RFC 6298 Retr. Timeout

Initialization:

RTO ←1 sec

After the first measurement:

SRTT ← R

RTTVAR ← R/2

RTO ← SRTT + max (G, K*RTTVAR)

After subsequent measurements:

RTTVAR ← (1 - beta) * RTTVAR + beta * |SRTT - R'|

SRTT ← (1 - alpha) * SRTT + alpha * R'

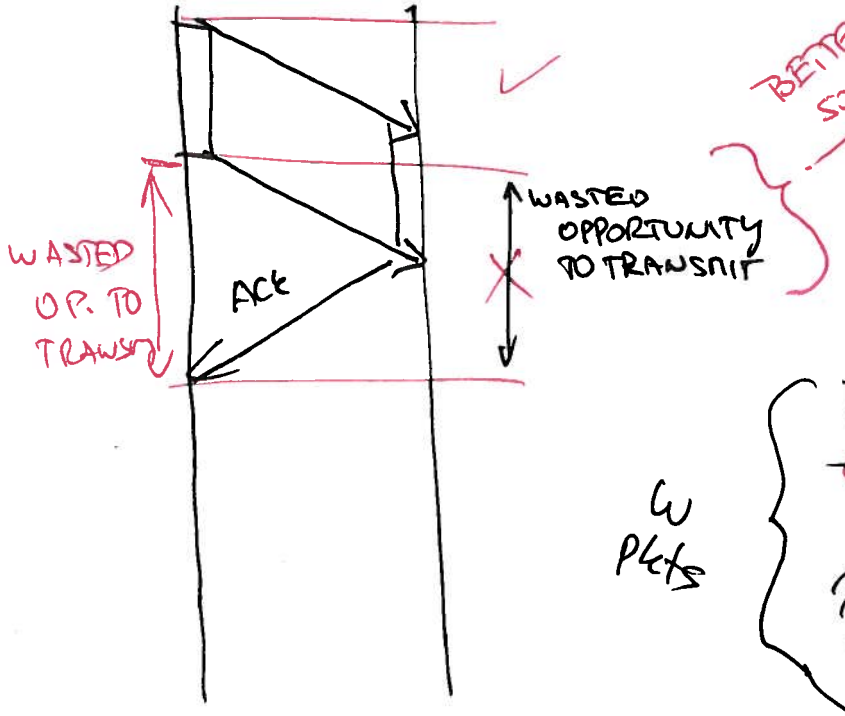
RTO ← SRTT + max (G, K*RTTVAR)

Where:

R - first RTT measurement
R' - subsequent RTT measurement
RTTVAR - RTT variance
SRTT - smoothed RTT estimate
RTO - retransmission timeout
G - clock granularity

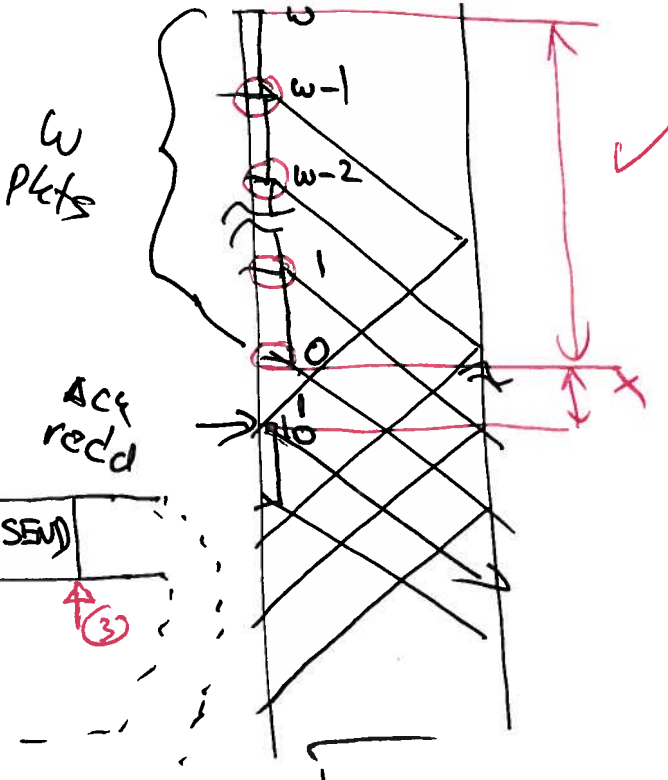
Recommended values:

