CS 305 Lab Tutorial
Lab 14 Device & Interconnection

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Thanks to Wei WANG

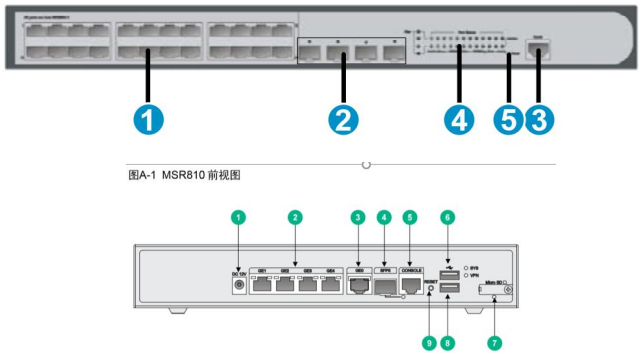
Topic

- Device
  - Layer3 Switch
  - Router

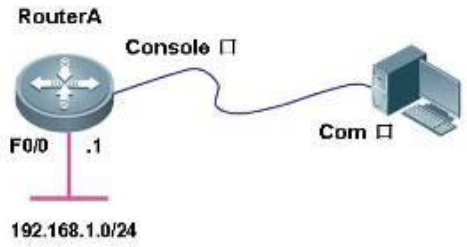
- Interconnection
  - real network
  - virtual network and real network(optional while maybe useful)
    - cloud in eNSP
    - interconnection
      - virtual network in eNSP and the real network

Device and physical connection

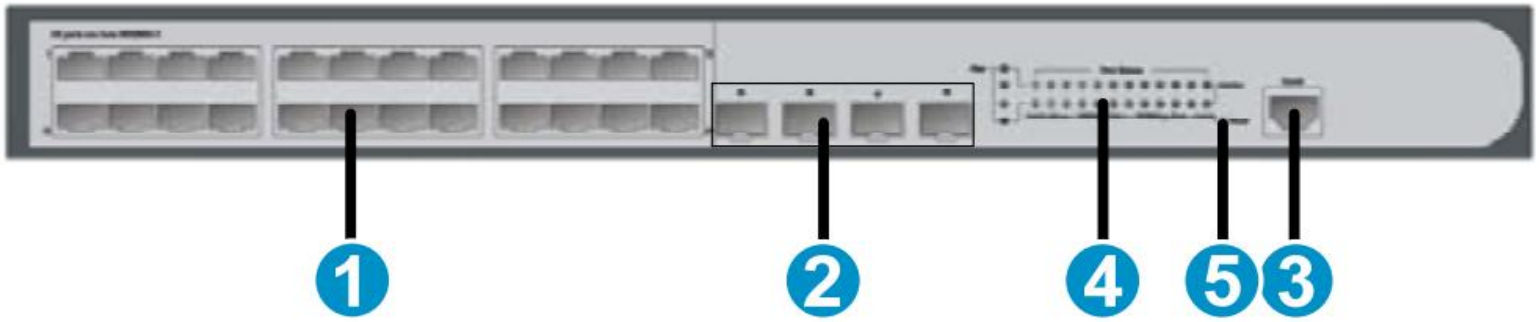
- Device
  - ➢ network device
    - Layer3 Switch
      - ✓ S5110/ S5130
    - Router
      - ✓ H3C MSR810/830/360-4
  - ➢ terminal device
    - PCs



- Physical connection
  - ➢ console line: for configuration
  - ➢ twisted pair cable : for network connection



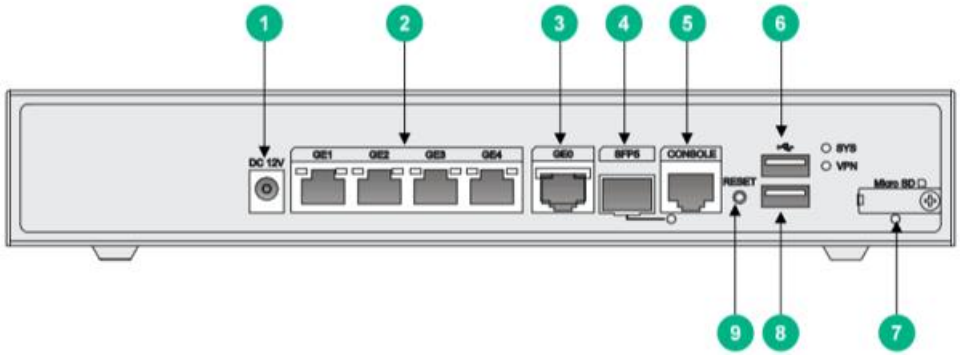
S5110 (Layer3 Switch)



1. 10/100/1000M Base-T electric interface
2. 100/1000 Base-X SFP optical interface
3. **Console interface**
4. Port status indicator
5. Power status indicator

Router(MSR810)

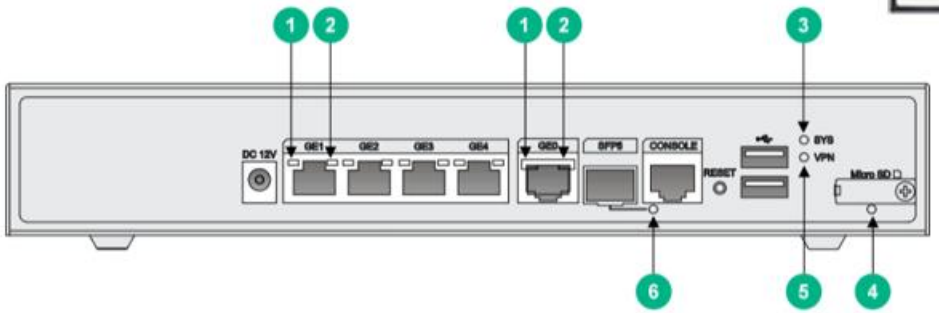
图A-1 MSR810 前视图



1.AC adapter socket	2.Gigabit Ethernet LAN interface GE1~GE4	3.Gigabit Ethernet wAN interface GE0
4.Gigabit Optical fiber interface	5. Configuration port CONSOLE	6. USB interface
7. Micro SD card slot	8. USB interface	9. RESET button

Router(MSR810)

图B-1 MSR810 前面板指示灯



1. GE port yellow Indicator light	2. GE port green Indicator light
3. SYS Indicator light	4. Micro SD card Indicator light
5. VPN Indicator light	6. SFP Optical fiber interface Indicator light

Indicator light	status	indicate
SYS Indicator light	green always on	SDRAM checking (bootrom phase)
	yellow Twinkle @1HZ	SDRAM checking faild(bootrom phase)
	off	No power input, or working failure status
GE green/yellow	green always on	Links are connected and work in Gigabit mode
	green twinkle	data sending and receiving ,work in Gigabit mode
	yellow always on	Links are connected and work in 10/100 Migabit mode
	yellow twinkle	data sending and receiving ,work in 10/100 Migabit mode
	off	Links are disconnected

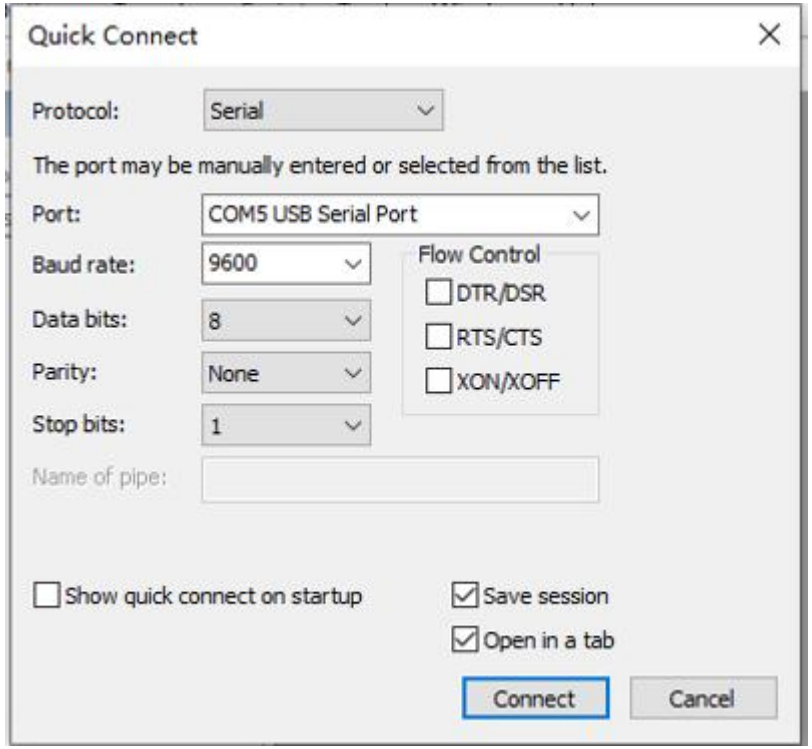
Connect with switch/router by console (1)

Turn on the network device(switch/router) and terminal device(PC)

1. Physical connection: connect the "**console**" port of network device(switch/router) with "**COM* USB Serial Port**" of PC.

