

Past-paper walk-through

Protocols ■ 14.1

eXercise

Questions in this set

- 9618/31 N25 Q3 ■ 10 marks
- 9618/32 N25 Q3 ■ 6 marks
- 9618/33 N25 Q4 ■ 6 marks
- 9618/31 J25 Q3 ■ 9 marks
- 9618/33 J25 Q4 ■ 9 marks
- 9618/31 N24 Q4 ■ 4 marks
- 9618/32 N24 Q5 ■ 7 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 3

9618/31 N25 ■ Q3 ■ 10 marks

(a) Explain why protocols are essential for communication between computer systems. [2]

(b) POP3 is an email communication protocol.

Identify and describe **two** other communication protocols that are used when sending or receiving emails.

Protocol 1

Protocol 2

(c) Describe **two** ways in which packet switching ensures a complete message is received when passing messages across a network. [4]

1. 2.

[4]

Solution 3

(a) Mark scheme

- One mark per mark point (Max 2)
- MP1
- Protocols set a standard for communication // Protocols establish a standard set of rules for communication
- MP2
- Protocols enable compatibility between devices from different manufacturers/platforms
- MP3
- Two devices wouldn't be able to communicate/send messages to each other if they were using different protocols

Solution 3

(b)

Mark scheme

- One mark for a protocol and one mark for a description (Max 4)
- Example answers:
- SMTP [1] a protocol used to send emails between mail servers // a protocol used to send emails from a computer to a mail server [1]
- IMAP [1] allows users to access/read their emails from any device without removing the message from the mail server // synchronises emails on any device [1]

Solution 3

(c) Mark scheme

- Two marks for each description mark as 2×2 (Max 4)
- Example answers:
- Packets checked at receiving end / on arrival [1]
- ... if packets arrive damaged or don't arrive at all, a re-send request is sent [1]
- Packets routed through different paths / sent individually [1]
- ... if a route is blocked, the packet is sent through a different route to ensure it arrives [1]
- If the packet's hop count is exceeded [1]

Solution 3

- ... the packet will be retired, which can generate a re-send request [1]

Question 3

9618/32 N25 ■ Q3 ■ 6 marks

HTTP and IMAP are examples of protocols used in the Application Layer of the TCP/IP protocol suite.

- (a) State the purpose of the HTTP and IMAP protocols. [2]
- (b) Describe how files are shared using the BitTorrent protocol. [4]

Solution 3

(a)

Mark scheme

- One mark per mark point (Max 2)
- ■ HTTP to send and receive / transfer web pages / hypertext / images / videos
- ■ IMAP allows users to access/read their emails from any device without removing the message from the mail server
- // synchronises emails on any device

Solution 3

(b) Mark scheme

- One mark per mark point (Max 4)
- MP1
- Files are shared over a peer-to-peer network
- MP2
- A small file, a torrent (descriptor file), is initially created by a peer
- MP3
- The torrent (descriptor file) contains metadata about the file to be shared
- MP4

Solution 3

- The whole file must initially be located on at least one peer
- MP5
- The file is broken into equal sized pieces
- MP6
- Other peers who wish to download the file first obtain the torrent (descriptor file) and connect to a tracker
- MP7
- A tracker acts like a server that holds all the data about all the computers connected to it / the swarm
- MP8

Solution 3

- Each peer downloads parts of the file from other peers until the entire file has been downloaded
- MP9
- As each peer receives a piece of the file, they become a source for that piece of the file
- MP10 A peer who has a complete file and is sharing it is a seed // Once a peer has completely downloaded the file and made the file available to others in the swarm, they become a seed.
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Question 4

9618/33 N25 ■ Q4 ■ 6 marks

Identify **and** describe **three** protocols that are used in the Application Layer of the TCP/IP protocol suite.

Protocol 1

Protocol 2

Protocol 3

[6]

Solution 4

- 4
- One mark for a correct protocol and one mark for a correct corresponding description (Max 6)
- Three from:
 - HTTP/S [1] a protocol/secure protocol used to transfer hypermedia documents / web pages / (data) files between networked devices [1]
 - FTP [1] a protocol to download, upload and transfer files from one location to another on a network [1]

Solution 4

- POP3 [1] a protocol used to retrieve/receive emails from a mail server to a computer [1]
- IMAP [1] allows users to access/read their emails from any device without removing the message from the mail server // synchronises emails on any device [1]
- SMTP [1] a protocol used to send emails between mail servers // a protocol used to send emails from a computer to a mail server [1]
- BitTorrent [1] a communication protocol used for peer-to-peer file sharing [1]

Question 3

9618/31 J25 ■ Q3 ■ 9 marks

The Application Layer and Transport Layer are two layers of the TCP/IP protocol suite.

(a) Describe the purpose of the Application Layer **and** the purpose of the Transport Layer.

Purpose of Application Layer

Purpose of Transport Layer

[5]

(b) Describe packet switching as a method of transmitting messages across the internet.

[4]

Solution 3

(a) Mark scheme

One mark per mark point (Max 5)

One mark per mark point for purpose of Application Layer (Max 3)

- MP1 To provide services / interface with the user // access to applications, for example login, file transfer, network file access, email, etc
- MP2 To provide mechanisms for securing communication e.g. encryption/authentication
- MP3 To define/provide protocols used to allow the exchange of data/communication // to contain programs that exchange data
- MP4 Error detection and recovery mechanisms to handle application specific errors

One mark per mark point for purpose of Transport Layer (Max 3)

Solution 3

- MP5 To provide logical communication between applications running on different hosts // To ensure that data is delivered to the correct application process on the destination machine
- MP6 To ensure error-free, end-to-end delivery of data between a source and a destination, in sequence // to provide error recovery techniques such as error detection codes and automatic repeat request
- MP7 To break data into segments when sent and to reconstruct when received // To reassemble segments at destination
- MP8 To regulate network connections // to provide flow control mechanisms to prevent data loss.

