Networks

Keyword	Definition
WAN/LAN	Wide Area Network / Local Area Network
Packet	One unit of data sent through an IP network
Routing	Directing IP packets to their destinations
IP address	Internet Protocol address. Where packets of data are sent to or received from
MAC address	Media Access Control address. The unique identifier of each device (or network interface card)
Router	Routes packets between two networks
Switch	Connects two or more devices together, data is sent only to the device it is intended for
Wireless network	A network using radio waves
Wired network	A network using cables

Wireless vs Wired

Advantages	Disadvantages
• No need to lay cables • Easy to connect new devices • Devices can be portable within the range of the access point	• Can be less reliable than wired networks • If many devices try to use the same access point at the same time, the connection can be very slow • Connection speed reduces the further the device is from the access point • Can be less secure than wired connections

Routers and Switches

- **Router**
  - Looks at the destination of packets of data and sends them to the network that is closer towards their destination
  - A home router will route packets between the home local area network (LAN) and the Internet
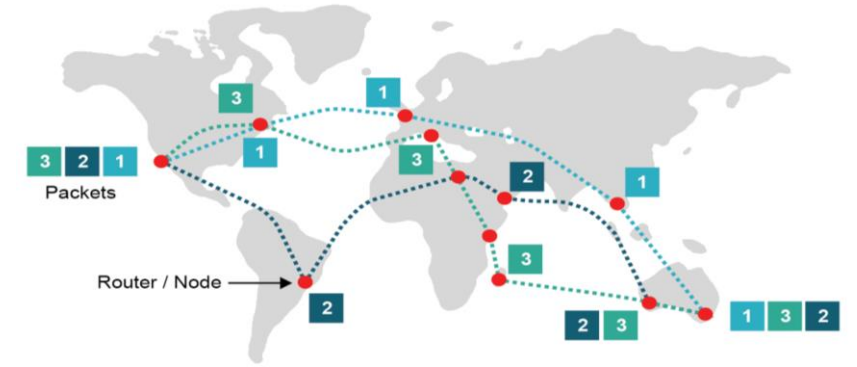
- **Switch**
  - Switches connect each node (computer) in a network
  - They know the MAC address of all connected computers and devices
  - When a packet of data arrives, they can send it to the correct computer
  - Hubs, by comparison will send the data to all connected computers

Networked Computers

Advantages of networks	Disadvantages of networks
Computers can share resources such as printers	Purchasing the network hardware is expensive
Files can be accessed through any computer in the network	Managing a large network is complicated
Data is easy to back up as it is stored centrally on the server	Viruses may be able to infiltrate the network and infect every computer

Internet packet routing

Network Hardware

A **Network Interface Card/Controller** (NIC) in your computer or device

A **switch / hub,** which connects together all the computers or devices on the LAN

A **modem** is required to connect to the Internet – this is usually combined with a router inside a single device

A **router** is needed to route packets towards their destination

A **Wireless Access Point** connects wireless devices to a network. Many home wireless access points are part of a router

Network Security Methods

Authentication   Encryption

Firewall   MAC address filtering

Networks

Star Topology

Advantages	Disadvantages
Fast data transfer to the hub as each wire isn't shared with other computers	Requires additional hardware such as the central switch and network cables
If one cable fails the other computers are not affected	If the central switch fails the whole network goes down
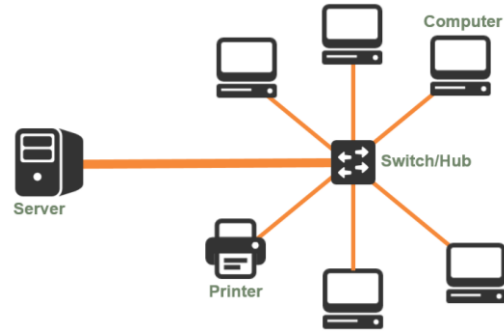
Bus Topology

| Advantages	Disadvantages
Less cable so cheaper to install the network	The single cable is shared by many devices so there will be many 'collisions' of data if data is sent at the same time
Easier to add more devices as they only need to connect to a central cable	If the cable is damaged, the whole network fails
	Any device can view all data on the cable creating a security risk
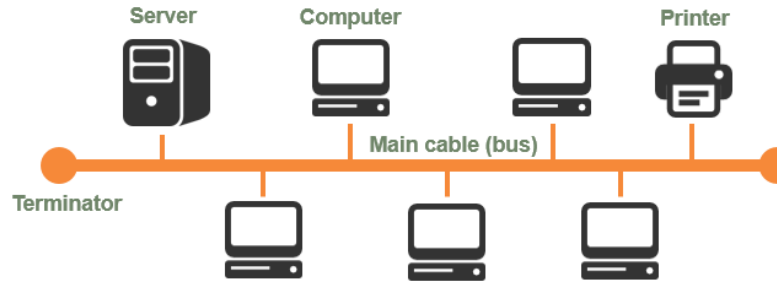
Acronym meanings

HTTP – Hypertext Transfer Protocol

HTTPS – Secure Hypertext Transfer Protocol

FTP – File Transfer Protocol

SMTP – Simple Mail Transfer Protocol

POP – Post Office Protocol

IMAP – Internet Message Application Protocol

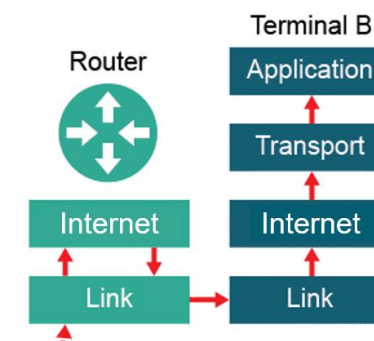TCP/IP – Transmission Control Protocol, Internet Protocol

UDP – User Datagram Protocol

Layers of TCP/IP stack

Application layer

Transport layer

Internet layer

Link layer

Sending data
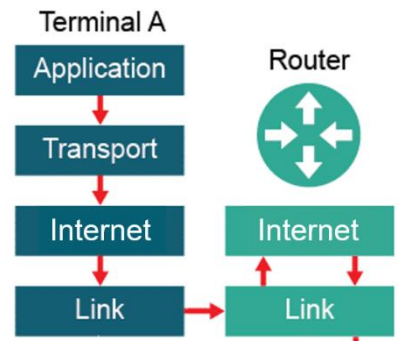
Receiving data

Cable choices

Copper cable	Fibre Optic cable
Adequate speed for low bandwidth applications	Very fast connection with much greater bandwidth
Low cost cable, with cheaper routing equipment	Much higher cabling and equipment cost
Signals affected by electrical interference	Signals travel as light waves so cannot be affected by stray electromagnetic signals
Significant loss of signal over distance – typically 100 m	Less loss of signal strength – typically 1 km+