Grade 12 A/L ICT · Lesson 6

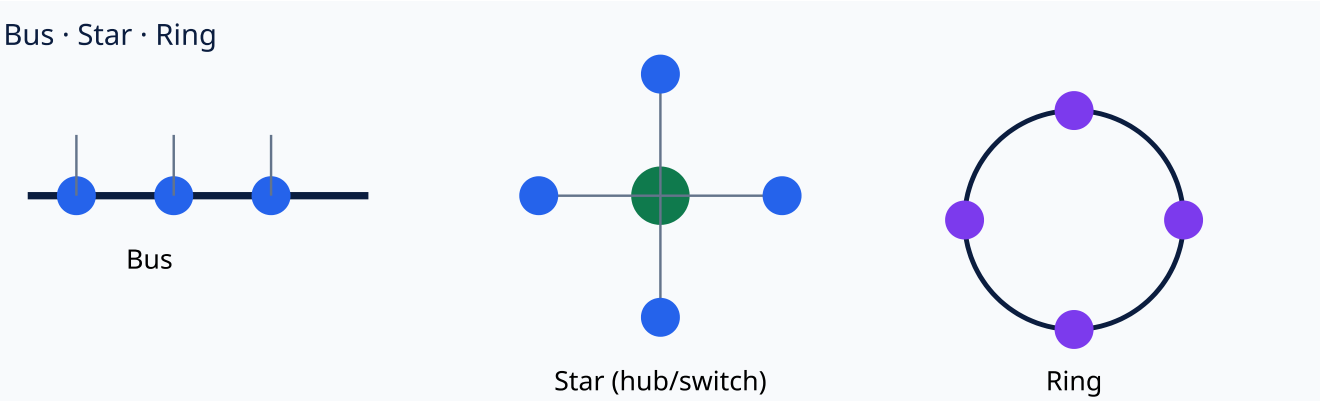
6.5 Network Topologies, Hubs and Switches

Syllabus 6.5. Connecting every device to every other (**all-to-all**) is impractical. A **bus** is simple but needs **media access** control. You also study **star**, **ring** and **mesh**, and how **hubs** and **switches** simplify wiring.

1. Why not all-to-all?

Links grow roughly with n^2 for n devices – costly and messy. Shared topologies reduce wiring.

2. Bus, star, ring, mesh



Bus, star and ring

- **Bus** – one shared cable; simple; access must be controlled.
- **Star** – devices to a centre (hub/switch).
- **Ring** – each to next in a loop.
- **Mesh** – many direct links (full or partial).

3. Hubs vs switches

A **hub** repeats bits to all ports (shared collision domain). A **switch** forwards frames more selectively using addresses, reducing collisions.

🧱 **Worked example: 24 PCs in a star to one switch: each PC–switch cable is its own collision domain; without VLANs the switch is one broadcast domain.**
Switch: per-port collision domains; hub: one shared collision domain.

🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* School labs use Ethernet switches; “hub” is still in the syllabus for contrast.

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Key Words

Topology – Layout pattern of links.	**Bus** – Single shared medium.
Star – Centre device with spokes.	**Ring** – Loop of device-to-device links.
Mesh – Many direct interconnections.	**Hub** – Multiport repeater to all ports.
Switch – Forwards frames using addresses.	**Media access** – Who may transmit on a shared medium.
Collision – Two signals overlap on shared media.	**Wiring** – Physical cabling of the LAN.
All-to-all – Full mesh of every pair.	**Node** – A device on the network.

Sample Q&A

1. Why is all-to-all impractical?

> **Answer:** Too many links as n grows.

2. Name four topologies.

> **Answer:** Bus, star, ring, mesh.

3. Bus problem?

> **Answer:** Controlling access to the shared media.

4. Hub vs switch (one point).

> **Answer:** Hub floods all; switch forwards selectively.

5. Star centre device?

> **Answer:** Hub or switch.

6. Mesh idea?

> **Answer:** Many direct links between nodes.

