

October 8 : TCP continued

Topics :

✓ - Fast recovery finish up

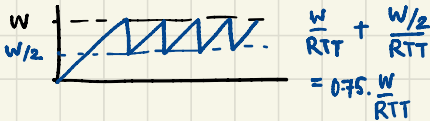
✓ - TCP state diagram

- TCP : Packets to Bytes.

✓ - TCP timers (single) for T/O

- AIMD

- Rough throughput



- Timeout estimation
↳ RTT, Variation
↳ Smoothing EWMA.

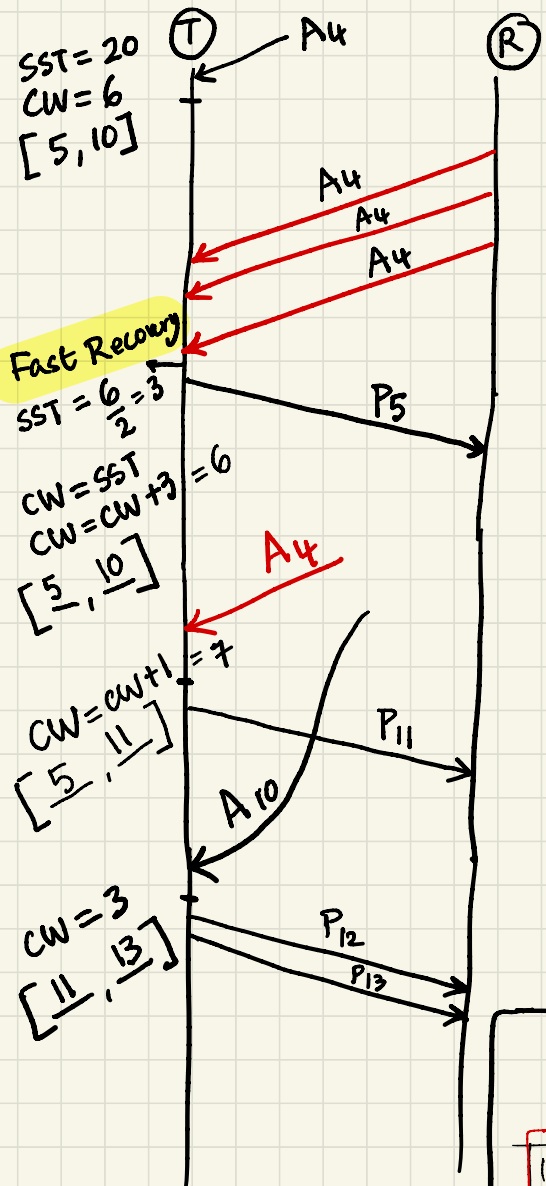
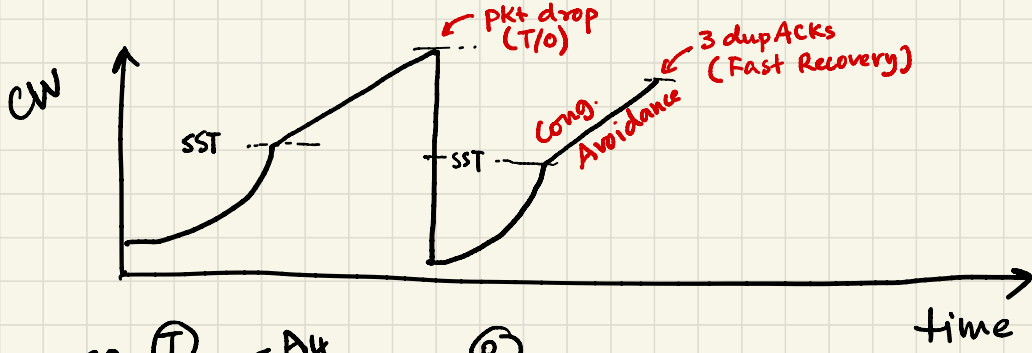
$$T/O = \underbrace{\text{Est}[RTT]} + 4 \cdot \text{dev}(RTT)$$

