2.4 Lab 4: Inter-VLAN Communication

2.4.1 Introduction

2.4.1.1 About This Lab

VLANs are separated at Layer 2 to minimize broadcast domains. To enable the communication between VLANs,Huawei provides a variety of technologies. The following two technologies are commonly used:

● Dot1q termination subinterface: Such subinterfaces are Layer 3 logical interfaces. Similar to a VLANIF interface, after a dot1q termination subinterface and its IP address are configured, the device adds the corresponding MAC address entry and sets the Layer 3 forwarding flag to implement Layer 3 communication between VLANs. A Dot1q termination subinterface applies to scenarios where a Layer 3 Ethernet port connects to multiple VLANs.

● VLANIF interface: VLANIF interfaces are Layer 3 logical interfaces. After a VLANIF interface and its IP address are configured, the device adds the MAC address and VID of the VLANIF interface to the MAC address table and sets the Layer 3 forwarding flag of the MAC address entry. When the destination MAC address of a packet matches the entry, the packet is forwarded at Layer 3 to implement Layer 3 communication between VLANs.

In this lab activity, you will use two methods to implement inter-VLAN communication.

2.4.1.2 Objectives

Upon completion of this task, you will be able to:

● Learn how to use Dot1q termination subinterfaces to implement inter-VLAN communication

● Learn how to use VLANIF interfaces to implement inter-VLAN communication

● Understand the forwarding process of inter-VLAN communication

2.4.1.3 Networking Topology

R2 and R3 belong to different VLANs and they need to communicate with each other through VLANIF interfaces and Dot1q termination subinterfaces.

Figure 2-1   Lab topology for inter-VLAN communication
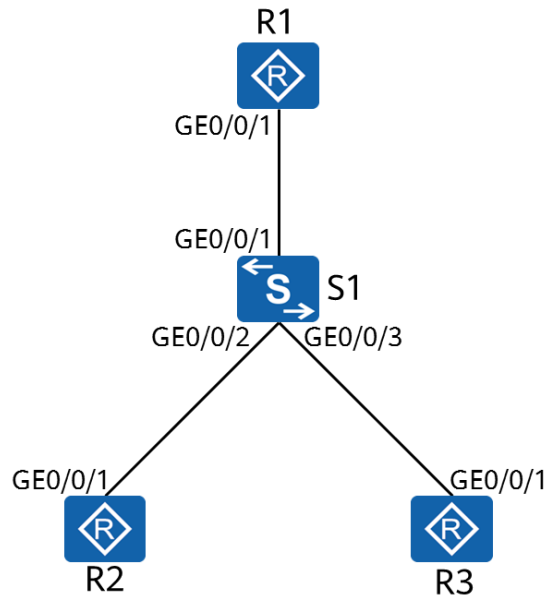
1. Simulate terminal users on R2 and R3 and assign IP addresses 192.168.2.1/24 and 192.168.3.1/24 to the interfaces.
2. The gateway addresses of R2 and R3 are 192.168.2.254 and 192.168.3.254 respectively.
3. On S1, assign GigabitEthernet0/0/2 and GigabitEthernet0/0/3 to VLAN 2 and VLAN 3, respectively.

1.1.2   Lab Configuration

1.1.2.1   Configuration Roadmap

1. Configure Dot1q termination subinterfaces to implement inter-VLAN communication.
2. Configure VLANIF interfaces to implement inter-VLAN communication.

1.1.2.2   Configuration Procedure

Step 1 Complete basic device configuration.

Name R1, R2, R3, and S1.

The details are not provided here.

Configure IP addresses and gateways for R2 and R3.

```
<R2> system-view
Enter system view, return user view with Ctrl+Z.
[R2]interface GigabitEthernet 0/0/1
[R2-GigabitEthernet0/0/1]ip address 192.168.2.1 24
[R2-GigabitEthernet0/0/1]quit
[R2]ip route-static 0.0.0.0 0 192.168.2.254
Configure a default route (equivalent to a gateway) for the device.



<R3>system-view
Enter system view, return user view with Ctrl+Z.
```

```
[R3]interface GigabitEthernet 0/0/1
[R3-GigabitEthernet0/0/1]ip address 192.168.3.1 24
[R3-GigabitEthernet0/0/1]quit
[R3]ip route-static 0.0.0.0 0 192.168.3.254
```

On S1, assign R2 and R3 to different VLANs.

```
[S1]vlan batch 2 3
Info: This operation may take a few seconds. Please wait for a moment...done.
[S1]interface GigabitEthernet 0/0/2
[S1-GigabitEthernet0/0/2]port link-type access
[S1-GigabitEthernet0/0/2]port default vlan 2
[S1-GigabitEthernet0/0/2]quit
[S1]interface GigabitEthernet 0/0/3
[S1-GigabitEthernet0/0/3]port link-type access
[S1-GigabitEthernet0/0/3]port default vlan 3
```

Step 2 Configure Dot1q termination subinterfaces to implement INter-VLAN communication.

Configure a trunk port on S1.

```
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]port trunk allow-pass vlan 2 3
The link between S1 and R1 must allow packets from VLAN 2 and VLAN 3 to pass through because R1 needs to terminate
the VLAN tags of packets exchanged between VLANs.
```

Configure a dot1q termination subinterface on R1.

```
[R1]interface GigabitEthernet 0/0/1.2
```

A subinterface is created and the subinterface view is displayed. In this example, **2** indicates the subinterface number. It is recommended that the subinterface number be the same as the VLAN ID.

```
[R1-GigabitEthernet0/0/1.2]dot1q termination vid 2
```

The **dot1q termination vid** *vlan-id* command configures the VLAN ID for Dot1q termination on a subinterface.

