

Pantheon Report

Generated at 2017-08-13 07:39:32 (UTC).

Data path: AWS Brazil 2 Ethernet (*local*) → Colombia ppp0 (*remote*).

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).

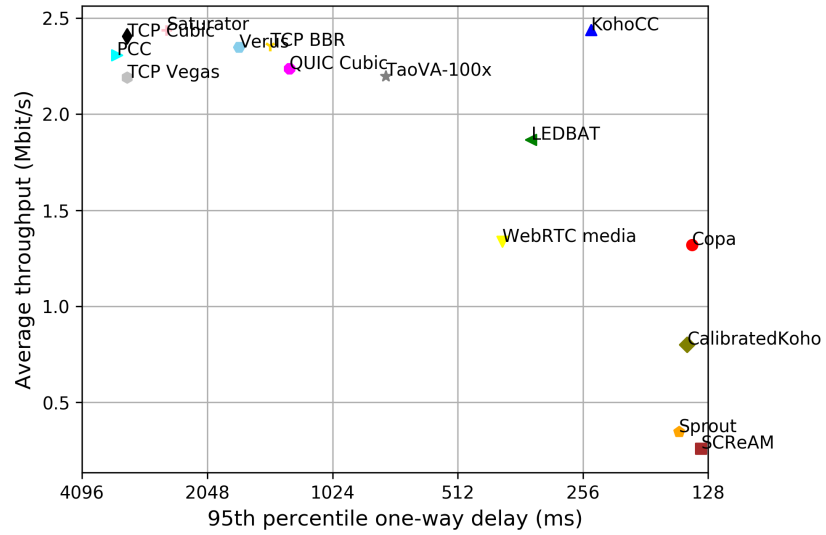
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).

NTP offsets were measured against **gps.ntp.br** and have been applied to correct the timestamps in logs.

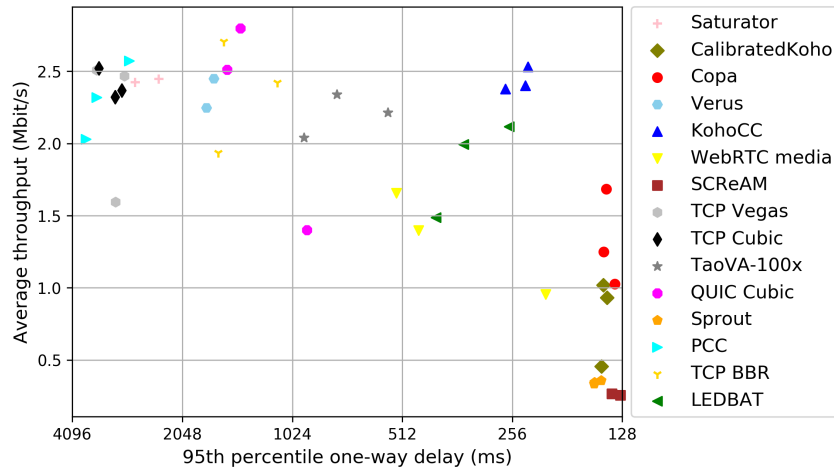
Git summary:

```
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
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 @ f1a14bffe749737437f61b1eaaeb30b267cde681
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 AWS Brazil 2 Ethernet to Colombia ppp0, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from AWS Brazil 2 Ethernet to Colombia ppp0, 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	1.57	1.01	0.53	1386.98	1512.80	1482.88	1.69	3.78	13.06
CalibratedKoho	3	0.56	0.23	0.27	143.32	143.48	146.58	0.15	0.14	0.45
Copa	3	0.73	0.57	0.71	136.73	139.95	137.95	0.10	0.14	0.50
TCP Cubic	3	2.29	0.18	0.02	3181.93	3218.77	3230.85	13.85	16.33	67.07
KohoCC	3	1.56	0.88	0.84	248.74	237.96	237.18	0.09	0.19	0.44
LEDBAT	3	1.41	0.51	0.27	330.80	347.29	372.85	0.69	0.45	2.35
PCC	3	1.66	1.03	0.00	3342.17	3149.33	3009.02	63.42	49.19	10.52
QUIC Cubic	3	1.42	1.07	0.50	1014.58	1303.87	1396.88	2.79	6.68	19.00
Saturator	2	1.72	0.98	0.46	2312.16	2716.92	2780.56	4.65	9.98	37.61
SCReAM	2	0.08	0.18	0.17	124.59	127.24	133.39	0.07	0.09	0.31
Sprout	3	0.16	0.19	0.19	152.12	147.09	144.77	0.05	0.01	0.04
TaoVA-100x	3	1.27	1.00	0.81	950.06	777.67	602.72	0.72	1.24	3.88
TCP Vegas	3	4.51	0.84	0.15	3554.65	2990.62	2273.00	10.96	17.42	54.77
Verus	2	2.34	0.01	0.01	1717.82	1721.64	1619.08	4.54	4.88	10.00
WebRTC media	3	0.94	0.27	0.13	426.56	352.61	303.49	0.14	0.37	0.60

Run 1: Statistics of TCP BBR

Start at: 2017-08-13 06:57:01

End at: 2017-08-13 06:57:31

Local clock offset: 0.411 ms

Remote clock offset: 3.12 ms

Below is generated by plot.py at 2017-08-13 07:38:57

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.42 Mbit/s

95th percentile per-packet one-way delay: 1124.973 ms

Loss rate: 3.33%

-- Flow 1:

Average throughput: 1.67 Mbit/s

95th percentile per-packet one-way delay: 1067.006 ms

Loss rate: 1.50%

-- Flow 2:

Average throughput: 0.90 Mbit/s

95th percentile per-packet one-way delay: 1125.234 ms

Loss rate: 5.15%

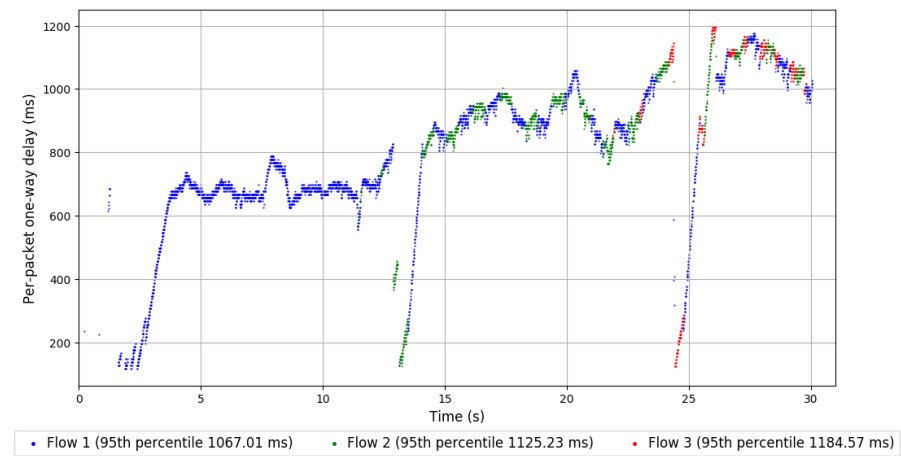
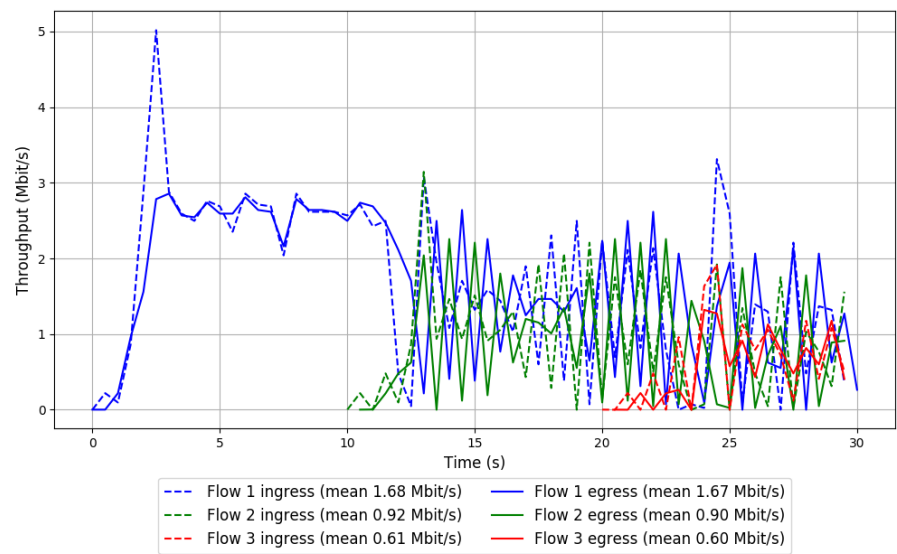
-- Flow 3:

Average throughput: 0.60 Mbit/s

95th percentile per-packet one-way delay: 1184.572 ms

Loss rate: 12.98%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2017-08-13 07:15:50

End at: 2017-08-13 07:16:21

Local clock offset: 0.363 ms

Remote clock offset: 1.412 ms

Below is generated by plot.py at 2017-08-13 07:38:57

Datalink statistics

-- Total of 3 flows:

Average throughput: 1.93 Mbit/s

95th percentile per-packet one-way delay: 1635.480 ms

Loss rate: 4.00%

-- Flow 1:

Average throughput: 1.18 Mbit/s

95th percentile per-packet one-way delay: 1526.824 ms

Loss rate: 1.88%

-- Flow 2:

Average throughput: 0.92 Mbit/s

95th percentile per-packet one-way delay: 1855.877 ms

Loss rate: 2.00%

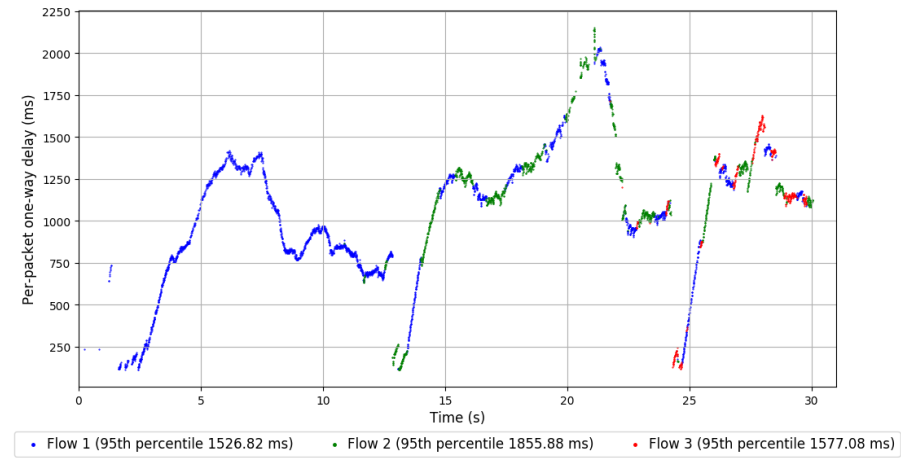
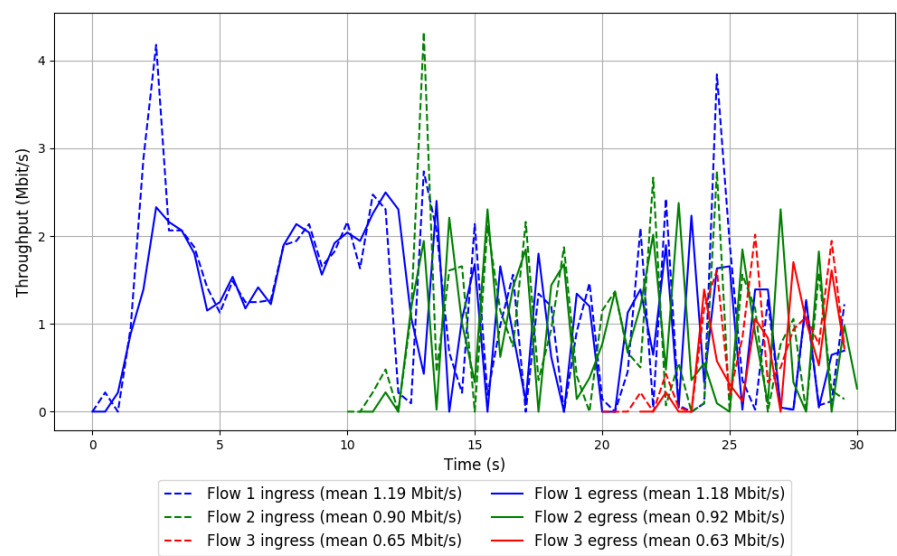
-- Flow 3:

Average throughput: 0.63 Mbit/s

95th percentile per-packet one-way delay: 1577.082 ms

Loss rate: 21.30%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2017-08-13 07:34:38

End at: 2017-08-13 07:35:08

Local clock offset: 0.432 ms

Remote clock offset: 3.098 ms

Below is generated by plot.py at 2017-08-13 07:38:59

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.71 Mbit/s

95th percentile per-packet one-way delay: 1577.021 ms

Loss rate: 2.55%

-- Flow 1:

Average throughput: 1.86 Mbit/s

95th percentile per-packet one-way delay: 1567.121 ms

Loss rate: 1.69%

-- Flow 2:

Average throughput: 1.21 Mbit/s

95th percentile per-packet one-way delay: 1557.291 ms

Loss rate: 4.18%

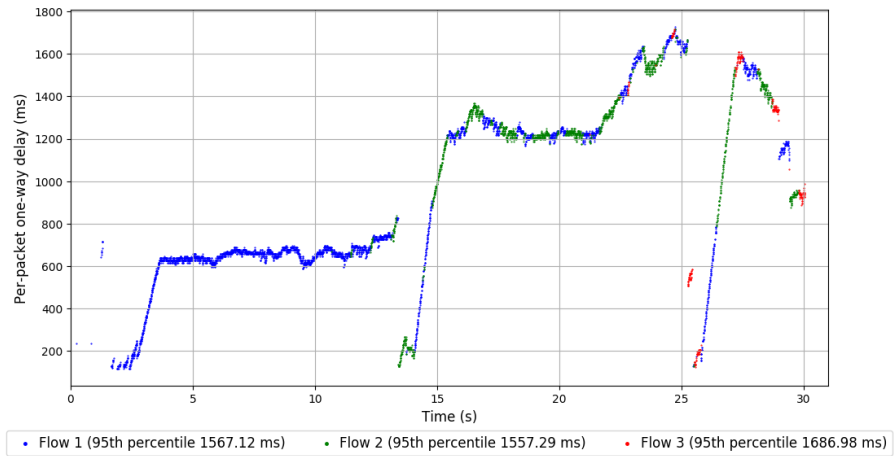
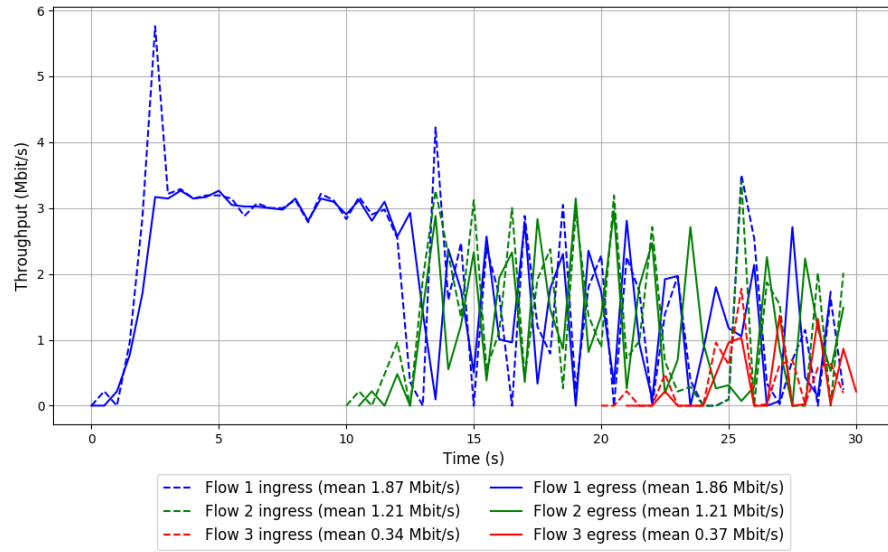
-- Flow 3:

Average throughput: 0.37 Mbit/s

95th percentile per-packet one-way delay: 1686.980 ms

Loss rate: 4.91%

Run 3: Report of TCP BBR — Data Link

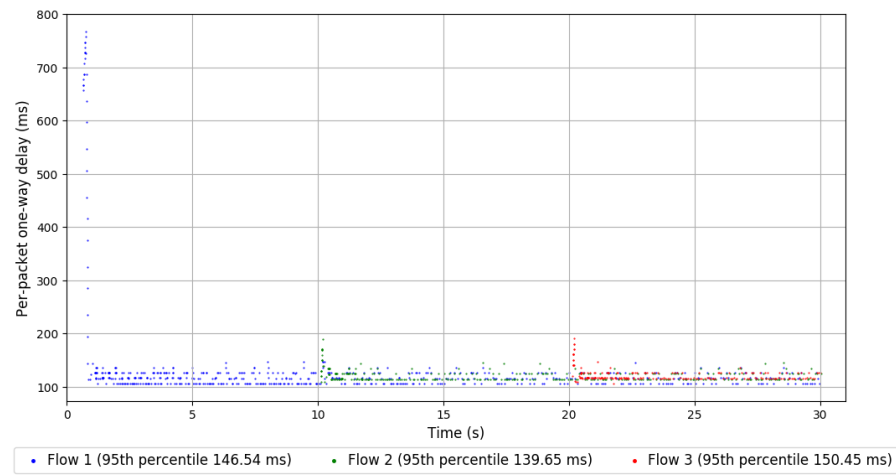
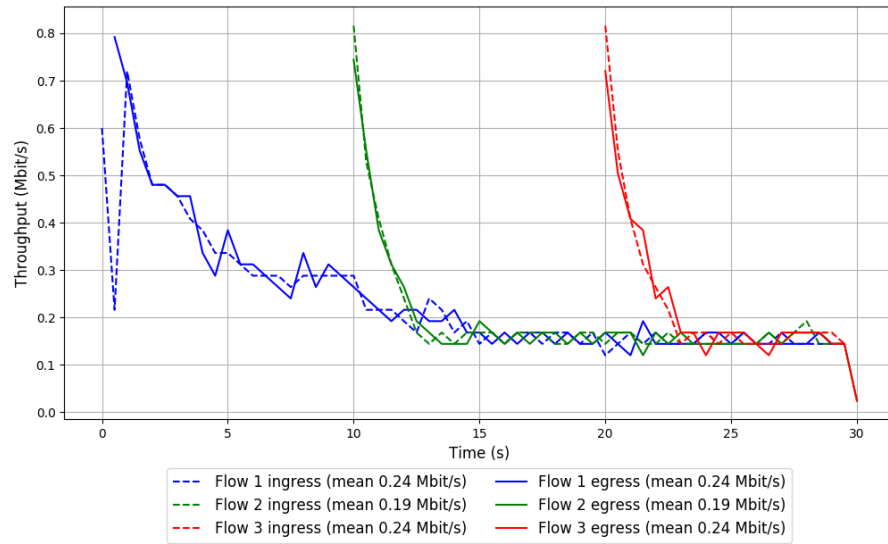


Run 1: Statistics of CalibratedKoho

Start at: 2017-08-13 06:48:15
End at: 2017-08-13 06:48:45
Local clock offset: 0.521 ms
Remote clock offset: -2.575 ms

Below is generated by plot.py at 2017-08-13 07:38:59
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.45 Mbit/s
95th percentile per-packet one-way delay: 146.105 ms
Loss rate: 0.18%
-- Flow 1:
Average throughput: 0.24 Mbit/s
95th percentile per-packet one-way delay: 146.536 ms
Loss rate: 0.17%
-- Flow 2:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 139.650 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.24 Mbit/s
95th percentile per-packet one-way delay: 150.453 ms
Loss rate: 0.51%

Run 1: Report of CalibratedKoho — Data Link

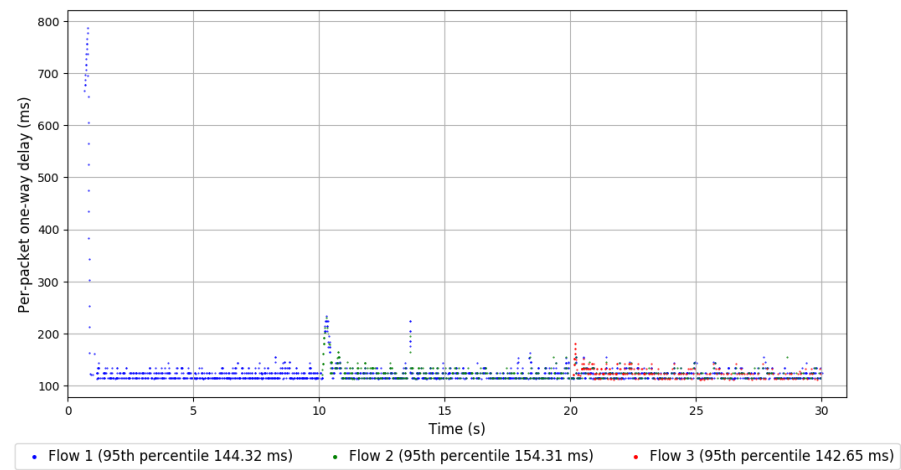
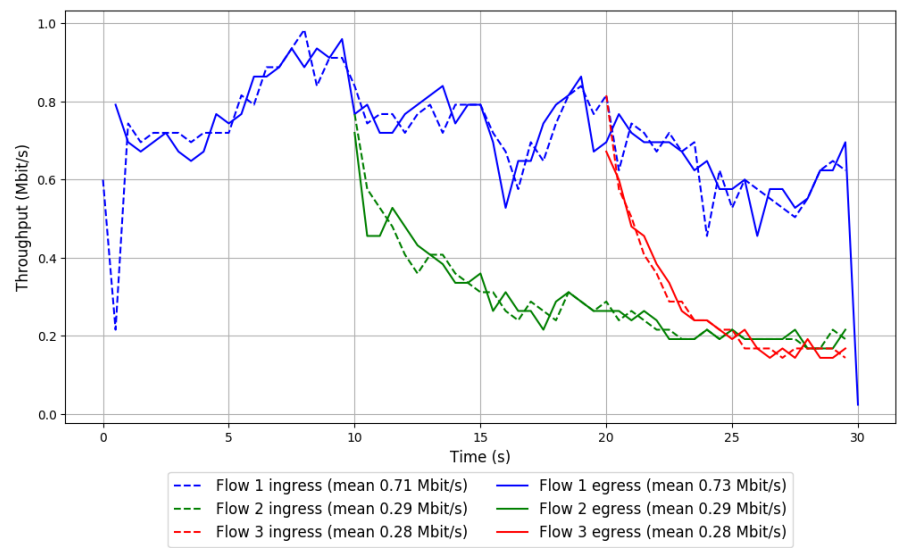


Run 2: Statistics of CalibratedKoho

Start at: 2017-08-13 07:07:02
End at: 2017-08-13 07:07:32
Local clock offset: 0.484 ms
Remote clock offset: -2.565 ms

Below is generated by plot.py at 2017-08-13 07:39:00
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.02 Mbit/s
95th percentile per-packet one-way delay: 144.420 ms
Loss rate: 0.20%
-- Flow 1:
Average throughput: 0.73 Mbit/s
95th percentile per-packet one-way delay: 144.323 ms
Loss rate: 0.06%
-- Flow 2:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 154.305 ms
Loss rate: 0.41%
-- Flow 3:
Average throughput: 0.28 Mbit/s
95th percentile per-packet one-way delay: 142.650 ms
Loss rate: 0.85%

Run 2: Report of CalibratedKoho — Data Link

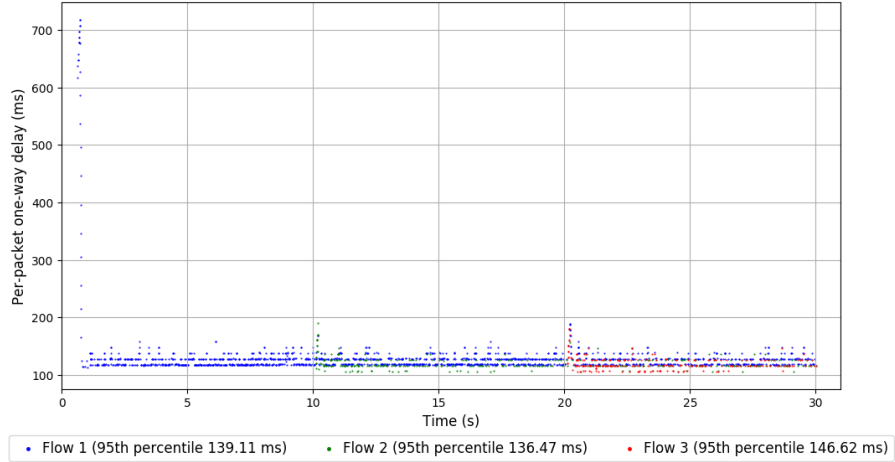
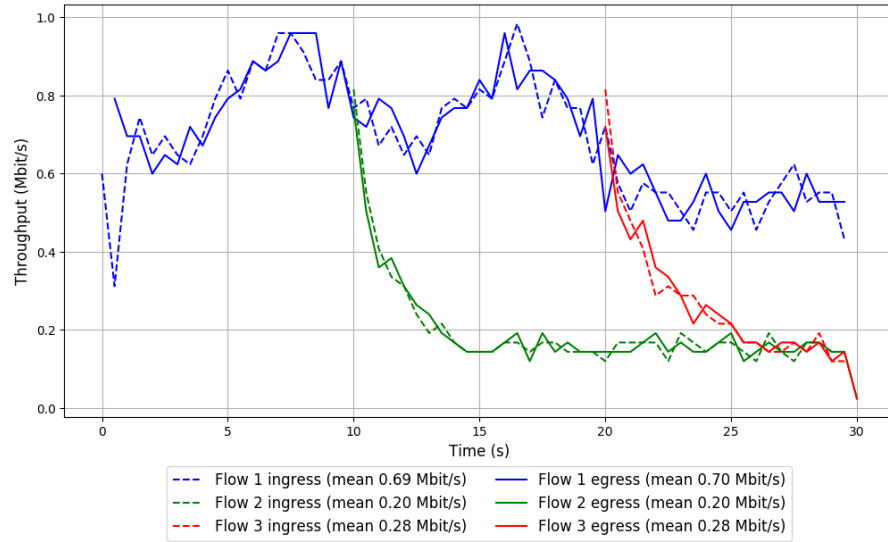


Run 3: Statistics of CalibratedKoho

Start at: 2017-08-13 07:25:51
End at: 2017-08-13 07:26:21
Local clock offset: 0.542 ms
Remote clock offset: -2.488 ms

Below is generated by plot.py at 2017-08-13 07:39:00
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.93 Mbit/s
95th percentile per-packet one-way delay: 140.882 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 0.70 Mbit/s
95th percentile per-packet one-way delay: 139.114 ms
Loss rate: 0.23%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 136.471 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.28 Mbit/s
95th percentile per-packet one-way delay: 146.622 ms
Loss rate: 0.00%

Run 3: Report of CalibratedKoho — Data Link



Run 1: Statistics of Copa

Start at: 2017-08-13 06:47:00

End at: 2017-08-13 06:47:30

Local clock offset: 0.547 ms

Remote clock offset: 2.31 ms

Below is generated by plot.py at 2017-08-13 07:39:01

Datalink statistics

-- Total of 3 flows:

Average throughput: 1.25 Mbit/s

95th percentile per-packet one-way delay: 143.837 ms

Loss rate: 0.24%

-- Flow 1:

Average throughput: 0.55 Mbit/s

95th percentile per-packet one-way delay: 145.046 ms

Loss rate: 0.15%

-- Flow 2:

Average throughput: 0.73 Mbit/s

95th percentile per-packet one-way delay: 144.838 ms

Loss rate: 0.18%

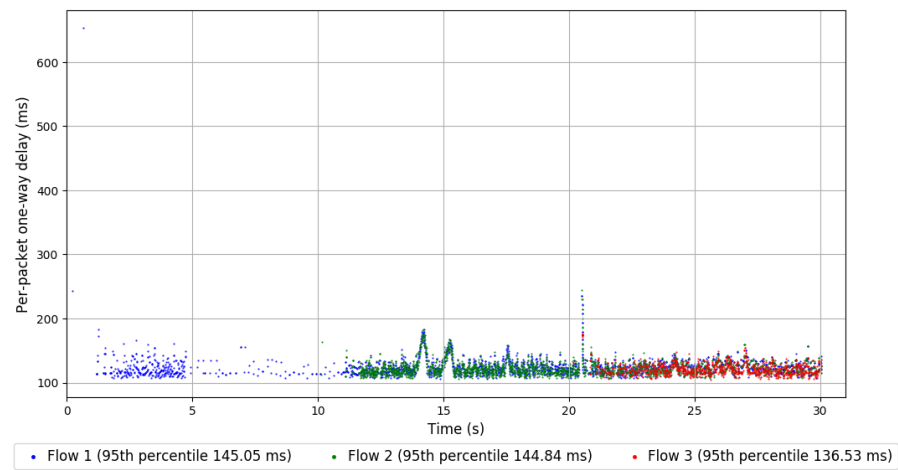
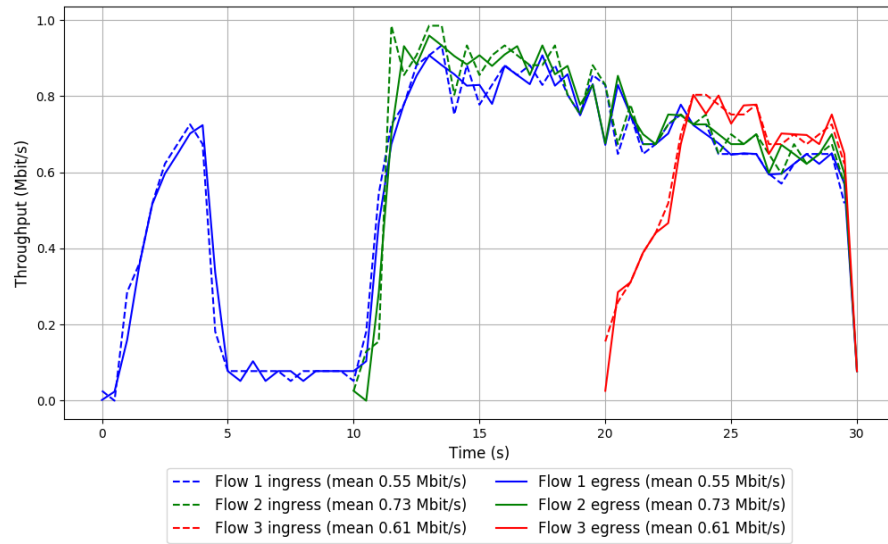
-- Flow 3:

Average throughput: 0.61 Mbit/s

95th percentile per-packet one-way delay: 136.532 ms

Loss rate: 0.64%

Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

Start at: 2017-08-13 07:05:47

End at: 2017-08-13 07:06:17

Local clock offset: 0.534 ms

Remote clock offset: 2.247 ms

Below is generated by plot.py at 2017-08-13 07:39:02

Datalink statistics

-- Total of 3 flows:

Average throughput: 1.68 Mbit/s

95th percentile per-packet one-way delay: 141.718 ms

Loss rate: 0.18%

-- Flow 1:

Average throughput: 0.88 Mbit/s

95th percentile per-packet one-way delay: 135.538 ms

Loss rate: 0.05%

-- Flow 2:

Average throughput: 0.83 Mbit/s

95th percentile per-packet one-way delay: 146.934 ms

Loss rate: 0.24%

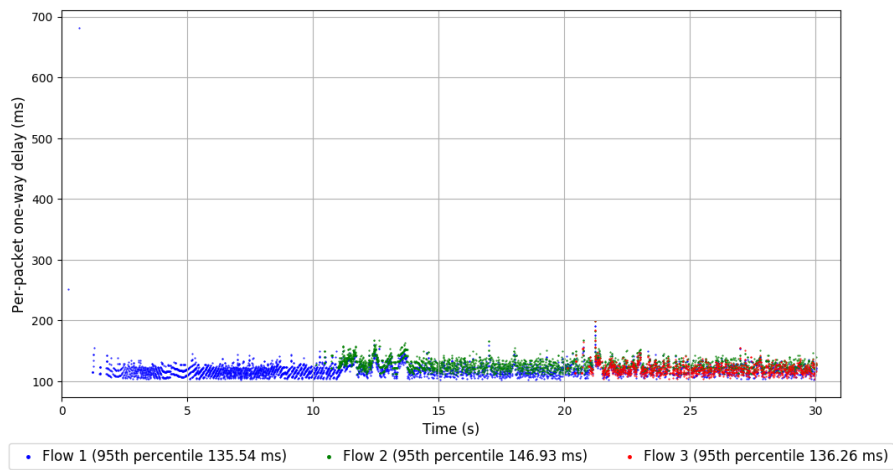
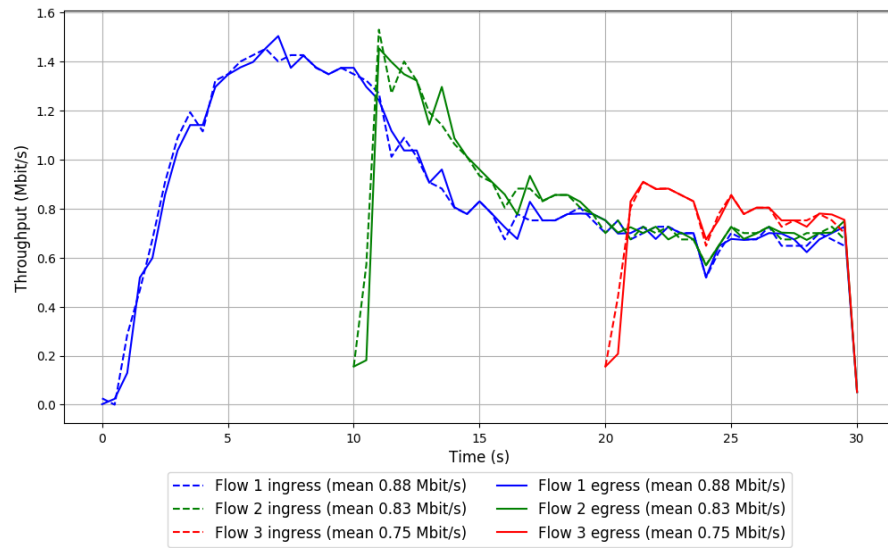
-- Flow 3:

Average throughput: 0.75 Mbit/s

95th percentile per-packet one-way delay: 136.264 ms

Loss rate: 0.51%

Run 2: Report of Copa — Data Link

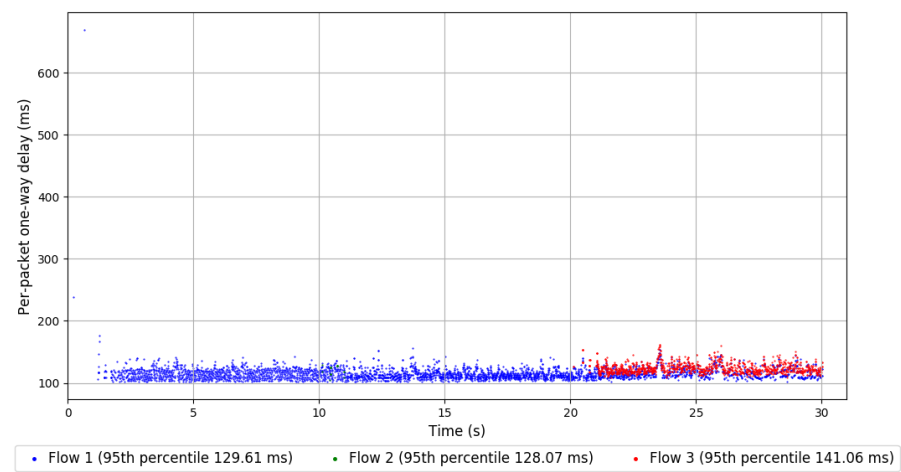
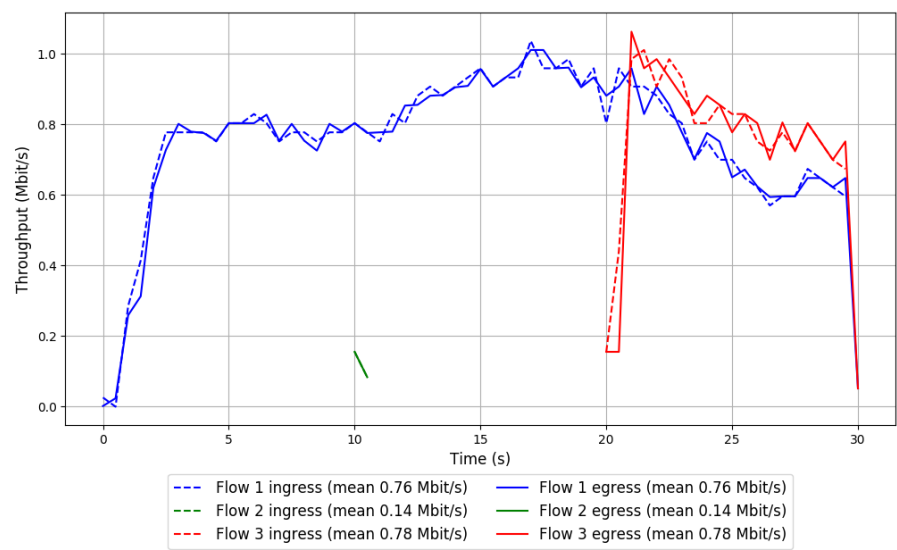


Run 3: Statistics of Copa

Start at: 2017-08-13 07:24:36
End at: 2017-08-13 07:25:06
Local clock offset: 0.447 ms
Remote clock offset: -1.696 ms

