# Inter-VLAN Communication



## Foreword

- By default, a Layer 2 switching network is a broadcast domain, which brings many problems. Virtual local area network (VLAN) technology isolates such broadcast domains, preventing users in different VLANs from communicating with each other. However, such users sometimes need to communicate.
- This course describes how to implement inter-VLAN communication.

## Objectives

- On completion of this course, you will be able to understand:
  - Methods of implementing inter-VLAN communication.
  - How to use routers (physical interfaces or sub-interfaces) to implement inter-VLAN communication.
  - How to use Layer 3 switches to implement inter-VLAN communication.
  - How Layer 3 packets are forwarded.

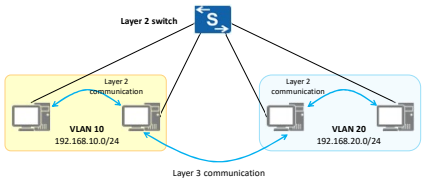
## Contents



## Inter-VLAN Communication (1)

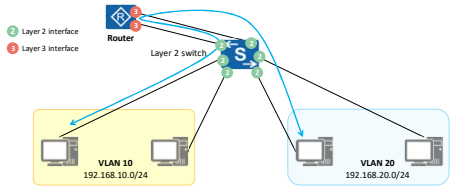
- In real-world network deployments, different IP address segments are assigned to different VLANs.
- PCs on the same network segment in the same VLAN can directly communicate with each other without the need for Layer 3 forwarding devices. This communication mode is called Layer 2 communication.
- Inter-VLAN communication belongs to Layer 3 communication, which requires Layer 3 devices.



## Inter-VLAN Communication (2)

- Common Layer 3 devices: routers, Layer 3 switches, firewalls, etc.
- Inter-VLAN communication is implemented by connecting a Layer 2 switch to a Layer 3 interface of a Layer 3 device. The communication packets are routed by the Layer 3 device.



## Contents

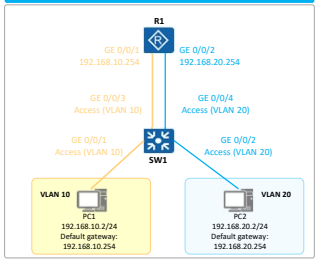


  HUAWEI



## Using a Router's Physical Interfaces

**Physical Connection**



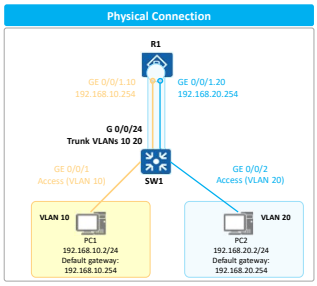

- The Layer 3 interfaces of the router function as gateways to forward traffic from the local network segment to other network segments.
- The Layer 3 interfaces of the router cannot process data frames with VLAN tags. Therefore, the interfaces of the switch connected to the router must be set to the access type.
- One physical interface of the router can function as the gateway of only one VLAN, meaning that the number of required physical interfaces are determined by the quantity of the deployed VLANs.
- A router, mainly forwarding packets at Layer 3, provides only a small number of physical interfaces. Therefore, the scalability of this solution is poor.

  HUAWEI



## Using a Router's Sub-interfaces

**Physical Connection**



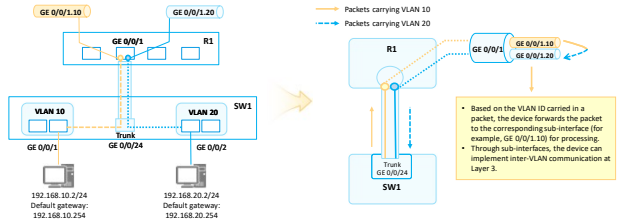

- A sub-interface is a logical interface created on a router's Ethernet interface and is identified by a physical interface number and a sub-interface number. Similar to a physical interface, a sub-interface can perform Layer 3 forwarding.
- Different from a physical interface, a sub-interface can terminate data frames with VLAN tags.
- You can create multiple sub-interfaces on one physical interface. After connecting the physical interface to the trunk interface of the switch, the physical interface can provide Layer 3 forwarding services for multiple VLANs.

  HUAWEI



## Sub-Interface Processing

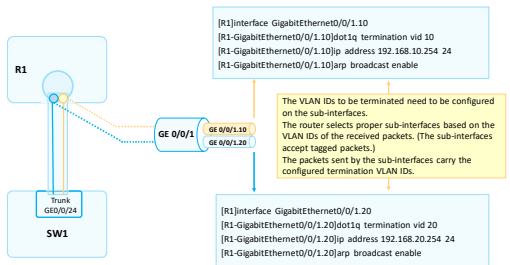
- The interface connecting the switch to the router is set to a trunk interface. The router forwards the received packets to the corresponding sub-interfaces according to the VLAN tags in the packets.




