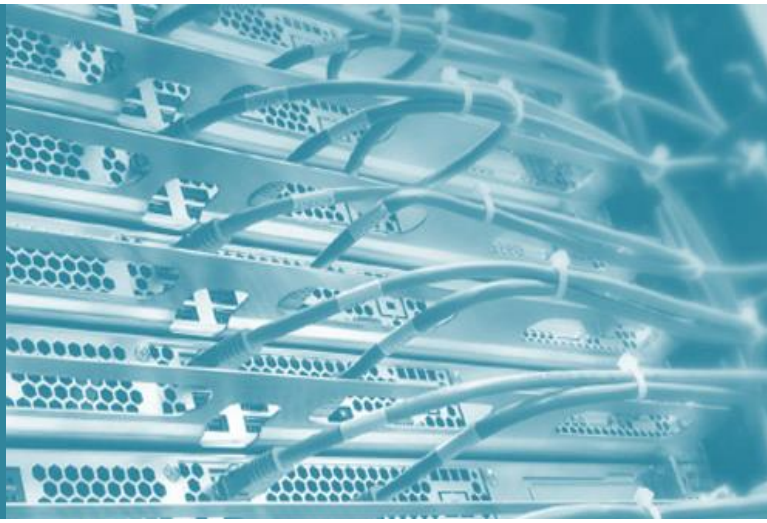
# LAB

Lab Exercise and Practice

# Introduction to Packet Tracer



BITS 2343 – Computer Network

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# LAB 1- Practice 1
# Creating a New Topology

Packet Tracer is a protocol simulator developed by Dennis Frezzo and his team at Cisco Systems. Packet Tracer (PT) is a powerful and dynamic tool that displays the various protocols used in networking, in either Real Time or Simulation mode. This includes layer 2 protocols such as Ethernet and PPP, layer 3 protocols such as IP, ICMP, and ARP, and layer 4 protocols such as TCP and UDP. Routing protocols can also be traced.

## Purpose

The purpose of this lab is to become familiar with building topologies in Packet Tracer.

## Requisite knowledge

This lab assumes some understanding of the Ethernet protocol. At this point we have not discussed other protocols, but will use Packet Tracer in later labs to discuss those as well.

## Scenario

In this lab activity, you will create a network that is similar diagram as shown in Figure 1.

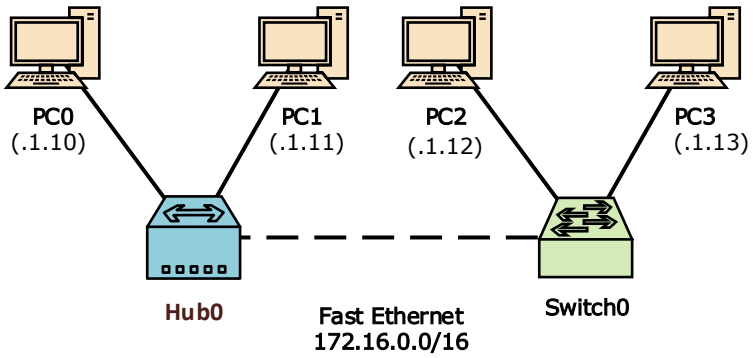
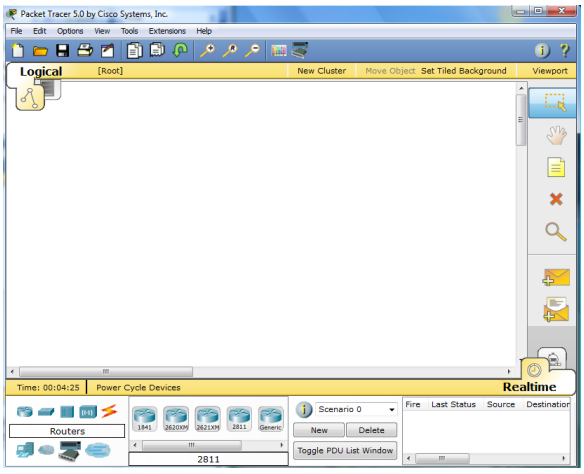



Figure 1

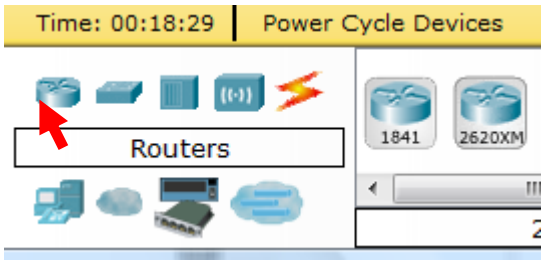
### Step 1: Start Packet Tracer

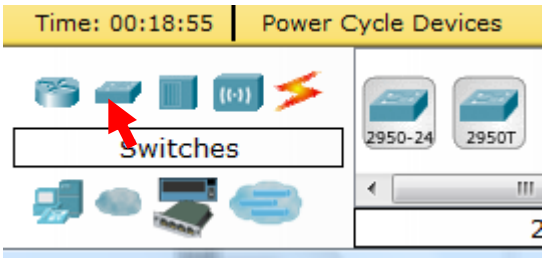


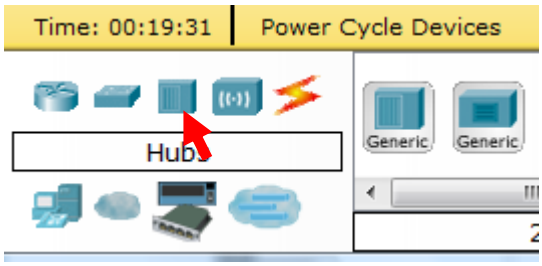
## Step 2: Choosing Devices and Connections

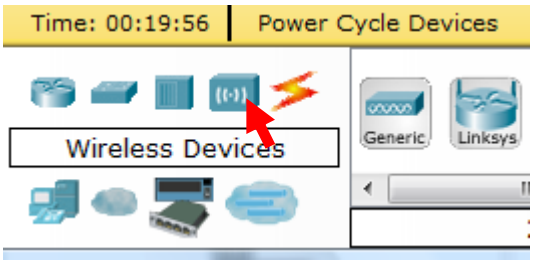
We will begin building our network topology by selecting devices and the media in which to connect them. Several types of devices and network connections can be used. For this lab we will keep it simple by using **End Devices**, **Switches**, **Hubs**, and **Connections**.

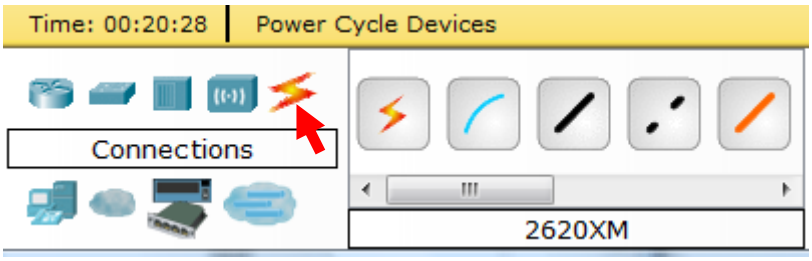
Single click on each group of devices and connections to display the various choices. The devices you see may differ slightly.

