

Pantheon Report

Generated at 2017-12-20 19:40:45 (UTC).

Data path: Stanford ppp0 (*remote*) → AWS California 1 Ethernet (*local*).

Repeated the test of 14 congestion control schemes 3 times.

Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

Increased UDP receive buffer to 16 MB (default) and 32 MB (max).

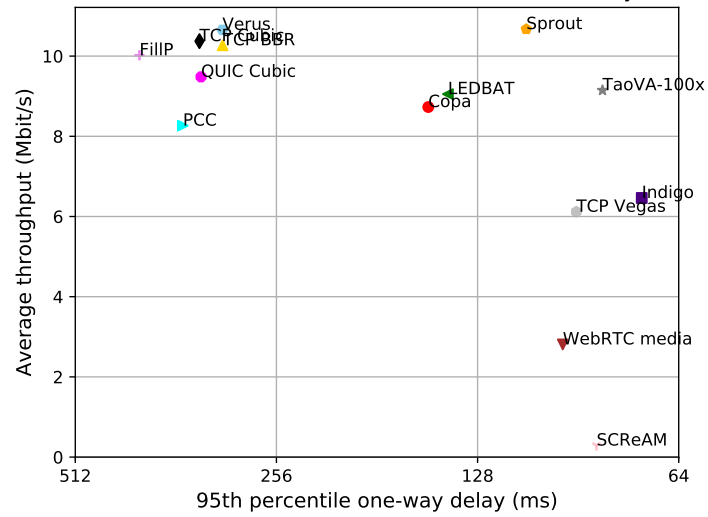
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).

NTP offsets were measured against `time.stanford.edu` and have been applied to correct the timestamps in logs.

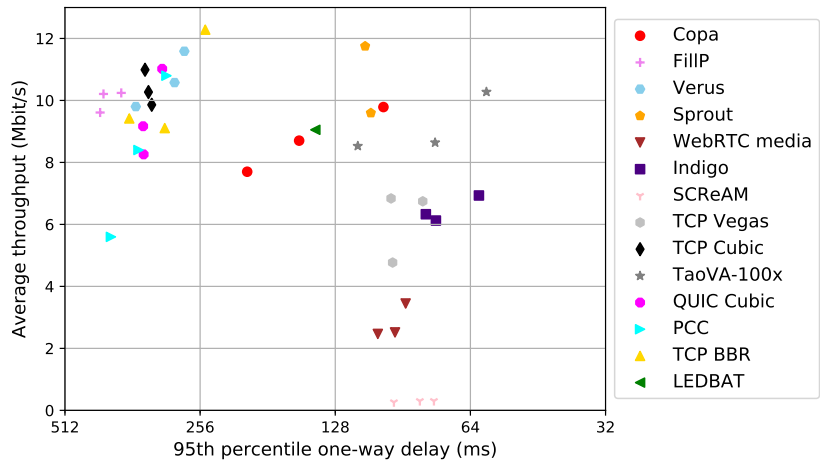
Git summary:

```
branch: master @ 904a5750834816b1e46a2c86405d707788d27c16
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
  M datagrump/sender.cc
third_party/fillp @ dcaef6b00654e660f73f7ed679d2eab61ce08639
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ b19f3730105f9aa95452552af924e3719b03cc55
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
  M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ fb1053193c2861da659ba9013db26744ccfcf993
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
  M receiver/src/buffer.h
  M receiver/src/core.cpp
  M sender/src/buffer.h
  M sender/src/core.cpp
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ f1a14bffe749737437f61b1eaeab30b267cde681
third_party/sprout @ 6f2efe6e088d91066a9f023df375eee2665089ce
  M src/examples/cellsim.cc
  M src/examples/sproutbt2.cc
  M src/network/sproutconn.cc
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
  M src/verus.hpp
  M tools/plot.py
third_party/webrtc @ a488197ddd041ace68a42849b2540ad834825f42
```

test from Stanford ppp0 to AWS California 1 Ethernet, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from Stanford ppp0 to AWS California 1 Ethernet, 3 runs of 30s each per scheme
3 flows with 10s interval between flows



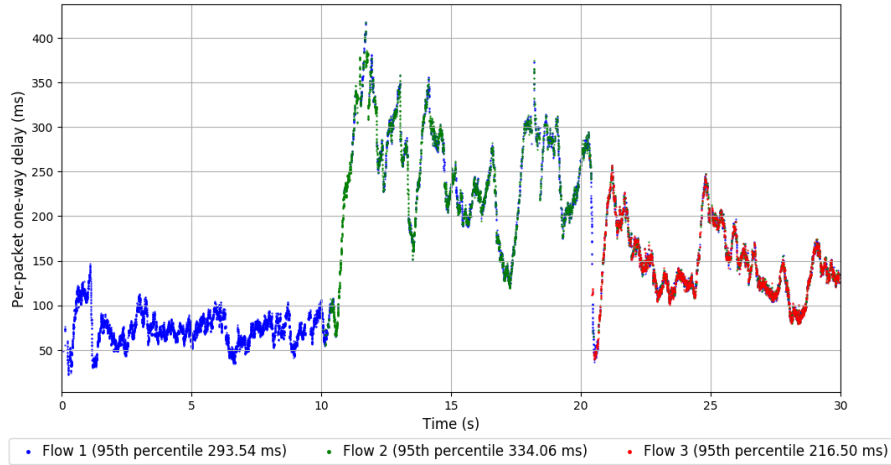
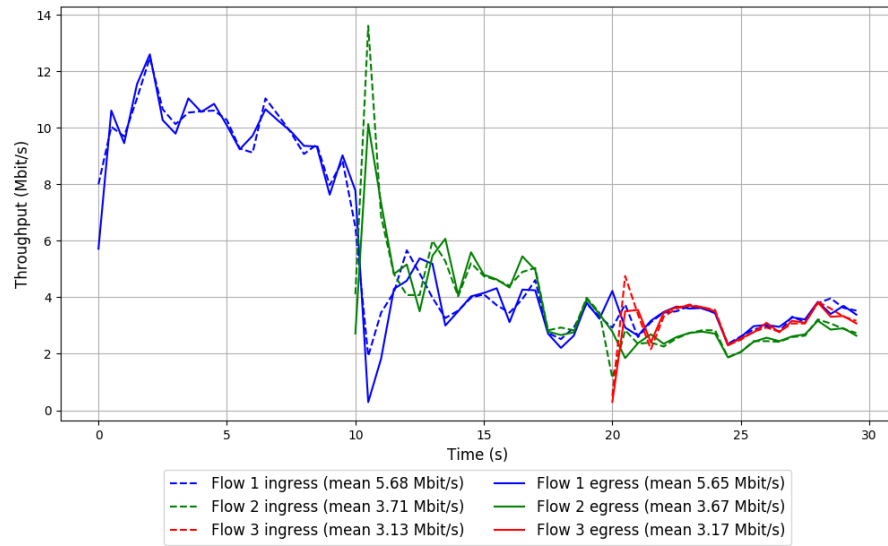
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	6.11	4.17	4.27	289.51	318.39	296.21	1.41	3.27	9.31
TCP Cubic	3	7.17	3.93	1.91	331.41	337.22	321.22	0.79	2.00	4.02
LEDBAT	1	5.48	4.22	2.39	142.27	141.83	137.46	0.32	0.56	0.99
PCC	3	5.43	3.42	1.75	346.73	355.08	357.49	9.35	14.02	24.21
QUIC Cubic	3	7.96	1.77	1.78	329.33	356.90	344.52	1.66	3.89	6.97
SCReAM	3	0.13	0.15	0.19	87.07	78.55	80.42	0.31	0.43	0.28
WebRTC media	3	1.62	0.77	0.43	96.82	91.13	101.27	0.60	0.50	1.29
Sprout	2	6.59	4.44	3.46	102.84	111.95	118.61	1.27	1.94	2.35
TaoVA-100x	3	5.17	4.37	4.15	69.71	92.51	134.50	0.66	0.91	2.40
TCP Vegas	3	2.25	3.77	4.12	78.81	91.85	105.50	0.22	0.11	0.30
Verus	3	6.69	4.62	2.83	289.78	328.19	321.26	11.48	13.46	27.64
Copa	3	5.19	4.21	3.00	141.10	155.67	173.21	0.31	0.63	2.86
FillP	3	7.43	2.43	3.12	415.65	394.17	371.12	57.90	91.49	94.74
Indigo	3	2.76	4.09	3.12	75.24	72.28	52.74	0.23	0.20	0.41

Run 1: Statistics of TCP BBR

Start at: 2017-12-20 18:00:53
End at: 2017-12-20 18:01:23
Local clock offset: 0.525 ms
Remote clock offset: -2.601 ms

Below is generated by plot.py at 2017-12-20 19:39:43
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.11 Mbit/s
95th percentile per-packet one-way delay: 306.933 ms
Loss rate: 1.13%
-- Flow 1:
Average throughput: 5.65 Mbit/s
95th percentile per-packet one-way delay: 293.542 ms
Loss rate: 0.81%
-- Flow 2:
Average throughput: 3.67 Mbit/s
95th percentile per-packet one-way delay: 334.057 ms
Loss rate: 1.62%
-- Flow 3:
Average throughput: 3.17 Mbit/s
95th percentile per-packet one-way delay: 216.501 ms
Loss rate: 1.70%

Run 1: Report of TCP BBR — Data Link

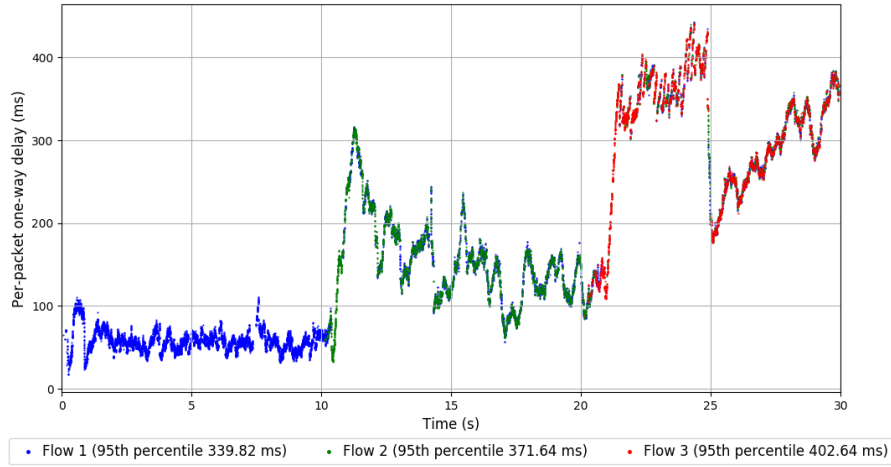
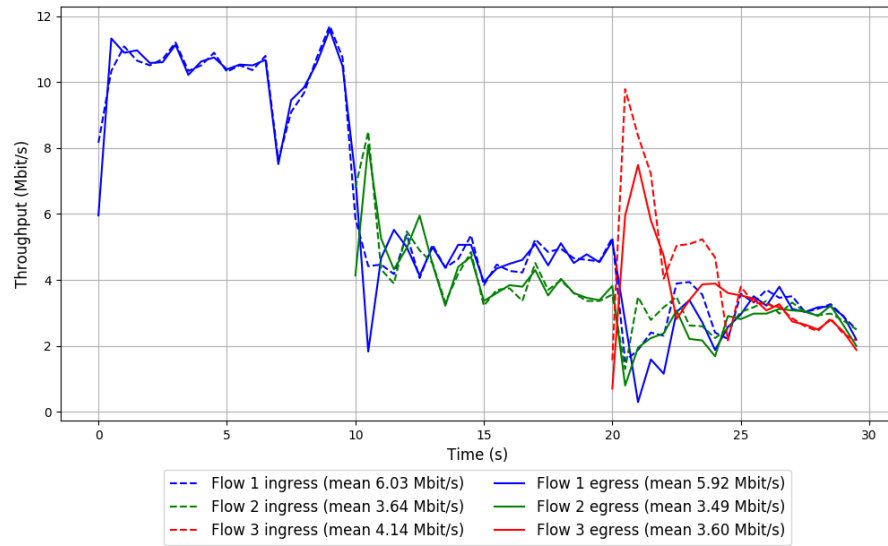


Run 2: Statistics of TCP BBR

Start at: 2017-12-20 18:18:43
End at: 2017-12-20 18:19:13
Local clock offset: 0.571 ms
Remote clock offset: -2.515 ms

Below is generated by plot.py at 2017-12-20 19:39:44
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.42 Mbit/s
95th percentile per-packet one-way delay: 368.113 ms
Loss rate: 4.33%
-- Flow 1:
Average throughput: 5.92 Mbit/s
95th percentile per-packet one-way delay: 339.824 ms
Loss rate: 2.03%
-- Flow 2:
Average throughput: 3.49 Mbit/s
95th percentile per-packet one-way delay: 371.639 ms
Loss rate: 4.60%
-- Flow 3:
Average throughput: 3.60 Mbit/s
95th percentile per-packet one-way delay: 402.643 ms
Loss rate: 14.00%

Run 2: Report of TCP BBR — Data Link

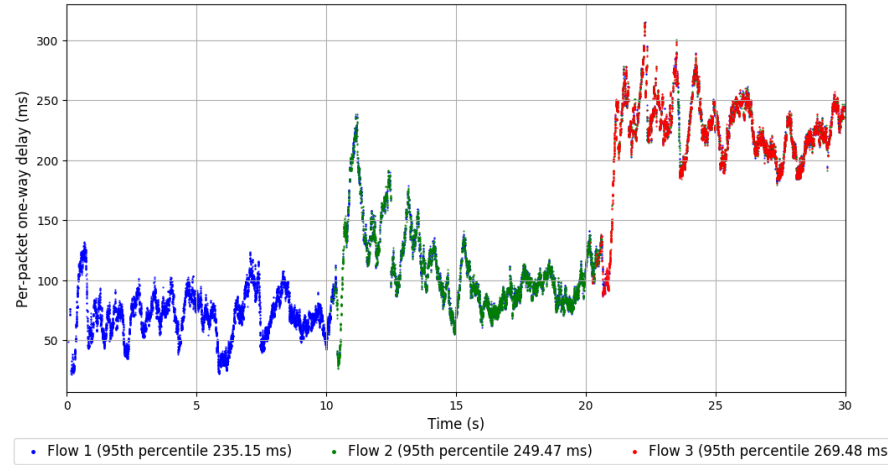
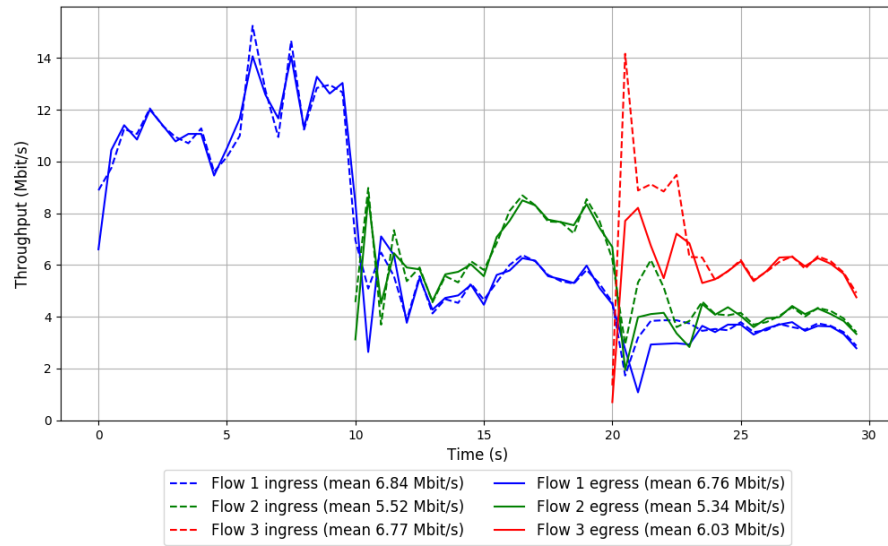


Run 3: Statistics of TCP BBR

Start at: 2017-12-20 18:36:35
End at: 2017-12-20 18:37:05
Local clock offset: 0.656 ms
Remote clock offset: -2.366 ms

Below is generated by plot.py at 2017-12-20 19:39:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 12.28 Mbit/s
95th percentile per-packet one-way delay: 249.337 ms
Loss rate: 3.94%
-- Flow 1:
Average throughput: 6.76 Mbit/s
95th percentile per-packet one-way delay: 235.152 ms
Loss rate: 1.40%
-- Flow 2:
Average throughput: 5.34 Mbit/s
95th percentile per-packet one-way delay: 249.465 ms
Loss rate: 3.60%
-- Flow 3:
Average throughput: 6.03 Mbit/s
95th percentile per-packet one-way delay: 269.483 ms
Loss rate: 12.22%

Run 3: Report of TCP BBR — Data Link

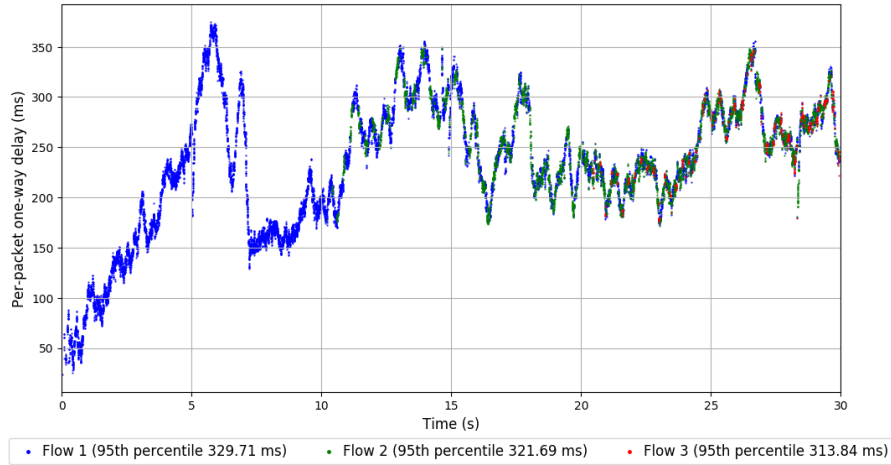
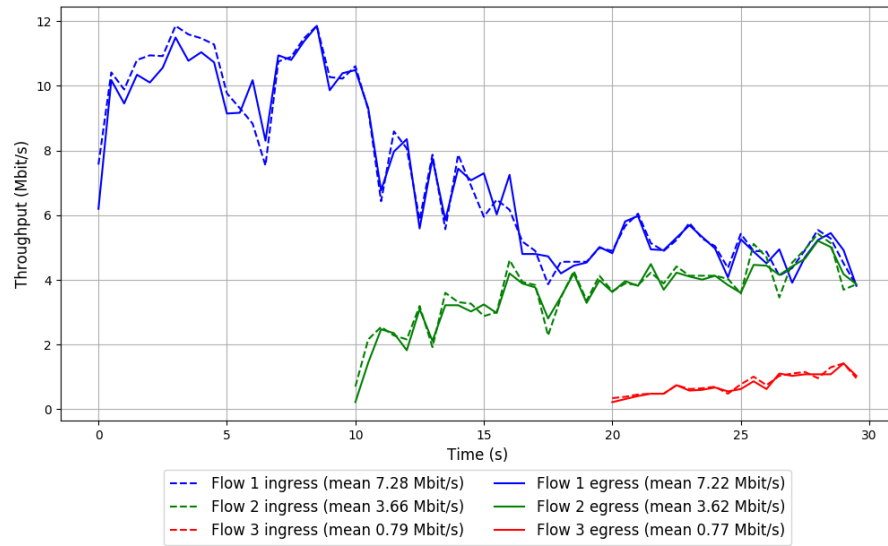


Run 1: Statistics of TCP Cubic

Start at: 2017-12-20 17:54:57
End at: 2017-12-20 17:55:27
Local clock offset: 0.636 ms
Remote clock offset: -2.519 ms

