Configuring Layer 3 Interfaces

CHAPTERS

This guide applies to:

T1600G-18TS v2 or above, T1600G-28TS v3 or above, T1600G-28PS v3 or above, T1600G-52TS v3 or above, T1600G-52PS v3 or above, T1700X-16TS v3 or above, T1700G-28TQ v3 or above, T2600G-18TS v2 or above, T2600G-28TS v3 or above, T2600G-28MPS v3 or above, T2600G-28SQ v1 or above, T2600G-52TS v3 or above.

1 Overview

Interfaces are used to exchange data and interact with interfaces of other network devices. Interfaces are classified into Layer 2 interfaces and Layer 3 interfaces.

- Layer 2 interfaces are the physical ports on the switch panel. They forward packets based on MAC address table.

- Layer 3 interfaces are used to forward IPv4 and IPv6 packets using static or dynamic routing protocols. You can use Layer 3 interfaces for IP routing and inter-VLAN routing.

This chapter introduces the configurations for Layer 3 interfaces. The supported types of Layer 3 interfaces are shown as below:

Table 1-1   Supported Types of Layer 3 interfaces

Type	Description
VLAN Interface	A Layer 3 interface with which acts as the default gateway of all the hosts in the corresponding VLAN.
Loopback Interface	An interface of which the status is always up.
Routed Port	A physical port configured as a Layer 3 port.
Port-channel Interface	Several routed ports are bound together and configured as a Layer 3 interface.

2 Layer 3 Interface Configurations

To complete IPv4 interface configuration, follow these steps:

1) Create a Layer 3 interface

2) Configure IPv4 parameters of the created interface

3) View detailed information of the created interface

To complete IPv6 interface configuration, follow these steps:

1) Create a Layer 3 interface

2) Configure IPv6 parameters of the created interface

3) View detailed information of the created interface

2.1 Using the GUI

2.1.1 Creating a Layer 3 Interface

Choose the menu **L3 FEATURES> Interface** to load the following page.

Figure 2-1   Creating a Layer 3 Interface

Follow these steps to create a Layer 3 interface.

1) In the **Routing Config** section, enable IPv4 routing or IPv6 routing. Then click **Apply**.

IPv4 Routing	Enable IPv4 routing function globally for all Layer 3 interfaces. It is enabled by default.

IPv6 Routing	(Optional) Enable IPv6 routing function globally for all Layer 3 interfaces. It is disabled by default.

2) In the **Interface Config** section, click ⊕ Add to load the following page, and configure the corresponding parameters for the Layer 3 interface. Then click **Create**.

Interface ID	Select an interface type and enter the ID of the interface.
IP Address Mode	Specify the IP address assignment mode of the interface.
	None: No IP address will be assigned to the interface.
	Static: Assign an IP address to the interface manually.
	DHCP: Assign an IP address to the interface through the DHCP server.
	BOOTP: Assign an IP address to the interface through the BOOTP server.
DHCP Option 12	If you select DHCP as the IP Address Mode, configure the Option 12 here.
	DHCP Option 12 is used to specify the client's name.
IP Address	Specify the IP address of the interface if you choose "Static" as the IP address assignment mode.
Subnet Mask	Specify the subnet mask of the interface's IP address.
Admin Status	Enable or disable the interface's Layer 3 capabilities.
Interface Name	(Optional) Enter a name for the interface.

- -

Note:

The created interface is an IPv4 interface. To configure the IPv6 features, please click "Edit IPv6" after the interface is created.

- -

2.1.2 Configuring IPv4 Parameters of the Interface

In **Figure 2-1** you can view the corresponding interface you have created in the **Interface Config** section. On the corresponding interface entry, click **Edit IPv4** to load the following page and edit the IPv4 parameters of the interface.

Figure 2-2   Configuring the IPv4 Parameters

1) In the **Modify IPv4 Interface** section, configure relevant parameters for the interface according to your actual needs. Then click **Apply**.

