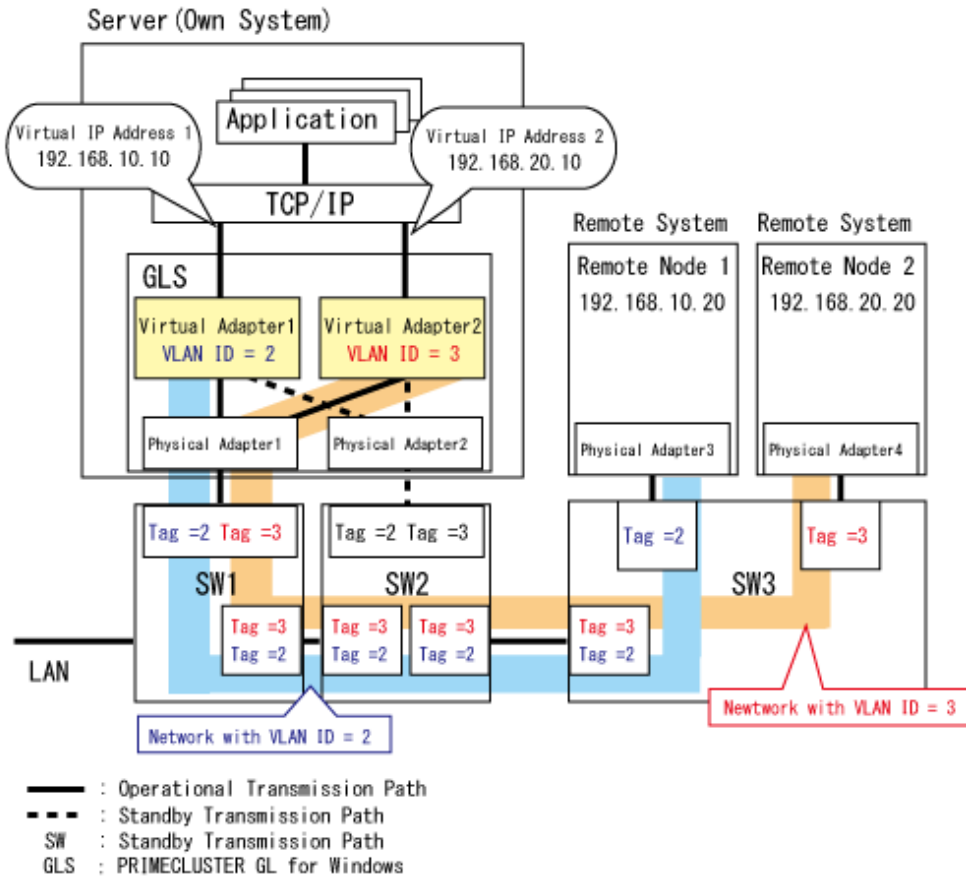
Virtual adapter 1 and virtual adapter 2 share a single physical line, but each adapter is assigned its own MAC address and IP address.

Virtual adapter 1 controls traffic on VLAN ID=2 and communicates with remote node 1.

Virtual adapter 2 controls traffic on VLAN ID=3 and communicates with remote node 2.

Note

Do not use the VLAN tagging function of GLS when VLAN tagging adapters of physical adapters are bundled.

2.4 Control of Script Execution

This section describes the control function provided by GLS for the execution of scripts.

2.4.1 Execution of User Scripts

When an error of a physical adapter is detected, or when ping monitoring has detected a communication error, scripts prepared by the user can be executed with a specific timing. This serves to inform the system administrator and the application of the communication error.

See

For details on the setting method, refer to "3.4.8 Setting Execution of User Scripts."

The timing for triggering user scripts is shown in the table below.

Table 2.4 Script Types and Timing for Triggering Script Execution

Script Type	Trigger Timing
When an error has been detected on a transmission path	When a linkdown of a physical adapter has been detected
	When a physical adapter has been deactivated
	When the ping monitor has detected an error of a network device
When an error has been detected in the destination system	When the ping monitor has detected an error of the destination system

Chapter 3 Installation

This chapter describes how to install and configure GLS.

3.1 Outline of Installation Procedure

Review this brief outline of the procedure before installing GLS.

Table 3.1 Outline of Installation Procedure

Step	Task Description		Refer to
1	Check conditions for using GLS.		1.3 System Requirements for GLS
2	Check precautions on design.		3.2.1 Precautions on Design
3	Design network configuration.		3.2.2 Designing the Network Configuration
4	Select ping targets.		3.2.3 Selecting Ping Targets
5	Check network settings.		3.2.4 Network Settings Check Sheet
6	Install GLS.		3.3 GLS Installation
7	Check precautions on installation.		3.4.1 Precautions on Preparing GLS for Use
8	Make GLS settings.	1. Set physical adapters.	3.4.2 Preliminary Tasks: Physical Adapter Settings
		2. Set virtual adapters.	3.4.3 Virtual Adapter Settings
		3. Make ping settings.	3.4.4 Ping Settings
		4. Set IP addresses.	3.4.5 Follow-up Tasks: IP Address Settings
		5. Activate virtual adapters.	3.4.6 Activating Virtual Adapters
		6. Start ping monitoring.	3.4.7 Starting Ping Monitoring
		7. Make settings for execution of user scripts.	3.4.8 Setting Execution of User Scripts
9	Check GLS operations.		3.5 Functional Check

GLS: PRIMECLUSTER GL for Windows

3.2 Network Design

This section describes how to design a network with attention to points such as operating conditions and network configuration.

Before designing your network configuration, it is important to review the GLS operating conditions. For more details on operating conditions for GLS, refer to "1.3 System Requirements for GLS."

3.2.1 Precautions on Design

Note the points described below when designing a network loop that uses the Spanning Tree Protocol (STP) to achieve redundancy.

- Mixed STPs

- Behavior of STP on Network Device Failure

Figure 3.1 Notes When Using STP

(a) Port Blocking by STP   (b) Broadcast Storm
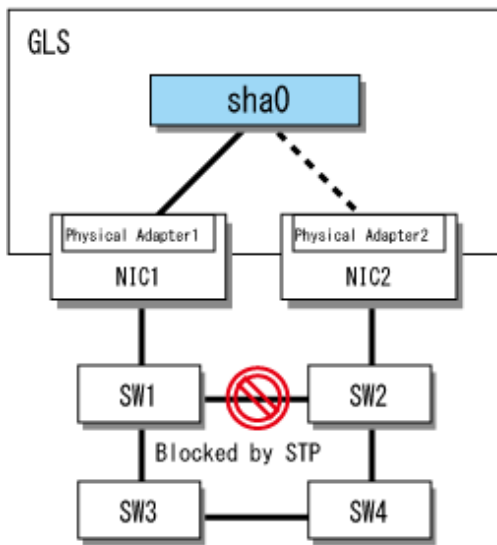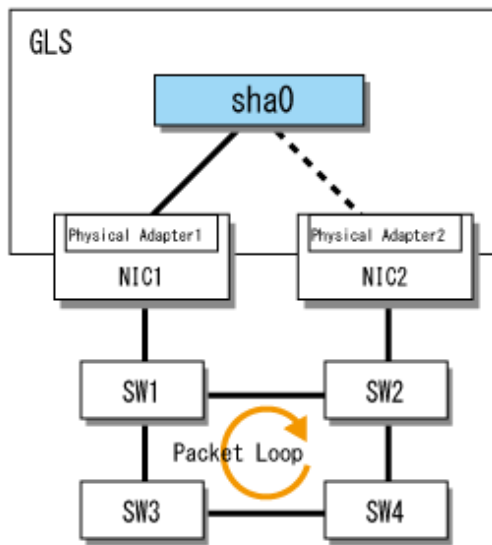
```
sha  : Virtual Adapter
NIC  : Network Interface Card
SW   : Network Switch
GLS  : PRIMECLUSTER GL for Windows
```

Mixed STPs

There are different types of STP. Which type can be used depends on the network devices that the STP is used with. If you mix protocols, STP may not function correctly. Check which protocol is the correct one for your system before using STP.

Behavior of STP on Network Device Failure

In networks using STP to prevent loop structures, the failure of a network device can cause the STP packet loop guard to stop working. In such cases, a loop may be created, causing a broadcast storm and thus bringing down the network. For this reason, it is recommended to use network devices that have an L2 loop prevention function.

3.2.2 Designing the Network Configuration

GLS provides a network configuration based on multiple NICs connecting to the same segment.

When designing a network configuration, it is important to take into consideration any quantitative restrictions, whether or not NICs are shared, and whether or not VLAN tagging is used.

Standard Configurations

The network configurations usually used with GLS are as follows:

- Single Virtual Adapter without Shared NICs

- Multiple Virtual Adapters without Shared NICs

- Shared NICs (All NICs Shared by Virtual Adapters Using VLAN Tagging)

- Shared NICs (Some NICs Shared by Virtual Adapters Using VLAN Tagging)

The main features of these configurations are listed below.

Single Virtual Adapter without Shared NICs

This is the configuration to use when a single network is duplicated.

Multiple Virtual Adapters without Shared NICs

This is the configuration to use when each user application resides on a different LAN. This configuration is also suitable for three-tier application servers and for separating LAN traffic for user operations and administrative operations.

Shared NICs (All NICs Shared by Virtual Adapters Using VLAN Tagging)

This is the configuration to use in environments such as a blade server system, where there is a limit on the number of NICs that can be used and the environment spans multiple networks.

Shared NICs (Some NICs Shared by Virtual Adapters Using VLAN Tagging)

This is the configuration to use when combining any of the three configurations described above.

Note
. . . .

- You cannot create partial NIC shares with multiple virtual adapters in GLS.

- In order to share NICs, you must set different VLAN tags for each virtual adapter and each NIC must connect to a different VLAN.
. . . .

For more details on the above patterns, refer to "Appendix A Sample GLS Configurations."

3.2.3 Selecting Ping Targets

When selecting the ping target systems to trigger adapter switching, note the following points:

- Adjacency of Network Devices to Server

- System with Hot Standby Router

- Network Devices on Remote Networks

- Destination Server

Adjacency of Network Devices to Server

To maintain redundancy of network devices, set at least two ping targets. If you only set one target, the system becomes unable to communicate if that system suffers a network failure. By setting two or more targets, you can ensure that user communications remain open even when carrying out maintenance on network devices.

Figure 3.2 Adjacency of Network Devices to Server
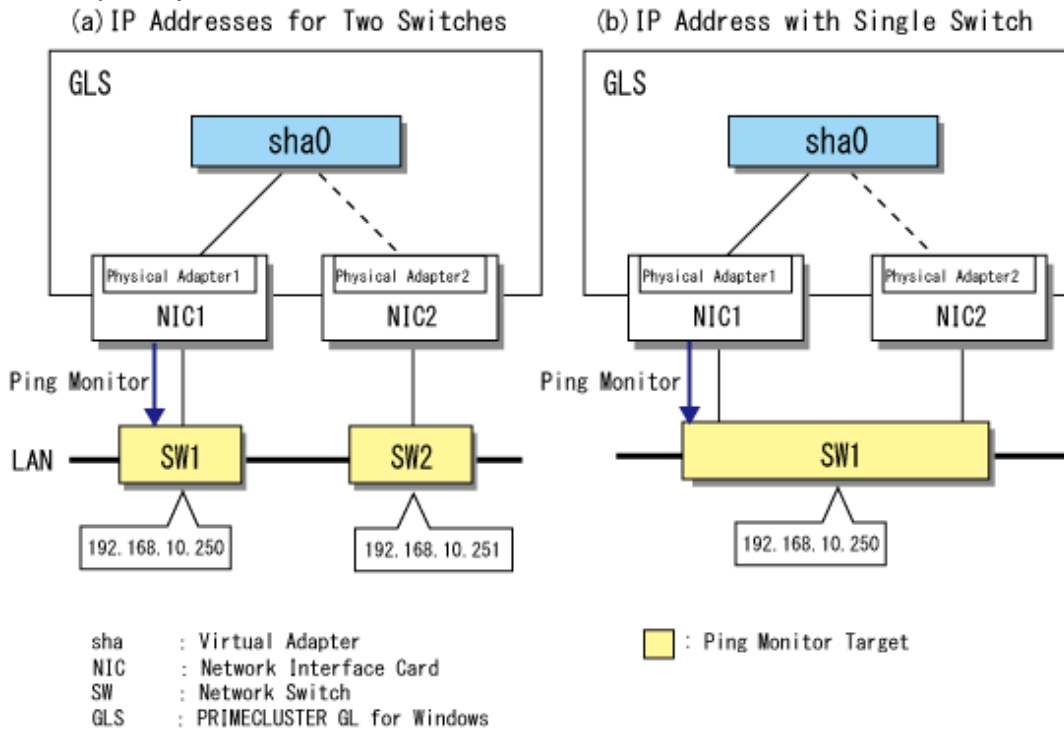
(a) IP Addresses for Two Switches

(b) IP Address with Single Switch

sha	: Virtual Adapter
NIC	: Network Interface Card
SW	: Network Switch
GLS	: PRIMECLUSTER GL for Windows

☐ : Ping Monitor Target

📝 Note

. . . .

It is not necessary to join switches with cascade connections. Use the method that best suits the network configuration.

. . . .

System with Hot Standby Router

If you set L3 switches (router) of a hot standby configuration as ping targets, set the IP address or virtual IP address for each L3 switch separately.

If you set as a ping target a virtual IP address that is transferred from one L3 switch to another, it is recommended to set the ping interval and number of pings to be greater than the length of time it takes for the virtual IP address to be switched from the failed L3 switch to the standby L3 switch. This is because, if you set a shorter period and one L3 switch fails, the system may assume that both L3 switches have failed.
For more details on ping intervals and number of pings, refer to "6.2.5 hanetpoll."

Figure 3.3 System with Hot Standby Router
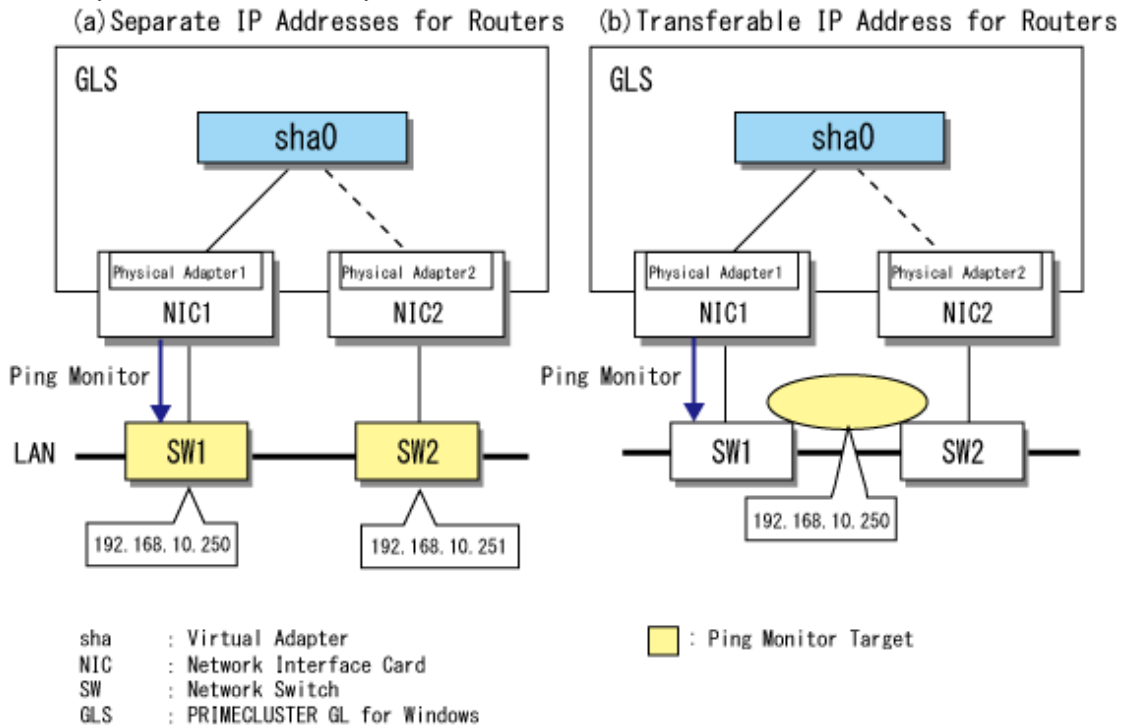
Note

....

It is not necessary to join switches with cascade connections. Use the method that best suits the network configuration.

....

Network Devices on Remote Networks

If you set the ping monitor and the monitor target on different networks, the ping monitor status depends on the routing information of the L3 switch (router) linking the server and the monitor target. Accordingly, you should increase the default values for ping monitoring intervals and frequency, taking into consideration the amount of time it takes to disseminate the RIP (Routing Information Protocol) and to update routing information after a network failure. Also, you should add adjacent network devices to the adapter switching parameters as monitor targets, making these settings with care to avoid incorrect switching.

For more details on the settings, refer to "6.2.5 hanetpoll."

Figure 3.4 Network Devices on Remote Networks

(a) IP Addresses on Remote Network

(b) IP Addresses on Same/Remote Network

```
sha  : Virtual Adapter
NIC  : Network Interface Card
SW   : Network Switch
GLS  : PRIMECLUSTER GL for Windows
```

☐ : Ping Monitor Target
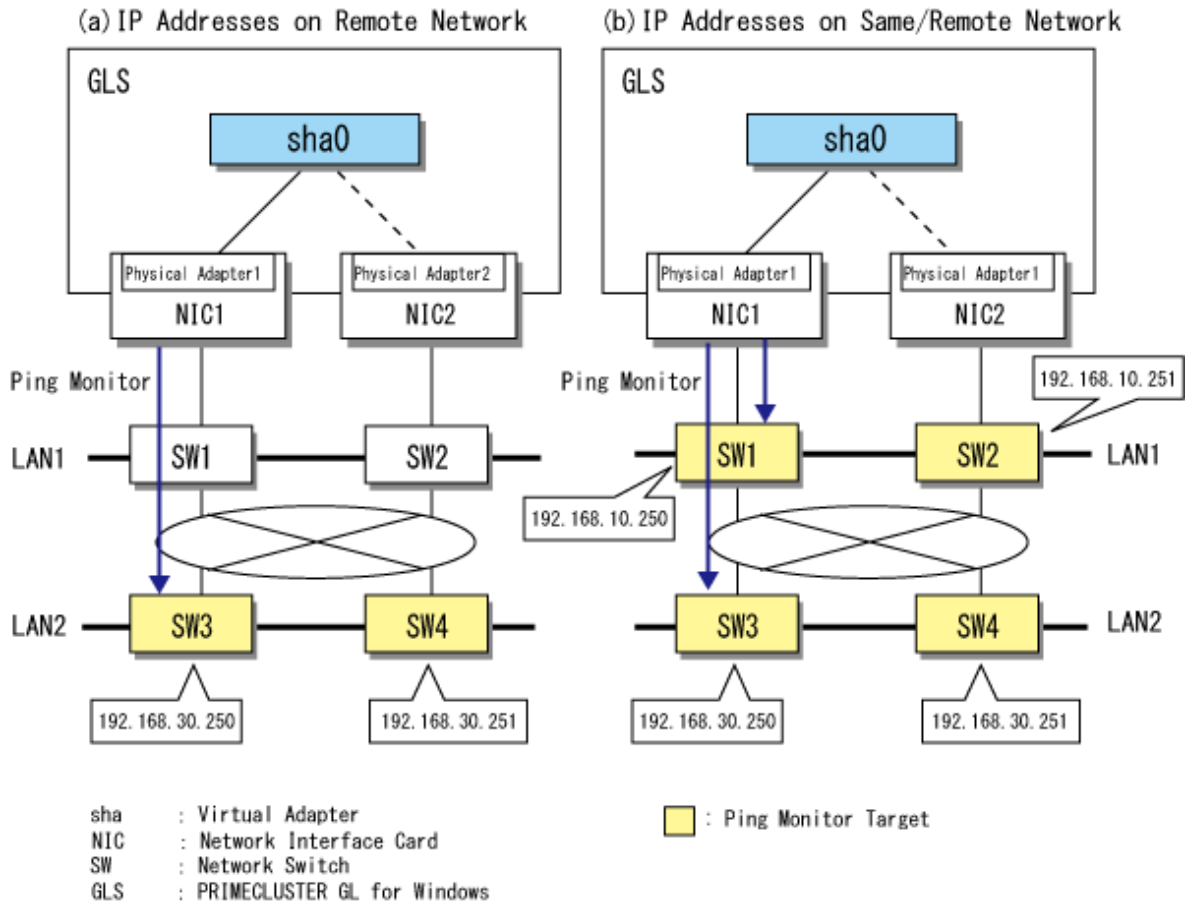
Destination Server

If you set a destination server as the ping target, restarting that server for maintenance will be handled as a transmission path error, causing the adapter to be switched. To prevent this, either add a neighboring network device, as well as the destination, to the adapter switch conditions or set so that switching is not carried out even if an error occurs in the destination server.

For more details on the settings, refer to "6.2.5 hanetpoll."

Figure 3.5 Destination Server as Ping Target
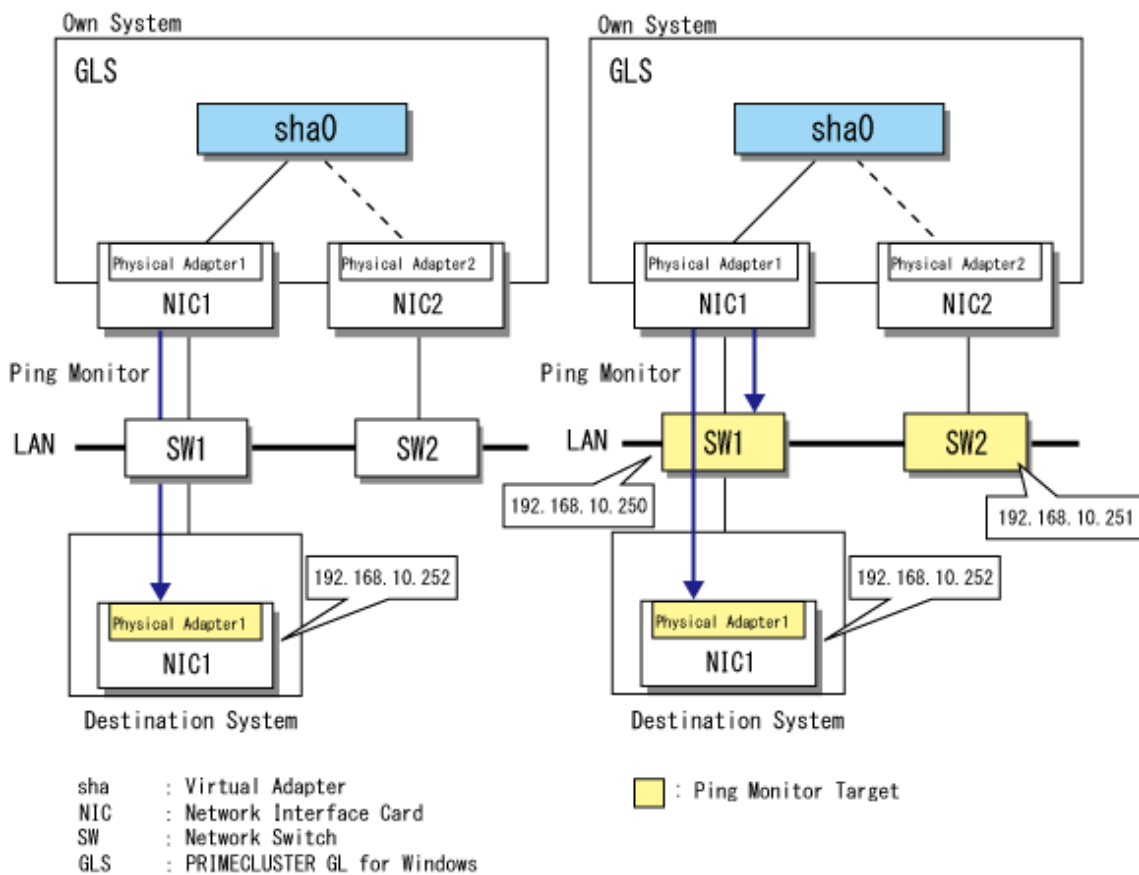
3.2.3.1 Failure Detection Time of Ping Monitoring

After setting ping target, set the detection time of ping monitoring according to the network configuration.

The failure detection time of ping monitoring is equal to the product of the interval and the number of times to monitor. If you set longer failure detection time, the period of stop operation will be longer. If you set shorter failure detection time, packet loss occurs due to the heavily loaded network, and it increases the probability of an error of the detection. Therefore, it is necessary to adjust the ping interval and the number of pings according to the network configuration in advance.

In GLS, when the network is heavily loaded, you can adjust the interval and the number of pings in advance to prevent the detection error of a failure in the transmission path. Generally, the default value will be fine.

🔖 See

For more details on the ping interval and the number of pings, refer to "6.2.5.4 param."

You can calculate the GLS' failure detection time (minimum/maximum value) as follows:

Failure detection time (minimum value)

```
ping interval (second(s)) x (number of pings - 1) + timeout for ping (Note)
```

Failure detection time (maximum value)

```
ping interval (second(s)) x (number of pings - 1) + timeout for ping (Note) + ping interval
(second(s))
```

Note) When ping interval is one second, timeout for ping is one second. When ping interval is other than one second, the timeout is two
seconds.

The detection time is calculated as follows when setting values are default:

Failure detection time (minimum value): 3 seconds x (5 times - 1) + 2 seconds = 14 seconds

Failure detection time (maximum value): 3 seconds x (5 times - 1) + 2 seconds + 3 seconds = 17 seconds

The following is a sequence of failure in the transmission paths of ping monitoring in NIC switching mode.

Figure 3.6 Sequence of failure in the transmission paths
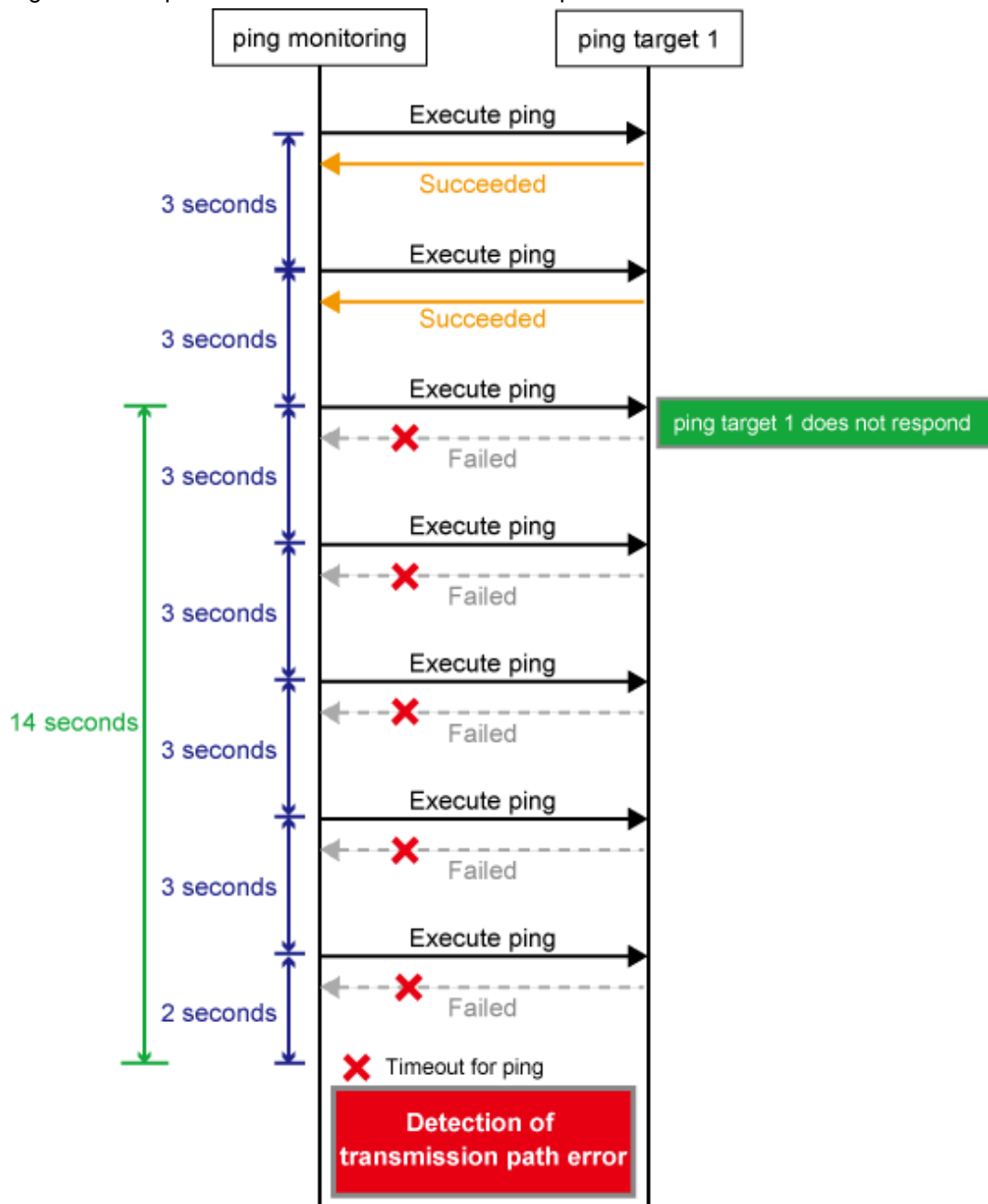
3.2.4 Network Settings Check Sheet

After making the network settings as planned, verify them with the following check sheet in order to avoid any problems in advance.

If there are any problems with the contents of your settings, please review them with reference to "3.2.2 Designing the Network Configuration."

Table 3.2 Network Settings Check Sheet

Item		Action
Cable	Connection	- Check that the cable is connected.
		- Check that the cable is not damaged. Check that the LED lamp of the port to which the switch cable is connected is flashing. If the lamp is not flashing, replace the cable.
		- Check that the cable is connected correctly.
		- Check that the system is correctly wired. If you are using a blade server, the wiring requirements differ according to the location of blades in the server cabinet and the allocation of network ports.
	Type	- Check that you are using the correct type of cable (straight-through cable or crossover cable). Functions such as Auto-MDIX, which automatically recognize cable types, may require Auto-negotiation as the communication mode. For more details, refer to the appropriate switch manual.
		- Check that you are using the correct category of cable (such as 5 or 5e) for the communication speed and cable length.
Switch settings	STP	- Check Spanning Tree Protocol (STP) settings. Depending on the STP specifications, when STP is set, the port to which the physical adapter connects may be temporarily blocked when the physical adapter links up, preventing communication. If necessary, change the ping interval to prevent GLS from switching adapters before the port is blocked. For more details on changing the ping interval, refer to "6.2.5 hanetpoll."
	VLAN ID	- Check for error in VLAN ID setting.

	Communication mode	- Check that the communication modes of the own node used by the physical adapter and the switch port are the same.
		If the communication modes of the switch and of the own node are different (for example, if the own node is set to use Auto-negotiation and the switch is set to use fixed full-duplex), collisions can occur, leading to packet loss.
		Note that devices on either end of Ethernet connections must use one of the following communication modes:
		
		  - Auto-negotiation - Auto-negotiation
		
		  - 10G full-duplex - 10G full-duplex
		
		  - 10G half-duplex - 10G half-duplex
		
		  - 1G full-duplex - 1G full-duplex
		
		  - 1G half-duplex - 1G half-duplex
		
		  - 100M full-duplex - 100M full-duplex
		
		  - 100M half-duplex - 100M half-duplex
		
		  - 10M full-duplex - 10M full-duplex

Item		Action
		- 10M half-duplex - 10M half-duplex
	IP address	- If the switch is a ping target, check that the IP address is set. In particular, check that the same IP address does not specify another network device or server at the same time.
NIC speed		- Check that NIC speeds in the own node are the same.
Network configuration		- Check that GLS supports the network connection method.

GLS: PRIMECLUSTER GL for Windows

Note

. . . .

If you have set an STP, after replacing a cable due to an error on the transmission path, it may take one or two minutes for communication to be restored.

. . . .

3.3 GLS Installation

For full details on installing GLS, refer to the Software Release Guide.

3.4 Preparing GLS for Use

This section describes how to prepare GLS for use. Make sure that you read the following precautions before you continue.

3.4.1 Precautions on Preparing GLS for Use

Precaution on GLS driver

Do not change the check status of the GLS driver (FUJITSU PRIMECLUSTER GL Network Protocol Driver) in the [Properties] window of the network adapter.

Precautions on Physical Adapters

- After you have finished making GLS settings, do not change the names of physical adapters that are bundled in virtual adapters.

- After activating a GLS virtual adapter, do not change the settings for any physical adapters that are bundled in the virtual adapter.

- Set the same properties (such as Jumbo Packet) for all physical adapters that are bundled in virtual adapters beforehand.

Precaution on Virtual Adapters

To deactivate virtual adapters, do not "Disable" them from [Network Connections] window. Use the stphanet command instead.

Precaution on Commands

Use the hanetconfig, hanetpoll, and strhanet commands to prepare GLS for use. Read the precautions on each command in "Chapter 6 Command Reference" before you use the commands.

3.4.2 Preliminary Tasks: Physical Adapter Settings

In order to set and use GLS correctly, you must make the settings for the physical adapters before bundling them into virtual adapters. If you are going to use the VLAN tagging function of a physical adapter, please create the VLAN tagging adapter of the physical adapter beforehand, and then make the following settings for the newly created adapter.

The procedure is as follows:

1. Enable all network adapters that will form part of virtual adapters.

   Display the [Network Connections] window by selecting from [Windows Settings]-[Network and Internet]-[Network and Sharing Center]-[Change adapter settings], then right click on your disabled network adapter and click [Enabled].

2. From [Properties] window of the network adapter enabled in step1, select the following check box.

   Check [Internet Protocol Version 6 (TCP/IPv6)] or [Internet Protocol Version 4 (TCP/IPv4)].

🛑 Note

If the communication by VLAN tagging with GLS is not available, you must disable the VLAN tagging function. If the communication by VLAN tagging is available, you can keep the VLAN tagging function of the physical adapters enabled.

3.4.3 Virtual Adapter Settings

This section describes how to set a virtual adapter, assuming the following criteria:

- Virtual adapter: sha0

- Physical adapters: Ethernet 1, Ethernet 2

Figure 3.7 Virtual Adapter Settings
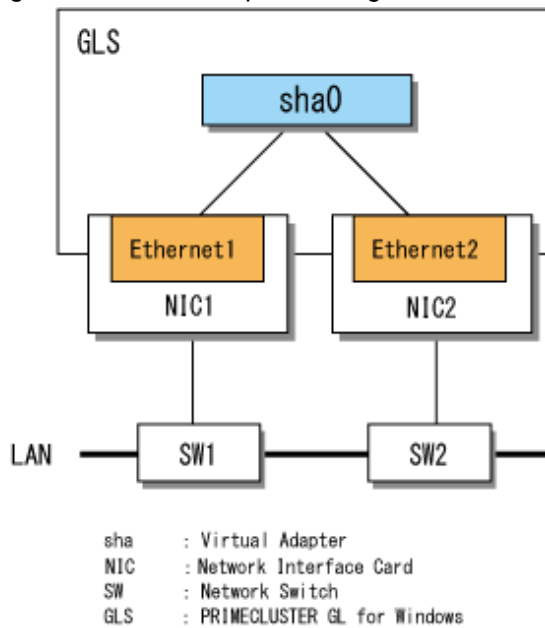

```
sha  : Virtual Adapter
NIC  : Network Interface Card
SW   : Network Switch
GLS  : PRIMECLUSTER GL for Windows
```

Use the hanetconfig command to make virtual adapter settings. Note that you must be a member of the Administrators group to execute hanetconfig.

1. Create the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 by executing hanetconfig with the create subcommand.

   ```
   > hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2"
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

🛑 Note

Deactivate all virtual adapters by executing the stphanet command before adding new adapters. For more details, refer to "6.2.8 stphanet."

2. Check that the settings are correct by executing the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name    VID  Adapters
+--------+----+-------------------------------------------------------------+
 sha0     ---- Ethernet 1, Ethernet 2
```

Point

- Repeat steps 1 and 2 for each virtual adapter that you create.

- The physical adapter that you specify first is usually first used as the operational adapter.

3.4.4 Ping Settings

Ping is a function for monitoring the communication status of network devices. By making ping settings for a destination system, you can detect when that system goes down. This improves the reliability of the network because, in addition to the link statuses, you can even determine the communication statuses of network devices.

Note

- GLS can run without using ping monitoring, but, in that case, it will not be able to detect communication errors in network devices. It is recommended to use ping for improved network reliability. Note that ping can only monitor network devices with an IP address.