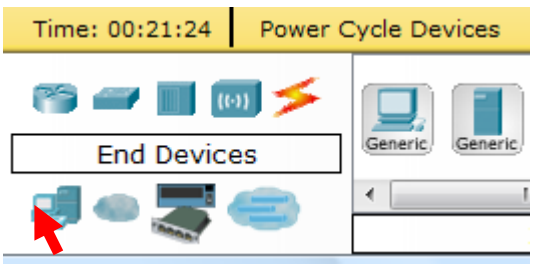


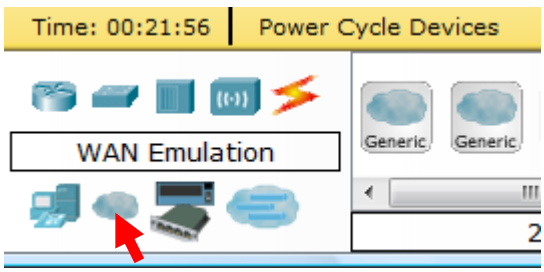



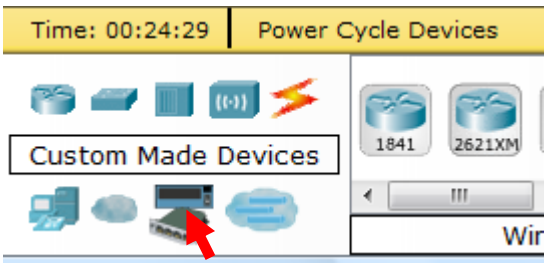



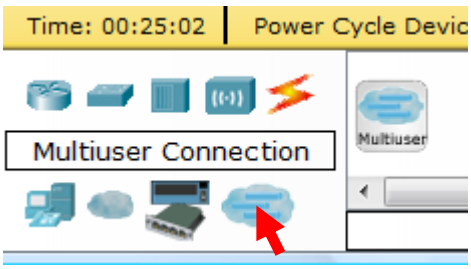



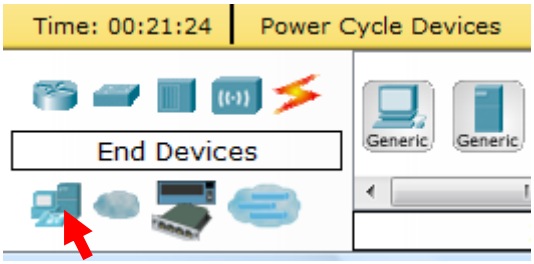



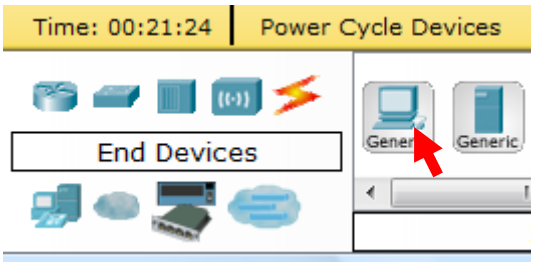



## Step 3: Building the Topology – Adding Hosts

Single click on the **End Devices**.



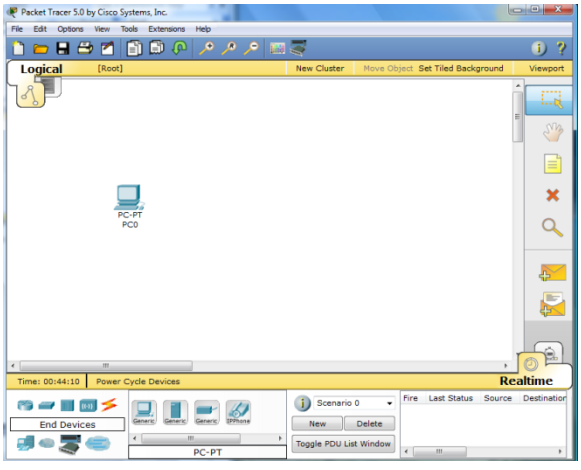

Single click on the **Generic** host.




Move the cursor into topology area. You will notice it turns into a plus "+" sign.

+

Single click in the topology area and it copies the device.

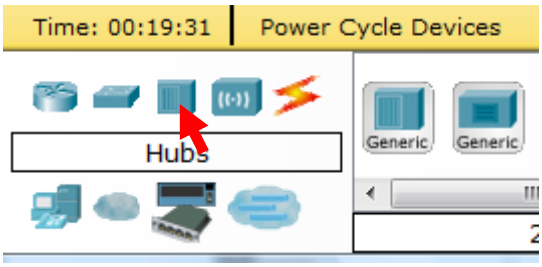




Add three more hosts.

## Step 4: Building the Topology – Connecting the Hosts to Hubs and Switches

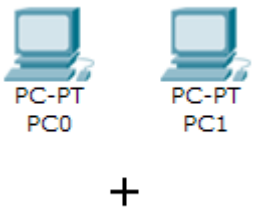
### Adding a Hub

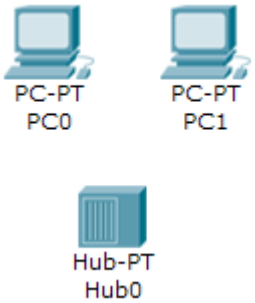
Select a hub, by clicking once on **Hubs** and once on a **Generic** hub.



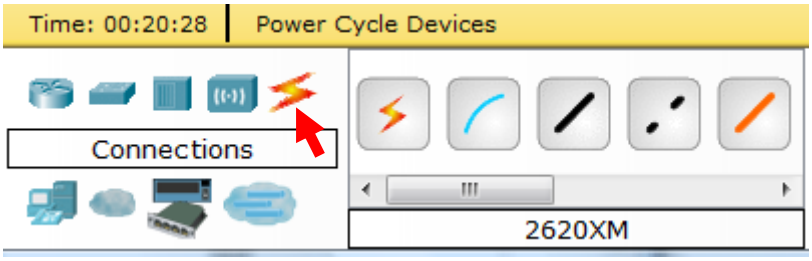



Add the hub by moving the plus sign "**+**" below PC0 and PC1 and click once.



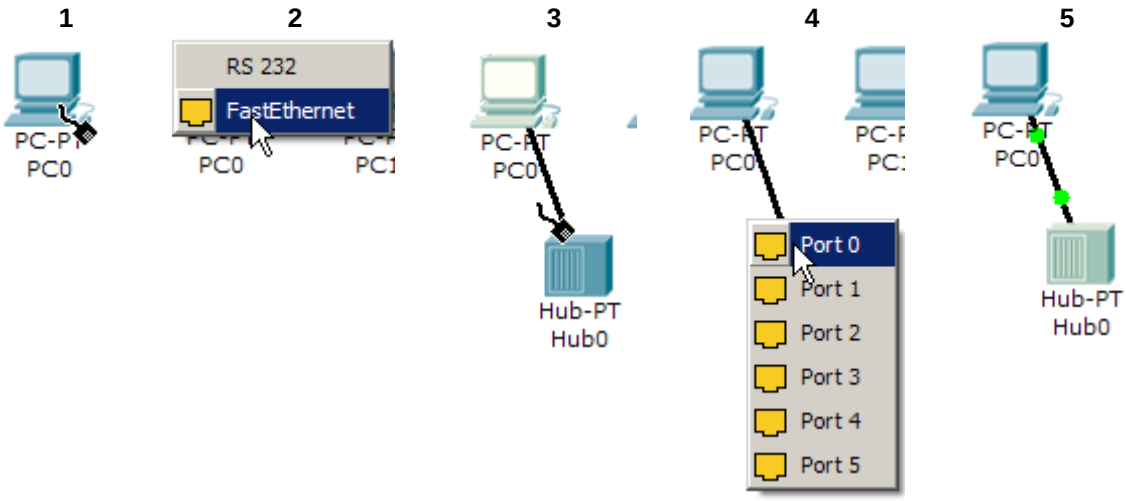

Connect PC0 to Hub0 by first choosing **Connections.**



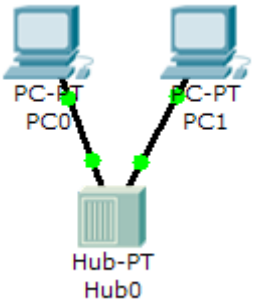

Click once on the **Copper Straight-through** cable.

Perform the following steps to connect **PC0** to **Hub0**:

1. Click once on **PC0**
2. Choose **FastEthernet**
3. Drag the cursor to **Hub0**
4. Click once on **Hub0** and choose **Port 0**
5. Notice the green link lights on both the **PC0** Ethernet NIC and the **Hub0** Port 0 showing that the link is active.

