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* OSI
  + - Application
    - Presentation
    - Session
    - Transport
    - Network
    - Data Link
    - Physical
  + More a way of thinking rather than actual implementation
  + Sometimes things can get confused
  + Layers only work directly with the one above and below it
    - This allows for sections to be updated easier
* Grouped up
  + User Support
    - Application
    - Presentation
    - Session
  + Network Support
    - Network
    - Data Link
    - Physical
  + Inbetween
    - Transport
    - Ties the other two together
* OSI
  + Application
    - Enabling application network access
  + Presentation
    - encryption, compression, translation
  + Session
    - manage session
  + Transport
    - process - to - process
    - provide reliable communication
  + Network
    - host - to - host
    - internetworking
  + Data Link
    - node - to - node
    - hop - to - hop
    - Organize the bits
  + Physical
    - implementation of moving bits
* TCP/IP
  + Osi Model from 4 down and 5,6,7 into the application layer
    - Application
      * Message
    - Transport
      * Packets/user datagrams/segments
      * Ports
    - Network
      * packets/datagrams
      * IP Address
    - Data Link
      * frame
      * Ethernet (MAC Address)
    - Physical
      * bit
* ARP
  + Takes a logical address (IP) and gives you a physical address (MAC ADDRESS)
* Addresses
  + Convert first hexidecimal section. This will be 8 bits. Look at the last bit.
  + Unicast
    - 0 as last bit
    - Addresses a single entity
  + Multicast
    - 1 as last bit
    - Addresses multiple entities
  + Broadcast
    - Shouting it out
    - Everyone on that local link can hear that information

Chapter 3 Underlying Technologies

* LAN
  + Here in the room, a campus
  + Ethernet, token ring, FDDI
* WAN
  + Wide Area Network
  + Covers the globe
* MAN
  + Covers a city
* LAN
  + IEEE
    - 802.3
      * LLC
      * MAC
* Ethernet Frame
  + Preamble | SFD | Destination Adr. | Source Adr.| Type Length | Data | Checksum
  + 7 Bites | 1 byte | 6 bytes | 6 bytes | 2 bytes | variable | 4 bytes
  + Physical Layer
* Big - endian order (network order)
  + The most significant bits come first
* Mac Address
  + Written in hexadecimal
  + a0:b4:32:76:9c:03
    - Second char shows if its unicast or multicast
    - Even number is unicast odd number is multicast
  + ff:ff:ff:ff:ff:ff
    - Broadcast address
* 10-Mbps
  + Bus/star topology
  + CSMA/CD
    - Listen before we talk
    - Used to avoid collisions on the same line
    - 2 times the propagation time that is the longest amount of time that it would take to detect a collision
    - transmission time \* delay = minimum size
  + Limit cable length due to attenuation and propagation
* 100-Mbps Ethernet (Fast ethernet)
  + Upgrade data rate
  + Keep everything else the same for backwards compatibility
  + Half-duplex (hub)
    - two way communication
    - Can’t have it simultaneously
  + full-duplex(star)
    - two way
    - Simultaneously
    - Don’t have to worry about detecting collisions
  + Auto-negotiation
* Gigabit Ethernet
  + Upgrade data rate
  + Keep everything else the same for backwards compatibility
  + Half-duplex
    - Traditional (100x faster but 100x shorter cable)
      * Need very short cable length (25M)
    - Carrier extension
      * Pad frame with a bunch of bits that take up space
    - Frame bursting
      * Hold back a frame until we get 2 or 3 so we can transmit more at once
* 10-Gigabit Ethernet
  + Upgrade data rate
  + Keep compatible
  + throw out half duplex