- To use ping, make these settings for all physical adapters bundled in the virtual adapter. You cannot make these settings only for a single physical adapter in the bundle.

This section describes how to make ping settings, assuming the following criteria:

- Virtual adapter: sha0

- Physical adapters: Ethernet 1, Ethernet 2

- IP addresses of switches: 192.168.2.10, 192.168.2.20

Figure 3.8 Ping Monitor Settings


```
sha : Virtual Adapter
NIC : Network Interface Card
SW  : Network Switch
GLS : PRIMECLUSTER GL for Windows
```
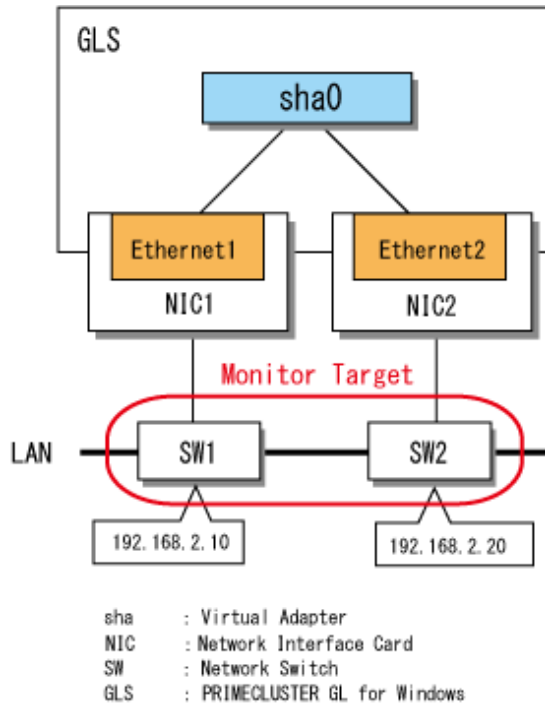
Use the hanetpoll command to make ping settings. Note that you must be a member of the Administrators group to execute hanetpoll.

Specify the IP addresses (192.168.2.10 and 192.168.2.20) of the switches to be monitored for the physical adapters Ethernet 1 and Ethernet 2, and then execute the hanetpoll command.

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

🅿 Point

. . . .

By setting a destination system as the ping target, you can detect whether or not there is a ping response from that system. You can also specify the switching behavior of adapters. For more details, refer to "6.2.5 hanetpoll."

. . . .

3.4.5 Follow-up Tasks: IP Address Settings

In order to set and use GLS correctly, you must make IP address settings for the virtual adapters.
For more information on using the netsh command, refer to the OS manual.

When using the adapter setting script of GLS

You can set IP addresses automatically using the adapter setting script provided with GLS.
Note that this script is executed automatically after you execute the strhanet command to activate all virtual adapters. For more details, refer to "6.2.7 strhanet."

The method is described below.

1. Open the following file.

```
<GLS Installation Folder>\usr\script\adapter\netconf.bat
```

2. Enter and save the required information in the file. The following example shows how to use the netsh command to set the IP address 192.168.1.10 for the virtual adapter sha0.

```
netsh interface ip set address "sha0" static 192.168.1.10 255.255.255.0
```

The following example shows the configuration when setting the IPv6 address (fc00::2).

```
netsh interface ipv6 set address "sha0" fc00::2
```

You can use the script that takes the name of the virtual adapter which has been transited from the inactive state to the active state as the argument.

1. Open the following file.

```
<GLS Installation Folder>\usr\script\adapter\netconf_indivi.bat
```

2. Enter the required information and save the file.
    Except for the point that the name of the virtual adapter which has been transited from the inactive state to the active state is taken as the argument, this step is the same as for netconf.bat. Note that the name of the virtual adapter is in the shaX (where X is an integer of 0 or larger) format. The number of arguments is one or more. The script may take one or more arguments.
    The following example shows how to use the netsh command to set the IP address 192.168.110.1 for the virtual adapter sha0 and the IP address 192.168.254.1 for the virtual adapter sha1.

```
@echo off
:LOOP_START

if "%1"=="" GOTO :LOOP_END

if "%1"=="sha0" (
netsh interface ip set address "sha0" static 192.168.110.1 255.255.255.0
)

if "%1"=="sha1" (
netsh interface ip set address "sha1" static 192.168.254.1 255.255.255.0
)

shift
goto :LOOP_START
:LOOP_END
```

The following example shows the configuration when setting the IP address (fc00:10::100) to the virtual adapter (sha0), and when setting the IP address (fc00:20::200) to the virtual adapter (sha1).

```
@echo off
:LOOP_START

if "%1"=="" GOTO :LOOP_END

if "%1"=="sha0" (
    netsh interface ipv6 set address "sha0" fc00:10::100
)

if "%1"=="sha1" (
    netsh interface ipv6 set address "sha0" fc00:20::200
)

shift
goto :LOOP_START
:LOOP_END
```

Moreover, if you have executed the strhanet command with the -n option, you can prepare scripts for each virtual adapter.

1. Create the following file.

```
<GLS Installation Folder>\usr\script\adapter\netconf_shaX.bat (X is an integer)
```

2. Enter the required information and save the file.
   Enter the same data as netconf.bat.

The following table shows when each script is called.

	strhanet	strhanet -n shaX
netconf.bat	Y	N
netconf_indivi.bat	Y	N
netconf_shaX.bat (X is an integer)	N	Y

 Note
···

- Do not enter GLS commands in the netconf.bat, netconf_indivi.bat, and netconf_shaX.bat (X is an integer) files.

- When activating a virtual adapter without specifying the -n option with the strhanet command, all the commands entered in the netconf.bat are executed. This time, if there are active virtual adapters, communications may be temporarily disabled by resetting IP addresses with netconf.bat.

···

When using the function of Windows

You can also use standard Windows functions to set IP addresses manually. There are two methods:

- Setting by GUI

- Setting by Commands

Note that, in order to set IP addresses manually, the virtual adapter must be activated in advance. For more details, refer to "3.4.6 Activating Virtual Adapters."

Setting by GUI

Display the [Network Connections] window by selecting from [Windows Settings]-[Network and Internet]-[Network and Sharing Center]-[Change adapter settings], then right click on your network adapter and open the [Properties] window, where you can change the IP address.

From [Properties] window of your network adapter, select and display [Internet Protocol Version 4 (TCP/IPv4)] or [Internet Protocol Version 6 (TCP/IPv6)]

Specify the IP address of the virtual adapter in the displayed window.

Setting by Commands

Windows provides the netsh command for setting IP addresses by command.

The following example shows how to use the netsh command to set the IP address for the virtual adapter from the Command Prompt.

```
> netsh interface ip set address "sha0" static 192.168.1.10 255.255.255.0
```

The following example shows the configuration by using the netsh command when setting the IPv6 address to the virtual adapter.

```
> netsh interface ipv6 set address "sha0" fc00::2
```

3.4.6 Activating Virtual Adapters

When you have checked that the virtual adapter settings are correct, activate the virtual adapter using the strhanet command.

The following example shows the input format for strhanet and the corresponding confirmation prompt.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details, refer to "6.2.7 strhanet."

- It may take about 90 seconds for each virtual adapter to be activated.

- When you execute the strhanet command, GLS virtual adapters automatically assign themselves a MAC address. The GLS method of assigning MAC addresses usually ensures that there is no duplication of MAC addresses already in use in other systems. If, for any reason, you need to set a static MAC address, execute the hanetconfig command with the Na option for defining the virtual adapter. For more details on the hanetconfig command, refer to "6.2.2 hanetconfig."

. . . .

- Once you activate a virtual adapter for the first time, that virtual adapter is activated automatically every time you start the system unless you deactivate that adapter.

- If you have set ping monitoring, message 00007 is displayed. If you carried out automatic IP address settings using the adapter setting script, you can start ping monitoring. For more details, refer to "3.4.7 Starting Ping Monitoring."
  If you set IP addresses manually, you must complete the IP address settings before you can start ping monitoring. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

. . . .

3.4.7 Starting Ping Monitoring

After you have checked that IP addresses have been set for all virtual adapters, you can start ping monitoring.
If you start ping monitoring and no IP address is set for one or more virtual adapters, the system may assume that an error has occurred and switch physical adapters.

Use the hanetpoll command to start ping monitoring.

The following example shows the input format for hanetpoll and the corresponding confirmation prompt.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

If you shut down Windows with a virtual adapter activated, ping monitoring starts automatically the next time you start Windows.
. . . .

3.4.8 Setting Execution of User Scripts

Batch files prepared by the user can be executed with a specific timing. For more details on the trigger timing, refer to "2.4.1 Execution of User Scripts." To apply this function, you must set the definition files beforehand. You may use a sample file for reference when creating a batch file.

[Sample Files]

When an error has been detected on a transmission path	<GLS Installation Folder>\usr\script\monitor\sha.sam
When an error has been detected in the destination system	<GLS Installation Folder>\usr\script\monitor\nodeEvent.sam

[Setup Files]

When an error has been detected on a transmission path	<GLS Installation Folder>\usr\script\monitor\shaX.bat
When an error has been detected in the destination system	<GLS Installation Folder>\usr\script\monitor\nodeEvent.bat

Note

・・

- The wait time after completing the batch file is max. 1 second. If the time for executing the batch file exceeds 1 second, possibly multiple instances of the batch file are being executed at the same time.

- Batch files for detecting errors on transmission paths have to be created separately for each virtual adapter. If you have multiple virtual adapters sharing the same physical adapter, please create a batch file for one of these virtual adapters.

・・

The procedure for setting batch files is as follows:

When an error has been detected on a transmission path

[Format for Triggering Scripts]

```
<GLS Installation Folder>\usr\script\monitor\shaX.bat param1 param2
```

```
param1
Primary:   Error in the primary adapter
Secondary: Error in the secondary adapter
all:       Errors in both adapters, primary and secondary


param2
disconnect: An error in the link status of a physical adapter has been detected.
fail:        The ping monitor has detected an error of a network device.
```

[Sample Definition File]

```
@echo off
@if not "%ECHO%"=="" echo %ECHO%
setlocal
pushd
set RETCODE=0
set TARGET=%1
set EVENT=%2

if {%TARGET%}=={Primary} (
        if {%EVENT%}=={disconnect} (
                rem -- add procedure for primary disconnect --
        ) else if {%EVENT%}=={fail} (
```

```
                    rem -- add procedure for primary fail --
            )
) else if {%TARGET%}=={Secondary} (
        if {%EVENT%}=={disconnect} (
                rem -- add procedure for secondary disconnect --
        ) else if {%EVENT%}=={fail} (
                rem -- add procedure for secondary fail --
        )
) else if {%TARGET%}=={all} (
        if {%EVENT%}=={disconnect} (
                rem -- add procedure for all disconnect --
        ) else if {%EVENT%}=={fail} (
                rem -- add procedure for all fail --
        )
)
```

When an error has been detected in the destination system

[Format for Triggering Scripts]

```
<GLS Installation Folder>\usr\script\monitor\nodeEvent.bat param1 param2
```

```
param1
target:  IP address of destination system
param2
fail:    The ping monitor has detected an error in the destination system.
```

[Sample Definition File]

```
@echo off
@if not "%ECHO%"=="" echo %ECHO%
setlocal
pushd
set RETCODE=0
set TARGET=%1
set EVENT=%2

rem -- modify target IP address --
set REMOTE_NODE1=192.168.1.1
set REMOTE_NODE2=192.168.1.2

if {%TARGET%}=={%REMOTE_NODE1%} (
        if {%EVENT%}=={fail} (
                rem -- add procedure for node monitoring --
        )
) else if {%TARGET%}=={%REMOTE_NODE2%} (
        if {%EVENT%}=={fail} (
                rem -- add procedure for node monitoring --
        )
)
```

3.5 Functional Check

When you have finished making the GLS settings, check that the status of every virtual adapter is "Active". You can check the statuses of virtual adapters by executing the dsphanet command.

The following example shows the input format for dsphanet and the corresponding confirmation prompt.

```
> dsphanet
 Name    Status   Adapters
```

```
+-------+--------+-------------------------------------------------------------+
 sha0    Active   Ethernet 1(ON), Ethernet 2(STBY)
 sha2    Active   Ethernet 4(STBY), Ethernet 5(ON)
```

If a virtual adapter is listed with its status as "Inactive", take appropriate action according to the information given in "Appendix E Troubleshooting."

If you have set ping monitoring, you can check its status by executing the dsphanet command with the -r option.

The following example shows the input format for dsphanet with the -r option and the corresponding confirmation prompt.

```
> dsphanet -r
[sha0]
 Adapters                        Resources
+------------------------------+---------------------------------------------+
 Ethernet 1(ON)                  LINK(O)
                                 PING(O)
                                  192.168.2.10(O),192.168.2.20(O)
 Ethernet 2(STBY)                LINK(O)
                                 PING(-)
                                  192.168.2.10(-),192.168.2.20(-)
[sha2]
 Adapters                        Resources
+------------------------------+---------------------------------------------+
 Ethernet 4(STBY)                LINK(O)
                                 PING(-)
                                  192.168.10.250(-),192.168.10.251(-)
 Ethernet 5(ON)                  LINK(O)
                                 PING(O)
                                  192.168.10.250(O),192.168.10.251(O)
```

If a physical adapter or ping monitor is listed with its status as "X", take appropriate action according to the information given in "Appendix E Troubleshooting."

For more details on the dsphanet command, refer to "6.3.1 dsphanet."

Point

. . . .

Once you have checked that the virtual adapter is functioning normally, it is recommended to create a backup of the virtual adapter definitions in order to be prepared in the event of a system error. You can use the hanetbackup command to create backups.

To create a backup file named glsbackup of the virtual adapter settings on the C drive, execute the following:

```
> hanetbackup -f C:\glsbackup
```

For details on backing up virtual adapter definitions, refer to "6.2.1 hanetbackup."

. . . .

Chapter 4 Operating GLS

This chapter explains how to operate GLS.

4.1 Starting and Stopping the System

This section describes how to start and stop GLS and virtual adapters.

4.1.1 Starting the System

In order to start the GLS system, you must activate virtual adapters. Once activated, virtual adapters are activated automatically each time Windows starts up. However, if you deactivate virtual adapters before shutting down Windows, you must use the strhanet command to activate virtual adapters the next time that you start Windows. Log in as a member of the Administrators group before executing the strhanet command.

The following example shows how to execute the strhanet command and gives a sample result.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the strhanet command, refer to "6.2.7 strhanet."

📘 Point
....

- Once you have activated a virtual adapter, it will be activated automatically each time you start Windows, as long as you do not deactivate it by a command. Therefore, there is usually no need to activate virtual adapters by entering commands.

- If you have set the ping monitor function, message 00007 is displayed. Start the ping monitor function if necessary. For more details on starting the ping monitor function, refer to "6.2.5 hanetpoll."

- If you use the adapter setting script to set IP addresses automatically, the script is executed automatically after you execute the strhanet command. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

- If a physical adapter where the ping monitoring is not set exists in physical adapters that are bundled in active virtual adapters when the GLS service starts up, the ping monitoring does not start. Set the ping monitoring for all the physical adapters to be bundled.
....

📘 Information
....
About GLS Setting Information when Windows is Started

- All settings for virtual adapters that have been made using the GUI or the netsh command will be reloaded each time you start Windows, as long as the virtual adapter is not deactivated by running the stphanet command.

- If you shut down Windows with the ping monitor function started, the ping monitor function starts automatically the next time you start GLS.
....

4.1.2 Stopping the System

GLS stops automatically when Windows shuts down, but virtual adapters remain activated.

If necessary, for example if you need to change virtual adapter settings, you can use the stphanet command to deactivate virtual adapters. Log in as a member of the Administrators group before executing the stphanet command.

> **Note**

. . . .

To deactivate virtual adapters, do not "Disable" them from [Network Connections] window. Use the stphanet command instead.

. . . .

The following example shows how to execute the stphanet command and gives a sample result.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the stphanet command, refer to "6.2.8 stphanet."

> **Information**

. . . .

If the ping monitor function is running, this is also stopped, and message 00005 is displayed.

. . . .

4.2 Checking Virtual Adapter Status

You can use the dsphanet command to check the status of virtual adapters.

The following example shows how to execute the dsphanet command and gives a sample result.

```
> dsphanet
 Name     Status    Adapters
+--------+--------+-----------------------------------------------------------+
 sha0     Active    Ethernet 1(ON), Ethernet 2(STBY)
 sha2     Active    Ethernet 4(FAIL), Ethernet 5(ON)
```

For more details on the dsphanet command, refer to "6.3.1 dsphanet."

Chapter 5 Maintenance

This chapter describes maintenance tasks for GLS.

5.1 Changing Virtual Adapter Status

This section describes how to change the status of virtual adapters.

📑 **Note**

. . . .

Log in as a member of the Administrators group before changing virtual adapter status.

. . . .

5.1.1 Displaying Adapter Status

This section describes how to display the virtual adapter status.

You can use the dsphanet command to display virtual adapter status.

The following example shows how to execute the dsphanet command and gives a sample result.

```
> dsphanet
 Name      Status    Adapters
+--------+--------+----------------------------------------------------------+
  sha0      Active    Ethernet 1(ON), Ethernet 2(STBY)
  sha2      Active    Ethernet 4(STBY), Ethernet 5(ON)
```

For more details on the displayed items and the dsphanet command, refer to "6.3.1 dsphanet."

📘 **Point**

. . . .

If you execute Windows' ipconfig command in the command prompt, only the virtual adapters are output as TCP/IP network adapters.

. . . .

5.1.2 Activating and Deactivating Virtual Adapters

This section describes how to activate and deactivate virtual adapters.

Activating

If you deactivate virtual adapters for any reason, you must reactivate them by executing the strhanet command. Log in as a member of the Administrators group before executing the strhanet command.

The following example shows how to execute the strhanet command and gives a sample result.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the strhanet command, refer to "6.2.7 strhanet."

📘 **Point**

. . . .

 - Once you have activated a virtual adapter, as long as you do not deactivate it by a GLS command or a function of the operating system,
   it is automatically activated whenever you start Windows. However, as activation and deactivation of virtual adapters by OS functions
   are not supported, there is no guarantee for GLS to operate properly after using OS functions.

- If you have set the ping monitor function, message 00007 is displayed. For more details on starting the ping monitor function, refer to "5.3.3 Starting and Stopping the Ping Monitor Function." Make sure that IP addresses have been set for all virtual adapters before you start ping monitoring. If you start the ping monitor function and no IP address is set for one or more virtual adapters, the system may assume that an error has occurred and switch physical adapters.

- If you use the adapter setting script to set IP addresses automatically, the script is executed automatically after you execute the strhanet command.

Deactivating

If you need to change virtual adapter settings or restore a virtual adapter settings file, you must first deactivate GLS virtual adapters.

Execute the stphanet command to deactivate virtual adapters. Log in as a member of the Administrators group before executing the stphanet command.

Note

- If you deactivate a virtual adapter by executing stphanet command, the virtual adapter will be deleted together with the information that is set to the virtual adapter. To reactivate the virtual adapter, you need to set the virtual adapter again.

- When you deactivate a virtual adapter, communications from higher level applications using the IP address set in that virtual adapter may be ended. For this reason, if necessary, close all such higher level applications before deactivating virtual adapters. If a virtual adapter is set for higher level applications, delete the virtual adapter.

- When you deactivate a virtual adapter by executing the stphanet command, it remains deactivated even when you restart Windows. Execute the strhanet command to activate deactivated virtual adapters.

- Do not "Disable" a virtual adapter from [Network Connections] window. Use the stphanet command instead.

The following example shows how to execute the stphanet command and gives a sample result.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the stphanet command, refer to "6.2.8 stphanet."

Information

When you execute the stphanet command, the ping monitor function stops and message 00005 is displayed.

5.2 Changing the Configuration of Virtual Adapters

This section describes how to change the configuration of virtual adapters.

Note

Deactivate all virtual adapters before changing the configuration of any virtual adapter. For more details on deactivating virtual adapters, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

5.2.1 Adding a Virtual Adapter

This section describes how to add a virtual adapter.

Figure 5.1 Adding a Virtual Adapter
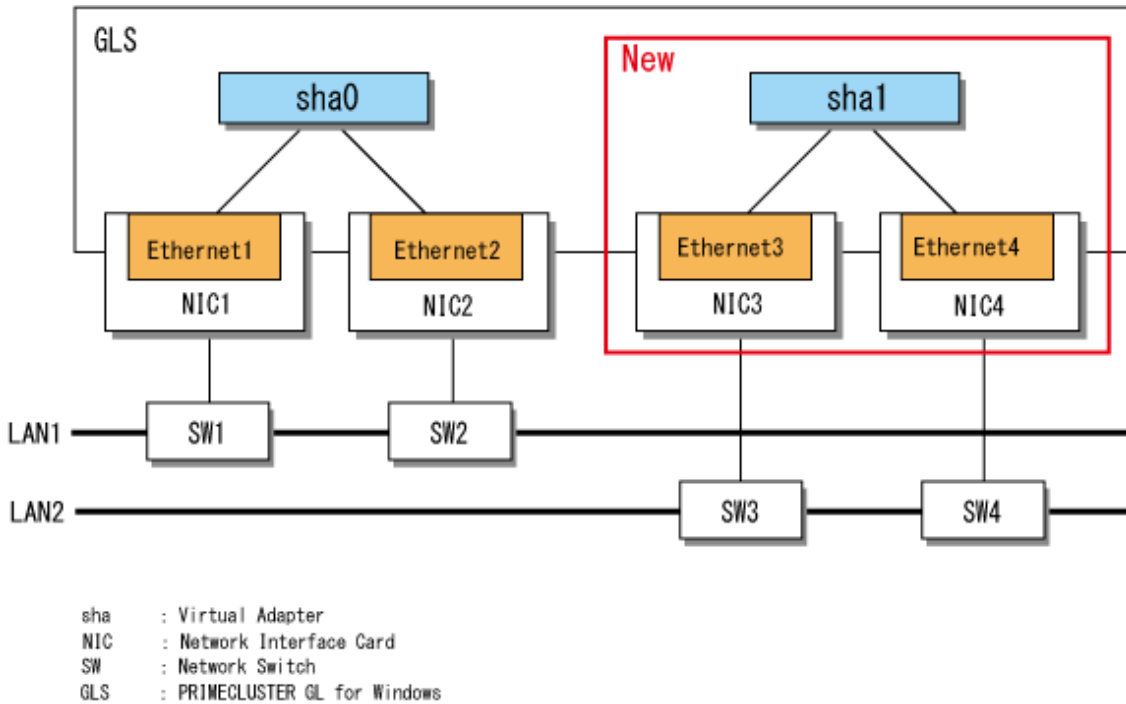

```
sha   : Virtual Adapter
NIC   : Network Interface Card
SW    : Network Switch
GLS   : PRIMECLUSTER GL for Windows
```

1. Deactivate all virtual adapters by executing the stphanet command.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Display the [Network Connections] window by selecting from [Windows Settings]-[Network and Internet]-[Network and Sharing Center]-[Change adapter settings], then check your network adapters that need to be bundled.

3. Create the new virtual adapter by executing the create subcommand of the hanetconfig command, specifying virtual adapter sha1 to bundle the physical adapters (Ethernet 3 and Ethernet 4).

```
> hanetconfig create -n sha1 -t "Ethernet 3","Ethernet 4"
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the hanetconfig command, refer to "6.2.2 hanetconfig."

4. Check the settings by executing the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name    VID  Adapters
+--------+----+---------------------------------------------------------------+
 sha0     ---- Ethernet 1,Ethernet 2
 sha1     ---- Ethernet 3,Ethernet 4
```

 Point
. . . .

- Repeat steps 2 and 3 for each virtual adapter that you create.

- Usually, the physical adapter that has been specified first will be used as the operational adapter.
. . . .

See

To ensure that GLS is set and functions correctly, perform the following tasks after adding virtual adapters:

- Set the ping monitor function.

  For more details, refer to "5.3.2 Setting Ping Monitoring."

- Set IP addresses.

  For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

- Activate virtual adapters.

  For more details, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

- Start the ping monitor function.

  For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

5.2.2 Deleting Virtual Adapters

This section describes how to delete a virtual adapter.

Figure 5.2 Deleting Virtual Adapters
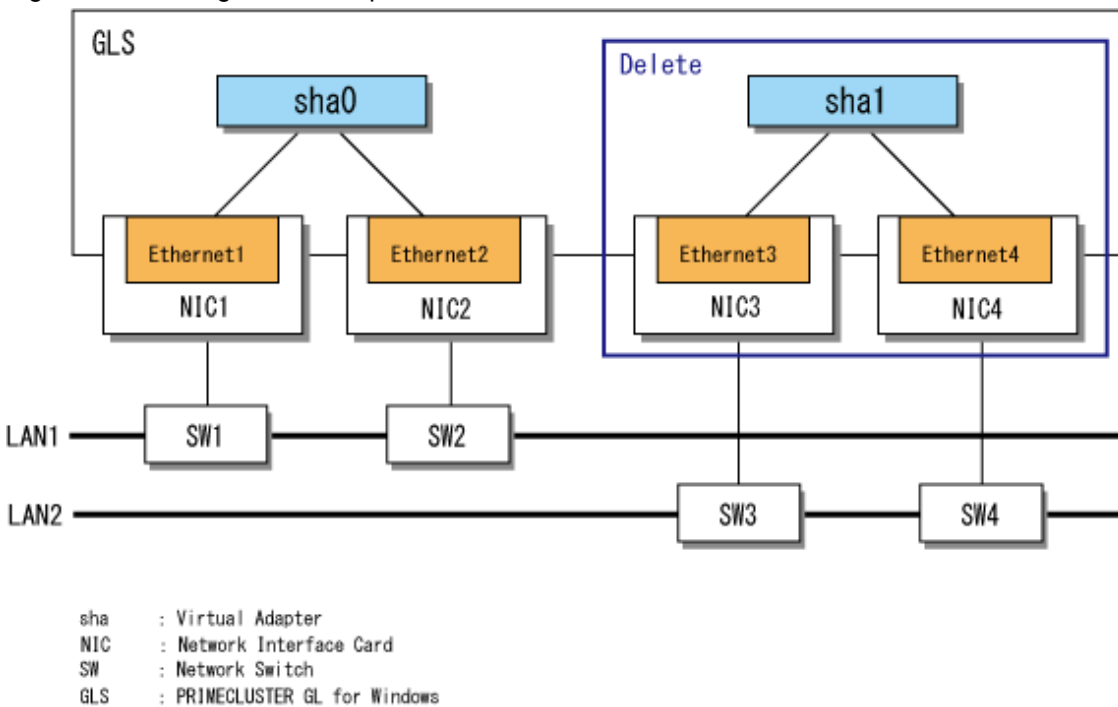

```
sha    : Virtual Adapter
NIC    : Network Interface Card
SW     : Network Switch
GLS    : PRIMECLUSTER GL for Windows
```

1. Deactivate all virtual adapters by executing the stphanet command.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Check whether the ping monitor function is set.

```
> hanetpoll print
```

For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

If ping monitoring is not set, step 3 is not applicable.

3. If you have set the ping monitor function, delete the corresponding settings.

   Execute the delete subcommand of the hanetpoll command for the physical adapters bundled in virtual adapter sha1, which is to be deleted.

```
> hanetpoll delete -t "Ethernet 3"
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll delete -t "Ethernet 4"
FJSVhanet: INFO: 00000: The command ended normally.
```

   For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

4. Delete the information defining the virtual adapter.

   Delete the virtual adapter sha1 by executing the delete subcommand of the hanetconfig command.

```
> hanetconfig delete -n sha1
FJSVhanet: INFO: 00000: The command ended normally.
```

   For more details on the hanetconfig command, refer to "6.2.2 hanetconfig."

See
....

To ensure that GLS is set and functions correctly, perform the following tasks after deleting virtual adapters:

- Activate the remaining virtual adapters.

  For more details, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

- Start the ping monitor function.

  For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."
....

Information
....

If you use a physical adapter that has been bundled in a virtual adapter by Network Load Balancing (NLB), updating the cluster configuration may fail. In this case, open the property of the host added to the cluster and click the [OK] button.
....

5.2.3 Changing Physical Adapters

This section describes how to change the physical adapters bundled into a virtual adapter. In the procedure below, the name of the virtual adapter is sha0. This virtual adapter contains two physical adapters: Ethernet 1 and Ethernet 2. In the procedure below, Ethernet 2 is replaced with Ethernet 3.

Figure 5.3 Changing Physical Adapters
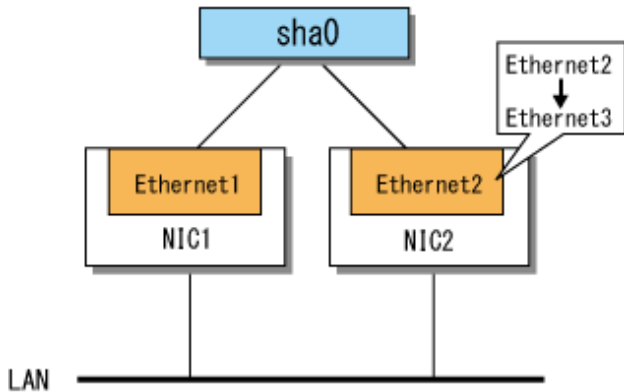
1. Check the name and status of the physical adapter to be changed.

   Execute the dsphanet command.

   ```
   > dsphanet
    Name     Status   Adapters
    +-------+--------+----------------------------------------------------+
    sha0    Active   Ethernet 1(ON),Ethernet 2(STBY)
   ```

   For more details on the dsphanet command, refer to "6.3.1 dsphanet"

   When the physical adapter to be changed is operational, change the status of the adapter to standby with the change subcommand of the hanetnic command.

   For details on the change subcommand of the hanetnic command, see "6.2.3.3 change."

2. Check whether the ping monitor function is set.

   ```
   > hanetpoll print
   ```

   For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

   If ping monitoring is not set, step 3, step 4, and step 5 are not applicable.

3. Stop the ping monitor function.

   Use the off subcommand of the hanetpoll command.

   ```
   > hanetpoll off
   ```

   Check that ping monitor function is stopped.

   Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters is "-."

   ```
   > dsphanet -r
   [sha0]
    Adapters                      Resources
    +-----------------------------+--------------------------------------+
    Ethernet 1(ON)                LINK(O)
                                  PING(-)
                                   192.168.2.10(-),192.168.2.20(-)
    Ethernet 2(STBY)              LINK(O)
                                  PING(-)
                                   192.168.2.10(-),192.168.2.20(-)
   ```

For more details on the dsphanet command, refer to "6.3.1 dsphanet."

4. Back up the information of the ping monitor target set for the physical adapter.

   Check that there is no file storing the information of the ping monitor target.

   ```
   > dir /b C:\glspollbackup
   File Not Found
   ```

   Save the information of the ping monitor target to a file.

   Use the print subcommand of the hanetpoll command.

   ```
   > hanetpoll print > C:\glspollbackup
   ```

5. Delete the information of the ping monitor targets.

   Delete the information of the ping monitor targets set for the physical adapter to be changed, which was checked in step 1.

   Use the delete subcommand of the hanetpoll command.

   ```
   > hanetpoll delete -t "Ethernet 2"
   ```

   Check that no ping monitor targets are set.

   Use the print subcommand of the hanetpoll command.

   ```
   > hanetpoll print
   Polling Status        = OFF
          interval(idle) =   3( 60) sec
          times          =   5 times
    Adapter                       Fo  Target ip
   +------------------------------+---+------------------------------------+
    Ethernet 1                    YES 192.168.2.10,192.168.2.20
   ```

6. Delete the information of the physical adapter to be changed, which was checked in step 1, from the definition data for the virtual adapter.

   Use the delete subcommand of the hanetnic command.

   ```
   > hanetnic delete -n sha0 -t "Ethernet 2"
   ```

   For more details on the hanetnic command, refer to "6.2.3 hanetnic."

   Check that physical adapters to be changed are not bundled in the virtual adapter.

   Execute the dsphanet command.

   ```
   > dsphanet
    Name    Status   Adapters
   +-------+--------+--------------------------------------------------------+
    sha0    Active   Ethernet 1(ON)
   ```

7. Install a new adapter into the definition data for the virtual adapter.

   Execute the add subcommand of the hanetnic command.

   ```
   > hanetnic add -n sha0 -t "Ethernet 3"
   ```

   Check that the new physical adapter is bundled in the virtual adapter.

   Use the dsphanet command.

```
> dsphanet
 Name     Status   Adapters
+-------+--------+--------------------------------------------------------+
 sha0    Active   Ethernet 1(ON),Ethernet 3(STBY)
```

8. Set the ping monitor target for the new physical adapter.

    1. Display the contents of the file saved in step 4 and check the information of the ping monitor target to be set.

    ```
    > type C:\glspollbackup
    Polling Status        = OFF
            interval(idle) =   3( 60) sec
            times          =   5 times
     Adapter                       Fo  Target ip
    +-----------------------------+---+-----------------------------------+
     Ethernet 1                    YES 192.168.2.10,192.168.2.20
     Ethernet 2                    YES 192.168.2.10,192.168.2.20
    ```

    2. Set the ping monitor target for the physical adapter.

    Use the create subcommand of the hanetpoll command.

    ```
    > hanetpoll create -t "Ethernet 3" -p 192.168.2.10,192.168.2.20
    ```

    3. Check that the information of the ping monitor targets is set.

    Use the print subcommand of the hanetpoll command.

    ```
    > hanetpoll print
    Polling Status        = OFF
            interval(idle) =   3( 60) sec
            times          =   5 times
     Adapter                       Fo  Target ip
    +-----------------------------+---+------------------------------------+
     Ethernet 1                    YES 192.168.2.10,192.168.2.20
     Ethernet 3                    YES 192.168.2.10,192.168.2.20
    ```

9. Start the ping monitor function.

Use the on subcommand of the hanetpoll command.

```
> hanetpoll on
```

Check that the ping monitor function is started.

Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters in "ON" state is "O."

```
> dsphanet -r
[sha0]
 Adapters                      Resources
+-----------------------------+-----------------------------------------+
 Ethernet 1(ON)                LINK(O)
                               PING(O)
                                192.168.2.10(O),192.168.2.20(O)
 Ethernet 3(STBY)              LINK(O)
                               PING(-)
                                192.168.2.10(-),192.168.2.20(-)
```

5.2.4 Changing the VLAN ID of a Virtual Adapter

This section describes how to change the VLAN ID of a virtual adapter. In the procedure below, the name of the virtual adapter is sha0 and the VLAN ID is changed from 10 to 20.

1. Deactivate all virtual adapters by executing the stphanet command.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Check the information defining the virtual adapter whose VLAN ID you need to change by executing the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name     VID  Adapters
+-------+----+----------------------------------------------------------------+
 sha0     10   Ethernet 1, Ethernet 2
```

For more details on the hanetconfig command, refer to "6.2.2 hanetconfig."

3. Check whether the ping monitor function is set.

```
> hanetpoll print
```

For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

If ping monitoring is not set, step 4 is not applicable.

4. If you have set the ping monitor function, delete the corresponding settings.

Delete the physical adapters bundled in the virtual adapter for which to change the settings by executing the delete subcommand of the hanetpoll command.

```
> hanetpoll delete -t "Ethernet 1"
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll delete -t "Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

5. Delete the virtual adapter whose VLAN ID you need to change by executing the delete subcommand of the hanetconfig command.

```
> hanetconfig delete -n sha0
```

6. Reset the virtual adapter with the new VLAN ID (20) by executing the create subcommand of the hanetconfig command.

```
> hanetconfig create -n sha0 -v 20 -t "Ethernet 1","Ethernet 2"
```

7. Check the changes by executing the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name     VID  Adapters
+-------+----+----------------------------------------------------------------+
 sha0     20   Ethernet 1, Ethernet 2
```

See
....

To ensure that GLS is set and functions correctly, perform the following tasks after changing the VLAN ID of a virtual adapter:

- Set the ping monitor function.

  For more details, refer to "5.3.2 Setting Ping Monitoring."

- Set IP addresses.

  For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

- Activate virtual adapters.

  For more details, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

- Start the ping monitor function.

 For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

5.2.5 Changing the MAC Address of a Virtual Adapter

MAC addresses of virtual adapters are generated automatically in GLS, but you can specify optional MAC addresses in cases where automatic generation causes an address to be duplicated.

This section describes how to change the MAC address of a virtual adapter. In the procedure below, the name of the virtual adapter is sha0 and the automatically generated MAC address is changed to the optional MAC address 02-01-01-01-01-01.

1. Deactivate all virtual adapters by executing the stphanet command.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Check the information defining the virtual adapter whose MAC address settings you need to change by executing the print subcommand of the hanetconfig command with the -d option.

