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Data Communication CS601 Lecture No 31

Lecture Prepared By

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CS601 Lecture No 31 Topic 180 to 185

Ethernet Protocol

- **Data-link layer and the physical layer are the territory of the local and wide area networks**
- **We can have wired or wireless networks**

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Ethernet protocol is **a typical LAN technology**. Standard Ethernet-based local area networks transmit data at speed up to 10 Mbps. New Ethernet cards known as Fast Ethernet represent high-speed LAN technology as it can provide data transfer rates as high as 100 Mbps.

Where is Ethernet protocol used?



local area networks

Ethernet is a family of wired computer networking technologies commonly used in **local area networks (LAN), metropolitan area networks (MAN) and wide area networks (WAN)**.

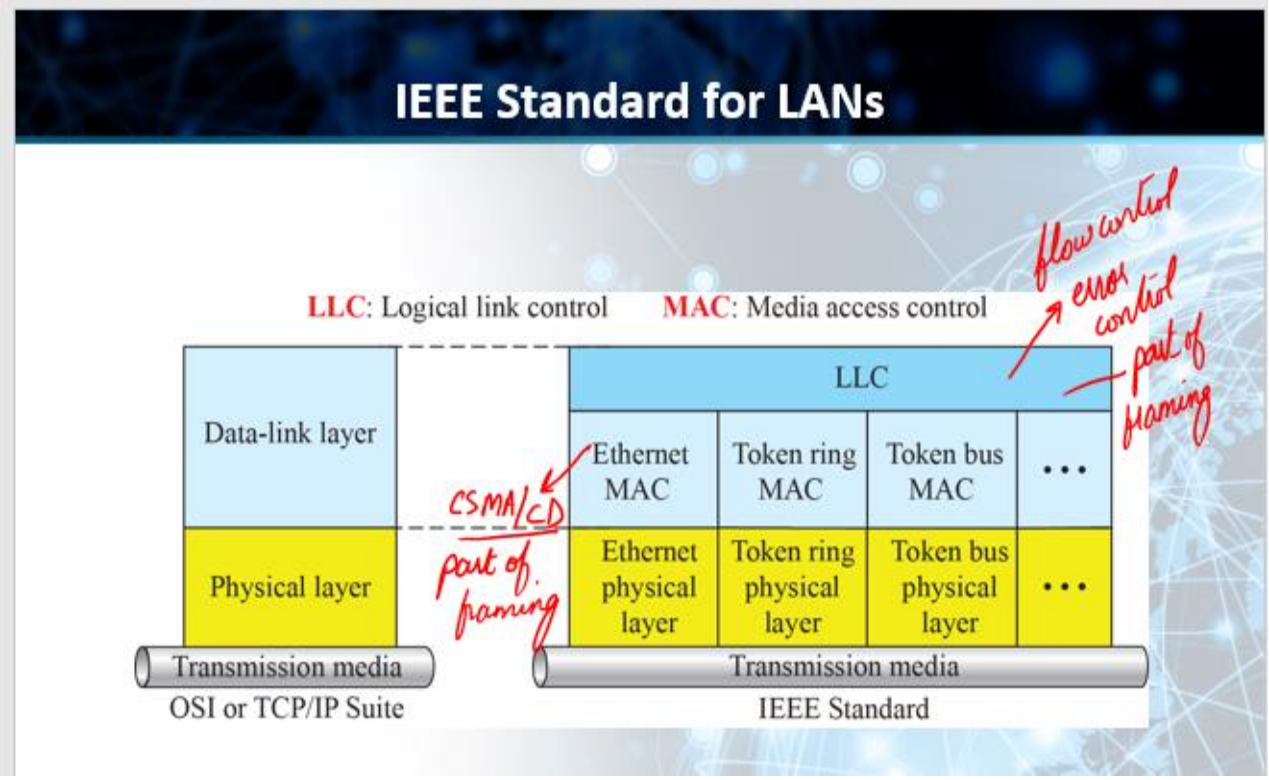
IEEE Project 802 (Institute of Electrical and Electronics Engineers)

