Lab - Building a Switch and Router Network
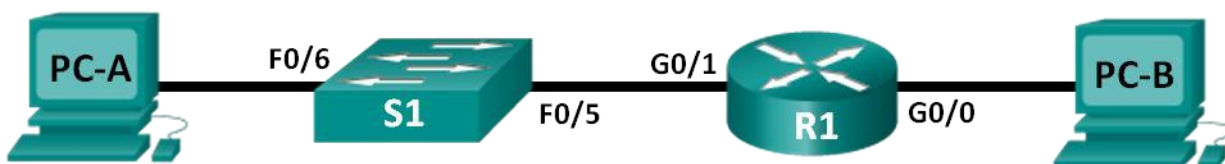
Topology

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
S1	VLAN 1	N/A	N/A	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

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

Part 2: Configure Devices and Verify Connectivity

- Assign static IP information to the PC interfaces.
- Configure the router.
- Verify network connectivity.

Part 3: Display Device Information

- Retrieve hardware and software information from the network devices.
- Interpret the output from the routing table.
- Display interface information on the router.
- Display a summary list of the interfaces on the router and switch.

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. However, the required commands are provided in Appendix A. Test your knowledge by trying to configure the devices without referring to the appendix.

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. Refer to Appendix B for the procedure to initialize and reload a router and switch.

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

Note: The Gigabit Ethernet interfaces on Cisco 1941 routers are autosensing and an Ethernet straightthrough 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.

Part 1: Set Up Topology and Initialize Devices

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

a. Attach the devices 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.

If configuration files were previously saved on the router and switch, initialize and reload these devices back to their basic configurations. For information on how to initialize and reload these devices, refer to Appendix B.

Part 2: 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.

Note: Appendix A provides configuration details for the steps in Part 2. You should attempt to complete Part 2 prior to reviewing this appendix.

Step 1: Assign static IP information to 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?

Er is nog geen route ingesteld door de default gateway.

Step 2: Configure the router.

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

b. Enter configuration mode.

c. Assign a device name to the router.

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

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

f. Assign **cisco** as the console password and enable login.

g. Assign **cisco** as the VTY password and enable login.

h. Encrypt the clear text passwords.

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

j. Configure and activate both interfaces on the router.

k. Configure an interface description for each interface indicating which device is connected to it.

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

m. Set the clock on the router.

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

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

Were the pings successful? Why?

Part 3: Display Device Information

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

Step 1: Retrieve hardware and software information from the network devices.

a. 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?

C1900-UNIVERSALK9-M

How much DRAM memory does the router have?

32768K bytes

How much NVRAM memory does the router have?

255k bytes

How much Flash memory does the router have?

249856k bytes

b. 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?

C2960-Lanbase-M

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

64bits

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

63488K bytes

What is the model number of the switch?

WS-C2960-24TT

Step 2: 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?

Connected routes

Step 3: 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?

Administratively down, line protocol is down

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

0005.5e1b.db02

How is the Internet address displayed in this command?

Internet address is 192.168.1.1/24

Step 4: 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
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#
```

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

   No shutdown

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

   Hij kent de juiste interface niet, hierdoor kunnen ze niet communiceren met elkaar.

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.
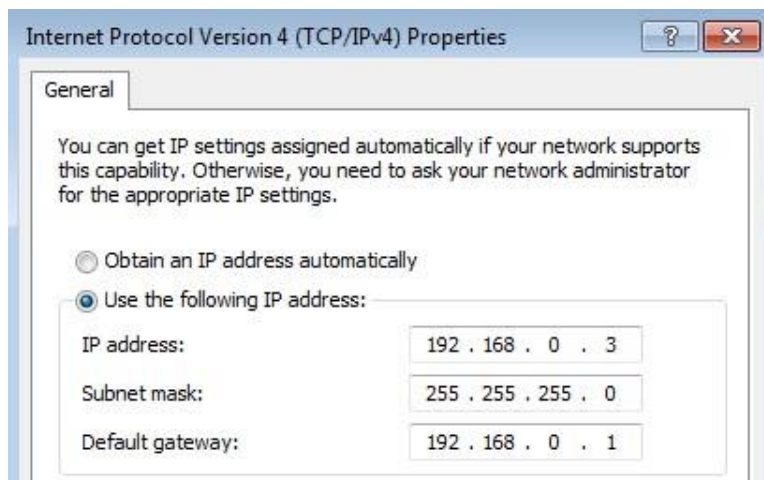
Appendix A: Configuration Details for Steps in Part 2

Step 1: Configure the PC interfaces.

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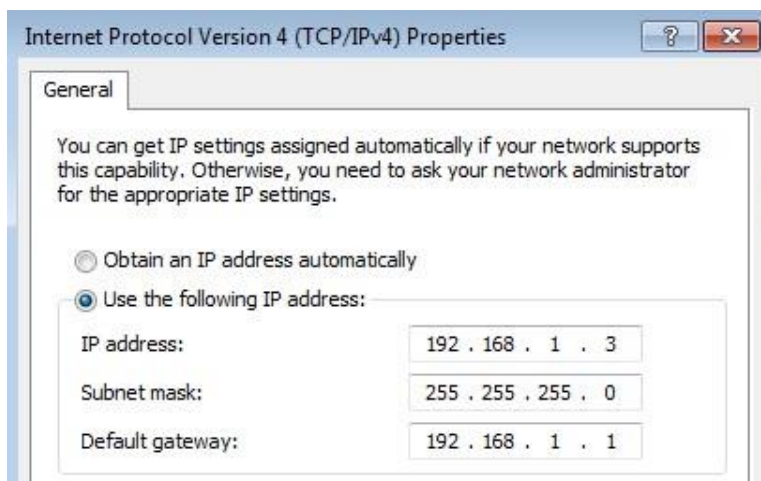
b. Configure the IP address, subnet mask, and default gateway settings on PC-B.

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

```
C:\>ping 192.168.0.3

Pinging 192.168.0.3 with 32 bytes of data:
Reply from 192.168.1.3: Destination host unreachable.
Reply from 192.168.1.3: Destination host unreachable.
Reply from 192.168.1.3: Destination host unreachable.
Reply from 192.168.1.3: Destination host unreachable.

