# GSRP Usage Guide

for the Guaranteed Network

Edition 1

# Preface

This document is intended to help deepen the understanding of GSRP (Gigabit Switch Redundancy Protocol), one of ALAXALA's own technologies. GSRP provides redundancy for switches in case of any failure, by securing a communication path via another switch.
For the purpose of the effective design and establishment of GSRP systems, this document describes the operational overview, the methods of configuration, the operational management, and the precautions regarding GSRP.

### Related documents

- AX-series product manual (http://www.alaxala.com/en/techinfo/manual/index.html)

### Notes on using this document

The information in this document is based on the basic operations verified under the environment specified by ALAXALA and does not guarantee operations regarding functionality, performance, and reliability under all environment requirements. Please understand that this document is intended to help with system configuration for our products.
Unless otherwise stated, the OS software version as of the creation of this document is as shown below.

| | |
|---|---|
| AX6300S series | Ver11.3 |
| AX3630S series | Ver11.2.A |
| AX2430S | Ver11.2.A |

Information in this document is subject to change without notice.

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### Conventions: The terms "Switch" and "switch"

The term Switch (upper-case "S") is an abbreviation for any or all of the following models:

- AX6700S/AX6600S/AX6300S series switch
- AX3600S, AX2400S series switch
- AX2500S series switch
- AX1200SA series switch

The term switch (lower-case "s") might refer to a Switch, another type of switch from the current vendor, or a switch from another vendor. The context decides the meaning.

# Contents

# Part 1

# Overview of GSRP

This part describes the overview, features, and supported specifications of GSRP.

# 1. What is GSRP?

## 1.1 Overview of GSRP

GSRP (**G**igabit **S**witch **R**edundancy **P**rotocol) is ALAXALA's proprietary technology for a redundancy switching functionality that provides a redundancy configuration for two GSRP switches, which allows communication to continue via another switch even if one switch encounters a line failure or a malfunction.
Spanning Tree Protocol (STP), which provides network redundancy, can be utilized as redundancy functionality in Layer 2, while VRRP provides the redundancy of default gateways in Layer 3. In contrast, GSRP provides Layer 2 redundancy and Layer 3 redundancy at the same time as a single feature.

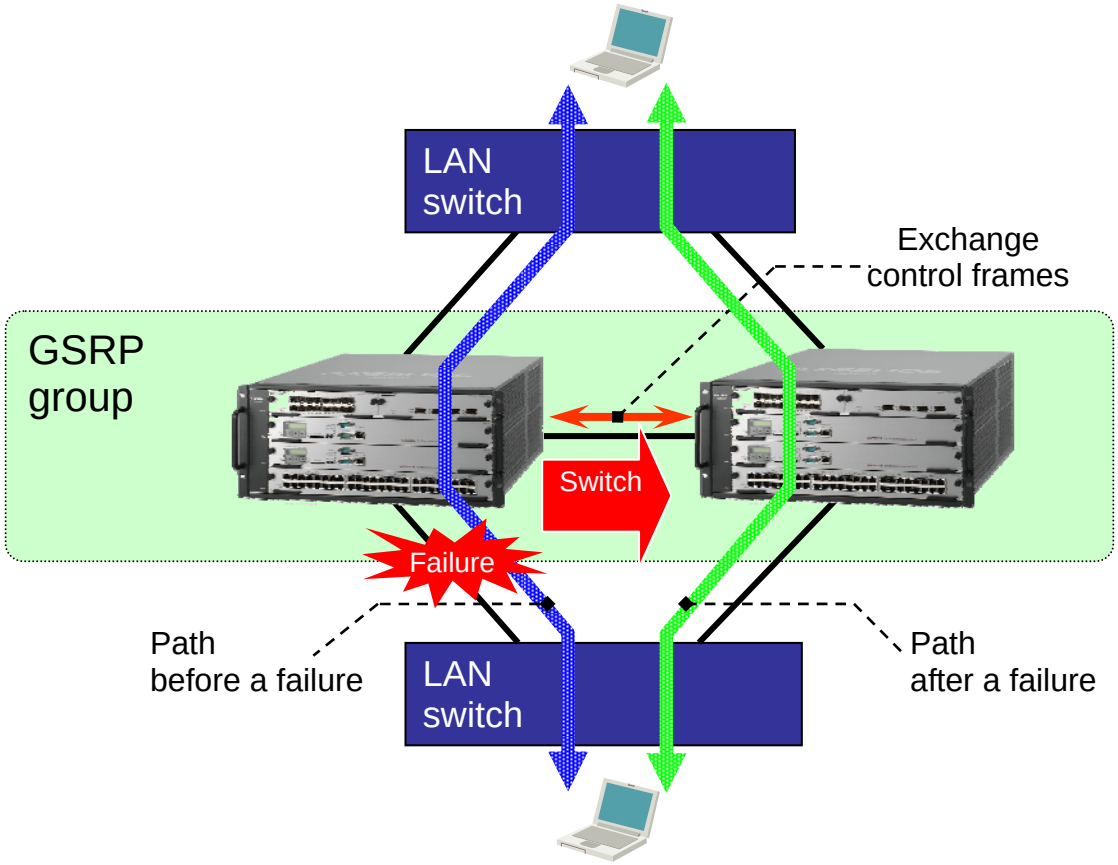



**Figure 1.1-1 Overview of GSRP**

## 1.2 Description of GSRP terms

The table below explains the terms relating to GSRP.

**Table 1.2-1 Description of GSRP terms**

| No. | Term | Description |
|---|---|---|
| 1 | GSRP switch | A switch that is equipped with L2 and L3 redundancy through GSRP functionality, and is operating as a master or backup with the GSRP function enabled |
| 2 | GSRP master | A GSRP switch operating as master. A master controls its VLAN groups so that it brings all VLANs in the groups to a forwarding state, and it provides communications based on the registration information of MAC addresses. |
| 3 | GSRP backup | A GSRP switch operating as backup. A backup controls its VLAN groups so that it brings all VLANs in the groups to a blocking state, resulting in no forwarding, although it sends and receives GSRP control frames and L2 control frames.<br>A backup becomes a master when a failure occurs in its adjacent master switch. |
| 4 | GSRP aware | A lower-level switch of a GSRP switch that is able to acknowledge GSRP Flush request frames from the GSRP switch and to clear the MAC address table. |
| 5 | GSRP unaware | A lower-level switch of a GSRP switch that is unable to acknowledge GSRP Flush request frames from the GSRP switch (A third-party product). |
| 6 | GSRP group | An instance of GSRP; it comprises up to two GSRP switches and one or more GSRP aware/unaware |
| 7 | VLAN group | A logical group that groups multiple VLANs; they constitute a unit of master and backup switching in a GSRP group. Load balancing for each VLAN is achieved by using such VLAN groups. |
| 8 | GSRP control frame | There are two types of GSRP control frames: **GSRP Advertise** for information exchange between a master and its backup; and **GSRP Flush request**, which informs neighboring GSRP aware switches of the switching of a master and removes the MAC address entries. |
| 9 | GSRP Advertise | A type of GSRP control frame; used for information exchange between a master and its backup via a direct link between switches (master and backup). |
| 10 | GSRP Flush request | A type of GSRP control frame: used to inform GSRP aware switches of the switching of a master or backup, and request the removal of the MAC address entries. |
| 11 | direct link | A connection link between a GSRP master and backup. It is essential for GSRP. A direct link is used for sending and receiving GSRP control frames (GSRP Advertise). It is recommended to make two or more lines as a direct link so as not to stop the communication between a master and its backup. |
| 12 | GSRP-managed VLAN | A VLAN that sends and receives GSRP control frames; it must be configured to connect with a direct link and to have communication ports with GSRP aware switches. |

# 2. GSRP Features and Supported Specifications

## 2.1 GSRP features

GSRP has the following benefits, and also achieves L2 and L3 redundancy as a single feature.

### (1) Avoiding an infinite loop

In some redundancy protocols such as STP, there is the possibility that a backup device might automatically shift to a master state if no normality checking frame is received from its partner, leading to communication failure.
In GSRP, in contrast, when GSRP backup becomes a master due to failure or for any other reason, it waits for its master to shift to the backup state before shifting to the GSRP master state. This prevents the two GSRP switches from transitioning to master at the same time, eliminating the risk of loops.

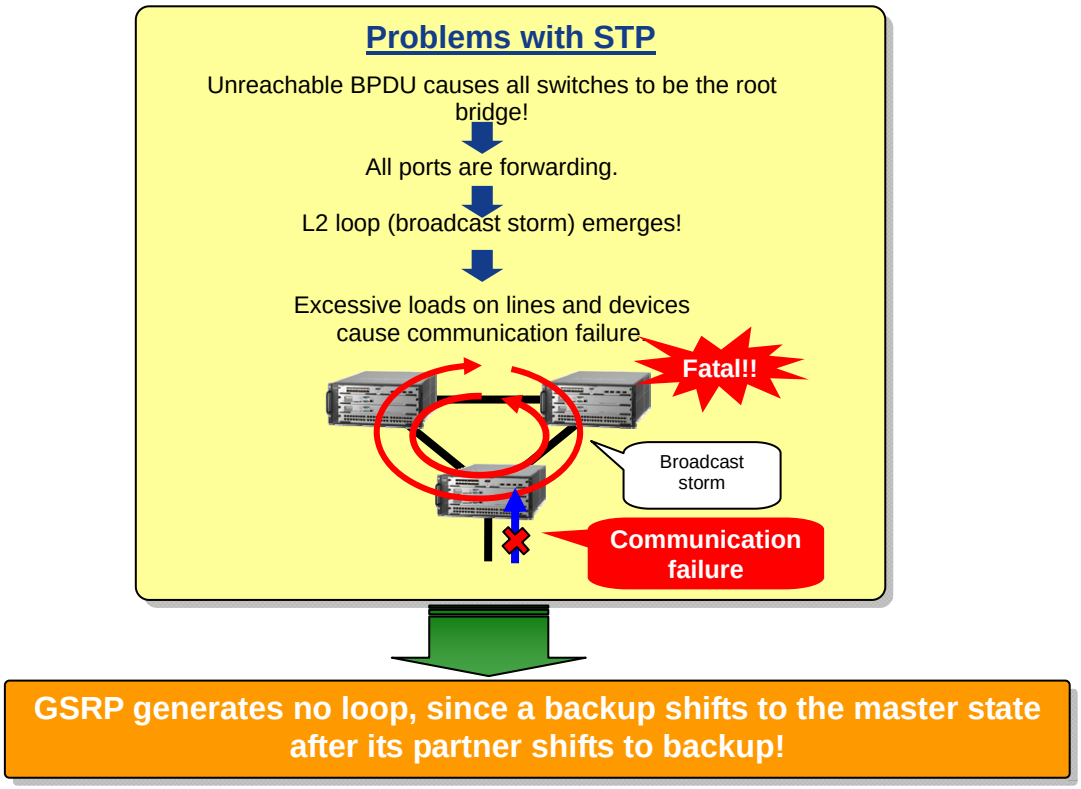



**Figure 2.1-1 The problem of overlapping masters in STP**

### (2) Layer 3 linkage

A network composed of STP needs linkage with VRRP to secure Layer 3 redundancy.
In contrast, GSRP implements Layer 2 and 3 redundancy as a single functionality. Therefore, GSRP has the advantage of linkage with Layer 3 and of easy-to-use operational management.

### (3) Restrictions in the range of sending control frames

In GSRP, all control frames will be sent and received by specified VLANs in order to restrict the range of sending control frames and to prevent them from being sent to unnecessary points.
This mechanism achieves stable operations even under high loads, since no control frame flows through any data line in a normal operation.

### (4) Load balancing among VLAN groups as a unit

In GSRP, the states (master and backup) are managed for each VLAN group. It is possible to achieve traffic balancing by establishing a load-balanced configuration with multiple VLAN groups.

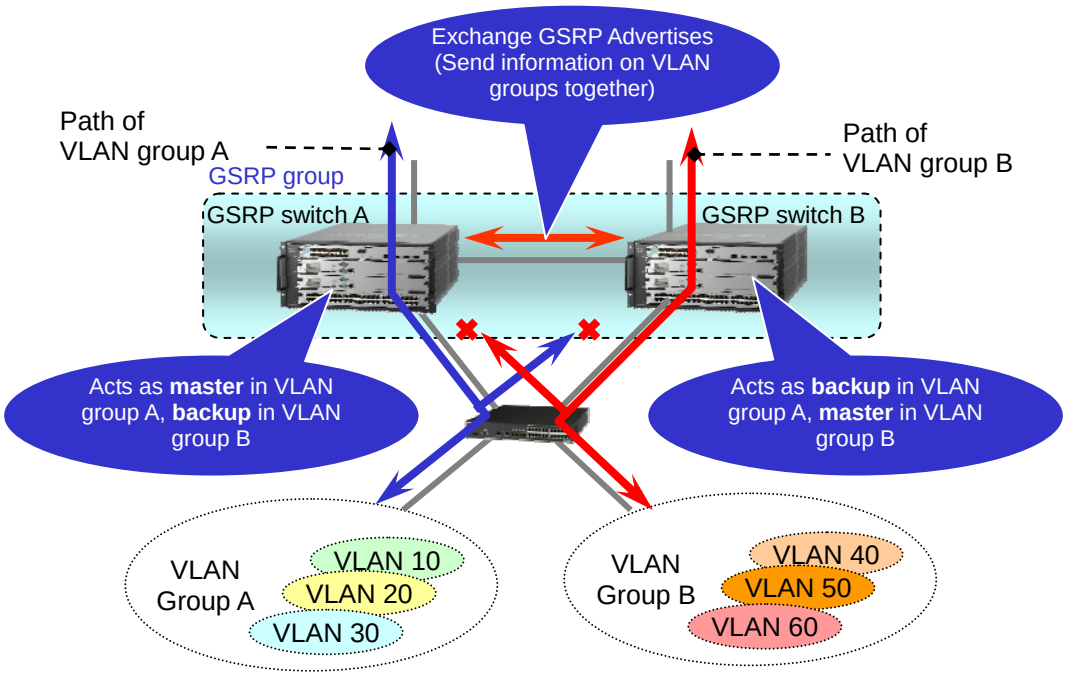
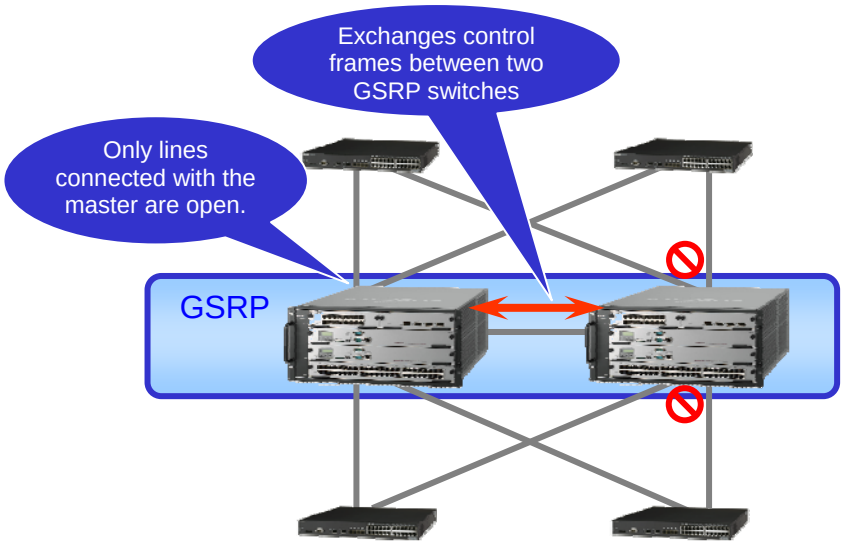



**Figure 2.1-2 GSRP's load balancing**

## 2.2 Overview of Layer 2 system

### (1) Overview of Layer 2 redundancy

GSRP is composed of two switches; which one acts as master will be determined by the control frames exchanged between the two GSRP switches. Only a GSRP master can establish communication; the GSRP backup does not communicate.




**2.2-1 Overview of the Layer 2 system**

### (2) Comparison between GSRP and STP

A comparison between GSRP and STP (rapid-PVST: IEEE802.1w) in Layer 2 systems is shown in the table below.

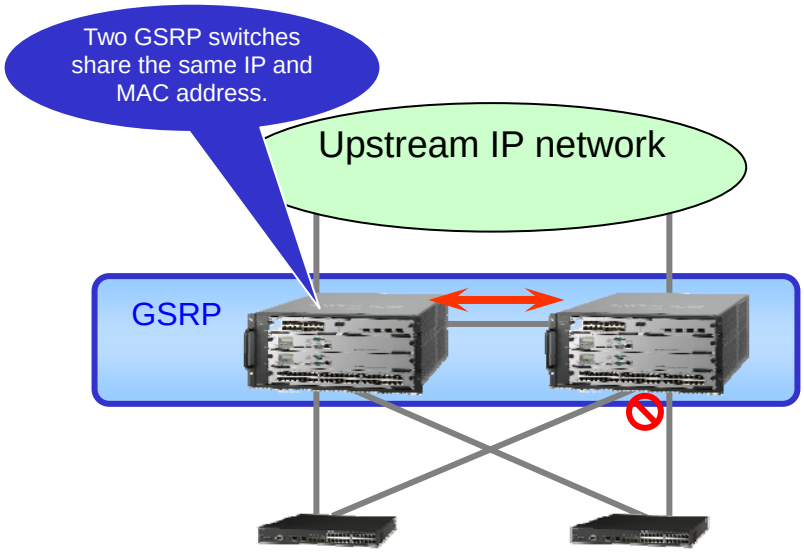
**Table 2.2-1 Comparison between GSRP and STP**

| No. | Item | GSRP | STP |
|---|---|---|---|
| 1 | Risk of L2 loop | · Controlled only by GSRP switches, no risk of L2 loop | · Broadcast storm is possible; high risk of L2 loop. |
| 2 | Switching speed | · Faster than STP | · Slow to recover from root bridge down |
| 3 | Applicability for large systems | · No limit to the number of VLANs | · The number of VLANs is limited. |
| 4 | Stability under high loads | · Stable at high loads since no control frame flows through data lines | · High loads in data lines can impede control frames, likely to cause traffic failure. |
| 5 | Connection with third-party devices | · ALAXALA proprietary functionality so no connectivity with third-party devices<br>· Outside of GSRP systems, third-party devices can be connected as GSRP unaware. | · Reciprocal connection with standard-compliant devices is supported. |

## 2.3 Overview of Layer 3 system

### (1) Overview of Layer 3 redundancy

GSRP supports Layer 3 redundancy switching functions as well as Layer 2 redundancy switching. In Layer 3 redundancy switching, two GSRP switches make a default gateway redundant by sharing the same IP address and MAC address.
In case of failure in a GSRP master, the GSRP backup shifts to master and automatically inherits the IP address to keep connected.




