Past-paper walk-through

Circuit switching, packet switching ▪ 14.2

eXercise

Questions in this set

- 9618/32 N25 Q4 ▪ 4 marks
- 9618/33 N25 Q3 ▪ 4 marks
- 9618/32 J25 Q4 ▪ 4 marks
- 9618/31 N24 Q3 ▪ 5 marks
- 9618/32 N24 Q1 ▪ 7 marks
- 9618/33 N24 Q3 ▪ 6 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 4

9618/32 N25 ▪ Q4 ▪ 4 marks

4 **(a)** Identify **one** benefit of circuit switching **and one** benefit of packet switching.

Question 4

Question 4

Question 4

Question 4

[2]

(b) Identify **two** differences between circuit switching and packet switching.

Question 4

Question 4

[2]

Solution 4

(a) Mark scheme

- One mark for a benefit of circuit switching (Max 1)
- MP1
- Once the connection is made, it is available until the end of the transmission (suitable for long continuous transmission)
- MP2
- The dedicated path ensures a steady rate of data transmission, once connection has been made (because the whole bandwidth is available)
- MP3

Solution 4

- The dedicated path ensures data is less likely to be lost.
- MP4
- No intermediate delays once the circuit is established, enables real time transmission
- MP5
- No additional time/delay to reorder needed because data arrives in the order it was sent / data sent as a continuous stream
- One mark for a benefit of packet switching (Max 1)
- MP6
- No need to tie up a communication line // path available to multiple users // bandwidth can be shared by multiple users

Solution 4

- MP7
- Possible to overcome failed / faulty / busy lines by re-routing packets
- MP8
- Individual packets can be resent if lost/damaged
- MP9
- Users only charged for the duration of connectivity
- MP10 High rate of data transmission possible
- MP11 Always uses digital networks so data is transmitted directly to the destination
- MP12 Good security because all packets can take different routes // A more secure method because all packets can take different routes

Solution 4

- 2
- October/November
- 2025

Solution 4

(b) Mark scheme

- One mark per difference (Max 2)
- MP1
- Circuit switching requires a dedicated line to be connected before the data transfer takes place, in packet switching, data transfer commences directly/ straight away
- MP2
- In circuit switching, each data unit knows the entire path address, but in packet switching, each data unit only knows the final address (routers decide intermediate paths)
- MP3

Solution 4

- Circuit switching uses the whole bandwidth of the transmission path, but packet switching shares it with other users
- // circuit switching uses a constant high bandwidth. Packet switching has variable bandwidth
- MP4
- In circuit switching each data unit follows the same route, but in packet switching, packets can follow any route
- MP5
- In circuit switching data arrives in the correct order but in packet switching it has to be reordered
- MP6

Solution 4

- Data remains intact / a continuous stream in circuit switching but is segmented in packet switching
- MP7
- Lost data in circuit switching requires the whole transmission to be resent, but individual packets can be resent in packet switching
- MP8
- Circuit switching doesn't suffer data loss but packets can be lost in packet switching.

Question 3

9618/33 N25 ▪ Q3 ▪ 4 marks

Describe how packet switching is used to pass messages across a network. Do **not** include checking for completeness and resending packets in your answer. **[4]**

Solution 3

- 3
- One mark per mark point (Max 4)
- MP1 the message is divided into small chunks called packets
- MP2 each packet is given a header with important data including source and destination IP addresses
- MP3 each packet is sent independently // packets can be sent through different routes
- MP4 packets are sent through the optimum route // packets can be re- routed if a route is unavailable
- MP5 packets are reassembled at the destination into the whole message

Question 4

9618/32 J25 ▪ Q4 ▪ 4 marks

Circuit switching may be used as a method of data transmission.
State **two** benefits and **two** drawbacks of circuit switching.
Benefit 1
Benefit 2
Drawback 1
Drawback 2 **[4]**

Solution 4

- 4
- One mark for each benefit (Max 2)
- MP1
- Suitable for long continuous transmission once the connection is made, it is available until the end of the transmission
- MP2
- No time lost in resending/rearranging packets as no loss of packets or out of order packets

Solution 4

- MP3
- Steady/high rate of transmission because the whole of the bandwidth is available
- MP4
- Data loss unlikely as all data follows the same path
- One mark for each drawback (Max 2)
- MP5
- Delays due to dedicated connection required to be set up/established before transmission can begin
- MP6
- The dedicated connection cannot be used to transmit any other data

