

Pantheon Report

Generated at 2018-01-25 20:29:10 (UTC).

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

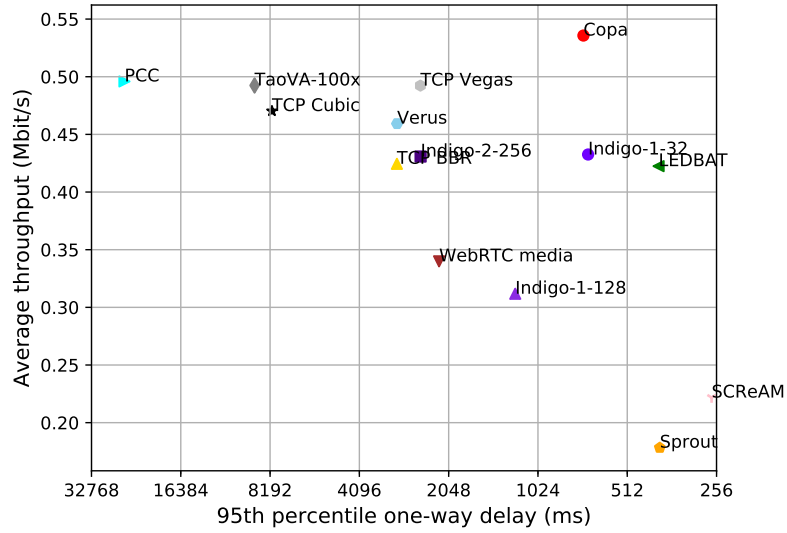
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).

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

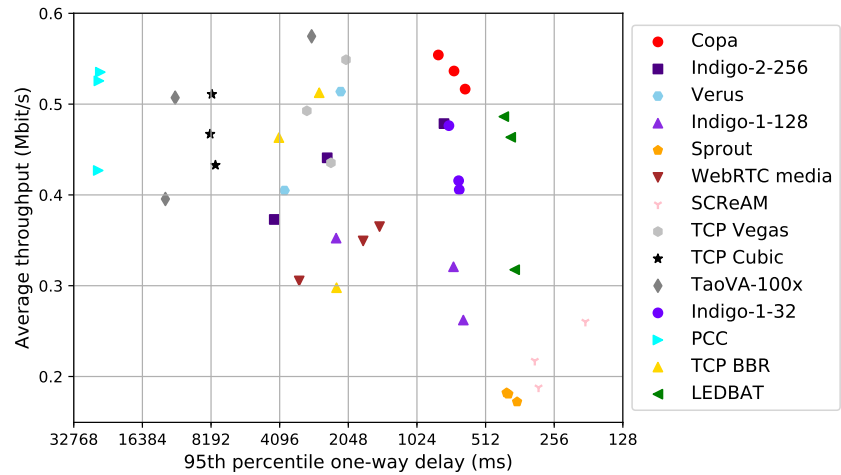
Git summary:

```
branch: master @ f23294ec38436c9f802847d477a41b7343ec76e6
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
  M datagrump/sender.cc
third_party/fillp @ ec9585325218d5048c4d4152fa42240af54c6e67
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ a9b2060d39e4da2e8987e893e3eca2a6c7cd0ab9
third_party/indigo-1-layer-128-unit @ 3ae9e4ef4230db7484501f82ce8b377695f2f66d
third_party/indigo-1-layer-32-unit @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/indigo-1-layer-32-unit-no-calib @ 1f3a7f75b41135ed5b540c0fd3505939528e2a5f
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
  M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ fb1053193c2861da659ba9013db26744ccfcf993
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
  M receiver/src/buffer.h
  M receiver/src/core.cpp
  M sender/src/buffer.h
  M sender/src/core.cpp
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ f1a14bffe749737437f61b1eae30b267cde681
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/vivace @ 423cbca3e8ea1d599e7b5cf725835e8a2b6bfac6
third_party/webrtc @ a488197ddd041ace68a42849b2540ad834825f42
```

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



test from Colombia ppp0 to AWS Brazil 2 Ethernet, 3 runs of 30s each per scheme
3 flows with 10s interval between flows



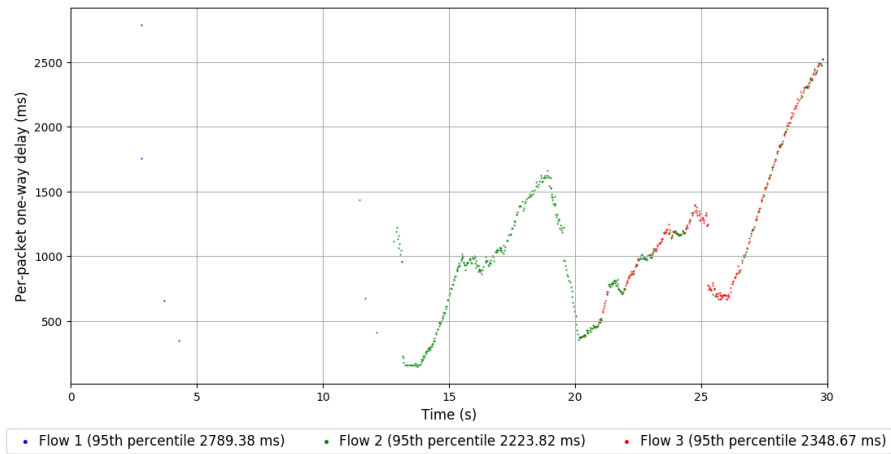
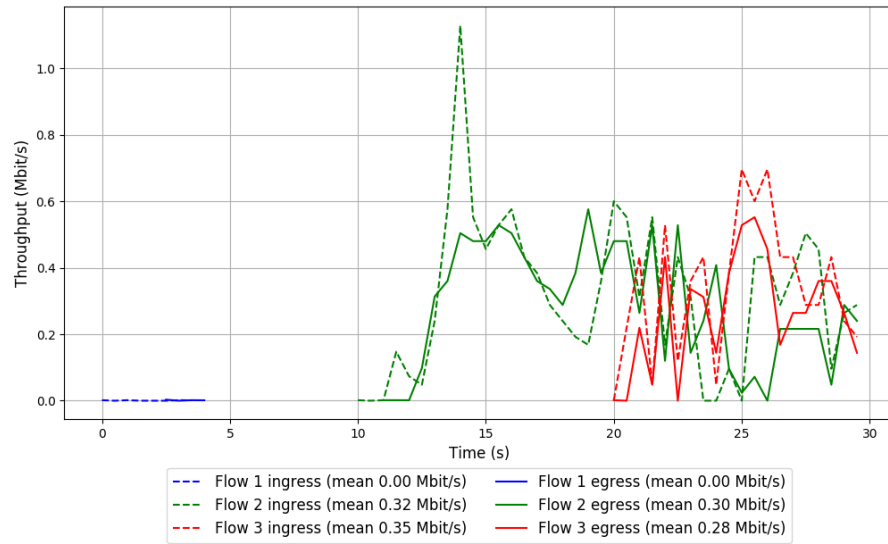
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	0.20	0.28	0.13	3213.84	3050.60	3006.07	3.12	11.91	33.73
TCP Cubic	3	0.46	0.03	0.00	8073.74	6745.11	8195.45	31.25	44.99	71.93
LEDBAT	3	0.12	0.31	0.22	1072.09	404.69	396.61	0.25	1.50	6.24
PCC	3	0.50	0.00	N/A	25361.38	N/A	N/A	98.78	N/A	N/A
QUIC Cubic	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SCReAM	3	0.08	0.14	0.11	247.33	244.28	273.38	0.91	1.04	2.00
WebRTC media	3	0.18	0.12	0.05	2110.45	2272.38	2050.98	3.92	3.24	0.61
Sprout	3	0.09	0.09	0.09	848.86	252.65	344.86	1.61	2.29	4.48
TaoVA-100x	3	0.33	0.32	0.07	5788.58	9314.43	3642.32	34.67	26.27	70.47
TCP Vegas	3	0.36	0.17	0.13	2363.62	2470.45	2683.96	5.72	11.54	41.43
Verus	2	0.43	0.02	0.07	3101.38	2732.25	2041.37	12.21	2.27	17.39
Copa	3	0.34	0.24	0.16	647.57	773.57	825.54	1.56	3.87	11.27
Indigo-2-256	3	0.17	0.28	0.26	1673.31	2138.17	2702.22	9.23	6.67	24.47
Indigo-1-32	3	0.23	0.21	0.20	591.60	718.01	719.34	1.81	2.03	5.98
Indigo-1-128	3	0.16	0.14	0.18	1159.63	709.45	1414.26	3.73	3.42	11.97

