Experiment 1

Aim:

Study on network elements, IP address, Subnet mask and network simulator(s)

Objectives:

1. An overview on network elements (i.e. switch, hub, router, bridge, repeater, access point).
2. An overview on different classes of IP addressing, subnet mask and gateway.
3. Introduction to Cisco Packet Tracer (CPT) tool to configure a network.
4. Making connection between two host PCs (end devices) and analysing the communication using ping command.

Exercises:

1. Differentiate layer 2 and layer 3 switches.
2. Compare and contrast IPv4 and IPv6 addresses. What are the default subnet mask for class A, class B and class C IP address?
3. Which of the classes does the following IP address belong to?
    a. 10.10.10.1
    b. 172.16.4.3
    c. 192.168.1.20
4. What are the key features of Cisco Packet Tracer?
5. Explain the two workspaces and two modes of operation in Packet Tracer.

Experiment - 1

Aim of the experiment :-

Study on network elements, IP address, Subnet mask and network simulator(s)

Objectives:

1. An overview on network elements

→ Switch: A layer 2 device that operates at the data link layer, providing multiple ports and enhancing network performance by forwarding data to the correct port based on MAC address

→ Hub: A multiport repeater that broadcast data all connected device, working at the physical layer (layer 1) but lacks data filtering capabilities

→ Router: A network layer device that forwards data packets between networks using IP address and routing tables. Routers connect LAN's and WAN's and can divide broadcast domain.

→ Bridge: Operate at the Data link layer used to connect 2 LANs by filtering data based on MAC Addresses.

→ Repeater: A physical layer device that regenerates weak or corrupted signals to extend network reach. It has two ports and amplifies signals.

→ Acces point: A wireless networking device allowing devices to connect to a wired networking simplifying connections in wireless networks.

2) An overview on different classes of IP addressing, subnet mask & gateway.

IP address → A unique 32-bit address used to identify devices on a network. IPv4 address are written a four ~~fundamental~~ decimal numbers separated by periods (eg: 192.168.1.1). There are two ports to an IP address Network ID and HOST ID.

Classes of IP addressing:

→ Class A: large numbers. Range 0.0.0.0 to 127.255.255.255
Subnet mask: 255.0.0.0

→ Class B: Medium to large sized networks
Range: 128.0.0.0 to 191.255.255.255
Subnet mask: 255.255.0.0

→ Class C: Small sized networks
Range: 192.0.0.0 to 223.255.255.255
Subnet mask: 255.255.0.0

→ Class D: Reserved for multicast
Range: 224.0.0.0 to 239.255.255.255

→ Class E: Reserved for experimental purposes
Range: 240.0.0.0 to 255.255.255.255

Subnet mask: A 32-bit number used to differentiate the network part and the host port of an IP address

Gateway: A network node that acts as an access point to another network, typically connecting a local network to the internet.

Objective-3:

Introduction to Cisco Packet Tracer (CPT) tool to configure a network.

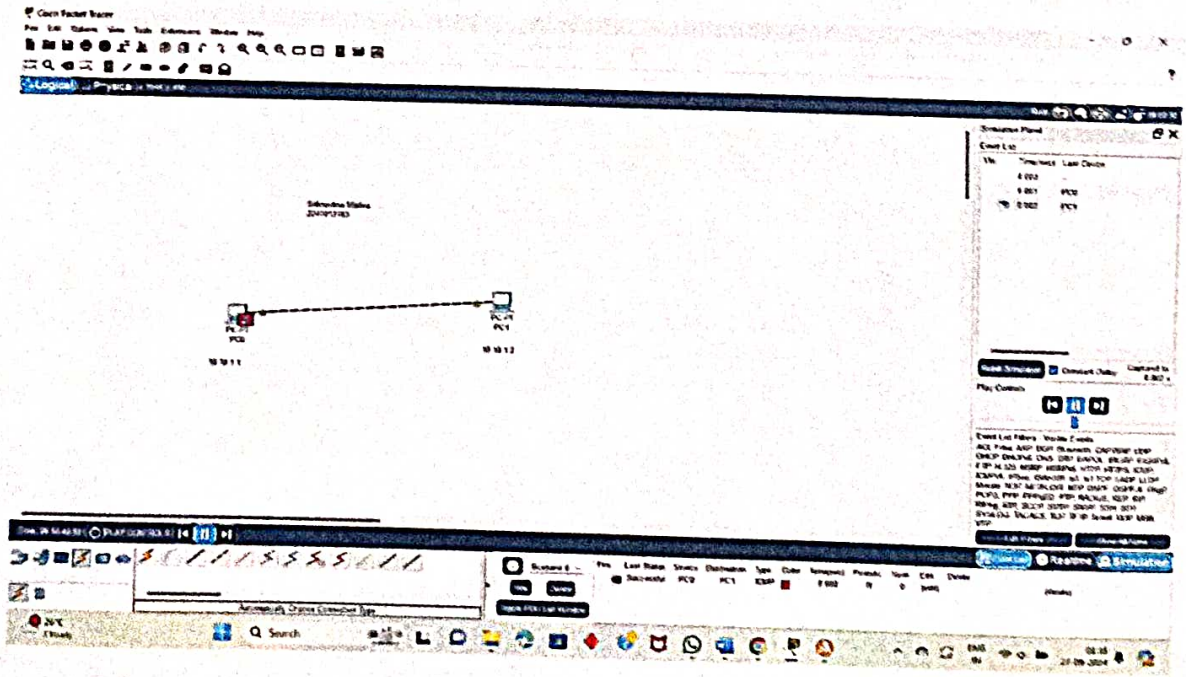
Cisco packettracer is a simulation tool that helps in designing & testing complex networks. It provides a virtual interface to build virtual networks and analyze their functionality.

