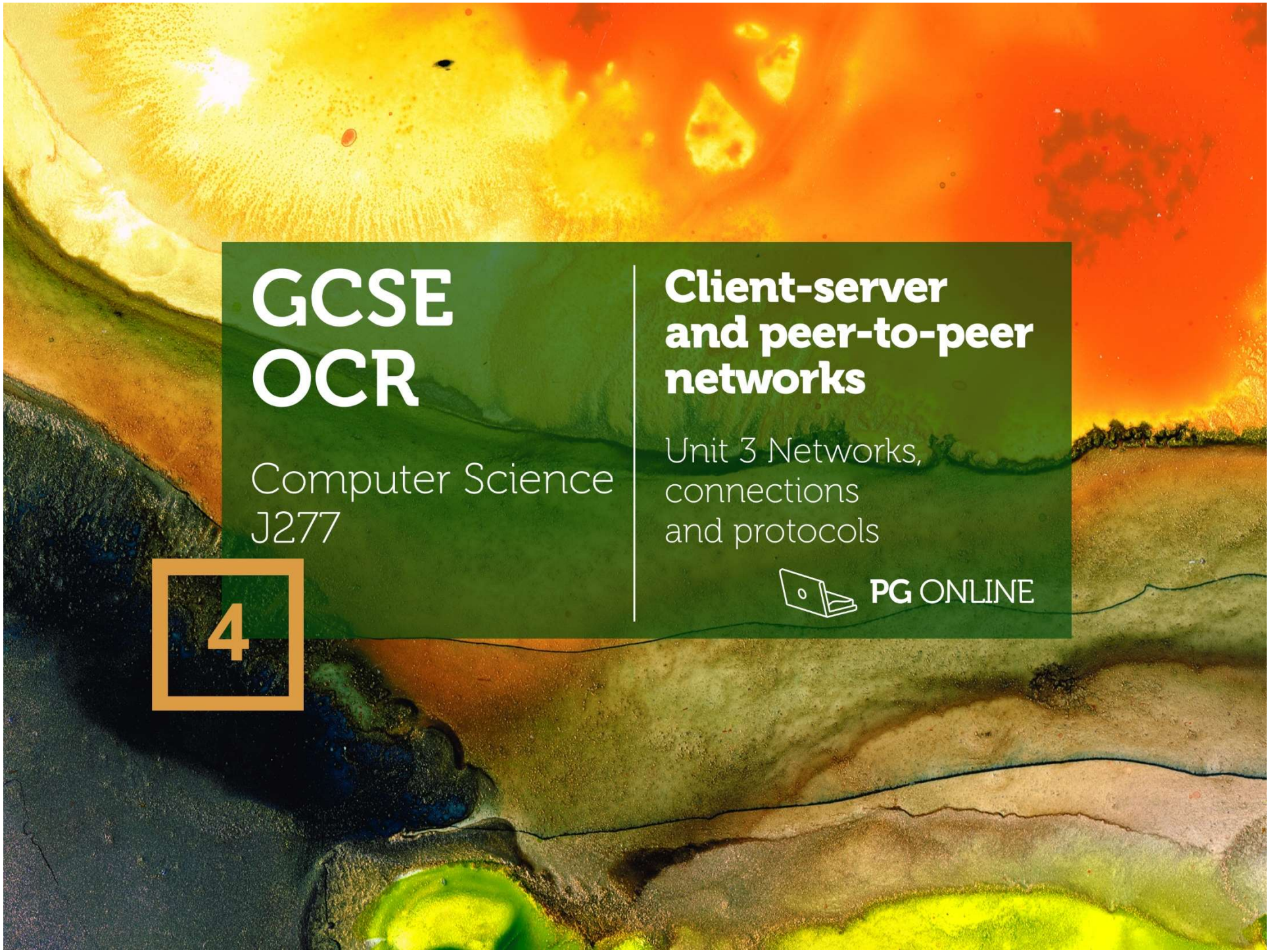

GCSE
OCR
Computer Science
J277
4
Client-server and peer-to-peer networks
Unit 3 Networks, connections and protocols
PG ONLINE