- **In 1985, the Computer Society of the IEEE started a project, called Project 802, to set standards to enable inter-communication among equipment from a variety of manufacturers**
- **Project 802 did not seek to replace any part of the OSI model or TCP/IP protocol suite**
- **A way of specifying functions of the physical layer and the data-link layer of major LAN protocols**

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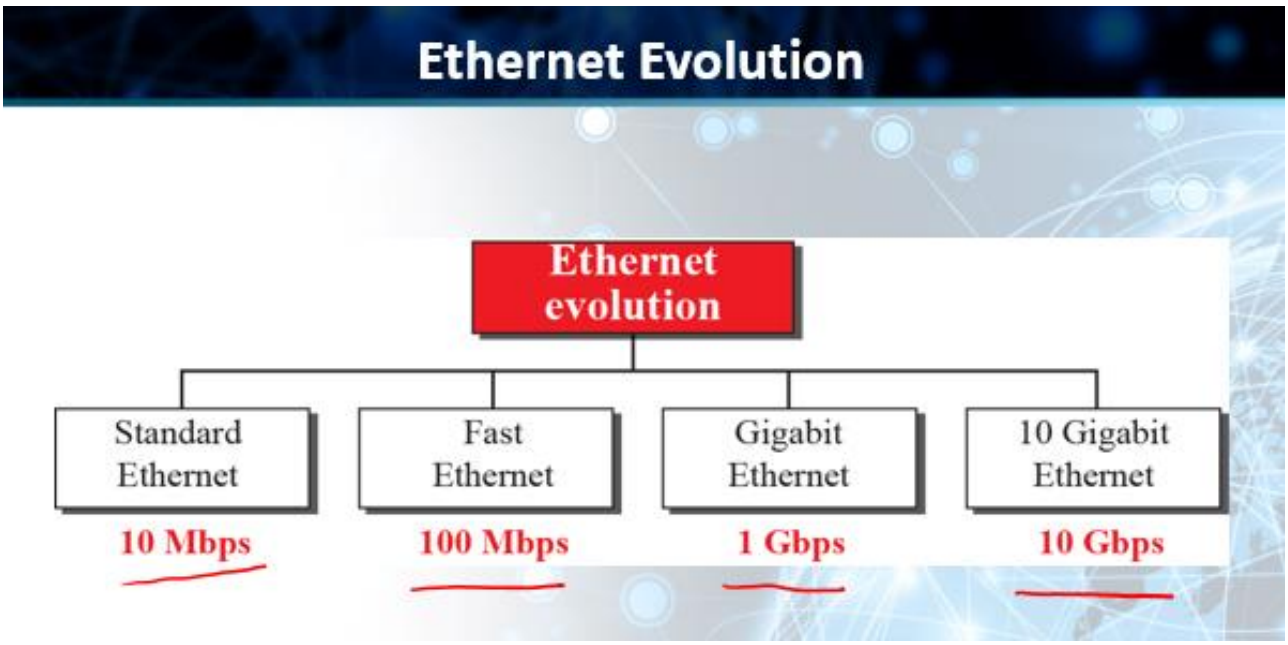
Ethernet Evolution

- **The Ethernet LAN was developed in the 1970s**
- **Since then, it has gone through four generations:**
  - ✓ **Standard Ethernet (10 Mbps)**
  - ✓ **Fast Ethernet (100 Mbps)**
  - ✓ **Gigabit Ethernet (1 Gbps)**
  - ✓ **10 Gigabit Ethernet (10 Gbps**

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Standard Ethernet

- **The original Ethernet technology with the data rate of 10 Mbps is called Standard Ethernet**
- **Most implementations have moved to later evolutions**
- **Still some features of the Standard Ethernet that have not changed during the evolution**

Connectionless & Unreliable Service

- **Each frame is independent of other**
- **No connection establishment or tear down process**
- **The sender may overwhelm receiver with frames and frames are dropped**
- **If frame drops, sender will not know about it unless we are using TCP (Transport)**
- **Ethernet is unreliable like IP and UDP**