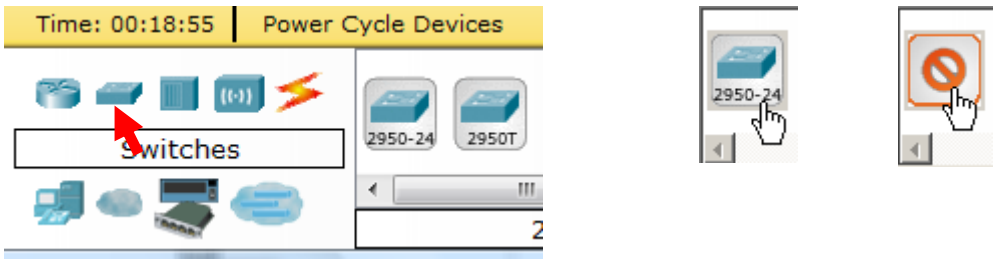



Repeat the steps above for **PC1** connecting it to **Port 1** on **Hub0**. (The actual hub port you choose does not matter.)

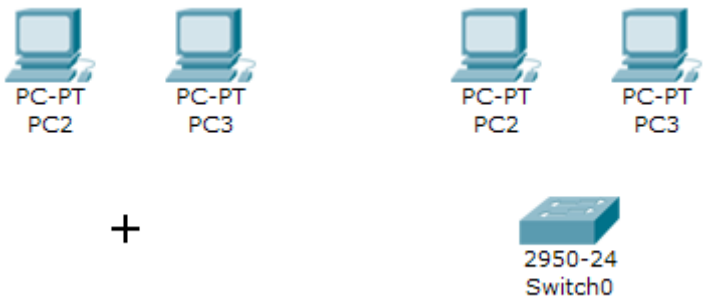



## Adding a Switch

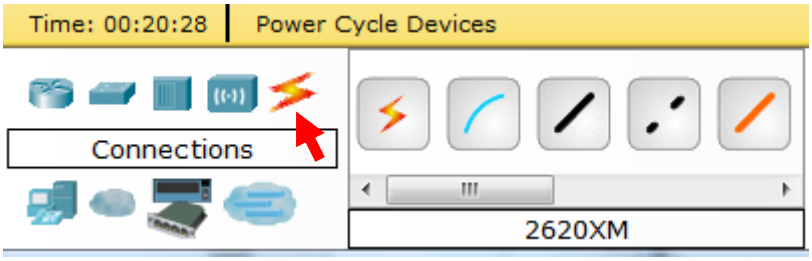
Select a switch, by clicking once on **Switches** and once on a **2950-24** switch.



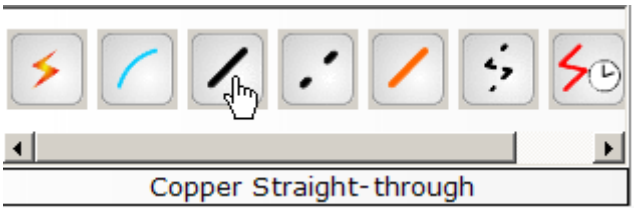

Add the switch by moving the plus sign "**+**" below PC2 and PC3 and click once.




Connect PC2 to Hub0 by first choosing **Connections.**



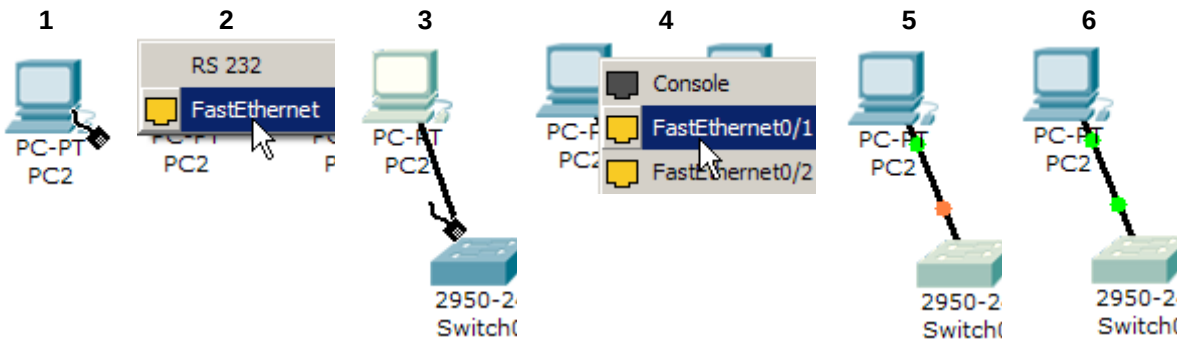

Click once on the **Copper Straight-through** cable.



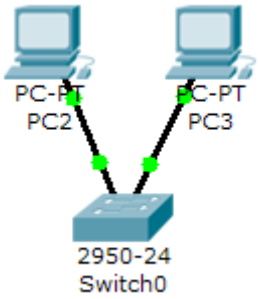

Perform the following steps to connect **PC2** to **Switch0**:

1. Click once on **PC2**
2. Choose **FastEthernet**
3. Drag the cursor to **Switch0**
4. Click once on **Switch0** and choose **FastEthernet0/1**
5. Notice the green link lights on **PC2** Ethernet NIC and amber light **Switch0 FastEthernet0/1 port**. The switch port is temporarily not forwarding frames, while it goes through the stages for the Spanning Tree Protocol (STP) process.
6. After a about 30 seconds the amber light will change to green indicating that the port has entered the forwarding stage. Frames can now forwarded out the switch port.

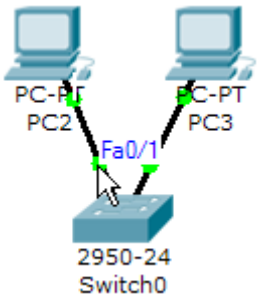
Note: Spanning Tree Protocol (STP) is discussed later.



Repeat the steps above for **PC3** connecting it to **Port 3** on **Switch0** on port **FastEtherent0/2**. (The actual switch port you choose does not matter.)



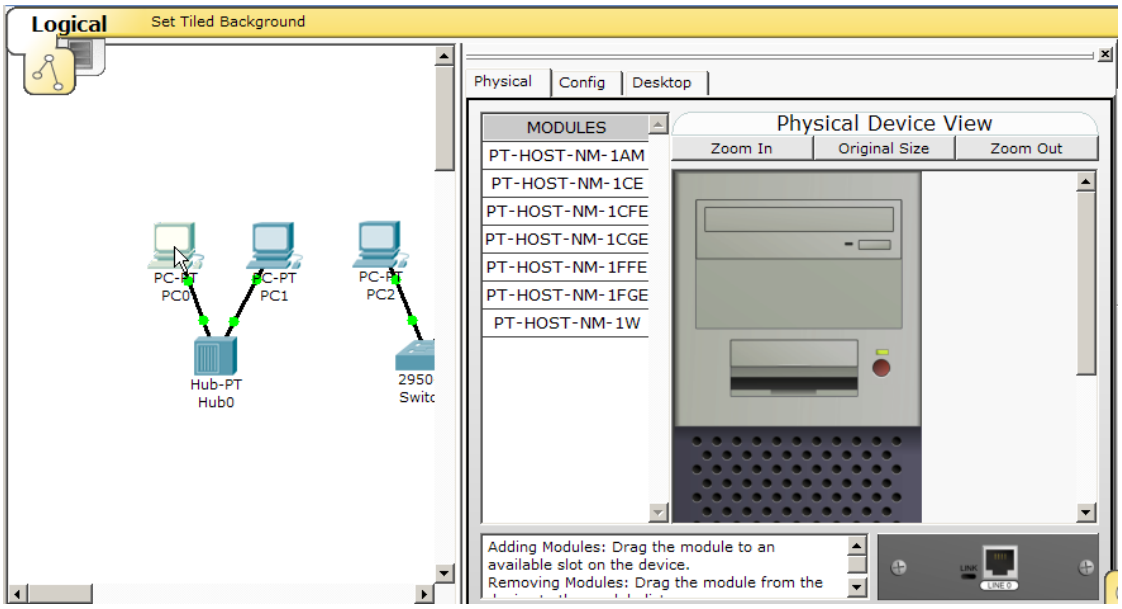

Move the cursor over the link light to view the port number. **Fa** means FastEthernet, 100 Mbps Ethernet.