**2.3-1 Overview of the Layer 3 system**

### (2) Comparison between GSRP and STP-VRRP

A comparison between GSRP and STP-VRRP in Layer 3 systems is shown in the table below. Note that the table compares the GSRP Layer 3 redundancy switching with the combination of VRRP and STP.

**Table 2.3-1 Comparison between GSRP and STP-VRRP**

| No. | Item | GSRP | STP-VRRP |
|---|---|---|---|
| 1 | Layer 2 + Layer 3 redundancy | · One function achieves Layer 3 linkage; easy to manage. | · Necessary to link two functions (STP and VRRP) |
| 2 | Switching speed | · Faster than STP-VRRP | · Depends on the switching speed of STP |
| 3 | Stability under high loads | · Stable at high loads since no control frame flows through data lines | · Likely to become unstable due to increased packets controlling STP and VRRP |
| 4 | Connection with third-party devices | · ALAXALA proprietary functionality so no connectivity with third-party devices<br>· Outside of GSRP systems, third-party devices can be connected as GSRP unaware. | · Reciprocal connection with standard-compliant devices is supported. |

## 2.4 GSRP's supported specifications

The specifications on the support of GSRP of the AX series are listed in the table below. Note that AX2400S does not support Layer 3 redundancy switching, while AX1200S supports only GSRP aware functionality. The AX3600S series and AX6000S series support the same functional specifications, though there is a difference between the accommodation conditions.

**Table 2.4-1 GSRP's supported specifications**

| No. | Function | AX1200S | AX2400S | AX3600S | AX6300S | AX6600S | AX6700S |
|---|---|---|---|---|---|---|---|
| 1 | Layer 2 redundancy switching | N | Y | Y | Y | Y | Y |
| 2 | Layer 3 redundancy switching | N | N | Y | Y | Y | Y |
| 3 | GSRP aware | Y | Y | Y | Y | Y | Y |
| 4 | Number of GSRP groups per device | N | 1 | 1 | 1 | 1 | 1 |
| 5 | Maximum number of the Switches composing a GSRP group | N | 2 | 2 | 2 | 2 | 2 |
| 6 | Maximum number of VLAN groups per GSRP group | N | 64 | 64 | 128 | 128 | 128 |
| 7 | Maximum number of VLANs per VLAN group | N | 1024 | 1024 | 4095 | 4095 | 4095 |
| 8 | Transmission interval of GSRP Advertise frames | N | 0.5-60 seconds | 0.5-60 seconds | 0.5-60 seconds | 0.5-60 seconds | 0.5-60 seconds |
| 9 | Retention time for GSRP Advertise frames | N | 1-120 seconds | 1-120 seconds | 1-120 seconds | 1-120 seconds | 1-120 seconds |
| 10 | Load balancing | N | Y | Y | Y | Y | Y |
| 11 | Backup fixation | N | Y | Y | Y | Y | Y |
| 12 | Port resetting | N | Y | Y | Y | Y | Y |
| 13 | Sequential switching prevention | N | Y | Y | Y | Y | Y |
| 14 | VLAN group-only control functionality | N | Y | Y | Y | Y | Y |
| 15 | Ports not controlled by GSRP | N | Y | Y | Y | Y | Y |

Legend Y : Supported N : Not supported

# Part 2

# Layer 2 Systems

This part describes the operation, application example, operational management, and precautions regarding GSRP in a Layer 2 system.

# 1. Operations of GSRP in Layer 2

## 1.1 Layer 2 redundancy switching

GSRP allows you to achieve Layer 2 network redundancy (loop avoided). Unlike STP, GSRP is controlled by the information exchanges between two switches, thus resulting not only in faster switching but also in applicability to large networks.

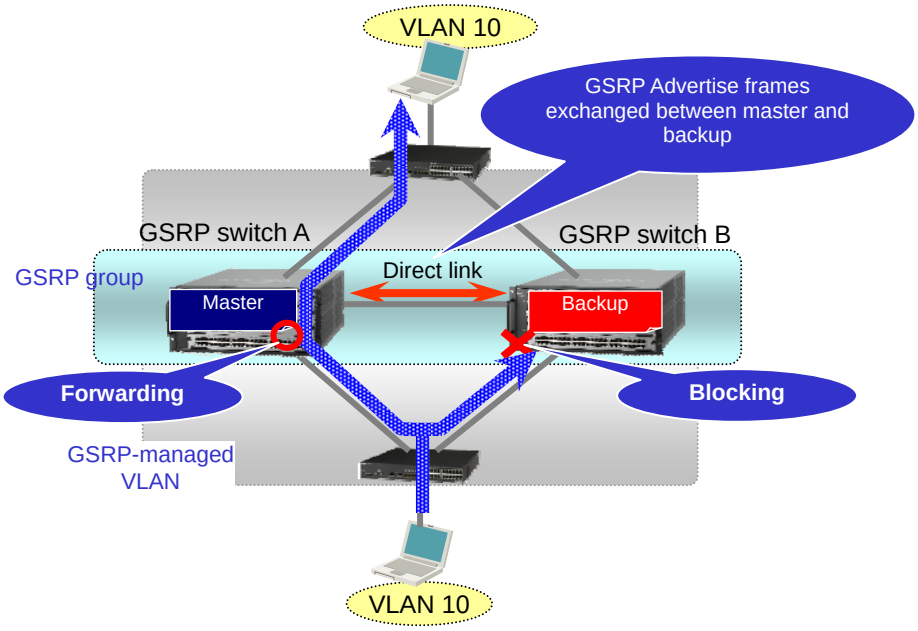



**Figure 1.1-1 Operations of GSRP**

A pair of two GSRP switches constitutes a GSRP group, where in normal operation, one is the master and the other is the backup. A direct link between the GSRP switches is one of the essential elements of a GSRP system. Via the link, the switches exchange GSRP Advertise frames to control the system. In GSRP, GSRP Advertise frames are used to switch the states of the master and backup. A GSRP switch in a master state sends forward the frames from specified VLAN groups, while the other backup switch blocks them.

To restart communications immediately after GSRP switches shift between master and backup states requires the MAC address table entries retained by surrounding switches to be cleared at the same time the GSRP switches shift. GSRP supports the following two methods of removing the MAC address table entries of surrounding switches.

- Transmission of GSRP Flush request frames
  GSRP switches send the control frames, called GSRP Flush request frames, to surrounding switches to require them to clear their MAC address table entries.
- Port resetting
  Port resetting functionality disconnects surrounding switches with GSRP switches for a short time. This is used when surrounding switches are GSRP unaware.

## 1.2 Operations in case of failures

### (1) Operations at the time of link failure

A link failure in any link between the GSRP master and the switches managed by it will be followed by the series of switching operations shown below.

1) GSRP switch A detects a link-down with the switches managed by it, decreasing the **number of active ports**;
2) GSRP switch A shifts to the backup state;
3) GSRP switch B, which currently has the right to be GSRP master as **GSRP Advertise** says the **number of active ports** is greater than that of GSRP switch A, shifts to a wait-for-master state;
4) GSRP switch A informs GSRP switch B that A is currently in a backup state;

5) GSRP switch B shifts to master;
6) GSRP switch B sends a **GSRP Flush request** to the GSRP-managed VLANs to force GSRP aware switches to clear their MAC address tables, and;
7) To force GSRP unaware switches to clear their MAC address table, GSRP switch A activates the port-resetting function to reset the ports (link-down).

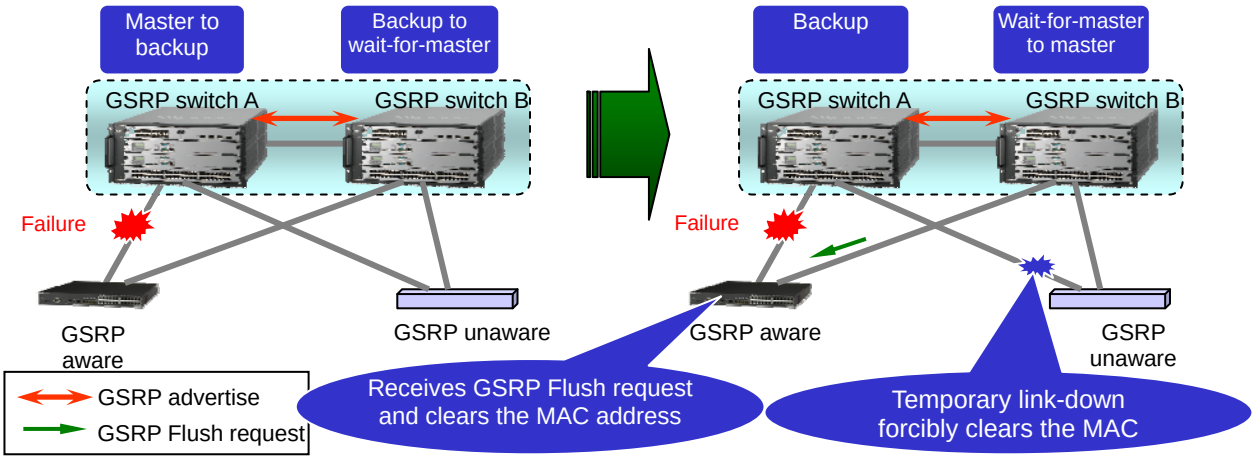



**Figure 1.2-1 Operations at the time of link failure**

### (2) Operations at the time of master switch failure

Any failure of a GSRP master switch will be followed by the series of switching operations as shown below.

1. If GSRP switch A fails, GSRP switch B detects the failure through the absence of **GSRP Advertise** from A, and shifts to a No neighbor state;
2. If the operation mode in case of direct link down detection is set to **manual**, a disconnection will be maintained until the user executes a switching command;
3. If the operation mode in case of direct link-down detection is set to **direct-down**, GSRP switch B automatically shifts to master, since **GSRP Advertise** from A is timed out and the direct link line is in a link-down state;
4. GSRP switch B sends a **GSRP Flush request** to the GSRP-managed VLANs to force GSRP aware switches to clear their MAC address tables, and;
5. The MAC address tables of GSRP unaware switches are cleared through the link-down associated with the failure of GSRP switch A.

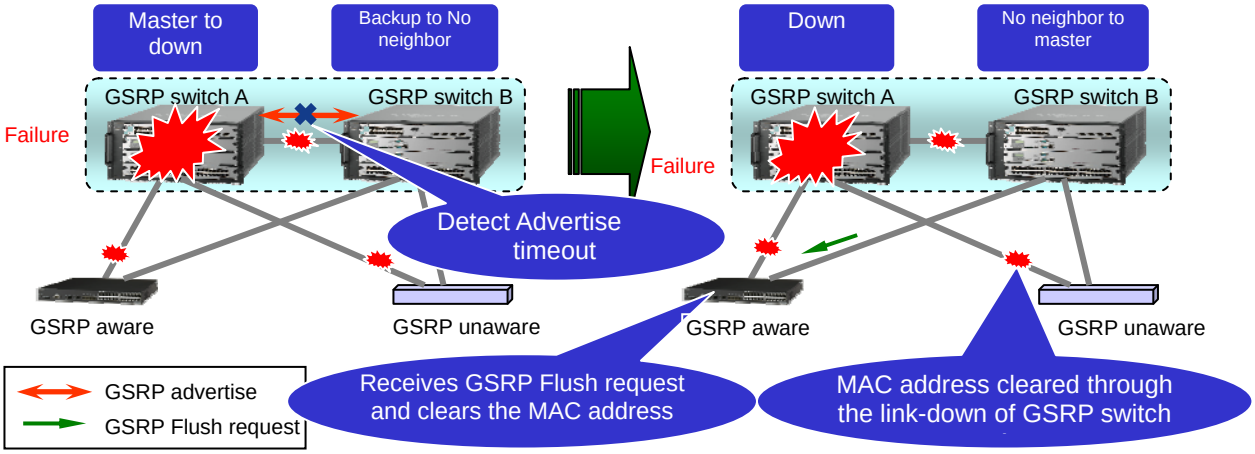



**Figure 1.2-2 Operations at the time of master device failure**

# 2. Application Example of GSRP in Layer 2

This chapter explains the key points and operation of GSRP configuration in a Layer 2 system.

## 2.1 Configuration of a Layer 2 system

An example of an application of GSRP into a Layer 2 system is shown below.

In this example system, two VLANs are divided into separate VLAN groups to achieve load balancing. VLAN 10 in VLAN group 1 communicates via GSRP switch A, while VLAN 20 in VLAN group 2 communicates via GSRP switch B. Thus, the loads of communication are distributed.

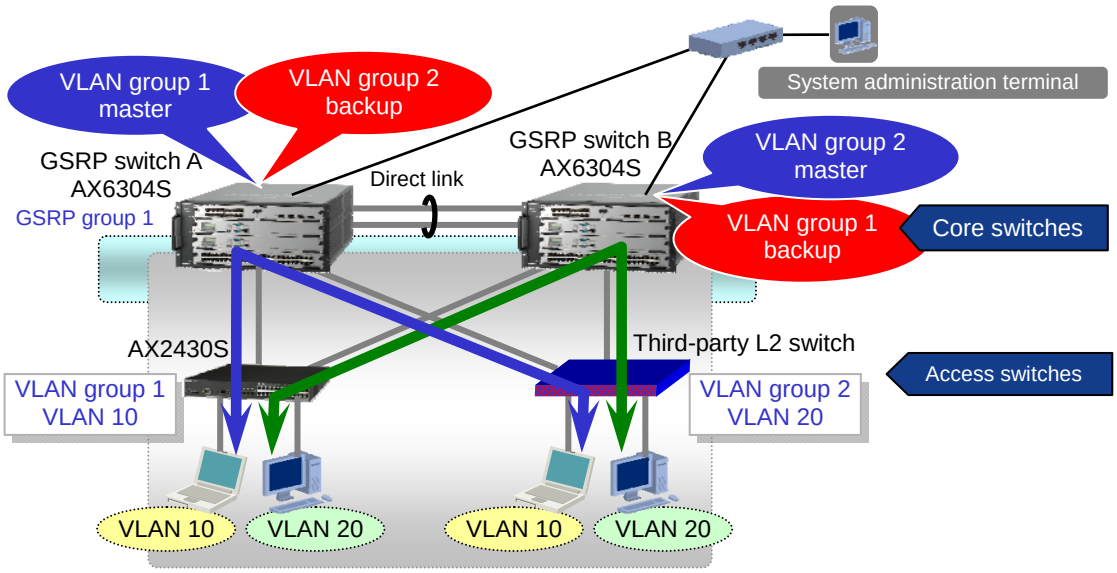



**Figure 2.1-1 Load-distributed GSRP configuration**

## 2.2 Configuration points

In this example, there are six key points to establish a GSRP system achieving Layer 2.

**(1) Disabling the spanning tree**
**(2) Configuration of a direct link**
**(3) Efficient load distribution with load-balancing for each VLAN group**
**(4) Optimization of configuration parameters**
**(5) Difference of settings between GSRP aware switches and GSRP unaware switches**
**(6) Setting of the remote control port**

The details of each point will be explained later.

## (1) Disabling the spanning tree

To establish GSRP, it is necessary to terminate the spanning tree in advance. No GSRP switch can activate GSRP without disabling the spanning tree.

## (2) Configuration of a direct link

- A redundant direct link is recommended.
  If you set up **direct-down** mode, where direct link failure detection automatically shifts a backup to master, redundant direct link through link aggregation between different NIFs is recommended to reduce the risk that two GSRP switches become master at the same time.

- Attach a direct link only to GSRP-managed VLANs.
  In Layer 2 systems, a direct link sends and receives only GSRP Advertise frames from GSRP-managed VLANs. No other VLAN setting for data transfer is required.

## (3) Efficient load distribution with load-balancing for each VLAN group

As shown in Figure 2.1-1, if you establish multiple VLAN groups, you can establish a load-balanced configuration for each VLAN group by giving different priority to them. The larger the number is, the higher its priority is.

In this example, if you set the priority between VLAN groups as:

**GSRP switch A: VLAN group 1 > VLAN group 2**
**GSRP switch B: VLAN group 1 < VLAN group 2**

Then, GSRP switch A will be the master in VLAN group 1, while GSRP switch B will be the master in VLAN group 2, thus enabling load distribution.

## (4) Optimization of configuration parameters

- Optimization of link debounce time
  Set up the **link debounce time** as short as possible within the range that maintains the link stable. This reduces the switching time of GSRP at the time of link failure.

- Optimization of the transmission interval and the retention time of GSRP Advertise frames
  Set up the transmission interval and the retention time of GSRP Advertise frames. The shorter the time is, the shorter the switching time is, at the expense of higher CPU loads. If high loads frequently occur to the CPU, set a longer time to these parameters, although it depends on system status.

| Parameters on GSRP Advertise frames | Default setting | Recommended |
|---|---|---|
| advertise-interval | 1 second | 0.5 seconds |
| advertise-holdtime | 5 seconds | 3 seconds |

## (5) Difference of settings between GSRP aware switches and GSRP unaware switches

Access switches that surround GSRP switches include GSRP aware switches supported by the AX-series switches, or GSRP unaware third-party switches. Although both are available, we recommend GSRP aware switches for the system design.

The following differences exist in the configuration and features between GSRP aware switches and GSRP unaware switches.

- GSRP aware switches
  This type of switch needs the same VLAN setting as GSRP-managed VLANs. Specify GSRP-managed VLAN as the connection port with GSRP switches.
  AX-series products support GSRP aware functionality. In addition, GSRP Flush request is available for the faster recovery of connection and switching time.

- GSRP unaware switches
  To use GSRP unaware switches requires port-resetting functionality for two GSRP switches. The functionality enables third-party switches to connect to a GSRP system. In shifting two GSRP switches from and to master and backup states, each port of a switch shifting to backup connected to a GSRP unaware switch is temporality shut down (link-down). Switching generally takes a longer time than GSRP aware switches.
  Use this functionality when neighboring switches are not AX series devices.