```
# Below is generated by plot.py at 2017-08-13 07:39:03
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.03 Mbit/s
95th percentile per-packet one-way delay: 134.219 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 0.76 Mbit/s
95th percentile per-packet one-way delay: 129.610 ms
Loss rate: 0.11%
-- Flow 2:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 128.072 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.78 Mbit/s
95th percentile per-packet one-way delay: 141.057 ms
Loss rate: 0.34%
```

Run 3: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2017-08-13 06:52:00

End at: 2017-08-13 06:52:30

Local clock offset: 0.457 ms

Remote clock offset: 2.184 ms

Below is generated by plot.py at 2017-08-13 07:39:04

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.32 Mbit/s

95th percentile per-packet one-way delay: 3125.333 ms

Loss rate: 15.92%

-- Flow 1:

Average throughput: 2.22 Mbit/s

95th percentile per-packet one-way delay: 3117.777 ms

Loss rate: 15.82%

-- Flow 2:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 3168.217 ms

Loss rate: 17.23%

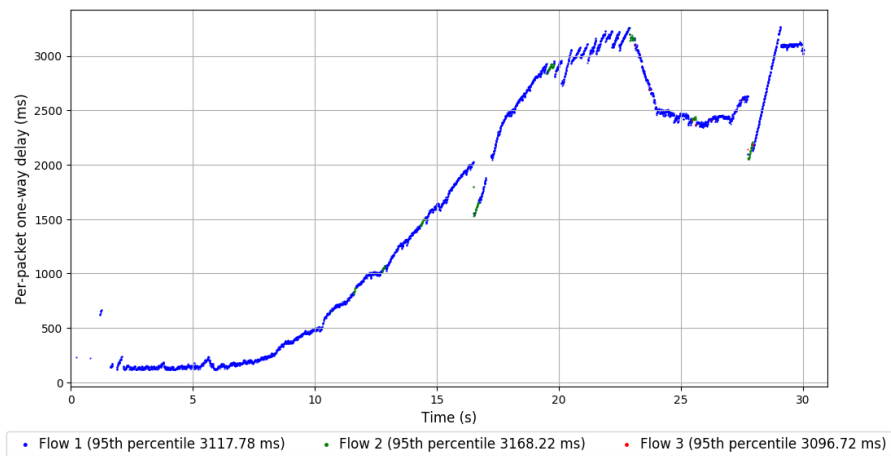
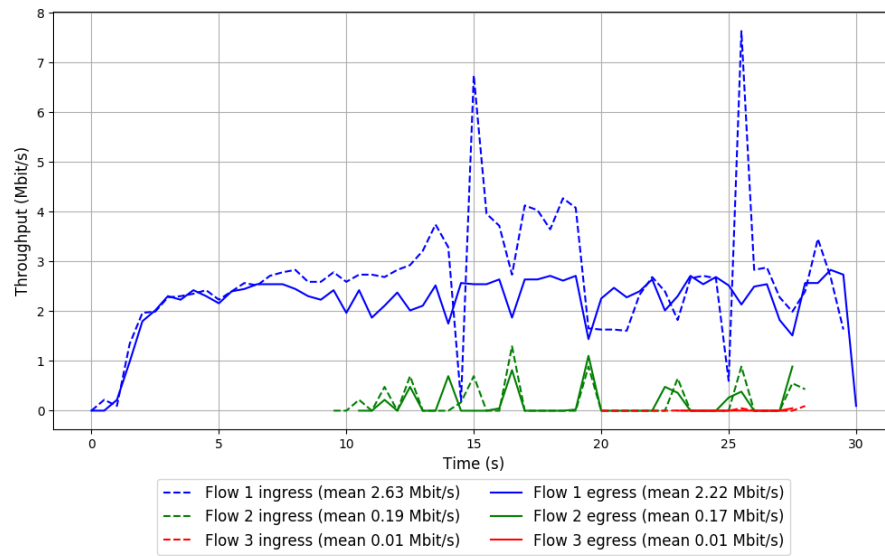
-- Flow 3:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 3096.724 ms

Loss rate: 61.45%

Run 1: Report of TCP Cubic — Data Link

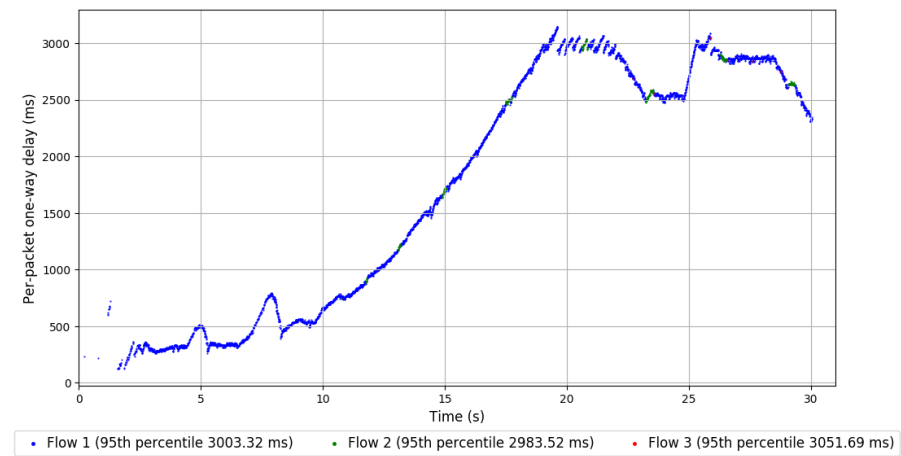
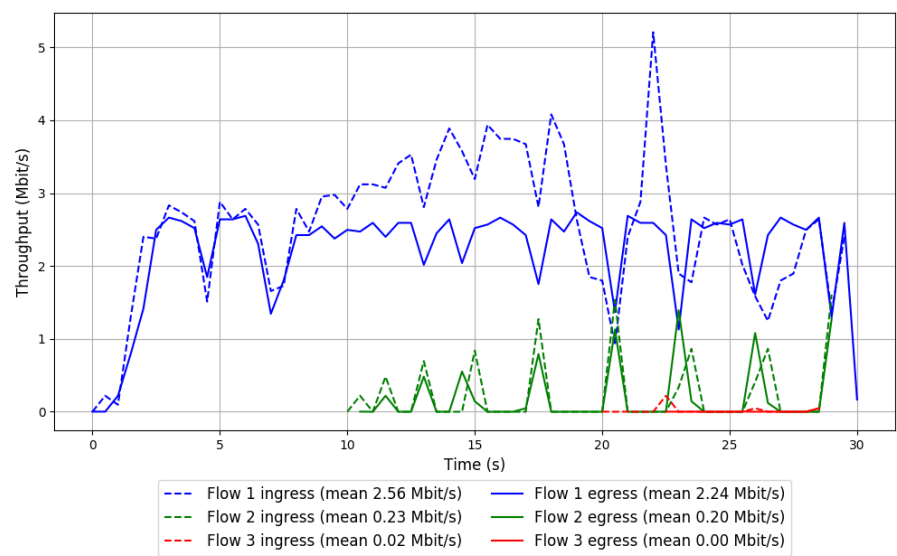


Run 2: Statistics of TCP Cubic

Start at: 2017-08-13 07:10:47
End at: 2017-08-13 07:11:17
Local clock offset: 0.477 ms
Remote clock offset: -2.582 ms

Below is generated by plot.py at 2017-08-13 07:39:05
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.37 Mbit/s
95th percentile per-packet one-way delay: 3003.229 ms
Loss rate: 13.19%
-- Flow 1:
Average throughput: 2.24 Mbit/s
95th percentile per-packet one-way delay: 3003.317 ms
Loss rate: 12.69%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 2983.519 ms
Loss rate: 19.20%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 3051.688 ms
Loss rate: 82.17%

Run 2: Report of TCP Cubic — Data Link

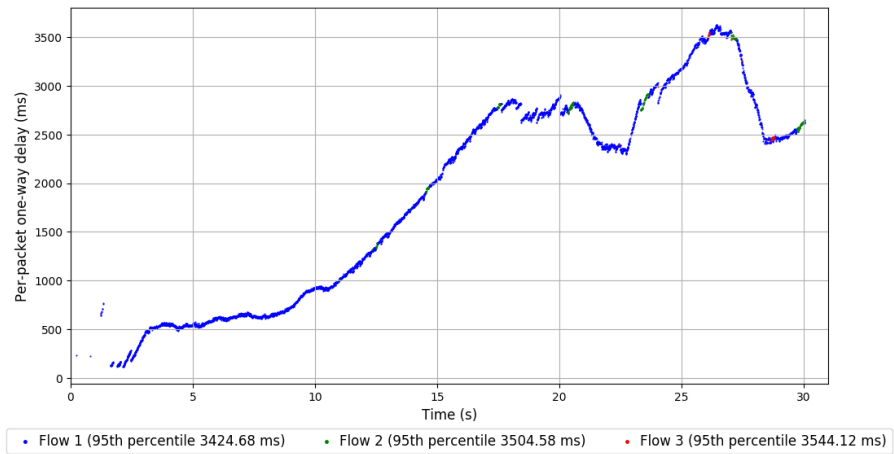
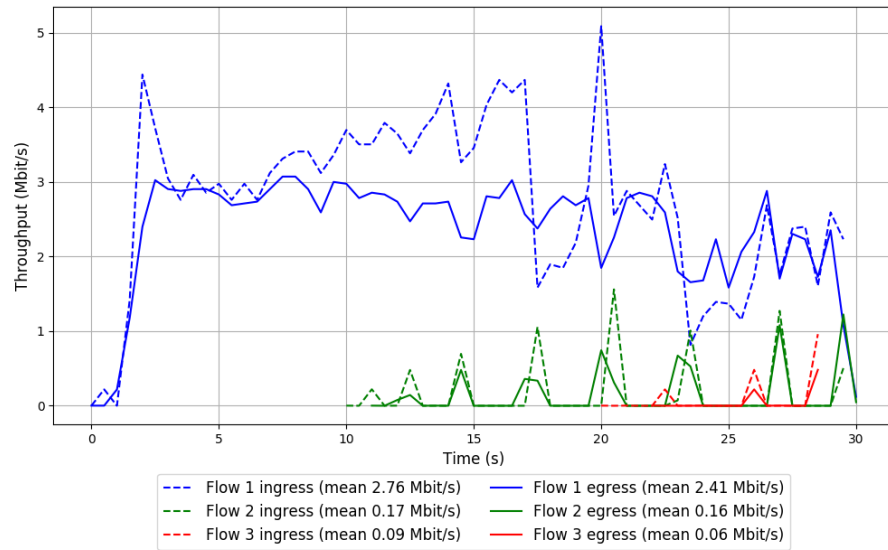


Run 3: Statistics of TCP Cubic

Start at: 2017-08-13 07:29:37
End at: 2017-08-13 07:30:07
Local clock offset: 0.551 ms
Remote clock offset: -1.642 ms

Below is generated by plot.py at 2017-08-13 07:39:05
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.52 Mbit/s
95th percentile per-packet one-way delay: 3464.393 ms
Loss rate: 13.45%
-- Flow 1:
Average throughput: 2.41 Mbit/s
95th percentile per-packet one-way delay: 3424.683 ms
Loss rate: 13.04%
-- Flow 2:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 3504.578 ms
Loss rate: 12.57%
-- Flow 3:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 3544.124 ms
Loss rate: 57.60%

Run 3: Report of TCP Cubic — Data Link

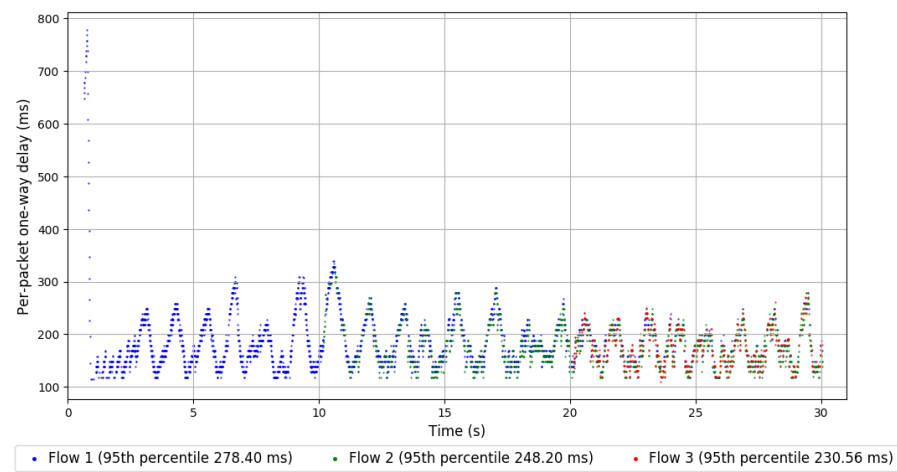
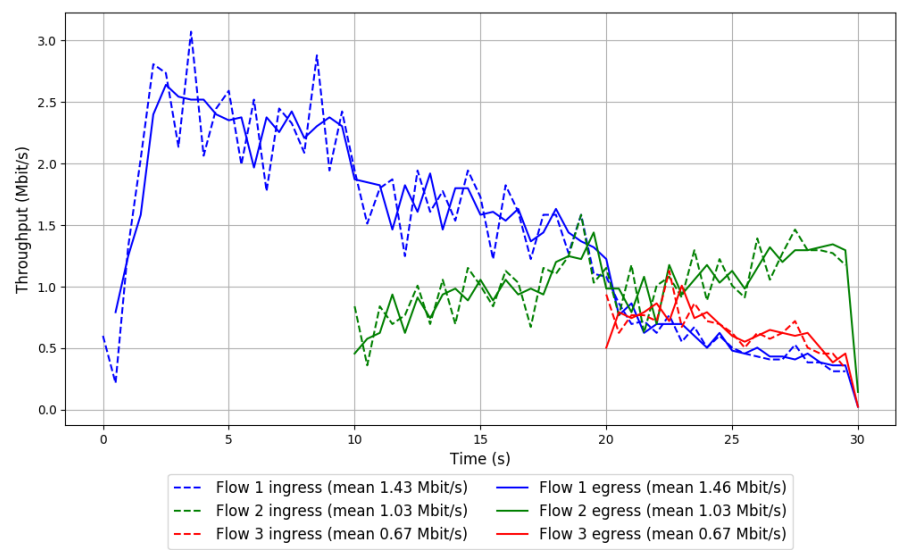