```
> hanetconfig print -d
 Name    VID  MAC Address
+-------+----+-----------------------------------------------------------------+
 sha0    ---- Auto
```

   For more details on the hanetconfig command, refer to "6.2.2 hanetconfig."

3. Check whether the ping monitor function is set.

```
> hanetpoll print
```

   For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

   If ping monitoring is not set, step 4 is not applicable.

4. If you have set the ping monitor function, delete the corresponding settings.

   Delete the physical adapters bundled in the virtual adapter for which to change the settings by executing the delete subcommand of the hanetpoll command.

```
> hanetpoll delete -t "Ethernet 1"
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll delete -t "Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

   For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

5. Delete the information defining the virtual adapter whose MAC address settings you need to change by executing the delete subcommand of the hanetconfig command.

```
> hanetconfig delete -n sha0
```

6. Reset the virtual adapter with the new MAC address by executing the create subcommand of the hanetconfig command.

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -a 02-01-01-01-01-01
```

7. Check that the changes were successful by executing the print subcommand of the hanetconfig command with the -d option.

```
> hanetconfig print -d
 Name    VID  MAC Address
+-------+----+----------------------------------------------------------------+
 sha0    ---- 02-01-01-01-01-01
```

🖼 See

. . . .

To ensure that GLS is set and functions correctly, perform the following tasks after changing the MAC address of a virtual adapter:

- Make settings for ping monitoring.

  For further details, refer to "5.3.2 Setting Ping Monitoring."

- Activate virtual adapters.

  For more details, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

- Start the ping monitor function.

  For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

. . . .

5.2.6 Changing the IP Address of a Virtual Adapter

This section describes how to change the IP address of a virtual adapter.
Note that you may also have to make the same change in the ping monitor settings.
The procedure is as follows:

1. Stop the ping monitor function.

   For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

2. Change the IP address of the virtual adapter.

   For more details, refer to the description below.

3. Delete the ping monitor target.

   For more details, refer to "6.2.5.2 delete."

4. Change the ping monitor target.

   For more details, refer to "3.4.4 Ping Settings."

5. Start the ping monitor function.

   For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

This section describes in detail step 2 above, how to change the IP address of a virtual adapter. For more details on steps 1, 3, 4, and 5, follow the respective link above.

To change the set IP address, first delete the existing setting, then make a new setting. You can use standard Windows functions to change IP addresses. There are two methods: one method uses the Windows GUI, the other uses Windows commands.

Changing in the GUI

To change the IP address, select [Internet Protocol Version 4 (TCP/IPv4)] or [Internet Protocol Version 6 (TCP/IPv6)] window.

[IPv4]

1. Open [Internet Protocol Version 4 (TCP/IPv4)] window.

2. Click [Advanced] to open the [Advanced TCP/IP Settings] window.

3. In the [IP addresses] field, select the IP address to delete and click [Remove].

4. Click [Add] to open the [TCP/IP Address] window.

5. Enter the appropriate IP address and subnet mask, then click [Add].

6. Click [OK] in the respective windows to complete the procedure.

[IPv6]

1. Open [Internet Protocol Version 6 (TCP/IPv6)] window.

2. Click [Advanced] to open the [Advanced TCP/IP Settings] window.

3. In the [IP addresses] field, select the IP address to delete and click [Remove].

4. Click [Add] to open the [TCP/IP Address] window.

5. Enter the appropriate IP address and the subnet prefix length, then click [Add].

6. Click [OK] in the respective windows to complete the procedure.

Note

An error may occur if you execute the strhanet or stphanet command when any network properties window is open. To prevent this, make sure that you close all related windows before you execute the strhanet or stphanet command.

Changing by Command

Windows provides the netsh command for setting IP addresses by command. The procedure is as follows:

1. In the command prompt, execute the netsh command for the IP address that you need to add as indicated below.

```
> netsh interface ip add address "sha0" 192.168.10.11 255.255.255.0
```

2. In the command prompt, execute the netsh command for the IP address that you need to delete as indicated below.

```
> netsh interface ip delete address "sha0" 192.168.10.10
```

The following shows how to change the IPv6 address.

1. In the command prompt, execute the netsh command for the IP address that you need to add as indicated below.

```
> netsh interface ipv6 add address "sha0" fc00:10::100
```

2. In the command prompt, execute the netsh command for the IP address that you need to delete as indicated below.

```
> netsh interface ipv6 delete address "sha0" fc00:10::110
```

Example

The following example shows how to use the netsh command to change the IP address of the virtual adapter sha0 from 192.168.2.1 to 192.168.3.1. Note that, in a network configuration such as the example, the IP address of the ping monitor target network switch must also be changed.

Figure 5.4 Changing the IP Address of a Virtual Adapter
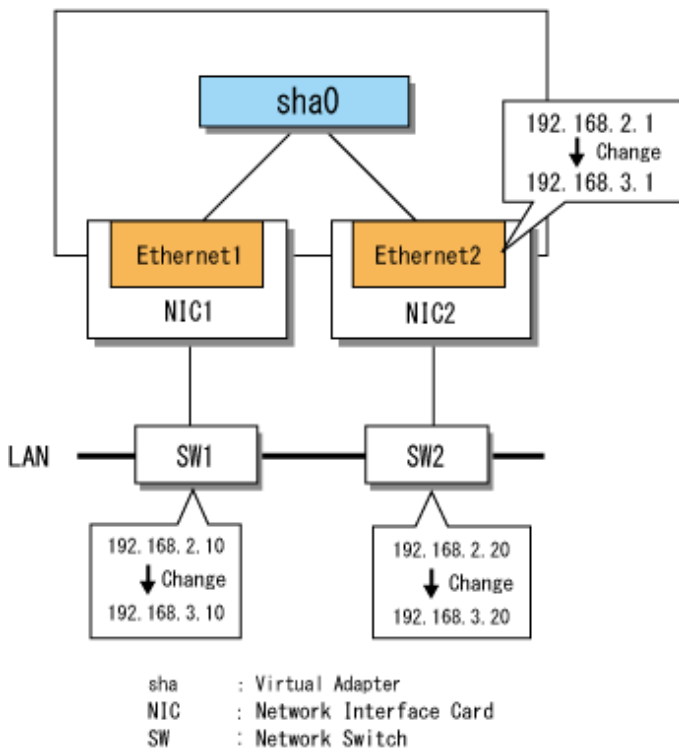

```
sha    : Virtual Adapter
NIC    : Network Interface Card
SW     : Network Switch
```

1. Stop the ping monitor function.

```
> hanetpoll off
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Change the IP address of the virtual adapter.

   First delete the existing setting, then make a new setting.
   For more details, refer to "Changing in the GUI" or "Changing by Command" in this section.

3. Change the ping monitor target. For more details, refer to "5.3.4 Changing the Ping Monitor Target."

4. Restart the ping monitor function.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

5.3 Ping Monitor Function Settings

This section describes how to set, start, and stop the ping monitor function, as well as how to change existing settings.

🔔 Note

. . . .

- You do not have to use the ping monitor function in order to use GLS, but if you do not, you will not be able to detect communication errors in network devices. It is recommended to use the ping monitor function in order to improve the reliability of the network. Note that the ping monitor function can only monitor network devices to which an IP address has been assigned.

- Use the hanetpoll command to make ping monitor settings. For more details, refer to "6.2.5 hanetpoll."

. . . .

5.3.1 Displaying Ping Monitor Status

This section describes how to display the status of ping monitoring. To display ping monitor status, execute the dsphanet command with the -r option.

The following example shows how to use the dsphanet command with the -r option and gives a sample result.

```
> dsphanet -r
[sha0]
 Adapters                     Resources
+-----------------------------+---------------------------------------------+
 Ethernet 1(ON)               LINK(O)
                              PING(O)
                               192.168.10.250(O),192.168.10.251(O)
 Ethernet 2(STBY)             LINK(O)
                              PING(-)
                               192.168.10.250(-),192.168.10.251(-)
[sha1,sha2]
 Adapters                     Resources
+-----------------------------+---------------------------------------------+
 Ethernet 3(STBY)             LINK(O)
                              PING(-)
                               192.168.20.250(-)
                               !192.168.20.100(-)
 Ethernet 4(ON)               LINK(O)
                              PING(O)
                               192.168.20.251(O)
                               !192.168.20.100(O)
[sha3]
 Adapters                     Resources
+-----------------------------+---------------------------------------------+
 Ethernet 5(FAIL)             LINK(X)
                              PING(X)
                               192.168.30.250(X)
 Ethernet 6(ON)               LINK(O)
                              PING(O)
                               192.168.30.251(O)
[sha4]
 Adapters                     Resources
+-----------------------------+---------------------------------------------+
 Ethernet 7(FAIL)             LINK(X)
                              PING(X)
                               192.168.40.250(X)
 Ethernet 8(FAIL)             LINK(X)
                              PING(-)
                               192.168.40.251(-)
```

If a physical adapter or ping monitor is listed with its status as X, take appropriate action according to the information given in "Appendix E Troubleshooting."

For more details on the dsphanet command, refer to "6.3.1 dsphanet."

You can also display details of the ping monitor settings. For more details, refer to "6.2.5 hanetpoll."

5.3.2 Setting Ping Monitoring

This section describes how to make the required settings for ping monitoring, based on the network configuration shown in Figure 5.5.

Figure 5.5 Example of Ping Monitor Settings


```
sha    : Virtual Adapter
NIC    : Network Interface Card
SW     : Network Switch
```
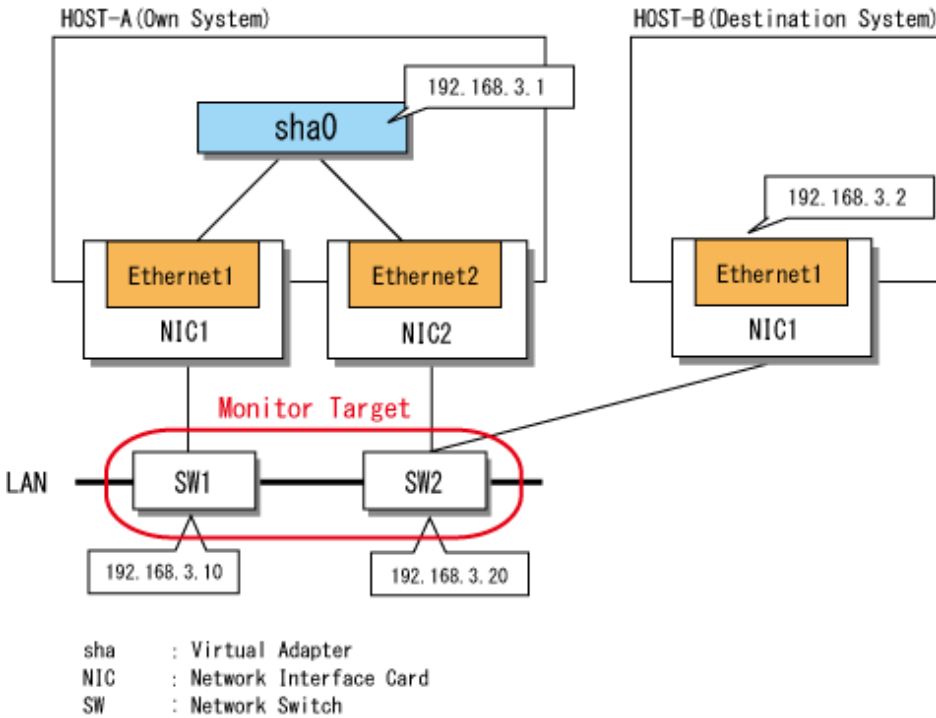
🗒️ **Note**

. . . .

You must complete the physical and virtual adapter settings before making ping monitor settings.

- For details on physical adapter settings, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

- For details on virtual adapter settings, refer to "3.4.3 Virtual Adapter Settings."

. . . .

Use the hanetpoll command to make ping monitor settings. Note that you must be a member of the Administrators group to execute hanetpoll.
The following example shows how to execute the hanetpoll command and gives a sample result.

In the sample procedure below, when the physical adapter Ethernet 1 is operational, the ping monitor target is 192.168.3.10, 192.168.3.20. When the physical adapter Ethernet 2 is operational, the ping monitor target is 192.168.3.10, 192.168.3.20.

```
> hanetpoll create -t "Ethernet 1" -p 192.168.3.10,192.168.3.20
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.3.10,192.168.3.20
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

If you set your destination systems as ping monitor targets, you can also monitor transmissions to those systems. You can also set ping monitoring so that users are merely notified of any failures on the transmission path by error messages, whereas adapters will not be switched. For more details, refer to "6.2.5 hanetpoll."

🖼️ **See**

. . . .

To ensure that GLS is set and functions correctly, perform the following tasks after making settings for ping monitoring:

- Set IP addresses.

  For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

- Activate virtual adapters.

  For more details, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

- Start the ping monitor function.

  For more details, refer to "5.3.3 Starting and Stopping the Ping Monitor Function."

5.3.3 Starting and Stopping the Ping Monitor Function

This section describes how to start and stop the ping monitor function.

Starting the Ping Monitor Function

Use the hanetpoll command to start the ping monitor function. When you start the ping monitor function, the ping monitor settings take effect.
Note that you must be a member of the Administrators group to execute hanetpoll.

Note

- To ensure that ping monitoring is successful, make sure that an IP address is set for all virtual adapters before starting the ping monitor function.

- To use ping monitoring, make these settings for all physical adapters that are bundled in the virtual adapter. You cannot make these settings only for a single physical adapter in the bundle. If you have made the settings for only one physical adapter, an error message (ID: 20052) will be displayed when you start the ping monitor function. In that case, restart the ping monitor function after making ping monitor settings for all physical adapters.

The following example shows how to execute the hanetpoll command and gives a sample result:

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

Information

If you restart Windows with the ping monitor function set, the ping monitor function starts automatically the next time you start GLS.

Stopping the Ping Monitor Function

You may need to stop the ping monitor function, for example to change the ping monitor settings. Use the hanetpoll command to stop the ping monitor function. When you stop the ping monitor function, the ping monitor settings have no effect.

The following example shows how to execute the hanetpoll command and gives a sample result:

```
> hanetpoll off
FJSVhanet: INFO: 00000: The command ended normally.
```

Information

- If you deactivate virtual adapters by executing the stphanet command, the ping monitor function stops.

- Even if you stop the ping monitor function, transmission paths are still switched in the event of a linkdown.

5.3.4 Changing the Ping Monitor Target

This section describes how to change the target for ping monitoring, based on the network configuration shown in Figure 5.6.

Figure 5.6 Changing the Ping Monitor Target
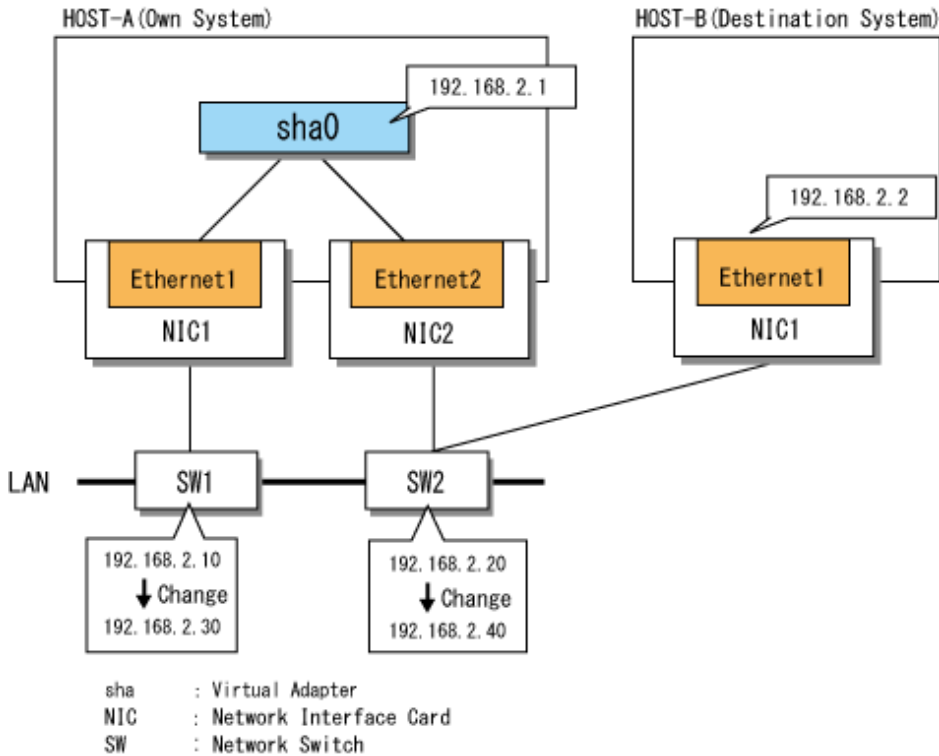
1. Stop the ping monitor function.

```
> hanetpoll off
FJSVhanet: INFO: 00000: The command ended normally.
```

Information

. . . .

Even if you stop the ping monitor function, transmission paths are still switched in the event of a linkdown.

. . . .

2. Delete the ping monitor target that you need to change.

```
> hanetpoll delete -t "Ethernet 1"
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll delete -t "Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

3. Set the new ping monitor target.

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.30,192.168.2.40
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.30,192.168.2.40
FJSVhanet: INFO: 00000: The command ended normally.
```

4. Start the ping monitor function.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

5.4 Backing Up and Restoring Definition Data for Virtual Adapters

This section describes how to back up and restore the definition data for virtual adapters.

Note

Deactivate all virtual adapters before restoring the definition data for any virtual adapter. For more details on deactivating virtual adapters, refer to "5.1.2 Activating and Deactivating Virtual Adapters."

5.4.1 Backing Up Definition Data for Virtual Adapters

This section describes how to create a backup of the definition data for virtual adapters, which should be carried out immediately after installing GLS and immediately after any changes to the configuration. You can use the hanetbackup command to back up the definition data for virtual adapters.

To create a backup file named glsbackup of the virtual adapter settings file on the C drive:

```
> hanetbackup -f C:\glsbackup
```

For more details on the hanetbackup command, refer to "6.2.1 hanetbackup."

Note

IP address settings are not backed up. For this reason, you must remake the IP address settings for the virtual adapters in the restored system. For further details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

5.4.2 Restoring Definition Data for Virtual Adapters

This section describes how to restore the settings of virtual adapters. You can use the hanetrestore command to restore backed up virtual adapter settings.

In the procedure below, the name of the virtual adapter is sha0 and the name of the backed up settings file from which the virtual adapter is restored is glsbackup.

1. Deactivate all virtual adapters by executing the stphanet command.

```
> stphanet
FJSVhanet: INFO: 00005: The ping monitoring stopped.
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Restore the settings file by executing the hanetrestore command.

```
> hanetrestore -f C:\glsbackup
```

3. Activate all virtual adapters by executing the strhanet command.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the hanetrestore command, refer to "6.2.6 hanetrestore."

Note
. . . .

Because IP address settings are not included in the backup, you must remake the IP address settings for the virtual adapters after restoring the file. For further details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

. . . .

5.5 Responding to Problems

This section describes how to respond to problems that may occur in the GLS system.

5.5.1 Procedure for Responding to Problems

This section describes the procedure to follow when a problem occurs.

Figure 5.7 Procedure for Responding to Problems
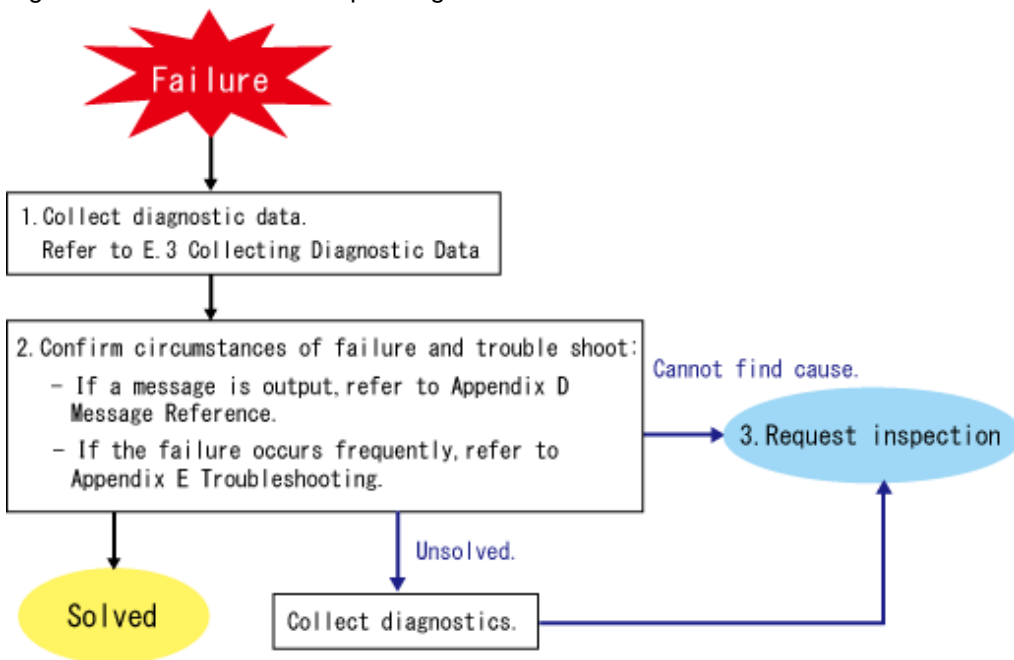
The procedure for responding to problems is as follows:

1. Collect appropriate diagnostic data.

   For more details, refer to "E.3 Collecting Diagnostic Data."

2. Check the circumstances of the failure and troubleshoot:

   - If a message is output, refer to "Appendix D Message Reference."

   - If the failure occurs frequently, refer to "Appendix E Troubleshooting."

3. If you cannot determine the cause of the problem, and you cannot solve the problem by troubleshooting, you can request field engineers to investigate.

   In this case, collect appropriate diagnostic data again and send it with the original diagnostic data to field engineers.

5.5.2 Replacing Network Switches

This section describes how to replace a network switch. The procedure is as follows:

1. Disconnect the cable in which the failure occurred.
   GLS automatically switches communications to a correctly functioning transmission path.

2. Replace the network switch and restore communications.

5.6 Maintenance Procedure for NIC

This section describes the maintenance procedure for NIC. Depending on the status of the system, there are the following two methods:

- Replacing an NIC during system operation (5.6.1 Active Maintenance of NIC)

- Replacing an NIC after shutdown of the system (5.6.2 Shutdown Maintenance of NIC)

Note

There are some restrictions on NICs supported by GLS.

Refer to "1.3 System Requirements for GLS" to check the requirements for NICs to replace.

5.6.1 Active Maintenance of NIC

This section describes how to replace an NIC during system operation.

See

For active maintenance of NIC, perform the procedure for active maintenance of physical adapters bundled in the virtual adapter by NIC Hot Plugging provided by PRIMEQUEST. For the outline and the procedure for hot plugging, see the following manuals:

- PRIMEQUEST 2000 Series

  PRIMEQUEST 2000 Series Administration Manual

- PRIMEQUEST 3000 Series

  PRIMEQUEST 3000 Series Enterprise Model Administration Manual

5.6.1.1 Replacement procedure

This section describes how to replace a physical adapter.

Note

To perform hot plugging, you must delete the physical adapter to be replaced from the virtual adapter beforehand. If hot plugging is performed before deleting the physical adapter to be replaced, the operating system may stop.

Figure 5.8 Replacing a Physical Adapter (During System Operation)
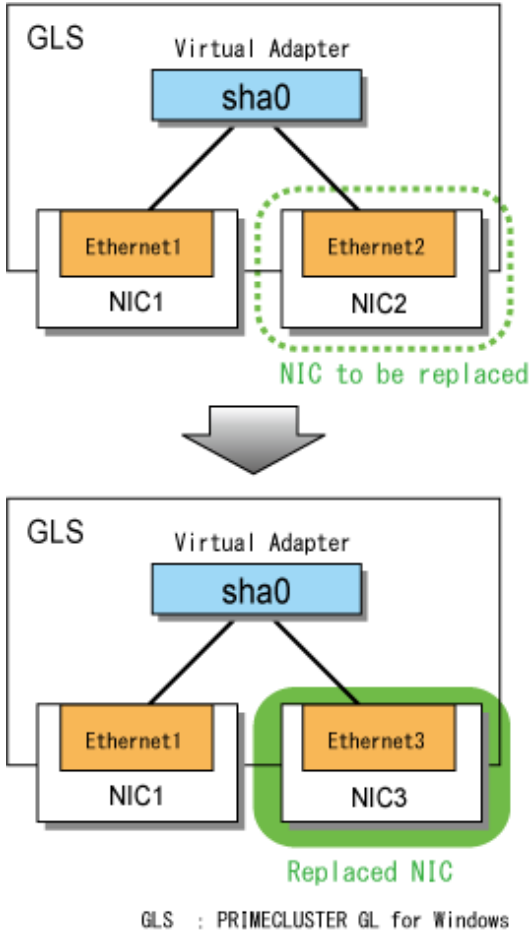
1. Check the name and status of the physical adapter to be replaced.

   Execute the dsphanet command.

   In this example, "Ethernet 2" is the physical adapter to be replaced.

   ```
   > dsphanet
    Name     Status    Adapters
   +-------+--------+----------------------------------------------------------+
    sha0     Active    Ethernet 1(ON), Ethernet 2(FAIL)
   ```

   When the physical adapter to be replaced is operational, change the status of the adapter to standby with the change subcommand of the hanetnic command.

2. Stop ping monitoring.

   Execute the off subcommand of the hanetpoll command.

   ```
   > hanetpoll off
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

   Check that ping monitoring is stopped.

   Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters is "-."

   ```
   > dsphanet -r
   [sha0]
    Adapters                        Resources
   +--------------------------------+--------------------------------------------+
   ```

```
   Ethernet 1(ON)                   LINK(O)
                                    PING(-)
                                     192.168.2.10(-),192.168.2.20(-)
   Ethernet 2(FAIL)                 LINK(X)
                                    PING(-)
                                     192.168.2.10(-),192.168.2.20(-)
```

3. Save the information of the ping monitor target set for the physical adapter to be replaced.

   Check that there is no file storing the information of the ping monitor target.

```
> dir /b C:\glspollbackup
File Not Found
```

   Save the information of the ping monitor target to a file.

   Use the print subcommand of the hanetpoll command.

```
> hanetpoll print > C:\glspollbackup
```

4. Delete the information of the ping monitor target set for the physical adapter to be replaced.

   Execute the delete subcommand of the hanetpoll command.

```
> hanetpoll delete -t "Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

   Check that no ping monitor targets are set for the physical adapter to be replaced.

   Execute the print subcommand of the hanetpoll command.

```
> hanetpoll print
Polling Status          = OFF
        interval(idle) =  3( 60) sec
        times          =  5 times
 Adapter                        Fo  Target ip
 +------------------------------+---+---------------------------------------+
  Ethernet 1                     YES 192.168.2.10,192.168.2.20
```

5. Prepare for replacing a physical adapter.

   1. Delete the information of the physical adapter to be replaced from the definition data of the virtual adapter.

      Execute the delete subcommand of the hanetnic command.

```
> hanetnic delete -n sha0 -t "Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

   2. Check that the physical adapter to be replaced is not bundled in the virtual adapter.

      Execute the dsphanet command.

```
> dsphanet
 Name     Status    Adapters
 +-------+--------+-----------------------------------------------------------+
  sha0     Active    Ethernet 1(ON)
```

6. Check the device name of the physical adapter to be replaced.

   Execute the ipconfig command.

```
> ipconfig /all
Ethernet adapter Ethernet 2:
```

```
    Description . . . . . . . . . . : Intel(R) I350 Gigabit Network Connection #3
```

You can see the device name of "Ethernet 2" is "Intel(R) I350 Gigabit Network Connection #3."

7. Check the physical location of the physical adapter to be replaced.

   For details, see the following manuals:

   - PRIMEQUEST 2000 Series

     "PCI Card Hot maintenance in Windows" in "PRIMEQUEST 2000 Series Administration Manual."

   - PRIMEQUEST 3000 Series

     "PCI Express card Hot Maintenance in Windows" in "PRIMEQUEST 3000 Series Enterprise Model Administration Manual."

8. Replace the corresponding NIC.

   For details, see the following manuals:

   - PRIMEQUEST 2000 Series

     "PCI Card Hot maintenance in Windows" in "PRIMEQUEST 2000 Series Administration Manual."

   - PRIMEQUEST 3000 Series

     "PCI Express card Hot Maintenance in Windows" in "PRIMEQUEST 3000 Series Enterprise Model Administration Manual."

9. Check the physical adapter name after replacement.

   Execute the ipconfig command.

```
> ipconfig /all
Ethernet adapter Ethernet 3:

  Description . . . . . . . . . . : Intel(R) I350 Gigabit Network Connection #3
```

You can see "Ethernet 3" is the physical adapter name for "Intel(R) I350 Gigabit Network Connection #3" after replacement.

10. Perform post-processing for replacement of the physical adapter.

    1. Check the virtual adapter name bundling the physical adapter after replacement.

       Execute the dsphanet command.

```
> dsphanet
 Name    Status   Adapters
+-------+--------+-----------------------------------------------------------+
 sha0    Active   Ethernet 1(ON)
```

    2. Add the physical adapter after replacement.

       Execute the add subcommand of the hanetnic command.

```
> hanetnic add -n sha0 -t "Ethernet 3"
FJSVhanet: INFO: 00000: The command ended normally.
```

    3. Check that the physical adapter after replacement is bundled in the virtual adapter.

       Execute the dsphanet command.

```
> dsphanet
 Name    Status   Adapters
+-------+--------+-----------------------------------------------------------+
 sha0    Active   Ethernet 1(ON), Ethernet 3 (STBY)
```

11. Set the ping monitor target for the added physical adapter.

    1. Display the contents of the file saved in Step 3 and check the information of the ping monitor target to be set.

```
> type C:\glspollbackup
Polling Status        = OFF
        interval(idle) =  3( 60) sec
        times          =  5 times
 Adapter                      Fo  Target ip
+-----------------------------+---+------------------------------------+
 Ethernet 1                   YES 192.168.2.10,192.168.2.20
 Ethernet 2                   YES 192.168.2.10,192.168.2.20
```

    2. For the added physical adapter, set the information of the ping monitor target set for the physical adapter before replacement.

```
> hanetpoll create -t "Ethernet 3" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

    3. Check that the information of the ping monitor target is set for the added physical adapter.

```
> hanetpoll print
Polling Status        = OFF
        interval(idle) =  3( 60) sec
        times          =  5 times
 Adapter                      Fo  Target ip
+-----------------------------+---+------------------------------------+
 Ethernet 1                   YES 192.168.2.10,192.168.2.20
 Ethernet 3                   YES 192.168.2.10,192.168.2.20
```

12. Start ping monitoring.

Execute the on subcommand of the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

Check that ping monitoring is started.

Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters in "ON" state is "O."

```
> dsphanet -r

[sha0]

 Adapters                     Resources
+-----------------------------+--------------------------------------------+
 Ethernet 1 (ON)              LINK(O)
                              PING(O)
                               192.168.2.10(O),192.168.2.20(O)
 Ethernet 3(STBY)             LINK(O)
                              PING(-)
                               192.168.2.10(-),192.168.2.20(-)
```

5.6.1.2 Addition procedure

This section describes how to add a physical adapter to a virtual adapter.

Figure 5.9 Adding a Physical Adapter

1. Stop ping monitoring.

   Execute the off subcommand of the hanetpoll command.

   ```
   > hanetpoll off
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

   Check that ping monitoring is stopped.

   Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters is "-."

   ```
   > dsphanet -r
   [sha0]
    Adapters                       Resources
   +------------------------------+-------------------------------------------+
    Ethernet 1(ON)                 LINK(O)
                                   PING(-)
                                    192.168.2.10(-),192.168.2.20(-)
   ```

2. Add a PCI card.

   For details, see the following manuals:

   - PRIMEQUEST 2000 Series

     "PCI Card Hot maintenance in Windows" in "PRIMEQUEST 2000 Series Administration Manual."

   - PRIMEQUEST 3000 Series

     "PCI Express card Hot Maintenance in Windows" in "PRIMEQUEST 3000 Series Enterprise Model Administration Manual."

3. Check the added physical adapter name.

   Execute the ipconfig command.

```
> ipconfig /all
Ethernet adapter Ethernet 3:

  Description . . . . . . . . . . : Intel(R) I350 Gigabit Network Connection #3
```

   You can see "Ethernet 3" is the physical adapter name for "Intel(R) I350 Gigabit Network Connection #3" after replacement.

4. Perform post-processing for addition of the physical adapter.

   1. Check the virtual adapter name bundling the physical adapter.

      Execute the dsphanet command.

```
> dsphanet
 Name     Status    Adapters
+-------+--------+---------------------------------------------------------+
 sha0     Active    Ethernet 1(ON)
```

   2. Add the physical adapter to the virtual adapter.

      Execute the add subcommand of the hanetnic command.

```
> hanetnic add -n sha0 -t "Ethernet 3"
FJSVhanet: INFO: 00000: The command ended normally.
```

   3. Check that the added physical adapter is bundled in the virtual adapter.

      Execute the dsphanet command.

```
> dsphanet
 Name     Status    Adapters
+-------+--------+---------------------------------------------------------+
 sha0     Active    Ethernet 1(ON), Ethernet 3(STBY)
```

5. Set the ping monitor target for the added physical adapter.

   Execute the create subcommand of the hanetpoll command.

```
> hanetpoll create -t "Ethernet 3" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

   Check that the ping monitor target is set for the added physical adapter.

   Execute the print subcommand of the hanetpoll command.

```
> hanetpoll print
Polling Status          = OFF
        interval(idle)  =  3( 60) sec
        times           =  5 times
 Adapter                        Fo  Target ip
+------------------------------+---+---------------------------------------+
 Ethernet 1                     YES 192.168.2.10,192.168.2.20
 Ethernet 3                     YES 192.168.2.10,192.168.2.20
```

6. Start ping monitoring.

   Execute the on subcommand of the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

Check that ping monitoring is started.

Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters in "ON" state is "O."
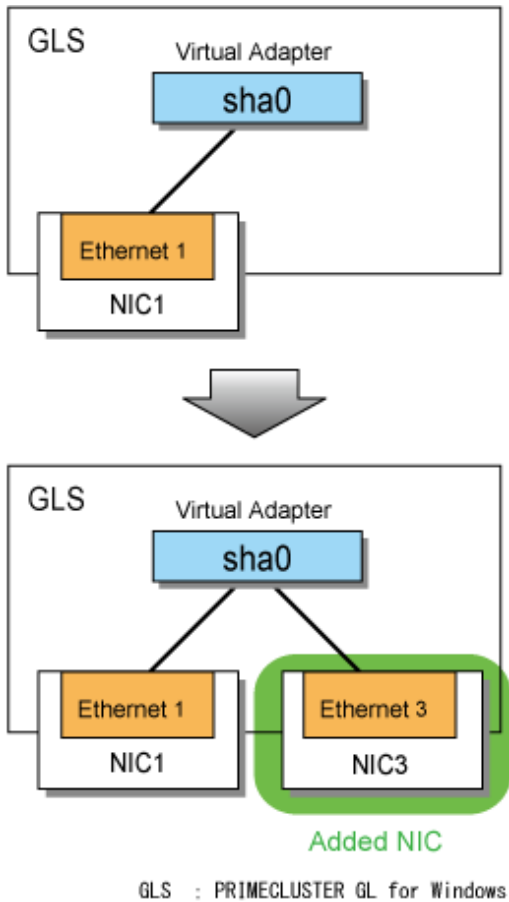
```
> dsphanet -r
[sha0]
 Adapters                         Resources
+--------------------------------+--------------------------------------------+
 Ethernet 1(ON)                   LINK(O)
                                  PING(O)
                                   192.168.2.10(O),192.168.2.20(O)
 Ethernet 3(STBY)                 LINK(O)
                                  PING(-)
                                   192.168.2.10(-),192.168.2.20(-)
```

5.6.1.3 Removal procedure

Removing a PCI card is not supported in the Windows version.

5.6.2 Shutdown Maintenance of NIC

This section describes how to replace an NIC after shutdown of the system.

