Lab - Building a Switch and Router Network

1. Topology



1. Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| R1 | G0/0 | 192.168.0.1 | 255.255.255.0 | N/A |
| G0/1 | 192.168.1.1 | 255.255.255.0 | N/A |
| PC-A | NIC | 192.168.1.3 | 255.255.255.0 | 192.168.1.1 |
| PC-B | NIC | 192.168.0.3 | 255.255.255.0 | 192.168.0.1 |

1. Objectives

Part 1: Set Up the Topology and Initialize Devices

Part 2: Configure Devices and Verify Connectivity

Part 3: Display Device Information

1. Background / Scenario

This is a comprehensive lab to review previously covered IOS commands. In this lab, you will cable the equipment as shown in the topology diagram. You will then configure the devices to match the addressing table. After the configurations have been saved, you will verify your configurations by testing for network connectivity.

After the devices have been configured and network connectivity has been verified, you will use IOS commands to retrieve information from the devices to answer questions about your network equipment.

This lab provides minimal assistance with the actual commands necessary to configure the router. Test your knowledge by trying to configure the devices without referring to the content or previous activities.

**Note**: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS Release 15.2(4)M3 (universalk9 image). The switches used are Cisco Catalyst 2960s with Cisco IOS Release 15.0(2) (lanbasek9 image). Other routers, switches, and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

**Note**: Ensure that the routers and switches have been erased and have no startup configurations. Consult with your instructor for the procedure to initialize and reload a router and switch.

1. Required Resources

* 1 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
* 1 Switch (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
* 2 PCs (Windows 7 or 8 with terminal emulation program, such as Tera Term)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet cables as shown in the topology

**Note**: The Gigabit Ethernet interfaces on Cisco 1941 routers are autosensing and an Ethernet straight-through cable may be used between the router and PC-B. If using another model Cisco router, it may be necessary to use an Ethernet crossover cable.

1. Set Up Topology and Initialize Devices
   1. Cable the network as shown in the topology.
      1. Attach the devices shown in the topology diagram, and cable, as necessary.

Router and PC are of the same network architecture! Use copper crossover cables. Connection made via GigabitEthernet of Router and FastEthernet of PC.

Switch and PC are of different kinds! Use straight through cables. Connection made via FastEthernet Ports.

Switch and router are of different kinds! Use straight through cables. Connection made via FastEthernet of switch and GigabitEthernet of Router.

* + 1. Power on all the devices in the topology.
  1. Initialize and reload the router and switch.

If configuration files were previously saved on the router and switch, initialize and reload these devices back to their basic configurations.

1. Configure Devices and Verify Connectivity

In Part 2, you will set up the network topology and configure basic settings, such as the interface IP addresses, device access, and passwords. Refer to the Topology and Addressing Table at the beginning of this lab for device names and address information.

* 1. Assign static IP information to the PC interfaces.
     1. Configure the IP address, subnet mask, and default gateway settings on PC-A.

Click on a PC -> Desktop -> IP Configuration: and fill IPv4 address, Subnet Mask, Default Gateway

* + 1. Configure the IP address, subnet mask, and default gateway settings on PC-B.
    2. Ping PC-B from a command prompt window on PC-A.

Click on a PC -> Desktop -> Command Prompt: C:\> ping 192.168.0.3(IPv4 of target)

Why were the pings not successful?

Output: Request timed out.

Because the 1941 Router0, which divides the set-up topology in to two networks is not yet configured.

Default gateway IP addresses we came across before are the Interface IP addresses of the Router that we need to configure.

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* 1. Configure the router.
     1. Console into the router and enable privileged EXEC mode.

Make a connection between a PC and the Router using console cable.

In PC: RS 232 port

In Router: Console Port

Click on PC -> Desktop- >Terminal:

Type “no” to not to enter the initial configuration mode!

Router> enable

* + 1. Enter configuration mode.

Router# configure terminal

* + 1. Assign a device name to the router.

Router(config)# hostname R1 (HOST\_NAME)

* + 1. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.

Why disable? Otherwise, DNS tries to convert everything we input into an IP address! And it get stuck when it cannot find a corresponding IP.

