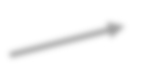
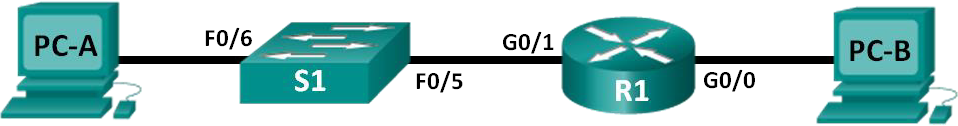


**Lab - Building a Switch and Router Network**

**Reminder**:

* 1. Download Week4-Topic-Outline-and-Highlights slides as you will need to refer to the slides while doing the lab.
  2. While following the steps below, type your answers to all the questions asked directly into this word document and remember to save it.
  3. After having finished the steps up to a checkpoint, ask your practical supervisor to check your work.

**Topology**



console cable

console cable

**Addressing Table**

straight-through cable straight-through cable

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 |

**Objectives**

###### Part 1: Set Up the Topology and Initialize Devices Part 2: Configure Devices and Verify Connectivity Part 3: Display Device Information

**Background / Scenario**

In this lab, you will build a switch and router network. 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 done, 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.

**Note**: Ensure that the routers and switches have been erased and have no startup configurations. Refer to Appendix A 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 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.

## Set Up Topology and Initialize Devices

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

**a.** Cable the network according to the topology. Use the switch and router interfaces as indicated in the topology diagram.

##### Step 2: Initialize and reload the router and switch.

**NOTE**: **PC-A** will console into the **switch**, **PC-B** will console into the **router**

1. IF NECESSARY, Initialize and reload the **router and switch** back to their basic configurations. For information on how to initialize and reload these devices, refer to **Appendix A.**
2. After you have connected the console cables, open Tera Term and use the **show running-config** to confirm that the initialization and reloading have been done successfully. (Look to see if the router or switch names have been changed from the default ones, also check if any interfaces have been configured with IP addresses, and also check if passwords have been set. Any of these will indicate that you need to do the initialize step

###### Notes:

* 1. You will need to console into the router and switch in order to initialize and reload them respectively.
  2. If you are prompted to enter a password, try **cisco** or **class. If you cannot access the device please ask for help**

**Checkpoint: display the Tera Term window on the switch and the router, and then ask your supervisor to check your cable connections.**

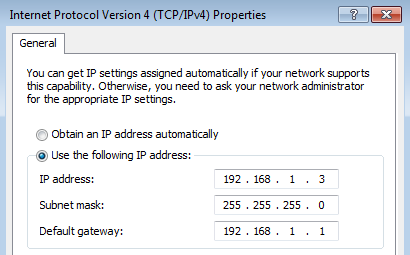
## Configure Devices and Verify Connectivity

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 beginning of this lab for device names and address information.

##### Step 1: Assign static IP information to the PC interfaces.

You have previously configured IP addresses on the PCs in week 6’s practical, so this step is done in the same way, except that you will now also configure the “default gateway” for each PC.

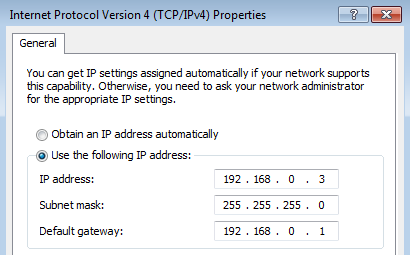
1. Configure the IP address, subnet mask, and default gateway settings on PC-A.

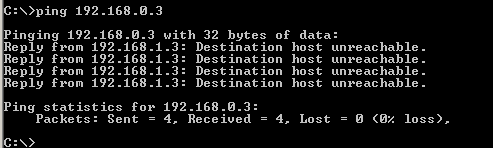


1. Configure the IP address, subnet mask, and default gateway settings on PC-B.

**NOTE**: The IP

addresses for PC-A and PC-B are from different networks, so take care when entering them



1. **On PC-A**, open the **cmd** prompt and **ping the IP address of PC-B** (to open the cmd prompt, in the Search Windows box at the left bottom of the screen, type in **cmd**, press Enter)

Why were the pings **not** successful?