Connect with switch/router by console (2)

2. Invoke the SecureCRT Portable on PC to communicate with CLI of switch

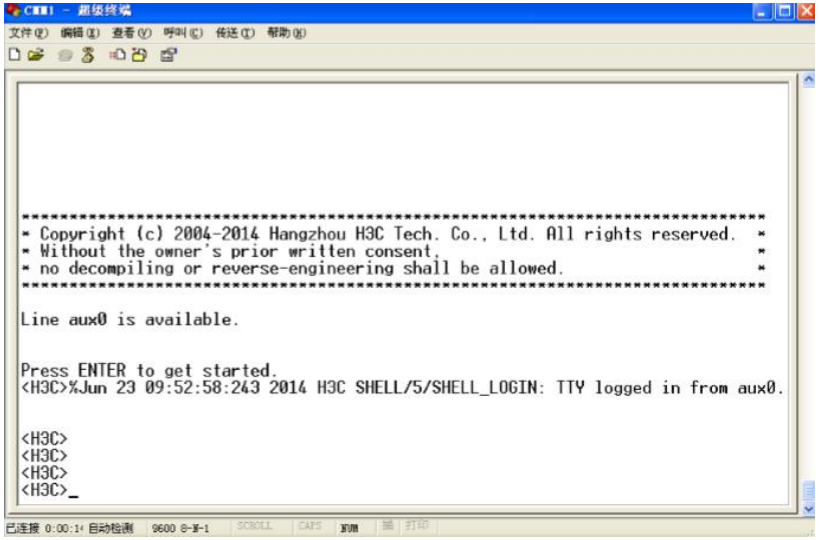


Type : Serial
Port : **COM*x***
Baud rate : 9600
Data-width: 8
Parity check: None
Stop bit: 1
Flow control : NO flow control

Tips: the *x* here(COM*x*) may vary due to different devices, and the screenshot on this page is only an example.

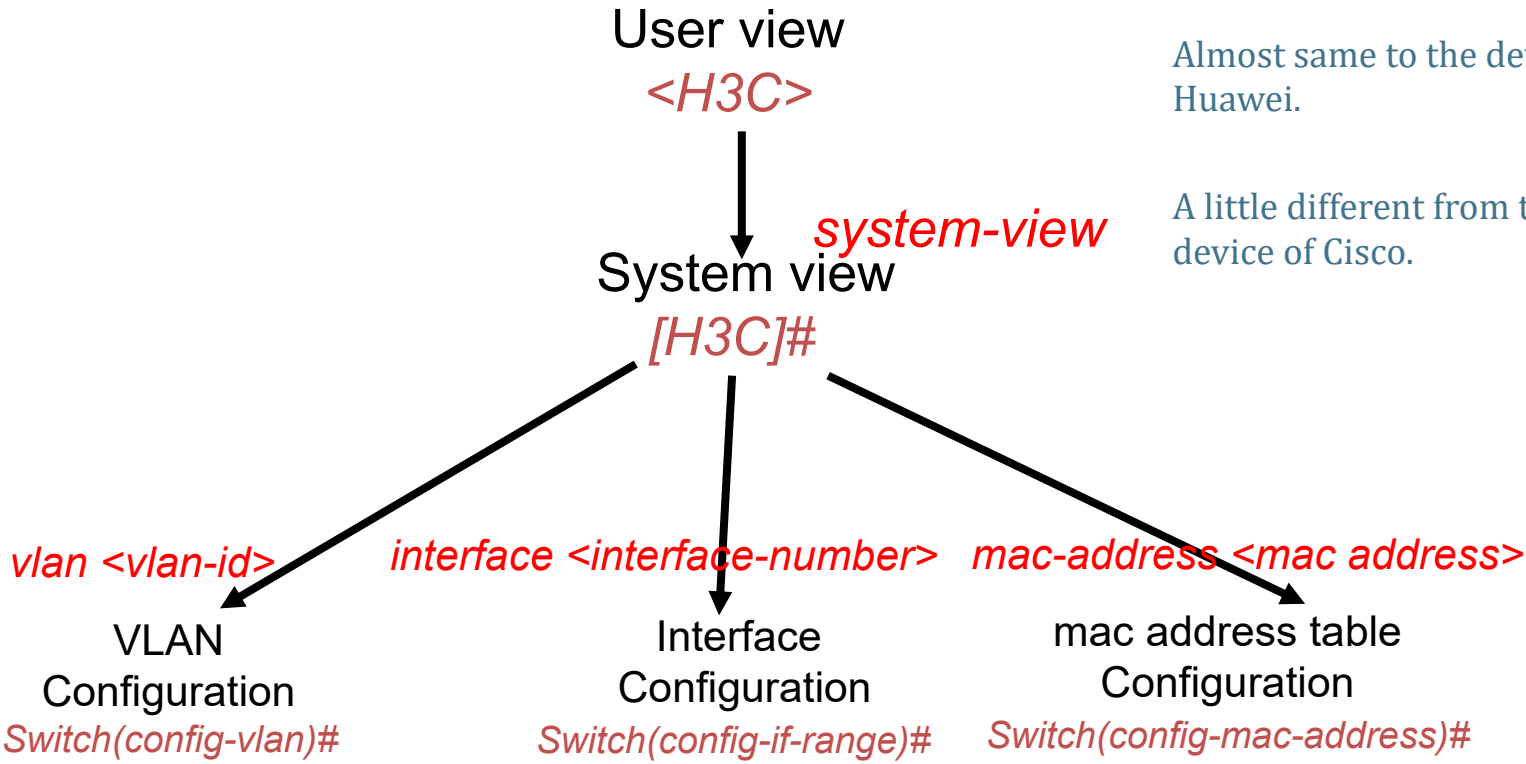
CLI (Command Line Interface)

- TEXT style instruction interaction interface between user and device.
  - Users input text commands, submit devices by inputting return key to execute corresponding commands for configure and manage the devices.
  - confirm the configuration results by viewing the output information.



NOTE:
while using "**MSG 360-4**", its '**login name**' and 'password' are both: **admin**.

Views and Command



Almost same to the device of Huawei.

A little different from the device of Cisco.

Tips: 1. ctrl+c could be used to return to exit current view.

2.tab key and '?' following the command will help you a lot.

Views in CLI(Command Line Interface)

- **USER** : After the user logs on to the device, he enters **the user view** directly. The prompt displayed on the screen is **<**Device Name**>.**

- **SYSTEM** : The **system view** can be shift from the user view, where the prompt displayed on the screen is: **[**device name**]**.
  - The system view can **configure** the operation parameters and some functions of the equipment, such as configuration welcome information, shortcut keys, etc.

- **FUNCTION**: Input specific commands in the system view, you can enter the **corresponding function view**
  - complete the configuration of the corresponding functions, such as: enter the interface view to configure interface parameters, enter the VLAN view to add ports to the VLAN, and so on

- **Tips:** using “undo” to cancel the finished setting command.

