Ethernet, Wi-Fi and Bluetooth

Computer systems (Paper 1) · revision notes

The two modes of connection: wired (Ethernet) and wireless (Wi-Fi and Bluetooth). Questions ask you to compare wired and wireless connections and to recommend the best connection for devices in a given scenario, justifying each choice.

Key facts

- Wired = Ethernet (copper or fibre cable)
- Ethernet +: fast, reliable, less interference, more secure
- Wi-Fi +: mobility, easy to add devices, no cabling
- Bluetooth: short range (about 10 m), low power, low bandwidth, devices paired directly
- Wireless = Wi-Fi (connects to a network) and Bluetooth (short-range links between devices)
- Ethernet −: cabling cost, less mobility, trip hazards
- Wi-Fi −: slower, interference, range limited by walls and distance, must be encrypted

Notes

Wired: Ethernet

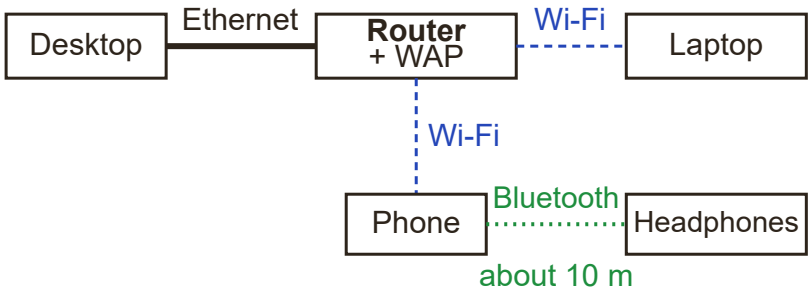
- **Ethernet** is the standard for wired connections in a LAN, using copper or fibre optic cables.
- Usually **faster** (higher bandwidth) and **more reliable** than wireless, with less interference.
- **More secure**: an attacker needs physical access to a cable or network socket.
- But cables cost money to install, may need holes drilled in walls, can be a trip hazard, and devices cannot be moved far.

Wireless: Wi-Fi

- **Wi-Fi** connects devices to a network using radio waves, through a wireless access point.
- Users can **move around**; it is easy to add devices, including visitors' phones and laptops; there are no cables to install.
- Usually **lower bandwidth** than a cable. The signal is weakened by **distance** and **walls**, and suffers **interference** from other networks and devices.
- All the devices connected to one access point share its bandwidth, so it slows down when busy.
- Signals can be picked up by anyone in range, so Wi-Fi must be **encrypted** and protected by a password.

Wireless: Bluetooth

- **Bluetooth** connects devices directly to each other over a **short range** (typically about 10 metres).
- Low bandwidth and **low power**, which suits battery-powered devices.
- Devices are **paired** with each other; no access point or router is needed.



Ethernet uses a cable; Wi-Fi goes through an access point; Bluetooth pairs two devices directly over a short range

- Examples: wireless headphones and speakers, keyboards and mice, smartwatches, game controllers and hands-free kits in cars.

How to answer each type of question

Compare wired and wireless connections

2 to 4 marks | **Grade 6**

1. Pick a feature: bandwidth, reliability, security, mobility or cost.
2. Say how BOTH connections compare on that feature, using 'whereas' or words like 'faster than'.
3. One comparison per mark.

Example. Compare Ethernet and Wi-Fi connections for a home network. [4]

Model answer. Ethernet usually has a higher bandwidth than Wi-Fi, so large downloads are faster (1). Ethernet is less affected by interference, whereas a Wi-Fi signal is weakened by walls and distance (1). Wi-Fi lets devices be used anywhere in the house, whereas an Ethernet device must be near a socket (1). Ethernet is more secure because a device must be plugged in, whereas Wi-Fi signals can be picked up from outside the house (1).

Describe Bluetooth and its uses

2 to 3 marks | **Grade 5**

1. Say it is a short-range wireless connection directly between devices.
2. Add a feature: low power or low bandwidth.
3. Give an example that fits: devices close together, often on batteries.

Example. Describe Bluetooth and give **one** example of its use. [3]

Model answer. A wireless connection directly between devices over a short range, typically about 10 metres (1). It uses little power and has a low bandwidth (1). Example: connecting wireless headphones to a phone (1).

Recommend a connection for each device

3 to 6 marks | Grade 7

1. For each device, ask: does it move? Does it need high bandwidth? Does it only link to one nearby device?
2. Recommend one connection (1 mark).
3. Justify it with a feature of the connection and the scenario (1 mark).

Example. A recording studio has a desktop computer that uploads large audio files, visitors who need Internet access on their phones, and a wireless keyboard for the desktop computer. Recommend the most suitable connection for each. Justify your choices. [6]

Model answer. Desktop computer: Ethernet (1), because it does not move and needs a high-bandwidth, reliable connection for large uploads (1). Visitors' phones: Wi-Fi (1), because visitors can connect their own devices without cables and move around (1). Keyboard: Bluetooth (1), because it only needs to link to the desktop a short distance away and uses little power, so its batteries last (1).

Don't lose marks

- Calling Bluetooth a way to connect to the Internet. It links nearby devices directly.
- Writing 'wireless is slower' with no reason. Say why: interference, distance, walls or shared bandwidth.
- Saying Wi-Fi is 'not secure'. It can be made secure with encryption; the risk is that anyone in range can pick up the signal.
- Giving the same justification for every device in a recommendation question.

More tips

Memory tricks

- Wired wins on SRS: Speed, Reliability, Security. Wireless wins on mobility and convenience.
- Bluetooth is the 'personal' connection: your own devices, a few metres apart, on batteries.
- If a device never moves and needs speed (desktop, games console, smart TV), think Ethernet.

Exam technique

- In compare questions, every sentence should mention both types of connection.
- Use each device's features from the scenario (moves or fixed, battery-powered, needs high bandwidth) to justify your choice.
- Bluetooth is the right answer when two devices close together need a simple, low-power link.

What each grade needs

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

Grade 3 — **Give examples of wired and wireless connections**
Ethernet is wired; Wi-Fi and Bluetooth are wireless.

Grade 4 — **State benefits of wired and wireless connections**
Wired: faster, more reliable and more secure. Wireless: mobility, no cables, easy to add devices.

Grade 5 — **Describe what Bluetooth is used for**

Short-range, low-power wireless links between nearby devices, e.g. headphones, keyboards and smartwatches.

Grade 6 — **Compare Ethernet and Wi-Fi in detail**

Make each point a comparison: bandwidth, reliability, interference, security, mobility and installation cost.

Grade 7 — **Recommend connections for a scenario**

Choose Ethernet, Wi-Fi or Bluetooth for each device and justify the choice using the scenario.

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