Name: ______________________________ Lab Time: ____________________

IT: Network: Cisco 1
Lab 7 – Network Layer

Scenario

In this lab, you will have the opportunity to configure a network environment using the Cisco Packet Tracer program.

Topology

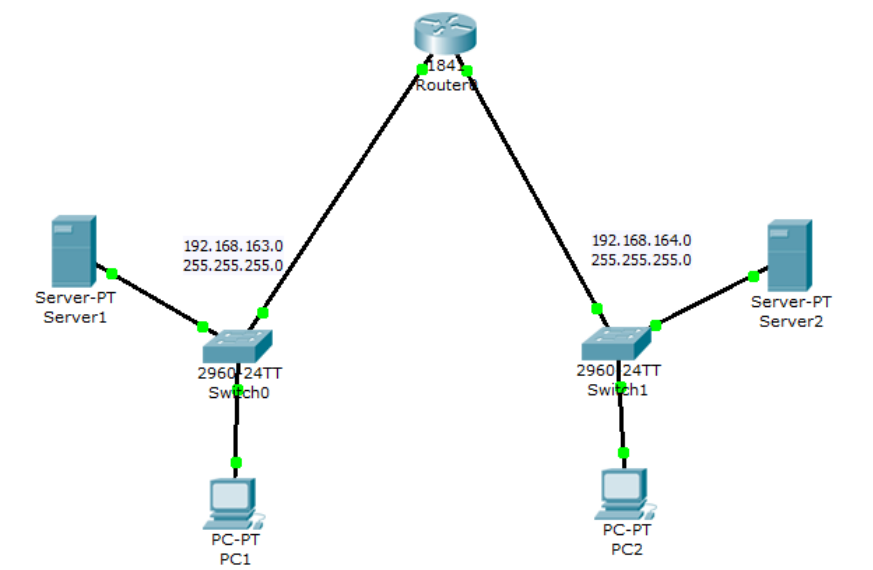


Figure 1: Topology

Address Table

Machine	Interface	IP Address	Subnet mask	Gateway
Server1	FastEthernet	192.168.163.10	255.255.255.0	192.168.163.1
PC1	FastEthernet	192.168.163.100	255.255.255.0	192.168.163.1
Server2	FastEthernet	192.168.164.10	255.255.255.0	192.168.164.1
PC2	FastEthernet	192.168.164.100	255.255.255.0	192.168.164.1
Router1	FastEthernet0/0	192.168.163.1	255.255.255.0	
	FastEthernet0/1	192.168.164.1	255.255.255.0	

Table 1: Address Table

Objectives

- Configure end-node network information using a GUI
- Configure router network information using a GUI
- Explore routing tables
- Understand the use of Ethernet and IP addresses in a routed environment

Task 1: Obtain and open the Packet Tracer data file

To make the lab manageable, the basic Packet Tracer configuration has been provided in a file on the instructor's web site. You will need to download the file onto your local workstation.

1. Open a web browser and navigate to http://network.nwtc.edu/afencl/Cisco1/
2. In the **Labs** section, right-click the link for the **C1Lab7DataFile.pkt** and select **Save target as…**
3. In the Save As dialog, select **Desktop** and click **Save.**
4. Confirm that the file is saved on your desktop. Note that the pkt extension may not be shown by default.
5. Double click on the Lab7DataFile on your desktop. Packet Tracer should start and open the file. You should see a screen similar to the Topology shown on Page 1.

Task 2: Configure static IP information for end nodes using a GUI

While the file provided has the various end-nodes, switches, and router defined and connected, the end-nodes and router need to be configured for network access. The router will be configured in the next task. Each device in a network must have its own unique IP address. These addresses could come automatically from a DHCP server or could be "statically" assigned by the operator/administrator. Due to the relatively small number of devices in our simulation, we will statically assign the IP information. This will include an IP address, a subnet mask and a default router or gateway on each machine.

