CSE-331 Computer Networks

CSE-331L Computer Networks

Course Instructor: Mr. Mohammad Nouman

University of Engineering & Technology Lahore.
(KSK Campus)

CSE-331 Computer Networks

Contents

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Lab No. 01

CLO1,2

Objective:

1. Study of following Network Devices in Detail
    - Repeater
    - Hub
    - Switch
    - Bridge
    - Router
    - Gate Way
2. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.

Network devices:

i- **Repeater:** Functioning at Physical Layer. A repeater is an electronic device that receives a signal and retransmits it at a higher level and/or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances. Repeater have two ports, so cannot be used to connect for more than two devices

ii- **Hub:** An Ethernet hub, active hub, network hub, repeater hub, hub or concentrator is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment. Hubs work at the physical layer (layer 1) of the OSI model. The device is a form of multiport repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.

iii- **Switch:** A network switch or switching hub is a computer networking device that connects network segments. The term commonly refers to a network bridge that processes and routes data at the data link layer (layer 2) of the OSI model. Switches that additionally process data at the network layer (layer 3 and above) are often referred to as Layer 3 switches or multilayer switches.

iv- **Bridge:** A network bridge connects multiple network segments at the data link layer (Layer 2) of the OSI model. In Ethernet networks, the term bridge formally means a device that behaves according to the IEEE 802.1D standard. A bridge and switch are very much alike; a switch being a bridge with numerous ports. Switch or Layer 2 switch is often used interchangeably with bridge Bridges can analyze incoming data packets to determine if the bridge is able to send the given packet to another segment of the network.

v- **Router:** A router is an electronic device that interconnects two or more computer networks and selectively interchanges packets of data between them. Each data packet contains address information that a router can use to determine if the source and destination are on the same network, or if the data packet must be transferred from one network to another. Where multiple routers are used in a large collection of interconnected networks, the routers exchange information about target system addresses, so that each router can build up a table showing the preferred paths between any two systems on the interconnected networks.

vi- **Gate Way:** In a communications network, a network node equipped for interfacing with another network that uses different protocols.

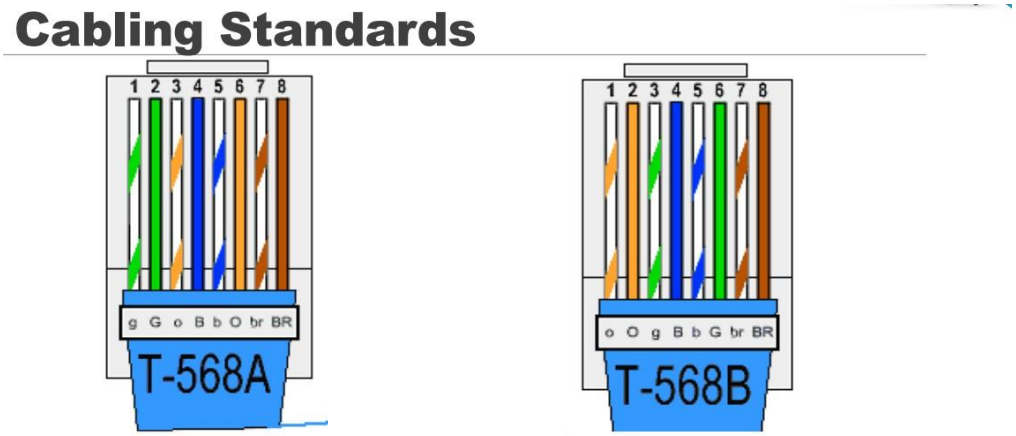
- A gateway may contain devices such as protocol translators, impedance matching devices, rate converters, fault isolators, or signal translators as necessary to provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between both networks.
- A protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing the required protocol conversions

Coding standards

What is 568?

ANSI/TIA-568 is a set of telecommunication standards from the Telecommunication Industry Association (TIA). The standard address commercial building cabling for telecommunication products and services.

TIA defines two different separate pin outs 568A and 568B for any eight conductor twisted pair cabling. 568A is recommended for most cabling systems and 568B as an alternative to accommodate certain cable systems.



Cabling Types:

There are three types of cables:

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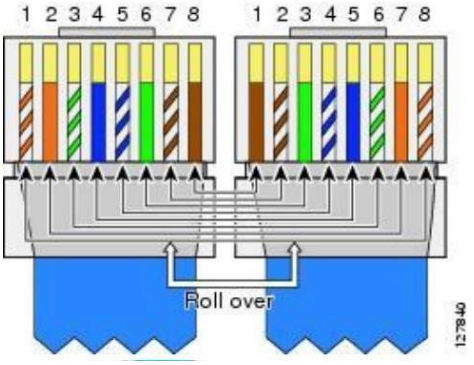
➢Rollover Cable



Straight Through

1 ⟷ 1
2 ⟷ 2
3 ⟷ 3
4 ⟷ 4
5 ⟷ 5
6 ⟷ 6
7 ⟷ 7
8 ⟷ 8

Cross-over

1 ⟷ 1
2 ⟷ 2
3 ⟷ 3
4 ⟷ 4
5 ⟷ 5
6 ⟷ 6
7 ⟷ 7
8 ⟷ 8

Rollover

1 ⟷ 8
2 ⟷ 7
3 ⟷ 6
4 ⟷ 5
5 ⟷ 4
6 ⟷ 3
7 ⟷ 2
8 ⟷ 1

Crimping Tool

A crimping tool is a device used to conjoin two pieces of metal by deforming one or both of them in a way that causes them to hold each other. The result of the tool's work is called a crimp. A good example of crimping is the process of affixing a connector to the end of a cable.

Cable Tester:

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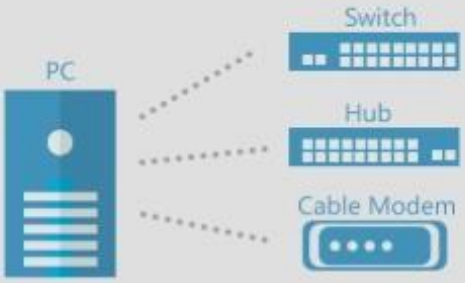
Cable Tester

TIA 568b is the most common pinout used in modern networking

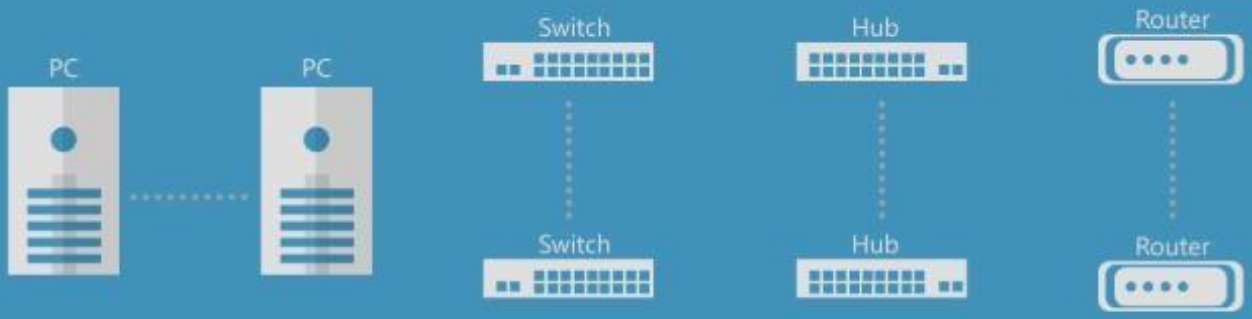
When to use a Straight Through Cable?

