1.3B Topologies, Layers & Protocols

Keywords & Definitions

Topology - The layout of a network

Packet Switching - the process of directing data packets on a network using routers and the IP protocol

IP Address - unique address assigned to a website or when a device accesses a network

MAC Address - hardwired onto a device. This is a unique address

Protocol - A set of rules for how computers communicate over a network

Layers - Protocols are broken into layers in order to organise the flow of data through the network

Encryption - scrambling data so that it cannot be understood by a hacker, need a key to decrypt it

Wired (Ethernet) VS Wireless Connection

Wired (Ethernet)

Cables have to be run from the router to all rooms in the house – health and safety	👎
Installation is expensive	👎
Faster traffics speed	👍
Good security – a user needs to physically plug their computer into the network with a cable	👍
Should not experience any interference	👍
Poor mobility as you cannot connect in a room without a socket	👎

Wireless

All you need is a wireless router to set up	👍
cheaper as only cost of a router	👍
Slower traffic speeds	👎
Poor security – anybody in range can use it (unless it is password protected)	👎
Interference – walls, other equipment, distance	👎
Mobility – able to move around the house and be connected	👍

Network Topologies

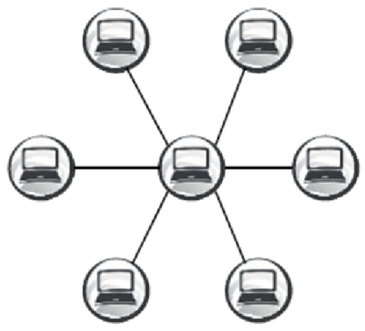
Star

Advantages

- Adding or removing devices is easy, it can be done without affecting the entire network
- Data packets can be directed to the intended node directly without having to pass along the complete network
- There will be less network traffic and fewer collisions
- If one link fails, all the other devices will continue to operate

Disadvantages

- If the file server/switch (centre component) fails, the entire network does
- It requires a lot of cable as each computer is connected individually so will be expensive



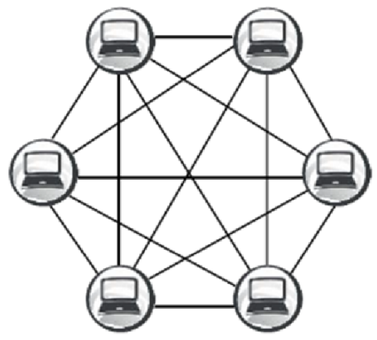
Mesh

Advantages

- Data can be transmitted from different devices at the same time
- It can handle high volumes of data traffic
- If one of the components fail, there is always an alternative route for the data
- Adding more devices will not affect the transmission of data as all nodes help to transmit the data

Disadvantages

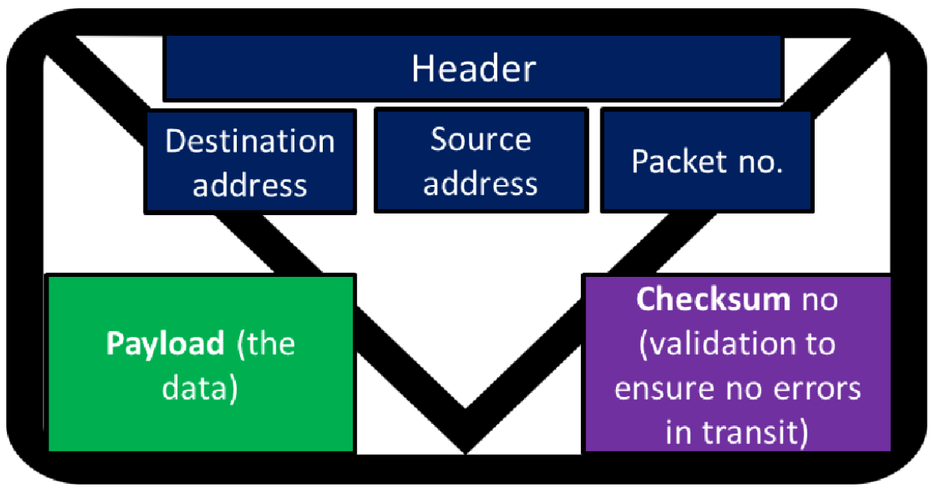
- The overall cost is expensive compared with other topologies
- Very difficult to manage as it requires continuous supervision



1.5 Topologies, Layers & Protocols

Packet Switching

Typical data packet structure:



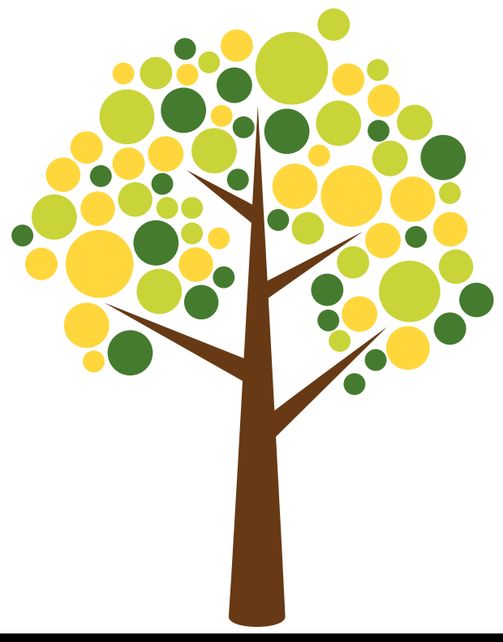
Layers

Advantages

- **Breaks network communication into manageable pieces**
- **A layer can be changed without the other layers being affected**
- **Makes it easier to identify and correct network errors**

Computer application (E.G sending an email) **HTTP, FTP, SMTP**	Layer 4 – Application Layer
Creates the connection – controlling data flow **TCP**	Layer 3 – Transport Layer
Sends and routes the data **IP**	Layer 2 – Network Layer
Physical hardware and cables	Layer 1 – Data Link Layer

All Trees Need Dirt
Alien Trevor Never Dies



Protocols

TCP/IP — Defines how data is sent and transmitted and received over the internet. Defines four 'layers' for the transmission of data.

HTTP — Used by web browsers to access websites and communicate with web servers.

HTTPS — A more secure version of HTTP. Encrypts all information sent and received

FTP — Used to access, edit and move files between devices on a network

POP3 — Used to retrieve emails from a server. The server holds the email until you download it, at which point it is deleted from the server.

IMAP — Used to retrieve emails from a server. The server holds the email until you delete it – you only download a copy.

SMTP — Used to send emails. Also used to transfer emails between servers,

World of work links

Programmer, IT Technician, Software Engineer, Teacher, Systems Architecture, Data Engineer, Software Developer