Run 1: Statistics of TCP BBR

Start at: 2018-01-25 18:35:58
End at: 2018-01-25 18:36:28
Local clock offset: 1.369 ms
Remote clock offset: -5.483 ms

Below is generated by plot.py at 2018-01-25 20:28:35
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 2306.819 ms
Loss rate: 17.17%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 2789.384 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 2223.823 ms
Loss rate: 13.57%
-- Flow 3:
Average throughput: 0.28 Mbit/s
95th percentile per-packet one-way delay: 2348.667 ms
Loss rate: 23.76%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-01-25 18:56:17

End at: 2018-01-25 18:56:47

Local clock offset: 1.42 ms

Remote clock offset: 0.177 ms

Below is generated by plot.py at 2018-01-25 20:28:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.51 Mbit/s

95th percentile per-packet one-way delay: 2747.284 ms

Loss rate: 9.36%

-- Flow 1:

Average throughput: 0.34 Mbit/s

95th percentile per-packet one-way delay: 2726.909 ms

Loss rate: 6.20%

-- Flow 2:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 2791.330 ms

Loss rate: 11.00%

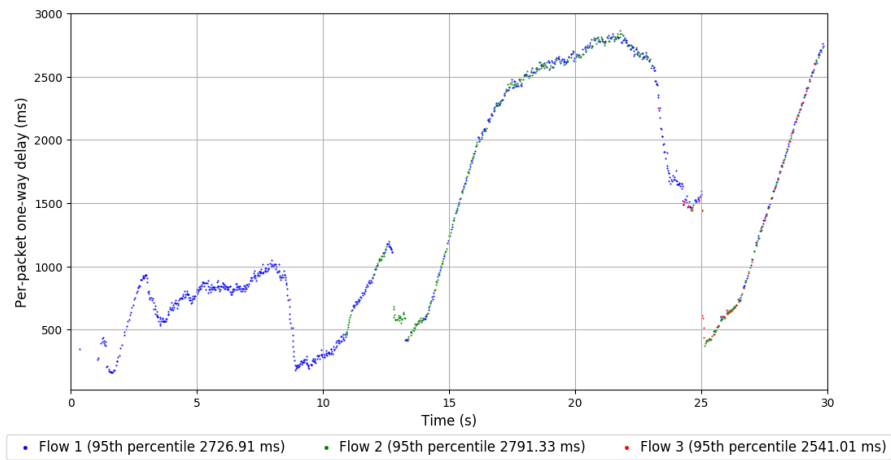
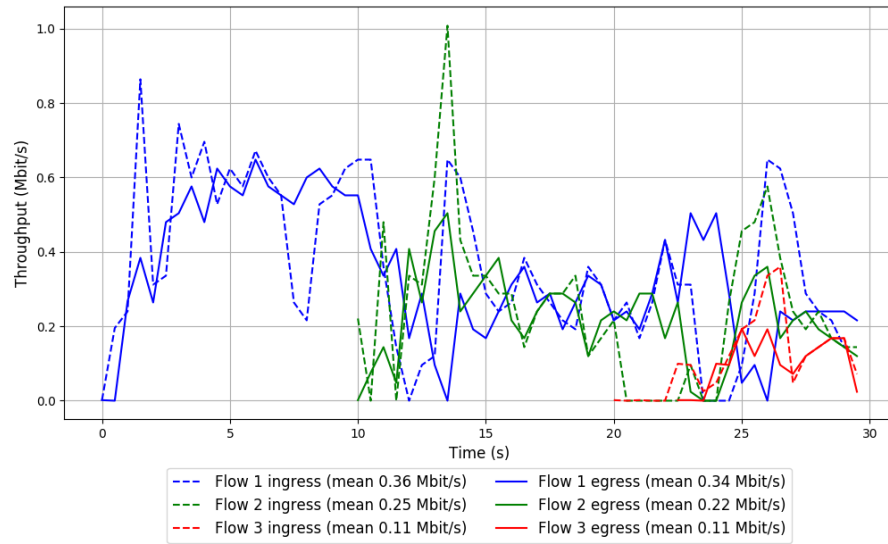
-- Flow 3:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 2541.005 ms

Loss rate: 32.49%

Run 2: Report of TCP BBR — Data Link

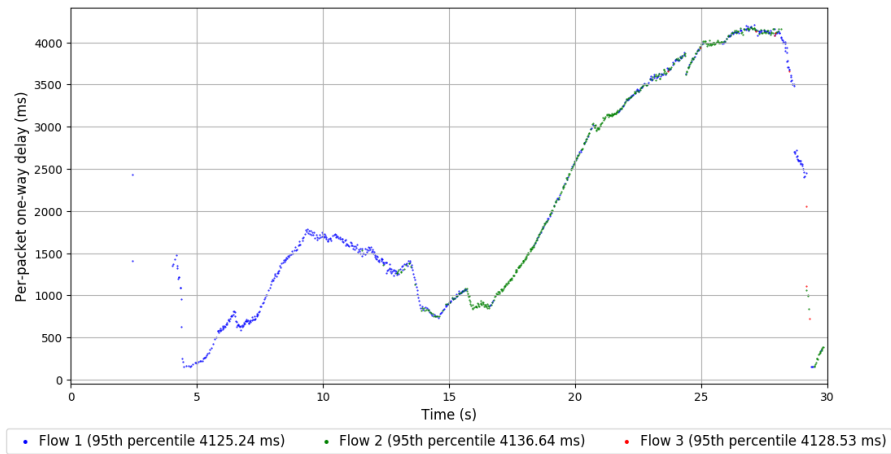
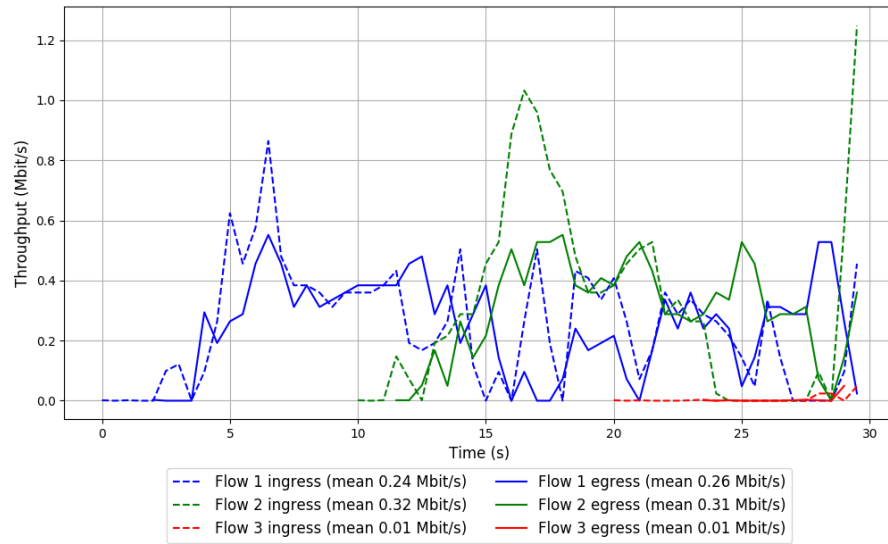


Run 3: Statistics of TCP BBR

Start at: 2018-01-25 19:16:37
End at: 2018-01-25 19:17:07
Local clock offset: 1.604 ms
Remote clock offset: -5.676 ms

Below is generated by plot.py at 2018-01-25 20:28:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.46 Mbit/s
95th percentile per-packet one-way delay: 4127.983 ms
Loss rate: 7.04%
-- Flow 1:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 4125.237 ms
Loss rate: 3.15%
-- Flow 2:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 4136.636 ms
Loss rate: 11.15%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 4128.532 ms
Loss rate: 44.94%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-01-25 18:38:31

End at: 2018-01-25 18:39:01

Local clock offset: 1.405 ms

Remote clock offset: 1.07 ms

Below is generated by plot.py at 2018-01-25 20:28:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.47 Mbit/s

95th percentile per-packet one-way delay: 8268.275 ms

Loss rate: 31.46%

-- Flow 1:

Average throughput: 0.46 Mbit/s

95th percentile per-packet one-way delay: 8268.275 ms

Loss rate: 31.52%

-- Flow 2:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 6998.976 ms

Loss rate: 27.74%

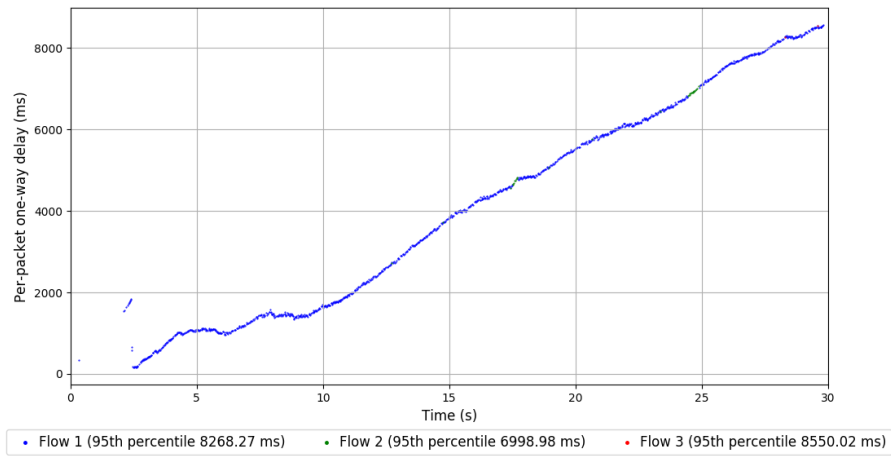
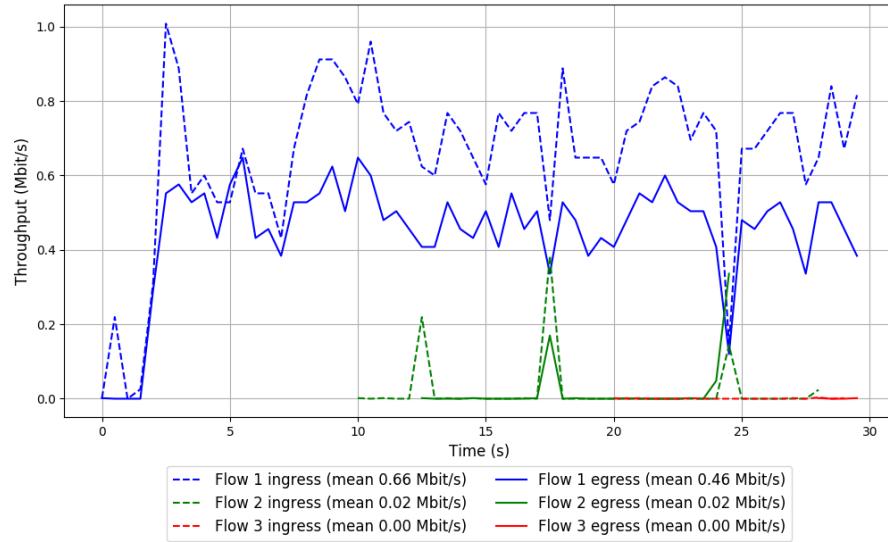
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8550.018 ms

Loss rate: 71.93%

Run 1: Report of TCP Cubic — Data Link

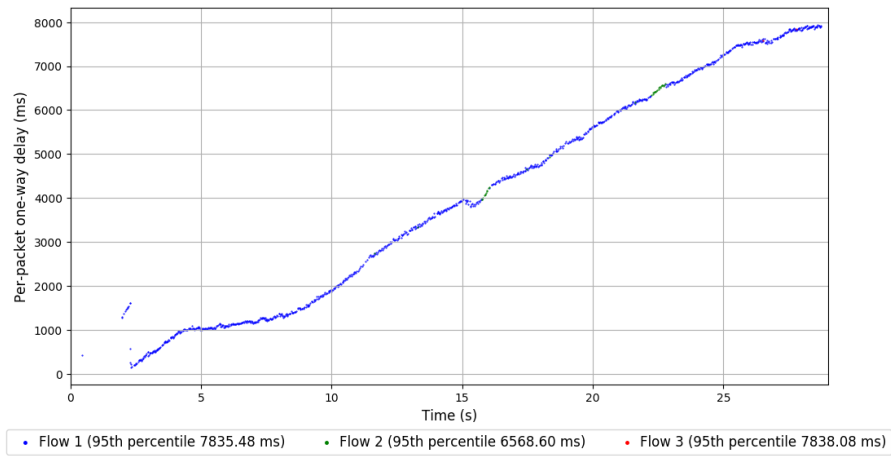
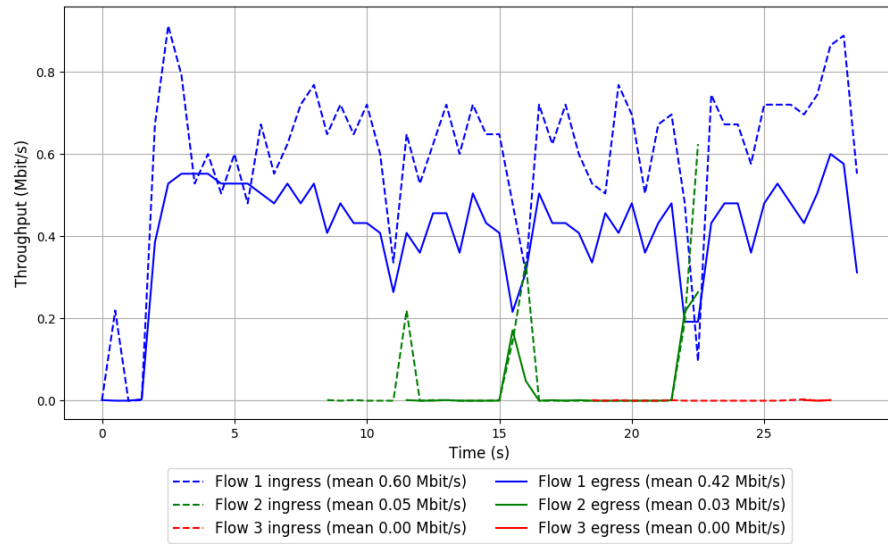


Run 2: Statistics of TCP Cubic

Start at: 2018-01-25 18:58:48
End at: 2018-01-25 18:59:18
Local clock offset: 1.418 ms
Remote clock offset: -4.585 ms

Below is generated by plot.py at 2018-01-25 20:28:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.43 Mbit/s
95th percentile per-packet one-way delay: 7835.367 ms
Loss rate: 31.86%
-- Flow 1:
Average throughput: 0.42 Mbit/s
95th percentile per-packet one-way delay: 7835.481 ms
Loss rate: 30.89%
-- Flow 2:
Average throughput: 0.03 Mbit/s
95th percentile per-packet one-way delay: 6568.602 ms
Loss rate: 53.59%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 7838.080 ms
Loss rate: 71.93%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-01-25 19:19:09

End at: 2018-01-25 19:19:39

Local clock offset: 1.53 ms

Remote clock offset: 0.928 ms

Below is generated by plot.py at 2018-01-25 20:28:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.51 Mbit/s

95th percentile per-packet one-way delay: 8117.471 ms

Loss rate: 32.13%

-- Flow 1:

Average throughput: 0.50 Mbit/s

95th percentile per-packet one-way delay: 8117.471 ms

Loss rate: 31.35%

-- Flow 2:

Average throughput: 0.03 Mbit/s

95th percentile per-packet one-way delay: 6667.765 ms

Loss rate: 53.64%

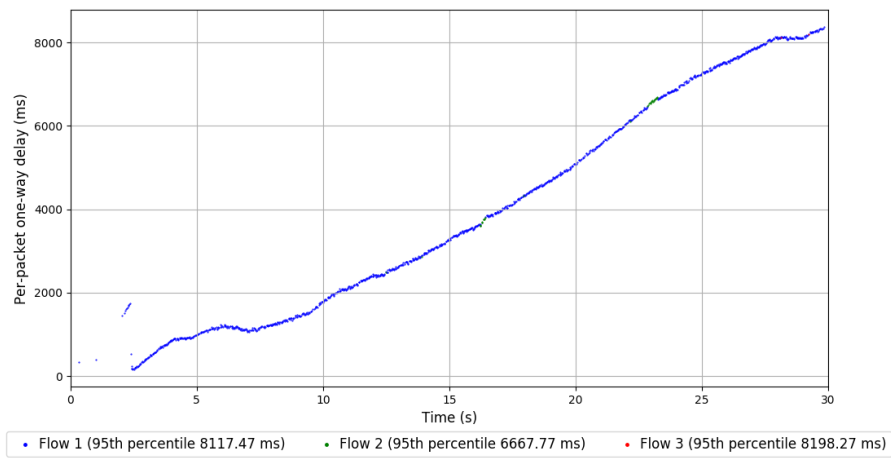
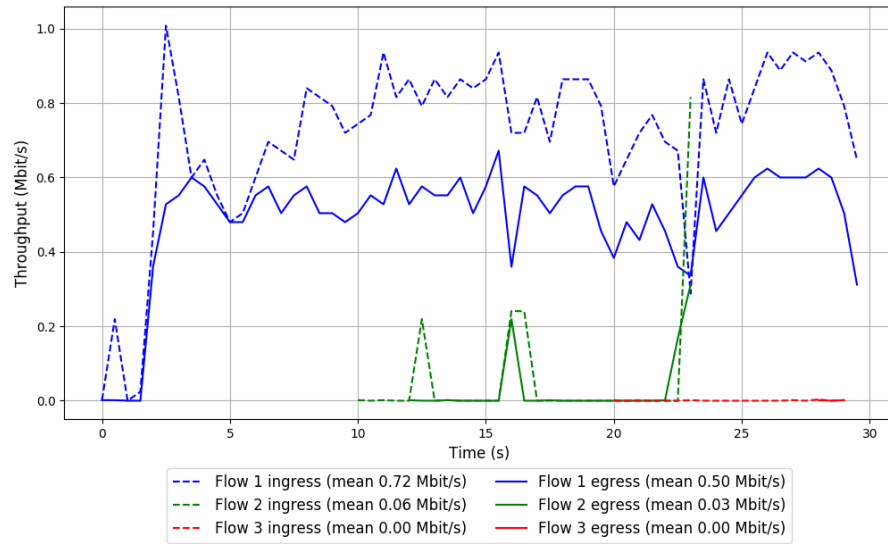
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8198.267 ms

Loss rate: 71.93%

Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of LEDBAT

Start at: 2018-01-25 18:44:50

End at: 2018-01-25 18:45:20

Local clock offset: 1.44 ms

Remote clock offset: 0.136 ms

Below is generated by plot.py at 2018-01-25 20:28:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.46 Mbit/s

95th percentile per-packet one-way delay: 397.207 ms

Loss rate: 2.20%

-- Flow 1:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 398.600 ms

Loss rate: 0.55%

-- Flow 2:

Average throughput: 0.26 Mbit/s

95th percentile per-packet one-way delay: 397.067 ms

Loss rate: 1.58%

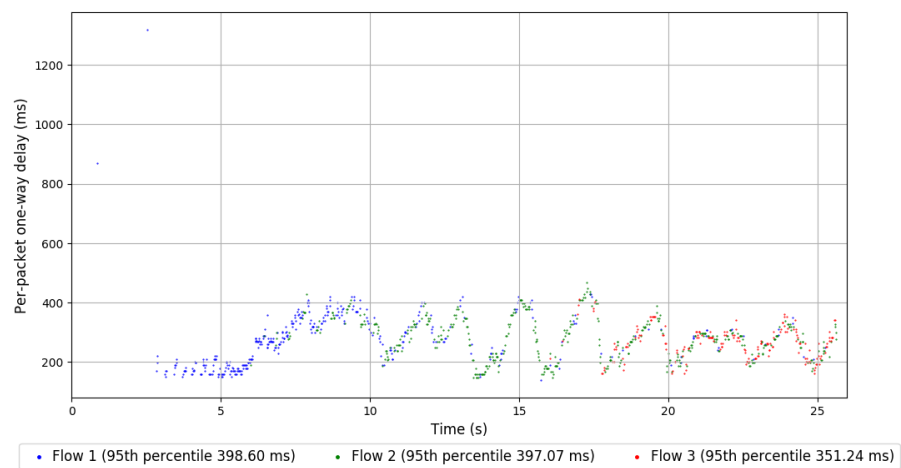
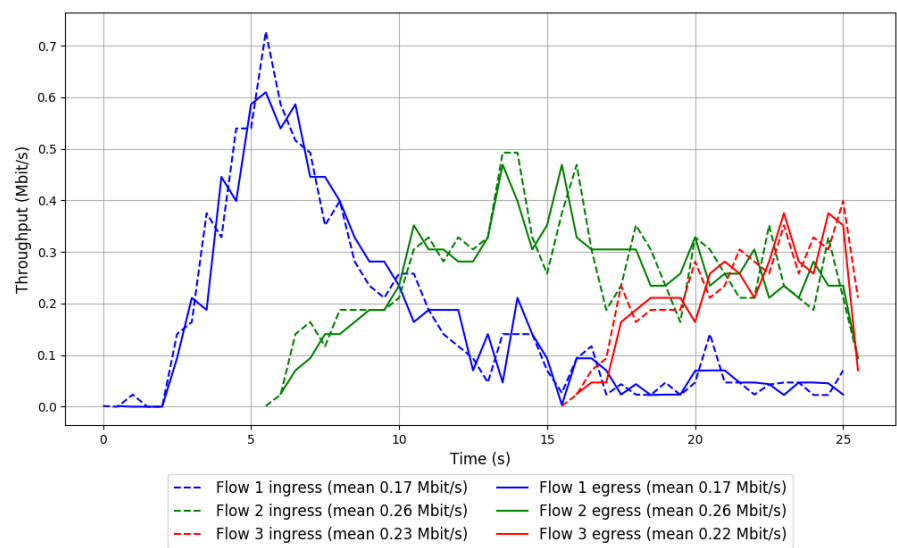
-- Flow 3:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 351.239 ms

Loss rate: 6.66%

Run 1: Report of LEDBAT — Data Link

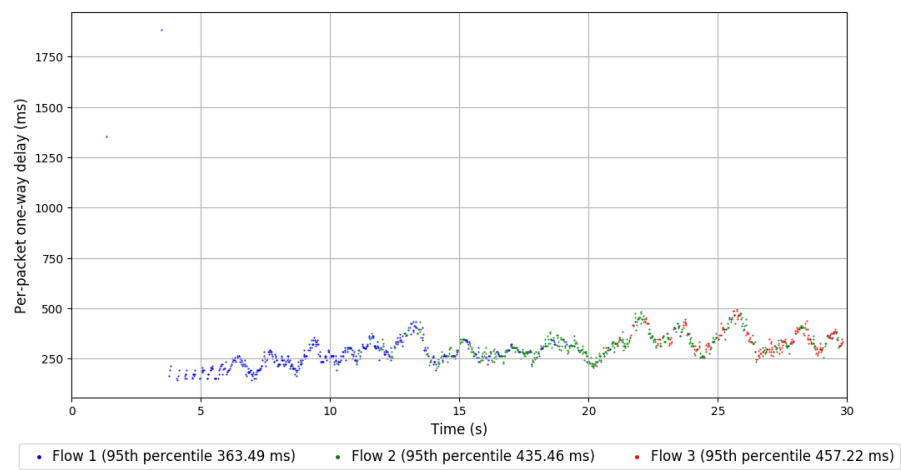
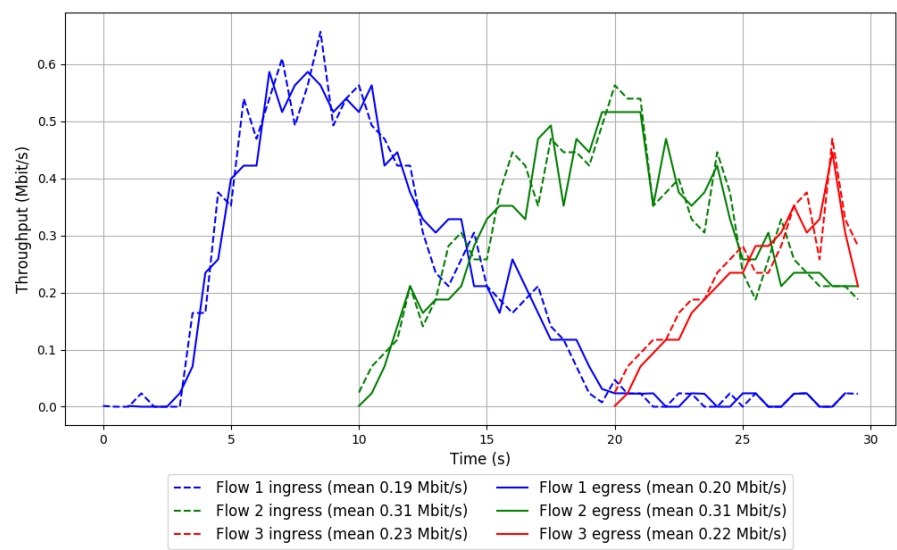


