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Data Communication Overview

Unit III

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⇒ Overview: A system of interconnected computer and computerized peripherals such as printer is called computer network. This interconnected among computer facilitates information sharing among them. Computer may be connected 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 a table, among bluetooth enabled devices.
- It may be spanned across a whole building.

- It may be spanned across a whole city.
- It may be spanned across multiple cities or provinces.
- It may be one ~~to~~ networks covering whole world.

⇒ Inter-Connectivity ⇒

- Every single devices can be connected to every other device on a network, making the network mesh.
- All device can be connected to a single medium but geographically disconnected. Created bus like structure.

→ Administration ⇒

From an administration point of view a network can be private network which belong a single autonomous system and cannot be accessed outside.

It physical or logical domain. A network can be public which is accessed by all.

→ Network Architecture

Computer network can be discriminated into various type such as Client server, peer to peer or hybrid, depending upon its architecture.

→ Network Applications

- Resource sharing such as printer and storage devices.
- Exchange of information by means of e-mails and FTP.
- Information sharing by using dynamic ~~web~~ web or internet.

→ Computer Network types:

Generally networks are distinguished based on their geographical span.

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→ Personal Area Network

A personal area network (PAN) is smallest network which is very personal to a user. This includes bluetooth enable device, or infra-red enable device. PAN has Connectivity range up to 10 meters. PAN may include wireless Computer, Keyboard and mouse, Bluetooth enable head phones, wireless printer and TV remotes.

→ Local Area Network:

A Computer network spanned inside a building and operated under single administrative system is generally termed as local area network (LAN). Usually, LAN cover an organization, officer, schools, College or universities. Number of system connected in (LAN) may vary from as least as two.

to as much as 16 million.
LAN can be wired, wireless or
in both forms at once.

⇒ Metropolitan area networks

The Metropolitan area network (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 Data Interface (FDDI).

Metro ethernet is a service which is provided by ISPs. This service enable it user to expand their local area network. For example, MAN can help an organization to connect all of its offices in a city.

⇒ Wide Area Network

As the name suggests the Wide Area Network (WAN) cover a wide area which may span across

provinces and even a whole Country. WAN may use advanced technologies such as Asynchronous Transfer frame relay, and asynchronous optical Network (SONET). WAN may be managed by multiple administration.

⇒ Internetworks

A network of ~~to~~ networks is called as Internetwork, or simply the Internet. It is the largest network in existence on this planet. The Internet chiefly connects all WANs and it can have connection to LANs and Home networks. Internet use TCP/IP protocol suite and uses IP as its addressing protocol.

⇒ Networks: LAN Technologies

Let us go through various LAN technologies in brief.

⇒ Ethernet:

Ethernet - shares media Network which users shared media has high probability of data Collision. ethernet users Carrier sense Multi access Collision Detection (CSMA/CD) technologies to detect Collision. Ethernet Connector is network interface Card equipped with 48-bit MAC address. This help other ethernet devices to identify and Communication with remote device on 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 meter 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 3 years till giga-ethernet introduced. giga-ethernet provides speeds up to 1000 mbits/seconds. IEEE 802.3ab standardize giga-ethernet over UTP using Cat 5, Cat 5e and Cat 6 Cable. IEEE 802.3ah define giga-ethernet over fiber.

→ Virtual LAN:

LAN user ethernet which is true works on shared media. Shared media, in ethernet create a single Broadcast domain and one single Collision domain. Introduction of switches to ethernet has removed single Collision domain issue and each device connected to switch works on its

separates ~~to~~ Collision domain. But even switches cannot divide a network into ~~se~~ separate Broadcast domain.

⇒ Computer Network Topologies

A network Topologies is the arrangement with ~~phys~~ which Computer system or network device 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 contain exactly two hosts such as Computer switches or router, server 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 a 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 recognizes one host as bus master to solve the issue.

⇒ Star Topology:

All hosts in star topology are connected to a central device known as a 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 host in the existing structure the administrator may need only one more extra cable.

⇒ Mesh Topology

In this type of topology a host is connected to one or multiple hosts. This topology has been

- hubs In point-to point Connection with every other host or may also have hosts which are in point-to point Connection to few hosts only.
- Full Mesh: All hosts have a point-to point Connection to every other other host.
- Partially Mesh: Not all hosts have point-to point Connection to every other host.

→ Trees Topology

Also known as Hierarchical Topology. This is the most ~~com~~ 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 host 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 structure whose design contains more than one topology is said to be hybrid topology.

Hybrid topology inherits merits and demerits all the incorporation topology.

⇒ Physical Layer Introduction

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

- Digital ~~sig~~ signals.

- Analog Signals

→ Transmission Impairment

When signals travel through the medium they tend to deteriorate.

This may have many reasons as given.

- Attenuation.

- Delay distortion

- Dispersion

- Noise.

- Thermal Noise.

- Intermodulation.

- Crosstalk

- Impulse

→ Transmission Media

The media over which the information between two computer system is

sent called transmission media,

Transmission media comes in two forms.

- Guided 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 is second layer of OSI layered Model. This layer is one of the most complicated layers and has complex functions and liabilities. Data link layer hides the detail of underlying hardware and represent itself at higher layer and the media to

protocols 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

⇒ Network layer Introduction
layer-3 in the OSI model is called Network layer. Network layer manages operation pertaining to host and network. addressing managing sub-network and inter networking.

⇒ 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 device and network.
- Populating routing tables or static routes.
- Inter networking between two different subnets.

⇒ Network layer Feature

With its standard functionalities layer 3 can provide various features as:

- Quality of 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 procedure pertaining to transportation of data or data stream are categorized into their layer.

→ Functions:

- This layer ensure that data must be recieved 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 Introduction

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

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which are involved in Communication system.