Below is generated by plot.py at 2017-12-20 19:39:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.86 Mbit/s
95th percentile per-packet one-way delay: 328.118 ms
Loss rate: 1.29%
-- Flow 1:
Average throughput: 7.22 Mbit/s
95th percentile per-packet one-way delay: 329.711 ms
Loss rate: 0.90%
-- Flow 2:
Average throughput: 3.62 Mbit/s
95th percentile per-packet one-way delay: 321.689 ms
Loss rate: 2.04%
-- Flow 3:
Average throughput: 0.77 Mbit/s
95th percentile per-packet one-way delay: 313.843 ms
Loss rate: 5.03%

Run 1: Report of TCP Cubic — Data Link

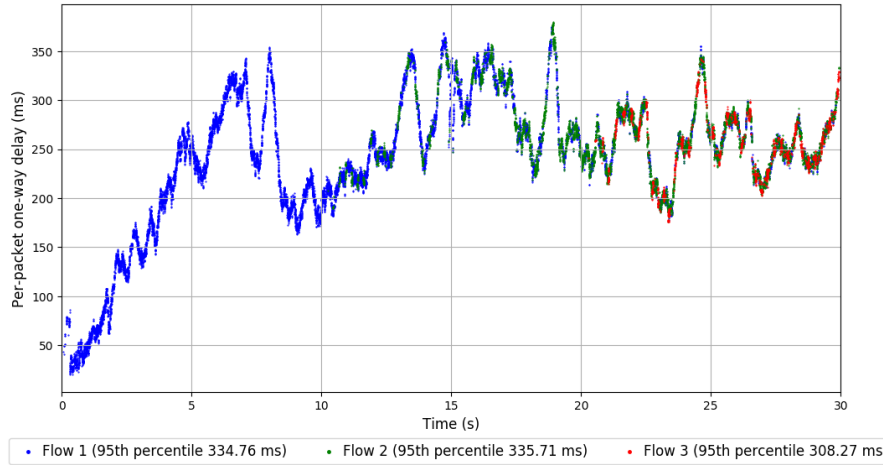
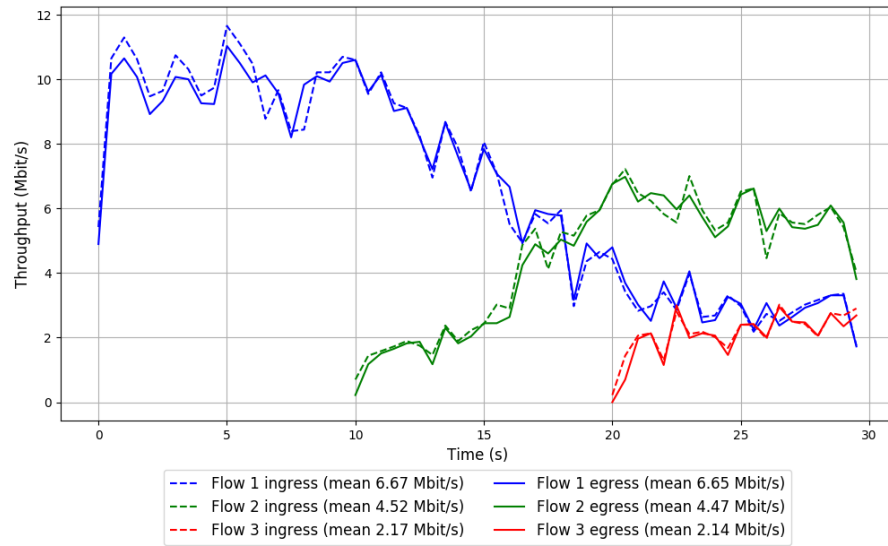


Run 2: Statistics of TCP Cubic

Start at: 2017-12-20 18:12:47
End at: 2017-12-20 18:13:17
Local clock offset: 0.632 ms
Remote clock offset: -2.565 ms

Below is generated by plot.py at 2017-12-20 19:39:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.27 Mbit/s
95th percentile per-packet one-way delay: 333.658 ms
Loss rate: 1.38%
-- Flow 1:
Average throughput: 6.65 Mbit/s
95th percentile per-packet one-way delay: 334.765 ms
Loss rate: 0.74%
-- Flow 2:
Average throughput: 4.47 Mbit/s
95th percentile per-packet one-way delay: 335.708 ms
Loss rate: 2.11%
-- Flow 3:
Average throughput: 2.14 Mbit/s
95th percentile per-packet one-way delay: 308.270 ms
Loss rate: 4.24%

Run 2: Report of TCP Cubic — Data Link

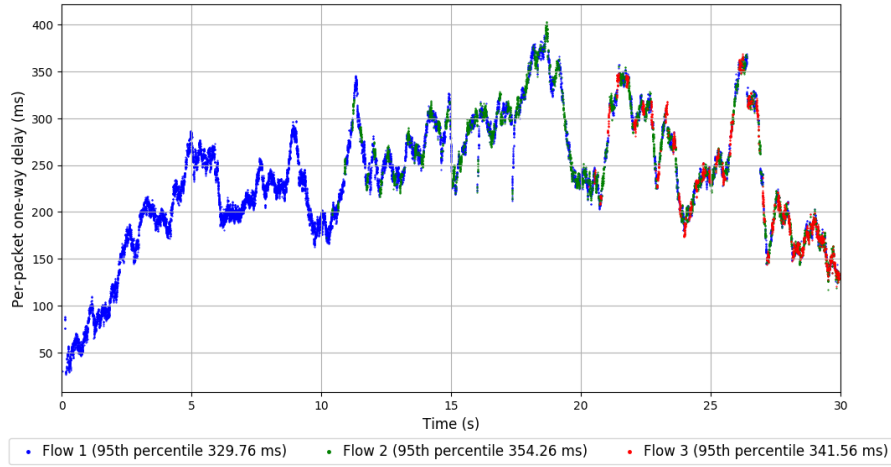
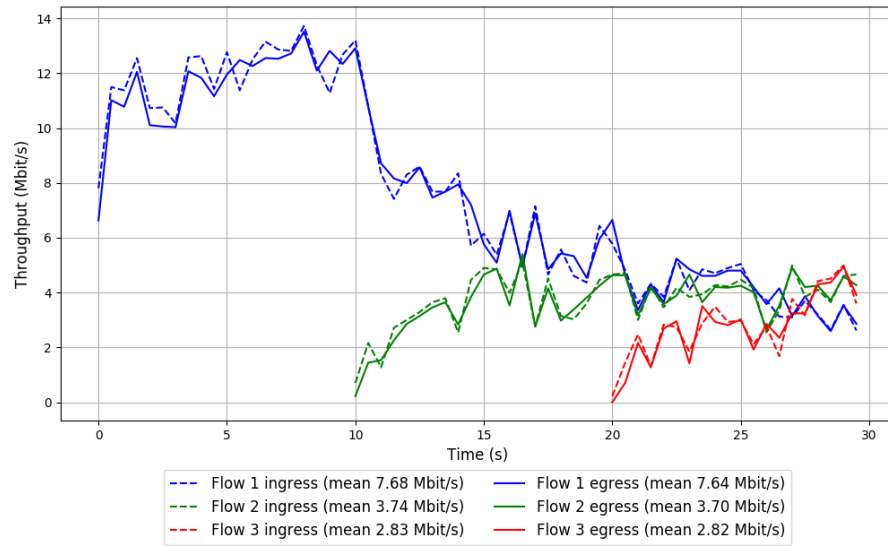


Run 3: Statistics of TCP Cubic

Start at: 2017-12-20 18:30:38
End at: 2017-12-20 18:31:08
Local clock offset: 0.551 ms
Remote clock offset: -2.353 ms

Below is generated by plot.py at 2017-12-20 19:39:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.99 Mbit/s
95th percentile per-packet one-way delay: 339.568 ms
Loss rate: 1.16%
-- Flow 1:
Average throughput: 7.64 Mbit/s
95th percentile per-packet one-way delay: 329.756 ms
Loss rate: 0.74%
-- Flow 2:
Average throughput: 3.70 Mbit/s
95th percentile per-packet one-way delay: 354.263 ms
Loss rate: 1.85%
-- Flow 3:
Average throughput: 2.82 Mbit/s
95th percentile per-packet one-way delay: 341.557 ms
Loss rate: 2.78%

Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of LEDBAT

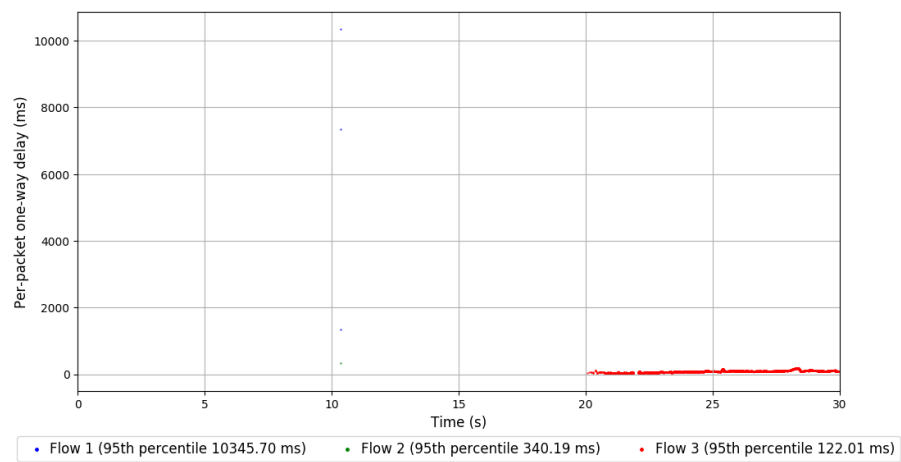
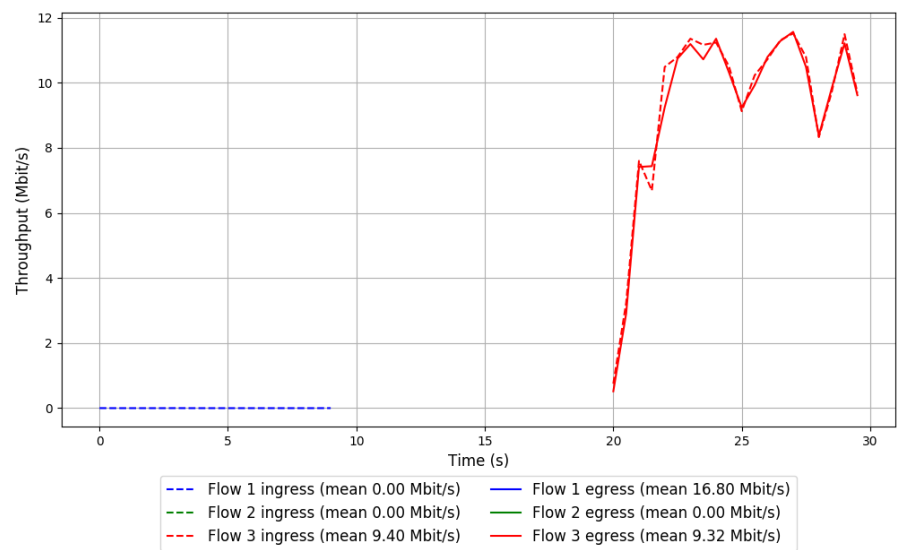
Start at: 2017-12-20 17:58:30

End at: 2017-12-20 17:59:00

Local clock offset: 0.523 ms

Remote clock offset: -2.619 ms

Run 1: Report of LEDBAT — Data Link

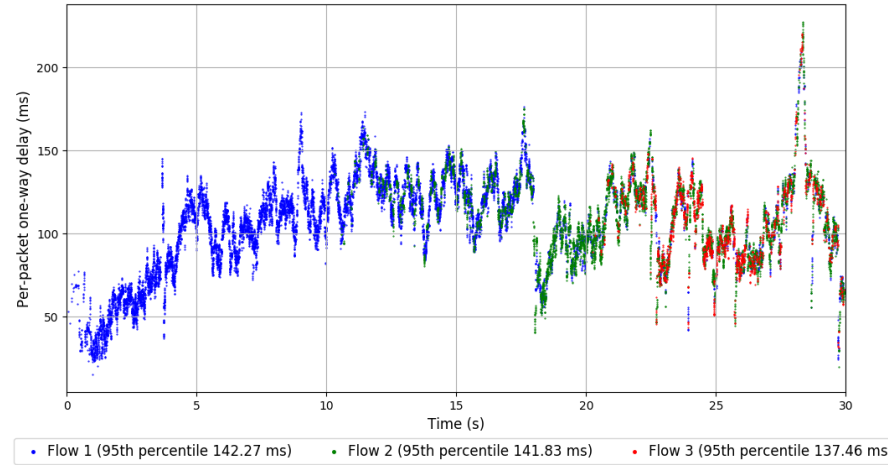
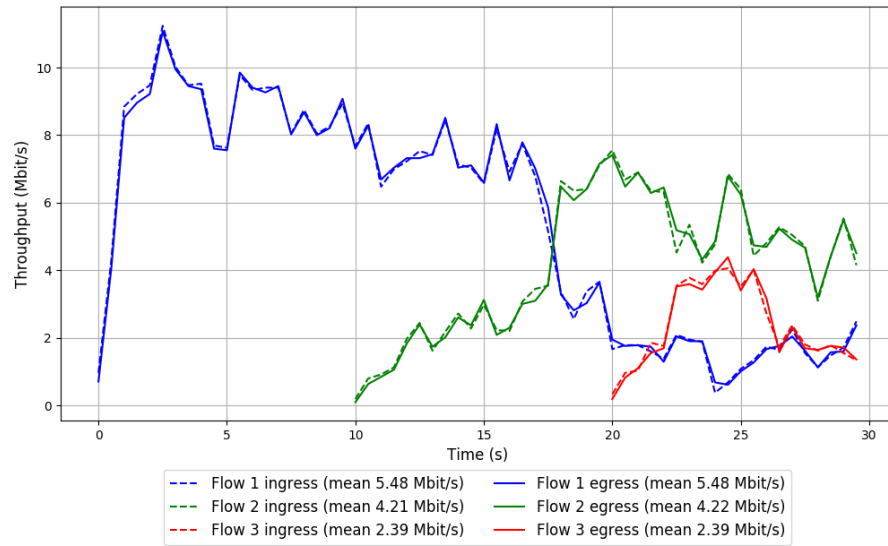


Run 2: Statistics of LEDBAT

Start at: 2017-12-20 18:16:21
End at: 2017-12-20 18:16:51
Local clock offset: 0.562 ms
Remote clock offset: -2.574 ms

Below is generated by plot.py at 2017-12-20 19:39:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.05 Mbit/s
95th percentile per-packet one-way delay: 141.783 ms
Loss rate: 0.45%
-- Flow 1:
Average throughput: 5.48 Mbit/s
95th percentile per-packet one-way delay: 142.274 ms
Loss rate: 0.32%
-- Flow 2:
Average throughput: 4.22 Mbit/s
95th percentile per-packet one-way delay: 141.826 ms
Loss rate: 0.56%
-- Flow 3:
Average throughput: 2.39 Mbit/s
95th percentile per-packet one-way delay: 137.455 ms
Loss rate: 0.99%

Run 2: Report of LEDBAT — Data Link



Run 3: Statistics of LEDBAT

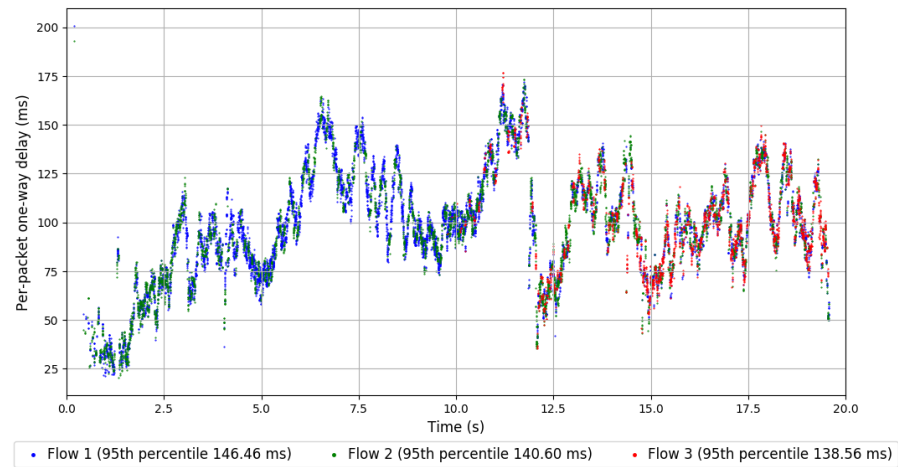
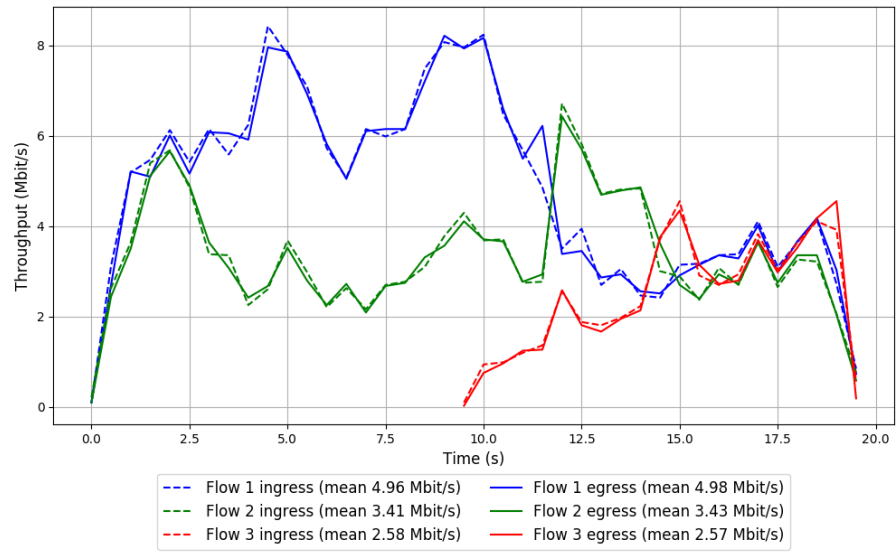
Start at: 2017-12-20 18:34:13

End at: 2017-12-20 18:34:43

Local clock offset: 0.544 ms

Remote clock offset: -2.386 ms

Run 3: Report of LEDBAT — Data Link

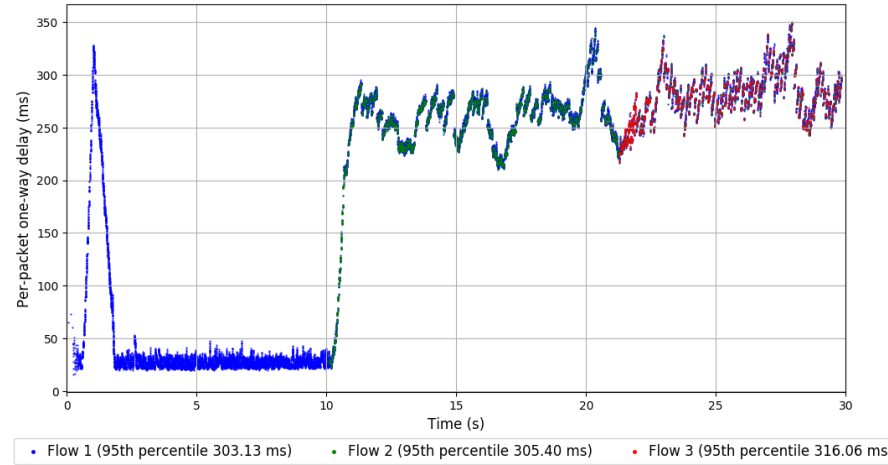
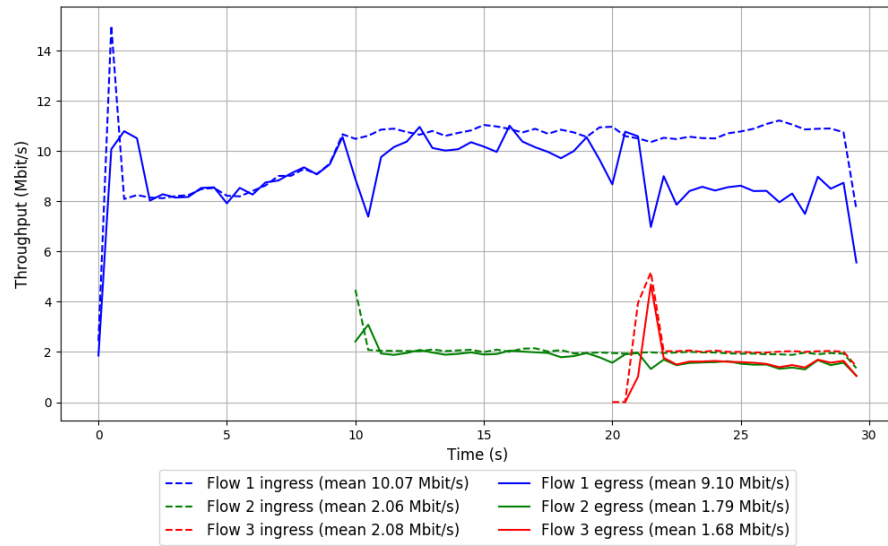


