Pacing in Transport Protocols

draft-welzl-iccrg-pacing-03

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ICCRG
IETF 123

Context and history

- Document gives guidance to implementers via:
  - Discussion of general considerations and consequences
  - An overview of how others do it

- -00 draft described Linux TCP and QUIC BBR
  - Linux TCP
  - QUIC BBR based on open source implementations:
    Google's *quiche* and Meta's *mvfst*

- -01 draft added Vidhi Goel and Michael Tüxen
  - .... who added text on pacing Apple OSes and FreeBSD

- -02 draft
  - extended discussion based on list feedback from Ingemar Johannson and
    Eduard Vasilenko, plus: RTT estimation, mini-bursts and their trade-offs, AQM

News in -03

- Added motivations for pacing
  - Not susceptible to ACK compression / thinning etc. making traffic pattern more bursty
  - Enables operation with shorter queues, can create right incentive
  - When applications use pacing to limit the rate, can reduce latency irrespective of the queue size
  - Improved RTT measurements
  - Receiver: more steady workload, can be better for some applications
  - Special not-general-Internet cases with well-known path properties: avoiding queues due to pacing can be important (e.g. supercomputing grids, private DC interconnect, and *draft-many-tiptop-usecase)*.

News in -03 /2

- Extended text on mini-bursts, e.g. beyond TSO:
  now also discussing GSO, LRO, GRO

- Application control
  - *Sammy* and *draft-johansson-ccwg-rfc8298bis-screamv2-03* pace video at a rate that's related to the video bitrate (more, to reduce the risk of late arrival, 50% in case of SCReAM)
    - Sammy: Spang, B., Kunamalla, S., Teixeira, R., Huang, T., Armitage, G., Johari, R., and N. McKeown, "Sammy: Smoothing Video Traffic to be a Friendly Internet Neighbor", ACM SIGCOMM '23: Proceedings of the ACM SIGCOMM 2023 Conference , 1 September 2023, https://doi.org/10.1145/3603269.3604839

Next steps

- Open issues in github
  - More detail on Apple OSes and FreeBSD
  - More general consequences of pacing
    E.g. There's some material in papers… still need to check.

- At IETF-120, IETF-121, IETF-122 and the mailing list, we saw significant interest in this document
  - Would be happy to see adoption

Thank you!

Your feedback is very welcome:
https://github.com/mwelzl/draft-iccrg-pacing

Questions?