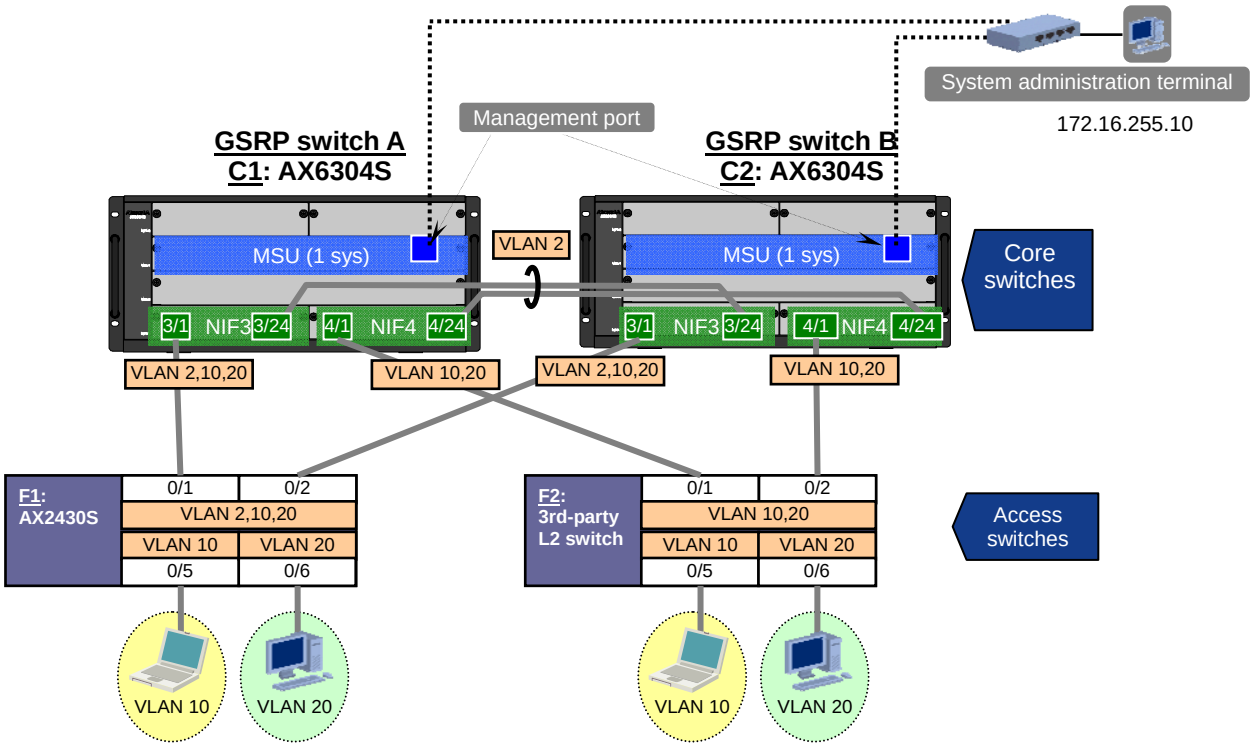
## (6) Setting of the remote control port

When GSRP is activated, all VLANs are controlled by GSRP. GSRP blocks all ports of any VLAN that does not belong to any VLAN group.
If you want to use telnet or SNMP to remotely manage the switches that use GSRP, use any of the three methods shown below.
The management port is used in the configuration example. The management port can always be used for communication regardless of GSRP states.

- Use of the management port.
  Only AX6000S series have the port.
- Set up a port not subject to GSRP-management (**`gsrp exception-port`**).
  It can at any time be used for communication regardless of GSRP states (master/backup).
- Set up GSRP VLAN group-only control (**`gsrp limit-control`**).
  This setting makes only VLANs belonging to any VLAN group subject to the control of GSRP. Any VLAN not belonging to any VLAN group can always be used for communication.

## 2.3 Configuration example

An example of a logical configuration is illustrated below. This section shows an example of each device based on the logical configuration.




| No. | Management purpose | |
|---|---|---|
| GSRP switch A | Management port | IP:172.16.255.1/24 |
| GSRP switch B | Management port | IP:172.16.255.2/24 |

**Figure 2.3-1 A logical configuration of GSRP**

### (1) Configuration of the core switch (GSRP switch)

| **Configuration of C1 (AX6304S)** | |
|---|---|
| **Disabling the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled in default in AX series. **(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,10,20 | Configures the VLAN to be applied. |
| **Configuration of the GSRP** | |
| (config)# gsrp 1<br>(config-gsrp)# gsrp-vlan 2 | Configures the GSRP group IDs.<br>Configures the GSRP-managed VLANs. |
| **Configuration of the direct link** | |
| (config)# interface range gigabitethernet 3/24, gigabitethernet 4/24<br>(config-if-range)# channel-group 1 mode on<br>(config)# interface port-channel 1<br>(config-if)# gsrp 1 direct-link | Configures a channel group containing different NIFs to make the direct link redundant. **(Configuration point (2))**<br><br>Configures Port channel 1 as GSRP1's direct link. |

| Configuration of C1 (AX6304S) | |
|---|---|
| **Configuration of VLAN groups and master/backup** | |
| (config)# gsrp 1<br>(config-gsrp)# vlan-group 1 vlan 10<br>(config-gsrp)# vlan-group 2 vlan 20<br><br>(config-gsrp)# vlan-group 1 priority 200<br>(config-gsrp)# vlan-group 2 priority 100 | Configures a VLAN group.<br>Joins VLAN `10` in VLAN group `1` and VLAN `20` in VLAN group `2`.<br>Configures the priorities among VLAN groups.<br>Assigns a higher priority to VLAN group `1` than Switch C2.<br>Assigns a lower priority to VLAN group `2`.<br>**(Configuration point (3))** |
| **Configuration of GSRP parameters** | |
| (config-gsrp)# advertise-interval 0.5<br>(config-gsrp)# advertise-holdtime 3<br><br>(config-gsrp)# no-neighbor-to-master direct-down | Configures the GSRP Advertise frames' transmission interval and retention time. **(Configuration point (4))**<br>Configures the direct link failure detection function. Lets backup automatically shift to master when there is a failure in the direct link. |
| **Configuration of the physical port interfaces** | |
| **Configuration of the ports** | |
| (config)# interface range gigabitethernet 3/1, gigabitethernet 3/24, gigabitethernet 4/1, gigabitethernet 4/24<br>(config-if-range)# link debounce time 0<br><br>(config)# interface gigabitethernet 3/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,10,20<br><br>(config)# interface gigabitethernet 4/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 10,20<br>(config-if)# gsrp 1 reset-flush-port<br><br>(config)# interface port-channel 1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2 | Sets as small a link-down detection time as possible.<br>**(Configuration point (4))**<br><br>Configures each port.<br>The access switch connected to Port `3/1` is GSRP aware. Sets up this port as the trunk port, and assign the GSRP-managed VLAN `2`, along with VLAN `10` and VLAN `20`, for data transfer.<br><br>The access switch connected to Port `4/1` is GSRP unaware. Sets up this port as the trunk port, and assign VLAN `10` and VLAN `20` for data transfer. Enable port resetting since the GSRP unaware switch is connected.<br>**(Configuration point (5))**<br><br>Configures Port channel `1`, set up as the direct link, as the trunk port and assign GSRP-managed VLAN. |
| **Configuration on remote management of the devices** | |
| (config)# interface mgmt 0<br>(config-if)# ip address 172.16.255.1 255.255.255.0<br><br>(config)# line vty 0 2 | Configures the port for management as the Management port.<br>Assign an IP address.<br>**(Configuration point (6))**<br>Permits telnet log-in (up to three at a time) |

Note: The configuration of Switch C2 is the same as that of Switch C1 except for the priority of GSRP VLAN groups and the IP address for remote control. For details, see the attached configuration file.

### (2) Configuration of the access switches

| Configuration of F1 (AX2430S) | |
|---|---|
| **Disabling the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled as default in the AX series. **(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,10,20 | Configures the VLAN to be applied. |
| **Configuration of the ports** | |
| (config)# interface range gigabitethernet 0/1-2<br>(config-if-range)# link debounce time 0<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,10,20<br><br>(config)# interface gigabitethernet 0/5<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 10<br><br>(config)# interface gigabitethernet 0/6<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 20 | Configures each port.<br>Configures Port `0/1-2` as the trunk port, and assign the GSRP-managed VLAN `2`, along with VLAN `10` and VLAN `20`, for data transfer.<br><br>Configures each port connected to a terminal.<br>Configures each VLAN assigned to each port as an access port. |

Note: Switch F2 (from a third party) requires no settings on the GSRP-managed VLAN to be configured. The other settings are normally the same as those of F1.

# 3. Operational Management

This chapter describes operational management, including the operation commands used for establishing a GSRP-enabled network and how to isolate the causes of failures.

## 3.1 Operation commands

GSRP operation commands are to be shown below.

### (1) Operational commands to check for the state of GSRP

- **`show gsrp [detail]`**

  Displays a summary of the state of GSRP; using [detail] (optional) shows the detailed information.

**An example of the results of the `show gsrp [detail]` command in a GSRP switch**

```
C1# show gsrp detail
Date 2010/05/20 14:11:16 UTC

GSRP ID: 1
 Local MAC Address        : 0012.e2a0.f600
 Neighbor MAC Address     : 0012.e2a0.3600
 Total VLAN Group Counts  : 2
 GSRP VLAN ID             : 2
 Direct Port              : 3/24,4/24
 Limit Control            : Off
 GSRP Exception Port      : -
 No Neighbor To Master    : direct-down
 Backup Lock              : disable
 Port Up Delay            : 0
 Last Flush Receive Time  : -
 Forced Shift Time        : -
 Layer 3 Redundancy       : Off
 Virtual Link ID          : -

                          Local               Neighbor
 Advertise Hold Time      : 3                 3
 Advertise Hold Timer     : 3                 -
 Advertise Interval       : 0.5               0.5
 Selection Pattern        : ports-priority-mac  ports-priority-mac

 VLAN Group ID      Local State         Neighbor State
 1                  Master              Backup
 2                  Backup              Master
```

... [GSRP configuration status]
Displays the detail of the GSRP of the switch

…[GSRP master/backup status]
Displays the GSRP Advertise timer value and selection method of the master/backup

…[VLAN group status]
VLAN group 1 uses this (C1) as the master.
VLAN group 2 uses the opposite (C2) as the master.

- **`show gsrp aware`**

  Displays the information on the GSRP aware switches; this command must be executed on any GSRP aware switch.

**An example of the results of the `show gsrp aware` command executed in a GSRP aware switch**

```
show gsrp aware
Date 2010/05/20 14:12:14 UTC

Last MAC Address Table Flush Time          : 2010/05/20 14:06:00
GSRP Flush Request Parameters :
 GSRP ID : 1       VLAN Group ID : 1   Port : 0/1
 Source MAC Address : 0012.e2a0.f600
```

…[GSRP aware status]
The last time it flushed the Mac Address table

…Information on the last GSRP that flushed the Mac Address table (The port that received the GSRP ID/VLAN group ID/flush frames)

### (2) Operation commands to control GSRP states

- **`set gsrp master`**

  Shifts the backup (No neighbor) state to the master; this command is valid only in the backup (No neighbor) state.

- **`clear gsrp port-up-delay`**

  In a VLAN assigned to a VLAN group, this command promptly updates a port in the link-up state to an active port, without waiting for the delay time configured with the **`port-up-delay`** configuration command.

### (3) Operation command to reset abnormal GSRP states

- **`restart gsrp`**

  Restart GSRP program after issuing the confirmation message for restart. All VLANs belonging to any GSRP VLAN groups stop receiving any frames, resulting in the termination of the communication.

## 3.2 Example of GSRP failure

This section introduces an example where a GSRP switch encounters a line failure. See **Figure 2.3-1** for detailed configuration.

### (1) Normal operation status

GSRP group 1 has two VLAN groups; VLAN group 1 sees GSRP switch A as the master, while VLAN group 2 sees GSRP switch B as the master. The GSRP states of both core switches are shown below.

**Normal operation status of the GSRP switch**

```
C1# show gsrp
Date 2010/05/20 14:11:16 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.f600
 Neighbor MAC Address    : 0012.e2a0.3600
 Total VLAN Group Counts : 2
Layer 3 Redundancy      : Off

 VLAN Group ID      Local State         Neighbor State
 1                  Master              Backup
 2                  Backup              Master

C1# show vlan list
Date 2010/05/20 14:15:44 UTC
VLAN counts:4
ID   Status  Fwd/Up /Cfg Name            Type  Protocol
   1 Down      0/  0/ 44 VLAN0001         Port  GSRP    1:  -(-)
   2 Down      0/  3/  3 VLAN0002         Port  GSRP    1:  -(-)
  10 Up        2/  2/  2 VLAN0010         Port  GSRP    1:  1(M)
  20 Down      0/  2/  2 VLAN0020         Port  GSRP    1:  2(B)

     GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

```
C2# show gsrp
Date 2010/05/20 14:11:30 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.3600
 Neighbor MAC Address    : 0012.e2a0.f600
 Total VLAN Group Counts : 2
Layer 3 Redundancy      : Off

 VLAN Group ID      Local State         Neighbor State
 1                  Backup              Master
 2                  Master              Backup

C2# show vlan list
Date 2010/05/20 14:15:59 UTC
VLAN counts:4
ID   Status  Fwd/Up /Cfg Name            Type  Protocol
   1 Down      0/  0/ 44 VLAN0001         Port  GSRP    1:  -(-)
   2 Down      0/  3/  3 VLAN0002         Port  GSRP    1:  -(-)
  10 Down      0/  2/  2 VLAN0010         Port  GSRP    1:  1(B)
  20 Up        2/  2/  2 VLAN0020         Port  GSRP    1:  2(M)

     GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

### (2) Operations in case of GSRP failure

If GSRP switch A, a core switch, encounters a line failure, the GSRP master and backup will be switched. In this case, a line failure on GSRP switch A (Switch C1), where VLAN group 1 is the master, results in the situation where neighboring GSRP switch B (Switch C2) has more active ports than GSRP switch A, causing GSRP switch B to shift to master.

Shown below are the messages issued from each device when GSRP switch A encounters a line failure.

**Messages from each device in case of a line failure**

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+     Messages issued from Core switch (GSRP switch A) C1                                                                      +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
05/20 14:12:31 E4 PORT GigabitEthernet3/1 25011101 1350:a00000004120 Error detected on the port.
   … Port 3/1 encountered a line failure.
05/20 14:12:31 E3 VLAN 20130008 0700:000000000000 GSRP 1 VLAN group 1 : state transitioned from Master to Backup, because the
number of active ports was less than neighbor's.
   … GSRP switching occurred. VLAN group 1, now holding smaller number of active ports than neighbor (C2),
   has shifted from master to backup.
05/20 14:12:31 E4 VLAN 25100002 0700:000a00000000 VLAN (10) Status is Down.
   … VLAN10 in VLAN group 1 has gone down.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+      Messages issued from Core switch (GSRP switch B) C2                                                                     +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
05/20 14:12:33 E3 VLAN 20130003 0700:000000000000 GSRP 1 VLAN group 1 : state transitioned to Master, because the number of active
ports was more than neighbor's.
  … GSRP switching occurred. VLAN group 1, now holding larger number of active ports than neighbor (C1),
     has shifted to master.
05/20 14:12:33 E4 VLAN 25100001 0700:000a00000000 VLAN (10) Status is Up.
  … This device (C2) has become master of VLAN group 1, the VLAN 10 has gone up.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+       Messages issued from Access Switch F1                                                                                  +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
05/20 14:19:05 E4 PORT GigabitEthernet0/1 25011101 1350:70020000e125 Error detected on the port.
05/20 14:19:06 E3 VLAN 20130015 0700:000000000000 GSRP aware : MAC Address Table entry cleared, because GSRP flush request received
on port 0/2, GSRP 1 VLAN group 1 Source MAC address 0012.e2a0.3600.
   … GSRP Flush request frames are received from GSRP switch B (C2), and MAC address table is cleared.
```

If GSRP switch A (Switch C1) encounters a line failure, VLAN group 1 of GSRP switch B (Switch C2) shifts from backup to master. VLAN group 2 keeps the state of master, resulting in two master VLAN groups being generated.

The example below shows the operation status of GSRP switches.

**Operation status of GSRP switches after a failure**

```
C1# show gsrp
Date 2010/05/20 14:21:18 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.f600
 Neighbor MAC Address    : 0012.e2a0.3600
 Total VLAN Group Counts : 2
 Layer 3 Redundancy      : Off

 VLAN Group ID      Local State         Neighbor State
 1                  Backup              Master
 2                  Backup              Master

C1# show vlan list
Date 2010/05/20 14:21:20 UTC
VLAN counts:4
ID   Status  Fwd/Up /Cfg Name             Type  Protocol
   1 Down     0/  0/ 44 VLAN0001       Port  GSRP   1:  -(-)
   2 Down     0/  2/  3 VLAN0002       Port  GSRP   1:  -(-)
  10 Down     0/  1/  2 VLAN0010       Port  GSRP   1:  1(B)
  20 Down     0/  1/  2 VLAN0020       Port  GSRP   1:  2(B)

      GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

```
C2# show gsrp
Date 2010/05/20 14:21:30 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.3600
 Neighbor MAC Address    : 0012.e2a0.f600
 Total VLAN Group Counts : 2
 Layer 3 Redundancy      : Off

 VLAN Group ID      Local State         Neighbor State
 1                  Master              Backup
 2                  Master              Backup

C2# show vlan list
Date 2010/05/20 14:21:35 UTC
VLAN counts:4
ID   Status  Fwd/Up /Cfg Name             Type  Protocol
   1 Down     0/  0/ 44 VLAN0001       Port  GSRP   1:  -(-)
   2 Down     0/  3/  3 VLAN0002       Port  GSRP   1:  -(-)
  10 Up       2/  2/  2 VLAN0010       Port  GSRP   1:  1(M)
  20 Up       2/  2/  2 VLAN0020       Port  GSRP   1:  2(M)

      GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

# 4. Precautions

### (1) Compatibility with the spanning tree

No spanning tree function (single spanning tree, PVST+, multiple spanning trees) is compatible with GSRP in one device.

### (2) Using port resetting in a load-balanced configuration

When you configure port resetting to one physical port that is shared with multiple VLAN groups, a shift of one of the VLAN groups from master to backup causes a communication interrupt, since the port is temporarily in a link-down state, although no other VLAN groups shift from master.
If you want to avoid the temporary link-down while using port resetting, make sure that multiple VLAN groups do not share one physical port.

### (3) Applying GSRP to a newly built network

Take the following measures to avoid frame loops when configuring GSRP into a network.

- **Shutdown** ports during configuration
  Prior to configuring GSRP, set the ports of the opposite switch to **shutdown** to set it in a down state. After the configuration, wait for the stable-state configuration of GSRP before starting operation.
- Start and set up GSRP switches one by one
  Of the two GSRP switches constituting a GSRP group, start and configure one switch, and make sure it has shifted to backup before starting and configuring the other GSRP switch.

### (4) In case of high CPU load

A heavy load placed on a CPU might cause the discarding of some of the received GSRP Advertise frames or might cause processing delay, leading to the output of timeout messages or state shifts. If such a state takes place frequently, set up a larger value to the transmission interval and retention time of the GSRP Advertise frames.

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# Part 3

# Layer 3 Systems

This part describes the operation, application examples, operational management, and precautions regarding GSRP in a Layer 3 system.

The following three application examples are explained later in this part.

**<Application example 1>**
Basic configuration of a Layer 3 system

**<Application example 2>**
Network separation system with Network Partition

**<Application example 3>**
Configuration of a backbone network

# 1. Operations of GSRP in Layer 3

## 1.1 Layer 3 redundancy switching

GSRP supports Layer 3 redundancy switching as well as Layer 2 redundancy switching at the same time.
Layer 3 redundancy switching is implemented by two GSRP switches sharing the same IP address and MAC address to create a redundant default gateway. By applying GSRP to a default gateway for PCs, the communication path from the PCs to an upstream IP network becomes redundant.

If a default gateway device encounters a failure, the other one can take over the same IP address and MAC address to continue the communication through the default gateway from the PCs.

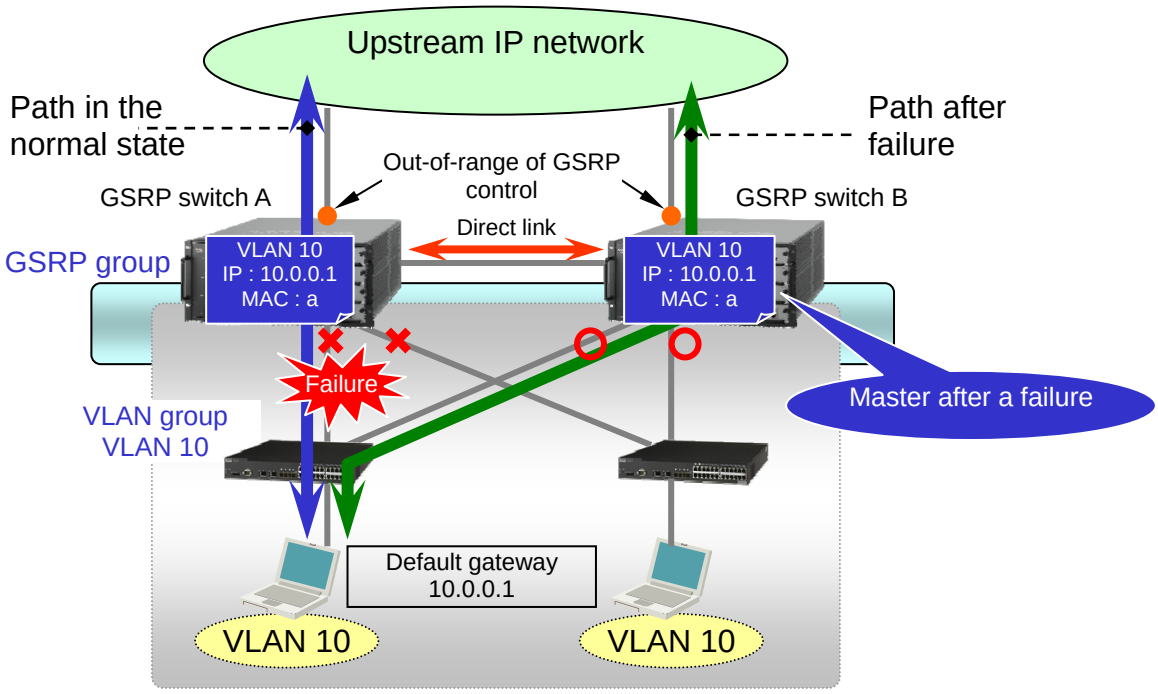



**Figure 1.1-1 Layer 3 redundancy switching**

The basic configuration of Layer 3 redundancy switching is listed below.

- A pair of two redundant switches implements the redundancy of the default router and the Layer 2 network.
- Both GSRP switches have the same IP address and MAC address (no need to re-learn a PC's ARP)
- Assign the same IP address to one VLAN shared with the two GSRP switches. The GSRP master implements IP forwarding as the default gateway, with the shared VLAN in an up state, while the GSRP backup does not implement IP forwarding, with the shared VLAN in a down state.
- Use a GSRP-proprietary virtual MAC address. Virtual addresses must be different between different VLAN groups.

## 1.2 Operations in case of failures

### (1) Operations at the time of link failure

In case of a link failure between a GSRP master and any of its switches in a Layer 3 system, the switchover operations listed below will occur.

1) GSRP switch A detects such link-down with the switches managed by it, decreasing the **number of Active ports**;
2) GSRP switch A shifts to the backup state;
3) GSRP switch B, which currently has the right to be GSRP master as **GSRP Advertise** says the **number of Active ports** is greater than that of GSRP switch A, shifts to a wait-for-master state;
4) GSRP switch A informs GSRP switch B that A is currently in a backup state;

5) GSRP switch B shifts to master;
6) GSRP switch B sends a **GSRP Flush request** to force GSRP aware switches to clear their MAC address tables, and;
7) Communication is kept active through GSRP switch B, according to the IP routing setting of GSRP switch B.

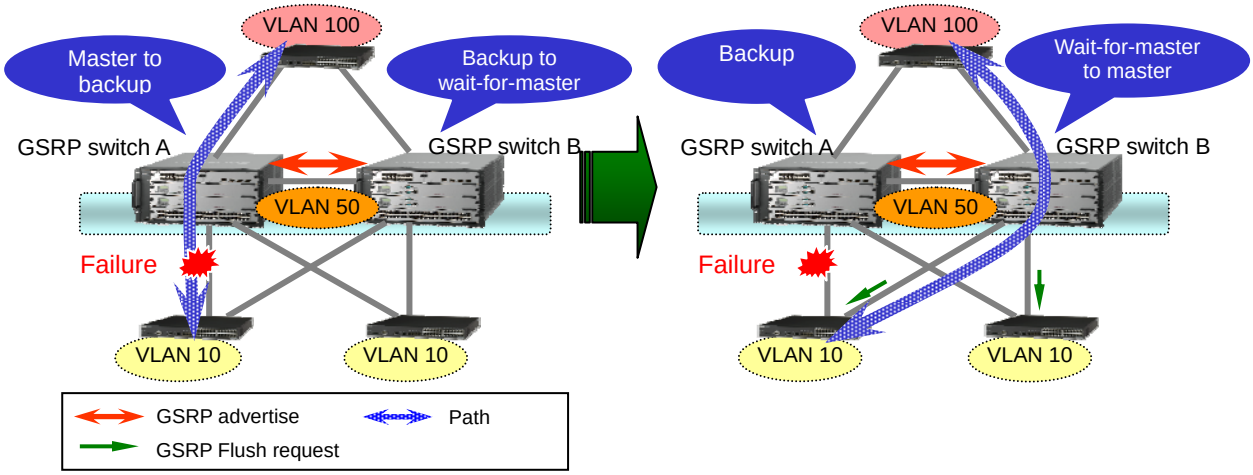



**Figure 1.2-1 Operations at the time of link failure**

### (2) Operations at the time of master switch failure

In case of a failure in the GSRP master switch in a Layer 3 system, the switchover operations listed below will occur.

1. If GSRP switch A fails, GSRP switch B detects the failure through the absence of **GSRP Advertise** from A, and shifts to No neighbor;
2. If the operation mode in case of direct link down detection is set to **manual**, a disconnection will be maintained until the user executes a switching command;
3. If the operation mode in case of direct link-down detection is set to **direct-down**, GSRP switch B automatically shifts to master, since **GSRP Advertise** from A is timed out and the direct link line is in a link-down state;
4. GSRP switch B sends a **GSRP Flush request** to the GSRP-managed VLANs to force GSRP aware switches to clear their MAC address tables, and;
5. The MAC address tables of GSRP unawares are cleared through the link-down associated with the failure of GSRP switch A.

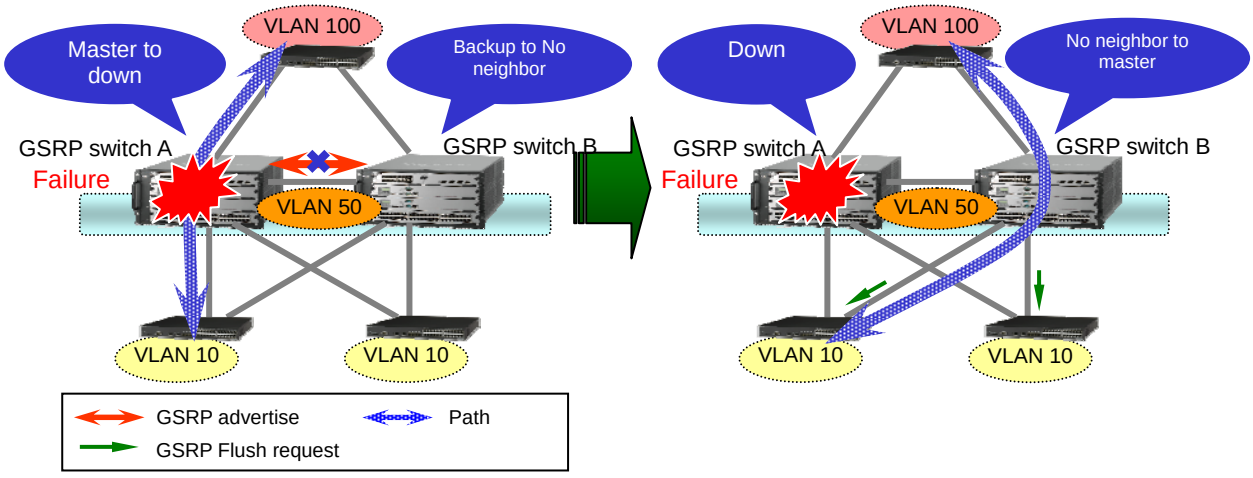



**Figure 1.2-2 Operations at the time of master device failure**

### (3) Operations in case of link failure with an upstream IP network

In case of link failure with an upstream IP network in a Layer 3 system, the following operations will take place.

1. Since the link port of GSRP switches and the upstream IP network is out of the range of GSRP control, no state shift of GSRP takes place. Therefore, GSRP switch A remains the master, and GSRP switch B remains the backup.
2. An inter-VLAN communication network on the direct link secures another available communication path.
3. Communication is kept active through the direct link, according to the IP routing setting of GSRP switch A and B.

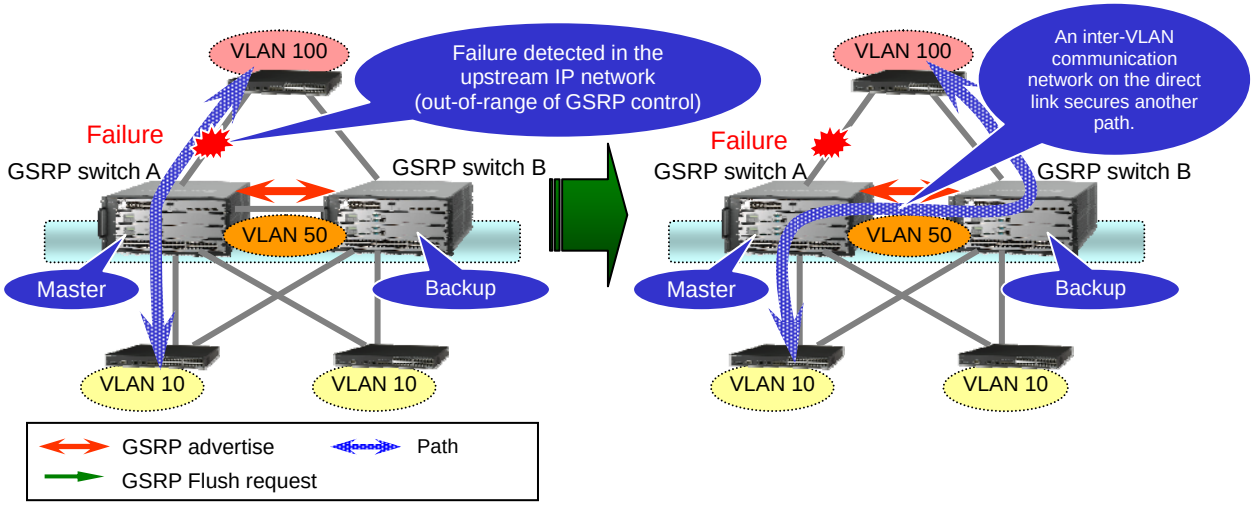



**Figure 1.2-3 Operations in case of a line failure with an upstream IP network**

# 2. Application Example 1 of GSRP in Layer 3

## 2.1 Basic configuration of a Layer 3 system

**Figure 2.1-1** illustrates a redundant system with Layer 3 GSRP. GSRP can replace a redundant system composed of STP and VRRP without changing any physical configuration.

This configuration example assumes that an existing set of two switches comprising a redundant system will be reused to form a system through GSRP Layer 3 redundancy.

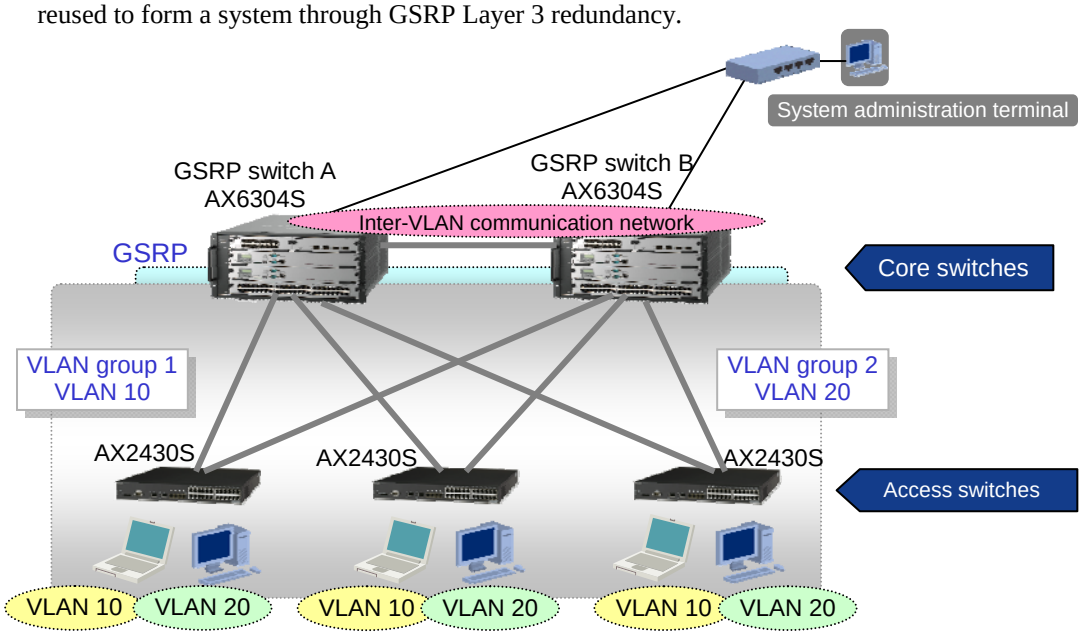



**Figure 2.1-1 An example of GSRP Layer 3 configuration**

This example system will use an inter-VLAN communication network, and IP routing will be implemented through passing Layer 3 forwarding between VLANs through the direct link. Such a basic configuration allows you to use multiple VLAN groups, enabling traffic load distribution.

## 2.2 Configuration points

There are 10 points to configure GSRP in this example.
Items **(7)** through **(10)** are characteristic of Layer 3 systems.

**(1) Disabling the spanning tree**
**(2) Configuration of a direct link**
**(3) Efficient load distribution with load-balancing for each VLAN group**
**(4) Optimization of configuration parameters**
**(5) Difference in the settings between GSRP aware switches and GSRP unaware switches**
**(6) Setting of the remote control port**
**(7) Use GSRP group IDs from 1 to 4.**
**(8) Enable Layer 3 redundancy switching.**
**(9) Setting of the link between GSRP switches**
**(10) Assign the same IP address to two GSRP switches.**

The details of each point are explained below.

## (1) Disabling the spanning tree

To establish GSRP, it is necessary to terminate the spanning tree in advance. No GSRP switch can activate GSRP without disabling the spanning tree.

## (2) The direct link is recommended to be redundant.

If you use **direct-down** mode, where direct link failure detection automatically shifts a backup to master, redundant direct link through link aggregation between different NIFs is recommended to reduce the risk that two GSRP switches become master at the same time.

## (3) Efficient load distribution with load-balancing for each VLAN group

If you establish multiple VLAN groups, you can establish a load-balanced configuration for each VLAN group by giving a different priority to them. The larger the number is, the higher its priority is.

In this example, if you set the priority between VLAN groups as:

**GSRP switch A: VLAN group 1 > VLAN group 2**
**GSRP switch B: VLAN group 1 < VLAN group 2**

Then, GSRP switch A will be the master in VLAN group 1, while GSRP switch B will be the master in VLAN group 2, thus enabling load distribution.

## (4) Optimization of configuration parameters

- Optimization of link debounce time
  Set up the **link debounce time** as short as possible within the range that maintains the link stable. This reduces the switching time of GSRP at the time of link failure.

- Optimization of the transmission interval and the retention time of GSRP Advertise frames
  Set up the transmission interval and the retention time of GSRP Advertise frames. The shorter the time is, the shorter the switching time is, at the expense of higher CPU loads. If high loads frequently occur on the CPU, set these parameters to a longer time, although it depends on the system status.

| Parameters on GSRP Advertise frames | Default setting | Recommended |
|---|---|---|
| advertise-interval | 1 second | 0.5 seconds |
| advertise-holdtime | 5 seconds | 3 seconds |

## (5) Difference in the settings between GSRP aware switches and GSRP unaware switches

Access switches that surround GSRP switches include GSRP aware switches, AX-series switches, or GSRP unaware, third-party switches. Although both are available, we recommend designing the system with GSRP aware switches.

The following differences exist in the configuration and features between GSRP aware switches and GSRP unaware switches.

- GSRP aware switches
  This type of switch needs the same VLAN setting as GSRP-managed VLANs. Specify GSRP-managed VLAN as the connection port with GSRP switches.
  AX-series products support GSRP aware functionality. In addition, GSRP Flush request is available for the faster recovery of connection and switching time.

- GSRP unaware switches
  To use GSRP unaware switches requires port-resetting functionality for two GSRP switches. The functionality enables third-party switches to connect to a GSRP system. In shifting two GSRP switches from and to master and backup, each port of the switch shifting to backup connected to a GSRP unaware switch is temporality shut down (link-down). Switching generally takes longer time than GSRP aware switches.
  Use this functionality when neighboring switches are not AX series devices.

## (6) Setting of the remote control port

When GSRP is activated, all VLANs are controlled by GSRP. GSRP blocks all ports of any VLAN that does not belong to any VLAN group.
If you want to use telnet or SNMP to remotely manage the switches that use GSRP, use any of the three methods shown below.

Management port is used in the configuration example. Management port can always be used for communication regardless of GSRP states.

- Use the management port.
  Only the AX6000S series has this port.
- Set up a port not subject to GSRP-management (**`gsrp exception-port`**).
  It can at any time be used for communication regardless of GSRP states (master/backup).
- Set up GSRP VLAN group-only control (**`gsrp limit-control`**).
  This setting makes only VLANs belonging to any VLAN group subject to the control of GSRP. Any VLAN not belonging to any VLAN group can always be used for communication.

The remaining items are characteristic of Layer 3 systems.

## (7) Use GSRP group IDs from 1 to 4.

In using Layer 3 redundancy switching, you need to set up GSRP group IDs of 1 to 4. With any group ID of five or larger, Layer 3 redundancy switching cannot be configured.

## (8) Enable Layer 3 redundancy switching.

To make a redundant GSRP system with a Layer 3 system, you need to enable Layer 3 redundancy switching in the GSRP settings. Enable it in both GSRP switches.

## (9) Setting of the link between GSRP switches

To make a load-distributed Layer 3 system, the following configurations are necessary toward the direct link.

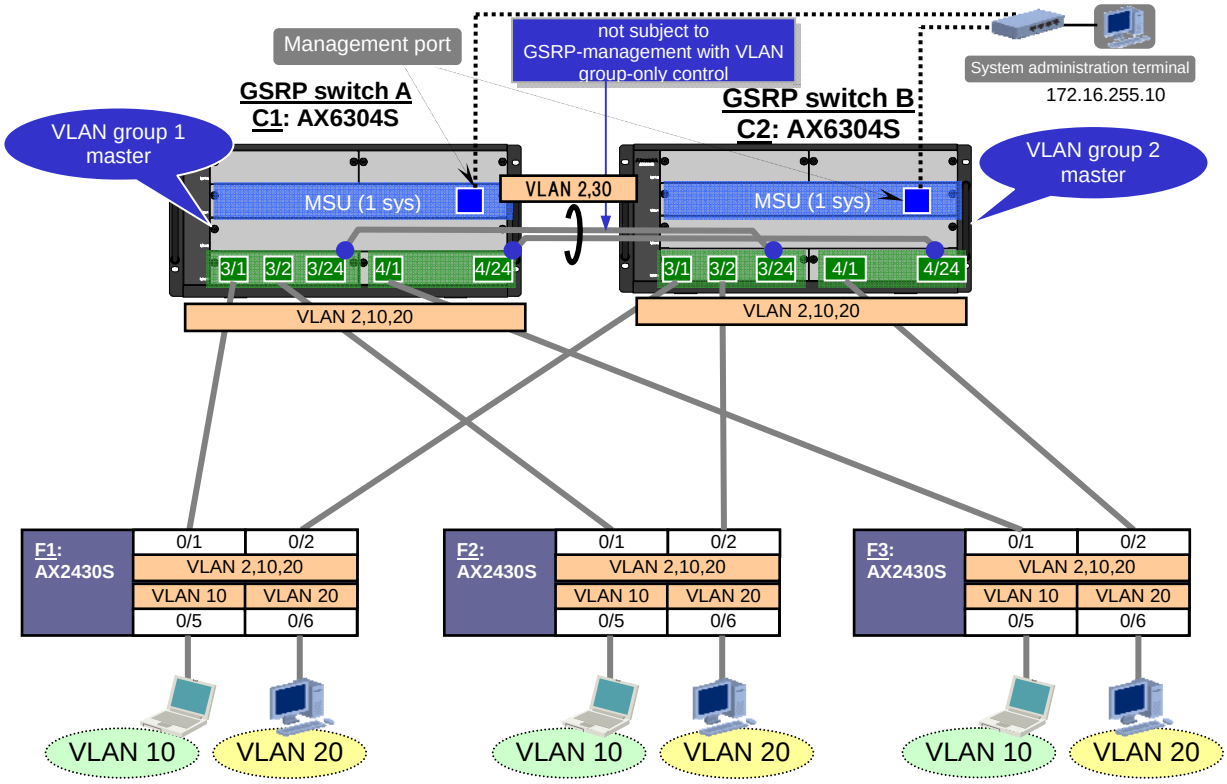
- Set up an inter-VLAN communication network as a direct link.
  To interconnect between two GSRP switches (master and backup), set up an inter-VLAN communication network and IP routing to the link between the GSRP switches.
- Exclude the direct link port from the subject of GSRP control.
  Select ports that are not under GSRP control (**`gsrp exception-port`**) or limit GSRP control to VLAN groups (**`gsrp limit-control`**).

## (10) Assign the same IP address to both GSRP switches.

Assign the same IP address to both GSRP switches of the VLANs under the control of GSRP. The VLAN interfaces of the GSRP master are in an up state, while those of the GSRP backup are in a down state.
Note that neither GSRP-managed VLANs nor VLANs for remote control are included.

## 2.3 Configuration example

An example of a logical configuration is illustrated below. This section shows an example of each device based on the logical configuration.




| No. | Management purpose | Control | Data communication | | |
|---|---|---|---|---|---|
| | | | VLAN group 1 | VLAN group 2 | Direct link |
| VLAN | - | VLAN 2 | VLAN 10 | VLAN 20 | VLAN 30 |
| IP | C1: 172.16.255.1<br>C2: 172.16.255.2 | - | VLAN 10:192.168.10.0/24 | VLAN 20:192.168.20.0/24 | VLAN 30:30.0.0.0/24 |

**Figure 2.3-1 A logical configuration of GSRP application example 1**

### (1) Configuration of the core switch (GSRP switch)

| **Configuration of C1 (AX6304S)** | |
|---|---|
| **Disabling the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled by default in AX series.<br>**(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,10,20,30 | Configures the VLAN to be applied. |
| **Configuration of the GSRP** | |
| (config)# gsrp 1<br>(config-gsrp)# gsrp-vlan 2 | Configures the GSRP group IDs.<br>Assigns 1 to 4 GSRP group IDs.<br>**(Configuration point (7))**<br>Configures the GSRP-managed VLANs. |
| **Setting on Layer 3 redundancy switching** | |
| (config-gsrp)# layer3-redundancy | Sets up Layer 3 redundancy switching.<br>**(Configuration point (8))**<br>Layer 3 can only be used with GSRP group IDs of 1 to 4. |

| Configuration of C1 (AX6304S) | |
|---|---|
| **Configuration of the direct link** | |
| (config)# interface range gigabitethernet 3/24, gigabitethernet 4/24<br>(config-if-range)# channel-group 1 mode on<br>(config)# interface port-channel 1<br>(config-if)# gsrp 1 direct-link | Configures a channel group containing different NIFs to make the direct link redundant.<br>**(Configuration point (2))**<br><br>Configures Port channel 1 as GSRP1's direct link. |
| **Configuration of master/backup (load-distributed)** | |
| (config)# gsrp 1<br>(config-gsrp)# vlan-group 1 vlan 10<br>(config-gsrp)# vlan-group 2 vlan 20<br><br>(config-gsrp)# vlan-group 1 priority 200<br>(config-gsrp)# vlan-group 2 priority 100 | Configures a VLAN group.<br>Joins VLAN 10 in VLAN group 1 and VLAN 20 in VLAN group 2.<br>Configures the priorities among VLAN groups.<br>Assigns a higher priority to VLAN group 1 than Switch C2.<br>Assigns a lower priority to VLAN group 2.<br>**(Configuration point (3))** |
| **Configuration of the GSRP parameters** | |
| (config-gsrp)# advertise-interval 0.5<br>(config-gsrp)# advertise-holdtime 3<br><br>(config-gsrp)# no-neighbor-to-master direct-down<br><br>(config)# gsrp limit-control | Configures the GSRP Advertise frames' transmission interval and retention time. **(Configuration point (4))**<br>Configures the direct link failure detection function. Let backup automatically shift to master when there is a failure in the direct link.<br><br>Enables limiting GSRP control to VLAN-group VLANs in order to exclude the direct link from GSRP control.<br>**(Configuration point (9))** |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 3/1-2, gigabitethernet 3/24, gigabitethernet 4/1, gigabitethernet 4/24<br>(config-if-range)# link debounce time 0<br><br>(config)# interface range gigabitethernet 3/1-2, gigabitethernet 4/1<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,10,20<br><br>(config)# interface port-channel 1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,30 | Sets as small a link-down detection time as possible.<br>**(Configuration point (4))**<br><br>Configures each port.<br>The connected access switches of port 3/1-2 and 4/1 are GSRP aware. Set up this port as the trunk port, and assign the GSRP-managed VLAN 2, along with VLAN 10 and VLAN 20, for data transfer.<br><br>Configures Port channel 1, set up as the direct link, as the trunk port and assign GSRP-managed VLAN 2 and the inter-VLAN communication path of VLAN 30. |
