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Assignment # 01

DCN Tutorial and
Application layer

1. (a) Define Data communication and computer Network?

(b) why we should learn Data communication and computer Network? Write down the applications of communication & computer network?

(c) What is computer Network? Write down the classification of computer Network?

(d) Describe the classification on computer Networks based on various factors?

(a)

Data communication and Computer Network:

Data communications refers to the transmission of this digital data between two or more computers and a computer network or data network is a telecommunications network that allows computers to exchange data.

(b)

We learn Data communication and computer network because -

1. Network Basic understanding:

a system of interconnected computers and computerized peripherals such as printers is called computer network. This interconnection among computers facilitates information sharing among them.

2. Network Engineering:

Network engineering is a complicated task, which involves software, firmware, chip level engineering, hardware, and electric pulses. To ease network engineering, the whole networking concept is divided into multiple layers.

## Internet:

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

## Applications of Communication & Computer Network:

- Resource sharing such as printers and storage devices.
- Exchange of information by means of e-mails and FTP.
- Information sharing by using web or Internet.

- Interaction with other users using dynamic web pages.
- Ip phones.
- Vedio conferences.
- parallel computing.
- Instant messaging.

(c)

## Computer Network:

A system of interconnected computers and computerized peripherals such as printers is called computer Network.

Classification of computer network:

1. Geographical span.
2. Inter-Connectivity.
3. Administration.
4. Architecture.

(d)

Describe the classification on computer networks:

1. Geographical span:

* It may be spanned across your table, among bluetooth enabled devices, Ranging not more than few meters.
* It may be spanned accross a whole building, including intermediate devices to connect all floors.

2. Inter-Connectivity:

* Every single device can be connected to every other device on network, making the network mesh.
* Each device is connected to its left and right peers only, creating linear structure.

## 3. Administration:

From an administration point of view a network can be private network which belongs to a single autonomous system and can not be accessed outside its physical and logical domain.

## 4. Network Architecture:

* There can be one or more systems acting as servers. Others being clients requests the servers to serve requests.
* There can be hybrid network which involves network Architecture of both the above types.

2. (a) Define personal Area Network? Write down the types of computer networks?

(b) Define LAN? Difference between LAN and MAN?

(c) Define WAN? How much it important in computer network, Explain.

(d) Write down the importance of Internetwork in computer networks?

(a)

## Personal Area Network (PAN):

A PAN is smallest network which is every personal to user. This may include Bluetooth enabled devices or infra-red enabled devices. PAN connectivity range upto 10 meters.

(a)

The types of computer network:

1. personal Area Network (PAN)
2. Local Area Network (LAN)
3. Metropolitan-Area Network (MAN)
4. Wide Area Network (WAN)
5. Inter Network.

(b)

LAN:

A computer network spanned inside a building and operated under single administrative system is generally termed as LAN.

Difference between LAN and MAN:

## Local Area Network (LAN):

a computer network spanned inside a building and operated under single administrative system is generally termed as LAN. Usually, LAN covers an organization offices, schools, colleges or universities. Number of system connected in LAN may vary form as least as two to as much as 16M.

## Metropolitan Area Network (MAN):

The metropolitan Area network 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 enables its users to expand their Local Area Networks.

(c)

## Wide Area Network (WAN):

As the name suggests, the wide Area Network (WAN) covers a wide area which may span across provinces and even a whole country. Generally, telecommunication networks are wide Area Network. these networks provide Connectivity to MANs and LANs. Since they are equipped with very high speed backbone, WANs use very expensive network equipment.

WAN may use advanced technologies such as asynchronous Transfer Mode (ATM), Frame Relay, and synchronous Optical Network (SONET). WAN may be managed by multiple administration.

(d)

A network of networks is called an internetwork in existence on this planet. The internet hugely connects all WANs and it can have connection to LANs and Home networks. Internet uses TCP/IP protocol suite and uses IP as shortage of address spaces, it is gradually migrating from IPv4 to IPv6.

Internet enabbs its users to share and access enormous amount of information worldwide. It uses WWW, FTP, email services, audio and vedio streaming etc. At huge-level internet works on client-Servel model.

