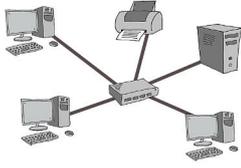# Network Topologies, Protocols and Layers
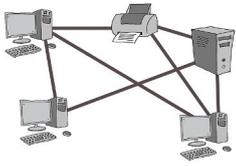
WiFi is a brand name for a popular type of wireless network.

Star Topology

All the devices connect to a central hub or switch.
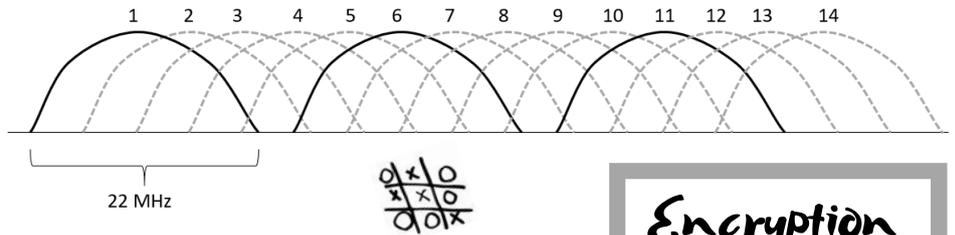
Mesh Topology

The devices connect to many other devices on the network.

WiFi frequency

Radio waves are sent out in waves and the number of times these are sent is known as the frequency. The higher the frequency, the more waves are sent in the same period of time.
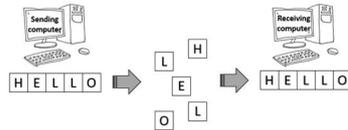
WIFI CHANNELS

Frequencies are divided into channels which overlap and share the bandwidth. If wireless networks are close together and use channels that overlap they will have reduced bandwith and will run slowly.

1   2   3   4   5   6   7   8   9   10   11   12   13   14

22 MHz

Encryption

Wireless networks are very susceptible to cyber-attacks as unprotected signals can be used by anyone near-by.

It is important to make sure the signals are encrypted so that only devices that are authorised to use the network can read and send messages over the network.

Ethernet

Ethernet is a set of standards (protocols) for how data is transmitted over a wired network and defines how devices on a network can easily communicate with the other devices and as long as new devices use the same standards they can be easily added to the network.

IP Address

Every device on the internet has a unique IP (Internet Protocol) address which is assigned to the device by the server.

Sending computer   Receiving computer
HELLO   L H E O L   HELLO

Mac Address

This is a hardware address associated with the Network Interface Card (NIC). Every NIC has a unique address made up of the manufacturer's ID and the individual card ID. This is known as a MAC (Media Access Control) address.
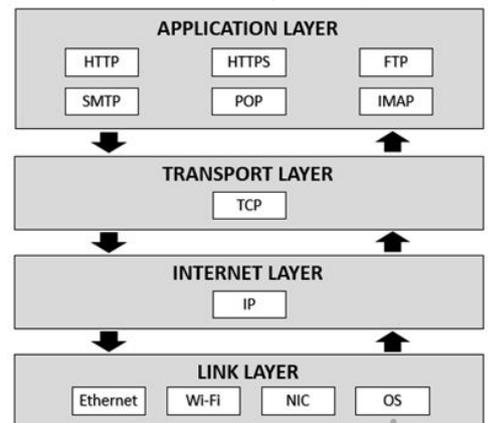
Packet Switching

When data is sent through a network, it is split into small sections called "packets". Each packet contains the address of the destination it needs and a message to tell the receiving computer how to put the pieces of the message back together in their original order.

Protocol	Purpose and Use
TCP/IP	TCP (Transmission Control Protocol) defines how to establish and maintain a network conversation through which applications can communicate and data can be sent (usually over the internet). IP (Internet Protocol) defines how data is sent from one computer to another on the internet and includes a standard way for how devices are addressed
HTTP	HTTP (Hypertext Transfer Protocol) defines how web pages are formatted and transmitted and how webservers should cope with commands on webpages
HTTPS	HTTPS (Hypertext Transfer Protocol Secure) is a secure version of HTTP which encrypts all data sent between the browser and the webpage. These are often used for payment pages on websites
FTP	FTP (File Transfer Protocol) this is a Standard network protocol that is used to transfer files. It can be used on LANs and WANs such as the internet
POP	POP (Post Office Protocol) defines how messages are extracted and retrieved from a remote mail server for access by the host machine
IMAP	IMAP (Internet Message Access Protocol) defines how email messages are stored on a mail server but allows the end user to view and manipulate the messages as though they were stored locally on the end user's computer
SMTP	SMTP (Simple Mail Transfer Protocol) defines how e-mail messages are sent between servers

Network Layers

The TCP/IP model has 4 layers :

APPLICATION LAYER

HTTP	HTTPS	FTP
SMTP	POP	IMAP

TRANSPORT LAYER

TCP

INTERNET LAYER

IP

LINK LAYER

Ethernet	Wi-Fi	NIC	OS

OS = Operating System

Network Topologies, Protocols and Layers

Revise it 👉

Highlight

Highlight key words (maximum of 2 per sentence) and then cover the page and try to write down all the key words you can remember. Go back and fill in all the ones you have missed.

Mind map

Using the handout, draw a mind map and include as many colours, images and diagrams as you can to illustrate it

Bullet Points

Write the main headings (leaving space between each) and then write bullet points of the main key points you need to remember under each heading. Re-read the handout and add any missed points to your list.

Post-it notes

Write a key word and the definition on a post-it note and stick them around your study area as a reminder of the terminology.

Record your notes

Re-write the handout in your own words and record yourself using your phone as you read your notes aloud.

TEST YOURSELF

Cover your notes and the answer before you attempt to answer this practice exam question.

Explain the one advantage and one disadvantage of a company connecting their computers together in a full mesh network instead of a star network. [4 marks]

Mark your answer

4 marks available in total, 1 mark available for identifying the advantage and a second point available for explaining why it is an advantage of disadvantage

Advantages:
- If one of the connections fails, there are other routes *[1 mark],* this means the network can still operate fully. *[1 mark]*
- Communication can be faster *[1 mark]*, because different routes can be used simultaneously rather than all passing through one device. *[1 mark]*

Disadvantages:
- Adding additional devices is more complicated *[1 mark]*, because it would need to be connected to all the other devices and not just a single device. *[1 mark]*
- Some connections would be redundant most of the time *[1 mark]*, as devices would usually communicate using only the most direct route. *[1 mark]*