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Information Regarding Data Communication and Computer Networks :

A Quick Review

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ABSTRACT:

The ability for computers to connect is provided by a computer network, sometimes referred to as a data network. Data links in computer networks are used to transfer data between networked computing devices. Cable or wireless media are used to build network links between nodes. The most well-known computer network is the Internet. Computer components known as network nodes originate, carry, and terminate data on a network. Nodes include hosts including desktop computers, mobile devices, servers, and networking hardware. When two devices can exchange data without being physically connected, they are said to be networked together. Access to the Internet, the shared use of application and storage servers, printers, fax machines, and email and instant messaging applications are all made possible via computer networks. Computer networks vary depending on the physical medium used to transmit signals, the communications protocols used to manage network traffic, and the scale, topology, and organizational objective of the network.

Keywords: *Local Area Network, Network Classifications, Network Security, Physical Layer, Computer Networks*

1. INTRODUCTION:

A computer network is a group of linked computers and related to electronic devices, such as printers.

Computers may exchange information more readable to this link. Computers can communicate with one another wirelessly or through wired connections. Networking engineering involves the use of hardware, electric pulses, software, firmware, chip-level engineering, and more. To make network engineering simpler, the entire networking concept has been divided into several layers. Each layer is separate from the others and is in charge of a certain duty. However, almost every networking job relies in some manner on each of these layers.

An internetwork, or simply the internet, is a network of networks. It is the biggest network in the entire planet. All WANs are vastly connected by the internet, which can also connect to LANs and home networks. TCP/IP is the IP is one of the protocols that make up the Internet. IPv4 is a protocol that is commonly used on the Internet nowadays. It is progressively transitioning from IPv4 to IPv6 because of a lack of address spaces. Users of the internet have access to and may exchange a tremendous amount of global knowledge. It uses services like email, FTP, streaming audio and video, the World Wide Web, and more. On a wide scale, the internet uses a client-server architecture. An internet backbone that operates at incredibly high speed is provided via fiber optics.

2. COMPUTER NETWORK TYPES

A. personal area network (PAN)

The smallest network a user can access is a Personal Area Network (PAN). Devices with Bluetooth or infrared capabilities may fit into this category. The connectivity range of PAN is 10 metres. PAN products include wireless computer mouse and keyboard, Bluetooth-enabled wireless printers, headphones, and TV remote controls. For instance, Piconet is a Personal Area Network with Bluetooth capabilities that can link up to eight devices in a master-slave arrangement.

B. local area network (LAN)

A computer network that covers the entire structure and is run by a single administrative system is referred to as a "local area network" (LAN). A company's colleges, offices, schools and universities are often covered by LAN. A LAN might have anything from two to sixteen million connected systems. It is advantageous for end users to share resources across a

local area network (LAN).It is simple to share resources like printers, file servers, scanners, and the internet between computers. Hardware for networking and routing that is inexpensive makes up LANs. File storage and other locally shared applications may be provided via local servers. It doesn't need a lot of routing and primarily uses private IP addresses.

C. network of metropolitan areas (MAN)

An all-encompassing cable television network is known as the Metropolitan Area Network (MAN).
Some possibilities (FDDI) include Ethernet, Token-ring, ATM, and Fibre Distributed Data Interface. Internet service providers (ISPs) offer the Metro Ethernet service.
This service allows users to increase the size of their local area networks. For instance, MAN can let a business link all of its locations around a city. The foundation of MAN is high-speed, high-capacity fibre optics. The MAN connects the wide area network with the local area network. LANs are linked to WANs or the internet using MAN.

D. wide area networking (WAN)

The Wide Area Network (WAN), as its name suggests, spans a wide area that could include an entire country or even a number of provinces. Wide Area Networks are frequently used in telecommunications networks. These networks link together MANs and LANs. Because they have a highly fast backbone, WANs utilise very expensive network equipment. Advanced WAN technologies (SONET) include Synchronous Optical Network, Asynchronous Transfer Mode (ATM), Frame Relay. The WAN may be under the control of several authorities.

3. COMPUTER NETWORK MODELS

A. OSI MODEL

Open System Interconnect is a free standard that can be used with any communication system.
The OSI model was developed by the International Standard Organisation (ISO). This model has seven layers, including The OSI Model Application Layer is in charge of giving the application's user an interface. This layer includes protocols that communicate with users directly. This layer outlines the format in which data in the native format of the remote host should be displayed. Tracking sessions between distant hosts is done via the session layer. For instance, the remote host may maintain the session once user/password authentication is finished before asking authentic cation again.End-to-end delivery between hosts is the responsibility of the Transport Layer. A network's network layer is in charge of allocating addresses and addressing hosts in a specific way. Data reading and writing to and from the line are handled by the Data Link Layer. The detection of link problems occurs at this layer. Hardware, wiring, power output, and pulse rate are only a few of the elements that the physical layer specifies.

