LANs, WANs and why computers are connected

4.1.1, 4.1.2 · Networks · revision notes

Why organisations connect computers in a network, and the difference between a local area network (LAN) and a wide area network (WAN). Expect 'State', 'Give' and 'Explain' questions, usually set in a context such as a school, shop or company, and sometimes a 6-mark 'Discuss' question.

Key facts

- Network: two or more devices connected so that they can share data and resources
- WAN = wide area network: large area (towns, cities, countries); links owned by third parties, e.g. telecommunications companies
- The internet is the largest WAN
- Drawbacks: cost, need for management, malware spreads, security risks, central devices can fail
- LAN = local area network: small area (one building or site); hardware owned by the organisation
- A WAN often connects several LANs together
- Reasons to network: share resources, share files, communicate, central management, log on anywhere

Notes

Why computers are connected in a network

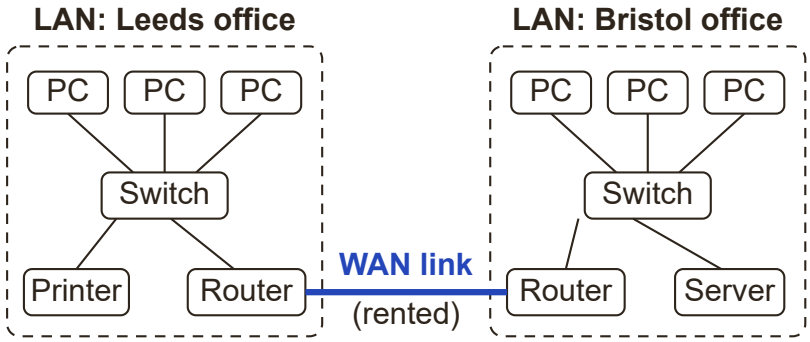
- A **network** is two or more computers or other devices connected together so that they can share data and resources.
- **Share resources**: one printer, one internet connection or one file server can be used by everyone, which saves money.
- **Share files and data**: files stored centrally, e.g. on a server, can be opened from any computer, so everyone works on the same up-to-date version.
- **Communicate**: users can send emails and messages, make video calls and work on the same documents together.
- **Central management**: backups, software installation, security updates and user accounts can all be handled from one place.
- **Log on anywhere**: users can sign in at any computer on the network and reach their own files.

Drawbacks of networks

- Setting up a network costs money (cables, switches, wireless access points, servers), and it usually needs a skilled person to manage it.
- Malware can spread from one infected computer to the others.
- More people can try to reach the data, including hackers from outside, so security measures are needed.
- If a central device such as a server or switch fails, many users may be unable to work.
- Heavy traffic can slow the network down.

LANs and WANs

- A **LAN (local area network)** covers a small geographical area, such as one building or one site, e.g. a school or an office.
- The hardware of a LAN (cables, switches, access points) is usually owned and managed by the organisation that uses it.
- A **WAN (wide area network)** covers a large geographical area, e.g. between towns, cities or countries. It is often used to join LANs together, e.g. the LANs in a company's shops in different cities.
- A WAN uses communication links owned by other organisations, such as telecommunications companies, which the organisation pays to use (e.g. leased lines).



Each LAN covers one site and its hardware is owned by the organisation. The WAN link that joins the two LANs is rented.

- The **internet** is the largest WAN of all.

How to answer each type of question

State a definition or give reasons for networking

1 to 2 marks | Grade 4

1. Learn the full names: local area network and wide area network.
2. For 'Give two reasons', write two clearly different reasons, one per line.
3. Make each reason specific, e.g. 'to share one printer' rather than 'to share things'.

Example. A primary school has 30 computers that are not connected to each other.
(a) State what LAN stands for. (1)
(b) Give **two** reasons why the school should connect its computers in a network. (2)

Model answer.

(a) Local area network (1)

(b) Any two from: so that all the classes can share one printer (1); so that pupils can save work on a server and open it from any computer (1); so that the internet connection can be shared (1); so that software updates and backups can be managed centrally (1).

Give differences between a LAN and a WAN

2 marks | Grade 5

1. Make each point a comparison: say what a LAN is like AND what a WAN is like.
2. Use the two standard differences: the geographical area covered, and who owns the communication links.