Privilege mode -> SOME\_ WIERED \_SHIT

R1#bimalka98

Translating "bimalka98"...domain server (255.255.255.255) -> THIS WILL RUN UNTIL TIME OUT!

To abort the Lookup: Use Global Escape Sequence for CISCO: CTRL+ ^ (^ IS THE SYMBOL GIVEN BY SHIFT+6)

Disabling DNS Lookup:

Global config Mode-> no ip domain-lookup

R1(config)#no ip domain-lookup

R1(config)#do sdgsgvsdv (EXECUTING PRIVILAGE MODE COMMANDS WITHIN GOBAL CONFIG MODE)

Translating "sdgsgvsdv"

% Unknown command or computer name, or unable to find computer address

* + 1. Assign **class** as the privileged EXEC(to enter the privileged mode[Router Password]) encrypted password.

R1(config)#enable secret class

* + 1. Assign **cisco** as the console password(to enter user execution mode) and enable login.

R1(config)#line console 0

R1(config-line)#password cisco

R1(config-line)#login

R1(config-line)#

* + 1. Assign **cisco** as the VTY password and enable login.

R1(config)#line vty 0 15

R1(config-line)#password cisco

R1(config-line)#login

R1(config-line)#

* + 1. Encrypt the clear text passwords.

Before encrypting let’s see what the clear text passwords in our running configurations are!

R1#show running-config

Building configuration...

!

!

Current configuration : 751 bytes

!

line con 0

password cisco

login

!

line aux 0

!

line vty 0 4

password cisco

login

line vty 5 15

password cisco

login

!

End

Problem is above passwords are in plain text. And therefore visible. Need to encrypt those.

Go to global config mode and type:

R1(config)#service password-encryption

Now see the running config again in privilege mode

R1#show running-config

line con 0

password 7 0822455D0A16

login

!

line aux 0

!

line vty 0 4

password 7 0822455D0A16

login

line vty 5 1

password 7 0822455D0A16

login

!

end

* + 1. Create a banner that warns anyone accessing the device that unauthorized access is prohibited.

R1(config)#banner motd "Unauthorized access is prohibited"

Go back to suer execution mode:

Unauthorized access is prohibited

User Access Verification

Password: CONSOLE\_PASSWORD

R1>enable

Password: PRIVILEGE\_EXEC\_ENCRYPTED\_PASSWORD

R1#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

R1(config)#

* + 1. Configure and activate both interfaces on the router.

R1(config)#interface gigabitEthernet 0/0

R1(config-if)#ip address 192.168.1.1 255.255.255.0

R1(config-if)#no shutdown

R1(config-if)#

%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R1(config)#interface gigabitEthernet 0/1

R1(config-if)#ip address 192.168.0.1 255.255.255.0

R1(config-if)#no shutdown

R1(config-if)#

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

Now all the cables must be in the active mode

To remove IP addresses! In case you set the wrong IP address.

R1(config)#interface gigabitEthernet 0/1

R1(config-if)#no ip address

R1(config-if)#do show ip interface brief

Interface IP-Address OK? Method Status Protocol

GigabitEthernet0/0 unassigned YES manual up up

GigabitEthernet0/1 unassigned YES manual up up

Vlan1 unassigned YES unset administratively down down

R1(config-if)#

* + 1. Configure an interface description for each interface indicating which device is connected to it.

R1(config)#interface gigabitEthernet 0/0

R1(config-if)#description LAN-A

R1(config-if)#exit

R1(config)#interface gigabitEthernet 0/10

%Invalid interface type and number

R1(config)#interface gigabitEthernet 0/1

R1(config-if)#description LAN-B

R1(config-if)#

* + 1. Save the running configuration to the startup configuration file.

R1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

R1#

* + 1. Set the clock on the router.

**Note**: Use the question mark (**?**) to help with the correct sequence of parameters needed to execute this command.

**clock** **timezone** zone hours-offset [minutes-offset] ; To display the system clock, use the **show** **clock** command in EXEC mode

R1#clock set 01:51:00 21 OCT 2021

* + 1. Ping PC-B from a command prompt window on PC-A.