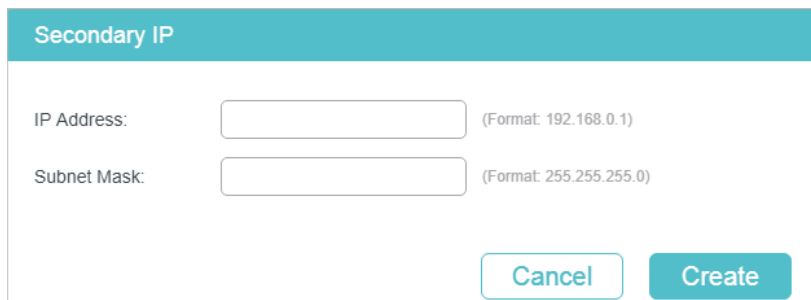|	
Interface ID	Displays the interface ID.
Admin Status	Enable the Layer 3 capabilities for the interface.
Interface Name	(Optional) Enter a name for the interface.
IP Address Mode	Specify the IP address assignment mode of the interface.
	None: No IP address will be assigned.
	Static: Assign an IP address manually.
	DHCP: Obtain an IP address through DHCP.
	BOOTP: Obtain an IP address through BOOTP.
IP Address	Specify the IP address of the interface if you choose "Static" as the IP address assignment mode.
Subnet Mask	Specify the subnet mask of the interface's IP address.

DHCP Option 12   If you select DHCP as the IP Address Mode, configure the Option 12 here.

DHCP Option 12 is used to specify the client's name.

2) In the **Secondary IP Table** section, click ⊕ Add to add a secondary IP for the specified interface which allows you to have two logical subnets. Then click **Create**.

IP Address   Specify the secondary IP address of the interface.

Subnet Mask   Specify the subnet mask of the secondary IP address.

3) (Optional) In the **Secondary IP Table** section, you can view the corresponding secondary IP entry you have created.

2.1.3 Configuring IPv6 Parameters of the Interface

In **Figure 2-1**, you can view the corresponding interface entry you have created in the **Interface Config** section. On the corresponding interface entry, click **Edit IPv6** to load the following page and configure the IPv6 parameters of the interface.

Figure 2-3   Configuring the IPv6 Parameters

1) In the **Modify IPv6 Interface** section, enable IPv6 feature for the interface and configure the corresponding parameters . Then click **Apply**.

Interface ID	Displays the interface ID.
Admin Status	Enable the Layer 3 capabilities for the interface.
IPv6 Enable	Enable the IPv6 feature of the interface.
Link-local Address Mode	Select the link-local address configuration mode. **Manual:** With this option selected, you can assign a link-local address manually. **Auto:** With this option selected, the switch generates a link-local address automatically.
Link-local Address	Enter a link-local address if you choose "Manual" as the Link-Local Address Mode.

Status	Displays the status of the link-local address. An IPv6 address cannot be used before pass the DAD (Duplicate Address Detection), which is used to detect the address conflicts. In the DAD process, the IPv6 address may in three different status:
	Normal: Indicates that the link-local address passes the DAD and can be used normally.
	Try: Indicates that the link-local address is in the progress of DAD and cannot be used right now.
	Repeat: Indicates that the link-local address is duplicated, this address is already used by another node and cannot be used by the interface.

2) Configure IPv6 global address of the interface via following three ways:

Via RA Message:

Enable global address auto configuration via RA message	With this option enabled, the interface automatically generates a global address and other information according to the address prefix and other configuration parameters from the received RA (Router Advertisement) message.

Via DHCPv6 Server:

Enable global address auto configuration via DHCPv6 Server	With this option enabled, the switch will try to obtain the global address from the DHCPv6 Server.

Manually:

In the **Global Address Config** section, click ➕ Add to manually assign an IPv6 global address to the interface.

Global Address

Address Format: ◉ EUI-64   ○ Not EUI-64

Global Address: [   ] (Format:3001::1)

Prefix Length: [   ] (1-64)

[Cancel] [Create]

Address Format	Select the global address format according to your needs.
	EUI-64: Indicates that you only need to specify an address prefix, then the system will create a global address automatically.
	Not EUI-64: Indicates that you have to specify an intact global address.
Global Address	When EUI-64 is selected, please input the address prefix here, otherwise, please input an intact IPv6 address here.

Prefix Length	Configure the prefix length of the global address.

3) View the global address entry in the Global Address Config.

