Grade 12 A/L ICT · Lesson 6

6.6 MAC Addresses, Frames and Ethernet

Syllabus 6.6. On a **LAN**, devices need unique **MAC addresses**. Data is sent in **frames**. **MAC protocols** (from simple **ALOHA** toward **Ethernet**) give orderly access. Messages may be **broadcast** or **unicast**.

1. Addresses and frames

A **MAC address** names a network interface so sender and receiver are known on the LAN. A **frame** packages addresses, type/length, data and error check.

Ethernet frame (simplified)



Simplified Ethernet frame

2. Orderly access

ALOHA let stations transmit and retry after collisions – simple but wasteful. **Ethernet** improved sharing (CSMA/CD ideas in classic wired Ethernet).

3. Broadcast and unicast

Unicast goes to one MAC; **broadcast** goes to all on the LAN segment.

🧱 **Worked example: Frame = dest MAC | src MAC | type | payload | FCS. Switch looks up dest MAC and forwards out the matching port.**
MAC is 48-bit; unique per NIC (ideally).

🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* Wi-Fi uses MAC frames too; modern Ethernet is full-duplex switched – collisions rare, syllabus history still matters.

Key Words

LAN – Local Area Network.

MAC address – Hardware address of an interface.

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Frame – Data-link unit with header and data.	**ALOHA** – Early random-access MAC protocol.
Ethernet – Widely used LAN technology/family.	**Broadcast** – Send to all stations.
Unicast – Send to one station.	**Collision** – Overlapping transmissions.
CSMA/CD – Classic Ethernet media access idea.	**FCS** – Frame check sequence for errors.
NIC – Network interface card/controller.	**Protocol** – Rules for orderly media access.

Sample Q&A

1. What is a MAC address?

> **Answer:** Unique address of a network interface on the LAN.

2. What is a frame?

> **Answer:** Data-link packet with addresses and payload.

3. ALOHA idea?

> **Answer:** Transmit; if collision, retry later.

4. Unicast vs broadcast?

> **Answer:** One receiver vs all on segment.

5. Why MAC protocols?

> **Answer:** Orderly shared-media access.

6. Ethernet evolved from?

> **Answer:** Improvements after simple ALOHA-style access.

MCQ

1. MAC addresses identify

A. only folders
B. network interfaces on a LAN
C. only CPU brands
D. only printers ink
E. only passwords

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2. Frames are used at

A. only DNS text
B. only paper mail
C. only the application GUI
D. only power plugs
E. the data-link / LAN level

3. ALOHA is

A. an IP version
B. a fruit only
C. a fiber colour
D. a simple early MAC protocol
E. a topology shape only

4. Broadcast means

A. encrypt gravity
B. send to none
C. send to all on the LAN segment
D. send to one phone only
E. delete frames

5. Unicast means

A. send to one address
B. ignore MAC
C. send to no one
D. send to every planet
E. flood forever

6. Ethernet improved

A. chair height
B. shoe size
C. shared-media access compared with plain ALOHA
D. pencil length
E. coffee taste

7. A simplified frame includes

A. destination and source MAC fields
B. only lunch menus
C. only parity of tea
D. only Wi-Fi passwords forever
E. only GPU clocks

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8. Collisions happen when

A. two icons move
B. two files open
C. two fonts change
D. two tabs blink
E. two stations transmit on shared media together

9. Which term means: “Local Area Network”?

A. Collision
B. Broadcast
C. NIC
D. LAN
E. Frame

10. Which term means: “Hardware address of an interface”?

A. Unicast
B. Protocol
C. CSMA/CD
D. ALOHA
E. MAC address

11. Which term means: “Data-link unit with header and data”?

A. LAN
B. Frame
C. Ethernet
D. Collision
E. FCS

12. Which term means: “Early random-access MAC protocol”?

A. ALOHA
B. CSMA/CD
C. Broadcast
D. NIC
E. MAC address

13. Which term means: “Widely used LAN technology/family”?

A. Frame
B. Ethernet
C. FCS
D. Unicast
E. Protocol

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14. Which term means: “Send to all stations”?

A. ALOHA
B. Collision
C. Broadcast
D. LAN
E. NIC

15. Which term means: “Send to one station”?

A. CSMA/CD
B. Protocol
C. MAC address
D. Unicast
E. Ethernet

16. Which term means: “Overlapping transmissions”?

A. Collision
B. LAN
C. Frame
D. Broadcast
E. FCS

17. Which term means: “Classic Ethernet media access idea”?

A. ALOHA
B. MAC address
C. CSMA/CD
D. Unicast
E. NIC

18. Which term means: “Frame check sequence for errors”?

A. Frame
B. FCS
C. Collision
D. Protocol
E. Ethernet

19. Which term means: “Network interface card/controller”?

A. LAN
B. CSMA/CD
C. ALOHA
D. NIC
E. Broadcast

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20. Which term means: “Rules for orderly media access”?

A. MAC address
B. Ethernet
C. FCS
D. Unicast
E. Protocol

Structured Questions

1. Define MAC address and frame. *(2 marks)*

> Interface address; packaged LAN unit.

2. Why unique addresses? *(2 marks)*

> Identify sender and intended receiver.

3. Outline ALOHA to Ethernet. *(2 marks)*

> Random access → improved sharing (CSMA/CD era).

4. Broadcast vs unicast. *(2 marks)*

> All vs one.

5. Label main frame fields. *(2 marks)*

> Dest MAC, src MAC, type/data, FCS.

Summary

- MAC addresses name interfaces.
- Frames carry LAN data.
- ALOHA then Ethernet.
- Broadcast and unicast.
- MAC protocols order shared access.

MCQ answer key – 6.6

1. **B** – Interfaces.
2. **E** – Data link.
3. **D** – Early MAC.
4. **C** – All stations.
5. **A** – One address.
6. **C** – Better MAC.
7. **A** – MAC fields.

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8. **E** – Overlap.
9. **D** – LAN – Local Area Network.
10. **E** – MAC address – Hardware address of an interface.
11. **B** – Frame – Data-link unit with header and data.
12. **A** – ALOHA – Early random-access MAC protocol.
13. **B** – Ethernet – Widely used LAN technology/family.
14. **C** – Broadcast – Send to all stations.
15. **D** – Unicast – Send to one station.
16. **A** – Collision – Overlapping transmissions.
17. **C** – CSMA/CD – Classic Ethernet media access idea.
18. **B** – FCS – Frame check sequence for errors.
19. **D** – NIC – Network interface card/controller.
20. **E** – Protocol – Rules for orderly media access.

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