

# Table of Contents

<b>Chapter 1 Ethernet Port Configuration .....</b>	<b>1-1</b>
1.1 Ethernet Port Overview.....	1-1
1.2 Ethernet Port Configuration .....	1-1
1.2.1 Entering Ethernet Port View.....	1-2
1.2.2 Enabling/Disabling an Ethernet Port .....	1-2
1.2.3 Setting the Description Character String for the Ethernet Port.....	1-2
1.2.4 Setting the Duplex Attribute of the Ethernet Port.....	1-3
1.2.5 Setting Speed on the Ethernet Port .....	1-3
1.2.6 Setting the Cable Type for the Ethernet Port.....	1-4
1.2.7 Enabling/Disabling Flow Control for the Ethernet Port.....	1-4
1.2.8 Permitting/Forbidding Jumbo Frame to Pass through the Ethernet Port.....	1-4
1.2.9 Setting the Ethernet Port Suppression Ratio .....	1-5
1.2.10 Setting the Link Type for the Ethernet Port.....	1-5
1.2.11 Adding the Ethernet Port to Specified VLANs.....	1-6
1.2.12 Setting the Default VLAN ID for the Ethernet Port.....	1-7
1.2.13 Setting Loopback Detection for the Ethernet Port.....	1-8
1.2.14 Copying Port Configuration to Other Ports .....	1-8
1.3 Displaying and Debugging Ethernet Port .....	1-9
1.4 Ethernet Port Configuration Example .....	1-10
1.5 Ethernet Port Troubleshooting.....	1-10
<b>Chapter 2 Link Aggregation Configuration .....</b>	<b>2-1</b>
2.1 Overview .....	2-1
2.1.1 Brief Introduction to Link Aggregation.....	2-1
2.1.2 Brief Introduction to LACP.....	2-1
2.1.3 Types of Link Aggregation .....	2-2
2.1.4 Load Sharing .....	2-3
2.2 Link Aggregation Configuration .....	2-4
2.2.1 Enabling/Disabling LACP .....	2-4
2.2.2 Creating/Deleting an Aggregation Group.....	2-5
2.2.3 Adding/Deleting an Ethernet Port into/from an Aggregation Group.....	2-6
2.2.4 Setting/Deleting the Aggregation Group Descriptor.....	2-6
2.2.5 Configuring System Priority.....	2-7
2.2.6 Configuring Port Priority .....	2-7
2.3 Displaying and Debugging Link Aggregation.....	2-8
2.4 Link Aggregation Configuration Example .....	2-8

# Chapter 1 Ethernet Port Configuration

## 1.1 Ethernet Port Overview

S5624P provides 24 fixed 10/100/1000Base-T Ethernet port, four combo SFP ports, two fixed stack ports and one expansion slot. The expansion slot can accommodate the 8-port SFP module, 1-port 10GE module or 2-port 10GE module.

S5648P provides 48 fixed 10/100/1000Base-T Ethernet port, four combo SFP ports, two fixed stack ports and one expansion slot. The expansion slot can accommodate the 8-port SFP module, 1-port 10GE module or 2-port 10GE module.

The Ethernet ports of S5600 series switches have the following features:

- 10/100/1000Base-T Ethernet ports support MDI/MDI-X auto-sensing and can operate in 1000M full-duplex, 100M half-duplex/ full-duplex, and 10M half-duplex/full-duplex modes.
- Gigabit SFP port operates in 1000M full duplex mode. The duplex mode can be set to **full** (full-duplex) and **auto** (auto-negotiation) and its speed can be set to **1000** (1000Mbps) and **auto** (auto-negotiation).
- 10Gigabit Ethernet port operates in 10000M full duplex mode. The duplex mode can be set to **full** (full-duplex) and **auto** (auto-negotiation) and its speed can be set to **10000** (1000Mbps) and **auto** (auto-negotiation).

The configurations of these Ethernet ports are basically the same, which will be described in the following sections.

## 1.2 Ethernet Port Configuration

Ethernet port configuration includes:

- Entering Ethernet port view
- Enabling/disabling an Ethernet port
- Setting the description character string for the Ethernet port
- Setting the duplex attribute for the Ethernet port
- Setting speed for the Ethernet port
- Setting the cable type for the Ethernet port
- Enabling/disabling flow control for the Ethernet port
- Permitting/forbidding the jumbo frame to pass through the Ethernet port
- Setting the Ethernet port suppression ratio
- Setting a link type for the Ethernet port
- Adding the Ethernet port to specified VLANs

- Setting the default VLAN ID for the Ethernet port
- Setting loopback detection for the Ethernet port
- Copying port configuration to other ports

### 1.2.1 Entering Ethernet Port View

Before configuring the Ethernet port, enter Ethernet port view first.

Perform the following configuration in system view.