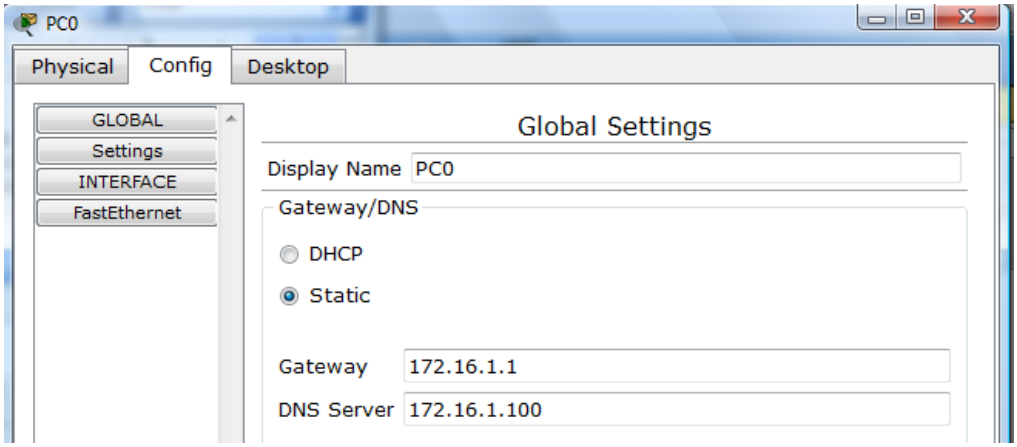

## Step 5: Configuring IP Addresses and Subnet Masks on the Hosts

Before we can communicate between the hosts we need to configure IP Addresses and Subnet Masks on the devices.

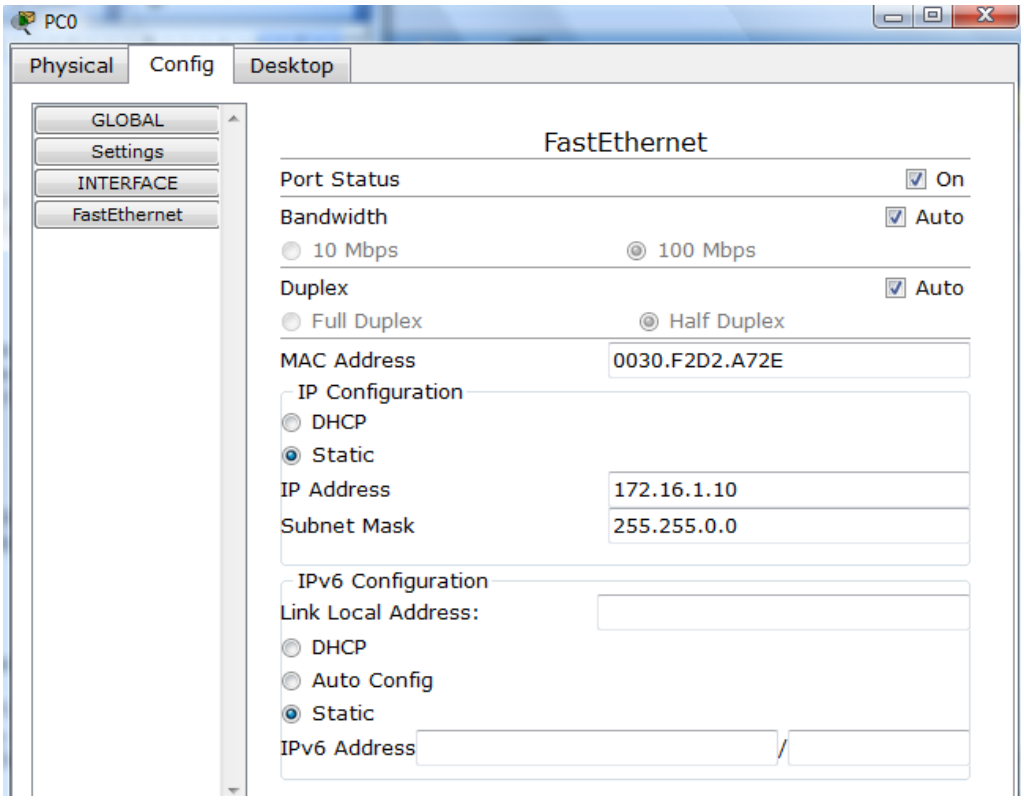
Click once on PC0.



Choose the **Config** tab and click on **Settings**. It is here that you can change the name of PC0. It is also here where you would enter a **Gateway** IP Address, also known as the default gateway and the **DNS Server** IP Address. We will discuss this later, but this would be the IP address of the local router. If you want, you can enter the Gateway IP Address 172.16.1.1 and DNS Server IP Address 172.16.1.100, although it will not be used in this lab.




Click on **Interface** and then **FastEthernet**. Although we have not yet discussed IP Addresses, add the IP Address to 172.16.1.10. Click once in the Subnet Mask field to enter the default Subnet Mask. You can leave this at 255.255.0.0. We will discuss this later.




Also, notice this is where you can change the Bandwidth (speed) and Duplex of the Ethernet NIC (Network Interface Card). The default is Auto (autonegotiation), which means the NIC will negotiate with the hub or switch. The bandwidth and/or duplex can be manually set by removing the check from the **Auto** box and choosing the specific option.

### Bandwidth - Auto

If the host is connected to a hub or switch port which can do 100 Mbps, then the Ethernet NIC on the host will choose 100 Mbps (Fast Ethernet). Otherwise, if the hub or switch port can only do 10 Mbps, then the Ethernet NIC on the host will choose 10 Mbps (Ethernet).

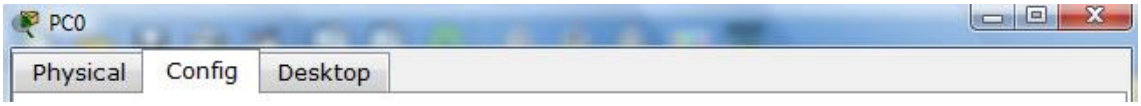
### Duplex - Auto

**Hub**: If the host is connected to a hub, then the Ethernet NIC on the host will choose Half Duplex.

**Switch**: If the host is connected to a switch, and the switch port is configured as Full Duplex (or Autonegotiation), then the Ethernet NIC on the host will choose Full Duplex. If the switch port is configured as Half Duplex, then the Ethernet NIC on the host will choose Half Duplex. (Full Duplex is a much more efficient option.)

The information is automatically saved when entered.

To close this dialog box, click the "**X**" in the upper right.

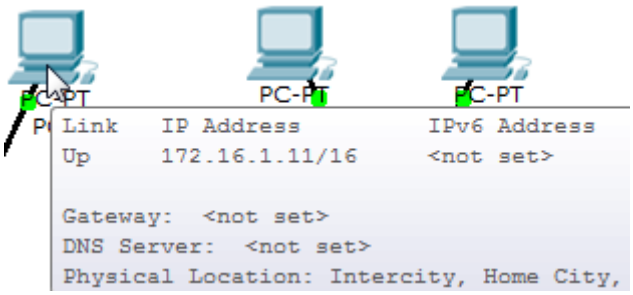



Repeat these steps for the other hosts. Use the information below for IP Addresses and Subnet Masks.

| Host | IP Address | Subnet Mask |
|---|---|---|
| PC0 | 172.16.1.10 | 255.255.0.0 |
| PC1 | 172.16.1.11 | 255.255.0.0 |
| PC2 | 172.16.1.12 | 255.255.0.0 |
| PC3 | 172.16.1.13 | 255.255.0.0 |

### Verify the information

To verify the information that you entered, move the Select tool (arrow) over each host.