1. In the Packet Tracer window, click on the icon for **Server 1**. In the Server1 screen that opens, click on the **Config** tab:

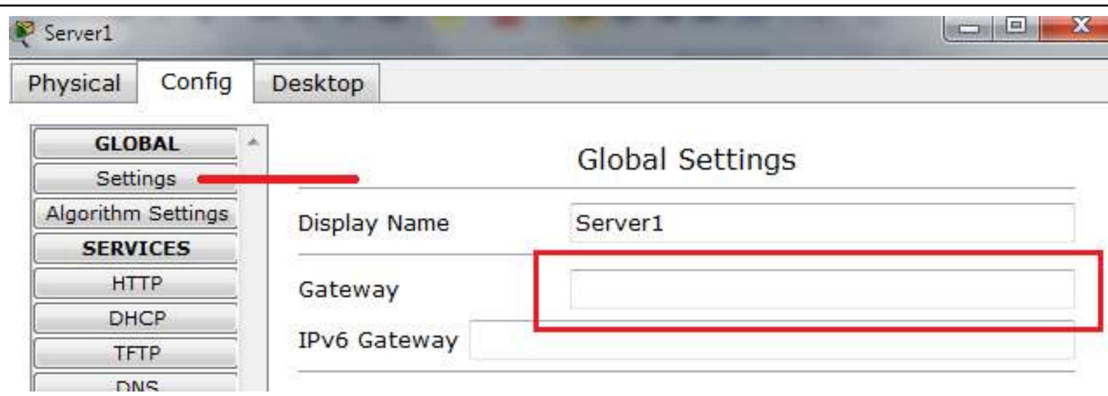


Figure 2: Server Network Settings

2. In the **Config** tab for Server1, click on the **Settings** button (as shown above). In this window you can specify the default Gateway for the end-node. Use the information in the Addressing table on Page 1 to fill in the Router for Server1.
3. Still in the Server1 Config tab, click the button for the FastEthernet interface:

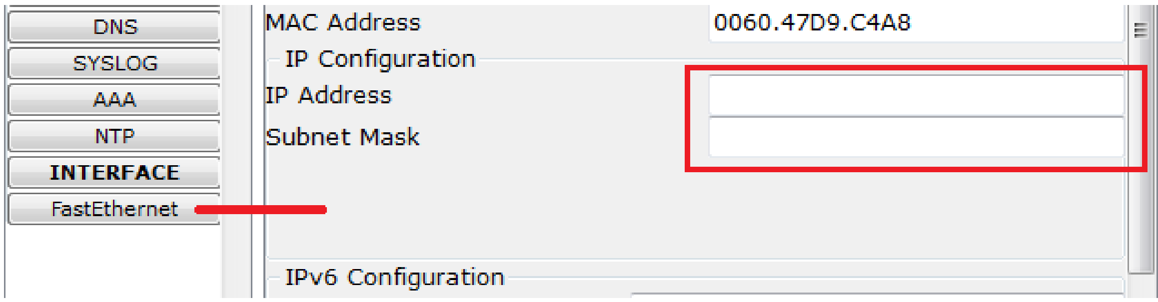


Figure 3: Server FastEthernet Settings

   As seen in Figure 3, in this window, you can configure the settings for the Ethernet card for Server 1. Use the Addressing table on Page 1 to fill in the IP address and subnet mask for Server1.
4. Close the Server1 dialog box by clicking the **X** in the upper right corner of the window.
5. Repeat Steps 1-4 above for PC1, Server2, and PC2. Each machine will be configured with an IP address, a subnet mask, and a default gateway; this information is given in Table 1on Page 1.
6. If desired, you may save your changes to the Packet Tracer data file.

Why do the IP Address for Server 1 and the IP Address for its configured Default Gateway need to have the same first three octets?

Why do the IP Address for Server 1 and the IP Address for Server 2 have different numbers in at least one of the first three octets?

Task 3: Configure IP information for a router using a GUI

In this task, you will configure the IP information for the two network interfaces of the router in our simulation.

1. In the Packet Tracer window, click on the icon for **Router 0**. In the Router 0 screen that opens, click on the **Config** tab.