**Table 1-1** Entering Ethernet port view

Operation	Command
Enter Ethernet port view	<b>interface</b> { <i>interface-type interface-num</i> }

### 1.2.2 Enabling/Disabling an Ethernet Port

The following command can be used for disabling or enabling the port. After configuring the related parameters and protocol of the port, you can use the following command to enable the port. If you do not want a port to forward data any more, use the command to disable it.

Perform the following configuration in Ethernet port view.

**Table 1-2** Enabling/disabling an Ethernet port

Operation	Command
Disable an Ethernet port	<b>shutdown</b>
Enable an Ethernet port	<b>undo shutdown</b>

By default, the port is enabled.

### 1.2.3 Setting the Description Character String for the Ethernet Port

To distinguish the Ethernet ports, you can use the following command to make some necessary descriptions.

Perform the following configuration in Ethernet port view.

**Table 1-3** Setting the description character string for the Ethernet port

Operation	Command
Set description character string for Ethernet port.	<b>description</b> <i>text</i>
Delete the description character string of Ethernet.	<b>undo description</b>

By default, the port description is a null character string.

The cascade ports do not support the **undo description** command.

## 1.2.4 Setting the Duplex Attribute of the Ethernet Port

To configure a port to send and receive data packets at the same time, set it to full-duplex. To configure a port to either send or receive data packets at a time, set it to half-duplex. If the port has been set to auto-negotiation mode, the local and peer ports will automatically negotiate about the duplex mode.

Perform the following configuration in Ethernet port view.

**Table 1-4** Setting the duplex attribute for the Ethernet port

Operation	Command
Set duplex attribute for Ethernet port.	<b>duplex</b> { <b>auto</b>   <b>full</b>   <b>half</b> }
Restore the default duplex attribute of Ethernet port.	<b>undo duplex</b>

Note that the 10/100/1000Base-T port can operate in full duplex, half duplex or auto-negotiation mode. When the port operates at 1000Mbps, the duplex mode can be set to **full** (full duplex) or **auto** (auto-negotiation). Gigabit port and 10Gigabit port support full duplex mode and can be configured to operate in **full** (full duplex) or **auto** (auto-negotiation) mode.

The port defaults the **auto** (auto-negotiation) mode.

## 1.2.5 Setting Speed on the Ethernet Port

You can use the following command to set the speed on the Ethernet port. If the speed is set to auto-negotiation mode, the local and peer ports will automatically negotiate about the port speed.

Perform the following configuration in Ethernet port view.

**Table 1-5** Setting speed on the Ethernet port

Operation	Command
Set Ethernet port speed	<b>speed { 10   100   1000   10000   auto }</b>
Restore the default speed on Ethernet port	<b>undo speed</b>

Note that the 10/100/1000Base-T port excluding the combo ports can operate at 10Mbps, 100Mbps, or 1000Mbps as per different requirements. However in half duplex mode, the port cannot operate at 1000Mbps. The Gigabit Ethernet port supports 1000Mbps and can be configured to operate at **1000** (1000Mbps) and **auto** (auto-negotiation).

By default, the speed of the port is in **auto** mode.

## 1.2.6 Setting the Cable Type for the Ethernet Port

The Ethernet port supports the straight-through and cross-over network cables. The following command can be used for configuring the cable type.

Perform the following configuration in Ethernet port view.

**Table 1-6** Setting the type of the cable connected to the Ethernet port

Operation	Command
Set the type of the cable connected to the Ethernet port.	<b>mdi { across   auto   normal }</b>
Restore the default type of the cable connected to the Ethernet port.	<b>undo mdi</b>

By default, the cable type is **auto** (auto-recognized). That is, the system can automatically recognize the type of cable connecting to the port.

## 1.2.7 Enabling/Disabling Flow Control for the Ethernet Port

After enabling flow control in both the local and the peer switch, if congestion occurs in the local switch, the switch will inform its peer to pause packet sending. Once the peer switch receives this message, it will pause packet sending, and vice versa. In this way, packet loss is reduced effectively. The flow control function of the Ethernet port can be enabled or disabled through the following command.

Perform the following configuration in Ethernet port view.

**Table 1-7** Enabling/Disabling Flow Control for the Ethernet Port

Operation	Command
Enable Ethernet port flow control	<b>flow-control</b>
Disable Ethernet port flow control	<b>undo flow-control</b>

By default, Ethernet port flow control is disabled.

## 1.2.8 Permitting/Forbidding Jumbo Frame to Pass through the Ethernet Port

The Ethernet port may encounter the jumbo frame exceeding the standard frame length, when switching large throughput data like transmitting files. This command can forbid or permit the jumbo frame to pass through the Ethernet port.

Perform the following configuration in Ethernet port view.

**Table 1-8** Permitting/forbidding jumbo frame to pass through the Ethernet port

Operation	Command
Permit jumbo frame to pass through the Ethernet port	<b>jumboframe enable</b>
Forbid jumbo frame to pass through the Ethernet port	<b>undo jumboframe enable</b>

By default, the jumbo frame with lengths between 1518 bytes and 9216 bytes including are permitted to pass through the Ethernet port.

