

Q: Why has the PCM sampling time been set at 125 μ sec?

This corresponds to a sampling rate of 8000 samples/sec. According to the Nyquist theory, this is the sampling frequency needed to capture all the information in a 4 kHz channel.

means 8000 samples per second

8000 samples in 1 Second

1 Sample in $1/8000$ second & i.e 125 μ sec

Q: What is the difference between message and packet switching?

Message switching sends data that can be arbitrarily long while packet switching has a maximum packet size that is any message longer than maximum size will be splitted into multiple packets.

Q: Three packets switching network each with n nodes. The first network is a star with a central switch, second is a bidirectional ring, a mesh that is fully interconnected. What are best, average and worst case?

Star:

Best case = Average case = Worst case = 2

In the case of a star topology, it is 2 as the first hop is from source to switch and the second hop from switch to destination.

Ring:

Best case = 1 Average case = $n/4$ Worst case = $n/2$

Best case is when, adjacent node is the destination. Since the ring is bi-directionally connected.

Fully Interconnected:

Best case = Average case = Worst case = 1

Since every node is directly connected.

Q: A CATV system has 100 commercial channels, all of them alternating programs with advertising. Is this more like TDM or FDM?

It is both. Each of the 100 channels is assigned its own frequency band (FDM), and on each channel the two logical streams of programs and advertisements are intermixed by TDM.

Q: How fast can a cable user receive data if the network is otherwise idle?

Receive Data = Data handle by PCM - Data reserved for Control Signals

Receive Data = 64 kbps - 8 kbps

Receive Data = 56 kbps

Q: A cable company decides to provide Internet access over cable in a neighborhood consisting of 5000 houses. The company uses a coaxial cable and spectrum allocation allowing 100 Mbps downstream bandwidth per cable. To attract customers, the company decides to guarantee at least 2 Mbps downstream bandwidth to each house at any time. Describe what the cable company needs to do to provide this guarantee?

A 2-Mbps downstream bandwidth guarantee to each house implies at most 50 houses per coaxial cable. Thus, the cable company will need to split up the existing cable into 100 coaxial cables and connect each of them directly to a fiber node. Therefore total bandwidth given to all users is 10-Gbps.

Total Bandwidth = 2-Mbps x 50 x 100 = 10,000-Mbps \approx 10-Gbps

Q: Is an oil pipeline a simplex system, half duplex, full duplex or none of them?

An oil pipeline would be classified as SIMPLEX, because the oil flows in only one direction.

Theoretically, I suppose it also could be half-duplex (flows in only one direction at a time, but can change direction). However, it would be very impractical to switch the direction of flow (but not impossible).

Q: Two networks each provide reliable connection-oriented service. One of them offers a reliable byte stream and the other offers a reliable message stream. Are these identical? If so, why is the distinction made? If not, give an example of how they differ.?

Message streams and byte streams are different. In a message stream, the network keeps track of message boundaries but in a byte stream, it does not. For example, Suppose, a process writes 1024 bytes to a connection and then after a while writes another 1024 bytes. The receiver will read for 2048 bytes. With a message stream, the receiver will get two messages, of 1024 bytes each. With a byte stream, the message boundaries do not count and the receiver will get the full 2048 bytes as a single unit. The fact that the originally two distinct messages would be lost.

Q: What is the principle difference between connectionless and connection-oriented communication?

connection-oriented

- In connection-oriented, virtual connection is created.
- Authentication of the destination node is done.
- More reliable
- Connection-oriented do handshaking
- It is slower than connectionless.

Connectionless

- Packets are sent without creating a virtual connection.
- Transfers data without authentication
- Not reliable
- No handshaking is done here
- Faster than connection-oriented

Q: Which of the OSI layers handle each of the following?

(a) dividing bit streams into framing

- data link layer

(b) determine which route through the subnet to use

- Network layer

Q: List two ways in which the OSI Reference model and the TCP/IP model are the same. Also list two ways in which they differ.

Same:

- Both have a stack of protocols
- The functionality of the layers are similar
- The layers are divided into application oriented (end-to-end) and transport oriented (chained) protocols with the application protocols above the transport ones.

Different:

- There are a different number of layers in each.

- OSI makes a clear distinction between service, interface and protocol whereas TCP/IP does not.
- OSI protocols are better hidden, more like a black box
- OSI had the model first and then the protocols. The opposite was true with TCP/IP.
- OSI gave no consideration to internetworking
- OSI offers only connection-oriented communication to users. TCP/IP offers both connection-oriented and connectionless.