##### Step 2: Configure the router with basic settings

**Note:** Configuring the basic settings of a router is similar to configuring a switch, but some commands are different, so read carefully. Please also note that **the switch is NOT to be configured in this lab**

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

Router> **enable**

Router#

* 1. Enter configuration mode.

Router# **conf t**

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

Router(config)#

* 1. Assign a device name to the router.

Router(config)# **hostname R1**

* 1. 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**

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

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

* 1. 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)#

* 1. 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)#

* 1. Encrypt the clear text passwords.

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

* 1. 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)#

**Step 3. Configure and activate both interfaces on the router**

1. Use the **show ip interface brief** command to determine the interface types and names on the router

**To configure these interfaces you will need to know what they are called**. On a Cisco router, normally there are two types of network interfaces, Ethernet interfaces and Serial interfaces.

Depending on the model of the router you are using, the name of an Ethernet interface can start with the letter G (for gigabit Ethernet interface) or Fa (for fast Ethernet interface). For example, when a router has two Gigabit Ethernet interfaces, the names of the interfaces could be GigabitEthernet0/0 and GigabitEthernet0/1 respectively (G0/0 and G0/1 for short), and when a router has two fast Ethernet interfaces, the names of the two interfaces could be FastEthernet0/0 and FastEthernet0/1 respectively (Fa0/0 and Fa0/1 for short),

The name of a serial interface normally starts with the letter S, e.g. S0/0/0 or S0/0/1.

For this lab, you will only work with Ethernet interfaces, and please note that the names are NOT case sensitive, so for example, either G0/0 or g0/0 will be accepted.

Router# **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. For **each** interface, configure its description (indicating which device is connected to it) and its IP address, and activate the interface.

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 shutdown**

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 shutdown**

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

1. On PC-A, open the cmd prompt and ping PC-B.

The ping should be successful (if not, check your connection and configuration on the router and the PCs) Why do you think the Ping is now successful whereas at Part 2 Step 1c the Ping was not successful?

## Display Device Information

In Part 3, you will use **show** commands to retrieve information from the **router and switch.** Recall that the show commands must be issued from the privileged mode: **Router# or Switch#** Refer to week 6 lecture slides to help you answer questions in this section.

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

1. **ON THE ROUTER**: Use the **show version** command to answer the following questions.
   1. What is the name of the IOS image that the router is running?
   2. How much DRAM memory does the router have?
   3. How much NVRAM memory does the router have?
   4. How much Flash memory does the router have?
2. **ON THE SWITCH**: Use the **show version** command to answer the following questions.
   1. What is the name of the IOS image that the switch is running?
   2. How much dynamic random access memory (DRAM) does the switch have?
   3. How much nonvolatile random-access memory (NVRAM) does the switch have?
   4. What is the model number of the switch?

##### Step 2: ON THE ROUTER: Display the routing table on the router.

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

1. What code is used in the routing table to indicate a directly connected network?
2. How many route entries are coded with a C code in the routing table?
3. What interface types are associated to the C coded routes?

##### Step 3: ON THE ROUTER: Display interface information on the router.

Use the **show interface G0/1** to answer the following questions.

1. What is the operational status of the G0/1 interface?
2. What is the Media Access Control (MAC) address of the G0/1 interface? \_
3. How is the Internet address displayed in this command?

##### 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.

1. **ON THE ROUTER**: enter the **show ip interface brief** command.

###### R1# show ip interface brief

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Interface  Embedded-Service-Engine0/0 | IP-Address  unassigned | OK?  YES | Method  unset | Status  administratively | down | Protocol  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# |  |  |  |  |  |  |

Which interfaces are Up

1. **ON THE SWITCH** , enter the **show ip interface brief** command.

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 |
| ……  …….  ………… |  |  |  |  |  |
| FastEthernet0/23 | 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# |  |  |  |  |  |

Which interfaces are Up

**Checkpoint: BEFORE you proceed to the next lab please leave the terminal windows open on PC-A and PC-B with the last commands showing (i.e. those commands above) and ask your supervisor to check your screens.**

# Appendix A: 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 random-access 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>

## 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.

1. 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.

1. 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>