## 1.2.9 Setting the Ethernet Port Suppression Ratio

You can use the following commands to restrict the broadcast/multicast/unicast traffic. Once the broadcast/multicast/unicast traffic exceeds the value set by the user, the system will maintain an appropriate broadcast/multicast/unicast packet ratio by discarding the overflow traffic, so as to suppress broadcast/multicast/unicast storm, avoid suggestion and ensure the normal service.

Perform the following configuration in Ethernet port view.

**Table 1-9** Setting the Ethernet port suppression ratio

Operation	Command
Set Ethernet port broadcast suppression ratio	<b>broadcast-suppression</b> { <i>ratio</i>   <b>pps max-pps</b> }

Restore the default Ethernet port broadcast suppression ratio	<b>undo broadcast-suppression</b>
Set Ethernet port multicast suppression ratio	<b>multicast-suppression</b> { <i>ratio</i>   <b>pps</b> <i>max-pps</i> }
Restore the default Ethernet port multicast suppression ratio	<b>undo multicast-suppression</b>
Set Ethernet port unicast suppression ratio	<b>unicast-suppression</b> { <i>ratio</i>   <b>pps</b> <i>max-pps</i> }
Restore the default Ethernet port unicast suppression ratio	<b>undo unicast-suppression</b>

By default, 100% broadcast/multicast/unicast traffic is allowed to pass through, that is, no broadcast/multicast/unicast suppression will be performed.

### 1.2.10 Setting the Link Type for the Ethernet Port

Ethernet port can operate in three different link types, access, hybrid, and trunk types. The access port carries one VLAN only, used for connecting to the user's computer. The trunk port can belong to more than one VLAN and receive/send the packets on multiple VLANs, used for connection between the switches. The hybrid port can also carry more than one VLAN and receive/send the packets on multiple VLANs, used for connecting both the switches and user's computers. The difference between the hybrid port and the trunk port is that the hybrid port allows the packets from multiple VLANs to be sent without tags, but the trunk port only allows the packets from the default VLAN to be sent without tags.

Perform the following configuration in Ethernet port view.

**Table 1-10** Setting the link type for the Ethernet port

Operation	Command
Configure the port as access port	<b>port link-type access</b>
Configure the port as hybrid port	<b>port link-type hybrid</b>
Configure the port as trunk port	<b>port link-type trunk</b>
Restore the default link type, that is, the access port.	<b>undo port link-type</b>

By default, the port is access port.

Note that you can configure three types of ports concurrently on the same switch, but you cannot switch between trunk port and hybrid port. You must turn it first into access

port and then set it as other type. For example, you cannot configure a trunk port directly as hybrid port, but first set it as access port and then as hybrid port.

### 1.2.11 Adding the Ethernet Port to Specified VLANs

The following commands are used for adding an Ethernet port to a specified VLAN. The access port can only be added to one VLAN, while the hybrid and trunk ports can be added to multiple VLANs.

Perform the following configuration in Ethernet port view.

**Table 1-11** Adding the Ethernet port to specified VLANs

Operation	Command
Add the current access port to a specified VLAN	<b>port access vlan</b> <i>vlan_id</i>
Add the current hybrid port to specified VLANs	<b>port hybrid vlan</b> <i>vlan_id_list</i> { <b>tagged</b>   <b>untagged</b> }
Add the current trunk port to specified VLANs	<b>port trunk permit vlan</b> { <i>vlan_id_list</i>   <b>all</b> }
Remove the current access port from to a specified VLAN.	<b>undo port access vlan</b>
Remove the current hybrid port from to specified VLANs.	<b>undo port hybrid vlan</b> <i>vlan_id_list</i>
Remove the current trunk port from specified VLANs.	<b>undo port trunk permit vlan</b> { <i>vlan_id_list</i>   <b>all</b> }

Note that the access port shall be added to an existing VLAN other than VLAN 1. The VLAN to which Hybrid port is added must have been existed. The one to which Trunk port is added cannot be VLAN 1.

After adding the Ethernet port to specified VLANs, the local port can forward packets of these VLANs. The hybrid and trunk ports can be added to multiple VLANs, thereby implementing the VLAN intercommunication between peers. For the hybrid port, you can configure to tag some VLAN packets, based on which the packets can be processed differently.

### 1.2.12 Setting the Default VLAN ID for the Ethernet Port

Since the access port can only be included in one VLAN only, its default VLAN is the one to which it belongs. The hybrid port and the trunk port can be included in several VLANs, it is necessary to configure the default VLAN ID. If the default VLAN ID has been configured, the packets without VLAN Tag will be forwarded to the port that



belongs to the default VLAN. When sending the packets with VLAN Tag, if the VLAN ID of the packet is identical to the default VLAN ID of the port, the system will remove VLAN Tag before sending this packet.