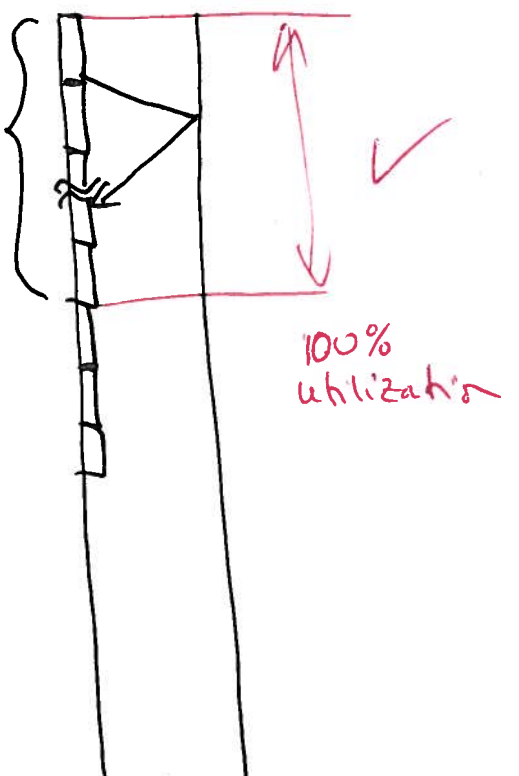
STOP & WAIT PROTOCOL

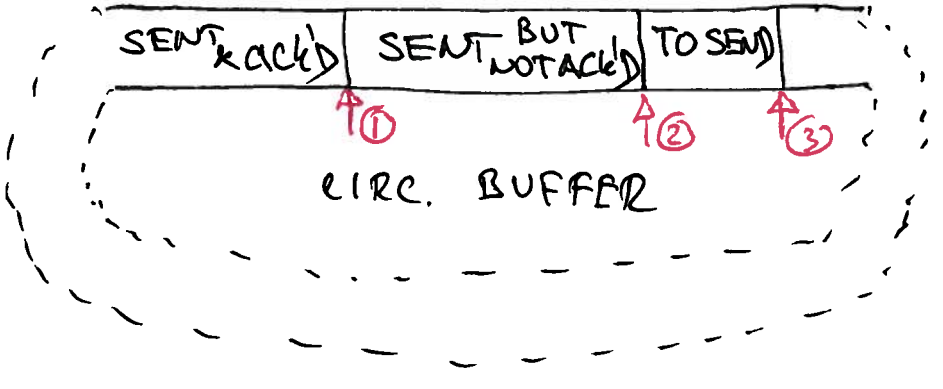


SLIDING WINDOW PROTOCOLS

MAX W UN-ACK'D PKTS (OR BYTES)