Commands and Keys

- Setting
  - Restore factory default, reboot
  - In different views (system, interface, sub-functions)
  - To set device, interface, ip address, service, AAA etc.
- Display
  - Device, interface, dhcp, ip routing-table etc.
  - The keys useful for displaying the output in pages.

keys	function
space key	continue to display the message of next screen
enter key	continue to display the message of next line
<Ctrl + C>	stop display,return to the command line state
<PageUp>	display last page
<PageDown>	display next page

Reminds on error inputs

表1-11 命令行常见错误信息表

英文错误信息	错误原因
% Unrecognized command found at '^' position.	命令无法解析，符号“^”指示位置出错
% Incomplete command found at '^' position.	符号“^”指示位置的参数输入不完整
% Ambiguous command found at '^' position.	符号“^”指示位置的关键字不明确，存在二义性
% Too many parameters.	输入参数太多
% Wrong parameter found at '^' position.	在符号“^”指示位置的参数错误

Tips: “ display history-command “ to display 10 history commands by default.

Ethernet Interface - work mode(1)

- There are several Ethernet interfaces supported on the device:
  - **Layer 2 Ethernet interface (bridge mode)**
    - a physical interface working in the data link layer, which can exchange and forward received messages in layer 2.
  - **Layer 3 Ethernet Interface (route mode)**
    - It is a physical interface working in the network layer. It can configure IP address and route the received message in layer3.
  - Layer 2 and 3 switchable Ethernet interface
    - It is a physical interface that can work in Layer2 mode or Layer3 mode, and be used as a Layer2 Ethernet interface or Layer3 Ethernet interface.
    - Using "**display ... brief**" to find the brief description on interface.
    - Using "**port-link mode ...**" to change the mode of interface, **bridge** or **route**.
    - Using "**ip address ...** " to configure the ip address of **Layer3 interface**.

Ethernet Interface - work mode(2)-switch

```
[H3C]display interface brief
The brief information of interface(s) under route mode:
Link: ADM - administratively down; Stby - standby
Protocol: (s) - spoofing
Interface            Link Protocol Main IP         Description
NULL0                UP   UP(s)    --

The brief information of interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed or Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
Interface            Link Speed   Duplex Type PVID Description
GE1/0/1              DOWN auto    A      A    1
GE1/0/2              DOWN auto    A      A    1
GE1/0/3              DOWN auto    A      A    1
GE1/0/4              DOWN auto    A      A    1
GE1/0/5              DOWN auto    A      A    1
GE1/0/6              DOWN auto    A      A    1
GE1/0/7              DOWN auto    A      A    1
GE1/0/8              DOWN auto    A      A    1
GE1/0/9              DOWN auto    A      A    1
GE1/0/10             DOWN auto    A      A    1
GE1/0/11             DOWN auto    A      A    1
GE1/0/12             DOWN auto    A      A    1
GE1/0/13             DOWN auto    A      A    1
GE1/0/14             DOWN auto    A      A    1
GE1/0/15             DOWN auto    A      A    1
GE1/0/16             DOWN auto    A      A    1
GE1/0/17             DOWN auto    A      A    1
GE1/0/18             DOWN auto    A      A    1
GE1/0/19             DOWN auto    A      A    1
GE1/0/20             DOWN auto    A      A    1
GE1/0/21             DOWN auto    A      A    1
GE1/0/22             DOWN auto    A      A    1
GE1/0/23             DOWN auto    A      A    1
GE1/0/24             DOWN auto    A      A    1
GE1/0/25             DOWN auto    A      A    1
GE1/0/26             DOWN auto    A      A    1
GE1/0/27             DOWN auto    A      A    1
GE1/0/28             DOWN auto    A      A    1

[H3C]
```

- Use "**display interface brief**" to show the brief info of all the interfaces.
  - for both layer2 switch and layer3 switch, the **physical ethernet interface** works on the **bridge** mode.
  - for **layer3 switch**, **vlan virsual interface** works on the **route** mode.
- All the gigabit gigabit-ethernet interface **access** into the **VLAN 1** by default.
- '**port link-type**' is configurable :
  - access
  - trunk
- Tips： all the interfaces of **switch** work on **bridge** mode, while the interface of **router** could work on **bridge** or **route** mode.

Ethernet Interface - work mode(3)-router

```
<H3C>display interface brief
The brief information of interface(s) under route mode:
Link: ADM - administratively down; Stby - standby
Protocol: (s) - spoofing
Interface            Link Protocol Main IP         Description
Cellular0/0          DOWN DOWN     --
GE0/0                DOWN DOWN     --
GE0/1                DOWN DOWN     --
GE0/8                DOWN DOWN     --
GE0/9                DOWN DOWN     --
NULL0                UP   UP(s)     --
Vlan1                DOWN DOWN     192.168.1.1

The brief information of interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed or Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
Interface            Link Speed   Duplex Type PVID Description
GE0/2                DOWN auto    A      A    1
GE0/3                DOWN auto    A      A    1
GE0/4                DOWN auto    A      A    1
GE0/5                DOWN auto    A      A    1
GE0/6                DOWN auto    A      A    1
GE0/7                DOWN auto    A      A    1
```

The link-mode of Router's interfaces could be set.

- **Bridge**: connecting two computers belong to the same network.
- **Route**: connecting two computers belong to different networks.

Tips: using "**port link-mode** xxx" to set the interface work on bridge or route mode.

```
[H3C-GigabitEthernet0/2]display this
#
interface GigabitEthernet0/2
 port link-mode bridge
#
return
[H3C-GigabitEthernet0/2]port link-mode route
[H3C-GigabitEthernet0/2]display this
#
interface GigabitEthernet0/2
 port link-mode route
#
return
[H3C-GigabitEthernet0/2]
```

Set IP address of Interface

- **An interface whose link-mode is route on both router and Layer3 switch could be set IP address.**
- Use “ip address x.x.x.x y.y.y.y” to set IP address. (here “x.x.x.x” is the IP address while “y.y.y.y” is the related subnet mask)
- Q: why “192.168.1.2 255.255.255.0” is an error setting while “192.168.2.1 255.255.255.0” is ok?

```
[H3C-GigabitEthernet0/2]ip addr
[H3C-GigabitEthernet0/2]ip address 192.168.1.2 255.255.255.0
 Error: The IP address you entered overlaps with another interface!
[H3C-GigabitEthernet0/2]ip address 192.168.2.1 255.255.255.0
[H3C-GigabitEthernet0/2]exit
```

```
<H3C>display interface brief
The brief information of interface(s) under route mode:
Link: ADM - administratively down; Stby - standby
Protocol: (s) - spoofing
Interface            Link Protocol Main IP         Description
Cellular0/0          DOWN DOWN     --
GE0/0                DOWN DOWN     --
GE0/1                DOWN DOWN     --
GE0/8                DOWN DOWN     --
GE0/9                DOWN DOWN     --
NULL0                UP   UP(s)     --
Vlan1                DOWN DOWN     192.168.1.1

The brief information of interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed or Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
Interface            Link Speed   Duplex Type PVID Description
GE0/2                DOWN auto    A      A    1
GE0/3                DOWN auto    A      A    1
GE0/4                DOWN auto    A      A    1
GE0/5                DOWN auto    A      A    1
GE0/6                DOWN auto    A      A    1
GE0/7                DOWN auto    A      A    1
```

Switch: MAC-address-table(1)

- For S5110, the mac-address could be learned as dynamic, or configured as static or dynamic.
  - A **static mac-address item** gets higher priority than a dynamic item
  - A **dynamic mac-address item** has a default aging time which is configurable, while a static item is no-aged.

```
[H3C]display mac-address
MAC ADDR        VLAN ID  STATE          PORT INDEX               AGING TIME(s)
309c-236e-8f3b  102      Learned        GigabitEthernet1/0/2     AGING
309c-236e-8f81  102      Learned        GigabitEthernet1/0/23    AGING

 --- 2 mac address(es) found ---
```

```
[H3C]display mac-address aging-time
Mac address aging time: 300s
```

```
[H3C]display mac-address
MAC ADDR        VLAN ID  STATE          PORT INDEX               AGING TIME(s)
309c-236e-8f3b  102      Learned        GigabitEthernet1/0/2     AGING
309c-236e-8f81  102      Learned        GigabitEthernet1/0/23    AGING

 --- 2 mac address(es) found ---

[H3C]mac-address static 309c-236e-8f3b interface gigabitethernet1/0/2 vlan 102
[H3C]display mac-address
MAC ADDR        VLAN ID  STATE          PORT INDEX               AGING TIME(s)
309c-236e-8f3b  102      Config static  GigabitEthernet1/0/2     NOAGED
309c-236e-8f81  102      Learned        GigabitEthernet1/0/23    AGING

 --- 2 mac address(es) found ---
```

