



# **PRIMECLUSTER™**

Global Link Services

Configuration and Administration Guide 4.1

Redundant Line Control Function

(for Linux)

November 2005



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# Introduction

## Purpose

This document describes the installation, configuration, operation, and maintenance of PRIMECLUSTER Global Link Services (hereafter GLS).

## Who should use this document

This document is intended for system administrators who are familiar with GLS operations and cluster control. Anyone who installs, configures, and maintains GLS to increase the availability of the system should read this documentation. A basic knowledge of PRIMECLUSTER is assumed.

## Abstract

The document consists of the following chapters, appendices, and glossary:

### Chapter 1 Overview

This chapter explains the redundant line control function of GLS.

### Chapter 2 Feature description

This chapter outlines the functions and features of GLS.

### Chapter 3 Environment configuration

This chapter discusses how to set up and configure GLS.

### Chapter 4 Operation

This chapter explains how to operate the redundant line control function.

### Chapter 5 GLS operation on cluster systems

This chapter explains how to operate the redundant line control on a cluster system.

### Chapter 6 Maintenance

This chapter focuses on a general approach to troubleshooting. It presents a troubleshooting strategy and identifies commands that are available in Resource Coordinator for finding and correcting problems. Further, it discusses how to collect troubleshooting information.

### Chapter 7 Command references

This chapter outlines GLS commands.

### Appendix A Messages and corrective actions

This appendix outlines messages and corrective actions to be taken to eliminate errors.

### Appendix B Examples of configuring system environments

This appendix explains how to configure the system environment with redundant network control.

### Appendix C Changes from previous versions

This appendix discusses changes to the GLS specification. It also suggests some operational guidelines.

### Appendix D Notice of supplemental information

This appendix provides supplemental information regarding GLS.

## Notational convention

The document conforms to the following notational conventions:



Point

- Text that requires special attention



Note

- Information that users should be cautious of



Information

- Information that users can refer to



See

- Manuals users find workable



Conclusion

- Brief summary of important information that users should understand

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# Chapter 1 Overview

This chapter discusses the concept of the redundant line control function provided by GLS.



## 1.1 What is redundant line control?

The redundant line control function provides a high-reliability communication infrastructure that supports continuous transmission in the event of a network path or card failure by making transmission routes redundant with multiple NIC (Network Interface Cards).

GLS enables the following network control methods:

### Fast switching mode

In Fast switching mode, a redundant transmission route between Linux servers or Solaris servers in the same network is used so that the total amount of data transferred can be increased, and that the data communication can be continued even if the transmission route fails. It also enables higher levels of throughput through redundant transmission routes. GLS performs early failure detection, so when one transmission route fails, the failed route will be cut off then the system will be operated on a reduced scale. The compatible hosts are PRIMEQUEST, PRIMERGY, PRIMEPOWER, GP7000F, GP-S, and Fujitsu S series.

Note that fast switching mode cannot be used to communicate with hosts on the other networks beyond the router.

Moreover, you can use a single transfer path. For details, refer to "2.2.5 Configuring single physical interface".

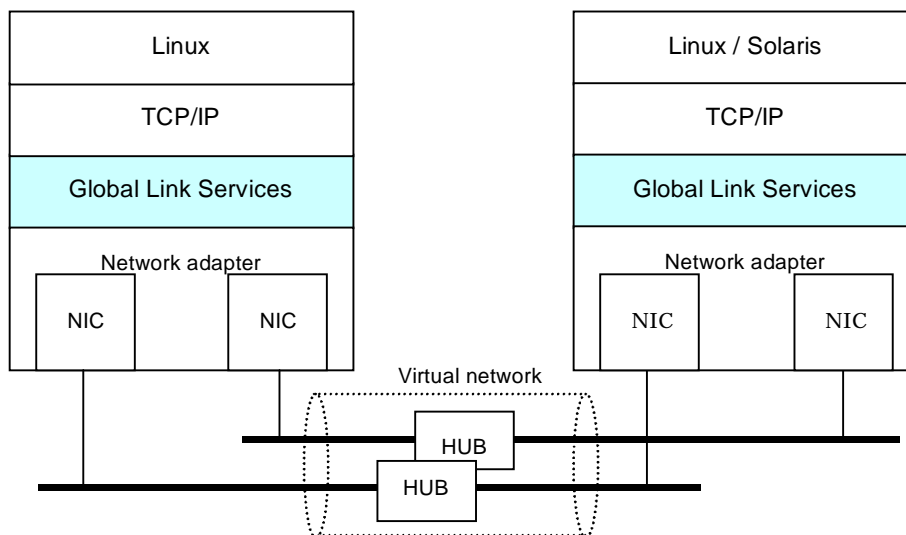


Figure 1.1 Fast switching mode

## NIC switching mode

In NIC switching mode, redundant NICs (LAN cards) are connected to each other on the same network and used exclusively. If one transmission route fails, ongoing communications will be switched to the other transmission route. There are no restrictions on remote systems to communicate with.

Note that NIC switching mode can be used to communicate with any hosts on the other networks beyond the router.

Moreover, you can use a single physical interface. For details, refer to "2.2.5 Configuring single physical interface".

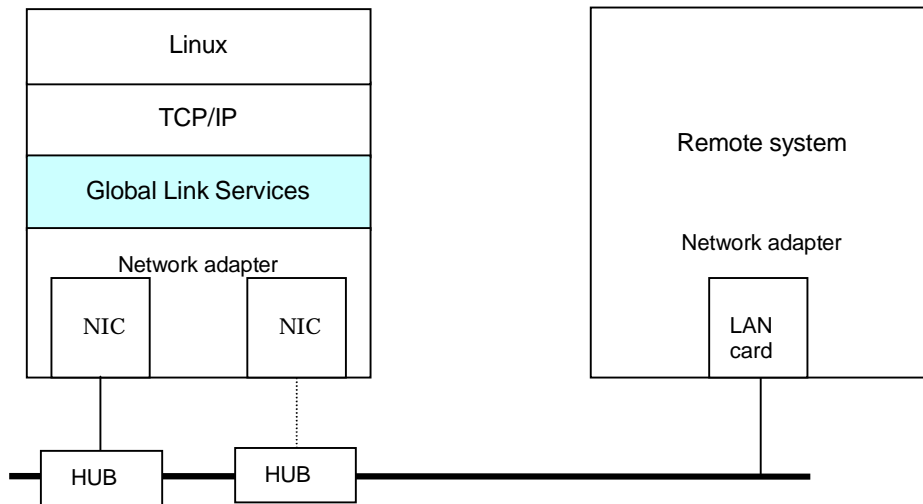


Figure 1.2 NIC switching mode

### 1.1.1 Functional comparison

The following table compares the functions of each network switching mode.

**Table 1.1 Function comparison**

Redundant line switching method		Fast switching mode	NIC switching mode	
Network control		Makes both of redundant transmission routes active and uses them concurrently. A stream of data is sent on a TCP connection.	Activates and uses one redundant transmission route exclusively and deactivates the other route.	
Fault monitoring	Detectable failures	NIC, cable, HUB, remote host	NIC, cable, HUB	
	Fault monitoring	Monitoring method	Monitors framework between the NIC of the host and that of the remote host. If the frame communication is disrupted, a transmission route failure will be detected.	
		Failure detection time	5 to 10 seconds (Default)	25 to 30 seconds. (Default)
	Recovery monitoring	Monitoring recovery method	Monitors framework between the NIC of the host and that of the remote host. If the frame communication is disrupted, a transmission route failure will be detected.	If a monitoring framework is sent from a standby NIC to an operating NIC, and the standby NIC receives a reply from the operating NIC within a specified time, transmission route recovery will be detected.
		Recovery detection time	1 to 5 seconds (Default)	About 1 to 30 seconds (Default)
	Fault monitoring start/stop		Automatically starts along with virtual interface activation and stops along with its deactivation.	Automatically starts along with virtual interface activation and stops along with its deactivation. Manual startup or stop of fault monitoring is also allowed with the operational command.
Line switching	Switchover	Automatically disconnects a failed transmission route and uses the other transmission route. Manual disconnection of the failed route is also allowed with the operational command.	Automatically deactivates NIC of a failed transmission route and activates a standby NIC. Manual switching operation is also allowed with the operational command.	
	Switchback	If a failed transmission route is recovered, it will automatically rejoin an ongoing operation. Manual disconnection of the failed route is also allowed with the operational command.	If a failed transmission route is recovered, it will automatically rejoin operation as a standby NIC. Manual rejoining is also allowed with the operational command.	

Conditions	Remote hosts	PRIMEQUEST, PRIMERGY, PRIMEPOWER, GP7000F, GP-S, Fujitsu S series	Arbitrary host
	IP address	IPv4 address, IPv6 address	IPv4 address, IPv6 address



### 1.1.2 Criteria for selecting redundant line control methods

You are supposed to select a redundant line control method according to your system operational conditions.

The flow chart for shown in Figure 1.3 will assist in determining the redundant line control method that would be the most effective for you.

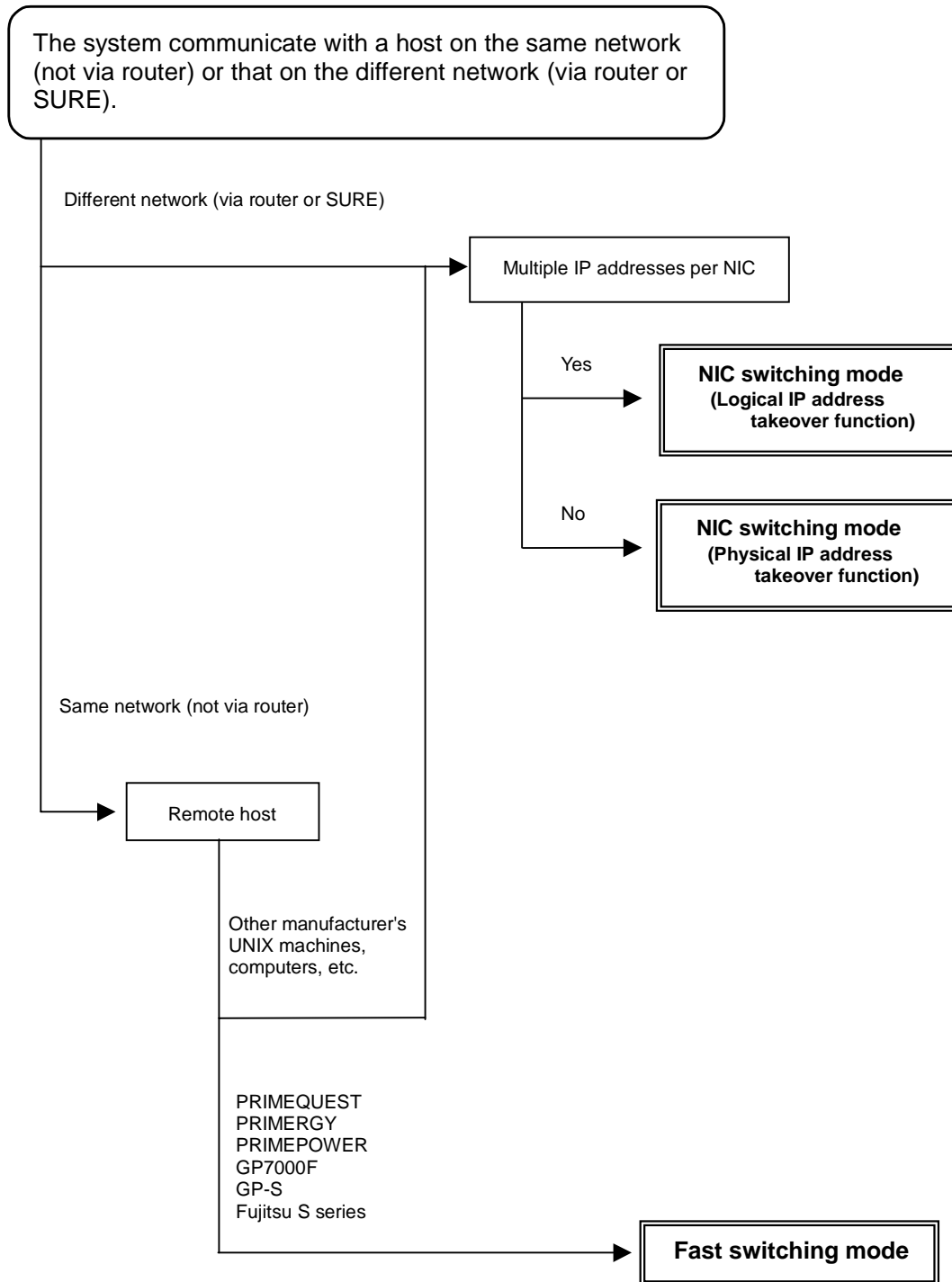


Figure 1.3 Redundant line control method decision flow chart



## 1.2 Redundant line control effects

The redundant line control function supports a high-reliability control network in terms of flexibility and fault-resistance.



# 1.3 System Configuration

Fast switching mode

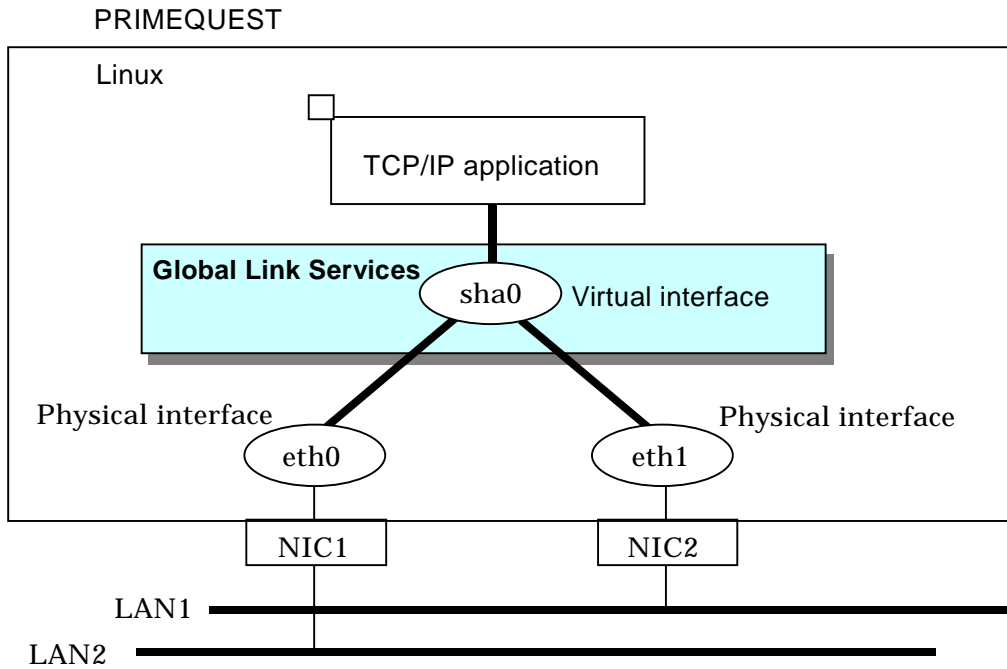


Figure 1.4 Fast switching mode

NIC switching mode

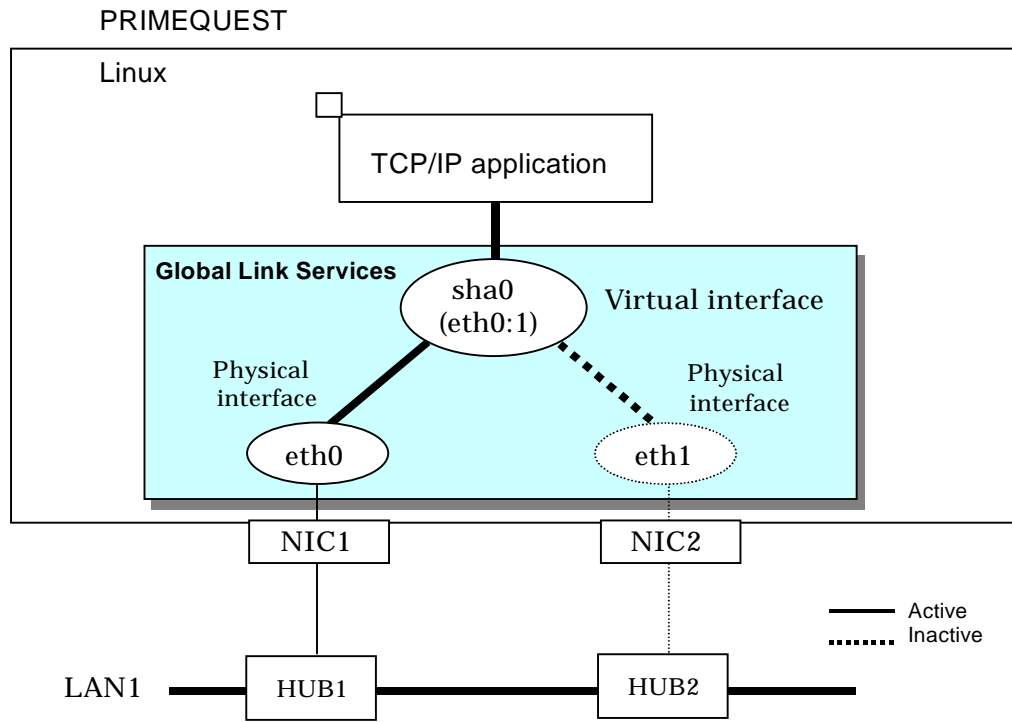


Figure 1.5 NIC switching mode

Main unit		PRIMEQUEST
NIC (Network Interface Cards)		The following Fujitsu adapters or cards can be used: <ul style="list-style-type: none"> <li>- Basic Ethernet interface</li> <li>- Ethernet card</li> <li>- Fast Ethernet card</li> <li>- Gigabit Ethernet card</li> </ul>
HUB (NIC switching mode)		IP address information must be configured for HUB, e.g. HUB with SNMP agent
Operating system (OS)		- Red Hat Enterprise Linux AS (v. 4)
Interfaces	Physical interface	Generated by each NIC. The interface name is determined by the NIC type (e.g. ethX).
	Virtual interface	Generated through redundant line control (e.g. sha0 and sha1). Network applications can communicate using a virtual IP address assigned to the virtual interface. In NIC switching, the virtual interface name is used technically although no virtual interface is generated. A logical IP is allocated to the actual network so that the network applications enable communication through the logical IP address.
Network number	Fast switching mode	A different network number is assigned to each physical interface and a virtual interface. In Figure 1.4, three network numbers must be prepared for the three interfaces.
	NIC switching mode	Only one number is assigned to each network. No virtual interface is generated
IP address	Fast switching mode	An IP address must be allocated to each physical interface and a virtual interface. If there are two or more virtual interfaces, an IP address will be allocated to each virtual interface. Both IPv4 address and IPv6 address can be used.
	NIC switching mode	An IP address must be allocated to each logical interface. If there are two or more logical interfaces, an IP address will be allocated to each logical interface. Both IPv4 address and IPv6 address can be used.





# Chapter 2 Feature description

This chapter outlines the functions and features of GLS.

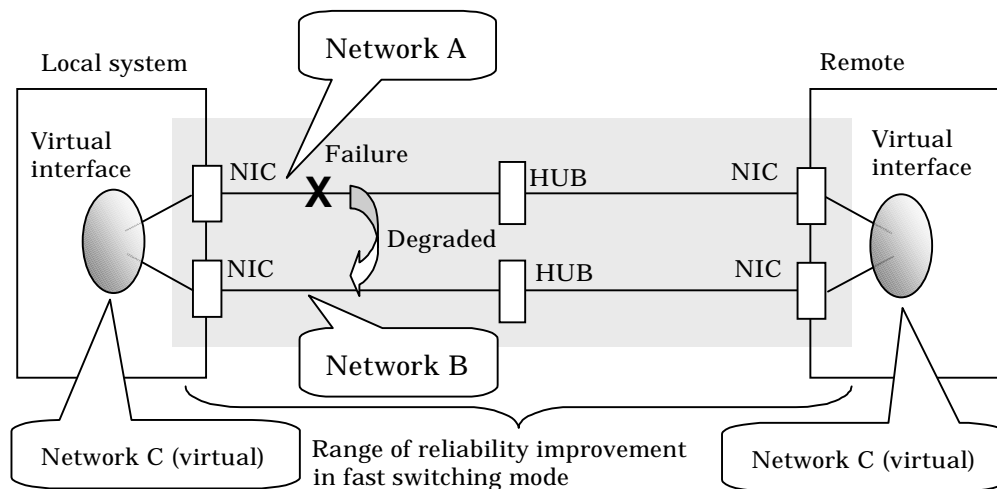


## 2.1 Overview of Functions

### 2.1.1 Fast switching mode

In this mode, each of multiple NIC (Network Interface Card) is connected to a different network and all of these NICs are activated and then used concurrently. Each outgoing packet is transmitted via an appropriate line according to the line conditions (whether or not any failure has occurred).

Also, an interface that is virtual (called a virtual interface in this document) is generated so that multiple NICs can be seen as one logical NIC. A TCP/IP application can conduct communication with the remote system, irrespective of the physical network redundant configuration, by using an IP address (called a virtual IP address in this document) set in this virtual interface as its own IP address of the local system.



**Figure 2.1 Example of duplicated operation in Fast switching mode**

#### Connection type

A system with which communication is to be carried out is connected to the same network and is not allowed to connect to a different network.

#### Features

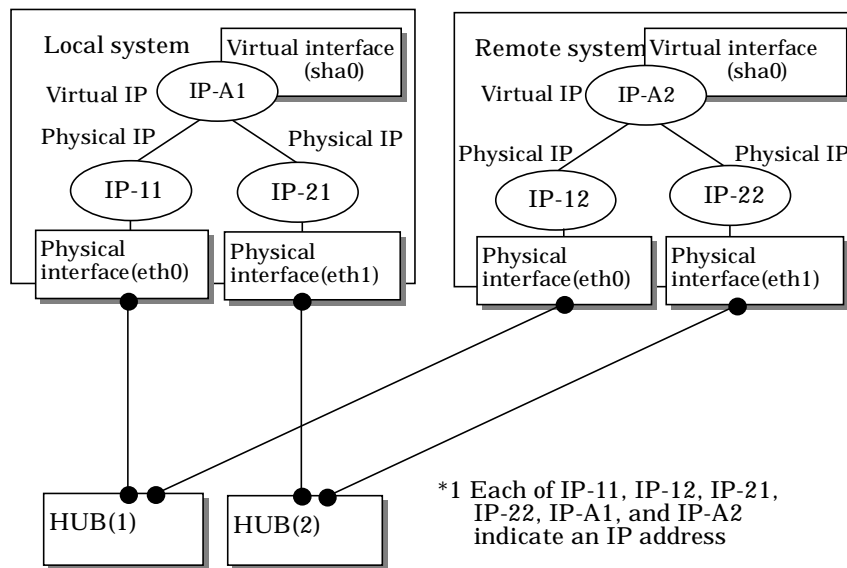
In the event of a failure, lines can be switched swiftly in a short period of time without affecting the applications. Since redundant lines are all activated, each line can be used for different purposes, enabling the efficient use of resources.

#### Recommended application areas

This mode is appropriate, for example, to communications between the application server and database server in a three-tier client-server system.

System configuration

Figure 2.2 shows a system configuration for Fast switching mode:



**Figure 2.2 System configuration for Fast switching mode**

The following explains each component and its meaning:

**Physical interface**

Indicates a physical interface (such as eth0 and eth1) of the duplicated NIC.

**Physical IP**

Indicates an IP address attached to a physical interface. This IP address is always active. Available IP addresses are IPv4 and IPv6 address.

**Virtual interface**

Indicates a virtual interface (such as sha0) so that the duplicated NIC can be seen as one NIC.

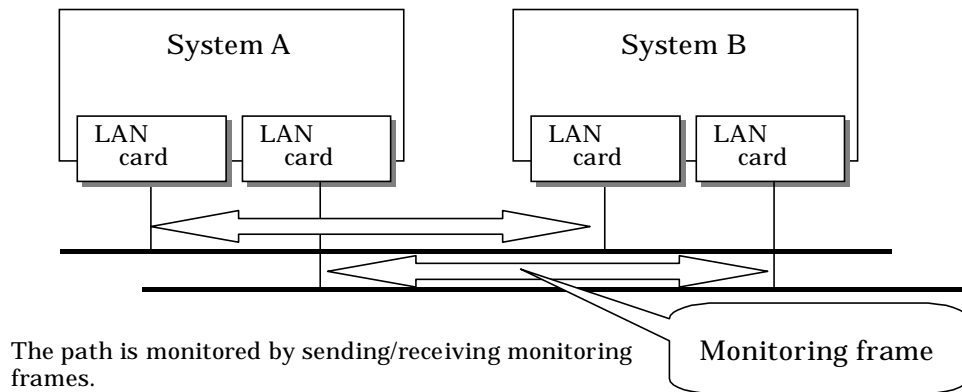
**Virtual IP**

Indicates a source IP address to be allocated to the virtual interface for communication with the remote hosts. Available IP addresses are IPv4 and IPv6 address.

### 2.1.1.1 Fault monitoring function

#### Fault monitoring

Sends a dedicated monitor frame to the other system's NIC at regular intervals (a default value is five seconds. It is possible to change by the `hanetparam` command) and waits for a response. When received a response, decides that a route is normal, and uses it for communication until next monitoring. When received no response, decides that an error occurred, and not use it for communication until decides it is normal at next monitoring. Monitoring is done in each NIC unit that the other device equips.



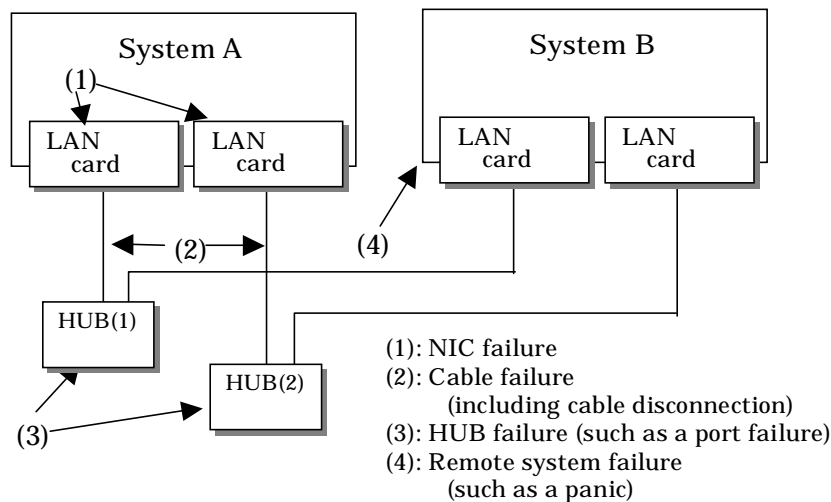
**Figure 2.3 Monitoring method in Fast switching mode**

#### Switching time

If a failure occurs in a multiplexed line, it takes approximately 10 seconds to disconnect the line.

#### Detectable failures

The following failures can be detected:



**Figure 2.4 Detectable failures in Fast switching mode**

Because the failures (1) - (4) appear to be the same failure, a type of the failure cannot be specified. Each device has to be checked to make this determination.

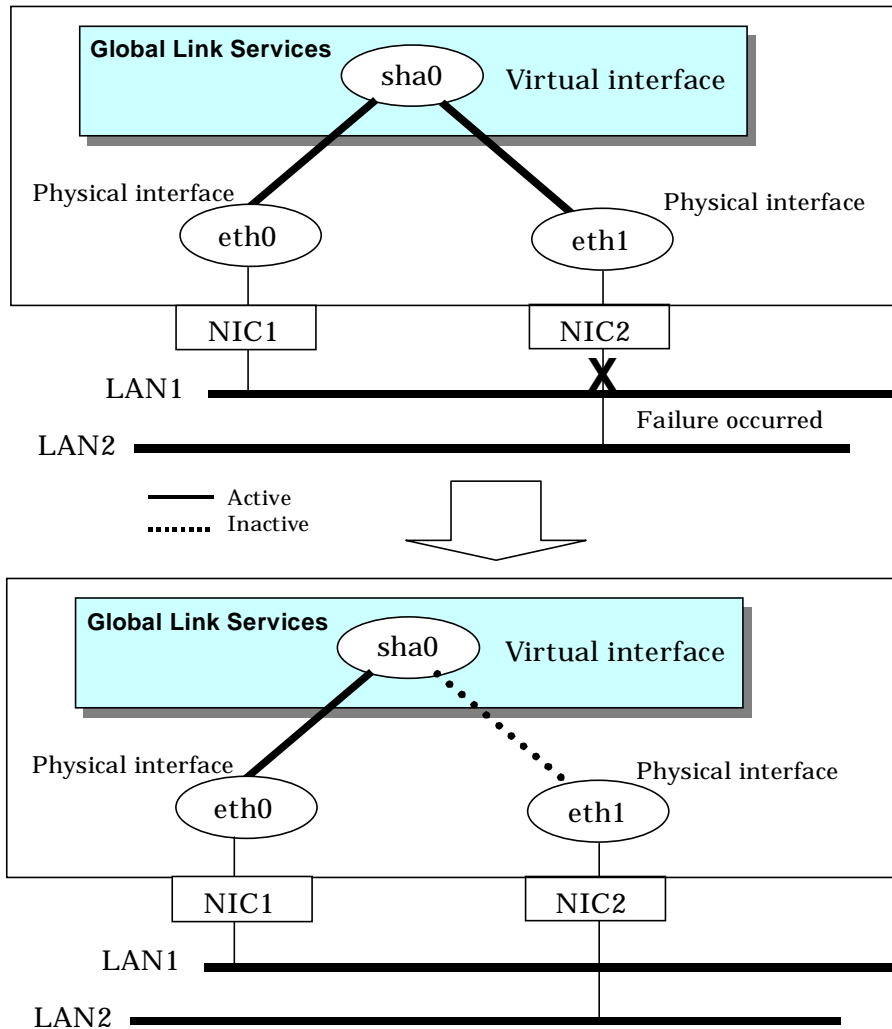
#### Fault monitoring start/stop

Monitoring is started automatically when the virtual interface is activated. Monitoring is automatically stopped when the virtual interface is inactivated. In cluster operation, the system allows each node to be started or stopped independently.

### 2.1.1.2 Switching function

#### Switching operation

A line whose failure is detected is automatically avoided, and the only normal line takes over the communication. Therefore, if at least one normal line remains, the communication can continue without rebooting the system. It is also possible to disconnect a specific line manually by using the operational command (hanetric command).



**Figure 2.5 Outline of switching operation performed when a failure occurs in Fast switching mode**

#### Failback operation

If the faulty line of a physical interface is recovered, the physical interface is automatically restored for normal communication. If a line was disconnected manually, the failback of the line needs to be performed manually to restore the original status.

### 2.1.1.3 Connectable remote host

An associated host is able to communicate with the following systems:

- PRIMEQUEST
- PRIMERGY
- PRIMEPOWER
- GP7000F
- GP-S
- Fujitsu S series

### 2.1.1.4 Available application

The requirement for user applications that can be operated in this mode is as follows:

- Applications need to be a TCP/IP application.

### 2.1.1.5 Notes

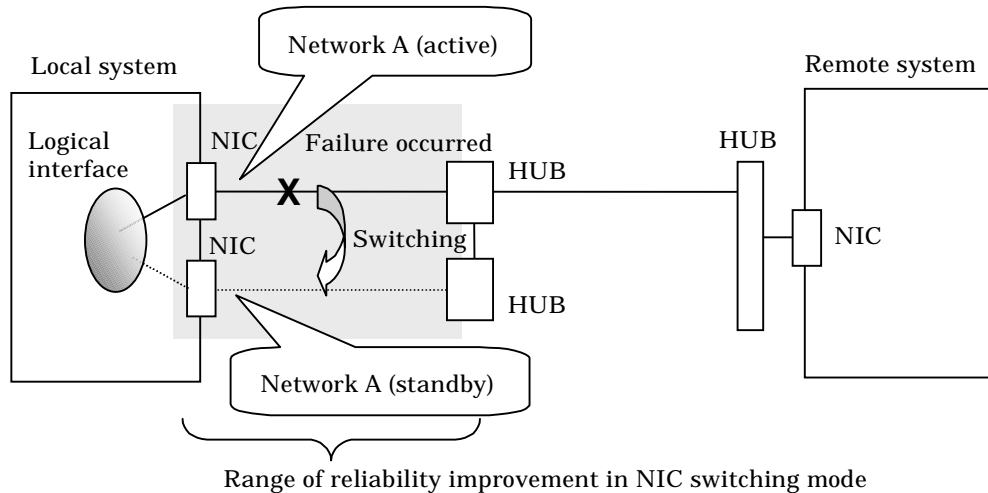
- When assigning IPv4 address to the virtual interface, IPv4 address must be assigned to all the redundant physical interfaces.
- If assigning IPv6 address to the virtual interface, IPv6 address must be assigned to all the redundant physical interfaces.
- If assigning both IPv4 and IPv6 to the virtual interface, these two forms of an IP address must be assigned to all the redundant physical interfaces.
- No multi-cast IP address can be used.





## 2.1.2 NIC switching mode

In this mode, duplicated NICs are connected to the same network and switching control of lines is performed based on the exclusive use (During normal operation, one NIC is made to go "up" for communication). A TCP/IP application can conduct communication with the remote system, irrespective of NIC switching, by using an IP address set in this "up" physical interface as its own local system IP address.



**Figure 2.6 Example of duplicated operation in NIC switching mode**



### Information

NIC switching mode handles logical interface as a takeover interface. When using physical interfaces eth0 and eth1, the takeover interface becomes eth0:1 and eth1:1. Note that it is possible to takeover physical interface without using logical interface. Look under section "2.1.2.2 Switching function" for details on NIC switching mode.

### Connection type

Duplicated NICs are connected to the same network. The remote system with which communication is to be carried out can be connected to either the same network or a different network via routers.

### Features

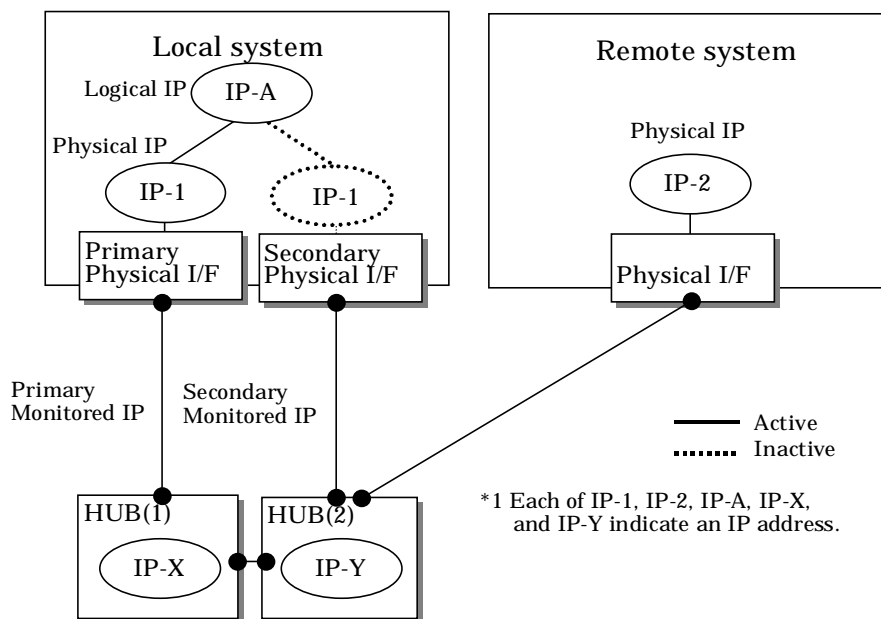
If each network device (such as the HUB and routers) has the duplicating function in a multi-vendor environment, this mode is effective when improving overall reliability in combination with these devices. In this case, the range of duplication is defined for each vendor.

### Recommended application areas

This mode is appropriate, for example, to communications in a multi-vendor environment in which UNIX servers and PC servers of other companies are mixed.

System configuration

Figure 2.7 shows a system configuration for NIC switching mode:



**Figure 2.7 System configuration in NIC switching mode**

The following explains each component and its meaning:

**Primary physical interface**

Indicates, of the duplicated NICs, the physical interface to be used first by activating it.

**Secondary physical interface**

Indicates the physical interface to be used after switching when a line failure is detected in the Primary physical interface.

**Physical IP**

Indicates an IP address attached to the Primary or Secondary physical interface. This IP address is always active. IPv4 address can be used for a physical interface. In case of IPv6, a link local address is automatically set as a physical IP address.

**Primary monitored IP**

Indicates the IP address of a monitored device (HUB) obtained when the Primary physical interface is used. In NIC switching mode, it is possible to use both IPv4 and IPv6 addresses as an address form.

**Secondary monitored IP**

Indicates the IP address of a monitored device (HUB) obtained when the Secondary physical interface is used. In NIC switching mode, it is possible to use both IPv4 and IPv6 addresses as an address form.

**Logical IP**

Indicates a local IP address for communication with the remote device. In NIC switching mode, it is possible to use both IPv4 and IPv6 addresses as an address form. When using a physical IP address takeover function, it is not activated. Please refer to "2.1.2.2 Switching function" about a physical IP address takeover function.

### 2.1.2.1 Fault monitoring function

#### Fault monitoring

The ping command is issued periodically to the HUB connected to the NIC currently operating and its response is monitored. Optionally, HUB-to-HUB communication can be monitored.

If a failure is detected in the NIC currently operating, the system switches to the standby NIC and monitoring similarly starts from the standby NIC side. Then, if a failure is also detected with the standby NIC, line monitoring stops.

When using a standby patrol function, monitoring starts automatically at the recovery of all transfer routes.

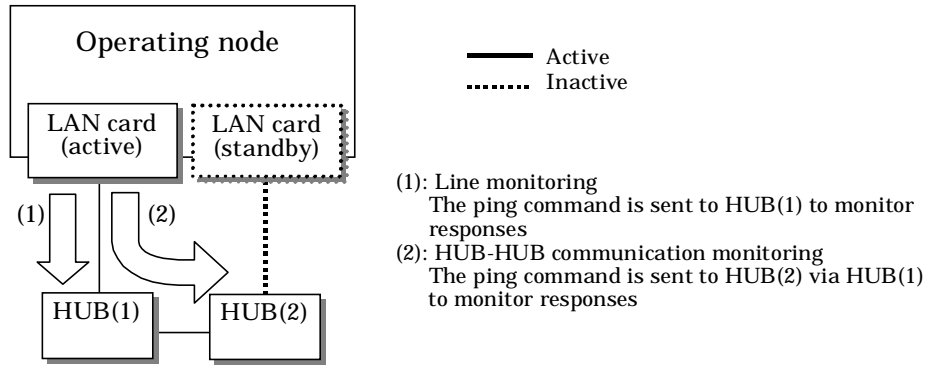


Figure 2.8 Monitoring method in NIC switching mode

#### Switching time

The switching time of a line is represented by [monitoring interval (sec) X monitoring count (count)] (for HUB-to-HUB communication monitoring, this is represented by [monitoring interval (sec) X monitoring count (count) X 2]). The monitoring interval can be set in the range of 1 to 300 seconds and the monitoring count can be set in the range of 1 to 300 times. By default, they are 5 seconds and 5 times respectively.

Even if the ping command failed immediately after started monitoring, it does not regard as a communication line failure until the waiting time (sec) for the Ethernet linkup passed. It is possible to set the waiting time for linkup in a range of 1 to 300 seconds and a default value is 60 seconds. However, if a value is smaller than [monitoring interval (sec) X monitoring count (count)], the time set for linkup is ignored and the time set by this [monitoring interval (sec) X monitoring count (count)] is adopted.

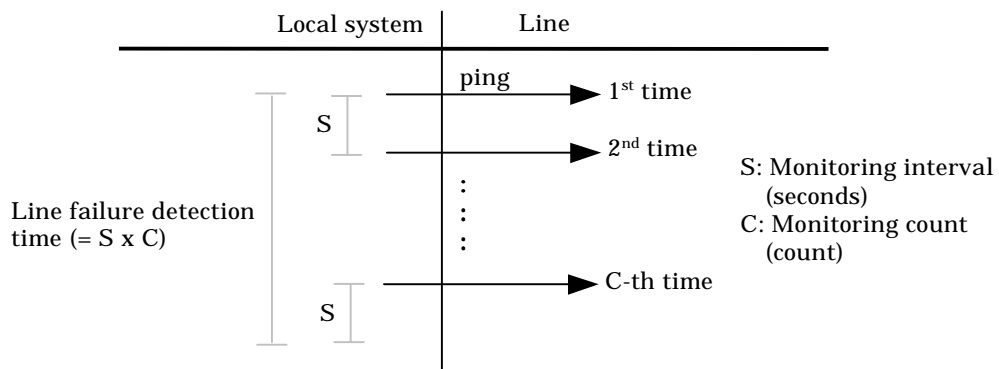
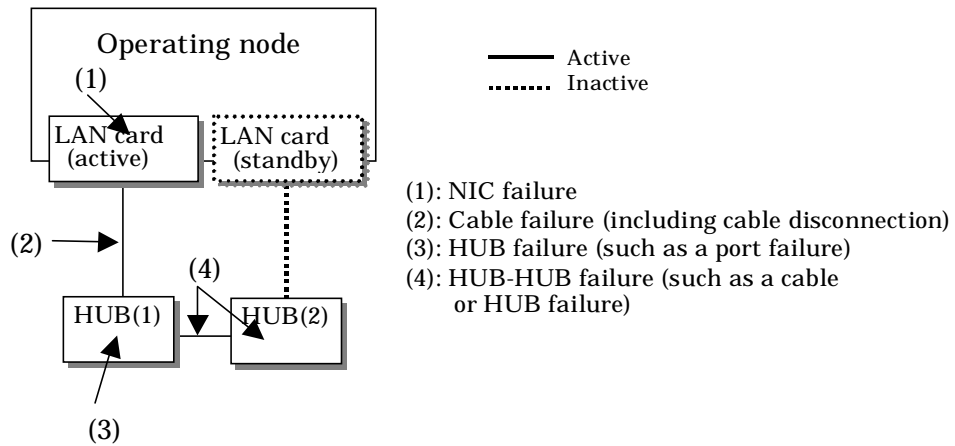


Figure 2.9 Fault detection time in NIC switching mode

### Detectable failures

The following failures can be detected:



**Figure 2.10 Effective monitoring range in NIC switching mode**

Because the failures (1) - (3) appear to be the same failure, a type of the failure cannot be specified. Each device has to be checked to make this determination.

### Monitoring start/stop timing

The line monitoring in NIC switching mode is automatically started when the system is activated and is automatically stopped when the system is stopped. In cluster operation, the line monitoring of each node is started and stopped independently. It is also possible to start or stop the line monitoring manually using the operational command (hanetpoll command).

### 2.1.2.2 Switching function

#### Switching operation

Switching operation changes the status of an active NIC into “inactive” state and then changes the status of standby NIC to “active” so that standby NIC can run as a new active device. At this point, the MAC address and IP addresses (physical IP and logical IP) are taken over and then an ARP request packet is broadcast, in which the MAC address/IP addresses of the local node are set as the source.

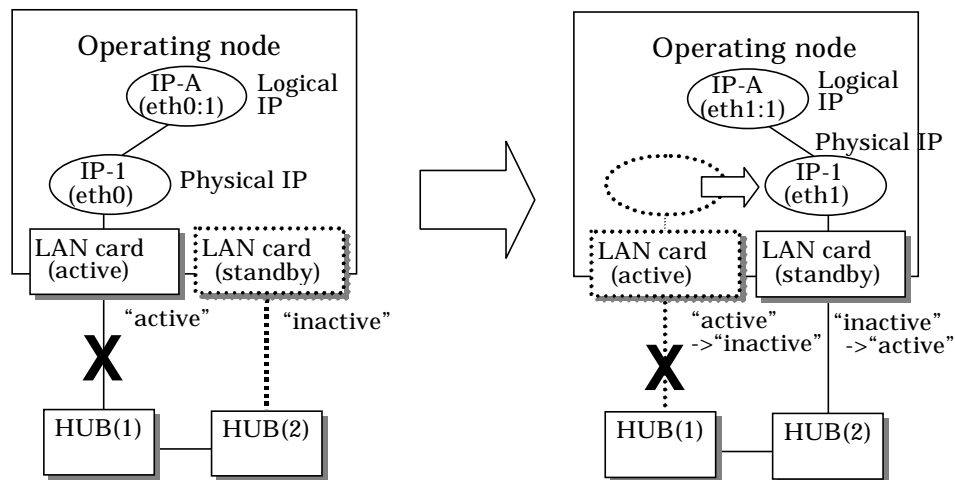
It is possible to choose either a logical IP address takeover function or a physical IP address takeover function as an IP takeover mode.

Both a logical IP address and a physical IP address are taking over at the time of logical IP address takeover function use. Only a physical IP address is taking over at the time of physical IP address takeover function use, without activating a logical IP address.

When using an IPv6 address, it is not possible to use a physical IP address takeover function. Figure 2.11 shows an example of node internal switching.

When a failure is detected, a console message is output to the syslog file (/var/log/messages). If a failure occurs when HUB-to-HUB communication monitoring is enabled, a console message is output to the syslog file (/var/log/messages).

#### - Logical IP address takeover function



#### - Physical IP address takeover function

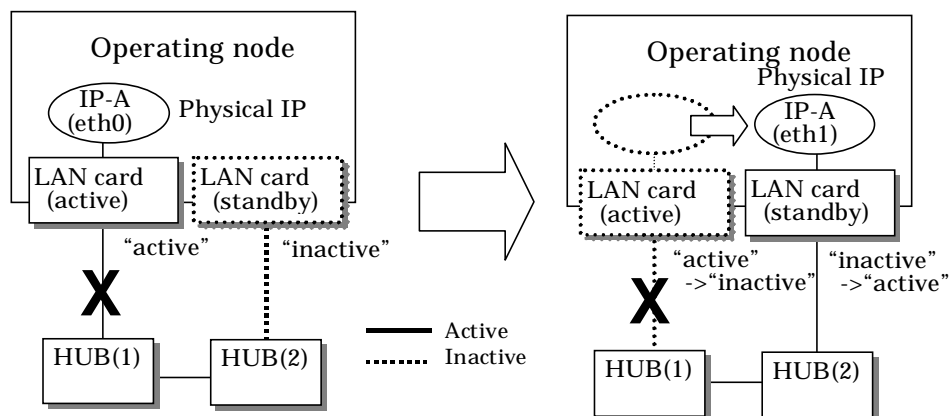


Figure 2.11 Outline of switching operation performed when a failure occurs in NIC switching mode

## Failback operation

If a relevant NIC recovers after NIC switching occurs due to failure detection, you must switch it back manually via `hanetnic change` command.

This command recovers the system and NIC to operate as an active NIC. In addition, if you setup a Standby Patrol Function, it automatically fails back the defective NIC without manually executing `hanetnic change` command. (For details regarding this operation, see "7.1 `hanetconfig Command`" and "7.9 `hanetnic Command`".) Furthermore, if in any case entire redundant NIC encounters failure, the monitoring process terminates. In such case, you must restart the process via `hanetpoll off/on` command after recovering the NIC. (For details on this command, see "7.7 `hanetpoll Command`")

### 2.1.2.3 Connectable remote host

Any system can be connected.

### 2.1.2.4 Available application

The requirement for user applications that can be operated in this mode is as follows:

- Applications need to be a TCP/IP application.
- Applications must be operational on a system to which multiple NICs are connected and on which multiple IP addresses are defined. (This system is called a multi-home host.) For example, a socket application needs to operate with its local IP address fixed with the `bind` function or set to any value. (Remote party applications do not check the IP address.)

### 2.1.2.5 Notes

- If assigning IPv4 address to the virtual interface, IPv4 address must be assigned to all the redundant physical interfaces.
- If assigning IPv6 address to the virtual interface, IPv6 address must be assigned to all the redundant physical interfaces.
- If assigning both IPv4 and IPv6 to the virtual interface, these two forms of an IP address must be assigned to all the redundant physical interfaces.
- No multi-cast IP address can be used.

## 2.2 Option Functions

Table 2.1 shows the option functions that can be used in each mode.

**Table 2.1 Available option functions in each mode**

Function	Mode	
	Fast switching mode	NIC switching mode
Configuring multiple virtual interfaces	A	A
Cluster fail-over when entire transfer routes fails	A	A
Sharing physical interface	A	A
Configuring multiple logical virtual interfaces	A	O
Configuring single physical interface	A	A
HUB monitoring	X	A
Standby patrol	O	A
Automatic fail-back	O	A
Dynamically adding/deleting/switching physical interface	A	A
User command execution	X	A

[Meaning of the symbols] A: Allowed, O: Replaced by other functions, X: Not allowed

## 2.2.1 Configuring multiple virtual interfaces

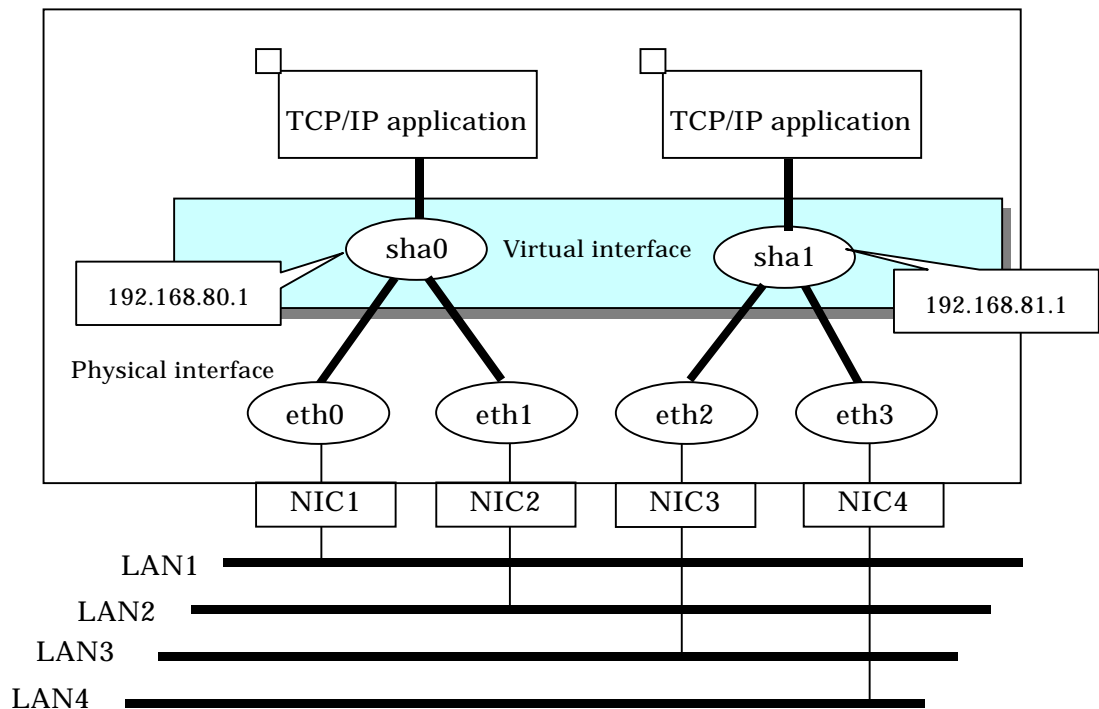
Multiple virtual interfaces can be defined in a single system. With this capability, the number of available transfer routes within a single system can be increased, which will be useful for a system requiring multiple networks, such as application gateway. With the multiple virtual interfaces, high network reliability can be ensured.



**Note**

- The virtual IP address of different subnet must be assigned to the multiple virtual interfaces.

Figure 2.12 below shows an example of defining 2 virtual interfaces. A virtual IP address of different subnet must be assigned in sha0 and sha1.



**Figure 2.12 Two virtual interfaces being defined**



## 2.2.2 Cluster fail-over when entire transfer routes fails

While operating a cluster, if every single transfer route fails for a particular virtual interface, a cluster can switchover to the other cluster. With this capability, the system can be recovered, without administrator's interference, by performing switchover within the cluster when detecting failures in the entire transfer route. Cluster fail-over is enabled in the initial setup for duplex transfer route operation in Fast switching mode, NIC switching mode. This function is automatically configured when the cluster definition is defined.

Figure 2.13 shows an example of fail-over to node B when communication is disabled via both eth0 and eth1 bundled with virtual interface sha0 on node A.



### Information

The following is an example of Fast switching mode and this applies to NIC switching mode as well.

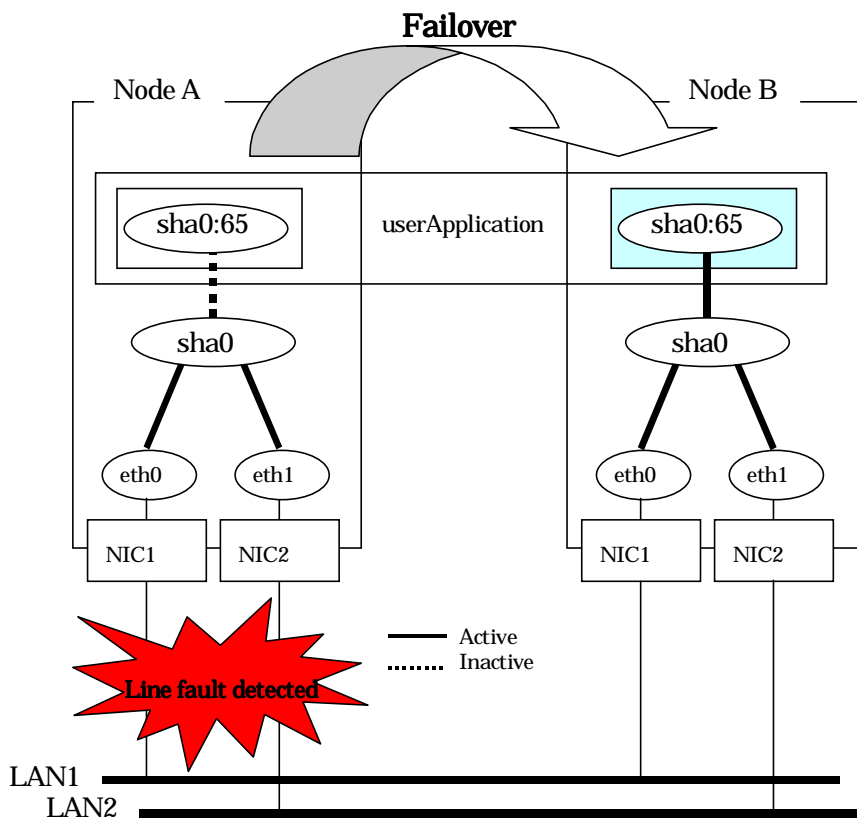


Figure 2.13 Cluster failover due to line fault

## 2.2.3 Sharing physical interface

If multiple virtual interfaces are created, these interfaces can share one or all physical interfaces. This is called "sharing physical interface".

Using this capability, it is possible to:

- Decrease the number of NICs used for the redundancy operation, and make effective use of limited resources in Fast switching mode.
- Configuring multiple IP addresses on a single NIC in NIC switching mode and use different IP address for each application.

### 2.2.3.1 Using Fast switching mode

One portion or entire physical interfaces can be shared by the virtual interfaces which institute Fast switching mode. Though, it is not possible to share the physical interface and virtual interface of NIC switching mode.



Note

- The virtual IP address of different subnet must be assigned to the multiple virtual interfaces.

Figure 2.14 shows an example of three virtual interfaces, sha0, sha1, and sha2 (All in Fast switching mode) sharing three physical interfaces eth1, eth2, and eth3.

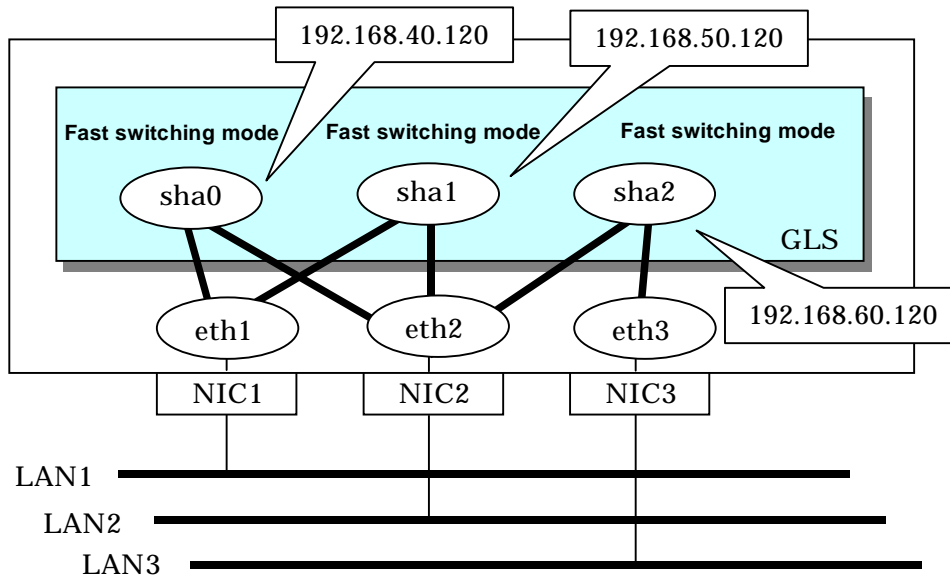


Figure 2.14 Example of sharing physical interface (1)

### 2.2.3.2 Using NIC switching mode

Within several virtual interfaces of NIC switching mode (logical IP takeover), if all the name of the physical interfaces and the value of the physical IP addresses are equivalent, then it is possible to share the physical interface. Sharing a portion of physical interface is not allowed. Nevertheless, sharing is not possible for NIC switching mode (physical IP takeover). In addition, sharing physical interface with the virtual interface is not possible for Fast switching mode.



#### Note

- The virtual IP address of same subnet must be assigned to the multiple virtual interfaces.

Figure 2.15 shows an example of three virtual interfaces sha0, sha1 and sha2 (all in NIC switching mode) sharing two physical interfaces eth1, and eth2.

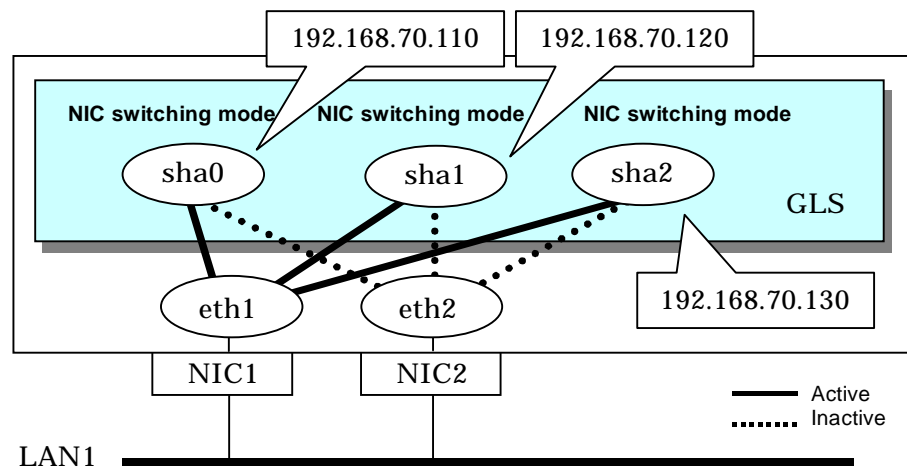


Figure 2.15 Example of sharing physical interface (2)

### 2.2.3.3 Notices

- In Fast switching mode, NIC sharing is not possible within the virtual interface that institutes IPv6 address. NIC sharing is possible between the virtual interfaces that are both configured with IPv4 address, or between the virtual interfaces that are configured with IPv6 address and IPv4 address.

## 2.2.4 Configuring multiple logical virtual interfaces

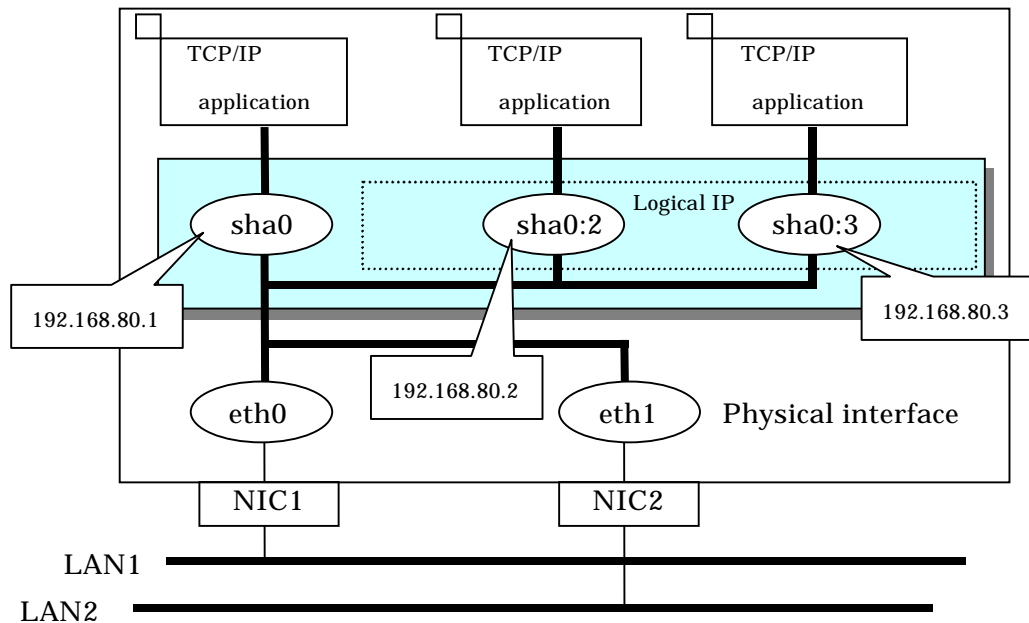
It is possible to define several IP addresses (logical virtual interfaces) on a single virtual interface. They are called logical virtual interfaces in this document. Using this function, various IP addresses can be used for each application.



Note

- The virtual IP address of same subnet must be assigned to the multiple virtual interfaces.

Figure 2.16 shows an example of defining two IP addresses (logical virtual interface) on a single virtual interface sha0. Configure the IP address of the same subnet to sha0, sha0:2, sha0:3.



**Figure 2.16 Logical virtual interfaces being defined**

The total number of interfaces can be created as a logical virtual interface is 63 (from 2 to 64). The logical virtual interfaces greater than 65 will be used as takeover virtual interface upon Cluster configuration.



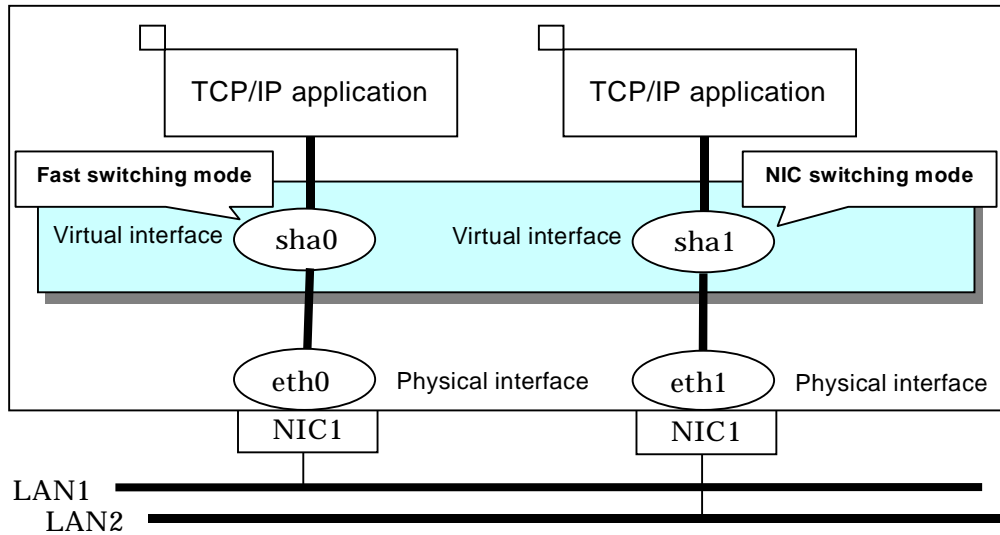
Note

- This function is only available for Fast switching mode.
- For NIC switching mode, if using physical interface sharing function, it can process (a process of allocating multiple IP addresses to one physical interface) equally as this function.

## 2.2.5 Configuring single physical interface

You can create a virtual interface, which has a single physical interface. This function enables failover because of a line failure even on a cluster system that has only one physical interface available for use.

Figure 2.17 shows an example of single physical interface configuration.



**Figure 2.17 Single physical interface configuration**



**Note**

- This feature is capable for Fast switching mode and NIC switching mode.
- The selection criteria of a mode where a single physical interface is used on GLS relies on the mode where redundant line is used. Refer to the fault monitoring function requirements section on "1.1.1 Functional comparison" before selecting a single physical interface for either mode.

## 2.2.6 HUB monitoring

This section describes HUB monitoring function for NIC switching mode.

### 2.2.6.1 HUB monitoring function

The HUB monitoring function issues the ping command to adjacent HUB at regular intervals and switches the interface to be used when a line failure is detected. Up to two HUBs can be registered per virtual interface. This function is available exclusively for NIC switching mode.

This function can also monitor a transfer path between two HUBs (this is called HUB-to-HUB monitoring function). HUB-to-HUB monitoring function detects a failure between two HUBs. This function can thus prevent a communication error from occurring due to NIC switching when a HUB-to-HUB failure occurs.



#### Information

If the standby patrol function is used, the HUB-to-HUB monitoring is not required because the standby patrol function is comprised with HUB-to-HUB monitoring function. (See section “2.2.7 Standby patrol function”)

Figure 2.18 shows an outline of the HUB monitoring function

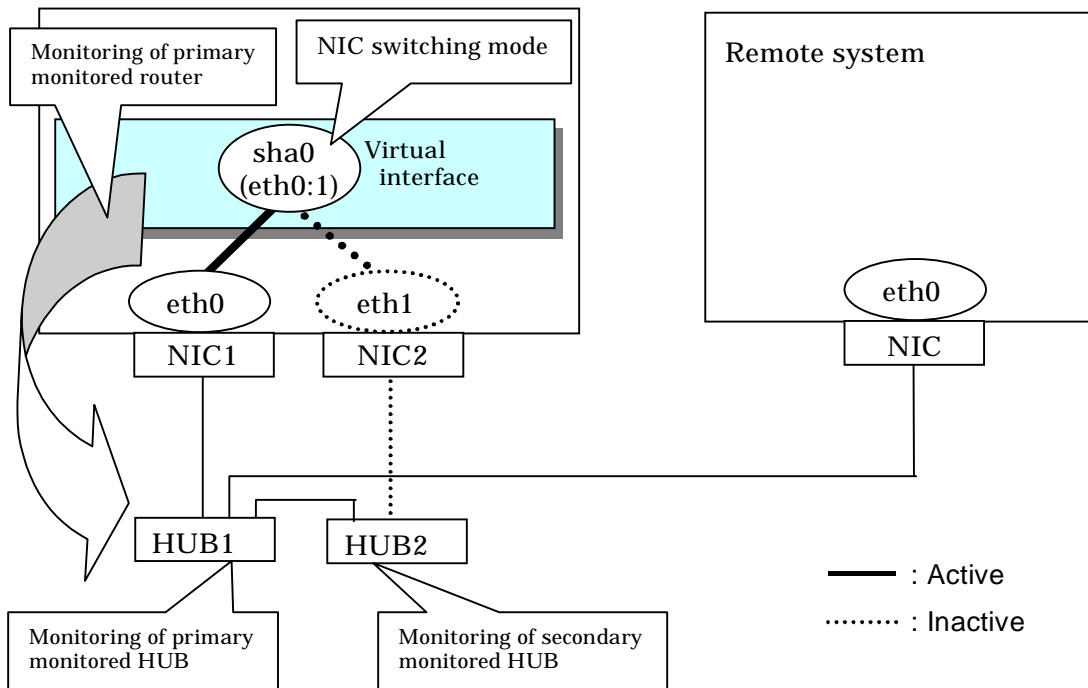


Figure 2.18 HUB monitoring function



#### Point

If a hub cannot have an IP address, IP address of a host or a router that is connected to the hub can be monitored. However, if the monitored host or router stops, polling the host or router fails and a NIC switching event might occur. In order to prevent an unnecessary switching process, it is recommended to set up two monitoring targets, as well as enabling HUB-to-HUB monitoring function in case one of the monitoring targets stops.



## Note

- Refer to “7.7 hanetpoll Command” for configuration of HUB-to-HUB monitoring feature.
- It is not recommended to operate with a single HUB. It is possible to have only one configuration for a remote end when using a single HUB. However, it defeats the purpose of multiplexing transfer paths if the HUB breaks.

### 2.2.6.1.1 Not using HUB-to-HUB monitoring feature

If the operation starts without HUB-to-HUB monitoring function, the primary HUB (Switch/HUB1 in the figure 2.19) is monitored using the ping command. When a failure is detected in the primary HUB, the NIC of the currently active system is inactivated and then the standby NIC is activated. After the standby NIC is activated, the secondary HUB (Switch/HUB2 in the figure 2.19) is monitored using the ping command.

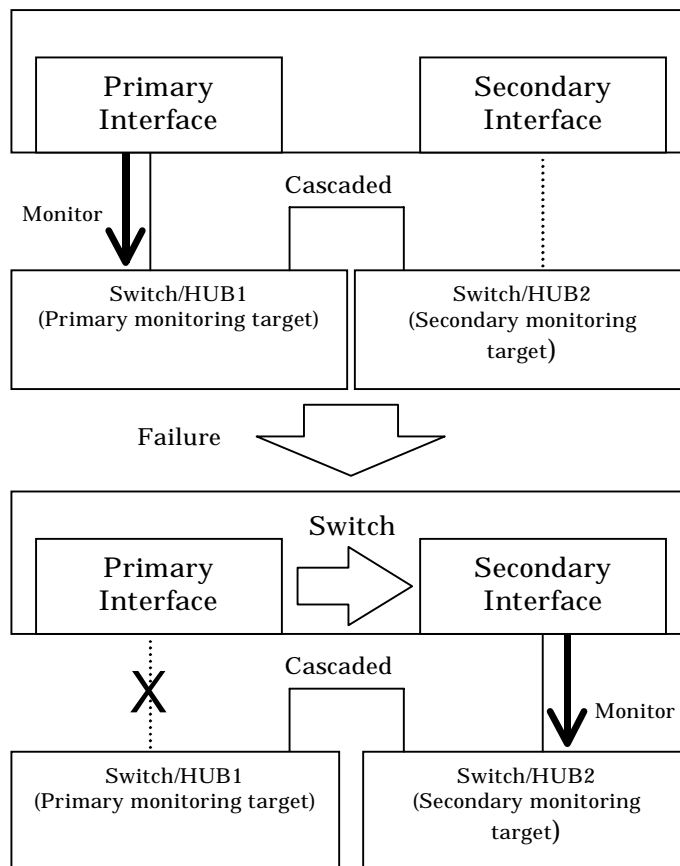


Figure 2.19 HUB-to-HUB monitoring disabled

### 2.2.6.1.2 Using HUB-to-HUB monitoring feature

If the operation starts using the HUB-to-HUB monitoring function, the secondary HUB (Switch/HUB2 in the figure 2.20) is monitored using the ping command. When a failure is detected on the secondary hub, HUB-to-HUB monitoring function starts polling the primary hub, as well as polling the secondary hub (Switch/HUB1 in Figure 2.20). (During this occasion, a monitoring failure message (No.873) regarding the secondary HUB will be outputted. Use this message to investigate the cause of the failure) Once the polling process on the primary HUB starts, this function then monitors both secondary and primary HUBs interchangeably. Monitoring process against the secondary HUB is recovery monitoring and it will stop monitoring the primary HUB when HUB-to-HUB monitoring function detects recovery of the secondary HUB. HUB-to-HUB monitoring function determines transfer path failure by checking the number of monitoring failures (the default is 5 times). If failures were detected repeatedly on both primary and secondary HUBs, then it determines there was transfer path failure. Note that a message (No.873) will be reported regarding the failure on the secondary HUB, therefore it is possible to recover the secondary HUB before the primary HUB switches to secondary HUB.