Run 1: Statistics of PCC

Start at: 2017-12-20 18:03:17
End at: 2017-12-20 18:03:47
Local clock offset: 0.624 ms
Remote clock offset: -2.568 ms

Below is generated by plot.py at 2017-12-20 19:40:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.80 Mbit/s
95th percentile per-packet one-way delay: 304.261 ms
Loss rate: 11.16%
-- Flow 1:
Average throughput: 9.10 Mbit/s
95th percentile per-packet one-way delay: 303.132 ms
Loss rate: 9.91%
-- Flow 2:
Average throughput: 1.79 Mbit/s
95th percentile per-packet one-way delay: 305.400 ms
Loss rate: 13.17%
-- Flow 3:
Average throughput: 1.68 Mbit/s
95th percentile per-packet one-way delay: 316.064 ms
Loss rate: 25.65%

Run 1: Report of PCC — Data Link

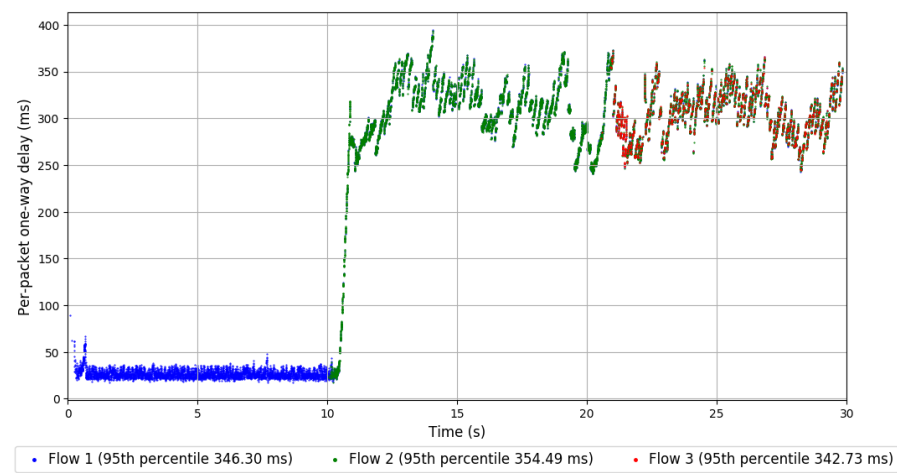
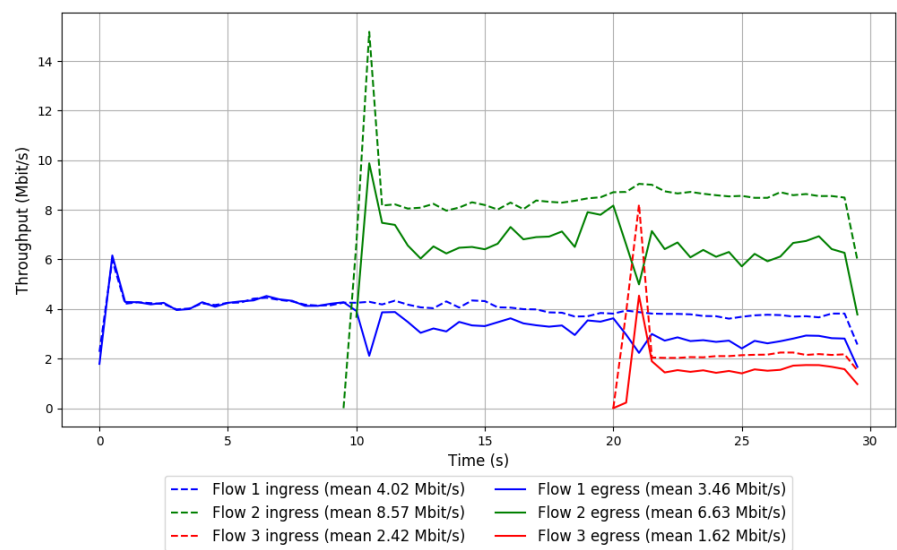


Run 2: Statistics of PCC

Start at: 2017-12-20 18:21:08
End at: 2017-12-20 18:21:38
Local clock offset: 0.588 ms
Remote clock offset: -2.455 ms

Below is generated by plot.py at 2017-12-20 19:40:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 8.40 Mbit/s
95th percentile per-packet one-way delay: 351.178 ms
Loss rate: 20.39%
-- Flow 1:
Average throughput: 3.46 Mbit/s
95th percentile per-packet one-way delay: 346.301 ms
Loss rate: 14.12%
-- Flow 2:
Average throughput: 6.63 Mbit/s
95th percentile per-packet one-way delay: 354.490 ms
Loss rate: 22.78%
-- Flow 3:
Average throughput: 1.62 Mbit/s
95th percentile per-packet one-way delay: 342.726 ms
Loss rate: 34.94%

Run 2: Report of PCC — Data Link

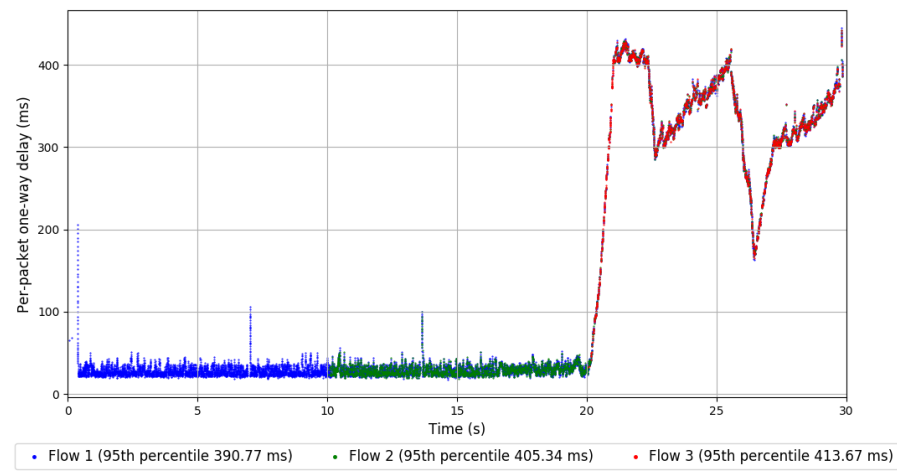
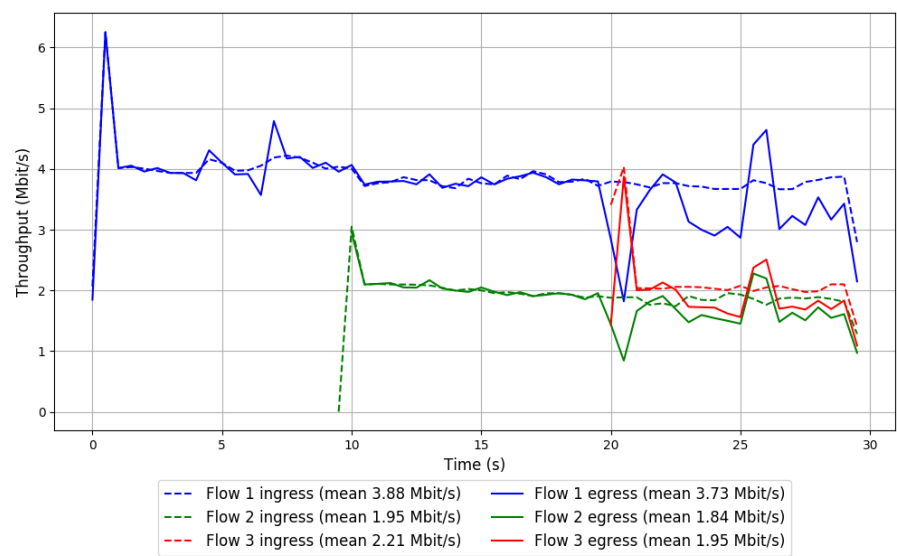


Run 3: Statistics of PCC

Start at: 2017-12-20 18:39:00
End at: 2017-12-20 18:39:30
Local clock offset: 0.657 ms
Remote clock offset: -2.377 ms

Below is generated by plot.py at 2017-12-20 19:40:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 5.60 Mbit/s
95th percentile per-packet one-way delay: 404.497 ms
Loss rate: 5.47%
-- Flow 1:
Average throughput: 3.73 Mbit/s
95th percentile per-packet one-way delay: 390.766 ms
Loss rate: 4.03%
-- Flow 2:
Average throughput: 1.84 Mbit/s
95th percentile per-packet one-way delay: 405.344 ms
Loss rate: 6.10%
-- Flow 3:
Average throughput: 1.95 Mbit/s
95th percentile per-packet one-way delay: 413.671 ms
Loss rate: 12.05%

Run 3: Report of PCC — Data Link

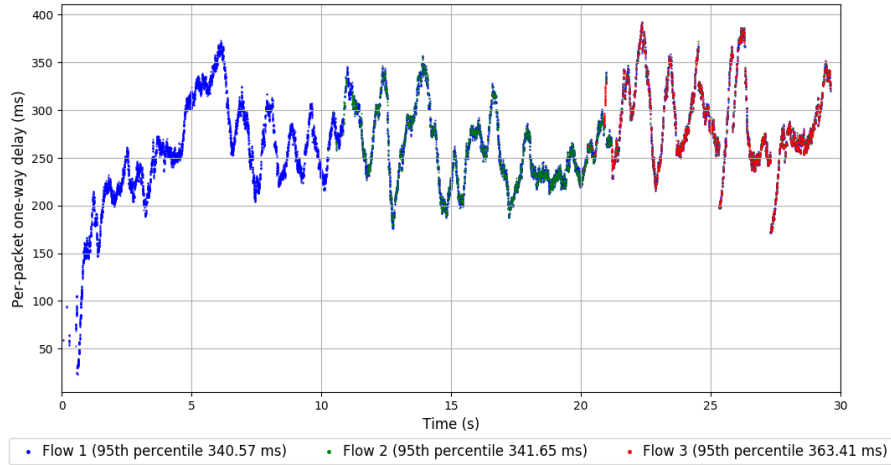
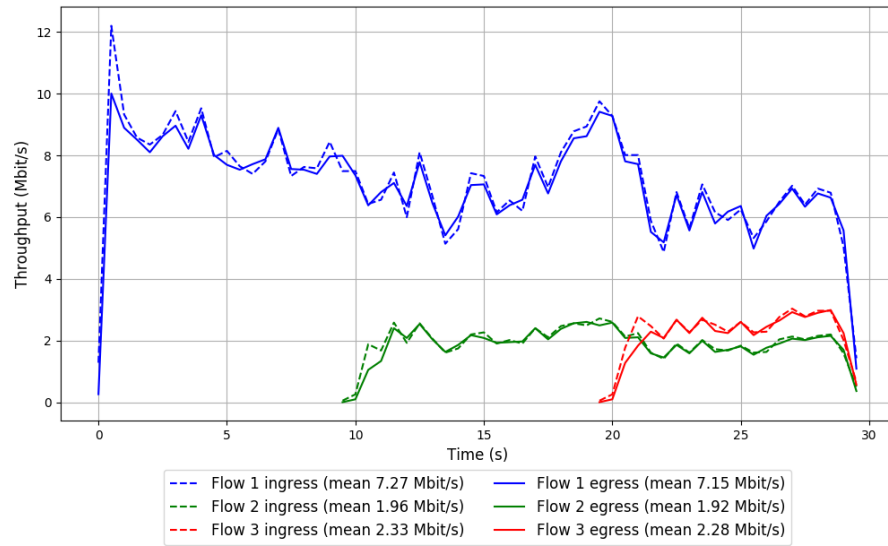


Run 1: Statistics of QUIC Cubic

Start at: 2017-12-20 17:52:34
End at: 2017-12-20 17:53:04
Local clock offset: 0.548 ms
Remote clock offset: -2.525 ms

Below is generated by plot.py at 2017-12-20 19:40:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.17 Mbit/s
95th percentile per-packet one-way delay: 342.888 ms
Loss rate: 2.33%
-- Flow 1:
Average throughput: 7.15 Mbit/s
95th percentile per-packet one-way delay: 340.574 ms
Loss rate: 1.95%
-- Flow 2:
Average throughput: 1.92 Mbit/s
95th percentile per-packet one-way delay: 341.648 ms
Loss rate: 3.08%
-- Flow 3:
Average throughput: 2.28 Mbit/s
95th percentile per-packet one-way delay: 363.406 ms
Loss rate: 4.56%

Run 1: Report of QUIC Cubic — Data Link

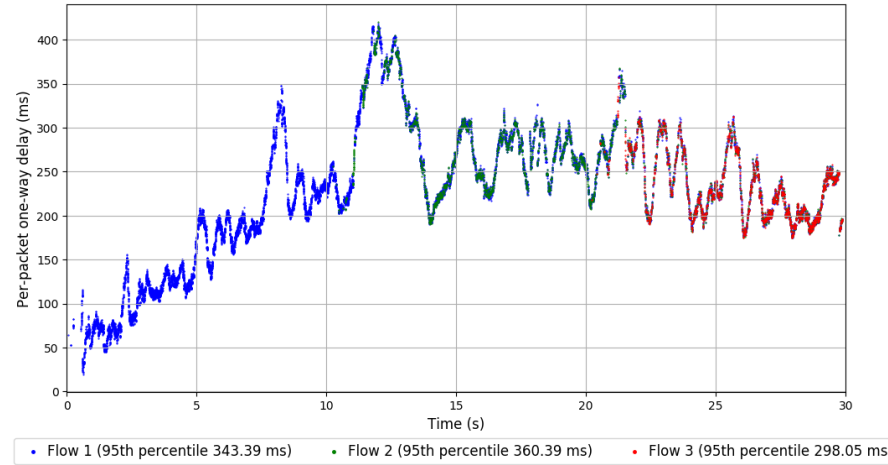
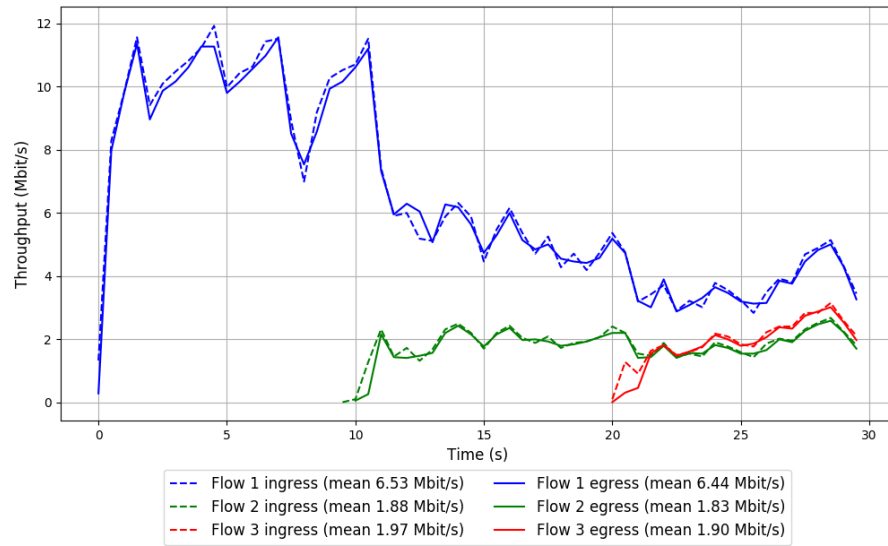


Run 2: Statistics of QUIC Cubic

Start at: 2017-12-20 18:10:24
End at: 2017-12-20 18:10:54
Local clock offset: 0.644 ms
Remote clock offset: -2.462 ms

Below is generated by plot.py at 2017-12-20 19:40:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 8.26 Mbit/s
95th percentile per-packet one-way delay: 342.006 ms
Loss rate: 2.32%
-- Flow 1:
Average throughput: 6.44 Mbit/s
95th percentile per-packet one-way delay: 343.391 ms
Loss rate: 1.66%
-- Flow 2:
Average throughput: 1.83 Mbit/s
95th percentile per-packet one-way delay: 360.387 ms
Loss rate: 3.91%
-- Flow 3:
Average throughput: 1.90 Mbit/s
95th percentile per-packet one-way delay: 298.053 ms
Loss rate: 5.88%

Run 2: Report of QUIC Cubic — Data Link

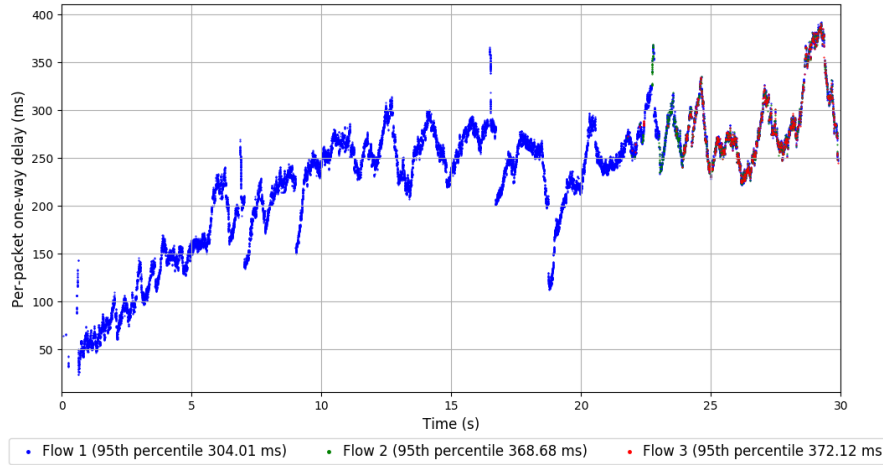
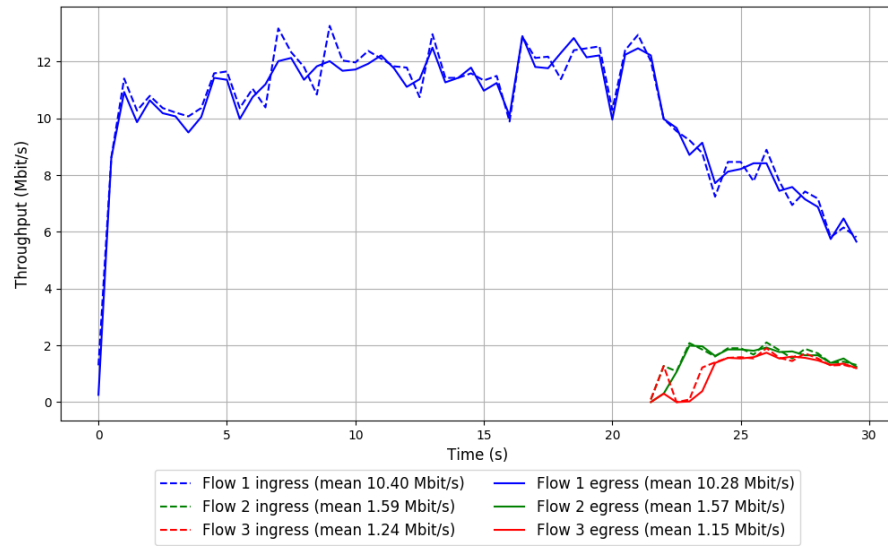