Straight-Through cables are used when connecting two dissimilar devices together



When to use a Crossover Cable?

Crossover cables are used when connecting two similar devices together



Course Instructor: Mr. Amjad Majeed

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Lab No. 02

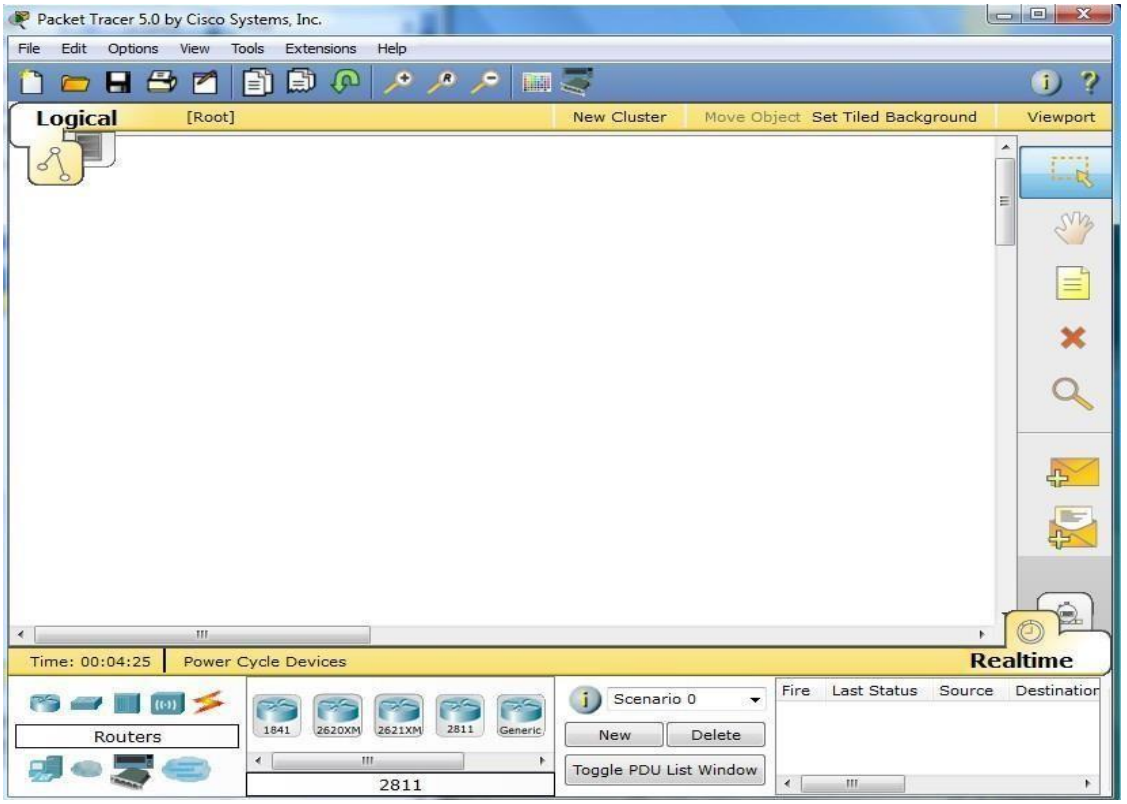
CLO2,3

Aim: Creating a Network topology using CISCO packet tracer software.

Packet Tracer – Creating a New Topology

What is Packet Tracer? 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.

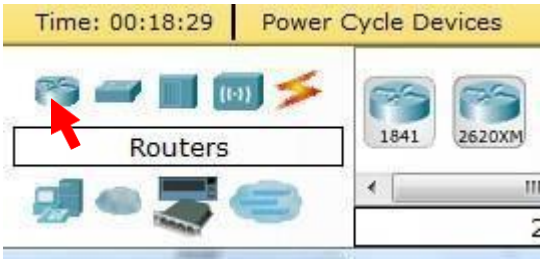
Step 1: Start Packet Tracer

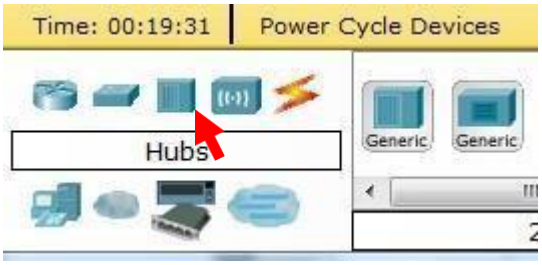


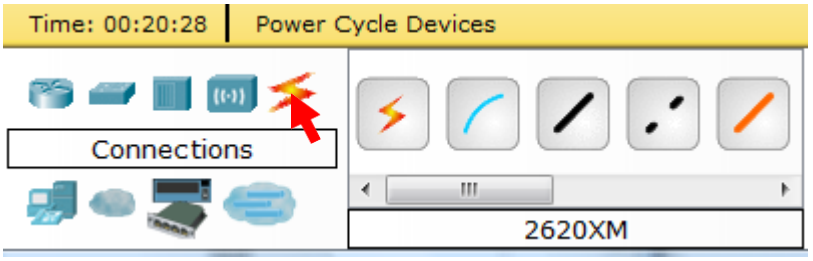
Step 2: Choosing Devices and Connections

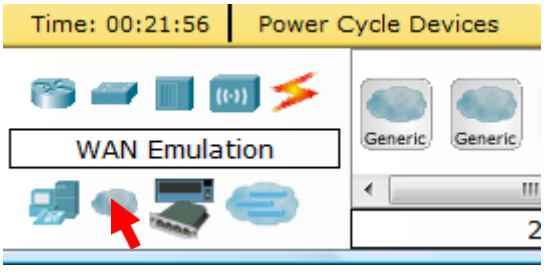
We will begin building our network topology by selecting devices and the media in which to connect them. Several types of devices and network connections can be used. For this lab we will keep it simple by using **End Devices**, **Switches**, **Hubs**, and **Connections**.

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

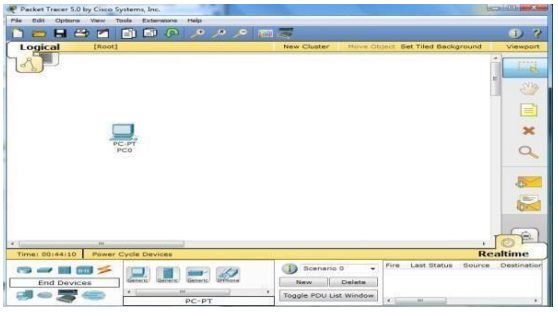
Single click on the **End Devices**.

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.

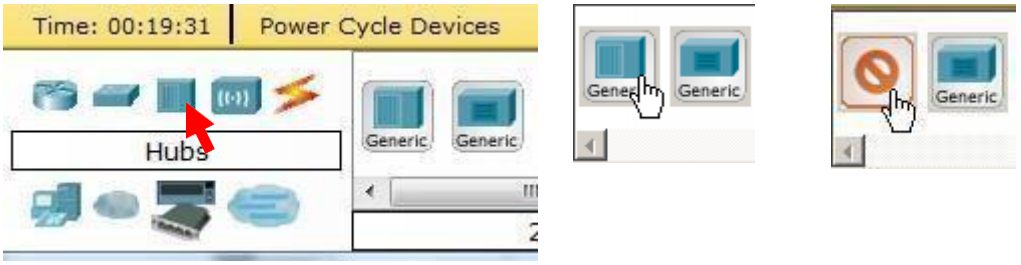


Add three more hosts.

