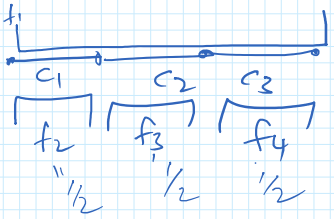
Lecture 11

24 September 2021 17:06

- Recap → Utility maximization
  - ↳ ensuring resources are not overwhelmed
  - → fairness / optimum allocation
- TCP → Reliable Data Transport ✓
  - → Congestion control ✓
- Overview of TCP properties
- TCP Header Structure

Utility Max. Framework



$c_i = 1$

Constraints

$f_1 + f_2 \le c_1$

$f_1 + f_3 \le c_2$

$f_3 + f_4 \le c_3$

⇒ resources are not overwhelmed.

Fair Allocation?

$f_1 = 1/2$ → Max-Min

$f_1 = 0$, $f_2 = f_3 = f_4 = 1$ → Sum-rate

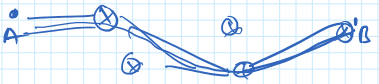
$f_1 = 1/4$, $f_1 = 3/4$ → proportional fairness

Objective

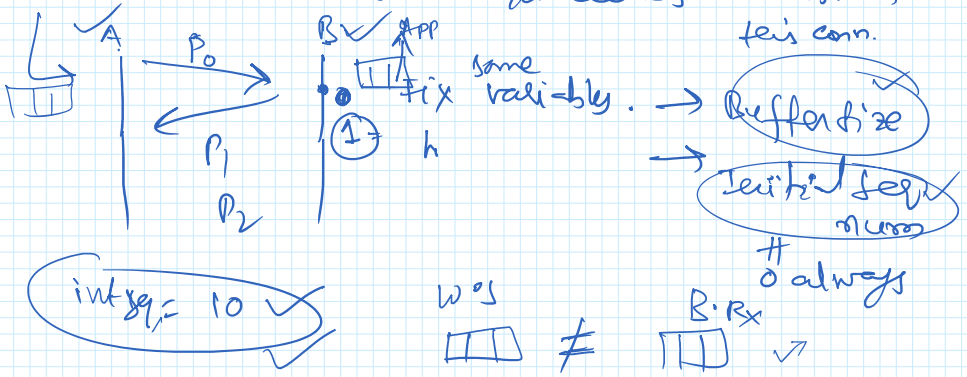
$\sum_i f_i$

$\sum_i \log f_i$

TCP properties



1. Connection-oriented protocol.
   - ↳ Understood by End hosts.
   - → No intermediate n/w devices understand this conn.

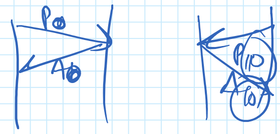


→ State information ✓

2. Full-Duplex.

TCP conn is established b/w A & B

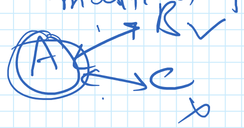
A —P0→ B
←Ack— } · init seq = 1



③ Point-point

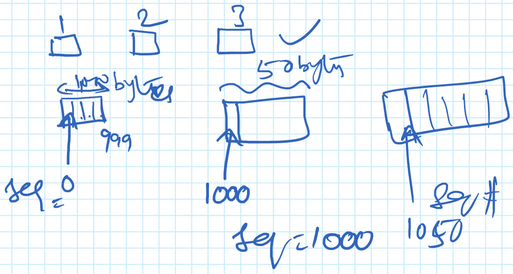
A ⟷ B

multicasting



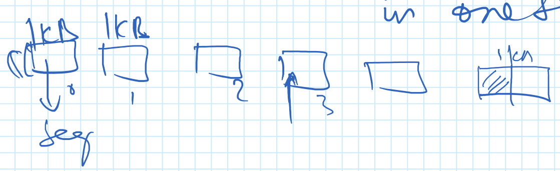
④ Seq num are not representing Pkt number

stream of Byte-Count.

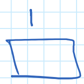


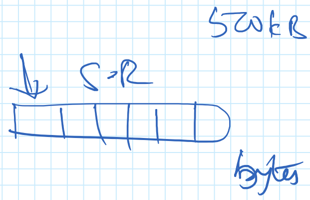
MSS - Maximum seg. size

1KB ↳ Max. num. of bytes of App. data in one segment



Telnet (Username)

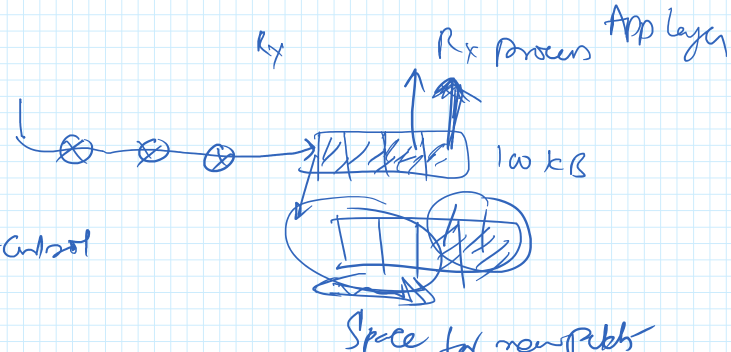




⑤ Flow-Control / Congestion-Control

Flow-Control ↓ not to overwhelm receiver.

