

Pantheon Report

Generated at 2017-08-13 07:36:27 (UTC).

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

Repeated the test of 15 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).

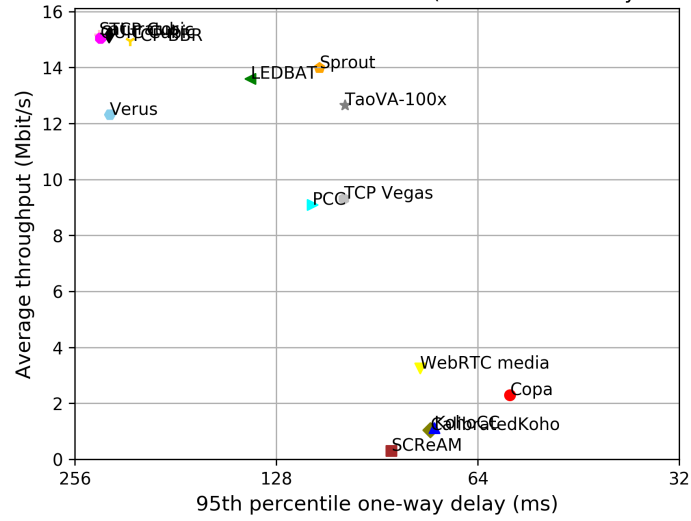
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).

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

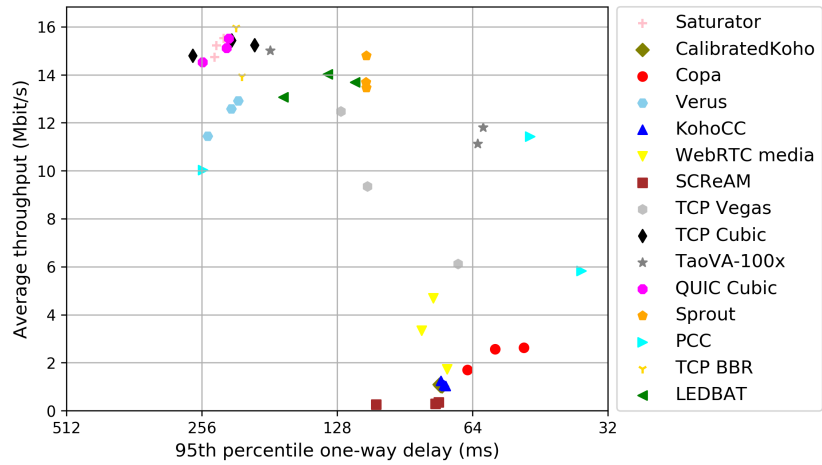
Git summary:

```
branch: master @ e43be7582298d552838afcf6382342bf187fbbd6
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
  M datagrump/sender.cc
third_party/genericCC @ dae96123232f1bcb37725348fa2378691ce26725
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
  M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-stimuli @ fc73a85ca16c34366d1888dc8a0d0d88d4ebf2a7
third_party/pantheon-tunnel @ baf443516dea3eeddeccaf9b916cc313273ca4f4
  M scripts/merge-tunnel-logs
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 @ f1a14bffe749737437f61b1eaeeb30b267cde681
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



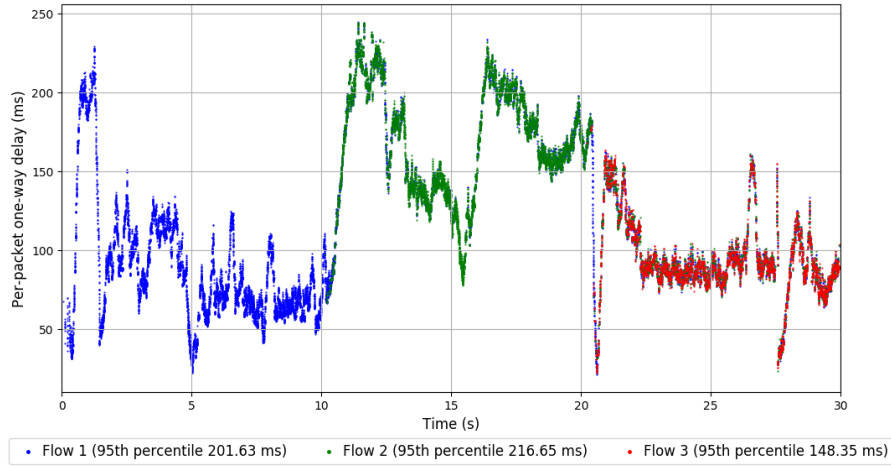
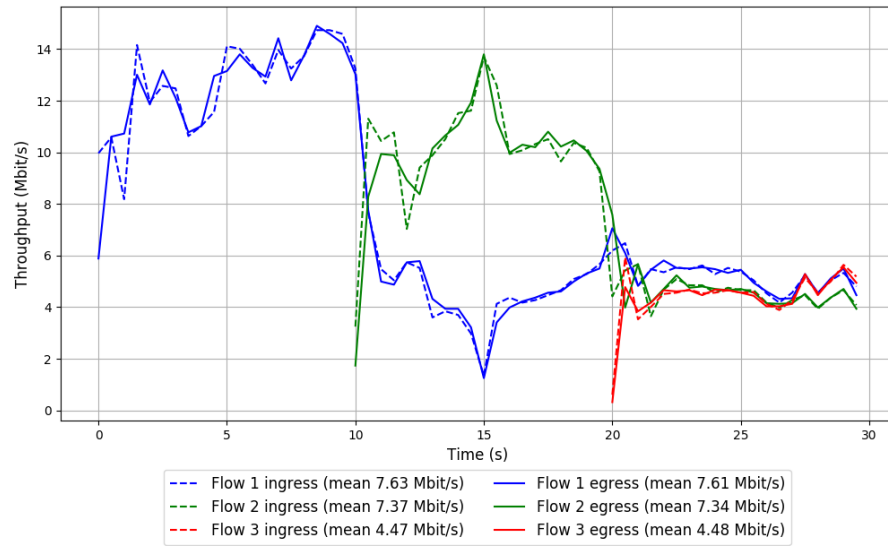
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	8.79	6.10	6.43	203.75	214.64	187.12	1.49	2.55	9.00
CalibratedKoho	3	0.49	0.53	0.62	75.96	74.50	77.62	0.71	0.91	1.28
Copa	3	1.06	1.33	1.59	64.28	50.08	34.35	0.12	0.14	0.19
TCP Cubic	3	10.85	4.61	3.86	226.65	235.64	207.03	0.46	0.90	1.89
KohoCC	3	0.51	0.57	0.71	76.64	70.88	68.77	0.56	0.76	1.20
LEDBAT	3	9.98	4.23	2.52	134.34	145.54	142.15	0.21	1.01	1.92
PCC	3	4.75	5.54	2.03	110.12	114.79	118.11	0.54	0.82	1.63
QUIC Cubic	3	11.41	4.02	3.07	234.43	226.90	236.65	1.49	2.51	4.05
Saturator	3	9.93	7.24	5.63	233.36	239.01	228.96	14.57	25.89	60.26
SCReAM	3	0.13	0.16	0.20	89.12	80.99	90.50	0.33	0.61	0.37
Sprout	3	8.30	6.28	4.64	104.57	111.40	122.87	2.06	1.56	2.47
TaoVA-100x	3	7.02	6.64	6.03	100.06	60.52	141.35	0.72	1.10	4.13
TCP Vegas	3	4.12	4.59	6.51	109.63	93.26	103.86	0.98	0.13	0.45
Verus	3	7.45	6.09	2.67	222.18	227.85	239.05	34.66	8.50	25.32
WebRTC media	3	1.34	1.47	0.56	78.08	76.66	81.16	0.52	1.07	3.06

Run 1: Statistics of TCP BBR

Start at: 2017-08-13 05:48:09
End at: 2017-08-13 05:48:39
Local clock offset: 0.631 ms
Remote clock offset: -2.441 ms

Below is generated by plot.py at 2017-08-13 07:35:29
Datalink statistics
-- Total of 3 flows:
Average throughput: 13.94 Mbit/s
95th percentile per-packet one-way delay: 208.783 ms
Loss rate: 0.71%
-- Flow 1:
Average throughput: 7.61 Mbit/s
95th percentile per-packet one-way delay: 201.626 ms
Loss rate: 0.45%
-- Flow 2:
Average throughput: 7.34 Mbit/s
95th percentile per-packet one-way delay: 216.652 ms
Loss rate: 0.92%
-- Flow 3:
Average throughput: 4.48 Mbit/s
95th percentile per-packet one-way delay: 148.349 ms
Loss rate: 1.36%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2017-08-13 06:06:03

End at: 2017-08-13 06:06:33

Local clock offset: 0.637 ms

Remote clock offset: -2.42 ms

Below is generated by plot.py at 2017-08-13 07:35:30

Datalink statistics

-- Total of 3 flows:

Average throughput: 15.96 Mbit/s

95th percentile per-packet one-way delay: 214.867 ms

Loss rate: 5.61%

-- Flow 1:

Average throughput: 9.98 Mbit/s

95th percentile per-packet one-way delay: 205.879 ms

Loss rate: 2.52%

-- Flow 2:

Average throughput: 4.86 Mbit/s

95th percentile per-packet one-way delay: 212.636 ms

Loss rate: 4.18%

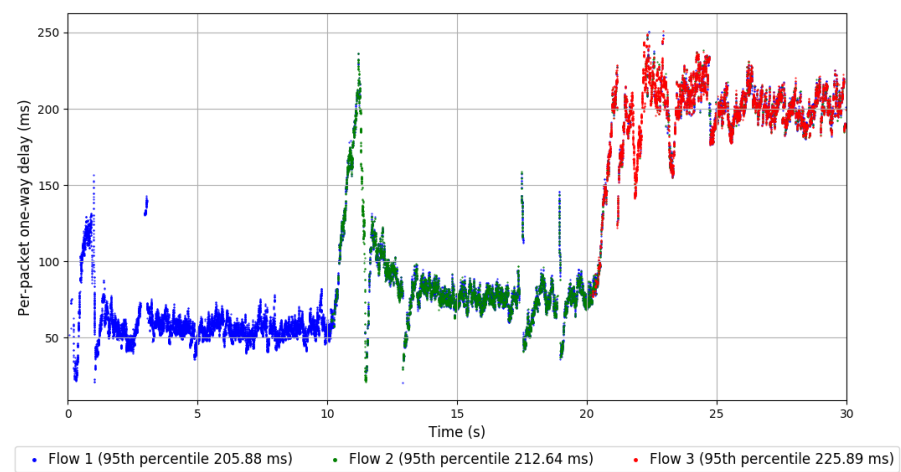
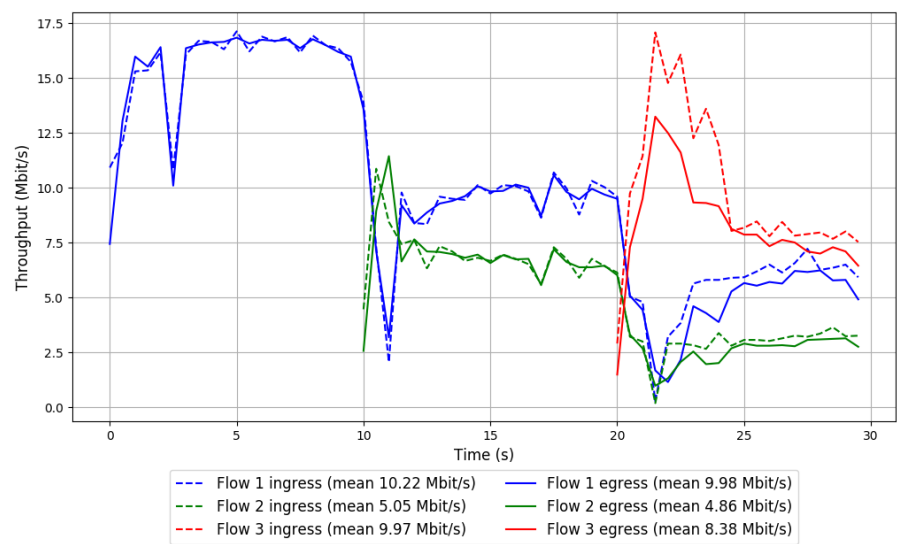
-- Flow 3:

Average throughput: 8.38 Mbit/s

95th percentile per-packet one-way delay: 225.891 ms

Loss rate: 16.65%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

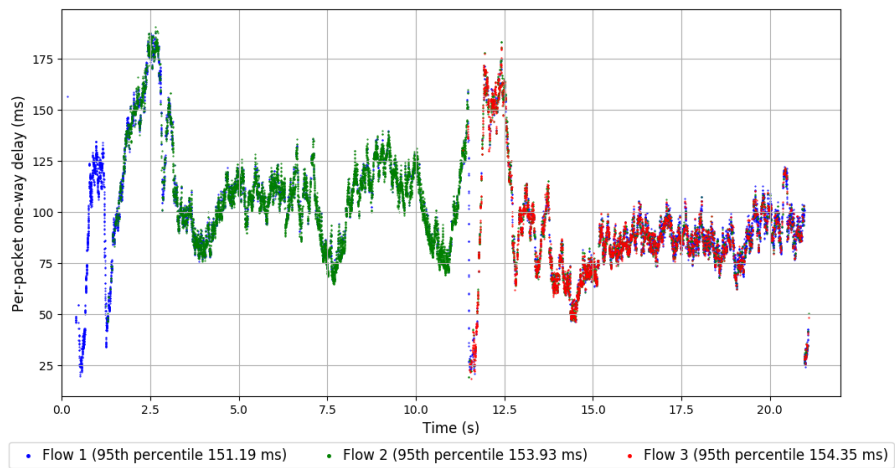
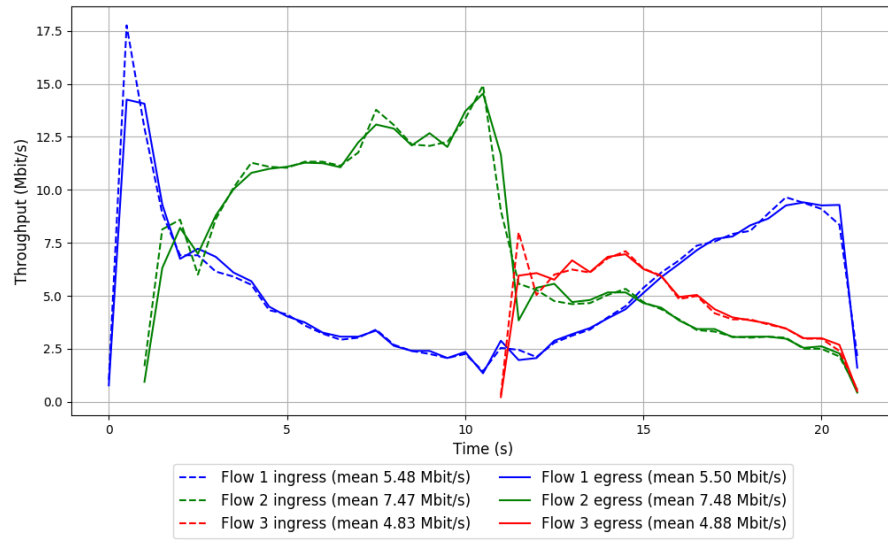
Start at: 2017-08-13 06:23:57

End at: 2017-08-13 06:24:27

Local clock offset: 0.658 ms

Remote clock offset: -2.198 ms

Run 3: Report of TCP BBR — Data Link

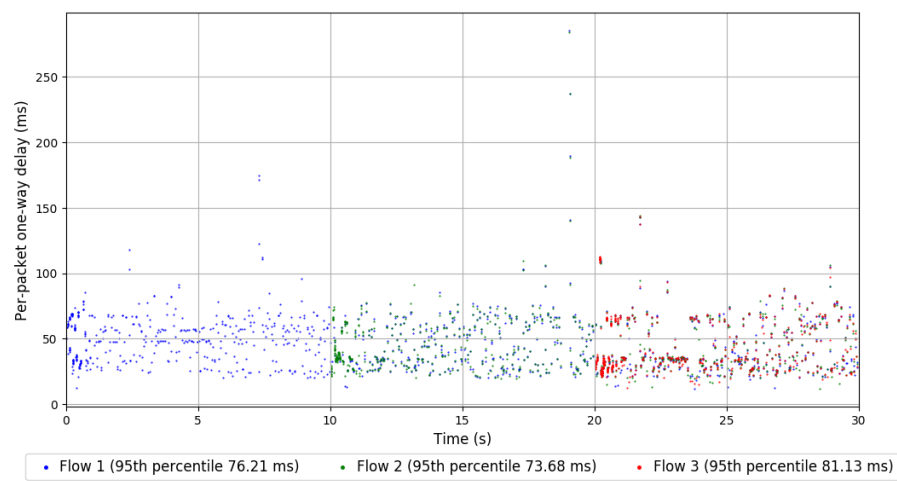
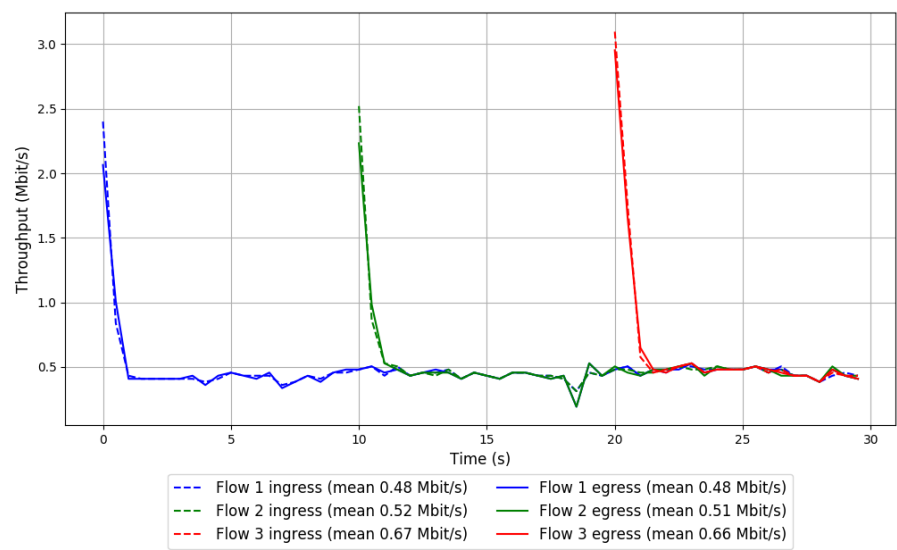


Run 1: Statistics of CalibratedKoho

Start at: 2017-08-13 05:52:56
End at: 2017-08-13 05:53:26
Local clock offset: 0.532 ms
Remote clock offset: -2.568 ms

Below is generated by plot.py at 2017-08-13 07:35:32
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.04 Mbit/s
95th percentile per-packet one-way delay: 75.416 ms
Loss rate: 1.07%
-- Flow 1:
Average throughput: 0.48 Mbit/s
95th percentile per-packet one-way delay: 76.208 ms
Loss rate: 0.83%
-- Flow 2:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 73.676 ms
Loss rate: 1.28%
-- Flow 3:
Average throughput: 0.66 Mbit/s
95th percentile per-packet one-way delay: 81.132 ms
Loss rate: 1.26%