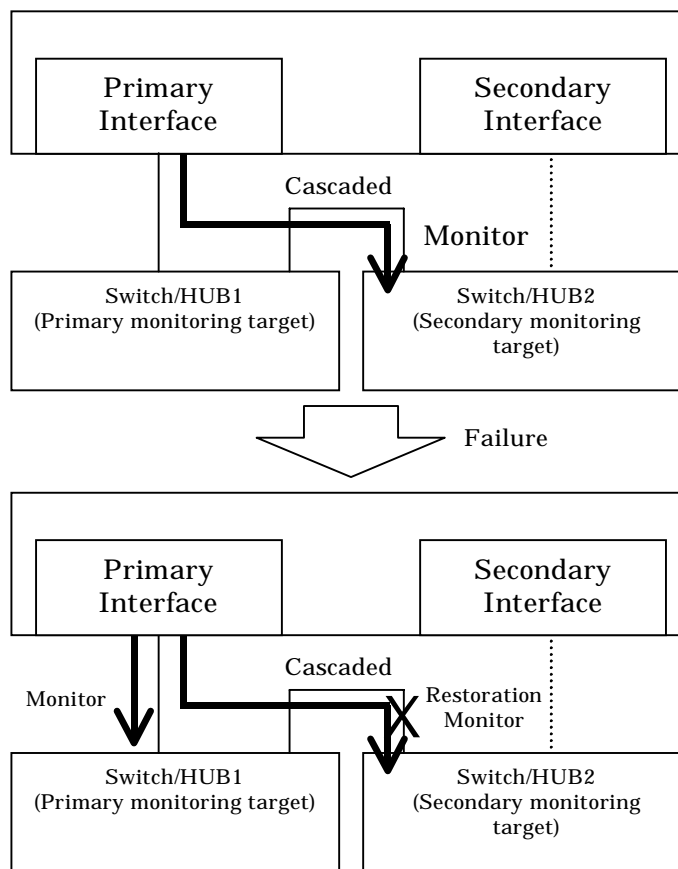


Figure 2.20 HUB-to-HUB monitoring enabled (failure on the secondary monitoring)



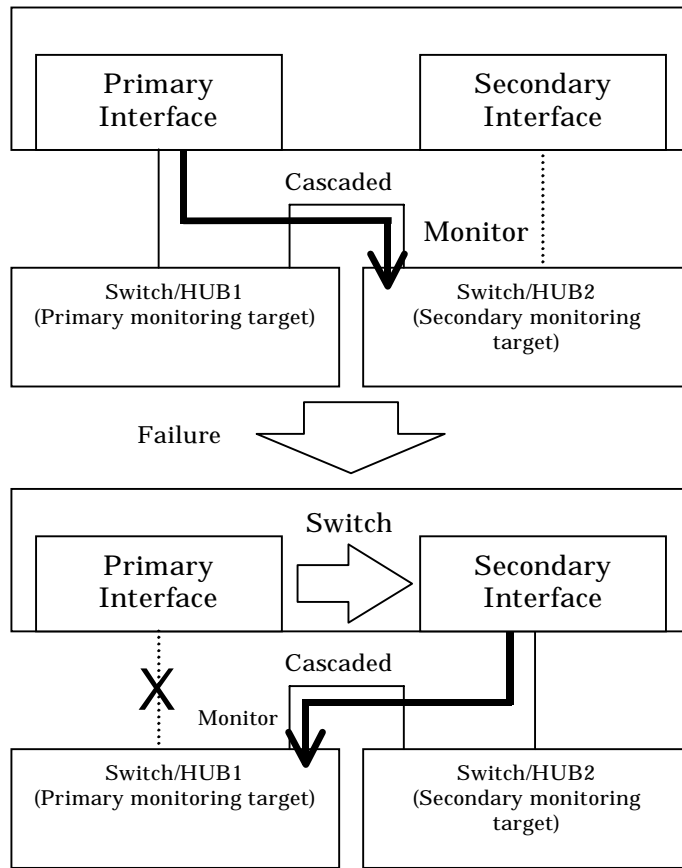


Figure 2.21 HUB-to-HUB monitoring enabled (failure on the primary monitoring)

## 2.2.7 Standby patrol function

A standby patrol function monitors the condition of the deactivated actual interface of a standby system in NIC switching mode.

This brings the following effects:

- A message will be reported to an administrator when a failure occurs in standby interface. Therefore, even if a failure has already occurred in operating interface, an administrator is aware of the failure occurred in the standby interface so that switching can be prevented.
- It is possible to fail the interface back automatically, when the standby interface recovers after switching to previous operation. (Automatic fail-back feature.)
- When the transfer path monitoring feature stops due to a failure in every one of the transfer paths, standby patrol feature allows to recover transfer path monitoring feature automatically.

Standby patrol starts when activated a system and when processed activation of the corresponding NIC switching mode, and stops automatically when a system stopped or when processed deactivation of the corresponding NIC switching mode. It is possible to operate manually. See "7.10 strptl Command" for starting standby patrol manually and "7.11 stpptl Command" for stopping standby patrol.

See "2.2.8 Automatic fail-back function" for an automatic fail-back function.

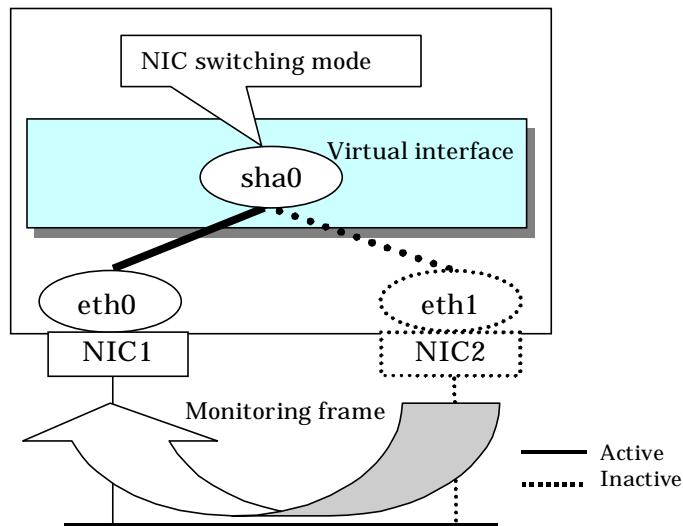


Figure 2.23 Standby patrol function



Note

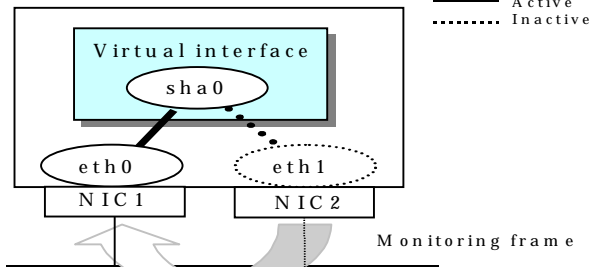
- This feature is available exclusively for NIC switching mode. Fast switching mode does not have standby interface. Thus, this feature does not apply to the mode.

## 2.2.8 Automatic fail-back function

In NIC switching mode, "automatically perform fail-back immediately after recovering the faulted transfer path" or "perform fail-back when the transfer path currently used encounters a failure" can be defined by using a standby patrol function.

For information on the setup, Figure 2.24 shows the outline of the automatic fail-back function.

### Initial status



### After a fault occurs

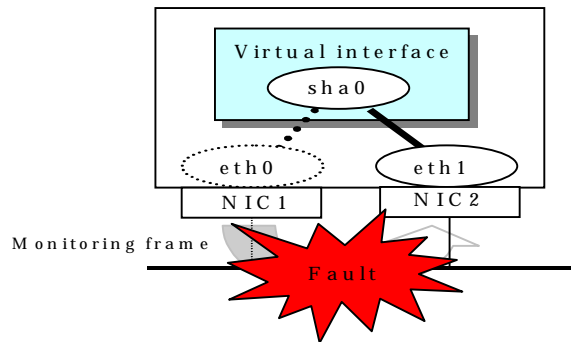
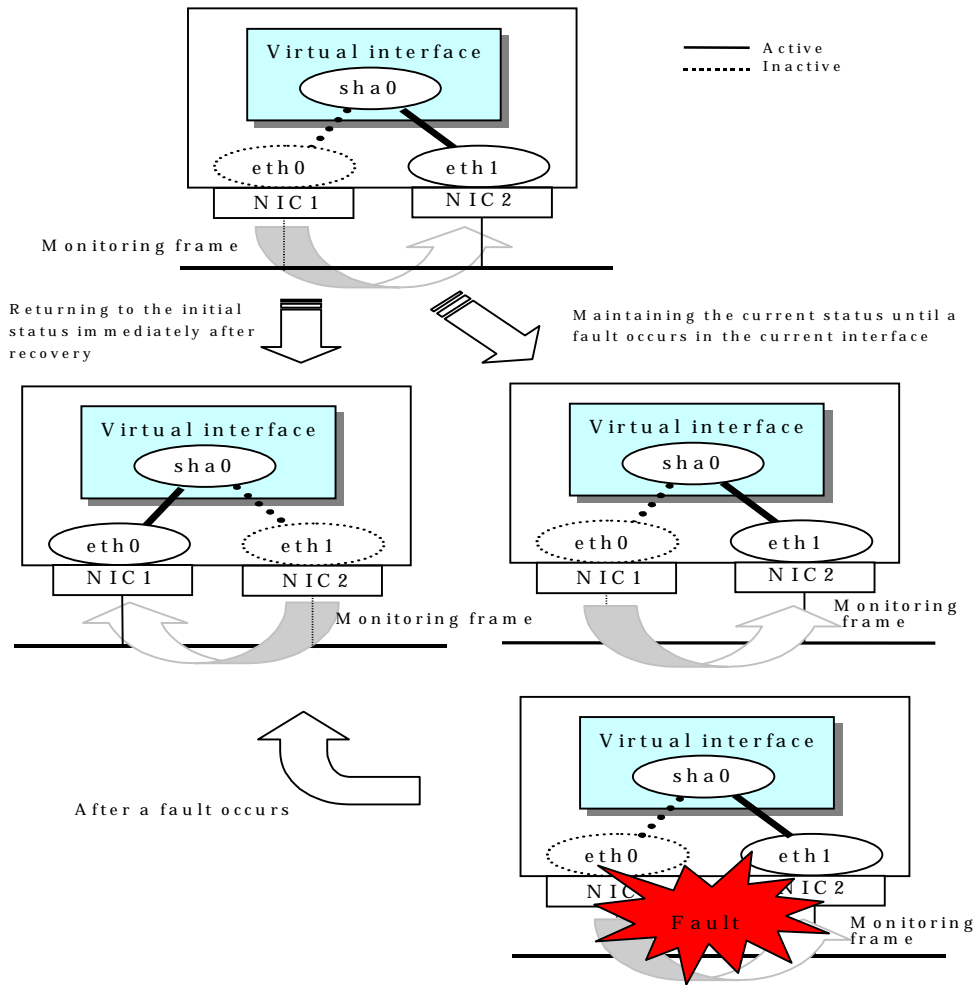


Figure 2.24 Automatic fail-back function (continued)

**Recovery from a fault**



**Figure 2.24 Automatic fail-back function (end)**

When specified other than HUB as a monitoring target device, occasionally automatic failback is not promptly executed after recovered the primary interface, depending on where an error occurred in a transfer route. Therefore, specify HUB as a monitoring target device to execute prompt failback.



**Note**

- After the failed interface is recovered, if a running interface fails before the Standby patrol detects the No.885 message indicating interface recovery, NIC switchback will not be executed. If this occurs, the Standby patrol will consider that both of the NICs are disabled until it detects the failed interface recovery. Recover the interface referring to "4.6.2 Recovery procedure from line failure in NIC switching mode".

## 2.2.9 Dynamically adding/deleting/switching physical interface

In Fast switching mode, it is possible to add/delete bundled physical interfaces with a virtual interface kept activated (dynamic). The `hanetnic` command adds/deletes dynamically. See "7.9 `hanetnic` Command" for the detail.

Figure 2.25 shows the outline of workings when executed a command to add/delete the physical interface dynamically.

There are following two modes in a command to add/delete the physical interface dynamically.

### Temporal dynamic addition/deletion:

Operates physical interfaces to bundle without editing a configuration information file. Therefore, it automatically returns to the original state by operating a machine to reboot, etc. It is not possible to add other than the physical interface that was deleted by this mode when adding dynamically.

### Permanent dynamic addition/deletion:

Edits a configuration information file. Therefore, changes are reflected even after operated a machine to reboot, etc. It is not possible to delete permanently when a virtual interface is registered to the cluster resource.

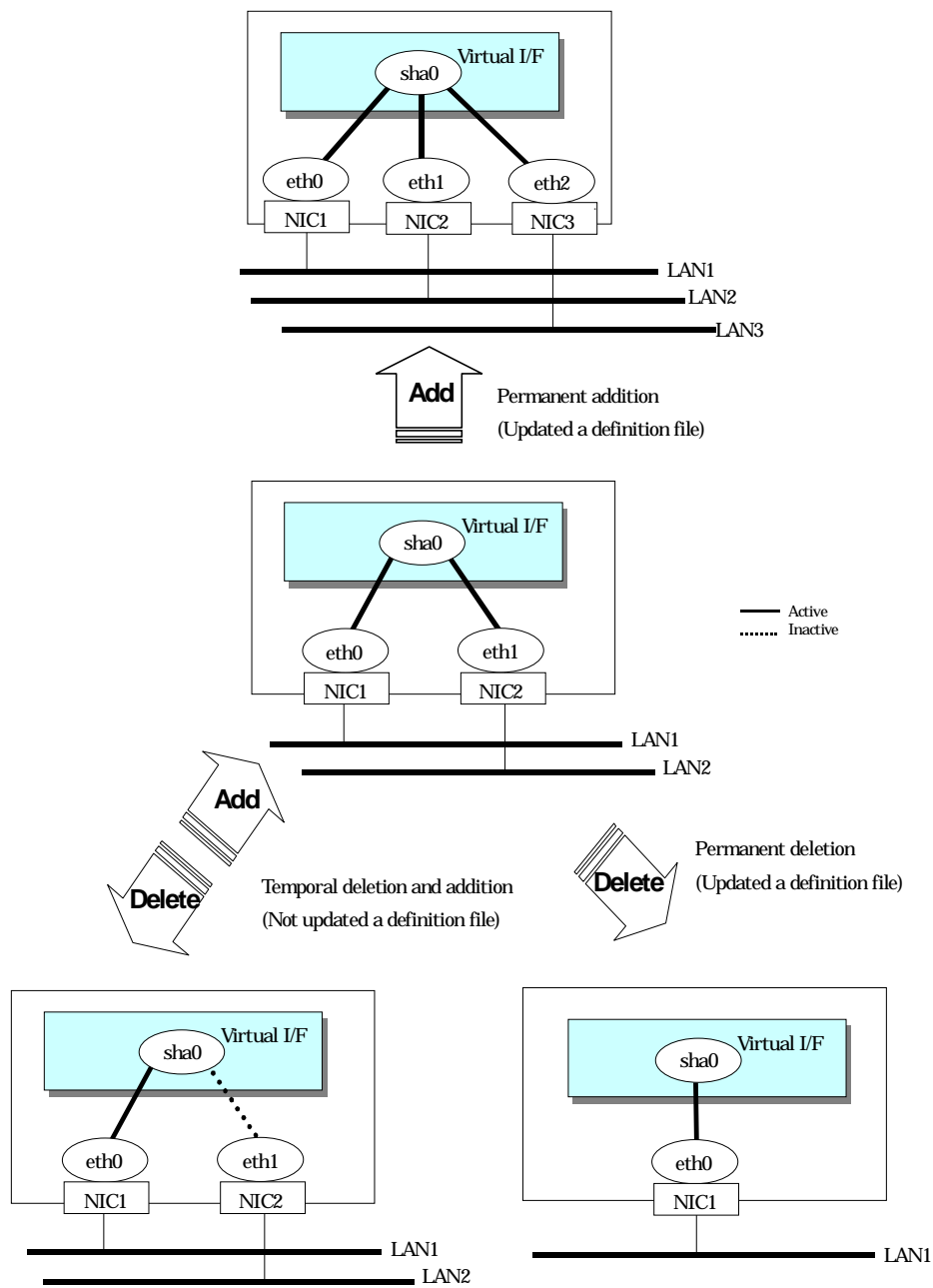


Figure 2.25 Dynamic adding/deleting function of physical interfaces used

In NIC switching mode, it is possible to make changes manually so that the standby physical interface can be used while the currently operating interface is active (dynamic). Figure 2.26 shows an outline of operations performed when the physical interface switching command is executed. For information on the setup,

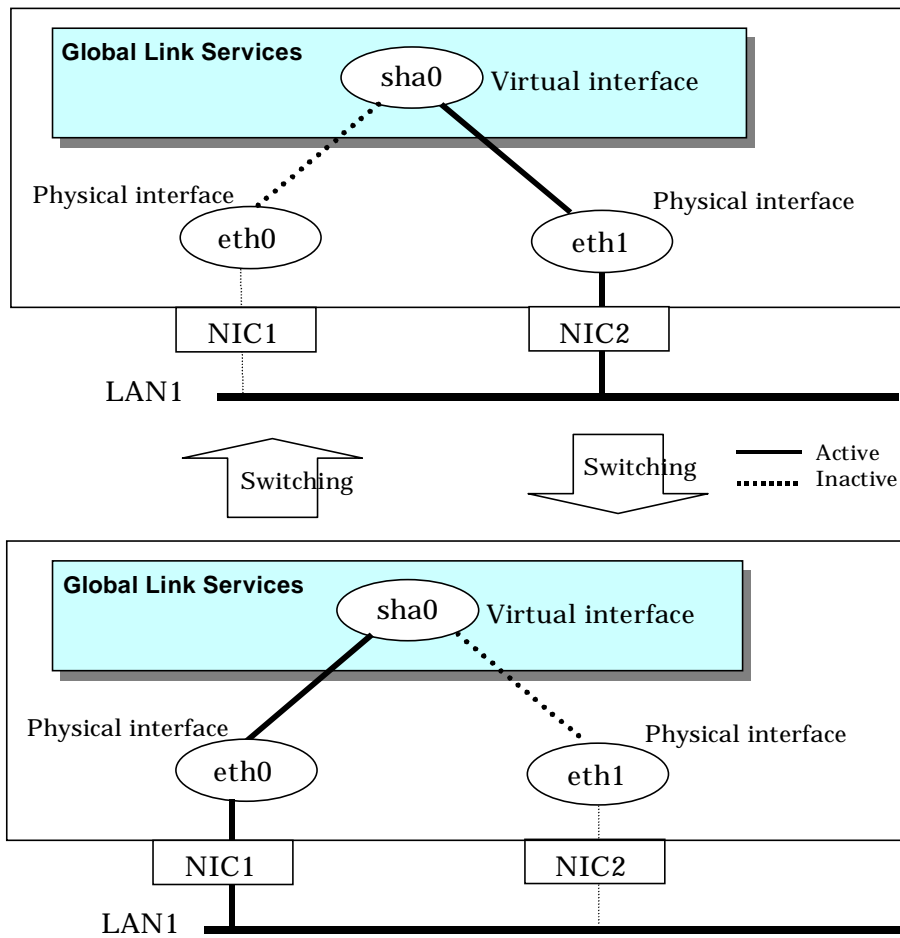


Figure 2.26 Dynamic switching function of physical interfaces used

## 2.2.10 User command execution function

In NIC switching mode, a user-defined command can be executed.



See

For information on the setup, see Section "3.6.9 Setting user command execution function".



Note

It is not possible to use this function in Fast switching mode.

Timing to run is as follows:

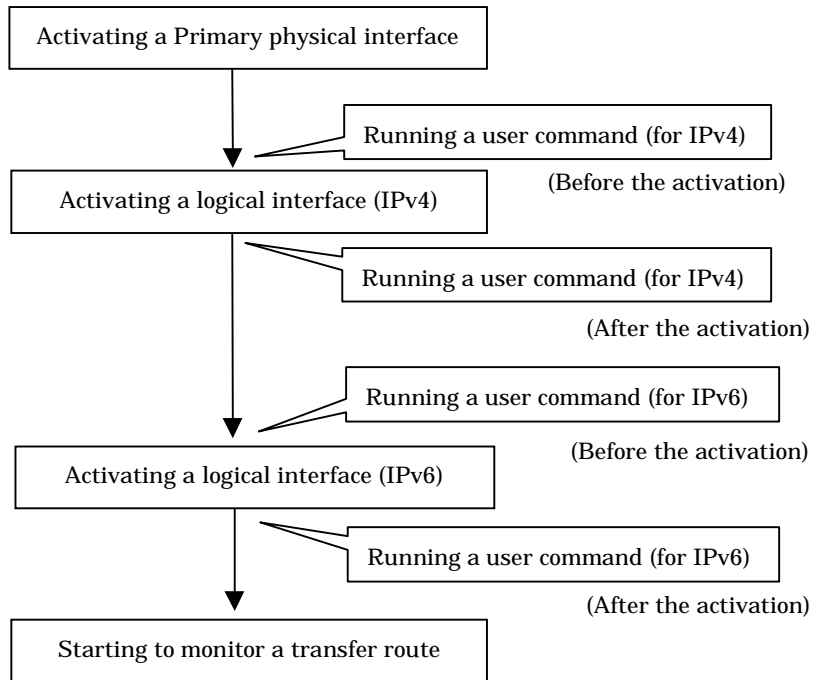
### (1) NIC switching mode

- **Running a user-specified command when activated or deactivated an IP address**  
Run a user-specified command when activated or deactivated a logical IP address (when using a logical IP address takeover function) or a physical IP address (when using a physical IP address takeover function) by automatically switching due to an error in monitoring a transfer route or by operating an operation command (activation, deactivation, or manual switching). Use this function to restart an application after activating or deactivating an IP address, to set the specified routing information, to delete the ARP information, and to change a MAC address.
- **Running a user-specified command when detected an error in a transfer route**  
Run a user-specified command when detected an error in monitoring a transfer route (such as LAN or HUB errors). Use this to notify a system administrator or an application of detecting an error.
- **Running a user-specified command when detected an error by standby patrol or recovery**  
Run a user-specified command when detected an error in monitoring a transfer route by standby patrol or recovery. Use this to notify a system administrator or an application of detecting an error or recovery. When set either of a monitoring interval ('-p' option) or the number of the times of continuous monitoring ('-o' option) of standby patrol to zero by a hanetparam command, it is not possible to use this user command execution function.



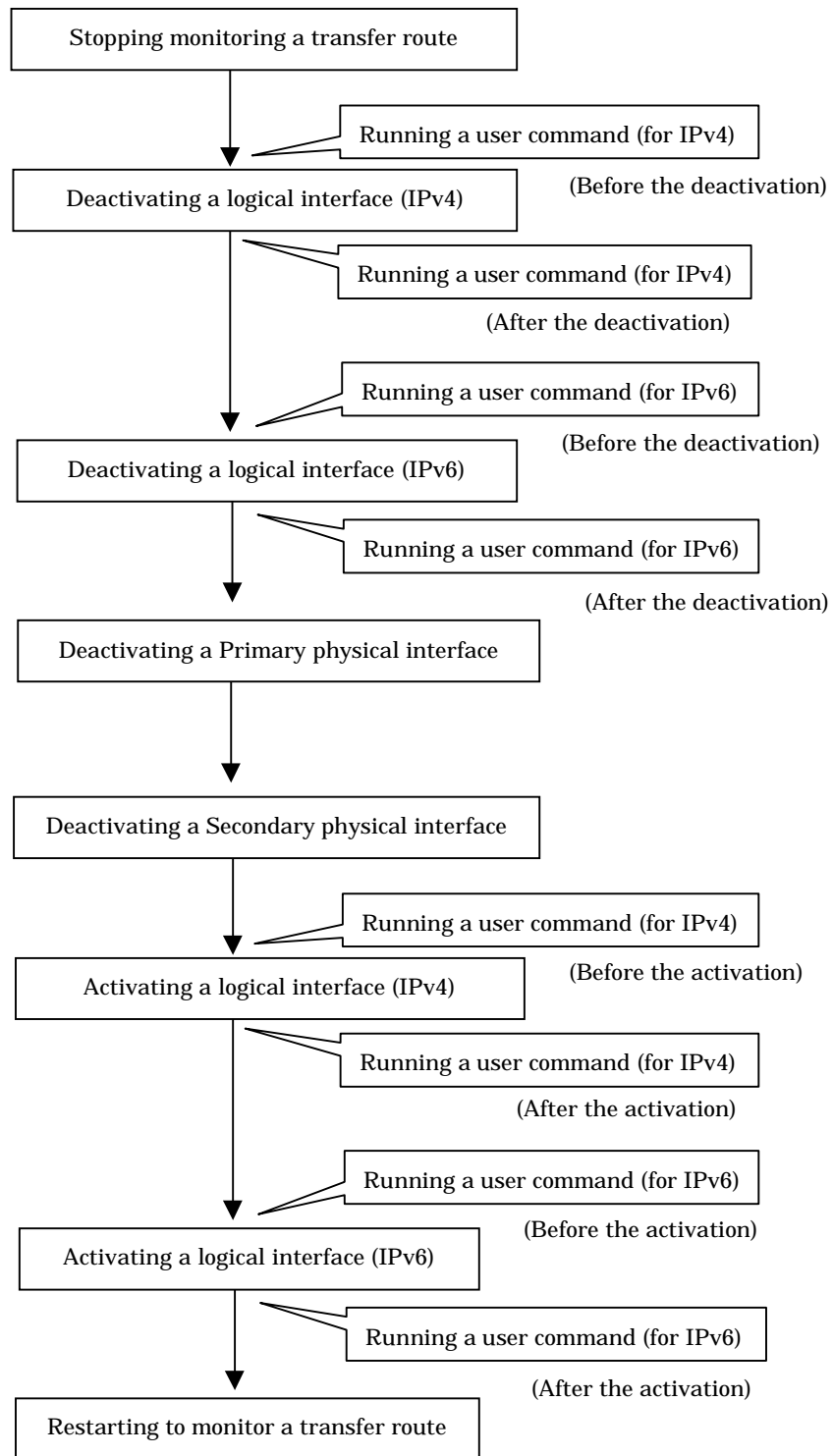
Figure 2.27 shows timing to run a user command when activated or deactivated an IP address in NIC switching mode (a logical IP address takeover function).

[When activated a system or a cluster service]



**Figure 2.27 Timing of running a user command when activating or deactivating an IP address (a logical IP address takeover function) (Continued.)**

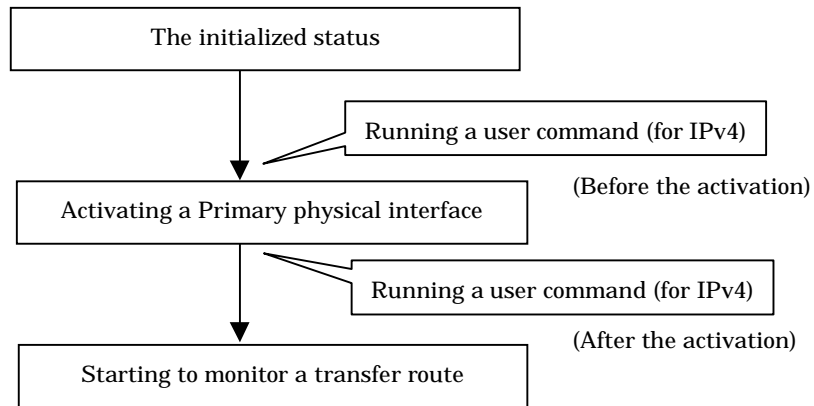
[When detected an error in a transfer route or when manually switched with a command]



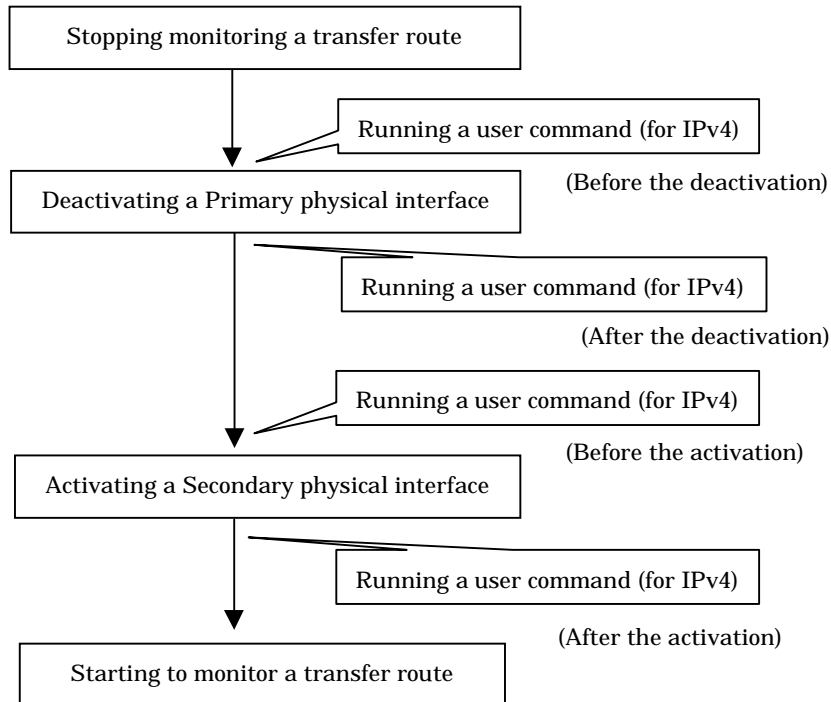
**Figure 2.27 Timing of running a user command when activating or deactivating an IP address (a logical IP address takeover function) (End.)**

Figure 2.28 shows timing to run a user command when activated or deactivated an IP address in NIC switching mode (a physical IP address takeover function).

[When activated a system or a cluster service]



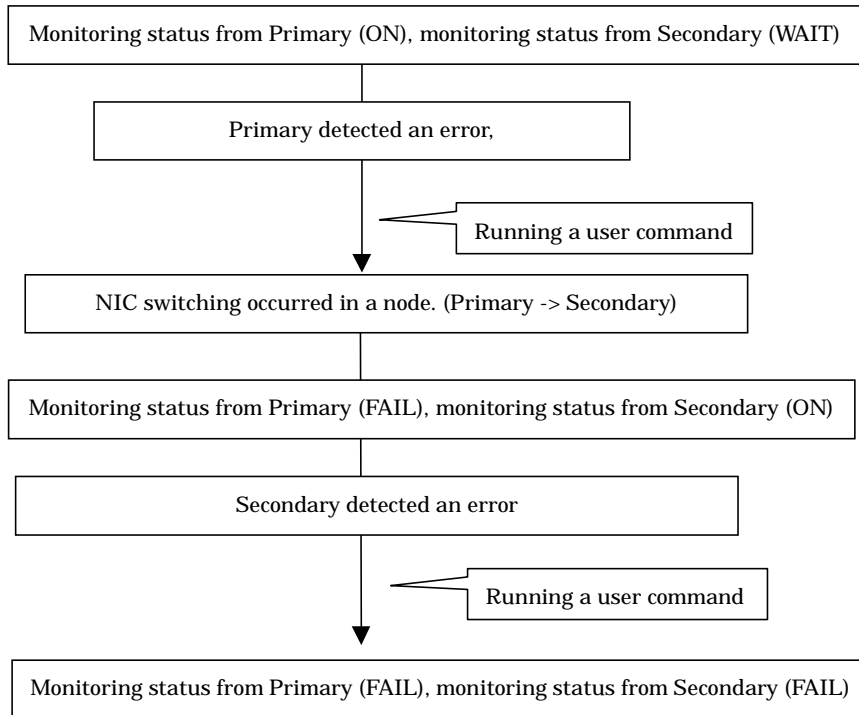
[When detected an error in a transfer route or when manually switched with a command]



**Figure 2.28 Timing of running a user command when activating or deactivating an IP address (a physical IP address takeover function)**

Figure 2.29 shows timing to run a user command when detected an error in a transfer route in NIC switching mode

[When started to monitor a transfer route from a Primary interface]



[When started to monitor a transfer route from a Secondary interface]

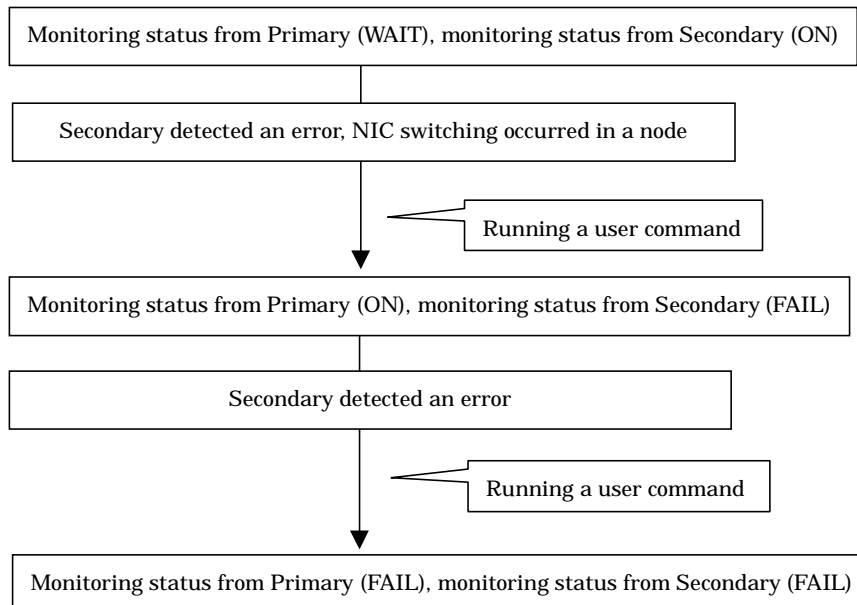
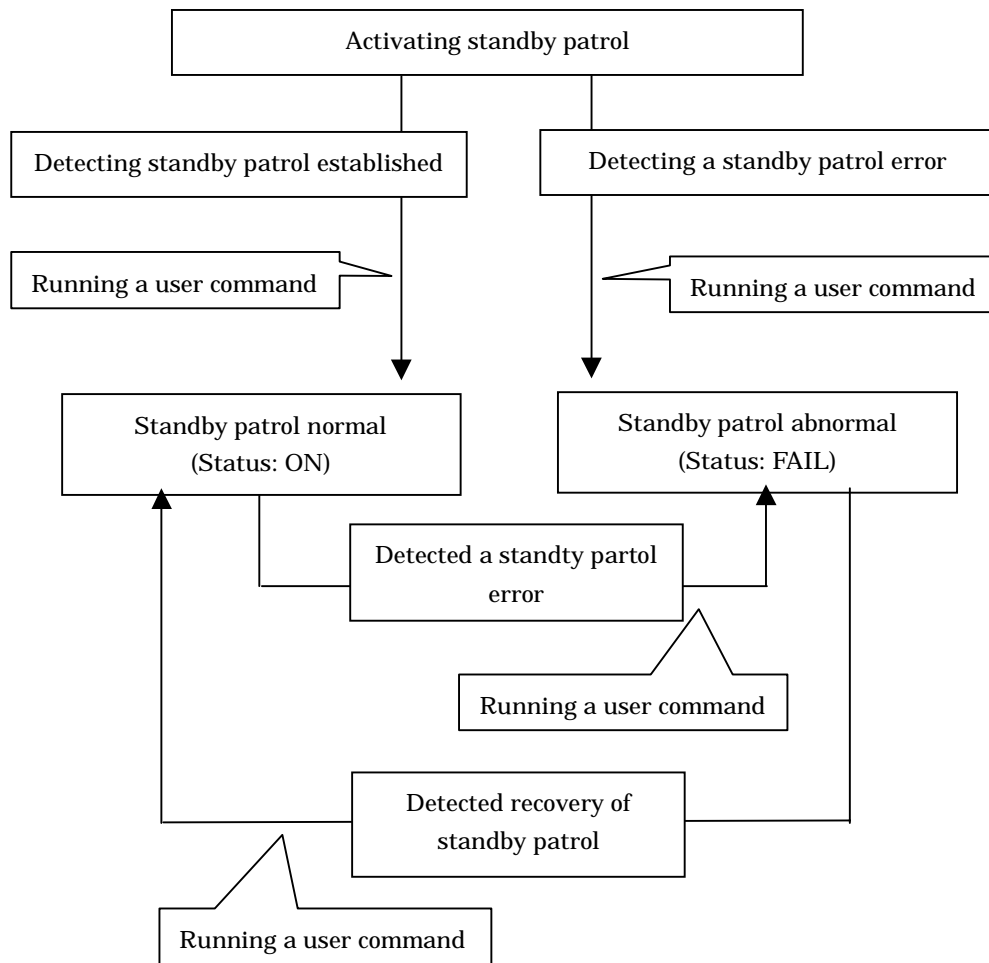


Figure 2.29 Timing of running a user command when detected an error in a transfer route

Figure 2.30 shows timing to run a user command when detected a standby patrol error or recovery in NIC switching mode.



**Figure 2.30 Timing of running a user command when detected a standby patrol error or recovery**



## 2.3 Other functions

Each mode supports the features shown in the table 2.2.

**Table 2.2 Functions available for each mode**

Function	Mode	
	Fast switching mode	NIC switching mode
Message output function when a line failure occurs	A	A
Active maintenance of NIC (PCI card)	A	A
Interface status monitoring feature	B	A

[Meaning of the symbols] A: Allowed, B: Allowed to only the cluster system, X: Not allowed

### 2.3.1 Message output when a line failure occurs

If a line failure is detected on a physical interface, an error message is displayed on the console. This function enables the real-time recognition of a line failure.

### 2.3.2 Active maintenance of NIC (PCI card)

Active maintenance of NIC enables NIC removal and replacement without disrupting ongoing operation.

When you use this function, see the "PRIMEQUEST 480/440 Operation Manual".

- PRIMEQUEST 480/440 Operation Manual

For information on how to perform active maintenance of the redundant line control function, see "4.5 Active maintenance (addition/removal/swapping)".

### 2.3.3 Interface status monitoring feature

By monitoring UP/Down status of an interface used in Redundant line control function, it is possible to recover the regular operation when a user mistakenly change Up/Down of a interface using ifconfig command. This feature automatically starts up when a virtual interface is activated.

The following is a list of interfaces available for recovery using this feature.

**Table 2.3 Recoverable interfaces using interface status monitoring feature**

Mode	Single System			Cluster System		
	Virtual I/F (logical I/F)	Logical virtual I/F	Physical I/F	Virtual I/F (logical I/F)	Logical virtual I/F	Physical I/F
Fast switching	N	N	N	A	A	N
NIC switching	A	-	A	A	-	A

[Meaning of the symbols] A: Recoverable N: Non-recoverable -: No such combination





## 2.4 Notes

### 2.4.1 General

Notes on setting a configuration:

- The minimum and maximum number of virtual and logical virtual interface can be defined is 1 to 64 in total.
- The number of physical interfaces can be used for redundancy on a single virtual interface is within 1 to 8 for Fast switching mode. For NIC switching mode, the range is within 1 to 2.
- The number of logical virtual interfaces that can be defined to a single logical virtual interface is within 1 to 63.
- To use all host names and IP addresses used in a Redundant line Control Function , they must be defined in /etc/hosts files of the local system
- The system automatically determines the length of MTU for an interface. Nonetheless, it is possible to change the length of MTU using user command execution function. For changing MTU length, refer to “3.6.9 Setting user command execution function”. Note that the length of MTU cannot be modified in NIC switching mode.

Notes on the operation:

- It is not possible to use a multicast IP address in a Redundant Line Control Function.
- Redundant control line function does not support IPv6-IPv4 tunneling interface(sitX).
- Redundant control line function is comprised with a function monitors conditions of interfaces. If a user manually switches a physical interface up/down, this function overrides user operation and restores these interfaces to the state where they were initially running.
- Do not operate physical interfaces that a virtual interface bundles with an ifconfig command.

Notes on upper applications:

- When using TCP in a working application, the data lost when an error occurred in a transfer route is guaranteed by resending from TCP and reaches the other system in the end. Therefore, TCP connection is not disconnected and there is no error in communication. However, it is necessary to set a timer value longer than the time to finish disconnecting/switching a transfer route when an application monitors a response by such as a timer. When TCP connection is disconnected by the reason such as not possible to change a timer value, reestablish the TCP connection and recover the communication.
- The data lost at the time of an error in a transfer route is not guaranteed when a working application uses the UDP. It is necessary to execute a recovery process such as sending the data by the application itself.
- It is not possible to use DHCP (a server function and a client function) as the upper application in a Redundant Line Control Function.
- When using NTP as an upper application, it is necessary to activate an IP address that a Redundant Line Control Function controls before activating an NTP daemon. No special operation is required when activating a system because a Redundant Line Control Function is activated before an NTP daemon. However, when manually activated an IP address with an operation command or when running cluster operation, reactivate an NTP daemon after an IP address is activated. In addition, when using NTP on GLS, a NTP daemon has to be defined to be able to communicate using a logical IP address. In this case, please add -L option to a configuration file (/etc/sysconfig/ntpd) of NTP daemon.

```
# Drop root to id 'ntp:ntp' by default. Requires kernel >= 2.2.18.
OPTIONS="-L -U ntp -p /var/run/ntpd.pid"
```

## 2.4.2 Duplicated operation by Fast switching mode

- Redundant Line Control Function must be operating on each system that performs duplicated operation by Fast switching mode.
- In Fast switching mode, one virtual network is configured to the redundant transfer route. Therefore, a new network number or a subnetwork number to this virtual network is necessary.
- Only one NIC interface is connectable on one network. It is not possible to connect more than one interface on the same network.
- Any combination is possible for redundant NICs. When combined those of different transfer abilities, the communication ability is suppressed by the one of less transfer ability. Therefore, it is recommended to combine the same kind of NICs and to make them redundant.
- In Fast switching mode, a dedicated Ethernet frame is used. Therefore, when operating VLAN (Virtual LAN), occasionally it is not possible to communicate depending on the setting of VLAN. In such a case, either stop using VLAN or change the setting of VLAN so that it becomes possible to use an optional Ethernet frame.

## 2.4.3 Duplicated operation via NIC switching mode

- One unit of HUB to be connected in NIC switching mode is sufficient, but communication may not be conducted normally if the HUB has MAC learning capabilities. In such a case, add a HUB to make a HUB-to-HUB connection and then connect the cable to each HUB (See "Figure 2.7 System configuration in NIC switching mode" of "2.1.2 NIC switching mode").
- In a standby patrol function of NIC switching mode, a dedicated Ethernet frame is used. Therefore, when operating VLAN (Virtual LAN), occasionally it is not possible to use a standby patrol function depending on the setting of VLAN. In such a case, either stop a standby patrol function or VLAN, or change the setting of VLAN so that it becomes possible to use an optional Ethernet frame.
- In NIC switching mode, it is necessary to use a hub that can be assigned an IP address in order for the hub to be monitored. If a hub cannot be assigned an IP address, an IP address of a device connected to the hub can be monitored. However, it should be noted that if the device whose IP address is monitored fails, the failure is regarded as a transfer route failure.
- If you are using IPv6 virtual interface, you must set "NETWORKING\_IPV6=yes" in the /etc/sysconfig/network file. By defining this configuration, the system loads ipv6 module during the system startup.
- When using an IPv6 virtual interface, an radvd daemon is occasionally reactivated not to delay configuring an IPv6 address automatically. A message "radvd[XXXX]: resuming normal operation" is output from the radvd daemon following this, but this is not an error.
- Do not configure the server running NIC switching mode as an IPv6 router.

# Chapter 3 Environment configuration

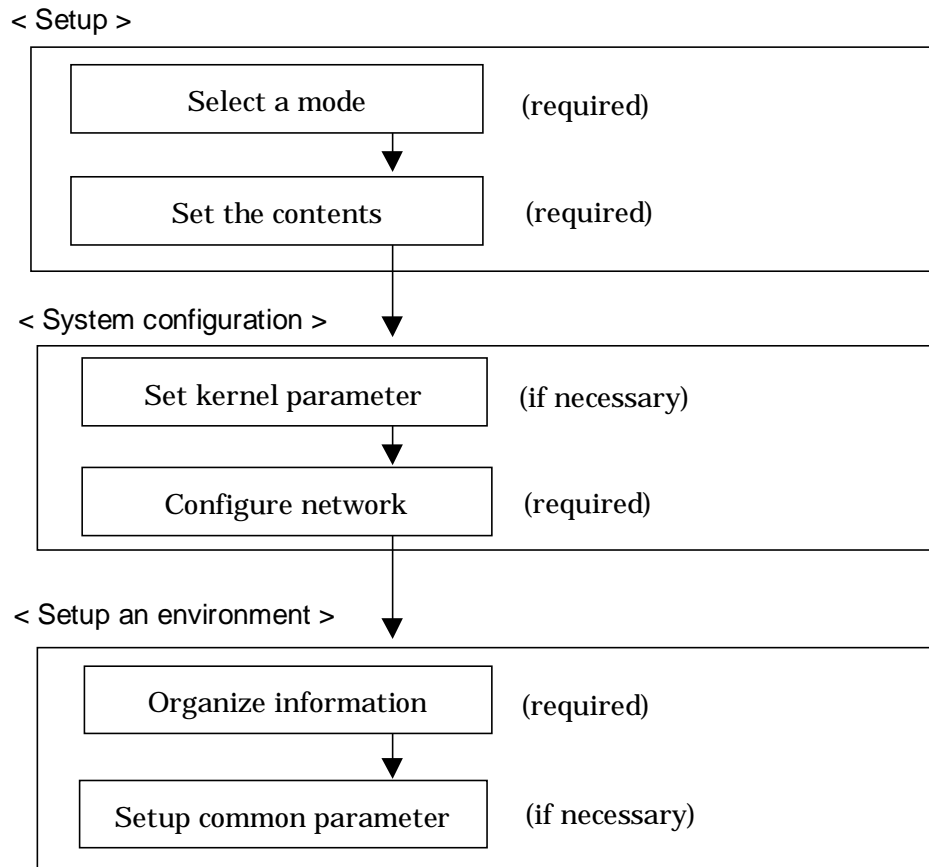
This chapter discusses how to set up and configure GLS.



## 3.1 Setup

Select a GLS mode and prepare the environmental information such as interface names and IP addresses.

The following is the procedure of this configuration



**Figure 3.1 Configuration to Setting up an environment**

### 3.1.1 Selecting mode

Determine which mode to use. Table 3.1 indicates the selection of modes.

For selecting adequate mode, refer to “1.1.2 Selecting mode”.

**Table 3.1 Selection of modes**

<b>Mode</b>	<b>Selecting mode</b>
Fast switching mode	Select this mode if every one of the remote hosts uses Fast switching mode. This mode can detect the abnormalities of the multiplexed transfer route immediately. When abnormalities are detected, communication can be immediately changed to a normal transfer route.
NIC switching mode	Select this mode, if a hot-standby router, a network load balancer, or servers and other various network devices from other manufacturers are used. Select this mode in most cases.

It is possible to create multiple virtual interfaces in a single system to use several modes concurrently.

Specify a mode using “hanetconfig create” command with -m option.

## 3.1.2 Selecting appropriate contents

Select appropriate contents for each mode.

### 3.1.2.1 Fast switching mode

When using Fast switching mode, determine the information required for configuration of the mode listed in the table 3.2.

**Table 3.2 Configuration information of Fast switching mode**

Components		Values	
Virtual interface information (1)	Virtual interface name	T-1	
	Virtual IP address or host name	T-2	
	Subnet mask	T-3	
	Physical interface information (1)	Physical interface name	T-4
		IP address or host name	T-5
		Subnet mask	T-6
	Physical interface information (2)	Physical interface name	T-7
		IP address or host name	T-8
		Subnet mask	T-9
(Repeat for the number of physical interfaces)			
(Repeat for the number of virtual interfaces)			

Description of each component is as follows:

#### <Virtual interface information>

Setup the followings for the number of virtual interfaces.

##### Virtual interface name(T-1)

Specify a name for a virtual interface, which will be assigned to the physical interface used for redundancy. Specify shaX (X represents a number) of this component using "hanetconfig create" command with -n option.

##### Virtual IP address or host name(T-2)

Specify an IP address or host name to be assigned for the virtual interface. The network portion (IPv4) and a prefix (IPv6) of this IP address must be different from the IP address assigned for the physical interface. When using IPv4, use "hanetconfig create" command with -i option to specify the IP address to be allocated for the virtual interface. When using IPv6, configure these in /etc/radvd.conf file.

##### Subnet mask(T-3)

When using IPv4 address, specify the sub network mask value applied to the virtual IP address. If subnet is not used, this configuration can be omitted. This component is set by using "hanetmask" command. However, this configuration is not necessary if using IPv6 address.

#### <Physical interface information>

Setup the followings for the number of physical interfaces used for redundancy.

**Physical interface name(T-4,7)**

Specify a name for the physical interface. This component can be set using "hanetconfig create" command with -t option (e.g. eth1, eth2 etc).

**Physical IP address or host name(T-5,8)**

If using IPv4 address, specify an IP address or host name to be assigned for the physical interface. The network portion of this IP address must be different from IP address of other physical and virtual interface. To setup this component, create "/etc/sysconfig/network-scripts/ifcfg-ethX" file and then assign the IP address in the file. Make sure this value is different from the other IP.

**Subnet mask (T-6,9)**

If using IPv4 address, specify a sub network mask value applied to the physical IP address. If subnet is not used for allocation, this configuration can be omitted. This configuration is written in /etc/sysconfig/network-scripts/ifcfg-ethX file. Note that, this configuration is not necessary if using IPv6 address.



### 3.1.2.2 NIC switching mode

Table 3.3 shows the information required to configure NIC switching mode:

**Table 3.3 Configuration information of NIC switching mode**

Components		Values	
Virtual interface information (1)	Virtual interface name	D-1	
	Virtual IP address (or host name)	D-2	
	Subnet mask	D-3	
	Physical interface information (1)	Physical interface name	D-4
		IP address or host name	D-5
	Physical interface information (2)	Physical interface name	D-6
	Standby interface information	Virtual interface name	D-7
		Automatic switching back mode	D-8
	Monitored remote system information	Primary Monitored remote system IP address or host name	D-9
		Secondary Monitored remote system IP address or host name	D-10
		HUB-to-HUB monitoring	D-11
(Repeat for the number of physical interfaces)			

Description of each component is as follows:

#### <Virtual interface information>

Setup the followings for the number of virtual interfaces.

#### Virtual interface name (D-1)

Name a virtual interface to be configured on a physical interface used for GLS. Specify the name using "hanetconfig create" command with -n option, in "shaX" (where X is a natural number) format.

#### Virtual IP address or host name (D-2)

Specify an IP address or host name allocated to the virtual interface. The network portion (for IPv4) or prefix (for IPv6) of this IP address must be the same IP address assigned to the physical interface. This value is specified using "hanetconfig create" command with -i option.

#### Subnet mask(D-3)

When using IPv4 address, specify the value of a sub network mask used for the virtual IP address. This configuration can be omitted if not allocating a subnet. Set a subnet mask by using "hanetmask" command. When using IPv6 address, it is not required to configure this value.

#### <Physical interface information>

Setup the followings for the number of physical interfaces for redundancy.

#### **Physical interface name (D-4,6)**

Specify a name of the physical interface. This can be specified using "hanetconfig create" command with -t option. (e.g.eth1, eth2 etc)

#### **Physical IP address or host name (D-5)**

Specify an IP address or host name assigned to the physical interface. This IP address must be different from the IP address of the other physical and virtual interfaces. In order to specify an IP address for the physical interface, create "/etc/sysconfig/network-scripts/ifcfg-ethX" file and then assign an IP address in the file.

#### **<Standby patrol information>**

When using Standby patrol function, setup the followings. Skip this process if Standby patrol function is not used.

#### **Virtual interface name (D-7)**

Specify a name to a virtual interface for standby patrol function. Specify it using "hanetconfig create" command with -n option, in "shaX" (where X is a natural number) format.

#### **Automatic switch back mode (D-8)**

Setting up the Standby patrol function enables the automatic switch back function when a transfer path recovers from a failure. Specify "q" to "hanetconfig create" command with -m option for using immediate switch-back after a transfer path recovery, or "p" for using standby interface capability.

#### **<Monitored remote system information>**

Setup the following for the number of virtual interfaces. This configuration cannot be omitted.

#### **Primary Monitored remote system IP address or host name (D-9)**

Specify an IP address or host name of a HUB to be monitored while primary physical interface is being used. This IP address is assigned using "hanetpoll create" command with -p option.

#### **Secondary Monitored remote system IP address or host name (D-10)**

Specify an IP address or host name of a HUB to be monitored while the secondary physical interface is being used. This IP address is specified using "hanetpoll create" command with -p option. This step can be omitted. In such case, the same value as primary remote end IP address or host name is applied.

#### **HUB-to-HUB monitoring (D-11)**

Indicate whether the HUB-to-HUB monitoring function should monitor a transfer path between the cascaded HUBs or not, when two HUBs are used:

on: monitor between HUBs,  
off: do not monitor between HUBs.

The default value is "off". Specify the value using "hanetpoll create" command with -b option.

### 3.1.2.3 Configuration of individual mode

Table 3.4 shows description of common parameters for each mode. These values apply to the whole system. However, these values cannot convert to unit of the virtual interface or redundancy mode. This configuration is not necessary when using the default value.

**Table 3.4 Configuration of redundancy mode**

Contents	Fast switching mode	NIC switching mode	Value	Default
Transfer path monitoring interval	A	N	K-1	5 sec
The number of constant monitoring prior to outputting message	A	N	K-2	0 time
The number of constant monitoring prior to switching cluster	A	N	K-3	5 sec
Switching cluster immediately after starting	A	N	K-4	none
Outputting message (monitoring the physical interface)	A	N	K-5	none
Standby patrol monitoring period	N	A	K-6	15 sec
The number of constant standby monitoring prior to outputting message	N	A	K-7	3 times
Monitoring period	N	A	K-8	5 sec
The number of monitoring	N	A	K-9	5 times
Recovery monitoring period	N	A	K-10	5 sec
Cluster switching	N	A	K-11	Yes
Link up waiting period	N	A	K-12	60 sec

[Meaning of the symbols] A: Available, N: Not available

The followings are description of each of the content.

#### Transfer path monitoring interval (K-1)

Specify the transfer path monitoring interval in seconds. The range of the intervals that can be specified is from 0 to 300 sec. If "0" is specified, it will not monitor the transfer path. Initially, it is set to 5 seconds. will not monitor the transfer path. Initially, it is set to 5 seconds. The transfer path monitoring interval is set using "hanetparam" command with -w option. This feature is available for Fast switching mode.

#### The number of constant monitoring prior to message output (K-2)

Specify the number of times for monitoring before outputting the message (No: 800 or 801) if the message needs to be output as a transfer path failure is detected. The effective range of the numbers which can be specified is from 0 to 100. If "0" is specified, it will not output a message. Initially it is set to 0 (does not output any message). This feature is specified using "hanetparam" command of -m option. Note that this feature is only available for Fast switching mode.

#### The number of constant monitoring prior to switching cluster (K-3)

Specify whether or not to switch over the cluster if a failure occurs on a whole transfer path of the virtual interface. The effective range of the numbers is from 0 to 100. it will not switch the cluster. When configuring to switch the cluster, set how many times it

repeatedly monitors. The range is from 1 to 100. Initially, it is set to 5, meaning that a cluster failover is triggered after continuously detecting the same failure 5 times. This feature is specified using "hanetparam" command with -i option. This feature is available only for Fast Switching.

#### **Switching cluster immediately after starting (K-4)**

Specify whether or not to switch the cluster immediately after the cluster starts up. Configure this if a failure occurs in entire transfer path of the virtual interface before the system starts up. The values which can be specified are either "on" or "off". If "on" is selected, cluster is switched immediately after the userApplication starts up. On the other hand, if "off" is selected, the cluster is not switched even after the userApplication starts up. As an initial value, it is set to "off". This setting is specified using "hanetparam" command with -c option. This is available for Fast switching mode.

#### **Outputting message (monitoring the physical interface) (K-5)**

Configure whether or not to output a message when the status of the physical interface changes (detecting a failure in transfer path or transfer path recover) in the virtual interface. The values which can be specified are either "on" or "off". If "on" is selected, a message (message number: 990, 991, 992) is outputted. If "off" is selected, a message is not outputted. Initially, it is set to "off". This setting is specified via "hanetparam" command with -s option. This is available for Fast switching mode.

#### **Standby patrol monitoring period (K-6)**

Specify the monitoring interval (in seconds) of operational NIC for standby patrol function. The values which can be specified are from 0 to 100. If "0" is specified, it will not run monitoring. Note if the user command function (using user command when standby patrol fails or detects recovery) is enabled, do not set the parameter to "0". If the parameter is set to "0", the user command function will not work. Initially, the parameter is set to 15 (seconds). This setting is specified via "hanetparam" command with -p option. This configuration is available for NIC switching mode with standby patrol function is enabled.

#### **The number of constant standby monitoring prior to outputting message (K-7)**

When a failure is detected in a transfer path using the standby patrol function, a message will be outputted to inform the failure. In this section, specify how many times to monitor until the message (message number: 875) is outputted. The values which can be specified are from 0 to 100. If "0" is selected, it stops outputting a message and disables monitoring using the standby patrol function. Note if the user command function (using user command when standby patrol fails or detects recovery) is enabled, do not set the parameter to "0". If the parameter is set to "0", the user command function will not work. Initially, the parameter is set to 3 (times). This configuration is specified via "hanetparam" command with -o option. This is available in NIC switching mode, which uses the standby patrol function. Using this option, the number of monitoring times doubles immediately after the standby patrol starts.

#### **Monitoring period (K-8)**

Specify the monitoring period in seconds. The values which can be specified are from 1 to 300. The default value is 5 (seconds). This configuration is specified by "hanetpoll on" command with -s option. This feature is available for NIC Switching.

#### **The number of monitoring (K-9)**

Specify the number of monitoring times. The values which can be specified are from 1 to 300. The default value is 5 (times). This configuration is specified using "hanetpoll on" command with -c option. This feature is available for NIC switching mode.

**Recovery monitoring period (K-10)**

Specify the monitoring period when a failure is detected by HUB to HUB monitoring for NIC switching mode. The values which can be specified are from 0 to 300. The default value is 5 (seconds). This configuration is assigned via "hanetpoll on" command with -b option. This feature is available for NIC switching mode.

**Cluster switching (K-11)**

Specify whether or not to switch the node when a failure occurs to every transfer paths.  
yes: Switch nodes when a failure occurs to a whole transfer paths.

no: Does not switch nodes when a failure occurs to a whole transfer path.

The default parameter is "yes". This configuration is specified by "hanetpoll on" command with -f. This feature is available for NIC switching mode operating as a cluster.

**Link up waiting period (K-12)**

In NIC switching mode, specify the time period (in seconds) until the HUB to links up after monitoring starts. The values which can be specified are from 1 to 300. If this option is not specified, then the default value is used. Initial value is set to 60 (seconds). If the value is less than the product of monitoring period and monitoring times (monitoring period X monitoring times), then the value is ignored and ends up using the value of the product of monitoring period and monitoring times. This configuration is specified by "hanetpoll on" command with -p option. This feature is available for NIC switching mode.



## 3.2 System Setup

Setup the system according to the contents determined in “3.1 Setup”.

### 3.2.1 Setup kernel parameters

In redundant line control function, the following values are required for the kernel parameter. If the required value is insufficient in a whole system, then add sufficient values. For modifying the kernel parameter, refer to the Linux, sysctl(8), or proc(5) manual.

**Table 3.13 Required Kernel parameter**

Kernel parameter	Required value	file
Maximum size of shared memory segment	5120	/proc/sys/kernel/shmmax
Maximum amount of shared memory segment	2	/proc/sys/kernel/shmmni
Maximum semaphore identification value	1	/proc/sys/kernel/sem
Maximum semaphore identification value in the system	1	/proc/sys/kernel/sem

### 3.2.2 Network configuration

#### 3.2.2.1 Setup common to modes

##### (1) Verification of the physical interface

Verify if the physical interface is inserted into the system using ifconfig command.

Also, if the physical interface is UP, check whether it is marked as "RUNNING". If "RUNNING" is not displayed, the links might be down on the interface. Check the cable switch and HUB speed settings. Use the "ethtool" command to check the link state.

```
# ifconfig -a
eth0      Link encap:Ethernet  HWaddr xx:xx:xx:xx:xx:xx
          inet addr:192.168.70.2  Bcast:192.168.70.255  Mask:255.255.255.0
          inet6 addr: fe80::xxx:xxxx:xxxx:xxxx/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2140 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2140 errors:0 dropped:0 overruns:0 carrier:0
          collisions:22 txqueuelen:1000
          RX bytes:278285 (271.7 KiB)  TX bytes:273656 (267.2 KiB)
          Base address:0xec80 Memory:d2fc0000-d2fe0000
eth1      Link encap:Ethernet  HWaddr 0x:xx:xx:xx:xx:xx
          inet addr:192.168.71.2  Bcast:192.168.71.255  Mask:255.255.255.0
          inet6 addr: fe80::xxx:xxxx:xxxx:xxxx/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2138 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2118 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:278492 (271.9 KiB)  TX bytes:273666 (267.2 KiB)
          Base address:0xecc0 Memory:d2fe0000-d3000000
```

In the above example, it is possible to use eth0 and eth1. For details regarding ifconfig command, refer to the Linux manual.

## (2) Checking the name service

When using name services such as DNS or NIS, define keywords such as hosts in /etc/nsswitch.conf file to first refer to the local file. This allows to solve the address even if the DNS, NIS or LDAP sever is unreachable. The following is an example of /etc/nsswitch.conf.

```
#
# /etc/nsswitch.conf
#
# An example Name Service Switch config file. This file should be
# sorted with the most-used services at the beginning.
#
# The entry '[NOTFOUND=return]' means that the search for an
# entry should stop if the search in the previous entry turned
# up nothing. Note that if the search failed due to some other reason
# (like no NIS server responding) then the search continues with the
# next entry.
#
# Legal entries are:
#
#      nisplus or nis+      Use NIS+ (NIS version 3)
#      nis or yp           Use NIS (NIS version 2), also called YP
#      dns                 Use DNS (Domain Name Service)
#      files               Use the local files
#      db                  Use the local database (.db) files
#      compat              Use NIS on compat mode
#      hesiod              Use Hesiod for user lookups
#      [NOTFOUND=return]   Stop searching if not found so far
#
# To use db, put the "db" in front of "files" for entries you want to be
# looked up first in the databases
#
# Example:
#passwd:    db files nisplus nis
#shadow:    db files nisplus nis
#group:     db files nisplus nis
#
passwd:     files
shadow:     files
group:      files
#
#hosts:     db files nisplus nis dns
hosts:      files dns
#
#.....
```

## (3) Configuring IPv4 routing daemon

GLS allows you to select zebra(ripd) for IPv4 routing daemon. If you are using the system as an IPv4 router, you must configure a routing daemon. Configuration procedure is as follows.

### zebra(ripd) configuration

- 1) When defining static route information, first startup zebra and login to zebra using telnet then proceed with the configuration. For details on zebra configuration, refer to zebra(8) manual.

```
# telnet localhost zebra
```

- 2) Configure zebra to startup during system startup (when run level is 2, 3, or 5).

```
# chkconfig --level 235 zebra on
```



- 3) Verify zebra is configured to startup on run level 2, 3, 5.

```
# chkconfig --list zebra
zebra          0:off  1:off  2:on   3:on   4:off  5:on   6:off
```

#### (4) IPv6 RA daemon configuration

GLS supports radvd(router advertisement daemon for IPv6) for RA (router advertisement) daemon. To use IPv6(dual) on Fast switching mode, you must start RA daemon on the host running GLS in order to transmit RA from virtual interfaces. Other than this purpose, RA daemon is not necessary. The following describes configuration procedure.

##### radvd configuration

- 1) Define the configuration in /etc/radvd.conf

When transmitting network information (network fec0:1::, prefix length 64) from sha0 with RA(router advertisement), define the configuration description as shown below. In addition, the difference in the version of radvd needs to define the following kernel parameters. For details on radvd configuration, refer to radvd manual.

/etc/sysctl.conf

```
net.ipv6.conf.all.forwarding = 1
```

/etc/radvd.conf

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

- 2) Configure radvd to startup during system startup (when run level is 2, 3, or 5).

```
# chkconfig --level 235 radvd on
```

- 3) Verify radvd is configured to startup on run level 2, 3, 5.

```
# chkconfig --list radvd
radvd          0:off  1:off  2:on   3:on   4:off  5:on   6:off
```

#### (5) route configuration

Static route configuration on the environment not using IPv4 routing daemon is described below.

##### Default gateway configuration

Define the default gateway address (GATEWAY). Note that default gateway device (GATEWAYDEV) can not be configured to a physical interface NIC switching mode bundles.

/etc/sysconfig/network-scripts/ifcfg-ethX or /etc/sysconfig/network

```
GATEWAY=192.168.1.254
```

### Static route configuration

To configure static route on a routing table, define the configuration on `/etc/sysconfig/network-scripts/route-ethX`.

`/etc/sysconfig/network-scripts/route-ethX`

```
GATEWAY0=192.168.40.10
NETMASK0=255.255.255.0
ADDRESS0=192.168.100.0
```

### (6) IPv6 module configuration

Supporting IPv6(dual) on GLS Fast switching or NIC switching mode, it is required to load IPv6 module on Linux. See the following for configuring IPv6 module.

#### Loading ipv6 module

- 1) Configure `/etc/sysconfig/network` to use IPv6 during system startup. Ignore the tunneling configuration, since GLS does not support tunneling feature.

```
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

- 2) Reboot the system.

```
# /sbin/shutdown -r now
```

- 3) Verify IPv6 module is loaded.

```
# lsmod
Module                Size  Used by
ipv6                   662756  10
```

### 3.2.2.2 System setup in Fast switching mode

Common settings between IPv4 and IPv6

- To specify "HWADDR=XX:XX:XX:XX:XX:XX" for the GLS physical interface settings (the `/etc/sysconfig/network-scripts/ifcfg-ethX` file), add "HOTPLUG=no" to the settings.
- To create backup of the physical interface settings (the `/etc/sysconfig/network-scripts/ifcfg-ethX` file), the file name must begin with names other than "ifcfg-". (e.g. bak\_ifcfg-ethX)  
If the file name begins with "ifcfg-", OS might recognize the interface as an interface to be activated during system startup.

When using an IPv4 address

- Define the IPv4 address (virtual IP address, physical IP address, logical virtual interface, takeover virtual IP address) and a host name in `/etc/hosts` file. These host names must be specified in the `/etc/hosts` file even if no host names but IP addresses are directly specified in environment definitions.
- Before defining a virtual interface, the physical interface you are going to apply must be in active state and be sure the IPv4 address is assigned. (In the file `/etc/sysconfig/network-scripts/ifcfg-ethX`, define "ONBOOT=yes" and "IPADDR=X.X.X.X" then reboot the system.)

When using an IPv6 address

- Define the IPv6 address (logical virtual interface, takeover virtual IP address) and a host name in `/etc/hosts` file.
- Before defining a virtual interface, the physical interface you are going to apply must be in active state and be sure the IPv6 link-local address is assigned. (In the file `/etc/sysconfig/network-scripts/ifcfg-ethX`, define "ONBOOT=yes" and in the `/etc/sysconfig/network` file, define "NETWORKING\_IPV6=yes" then reboot the system.)

- You must start the radvd daemon on 2 or more servers running as Fast switching mode in order to set the stateless address auto-configuration. Note that when starting up radvd on multiple servers, synchronize the prefix data of the virtual interfaces defined in /etc/radvd.conf between the servers. An example of setting a /etc/radvd.conf file when using a Linux server as an IPv6 router is shown below. In addition, depending on the version of radvd, kernel parameter (net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on this topic, see the manual of radvd.conf(5) and radvd(8).

/etc/radvd.conf

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

- When setting stateless address auto-configuration against the physical interface(ethX) using Fast switching mode, start up radvd on either of the servers or provide IPv6 router on the same network. Additionally, stateless address auto-configuration on the physical interface (ethX) does not apply on the server that has kernel configuration (net.ipv6.conf.all.forwarding=1) for starting up radvd. In such case, after starting radvd, use sysctl command to reconfigure the kernel parameter. For details, refer to sysctl(8) manual.