Figure 5.10 Replacing a Physical Adapter (After System Shutdown)
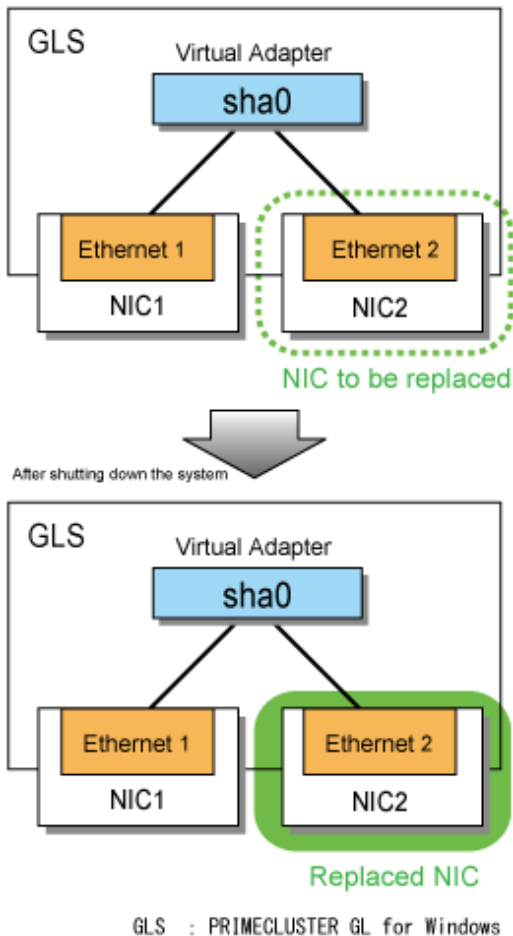
1. Check that the physical adapter bundled in the virtual adapter is in the "FAIL" state.

```
> dsphanet
 Name    Status   Adapters
+-------+--------+-------------------------------------------------------------+
 sha0    Active   Ethernet 1(ON), Ethernet 2(FAIL)
```

2. Shutdown the system.

3. Replace the physical adapter and restart the system.

4. Check that the physical adapter after replacement is in the "STBY" state.

```
> dsphanet
 Name    Status   Adapters
+-------+--------+-------------------------------------------------------------+
 sha0    Active   Ethernet 1(ON), Ethernet 2(STBY)
```

If the physical adapter after replacement is in the "FAIL" or "OFF" state, perform "Action" in "E.2.3 Communications Fail even after Replacing NIC."

Chapter 6 Command Reference

This chapter describes the commands used in GLS.

6.1 Overview of Commands

This section describes the types of command and gives notes on using the commands.

6.1.1 Command Types

GLS has the following three types of command. They are all executed from the Windows command prompt.

- For use with virtual adapters

- For displaying operational status

- For collecting diagnostic data.

The table below gives a complete list of the commands that are used in GLS.

Table 6.1 Command List

Type	Command	Subcommand	Description
For virtual adapters	hanetconfig	create	Makes and deletes virtual adapter settings. Displays config and version information.
		delete	
		print	
		version	
	hanetnic	add	Adds and deletes a physical adapter. Changes the operational status of a virtual adapter.
		delete	
		change	
	hanetpoll	create	Displays, makes and deletes ping settings. Starts and stops ping monitoring.
		delete	
		print	
		param	
		on	
		off	
	hanetparam	None	Changes and displays the setting information of GLS.
		print	
	strhanet		Activates the virtual adapter.
	stphanet		Deactivates the virtual adapter.
	hanetbackup		Backs up the configuration information for GLS.
	hanetrestore		Restores the configuration information for GLS.
For displaying operational status	dsphanet		Displays the operational or monitoring status of GLS.
For collecting diagnostic data	hanet_snap		Collects diagnostic data used in solving problems.

GLS: PRIMECLUSTER GL for Windows

6.1.2 General Notes

This section gives general notes on using the commands.

Rights to Execute Commands

The table below lists the restrictions on who can run the various commands.

Table 6.2 Rights to Execute Commands

Command	Subcommand	Required Rights
hanetconfig	create	Administrators
	delete	Administrators
	print	Administrators or Users
	version	Administrators or Users
hanetnic	add	Administrators
	delete	Administrators
	change	Administrators
hanetpoll	create	Administrators
	delete	Administrators
	print	Administrators or Users
	param	Administrators
	on	Administrators
	off	Administrators
hanetparam	None	Administrators
	print	Administrators or Users
strhanet		Administrators
stphanet		Administrators
hanetbackup		Administrators
hanetrestore		Administrators
dsphanet		Administrators or Users
hanet_snap		Administrators

Command Format

The notation conventions used in describing commands in this chapter are listed in the table below.

Table 6.3 Command Format

Item	Description
[ ]	Denotes an option that can be omitted. Example: [-r]
[|]	Denotes multiple options that can be omitted. The vertical bar (|) is used to separate options. Example: [-s|-g]
{ | }	Denotes multiple options, of which only one can and must be specified. The vertical bar (|) is used to separate options. Example: {vadapter|all}

Item	Description
Italics	Denotes a variable character string (as a value for an option). In the example below, "vadapter" is the variable string. Example: hanetconfig delete -n *vadapter*

6.2 Commands for Virtual Adapters

This section describes commands for use with virtual adapters.

6.2.1 hanetbackup

You can use the hanetbackup command to create a backup of the configuration information for GLS.

Format

```
hanetbackup -f backupfilename
```

Description

Creates a backup file of the following configuration information for GLS:

- Configuration definition of virtual adapters

- Configuration information of ping monitoring

- Setting information of GLS

Options

-f backupfilename

Specifies the name of the virtual adapter settings backup file. If you are creating the backup file in the current folder, you only need to specify the file name. If you are creating the backup file in a folder other than the current folder, you must specify the file path as well as the file. You can also specify a remote machine as a file backup target.

Notes

- IP address settings are not backed up. For this reason, you must remake the IP address settings of the virtual adapter when you restore the system.

- The backup cannot be performed if you specify a backup file on a remote computer and there is an error in the IP address of that computer, or there is any problem with the network settings or the network itself.

Examples

1

To create a backup of the virtual adapter settings backup file (glsbackup) in the current folder:

```
> hanetbackup -f glsbackup
```

2

To create a backup of the virtual adapter settings backup file (glsbackup) on the C drive:

```
> hanetbackup -f C:\glsbackup
```

6.2.2 hanetconfig

You can use the hanetconfig command to set, delete, and display config definitions of virtual adapters. Subcommands of the hanetconfig command are listed in the table below.

Table 6.4 Subcommands of the hanetconfig Command

Subcommand	Description	Required Rights
create	Creates configuration information.	Administrators
delete	Deletes configuration information.	Administrators
print	Displays configuration information.	Administrators or Users
version	Displays version information.	Administrators or Users

6.2.2.1 create

In order to use GLS, you must create config information for the virtual adapters. To create this information, use the create subcommand.

Format

```
hanetconfig create -n vadapter -t adapter1[,adapter2] [-v {vlanid|hv}] [-a {macaddr|phy}]
```

Description

Creates config information for virtual adapters.

Options

-n vadapter

Specifies the names of the virtual adapters for which to create new config information. You can specify up to 16 virtual adapters.

The format of the virtual adapter names is fixed. Each name must begin with the text string "sha" followed by a number from 0 - 15. Apart from the name "sha0", the first digit of the number cannot be zero. If the name does not follow this format, the command exits with an error message.

- Examples of Valid Names:

  sha0, sha10, sha15

- Examples of Invalid Names:

  sha01, sha1b, sha99

-t adapter1[,adapter2]

Specifies the names of the physical adapters bundled into the virtual adapter. The names are separated by commas (,). If a physical adapter name contains a space, the network adapter name must be enclosed in double quotation marks (").

It is also possible to abbreviate the text string "Ethernet" or "Local Area Connection" in specifying the name of a physical adapter.

Normal specification (not abbreviated):

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2"
```

Abbreviated specification:

```
> hanetconfig create -n sha0 -t 1,2
```

The table below shows the adapter names as displayed by Windows and the corresponding abbreviations in GLS commands.

Table 6.5 Adapter Names in Windows and Abbreviations in GLS Commands:

Adapter Name in Windows	Abbreviation in GLS Commands
"Ethernet" or "Ethernet 0"	0
"Ethernet 1"	1
"Ethernet 2"	2

GLS: PRIMECLUSTER GL for Windows

You can see the list of physical adapters in the [Network Connections] window by selecting [Windows Settings]-[Network and Internet]-[Network and Sharing Center]-[Change adapter settings] or by executing Windows' ipconfig command.

-v {vlanid | hv}

Sets the virtual adapter VLAN IDs when using VLAN tagging to share physical adapters with multiple virtual adapters. The valid range of vlanids is 1 - 4095. If you specify an vlanid outside this range, this command outputs an error message and exits.
Note that you cannot set more than one virtual adapter with the same vlanid.

When you register a virtual adapter to Virtual Switch Manager to use it in a Hyper-V environment, specify "hv". When you specify "hv", the virtual adapter cannot be shared with physical adapter that is bundled by other virtual adapter.

-a {macaddr | phy}

Sets the MAC address to attach to virtual adapters.

Directly specify the MAC address to attach to virtual adapters for macaddr. GLS usually generates the virtual adapter MAC addresses automatically based on the physical adapter MAC addresses. For this reason, it is not usually necessary to specify macaddr. However, if you do need to specify this option, note that the MAC addresses must be unique within each segment.

The format of MAC addresses is as follows:

```
XX-XX-XX-XX-XX-XX
```

XX represents a hexadecimal value. Separate the values using hyphens (-).

To automatically set the MAC address of the primary adapter to the MAC address of a virtual adapter, specify "phy". When "phy" is specified, "phy" cannot be set to other virtual adapters which share the NIC.

Note

You cannot specify multicast or broadcast MAC addresses.

Notes

- This command is not available in safe mode.

- To display the IP address of the administrative LAN with the management blade of the blade server, specify "phy" to the -a option.

- In the configuration where "phy" is specified to the -a option, the MAC address of the secondary adapter is set to a virtual adapter if the primary adapter cannot be recognized due to an error or the like.

- Do not specify "phy" to the -a option in the following cases:

    - When bundling the dynamic link aggregation in a virtual adapter

    - When using GLS on a guest OS in VMware

Examples

1

To set the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 and not using a VLAN ID:

```
> hanetconfig create -n sha0  -t "Ethernet 1","Ethernet 2"
```

2

To set the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 and using 2 as the VLAN ID:

```
> hanetconfig create -n sha0 -v 2  -t "Ethernet 1","Ethernet 2"
```

3

To set the virtual adapter sha0 using 2 as the VLAN ID and the virtual adapter sha1 using 3 as the VLAN ID, both comprised of the physical adapters Ethernet 1 and Ethernet 2:

```
> hanetconfig create -n sha0 -v 2 -t "Ethernet 1","Ethernet 2"
> hanetconfig create -n sha1 -v 3 -t "Ethernet 1","Ethernet 2"
```

4

To set the virtual adapter sha0 using 2 as the VLAN ID and the virtual adapter sha1 not using a VLAN ID, both comprised of the physical adapters Ethernet 1 and Ethernet 2:

```
> hanetconfig create -n sha0 -v 2 -t "Ethernet 1","Ethernet 2"
> hanetconfig create -n sha1 -t "Ethernet 1","Ethernet 2"
```

5

To set the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 and assign the MAC address 02-01-01-01-01-01 to this virtual adapter:

```
> hanetconfig create -n sha0  -t "Ethernet 1","Ethernet 2" -a 02-01-01-01-01-01
```

6

To set the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 and assign the MAC address of the primary adapter (Ethernet 1):

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -a phy
```

7

To set the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 and not using a VLAN ID, abbreviating the text string "Ethernet":

```
> hanetconfig create -n sha0  -t 1,2
```

8

To set the virtual adapter for Hyper-V comprised of the physical adapters Ethernet 1 and Ethernet 2:

```
> hanetconfig create -n sha0 -v hv -t "Ethernet 1","Ethernet 2"
```

6.2.2.2 delete

You can use the delete subcommand to delete config information for virtual adapters.

Format

```
hanetconfig delete -n {vadapter|all}
```

Description

Deletes config information for virtual adapters.

Options

-n vadapter

Specifies the virtual adapter name for which to delete the config information.

-n all

Specifies that all virtual adapters are to be deleted.

Examples

1

To delete the virtual adapter sha0:

```
> hanetconfig delete -n sha0
```

2

To delete all virtual adapters:

```
> hanetconfig delete -n all
```

6.2.2.3 print

You can use the print subcommand to display the config information for the created virtual adapter.

Format

```
hanetconfig print [-d]
```

Description

Displays config information of virtual adapters, e.g. names of bundled physical adapters and VLAN IDs. VLAN IDs and MAC addresses can be displayed by specifying the command option.

Option

-d

Displays virtual adapter information such as MAC addresses.

Output Format

Format without -d Option

```
> hanetconfig print
 Name    VID  Adapters
+-------+----+-------------------------------------------------------------+
 sha0    ---- Ethernet 1,Ethernet 2
 sha1    2    Ethernet 3,Ethernet 4
 sha2    1021 Ethernet 3,Ethernet 4
 sha3    hv   Ethernet 5,Ethernet 6
```

The table below explains the output items.

Table 6.6 Output Items

Item	Details	
Name	Virtual adapter name	
VID	VLAN tagging data	
	----	Communicates without using VLAN tagging
	1 - 4095	VLAN ID Communicates using VLAN tagging
	hv	Communicates by working together with Hyper-V Virtual Switch Manager.
Adapters	List of physical adapters bundled together in the virtual adapter	

Format with -d Option

```
> hanetconfig print -d
 Name    VID  MAC Address
+-------+----+----------------------------------------------------------------+
 sha0    ---- Auto
 sha1    2    Auto
 sha2    1021 XX-XX-XX-XX-XX-XX
 sha3    hv   Auto
 sha4    ---- Physical
```

The table below explains the output items.

Table 6.7 Output Items

Item	Details	
Name	Virtual adapter name	
VID	VLAN tagging data	
	----	Communicates without using VLAN tagging
	1 - 4095	VLAN ID Communicates using VLAN tagging
	hv	Communicates by working together with Hyper-V Virtual Switch Manager.
MAC Address	MAC Address	
	Auto	Automatically generated MAC addresses assigned to virtual adapters
	XX-XX-XX-XX-XX-XX	Manually set MAC addresses assigned to virtual adapters
	Physical	Denotes that the MAC address of the primary adapter is assigned to a virtual adapter.

Examples

1

To display the config information (with sample display):

```
> hanetconfig print
 Name    VID  Adapters
+-------+----+----------------------------------------------------------------+
 sha0    ---- Ethernet 1,Ethernet 2
 sha1    2    Ethernet 3,Ethernet 4
 sha2    1021 Ethernet 5,Ethernet 6
```

2

To display detailed settings of virtual adapters:

```
> hanetconfig print -d
 Name    VID  MAC Address
+-------+----+----------------------------------------------------------------+
 sha0    ---- Auto
 sha1    2    Auto
 sha2    1021 02-01-01-01-01-01
```

6.2.2.4 version

You can use the version subcommand to display the version of the GLS program.

Format

```
hanetconfig version
```

Description

Displays the GLS version.

Example

To display the GLS version information:

```
> hanetconfig version
HA-Net version 4.4A00
```

6.2.3 hanetnic

You can use the hanetnic command to add or delete a physical adapter bundled in a virtual adapter and to change the operational status of a physical adapter bundled in a virtual adapter. Subcommands of the hanetnic command are listed in the table below.

Table 6.8 Subcommands of the hanetnic Command

Subcommand	Description	Required Rights
add	Adds a physical adapter.	Administrators
delete	Deletes a physical Adapter.	Administrators
change	Changes the operational status.	Administrators

6.2.3.1 add

To add a physical adapter to a virtual adapter, use the add subcommand.

This command can be used regardless of whether the virtual adapter is activated or deactivated.

Format

```
hanetnic add -n vadapter -t adapter
```

Description

Adds a physical adapter bundled in a virtual adapter dynamically.

Options

-n vadapter

Specifies the name of the virtual adapter to which the physical adapter is added.

-t adapter

Specifies the name of the physical adapter to be added. If the physical adapter name contains a space, the network adapter name must be enclosed in double quotation marks ("). It is also possible to abbreviate the text string "Ethernet" or "Local Area Connection" in specifying the name of a physical adapter.

Notes

- Make sure that the network properties screen is closed before running this command. Otherwise, an error may occur in executing the command.

- When you specify a virtual adapter that shares a physical adapter with any other virtual adapters by the -n option, the physical adapter specified by the -t option will be added to all virtual adapters sharing the physical adapter.

- Do not force termination while the command is running. When termination is forced, re-execute the command. If an error repeats, restart the system and then re-execute the command.

- Do not execute the following commands at the same time, because the configuration information of virtual adapter may not be changed. Make sure the configuration information of virtual adapter is changed if the following commands have been executed at the same time. If not, execute the following commands again one by one.

    - hanetnic command

    - strhanet command

    - stphanet command

Example

To add the physical adapter Ethernet 2 to the virtual adapter sha0:

```
> hanetnic add -n sha0 -t "Ethernet 2"
```

6.2.3.2 delete

To delete a physical adapter bundled in a virtual adapter, use the delete subcommand.

This command can be used regardless of whether the virtual adapter is activated or deactivated.

Format

```
hanetnic delete -n vadapter -t adapter
```

Description

Deletes a physical adapter bundled in a virtual adapter dynamically.

Options

-n vadapter

Specifies the name of the virtual adapter bundling the physical adapter to be deleted.

-t adapter

Specifies the name of the physical adapter to be deleted. If the physical adapter name contains a space, the network adapter name must be enclosed in double quotation marks ("). It is also possible to abbreviate the text string "Ethernet" or "Local Area Connection" in specifying the name of a physical adapter.

Specify the name of the physical adapter described in the config information of the virtual adapter specified with the -n option.

Notes

- Make sure that the network properties screen is closed before running this command. Otherwise, an error may occur in executing the command.

- When you specify a virtual adapter that shares the physical adapter specified by the -t option with any other virtual adapters by the -n option, the physical adapter will be deleted from all virtual adapters bundling the physical adapter.

- When the physical adapter to be deleted is operational, change the status of the adapter to standby with the change subcommand of the hanetnic command, and then delete it.

- Do not force termination while the command is running. When termination is forced, re-execute the command. If an error repeats, restart the system and then re-execute the command.

- Do not execute the following commands at the same time, because the configuration information of virtual adapter may not be changed. Make sure the configuration information of virtual adapter is changed if the following commands have been executed at the same time. If not, execute the following commands again one by one.

    - hanetnic command

    - strhanet command

    - stphanet command

Example

To delete the physical adapter Ethernet 2 bundled in the virtual adapter sha0:

```
> hanetnic delete -n sha0 -t "Ethernet 2"
```

6.2.3.3 change

To switch the status of a physical adapter from standby to operational, use the change subcommand.

Format

```
hanetnic change -n vadapter
```

Description

Changes the status of physical adapters bundled in a virtual adapter from standby to operational.

Options

-n vadapter

Specifies the name of the virtual adapter containing the physical adapters that are to be switched to operational.

Notes

- If there are no physical adapters in standby, no change of operational status will be effected.

- Before running the command, run the dsphanet command to make sure that there is a standby physical adapter. For more details, refer to "6.3.1 dsphanet."

- This command is not available in safe mode.

Example

To change the status of physical adapters bundled in virtual adapter sha0 from standby to operational:

```
> hanetnic change -n sha0
```

6.2.4 hanetparam

You can use the hanetparam command to change and display the setting information of GLS.

Format

```
hanetparam -p {yes|no}
```

Description

Changes the setting information of GLS.

Options

-p {yes|no}

Specifies whether to preferentially use the primary adapter of the virtual adapter as the operational adapter when the GLS service starts up. The values which can be specified are either "yes" or "no". When specified "yes", the primary adapter is preferentially used when the GLS service starts up. When specified "no", a physical adapter which first becomes available for communication is used as the operational adapter. The default value is "no".

Example

To preferentially use the primary adapter when the GLS service starts up:

```
> hanetparam -p yes
```

6.2.4.1 print

You can use the print subcommand to display the contents of the setting information of GLS.

Format

```
hanetparam print
```

Description

Displays the contents of the setting information of GLS.

Output Format

The following show the output format.

```
> hanetparam print
 Give priority to a primary adapter on start-up(p) :NO
```

The table below explains the output items.

Table 6.9 Output Items

Display	Description	
Give priority to a primary adapter on start-up(p)	YES	The primary adapter is preferentially used as the operational adapter when the GLS service starts up.
	NO	A physical adapter which first becomes available for communication is used as the operational adapter.

GLS: PRIMECLUSTER GL for Windows

Example

To display the contents of the configuration information set by using the hanetparam command:

```
> hanetparam print
Give priority to a primary adapter on start-up(p) :YES
```

6.2.5 hanetpoll

You can use the hanetpoll command to make, delete, and display the ping settings. Subcommands of the hanetpoll command are listed in the table below.

Table 6.10 Subcommands of the hanetpoll Command

Subcommand	Description	Required Rights
create	Makes ping settings.	Administrators
delete	Deletes ping settings.	Administrators
print	Displays ping settings.	Administrators or Users
param	Changes the ping interval and number of pings.	Administrators
on	Starts ping monitoring.	Administrators
off	Stops ping monitoring.	Administrators

6.2.5.1 create

To create ping settings, use the create subcommand.

Format

```
hanetpoll create -t adapter -p ping_target1[,ping_target2] [-f yes|no]
```

Description

Creates ping settings.

Options

-t adapter

Specifies the name of the physical adapter (specified with the hanetconfig command, create subcommand, -t option) bundled in the virtual adapter. When this physical adapter is operational, the ping targets specified with the -p option are monitored.

It is also possible to abbreviate the text string "Ethernet" or "Local Area Connection" in specifying the name of a physical adapter.

Normal specification (not abbreviated):

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.10
```

Abbreviated specification:

```
> hanetpoll create -t 1 -p 192.168.2.10
```

The table below shows the adapter names as displayed by Windows and the corresponding abbreviations in GLS commands.

Table 6.11 Adapter Names in Windows and Abbreviations in GLS Commands:

Adapter Name in Windows	Abbreviation in GLS Commands
"Ethernet" or "Ethernet 0"	0
"Ethernet 1"	1
"Ethernet 2"	2

GLS: PRIMECLUSTER GL for Windows

-p ping_target1[,ping_target2]

Specifies the IP address of the ping target. When specifying multiple IP addresses, they must be delimited by commas (,). Such sequences of IP addresses are called "IP address lists", and each may contain up to 3 addresses. Also, a maximum of 3 IP address lists can be specified per physical adapter.

If none of the IP addresses in the list responds to the ping signal, the IP address list is faulty. If any single list in the IP address lists specified for a physical adapter malfunctions, the NIC switches to another one.

When you specify the IP address for a physical adapter bundled in a virtual adapter as a ping target, you must also specify an IP address for the other physical adapter in that virtual adapter as a ping target.

The IPv4 or IPv6 addresses can be set as the address format. When you specify the IPv6 address, you cannot specify a prefix length. Also, the format of the IPv6 address which can be specified conforms to the specifications of operating systems.
If you use the IPv6 address for the ping target, the following types of IPv6 addresses can be set:

- Global Unicast Address

- Unique Local Unicast Address

-f {yes|no}

Allocates attributions for IP address lists.

- When specifying "yes"

   Adapters are swapped when an IP address list is faulty. If a user script (when an error has been detected on a transmission path) is set, the user script is executed.

- When specifying "no"

   An event log is output when a communication error is detected. If a user script (when an error has been detected in the destination system) is set, the user script is executed. Adapters are not swapped.

If you omit this option, the default value, "yes", is assumed.

You can specify the "yes" and "no" options each for a maximum of 3 times in an IP address list.

Notes

- This command is not available in safe mode.

Examples

1

To set the IP address 192.168.10.10 as the ping target for the operational physical adapter Ethernet 1:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.10.10
```

2

To set the IP address 2001:db8:10:1::10 as the ping target for the operational physical adapter Ethernet 1:

```
> hanetpoll create -t "Ethernet 1" -p 2001:db8:10:1::10
```

3

To set the IP addresses 192.168.10.10 and 192.168.10.20 as the ping targets for the operational physical adapter Ethernet 2:

```
> hanetpoll create -t "Ethernet 2" -p 192.168.10.10,192.168.10.20
```

4

To set the IP addresses 192.168.10.10 and 192.168.2.2 (destination system) as the ping targets for the operational physical adapter Ethernet 1 so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.10.10,192.168.2.2 -f no
```

5

To set the IP address 192.168.10.10 as the ping target for the operational physical adapter Ethernet 1, abbreviating the text string "Ethernet":

```
> hanetpoll create -t 1 -p 192.168.10.10
```

6

Swapping of adapters when either 192.168.10.10 or 192.168.10.20 is malfunctioning:

```
> hanetpoll create -t 1 -p 192.168.10.10
> hanetpoll create -t 1 -p 192.168.10.20
```

7

Swapping of adapters when both IP addresses in a pair, either 192.168.10.10 and 192.168.10.20, or 192.168.10.30 and 192.168.10.40 are malfunctioning:

```
> hanetpoll create -t 1 -p 192.168.10.10,192.168.10.20
> hanetpoll create -t 1 -p 192.168.10.30,192.168.10.40
```

6.2.5.2 delete

You can use the delete subcommand to delete ping target settings.

Format

```
hanetpoll delete -t {adapter|all}
```

Description

Deletes ping target settings.

Options

-t adapter

Specifies the name of the physical adapter for which ping monitoring is set. It is also possible to abbreviate the text string "Ethernet" or "Local Area Connection" in specifying the name of a physical adapter.

Normal specification (not abbreviated):

```
> hanetpoll delete -t "Ethernet 1"
```

Abbreviated specification:

```
> hanetpoll delete -t 1
```

The table below shows the adapter names as displayed by Windows and the corresponding abbreviations in GLS commands.

Table 6.12 Adapter Names in Windows and Abbreviations in GLS Commands:

Adapter Name in Windows	Abbreviation in GLS Commands
"Ethernet" or "Ethernet 0"	0
"Ethernet 1"	1
"Ethernet 2"	2

GLS: PRIMECLUSTER GL for Windows

-t all

Specifies deletion of all settings for ping monitoring.

Examples

1

To delete the ping settings for the physical adapter Ethernet 1:

```
> hanetpoll delete -t "Ethernet 1"
```

2

To delete the ping settings for all physical adapters:

```
> hanetpoll delete -t all
```

6.2.5.3 print

You can use the print subcommand to display details of ping target settings.

Format

```
hanetpoll print
```

Description

Displays details of ping target settings.

Output Format

The table below explains the output format.

- When the ping monitoring target is the IPv4 address

```
> hanetpoll print
 Polling Status        =   ON
        interval(idle) =   3( 60) sec
        times          =   5 times
 Adapter                      Fo  Target ip
+-----------------------------+---+----------------------------------------+
 Ethernet 1                   YES 192.168.10.10
                              NO  192.168.10.100
 Ethernet 2                   YES 192.168.10.20
                              NO  192.168.10.100
```

- When the ping monitoring target is the IPv6 address

```
> hanetpoll print
 Polling Status        =   ON
        interval(idle) =   3( 60) sec
        times          =   5 times
 Adapter                      Fo  Target ip
+-----------------------------+---+----------------------------------------+
 Ethernet 1                   YES 2001:db8:10:1::10
                              NO  2001:db8:10:1::100
 Ethernet 2                   YES 2001:db8:10:1::20
                              NO  2001:db8:10:1::100
```

The table below explains the output items.

Table 6.13 Output Items

Item	Details	
Polling Status	Status of ping monitoring	
	ON	Denotes that ping monitoring has started. The status becomes ON when one or more physical adapters where the ping monitoring is running exist.
	OFF	Denotes that ping monitoring has stopped.

Item	Details	
interval(idle)	Ping interval (standby time until pinging starts)	
	interval	Interval between pings
	idle	Time from immediately after ping monitoring starts to when it actually starts monitoring. If a network device is using STP, it may not be possible to establish communication between the device and the server before the STP timer times out. By setting an idle time, you can prevent GLS from mistakenly assuming that an error has occurred during this period.
times	Maximum number of unanswered pings before an error is assumed to have occurred	
Adapter	Physical adapter name	
Fo	Setting for switching network adapter if ping monitoring detects an error	
	YES	Denotes that the network adapter is switched if ping monitoring detects an error.
	NO	Denotes that the network adapter is not switched if ping monitoring detects an error. An error message informs the user that an error has been detected.
Target ip	IP address of ping monitoring target	

GLS: PRIMECLUSTER GL for Windows

6.2.5.4 param

You can use the param subcommand to set the ping monitoring time.

Format

```
hanetpoll param [-s sec|-c times|-p sec]
```

Description

Sets the ping monitoring time.

Options

-s sec

Specifies the interval at which pings are sent. The valid range is 1 - 300, but the product of this value and the value set for the -c option must be no more than 300.
The initial value is 3. If this option is omitted, the value when it was previously set is assumed.

-c times

Specifies the number of times pings are sent before the system assumes that a network error has occurred. The valid range is 1 - 300, but the product of this value and the value set for the -s option must be no more than 300.
The initial value is 5. If this option is omitted, the value when it was previously set is assumed.

-p sec

Specifies the number of seconds that may elapse from immediately after ping monitoring starts to when it actually starts monitoring. The valid range is 1 - 300 seconds.
If the value set for this option is less than the product of the values set for the -s and -c options, the value set for this option is ignored and the product of the values set for the -s and -c options is assumed. The initial value is 60.

Notes

- If one or more physical adapters where ping monitoring has started, stop ping monitoring using the off subcommand before executing this command. For more details, refer to "6.2.5.6 off."

- Make sure to set the values for the -s and -c options so that the product of these values multiplied with each other does not exceed "300".

- Do not set low values for the -s and -c options. If you do, and packet loss occurs, the ping monitor may assume an error has occurred even if the network is functioning normally.

  Use the following guidelines for the settings:

  - If the pinged network device is located beyond the L3 switch (router)

    5 pings (-c option) at 3-second intervals (-s option)

  - If the pinged network device is located on the same network

    5 pings (-c option) at 2-second intervals (-s option)

- This command is not available in safe mode.

Example

To set the ping interval to two seconds:

```
> hanetpoll param -s 2
```

6.2.5.5 on

You can use the on subcommand to start ping monitoring.

Format

```
hanetpoll on [-n vadapter]
```

Description

Starts ping monitoring.

Options

-n vadapter

Specifies virtual adapters where ping monitoring will be started. Ping monitoring will be started on all physical adapters bundled in the specified virtual adapter.
If this option is omitted, ping monitoring is started on all virtual adapters.

Notes

- Make sure that IP addresses have been set for all virtual adapters before you start ping monitoring.

- This command is not available in safe mode.

Examples

1

To start ping monitoring on all virtual adapters:

```
> hanetpoll on
```

2

To start ping monitoring on the specified virtual adapter:

```
> hanetpoll on -n sha0
```

6.2.5.6 off

You can use the off subcommand to stop ping monitoring.

Format

```
hanetpoll off [-n vadapter]
```

Description

Stops ping monitoring.

Options

-n vadapter

Specifies virtual adapters where ping monitoring will be stopped. Ping monitoring will be stopped on all physical adapters bundled in the specified virtual adapter.
If this option is omitted, ping monitoring is stopped on all virtual adapters.

Examples

1

To stop ping monitoring on all virtual adapters:

```
> hanetpoll off
```

2

To stop ping monitoring on the specified virtual adapter:

```
> hanetpoll off -n sha0
```

Note

- This command is not available in safe mode.

6.2.6 hanetrestore

You can use the hanetrestore command to restore the configuration information for GLS.

Format

```
hanetrestore -f restorefilename
```

Description

Restores the following configuration information for GLS:

- Configuration definition of virtual adapters

- Configuration information of ping monitoring

- Setting information of GLS

Options

-f restorefilename

Specifies the name of the backup file to be restored. To restore from the current folder, specify the file name only. To restore from a folder other than the current folder, specify the backup file path name.

Note

- Deactivate all virtual adapters before executing this command.

- Because the virtual adapter IP address settings are not included in the backup, you must reset IP addresses after the restore.

- This command is not available in safe mode.

Example

To restore the virtual adapter settings file (glsbackup) backed up on the C drive:

```
> hanetrestore -f C:\glsbackup
```

6.2.7 strhanet

You can use the strhanet command to activate virtual adapters.

Format

```
strhanet [-n vadapter]
```

Description

Activates virtual adapters set using the hanetconfig command. If you use the adapter setting script to set IP addresses automatically, the script is executed automatically after you execute the strhanet command.

Options

-n vadapter

Specifies the names of the virtual adapters to be activated.
If this option is omitted, all virtual adapters in inactive state are activated.
To activate an inactive virtual adapter in the environment where active virtual adapters exist, specify this option.

Notes

- Once you have activated a virtual adapter, that adapter is activated automatically every time you start the system. Therefore, it is not necessary to activate it again.

- Make sure that the network properties screen is closed before running this command. Otherwise, an error may occur in executing the command.

- It may take about 90 seconds for each virtual adapter to be activated.

- This command is not available in safe mode.

- After running the strhanet command, unintended adapter names may be displayed. On refreshing the screen, it will display the correct list of adapter names.

- Do not force termination of the strhanet command while it is running.
  If such termination is unavoidable, run the stphanet command afterwards to deactivate the virtual adapters; then, run the strhanet command, and reboot the system.
  After terminating the strhanet command, there may be cases that virtual adapters will be detected as new devices. In such a case, please install the GLS drivers on the device detection screen before carrying out this countermeasure.

- Do not execute the following commands at the same time, because the configuration information of virtual adapter may not be changed. Make sure the configuration information of virtual adapter is changed if the following commands have been executed at the same time. If not, execute the following commands again one by one.

  - hanetnic command

  - strhanet command

  - stphanet command

- If any virtual adapter is paused, you cannot specify the -n option.

Examples

1

To activate all virtual adapters in inactive state:

```
> strhanet
```

2

To activate the specified virtual adapter:

```
> strhanet -n sha0
```

6.2.8 stphanet

You can use the stphanet command to deactivate virtual adapters.

Format

```
stphanet [-n vadapter] [-m]
```

Description

Deactivates virtual adapters set using the hanetconfig command and stops ping monitoring.

Options

-n vadapter

Specifies the names of the virtual adapters to be deactivated.
If this option is omitted, all virtual adapters in active state are deactivated.

Ping monitoring running on physical adapters bundled in the virtual adapter is also stopped.

-m

Pauses all virtual adapters set by the hanetconfig command. If ping monitoring is activated, ping monitoring is stopped. Use this option only for maintenance tasks for GLS drivers.

Notes

- You must close all higher level applications before deactivating virtual adapters. If a virtual adapter is set for higher level applications, delete the virtual adapter.

- You must close all higher level applications before pausing virtual adapters.

- Once you have deactivated or paused a virtual adapter, it remains deactivated or paused even when you restart the system. Use the strhanet command to activate the virtual adapter. For more details, refer to "6.2.7 strhanet."

- Make sure that the network properties screen is closed before running this command. Otherwise, an error may occur in executing the command.

- It may take about 30 seconds for each virtual adapter to be deactivated.

- This command is not available in safe mode.

- Do not force termination of the stphanet command while it is running. If you do so, you cannot activate a virtual adapter with the name at the termination. In this case, execute the stphanet command again and delete the virtual adapter setting, and then create a virtual adapter with another virtual adapter name.

- Do not execute the following commands at the same time, because the configuration information of virtual adapter may not be changed. Make sure the configuration information of virtual adapter is changed if the following commands have been executed at the same time. If not, execute the following commands again one by one.

    - hanetnic command

- strhanet command

- stphanet command

- If any virtual adapter is paused, you cannot specify the -n option.

- You cannot specify the -m option and the -n option together.

- If virtual adapters to be deactivated specified by the -n option share NIC and their IP addresses are used for ping monitoring, the following operations may result in a failure of ping monitoring:

  - After starting ping monitoring (after the execution of the -on subcommand of the hanetpoll command)

  - After restarting the server

  - After restarting the GLS service

If ping monitoring fails, change the ping monitor target or activate virtual adapters, which have been deactivated, again.

Examples

1

To deactivate all virtual adapters in active state:

```
> stphanet
```

2

To deactivate the specified virtual adapter:

```
> stphanet -n sha0
```

3

To pause all virtual adapters:

```
> stphanet -m
```

6.3 Command for Displaying Operational Status

This section describes the command used to display the operational status.

6.3.1 dsphanet

You can use the dsphanet command to display the operational or monitoring status of virtual adapters.

Format