Objectives

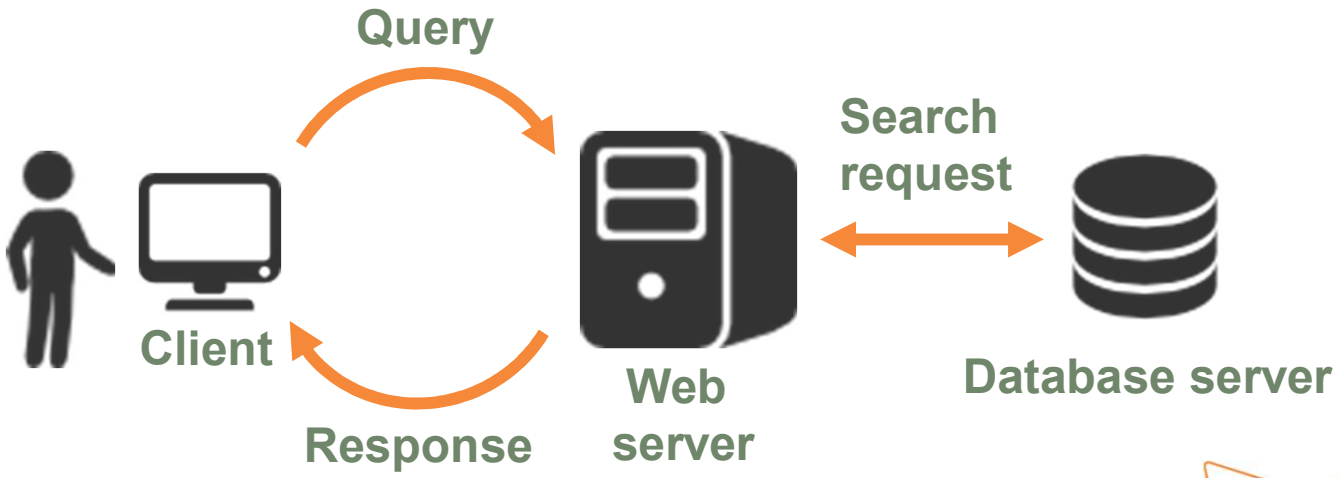
- Explain the role of computers in client-server and peer-to-peer networks
- Explain the advantages and disadvantages of client-server and peer-to-peer networks
- Describe what is meant by:
  - Hosting
  - The Cloud
- Explain the advantages and disadvantages of various transmission media
- Describe the factors that affect network performance

Starter

- A web address is entered to request a web page
  - What happens after enter is pressed?

The client-server model

- In the client-server model, there is a client computer and a server
  - The **server** is a powerful computer which provides services or resources required by any of the clients
  - A **client** is a computer or device which requests the services or resources provided by the server



Servers on LANs and WANs

- One or more servers may be part of a local area network
  - A server may also be part of a wide area network
- Companies such as Google and Amazon have huge data centres servers in several different countries
- Each data centre will contain thousands of servers