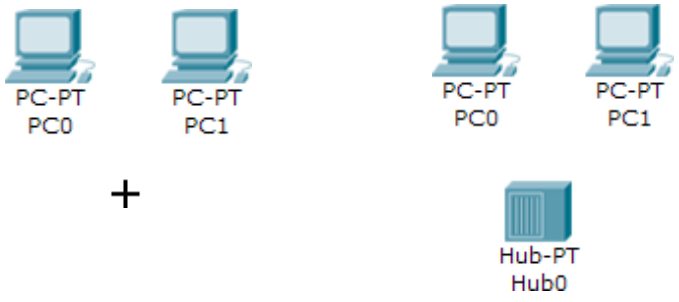
Step 4: Building the Topology – Connecting the Hosts to Hubs and Switches

Adding a Hub

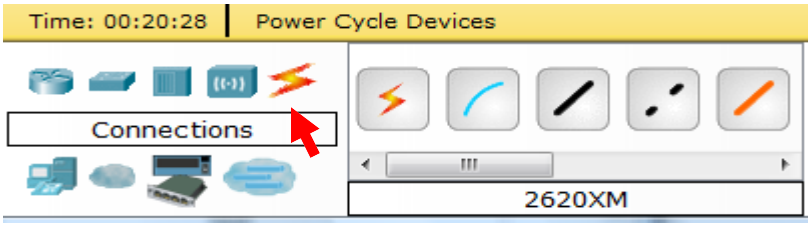
Select a hub, by clicking once on **Hubs** and once on a **Generic** hub.



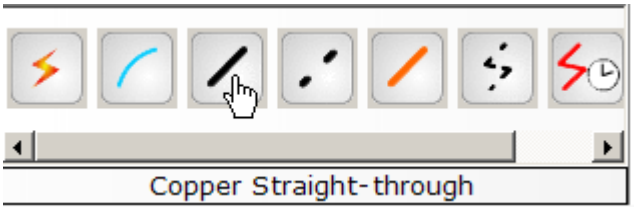
Add the hub by moving the plus sign "+" below PC0 and PC1 and click once.



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



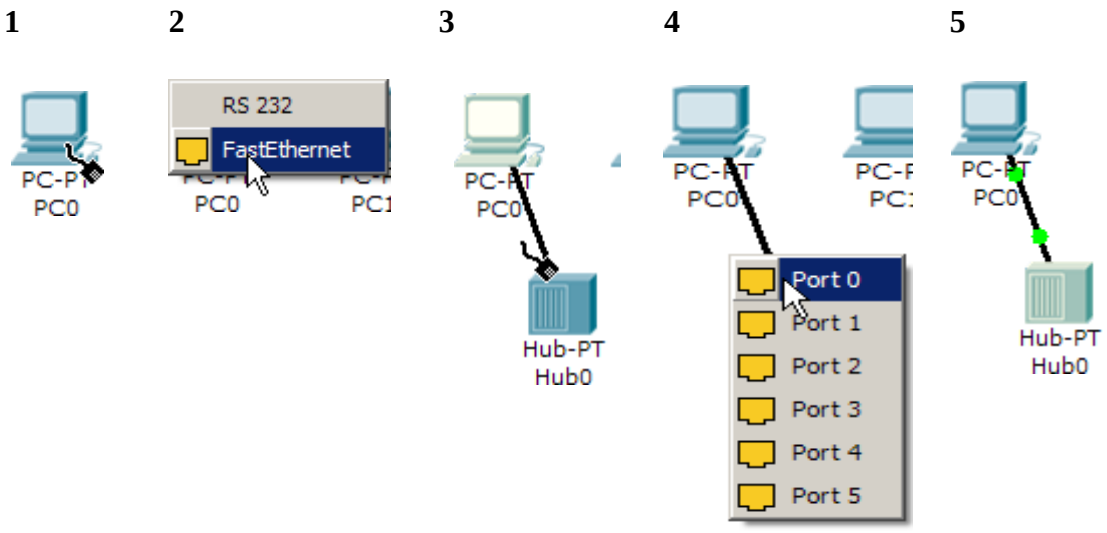
Click once on the **Copper Straight-through** cable.



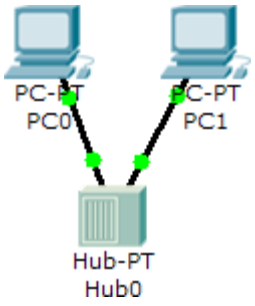
Perform the following steps to connect **PC0** to **Hub0**:

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.

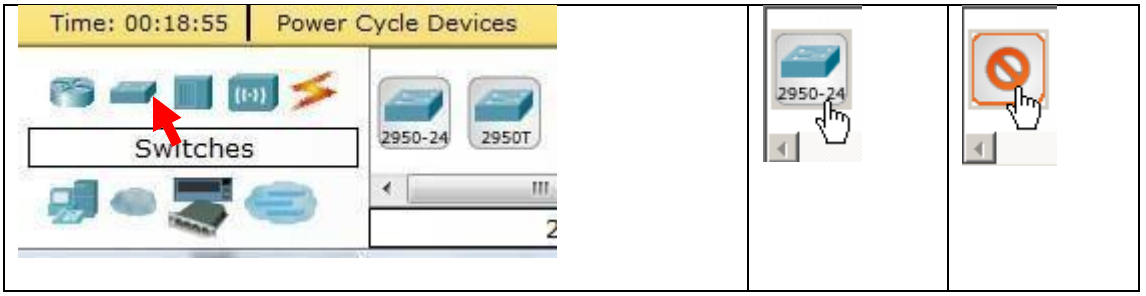


Repeat the steps above for **PC1** connecting it to **Port 1** on **Hub0**. (The actual hub port you choose does not matter.)



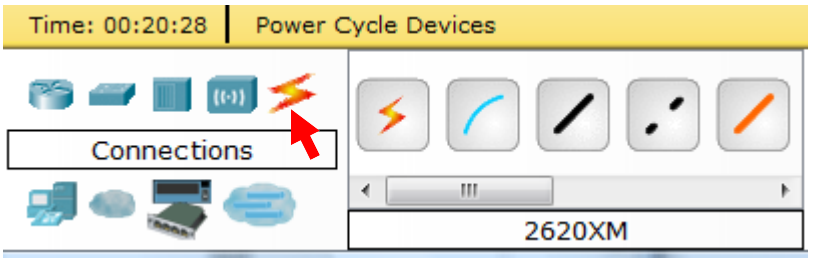
Adding a Switch

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.**

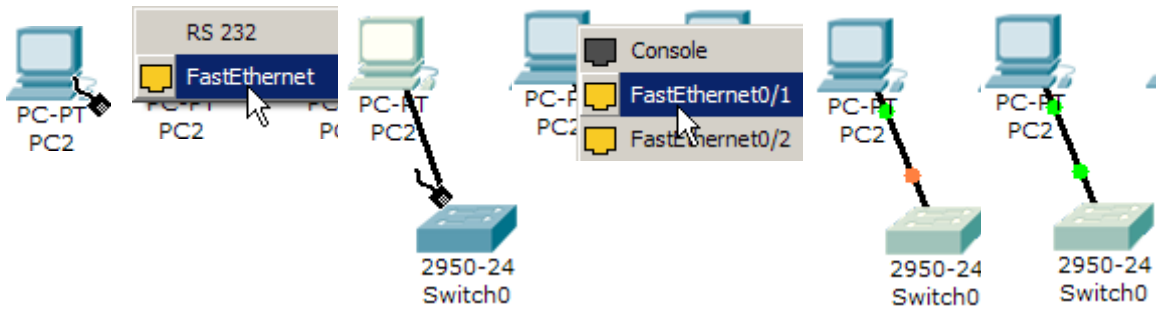


Click once on the **Copper Straight-through** cable.