Run 1: Report of CalibratedKoho — Data Link

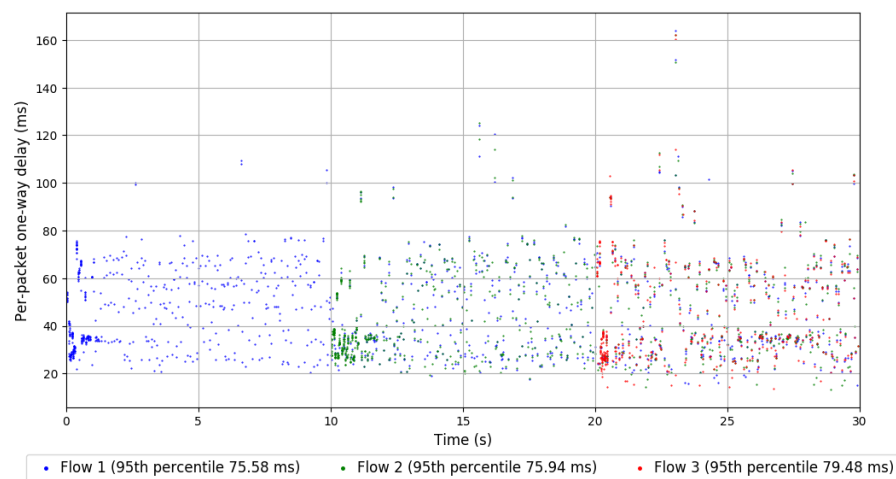
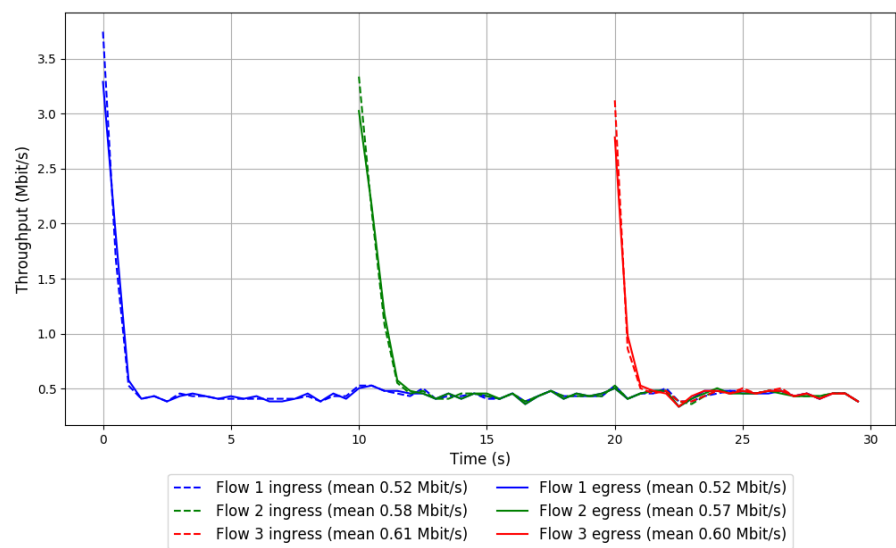


Run 2: Statistics of CalibratedKoho

Start at: 2017-08-13 06:10:49
End at: 2017-08-13 06:11:19
Local clock offset: 0.669 ms
Remote clock offset: -2.278 ms

Below is generated by plot.py at 2017-08-13 07:35:32
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.10 Mbit/s
95th percentile per-packet one-way delay: 75.843 ms
Loss rate: 0.80%
-- Flow 1:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 75.579 ms
Loss rate: 0.62%
-- Flow 2:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 75.935 ms
Loss rate: 0.63%
-- Flow 3:
Average throughput: 0.60 Mbit/s
95th percentile per-packet one-way delay: 79.484 ms
Loss rate: 1.59%

Run 2: Report of CalibratedKoho — Data Link

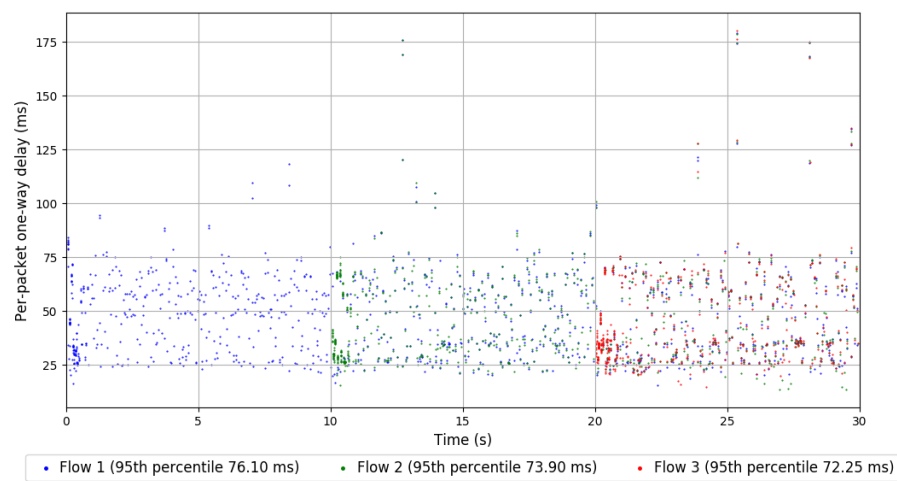
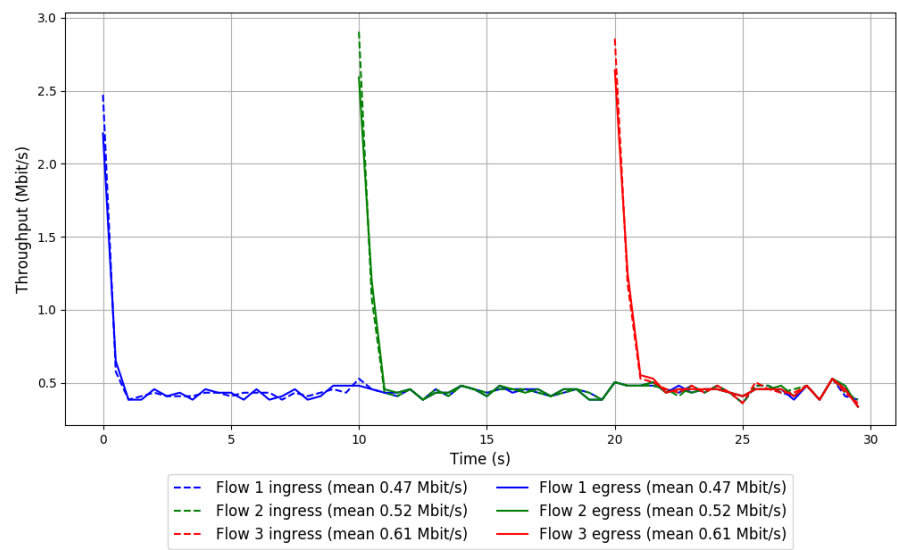


Run 3: Statistics of CalibratedKoho

Start at: 2017-08-13 06:28:43
End at: 2017-08-13 06:29:13
Local clock offset: 0.558 ms
Remote clock offset: -2.172 ms

Below is generated by plot.py at 2017-08-13 07:35:33
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.02 Mbit/s
95th percentile per-packet one-way delay: 74.871 ms
Loss rate: 0.78%
-- Flow 1:
Average throughput: 0.47 Mbit/s
95th percentile per-packet one-way delay: 76.098 ms
Loss rate: 0.68%
-- Flow 2:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 73.900 ms
Loss rate: 0.81%
-- Flow 3:
Average throughput: 0.61 Mbit/s
95th percentile per-packet one-way delay: 72.248 ms
Loss rate: 0.99%

Run 3: Report of CalibratedKoho — Data Link

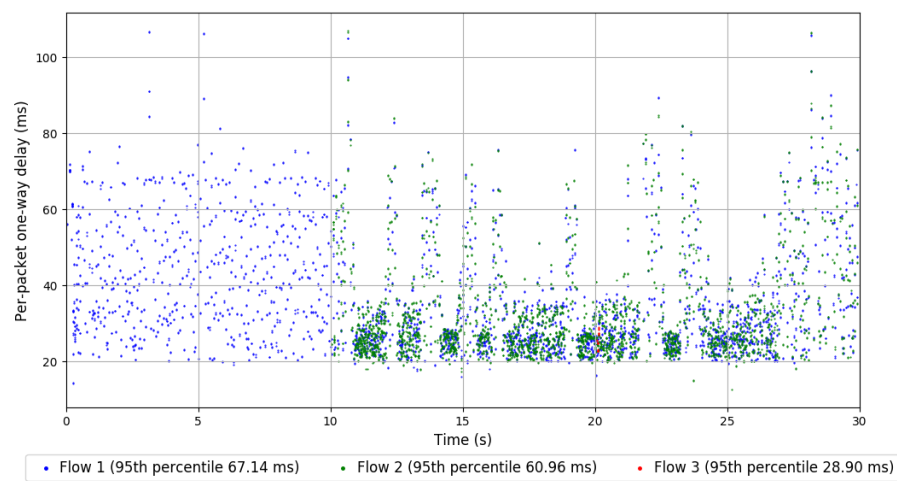
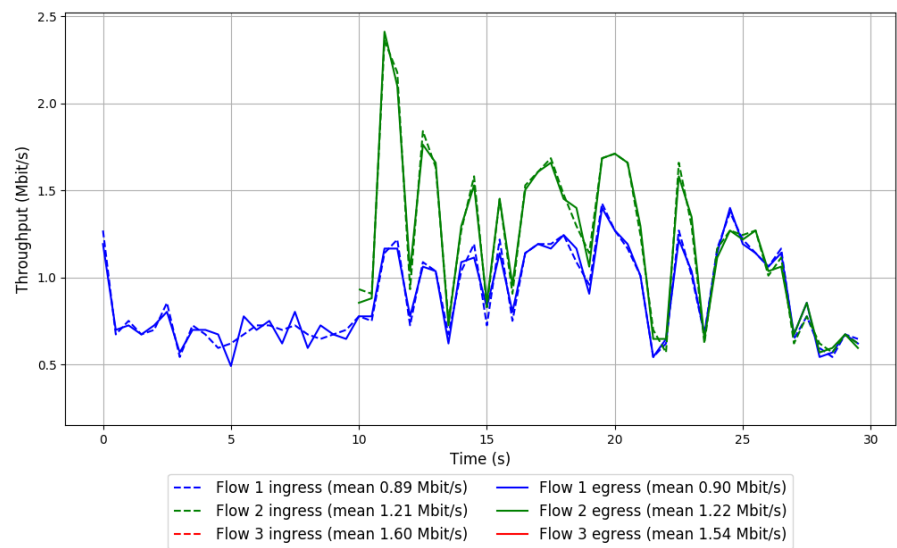


Run 1: Statistics of Copa

Start at: 2017-08-13 05:58:53
End at: 2017-08-13 05:59:23
Local clock offset: 0.534 ms
Remote clock offset: -2.578 ms

Below is generated by plot.py at 2017-08-13 07:35:34
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.71 Mbit/s
95th percentile per-packet one-way delay: 65.682 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 0.90 Mbit/s
95th percentile per-packet one-way delay: 67.138 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 1.22 Mbit/s
95th percentile per-packet one-way delay: 60.956 ms
Loss rate: 0.11%
-- Flow 3:
Average throughput: 1.54 Mbit/s
95th percentile per-packet one-way delay: 28.896 ms
Loss rate: 0.00%

Run 1: Report of Copa — Data Link

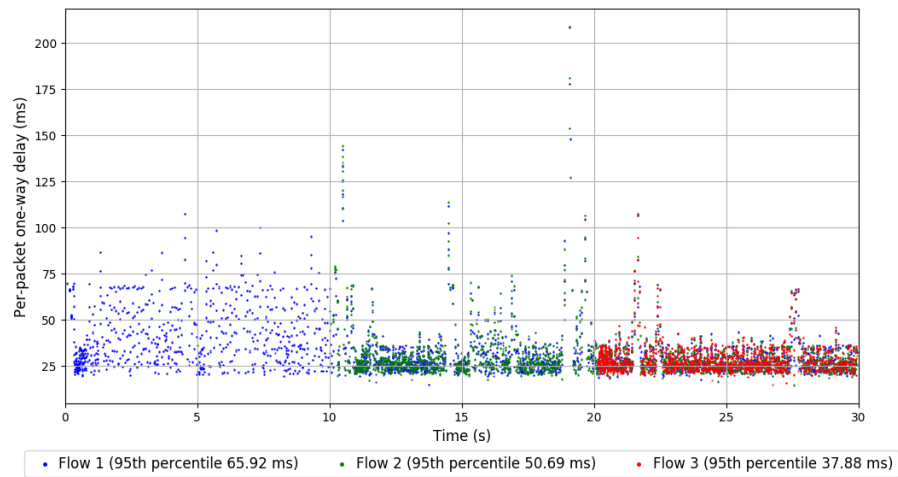
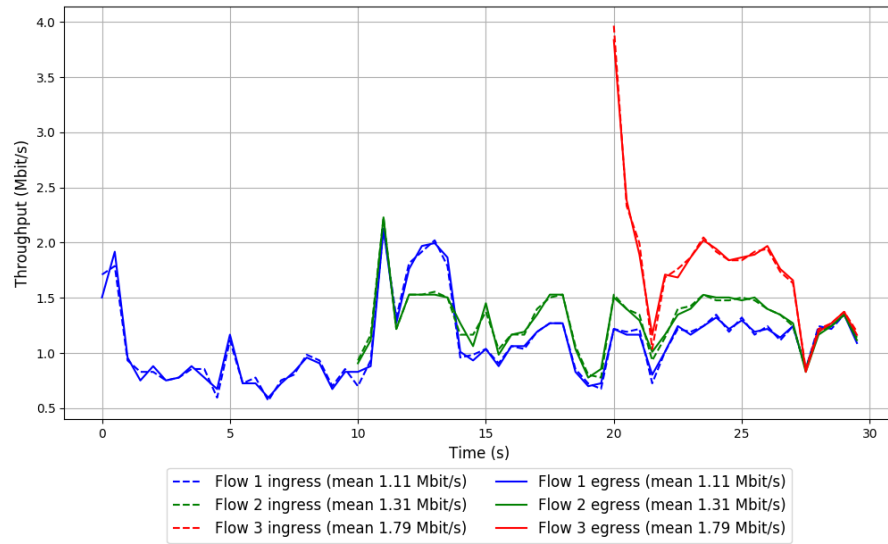


Run 2: Statistics of Copa

Start at: 2017-08-13 06:16:46
End at: 2017-08-13 06:17:16
Local clock offset: 0.581 ms
Remote clock offset: -2.271 ms

Below is generated by plot.py at 2017-08-13 07:35:35
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.57 Mbit/s
95th percentile per-packet one-way delay: 57.067 ms
Loss rate: 0.20%
-- Flow 1:
Average throughput: 1.11 Mbit/s
95th percentile per-packet one-way delay: 65.919 ms
Loss rate: 0.15%
-- Flow 2:
Average throughput: 1.31 Mbit/s
95th percentile per-packet one-way delay: 50.685 ms
Loss rate: 0.19%
-- Flow 3:
Average throughput: 1.79 Mbit/s
95th percentile per-packet one-way delay: 37.881 ms
Loss rate: 0.30%

Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

Start at: 2017-08-13 06:34:40

End at: 2017-08-13 06:35:10

Local clock offset: 0.684 ms

Remote clock offset: -2.21 ms

Below is generated by plot.py at 2017-08-13 07:35:36

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.62 Mbit/s

95th percentile per-packet one-way delay: 49.211 ms

Loss rate: 0.15%

-- Flow 1:

Average throughput: 1.17 Mbit/s

95th percentile per-packet one-way delay: 59.782 ms

Loss rate: 0.11%

-- Flow 2:

Average throughput: 1.47 Mbit/s

95th percentile per-packet one-way delay: 38.608 ms

Loss rate: 0.13%

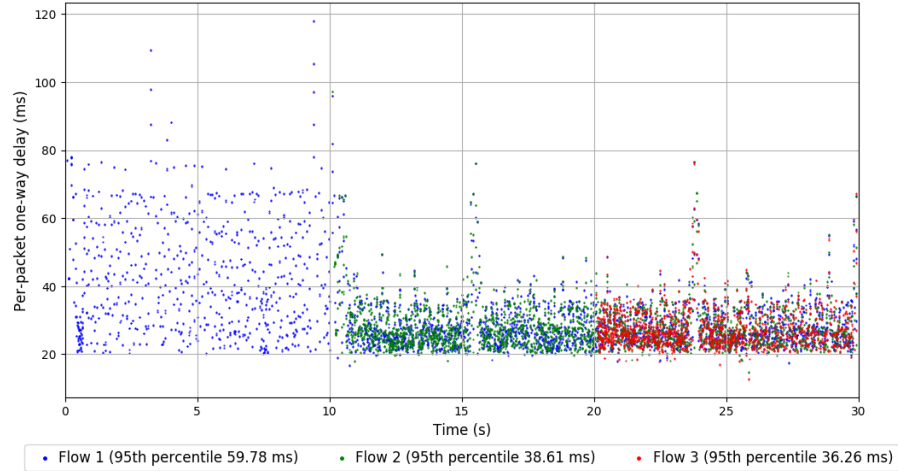
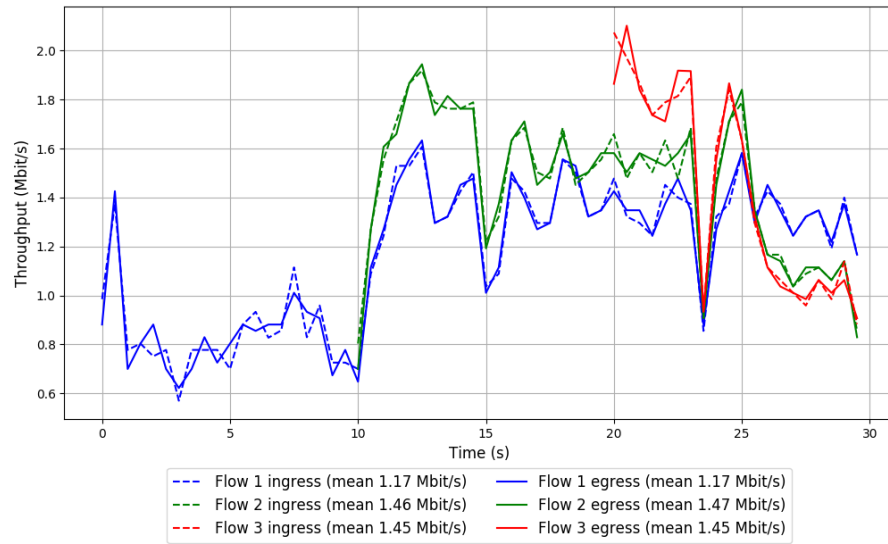
-- Flow 3:

Average throughput: 1.45 Mbit/s

95th percentile per-packet one-way delay: 36.259 ms

Loss rate: 0.28%

Run 3: Report of Copa — Data Link

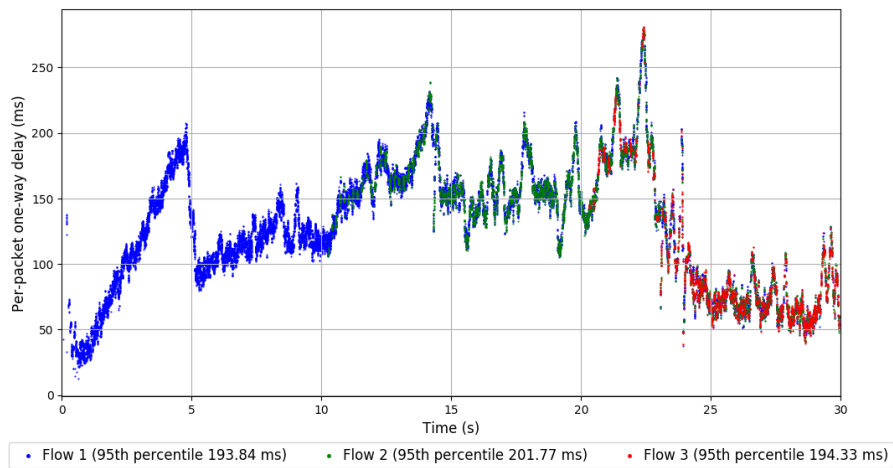
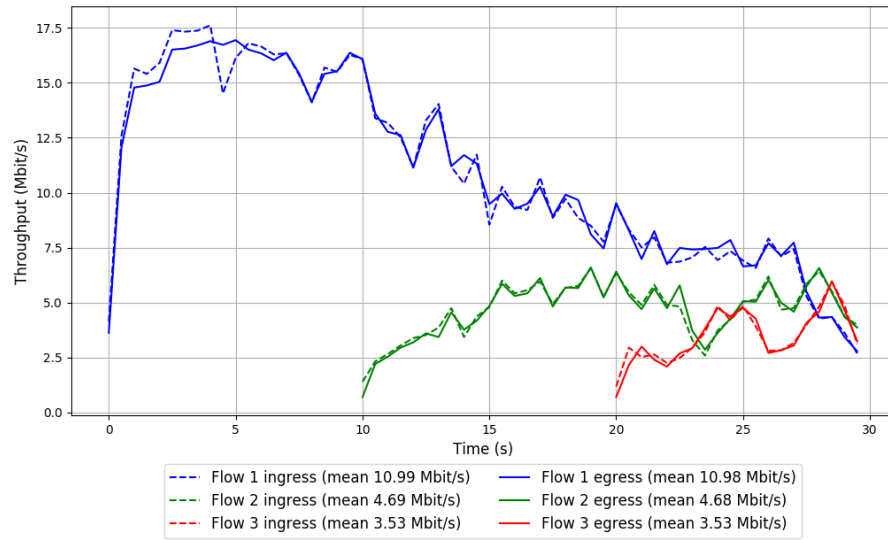


Run 1: Statistics of TCP Cubic

Start at: 2017-08-13 06:02:28
End at: 2017-08-13 06:02:58
Local clock offset: 0.666 ms
Remote clock offset: -2.561 ms

Below is generated by plot.py at 2017-08-13 07:35:38
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.23 Mbit/s
95th percentile per-packet one-way delay: 195.350 ms
Loss rate: 0.42%
-- Flow 1:
Average throughput: 10.98 Mbit/s
95th percentile per-packet one-way delay: 193.844 ms
Loss rate: 0.24%
-- Flow 2:
Average throughput: 4.68 Mbit/s
95th percentile per-packet one-way delay: 201.769 ms
Loss rate: 0.71%
