Lab – Build a Switch Router Network

Topology
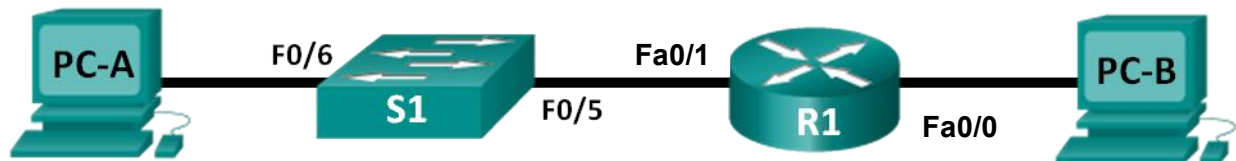
Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.0.1	255.255.255.0	N/A
	Fa0/1	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

Objectives

Part 1: Set Up the Topology and Initialize Devices

- Cable equipment to match the network topology.
- Initialize and restart the router and switch.

Part 2: Configure Devices and Verify Connectivity

- Assign static IPv4 information to the PC interfaces.
- Configure basic router settings.
- Verify network connectivity.

Part 3: Show router information

Background / Scenario

This is a comprehensive lab to review previously covered IOS router commands. In Parts 1 and 2, you will cable the equipment and complete basic configurations and IPv4 interface settings on the router.

In Part 3, you will configure a single area OSPF on the router.

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, Vista, or XP 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

Part 1:   Set Up the Topology and Initialize Devices

Step 1:   Cable the network as shown in the topology.

a. Attach the devices as shown in the topology diagram, and cable as necessary.

b. Power on all the devices in the topology.

Step 2:   Initialize and reload the router and switch.

Note: Appendix A details the steps to initialize and reload the devices.

Part 2:   Configure Devices and Verify Connectivity

Step 1:   Configure the PC interfaces.

a. Configure the IP address, subnet mask, and default gateway settings on PC-A.

b. Configure the IP address, subnet mask, and default gateway settings on PC-B.

c. Ping PC-B from a command prompt window on PC-A.

Why were the pings not successful?

_____

The router interfaces (default gateways) have not been configured yet so Layer 3 traffic is not being routed between subnets.

Step 2:   Configure the router.

a. Console into the router and enable privileged EXEC mode.

```
Router> enable
Router#
```

b. Enter into global configuration mode.

```
Router# config terminal
Router(config)#
```

c. Assign a device name to the router.

```
Router(config)# hostname R1
```

d. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were hostnames.

```
R1(config)# no ip domain-lookup
```

e. Assign **cisco** as the privileged EXEC encrypted password.

```
R1(config)# enable secret cisco
```

f. Assign **ciscoconpass** as the console password, establish a timeout, enable login, and add the **logging synchronous** command. The **logging synchronous** command synchronizes debug and Cisco IOS software output and prevents these messages from interrupting your keyboard input.

```
R1(config)# line con 0
R1(config-line)# password ciscoconpass
R1(config-line)# exec-timeout 5 0
R1(config-line)# login
R1(config-line)# logging synchronous
```

```
R1(config-line)# exit
R1(config)#
```

For the **exec-timeout** command, what do the **5** and **0** represent?

_____

g. Encrypt the clear text passwords.

```
R1(config)# service password-encryption
```

h. Create a banner that warns anyone accessing the device that unauthorized access is prohibited.

```
R1(config)# banner motd #Unauthorized access prohibited!#
```

i. Configure an IP address and interface description. Activate both interfaces on the router.

```
R1(config)# int fa0/0
R1(config-if)# description Connection to PC-B
R1(config-if)# ip address 192.168.0.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# int fa0/1
R1(config-if)# description Connection to S1
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# exit
R1#
```

j. Set the clock on the router; for example:

```
R1# clock set 17:00:00 18 Feb 2013
```

k. Save the running configuration to the startup configuration file.

```
R1# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

What would be the result of reloading the router prior to completing the **copy running-config startup-config** command?

_____

_____

Step 3: Verify network connectivity.

a. Ping PC-B from a command prompt on PC-A.

Note: It may be necessary to disable the PCs firewall.

Were the pings successful and why? _____

Part 3: Show Router Information

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

Step 1: Display the routing table on the router.

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

```
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.0/24 is directly connected, FastEthernet0/0
L        192.168.0.1/32 is directly connected, FastEthernet0/0
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, FastEthernet0/1
L        192.168.1.1/32 is directly connected, FastEthernet0/1
```

What do codes "C" and "L" mean? _____

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

Step 2: Display interface information on the router.

Use the **show interface fa0/1** to answer the following questions.