Perform the following configuration in Ethernet port view.

**Table 1-12** Setting the default VLAN ID for the Ethernet port

Operation	Command
Set the default VLAN ID for the hybrid port.	<b>port hybrid pvid vlan <i>vlan_id</i></b>
Set the default VLAN ID for the trunk port	<b>port trunk pvid vlan <i>vlan_id</i></b>
Restore the default VLAN ID of the hybrid port to the default value	<b>undo port hybrid pvid</b>
Restore the default VLAN ID of the trunk port to the default value	<b>undo port trunk pvid</b>

By default, the VLAN of hybrid port and trunk port is VLAN 1 and that of the access port is the VLAN to which it belongs.

Note that to guarantee the proper packet transmission, the default VLAN ID of local hybrid port or Trunk port should be identical with that of the hybrid port or Trunk port on the peer switch.

### 1.2.13 Setting Loopback Detection for the Ethernet Port

The following commands are used for enabling the port loopback detection and setting detection interval for the external loopback condition of each port. If there is a loopback port found, the switch will put it under control.

Other correlative configurations function only when port loopback detection is enabled in system view.

Perform the following configuration in corresponding view.

**Table 1-13** Setting loopback detection for the Ethernet port

Operation	Command
Enable loopback detection on the port (System view/Ethernet port view)	<b>loopback-detection enable</b>
Disable loopback detection on the port (System view/Ethernet port view)	<b>undo loopback-detection enable</b>
Enable the loopback controlled function of the trunk and hybrid ports (Ethernet port view)	<b>loopback-detection control enable</b>

Disable the loopback controlled function of the trunk and hybrid ports (Ethernet port view)	<b>undo loopback-detection control enable</b>
Configure that the system performs loopback detection to all VLANs on Trunk and Hybrid ports (Ethernet port view)	<b>loopback-detection per-vlan enable</b>
Configure that the system only performs loopback detection to the default VLANs on the port (Ethernet port view)	<b>undo loopback-detection per-vlan enable</b>

By default, the port loopback detection function and the loopback detection controlled function on Trunk and Hybrid ports are disabled. The detection interval is 30 seconds, and the system detects the default VLAN on the Trunk and Hybrid ports.

To implement the loopback detection function, you need a self-loop terminal.

### 1.2.14 Copying Port Configuration to Other Ports

To keep the configuration of other ports consistent with a specified port, you can copy the configuration of that specified port to other ports. Such contents may involve: STP setting, QoS setting, VLAN setting, port setting, and LACP setting. The STP setting includes STP enabling/disabling, link attribute (point-to-point or not), STP priority, path cost, max transmission speed, loop protection, root protection, edge port or not. The QoS setting includes traffic limiting, priority marking, default 802.1p priority, bandwidth assurance, congestion avoidance, traffic redirection, traffic statistics. The VLAN setting includes permitted VLAN types, default VLAN ID. The port setting includes port link type, port speed, duplex mode. LACP setting includes LACP enabling/disabling.

Perform the following configuration in system view.

**Table 1-14** Copying port configuration to other ports

Operation	Command
Copy port configuration to other ports	<b>copy configuration source</b> { <i>interface-type interface-number</i>   <b>aggregation-group</b> <i>agg-id</i> } <b>destination</b> { <i>interface-list</i> [ <b>aggregation-group</b> <i>agg-id</i> ]   <b>aggregation-group</b> <i>agg-id</i> }

Note that if the copy source is an aggregation group, take the port with minimum ID as the source; if the copy destination is an aggregation group, make the configurations of all group member ports identical with that of the source.

## 1.3 Displaying and Debugging Ethernet Port

After the above configuration, execute **display** command in any view to display the running of the Ethernet port configuration, and to verify the effect of the configuration.

Execute **reset** command in user view to clear the statistics information of the port.

Execute **loopback** command in Ethernet port view to check whether the Ethernet port works normally. In the process of the loopback test, the port cannot forward the packets. The loop test will finish automatically after being executed for a while.

**Table 1-15** Displaying and debugging Ethernet port

Operation	Command
Configure to perform loopback test on the Ethernet port.	<b>loopback</b> { <b>external</b>   <b>internal</b> }
Display all the information of the port	<b>display interface</b> { <i>interface-type</i>   <i>interface-type interface-num</i> }
Display the information of the port in the specific unit	<b>display unit</b> <i>unit-id</i> <b>interface</b>
Display Combo port, hybrid port or trunk port	<b>display port</b> { <b>combo</b>   <b>hybrid</b>   <b>trunk</b> }
Display the state of loopback detection on the port	<b>display loopback-detection</b>
Display VLAN VPN configuration in the current system	<b>display port vlan-vpn</b>
Clear the statistics information of the port	<b>reset counters interface</b> [ <i>interface-type</i>   <i>interface-type interface-num</i> ]

Note that:

- The loopback test cannot be performed on the port disabled by the **shutdown** command. During the loopback test, the system will disable **speed**, **duplex**, **mdi** and **shutdown** operation on the port. Some ports do not support the loopback test. If performing this command in these ports, you will see the system prompt.
- After 802.1X is enabled, the port information cannot be reset.