Global Address	View or modify the global address.
Prefix Length	View or modify the prefix length of the global address.
Type	Displays the configuration mode of the global address. **Manual:** Indicates that the corresponding address is configured manually. **Auto:** Indicates that the corresponding address is created automatically using the RA message or obtained from the DHCPv6 Server.
Preferred Lifetime	Displays the preferred lifetime of the global address. Preferred lifetime is the length of time that a valid IPv6 address is preferred. When the preferred time expires, the address becomes deprecated but still can be used, and you need to switch to another address.
Valid Lifetime	Displays the valid lifetime of the global address. Valid lifetime is the length of time that an IPv6 address is in the valid state. When the valid lifetime expires, the address become invalid and can be no longer usable.
Status	Displays the status of the link-local address. An IPv6 address cannot be used before pass the DAD (Duplicate Address Detection), which is used to detect the address conflicts. In the DAD process, the IPv6 address may in three different status: **Normal:** Indicates that the global address passes the DAD and can be normally used. **Try:** Indicates that the global address is in the progress of DAD and cannot be used right now. **Repeat:** Indicates that the global address is duplicated, this address is already used by another node. This address cannot be used by the interface.

2.1.4 Viewing Detail Information of the Interface

In **Figure 2-1** you can view the corresponding interface entry you have created in the **Interface Config** section. On the corresponding interface entry, click **Detail** to load the following page and view the detail information of the interface.

Figure 2-4   Viewing the detail information of the interface

2.2   Using the CLI

2.2.1 Creating a Layer 3 Interface

Follow these steps to create a Layer 3 interface. You can create a VLAN interface, a loopback interface, a routed port or a port-channel interface according to your needs.

Step 1	**configure**	
	Enter global configuration mode.	

Step 2	Create a VLAN interface:
	interface vlan *vlan-id*
	*vlan-id***:** Specify an IEEE 802.1Q VLAN ID that already exists, ranging from 1 to 4094.
	Create a loopback interface:
	interface loopback { *id* **}**
	id: Specify the ID of the loopback interface, ranging from 1 to 64.
	Create a routed port:
	interface { fastEthernet *port* **| range fastEthernet** *port-list* **| gigabitEthernet** *port* **| range gigabitEthernet** *port-list* **| ten-gigabitEthernet** *port* **| range ten-gigabitEthernet** *port-list* **}**
	Enter interface configuration mode.
	port: Specify the Ethernet port number, for example 1/0/1.
	port-list: Specify the list of Ethernet ports, for example 1/0/1-3, 1/0/5.
	no switchport
	Switch the Layer 2 port into the Layer 3 routed port.
	Create a port-channel interface:
	interface { port-cahnnel *port-channel* **| range port-channel** *port-channel-list* **}**
	Enter interface configuration mode.
	port-channel: Specify the port channel, the valid value ranges from 1 to 14.
	port-channel-list: Specify the list of the port-channel interface, for example 1-3, 5.
	no switchport
	Switch the port channel to a Layer 3 port channel interface.
Step 3	**description** *string*
	Specify a description for the Layer 3 interface.
	string: The description of the Layer 3 interface, ranging from 1 to 32 characters.
Step 4	**end**
	Return to privileged EXEC mode.
Step 5	**copy running-config startup-config**
	Save the settings in the configuration file.

The following example shows how to create a VLAN interface with a description of VLAN-2.

Switch#configure

Switch(config)#interface vlan 2

Switch(config-if)#description VLAN-2

Switch(config-if)#end

Switch#copy running-config startup-config

2.2.2 Configuring IPv4 Parameters of the Interface

Follow these steps to configure the IPv4 parameters of the interface.

Step 1	**configure** Enter global configuration mode.	

Step 2	**interface** { *interface-type* } { *interface-id*} Enter Layer 3 interface configuration mode. *interface-type*: Type of the Layer 3 interface, including fastEthernet, gigabitEthernet, ten-gigabitEthernet, loopback and VLAN. *interface-id:* The interface ID.

Step 3	Automatically assign an IP Address for the interface via DHCP or BOOTP: **ip address-alloc {** dhcp **|** bootp **}** Specify the IP Address assignment mode of the interface. dhcp: Specify the Layer 3 interface to obtain an IPv4 address from the DHCP Server. bootp: Specify the Layer 3 interface to obtain an IPv4 address from the BOOTP Server. Manually assign an IP Address for the interface: **ip address {** *ip-addr* **} {** *mask* **} [secondary]** Configure the IP address and subnet mask for the specified interface manually. *ip-addr*: Specify thse IP address of the Layer 3 interface. *mask*: Specify the subnet mask of the Layer 3 interface. **secondary:** Specify the interface's secondary IP address which allows you to have two logical subnets. If this parameter is omitted here, the configured IP address is the interface's primary address.