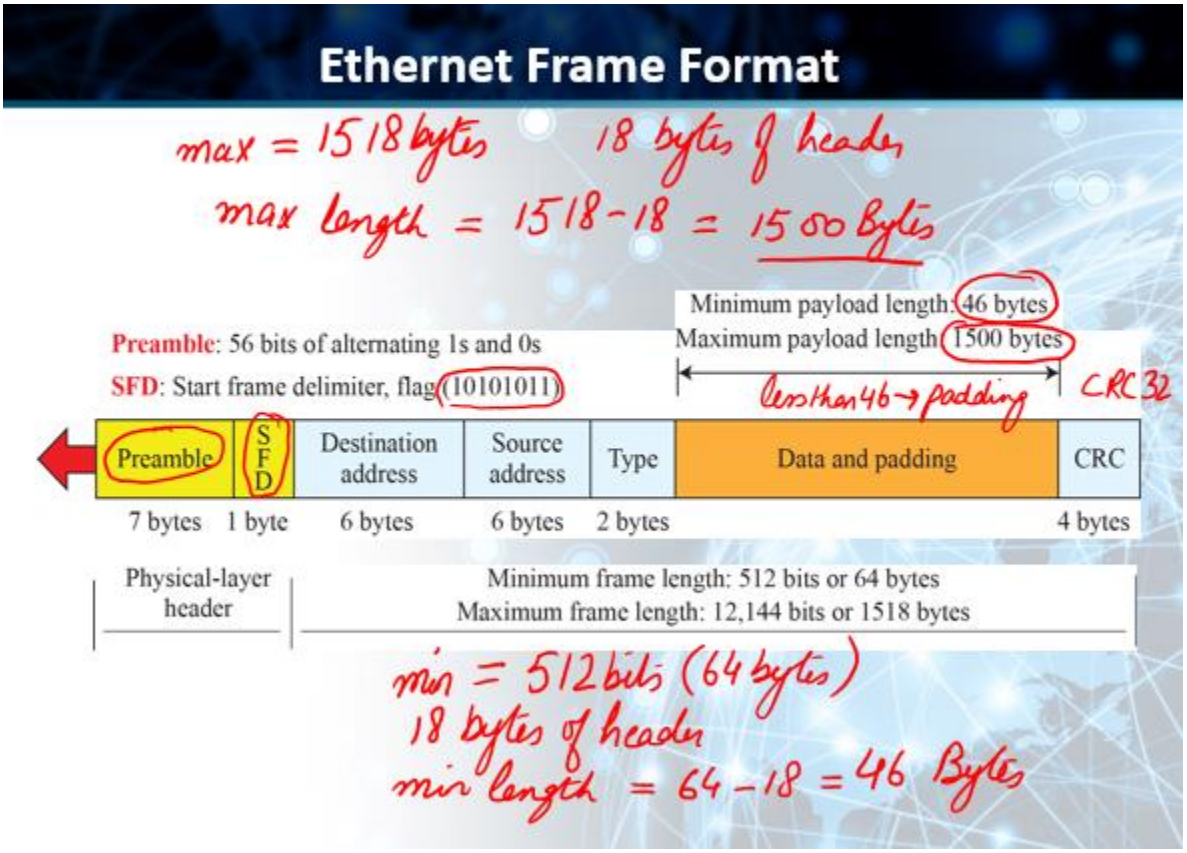
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- **If a frame is corrupted, receiver silently drops it**
- **Left to high level protocols to find out abut it**



Addressing in Standard Ethernet

- **Each station on Ethernet has its own network interface card (NIC)**
- **The NIC fits inside the station and provides the station with a link-layer/physical address**
- **The Ethernet address is 6 bytes (48 bits), normally written in hexadecimal notation, with a colon between the bytes**