Internet is serving many proposes and is involved in many aspects of life. some of them are:

1. Websites
2. Email.
3. Instant Messaging.
4. Blogging.
5. Social Media
6. Marketing
7. Audio and vedio streaming.

3. (a) Define Ethernet? Write down the catagories of Ethernet?

(b) Define Virtual LAN? How much it's important in Network LAN Technologies?

(c) Define computer Network Models. Write down the classification of ~~com~~ it?

(d) Define Layered Tasks? Difference between OSI Model and Internet Model, Explain.

(a)

Ethernet:

Ethernet is a widely deployed LAN Technology. This technology was invented by Bob Metcalfe and D.R. Boggs in the year 1970. It was standardized

in IEEE 802.3 in 1980.
Ethernet shares media. Network which uses shared media has high probability of data collision.
There are two types of Ethernet:

1. Fast - Ethernet.
2. Giga - Ethernet.

(b)

Virtual LAN:

LAN uses Ethernet which in turn works on shared Media. shared media in Ethernet create one single Broadcast domain and one single collision domain.
Introduction of switches to Ethernet has removed single collission domain issue and each

device connected to switch works in its seperate collission domain. But even switches can not divide a network into seperate Broadcast domains.

Virtual LAN is a solution to divide a single Broadcast domain into multiple Broadcast domains. Host in one VLAN can not speak to a host in another. By default, all hosts are placed into the same VLAN.

(c)

Computer Network Model:

Networking engineering is a coplicated task, which involves software, firmware, chip level engineering, hardware, and electric pulses. To ease network

engineering, the whole networking concept is divided into multiple layers. Each layer is involved in some particular task and is independent of all other layes.

The classification of computer Network Models:

1. Layered Tasks.
2. OSI Model.
3. Internet Model.

Layers share data between them and they depend on each other only to take input and send output.

(d)

## Layered Tasks :

In layered architecture of Network Model, one whole network process is divided into small tasks. Each small task is then assigned to a particular layer which works dedicatedly to process the task only.

Difference between OSI Model and Internet Model :

Open system Interconnect is an open standard Organisation (ISO). OSI model is established by International Standard Organisation. This Model has seven layers.

Application Layer

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presentation Layer

↓

Session Layer

↓

Trasport Layer

↓

Network Layer

↓

Data link Layer

↓

physical Layer

## Internet Model:

Internet uses TCP/IP protocol suite. This defines Internet Model which contains foure layered architecture. OSI Model is general communication model but Internet Model is what the internet uses for all its communication. This model has the following layers:

Application Layer

↓

Transport Layer

↓

Internet Layer

↓

Link Layer

4. (a) Define Computer Network Topologies? Write down the classification of network Topologies ?

(b) Define Bus Topology ? Briefly describe about the star topology ?

(c) Define Mesh Topology ? Difference between Ring Topology and Mesh Topology ?

(d) Define Daisy chain ? Difference between Tree Topology and Hybrid Topology ?

(a)

## Computer Network Topologies:

A Network Topology is the arrangement with which computer systems or network devices are connected each other.

Classification of network topologies:

1. point-to-point.
2. Bus Topology.
3. Star Topology:
4. Ring Topology.
5. Mesh Topology.
6. Tree Topology.
7. Daisy chain
8. Hybrid Topology.

(b)

## Bus Topology:

In case of Bus Topology, all devices share single communication line or cable. Bus topology may have problem while multiple hosts sending data at the same time.

All hosts in star topology are connected to a central device, known as hub device, using a point to point connection. That is, there exists a point to point connection between hosts and hub. The hub device can be any of the following.

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

2. Layer-3 device such as router or gateway.

As in Bus topology, hub acts as single point of failure. If hub fails, connectivity of all hosts to all other host fails.

(c)

Mesh topology:

In this type of topology, a host is connected to one or multiple hosts. This topology has hosts in point to point connection.

Difference between ring topology and Mesh topology:

Ring topology:

In ring topology, each host machine

connects to exactly two other machines, creating 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.

Mesh topology:

In this type of topology a host is connected to one or multiple hosts. This topology has host in point-to-point connection with every other host or may also have hosts which are in point-to-point connection a few hosts only. Mesh topology comes into two types:

* Full Mesh.
* Partially Mesh.

(d)

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.