```
Run 1: Statistics of KohoCC

Start at: 2017-08-13 06:58:16
End at: 2017-08-13 06:58:46
Local clock offset: 0.419 ms
Remote clock offset: 2.198 ms

# Below is generated by plot.py at 2017-08-13 07:39:06
# Datalink statistics
-- Total of 3 flows:
Average throughput: 2.38 Mbit/s
95th percentile per-packet one-way delay: 267.301 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 1.46 Mbit/s
95th percentile per-packet one-way delay: 278.402 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 1.03 Mbit/s
95th percentile per-packet one-way delay: 248.204 ms
Loss rate: 0.35%
-- Flow 3:
Average throughput: 0.67 Mbit/s
95th percentile per-packet one-way delay: 230.560 ms
Loss rate: 0.36%
```

Run 1: Report of KohoCC — Data Link

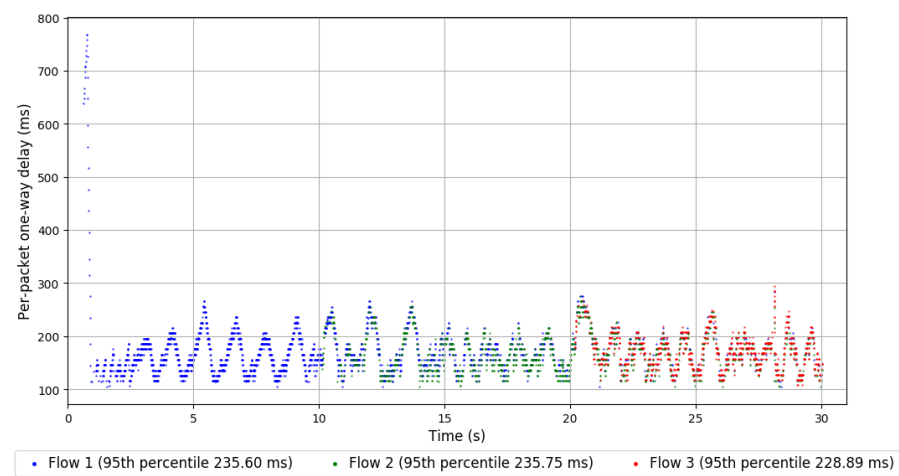
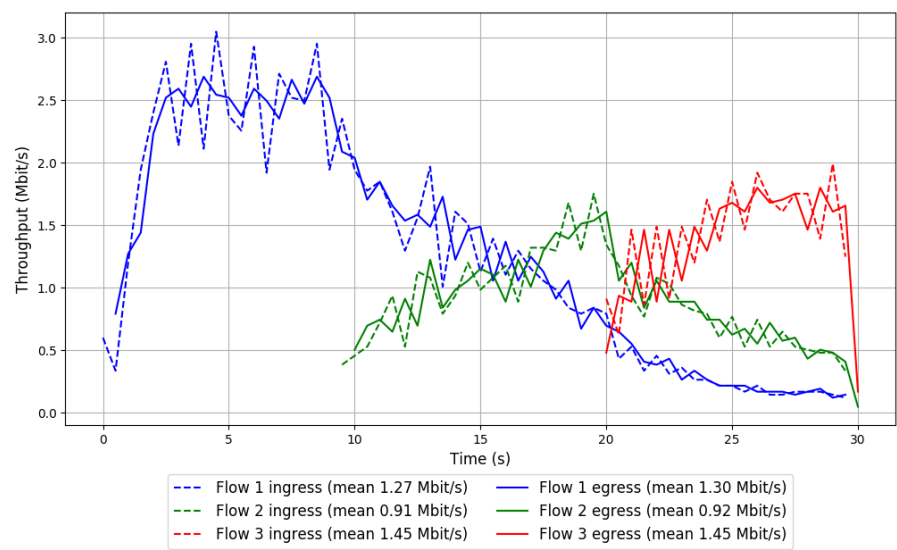


Run 2: Statistics of KohoCC

Start at: 2017-08-13 07:17:05
End at: 2017-08-13 07:17:35
Local clock offset: 0.458 ms
Remote clock offset: -2.588 ms

Below is generated by plot.py at 2017-08-13 07:39:07
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.40 Mbit/s
95th percentile per-packet one-way delay: 235.622 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 1.30 Mbit/s
95th percentile per-packet one-way delay: 235.599 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 0.92 Mbit/s
95th percentile per-packet one-way delay: 235.755 ms
Loss rate: 0.13%
-- Flow 3:
Average throughput: 1.45 Mbit/s
95th percentile per-packet one-way delay: 228.889 ms
Loss rate: 0.67%

Run 2: Report of KohoCC — Data Link



Run 3: Statistics of KohoCC

Start at: 2017-08-13 07:35:53

End at: 2017-08-13 07:36:23

Local clock offset: 0.504 ms

Remote clock offset: 2.212 ms

Below is generated by plot.py at 2017-08-13 07:39:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.53 Mbit/s

95th percentile per-packet one-way delay: 232.115 ms

Loss rate: 0.19%

-- Flow 1:

Average throughput: 1.93 Mbit/s

95th percentile per-packet one-way delay: 232.229 ms

Loss rate: 0.21%

-- Flow 2:

Average throughput: 0.69 Mbit/s

95th percentile per-packet one-way delay: 229.916 ms

Loss rate: 0.09%

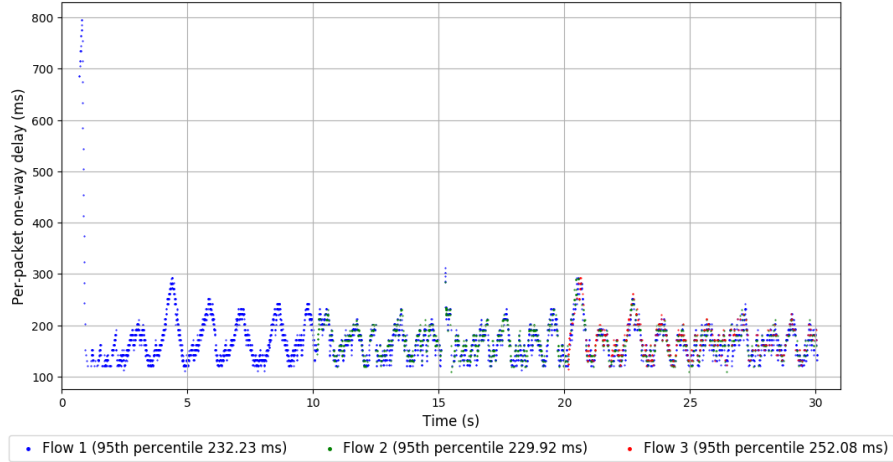
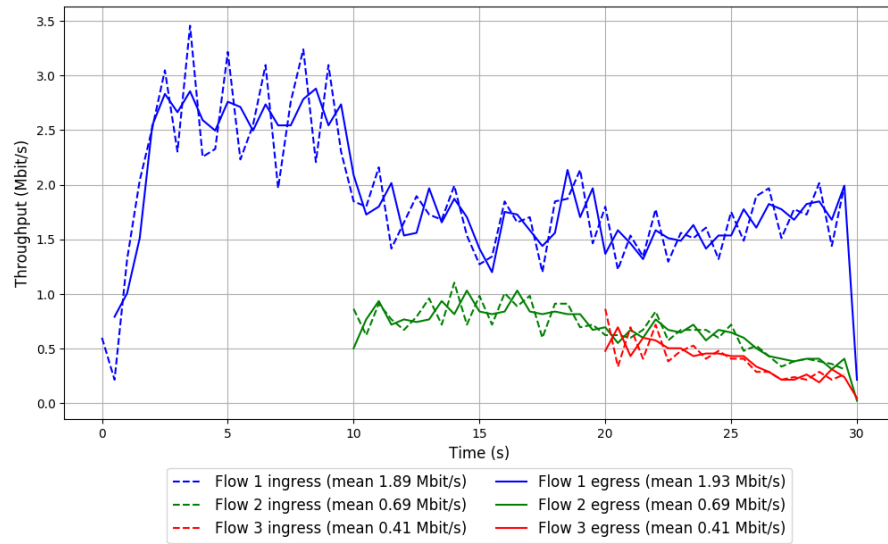
-- Flow 3:

Average throughput: 0.41 Mbit/s

95th percentile per-packet one-way delay: 252.084 ms

Loss rate: 0.29%

Run 3: Report of KohoCC — Data Link

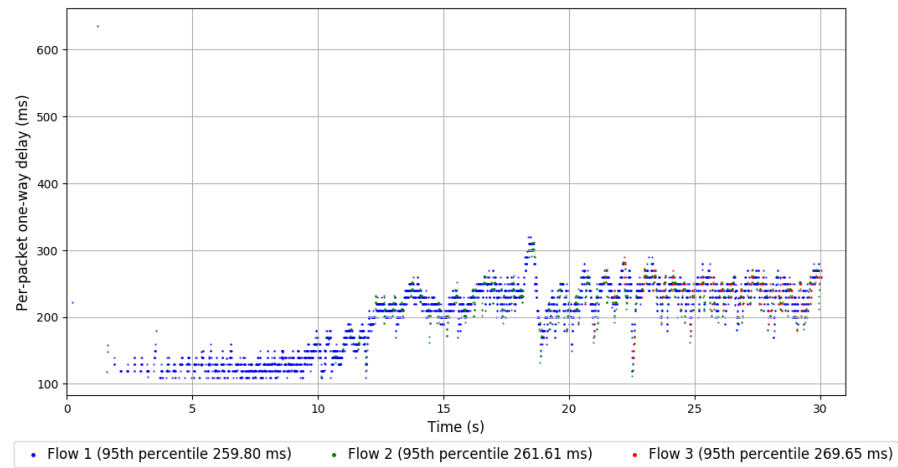
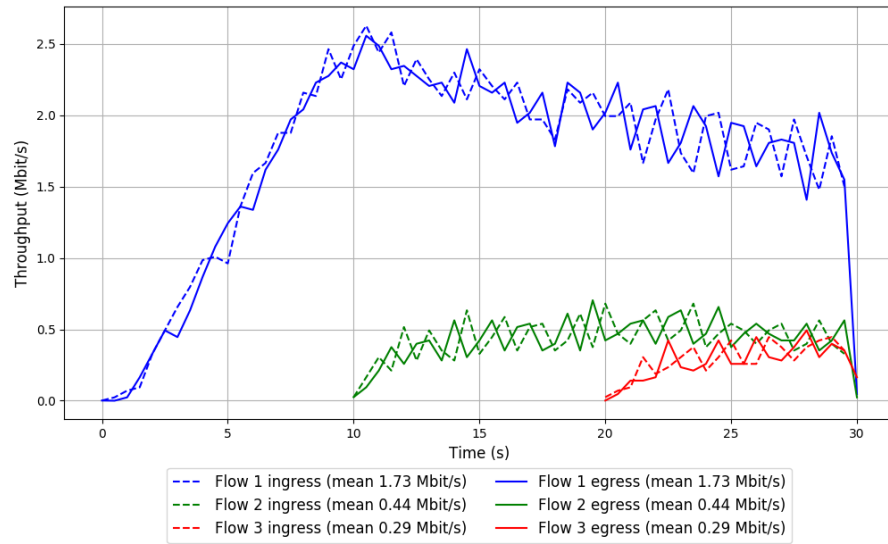


