

Chapter 14 Student Book Answers

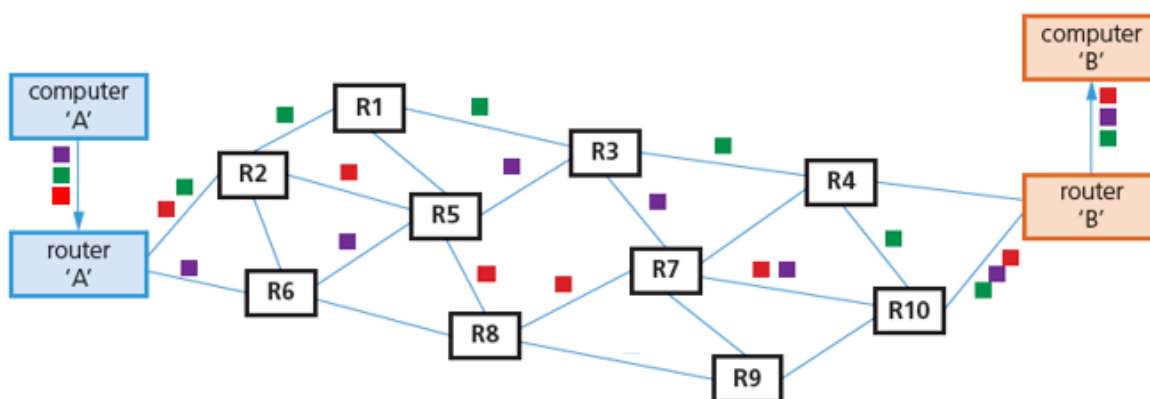
14.1 What you should already know

- 1
 - a) IP = internet protocol
TCP = transport control protocol
 - b) Protocols are sets of rules agreed by sender and receiver when sending data or communicating over a network.
- 2
 - a) Peer-to-peer – each node in a peer-to-peer network is connected to each other node; each node provides services to all the users on the network.
 - b) **Benefits:**
 - Each workstation can provide a service or request a service.
 - Each peer has its own data.
 - The network doesn't suffer from 'bottlenecks'.**Drawbacks:**
 - It offers little security since there is no central security system.
 - It works well with only a few devices (for example, 12) otherwise suffers performance and management issues.
 - It suffers instability since each workstation needs to manage (for example, update) its own data.
- 3
 - a) Stack – last in first out (LIFO) structure; used to store collection of objects.
 - b) Queue – first in first out (FIFO) structure; new items added at end of queue and removed from front of queue.
 - c) **Uses of stack**
 - used in binary searches
 - used in the “UNDO” mechanism in text editors
 - used in syntax checks when compiling source code.**Uses of queue**
 - used in buffers
 - used in parsing during compilation (infix to postfix).
- 4
 - a) Ethernet is the main LAN protocol
 - it transmits data in frames; it is the protocol used when connecting a number of computers to form a LAN
 - it controls the passing of information and avoids simultaneous transmission by two or more computers.
 - b) IP conflicts
 - occur when two receiving devices on a network have the same IP addresses
 - can be resolved by restarting the computer so that a dynamic IP address would be reassigned
 - the administrator can change IP addresses on devices which don't have static IP addresses.
- (5)
 - (a) **DNS** – domain name system gives domain names for internet hosts and is a system for finding IP addresses of domain names.
 - (b) **Http** – (hypertext transfer protocol) the protocol responsible for the correct transfer of files that make up web pages from the world wide web.
 - (c) **Status flags** – the special registers in a computer that contain data/information about the state of the processor. The individual values are read or written to by machine code instructions during execution.

14.2 What you should already know

- 1 a) **PSTN** – public switched telephone network
 - used as means to connect computer and LANs via telephone network
 - lines are always ‘open’ and always remain active
 - makes use of circuit switching.
- b) **VoIP** – Voice over internet Protocol
 - communication method (audio and visual) across internet
 - uses packet switching
 - uses encryption and data compression
 - connection only made during actual transmission