Difference between tree topology and Hybrid topology:

Tree topology:

Also known as Hierarchical Topology, this is the most common form of network topology in use presently. This topoby divides the network in to multiple levels / layers of network.

Hybrid topology:

A network structure whose design

contains more than one topology is said to be hybrid topology. Hybrid topology inherits merits and demerits of all the incorporating topologies. The above picture represents an arbitrarily hybrid topology.

5. (a) Define Computer Network Security? Write down the categories of network security?

(b) Briefly described the categories of computer Network security?

(c) Define Message Digest? Difference Secret key Encryption and public key Encryption?

(d) Explain, Application layer is the topmost layer in OSI and TCP/IP layered Model.

(a)

Computer Network Security:

During initial days of internet, it use was limited to military and universities for research and development purpose. Later when all networks merged together and formed internet, the data useds to travel through public transit network. Common people may send data that can be highly sensitive.

the categories of computer network Security:

1. Interruption.
2. privacy - Breach.
3. Intregrity.
4. Authenticity.

(b)

Common people may send the data that can be online highly sensitive such as their bank credentials, username and passwords, personal documents, online shopping details, or confidential documents. security threads can be divided into the following categories:

1. Interruption:

Interruption is a security threat

in which availability of resources is attacked. For example, a user is unable to access its web-servers or the web-servers is hijacked

2. privacy-Breach:

In this threat, the privacy of a user is compromised. Someone, who is not the authorized person is accessing or intercepting data sent or recieved by the original authenticated user.

3. Integrity:

This type of thread includes any alteration or modification in the original context of communication

4. Authentiority:

This threat occurs when an

attacker or a security violator poses as a genuine person and accesses the resources or communicates with other genuine users.

(c)

Message digest:

In this method, actual data is not sent, instead a hash value is calculated and sent. The other end user computes its own hash value and compares with the one just received.

Difference between Secret key and public key Encryption:

Secret key Encryption:

Both senders and receivers have one secret key. This secret key is used to encrypt the data at sender's end.

After the data is encrypted, it is sent on the public domain to the receiver. Because the receiver knows and has the secret key, the encrypted data packs can easily be decrypted.

## public key Encryption:

In this encryption system, every user has its own secret key and it is not in the shared domain. The secret key is never revealed on public domain. Along with secret key, every user has its own but public key. public key is always made public and is used by senders to encrypted the data.

(d)

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 interacting with users and users applications. This layer is for applications which are involved in communication system. The transport layer does the rest with the help of all the layers below it:

Application layer

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Presentation layer

↓

Session layer

↓

Transport layer

↓

Network layer

↓

Data link layer

↓

Physical layer

when we use a web browser, which is actually using HTTP to interact with the network. HTTP is application layer protocal.

Another example is File transfer protocol, which helps a user to transfer text based or binary file across the network.

Application Layer used by that software: DNS is a protocol which helps user application protocols such as HTTP to accomplish its work.

6. (a) Define Client - Server Model.

(b) Describe the communication system of client - Server Model?

(c) Define Remote procedure call? Write down the way of remote procedure call that happen?

(d) Write down the advantages of Network Application?

(a)

Client Server Model:

In client server Model one remote process acts as a client and requests some resource from anothe application process acting as server. Any process can act as server or client. It is not the type of machine, size

of the machine, or its computing power which makes it server.