| **Configuration of VLAN interfaces** | |
| (config)# interface vlan 10<br>(config-if) ip address 192.168.10.1 255.255.255.0<br><br>(config)# interface vlan 20<br>(config-if) ip address 192.168.20.1 255.255.255.0<br><br>(config)# interface vlan 30<br>(config-if) ip address 30.0.0.1 255.255.255.0 | Assigns an IP address to VLAN 10.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN 20.<br>Assigns the same IP address to Switch C2.<br>**(Configuration point (10))**<br>Assigns an IP address to VLAN 30.<br>Assigns a different IP address of the same subnet to Switch C2. |
| **Configuration of IP routing** | |
| (config)# ip route 192.168.20.0 255.255.255.0 30.0.0.2 | As the next hop of the static route 192.168.20.0/24, assign the adjacent gateway 30.0.0.2.<br>**(Configuration point (9))** |
| **Configuration on remote management of the devices** | |
| (config)# interface mgmt 0<br>(config-if)# ip address 172.16.255.1 255.255.255.0<br><br>(config)# line vty 0 2 | Sets up the Management port for remote control purpose.<br>Assigns an IP address.<br>**(Configuration point (6))**<br>Permits telnet log-in (up to three at a time) |

Note: The configuration of Switch C2 is the same as that of Switch C1, except for the IP address and IP routing assigned to VLAN 30, the priority of GSRP VLAN groups, and the IP address for remote control. For details, see the attached configuration file.

### (2) Configuration of the access switches

| Configuration of F1 (AX2430S) | |
|---|---|
| **Disabling the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled as default in the AX series. **(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,10,20 | Configures the VLAN to be applied. |
| **Configuration of the ports** | |
| (config)# interface range gigabitethernet 0/1-2<br>(config-if-range)# link debounce time 0<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,10,20<br><br>(config)# interface gigabitethernet 0/5<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 10<br><br>(config)# interface gigabitethernet 0/6<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 20 | Configures each port.<br>Configures Port `0/1-2` as the trunk port, and assign the GSRP-managed VLAN `2`, along with VLAN `10` and VLAN `20`, for data transfer.<br><br>Configures each port connected to a terminal.<br>Configures each VLAN assigned to each port as an access port. |

Note: The configuration of Switch F2 is equivalent to that of Switch F1.

# 3. Application Example 2 of GSRP in Layer 3

## 3.1 Network separation system with Network Partition

**Figure 3.1-1** illustrates a GSRP redundant system utilizing Network Partition. In this configuration example, GSRP is applied to two independent networks utilizing Network Partition.

Network Partition[*1] establishes multiple logical networks with a simple physical configuration by combining **VRF (Virtual/VPN Routing and Forwarding)** to logically separate Layer 3 functionality and VLAN, the logical network technology of Layer 2.

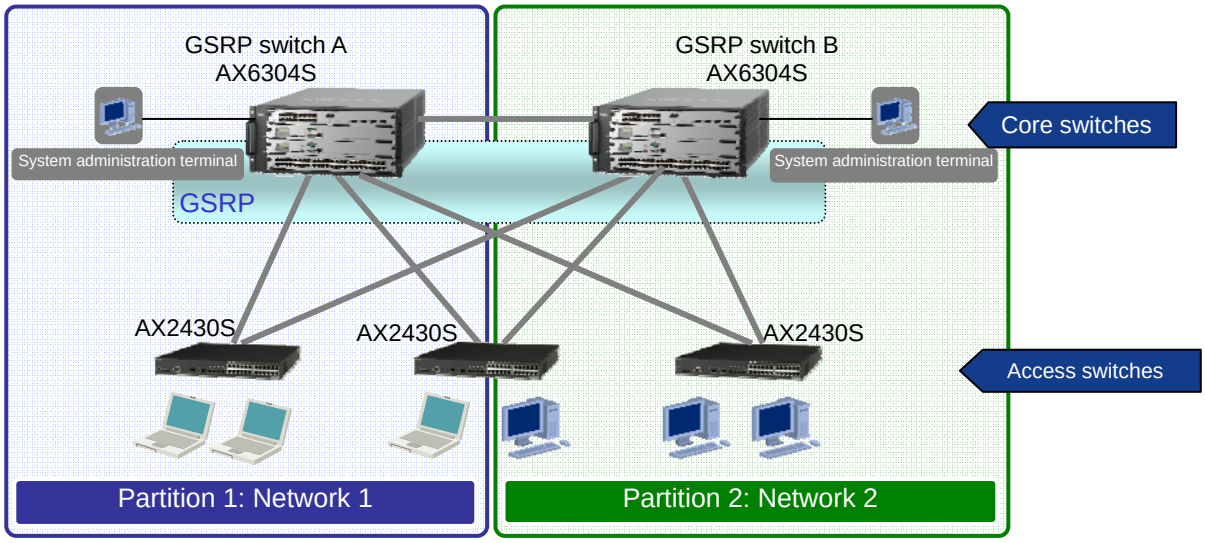



**Figure 3.1-1 A network separation system utilizing Network Partition**

[*1] For details on Network Partition, refer to the following solution guide.
***AX series Network Partition Solution Guide [Basic]***

This configuration example takes advantage of GSRP to assign a different GSRP master to different VLANs used by partitions. This enables load distribution in a partition basis, eliminates the consideration of routing between GSRP switches, and allows you to configure a system easily with minimum settings.

## 3.2 Configuration points

There are 3 points to configure GSRP in this example.

**(1) The same points as the configuration points of Application Example 1 *Basic configuration of a Layer 3 system***
**(2) Setting of the link between GSRP switches**
**(3) Streamline the settings by sharing VLANs used in Network Partition with GSRP.**

The details of each point are explained below.

## (1) Configuration points of Layer 3 systems

The following configuration points are the same as those of Application Example 1 *Basic configuration of a Layer 3 system*. For details, see the configuration points of the above example.

**Configuration points of Application Example 1 *Basic configuration of a Layer 3 system*:**

- Disable STP.
- A direct link is recommended to be redundant.
- Load distribution on VLAN group basis
- Optimization of configuration parameters
- Difference in the settings between GSRP aware switches and GSRP unaware switches
- Setting of the remote control port
- Assign 1 to 4 for GSRP IDs.
- Enable Layer 3 redundancy switching.
- Setting of GSRP switches
  -> There is a difference in this setting. For details see configuration point **(2)**.
- Assign the same IP address to the one between GSRP switches

## (2) Setting of the link between GSRP switches

This configuration example assumes a system where two partitions are completely separated without any communication between VRF. Therefore, it is not necessary to set up the inter-VLAN communication network of the direct link and routing associated with the network.

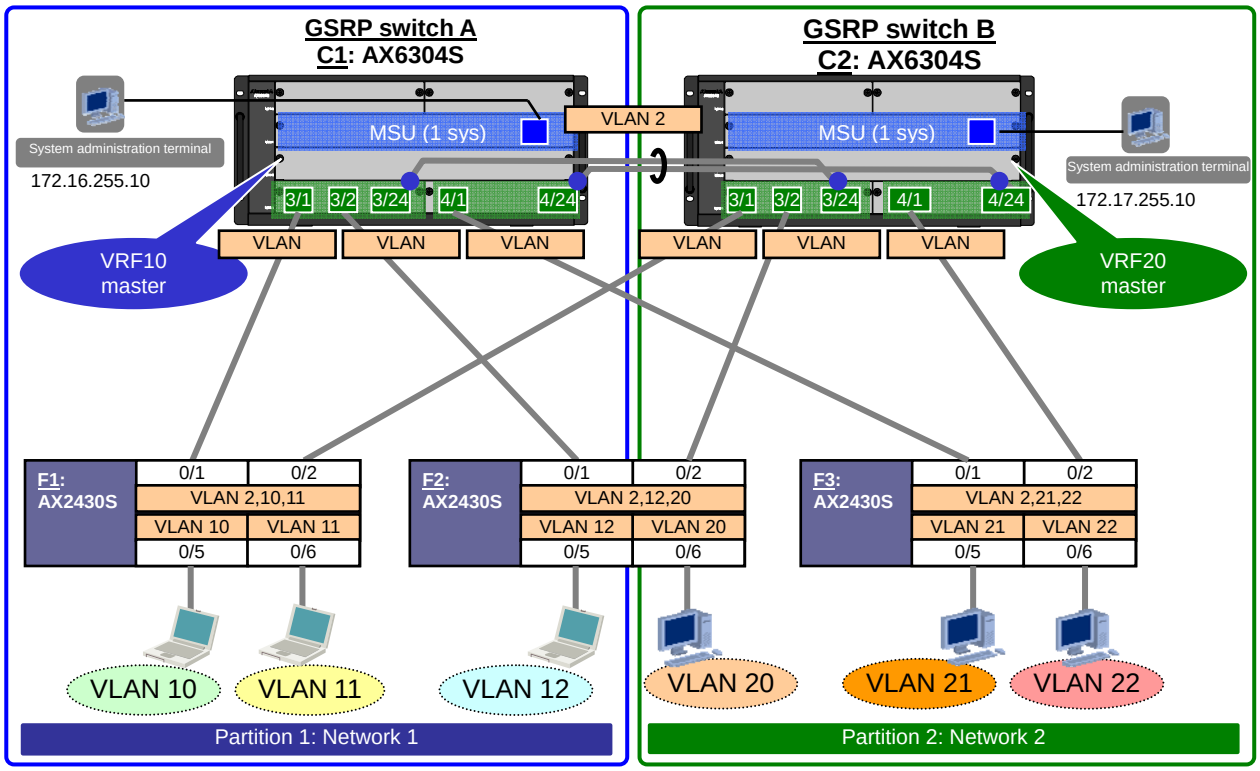
## (3) Streamline the settings by sharing VLANs used in Network Partition with GSRP.

GSRP can configure VLANs belonging to any VLAN group without depending on VRF, allowing you to configure a system in consideration of load balancing. However, you need to carefully design the routing between the GSRP switches and other settings.

When combining GSRP and Network Partition to use two separated partitions, making VLANs used in VRF belong to a GSRP VLAN group in the same partition eliminates the need to set up the routing between GSRP switches, resulting in simpler settings.
This is another benefit of a more understandable and logical configuration and operation for the switching of GSRP.

## 3.3 Configuration example

An example of a logical configuration is illustrated below. This section shows an example of each device based on the logical configuration.




| No. | Management purpose | Control | Data communication | | |
|---|---|---|---|---|---|
| | | | Network 1: VRF10 | Network 2: VRF20 | Direct link |
| VLAN | - | VLAN 2 | VLAN 10, 11, 12 | VLAN 20, 21, 22 | - |
| IP | C1: 172.16.255.1<br>C2: 172.17.255.1 | - | VLAN 10: 192.168.10.0/24<br>VLAN 11: 192.168.11.0/24<br>VLAN 12: 192.168.12.0/24 | VLAN 20: 192.168.20.0/24<br>VLAN 21: 192.168.21.0/24<br>VLAN 22: 192.168.22.0/24 | - |

**Figure 3.3-1 A logical configuration of GSRP application example 2**

### (1) Configuration of the core switch (GSRP switch)

| **Configuration of C1 (AX6304S)** | |
|---|---|
| **Disabling the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled in default in AX series.<br>**(Configuration point (1))** |
| **Configuration of the VRF** | |
| (config)# vrf mode gsrp-enable-ipv4-ipv6<br>PSP will be restarted automatically when the selected mode differs from current mode.<br>Do you wish to change mode (y/n): y<br><br>(config)# vrf definition 10<br>(config)# vrf definition 20 | Sets up VRF as associated with GSRP.<br>(PSP restart is confirmed; type "y" if OK)<br><br><br><br>Enables VRF 10.<br>Enables VRF 20. |
| **VLAN configuration** | |
| (config)# vlan 2,10-12,20-22 | Configures the VLAN to be applied. |

| Configuration of C1 (AX6304S) | |
|---|---|
| **Configuration of the GSRP** | |
| (config)# gsrp 1<br>(config-gsrp)# gsrp-vlan 2 | Configures the GSRP group IDs.<br>Assigns 1 to 4 GSRP group IDs.<br>**(Configuration point (1))**<br>Configures the GSRP-managed VLANs. |
| **Configuration on Layer 3 redundancy switching** | |
| (config-gsrp)# layer3-redundancy | Sets up Layer 3 redundancy switching.<br>**(Configuration point (1))**<br>Layer 3 can only be used with GSRP group IDs of 1 to 4. |
| **Configuration of the direct link** | |
| (config)# interface range gigabitethernet 3/24, gigabitethernet 4/24<br>(config-if-range)# channel-group 1 mode on<br>(config)# interface port-channel 1<br>(config-if)# gsrp 1 direct-link | Configures a channel group containing different NIFs to make the direct link redundant.<br>**(Configuration point (1))**<br>Configures Port channel 1 as GSRP1's direct link. |
| **Configuration of master/backup** | |
| (config)# gsrp 1<br>(config-gsrp)# vlan-group 1 vlan 10-12<br>(config-gsrp)# vlan-group 2 vlan 20-22<br><br>(config-gsrp)# vlan-group 1 priority 200<br>(config-gsrp)# vlan-group 2 priority 100 | Configures a VLAN group.<br>Joins VLAN 10-12 in VLAN group 1 and VLAN 20-22 in VLAN group 2.<br>Configures the priorities among VLAN groups.<br>Assigns a higher priority to VLAN group 1 than Switch C2.<br>Assigns a lower priority to VLAN group 2.<br>**(Configuration point (1))** |
| **Configuration of the GSRP parameters** | |
| (config-gsrp)# advertise-interval 0.5<br>(config-gsrp)# advertise-holdtime 3<br><br>(config-gsrp)# no-neighbor-to-master direct-down | Configures the GSRP Advertise frames' transmission interval and retention time. **(Configuration point (1))**<br>Configures the direct link failure detection function. Lets backup automatically shift to master when there is a failure in the direct link. |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 3/1-2, gigabitethernet 3/24, gigabitethernet 4/1, gigabitethernet 4/24<br>(config-if-range)# link debounce time 0<br><br>(config)# interface gigabitethernet 3/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,10-11<br><br>(config)# interface gigabitethernet 3/2<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,12,20<br><br>(config)# interface gigabitethernet 4/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,21-22<br><br>(config)# interface port-channel 1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2 | Sets as small a link-down detection time as possible.<br><br>Configures each port.<br>Connecting to the GSRP aware access switch<br>Sets Port 3/1 as the trunk port, set VLAN 2 for GSRP control, and set VLAN 10 and VLAN 11 for data transfer.<br><br>Sets Port 3/2 as the trunk port, set VLAN 2 for GSRP control, and set VLAN 12 and VLAN 20 for data transfer.<br><br>Sets Port 4/1 as the trunk port, set VLAN 2 for GSRP control, and sets VLAN 21 and VLAN 22 for data transfer.<br><br>Sets Port channel 1, set up as the direct link, as the trunk port, and sets GSRP-managed VLAN 2.<br>There is no need to set up an inter-VLAN communication network.<br>**(Configuration point (2))** |
| **Configuration of VLAN interfaces** | |
| (config)# interface vlan 10<br>(config-if) vrf forwarding 10<br>(config-if) ip address 192.168.10.1 255.255.255.0<br><br>config)# interface vlan 11<br>(config-if) vrf forwarding 10<br>(config-if) ip address 192.168.11.1 255.255.255.0 | VLAN 10 is used by VRF 10.<br>Assigns an IP address to VLAN 10.<br>Assigns the same IP address to Switch C2.<br><br>VLAN 11 is used by VRF 10.<br>Assigns an IP address to VLAN 11.<br>Assigns the same IP address to Switch C2. |

| Configuration of C1 (AX6304S) | |
|---|---|
| config)# interface vlan 12<br>(config-if) vrf forwarding 10<br>(config-if) ip address 192.168.12.1 255.255.255.0 | VLAN 12 is used by VRF 10.<br>Assigns an IP address to VLAN 12.<br>Assigns the same IP address to Switch C2. |
| (config)# interface vlan 20<br>(config-if) vrf forwarding 20<br>(config-if) ip address 192.168.20.1 255.255.255.0 | VLAN 20 is used by VRF 20.<br>Assigns an IP address to VLAN 20.<br>Assigns the same IP address to Switch C2. |
| config)# interface vlan 21<br>(config-if) vrf forwarding 20<br>(config-if) ip address 192.168.21.1 255.255.255.0 | VLAN 21 is used by VRF 20.<br>Assigns an IP address to VLAN 21.<br>Assigns the same IP address to Switch C2. |
| config)# interface vlan 22<br>(config-if) vrf forwarding 20<br>(config-if) ip address 192.168.22.1 255.255.255.0 | VLAN 22 is used by VRF 20.<br>Assigns an IP address to VLAN 22.<br>Assigns the same IP address to Switch C2.<br>**(Configuration point (3))** |
| **Configuration on remote management of the devices** | |
| (config)# interface mgmt 0<br>(config-if)# ip address 172.16.255.1 255.255.255.0 | Sets up the management port for remote management.<br>Assigns an IP address.<br>**(Configuration point (1))** |
| (config)# line vty 0 2 | Permits telnet log-in (up to three at a time) |

Note: The configuration of Switch C2 is the same as that of Switch C1 except for the priority of GSRP VLAN groups and the IP address for remote control. For details, see the attached configuration file.

### (2) Configurations of access switches

| Configurations of F1 (AX2430S) | |
|---|---|
| **Suppression of the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled as default in the AX series.<br>**(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,10-11 | Configures the VLAN to be applied. |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 0/1-2<br>(config-if-range)# link debounce time 0<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,10-11 | Sets up the link-down detection time to minimum.<br>**(Configuration point (1))**<br>Ports 0/1-2 connect to C1 and C2, respectively.<br>Sets up the port as the trunk port, set up VLAN 2 for GSRP control, and set VLAN 10 and VLAN 11 for data transfer. |
| (config)# interface range gigabitethernet 0/5<br>(config-if-range)# switchport mode access<br>(config-if-range)# switchport access vlan 10 | Port 0/5 connects to the terminal.<br>Sets up this port as the access port, and set up VLAN 10 for data transfer. |
| (config)# interface range gigabitethernet 0/6<br>(config-if-range)# switchport mode access<br>(config-if-range)# switchport access vlan 11 | Port 0/6 connects to the terminal.<br>Sets up this port as the access port, and set up VLAN 11 for data transfer. |

Note: Switches F2 and F3 have the same setting as F1, except for the VLANs to be handled.

# 4. Application Example 3 of GSRP in Layer 3

## 4.1 Configuration on a backbone network

**Figure 4.1-1** illustrates a configuration example of a backbone network utilizing GSRP.

This configuration uses GSRP to control the link between access switches in each floor, along with the core switches. The backbone upstream network is connected via IP routing. The upstream IP network utilizes GSRP's Layer 3 redundancy switching, while IP routing is implemented with static routing or dynamic routing.

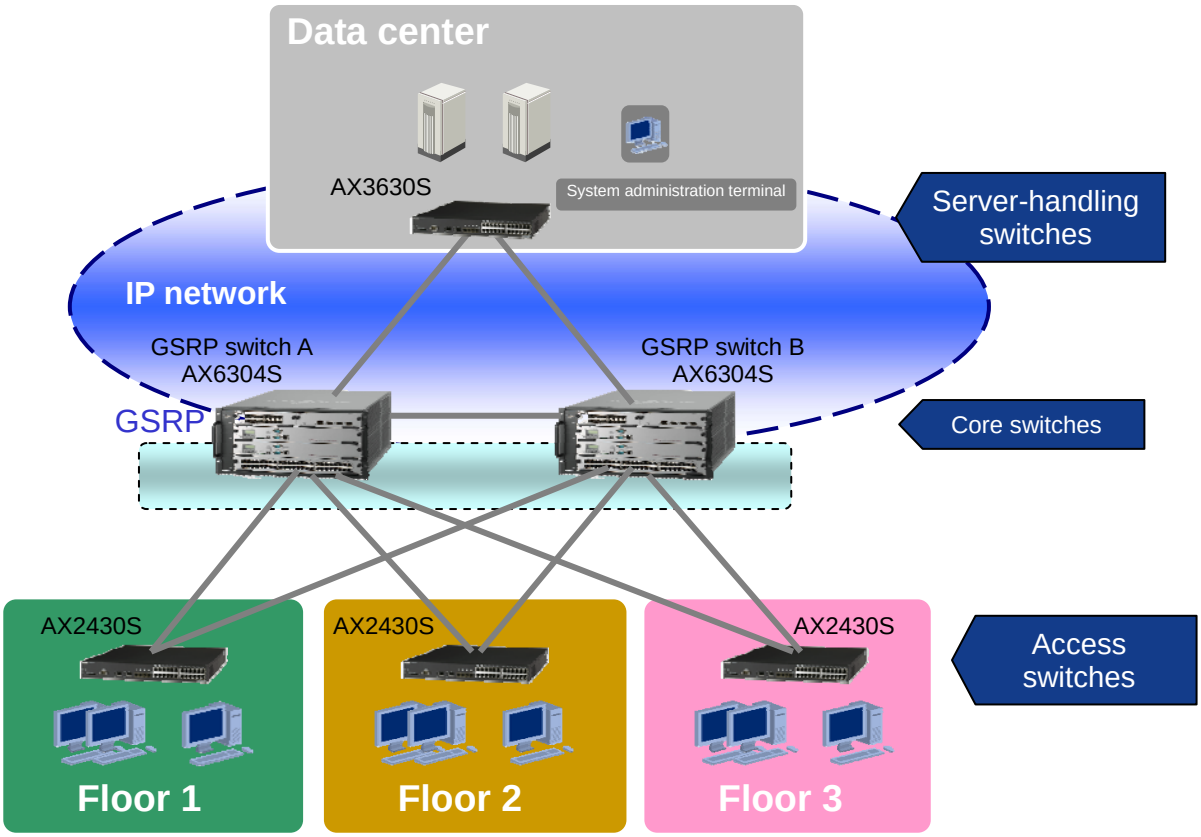



**Figure 4.1-1 GSRP backbone network**

## 4.2 Configuration points

There are 3 points to configure GSRP in this example.

**(1) The same points as the configuration points of Application Example 1 *Basic configuration of a Layer 3 system***
**(2) Settings on the side of the upstream network**
**(3) `port-up-delay` is recommended if using OSPF.**

The details of each point are explained below.

## (1) Configuration points of Layer 3 systems

The following configuration points are that same as those of Application Example 1 *Basic configuration of a Layer 3 system*. For details, see the configuration points of the above example.

**Configuration points of Application Example 1 *Basic configuration of a Layer 3 system***

- Disable STP.
- A direct link is recommended to be redundant.
- Load distribution on VLAN group basis
- Optimization of configuration parameters
- Difference in the settings between GSRP aware switches and GSRP unaware switches
- Setting of the remote control port
- Assign 1 to 4 for GSRP IDs.
- Enable Layer 3 redundancy switching.
- Setting of GSRP switches
- Assign the same IP address to the one between GSRP switches

## (2) Settings on the side of the upstream network

The points regarding upstream network settings are as follows:

- Exclude the connection port to the upstream network from the subject of GSRP control.
  Specify it as not under GSRP control (**`gsrp exception-port`**) or as GSRP VLAN group-only control (**`gsrp limit-control`**).

- Set up IP routing and enable failure monitoring.
  Configure IP routing so that both GSRP switches can communicate with the upstream network. Set up the dynamic monitoring functionality of dynamic routing or static routing so as to detect any failure in the upstream network.

- Continue communications through the direct link in case of failure in the upstream network.
  In general, each GSRP switch is set to communicate with the upstream network. In case of failure in the upstream network, the neighboring GSRP switch will be used to continue communication.

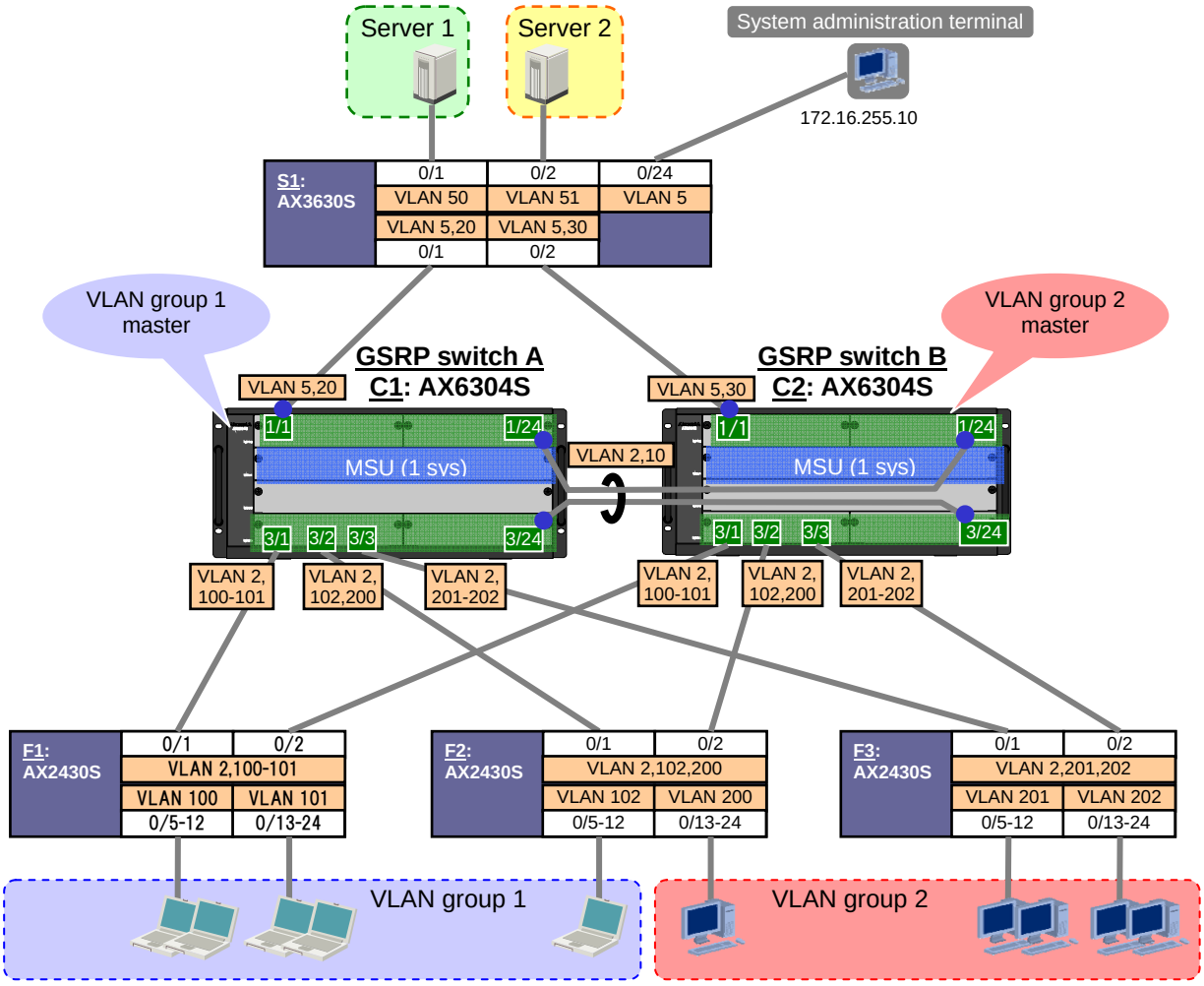
## (3) `port-up-delay` is recommended if using OSPF.

Using OSPF to establish an upstream network causes a disconnection of one minute or so to occur when recovering the failure of any GSRP switch. Switchover from backup to master immediately occurs due to the default setting of GSRP (switch restarting), resulting in disconnection until OSPF adjacency is established.

To avoid such a situation, it is recommended that the GSRP parameter **`port-up-delay`** be set to **60 seconds or more** if using OSPF. With this setting, after restarting GSRP switches, OSPF adjacency is established before switchover, reducing the disconnection period.
Specifying **infinity** to **`port-up-delay`** suppresses automated switchover. Use this option if you want to suppress automated switchover.

## 4.3 Configuration example

An example of a logical configuration is illustrated below. This section shows an example of each device based on the logical configuration.




| No. | Management purpose | Control | Data communication | | |
|---|---|---|---|---|---|
| | | | VLAN group 1 | VLAN group 2 | Upstream IP NW |
| VLAN | VLAN 5 | VLAN 2 | VLAN 100-102 | VLAN 200-202 | VLAN 10, 20, 30, 50-51 |
| IP | C1:172.16.255.1<br>C2:172.16.255.2<br>S1:172.16.255.3 | - | VLAN 100:192.168.100.0/24<br>VLAN 101:192.168.101.0/24<br>VLAN 102:192.168.102.0/24 | VLAN 200:192.168.200.0/24<br>VLAN 201:192.168.201.0/24<br>VLAN 202:192.168.202.0/24 | VLAN 10:10.0.0.0/24<br>VLAN 20:20.0.0.0/24<br>VLAN 30:30.0.0.0/24<br>VLAN 50:172.16.50.0/24<br>VLAN 51:172.16.51.0/24 |

