Computer Networks-Lab 02

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Computer Networks Lab 02

Objective

The objective of this lab is to introduce students to various network devices such as hubs, switches, and routers. Through simulations using Packet Tracer, students will gain practical knowledge of the functionality and configuration of these devices. They will understand their roles in network communication and develop skills in setting up and connecting end devices.

Learning Outcomes

By the end of this lab, students will be able to:

- Identify and describe different network devices, including hubs, switches, and routers.
- Understand the purpose and functionality of each network device.
- Differentiate between the operations of a hub, switch, and router in a network.
- Configure and simulate a hub using end devices in Packet Tracer.
- Configure and simulate a switch using end devices in Packet Tracer.
- Troubleshoot basic network connectivity issues using the simulated network devices.

STRAIGHT-THROUGH CABLE

A straight-through network cable is just what the name suggests, a cable that passes data straight through from one end to another end. These cables are used for a variety of connections, for instance, connecting a computer to a hub or switch, connecting a computer to a cable/ISDN/DSL modem, and linking switches and hubs together. One such cable connection is shown in Figure 2.1

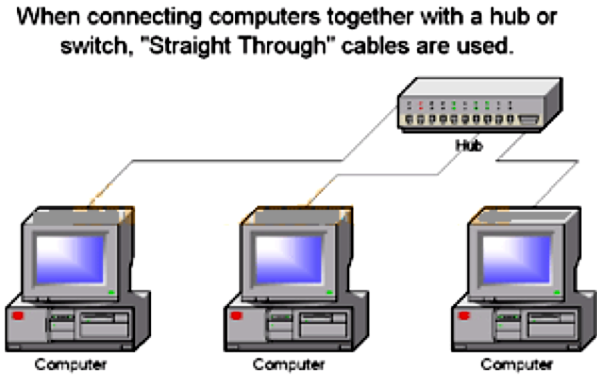
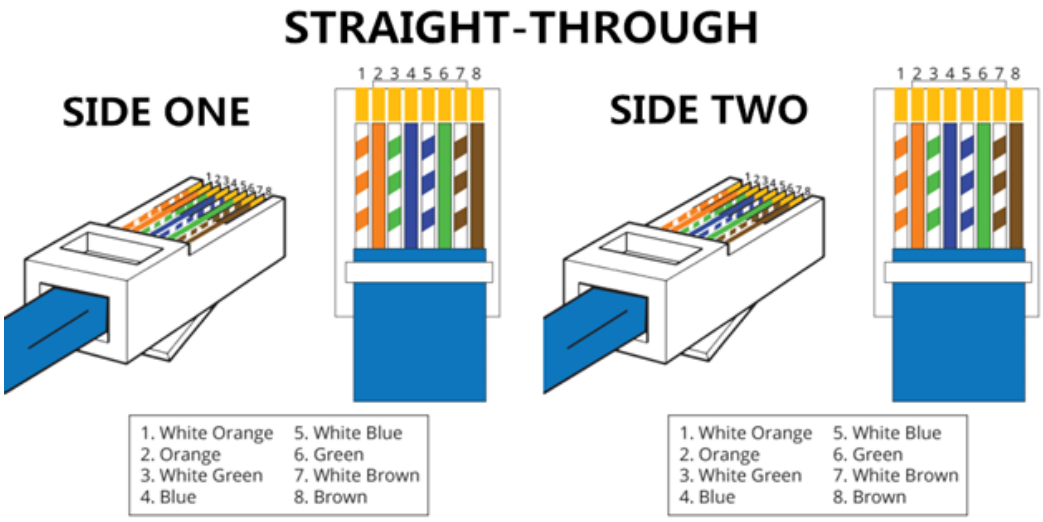


Figure: Straight-through Cable

Typically the ports on a hub are MDIX ports that allow the machine at the other end to utilize its MDI Port without the need for a crossover cable. Through these ports, hub automatically performs the crossover functions, which are required to properly align the cables with each other. When no hub or switch is used, cable itself must physically perform these crossover functions.



CROSS-OVER CABLE

A cross-over network cable is used to connect two computers directly. It is also used when you connect two hubs/Switches with a normal port on both hubs/Switches. (In other words, the cross cable is used relatively in a rare case.). It is used to connect similar devices.