-- Flow 3:
Average throughput: 3.53 Mbit/s
95th percentile per-packet one-way delay: 194.328 ms
Loss rate: 1.34%

Run 1: Report of TCP Cubic — Data Link

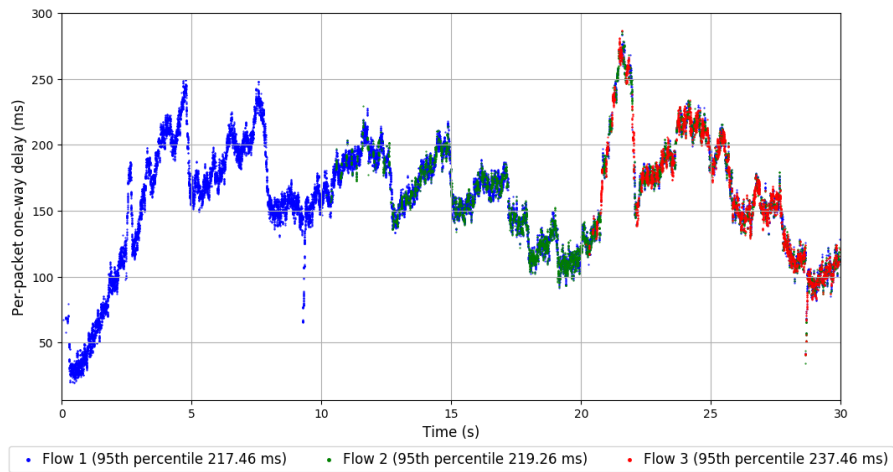
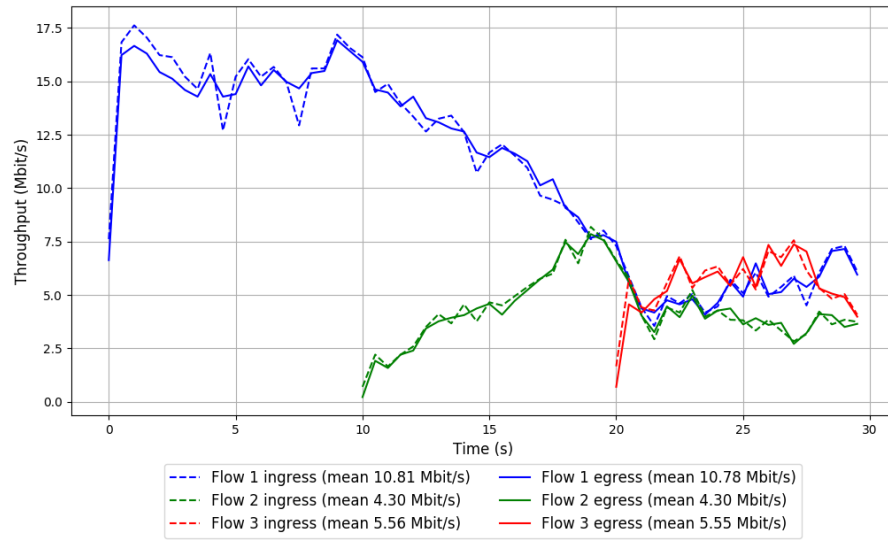


Run 2: Statistics of TCP Cubic

Start at: 2017-08-13 06:20:21
End at: 2017-08-13 06:20:51
Local clock offset: 0.585 ms
Remote clock offset: -2.285 ms

Below is generated by plot.py at 2017-08-13 07:35:39
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.44 Mbit/s
95th percentile per-packet one-way delay: 219.794 ms
Loss rate: 0.68%
-- Flow 1:
Average throughput: 10.78 Mbit/s
95th percentile per-packet one-way delay: 217.458 ms
Loss rate: 0.52%
-- Flow 2:
Average throughput: 4.30 Mbit/s
95th percentile per-packet one-way delay: 219.256 ms
Loss rate: 0.84%
-- Flow 3:
Average throughput: 5.55 Mbit/s
95th percentile per-packet one-way delay: 237.458 ms
Loss rate: 1.42%

Run 2: Report of TCP Cubic — Data Link

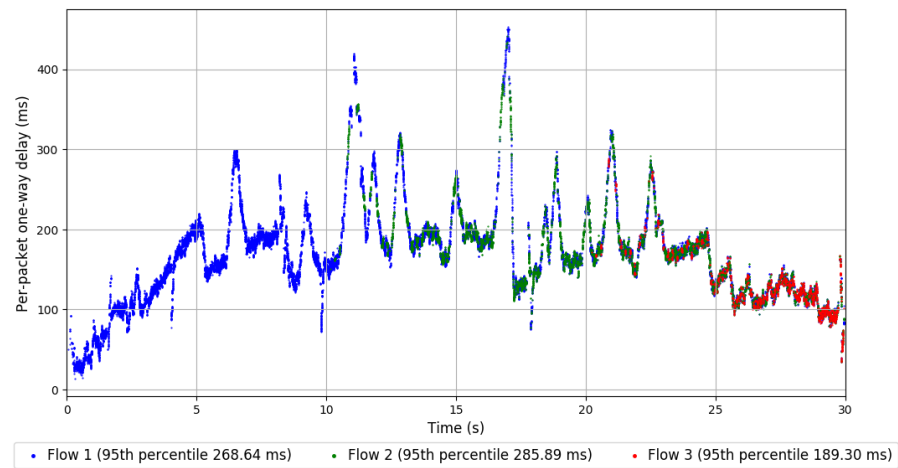
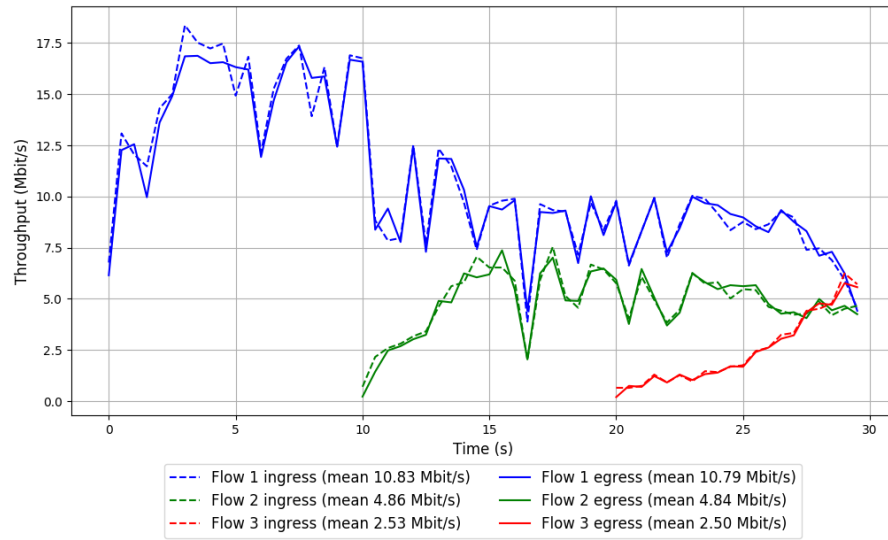


Run 3: Statistics of TCP Cubic

Start at: 2017-08-13 06:38:15
End at: 2017-08-13 06:38:45
Local clock offset: 0.669 ms
Remote clock offset: -2.197 ms

Below is generated by plot.py at 2017-08-13 07:35:41
Datalink statistics
-- Total of 3 flows:
Average throughput: 14.80 Mbit/s
95th percentile per-packet one-way delay: 268.229 ms
Loss rate: 0.86%
-- Flow 1:
Average throughput: 10.79 Mbit/s
95th percentile per-packet one-way delay: 268.639 ms
Loss rate: 0.61%
-- Flow 2:
Average throughput: 4.84 Mbit/s
95th percentile per-packet one-way delay: 285.887 ms
Loss rate: 1.15%
-- Flow 3:
Average throughput: 2.50 Mbit/s
95th percentile per-packet one-way delay: 189.303 ms
Loss rate: 2.92%

Run 3: Report of TCP Cubic — Data Link

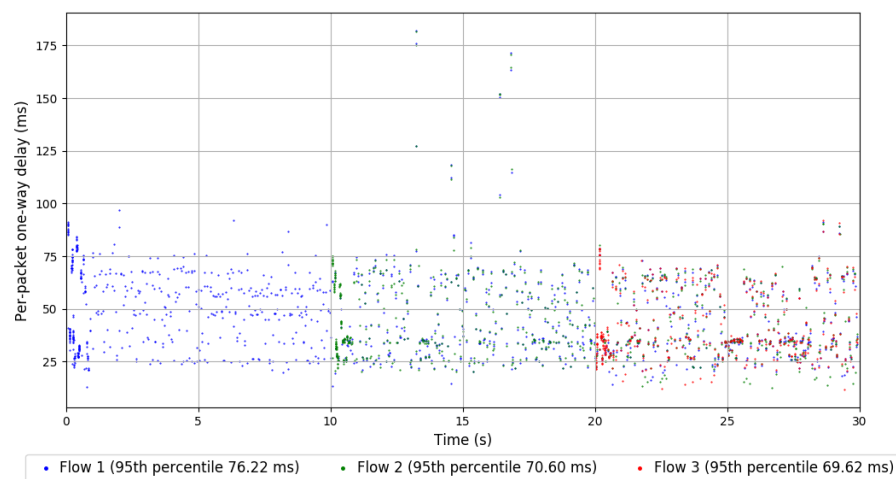
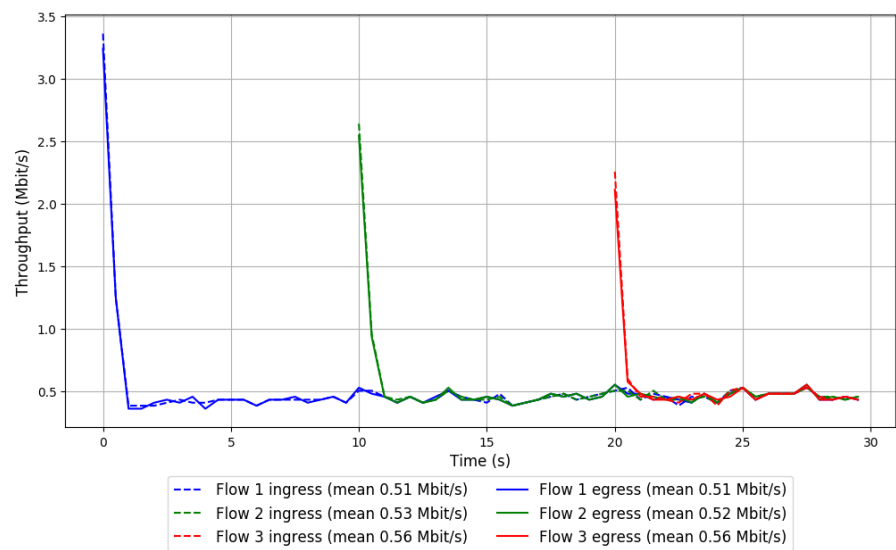


Run 1: Statistics of KohoCC

Start at: 2017-08-13 05:55:19
End at: 2017-08-13 05:55:49
Local clock offset: 0.551 ms
Remote clock offset: -2.521 ms

Below is generated by plot.py at 2017-08-13 07:35:41
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.04 Mbit/s
95th percentile per-packet one-way delay: 73.537 ms
Loss rate: 0.73%
-- Flow 1:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 76.221 ms
Loss rate: 0.47%
-- Flow 2:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 70.603 ms
Loss rate: 0.69%
-- Flow 3:
Average throughput: 0.56 Mbit/s
95th percentile per-packet one-way delay: 69.616 ms
Loss rate: 1.51%

Run 1: Report of KohoCC — Data Link

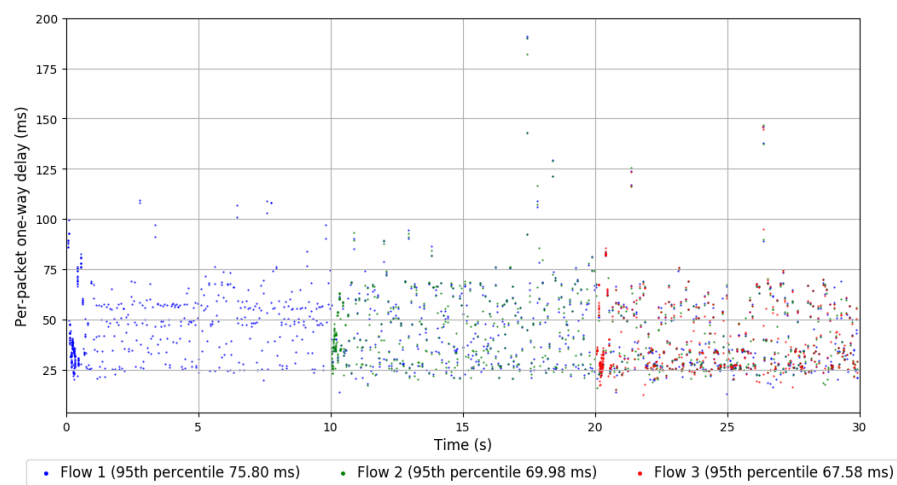
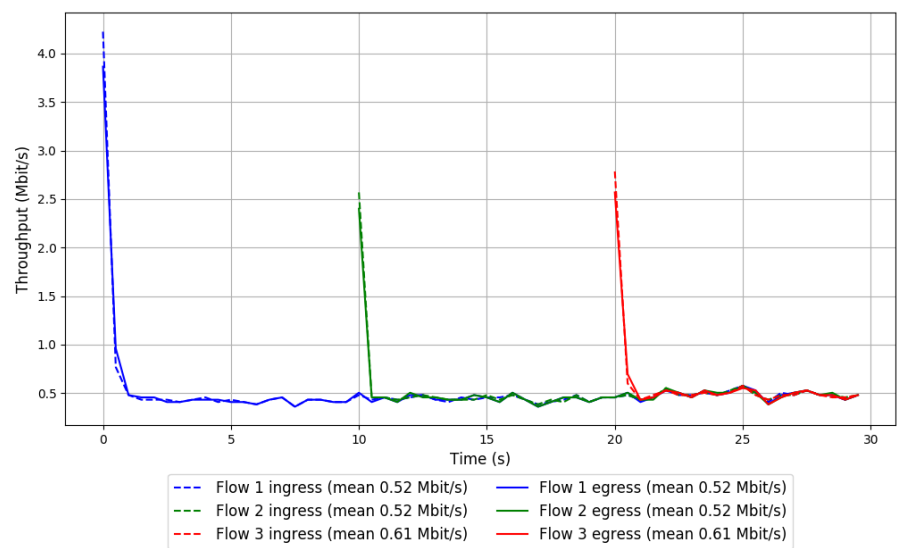


Run 2: Statistics of KohoCC

Start at: 2017-08-13 06:13:11
End at: 2017-08-13 06:13:41
Local clock offset: 0.57 ms
Remote clock offset: -2.196 ms

Below is generated by plot.py at 2017-08-13 07:35:42
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.06 Mbit/s
95th percentile per-packet one-way delay: 74.256 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 75.801 ms
Loss rate: 0.54%
-- Flow 2:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 69.978 ms
Loss rate: 0.81%
-- Flow 3:
Average throughput: 0.61 Mbit/s
95th percentile per-packet one-way delay: 67.579 ms
Loss rate: 1.19%

Run 2: Report of KohoCC — Data Link

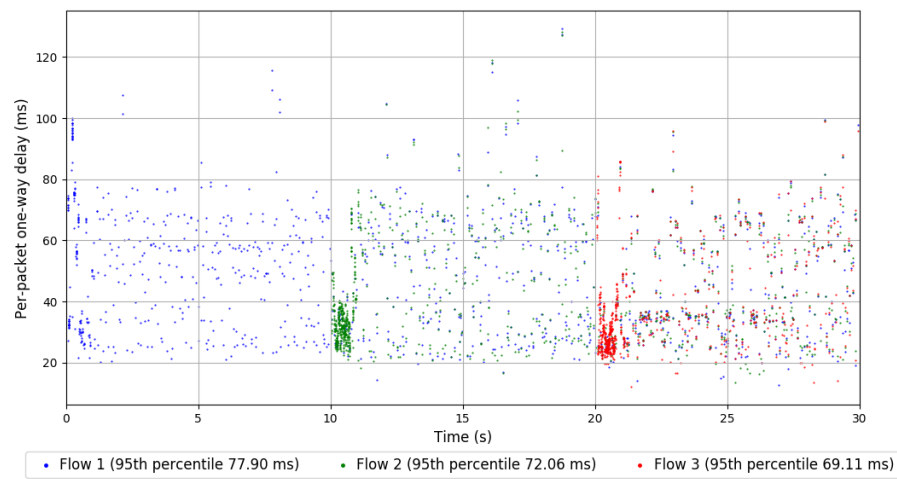
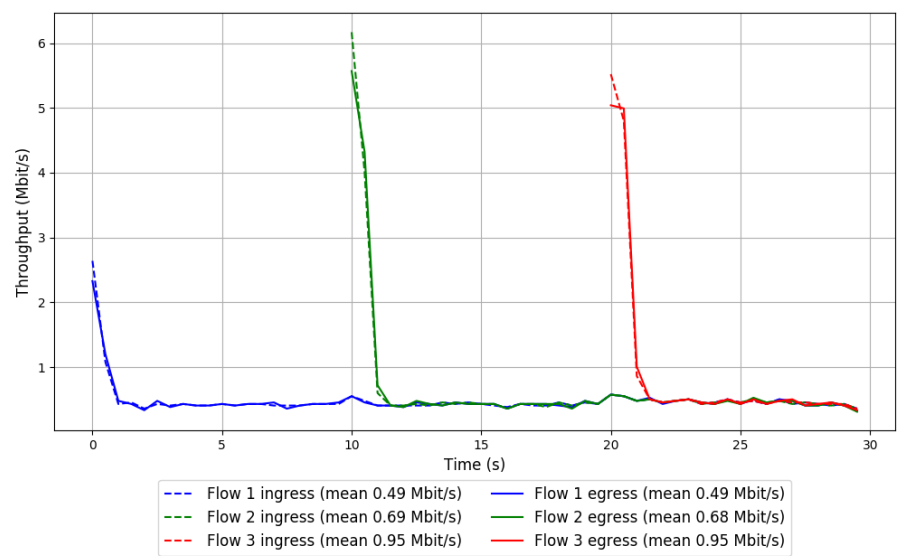


Run 3: Statistics of KohoCC

Start at: 2017-08-13 06:31:05
End at: 2017-08-13 06:31:35
Local clock offset: 0.558 ms
Remote clock offset: -2.159 ms

Below is generated by plot.py at 2017-08-13 07:35:42
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.25 Mbit/s
95th percentile per-packet one-way delay: 75.298 ms
Loss rate: 0.76%
-- Flow 1:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 77.902 ms
Loss rate: 0.66%
-- Flow 2:
Average throughput: 0.68 Mbit/s
95th percentile per-packet one-way delay: 72.062 ms
Loss rate: 0.79%
-- Flow 3:
Average throughput: 0.95 Mbit/s
95th percentile per-packet one-way delay: 69.110 ms
Loss rate: 0.89%

Run 3: Report of KohoCC — Data Link



Run 1: Statistics of LEDBAT

Start at: 2017-08-13 05:45:46

End at: 2017-08-13 05:46:16

Local clock offset: 0.499 ms

Remote clock offset: -2.54 ms

Below is generated by plot.py at 2017-08-13 07:35:44

Datalink statistics

-- Total of 3 flows:

Average throughput: 13.69 Mbit/s

95th percentile per-packet one-way delay: 116.823 ms

Loss rate: 0.54%

-- Flow 1:

Average throughput: 8.77 Mbit/s

95th percentile per-packet one-way delay: 105.413 ms

Loss rate: 0.21%

-- Flow 2:

Average throughput: 6.06 Mbit/s

95th percentile per-packet one-way delay: 122.391 ms

Loss rate: 1.06%