Switch: MAC-address-table(2)

- The '**blackhole**' mac address means while the packets related to the blackhole, they will be dropped, switch will not forward the packets.
- The 'blackhole' mac address is marked on the mac-address table.
- using command "mac-address blackhole mac-address-x vlan vlan_id" to configure the mac-address-x as a blackhole mac address.

```
[H3C]display mac-address
MAC ADDR        VLAN ID  STATE          PORT INDEX               AGING TIME(s)
309c-236e-8f3b  102      Learned        GigabitEthernet1/0/2     AGING
309c-236e-8f81  102      Learned        GigabitEthernet1/0/23    AGING

 --- 2 mac address(es) found ---

[H3C]mac-address blackhole 309c-236e-8f3b vlan 102
[H3C]display mac-address
MAC ADDR        VLAN ID  STATE          PORT INDEX               AGING TIME(s)
309c-236e-8f3b  102      Blackhole      N/A                      NOAGED
309c-236e-8f81  102      Learned        GigabitEthernet1/0/23    AGING

 --- 2 mac address(es) found ---
```

'ping' a PC whose MAC address is marked as 'blackhole' on a connected switch to test whether it is reachable or not.

Switch: Isolate Port Group

- The interfaces which belong to an **isolate group** can't reach each other, but can communicate with the interfaces which does not belong to the isolate group.

```
[H3C]display port-isolate group
 Port-isolate group information:
 Uplink port support: NO
 Group ID: 1
 Group members:
    No ports.

[H3C]inter
[H3C]interface giga
[H3C]interface GigabitEthernet 1/0/2
[H3C-GigabitEthernet1/0/2]port-isolate enable
[H3C-GigabitEthernet1/0/2]quit
[H3C]interface giga
[H3C]interface GigabitEthernet 1/0/23
[H3C-GigabitEthernet1/0/23]port-isolate enable
[H3C-GigabitEthernet1/0/23]quit
[H3C]display port-isolate group
 Port-isolate group information:
 Uplink port support: NO
 Group ID: 1
 Group members:
    GigabitEthernet1/0/2     GigabitEthernet1/0/23

[H3C]
```

- Two steps to add an interface into isolate port group:
  - step1: using "interface xxx" to enter interface function configuration mode.
  - step2: using command "port-isolate enable" to add this interface into isolate port group

Switch: VLAN

- A **Virtual LAN (VLAN)** is any broadcast domain that is partitioned and isolated in a computer network at the data link layer (OSI layer 2).
- Use command "**vlan vlan_id**" to create or configure a VLAN.
- **For Layer3 switch, while a vlan is created, use command "interface vlan <vlan_id>" to create a virtual vlan interface.**

```
[H3C]display vlan
 Total 1 VLAN exist(s).
 The following VLANs exist:
  1(default),
[H3C]display vlan 1
 VLAN ID: 1
 VLAN Type: static
 Route Interface: not configured
 Description: VLAN 0001
 Name: VLAN 0001
 Tagged   Ports: none
 Untagged Ports:
    GigabitEthernet1/0/1     GigabitEthernet1/0/2     GigabitEthernet1/0/3
    GigabitEthernet1/0/4     GigabitEthernet1/0/5     GigabitEthernet1/0/6
    GigabitEthernet1/0/7     GigabitEthernet1/0/8     GigabitEthernet1/0/9
    GigabitEthernet1/0/10    GigabitEthernet1/0/11    GigabitEthernet1/0/12
    GigabitEthernet1/0/13    GigabitEthernet1/0/14    GigabitEthernet1/0/15
    GigabitEthernet1/0/16    GigabitEthernet1/0/17    GigabitEthernet1/0/18
    GigabitEthernet1/0/19    GigabitEthernet1/0/20    GigabitEthernet1/0/21
    GigabitEthernet1/0/22    GigabitEthernet1/0/23    GigabitEthernet1/0/24
    GigabitEthernet1/0/25    GigabitEthernet1/0/26    GigabitEthernet1/0/27
    GigabitEthernet1/0/28
```

Switch: Link-type (access to VLAN)

```
[H3C-GigabitEthernet1/0/1]display this
#
interface GigabitEthernet1/0/1
#
return
[H3C-GigabitEthernet1/0/1]port link-type access
[H3C-GigabitEthernet1/0/1]port access vlan 101
[H3C-GigabitEthernet1/0/1]display this
#
interface GigabitEthernet1/0/1
 port access vlan 101
#
return
[H3C-GigabitEthernet1/0/1]
```

- If the 'port link-type' is access, it means the interface can only belongs to one VLAN .

NOTES:
1. VLAN 101 is not the default VLAN on Layer Switch / Router.
2. VLAN should be created before be accessed by interfaces.

```
[H3C]display vlan
 Total 2 VLAN exist(s).
 The following VLANs exist:
  1(default), 101,
[H3C]display vlan 1
 VLAN ID: 1
 VLAN Type: static
 Route Interface: not configured
 Description: VLAN 0001
 Name: VLAN 0001
 Tagged   Ports: none
 Untagged Ports:
    GigabitEthernet1/0/2     GigabitEthernet1/0/3     GigabitEthernet1/0/4
    GigabitEthernet1/0/5     GigabitEthernet1/0/6     GigabitEthernet1/0/7
    GigabitEthernet1/0/8     GigabitEthernet1/0/9     GigabitEthernet1/0/10
    GigabitEthernet1/0/11    GigabitEthernet1/0/12    GigabitEthernet1/0/13
    GigabitEthernet1/0/14    GigabitEthernet1/0/15    GigabitEthernet1/0/16
    GigabitEthernet1/0/17    GigabitEthernet1/0/18    GigabitEthernet1/0/19
    GigabitEthernet1/0/20    GigabitEthernet1/0/21    GigabitEthernet1/0/22
    GigabitEthernet1/0/23    GigabitEthernet1/0/24    GigabitEthernet1/0/25
    GigabitEthernet1/0/26    GigabitEthernet1/0/27    GigabitEthernet1/0/28
[H3C]display
[H3C]display vlan 101
 VLAN ID: 101
 VLAN Type: static
 Route Interface: not configured
 Description: VLAN 0101
 Name: VLAN 0101
 Tagged   Ports: none
 Untagged Ports:
    GigabitEthernet1/0/1
[H3C]
```

Switch: Link-type (trunk to VLAN)

```
[H3C-GigabitEthernet1/0/1]undo port link-type
[H3C-GigabitEthernet1/0/1]undo port access vlan
[H3C-GigabitEthernet1/0/1]port link-type trunk
[H3C-GigabitEthernet1/0/1]port trunk permit vlan 101
 Please wait... Done.
[H3C-GigabitEthernet1/0/1]display this
#
interface GigabitEthernet1/0/1
 port link-type trunk
 port trunk permit vlan 1 101
#
return
[H3C-GigabitEthernet1/0/1]
```

- If the 'port link-type' is trunk, it means the interface could belongs to more than one VLAN.

```
[H3C]display vlan
 Total 2 VLAN exist(s).
 The following VLANs exist:
  1(default), 101,
[H3C]display vlan 1
VLAN ID: 1
VLAN Type: static
Route Interface: not configured
Description: VLAN 0001
Name: VLAN 0001
Tagged   Ports: none
Untagged Ports:
   GigabitEthernet1/0/1     GigabitEthernet1/0/2     GigabitEthernet1/0/3
   GigabitEthernet1/0/4     GigabitEthernet1/0/5     GigabitEthernet1/0/6
   GigabitEthernet1/0/7     GigabitEthernet1/0/8     GigabitEthernet1/0/9
   GigabitEthernet1/0/10    GigabitEthernet1/0/11    GigabitEthernet1/0/12
   GigabitEthernet1/0/13    GigabitEthernet1/0/14    GigabitEthernet1/0/15
   GigabitEthernet1/0/16    GigabitEthernet1/0/17    GigabitEthernet1/0/18
   GigabitEthernet1/0/19    GigabitEthernet1/0/20    GigabitEthernet1/0/21
   GigabitEthernet1/0/22    GigabitEthernet1/0/23    GigabitEthernet1/0/24
   GigabitEthernet1/0/25    GigabitEthernet1/0/26    GigabitEthernet1/0/27
   GigabitEthernet1/0/28
[H3C]display vlan 101
VLAN ID: 101
VLAN Type: static
Route Interface: not configured
Description: VLAN 0101
Name: VLAN 0101
Tagged   Ports:
   GigabitEthernet1/0/1
Untagged Ports: none

[H3C]
```