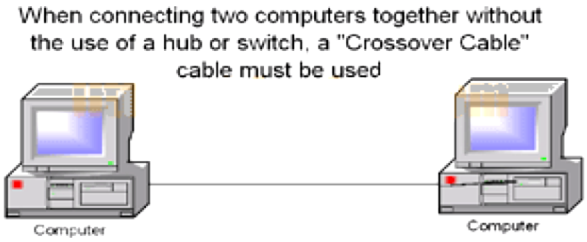
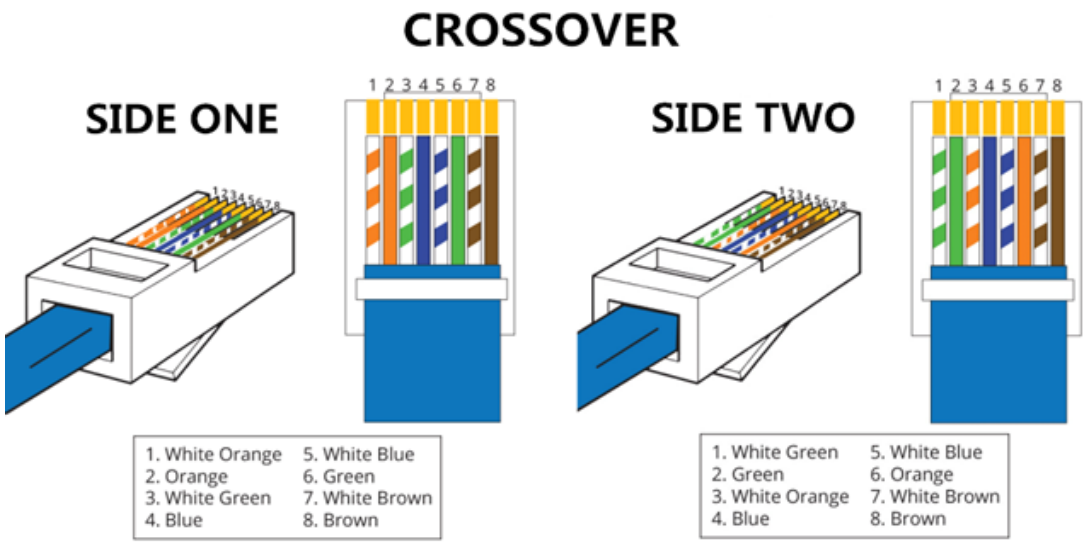