```
# sysctl -w net.ipv6.conf.all.forwarding=0
```

### 3.2.2.3 System setup in NIC switching mode

Common settings between IPv4 and IPv6

- To specify "HWADDR=XX:XX:XX:XX:XX:XX" for the GLS physical interface settings (the "/etc/sysconfig/network-scripts/ifcfg-ethX" file), add "HOTPLUG=no" to the settings.
- To create backup of the physical interface settings (the "/etc/sysconfig/network-scripts/ifcfg-ethX" file), the file name must begin with names other than "ifcfg-". (e.g. bak\_ifcfg-ethX)  
If the file name begins with "ifcfg-", OS might recognize the interface as an interface to be activated during system startup.

When using an IPv4 address

- Define the IPv4 address (virtual IP address, physical IP address, monitored IP addresses to be specified in monitoring destination information) and a host name in /etc/hosts file. These host names must be specified in the /etc/hosts file even if no host names but IP addresses are directly specified in environment definitions.
- Before booting an OS, the primary interface (physical interface) you are going to apply must in active state and make sure IPv4 address is assigned. (In the file /etc/sysconfig/network-scripts/ifcfg-ethX, define "ONBOOT=yes" and in the /etc/sysconfig/network file, define "NETWORKING\_IPV6=yes".) Also, make sure the secondary interface (physical interface) is in inactive state. (In the /etc/sysconfig/network-scripts/ifcfg-ethX file, define "ONBOOT=no".)
- For Redundant Line Control Function, the path information must be initialized and the routing daemon must be restarted. If path information is statically specified, the static paths must be described in a configuration file for routing daemon.

When using an IPv6 address

- Define the IPv6 address (takeover virtual IP address, monitored IP addresses to be specified in monitoring destination information) and a host name in /etc/hosts file.

- Before booting an OS, the primary interface (physical interface) you are going to apply must in active state and be sure IPv6 address is assigned. (In the file `/etc/sysconfig/network-scripts/ifcfg-ethX`, define "ONBOOT=yes" and in the file `/etc/sysconfig/network`, set "NETWORKING\_IPV6=yes") Also, make sure the secondary interface (physical interface) is in inactive state. (In the file `/etc/sysconfig/network-scripts/ifcfg-ethX`, set "ONBOOT=no".)
- Do not set the server running NIC switching mode as IPv6 router.
- In order to set stateless address auto-configuration against the physical interface(ethX) that uses NIC switching mode, make sure to set IPv6 router on the network connecting the server. Moreover, for IPv6 address prefix and prefix length configured in Redundant Line Control function, specify the same value configured on the IPv6 router. The following is an example of setting a `/etc/radvd.conf` file when using a Linux server as an IPv6 router. In addition, depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined on `/etc/sysctl.conf` file. For details on this, see the manual of `radvd.conf(5)` and `radvd(8)`.

`/etc/radvd.conf`

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

## 3.3 Additional system setup

This section describes additional setup procedure for setting up the system.



Note

- The configuration command of a Redundant Line Control function can be executed only when the system is operating in multi-user mode.

### 3.3.1 Fast switching mode

The following shows the procedure to add configuration information for Fast switching mode. When sharing NIC used in a virtual interface of the already defined Fast switching mode and adding the configuration information, use the same procedure:

1. Create a virtual interface using "hanetconfig create" command. If NICs are shared amongst several virtual interfaces, the same pair of physical interfaces should be specified to create each of the virtual interfaces with "hanetconfig create" command. For information, see "7.1 hanetconfig Command".
2. Setup a subnet mask to a virtual IP address using the "hanetmask create" command. For information, see "7.5 hanetmask Command".

### 3.3.2 NIC switching mode

The procedure to add the configuration information using NIC unused in the other virtual interfaces is as follows:

1. Set up a virtual interface using the "hanetconfig create" command. For information, see "7.1 hanetconfig Command".
2. Set up the standby patrol function using the "hanetconfig create" command (only if the standby patrol function is used). For information, see "7.1 hanetconfig Command".
3. Set up the HUB monitoring function using the "hanetpoll create" command. For information, see "7.7 hanetpoll Command".
4. Setup a subnet mask to a virtual IP address using the "hanetmask create" command. For information, see "7.5 hanetmask Command".

The procedure to share NIC used in a virtual interface of the already defined NIC switching mode and to add the configuration information is as follows (when using an NIC sharing function):

1. Set a virtual interface with "hanetconfig copy" command. See "7.1 hanetconfig Command" for the detail.
2. Set standby patrol with "hanetconfig create" command. (Only when using a standby patrol function.) It is not necessary to set if a standby patrol function is already set in a virtual interface that already shares NIC. See "7.1 hanetconfig Command" for the detail.
3. Set a HUB monitoring function with "hanetpoll copy" command. See "7.7 hanetpoll Command" for the detail.
4. Setup a subnet mask to a virtual IP address using the "hanetmask create" command. For information, see "7.5 hanetmask Command".



Note

- When setting the definition information of NIC switching mode, if virtual interfaces of the other NIC switching modes are already working, already working, it is necessary to stop them once to make the added information valid. Therefore, deactivate GLS temporarily using "stphanet" command and then execute "strhanet" command to restart it. In cluster operation, reactivate a userApplication of NIC switching mode.
- In NIC switching mode, physical interfaces are activated or deactivated when switching over the transfer path. However, these logs might not be recorded according to the state of the definition. Please refer to "3.6.6.4 Setting up system log for interface up/down" for the method of recording these logs.
- Ensure to specify the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-ethX when specifying physical IP address by "hanetconfig" command using '-i' or '-e' option. If you specify different physical IP address, it disturbs communication using physical interface because this IP address will overwrite the physical IP address

- specified with “hanetconfig” command when activating the virtual interface.
- If your HUB is using STP (Spanning Tree Protocol), NIC switching occurs while a failure does not occur on a transmission route. In such a case, it is necessary to tune a monitoring parameter of the HUB monitoring function. See “7.7 hanetpoll Command” or “D.1.3.1 Switching takes place in NIC switching mode regardless of failure at the monitoring end”.

### 3.3.3 Setting parameter for individual mode

See the following procedure for using a value different from the default value indicated in section “3.1.2.3 Configuration of individual mode”.

1. Use “hanetparam” command and “hanetpoll on” command for setting up the common parameter.  
For detailed description regarding these commands, see “7.6 hanetparam Command” or “7.7 hanetpoll Command”.
2. Reboot the system.

## 3.4 Changing system setup

This section explains a procedure of modifying the system setup.



### Note

- The configuration command of a Redundant Line Control function can be executed only when the system is operating in multi-user mode.
- Once the setup is completed for redundant line control function, the information regarding the host name (host name information over host database such as /etc/hosts file) cannot be changed. To modify the information on host database, remove redundant line control function configuration, and modify the information on the host database, then reconfigure the system.



### Information

- Once configuration is completed, “resethanet -s” command allows you to reflect the settings without rebooting the system. For details on this command refer to “7.15 resethanet Command”.

### 3.4.1 Fast switching mode

The following shows the procedure for changing configuration information for Fast switching mode:

1. Inactivate the concerned virtual interface using the “stphanet” command. For information, see “7.3 stphanet Command”.
2. Change the configuration information.
3. After changing the configuration information, activate the concerned virtual interface using the “strhanet” command. For information, see “7.2 strhanet Command”.

The procedure to change the information of a monitoring function is as follows:

1. Change the information of a monitoring function using a “hanetparam” command. See “7.6 hanetparam Command” for the detail. In this case, it is not necessary to reactivate a virtual interface. The information becomes valid immediately after changed.
2. Reboot the system after applying changes.

The following lists the information that can be changed for Fast switching mode. No information can be changed besides the information listed below. Delete the concerned definition and add it again.

- Configuration definition information  
Use the “hanetconfig” command to change the following information. For information, see “7.1 hanetconfig Command” or “7.5 hanetmask Command”.
  - Host name or IP address to be attached to a virtual interface or a logical virtual interface
  - Interface names to be bundled by a virtual interface
  - Subnet mask to a virtual interface or a logical virtual interface
- Monitoring function information  
Use the “hanetparam” command to change the following information. For information, see “7.6 hanetparam Command”.
  - Transfer path monitoring interval
  - The number of constant monitoring prior to outputting message
  - The number of constant monitoring prior to switching cluster
  - Timing of activating the virtual interface
  - Outputting message (monitoring the physical interface)
  - Switching cluster immediately after starting RMS

## 3.4.2 NIC switching mode

The procedure to change the configuration information, and the configuration information and the other information at the same time is as follows:

1. Stop the HUB monitoring function using "hanetpoll off" command. See "7.7 hanetpoll Command" for the detail.
2. Deactivate a virtual interface to change using a "stphanet" command. See "7.3 stphanet Command" for the detail.
3. Change the setup information and common parameter. (For changing monitoring period, the number of monitoring times, recovery monitoring period, cluster switching and link up period, apply changes with "hanetpoll on" command.) See "7.7 hanetpoll Command" for the detail.
4. Deactivate temporarily all virtual interfaces set in NIC switching mode using a "stphanet" command, then reactivate them using a "strhanet" command. See "7.2 strhanet Command" and "7.3 stphanet Command" for the detail.
5. Starts a function to monitor HUB using a "hanetpoll on" command. (For changing monitoring period, the number of monitoring times, recovery monitoring period, cluster switching and link up period, apply changes with "hanetpoll on" command) See "7.7 hanetpoll Command" for the detail.

The procedure for enabling a change made on the monitoring information is as follows:

1. Stop the HUB monitoring function using "hanetpoll off" command. See "7.7 hanetpoll Command" for the detail.
2. Start the HUB monitoring function to monitor the hubs using "hanetpoll on" command. (Changes made to the monitoring period, the number of monitoring times, the monitoring recovery period, the waiting time for a cluster failover, and the waiting time for a link up are reflected when "hanetpoll on" command is executed. For more information, refer to "changing configuration and additional information at the same time".) See "7.7 hanetpoll Command" for the detail.

The following lists the information that can be changed for NIC switching mode. No information can be changed besides the information listed below. Delete the concerned definition and add it again.

- Configuration definition information  
Use the "hanetconfig" command to change the following information. For information, see Section "7.1 hanetconfig Command".
  - Host name or IP address to be attached to a virtual interface or a logical virtual interface
  - A physical interface name for the virtual interface
  - An IP address or host name of the physical interface
  - Subnet mask to a virtual interface, a logical virtual interface or a physical interface
- Standby patrol information  
Use the "hanetconfig" command to change the following information. For information, see "7.1 hanetconfig Command".
  - Interface names to be bundled by a virtual interface
- Information of monitored remote system and common parameters  
Use the "hanetpoll" command to change the following information. For information, see "7.7 hanetpoll Command".
  - Information on monitored remote system (primary monitored remote system IP address and secondary monitored remote system IP address)
  - HUB-to-HUB monitoring
  - Monitoring interval
  - The number of monitoring times
  - Recovery monitoring period
  - Cluster switching
  - Link up waiting time
- Use the "hanetparam" command to change the following information. For information, see "7.6 hanetparam Command".
  - Standby patrol monitoring interval
  - The number of constant standby monitoring prior to outputting message



**Note**

- Ensure to specify the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-ethX` when specifying physical IP address by “`hanetconfig`” command using ‘-i’ or ‘-e’ option. If you specify different physical IP address, it disturbs communication using physical interface because this IP address will overwrite the physical IP address specified with “`hanetconfig`” command when activating the virtual interface.

### 3.4.3 Note on changing configuration information

The following shows a note on changing configuration information.

- It is not possible to change the configuration information of a virtual interface registered to a cluster resource. It is necessary to delete the cluster resource to which the target virtual interface has been registered, and reregister the virtual interface to a cluster resource after changing the configuration information.



## 3.5 Deleting configuration information

This section explains procedures of deleting various definitions information such as virtual interfaces and monitoring function to be used for Redundant Line Control Function.



### Note

- The configuration command of a Redundant Line Control function can be executed only when the system is operating in multi-user mode.



### Information

- Use "resethanet" command to delete the entire configured values of the virtual interface for Redundant Line Control function. For details on "resethanet" command, refer to "7.15 resethanet Command".

### 3.5.1 Fast switching mode

The following shows the procedure for deleting configuration information:

1. Inactivate the concerned virtual interface using the "stphanet" command. For information, see "7.3 stphanet Command".
2. Delete the configuration information of the concerned virtual interface. For information, see "7.1 hanetconfig Command".
3. Delete the subnet mask information of the concerned virtual interface using the "hanetmask delete" command. For information, see "7.5 hanetmask Command".

### 3.5.2 NIC switching mode

The following shows the procedure for deleting configuration information:

1. Stop the HUB monitoring function using the "hanetpoll off" command. For information, see "7.7 hanetpoll Command".
2. Inactivate the virtual interface of the concerned NIC switching mode using the "stphanet" command. To delete the operated definition in a cluster system, deactivate a virtual interface of the standby patrol using "stpptl" command (only when using a standby patrol function). For information, see "7.3 stphanet Command" and "7.11 stpptl Command".
3. Delete the concerned monitoring destination information. For information, see "7.7 hanetpoll Command".
4. Delete the configuration information of the concerned virtual interface. For information, see "7.1 hanetconfig Command".
5. Delete the subnet mask information of the concerned virtual interface using the "hanetmask delete" command. For information, see "7.5 hanetmask Command".
6. Reboot the system.

### 3.5.3 Note on deleting configuration information

The following shows a note on deleting configuration information.

- "hanetconfig delete" command cannot delete a virtual interface that has been used to create a takeover IP resource via "hanethvrsc create" command. In order to delete the virtual interface, use "hanethvrsc delete" command first to delete the takeover IP resource that is created with the target virtual interface, and then issue "hanetconfig delete" command to delete the virtual interface. Refer to "7.14 hanethvrsc Command" for the deletion method of a resource for a virtual interface.
- If deleting all configuration information at once, use "resethanet" command. See "7.15 resethanet Command" for detail.



## 3.6 Setting Option Function

### 3.6.1 Configuring multiple virtual interfaces

Use the “hanetconfig” command to set the multiple virtual interfaces setting function. For details about this command, see “7.1 hanetconfig Command”.

### 3.6.2 Switching cluster when all the transfer paths fails

In Fast switching mode, execute “hanetparam” command to switch the cluster when failure occurs in the whole transfer path, See “7.6 hanetparam Command” for detail.

Additionally, if failure occurs in the whole transfer path in NIC switching modes, use “hanetpoll” command to switch the cluster. See “7.7 hanetpoll Command” for detail.

### 3.6.3 Sharing physical interface

Use the “hanetconfig” command to set the physical interface sharing function. For details about this command, see the execution examples in Section “7.1 hanetconfig Command”.

### 3.6.4 Multiple logical virtual interface definition

Use the “hanetconfig” command to set the multiple logical virtual interface definition function. For details about this command, see the execution examples in “7.1 hanetconfig Command”.

### 3.6.5 Single physical interface definition

Use the “hanetconfig” command to set the single physical interface definition function. For details about this command, see the execution examples in “7.1 hanetconfig Command”.

### 3.6.6 HUB monitoring

Set the HUB monitoring function for the operation in NIC switching mode. Set the HUB monitoring function in accordance with the following procedure:

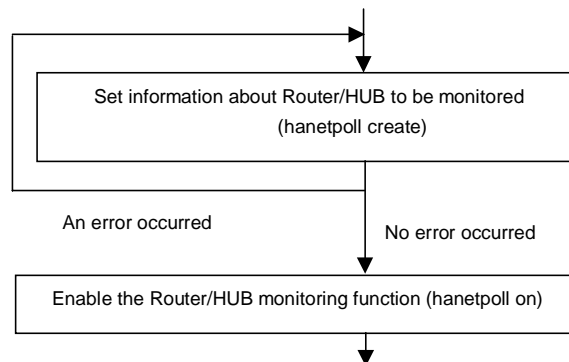


Figure 3.2 Setting procedure of the HUB monitoring function

#### 3.6.6.1 Creating monitoring information

Create the monitoring information of the HUB monitoring function. Use the “hanetpoll” command for this setting. For details about this command, see Section “7.7 hanetpoll Command”.

#### 3.6.6.2 Enabling HUB monitoring function

Enable the HUB monitoring function.

Use the “hanetpoll on” command to set up this function. If the “hanetpoll on” command is executed, the ping command is executed on the HUB.



Note

In NIC switching mode, no line failure is assumed until the link up wait time (IDLE (seconds) in Figure 3.3) passes even if the ping command fails. This is because monitoring starts after a physical interface is activated. Time required for link up depends on the HUB type to be connected. If the line monitoring fails although the HUB is not faulty, extend the wait time as required, using the -p parameter of the "hanetpoll on" command.

If the "hanetpoll on" command is executed while the virtual interface with monitoring destination information specified is activated, the router monitoring function is immediately enabled.

If the "hanetpoll" command is executed while the virtual interface with monitoring destination information specified is not activated, the HUB monitoring function is not enabled.

If, after the HUB monitoring function is enabled, the virtual interface with monitoring destination information specified is activated, the HUB monitoring function is not enabled. In this case, disable the HUB monitoring function, activate the virtual interface, and enable the HUB monitoring function again. For more information, see Section "7.7 hanetpoll Command".

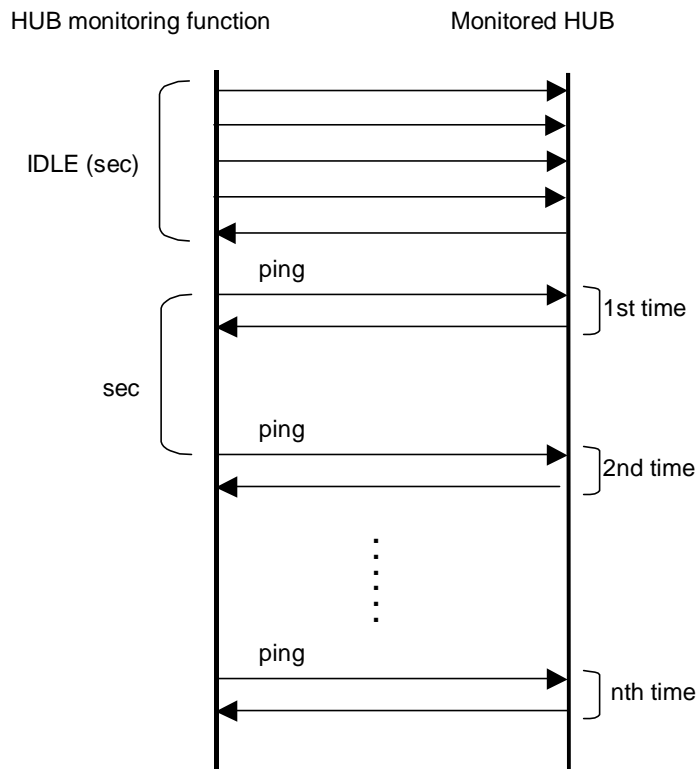


Figure 3.3 Basic sequence of HUB monitoring

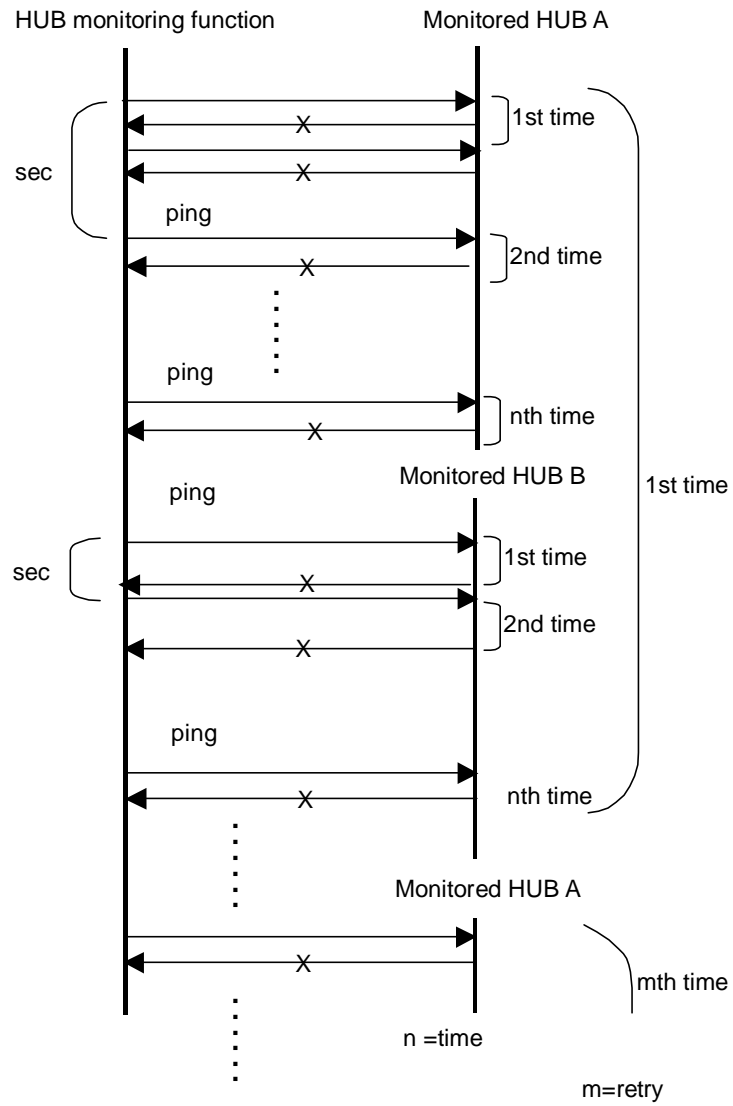


Figure 3.4 HUB monitoring sequence after detect line fault

### 3.6.6.3 Transfer route error detection time for NIC switching mode

This section describes on transfer route error detection sequence of HUB monitoring feature on NIC switching mode.

The followings are examples of the case of one monitoring target and two monitoring targets both using HUB-to-HUB monitoring feature.

One monitoring target:

$$\text{Error detection time} = \text{monitoring interval(in seconds)} \times (\text{monitoring frequency} - 1) + \text{ping time out period}(*1)$$

\*1: If the monitoring interval is 1 second, ping time out period would be 1 second, otherwise, ping time out period would be 2 seconds.

The default value would look like the following.

$$5 \text{ sec} \times (5 \text{ time} - 1) + 2 \text{ sec} = 22 \text{ sec}$$

Two monitoring targets:

$$\text{Error detection time} = \text{monitoring interval(in seconds)} \times (\text{monitoring frequency} - 1) + \text{ping time out period}(*2) \times 2$$

\*2: If the monitoring interval is 2 seconds, ping time out period would be 1 second, otherwise, ping time out period would be 2 seconds.

The default value would be like the following.

$$5 \text{ sec} \times (5 \text{ time} - 1) + 2 \text{ sec} \times 2 = 24 \text{ sec}$$

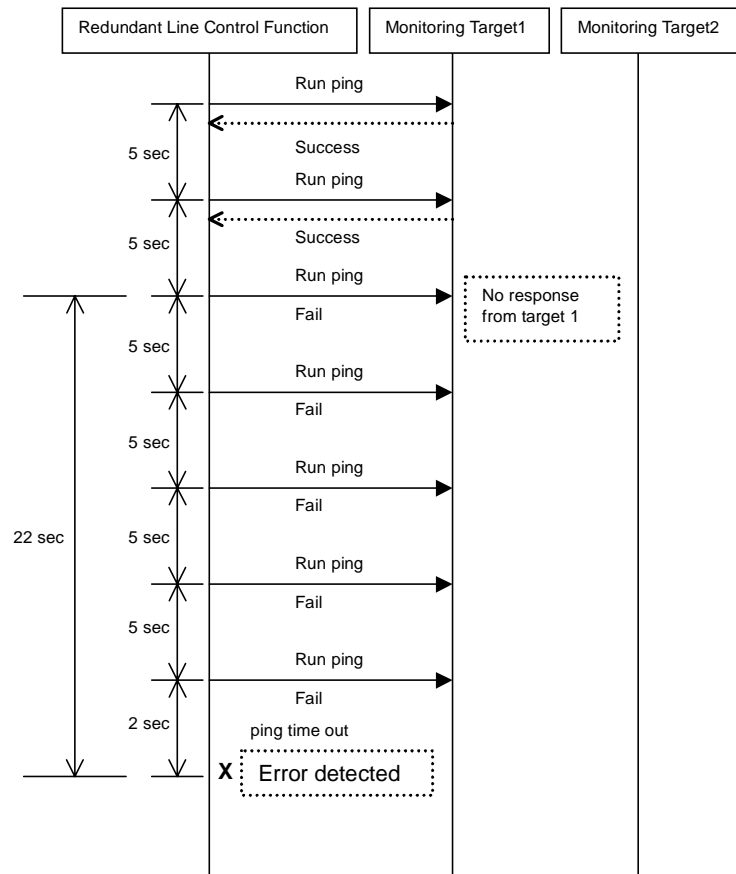


Figure 3.5 Transfer path error detection sequence (one monitoring target)



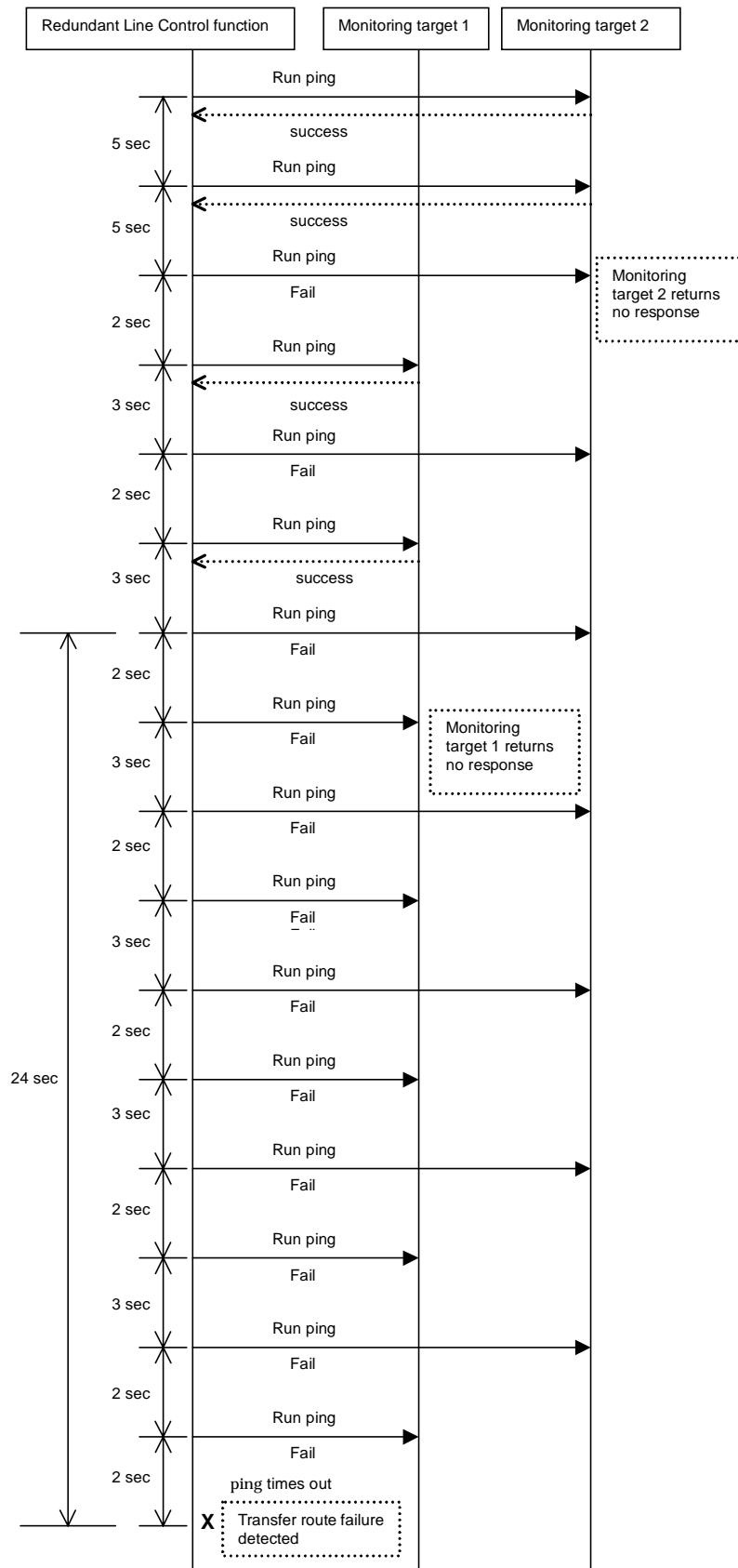


Figure 3.6 Transfer path error detection sequence (two monitoring target)

### 3.6.6.4 Setting up the system log for interface up/down

Operation history of the interface up/down can be output as a syslog message. Since this message is output at the INFO level, the following setting is needed:

#### [Setting file]

/etc/syslog.conf

#### [Settings]

When enabling message output, add "\*.info" information to the setting file. In this setting, messages are output to the /var/log/messages file.

```
# Log all kernel messages to the console.
# Logging much else clutters up the screen.
#kern.* /dev/console

# Log anything (except mail) of level info or higher.
# Don't log private authentication messages!
*.info;mail.none;authpriv.none;cron.none /var/log/messages

# The authpriv file has restricted access.
authpriv.* /var/log/secure

# Log all the mail messages in one place.
mail.* /var/log/maillog
```

When disabling message output, delete "\*.info" information from the setting file.

```
# Log all kernel messages to the console.
# Logging much else clutters up the screen.
#kern.* /dev/console

# Log anything (except mail) of level info or higher.
# Don't log private authentication messages!
mail.none;authpriv.none;cron.none /var/log/messages

# The authpriv file has restricted access.
authpriv.* /var/log/secure

# Log all the mail messages in one place.
mail.* /var/log/maillog
```

#### [Setting notification]

After changing the setting file (/etc/syslog.conf), obtain the super-user rights and then restart to the syslog daemon (syslogd) as shown below:

```
# /etc/init.d/syslog restart
```

#### [Others]

For details about how to set the system log, see the system online manuals. Because line monitor error messages are output to the log at the ERROR level, there is no need to make any special settings.

## 3.6.7 Standby patrol function

### 3.6.7.1 Setting what to be monitored

It is possible to set a function to monitor the state of a standby interface in non-activated condition when operating NIC switching mode. It is also possible to set an Automatic fail-back function when a primary interface is recovered using a standby patrol function. Use the "hanetconfig" command to set it. See "7.1 hanetconfig Command" as to how to set it.



Note

It is necessary to set a virtual interface of NIC switching mode (an operation mode is either "d" or "e") before this setting.

### 3.6.7.2 Setting monitoring interval

Set the monitoring interval for the standby NIC. Use the "hanetparam" command for this setting. For details about this command, see Section "7.6 hanetparam Command".

### 3.6.7.3 Setting error monitoring interval

Set the monitoring failure count for the standby NIC before a message is output. Use the "hanetparam" command for this setting. For details about this command, see Section "7.6 hanetparam Command".

## 3.6.8 Setting dynamic addition/deletion/switching function of physical interfaces

### 3.6.8.1 Dynamic addition of physical interfaces

In Fast switching mode, it is possible to add an actual interface to be redundant while keeping a virtual interface activated. This is called "Dynamic addition of an actual interface". To add dynamically, use a "hanetnic add" command. See "7.9 hanetnic Command" as to how to set.

### 3.6.8.2 Dynamic deletion of physical interfaces

In Fast switching mode, it is possible to delete a redundant actual interface while keeping a virtual interface activated. This is called "Dynamic deletion of an actual interface". To delete dynamically, use a "hanetnic delete" command. See "7.9 hanetnic Command" as to how to set.

### 3.6.8.3 Dynamic switching of physical interfaces

In NIC switching mode, it is possible to switch a using actual interface from an operation system to a standby system while keeping the operation state. This is called "dynamic switching of an actual interface". To change dynamically, use a "hanetnic change" command. See "7.9 hanetnic Command" as to how to set.

## 3.6.9 Setting User command execution function

In NIC switching mode, a command pre-defined by a user can be executed at specific timing. For information on execution timing, see "2.2.10 User command execution function". In NIC switching mode, this function can be used to flush an ARP table, change the interface status, and change the MTU length, etc. The following settings must be made to execute a user command. See the sample files for information on creating a script file appropriate for a user's environment.

Sample file for NIC switching mode

- /etc/opt/FJSVhanet/script/interface/sha.interface.sam (When activating or deactivating an IP address)
- /etc/opt/FJSVhanet/script/failover/sha.failover.sam (When detected an error in a transfer route)
- /etc/opt/FJSVhanet/script/patrol/sha.patrol.sam (When detected a standby patrol error or recovery)

[Setup files]

The storage destination and file name of a setup file varies depending on the type and name of a virtual interface.

Setup file for NIC switching mode

- /etc/opt/FJSVhanet/script/interface/shaX (When activating or deactivating an IP address)
- /etc/opt/FJSVhanet/script/failover/shaX (When detected an error in a transfer route)
- /etc/opt/FJSVhanet/script/patrol/shaX (When detected a standby patrol error or recovery)

\* shaX is the created virtual interface name for NIC switching mode.



Note

- Do not call the operational command for redundancy line control function in the script file.
- The commands executed in the script file does not output message to the standard output. When checking for the contents of the outputted message, set the redirect path /dev/console/ and output the message to the console display. For detail, refer to the sample script file.
- In a clustered system, the script for NIC switching mode of activating or deactivating IP addresses is executed only by active node. It will not run for standby node.
- Create a script file for each virtual interface. If both of IPv4 address and IPv6 address is set to a single virtual interface (or dual stack configuration), define the script file for each address family.

### 3.6.9.1 Settings for NIC switching mode

The following shows the script file call format and the definition file sample for the operation in NIC switching mode.

#### (1) When activated or deactivated an IP address

[Script file call format]

```
/bin/sh shaX param1 param2 param3 param4
```

param1

activate: Activated

inactivate: Inactivated

param2

before: Before activation or deactivation

after: After activation or deactivation

param3

ifname: Physical interface name

param4

inet6: Address family (IPv6 only)

\* No param4 for IPv4.

[Definition file sample]

```
#!/bin/sh
#
#       All Rights Reserved, Copyright (c) FUJITSU LIMITED 2004
#
#ident  "%W% %G% %U% - FUJITSU"
#
#
# Control interface for HA-Net
#
#
```

```

#       Params
#
#       $1       activate or inactivate
#       $2       before or after
#       $3       physical interface name
#       $4       address family (IPv6 only)
#
#
# Set Params
#
#INTERFACE=$3
#IP_ADDR1="xx.xx.xx.xx"
#IP_ADDR2="yy.yy.yy.yy"
#MAC_ADDR1="xx:xx:xx:xx:xx:xx"
#MAC_ADDR2="yy:yy:yy:yy:yy:yy"

case $# in
3)   ADDRESS_FAMILY="inet"
;;
4)   if [ $4 = "inet6" ]
      then
        ADDRESS_FAMILY="inet6"
      else
        ADDRESS_FAMILY="unknown"
      fi
;;
*)   ADDRESS_FAMILY="unknown"
;;
esac

if [ $ADDRESS_FAMILY = "inet" ]
then

case "$1" in
'activate')

#
# Activate interface
#

case "$2" in
'before')
#
# script before activate interface
#

# echo "execute script before activate interface on" $INTERFACE > /dev/console

#if [ ! $INTERFACE = "ethX" ]
#then
#   ifconfig $INTERFACE
#else
#   ifconfig $INTERFACE
#fi

;;

'after')
#

```

```
# script after activate interface
#

# echo "execute script after activate interface on" $INTERFACE > /dev/console

#if [ ! $INTERFACE = "ethX" ]
#then
#   arp -d $IP_ADDR1
#   ping $IP_ADDR2 2
#else
#   arp -d $IP_ADDR2
#   ping $IP_ADDR1 2
#fi

;;

*)
    ;;
esac

;;

'inactivate')
#
# inactivate interface
#

case "$2" in
'before')
#
# script before inactivate interface
#

# echo "execute script before inactivate interface on" $INTERFACE > /dev/console
;;

'after')
#
# script after inactivate interface
#

# echo "execute script after inactivate interface on" $INTERFACE > /dev/console

;;

*)
    ;;
esac

;;

*)
    ;;
esac

fi

if [ $ADDRESS_FAMILY = "inet6" ]
then

case "$1" in
'activate')

#
# Activate interface
```

```
#
case "$2" in
'before')
#
# script before activate interface
#
# echo "execute script before activate interface on" $INTERFACE > /dev/console
;;
'after')
#
# script after activate interface
#
# echo "execute script after activate interface on" $INTERFACE > /dev/console
;;
*)
;;
esac
;;
'inactivate')
#
# inactivate interface
#
case "$2" in
'before')
#
# script before inactivate interface
#
# echo "execute script before inactivate interface on" $INTERFACE > /dev/console
;;
'after')
#
# script after inactivate interface
#
# echo "execute script after inactivate interface on" $INTERFACE > /dev/console
;;
*)
;;
esac
;;
*)
;;
esac
fi
```

```
exit 0
```

## (2) When detected an error in a transfer route

### [Script file call format]

```
/bin/sh shaX param1
param1
Primary: Error in a Primary interface
Secondary: Error in a Secondary interface
all: Error in both Primary/Secondary interfaces
```

### [Definition file sample]

```
#!/bin/sh
#
# All Rights Reserved, Copyright (c) FUJITSU LIMITED 2004
#
#ident "%W% %G% %U% - FUJITSU"
#
# Control interface for HA-Net
#
# Params
#
# $1 communication line state primary/secondary/all
#
# Set Params
#
#STATE=$1
#PROC="process_name"
#kill -15 `/bin/ps -e | /bin/sed -n ¥
# -e/'$PROC'$/s/[^0-9 ¥t].*//p' ¥
# ` > /dev/null 2>/dev/null
#if [ $STATE = "primary" ]
#then
# echo "execute script Polling fail : primary" > /dev/console
#fi
#if [ $STATE = "secondary" ]
#then
# echo "execute script Polling fail : secondary" > /dev/console
#fi
#if [ $STATE = "all" ]
#then
# echo "execute script Polling failover" > /dev/console
#fi
```

## (3) When detected a standby patrol error or recovery

### [Script file call format]

```
/bin/sh shaX param1 param2
param1
establish: Standby patrol established
recover: Standby NIC monitoring recovered
fail: Standby NIC error
param2
Physical interface name of standby NIC: Physical interface name such as ethX
unknown: Standby NIC undecided
```



[Definition file sample]

```
#!/bin/sh
#
#       All Rights Reserved, Copyright (c) FUJITSU LIMITED 2004
#
#ident  "%W% %G% %U% - FUJITSU"
#
# Control interface for HA-Net
#
#
#       Params
#
#       $1  standby NIC state   establish/recovery/fail
#       $2  standby NIC name    ethX
#
#
# Set Params
#
#STATE=$1
#NIC=$2
#if [ $STATE = "fail" ]
#then
# echo "execute script Patrol fail ($NIC)" > /dev/console
#fi
#if [ $STATE = "establish" ]
#then
# echo "execute script Patrol establish ($NIC)" > /dev/console
#fi
#if [ $STATE = "recover" ]
#then
# echo "execute script Patrol recover ($NIC)" > /dev/console
#fi
```



## 3.7 Configuring other functions

### 3.7.1 Outputting message when transfer paths fails

To configure the system to output a message when a failure occurs in a transfer path, use “hanetparam” command. For details, refer to “7.6 hanetparam Command”.



# Chapter 4 Operation

This chapter explains how to operate the redundant line control function.

Redundant line control function is operated with commands.

Table 4.1 below lists the redundant line control function operation commands.

**Table 4.1 Redundant line control function operation commands**

Type	Command	Function	Authority
Activating and deactivating a virtual interface	/opt/FJSVhanet/usr/sbin/strhanet	Activating a virtual interface	Super user
	/opt/FJSVhanet/usr/sbin/stphanet	Deactivating a virtual interface	Super user
Changing operation	/opt/FJSVhanet/usr/sbin/hanetconfig modify	Changing configuration information	Super user
	/opt/FJSVhanet/usr/sbin/hanetpoll on	Enabling the HUB polling function	Super user
	/opt/FJSVhanet/usr/sbin/hanetpoll off	Disabling the router polling function	Super user
Displaying the operation status	/opt/FJSVhanet/usr/sbin/dsphanet	Displaying the operation status of a virtual interface	Super user
Displaying the polling status	/opt/FJSVhanet/usr/sbin/dsppoll	Displaying the polling status of a HUB	Super user
Backing up and restoring an configuration file	/opt/FJSVhanet/usr/sbin/hanetbackup	Backing up an configuration file	Super user
	/opt/FJSVhanet/usr/sbin/hanetrestore	Restoring an configuration file	Super user



## 4.1 Starting and Stopping Redundant Line Control Function

This section explains how to start and stop Redundant Line Control Function.

### 4.1.1 Starting Redundant Line Control Function

Redundant Line Control Function starts automatically when the system starts up.

Then, the preset virtual and logical virtual interfaces are also automatically activated. (However, virtual interfaces in cluster operation mode are activated according to the cluster application status.)

### 4.1.2 Stopping Redundant Line Control Function

Redundant Line Control Function stops automatically when the system is shut down.

Then, the preset virtual and logical virtual interfaces are also automatically inactivated. (However, virtual interfaces in cluster operation mode are activated according to the cluster application status.)





## 4.2 Activating and Inactivating Virtual Interfaces

This section explains how to activate and inactivate virtual interfaces.

The method explained here is valid in single-system operation mode but not in cluster-system operation mode. In cluster-system operation mode, virtual interfaces are activated or inactivated by the start or stop of the userApplication where the virtual interfaces belong.

### 4.2.1 Activating virtual interfaces

If the configuration has been completed, virtual interfaces are automatically activated at system start. To activate virtual interfaces without a system restart after installing Redundant Line Control Function, setting configuration information, and specifying an operation mode, use the `strhanet` command.

For details about this command, see "7.2 `strhanet` Command".



Note

- Be sure to use a `strhanet` command to activate a virtual interface. Do not use an `ifconfig` command to do the operation.
- Do not operate physical interfaces that a virtual interface bundles with an `ifconfig` command while activating a virtual interface.

### 4.2.2 Inactivating virtual interfaces

Virtual interfaces are automatically inactivated at system shutdown. To inactivate virtual interfaces without a system restart, use the `stphanet` command.

For details about this command, see "7.3 `stphanet` Command".



Note

- Be sure to use a `stphanet` command to deactivate a virtual interface. Do not use an `ifconfig` command to do the operation.



## 4.3 Displaying Operation Status

Use the `dsphanet` command to display the operation status of virtual interfaces.

Specifying options enables the display of the operation status of specific virtual interfaces, the operation status of communication parties in Fast switching mode. For details about this command, see "7.4 `dsphanet` Command".



## 4.4 Displaying Monitoring Status

Use the dsppoll command to display the monitoring statuses of the HUB function and the communication target monitoring function.

For information on this command, see "7.8 dsppoll Command".



## 4.5 Active maintenance (addition/removal/swapping)

The redundant line control function enables active maintenance of redundant NIC (PCI cards). This section discusses how to perform active maintenance tasks.

### 4.5.1 Active maintenance by PCI Hot Plug

This section describes how to set the PCI Hot Plug for redundant PCI.

For the procedure of for setting up the PCI Hot Plug provided by PRIMEQUEST, see "Appendix B Hot Plug" of the "PRIMEQUEST 480/440 Operation Manual".

The following table shows what active operation is enabled through PCI Hot Plug.

**Figure 4.2 Active maintenance with PCI Hot Plug in redundant line control function**

Mode	System configuration	PCI Hot Plug		
		Add	Remove	Swap
Fast switching mode	Single system	A	A	A
	Cluster system	B (*1)	B (*2)	A
NIC switching mode	Single system	A	A	A
	Cluster system	B (*1)	B (*2)	A

[Meaning of the symbols]

A: Active maintenance is enabled when GLS is running

B: Active maintenance is enabled when GLS is stopped

\*1: When adding NIC in a cluster system, see "B.4.1.1 Addition procedure" of the "PRIMEQUEST 480/440 Operation Manual" then set the virtual interface according to "5.2 Adding configuration for Cluster System".

\*2: When deleting NIC in a cluster system, delete the virtual interface according to "5.4 Deleting configuration for Cluster System" then delete NIC according to "B.4.1.2 Removal procedure" of the "PRIMEQUEST 480/440 Operation Manual".



Note

The hardware change detection tool (kudzu (1)) may be run when the system is rebooted after a NIC is added, removed, or swapped. In such cases, take appropriate action by following the steps below.

1) If a NIC has been added

kudzu (1) displays a window for specifying whether to add device information for the added NIC to the system. From [Configure], [Ignore], and [Do Nothing], select [Configure]. Then, the "Configure TCP/IP" window for setting IP addresses is displayed. Do not enter anything in this window, and select [Back].

2) If a NIC has been removed

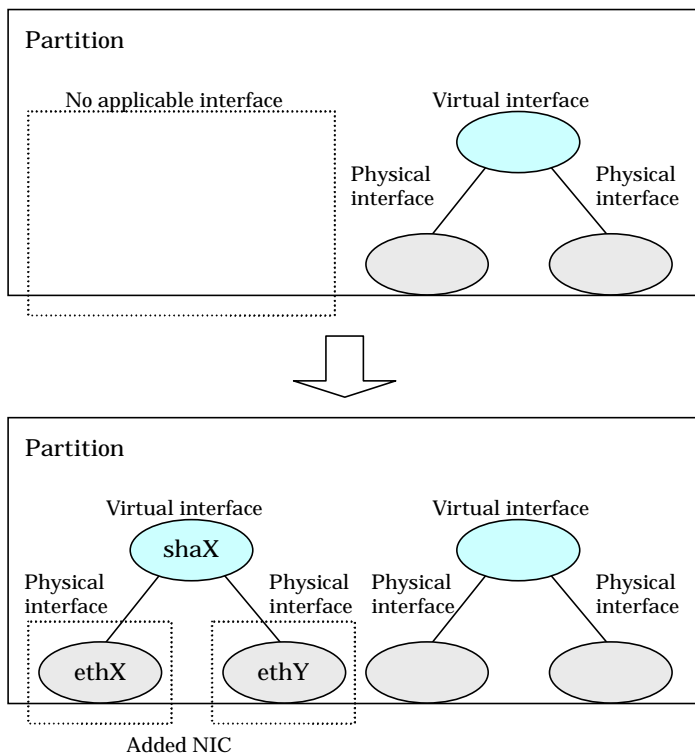
kudzu (1) displays a window for specifying whether to delete the device information for the removed NIC from the system. From [Remove Configuration], [Keep Configuration], and [Do Nothing], select [Remove Configuration].

3) If a NIC has been swapped

Follow step 1, "If a NIC has been added," and then step 2, "If a NIC has been removed."

### 4.5.1.1 Addition procedure

This section describes the procedure for adding NICs and creating a virtual interface to make the added NICs redundant.



**Figure 4.1 Addition of a virtual interface for making the added NICs (ethX,ethY) redundant**

For a Fast switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp                203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Make sure that power to the target PCI slot is off.

For details, see "B.2.3.1 Checking the power status" of the "PRIMEQUEST 480/440 Operation Manual".

```
# cat /sys/bus/pci/slots/"<slot-number>"/power
0
```

3. Add a NIC to the PCI slot.



## 4. Turn on power to the PCI slot.

For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 1 > /sys/bus/pci/slots/"<slot-number>"/power
```

## 5. Check the hardware address.

An interface (ethX) is created for the added NIC when power is turned on. Execute the ifconfig (8) command to check the hardware address of the added NIC (HWaddr). To add more NICs, repeat steps 2 to 5.

## 6. Perform post-addition processing.

- 1) The added NICs must be activated at system startup. For this purpose, make the settings shown below in each interface setting file (/etc/sysconfig/network-scripts/ifcfg-eth<x>). Specify the hardware address that was checked in Step 5 for "HWADDR". Also specify "HOTPLUG=no".

ifcfg-ethX

```
DEVICE=ethX
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=XXX.XXX.XXX.XXX
IPADDR=XXX.XXX.XXX.XXX
NETMASK=XXX.XXX.XXX.XXX
NETWORK=XXX.XXX.XXX.XXX
ONBOOT=yes
TYPE=Ethernet
```

ifcfg-ethY

```
DEVICE=ethY
BOOTPROTO=static
HWADDR=YY:YY:YY:YY:YY:YY
HOTPLUG=no
BROADCAST=YYY:YYY:YYY:YYY
IPADDR=YYY:YYY:YYY:YYY
NETMASK=YYY:YYY:YYY:YYY
NETWORK=YYY:YYY:YYY:YYY
ONBOOT=yes
TYPE=Ethernet
```

- 2) Activate the added NICs.

```
# /sbin/ifup ethX
# /sbin/ifup ethY
```

- 3) If necessary, specify subnet mask information for the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i network_address -m netmask
```

- 4) Make the virtual interface settings to make the NICs redundant.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n shaX -m t -i ipaddress -t ethX,ethY
```

- 5) Activate the virtual interface.

```
# /opt/FJsvhanet/usr/sbin/strhanet -n shaX
```

### For a NIC switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp          203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Make sure that power to the target PCI slot is off.

For details, see "B.2.3.1 Checking the power status" of the "PRIMEQUEST 480/440 Operation Manual".

```
# cat /sys/bus/pci/slots/"<slot-number>"/power
0
```

3. Add a NIC to the PCI slot.
4. Turn on power to the PCI slot.

For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 1 > /sys/bus/pci/slots/"<slot-number>"/power
```

5. Check the hardware address.

An interface (ethX) is created for the added NIC when power is turned on. Execute the ifconfig (8) command to check the hardware address of the added NIC (HWaddr). To add more NICs, repeat steps 2 to 5.

6. Perform post-addition processing.

- 1) The current NIC must be activated and the standby NIC must be deactivated at system startup. For this purpose, write each interface setting file (/etc/sysconfig/network-scripts/ifcfg-eth<x>) so that "ONBOOT=yes" is specified for the current NIC and "ONBOOT=no" is specified for the standby NIC. Specify the hardware address that was checked in Step 5 for "HWADDR". Specify "HOTPLUG=no" for both NICs.

ifcfg-ethX (Primary interface)

```
DEVICE=ethX
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=XXX.XXX.XXX.XXX
IPADDR=XXX.XXX.XXX.XXX
NETMASK=XXX.XXX.XXX.XXX
NETWORK=XXX.XXX.XXX.XXX
ONBOOT=yes
TYPE=Ethernet
```

ifcfg-ethY (Secondary interface)

```
DEVICE=ethY
HWADDR=YY:YY:YY:YY:YY:YY
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 2) Change the interface names of the added NICs to the names specified in the interface setting files (/etc/sysconfig/network-scripts/ifcfg-eth<x>). Specify the same interface names and MAC addresses in the nameif (8) command as those in "DEVICE" and "HWADDR" in the ifcfg-ethX and ifcfg-ethY files that were set in 1) of step 6. When the nameif (8) command is executed, the specified interface must be deactivated.

```
# /sbin/nameif ethX XX:XX:XX:XX:XX:XX
# /sbin/nameif ethY YY:YY:YY:YY:YY:YY
```

- 3) If necessary, specify subnet mask information for the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i network_address -m netmask
```

- 4) Make the virtual interface settings to make the NICs redundant.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n shaX -m d -i ipaddress1 -e ipaddress2 -t ethX,ethY
```

- 5) Specify hub monitoring destination information.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll create -n shaX -p ipaddr1,ipaddr2
```

- 6) If necessary, set the standby patrol function.

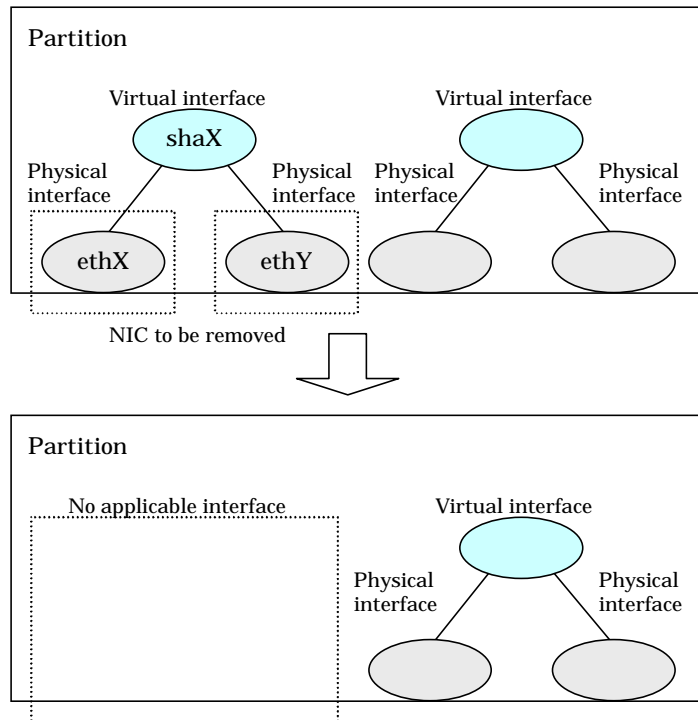
```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n shaY -m p -t shaX
```

- 7) Restart GLS to enable the changed settings. This restart also activates the virtual interface and starts its monitoring.

```
# /opt/FJSVhanet/usr/sbin/resethanet -s
```

### 4.5.1.2 Removal procedure

This section describes the procedure for removing NICs whose virtual interface makes them redundant.



**Figure 4.2 Removing NICs whose virtual interface makes them redundant (ethX, ethY)**

For a Fast switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp                203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Prepare for removing a card.

- 1) Deactivate the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/stphanet -n shaX
```

- 2) Delete the virtual interface configuration information.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete -n shaX
```

- 3) If necessary, delete the subnet mask information about the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask delete -i network_address
```

- 4) Deactivate the target NIC.

```
# /sbin/ifdown ethX
# /sbin/ifdown ethY
```

3. Turn off power to the target PCI slot.

The interface (ethX) is deleted when power is turned off. For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 0 > /sys/bus/pci/slots/"<slot-number>"/power
```

4. Remove the NIC from the PCI slot.

To remove more NICs, repeat steps 2 to 4.

5. Perform post-removal processing.

- 1) Delete each interface setting file (/etc/sysconfig/network-scripts/ifcfg-eth<x>).

```
# /bin/rm /etc/sysconfig/network-scripts/ifcfg-ethX
# /bin/rm /etc/sysconfig/network-scripts/ifcfg-ethY
```

#### For a NIC switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp                203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Prepare for removing a card.

- 1) Deactivate the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/stphanet -n shaX
```

- 2) Stop interface status monitoring.

```
# /bin/touch /var/opt/FJSVhanet/tmp/disable_watchif
```

- 3) Stop hub monitoring.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll off
```

- 4) Delete the hub monitoring destination information.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll delete -n shaX
```

- 5) Delete the standby patrol function. If the standby patrol function is not used, skip this step.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete -n shaY
```

- 6) Delete the virtual interface configuration information.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete -n shaX
```

- 7) If necessary, delete the subnet mask information about the virtual interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask delete -i network_address
```

- 8) Deactivate the target NIC.

```
# /sbin/ifdown ethX  
# /sbin/ifdown ethY
```

3. Turn off power to the target PCI slot.

The interface (ethX) is deleted when power is turned off. For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 0 > /sys/bus/pci/slots/"<slot-number>"/power
```

4. Remove the NIC from the PCI slot.

To remove more NICs, repeat steps 2 to 4.

5. Perform post-removal processing.

- 1) Delete each interface setting file (/etc/sysconfig/network-scripts/ifcfg-eth<x>).

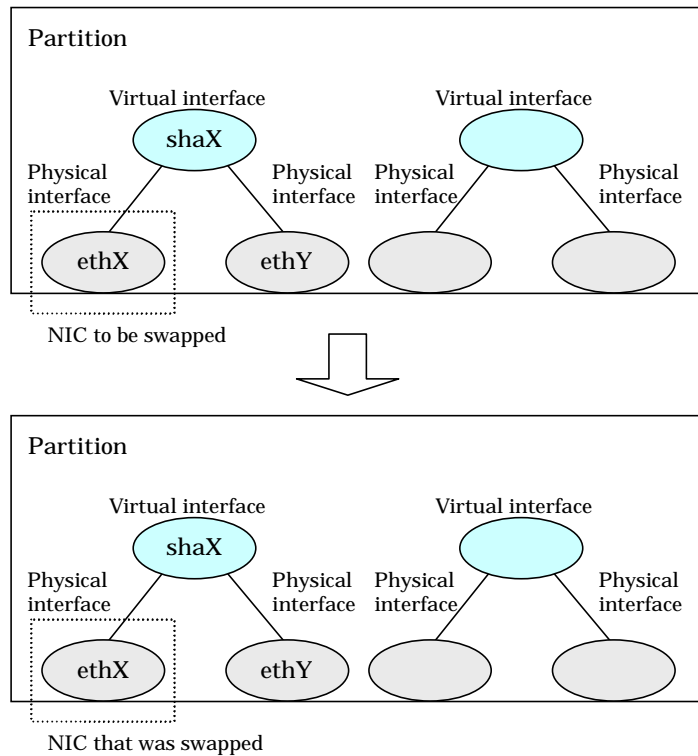
```
# /bin/rm /etc/sysconfig/network-scripts/ifcfg-ethX  
# /bin/rm /etc/sysconfig/network-scripts/ifcfg-ethY
```

- 2) Restart GLS to enable the changed settings.

```
# /opt/FJSVhanet/usr/sbin/resethanet -s
```

### 4.5.1.3 Swapping procedure

This section describes the procedure for swapping a NIC whose virtual interface makes it redundant.



**Figure 4.3 Swapping a NIC whose virtual interface make it redundant (ethX)**

For a Fast switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp          203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Prepare for swapping a card.

- 1) From the virtual interface definition, temporarily delete the definition information about the NIC to be swapped.

```
# /opt/FJShanet/usr/sbin/hanetnic delete -n shaX -i ethX
```

- 2) Enter the dsphanet command to confirm that the device status of the NIC is "CUT".

```
# /opt/FJSVhanet/usr/sbin/dsphanet
[IPv4,Patrol]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+
shaX     Active  t  OFF  ethX(CUT),ethY(ON)
```

- 3) Deactivate the NIC.

```
# /sbin/ifdown ethX
```

3. Turn off power to the target PCI slot.

The interface (ethX) is deleted when power is turned off. For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 0 > /sys/bus/pci/slots/"<slot-number>"/power
```

4. Swap the NIC in the PCI slot.

5. Turn on power to the PCI slot.

For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 1 > /sys/bus/pci/slots/"<slot-number>"/power
```

6. Check the hardware address.

An interface (ethX) is created for the swapped NIC when power is turned on. Execute the ifconfig (8) command to check the hardware address of the swapped NIC (HWaddr).

7. Perform post-swap processing.

- 1) Change the specified value of "HWADDR" in the interface setting file (/etc/sysconfig/network-scripts/ifcfg-eth<x>) to the hardware address of the swapped NIC that was checked in Step 6.

ifcfg-ethX

```
DEVICE=ethX
BOOTPROTO=static
HWADDR=ZZ:ZZ:ZZ:ZZ:ZZ:ZZ
HOTPLUG=no
BROADCAST=XXX.XXX.XXX.XXX
IPADDR=XXX.XXX.XXX.XXX
NETMASK=XXX.XXX.XXX.XXX
NETWORK=XXX.XXX.XXX.XXX
ONBOOT=yes
TYPE=Ethernet
```

- 2) Activate the swapped NIC.

```
# /sbin/ifup ethX
```

- 3) Restore the NIC definition that was temporarily deleted prior to swapping in 1) of Step 2).

```
# /opt/FJSVhanet/usr/sbin/hanetnic add -n shaX -i ethX
```



- 4) Enter the dsphanet command to confirm that the device status of the swapped NIC is "ON".

```
# /opt/FJSVhanet/usr/sbin/dsphanet
[IPv4,Patrol]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+
shaX      Active  t  OFF  ethX(ON),ethY(ON)
```

### For a NIC switching mode

1. Confirm that the PCI Hot Plug driver is installed.

If the PCI Hot Plug driver is not installed, install it according to "B.2.2 Installation of a PCI Hot Plug driver" of the "PRIMEQUEST 480/440 Operation Manual".

Confirmation procedure

```
# lsmod | grep shpchp
shpchp          203816  0
```

Installation procedure

```
# modprobe shpchp
```

2. Prepare for swapping a card.

- 1) Stop hub monitoring.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll off
```

- 2) Stop standby patrol monitoring. If the standby patrol function is not used, skip this step.

```
# /opt/FJSVhanet/usr/sbin/stpctl -n shaY
```

- 3) Enter the dsphanet command to check the status of the NIC to be swapped. The NIC must be in a different state from that of an active NIC (the NIC must be in the "OFF" or "STOP" state). If the NIC is active, follow Step 4 to switch its state to standby.

```
# /opt/FJSVhanet/usr/sbin/dsphanet
[IPv4,Patrol]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+
shaX      Active  d  OFF  ethX(ON),ethY(OFF)
```

- 4) If the NIC is an active NIC, switch its state to standby. After the switch, enter the dsphanet command to confirm that the NIC is a standby NIC(OFF).

```
# /opt/FJSVhanet/usr/sbin/hanetnic change -n shaX
```

```
# /opt/FJSVhanet/usr/sbin/dsphanet
[IPv4,Patrol]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+
shaX      Active  d  OFF  ethX(OFF),ethY(ON)
```

- 5) Stop interface status monitoring.

```
# /bin/touch /var/opt/FJSVhanet/tmp/disable_watchif
```

- 6) Deactivate the NIC.

```
# /sbin/ifdown ethX
```

3. Turn off power to the target PCI slot.

The interface (ethX) is deleted when power is turned off. For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 0 > /sys/bus/pci/slots/"<slot-number>"/power
```

4. Swap the NIC in the PCI slot.

5. Turn on power to the PCI slot.

For details, see "B.2.3.2 Power-on and power-off procedures" of the "PRIMEQUEST 480/440 Operation Manual".

```
# echo 1 > /sys/bus/pci/slots/"<slot-number>"/power
```

6. Check the hardware address.

An interface (ethX) is created for the swapped NIC when power is turned on. Execute the `ifconfig (8)` command to check the hardware address of the swapped NIC (HWaddr).

7. Perform post-swap processing.

- 1) Change the specified value of "HWADDR" in the interface setting file (`/etc/sysconfig/network-scripts/ifcfg-eth<x>`) to the hardware address of the swapped NIC that was checked in Step 5.

`ifcfg-ethX` (NIC that was swapped)

```
DEVICE=ethX
BOOTPROTO=static
HWADDR=ZZ:ZZ:ZZ:ZZ:ZZ:ZZ
HOTPLUG=no
BROADCAST=XXX.XXX.XXX.XXX
IPADDR=XXX.XXX.XXX.XXX
NETMASK=XXX.XXX.XXX.XXX
NETWORK=XXX.XXX.XXX.XXX
ONBOOT=yes
TYPE=Ethernet
```

- 2) Change the interface name of the swapped NIC to the name specified in the interface setting file (`/etc/sysconfig/network-scripts/ifcfg-eth<x>`). Specify the same interface name and hardware address in the `nameif (8)` command as those in "DEVICE" and "HWADDR" in the `ifcfg-ethX` file that was set in 1) of step 6. When the `nameif (8)` command is executed, the specified interface must be deactivated.

```
# /sbin/nameif ethX ZZ:ZZ:ZZ:ZZ:ZZ:ZZ
```

- 3) Set the state of the swapped NIC to that of a standby NIC of GLS. Confirm that an IPv4 address is not assigned and the "UP" and "NOARP" flags are set.

```
# /sbin/ifconfig ethX 0 -arp up
# /sbin/ifconfig ethX
ethX      Link encap:Ethernet  HWaddr ZZ:ZZ:ZZ:ZZ:ZZ:ZZ
          inet6 addr: fe80::XXXXXXXXXXXXXXXX/64 Scope:Link
          UP BROADCAST NOARP MULTICAST  MTU:1500  Metric:1
```

- 4) If necessary, fail-back the NIC.

```
# /opt/FJSVhanet/usr/sbin/hanetnic change -n shaX
```

- 5) Start standby patrol monitoring. If the standby patrol function is not used, skip this step.

```
# /opt/FJSVhanet/usr/sbin/strptl -n shaY
```

- 6) Restart hub monitoring.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll on
```

- 7) Restart interface status monitoring.