2

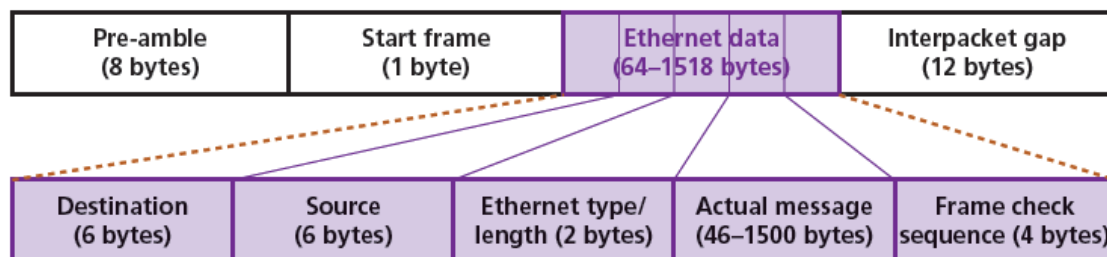


Activity 14A

- 1 a) Application Layer
Transport Layer
Internet/Network Layer
Network/Datalink Layer
- b) Application Layer – HTTP, SMTP, POP, IMAP, DNS, FTP, SNMP
Transport Layer – TCP, SSL, TLS, UDP
Internet Layer – IPv4/6, Ethernet, ARP
Network – IEEE 802.11 etc.
- c) i) SMTP
 - text-based protocol when sending emails
 - this is a push protocol.
 MIME
 - improved version of SMTP which can handle binary files.
 POP3/4
 - protocol used when receiving emails
 - this is a pull protocol.
 IMAP
 - protocol used when receiving emails
 - improved version of POP3/4.
- ii) MIME can handle binary file attachments when sending emails

- 2 a) Ethernet is the main LAN protocol.
- It transmits data in frames.
 - It is the protocol used when connecting a number of computers to form a LAN.
 - It controls the passing of information and avoids simultaneous transmission by two or more computers.

b) frame:



- c) They require IP to go outside local networks. The IP protocol sits on top of the Ethernet protocol.
- 3 a) i) Peer – this is a client in a peer-to-peer network.
 ii) Swarm – connected peers that share a (data) torrent.
 iii) Tracker – central server that stores details of all other computers in the swarm.
 iv) Leech – peer with negative feedback from the swarm.
 v) Seed – when a peer starts to upload downloaded material to other peers in the swarm.
- b) The peer randomly selects other peers in the swarm, but only continue to upload to peers that provide regular downloads. If a peer isn't downloading then they will be isolated by other peers.
- 4 a) **Packet header**
- IP address source
 - IP address of receiver
 - hop number
 - length of packet (in bytes)
 - number of packets in the message
 - sequence number of each packet to allow reassembly
 - IP protocol version.
- b) **Routing tables**
- contain information necessary to forward a package along shortest/best route to allow it to reach its destination
 - as soon as a packet reaches a router, the packet heading is read and is examined and compared to the routing table
 - table supplies router with instructions for sending packet (to hop) to next router.

5 **Description:**

- This uses either an internet phone or microphone and speakers (video calls also require a webcam).
- The internet connection is only 'live' while data (sound/video image) is being transmitted.
- Uses of voice over internet protocol (VoIP) which converts sound to digital packages (encoding) which can be sent over the internet.
- VoIP uses packet switching; the networks simply send and retrieve data as it is needed – there is no dedicated line unlike PSTN. Data is routed through 1000s of possible pathways thus allowing the fastest route to be determined.
- The conversation (i.e. data) is split into data packages with each packet containing at least the senders address, receivers address and order number of packet. The sending computer sends the

data to its router which sends the packets to another router and so on. At the receiving end the packets are reassembled into the original state.