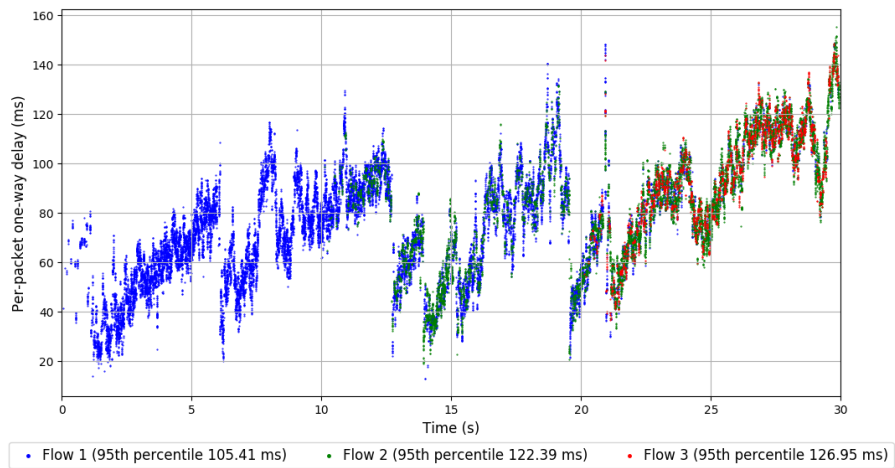
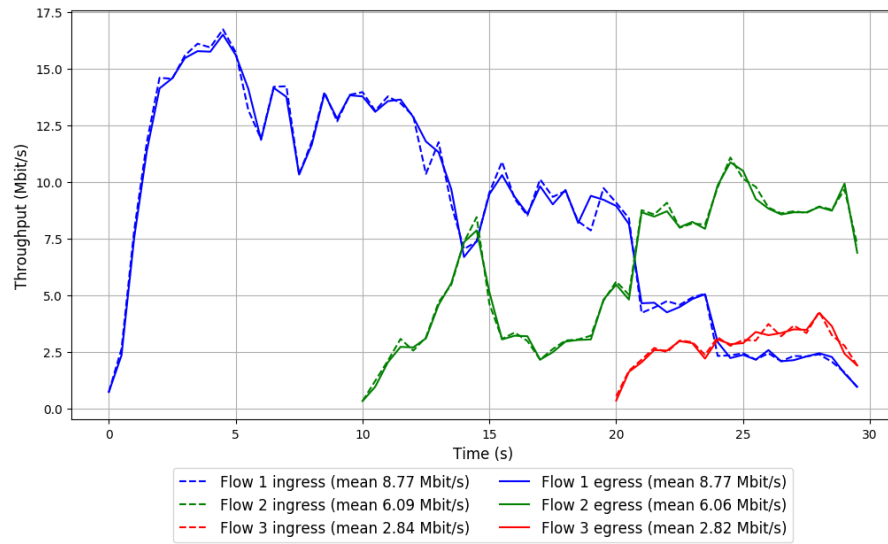
-- Flow 3:

Average throughput: 2.82 Mbit/s

95th percentile per-packet one-way delay: 126.951 ms

Loss rate: 1.39%

Run 1: Report of LEDBAT — Data Link



Run 2: Statistics of LEDBAT

Start at: 2017-08-13 06:03:40

End at: 2017-08-13 06:04:10

Local clock offset: 0.632 ms

Remote clock offset: -2.5 ms

Below is generated by plot.py at 2017-08-13 07:35:46

Datalink statistics

-- Total of 3 flows:

Average throughput: 13.07 Mbit/s

95th percentile per-packet one-way delay: 168.724 ms

Loss rate: 0.40%

-- Flow 1:

Average throughput: 10.63 Mbit/s

95th percentile per-packet one-way delay: 163.405 ms

Loss rate: 0.11%

-- Flow 2:

Average throughput: 2.61 Mbit/s

95th percentile per-packet one-way delay: 178.214 ms

Loss rate: 1.41%

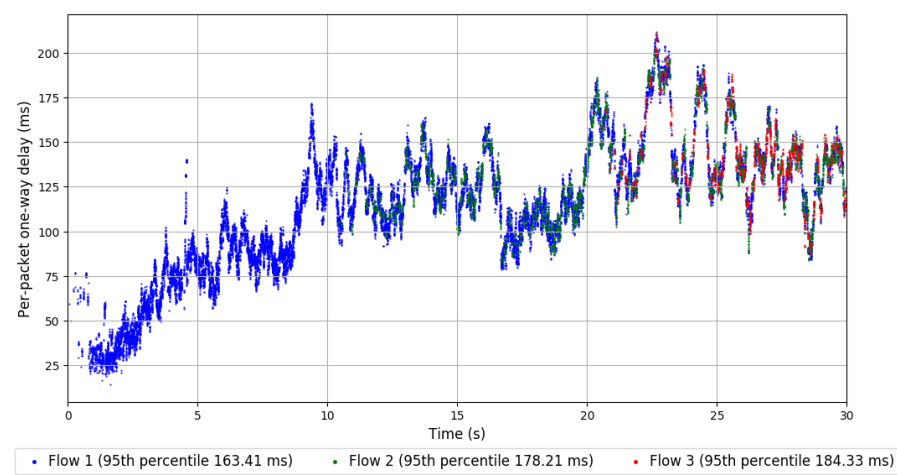
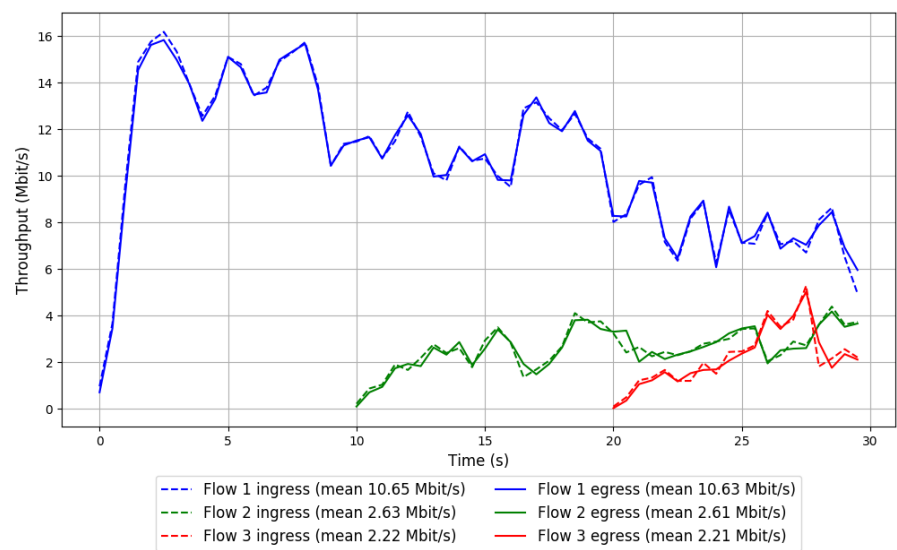
-- Flow 3:

Average throughput: 2.21 Mbit/s

95th percentile per-packet one-way delay: 184.329 ms

Loss rate: 2.25%

Run 2: Report of LEDBAT — Data Link

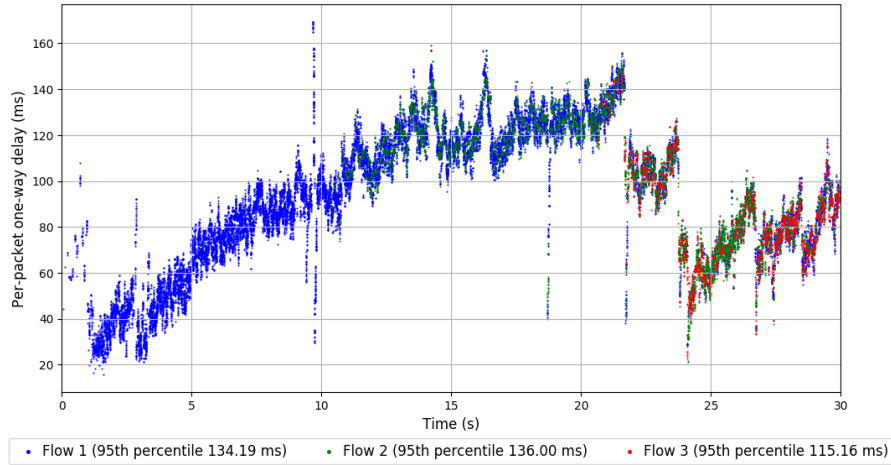
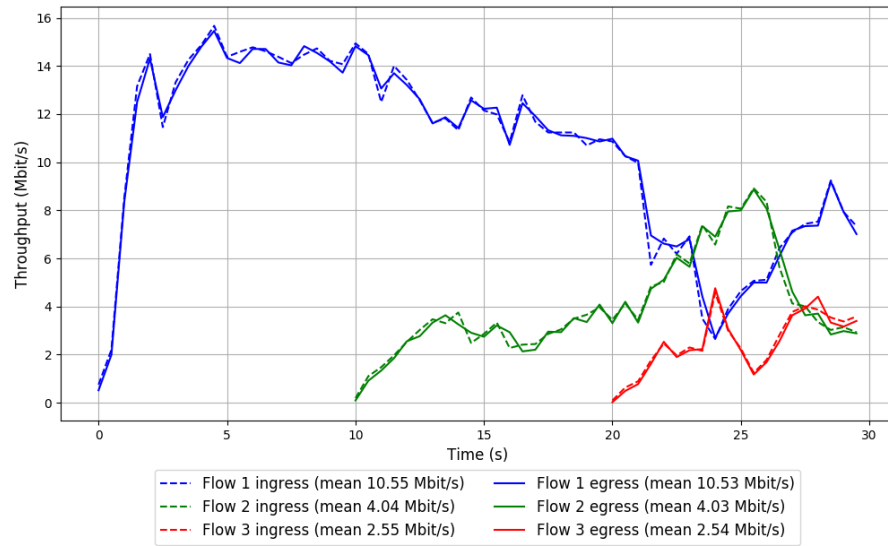


Run 3: Statistics of LEDBAT

Start at: 2017-08-13 06:21:33
End at: 2017-08-13 06:22:03
Local clock offset: 0.586 ms
Remote clock offset: -2.206 ms

Below is generated by plot.py at 2017-08-13 07:35:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 14.02 Mbit/s
95th percentile per-packet one-way delay: 134.318 ms
Loss rate: 0.46%
-- Flow 1:
Average throughput: 10.53 Mbit/s
95th percentile per-packet one-way delay: 134.194 ms
Loss rate: 0.30%
-- Flow 2:
Average throughput: 4.03 Mbit/s
95th percentile per-packet one-way delay: 136.004 ms
Loss rate: 0.57%
-- Flow 3:
Average throughput: 2.54 Mbit/s
95th percentile per-packet one-way delay: 115.162 ms
Loss rate: 2.11%

Run 3: Report of LEDBAT — Data Link

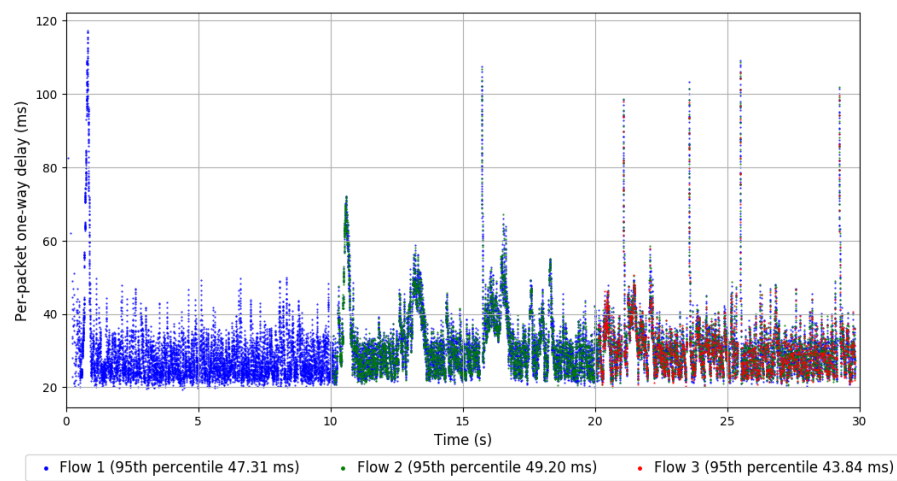
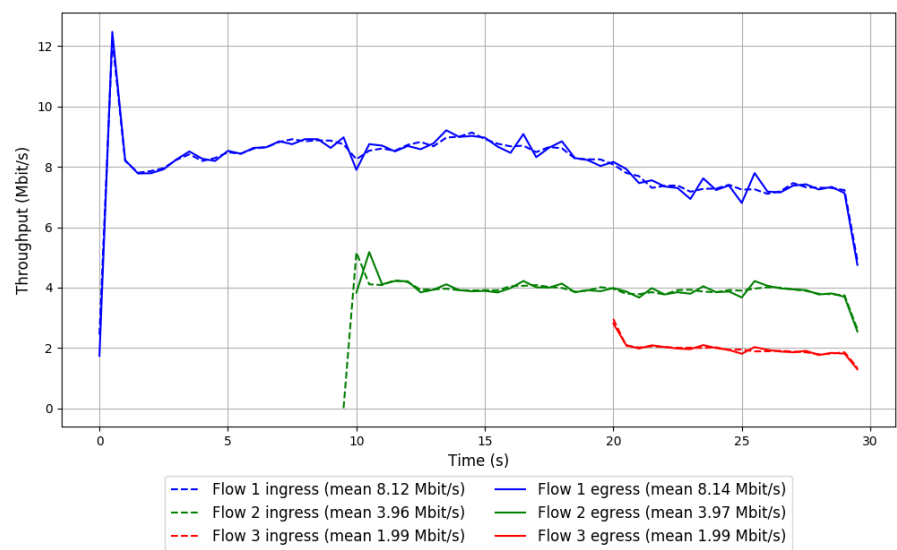


Run 1: Statistics of PCC

Start at: 2017-08-13 05:46:58
End at: 2017-08-13 05:47:28
Local clock offset: 0.602 ms
Remote clock offset: -2.539 ms

Below is generated by plot.py at 2017-08-13 07:35:48
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.43 Mbit/s
95th percentile per-packet one-way delay: 47.714 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 8.14 Mbit/s
95th percentile per-packet one-way delay: 47.307 ms
Loss rate: 0.12%
-- Flow 2:
Average throughput: 3.97 Mbit/s
95th percentile per-packet one-way delay: 49.200 ms
Loss rate: 0.20%
-- Flow 3:
Average throughput: 1.99 Mbit/s
95th percentile per-packet one-way delay: 43.835 ms
Loss rate: 0.44%

Run 1: Report of PCC — Data Link

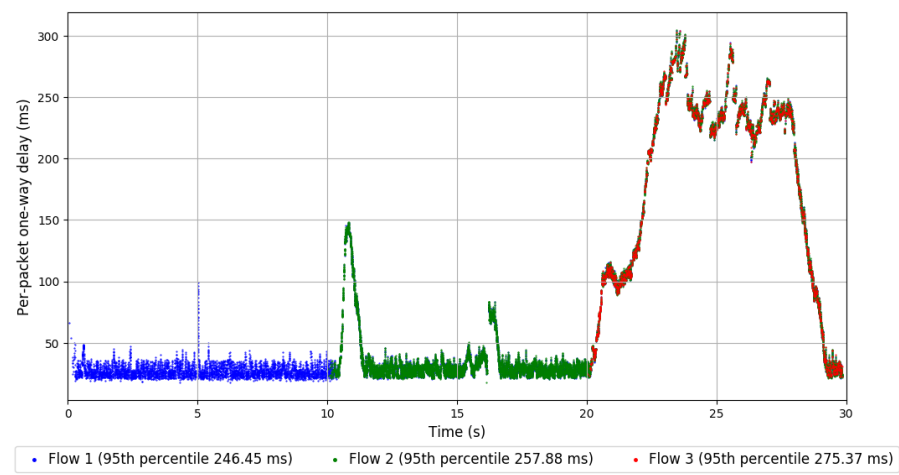
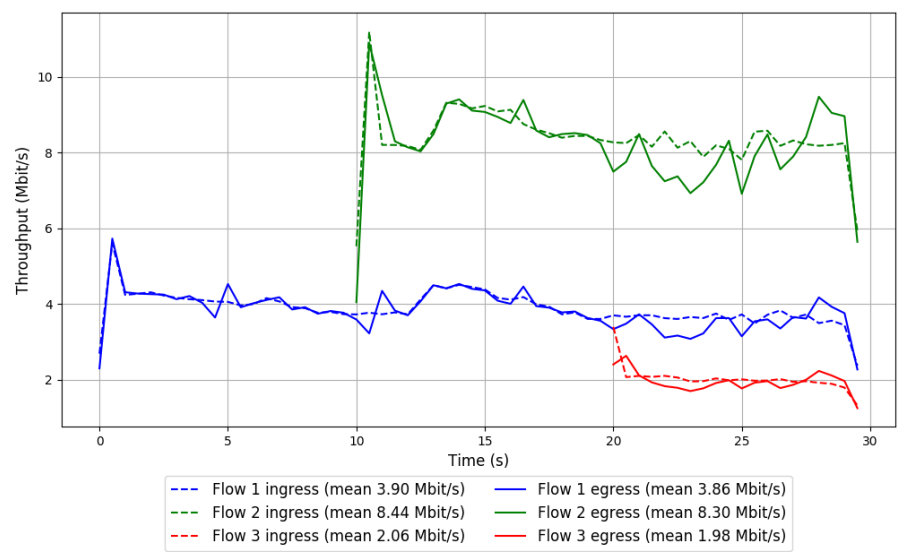


Run 2: Statistics of PCC

Start at: 2017-08-13 06:04:52
End at: 2017-08-13 06:05:22
Local clock offset: 0.575 ms
Remote clock offset: -2.462 ms

Below is generated by plot.py at 2017-08-13 07:35:51
Datalink statistics
-- Total of 3 flows:
Average throughput: 10.03 Mbit/s
95th percentile per-packet one-way delay: 254.707 ms
Loss rate: 1.84%
-- Flow 1:
Average throughput: 3.86 Mbit/s
95th percentile per-packet one-way delay: 246.449 ms
Loss rate: 1.26%
-- Flow 2:
Average throughput: 8.30 Mbit/s
95th percentile per-packet one-way delay: 257.883 ms
Loss rate: 1.98%
-- Flow 3:
Average throughput: 1.98 Mbit/s
95th percentile per-packet one-way delay: 275.373 ms
Loss rate: 4.01%

Run 2: Report of PCC — Data Link

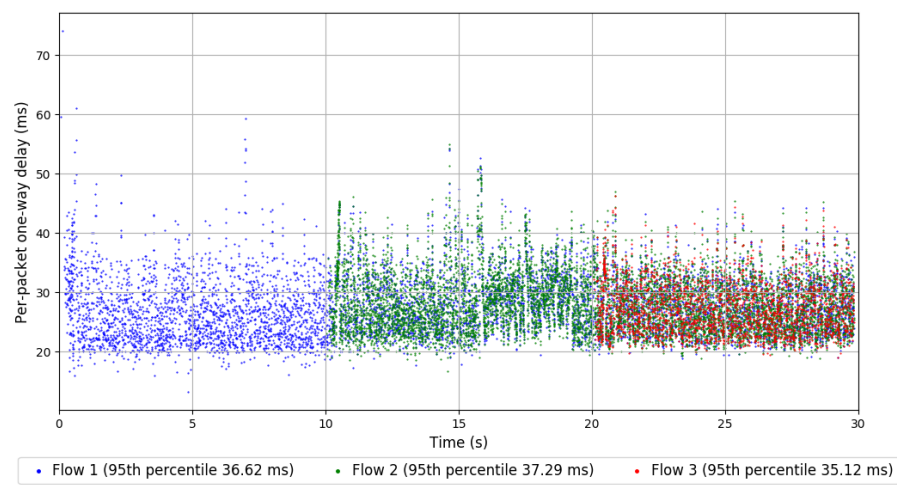
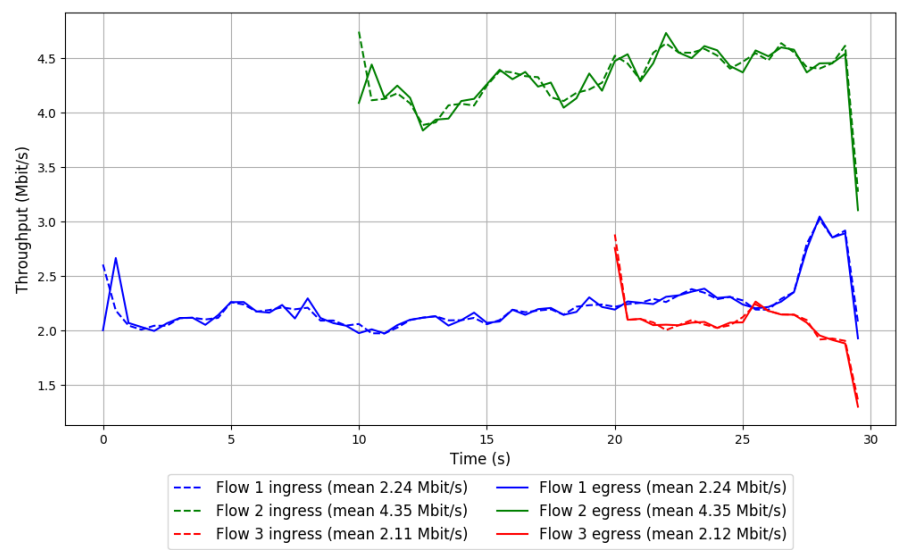


Run 3: Statistics of PCC

Start at: 2017-08-13 06:22:45
End at: 2017-08-13 06:23:15
Local clock offset: 0.641 ms
Remote clock offset: -2.298 ms

Below is generated by plot.py at 2017-08-13 07:35:51
Datalink statistics
-- Total of 3 flows:
Average throughput: 5.82 Mbit/s
95th percentile per-packet one-way delay: 36.704 ms
Loss rate: 0.28%
-- Flow 1:
Average throughput: 2.24 Mbit/s
95th percentile per-packet one-way delay: 36.617 ms
Loss rate: 0.24%
-- Flow 2:
Average throughput: 4.35 Mbit/s
95th percentile per-packet one-way delay: 37.289 ms
Loss rate: 0.27%
-- Flow 3:
Average throughput: 2.12 Mbit/s
95th percentile per-packet one-way delay: 35.125 ms
Loss rate: 0.44%

Run 3: Report of PCC — Data Link

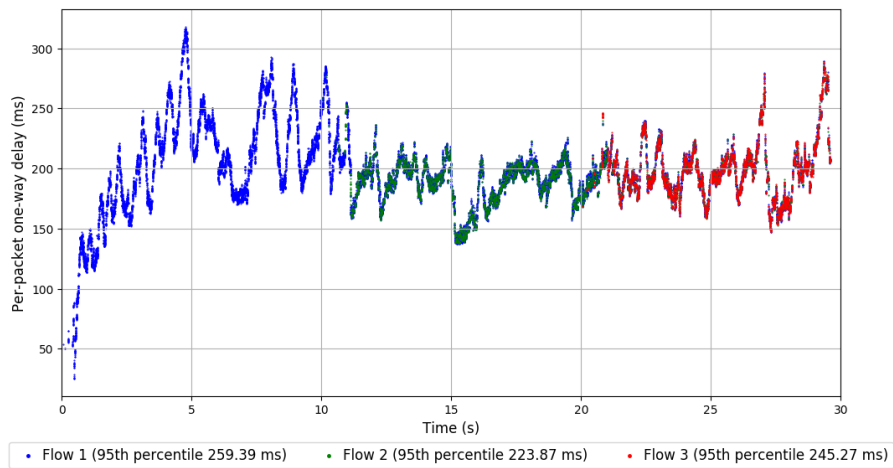
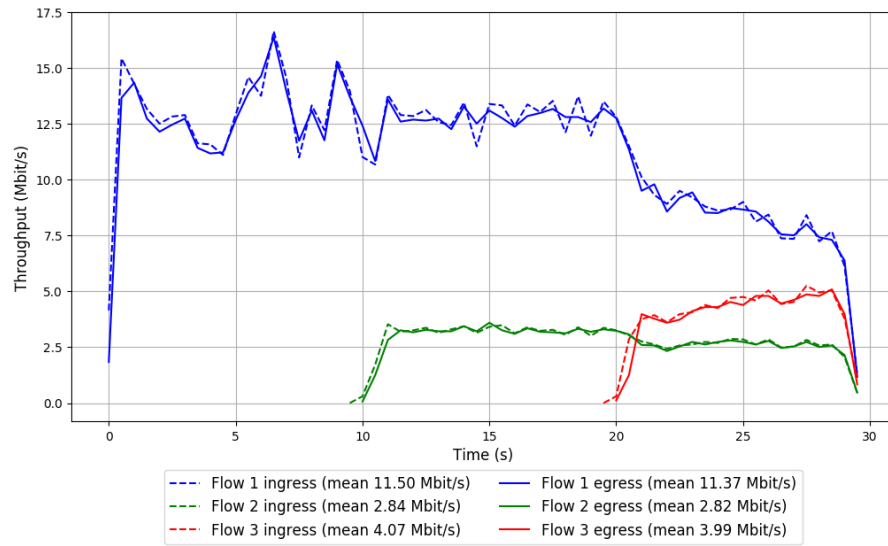


Run 1: Statistics of QUIC Cubic

Start at: 2017-08-13 05:56:30
End at: 2017-08-13 05:57:00
Local clock offset: 0.621 ms
Remote clock offset: -2.522 ms

Below is generated by plot.py at 2017-08-13 07:35:54
Datalink statistics
-- Total of 3 flows:
Average throughput: 14.53 Mbit/s