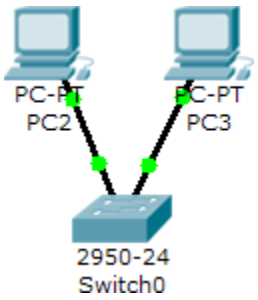
Perform the following steps to connect **PC2** to **Switch0**:

1. Click once on **PC2**
2. Choose **Fast Ethernet**
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 forward out the switch port.

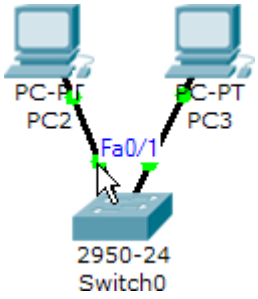
1 2 3 4 5 6



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.)



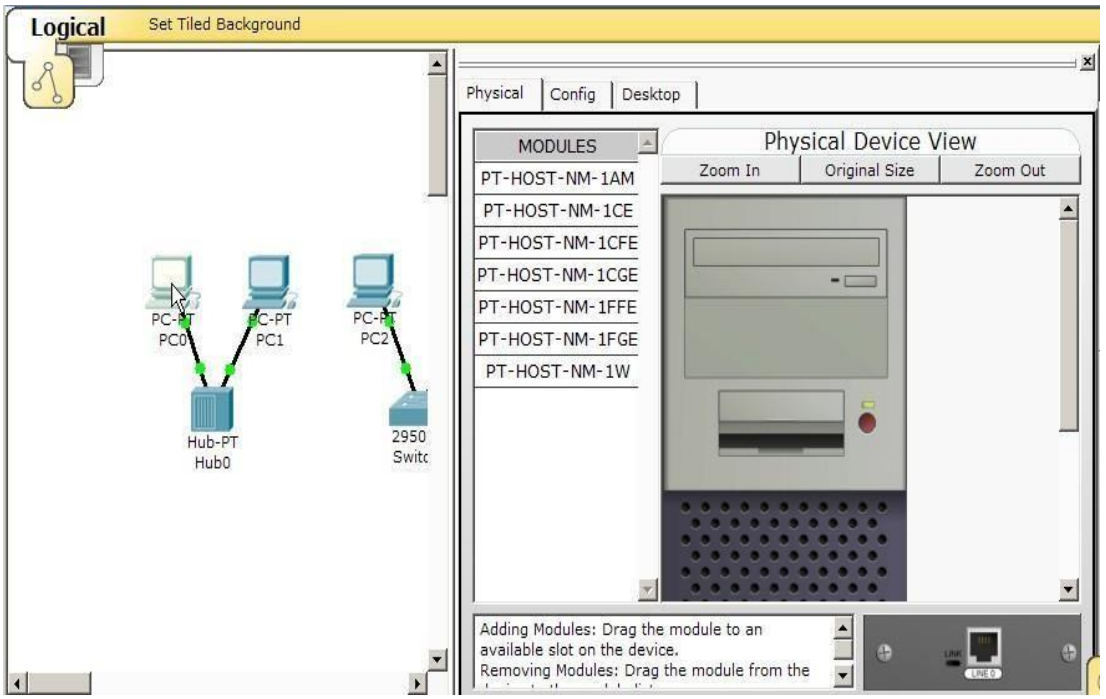
Move the cursor over the link light to view the port number. **Fa** means FastEthernet, 100 Mbps Ethernet.



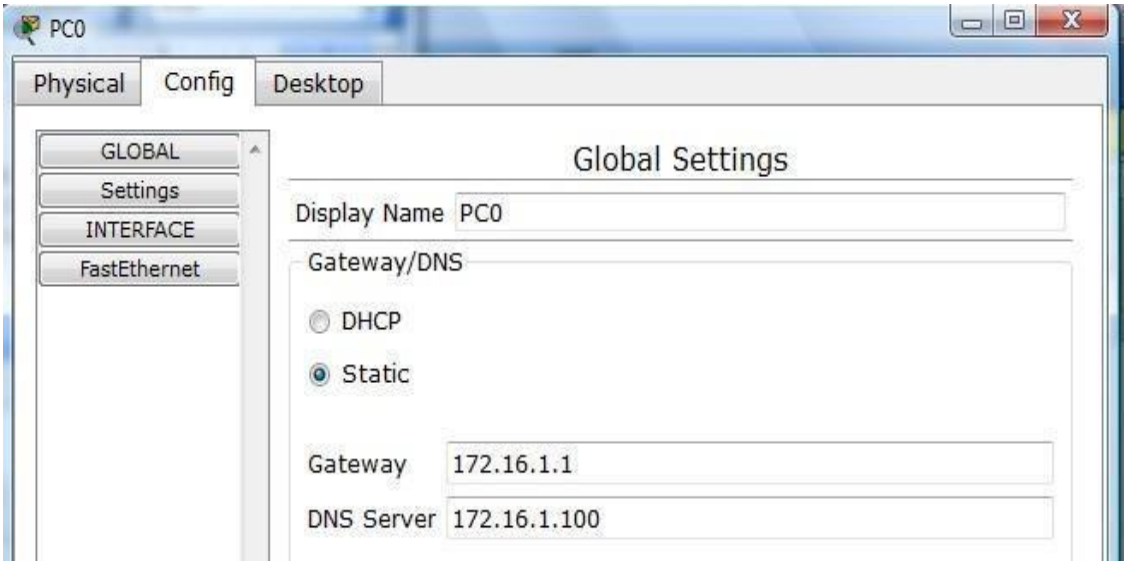
Step 5: Configuring IP Addresses and Subnet Masks on the Hosts