**Figure 4.3-1 An example of the logical configuration of a backbone network**

### (1) Configuration of the core switch (GSRP switch A)

| Configuration of C1 (AX6304S) | |
|---|---|
| **Suppression of the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled by default in the AX series. **(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,5,10,20,100-102,200-202 | Configures the VLAN to be applied. **(*1)** |
| **Configuration of the GSRP** | |
| (config)# gsrp 1<br>(config-gsrp)# gsrp-vlan 2 | Configures the GSRP group IDs.<br>Assigns 1 to 4 GSRP group IDs.<br>**(Configuration point (1))**<br>Configures the GSRP-managed VLANs. |
| **Configuration on Layer 3 redundancy switching** | |
| (config-gsrp)# layer3-redundancy | Sets up Layer 3 redundancy switching.<br>**(Configuration point (1))**<br>Layer 3 can only be used with GSRP group IDs of 1 to 4. |
| **Configuration of the direct link** | |
| (config)# interface range gigabitethernet 1/24, gigabitethernet 3/24<br>(config-if-range)# channel-group 1 mode on<br><br>(config)# interface port-channel 1<br>(config-if)# gsrp 1 direct-link | Configures the channel group to make the direct-link redundant.<br><br>Configures Port channel 1 as GSRP1's direct link. |
| **Configuration of master/backup** | |
| (config)# gsrp 1<br>(config-gsrp)# vlan-group 1 vlan 100-102<br>(config-gsrp)# vlan-group 2 vlan 200-202<br><br>(config-gsrp)# vlan-group 1 priority 200<br>(config-gsrp)# vlan-group 2 priority 100 | Configures a VLAN group.<br>Joins VLAN 100-102 in VLAN group 1 and VLAN 200-202 in VLAN group 2.<br>Configures the priorities among VLAN groups.<br>Assigns a higher priority to VLAN group 1 than Switch C2.<br>Assigns a lower priority to VLAN group 2.<br>**(Configuration point (1))** **(*1)** |
| **Configuration of the GSRP parameters** | |
| (config-gsrp)# advertise-interval 0.5<br>(config-gsrp)# advertise-holdtime 3<br><br>(config-gsrp)# no-neighbor-to-master direct-down<br><br>(config-gsrp)# port-up-delay 60<br><br>(config)# gsrp limit-control | Configures the GSRP Advertise frames' transmission interval and retention time. **(Configuration point (1))**<br>Configures the direct link failure detection function. Lets backup automatically shift to master when there is a failure in the direct link.<br>Configures port-up-delay to 60 seconds when using OSPF as routing protocol. (Configuration point **(3)**)<br>Enables limiting GSRP control to VLAN-group VLANs in order to exclude the direct link from GSRP control.<br>**(Configuration point (2))** |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 1/1, gigabitethernet 1/24, gigabitethernet 3/1-3, gigabitethernet 3/24<br>(config-if-range)# link debounce time 0<br><br>(config)# interface gigabitethernet 3/1<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,100-101<br><br>(config)# interface gigabitethernet 3/2<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,102,200<br><br>(config)# interface gigabitethernet 3/3<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,201-202 | Sets as small a link-down detection time as possible.<br>**(Configuration point (1))**<br><br>Configures each port.<br>The connected access switches of port 3/1-3 is GSRP aware.<br>Sets Port 3/1 as the trunk port, set VLAN 2 for GSRP control, and sets VLAN 100-101 for data transfer.<br><br>Sets Port 3/2 as the trunk port, set VLAN 2 for GSRP control, and sets VLAN 102 and VLAN 200 for data transfer.<br><br>Sets Port 3/3 as the trunk port, set VLAN 2 for GSRP control, and sets VLAN 201 and VLAN 202 for data transfer.<br><br>Port channel 1 is a GSRP direct link.<br>Sets this port channel as the trunk port, and sets up VLAN 2 for |

| **Configuration of C1 (AX6304S)** | |
|---|---|
| (config)# interface port-channel 1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 2,10<br><br>(config)# interface gigabitethernet 1/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 5,20 | GSRP control and VLAN `10` for data transfer.<br><br>Port `1/1` connects to the upstream IP network.<br>Sets this port as the trunk port, and sets up VLAN `20` for data transfer and VLAN `5` for remote control. **(*1)** |
| **Configuration of VLAN interfaces** | |
| (config)# interface vlan 100<br>(config-if) ip address 192.168.100.1 255.255.255.0<br><br>(config)# interface vlan 101<br>(config-if) ip address 192.168.101.1 255.255.255.0<br><br>(config)# interface vlan 102<br>(config-if) ip address 192.168.102.1 255.255.255.0<br><br>(config)# interface vlan 200<br>(config-if) ip address 192.168.200.1 255.255.255.0<br><br>(config)# interface vlan 201<br>(config-if) ip address 192.168.201.1 255.255.255.0<br><br>(config)# interface vlan 202<br>(config-if) ip address 192.168.202.1 255.255.255.0<br><br>(config)# interface vlan 10<br>(config-if) ip address 10.0.0.1 255.255.255.0<br><br>(config)# interface vlan 20<br>(config-if) ip address 20.0.0.1 255.255.255.0 | Assigns an IP address to each VLAN interface.<br>**(Configuration point (1))**<br>Assigns an IP address to VLAN `100`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `102`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `102`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `200`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `201`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `202`.<br>Assigns the same IP address to Switch C2.<br><br>Assigns an IP address to VLAN `10`.<br>Assigns `10.0.0.2/24` to Switch C2. **(*1)**<br><br>Assigns an IP address to VLAN `20`.<br>Switch C2 is configured as VLAN `30`, and then configure `30.0.0.1/24`. **(*1)** |
| **IP routing configuration (Configuration point (2)) (*1)** | |
| **When using dynamic routing (OSPF)** | |
| (config)# router ospf 1<br>(config-router)# router-id 1.1.1.1<br>(config-router)# network 10.0.0.0 0.0.0.255 area 0<br>(config-router)# network 20.0.0.0 0.0.0.255 area 0<br>(config-router)# network 192.168.0.0 0.0.255.255 area 0 | Sets up OSPF.<br><br>Sets up the router ID and OSPF control network. |
| **When using static routing** | |
| (config)# ip route 172.16.50.0 255.255.255.0 20.0.0.2 100<br>(config)# ip route 172.16.50.0 255.255.255.0 10.0.0.2 200<br><br>(config)# ip route 172.16.51.0 255.255.255.0 20.0.0.2<br><br><br>(config)# ip route 192.168.100.0 255.255.255.0 10.0.0.2<br>(config)# ip route 192.168.101.0 255.255.255.0 10.0.0.2<br>(config)# ip route 192.168.102.0 255.255.255.0 10.0.0.2<br><br>(config)# ip route 192.168.200.0 255.255.255.0 10.0.0.2<br>(config)# ip route 192.168.201.0 255.255.255.0 10.0.0.2<br>(config)# ip route 192.168.202.0 255.255.255.0 10.0.0.2 | Assigns neighboring gateway `20.0.0.2` to the next hop of static route `172.16.50.0/24`. Assign neighboring gateway `10.0.0.2` to the next hop of alternative route.<br>Assigns neighboring gateway `20.0.0.2` to the next hop of the alternative route of static route `172.16.51.0/24`.<br><br>Assigns neighboring gateway `10.0.0.2` to the next hop of alternative route of static routes `192.168.100.0/24`, `192.168.101.0/24` and `192.168.102.0/24`.<br><br>Assigns neighboring gateway `10.0.0.2` to the next hop of alternative route of static routes `192.168.200.0/24`, `192.168.201.0/24` and `192.168.202.0/24`. |
| **Configuration on remote management of the devices** | |

| Configuration of C1 (AX6304S) | |
|---|---|
| (config)# interface vlan 5<br>(config-if)# ip address 172.16.255.1 255.255.255.0<br><br>(config)# line vty 0 2 | Sets up the IP address for the VLAN for remote control. **(*1)**<br><br>Permits telnet log-in (up to three at a time) |

* **(*1)** in the table indicates the points where there are differences between Switch C1 and Switch C2.

### (2) Settings of the core switch (Switch C2: GSRP switch B)

The table shows only the difference from C1.

| Configuration of C2 (AX6304S) | |
|---|---|
| **Configuration of VLANs** | |
| (config)# vlan 2,5,10,30,100-102,200-202 | Configures the VLAN to be used. |
| **Configuration of the GSRP** | |
| **Configuration of master/backup** | |
| (config)# gsrp 1<br>(config-gsrp)# vlan-group 1 vlan 100-102<br>(config-gsrp)# vlan-group 2 vlan 200-202<br><br>(config-gsrp)# vlan-group 1 priority 100<br>(config-gsrp)# vlan-group 2 priority 200 | Configures a VLAN group.<br>Joins VLAN `100-102` in VLAN group `1` and VLAN `200-202` in VLAN group `2`.<br>Configures the priorities among VLAN groups.<br>Assigns higher priority to VLAN group `2` than Switch C2.<br>Assigns lower priority to VLAN group 1. |
| **Configuration of the physical port interfaces** | |
| (config)# interface gigabitethernet 1/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 5,30 | Port `1/1` connects to the upstream IP network.<br>Sets up this port as the trunk port, and set up VLAN `30` for data transfer and VLAN `5` for remote control. |
| **Configuration of VLAN interfaces** | |
| (config)# interface vlan 10<br>(config-if) ip address 10.0.0.2 255.255.255.0<br><br>(config)# interface vlan 30<br>(config-if) ip address 30.0.0.1 255.255.255.0 | Assigns an IP address to each VLAN interface.<br>Assigns an IP address to VLAN `10`.<br><br>Assigns an IP address to VLAN `30`. |
| **Configuration of IP routing** | |
| **When using dynamic routing (OSPF)** | |
| (config)# router ospf 1<br>(config-router)# router-id 1.1.1.2<br>(config-router)# network 10.0.0.0 0.0.0.255 area 0<br>(config-router)# network 30.0.0.0 0.0.0.255 area 0<br>(config-router)# network 192.168.0.0 0.0.255.255 area 0 | Sets up OSPF.<br><br>Sets up the router ID and OSPF control network. |
| **When using static routing** | |
| (config)# ip route 172.16.51.0 255.255.255.0 30.0.0.2 100<br>(config)# ip route 172.16.51.0 255.255.255.0 10.0.0.1 200<br><br>(config)# ip route 172.16.50.0 255.255.255.0 30.0.0.2<br><br><br>(config)# ip route 192.168.100.0 255.255.255.0 10.0.0.1<br>(config)# ip route 192.168.101.0 255.255.255.0 10.0.0.1<br>(config)# ip route 192.168.102.0 255.255.255.0 10.0.0.1<br><br>(config)# ip route 192.168.200.0 255.255.255.0 10.0.0.1<br>(config)# ip route 192.168.201.0 255.255.255.0 10.0.0.1<br>(config)# ip route 192.168.202.0 255.255.255.0 10.0.0.1 | Assigns neighboring gateway `30.0.0.2` to the next hop of static route `172.16.51.0/24`. Assigns neighboring gateway `10.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `30.0.0.2` to the next hop of the alternative route of static route `172.16.50.0/24`.<br><br>Assigns neighboring gateway `10.0.0.1` to the next hop of alternative route of static routes `192.168.100.0/24`, `192.168.101.0/24` and `192.168.102.0/24`.<br><br>Assigns neighboring gateway `10.0.0.1` to the next hop of alternative route of static routes `192.168.200.0/24`, `192.168.201.0/24` and `192.168.202.0/24`. |

| Configuration of C2 (AX6304S) | |
|---|---|
| **Configuration on remote management of the devices** | |
| (config)# interface vlan 5<br>(config-if)# ip address 172.16.255.2 255.255.255.0<br><br>(config)# line vty 0 2 | Sets up the IP address for the VLAN for remote control.<br><br>Permits telnet log-in (up to three at a time) |

### (3) Configuration of server-handling switches

| Configuration of S1 (AX3630S) | |
|---|---|
| **Suppression of the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled as default in the AX series. **(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 5,20,30,50-51 | Configures the VLAN to be applied. |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 0/1-2<br>(config-if-range)# link debounce time 0<br><br>(config)# interface gigabitethernet 0/1<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 5,20<br><br>(config)# interface gigabitethernet 0/2<br>(config-if)# switchport mode trunk<br>(config-if)# switchport trunk allowed vlan 5,30<br><br>(config)# interface gigabitethernet 0/5<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 50<br><br>(config)# interface gigabitethernet 0/6<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 51<br><br>(config)# interface gigabitethernet 0/24<br>(config-if)# switchport mode access<br>(config-if)# switchport access vlan 5 | Sets as small a link-down detection time as possible. **(Configuration point (1))**<br><br>Port `0/1` connects to Switch C1.<br>Sets up this port as the access port, and sets up VLAN `20` for data transfer and VLAN `5` for remote control.<br><br>Port `0/2` connects to Switch C2.<br>Sets up this port as the access port, and sets up VLAN `30` for data transfer and VLAN `5` for remote control.<br><br>Port `0/5` connects to server A.<br>Sets up this port as the access port, and sets up VLAN `50` for data transfer.<br><br>Port `0/6` connects to server B.<br>Sets up this port as the access port, and sets up VLAN `51` for data transfer.<br><br>Port `0/24` is a system control port.<br>Sets up this port as the access port, and sets up VLAN `5` for remote control. |
| **Configuration of VLAN interfaces** | |
| (config)# interface vlan 20<br>(config-if) ip address 20.0.0.2 255.255.255.0<br><br>(config)# interface vlan 30<br>(config-if) ip address 30.0.0.2 255.255.255.0<br><br>(config)# interface vlan 50<br>(config-if) ip address 172.16.50.1 255.255.255.0<br><br>(config)# interface vlan 51<br>(config-if) ip address 172.16.51.1 255.255.255.0 | Assigns an IP address to each VLAN interface.<br>Assigns an IP address to VLAN `20`.<br><br>Assigns an IP address to VLAN `30`.<br><br>Assigns an IP address to VLAN `50`.<br><br>Assigns an IP address to VLAN `51`. |
| **Configuration of IP routing** **(Configuration point (2))** | |
| **When using dynamic routing (OSPF)** | |
| (config)# router ospf 1<br>(config-router)# router-id 1.1.1.3<br>(config-router)# network 20.0.0.0 0.0.0.255 area 0<br>(config-router)# network 30.0.0.0 0.0.0.255 area 0<br>(config-router)# network 172.16.0.0 0.0.255.255 area 0 | Sets up OSPF.<br><br>Sets up the router ID and OSPF control network. |

| Configuration of S1 (AX3630S) | |
|---|---|
| **When using static routing** | |
| (config)# ip route 192.168.100.0 255.255.255.0 20.0.0.1 100<br>(config)# ip route 192.168.100.0 255.255.255.0 30.0.0.1 200<br><br>(config)# ip route 192.168.101.0 255.255.255.0 20.0.0.1 100<br>(config)# ip route 192.168.101.0 255.255.255.0 30.0.0.1 200<br><br>(config)# ip route 192.168.102.0 255.255.255.0 20.0.0.1 100<br>(config)# ip route 192.168.102.0 255.255.255.0 30.0.0.1 200<br><br>(config)# ip route 192.168.200.0 255.255.255.0 30.0.0.1 100<br>(config)# ip route 192.168.200.0 255.255.255.0 20.0.0.1 200<br><br>(config)# ip route 192.168.201.0 255.255.255.0 30.0.0.1 100<br>(config)# ip route 192.168.201.0 255.255.255.0 20.0.0.1 200<br><br>(config)# ip route 192.168.202.0 255.255.255.0 30.0.0.1 100<br>(config)# ip route 192.168.202.0 255.255.255.0 20.0.0.1 200 | Assigns neighboring gateway `20.0.0.1` to the next hop of static route `192.168.100.0/24`. Assigns neighboring gateway `30.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `20.0.0.1` to the next hop of static route `192.168.101.0/24`. Assigns neighboring gateway `30.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `20.0.0.1` to the next hop of static route `192.168.102.0/24`. Assigns neighboring gateway `30.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `30.0.0.1` to the next hop of static route `192.168.200.0/24`. Assigns neighboring gateway `20.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `30.0.0.1` to the next hop of static route `192.168.201.0/24`. Assigns neighboring gateway `20.0.0.1` to the next hop of alternative route.<br>Assigns neighboring gateway `30.0.0.1` to the next hop of static route `192.168.202.0/24`. Assigns neighboring gateway `20.0.0.1` to the next hop of alternative route. |
| **Configuration on remote management of the devices** | |
| (config)# interface vlan 5<br>(config-if)# ip address 172.16.255.3 255.255.255.0<br><br>(config)# line vty 0 2 | Sets up the IP address for the VLAN for remote control.<br><br>Permits telnet log-in (up to three at a time) |

### (4) Configuration of the access switches

| Configuration of F1 (AX2430S) | |
|---|---|
| **Suppression of the spanning tree** | |
| (config)# spanning-tree disable | Disables PVST+, which is enabled as default in the AX series.<br>**(Configuration point (1))** |
| **Configuration of VLANs** | |
| (config)# vlan 2,100-101 | Configures the VLAN to be applied. |
| **Configuration of the physical port interfaces** | |
| (config)# interface range gigabitethernet 0/1-2<br>(config-if-range)# link debounce time 0<br>(config-if-range)# switchport mode trunk<br>(config-if-range)# switchport trunk allowed vlan 2,100-101<br><br>(config)# interface range gigabitethernet 0/5-12<br>(config-if-range)# switchport mode access<br>(config-if-range)# switchport access vlan 100<br><br>(config)# interface range gigabitethernet 0/13-24<br>(config-if-range)# switchport mode access<br>(config-if-range)# switchport access vlan 101 | Sets as small a link-down detection time as possible.<br>**(Configuration point (1))**<br>Ports `0/1-2` connect to C1 and C2, respectively.<br>Sets up the port as the trunk port, set up VLAN `2` for GSRP control, and set VLAN `100` and VLAN `101` for data transfer.<br><br>Ports `0/5-12` connect to the terminal.<br>Sets up the port as the access port, and set up VLAN `100` for data transfer.<br><br>Ports `0/13-24` connect to the terminal.<br>Sets up the port as the access port, and set up VLAN `101` for data transfer. |

Note: Switches F2 and F3 have the same setting as F1, except for the VLANs to be handled.

# 5. Operational Management

This chapter describes operational management, including the operation commands used for establishing a GSRP-enabled network and how to isolate the causes of failures.

## 5.1 Operation commands

GSRP operation commands are to be shown below.

### (1) Operational commands to check for the state of GSRP

- **`show gsrp [detail]`**

  Displays a summary of the state of GSRP; using [detail] (optional) shows the detailed information.

**An exemple of the result of the show `gsrp [detail]` command in a GSRP switch**