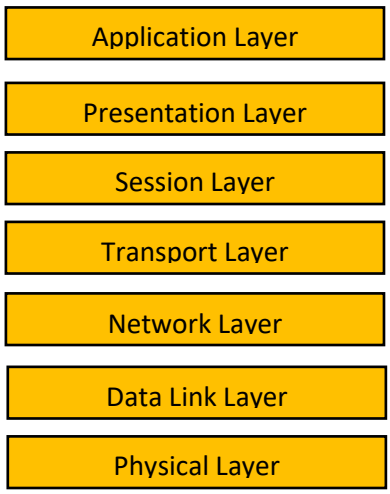

Figure 1OSI Model

B. TCP/IP Model

The Internet uses the TCP/IP protocol suite, also referred to as the Internet suite. The Internet Model, which has a four-layered design, is described in this way. The Internet Model is the model that the internet uses for all communication, whereas the OSI Model is a broad communication model. The internet is independent, just like its underlying network architecture. These are the layers in this model: The Internet Model Application Layer specifies the protocol that enables user interaction with the network. Examples of protocols are FTP, HTTP, and others. This layer outlines the protocol for data transport between hosts. The most significant protocol at this tier is Transmission Control Protocol (TCP). This layer is Responsible for end-to-end delivery and makes sure that data is transferred between hosts in the proper sequence. The Internet Protocol (IP) functions at this layer. This layer facilitates addressing and host identification. The real data transmission and reception take place at the Link Layer. In contrast to its OSI Model equivalent, this layer is independent of the underlying network architecture and hardware.

4. PHYSICAL LAYER

The physical layer of the OSI model communicates with actual hardware and signalling systems. actual thingOnly one layer in the OSI network architecture addresses the physical link between two distinct stations. This layer describes, among other things, the hardware, cable, wiring, frequencies, and pulses that are utilised to represent binary signals.

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The Physical layer provides services to the Data-link layer. Frames are delivered from the datalink layer to the physical layer. The physical layer transforms them into electrical pulses, which stand in for binary data. The binary data is then transmitted over wired or wireless devices.

There are two ways to store data or information: analogue storage and digital storage. For a computer to use the data, it must be in unique digital form. Similar to data, signals can take analogue or digital forms. Before being transferred digitally, data must first be converted to digital form.

5. DATA LINK LAYER

The message is delivered from node to node through the data connection layer. This layer's primary responsibility is to provide error-free data flow from one node to another over the physical layer. It is the duty of the DLL to transmit a packet to the host using its MAC address when it enters a network.

There are two sublayers that make up the data link layer:

1. Logical Link Control (LLC)
2. Media Access Control (MAC)

Depending on the frame size of the NIC (Network Interface Card), the packet received from the network layer is further divided into frames. The header of DLL also contains the MAC addresses of the Sender and the Receiver.

By sending an ARP (Address Resolution Protocol) request across the wire and asking "Who has that IP address?" it is possible to determine the Receiver's MAC address. and the reply from the final host will contain its MAC address. [1]

6. NETWORK LAYER

When a gadget has several routes to a goal, it always chooses the one that has prefers above the others. Routing is the name given to this process of choosing. Routing may be done by routers, which are specific network hardware, or by software processes. The capability and breadth of software-based routers are restricted. A default route is always set on a router. If there is no route found for a particular destination can be identified, a default route instructs the router where to send the packet. In the event that there are several paths to the same destination. Routes may be set up statically or learned dynamically. One route may be set to take precedence over others. [2]

7. TRANSPORT LAYER

The transport layer is Layer 4 of the Open Systems Interconnection (OSI) communications model. It is responsible for ensuring that the data packets arrive accurately and reliably between sender and receiver. The transport layer most often uses TCP or User Datagram Protocol (UDP). In the TCP/IP network model, the transport layer comes between the application and network layers. [3]

8. SESSION LAYER

The session layer is Layer 5 layer from the bottom in the OSI model. The job of the session layer is to control and maintain connections between systems to share data. It establishes, maintains, and ends sessions across all channels. It verifies authenticity and offers recovery alternatives for active sessions in the event of a network fault. It synchronizes data flow and controls sessions. [4]

9. APPLICATION LAYER

The application layer in the OSI model is the closest layer to the end user which means that the application layer and end user can interact directly with the software application. The application layer programs are based on client and servers. [5]

10. SUMMARY

Connecting computer systems and peripherals creates a network. They offer several benefits. Some of them are Shared resources including things like printers and storage devices. Email and FTP are used to exchange information. Internet-based or web-based information sharing use of dynamic web pages for social interaction Internet Protocol (IP) capable phones. conferences held via videoconference. parallel processing Instant message transmission

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