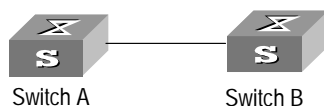
## 1.4 Ethernet Port Configuration Example

### I. Networking requirements

Switch A is connected to Switch B through Trunk port GigabitEthernet1/0/1. Configure the Trunk port with default VLAN ID, so that: when receiving the packets without VLAN Tag, the port can forward them to the member ports belonging to the default VLAN;

when it sending the packets with VLAN Tag and the packet VLAN ID is the default VLAN ID, the Trunk port remove the packet VLAN Tag and forward the packet.

## II. Networking diagram



**Figure 1-1** Configuring the default VLAN for a trunk port

## III. Configuration procedure

The following configurations are used for Switch A. Please configure Switch B in the similar way.

# Enter the Ethernet port view of GigabitEthernet1/0/1.

```
[Quidway] interface gigabitethernet1/0/1
```

# Set the GigabitEthernet1/0/1 as a trunk port and allows VLAN 2, 6 through 50, and 100 to pass through.

```
[Quidway-GigabitEthernet1/0/1] port link-type trunk
```

```
[Quidway-GigabitEthernet1/0/1] port trunk permit vlan 2 6 to 50 100
```

# Create the VLAN 100.

```
[Quidway] vlan 100
```

# Configure the default VLAN ID of GigabitEthernet1/0/1 as 100.

```
[Quidway-GigabitEthernet1/0/1] port trunk pvid vlan 100
```

## 1.5 Ethernet Port Troubleshooting

Fault: Default VLAN ID configuration failed.

Troubleshooting: Take the following steps.

- Execute the **display interface** or **display port** command to check if the port is a trunk port or a hybrid port. If it is neither of them, configure it as a trunk port or a hybrid port.
- Then configure the default VLAN ID.

## Chapter 2 Link Aggregation Configuration

### 2.1 Overview

#### 2.1.1 Brief Introduction to Link Aggregation

Link aggregation means aggregating several ports together to implement the outgoing/incoming payload balance among the member ports and enhance the connection reliability. Link aggregation includes manual aggregation, dynamic LACP aggregation and static LACP aggregation. In terms of load sharing, link aggregation may be load sharing aggregation and non-load sharing aggregation.

For the member ports in an aggregation group, their basic configurations must be the same. That is, if one is a trunk port, others must also be; when it turns into access port, then others must change to access port.

Basic configuration includes STP setting, QoS setting, VLAN setting, and port setting.

- The STP setting includes STP enabling/disabling, link attribute (point-to-point or not), STP priority, path cost, max transmission speed, loop protection, root protection, edge port or not.
- The QoS setting includes traffic limiting, priority marking, default 802.1p priority, bandwidth assurance, congestion avoidance, traffic redirection, traffic statistics.
- The VLAN setting includes permitted VLAN types, default VLAN ID.
- The port setting includes port speed, duplex mode and link type.

One S5600 switch can support up to 32 aggregation groups. Each group can have eight Gigabit Ethernet ports or four 10Gigabit ports at most.

#### 2.1.2 Brief Introduction to LACP

IEEE802.3ad-based link aggregation control protocol (LACP) implements dynamic link aggregation and disaggregation and exchanges information with the peer through LACP data unit (LACPDU). When LACP is enabled on it, the port notifies, through sending LACPDU, the peer of its system priority, system MAC, port priority, port number and operation key. On receiving these types of information, the peer compares the received information with that store at other ports to determine which ports can be aggregated, so that the two parties can agree on adding/deleting which port into/from a certain dynamic aggregation group.

Operation key is a configuration set generated by LACP based on port setting (speed, duplex mode, basic configuration and management key). When LACP is enabled, the management key of a dynamic aggregation port is 0 by default, but the management key of a static aggregation port consists with the aggregation group ID. For a dynamic aggregation group, all member ports must have the same operation key, while for a manual or static aggregation group, only the active member ports must have the same operation key.

### 2.1.3 Types of Link Aggregation

Link aggregation can be classified as manual aggregation, dynamic LACP aggregation and static LACP aggregation.

#### I. Manual aggregation and static LACP aggregation

Both manual aggregation and static LACP aggregation require manual configuration of aggregation groups and prohibit automatic adding or deleting of member ports by the system. You must delete the aggregation group, instead of the port, if the group contains only one port. At a manual aggregation port, LACP is disabled and you are not allowed to enable it. LACP is enabled at a static aggregation port. When a static aggregation group is deleted, its member ports form one or several dynamic LACP aggregation groups and LACP remains enabled on them. You are not allowed to disable LACP protocol at a static aggregation group.