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

C:\>
```

Step 2: Configure the router.

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

```
Router> enable
Router#
```

b. Enter configuration mode.

```
Router# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
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 host names.

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

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

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

f. Assign **cisco** as the console password and enable login.

```
R1(config)# line con 0
R1(config-line)# password cisco
R1(config-line)# login
```

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

g. Assign **cisco** as the vty password and enable login.

```
R1(config)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# exit
R1(config)#
```

h. Encrypt the clear text passwords.

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

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

```
R1(config)# banner motd #
Enter TEXT message.  End with the character '#'.
  Unauthorized access prohibited!
#
R1(config)#
```

j. Configure and activate both interfaces on the router.

```
R1(config)# int g0/0
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 shut
R1(config-if)#
*Nov 29 23:49:44.195: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to
down
*Nov 29 23:49:47.863: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to
up
*Nov 29 23:49:48.863: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0, changed state to up
R1(config-if)# int g0/1
R1(config-if)# description Connection to S1.
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shut
R1(config-if)# exit
R1(config)# exit
*Nov 29 23:50:15.283: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to
down
*Nov 29 23:50:18.863: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to
up
*Nov 29 23:50:19.863: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/1, changed state to up
R1#
```

k. Save the running configuration to the startup file.

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

```
[OK]
R1#
```

l. Set the clock on the router.
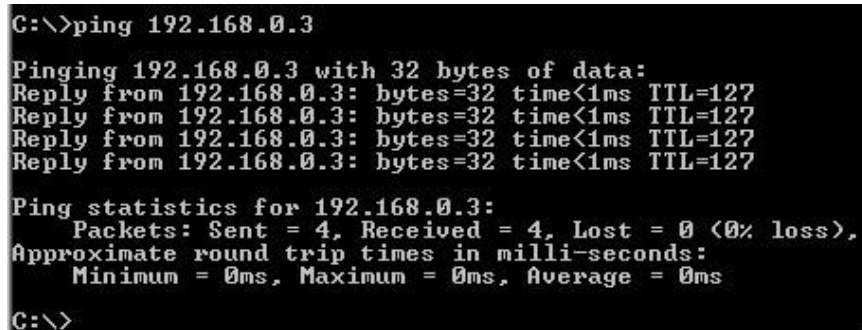
```
R1# clock set 17:00:00 29 Nov 2012
R1#
*Nov 29 17:00:00.000: %SYS-6-CLOCKUPDATE: System clock has been updated from 23:55:46
UTC Thu Nov 29 2012 to 17:00:00 UTC Thu Nov 29 2012, configured from console by
console.
R1#
```

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

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

```
C:\>ping 192.168.0.3

Pinging 192.168.0.3 with 32 bytes of data:
Reply from 192.168.0.3: bytes=32 time<1ms TTL=127
Reply from 192.168.0.3: bytes=32 time<1ms TTL=127
Reply from 192.168.0.3: bytes=32 time<1ms TTL=127
Reply from 192.168.0.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Appendix B: Initializing and Reloading a Router and Switch Part

1: Initialize the Router and Reload

Step 1: Connect to the router.

Console into the router and enter privileged EXEC mode using the **enable** command.

```
Router> enable Router#
```

Step 2: Erase the startup configuration file from NVRAM.

Type the **erase startup-config** command to remove the startup configuration from nonvolatile randomaccess memory (NVRAM).

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

Step 3: Reload the router.

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 will abort 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 receive a prompt to save the running configuration prior to reloading the router. Respond by typing **no** and press Enter.

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

4: Bypass the initial configuration dialog.

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 Step
```

5: Terminate the autoinstall program.

You will be prompted to terminate the autoinstall program. Respond **yes** and then press Enter.

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

Part 2: Initialize the Switch and Reload

Step 1: Connect to the switch.

Console into the switch and enter privileged EXEC mode.

```
Switch> enable
Switch#
```

Step 2: Determine if there have been any virtual local-area networks (VLANs) created.

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#
```

Step 3: Delete the VLAN file.

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

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

You will be prompted to verify the file name. At this point, you can change the file name or just press Enter if you have entered the name correctly.

b. When you are prompted to delete this file, press Enter to confirm the deletion. (Pressing any other key
    will abort the deletion.)

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

Step 4: Erase the startup configuration file.

Use the **erase startup-config** command to erase the startup configuration file from NVRAM. When you are
prompted to remove the configuration file, press Enter to confirm the erase. (Pressing any other key will abort
the operation.)

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

Step 5: Reload the switch.

Reload the switch to remove any old configuration information from memory. When you are prompted to
reload the switch, press Enter to proceed with the reload. (Pressing any other key will abort the reload.)

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

Note: You may receive a prompt to save the running configuration prior to reloading the switch. Type **no**
and press Enter.

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

6: Bypass the initial configuration dialog.

After the switch reloads, you should see a prompt to enter the initial configuration dialog. Type **no** at the
prompt and press Enter.

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