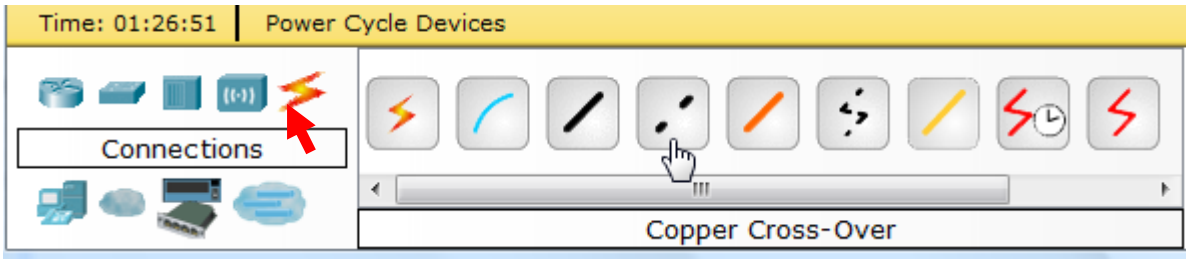



### Deleting a Device or Link

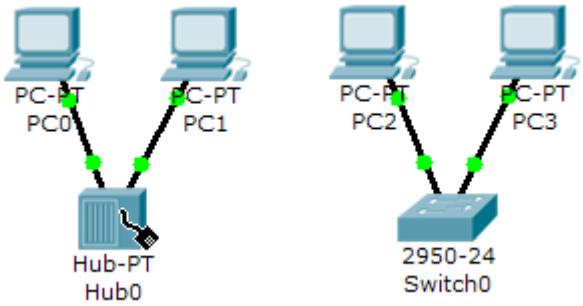
To delete a device or link, choose the **Delete** tool and click on the item you wish to delete.

## Step 6: Connecting Hub0 to Switch0

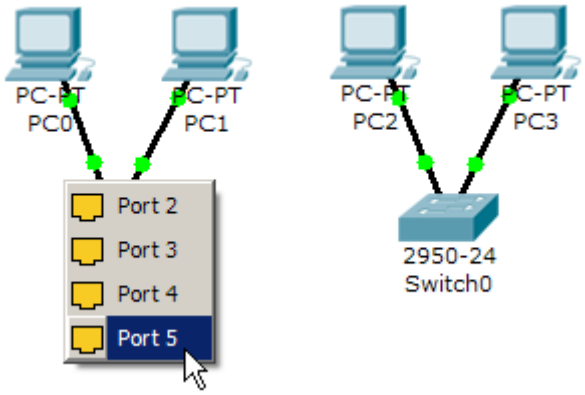
To connect like-devices, like a Hub and a Switch, we will use a Cross-over cable. Click once the **Cross-over** Cable from the **Connections** options.



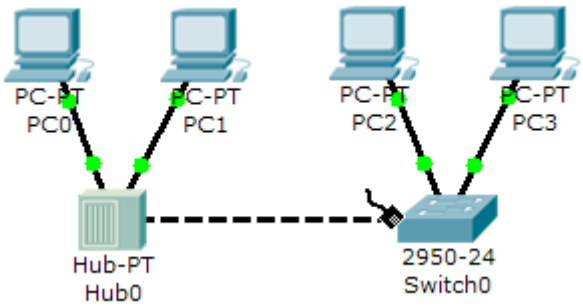

Move the Connections cursor over **Hub0** and click once.



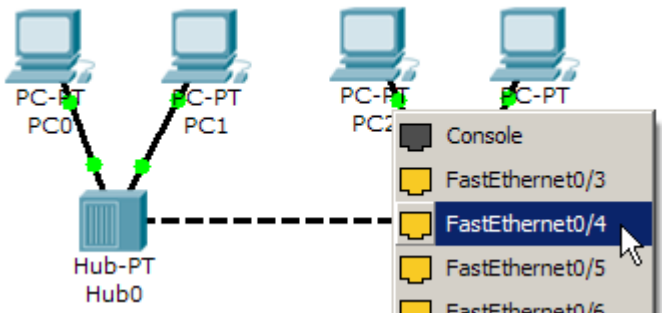

Select **Port 5** (actual port does not matter).



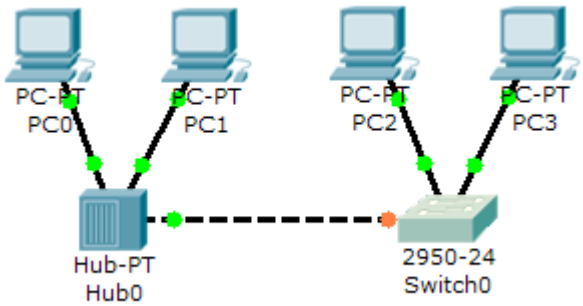

Move the Connections cursor to **Switch0**.

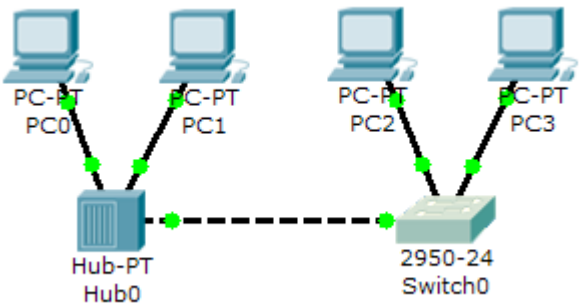


Click once on **Switch0** and choose **FastEthernet0/4** (actual port does not matter).




The link light for switch port **FastEthernet0/4** will begin as amber and eventually change to green as the Spanning Tree Protocol transitions the port to forwarding.



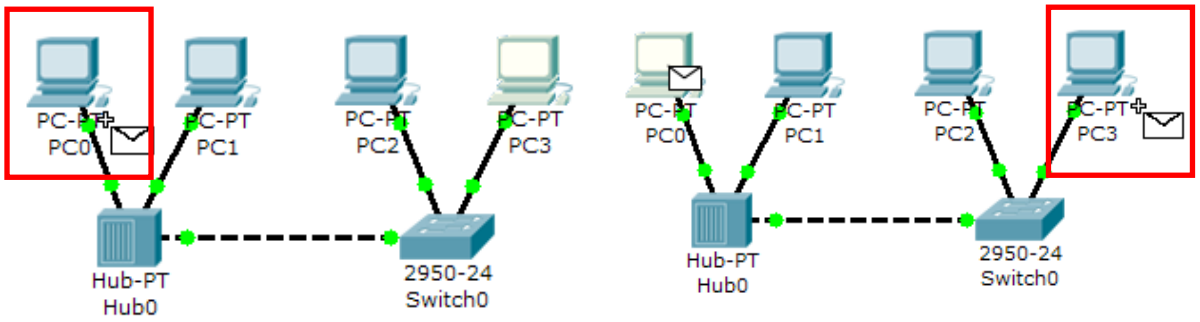




## Step 7: Verifying Connectivity in Realtime Mode

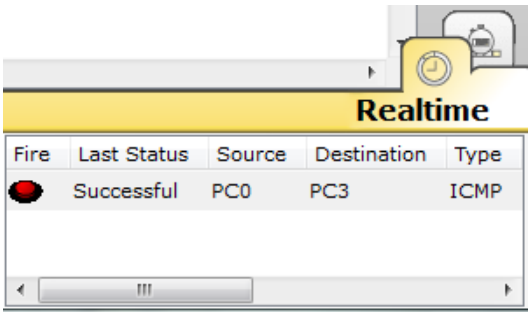
Be sure you are in **Realtime** mode.


Select the **Add Simple PDU** tool used to ping devices..