Run 2: Statistics of LEDBAT

Start at: 2018-01-25 19:05:06
End at: 2018-01-25 19:05:36
Local clock offset: 1.521 ms
Remote clock offset: -4.614 ms

Below is generated by plot.py at 2018-01-25 20:28:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 425.902 ms
Loss rate: 1.75%
-- Flow 1:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 363.492 ms
Loss rate: 0.20%
-- Flow 2:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 435.463 ms
Loss rate: 1.52%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 457.218 ms
Loss rate: 6.18%

Run 2: Report of LEDBAT — Data Link

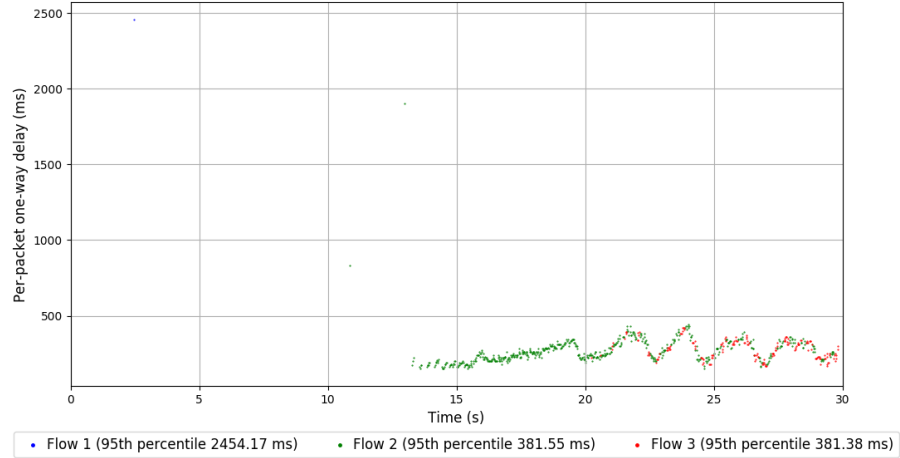
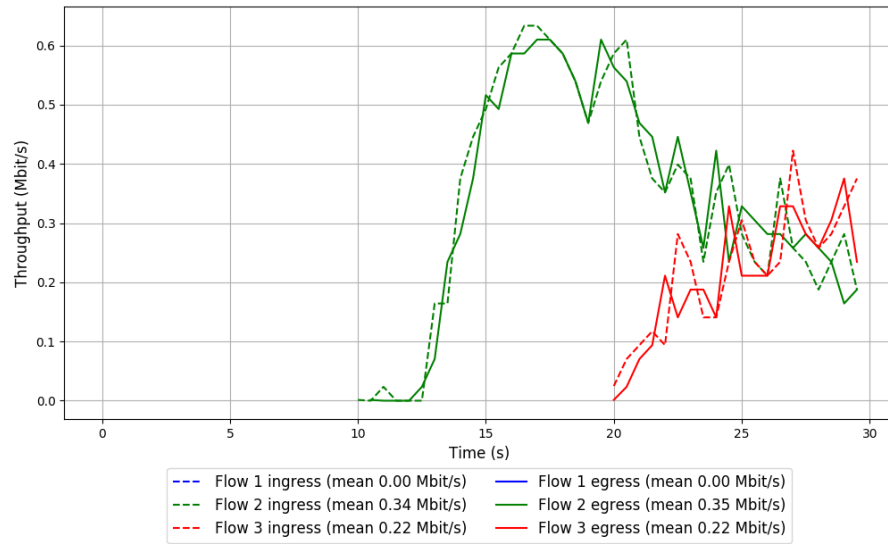


Run 3: Statistics of LEDBAT

Start at: 2018-01-25 19:25:30
End at: 2018-01-25 19:26:00
Local clock offset: 1.596 ms
Remote clock offset: -5.023 ms

Below is generated by plot.py at 2018-01-25 20:28:40
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.32 Mbit/s
95th percentile per-packet one-way delay: 381.609 ms
Loss rate: 2.50%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 2454.168 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.35 Mbit/s
95th percentile per-packet one-way delay: 381.545 ms
Loss rate: 1.40%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 381.385 ms
Loss rate: 5.88%

Run 3: Report of LEDBAT — Data Link

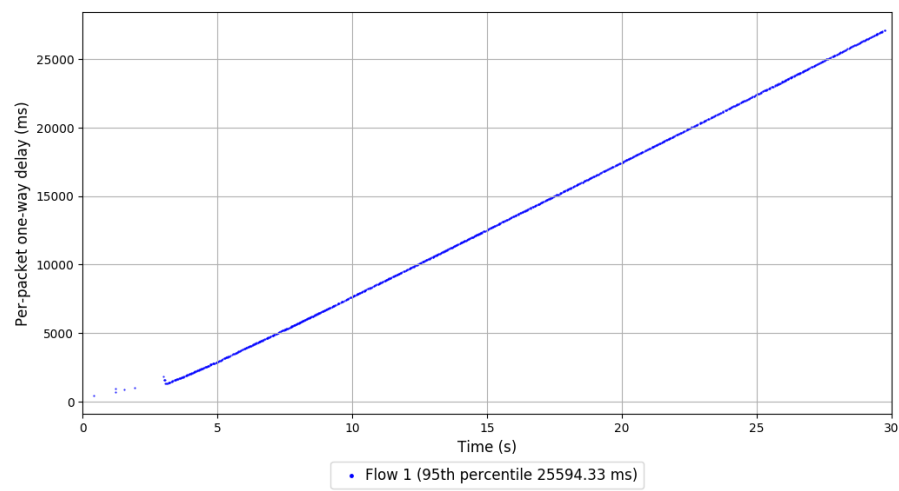
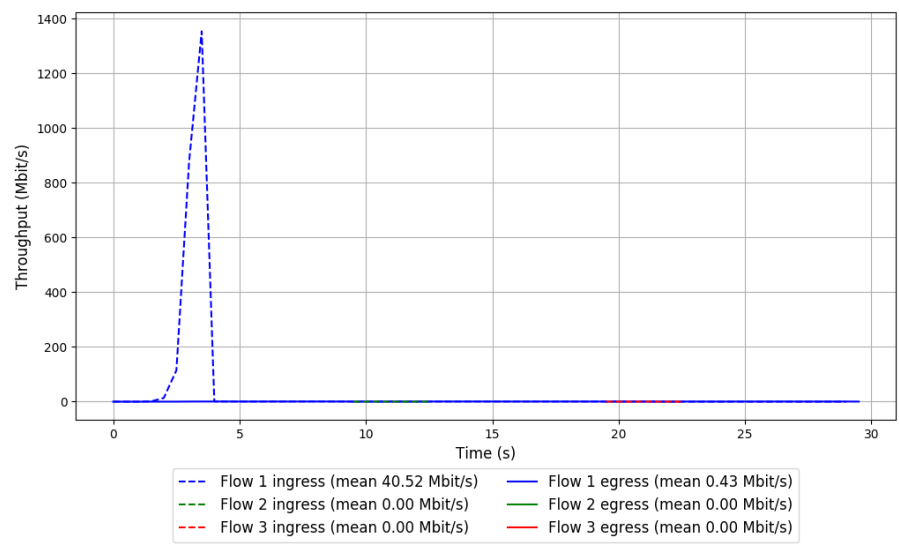


Run 1: Statistics of PCC

Start at: 2018-01-25 18:28:21
End at: 2018-01-25 18:28:51
Local clock offset: 1.215 ms
Remote clock offset: -5.528 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.43 Mbit/s
95th percentile per-packet one-way delay: 25594.328 ms
Loss rate: 98.95%
-- Flow 1:
Average throughput: 0.43 Mbit/s
95th percentile per-packet one-way delay: 25594.328 ms
Loss rate: 98.95%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s