$$\hat{R}_t = \alpha \hat{R}_{t-1} + (1-\alpha) R_t$$

$$\Delta_t = \alpha \Delta_{t-1} + (1-\alpha)(R_t - \hat{R}_t)$$

- Flow control

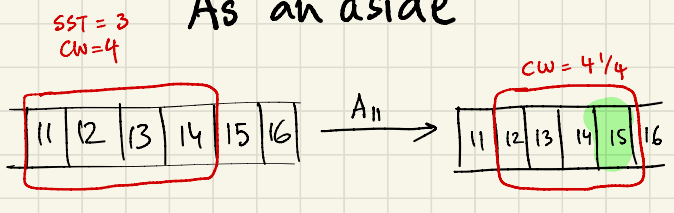
- TCP Fairness

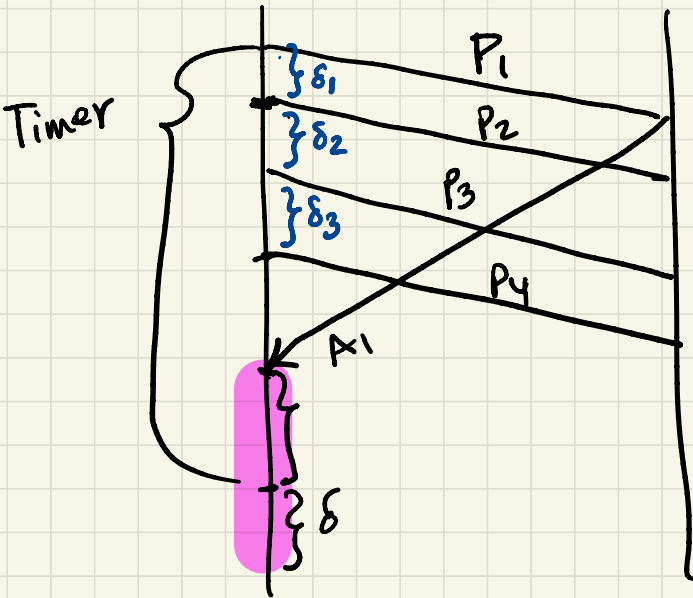
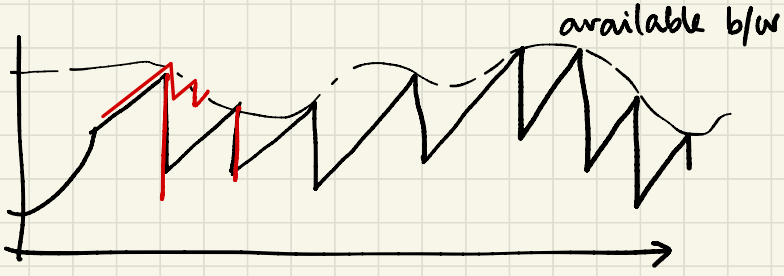


Fast Recovery

- ① $SST = \frac{CW}{2}$
- ② Transmit ^{one} missing pkt (only one) (that is definitely causing dupACKs).
- ③ $CW = SST + 3$
- ④ Transmit new pkts if this CW allows
- ⑤ New DupACK :
 $CW = CW + 1$
 Tx new pkt if CW permits
- ⑥ New ACK
 $CW = SST$
 dupACK count = 0
 start Cong. avoidance.

As an aside





TCP uses only 1 timer

9:00:10s → P₁ → T/O = 25s

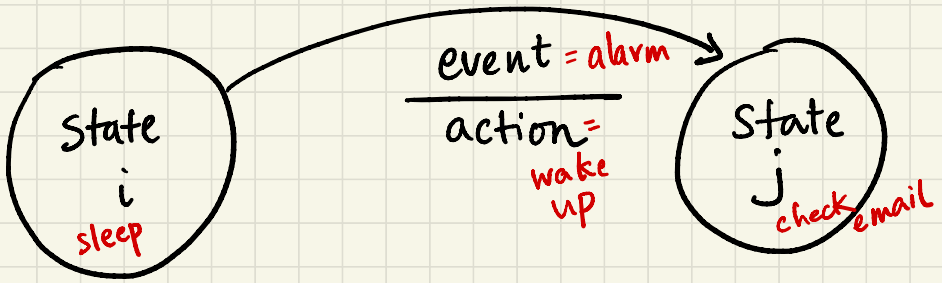
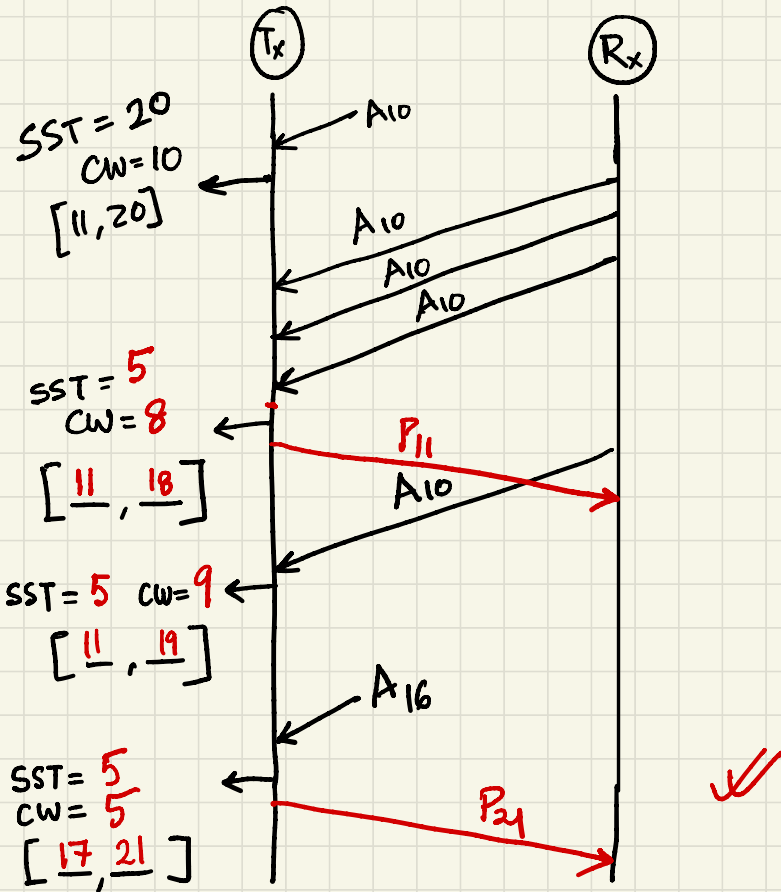
20s → P₂

30s → P₃ → A₁

40s → P₄

~~T/O for P₁~~
T/O for P₂ at 45s

5 sec remaining for T/O + P₂ was sent 10s after P₁, = 5 + 10 = 15
Set timer for 15



TCP State diagram :