```
R1# show interfaces fa0/1
FastEthernet0/1 is up, line protocol is up
  Hardware is CN Fast Ethernet, address is fc99.4775.c3e1 (bia fc99.4775.c3e1)
  Internet address is 192.168.1.1/24
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full Duplex, 100Mbps, media type is RJ45
  output flow-control is unsupported, input flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:06, output 00:00:04, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     17 packets input, 5409 bytes, 0 no buffer
     Received 17 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
```

```
            0 watchdog, 13 multicast, 0 pause input
        14 packets output, 1743 bytes, 0 underruns
        0 output errors, 0 collisions, 1 interface resets
        3 unknown protocol drops
        0 babbles, 0 late collision, 0 deferred
        0 lost carrier, 0 no carrier, 0 pause output
        0 output buffer failures, 0 output buffers swapped out
```

What is the operational status of the Fa0/1 interface?

_____

FastEthernet0/1 is up, line protocol is up

What is the Media Access Control (MAC) address of the Fa0/1 interface?

_____

Answers will vary but will appear in the form of: xxxx.xxxx.xxxx, where each x will be replaced with a hexadecimal number.

How is the Internet address displayed in this command?

_____

Internet address is 192.168.1.1/24.

Step 3: 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.

a. 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
FastEthernet0/0            192.168.0.1     YES manual up                     up
FastEthernet0/1            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#
```

b. 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#
```

Reflection

1. If the Fa0/1 interface showed administratively down, what interface configuration command would you use to turn the interface up?

    _____

    R1(config-if)# **no shut**

2. What would happen if you had incorrectly configured interface Fa0/1 on the router with an IP address of 192.168.1.2?

    _____

    _____

    PC-A would not be able to ping PC-B. This is because PC-B is on a different network than PC-A which requires the default-gateway router to route these packets. PC-A is configured to use the IP address of 192.168.1.1 for the default-gateway router, but this address is not assigned to any device on the LAN. Any packets that need to be sent to the default-gateway for routing will never reach their destination.

Appendix A: Initializing and Reloading a Router and Switch

Step 1: Initialize and reload the router.

a. Console into the router and enable privileged EXEC mode.

```
Router> enable
Router#
```

b. Type the **erase startup-config** command to remove the startup configuration from NVRAM.

```
Router# erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
[OK]
Erase of nvram: complete
Router#
```

c. Issue the **reload** command to remove an old configuration from memory. When prompted to **Proceed with reload**, press Enter to confirm the reload. (Pressing any other key aborts the reload.)

```
Router# reload
Proceed with reload? [confirm]
*Nov 29 18:28:09.923: %SYS-5-RELOAD: Reload requested by console. Reload Reason:
Reload Command.
```

Note: You may be prompted to save the running configuration prior to reloading the router. Type **no** and press Enter.

```
System configuration has been modified. Save? [yes/no]: no
```

d. After the router reloads, you are prompted to enter the initial configuration dialog. Enter **no** and press Enter.

```
Would you like to enter the initial configuration dialog? [yes/no]: no
```

e. You are prompted to terminate autoinstall. Type **yes** and then press Enter.

```
Would you like to terminate autoinstall? [yes]: yes
```

Step 2: Initialize and reload the switch.

a. Console into the switch and enter privileged EXEC mode.

```
Switch> enable
Switch#
```

b. Use the **show flash** command to determine if any VLANs have been created on the switch.

```
Switch# show flash
Directory of flash:/

    2  -rwx        1919   Mar 1 1993 00:06:33 +00:00  private-config.text
    3  -rwx        1632   Mar 1 1993 00:06:33 +00:00  config.text
    4  -rwx       13336   Mar 1 1993 00:06:33 +00:00  multiple-fs
    5  -rwx    11607161   Mar 1 1993 02:37:06 +00:00  c2960-lanbasek9-mz.150-2.SE.bin
    6  -rwx         616   Mar 1 1993 00:07:13 +00:00  vlan.dat

32514048 bytes total (20886528 bytes free)
Switch#
```

c. If the **vlan.dat** file was found in flash, then delete this file.

```
Switch# delete vlan.dat
Delete filename [vlan.dat]?
```

d. You are prompted to verify the filename. At this point, you can change the filename or just press Enter if you have entered the name correctly.

e. You are prompted to confirm deleting this file. Press Enter to confirm deletion. (Pressing any other key aborts the deletion.)

```
Delete flash:/vlan.dat? [confirm]
Switch#
```

f. Use the **erase startup-config** command to erase the startup configuration file from NVRAM. You are prompted to confirm removing the configuration file. Press Enter to confirm to erase this file. (Pressing any other key aborts the operation.)

```
Switch# erase startup-config
```

```
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
[OK]
Erase of nvram: complete
Switch#
```

g. Reload the switch to remove any old configuration information from memory. You are prompted to confirm reloading the switch. Press Enter to proceed with the reload. (Pressing any other key aborts the reload.)

```
Switch# reload
Proceed with reload? [confirm]
```

Note: You may be prompted to save the running configuration prior to reloading the switch. Type **no** and press Enter.

```
System configuration has been modified. Save? [yes/no]: no
```

h. After the switch reloads, you should be prompted to enter the initial configuration dialog. Type **no** and press Enter.

```
Would you like to enter the initial configuration dialog? [yes/no]: no
Switch>
```