```
# /bin/rm /var/opt/FJSVhanet/tmp/disable_watchif
```



## 4.6 Recovery Procedure from Line Failure

This section explains the recovery procedure in various modes after a line failure has occurred.

### 4.6.1 Recovery procedure from line failure in Fast switching mode

No special operation is required because recovery is automatically made after a line failure has occurred.

However, some applications may need to be restarted.

### 4.6.2 Recovery procedure from line failure in NIC switching mode

The following shows the recovery procedure from a line failure in NIC switching mode.

Some applications may need to be restarted after the recovery procedure on Redundant Line Control Function.

#### [One-system (currently active NIC) failure]

After line recovery, execute the following command:

```
# /opt/FJSVhanet/usr/sbin/hanetnic change -n shaX
```

\* shaX is the virtual interface name for NIC switching mode.

#### [Both-system (currently active and standby NICs) failure]

After line recovery, execute the following command:

```
# /opt/FJSVhanet/usr/sbin/hanetpoll on
```



## 4.7 Backing up and Restoring Configuration Files

This section explains how to back up and restore configuration files of Redundant Line Control Function.

### 4.7.1 Backing up Configuration Files

Use the hanetbackup command to back up configuration files.

For details about this command, see "7.12 hanetbackup Command".

### 4.7.2 Restoring Configuration Files

Use the hanetrestore command to restore configuration files.

For details about this command, see "7.13 hanetrestore Command".

After executing this command, restart the system immediately. The correct operation of Redundant Line Control Function cannot be assured if the system is not restarted.





# Chapter 5 GLS operation on cluster systems

This chapter explains how to operate the redundant line control on a cluster system.



## 5.1 Outline of Cluster System Support

In cluster system, Redundant Line Control Function supports the following operation modes:

- Active standby (1:1 and N:1)
- Mutual standby
- Cascade
- Priority transfer

How cluster failover is dealt with in each mode is shown below.

**Table 5.1 List of the cluster system compatible function**

Mode	Active Standby System (1:1)	Active Standby System (N:1)	Mutual standby System	Cascade System	Priority transfer system	Duplicate transfer path for SIS
Fast switching mode	A	A	A	A	A	X
NIC switching mode	A	A	A	A	A	A

[Meaning of the symbols] A: Supported X: Not supported

Virtual IP addresses allocated to virtual interfaces are taken over if a cluster switching event occurs. GLS does not provide any function to support MAC address takeover and system node name takeover. Table 5.2 indicates the support status of each takeover function.

**Table 5.2 Supported cluster take over information**

Cluster Operation mode	IP address	MAC address	IP address + MAC address	IP address + System node name	IP address + MAC address + System node name
1:1 Active standby	A	X	X	X	X
N:1 Active standby	A	X	X	X	X
Mutual standby	A	X	X	X	X
Cascade	A	X	X	X	X
Priority transfer	A	X	X	X	X

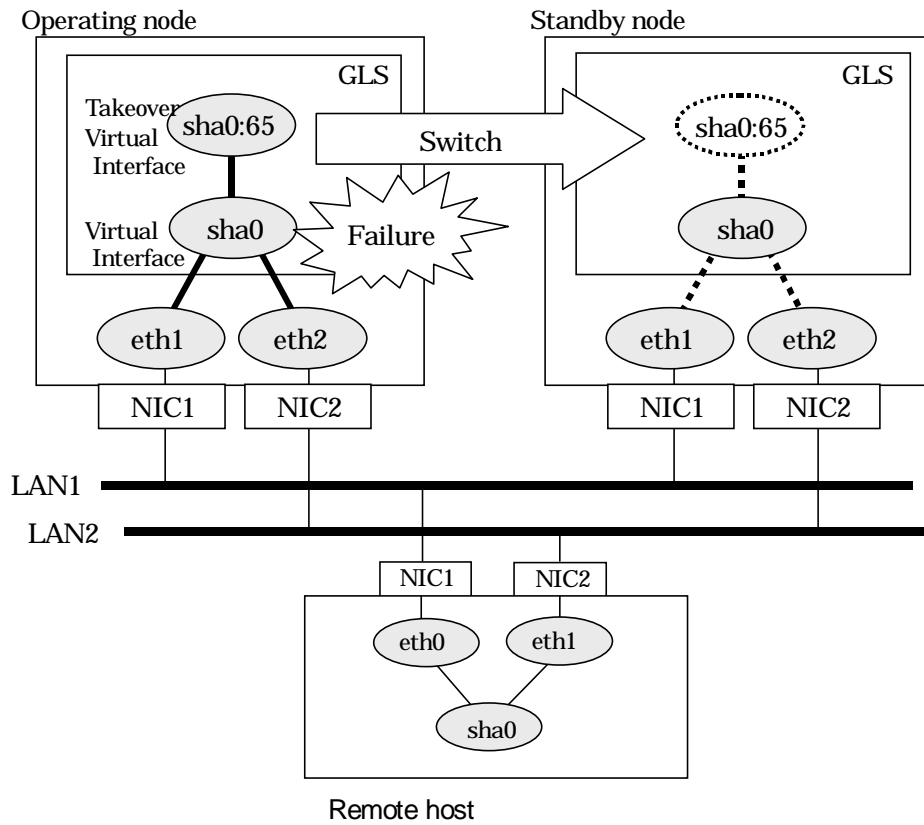
[Meaning of the symbols] A: Supported X: Not supported



**Note**

- Configuring GLS as Priority transfer, one of the cluster operation, follows the same procedure for configuring Cascade operation.
- When using Fast switching mode, you need a host running Fast switching mode as an associate host other than a node configuring a Cluster system. Failover of GLS resource may fail if there is only one Cluster system configuring nodes on the transfer route monitoring host due to simultaneous detection of transfer route failure on operation node and standby node.
- Scalable configuration as well as standby configuration in High-availability scalable settings are not supported.

Figure 5.1 shows an example of cluster switching for the virtual interface



**Figure 5.1 Cluster Switching for the virtual interface**

The logical unit number for the virtual interface for cluster switching is 65 or later. (sha0:65, sha0:66)

## 5.1.1 Active Standby

### 5.1.1.1 Starting

#### 5.1.1.1.1 Fast switching mode

With userApplication startup, the takeover virtual interface (sha0:65) over operating node will be activated, enabling communication using the takeover virtual IP address.

When operating, Fast switching mode uses the redundant line control function to communicate with the remote system.

Note that the virtual interface (such as sha0) is inactive just after GLS starts up. The virtual interface will be active after the first startup of userApplication. Once it becomes active, regardless of stopping or restarting userApplication, it remains to be active until the system stops.

Figure 5.2 shows behavior of Fast switching mode after starting up

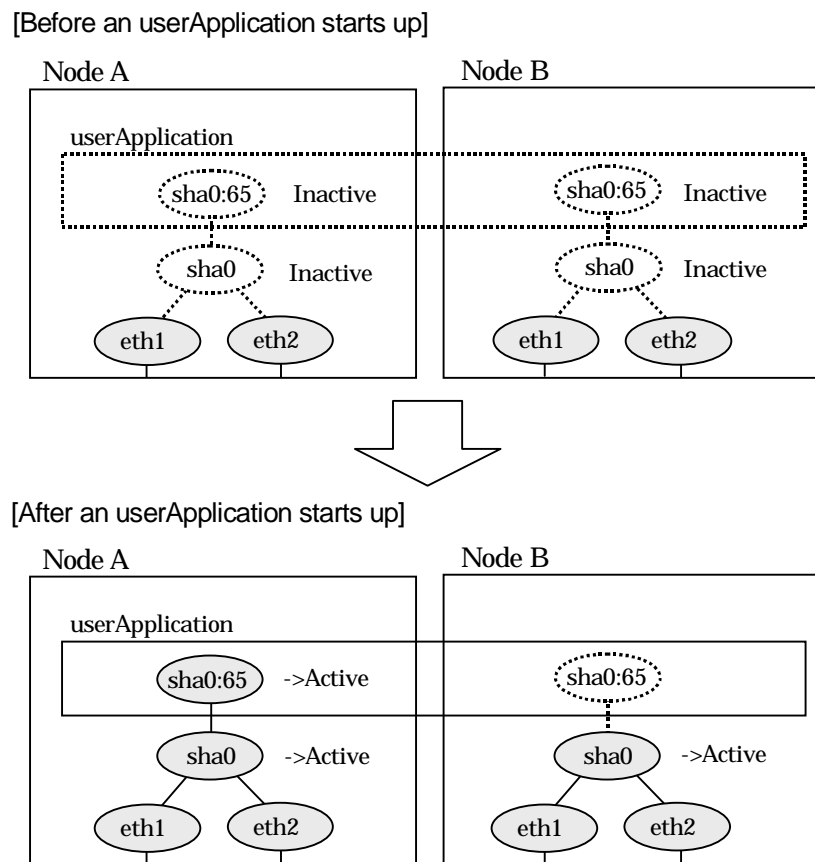


Figure 5.2 Startup behavior of Fast switching mode

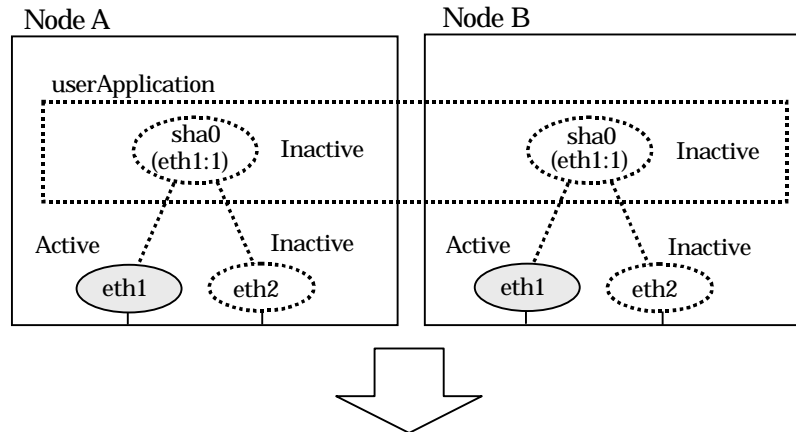
### 5.1.1.1.2 NIC switching mode

NIC switching mode has the following address takeover functions. Select a function to be used depending on your operation.

- **Logical address takeover**  
Using the logical address takeover function allows a LAN to have several virtual IP addresses. Ordinary communication will be done via a physical IP address, and a communication through GLS will be done via the virtual IP addresses.  
For the remote system device to make a connection, a physical IP address should be specified as the connection address. Then, the remote system device can directly connect to the active or standby node and manage each of the nodes regardless of the status transition of the userApplication.  
For this function, two IP addresses are assigned to one physical interface. To use a TCP/IP application that requires only one IP address to be specified, use the physical address takeover function I or II.
- **Physical IP address takeover I**  
Use the Physical IP address takeover function I for a GLS network and an ordinary network to exist in a same LAN, sharing an IP address allocated to a physical interface. This function allows a connection to be made for each of the active and standby nodes independently. However, IP address of the standby node changes according to the status transition of the userApplication. Thus, when clusters are switched, the TCP connection to the standby node is cleared. For the communication target device to make a connection again, the connection IP address must be changed.
- **Physical IP address takeover II**  
Use the Physical IP address takeover function II to use a LAN only for GLS networking. In this case, no connection can be made to the standby node because the LAN of the standby node is inactivated. Another LAN must be provided to make a connection.

Figure 5.3 shows the active standby configuration diagram of duplicated operation in NIC switching mode (logical IP address takeover function). The operation in this figure is as follows: On active node A, the logical interface (eth1:1) of the secondary interface (eth1) is assigned the takeover virtual IP address (IP-A) and activated. If switching occurs due to a failure, the takeover virtual interface (eth1:1) that has been assigned the takeover IP address (IP-A) is inactivated. Then, on standby node B, the logical interface (eth0:1) that has been assigned the takeover IP address (IP-A) on the already activated primary interface (eth0) is activated.

[Before an userApplication starts up]



[After an userApplication starts up]

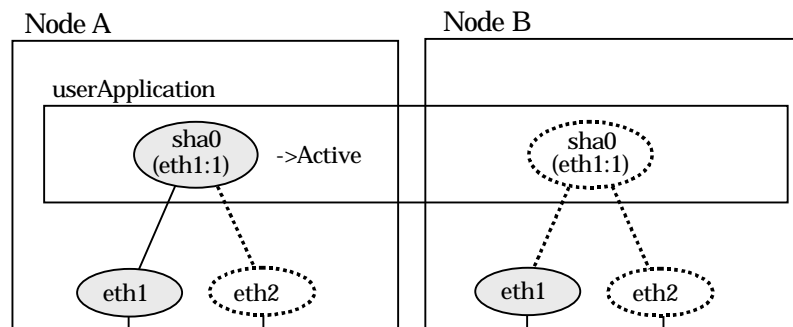
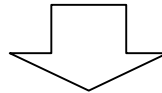
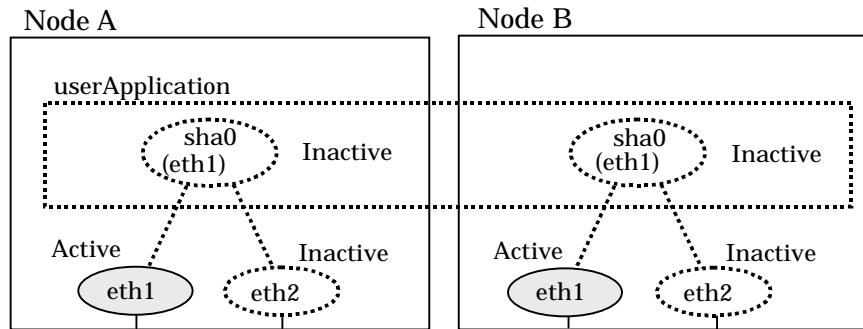


Figure 5.3 Startup behavior of NIC switching mode (take over logical IP)

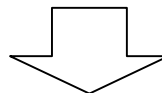
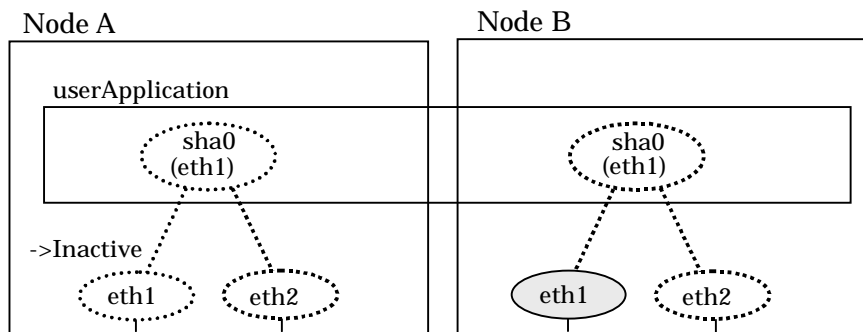
For taking over physical IP address I, activate the physical interface (eth1) for operating node and standby node when the redundant line control function starts up. After the userApplication starts, it will activate the physical interface by allocating a takeover IP address to the physical interface on the operating node. At this time, a physical interface (eth1) over the standby node remains to be inactive.

Figure 5.4 shows a startup behavior of takeover physical IP address I

[Before an userApplication starts up]



[Starting an userApplication]



[After an userApplication starts up]

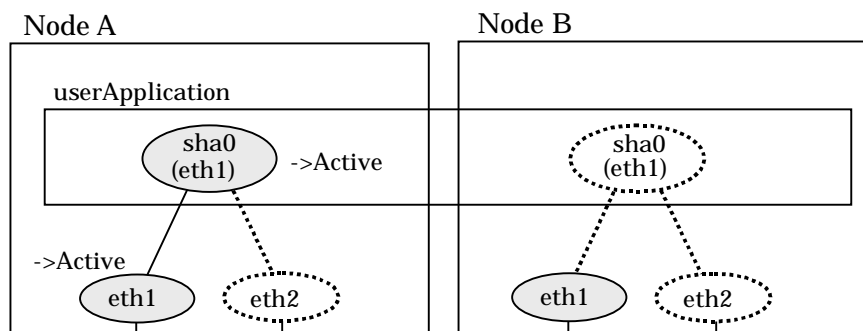


Figure 5.4 Startup behavior of NIC switching mode (takeover physical IP address I)



For taking over physical IP address II, it does not activate the physical interface (eth1) for both operating node and standby node when redundant line control function starts up. Instead it allocates a takeover IP address to the physical interface (eth1) on the operating node and then it activates the physical interface. In this case, the physical interface (eth1) for standby node remains inactive.

Figure 5.5 shows a startup behavior of the takeover physical IP address II

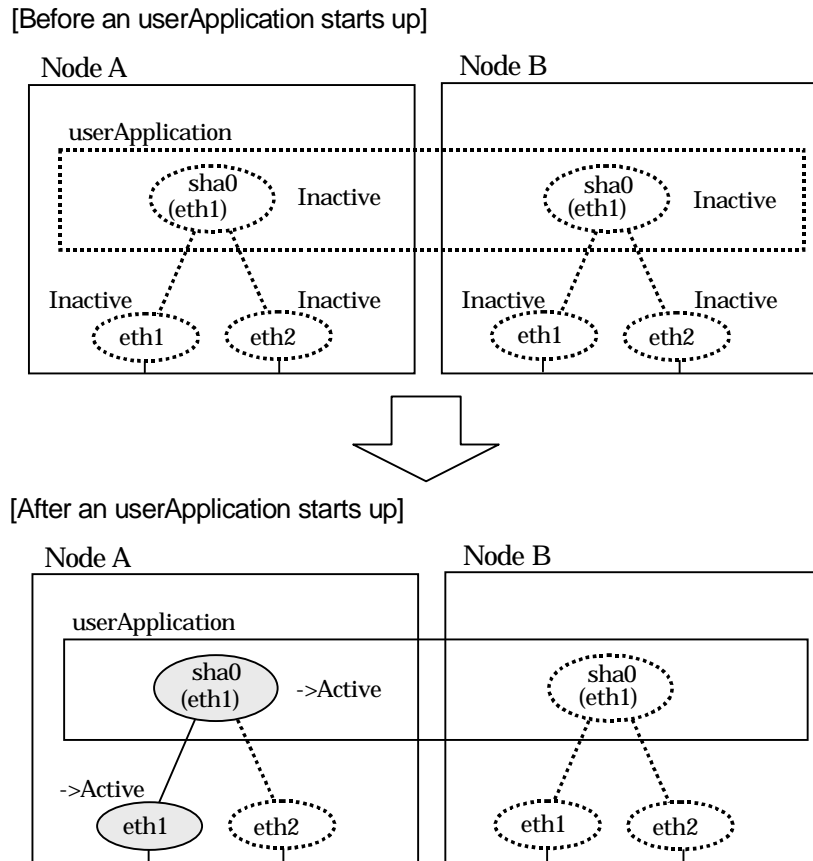


Figure 5.5 Startup behavior of NIC switching mode (takeover physical IP address II)

### 5.1.1.2 Switching

During normal operation, the system communicates with the remote system using Redundant Line Control Function on the operating node.

If a failure (panic, hang-up, or line failure) occurs on the operating node, Redundant Line Control Function switches the resources to the standby node. Then, applications make reconnection to take over the communication from the operating node.

#### 5.1.1.2.1 Fast switching mode

Figure 5.6 indicates switching behavior of Fast switching mode.

In the following figure, the takeover IP address (IPa) is allocated to the takeover virtual interface (sha0:65) for operating node A. Then it activates the takeover virtual interface. When switching the interface due to failures in the transfer path, the takeover virtual interface (sha0:65) for operating node A becomes inactive. Then in standby node B, the takeover virtual interface (sha0:65), which has allocated the takeover IP address (IPa) becomes active. Note that the virtual interface (sha0) in node A remains unchanged.

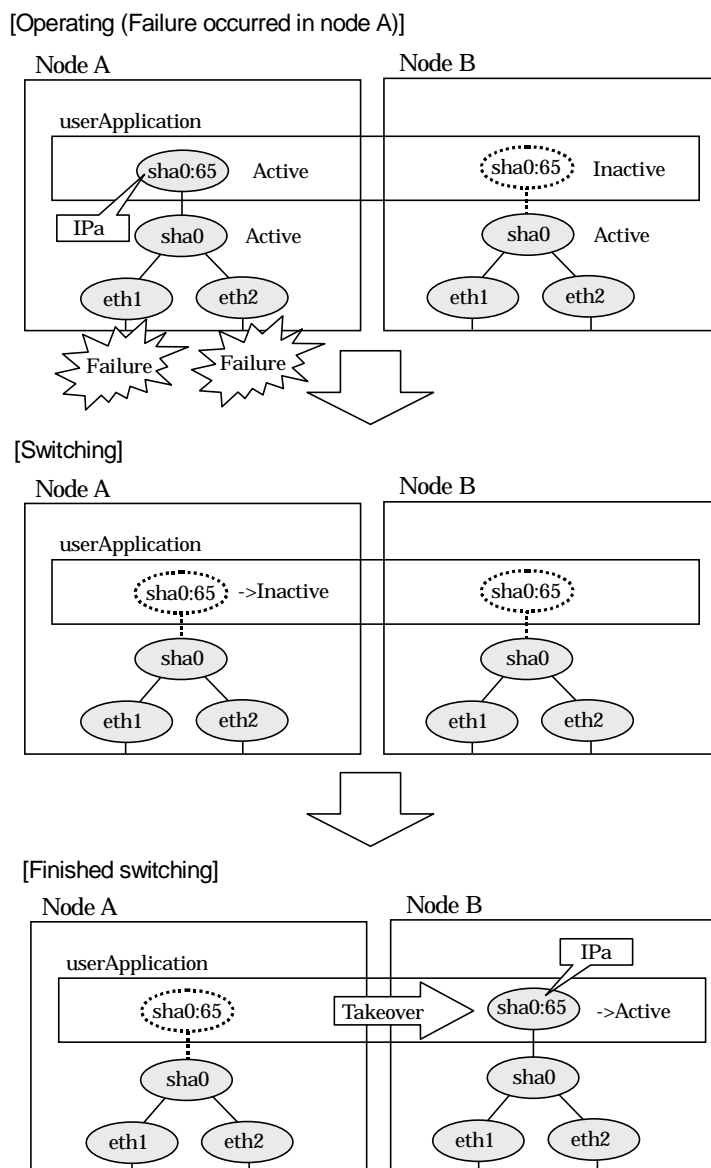


Figure 5.6 Switching behavior of Fast switching mode

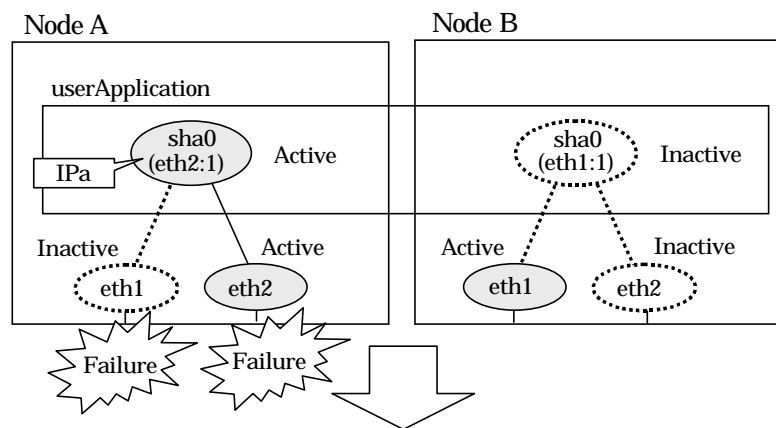
### 5.1.1.2.2 NIC switching mode

Figure 5.7 illustrates switching behavior of NIC switching mode (logical IP address takeover function).

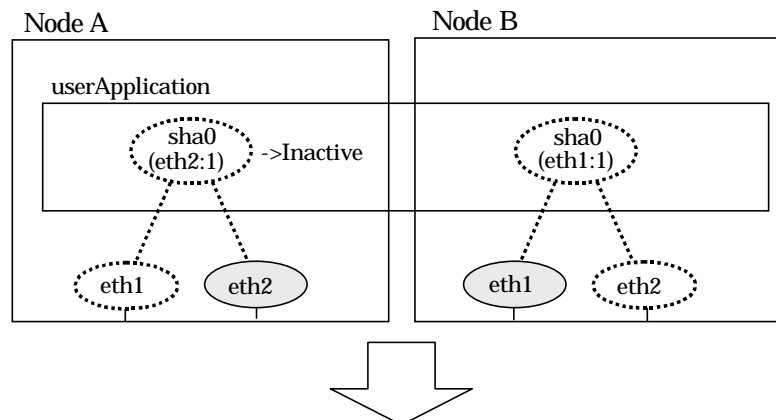
In the following figure, the takeover virtual IP address (IPa) in the operating node A is allocated to the logical interface (eth2.1) for the secondary interface. Once IPa is allocated, the logical interface (eth2.1) for the secondary interface turns into activate state.

When switching the node due to failure in the transfer routes, NIC switching mode inactivates the logical virtual interface which has allocated the takeover IP address (IPa) in the operating node A. Then it allocates the takeover IP address to the primary interface (eth1) and finally activates the logical interface (eth1:1).

[Operating (Failure occurred in node A)]



[Switching]



[Finished switching]

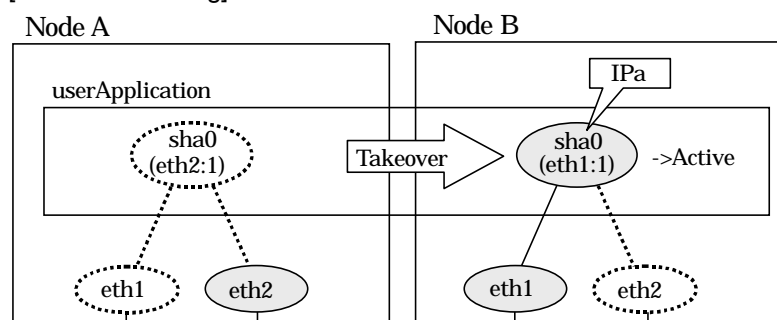


Figure 5.7 Switching behavior of NIC switching mode (takeover logical IP)

Figure 5.8 illustrates switching behavior of NIC switching mode (takeover physical IP address I). In the following figure, the takeover virtual IP address (IPa) in the operating node A is allocated to the secondary interface. Once IPa is allocated it turns into activate state.

When switching the node due to a failure in the transfer routes, temporarily inactivate the primary interface (eth1), which has been active in the standby node B. Then it allocates the takeover IP address (IPa) to activate the primary interface (eth1). Once the primary interface activates, different IP address is allocated to the secondary interface (eth2) by means of inactivating eth2.

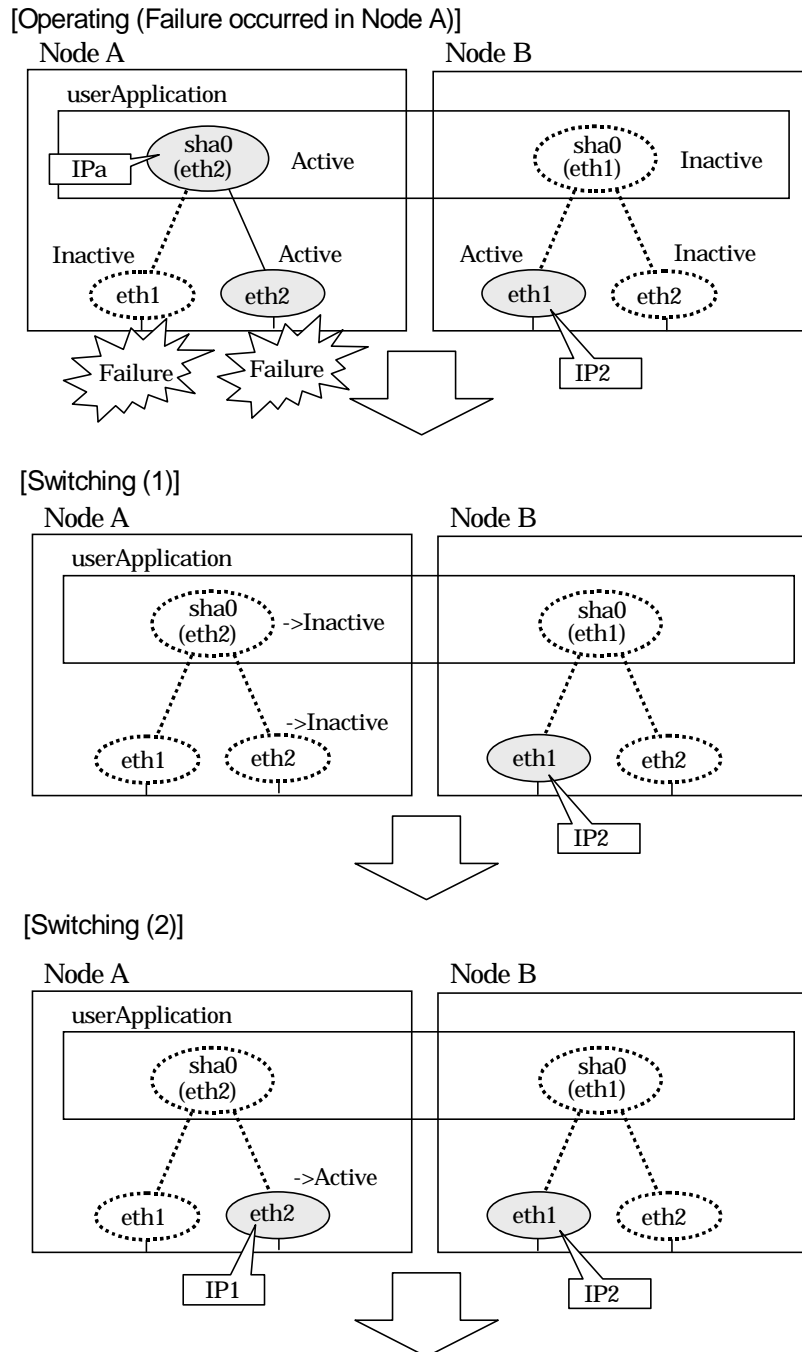


Figure 5.8 Switching behavior of NIC switching mode (takeover physical IP I) (continued)

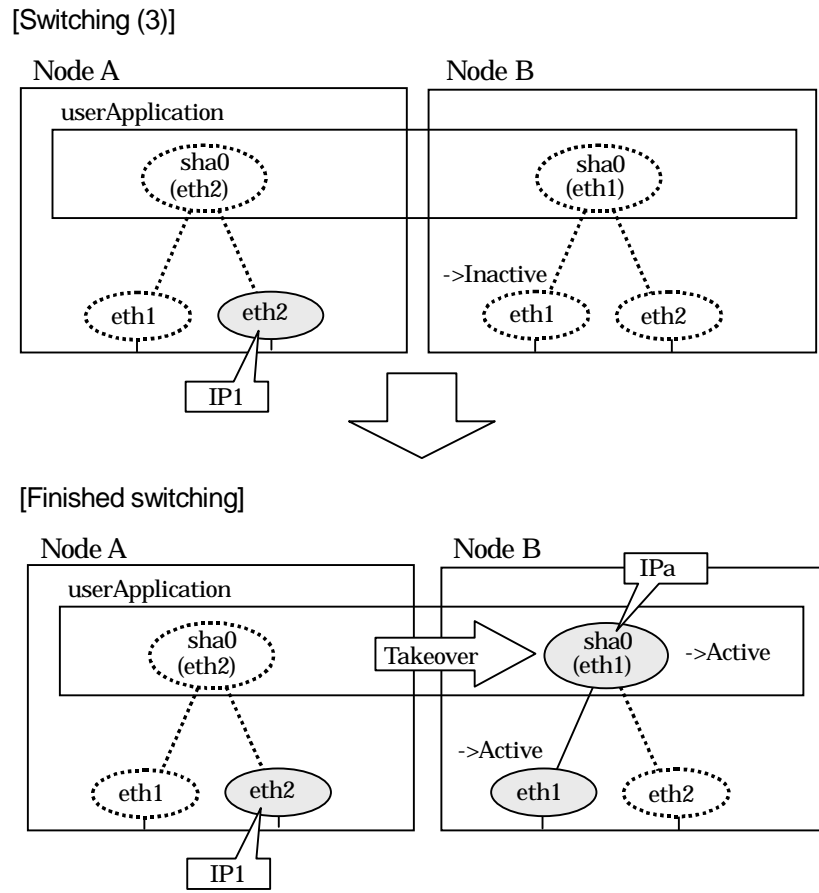


Figure 5.8 Switching behavior of NIC switching mode (takeover physical IP) (end)

Figure 5.9 illustrates switching behavior of NIC switching mode (takeover physical IP address II). In the following figure, the takeover IP address (IPa) in the operating node A is allocated to the secondary interface. Once IPa is allocated it turns into activate state.

When switching the node because of a failure in the transfer path, the standby node B turns to be active by allocating the takeover IP address (IPa) to the primary interface (eth1). After the IP address is successfully passed over to the standby node, the secondary interface (eth2), which previously owned the takeover IP address (IPa) in node A becomes inactive.

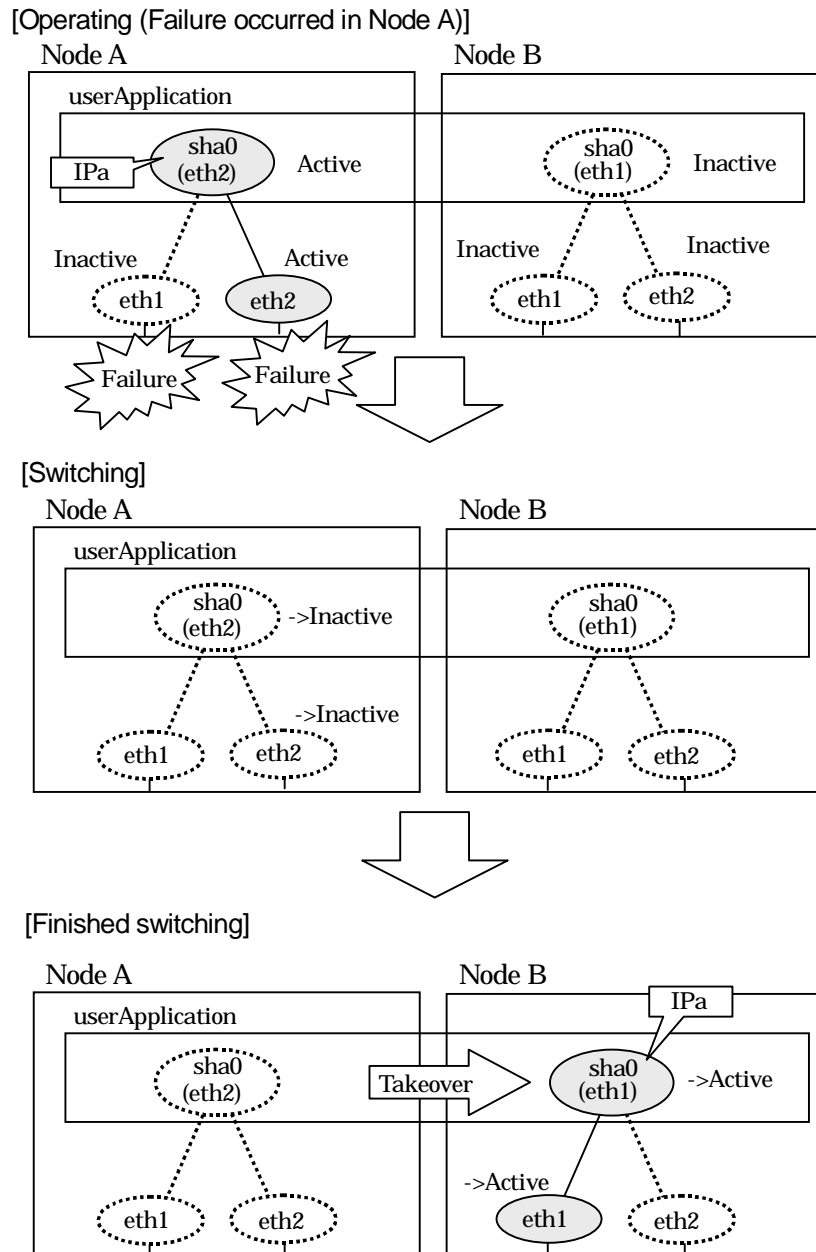


Figure 5.9 Switching behavior of NIC switching mode (takeover physical IP address II)

### 5.1.1.3 Fail-back

The following shows a procedure of performing fail-back after failure recovery if node switching occurs.

- 1) Make recovery for a node on which a failure has occurred.

If switching has occurred due to panic or hang-up, reboot the node that has panicked or hanged up.

If switching has occurred due to a line failure, restore the line to a normal status (perform necessary work such as reconnecting a cable, powering on a HUB again, and replacing a faulty HUB).

- 2) Restore the original operation status.

Restore the original operation status by performing fail-back operation for userApplication from "Cluster Admin" in Web-Based Admin View.

### 5.1.1.4 Stopping

#### 5.1.1.4.1 Fast switching mode

Figure 5.10 illustrates stopping process of userApplication.

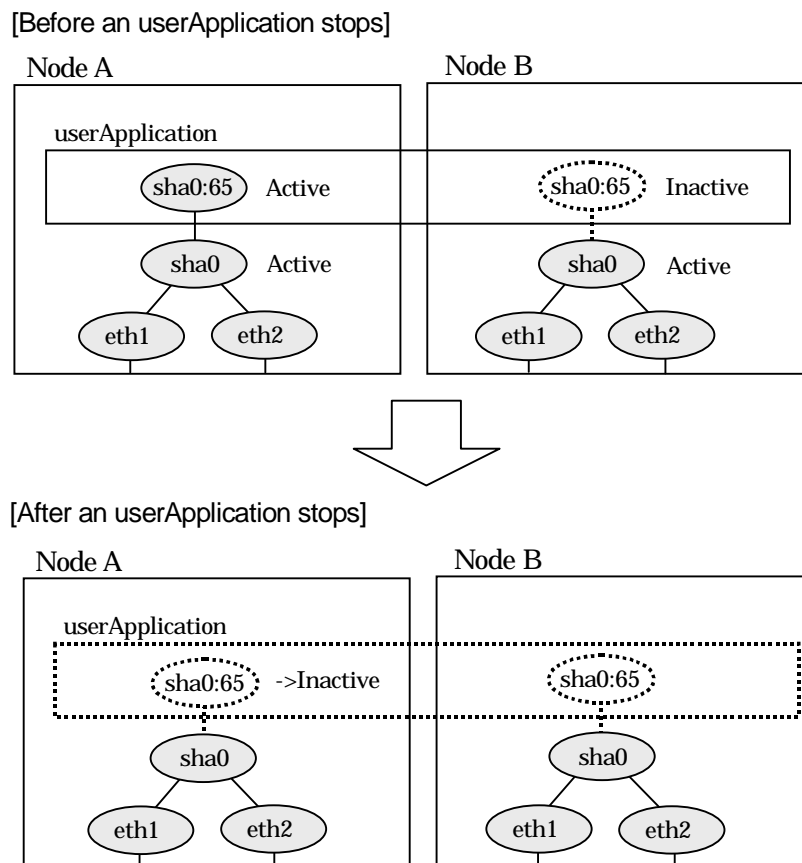


Figure 5.10 Stopping behavior of Fast switching mode

### 5.1.1.4.2 NIC switching mode

Figure 5.11 illustrates stopping process of userApplication for logical IP takeover.

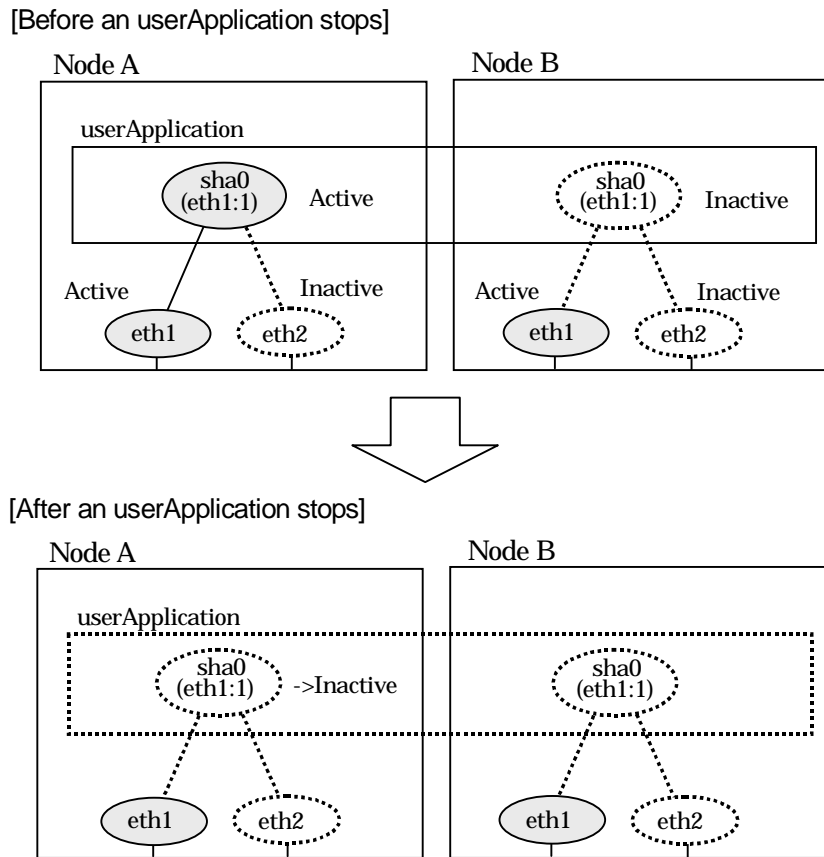
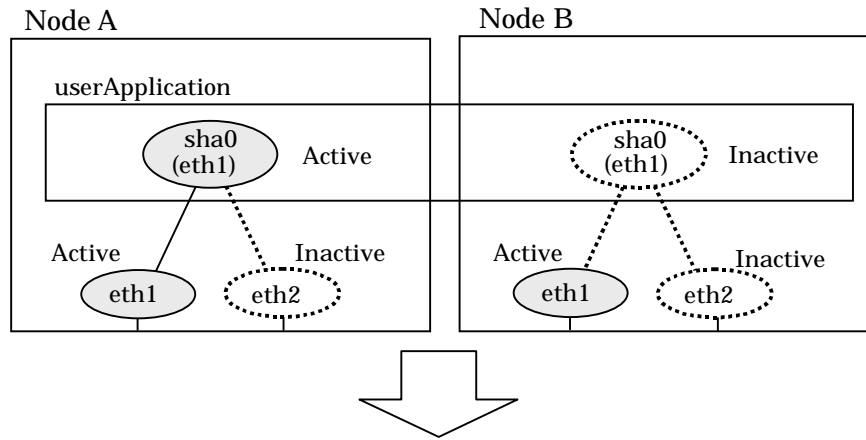


Figure 5.11 Stopping process of NIC switching mode (logical IP takeover)

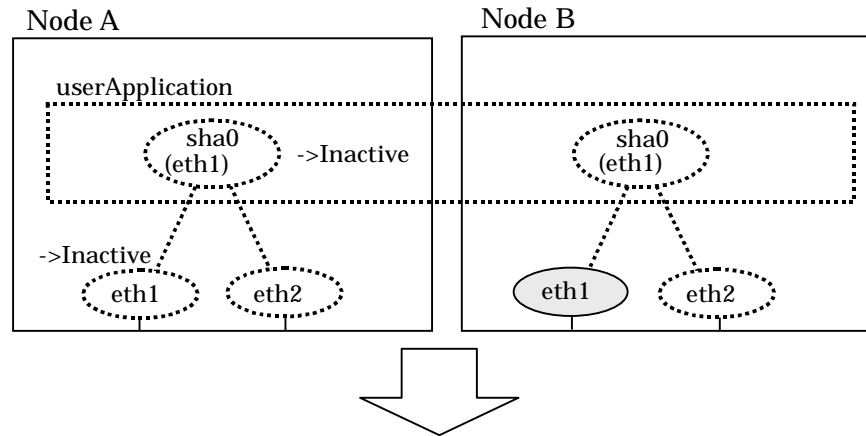


Figure 5.12 illustrates stopping behavior of userApplication for the physical IP takeover I.

[Before an userApplication stops]



[Stopping]



[After an userApplication stops]

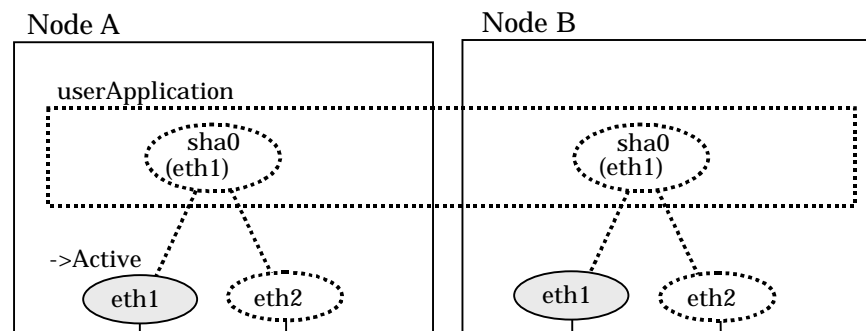


Figure 5.12 Stopping process of NIC switching mode (physical IP takeover)

Figure 5.13 illustrates stopping behavior of userApplication for the physical IP takeover II.

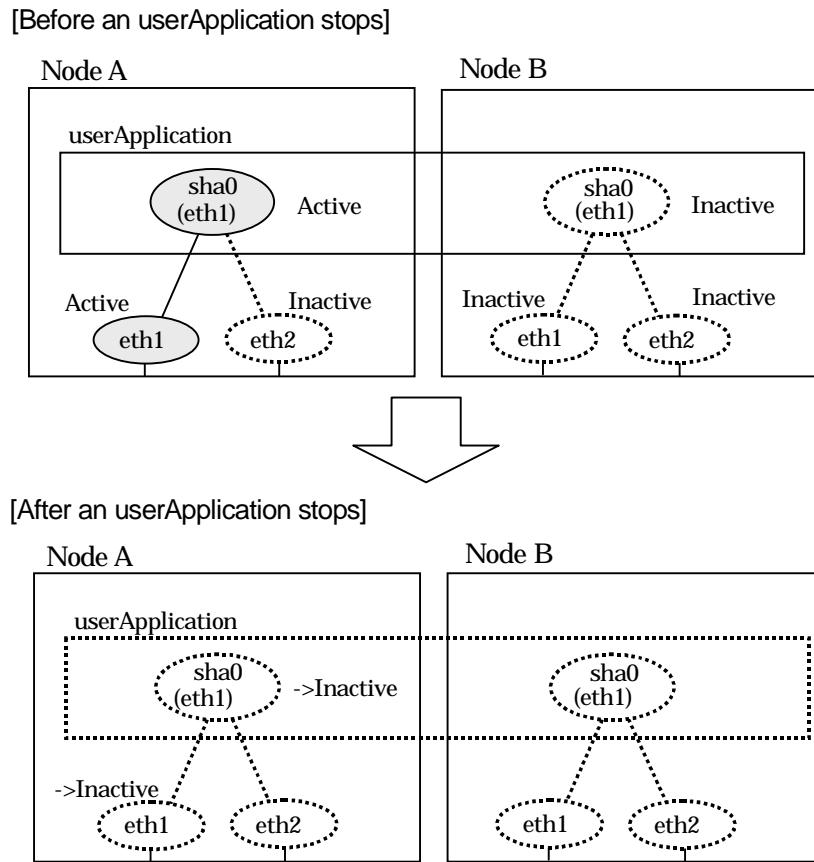


Figure 5.13 Stopping process of NIC switching mode (physical IP takeover)

## 5.1.2 Mutual standby

A mutual standby operation can be achieved by defining several virtual interfaces and by configuring each resource as a separate userApplication.

### 5.1.2.1 Starting

Starting process is equivalent to the active standby operation, except that the mutual standby operation contains various userApplications. For more information, see "5.1.1.1 Starting".

### 5.1.2.2 Switching

Usually, userApplication communicates with the remote system using the virtual interface on each node. If a failure (such as panic, hang-up, or transfer path failure) occurs on the operating node, the virtual interface comprised in that corresponding node is passed over to the standby node. With an application allowing reconnection, it takes over the connection of the operating node.

#### 5.1.2.2.1 Fast switching mode

Figure 5.14 shows the mutual standby configuration diagram of duplicated operation in Fast switching mode. The takeover of an address, etc. is performed in the same way as for the active standby configuration. For more information, see "5.1.1.1.1 Fast switching mode".

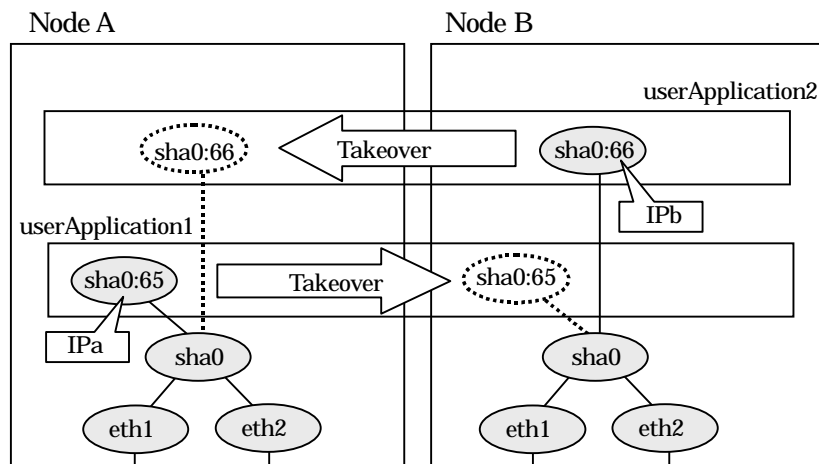
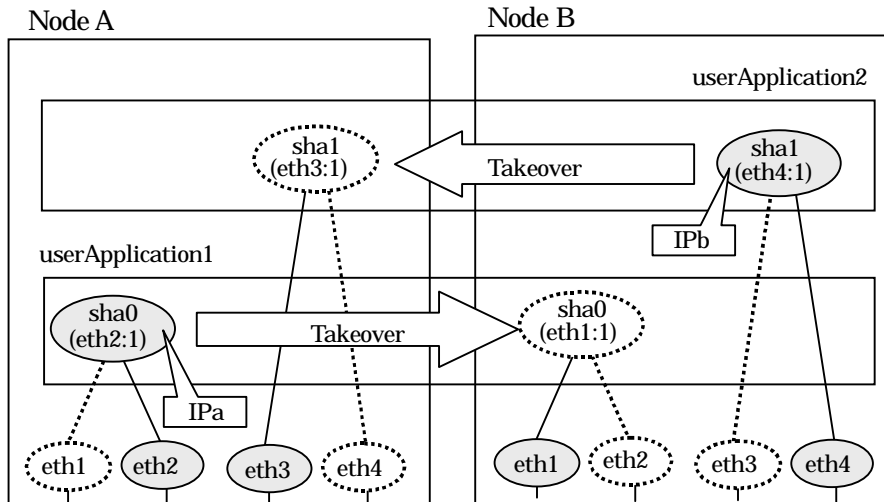


Figure 5.14 Mutual standby configuration diagram in Fast switching mode

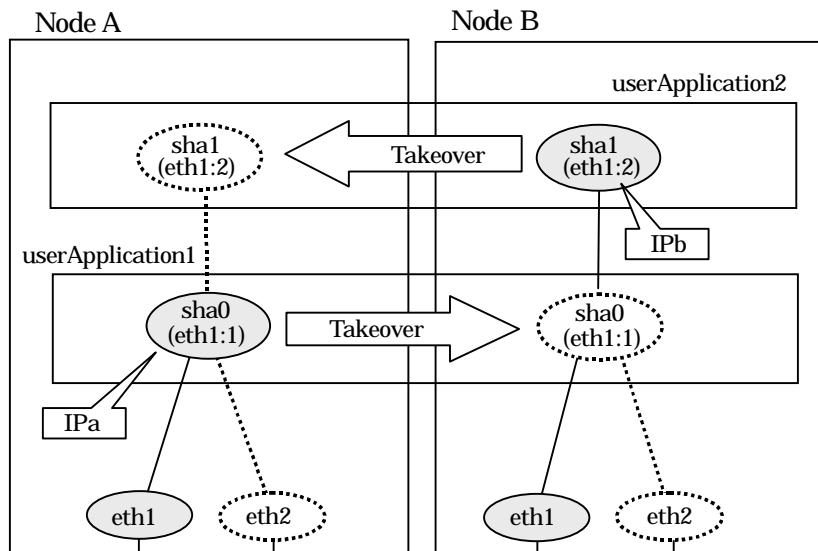
### 5.1.2.2.2 NIC switching mode

Figure 5.15 shows the mutual standby configuration diagram in NIC switching mode (NIC non-sharing). The takeover of an address, etc. is performed in the same way as for the active standby configuration. For more information, see "5.1.1.1.2 NIC switching mode".



**Figure 5.15 Mutual standby configuration diagram in NIC switching mode (NIC non-sharing)**

Figure 5.16 shows the mutual standby configuration diagram in NIC switching mode (NIC sharing). The takeover of an address, etc. is performed in the same way as for the active standby configuration. For more information, see "5.1.1.1.2 NIC switching mode".



**Figure 5.16 Mutual standby configuration diagram in NIC switching mode (NIC sharing)**

### **5.1.2.3 Fail-back**

The fail-back is performed in the same way as for the active standby configuration. For details, see "5.1.1.3 Fail-back".

### **5.1.2.4 Stopping**

Stopping operation is equivalent to active standby connection. For details, see "5.1.1.4 Stopping".



## 5.1.3 Cascade

### 5.1.3.1 Starting

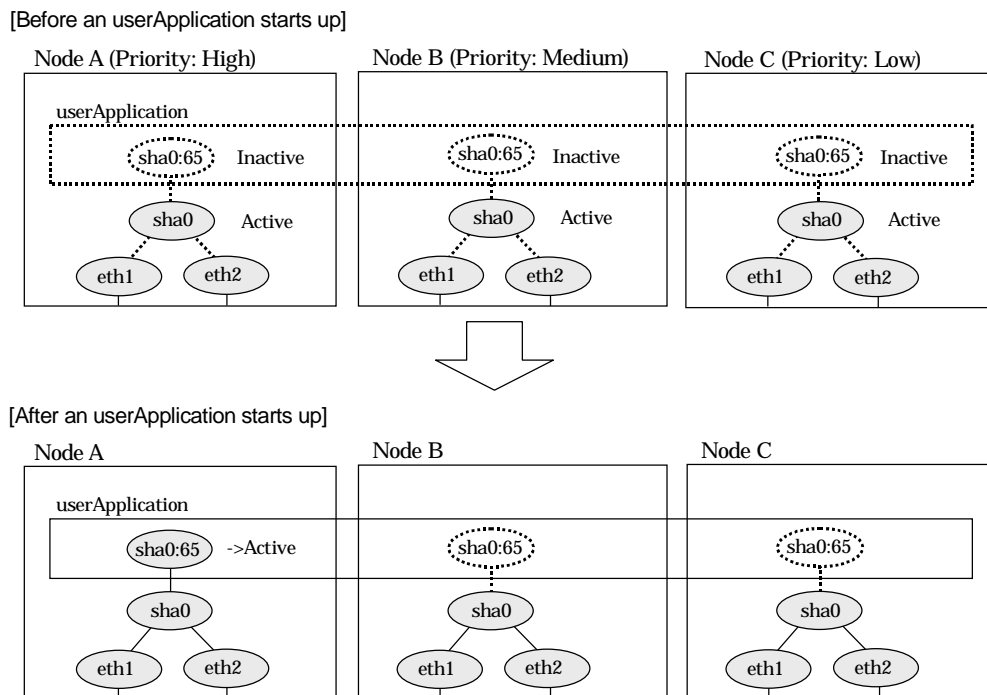
#### 5.1.3.1.1 Fast switching mode

When the userApplication starts up, the takeover virtual interface (sha0:65) becomes active on the operating node, allows to hold communication using the takeover virtual IP address.

During normal operation, userApplication communicates with the remote system using the virtual interface on the operating node.

After the redundant control function start-up, the virtual interface is activated. Once it has been activated, regardless of the cluster system shutdown or restart, it stays to be active until the system shuts down.

Figure 5.17 illustrates start-up behavior of Fast switching mode



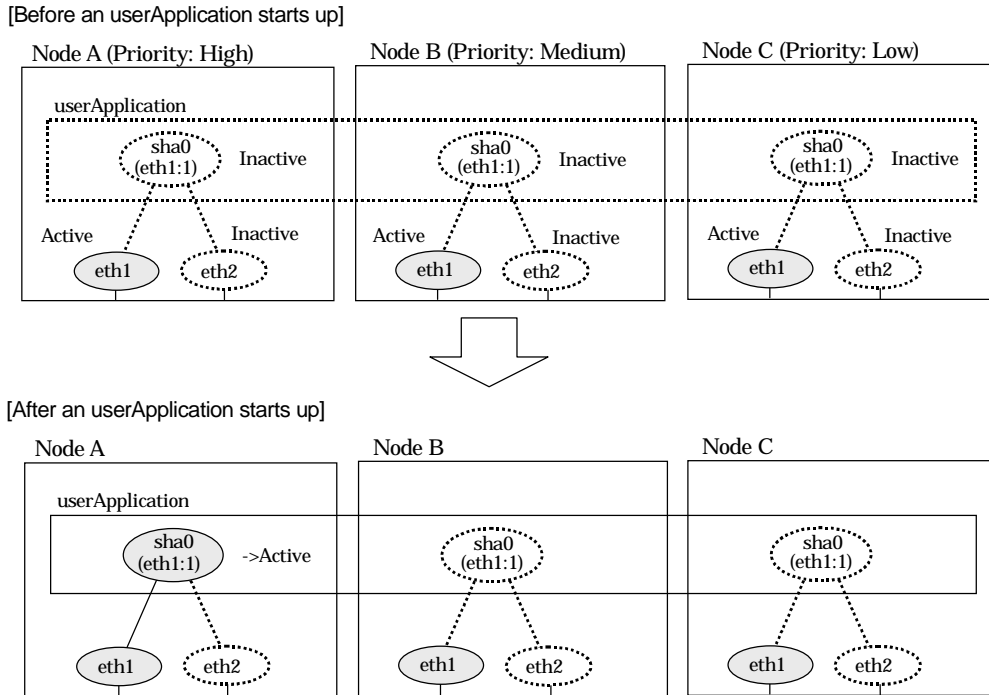
**Figure 5.17 Start-up behavior of Fast switching mode**

### 5.1.3.1.2 NIC switching mode

There are three types of IP takeover feature in NIC switching mode. For detail, refer to “5.1.1.1.2 NIC switching mode”.

The physical interface (eth1) for each node becomes active when the redundant control function starts up for logical IP takeover. Once the userApplication starts up, takeover virtual interface (eth1:1) then becomes active on the operating node which has higher priority.

Figure 5.18 illustrates start-up behavior of logical IP takeover.



**Figure 5.18 Start-up behavior of NIC switching mode (logical IP takeover)**



The physical interface (eth1) for each node becomes active when the redundant control function starts up for the physical IP takeover I. Once the userApplication starts up, it activates the physical interface (eth1) by allocating the takeover IP address to the physical interface (eth1) on the operating node, which has a higher priority. During this process, the physical interface (eth1) on the standby node maintains its state.

Figure 5.19 illustrates start-up behavior of the physical IP takeover I.

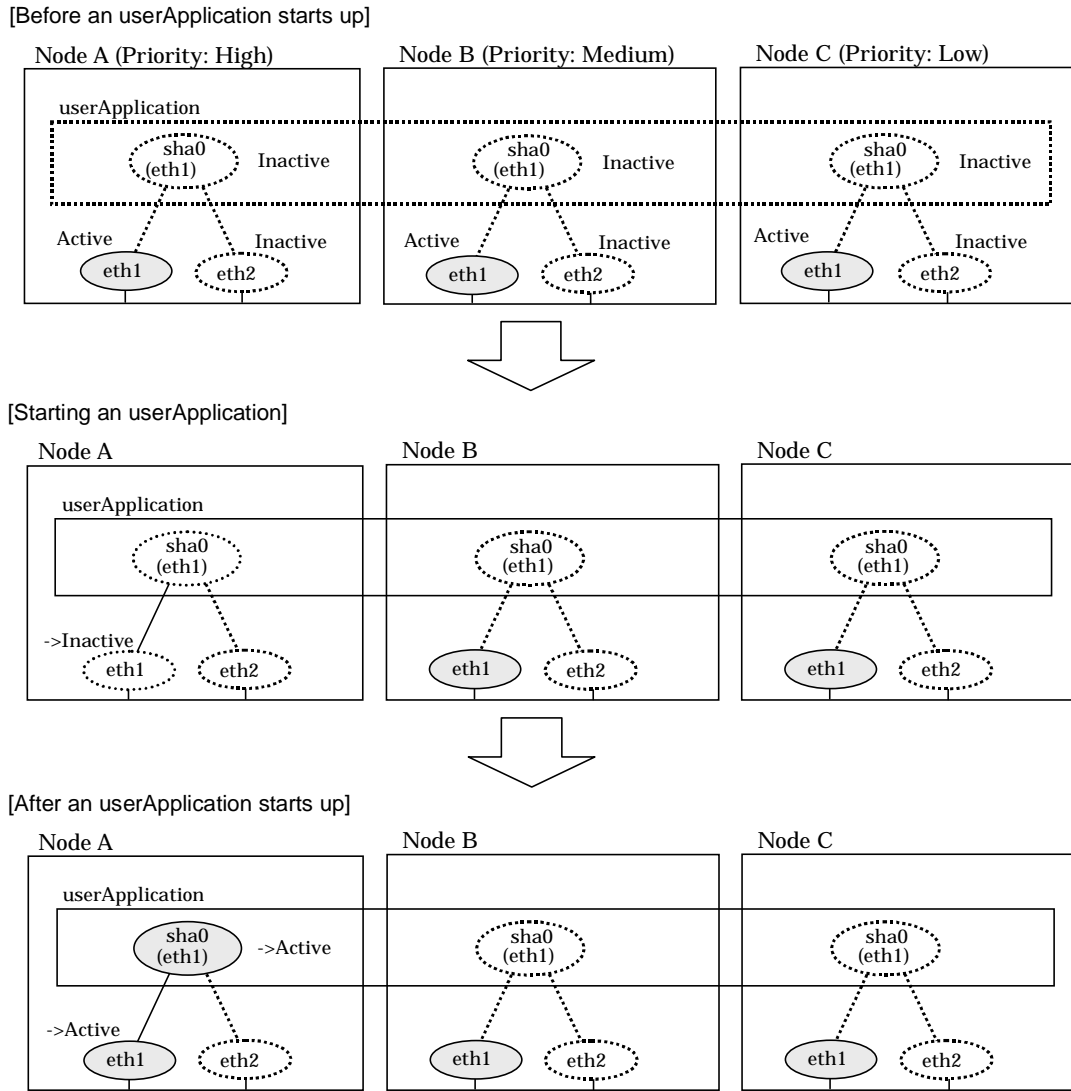


Figure 5.19 Start-up behavior of NIC switching mode (physical IP takeover)

The physical interface (eth1) for each node stays to be inactive when the redundant control function starts up for the physical IP takeover II. Once the userApplication starts up, it activates the physical interface (eth1) by allocating the takeover IP address to the physical interface (eth1) on the operating node, which has a higher priority. While this process takes place, the physical interface on the standby node remains inactive.

Figure 5.20 illustrates start-up behavior of physical IP takeover II

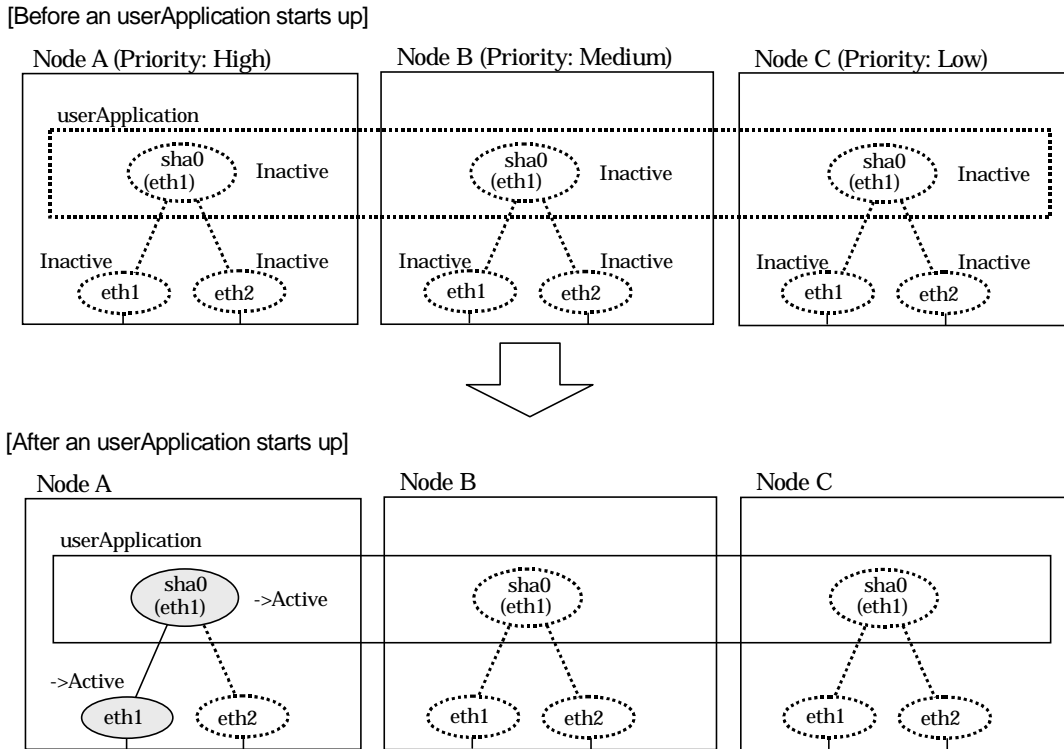


Figure 5.20 Start-up behavior of NIC switching mode (physical IP takeover II)

### 5.1.3.2 Switching

During normal operation, userApplication communicates with the remote system using the takeover virtual interface on the operating node.

When a failure (panic, hang, detecting failure in transfer route) occurs in the operating node, redundant control function allows switching to the standby node, which has a higher priority within a several other standby nodes. It inherits the communication of operating node by reconnecting to the node using the application.

#### 5.1.3.2.1 Fast switching mode

Figure 5.21 illustrates switching behavior of Fast switching mode.

In the following figure, the takeover IP address (IPa) is allocated to the takeover virtual interface (sha0:65) for operating node A. Then it activates the takeover virtual interface. When switching the interface due to failures in the transfer path, the takeover virtual interface (sha0:65) for operating node A becomes inactive. Then in standby node B, the takeover virtual interface (sha0:65), which has allocated the takeover IP address (IPa) becomes active. Note that the virtual interface (sha0) in node A stays unchanged.

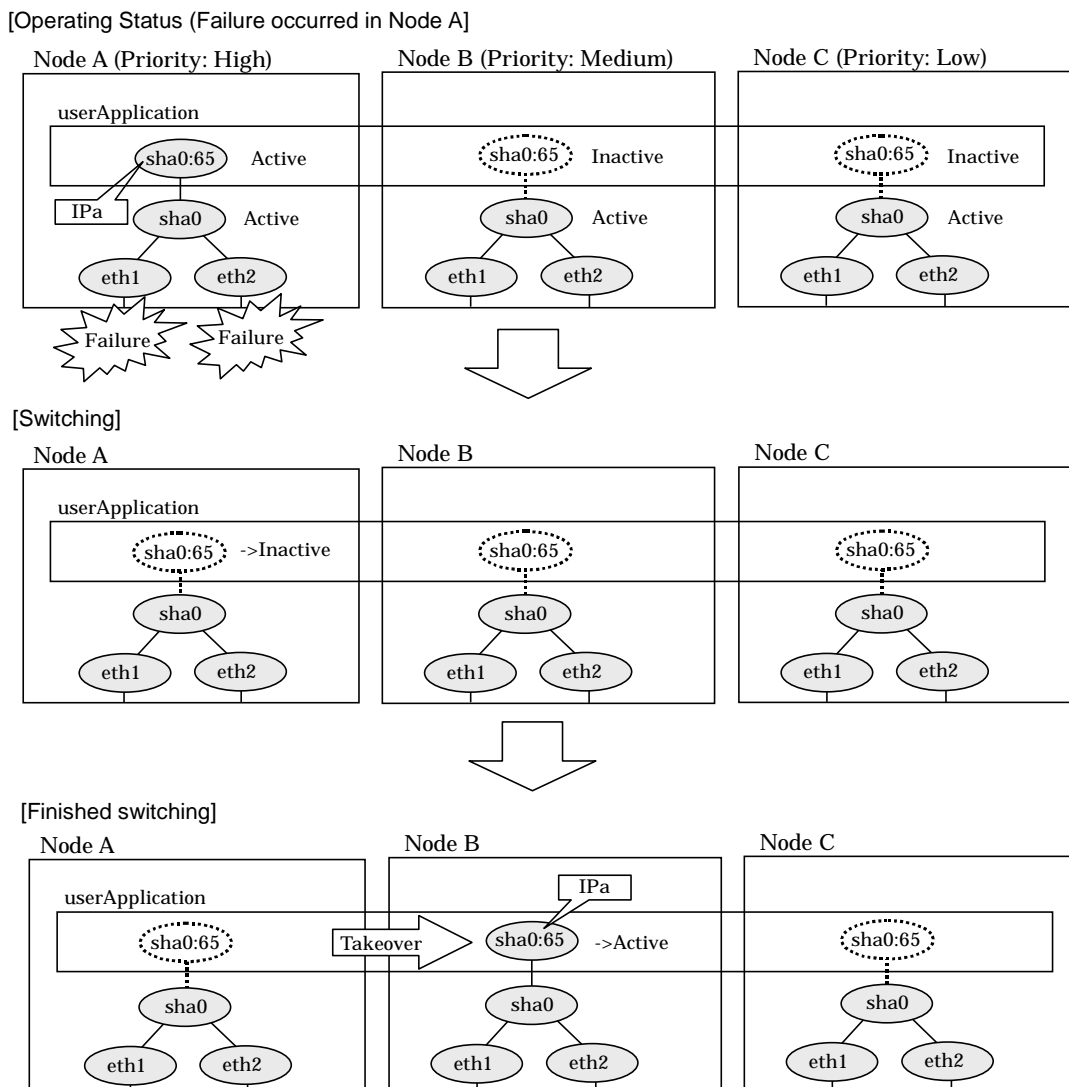


Figure 5.21 Switching operation of Fast switching mode

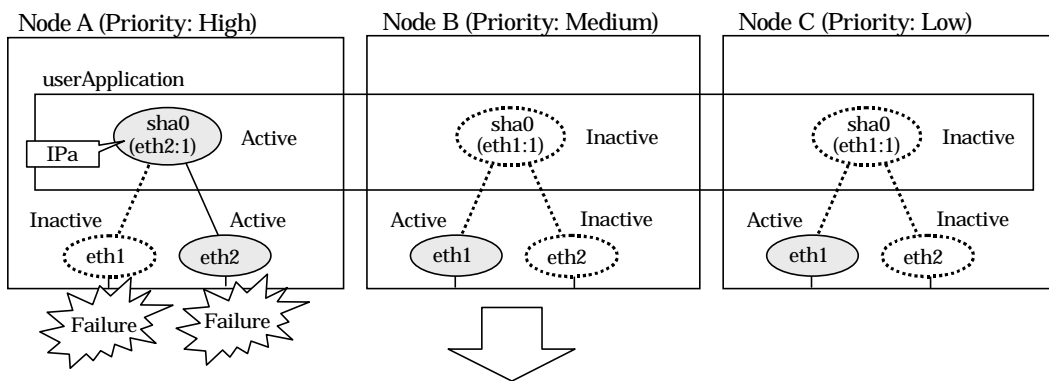
### 5.1.3.2.2 NIC switching mode

Figure 5.22 illustrates switching behavior of NIC switching mode (logical IP address takeover function).

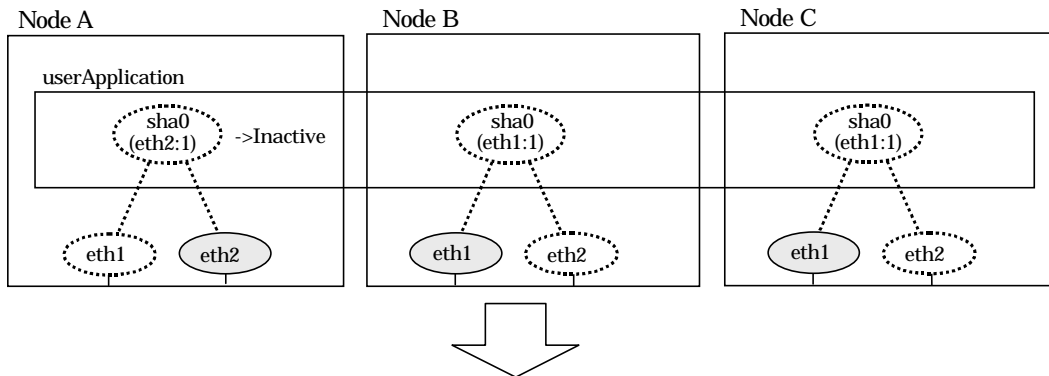
In the following figure, the takeover virtual IP address (IPa) in the operating node A is allocated to the logical interface (eth2.1) for the secondary interface. Once IPa is allocated, the logical interface (eth2.1) for the secondary interface turns into activate state.

When switching the node due to failure in the transfer routes, NIC switching mode inactivates the logical virtual interface which has allocated the takeover IP address (IPa) in the operating node A. Then it allocates the takeover IP address to the primary interface (eth1) and finally activates the logical interface (eth1.1).

[Operating Status (Failure occurred in Node A)]



[Switching]



[Finished switching]

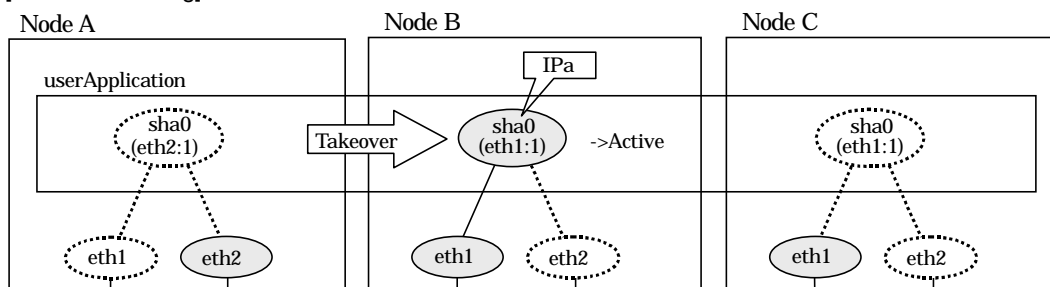


Figure 5.22 Switching operation of NIC switching mode (logical IP takeover)

Figure 5.23 illustrates switching behavior of NIC switching mode (takeover physical IP address I).

In the following figure, the takeover virtual IP address (IPa) in the operating node A is allocated to the secondary interface. Once IPa is allocated it turns into activate state.

When switching the node due to a failure in the transfer routes, temporarily inactivate the primary interface (eth1), which has been active in the standby node B. Then it allocates the takeover IP address (IPa) to activate the primary interface (eth1). Once the primary interface activates, different IP address is allocated to the secondary interface (eth2) by means of inactivating eth2.

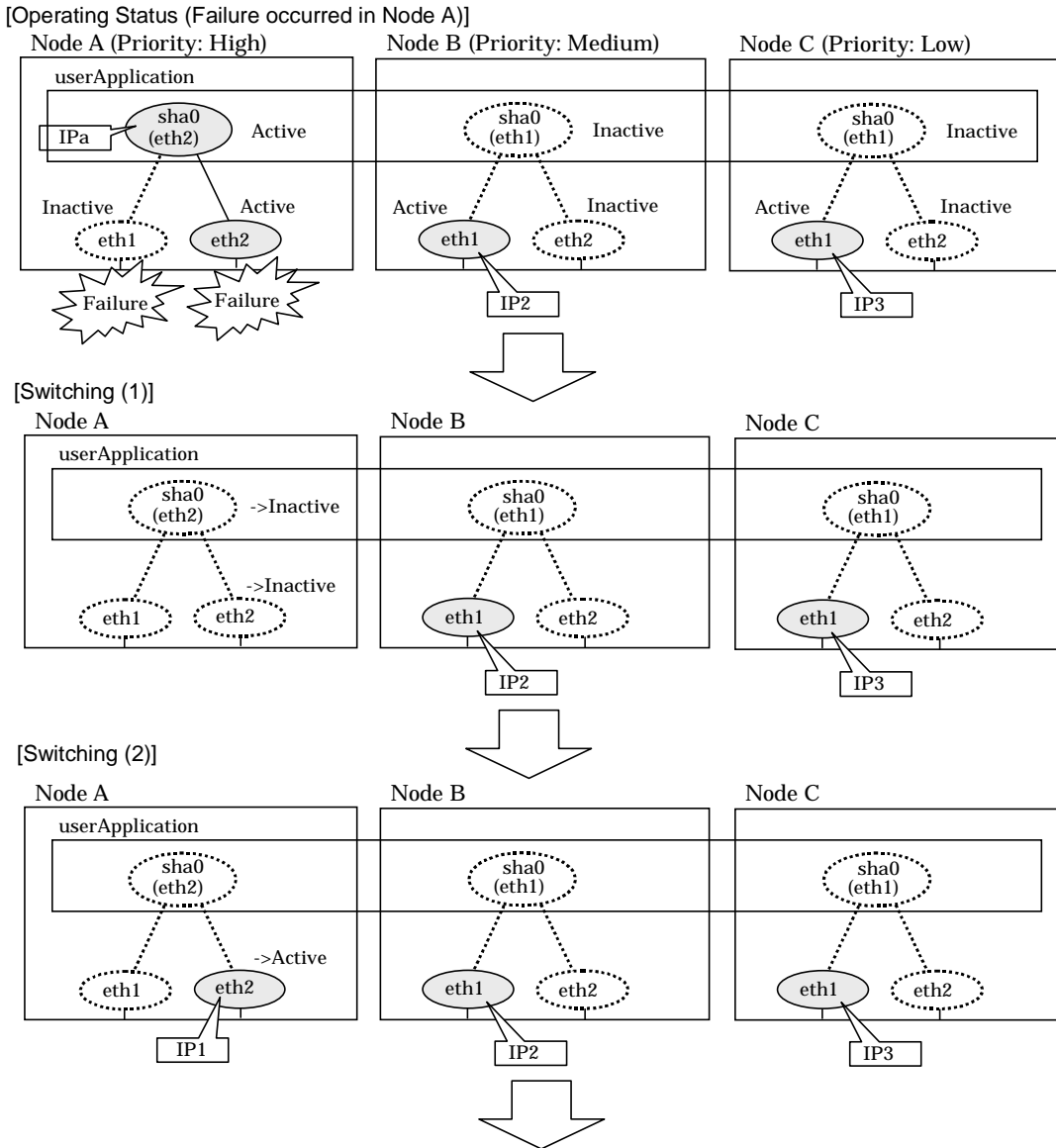


Figure 5.23 Switching operation of NIC switching mode (physical IP takeover I) (continues)

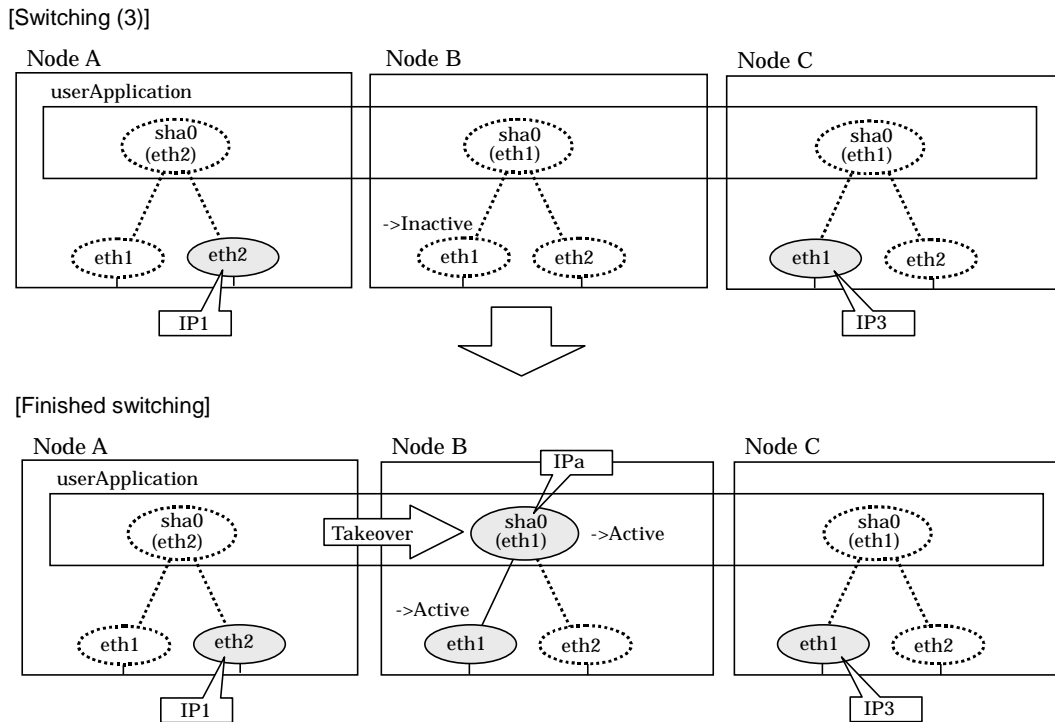


Figure 5.23 Switching operation of NIC switching mode (physical IP takeover I) (end)

Figure 5.24 illustrates switching behavior of NIC switching mode (takeover physical IP address I).

In the following figure, the takeover IP address (IPa) in the operating node A is allocated to the secondary interface. Once IPa is allocated it turns into activate state.

When switching the node because of a failure in the transfer path, activate the standby node B turns to be active by allocating the takeover IP address (IPa) to the primary interface (eth1). After the IP address is successfully passed over to the standby node B, becomes inactive the secondary interface (eth2), which previously owned the takeover IP address (IPa) in node A.

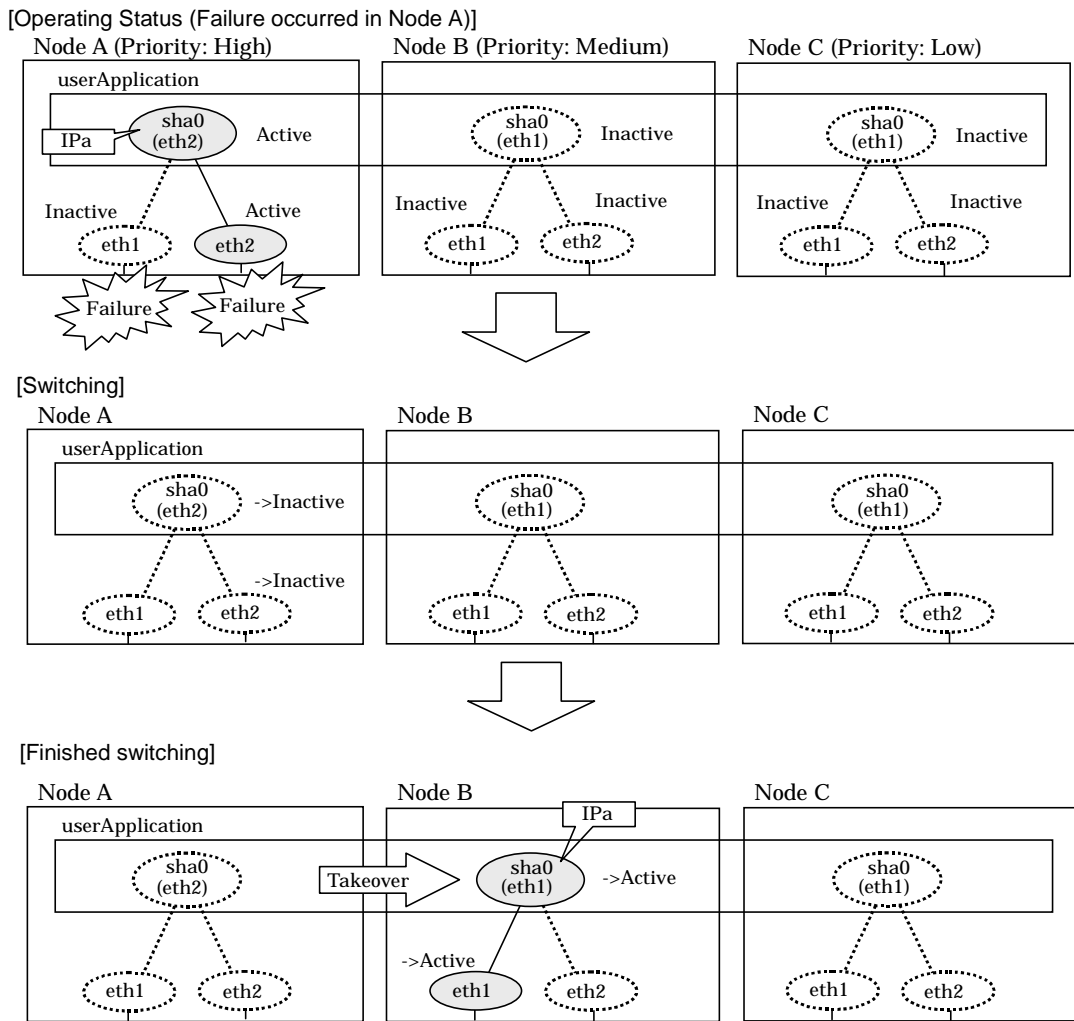


Figure 5.24 Switching operation of NIC switching mode (physical IP takeover II)

### 5.1.3.3 Fail-back

The following is a fail-back procedure, describing how to recover from the cluster switching.

1) Recovering the node, which encountered a failure

If switching was caused by panic or hang up, then reboot the node.

On the other hand, if switching was caused by a transfer path failure, then recover the transfer path encountered a failure. (Recovering options are reconnecting the cable, restore the power of HUB, and exchange the broken HUB.)

2) Fail-back to an arbitrary node on standby

Fail-back the userApplication to an arbitrary node on standby using "Cluster Admin" of Web-Based Admin View.

### 5.1.3.4 Stopping

#### 5.1.3.4.1 Fast switching mode

Figure 5.25 illustrates stopping operation of a userApplication

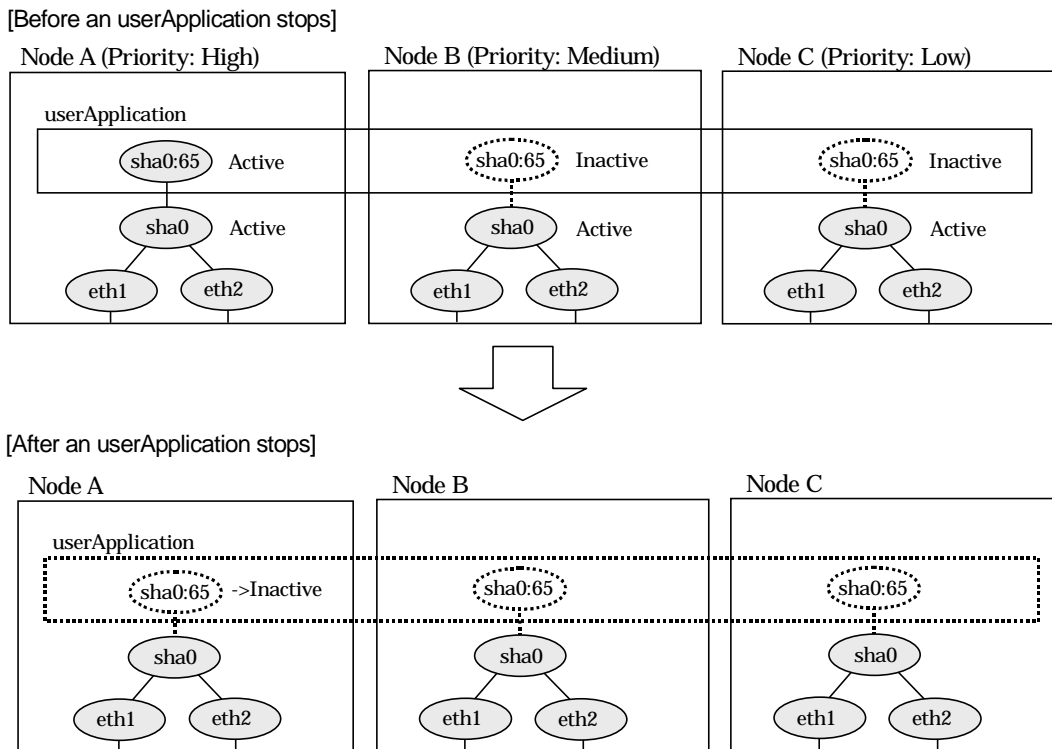


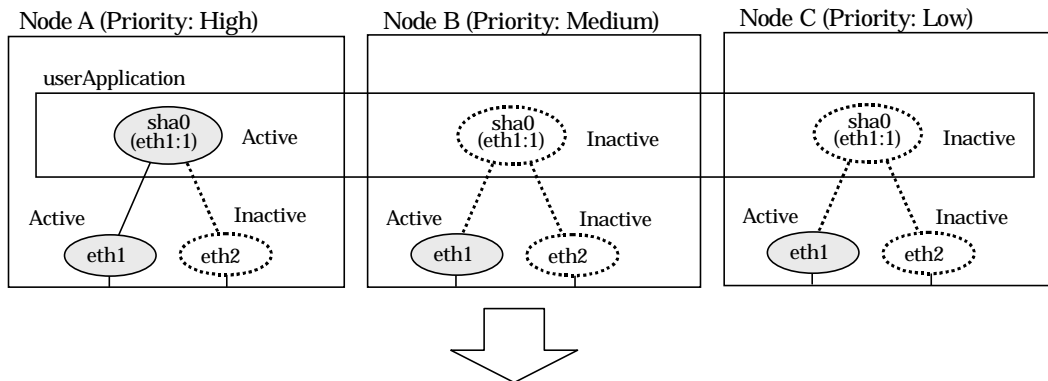
Figure 5.25 Stopping operation of Fast switching mode



### 5.1.3.4.2 NIC switching mode

Figure 5.26 illustrates stopping operation of a userApplication for logical IP takeover.

[Before an userApplication stops]



[After an userApplication stops]

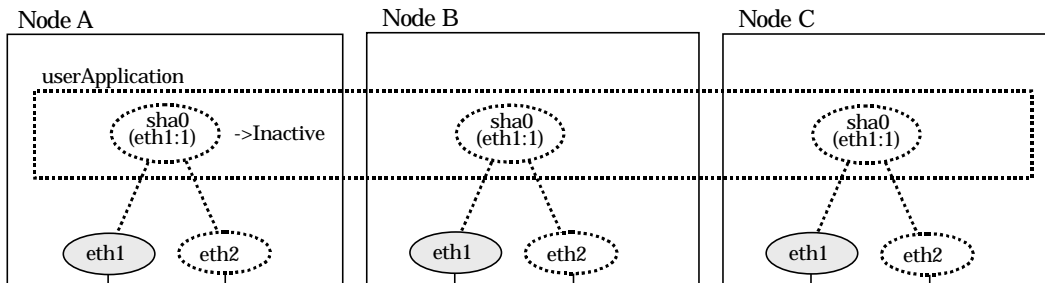
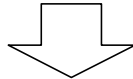
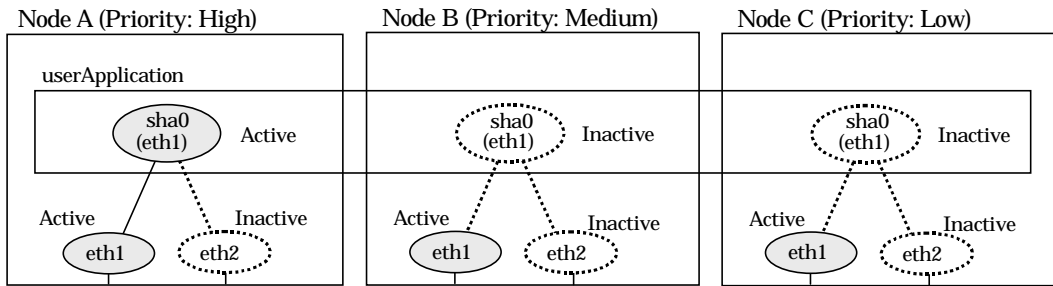


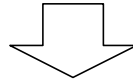
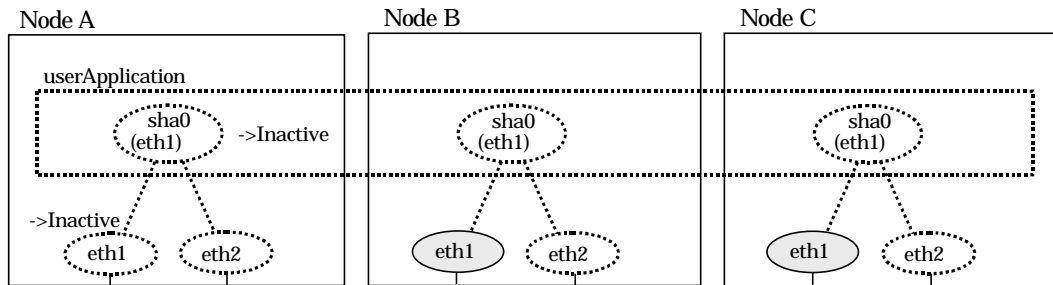
Figure 5.26 Stopping operation of NIC switching mode (logical IP takeover)

Figure 5.27 illustrates stopping operation of a userApplication for physical IP takeover I.

[Before an userApplication stops]



[Stopping]



[After an userApplication stops]

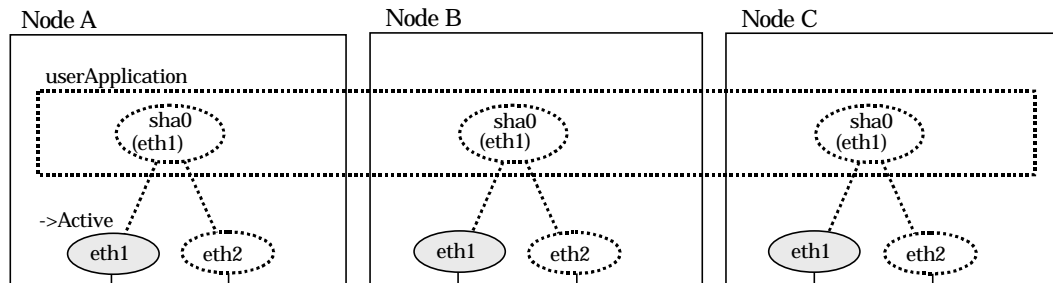
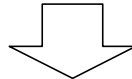
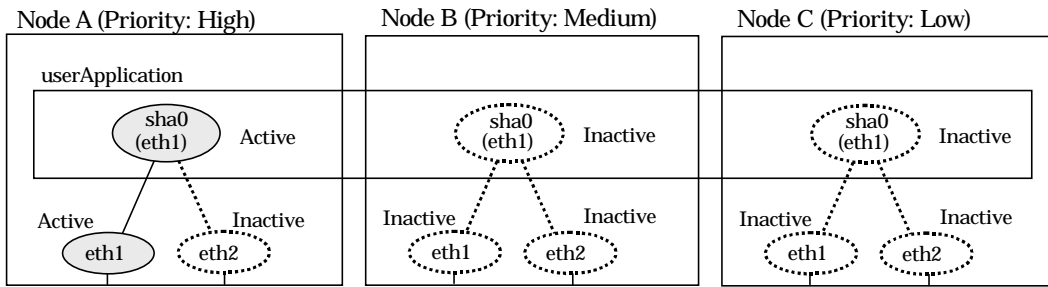


Figure 5.27 Stopping operation of NIC switching mode (physical IP takeover I)

Figure 5.28 illustrates stopping operation of a userApplication for physical IP takeover II.

[Before an userApplication stops]



[After an userApplication stops]

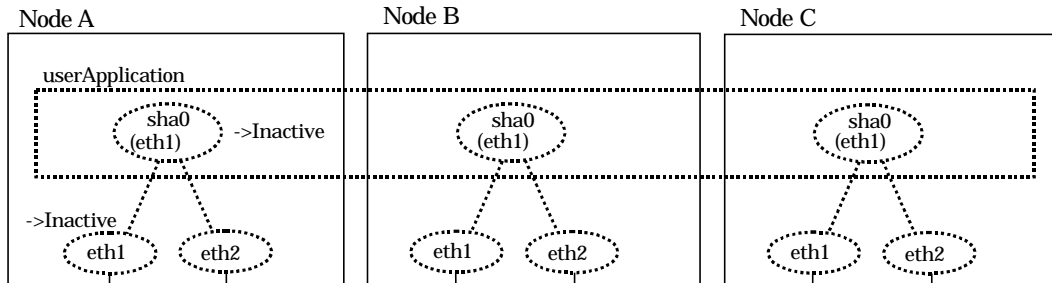


Figure 5.28 Stopping operation of NIC switching mode (physical IP takeover II)



## 5.1.4 Monitoring resource status of standby node

In a userApplication for standby operation, it is possible to monitor standby node as well as a status of resource used in an operating node of GLS.

The following describes about monitoring GLS resource status of standby node.

### 5.1.4.1 Preface

Normally, a userApplication for standby operation does not monitor GLS resource status for standby node. In such case, even though a transfer path failure occurs in a standby node, the erroneous GLS resource remains to be unreleased and nothing is reported to the user. As a result, GLS resource error in standby node remains to be unsolved. To avoid this problem, GLS resource for standby node must be monitored with caution.

In order to monitor the GLS resource for a standby node, configure the "Standby Transition" when creating a userApplication.

Once the Standby Transition is successfully configured, it separates the erroneous GLS resource and reports the error to the user when a transfer failure occurs in a standby node. (This can be checked in "Cluster Admin" of Web-Based Admin View).

### 5.1.4.2 Configuration

Refer to "PRIMECLUSTER Installation and Administration Guide 4.1" for configuration of monitoring GLS resource status for a standby node.

### 5.1.4.3 Recovering from a resource failure in Standby node

See the following procedure for recovering GLS resource.

#### 1) Recovering the transfer path failure

Restore the erroneous transfer path (Reconnecting the cable, restore the power of Switch/HUB, and replace the erroneous Switch/HUB)

#### 2) Initializing GLS resource error

Clear the erroneous GLS resource status using "Cluster Admin" for Web-Based Admin View. (Use hvutil -c)

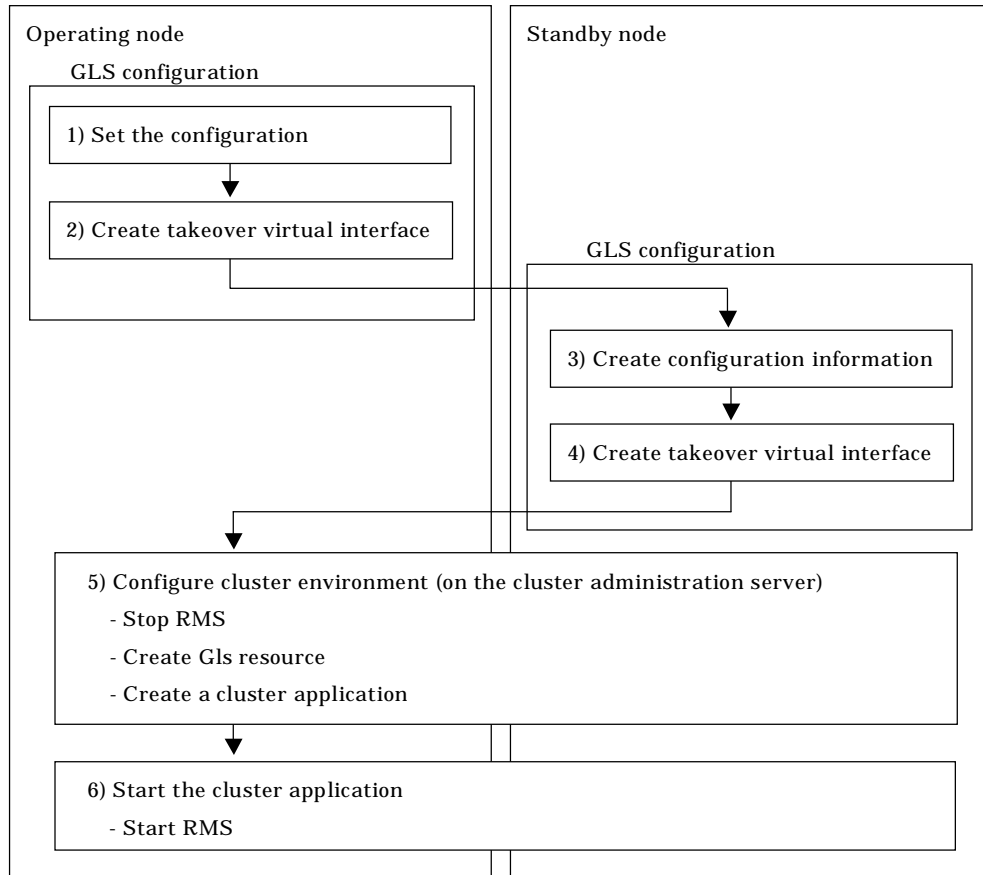
From this operation, GLS resource for standby node is reconfigured in a userApplication as a standby status.



## 5.2 Adding configuration for Cluster system

In addition to configuring standard environment, configuration of takeover virtual interface and cluster environment is required for the cluster system.

Figure 5.29 shows a flow chart of configuring additional cluster environment for 1:1 Standby Operation. For mutual standby and N:1 operation standby, follow the steps from “1) Set the configuration information” to “5) Setup the cluster environment” for the number of necessary node. Refer to “Appendix B Examples of Setting Up”.



**Figure 5.29 Flowchart for adding configuration for cluster system**

Redundant Line Control Function provides commands for defining cluster operations. To execute these commands, cluster system must be installed in the system. Table 5.3 lists the cluster definition operation commands.

**Table 5.3 Cluster definition operation commands**

Type	Command	Function	Authority
Configuration of a virtual interface and the takeover resources.	/opt/FJSVhanet/usr/sbin/hanethvrsc	Registration/deletion/display of a virtual interface and the takeover resources.	Super user

## 5.2.1 Creating configuration information

Create the necessary configuration information for constructing a virtual interface. The information must be created on both the active and standby nodes. For details about the creation procedure, see "Chapter 3 Environment configuration".

## 5.2.2 Creating Takeover virtual interface

Takeover virtual interface for registering with userApplication is set up. It is necessary to perform this setup on all nodes. When setting for Fast switching mode, it is necessary to set a "takeover IP address". (It is not necessary to set for NIC switching mode.) An example of the setting is as follows. See "7.14 hanethvrsc Command" for the detail of the command.

[Configuring a takeover virtual interface]