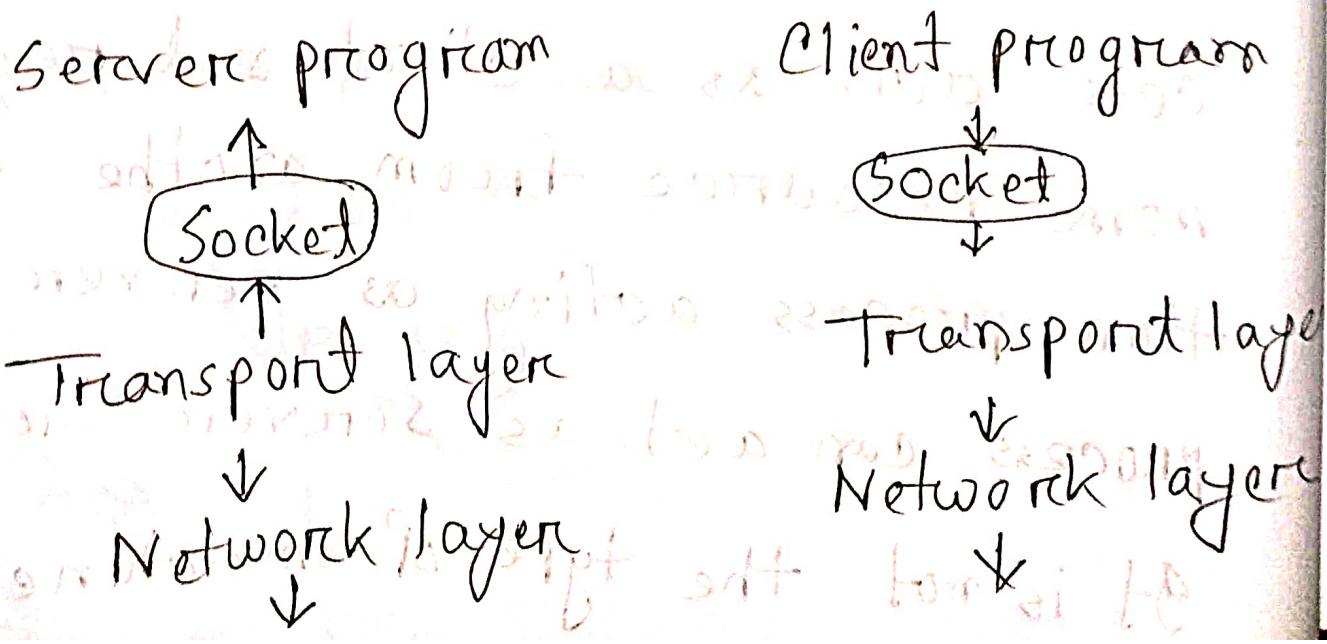
(b).

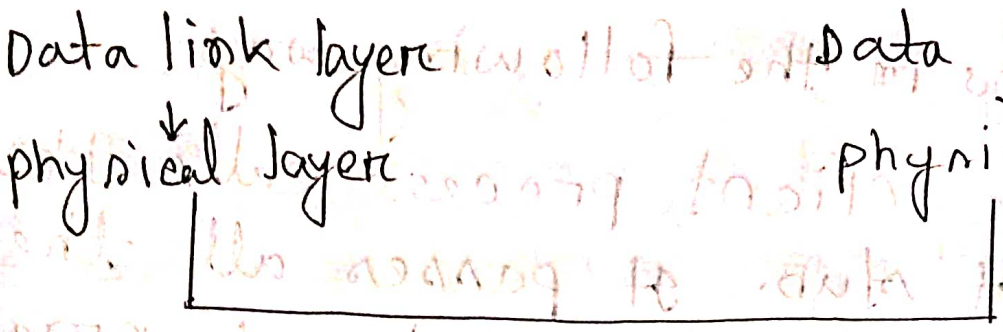
Two processes in client-server model can interact in various ways:

* Sockets.
* Remote procedure calls (RPC).

Sockets:

In this paradigm, the process acting as server opens a socket using a well known port and waits until some client request comes.






Remote procedure call:
this is a mechanism where one process interacts with another by means of procedure calls. One process calls the procedure lying on remote host.

(c)

Remote procedure call:
this is a mechanism where one process interacts with another by means of procedure calls. One process (client) calls the procedure lying on remote host. The process on remote host is said to be server. Both processes are allocated stubs. This communication

happens in the following way:

1. The client process calls the client stub. It passes all the parameters pertaining to program local to it.
2. All parameters are then packed and a system call is made to send them to other side of the network.
3. kernel sends the data over the network and the other end receives it.
4. The result is sent back to the client in the same manner.

(d)

Computers systems and peripherals are connected to from a network. They provide numerous advantages:

i) Resource sharing such as printers and storage devices.

ii) Exchange of information by means of e_Mails and FTP.

iii) Information sharing by using Web or Internet.

iv) Interaction with other users using dynamic web pages.

v) IP phones.

vi) Vedio conferences.

vii) Parallel computing.

viii) Instant messaging

7. (a) Define Application layer? Write down the categories of Application layer protocols?

(b) Define DNS? Briefly described about the protocol of SMTP?

(c) Define POP? Write down the difference between FTP and POP protocol?

