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Ethernet

Networking Basics

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Ethernet

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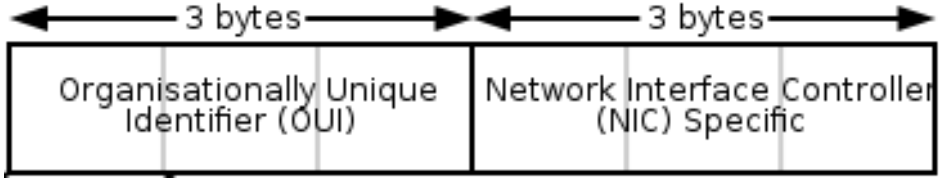
- A family of computer networking technologies for local area networks (LANs). Ethernet was commercially introduced in 1980 and standardized in 1985 as IEEE 802.3.
- Exists at both Data link layer and Physical layer of the OSI model
- Utilizes Collision detection CSMA/CD
  - What it is, How it works
  - What is the impact to performance
  - It doesn't prevent collisions, just helps to avoid them and recover from them.

Ethernet at the data link layer L2

- **Media Access Control – MAC address**
- **Unique hardware Identifier 6 bytes long**
- **MAC provides Ethernet addressing**



Moxa is 00:90:E8

Examples:
00:90:E8:00:1f:27 –Unicast MAC address
FF:FF:FF:FF:FF:FF –Broadcast MAC address
01:00:5e:xx:yy:zz --Multicast MAC address

Ethernet at the physical layer

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- IEEE and EIA/TIA are the standards bodies that creates the physical layer standards for Ethernet
  - Example of EIA/TIA: RJ45 registered jack UTP unshielded twisted pair, Category 5 (Cat-5)
- When designing a LAN its important to know the different types of media available to you.
- Mixing and matching the different types available to you can help you come up with a cost effective solution that also performs well.

Common cable types

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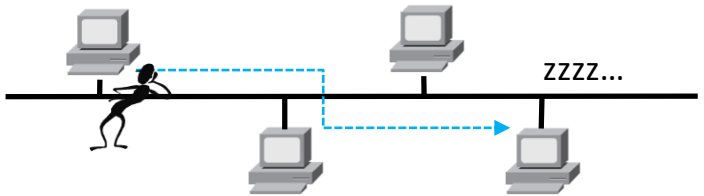
IEEE Spec	Ethernet Name	Speed	Notes	Distance
802.3	10Base-T	10Mbps	Cat-3 UTP, RJ45	100 m
802.3u	100Base-TX	100Mbps	Fast Ethernet, two pair, RJ45	100 m
802.3u	100Base-FX	100Mbps	Fiber	2/15km
802.3ab	1000Base-T	1Gbps	Cat-5e UTP four pair, RJ45	100 m
802.3z	1000Base-SX	1Gbps	Fiber, 850nm laser, short wave	MMF 550 m
802.3z	1000Base-LX	1Gbps	Fiber, 1300nm laser, long wave	550/5000 m
802.3an	10GBase-T	10Gbps	Cat-6,7 RJ45	100m

- Use Fiber for greater noise immunity, electrical isolation, long cable runs.
- Multi-Mode Fiber (MMF) most common for shorter lengths, Cost effective
- Single-Mode Fiber (SMF) for longer lengths, more expensive however

Ethernet and CSMA/CD

- Carrier Sense Multiple Access with Collision Detection (CSMA/CD)
- First listen to the wire and make sure its quiet
- If its not, then back off for a while and try again
- If its quiet, then go ahead and transmit data.



What if two transmit at the same time?

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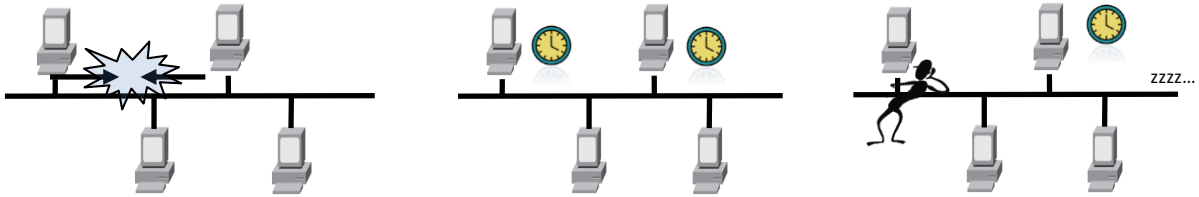
- If two clients transmit at the same time, the voltage on the wire changes and is detected by both clients.
- They both generate a ‘jam signal’ This causes both clients to back off for a random period of time.
- After the timer expires each client will listen to the wire for a quiet period and start the transmission process again.



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