Run 3: Statistics of QUIC Cubic

Start at: 2017-12-20 18:28:15
End at: 2017-12-20 18:28:45
Local clock offset: 0.635 ms
Remote clock offset: -2.311 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.02 Mbit/s
95th percentile per-packet one-way delay: 310.957 ms
Loss rate: 1.78%
-- Flow 1:
Average throughput: 10.28 Mbit/s
95th percentile per-packet one-way delay: 304.014 ms
Loss rate: 1.37%
-- Flow 2:
Average throughput: 1.57 Mbit/s
95th percentile per-packet one-way delay: 368.676 ms
Loss rate: 4.67%
-- Flow 3:
Average throughput: 1.15 Mbit/s
95th percentile per-packet one-way delay: 372.115 ms
Loss rate: 10.48%

Run 3: Report of QUIC Cubic — Data Link

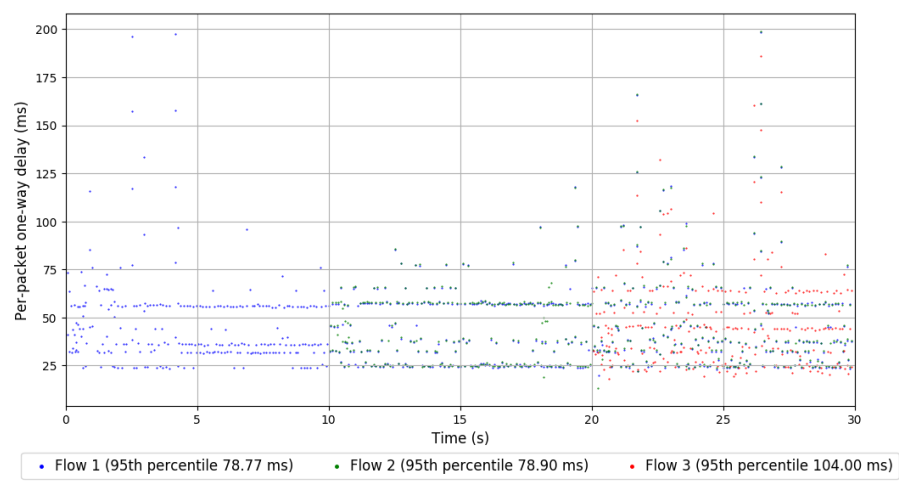
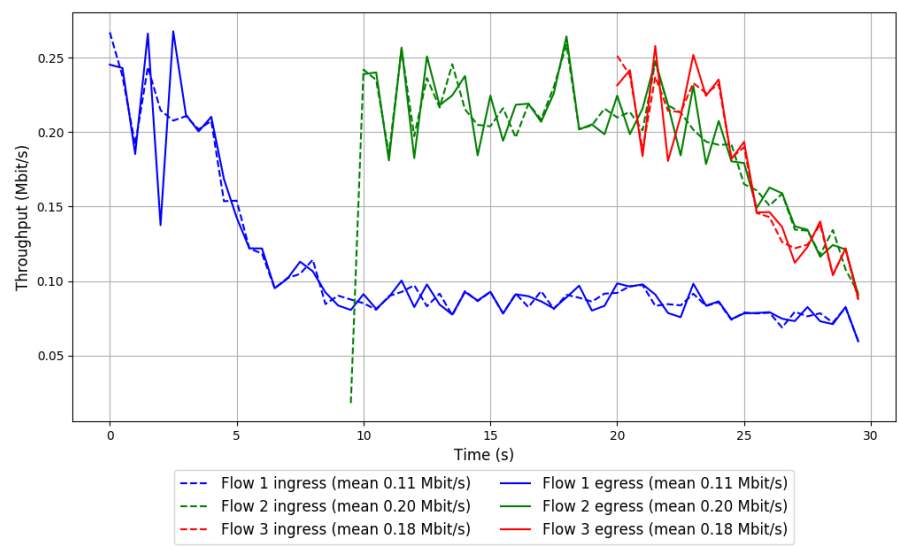


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Run 1: Statistics of SCReAM

Start at: 2017-12-20 18:08:02
End at: 2017-12-20 18:08:32
Local clock offset: 0.559 ms
Remote clock offset: -2.447 ms

# Below is generated by plot.py at 2017-12-20 19:40:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 82.940 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 78.772 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 78.904 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 103.999 ms
Loss rate: 0.23%
```

Run 1: Report of SReAM — Data Link

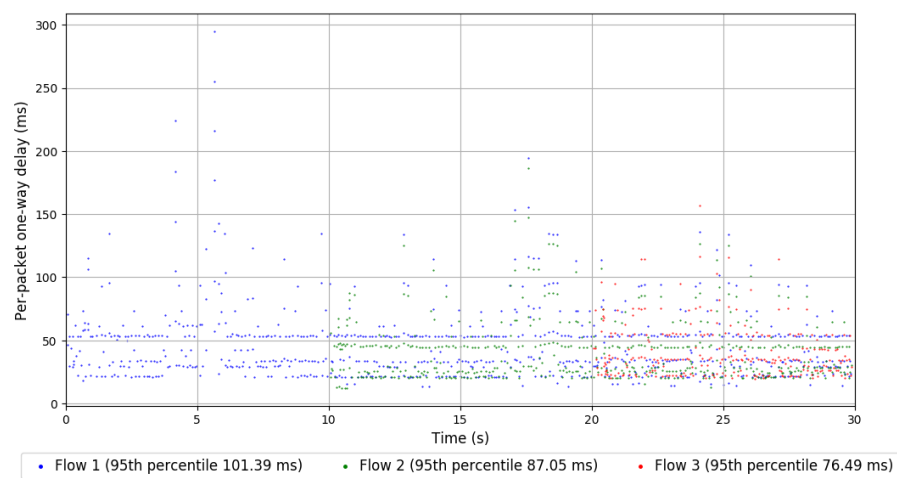
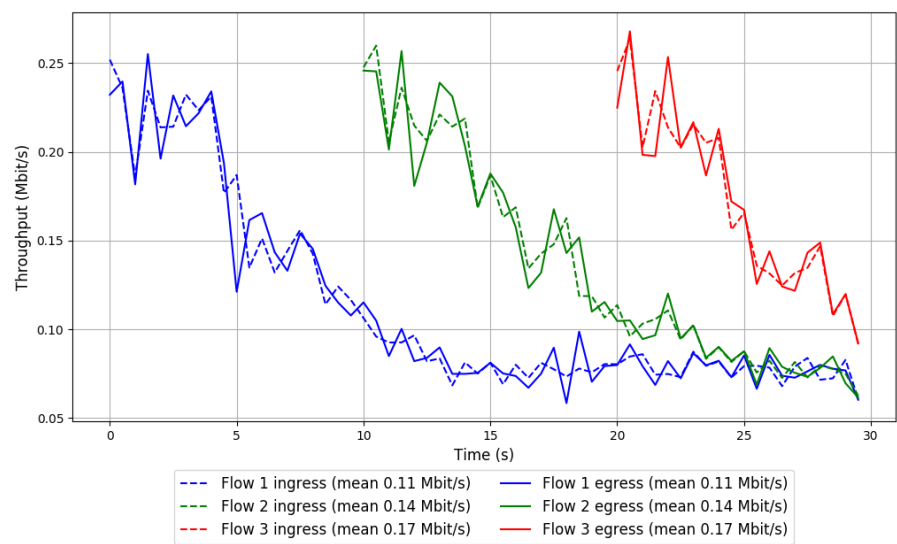


Run 2: Statistics of SCReAM

Start at: 2017-12-20 18:25:53
End at: 2017-12-20 18:26:23
Local clock offset: 0.553 ms
Remote clock offset: -2.348 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 94.743 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 101.386 ms
Loss rate: 0.29%
-- Flow 2:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 87.050 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 76.487 ms
Loss rate: 0.25%

Run 2: Report of SReAM — Data Link

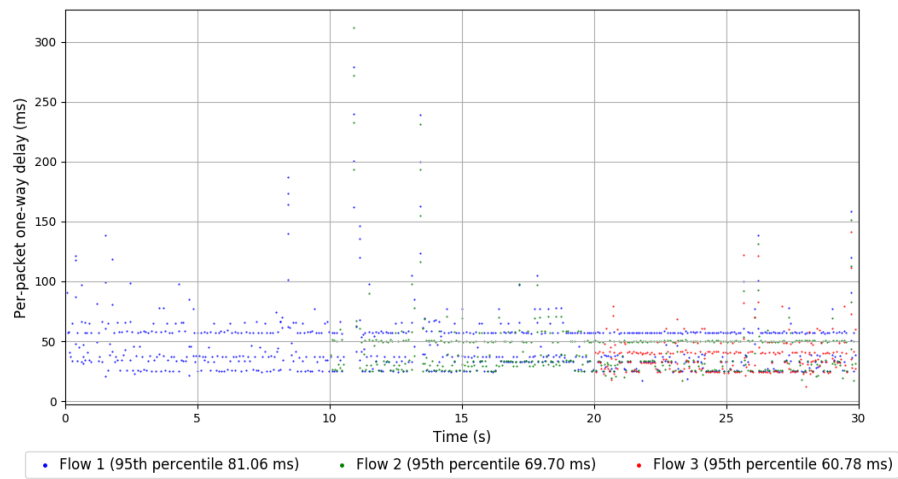
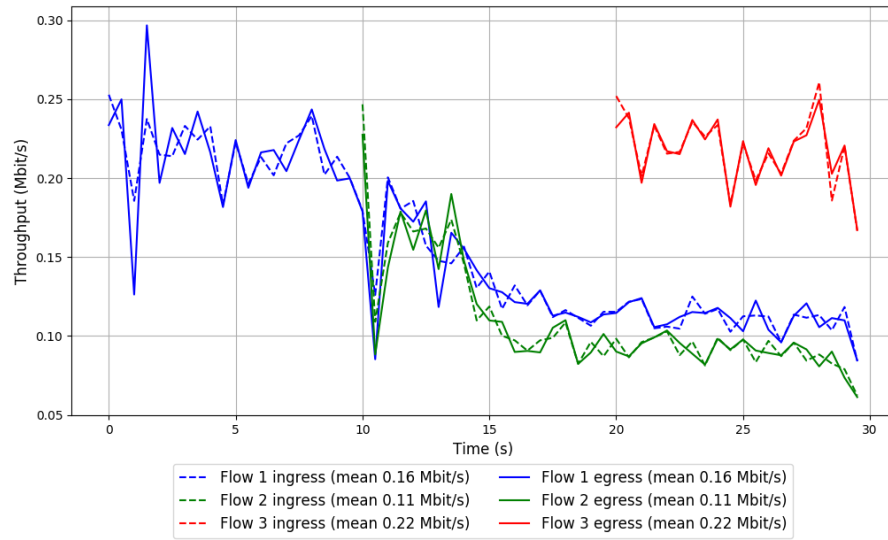


Run 3: Statistics of SCReAM

Start at: 2017-12-20 18:43:45
End at: 2017-12-20 18:44:15
Local clock offset: 0.579 ms
Remote clock offset: -2.468 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 77.167 ms
Loss rate: 0.63%
-- Flow 1:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 81.058 ms
Loss rate: 0.56%
-- Flow 2:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 69.701 ms
Loss rate: 1.05%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 60.784 ms
Loss rate: 0.36%

Run 3: Report of SReAM — Data Link

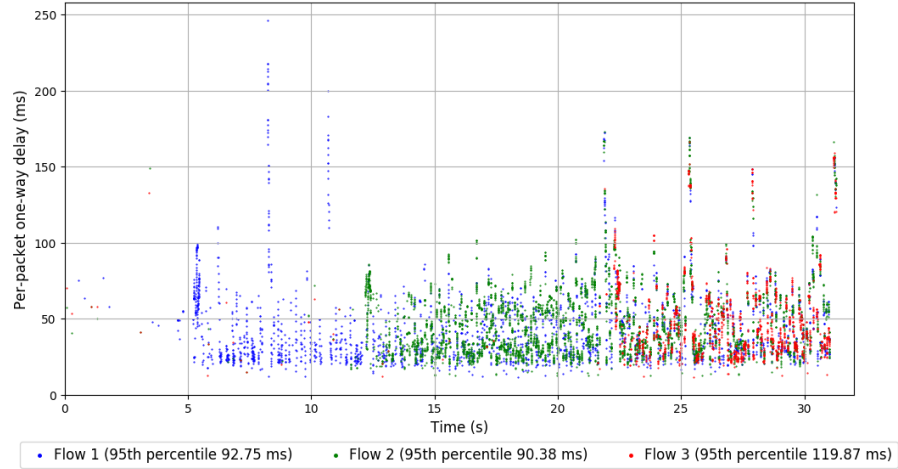
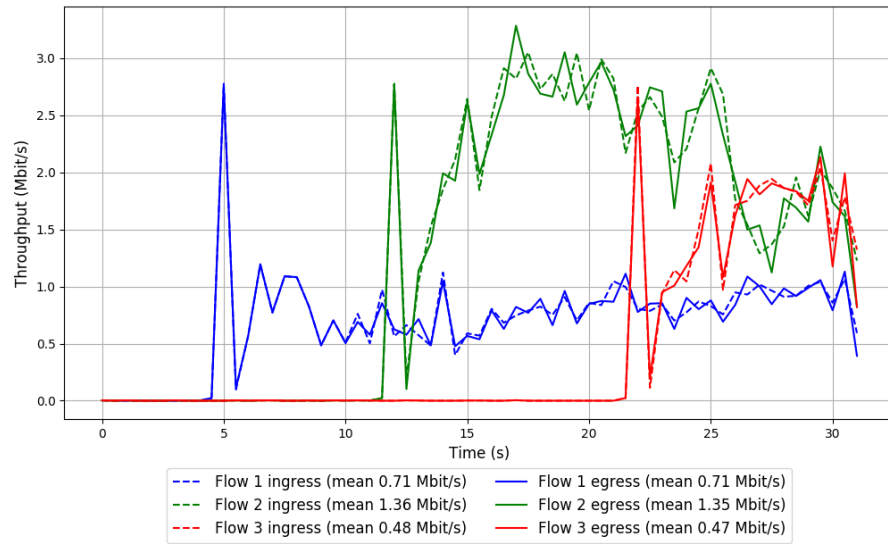


Run 1: Statistics of WebRTC media

Start at: 2017-12-20 17:59:41
End at: 2017-12-20 18:00:11
Local clock offset: 0.543 ms
Remote clock offset: -2.596 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 94.213 ms
Loss rate: 1.15%
-- Flow 1:
Average throughput: 0.71 Mbit/s
95th percentile per-packet one-way delay: 92.753 ms
Loss rate: 0.69%
-- Flow 2:
Average throughput: 1.35 Mbit/s
95th percentile per-packet one-way delay: 90.384 ms
Loss rate: 1.06%
-- Flow 3:
Average throughput: 0.47 Mbit/s
95th percentile per-packet one-way delay: 119.871 ms
Loss rate: 2.08%

Run 1: Report of WebRTC media — Data Link

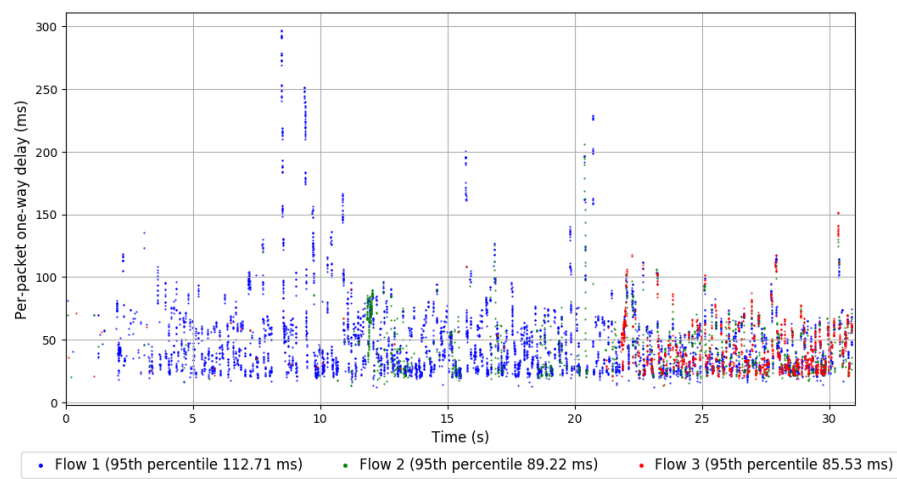
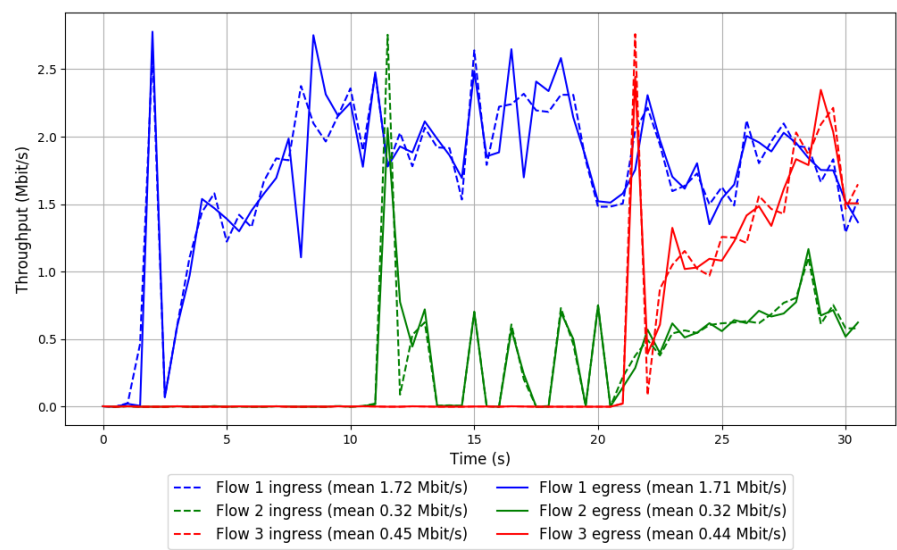


Run 2: Statistics of WebRTC media

Start at: 2017-12-20 18:17:32
End at: 2017-12-20 18:18:02
Local clock offset: 0.643 ms
Remote clock offset: -2.491 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.47 Mbit/s
95th percentile per-packet one-way delay: 102.893 ms
Loss rate: 0.78%
-- Flow 1:
Average throughput: 1.71 Mbit/s
95th percentile per-packet one-way delay: 112.711 ms
Loss rate: 0.78%
-- Flow 2:
Average throughput: 0.32 Mbit/s
95th percentile per-packet one-way delay: 89.216 ms
Loss rate: 0.28%
-- Flow 3:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 85.534 ms
Loss rate: 1.15%

Run 2: Report of WebRTC media — Data Link

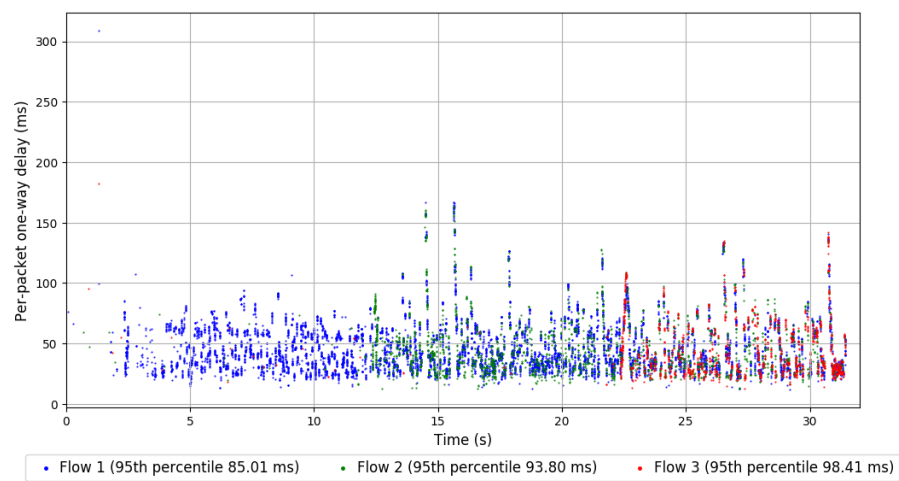
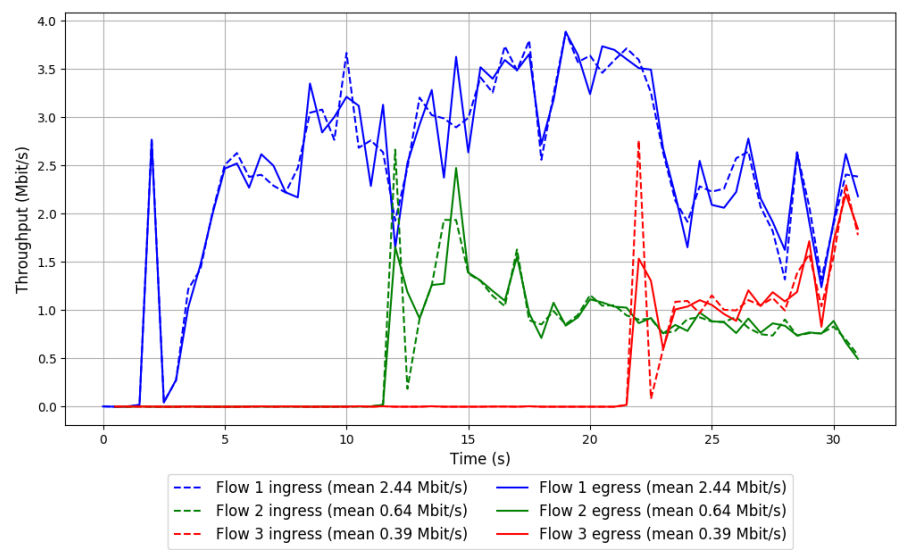


Run 3: Statistics of WebRTC media

Start at: 2017-12-20 18:35:24
End at: 2017-12-20 18:35:54
Local clock offset: 0.672 ms
Remote clock offset: -2.418 ms

Below is generated by plot.py at 2017-12-20 19:40:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 3.45 Mbit/s
95th percentile per-packet one-way delay: 89.218 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 2.44 Mbit/s
95th percentile per-packet one-way delay: 85.009 ms
Loss rate: 0.34%
-- Flow 2:
Average throughput: 0.64 Mbit/s
95th percentile per-packet one-way delay: 93.799 ms
Loss rate: 0.17%
-- Flow 3:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 98.412 ms
Loss rate: 0.63%

Run 3: Report of WebRTC media — Data Link



Run 1: Statistics of Sprout

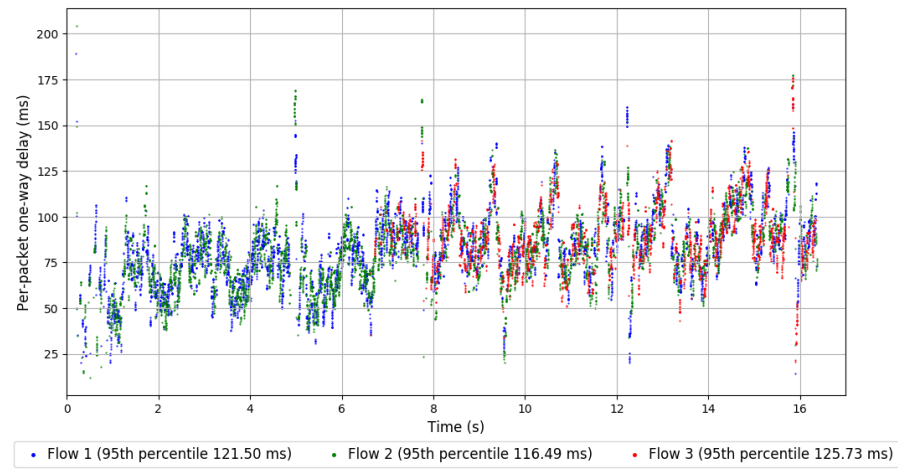
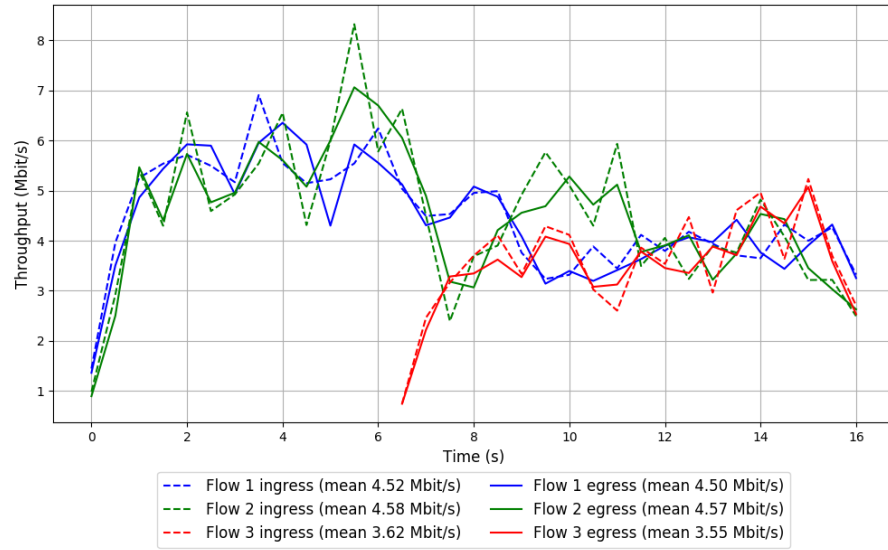
Start at: 2017-12-20 18:04:28

End at: 2017-12-20 18:04:58

Local clock offset: 0.636 ms

Remote clock offset: -2.556 ms

Run 1: Report of Sprout — Data Link

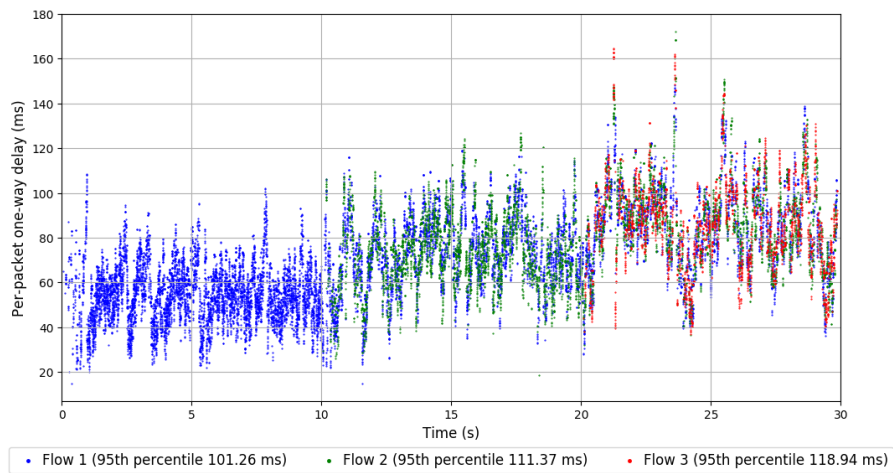
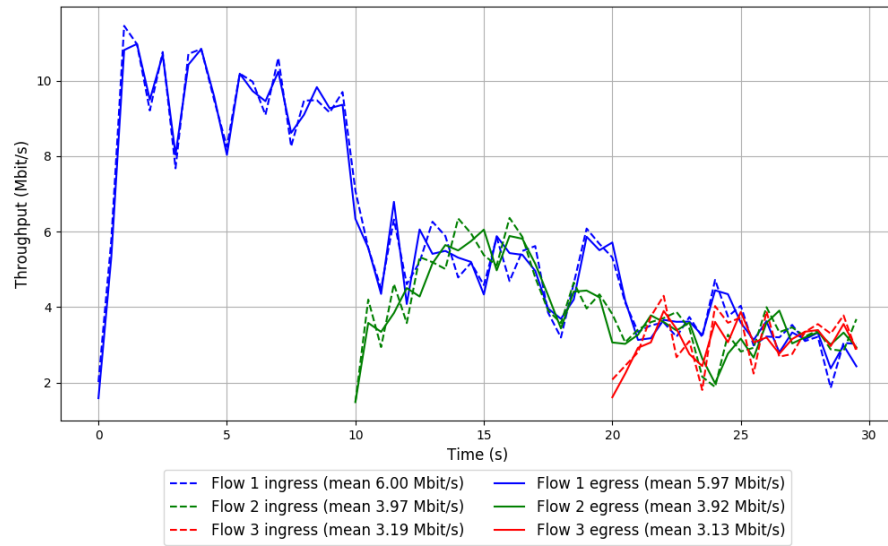


Run 2: Statistics of Sprout

Start at: 2017-12-20 18:22:19
End at: 2017-12-20 18:22:49
Local clock offset: 0.555 ms
Remote clock offset: -2.423 ms