  HUAWEI



## Example for Configuring Sub-interfaces



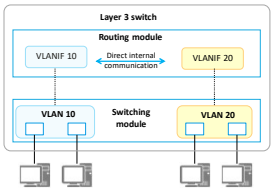

  HUAWEI

## Contents



  HUAWEI

## Layer 3 Switch and VLANIF Interfaces

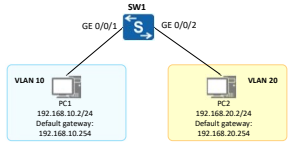



- A Layer 2 switch provides only Layer 2 switching functions.
- A Layer 3 switch provides routing functions through Layer 3 interfaces (such as VLANIF interfaces) as well as the functions of a Layer 2 switch.
- A VLANIF interface is a Layer 3 logical interface that can remove and add VLAN tags. VLANIF interfaces therefore can be used to implement inter-VLAN communication.
- A VLANIF interface number is the same as the ID of its corresponding VLAN. For example, VLANIF 10 is created based on VLAN 10.

  HUAWEI

## Example for Configuring VLANIF Interfaces

- VLANIF 10 192.168.10.254/24
- VLANIF 20 192.168.20.254/24




- Configuration Requirements
  Configure VLANs 10 and 20 for the interfaces connecting to PC1 and PC2, respectively. Configure the Layer 3 switch to allow the two PCs to communicate with each other.

Basic configurations:

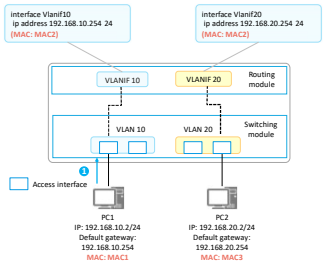
```
[SW1]vlan batch 10 20
[SW1] interface GigabitEthernet 0/0/1
[SW1-GigabitEthernet0/0/1] port link-type access
[SW1-GigabitEthernet0/0/1] port default vlan 10
[SW1] interface GigabitEthernet 0/0/2
[SW1-GigabitEthernet0/0/2] port link-type access
[SW1-GigabitEthernet0/0/2] port default vlan 20
```

Configure VLANIF interfaces:

```
[SW1]interface Vlanif 10
[SW1-Vlanif10]ip address 192.168.10.254 24
[SW1]interface Vlanif 20
[SW1-Vlanif20]ip address 192.168.20.254 24
```

  HUAWEI

## VLANIF Forwarding Process (1)



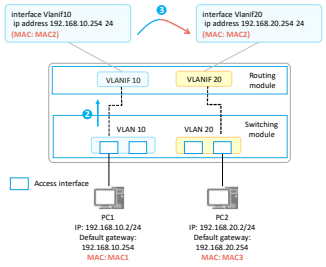

This example assumes that the required ARP or MAC address entries already exist on the PCs and the Layer 3 switch.

The communication process between PC1 and PC2 is as follows:

1. PC1 performs calculation based on its local IP address, local subnet mask, and destination IP address, and finds that the destination device PC2 is not on its network segment. PC1 then determines that Layer 3 communication is required and sends the traffic destined for PC2 to its gateway. Data frame sent by PC1: source MAC = MAC1, destination MAC = MAC2

  HUAWEI

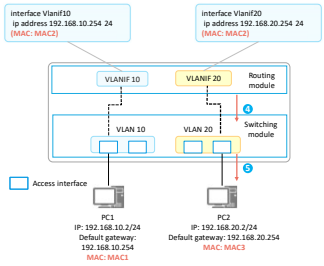
## VLANIF Forwarding Process (2)




2. After receiving the packet sent from PC1 to PC2, the switch decapsulates the packet and finds that the destination MAC address is the MAC address of VLANIF 10. The switch then sends the packet to the routing module for further processing.
3. The routing module finds that the destination IP address is 192.168.20.2, which is not the IP address of its local interface, and determines that this packet needs to be forwarded at Layer 3. By searching the routing table, the routing module finds a matching route – the direct route generated by VLANIF 20 – for this packet.

  HUAWEI

## VLANIF Forwarding Process (3)




4. Because the matching route is a direct route, the switch determines that the packet has reached the last hop. It searches its ARP table for 192.168.20.2, obtains the corresponding MAC address, and sends the packet to the switching module for re-encapsulation.
5. The switching module searches its MAC address table to determine the outbound interface of the frame and whether the frame needs to carry a VLAN tag. Data frame sent by the switching module: source MAC = MAC2, destination MAC = MAC3, VLAN tag = None

  HUAWEI