95th percentile per-packet one-way delay: 255.007 ms
Loss rate: 1.65%
-- Flow 1:
Average throughput: 11.37 Mbit/s
95th percentile per-packet one-way delay: 259.388 ms
Loss rate: 1.34%
-- Flow 2:
Average throughput: 2.82 Mbit/s
95th percentile per-packet one-way delay: 223.868 ms
Loss rate: 2.01%
-- Flow 3:
Average throughput: 3.99 Mbit/s
95th percentile per-packet one-way delay: 245.272 ms
Loss rate: 3.79%

Run 1: Report of QUIC Cubic — Data Link

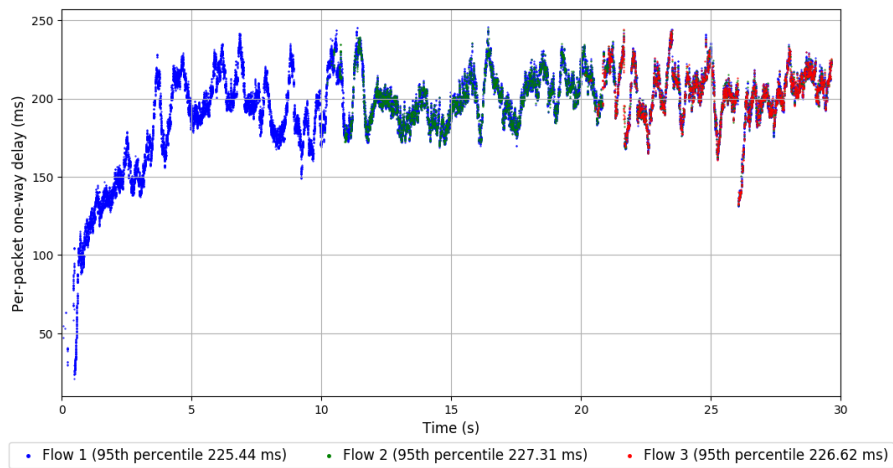
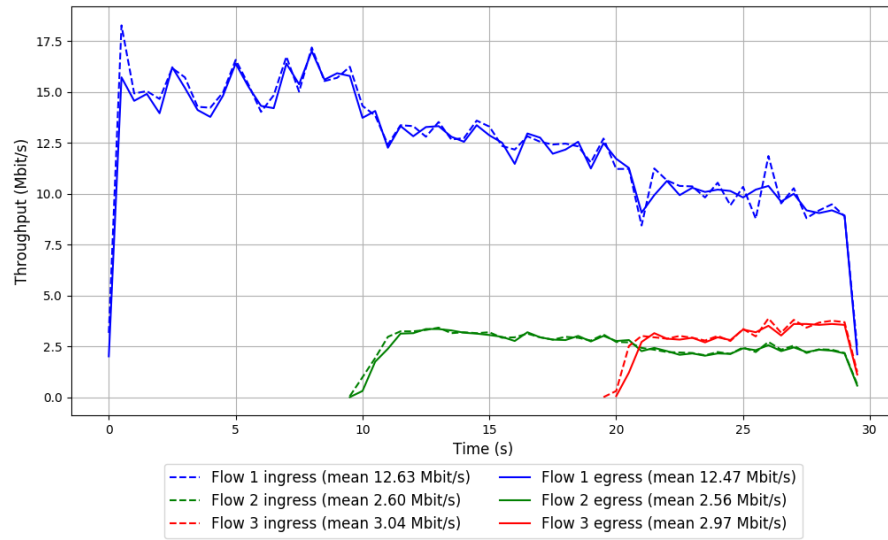


Run 2: Statistics of QUIC Cubic

Start at: 2017-08-13 06:14:22
End at: 2017-08-13 06:14:52
Local clock offset: 0.683 ms
Remote clock offset: -2.272 ms

Below is generated by plot.py at 2017-08-13 07:35:54
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.12 Mbit/s
95th percentile per-packet one-way delay: 225.772 ms
Loss rate: 1.79%
-- Flow 1:
Average throughput: 12.47 Mbit/s
95th percentile per-packet one-way delay: 225.443 ms
Loss rate: 1.46%
-- Flow 2:
Average throughput: 2.56 Mbit/s
95th percentile per-packet one-way delay: 227.314 ms
Loss rate: 2.41%
-- Flow 3:
Average throughput: 2.97 Mbit/s
95th percentile per-packet one-way delay: 226.620 ms
Loss rate: 4.79%

Run 2: Report of QUIC Cubic — Data Link

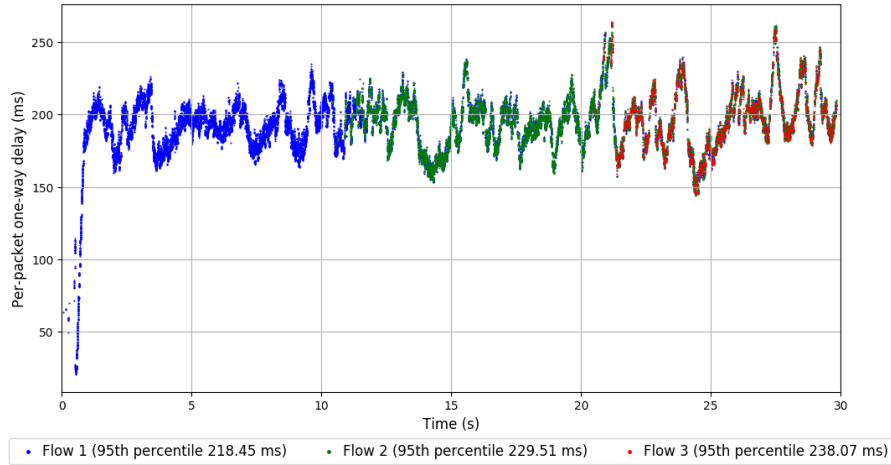
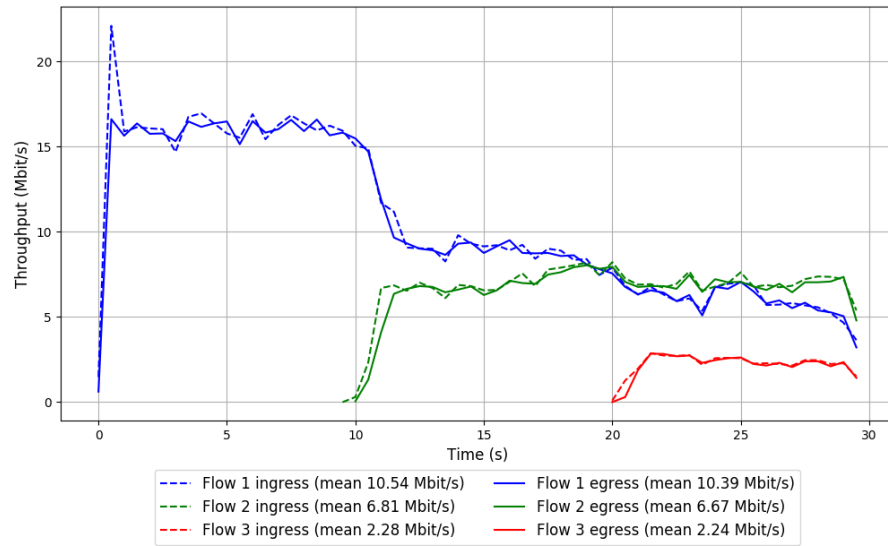


Run 3: Statistics of QUIC Cubic

Start at: 2017-08-13 06:32:17
End at: 2017-08-13 06:32:47
Local clock offset: 0.651 ms
Remote clock offset: -2.137 ms

Below is generated by plot.py at 2017-08-13 07:35:56
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.51 Mbit/s
95th percentile per-packet one-way delay: 223.230 ms
Loss rate: 2.17%
-- Flow 1:
Average throughput: 10.39 Mbit/s
95th percentile per-packet one-way delay: 218.451 ms
Loss rate: 1.67%
-- Flow 2:
Average throughput: 6.67 Mbit/s
95th percentile per-packet one-way delay: 229.506 ms
Loss rate: 3.12%
-- Flow 3:
Average throughput: 2.24 Mbit/s
95th percentile per-packet one-way delay: 238.066 ms
Loss rate: 3.58%

Run 3: Report of QUIC Cubic — Data Link

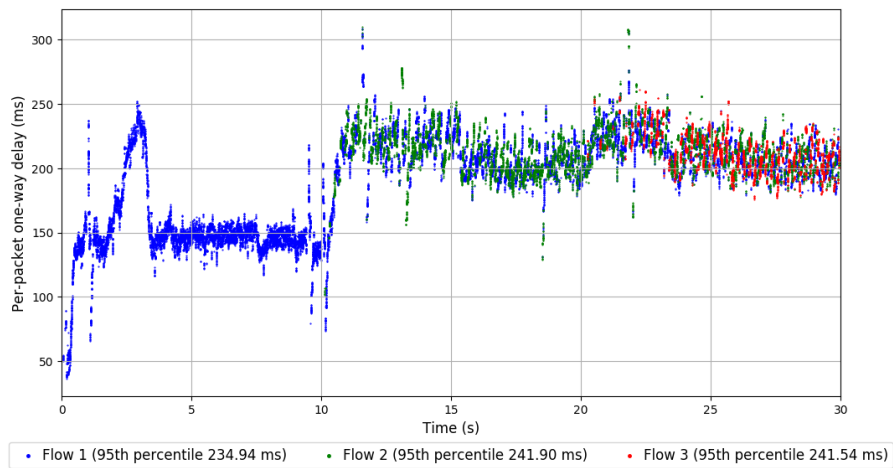
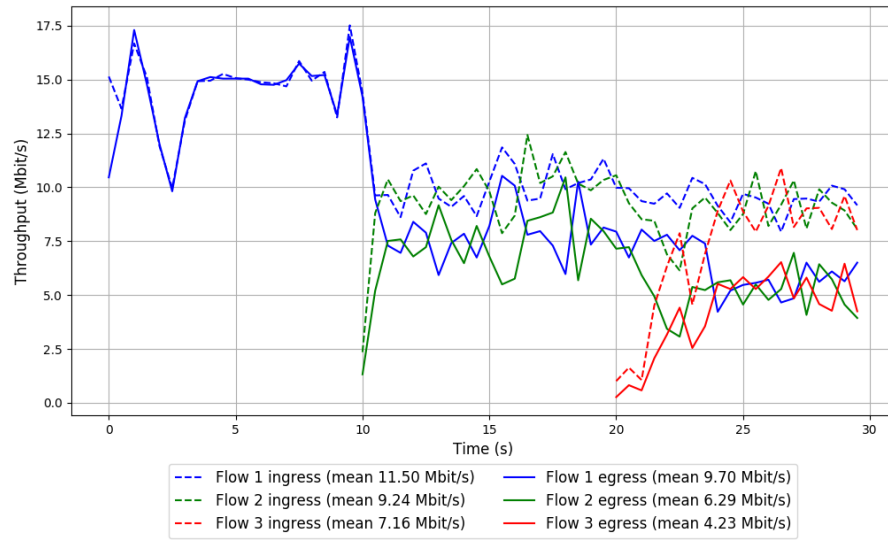


Run 1: Statistics of Saturator

Start at: 2017-08-13 05:49:21
End at: 2017-08-13 05:49:51
Local clock offset: 0.593 ms
Remote clock offset: -2.555 ms

Below is generated by plot.py at 2017-08-13 07:35:58
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.23 Mbit/s
95th percentile per-packet one-way delay: 237.721 ms
Loss rate: 24.00%
-- Flow 1:
Average throughput: 9.70 Mbit/s
95th percentile per-packet one-way delay: 234.941 ms
Loss rate: 15.80%
-- Flow 2:
Average throughput: 6.29 Mbit/s
95th percentile per-packet one-way delay: 241.896 ms
Loss rate: 32.28%
-- Flow 3:
Average throughput: 4.23 Mbit/s
95th percentile per-packet one-way delay: 241.536 ms
Loss rate: 42.27%

Run 1: Report of Saturator — Data Link

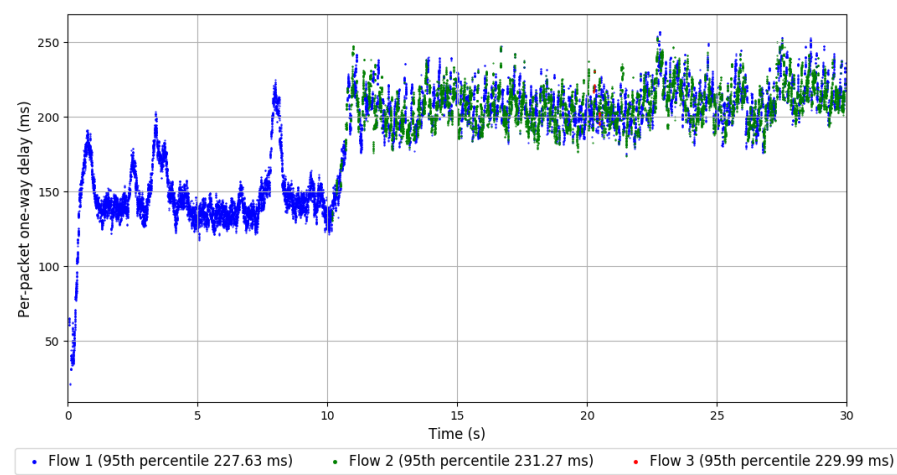
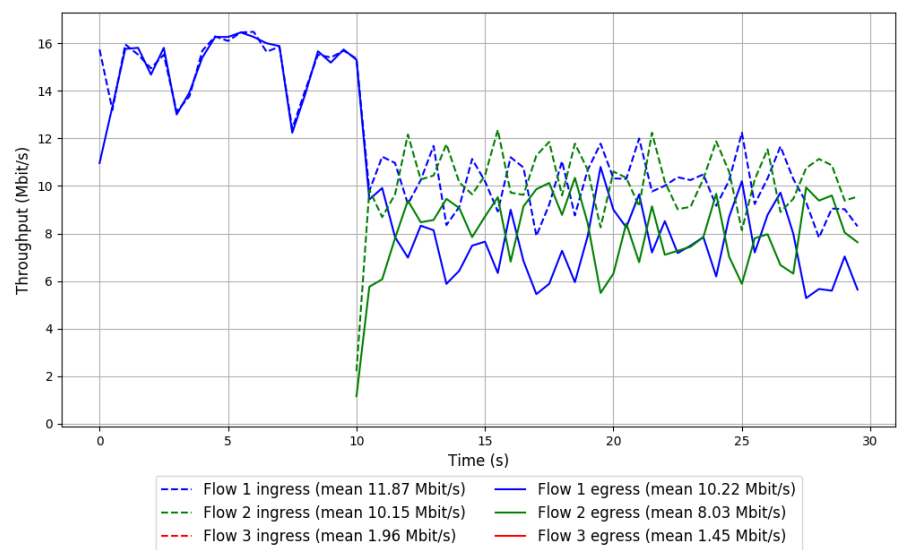


Run 2: Statistics of Saturator

Start at: 2017-08-13 06:07:14
End at: 2017-08-13 06:07:44
Local clock offset: 0.644 ms
Remote clock offset: -2.443 ms

Below is generated by plot.py at 2017-08-13 07:36:00
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.53 Mbit/s
95th percentile per-packet one-way delay: 229.195 ms
Loss rate: 16.88%
-- Flow 1:
Average throughput: 10.22 Mbit/s
95th percentile per-packet one-way delay: 227.627 ms
Loss rate: 14.15%
-- Flow 2:
Average throughput: 8.03 Mbit/s
95th percentile per-packet one-way delay: 231.268 ms
Loss rate: 21.49%
-- Flow 3:
Average throughput: 1.45 Mbit/s
95th percentile per-packet one-way delay: 229.989 ms
Loss rate: 63.51%

Run 2: Report of Saturator — Data Link

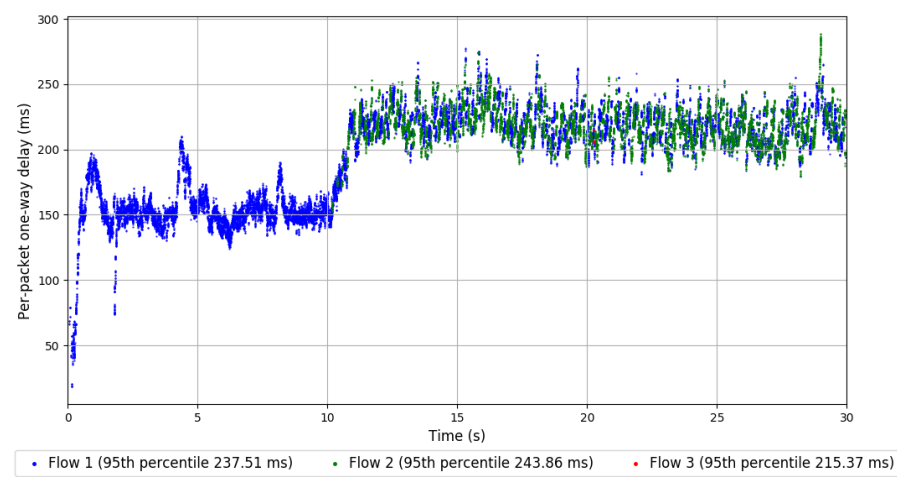
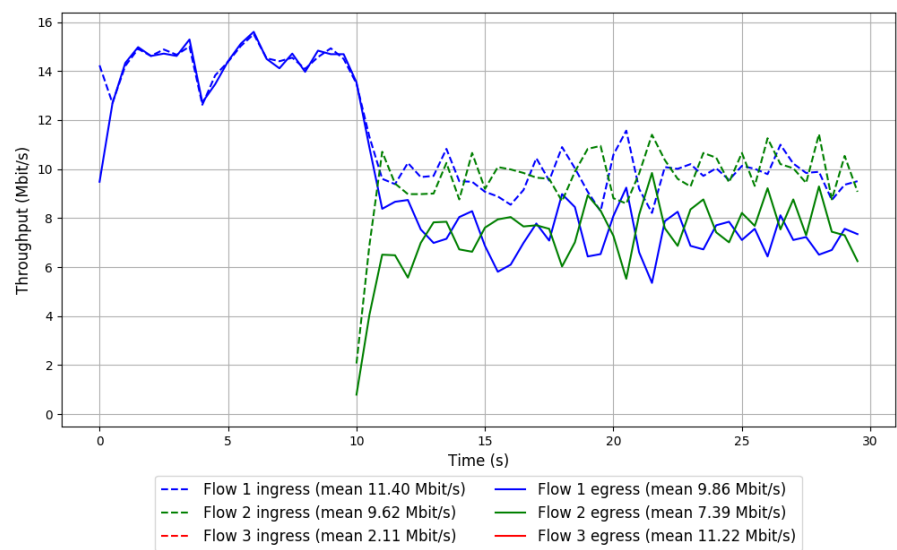


Run 3: Statistics of Saturator

Start at: 2017-08-13 06:25:08
End at: 2017-08-13 06:25:38
Local clock offset: 0.677 ms
Remote clock offset: -2.223 ms

Below is generated by plot.py at 2017-08-13 07:36:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 14.74 Mbit/s
95th percentile per-packet one-way delay: 240.051 ms
Loss rate: 17.46%
-- Flow 1:
Average throughput: 9.86 Mbit/s
95th percentile per-packet one-way delay: 237.514 ms
Loss rate: 13.76%
-- Flow 2:
Average throughput: 7.39 Mbit/s
95th percentile per-packet one-way delay: 243.863 ms
Loss rate: 23.89%
-- Flow 3:
Average throughput: 11.22 Mbit/s
95th percentile per-packet one-way delay: 215.366 ms
Loss rate: 75.00%

Run 3: Report of Saturator — Data Link

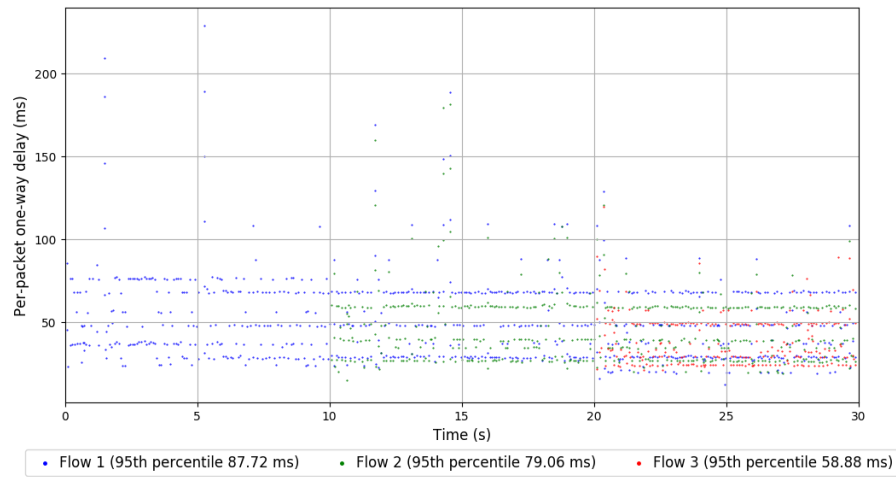
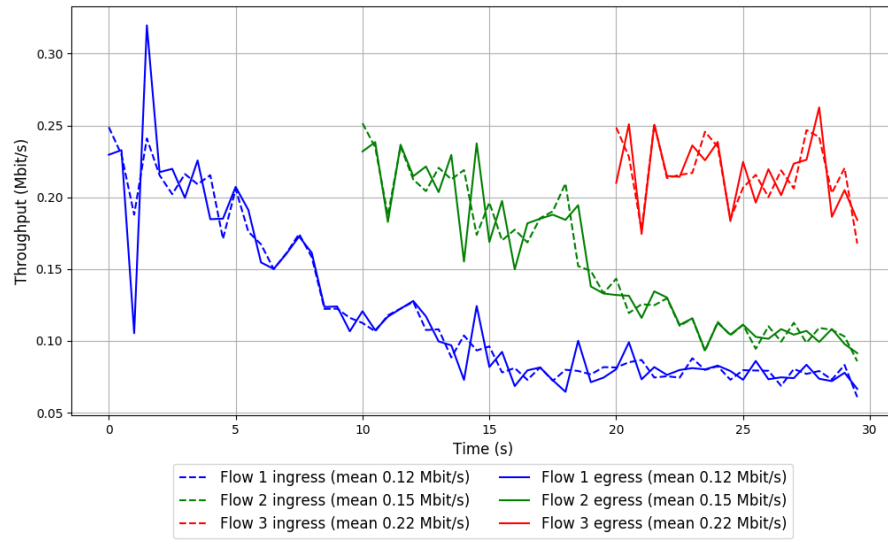


Run 1: Statistics of SCReAM

Start at: 2017-08-13 05:51:45