```
# Below is generated by plot.py at 2017-12-20 19:40:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 9.60 Mbit/s
95th percentile per-packet one-way delay: 106.645 ms
Loss rate: 1.09%
-- Flow 1:
Average throughput: 5.97 Mbit/s
95th percentile per-packet one-way delay: 101.257 ms
Loss rate: 0.72%
-- Flow 2:
Average throughput: 3.92 Mbit/s
95th percentile per-packet one-way delay: 111.372 ms
Loss rate: 1.44%
-- Flow 3:
Average throughput: 3.13 Mbit/s
95th percentile per-packet one-way delay: 118.938 ms
Loss rate: 2.28%
```


Run 2: Report of Sprout — Data Link

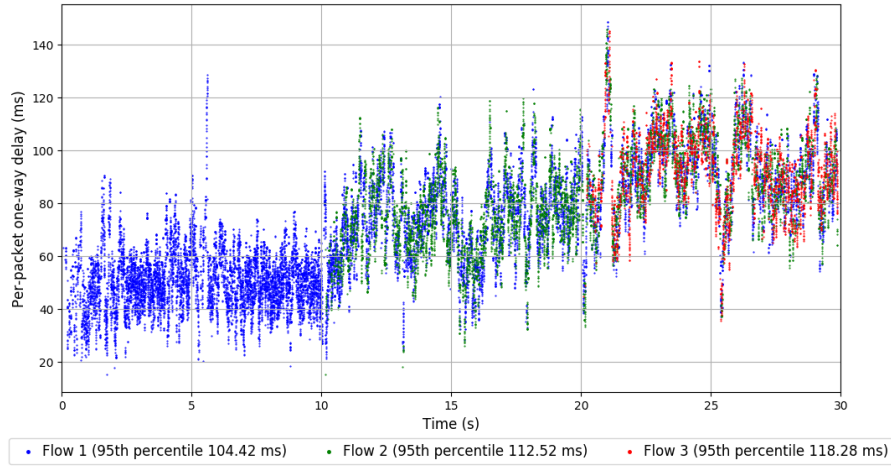
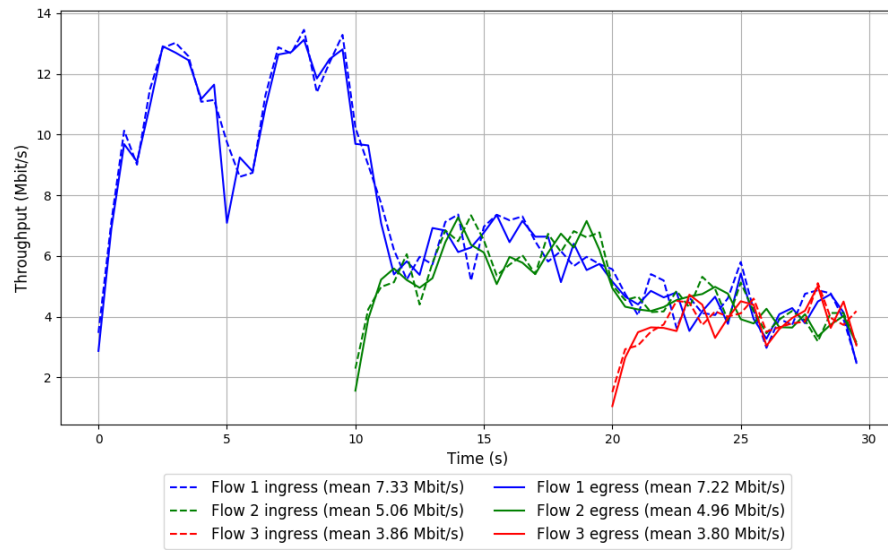


Run 3: Statistics of Sprout

Start at: 2017-12-20 18:40:11
End at: 2017-12-20 18:40:41
Local clock offset: 0.644 ms
Remote clock offset: -2.378 ms

Below is generated by plot.py at 2017-12-20 19:40:16
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.75 Mbit/s
95th percentile per-packet one-way delay: 109.815 ms
Loss rate: 2.05%
-- Flow 1:
Average throughput: 7.22 Mbit/s
95th percentile per-packet one-way delay: 104.421 ms
Loss rate: 1.81%
-- Flow 2:
Average throughput: 4.96 Mbit/s
95th percentile per-packet one-way delay: 112.523 ms
Loss rate: 2.44%
-- Flow 3:
Average throughput: 3.80 Mbit/s
95th percentile per-packet one-way delay: 118.276 ms
Loss rate: 2.42%

Run 3: Report of Sprout — Data Link

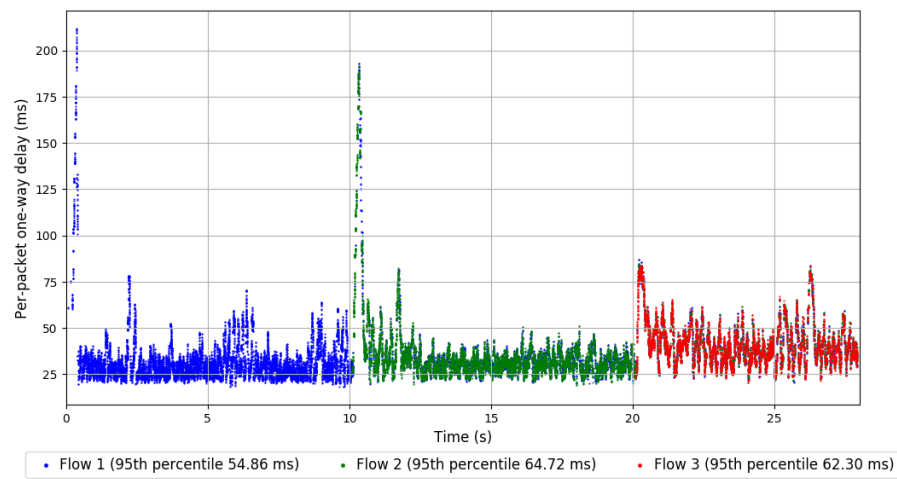
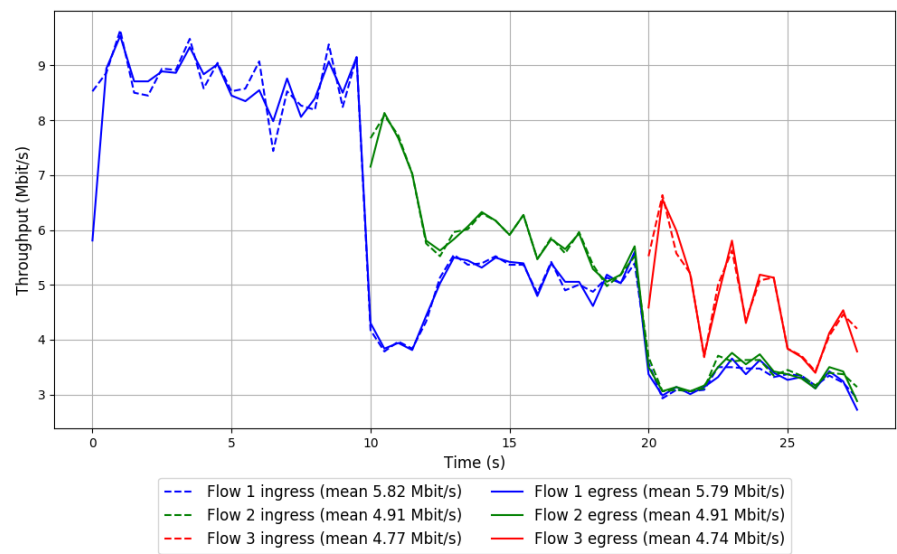


Run 1: Statistics of TaoVA-100x

Start at: 2017-12-20 18:06:50
End at: 2017-12-20 18:07:20
Local clock offset: 0.554 ms
Remote clock offset: -2.529 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.28 Mbit/s
95th percentile per-packet one-way delay: 58.950 ms
Loss rate: 0.67%
-- Flow 1:
Average throughput: 5.79 Mbit/s
95th percentile per-packet one-way delay: 54.859 ms
Loss rate: 0.75%
-- Flow 2:
Average throughput: 4.91 Mbit/s
95th percentile per-packet one-way delay: 64.717 ms
Loss rate: 0.30%
-- Flow 3:
Average throughput: 4.74 Mbit/s
95th percentile per-packet one-way delay: 62.299 ms
Loss rate: 1.21%

Run 1: Report of TaoVA-100x — Data Link

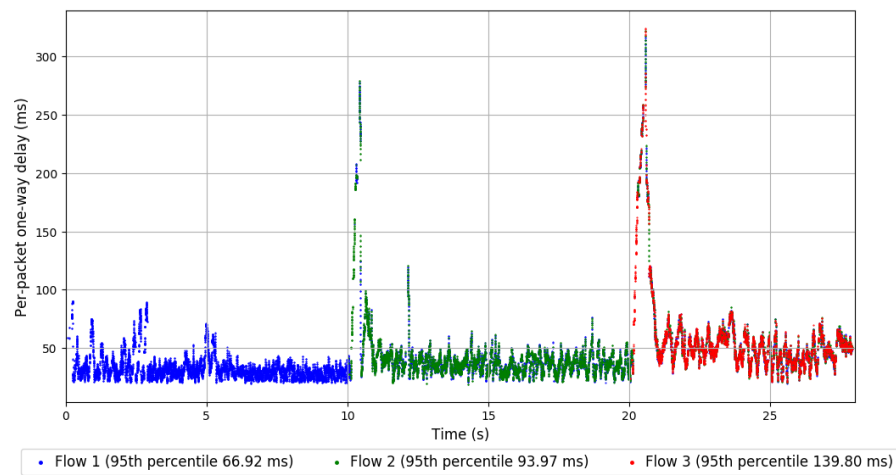
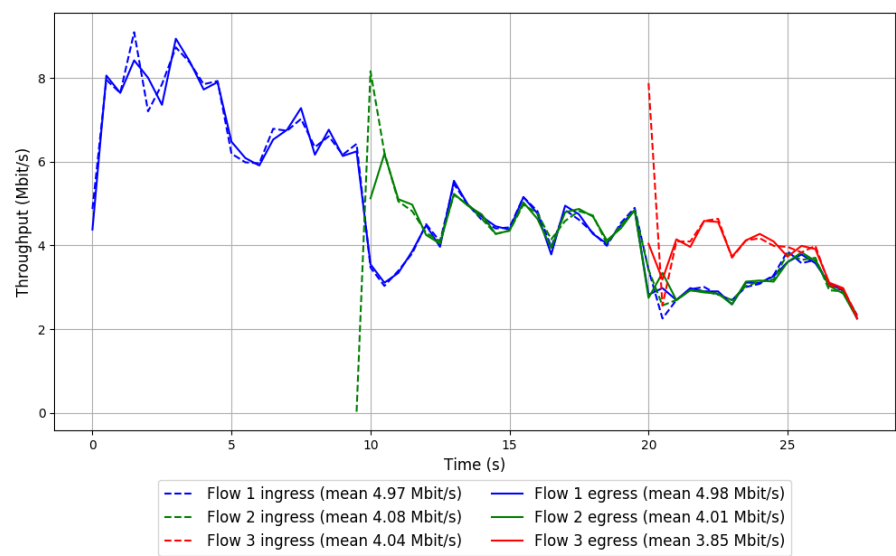


Run 2: Statistics of TaoVA-100x

Start at: 2017-12-20 18:24:41
End at: 2017-12-20 18:25:11
Local clock offset: 0.584 ms
Remote clock offset: -2.297 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 8.64 Mbit/s
95th percentile per-packet one-way delay: 76.703 ms
Loss rate: 1.38%
-- Flow 1:
Average throughput: 4.98 Mbit/s
95th percentile per-packet one-way delay: 66.917 ms
Loss rate: 0.18%
-- Flow 2:
Average throughput: 4.01 Mbit/s
95th percentile per-packet one-way delay: 93.972 ms
Loss rate: 2.04%
-- Flow 3:
Average throughput: 3.85 Mbit/s
95th percentile per-packet one-way delay: 139.799 ms
Loss rate: 5.11%

Run 2: Report of TaoVA-100x — Data Link

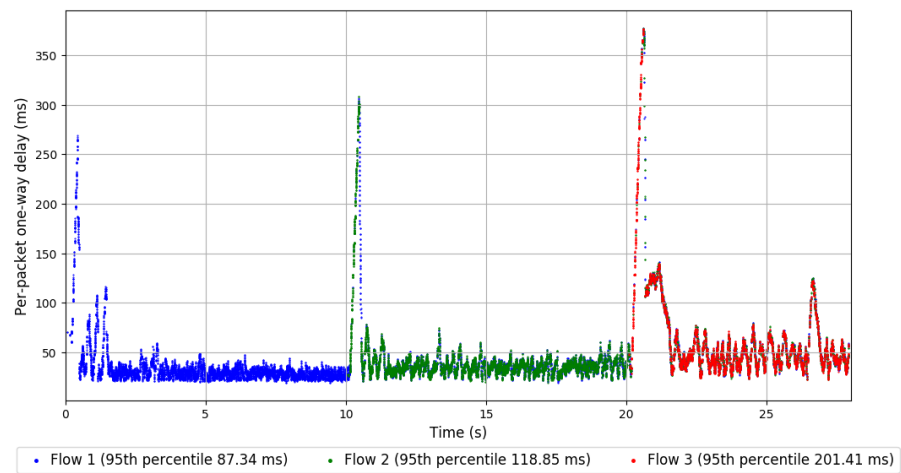
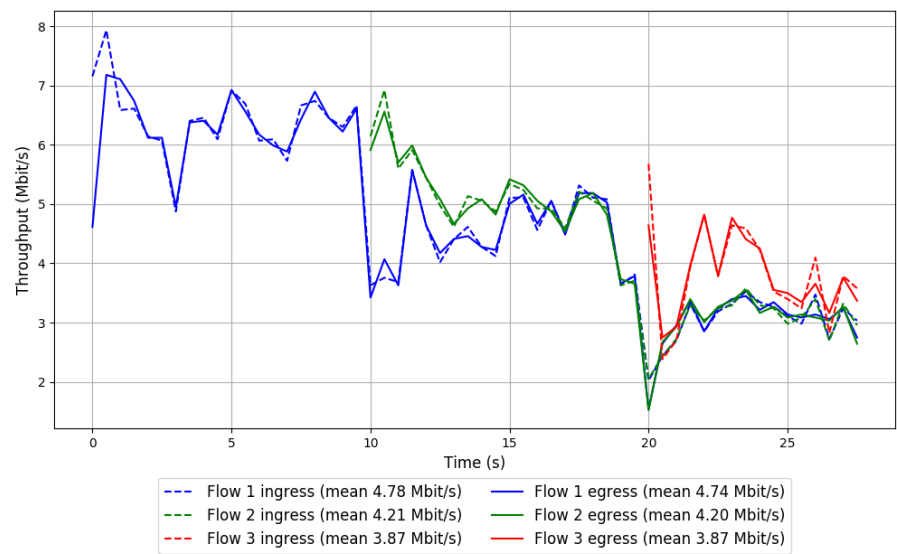


Run 3: Statistics of TaoVA-100x

Start at: 2017-12-20 18:42:33
End at: 2017-12-20 18:43:03
Local clock offset: 0.659 ms
Remote clock offset: -2.499 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 8.53 Mbit/s
95th percentile per-packet one-way delay: 114.030 ms
Loss rate: 0.81%
-- Flow 1:
Average throughput: 4.74 Mbit/s
95th percentile per-packet one-way delay: 87.343 ms
Loss rate: 1.04%
-- Flow 2:
Average throughput: 4.20 Mbit/s
95th percentile per-packet one-way delay: 118.854 ms
Loss rate: 0.38%
-- Flow 3:
Average throughput: 3.87 Mbit/s
95th percentile per-packet one-way delay: 201.415 ms
Loss rate: 0.89%

Run 3: Report of TaoVA-100x — Data Link

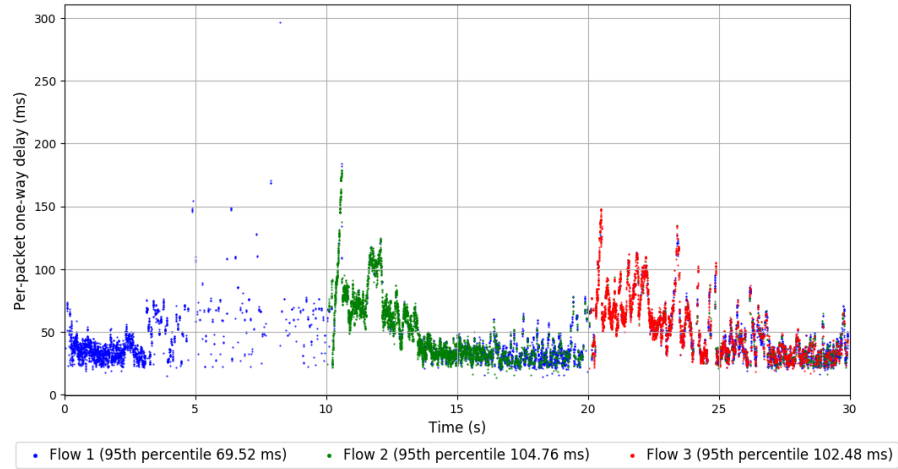
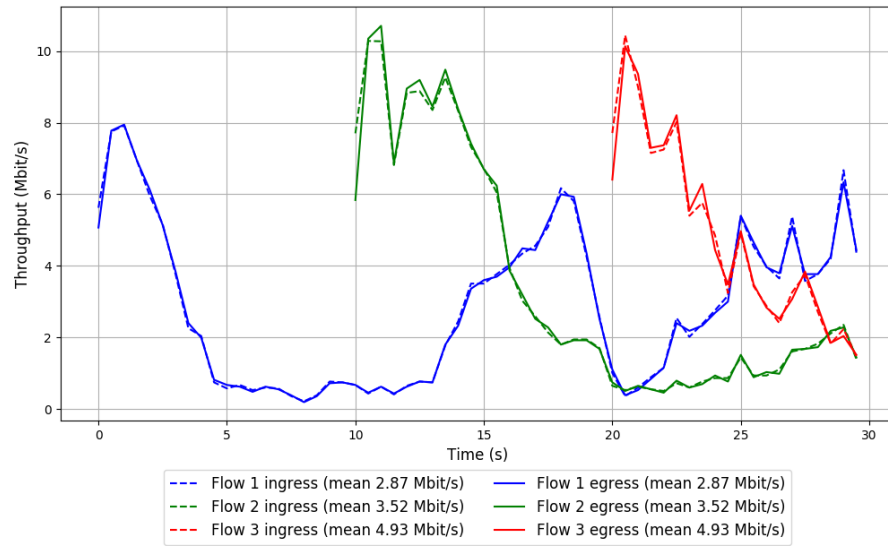


Run 1: Statistics of TCP Vegas

Start at: 2017-12-20 18:05:39
End at: 2017-12-20 18:06:09
Local clock offset: 0.538 ms
Remote clock offset: -2.553 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 6.84 Mbit/s
95th percentile per-packet one-way delay: 96.150 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 2.87 Mbit/s
95th percentile per-packet one-way delay: 69.515 ms
Loss rate: 0.33%
-- Flow 2:
Average throughput: 3.52 Mbit/s
95th percentile per-packet one-way delay: 104.756 ms
Loss rate: 0.10%
-- Flow 3:
Average throughput: 4.93 Mbit/s
95th percentile per-packet one-way delay: 102.485 ms
Loss rate: 0.20%

Run 1: Report of TCP Vegas — Data Link

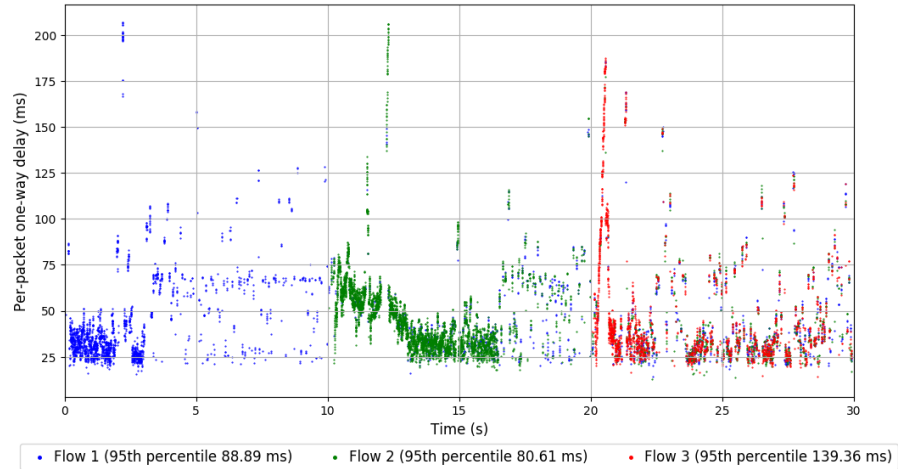
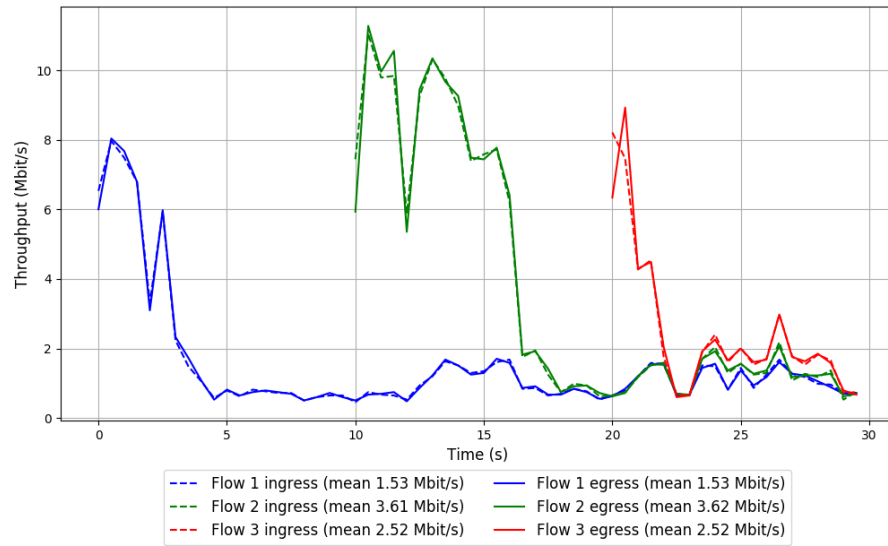


Run 2: Statistics of TCP Vegas

Start at: 2017-12-20 18:23:30
End at: 2017-12-20 18:24:00
Local clock offset: 0.581 ms
Remote clock offset: -2.304 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 4.77 Mbit/s
95th percentile per-packet one-way delay: 95.379 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 1.53 Mbit/s
95th percentile per-packet one-way delay: 88.894 ms
Loss rate: 0.21%
-- Flow 2:
Average throughput: 3.62 Mbit/s
95th percentile per-packet one-way delay: 80.612 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 2.52 Mbit/s
95th percentile per-packet one-way delay: 139.361 ms