W IS PROPORTIONAL TO TRANSM. RATE

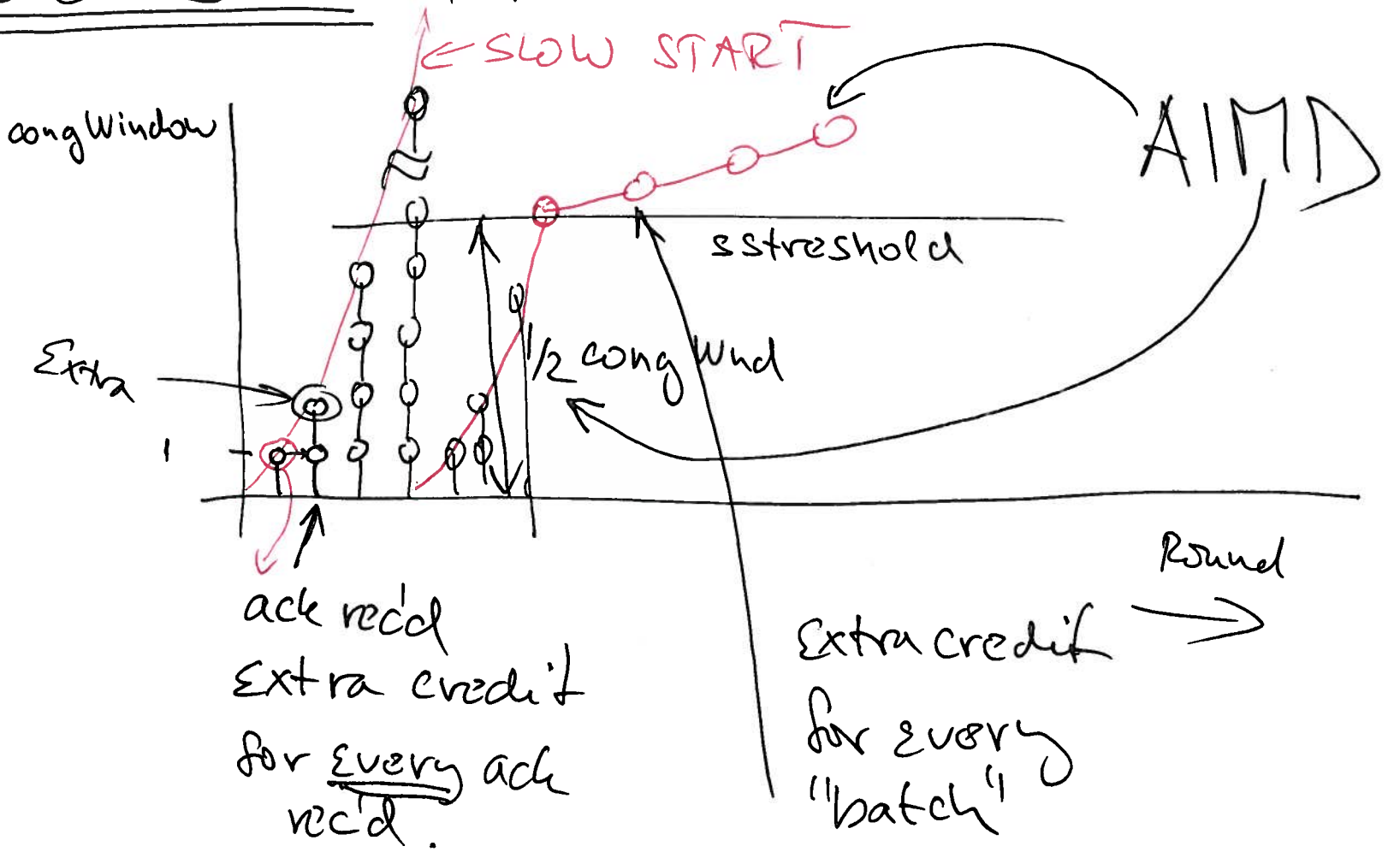
Network Congestion Ctrl.

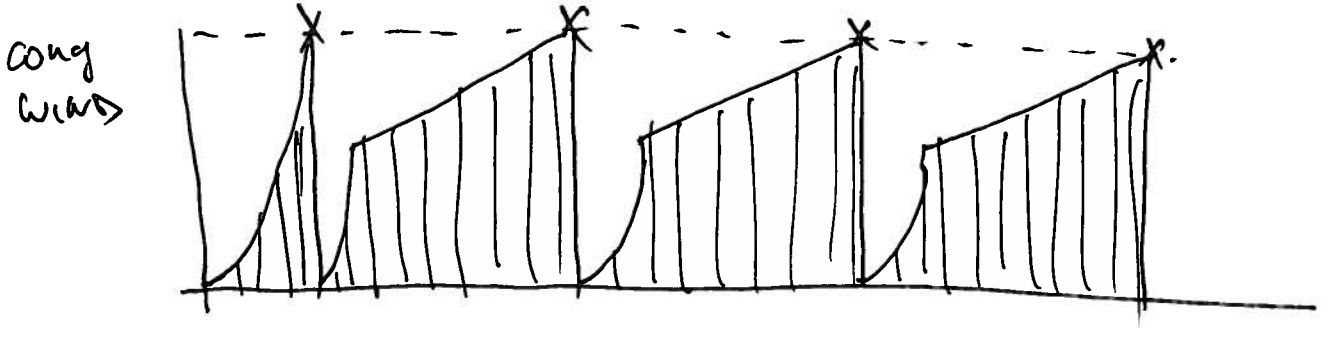
- Method:

  `TransWind = min(RecvWind, CongWind)`

- `TransWind` - used in transmission
- `RecvWind` - from Window Size field
- `CongWind` - transmitter's estimate of how many unacknowledged packets can be pushed onto the network without causing congestion