Click once on PC0, then once on PC3.



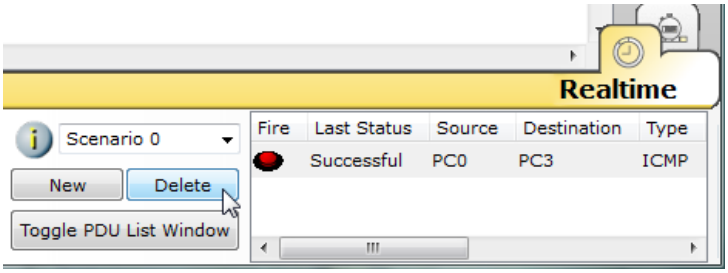

The PDU **Last Status** should show as **Successful**.



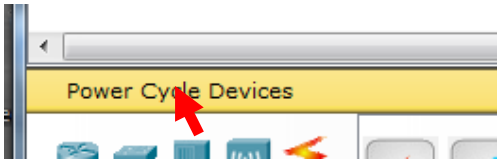

## Resetting the Network

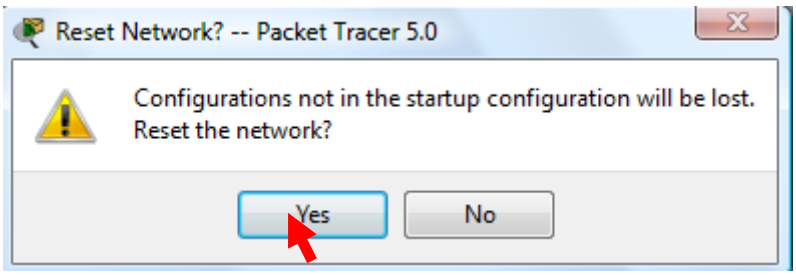
At this point we will want to reset the network, whenever you want to reset the network and begin the simulation again, perform the following tasks:

Click **Delete** in the PDU area.



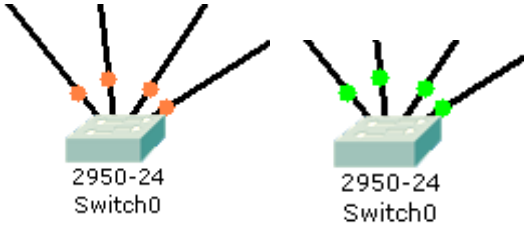

Now, Power Cycle Devices and confirm the action.



## Waiting for Spanning Tree Protocol (STP)

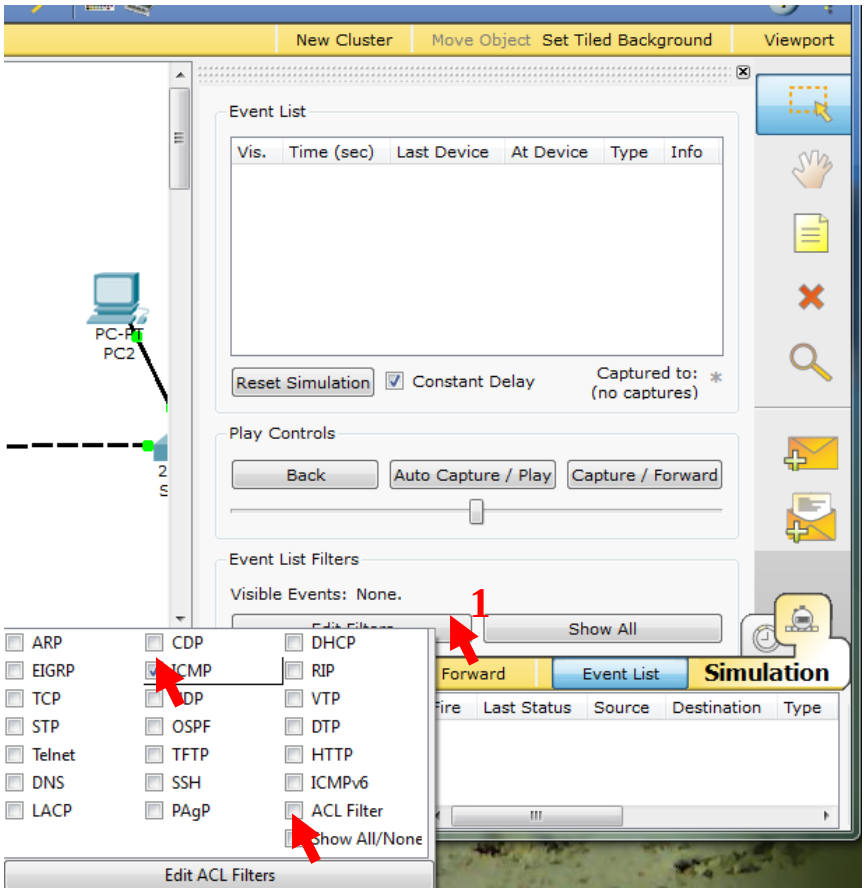
Note: Because Packet Tracer also simulates the Spanning Tree Protocol (later), at times the switch may show amber lights on its interfaces. You will need to wait for the lights to turn green on the switches before they will forward any Ethernet frames.




## Step 8: Verifying Connectivity in Simulation Mode

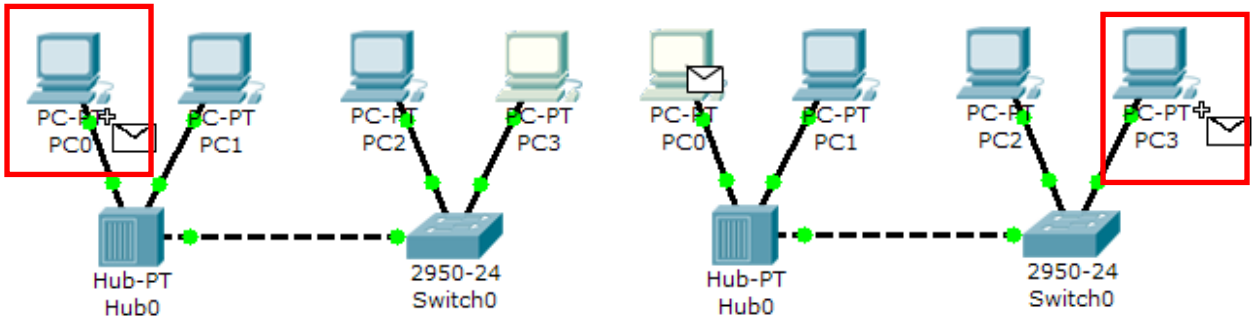
Be sure you are in Simulation mode.


Deselect all filters (All/None) and select only ICMP.

