Computer Networks

1st assignment

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Q1. a) Discuss the fundamental measures of communication system.

Ans- Data communication is the exchange of data between two devices via some form of transmission medium such as wire cable. For data communication to occur, the communicating devices must be a part of a communication system made up of a combination of hardware (physical equipment) and software (programs). The effectiveness of a data communication system depends on four fundamental characteristics:

1) Delivery - The system must deliver data to the correct destination. It must be received by the intended device or user and only that device or user.
2) Accuracy - The system must deliver the data accurately without it getting altered.
3) Timeliness - Message must get delivered in timely manner.
4) Jitter - There shouldn't be uneven delays in packet arrival time.

A data communication system has five basic components that satisfy the above characteristics:-

i) Message
ii) Sender
iii) Receiver
iv) Transmission medium
v) Protocol

b) Discuss some of the open challenges in communication systems.

Ans- Data communication is a very intricate process. Even the smallest of errors and problems can lead to the failure of transmission. There are many challenges and hurdles that needs to be taken care of -

- If reciever discards the message from the sender due to some reason (irrelevant or late message), the whole purpose of communication fails.
- Timeliness of transfer is very critical. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.
- There should be a common feature between the communicating parties for succesful communication which governs the whole process. It is called communication protocol.
- Address conflict must be resolved. If MAC address matches on transmitting message, no transmission will take place. In such cases, logical addressing is used.
- Security is also of paramount importance. A transmission must be secure so that no third party other than the communicating party can snoop on the messages being sent.

c) Discuss the basic communication tasks that define networking.

Ans- Some of the basic communication tasks that define networking are -

- Transmission system utilization
- Interfacing
- Signal correction
- Synchronization
- Error detection and correction
- Addressing and routing
- Recovery
- Message formatting
- Security
- Network management

A network is the interconnection of a set of devices capable of communication. A device can be a host (or an end system) such as large computer, laptop or phone. It can also be a connecting device such as a router or modem, switch etc. These devices in a network are connected using wired or wireless transmission media such as cable or air.

Apart from the above functionalities, a network must also be able to meet a certain number of criteria. The most important of these are -

i) Performance
ii) Reliability
iii) Security

d) Discuss the design goals of DARPA when formulating TCP/IP protocol suite and evaluate how some of the design goals have been achieved through the TCP.

Ans- The evolution of TCP/IP or in fact the current form of internet started at DARPA in 1970s. The core group of ARPANET was working on an 'internetting project'. Their initial goal was to link dissimilar networks so that a host on one network could communicate with a host on another. However, there were many problems to overcome: diverse packet sizes, diverse interfaces, and diverse transmission rates, as well as differing reliability requirements. They devised the idea of a device called a gateway to serve as the intermediary hardware to transfer data from one network to another.

Later on they published a paper on transmission control protocol laying down the initial design goals by introducing new concepts such as encapsulation, the datagram, and the functions of a gateway. A radical idea was the transfer of responsibility for error correction from the IMP to the host machine.

These design goals were later achieved by DCA when they split TCP into two protocols: Transmission control protocol (TCP) and internet protocol (IP). IP would handle the routing while TCP would be responsible for higher level functions such as segmentation, reassembly, and error detection. The current TCP/IP protocol suite fulfils the initial design goals of ARPANET group by providing a layered architecture of hierarchical protocol made up of interactive modules, each of which provides a specific functionality that DARPA wanted.

Q2. a) Discuss the different factors for measuring the performance of a network.

Ans - Different factors for measuring the performance of a network are -

i) Transit time

The time during which message is in transit. The lower is transit time, better the performance.

ii) Response time

The time interval between sending the message and recieving the response.

iii) Throughput

The amount of data transferred via a reference point (router, gateway) of a network per unit time.

There is another category of performance measure -

Fault tolerance

It is measured by the frequency of occurence of fault within a network and how quickly the network can be revived if a fault has occured.

b) Discuss about the differences between OSI & TCP/IP reference model.

Ans - The basic difference b/w TCP/IP and OSI model

TCP/IP	OSI
• Contains 4 layers.	• Contains 7 layers
• Uses loose layering (horizontal).	• Uses strict layering (vertical).
• Connectionless and connection-oriented in transport layer but only connection oriented in network layer.	• Connectionless and connection oriented in network layer and only connection oriented in transport layer.
• Doesn't distinguish b/w services, interfaces and protocols.	• Distinguishes b/w services, interfaces and protocols.
• More reliable.	• Less reliable.