CSET 2200 Lecture 10

Review/Questions

Layer 4

- Next Layer above Layer 3
- For our purpose Layer 4 means TCP/UDP and ICMP
- Adds services on top of layer 3

TCP

- Transmission Control Protocol
- Connection Oriented
- One of the main protocols used on internet

TCP (contd)

- Reliable Delivery
    - Error corrected
    - Packets in order
    - Lost packets retransmitted

TCP (contd)

- Virtual connection
  - Acts as if a independent connection

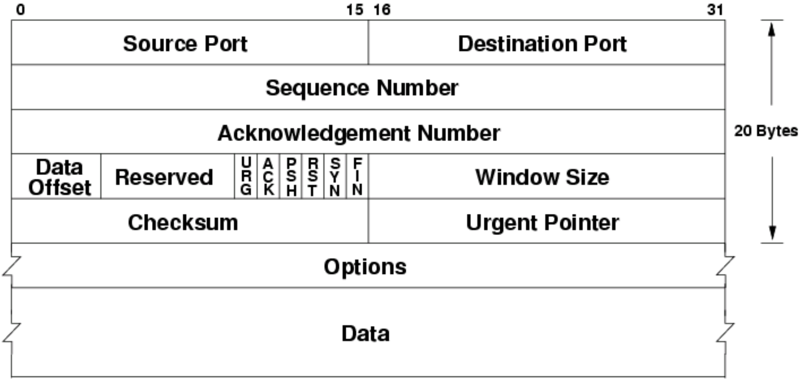
TCP (contd)

- PDU is Segments
- Segments contain user data
- TCP ensures bytes out match bytes in

TCP (contd)

- TCP also provides multiplexing
- Does so by using ports
- 65535 possible ports

TCP Header



0
15 16
31

Source Port
Destination Port

Sequence Number

Acknowledgement Number

Data Offset
Reserved
URG
ACK
PSH
RST
SYN
FIN
Window Size

Checksum
Urgent Pointer

Options

Data

20 Bytes

Figure 1: TCP Header

TCP Connections

- Relies on 3 way handshake
- Receiving end opens port
- Sender sends SYN
- SYN + ACK
- ACK

TCP Transfers

- Each packet gets an ACK
- Timer for each packet - retransmit if no ack
- Waits for ack before next packet
- Windowing changes above

Connection Termination

- Person disconnecting sends FIN
- Other end ACK
- Same ends sends FIN
- Final ACK

TCP State Machine

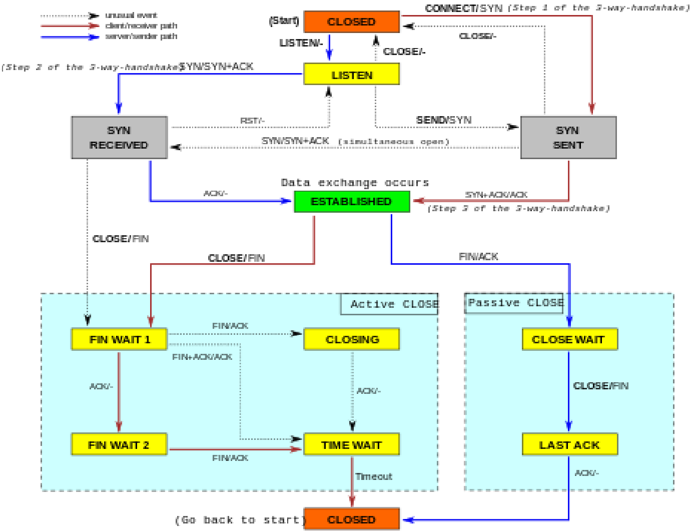


Figure 2: TCP State Machine

TCP Window

- Allows multiple packets without ACK
- Up to amount specified in window size header
- Window “slides” past all ACK’d packets
- Newer TCP uses a multiplier on window size

Options

- Unlike IP, lots of options used
  - NOP for padding
  - Maximum Segment Size
  - Window Scale
  - Timestamp and previous timestamp

Security issues with TCP

- Spoofing
- Connection Teardown
- RST

TCPDump Examples

Questions

Next Session - UDP/ICMP

- Chapter 23, 25