Addressing

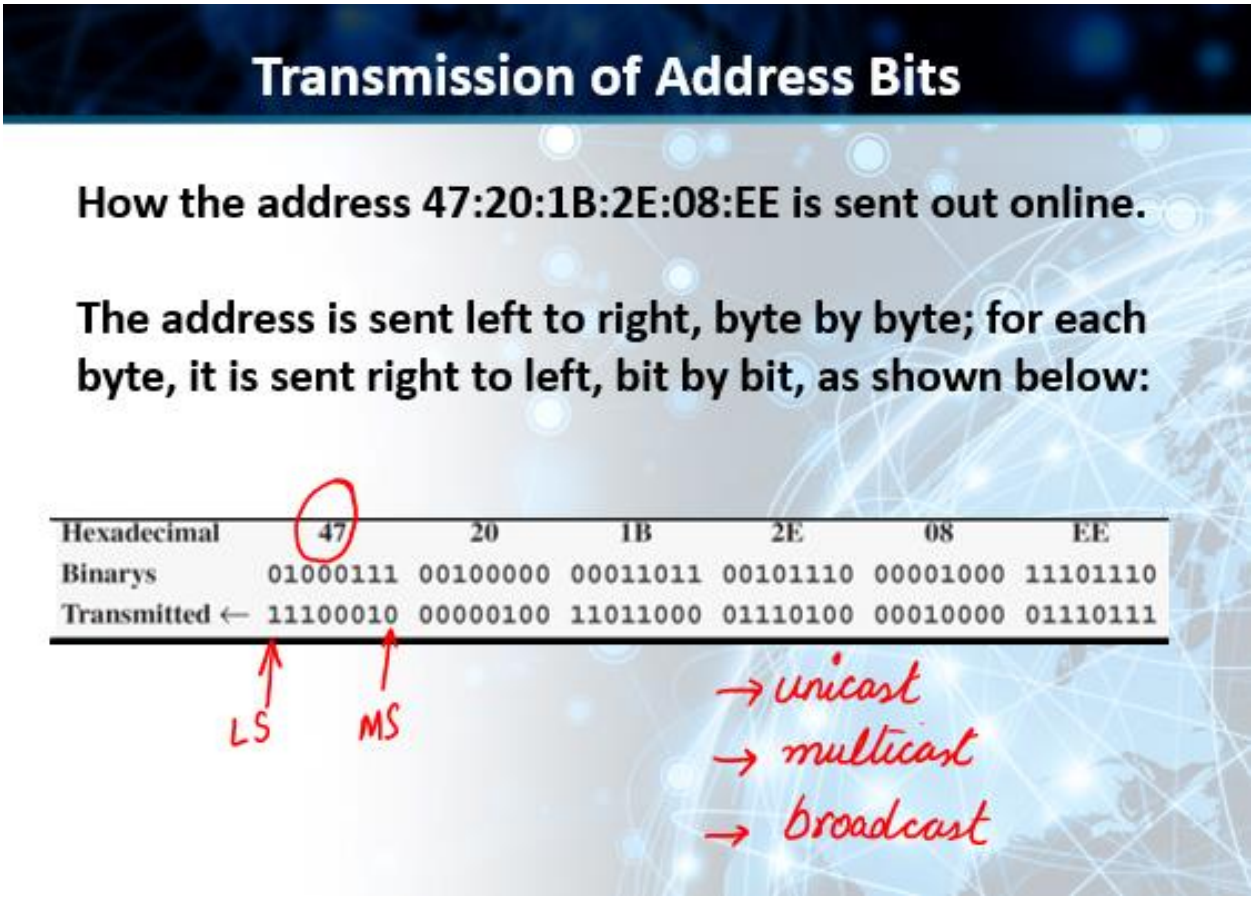
- **For example, the following shows an Ethernet MAC address:**

