Day 1 Assignment 1

**- write some network terminology.**

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**A. Network Topology**

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Network Topology is the way that defines the structure, and how these components are connected to each other.

Types

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The arrangement of a network that comprises nodes and connecting lines via sender and receiver is referred to as Network Topology. The various network topologies are:

1. Point to Point Topology

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Point-to-Point Topology is a type of topology that works on the functionality of the sender and receiver. It is the simplest communication between two nodes, in which one is the sender and the other one is the receiver. Point-to-Point provides high bandwidth.

2. Mesh Topology

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In a mesh topology, every device is connected to another device via a particular channel. In Mesh Topology, the protocols used are AHCP (Ad Hoc Configuration Protocols), DHCP (Dynamic Host Configuration Protocol), etc.

3. Star Topology

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In Star Topology, all the devices are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node. The hub can be passive in nature i.e., not an intelligent hub such as broadcasting devices, at the same time the hub can be intelligent known as an active hub. Active hubs have repeaters in them. Coaxial cables or RJ-45 cables are used to connect the computers. In Star Topology, many popular Ethernet LAN protocols are used as CD(Collision Detection), CSMA (Carrier Sense Multiple Access), etc.

4. Bus Topology

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Bus Topology is a network type in which every computer and network device is connected to a single cable. It is bi-directional. It is a multi-point connection and a non-robust topology because if the backbone fails the topology crashes. In Bus Topology, various MAC (Media Access Control) protocols are followed by LAN ethernet connections like TDMA, Pure Aloha, CDMA, Slotted Aloha, etc.

5. Ring Topology

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In a Ring Topology, it forms a ring connecting devices with exactly two neighboring devices. A number of repeaters are used for Ring topology with a large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.

6. Tree Topology

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This topology is the variation of the Star topology. This topology has a hierarchical flow of data. In Tree Topology, protocols like DHCP and SAC (Standard Automatic Configuration ) are used.

7. Hybrid Topology

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This topological technology is the combination of all the various types of topologies we have studied above. Hybrid Topology is used when the nodes are free to take any form. It means these can be individuals such as Ring or Star topology or can be a combination of various types of topologies seen above. Each individual topology uses the protocol that has been discussed earlier.

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**B.Network Models**

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OSI Model:

------------A seven-layer model used to understand and implement network protocols (Layers: Physical, Data Link, Network, Transport, Session, Presentation, Application).

TCP/IP Model:

------------ A four-layer model (Layers: Network Interface, Internet, Transport, Application) for understanding how data is transmitted over a network.

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**C. Network Devices**

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Router:

--------- Directs data packets between networks, determining the best path for the data.

Switch:

-------- Connects devices within a single network and uses MAC addresses to forward data to the correct destination.

Hub:

-------- A basic device that connects multiple devices in a network, broadcasting data to all devices.

Access Point (AP):

--------- Allows wireless devices to connect to a wired network using Wi-Fi.

Firewall:

---------- Monitors and controls incoming and outgoing network traffic based on predetermined security rules.

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**D. Network Protocols**

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IP (Internet Protocol): Addresses and routes packets across networks (IPv4, IPv6).

TCP (Transmission Control Protocol): Ensures reliable data transmission between devices.

UDP (User Datagram Protocol): Provides a faster, but less reliable, transmission.

HTTP (HyperText Transfer Protocol): Used for transferring web pages over the Internet.

FTP (File Transfer Protocol): Transfers files between computers on a network.

SMTP (Simple Mail Transfer Protocol): Used for sending emails.

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**E.Networking Concepts**

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Bandwidth: The maximum rate of data transfer across a network path.

Latency: The delay before a transfer of data begins following an instruction for its transfer.

Throughput: The actual rate of successful data transfer.

Packet: A unit of data transmitted over a network.

Port: A communication endpoint used by protocols to distinguish different types of traffic.

NAT : Network Address Translation

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**F.Networking Tools**

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Ping: Tests the reachability of a host on an IP network.

Traceroute: Determines the route data takes to reach a network host.

Wireshark: A network protocol analyzer that captures and interactively analyzes network traffic.

Netstat: Displays network connections, routing tables, and interface statistics.

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**G. Security**

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VPN (Virtual Private Network):

Extends a private network across a public network, allowing users to send and receive data as if they were directly connected to the private network.

TLS/SSL (Transport Layer Security/Secure Sockets Layer):

Cryptographic protocols designed to provide secure communication over a computer network.

IDS/IPS (Intrusion Detection System/Intrusion Prevention System):

Monitors network traffic for suspicious activity and potential threats.

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**H.Network Services**

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DNS (Domain Name System): Translates domain names to IP addresses.

DHCP (Dynamic Host Configuration Protocol): Automatically assigns IP addresses to devices on a network.

VoIP (Voice over IP): Delivers voice communications and multimedia sessions over IP networks.

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**I. Network Types**

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LAN (Local Area Network): A network covering a small geographic area, like a home or office.

WAN (Wide Area Network): A network that extends over a large geographical area.

MAN (Metropolitan Area Network): A network that covers a city or a large campus.

PAN (Personal Area Network): A network for personal devices, typically within a range of a few meters.

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**J. Data Transmission**

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Unicast: One-to-one transmission from one sender to one receiver.

Broadcast: One-to-all transmission to all devices in the network.

Multicast: One-to-many transmission, but only to a specific group of receivers.