A Google server room in Council Bluffs, Iowa

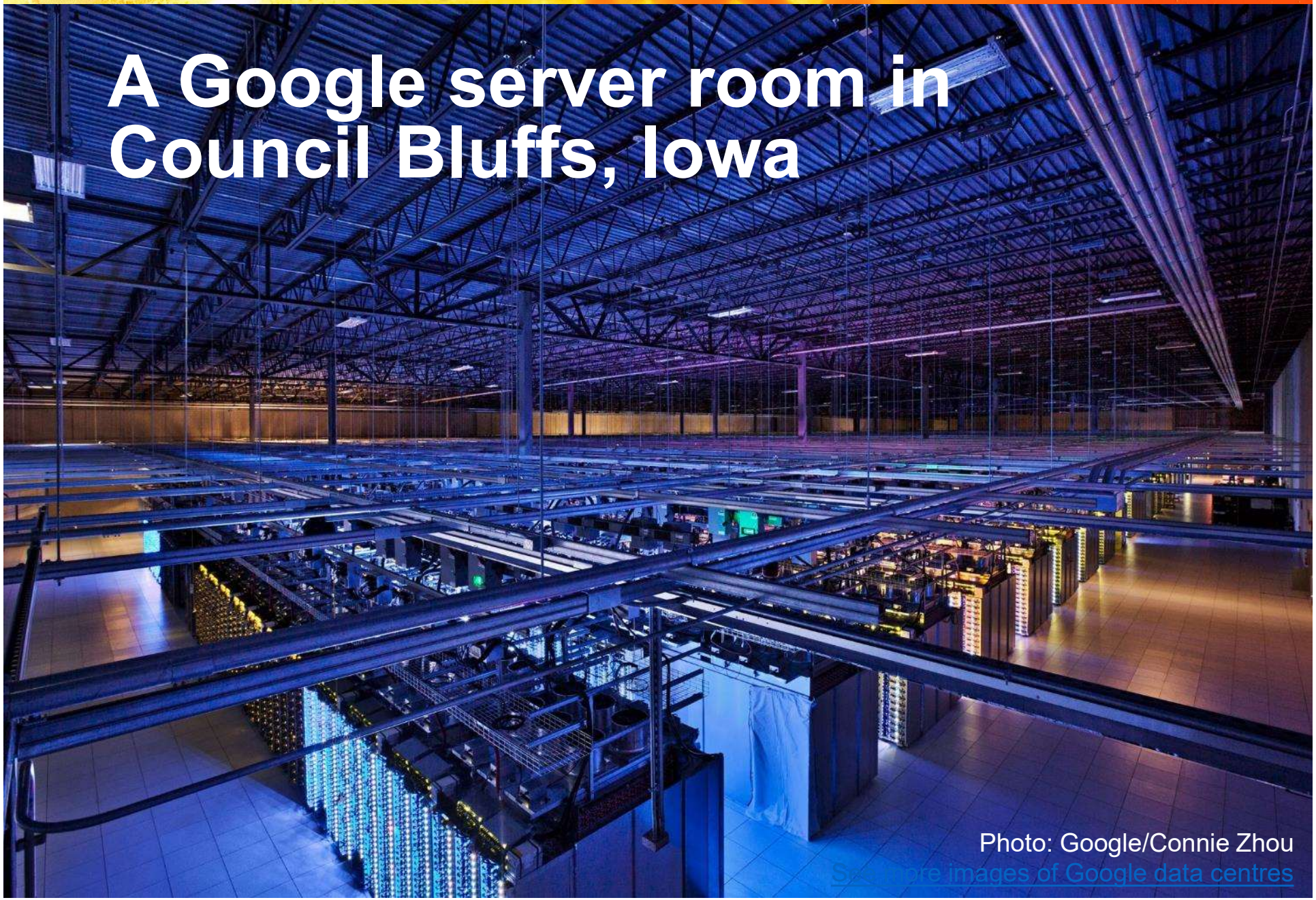
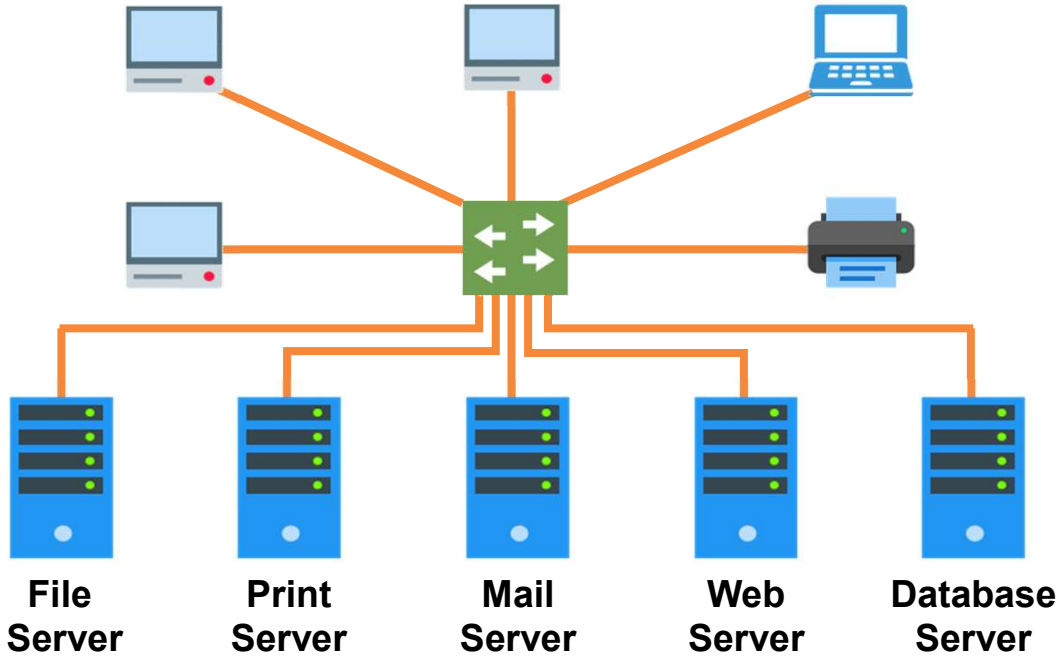


Photo: Google/Connie Zhou

See more images of Google data centres

A school client-server setup

- Five different types of server in a typical school are given below
  - What do each of them do?



