

Worksheet: Data Transmission (Packet Switching) – Answer Key

Section A: Multiple Choice Questions (5 marks)

1. What is the approximate size of a data packet?

Answer: b) 64 KiB

Explanation:

- Data packets are typically broken down into smaller chunks for efficient transmission.
 - The standard size of a data packet is approximately **64 Kibibytes (KiB)** (not to be confused with kilobytes (KB)).
 - This size ensures a balance between efficient transmission and minimal overhead from headers and trailers.
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2. Which part of the packet contains the actual data being transmitted?

Answer: b) Payload

Explanation:

- A data packet consists of three main parts:
 1. **Header** – Contains control information (sender/receiver IP, sequence number, etc.).
 2. **Payload** – The **actual data** being transmitted (e.g., part of a file, message, or video stream).
 3. **Trailer** – Includes error-checking data (CRC) and an end marker.
 - The **payload** is the core content, while the header and trailer assist in delivery and verification.
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3. What is the purpose of the sequence number in the packet header?

Answer: b) To reassemble packets in the correct order

Explanation:

- In **packet switching**, packets may take different routes and arrive **out of order**.
 - The **sequence number** in the header helps the receiving device:
 - Identify the correct order of packets.
 - Reassemble them properly (e.g., reconstructing a file or video stream).
 - Without sequence numbers, data could be jumbled, leading to corruption.
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4. What does CRC Check in the trailer ensure?

Answer: b) Data accuracy

Explanation:

- **CRC (Cyclic Redundancy Check)** is an error-detection method.
 - **How it works:**
 1. The sender calculates a **checksum** (a numerical value) based on the payload's binary data.
 2. This checksum is stored in the **trailer**.
 3. The receiver recalculates the checksum upon arrival.
 4. If the values **match**, the data is error-free.
 5. If they **differ**, the packet is corrupted, and **retransmission is requested**.
 - Thus, CRC ensures **data integrity** (accuracy).
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5. In packet switching, what determines the route of a packet?

Answer: c) Routers based on network conditions

Explanation:

- In **packet switching**, packets travel independently and may take different paths.
 - **Routers** examine the **destination IP address** in the packet header and decide the best path based on:
 - Current network traffic (to avoid congestion).
 - Shortest available route.
 - Link failures (rerouting if a path is down).
 - This **dynamic routing** ensures efficient and reliable delivery.
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Section B: Short Answer Questions (10 marks)

6. Definition and distinction:

- **Data transmission:** The process of sending data from one device to another via a communication medium (e.g., cables, Wi-Fi). *(1 mark)*
- **Local transmission:** Occurs within the same network (e.g., LAN). *(0.5 mark)*
- **Remote transmission:** Occurs over long distances (e.g., internet). *(0.5 mark)*

7. Packet structure and functions:

- **Header:** Contains metadata (e.g., sender/receiver IP, sequence number, packet size) for routing and reassembly. *(1 mark)*
- **Payload:** The actual data being transmitted (~64 KiB). *(1 mark)*
- **Trailer:** Includes end marker and CRC Check for error detection. *(1 mark)*

8. Out-of-order arrival and handling:

- Packets take different routes due to dynamic routing by routers, leading to varying delays. (1 mark)
- The destination device uses sequence numbers in headers to reassemble packets correctly. (1 mark)

9. Role of routers:

- Routers examine packet headers and determine the optimal path for each packet based on network conditions. (1 mark)

10. Advantage and drawback of packet switching:

- **Advantage:** Efficient use of bandwidth; packets can reroute if a path fails. (1 mark)
 - **Drawback:** Delay (latency) due to reassembly or real-time streaming issues. (1 mark)
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Section C: Structured Questions (10 marks)

11. Packet header analysis:

- a) The sequence number ensures packets are reassembled in the correct order at the destination. (1 mark)
- b) The receiver checks the packet size to verify if all data has arrived (e.g., detect missing packets). (1 mark)

12. CRC Check scenario:

- a) The mismatch ("B" vs. "A") indicates a data error (e.g., corruption during transmission). (1 mark)
- b) The receiver will request the sender to retransmit the packet. (1 mark)

13. Reliability of packet switching:

- If a path is busy/faulty, routers dynamically reroute packets via alternative paths. (1 mark)
- CRC Checks detect errors, triggering retransmission for accuracy. (1 mark)
- No single point of failure; packets take independent routes. (1 mark)

14. Suitability for live streaming:

- **Agree:**
 - 1. **Out-of-order packets** cause buffering delays, disrupting real-time playback. (1.5 marks)
 - 2. **Retransmission** of lost packets is impractical for live streams (e.g., sports). (1.5 marks)
- **Disagree (alternative answer):**
 - 1. Modern protocols (e.g., UDP) prioritize speed over reliability for streaming. (1.5 marks)
 - 2. Buffering compensates for minor delays. (1.5 marks)