Routing table

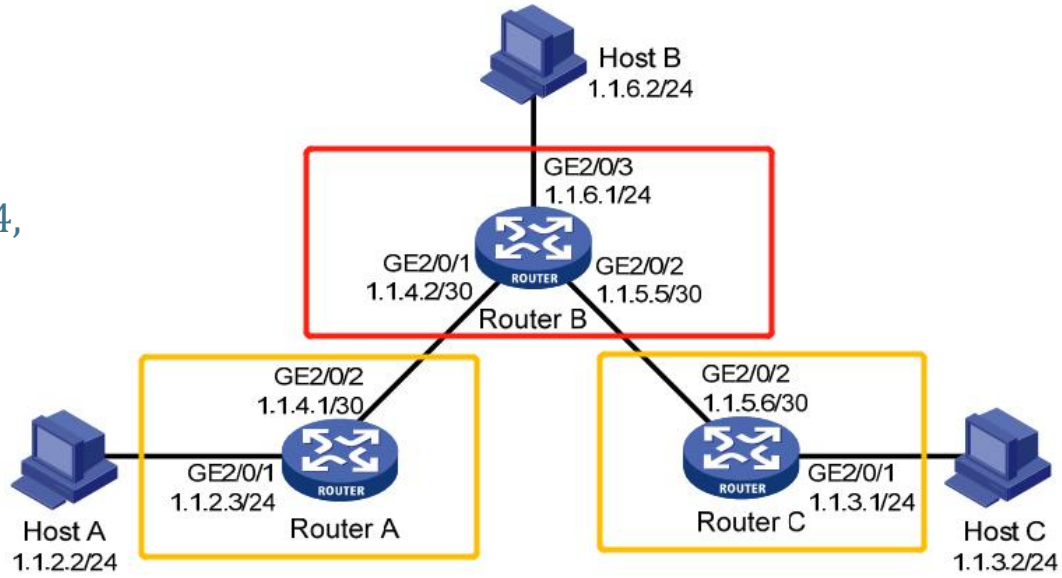
- Routing tables contain routing discovered by various routing protocols, which are usually classified into three categories according to their sources:
  - **Direct Routing**: Routing discovered by link layer protocols, also known as interface routing.
  - **Static routing**: The routing that the network administrator configures manually. The disadvantage is that whenever the network topology changes, it needs to be reconfigured manually and can not be automatically adapted.
  - **Dynamic routing**: Routing discovered by routing protocols.

- Tips: using "**display ip routing-table**" to show the routing table on **Router/Layer3 Switch**.

```
[H3C]display ip routing-table
Routing Tables: Public
         Destinations : 6        Routes : 6

Destination/Mask    Proto  Pre  Cost        NextHop         Interface

10.10.1.0/24        Direct 0    0           10.10.1.1       GE0/2
10.10.1.1/32        Direct 0    0           127.0.0.1       InLoop0
10.10.7.0/24        Direct 0    0           10.10.7.73      GE0/7
10.10.7.73/32       Direct 0    0           127.0.0.1       InLoop0
127.0.0.0/8         Direct 0    0           127.0.0.1       InLoop0
127.0.0.1/32        Direct 0    0           127.0.0.1       InLoop0

[H3C]ip rou
[H3C]ip route-static 10.10.2.0 24 10.10.7.71
[H3C]display ip routing-table
Routing Tables: Public
         Destinations : 7        Routes : 7

Destination/Mask    Proto  Pre  Cost        NextHop         Interface

10.10.1.0/24        Direct 0    0           10.10.1.1       GE0/2
10.10.1.1/32        Direct 0    0           127.0.0.1       InLoop0
10.10.2.0/24        Static 60   0           10.10.7.71      GE0/7
10.10.7.0/24        Direct 0    0           10.10.7.73      GE0/7
10.10.7.73/32       Direct 0    0           127.0.0.1       InLoop0
127.0.0.0/8         Direct 0    0           127.0.0.1       InLoop0
127.0.0.1/32        Direct 0    0           127.0.0.1       InLoop0
```

Add Static Routing

- Router B got the direct routing to 1.1.6.1/24, 1.1.4.2/30, 1.1.5.5/30
- If B wants to routing to 1.1.2.0/24, 1.1.3.0/24, Route B needs to add routing info as follows:




```
<RouterB> system-view
[RouterB] ip route-static 1.1.2.0 255.255.255.0 1.1.4.1
[RouterB] ip route-static 1.1.3.0 255.255.255.0 1.1.5.6
```

Tips1: “1.1.2.0 255.255.255.0” is the NetID and Subnet Mask of the destination, 1.1.4.1 is the IP address of next-hop.

Practice 14.1

1. Build a network: connect PCa and PCb with a Layer 3 Switch / Router, set PCa to be in the same network with PCb.

2. On PCa , use “ping” to test whether PCb is reachable.

3. Use at least two ways to make PCa un-reachable from PCb without changing the connections on them.

4. After finishing step1~3, using “display mac-address” to find the mac-address table of Layer 3 Switch/Router:

   1) How many items are there on the switch mac-address table? Are they static or dynamic?

   2) For every item, does the mac-address belong to the connected PC or the connected interface of Layer 3 Switch / Router?

Practice 14.2

1. Use ”display vlan brief” to find the information about VLAN and interface.
2. Is there any default VLAN on Layer 3 Switch / Router? Which interfaces belong to this default VLAN?
3. Create two VLANs: VLAN ‘x’ and VLAN ‘y’ on Layer3 Switch / Router.
4. Configure the VLANs and interfaces:
   1) Giga-ethernet interface ‘a1’ accesses to VLAN ‘x’
   2) Giga-ethernet interface ‘b1’ accesses to VLAN ‘y’
5. Setup the connections:
   1) Connect the Giga-ethernet interface ‘a1’ with PCa
   2) Connect the Giga-ethernet interface ‘b1’ with PCb
6. Configure PCa and PCb with static IP addresses which belong to the same network.
   Use “ping” on PCa to test if PCb is reachable.
7. Is there anyway to make the PCa reachable from PCb without changing the connection? Try and test.

NOTES: 'x', 'y' should be two different numbers, while 'a1' and 'b1' should be the index of interface on Layer3 Switch / Router.

Practice 14.3

while using “MSG 360-4”, its 'login name' and 'password' are both: admin.

- Connect with Router by console, answer the following question:
  - Find the “hardware address”, ”bandwidth”of an interface, check if it has ever received or sent packets.
  - How many types of link-mode could an interface of router be set? Could the link-mode be changed for an interface? How to change it?
  - Could it be possible to set an IP address on an interface which works on bridge mode? If yes, try it.
  - Could it be possible to set port link-type on an interface which works on route mode? If yes, try it.

- Tips: use “display interface gig xxx” could find more details about the interface.