```
Run 1: Statistics of LEDBAT

Start at: 2017-08-13 06:42:00
End at: 2017-08-13 06:42:30
Local clock offset: 0.444 ms
Remote clock offset: -1.793 ms

# Below is generated by plot.py at 2017-08-13 07:39:08
# Datalink statistics
-- Total of 3 flows:
Average throughput: 2.12 Mbit/s
95th percentile per-packet one-way delay: 261.257 ms
Loss rate: 0.57%
-- Flow 1:
Average throughput: 1.73 Mbit/s
95th percentile per-packet one-way delay: 259.801 ms
Loss rate: 0.63%
-- Flow 2:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 261.606 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 269.650 ms
Loss rate: 1.22%
```

Run 1: Report of LEDBAT — Data Link

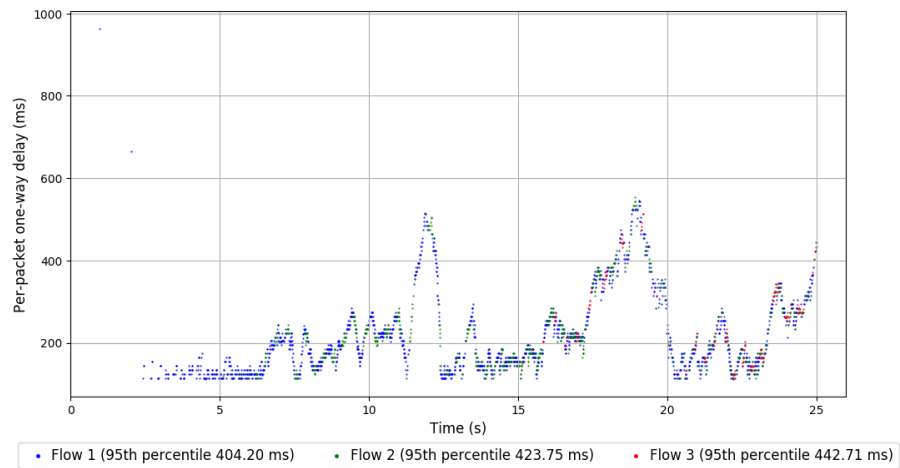
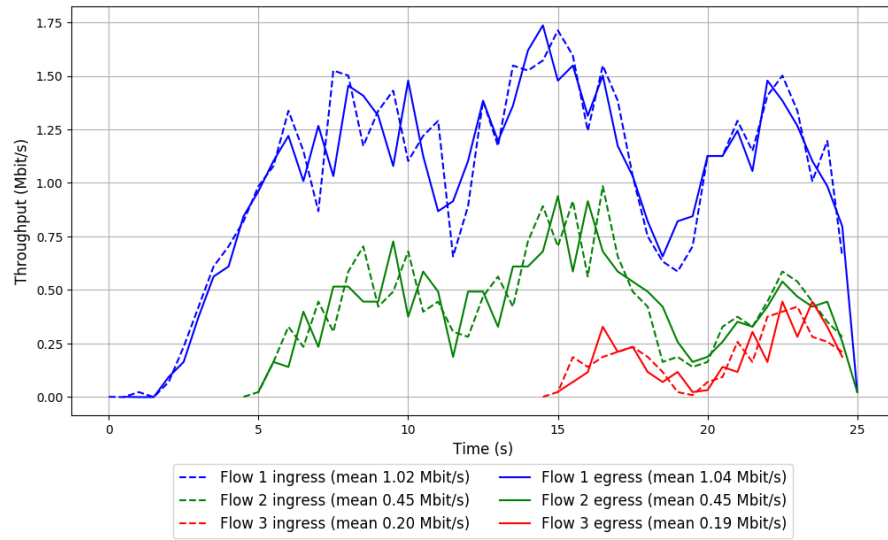


Run 2: Statistics of LEDBAT

Start at: 2017-08-13 07:00:47
End at: 2017-08-13 07:01:17
Local clock offset: 0.345 ms
Remote clock offset: -2.634 ms

Below is generated by plot.py at 2017-08-13 07:39:09
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.49 Mbit/s
95th percentile per-packet one-way delay: 414.139 ms
Loss rate: 1.20%
-- Flow 1:
Average throughput: 1.04 Mbit/s
95th percentile per-packet one-way delay: 404.203 ms
Loss rate: 1.11%
-- Flow 2:
Average throughput: 0.45 Mbit/s
95th percentile per-packet one-way delay: 423.747 ms
Loss rate: 1.17%
-- Flow 3:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 442.712 ms
Loss rate: 2.43%

Run 2: Report of LEDBAT — Data Link

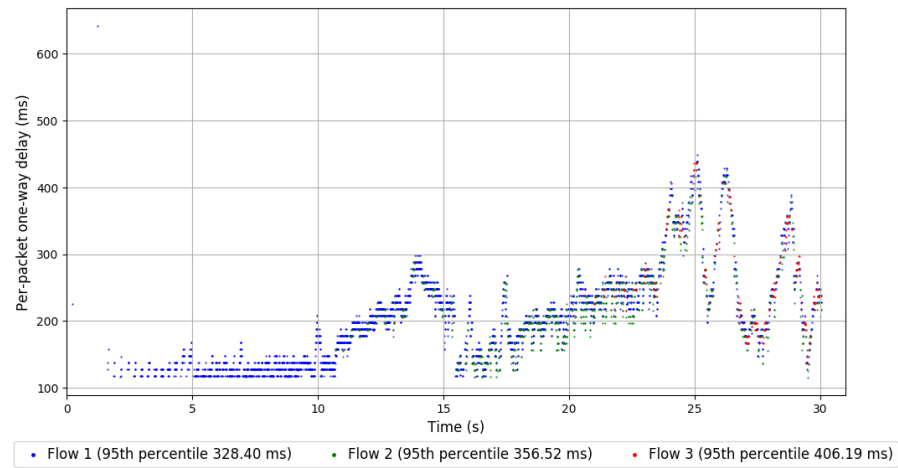
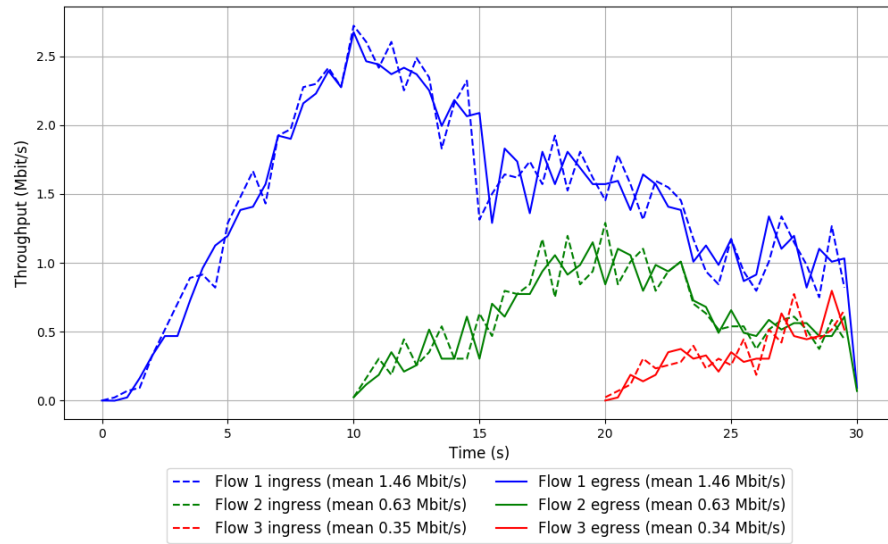


Run 3: Statistics of LEDBAT

Start at: 2017-08-13 07:19:36
End at: 2017-08-13 07:20:06
Local clock offset: 0.447 ms
Remote clock offset: -2.601 ms