Serving all your needs

Answers

- In a school network, there may be dozens or even hundreds of clients and several servers
  - A file server holds all the data files and databases and manages backups
  - A print server may organise printing on different printers
  - An email server may receive emails, detect and block spam, distribute emails to users
  - A web server may host the school's external website
  - A database server may hold student records

Role of the client

- The client sends requests to the server
- Waits for a reply
- Receives the reply

Role of the server

- The server waits for requests from a client
- Performs any processing required to fulfil the request
- The requested data is sent back to the client
    - What are the advantages of using a client-server model?

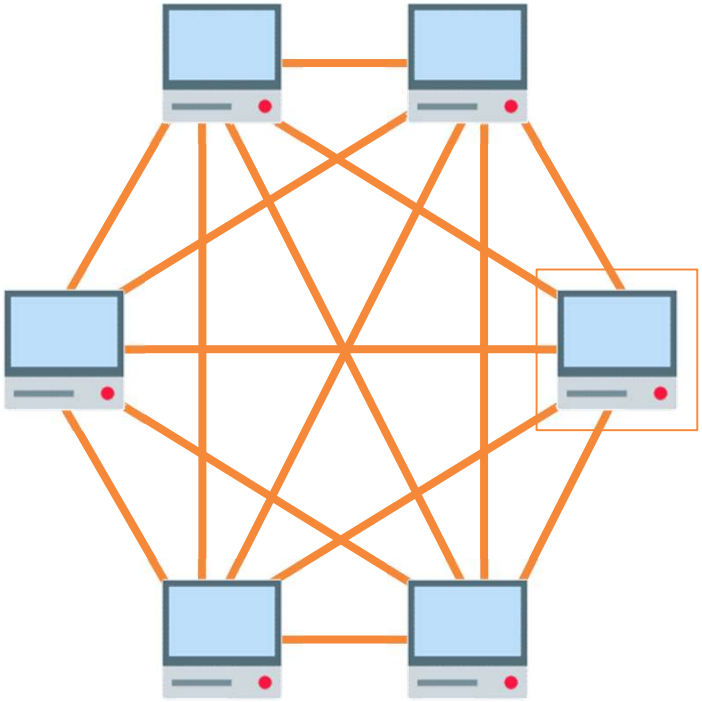
Client-server advantages

Answers

- Some specific examples of advantages include:
  - With file servers, just one file server needs to be backed up and files can be accessed from any computer
  - Email servers provide a central place for email that is then accessed from different devices
  - One print server can manage all files to be printed. This allows one printer to be shared by many computers

Peer-to-peer (P2P) structure

- A peer-to-peer network has no central server



Peer-to-peer networking

- Features of a peer-to-peer network include:
  - Suitable for a small companies with fewer computers
  - No central server controls files or security
  - All computers can easily see files on all other computers
  - All computers can communicate with each other without going through a server

Advantages of a P2P network

- There are a number of advantages of P2P networks
  - Easier to set up – computers can simply be cabled together
  - No need for dedicated server equipment
  - Individual computers can share a printer, router, modem and other hardware
  - Users can communicate directly with each other and share each others' files
- Peer to peer networks are often used in home setups or a small office with few computers
  - What are the disadvantages?

Disadvantages of P2P networks

- There are a number of disadvantages of peer to peer networks including:
  - Viruses and malware are more easily transferred over this type of network as there is no central firewall
  - Data recovery and backup is not done centrally, so each computer has to have its own backup system
  - Files are not centrally organised, but stored on individual computers and may be hard to locate if the computer's owner does not have a logical filing and naming system
  - If a computer is switched off, data on that machine cannot be retrieved from other machines

Client server vs Peer-to-Peer

Client-Server	Peer-to-Peer
A central backup server backs up all file servers	Each computer needs to be backed up
Security is controlled by a central server	Security is controlled by each individual machine
All users are reliant on the central server	There is no central server. If one computer goes down then only its services are lost
Using servers enables businesses to grow to hundreds or thousands of computers and users	Peer-to-peer networks are difficult to maintain beyond a few computers