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

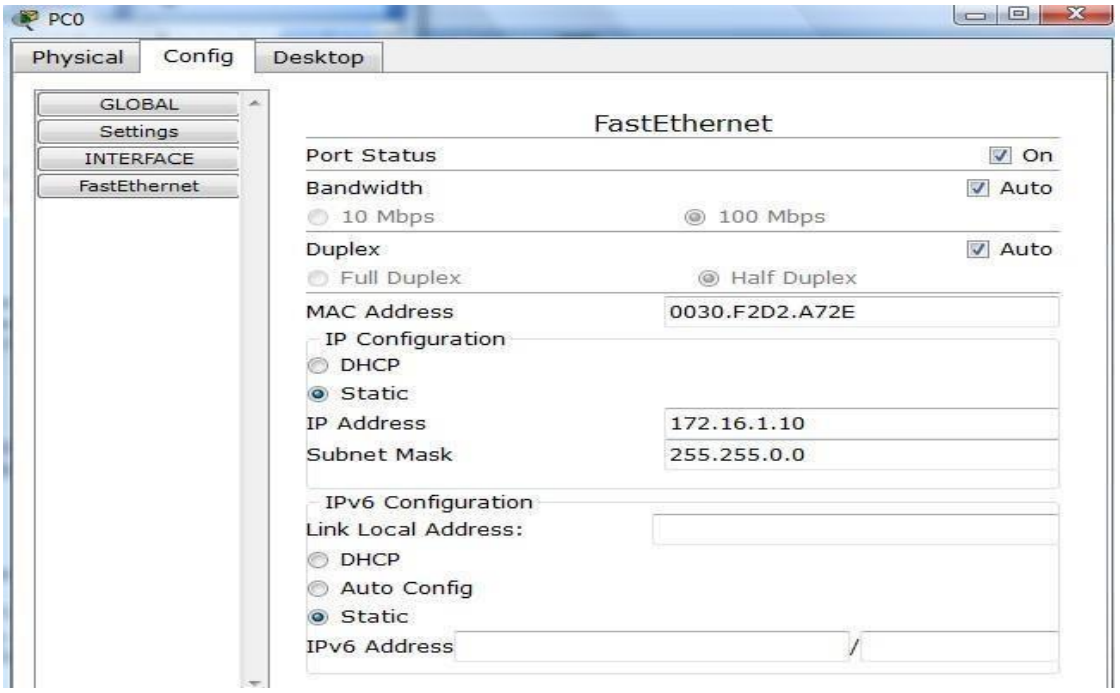
Click once on PC0.



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 **Fast Ethernet**. 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 (auto negotiation), 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).

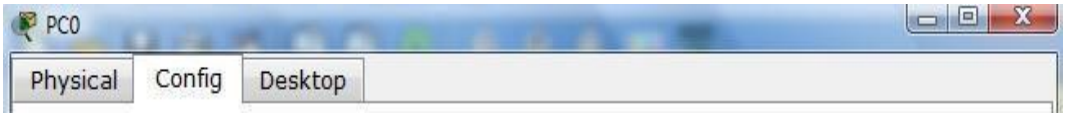
Duplex - Auto

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 Auto negotiation), 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.

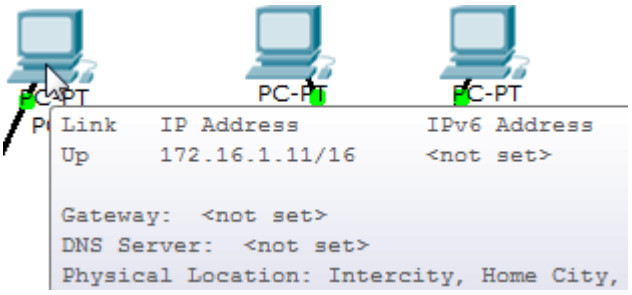


Repeat these steps for the other hosts. Use the information below for IP Addresses and Subnet Masks.

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.

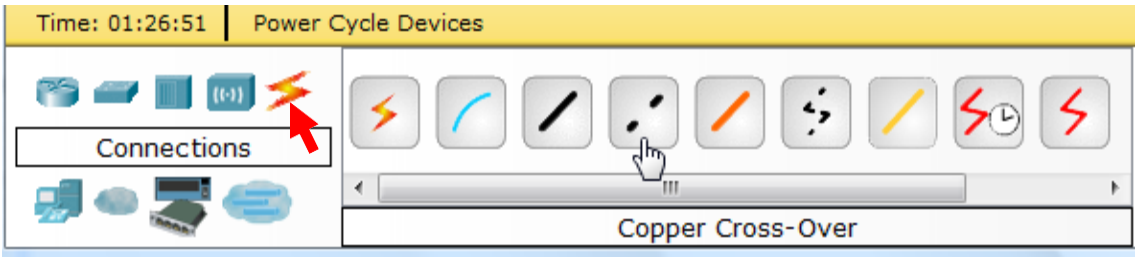


Deleting a Device or Link

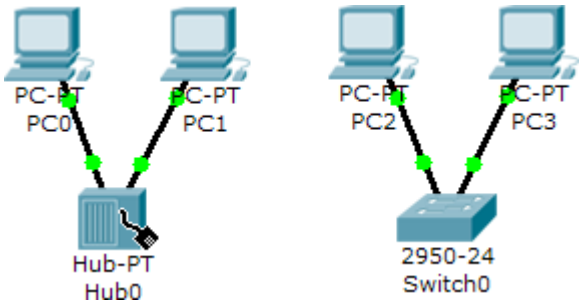
To delete a device or link, choose the **Delete** tool and click on the item you wish to delete.

Step 6: Connecting Hub0 to Switch0

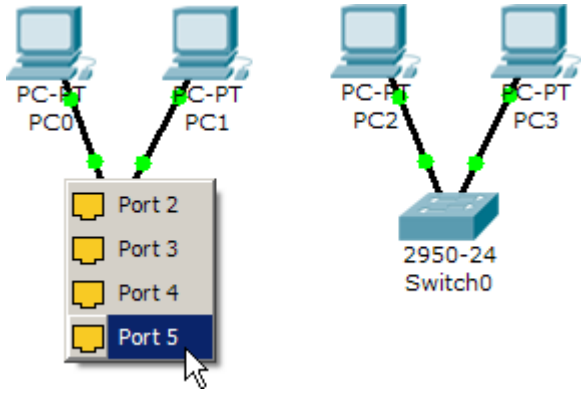
To connect like-devices, like a Hub and a Switch, we will use a Cross-over cable. Click once the **Cross-over** Cable from the **Connections** options.



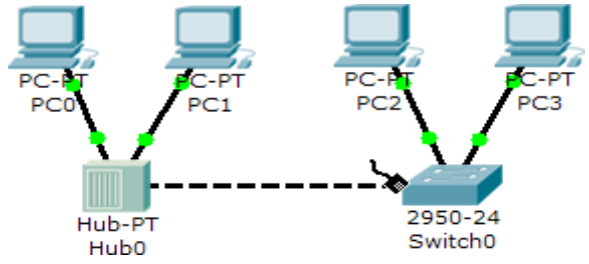
Move the Connections cursor over **Hub0** and click once.



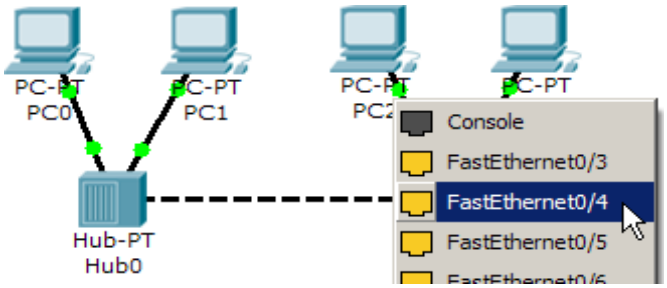
Select **Port 5** (actual port does not matter).