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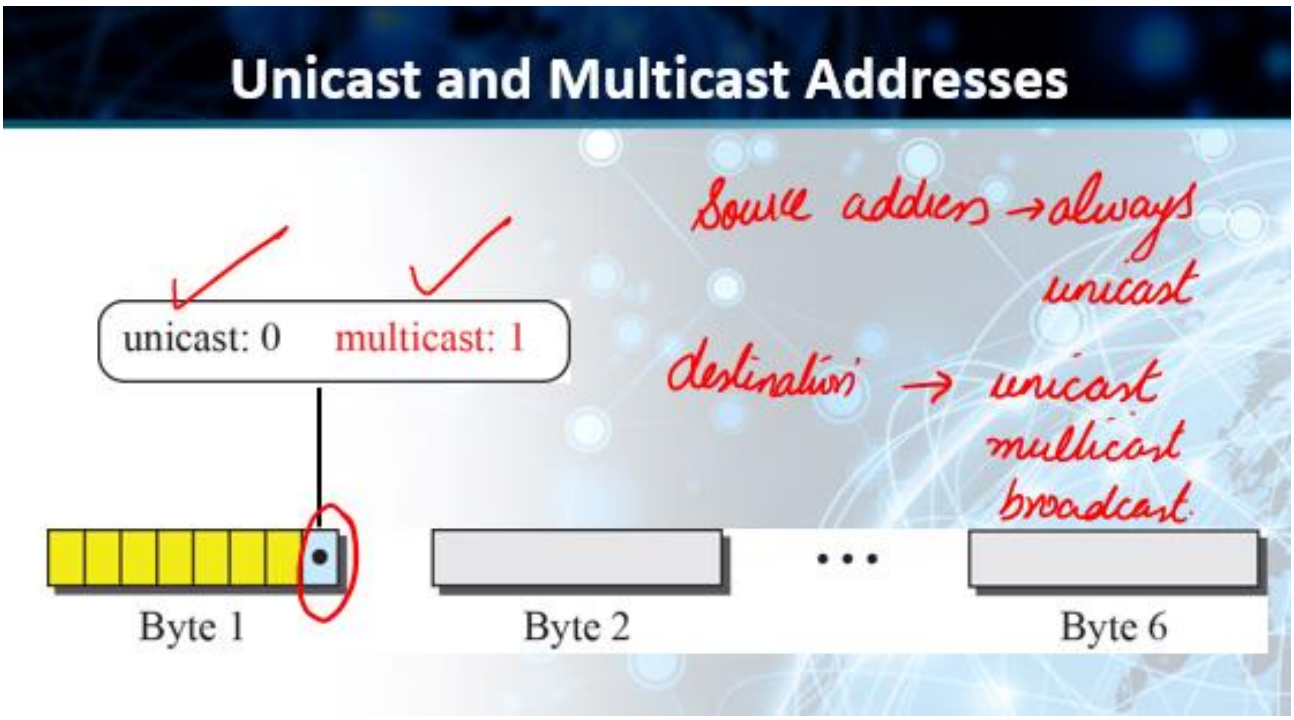
4A:30:10:21:10:1A