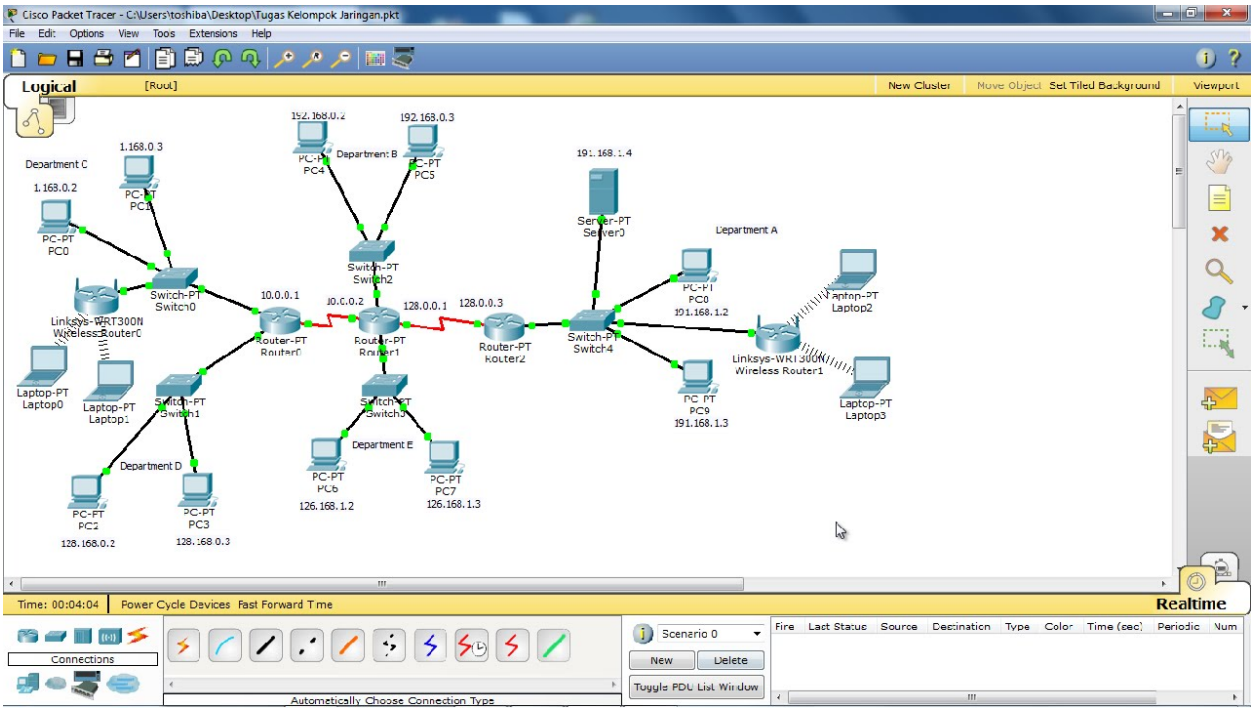
Figure 3.8. Cross-Over Cable



CISCO Packet Tracer

Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface.

Packet Tracer makes use of a drag and drop user interface, allowing users to add and remove simulated network devices as they see fit.



Cisco packet tracer : Connecting Two PCs

We will look into how we can connect two computers/laptops using a virtual program called **CISCO Packet Tracer**.

Prerequisites:

- Laptop/Desktop
- CISCO Packet Tracer program

Run the Cisco Packet Tracer and Start the application.

Implementation:

Follow the below steps to implement the connection:

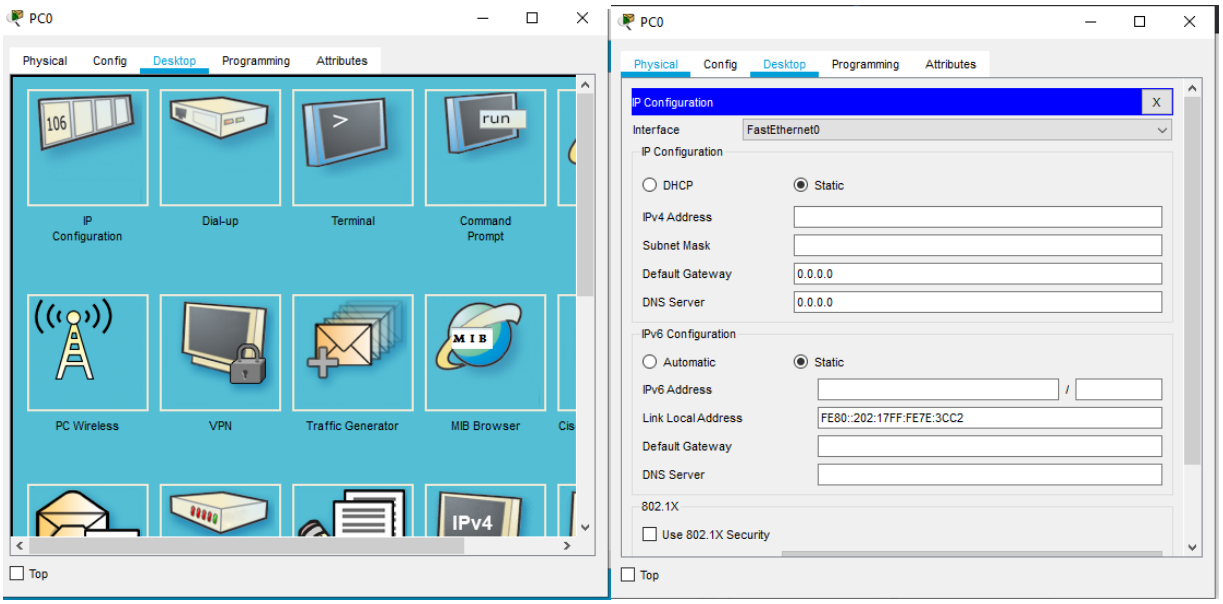
Step 1: From the bottom toolbar, click on ‘End Devices’ and select ‘PC’ and then click on the screen (for two PC’s do this step twice).

Bottom toolbar->End devices->PC

Step 2: Now to connect the PC's, we require a wire; we use cross-over wire to connect similar devices. Select Connections from the bottom toolbar, and select cross-over wire (that is the fourth wire).