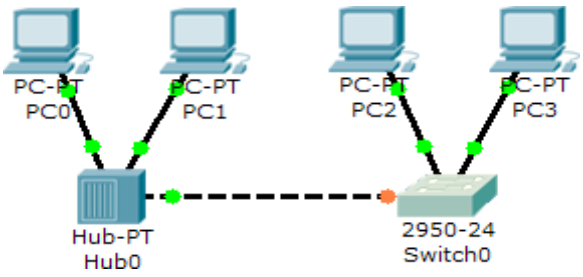
Move the Connections cursor to **Switch0**.

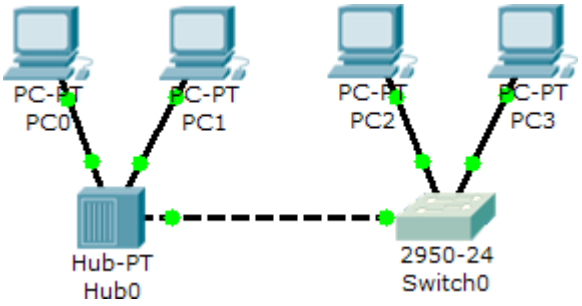


Click once on **Switch0** and choose **FastEthernet0/4** (actual port does not matter).



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.



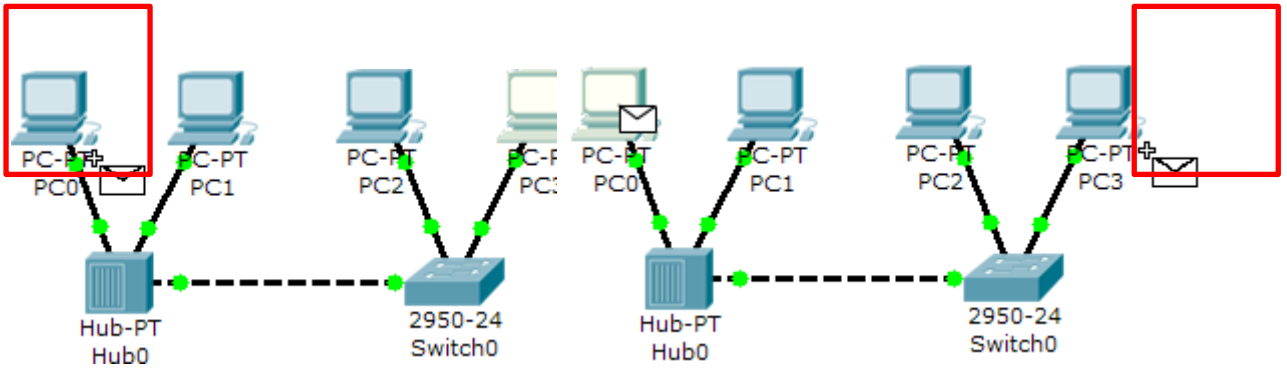


Step 7: Verifying Connectivity in Real-time Mode

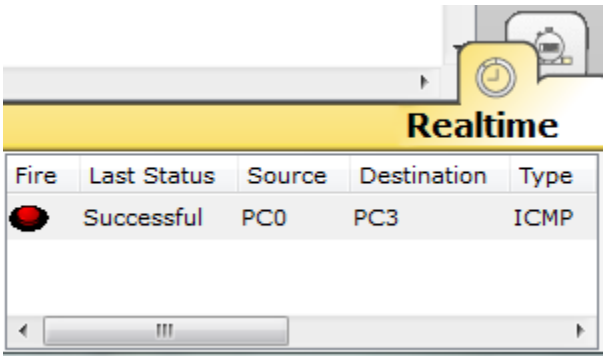
Be sure you are in **Real-time** mode.

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

Click once on PC0, then once on PC3.



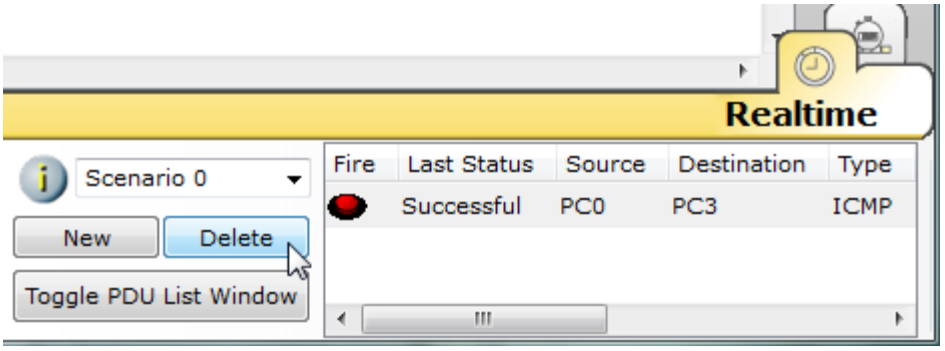
The PDU **Last Status** should show as **Successful**.



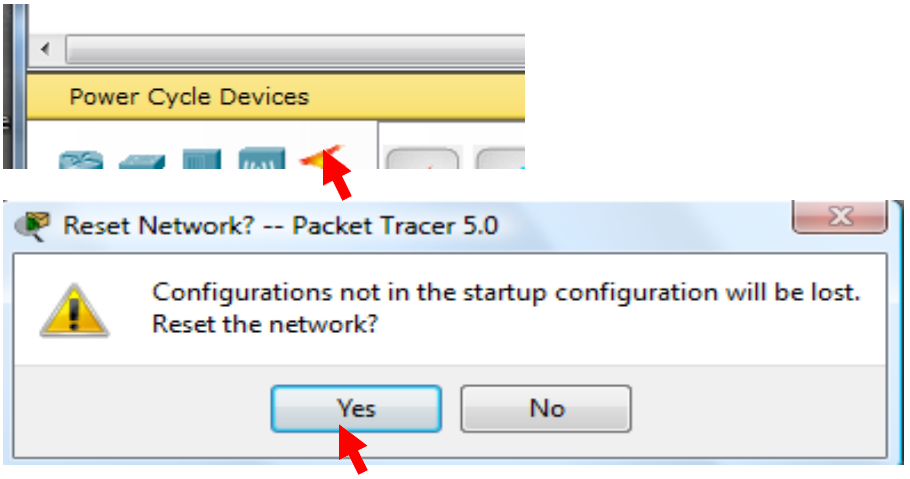
Retting the Network

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.

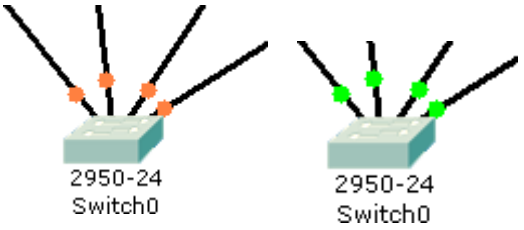


Now, Power Cycle Devices and confirm the action.