Practice 14.4

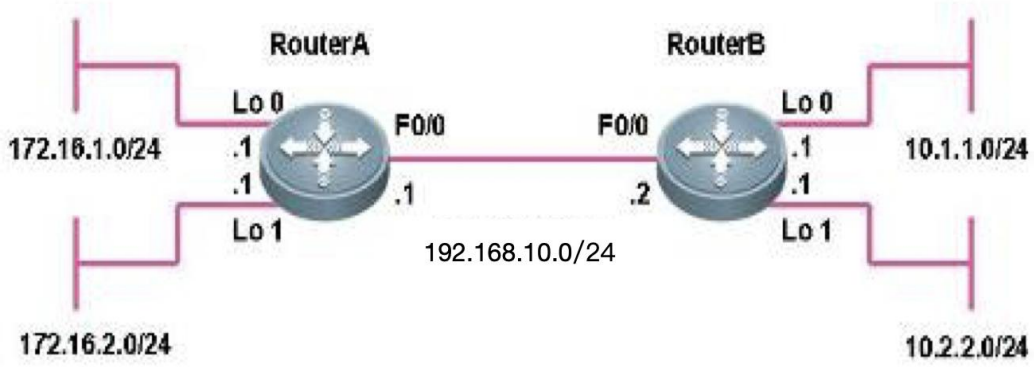
- Build a network with two PCs(PCa and PCb) and a Router.
- Configure the network to make:
  - PCa belongs to subnet1, PCb belongs to subnet2, Router connects subnet1 and subnet2.
    - The network ID of Subnet1 and subnet2 are both B type address with 16bits network ID length.
  - PCa and PCb work as DHCP client, Router works as DHCP server.
  - On the Router, there are at least 2 DHCP ip-pool with different network and different gateway-list

- Test
  - Show the IP address of PCa and PCb.
  - Use command "ping" to test the connection between two PCs, are they reachable or not? Why? show ip routing-table on the Router.
  - Set MTU on the interface which connect with PCa. Set MTU as 46.
    - invoke "Wireshark" on PCa to capture the ICMP packets.
    - use "ping *destination -l 90*" on PCa(destination here is the IP address of the interface which connects with PCa).
    - Does the IP fragment occur on the ICMP request or ICMP reply or both?
- Tips: use "mtu xxx" to set the MTU value of the interface.

Practice 14.5

1. Implement cross-router communication
2. Show the route-table info on Router A and Router B

Tips： Layer3 Switch could work as a simple router



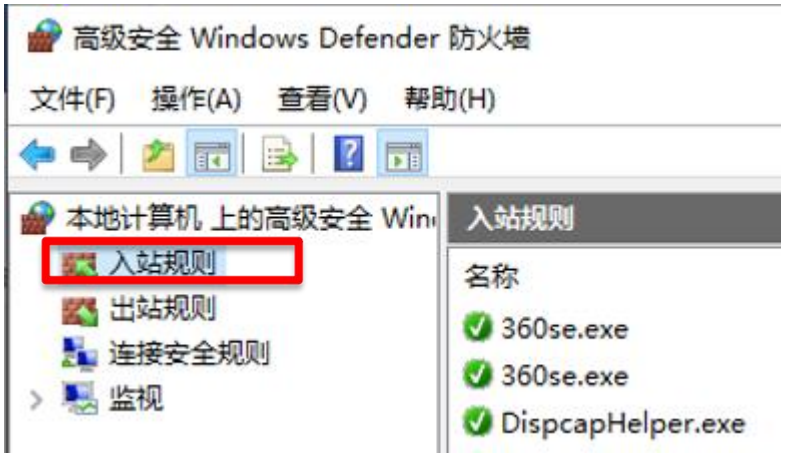
Tips (1-1)

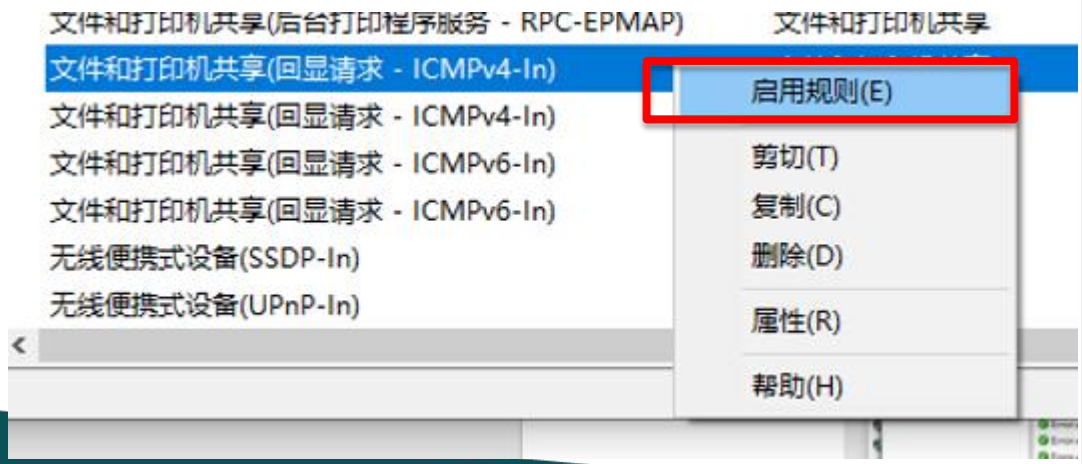
- If two PCs connecting to the same switch can not receive ICMP reply messages from each other, you can make some change about Fire Wall of the PC.

Tips (1-2)

- Go to [Control Panel] -> [System and Secure] -> [Windows Defender Fire Wall] -> [Advanced Setting]

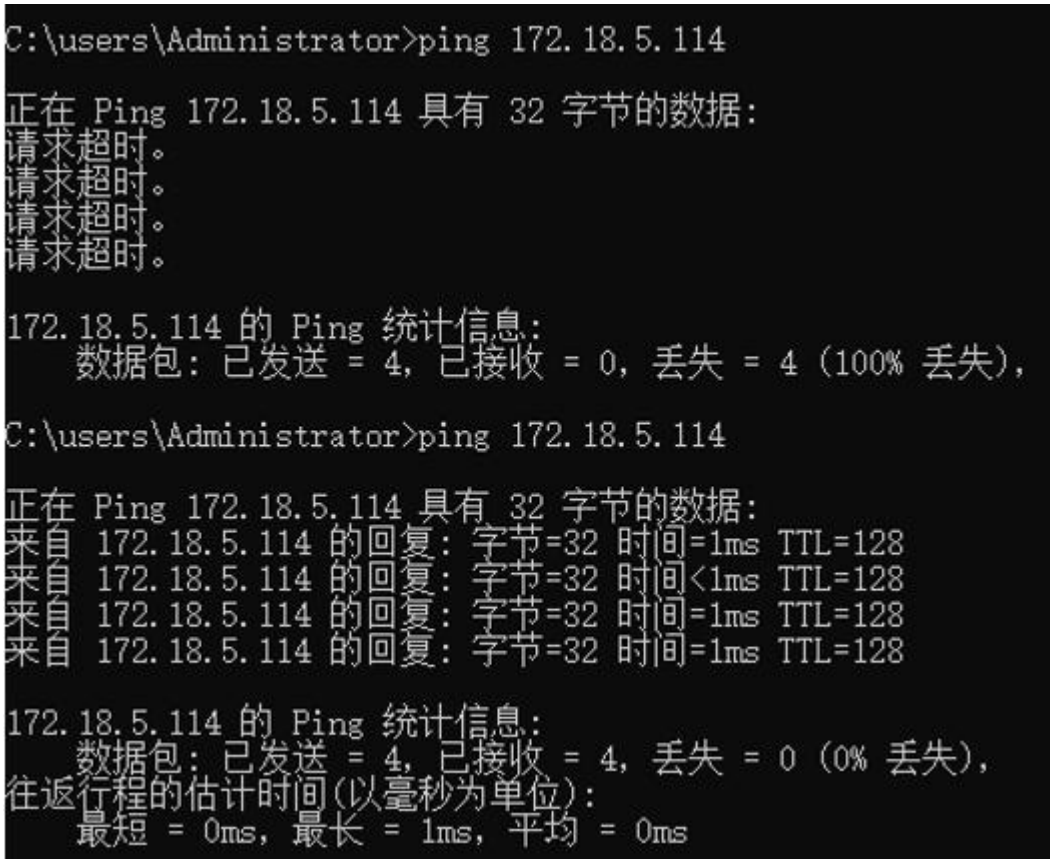
Tips (1-3)


高级安全 Windows Defender 防火墙
文件(F) 操作(A) 查看(V) 帮助(H)
本地计算机 上的高级安全 Win
入站规则
出站规则
连接安全规则
监视
入站规则
名称
360se.exe
360se.exe
DispcapHelper.exe


文件和打印机共享(后台打印程序服务 - RPC-EPMAP)
文件和打印机共享
文件和打印机共享(回显请求 - ICMPv4-In)
文件和打印机共享(回显请求 - ICMPv4-In)
文件和打印机共享(回显请求 - ICMPv6-In)
文件和打印机共享(回显请求 - ICMPv6-In)
无线便携式设备(SSDP-In)
无线便携式设备(UPnP-In)
启用规则(E)
剪切(T)
复制(C)
删除(D)
属性(R)
帮助(H)


