

Exercise walk-through

Circuit switching, packet switching ■ 14.2

eXercise

You must be able to

- describe **circuit switching** and its trade-offs
- **describe packet switching** clearly (a frequent 4-mark question)
- compare the two and justify which the internet uses

Method — Circuit switching

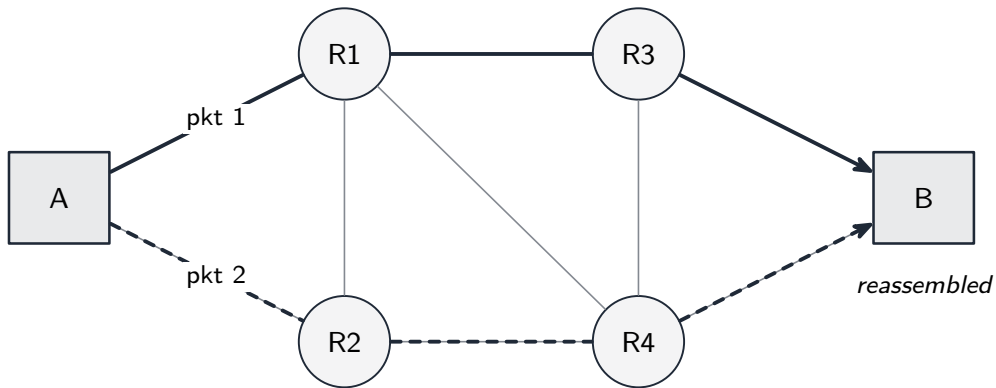
A **dedicated path** is reserved end-to-end **before** any data is sent, kept for the whole conversation, then released. It gives **reserved bandwidth** and in-order delivery, but **wastes** the link during silences and is slow to set up (the old telephone network).

Method — Packet switching

The message is split into **packets** that travel **independently**; routers choose each packet's next hop, so packets may take **different routes** and arrive out of order, then are **reassembled** at the destination:

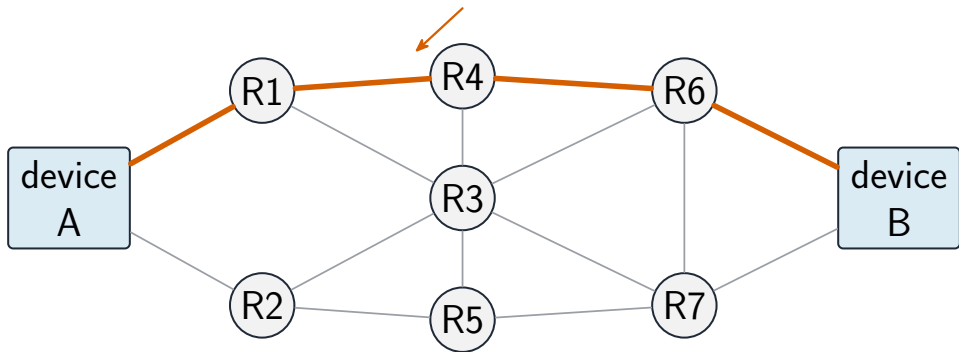
How to describe it (4 marks): the message is broken into **packets**; each carries the **destination/source address** and a **sequence number**; each packet is routed **independently**; packets may take **different paths** and arrive **out of order**; the destination uses the sequence numbers to **reassemble** them.

Method — Packet switching



Method — Packet switching

one dedicated path reserved for the whole call



Circuit switching contrasted with packet switching

Method — Comparison

Aspect	Circuit switching	Packet switching
Path	dedicated, reserved	shared, per-packet
Setup	slow	none
Bandwidth	inefficient	efficient
Robustness	one failure cuts the call	reroutes around failures
Suits	voice (constant rate)	web/email (bursty)

Practice 2.1 ■ 1 mark

State what **circuit switching** is.

Solution 2.1

Worked steps

Setting up a **dedicated path** between the two ends, reserved for the **whole** communication **B1**.

Practice 2.2 ■ 1 mark

State what **packet switching** is.

Solution 2.2

Worked steps

Splitting the message into **packets** that are sent **independently** across the network and reassembled at the destination **B1**.

Practice 2.3 ■ 1 mark

State **one** benefit of circuit switching.

Solution 2.3

Worked steps

Any one: **reserved bandwidth**; in-order delivery; consistent/low latency once set up **B1**.

Practice 2.4 ■ 1 mark

State **one** benefit of packet switching.

Solution 2.4

Worked steps

Any one: **efficient** use of links (shared/multiplexed); **robust** (reroutes around failures); no slow setup **B1**.

Exam-style 3.1 ■ 4 marks

Describe packet switching as a method of transmitting a message across the internet.

Solution 3.1

Method: Packet switching

Worked steps

Any four: message split into **packets** (B1); each packet has **destination/source address** and a **sequence number** (B1); each packet routed **independently**, routers choose the next hop (B1); packets may take **different routes / arrive out of order** (B1); destination **reassembles** using sequence numbers / requests missing packets (B1) — max 4.

Exam-style 3.2 ■ 4 marks

State **two** benefits and **two** drawbacks of **circuit switching**.

Solution 3.2

Worked steps

Benefits (any two): reserved bandwidth; guaranteed in-order delivery; predictable latency. Drawbacks (any two): wastes capacity during silences; slow to set up; a single link failure cuts the whole circuit $\text{B1} \times 4$.

Exam-style 3.3 ■ 2 marks

Explain why the internet uses **packet switching** rather than circuit switching.

Solution 3.3

Method: Packet switching

Worked steps

Packet switching uses links **efficiently** (shared between many conversations) **B1** and is **robust** — it can reroute packets around a failed link, so the network keeps working **B1**.