

CS 447-003 Networks and Data Communications
Spring 2024

Quiz #2 on January 18, 2023 (SOLUTIONS)

Your Last Three Digits: _____

(please do NOT write all of your student ID or your name)

Grade: _____

- (1) Why do we want “(switching) networks” instead of full mesh of one-to-one communication channels? Explain with an example (using some mathematical formula).

A full-mesh of one-to-one communication channels is not scalable. It is not scalable, since the number of communication channels (links) will increase in the order of N^2 , while N represents the number of computers to communicate.

- (2) What are “packet-switching networks”?

Packet-switching networks are the networks (inter-connections of host computers), where (a) payloads are first chopped into smaller pieces, called “packets” and switches and routers on a way (b) relay packets from a sender to a receiver (thus there is no need for a dedicated network connection from a sender to a receiver).

Note: for full credit, both (a) and (b) should be described.

- (3) What are “virtual-circuit packet-switching networks”? Mention one example for virtual-circuit packet-switching networks.

- (Physical) transmission path is set up prior to the beginning of payload transmission (your payload will be transmitted as packets in the same order as it is transmitted at a sender)
- Transmission quality (bandwidth and delay) is guaranteed (little overhead after a transmission starts).
- Resource is shared (when you are not using the resource you reserved, others can use them)

(4) What are the primary advantages and disadvantages in “datagram packet-switching networks”?

Advantages:

- low cost (resource sharing)
- Faster for transferring small messages
- Fault-tolerant (packets can go dynamically divert failed links)

Disadvantages:

- No guarantee for message (packet) deliveries to their destinations
- The delay after a sender transmits but before a receiver receives the transmitted payload takes longer (except for transmissions of single tiny messages)

(5) Complete the following table that compares circuit switching networks, packet switching networks, and virtual circuit networks.

Factors	Circuit-Switching	Virtual Circuit	Datagram
No overhead after TX starts?	NO	NO (Packet header)	YES (Packet header)
Routing delay?	NO	No (Almost 0)	YES (High)
Guaranteed Tx Bandwidth?	YES	YES	NO
Advantages	Guaranteed Quality	Guaranteed Quality Resource sharing	Resource sharing Low cost Non-blocking
Disadvantages	High cost Blocking service	High cost Blocking service	Best Effort Service Poor security
Applications	analog tel. networks		Internet