Exploring Rate-Based Congestion Control in NDN

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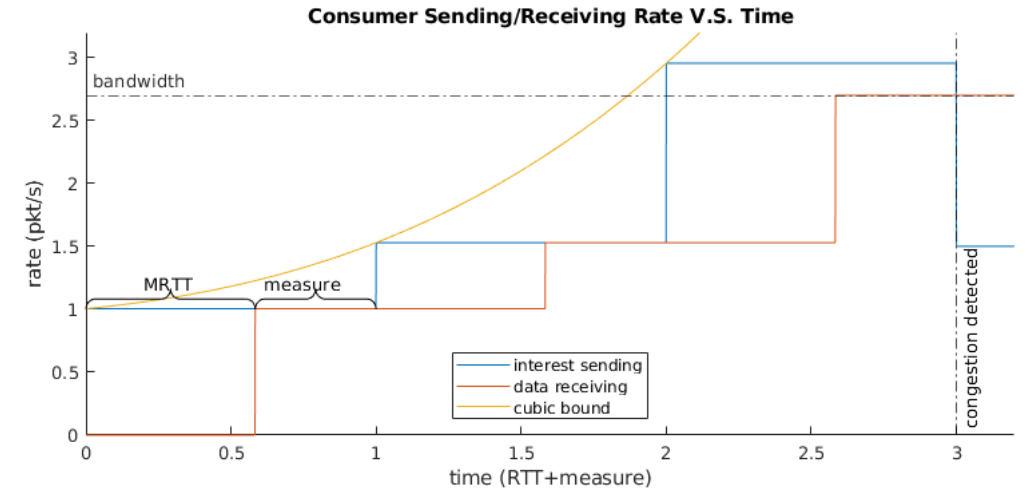
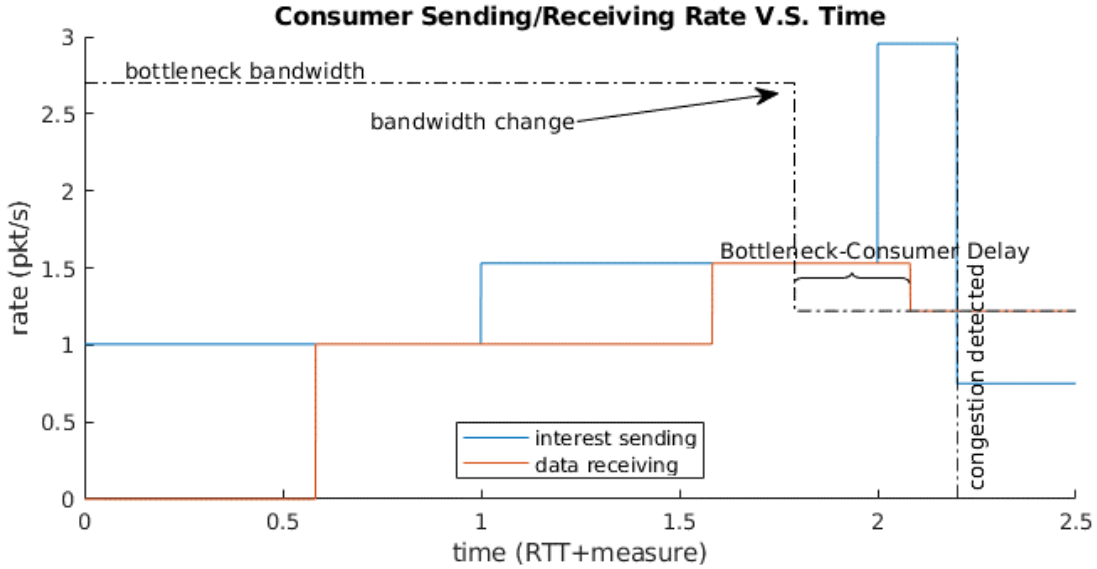
Congestion control and Named data Networking

- Different from IP network, NDN supports in-network caching and dynamic multipath forwarding.
- They cause fluctuations of round-trip time(RTT) and data arrival rate measurements. Consequently, they invalidates the concept of “pipe size” (maximum number of packets in network without queueing).

Rate based congestion control design

- Control the interest sending rate instead of congestion window size
- Each round start by sending interest at same rate for the maximum round trip time (MRTT) among forwarding paths.
- Then, measure the data arrival rate.
- Detect congestion by
  - Thresholding the difference between data arrival rate and the current interest sending rate. If sending is faster than arrival, there's congestion.
  - Detect drop of data arrival rate, which indicates a congestion caused by external factors.
- Adjust the interest sending rate accordingly
  - No congestion: increase the interest sending rate according to a CUBIC curve
  - With congestion: multiplicative decrease the interest sending rate.





Evaluation in NDNSim

- Good fairness
- 92% bandwidth usage
- Steady state queue usage is much lower than the BDP