Loss rate: 0.48%

Run 2: Report of TCP Vegas — Data Link

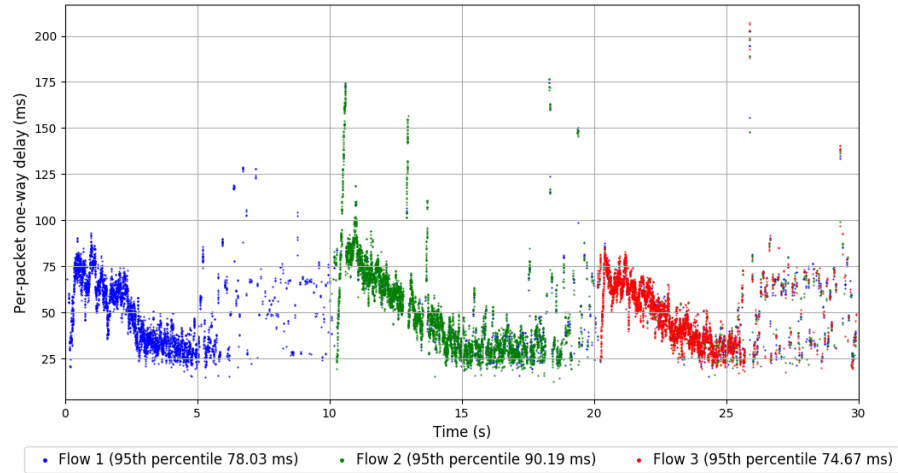
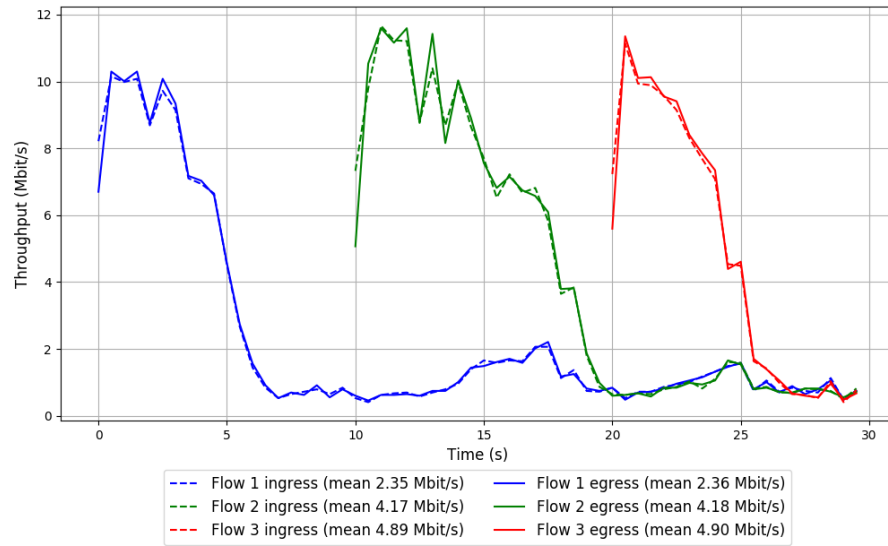


Run 3: Statistics of TCP Vegas

Start at: 2017-12-20 18:41:22
End at: 2017-12-20 18:41:52
Local clock offset: 0.57 ms
Remote clock offset: -2.472 ms

Below is generated by plot.py at 2017-12-20 19:40:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 6.75 Mbit/s
95th percentile per-packet one-way delay: 81.725 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 2.36 Mbit/s
95th percentile per-packet one-way delay: 78.028 ms
Loss rate: 0.12%
-- Flow 2:
Average throughput: 4.18 Mbit/s
95th percentile per-packet one-way delay: 90.195 ms
Loss rate: 0.10%
-- Flow 3:
Average throughput: 4.90 Mbit/s
95th percentile per-packet one-way delay: 74.668 ms
Loss rate: 0.22%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2017-12-20 17:53:46

End at: 2017-12-20 17:54:16

Local clock offset: 0.608 ms

Remote clock offset: -2.55 ms

Below is generated by plot.py at 2017-12-20 19:40:26

Datalink statistics

-- Total of 3 flows:

Average throughput: 9.80 Mbit/s

95th percentile per-packet one-way delay: 355.982 ms

Loss rate: 24.23%

-- Flow 1:

Average throughput: 6.72 Mbit/s

95th percentile per-packet one-way delay: 335.795 ms

Loss rate: 26.66%

-- Flow 2:

Average throughput: 3.55 Mbit/s

95th percentile per-packet one-way delay: 394.252 ms

Loss rate: 18.06%

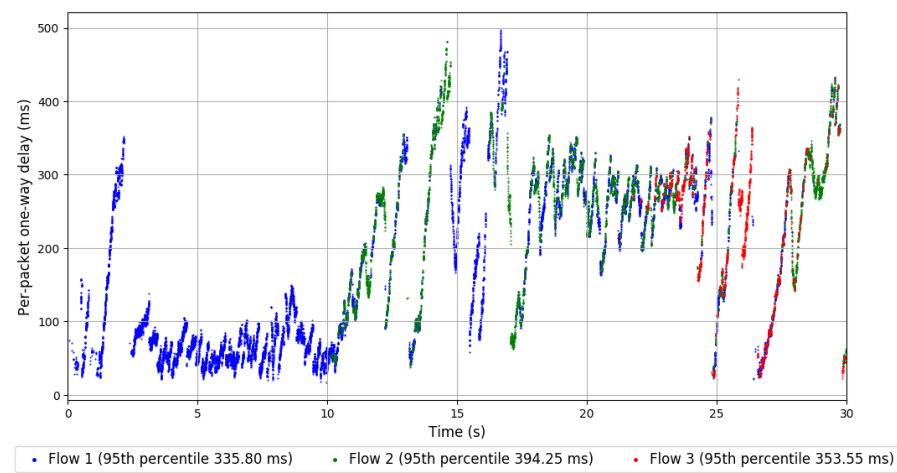
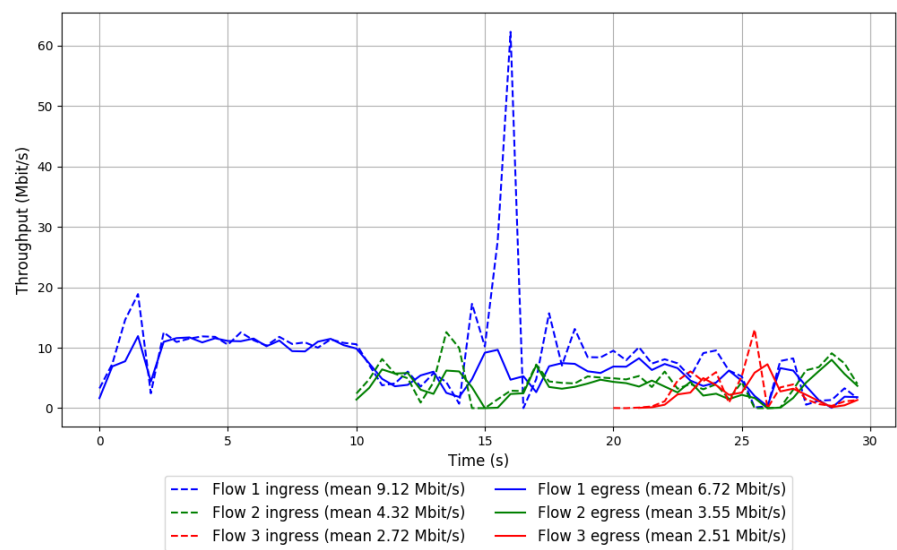
-- Flow 3:

Average throughput: 2.51 Mbit/s

95th percentile per-packet one-way delay: 353.552 ms

Loss rate: 19.36%

Run 1: Report of Verus — Data Link

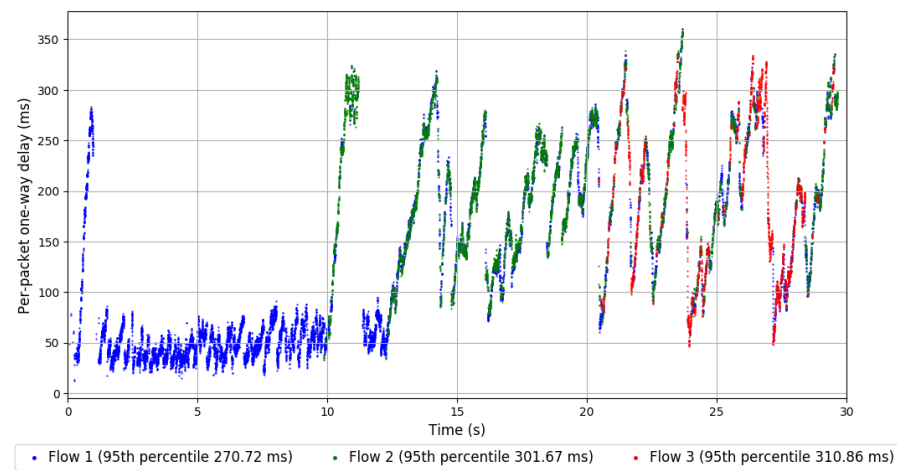
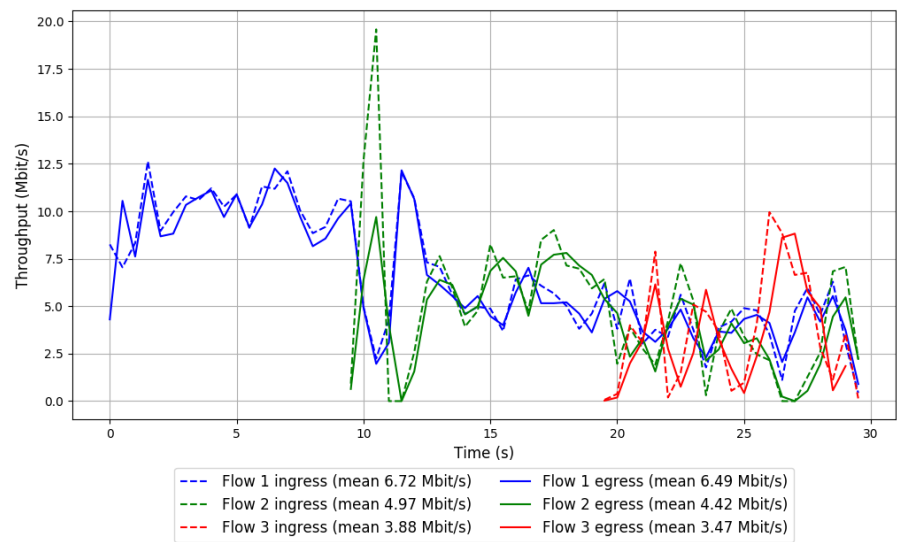


Run 2: Statistics of Verus

Start at: 2017-12-20 18:11:36
End at: 2017-12-20 18:12:06
Local clock offset: 0.546 ms
Remote clock offset: -2.546 ms

Below is generated by plot.py at 2017-12-20 19:40:26
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.58 Mbit/s
95th percentile per-packet one-way delay: 291.818 ms
Loss rate: 6.84%
-- Flow 1:
Average throughput: 6.49 Mbit/s
95th percentile per-packet one-way delay: 270.719 ms
Loss rate: 3.48%
-- Flow 2:
Average throughput: 4.42 Mbit/s
95th percentile per-packet one-way delay: 301.667 ms
Loss rate: 11.34%
-- Flow 3:
Average throughput: 3.47 Mbit/s
95th percentile per-packet one-way delay: 310.863 ms
Loss rate: 12.63%

Run 2: Report of Verus — Data Link

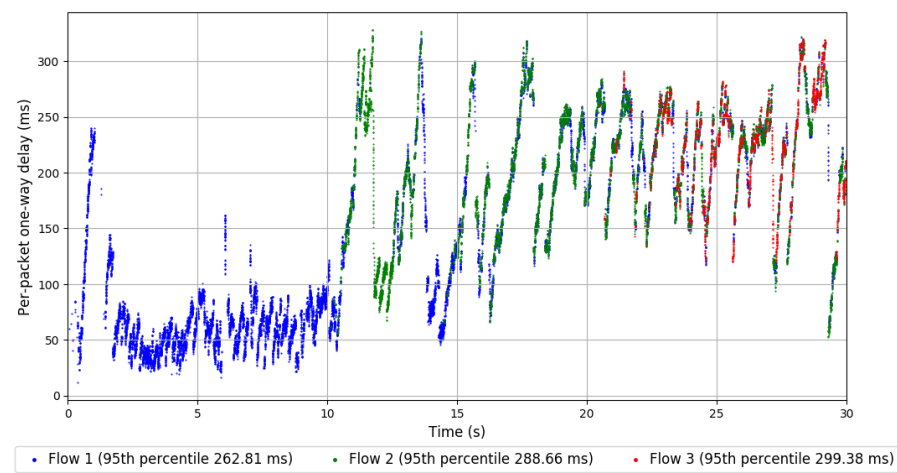
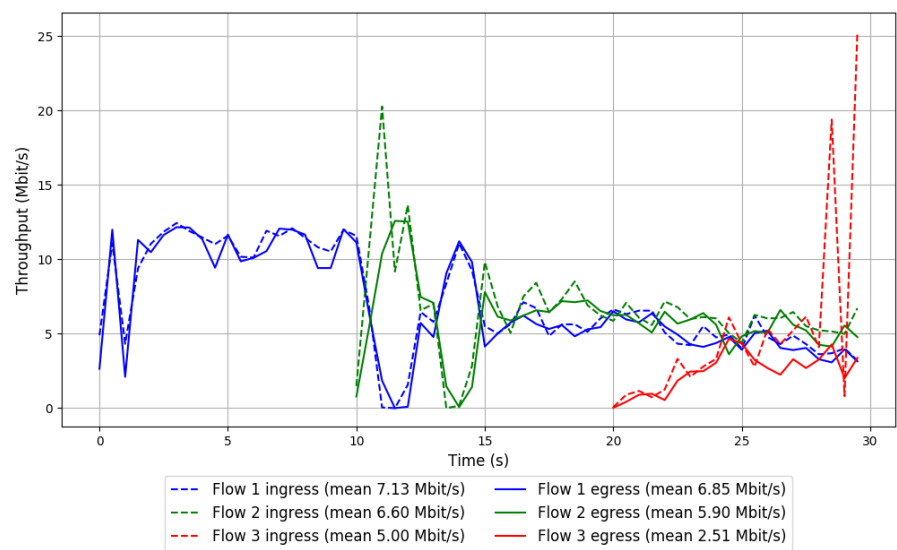


Run 3: Statistics of Verus

Start at: 2017-12-20 18:29:27
End at: 2017-12-20 18:29:57
Local clock offset: 0.547 ms
Remote clock offset: -2.354 ms

Below is generated by plot.py at 2017-12-20 19:40:28
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.59 Mbit/s
95th percentile per-packet one-way delay: 277.575 ms
Loss rate: 12.38%
-- Flow 1:
Average throughput: 6.85 Mbit/s
95th percentile per-packet one-way delay: 262.811 ms
Loss rate: 4.29%
-- Flow 2:
Average throughput: 5.90 Mbit/s
95th percentile per-packet one-way delay: 288.663 ms
Loss rate: 10.97%
-- Flow 3:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 299.375 ms
Loss rate: 50.92%

Run 3: Report of Verus — Data Link

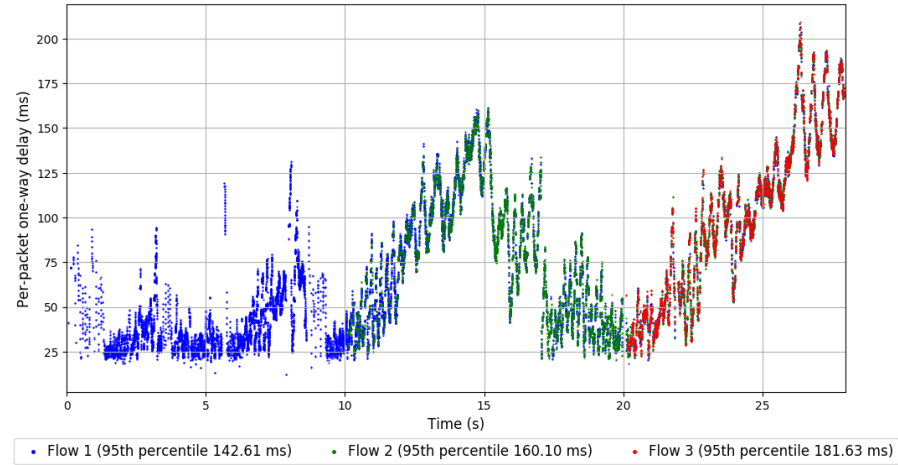
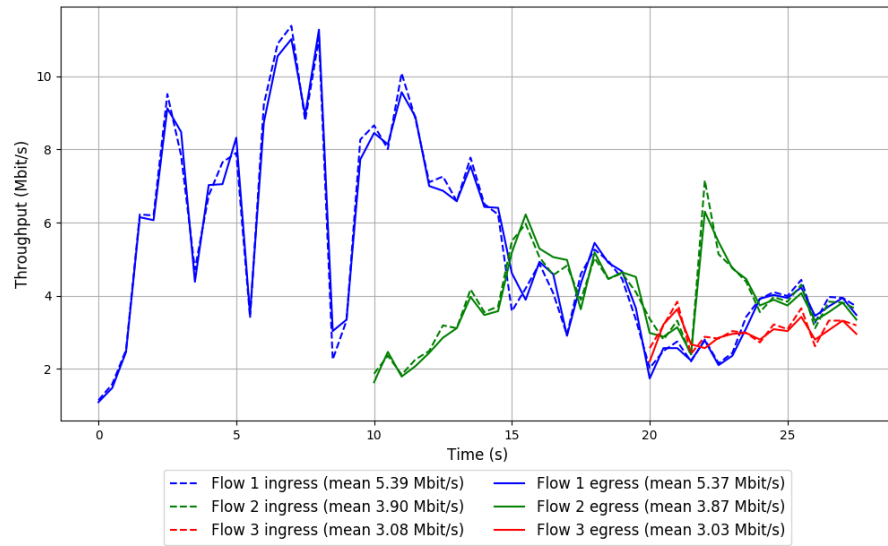


Run 1: Statistics of Copa

Start at: 2017-12-20 18:09:12
End at: 2017-12-20 18:09:42
Local clock offset: 0.61 ms
Remote clock offset: -2.437 ms

Below is generated by plot.py at 2017-12-20 19:40:35
Datalink statistics
-- Total of 3 flows:
Average throughput: 8.70 Mbit/s
95th percentile per-packet one-way delay: 154.052 ms
Loss rate: 0.94%
-- Flow 1:
Average throughput: 5.37 Mbit/s
95th percentile per-packet one-way delay: 142.609 ms
Loss rate: 0.60%
-- Flow 2:
Average throughput: 3.87 Mbit/s
95th percentile per-packet one-way delay: 160.098 ms
Loss rate: 1.07%
-- Flow 3:
Average throughput: 3.03 Mbit/s
95th percentile per-packet one-way delay: 181.632 ms
Loss rate: 2.65%

Run 1: Report of Copa — Data Link

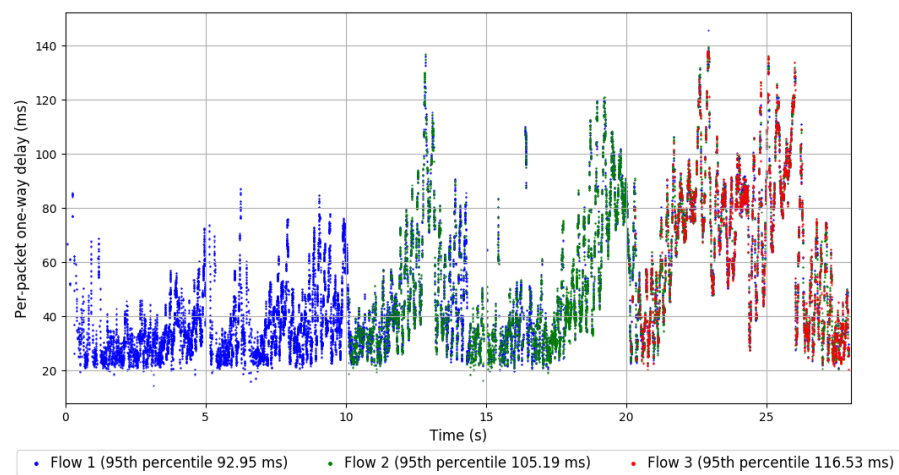
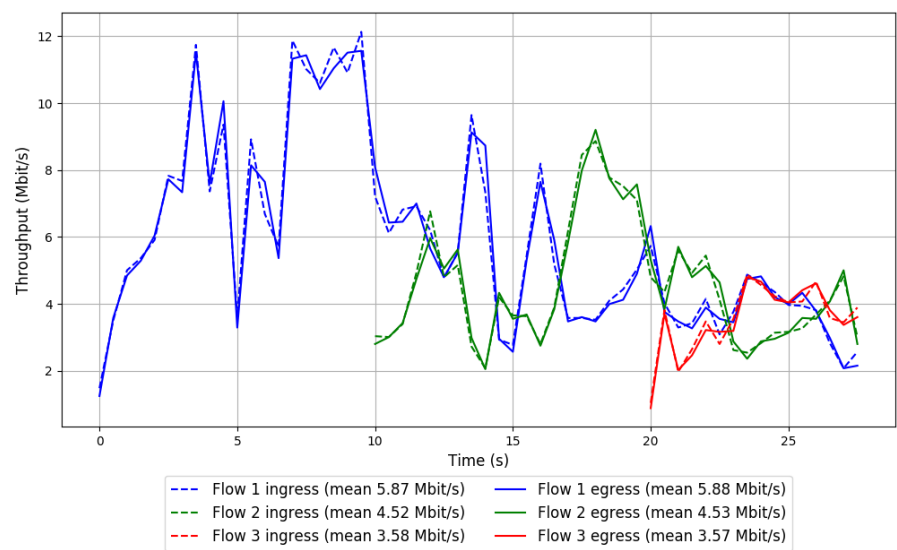


Run 2: Statistics of Copa

Start at: 2017-12-20 18:27:04
End at: 2017-12-20 18:27:34
Local clock offset: 0.606 ms
Remote clock offset: -2.324 ms

Below is generated by plot.py at 2017-12-20 19:40:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.79 Mbit/s
95th percentile per-packet one-way delay: 99.981 ms
Loss rate: 0.30%
-- Flow 1:
Average throughput: 5.88 Mbit/s
95th percentile per-packet one-way delay: 92.955 ms
Loss rate: 0.20%
-- Flow 2:
Average throughput: 4.53 Mbit/s
95th percentile per-packet one-way delay: 105.187 ms
Loss rate: 0.27%
-- Flow 3:
Average throughput: 3.57 Mbit/s
95th percentile per-packet one-way delay: 116.533 ms
Loss rate: 1.01%

Run 2: Report of Copa — Data Link

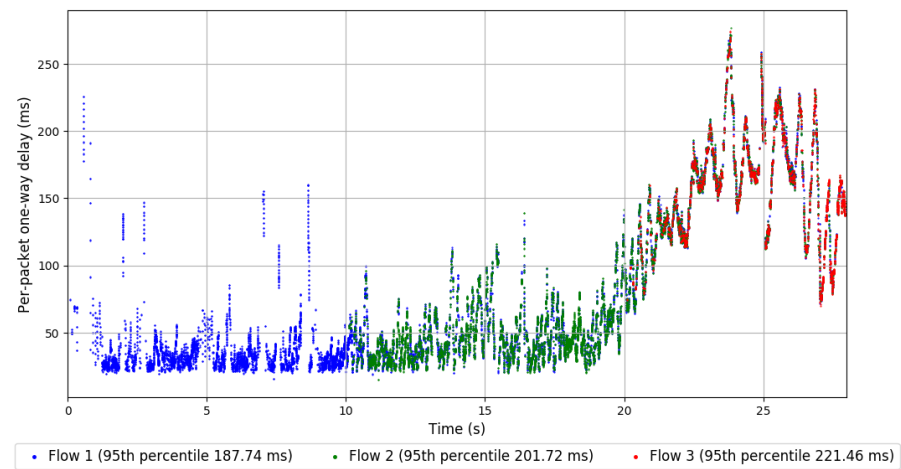
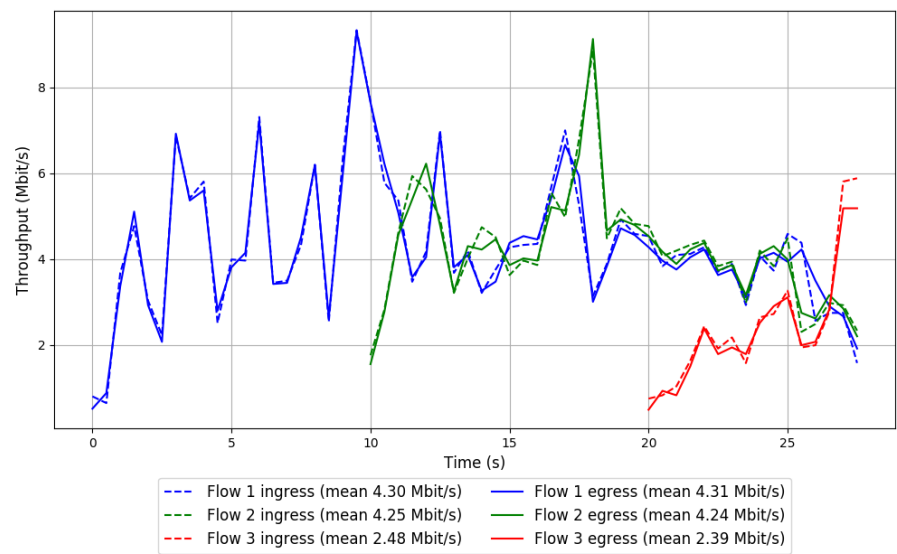


Run 3: Statistics of Copa

Start at: 2017-12-20 18:44:56
End at: 2017-12-20 18:45:26
Local clock offset: 0.649 ms
Remote clock offset: -2.474 ms