Q: List two advantages and two disadvantages of having an international standard for network protocol?

Advantages:

- The primary reason for standards is to ensure that hardware and software produced by different vendors can work together. Without networking standards, it would be difficult to develop networks that easily share information.
- Easier maintenance and installation because you get used on the standard.
- Standards also mean that customers are not locked into one vendor. They can buy hardware and software from any vendor whose equipment meets the standard. In this way, standards help to promote more competition and hold down prices.

Disadvantages:

- purchasing media cables and all networking equipment, including servers, is very expensive.
- there is always a risk of viruses or hacking that can harm the whole network. Security procedures, like a firewall, are needed to prevent it.
- Any network requires a qualified network administrator. If a network is big, it becomes more complicated to manage it because it requires a whole department of IT personnel who needs to be trained periodically

Q: What are the 2 reasons for using layered protocol?

Protocol layering is a technique we observe in TCP/IP(Transmission Control Protocol/Internet Protocol). The main advantage of layered protocol is simplicity of construction and debugging.

Abstraction

As each layer has a defined purpose, separate from other layers. Therefore, changes can be done to one layer without affecting the above and below layer means protocols can be changed easily without affecting higher or lower layers. Because layered protocols allow designers to focus on each layer independently.

Reduces complexity

Layered protocols break up the design problem into smaller and more manageable pieces. It takes something very complicated and breaks it up into something smaller and more manageable.

Q5. If the unit exchanged at the data link layer is called a frame and the unit exchanged at the network level is called a packet, do frames encapsulate packets or do packets encapsulate frames? Explain your answer .

Data link layer performs the framing process and provides this service to the layer above layer "the network layer".

Frame is the serial collection of bits, and it **encapsulates packets**.

When a packet arrives at the data link layer, the entire thing, header, data, and all, is used as the data field of a frame. Then the entire packet is put in an envelope (the frame).

Whereas, packets are the fragmented form of data, and it encapsulates segments.

Q: What is the main difference between TCP & UDP?

- TCP is a connection-oriented protocol, whereas UDP is a connectionless protocol.
- The speed for TCP is slower & less efficient in performance while the speed of UDP is faster & more efficient.
- TCP uses handshake protocol like SYN, SYN-ACK, ACK while UDP uses no handshake protocols
- TCP does error checking and also makes error recovery, on the other hand, UDP performs error checking, but it discards erroneous packets.
- TCP has acknowledgment segments, but UDP does not have any acknowledgment segments.
- When we compare TCP vs UDP protocol, TCP is heavy-weight, and UDP is lightweight.
- Retransmission of data packets is possible in TCP in case packets get lost or need to be resend. On the other hand, retransmission of packets is not possible in UDP.
- TCP has a (20-60) bytes variable length header. UDP has an 8 bytes fixed-length header.
- TCP doesn't support Broadcasting while UDP supports Broadcasting.

Q: Make a list of activities that you do everyday in which computer/communication networks are used. How would your life be altered? If these networks were suddenly switched off?

The computer communication networks & internet has become embedded in every aspect of our day-to-day lives, changing the way we interact with others. They have been recognized as the most life changing and successful inventions solving problems in human life.

Look at the educational sector, health, transportation, or communication sector, we can see the influence and application of computers. Computers and its uses grew rapidly and widely throughout the world. It helps to resolve problems human life encounters in daily life. Therefore, they have more influence on our life. The impact of computer usage on our life is obviously identified as Savings of Money, Time and Effort.

Print media, Television and Radio play an important role in our life. They too have influence of computers from production, control, storage and broadcasting. We are able to create a document, display it on screen, modify and print it on a printer or publish in front of the world through the world wide web.

Life without the World Wide Web seems nearly unimaginable.

The Internet has turned our existence upside down. It has revolutionized communications, to the extent that it is now our preferred medium of everyday communication. In almost everything we do, we use the Internet.

Ordering a pizza,
buying a television,
sharing a moment with a friend,
sending a picture over instant messaging.

The Internet itself has been transformed. Today, we can send data from one end of the world to the other in a matter of seconds, make online presentations, live in parallel “game worlds,” and use pictures, video, sound, and text to share our real lives, our genuine identity. The internet is robust. It's not dependent upon a single machine or cable. It's a network made up of other computer networks.

In short, if these were to switch off suddenly, the world would change substantially. Let's just hope it doesn't happen then.