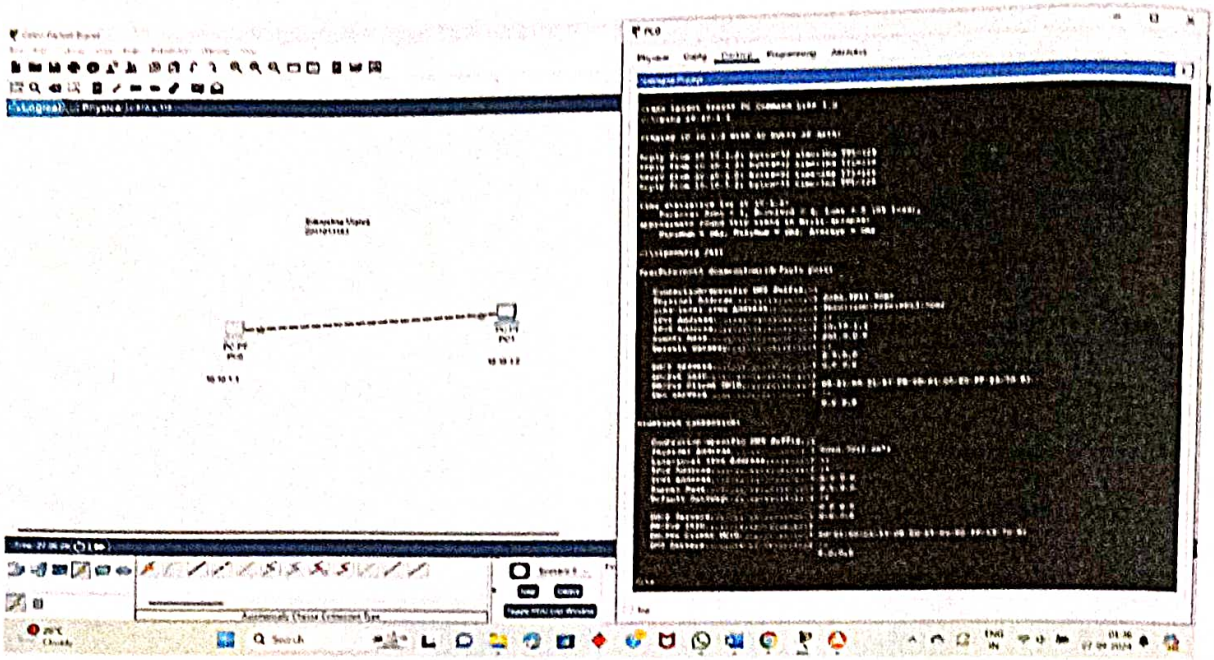
Objective-4:

Making a connection between two host PCs (end device) and analysing the communication using ping command

The connection will be made to two PCs, via the copper cross-over wire and the connection analysis will be done by using Ping command

Observation:-





Conclusion :-

This experiment successfully establishes a study an network elements & we get to know how network simulations occur on the CISCO Packet Tracer. We also get to know how to use ping command & hold message simulations are handled via hub & switch.

Exercises :-

1) Differentiate layer 2 & layer 3 switches

Layer 2 switch	Layer 3 switch
- Operate on layer 2 (Data link) of OSI model.	- Operate on layer 3 (Network layer) of OSI model.
- Work with MAC Address only	- Can perform functioning of both 2 & 3 layer switch.
- Used to reduce traffic on local network	- Mostly used to implement VLAN (Virtual Local Area Network)
- It has single broadcast domain.	- It has multiple broadcast domain
- Can communicate within a network only	- Can communicate within or outside network.

2) Compare & contrast IPv4 and IPv6 addresses. What are the default subnet mask for class A, class B & class C IP address?

IPv4	IPv6
- It has a 32-bit address length	- It has a 128-bit address length
- It supports Manual & DHCP address configuration	- It supports Auto and renumbering address configuration.
- Checksum field is available	- Checksum field is not available.
- IPv4 has a header of 20-60 bytes	- IPv6 has a header of 40 bytes fixed.
- It can generate 429×10^9 address space	- It generates 3.48×10^{38} address space.
- IPv4's IP addresses supports VLSM	- IPv6 doesn't support VLSM.
- Ex:- 66.94.29.13	- Ex:- 2001:0000:3238:DFE1:0063:0000:0000:FEFB

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Default Subnet Masks :-

* Class A IP address:
  - Default Subnet Mask: 255.0.0.0
  - Address Range: 0.0.0.0 to 127.255.255.255
* Class B IP address:
  - Default Subnet Mask: 255.255.0.0
  - Address Range: 128.0.0.0 to 191.255.255.255
* Class C IP Address:
  - Default Subnet Mask: 255.255.255.0
  - Address Range: 192.0.0.0 to 223.255.255.255

3) Which of the classes does the following IP address belong to?

a) 10.10.10.1 ⟶ class A

b) 172.16.4.3 ⟶ class B

c) 192.168.1.20 ⟶ class C

4) What are the key features of Cisco Packet Tracer?

→ Network simulation and visualization
→ Supports multiple devices & protocols.
→ Allow configuration and testing of Real-world networking scenarioes.
→ Enables practice to Cisco certification exams.

5) Explain the 2 workspaces & two modes of operation in Packet Tracer

Workspace:-

→ Logical workspace: Design & configuarge network logically
→ Physical workspace: ~~Visualize the physical~~ visual representation of how these devices would appear & connect in a real environment

Mode:-

-> Realtime Mode:- Simulates the networking operations

->Simulation Mode:- Allow step by step analysis of packet transmissions across networks.

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