Flow Queue PIE: A Hybrid Packet Scheduler and Active Queue Management Algorithm

draft-tahiliani-tsvwg-fq-pie-02

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TSVWG, IETF 124

Overview of the draft

- Combines “flow queuing” and PIE algorithm
  - Similar to how FQ-CoDel combines FQ and CoDel
- The functioning of FQ is similar to RFC 8290
  - Incoming packets are hashed into buckets, each having its own queue
  - Packets are dequeued using a DRR-based packet scheduler
- The functioning of PIE is similar to RFC 8033 with minor modifications
  - Uses timestamps to calculate queue delay
- Implementations of FQ-PIE
  - Linux
    - Supported in multiple Linux distributions
  - FreeBSD (thanks to Grenville Armitage and team!)
  - network simulator - 3 (ns-3)

Status of FQ-PIE

	CoDel	FQ-CoDel	PIE	FQ-PIE
Linux/FreeBSD implementation	Yes	Yes	Yes	Yes
Specification	RFC 8289	RFC 8290	RFC 8033	Not available

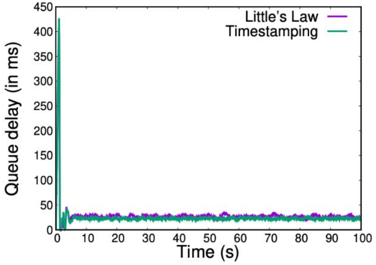
Thanks: Michael Welzl

History of the document

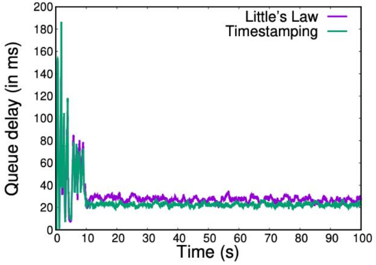
- -00 draft described FQ-PIE
- -01 draft updated the scope of experimentation by adding scenarios from RFC 7928
- -02 draft adds text about the FreeBSD implementation of FQ-PIE
- adoption call from August 25, 2025 to September 15, 2025 - thanks to tsvwg chairs!

Suggestion from IETF 123

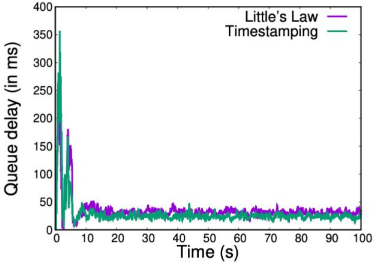
- Greg White: It would be interesting to study what impact it has on the performance when timestamps are used for estimating queue delay.



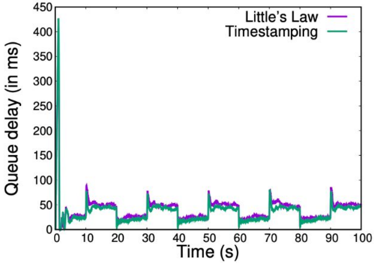
(a) Synchronous Fairness



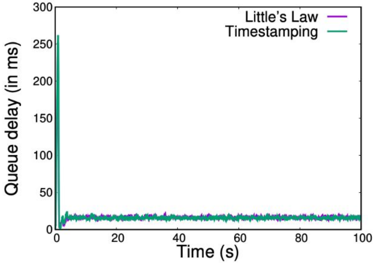
(b) Start-time Fairness



(c) RTT Fairness



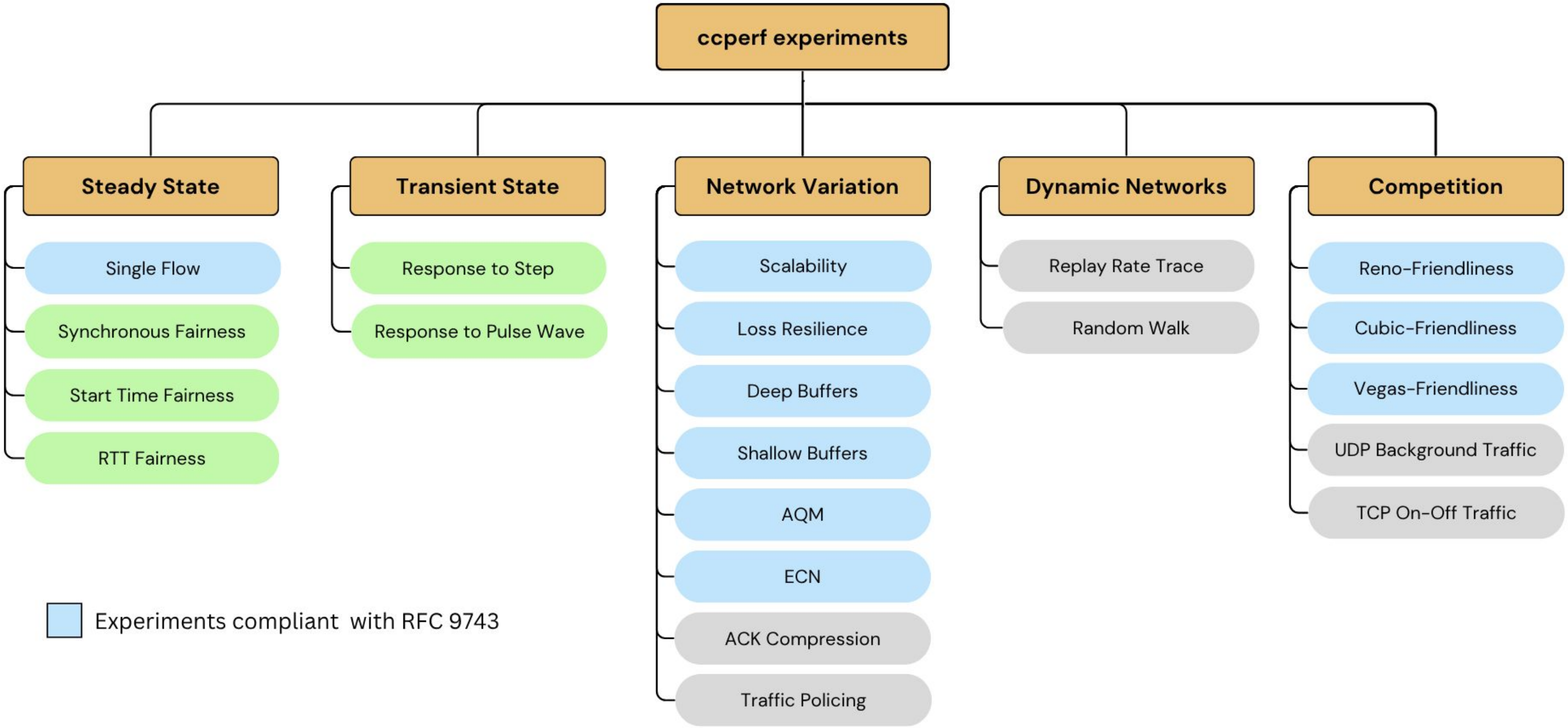
(d) Pulse wave



(e) UDP Background

Credits: Arun Kumar Ramarajan

Additional slides (IETF 124)



Credits: Deepa Kumari, Suvam Mukherjee and Vivek Jain