Exercise walk-through

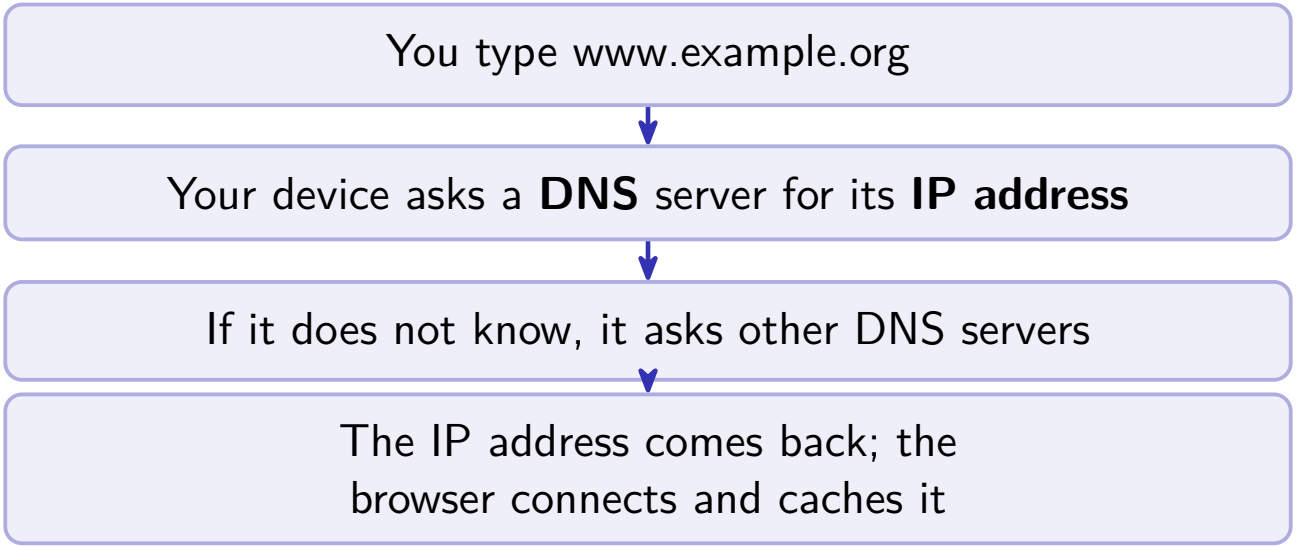
2.2
Protocols and data transmission

International Baccalaureate · IB Diploma · Computer Science · HL

Name the device by its job

Device	Job
switch	joins devices in a **LAN**; forwards each frame to its port
router	joins networks; forwards packets along a route
access point	lets wireless devices join a wired LAN
modem	turns data into a signal for the line, and back
firewall	checks traffic against rules; blocks the rest

DNS: finding a server



Check yourself

Device answers: say the job, not just the name

↓

TCP or UDP: reliability for files, speed for live data

↓

Packet switching: split, header, route, reassemble, resend

↓

Bytes x 8 before dividing by bits per second

Exercises 2.1·2.2

2.1 State the layer of the TCP/IP model at which each works: (i) IP; (ii) HTTP; (iii) TCP. [3]

2.2 State whether TCP or UDP suits: (i) sending an e-mail; (ii) a live sports stream. [2]

Exercises 2.1·2.2

2.1 State the layer of the TCP/IP model at which each works: (i) IP; (ii) HTTP; (iii) TCP. [3]

2.1

- (i) **internet**
- (ii) **application**
- (iii) **transport**

2.2 State whether TCP or UDP suits: (i) sending an e-mail; (ii) a live sports stream. [2]

2.2

- (i) **TCP**: every part must arrive
- (ii) **UDP**: speed matters more than a lost packet

Exercises 2.3·2.4

2.3 Calculate the ideal time to send a 6 MB file over a 4 Mbit/s link. [2]

2.4 Explain why a web server needs a static IP address. [1]

Exercises 2.3·2.4

2.3 Calculate the ideal time to send a 6 MB file over a 4 Mbit/s link. [2]

2.3

- $6 \times 10^6 \times 8 = 48 \times 10^6$ bits
- $48 \times 10^6 \div 4 \times 10^6 =$ **12 s**

2.4 Explain why a web server needs a static IP address. [1]

2.4

- its address must not change, so DNS can always point clients to it

Exercises 3.1·3.2

3.1 What does DNS do? [1]

- **A** gives a device an IP address
- **B** turns a domain name into an IP address
- **C** encrypts web pages
- **D** splits data into packets

3.2 Why was IPv6 introduced? [1]

- **A** IPv4 has too few addresses
- **B** IPv4 cannot be routed
- **C** IPv6 addresses are shorter
- **D** IPv6 needs no router

Exercises 3.1·3.2

3.1 What does DNS do? [1]

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3.1 B

- name to address

3.2 Why was IPv6 introduced? [1]

- ☐ **A** IPv4 has too few addresses
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- ☐ **D** IPv6 needs no router

3.2 A

- 32 bits give only about 4.3 billion

Exercise 3.3

3.3 Which statement about throughput is true? [1]

- **A** it is always equal to the bandwidth
- **B** it is the delay before data arrives
- **C** it is the data actually delivered per second, at most the bandwidth
- **D** it is measured in milliseconds

Exercise 3.3

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3.3 C

- other traffic and errors reduce it

Exercise 3.4 (a)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(a) Describe how the student's laptop gets an IP address. [2]

Exercise 3.4 (a)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(a) Describe how the student's laptop gets an IP address. [2]

(a)

- the laptop asks for an address when it joins; a DHCP server replies
- it lends a free private IP address for a time

Exercise 3.4 (b)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(b) Describe how the browser finds the server's IP address. [3]

Exercise 3.4 (b)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(b) Describe how the browser finds the server's IP address. [3]

(b)

- the browser asks a DNS server for the IP address of `www.school-library.org`
- if it does not know, that DNS server asks other DNS servers
- the IP address is returned and the browser connects to it

Exercise 3.4 (c)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(c) The link is 16 Mbit/s. Calculate the ideal download time. [2]

Exercise 3.4 (c)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(c) The link is 16 Mbit/s. Calculate the ideal download time. [2]

(c)

- $24 \times 10^6 \times 8 = 192 \times 10^6$ bits
- $192 \times 10^6 \div 16 \times 10^6 = \mathbf{12\ s}$

Exercise 3.4 (d)

3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(d) Explain why the e-book is sent using TCP. [2]

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3.4 A student joins the school Wi-Fi and opens `www.school-library.org` to download a 24 MB e-book.

(d) Explain why the e-book is sent using TCP. [2]

(d)

- every byte of the file must arrive, in the right order
- TCP numbers the data, checks it arrived and resends missing parts