Packet Tracer PC Command Line 1.0

C:\>ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Reply from 192.168.0.1: bytes=32 time=107ms TTL=255

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.0.1:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 107ms, Average = 26ms

C:\>

Were the pings successful? Why?

Ping was successful! Because network is up and running.

1. Display Device Information

In Part 3, you will use **show** commands to retrieve information from the router and switch.

* 1. Retrieve hardware and software information from the network devices.
     1. Use the **show version** command to answer the following questions about the router.

What is the name of the IOS image that the router is running?

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How much DRAM memory does the router have?

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How much NVRAM memory does the router have?

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How much Flash memory does the router have?

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* + 1. Use the **show version** command to answer the following questions about the switch.

What is the name of the IOS image that the switch is running?

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How much dynamic random access memory (DRAM) does the switch have?

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How much nonvolatile random-access memory (NVRAM) does the switch have?

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What is the model number of the switch?

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* 1. Display the routing table on the router.

Use the **show ip route** command on the router to answer the following questions.

What code is used in the routing table to indicate a directly connected network? \_\_\_\_\_

How many route entries are coded with a C code in the routing table? \_\_\_\_\_\_\_\_\_

What interface types are associated to the C coded routes?

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* 1. Display interface information on the router.

Use the **show interface g0/1** to answer the following questions.

What is the operational status of the G0/1 interface?

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What is the Media Access Control (MAC) address of the G0/1 interface?

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How is the Internet address displayed in this command?

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* 1. Display a summary list of the interfaces on the router and switch.

There are several commands that can be used to verify an interface configuration. One of the most useful of these is the **show ip interface brief** command. The command output displays a summary list of the interfaces on the device and provides immediate feedback to the status of each interface.

* + 1. Enter the **show ip interface brief** command on the router.

R1# **show ip interface brief**

Interface IP-Address OK? Method Status Protocol

Embedded-Service-Engine0/0 unassigned YES unset administratively down down

GigabitEthernet0/0 192.168.0.1 YES manual up up

GigabitEthernet0/1 192.168.1.1 YES manual up up

Serial0/0/0 unassigned YES unset administratively down down

Serial0/0/1 unassigned YES unset administratively down down

R1#

* + 1. Enter the **show ip interface brief** command on the switch.

Switch# **show ip interface brief**

Interface IP-Address OK? Method Status Protocol

Vlan1 unassigned YES manual up up

FastEthernet0/1 unassigned YES unset down down

FastEthernet0/2 unassigned YES unset down down

FastEthernet0/3 unassigned YES unset down down

FastEthernet0/4 unassigned YES unset down down

FastEthernet0/5 unassigned YES unset up up

FastEthernet0/6 unassigned YES unset up up

FastEthernet0/7 unassigned YES unset down down

FastEthernet0/8 unassigned YES unset down down

FastEthernet0/9 unassigned YES unset down down

FastEthernet0/10 unassigned YES unset down down

FastEthernet0/11 unassigned YES unset down down

FastEthernet0/12 unassigned YES unset down down

FastEthernet0/13 unassigned YES unset down down

FastEthernet0/14 unassigned YES unset down down

FastEthernet0/15 unassigned YES unset down down

FastEthernet0/16 unassigned YES unset down down

FastEthernet0/17 unassigned YES unset down down

FastEthernet0/18 unassigned YES unset down down

FastEthernet0/19 unassigned YES unset down down

FastEthernet0/20 unassigned YES unset down down

FastEthernet0/21 unassigned YES unset down down

FastEthernet0/22 unassigned YES unset down down

FastEthernet0/23 unassigned YES unset down down

FastEthernet0/24 unassigned YES unset down down

GigabitEthernet0/1 unassigned YES unset down down

GigabitEthernet0/2 unassigned YES unset down down

Switch#

1. Reflection
   1. If the G0/1 interface showed administratively down, what interface configuration command would you use to turn the interface up?

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* 1. What would happen if you had incorrectly configured interface G0/1 on the router with an IP address of 192.168.1.2?

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1. Router Interface Summary Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Router Interface Summary | | | | |
| Router Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
| 1800 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 1900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2801 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |
| 2811 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| **Note**: To find out how the router is configured, look at the interfaces to identify the router type and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface. | | | | |