

CS 305 Lab Tutorial

Lecture 15 Router

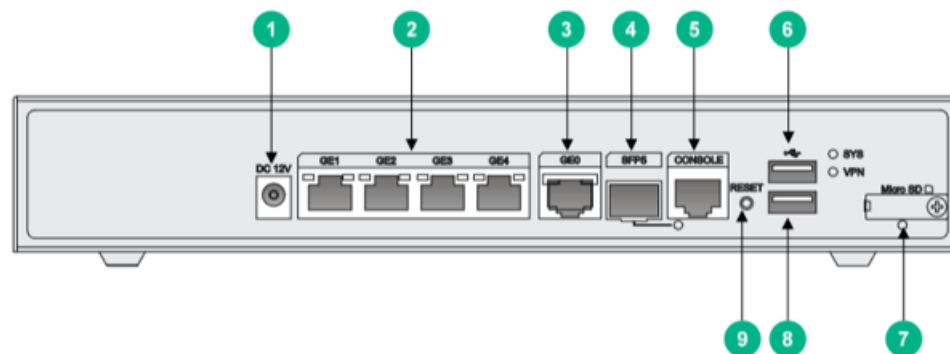
(H3C MSR810/830/360-4)

Dept. Computer Science and Engineering
Southern University of Science and Technology

Router(MSR810)



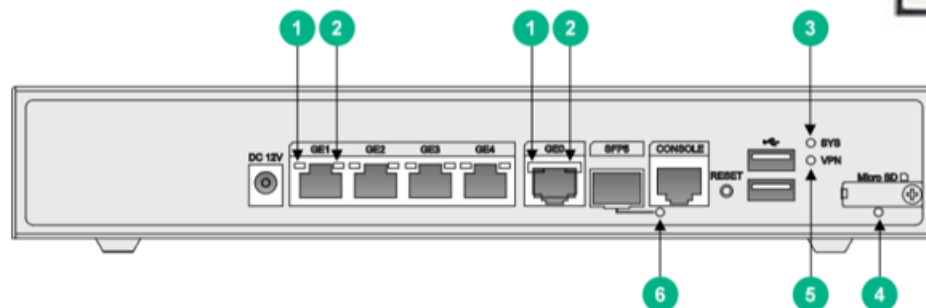
图A-1 MSR810 前视图



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



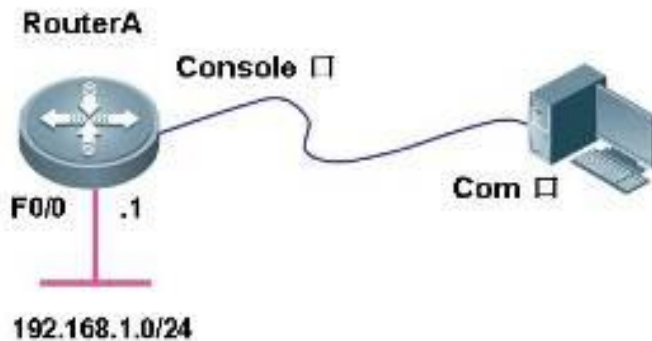
1. GE port yellow Indicator light	2. GE port green Indicator light
3. SYS Indicator light	4. Micro SD card Indicator light
5. VPN Indicator light	6. SFP Optical fiber interface Indicator light

Indicator light	status	indicate
SYS Indicator light	green always on	SDRAM checking (bootrom phase)
	yellow Twinkle @1HZ	SDRAM checking failed(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 router by console

To configure the router by PC:

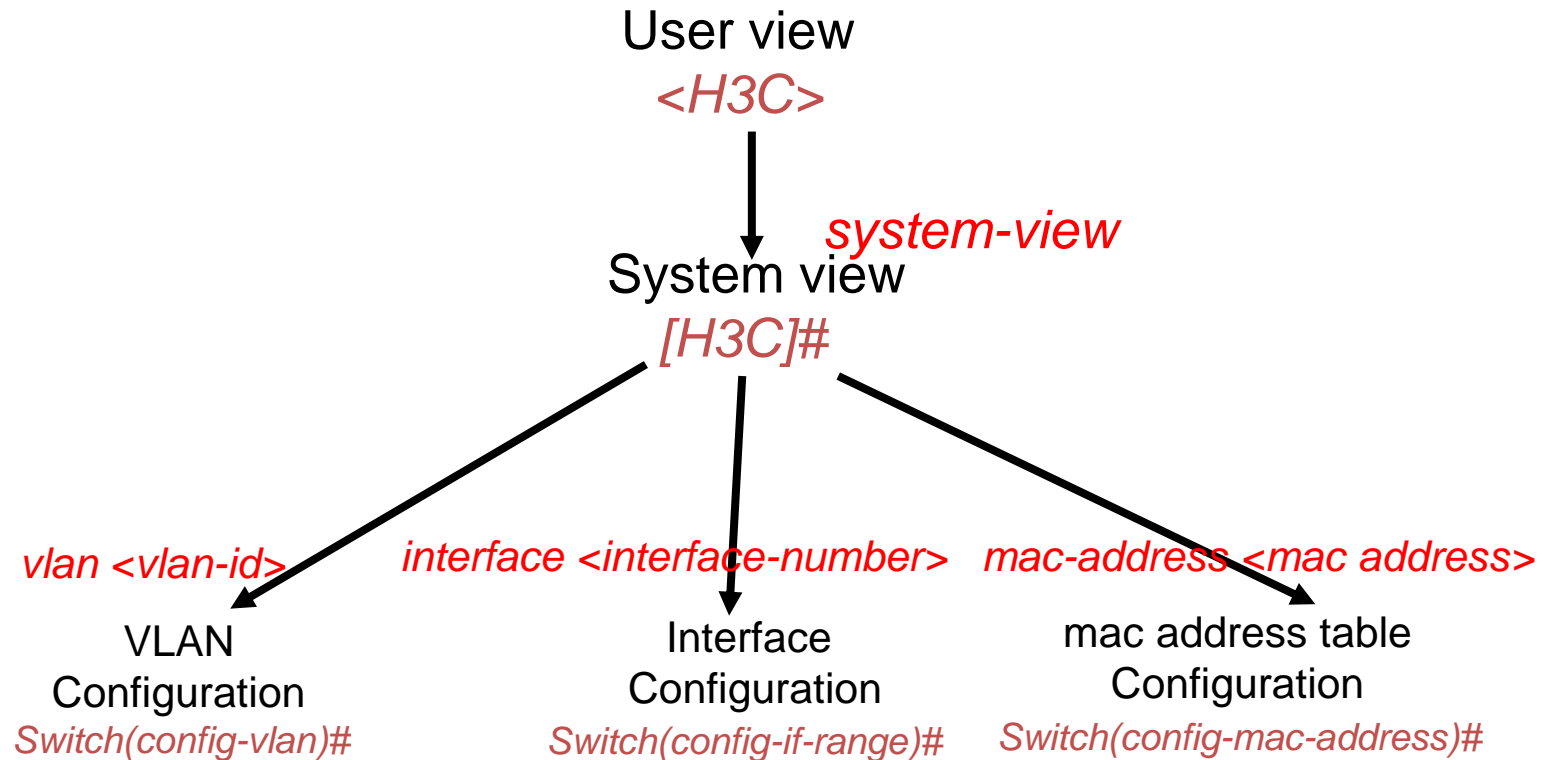
1. Connect the “console” port of Router with “COM* USB Serial Port” of PC.
2. Invoke the SecureCRT on PC to communicate with CLI of Router.



The 'Quick Connect' dialog box in SecureCRT. It is used to configure a serial connection to a device like a router. The 'Protocol' is set to 'Serial'. The 'Port' is set to 'COM4 USB Serial Port'. The 'Baud rate' is set to '9600', 'Data bits' to '8', 'Parity' to 'None', and 'Stop bits' to '1'. The 'Flow Control' section has three checkboxes: 'DTR/DSR', 'RTS/CTS', and 'XON/XOFF', all of which are currently unchecked. There is a text field for 'Name of pipe'. At the bottom, there are checkboxes for 'Show quick connect on startup' (unchecked), 'Save session' (checked), and 'Open in a tab' (checked). 'Connect' and 'Cancel' buttons are at the bottom right.