End at: 2017-08-13 05:52:15
Local clock offset: 0.629 ms
Remote clock offset: -2.567 ms

Below is generated by plot.py at 2017-08-13 07:36:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 77.445 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 87.718 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 79.055 ms
Loss rate: 0.14%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 58.881 ms
Loss rate: 0.36%

Run 1: Report of SReAM — Data Link

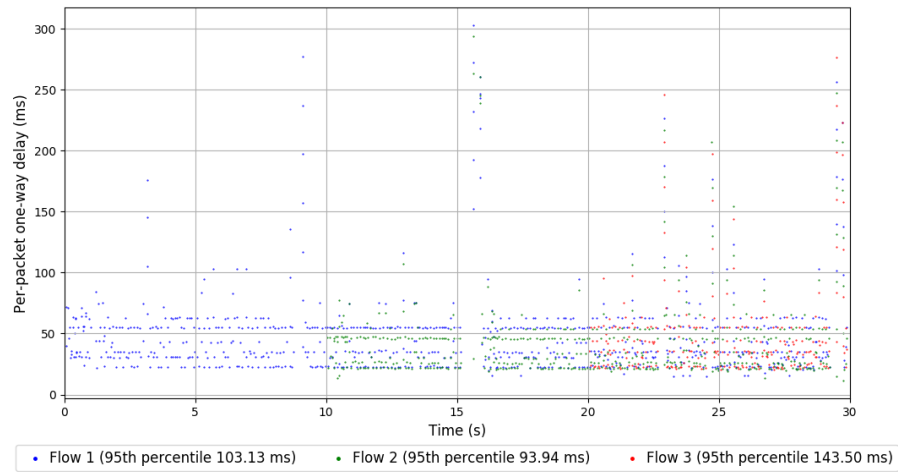
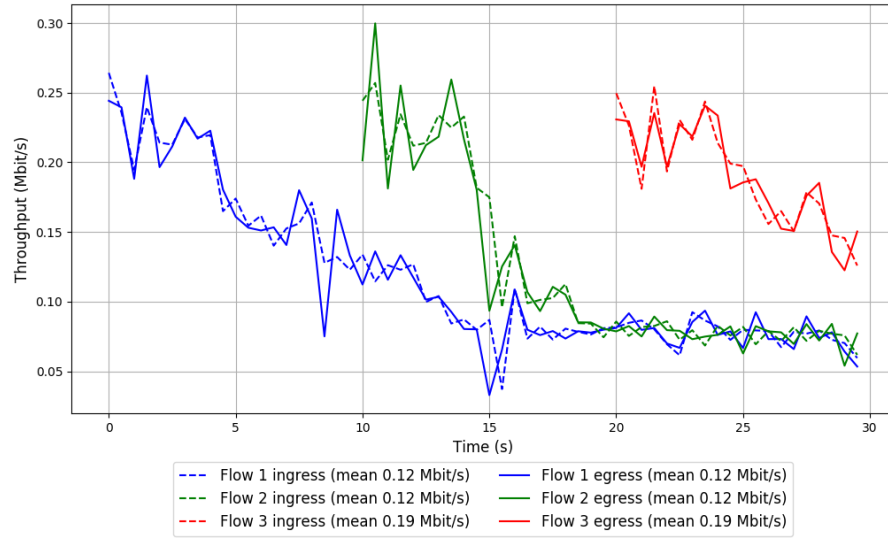


Run 2: Statistics of SCReAM

Start at: 2017-08-13 06:09:38
End at: 2017-08-13 06:10:08
Local clock offset: 0.656 ms
Remote clock offset: -2.296 ms

Below is generated by plot.py at 2017-08-13 07:36:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 104.978 ms
Loss rate: 0.92%
-- Flow 1:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 103.130 ms
Loss rate: 0.83%
-- Flow 2:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 93.936 ms
Loss rate: 1.54%
-- Flow 3:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 143.505 ms
Loss rate: 0.28%

Run 2: Report of SReAM — Data Link

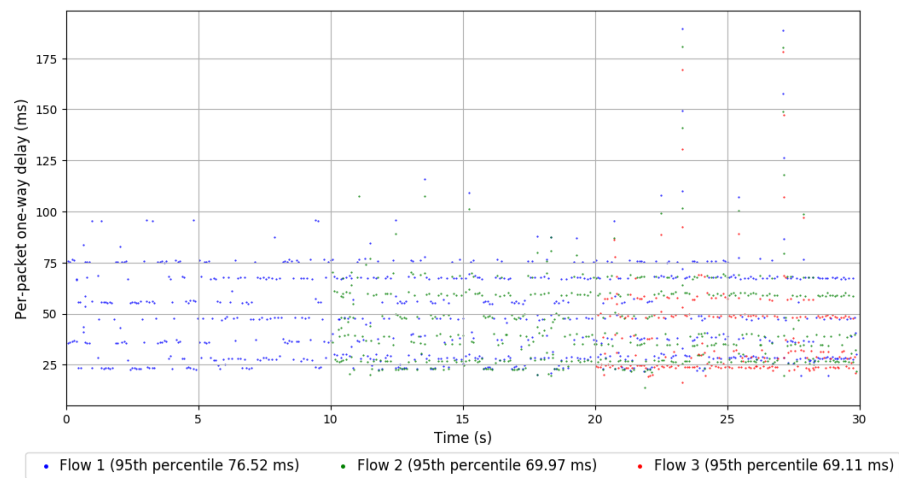
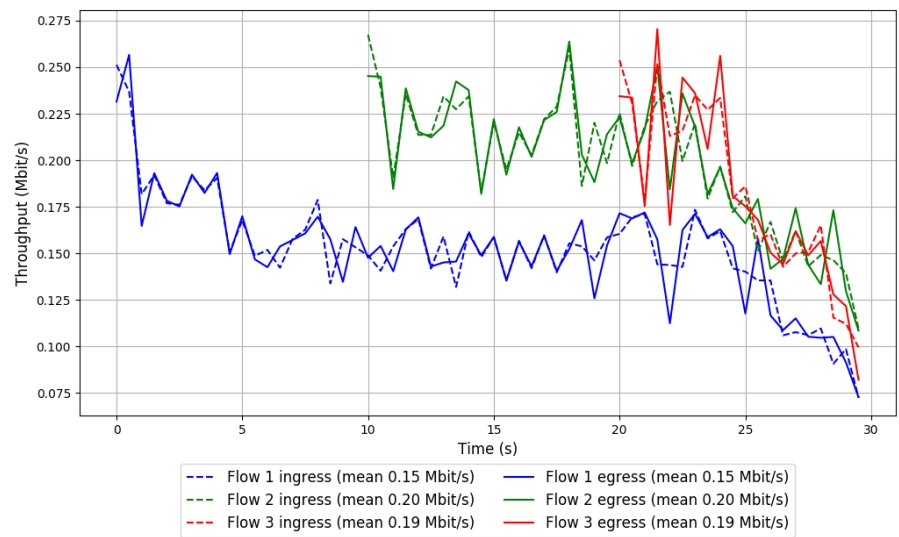


Run 3: Statistics of SCReAM

Start at: 2017-08-13 06:27:32
End at: 2017-08-13 06:28:02
Local clock offset: 0.641 ms
Remote clock offset: -2.163 ms

Below is generated by plot.py at 2017-08-13 07:36:03
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.35 Mbit/s
95th percentile per-packet one-way delay: 76.192 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 76.517 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 69.975 ms
Loss rate: 0.14%
-- Flow 3:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 69.115 ms
Loss rate: 0.48%

Run 3: Report of SReAM — Data Link

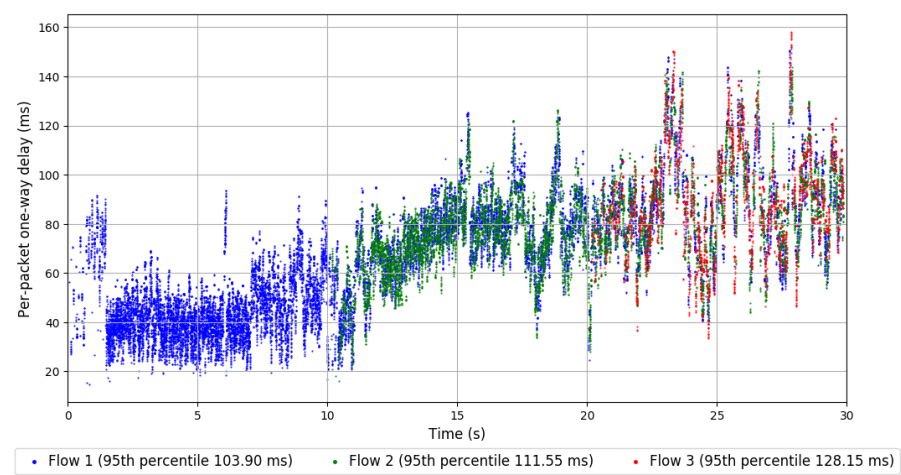
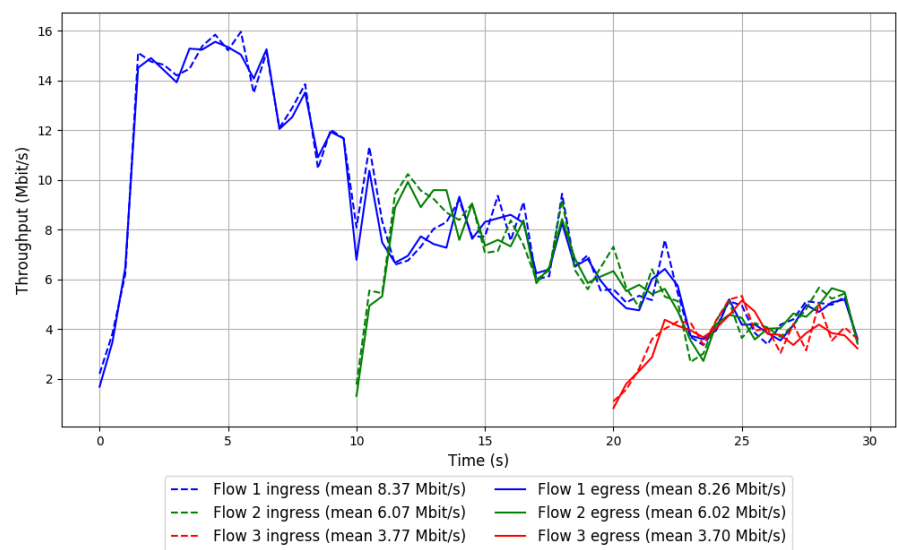


Run 1: Statistics of Sprout

Start at: 2017-08-13 05:57:41
End at: 2017-08-13 05:58:11
Local clock offset: 0.566 ms
Remote clock offset: -2.586 ms

Below is generated by plot.py at 2017-08-13 07:36:05
Datalink statistics
-- Total of 3 flows:
Average throughput: 13.46 Mbit/s
95th percentile per-packet one-way delay: 110.311 ms
Loss rate: 1.64%
-- Flow 1:
Average throughput: 8.26 Mbit/s
95th percentile per-packet one-way delay: 103.901 ms
Loss rate: 1.66%
-- Flow 2:
Average throughput: 6.02 Mbit/s
95th percentile per-packet one-way delay: 111.549 ms
Loss rate: 1.29%
-- Flow 3:
Average throughput: 3.70 Mbit/s
95th percentile per-packet one-way delay: 128.152 ms
Loss rate: 2.59%

Run 1: Report of Sprout — Data Link

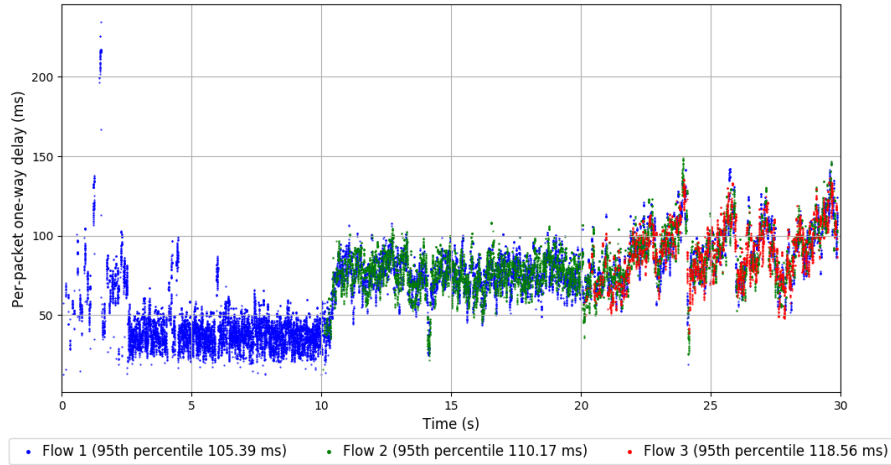
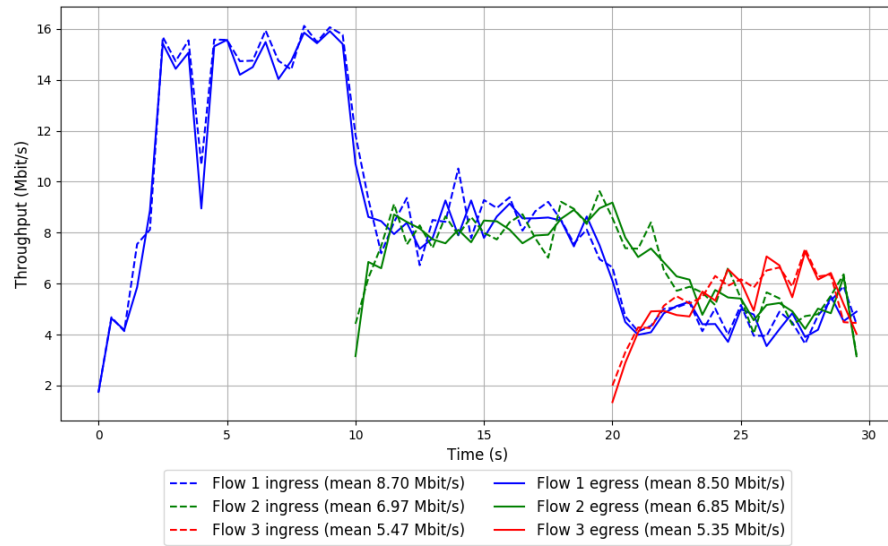


Run 2: Statistics of Sprout

Start at: 2017-08-13 06:15:34
End at: 2017-08-13 06:16:04
Local clock offset: 0.58 ms
Remote clock offset: -2.266 ms

Below is generated by plot.py at 2017-08-13 07:36:06
Datalink statistics
-- Total of 3 flows:
Average throughput: 14.80 Mbit/s
95th percentile per-packet one-way delay: 110.417 ms
Loss rate: 2.29%
-- Flow 1:
Average throughput: 8.50 Mbit/s
95th percentile per-packet one-way delay: 105.391 ms
Loss rate: 2.55%
-- Flow 2:
Average throughput: 6.85 Mbit/s
95th percentile per-packet one-way delay: 110.171 ms
Loss rate: 1.65%
-- Flow 3:
Average throughput: 5.35 Mbit/s
95th percentile per-packet one-way delay: 118.558 ms
Loss rate: 2.65%

Run 2: Report of Sprout — Data Link

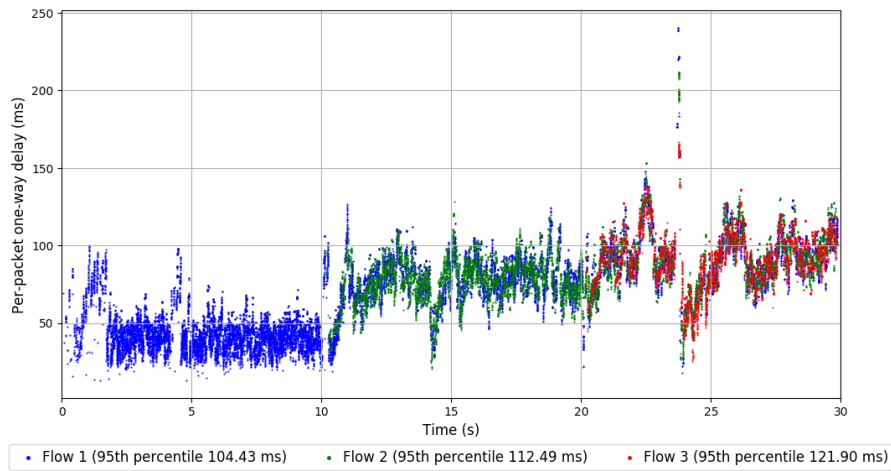
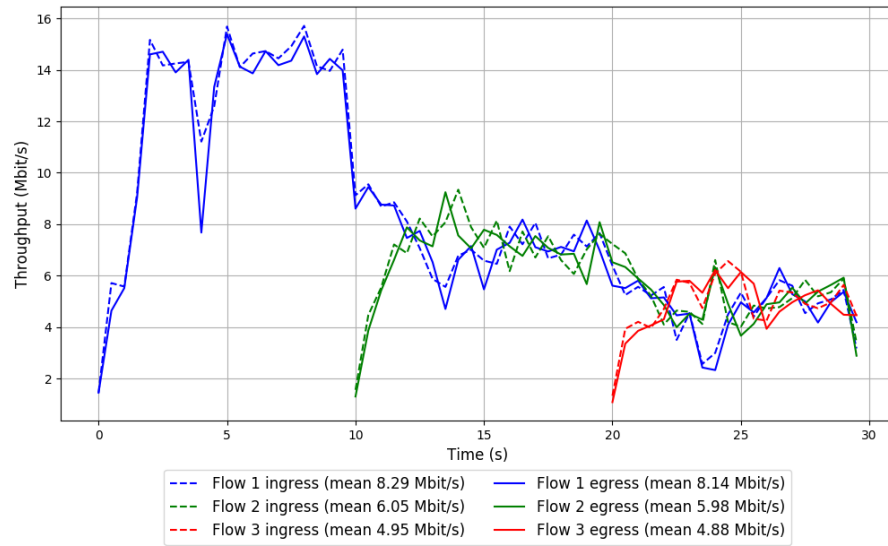


Run 3: Statistics of Sprout

Start at: 2017-08-13 06:33:29
End at: 2017-08-13 06:33:59
Local clock offset: 0.661 ms
Remote clock offset: -2.163 ms

```
# Below is generated by plot.py at 2017-08-13 07:36:08
# Datalink statistics
-- Total of 3 flows:
Average throughput: 13.70 Mbit/s
95th percentile per-packet one-way delay: 110.544 ms
Loss rate: 1.92%
-- Flow 1:
Average throughput: 8.14 Mbit/s
95th percentile per-packet one-way delay: 104.429 ms
Loss rate: 1.96%
-- Flow 2:
Average throughput: 5.98 Mbit/s
95th percentile per-packet one-way delay: 112.486 ms
Loss rate: 1.74%
-- Flow 3:
Average throughput: 4.88 Mbit/s
95th percentile per-packet one-way delay: 121.904 ms
Loss rate: 2.17%
```


Run 3: Report of Sprout — Data Link

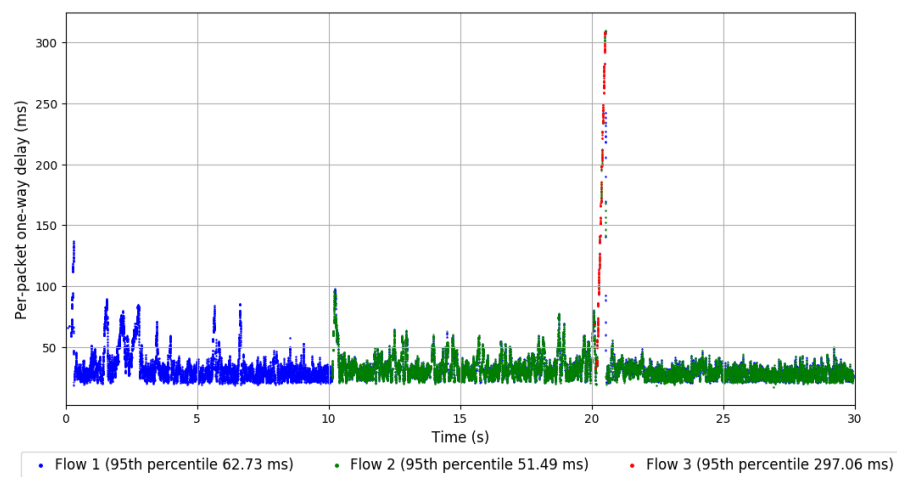
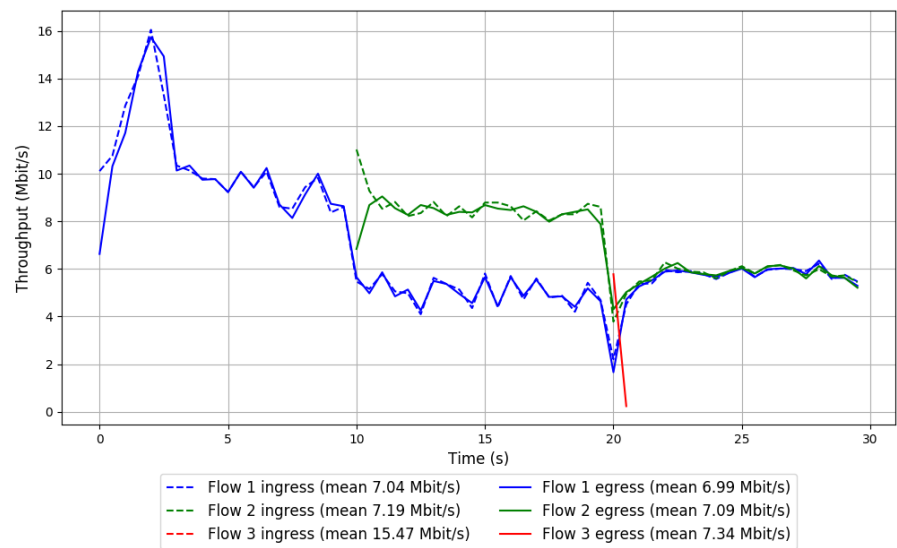


```
Run 1: Statistics of TaoVA-100x

Start at: 2017-08-13 06:01:16
End at: 2017-08-13 06:01:46
Local clock offset: 0.639 ms
Remote clock offset: -2.577 ms

# Below is generated by plot.py at 2017-08-13 07:36:10
# Datalink statistics
-- Total of 3 flows:
Average throughput: 11.81 Mbit/s
