Network hardware

Computer systems (Paper 1) · revision notes

The hardware needed to connect stand-alone computers into a LAN: network interface cards, switches, routers, wireless access points and the transmission media (cables or radio waves). Expect questions asking you to name a device from a description, describe its role, or choose the hardware or cable for a scenario.

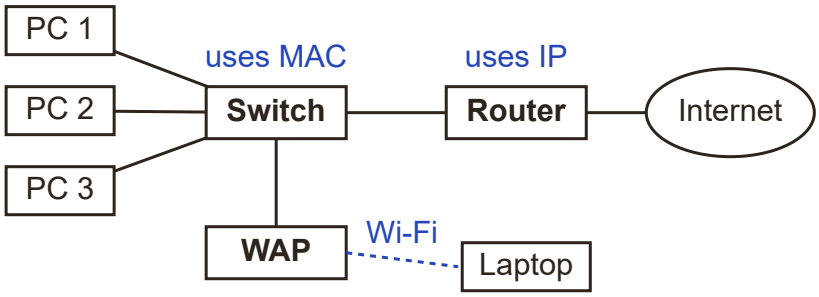
Key facts

- NIC: connects a device to a network; has a unique MAC address
- Router: connects networks; forwards packets using IP addresses
- Copper cable: cheap; signal loss over distance; electrical interference
- Wireless: radio waves; mobility; lower bandwidth and limited range
- Switch: connects devices in a LAN; sends data to the correct device using MAC addresses
- WAP: lets wireless devices join a wired network
- Fibre optic: light pulses; highest bandwidth, long distances, no electrical interference; expensive

Notes

The devices

- **NIC (Network Interface Card or Controller)**: lets a device connect to a network. It can be wired or wireless and is usually built into the motherboard. Each NIC has a unique **MAC address**.
- **Switch**: connects devices together **within a LAN**. It receives data, reads the destination **MAC address** and sends the data only to the device it is intended for.
- **Router**: connects **different networks** together, such as a home LAN and the Internet. It reads the destination **IP address** of each packet and forwards it along the best route.
- **WAP (Wireless Access Point)**: lets wireless devices connect to a wired network using radio waves (Wi-Fi).



A switch joins the devices in the LAN, a WAP adds wireless devices, and the router connects the LAN to the Internet

- A home 'router' usually combines a router, a switch and a wireless access point in one box.

Transmission media

- **Copper cable** (e.g. Ethernet cable): cheap and easy to install, but the signal weakens over long distances and can suffer electrical interference.
- **Fibre optic cable**: sends data as pulses of light. Very high bandwidth, works over long distances and is not affected by electrical interference. More expensive and harder to install and repair.
- **Wireless** (radio waves): no cables are needed and devices can move around, but it has lower bandwidth and limited range, and the signal is affected by walls and other signals.

Switch or router?

- Switch = inside one network, uses MAC addresses. Router = between networks, uses IP addresses.
- Because a switch sends data only to the intended device, there is less unnecessary traffic than if every device received everything.
- Every packet going to or from the Internet passes through a router; data between two computers in the same room normally only needs the switch.

How to answer each type of question

Identify the hardware from a description 1 mark each **Grade 3**

1. Look for the key idea: 'between networks' = router; 'within a LAN' or 'MAC address' = switch; 'wireless devices' = WAP; 'lets a device connect' = NIC.
2. Give the full name or the correct abbreviation.

Example. Identify the network device described by each statement.
(a) Allows wireless devices to connect to a wired network. [1]
(b) Forwards packets from a school's LAN to the Internet. [1]
(c) Connects the computers in one classroom and sends data only to the computer it is intended for. [1]

Model answer.

(a) Wireless access point / WAP (1)
(b) Router (1)
(c) Switch (1)

Describe the role of a device

2 to 3 marks | Grade 5

1. Say what it connects: devices within a LAN, or different networks.
2. Say which address it reads: MAC or IP.
3. Say what it does with the data: sends it to the right device, or forwards it along a route.

Example. Describe the role of a router. [3]

Model answer. A router connects different networks together, e.g. a home network and the Internet (1). It reads the destination IP address of each packet (1) and forwards the packet along the best route towards its destination (1).

Justify hardware or transmission media for a scenario

3 to 6 marks | Grade 7

1. Read what the scenario needs: wired devices, wireless devices, Internet access, long distances.
2. Name each item or medium and give a reason linked to the scenario.
3. For media, compare with the alternative (e.g. fibre versus copper).

Example. A school is connecting a new sports hall, 300 metres from the main building, to the school network.
Explain why fibre optic cable should be used for this link rather than copper cable. [3]

Model answer. Fibre can carry signals over long distances without them weakening, whereas a copper signal would weaken too much over 300 m (1). Fibre has a higher bandwidth, so more data can be sent per second (1). Fibre is not affected by electrical interference, so fewer errors occur (1).

Don’t lose marks

- Saying a switch connects a LAN to the Internet. That is the router's job.
- Saying a router uses MAC addresses to send data across the Internet. Routers use IP addresses.
- Writing 'Wi-Fi' when the question asks for a device. Wi-Fi is the standard; the wireless access point is the hardware.
- Saying fibre is better 'because light is fast'. Give the real reasons: higher bandwidth, less signal loss over distance and no electrical interference.

More tips

Memory tricks

- Switch = Same network (both start with S). Router = Routes between networks.
- 'MAC stays local, IP goes global': switches use MAC addresses, routers use IP addresses.
- Fibre = Fast (high bandwidth), Far (long distance), Free from electrical interference, but costly.

Exam technique

- Abbreviations (NIC, WAP) usually earn the mark, but spell them correctly.
- In 'describe the role' questions, name the address the device uses and what it does with the data.
- In scenario questions, only list hardware the scenario needs, and give each item a purpose linked to the scenario.

What each grade needs

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

Grade 3

Name the hardware needed for a LAN

NIC, switch, router, wireless access point and transmission media.

Grade 4

State the purpose of each device

E.g. a WAP lets wireless devices join a wired network; a router connects the LAN to the Internet.

Grade 5

Describe how a switch uses MAC addresses

A switch reads the destination MAC address and sends the data only to the device it is for.

Grade 5

Describe how a router uses IP addresses

A router reads the destination IP address and forwards packets between networks towards their destination.

Grade 6

Compare copper, fibre and wireless media

Fibre has the highest bandwidth and range and no electrical interference but costs more; wireless gives mobility but is slower.

Grade 7

Choose and justify hardware for a scenario

Identify each item needed, e.g. for a café with Wi-Fi and a wired till, and explain why each one is needed.

Free notes, Full packs, practice papers and mock exams at chhetriacademy.com. Written for this site; not taken from past papers. Stuck? 1-to-1 tutoring with a free 30-minute trial lesson.