In a manual or static LACP aggregation group, its ports may be in active or inactive state and only the active ports can transceive user service packets, but not inactive ports. The active port with the minimum port number serves as the master port, while others as sub-ports.

In a manual aggregation group, the system sets the ports to active or inactive state based on these rules:

- Based on the descending order of priority levels from full duplex/high speed, to full duplex/low-speed, to half duplex/high speed and till half duplex/low speed, the system sets the port with the highest priority to active state, and others to inactive state.
- The system sets to inactive state the ports which cannot aggregate with the active port with minimum port number, due to hardware limit, for example, trans-board aggregation unavailable.
- The system sets to inactive state the ports with basic configurations different from that of the active port with minimum port number.

In a static LACP aggregation group, the system sets the ports to active or inactive state based on these rules:

- Based on the descending order of priority levels from full duplex/high speed, to full duplex/low speed, to half duplex/high speed and till half duplex/low speed, the system sets the port with the highest priority to active state, and others to inactive state.
- The system sets to inactive state the ports which connect to different peer devices from that one the active port with minimum port number connects to, or the ports in different aggregation groups though they are connected to the same peer device.
- The system sets to inactive state the ports which cannot aggregate with the active port with minimum port number, due to hardware limit, for example, trans-board aggregation unavailable.
- The system sets to inactive state the ports with basic configurations different from that of the active port with minimum port number.

Since only a defined number of ports can be supported in an aggregation group, then if the active ports in an aggregation group exceed the port quantity threshold for that group, the system shall set some ports with smaller port numbers (in ascending order) as selected ports and others as unselected ports. Both selected and unselected ports can transceive LACP protocol, but unselected ports cannot forward user service packets.

## II. Dynamic LACP aggregation

Dynamic LACP aggregation may automatic adding/deleting by the system but prohibits manual configuration of users. Dynamic LACP aggregation can be established even for a single port, as is called single port aggregation. LACP is enabled at dynamic aggregation ports. Only the ports with the same speed, duplex mode and basic configuration and connected to the same device can be aggregated dynamically.

Since only a defined number of ports can be supported in an aggregation group, then if the ports in an aggregation group exceed the port quantity threshold for that group, the system shall set some ports with smaller system IDs (system priority + system MAC address) and port IDs (port priority + port number) as selected ports and others as unselected ports. If not, all member ports are selected ports. Both selected and unselected ports can transceive LACP protocol, but unselected ports cannot forward user service packets. Among the selected ports of an aggregation group, the one with minimum port number serves as the master port for that group and others are sub-ports.

In comparing system IDs, the system first compares system priority values; if they are equal, then it compares system MAC addresses. The smaller system ID is considered prior. Comparing port IDs comes in the same way: the system first compares port priority values and then port numbers and the small port ID is considered prior. If system ID changes from non-priority to priority, then the selected or unselected state is

determined by the port priority of the system. You can decide whether the port is selected or unselected by setting system priority and port priority.

### 2.1.4 Load Sharing

In terms of load balancing, link aggregation may be load balancing aggregation and non-load balancing aggregation. In general, the system only provides limited load balancing aggregation resources, so the system need to rationally allocate these resources among manual aggregation groups, static LACP aggregation groups, dynamic LACP aggregation groups and the aggregation groups including special ports which require hardware aggregation resources. The system will always allocate hardware aggregation resources to the aggregation groups with higher priority levels. When the load sharing aggregation resources are used up for existing aggregation groups, newly-created aggregation groups will be non-load sharing ones. The priority levels (in descending order) for allocating load sharing aggregation resources are as follows:

- Aggregation groups including special ports which require hardware aggregation resources
- Manual and static LACP aggregation groups
- Aggregation groups that probably reach the maximum rate after the resources are allocated to them
- Aggregation groups with the minimum master port numbers if they reach the equal rate with other groups after the resources are allocated to them

When aggregation groups of higher priority levels appear, the aggregation groups of lower priority levels release their hardware resources. For single-port aggregation groups, if they can transceive packets normally without occupying hardware resources, they shall not occupy the resources.

A load sharing aggregation group may contain several selected ports, but a non-load sharing aggregation group can only have one selected port, while others as unselected ports. Selection criteria of selected ports vary for different types of aggregation groups.

## 2.2 Link Aggregation Configuration

Link aggregation configuration includes:

- Enabling/disabling LACP
- Creating/deleting an aggregation group
- Adding/deleting an Ethernet port into/from an aggregation group
- Setting/deleting the aggregation group descriptor
- Configuring system priority
- Configuring port priority



## 2.2.1 Enabling/Disabling LACP

You should first enable LACP at the ports before performing dynamic aggregation, so that both parties can agree on adding/deleting the ports into/from a dynamic LACP aggregation group.

Perform the following configuration in Ethernet port view.

**Table 2-1** Enabling/Disabling LACP

Operation	Command
Enable LACP at the port	<b>lacp enable</b>
Disable LACP at the port	<b>undo lacp enable</b>

By default, LACP is disabled at the port.