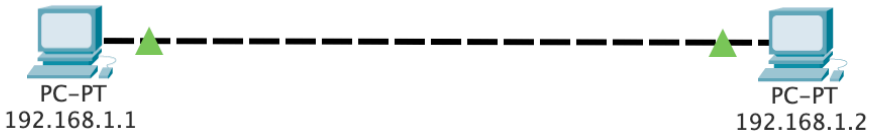
Step 3: After selecting the wire click on the computer on the screen(here PC0) and select FastEthernet0. Then, drag the wire to the other pc (here PC1) and do the same.

Step 4: Now, we will assign the IP address to both the PCs (PC0 & PC1). An **IP address** (Internet Protocol) is nothing but the numerical designation of the devices connected to the network, that use the Internet protocol as a communication medium. Click on PC0. A dialog box will appear on the screen, select Desktop and then select IP configuration :



After clicking on IP configuration this is what will appear. Now in IPv4 Address, write 192.168.1.1, Subnet mask will be 255.255.255.0. Similarly, assign 192.168.1.2 to PC1

We have successfully connected two computers.



Verify the connection using ping

Verify the connection by pinging the IP address of any host in PC0.

- Use the ping command to verify the connection.
- We will check if we are getting any replies or not.
- Here we get replies from a targeted node on both PCs. So, the connection is verified.

```
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Understanding OUTPUT:

Interesting result from ping is round-trip time calculation. Measured in milliseconds, round-trip time indicates the delay between the sending of a ping request packet and the receipt of the corresponding response packet. The network delay or latency indicated by ping offers a good indicator of the responsiveness of network services on that remote host.

By default, ping waits Approximately 4,000 milliseconds (4 seconds) for each response to be returned before displaying the "Request Timed Out" message.

PING