```
dsphanet [-r]
```

Description

Displays the operational status of virtual adapters. By adding the -r option, you can display the monitoring status.

Options

-r

Displays detailed information on the monitoring status of virtual adapters.

Output Format

The table below explains the output items.

Table 6.14 Output Items

Item	Details		
Name	Virtual adapter name		
Status (*1)	Activity of virtual adapters		
	Active	Denotes that the virtual adapter is active.	
	Inactive	Denotes that the virtual adapter is inactive or paused (*4).	
Adapters	Physical adapter name (status)		
	ON	Operational: Denotes that the virtual adapter is using this physical adapter for communications.	
	STBY	Standby: Denotes that the virtual adapter can use this physical adapter for communications.	
	OFF	Not in use: Denotes that the virtual adapter is not using this physical adapter for communications.	
	FAIL	Failed: Denotes that the connection of a transmission path to this physical adapter failed, for example because of a disconnected cable.	
Resources (*2)	Link status of physical adapters and status of monitored ping targets		
	LINK	Monitors the link status of physical adapters.	
		O	Denotes that the physical adapter is linked up.
		X	Denotes that the physical adapter is linked down.
		-	Denotes that the status monitor for physical adapters has stopped.
	PING	Denotes the ping monitor status of physical adapters.	
		O	Denotes that ping monitoring is functioning normally.
		X	Denotes that ping monitoring is not functioning normally or that a failure has been detected in the ping monitor target before ping monitoring is stopped. (*3)
		-	Denotes that ping monitoring is not running or that the ping monitor target specified to "yes" with the -f option of the hanetpoll create command to switch the adapter is not set.
	IP address	Denotes the ping monitor status of IP addresses for ping monitor targets.	
		The "!" mark is displayed at the beginning of a ping monitor target for which the adapter is not switched and only communication failure is detected.	
		O	Denotes that ping monitoring for the IP address is functioning normally.
		X	Denotes that ping monitoring for the IP address is not functioning normally or that a failure has been detected in the ping monitor target before ping monitoring is stopped. (*3)
		-	Denotes that ping monitoring for the IP address is not running.

Notes:

*1. Output when no options are specified.

*2. Output only when the -r option is specified.

*3. When the operational adapter has switched due to an error in the ping monitoring target, ping monitoring of the standby physical adapter is suspended; in order to indicate the error in the monitoring target causing this, the IP address status is displayed as an "X".

*4. When paused, virtual adapters displayed on the network connection window are in inactive state.

Examples

1

To display the operational status of all virtual adapters used in GLS:

```
> dsphanet
 Name      Status   Adapters
+-------+--------+----------------------------------------------------------+
 sha0     Active   Ethernet 1(ON),Ethernet 2(STBY)
 sha1     Active   Ethernet 3(STBY),Ethernet 4(ON)
 sha2     Active   Ethernet 3(STBY),Ethernet 4(ON)
 sha3     Active   Ethernet 5(FAIL),Ethernet 6(ON)
 sha4     Active   Ethernet 7(FAIL),Ethernet 8(FAIL)
```

2

To display detailed information on the monitoring status of all virtual adapters used in GLS:

- When the ping monitoring target is the IPv4 address

```
> dsphanet -r
[sha0]
 Adapters                       Resources
+------------------------------+-------------------------------------------+
 Ethernet 1(ON)                 LINK(O)
                                PING(O)
                                 192.168.10.250(O),192.168.10.251(O)
 Ethernet 2(STBY)               LINK(O)
                                PING(-)
                                 192.168.10.250(-),192.168.10.251(-)
[sha1,sha2]
 Adapters                       Resources
+------------------------------+-------------------------------------------+
 Ethernet 3(STBY)               LINK(O)
                                PING(-)
                                 192.168.20.250(-)
                                 !192.168.20.100(-)
 Ethernet 4(ON)                 LINK(O)
                                PING(O)
                                 192.168.20.251(O)
                                 !192.168.20.100(O)
[sha3]
 Adapters                       Resources
+------------------------------+-------------------------------------------+
 Ethernet 5(FAIL)               LINK(X)
                                PING(X)
                                 192.168.30.250(X)
 Ethernet 6(ON)                 LINK(O)
                                PING(O)
                                 192.168.30.251(O)
[sha4]
 Adapters                       Resources
+------------------------------+-------------------------------------------+
 Ethernet 7(FAIL)               LINK(X)
                                PING(X)
                                 192.168.40.250(X)
 Ethernet 8(FAIL)               LINK(X)
                                PING(-)
                                 192.168.40.251(-)
```

- When the ping monitoring target is the IPv6 address

```
> dsphanet -r
[sha0]
 Adapters                       Resources
```

```
+-----------------------------+-------------------------------------------+
 Ethernet 1(ON)                LINK(O)
                               PING(O)
                                2001:db8:10:1::250(O),2001:db8:10:1::251(O)
 Ethernet 2(STBY)              LINK(O)
                               PING(-)
                                2001:db8:10:1::250(-),2001:db8:10:1::251(-)
[sha1,sha2]
 Adapters                      Resources
+-----------------------------+-------------------------------------------+
 Ethernet 3(STBY)              LINK(O)
                               PING(-)
                                2001:db8:20:1::250(-)
                                !2001:db8:20:1::100(-)
 Ethernet 4(ON)               LINK(O)
                               PING(O)
                                2001:db8:20:1::251(O)
                                !2001:db8:20:1::100(O)
[sha3]
 Adapters                      Resources
+-----------------------------+-------------------------------------------+
 Ethernet 5(FAIL)              LINK(X)
                               PING(X)
                                2001:db8:30:1::250(X)
 Ethernet 6(ON)                LINK(O)
                               PING(O)
                                2001:db8:30:1::251(O)
[sha4]
 Adapters                      Resources
+-----------------------------+-------------------------------------------+
 Ethernet 7(FAIL)              LINK(X)
                               PING(X)
                                2001:db8:40:1::250(X)
 Ethernet 8(FAIL)              LINK(X)
                               PING(-)
                                2001:db8:40:1::251(-)
```

6.4 Command for Collecting Diagnostic Data

This section describes the command used to collect diagnostic data.

Use the hanet_snap command or FJQSS (Information Collection Tool) when collecting diagnostic data.

Use FJQSS when collecting data simultaneously with other middleware products that are compatible with FJQSS.

6.4.1 hanet_snap

You can use the hanet_snap command to batch collect data for diagnosing problems.

Format

```
hanet_snap [-s|-g] -f filename
```

Description

Batch collects data for diagnosing problems. You can collect data from GLS and from Windows. By specifying options, you can specify that only the required data is collected.

Options

-s

Specifies that the minimum amount of diagnostic data for GLS and Windows is collected.

-g

Specifies that only diagnostic data for GLS is collected.

-f filename

Specifies the name of the file to which to save the collected diagnostic data. To save the data to a file in the current folder, specify the file name only. To save the data to a file in a folder other than the current folder, specify the file path name.
You can specify a backup file on a remote computer, but in this case the backup cannot be performed if there is an error in the IP address of that computer or there is any problem with the network settings or the network itself.

The table below shows what data is collected depending on the specified option.

Table 6.15 Collected Data

Item	Details	Option		
		None	-s	-g
GLS settings information	- Result of hanetconfig print - Result of hanetconfig version - Result of hanetpoll print - Result of hanetparam print - Result of dsphanet - Result of hanetbackup	Yes	Yes	Yes
GLS user script information	- Data in script folder	Yes	Yes	Yes
GLS log information	- Data in log folder	Yes	Yes	Yes
GLS software information	- Registry	Yes	Yes	Yes
Internal GLS virtual driver information	- Data in driver folder - Internal data of GLS virtual driver	Yes	Yes	Yes
Driver information	- OEM driver information	Yes	Yes	Yes
Network adapter information	- Registry	Yes	Yes	Yes
Application log information for modification provided by the Updatesite (middleware)	- Application log for modification provided by the Updatesite (middleware)	Yes	No	No
Windows network information	- arp -a - hostname - ipconfig /all - nbtstat -c - net accounts - net config server - net config workstation - net share - net start - net statistics server - net statistics workstation - netsh dump - netsh routing ip show filter	Yes	No	No

Item	Details	Option		
		None	-s	-g
	- netsh routing ip show interface			
	- netsh routing ip show persistentroutes			
	- netsh routing ip show rtmdestinations			
	- netsh routing ip show rtmroutes			
	- netstat -an			
	- netstat -r			
	- pnputil -e			
	- Result of powershell Get-NetAdapter			
	- Result of powershell Get-NetAdapterAdvancedProperty			
	- Result of powershell Get-PnpDevice -Class 'Net'			
	- qprocess			
	- quser			
	- qwinsta			
	- route print			
	- Network function information			
Windows system information	- date /T - time /T - schtasks - systeminfo - tasklist /SVC	Yes	Yes	No
Windows log	- Application event log - System event log	Yes	No	No
Hyper-V configuration information	- Result of wmic - Registry	Yes	No	No
PowerShell information	- powershell $PSVersionTable	Yes	No	No

Yes: Collected No: Not collected

GLS: PRIMECLUSTER GL for Windows

Examples

1

To save diagnostic data on GLS and Windows to a file named "savedata" in the current folder:

```
> hanet_snap -f savedata
```

2

To save diagnostic data on GLS and Windows to a file named "savedata" on the C drive:

```
> hanet_snap -f C:\savedata
```

Note

- In safe mode, this command is only available when option -g is specified.

6.4.2 Collecting Information by FJQSS (Information Collection Tool)

By using FJQSS (Information Collection Tool), collect the investigation material required to maintain the redundant line control function.

The collected material includes all the investigation materials in the list of the collected information in "6.4.1 hanet_snap."

The network drive needs to be used when setting the folder on the network at the output destination of the diagnostic data.

For more information about FJQSS, refer to one of the following formats of "FJQSS User's Guide":

- Click [Start] menu, and select [FJQSS (Information Collection Tool)]>[FJQSS User's Guide].

- Refer to "FJQSS User's Guide" bundled with the installation media of the product.

Appendix A Sample GLS Configurations

This appendix provides examples of how to configure the GLS environment (depending on network configuration and operating conditions) and gives examples of command input.

## A.1   Sample GLS Settings without Shared NICs

This section provides examples of environment configuration when NICs are not shared with multiple virtual adapters.

A.1.1   Configuration with a Single Virtual Adapter

This is the configuration to use when a single network is duplicated.

Configuration

Figure A.1 Configuration with a Single Virtual Adapter


```
sha    : Virtual Adapter
NIC    : Network Interface Card
SW     : Network Switch
```
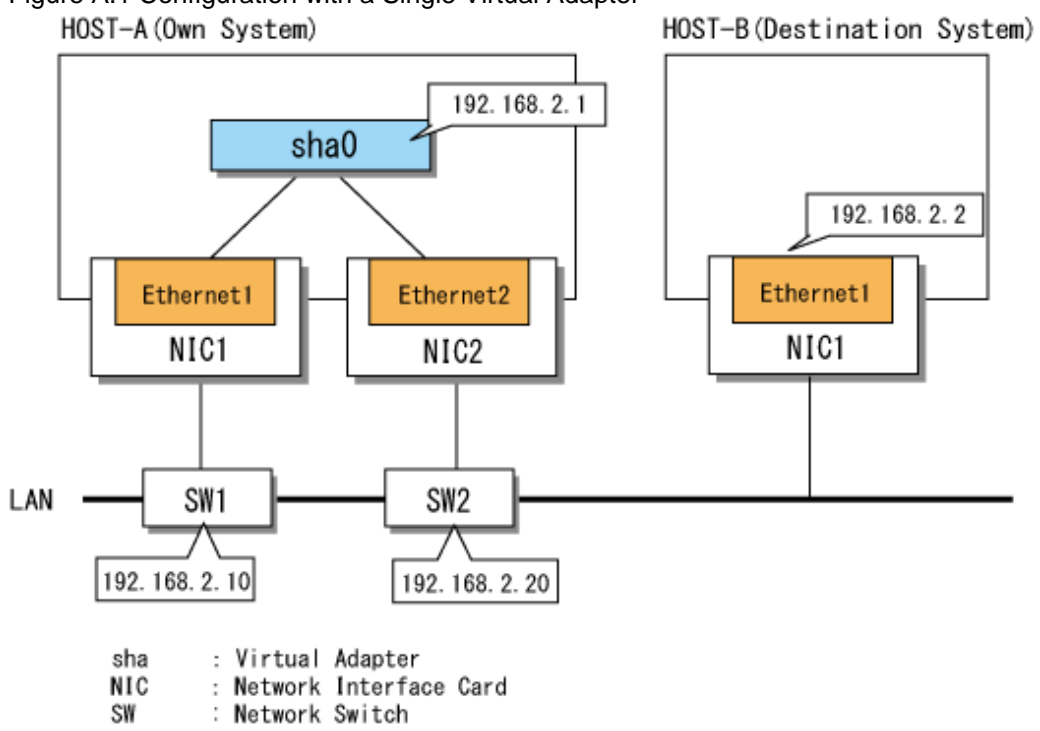
Setting Procedure Assuming the Configuration in Figure A.1

1. Set the physical adapter.

   For more details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

2. Set the virtual adapter.

   Execute the hanetconfig command and create a virtual adapter (sha0) by bundling the physical adapters Ethernet 1 and Ethernet 2.

   ```
   > hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2"
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

3. Set the ping monitor function.

   Execute the hanetpoll command with the following specifications:

   Monitor target when Ethernet 1 is operational: 192.168.2.10,192.168.2.20
   Monitor target when Ethernet 2 is operational: 192.168.2.10,192.168.2.20

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

Information

. . . .

By setting a destination system as the ping monitor target, you can specify the switching behavior of adapters if a network error is detected.

To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

. . . .

For more details, refer to "6.2.5 hanetpoll."

4. Set IP addresses for virtual adapters.

   You can set IP addresses automatically using the adapter setting script provided with GLS. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

Note

. . . .

In order to set an IP address manually, the virtual adapter must be activated in advance.

. . . .

5. Activate the virtual adapter.

   Execute the strhanet command to activate the virtual adapter.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

6. Start the ping monitor function.

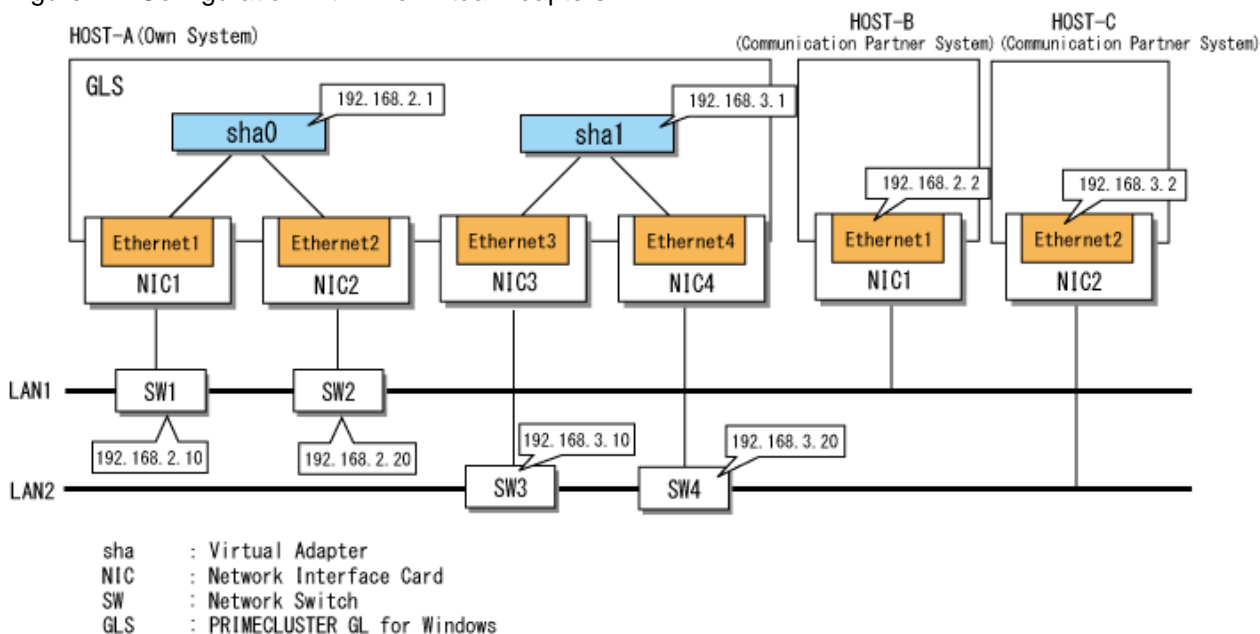   Execute the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

A.1.2 Configuration with Two Virtual Adapters

This is the configuration to use when each user application resides on a different LAN. This configuration is also suitable for three-tier application servers and for separating LAN traffic for user operations and administrative operations.

Configuration

Figure A.2 Configuration with Two Virtual Adapters


```
sha : Virtual Adapter
NIC : Network Interface Card
SW  : Network Switch
GLS : PRIMECLUSTER GL for Windows
```

Setting Procedure Assuming the Configuration in Figure A.2

1. Set the physical adapter.

   For more details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

2. Set the virtual adapters.

   Execute the hanetconfig command and create the virtual adapter sha0 by bundling the physical adapters Ethernet 1and Ethernet 2. Execute the hanetconfig command again and create the virtual adapter sha1 by bundling the physical adapters Ethernet 3 and Ethernet 4.

   ```
   > hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2"
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetconfig create -n sha1 -t "Ethernet 3","Ethernet 4"
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

3. Set the ping monitor function.

   Execute the hanetpoll command with the following specifications:

   Monitor target when Ethernet 1 is operational: 192.168.2.10,192.168.2.20
   Monitor target when Ethernet 2 is operational: 192.168.2.10,192.168.2.20
   Monitor target when Ethernet 3 is operational: 192.168.3.10,192.168.3.20
   Monitor target when Ethernet 4 is operational: 192.168.3.10,192.168.3.20

   ```
   > hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t "Ethernet 3" -p 192.168.3.10,192.168.3.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t "Ethernet 4" -p 192.168.3.10,192.168.3.20
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

. . . .

By setting a destination system as the ping monitor target, you can specify the switching behavior of adapters if a network error is detected.

To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 3" -p 192.168.3.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 4" -p 192.168.3.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

. . . .

For more details, refer to "6.2.5 hanetpoll."

4. Set IP addresses for virtual adapters.

You can set IP addresses automatically using the adapter setting script provided with GLS. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

. . . .

In order to set an IP address manually, the virtual adapter must be activated in advance.

. . . .

5. Activate the virtual adapters.

Execute the strhanet command to activate the virtual adapters.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

6. Start the ping monitor function.

Execute the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```
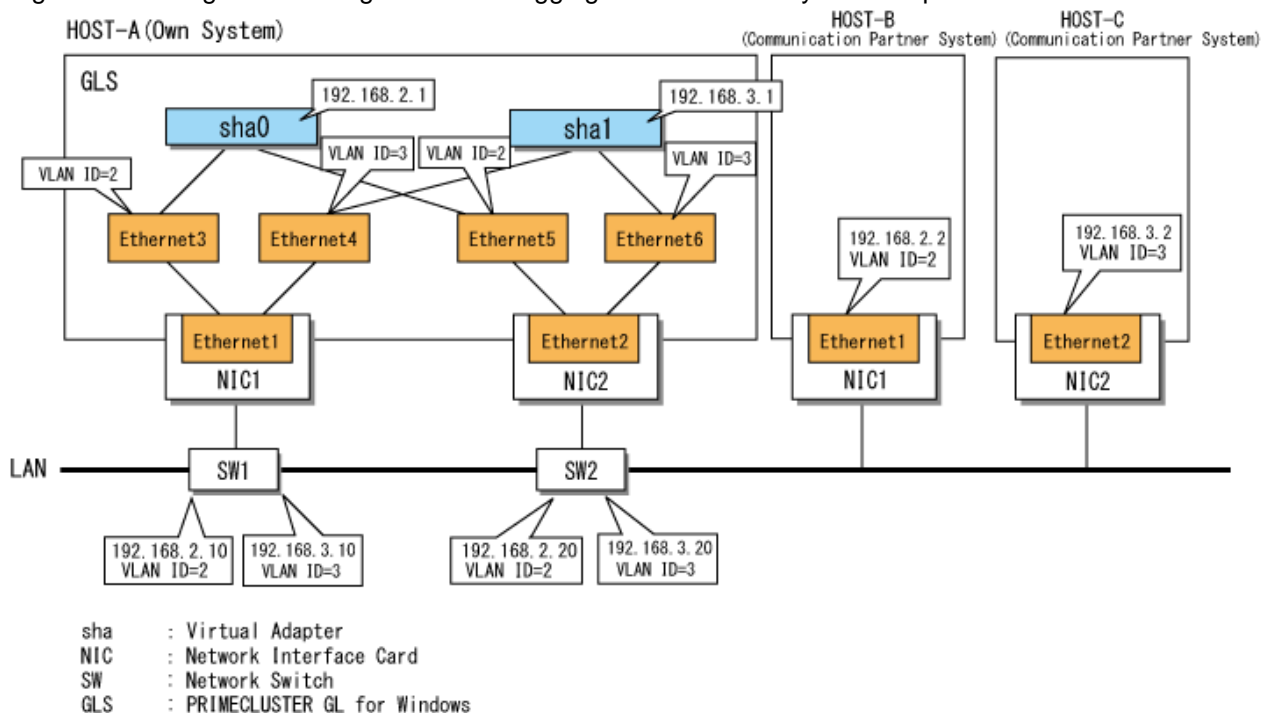
A.1.3 Configuration Using the VLAN Tagging Function of a Physical Adapter

This configuration is suitable for using multiple networks in an environment with a limited amount of available NICs, e.g. blade servers.

Configuration

Figure A.3 Configuration Using the VLAN Tagging Function of a Physical Adapter


```
sha  : Virtual Adapter
NIC  : Network Interface Card
SW   : Network Switch
GLS  : PRIMECLUSTER GL for Windows
```

Setting Procedure Assuming the Configuration in Figure A.3

1. Create the VLAN tagging adapters.

   For further details, refer to the documentation provided with the network driver.

2. Make the settings for the VLAN tagging adapters.

   For further details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

3. Make the settings for the virtual adapters.

   Use the hanetconfig command to bundle the VLAN tagging adapters.

   Virtual adapter sha0: bundles Ethernet 3 and Ethernet 5.
   Virtual adapter sha1: bundles Ethernet 4 and Ethernet 6.

   ```
   > hanetconfig create -n sha0 -t "Ethernet 3","Ethernet 5"
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetconfig create -n sha1 -t "Ethernet 4","Ethernet 6"
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

4. Make the settings for ping monitoring.

   Execute the hanetpoll command with the following specifications:

   Ping targets when Ethernet 3 is operational: 192.168.2.10,192.168.2.20
   Ping targets when Ethernet 5 is operational: 192.168.2.10,192.168.2.20
   Ping targets when Ethernet 4 is operational: 192.168.3.10,192.168.3.20
   Ping targets when Ethernet 6 is operational: 192.168.3.10,192.168.3.20

   ```
   > hanetpoll create -t "Ethernet 3" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t " Ethernet 5" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t "Ethernet 4" -p 192.168.3.10,192.168.3.20
   ```

```
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t " Ethernet 6" -p 192.168.3.10,192.168.3.20
FJSVhanet: INFO: 00000: The command ended normally.
```

In a configuration using VLAN tagging adapters, the physical wiring is shared among the virtual adapters, but ping monitoring is carried out separately for each VLAN; therefore, ping targets cannot be shared. As ping targets, please set IP addresses on the same VLAN.

Depending on the network switches being used, you may not be able to set IP addresses for several VLANs. In such a case, please set the IP address of a router or of another network switch as the ping target.

Information

When setting a remote system as the ping target, you can specify the switching behavior of network adapters if an error at the ping target is detected.

To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 3" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 5" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 4" -p 192.168.3.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 6" -p 192.168.3.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details on the hanetpoll command, refer to "6.2.5 hanetpoll."

5. Set IP addresses for virtual adapters.

   You can set IP addresses automatically using the adapter setting script provided with GLS. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

Note

In order to set an IP address manually, the virtual adapter must be activated in advance.

6. Activate the virtual adapters.

   Execute the strhanet command to activate the virtual adapters.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

7. Start ping monitoring.

   Execute the hanetpoll command to start ping monitoring.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

A.2 Sample GLS Settings with Shared NICs

This section provides examples of environment configuration when NICs are shared with multiple virtual adapters using VLAN tagging.

> **Note**

....

- You cannot create partial NIC shares with multiple virtual adapters in GLS.

- In order to share NICs, you must set a different VLAN tag for each virtual adapter and each NIC must connect to a different VLAN.

....

A.2.1 Configuration with All NICs Shared by Virtual Adapters Using VLAN Tagging

This configuration is suitable for using multiple networks in environments where the amount of NICs that can be used like a Blade Server is limited.

Configuration

Figure A.4 Configuration with All NICs Shared by Virtual Adapters Using VLAN Tagging
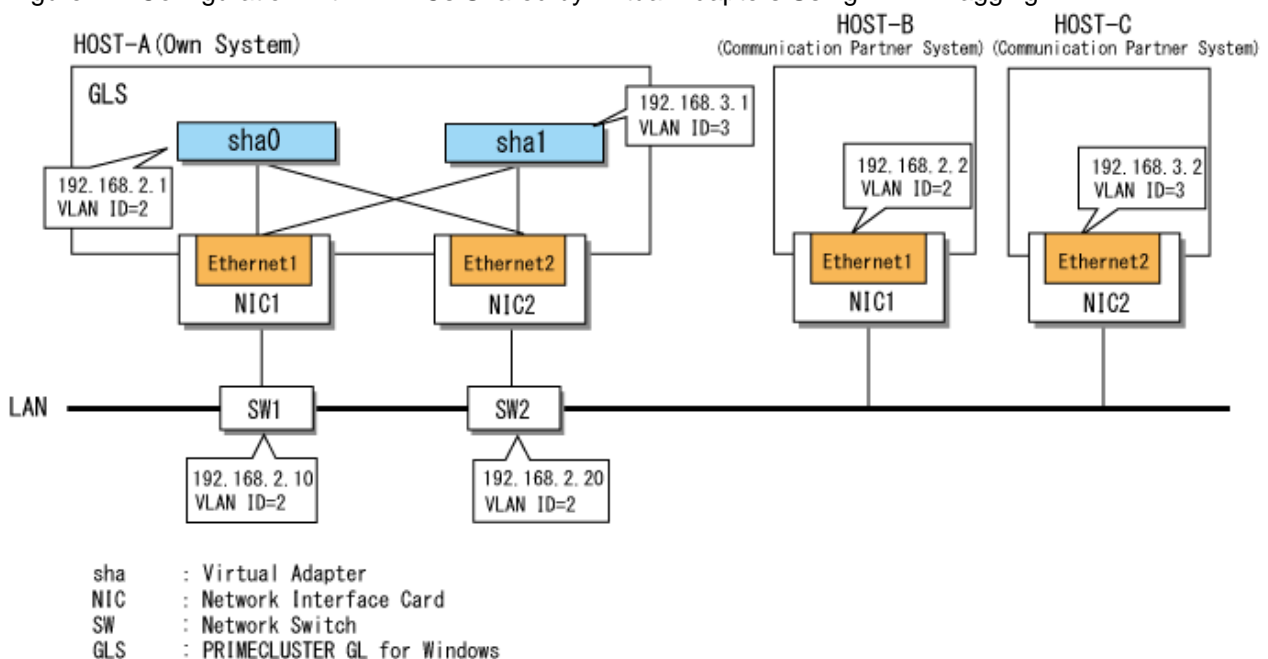
Setting Procedure Assuming the Configuration in Figure A.4

1. Set the physical adapter.

   For more details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

2. Set the virtual adapters.

   Using the hanetconfig command, bundle the physical adapters Ethernet 1 and Ethernet 2 and create the virtual adapter sha0 with 2 as its VLAN ID. Using the hanetconfig command again, bundle the physical adapters Ethernet 2 and Ethernet 3 and create the virtual adapter sha1 with 3 as its VLAN ID.

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -v 2
FJSVhanet: INFO: 00000: The command ended normally.
> hanetconfig create -n sha1 -t "Ethernet 1","Ethernet 2" -v 3
FJSVhanet: INFO: 00000: The command ended normally.
```

📝 **Note**

When you share NICs, the VLAN IDs of the virtual adapters that connect to an NIC must not match. If the same VLAN ID is specified for different virtual adapters, an error message is displayed when the command is executed.

3. Set the ping monitor function.

Execute the hanetpoll command with the following specifications:

Monitor target when Ethernet 1 is operational: 192.168.2.10,192.168.2.20
Monitor target when Ethernet 2 is operational: 192.168.2.10,192.168.2.20

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

In a configuration that shares physical cables using VLAN tagging, it is not necessary to set ping monitor targets in every VLAN tag. In this example, the virtual adapters sha0 and sha1 share the same physical adapter, and the ping monitor target is set for the IP addresses (192.168.2.10 and 192.168.2.20) for which the VLAN ID is 2. In this case, because operations are switched from NIC1 to NIC2 in the event of a break in communications using the IP addresses for which the VLAN ID is 2, communication for the virtual adapters sha0 and sha1, which share the same physical cable, continues.

📖 **Information**

By setting a destination system as the ping monitor target, you can specify the switching behavior of adapters if a network error is detected.
To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details, refer to "6.2.5 hanetpoll."

4. Set IP addresses for virtual adapters.

You can set IP addresses automatically using the adapter setting script provided with GLS. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

📝 **Note**

In order to set an IP address manually, the virtual adapter must be activated in advance.

5. Activate the virtual adapters.

Execute the strhanet command and activate the virtual adapters.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

6. Start the ping monitor function.

Execute the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

A.2.2 Configuration with Some NICs Shared by Virtual Adapters Using VLAN Tagging

This is the configuration to use when combining any of the three configurations described above. Those three configurations are:

- Single Virtual Adapter without Shared NICs

- Multiple Virtual Adapters without Shared NICs

- Shared NICs (All NICs Shared by Virtual Adapters Using VLAN Tagging)

Configuration

Figure A.5 Configuration with Some NICs Shared by Virtual Adapters Using VLAN Tagging
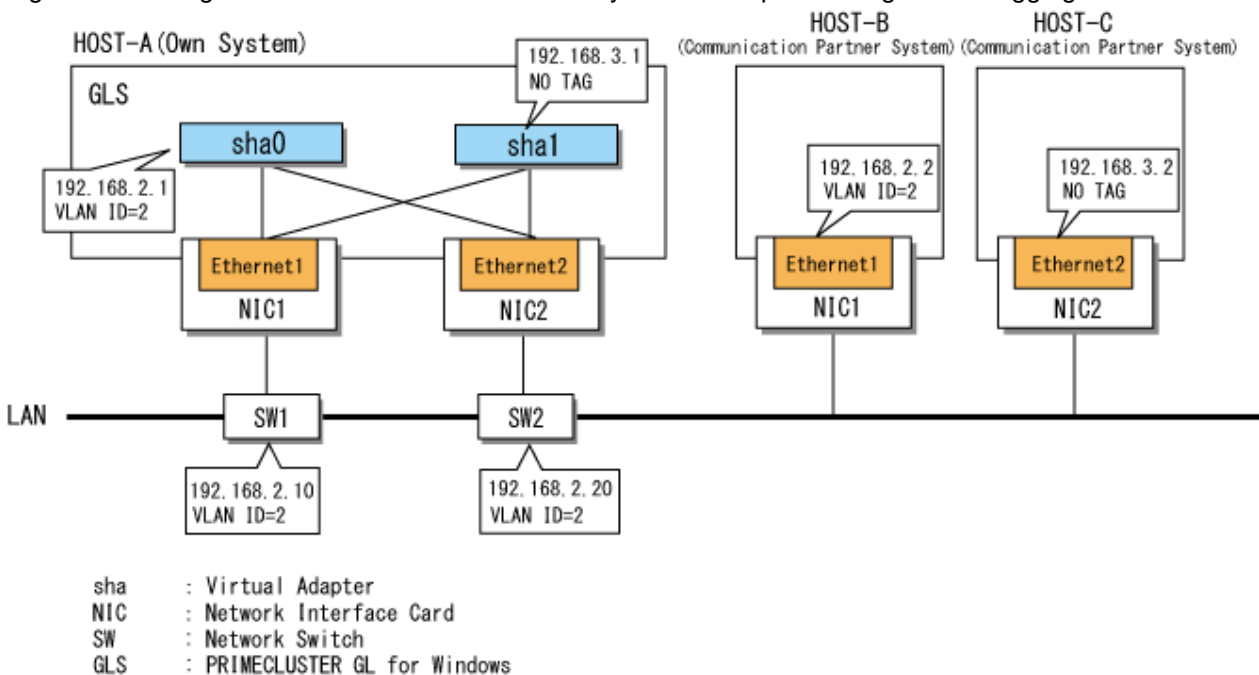
Setting Procedure Assuming the Configuration in Figure A.5

1. Set the physical adapter.

   For more details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

2. Set the virtual adapters.

   Using the hanetconfig command, bundle the physical adapters Ethernet 1 and Ethernet 2 and create the virtual adapter sha0 with 2 as its VLAN ID. Using the hanetconfig command again, bundle the physical adapters Ethernet 1 and Ethernet 2 and create the virtual adapter sha1.

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -v 2
FJSVhanet: INFO: 00000: The command ended normally.
> hanetconfig create -n sha1 -t "Ethernet 1","Ethernet 2"
FJSVhanet: INFO: 00000: The command ended normally.
```

3. Set the ping monitor function.

   Execute the hanetpoll command with the following specifications:

Monitor target when Ethernet 1 is operational: 192.168.2.10,192.168.2.20
Monitor target when Ethernet 2 is operational: 192.168.2.10,192.168.2.20

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
FJSVhanet: INFO: 00000: The command ended normally.
```

Information

By setting a destination system as the ping monitor target, you can specify the switching behavior of adapters if a network error is detected.
To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

For more details, refer to "6.2.5 hanetpoll."

4. Set IP addresses for virtual adapters.

   You can set IP addresses automatically using the adapter setting script provided with GLS. For more details, refer to "3.4.5 Follow-up Tasks: IP Address Settings."

Note

In order to set an IP address manually, the virtual adapter must be activated in advance.

5. Activate the virtual adapters.

   Execute the strhanet command and activate the virtual adapters.

```
> strhanet
FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
needed.
FJSVhanet: INFO: 00000: The command ended normally.
```

6. Start the ping monitor function.

   Execute the hanetpoll command.

```
> hanetpoll on
FJSVhanet: INFO: 00000: The command ended normally.
```

Appendix B Operation in Hyper-V Environment

This appendix describes operation of GLS in Hyper-V.

B.1 Overview of Hyper-V

Microsoft Hyper-V enables server virtualization. Server virtualization enables you to consolidate multiple servers on a single server (host OS) as guest OSes.

B.2 Configuration of Virtual Switch in Hyper-V

In an environment using Hyper-V, a server where applications run is consolidated as a guest OS on the host OS. A network adapter on a guest OS is connected to the Hyper-V virtual switch. A guest OS communicates with the external network via this virtualswitch.

GLS operates on the host OS or a guest OS with Hyper-V.

B.3 GLS Operation on the Host OS

In Windows Server 2019 environment, by duplicating a physical adapter on the host OS and connecting it to the Hyper-V virtual switch, networks of guest OSes are duplicated.

The GLS virtual adapter created on the host OS can communicate in the configuration where the virtual LAN ID is added to the network adapter on a guest OS to transfer packets with a tag to guest OSes. Moreover, the ping monitor function can be used by setting an IP address to a network adapter which is allowed to be shared on the host OS.

Figure B.1 Configuration with GLS Installed on the Host OS
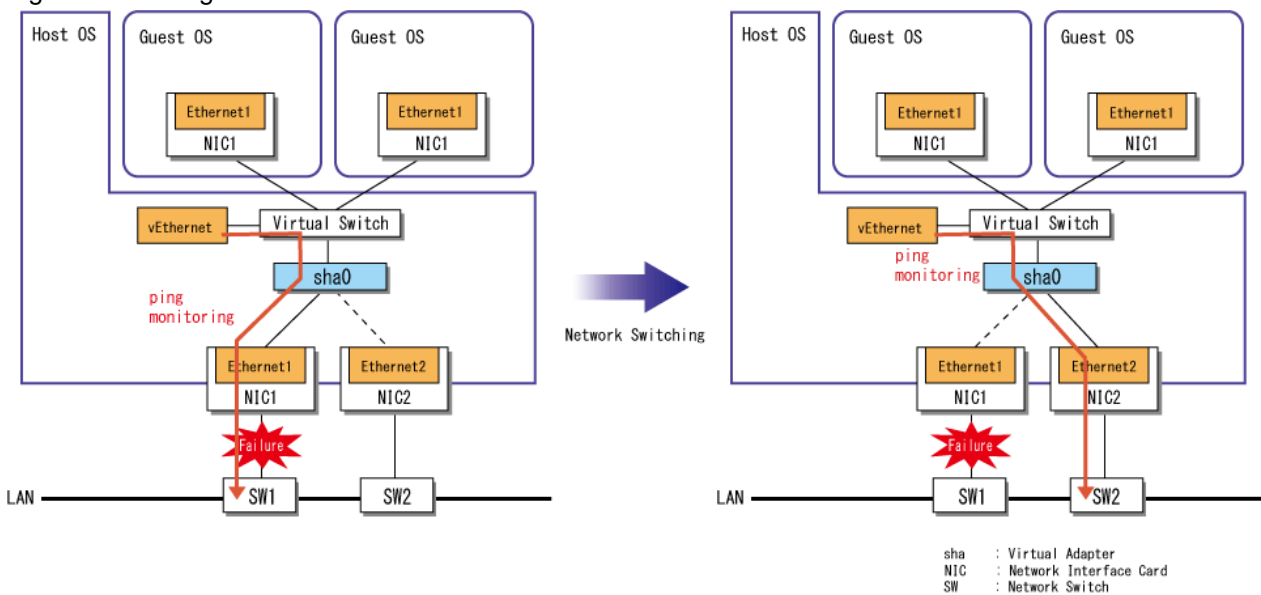
This configuration cannot be used in Windows Server 2016 environment.