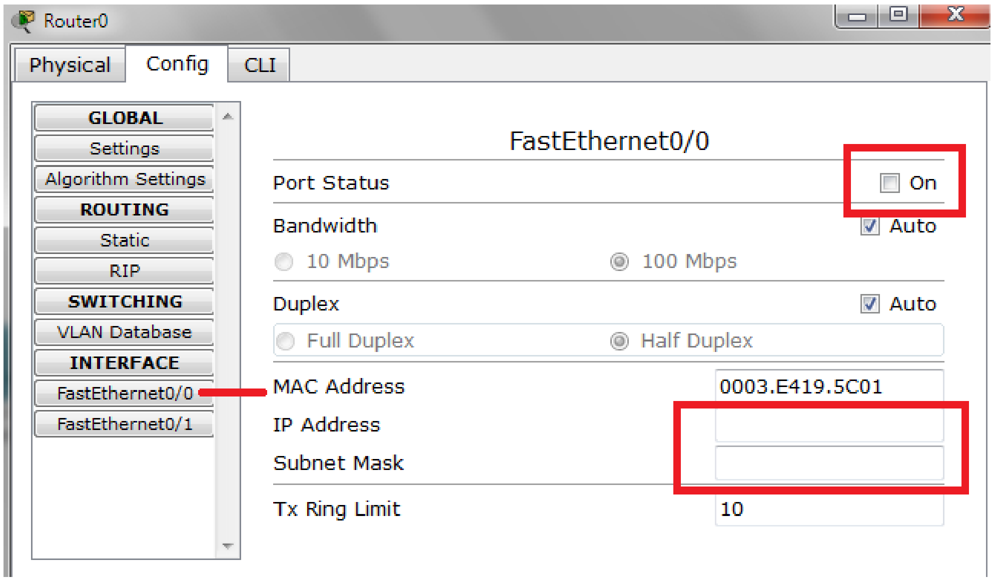


Figure 4: Router 0 FastEthernet config

2. Click the **FastEthernet0/0** button as shown in Figure 4 above. In this screen you can configure both the IP address and subnet mask for the first Ethernet interface for Router0. Use the Addressing Table on Page 1 to fill in the correct address for FastEthernet0/0.
3. To activate the network interface on the router, click in the box next to the **Port Statu**s of **On** in the upper right corner of the screen.
4. Repeat Steps 2 and 3 for the **FastEthernet0/1** network interface on Router0 using the address information found in Table 1on Page 1.
5. Close the Router0 dialog by clicking the **X** in the upper-right corner of the window.

Why does a router (such as Router0) have two different IP addresses?

Should the first three octets of the IP addresses assigned the two interfaces on Router0 be the same or different? Why or why not?

Task 4: Test the routed environment using ping

In this task you will use the **ping** program to test the connectivity in your simulated network environment.

1. In the main Packet Tracer window, click the icon for **PC1**. In the PC1 dialog box, click the **Desktop** tab and then click on the **Command Prompt** icon. A simulated Windows command prompt should appear.
2. At the command prompt, type **ipconfig** and ***record the network configuration of PC1*** below:

```
IP Address:
Subnet Mask:
Default Gateway:
```

3. At the command prompt of PC1, use the **ping** command to send ping requests to the local **PC1** address (e.g., **`ping 192.168.163.100`**) – Yes, you're pinging yourself. ***What is the result of the command (e.g., did the ping succeed)***:

4. At the command prompt of PC1, use the **ping** command to send ping requests to **Server1** and the **FastEthernet0/0** interface of **Router0** (use the Addressing Table if you need to recall the addresses for these interfaces). ***What is the result of these commands (e.g., did the ping succeed):***

```
Server1:


Router0-FastEthernet0/0:
```

5. At the command prompt of PC1, use the ping command to check connectivity to **192.168.164.1** (the address assigned to the **FastEthernet0/1** interface on Router0). ***Does this ping work***? (Hint: it should.)

   How was PC1 able to communicate with the interface on the router that is in the other network?

6. Test connectivity to **Server2** and **PC2** from the command prompt of PC1 – obtain the IP addresses from the Addressing table on page 1. If you get a "Request timed out" message, try the ping again – it should work the second time.

Indicate the path you would anticipate a packet to take when traveling from PC1 to Server2 by drawing the path on the topology in Figure 5.