入站规则
名称
文件和打印机共享(SMB-In)
文件和打印机共享(后台打印程序服务 - RPC)
文件和打印机共享(后台打印程序服务 - RPC)
文件和打印机共享(后台打印程序服务 - RPC-EPMAP)
文件和打印机共享(后台打印程序服务 - RPC-EPMAP)
文件和打印机共享(回显请求 - ICMPv4-In)
文件和打印机共享(回显请求 - ICMPv4-In)
文件和打印机共享(回显请求 - ICMPv6-In)
文件和打印机共享(回显请求 - ICMPv6-In)
无线便携式设备(SSDP-In)
无线便携式设备(UPnP-In)
无线显示基础结构反向通道(TCP-In)
无线显示器(TCP-In)
性能日志和警报(DCOM-In)
性能日志和警报(DCOM-In)
性能日志和警报(TCP-In)
性能日志和警报(TCP-In)
虚拟机监控(DCOM-In)
虚拟机监控(NB-Session-In)
虚拟机监控(RPC)
虚拟机监控(回显请求 - ICMPv6-In)
虚拟机监控(回显请求- ICMPv4-In)
移动套餐

Tips (1-4)



After reset or close the "Windows Defender Fire Wall" on the testing PCs, the "ping" test would pass.

NOTE:
Don't forget Restore settings or reopen the "Windows Defender Fire Wall" on the testing PCs after the testing!

Interconnection
-between virtual and real networks

"Cloud"

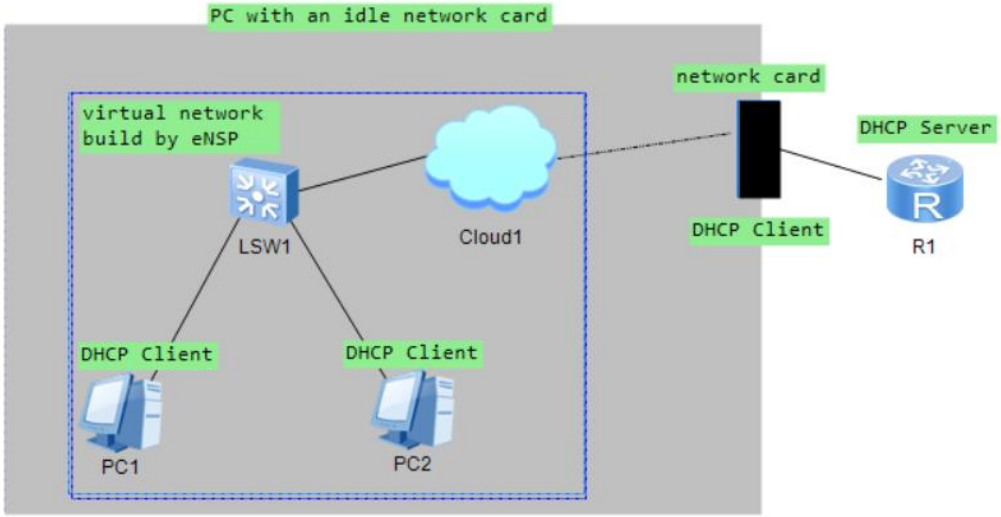
- ✓ "Cloud" in eNSP could communicate with virtual or real network cards on the PC where eNSP is located.
- ✓ Withe the help of the "Cloud" and real network card, virtual network in eNSP could communicate with real networks.

Prerequisite: 1) eNSP is installed on the PC; 2) there is an idle network cards on the PC; 3)network devices, and network cables

Specific steps:

1) **Connect** the idle network card(.e.g. "eth2") on the PC with an ethernet interface(.e.g. "ge0/1") of the real network device.
2) **Configure** the network card("eth2") and the network device to ensure that the network card("eth2") and the interface ("ge0/1") of the network device are in the same subnet.
3) **Build** a network topology by eNSP(.e.g. named as "test.topo") and add a "Cloud" device to the topology.
4) **Configure** the"Cloud" device in the "test.topo" of eNSP, **connect** the "Cloud" device with the network in the topology.

Interconnection(Demo1)
-between virtual and real networks



Demo1: Create two networks:

1)a real network consisting of a router (or layer 3 switch) and a PC, with eNSP installed on the PC and an idle network card.

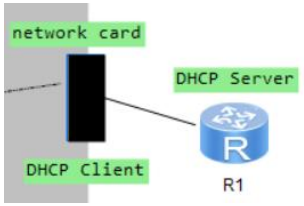
2) a virtual network is created through eNSP, consisting of a “Cloud” device, two PCs(PC1 and PC2), and a switch(LSW1).

3)The connection relationship between devices is shown in the figure.

4) the “Cloud” device in the virtual network is logically connected to the idle network cards.

5) Tests

Interconnection(demo1-2-1) -between virtual and real networks



Demo1-2-1: **Configure** the network card("eth2") and the network device to ensure that the network card("eth2") and the interface ("ge0/1") of the network device are in the same subnet.

- method 1) configure the network card and the interface of the network device with static IP address and subnet mask.

.e.g. 192.168.1.101 255.255.255.0 192.168.1.254 255.255.255.0

- method 2) **Configure a DHCP server on a router or layer 3 switch and apply it to the interface of network devices connected to the network card. suppose the device is a layer3 switch, its interface "ge1/0/4" connects with the network card.**
  - Build a vlan (suppose vlan 101) , make the interface "ge1/0/4" access to vlan 101.
  - configure the virtual vlan interface with an IP address: 192.168.1. 1 24.
    - (1) int vlan 101
    - (2) ip address <ip address> <subnet mask>
  - enable DHCP service
    - enable dhcp
  - creat a **DHCP server ip-pool** , configure it with **network** 192.168.1.0 24, **gateway-list** 192.168.1.254
    - TIPS:
      1) "gateway-list" should be the IP address of the virtual vlan interface
      2) "network" info should be same as the gateway-list

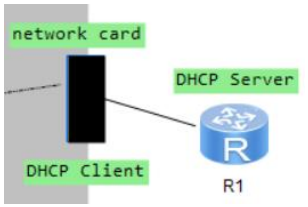
```
[H3C]vlan 101
[H3C-vlan101]quit
```

```
[H3C]int gi1/0/24
[H3C-GigabitEthernet1/0/24]port access vlan 101
[H3C-GigabitEthernet1/0/24]
```

```
[H3C-vlan-interface101]dis this
#
interface Vlan-interface101
 ip address 192.168.101.1 255.255.255.0
#
return
```

```
[H3C-dhcp-pool-101]dis this
#
dhcp server ip-pool 101
 network 192.168.101.0 mask 255.255.255.0
 gateway-list 192.168.101.1
#
return
[H3C-dhcp-pool-101]
```

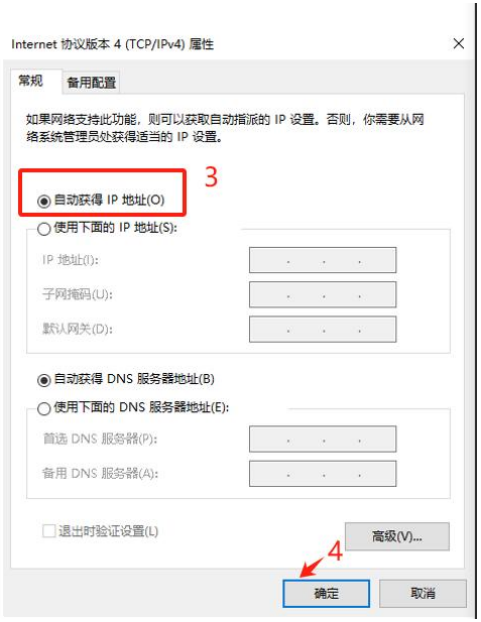
Interconnection(demo1-2-2) -between virtual and real networks



Demo1-2-2:

1) configure the network card as DHCP client.

