Identifying and Handling Non-Queue Building Flows in a Bottleneck Link

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Inspirations

fq_codel gives strict priority to “sparse” flows
Is there a way to achieve a similar benefit in non–fq systems?

In a dual-queue L4S node, can we identify “sparse” unresponsive traffic that can be carried in the L-queue?
Goals

Reliable (P99) low latency and low loss for “sparse” traffic flows

Allow capacity-seeking applications to compete for bandwidth

Support L4S
Queue-Building vs Non-Queue-Building

• Queue-Building flows
  • Capacity-seeking flows using a traditional congestion controller
  • Highly bursty flows that exceed the link capacity

• Non-Queue-Building
  • Relatively low data rate, not capacity seeking
  • Perhaps latency sensitive (but not necessarily)
  • Highly unlikely to send large bursts that exceed available link capacity
  • Might send short bursts
Dual-Queue Link

• One deep queue (with AQM?) for Queue-Building Flows
• One shallow queue for Non-Queue-Building Flows

• Align with L4S dual-queue coupled AQM approach to support L4S TCP
Identifying NQB flows

• Application/OS self identification
  • Application and/or Operating System are in best position to know sender behavior
  • Standardized packet mark (DSCP) to indicate NQB

• Queuing Behavior Analysis
  • Monitor packet arrivals (per 5-tuple) to determine which flows are QB
Trust but Verify – Marking + Analysis

• Application/endpoint marking - Trustable?
  • No incentive to lie
  • QB flows get better performance in the QB queue
  • NQB flows get better performance in the NQB queue

• But, sometimes bad things happen
  • QB flow entering the NQB queue would cause problems (latency/loss) for other flows

• Queue Protection Function
  • Perform Queue Behavior Analysis only on NQB marked packets
  • Re-direct QB flows to the QB queue
Summary of feedback from the mailing list

- Be more clear on problem statement & requirements
- Don’t point out the downsides of fq_codel unless you want a fight...