In this example, when GigabitEthernet0/0/1 receives data tagged with VLAN 2, it sends the data to subinterface 2 for VLAN termination and subsequent processing. The data sent from subinterface 2 is also tagged with VLAN 2.

```
[R1-GigabitEthernet0/0/1.2]arp broadcast enable
```

Subinterfaces for VLAN tag termination cannot forward broadcast packets and automatically discard them upon receiving. To allow such subinterfaces to forward broadcast packets, the ARP broadcast function must be enabled using the **arp broadcast enable** command. By default, this function is enabled on some devices.

```
[R1-GigabitEthernet0/0/1.2]ip address 192.168.2.254 24
[R1-GigabitEthernet0/0/1.2]quit
[R1]interface GigabitEthernet 0/0/1.3
[R1-GigabitEthernet0/0/1.3]dot1q termination vid 3
[R1-GigabitEthernet0/0/1.3]arp broadcast enable
[R1-GigabitEthernet0/0/1.3]ip address 192.168.3.254 24
[R1-GigabitEthernet0/0/1.3]quit
```

Test the connectivity between VLANs.

```
<R2>ping 192.168.3.1
 PING 192.168.3.1: 56  data bytes, press CTRL_C to break
   Reply from 192.168.3.1: bytes=56 Sequence=1 ttl=254 time=60 ms
   Reply from 192.168.3.1: bytes=56 Sequence=2 ttl=254 time=40 ms
   Reply from 192.168.3.1: bytes=56 Sequence=3 ttl=254 time=110 ms
   Reply from 192.168.3.1: bytes=56 Sequence=4 ttl=254 time=70 ms
   Reply from 192.168.3.1: bytes=56 Sequence=5 ttl=254 time=100 ms

 --- 192.168.3.1 ping statistics ---
```

```
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 40/76/110 ms

<R2>tracert 192.168.3.1
 traceroute to  192.168.3.1(192.168.3.1), max hops: 30 ,packet length: 40,press CTRL_C to break

 1 192.168.2.254 30 ms  50 ms  50 ms

 2 192.168.3.1 70 ms  60 ms  60 ms
VLAN 2 and VLAN 3 can communicate with each other.
```

Step 3 Configure VLANIF interfaces to enable inter-VLAN communication.

Delete the configuration in the previous step.

```
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]undo port trunk allow-pass vlan 2 3
[S1-GigabitEthernet0/0/1]undo port link-type
[R1]undo interface GigabitEthernet 0/0/1.2
[R1]undo interface GigabitEthernet 0/0/1.3
```

Create a VLANIF interface on S1.

```
[S1]interface Vlanif 2
```

The **interface vlanif** *vlan-id* command creates a VLANIF interface and displays the VLANIF interface view. You must create a VLAN before configuring a VLANIF interface.

```
[S1-Vlanif2]ip address 192.168.2.254 24
[S1-Vlanif2]quit
[S1]interface Vlanif 3
[S1-Vlanif3]ip address 192.168.3.254 24
[S1-Vlanif3]quit
```

Test the connectivity between VLANs.

```
<R2>ping 192.168.3.1
 PING 192.168.3.1: 56  data bytes, press CTRL_C to break
   Reply from 192.168.3.1: bytes=56 Sequence=1 ttl=254 time=100 ms
   Reply from 192.168.3.1: bytes=56 Sequence=2 ttl=254 time=50 ms
   Reply from 192.168.3.1: bytes=56 Sequence=3 ttl=254 time=50 ms
   Reply from 192.168.3.1: bytes=56 Sequence=4 ttl=254 time=60 ms
   Reply from 192.168.3.1: bytes=56 Sequence=5 ttl=254 time=70 ms
 --- 192.168.3.1 ping statistics ---
   5 packet(s) transmitted
   5 packet(s) received
   0.00% packet loss
   round-trip min/avg/max = 50/66/100 ms

<R2>tracert 192.168.3.1

 traceroute to  192.168.3.1(192.168.3.1), max hops: 30 ,packet length: 40,press CTRL_C to break

 1 192.168.2.254 40 ms  30 ms  20 ms

 2 192.168.3.1 40 ms  30 ms  40 ms
VLAN 2 and VLAN 3 can communicate with each other.
```

----End

1.1.3   Verification

The details are not provided here.

1.1.4 Configuration Reference

Configuration on S1

```
#
sysname S1
#
vlan batch 2 to 3
#
interface Vlanif2
 ip address 192.168.2.254 255.255.255.0
#
interface Vlanif3
 ip address 192.168.3.254 255.255.255.0
#
interface GigabitEthernet0/0/2
 port link-type access
 port default vlan 2
#
interface GigabitEthernet0/0/3
 port link-type access
 port default vlan 3
#
return
```

Configuration on R2

```
#
 sysname R2
#
interface GigabitEthernet0/0/1
 ip address 192.168.2.1 255.255.255.0
#
ip route-static 0.0.0.0 0.0.0.0 192.168.2.254
#
return
```

Configuration on R3

```
#
 sysname R3
#
interface GigabitEthernet0/0/1
 ip address 192.168.3.1 255.255.255.0
#
ip route-static 0.0.0.0 0.0.0.0 192.168.3.254
#
return
```

1.1.5 Quiz

1. If R2 needs to access the network connected to R1, what configuration needs to be performed on S1?

2. As a Layer 3 interface, when will a VLANIF interface go Up?