Field	Value
Protocol	Serial
Port	COM4 USB Serial Port
Baud rate	9600
Data bits	8
Parity	None
Stop bits	1
Flow Control	<input type="checkbox"/> DTR/DSR <input type="checkbox"/> RTS/CTS <input type="checkbox"/> XON/XOFF
Name of pipe	
Show quick connect on startup	<input type="checkbox"/>
Save session	<input checked="" type="checkbox"/>
Open in a tab	<input checked="" type="checkbox"/>

Views and Command



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

Ethernet Interface

- There are several Ethernet interfaces supported on the device:
 - **Layer 2 Ethernet interface**
 - a physical interface working in the data link layer, which can exchange and forward received messages in layer 2.
 - **Layer 3 Ethernet Interface**
 - It is a physical interface working in the network layer. It can configure IP address and route the received message in three layers.
 - 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 ethernet interface.

Show the link-mode of interface

```
<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
```

```
[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]
```

- 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.

Set IP address of Interface

- An interface whose link-mode is route could be set IP address.
- Use “ip address x.x.x.x y.y.y” to set IP address. (here “x.x.x.x” is the IP address while “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
```


Routing table

- Routing tables contain routings 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.

```
[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

Routing

- In the network, the **Router** chooses an appropriate path **according to the destination address** of the received message and forwards the message **to the next router**. The last router in the path is responsible for forwarding the message to the destination host.
- **Routing is the path information of the message in the process of forwarding, which is used to guide the message forwarding.**
- According to different routing destinations, routing can be divided into:
 - **Network Routing:** destination is network segment, subnet mask length is less than 32 bits.
 - **Host routing:** destination is host, subnet mask length is 32 bits.
- According to whether the destination is directly connected to the router, the routing is divided into:
 - **Direct Routing:** the destination network is directly connected to the router.
 - **Indirect routing:** the destination network is not directly connected to the router.

FIB(Forwarding Information Base)

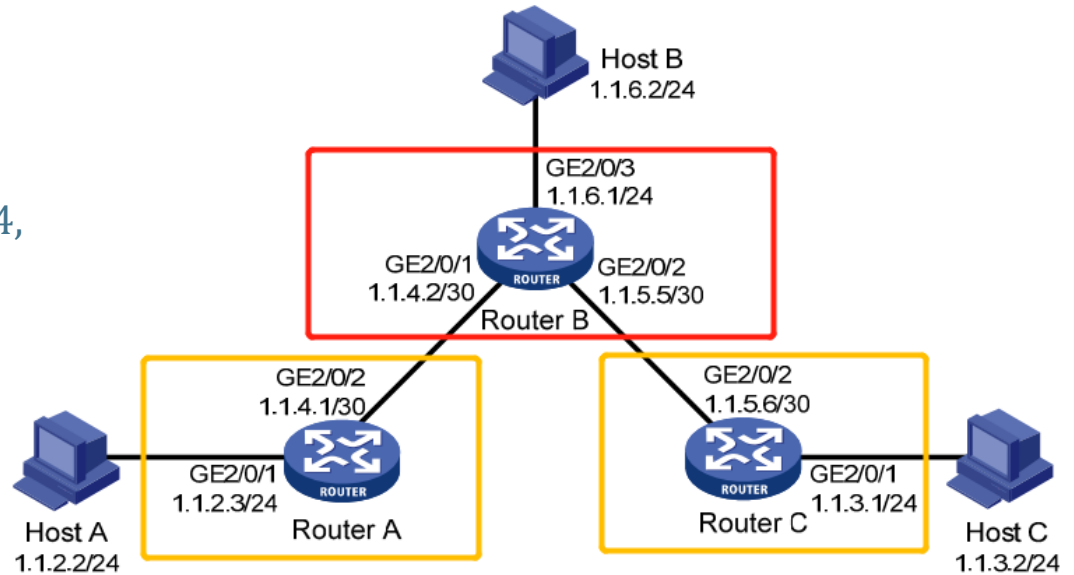
- Each forwarding item in the FIB table indicates which physical interface of the router should be used to send messages to a subnet or a host to reach the next router in the path, or to the destination host in the directly connected network without passing through another router.

```
<H3C>display fib
Destination count: 8    FIB entry count: 8
Flag:
  U:Useable    G:Gateway    H:Host    B:Blackhole    D:Dynamic    S:Static
  R:Relay

Destination/Mask    Nexthop            Flag    OutInterface    InnerLabel    Token
10.10.4.0/24        10.10.7.71         USG     GE0/7           Null          Invalid
10.10.2.0/24        10.10.7.71         USG     GE0/7           Null          Invalid
10.10.7.0/24        0.0.0.0            U       GE0/7           Null          Invalid
10.10.7.73/32       127.0.0.1          UH      InLoop0         Null          Invalid
10.10.1.0/24        0.0.0.0            U       GE0/2           Null          Invalid
10.10.1.1/32        127.0.0.1          UH      InLoop0         Null          Invalid
127.0.0.1/32        127.0.0.1          UH      InLoop0         Null          Invalid
127.0.0.0/8         127.0.0.1          U       InLoop0         Null          Invalid
<H3C>
```

