

## LAB MANUAL

### Local Computer Networks (5<sup>th</sup> Semester)

**Objective:** *To assess the performance of different LAN configurations and protocols.*

**Requirements:**

- Windows PC
- CISCO Packet Tracer Software

### Theory

#### *Definition*

A Local Area Network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can vary in size, ranging from a home network with a single user to an enterprise network with thousands of users and devices within an office or school. A LAN consists of cables, access points, switches, routers, and other components that enable devices to connect to internal servers, web servers, and other LANs through Wide Area Networks (WANs). The advantages of a LAN are similar to those of any networked group of devices. These devices can share a single Internet connection, exchange files, print to shared printers, and can be accessed and even controlled by one another.

#### *Study of following Network Devices:*

- ✓ **NIC (Network Interface Card):** Also known as a Network Adapter, it connects a host to a network medium, providing the physical interface for data transmission. It prepares, sends, and controls data, and can receive and translate data into bytes for the CPU. It contains a unique MAC Address for data communication.
- ✓ **Repeater:** Operates at the Physical Layer. It receives and retransmits signals at a higher level or power, extending signal coverage over longer distances. Repeaters have two ports and are limited to connecting two devices.
- ✓ **Hub:** An Ethernet hub, also known as an active hub or concentrator, connects multiple Ethernet devices together, functioning as a single network segment at the physical layer (Layer 1). It acts as a multiport repeater and participates in collision detection, forwarding jam signals if a collision is detected.
- ✓ **Switch:** A network switch or switching hub connects network segments and processes and routes data at the data link layer (Layer 2) of the OSI model. Layer 3 switches or multilayer switches can handle data at higher layers as well.
- ✓ **Bridge:** A network bridge connects multiple network segments at the data link layer (Layer 2) of the OSI model. Bridges, similar to switches, can analyze incoming data packets and determine whether to forward them to another network segment.
- ✓ **Router:** An electronic device that interconnects two or more computer networks and selectively routes data packets between them based on address information. Routers exchange information about target system addresses in complex networks.
- ✓ **Gateway:** A network node equipped to interface with another network using different protocols. Gateways may include devices like protocol translators, impedance matching

devices, or rate converters to ensure interoperability between networks. They require mutually acceptable administrative procedures between networks and perform protocol conversions when connecting networks with different protocol technologies.

### **Classification of IP address**

IP addresses are divided into different classes, which determine the maximum number of hosts per network ID. Only three classes are actually used for network connectivity. The following table lists all of the address classes.

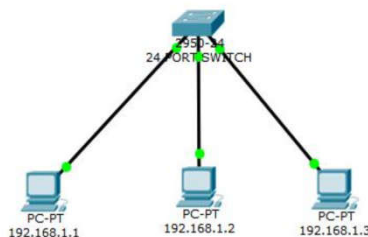
Class	Address Range	Supports
<b>Class A</b>	to 126.255.255.254 First 8 bits are used for network part and the remaining for host part.	Supports 16 million hosts on each of 127 networks.
<b>Class B</b>	128.1.0.1 to 191.255.255.254 First 16 bits are used for network part and the remaining (16 bits) for host part.	Supports 65,000 hosts on each of 16,000 networks.
<b>Class C</b>	192.0.1.1 to 223.255.254.254 First 24 bits are used for network part and the remaining (8 bits) for host part.	Supports 254 hosts on each of 2 million networks.
<b>Class D</b>	224.0.0.0 to 239.255.255.255	Reserved for multicast groups.
<b>Class E</b>	240.0.0.0 to 254.255.255.254	Reserved (experimental purposes).

Default Subnet mask it is used to identify the network part from the host part. Put binary one for the parts that represent network part and zero for the part that represent host part.

a) **Class A:** 255.0.0.0 b) **Class B:** 255.255.0.0 c) **Class C:** 255.255.255.0

### **Experiment No. (1): Configuration of LAN**

- ✓ Open the Cisco Packet Tracer software.
- ✓ Drag and drop three PCs using the End Device Icons located in the top left corner.
- ✓ Select an 8-port switch from the switch icon list in the bottom left corner.
- ✓ Establish connections using straight-through Ethernet cables.
- ✓ Assign IP addresses to PC1, PC2, and PC3 as follows: PC1 - 192.168.1.1, PC2 - 192.168.1.2, and PC3 - 192.168.1.3.
- ✓ Perform a ping test between the PCs and observe the transfer of data packets in both real-time and simulation mode.



1. What is the purpose of Experiment No. (1)?
2. What type of cables are used to establish connections in this experiment?
3. Can you provide the assigned IP addresses for PC1, PC2, and PC3? In which class do these addresses belong? Can we replace them with addresses from other classes?
4. What is the purpose of the ping test in this experiment?
5. What should you observe during the ping test?
6. What are some potential troubleshooting steps if the ping test fails?