Solution 4

- MP7
- System resources may be underutilised/inefficient/not very flexible because the bandwidth can't be shared/high bandwidth is required //
- Bandwidth may be wasted // May send empty frames // the circuit is always there whether or not used
- MP8
- There are no alternative routes if there is a failure or fault on the line
- MP9
- Reduced security due to use of single path
- MP10

Solution 4

- Scalability is difficult

Question 3

9618/31 N24 ▪ Q3 ▪ 5 marks

(a) Describe circuit switching as a method of data transmission. **[3]**

(b) State **one** benefit and **one** drawback of circuit switching as a method of data transmission. **[2]**

Solution 3

(a) Mark scheme

- One mark per mark point (Max 3)
- MP1 A dedicated circuit / channel is required
- MP2 The circuit is established before the transmission begins
- MP3 The circuit lasts for the whole of the transmission // The circuit is closed at the end of the transmission
- MP4 Data travels in a continuous stream along the same route
- MP5 Transmission is usually bidirectional.

Solution 3

(b) Mark scheme

- One mark for a benefit (Max 1)
- MP1 No need for data to be reassembled // data / frames arrive in the same order in which they were sent
- MP2 Suitable for real time transmission // fast data transfer rate
- MP3 The whole of the bandwidth is available
- One mark for a drawback (Max 1)
- MP4 No other transmission can use the same circuit when it is in use // Bandwidth can be wasted as it cannot be used by other messages

Solution 3

- MP5 Not secure // Can be intercepted as all data travelling along the same route
- MP6 If there is a problem with the route the transmission ends // No other route is available without first doing the setup
- MP7 The circuit is always there whether or not it's being used
- MP8 Can take time to set up before transmission starts.

Question 1

9618/32 N24 ▪ Q1 ▪ 7 marks

1 **(a)** Describe how packet switching is used to transmit messages across a network.

Question 1

(b) State **two** benefits and **two** drawbacks of packet switching as a method of transmitting messages across a network.

Question 1

Question 1

Question 1

Question 1

Question 1

Question 1

Question 1

Question 1

[4]

Solution 1

(a) Worked steps

Follow one message from sender to receiver. Three marks, from a longer list — pick three that tell the story in order rather than three that repeat each other.

- The data is **divided into equal-sized packets**.
- Each packet gets a **header** carrying the source and destination IP addresses and a **packet number**.
- Packets are transmitted **independently** and may take **different routes**.
- The route for each is chosen from a **routing table**, taking the best available path given the current congestion.
- Packets therefore usually **arrive out of order**, and are **reassembled** at the destination using the sequence numbers in their headers.

Solution 1

- Any packet that is **missing or corrupted** is requested again and re-sent.

The three things that make it *packet* switching are: split into packets, routed independently, reassembled at the far end. An answer that omits reassembly has not explained how a message survives the journey. **Mark scheme**

- One mark per mark point (Max 3)
- MP1 The data to be transmitted is divided into equal sized packets
- MP2 A packet header is attached to each packet containing key information
- MP3 ... such as source/destination IP addresses, packet number, etc
- MP4 Packets are transmitted independently

Solution 1

- MP5 ... and may travel though different routes/paths to the destination
- MP6 Routes are determined using a routing table//Packets take the optimum route depending on congestion
- MP7 The packets usually arrive out of order
- MP8 The packets are reassembled in the correct order at the destination // The packets are re-ordered using the
- sequence number/the header
- MP9 If packets are missing/corrupted a re-transmission request is sent / packets are re-sent.
- 3

Solution 1

(b) Worked steps

Four marks — **two benefits and two drawbacks** — and every one of them follows from "packets travel independently".
Benefits:

- Packets are more likely to arrive, because a blocked route can be **avoided** and a lost packet can be **re-sent**.
- **Bandwidth is shared**, so packets from different messages use the same links.
- Reasonably **secure**, because packets generally travel by different routes and no single interception sees the whole message.
- A **high transmission rate** is possible.

Drawbacks:

Solution 1

- **Delay**, because packets must be reordered and reassembled, missing ones re-sent, and the bandwidth shared with other traffic.
- It needs a **complex algorithm** to route and reassemble.
- It needs **substantial memory** to buffer packets while they are collected.