```
# /opt/FJSV/hanet/usr/sbin/hanethvrsc create -n "virtual-interface-name" [-i takeover-IP-address]
```

## 5.2.3 Configuring cluster system

Register the takeover virtual interface created in "5.2.2 Creating takeover virtual interface" as GlS resource, and create a userApplication. Cluster system can be configured using RMS Wizard. Refer to "PRIMECLUSTER Installation and Administration Guide 4.1" for details.

## 5.2.4 Starting an userApplication

After completing the configuration for a cluster system, start the userApplication on both cluster operating nodes. Refer to "PRIMECLUSTER Installation and Administration Guide 4.1" for details.



## 5.3 Modifying configuration for Cluster system

Configuration information and takeover resource information operated by the cluster system cannot be changed directly. Delete the takeover resource information first, and after changing corresponding configuration information, register the takeover resources information again.



## 5.4 Deleting configuration for Cluster system

For deleting the configuration of a cluster system, follow the figure below. For mutual standby operation, follow the steps from “2) Delete takeover virtual interface” up to “5) Delete configuration information” for the number of necessary nodes.

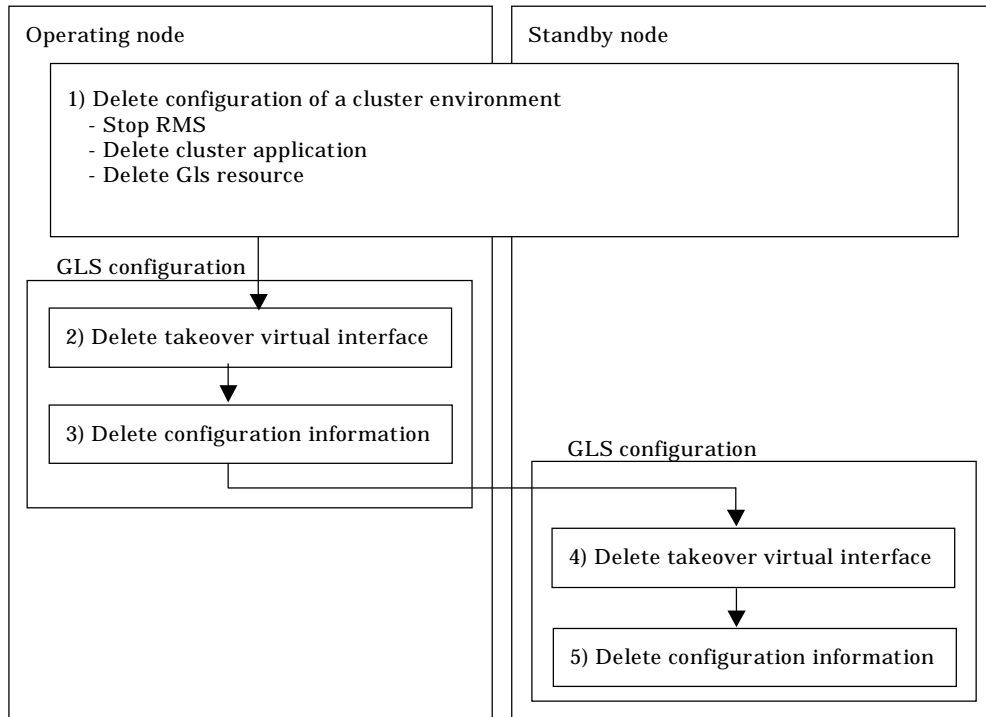


Figure 5.30 Flowchart for deleting configuration for cluster system

### 5.4.1 Deleting configuration for a cluster environment

Stop the RMS and delete the userApplication and Gls resource. Use RMS Wizard for this operation. Refer to “PRIMECLUSTER Installation and Administration Guide 4.1” for detail.

### 5.4.2 Deleting Takeover virtual interface

Delete a virtual interface to control a cluster from the resources database. It is necessary to perform this operation on all nodes.

An example of deletion is as follows. See “7.14 hanethvrsc Command” for the detail of the command.

```
# /opt/FJSV/hanet/usr/sbin/hanethvrsc delete -n "logical-virtual-interface-name"
```

### 5.4.3 Deletion of a Configuration information

Delete configuration information. Perform deletion process on the operating node and standby node. For deletion procedure, refer to “3.5 Deleting configuration information”.



# Chapter 6 Maintenance

This chapter focuses on a general approach to troubleshooting. It presents a troubleshooting strategy and identifies commands that are available in Resource Coordinator for finding and correcting problems. Further, it discusses how to collect troubleshooting information.



## 6.1 Redundant Line Control Function Troubleshooting Data to be Collected

In the event of a problem in Redundant Line Control Function operation, Redundant Line Control Function troubleshooting requires information about the problem to be collected.

When collecting examination materials of a Redundant Line Control Function all together, see "6.1.1 Command to collect materials".

### 6.1.1 Command to collect materials

[Form]

```
/opt/FJSVhanet/usr/sbin/hanet_snap [-s] [save-directory]
```

[Detail of the function]

This command collects examination materials necessary for maintaining a Redundant Line Control Function.

In addition, only in the case of super-user authority, this command can be executed.

[Option]

It is possible to specify following options and parameters.

-s:

Specify -s to collect the minimum examination materials.

When omitted this option, all examination materials are collected.

save-directory:

Specify save-directory to store collected materials.

When omitted this parameter, materials are stored in "/tmp".

A list of the collected information is as follows:

[Meaning of the symbols] Y: It extracts. N: It does not extract.

Type	File name when collected	Collected information	minimum examination materials
System information: OSInfo/	arp_n	arp -n	Y
	arpables_list	arpables --list	Y
	chkconfig	chkconfig --list	Y
	dmesg	dmesg.log	N
	etc/	/etc/gateways /etc/hosts /etc/iftab /etc/mactab /etc/modprobe.conf /etc/nsswitch.conf /etc/quagga/ /etc/radvd.conf /etc/services /etc/sysconfig/arpables /etc/syslog.conf	Y

	/etc/sysctl.conf /etc/sysconfig/iptables-config /etc/sysconfig/ip6tables-config	Y
free	free -bt	Y
ifconfig_a	ifconfig -a	Y
ipchains_l	ipchains -L	Y
ipcs_a	ipcs -a	Y
ip_info	ip link ip addr ip -f inet route ip -f inet6 route ip rule ip neigh ip tunnel ip maddr ip mroute	Y
iptables_list	iptables --list	Y
iANS/	/etc/ians ianscfg -s	Y
BASP/	/etc/basp baspcfg show	Y
ctld_pinfo	/proc/XXX/cmdline /proc/XXX/maps /proc/XXX/fd /proc/XXX/stat /proc/XXX/statm /proc/XXX/status	Y
sel_pinfo	/proc/XXX/cmdline /proc/XXX/maps /proc/XXX/fd /proc/XXX/stat /proc/XXX/statm /proc/XXX/status	Y
ethdev_info	ethtool	Y
include/	/lib/modules/`uname -r`/build/include/linux/ kernel.h version.h module.h rhconfig.h autoconf.h	Y
	/boot/kernel.h /etc/redhat-release	Y
log/	/var/log/messages* /var/log/boot.log*	N
lsmod	lsmod	Y
lspci	lspci	Y
mii_tool	mii-tool	Y
proc_net/	/proc/net/	N



6.1 Redundant Line Control Function Troubleshooting Data to be Collected

	netstat	netstat -na netstat -ni netstat -np netstat -nr netstat -na -A inet6 netstat -nr -A inet6 netstat -ng netstat -ns	Y
	proc_dev	/proc/devices	Y
	ps_ewfl	ps -ewfl	Y
	sysconfig/	/etc/network /etc/sysconfig/netdump /etc/sysconfig/ntpd /etc/sysconfig/static-routes /etc/sysconfig/network- scripts/	Y
	sysctl_a	sysctl -a	N
	sys_info	/proc/cpuinfo /proc/interrupts /proc/meminfo /proc/iomem /proc/ioports /proc/version /proc/slabinfo	Y
	uname_a	uname -a	Y
	uptime	uptime	Y
GLS information: hanetInfo/	config/	/etc/opt/FJSVhanet/config/	Y
	dsp_conf	dsphanet dsphanet -o dspoll	Y
	filelist_tmp	/var/opt/FJSVhanet/tmp/	Y
	log/	/var/opt/FJSVhanet/log/	Y
	rpminfo	rpm -qi FJSVhanet	Y
	print_conf	hanetconfig print hanetpoll print hanetmask print hanetparam print hanethvsc print	Y
	dev_sha	ls -l /dev/sha	Y
	/sha.ko	/opt/FJSVhanet/usr/kernel/dr v/sha.ko	Y
Cluster system information: RCInfo/	hvdisp_a	hvdisp -a	N
	log/	/var/opt/reliant/log/	N

[Output form]

The collected materials are compressed and stored by tar and compress commands. A stored file name is "machine name" + "Date collected (YYMMDDhhmmss)".tar.gz.

Ex.) hostname040126093843.tar.gz

[Using example]

When collecting all examination materials under /tmp.

```
# /opt/FJSVhanet/usr/sbin/hanet_snap
```

When collecting the minimum examination materials under /tmp.

```
# /opt/FJSVhanet/usr/sbin/hanet_snap -s
```

When collecting the minimum examination materials under /home/user1.

```
# /opt/FJSVhanet/usr/sbin/hanet_snap -s /home/user1
```

# Chapter 7 Command references

This chapter outlines GLS commands.



## 7.1 hanetconfig Command

### [Name]

hanetconfig - Setting, modifying, deleting, and displaying a configuration definition of Redundant Line Control Function

### [Synopsis]

/opt/FJSVhanet/usr/sbin/hanetconfig command [args]

### [Feature description]

The hanetconfig command defines configuration information required for the operation of Redundant Line Control Function. This command also modifies, deletes, and displays a setting.

Command	Process outline	Authority
create	Creates configuration information	Super user
copy	Copies configuration information	Super user
print	Displays configuration information	General user
modify	Modifies configuration information	Super user
delete	Deletes configuration information	Super user
version	Displays the version	General user

### (1) create command

Configuration information must be defined for a virtual interface before Redundant Line Control Function can be operated. Use the create command to create a definition of configuration information. The create command can also create definitions of more than one logical virtual interface on the virtual interface. The following is the command format for building a virtual interface:

- When creating a virtual interface

```
Fast switching mode (IPv4):
/opt/FJSVhanet/usr/sbin/hanetconfig create [inet] -n devicename -m t -i ipaddress -t
interface1[,interface2,...]

Fast switching mode (IPv6):
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n devicename -m t -t
interface1[,interface2,...]

NIC switching mode (IPv4: Logical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig create [inet] -n devicename -m d -i ipaddress1 -
e ipaddress2 -t interface1[,interface2]

NIC switching mode (IPv6: Logical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n devicename -m d -i
ipaddress/prefix -t interface1[,interface2]

NIC switching mode (Physical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig create -n devicename -m e -i ipaddress1 [-e
ipaddress2] -t interface1[,interface2]

Standby patrol function (automatic failback if a failure occurs / immediate automatic
failback):
/opt/FJSVhanet/usr/sbin/hanetconfig create -n devicename -m {p | q} -t interface
```

- When creating a logical virtual interface

```
Fast switching mode (IPv4):
/opt/FJSVhanet/usr/sbin/hanetconfig create [inet] -n devicename -i ipaddress

Fast switching mode (IPv6):
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n devicename -i ipaddress/prefix
```

[inet | inet6]

Specify an IP address form to set to a virtual interface.

```
inet      : IPv4 address
inet6    : IPv6 address
```

When omitted, it is dealt with as specified inet. It is necessary to specify this option first (immediately after a string of "create") before other options. This option can be specified only when using Fast switching mode or NIC switching mode (a logical IP address takeover function).

-n devicename:

Specify the name of a virtual interface or logical virtual interface for which the configuration information should be set. Specify the virtual interface name with a string that begins with "sha" and is followed by a value (0 to 255) (such as sha0 and sha10). Specify the logical virtual interface name as "virtual-interface-name: value (2 to 64)" (such as sha0:2 and sha10:5). If you specify a virtual interface or logical virtual interface in any other format, an error message is output and this command terminates abnormally. Logical virtual interface can only be configured on operation mode "t".

-m t|d|e|p|q:

Specify an operation mode. If devicename is a logical virtual interface, specify the operation mode of a corresponding virtual interface.

- t: Fast switching mode  
Specify this parameter to use the Redundant Line Control Function in Fast switching mode.
- d: NIC switching mode (logical IP address takeover function)  
Specify this parameter to use the Redundant Line Control Function in NIC switching mode. Communication is performed by activating a physical interface to be used and its logical interface and taking over the IP address attached to the logical interface.
- e: NIC switching mode (physical IP address takeover function)  
Specify this parameter to use the Redundant Line Control Function in NIC switching mode. Communication is performed by taking over the IP address attached to the physical interface without activating a logical interface.
- p: Standby patrol function (automatic fail-back if a failure occurs)  
Specify this parameter to use the Redundant Line Control Function in NIC switching mode and monitor the status of the standby NIC. If the standby NIC is communicating due to a failure and the active NIC recovers, no fail-back occurs until the currently used NIC encounters a failure.
- q: Standby patrol function (immediate automatic fail-back)  
Specify this parameter to use the Redundant Line Control Function in NIC switching mode and monitor the status of the standby NIC. If the standby NIC is communicating due to a failure and the active NIC recovers, a fail-back immediately occurs.

The following table lists options that can be specified in each operation mode.

Specifiable parameter (Operation mode)	inet   inet6	-n	-i	-e	-t
't' (Fast switching mode)	Supported	O	O (*6)	X	O (*1)

'd' (NIC switching mode (logical IP address takeover function))	Supported	O	O	O (*4)	O (*2)
'e' (NIC switching mode (physical IP address takeover function))	Not supported	O	O	O (*5)	O (*2)
'p' (Standby patrol function (automatic fail-back if a failure occurs))	Not supported	O	X	X	O (*3)
'q' (Standby patrol function (immediate automatic fail-back))	Not supported	O	X	X	O (*3)

[Meaning of the symbols] O: Required, X: Not required

\*1 Specify a physical interface (The same physical interface can be specified if the operation mode is "t"). 1 to 8 physical interfaces can be assigned.

\*2 Specify a physical interface that is not specified in any other operation mode. One or two physical interface can be assigned.

\*3 Specify a virtual interface specified in the operation mode "d" or "e". Only one interface can be assigned.

\*4 It is not possible to specify this parameter when set inet6 to an address form.

\*5 This parameter may be omitted if the physical IP address takeover function II is used (not activating an interface on the standby node in the cluster system).

\*6 It can specify, only when creating logical virtual interface.

-i `ipaddress1`[/prefix]:

`ipaddress1`

Specify a host name or an IP address to assign to a virtual interface or a logical virtual interface (devicename specified by -n option). The specified IP address or host must be defined in an /etc/hosts file. When assigning an IP address to a logical virtual interface, it is necessary to specify the same subnet as that of a virtual interface. If specified a different subnet, occasionally it is not possible to communicate.

[/prefix]

Specify the length of a prefix of `ipaddress1` following "/" (slash). The range possible to specify is between zero to 128. This parameter is required only when specifying an IPv6 address to `ipaddress1` or a host name defined in an /etc/hosts file. It is not possible to specify for an IPv4 address.

-e `ipaddress2`:

Specify an IP address or a host name to assign to a physical interface. It is possible to set an IP address or a host name in an IPv4 form only and must be defined in an /etc/hosts file. It is possible to specify this option only when specified inet for an address form. (When specified inet6, a link local address is automatically assigned.) It is necessary to set this option in NIC switching mode (operation mode is "d" or "e"). In cluster operation, it is possible to omit this option if an interface of NIC switching mode (operation mode is "e") is not activated by a standby node.

-t `interface1`[,`interface2`,...]:

Specify interface names to be bundled by a virtual interface, by listing them delimited with a comma (,).

Specify virtual interface names (such as sha1 and sha2) for standby patrol function (operation mode "p" or "q").

Specify physical interface names (such as eth0) for any other mode (operation mode "t", "d", or "e") than standby patrol function.

## (2) copy command

Use the copy command to create different configuration information while sharing an NIC used in other configuration information (virtual interface in NIC switching mode (operation mode "d")). This command thus allows configuration information to be automatically created by using the copy source information and without requiring you to specify an IP address to be attached to a physical interface, interface names to be bundled by a virtual interface, and an operation mode. This command realizes simpler operation than directly executing the hanetconfig create command.

In addition, this command can copy only virtual interface of NIC switching mode (operation mode "d").

The following is the command format for copying a virtual interface:

- When duplicating a virtual interface of IPv4 from a virtual interface of IPv4

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy [inet] -n devicename1,devicename2 -i ipaddress
```

- When duplicating a virtual interface of IPv4 from a virtual interface of IPv6 (dual stack configuration)

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy [inet] -n devicename1,devicename1 -i ipaddress1 -e ipaddress2
```

- When duplicating a virtual interface of IPv6 from a virtual interface of IPv6

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n devicename1,devicename2 -i ipaddress/prefix
```

- When duplicating a virtual interface of IPv6 from a virtual interface of IPv4 (dual stack configuration)

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n devicename1,devicename1 -i ipaddress/prefix
```

[inet | inet6]

Specify an IP address form to set to a copy-to virtual interface.

```
inet      : IPv4 address
inet6    : IPv6 address
```

When omitted, it is dealt with as specified inet. It is necessary to specify this option first (immediately after a strings of copy) before other options.

-n devicename1, devicename2:

devicename1:

Specify a copy-from virtual interface name. It is possible to specify only a virtual interface name of NIC switching mode (operation mode is "d").

devicename2:

Specify a copy-to virtual interface name. When configuring IPv4/IPv6 dual stack, specify the same virtual interface name (devicename1) as that of copy-from.

-i ipaddress1[/prefix]:

Specify a host name or an IP address to assign to a copy-to virtual interface specified by devicename2. See -i option of a create command for the detail of how to set.

-e ipaddress2:

Specify an IP address or a host name to assign to a physical interface. This option is required to duplicate a virtual interface of IPv4 from that of IPv6 (dual stack configuration). See -e option of a create command for the detail of how to set.



### (3) print command

Use the print command to display the current configuration information. The following is the format of the print command.

```
/opt/FJShanet/usr/sbin/hanetconfig print [-n devicename1[,devicename2,...]]
```

**-n devicename1,devicename2,...:**

Specify the name of a virtual interface or logical virtual interface whose configuration information should be displayed. If this option is not specified, the print command displays all the configuration information for the currently set virtual interfaces and logical virtual interfaces.

The following shows an example of displaying configuration information.

```
# /opt/FJShanet/usr/sbin/hanetconfig print
[IPv4,Patrol]

Name      Hostname      Mode Physical ipaddr  Interface List
+-----+-----+-----+-----+-----+
sha0      192.168.10.110  d   192.160.10.10  eth0,eth1
sha1      -              p   -              sha0
sha2      hostC          d   -              eth2,eth3
sha3      -              p   -              sha2

[IPv6]

Name      Hostname/prefix  Mode Interface List
+-----+-----+-----+-----+
sha0      fec0:1::123/64   d   eth0,eth1
```

Display		Contents
[IPv4,Patrol]		The information of an IPv4 virtual interface and standby patrol
[IPv4,Patrol]	Name	A virtual interface name.
	Hostname	The host name or virtual IP address of a virtual interface.
	Mode	The operation mode of a virtual interface.
	Physical ipaddr	A physical IP address defined in standby patrol mode.
	Interface List	A virtual interface name in standby patrol function (operation mode "p" or "q"). Outputs a physical interface name (such as eth0) in other mode.
[IPv6]		The information of an IPv6 virtual interface
[IPv6]	Name	A virtual interface name.
	Hostname/prefix	A host name or an IP address and a prefix value of a virtual interface.
	Mode	The operation mode of a virtual interface.
	Interface List	A virtual interface name in standby patrol function (operation mode "p" or "q"). Outputs a physical interface name (such as eth0) in other mode.

#### (4) modify command

Use the modify command to modify the configuration of Redundant Line Control Function. The following is the format of the modify command that modifies configuration information for a virtual interface:

- When changing configuration information of a virtual interface

```
Fast switching mode (IPv4):
/opt/FJSVhanet/usr/sbin/hanetconfig modify [inet] -n devicename {[-i ipaddress1] [-t
interface1[,interface2,...]]}

Fast switching mode (IPv6):
/opt/FJSVhanet/usr/sbin/hanetconfig modify inet6 -n devicename -t
interface1[,interface2,...]

NIC switching mode (IPv4: Logical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig modify [inet] -n devicename {[-i ipaddress1] [-e
ipaddress2] [-t interface1[,interface2]]}

NIC switching mode (IPv6: Logical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig modify inet6 -n devicename {[-i
ipaddress1/prefix] [-t interface1[,interface2]]}

NIC switching mode (Physical IP address takeover function):
/opt/FJSVhanet/usr/sbin/hanetconfig modify -n devicename {[-i ipaddress1] [-e
ipaddress2] [-t interface1[,interface2]]}

Standby patrol function:
/opt/FJSVhanet/usr/sbin/hanetconfig modify -n devicename {[-t interface1]}
```

- When changing configuration information of a virtual interface

```
Fast switching mode (IPv4):
/opt/FJSVhanet/usr/sbin/hanetconfig modify [inet] -n devicename -i ipaddress

Fast switching mode (IPv6):
/opt/FJSVhanet/usr/sbin/hanetconfig modify inet6 -n devicename -i ipaddress/prefix
```

[inet | inet6]

Specify an IP address form to set to a changing virtual interface.

```
inet      : IPv4 address
inet6    : IPv6 address
```

When omitted, it is dealt with as specified inet. It is necessary to specify this option first (immediately after a string of modify) before other options.

This option can be specified only when using Fast switching mode or NIC switching mode (a logical IP address takeover function).

-n devicename:

Specify the name of a virtual interface whose configuration information should be modified. This parameter is required.

-i ipaddress1[/prefix]:

Specify a host name or IP address to be attached to a virtual or logical virtual interface (devicename specified by -n option) to be used for Redundant Line Control Function. This host name must correspond to an IP address in a network database such as the /etc/hosts file. You can directly specify an IP address instead of a host name. In this case, you must specify the IP address in dotted decimal notation. When you specify address information for a logical virtual interface, be sure to specify an address in the same subnet as the address of a corresponding virtual interface. Communication may be disabled if any other subnet is specified.

-e ipaddress2:

Specify an IP address to be attached to a physical interface. This host name must correspond to an IP address in a network database such as the /etc/hosts file. You can directly specify an IP

address instead of a host name. In this case, you must specify the IP address in dotted decimal notation.

This parameter can be modified only if the operation mode of a virtual interface to be modified is NIC switching mode (operation mode "d" or "e").

**-t interface1[,interface2,...]:**

Specify interface names to be bundled by a virtual interface, by listing them delimited with a comma (,).

Specify virtual interface names (such as sha1 and sha2) if the operation mode of a virtual interface to be modified is standby patrol function (operation mode "p" or "q").

Specify physical interface names (such as eth0) if the operation mode of a virtual interface to be modified is not standby patrol function (operation mode "p" or "q").

### (5) delete command

Use the delete command to delete the configuration of Redundant Line Control Function. The following is the format of the delete command:

```
/opt/FJSVhanet/usr/sbin/hanetconfig delete [inet | inet6] -n
{devicename1[,devicename2,...] | all}
```

**[inet | inet6]**

Specify an IP address form of a deleting virtual interface.

```
inet      : IPv4 address
inet6    : IPv6 address
```

When omitted, it is dealt with as specified inet. It is necessary to specify this option first (immediately after a string of delete) before other options.

This option can be specified only when using Fast switching mode or NIC switching mode (a logical IP address takeover function).

**-n devicename1[,devicename2,...]:**

Specify the names of virtual interfaces (such as sha0 and sha1) or logical virtual interfaces (such as sha0:2 and sha1:10) whose configuration information should be deleted.

**all:**

Specify this parameter to delete all the defined virtual and logical interfaces.

### (6) version command

The version of this product is displayed. The following is the format of the version command.

```
/opt/FJSVhanet/usr/sbin/hanetconfig version
```

The following shows an example of displaying version information.

```
HA-Net version 2.7
```

### [Notes]

- When you define a logical virtual interface, be sure to define also a virtual interface to which the logical virtual interface belongs. (For example, when you define a logical virtual interface of sha2:2, sha2 must also be defined.)
- When you define a logical virtual interface, no input item except required items (the physical interface name and operation mode used in the logical virtual interface) can be set in the logical virtual interface definition. This is because the values specified for the virtual interface are set for them.
- Only a value from 2 to 64 can be specified as the logical number of the logical virtual

- interface.
- A new virtual interface can be added while other virtual interfaces are active. No new logical virtual interface can be attached to an active virtual interface. Add a logical virtual interface after deactivating the relevant virtual interface.
- If the HUB monitoring is set, no relevant configuration information can be deleted. Delete configuration information after deleting the relevant information of the HUB monitoring function.
- An IP address or host name to be specified to create, copy, or modify configuration information must be defined in /etc/hosts file.
- If more than one virtual interface is created while sharing a NIC bundled in NIC switching mode, the standby patrol need not be set for each of the virtual interfaces.
- When specified a numeric string for a host name, it is dealt with as decimal and converted into an IP address corresponding to its value to work. (For instance, when specified "123456", it is regarded an IP address "0.1.226.64" is specified.)
- As for an actual interface to configure Fast switching mode (the operation mode is "t"), be sure to define to use in TCP/IP before defining a virtual interface. (Check if or not there is /etc/sysconfig/network-scripts/ifcfg-ethX file. If not, create it and reboot a system.)
- When specified a host name to where to set a host name or an IP address with this command, it is not possible to change the corresponding host name on the host database of such as /etc/hosts file. To change the information of the host name, it is necessary to temporarily delete a definition of a Redundant Line Control Function to use the corresponding host name and to set the definition again.
- When using an IPv6 address, an IP address that is set by -i option of a create command is not a target of address automatic configuration by an IPv6 protocol. Therefore, specify the same to a prefix and the length of a prefix as those set in an IPv6 router on the connected network. Set a value different from that of the other system for an "interface IP" inside an IP address field.
- When configuring a virtual interface for Fast switching mode as Dual Stack, the bundled physical interfaces cannot be modified with "modify -t" command. To apply changes, delete the configuration information of the virtual interface and then reconfigure.
- Do not use characters other than alphanumeric characters, period, and hyphen for the host name. If characters other than the above are used, re-write the host names in /etc/hosts so that it does not contain any other characters. Also, the first and last character for the host name must be alphanumeric character.

### [Examples]

#### (1) create command

The following shows an example of the setting command used in Fast switching mode to bundle two physical interfaces (eth0 and eth1) as the virtual interface host HAhost to duplicate the virtual interface sha0.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i HAhost -t eth0,eth1
```

The following shows an example of the setting command used to define two logical virtual interfaces (sha0:2 and sha0:3) on the virtual interface (sha0).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i hostf -t eth0,eth1  
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0:2 -i hostg  
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0:3 -i hosth
```

The following shows an example of the setting command used to have the virtual interface (sha0) bundle only one physical interface (eth0).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i hosti -t eth0
```

The following shows an example of the setting command used in NIC switching mode to set two physical interfaces (eth0 and eth1) and use the logical IP address takeover function and the standby patrol function (operation mode "p"). Before NIC switching mode can be used, the HUB monitoring function must be set.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i hostg -e hosth -t
eth0,eth1
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

The following shows an example of the setting command used in NIC switching mode to set two physical interfaces (eth0 and eth1) and use the physical IP address takeover function and the standby patrol function (operation mode "p"). Before NIC switching mode can be used, the HUB monitoring function must be set.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i hosti -e hostj -t
eth0,eth1
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -a 02:00:00:00:00:01 -t
sha0
```

The following is an example that set two physical interfaces (eth0 and eth1) to use a logical IP address takeover function by an IPv6 address in NIC switching mode. It is necessary to set a HUB monitoring function other than this setting.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig inet6 create -n sha0 -m d -i fec0:1::1/64 -t
eth0,eth1
or
# /opt/FJSVhanet/usr/sbin/hanetconfig inet6 create -n sha0 -m d -i hostg/64 -t
eth0,eth1
```

The following is an example of configuring two physical interfaces (eth0 and eth1) and creating a virtual interface (sha0) using IPv6 address.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## (2) modify command

The following is an example of modifying bundled physical interfaces (eth0 and eth1) in the virtual interface (sha0) to different physical interfaces (eth2 and eth3).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig modify -n sha0 -t eth2,eth3
```

The following is an example of modifying the virtual IP address defined in the virtual interface (sha0).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig modify -n sha0 -i hostc
```

## (3) copy command

The following is an example of sharing the NIC, used in the virtual interface (sha0 for IPv4) for NIC switching mode (operation mode "d"), with another virtual interface (sha2 for IPv4).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha2 -i host4
```

The following is an example of sharing the NIC, used in the virtual interface (sha0 for IPv6) for NIC switching mode (operation mode "d"), with another virtual interface (sha2 for IPv4).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha0 -i host4 -e hostp
```

The following is an example of sharing the NIC, used in the virtual interface (sha0 for IPv6) for NIC switching mode (operation mode "d"), with another virtual interface (sha2 for IPv6).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha2 -i host6/64
```

The following is an example of sharing the NIC, used in the virtual interface (sha0) for IPv4) for NIC switching mode (operation mode "d"), with another virtual interface (sha2 for IPv6).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha0 -i host6/64
```

#### (4) delete command

The following is an example of deleting the virtual interface (sha2 for IPv4).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete -n sha2
```

The following is an example of deleting the virtual interface (sha2 for IPv6).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete inet6 -n sha2
```

The following is an example of deleting the logical virtual interface (sha0:2).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete -n sha0:2
```

The following is an example of deleting the logical virtual interface (sha0:2 for IPv6).

```
# /opt/FJSVhanet/usr/sbin/hanetconfig delete inet6 -n sha0:2
```

## 7.2 strhanet Command

### [Name]

strhanet - Activation of virtual interfaces

### [Synopsis]

```
/opt/FJSSVhanet/usr/sbin/strhanet [inet | inet6 | dual] [-n devicename1[,devicename2,...]]
```

### [Feature description]

The strhanet command activates virtual interfaces in accordance with the generated configuration information.

### [Option]

It is possible to specify the following options:

[inet | inet6 | dual]

Specify an IP address form assigned to a virtual interface to be activated.

```
inet      : IPv4 address
inet6    : IPv6 address
dual     : IPv4/IPv6 dual stack configuration
```

When omitted, virtual interfaces of all forms are to be dealt with. IPv4 and IPv6 addresses are activated at the same time in a virtual interface of dual stack configuration. It is not possible to activate only an IPv4 address or only an IPv6 address respectively. Dual stack configuration in this case does not mean IPv4 and IPv6 addresses are set on each of the stacked physical interfaces, but they are set to one virtual interface defined in a Redundant Line Control Function. This option is valid only in Fast switching mode (operation mode is "t") or NIC switching mode (operation mode is "d").

-n devicename1[,devicename2,...]:

Specify a virtual interface name to be activated. Multiple virtual interfaces can be specified by delimiting them with a comma (.). Configuration information for virtual interface names specified here must have been generated with the hanetconfig create command. If this option is not specified, all created virtual interfaces are activated.

### [Related commands]

```
hanetconfig
stphanet
dsphanet
```

### [Notes]

- If an additional virtual interface is activated in Fast switching mode, nodes that have been activated in Fast switching mode may be temporarily overloaded.
- This command can activate a virtual interface only if configuration information has already been set by using the hanetconfig command before executing this command. For details, see "Chapter 3 Environment configuration".
- Virtual interfaces used in a cluster system cannot be activated with this command.
- No logical virtual interface can be specified for the -n option. Logical virtual interfaces are automatically activated when corresponding virtual interfaces are activated.
- This command can be specified for virtual interfaces in Fast switching mode (operation mode "t"), NIC switching mode (operation mode "d" or "e"). This command cannot be specified for virtual interfaces in Standby patrol function (operation mode "p" or "q").
- A standby patrol function ("p" or "q") is automatically activated when activated a virtual interface of the corresponding NIC switching mode ("d" or "e").
- To add and activate a virtual interface of the other NIC switching modes ("d" or "e") with a virtual interface of NIC switching mode ("d" or "e") is already activated, stop temporarily all virtual interfaces of the activated NIC switching mode ("d" or "e") using a stphanet command. Then execute a strhanet command and activate the virtual interfaces.
- Be sure to use a strhanet command to activate a virtual interface. Do not use an ifconfig

command to do the operation. Do not operate physical interfaces that a virtual interface bundles with an ifconfig command while activating a virtual interface.

- If you want to activate a virtual interface using Fast switching mode, wait at least 1 minute to execute the command to activate after deactivating it.

[Examples]

The following is an example in which all virtual interfaces defined in the configuration information for Redundant Line Control Function are activated.

```
# /opt/FJSVhanet/usr/sbin/strhanet
```

The following is an example in which only the virtual interface sha2 defined in the configuration information for Redundant Line Control Function is activated.

```
# /opt/FJSVhanet/usr/sbin/strhanet -n sha2
```

The following shows an example to activate all virtual interfaces of Fast switching mode or NIC switching mode and also in an IPv6 address form from virtual interfaces defined in the configuration information.

```
# /opt/FJSVhanet/usr/sbin/strhanet inet6
```



## 7.3 stphanet Command

### [Name]

stphanet - Inactivation of virtual interfaces

### [Synopsis]

```
/opt/FJSSVhanet/usr/sbin/stphanet [inet | inet6 | dual] [-n devicename1[,devicename2,...]]
```

### [Feature description]

The stphanet command makes it possible to deactivate a virtual interface.

### [Option]

It is possible to specify the following options:

[inet | inet6 | dual]

Specify an IP address form assigned to a virtual interface to be deactivated.

inet	: IPv4 address
inet6	: IPv6 address
dual	: IPv4/IPv6 dual stack configuration

When omitted, virtual interfaces of all forms are to be dealt with. IPv4 and IPv6 addresses are deactivated at the same time in a virtual interface of dual stack configuration. It is not possible to deactivate only an IPv4 address or only an IPv6 address respectively. Dual stack configuration in this case does not mean IPv4 and IPv6 addresses are set on each of the stacked physical interfaces, but they are set to one virtual interface defined in a Redundant Line Control Function. This option is valid only in Fast switching mode (operation mode is "t") or NIC switching mode (operation mode is "d").

-n devicename1[,devicename2,...]:

Specify a virtual interface name to be inactivated. Multiple virtual interfaces can be specified by delimiting them with a comma (.). Virtual interface names specified here must have been activated by using the strhanet command. If this option is not specified, all active virtual interfaces are inactivated.

### [Related commands]

strhanet  
dsphanet

### [Notes]

- Virtual interfaces used in a cluster system cannot be inactivated with this command.
- Only logical virtual interfaces cannot be inactivated. By terminating virtual interfaces, related logical virtual interfaces are automatically terminated.
- When inactivating virtual interfaces and logical virtual interfaces, a high-level application must be terminated first.
- It is possible to specify this command to a virtual interface of Fast switching mode (operation mode is "t"), NIC switching mode ("d" or "e"). It is not possible to specify to a virtual interface of a standby patrol function ("p" or "q"). A Standby patrol function ("p" or "q") is automatically deactivated when deactivated a virtual interface of the corresponding NIC switching mode ("d" or "e").
- Be sure to use a stphanet command to deactivate a virtual interface. Do not use an ifconfig command to do the operation.
- A virtual interface of standby patrol set after activated NIC switching mode and activated by strptl command is not deactivated. Use stpctl command to deactivate.
- When a virtual interface of NIC switching mode is deactivated and only a virtual interface of standby patrol is activated, use stpctl command to deactivate the virtual interface of standby patrol.
- When deactivating a virtual interface, if stacked physical interfaces are not used at all, deactivate them as well.
- When using Fast switching mode on IPv6 environment, it takes maximum 30 seconds to complete stphanet command. The following message might be outputted to

/var/log/messages, but it is not an error.

"kernel: unregister\_netdevice: waiting for shaX to become free."

- If you want to inactivate a virtual interface using Fast switching mode, wait at least 1 minute to execute the command to activate after deactivating it.

### [Examples]

The following is an example in which all virtual interfaces (excluding virtual interfaces in cluster operation) defined in the configuration information for Redundant Line Control Function are inactivated.

```
# /opt/FJSVhanet/usr/sbin/stphanet
```

The following is an example in which only the virtual interface sha2 defined in the configuration information for Redundant Line Control Function is inactivated.

```
# /opt/FJSVhanet/usr/sbin/stphanet -n sha2
```

The following shows an example to deactivate all virtual interfaces of Fast switching mode or NIC switching mode and also in dual stack configuration.

```
# /opt/FJSVhanet/usr/sbin/stphanet dual
```

## 7.4 dsphanet Command

### [Name]

dsphanet - Displaying the operation status of virtual interfaces

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/dsphanet [-n devicename1[,devicename2,...]] -o]
```

### [Feature description]

The dsphanet command displays the current operation status of virtual interfaces and logical virtual interfaces.

### [Option]

You can specify the following options:

**-n devicename1[,devicename2,...]:**

Specify the name of a virtual interface whose status should be displayed. You can specify more than one virtual interface by listing them delimited with a comma (.). If this option is not specified, this command displays all the virtual interfaces that are properly defined.

**-o:**

Displays all communication parties of virtual interfaces defined in Fast switching mode (operation mode "t"). This option does not display communication parties of virtual interfaces not yet activated using the strhanet command.

### [Display format]

The following shows the display formats used when no option is specified and when the -n option is specified.

```
# /opt/FJSVhanet/usr/sbin/dsphanet
[IPv4,Patrol]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+-----+
sha0      Active  d   OFF  eth0(ON),eth1(OFF)
sha1      Active  t   OFF  eth2(ON),eth3(ON)
sha2      Active  p   OFF  sha0(ON)
[IPv6]
Name      Status  Mode CL  Device
+-----+-----+-----+-----+-----+
sha0      Active  d   OFF  eth0(ON),eth1(OFF)
sha1      Active  t   OFF  eth2(ON),eth3(ON)
```

Display	Contents	
[IPv4,Patrol]	Virtual interface information of an IPv4 address and standby patrol form.	
[IPv6]	Virtual interface information of an IPv6 address form.	
Name	A virtual interface name.	
Status	Active	The status of a virtual interface is active status.
	Inactive	The status of a virtual interface is inactive status.
Mode	t	Fast switching mode

	d	NIC switching mode (logical IP address takeover function)
	e	NIC switching mode (physical IP address takeover function)
	p	Standby patrol function (automatic fail-back if a failure occurs)
	q	Standby patrol function (immediate automatic fail-back)
CL	ON	Cluster resource
	OFF	None cluster resource
Device	(ON)	Enabled. The status if the interface is enabled and also available. For the standby patrol interface, the status is displayed if the transfer path is valid.
	(OFF)	Disabled. The status if the virtual interface in disabled. For Fast switching mode, it also displays the status when the failure is detected in the remote systems. In NIC switching mode, it displays the status when the standby patrol function is disabled.
	(STOP)	Ready for use. The status immediately after configuring the environment for NIC switching mode.
	(FAIL)	Error in one system. Displays the status if the failure is detected on standby patrol function.
	(CUT)	Unused. Displays the status if temporally dispatched by hanetnic delete command.

The following shows the display format used when the -o option is specified.

```
# /opt/FJSVhanet/usr/sbin/dsphanet -o
NIC      Destination Host Status
+-----+-----+-----+
eth0     habostA      Active
          habostB      Active
          habostC      Inactive
eth1     habostA      Active
          habostB      Active
          habostC      Inactive
```

Display		Contents
NIC		A physical interface name.
Destination Host		The host name of the communication target. (If the target host does not exist, it will display "none".)
Status	Active	The status of the communication target is active status.
	Inactive	The status of the communication target is inactive status.

**[Related commands]**

strhanet  
stphanet

**[Notes]**

- This command can be specified for any virtual interfaces.
- Only one option can be specified at one time.

**[Examples]**

The following shows an example of displaying the active or inactive status of all virtual interfaces that are properly defined in the configuration information for Redundant Line Control Function.

```
# /opt/FJSVhanet/usr/sbin/dsphanet
```

The following shows an example of displaying all the communication parties of virtual interfaces in Fast switching mode (operation mode "t") properly defined in the configuration information for Redundant Line Control Function.

```
# /opt/FJSVhanet/usr/sbin/dsphanet -o
```



## 7.5 hanetmask Command

### [Name]

hanetmask – Sets, modifies, deletes, and prints a subnet mask.

### [Synopsis]

/opt/FJSVhanet/usr/sbin/hanetmask command [args]

### [Feature description]

This hanetmask command sets/modifies/deletes/prints a subnet mask value to specify when activating a virtual IP address.

Command	Process outline	Authority
create	Sets a subnet mask.	Super user
print	Prints a subnet mask.	General user
modify	Modifies a subnet mask.	Super user
delete	Deletes a subnet mask.	Super user

#### (1) create command

Sets a subnet mask value to a virtual IP address defined by a hanetconfig command. A form of a create command is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i network_address -m netmask
```

**-i network\_address:**

Specifies a network address of a virtual IP to set a subnet mask value in decimal dotted notation.

**-m netmask:**

Specifies a subnet mask value to a network address specified by -i in decimal dotted notation.

#### (2) print command

It is possible to print current information of a subnet mask by a print command. A form of a print command is as follows:

```
/opt/FJSVhanet/usr/sbin/hanetmask print [-i network_address1[,network_address2.....]]
```

**-i network\_address1[,network\_address2.....]:**

It is possible to specify a network address to print dividing by a comma (“,”). Here it specifies a network address specified by -i of a create command.

When not specified a -i option, all subnet mask information set at present is printed. An example of printing subnet mask information is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetmask print
network-address netmask
+-----+-----+
10.34.151.0    255.255.255.0
```

Display	Contents
network-address	A network address of a virtual IP.
netmask	A subnet mask value to set to a network address.

### (3) modify command

When modifying a subnet mask value created by a create command, use a modify command. A form of a modify command is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetmask modify -i network_address -m netmask
```

**-i network\_address:**

Specifies a network address of subnet mask information to modify in decimal dotted notation.

**-m netmask:**

Specifies a modified subnet mask value to a network address specified by -i in decimal dotted notation.

### (4) delete command

When deleting a subnet mask value created by a create command, use a delete command. A form of a delete command is as follows:

```
/opt/FJSVhanet/usr/sbin/hanetmask delete -i  
{network_address1[,network_address2.....] | all}
```

**-i network\_address1[,network\_address2.....]:**

It is possible to specify a network address to delete dividing by a comma (","), Here it specifies a network address specified by -i of a create command.

**-i all:**

Deletes all subnet mask information set at present.

### [Notes]

- When dividing a network, which a virtual interface belongs to, into a subnet, set a subnet mask value by this command without fail. If not set, it is not possible to communicate with other systems. It is not necessary to execute this command if not divide into a subnet.
- Set the same subnet mask value without fail in a system connected to the same network.
- In NIC switching mode, set the same subnet mask value as that set to a physical IP address (a value set in /etc/sysconfig/network-scripts/ifcfg-ethX file) to a network address of a virtual IP.
- Configuration using this command is only required for NIC switching mode, Fast switching mode, IPv4 configuration, and dual configuration. This configuration is not required for IPv6 configuration. The configured subnet mask assigned to a physical interface is subject to the address of the virtual interface of Fast switching mode, logical virtual interface, virtual interface of NIC switching mode and physical interface.



**[Examples]****(1) create command**

An example to define a subnet mask 255.255.255.0 to a network address 10.34.151.0 is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i 10.34.151.0 -m 255.255.255.0
```

**(2) print command**

Prints a list of subnet mask information.

```
# /opt/FJSVhanet/usr/sbin/hanetmask print
```

**(3) modify command**

An example to modify a subnet mask, set to an already defined network address 10.34.0.0, to 255.255.0.0 is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetmask modify -i 10.34.0.0 -m 255.255.0.0
```

**(4) delete command**

Deletes all subnet mask information.

```
# /opt/FJSVhanet/usr/sbin/hanetmask delete -i all
```



## 7.6 hanetparam Command

### [Name]

hanetparam - Setting up the monitoring function when Fast switching mode, NIC switching mode, or the standby patrol function is used

### [Synopsis]

```
/opt/FJShanet/usr/sbin/hanetparam {-w sec | -m times | -l times | -p sec | -o times | -c {on | off} |
-s {on | off}}
/opt/FJShanet/usr/sbin/hanetparam print
```

### [Feature description]

The hanetparam command sets up the monitoring function.

### [Option]

You can specify the following options:

#### < Valid options in Fast switching mode >

##### -w value

Specify the interval (value) for monitoring the communication target in Fast switching mode. A value from 0 to 300 can be specified. No monitoring is performed if 0 is specified in value. By default, 5 is specified. This parameter is enabled only for Fast switching mode.

##### -m value

Specify the monitoring retry count (value) before message output when the message output function for a line failure is enabled.

Specify the monitoring retry count (value) before message output. A value from 0 to 100 can be specified. No message is output if 0 is specified in value. By default, no message is output. This parameter is enabled only for Fast switching mode.

##### -l value

Specify the cluster failover function.

Specify how many times (count) communication with the communication target can fail consecutively before cluster failover is performed. A value from 0 to 100 can be specified. No cluster failover is performed if 0 is specified in value. When performing Cluster switching, specify the number of repeatedly monitoring within the range between 1-100 for monitoring Cluster switching. The default is set to 5 (switch the Cluster if failure was detected on the entire transfer routes). This option is only available for Cluster operation on Fast switching mode.

##### -c value

When operating Fast switching mode on a cluster system and when an error occurred in all transfer routes at the activation of a userApplication, sets if or not to execute failover between clusters (job switching between nodes).

Specify "on" to value for executing failover between clusters (job switching between nodes) when an error occurred in all transfer routes at activation of a userApplication.

Specify "off" to value for not executing failover between clusters when an error occurred in all transfer routes at activation of a userApplication.

"off" is set to value as an initial setting value.

##### -s value

Specify if or not to output a message when a physical interface, which a virtual interface uses, changed the status (detected an error in a transfer route or recovery). A value possible to specify is "on" or "off". When specified "on", a message is output (message number: 990, 991, and 992). When specified "off", a message is not output. The initial value is "off". This parameter is valid only in Fast switching mode.

< Valid options in NIC switching mode >

-p value

Specify the interval (value) for monitoring the communication target when the standby patrol function is enabled. A value from 0 to 100 can be specified. No monitoring is performed if 0 is specified in value.

Do not specify 0 to this parameter when set a user command execution function (executing a user command when standby patrol detected an error or recovery). User command execution does not function if specified 0.

By default, 15 is specified. This parameter is enabled only for NIC switching mode.

-o value

Specify the monitoring retry count (value) before message output when the message output function for a standby patrol failure is enabled.

Specify the monitoring retry count (value) before message output. A value from 0 to 100 can be specified.

When specified 0, stop outputting messages and make monitoring by a standby patrol function invalid. Do not specify 0 to this parameter when set a user command execution function (executing a user command when standby patrol detected an error or recovery). User command execution does not function, if specified 0.

By default, 3 is specified. This parameter is enabled only for NIC switching mode. The number of the times of continuous monitoring is "a set value of this option x 2" immediately after started standby patrol.

< Valid options in all modes >

print:

Outputs a list of settings.

The following shows the output format:

```
# /opt/FJShanet/usr/sbin/hanetparam print
Line monitor interval(w)      :5
Line monitor message output (m) :0
Cluster failover (l)          :5
Standby patrol interval(p)    :15
Standby patrol message output(o) :3
Cluster failover in unnormality (c):OFF
Line status message output (s) :OFF
```

Display		Contents
Line monitor interval (w)		The setting for the transmission line monitoring interval.
Line monitor message output (m)		The monitoring retry count before message output when a line failure occurs.
Cluster failover (l)		The consecutive monitoring failure count before execution of cluster failover.
Standby patrol interval (p)		The monitoring interval of the standby patrol.
Standby patrol message output (o)		The consecutive monitoring failure count before output of a message when a standby patrol failure occurs.
Cluster failover in unnormality(c)		Workings when an error occurred in all transfer routes at activating a userApplication.
Cluster failover in unnormality(c)	ON	Cluster switching immediately occurs.
	OFF	Cluster switching does not occur at activating a userApplication.

Line status message output (s)		With or without a message output when a physical interface changed the status.
Line status message output (s)	ON	A message is output.
	OFF	A message is not output.

**[Related command]**

hanetpoll

**[Notes]**

- This command can be specified for a virtual interface in Fast switching mode (operation mode "t"), NIC switching mode (operation mode "d" or "e"), and standby patrol function (operation mode "p" or "q").
- The setting by this command is valid in the whole system. It is not possible to change in a unit of virtual interface.
- After executing this command, reboot the system immediately. The applied value will not be effective until the system restarts.

**[Examples]**

&lt; Example of Fast switching mode &gt;

## (1) Example of setting line failure monitoring interval

The following shows an example of using this command to perform monitoring at intervals of 5 seconds.