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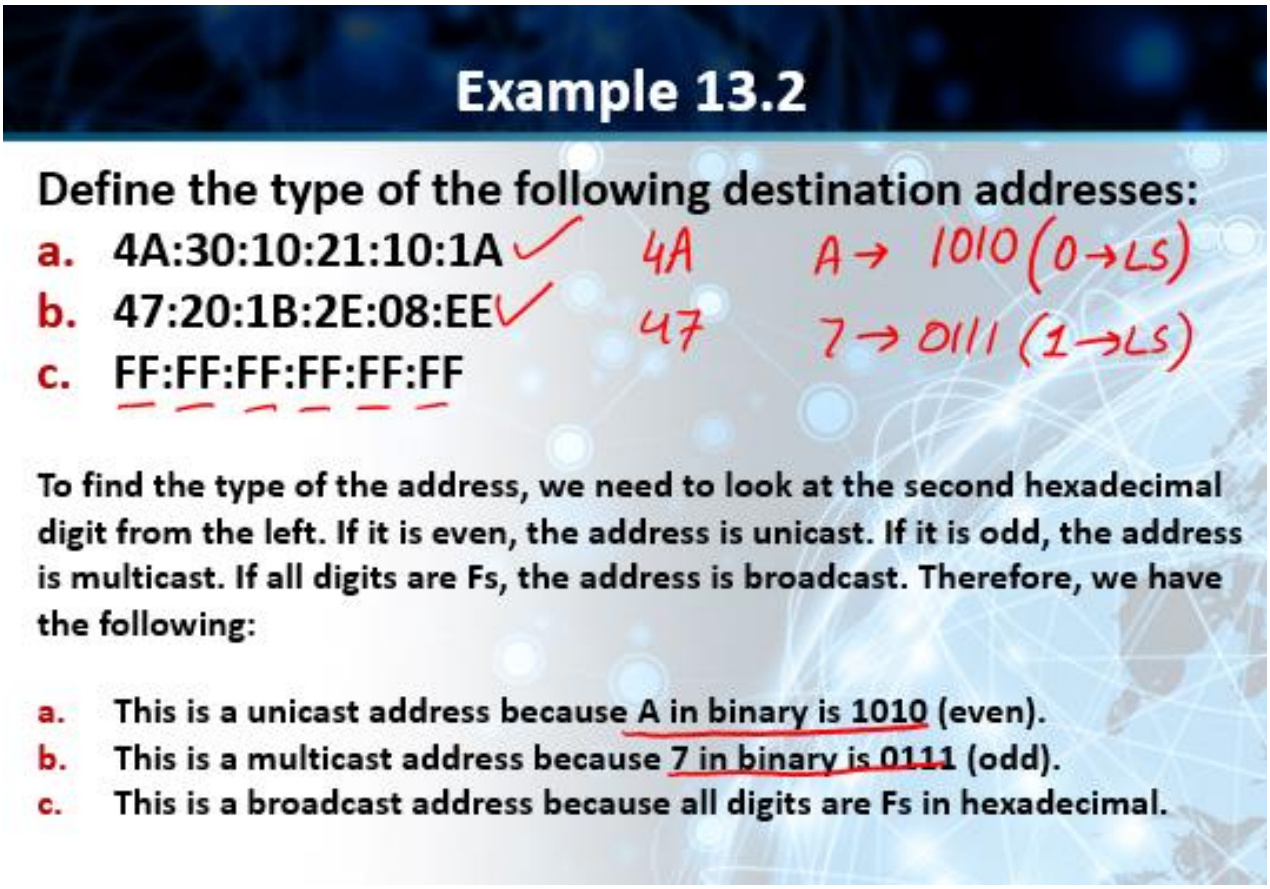
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Access Method in Standard Ethernet

- **Since the network that uses the standard Ethernet protocol is a broadcast network, we need to use an access method to control access to the sharing medium**
- **The standard Ethernet chose CSMA/CD with 1-Persistent Method**

Efficiency of Standard Ethernet

- **The ratio of the time used by a station to send data to the time the medium is occupied by this station**
- **The practical efficiency of standard Ethernet has been measured to be:**