Every benefit has a drawback attached to the same mechanism — sharing gives efficiency and delay; independent routing gives resilience and out-of-order arrival. Answering in those pairs is the surest way to produce four distinct points. **Mark scheme**

- One mark for each benefit (Max 2)

Solution 1

- MP1 Packets are more likely to arrive because they can be re-routed if a problem occurs with one of the routes//Packets
- are more likely to arrive because if a packet is lost, it can be re-transmitted
- MP2 Bandwidth can be shared allowing packets from different messages to share the same path
- MP3 Considered secure as the packets generally travel via different routes
- MP4 High data transmission rate is possible
- One mark for each drawback (Max 2)
- MP5 Time delay because packets need to be re-ordered/reassembled at the destination//Time delay caused by missing

Solution 1

- packets needing to be re-sent//Time delay because it has to share the bandwidth of the circuit / channel with
- other packets
- MP6 Requires a complex algorithm to function
- MP7 Needs lots of RAM to handle large amounts of data.
- 4
- 9618/32
- October/November 2024

Question 3

9618/33 N24 ▪ Q3 ▪ 6 marks

3 **(a)** Describe circuit switching as a method of data transmission.

Question 3

(b) State **one** benefit and **one** drawback of circuit switching as a method of data transmission.

Question 3

[2]

Solution 3

(a) Worked steps

Circuit switching reserves a path **before** anything is sent, and keeps it for the whole conversation. Three marks from:

- A **dedicated circuit or channel** is required.
- It is **established before** the transmission begins.
- It **lasts for the whole transmission** and is closed at the end.
- Data travels as a **continuous stream along the same route**.
- Transmission is usually **bidirectional**.

Solution 3

The model to keep in mind is a traditional telephone call: the connection is set up, held whether or not anyone is speaking, and released at the end. Everything in the answer follows from that. **Mark scheme**

- One mark per mark point (Max 3)
- MP1 A dedicated circuit / channel is required
- MP2 The circuit is established before the transmission begins
- MP3 The circuit lasts for the whole of the transmission // The circuit is closed at the end of the transmission
- MP4 Data travels in a continuous stream along the same route
- MP5 Transmission is usually bidirectional.

Solution 3

- 3
- 9618/33
- October/November 2024

Solution 3

(b) Worked steps

One benefit and one drawback, and both come from the same fact — the circuit is dedicated.

Benefit (one of):

- No reassembly is needed: data arrives **in the order it was sent**.
- Suitable for **real-time** transmission, with a fast and steady rate.
- The **whole bandwidth** of the circuit is available to this transmission.

Drawback (one of):

- **No one else can use the circuit** while it is held, so bandwidth is wasted during silences.
- **Less secure**: all the data follows one route, so intercepting it captures everything.

Solution 3

- If the **route fails the transmission ends** — there is no alternative path without setting up again.
- It takes **time to set up** before anything can be sent.

Because the marks here are the mirror image of the packet-switching question, the safest way to answer both is to pick the property and state its two consequences: a dedicated path gives order and speed, and costs flexibility and efficiency. **Mark scheme**

- One mark for a benefit (Max 1)
- MP1 No need for data to be reassembled // data / frames arrive in the same order in which they were sent
- MP2 Suitable for real time transmission // fast data transfer rate

Solution 3

- MP3 The whole of the bandwidth is available
- One mark for a drawback (Max 1)
- MP4 No other transmission can use the same circuit when it is in use // Bandwidth can be wasted as it cannot be used by
- other messages
- MP5 Not secure // Can be intercepted as all data travelling along the same route
- MP6 If there is a problem with the route the transmission ends // No other route is available without first doing the setup
- MP7 The circuit is always there whether or not it's being used
- MP8 Can take time to set up before transmission starts.
- 2

Solution 3

- 4
- One mark per mark point (Max 4)
- MP1 Each layer can only accept input from the next higher layer or the next lower layer
- MP2 There is an interface between the adjacent layers which is the only interaction between layers
- MP3 Data is added to the headers as the frames/packets pass through the layers
- MP4 The interactions are carried out by installed software
- MP5 User interaction takes place at the highest/Application layer of the stack through protocols associated with that layer
- of the stack

Solution 3

- MP6 Direct access to hardware takes place at the lowest/Link layer of the stack.
- 4
- 9618/33
- October/November 2024