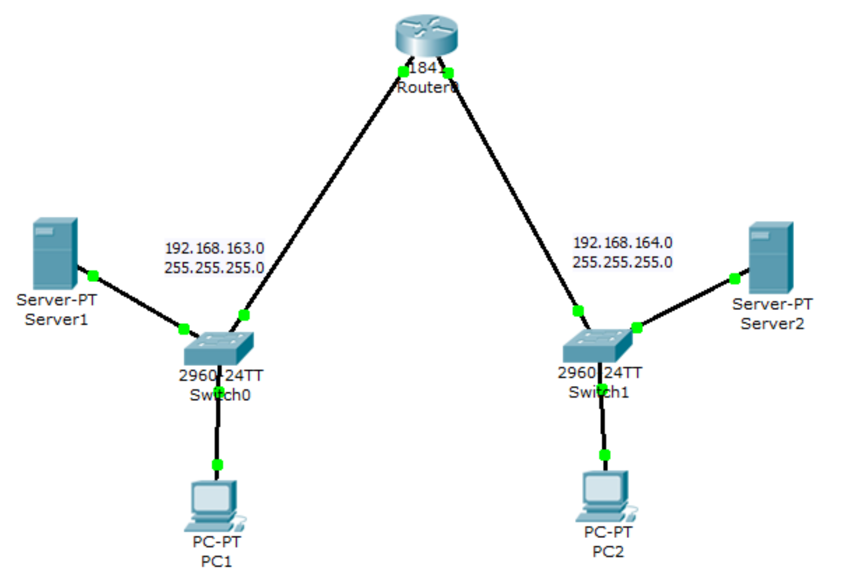


Figure 5: Trace the path taken from PC1 to Server2

7. Close the PC1 dialog box (click the **X** in the upper-right corner).
8. In the main Packet Tracer window, click on the icon for **Router0**. In the Router0 window, click the **CLI** tab. (Note: CLI stands for Command Line Interface.)
9. If you ***don't*** see a message saying "Press RETURN to get started", click in the CLI window then type **exit** and hit **Enter**. Repeat this until you do see that message.
10. Hit **Enter** to get to the router prompt ("Router>").
11. At the **Router>** prompt, type `show ip route`. This will display the routing table on Router0. The output of this command starts with a list of "Codes", the "Gateway of last resort", and finally the actual routing table. ***Record the routing table seen from Router0 below*** (there should be **two** entries – you can ignore the definition of the codes that are displayed):

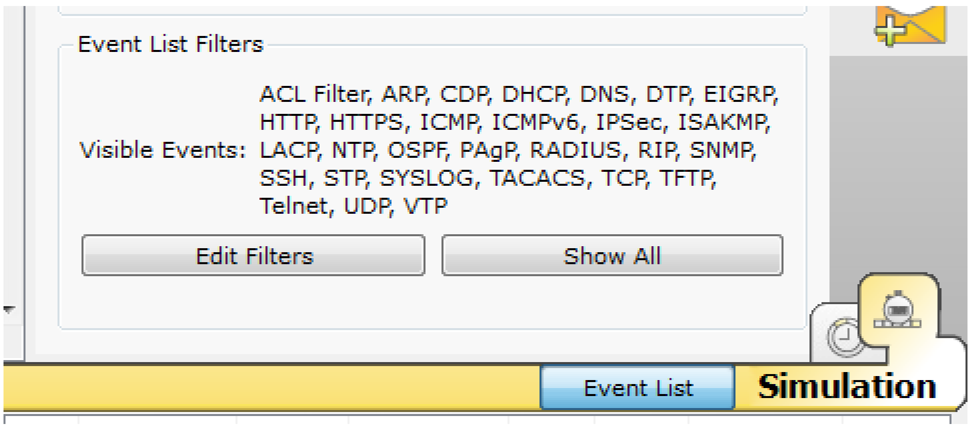
12. At the Router> prompt, type **ping 192.168.163.100**. Five packets will be sent out. ***<u>What character does the Cisco router CLI use to represent each of the five successful ping packets</u>***?