```
# /opt/FJSVhanet/usr/sbin/hanetparam -w 5
```

## (2) Example of enabling or disabling the message output function used when a line failure occurs

The following shows an example of using this command to output a message if communication with the communication target fails five consecutive times.

```
# /opt/FJSVhanet/usr/sbin/hanetparam -m 5
```

## (3) Example of setting the cluster failover function

The following shows an example of using this command to perform cluster failover if communication with the communication target fails five consecutive times.

```
# /opt/FJSVhanet/usr/sbin/hanetparam -l 5
```

## (4) A setting example of the workings when an error occurred in every transfer route at the activation of a userApplication

An example of a command to execute failover between clusters when an error occurred in every transfer route immediately after activated a userApplication is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetparam -c on
```

- (5) An example of setting with/without outputting a message when a physical interface, which a virtual interfaces uses, changed the status

An example of a command to output a message when a physical interface, which a virtual interface uses, changed the status is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanetparam -s on
```

< Example of NIC switching mode >

- (1) Example of setting the standby patrol monitoring interval

The following shows an example of using this command to perform monitoring at intervals of five seconds.

```
# /opt/FJSVhanet/usr/sbin/hanetparam -p 5
```

- (2) Example of setting the message output function used when a standby patrol failure occurs

The following shows an example of using this command to output a message when communication with the communication target fails five consecutive times.

```
# /opt/FJSVhanet/usr/sbin/hanetparam -o 5
```

< Example common to all modes >

- (1) Example of executing the status display command

The following shows an example of displaying the settings made using the hanetparam command.

```
# /opt/FJSVhanet/usr/sbin/hanetparam print
```

## 7.7 hanetpoll Command

### [Name]

hanetpoll - Setting, modifying, deleting, and displaying the monitoring destination information for the HUB monitoring function

### [Synopsis]

/opt/FJSVhanet/usr/sbin/hanetpoll command [args]

### [Feature description]

The hanetpoll command sets the monitoring destination information required for the HUB monitoring function. This command also modifies, deletes, displays, enables, or disables the settings.

command	Process outline	Authority
create	Creates monitoring destination information	Super user
copy	Copies monitoring destination information	Super user
print	Displays monitoring destination information	General user
modify	Modifies monitoring destination information	Super user
delete	Deletes monitoring destination information	Super user
on	Enabling the HUB monitoring function	Super user
off	Disabling the HUB monitoring function	Super user

### (1) create command

The operation of the HUB monitoring function requires the definition of monitoring destination information. Use the create command to define monitoring destination information.

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n devicename -p
polladdress1[,polladdress2] [-b {on | off}]
```

#### -n devicename:

Specify the name of a virtual interface to be monitored. Specify a virtual interface created using the hanetconfig create command or the hanetconfig copy command. No logical virtual interface name can be specified.

#### -p polladdress1[,polladdress2]:

Specify a monitor-to host name or IP address. Specify a monitor-to host name or IP address to "polladdress1" when activating a Primary interface. Specify a monitor-to host name or IP address to "polladdress2" when activating a Secondary interface. When Primary and Secondary interfaces monitor the same thing, or when a Secondary interface is not defined (a single case), omit "polladdress2". In NIC switching mode, specify a host name or an IP address of the connected HUB. It is also possible to set IPv4 or IPv6 addresses as an address form. When setting an IPv6 address, do not specify a prefix value. When specifying a host name, do not use the same name that exists in IPv4 and IPv6. If the same name exists, it is dealt with as an IPv6 host.

-b on | off:

If two HUBs are specified as monitoring destinations in NIC switching mode, communication between the primary and secondary HUBs can be monitored.

- on: Monitors communication between two HUBs.
- off: Does not monitor communication between two HUBs.

### (2) copy command

Use the copy command to create copy monitoring destination information on a virtual interface in NIC switching mode. This command thus allows monitoring destination information to be automatically created by using the copy source information and without requiring you to specify monitoring destination information and HUB-to-HUB monitoring mode. This command realizes simpler operation than directly executing the hanetpoll create command. The following is the command format for the copy command:

```
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n devicename1,devicename2
```

-n devicename1,devicename2:

Specify the names of virtual interfaces from and to which monitoring destination information should be copied.

devicename1:

Specify the name of a virtual interface that is set in monitoring information in the copy source.

devicename2:

Specify the name of a new virtual interface to be monitored. Specify a virtual interface created using the hanetconfig create command or the hanetconfig copy command. No logical virtual interface name can be specified.

### (3) print command

Use the print command to display the current monitoring destination information. Use this command to view the current monitoring destination information. The following is the format of the print command.

```
/opt/FJSVhanet/usr/sbin/hanetpoll print [-n devicename1[,devicename2,...]]
```

-n devicename1[,devicename2,...]:

Specify the names of virtual interfaces whose monitoring destination information should be displayed. If this option is not specified, the print command displays all the monitoring destination information currently specified.

The following shows an example of displaying information without any option specified.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll print
Polling Status      = OFF
    interval(idle) =  5( 60) sec
    times          =  5 times
    repair_time    =  5 sec
FAILOVER Status     = YES
Name  HUB Poll Hostname
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
sha0   OFF  hostA,192.168.10.10
```

Display	Contents
Polling Status	The current status of the monitoring function.



Polling Status	ON	The monitoring function is enabled.
	OFF	The monitoring function is disabled.
interval(idle)	interval	The monitoring interval in the stationary status.
	idle	In seconds the wait time that elapses after monitoring starts and before the HUB links up.
times		The monitoring count.
repair_time		The recovery monitoring interval in seconds.
FAILOVER Status		With or without cluster switching when an error occurred in all transfer routes.
FAILOVER Status	YES	Node switching is performed when the virtual interface is registered in the cluster resource.
	NO	No node switching is performed.
Name		The name of a virtual interface to be monitored.
HUB Poll		The HUB-to-HUB monitoring status.
HUB Poll	ON	The monitoring function is enabled.
	OFF	The monitoring function is disabled.
	---	The monitoring function is not used.
Hostname		The host name or IP address to be monitored, in the order of the primary and secondary monitoring destinations. In the example, "hostA" is the primary monitoring destination and "192.168.10.10" is the secondary monitoring destination.

#### (4) modify command

Use the modify command to modify the monitoring destination information.

```
/opt/FJSVhanet/usr/sbin/hanetpoll modify -n devicename {[-p polladdress1[,polladdress2]] [-b {on | off}]}
```

**-n devicename:**

Specify the name of a virtual interface whose monitoring destination information should be modified. Specify a virtual interface whose monitoring destination information is currently defined.

**-p polladdress1[,polladdress2]**

Specify the host names or IP addresses of the monitoring destinations to be modified. In RIP mode, specify the host names or IP addresses of neighboring routers as the monitoring destinations. In NIC switching mode, specify the host names or IP addresses of the primary and secondary HUBs.

**-b on | off:**

If two HUBs are specified as monitoring destinations in NIC switching mode, communication between the primary and secondary HUBs can be monitored. This parameter cannot be specified for the monitoring destination information in RIP mode.

on: Monitors communication between two HUBs.

off: Does not monitor communication between two HUBs.



## Note

Changing the number of monitoring targets from two targets to one target, verify that HUB-to-HUB monitoring exists, and if the value is set "on", then change it back to "off".

## (5) delete command

Use the delete command to delete the monitoring destination information. The following is the format of the delete command:

```
/opt/FJSVhanet/usr/sbin/hanetpoll delete -n {devicename1[,devicename2,...] | all}
```

**-n devicename1[,devicename2,...]:**

Specify the names of virtual interfaces (such as sha0 and sha1) whose monitoring destination information should be deleted.

**all:**

Specify this parameter to delete all the defined monitoring destination information.

## (6) on command

To make the created HUB monitoring function valid, and to change an interval to monitor a HUB monitoring function, use the on command:

```
/opt/FJSVhanet/usr/sbin/hanetpoll on [-s sec] [-c times] [-b sec] [-f {yes | no}] [-p sec]
```

**-s sec:**

Specify the monitoring time in seconds. A value from 1 to 300 can be specified (note that the product of sec and time must be 300 or less). If this option is not specified, the previous setting is enabled. Initially, 5 (seconds) is specified.

**-c times:**

Specify the monitoring count. A value from 1 to 300 can be specified (note that the product of sec and time must be 300 or less). If this option is not specified, the previous setting is enabled. Initially, 5 (times) is specified.

**-b sec:**

When detected an error in HUB-to-HUB monitoring of NIC switching mode, specify an interval to monitor recovery. The range possible to set is zero to 300. If not specified this option, the values set the last time become valid. 5 (seconds) is set as the initial set value.

**-f yes | no:**

Specify the operation used when node switching occurs due to a line failure during cluster operation. If this option is not specified, the previous setting is enabled. Initially, "yes" is specified. (This parameter is enabled only during cluster operation.)

yes: Node switching is performed if a line monitoring failure occurs.

no: No node switching is performed if a line monitoring failure occurs.

**-p sec:**

Specify in seconds the wait time that should elapse after monitoring starts and before the HUB links up in NIC switching mode. A value from 1 to 300 can be specified. If this option is not specified, the previous setting is enabled. Initially, 60 (seconds) is specified. If the specified value is less than the monitoring interval multiplied by the monitoring count, the system ignores the specified link-up time and adopts the time obtained by multiplying the monitoring interval by the monitoring count.

## (7) off command

Use the off command to disable the HUB monitoring function. The following is the format of the off command:

```
/opt/FJSVhanet/usr/sbin/hanetpoll off
```

### [Notes]

- Be sure to specify address information for neighboring hubs (hubs in the subnet to which physical interfaces bundled by the specified virtual interface belong) as the hub monitoring destination. If any other address information is specified, the HUB monitoring function may not operate properly.
- Before monitoring destination information can be specified using this command, configuration information must be set using the hanetconfig command.
- This command can be specified for a virtual interface in NIC switching mode (operation mode "d" or "e").
- After modifying monitoring destination information, disable the HUB monitoring function (hanetpoll off) and then enable it again (hanetpoll on). If the HUB monitoring function is enabled while it has already been enabled (duplicated activation of hanetpoll on), no monitoring destination information is reflected after modification.
- A virtual interface to be used in the cluster system is monitored only while a userApplication to which the virtual interface belongs is in operation.
- If a virtual interface to be monitored is set to Fast switching mode, an error message is output to indicate this fact and the line is not monitored.
- The monitoring time and count to be specified using the hanetpoll on command must be specified so that their product does not exceed 300.
- The retry count to be specified using the hanetpoll on command can be set to 0 from 99999. Monitoring continues indefinitely if 0 is specified.
- Use the hanetpoll print command to display the latest user-defined information (result of create, delete, modify, on, and off) but not to display the current status of hub monitoring.
- If any valid monitoring destination information exists, monitoring automatically starts when the system is started up.
- Be sure to define in the /etc/hosts file IP addresses and host names to be specified when the monitoring destination information is set or modified.
- When specified a numeric string for a host name, it is dealt with as decimal and converted into an IP address corresponding to its value to work. (For instance, when specified "123456", it is regarded an IP address "0.1.226.64" is specified.)
- When setting the same monitor-to device for the monitor-to information of more than one virtual interface, use a copy command, not a create command, for setting the second and after. If used a create command, occasionally the state is not displayed properly by a dsppoll command.
- When specified a host name to where to set a host name or an IP address with this command, it is not possible to change/delete the corresponding host name on the host database of such as /etc/hosts file. To change/delete the information of the host name, it is necessary to temporarily delete a definition of a Redundant Line Control Function to use the corresponding host name and to set the definition again.
- When specified a host name with this command to where a host name or an IP address should be set, it is not possible to change a corresponding host name on the database such as /etc/hosts files. To change host name information, it is necessary to delete the definition of a Redundant Line Control Function that uses a corresponding host name, and to reconfigure.
- Do not specify a multicast address as a monitor-to address.
- Do not use characters other than alphanumeric characters, period, and hyphen for the host name. If characters other than the above are used, re-write the host names in /etc/hosts so that it does not contain any other characters. Also, the first and last character for the host name must be alphanumeric character.

[Examples]

(1) create command

The following shows an example of creating configuration information for monitoring two routers routerA and routerB on virtual interface sha2. The host name is assumed to be associated with the IP address in the /etc/hosts file.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll create -n sha2 -p routerA,routerB
```

(2) copy command

The following is an example of copying monitoring target data defined in virtual interface sha0 for NIC switching mode into sha1. (By copying the configuration data of sha0 onto sha1, when sha0 performs failover operation, sha1 also fails back along with sha0).

```
# /opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

(3) print command

The following shows an example of displaying the configuration information list of a virtual interface.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll print
```

(4) modify command

The following shows an example of changing configuration information for monitoring two hubs hubA and hubB to hubA and hubC on virtual interface sha2. The host name is assumed to be associated with the virtual IP address in the /etc/hosts file.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll modify -n sha2 -p hubA,hubC
```

(5) delete command

The following shows an example of deleting the monitoring destination information on virtual interface sha2 from the definition.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll delete -n sha2
```

(6) on command

The following shows an example of starting the HUB monitoring function.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll on
```

(7) off command

The following shows an example of stopping the HUB monitoring function.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll off
```

## 7.8 dsppoll Command

### [Name]

dsppoll - Displaying the monitoring status

### [Synopsis]

/opt/FJSVhanet/usr/sbin/dsppoll

### [Feature description]

The dsppoll command displays the current monitoring status of monitoring information created using the hanetpoll command..

### [Display format]

The following shows the display format used when no option is specified.

```
# /opt/FJSVhanet/usr/sbin/dsppoll
Polling Status = ON
interval(idle) = 5( 60)
times = 5
repair_time = 5
FAILOVER Status = YES

Status Name Mode Primary Target/Secondary Target HUB-HUB
+-----+-----+-----+-----+-----+-----+-----+
ON sha0 d 192.168.74.2(ON)/192.168.74.3(WAIT) ACTIVE
ON sha1 d fec0:1::100(ON)/fec0:1::101(WAIT) ACTIVE
```

Display		Contents
Polling Status	ON	The monitoring function is enabled.
	OFF	The monitoring function is disabled.
interval (idle)	interval	In seconds the monitoring interval in the stationary status.
	(idle)	In seconds the wait time that elapses after monitoring starts and before the HUB links up.
Times		The monitoring count.
Repair_time		The recovery monitoring interval in seconds.
FAILOVER Status	YES	Node switching is performed when the virtual interface is registered in the cluster resource.
	NO	No node switching is performed.
Status	ON	Monitoring is in progress.
	OFF	Monitoring is stopped.
Name		: The name of a virtual interface to be monitored.
Mode	d	NIC switching mode (logical IP address takeover function)
	e	NIC switching mode (physical IP address takeover function)
Primary Target/Secondary Target		Monitoring status in Primary/Secondary monitor-to IP address or a host name and parenthesis.
		(ON)   Monitoring is in progress.

	(WAIT)	Waiting is in progress.
	(FAIL)	Monitoring failed (monitoring is stopped).
	(STOP)	Unused.
HUB-HUB	WAIT	HUB-to-HUB monitoring has stopped.
	ACTIVE	HUB-to-HUB monitoring is operating.
	FAIL	HUB-to-HUB monitoring has failed.
	OFF	HUB-to-HUB monitoring is unused.

[Related commands]

hanetpoll

[Notes]

- If no option is specified, this command can be specified for a virtual interface in NIC switching mode (operation mode "d" or "e").

[Examples]

The following shows an example of displaying all the monitoring statuses properly defined using the hanetpoll command.

```
# /opt/FJSV/hanet/usr/sbin/dsppoll
```

## 7.9 hanetnic Command

### [Name]

hanetnic - Dynamic addition/deletion/switching of physical interfaces

### [Synopsis]

/opt/FJSVhanet/usr/sbin/hanetnic command [args]

### [Feature description]

The hanetnic command can add, delete, or switch physical interfaces to be used dynamically while the relevant virtual interface is active.

Command	Process outline	Authority
add	Adds physical interfaces	Super user
delete	Deletes physical interfaces	Super user
change	Changes physical interface used	Super user



#### Note

When adding, deleting, or switching interfaces dynamically using this command, the virtual interface must be active.

### (1) add command

This command adds physical interfaces bundled by a virtual interface in Fast switching mode dynamically. (Real interfaces are added while the virtual interface is active.) However, only physical interfaces specified in configuration information can be specified. The following is the format of the add command:

```
/opt/FJSVhanet/usr/sbin/hanetnic add -n devicename -i interface [-f]
```

#### -n devicename:

Specify a virtual interface name to which the physical interface to be added belongs. It is possible to specify only virtual interface names with Fast switching mode (operation mode "t") specified.

#### -i interface:

Specify a name of an interface to be added.

When dynamically adding (which requires to modification of the configuration information) a virtual interface, set a name of a new interface.

Similarly, for actively exchanging an interface (which does not require modification in the configuration information), run the dsphanet command in order to identify the name of the interface to be added. Moreover, within the interface name displayed in "Device" field, specify the interface name displayed as "(CUT)".

#### -f:

Specifies when changes the configuration information of a virtual interface at the same time. (Permanent dynamic addition.)

## (2) delete command

This command deletes physical interfaces bundled by a virtual interface in Fast switching mode dynamically (Real interfaces are deleted while the virtual interface is active). However, only physical interfaces specified in configuration information can be specified. The following is the format of the delete command:

```
/opt/FJSVhanet/usr/sbin/hanetnic delete -n devicename -i interface [-f]
```

### -n devicename:

Specify a virtual interface name to which the physical interface to be deleted belongs. It is possible to specify only virtual interface names with Fast switching mode (operation mode "t").

### -i interface:

Specify the name of the interface for deletion.  
First, run the dsphanet command to identify the name of the interface subjected for deletion. Then, specify the interface name in the "Device" field where virtual interface displayed.

### -f:

Specifies when changes the configuration information of a virtual interface at the same time. (Permanent dynamic deletion.)

## (3) change command

This command changes physical interfaces used in a virtual interface in NIC switching mode to those of the standby system. The following is the format of the change command:

```
/opt/FJSVhanet/usr/sbin/hanetnic change -n devicename
```

### -n devicename:

Specify the virtual interface name of the used physical interface to be changed. It is possible to specify only virtual interface names with NIC switching mode (operation mode "d" or "e") specified.

## [Notes]

- As for an actual interface to dynamically add for a virtual interface of Fast switching mode (the operation mode is "t"), be sure to define to use in TCP/IP before adding dynamically. (Check if or not there is /etc/sysconfig/network-scripts/ifcfg-ethX file. If not, create it. Then execute "/sbin/ifup ethX " command, and activate the interface.)

## [Examples]

### (1) add command

The following example adds eth0 to the bundled physical interfaces in the virtual interface sha0. It is assumed that sha0 has already been defined in Fast switching mode (operation mode "t") and eth0 has been deleted by using the "hanetnic delete" command.

```
# /opt/FJSVhanet/usr/sbin/hanetnic add -n sha0 -i eth0
```

### (2) delete command

The following example deletes eth1 from the bundled physical interfaces in the virtual interface sha0. It is assumed that sha0 has already been defined in Fast switching mode (operation mode "t").

```
# /opt/FJSVhanet/usr/sbin/hanetnic delete -n sha0 -i eth1
```



**(3) change command**

The following example replaces physical interfaces used in the virtual interface sha0 with those of the standby system. It is assumed that sha0 has already been defined in NIC switching mode (operation mode "d").

```
# /opt/FJSVhanet/usr/sbin/hanetnic change -n sha0
```



## 7.10 strptl Command

### [Name]

strptl - Starting the standby patrol

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/strptl -n devicename1[,devicename2,...]
```

### [Feature description]

The strptl command starts the standby patrol in NIC switching mode.

### [Option]

You can specify the following option:

**-n devicename1[,devicename2,...]:**

Specify the name of a virtual interface of the standby patrol to be started. You can specify more than one virtual interface by listing them delimited with a comma (,).

### [Related commands]

stpctl

### [Notes]

- The standby patrol is automatically started when the system is started up. Use this command to start the standby patrol manually after the system is started up.

### [Examples]

The following shows an example of starting the standby patrol defined in a virtual interface (sha4).

```
# /opt/FJSVhanet/usr/sbin/strptl -n sha4
```



## 7.11 stpctl Command

### [Name]

stpctl - Stopping the standby patrol

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/stpctl -n devicename1[,devicename2,...]
```

### [Feature description]

The stpctl command stops the standby patrol in NIC switching mode.

### [Option]

You can specify the following option:

**-n devicename1[,devicename2,...]:**

Specify the name of a virtual interface of the standby patrol to be stopped. You can specify more than one virtual interface by listing them delimited with a comma (,).

### [Related commands]

strptl

### [Notes]

- The standby patrol is automatically stopped when the system is shut down. Use this command to stop the standby patrol manually after the system is started up.

### [Examples]

The following shows an example of stopping the standby patrol defined in a virtual interface (sha4).

```
# /opt/FJSVhanet/usr/sbin/stpctl -n sha4
```



## 7.12 hanetbackup Command

### [Name]

hanetbackup - Backing up the environment definition files

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/hanetbackup [-d backupdir]
```

### [Feature description]

The hanetbackup command backs up the environment definition files used by Redundant Line Control Function. The backup files are named "hanetYYYYMMDD.bk". YYYYMMDD is the information obtained when the command is executed (YYYY, MM, and DD stands for the year, month and day, respectively).

### [Option]

You can specify the following option:

**-d backupdir**

Specify a directory to which backup environment definition files should be saved. If this option is omitted, the backup files will be saved to under /tmp.

### [Related commands]

hanetrestore

### [Notes]

- If the backup command is executed more than once on the same day using the same output destination, the backup file will be overwritten. Before executing this command, save as required the file that has been output using this command.

### [Examples]

The following shows an example of outputting environment definition files to under /tmp.

```
# /opt/FJSVhanet/usr/sbin/hanetbackup
```





## 7.13 hanetrestore Command

### [Name]

hanetrestore - Restoring the environment definition files

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/hanetrestore -f backupfilename
```

### [Feature description]

The hanetrestore command restores the environment definition files used by Redundant Line Control Function.

### [Option]

You can specify the following options:

**-f backupfilename**

Specify a file created using the backup command.

### [Related commands]

hanetbackup

### [Notes]

- After executing this command, be sure to reboot the system.
- Do not execute this command when the environment setting is completed. If executed, there is a possibility that a conflict will occur in the definition information, which makes it not possible to work properly. In this case, delete the definition information by a resethanet command and set the environment again. See "7.15 resethanet Command" for the detail of a resethanet command.
- Recovery can be made exclusively on the same system configuration where the configuration file is backed up.

### [Examples]

The following shows an example of restoring a file (/tmp/hanet20041231.bk) created using the backup command.

```
# /opt/FJSVhanet/usr/sbin/hanetrestore -f /tmp/hanet20041231.bk
```



## 7.14 hanethvrsc Command

### [Name]

hanethvrsc - Sets the information of a virtual interface to register in the cluster resources.

### [Synopsis]

/opt/FJSVhanet/usr/sbin/hanethvrsc command [args]

### [Feature description]

hanethvrsc command makes it possible to create/delete/display the information of a virtual interface to register in the resources of PRIMECLUSTER.

Command	Process outline	Authority
create	Creates virtual interface information	Super user
delete	Deletes virtual interface information	Super user
print	Displays virtual interface information	Super user

#### (1) create command

Creates the information of a virtual interface to register in the resources of PRIMECLUSTER. The information of a virtual interface is consisted of a takeover virtual interface and a takeover IP address. It is possible to create up to 64 takeover virtual interfaces. A logical number of a takeover virtual interface (a number to add after “:”) is automatically numbered from 65.

- When creating the information of a virtual interface:

Fast switching mode:  
 /opt/FJSVhanet/usr/sbin/hanethvrsc create -n devicename -i {takeover-ipv4 | takeover-ipv6/prefix | takeover-ipv4,takeover-ipv6/prefix}

NIC switching mode:  
 /opt/FJSVhanet/usr/sbin/hanethvrsc create -n devicename

-n devicename:

Specify a name of the virtual interface for Fast switching, NIC switching mode created with hanetconfig command. A multiple takeover IP can be applied to a single virtual interface name for Fast switching mode. For NIC switching mode, one takeover IP can be applied against one virtual interface name.

-i takeover-ipv4[,takeover-ipv6/prefix]:

Specifies a host name or an IP address of a takeover IP. This option is necessary when a virtual interface to specify by -n option is Fast switching mode. Not necessary when NIC switching mode. In NIC switching mode, a value specified by -i option of hanetconfig create command is automatically set as a takeover IP.

#### (2) delete command

Deletes the information of a virtual interface from the cluster resources.

# /opt/FJSVhanet/usr/sbin/hanethvrsc delete -n devicename

-n devicename:

Specifies a name of a logical virtual interface created by create command (shaXX:YY). However,

it is not possible to delete while RMS is working.

(3) print command

Displays a list of the information of a virtual interface to register in the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc print
```

An example of a display is as follows:

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc print
  ifname      takeover-ipv4  takeover-ipv6
+-----+-----+-----+
sha1:65      takeover-ipl   -
sha2:65      -              takeover-ip2
sha3:65      192.13.70.1   fec0:1::123/64
```

Display	Contents
ifname	A name of a logical virtual interface to register in the cluster resources.
takeover-ipv4	A host name or an IP address of a takeover IP (IPv4) to add to a logical virtual interface.
takeover-ipv6	A host name or an IP address of a takeover IP (IPv6) to add to a logical virtual interface.
'-'(hyphen)	Neither a hostname nor an IP address is set.

[Notes]

- When specified a host name to where to set a host name or an IP address with this command, it is not possible to change/delete the corresponding host name on the host database of such as /etc/hosts file. To change/delete the information of the host name, it is necessary to temporarily delete a definition of a Redundant Line Control Function to use the corresponding host name and to set the definition again.

[Examples]

(1) create command

An example of using create command when setting Fast switching mode (IPv4):

An example of using create command when registering a virtual interface sha0 added a takeover IP address (10.1.1.1) in the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 10.1.1.1
```

An example of configuring Fast switching mode (IPv6):

The following is an example of registering the virtual interface sha0 in the cluster resource after applying the takeover IP address (fec0:1::1/64).

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

An example of configuring Fast switching mode (IPv4/IPv6):

The following is an example of registering the virtual interface sha0 in the cluster resource after applying IPv4 takeover IP address (10.1.1.1) and IPv6 takeover IP address (fec0:1::1/64).

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 10.1.1.1,fec0:1::1/64
```

An example of using create command when setting NIC switching mode:

An example of using create command when registering a virtual interface sha1 in the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

### (2) delete command

An example of using create command when deleting a logical virtual interface sha1:65 from the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc delete -n sha1:65
```

### (3) print command

An example of displaying a list of the information of a virtual interface to register to the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc print
```



## 7.15 resethanet Command

### [Name]

resethanet - Initializes the information of virtual interface configuration and reactivates a Redundant Line Control Function.

### [Synopsis]

```
/opt/FJSVhanet/usr/sbin/resethanet -i | -s
```

### [Feature description]

resethanet commands initializes the information of virtual interface configuration and reactivates a Redundant Line Control Function. The initialized configuration information is as follows.

- The subnet mask information (the definition information set by hanetmask command)
- The information of virtual interface configuration (the definition information set by hanetconfig command)
- The monitor-to information (the definition information set by hanetpoll command)

The parameters set by hanetpoll on command, hanetparam command, command are not initialized.

### [Option]

Specify the following options:

-i:

Specify to initialize the information of virtual interface configuration. Do not specify this option except to stop using a Redundant Line Control Function during the operation, or to recreate the information of virtual interface configuration. If even one virtual interface is registered as cluster resources in the corresponding system, it is not possible to initialize.

-s:

Specify to reactivate a Redundant Line Control Function. This option validates changed content of the setting without rebooting a system when changed the information of virtual interface configuration. If RMS is activated at PRIMECLUSTER operation in a corresponding system, it is not possible to reactivate.

### [Notes]

- When the configuration information is initialized with the command, it cannot be returned to the original state prior to initialization.  
Users are recommended to save the information using the hanetbackup command.
- When you execute this command, please stop RMS beforehand.

### [Examples]

The following is an example of initialize the configuration information of a virtual interface.

```
# /opt/FJSVhanet/usr/sbin/resethanet -i
```

The following is an example of reactivates a Redundant Line Control Function.

```
# /opt/FJSVhanet/usr/sbin/resethanet -s
```





# **Appendix A Messages and corrective actions**

This appendix outlines messages and corrective actions to be taken to eliminate errors.



## A.1 Messages Displayed by Redundant Line Control Function

This section explains the meaning of, and action to take for each message output by Redundant Line Control Function regarding such commands as the configuration commands and operation commands.

Each message has the following format:

[Output message]

1. A format for information messages and error output messages:

```
hanet: BBBCC DDDDD: EEEE FFFF
      (1)  (3)  (4)  (5)  (6)
```

2. A format for console output messages and internal information output messages:

```
hanet: AAAAA: BBBCC DDDDD: EEEE FFFF
      (1)  (2)  (3)  (4)  (5)  (6)
```

### (1) Component name

Always begins with "hanet".

### (2) Error Kind

Included in the console messages and internal information. AAAAA provides the following information:

**ERROR:**

Error message

**WARNING:**

Warning message

**INFO:**

Information message. It is only output when syslog ("3.6.6.4 Setting up the system log for interface up/down") is set.

**TRACE:**

Internal information

### (3) Message number (Displayed in total five digits.)

Outputs an output message with a unique number. Not displayed when output an internal message.

The first three digits (BBB) indicate the message number.  
The last two digits (CC) indicate the internal code.

(4) Outline of errors

The output information (DDDDD) is as follows. Not output when it is a console message.

information:

Means that an output message is the information.

warning:

Means that there is an error in the definition information (a process continues).

operation error:

Means that the executed command method has an error.

configuration error:

Means that there is an error in the definition information.

internal error:

Means that there is a fatal error.

(5) Error details

Message may be output as required.

(6) Others

The complimentary information (FFFFF) is occasionally output if necessary.

### A.1.1 Information message (number 0)

Message number	Message	Meaning	Action
000	normal end.	Execution of the command was successfully completed.	None

### A.1.2 Error output message (numbers 100 to 700)

The meaning of and response to each message output by Redundant Line Control Function is listed below.

#### Message number 1xx – 2xx

Message number	Message	Meaning	Action
101	command can be executed only with super-user.	An unauthorized user performed the operation.	Only a user with super-user privilege can perform this operation.
102	this interface is already linked.	The specified virtual device has already been activated.	Execute the dsphanet command to make sure that the virtual interface is in the activated status.
105	invalid ip_address.	An invalid IP address is specified.	Specify the correct IP address for re-execution.
111	invalid parameter.	An invalid parameter is specified.	Read the appropriate command reference, and execute the command again.
112	invalid argument.	An invalid command argument was found.	Read the appropriate command reference, and execute the command again.
113	polling already active.	The HUB monitoring function has already been activated.	No action is required.
114	-r option value is invalid.	An invalid value is specified.	Read the appropriate command reference to get the correct value, and execute the command again.
115	-s -c option total value is invalid.	An invalid value is specified.	Specify the values (-s and -c) so that the product of the two values does not exceed 300, and execute the command again.
116	-s -c option value is invalid.	An invalid value is specified.	The values (-s and -c) must be selected from within a range of 1 to 300. Specify a number within the range for each value, and execute the command again.
117	polling already stopped.	The HUB monitoring function has already been deactivated.	No action is required.

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118	interface is inactive.	The specified virtual interface has been deactivated.	Execute the dsphanet command to check the status of the specified virtual interface.
119	interface is active.	The specified virtual interface has been activated.	Execute the dsphanet command to check the status of the specified virtual interface.
120	invalid device name.	An invalid virtual interface name is specified.	Specify the correct virtual interface name, and execute the command again.
121	directory not found.	The specified directory was not found.	Specify a directory name that already exists, and execute the command again.
122	backup file not found.	The specified backup file was not found.	Specify a backup file that already exists, and execute the command again.
123	invalid backup file.	The specified backup file is invalid.	Specify the backup file that was created by the hanetbackup command, and execute the command again.
124	not directory	Directory name was not found where directory was expected.	Specify a directory, and execute the command again.
125	interface is Cluster interface.	The specified interface is available in the cluster operation.	Specify an interface that is not being used in the cluster operation, and execute the command again.
126	shared resource is not found.	An invalid common resource is specified.	Specify a correct common resource name, and execute the command again.
127	invalid key	An invalid resource key is specified.	Specify a correct resource key, and execute the command again.
128	invalid logicalIP.	An invalid logical IP address is specified.	Specify a correct logical IP address, and execute the command again.
129	logicalIP is already defined.	The specified logical IP address has been specified in configuration information.	Specify a different logical IP address, and execute the command again.
130	logicalIP is not specified.	No logical IP address is specified.	Specify a logical IP address, and execute the command again.
131	primaryIF is not specified.	No primary interface is specified.	Specify a primary interface, and execute the command again.
132	invalid primaryIF.	An invalid primary interface is specified.	Specify a correct primary interface, and execute the command again.

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133	physicalIP is not specified.	No physical IP address is specified for the interface.	Specify a physical IP address for the interface, and execute the command again.
134	invalid physicalIP.	The physical IP address of the interface is invalid.	Specify a correct physical IP address, and execute the command again.
135	primary polling address is not specified.	No monitoring destination IP address is specified for the primary interface.	Specify a monitoring destination IP address for the primary interface, and execute the command again.
136	invalid primary polling address.	The monitoring destination IP address of the primary interface is invalid.	Specify a correct monitoring destination IP address, and execute the command again.
137	secondaryIF is not specified.	No secondary interface is specified.	Specify a secondary interface, and execute the command again.
138	invalid secondaryIF.	An invalid secondary interface is specified.	Specify a correct secondary interface, and execute the command again.
139	secondary polling address is not specified.	No monitoring destination IP address of the secondary interface is specified.	Specify a monitoring destination IP address of the secondary interface, and execute the command again.
140	invalid secondary polling address.	An invalid monitoring destination IP address is specified for the secondary interface.	Specify a correct monitoring destination IP address for the secondary interface, and execute the command again.
141	HUB-HUB polling flag is not specified.	Whether HUB-to-HUB communication monitoring is performed is not specified.	Specify whether to perform the HUB-to-HUB communication monitoring (ON or OFF), and execute the command again.
142	invalid HUB-HUB polling flag.	There is an error in the specification indicating whether HUB-to-HUB communication monitoring is performed.	Specify ON or OFF of the HUB-to-HUB communication monitoring, and execute the command again.
143	logicalIP is defined in physicalIP.	The IP address specified as a logical IP address overlaps the physical IP address.	Specify an IP address that is not specified in the virtual interface as the logical IP address, and execute the command again.
144	secondaryIF equal primaryIF.	The primary interface and the secondary interface are identical.	Specify different interfaces, and execute the command again.
145	interface is already defined in another set.	The specified interface is used in another operation set.	Specify an interface that is not used in other operation sets, and execute the command again.
146	interval is not specified.	No monitoring interval is	Specify a monitoring interval, and execute the

		specified.	command again.
147	invalid interval specified.	The monitoring interval value is invalid.	Specify a correct monitoring interval, and execute the command again.
148	count is not specified.	No monitoring count is specified.	Specify a monitoring count, and execute the command again.
149	invalid count specified.	The monitoring count value is invalid.	Specify a correct monitoring count, and execute the command again.
150	invalid argument.	An invalid option is specified.	Refer to the command reference, and execute the command again.
151	logicalIP is active.	The specified processing could not be performed because the transmission line monitoring of the specified operation set was operating.	Stop the transmission line monitoring, and execute the command again.
152	logicalIP is inactive.	The specified processing could not be performed because the transmission line monitoring of the specified operation set was stopped.	Start the transmission line monitoring, and execute the command again.
153	logicalIP is not defined.	The specified operation set is not defined.	Specify a correct operation set.
154	logicalIP is registered to cluster resource.	The specified operation set is registered as a cluster resource.	Delete the operation set from the cluster resources.
155	invalid ping on/off.	HUB-to-HUB communication monitoring information specified in the operation set information is invalid.	Specify correct operation set information.
156	secondaryIF is not defined.	Because the secondary interface is not specified, interfaces cannot be switched.	Specify an operation set in which the secondary interface is defined.
157	product of interval and time should be less than 300.	The detection time (product of the monitoring interval and monitoring count) of line failure is too large.	Specify the monitoring interval and monitoring count so that their product does not exceed 300 seconds.
158	invalid interface count(max 16)	The maximum number of real interfaces that a virtual interface can bundle in GS linkage mode is exceeded (maximum 16).	Reduce the number of bundled real interfaces, and execute the command again.
159	MAC address is already defined.	The specified MAC address has already been specified.	Specify a different MAC address, and execute the command again.



## A.1 Messages Displayed by Redundant Line Control Function

160	specified devicename could not support cluster.	The specified device does not support cluster operation.	Specify an interface name that support cluster operation, and execute the command again.
161	polling function is defined.	The monitoring function is specified.	Delete a monitoring function with the name of the corresponding virtual interface, and execute again.
162	invalid MAC address.	An invalid MAC address is specified.	Specify a correct MAC address, and execute the command again.
163	IP address or Hostname is already defined.	The specified IP address or host name has already been specified.	Specify a different IP address or host name, and execute the command again. In addition, when a problem cannot be solved by this action, please perform the same action as the following messages. A problem may be solved. Message number: 169, 170
164	interface name is already defined.	The specified interface name has already been specified.	Specify a different interface, and execute the command again. In addition, when a problem cannot be solved by this action, please perform the same action as the following messages. A problem may be solved. Message number: 166
165	invalid interface name.	An invalid interface name is specified.	Specify a correct interface name, and execute the command again. When the virtual interface is registered in cluster resource, please execute it again after stopping RMS.
166	invalid mode.	A virtual interface configured with invalid operation mode or incompatible operation mode was specified.	Specify a virtual interface configured with valid operation mode or compatible operation mode.
167	parent device name not found.	No virtual interface corresponding to the logical virtual interface was found.	Specify a correct logical virtual interface, and execute the command again.
168	invalid hostname.	Specified host name or defined host name does not exist in /etc/hosts file. Or, specified host name is invalid.	Check for the existing host name specified in the command argument or hostname specified in configuration settings for redundant line control function, in /etc/hosts file. If the host name does not exist, create one and try again. If the host name exists in these files, check if

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			the name contains characters other than alphanumeric characters, hyphen, and period. Also make sure it does not use non-alphanumeric characters for the first and last character. If it contains these characters, change the name and re-execute the command.
169	physical interface name is already defined.	The specified physical interface name has already been specified.	Specify a different physical interface name, and execute the command again. In addition, when a problem cannot be solved by this action, please perform the same action as the following messages. A problem may be solved. Message number: 166
170	invalid physical interface name.	An invalid physical interface name is specified.	Specify the correct name of the physical interface (the name of the virtual interface when the mode is "p" or "q"), and execute again. When setting a standby patrol function, check that two physical interfaces are defined that configure a virtual interface to be monitored. In addition, when a problem cannot be solved by this action, please perform the same action as the following messages. A problem may be solved. Message number: 164
171	trunking interface list is not specified.	No interface that operates in Fast switching mode is specified.	Specify an interface, and execute the command again.
172	mode p interface is defined.	A virtual interface in mode P is specified.	Delete the interface in mode P, and execute the command again.
173	mode c interface is activated.	An interface in mode C is activated.	Inactivate the interface in mode C, and execute the command again.
174	ifname is not defined in hanetconfig.	The specified virtual interface name is not specified in configuration information.	Create configuration information using the hanetconfig command, and execute the command again.
175	same polling address are specified.	Primary and Secondary interfaces specified the same monitor-to address.	Specify different monitoring destinations, and execute the command again.
176	polling target is not alive.	No response is received from the monitoring destination.	Check the monitoring destination, and execute the command again.

A.1 Messages Displayed by Redundant Line Control Function

177	polling is active.	The monitoring function is operating.	Stop (OFF) the monitoring function using the hanetpoll command, and execute the command again.
178	invalid version.	An incorrect version is specified.	Specify the version of the backed up Redundant Line Control Function, and execute the command again.
179	invalid virtual interface count(max 64).	The number of virtual interfaces of the communication target exceeded the maximum number (maximum 64).	Delete unnecessary definitions, and execute the command again.
180	mode q interface is defined.	An invalid option is specified.	Deactivate an interface of mode q and execute again.
181	invalid client count(max 128).	An invalid option is specified.	Execute the command again with a correct value.
182	-p option value is invalid.	An invalid option is specified.	See the command reference and execute the command again with a correct value.
183	-b option value is invalid.	An invalid option is specified.	See the command reference and execute the command again with a correct value.
184	shared resource can not be specified.	An invalid option is specified.	See the command reference and execute the command again with a correct value.
185	function is already defined by another.	An invalid option is specified.	Check the configuration information again, delete unnecessary definitions, and execute again.
186	could not get information.	Communication between command-daemon failed.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
187	could not delete last 1 NIC.	It is not possible to delete if a using actual interface is only one when deleting dynamically an actual interface.	After stopped a virtual interface to process, delete or change the specified actual interface. When changing a definition of a virtual interface, delete or change a definition with hanetconfig command.
188	number of physical interface is already maximum.	The number of the physical interfaces that configures the specified virtual interface has reached the maximum number possible to bundle. Therefore, it is not possible to add an actual interface	Review the number of the physical interfaces that configures a virtual interface, and change a definition using a hanetconfig command if necessary.

		dynamically.	
189	invalid network address.	The specified network address is invalid.	Check if or not the specified network address matches with that of a virtual interface network using <code>hanetconfig print</code> command. Specify a correct network address again.
190	virtual gateway function is defined.	A virtual gateway function is already set.	Delete a virtual gateway function with the name of the corresponding virtual interface, then execute again.
191	StandbyIP address function is defined.	A function to specify a standby IP address is already set.	Delete a function to specify a standby IP address with the name of the corresponding virtual interface, and execute again.
192	resource monitor process for virtual interface is running.	A resource monitor for the virtual interface is working.	Execute <code>hvshut</code> command provided by a cluster system, halt a resource monitor, and execute again.
193	Specified interface is already linked to IP.	The IP address is already assigned to the specified interface.	Check if or not there is <code>/etc/sysconfig/network-scripts/ifcfg-ethX</code> file.
194	Specified interface is not bundled by a virtual interface.	The specified interface is not defined as the one to configure a virtual interface.	Check the interface that configures a virtual interface using <code>hanetconfig print</code> command. Specify an interface name displayed in the Interface List, and execute the command again. In addition, when you add the interface which does not exist on a definition, please specify <code>-f</code> option of the <code>hanetnic add</code> command, and execute the command again.
195	Standby patrol function could not started.	It is not possible to execute a standby patrol function.	Check that the system has already recognized all physical interfaces that configure a virtual interface to be monitored by a standby patrol function, and execute again.
196	Standby patrol function is defined.	A standby patrol function is already set.	Delete a standby patrol function of the corresponding virtual interface name, and execute again.
197	specified physical interface is already unlinked.	Activation of the specified physical interface is already deleted.	Using <code>dsphanet</code> command, check that the specified physical interface is not used yet.
198	address family of takeover IP address incompatible.	The specified address form of a takeover IP	Make an address form of a takeover IP address

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		address (an address family) is not compatible with that of a setting virtual interface.	compatible with that of a setting virtual interface and execute again.
199	invalid takeover IP address.	The specified takeover IP address is invalid.	Check a value of the specified takeover IP address and execute again.
200	invalid hostname or prefix value.	The specified host name or prefix value is invalid.	Check the specified host name or prefix value and execute again.
201	dual stack interface can not be specified.	It is not possible to specify a virtual interface of dual stack configuration.	Delete a definition of the corresponding virtual interface and define newly.
202	address family of polling IP address incompatible.	The specified address form of a monitor-to IP address (an address family) is not compatible with that of a setting virtual interface.	Make an address form of a monitor-to IP address compatible with that of a setting virtual interface and execute again.
203	interfaces defined as cluster resources still exist.	One or more virtual interfaces registered as cluster resources exist.	Delete the cluster resources and execute the command again.
204	interface defined as cluster resource is still active.	A virtual interface is active as cluster resources.	Stop RMS and execute again.
205	mode can't be changed for dual stack interface.	Mode can't be changed if the virtual IF is a dual stack.	Temporary delete the configuration information of the virtual interface and reconfigure.
206	mode can't be changed for IPv6 interface.	Mode cannot be changed if the virtual IF is IPv6.	Temporary delete the configuration information of the virtual interface and reconfigure.
207	order of physical interface is different or invalid physical interface name.	Order of the interfaces is incorrect or the name of the interface is invalid.	Check the contents of the interface and retry.
208	configuration is not defined.	Valid configuration information or monitoring target's information is not configured.	Configure the valid configuration information or monitoring target's information.
209	specified address family is not defined.	The virtual interface for the specified address family is not defined.	Match the specifying address family with the address family of the virtual interface defined in the configuration then retry.
210	invalid address family.	The specified address family does not match the address family of the virtual interface.	Match the specifying address family with the address family of the virtual interface defined in the configuration then retry.
211	invalid MAC address(multicast or broadcast).	The specified MAC address is invalid.	Specify a MAC address other than a multicast address or broadcast address.

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212	polling attribute of specified devicename cannot be changed individually.	The monitoring information of the virtual interface cannot be changed individually.	Specify the monitoring configuration value as changeable virtual interface that can be specified individually.
216	When polling address is one, HUB-HUB polling flag must be OFF.	When polling address is one, HUB-to-HUB polling flag must be set OFF.	Set two polling targets or set the flag OFF, then retry the operation.
217	specified physical interface is inactive.	The specified physical interface is inactive.	Ensure the hostname configuration file (/etc/sysconfig/network-scripts/ifcfg-interface) for the physical interface exists. If it does not exist, create a new configuration file including physical IP address or hostname and then reboot the system. After rebooting the system, execute the command. If the above file exists, run the following command: /sbin/ifconfig "interface name" "physical IP address". Then, execute the command again.
218	bundled interface does not exist.	A virtual interface bundling physical interface does not exist.	Ensure virtual interface bundling physical interface exists. Then re-execute the command.

**Message number 3xx**

<b>Message number</b>	<b>Message</b>	<b>Meaning</b>	<b>Action</b>
301	could not open configuration file.	Failed to open the configuration information file.	Check whether the creation of configuration information has been completed.
302	invalid interface name.	An invalid virtual interface name was found in configuration information.	Review the configuration information.
303	hostname is not specified.	The host name is not specified in the configuration information.	Review the configuration information.
304	invalid hostname.	An invalid host name is specified in configuration information.	Review the configuration information.
305	trunking interface list is not specified.	The bundled physical interface is not specified in configuration information.	Review the configuration information.
306	invalid interface count(max 8).	The number of physical interfaces to be bundled exceeds the preset value.	Specify 8 or fewer physical interfaces as the number of interfaces to be bundled.
307	interface name is already defined.	The virtual interface name you want to specify has already been defined in the configuration information.	Specify a virtual interface so that it does not conflict with the other interfaces in the configuration information, and execute the command again.
308	physical interface name is already defined.	The physical interface name that you want to bundle in a virtual interface has already defined.	Review the configuration information.
309	interface address is already defined.	The same IP address is specified for more than one virtual interface.	Review the configuration information.
310	invalid physical interface name.	An invalid physical interface name is specified in the configuration information.	Review the configuration information.
311	invalid file format.	An invalid file format was found in configuration information.	Execute the check command for the configuration information, and take the appropriate action according to the output message.
312	parent device name not found.	The configuration information does not contain the virtual interface with the logical virtual interface.	Review the configuration information.
313	invalid mode.	An invalid operation mode is specified in the configuration information.	Review the configuration information.
314	target is not defined.	The destination	Review the destination

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		information for monitoring does not contain the address information of the monitoring destination.	information for monitoring.
315	polling device is already defined.	The destination information for monitoring contains multiple specification entries with the same virtual interface name.	Review the destination information for monitoring.
316	same polling address are specified.	Primary/Secondary interfaces specified the same monitor-to address.	Review the destination information for monitoring.
317	interface name is not defined.	The virtual interface name is not specified in the destination information for monitoring.	Review the destination information for monitoring.
318	invalid device count(max 64).	The number of specified virtual interfaces exceeds 64.	Review the configuration information or destination information for monitoring.
319	Invalid logical device count(max 63).	The number of specified logical virtual interfaces exceeds 63 (i.e., the maximum number for one virtual interface).	Review the configuration information.
320	Configuration is invalid.	The configuration information contains invalid data.	Review the configuration information.
321	Configuration is not defined.	Failed to find valid configuration information or destination information for monitoring.	Define the settings for the configuration information or destination information for monitoring.
322	invalid define count(max 64).	The total of defined virtual interfaces and defined logical virtual interfaces exceeds 64 (i.e., the maximum number for definition).	Review the configuration information.
323	LogicalIP is already max.	The number of logical IP addresses exceeded the maximum defined number.	Review the configuration information.
324	current configuration is invalid.	No operation set can be created because the definition of the created operation set contains invalid information.	Review the operation set information.
325	invalid ping on/off.	ON/OFF information for monitoring is not specified in the operation set information.	Review the operation set information.
326	invalid logicalIP.	The logical IP address is invalid.	Review the configuration information.
327	LogicalIP is already defined.	The logical IP address has already been specified.	Review the configuration information.



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328	logicalIP not found.	The logical IP address was not found.	Review the configuration information.
329	primaryIF not found.	The primary interface was not found.	Review the configuration information.
330	invalid primaryIF.	The primary interface is invalid.	Review the configuration information.
331	physicalIP not found.	The physical IP address was not found.	Review the configuration information.
332	invalid physicalIP.	The physical IP address is invalid.	Review the configuration information.
333	primary polling address not found.	No monitoring destination address of the primary interface was found.	Review the monitoring destination information and configuration information.
334	invalid primary polling address.	The monitoring destination address of the primary interface is invalid.	Review the monitoring destination information and configuration information.
335	invalid secondaryIF.	The secondary interface is invalid.	Review the configuration information.
336	secondary polling address not found.	No monitoring destination address of the secondary interface was found.	Review the monitoring destination information and configuration information.
337	invalid secondary polling address.	The monitoring destination address of the secondary interface is invalid.	Review the monitoring destination information and configuration information.
338	HUB-HUB polling flag not found.	Whether HUB-to-HUB communication monitoring is performed is not specified.	Review the monitoring destination information and configuration information.
339	logicalIP equal physicalIP.	The same value is specified as the logical IP address and physical IP address.	Review the configuration information.
340	secondaryIF equal primaryIF.	The same value is specified as the primary interface and secondary interface.	Review the monitoring destination information and configuration information.
341	interface is already defined in another set.	An interface used in another operation set is specified.	Review the configuration information.
342	invalid HUB-HUB poll on/off.	There is an error in the specification indicating whether HUB-to-HUB communication monitoring is performed.	Review the monitoring destination information and configuration information.
343	physicalIP is already defined in another set.	A logical IP address used in another operation set is specified.	Review the configuration information.
344	polling information is different.	Different information is specified in the operation set sharing a physical interface.	Review the operation set information.

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345	cluster configuration is incomplete.	The transmission line monitoring cannot be started because the cluster system settings are incomplete.	Review the setting of a cluster system, and reboot a machine.
346	invalid client count.	The number of the clients is improper.	Execute the command again with the correct number of the clients.
347	client address is already defined.	Already defined the specified client address.	See the client definition information, specify an address not redundant, and execute again.
348	invalid client address.	The specified client address is improper.	Check the client address and execute the command again.
349	invalid PmgropelD.	The PM group ID is improper.	Check the PM group ID and execute the command again.
350	invalid network address.	The specified network address is improper.	Check the network address and execute the command again.
352	routed is not started.	Not yet activated a routing daemon (routed).	Change a system definition (check if or not there is /etc/defaultrouter file, change a name or delete it if exists) to activate a routing daemon (routed) and reboot the system.
353	invalid prefix value	A prefix value is invalid.	Check the specified IP address and previx value.
354	interface is specified redundantly.	Redundancy was found on the specified virtual interface.	Specify the valid virtual interface and re-execute the command again.
356	could not get polling information.	Failed to obtain polling information.	Configure the polling information and re-execute the command. If the same error occurs after re-executing the command, then collect appropriate logs for Redundant Line Control function and contact our system engineers with the reported error message.
358	the same network addresses are inappropriate.	The network addresses assigned between the interfaces cannot be the same network address.	Review the assigned IP address (hostname) and network mask (prefix length). The network addresses between must use different network address. Assign the different network addresses between the interfaces.
360	takeover ip address is not defined.	A takeover IP address is not set.	Review the setting of a Redundant Line Control Function and a cluster system.

## A.1 Messages Displayed by Redundant Line Control Function

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361	virtual interface is not defined.	A virtual interface is not set.	Review the setting of a Redundant Line Control Function and a cluster system.
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Message number 5xx

Message number	Message	Meaning	Action
501	socket() fail.	An error was found in the internal system call.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials necessary for examining a cluster system.
502	ioctl(SIOCGIFCONF) fail.	An error was found in the internal system call.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials necessary for examining a cluster system.
510	could not allocate memory.	An error was found in the internal system call.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials necessary for examining a cluster system.
511	could not open file.	An error was found in the internal system call.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system

A.1 Messages Displayed by Redundant Line Control Function

			engineer (SE).
512	could not read file.	An error was found in the internal system call.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
513	could not write file.	An error was found in the internal system call.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
514	open() fail.	An error was found in the internal system call.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
515	ioctl(SHAIOCSETPARAM) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
516	ioctl(I_PUNLINK) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
517	ioctl(SHAIOCGETLID) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a

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			Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
518	ioctl(I_PLINK) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
519	ioctl(SHAIOCPLUMB) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
525	ioctl(SHAIOCGETINFO) fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
538	total entry is negative value.	An unexpected error occurred during reading configuration information.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
539	ioctl(SHAIOCNODENAME) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake,

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			execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
540	ioctl(SHAIIOCIPADDR) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
541	ioctl(SHAIIOCSAP) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
542	ioctl(SHAIIOCDEBUG) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
543	ioctl(SHAIOCWATCHDOG) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
544	ioctl(SHAIOCDISCARD) fail.	An unexpected system	Check that there is no a

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		call error occurred.	mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
545	ioctl(SHAIOCMESAGE) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
546	unexpected error.	An unexpected system call error occurred.	Execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
547	ioctl(SIOCGIFFLAGS) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
548	ioctl(SIOCGIFNUM) fail.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
549	polling process is inactive.	An internal process was not executed.	Collect materials for examination of a



A.1 Messages Displayed by Redundant Line Control Function

			Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
550	opendir failed.	An unexpected system call error occurred.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
551	semaphore lock failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
552	semaphore unlock failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
553	shared memory attach failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
554	shared memory dettach failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
555	IPC key generate failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
556	get semaphore failed.	An error was found in the internal system call.	The following system resources are required for a Redundant Line Control Function: * semsys:seminfo_semmni (The maximum number of the semaphore identifiers) : One or greater * semsys:seminfo_semmns (The maximum number of the semaphores in a system) : One or greater If the values are not

			<p>sufficient, edit the kernel parameter file (/etc/system) and add the required value to the original parameter value.</p> <p>If the problem continues to occur after correcting the kernel parameter values, then there is a possibility that the semaphore identifier for the Redundant Line Control Function has already been used by another application. In such case, follow the procedure described below to use a different identifier:</p> <pre># cd /opt/FJSVhanet/etc/sbin # mv hanetctld hanetctld.org # cp hanetctld.org hanetctld # shutdown -r now</pre> <p>If the problem still remains even after the identifier has been changed, collect examination materials of a Redundant Line Control Function and contact a Fujitsu SE.</p>
557	get shared memory segment identifier failed.	An error was found in the internal system call.	<p>The following system resources are required for a Redundant Line Control Function:</p> <ul style="list-style-type: none"> <li>* shmsys:shminfo_shmmax (The maximum size of the shared memory segment) : 5120 or greater</li> <li>* shmsys:shminfo_shmmni (The maximum number of the shared memory segments) : two or greater</li> </ul> <p>If the values are not sufficient, edit the kernel parameter file (/etc/system) and add the required value to the original parameter value.</p> <p>Additionally, do not specify shmsys:shminfo_shmmin( minimum size of the shared memory segment).</p> <p>If the problem continues to occur after correcting the kernel parameter values, then there is a possibility that the shared memory identifier for the Redundant Line Control Function has already been used by another application. In such case, follow the procedure described below to use a different identifier:</p>

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			<pre># cd /opt/FJSV/hanet/etc/sbin # mv hanetselect hanetselect.org # cp hanetselect.org hanetselect</pre> <p>If the problem still remains even after the identifier has been changed, collect examination materials of a Redundant Line Control Function and contact a Fujitsu SE.</p>
558	control semaphore failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
559	internal error.	An internal error occurred.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
560	control shared memory failed.	An error was found in the internal system call.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
561	daemon process does not exist.	An internal error occurred.	If not rebooted after the installation, first reboot, then execute again. If the same message is output even after rebooted, collect materials for examination of a Redundant Line Control Function, and tell Fujitsu system engineer (SE) an error message.
562	failed to alloc memory.	Failed to acquire memory.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
563	failed to activate logicalIP.	An internal error occurred.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
564	failed to inactivate logicalIP.	An internal error occurred.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).

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565	ioctl(SHAIOCPATROLL) fail.	An error was found in the internal system call.	Execute the command again. If the same error message is output, contact a Fujitsu system engineer (SE) about the error message.
566	ether_aton() fail.	An error was found in the internal system call.	Check that there is no a mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute a command again. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
567	ioctl(SIOCGIFADDR) fail.	An error occurred in the internally used system call.	Check there is no mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute the command again. If the same phenomenon still occurs, collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
568	ioctl(SIOCGIFNETMASK) fail.	An error occurred in the internally used system call.	Check there is no mistake in the setting of a Redundant Line Control Function. After checked there is no mistake, execute the command again. If the same phenomenon still occurs, collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
569	could not communicate with daemon process.	Failed to communicate between a command and a daemon.	Collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
570	failed to get socket.	An error occurred in the internally used system call.	Collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
571	failed to send request.	An error occurred in the internally used system call.	Collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.

A.1 Messages Displayed by Redundant Line Control Function

572	failed to receive response.	An error occurred in the internally used system call.	Collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
573	request timeout.	An error occurred in the internally used system call.	Collect materials for examination of a Redundant Line Control Function, and tell Fujitsu SE an error message.
574	failed to delete virtual interface.	Failed to delete a virtual interface.	Execute the command again. If the same phenomenon still occurs, collect the examination materials of a Redundant Line Control Function and inform a Fujitsu SE about an error message.
575	failed to restart hanet.	Failed to reactivate a Redundant Line Control Function.	Execute the command again. If the same phenomenon still occurs, collect the examination materials of a Redundant Line Control Function and inform a Fujitsu SE about an error message.
576	failed to enable configuration.	An error has occurred while processing the configured values.	Restart the Redundant Line Control function; (/opt/FJSVhanet/usr/sbin/resethanet -s) and review the reflected configuration values. If the same error occurs after rebooting the system, then collect appropriate logs for Redundant Line Control function and contact our system engineers with the reported error message.
577	failed to create a directory.	Creation of a work directory failed when the command for collecting troubleshooting information was executed.	Check if a directory on which the troubleshooting information should be stored exists, and the user has access privileges. If there is nothing wrong with the above, execute the command again. If there are any problems, solve the problems then execute the command again.

**Message number 7xx**

<b>Message number</b>	<b>Message</b>	<b>Meaning</b>	<b>Action</b>
700	invalid network mask.	The specified subnet mask is invalid.	Specify the correct subnet mask and retry.
701	ipv6 module is not loaded.	ipv6 module is not loaded.	Configure the system to load ipv6 module during the system startup and then reboot the system.

### A.1.3 Console output messages (numbers 800 to 900)

The following describes the messages output on the console by Redundant Line Control Function, explanation, and operator response.

#### Message number 8xx

Message number	Message	Meaning	Action
800	line status changed: Link Down at TRUNKING mode (interface on devicename, target=host_name)	An error occurred in the communication with the remote host system (host_name) using the physical interface (interface) controlled by the virtual interface (devicename) that is operating in the Fast switching mode.	Check whether an error has occurred on the communication path to the remote host system.
801	line status changed: Link Up at TRUNKING mode (interface on devicename, target=host_name)	The communication with the remote host system (host_name) using the physical interface (interface) controlled by the virtual interface (devicename) is recovered.	No action is required.
802	file open failed.	Failed to open the file.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
803	file read failed.	Failed to read the file.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
804	pipe create failed.	Failed to create the internal communication pipe.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
805	internal error.	An internal error occurred.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
806	cannot get my process id	Failed to obtain the local process ID.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
814	cannot up interface.	Failed to up the virtual interface.	Collect materials for examination of a Redundant Line Control

Appendix A Messages and corrective actions

			Function, and tell an error message to Fujitsu system engineer (SE).
815	sha device open failed.	Failed to open the "sha" driver.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
816	ioctl(SHAIOCSETRSCMON) failed.	Failed to send the monitor start request.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
817	CIOpen failed.	The connection to the cluster failed.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials necessary for examining a cluster system.
822	no data in cluster event.	No data was found in the cluster event.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials necessary for examining a cluster system.
823	CISetStat failed.	The cluster resource status could not be set.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual of a cluster system as to the materials



A.1 Messages Displayed by Redundant Line Control Function

			necessary for examining a cluster system.
824	directory open failed.	Failed to open the directory.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
825	signal send failed.	Failed to send the signal.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
826	command can be executed only with super-user.	The execution-time authority is invalid.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
827	could not allocate memory.	Failed to obtain the memory.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
828	fork failed.	The fork () failed.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
829	child process execute failed.	Failed to generate the child process.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
830	getmsg failed.	Failed to receive the data from the "sha" driver.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
831	shared library address get failed.	Failed to obtain the shared library address.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
832	poll failed.	The poll () failed.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
833	ioctl(SHAIOCSETIPADDR) failed.	Failed to notify the IP address.	Collect materials for examination of a

Appendix A Messages and corrective actions

			Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
834	interface does not exist.	The interface defined in NIC switching mode does not exist.	Please check that there is no error in the definition of a Redundant Line Control Function, and the definition of a system. Moreover, please check about the existence of the corresponding interface using the ifconfig command. When abnormalities cannot be discovered, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
845	could not restart routed.	Failed to restart the routing daemon. The HUB monitoring function is stopped and cluster switching is performed.	Check that there is no mistake in the setting of a system, a Redundant Line Control Function, and a cluster system. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual as to the materials necessary for examining a cluster system.
846	could not restart rdisc.	Failed to restart the router discovery daemon. The HUB monitoring function is stopped and cluster switching is performed.	Check that there is no mistake in the setting of a system, a Redundant Line Control Function, and a cluster system. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual as to the materials necessary for examining a cluster system.
847	internal error retry over. polling stop.	A HUB monitoring internal error occurred. The HUB monitoring is stopped.	Check that there is no mistake in the setting of a system, a Redundant Line Control Function, and a cluster system. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control

## A.1 Messages Displayed by Redundant Line Control Function

			Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual as to the materials necessary for examining a cluster system.
848	device is inactive. polling stop.	The virtual interface for HUB monitoring is not activated. The HUB monitoring function is disabled.	Activate the virtual interface. Then, inactivate and activate the HUB monitoring function. This message may be displayed when cluster switching occurs during cluster operation, but in this case, no action is needed.
849	poll fail retry over. polling stop.	The transmission line failed as many times as specified by the retry count consecutively. The HUB monitoring function is disabled.	Check the line failure. After checking the line recovery, inactivate and activate the HUB monitoring function.
850	cannot down interface.	Failed to inactivate the physical interface.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
851	primary polling failed. lip=logicalIP, target=pollip.	An error of path to the primary monitoring destination was detected in the initial check of the physical interface. LogicalIP: Logical IP Pollip: Monitoring destination IP	Check for any failure on the communication path to the monitoring destination.
852	secondary polling failed. lip=logicalIP, target=pollip.	An error of path to the secondary monitoring destination was detected in the initial check of the physical interface. LogicalIP: Logical IP, pollip: Monitoring destination IP	Check for any failure on the communication path to the monitoring destination.
853	physical interface up failed.	Failed to activate a physical interface.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).

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854	logical interface up failed.	Failed to activate a logical interface.	Check that there is no mistake in the setting of a Redundant Line Control Function and a cluster system. If there is no mistake, collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
855	cluster logical interface is not found.	The logical interface registered with the cluster was not found.	Check that there is no mistake in the setting of a system, a Redundant Line Control Function, and a cluster system. If the same phenomenon occurs, collect materials for examination of a Redundant Line Control Function and a cluster system, and tell an error message to Fujitsu system engineer (SE). See the manual as to the materials necessary for examining a cluster system.
856	cluster configuration is incomplete.	The logical IP address cannot be activated because the cluster settings are incomplete.	Review the cluster system settings, and reboot the system
857	polling information is not defined.	Monitoring destination information is not defined.	Define monitoring destination information using the hanetpoll command.
860	interface does not exist.	There is no interface which NIC switching mode is using.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
861	cannot set interface flags.	The flag operation to an interface in use became failure.	Collect materials for examination of a Redundant Line Control Function, and tell an error message to Fujitsu system engineer (SE).
870	polling status changed: Primary polling failed. (ifname,target=pollip)	Line monitoring on the primary side failed. ifname: Interface name, pollip: Monitoring destination address	Check for any failure on the communication path to the monitoring destination.
871	polling status changed: Secondary polling failed. (ifname,target=pollip)	Line monitoring on the secondary side failed. ifname: Interface name, pollip: Monitoring destination address	Check for any failure on the communication path to the monitoring destination. If monitoring stopped after checking the recovery of the communication path, make a HUB monitoring function invalid and valid

A.1 Messages Displayed by Redundant Line Control Function

			using the hanetpoll command. If monitoring fails even though possible to communicate normally, tune the intervals and the number of the times of monitoring, and the time to wait for a linkup with the hanetpoll command.
872	polling status changed: PrimaryHUB to SecondaryHUB polling failed. (ifname,target=pollip)	HUB-to-HUB communication monitoring on the primary side failed. ifname: Interface name, pollip: Monitoring destination address	Check for any failure on the communication path to the monitoring destination.
873	polling status changed: SecondaryHUB to PrimaryHUB polling failed. (ifname,target=pollip)	HUB-to-HUB communication monitoring on the secondary side failed. ifname: Interface name, pollip: Monitoring destination address	Check for any failure on the communication path to the monitoring destination.
874	polling status changed: HUB repair (target=pollip)	Line failure in HUB-to-HUB communication monitoring was repaired. pollip: Monitoring destination address	No action is required.
875	standby interface failed.(ifname)	An error involving standby interface was detected in the standby patrol. ifname: Interface name	Check that there is no error in a transfer route of the standby side. When it takes long time to link up, occasionally a recovery message is output immediately after this message is output. In this case, a transfer route of the standby side is normal. Therefore, it is not necessary to deal with.
876	node status is noticed.(sourceip:status)	A node status change was notified from the remote system. sourceip: Source address, status: Notified status	Check the status of the source.
877	route error is noticed.(sourceip)	A communication path failure was notified from the remote system. sourceip: Source address	Check for any failure on the communication path to the source.
878	route error is detected.(target=IP)	A communication path failure was detected from the remote system. IP: Remote system address	Check for any failure on the communication path to the source.
880	failed to send node down notice by time out. (dstip)	Node status notification failed due to timeout. dstip: Destination address	Check for any failure of the remote system and on the communication path to the remote system.
881	semaphore is broken.	Creates a semaphore again because it is	It is not necessary to deal

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	(errno)	deleted.	with.
882	shared memory is broken. (errno)	Creates a shared memory again because it is deleted.	It is not necessary to deal with.
883	activation of a wrong interface has been detected. (ifname)	Since the interface was unjustly activated by the user, the state of an interface is restored. ifname: interface name	Check that the interface has been recovered correctly. In addition, when this message is displayed to the user operating nothing, please investigate the cause of the abnormality occurred.
884	unexpected interface deactivation has been detected. (ifname)	Since the interface was unjustly deactivated by the user, the state of an interface is restored. ifname: interface name	Check that the interface has been recovered correctly. In addition, when this message is displayed to the user operating nothing, please investigate the cause of the abnormality occurred.
885	standby interface recovered.(ifname)	The remote system interface recovered. ifname: Source address	It is not necessary to deal with.
886	recover from route error is noticed.(ifname)	The recovery was notified from the remote system. ifname: Interface name	It is not necessary to deal with.
887	recover from route error is detected. (target=IP)	The recovery of the remote system was detected. IP: Remote system address	It is not necessary to deal with.
888	interface is activated. (ifname)	The physical interface was activated. ifname: Interface name	It is not necessary to deal with.
889	interface is inactivated. (ifname)	The physical interface was inactivated. ifname: Interface name	It is not necessary to deal with.
890	logical IP address is activated. (logicalIP)	The logical IP address was activated. logicalIP: Logical IP	It is not necessary to deal with.
891	logical IP address is inactivated. (logicalIP)	The logical IP address was inactivated. logicalIP: Logical IP	It is not necessary to deal with.
892	logical virtual interface is activated. (ifname)	The logical virtual interface was activated. ifname: Interface name	It is not necessary to deal with.
893	logical virtual interface is inactivated. (ifname)	The logical virtual interface was inactivated. ifname: Interface name	It is not necessary to deal with.
894	virtual interface is activated. (ifname)	The virtual interface was activated. ifname: Interface name	It is not necessary to deal with.
895	virtual interface is inactivated. (ifname)	The virtual interface was inactivated. ifname: Interface name	It is not necessary to deal with.