95th percentile per-packet one-way delay: 60.655 ms
Loss rate: 1.30%
-- Flow 1:
Average throughput: 6.99 Mbit/s
95th percentile per-packet one-way delay: 62.731 ms
Loss rate: 0.97%
-- Flow 2:
Average throughput: 7.09 Mbit/s
95th percentile per-packet one-way delay: 51.494 ms
Loss rate: 1.70%
-- Flow 3:
Average throughput: 7.34 Mbit/s
95th percentile per-packet one-way delay: 297.055 ms
Loss rate: 5.75%
```

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

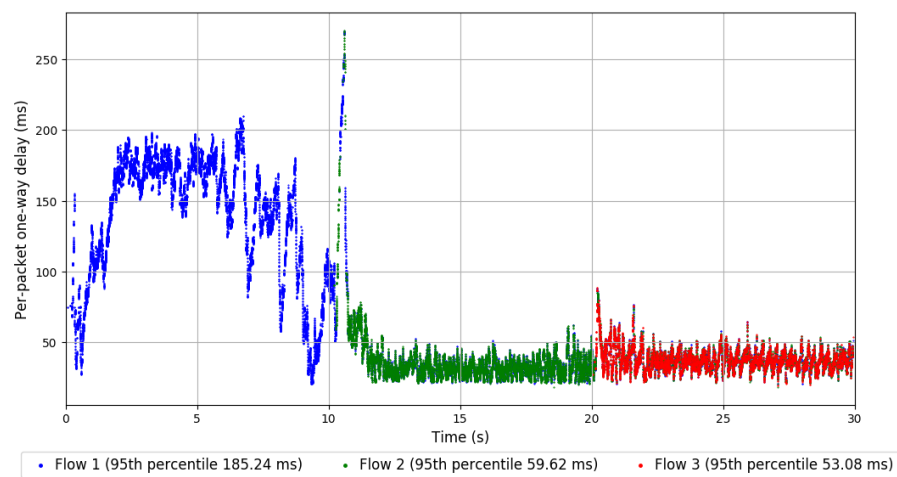
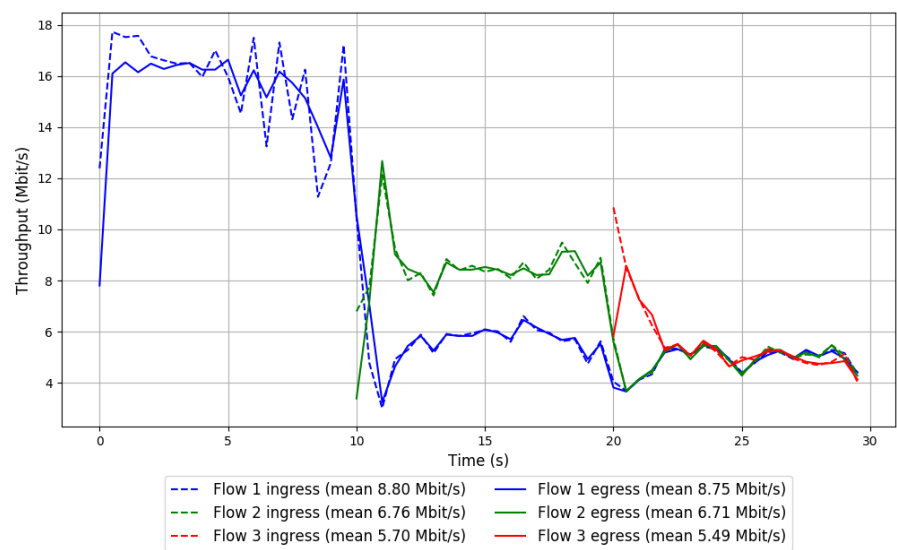


Run 2: Statistics of TaoVA-100x

Start at: 2017-08-13 06:19:08
End at: 2017-08-13 06:19:38
Local clock offset: 0.659 ms
Remote clock offset: -2.245 ms

Below is generated by plot.py at 2017-08-13 07:36:14
Datalink statistics
-- Total of 3 flows:
Average throughput: 15.02 Mbit/s
95th percentile per-packet one-way delay: 180.478 ms
Loss rate: 1.42%
-- Flow 1:
Average throughput: 8.75 Mbit/s
95th percentile per-packet one-way delay: 185.241 ms
Loss rate: 0.90%
-- Flow 2:
Average throughput: 6.71 Mbit/s
95th percentile per-packet one-way delay: 59.622 ms
Loss rate: 1.28%
-- Flow 3:
Average throughput: 5.49 Mbit/s
95th percentile per-packet one-way delay: 53.083 ms
Loss rate: 4.15%

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

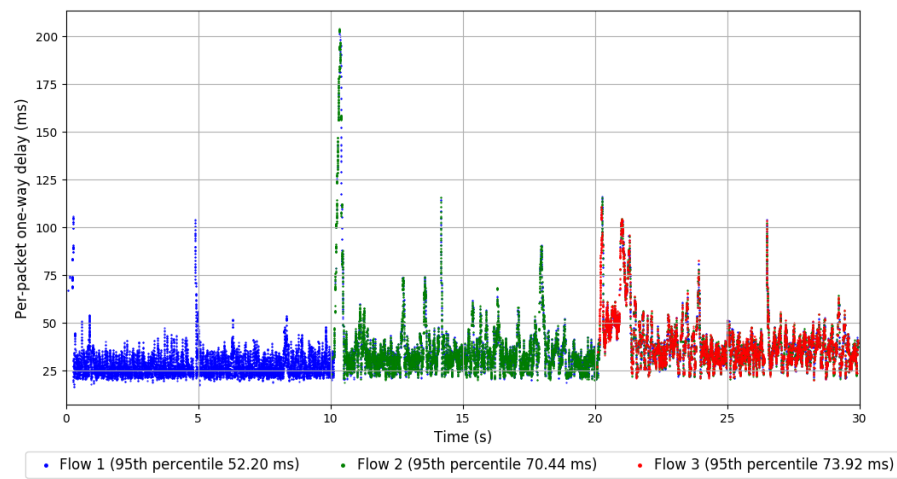
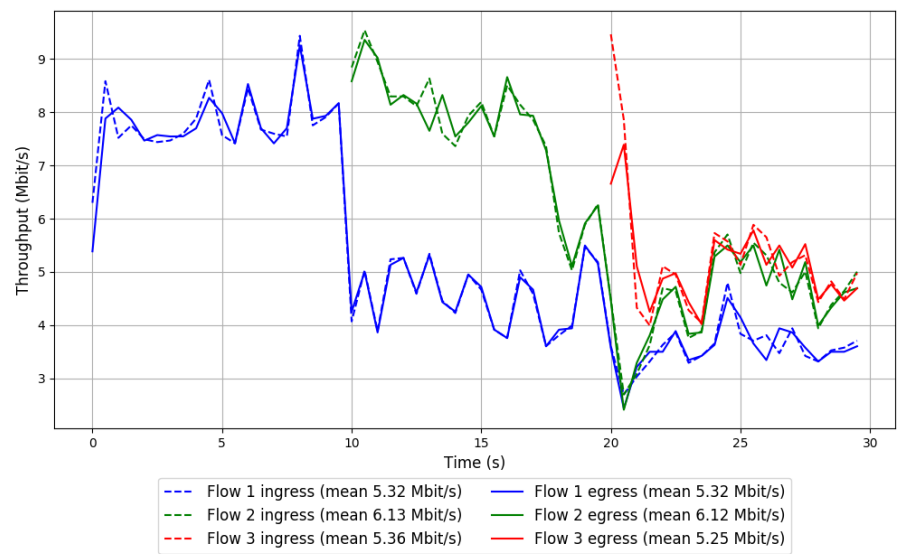


Run 3: Statistics of TaoVA-100x

Start at: 2017-08-13 06:37:03
End at: 2017-08-13 06:37:33
Local clock offset: 0.566 ms
Remote clock offset: -2.141 ms

Below is generated by plot.py at 2017-08-13 07:36:14
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.13 Mbit/s
95th percentile per-packet one-way delay: 62.420 ms
Loss rate: 0.66%
-- Flow 1:
Average throughput: 5.32 Mbit/s
95th percentile per-packet one-way delay: 52.197 ms
Loss rate: 0.30%
-- Flow 2:
Average throughput: 6.12 Mbit/s
95th percentile per-packet one-way delay: 70.443 ms
Loss rate: 0.33%
-- Flow 3:
Average throughput: 5.25 Mbit/s
95th percentile per-packet one-way delay: 73.917 ms
Loss rate: 2.50%

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

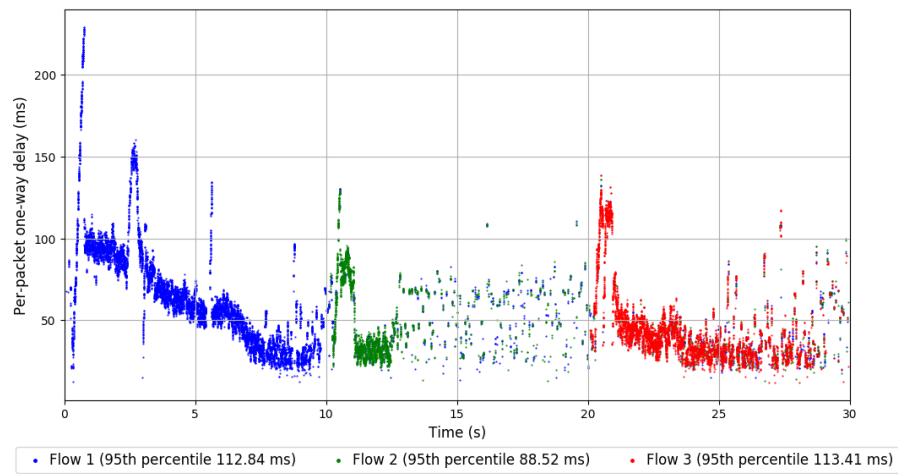
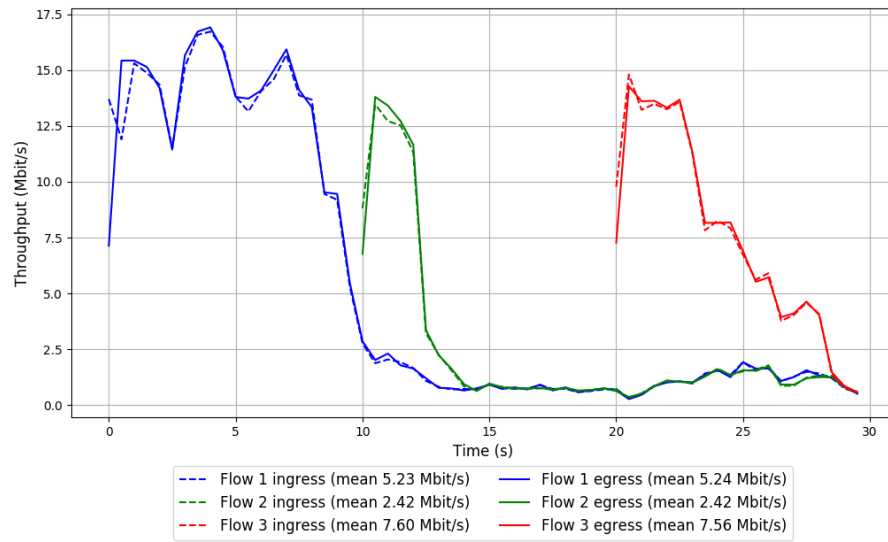


Run 1: Statistics of TCP Vegas

Start at: 2017-08-13 05:54:07
End at: 2017-08-13 05:54:37
Local clock offset: 0.52 ms
Remote clock offset: -2.561 ms

Below is generated by plot.py at 2017-08-13 07:36:16
Datalink statistics
-- Total of 3 flows:
Average throughput: 9.35 Mbit/s
95th percentile per-packet one-way delay: 109.798 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 5.24 Mbit/s
95th percentile per-packet one-way delay: 112.837 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 2.42 Mbit/s
95th percentile per-packet one-way delay: 88.519 ms
Loss rate: 0.25%
-- Flow 3:
Average throughput: 7.56 Mbit/s
95th percentile per-packet one-way delay: 113.412 ms
Loss rate: 0.99%

Run 1: Report of TCP Vegas — Data Link

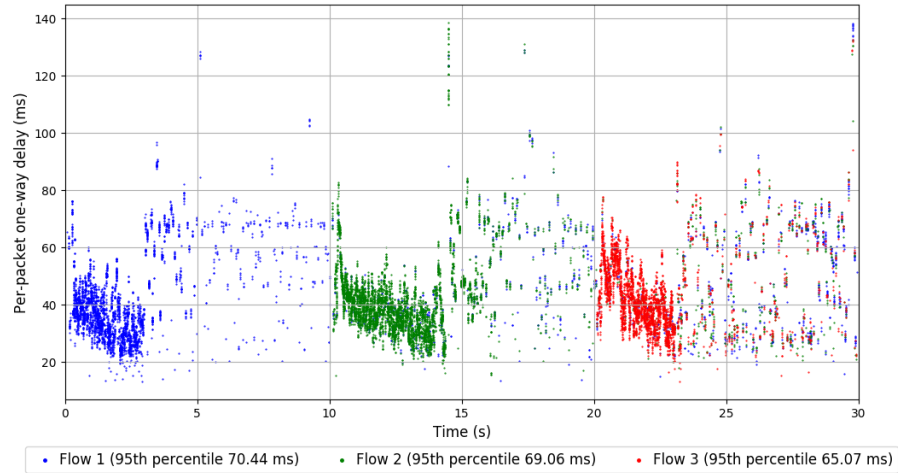
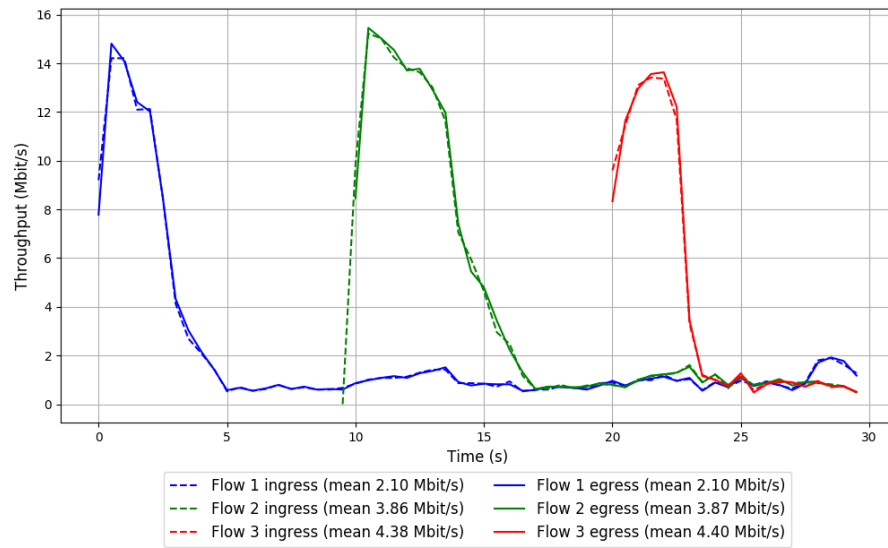


Run 2: Statistics of TCP Vegas

Start at: 2017-08-13 06:12:00
End at: 2017-08-13 06:12:30
Local clock offset: 0.626 ms
Remote clock offset: -2.28 ms

Below is generated by plot.py at 2017-08-13 07:36:16
Datalink statistics
-- Total of 3 flows:
Average throughput: 6.13 Mbit/s
95th percentile per-packet one-way delay: 68.997 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 2.10 Mbit/s
95th percentile per-packet one-way delay: 70.445 ms
Loss rate: 0.19%
-- Flow 2:
Average throughput: 3.87 Mbit/s
95th percentile per-packet one-way delay: 69.058 ms
Loss rate: 0.05%
-- Flow 3:
Average throughput: 4.40 Mbit/s
95th percentile per-packet one-way delay: 65.074 ms
Loss rate: 0.17%

Run 2: Report of TCP Vegas — Data Link

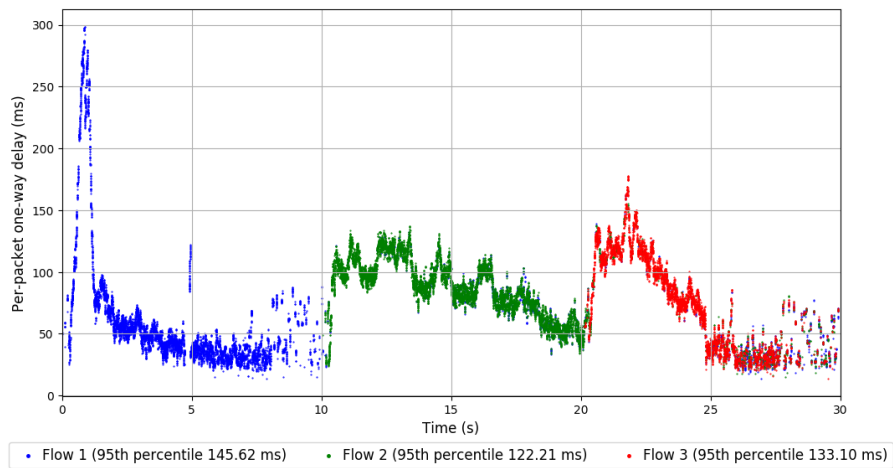
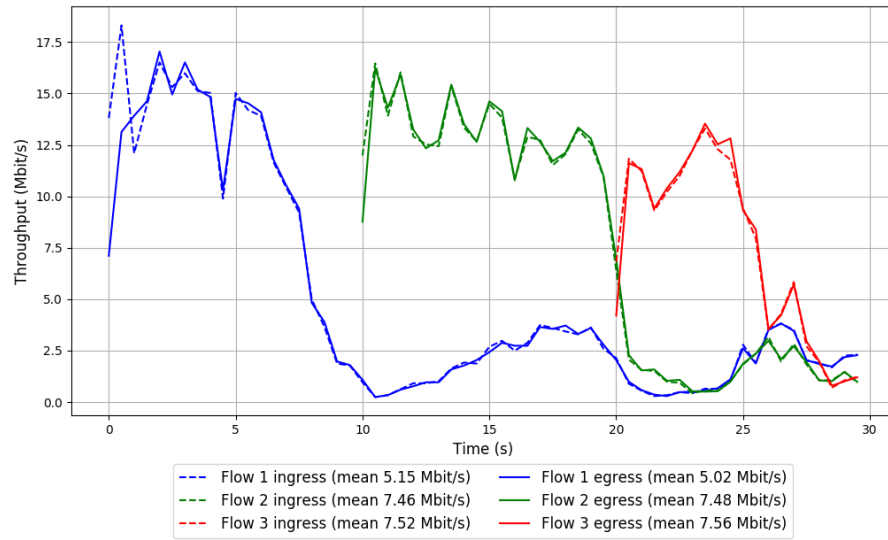


Run 3: Statistics of TCP Vegas

Start at: 2017-08-13 06:29:54
End at: 2017-08-13 06:30:24
Local clock offset: 0.644 ms
Remote clock offset: -2.169 ms

Below is generated by plot.py at 2017-08-13 07:36:18
Datalink statistics
-- Total of 3 flows:
Average throughput: 12.47 Mbit/s
95th percentile per-packet one-way delay: 125.755 ms
Loss rate: 1.17%
-- Flow 1:
Average throughput: 5.02 Mbit/s
95th percentile per-packet one-way delay: 145.618 ms
Loss rate: 2.70%
-- Flow 2:
Average throughput: 7.48 Mbit/s
95th percentile per-packet one-way delay: 122.211 ms
Loss rate: 0.08%
-- Flow 3:
Average throughput: 7.56 Mbit/s
95th percentile per-packet one-way delay: 133.100 ms
Loss rate: 0.19%

Run 3: Report of TCP Vegas — Data Link

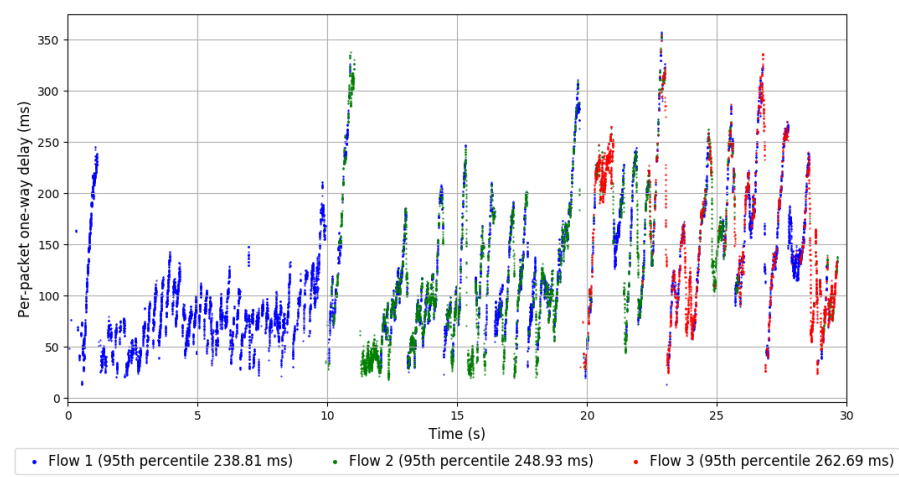
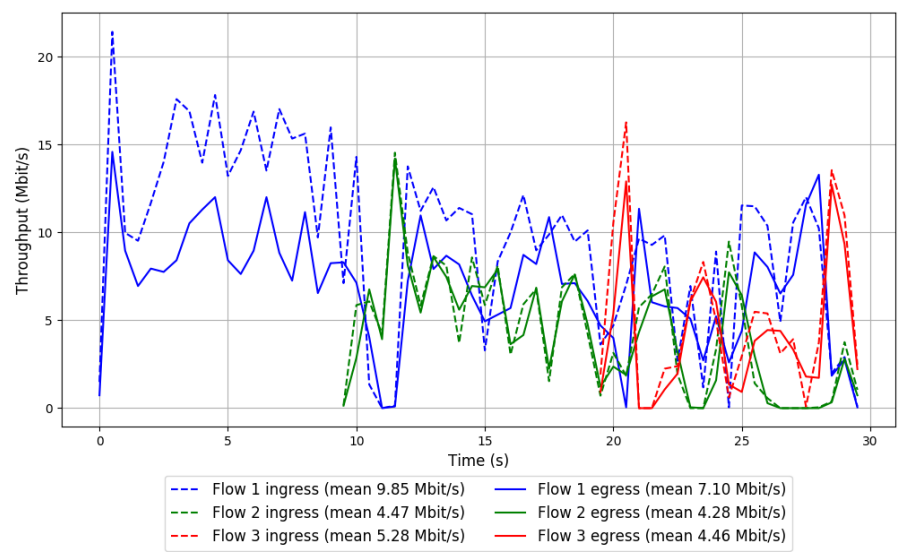