(d) "HTTP is a stateless protocol, which means the server maintains no information about earlier requests by clients" explain.

(a)

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 interacting with user and user appliation Application layer protocol divided into two categories:

i) protocol which are used by users. For email for example, eMail.

ii) protocols which help and support protocols used by users. For example DNS.

(b)

## Domain Name system:

DNs works on client server model. It uses UDP protocol for transport layer communication. DNs uses

hierarchical domain based naming scheme.

The Simple Mail Transfer protocol is used to transfer electronic mail from one user to another. This task is done by means of email client software (User Agents) the user is using. User Agents help the user to type and format the email and store it until internet is available. When an email is submitted to send, the sending process is handled by Message Transfer Agent which is normally comes inbuilt in email client software.

Client software uses Internet Message Access protocol (IMAP) or POP protocols to receive emails.

(c)

**Post office protocol:**

The post office protocol version 3 (POP 3) is a simple mail retrieval protocol used by User Agents (client email software) to receive mails from mail server.

File transfer protocol (FTP) is the most widely used protocol for file transfer over the network. FTP uses TCP/IP for communication and it works on TCP port 21. FTP works on client requests file from

servers sends requested resource back to the client.

Post office protocol:

The post office protocol version 3 (POP 3) is a simple mail retrieval protocol. When a client needs to retrieve mails from servers, it opens a connection with the servers on TCP port 110.

(d)

The Hyper Text Transfer protocol (HTTP) is the foundation of World Wide Web. Hypertext is well organized documentation system which uses hyperlinks to link the pages in the text documents.

HTTP works on client server model. When a user wants to access any HTTP page on the internet, the client machine at user end initiates a TCP connection to server on port 80. When the server accepts the client request, the client is authorized to access web pages.

To access the web pages, a client normally uses web browsers, who are responsible for initiating, maintaining and closing TCP connections. HTTP is a stateless protocol, which means the server maintains no information about earlier requests by clients.

8. (a) Define Network Services? Write down some basic services computer network?

(b) Define Directory Services? How can directory services helps us?

(c) Describe file services include sharing and transferring files over the network.

(d) Define Application Services? Write down the process of communication services?

(a)

Network Services:

Computer systems and computerized systems help human beings to work efficiently and explore the unthinkable.

When these devices are connected together to form a network, the capabilities are enhanced multiple times.

Some basic services computer network can offer are :

i) Directory Services.

ii) File Services.

iii) Communication Services.

iv) Application Services.

(b)

## Directory Services:

These services are mapping between name and its value, which can be variable value or fixed. This software system helps to

store the information, organize it, and provides various means of accessing it.

i) Accounting: In an organization, a number of users have their user names and passwords mapped to them.

ii) Authentication and Authorization: User credentials are checked to authenticate a user at the time of login and/or periodically. User accounts can be set into hierarchical structure and their access to resources can be controlled using authorization schemes.

iii) Domain Name Services: DNS is widely used and one of the essential services on which internet works. This

system maps IP addresses to domain names, which are easier to remember and recall than IP addresses.

(c)

File Services include sharing and transferring files over the network.

i) File sharing: One of the reason which gave birth to networking was file sharing. File sharing enables its users to share their data with other users. User can upload the file to a specific server, which is accessible by all intended users.

ii) File Transfer: This is an activity to copy or move file from one

computer or to multiple computers, with help of underlying network. Network enables its user to locate other users in the network and transfers files.

(d)

Application Services:

These are nothing but providing network based services to the users such as services, database managing; and resource sharing.

The process of communication services:

i) Email: Electronic mail is a communication method and something a computer user can not work without. This is the basis of today's internet features.

Email system has one or more email servers.

ii) Social Networking: Recent technologies have made technical life social. The computer savvy peoples can find other known peoples or friends, can not connect with them, and can share thoughts, pictures, and vedios.

iii) Internet chat: Internet chat provides instant text transfer services between two hosts. Two or more people can communicate with each other using text based Internet Relay chat services.

iv) Discussion Boards: Dicussion board provide a mechanism to connect multiple peoples with same interests.

v) Remote Access: This service enables users to access the data residing on the remote computer. This feature is known as a Remote desktop. This can be done via some remote device e.g. mobile phone or home computer.