A.1 Messages Displayed by Redundant Line Control Function

896	path to standby interface is established. (ifname)	Monitoring by standby patrol started normally. Ifname: A name of a standby patrol interface.	It is not necessary to deal with.
897	immediate exchange to primary interface is canceled. (ifname)	Restrained prompt failback to the primary interface by standby patrol. ifname: A name of an interface. This message is output when the monitor-to information to set by a hanetpoll create command is other than HUB.	It is not necessary to deal with. When executing prompt failback, use a hanetpoll modify command and change the monitor-to information to a host name or an IP address of HUB.
898	unexpected interface flags have been detected. (ifname) (code)	Since the interface was unjustly changed by the user, the state of an interface is restored. ifname: interface name code: detailed code	Check that the interface has been recovered correctly. In addition, when this message is displayed to the user operating nothing, please investigate the cause of the interface flag change.
899	route to polling address is inconsistent.	The network address defined to virtual interface and monitoring target is not the same, or since inappropriate routing information was registered into routing table, the mistaken monitoring is performed.	Please correct, when you check monitoring target address and there is an error. When there is no error in monitoring target address, please check whether inappropriate routing information is registered into the routing table.

**Message number 9xx**

Message number	Message	Meaning	Action
990	line status changed: all lines disabled: (devicename: interface1=Down, interface2=Down, ...)	In Fast switching mode, it is not possible to continue communicating with the other end host because all physical interfaces (interfaceN) bundled by a virtual interface in operation (devicename) became Down.	Check if or not there is any error in a transfer route of communication to the other end host for all physical interfaces.
991	line status changed: some lines in operation: (devicename: interface1=[Up Down], interface2=[Up Down], ...)	In Fast switching mode, part of the physical interfaces (interfaceN) bundled by a virtual interface in operation (devicename) became Down (or Up).	Check if or not there is any error in a transfer route of communication to the other end host for physical interfaces in Down status.
992	line status changed: all lines enabled: (devicename: interface1=Up, interface2=Up, ...)	In Fast switching mode, all physical interfaces (interfaceN) bundled by a virtual interface in operation (devicename) became Up and communication with the other end host recovered.	No action is required.



### A.1.4 Internal information output messages (no message number)

The following describes the messages to output the internal information of Redundant Line Control Function to `/var/log/messages`, and their meaning.

Message number	Message	Meaning	Action
-	update cluster resource status.	To update the state of the cluster resources.	No action is required.
-	receive message from sha driver.	Received a message from an SHA driver.	No action is required.
-	receive event from cluster:	Received an event from the cluster management.	No action is required.
-	polling	To control a monitoring function.	No action is required.
-	routed killed.	To terminate an routed daemon process.	No action is required.
-	rdisc killed.	To terminate an rdisc daemon process.	No action is required.
-	ripd killed.	To terminate an ripd daemon process.	No action is required.
-	child proc exit.	A monitoring process terminated.	No action is required.



# Appendix B Examples of configuring system environments

This appendix explains how to configure the system environment with redundant network control.

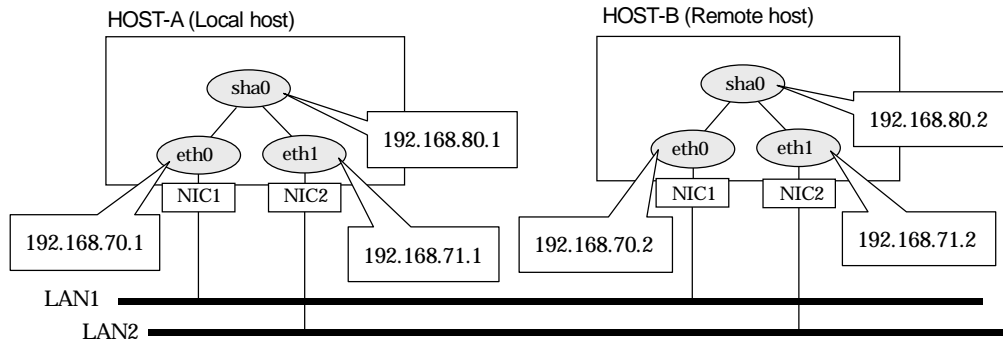


## B.1 Example of configuring Fast switching mode (IPv4)

### B.1.1 Example of the Single system

This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet
```

# [HOST-B]

## 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

5) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet
```

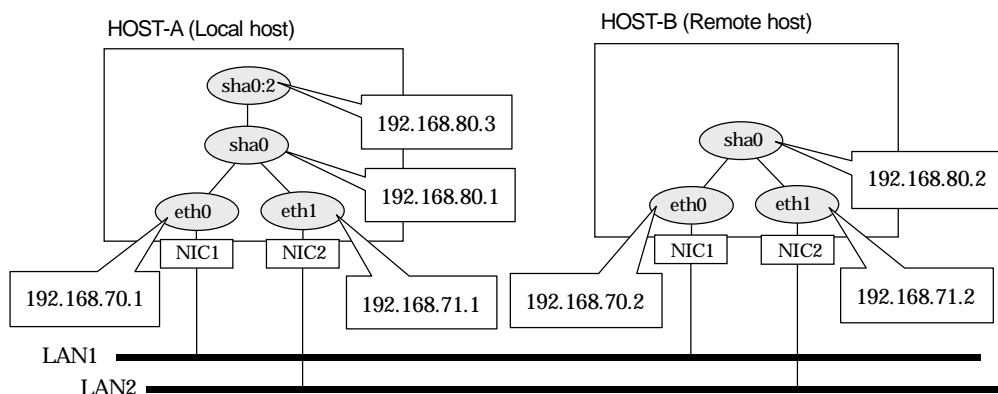




## B.1.2 Example of the Single system in Logical virtual interface

This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.80.3    hosta1  # HOST-A Logical virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Creating of logical virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0:2 -i 192.168.80.3
```

## 6) Activating of virtual interface and logical virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

## 5) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet
```



### B.1.3 Example of the Cluster system (1:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

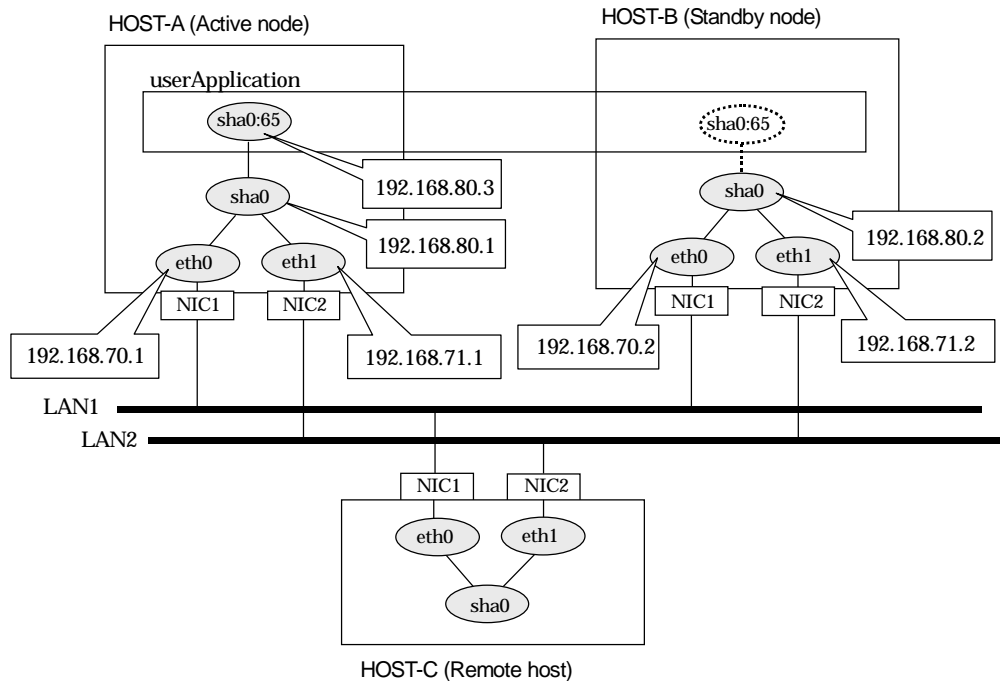
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.1.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
192.168.80.3    hosta1 # HOST-A/B Takeover virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
```

```
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.3
```

# [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
```

```
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.3
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.





## B.1.4 Example of the Cluster system (Mutual Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

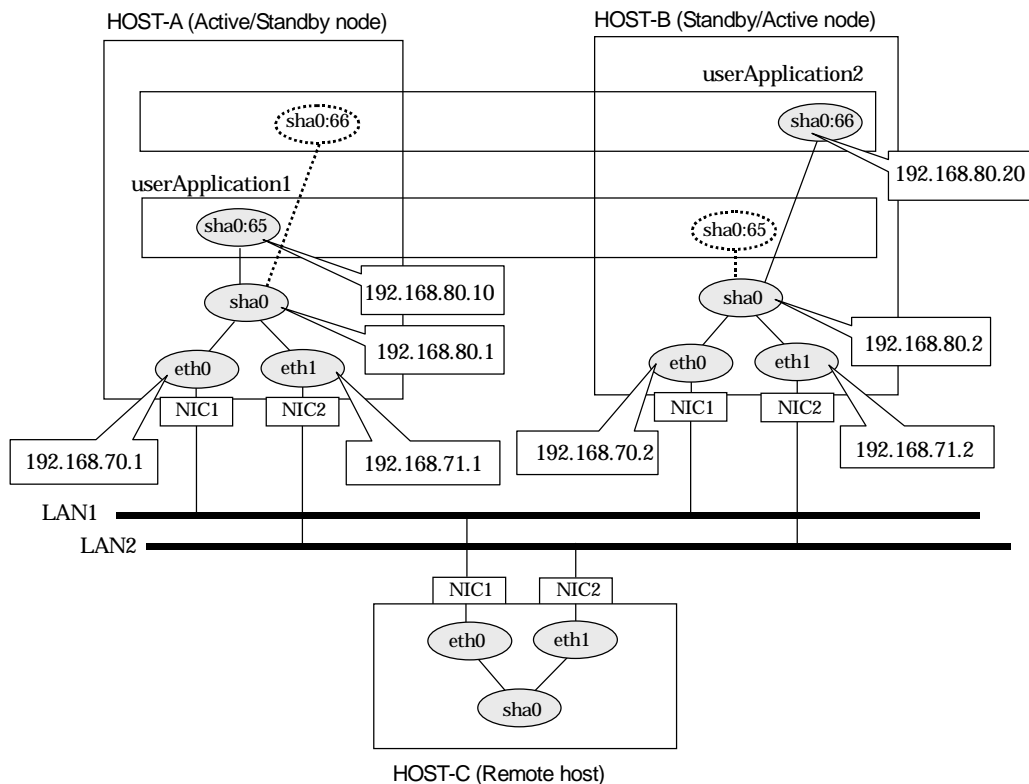
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.1.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
192.168.80.10  hosta1 # HOST-A/B Takeover virtual IP
192.168.80.20  hostb1 # HOST-A/B Takeover virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.1.5 Example of the Cluster system (N:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

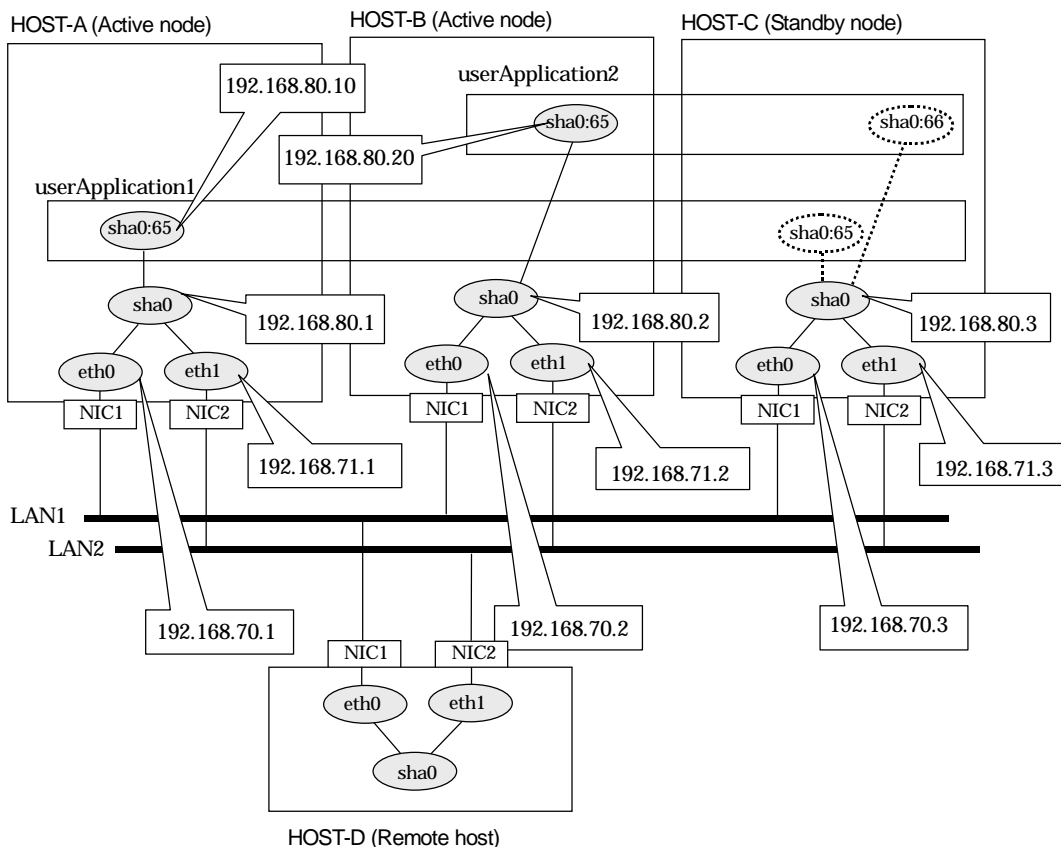
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.1.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```

192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
192.168.70.3    host31 # HOST-C Physical IP
192.168.71.3    host32 # HOST-C Physical IP
192.168.80.3    hostc  # HOST-C Virtual IP
192.168.80.10   hosta1 # HOST-A/C Takeover virtual IP
192.168.80.20   hostb1 # HOST-B/C Takeover virtual IP

```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
```

```
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJShanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJShanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJShanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20
```

## [HOST-C]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
```

```
IPADDR=192.168.71.3
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify `eth0` and `eth1` are active using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.3 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10
```

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring `HOST-A`, `HOST-B`, and `HOST-C`, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.1.6 Example of the Cluster system (Cascade)

This section describes an example configuration procedure of the network shown in the diagram below.

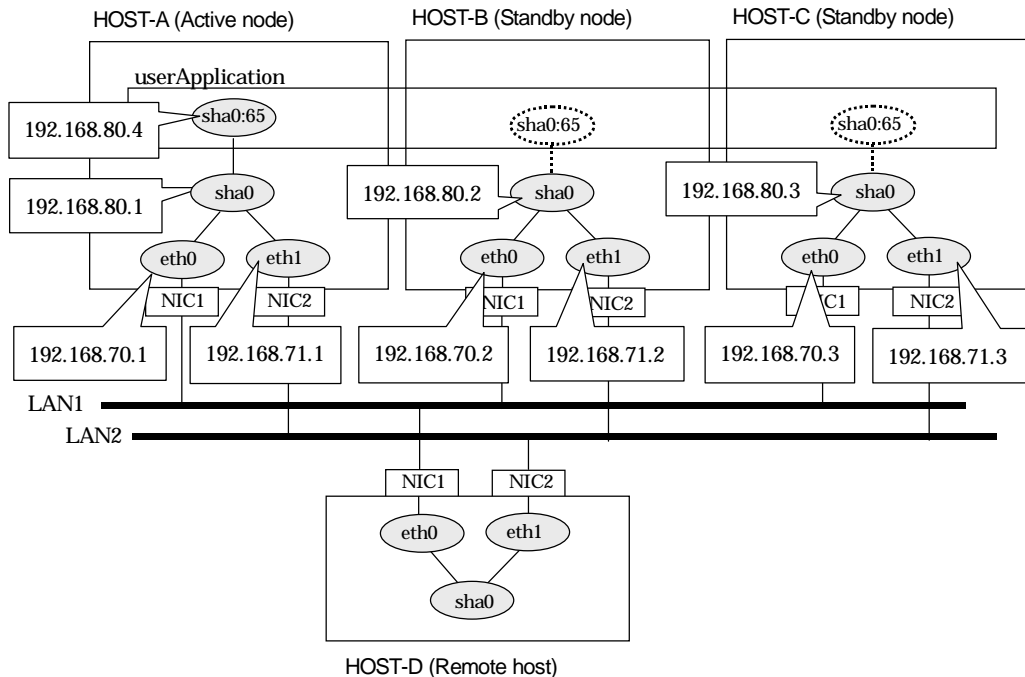
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.1.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  host11 # HOST-A Physical IP
192.168.71.1  host12 # HOST-A Physical IP
192.168.80.1  hosta  # HOST-A Virtual IP
192.168.70.2  host21 # HOST-B Physical IP
192.168.71.2  host22 # HOST-B Physical IP
192.168.80.2  hostb  # HOST-B Virtual IP
192.168.70.3  host31 # HOST-C Physical IP
192.168.71.3  host32 # HOST-C Physical IP
192.168.80.3  hostc  # HOST-C Virtual IP
192.168.80.4  hosta1 # HOST-A/B/C Takeover virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
```

```
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.4
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsc create -n sha0 -i 192.168.80.4
```

## [HOST-C]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.3
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are active using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.3 -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.4
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

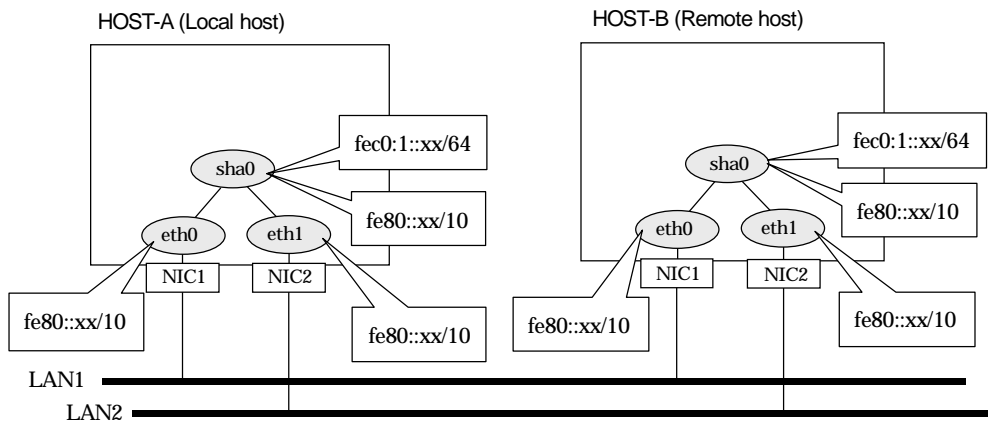
## B.2 Example of configuring Fast switching mode (IPv6)

### B.2.1 Example of the Single system

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

1-1) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-2) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

##### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

### 4) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

### 5) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

### 1) Setting up the system

1-1) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-2) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 5) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```



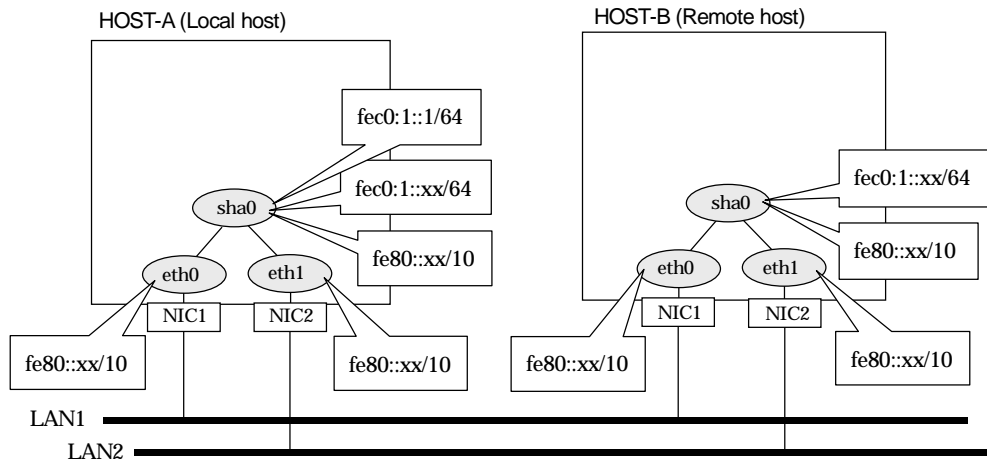


## B.2.2 Example of the Single system in Logical virtual interface

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



### [HOST-A]

#### 1) Setting up the system

- 1-1) Define an address for logical virtual IP and host name in /etc/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0::1      v6hosta1  # HOST-A Logical virtual IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

#### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

### 4) Creating of logical virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0:2 -i fec0:1::1/64
```

### 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPv6_FORWARD=yes
```

### 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

### 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify `eth0` and `eth1` are enabled as an IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Setting up IPv6 routers

Create `/etc/radvd.conf` file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of `radvd`, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 5) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```



### B.2.3 Example of the Cluster system (1:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

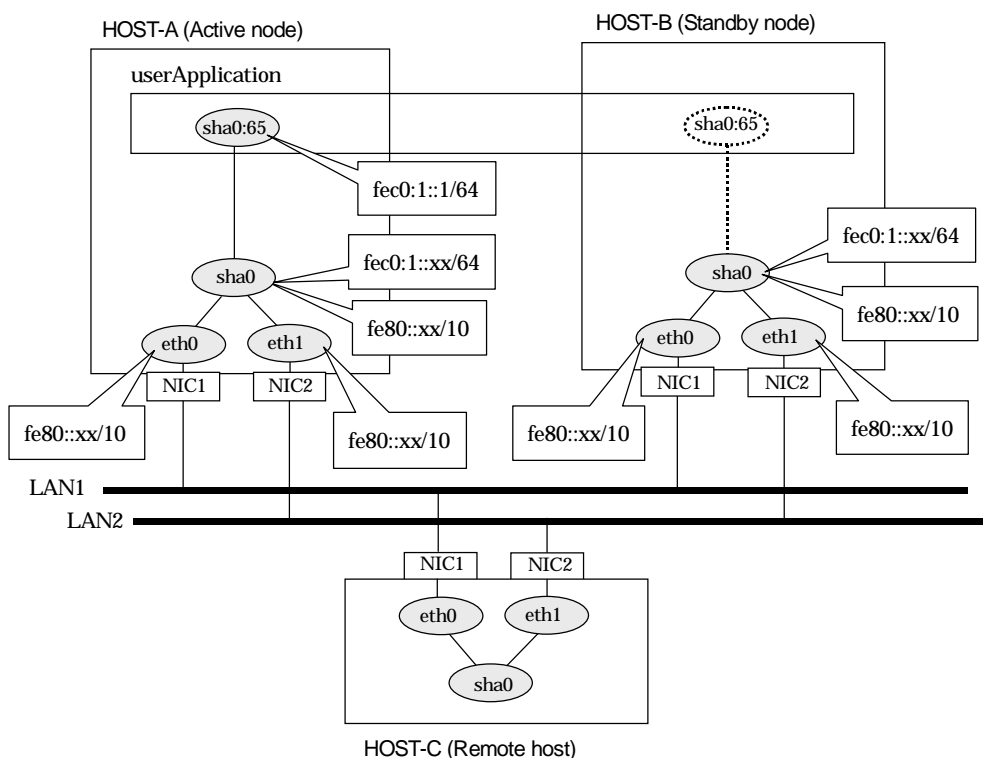
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.2.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

- 1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1    v6hosta1    # HOST-A/B Takeover virtual IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

## 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



## Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a Gls resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.2.4 Example of the Cluster system (Mutual standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

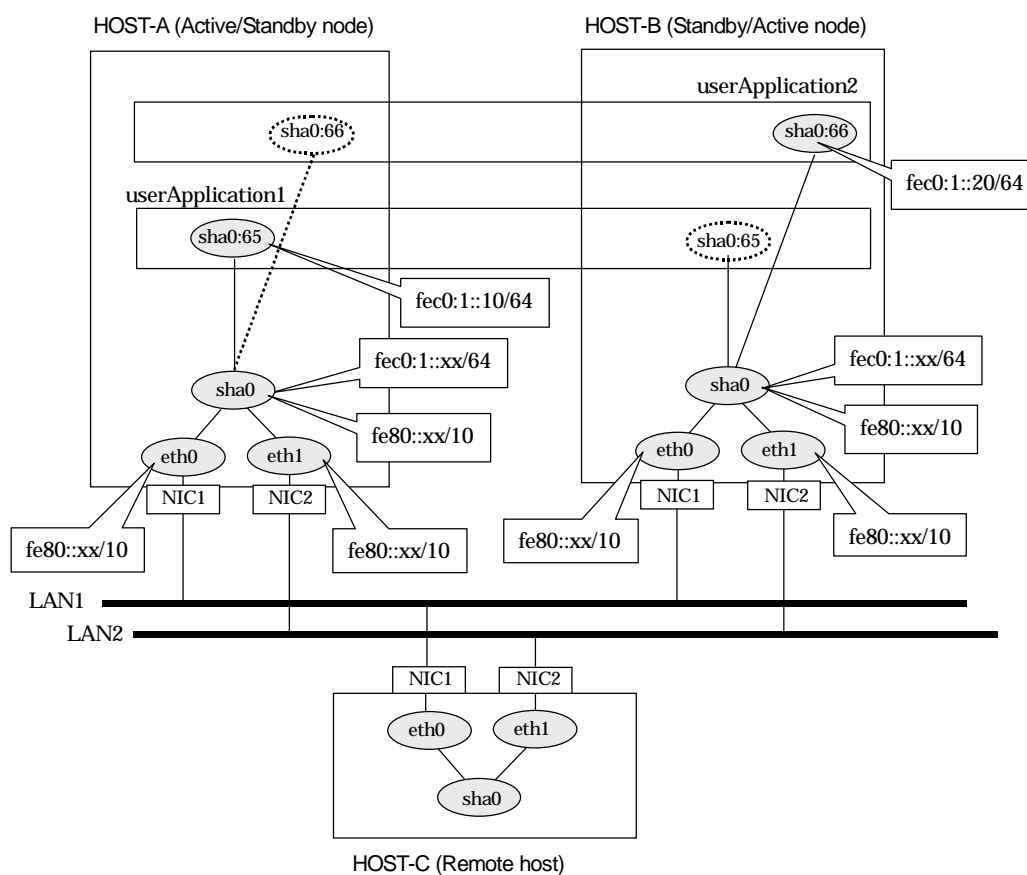
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.2.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

- 1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::10    v6hosta1  # HOST-A/B Takeover virtual IP
fec0:1::20    v6hostb1  # HOST-A/B Takeover virtual IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::10/64
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::20/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

## 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i fec0:1::10/64
```

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i fec0:1::20/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is

recommended to setup at least two IPv6 routers.  
Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

## B.2.5 Example of the Cluster system (N:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The values for xx, and yy in the IP address of the figure below are assigned automatically by the automatic address configuration.

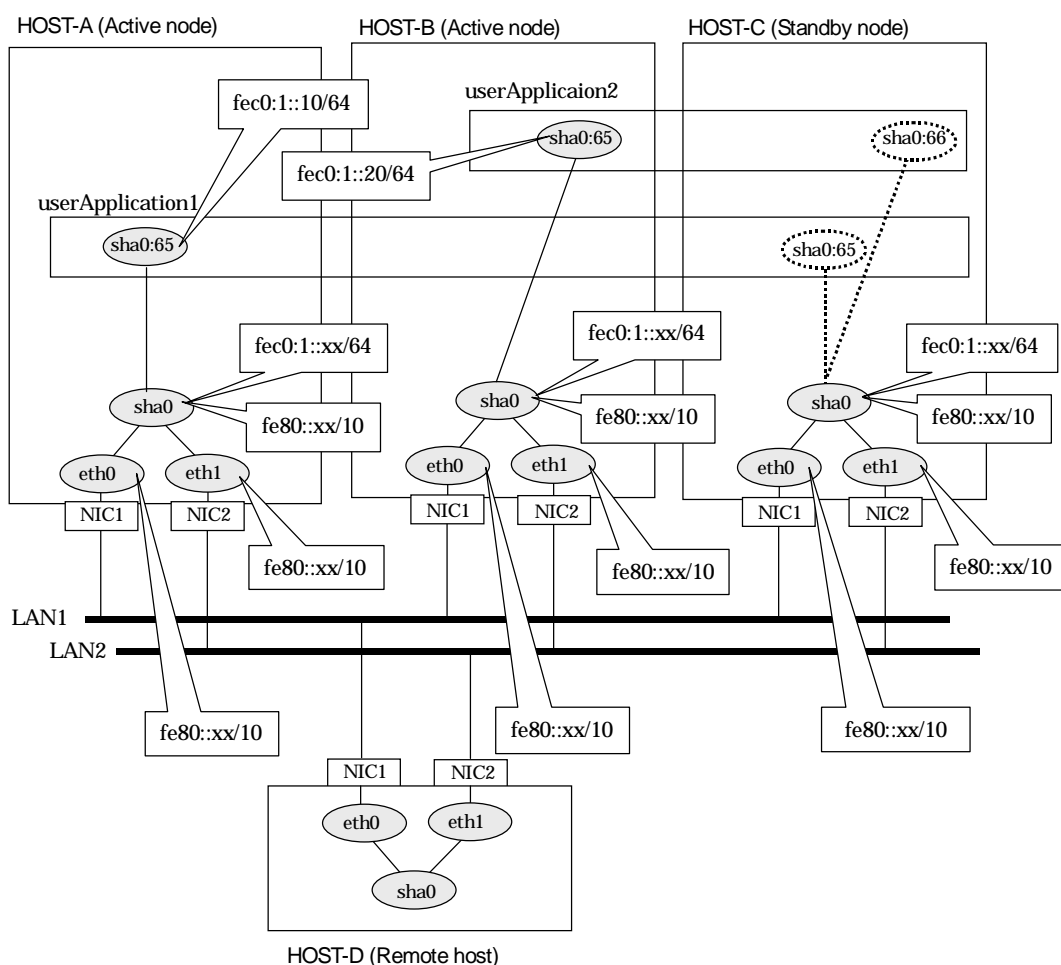
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.2.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

- 1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

fec0:1::10	v6hosta1	# HOST-A/C Takeover virtual IP
fec0:1::20	v6hostb1	# HOST-B/C Takeover virtual IP

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::10/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

### [HOST-B]

#### 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

#### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

#### 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

#### 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::20/64
```

#### 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPv6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-C]

### 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in `/etc/hosts` file. Defined content is same as HOST-A.

1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify `eth0` and `eth1` are enabled as an IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

### 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

### 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i fec0:1::10/64
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i fec0:1::20/64
```



## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.2.6 Example of the Cluster system (Cascade)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

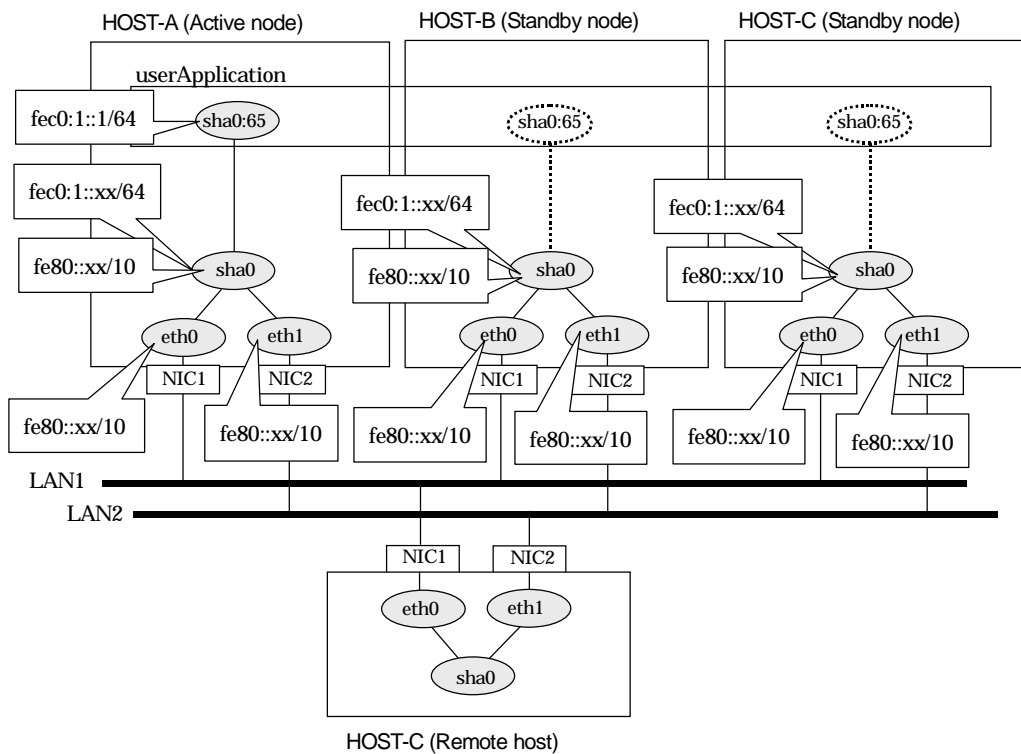
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.2.1 Example of the single system".



### [HOST-A]

#### 1) Setting up the system

- 1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1      v6hosta1  # HOST-A/B/C Takeover virtual IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

## 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-C]

### 1) Setting up the system

1-1) Define an address for takeover virtual IP and host name in /etc/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

### 4) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i fec0:1::1/64
```

### 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
    }
}
```

```
AdvRouterAddr on;  
};  
};
```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.





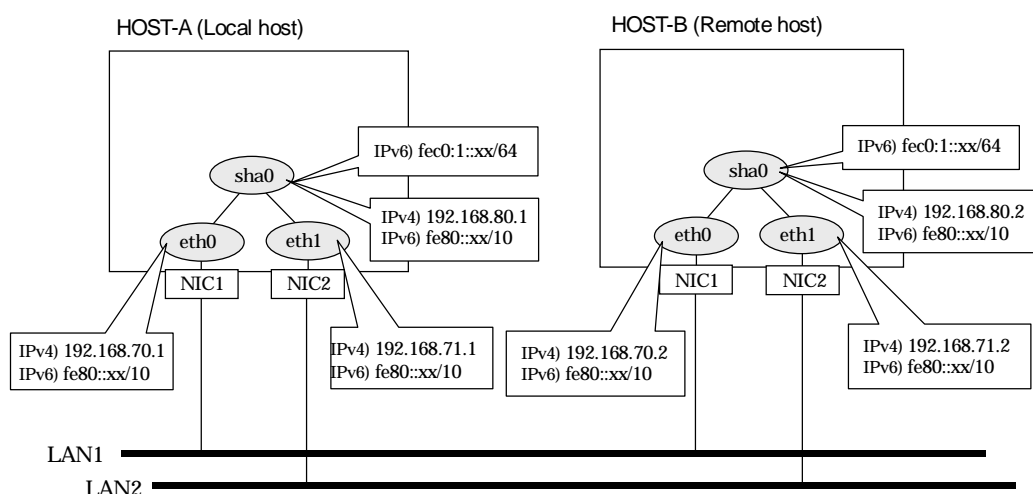
## B.3 Example of configuring Fast switching mode (IPv4/IPv6)

### B.3.1 Example of the Single system

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system

```
/sbin/shutdown -r now
```

### [HOST-B]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

#### 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

#### 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

#### 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

#### 5) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
```

```
MinRtrAdvInterval 3;
MaxRtrAdvInterval 10;
prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
{
    AdvOnLink on;
    AdvAutonomous on;
    AdvRouterAddr on;
};
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 6) Reboot

Run the following command and reboot the system.

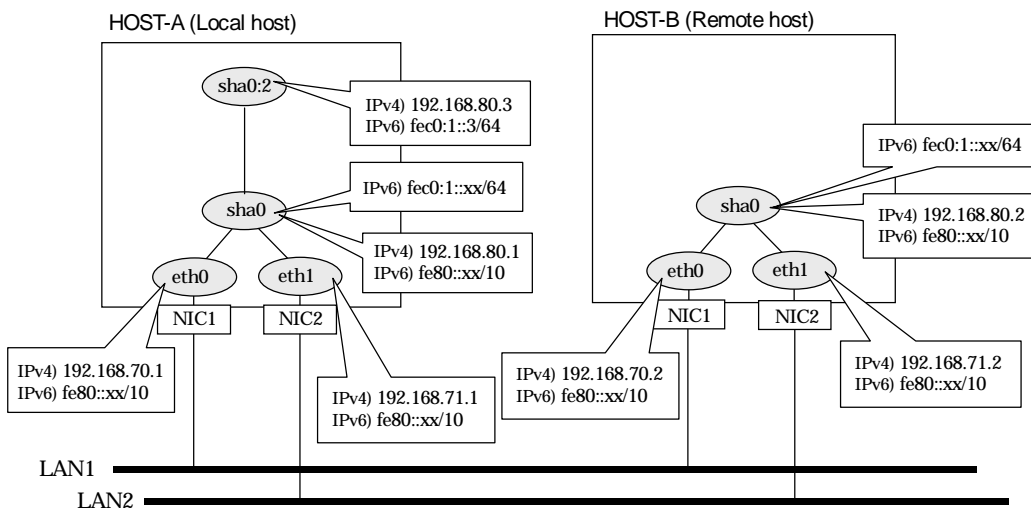
```
/sbin/shutdown -r now
```

### B.3.2 Example of the Single system in Logical virtual interface

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.80.3    hosta1 # HOST-A Logical virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
fec0:1::3      v6hosta1 # HOST-A Logical virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify `eth0` and `eth1` are enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of logical virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0:2 -i 192.168.80.3
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0:2 -i fec0:1::3/64
```

## 6) Setting up IPv6 routers

Create `/etc/radvd.conf` file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of `radvd`, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

**[HOST-B]****1) Setting up the system**

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Setting a subnet mask**

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

**4) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
```

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

**5) Setting up IPv6 routers**

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
```

```
AdvAutonomous on;  
AdvRouterAddr on;  
};  
};
```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual.

## 6) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```



### B.3.3 Example of the Cluster system (1:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

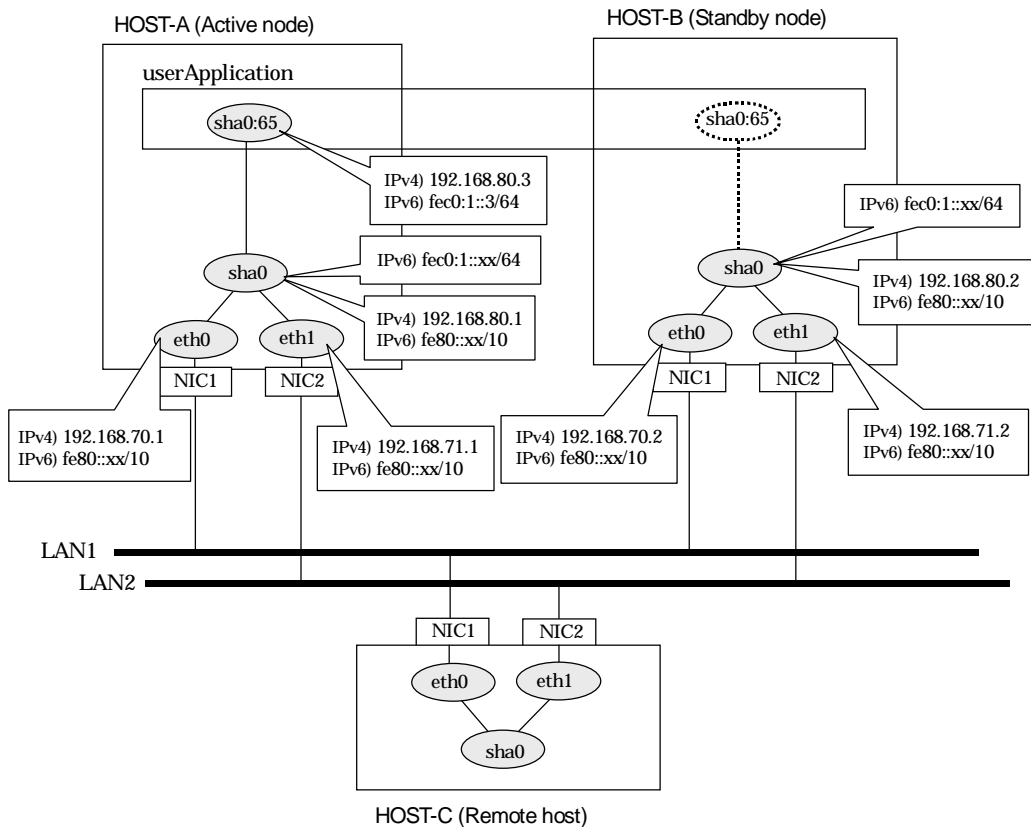
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.3.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```

192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
192.168.80.3    hosta1 # HOST-A/B Takeover virtual IP
fec0:1::3      v6hosta1 # HOST-A/B Takeover virtual IP
    
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.3, fec0:1::3/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

};

**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers. Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPv6_FORWARD=yes
```

**7) Reboot**

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

**[HOST-B]****1) Setting up the system**

1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify `eth0` and `eth1` are enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.3, fec0:1::3/64
```

6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

7) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

### B.3.4 Example of the Cluster system (Mutual standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

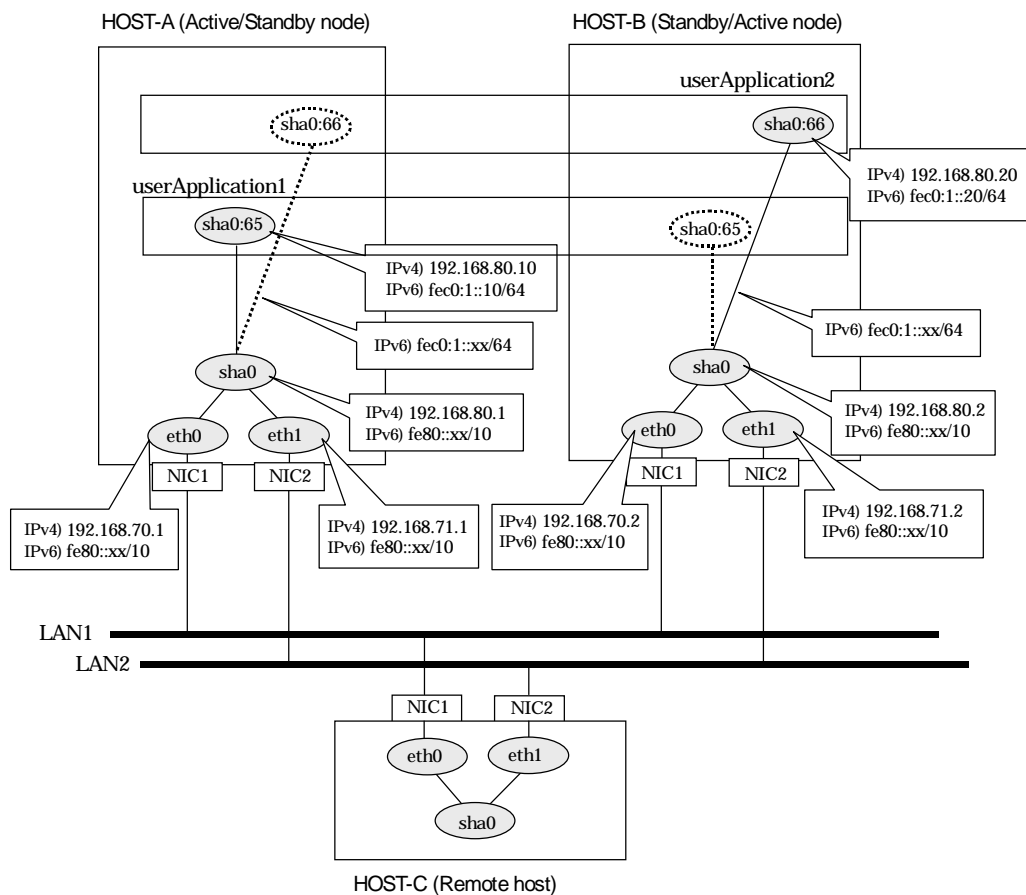
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.3.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

192.168.70.1	host11	# HOST-A Physical IP
192.168.71.1	host12	# HOST-A Physical IP
192.168.80.1	hosta	# HOST-A Virtual IP
192.168.70.2	host21	# HOST-B Physical IP
192.168.71.2	host22	# HOST-B Physical IP
192.168.80.2	hostb	# HOST-B Virtual IP
192.168.80.10	hosta1	# HOST-A/B Takeover virtual IP

```
192.168.80.20 hostb1 # HOST-A/B Takeover virtual IP
fec0:1::10 v6hosta1 # HOST-A/B Takeover virtual IP
fec0:1::20 v6hostb1 # HOST-A/B Takeover virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10,fec0:1::10/64
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20,fec0:1::20/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
}
```

```

AdvOnLink on;
AdvAutonomous on;
AdvRouterAddr on;
};

```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```

DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet

```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```

DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet

```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```

NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no

```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10, fec0:1::10/64
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20, fec0:1::20/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



### B.3.5 Example of the Cluster system (N:1 Standby)

This section describes an example configuration procedure of the network shown in the diagram below.

The values for xx in the IP address of the figure below are assigned automatically by the automatic address configuration.

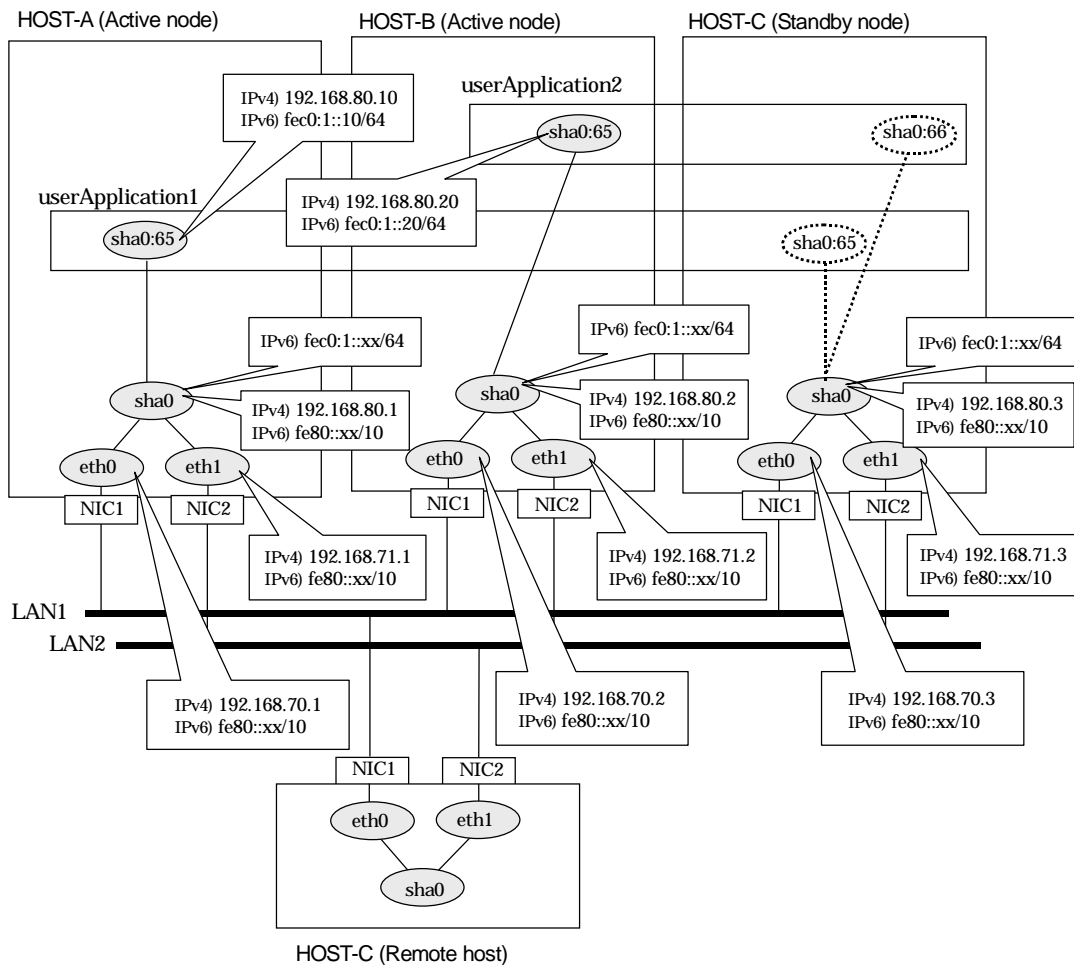
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.3.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    host11 # HOST-A Physical IP
192.168.71.1    host12 # HOST-A Physical IP
192.168.80.1    hosta  # HOST-A Virtual IP
```

```

192.168.70.2    host21 # HOST-B Physical IP
192.168.71.2    host22 # HOST-B Physical IP
192.168.80.2    hostb  # HOST-B Virtual IP
192.168.70.3    host31 # HOST-C Physical IP
192.168.71.3    host32 # HOST-C Physical IP
192.168.80.3    hostc  # HOST-C Virtual IP
192.168.80.10   hosta1 # HOST-A/C Takeover virtual IP
192.168.80.20   hostb1 # HOST-B/C Takeover virtual IP
fec0:1::10      v6hosta1 # HOST-A/C Takeover virtual IP
fec0:1::20      v6hostb1 # HOST-B/C Takeover virtual IP
    
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```

DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
    
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```

DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
    
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```

NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
    
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```

/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
    
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.10,fec0:1::10/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
```

```
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify `eth0` and `eth1` are enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.20,fe0:1::20/64
```

## 6) Setting up IPv6 routers

Create `/etc/radvd.conf` file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of `radvd`, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-C]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.3
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i 192.168.80.10, fec0:1::10/64
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0 -i 192.168.80.20, fec0:1::20/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    }
}
```

```
};  
};
```



**Note**

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a Gls resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

### B.3.6 Example of the Cluster system (Cascade)

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

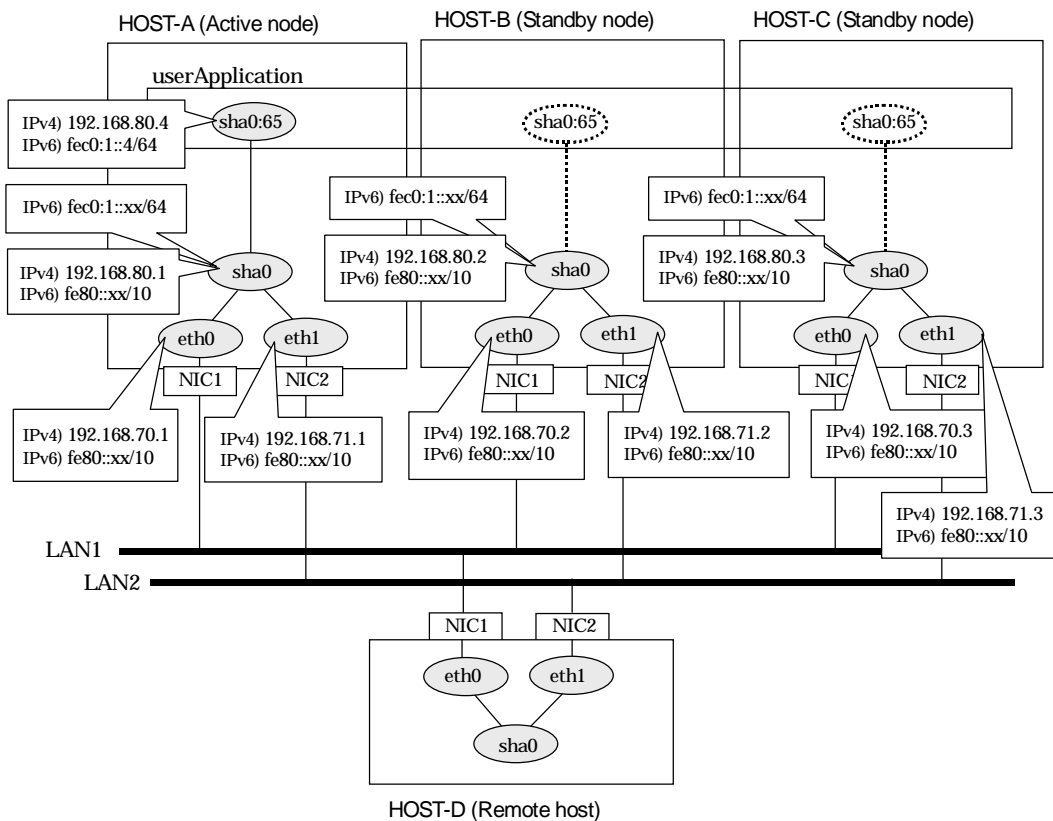
For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.

You need at least a remote host using Fast switching mode other than a node used for configuring a Cluster system. For details on configuring a remote host, refer to "B.3.1 Example of the single system".



#### [HOST-A]

##### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

192.168.70.1	host11	# HOST-A Physical IP
192.168.71.1	host12	# HOST-A Physical IP
192.168.80.1	hosta	# HOST-A Virtual IP
192.168.70.2	host21	# HOST-B Physical IP
192.168.71.2	host22	# HOST-B Physical IP
192.168.80.2	hostb	# HOST-B Virtual IP
192.168.70.3	host31	# HOST-C Physical IP
192.168.71.3	host32	# HOST-C Physical IP
192.168.80.3	hostc	# HOST-C Virtual IP

```
192.168.80.4    hosta1 # HOST-A/B/C Takeover virtual IP
fec0:1::4     v6hosta1 # HOST-A/B/C Takeover virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.1
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.1 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.4,fec0:1::4/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64       # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
    }
}
```



```

AdvRouterAddr on;
};
};

```



#### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```

DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet

```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```

DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet

```

1-3) On the `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```

NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no

```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.2 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.4, fec0:1::4/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



### Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is recommended to setup at least two IPv6 routers.

Depending on the version of radvd, kernel parameter(net.ipv6.conf.all.forwarding=1) must be defined in /etc/sysctl.conf file. For details on /etc/radvd.conf, refer to the radvd.conf(5), radvd(8) manual. In addition, when a system is SLES, please define a /etc/sysconfig/sysctl file as follows.

```
IPv6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [HOST-C]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.71.255
IPADDR=192.168.71.3
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth1 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.80.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m t -i 192.168.80.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m t -t eth0,eth1
```

## 5) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0 -i 192.168.80.4, fec0:1::4/64
```

## 6) Setting up IPv6 routers

Create /etc/radvd.conf file and set the followings

```
interface sha0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from sha0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```



Note

In the server that runs Fast switching mode, configure two or more router as IPv6 router. If the IPv6 router breaks down, it cannot use site-local address to communicate. To prevent this, it is

recommended to setup at least two IPv6 routers.  
Depending on the version of radvd, kernel parameter(`net.ipv6.conf.all.forwarding=1`) must be defined in `/etc/sysctl.conf` file. For details on `/etc/radvd.conf`, refer to the `radvd.conf(5)`, `radvd(8)` manual. In addition, when a system is SLES, please define a `/etc/sysconfig/sysctl` file as follows.

```
IPV6_FORWARD=yes
```

## 7) Reboot

Run the following command and reboot the system.

```
/sbin/shutdown -r now
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a Gls resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

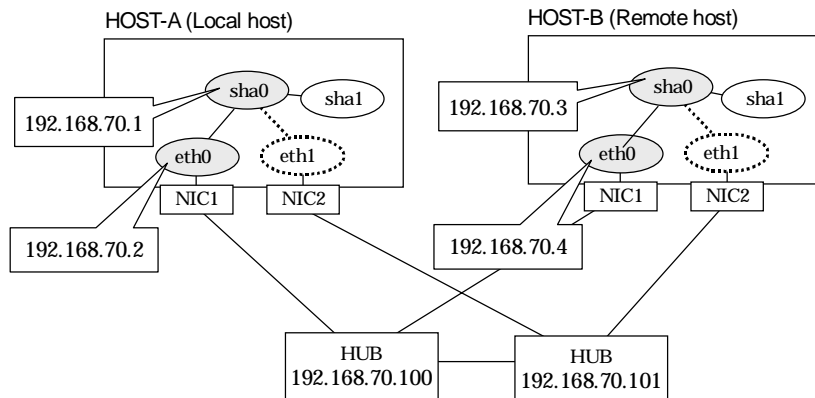
After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

## B.4 Example of configuring NIC switching mode (IPv4)

### B.4.1 Example of the Single system without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A Virtual IP
192.168.70.2  host11 # HOST-A Physical IP
192.168.70.3  hostb  # HOST-B Virtual IP
192.168.70.4  host21 # HOST-B Physical IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify `eth0` is enabled using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
```

```
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify `eth0` is enabled using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.3 -e 192.168.70.4 -t eth0,eth1
```



### Note

Ensure that the physical IP address specified using option `'-e'` is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

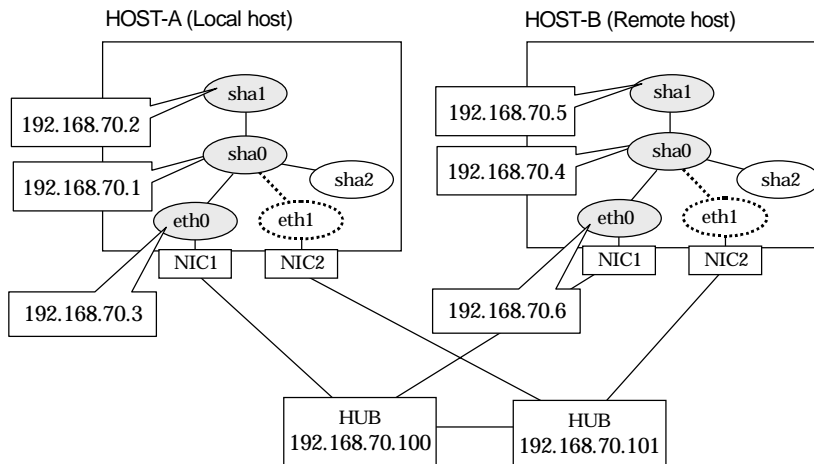




## B.4.2 Example of the Single system with NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



[HOST-A]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    hosta1 # HOST-A Virtual IP
192.168.70.2    hosta2 # HOST-A Virtual IP
192.168.70.3    host11 # HOST-A Physical IP
192.168.70.4    hostb1 # HOST-B Virtual IP
192.168.70.5    hostb1 # HOST-B Virtual IP
192.168.70.6    host21 # HOST-B Physical IP
192.168.70.100  swhub1 # Primary HUB IP
192.168.70.101  swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify `eth0` is enabled as using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

# [HOST-B]

## 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Defined content is same as HOST-A.

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.6
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.4 -e 192.168.70.6 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.5
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

## 8) Starting the HUB monitoring function

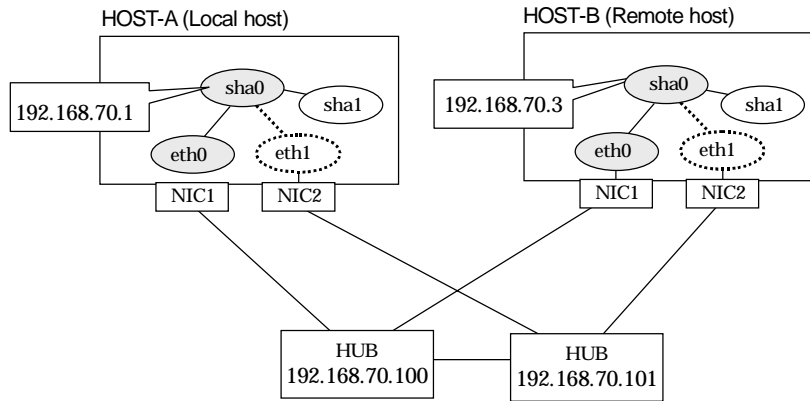
```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```



### B.4.3 Example of the Single system in Takeover physical IP address (pattern II)

This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A Virtual IP
192.168.70.3  hostb  # HOST-B Virtual IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.1 -t eth0,eth1
```

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

### 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

---

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.3 -t eth0,eth1
```

5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

7) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```





## B.4.4 Example of the Cluster system (1:1 Standby)

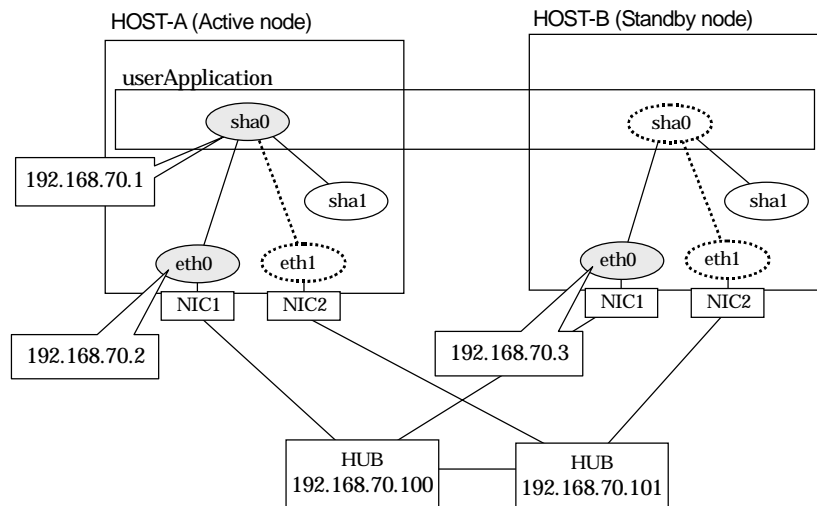
This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B Virtual IP (Takeover IP)
192.168.70.2  host11 # HOST-A Physical IP
192.168.70.3  host21 # HOST-B Physical IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.4.5 Example of the Cluster system (Mutual standby) without NIC sharing

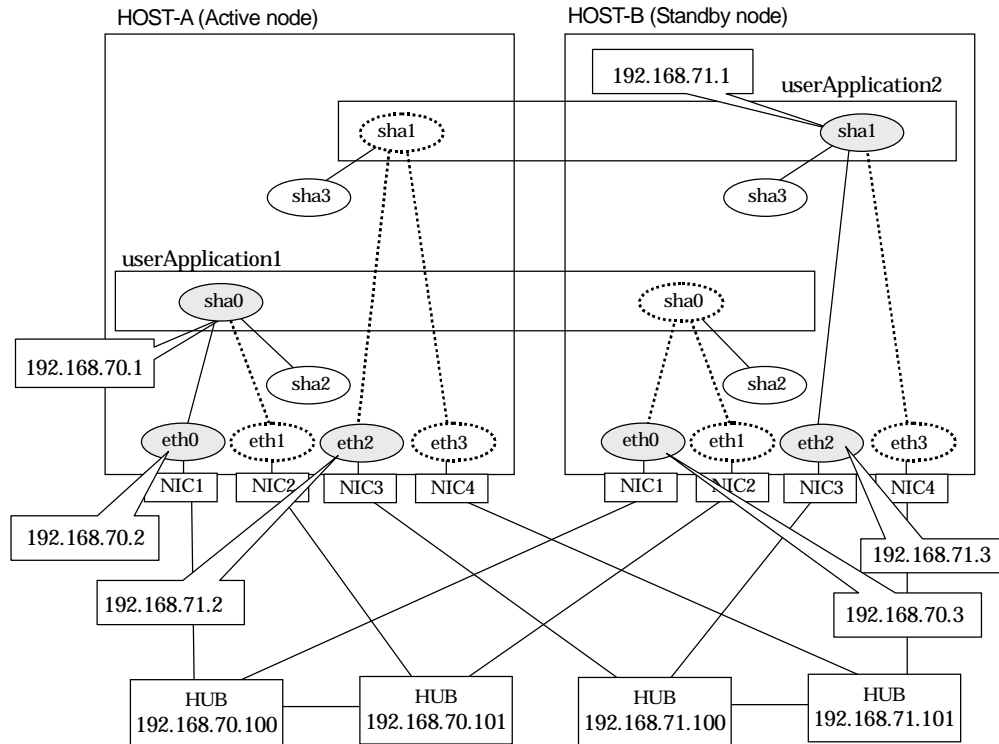
This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



[HOST-A]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1    hosta    # HOST-A/B Virtual IP (Takeover IP1)
192.168.70.2    host11   # HOST-A Physical IP
192.168.70.3    host21   # HOST-B Physical IP
192.168.71.1    hostb    # HOST-A/B Virtual IP (Takeover IP2)
192.168.71.2    host12   # HOST-A Physical IP
192.168.71.3    host22   # HOST-B Physical IP
192.168.70.100  swhub1   # Primary HUB IP
192.168.70.101  swhub2   # Secondary HUB IP
192.168.71.100  swhub3   # Primary HUB IP
192.168.71.101  swhub4   # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
```

```
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```
DEVICE=eth2
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```
DEVICE=eth3
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 and eth2 are enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.71.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m d -i 192.168.71.1 -e 192.168.71.2 -t eth2,eth3
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0 and /etc/sysconfig/network-scripts/ifcfg-eth2.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p 192.168.71.100,192.168.71.101 -b off
```

6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0  
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -t sha1
```

7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0  
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha1
```

8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2  
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

[HOST-B]

1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0  
BOOTPROTO=static  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
BROADCAST=192.168.70.255  
IPADDR=192.168.70.3  
NETMASK=255.255.255.0  
NETWORK=192.168.70.0  
ONBOOT=yes  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
ONBOOT=no  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```
DEVICE=eth2  
BOOTPROTO=static  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
BROADCAST=192.168.70.255  
IPADDR=192.168.71.3  
NETMASK=255.255.255.0  
NETWORK=192.168.71.0  
ONBOOT=yes  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```
DEVICE=eth3  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
ONBOOT=no  
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system make sure eth0 and eth2 are enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.71.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m d -i 192.168.71.1 -e 192.168.71.3 -t eth2,eth3
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0 and /etc/sysconfig/network-scripts/ifcfg-eth2.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p 192.168.71.100,192.168.71.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -a 02:00:00:00:00:02 -t sha0
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -a 02:00:00:00:00:03 -t sha1
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.4.6 Example of the Cluster system (Mutual standby) with NIC sharing

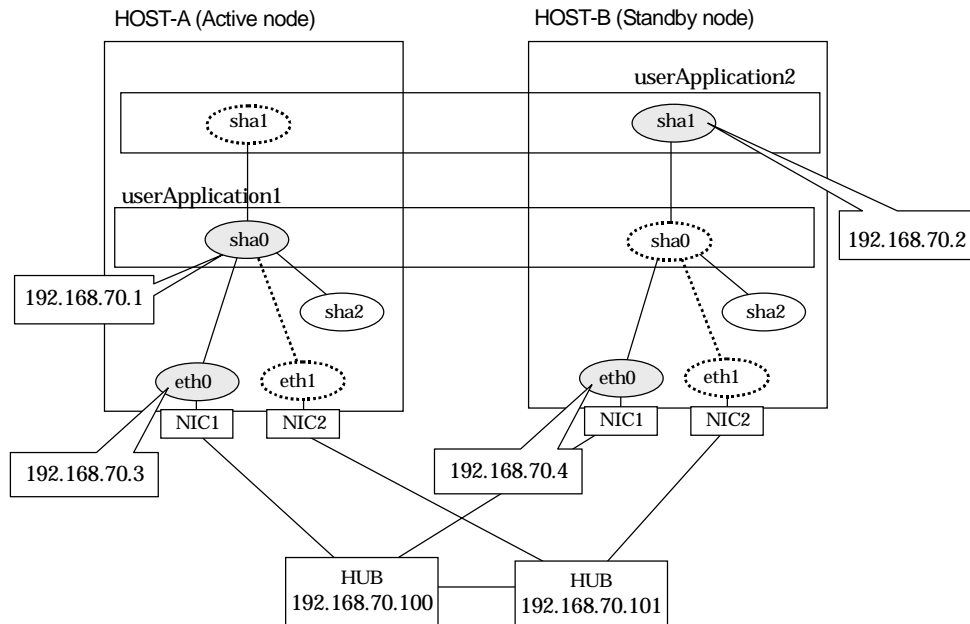
This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B Virtual IP (Takeover IP1)
192.168.70.2  hostb  # HOST-A/B Virtual IP (Takeover IP2)
192.168.70.3  host11 # HOST-A Physical IP
192.168.70.4  host21 # HOST-B Physical IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
```

```
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.4 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvsc create -n sha1
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

## B.4.7 Example of the Cluster system in Takeover physical IP address (pattern I)

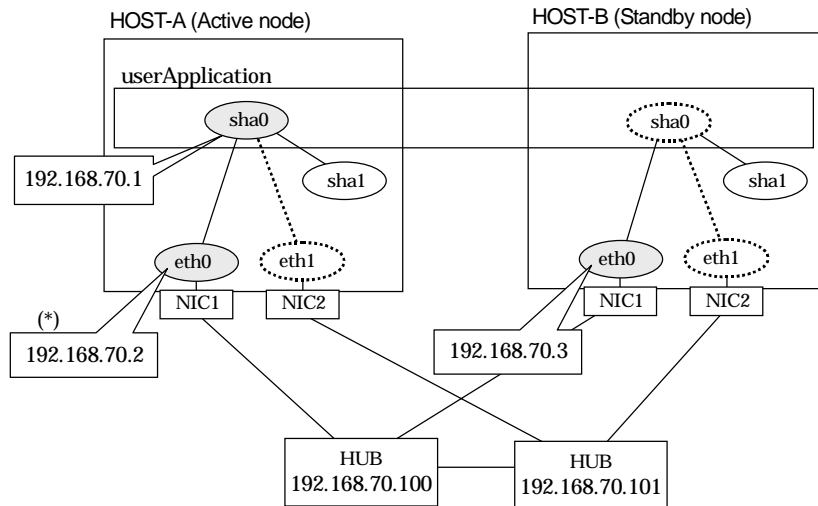
This section describes an example configuration procedure of the network shown in the diagram below. (Network configuration for enabling physical interface on a standby node.)

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



\*) Physical IP address (192.168.70.2) is inactivated when takeover IP address (192.168.70.1) is activated.

### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B Virtual IP (Takeover IP)
192.168.70.2  host11 # HOST-A Physical IP
192.168.70.3  host21 # HOST-B Physical IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
```

```
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
```

5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.