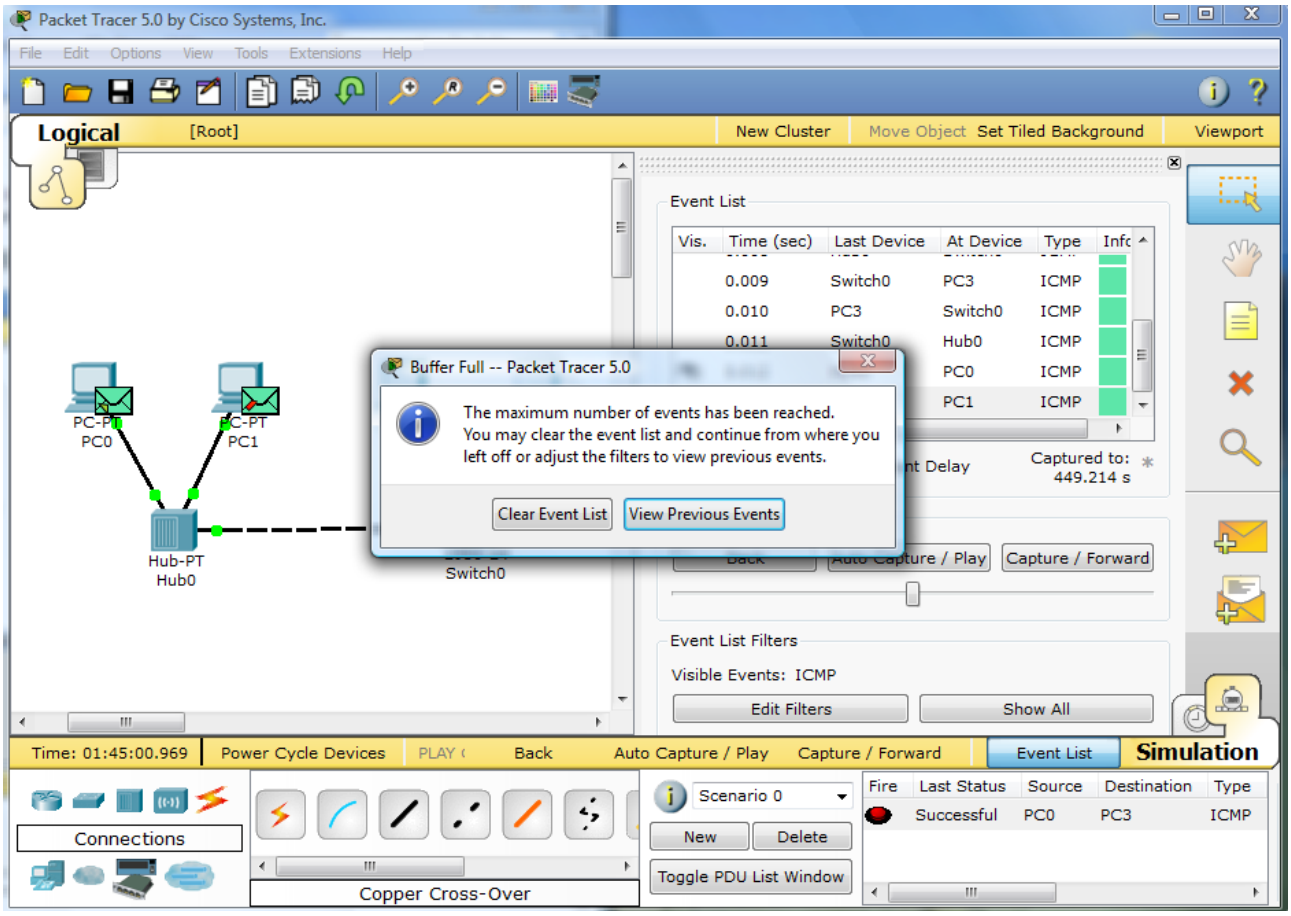


Select the **Add Simple PDU** tool used to ping devices..

Click once on PC0, then once on PC3.

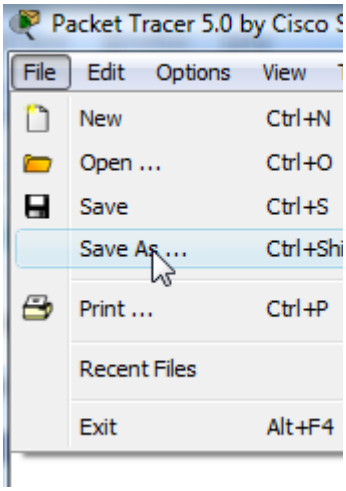


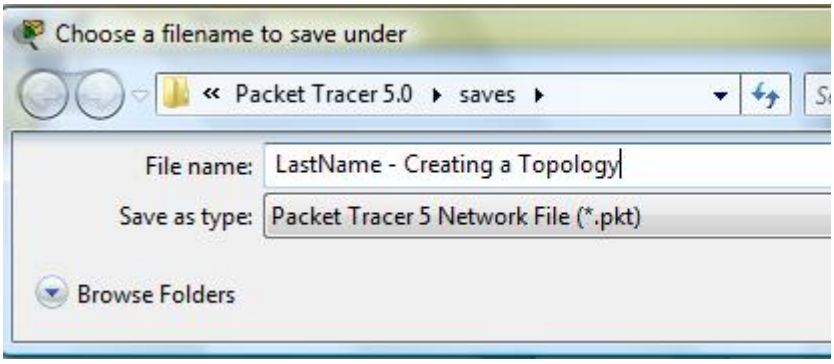

Continue clicking **Capture/Forward** button until the ICMP ping is completed. You should see the ICMP messages move between the hosts, hub and switch. The PDU **Last Status** should show as **Successful**. Click on **Clear Event List** if you do not want to look at the events or click **Preview Previous Events** if you do. For this exercise it does not matter.



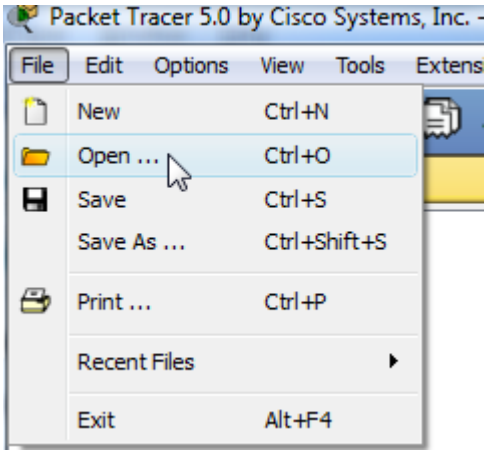
## Step 9: Saving the Topology

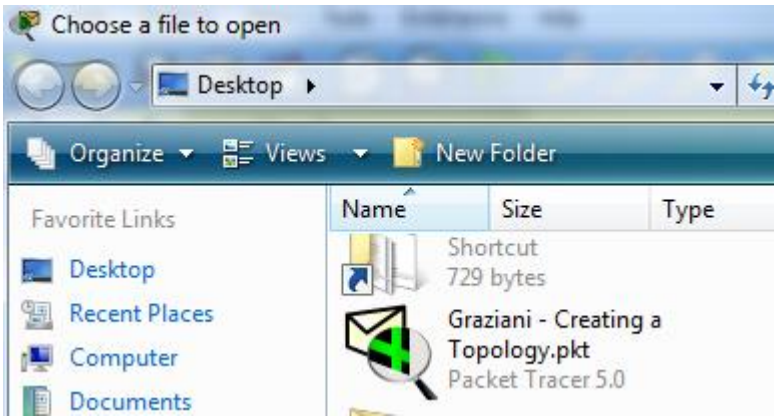
Perform the following steps to save the topology (uses .pkt file extension).



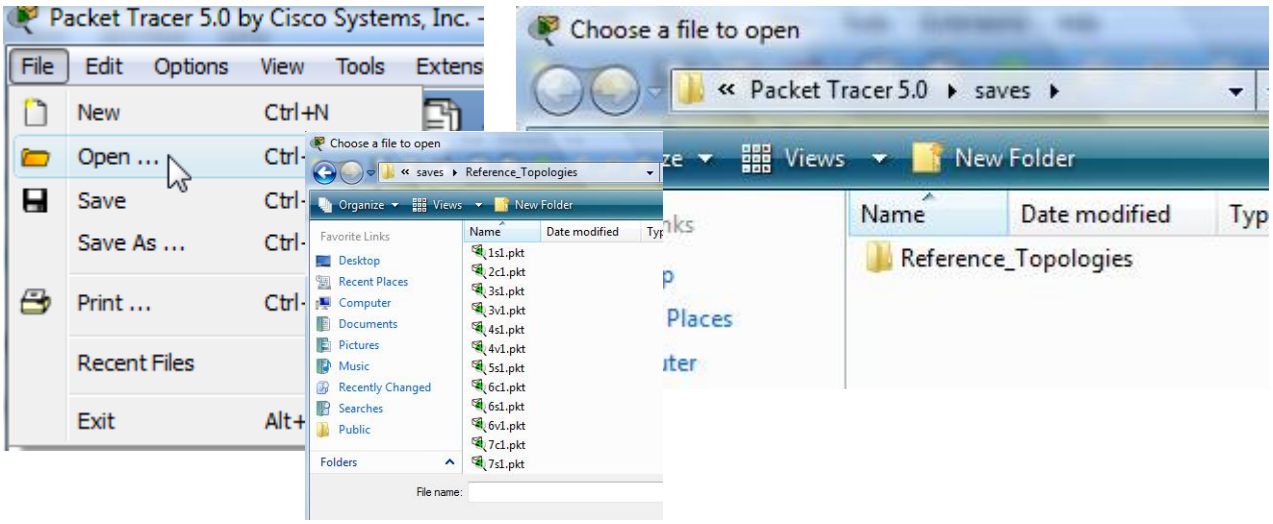




## Opening Existing Topologies




Opening Existing PT Topologies



# LAB 1- Practice 2
# Working with the Application Layer: DHCP, DNS, and HTTP

Figure 1 is an example of what your final topology should look like.

