

CS551

TCP Congestion Control

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<http://merlot.usc.edu/cs551-f12>

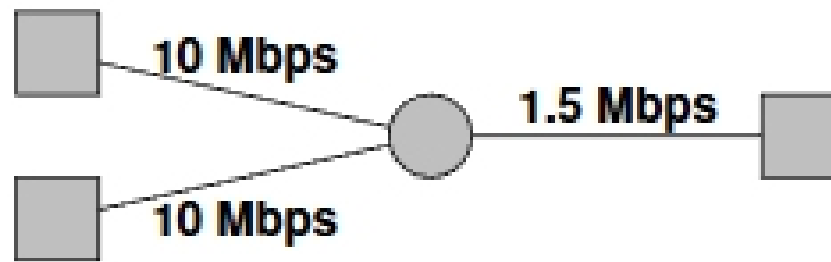


Causes and Costs of Congestion

- ➔ **Queueing delays in router as packet arrival rate nears link capacity**
 - = even if routers have infinite buffer space
 - costs: wasting bandwidth to forward unneeded copies
- ➔ **Retransmissions costs: (routers have finite buffer, so packet get dropped)**
 - = routers have finite buffer (packets get dropped)
 - = retransmitted data eat up bandwidth
 - = when a packet is dropped along a path, the transmission capacity that was used at each of the upstream routers to forward that packet was wasted
- ➔ **The theory behind congestion control**
 - = stability
 - = efficiency



Congestion



- ➔ If both sources send at full speed, the router is overwhelmed
 - = *congestion collapse*: senders lose data from congestion and they resend, causing *more* congestion (can be self-reinforcing)

- ➔ Other forms of congestion collapse:
 - = Retransmissions of large packets after loss of a single fragment
 - = Non-feedback controlled sources