

UNIT-3

Date

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Data Communication

Overview:

A system of interconnected computers and computerized peripherals such as printer is called as Computer Network.

This interconnection among computers facilitates information sharing among them. Computers may connect to each other by either wired or wireless media.

Classification of Computer Networks.

Computer networks are classified based on various factors. They include:

Geographical Span

Inter Connectivity

Administration

Architecture.

→ Geographical Span

- It may be Spanned across your table, among bluetooth enable devices. Ranging not more than few meters.
- It may be Spanned across a whole building, including devices to connect all floors.
- It may be spread Spanned across a whole city.
- It may be Spanned across multiple cities or provinces.
- It may be one network covering whole world.

→ Inter-Connectivity

- Every Single device can be connected to every other device on network, making the network mesh.

All devices can be connected to a single medium but geographically disconnected, created bus like structure.

→ Administration

Form an administration point of view, a network can be private network which belongs a single autonomous system. and cannot be accessed by outside by physical or logical domain.

A network can be public which is accessed by all.

→ Network Application Architecture

Computer network can be discriminated into various types such as client server peer to peer or hybrid, depending upon its

its architecture

⇒ Network Application

- Resources Sharing such as printer and storage devices
- Exchange of information by means of e-mail and FTP
- Information sharing by using web or internet.

Computer Network Types

Generally, networks are distinguished based on their geographical span.

→ Personal Area Network

A personal area network (PAN) is the smallest network which is very personal to a user. This may include Bluetooth enable devices or infra-red

enable devices. PAN has Connectivity range up to 10 meters. PAN may include wireless Computer keyboard and mouse, bluetooth enable headphones, wireless Printers and TV remotes.

→ Local Area Network

A computer network spanned inside a building and operated under single administration system is generally termed as local area network (LAN). usually LAN covers an organisation officers, schools, colleges or universities. Number of systems connected in LAN may vary from as least as two to as much as 16 million, LAN can be wired, or in both forms at once.

→ Metropolitan Area Network

The Metropolitan area network (MAN) (MAN) generally expands throughout a city such as Cable TV network. It can be in the form of Ethernet, token ring, ATM or fiber distributed or Fiber distributed Data Interface (FDDI)

Metro Ethernet is a service which is provided by ISPs. This service enables its users to expand their local area networks. for eg. MAN can help an organisation to connect all of its offices in a city.

→ Wide Area Network

As the name suggests, the wide area network (WAN)

Covers a wide area which may span across provinces and even a whole Country. WAN may use advanced tec. Such as Asynchronous transfer modes (ATM), Frame Relay and synchronous optical network (SONET). WAN may be managed by multiple administration.

-> Internetwork

A network of networks is called an interwork, or simply the Internet. It is the largest network in existence on this planet. The internet largely connects and it can have connection of LANs and home network. Internet uses TCP/IP protocol suite and uses IP as its addressing.

Protocol.

Network LAN Technologies

Let us go through various LAN technologies in brief

→ Ethernet:

Ethernet Shares media. Network which uses shared media has high probability of data collision. Ethernet uses Carrier Sense Multi access Collision Detection (CSMA/CD) technologies to detect collisions. Ethernet Connector is network interface card equipped with 48-bits MAC address. This help other ethernet devices to identify and communicate

with remote devices in ethernet.

→ Fast - Ethernet:

Fast-ethernet on fiber is defined under 100BASE-FX Standard which provides speed up to 100 MBPS on fiber ethernet over fiber can be extended up to 100 meters in half-duplex mode and can reach maximum of 2000 meters in full-duplex over multimode fibers.

→ Giga - Ethernet

After being introduced in 1995, Fast ethernet could enjoy its high speed status only for ~~five~~ 3 years till Giga - Ethernet

Introduced, Giga-Ethernet provides a speed upto 1000 mbits/seconds. IEEE 802.3ab standardize Giga-Ethernet over UTP using Cat-5, Cat 5e, Cat-6 cables. IEEE 802.3ah defines Giga-Ethernet over fiber.

→ Virtual LAN.

LAN uses ethernet which in turn works on Shared media. Shared media in Ethernet create on single Broadcast domain and on single Collision domain. Introduction of Switches to Ethernet has removed single Collision domain issue and each device, connected to switch

works in its separate collision domain. But even switches cannot divide a network into a separate broadcast domain.