The ping command is one of the most well-known tools available. Simply put, ping sends an "are you there?" message to a remote host. If the host is, in fact, there, ping returns a "yup, I'm here" message. It does this using a protocol known as ICMP, or Internet Control Message Protocol. ICMP was designed to be an error reporting protocol and has a wide variety of uses that we won't go into here.

NETWORKING DEVICES

HUB

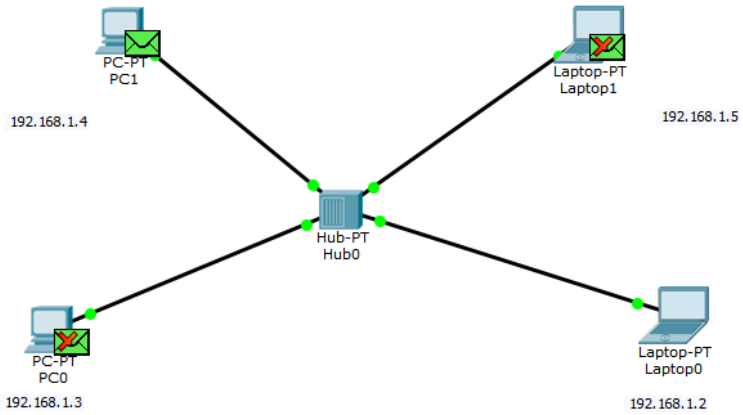
When referring to a network, a hub is the most basic networking device that connects multiple computers or other network devices together. Unlike a network switch or router, a network hub has no routing tables or intelligence on where to send information and broadcasts all network data across each connection. Most hubs can detect basic network errors such as collisions, but having all information broadcast to multiple ports can be a security risk and cause bottlenecks. In the past

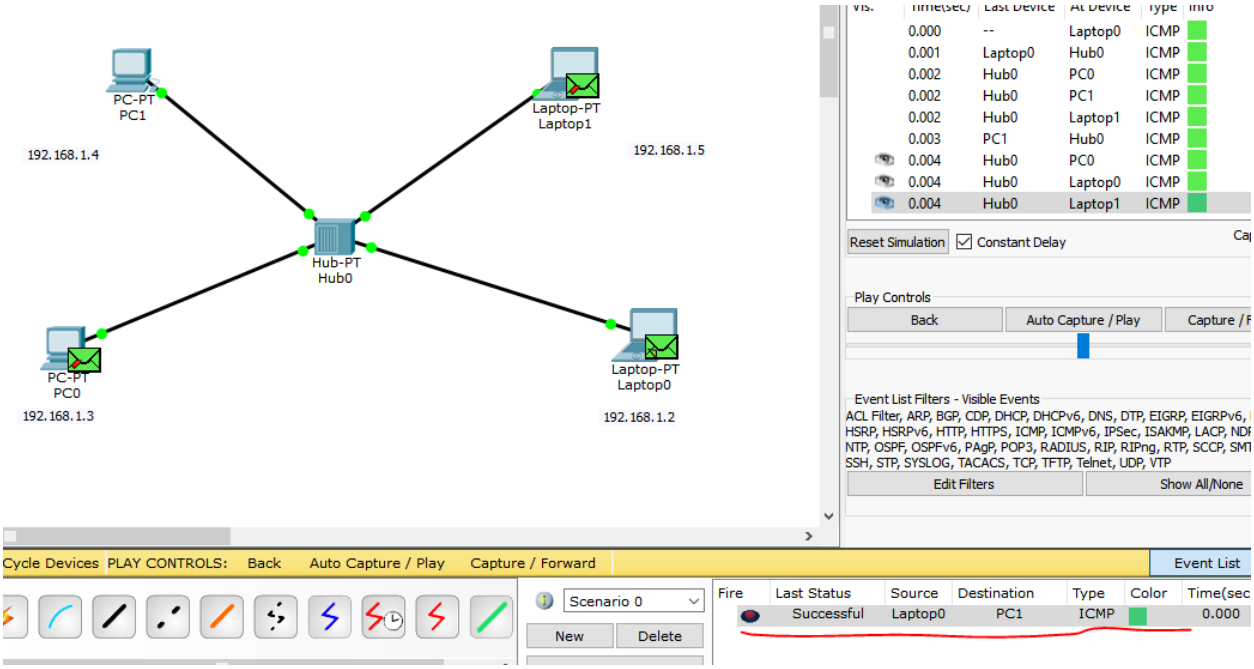
network hubs were popular because they were much cheaper than a switch and router, but today most switches do not cost much more than a hub and are a much better solution for any network.

Figure 3.10. Dlink 7 port HUB

Simulation of Hub with end devices

Task: Construct and simulate the following topology





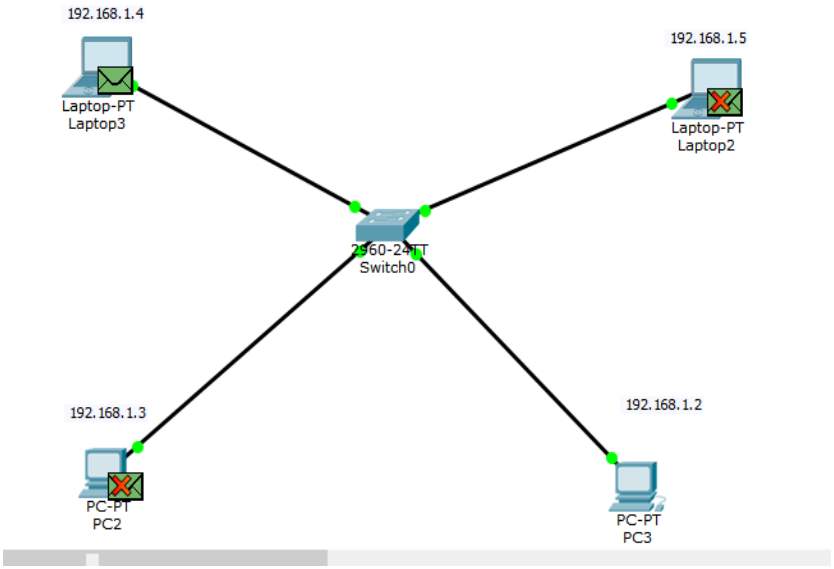
SWITCH

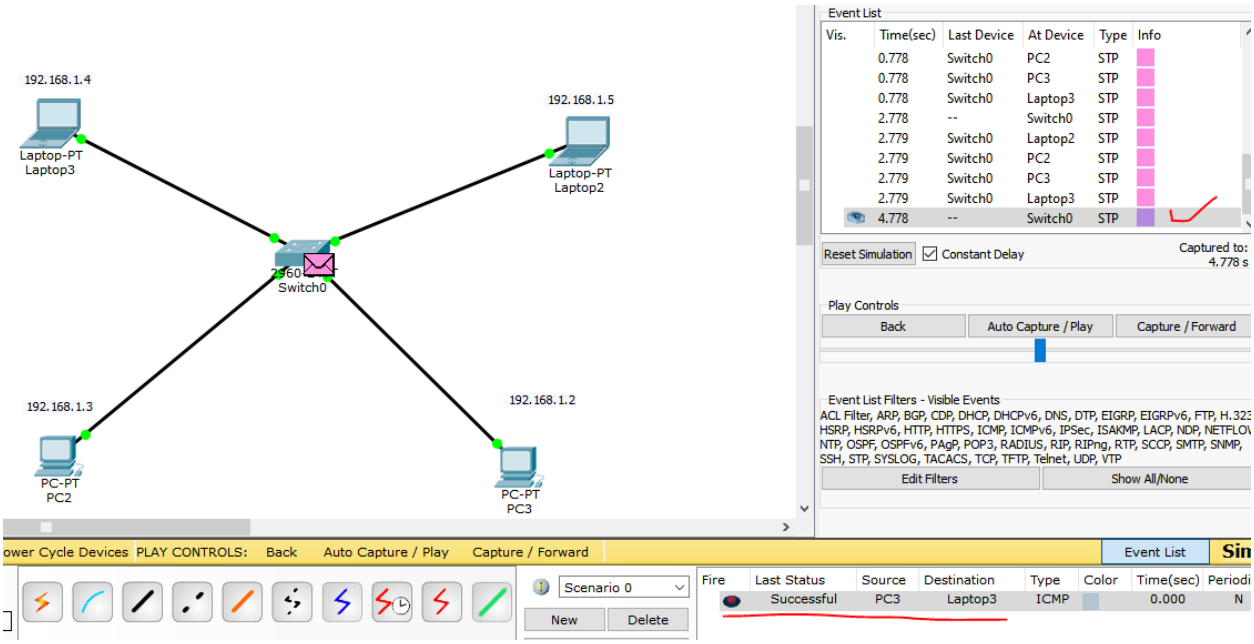
On a network, a switch is a hardware device that filters and forwards packets through the network, but often not capable of much more. The first network device that was added to the Internet was a switch called the IMP, which helped send the first message on October 29, 1969. A network switch is more advanced than a hub but not as advanced as a router. The picture shows an example of a NETGEAR 5 port switch.

Figure 3.11. NETGEAR 5 Port Switch

Simulation of Switch with end devices

Task: Construct and simulate the following topology





ROUTER