Run 1: Statistics of Verus

Start at: 2017-08-13 06:00:04
End at: 2017-08-13 06:00:34
Local clock offset: 0.554 ms
Remote clock offset: -2.526 ms

Below is generated by plot.py at 2017-08-13 07:36:19
Datalink statistics
-- Total of 3 flows:
Average throughput: 11.44 Mbit/s
95th percentile per-packet one-way delay: 248.416 ms
Loss rate: 21.93%
-- Flow 1:
Average throughput: 7.10 Mbit/s
95th percentile per-packet one-way delay: 238.810 ms
Loss rate: 28.08%
-- Flow 2:
Average throughput: 4.28 Mbit/s
95th percentile per-packet one-way delay: 248.925 ms
Loss rate: 5.09%
-- Flow 3:
Average throughput: 4.46 Mbit/s
95th percentile per-packet one-way delay: 262.690 ms
Loss rate: 16.40%

Run 1: Report of Verus — Data Link

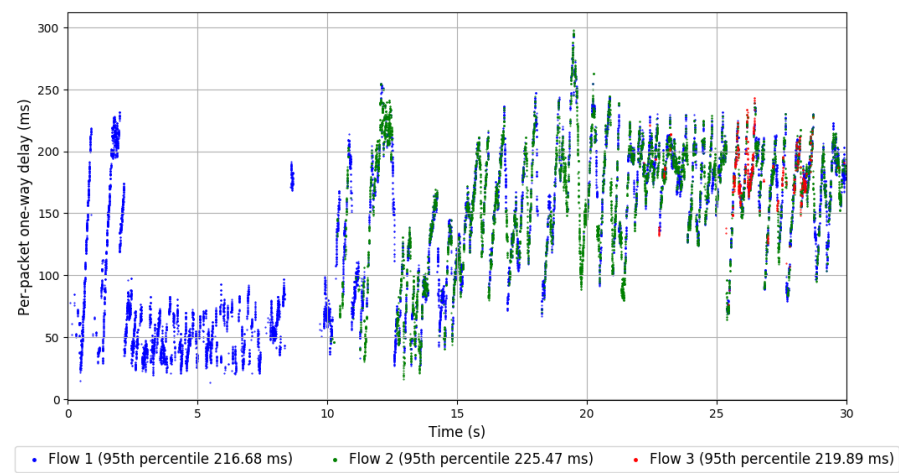
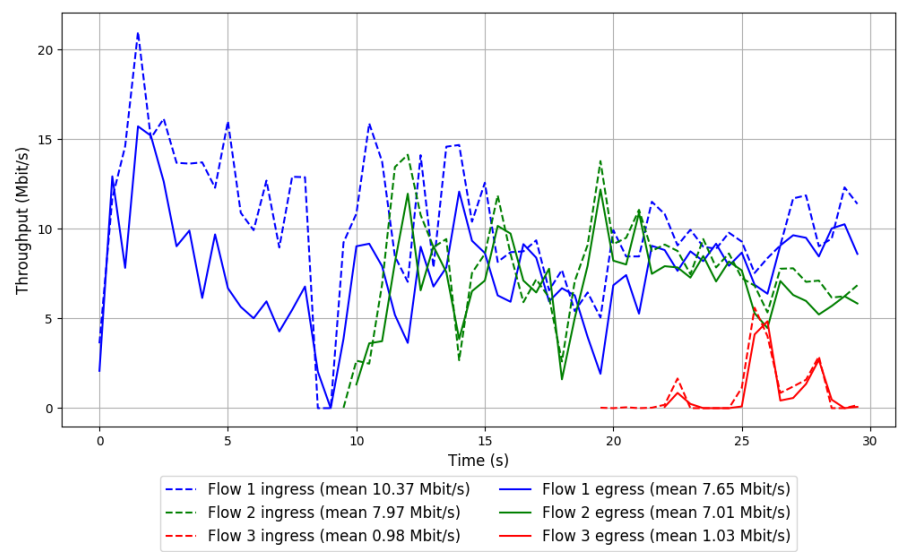


Run 2: Statistics of Verus

Start at: 2017-08-13 06:17:57
End at: 2017-08-13 06:18:27
Local clock offset: 0.684 ms
Remote clock offset: -2.205 ms

Below is generated by plot.py at 2017-08-13 07:36:21
Datalink statistics
-- Total of 3 flows:
Average throughput: 12.58 Mbit/s
95th percentile per-packet one-way delay: 220.176 ms
Loss rate: 21.64%
-- Flow 1:
Average throughput: 7.65 Mbit/s
95th percentile per-packet one-way delay: 216.681 ms
Loss rate: 26.47%
-- Flow 2:
Average throughput: 7.01 Mbit/s
95th percentile per-packet one-way delay: 225.469 ms
Loss rate: 12.39%
-- Flow 3:
Average throughput: 1.03 Mbit/s
95th percentile per-packet one-way delay: 219.890 ms
Loss rate: 18.54%

Run 2: Report of Verus — Data Link



Run 3: Statistics of Verus

Start at: 2017-08-13 06:35:51

End at: 2017-08-13 06:36:21

Local clock offset: 0.643 ms

Remote clock offset: -2.23 ms

Below is generated by plot.py at 2017-08-13 07:36:23

Datalink statistics

-- Total of 3 flows:

Average throughput: 12.92 Mbit/s

95th percentile per-packet one-way delay: 212.640 ms

Loss rate: 39.11%

-- Flow 1:

Average throughput: 7.60 Mbit/s

95th percentile per-packet one-way delay: 211.061 ms

Loss rate: 49.42%

-- Flow 2:

Average throughput: 6.98 Mbit/s

95th percentile per-packet one-way delay: 209.146 ms

Loss rate: 8.01%

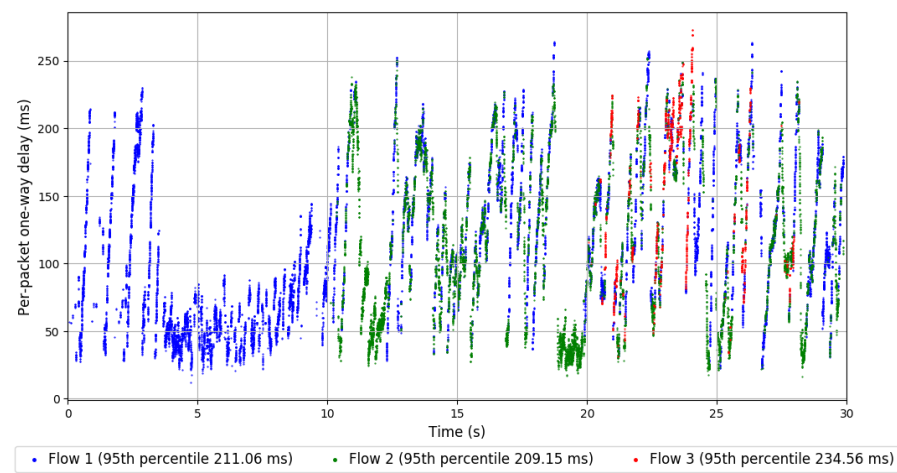
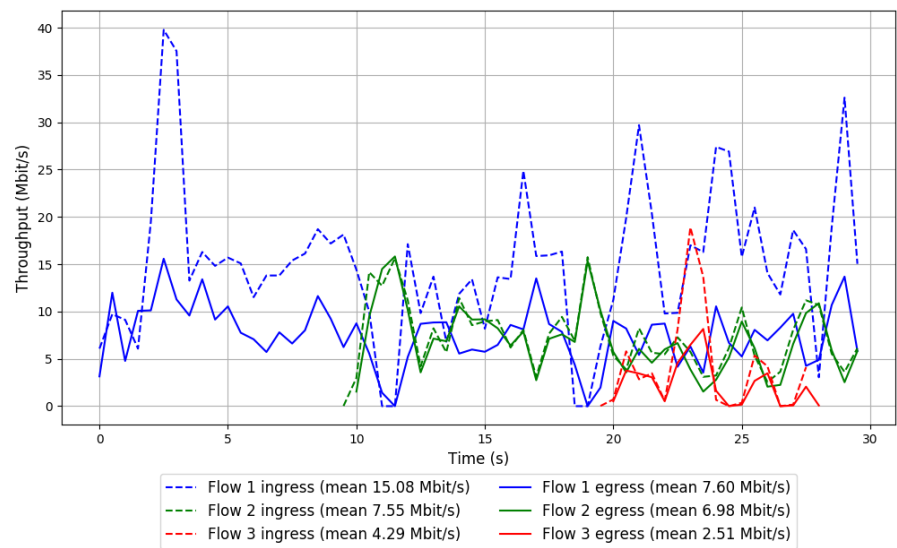
-- Flow 3:

Average throughput: 2.51 Mbit/s

95th percentile per-packet one-way delay: 234.556 ms

Loss rate: 41.01%

Run 3: Report of Verus — Data Link

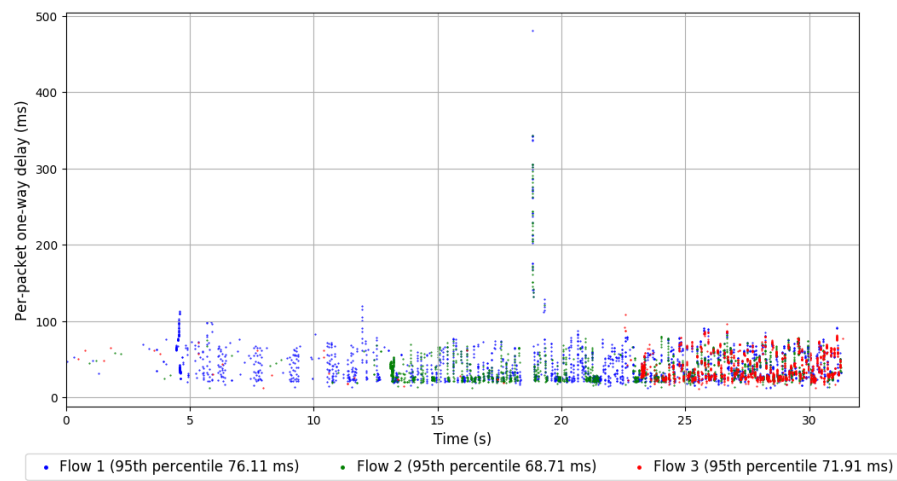
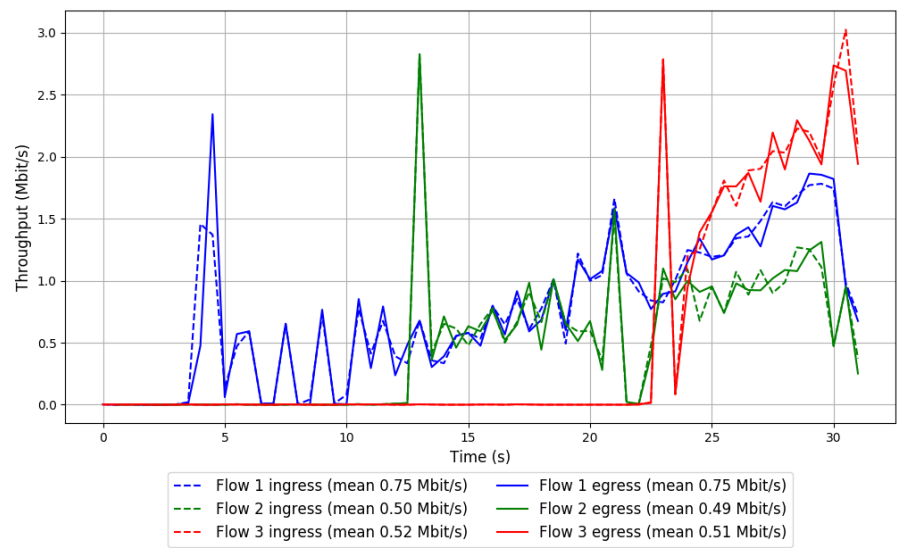


Run 1: Statistics of WebRTC media

Start at: 2017-08-13 05:50:34
End at: 2017-08-13 05:51:04
Local clock offset: 0.604 ms
Remote clock offset: -2.569 ms

Below is generated by plot.py at 2017-08-13 07:36:23
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.73 Mbit/s
95th percentile per-packet one-way delay: 72.930 ms
Loss rate: 1.08%
-- Flow 1:
Average throughput: 0.75 Mbit/s
95th percentile per-packet one-way delay: 76.111 ms
Loss rate: 0.48%
-- Flow 2:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 68.709 ms
Loss rate: 1.13%
-- Flow 3:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 71.910 ms
Loss rate: 1.91%

Run 1: Report of WebRTC media — Data Link

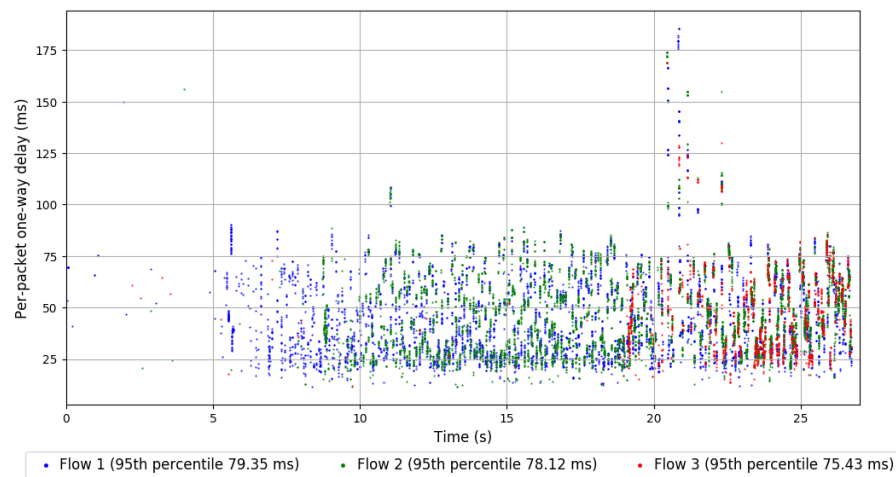
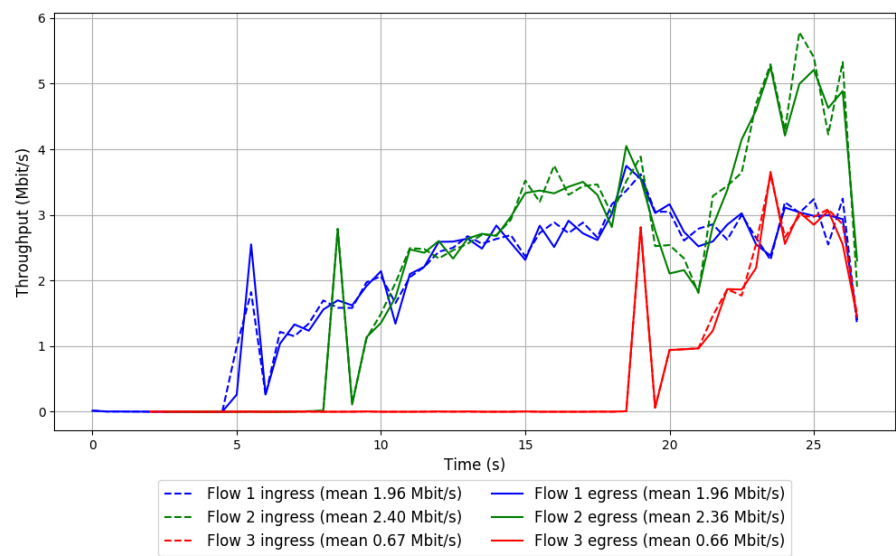


Run 2: Statistics of WebRTC media

Start at: 2017-08-13 06:08:27
End at: 2017-08-13 06:08:57
Local clock offset: 0.564 ms
Remote clock offset: -2.357 ms

Below is generated by plot.py at 2017-08-13 07:36:24
Datalink statistics
-- Total of 3 flows:
Average throughput: 4.70 Mbit/s
95th percentile per-packet one-way delay: 78.243 ms
Loss rate: 1.27%
-- Flow 1:
Average throughput: 1.96 Mbit/s
95th percentile per-packet one-way delay: 79.346 ms
Loss rate: 0.46%
-- Flow 2:
Average throughput: 2.36 Mbit/s
95th percentile per-packet one-way delay: 78.123 ms
Loss rate: 1.54%
-- Flow 3:
Average throughput: 0.66 Mbit/s
95th percentile per-packet one-way delay: 75.434 ms
Loss rate: 2.94%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2017-08-13 06:26:20
End at: 2017-08-13 06:26:50
Local clock offset: 0.558 ms
Remote clock offset: -2.121 ms

Below is generated by plot.py at 2017-08-13 07:36:24
Datalink statistics
-- Total of 3 flows:
Average throughput: 3.34 Mbit/s
95th percentile per-packet one-way delay: 83.151 ms
Loss rate: 1.16%
-- Flow 1:
Average throughput: 1.32 Mbit/s
95th percentile per-packet one-way delay: 78.779 ms
Loss rate: 0.63%
-- Flow 2:
Average throughput: 1.55 Mbit/s
95th percentile per-packet one-way delay: 83.143 ms
Loss rate: 0.53%
-- Flow 3:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 96.149 ms
Loss rate: 4.33%

Run 3: Report of WebRTC media — Data Link

