1. Explain the terms circuit switching and packet switching. Discuss the advantages and disadvantages of both.

**Packet Switching**

In packet-based networks, the message gets broken into small data packets. These packets are sent out from the computer and they travel around the network seeking out the most efficient route to travel as circuits become available. This does not necessarily mean that they seek out the shortest route.

Each packet may go a different route from the others. Each packet is sent with a ‘header address’ which tells it where its final destination is, so it knows where to go. The header address also describes the sequence for reassembly at the destination computer so that the packets are put back into the correct order. One packet also contains details of how many packets should be arriving so that the recipient computer knows if one packet has failed to turn up. If a packet fails to arrive, the recipient computer sends a message back to the computer which originally sent the data, asking for the missing packet to be resent.

**Advantages :**

Security

Bandwidth used to full potential

Devices of different speeds can communicate

Not affected by line failure (redirects signal)

Availability – no waiting for a direct connection to become available

During a crisis or disaster, when the public telephone network might stop working, e-mails and texts can still be sent via packet switching

**Disadvantages :**

Under heavy use there can be a delay

Data packets can get lost or become corrupted

Protocols are needed for a reliable transfer

Not so good for some types data streams (e.g. real-time video streams can lose frames due to the way packets arrive out of sequence)

**Circuit switching**

Circuit switching was designed in 1878 in order to send telephone calls down a dedicated channel. This channel remains open and in use throughout the whole call and cannot be used by any other data or phone calls. There are three phases in circuit switching: Establish, Transfer, Disconnect. The telephone message is sent all together; it is not broken up. The message arrives in the same order that it was originally sent. In modern circuit-switched networks, electronic signals pass through several switches before a connection is established. During a call no other network traffic can use those switches. The resources remain dedicated to the circuit during the entire data transfer and the entire message follows the same path. Circuit switching can be analog or digital. A circuit-switched network is excellent for data that needs a constant link from end-to-end, for example, real-time video.

**Advantages:**

Circuit is dedicated to the call – no interference, no sharing

Guaranteed the full bandwidth for the duration of the call

Guaranteed quality of service

**Disadvantages:**

Inefficient – the equipment may be unused for a lot of the call; if no data is being sent, the dedicated line still remains open. It takes a relatively long time to set up the circuit.

During a crisis or disaster, the network may become unstable or unavailable.

It was primarily developed for voice traffic rather than data traffic.

**Comparison:**

It is easier and less expensive to double the capacity of a packet switched network—a circuit network is heavily dependent on the number of channels available. Circuit-switched technologies, which take four times as long to double their performance/cost, force ISPs to buy that many more boxes to keep up. This is why everyone is looking for ways to get Internet traffic off the telephone network.

1. How is an Ethernet network different from a token ring network? What is the role of a repeater, bridge, and switch in an Ethernet network?