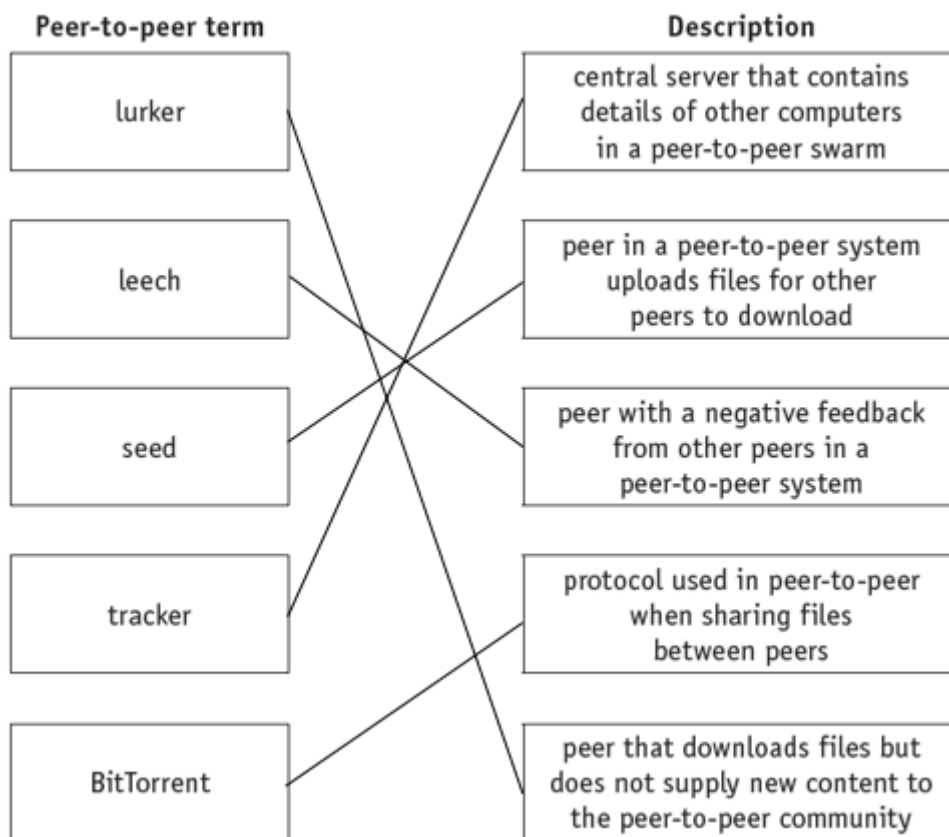
- VoIP also carries out file compression to reduce the amount of data being transmitted.
- Because the link only exists while data is being transmitted, a typical 10 minute phone call may only contain about 3 minutes where people are talking, thus only 3MB of data is transmitted making it much more efficient than PSTN.

Problems:

- Picture and sound may not be synchronised (packets arrive at different times).
- Video is not continuous (due to time delay reassembling packets in correct order).
- Sound/video quality may be degraded (caused by competing network traffic).

End of chapter questions

1 a)



b)

Application layer
Transport layer
Internet (network) layer
Network/Datalink layer

c) SMTP

- text-based protocol when sending emails
- this is a push protocol.

MIME

- improved version of SMTP which can handle binary files.

POP3/4

- protocol used when receiving emails
- this is a pull protocol.

IMAP

- protocol used when receiving emails
- improved version of POP3/4.

2 a)

destination MAC address	source MAC address	Ethernet type	payload/data/ message	frame check sequence/ check sum
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b) Metadata summarises basic information about other data**c) In the BitTorrent Protocol**

- file to be shared is split into pieces
- peer creates small files called a torrent ...
- ... which contains metadata about the files to be shared
- tracker keeps record of all of the peers in the swarm and the parts of the file they have
- tracker coordinates file distribution
- peers connected to a tracker which tells them which other peers are downloading the file
- peers downloading file can get pieces from different peers simultaneously
- once a peer has a piece of file it can become a seed for the parts downloaded.

3 a) Circuit switching

- dedicated circuit/channel/path ...
- ... which lasts for the duration of the connection

b) Circuit switching

- gives a dedicated circuit
- whole bandwidth is available
- faster data transfer rate
- packets arrive in same order they were sent
- packets cannot get lost
- better for real time applications.

Packet switching

- data is split into packets
- data shares bandwidth
- packets may arrive out of order, so there is a delay until packet order is restored
- packets may get lost, so retransmission causes delays.

c) When a web page is transferred from a web server to a computer

- web page divided into packets
- each packet has a destination address
- router looks up IP address ...
- ... and decides where to send packet next for most efficient/shortest path
- packets can take different routes
- home computer software reassembles packets to rebuild web page.

4 a)

statements	circuit switching	packet switching
a dedicated circuit/path is needed at all times	✓	✗
the same route/circuit is used for every packet in the message	✓	✗
bandwidth is shared with other packets of data	✗	✓
none of the bandwidth available is wasted during transmission	✗	✓
packets arrive at the destination in the correct order	✓	✗

- b) i) Hop number is a number in a header used to stop packets which never reach their destination from clogging up routes.
- ii) Checksum is a number generated from a set of data which is transmitted with the data. The receiver also calculates the checksum to ensure no transmission errors have occurred.
- c) **Routing tables**
- contain information necessary to forward a package along shortest/best route to allow it to reach its destination
 - as soon as a packet reaches a router, the packet header is read and is examined and compared to the routing table
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