B.3.1 Installation

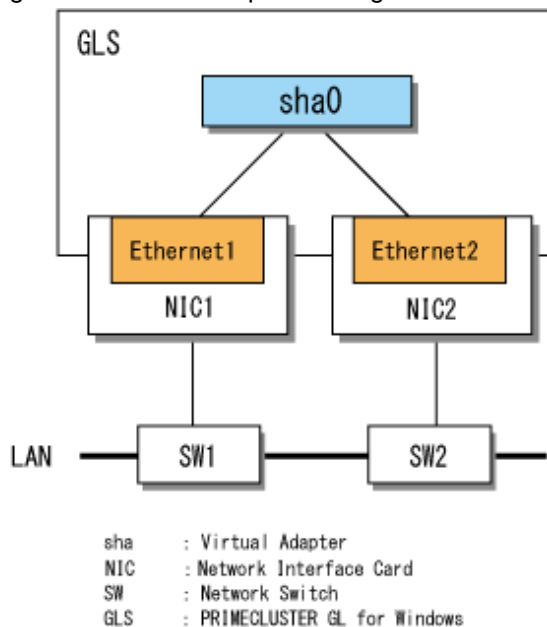This section describes installation of GLS.

B.3.1.1 Virtual Adapter Settings

This section describes how to set a virtual adapter, assuming the following criteria:

- Virtual adapter: sha0

- Physical adapters: Ethernet 1, Ethernet 2

Figure B.2 Virtual Adapter Settings


```
sha     : Virtual Adapter
NIC     : Network Interface Card
SW      : Network Switch
GLS     : PRIMECLUSTER GL for Windows
```

Use the hanetconfig command to make virtual adapter settings. Note that you must be a member of the Administrators group to execute hanetconfig.

1. Create the virtual adapter sha0 comprised of the physical adapters Ethernet 1 and Ethernet 2 by executing hanetconfig with the create subcommand.

```
> hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -v hv
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Check that the settings are correct by executing the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name     VID  Adapters
+--------+----+-----------------------------------------------------------+
 sha0     hv   Ethernet 1,Ethernet 2
```

Note

- You must specify "hv" with the -v option of the create subcommand of the hanetconfig command.

- A virtual adapter to be connected to the Hyper-V virtual switch cannot share the NIC with other virtual adapters.

B.3.1.2 Ping Settings

For details, see "3.4.4 Ping Settings."

B.3.1.3 Activating Virtual Adapters

For details, see "3.4.6 Activating Virtual Adapters."

Information

When connecting a virtual adapter to the Hyper-V virtual switch, you do not need to set the IP address to the virtual adapter.

B.3.1.4 Creating a Virtual Switch

Create a Hyper-V virtual switch.

1. From the [Hyper-V Manager] window, select [Virtual Switch Manager].

2. Under [New virtual network switch], select [External], and click [Create virtual switch].

3. Enter an arbitrary name in the name field and select "FUJITSU PRIMECLUSTER GL Network Miniport Driver" as the external network. Click [OK].

4. Set an IP address manually for "vEthernet (virtual switch name)" generated on the virtual adapter (sha0) by the Hyper-V virtual switch manager.
   For details on how to set IP addresses, see the manual of OS.

5. Restart the host OS or the GLS service.
   For details on how to restart the GLS service, see "B.3.2.1 Restarting the Host OS or the GLS Service."

Note

- To use the ping monitoring of GLS, check [Allow management operating system to share this network adapter] when creating a Hyper-V virtual switch.

B.3.1.5 Creating a Network Adapter on a Guest OS

Create a network adapter on a guest OS.

1. From [Hyper-V Manager], open the setting window for a guest OS.

2. Select [Network Adapter] from [Add Hardware], and click the [Add] button.

3. Select the virtual switch connected to the GLS virtual adapter for [Network]. Set up the VLAN ID as needed and click the [Apply] button.

B.3.1.6 Setting Scripts for Hyper-V

Set the scripts for Hyper-V.

Follow the procedure below to inform the information of MAC addresses for each OS to network switches from the virtual adapter sha0 which is registered to Hyper-V Virtual Switch Manager. This setting enables the transmission to immediately restart when the network is switched.

```
> copy "<GLS Installation Folder>\usr\script\adapter\hyperv.sam" "<GLS Installation Folder>\usr
\script\adapter\sha0.bat"
```

For details, see "B.3.2.2 Restarting the Transmission for Network Switching."

B.3.2 Operation

This section explains how to operate GLS.

B.3.2.1 Restarting the Host OS or the GLS Service

To start the GLS system after creating the Hyper-V virtual switch, you must restart the host OS or the GLS service.

There are the following two methods for restarting the GLS service:

- Restarting the service by the GUI

  Use the [Services] window to restart the GLS service by the GUI.

  Open [Services] from [Windows Administrative Tools] menu.

  Right-click the service with the name of "PRIMECLUSTER GLS" and select [Restart].

- Restarting the service with the command

  Use the sc command to restart the GLS service with the command.

```
> sc stop hanetctld
> sc start hanetctld
```

Note

- Switching of the physical adapters in the active state may occur when the GLS service is restarted in the following case:

  - The primary adapter of the virtual adapter is used as the operational adapter preferentially.
    (If "yes" is specified with the -p option of the hanetparam command.)

- A failover of the cluster may occur when the GLS service is restarted in the following case:

  - The IP address of the GLS virtual adapter is set as the resource of WSFC.

B.3.2.2 Restarting the Transmission for Network Switching

If the network is switched in the configuration where GLS is installed on the host OS, the virtual adapter sends the MAC address of the network adapter on a guest OS to a proximity switch, and then the MAC learning table is updated. This enables the transmission to immediately restart when the network is switched.

Information

You can also set the information to be sent to a proximity switch manually.

For information to be set, check a network adapter to be connected to the virtual switch with which the GLS virtual adapter is registered. For the host OS, check the information referring to a result displayed by executing the ipconfig command. For a guest OS, open the setting window for guest OS from [Hyper-V Manager] and see "MAC Address" and "VLAN ID" in [Network Adapter]. If a guest OS has never been started, "MAC Address" which is allocated dynamically is not displayed. Start the guest OS to check "MAC Address."

Enter the information you checked in the file "<GLS Installation Folder>\usr\script\adapter\maclist.txt" in the format as shown below:

```
Virtual adapter name   VLAN ID   MAC address   Machine name
```

Separate the items using tabs. Moreover, specify a hyphen to the VLAN ID without VLAN tag settings or a machine name which is used to set the network adapter on the host OS.

[Example]

```
sha0  -  ZZ-ZZ-ZZ-ZZ-ZZ-ZZ -
sha0  2  XX-XX-XX-XX-XX-XX VM1
sha0  3  YY-YY-YY-YY-YY-YY VM2
```

Information

- If there is no file which includes the information to be sent to a proximity switch, GLS automatically obtains and sends the information when the network is switched.
  When you set the file manually, the MAC address information is sent to a proximity switch based on the information entered in the file.

- If you do not use the network adapter which is allowed to be shared on the host OS, it is unnecessary to enter the MAC address of the adapter in maclist.txt.
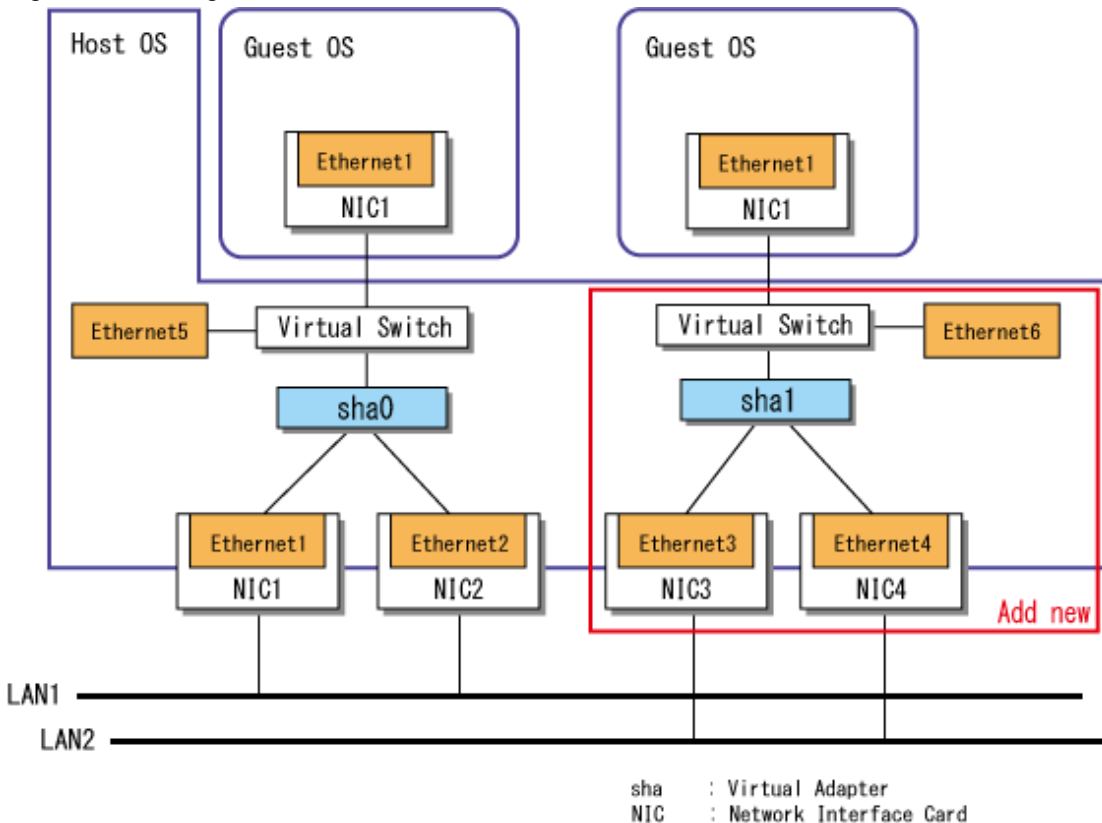
. . . .

B.3.3 Changing the Configuration

This section describes how to change the configuration of a virtual switch.

B.3.3.1 Adding a Virtual Switch

This section describes how to add a virtual switch under the following conditions.

Figure B.3 Adding a Virtual Switch


```
sha   : Virtual Adapter
NIC   : Network Interface Card
```

1. Stop all ping monitoring.

```
> hanetpoll off
FJSVhanet: INFO: 00000: The command ended normally.
```

2. Create a new virtual adapter.

   Specify the GLS virtual adapter sha1 to bundle the physical adapters (Ethernet 3 and Ethernet 4) and execute the create subcommand of the hanetconfig command.

```
> hanetconfig create -n sha1 -t "Ethernet 3","Ethernet 4" -v hv
FJSVhanet: INFO: 00000: The command ended normally.
```

3. Check the settings.
   Execute the print subcommand of the hanetconfig command.

```
> hanetconfig print
 Name     VID  Adapters
+--------+----+-----------------------------------------------------------+
```

```
 sha0     hv   Ethernet 1,Ethernet 2
 sha1     hv   Ethernet 3,Ethernet 4
```

4. Activate the GLS virtual adapter sha1 by executing the strhanet command.

```
> strhanet -n sha1
FJSVhanet: INFO: 00000: The command ended normally.
```

5. Connect the GLS virtual adapter sha1 to the Hyper-V virtual switch.

   For details, see "B.3.1.4 Creating a Virtual Switch."

6. Create a network adapter on a guest OS by using the virtual switch created in step 5.

   For details, see "B.3.1.5 Creating a Network Adapter on a Guest OS."

7. Set the scripts for Hyper-V.

   For details, see "B.3.1.6 Setting Scripts for Hyper-V."

See

To ensure that GLS is set and functions correctly, perform the ping monitoring setting after adding virtual switches.

For details, see "5.3.2 Setting Ping Monitoring."

B.3.3.2 Deleting a Virtual Switch

This section describes how to delete a virtual switch under the following conditions.

Figure B.4 Deleting a Virtual Switch
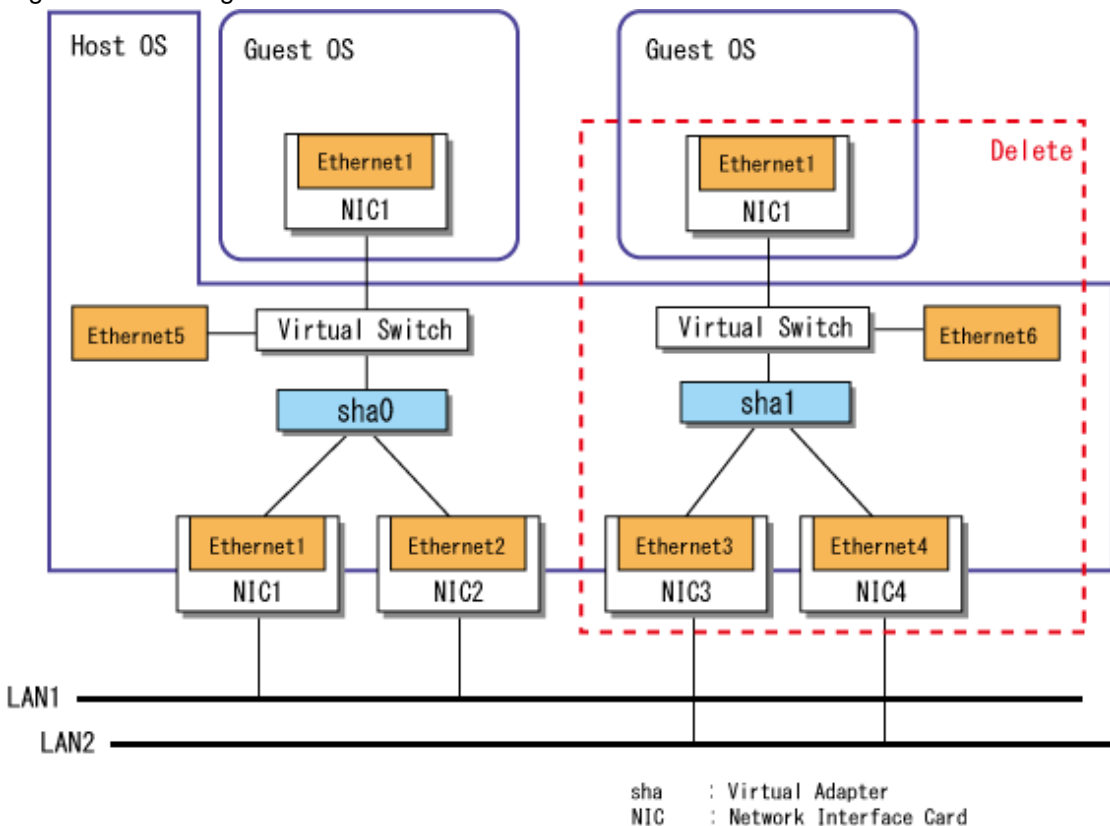
1. Stop guest OSes connected to the Hyper-V virtual switch. with which the GLS virtual adapter sha1 to be deleted is registered.

2. Open the setting window for guest OSes from [Hyper-V Manager] and set the configuration to [Not connected] for the network adapter connected to the virtual switch which is the target to be deleted. Delete the network adapter if you do not use it after deleting the virtual switch.

3. Stop ping monitoring on the GLS virtual adapter sha1 to be deleted.

```
> hanetpoll off -n sha1
FJSVhanet: INFO: 00000: The command ended normally.
```

4. Change the settings of the virtual switch with which the GLS virtual adapter sha1 to be deleted is registered.

   From the [Hyper-V Manager] window, select [Virtual Switch Manager].
   Select the virtual switch you need to delete and click the [Remove] button.

5. Delete the scripts for Hyper-V.

```
> del "<GLS Installation Folder>\usr\script\adapter\sha1.bat"
```

   For details, see "B.3.2.2 Restarting the Transmission for Network Switching."

6. Deactivate the GLS virtual adapter sha1 to be deleted by executing the stphanet command.

```
> stphanet -n sha1
FJSVhanet: INFO: 00000: The command ended normally.
```

7. Check whether the ping monitoring is set.

```
> hanetpoll print
```

   If ping monitoring is not set, step 8 is not applicable.

8. If you have set the ping monitoring, delete the corresponding settings.

   Execute the delete subcommand of the hanetpoll command for the physical adapters bundled in the GLS virtual adapter sha1, which is to be deleted.

```
> hanetpoll delete -t "Ethernet 3"
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll delete -t "Ethernet 4"
FJSVhanet: INFO: 00000: The command ended normally.
```

9. Delete the information defining the virtual adapter.

   Delete the GLS virtual adapter sha1 by executing the delete subcommand of the hanetconfig command.

```
> hanetconfig delete -n sha1
FJSVhanet: INFO: 00000: The command ended normally.
```

B.3.3.3 Changing Physical Adapters

This section describes how to change the physical adapters bundled into a virtual adapter. In the procedure below, the name of the virtual adapter is sha0. This virtual adapter contains two physical adapters: Ethernet 1 and Ethernet 2. In the procedure below, Ethernet 2 is replaced with Ethernet 3.

Figure B.5 Changing Physical Adapters
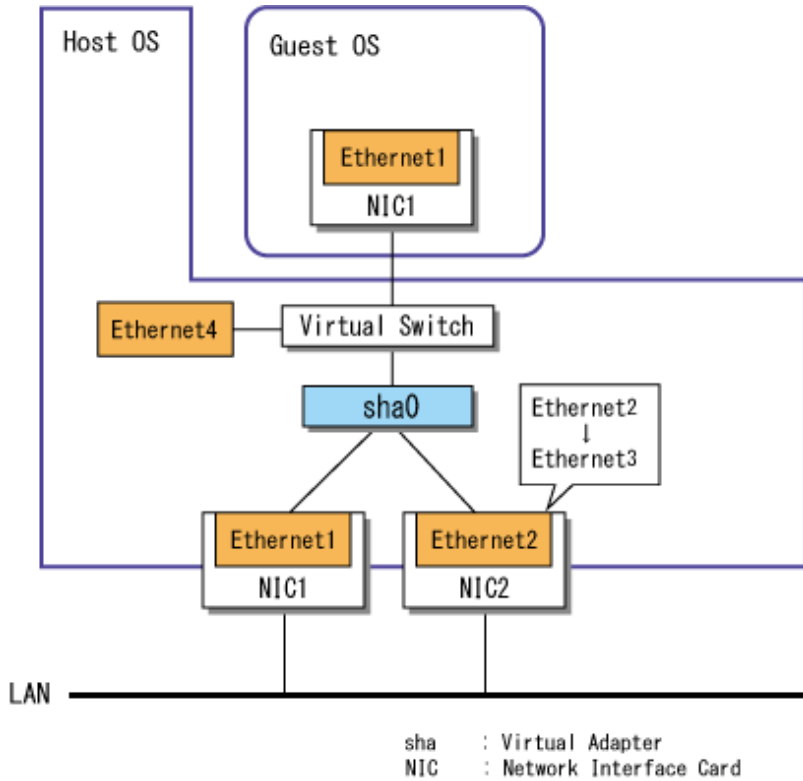
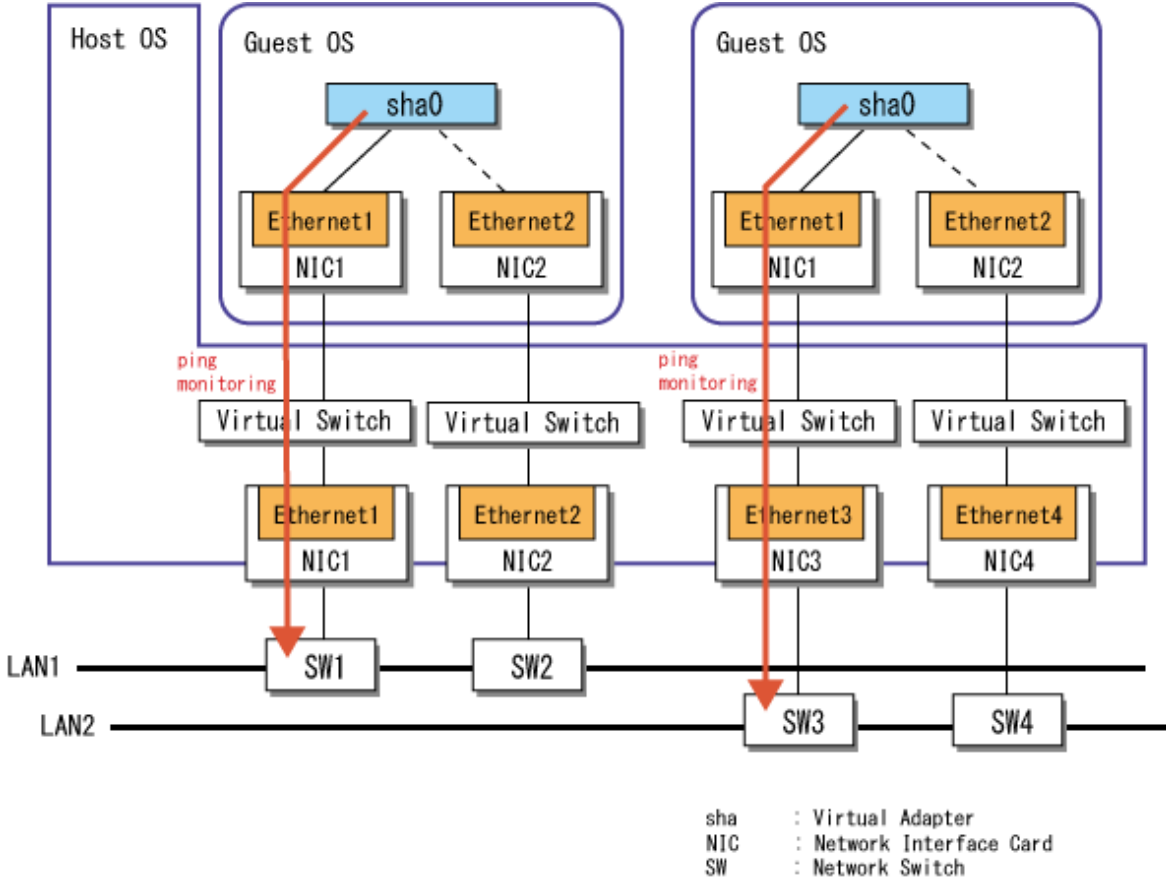For details on how to change, see "5.2.3 Changing Physical Adapters."

B.4 GLS Operation on Guest OSes

Duplicate the virtual adapter on a guest OS by installing GLS into a guest OS.

Moreover, the ping monitor function is available on each guest OS.

Figure B.6 Configuration with GLS Installed on Guest OSes

Information

When configuring a cluster system between guests by working together with WSFC, an error is detected and failover is performed in the event of a both-sided network failure, and then transaction will be continued.

B.4.1 Installation

You can install GLS on a guest OS in the same way as you install GLS on a physical server.

For details, see "Chapter 3 Installation."

Note

- Check [Enable spoofing of MAC addresses] when creating a network adapter bundled by GLS with Hyper-V Manager.

- The network adapter which was allocated to the guest OS by using SR-IOV cannot be bundled in virtual adapters.

- Since the link status of a physical adapter on the host OS is not sent to a guest OS with Hyper-V, the link status cannot be monitored. Therefore, you must set ping monitoring for each guest OS.

Information

For tagged VLAN connection, specify the VLAN ID in the setting of a network adapter for a guest OS. You do not need to set the VLAN ID for the GLS virtual adapter.

B.4.2 Operation

You can operate GLS on a guest OS in the same way as you operate GLS on a physical server.

For details, see "Chapter 4 Operating GLS."

B.4.3 Maintenance

You can maintain GLS on a guest OS in the same way as you maintain GLS on a physical server.

For details, see "Chapter 5 Maintenance."

B.5 Examples of Configuring System Environments

This section provides examples of configuring system environments when installing GLS in a Hyper-V environment.

B.5.1 When Installing GLS in Host OS

In Windows Server 2019 environment, this configuration is suitable for duplicating the network in Hyper-V environment by registering the GLS virtual adapter to the Hyper-V virtual Switch Manager.

Configuration

Figure B.7 Configuration to Install GLS on the Host OS
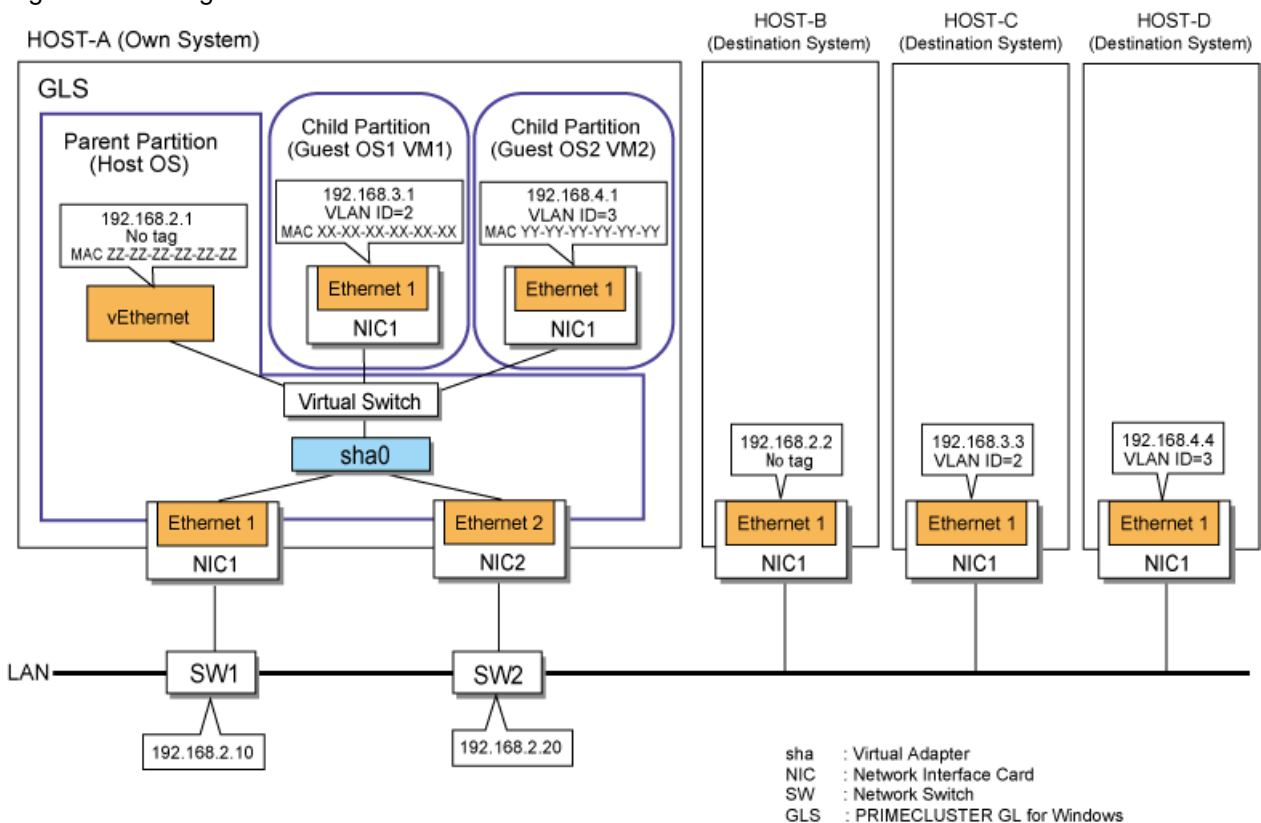
> **Note**
>
> ....
>
> This configuration cannot be used in Windows Server 2016 environment.
>
> ....

Setting procedure

Assuming the Configuration in Figure B.7

1. Set the physical adapter.

   For more details, refer to "3.4.2 Preliminary Tasks: Physical Adapter Settings."

2. Set the virtual adapter.

   Execute the hanetconfig command and create the virtual adapter sha0 for Hyper-V by bundling the physical adapters Ethernet 1 and Ethernet 2.

   ```
   > hanetconfig create -n sha0 -t "Ethernet 1","Ethernet 2" -v hv
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

3. Set the ping monitor function.

   Execute the hanetpoll command with the following specifications:

   Monitor target when Ethernet 1 is operational: 192.168.2.10, 192.168.2.20
   Monitor target when Ethernet 2 is operational: 192.168.2.10, 192.168.2.20

   ```
   > hanetpoll create -t "Ethernet 1" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   > hanetpoll create -t "Ethernet 2" -p 192.168.2.10,192.168.2.20
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

📘 **Information**

· ·

When setting a destination system as the ping target, you can set the network adapter not to switch if a network error is detected. To set so that the network adapter is not switched if an error is detected:

```
> hanetpoll create -t "Ethernet 1" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
> hanetpoll create -t "Ethernet 2" -p 192.168.2.2 -f no
FJSVhanet: INFO: 00000: The command ended normally.
```

· ·

For details on hanetpoll command, refer to "6.2.5 hanetpoll."

4. Activate the virtual adapter.

   Execute the strhanet command to activate the virtual adapter.

   ```
   > strhanet
   FJSVhanet: INFO: 00007: Start the ping monitoring using the hanetpoll command if
   needed.
   FJSVhanet: INFO: 00000: The command ended normally.
   ```

5. Create the Hyper-V virtual switch.

   1. From the [Administrative Tools] menu on the [Start] menu, select [Hyper-V Manager].
      You can also select [Hyper-V Manager] from [Tools] in [Server Manager].

   2. From the [Hyper-V Manager] window, select [Virtual Switch Manager].

   3. Select [New virtual network switch]-[External], then click [Create virtual switch].

   4. Enter an arbitrary name in the name field and select "FUJITSU PRIMECLUSTER GL Network Miniport Driver" as the external network. Click [OK].

For more details, refer to the manual of Hyper-V.

6. Set an IP address manually for "vEthernet (virtual switch name)" which is created on the virtual adapter sha0 by Hyper-V Virtual Switch Manager.

   For details on how to set IP addresses, refer to the manual of OS.

7. Restart the host OS or the GLS service.

   For details on how to restart the GLS service, see "B.3.2.1 Restarting the Host OS or the GLS Service."

   Ping monitoring starts when the host OS or the GLS service is restarted.

8. Register virtual adapter sha0 to GuestOS1 as VLAN ID2.

   1. From [Hyper-V Manager], open the setting window for GuestOS1.

   2. Under [Add Hardware], select [Network Adapter], and click the [Add] button.

   3. Select the virtual adapter sha0 for [Virtual switch], and check [Enable virtual LAN identification].
      Enter "2" to [VLAN ID], and click the [Apply] button.

      For more details, refer to the manual of Hyper-V.

9. Set an IP address manually for the adapter (Ethernet 1) on GuestOS1.

   For details on how to start guest OS, refer to the manual of Hyper-V.
   For details on how to set IP addresses, refer to the manual of OS.

10. Register the virtual adapter sha0 to GuestOS2 as VLAN ID3.

    For details on how to register, refer to step 8 and 9.

11. Set the scripts for Hyper-V.

```
> copy "<GLS Installation Folder>\usr\script\adapter\hyperv.sam" "<GLS Installation
Folder>\usr\script\adapter\sha0.bat"
```

    For details, see "B.3.2.2 Restarting the Transmission for Network Switching."

Information

. . . .

After starting the operation, if you deactivate GLS virtual adapter, delete the GLS virtual adapter from Hyper-V, and then execute the stphanet command.

. . . .

B.5.2 When Installing GLS in Guest OS

This configuration is suitable for duplicating network adapters by installing GLS into a guest OS with Hyper-V.

Configuration

Figure B.8 Configuration with GLS Installed Guest OSes
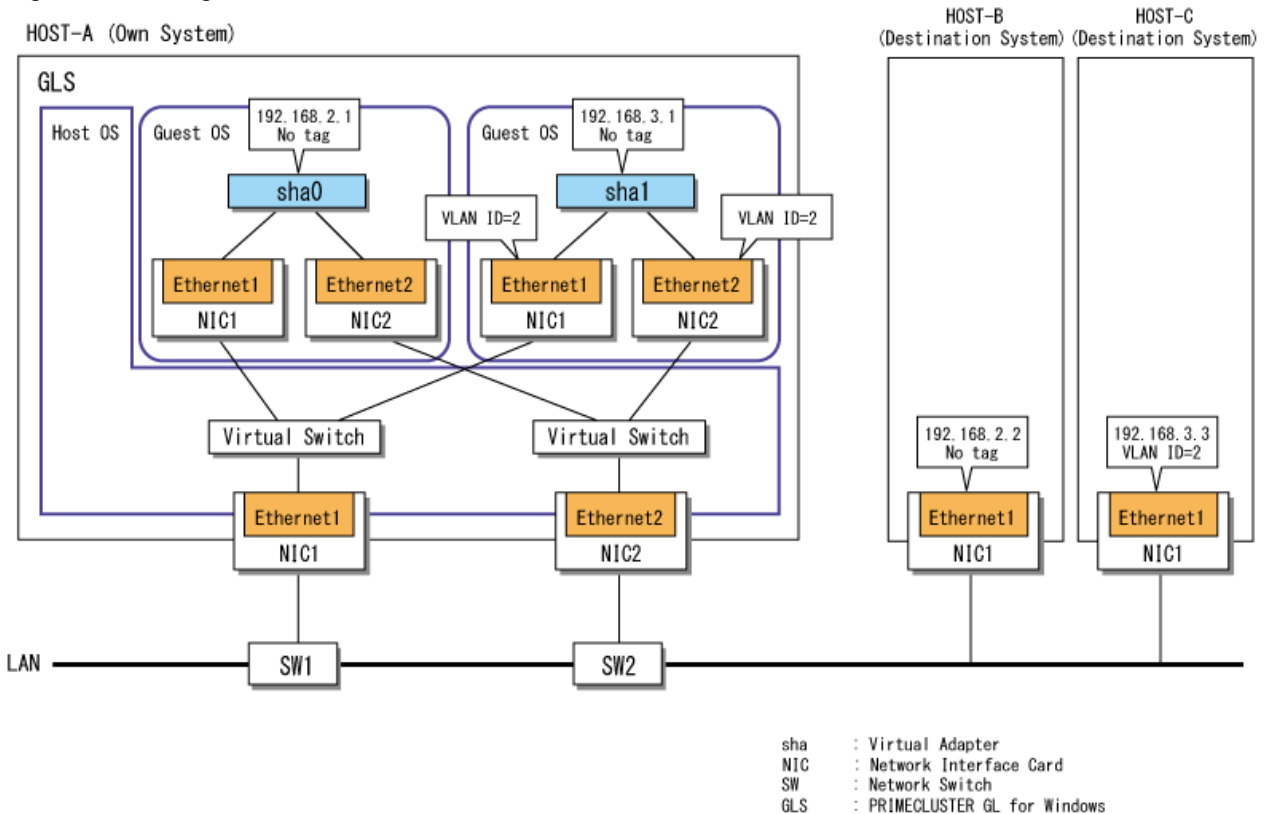
Setting procedure

The setting procedure is the same as that of a physical server.

For details, see "A.1.1 Configuration with a Single Virtual Adapter" or "A.1.2 Configuration with Two Virtual Adapters."

🖐 Note

- Check [Enable spoofing of MAC addresses] when creating a network adapter bundled by GLS with Hyper-V Manager.

- Since the link status of a physical adapter on the host OS is not sent to a guest OS with Hyper-V, the link status cannot be monitored. Therefore, you must set ping monitoring for each guest OS.

📘 Information

For tagged VLAN connection, specify the VLAN ID in the setting of a network adapter for a guest OS. You do not need to set VLAN ID for the GLS virtual adapter.

Appendix C Operation on VMware

This appendix describes the operation of GLS on VMware. For details on VMware, see the VMware documentation.

C.1 VMware Overview

VMware is a product offered by VMware, Inc., which achieves server virtualization. Server virtualization enables you to consolidate multiple servers on one server.

C.2 Configuration of VMware

In a VMware environment, servers on which applications operate are consolidated as a guest OS of VMware. NICs of a guest OS are connected to ports on the virtual switch on the VMware host. A guest OS communicate with external devices via this virtual switch. Ports on the virtual switch are managed by VMware as a port group.