A hardware device designed to take incoming packets, analyze the packets, moving the packets to another network, converting the packets to another network interface, dropping the packets, directing packets to the appropriate locations, and performing any other number of other actions. The picture shows the Linksys BEFSR11 router and is what most home routers resemble.

Figure 3.12. Linksys BEFSR11 Router

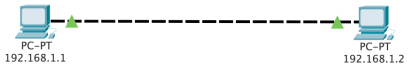
A router has a lot more capabilities than other network devices such as a hub or a switch that are only able to perform basic network functions. For example, a hub is often used to transfer data between computers or network devices, but does not analyze or do anything with the data it is transferring. Routers however can analyze the data being sent over a network, change how it is packaged and send it to another network or over a different network. For example, routers are commonly used in home networks to share a single Internet connection with multiple computers.

Q. What is difference between Hub, Switch and Router?

Lab Tasks

Task 1: Using Packet Tracer connect two PCs as shown above and perform the following:

a. First Configure the PCs as shown and verify the connection using ping command.



b. Configure PC1 as follow: IPv4: 192.168.1.1 Subnet mask: 255.255.255.0

And PC2 as: IPv4: 192.168.2.1 Subnet mask: 255.255.255.0

c. Configure PC1 as follow: IPv4: 192.168.1.1 Subnet mask: 255.255.0.0

And PC2 as: IPv4: 192.168.2.1 Subnet mask: 255.255.0.0

Verify each configuration using ping command and briefly describe the response.

Task 2: Simulation of a Hub with End Devices in Packet Tracer

- Connect end devices to a hub and observe how the hub forwards network traffic.
- Verify connectivity and communication between end devices connected to the hub.

Task 3: Simulation of a Switch with End Devices in Packet Tracer