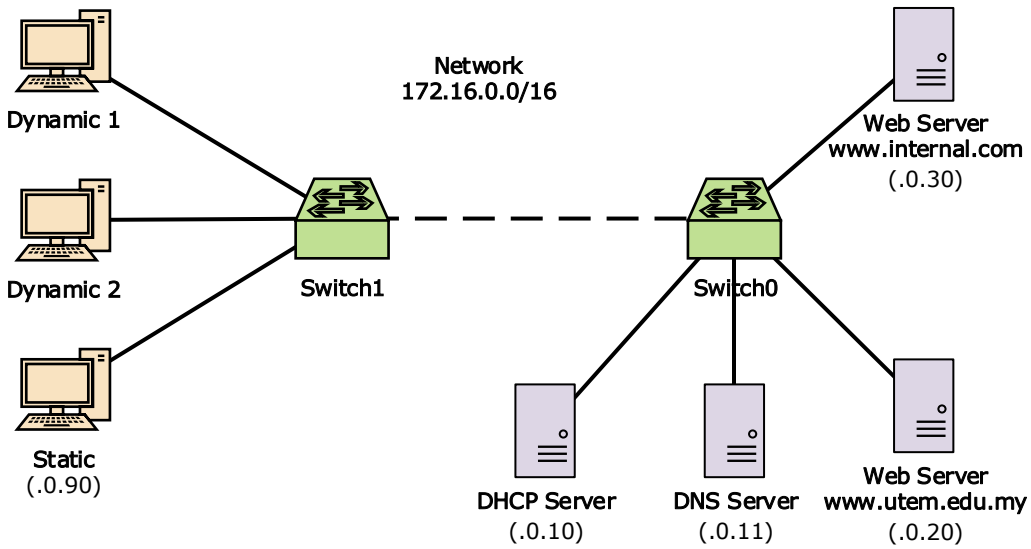



Figure 1: Topology Diagram

## Instructions:

1. Start Packet Tracer using **Realtime** mode.
   - Options -> Preferences
     - Enable "Show Link Lights"
     - Disable "Hide Device Label"

2. Configuring the DHCP Server

Add a server.
Global Settings:
- Change the Display Name to "**DHCP Server**"
- Set the Gateway to **172.16.0.1**

FastEthernet:
- Set the IP address to **172.16.0.10**
- Set the Subnet Mask to **255.255.0.0**

HTTP:
- Set HTTP Service and HTTPS Service to **Off**

DHCP:
- Set the Default Gateway to **172.16.0.1**
- Set the DNS Server to **172.16.0.11**
- Set the Start IP Address to **172.16.0.100**

DNS:
- Set the Service to **Off**

3. Configuring the DNS Server

Add a server.
Global Settings:
- Change the Display Name to "**DNS Server**"
- Set the Gateway to **172.16.0.1**

FastEthernet:
- Set the IP address to **172.16.0.11**
- Set the Subnet Mask to **255.255.0.0**

HTTP:
- Set HTTP Service and HTTPS Service to **Off**

DHCP:
- Set the Service to **Off**

DNS:
- Entering the www.utem.edu.my Domain Name
  - Enter for the Domain Name **www.utem.edu.my**
  - Enter for IP Address **172.16.0.20**
  - Click **Add**
- Entering the www.internal.com Domain Name
  - Enter for the Domain Name **www.internal.com**
  - Enter for IP Address **172.16.0.30**
  - Click **Add**

4. Configuring the www.utem.edu.my Web Server

Add a server.
Global Settings:
- Change the Display Name to "**Web Server: www.utem.edu.my**"
- Set the Gateway to **172.16.0.1**

FastEthernet:
- Set the IP address to **172.16.0.20**
- Set the Subnet Mask to **255.255.0.0**

DHCP:
- Set the Service to **Off**

DNS:
- Set the Service to **Off**

HTTP
- Change the sentence, "<hr>Welcome to Packet Tracer 5.0, the best thing since..... Packet Tracer 4.0." to "<hr> Welcome to UTeM's public web page!" You may add other information as well.

5. Configuring the www.internal.com Web Server

Add a server.
Global Settings:
- Change the Display Name to "**Web Server: www.internal.com**"
- Set the Gateway to **172.16.0.1**

FastEthernet:

- Set the IP address to **172.16.0.30**
- Set the Subnet Mask to **255.255.0.0**

DHCP:

- Set the Service to **Off**

DNS:

- Set the Service to **Off**

HTTP

- Change the sentence, "<hr>Welcome to Packet Tracer 5.0, the best thing since..... Packet Tracer 4.0." to "<hr> This is the corporate internal network!" You may add other information as well.

6. Configure TWO Client Computers using DHCP

Add two client computers.
Global Settings:

- Change the Display Names to "**Dynamic 1**" and to "**Dynamic 2**" respectively
- Set the Gateway/DNS to **DHCP**

FastEthernet:

- Set the IP Configuration to **DHCP**

7. Configure ONE Client Computers using Static IP Addressing

Add one client computers.
Global Settings:

- Change the Display Name to "**Static**"
- Set the Gateway/DNS to **Static**
    - Set Gateway to **172.16.0.1**
    - Set the DNS Server to **172.16.0.11**

FastEthernet:

- Be sure the configuration is set to **Static**
- Set the IP address to **172.16.0.90**
- Set the Subnet Mask to **255.255.0.0**

8. Adding switches

- Add TWO switches.
- Connect the servers to one switch using a straight-through cable.
- Connect the client computers to the other switch using a straight-through cable.
- Interconnect the two switches using a crossover cable.

9. Verify connectivity

- Ping (ICMP)
    - From a client computer use the Desktop Command prompt to ping the other client computers and the servers.
    - Example: From the Dynamic 1 client, C> **ping 172.16.0.20**
    - The first one or two pings may fail, but you should receive a reply on the later pings. This is due to the ping timing out while the ARP process takes place (later).

- Web Browser (HTTP)
    - On the client computers use the Desktop Web Browser, enter the URLs of the Web Servers www.utem.edu.my and www.internal.com.
    - You should see the web pages that you created on these servers.

10. Using Simulation Mode

Click on Simulation.

Note: To reset a simulation, click on "Reset Simulation"

Click on Edit Filters

- Choose Show All/None so that all the boxes (protocols) are unchecked.
- Select (check) the following protocols: DHCP, ICMP, HTTP, DNS.

Web Browser (HTTP)

- On the client computers use the Desktop Web Browser, enter the URLs of the Web Servers www.utem.edu.my or www.internal.com.
- Click on Auto Capture/Play (automatically forwards the packets) or Capture Forward (must keep clicking to advance the packets)

DHCP

- Reset the simulation by clicking on "Reset Simulation"
- To view DHCP, on one of the "Dynamic "client computers using DHCP go to the Desktop Command prompt.
- To have the client computer ask for new IP address and other information from the DHCP server, enter the command: C> ipconfig /renew