Waiting for Spanning Tree Protocol (STP)

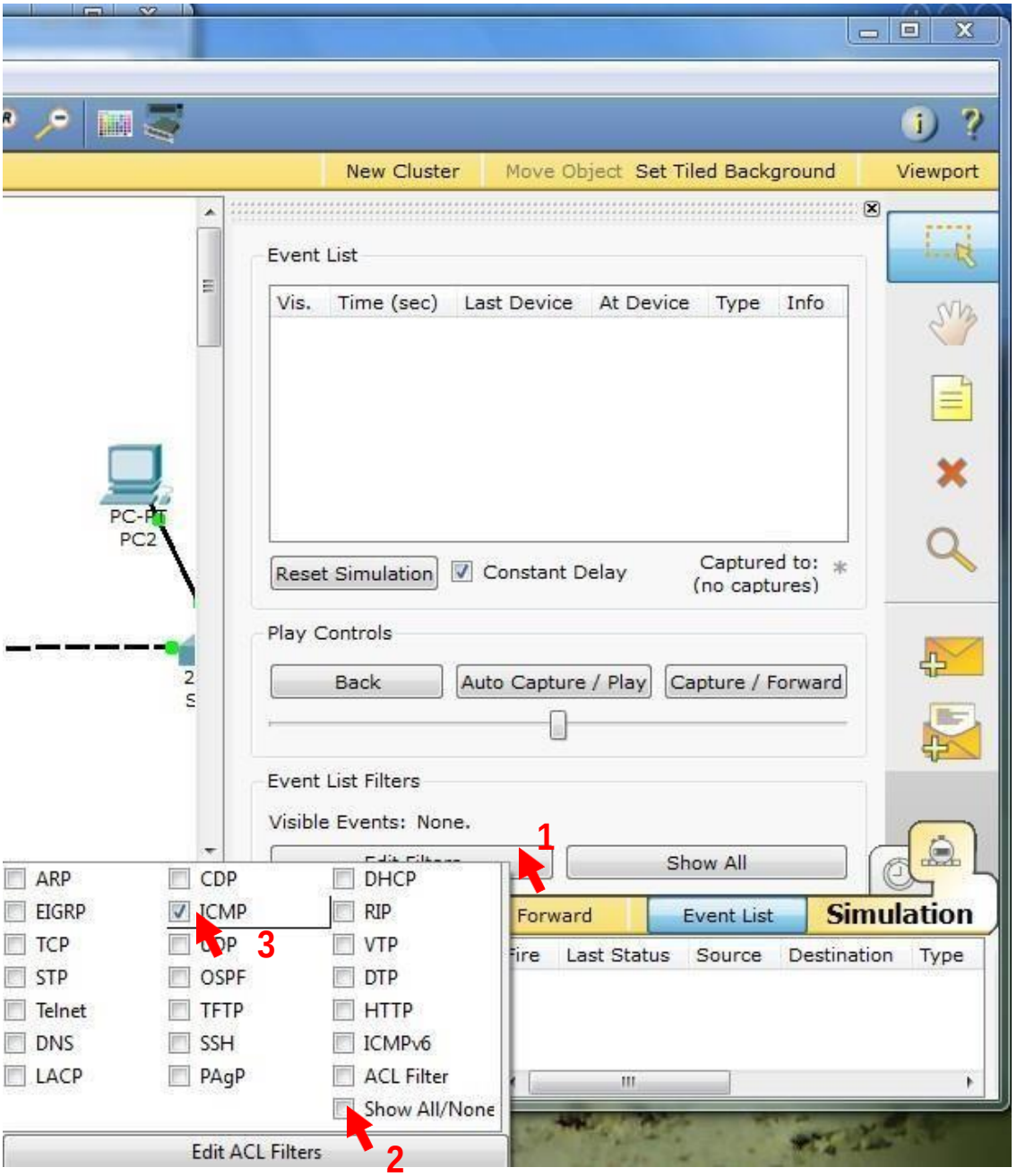
Note: Because Packet Tracer also simulates the Spanning Tree Protocol (later), at times the switch may show amber lights on its interfaces. You will need to wait for the lights to turn green on the switches before they will forward any Ethernet frames.



Step 8: Verifying Connectivity in Simulation Mode

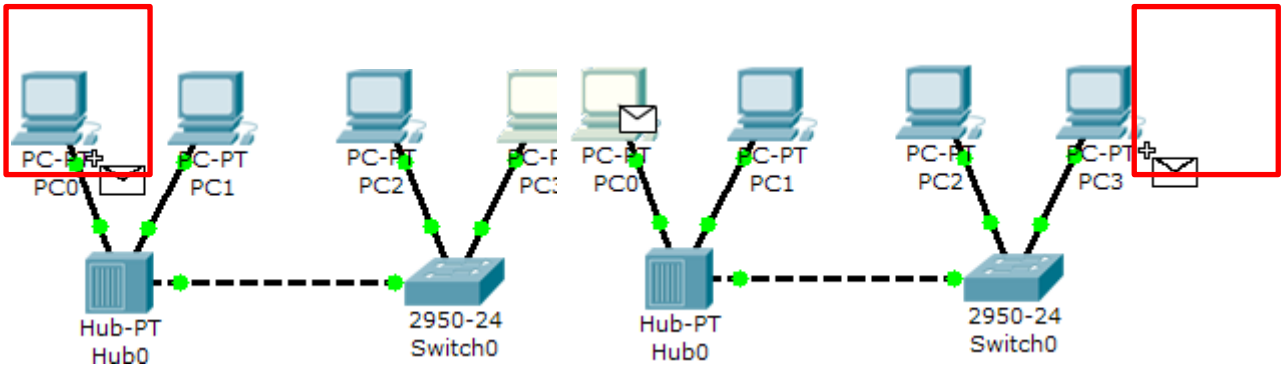
Be sure you are in **Simulation** mode.