```
# Below is generated by plot.py at 2017-12-20 19:40:37
# Datalink statistics
-- Total of 3 flows:
Average throughput: 7.70 Mbit/s
95th percentile per-packet one-way delay: 201.081 ms
Loss rate: 0.72%
-- Flow 1:
Average throughput: 4.31 Mbit/s
95th percentile per-packet one-way delay: 187.739 ms
Loss rate: 0.14%
-- Flow 2:
Average throughput: 4.24 Mbit/s
95th percentile per-packet one-way delay: 201.716 ms
Loss rate: 0.54%
-- Flow 3:
Average throughput: 2.39 Mbit/s
95th percentile per-packet one-way delay: 221.461 ms
Loss rate: 4.93%
```

Run 3: Report of Copa — Data Link

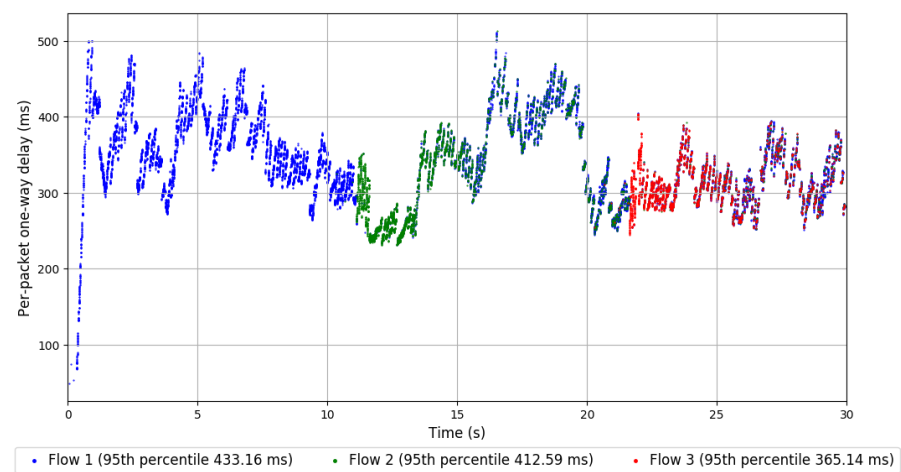
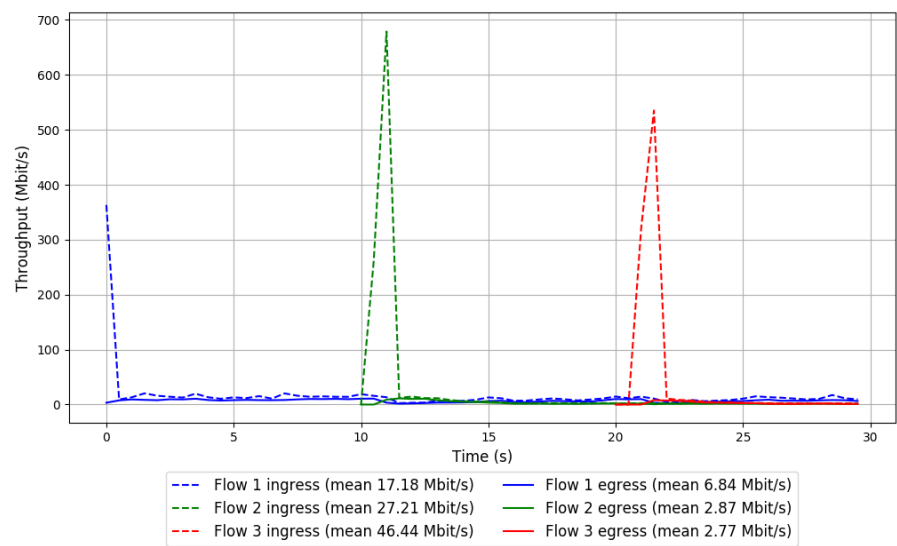


Run 1: Statistics of FillP

Start at: 2017-12-20 18:02:04
End at: 2017-12-20 18:02:34
Local clock offset: 0.524 ms
Remote clock offset: -2.489 ms

Below is generated by plot.py at 2017-12-20 19:40:42
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.61 Mbit/s
95th percentile per-packet one-way delay: 427.529 ms
Loss rate: 81.06%
-- Flow 1:
Average throughput: 6.84 Mbit/s
95th percentile per-packet one-way delay: 433.159 ms
Loss rate: 60.28%
-- Flow 2:
Average throughput: 2.87 Mbit/s
95th percentile per-packet one-way delay: 412.591 ms
Loss rate: 89.65%
-- Flow 3:
Average throughput: 2.77 Mbit/s
95th percentile per-packet one-way delay: 365.136 ms
Loss rate: 94.20%

Run 1: Report of FillP — Data Link

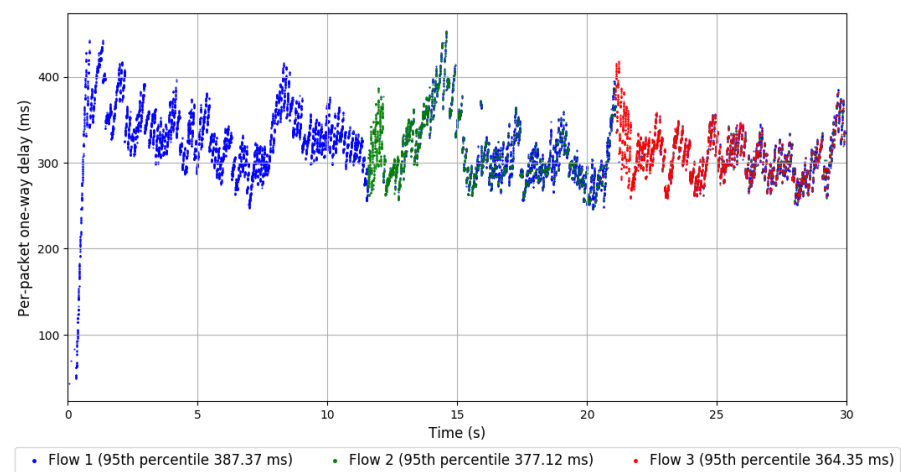
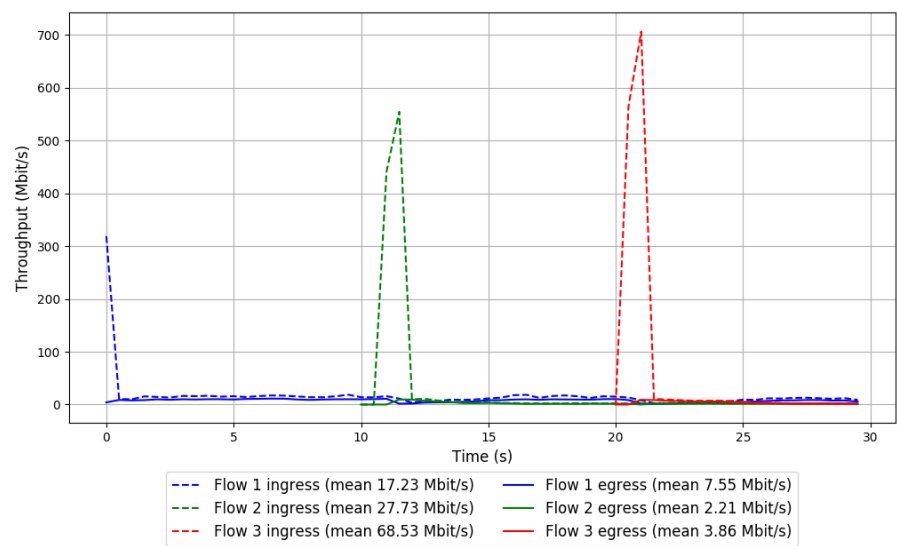


Run 2: Statistics of FillP

Start at: 2017-12-20 18:19:55
End at: 2017-12-20 18:20:25
Local clock offset: 0.569 ms
Remote clock offset: -2.465 ms

Below is generated by plot.py at 2017-12-20 19:40:44
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.24 Mbit/s
95th percentile per-packet one-way delay: 383.609 ms
Loss rate: 82.47%
-- Flow 1:
Average throughput: 7.55 Mbit/s
95th percentile per-packet one-way delay: 387.374 ms
Loss rate: 56.24%
-- Flow 2:
Average throughput: 2.21 Mbit/s
95th percentile per-packet one-way delay: 377.125 ms
Loss rate: 92.17%
-- Flow 3:
Average throughput: 3.86 Mbit/s
95th percentile per-packet one-way delay: 364.353 ms
Loss rate: 94.53%

Run 2: Report of FillP — Data Link

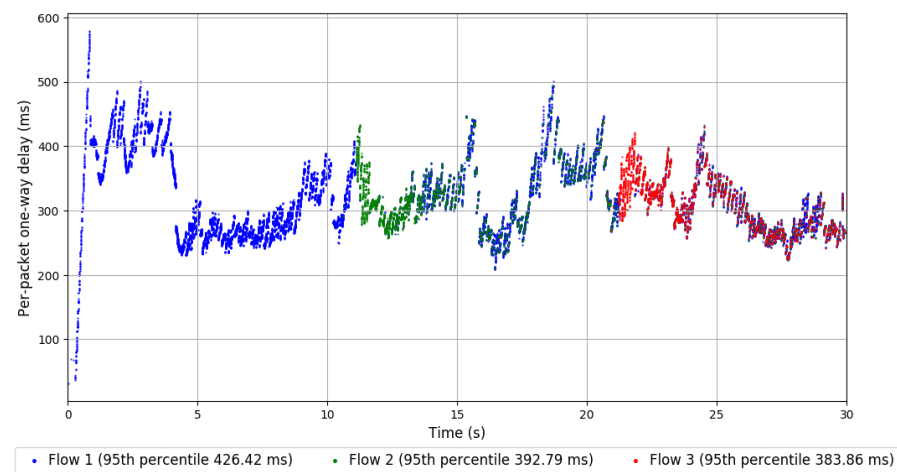
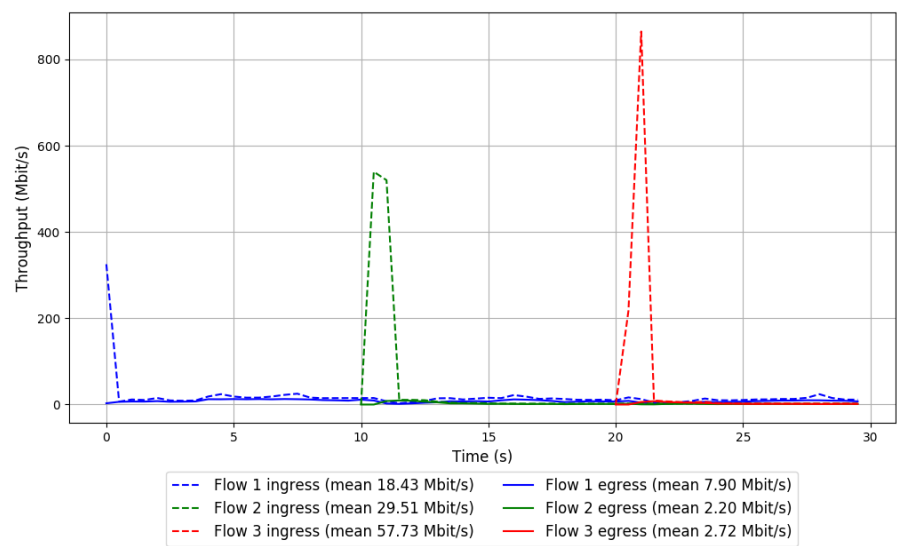


Run 3: Statistics of FillP

Start at: 2017-12-20 18:37:47
End at: 2017-12-20 18:38:17
Local clock offset: 0.673 ms
Remote clock offset: -2.387 ms

Below is generated by plot.py at 2017-12-20 19:40:44
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.21 Mbit/s
95th percentile per-packet one-way delay: 420.228 ms
Loss rate: 82.17%
-- Flow 1:
Average throughput: 7.90 Mbit/s
95th percentile per-packet one-way delay: 426.416 ms
Loss rate: 57.19%
-- Flow 2:
Average throughput: 2.20 Mbit/s
95th percentile per-packet one-way delay: 392.787 ms
Loss rate: 92.65%
-- Flow 3:
Average throughput: 2.72 Mbit/s
95th percentile per-packet one-way delay: 383.856 ms
Loss rate: 95.49%

Run 3: Report of FillP — Data Link

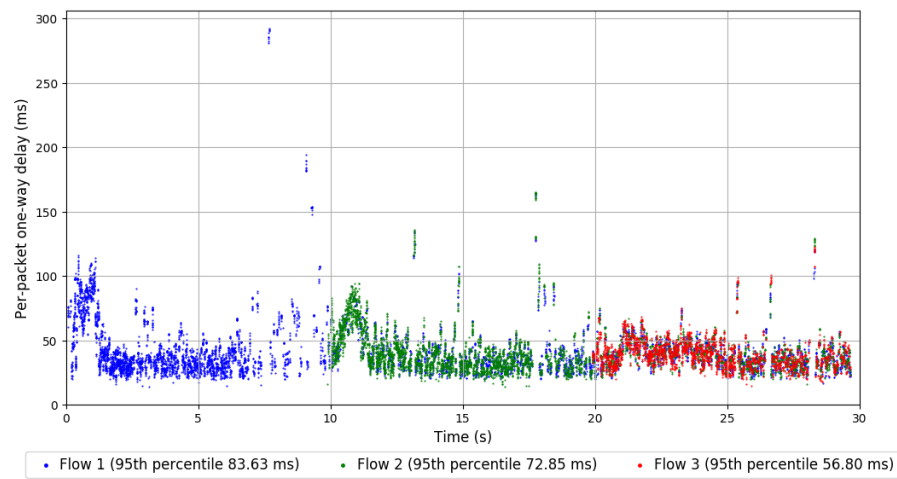
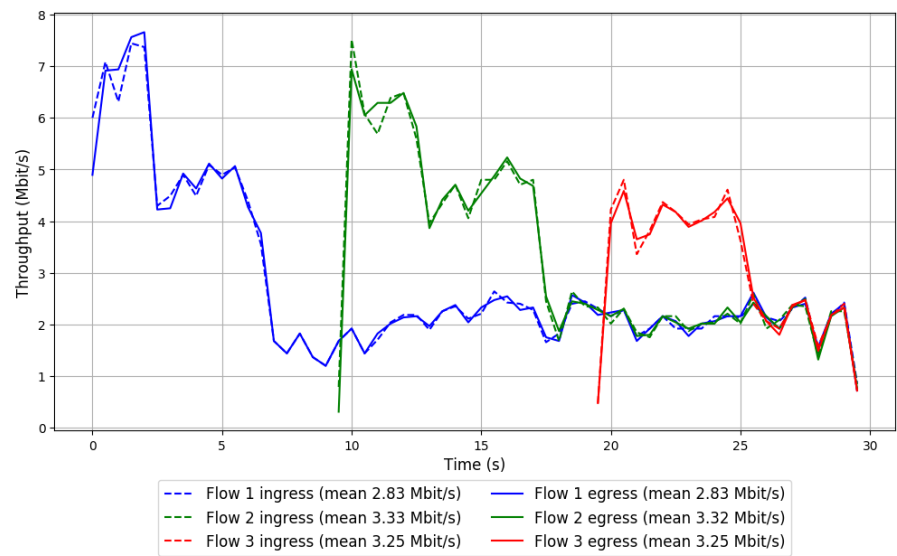


