

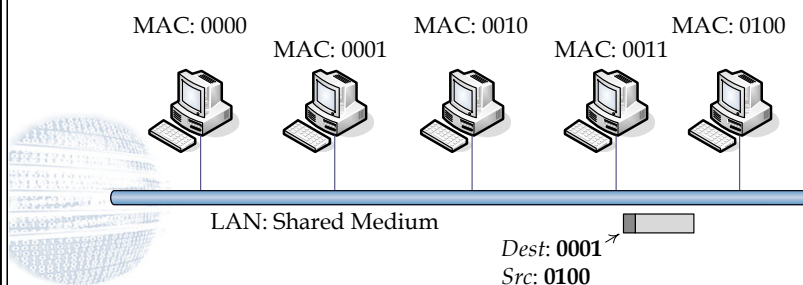
# Lecture 7: Ethernet Hardware Addressing & Frame Format

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EE426: Communication Networks

## MAC Addresses

- The shared medium in a LAN connects a large number of stations.
- However, typically communications involve only one source and one destination.
- MAC Addresses allow a frame to reach its destination.



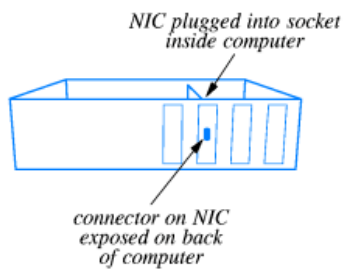
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2

# Ethernet MAC Address

- Ethernet uses a unique 48 bit (6 byte) (MAC address) (Physical address) (Hardware address)
- Example:
  - 08-00-07-A9-B2-FC or 00:00:94:BA:0E:CC



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# Does DA match hardware?

Bytes	7	1	6	6	2	0 - 1500	0 - 46	4
	Preamble	S O F	Destination Address	Source Address	Length	Data	Pad	CRC

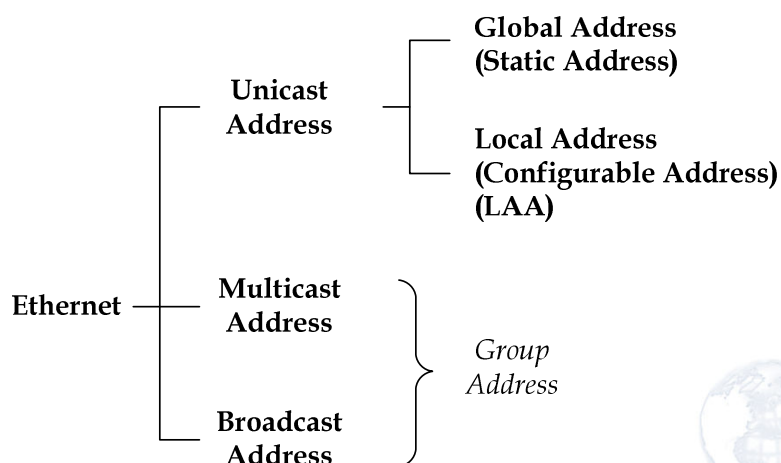


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## Types of Ethernet MAC Addresses



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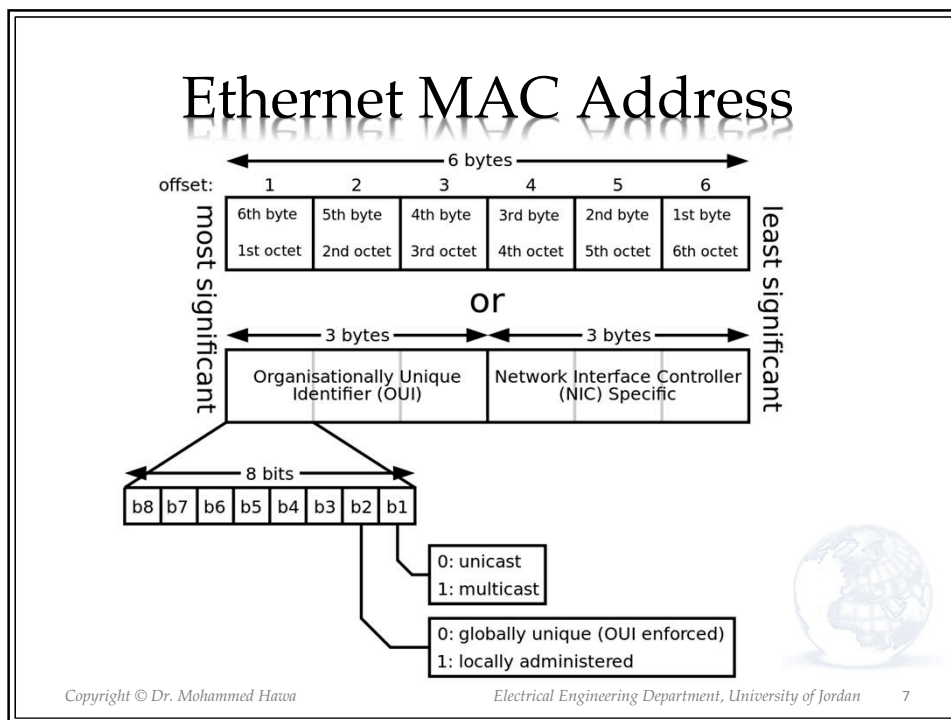
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## Types of Ethernet MAC Addresses