Run 1: Report of PCC — Data Link

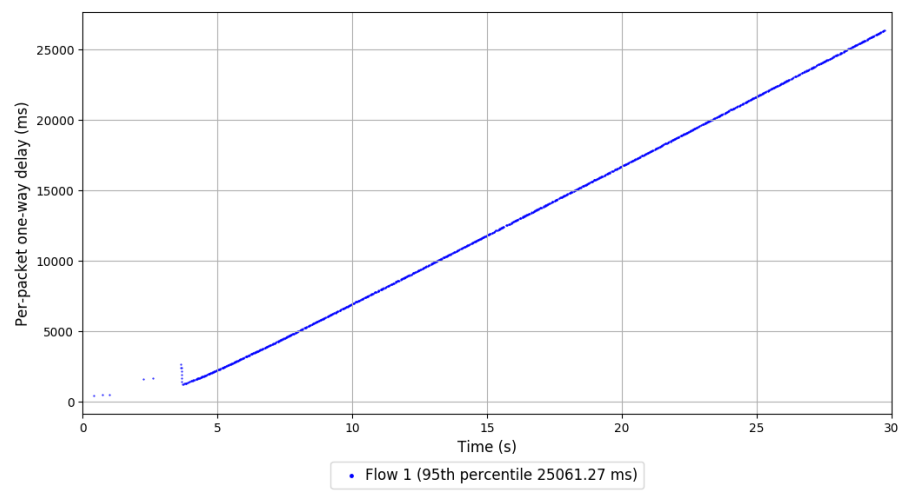
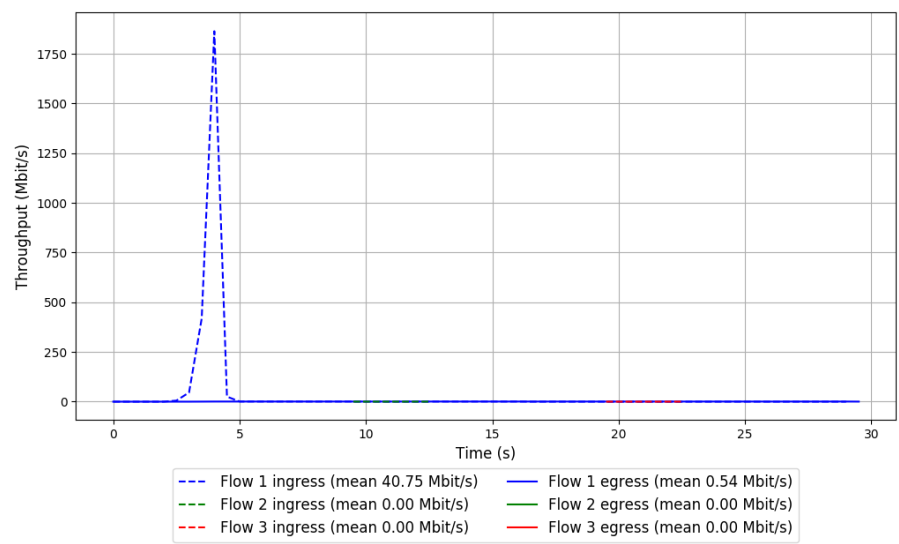


Run 2: Statistics of PCC

Start at: 2018-01-25 18:48:39
End at: 2018-01-25 18:49:09
Local clock offset: 1.465 ms
Remote clock offset: -5.551 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.54 Mbit/s
95th percentile per-packet one-way delay: 25061.267 ms
Loss rate: 98.68%
-- Flow 1:
Average throughput: 0.54 Mbit/s
95th percentile per-packet one-way delay: 25061.267 ms
Loss rate: 98.68%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s

Run 2: Report of PCC — Data Link



Run 3: Statistics of PCC

Start at: 2018-01-25 19:08:57

End at: 2018-01-25 19:09:27

Local clock offset: 1.491 ms

Remote clock offset: -4.72 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.53 Mbit/s

95th percentile per-packet one-way delay: 25428.557 ms

Loss rate: 98.71%

-- Flow 1:

Average throughput: 0.53 Mbit/s

95th percentile per-packet one-way delay: 25428.557 ms

Loss rate: 98.71%

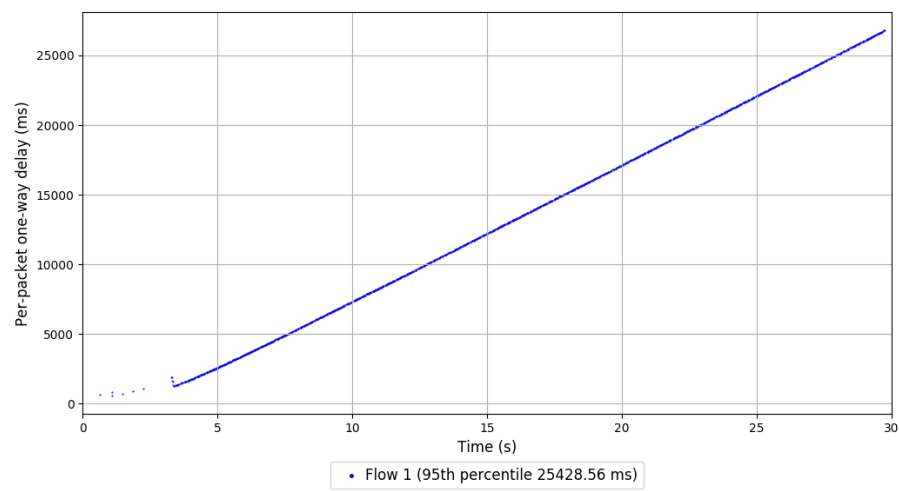
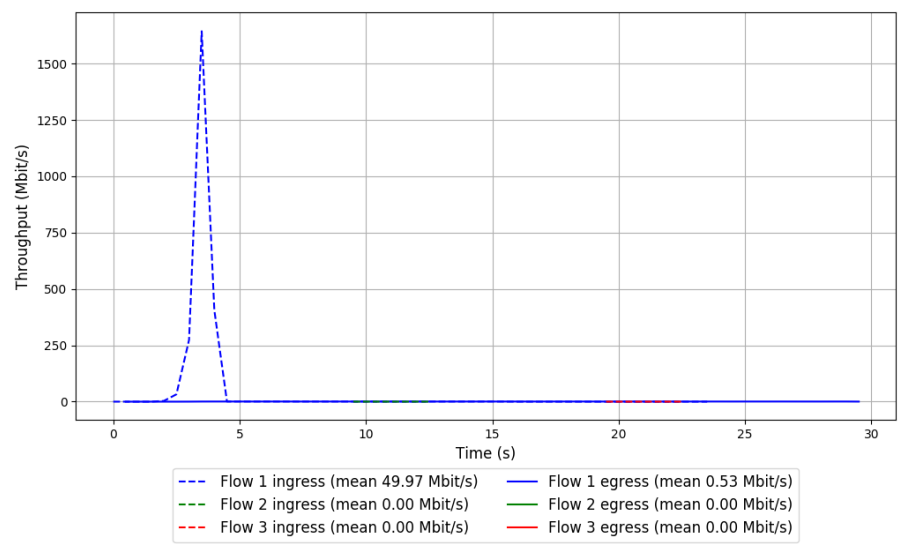
-- Flow 2:

Average throughput: 0.00 Mbit/s

-- Flow 3:

Average throughput: 0.00 Mbit/s

Run 3: Report of PCC — Data Link



Run 1: Statistics of QUIC Cubic

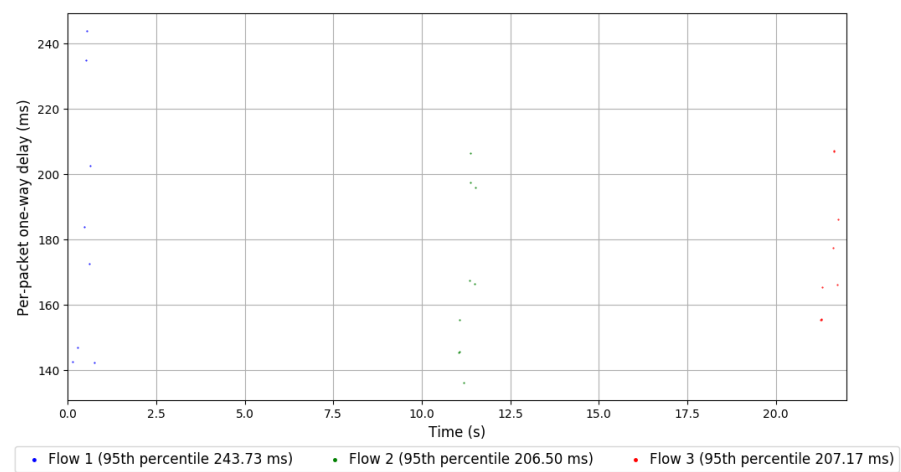
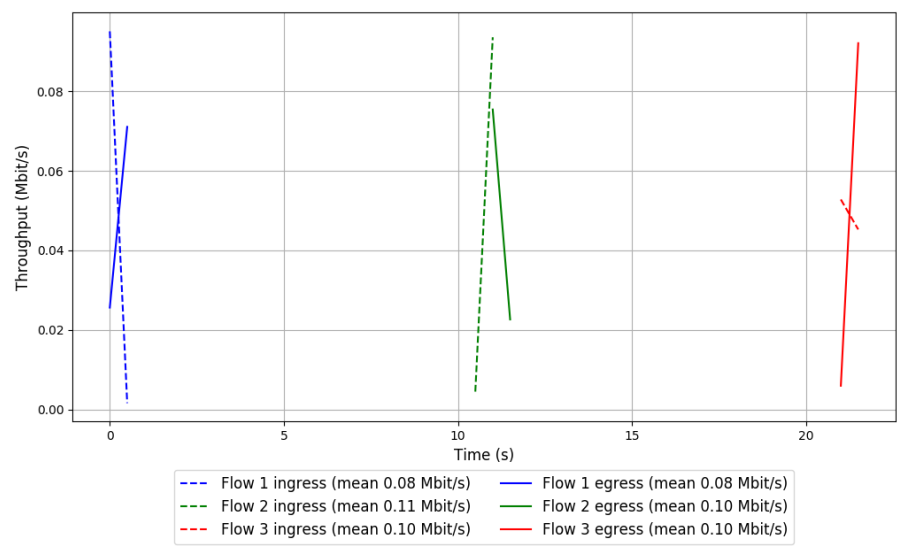
Start at: 2018-01-25 18:30:54

End at: 2018-01-25 18:31:24

Local clock offset: 1.316 ms

Remote clock offset: -5.506 ms

Run 1: Report of QUIC Cubic — Data Link



Run 2: Statistics of QUIC Cubic

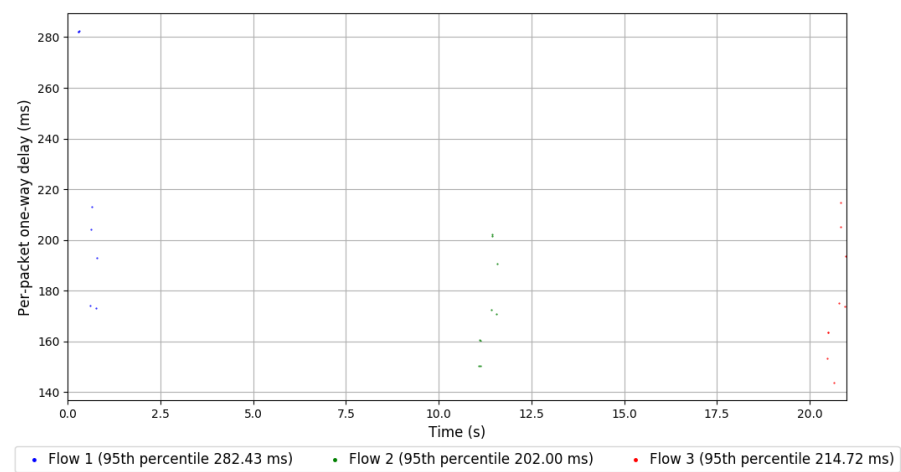
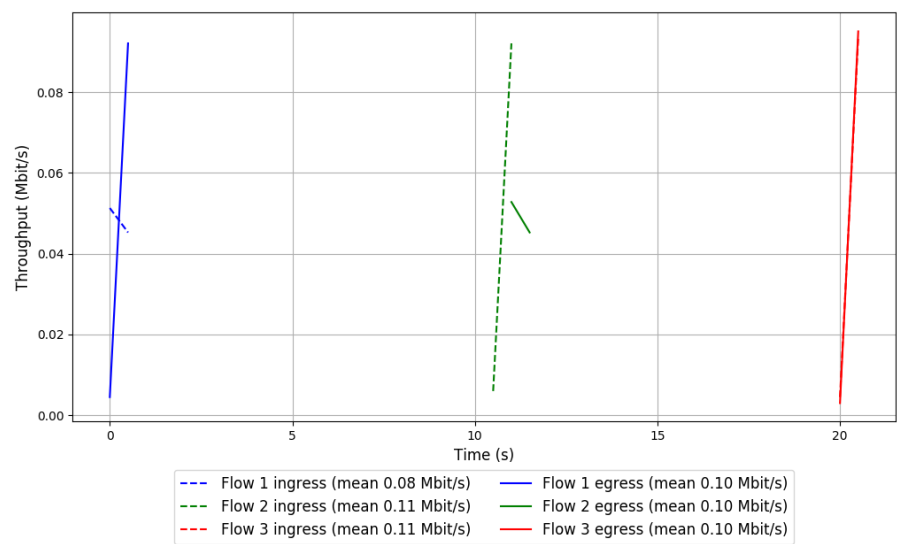
Start at: 2018-01-25 18:51:12

End at: 2018-01-25 18:51:42

Local clock offset: 1.465 ms

Remote clock offset: -4.634 ms

Run 2: Report of QUIC Cubic — Data Link



Run 3: Statistics of QUIC Cubic

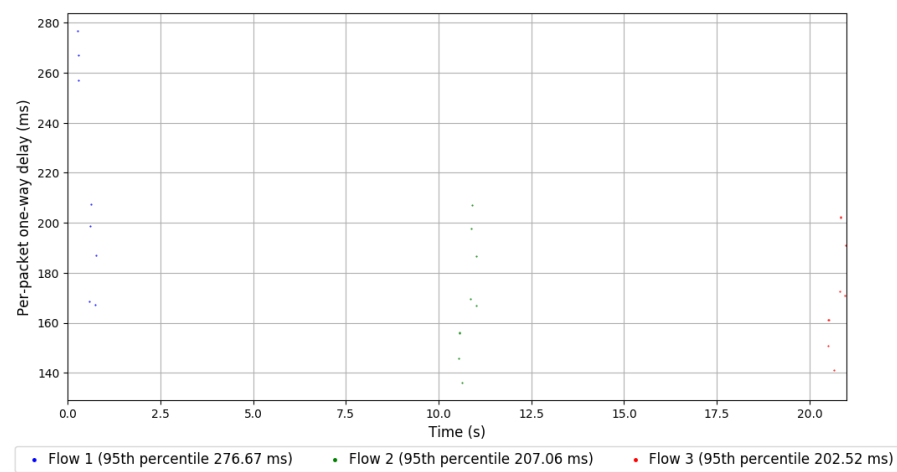
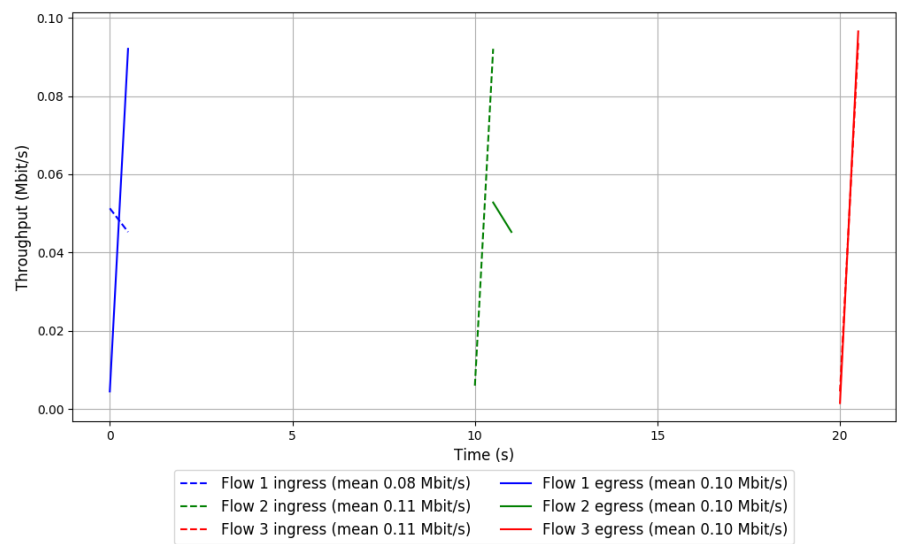
Start at: 2018-01-25 19:11:33