```
C1# show gsrp detail
Date 2010/04/20 16:17:19 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.f600
 Neighbor MAC Address    : 0012.e2a0.3600
 Total VLAN Group Counts : 2
 GSRP VLAN ID            : 2
 Direct Port             : 1/24,3/24
 Limit Control           : On
 GSRP Exception Port     : -
 No Neighbor To Master   : direct-down
 Backup Lock             : disable
 Port Up Delay           : 60
 Last Flush Receive Time : -
 Forced Shift Time       : -
 Layer 3 Redundancy      : On
 Virtual Link ID         : -

                           Local                Neighbor
 Advertise Hold Time     : 3                    3
 Advertise Hold Timer    : 3                    -
 Advertise Interval      : 0.5                  0.5
 Selection Pattern       : ports-priority-mac   ports-priority-mac

 VLAN Group ID      Local State         Neighbor State
 1                  Master              Backup
 2                  Backup              Master
```

... [GSRP configuration status]
Displays the detail of the GSRP of the switch

…[GSRP master/backup status]
Displays the GSRP Advertise timer value and selection method of the master/backup

…[VLAN group status]
VLAN group 1 uses this (C1) as the master.
VLAN group 2 uses the opposite (C2) as the master.

- **`show gsrp aware`**

  Displays the information on the GSRP aware switches; this command must be executed on any GSRP aware switch.

**An exemple of the result of the show `gsrp aware` command executed in a GSRP aware switch**