- **Group Address:** Least significant bit of the most significant byte of the destination address is a 1.
  - **Broadcast Address:** FF-FF-FF-FF-FF-FF.
  - **Multicast Address:** Other addresses with a LSB of 1.
- **Unicast Address:** Least significant bit of the most significant byte of the destination address is a 0.
- There are two types of **Unicast addresses** used by Ethernet:
  - **Global MAC Address** (also called Static MAC Address)
  - **Local MAC Address** (also called Configurable MAC Address, or Locally Administered Address).

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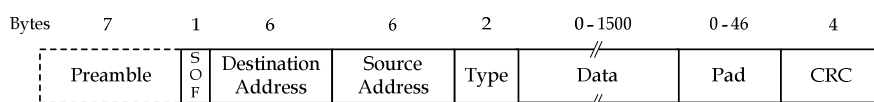


## Rules for Reading Frames

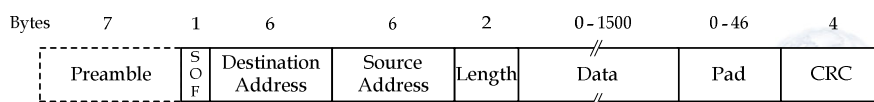
- An Ethernet card passes the Ethernet frame to the upper layer if the destination address (DA) is equal to:
  - Broadcast address: FF-FF-FF-FF-FF-FF.
  - Multicast address of a multicast group to which the station belongs.
  - Global unicast address of the card when LAA is not setup.
  - LAA unicast address of the card when LAA is setup.
  - Any address if the card is in promiscuous mode.

## Ethernet Headers & Frame Format Type II vs. IEEE 802.3

### Type II Ethernet Frame:



### IEEE 802.3 Ethernet Frame:



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## Ethernet Frame Fields [1]

- **Preamble:** Consists of 7 bytes, each byte containing the bit pattern **10101010**. It helps synchronize the receiver clock. No part of the preamble ever enters the Ethernet adapter's memory buffer since it is a physical layer header.
- **Start of Frame (SOF) delimiter:** One byte with the bit pattern **10101011** used for framing. It is compatible with other IEEE 802.x standards.
- **Destination Address (DA) and Source Address (SA):** Contain Ethernet MAC addresses of the source and destination (each of 6 bytes).

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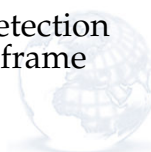
## Type field

Protocol	Type field
IPv4 packet	0800h
IPv6 packet	86DD
CCITT X.25 packet	0805h
Frame Relay	6559h
Reverse ARP	8035h
Novel Corporation IPX	8137h – 8138h
Reserved	FFFFh



## Ethernet Frame Fields [2]

- **Length:** Indicates how many bytes exist in the Data field of the frame. Possible values are 0 (or 8) to 1500. In this case, the Type of the frame is indicated by a special header in the data portion of the frame, called a Logical Link Control (LLC) header, and not by a field in the frame header.
- **Data:** Contains the upper layer PDU (0 to 1500 bytes).
- **Pad:** Frames with fewer than 64 bytes in total length are padded out to 64 bytes with random bytes in the Pad field.
- **CRC:** A 32-bit CRC code is used as an error detection code. The receiver verifies the CRC and if the frame contains errors, the frame is discarded.



# Logical Link Control

- Logical Link Control (LLC) sub-layer: LLC is defined in the IEEE 802.2 standard.