Note that:

- You cannot enable LACP at the stack port, mirrored port, port with static MAC address configured, port with static ARP configured, and port with 802.1x enabled.
- You are inhibited to enable LACP at the port in a manual aggregation group.
- You can add a port with LACP enabled into a manual aggregation group, but then the LACP will be disabled on it automatically. Or you can add a port with LACP disabled into a static LACP aggregation group, and then the LACP will be enabled automatically.
- Switch selects the port with the minimum port number as the master port of the aggregation group. This rule is suitable for all types of aggregation group.

## 2.2.2 Creating/Deleting an Aggregation Group

You can use the following command to create a manual aggregation group or static LACP aggregation group, but the dynamic LACP aggregation group is established by the system when LACP is enabled on the ports. You can also delete an existing aggregation group: when you delete a manual aggregation group, all its member ports are disaggregated; when you delete a static or dynamic LACP aggregation group, its member ports form one or several dynamic LACP aggregation groups.

Perform the following configuration in system view.

**Table 2-2** Creating/deleting an aggregation group

Operation	Command
Create an aggregation group	<b>link-aggregation group <i>agg-id</i> mode { manual   static }</b>

Delete an aggregation group

**undo link-aggregation group** *agg-id*

Switch selects the port with the minimum port number as the master port of the aggregation group. This rule is suitable for all types of aggregation group.

A manual or static aggregation group can have up to eight ports. You can use the **link-aggregation group** *agg-id* **mode** command to change an existent dynamic aggregation group into a manual or static one. If the port number in a group exceeds eight, this operation fails and the system prompts you about configuration failure.

During creating an aggregation group, if it already exists in the system but contains no member port, it changes to the new type; if it already exists in the system and contains member ports, then you can only change a dynamic or static LACP aggregation group to a manual one, or a dynamic LACP aggregation group to a static one. In the former case, LACP shall be disabled at the member ports automatically, while in the latter case, LACP shall remain enabled.

### 2.2.3 Adding/Deleting an Ethernet Port into/from an Aggregation Group

You can add/delete ports into/from a manual or static LACP aggregation group, but member port adding or deleting for a dynamic LACP aggregation group is implemented by the system.

Perform the following configuration in Ethernet port view.

**Table 2-3** Adding/deleting an Ethernet port into/from an aggregation group

Operation	Command
Add an Ethernet port into the aggregation group	<b>port link-aggregation group</b> <i>agg-id</i>
Delete an Ethernet port from the aggregation port	<b>undo port link-aggregation group</b>

Note that:

- You cannot enable LACP at the stack port, mirrored port, port with static MAC address configured, port with static ARP configured, and port with 802.1x enabled.
- You must delete the aggregation group, instead of the port, if the manual or static LACP aggregation group contains only one port.

### 2.2.4 Setting/Deleting the Aggregation Group Descriptor

Perform the following configuration in system view.

**Table 2-4** Setting/deleting the aggregation group descriptor

Operation	Command
Set aggregation group descriptor	<b>link-aggregation group <i>agg-id</i> description <i>aname</i></b>
Delete aggregation group descriptor	<b>undo link-aggregation group <i>agg-id</i> description</b>

By default, an aggregation group has no descriptor.

Note that if you have saved the current configuration with the **save** command, the configured manual aggregation groups, static LACP aggregation groups and corresponding descriptors exist when the system reboots. But the dynamic LACP aggregation groups do not exist, and even the descriptors configured for them will not be restored.

## 2.2.5 Configuring System Priority

The LACP refers to system IDs in determining if the member ports are selected or unselected one for a dynamic LACP aggregation group. The system ID consists of two-byte system priority and six-byte system MAC, that is, system ID = system priority + system MAC. In comparing system IDs, the system first compares system priority values; if they are equal, then it compares system MAC addresses. The smaller system ID is considered prior.

Changing system priority may affect the priority levels of member ports, and further their selected or unselected state.

Perform the following configuration in system view.

**Table 2-5** Configuring system priority

Operation	Command
Configure system priority	<b>lacp system-priority <i>system-priority-value</i></b>
Restore the default system priority	<b>undo lacp system-priority</b>

By default, system priority is 32768.

## 2.2.6 Configuring Port Priority

The LACP compares system IDs first and then port IDs (if system IDs are the same) in determining if the member ports are selected or unselected ones for a dynamic LACP aggregation group. If the ports in an aggregation group exceed the port quantity

threshold for that group, the system shall set some ports with smaller port IDs as selected ports and others as unselected ports. The port ID consists of two-byte port priority and two-byte port number, that is, port ID = port priority + port number. The system first compares port priority values and then port numbers and the small port ID is considered prior.

Perform the following configuration in Ethernet port view.

**Table 2-6** Configuring port priority

Operation	Command
Configure port priority	<b>lacp port-priority</b> <i>port-priority-value</i>
Restore the default port priority	<b>undo lacp port-priority</b>

By default, port priority is 32768.