```
F1# show gsrp aware
Date 2010/04/20 16:18:54 UTC

Last MAC Address Table Flush Time          : 2010/04/20 16:10:52
GSRP Flush Request Parameters :
 GSRP ID : 1       VLAN Group ID : 1   Port : 0/1
 Source MAC Address : 0012.e2a0.f600
```

…[GSRP aware status]
The last time it flushed the Mac Address table

…Information on the last GSRP that flushed the Mac Address table
(The port that received the GSRP ID/VLAN group ID/flush frames)

### (2) Operation commands to control GSRP states

- **`set gsrp master`**

  Shifts the backup (No neighbor) state to the master; this command is valid only for the backup (No neighbor) state.

- **`clear gsrp port-up-delay`**

  In a VLAN assigned to a VLAN group, this command promptly updates a port in the link-up state to an active port, without waiting for the delay time configured with the **`port-up-delay`** configuration command.

### (3) Operation command to reset abnormal GSRP states

- **`restart gsrp`**

  Restart GSRP program after issuing the confirmation message for restart. All VLANs belonging to any GSRP VLAN groups stop receiving any frames, resulting in the termination of the communication.

## 5.2 Example of GSRP failure

This section explains a case where a GSRP switch encounters a failure in a GSRP-enabled Layer 3 system. See **Figure 4.3-1** for detailed configuration.

### (1) Normal operation status

GSRP group 1 has two VLAN groups; VLAN group 1 sees GSRP switch A as the master, while VLAN group 2 sees GSRP switch B as the master. The upstream IP network is routed by OSPF. The GSRP states of both core switches are shown below.

**Normal operation status of the GSRP switch**

```
C1# show gsrp
Date 2010/04/23 10:29:19 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.f600
 Neighbor MAC Address    : 0012.e2a0.3600
 Total VLAN Group Counts : 2
 Layer 3 Redundancy      : On

 VLAN Group ID      Local State         Neighbor State
 1                  Master              Backup
 2                  Backup              Master

C1# show vlan list
Date 2010/04/23 10:30:18 UTC
VLAN counts:10
ID   Status  Fwd/Up /Cfg Name       Type  Protocol
   1 Down      0/  0/ 42 VLAN0001   Port  -
   2 Up        5/  5/  5 VLAN0002   Port  -
  10 Up        2/  2/  2 VLAN0010   Port  -
  20 Up        1/  1/  1 VLAN0020   Port  -
 100 Up        1/  1/  1 VLAN0100   Port  GSRP    1:  1(M)
 101 Up        1/  1/  1 VLAN0101   Port  GSRP    1:  1(M)
 102 Up        1/  1/  1 VLAN0102   Port  GSRP    1:  1(M)
 200 Down      0/  1/  1 VLAN0200   Port  GSRP    1:  2(B)
 201 Down      0/  1/  1 VLAN0201   Port  GSRP    1:  2(B)
 202 Down      0/  1/  1 VLAN0202   Port  GSRP    1:  2(B)

      GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

```
C2# show gsrp
Date 2010/04/23 10:29:35 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.3600
 Neighbor MAC Address    : 0012.e2a0.f600
 Total VLAN Group Counts : 2
 Layer 3 Redundancy      : On

 VLAN Group ID      Local State         Neighbor State
 1                  Backup              Master
 2                  Master              Backup

C2# show vlan list
Date 2010/04/23 10:30:28 UTC
VLAN counts:10
ID   Status  Fwd/Up /Cfg Name       Type  Protocol
   1 Down      0/  0/ 42 VLAN0001   Port  -
   2 Up        5/  5/  5 VLAN0002   Port  -
  10 Up        2/  2/  2 VLAN0010   Port  -
  20 Up        1/  1/  1 VLAN0020   Port  -
 100 Down      1/  1/  1 VLAN0100   Port  GSRP    1:  1(B)
 101 Down      1/  1/  1 VLAN0101   Port  GSRP    1:  1(B)
 102 Down      1/  1/  1 VLAN0102   Port  GSRP    1:  1(B)
 200 Up        0/  1/  1 VLAN0200   Port  GSRP    1:  2(M)
 201 Up        0/  1/  1 VLAN0201   Port  GSRP    1:  2(M)
 202 Up        0/  1/  1 VLAN0202   Port  GSRP    1:  2(M)

      GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

### (2) Operations in case of GSRP failure

If GSRP switch A, a core switch, encounters a device failure, the switchover of GSRP master and backup occurs. In this case, GSRP switch A (Switch C1), where VLAN group 1 acts as the master, encounters a device down, and the neighboring GSRP switch B (Switch C2) detects GSRP Advertise timeout, which invokes the switchover of GSRP.

The messages issued from each switch in case of failure in GSRP switch A are shown below.

**Messages from devices in case of MSU module failure**

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+         Message from Switch C1, core switch (GSRP switch A)                                                                  +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:29 E8 MSU 25070202 2301:400100001000 MSU restarted because of PSP hardware failure.
    … PSP hardware failure caused MSU module to restart
04/23 10:49:30 E3 VLAN 20130013 0700:000000000000 GSRP 1 VLAN group 1 : advertise timeout detected on Master.
04/23 10:49:30 E4 VLAN 20130011 0700:000000000000 GSRP 1 VLAN group 2 : state transitioned to Backup(No Neighbor).
04/23 10:49:31 E3 MSU 01200171 2301:455f00000001 This system (MSU1) restarted due to its failure.
    … GSRP Advertise timeout was detected, resulting in No neighbor. Then the switch restarted due to MSU module failure.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+         Message from Switch C2, core switch (GSRP switch B)                                                                  +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:32 E4 PORT GigabitEthernet1/24 25011101 1350:a00000004120 Error detected on the port.
04/23 10:49:32 E3 MAC 20120010 0800:000000000000 Port(1/24) detached from Channel Group(1) - Port down.
04/23 10:49:32 E4 PORT GigabitEthernet3/24 25011101 1350:a00000004120 Error detected on the port.
04/23 10:49:32 E4 VLAN 25100002 0700:000a00000000 VLAN (10) Status is Down.
04/23 10:49:32 E3 MAC 20120010 0800:000000000000 Port(3/24) detached from Channel Group(1) - Port down.
04/23 10:49:32 E4 MAC 20120003 0800:000000000000 Channel Group(1) is Down - All port detached.
    … As neighboring switch (C1) went down, port channel 1 enters link-down.
04/23 10:49:33 E4 VLAN 20130007 0700:000000000000 GSRP 1 VLAN group 1 : state transitioned to Master, because the direct link
failure was detected.
04/23 10:49:33 E3 VLAN 20130013 0700:000000000000 GSRP 1 VLAN group 2 : advertise timeout detected on Master.
    … As GSRP direct link entered link-down, VLAN group 1 shifted to master.
04/23 10:49:33 E4 VLAN 25100001 0700:006400000000 VLAN (100) Status is Up.
04/23 10:49:33 E4 VLAN 25100001 0700:006500000000 VLAN (101) Status is Up.
04/23 10:49:33 E4 VLAN 25100001 0700:006600000000 VLAN (102) Status is Up.
04/23 10:49:34 E3 VLAN 20130013 0700:000000000000 GSRP 1 VLAN group 1 : advertise timeout detected on Master.
    … As VLAN group 1 (VLAN100,VLAN101,VLAN102) shifted to master, the VLAN went up.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+         Message from Server Switch S1                                                                                        +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:33 E4 PORT GigabitEthernet0/1 25011101 1350:70020000e125 Error detected on the port.
04/23 10:49:33 E4 VLAN 25100002 0700:000100000000 VLAN (20) Status is Down.
    … Down in neighboring switch (C1) caused Port 0/1 to go link-down, resulting in down of VLAN20.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+          Message from Access Switch F1                                                                                       +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:35 E4 PORT GigabitEthernet0/1 25011101 1350:70020000e125 Error detected on the port.
04/23 10:49:36 E3 VLAN 20130015 0700:000000000000 GSRP aware : MAC Address Table entry cleared,because GSRP flush request received
on port 0/2, GSRP 1 VLAN group 1 Source MAC address 0012.e2a0.3600.
    … GSRP Flush request frames of VLAN group 1 was received from GSRP switch B (C2), MAC address table was cleared.
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+          Message from Access Switch F2                                                                                       +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:31 E4 PORT GigabitEthernet0/1 25011101 1350:70020000e125 Error detected on the port.
04/23 10:49:32 E3 VLAN 20130015 0700:000000000000 GSRP aware : MAC Address Table entry cleared,because GSRP flush request received
on port 0/2, GSRP 1 VLAN group 1 Source MAC address 0012.e2a0.3600.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+          Message from Access Switch F3                                                                                       +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
04/23 10:49:31 E4 PORT GigabitEthernet0/1 25011101 1350:70020000e125 Error detected on the port.
    … GSRP Flush request frames of VLAN group 1 was received from GSRP switch B (C2), MAC address table was cleared.
```

As GSRP switch A encounters a failure into a down state, VLAN group 1 in GSRP switch B shifts from backup to master. VLAN group 2 keeps its state of master, resulting in two VLAN groups in a master state.

The operational status of GSRP switch B is shown below.

**Operational status of GSRP switch B after a failure**

```
C2# show gsrp
Date 2010/04/23 10:51:35 UTC

GSRP ID: 1
 Local MAC Address       : 0012.e2a0.3600
 Neighbor MAC Address    : -
 Total VLAN Group Counts : 2
 Layer 3 Redundancy      : On

VLAN Group ID      Local State         Neighbor State
 1                  Master              -
 2                  Master              -

C2# show vlan list
Date 2010/04/23 10:51:48 UTC
VLAN counts:10
ID   Status  Fwd/Up /Cfg Name        Type  Protocol
   1 Down      0/  0/ 42 VLAN0001    Port  -
   2 Up        5/  5/  5 VLAN0002    Port  -
  10 Up        2/  2/  2 VLAN0010    Port  -
  20 Up        1/  1/  1 VLAN0020    Port  -
 100 Up        1/  1/  1 VLAN0100    Port  GSRP    1:  1(M)
 101 Up        1/  1/  1 VLAN0101    Port  GSRP    1:  1(M)
 102 Up        1/  1/  1 VLAN0102    Port  GSRP    1:  1(M)
 200 Up        1/  1/  1 VLAN0200    Port  GSRP    1:  2(M)
 201 Up        1/  1/  1 VLAN0201    Port  GSRP    1:  2(M)
 202 Up        1/  1/  1 VLAN0202    Port  GSRP    1:  2(M)

     GSRP GSRP ID:VLAN Group ID(M:Master/B:Backup)
```

In both VLAN groups 1 and 2, GSRP switch B acts as the master.

### (3) Operation after the recovery of GSRP failure

In GSRP, as the port-up state obtained by a failed switch or port will be immediately reflected into an active port, a switchover (shift from backup to master) with priority will be automatically executed.
In an upstream network utilizing OSPF, however, the automated switchover of GSRP recovery might take a long time to restart the stopped communication.

To avoid such a situation, automated switchover can be suppressed by using the GSRP configuration command **`port-up-delay infinity`**. Use operation command **`clear gsrp port-up-delay`** to shift the states of master/backup.

# 6. Precautions

### (1) Compatibility with other functionalities

The following functions have a problem regarding coexistence with GSRP.

- No spanning tree function (single spanning tree, PVST+, multiple spanning trees) is compatible with GSRP in one device.
- VRRP and GSRP cannot be used in the same switch at the same time.

### (2) Using port resetting in a load-balanced configuration

When you configure port resetting to one physical port that is shared with multiple VLAN groups, a shift of one of such VLAN groups from master to backup causes a communication interrupt, since the port is temporarily in a link-down state, although no other VLAN groups shift from master.
If you want to avoid such temporal link-down while using port resetting, make sure that multiple VLAN groups do not share one physical port.

### (3) Applying GSRP to a newly built network

Take the following measures to avoid frame loop when configuring GSRP into a network.

- **Shutdown** ports during configuration
  Prior to configuring GSRP, set the ports to the opposite switch to **shutdown** to set it in a down state. After the configuration, wait for the stable-state configuration of GSRP before starting operation.
- Start and set up GSRP switches one by one
  Of the two GSRP switches constituting a GSRP group, start and configure one switch, and make sure it has shifted to backup before starting and configuring the other GSRP switch.

### (4) In case of high CPU load

A heavy load placed on a CPU might cause the discarding of some of the received GSRP Advertise frames or might cause processing delays, leading to the output of timeout messages or state shifts. If such a state takes place frequently, set up a larger value to the transmission interval and retention time of the GSRP Advertise frames.

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# Appendix: Configuration Files

This appendix shows the configuration examples described in this guide. All the configurations for the switches of Layer 2 systems in Part 2 and Layer 3 systems in Part 3 are attached to this file as a text file. (Extracting the attached files requires Adobe Reader 6.0 or later.) For each configuration, refer to the attached file that matches with the filename.

### (1) Part 2 Layer 2 system

| | Switch | Filename |
|---|---|---|
| **Application example of GSRP in Layer 2**<br>Load-distributed configuration | C1 : AX6304S | L2_C1-AX63S.txt |
| | C2 : AX6304S | L2_C2-AX63S.txt |
| | F1 : AX2430S | L2_F1-AX24S.txt |

### (2) Part 3 Layer 3 system

| | Switch | Filename |
|---|---|---|
| **Application example 1 of GSRP in Layer 3**<br>Configuration of a basic system | C1 : AX6304S | 1_L3_C1-AX63S.txt |
| | C2 : AX6304S | 1_L3_C2-AX63S.txt |
| | F1 : AX2430S | 1_L3_F1-AX24S.txt |
| | F2 : AX2430S | 1_L3_F2-AX24S.txt |
| | F3 : AX2430S | 1_L3_F3-AX24S.txt |

| | Switch | Filename |
|---|---|---|
| **Application example 2 of GSRP in Layer 3**<br>Configuration of a network separation system | C1 : AX6304S | 2_L3_C1-AX63S.txt |
| | C2 : AX6304S | 2_L3_C2-AX63S.txt |
| | F1 : AX2430S | 2_L3_F1-AX24S.txt |
| | F2 : AX2430S | 2_L3_F2-AX24S.txt |
| | F3 : AX2430S | 2_L3_F3-AX24S.txt |

| | Switch | Filename |
|---|---|---|
| **Application example 3 of GSRP in Layer 3**<br>Configuration of a backbone network | C1 : AX6304S | 3_L3_C1-AX63S_ospf.txt |
| | | 3_L3_C1-AX63S_static.txt |
| | C2 : AX6304S | 3_L3_C2-AX63S_ospf.txt |
| | | 3_L3_C2-AX63S_static.txt |
| | S1 : AX3630S | 3_L3_S1-AX36S_ospf.txt |
| | | 3_L3_S1-AX36S_static.txt |
| | F1 : AX2430S | 3_L3_F1-AX24S.txt |
| | F2 : AX2430S | 3_L3_F2-AX24S.txt |
| | F3 : AX2430S | 3_L3_F3-AX24S.txt |

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