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
```

Tips: “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 15.1

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

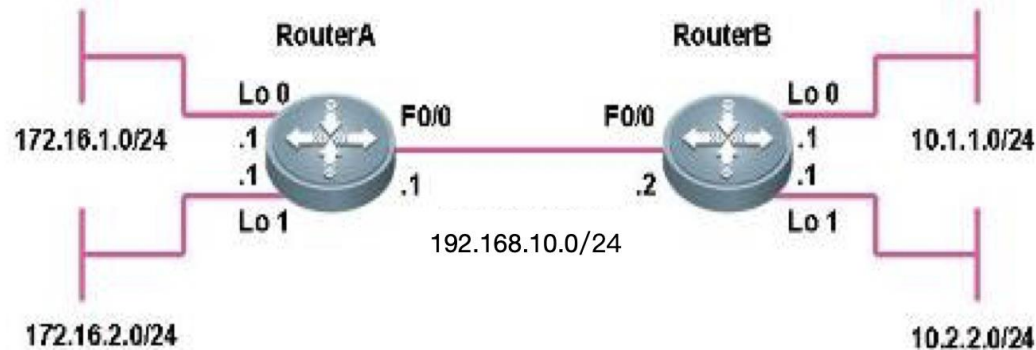
- Connect with Router by console, answer the following question:
 - Find the “hardware address”, “bandwidth” of an interface, check if it has ever received or sent packets.
 - How many types of link-mode could an interface of router be set? Could the link-mode be changed for an interface? How to change 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 15.2

- 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.

15.3 Option practice (use two Routers)

1. Implement cross-router communication
2. Show the route-table and fib info on Router A and Router B
3. Save the configuration as setup configuration



Tips : reboot

```
<ns> reboot
Start to check configuration with next startup configuration file, please wait.....DONE!
This command will reboot the device. Current configuration will be lost, save current configuration
? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
Validating file. Please wait...
Configuration is saved to device successfully.
This command will reboot the device. Continue? [Y/N]:y
#Jan 1 00:23:47:779 2013 H3C DEVM/1/REBOOT:
Reboot device by command.

%Jan 1 00:23:47:779 2013 H3C DEVM/5/SYSTEM_REBOOT: System is rebooting now. 鈍煥 System is starting.
..
Press Ctrl+D to access BASIC-BOOTWARE MENU
Booting Normal Extend Bootware

*****
*
*                               H3C MSR830 BootWare, Version 5.10
*
*
*****
copyright (c) 2004-2017 New H3C Technologies Co., Ltd.

Compiled Date       : Apr 25 2017
CPU ID              : 0xa
CPU L1 Cache        : 32KB
CPU L2 Cache        : 256KB
Memory Type         : DDR3 SDRAM
Memory Size         : 256MB
Memory Speed        : 533MHz
Flash Size          : 128MB
PCB Version         : 2.0
```

In user view “reboot” will remind to save the current configuration as startup cfg, if you choose yes , the configuration will work on the coming reboot stage.