GLS operates on a guest OS of VMware. The reliability of the network used by user applications is enabled by bundling the ports on the virtual switch.
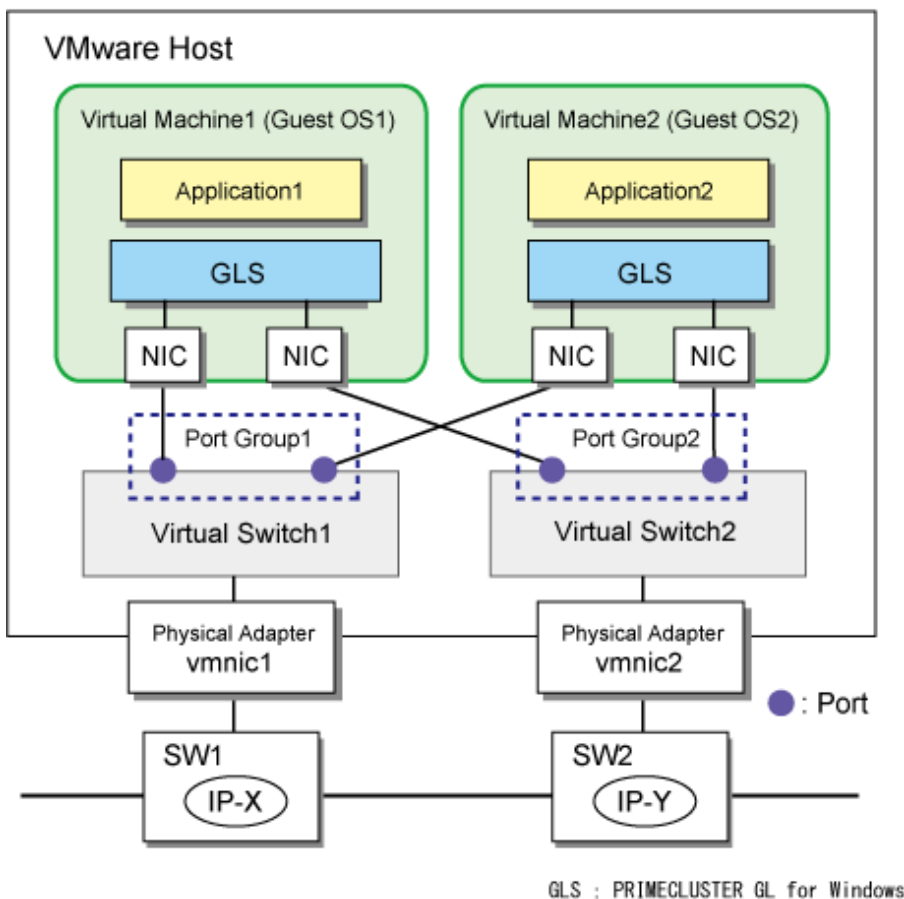
C.3 Virtual Network Design in VMware

C.3.1 Concept of Network Configuration in VMware

For a virtual network required for VMware, see the VMware documentation.

To make a redundant network by using GLS on a guest OS of VMware, ports bundled by GLS must be connected to different virtual switches. Therefore, as many virtual switches as ports bundled by GLS are required.

Information

. . . .

Only networks on guest OSes can be made redundant with GLS.

. . . .

Note

. . . .

Set [Accept] to [Promiscuous Mode] under [Security] for the virtual switch used by GLS.

. . . .

C.4 GLS Operation on VMware

This section describes how to monitor the GLS network for the virtual network configuration of VMware and how to switch to a normal network when a network failure occurs.

C.4.1 Configuration for Creating a Highly Reliable Network on Guest OSes

This section describes the operation of the configuration to create a highly reliable network using guest OSes of VMware.
For the operation of GLS in VMware, there is no difference from the operation on a physical server.

GLS on a guest OS performs ping monitoring for SW1 placed outside the server. If a failure occurred on SW1, GLS switches the path from the primary adapter (NIC1) to the secondary adapter (NIC2) to keep connection. In addition, vmnic2 becomes the operational adapter after the connection is switched to NIC2. Then, ping monitoring is performed for SW2 via the virtual switch 2 and the operational adapter (vmnic2).

Figure C.1 Configuration for Creating a Highly Reliable Network on Guest OSes
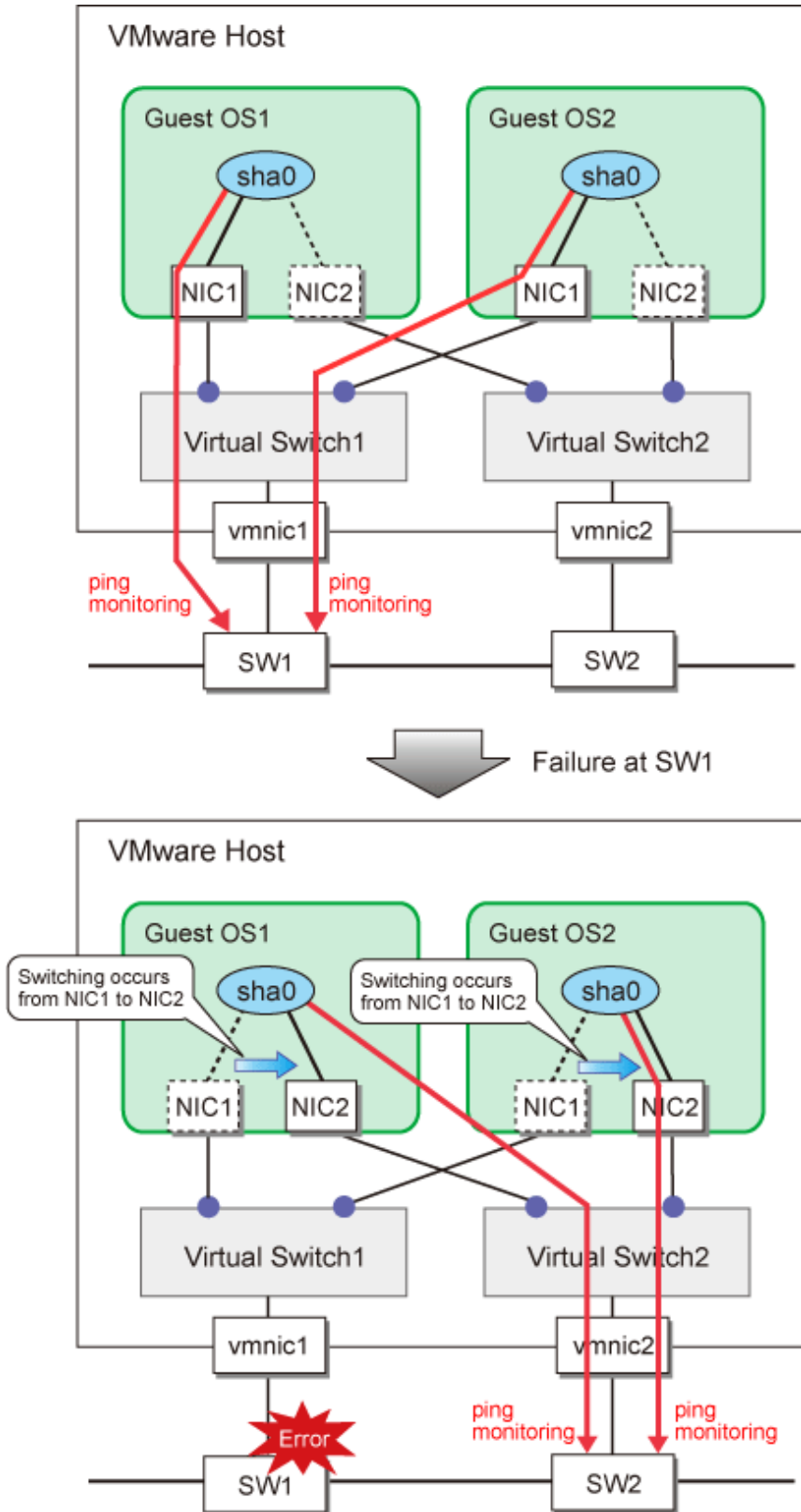
![Note]
Note

- Since the link status of a physical adapter on the host OS is not sent to a guest OS with VMware, the link status cannot be monitored. Therefore, you must set ping monitoring for each guest OS.

- For tagged VLAN connection, set the VLAN ID for a port group of VMware. You do not need to set VLAN ID for the GLS virtual adapter.

- When using the -a option of the hanetconfig create in a VMware environment, do not make the following settings. You do not need to use the -a option usually.

  - Specify "phy" for the -a option.

  - Specify the MAC address used by virtual networks on VMware for the -a option.

C.5　Setup Procedure for GLS in Virtual Machines

According to the VMware documentation, configure guest OSes or virtual switches. After installing GLS on guest OSes, perform the same procedure as that of physical servers for configuration.

C.6　Examples of Configuration Setup

C.6.1　Setup Example for Creating a Highly Reliable Network of Guest OSes

This section describes a configuration setup example for the following network configuration.
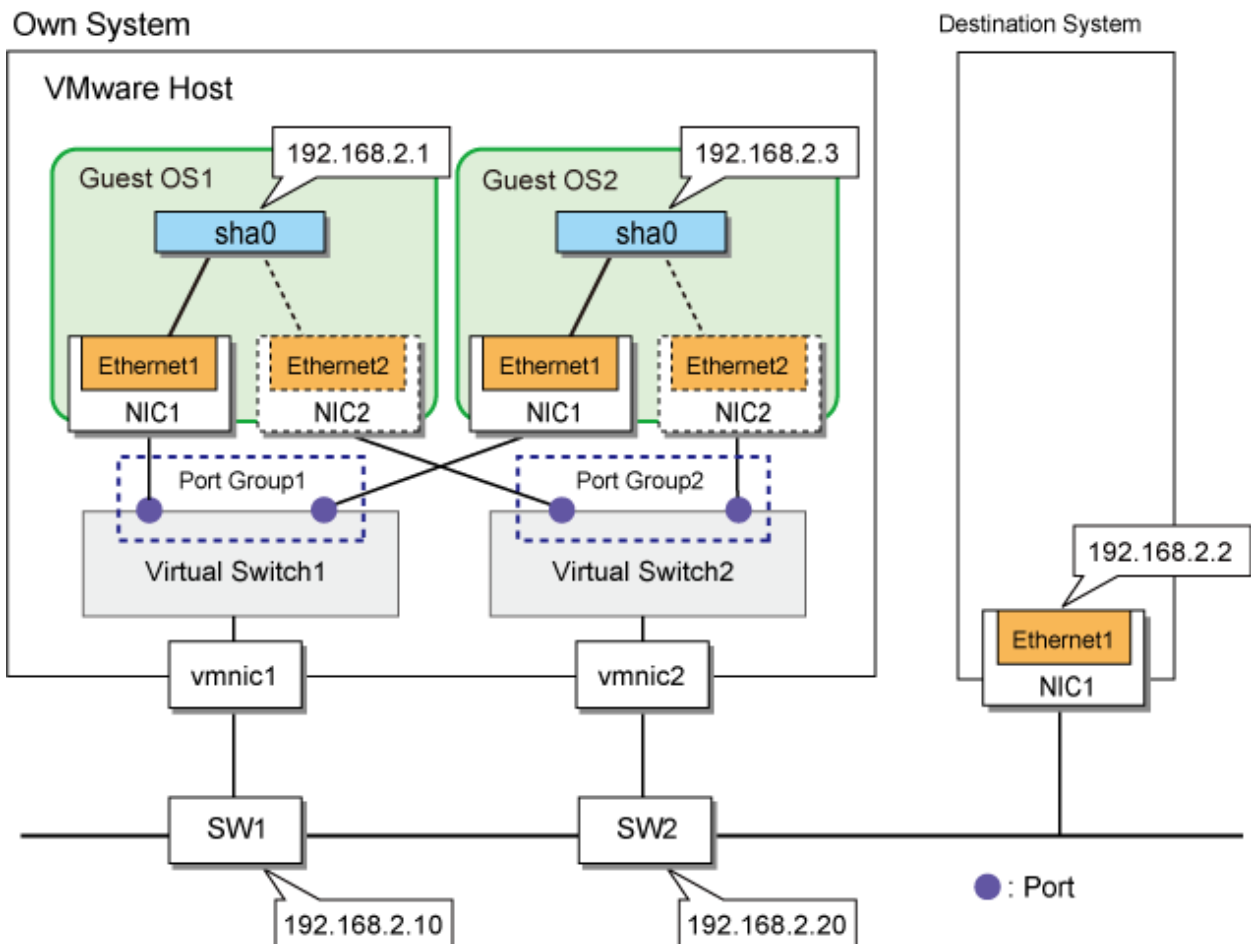
Setting up VMware host

Set up each adapter of guest OSes (NIC1 and NIC2) so that they are connected to ports of different virtual switches.

Moreover, set [Accept] to [Promiscuous Mode] under [Security] for each virtual switch.

Setting up the guest OS1 and the guest OS2

Setting up GLS is the same as for physical servers. See "A.1.1 Configuration with a Single Virtual Adapter" or "A.1.2 Configuration with Two Virtual Adapters."

If you use GLS on a guest OS in VMware, you must restart the guest OS after completing the GLS setup.

Appendix D Message Reference

This appendix describes the different types and formats of message output in GLS as well as the user response required for each.

D.1 Overview of Messages

Two types of message are output in GLS:

- Messages output to the command prompt

- Messages output to the event log.

This section lists and describes the types, destination, and format of output messages for each component.

D.1.1 Message Type and Output Destination

The following three types of message are output:

- Information

- Warning

- Error

These messages are output to the destinations listed in the table below.

Table D.1 Message Type and Output Destination

Type	Output to
Message output from commands	Command prompt (standard output / standard errors)
Message output from demon	System event log

D.1.2 Message Format

This section lists and describes the format of messages according to the destination to which they are output.

Messages Output to the Command Prompt

The format of messages output to the command prompt is as follows:

```
FJSVhanet:_Error Type:_Message ID:_Message Text
```

Note: The underbars (_) represent blank spaces.

Error Type

The types of message output to the command prompt are as follows:

Table D.2 Command Error Types

Error Type	Meaning	Code
INFO	Information	0
WARNING	Warning	1
ERROR	Error	2

Message ID

The message ID is a five-digit number comprising a single-digit code indicating the error type, followed by a four-digit message number, as follows:

```
ABBBB
```

A: Code

B: Message Number

Message Text

The message text gives a brief description of why the message was output.

Sample Output

The samples below show the types of message displayed in the command prompt.

```
FJSVhanet: INFO: 00000: The command ended normally.
FJSVhanet: WARNING: 10000: Configuration is not complete.
FJSVhanet: ERROR: 29999: An internal API failed.
```

Messages Output to the Event Log

The format of messages output to the event log depends on the event viewer.

The types of message that are output are as follows:

Table D.3 Event Log Error Types

Error Type	Meaning
INFO	Information
WARNING	Warning
ERROR	Error

D.2 Messages Output to the Command Prompt

This section lists and describes the messages output to the command prompt.

D.2.1 Code Type 0 Messages (INFO)

The table below lists and describes the information messages (code type 0) output to the command prompt.

Table D.4 Information Messages

Message ID	Message Text	Meaning	User Response
00000	The command ended normally.	The command was successfully executed.	-
00001	This virtual adapter is being activated.	This virtual adapter is in the process of being activated.	-
00002	This virtual adapter is already activated.	This virtual adapter has already been activated.	-
00003	This virtual adapter is already deactivated.	This virtual adapter has already been deactivated.	-
00004	This virtual adapter is being deactivated.	This virtual adapter is in the process of being deactivated.	-
00005	The ping monitoring stopped.	Ping monitoring stopped.	-
00006	The ping monitoring started.	Ping monitoring started.	-

Message ID	Message Text	Meaning	User Response
00007	Start the ping monitoring using the hanetpoll command if needed.	If necessary, start ping monitoring by executing the hanetpoll command.	-
00008	This service is already installed.	This service is already installed.	-
00009	This service is already uninstalled.	This service is already uninstalled.	-
00010	This service has been marked for deletion.	This service is in the process of being deleted.	-
00011	Cannot start ping monitoring because virtual network adapters are not activated.	Cannot start ping monitoring because virtual adapters are not activated.	Please activate the virtual adapters.
00012	Start the user script.	The adapter setting script has been started.	-
00013	The user script ended. (return code=code,file name=fname)	Execution of the adapter setting script is completed. code: return code of the script fname: script file name	-
00014	The service is not running.	The service is not running.	-
00015	Executing the user script.	Executing the adapter setting script.	-
00016	Hyper-V is not installed on this system.	Hyper-V is not installed on this system.	Install Hyper-V.
00017	The virtual adapter is paused.	The GLS virtual adapter is paused.	-
00018	The paused virtual adapter is activated. Activate other virtual adapters if needed.	The paused state of the GLS virtual adapter is cleared.	Activate virtual adapters in the inactive state using the strhanet command if needed.

GLS: PRIMECLUSTER GL for Windows

D.2.2 Code Type 1 Messages (WARNING)

The table below lists and describes the warning messages (code type 1) output to the command prompt.

Table D.5 Warning Messages

Message ID	Message Text	Meaning	User Response
10000	Configuration is not complete.	The required settings have not been made. This means that the attempted operation cannot be carried out.	Try again after making the required settings.
10001	Failed to set the name of the virtual adapter. (correct=vname1,current=vname2)	Failed to set the name of the virtual adapter. vname1: correct name of the virtual adapter vname2: current name of the virtual adapter	Deactivate the virtual adapter using the stphanet command, then try again.

D.2.3 Code Type 2 Messages (ERROR)

The table below lists and describes the error messages (code type 2) output to the command prompt.

Table D.6 Error Messages

Message ID	Message Text	Meaning	User Response
20000	The command was executed by a user other than an administrator.	The command was executed by a user who is not a member of the "Administrators" group.	Log in as a member of the "Administrators" group, then execute the command.
20001	The number of defined virtual network adapters exceeds the maximum limit.	The number of virtual adapters defined by the -n option of the hanetconfig command exceeds the maximum allowed value.	Check the number of defined virtual adapters. The maximum number of virtual adapters that you can specify is 16. For more details, refer to "1.3 System Requirements for GLS."
20002	The specified physical network adapter does not exist. (-t adapter) : pname	The physical adapter specified in the option of the command cannot be found. pname: physical adapter name	Check that the adapter name is correct and try again. If necessary, link the adapter to TCP/IP and try again. Else, if you have specified an adapter that is bundled in a currently active virtual adapter, deactivate that virtual adapter and try again.
20003	The specified virtual network adapter name is already in use. (-n vadapter) :vname	You cannot specify this name for the virtual adapter because a virtual adapter of the same name already exists. vname: virtual adapter name	Specify a different name.
20004	The specified virtual adapter name does not exist. (-n vname)	No virtual adapter of the specified name exists. The operation cannot be executed. vname: virtual adapter name	Check that the name is correct, then try again.
20005	The specified VLAN ID is incorrect.	The specified VLAN ID is not valid.	Check that the VLAN ID is correct and try again. Note that the valid range for VLAN IDs is 1 through 4095. For more details, refer to "1.3 System Requirements for GLS."
20006	The specified physical network adapter is already in a partial share with another virtual network adapter. (-t adapter) : pname (vadapter) : vname	The specified physical adapter is already in a partial share with another virtual adapter. pname: physical adapter name vname: virtual adapter name	Specify a different physical adapter.
20007	An identical physical adapter was specified.	The specified physical adapter is already specified for this virtual adapter.	You cannot bundle identical physical adapters in a virtual adapter. Specify a different physical adapter.
20008	A virtual adapter with the same VLAN ID is already configured. (-v vlanid) : vlan (vadapter) : vname	A virtual adapter with the same VLAN ID is already set. vlan: specified VLAN ID vname: virtual adapter name	Set a unique VLAN ID for the virtual adapter to be additionally defined, then try again.

Message ID	Message Text	Meaning	User Response
20009	Cannot start the operation because configuration is not complete.	Cannot start the operation because configuration is not complete.	Finish making settings using the hanetconfig command, then try again.
20010	Cannot start the operation because GLS is already installed.	Cannot start the operation because GLS is already installed.	-
20011	Cannot start the operation because the virtual adapter is being activated.	You cannot execute this operation because the virtual adapter is being activated.	Deactivate the virtual adapter using the stphanet command, then try again.
20012	The specified parameter value is incorrect. (detail)	The specified parameter value is incorrect. detail: specified parameter value, values or formats you can specify, etc.	Refer to "Chapter 6 Command Reference," then try again.
20013	Failed to communicate with the driver.	Failed to communicate with the GLS driver.	Check that the GLS driver is installed and try again. For more details, refer to "E.2.8 Error Message 20013 is displayed."
20014	Failed to get information from the registry.	Failed to get GLS setting information from the registry.	Try again. If the error repeats, delete the GLS settings then try again.
20015	Failed to write to the registry.	Failed to write GLS settings to the registry.	Try again. If the error repeats, delete the GLS settings then try again.
20016	Cannot start the operation because the virtual adapter is activated.	You cannot execute this operation because the virtual adapter is being activated.	Deactivate the virtual adapter using the stphanet command, then try again.
20017	Cannot start the operation because the virtual adapter is being deactivated. (-n vadapter) : vname	You cannot execute this operation because the virtual adapter is deactivated. vname: virtual adapter name	Deactivate the virtual adapter using the stphanet command, then try again.
20018	Failed to activate. Execute the stphanet command.	Failed to activate. Execute the stphanet command.	Deactivate the virtual adapter using the stphanet command, then try again.
20019	Failed to deactivate. Re-execute the stphanet command.	Failed to deactivate. Re-execute the stphanet command.	Try again.
20020	Failed to activate. Re-execute the strhanet command.	Failed to activate.	Retry activation.
20021	Some virtual network adapter is activated.	You cannot execute this operation because some virtual adapters are activated.	Deactivate the virtual adapters using the stphanet command, then try again.
20022	The specified mac address is already in use. (-a macaddr) : mac	You cannot specify this MAC address for the virtual adapter because another virtual adapter is already using the same MAC address. mac: specified MAC address	Check the MAC address setting by executing the print subcommand of the hanetconfig command, then specify a different MAC address. For more details, refer to "6.2.2.3 print."
20023	The ping monitoring is not configured.	No settings have been made for ping monitoring.	Make the required settings using the hanetpoll command.

Message ID	Message Text	Meaning	User Response
20024	The ping monitoring is already executed.	Ping monitoring is already started.	-
20025	The ping monitoring is already stopped.	Ping monitoring is already stopped.	-
20026	The specified IP address is invalid. (-p xxx.xxx.xxx.xxx) : IP	The specified IP address is invalid. IP: specified IP address	Specify a valid IP address.
20027	The specified ping monitoring target is already configured. (-p ping_target) : pollip	The specified ping monitoring target has already been specified. pollip: monitored IP address	Specify a different ping monitoring target.
20028	The specified ping monitoring target does not exist.	The specified ping monitoring target does not exist.	Check if the specified ping monitoring target is already specified by executing the print subcommand of the hanetpoll command. For more details, refer to "6.2.5.3 print."
20029	The product of the interval and the number of times to monitor exceeds 300 seconds.	The product of the ping interval and the number of pings exceeds 300.	Change the ping interval and the number of pings settings so that their product does not exceed 300.
20030	Cannot change settings while the ping monitor function is running.	You cannot change ping monitor settings while the ping monitor function is running.	Stop the ping monitor function by executing the hanetpoll command, then change the settings.
20031	The number of IP addresses to be monitored for a physical adapter exceeds the maximum limit of 3.	The number of IP addresses set within the same IP address list exceeds the maximum.	The number of ping target IP addresses that can be set within the same IP address list is limited to 3. Revise the ping target settings so that this maximum is not exceeded.
20032	The number of IP address lists to be monitored for a physical adapter exceeds the maximum limit of 3.	The number of IP address lists set for the same physical adapter exceeds the maximum.	The number of IP address lists that can be set per physical adapter is limited to 3. Revise the ping target settings so that this maximum is not exceeded.
20033	The adapter was switched because the ping monitor detected a failure.	The adapter was switched because the ping monitor function detected a network failure.	Execute the dsphanet command to check the status of the monitor target in which the failure was detected.
20034	The ping monitor detected a failure.	The ping monitor function detected a network failure.	Execute the dsphanet command to check the status of the monitor target in which the failure was detected.
20035	The adapter was restored.	The adapter is restored.	-
20036	Cannot operate the specified file.	Cannot operate the specified file.	Make sure that the specified file exists, then try again.
20037	The specified backup file is invalid.	The specified backup file is invalid.	Specify the backup file with the hanetbackup command, then try again.
20038	The primary adapter and the secondary adapter are the same.	The primary adapter and the secondary adapter are the same.	Specify different primary and secondary adapters, then try again.

Message ID	Message Text	Meaning	User Response
20039	The number of bundled physical adapter exceeds the maximum limit. (-n vname)	The number of bundled physical adapter s exceeds the maximum limit. vname: virtual adapter name	Specify no more than two physical adapters to be bundled in a virtual adapter.
20040	Cannot switch adapter because virtual adapter bundles only one adapter. (-n vname)	Cannot switch adapters because virtual adapter bundles only one physical adapter. vname: virtual adapter name	Check the amount of defined physical adapters.
20041	Cannot switch adapter because standby adapter does not exist. (-n vname)	Cannot switch adapters because there is no standby adapter. vname: virtual adapter name	Run the dsphanet command to check physical adapter statuses.
20042	Cannot delete settings while the ping monitor function is configured. Cannot delete settings while the ping monitor function is configured. (-t pname)	Cannot delete settings while ping monitoring is active. pname: physical adapter name	Deactivate ping monitoring before you can delete the settings.
20043	The service does not exist.	The service does not exist.	Check that the GLS service is displayed on the service screen of the administrator tool.
20044	Failed to control the service.	Failure of the service controller.	Check the Service screen of the administrator tool for the GLS service status. Then, try to run the command again.
20045	The service is not running.	The service is not running.	Retry after starting the GLS service.
20046	Failed to communicate with the service.	Failure in data communication with the service.	Check the Service screen of the administrator tool for the GLS service status. Then, try to run the command again.
20047	Failed to install the driver.	Failed to install the driver.	Close the Ethernet Properties screen, and then try to run the command again.
20048	Failed to uninstall the driver.	Failed to uninstall the driver.	Check that the driver is installed on the Ethernet Properties screen. Then, close the Properties screen and try to run the command again.
20049	The specified file does not exist.	The specified file does not exist.	Specify another file and try again.
20050	The specified directory does not exist.	The specified directory does not exist.	Specify another directory and try again.
20051	The virtual adapter is not configured. (-n vadapter) : vname	The virtual adapter is not configured. vname: virtual adapter name	Make settings for the virtual adapter and try again.
20052	The ping monitor configuration is incomplete. (vname)	The ping monitor function could not be started, because the corresponding configuration data are incomplete.	Check the ping monitor configuration data using the hanetpoll command, and make ping monitor settings for all

Message ID	Message Text	Meaning	User Response
		vname: virtual adapter name	physical adapters before you try again.
20053	The specified physical network adapter is already used by other virtual network adapters. (vadapter) : vname	The specified physical network adapter is already used by other virtual network adapters. vname: virtual adapter name	Specify another physical adapter. Note that a virtual adapter for Hyper-V cannot be shared with physical driver that is bundled by other virtual adapter.
20054	Virtual adapter for Hyper-V is not supported on this platform.	Virtual adapter for Hyper-V is not supported in this environment.	Create a virtual adapter other than virtual adapter for Hyper-V. Hyper-V supported environment is required to use commands and options for GLS' Hyper-V.
20055	The number of mac addresses exceeds the maximum limit.	The number of MAC addresses which can be specified exceeds the maximum limit.	The number of MAC addresses which can be specified at one time is limited to 128. Revise the settings so that this maximum is not exceeded.
20056	This command is not supported on this platform.	This command is not supported in this environment.	Check the environment.
20057	Cannot start the operation because operational adapter does not exist.	Cannot start the operation because operational adapter does not exist.	Run the dsphanet command to check physical adapter statuses.
20058	Cannot delete the specified physical adapter because it is not bundled in the virtual adapter. (-t adapter) : pname (vadapter) : vname	Cannot start the operation because the specified physical adapter is not bundled in the virtual adapter. pname: physical adapter name vname: virtual adapter name	Check that the physical adapter specified with the -t option is bundled in the virtual adapter specified with the -n option, referring to a result displayed by executing the print subcommand of the hanetconfig command.
20059	Cannot delete the physical adapter. (-t pname)	Cannot delete the specified physical adapter. pname: physical adapter name	When the virtual adapter bundles one physical adapter, you cannot delete the physical adapter. Check the number of physical adapters bundled in the virtual adapter, referring to a result displayed by executing the print subcommand of the hanetconfig command.
20060	Cannot delete the specified physical adapter because it is operational. (-t pname)	Cannot delete an operational physical adapter. pname: physical adapter name	For deleting an operational physical adapter, change the status of the adapter to standby with the change subcommand of the hanetnic command and then delete the adapter.
20061	Failed to add the physical adapter. Re-execute the hanetnic add command.	Failed to add the physical adapter to the virtual adapter.	Try again.
20062	Failed to delete the physical adapter. Re-execute the hanetnic delete command.	Failed to delete the physical adapter from the virtual adapter.	Try again.
20063	Cannot continue the process because the status	Cannot continue the process because the status of the virtual adapter is failure.	Deactivate the virtual adapter by executing the stphanet command, then try again.

Message ID	Message Text	Meaning	User Response
	of the virtual adapter is failure.		
20064	Failed to execute the command due to an internal error.	Failed to execute the command due to an internal error.	Try again. If the error repeats, restart the operating system, and then try again.
20065	Failed to add the physical adapter. Execute the hanetnic delete command.	Failed to add the physical adapter to the virtual adapter.	Delete the physical adapter from the virtual adapter with the delete subcommand of the hanetnic command, then try to add the physical adapter.
20066	Cannot set the physical MAC mode for the specified virtual adapter. (vadapter) : vname	Cannot set the MAC address of the primary adapter for the specified virtual adapter. vname: virtual adapter name	If the physical adapter is shared, you cannot set the MAC address of the primary adapter for multiple virtual adapters. Review the settings.
20067	Cannot start the operation because the virtual adapter is paused.	Cannot start the operation because the virtual adapter is paused.	Deactivate the virtual adapter by using the stphanet command, then try again. If this message is displayed when the -n option is specified with the strhanet command, try again without specifying the -n option.
20068	Cannot delete the specified physical adapter because it is the operational adapter of another virtual adapter.	Cannot delete the specified physical adapter because it is the operational adapter of another virtual adapter.	Specify another physical adapter, then try again.
20069	Cannot start the operation because the virtual adapter is not activated.	Cannot start the operation because the GLS virtual adapter is not activated.	Activate the GLS virtual adapter, then try again.
29998	Failed to communicate between components.	Failed to communicate between components.	Collect materials for examination of GLS, and tell field engineers an error message. For details on collecting diagnostic data, refer to "6.4.1 hanet_snap."
29999	An internal API failed.	An internal API failed.	Execute the stphanet command to forcibly stop the virtual adapter.

GLS: PRIMECLUSTER GL for Windows

D.3 Messages Output to the Event Log

This section lists and describes the messages output to the event log.

D.3.1 Information Messages (INFO)

The table below lists and describes the information messages output to the event log.

Table D.7 Information Messages

Event ID	Message Text	Meaning	User Response
1000	The virtual network adapter was generated.	The virtual adapter was generated.	-
1001	The virtual network adapter was deleted.	The virtual adapter was deleted.	-
1002	The virtual network adapter linked up.	The virtual adapter linked up.	-
1003	The physical network adapter linked up. (physical adapter=pname)	The physical adapter linked up. pname: physical adapter name	-
1004	The adapter was restored.	The adapter was restored.	-
1005	The service started.	The service started.	-
1006	The service stopped.	The service stopped.	-
1007	The service suspended.	The service was suspended.	-
1008	The service restarted.	The service restarted.	-
1009	The ping monitor started.	The ping monitor function started.	-
1010	The ping monitor stopped.	The ping monitor function stopped.	-
1011	The operational adapter of virtual adapter was switched from physical adapter to physical adapter. (virtual adapter=vname , from=pname1 , to=pname2)	Switching of operational adapters in virtual adapter is completed. vname: virtual adapter name pname1: physical adapter before switching pname2: physical adapter after switching	-
1012	Recovered to communicate with IP addresses to be monitored. (pname,IP=pollip,IPLIST =polliplist)	Recovered to communicate with the IP address of the ping monitor target. pname: physical adapter name pollip: monitored IP polliplist: IP address list	-

D.3.2 Warning Messages (WARNING)

This section lists the warning messages output to the event log.

Table D.8 Warning Messages

Event ID	Message Text	Meaning	User Response
2000	The virtual network adapter linked down.	The virtual adapter linked down.	Check that the cables connecting the physical adapters bundled in the virtual adapter are correctly connected. Also check that the physical adapters are valid.
2001	The physical adapter linked down. (physical adapter=pname)	The physical adapter linked down.	Check that the cable connecting the physical adapter is connected.

Event ID	Message Text	Meaning	User Response
		pname: physical adapter name	
2002	Ping monitoring of physical adapters failed.	Ping monitoring of the physical adapter failed.	Check that the target network device and NIC are functioning correctly.
2003	Failed to communicate with IP addresses to be monitored. (pname,IP=pollip,IPLIST =polliplist)	Failed to communicate with the IP address of the ping monitor target. pname: physical adapter name pollip: monitored IP polliplist: IP address list	Check that the target network device and NIC are functioning correctly.

D.3.3 Error Messages (ERROR)

This section lists the error messages output to the event log.

Table D.9 Error Messages

Event ID	Message Text	Meaning	User Response
3000	A failure occurred in all adapters. (virtual adapter=vname)	A failure occurred in all adapters. vname: virtual adapter name	Check that the cables connecting the physical adapters bundled in the virtual adapter are correctly connected. Also check that the physical adapters are valid and that the target network device is functioning correctly.
3001	Failed to start the service.	Failed to start the service.	Try again. If the service still will not start, collect materials for examination of GLS, and tell field engineers an error message.
3002	Failed to stop the service.	Failed to stop the service.	Try again. If the service still will not stop, collect materials for examination of GLS, and tell field engineers an error message.

Appendix E Troubleshooting

This appendix describes known problems in GLS and explains how to respond to those problems. It also includes information on what diagnostic data to collect, and how to collect it, in case you need to contact field engineers regarding a problem.

E.1 During Installation

This section describes problems known to occur during installation and setup of GLS, and gives information on their cause and how to deal with them.

E.1.1 Cannot Communicate Using Virtual Adapters

Problem

Your system cannot communicate using the virtual adapters.

Cause

The cause may be one of the following:

- A virtual adapter has not been activated, or activation failed.

- There are duplicate IP addresses in the own or in the remote system.

- The MAC address is the same as the remote node.

Action

Follow the procedure below to check that the GLS and OS settings are correct.

1. Check the status of the virtual adapters by executing the dsphanet command.

   If the status of any virtual adapter remains "Inactive" even though you executed the strhanet command, execute the stphanet command to deactivate all virtual adapters and then re-execute the strhanet command.

2. Check that there are no duplicate IP addresses of any GLS virtual adapter in the own system.

   Use the following methods to check the IP addresses:

   - Execute the ipconfig command to check IP addresses of the own system virtual adapters.

   - Execute the netsh command to check IP addresses of the own system virtual adapters and physical adapters.

   - Open [Windows Settings]-[Network Connections] window to check all IP addresses in use in the own system.

3. Check that there are no duplicate IP addresses of any GLS virtual adapter in remote servers or network devices.

   For details on how to check the IP addresses, refer to the relevant manual of the server's operating system or the network device.

4. Check that there are no duplicate MAC addresses in the remote node.

   In GLS, GLS virtual adapter MAC addresses are generated automatically.

   You can check the virtual adapter MAC addresses of the own system by executing the print subcommand of the hanetconfig command with the -d option, then cross-check with the MAC addresses of the remote system.
   For more details, refer to "6.2.2.3 print."

   If the address is a duplicate, change it. For more details, refer to "5.2.5 Changing the MAC Address of a Virtual Adapter."

   Note that, in most cases, it is unlikely for an automatically generated MAC address to have a duplicate in a remote system.