```
# Below is generated by plot.py at 2017-08-13 07:39:09
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.99 Mbit/s
95th percentile per-packet one-way delay: 348.056 ms
Loss rate: 0.47%
-- Flow 1:
Average throughput: 1.46 Mbit/s
95th percentile per-packet one-way delay: 328.403 ms
Loss rate: 0.32%
-- Flow 2:
Average throughput: 0.63 Mbit/s
95th percentile per-packet one-way delay: 356.524 ms
Loss rate: 0.19%
-- Flow 3:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 406.190 ms
Loss rate: 3.39%
```

Run 3: Report of LEDBAT — Data Link

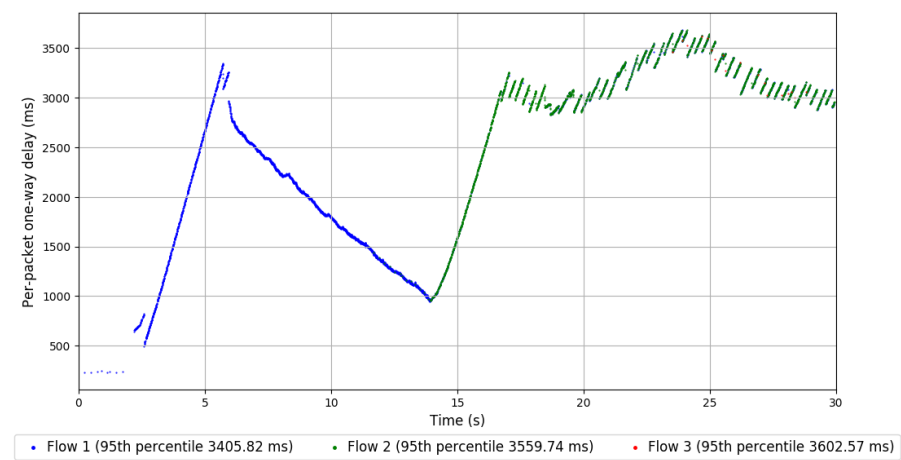
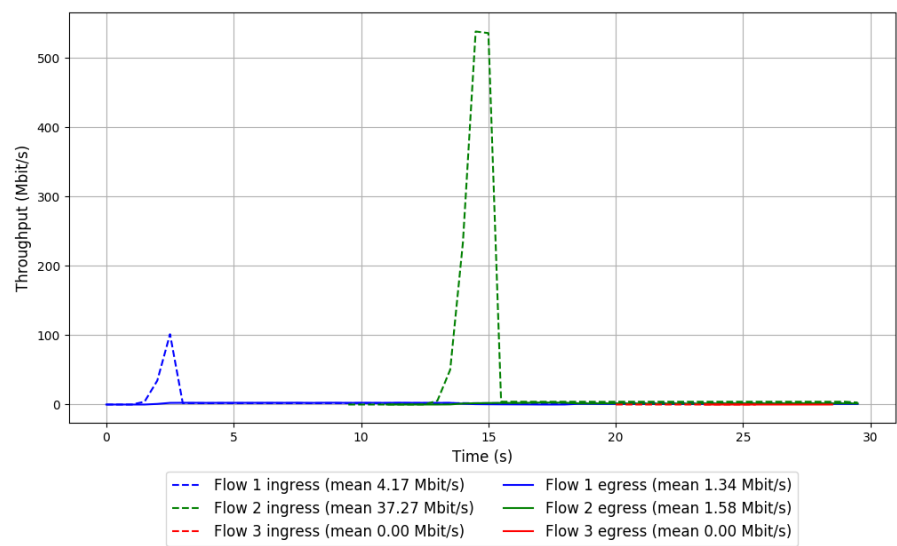


Run 1: Statistics of PCC

Start at: 2017-08-13 06:53:15
End at: 2017-08-13 06:53:45
Local clock offset: 0.328 ms
Remote clock offset: -1.795 ms

Below is generated by plot.py at 2017-08-13 07:39:11
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.32 Mbit/s
95th percentile per-packet one-way delay: 3511.764 ms
Loss rate: 92.03%
-- Flow 1:
Average throughput: 1.34 Mbit/s
95th percentile per-packet one-way delay: 3405.820 ms
Loss rate: 68.08%
-- Flow 2:
Average throughput: 1.58 Mbit/s
95th percentile per-packet one-way delay: 3559.738 ms
Loss rate: 96.07%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 3602.572 ms
Loss rate: 9.20%

Run 1: Report of PCC — Data Link



Run 2: Statistics of PCC

Start at: 2017-08-13 07:12:02

End at: 2017-08-13 07:12:32

Local clock offset: 0.466 ms

Remote clock offset: -1.7 ms

Below is generated by plot.py at 2017-08-13 07:39:11

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.57 Mbit/s

95th percentile per-packet one-way delay: 2863.685 ms

Loss rate: 61.49%

-- Flow 1:

Average throughput: 1.60 Mbit/s

95th percentile per-packet one-way delay: 2862.001 ms

Loss rate: 65.80%

-- Flow 2:

Average throughput: 1.50 Mbit/s

95th percentile per-packet one-way delay: 2865.642 ms

Loss rate: 51.50%

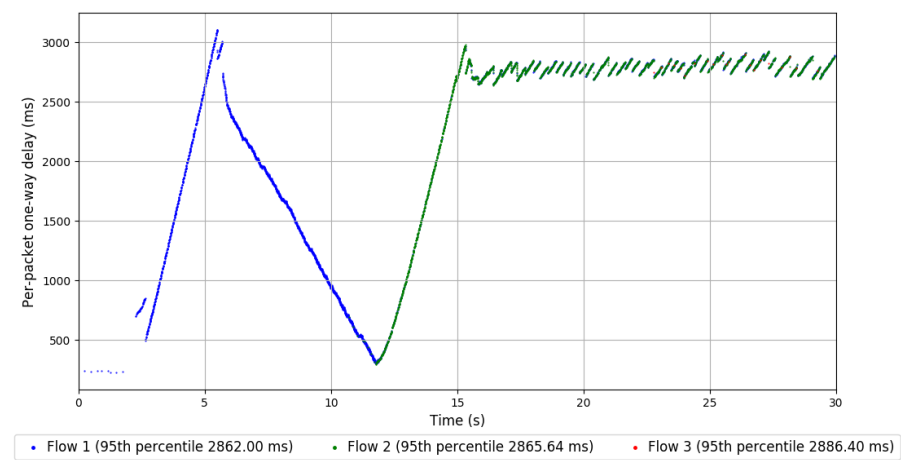
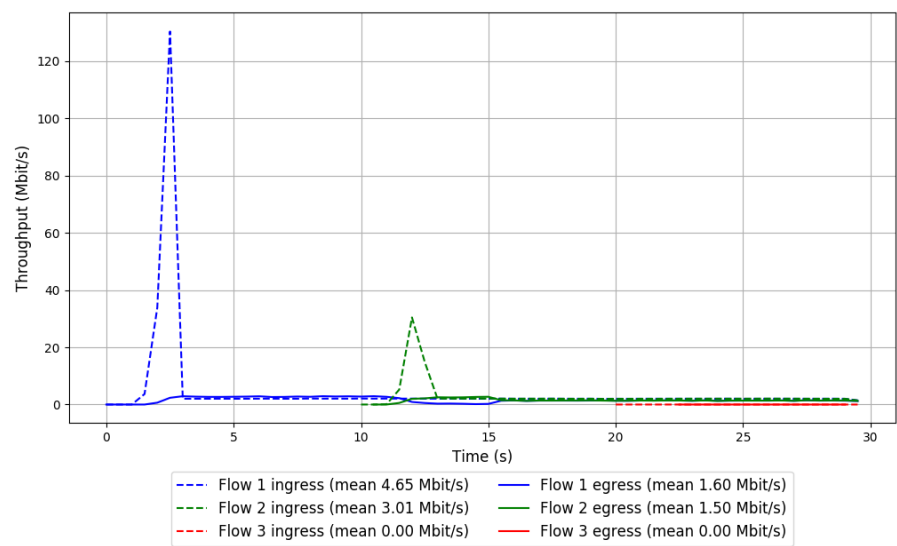
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 2886.403 ms

Loss rate: 15.23%

Run 2: Report of PCC — Data Link

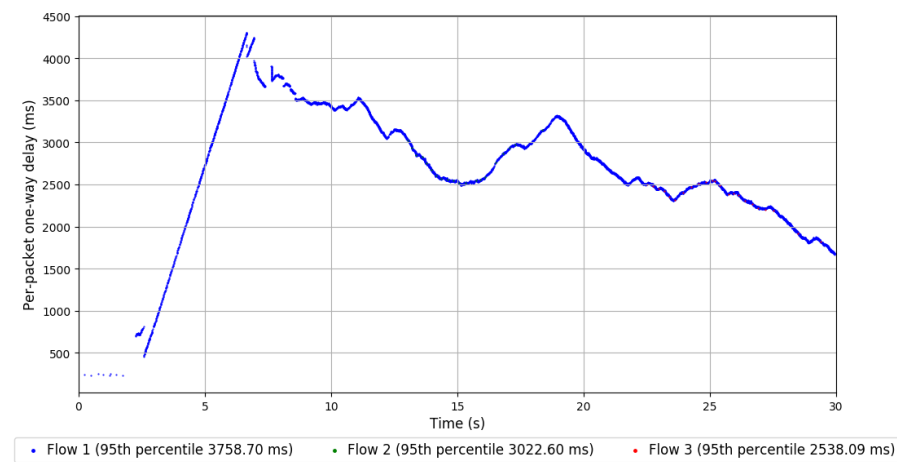
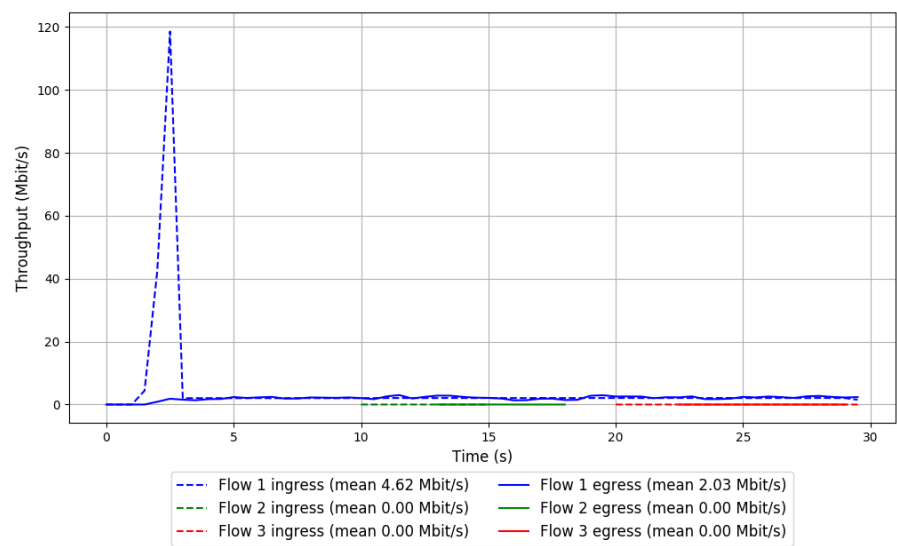


Run 3: Statistics of PCC

Start at: 2017-08-13 07:30:52
End at: 2017-08-13 07:31:22
Local clock offset: 0.58 ms
Remote clock offset: -2.543 ms

Below is generated by plot.py at 2017-08-13 07:39:13
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.03 Mbit/s
95th percentile per-packet one-way delay: 3757.092 ms
Loss rate: 56.35%
-- Flow 1:
Average throughput: 2.03 Mbit/s
95th percentile per-packet one-way delay: 3758.695 ms
Loss rate: 56.37%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 3022.604 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 2538.095 ms
Loss rate: 7.13%

Run 3: Report of PCC — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2017-08-13 06:49:30

End at: 2017-08-13 06:50:00

Local clock offset: 0.535 ms

Remote clock offset: -1.72 ms

Below is generated by plot.py at 2017-08-13 07:39:13

Datalink statistics

-- Total of 3 flows:

Average throughput: 1.40 Mbit/s

95th percentile per-packet one-way delay: 934.656 ms

Loss rate: 5.93%

-- Flow 1:

Average throughput: 0.08 Mbit/s

95th percentile per-packet one-way delay: 129.637 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 1.80 Mbit/s

95th percentile per-packet one-way delay: 919.418 ms

Loss rate: 4.55%

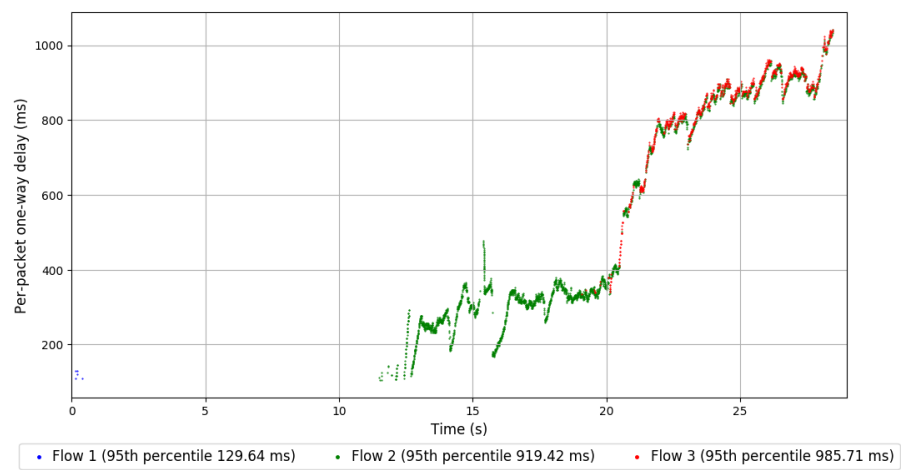
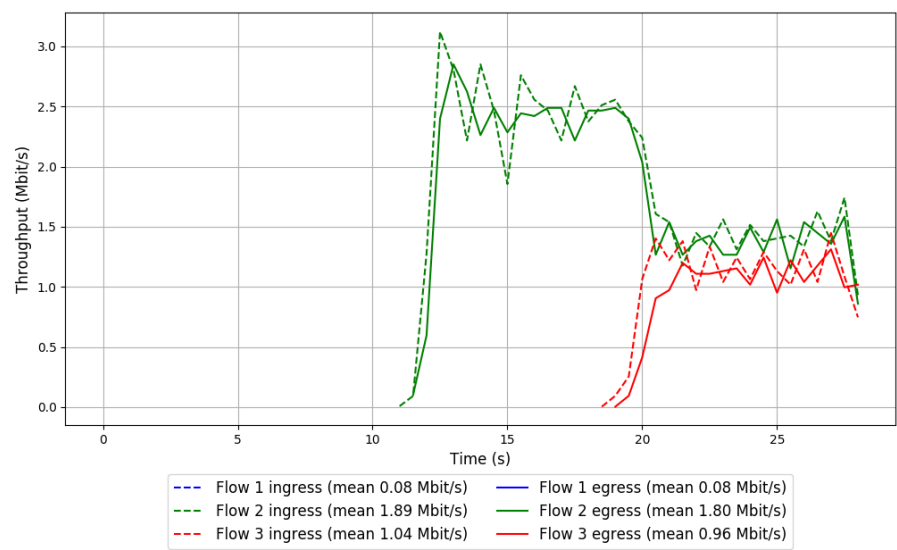
-- Flow 3:

Average throughput: 0.96 Mbit/s

95th percentile per-packet one-way delay: 985.713 ms

Loss rate: 10.33%

Run 1: Report of QUIC Cubic — Data Link

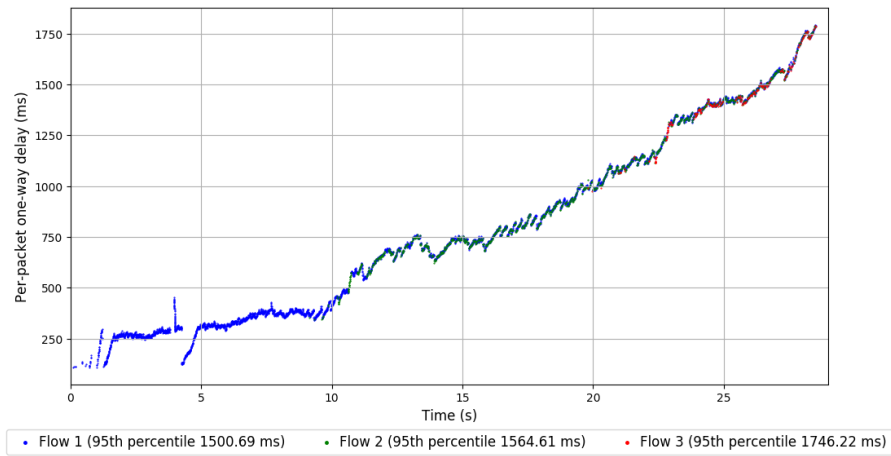
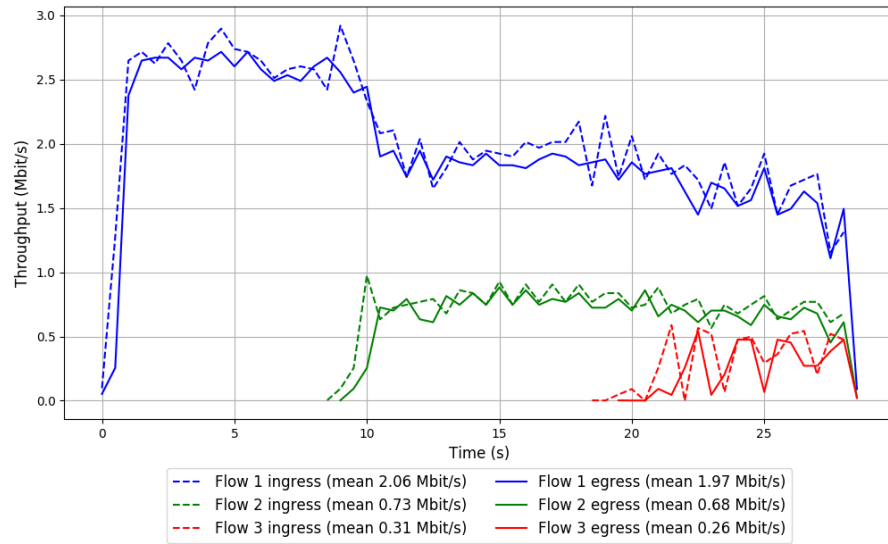


Run 2: Statistics of QUIC Cubic

Start at: 2017-08-13 07:08:17
End at: 2017-08-13 07:08:47
Local clock offset: 0.435 ms
Remote clock offset: -2.659 ms

Below is generated by plot.py at 2017-08-13 07:39:14
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 1546.462 ms
Loss rate: 5.96%
-- Flow 1:
Average throughput: 1.97 Mbit/s
95th percentile per-packet one-way delay: 1500.695 ms
Loss rate: 4.35%
-- Flow 2:
Average throughput: 0.68 Mbit/s
95th percentile per-packet one-way delay: 1564.612 ms
Loss rate: 8.65%
-- Flow 3:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 1746.221 ms
Loss rate: 24.38%

Run 2: Report of QUIC Cubic — Data Link

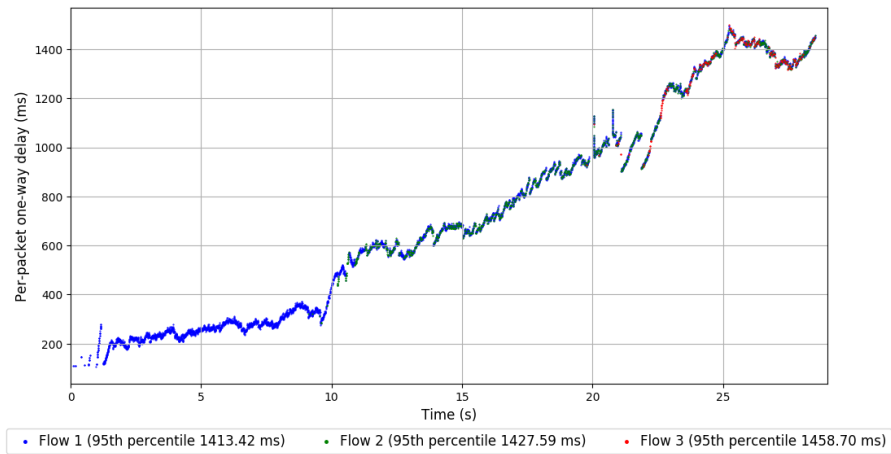
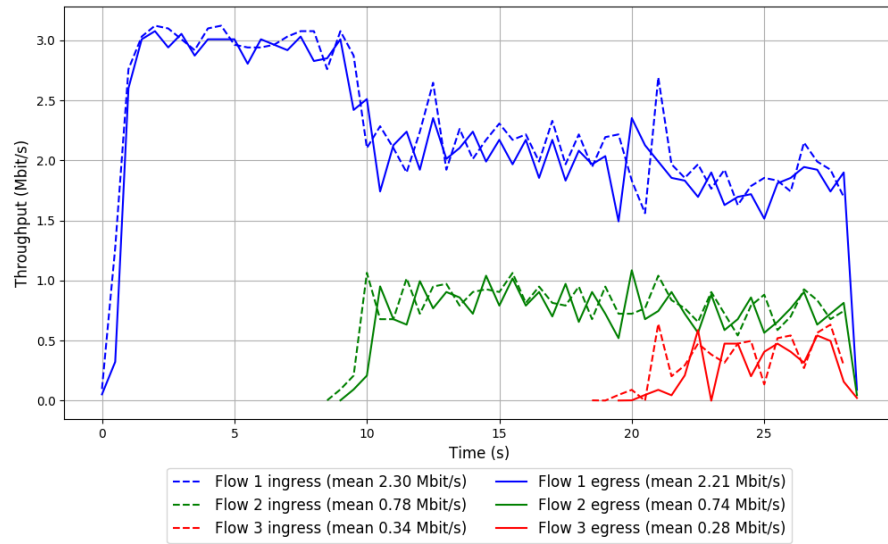


Run 3: Statistics of QUIC Cubic

Start at: 2017-08-13 07:27:06
End at: 2017-08-13 07:27:36
Local clock offset: 0.576 ms
Remote clock offset: -1.623 ms

Below is generated by plot.py at 2017-08-13 07:39:14
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.80 Mbit/s
95th percentile per-packet one-way delay: 1421.596 ms
Loss rate: 5.23%
-- Flow 1:
Average throughput: 2.21 Mbit/s
95th percentile per-packet one-way delay: 1413.417 ms