Solution 3

(b) Mark scheme

One mark per mark point (Max 4)

- MP1 Data are broken into equal sized packets
- MP2 Data packets have headers containing information such as the IP addresses of the sender and receiver
- MP3 Each packet of data is sent independently to the destination // Packets don't necessarily follow the same route
- MP4 Each packet is sent via the most optimum path available
- MP5 Packets don't necessarily arrive in the order they were sent // Packets are reconstructed at the destination in the correct order
- MP6 Missing / damaged packets are re-sent

Question 4

9618/33 J25 ■ Q4 ■ 9 marks

The Internet layer and Link layer are two layers of the TCP/IP protocol suite.

(a) Describe the purpose of the Internet layer **and** the purpose of the Link layer. **[5]**

(b) Describe the function of a router in packet switching. **[4]**

Solution 4

(a) Mark scheme

- One mark per mark point (Max 5)
- One mark per mark point for purpose of Internet Layer (Max 3)
- MP1
- To identify the intended network and host.
- MP2
- To add header containing IP addresses. // To address packets with their source and destination IP Addresses.
- MP3

Solution 4

- To prepare packets for delivery by formatting them into datagrams.
- MP4
- To route datagrams through the optimum route over a network.
- One mark per mark point for purpose of Link Layer (Max 3)
- MP5
- To prepare the next hop by managing the link between two directly connected devices. // To identify and move traffic across local segments.
- MP6
- To format datagrams into frames for transmission.
- MP7

Solution 4

- To identify network protocols in the packet header. // To ensure correct network protocols are/is followed.
- MP8
- To deliver frames to the receiving network. // To receive frames from the sending network. // To map IP addresses to MAC physical addresses.
- MP9
- To provide error checking/error correction/recovery/reconstruction
- MP10 including resend requests.

Solution 4

(b) Mark scheme

- One mark for each correct marking point (Max 4)
- MP1
- The router reads the IP address of the destination from the packet header.
- MP2
- A router uses a routing table to find information ...
- MP3
- ... about e.g., available hops / netmask / gateway used / adjacent routers / the status of the routers along the route.

Solution 4

- MP4
- The router determines the next hop / optimum route. // The router sends the packet on its next hop.
- MP5
- The router manages the hop counter // The hop counter is reduced by 1 every time the packet passes a router.

Question 4

9618/31 N24 ■ Q4 ■ 4 marks

The TCP/IP protocol may be viewed as a stack that contains four layers: Application, Transport, Internet, Link.

Describe how the layers of the TCP/IP protocol stack interact with each other. **[4]**

Solution 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 4

- MP6 Direct access to hardware takes place at the lowest/Link layer of the stack.

Question 5

9618/32 N24 ■ Q5 ■ 7 marks

- 5 (a) Name and describe **two** protocols used by the Application Layer of the TCP/IP protocol suite.

Question 5

[4]

- (b) Explain the purpose and function of the Application Layer in the TCP/IP protocol suite.

Solution 5

(a) Worked steps

Four marks: **two protocols named**, each with a **matching description**. So pick two you can describe, and describe the one you named.

- **HTTP / HTTPS** — for sending and receiving **web pages** (hypertext).
- **FTP** — for transferring **files** over a network.
- **SMTP** — a **push** protocol, for **sending** email.
- **POP3** — a **pull** protocol, for **downloading** email from a server.
- **IMAP** — also a pull protocol for retrieving email, keeping the messages on the server.

Solution 5

All of these belong to the **Application Layer**, which is what the question asked for. TCP and IP are the usual wrong answers: they are Transport and Internet layer protocols, and naming them scores nothing here however well described. The push/pull distinction is worth using, because it separates the three mail protocols in one word each: SMTP pushes mail out, POP3 and IMAP pull it in. [Mark scheme](#)

- One mark for each correct name (Max 2)
- One mark for each correct corresponding expansion (Max 2)
- MP1 HTTP/HTTPS
- MP2 For sending and receiving / transferring web pages / hypertext
- MP3 FTP

Solution 5

- MP4 For sending and receiving files over a network / between devices
- MP5 POP3
- MP6 Pull protocol / for receiving / downloading emails
- MP7 IMAP
- MP8 Pull protocol / for receiving / downloading emails
- MP9 SMTP
- MP10 Push protocol / for sending / uploading emails
- MP11 BitTorrent
- MP12 Peer-to-peer file sharing over a network
- 4

Solution 5

(b) Worked steps

Three marks about what the layer **does**:

- It provides **access to the programs that exchange data** — it is the layer that interacts directly with the user's application.
- It is used by, for example, **web browsers and server software**.
- It **passes data to and from the Transport layer**, letting applications reach the services the lower layers provide.
- It **defines the protocols** an application uses to exchange data.

Solution 5

The framing that makes this easy to remember: the Application Layer is the **top** of the TCP/IP stack, so it is the only one an application ever touches. Everything below it — segmenting, addressing, transmitting — is hidden, and the layer's job is to be that boundary. **Mark scheme**

- One mark per mark point (Max 3)
- MP1 The application layer provides access to all the programs that exchange data // Interacts directly with user.
- MP2 ... used by, for example, web browsers, server software.
- MP3 Communicates/enables data transfer to/from Transport layer // It allows applications to access the services used in

Solution 5

- other TCP/IP layers.
- MP4 It defines the protocols that any application uses to allow the exchange of data.
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