Computer Network Topologies

A network topology is an arrangement with which computer system or network devices are connected to each other. Topologies may define both physical and logical aspect of the network. Both logical and physical topologies could be same or different in a same network.

→ Point to Point: Point to point network contains exactly

two hosts such as Computer Switches or routers, Servers, Connected back to back using a single piece of cable. often, the receiving end of one host is connected to sending end of the other and vice-versa.

Bus Topology

In Case of Bus topology, all devices share single communication line or cable.

Bus topology may have problem while multiple host sending data at the same time. Therefore, Bus topology either uses CSMA/CD technology or recognize one host as bus master to solve the issue.

→ Star Topology

All hosts in Star topology are connected to a central device known as hub device, using a point to point connection.

- Layer-1 device such as hub or repeater
- Layer-2 device such as switch or bridge
- Layer-3 device such as router or gateway.

→ Ring Topology

In ring topology, each host machine connects to exactly two other machines, creating a circular network structure. When one host tries to communicate or send message to a host which is not adjacent to it, the data

travels through all intermediate hosts. To connect one more hosts in the existing str. the administration may need only one more extra cable.

→ Mesh Topology.

In this type of topology, a host is connected to one or more hosts.

This topology has hosts in point to point connection with every other host or many also have hosts which are in point-to-point connection to few hosts only.

- Full Mesh: All hosts have point-to-point connection to every other host in the network.

- Partially Mesh: Not all hosts have point-to-point connection to every other host.

→ Tree Topology

Also known as Hierarchical Topology, this is the most common form of network topology in use presently. This topology imitates an extended star topology and inherits properties of bus topology.

→ Daisy chain

This topology connects all the hosts in a linear fashion. Similar to ring topology, all hosts are connected to two hosts only, except the end hosts.

Means if the end hosts in daisy chain are connected then it represents ring topology.

→ Hybrid Topology

A network str. whose design contains more than one topology is said to be hybrid. Hybrid topology inherits merits and demerits of all the incorporating topologies.

Physical layer introduction

→ Signals: When data is sent over physical medium, it needs to be first converted into electromagnetic signals.

Data itself can be analog.

- Digital Signals
- Analog Signals

→ Transmission Impairment:

When signals travel through the medium they tend to deteriorate. This may have many reasons as given.

- Attenuation
- Dispersion
- Delay distortion
- Noise
- Thermal noise
- Intermodulation
- Crosstalk
- Impulse

→ Transmission Media

The media over which the information between two computer systems is sent called transmission media.

- Guide media
- Unguided media

→ Channel Capacity:

The Speed of transmission of information is said to be the Channel Capacity.

- Bandwidth
- Error-rate
- Encoding

Data - Link Layer Introduction

Data - link layer introduction is second layer of OSI layered model. This layer is one of the most complicated layers and has complex functionalities and liabilities. Data link

layer hides the detail of underlying hardware and represents itself to upper layer as the medium to communicate

- Local link Control: It deals with protocol, flow-control, and error control.
- Media access Control: It deals with actual control of media

→ Functionality of Data Link layer:

Data link layer does many tasks on behalf of upper layer. These are.

- Framing
- Addressing
- Synchronization

- Error Control
- Flow Control
- Multi-Access
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Network Layer Introduction

Layer-3 in the OSI model is called network layer. Network layer manages options pertaining to host and network addressing, naming sub-networks, and internetworking.

Layer-3 Functionalities

Devices which work on network layer mainly focus on routing. Routing may include various tasks aimed to achieve a single goal. These can be

- Addressing and networks.
- Population routing tables or Static routes.
- Interworking between two different subnets.

→ Network Layer Features.

With its standard functionalities layer 3 can provide features are.

- Quality and Service management
- Load balancing and link management
- Security.

Transport Layer Introduction

Next layer in OSI model is recognized as transport layer (layer 4). All modules and procedures pertaining to transportation of data or data stream are categorized into this layer :

→ Functions.

- This layer ensures that data must be received in the same sequence in which it was sent.
- This layer provides end-to-end delivery of data between hosts which may or may not belong to the same Subnet.

Application Layer

Application layer is the top most layer in OSI and TCP/IP layered model. This layer exists in both layered models because of its significance of interaction with user and user application. This layer is for application wh

are involved in Communication
System.