```
Run 1: Statistics of Indigo

Start at: 2017-12-20 17:56:08
End at: 2017-12-20 17:56:38
Local clock offset: 0.514 ms
Remote clock offset: -2.525 ms

# Below is generated by plot.py at 2017-12-20 19:40:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 6.12 Mbit/s
95th percentile per-packet one-way delay: 76.390 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 2.83 Mbit/s
95th percentile per-packet one-way delay: 83.631 ms
Loss rate: 0.19%
-- Flow 2:
Average throughput: 3.32 Mbit/s
95th percentile per-packet one-way delay: 72.851 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 3.25 Mbit/s
95th percentile per-packet one-way delay: 56.804 ms
Loss rate: 0.38%
```

Run 1: Report of Indigo — Data Link

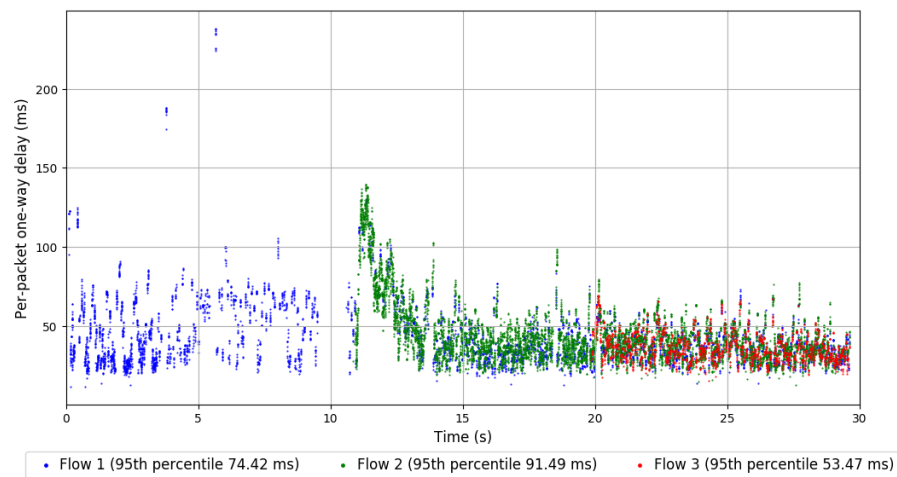
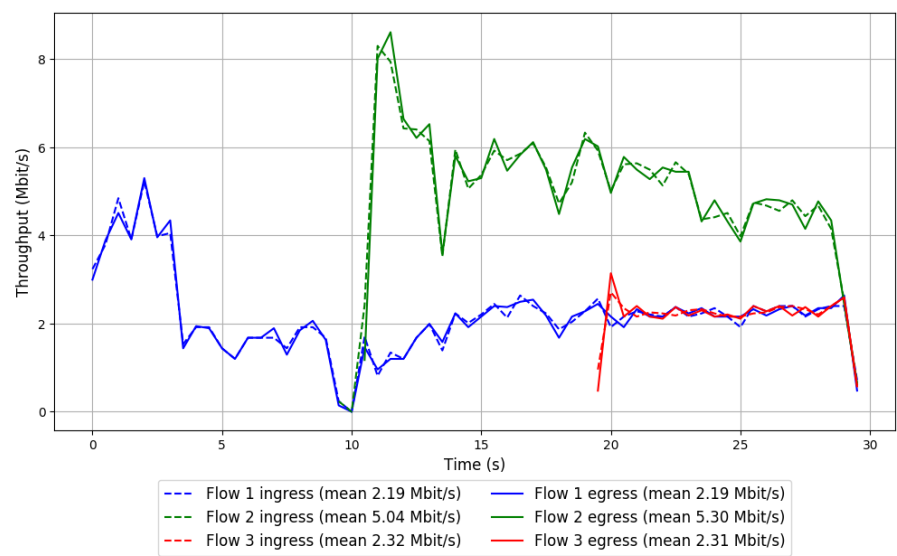


Run 2: Statistics of Indigo

Start at: 2017-12-20 18:13:58
End at: 2017-12-20 18:14:28
Local clock offset: 0.538 ms
Remote clock offset: -2.501 ms

Below is generated by plot.py at 2017-12-20 19:40:44
Datalink statistics
-- Total of 3 flows:
Average throughput: 6.33 Mbit/s
95th percentile per-packet one-way delay: 80.435 ms
Loss rate: 0.32%
-- Flow 1:
Average throughput: 2.19 Mbit/s
95th percentile per-packet one-way delay: 74.418 ms
Loss rate: 0.37%
-- Flow 2:
Average throughput: 5.30 Mbit/s
95th percentile per-packet one-way delay: 91.494 ms
Loss rate: 0.24%
-- Flow 3:
Average throughput: 2.31 Mbit/s
95th percentile per-packet one-way delay: 53.473 ms
Loss rate: 0.53%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2017-12-20 18:31:50
End at: 2017-12-20 18:32:20
Local clock offset: 0.562 ms
Remote clock offset: -2.313 ms

Below is generated by plot.py at 2017-12-20 19:40:44
Datalink statistics
-- Total of 3 flows:
Average throughput: 6.93 Mbit/s
95th percentile per-packet one-way delay: 61.267 ms
Loss rate: 0.18%
-- Flow 1:
Average throughput: 3.26 Mbit/s
95th percentile per-packet one-way delay: 67.682 ms
Loss rate: 0.12%
-- Flow 2:
Average throughput: 3.64 Mbit/s
95th percentile per-packet one-way delay: 52.481 ms
Loss rate: 0.17%
-- Flow 3:
Average throughput: 3.80 Mbit/s
95th percentile per-packet one-way delay: 47.931 ms
Loss rate: 0.32%

Run 3: Report of Indigo — Data Link