Step 4	**show ip interface brief** Verify the summary information of the Layer 3 interfaces.

Step 5	**end** Return to privileged EXEC mode.

Step 6	**copy running-config startup-config** Save the settings in the configuration file.

The following example shows how to configure the IPv4 parameters of a routed port, including setting a static IP address for the port and enabling the Layer 3 capabilities:

Switch#configure

Switch(config)#interface gigabitEthernet 1/0/1

Switch(config-if)#no switchport

Switch(config-if)#ip address 192.168.0.100 255.255.255.0

Switch(config-if)#show ip interface brief

Interface	IP-Address	Method	Status	Protocol	Shutdown
Gi1/0/1	192.168.0.100/24	Static	Up	Up	no

Switch(config-if)#end

Switch#copy running-config startup-config

2.2.3 Configuring IPv6 Parameters of the Interface

Follow these steps to configure the IPv6 parameters of the interface.

Step 1	**configure** Enter global configuration mode.	
Step 2	**interface** { *interface-type* } { *interface-id* } Enter Layer 3 interface configuration mode. *interface-type*: Type of the Layer 3 interface, including fastEthernet, gigabitEthernet, ten-gigabitEthernet, loopback and VLAN. *interface-id:* The interface ID.	
Step 3	**ipv6 enable** Enable the IPv6 feature on the specified Layer 3 interface. By default, it is enabled on VLAN interface 1. IPv6 function can only be enabled on one Layer 3 interface at a time.	
Step 4	Configure the IPv6 link-local address for the specified interface: Manually configure the ipv6 link-local address for the specified interface: **ipv6 address** *ipv6-addr* **link-local** *ipv6-addr*: Specify the link-local address of the interface. It should be a standardized IPv6 address with the prefix fe80::/10, otherwise this command will be invalid. Automatically configure the ipv6 link-local address for the specified interface: **ipv6 address autoconfig**	

Step 5	Configure the IPv6 global address for the specified interface:
	Automatically configure the interface's global IPv6 address via RA message: **ipv6 address ra** Configure the interface's global IPv6 address according to the address prefix and other configuration parameters from its received RA (Router Advertisement) message. Automatically configure the interface's global IPv6 address via DHCPv6 server: **ipv6 address dhcp** Enable the DHCPv6 Client function. When this function is enabled, the Layer 3 interface will try to obtain the IPv6 address from DHCPv6 server. Manually configure the interface's global IPv6 address: **ipv6 address** *ipv6-addr* *ipv6-addr:* The Global IPv6 address with network prefix, for example 3ffe::1/64. **ipv6 address** *ipv6-addr* **eui-64** Specify a global IPv6 address with an extended unique identifier (EUI) in the low-order 64 bits of the IPv6 address. Specify only the network prefix; the last 64 bits are automatically computed from the switch MAC address. This enables IPv6 processing on the interface.
Step 6	**show ipv6 interface** Verify the configured ipv6 information of the interface.
Step 7	**end** Return to privileged EXEC mode.
Step 8	**copy running-config startup-config** Save the settings in the configuration file.

The following example shows how to enable the IPv6 function and configure the IPv6 parameters of a VLAN interface:

Switch#configure

Switch(config)#interface vlan 2

Switch(config-if)#ipv6 enable

Switch(config-if)#ipv6 address autoconfig

Switch(config-if)#ipv6 address dhcp

Switch(config-if)#show ipv6 interface

Vlan2 is up, line protocol is up

IPv6 is enable, Link-Local Address: fe80::20a:ebff:fe13:237b[NOR]