Example. Give **two** differences between a local area network (LAN) and a wide area network (WAN). (2)

Model answer. A LAN covers a small geographical area, such as one building, whereas a WAN covers a large area, such as several countries (1). The hardware of a LAN is usually owned by the organisation, whereas a WAN uses communication links owned by third parties, such as telecommunications companies (1).

Explain two benefits (or drawbacks) of a network in context 4 marks **Grade 6**

1. Identify a benefit (1 mark).
2. Expand it with 'so…' or 'which means…' to give its effect in this scenario (1 mark).
3. Repeat for a second benefit that is a different idea, not the same point in other words.

Example. A garage has four computers that are not connected. Staff copy job records between them on USB flash drives.
Explain **two** benefits to the garage of connecting the computers in a network. (4)

Model answer. Job records could be stored centrally and opened from any of the computers (1), so every mechanic sees the same, up-to-date record for each car without copying files around (1). One printer could be shared by all four computers (1), which saves the garage the cost of buying a printer for each one (1).

6-mark: Discuss whether an organisation should set up a network 6 marks (levels-based) **Grade 7**

1. Plan three or four benefits and three or four drawbacks, each linked to the scenario.
2. Cover a range of ideas: sharing, communication, central management, cost, security and reliability.
3. Develop each point with a consequence ('so…', 'which means…').
4. End with a conclusion that follows from what you have written.

Example. A charity has eight volunteers who work in one office. Each uses their own laptop, which is not connected to the others, and files are shared by email.
Discuss whether the charity should set up a local area network. (6)

Model answer. Marked by levels: the top band needs developed points on both sides, linked to the charity, and a supported conclusion. Points could include: shared storage means everyone works on the latest version of a file instead of emailing copies; one printer and one internet connection can be shared, reducing costs; central backups protect the charity's data better than copies on single laptops; but equipment such as a router, switch or access points costs money, which a charity may not have; someone must set up and manage the network and the user accounts; malware on one laptop could spread to the others, so anti-malware software and access control are needed. Conclusion: because the volunteers share files every day, a simple wireless LAN is probably worth its modest cost.

Don’t lose marks

- Saying a WAN is just 'bigger' or 'faster'. Say that it covers a larger geographical area and uses links owned by third parties.
- Saying a LAN must be wired and a WAN must be wireless. Either can use wired or wireless links; the differences are area and ownership.
- Giving the same benefit twice, e.g. 'share files' and 'share data'. Make the two points clearly different.
- Writing 'it is cheaper' without saying why, e.g. one shared printer instead of a printer for every computer.

Mixing up the internet (a WAN) with the World Wide Web (the web pages that are reached over the internet).

More tips

Memory tricks

- LAN = Local = one site; WAN = Wide = many sites. Remember the two differences as 'area and ownership'.
- To find benefits, picture the office without a network: a printer on every desk, files on USB sticks, updates done one computer at a time. Reverse each one and you have a benefit.
- Quick LAN or WAN check: does the data leave the organisation's own site over someone else's links? If yes, it is a WAN.

Exam technique

- In 'Explain' questions each point is usually worth 2 marks: the benefit, then its consequence in the context.
- Use the scenario: name the actual things in it (patient records, stock levels, pupils' work) rather than writing a general answer.
- 'Give two differences' needs both sides of each difference: 'a LAN…, whereas a WAN…'.
- In a 6-mark 'Discuss' question, cover both benefits and drawbacks and finish with a conclusion.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **State what LAN and WAN stand for**
LAN stands for local area network and WAN stands for wide area network.

Grade 4 — **Give reasons for connecting computers in a network**
Sharing resources, sharing files, communicating and managing the computers centrally.

Grade 5 — **Give differences between a LAN and a WAN**
Compare the area covered and who owns the communication links, e.g. a LAN covers one site and is owned by the organisation.

Grade 5 — **Give disadvantages of a network**
For example, malware can spread between connected computers, and the equipment and management cost money.

Grade 6 — **Explain benefits of a network in context**
Link each benefit to the scenario, e.g. records stored on a server can be opened from every computer in the building.

Grade 7 — **Discuss whether an organisation should use a network**
Weigh the benefits against the costs, security risks and reliance on central devices, then reach a justified conclusion.

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