Loss rate: 4.02%
-- Flow 2:
Average throughput: 0.74 Mbit/s
95th percentile per-packet one-way delay: 1427.590 ms
Loss rate: 6.84%
-- Flow 3:
Average throughput: 0.28 Mbit/s
95th percentile per-packet one-way delay: 1458.700 ms
Loss rate: 22.29%

Run 3: Report of QUIC Cubic — Data Link

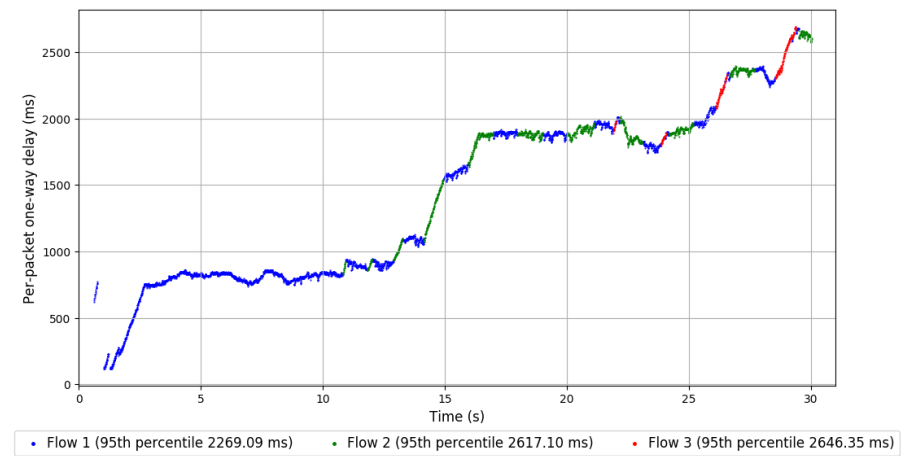
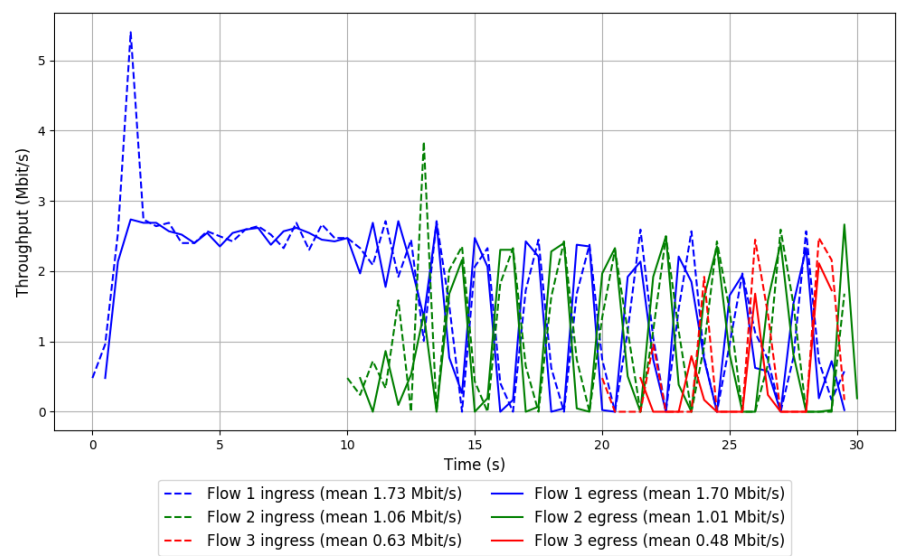


Run 1: Statistics of Saturator

Start at: 2017-08-13 06:55:46
End at: 2017-08-13 06:56:16
Local clock offset: 0.412 ms
Remote clock offset: -2.633 ms

Below is generated by plot.py at 2017-08-13 07:39:16
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.45 Mbit/s
95th percentile per-packet one-way delay: 2378.641 ms
Loss rate: 8.40%
-- Flow 1:
Average throughput: 1.70 Mbit/s
95th percentile per-packet one-way delay: 2269.095 ms
Loss rate: 4.67%
-- Flow 2:
Average throughput: 1.01 Mbit/s
95th percentile per-packet one-way delay: 2617.102 ms
Loss rate: 8.47%
-- Flow 3:
Average throughput: 0.48 Mbit/s
95th percentile per-packet one-way delay: 2646.351 ms
Loss rate: 40.00%

Run 1: Report of Saturator — Data Link



Run 2: Statistics of Saturator

Start at: 2017-08-13 07:14:35

End at: 2017-08-13 07:15:05

Local clock offset: 0.447 ms

Remote clock offset: 1.388 ms

Below is generated by plot.py at 2017-08-13 07:39:16

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.43 Mbit/s

95th percentile per-packet one-way delay: 2756.404 ms

Loss rate: 8.62%

-- Flow 1:

Average throughput: 1.74 Mbit/s

95th percentile per-packet one-way delay: 2355.230 ms

Loss rate: 4.63%

-- Flow 2:

Average throughput: 0.95 Mbit/s

95th percentile per-packet one-way delay: 2816.735 ms

Loss rate: 11.50%

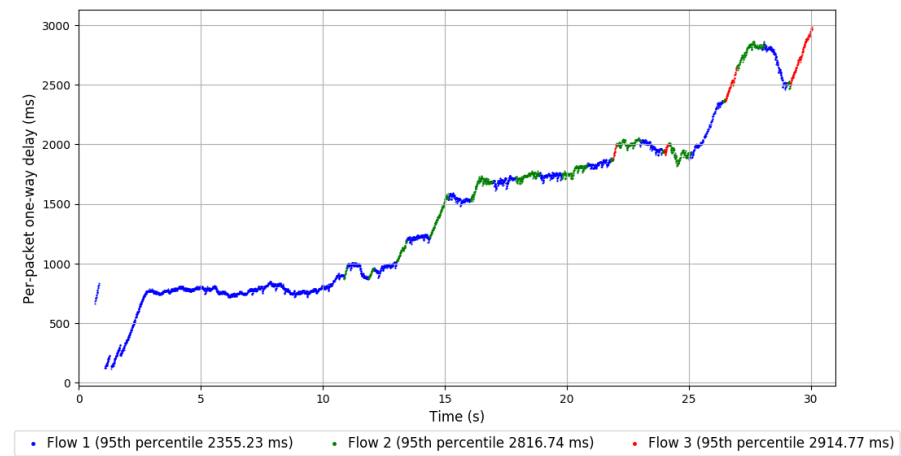
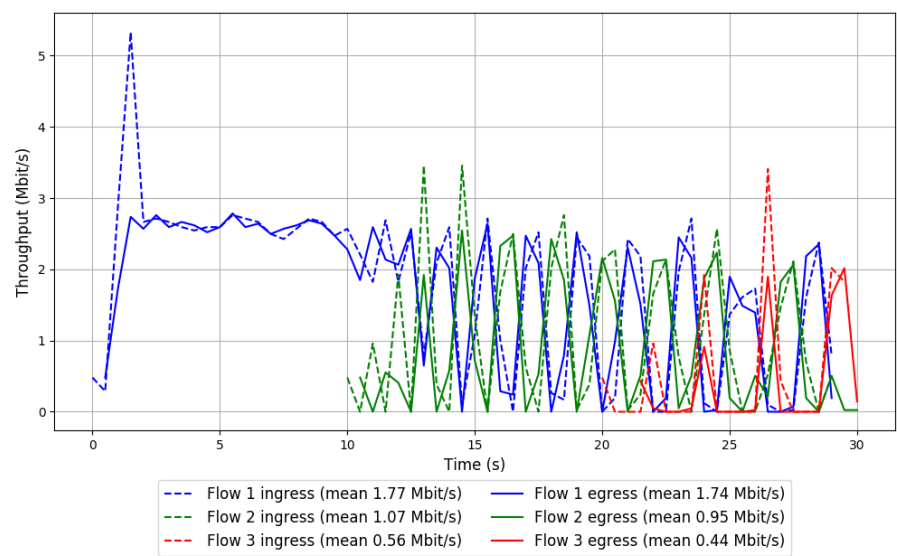
-- Flow 3:

Average throughput: 0.44 Mbit/s

95th percentile per-packet one-way delay: 2914.774 ms

Loss rate: 35.22%

Run 2: Report of Saturator — Data Link



Run 3: Statistics of Saturator

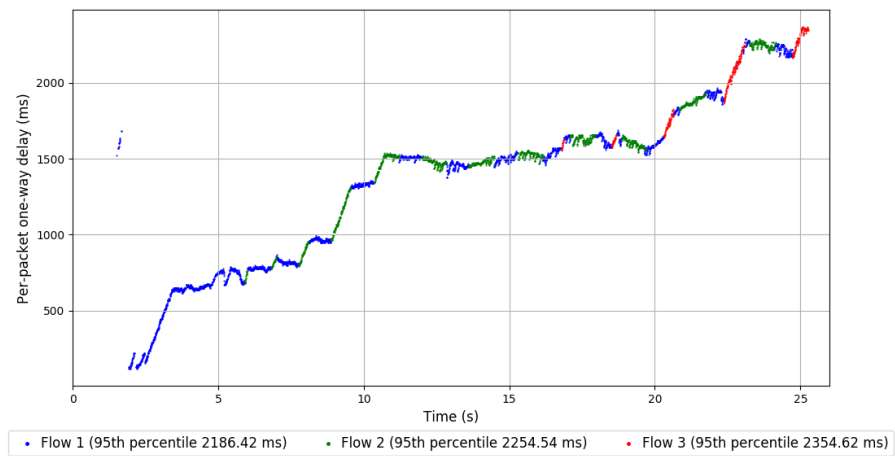
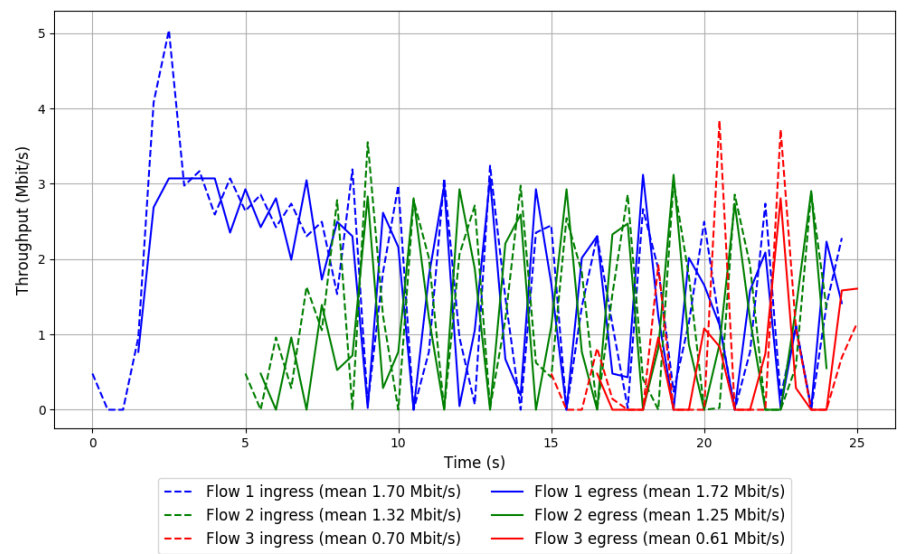
Start at: 2017-08-13 07:33:22

End at: 2017-08-13 07:33:52

Local clock offset: 0.42 ms

Remote clock offset: -2.703 ms

Run 3: Report of Saturator — Data Link



Run 1: Statistics of SCReAM

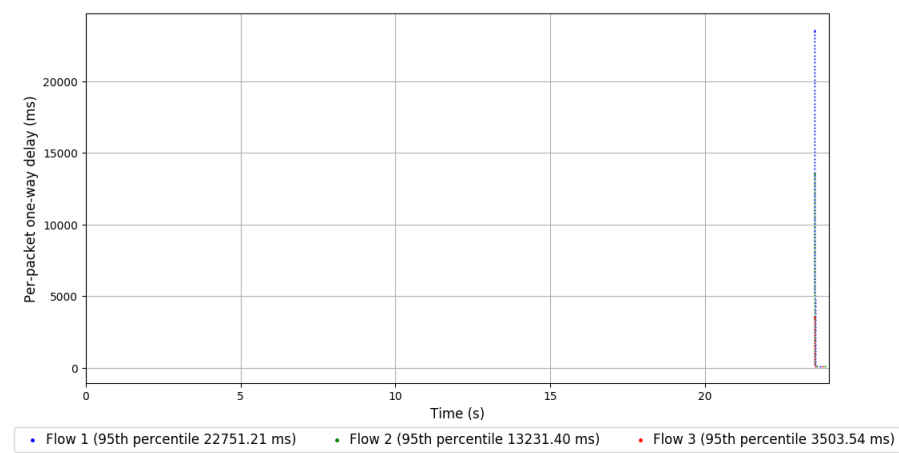
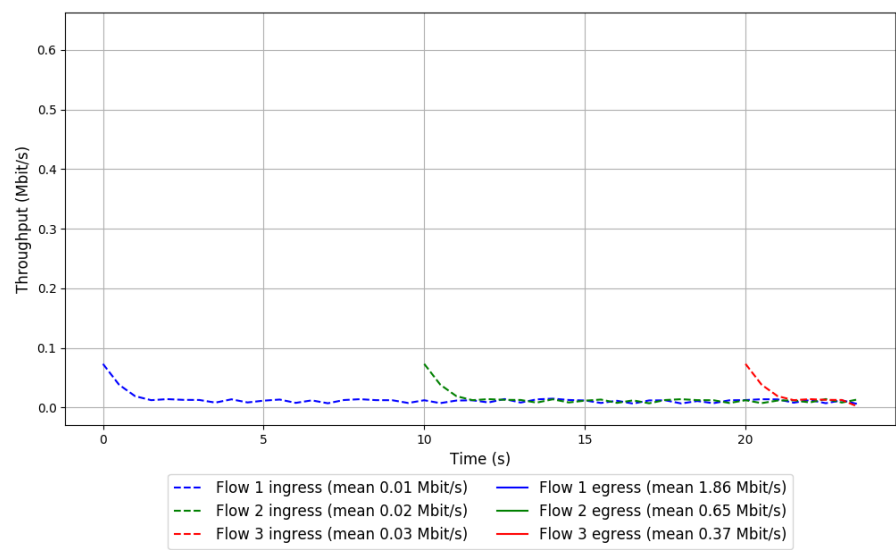
Start at: 2017-08-13 06:45:46

End at: 2017-08-13 06:46:16

Local clock offset: 0.45 ms

Remote clock offset: 2.265 ms

Run 1: Report of SReAM — Data Link

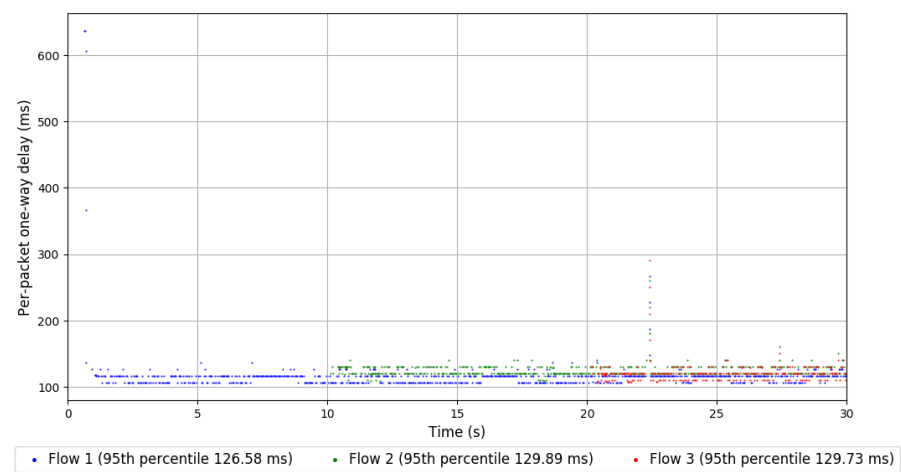
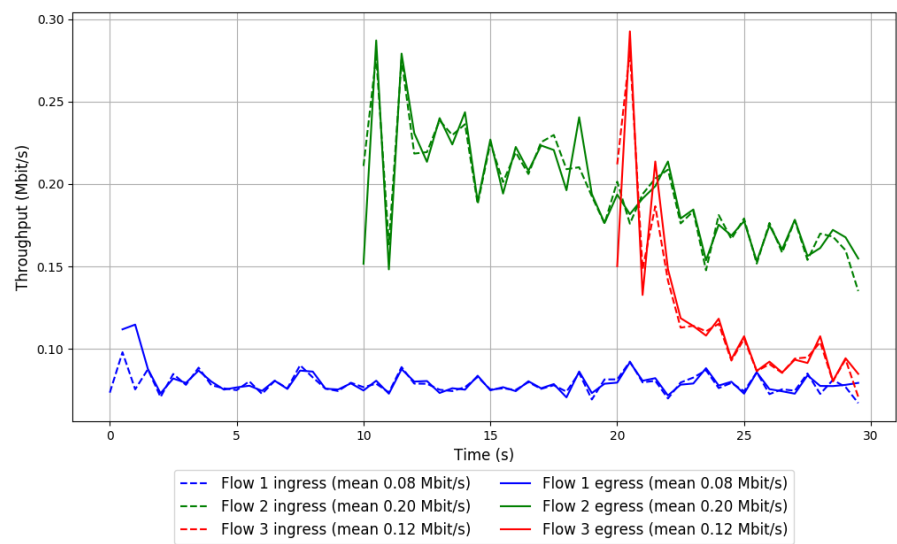


Run 2: Statistics of SReAM

Start at: 2017-08-13 07:04:32
End at: 2017-08-13 07:05:02
Local clock offset: 0.463 ms
Remote clock offset: -2.614 ms

Below is generated by plot.py at 2017-08-13 07:39:18
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 129.749 ms
Loss rate: 0.18%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 126.584 ms
Loss rate: 0.13%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 129.892 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 129.731 ms
Loss rate: 0.27%

Run 2: Report of SReAM — Data Link



Run 3: Statistics of SCReAM

Start at: 2017-08-13 07:23:21

End at: 2017-08-13 07:23:51

Local clock offset: 0.484 ms

Remote clock offset: 2.246 ms

Below is generated by plot.py at 2017-08-13 07:39:18

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.27 Mbit/s

95th percentile per-packet one-way delay: 136.862 ms

Loss rate: 0.10%

-- Flow 1:

Average throughput: 0.08 Mbit/s

95th percentile per-packet one-way delay: 122.586 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 0.16 Mbit/s

95th percentile per-packet one-way delay: 124.588 ms

Loss rate: 0.00%

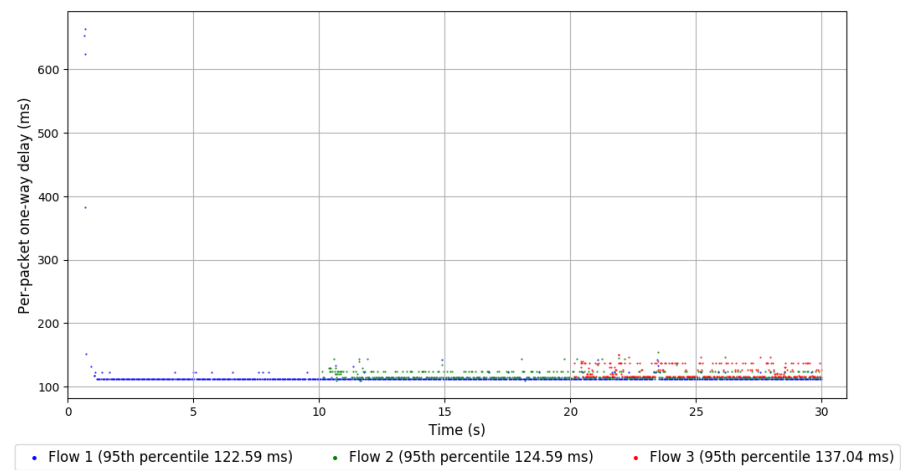
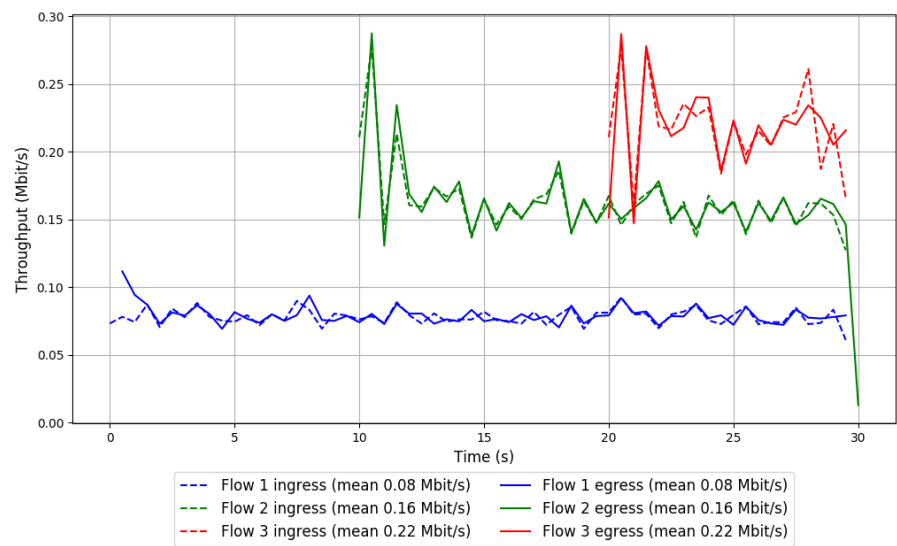
-- Flow 3:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 137.040 ms

Loss rate: 0.35%

Run 3: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2017-08-13 06:44:31

End at: 2017-08-13 06:45:01

Local clock offset: 0.545 ms

Remote clock offset: 2.328 ms

Below is generated by plot.py at 2017-08-13 07:39:19

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 152.511 ms

Loss rate: 0.02%

-- Flow 1:

Average throughput: 0.15 Mbit/s

95th percentile per-packet one-way delay: 155.460 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 0.19 Mbit/s

95th percentile per-packet one-way delay: 145.270 ms

Loss rate: 0.02%

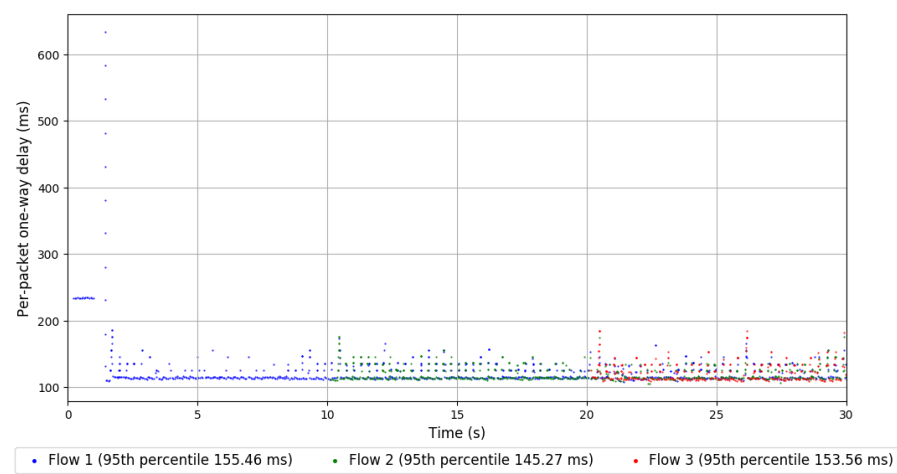
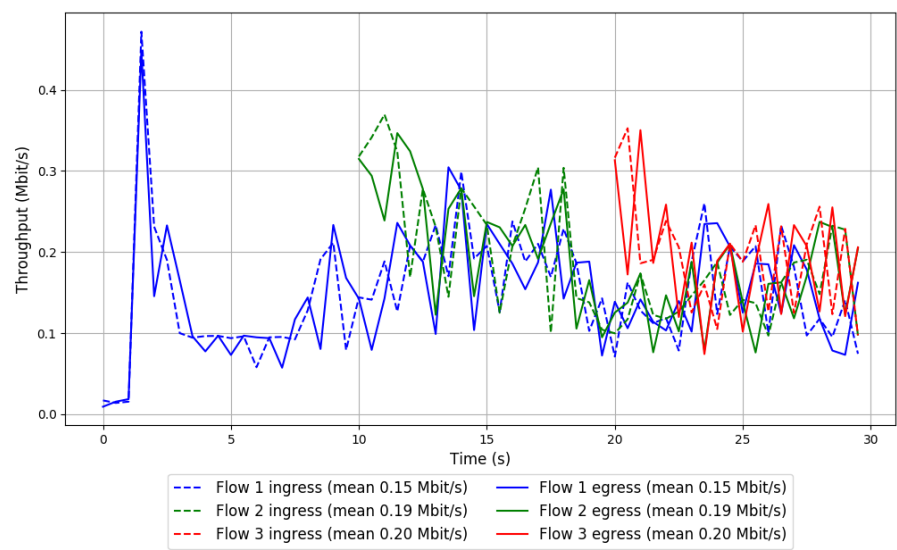
-- Flow 3:

Average throughput: 0.20 Mbit/s

95th percentile per-packet one-way delay: 153.564 ms

Loss rate: 0.06%

Run 1: Report of Sprout — Data Link

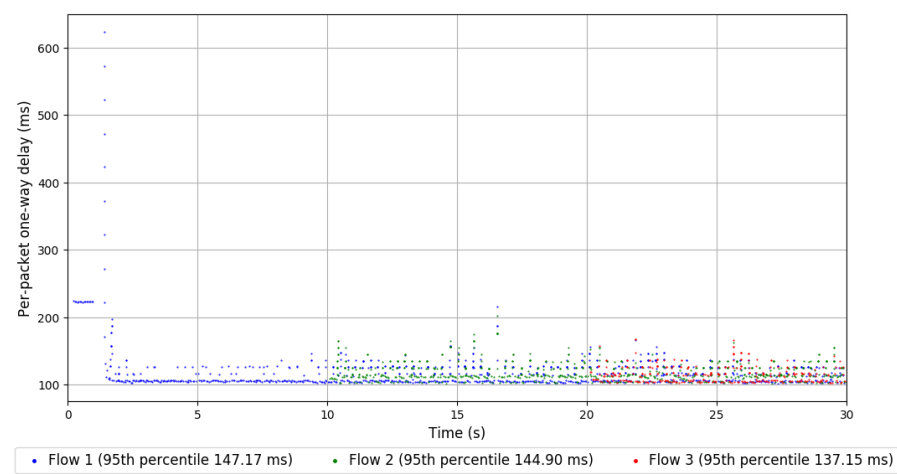
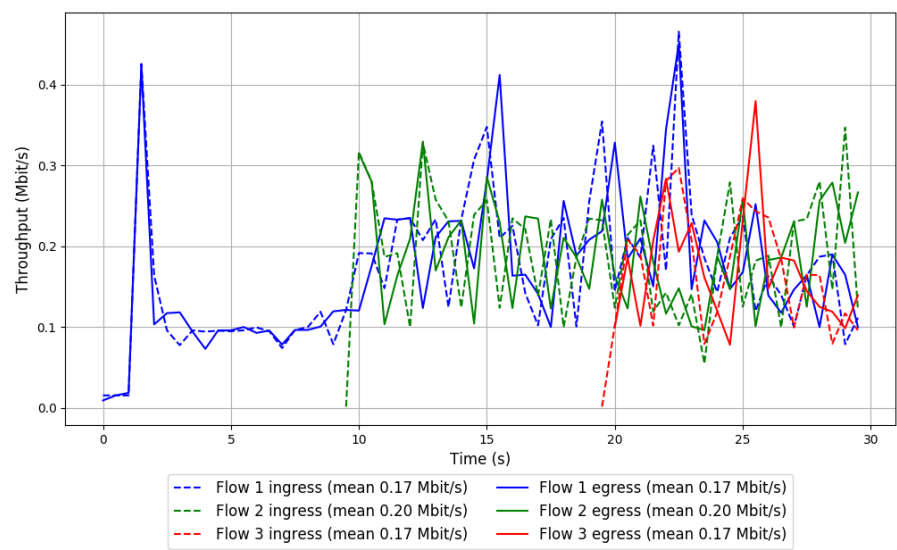


Run 2: Statistics of Sprout

Start at: 2017-08-13 07:03:17
End at: 2017-08-13 07:03:47
Local clock offset: 0.476 ms
Remote clock offset: -2.601 ms