Congestion-Control ↓ Not to overwhelm n/w resources



Flow-control

size

Size

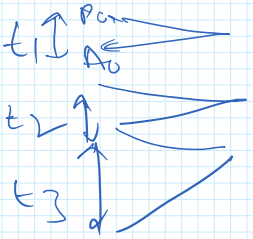
Space for receiver

Flow-control: ⇒ adapt sender window size based on available buffer space at Rx.

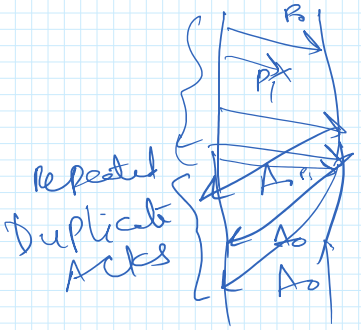
6. Congestion-Control

= Adapting window size to ensure n/w resources are not overwhelmed.

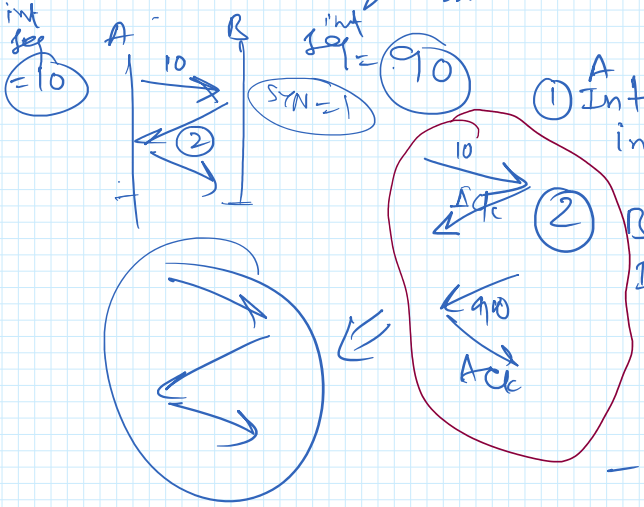
TCP Vegas — Infer Congestion from feedback delays



TCP Reno — Pckt losses due to Timeout / Too many Duplicate Acks.



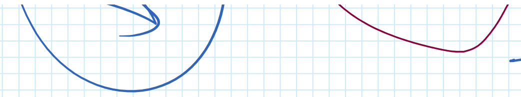
3-way Handshaking
- Full-Duplex
- Random init Seq nums



(1) A Initiate a Conn/B. init Seq(A) = 10

(2) B need to tell I'm fine with having conn. I noted your init Seq num.

— My init Seq



num.
— My init seq is 90

③ I noted your init seq = 90

TCP Header Structure:

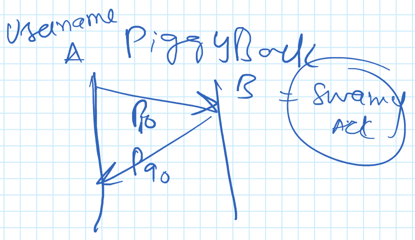
1. Process multiplexing / DeMux. → Dest port num → 16 bit
   Sender port num → 16 bit

2. Checksum → 16-bit
3. Seq. num → 32-bit
4. Ack. num → 32-bit
} Reliability

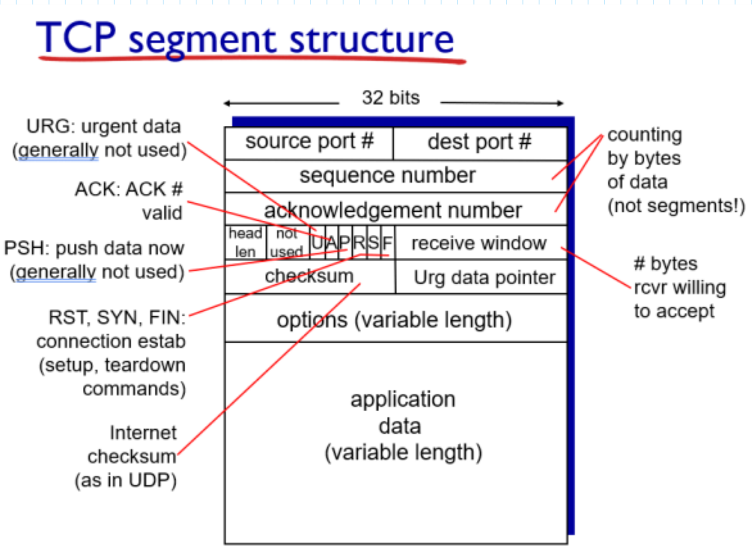
5. Receiver window → 16-bit → Flow control

6. Length

7. Flags (Binary one bit flag)
   → SYN, FIN, RST } Starting / terminating a TCP connection
   → ACK = 1
   → URG, PSH } Urgency



8. Options
   MSS



(Picture from Book slides)

Typical TCP Header size = 20 Bytes (without the options header).