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

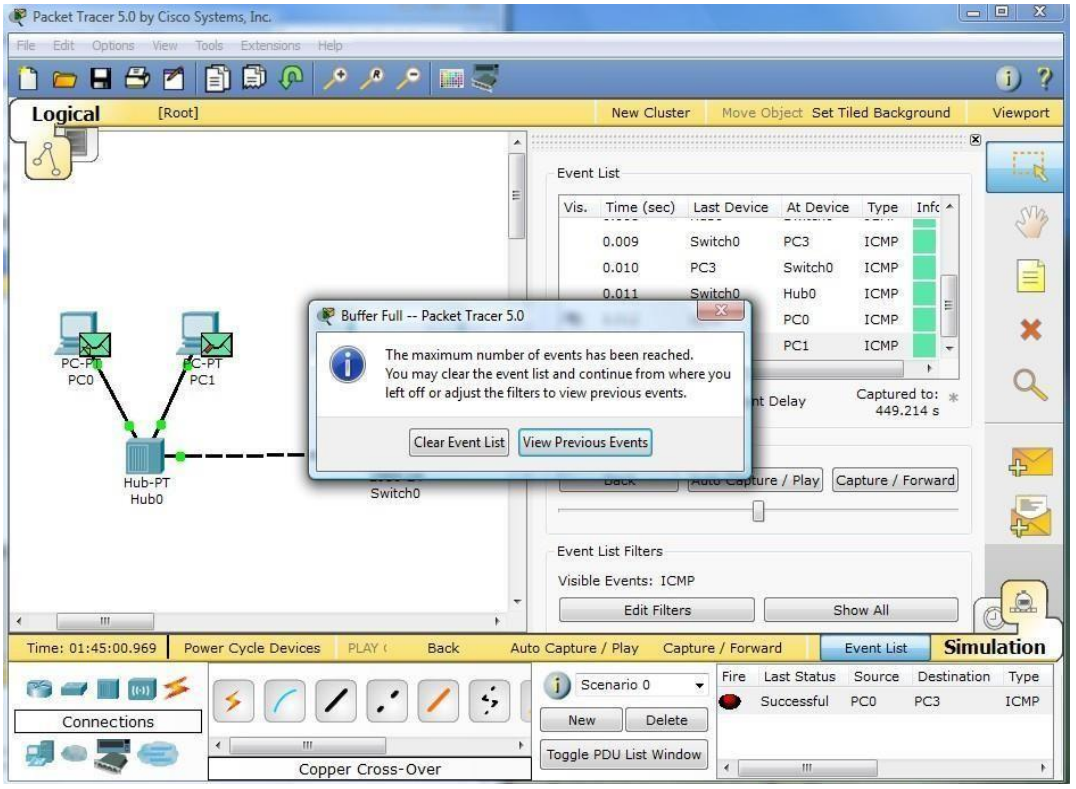

New Cluster
Move Object
Set Tiled Background
Viewport
Event List
Vis.
Time (sec)
Last Device
At Device
Type
Info
PC-PT
PC2
Reset Simulation
Constant Delay
Captured to:
(no captures)
Play Controls
Back
Auto Capture / Play
Capture / Forward
Event List Filters
Visible Events: None.
Show All
Forward
Event List
Simulation
Last Status
Source
Destination
Type
ARP
CDP
DHCP
EIGRP
ICMP
RIP
TCP
UDP
VTP
STP
OSPF
DTP
Telnet
TFTP
HTTP
DNS
SSH
ICMPv6
LACP
PAgP
ACL Filter
Show All/None
Edit ACL Filters
1
2
3

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

Click once on PC0, then once on PC3.

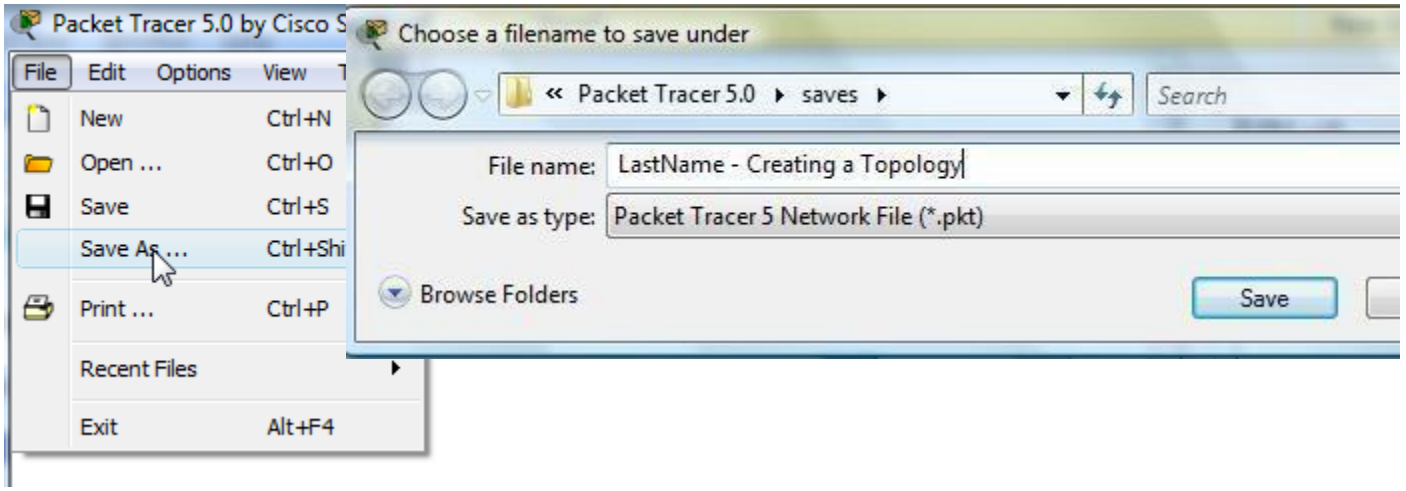


Continue clicking **Capture/Forward** button until the ICMP ping is completed. You should see the ICMP messages move between the hosts, hub and switch. The PDU **Last Status** should show as **Successful**. Click on **Clear Event List** if you do not want to look at the events or click **Preview Previous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

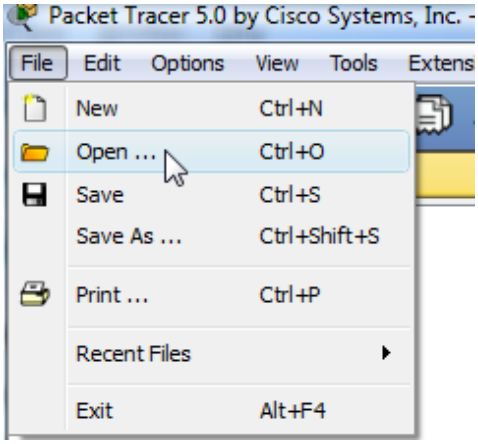


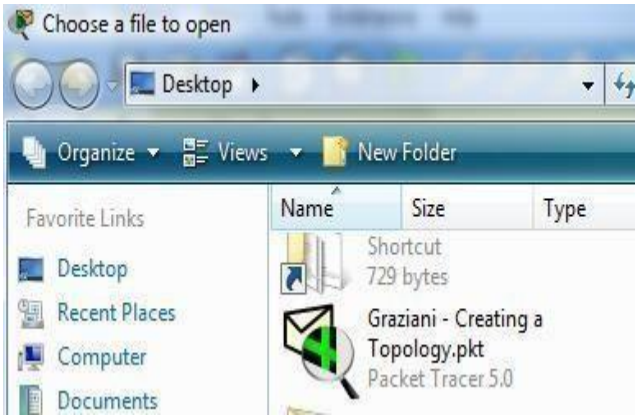
Step 9: Saving the Topology

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

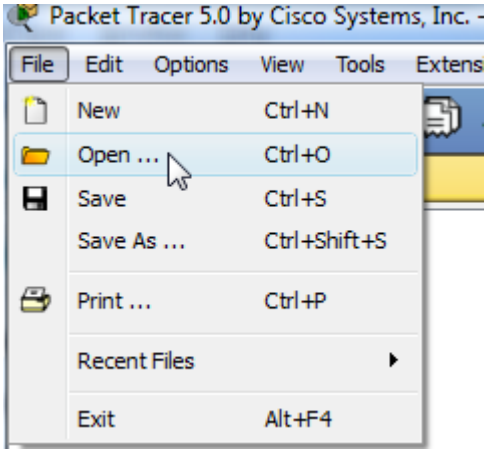


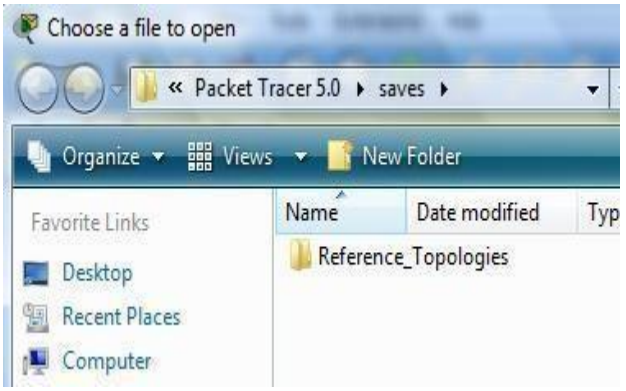
Opening Existing Topologies





Opening Existing PT Topologies





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