The changing Internet

Definition 1. *A Networked System is a cooperating set of autonomous computing devices that exchange data to perform some application goal*
Note 1. *Channel constraints bound communications speed and reliability*
Definition 2. *The OSI Reference Model: Application Layer, Presentation Layer, Session Layer, Transport Layer, Network Layer, Data Link Layer, Physical Layer*
Note 2. *Real networks don't follow the OSI Reference Model*
Physical Layer: Transmits raw bits over a physical medium.
Baseband Data Encoding: NRZ: 0 is represented by no change in voltage, 1 is represented by a change in voltage. Easy to miscount bits if long run of same value.
Manchester: Encoding: 0 is represented by a transition from high to low, 1 is represented by a transition from low to high.
Modulation: Allows multiple signals on a channel, modulated onto carriers of different frequency. Amplitude Modulation, Frequency Modulation, Phase Modulation.
Data Link Layer: provides framing, addressing, media access control, error detection, and flow control.
Framing: Separate the bitstream into meaningful frames of data.
Media Access Control: How devices share the channel. If another transmission is active, the device must wait until the channel is free.
Network Layer: provides routing, addressing, and packet switching. Internet Protocol (IP).
IPv4: 32-bit address space. Fragmentation difficult at high data rates.
IPv6: 128-bit address space. No in-network fragmentation. Simple header format.
Routing: Each network administered separately - an autonomous system (AS), different technologies and policies. wh Inter-domain Rounting: Route advertisements are sent to the routing table of the destination. Border Gateway Protocol (BGP). Advertisements have AS-path.
Transport Layer: provides end-to-end error recovery, flow control, and multiplexing.
TCP: Connection-oriented, reliable, in-order delivery, flow control, congestion control.
UDP: Connectionless, unreliable, out-of-order delivery, no flow control, no congestion control.
Session Layer: provides session establishment, maintenance, and termination.
Managing Connections: How to find participants in a connection, how to setup and manage the connection.
Presentation Layer: provides data representation and encryption.
Application Layer: provides the interface to the application. Deliver email, stream video, etc.
Happy Eyeballs: The process of trying multiple connections to a server to find one that is available.