Lecture 11

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

- TCP Round-Trip Estimation
- Fast Retransmit, Fast Recovery
- *Scribe for today?*

RTT Estimation

- RTT = Time between pkt. send and when its Ack is recd.
- EWMA: Exponentially Weighted Moving Average
- SRTT: Smoothed RTT
- SRTT = alpha*SRTT + (1-alpha)*RTT_i
  - What should be the value of alpha?
  - alpha is chosen to be 7/8

Retransmission Timeout

- Initially, RTO = beta X SRTT
  - What should be the value of beta?
- RTO (Retransmission Timeout) = SRTT + 4*RTT_var
- RTO back-off

RTT Sampling Ambiguity

- During retransmit, which RTT to consider?
- Choices are:
  - First transmission
  - Last transmission
  - Ignore RTT sample
- Karn's algorithm: ignore RTT sample, but maintain backed-off RTO until valid RTT sample
- Can use timestamps to resolve ambiguity
  - But, involves overhead; can't compress header

Fast Retransmit/Fast Recovery

- TCP detects packet-loss by looking for packet reordering
  - Three out-of-order packets ==> Three DUP-ACKs ==> Conclude packet loss
- ssthresh = CWND/2
- CWND = ssthresh+3
- CWND++ for each DUP-ACK received
- On receiving first “fresh” ack, CWND=ssthresh

Fast Retr./Fast Rec. (Details)

- Congestion avoidance:
  - Seq no: U is dropped, CWND=W
  - [U, U+W) are in transit
  - Window pulled back to W/2
  - In one RTT, W-1 DUP-ACKs arrive
  - Packets [U, U+W/2+W-1) are sent
  - W/2-1 new packets are sent
- No “burst” of packets:
  - New ACK arrives asking for U+W
- Bottleneck clears:
  - Sender does nothing for the first W/2 DUP-ACKs

Topics next week

- QoS: IntServ
  - Assigned reading
- QoS: DiffServ