Lecture 8

CS625: Advanced Computer Networks
Fall 2004

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http://www.cse.iitk.ac.in/users/braman/courses/cs625-fall2004/outline.html

Outline for Today

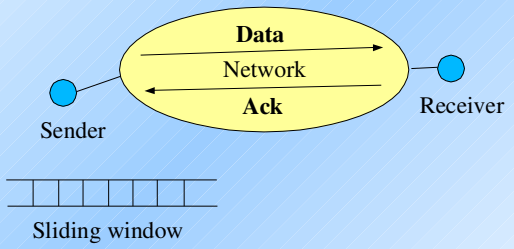
- Fair queuing (from previous class)
- TCP congestion control
- *Scribe for today?*

TCP Functionalities

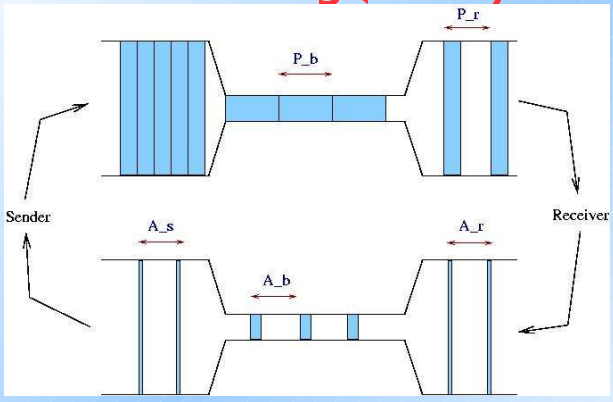
- Reliable, in-order delivery
  - Window/Ack based protocol, with timeout
- Congestion control
  - Detect available bandwidth
  - Cut down sending rate on congestion

Window/Ack Mechanism

- Sender maintains window of packets
- Advance window (only) on receiving ack

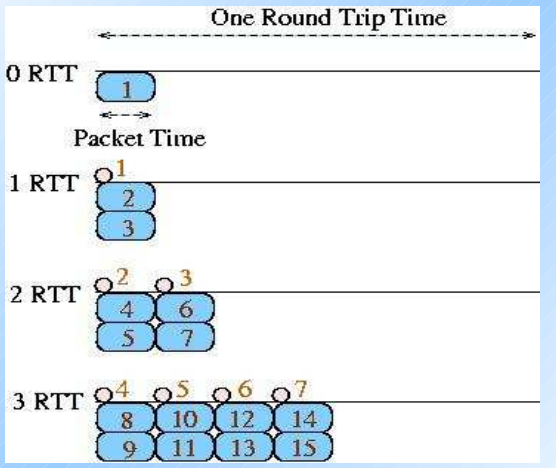


TCP Ack Clocking (Steady State)



- Sender sends window of pkts back-to-back
  - Horizontal dimn: time, Vertical: bandwidth
  - Bandwidth x time = bits (const. for a pkt)

Slow Start: Getting to Equilibrium



- Congestion window grows exponentially

Congestion Avoidance

- After first packet loss, stop exponential growth
- Cut congestion window in half
- Enter congestion avoidance
- Grow CWND by 'one' every RTT

Topics next week

- Random Early Detect (RED)
- TCP variants
- QoS: IntServ and DiffServ
  - Assigned reading