```
# Below is generated by plot.py at 2017-08-13 07:39:20
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.36 Mbit/s
95th percentile per-packet one-way delay: 146.304 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 147.173 ms
Loss rate: 0.16%
-- Flow 2:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 144.900 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 137.149 ms
Loss rate: 0.05%
```

Run 2: Report of Sprout — Data Link



Run 3: Statistics of Sprout

Start at: 2017-08-13 07:22:06

End at: 2017-08-13 07:22:36

Local clock offset: 0.398 ms

Remote clock offset: 1.335 ms

Below is generated by plot.py at 2017-08-13 07:39:20

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.34 Mbit/s

95th percentile per-packet one-way delay: 152.773 ms

Loss rate: 0.01%

-- Flow 1:

Average throughput: 0.15 Mbit/s

95th percentile per-packet one-way delay: 153.738 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 0.19 Mbit/s

95th percentile per-packet one-way delay: 151.109 ms

Loss rate: 0.02%

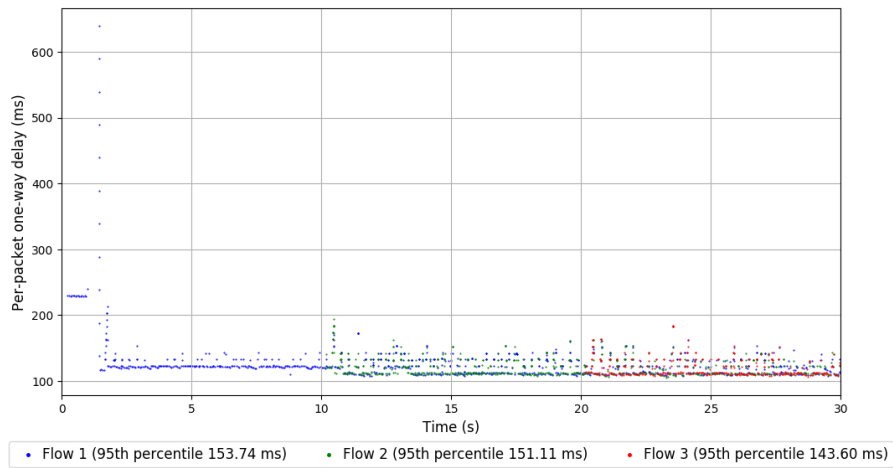
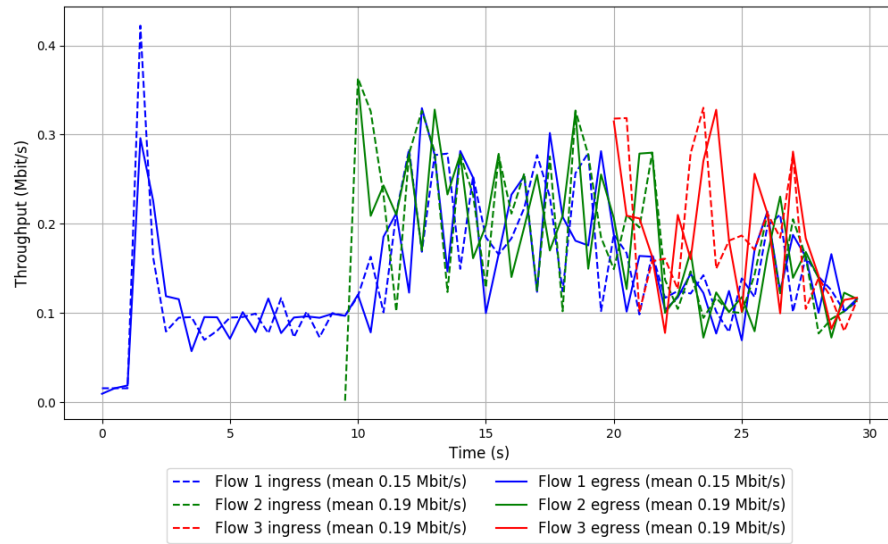
-- Flow 3:

Average throughput: 0.19 Mbit/s

95th percentile per-packet one-way delay: 143.596 ms

Loss rate: 0.00%

Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

Start at: 2017-08-13 06:43:15

End at: 2017-08-13 06:43:45

Local clock offset: 0.478 ms

Remote clock offset: -1.67 ms

Below is generated by plot.py at 2017-08-13 07:39:22

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.34 Mbit/s

95th percentile per-packet one-way delay: 773.555 ms

Loss rate: 1.06%

-- Flow 1:

Average throughput: 1.37 Mbit/s

95th percentile per-packet one-way delay: 743.614 ms

Loss rate: 0.50%

-- Flow 2:

Average throughput: 1.06 Mbit/s

95th percentile per-packet one-way delay: 933.133 ms

Loss rate: 0.85%

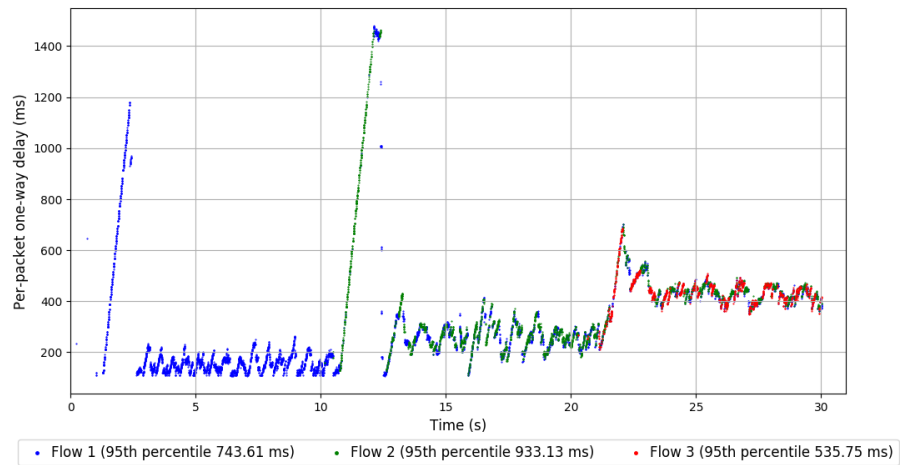
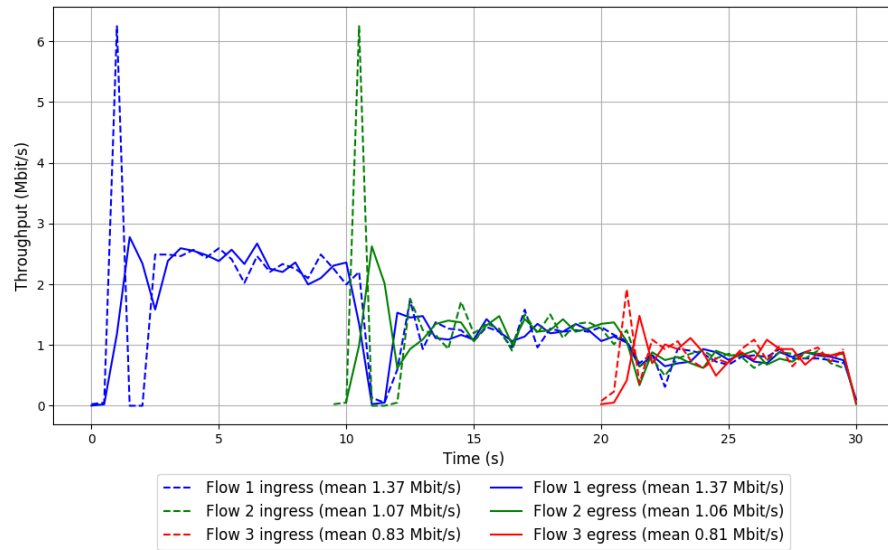
-- Flow 3:

Average throughput: 0.81 Mbit/s

95th percentile per-packet one-way delay: 535.748 ms

Loss rate: 4.42%

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



Run 2: Statistics of TaoVA-100x

Start at: 2017-08-13 07:02:02

End at: 2017-08-13 07:02:32

Local clock offset: 0.457 ms

Remote clock offset: 2.267 ms

Below is generated by plot.py at 2017-08-13 07:39:22

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.04 Mbit/s

95th percentile per-packet one-way delay: 951.784 ms

Loss rate: 1.45%

-- Flow 1:

Average throughput: 1.21 Mbit/s

95th percentile per-packet one-way delay: 1074.059 ms

Loss rate: 1.11%

-- Flow 2:

Average throughput: 0.91 Mbit/s

95th percentile per-packet one-way delay: 953.710 ms

Loss rate: 2.11%

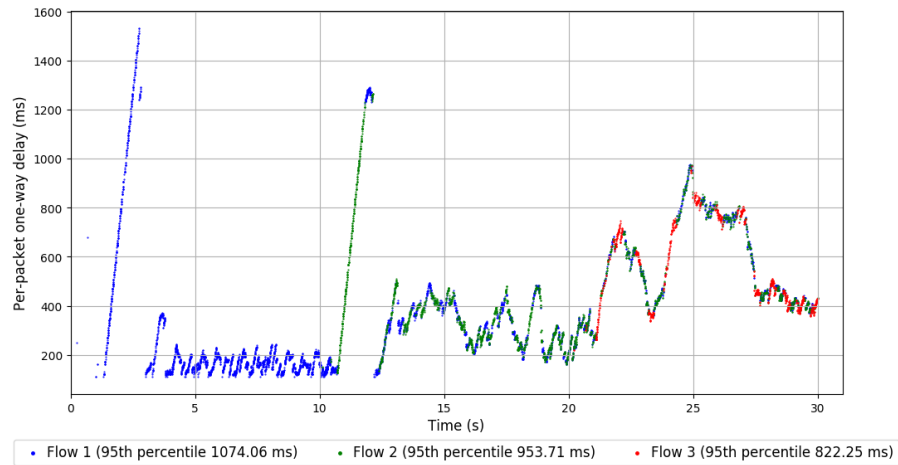
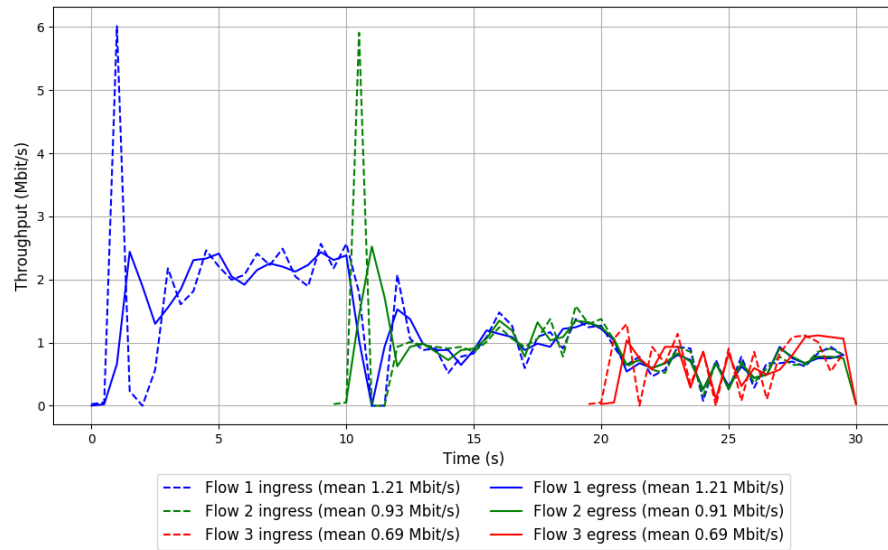
-- Flow 3:

Average throughput: 0.69 Mbit/s

95th percentile per-packet one-way delay: 822.255 ms

Loss rate: 1.51%

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

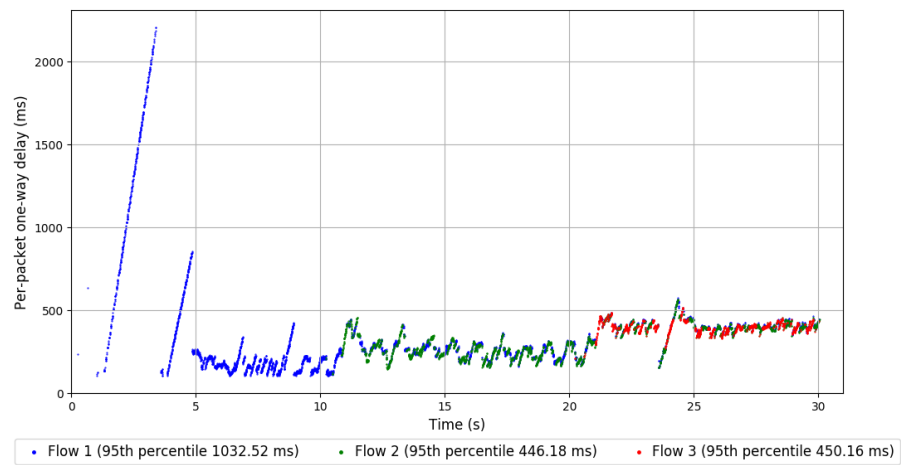
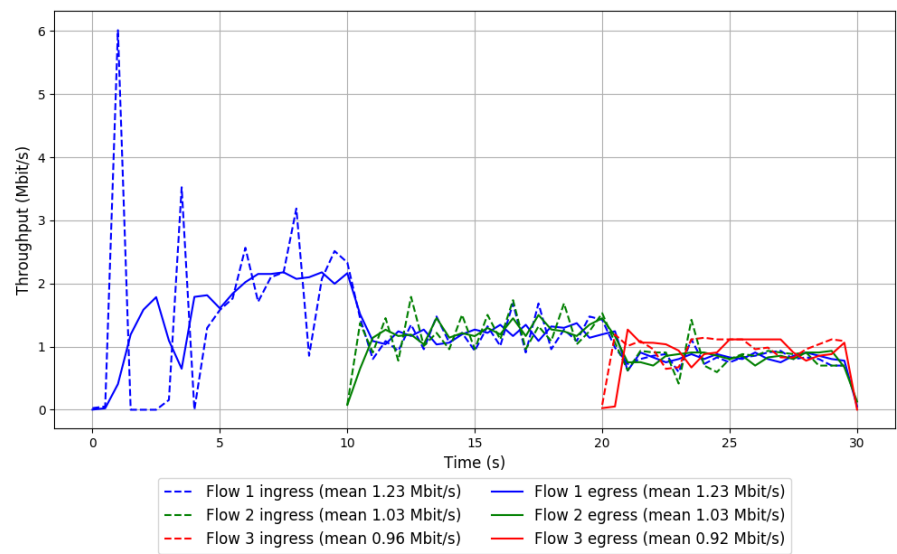


Run 3: Statistics of TaoVA-100x

Start at: 2017-08-13 07:20:51
End at: 2017-08-13 07:21:21
Local clock offset: 0.38 ms
Remote clock offset: -2.627 ms

Below is generated by plot.py at 2017-08-13 07:39:24
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.21 Mbit/s
95th percentile per-packet one-way delay: 560.766 ms
Loss rate: 1.35%
-- Flow 1:
Average throughput: 1.23 Mbit/s
95th percentile per-packet one-way delay: 1032.520 ms
Loss rate: 0.56%
-- Flow 2:
Average throughput: 1.03 Mbit/s
95th percentile per-packet one-way delay: 446.177 ms
Loss rate: 0.76%
-- Flow 3:
Average throughput: 0.92 Mbit/s
95th percentile per-packet one-way delay: 450.158 ms
Loss rate: 5.70%

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

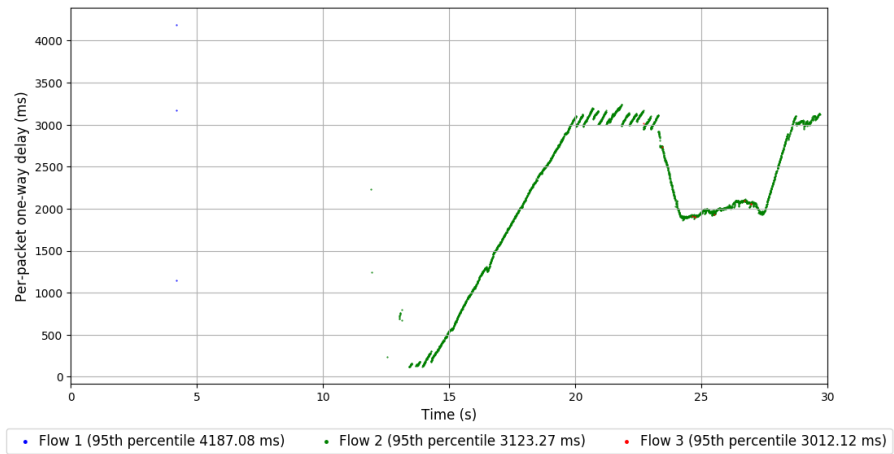
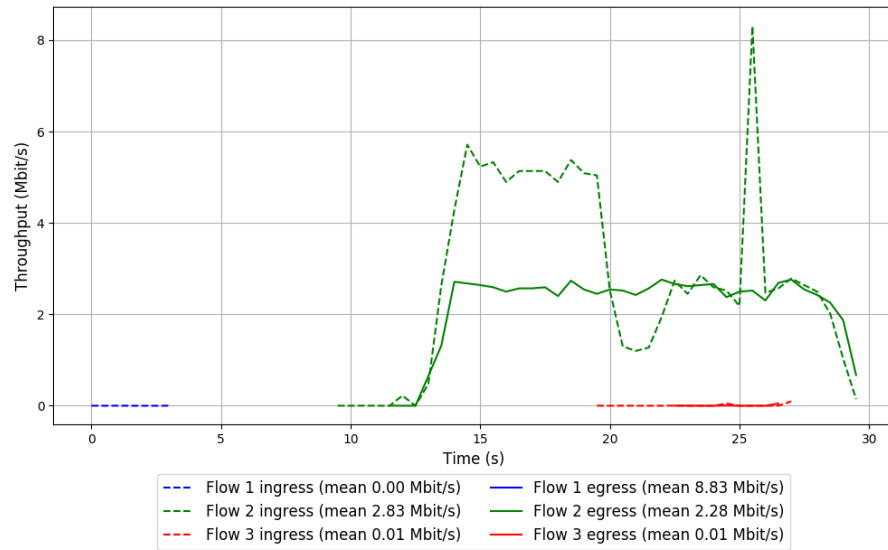


Run 1: Statistics of TCP Vegas

Start at: 2017-08-13 06:54:31
End at: 2017-08-13 06:55:01
Local clock offset: 0.334 ms
Remote clock offset: -1.784 ms

Below is generated by plot.py at 2017-08-13 07:39:24
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.59 Mbit/s
95th percentile per-packet one-way delay: 3123.277 ms
Loss rate: 27.90%
-- Flow 1:
Average throughput: 8.83 Mbit/s
95th percentile per-packet one-way delay: 4187.076 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 2.28 Mbit/s
95th percentile per-packet one-way delay: 3123.267 ms
Loss rate: 27.85%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 3012.119 ms
Loss rate: 62.01%

Run 1: Report of TCP Vegas — Data Link

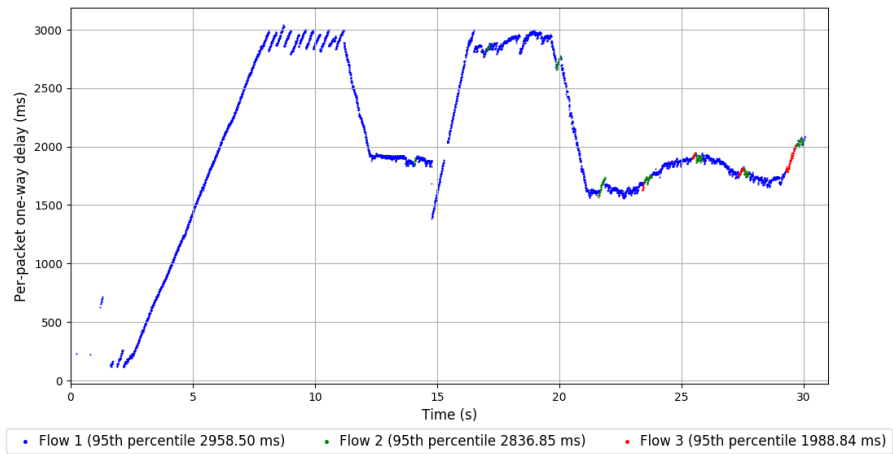
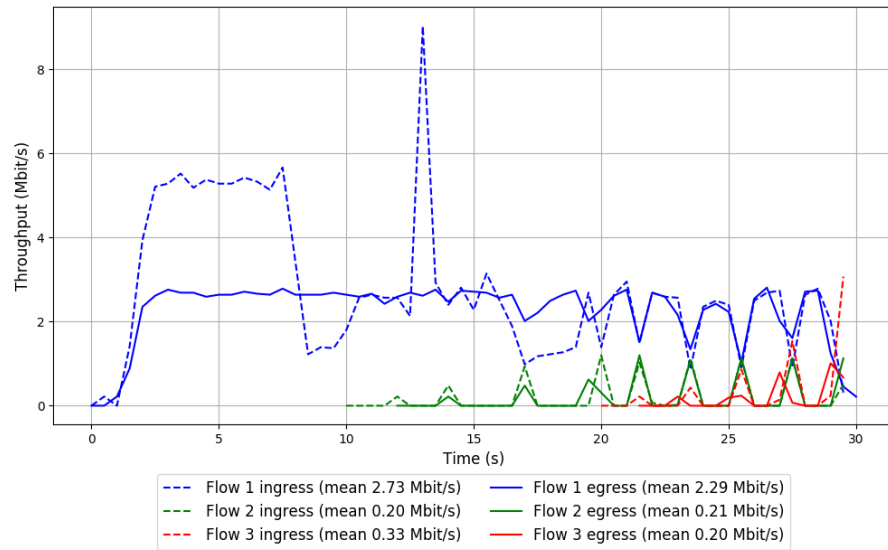


Run 2: Statistics of TCP Vegas

Start at: 2017-08-13 07:13:17
End at: 2017-08-13 07:13:47
Local clock offset: 0.445 ms
Remote clock offset: -1.703 ms

Below is generated by plot.py at 2017-08-13 07:39:25
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.47 Mbit/s
95th percentile per-packet one-way delay: 2949.056 ms
Loss rate: 17.29%
-- Flow 1:
Average throughput: 2.29 Mbit/s