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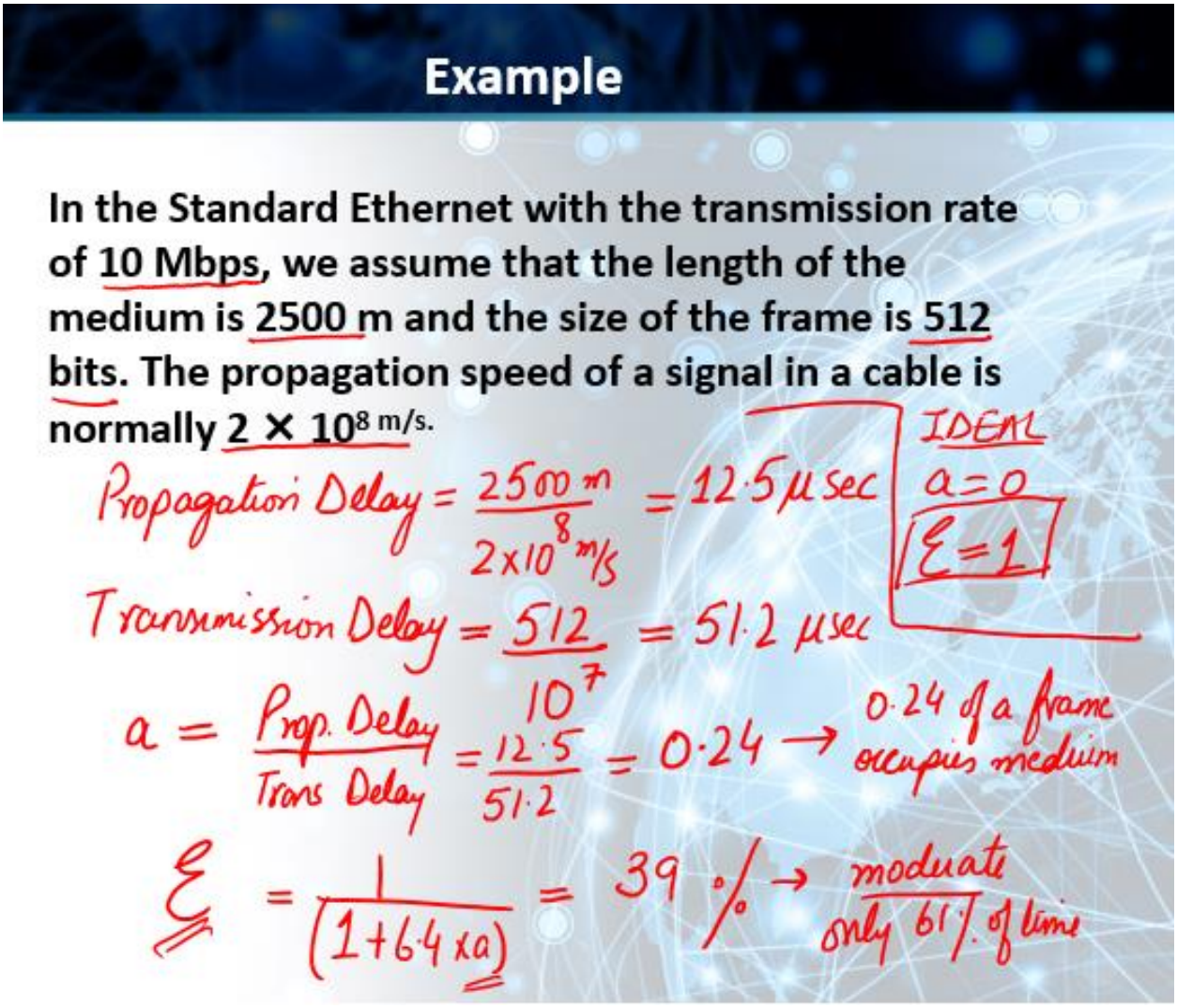
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Efficiency = 1/(1+ 6.4 x a)

where a = number of frames that can fit on a medium



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Out Of Topic Example

Problem-07:

Consider a 10 Mbps Ethernet LAN that has stations attached to a 2.5 km long coaxial cable. Given that the transmission speed is 2.3 x 10^8 m/sec, the packet size is 128 bytes out of which 30 bytes are overhead, find the effective transmission rate and maximum rate at which the network can send data.

Solution-

Given-

- Bandwidth = 10 Mbps
- Distance = 2.5 km
- Transmission speed = 2.3 x 10^8 m/sec
- Total packet size = 128 bytes
- Overhead = 30 bytes

Calculating Transmission Delay-

Transmission delay (T_t)

= Packet size / Bandwidth

= 128 bytes / 10 Mbps

= (128 x 8 bits) / (10 x 10^6 bits per sec)

= 1024 / 10^7 sec

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= 102.4 μsec

Calculating Propagation Delay-

Propagation delay (T_p)

= Distance / Speed

= 2.5 km / (2.3 x 10^8 m/sec)

= (2.5 x 10^3 m) / (2.3 x 10^8 m/sec)

= 1.08 x 10^{-5} sec

= 10.8 μsec

Calculating Value of 'a'-

a

= T_p / T_t

= 10.8 μsec / 102.4 μsec

= 0.105

Calculating Efficiency-

Efficiency(η)

= 1 / (1 + 6.44 x a)

= 1 / (1 + 6.44 x 0.105)

= 1 / 1.67

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= 0.59

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