13. Close the Router0 dialog box by clicking the **<u>X</u>** in the upper-right corner.

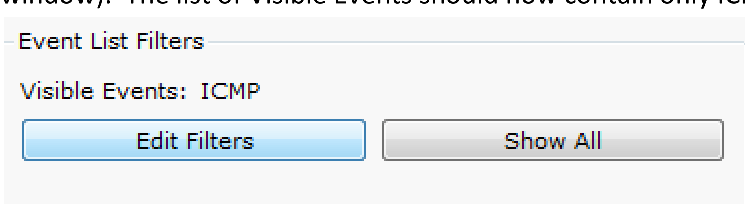
Task 5: Observe Ethernet and IP address use in a routed environment

In this task, we will use the Simulation mode of Packet Tracer to follow ping packets in our routed network environment.

1. In the lower-right corner of the Packet tracer window, click the simulation icon (recall that it looks like a stopwatch)



2. To make things a little easier, we will configure Packet Tracer to show *only* ICMP messages – this is the protocol used by ping packets. Click the **Edit Filters** button as shown in the above figure. A list of protocols will appear.
3. In the sub-window that appears, click the check box next to **Show All/None**. This will clear all protocols. Put a check mark in the box next to **ICMP** -- this should be the *<u>only</u>* check mark in your filter. Now click anywhere outside this sub-window (e.g., in the main Packet Tracer window). The list of Visible Events should now contain only ICMP:



4. With Packet Tracer in simulation mode, open the command prompt for **PC1** (Click PC1 > Desktop > Command Prompt) and type the command **<u>`ping -n 1 192.168.164.10`</u>**. This will cause PC1 to send *one* ping request to Server2.
5. Click the Capture/Forward button until the ICMP packet reaches Switch 0 (one or two clicks).

6. Click on the ICMP packet that has reached Switch0. ***Fill in the following information about the inbound packet (PDU) at Switch0 (that is, look at the Inbound PDU Details tab)***:

```
Source Ethernet (MAC) Address:
Destination Ethernet (MAC) Address:
Source IP Address:
Destination IP Address:
```

7. Close the packet details and click on the Capture/Forward button again. The packet should travel from Switch0 to Router0.
8. Click on the ICMP packet that has reached Router0. On the OSI Model tab, ***record the addresses shown at Layer 3 in both the "In Layers" and "Out Layers".***

```
Source IP address in the "In Layers":
Destination IP address in the "In Layers":
Source IP address in the "Out Layers":
Destination IP address in the "Out Layers":
```

Why are the addresses at the IP layer (Layer 3) the same (In and out)?

9. ***Record the addresses shown at Layer 2 in both the "In Layers" and "Out Layers"***.

```
Source Ethernet address in the "In Layers":
Destination Ethernet address in the "In Layers":
Source Ethernet address in the "Out Layers":
Destination Ethernet address in the "Out Layers":
```

Why are the addresses at the Ethernet layer (Layer 2) different (In and Out)?

10. Continue processing the simulation and watch the packet travel to the destination and back. ***Is this the path that you had predicted earlier in the lab***?

11. Close the main Packet Tracer window (click the **X** in the upper right corner).
    a. When asked if you want to save your changes you can click **No**.

Task 6: Reflection

In this lab, you had the opportunity to work with IP addressing as an implementation of the Network layer of the OSI model. The network layer is responsible for routing in an interconnected multi-network environment. Part of the IP address assigned to a device represents the *network* that device is connected to; the rest of the address represents the device node on that network. All stations on a given network must have the same network component; stations on different networks must have different network components. The addresses in this lab were “statically” assigned to end-nodes as well as routers using a graphical-user interface (GUI)

Routers are used to connect multiple independent networks together. Routers have one IP address for each network they are connected to. When a router receives a packet on one interface that has a destination address on a different network, the router removes the Data-link layer headers and re-transmits the packet with a *new* data-link header on the network that is “closer” to the destination – possibly the destination network if the router is directly connected to that particular network or a network connected to a different router that will move the packet towards the ultimate destination.

Task 7: Cleanup

During this lab, you downloaded (and perhaps modified) a Packet Tracer file. Find this file (most likely on the desktop) and delete it. Unless otherwise instructed, you may then shut down your workstation.