## 2.3 Displaying and Debugging Link Aggregation

After the above configuration, execute **display** command in any view to display the running of the link aggregation configuration, and to verify the effect of the configuration.

You can also use in user view the **reset** command to clear LACP statistics of the port and **debugging** commands to debug LACP.

**Table 2-7** Displaying and debugging link aggregation

Operation	Command
Display summary information of all aggregation groups	<b>display link-aggregation summary</b>
Display detailed information of a specific aggregation group	<b>display link-aggregation verbose</b> [ <i>agg-id</i> ]
Display local system ID	<b>display lacp system-id</b>
Display detailed link aggregation information at the port	<b>display link-aggregation interface</b> { <i>interface-type interface-number</i> } [ <b>to</b> { <i>interface-type interface-num</i> } ]
Clear LACP statistics at the port	<b>reset lacp statistics</b> [ <b>interface</b> { <i>interface-type interface-number</i> } [ <b>to</b> { <i>interface-type interface-num</i> } ] ]
Disable/enable debugging LACP state machine	[ <b>undo</b> ] <b>debugging lacp state</b> [ <b>interface</b> { <i>interface-type interface-number</i> } [ <b>to</b> { <i>interface-type interface-num</i> } ] ] { { <b>actor-churn</b>   <b>mux</b>   <b>partner-churn</b>   <b>ptx</b>   <b>rx</b> }*   <b>all</b> }

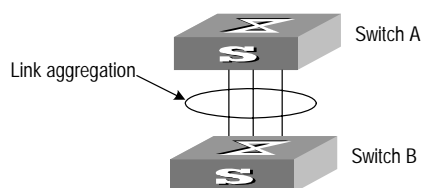
Disable/enable debugging LACP packets	[ undo ] debugging lacp packet [ interface { interface-type interface-number } [ to { interface-type interface-num } ] ]
Disable/enable debugging link aggregation errors	[ undo ] debugging link-aggregation error
Disable/enable debugging link aggregation events	[ undo ] debugging link-aggregation event

## 2.4 Link Aggregation Configuration Example

### I. Networking Requirement

Switch A connects switch B with three aggregation ports, numbered as GigabitEthernet1/0/1 to GigabitEthernet1/0/3, so that incoming/outgoing load can be balanced among the member ports.

### II. Networking diagram



**Figure 2-1** Networking for link aggregation

### III. Configuration procedure

The following only lists the configuration for switch A, and that on switch B is similar.

#### 1) Manual link aggregation

# Create manual aggregation group 1.

```
[Quidway] link-aggregation group 1 mode manual
```

# Add Ethernet ports GigabitEthernet1/0/1 to GigabitEthernet1/0/3 into aggregation group 1.

```
[Quidway] interface gigabitethernet1/0/1
```

```
[Quidway-GigabitEthernet1/0/1] port link-aggregation group 1
```

```
[Quidway-GigabitEthernet1/0/1] interface gigabitethernet1/0/2
```

```
[Quidway-GigabitEthernet1/0/2] port link-aggregation group 1
```

```
[Quidway-GigabitEthernet1/0/2] interface gigabitethernet1/0/3
```

```
[Quidway-GigabitEthernet1/0/3] port link-aggregation group 1
```

## 2) Static LACP aggregation

# Create static LACP aggregation group 1.

```
[Quidway] link-aggregation group 1 mode static
```

# Add Ethernet ports GigabitEthernet1/0/1 to GigabitEthernet1/0/3 into aggregation group 1.

```
[Quidway] interface gigabitethernet1/0/1
```

```
[Quidway-GigabitEthernet1/0/1] port link-aggregation group 1
```

```
[Quidway-GigabitEthernet1/0/1] interface gigabitethernet1/0/2
```

```
[Quidway-GigabitEthernet1/0/2] port link-aggregation group 1
```

```
[Quidway-GigabitEthernet1/0/2] interface gigabitethernet1/0/3
```

```
[Quidway-GigabitEthernet1/0/3] port link-aggregation group 1
```

## 3) Dynamic LACP aggregation

# Enable LACP at Ethernet ports GigabitEthernet1/0/1 to GigabitEthernet1/0/3.

```
[Quidway] interface gigabitethernet1/0/1
```

```
[Quidway-GigabitEthernet1/0/1] lacp enable
```

```
[Quidway-GigabitEthernet1/0/1] interface gigabitethernet1/0/2
```

```
[Quidway-GigabitEthernet1/0/2] lacp enable
```

```
[Quidway-GigabitEthernet1/0/2] interface gigabitethernet1/0/3
```

```
[Quidway-GigabitEthernet1/0/3] lacp enable
```

Only when the three ports are configured with identical basic configuration, rate and duplex mode, can they be added into a same dynamic aggregation group after LACP is enabled on them, for load sharing.