## B.4.8 Example of the Cluster system in Takeover physical IP address (pattern II)

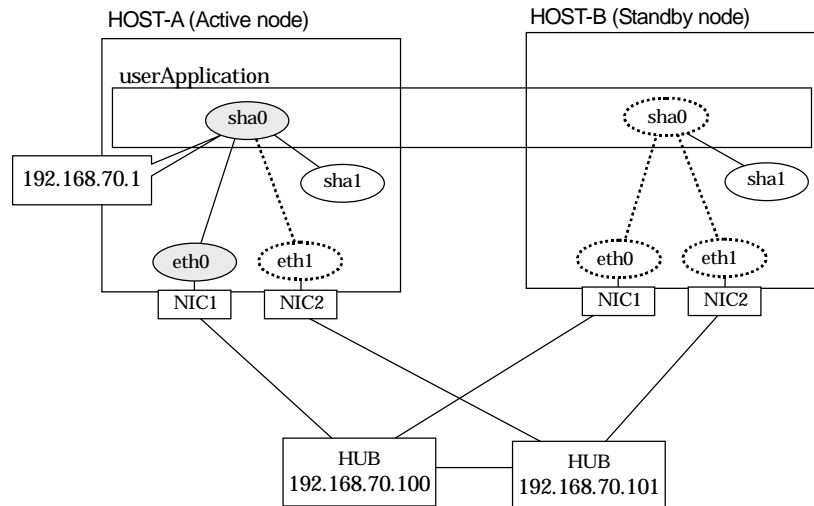
This section describes an example configuration procedure of the network shown in the diagram below. (Network configuration for not enabling physical interface on a standby node.)

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B Virtual IP (Takeover IP)
192.168.70.100  swhub1  # Primary HUB IP
192.168.70.101  swhub2  # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.1
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.1 -t eth0,eth1
```

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

2) Reboot

Run the following command to reboot the system.

```
/sbin/shutdown -r now
```

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m e -i 192.168.70.1 -t eth0,eth1
```

5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.4.9 Example of the Cluster system (Cascade)

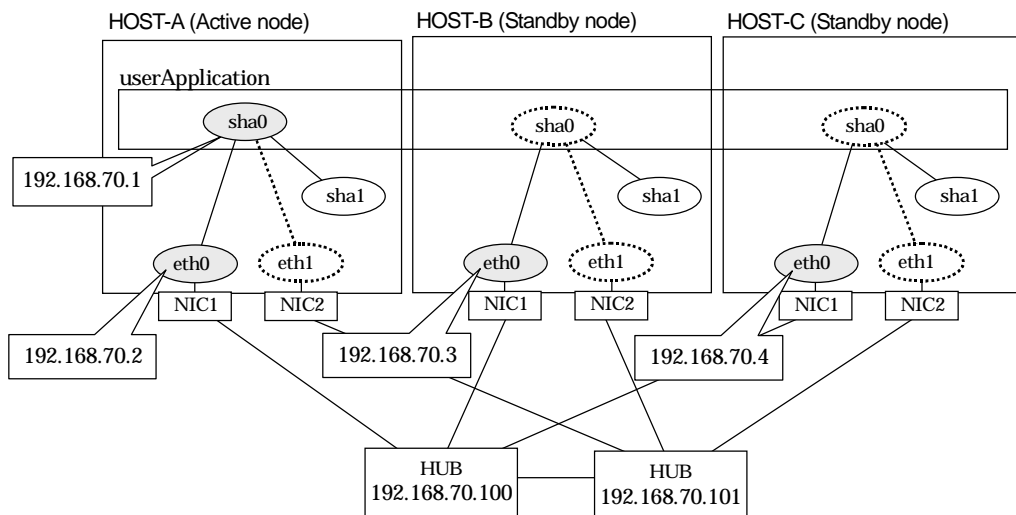
This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



[HOST-A]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B/C Virtual IP (Takeover IP)
192.168.70.2  host11 # HOST-A Physical IP
192.168.70.3  host21 # HOST-B Physical IP
192.168.70.4  host31 # HOST-C Physical IP
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-C]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
```

```
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

## 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.4 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 6) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -a 02:00:00:00:00:02 -t sha0
```

## 7) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 8) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 9) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".



2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.4.10 Example of the Cluster system (NIC non-redundant)

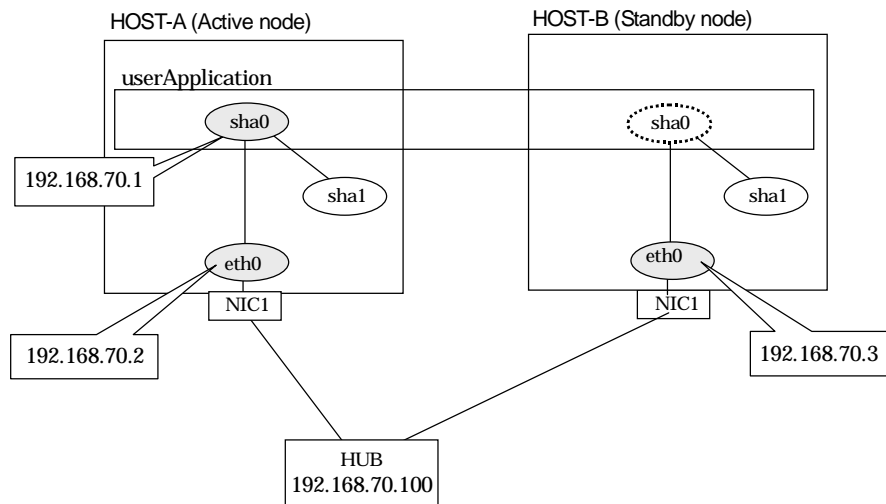
This section describes an example configuration procedure of the network shown in the diagram below.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



### [HOST-A]

#### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file.

```
192.168.70.1  hosta  # HOST-A/B Virtual IP (Takeover IP)
192.168.70.2  host11 # HOST-A Physical IP
192.168.70.3  host21 # HOST-B Physical IP
192.168.70.100 swhub1 # Primary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-eth0 file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

#### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

### 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

### 5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100 -b off
```

### 6) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

### 7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-eth0 file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=no
```

### 2) Reboot

Run the following command to reboot the system. After rebooting the system, verify eth0 is enabled using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

### 4) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0
```



**Note**

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

5) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100 -b off
```

6) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a Gls resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



## B.5 Example of configuring NIC switching mode (IPv6)

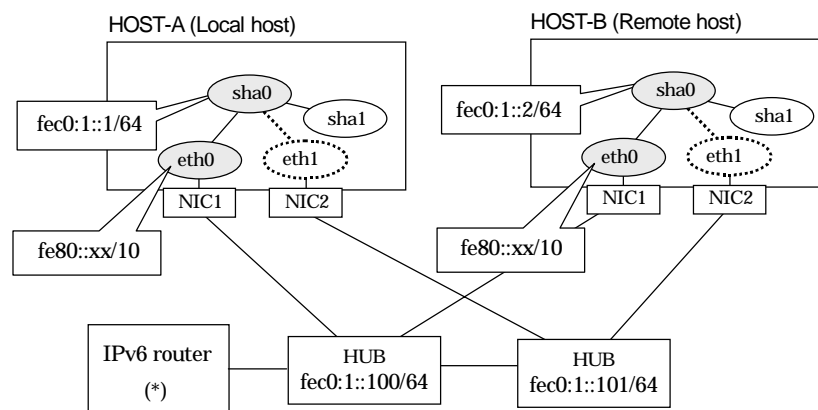
When using IPv6 address, it is required to set an IPv6 router on the same network. Also, specify the same prefix and prefix length of IPv6 address for redundant control line function configured in the IPv6 router.

### B.5.1 Example of the Single system without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



Note

An example of configuring `/etc/radvd.conf` to use Linux server as an IPv6 router is described below. For details on `/etc/radvd.conf`, refer to `radvd.conf(5)` manual. Do not configure `radvd` on the server running NIC switching mode.

- 1) On `/etc/sysconfig/network-scripts/ifcfg-ethX` file (`ethX` refers to an interface name), define a statement allows to activate the entire interfaces during the system startup. The following is an example of `ifcfg-eth0`.

```
DEVICE=eth0
ONBOOT=yes
TYPE=Ethernet
```

- 2) On `/etc/sysconfig/network` file, define a statement allows the system to load IPv6 module.

```
NETWORKING=yes
NETWORKING_IPV6=yes
```

- 3) Create `/etc/radvd.conf` file and define the following on the interface `radvd` uses. Depending on the versions of `radvd`, you must define the kernel parameter (`net.ipv6.conf.all.forwarding=1`) on `/etc/sysctl.conf` file. For details on this configuration, see `radvd.conf(5)` or `radvd(8)` manual.

```
interface eth0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64      # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
```

```

AdvAutonomous on;
AdvRouterAddr on;
};
};

```

- 4) Reboot the system. Make sure radvd process is running after rebooting the system.

## [HOST-A]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```

fec0:1::1    v6hosta    # HOST-A Virtual IP
fec0:1::2    v6hostb    # HOST-B Virtual IP
fec0:1::100  swhub1     # Primary HUB IP
fec0:1::101  swhub2     # Secondary HUB IP

```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```

DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```

DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet

```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```

NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no

```

### 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Creating of virtual interface

```
/opt/FJShanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

### 4) Setting up the HUB monitoring function

```
/opt/FJShanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

### 5) Setting up the Standby patrol monitoring function

```
/opt/FJShanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

### 6) Activating of virtual interface

```
/opt/FJShanet/usr/sbin/strhanet -n sha0
```

### 7) Starting the HUB monitoring function

```
/opt/FJShanet/usr/sbin/hanetpoll on
```



**[HOST-B]****1) Setting up the system**

1-1) Create /etc/hostname6.eth0 file as an empty file.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::2/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**6) Activating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

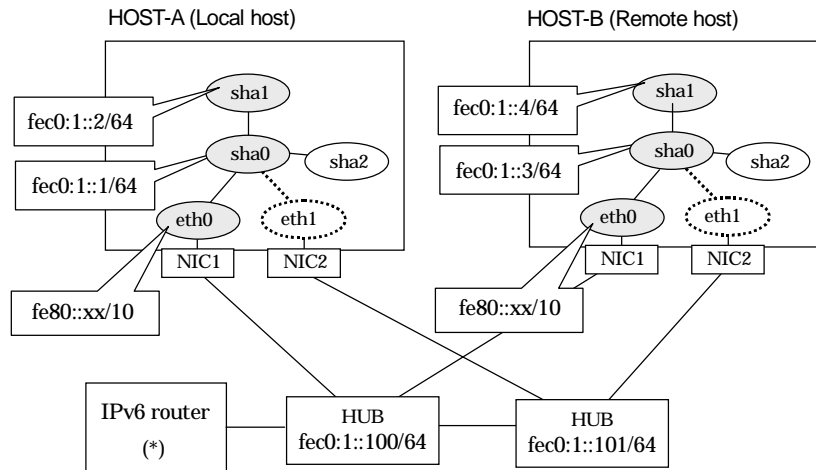


## B.5.2 Example of the Single system with NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring `/etc/radvd.conf` of the figure above. For details on `/etc/radvd.conf`, refer to `radvd.conf(5)` manual. In addition, do not configure `radvd` on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

[HOST-A]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1    v6hosta1    # HOST-A Virtual IP
fec0:1::2    v6hosta2    # HOST-A Virtual IP
fec0:1::3    v6hostb1    # HOST-B Virtual IP
fec0:1::4    v6hostb2    # HOST-B Virtual IP
fec0:1::100  swhub1      # Primary HUB IP
fec0:1::101  swhub2      # Secondary HUB IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

## 4) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 5) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 6) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

## 7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::3/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::4/64
```

## 4) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 5) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 6) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

## 7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```





**[HOST-A]****1) Setting up the system**

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1      v6hosta      # HOST-A/B Takeover virtual IP
fec0:1::100   swhub1       # Primary HUB IP
fec0:1::101   swhub2       # Secondary HUB IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

- Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```



**[HOST-B]****1) Setting up the system**

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

### B.5.4 Example of the Cluster system (Mutual standby) without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

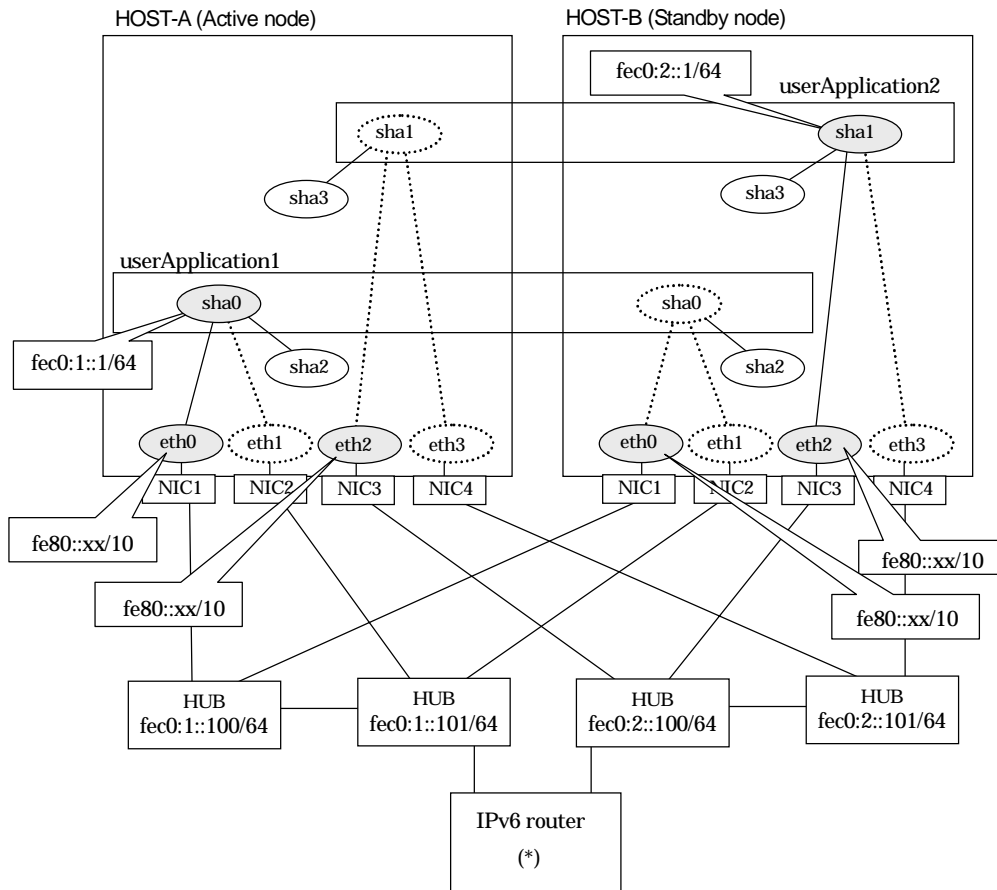
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```

interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
    }
}
    
```

```

        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
interface eth1
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:2::0/64        # Sending Prefix fec0:2::0/64 from eth1
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
};

```

## [HOST-A]

## 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```

fec0:1::1    v6hosta    # HOST-A/B Takeover virtual IP
fec0:1::100  swhub1     # Primary HUB IP
fec0:1::101  swhub2     # Secondary HUB IP
fec0:2::1    v6hostb    # HOST-A/B Takeover virtual IP
fec0:2::100  swhub3     # Primary HUB IP
fec0:2::101  swhub4     # Secondary HUB IP

```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```

DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```

DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```

DEVICE=eth2
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```

DEVICE=eth3
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet

```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth2 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha1 -m d -i fec0:2::1/64 -t eth2,eth3
```

## 4) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p fec0:2::100,fec0:2::101 -b off
```

## 5) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -t sha1
```

## 6) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

## 7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 8) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

## [HOST-B]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```
DEVICE=eth2
HWADDR=XX:XX:XX:XX:XX:XX
```

```
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```
DEVICE=eth3
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth2 are enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Creating of virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha1 -m d -i fec0:2::1/64 -t eth2,eth3
```

## 4) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p fec0:2::100,fec0:2::101 -b off
```

## 5) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -a 02:00:00:00:00:02 -t sha0
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -a 02:00:00:00:00:03 -t sha1
```

## 6) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

## 7) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 8) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

## B.5.5 Example of the Cluster system (Mutual standby) with NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

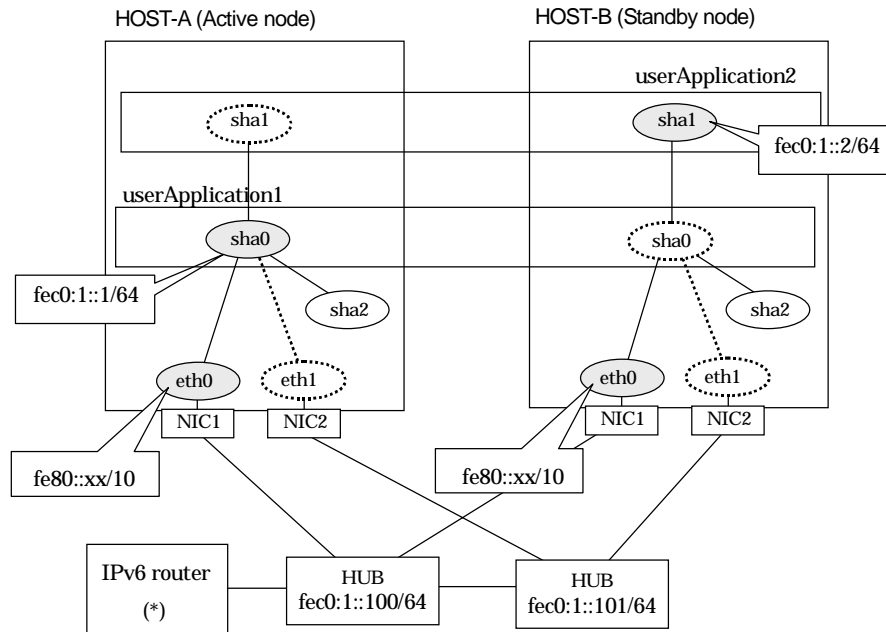
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;          # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64       # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

**[HOST-A]****1) Setting up the system**

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1      v6hosta      # HOST-A/B Takeover virtual IP
fec0:1::2      v6hostb      # HOST-A/B Takeover virtual IP
fec0:1::100    swhub1       # Primary HUB IP
fec0:1::101    swhub2       # Secondary HUB IP
```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

- Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```



**[HOST-B]****1) Setting up the system**

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a Gls resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

## B.5.6 Example of the Cluster system (Cascade)

This section describes an example configuration procedure of the network shown in the diagram below.

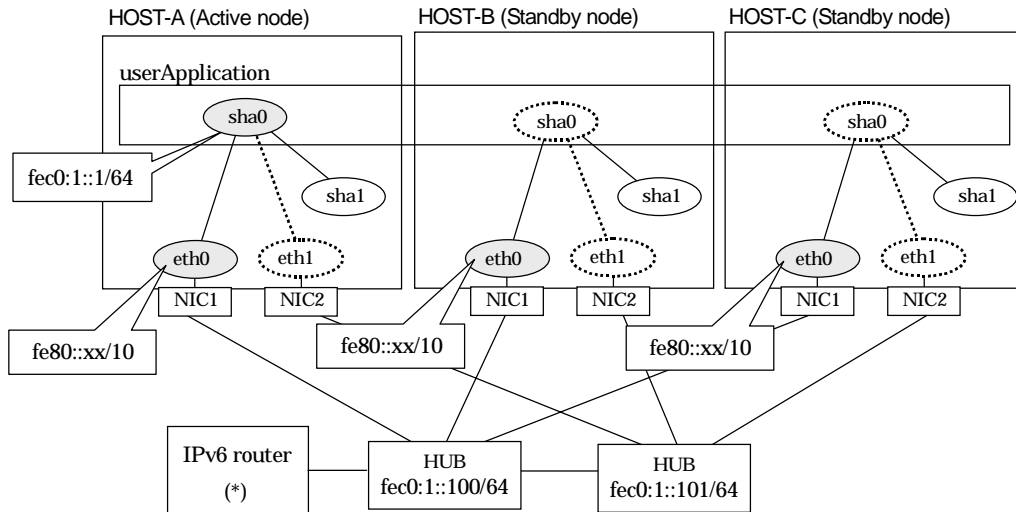
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring `/etc/radvd.conf` of the figure above. For details on `/etc/radvd.conf`, refer to `radvd.conf(5)` manual. In addition, do not configure `radvd` on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

**[HOST-A]****1) Setting up the system**

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
fec0:1::1    v6hosta    # HOST-A/B/C Takeover virtual IP
fec0:1::100  swhub1     # Primary HUB IP
fec0:1::101  swhub2     # Secondary HUB IP
```

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

**2) Reboot**

- Run the following command and reboot the system. After rebooting the system, verify `eth0` is enabled as an IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

**[HOST-B]****1) Setting up the system**

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

**[HOST-C]****1) Setting up the system**

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

**3) Creating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

**4) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p fec0:1::100,fec0:1::101 -b off
```

**5) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -a 02:00:00:00:00:02 -t sha0
```

**6) Creating of takeover virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

**7) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

**8) Starting the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

### [Configuration by RMS Wizard]

#### 1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

#### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.





## B.6 Example of configuring NIC switching mode (IPv4/IPv6)

When using IPv6 address, it is required to set an IPv6 router on the same network. Also, specify the same prefix and prefix length of IPv6 address for redundant control line function configured in the IPv6 router.

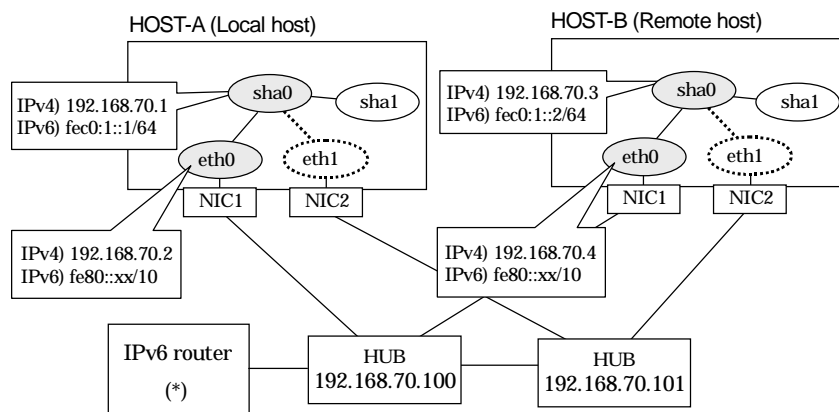
### B.6.1 Example of the Single system without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring `/etc/radvd.conf` of the figure above. For details on `/etc/radvd.conf`, refer to `radvd.conf(5)` manual. In addition, do not configure `radvd` on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

**[HOST-A]****1) Setting up the system**

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    hosta    # HOST-A Virtual IP
192.168.70.2    host11   # HOST-A Physical IP
192.168.70.3    hostb    # HOST-B Virtual IP
192.168.70.4    host21   # HOST-B Physical IP
192.168.70.100  swhub1   # Primary HUB IP
192.168.70.101  swhub2   # Secondary HUB IP
fec0:1::1      v6hosta  # HOST-A Virtual IP
fec0:1::2      v6hostb  # HOST-B Virtual IP
```

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

**3) Setting a subnet mask**

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

**4) Creation of IPv4 virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



**Note**

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha0 -i fec0:1::1/64
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 8) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.3 -e 192.168.70.4 -t eth0,eth1
```



**Note**

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

**5) Creation of IPv6 virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha0 -i fec0:1::2/64
```

**6) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

**7) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

**8) Activating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
```

**9) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

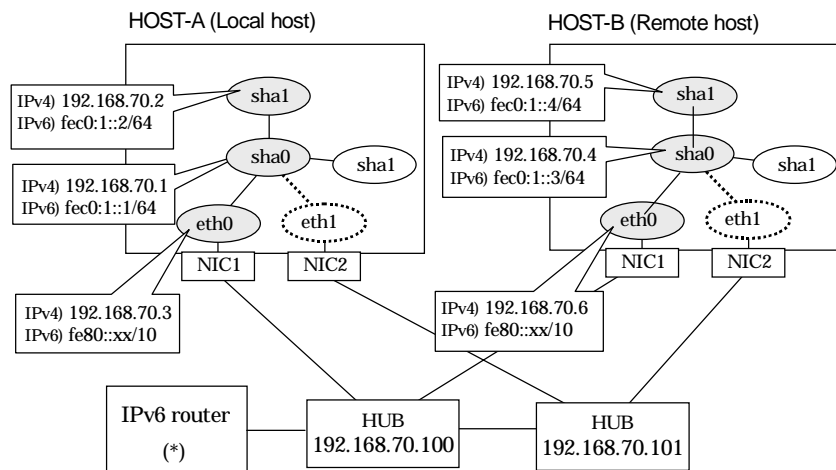
## B.6.2 Example of the Single system with NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring `/etc/radvd.conf` of the figure above. For details on `/etc/radvd.conf`, refer to `radvd.conf(5)` manual. In addition, do not configure `radvd` on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

### [HOST-A]

#### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1  hosta1 # HOST-A Virtual IP
192.168.70.2  hosta2 # HOST-A Virtual IP
192.168.70.3  host11 # HOST-A Physical IP
192.168.70.4  hostb1 # HOST-B Virtual IP
192.168.70.5  hostb2 # HOST-B Virtual IP
192.168.70.6  host21 # HOST-B Physical IP
```

```
192.168.70.100 swhub1 # Primary HUB IP
192.168.70.101 swhub2 # Secondary HUB IP
fec0:1::1     v6hosta1 # HOST-A Virtual IP
fec0:1::2     v6hosta2 # HOST-A Virtual IP
fec0:1::3     v6hostb1 # HOST-B Virtual IP
fec0:1::4     v6hostb2 # HOST-B Virtual IP
```

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0, 1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 8) Activating of virtual interface

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.6
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.4 -e 192.168.70.6 -t
eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.5
```



**Note**

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

**5) Creation of IPv6 virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::3/64 -t eth0,eth1  
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::4/64
```

**6) Setting up the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off  
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

**7) Setting up the Standby patrol monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

**8) Activating of virtual interface**

```
/opt/FJSVhanet/usr/sbin/strhanet -n sha0  
/opt/FJSVhanet/usr/sbin/strhanet -n sha1
```

**9) Starting the HUB monitoring function**

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```



### B.6.3 Example of the Cluster system (1:1 Standby) without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

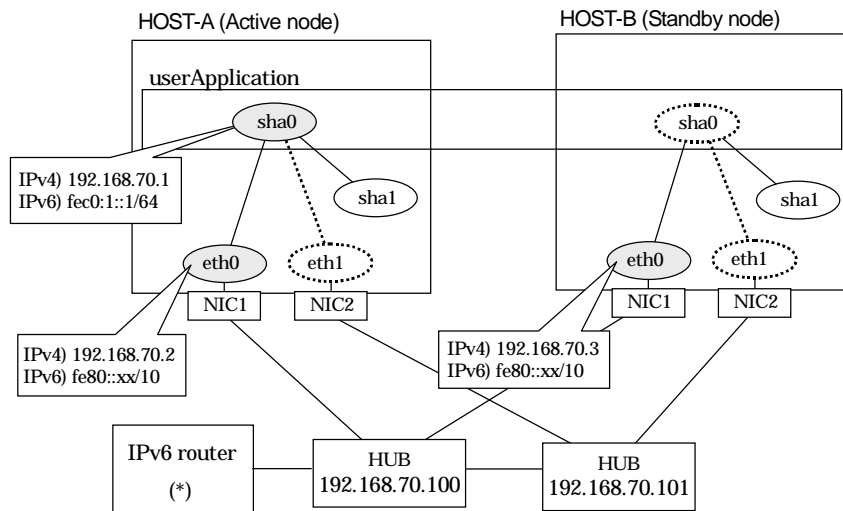
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

**[HOST-A]****1) Setting up the system**

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    hosta    # HOST-A/B Takeover virtual IP
192.168.70.2    host11   # HOST-A Physical IP
192.168.70.3    host21   # HOST-B Physical IP
192.168.70.100  swhub1   # Primary HUB IP
192.168.70.101  swhub2   # Secondary HUB IP
fec0:1::1      v6hosta1 # HOST-A/B Takeover virtual IP
```

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

**2) Reboot**

Run the following command and reboot the system. After rebooting the system, verify `eth0` is enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

**3) Setting a subnet mask**

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

**4) Creation of IPv4 virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



**Note**

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

**5) Creation of IPv6 virtual interface**

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

## 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPv6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
```



Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

### B.6.4 Example of the Cluster system (Mutual Standby) without NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

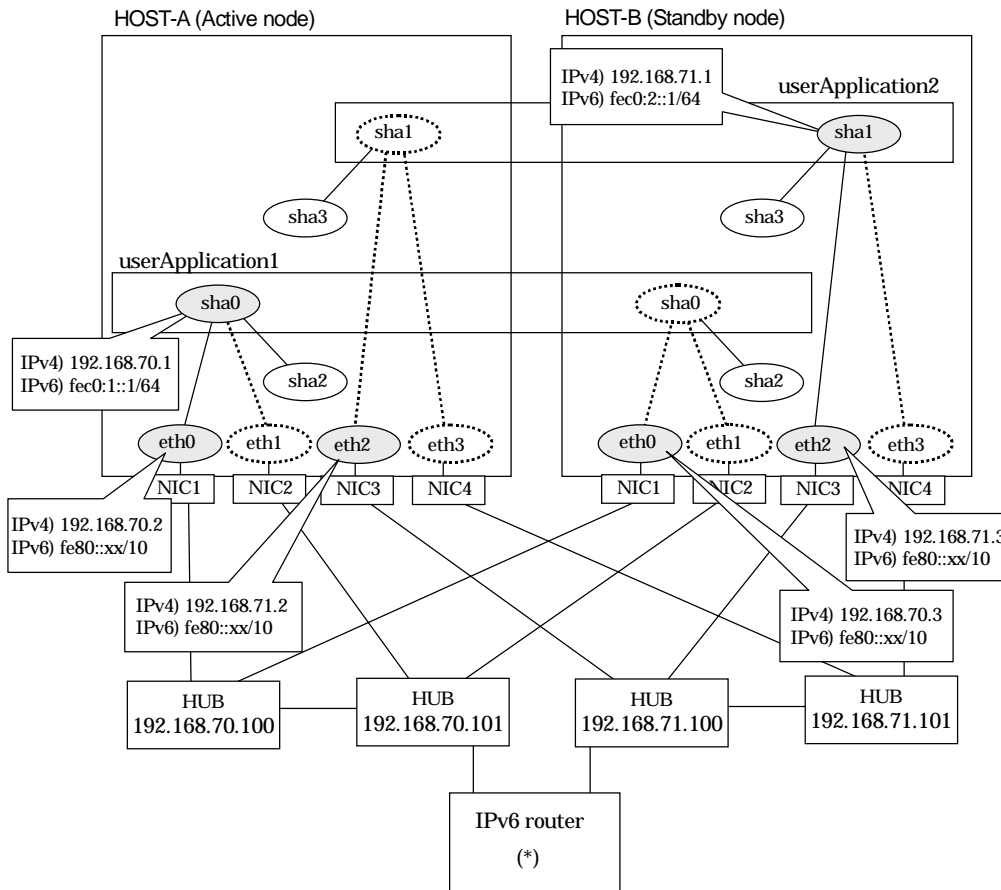
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
    }
}
```

```

        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
interface eth1
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:2::0/64        # Sending Prefix fec0:2::0/64 from eth1
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
};

```

## [HOST-A]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```

192.168.70.1    hosta    # HOST-A/B Virtual IP (Takeover IP1)
192.168.70.2    host11   # HOST-A Physical IP
192.168.70.3    host21   # HOST-B Physical IP
192.168.71.1    hostb    # HOST-A/B Virtual IP (Takeover IP2)
192.168.71.2    host12   # HOST-A Physical IP
192.168.71.3    host22   # HOST-B Physical IP
192.168.70.100  swhub1   # Primary HUB IP
192.168.70.101  swhub2   # Secondary HUB IP
192.168.71.100  swhub3   # Primary HUB IP
192.168.71.101  swhub4   # Secondary HUB IP
fec0:1::1      v6hosta   # HOST-A/B Takeover virtual IP
fec0:2::1      v6hostb   # HOST-A/B Takeover virtual IP

```

- 1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```

DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```

DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet

```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```

DEVICE=eth2
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no

```

```
BROADCAST=192.168.71.255
IPADDR=192.168.71.2
NETMASK=255.255.255.0
NETWORK=192.168.71.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```
DEVICE=eth3
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth2 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.71.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t
eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m d -i 192.168.71.1 -e 192.168.71.2 -t
eth2,eth3
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0 and /etc/sysconfig/network-scripts/ifcfg-eth2.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha1 -m d -i fec0:2::1/64 -t eth2,eth3
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p 192.168.71.100,192.168.71.101 -b off
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -t sha1
```

## 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrs create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrs create -n sha1
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2  
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1,2,3) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0  
BOOTPROTO=static  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
BROADCAST=192.168.70.255  
IPADDR=192.168.70.3  
NETMASK=255.255.255.0  
NETWORK=192.168.70.0  
ONBOOT=yes  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
ONBOOT=no  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth2

```
DEVICE=eth2  
BOOTPROTO=static  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
BROADCAST=192.168.71.255  
IPADDR=192.168.71.3  
NETMASK=255.255.255.0  
NETWORK=192.168.71.0  
ONBOOT=yes  
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth3

```
DEVICE=eth3  
HWADDR=XX:XX:XX:XX:XX:XX  
HOTPLUG=no  
ONBOOT=no  
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes  
NETWORKING_IPV6=yes  
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 and eth2 are enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```



## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.71.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t
eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m d -i 192.168.71.1 -e 192.168.71.3 -t
eth2,eth3
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0` and `/etc/sysconfig/network-scripts/ifcfg-eth2`.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha1 -m d -i fec0:2::1/64 -t eth2,eth3
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha1 -p 192.168.71.100,192.168.71.101 -b off
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha3 -m p -t sha1
```

## 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrs create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrs create -n sha1
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
/opt/FJSVhanet/usr/sbin/strptl -n sha3
```

## [Configuration by RMS Wizard]

## 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

## 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



### B.6.5 Example of the Cluster system (Mutual Standby) with NIC sharing

This section describes an example configuration procedure of the network shown in the diagram below.

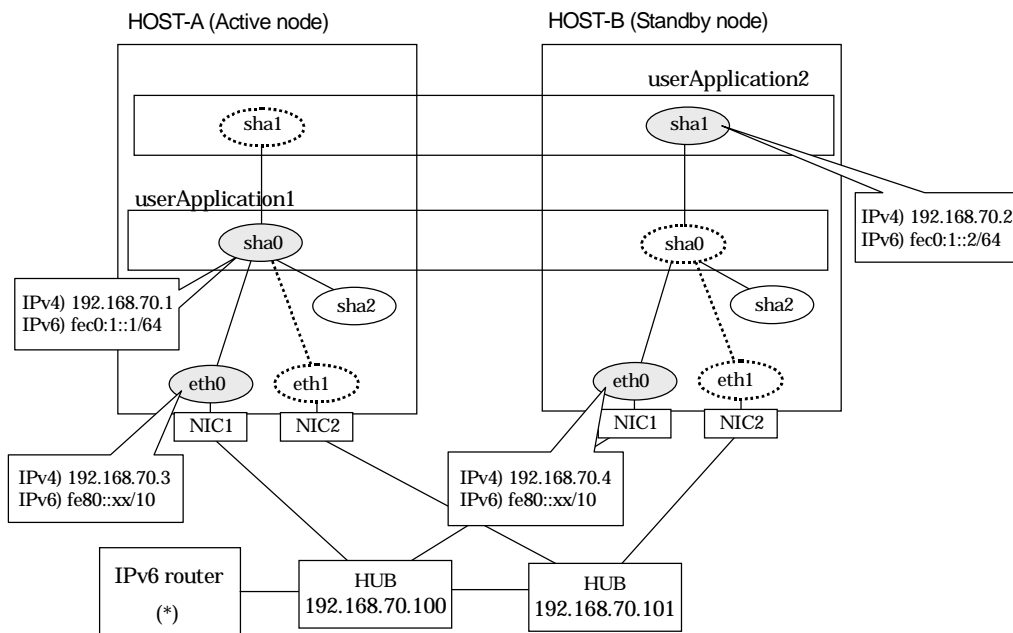
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```

interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
    
```

## [HOST-A]

### 1) Setting up the system

- 1-1) Define IP addresses and hostnames in `/etc/inet/hosts` file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1    hosta    # HOST-A/B Virtual IP (Takeover IP1)
192.168.70.2    hostb    # HOST-A/B Virtual IP (Takeover IP2)
192.168.70.3    host11   # HOST-A Physical IP
192.168.70.4    host21   # HOST-B Physical IP
192.168.70.100  swhub1   # Primary HUB IP
192.168.70.101  swhub2   # Secondary HUB IP
fec0:1::1      v6hosta  # HOST-A/B Takeover virtual IP
fec0:1::2      v6hostb  # HOST-A/B Takeover virtual IP
```

- 1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

- 1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

### 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

### 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

### 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t
eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

## 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Write the host name defined above in /etc/sysconfig/network-scripts/ifcfg-eth0 file. If the file does not exist, create a new file.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

### 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

### 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.4 -t eth0,eth1  
/opt/FJSVhanet/usr/sbin/hanetconfig copy -n sha0,sha1 -i 192.168.70.2
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

### 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1  
/opt/FJSVhanet/usr/sbin/hanetconfig copy inet6 -n sha0,sha1 -i fec0:1::2/64
```

### 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off  
/opt/FJSVhanet/usr/sbin/hanetpoll copy -n sha0,sha1
```

### 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha2 -m p -t sha0
```

### 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0  
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha1
```

### 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

### 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha2
```

## [Configuration by RMS Wizard]

### 1) Configuration of userApplication

After configuring HOST-A and HOST-B, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

### 2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.

### B.6.6 Example of the Cluster system (Cascade)

This section describes an example configuration procedure of the network shown in the diagram below.

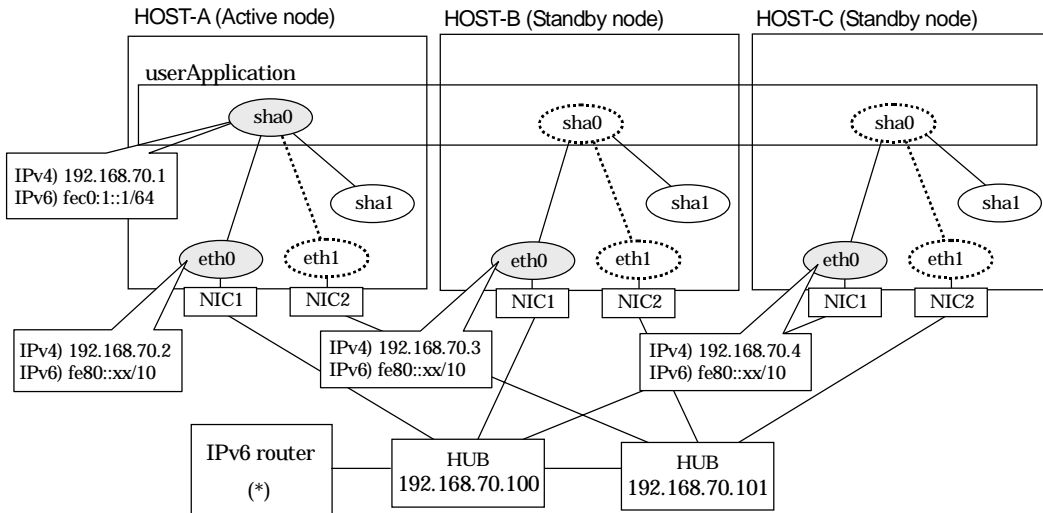
The xx in the figure below are assigned automatically by the automatic address configuration.

For the network configuration other than GLS, refer to "3.2.2 Network configuration".

For configuring the cluster system, refer to the Cluster system manual.

In this section, description of private LAN is omitted.

The dotted line indicates that the interface is inactive.



Note

For configuring Linux server to use as IPv6 router, refer to "B.5.1 Example of the Single system without NIC sharing". The following is an example of configuring /etc/radvd.conf of the figure above. For details on /etc/radvd.conf, refer to radvd.conf(5) manual. In addition, do not configure radvd on the server running NIC switching mode.

```
interface eth0
{
    AdvSendAdvert on;           # Sending router advertisements
    MinRtrAdvInterval 3;
    MaxRtrAdvInterval 10;
    prefix fec0:1::0/64        # Sending Prefix fec0:1::0/64 from eth0
    {
        AdvOnLink on;
        AdvAutonomous on;
        AdvRouterAddr on;
    };
};
```

#### [HOST-A]

##### 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Note that it is not necessary to define an IPv6 address, which automatically allocates address by the Stateless Address Autoconfiguration feature.

```
192.168.70.1  hosta  # HOST-A/B/C Takeover virtual IP
192.168.70.2  host11 # HOST-A Physical IP
```

```
192.168.70.3    host21    # HOST-B Physical IP
192.168.70.4    host31    # HOST-C Physical IP
192.168.70.100  swhub1    # Primary HUB IP
192.168.70.101  swhub2    # Secondary HUB IP
fec0:1::1      v6hosta1    # HOST-A/B/C Takeover virtual IP
```

1-2) Configure `/etc/sysconfig/network-scripts/ifcfg-ethX` (X is 0,1) file as follows.

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth0`

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.2
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of `/etc/sysconfig/network-scripts/ifcfg-eth1`

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the `/etc/sysconfig/network` file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using `ifconfig` command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.2 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in `/etc/sysconfig/network-scripts/ifcfg-eth0`.

## 5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

## 6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

## 7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```



## 8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

## 9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

## 10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

## [HOST-B]

## 1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.3
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

## 2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

## 3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

## 4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.3 -t eth0,eth1
```



Note

Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvrs create -n sha0
```

9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

[HOST-C]

1) Setting up the system

1-1) Define IP addresses and hostnames in /etc/inet/hosts file. Defined content is same as HOST-A.

1-2) Configure /etc/sysconfig/network-scripts/ifcfg-ethX (X is 0,1) file as follows.

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE=eth0
BOOTPROTO=static
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
BROADCAST=192.168.70.255
IPADDR=192.168.70.4
NETMASK=255.255.255.0
NETWORK=192.168.70.0
ONBOOT=yes
TYPE=Ethernet
```

- Contents of /etc/sysconfig/network-scripts/ifcfg-eth1

```
DEVICE=eth1
HWADDR=XX:XX:XX:XX:XX:XX
HOTPLUG=no
ONBOOT=no
TYPE=Ethernet
```

1-3) On the /etc/sysconfig/network file, define a statement which enables the network configuration.

```
NETWORKING=yes
NETWORKING_IPV6=yes
IPV6TO4INIT=no
```

2) Reboot

Run the following command and reboot the system. After rebooting the system, verify eth0 is enabled as an IPv4/IPv6 interface using ifconfig command.

```
/sbin/shutdown -r now
```

3) Setting a subnet mask

```
/opt/FJSVhanet/usr/sbin/hanetmask create -i 192.168.70.0 -m 255.255.255.0
```

4) Creation of IPv4 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i 192.168.70.1 -e 192.168.70.4 -t eth0,eth1
```



Ensure that the physical IP address specified using option '-e' is the same IP address configured in /etc/sysconfig/network-scripts/ifcfg-eth0.

5) Creation of IPv6 virtual interface

```
/opt/FJSVhanet/usr/sbin/hanetconfig create inet6 -n sha0 -m d -i fec0:1::1/64 -t eth0,eth1
```

6) Setting up the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p 192.168.70.100,192.168.70.101 -b off
```

7) Setting up the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetconfig create -n sha1 -m p -t sha0
```

8) Creating of takeover virtual interface

```
/opt/FJSVhanet/usr/sbin/hanethvsrc create -n sha0
```

9) Starting the HUB monitoring function

```
/opt/FJSVhanet/usr/sbin/hanetpoll on
```

10) Starting the Standby patrol monitoring function

```
/opt/FJSVhanet/usr/sbin/strptl -n sha1
```

[Configuration by RMS Wizard]

1) Configuration of userApplication

After configuring HOST-A, HOST-B and HOST-C, register the created takeover virtual interface as a GIs resource to create a cluster application. Use RMS Wizard to set up the cluster configuration. For details, see "PRIMECLUSTER Installation and Administration Guide 4.1".

2) Starting of userApplication

After completing the configuration, start the userApplication to activate the takeover virtual interface on the operation node.



# Appendix C Changes from previous versions

This appendix discusses changes to the GLS specification. It also suggests some operational guidelines.



## C.1 Changes from Redundant Control Line function 4.0A20 to version 4.1A20

Table C.1 represents a list of modifications.

**Table C.1 A list of modifications**

Type	Modification	Version
New commands	None.	-
Incompatible commands	hanetconfig command	Redundant Control Line function 4.1A20
	hanetpoll command	Redundant Control Line function 4.1A20
	strhanet command	Redundant Control Line function 4.1A20
	stphanet command	Redundant Control Line function 4.1A20
Incompatible function	Resource state monitoring function for standby node	Redundant Control Line function 4.1A20
	Interface state monitoring feature	Redundant Control Line function 4.1A20

### C.1.1 A list of new commands

There are no new commands for redundant control line function 4.1.

### C.1.2 A list of incompatible commands

The followings are the incompatible commands of redundant control line function from the previous version.

#### C.1.2.1 hanetconfig command

##### [Contents]

If a host name you specify via "-i" or "-e" option of the hanetconfig command includes invalid characters (except for alpha-numeric characters, period, and hyphen) mentioned in RFC952 and RFC1123, it is treated as an error. For details on this issue, refer to "7.1 hanetconfig Command".

##### [Changes]

##### Before modification

Invalid characters were not treated as an error.

##### After modification

Invalid characters were treated as an error.

##### [Notes]

- When migrating the backup configuration setting file to 4.1A20, if the backup configuration settings file (created via hanetbackup command) prior to 4.0A20 contains host name written in characters other than alphanumeric, period or hyphen, delete these characters. The virtual interface cannot be activated if the host name contains characters other than alphanumeric, period or hyphen.

### C.1.2.2 hanetpoll command

#### [Contents]

If a host name you specify via "-p" option of the hanetpoll command includes invalid characters (except for alpha-numeric characters, period, and hyphen) mentioned in RFC952 and RFC1123, it is treated as an error. For details on this issue, refer to "7.7 hanetpoll Command".

#### [Changes]

##### Before modification

Invalid characters were not treated as an error.

##### After modification

Invalid characters were treated as an error.

#### [Notes]

- When migrating the backup configuration setting file to 4.1A20, if the backup configuration settings file (created via hanetbackup command) prior to 4.0A20 contains host name written in characters other than alphanumeric, period or hyphen, delete these characters. The virtual interface cannot be activated if the host name contains characters other than alphanumeric, period or hyphen.

### C.1.2.3 strhanet command

#### [Contents]

If there is more than one virtual interface failed to activate when attempting to activate the virtual interface, error messages will be produced according to the number of virtual interfaces encountered the failure.

#### [Changes]

##### Before modification

This command did not generate an error message for every virtual interface.

The following message will be displayed when enabling multiple virtual interfaces.

```
# /opt/FJSVhanet/usr/sbin/strhanet -n sha0,sha1
hanet: 00000: information: normal end.
```

##### After modification

Now, this command generates an error message for every virtual interface.

The following message will be displayed when enabling multiple virtual interfaces.

```
# /opt/FJSVhanet/usr/sbin/strhanet -n sha0,sha1
hanet: 00000: information: normal end. name=sha0
hanet: 00000: information: normal end. name=sha1
```

#### [Notes]

- You can verify which virtual interface has encountered a failure while running the command.



### C.1.2.4 stphanet command

#### [Contents]

If there is more than one virtual interface failed to inactivate when attempting to inactivate the virtual interface, error messages will be produced according to the number of virtual interfaces encountered the failure.

#### [Changes]

##### Before modification

This command did not generate an error message for every virtual interface.

The following message will be displayed when disabling multiple virtual interfaces.

```
# /opt/FJSVhanet/usr/sbin/stphanet -n sha0,sha1
hanet: 00000: information: normal end.
```

##### After modification

Now, this command generates an error message for every virtual interface.

The following message will be displayed when disabling multiple virtual interfaces.

```
# /opt/FJSVhanet/usr/sbin/stphanet -n sha0,sha1
hanet: 00000: information: normal end. name=sha0
hanet: 00000: information: normal end. name=sha1
```

#### [Notes]

- You can verify which virtual interface has encountered a failure while running the command.

### C.1.3 A list of incompatible functions

The followings are the incompatible commands of redundant control line function from the previous version.

#### C.1.3.1 Resource state monitoring function for standby node

##### [Contents]

When creating cluster application, it is possible to convert standby node of GLS resource into "Standby" state by setting a value of "Standby Transition" attribute. If neglecting this configuration, it will not monitor the status of standby node of GLS resource. For reference, see "5.1.4 Monitoring resource status of standby node".

##### [Changes]

##### Before modification

GLS resource is set to "Offline" and it does not monitor the standby node of GLS resource state.

##### After modification

GLS resource is converted as "Standby" status and it monitors the standby node of GLS resource status.

##### [Notes]

- When attempting to restore the configuration file for 4.0A20 to the cluster system of version 4.1A20 or later using the backup function of a cluster system, the value "StandbyTransistion" attribute will not be set as the default value. If this configuration is used without any modification, it does not monitor the GLS resource status in standby node. In such case, temporary stop the cluster application and use Admin View to apply the "StandbyTransition" attribute in the configuration file.

### C.1.3.2 Interface state monitoring feature

#### [Contents]

If a user abruptly use ifconfig command to change the status of configured physical interface up or down, interface state monitoring function recovers this change to the state where it was initially running. For details on interface state monitoring function, refer to "2.3.3 Interface state monitoring feature".

#### [Changes]

##### Before modification

It does not recover to the original state.

##### After modification

Recovers to the original state.

#### [Notes]

- In order to apply changes to physical interfaces, restart interface status monitoring function of the bundled physical interface using `resethanet -s` command after applying changes to the configuration settings. For details on `resethanet` command, refer to "7.15 `resethanet` Command".

## C.2 Changes from Redundant Control Line function 4.1A20 to version 4.1A30

Table C.2 is a list of changes made from the previous version.

**Table C.2 List of changes from Redundant Control Line function 4.1A20 to 4.1A30**

Type	Modification	Version
New commands	None.	-
Incompatible commands	hanetpoll Command	Redundant Control Line function 4.1A30
	resethanet Command	Redundant Control Line function 4.1A30
Incompatible function	Verifying the Network address	Redundant Control Line function 4.1A30

### C.2.1 A list of new commands

There are no new commands for redundant control line function 4.1A30.

### C.2.2 A list of incompatible commands

#### C.2.2.1 hanetpoll command

##### [Contents]

In the "-p" option of the hanetpoll command, the IP address of IPv6 link-local address can be specified as a monitoring target.

##### [Changes]

###### Before modification

It will become an error if the IP address of IPv6 link-local address is specified to be a monitoring target.

###### After modification

It does not become an error even if it specifies the IP address of IPv6 link-local address to be a monitoring target.

##### [Notes]

- In the case of the network environment where an IPv6 address is not defined automatically, if the IP address of IPv6 link-local address is specified to be a monitoring target, it can monitor.

#### C.2.2.2 resethanet command

##### [Contents]

When an environmental definition is deleted by using the "resethanet -i" command, subnet mask information defined by the "hanetmask" command is deleted together.

##### [Changes]

###### Before modification

Subnet mask information defined by "hanetmask" command is not deleted.

###### After modification

Subnet mask information defined by "hanetmask" command is deleted.

## C.2.3 A list of incompatible functions

### C.2.3.1 Verifying the Network address

#### [Contents]

During system configuration or activation of virtual interfaces, Redundant Line Control function now verifies for the consistency of network address for configured virtual IP address and physical IP address. In the case where invalid network address of virtual or physical IP address are configured, it will output the following warning.

Warning:

hanet: 35800: warning: the same network addresses are inappropriate.



Note

Before the hanetconfig command defines virtual interfaces, please define subnet mask by hanetmask command. A warning message may be outputted when subnet mask is not being defined in advance.

#### [Changes]

Before modification

It did not check for the consistency of network address for the configured IP addresses.

Network Address	Redundant Mode	Results	
Network address of each interface (physical interface, virtual interface, etc.) is consistent	NIC switching mode	Valid configuration	No warning message
	Fast switching mode	Invalid configuration	No warning message

After modification

Verifies for the consistency of network address for the configured IP addresses.

Network Address	Redundant Mode	Results	
Network address of each interface (physical interface, virtual interface, etc.) is consistent	NIC switching mode	Valid configuration	No warning message
	Fast switching mode	Invalid configuration	Outputs warning message (No.358)

#### [Notes]

- If warning message (No.358) displays while running the following commands, check the IP address or net mask value configured on the physical and virtual interfaces. It is possible that IP address or net mask value is invalid. Note that, command process continues execution regardless of the warning messages.
  - /opt/FJSVhanet/usr/sbin/hanetconfig create
  - /opt/FJSVhanet/usr/sbin/hanetconfig modify
  - /opt/FJSVhanet/usr/sbin/hanetconfig copy
  - /opt/FJSVhanet/usr/sbin/strhanet
  - /opt/FJSVhanet/usr/sbin/hanetnic add
  - /opt/FJSVhanet/usr/sbin/hanethvrsc create
- When the definition error of a network address is detected at the time of system starting or RMS starting, a warning message may be outputted to syslog instead of a standard error (stderr).

## **C.3 Changes from Redundant Control Line function 4.1A30 to version 4.1A40**

There is no difference of the function.



# Appendix D Notice of supplemental information

This appendix provides supplemental information regarding GLS.





## D.1 Trouble shooting

The cause of the frequently occurred trouble when using a Redundant Line Control Function and how to deal with it are explained in this section.

### D.1.1 Communication as expected cannot be performed (Common to IPv4 and IPv6)

#### D.1.1.1 The route information set by a route command is deleted

**Symptom:**

The static route information set by a route add command is deleted.

**Corrective action:**

The static route information configured with "route add" command may be deleted when activating/inactivating the interface and detecting failure on the transfer path. If routing daemon is not used, define the static route information on the OS configuration file. For RHEL-AS4, define the settings on /etc/sysconfig/network-scripts/route-ethX. When using the routing daemon, define the static route information on the routing daemon configuration file.



For details regarding this configuration, refer to "3.2.2 Network configuration".

#### D.1.1.2 Automatic address configuration lags behind for IPv6

**Symptom:**

Automatic stateless address configuration for IPv6 may not operate instantly when activating IPv6. As a consequence, it takes time to add site-local/global addresses.

**Corrective action:**

When activating an interface for IPv6, a link-local address is added to the physical interface to activate the physical interface. To instantly create site-local/global address by the automatic stateless address configuration, it transmits the "router solicitation message" to the adjacent router to request for router advertisement message from the router. However, once the interface activates, if spanning tree protocol (STP) is running on the HUB, it takes time to hold a communication. Thus it may fail to request router advertisement messages.

Because IPv6 router transmits the router advertisement message periodically and automatic stateless address configuration runs after certain amount of time, it is possible to hold a communication of site-local/global addresses. Nevertheless, if the time interval parameter of transmitting the router advertisement message is set for a considerably long time, it may consume a long time until the automatic stateless address configuration starts and to hold a communication.

In such case, either establish a link for operating NIC and standby NIC or modify the router setting so that a router transmits the router advertisement message within a fewer minutes interval.



## D.1.2 Virtual interface or the various functions of Redundant Line Control Function cannot be used

### D.1.2.1 An interface of NIC switching mode is not activated

#### Symptom:

The following message is output and activation of an interface fails.

```
hanet: ERROR: 85700: polling information is not defined. Devname = sha0(0)
```

#### Corrective action:

In NIC switching mode, switching interfaces inside a node and between nodes are controlled using a failure monitoring function. Therefore, NIC switching mode does not work only by defining the information of a virtual interface using a hanetconfig create command. It is necessary to set the monitor-to information by a hanetpoll create command. When the monitor-to information is not set, a takeover IP address is not activated either. Activation of a service fails in cluster operation.

When using a logical address takeover function, and also when sharing a physical interface, it is necessary to have the monitor-to information in a unit of information of each virtual interface. In such a case, duplicate the information of a virtual interface and the monitor-to information that defined initially using a hanetconfig copy command and a hanetpoll copy command.

### D.1.2.2 Error detection message displays for standby patrol in NIC switching mode

#### Symptom:

The following messages display during recovering process of standby patrol in NIC switching mode. As a result, it fails to instantly switch back from the secondary interface to the primary interface.

```
hanet: INFO: 88500: standby interface recovered. (sha1)  
hanet: INFO: 89700: immediate exchange to primary interface is canceled. (sha1)
```

#### Corrective action:

After switching from the primary interface to the secondary interface due to transfer path failure, if a standby patrol recovers prior to elapsed link up delay time (default is 60 sec), the switching process between the primary and secondary interface may loop infinitely. To prevent from this symptom, the above messages will be displayed to stop the switching process for the primary interface. The main reason of covering this issue in this section is to prevent infinite loop of switching interfaces when setting routes for monitoring and instead of HUBs.

### D.1.2.3 Error detection message displays for standby patrol in NIC switching mode

#### Symptom:

The following message is output and activation of an interface fails.

```
hanet: WARNING: 87500: standby interface failed.
```

#### Corrective action:

On the network where VLAN switch exists on the transfer path monitored via standby patrol function, this error occurs if the following two circumstances take place:

- 1) Connecting a redundant NIC to a port of disparate VLAN identifier.

- 2) Connecting one of a redundant NIC or both redundant NICs to tagged member port of the switch.

The VLAN switch cannot communicate in between the ports where VLAN identifiers are disparate. Therefore, when connecting redundant NIC to disparate VLAN identifier, transmitting the monitoring frame fails between standby NIC and operation NIC, consequentially outputting 875 message. Additionally, even if VLAN identifiers are the same port and this port is set to tag member, and in the condition where the NIC does not support tag VLAN (IEEE802.1Q compliance), it still fails to retrieve tag frame from the switch. Once again, transmitting the monitoring frame fails outputting 875 message. To rectify this problem, double check the VLAN configuration of the switch and make sure VLAN identifier is identical on the port connecting redundant NIC. If the NIC you are using does not support tag VLAN, set the port of the switch as non-tag member.

### D.1.3 Failure occurs during operation (Common to both Single and Cluster system)

#### D.1.3.1 Switching takes place in NIC switching mode regardless of failure at the monitoring end

Symptom:

Even though there is no error in network devices, the following message is output and HUB monitoring ends abnormally.

```
hanet: ERROR: 87000: polling status changed: Primary polling failed.
(eth0,target=192.13.71.20)
hanet: ERROR: 87100: polling status changed: Secondary polling failed.
(eth1,target=192.13.71.21)
```

Corrective action:

In NIC switching mode, occasionally it takes time to establish a data link at Ethernet level following activation of an interface. Even though activated an interface, it is not possible to communicate immediately. Generally it becomes possible to communicate in dozens of seconds after activated, but some HUBs to connect take more than one minute, and occasionally HUB monitoring fails and switching occurs.

In such a case, extend the time to wait for linking up (default value: 60 seconds) by a hanetpoll on command. Also when HUB to use is set to use STP (Spanning Tree Protocol), occasionally takes long time to become possible to communicate. Extend the time to wait for linking up if necessary. On the HUB where STP is running, possible next connection could take twice as the transfer delay time (normally 30 sec) after linked up. Standard link up latency of operating STP can be derived from the equation below. For verifying STP transfer delay time, see the manual of HUB your using.

$$\text{link up latency} > \text{STP transfer delay time} * 2 + \text{monitoring period} * \text{number of monitoring}$$


Note

- To operate HUB monitoring over the system that runs firewall, configure the firewall so that ping can pass through the firewall. Otherwise, it fails to operate HUB monitoring.

#### D.1.3.2 Takes time to execute an operation command or to activate a cluster service

Symptom:

Takes time to execute an operation command of a Redundant Line Control Function.  
Takes time to activate a service or to switch nodes at the cluster operation.

**Corrective action:**

When a host name or an IP address specified in the information of a virtual interface, the monitor-to information, etc. is not described in /etc/hosts file, or when "files" are not specified at the top in an address solution of /etc/nsswitch.conf, occasionally it takes time to process an internally executed name-address conversion. Therefore, it takes time to execute a command, or for the cluster state to change. Check that all IP addresses and host names to use in a Redundant Line Control Function are described in /etc/hosts, and that /etc/hosts is referred first at name-address conversion.



## D.1.4 Failure occurs during operation (In the case of a Cluster system)

### D.1.4.1 Node switching is not executed in Fast switching mode

#### Symptom:

Failover between clusters (job switching between nodes) is not executed in Fast switching mode at cluster operation.

#### Corrective action:

In Fast switching mode, it is decided that an error occurred in a transfer route when a response from all other systems in communication was cut off. Therefore, node switching is not executed when all cables are pulled out or when the power of all HUBs is not turned on. If "Link detected: no" message pops up, check the status of the cable and HUB. Although, if the driver for NIC does not support ethtool command, you can not use this command. When the following message is often displayed, check the cables or HUBs.

```
# ethtool eth0
Settings for eth1:
  Supported ports: [ TP MII ]
  Supported link modes:   10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
  Supports auto-negotiation: Yes
  Advertised link modes:  10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
  Advertised auto-negotiation: No
  Speed: 100Mb/s
  Duplex: Full
  Port: MII
  PHYAD: 1
  Transceiver: internal
  Auto-negotiation: off
  Supports Wake-on: g
  Wake-on: g
  Current message level: 0x00000007 (7)
  Link detected: yes
```





## **D.1.5 Resuming connection lags after switching (Common to both Single and Cluster system)**

### **D.1.5.1 Recovery of transmission falls behind after switching to standby interface in NIC switching mode**

**Symptom:**

When switching interface from operating NIC to standby NIC in NIC switching mode where HUB in the network is running Spanning Tree Protocol (STP), it takes roughly 30 seconds to hold a communication with standby NIC.

**Corrective action:**

In the HUB where STP is running, establishing link by activating an interface does not necessarily mean to acquire communication instantly. In such environment, after a link has established on the port where NIC is connected, transmitting data is temporary constrained by transmission delay timer (Forward-time). In order to establish a communication instantly after switching to standby NIC, use the standby patrol. Standby patrol establishes a link regularly in both operation and standby NIC, so that the transmitting data would not be constrained by transmission delay timer (Forward-time) of STP.



## D.1.6 Incorrect operation by the user

### D.1.6.1 Accidentally deleted the virtual interface with ifconfig command

#### Symptom:

Unable recover the virtual interface (sha) deleted with ifconfig command by accident.

#### Corrective action:

There would be no guarantee on system behavior, if a virtual interface (sha) is disabled or deleted. In order to recover a virtual interface, follow the procedure below:

#### [Example 1]

Accidentally executing "ifconfig sha0 down" against a virtual interface sha0 for Fast switching mode.

```
If IPv4 address is being used:  
# ifconfig sha0 IPv4 address netmask network mask broadcast broadcast address arp  
up  
  
IPv6 address is being used:  
# ifconfig sha0 up  
# ifconfig sha0 add IPv6 address/prefixlen
```



[See](#)

In the case of a cluster system, a virtual interface is restored automatically. In addition, please refer to "2.3.3 Interface status monitoring feature" automatically about the virtual interface which can be restored.

## D.1.7 Environment configuration mistakes

### D.1.7.1 GLS daemon is not activated

**Symptom:**

When the Linux kernel is updated, the GLS daemon is not activated. Also, an error message indicating "Starting hanet: failed" is output to the system startup log (/var/log/boot.log).

**Corrective action:**

Compile the GLS virtual driver (sha driver) when installing the GLS package. If the kernel version when the GLS package is installed is different than that when GLS is operated, driver loading will fail so that the GLS daemon will not be activated.

Check if the kernel version is the same. If you want to update the Linux kernel, it is necessary to install the GLS package again.

---

# Glossary

This appendix provides glossary as a tool for studying this users guide.

This glossary includes terms that are frequently used when discussing the document.

Users can find definitions of unfamiliar words, or of familiar words that may have an unfamiliar meaning in the context of this document.

## **Active interface**

An interface currently used for communication.

[Related article] Standby interface

## **Automatic fail-back function**

A function to automatically fail back without any operator when the failed LAN recovered. See a standby patrol function (automatic fail-back if a failure occurs) or a standby patrol function (immediate automatic fail-back) for the detail.

## **Cluster failover function (failover function)**

A function to fail over between clusters if all physical interfaces bundled by a virtual interface caused an error or if an active node panicked or hung when operating clusters.

## **Dynamic switching function**

A function to switch to a standby interface while an active interface is active.

## **Fast switching mode**

Fast switching mode keeps the communication alive during transfer route failure and increases the total throughput by multiplexing transfer routes between servers on the same network.

## **HUB monitoring function**

A function to monitor from an active interface to a HUB connected to an active interface. It switches to a standby interface if detected an error.

[Related article] HUB-to-HUB monitoring function, Line monitoring

## **HUB-to-HUB monitoring function**

A function to monitor an error in the connection between the HUBs (cascade connection). The monitoring range is from an active interface to a HUB connected to an active interface, and to the one connected to a standby interface. This function includes the monitoring range of a HUB monitoring function. However, it does not monitor a standby interface.

[Related article] HUB monitoring function

## **LAN card**

The same meaning as that of NIC.

## **Line monitoring**

The same meaning as that of HUB monitoring function.

[Related article] Inter-HUB monitoring function

## **Logical interface**

A logical interface created in a different name to the same one physical interface. For instance, a logical interface to a physical interface eth0 is eth0:X (X is 0, 1, 2...)

[Related article] Logical IP address

## **Logical IP address (logical IP)**

An IP address assigned to a logical interface.

[Related article] Logical interface

## **Logical IP address takeover function**

A function to take over a logical IP address from cluster to cluster. It is possible to take over a logical IP address if switching from an active node to a standby node occurred between clusters.

A physical IP address is not taken over in this case.

## **Logical virtual interface**

Logical virtual interface is a logical interface created as distinguished name for a virtual interface. For example, a logical virtual interface for the virtual interface sha0 is represented as sha0:X (X refers to 2,3..64).

Note that if X becomes larger than 65, they are then used as a takeover virtual interface on a

---

cluster environment.

### **Monitoring frame**

A Monitoring frame is an unique frame GLS handles to monitor the transfer paths. Fast switching mode uses this feature to monitor associate host. For NIC switching mode, it uses this feature as standby patrol function to monitor standby interfaces.

[Related article] Standby patrol function, HUB monitoring function, Inter-HUB monitoring function

### **NIC sharing**

A function to create more than one piece of configuration information by sharing the NIC if the adding physical IP address is the same in all NICs and configuration information. Use this function to assign more than one IP to a pair of the redundant NICs. Use this to execute cluster mutual standby operation as well.

### **NIC switching mode**

A mode to realize high reliability by exclusively using a redundant NIC and switching when an error occurred. It is necessary to connect a redundant NIC in the same network in this mode.

### **Physical interface**

An interface created for the NIC equipped with in a system.

[Related article] Physical interface

### **Physical IP address (physical IP)**

An IP address assigned to a physical interface.

[Related article] Physical interface

### **Physical IP address takeover function**

Physical IP address takeover function is a function that takes over physical IP addresses between redundant NICs. On a cluster operation, it consists with two separate functions, they are Physical IP address takeover function I and IP address takeover function II.

### **Physical IP address takeover function I**

This function takes over physical IP addresses between a cluster environment. Apply hanetconfig command with -e option before creating a virtual interface. It could takeover the physical IP address when switching occurs from operation node and standby node on cluster environment. Moreover, it activates physical interface on standby node of the cluster.

### **Physical IP address takeover function II**

This function takes over physical IP addresses between a cluster environment. Apply hanetconfig command without -e option before creating a virtual interface. It could takeover the physical IP address when switching occurs from operation node and standby node on cluster environment. Moreover, it does not activate physical interface on standby node of the cluster.

### **Primary interface**

An interface to use for communication initially in NIC switching mode.

[Related article] Secondary interface

### **Real interface**

The same meaning as that of a physical interface.

### **Redundant Line Control function**

A function to realize high reliability of communication by making a network line redundant.

### **RMS Wizard**

A software package composed of various configuration and administration tools used to create and manage applications in an RMS configuration. For details, see "PRIMECLUSTER Installation and Administration Guide".

### **Secondary interface**

An interface initially standing by in NIC switching mode. It switches from a standby interface to an active interface if an error occurred in a primary interface.

### **Sharing transfer route monitoring**

This refers to the case where multiple virtual interfaces specifies the same polling target. All of the virtual interfaces specified with the same polling target will simultaneously switch over when a failure occurs on the transfer route.

[Related article] NIC switching mode

---

### **Standby interface**

An interface currently not used for communication, but to be used after switched.  
[Related article] Active interface

### **Standby patrol function**

A function to monitor the status of a standby interface in NIC switching mode. Monitoring a standby interface regularly detects a failure of NIC switching in advance. Standby patrol is to send a monitoring frame from a standby interface to an active interface and monitor its response. The monitoring range is from a standby interface to a HUB connected to a standby interface, a HUB connected to an active interface, and an active interface. This includes the monitoring range of an inter-HUB monitoring function. Therefore, it is not necessary to use an inter-HUB monitoring function when using a standby patrol function. The monitoring range of inter-HUB monitoring is from an active interface to a HUB connected to an active interface and the one connected to a standby interface, without including a standby interface.  
[Related article] Standby patrol function (automatic fail-back if a failure occurs), Standby patrol function (immediate automatic fail-back)

### **Standby patrol function (automatic fail-back if a failure occurs)**

A standby patrol function to automatically incorporate the failed interface as a standby interface when it recovered. This function automatically incorporates the failed primary interface as a standby interface when it recovered. This makes it possible to fail back to a primary interface if an error occurred in a secondary interface.  
[Related article] Standby patrol function, Standby patrol function (immediate automatic fail-back)

### **Standby patrol function (immediate automatic fail-back)**

A standby patrol function to fail back immediately after the failed interface recovered. When the failed primary interface recovered, this function immediately fails it back as an active interface. A secondary interface is incorporated as a standby interface in this case.  
[Related article] Standby patrol function, Standby patrol function (automatic fail-back if a failure occurs)

### **Takeover virtual interface**

Takeover virtual interface is an interface of GLS, which takes over an interface between the cluster nodes. Takeover virtual interface is configured with a logical virtual interface containing logical number of 65 or later.

### **User command execution function**

This refers execution of a command manually operated by the user.  
[Related article] NIC switching mode, GS/SURE linkage mode

### **Virtual interface**

An interface created for a Redundant Line Control Function to deal with a redundant NIC as one virtual NIC. The virtual interface name is described as shaX (X is 0, 1, 2...)  
[Related article] Virtual IP address

### **Virtual IP address (virtual IP)**

An IP address assigned to a virtual interface.  
[Related article] Virtual interface

### **Web-Based Admin View**

This is a common base enabling use of the Graphic User Interface of PRIMECLUSTER. This interface is in Java. For details, see "PRIMECLUSTER Installation and Administration Guide".

---

# Abbreviations

**GLS**

Stands for Global Link Services.

**LAN**

Local area network

**NIC**

Stands for Network Interface Card. Also called a LAN card.

**PHP**

PCI Hot Plug

**SIS**

Stands for Scalable Internet Services.

**RMS**

Reliant Monitor Services.



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