Miscellaneous Networking Terms and Concepts

Semi-random terms and bits of loose ends here…

Various Terms

- Symmetric or Asymmetric Protocol
  - There are several contexts for symmetry, but one is that symmetric refers to peer-to-peer communications, while asymmetry refers to client-server communications.
- Octet
  - an octet is the same as a byte of data. Octet is used in the context of data transmission.

Connection-Oriented vs. Connectionless

- Connection-oriented communication
  - Like a telephone call
  - Establish communications, transfer data, terminate connection
  - Reliable, but overhead required
  - E.g. TCP is a connection-oriented protocol
- Connectionless communication
  - More like the post office without confirmation. Drop mail in the box, don't really know if it's delivered unless the recipient sends a reply and the reply is not lost
  - Faster, cheaper, but less reliable
  - E.g. UDP is a connectionless protocol

Connection-Oriented Protocol
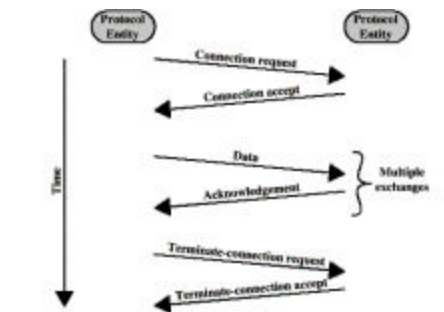
Protocol Data Unit

- PDU – Protocol Data Unit.
  – An encapsulated chunk of data referring to a specific protocol.
  – Related terms are *packet* and *datagram*.
  – Packet: Typically a PDU used in the context of connected-oriented protocols
  – Datagram: Typically a PDU used in the context of connection-less protocols.

Segmentation

- As we have discussed, it is possible for data to be broken up into chunks, or segments, and transmitted individually. A couple reasons for segmentation are:
  – Network may only accept blocks of data of certain size. ATM only allows 53 bytes while Ethernet has a maximum of 1526 bytes.
  – Error control may be more efficient with smaller sizes. However, overhead and throughput will be affected.
  – Receiving entities may need smaller buffers. However, we might spend more time processing lots of little packets.
  – Equitable access for shared facilities

Ordered Delivery

- Ordered Delivery refers to the PDU's arriving in order, or at least being processed in order.
- Generally we will want to process in order using connection-oriented protocols.
  – Packets may travel different routes through the network and arrive out of order
  – To re-order packets, we need a buffer to store received data and assign numbers to each packet.
  – Note that the max sequence number must be greater than the maximum number of outstanding packets.

Flow Control

- Flow Control refers to a receiving entity being able to limit the rate of data a sender is transmitting.
  – For example, the sender is transmitting faster than the receiver can handle (and perhaps his buffer is getting full).
- We'll examine several techniques later, including stop-and-wait and sliding window techniques.

Addressing

- Generally we need addresses at three layers:
  - Application address: Name (www.whatever), Port
  - Network address: IP Address
  - Data Link Address: Ethernet MAC
- Within their scope, these addresses must be unique!
- Different ways to use addresses:
  - Unicast addressing is a message directed to one particular destination.
  - Multicast addressing is a message directed to a specific subset of entities.
  - Broadcast addressing is a message directed to everyone.

Multiplexing

- Different definitions for hardware and software
- Hardware sense: we'll cover shortly
- Software sense:
  - Packets are sent in one jumbled stream. For example, two apps send data in one stream of packets. The source and destination apps are identified by port number.
  - Demultiplexing: Sorting the packets and sending them to the proper app on the receiving side. This is also done based on the port numbers stored in the packet.

Transmission Services

- Finally, a protocol might provide extra services that are useful. A few of these are:
  - Priority. Given some messages higher priority to get through
  - Quality of Service. Guarantees on minimum throughput or minimum delay may be required for some applications
  - Security. Either restricting access or methods for maintaining privacy may be invoked