E.1.2 Loss of Communication After Replacing the Cable Due to Failure in the Transmission path
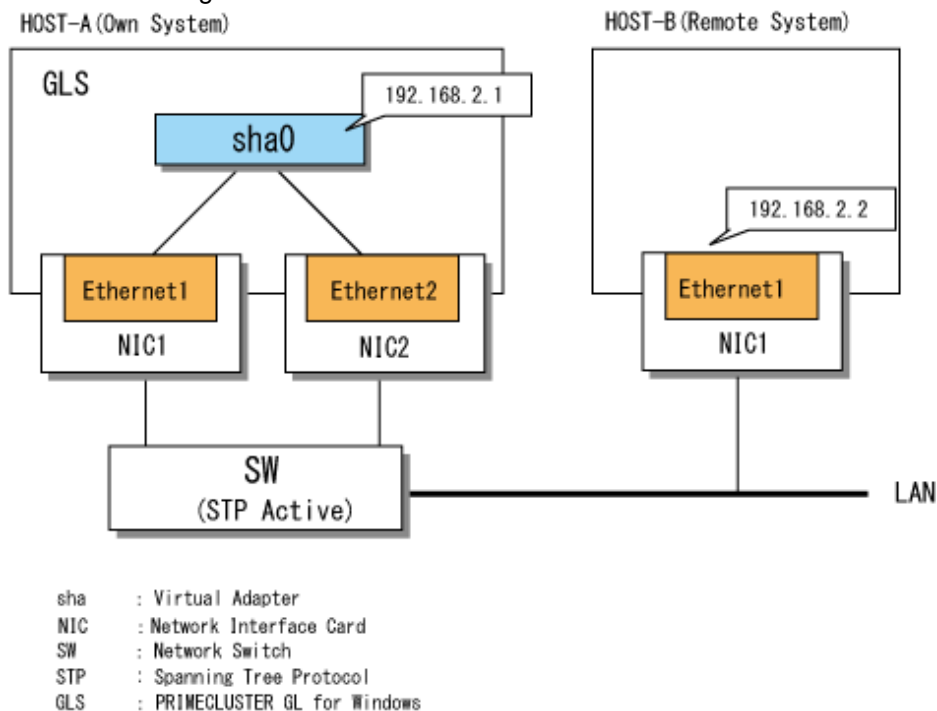
Problem

Loss of communication after replacing the cable due to failure in the transmission path.

Cause

When Spanning Tree Protocol (STP) is set for the network switch, replacing the cable due to failure in the transmission path can cause a temporary loss of communication.

Figure E.1 STP Settings


```
sha   : Virtual Adapter
NIC   : Network Interface Card
SW    : Network Switch
STP   : Spanning Tree Protocol
GLS   : PRIMECLUSTER GL for Windows
```

Action

If you wait for 1 or 2 minutes, communication should recover by itself, so then you can try again.

E.1.3 The Primary Adapter Does Not Becomes the Operational Adapter

Problem

After restarting the operating system, the primary adapter does not become the operational adapter even if the virtual adapter is activated with the strhanet command.

Cause

If the driver software for the physical adapter is old, this problem may occur.

Action

Restart the operating system.

Moreover, installation of updates through Windows Update is recommended.

E.1.4 A Physical Adapter in the Standby State Cannot be Changed to the Active State

Problem

A physical adapter in the standby state cannot be changed to the active state.

Cause

If the driver software for the physical adapter is old, this problem may occur.

Action

Restart the operating system.

Moreover, installation of updates through Windows Update is recommended.

E.1.5   netsh cannot assign IP address

Problem

The IP address cannot be assigned by the script even when the virtual adapter is activated by the strhanet command.

Cause

"DHCP Client" service might stop.

Action

Start "DHCP Client" service if it stopped.

"DHCP Client" service is necessary for adding the IP address by the netsh command.

E.2   Problems during Operation

This section describes problems known to occur during operation of GLS, and gives information on their cause and how to deal with them.

E.2.1   Switch Repeats Linkup/Linkdown

Problem

Linkup and linkdown messages (Category: INFO, Event ID: 1003/Category: WARNING, Event ID: 2002) appear alternately at short intervals in the event log. Alternatively, the results of executing the dsphanet command show "FAIL" and "ON" alternately in the Adapters field.
This problem denotes instability in the GLS virtual adapter communications.

Cause

There may be a defect in the NIC, network cable, or network switch.

Action

Check the NIC, network cable, and network switch for defects. If necessary, replace any defective items.
For important information on replacing an NIC or network switch, refer to "5.5 Responding to Problems."

E.2.2   Linkdown between Switch and Adapter

Problem

A physical adapter linkdown message (Category: WARNING, Event ID: 2002) appears in the event log. Alternatively, the results of executing the dsphanet command show "FAIL" in the Adapters field.

Cause

There may be a defect in the NIC, network cable, or network switch.

Action

Check the NIC, network cable, and network switch for defects. If necessary, replace the defective item.
For important information on replacing an NIC or network switch, refer to "5.5 Responding to Problems."

Note that when the GLS monitor function detects a failure in a transmission path, the switch function automatically switches the operational adapter and continues communication

E.2.3　Communications Fail even after Replacing NIC

Problem

You still experience a failure in the transmission paths even after replacing the NIC.

Cause

NIC replacement may have disabled recognition of the physical adapters bundled together in the virtual adapters.

Action

Check the existence of adapters by following the procedure below, and then restore the transmission path.

1. Check that the adapters exist.

   Check the physical adapter which has an error by using the dsphanet command.

   - If there is a physical adapter whose status is "FAIL":

     Using the Properties of the Internet Protocol (TCP/IP), check whether any physical adapters where an error such as linkdown occurs exist. You should also check the network switches for errors.

     ```
     > dsphanet
      Name     Status   Adapters
     +-------+--------+------------------------------------------------------------+
      sha0    Active   Ethernet 1(ON), Ethernet 2(FAIL)
     ```

   - If there is a physical adapter whose status is "OFF":

     The adapter name might be changed after replacement of the physical adapter. Check that the physical adapter name after replacement is different from the name defined in GLS setting in the [Network Connections] window. In this case, go to step 2.

     ```
     > dsphanet
      Name     Status   Adapters
     +-------+--------+------------------------------------------------------------+
      sha0    Active   Ethernet 1(ON), Ethernet 2(OFF)
     ```

2. Install the physical adapter after replacement into the GLS virtual adapter.

   1. Stop the ping monitor function.

      Execute the off subcommand of the hanetpoll command.

      ```
      > hanetpoll off
      ```

      Check that the ping monitor function is stopped.

      Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters is "-."

      ```
      > dsphanet -r
      [sha0]
       Adapters                        Resources
      +-------------------------------+--------------------------------------------+
       Ethernet 1(ON)                  LINK(O)
      ```

```
                                        PING(-)
                                         192.168.2.10(-),192.168.2.20(-)
  Ethernet 2(OFF)                        LINK(-)
                                        PING(-)
                                         192.168.2.10(-),192.168.2.20(-)
```

2. Back up the information of the ping monitor target set for the physical adapter.

Check that there is no file storing the information of the ping monitor target.

```
> dir /b C:\glspollbackup
File Not Found
```

Save the information of the ping monitor target to a file.

Use the print subcommand of the hanetpoll command.

```
> hanetpoll print > C:\glspollbackup
```

3. Delete the information of the ping monitor targets.

Delete the information of the ping monitor target set for the physical adapter in the "OFF" state, which was checked in step 1 of Action.

Use the delete subcommand of the hanetpoll command.

```
> hanetpoll delete -t "Ethernet 2"
```

Check that no ping monitor targets are set.

Use the print subcommand of the hanetpoll command.

```
> hanetpoll print
Polling Status       = OFF
       interval(idle) =   3( 60) sec
       times         =   5 times
 Adapter                       Fo  Target ip
+------------------------------+---+----------------------------------------+
 Ethernet 1                    YES 192.168.2.10,192.168.2.20
```

4. Delete the information of the physical adapter in the "OFF" state, which was checked in step 1 of Action, from the definition data for the virtual adapter.

Use the delete subcommand of the hanetnic command.

```
> hanetnic delete -n sha0 -t "Ethernet 2"
```

Check that the physical adapters in the "OFF" state are not bundled in the virtual adapter.

Execute the dsphanet command.

```
> dsphanet
 Name     Status    Adapters
+-------+--------+-------------------------------------------------------------+
 sha0     Active    Ethernet 1(ON)
```

5. Install the physical adapter after replacement into the definition data for virtual adapters.

   Execute the add subcommand of the hanetnic command.

   The physical adapter name after replacement is "Ethernet 3" in the following example:

```
> hanetnic add -n sha0 -t "Ethernet 3"
```

   Check that the physical adapter after replacement is bundled in the virtual adapter.

   Use the dsphanet command.

```
> dsphanet
 Name     Status    Adapters
+-------+--------+-----------------------------------------------------------+
 sha0     Active    Ethernet 1(ON),Ethernet 3(STBY)
```

6. Set the ping monitor target for the installed physical adapter.

   1. Display the contents of the file saved in step 2 and check the information of the ping monitor target to be set.

```
> type C:\glspollbackup
Polling Status         = OFF
        interval(idle) =   3( 60) sec
        times          =   5 times
 Adapter                        Fo  Target ip
+-----------------------------+---+------------------------------------+
 Ethernet 1                     YES 192.168.2.10,192.168.2.20
 Ethernet 2                     YES 192.168.2.10,192.168.2.20
```

   2. Set the ping monitor target for the physical adapter.

      Use the create subcommand of the hanetpoll command.

```
> hanetpoll create -t "Ethernet 3" -p 192.168.2.10,192.168.2.20
```

   3. Check that the information of the ping monitor targets is set.

      Use the print subcommand of the hanetpoll command.

```
> hanetpoll print
Polling Status         = OFF
        interval(idle) =   3( 60) sec
        times          =   5 times
 Adapter                        Fo  Target ip
+-----------------------------+---+-------------------------------------+
 Ethernet 1                     YES 192.168.2.10,192.168.2.20
 Ethernet 3                     YES 192.168.2.10,192.168.2.20
```

7. Start the ping monitor function.

   Use the on subcommand of the hanetpoll command.

```
> hanetpoll on
```

   Check that the ping monitor function is started.

   Execute the dsphanet command with the -r option and check that the ping monitor status of all physical adapters in "ON" state is "O."

```
> dsphanet -r
[sha0]
 Adapters                          Resources
+---------------------------+-------------------------------------------+
 Ethernet 1(ON)                    LINK(O)
                                   PING(O)
                                    192.168.2.10(O),192.168.2.20(O)
 Ethernet 3(STBY)                  LINK(O)
                                   PING(-)
                                    192.168.2.10(-),192.168.2.20(-)
```

E.2.4 The Virtual Adapter Links Down

Problem

The virtual adapter links down.

Cause

If all of the transmission paths bundled in the virtual adapter link down, the virtual adapter itself links down. When this happens, the TCP/IP applications using the virtual adapter for communication are disconnected and communication is terminated.

This is the standard behavior for physical adapters in Windows operating systems. GLS follows the Windows pattern.

Figure E.2 Relation between Physical/Virtual Adapter Linkdown and TCP/IP Connections
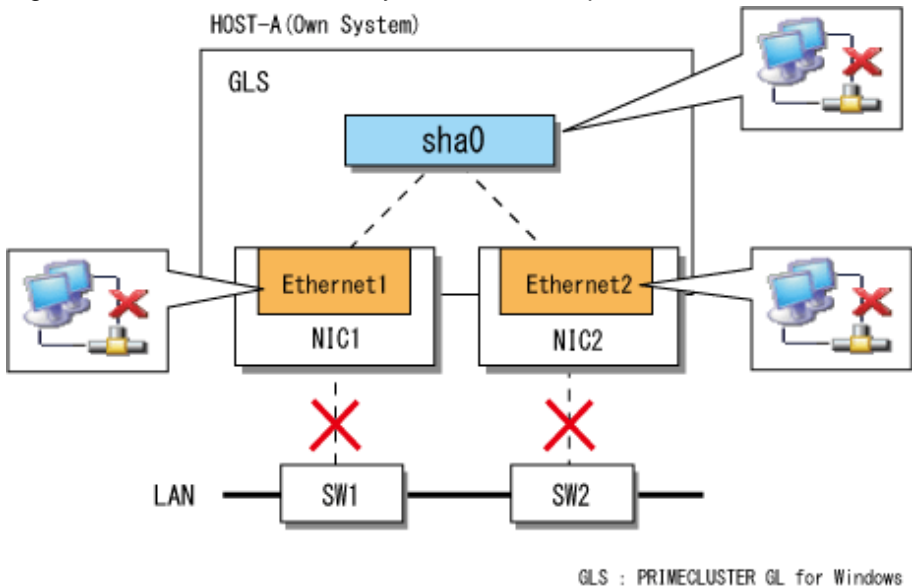
Action

Restart communication in the higher level applications after the transmission path is restored.

E.2.5 Executing strhanet does not Activate Virtual Adapters

Problem

One or more virtual adapters are not activated when you execute the strhanet command.

Cause

The system may be overloaded.

Action

Deactivate all virtual adapters by executing the stphanet command, then execute the strhanet command again.

E.2.6　Cannot Execute strhanet or stphanet

Problem

Execution of either the strhanet or stphanet command has failed.

Cause

Execution of the strhanet and stphanet commands may fail, if the network properties window is open.

Action

Close the network properties window and try again. If the error repeats, try again following the instructions in the displayed error message. If this does not solve the problem, collect GLS diagnostic data then contact field engineers.

E.2.7　Ping Monitoring Fails

Problem

The ping monitor function does not work.

Cause

The cause may be one of the following:

    a. Incorrect network route settings

    b. Target network device is stopped or is not running correctly

    c. Incorrect VLAN tag settings

    d. No VLAN tag setting in the network device

    e. Other

Action

Take action appropriate to the cause, as described below.

    a. **Incorrect network route settings**

        The ping monitor function may not work if any network adapters in the same system have the same network address.

The figure below shows a network configuration that consists of a GLS virtual adapter and a physical adapter that is not a part of the GLS system.
The IP address of the GLS virtual adapter is 192.168.1.1/24, and the IP address of the physical adapter is 192.168.1.2/24.

Figure E.3 Ping Monitoring Fails Due to Incorrect Network Route Settings
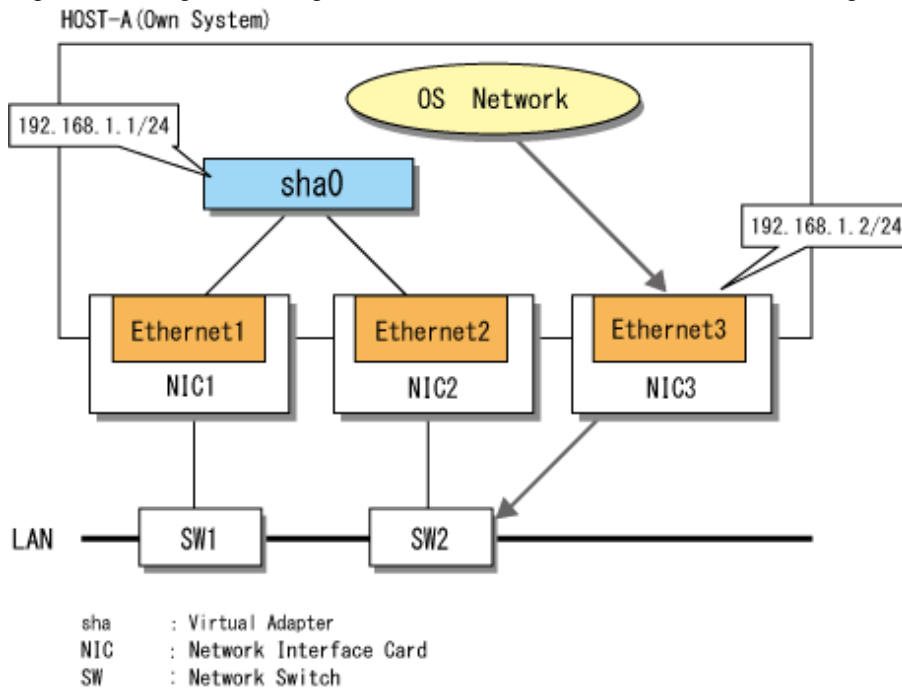
In the example in Figure E.3, the GLS virtual adapter (sha0) and the physical adapter (Ethernet 3) have the same network address. Because of this, pings are sent from the wrong route, and the GLS transmission path cannot be monitored.

The "route PRINT" command displays the routing table of the OS, as shown below.

```
> route PRINT
(Section Omitted)
Active Routes:
Network Destination        Netmask          Gateway          Interface  Metric
      192.168.1.0     255.255.255.0     192.168.1.2      192.168.1.2     XX
      192.168.1.0     255.255.255.0     192.168.1.1      192.168.1.1     XX
(Section Omitted)
===========================================================================
>
```

Adapters that send IP packets such as pings are handled in descending order in the routing table of the OS. For this reason, in the example above, the ping packet sent for GLS monitoring purposes is handled as being sent from the non-GLS physical adapter, and so the network that is intended to be monitored cannot be monitored.

Make sure to set different addresses for the GLS virtual adapter than for other network addresses.

Note that the problem of duplicate network addresses affects any network, regardless of whether or not GLS is used.

b. **Target network device is stopped or is not running correctly**

The communications device to be monitored may not respond to pinging. In such a case, check that the device is functioning correctly. If a network switch is set as the GLS ping monitor target, make sure that an IP address is set for the network switch.

c. **Incorrect VLAN tag settings**

If VLAN tags are set for GLS virtual adapters, set an IP address with a different network address for each virtual adapter. The figure below shows a configuration in which incorrect communication is possible.

Figure E.4 Ping Monitoring Fails Due to Incorrect VLAN Tag Settings
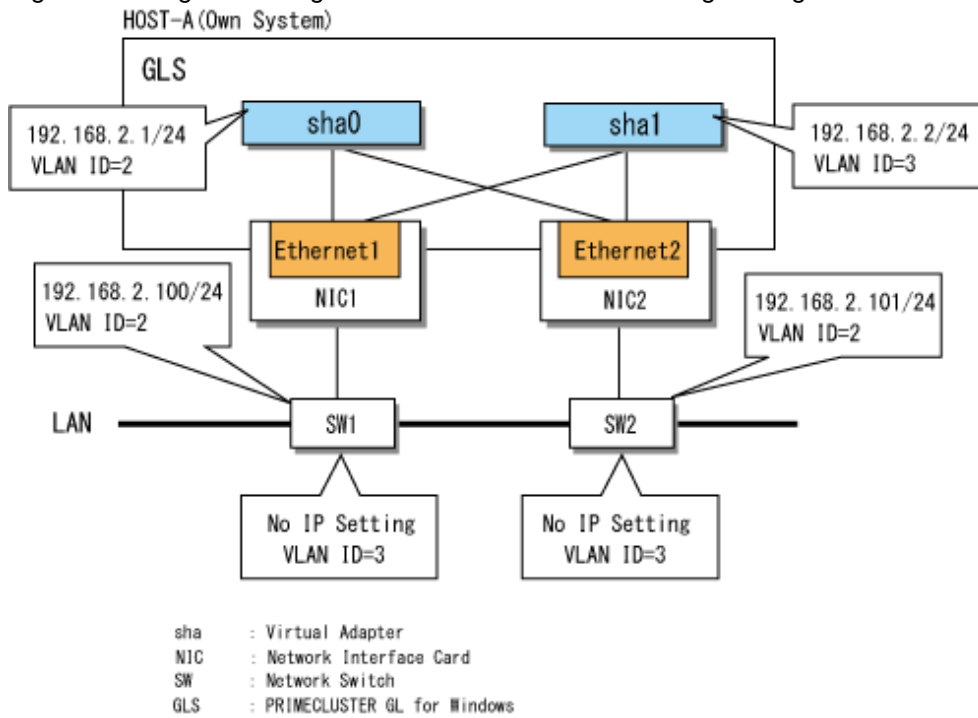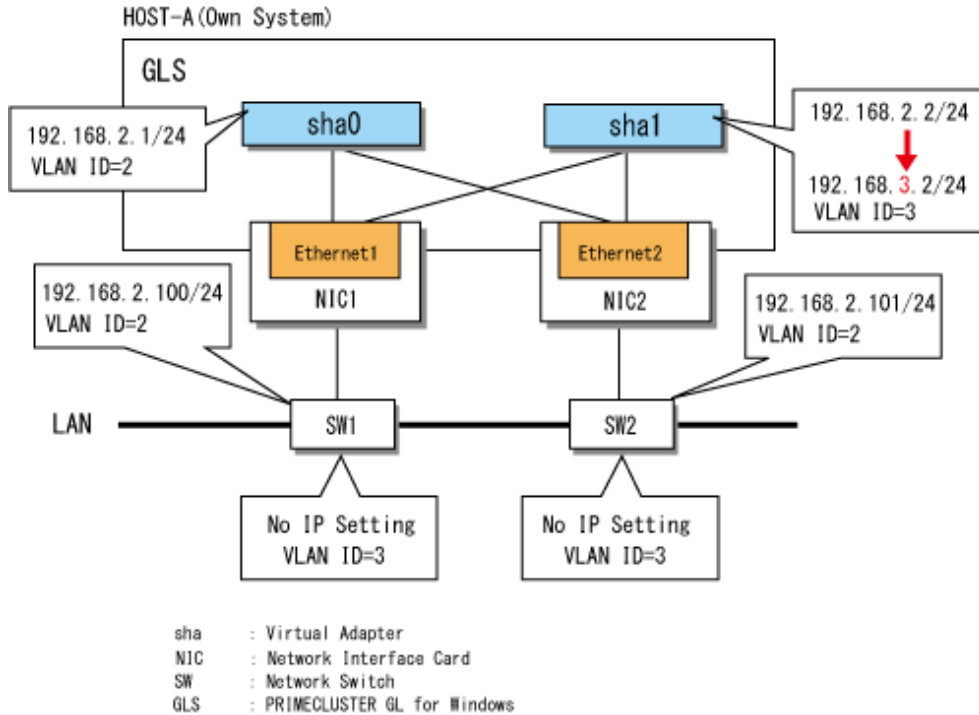

[Ping Monitor Settings]

```
> hanetpoll print
 Polling Status        =  ON
        interval(idle) =   3( 60) sec
        times          =   5 times
 Adapter                      Fo  Target ip
 +------------------------------+---+-----------------------------------------+
  Ethernet 1                    YES 192.168.2.100
  Ethernet 2                    YES 192.168.2.101
```

In a configuration such as in Figure E.4 with a routing table as follows, the GLS ping packet is sent from sha1 (VLAN=3). However, because no VLAN3 IP address is set for switches SW1 and SW2, ping monitoring fails.

```
> route PRINT
(Section Omitted)
Active Routes:
Network Destination        Netmask          Gateway        Interface  Metric
      192.168.2.0    255.255.255.0     192.168.2.2      192.168.2.2    XX
      192.168.2.0    255.255.255.0     192.168.2.1      192.168.2.1    XX
(Section Omitted)
==========================================================================
>
```

Set different network addresses for sha0 and sha1. In the example in Figure E.5, 192.168.3.2/24 is set as the IP address of sha1, which is different to the network address of sha0.

Figure E.5 Correct VLAN Tag Settings

d. **No VLAN tag setting in the network device**

If communication using VLAN tags is not possible, check that the VLAN tag settings of the ping monitor target switch and destination are correct.

e. **Other**

The GLS ping monitor function uses GLS virtual adapters. For this reason, whatever causes communication by virtual adapter to fail may also cause ping monitoring to fail. If the actions described above do not solve the problem, refer to "E.1.1 Cannot Communicate Using Virtual Adapters."

E.2.8   Error Message 20013 is displayed

Problem

Error message 20013 is displayed.

```
FJSVhanet: ERROR: 20013: Failed to communicate with the driver.
```

Cause

The GLS driver may not be installed.

Action

To check whether or not the GLS driver is installed:

1. Display the [Network Connections] window by selecting from [Windows Settings]-[Network and Internet]-[Network and Sharing Center]-[Change adapter settings], then right click any network connection and open the [Properties] window.

2. Open the [Network] tab of the property window, and then check that the [FUJITSU PRIMECLUSTER GL Network Protocol Driver] is displayed in the list under [This connection uses the following items:].

If the GLS driver is installed and this message is still displayed, collect GLS diagnostic data then contact field engineers. For details on collecting diagnostic data, refer to "6.4.1 hanet_snap."

E.3 Collecting Diagnostic Data

This section describes what kinds of diagnostic data to collect (and how to collect the data) before contacting field engineers with regard to a problem in GLS.

E.3.1 Types of Diagnostic Data

If a problem occurs in the operation of the network or GLS, collect the diagnostic data listed in the table below.

Table E.1 Types of Diagnostic Data

Diagnostic Data	Content
Files output by hanet_snap	Basic information for determining the cause of the problem. For more details, refer to "6.4.1 hanet_snap."
Network map	The map of the network for the system in which GLS is installed.
Dump	The dump at the time of the system failure.

GLS: PRIMECLUSTER GL for Windows

E.3.2 Collecting Data Using the hanet_snap Command

You can get basic information on the cause of the trouble in a single operation by executing the hanet_snap command. For more details on the hanet_snap command, refer to "6.4.1 hanet_snap."

Appendix F Changes From Previous Versions

This appendix describes new features and changes of the GLS specification.

F.1 Changes from 4.3A00 to 4.3A10

The following table lists the changes.

Table F.1 List of Changes from 4.3A00 to 4.3A10

Category	Item	Version
New command	hanetparam command	4.3A10 or later
Incompatible command	hanetconfig command	4.3A10 or later
	stphanet command	4.3A10 or later
Incompatible function	None	-

F.1.1 New Command

F.1.1.1 hanetparam Command

[Contents]

A command to change the setting information of GLS is added. For details, see "6.2.4 hanetparam."

[Changes]

Before modification

There are no commands to change the setting information of GLS.

After modification

A command to change the setting information of GLS is added. You can specify whether to preferentially use the primary adapter of the virtual adapter as the operational adapter when the GLS service starts up.

F.1.2 Incompatible Commands

This section describes the incompatible commands of GLS 4.3A10 from the previous version.

F.1.2.1 hanetconfig Command

[Incompatible Contents]

This command allows you to specify the MAC address of the primary adapter automatically to the MAC address of a virtual adapter. For details, see "6.2.2 hanetconfig."

[Changes]

Before modification

The hanetconfig command does not allow you to automatically set the MAC address of the primary adapter to the MAC address of the virtual adapter.

After modification

The hanetconfig command allows you to automatically set the MAC address of the primary adapter to the MAC address of the virtual adapter.

F.1.2.2 stphanet Command

[Incompatible Contents]

This command allows you to pause all virtual adapters and maintain the GLS driver. For details, see "6.2.8 stphanet."

[Changes]

Before modification

You cannot neither pause all virtual adapters nor maintain the GLS driver.

After modification

You can pause all virtual adapters and maintain the GLS driver.

F.1.3   Incompatible Function

There is no change.

F.2   Changes from 4.3A10 to 4.3A20

The following table lists the changes.

Table F.2 List of Changes from 4.3A10 to 4.3A20

Category	Item	Version
New command	None	-
Incompatible command	hanetconfig command	4.3A20 or later
	hanetnic command	4.3A20 or later
	hanetpoll command	4.3A20 or later
	strhanet command	4.3A20 or later
	stphanet command	4.3A20 or later
Incompatible function	Supports restoration of the network functions which physical adapters use.	4.3A20 or later

F.2.1   New Command

There is no new command.

F.2.2   Incompatible Commands

This section describes the incompatible commands of GLS 4.3A20 from the previous version.

F.2.2.1 hanetconfig Command

[Incompatible Contents]

This command allows you to add or delete virtual adapters if there are any active virtual adapters. For details, see "6.2.2 hanetconfig."

[Changes]

Before modification

If there are any active virtual adapters, you cannot add or delete virtual adapter.

After modification

Even if there are any active virtual adapters, you can add or delete virtual adapter.

F.2.2.2 hanetnic Command

[Incompatible Contents]

If all the following conditions are met, you cannot dynamically delete physical adapters.

- Multiple virtual adapters share a physical adapter.

- Active and inactive virtual adapters exist together in one configuration.

- An unused physical adapter for a certain virtual adapter is used as the operational adapter for a different virtual adapter.

[Changes]

Before modification

In the configuration where multiple virtual adapters share a physical adapter, active and inactive virtual adapters never exist together. Therefore, an unused physical adapter for a certain virtual adapter is never used as the operational adapter for a different virtual adapter.

After modification

In the configuration where multiple virtual adapters share a physical adapter, active and inactive virtual adapters can exist together. Moreover, state of physical adapters under each virtual adapter may be different.
Therefore, an unused physical adapter for a certain virtual adapter can be used as the operational adapter for a different virtual adapter. In this case, you cannot dynamically delete physical adapters.

F.2.2.3 hanetpoll Command

[Incompatible Contents]

This command allows you to set or remove destinations if there are any virtual adapters where ping monitoring has started. This command also allows you to specify the virtual adapter where ping monitoring will be started or stopped. For details, see "6.2.5 hanetpoll."

[Changes]

Before modification

If there are any virtual adapters where ping monitoring has started, you cannot set or remove destinations.
Moreover, you cannot specify the virtual adapter where ping monitoring will be started or stopped.

After modification

Even if there are any virtual adapters where ping monitoring has started, you can set or remove destinations.
Moreover, you can specify the virtual adapter where ping monitoring will be started or stopped.

F.2.2.4 strhanet Command

[Incompatible Contents]

This command allows you to specify the names of virtual adapters to be activated. Also, the script file name which the strhanet command executes is output to the message "00013." Moreover, the message output when the strhanet command is executed during the virtual adapter is paused. For details, see "6.2.7 strhanet."

[Changes 1]

Before modification

You cannot specify the names of virtual adapters to be activated.

After modification

You can specify the names of virtual adapters to be activated.

[Changes 2]

Before modification

00013: The user script ended.(return code=code)

After modification

00013: The user script ended.(return code=code,file name=fname)

See

For details, see "D.2.1 Code Type 0 Messages (INFO)."

[Changes 3]

Before modification

The message "00000" is output.

After modification

The message "00000" and the message "00018" are output.

F.2.2.5 stphanet Command

[Incompatible Contents]

This command allows you to specify the names of virtual adapters to be deactivated. Moreover, the message output when the -m option is specified is added. For details, see "6.2.8 stphanet."

[Changes 1]

Before modification

You cannot specify the names of virtual adapters to be deactivated.

After modification

You can specify the names of virtual adapters to be deactivated.

[Changes 2]

Before modification

The message "00000" is output.

After modification

The message "00000" and the message "00017" are output.

F.2.3   Incompatible Functions

This section describes the incompatible functions of GLS 4.3A20 from the previous version.

F.2.3.1 Supports Restoration of the Network Functions which Physical Adapters Use

[Incompatible Contents]

After the stphanet command or the delete subcommand of the hanetnic command is executed, physical adapters which have been bundled in the virtual adapter can use the same network functions as before bundled.

[Changes 1]

Before modification

For physical adapters which have been bundled in the virtual adapter, all installed network functions are checked.

After modification

For physical adapters which have been bundled in the virtual adapter, the same network functions as before bundled are checked.

[Changes 2]

Before modification

The GLS driver is checked on all network adapters after installing GLS.

After modification

The GLS driver is not checked on all network adapters after installing GLS.

[Changes 3]

Before modification

With physical adapters bundled in the virtual adapter, the check status of the GLS driver is not changed depending on whether the virtual adapter is activated or deactivated.

After modification

With physical adapters bundled in the virtual adapter, the check status of the GLS driver is changed as follows, depending on whether the virtual adapter is activated or deactivated.

- After the virtual adapter is activated:
  The GLS driver is checked.

- After the virtual adapter is deactivated:
  The GLS driver is not checked.

 Point

. . . .

The check status of the network function is displayed in the [Properties] window by selecting a physical adapter in [Windows Settings]-[Network Connections].

. . . .

F.3 Changes from 4.3A20 to 4.3A30

The following table lists the changes.

Table F.3 List of Changes from 4.3A20 to 4.3A30

Category	Item	Version
New command	None	-
Incompatible command	None	-
Incompatible function	None	-

F.4 Changes from 4.3A30 to 4.4A00

The following table lists the changes.

Table F.4 List of Changes from 4.3A30 to 4.4A00

Category	Item	Version
New command	None	-
Incompatible command	hanetconfig command hanetnic command hentpoll command	4.4A00 or later
Incompatible function	None	-

F.4.1　New Command

There is no new command.

F.4.2　Incompatible Commands

This section describes the incompatible commands of GLS 4.4A00 from the previous version.

F.4.2.1　"Ethernet X" is supported as an abbreviation of a physical adapter.

[Incompatible Contents]

The abbreviation "Ethernet X" can be used as the physical name of the following sub commands for t-option.

- create sub command of the hanetconfig command

- add sub command and delete sub command of the hanetnic command

- create sub command and delete sub command of the hanetpoll command

[Changes]

Before modification

"Ethernet X" cannot be specified as an abbreviation.

After modification

"Ethernet X" can be specified as an abbreviation.

F.4.3　Incompatible Function

There is no incompatible function.

F.5　Changes from 4.4A00 to 4.5A10

The following table lists the changes.

Table F.5 List of Changes from 4.4A00 to 4.5A10

Category	Item	Version
New command	None	-
Incompatible command	None	-
Incompatible function	None	-

[Others]

The default GLS installation folder is changed from 4.5A10.

When installing GLS in the same folder as the previous default folder, change the installation destination folder.

Before modification

C:\Program Files\Fujitsu\PRIMECLUSTER GLS

After modification

C:\Program Files\Fujitsu\PRIMECLUSTER GL

Glossary

Activate

Refers to making a virtual adapter operational.

Adapter Setting Script

Script for assigning IP addresses in virtual adapters automatically.
This script is executed automatically after you execute the strhanet command to activate virtual adapters.

Blade Server

A server consisting of multiple computer boards ("server blades") housed together for ease of maintenance and storage. Each blade functions as an individual server.

Deactivate

Refers to making a virtual adapter unavailable for use.

Disconnect Function

A function for disconnecting failed standby adapters depending on notifications from the monitor function.

Duplicate Control Function

A function for achieving high reliability in communications by controlling the redundancy of network communication paths.

LAN

Acronym of Local Area Network.
A LAN is a network of multiple computers and other devices (such as printers) in a restricted location (such as an office).

Link Status Monitor

A function for monitoring transmission paths based on notifications of communication status between physical adapters and neighboring network devices.

MAC Address

A fixed number assigned as an identifier to an NIC.
The transfer of data between NICs is based on MAC (Media Access Control) addresses.

Monitor Function

A function for monitoring network devices connected to the server in which GLS is installed.
The monitor function sends notification to the switch function or restore function when a network failure occurs or when a network device is restored.

Network Switch

A generic name for a communications device for switching transmission paths and packet exchange.

NIC

Acronym of Network Interface Card.
A generic name for a component to connect computers and other devices to a network such as a LAN.
An NIC contains at least one network adapter for use in network communications.

NIC Sharing

A function for assigning an IP address to different network addresses by sharing NICs between virtual adapters.

NIC Switching Mode

A method of achieving high reliability in communications by duplicating network transmission paths using exclusively a pair of NICs that switch to each other when one of them has a failure. The NICs must be connected on the same network.

Operational

The status of being in use for communications, or the transmission path for these communications.
A physical adapter during operation is referred to as an "operational adapter".

Pause

A virtual adapter is temporarily inactive.

Physical Adapter

A network adapter in an NIC.

Ping Monitor

A function for monitoring the communication status of the network. By setting a destination system as the ping monitor target, you can detect communication failures up to that system.
The ping monitor also sends notification to the switch function or restore function when a network failure occurs or when a network device is restored.

Primary Adapter

The first physical adapter bundled in a virtual adapter.
This adapter is displayed in the first position of Adapters with the hanetconfig print command.

PRIMEQUEST

The family of IA (Intel Architecture) servers manufactured by Fujitsu Ltd.

PRIMERGY

The family of IA (Intel Architecture) servers manufactured by Fujitsu Ltd.

Restore Function

A function for connecting a physical adapter as an operational adapter or standby adapter once it has been restored after a failure.

Secondary Adapter

The second physical adapter bundled in a virtual adapter.
This adapter is displayed in the second position of Adapters with the hanetconfig print command.

Standby

The status of being ready to take over in case of a failure in an operational adapter, or the transmission path for that takeover.
A physical adapter during standby is referred to as a "standby adapter".

STP

Acronym of Spanning Tree Protocol.
A method of averting problems that may occur when network switches are structured as loops.

Switch Blade

A server blade equipped with a Gigabit LAN and switching hub function.

Switch Function

A function for switching communications from operational to standby adapters depending on notifications from the monitor function.

Virtual Adapter

A virtual network adapter created by bundling physical adapters.

Virtual IP Address

An IP address assigned to a virtual adapter.

Virtual MAC Address

A MAC address assigned to a virtual adapter.

VLAN Tagging

A method of attaching network-specific identifiers (called tags) to packets used when creating multiple virtual networks on the same physical line.

VLAN Tagging Adapter

A virtual adapter created with the VLAN tagging function of physical adapters.

Index

[W]