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MCQ

1. All-to-all is impractical because

A. number of links grows very fast
B. OSI bans buses
C. IP deletes stars
D. cables hate copper
E. Wi-Fi forbids mesh

2. A bus uses

A. one shared cable/medium
B. only USB sticks
C. only DNS
D. only paper
E. only satellites

3. Star topology centres on

A. a random book
B. a hub or switch
C. a single pixel
D. a parity bit
E. a lunch box

4. A hub typically

A. runs DNS alone
B. assigns MAC randomly
C. encrypts with AES only
D. routes IP worldwide
E. repeats to all ports

5. A switch typically

A. paints fiber
B. forwards using addresses
C. ignores all frames
D. blocks electricity
E. eats packets

6. Ring means

A. devices linked in a loop
B. only wireless mist
C. a square only
D. only one PC
E. no links

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7. Media access is needed on a bus because

A. MAC is paint
B. the medium is shared
C. IP is optional
D. the medium is imaginary
E. fiber is dry

8. Mesh provides

A. only one wire forever
B. only stars
C. many direct interconnections
D. only rings
E. zero links

9. Which term means: “Layout pattern of links”?

A. Star
B. Hub
C. All-to-all
D. Topology
E. Media access

10. Which term means: “Single shared medium”?

A. Node
B. Collision
C. Bus
D. Switch
E. Ring

11. Which term means: “Centre device with spokes”?

A. Media access
B. Topology
C. Wiring
D. Star
E. Mesh

12. Which term means: “Loop of device-to-device links”?

A. Bus
B. Ring
C. All-to-all
D. Hub
E. Collision

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13. Which term means: “Many direct interconnections”?

A. Star
B. Node
C. Wiring
D. Mesh
E. Switch

14. Which term means: “Multiport repeater to all ports”?

A. Topology
B. Media access
C. All-to-all
D. Ring
E. Hub

15. Which term means: “Forwards frames using addresses”?

A. Mesh
B. Node
C. Switch
D. Collision
E. Bus

16. Which term means: “Who may transmit on a shared medium”?

A. Hub
B. Wiring
C. Media access
D. Star
E. Topology

17. Which term means: “Two signals overlap on shared media”?

A. Ring
B. Switch
C. All-to-all
D. Bus
E. Collision

18. Which term means: “Physical cabling of the LAN”?

A. Wiring
B. Star
C. Node
D. Media access
E. Mesh

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19. Which term means: “Full mesh of every pair”?

A. Topology
B. Collision
C. Hub
D. Ring
E. All-to-all

20. Which term means: “A device on the network”?

A. Mesh
B. Wiring
C. Bus
D. Node
E. Switch

Structured Questions

1. Explain why all-to-all fails at scale. *(2 marks)*

> Link count rises steeply with n.

2. Compare bus and star. *(2 marks)*

> Bus shared cable; star via centre.

3. Draw bus, star, ring. *(2 marks)*

> Correct labelled sketches.

4. Hub vs switch. *(2 marks)*

> Hub floods; switch selective forward.

5. What media-access problem does a bus create? *(2 marks)*

> Who transmits without collisions.

Summary

- All-to-all is costly.
- Bus, star, ring, mesh.
- Bus needs media access control.
- Hubs flood; switches filter.
- Wiring is simplified by centre devices.

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MCQ answer key – 6.5

1. **A** – Too many links.
2. **A** – Shared medium.
3. **B** – Hub/switch.
4. **E** – Floods ports.
5. **B** – Address-aware.
6. **A** – Loop.
7. **B** – Shared.
8. **C** – Many links.
9. **D** – Topology – Layout pattern of links.
10. **C** – Bus – Single shared medium.
11. **D** – Star – Centre device with spokes.
12. **B** – Ring – Loop of device-to-device links.
13. **D** – Mesh – Many direct interconnections.
14. **E** – Hub – Multiport repeater to all ports.
15. **C** – Switch – Forwards frames using addresses.
16. **C** – Media access – Who may transmit on a shared medium.
17. **E** – Collision – Two signals overlap on shared media.
18. **A** – Wiring – Physical cabling of the LAN.
19. **E** – All-to-all – Full mesh of every pair.
20. **D** – Node – A device on the network.

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