2) run the command “ipconfig /renew” in windows “cmd” tool, apply an IP address and the related configuration from the DHCP server.




```
以太网适配器 以太网 2:

   连接特定的 DNS 后缀 . . . . . . . :
   描述. . . . . . . . . . . . . . . : Realtek PCIe GbE Family Controller
   物理地址. . . . . . . . . . . . . : 00-E0-4C-9B-B3-C9
   DHCP 已启用 . . . . . . . . . . . : 是
   自动配置已启用. . . . . . . . . . : 是
   本地链接 IPv6 地址. . . . . . . . : fe80::38af:adcf:c5ca:a443%2(首选)
   IPv4 地址 . . . . . . . . . . . . : 192.168.101.2(首选)
   子网掩码 . . . . . . . . . . . . : 255.255.255.0
   获得租约的时间 . . . . . . . . . : 2023年12月14日 12:19:31
   租约过期的时间 . . . . . . . . . : 2023年12月15日 12:19:31
   默认网关. . . . . . . . . . . . . : 192.168.101.1
   DHCP 服务器 . . . . . . . . . . . : 192.168.101.1
   DHCPv6 IAID . . . . . . . . . . . : 33611852
   DHCPv6 客户端 DUID . . . . . . . : 00-01-00-01-2D-0C-2E-22-00-D8-61-64-CB-3F
   DNS 服务器 . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   TCPIP 上的 NetBIOS . . . . . . . : 已启用
```

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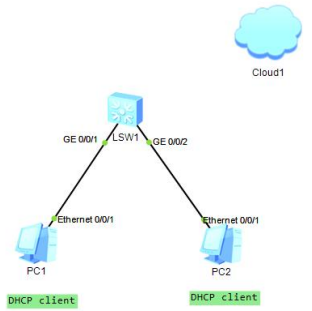
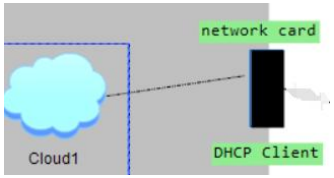
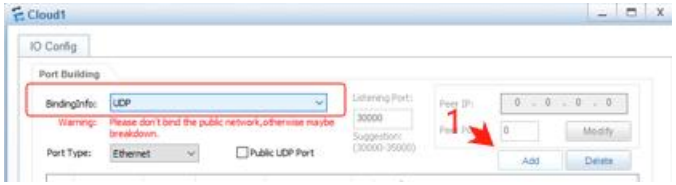
Interconnection(demo1-3) -between virtual and real networks

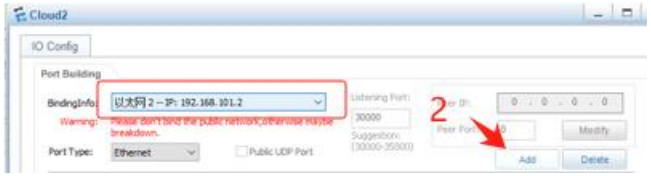
Demo1-3: **Build** a simple network topology(PC1 and PC2 configured as DHCP client, both of PC1 and PC2 connects to switch LSW1) in eNSP, **add** a "Cloud" device to the topology, and **Configure** the "Cloud" device in the eNSP network topology.



- step0: right click on the "Cloud" , then choose "settings"
- step1,2: add two Bindinfo: (1)UDP (2) network card(whose IP address has been set)
- step3: configure and add Port map settings







Interconnection(demo1-4) -between virtual and real networks

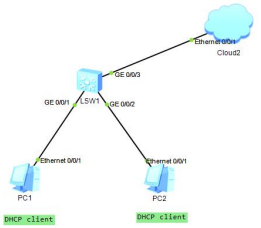
Demo1-4: connnect the “Cloud” device with the switch LSW1 after the “Cloud” device is setted.

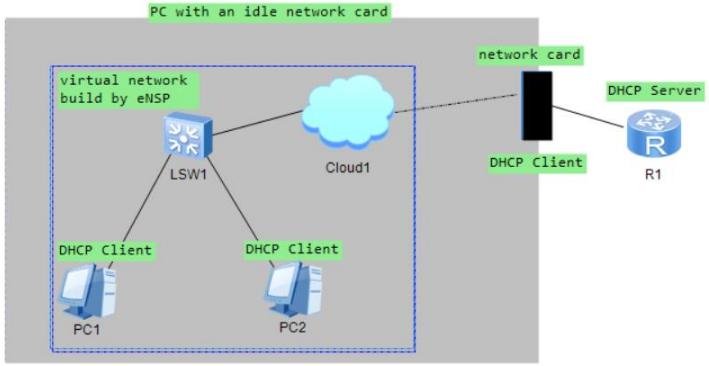
Testing:

1) run “ipconfig /renew” on PC1 and PC2 to get the IP configurations from the DHCP server.

2) run “ipconfig” to check

TIPS: It is recommended to turn off the firewall during testing.





PC1

Basic Config | Command | MCPacket | UdpPacket | Console

```
Welcome to use PC Simulator!

PC>ipconfig

Link local IPv6 address...........: fe80::5689:98ff:fe00:7f11
IPv6 address......................: :: / 128
IPv6 gateway......................: ::
IPv4 address......................: 192.168.101.4
Subnet mask.......................: 255.255.255.0
Gateway...........................: 192.168.101.1
Physical address..................: 54-89-98-00-7F-11
DNS server........................:
```

PC2

Basic Config | Command | MCPacket | UdpPacket | Console

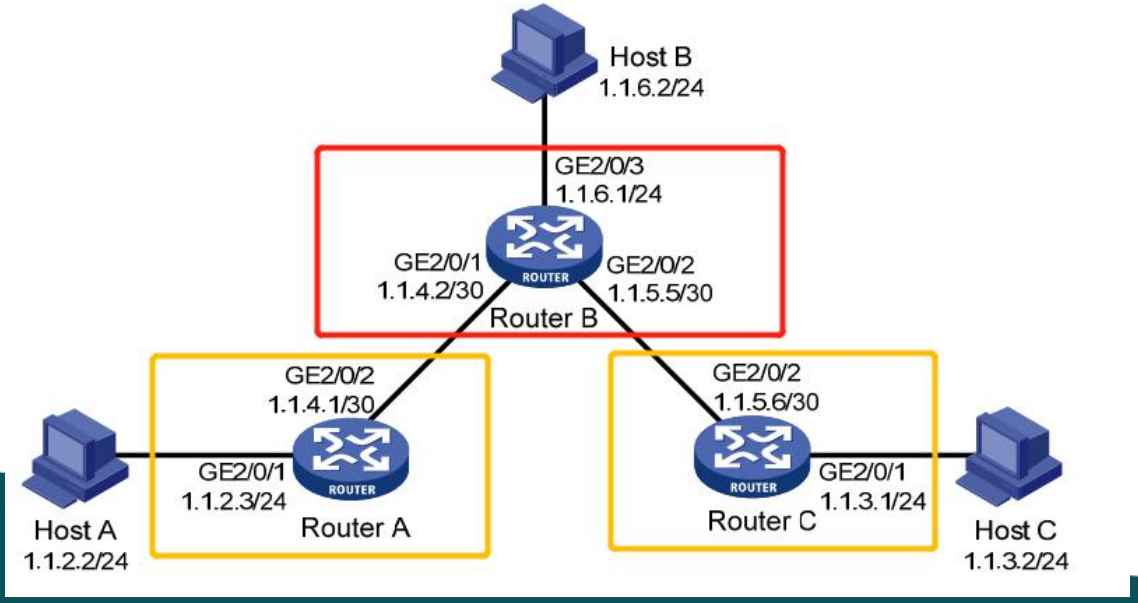
```
Welcome to use PC Simulator!

PC>ipconfig

Link local IPv6 address...........: fe80::5689:98ff:fe92:3585
IPv6 address......................: :: / 128
IPv6 gateway......................: ::
IPv4 address......................: 192.168.101.3
Subnet mask.......................: 255.255.255.0
Gateway...........................: 192.168.101.1
Physical address..................: 54-89-98-92-35-85
DNS server........................:
```

Practice 14.6

- Please build the following network topology through virtual and real network interconnection to achieve network connectivity.
  - using at least an ENSP virtual network and a real network device.
  - configuration about routing entry.
    - option1: set Static routing
    - option2: set routing protocols such as RIP or OSPF
  - tests
    - show the ip routing-table on the device
    - test the network connectivity



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