95th percentile per-packet one-way delay: 2958.503 ms
Loss rate: 16.47%
-- Flow 2:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 2836.849 ms
Loss rate: 6.43%
-- Flow 3:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 1988.840 ms
Loss rate: 50.86%

Run 2: Report of TCP Vegas — Data Link

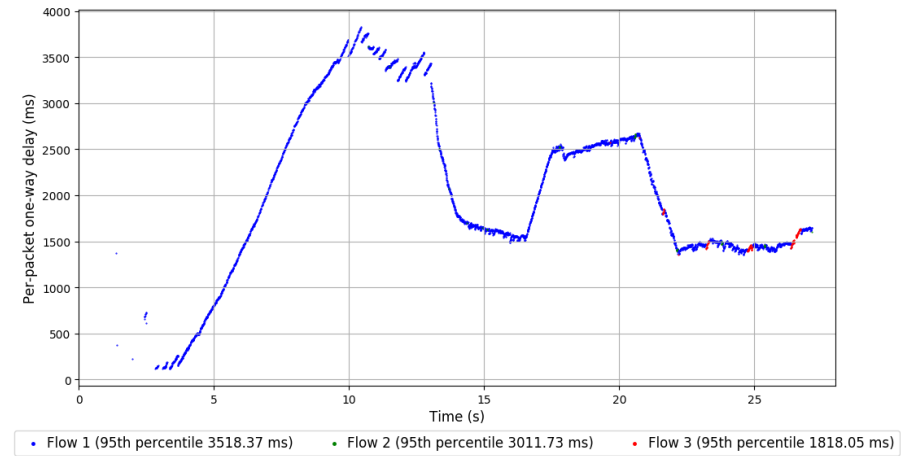
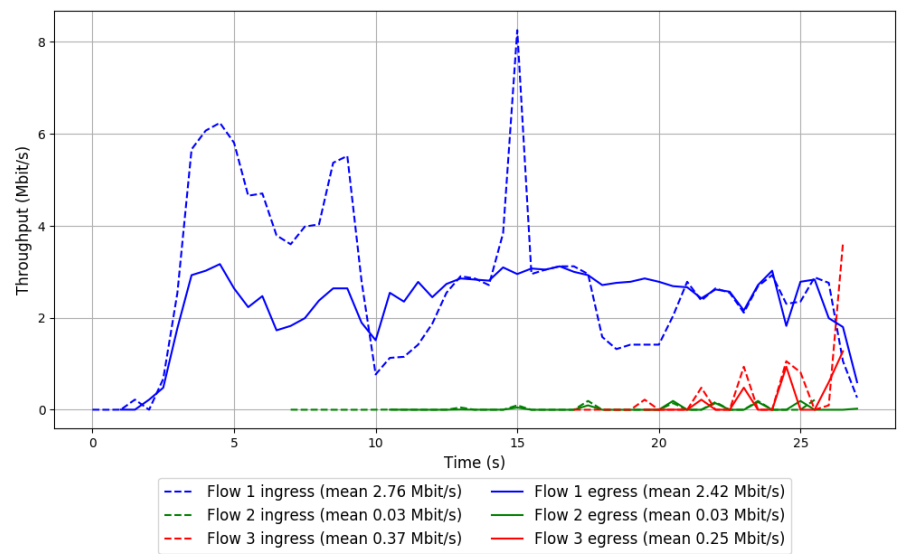


Run 3: Statistics of TCP Vegas

Start at: 2017-08-13 07:32:07
End at: 2017-08-13 07:32:37
Local clock offset: 0.519 ms
Remote clock offset: -2.618 ms

Below is generated by plot.py at 2017-08-13 07:39:25
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 3518.216 ms
Loss rate: 18.04%
-- Flow 1:
Average throughput: 2.42 Mbit/s
95th percentile per-packet one-way delay: 3518.373 ms
Loss rate: 16.42%
-- Flow 2:
Average throughput: 0.03 Mbit/s
95th percentile per-packet one-way delay: 3011.731 ms
Loss rate: 17.97%
-- Flow 3:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 1818.047 ms
Loss rate: 51.44%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2017-08-13 06:59:32

End at: 2017-08-13 07:00:02

Local clock offset: 0.438 ms

Remote clock offset: -2.62 ms

Below is generated by plot.py at 2017-08-13 07:39:26

Datalink statistics

-- Total of 3 flows:

Average throughput: 2.25 Mbit/s

95th percentile per-packet one-way delay: 1758.257 ms

Loss rate: 3.98%

-- Flow 1:

Average throughput: 2.24 Mbit/s

95th percentile per-packet one-way delay: 1757.505 ms

Loss rate: 3.97%

-- Flow 2:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 1791.772 ms

Loss rate: 5.00%

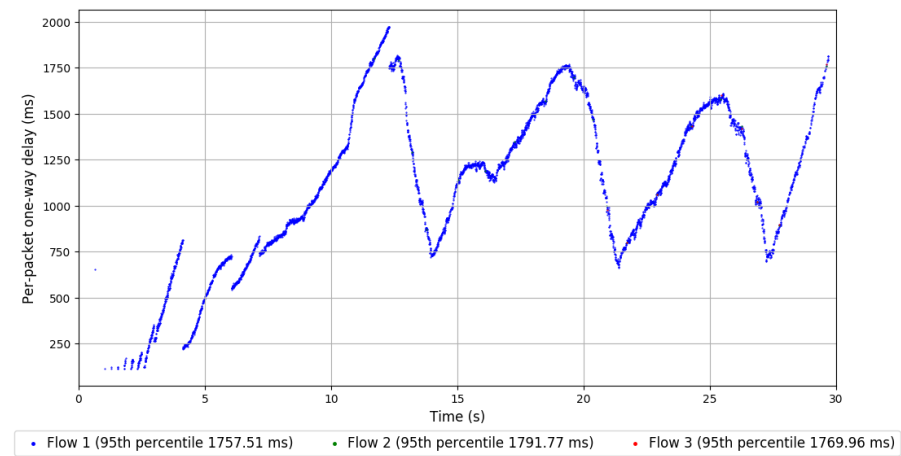
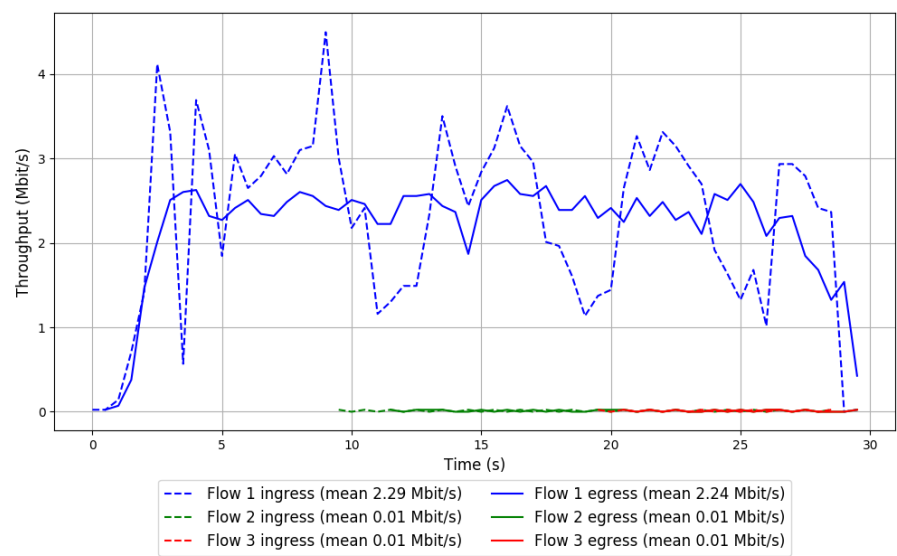
-- Flow 3:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 1769.965 ms

Loss rate: 10.00%

Run 1: Report of Verus — Data Link

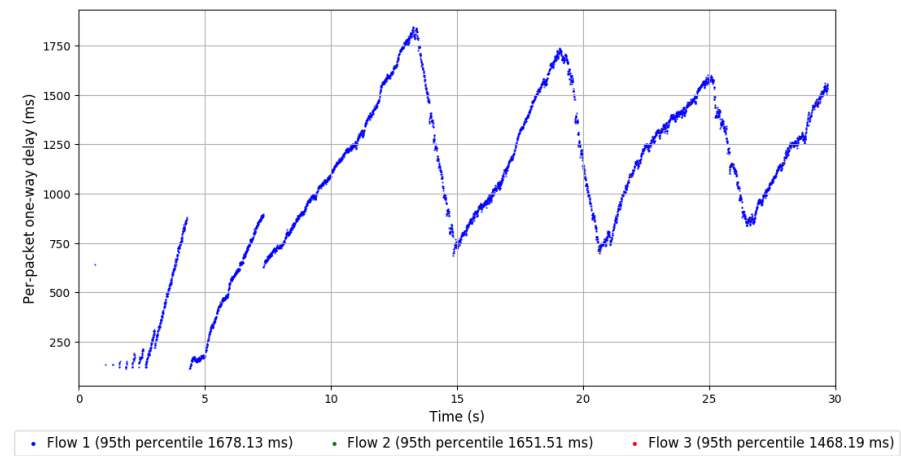
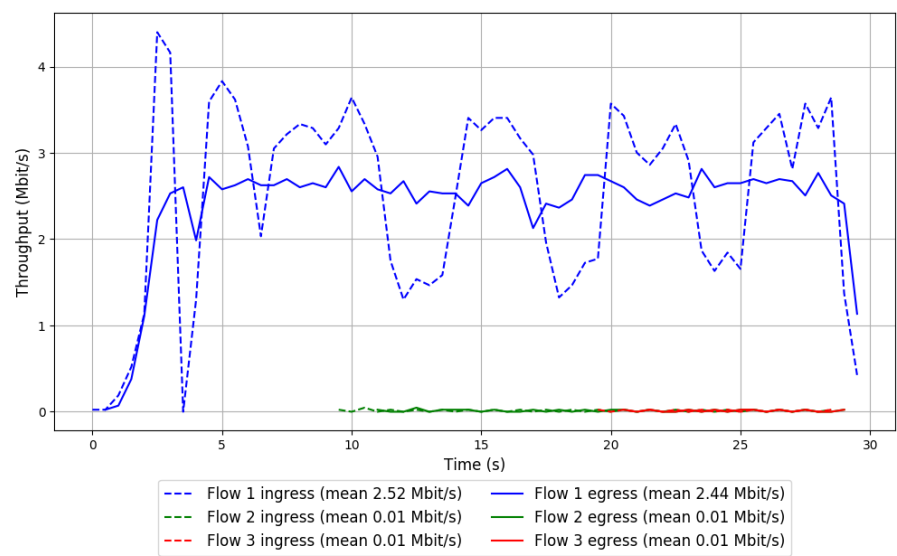


Run 2: Statistics of Verus

Start at: 2017-08-13 07:18:21
End at: 2017-08-13 07:18:51
Local clock offset: 0.392 ms
Remote clock offset: -2.565 ms

Below is generated by plot.py at 2017-08-13 07:39:27
Datalink statistics
-- Total of 3 flows:
Average throughput: 2.45 Mbit/s
95th percentile per-packet one-way delay: 1678.048 ms
Loss rate: 5.12%
-- Flow 1:
Average throughput: 2.44 Mbit/s
95th percentile per-packet one-way delay: 1678.133 ms
Loss rate: 5.12%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1651.513 ms
Loss rate: 4.76%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1468.192 ms
Loss rate: 10.00%

Run 2: Report of Verus — Data Link



Run 3: Statistics of Verus

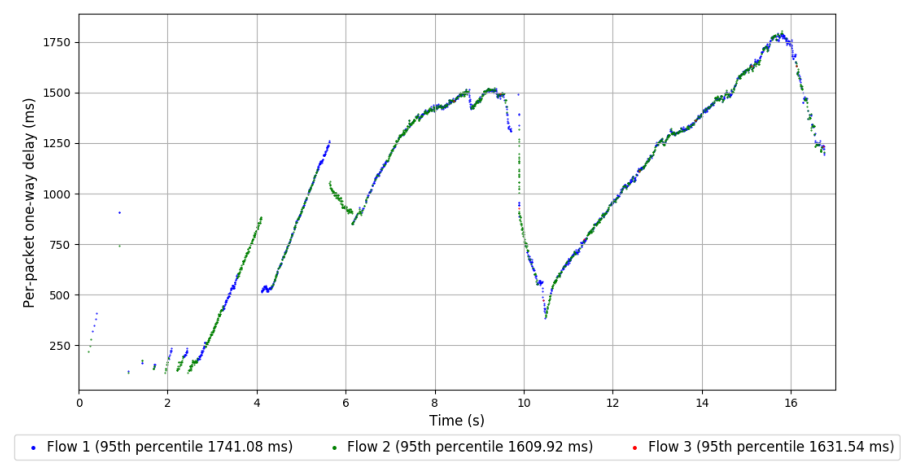
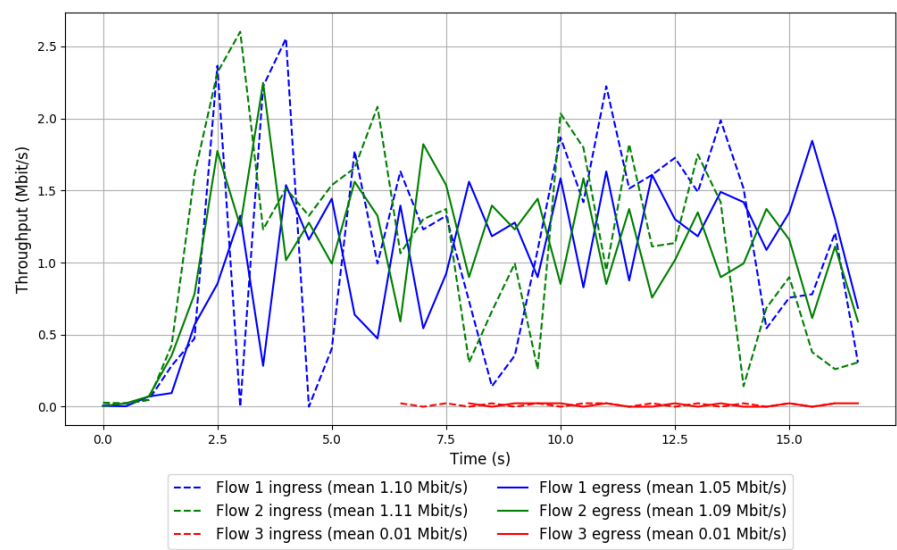
Start at: 2017-08-13 07:37:08

End at: 2017-08-13 07:37:38

Local clock offset: 0.432 ms

Remote clock offset: -2.747 ms

Run 3: Report of Verus — Data Link

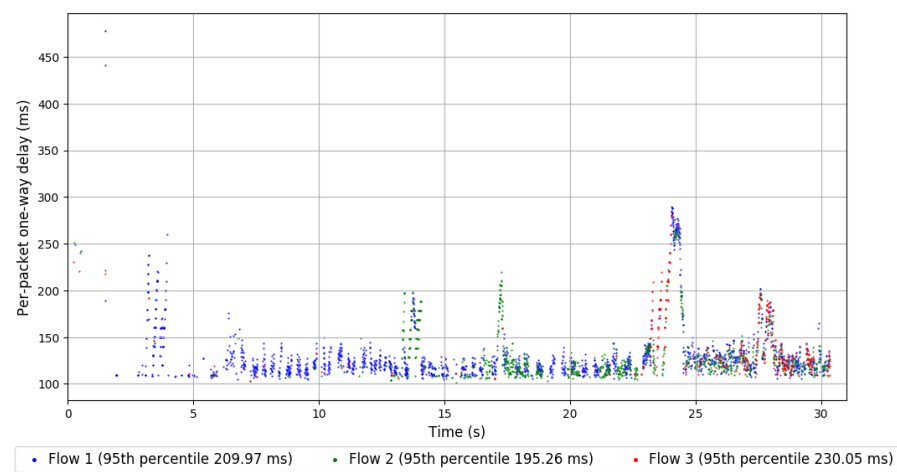
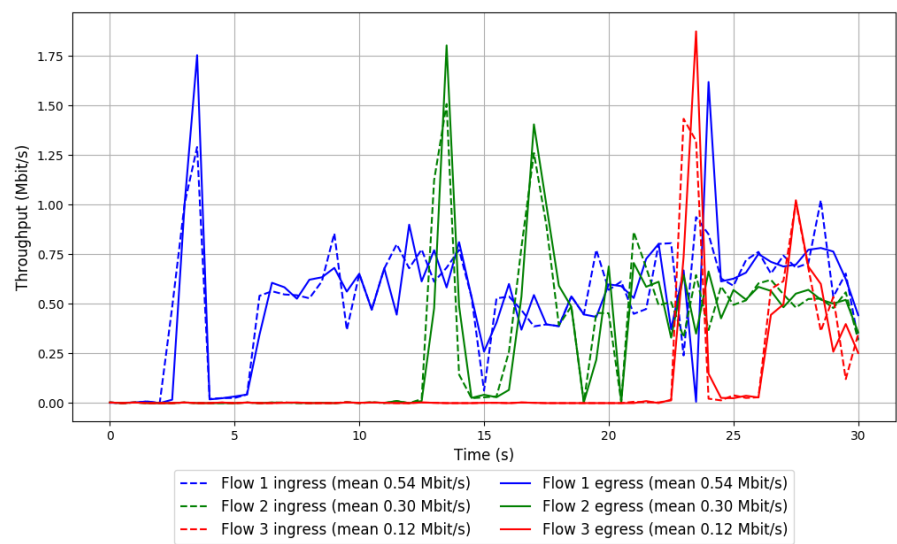


Run 1: Statistics of WebRTC media

Start at: 2017-08-13 06:50:45
End at: 2017-08-13 06:51:15
Local clock offset: 0.416 ms
Remote clock offset: -1.771 ms

Below is generated by plot.py at 2017-08-13 07:39:29
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.95 Mbit/s
95th percentile per-packet one-way delay: 207.583 ms
Loss rate: 0.41%
-- Flow 1:
Average throughput: 0.54 Mbit/s
95th percentile per-packet one-way delay: 209.970 ms
Loss rate: 0.16%
-- Flow 2:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 195.265 ms
Loss rate: 0.48%
-- Flow 3:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 230.047 ms
Loss rate: 1.35%

Run 1: Report of WebRTC media — Data Link

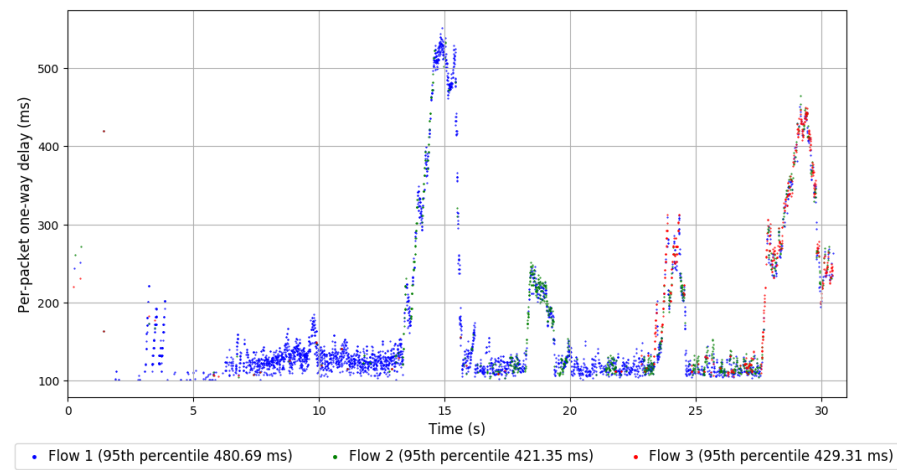
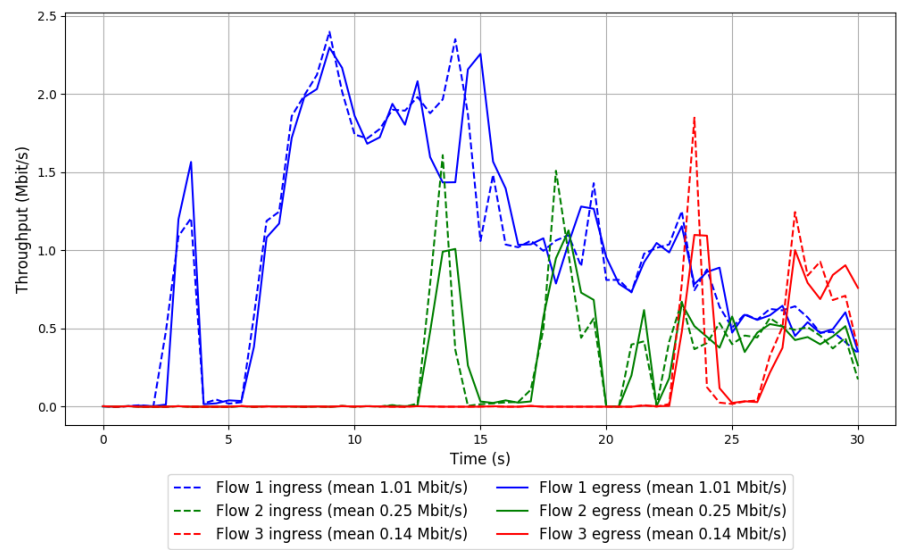


Run 2: Statistics of WebRTC media

Start at: 2017-08-13 07:09:32
End at: 2017-08-13 07:10:02
Local clock offset: 0.403 ms
Remote clock offset: -1.731 ms

Below is generated by plot.py at 2017-08-13 07:39:29
Datalink statistics
-- Total of 3 flows:
Average throughput: 1.40 Mbit/s
95th percentile per-packet one-way delay: 462.478 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 1.01 Mbit/s
95th percentile per-packet one-way delay: 480.688 ms
Loss rate: 0.26%
-- Flow 2:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 421.351 ms
Loss rate: 0.63%
-- Flow 3:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 429.315 ms
Loss rate: 0.45%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2017-08-13 07:28:21

End at: 2017-08-13 07:28:51

Local clock offset: 0.602 ms

Remote clock offset: -2.54 ms

Below is generated by plot.py at 2017-08-13 07:39:30

Datalink statistics

-- Total of 3 flows:

Average throughput: 1.66 Mbit/s

95th percentile per-packet one-way delay: 531.376 ms

Loss rate: 0.00%

-- Flow 1:

Average throughput: 1.28 Mbit/s

95th percentile per-packet one-way delay: 589.033 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 0.26 Mbit/s

95th percentile per-packet one-way delay: 441.200 ms

Loss rate: 0.01%

-- Flow 3:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 251.098 ms

Loss rate: 0.00%

Run 3: Report of WebRTC media — Data Link