Peer-to-peer on a WAN

- The P2P configuration can also be used for file-sharing
- Peer-to-peer networks are often used for the illegal distribution of copyright material such as music and films, as they are harder to close down
  - Some peer-to-peer networks have been more successful such as BitTorrent
  - Peer-to-peer file sharing allows each user to share parts of a file, rather than all downloads coming from one central server
  - This significantly reduces the amount of bandwidth required when trying to share a file

Worksheet 4

- Complete **Task 1** on **Worksheet 4**

Hosting

- Web hosting is a service offered by companies that will host web pages and files for websites
  - The web hosts will often provide database servers
  - Companies that provide more general hosting, such as backup servers, are known as hosting service providers
- Advantages of using a web host over sharing files from your own computer include:
  - Web hosts have far more bandwidth – so they can serve more users
  - Web hosts are able to monitor their equipment 24 hours a day
  - Web hosts will backup web sites remotely

The Cloud

- The ‘Cloud’ is a term used to refer to services that are delivered over the Internet
  - It enables users connected to any Internet-enabled computer to access these services
  - What types of services are available?

Cloud Computing applications

- Some examples include Google Drive, OneDrive and Dropbox
- The applications are potentially limitless, from word processing or database software, business applications and online exams, to apps that you run on your smartphone

Software as a Service (SaaS)

- Cloud-based servers enable access to software on demand
  - Typically the software is used on a subscription basis
  - The software doesn't need to be installed on a local machine
  - The software can be accessed from any Internet-connected computer, including smartphones
- Examples include:
  - Online accounting packages
  - Customer Relationship Management systems (CRMs)
  - Share trading applications

Online applications

Cloud computing advantages

- There are a number of advantages of cloud computer including:
  - You can access your data and applications from anywhere at any time
  - You don't need a powerful computer with a huge hard drive – everything is stored and run on a remote computer
  - Backing up data is no longer crucial – it is done by the service provider

Disadvantages

- There are a number of disadvantages of using cloud computing
  - Personal data will be stored on another company's servers
  - If the Internet connection is lost, often the service becomes unusable
  - Slow Internet connections may result in a poor quality of service
  - Although most cloud services will backup data stored with them, it is not easy for people and organisations to see how resilient this is

Worksheet 4

- Complete **Task 2** on the worksheet

Transmission media

- Computers can be connected using various methods:
  - Copper cable
  - Fibre optics
  - Wi-Fi
- How is data transmitted using each method?

Comparison of media types

	Advantages	Disadvantages
Copper cable (uses electricity)	• tried and trusted technology • relatively inexpensive	• signal affected by electric and magnetic fields • low bandwidth • heavy cables
Fibre optics (uses light)	• very fast data transmission • low loss of signal over distance • not affected by magnetic or electric fields • require very little power • more difficult to 'tap into' than copper cables	• high investment cost • need for expensive optical transmitters and receivers
Wireless transmission (uses radio waves)	• no need for trailing wires (safer) • allows devices to be used anywhere provided there is a signal • easier to add devices to a network	• data transmission rate less than wired systems • signal can be blocked by objects or walls • increased security issues

