

The Fundamentals of Computer Networks

Devices means any computing device, including printers, scanners, webcams, servers and switches. The important thing is that networks are usually more than just computer terminals

Make sure you know three distinct advantages and disadvantages. It's important in an exam to avoid saying the same thing in an answer.

Network managers, in particular, are skilled and well paid employees. Networks also usually require technicians.

Copper is a non-renewable resource which is in high demand from the electronics industry. It can be recycled.

Fibre optic cabling is also more likely to break – if the glass or plastic core is broken, the communication link is broken.

Computer Networks

A **computer network** is a collection of **devices** (including computer terminals) which are connected together. Devices across a network can communicate with each other and pass data between each other.

The devices on a network might be connected using wires or wirelessly.

Reasons for using a network (advantages):

- to share hardware devices – e.g. share a printer between many machines – easier and you don't need a device per user
- to share access to software
- to communicate, e.g. e-mail, messaging systems, air drop etc...
- to share data/files stored on a central server
- to allow users to move between machines and access their files
- to back data up in a centralised place – allowing files to be restored a device fails
- to monitor the activity of users

Disadvantages of networks:

- security, e.g. sensitive data can be accessed or accidentally shared; viruses can be introduced to every machine on a network
- cost of installation and management
- complexity – large networks are complex and often require staff to maintain them (adding costs)
- central servers hold all data. If these go down the network can't be used and data could be lost
- a network can slow down if many people are using it

Connecting Networks

Devices on a network can be connected using wires or wirelessly. Each device on a network needs a **Network Interface Card** (NIC) in order to be able to connect.

Wired networks use either **copper** or **fibre optic** cabling. Copper cabling is cheaper per metre and will almost always be supported by the NICs built in to modern devices.

Fibre optic connections use pulses of light to communicate down wires with a thin, flexible glass or plastic tube. They are more expensive and need a newer NIC for each device. But they are much quicker and provide greater **bandwidth**. They suffer less electromagnetic interference from other devices: over 100 metres a copper cable will lose 94% of its signal strength, whilst a fibre optic cable will lose only 3%.

Wireless networks require devices to have a wireless NIC. Many modern devices have these built-in and can be connected quickly and easily to a wireless network, but the hardware may need to be added.

Not all devices on an office or school network may have a wireless NIC as standard.

Wireless networks have many **advantages**. They allow users to move freely around the network with multiple devices, making work easier to complete and increasing flexibility. They remove the need for wires which take up space and cost time and money to install and maintain. Networks can be setup quickly and devices added quickly and can be used wherever they are needed.

But there are **disadvantages** to wireless networks. Connection speeds are usually slower using wireless networks and connections are sometimes less reliable. Signals can be blocked by walls, ceilings etc... and so wireless networks may not work well in some areas of a site. Multiple wireless connection points or boosters may be required – adding to the cost of installing a wireless network.

Wired networks are more secure and can transfer files more quickly. This is especially important on a larger network using large files, such as multimedia files.

- less secure – the ease of connecting a device to a network means it is easier to hack into the network
- bandwidth stealing – using an non-secured wireless hotspot
- devices on a wireless network are more mobile and so more vulnerable to theft or getting lost
- bandwidth loss – more devices may connect to the network, slowing data transfer speeds as bandwidth is used up
- it is more difficult to monitor users on a wireless network

Network speed can be a major problem with wireless networks

Activity 1:

- Define the term **network** (2 marks)
- Produce a table to summarise the advantages and disadvantages of using networks
- Describe the two types of cabling which can be used to connect a wired network
- Describe the advantages and disadvantages of using copper and fibre optic cabling to connect to a network
- Produce a table summarising the advantages and disadvantages of using a wireless network
- Describe the advantages and disadvantages of using a wired network
- Write definitions of the following terms:

bandwidth

wired network

network interface card

wireless network

Activity 2:

Obidos Travel is a travel agents employing seven customer service agents. Each agent has a standalone computer. They are considering using a computer network.

- Give three advantages for Obidos Travel of using a computer network
- Give three disadvantages of using a computer network for Obidos Travel
- Discuss whether Obidos Travel should use a wired or wireless network (6 marks)