Global Address RA: Disable

Global Address DHCPv6: Enable

Global unicast address(es):   ff02::1:ff13:237b

Joined group address(es):   ff02::1

ICMP error messages limited to one every 1000 milliseconds

ICMP redirects are enable

MTU is 1500 bytes

ND DAD is enable, number of DAD attempts: 1

ND retrans timer is 1000 milliseconds

ND reachable time is 30000 milliseconds
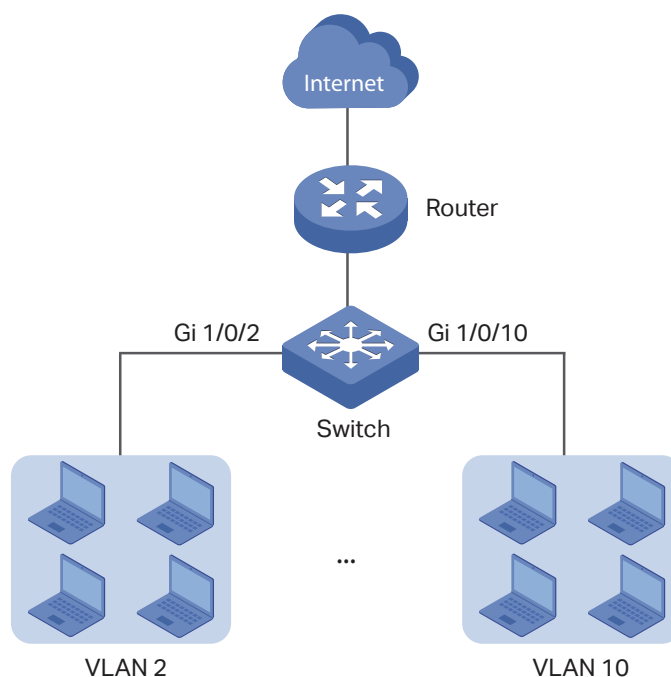
Switch(config-if)#end

Switch#copy running-config startup-config

3 Configuration Example

3.1 Network Requirement

The administrator need to allow the hosts in VLANs can access the internet. The topology is shown as below.

Figure 3-1   Network Topology

3.2 Configuration Scheme

For the hosts in VLANs are seperated at layer 2. To make it possible for these host to access the internet, we need to configure a VLAN interface on the switch for each VLAN. The VLAN interface can be considered as the default gateway for the hosts in the VLAN. All the requests to internet are sent to the VLAN interface first, then the VLAN interface will forward the packets to the internet according to the routing table.

Demonstrated with T2600G-28TS, this chapter provides configuration procedures in two ways: using the GUI and using the CLI.

3.3 Using the GUI

For the configurations for all the VLANs are similiar, here we only take the configuration of VLAN interface for VLAN 2 as an example**.**

1) Go to **L2 FEATURES > VLAN > 802.1Q VLAN** to create VLAN 2. Add port 1/0/2 to VLAN 2 with its egress rule as Untagged.

Table 3-1   Create VLAN 2

2) Go to **L3 FEATURES > Interface** to enable IPv4 routing (enabled by default), then click Add to create VLAN interface 2. Here we choose the IP address mode as **Static** and manually assign an IP address 192.168.2.1 to the interface.

Table 3-2   Create VLAN Interface 2

3) Click Save to save the settings.

3.3.1 Using the CLI

1) Create VLAN 2 and add port 1/0/2 to VLAN 2 with its egress rule as Untagged.

Switch#configure

Switch(config)#vlan 2

Switch(config-vlan)#exit

Switch(config)#interface gigabitEthernet 1/0/2

Switch(config-if)#switchport general allowed vlan 2 untagged

Switch(config-if)#exit

2) Create VLAN interface 2 for VLAN 2. Configure the IP address of VLAN interface 2 as 192.168.2.1.

Switch(config)#interface vlan 2

Switch(config-if)#ip address 192.168.2.1 255.255.255.0

Switch(config-if)#end

Switch#copy running-config startup-config

Verify the VLAN Interface Configurations

Verify the configurations of VLAN interface 2.

Switch#show interface vlan 2

VLAN2 is down, line protocol is down

 Hardware is CPU Interface, address is 00:0a:eb:13:a2:98

 ip is 192.168.2.1/24

4 Appendix: Default Parameters

Default settings of interface are listed in the following tables.

Table 4-1   Default Settings of Routing Config

Parameter	Default Setting
IPv4 Routing	Enable
IPv6 Routing	Disable

Table 4-2   Configuring the IPv4 Parameters of the Interface

Parameter	Default Setting
Interface ID	VLAN
IP Address Mode	None
Admin Status	Enable

Table 4-3   Configuring the IPv6 Parameters of the Interface

Parameter	Default Setting
Admin Status	Enable
IPv6 Enable	Enable
Link-local Address Mode	Auto
Enable global address auto configuration via RA message	Enable
Enable global address auto configuration via DHCPv6 Server	Disable