TCP SLOW START ✳ pkt loss

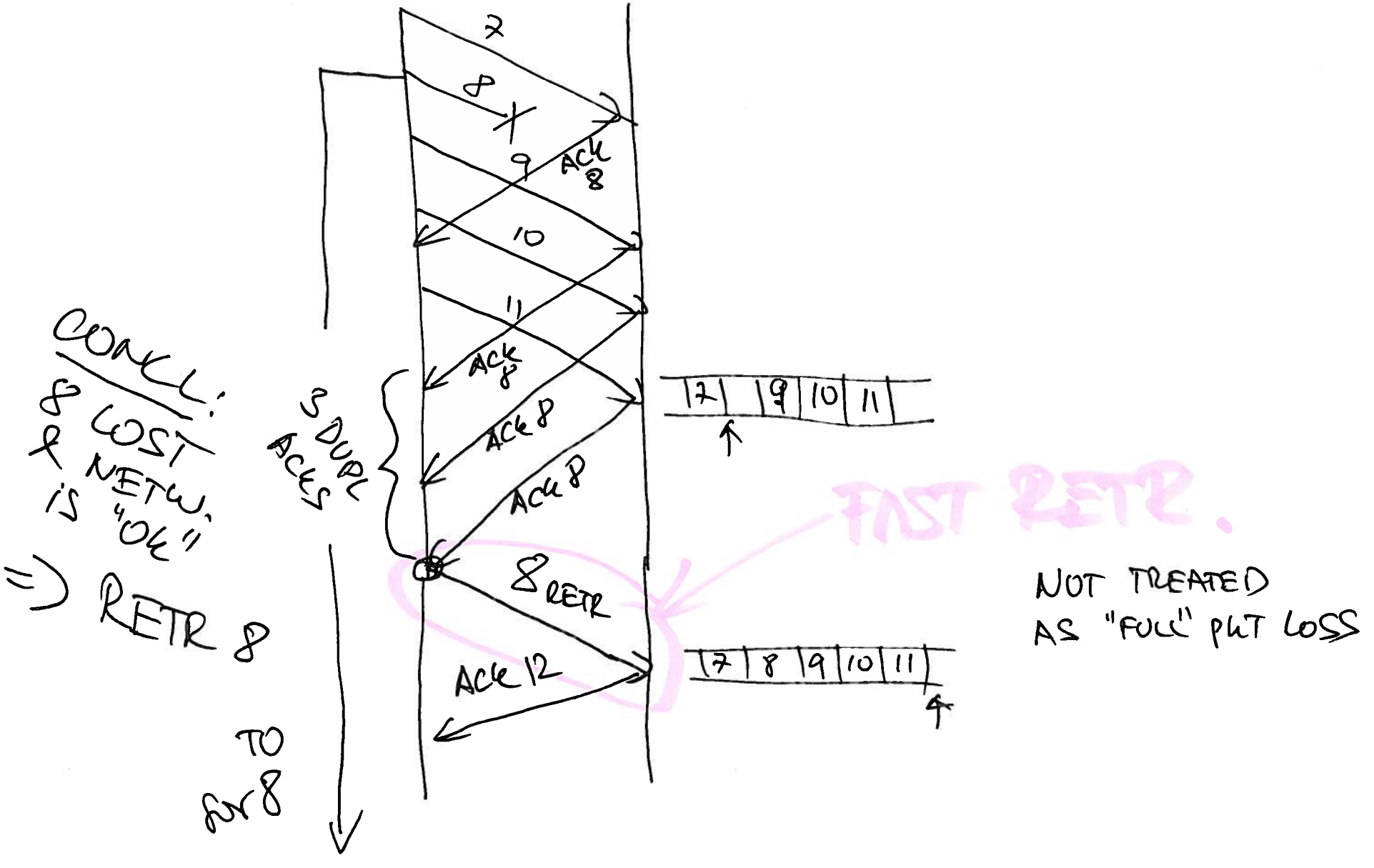




Congestion Window

- Components algorithms of TCP network congestion control (RFC 2001):
  - Slow Start
  - Congestion Avoidance
  - Fast Retransmit
  - Fast Recovery

FAST RETRANSM./RECOVERY



Variants of TCP

- Original TCP (RFC1122)
- TCP Tahoe (adds Fast Retransmit)
- TCP Reno (adds Fast Recovery)
- TCP CUBIC (current versions of Linux)
  - does not rely on the receipt of ACKs to increase the window size
- TCP Fast

TCP FAIRNESS