Network performance

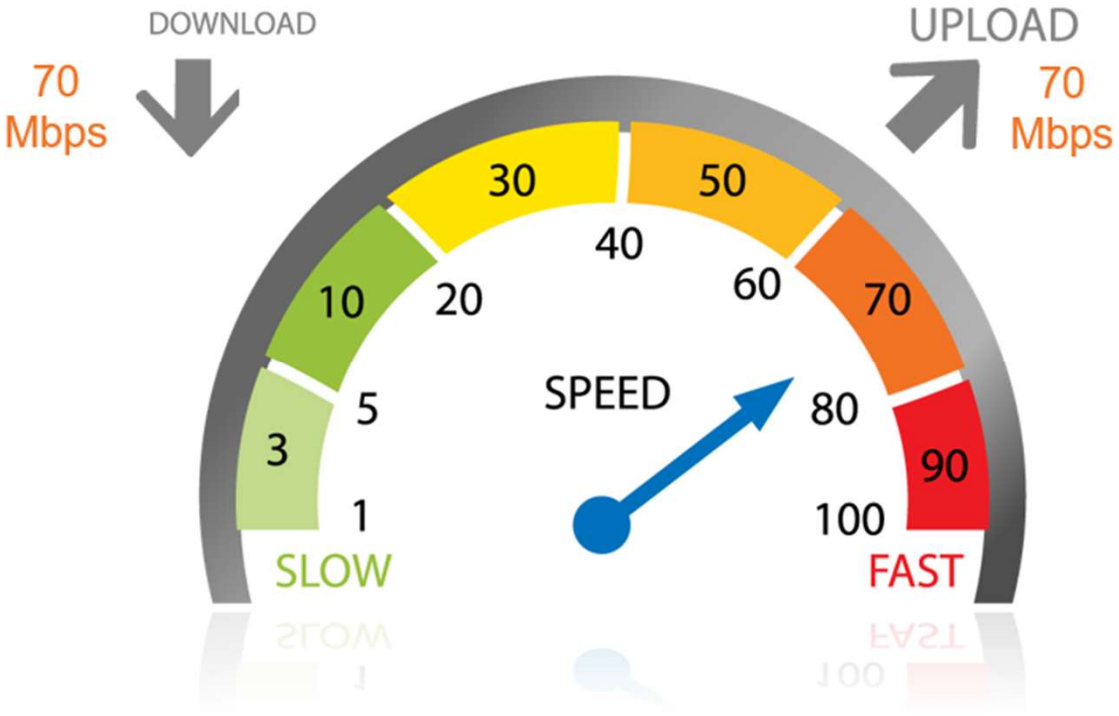
- There are several factors that affect the performance of a network including:
  - Bandwidth
  - Latency
  - Error rate/collisions
- What do each of these terms mean?

Bandwidth

- Bandwidth is the amount of data that can be carried through a connection at a time
  - A good analogy is the amount of water that a water pipe can carry

Connection Speeds

- Connection speeds are measured in Mbps (Megabits per Second)
- Run a speed test: www.speedtest.net

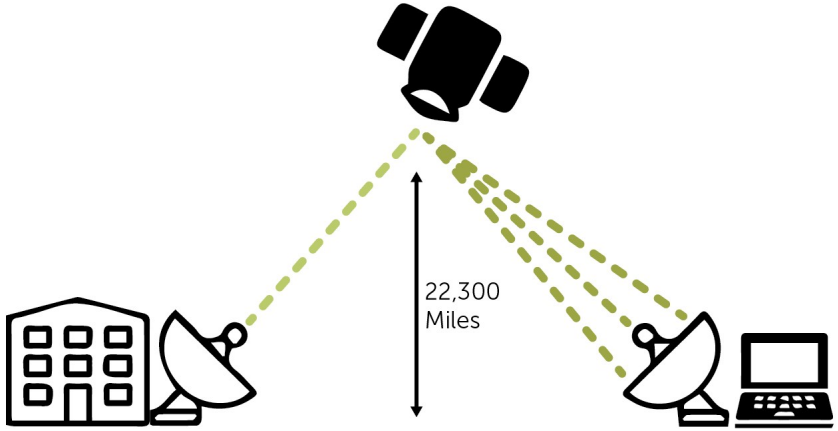


Latency

- When playing multiplayer games online, it is vital that the connection has very little delay between the client and server
  - The delay is known as latency
  - How does this differ to bandwidth?

Latency

- Latency is the length of time a packet of information takes to travel through the network
  - Bandwidth is how many packets of information can travel through per second
  - The latency of a phone call via a satellite phone will be longer than that via a landline as it has to travel further



Worksheet 4

- Complete **Task 3** on the worksheet

Plenary

- Fill in the text below with the words at the bottom

A school makes use of a _____ that allows many users to access their _____ from different _____ machines. If all users try to access files at the same time, it may become _____ to receive the files. One reason for this is that there is not enough _____.

Bandwidth	**File server**	**Client**
Files	**Slower**	

Plenary

Answers

- Fill in the text below with the words at the bottom

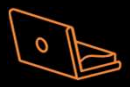
A school makes use of a file server that allows many users to access their files from different client machines. If all users try to access files at the same time, it may become slower to receive the files. One reason for this is that there is not enough bandwidth.

Bandwidth **File server** **Client**

Files **Slower**

Copyright

Licence agreement



PG ONLINE