End at: 2018-01-25 19:12:03

Local clock offset: 1.547 ms

Remote clock offset: -4.6 ms

Run 3: Report of QUIC Cubic — Data Link

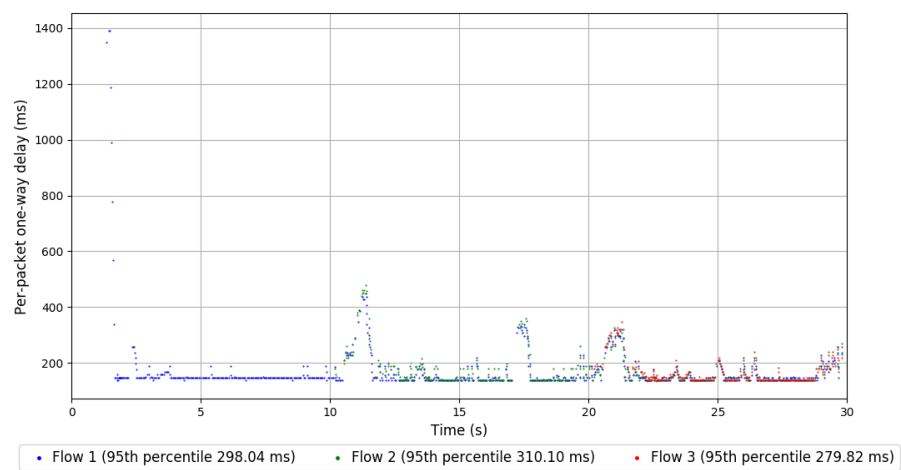
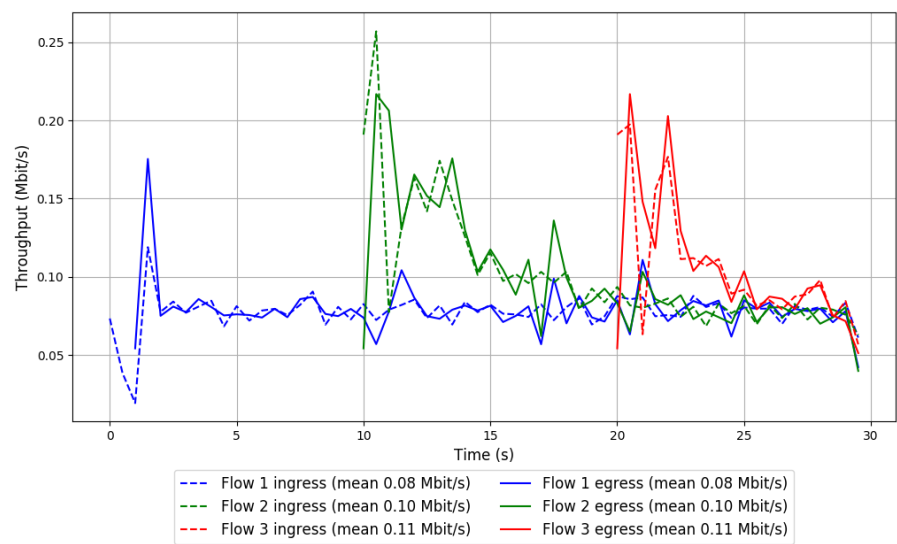


Run 1: Statistics of SCReAM

Start at: 2018-01-25 18:39:47
End at: 2018-01-25 18:40:17
Local clock offset: 1.418 ms
Remote clock offset: -5.561 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 299.882 ms
Loss rate: 1.33%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 298.040 ms
Loss rate: 1.06%
-- Flow 2:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 310.099 ms
Loss rate: 1.26%
-- Flow 3:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 279.818 ms
Loss rate: 2.05%

Run 1: Report of SReAM — Data Link



Run 2: Statistics of SCReAM

Start at: 2018-01-25 19:00:04

End at: 2018-01-25 19:00:34

Local clock offset: 1.497 ms

Remote clock offset: 1.233 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.26 Mbit/s

95th percentile per-packet one-way delay: 186.854 ms

Loss rate: 1.16%

-- Flow 1:

Average throughput: 0.08 Mbit/s

95th percentile per-packet one-way delay: 154.782 ms

Loss rate: 0.82%

-- Flow 2:

Average throughput: 0.19 Mbit/s

95th percentile per-packet one-way delay: 187.021 ms

Loss rate: 1.01%

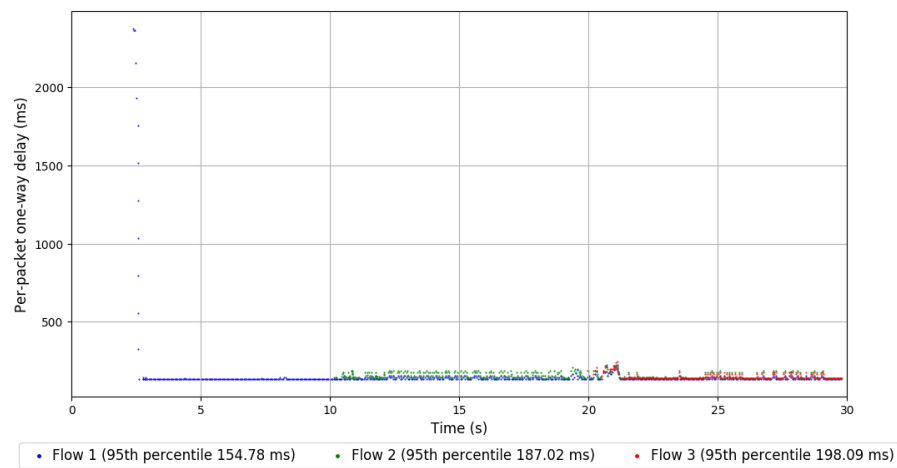
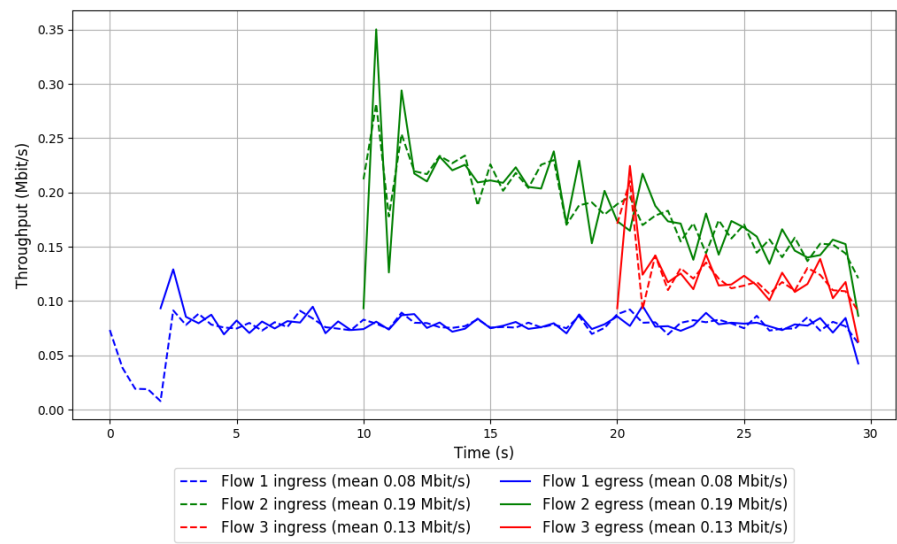
-- Flow 3:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 198.087 ms

Loss rate: 2.19%

Run 2: Report of SCSReAM — Data Link



Run 3: Statistics of SCReAM

Start at: 2018-01-25 19:20:25

End at: 2018-01-25 19:20:55

Local clock offset: 1.596 ms

Remote clock offset: -5.76 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 311.452 ms

Loss rate: 0.97%

-- Flow 1:

Average throughput: 0.08 Mbit/s

95th percentile per-packet one-way delay: 289.171 ms

Loss rate: 0.84%

-- Flow 2:

Average throughput: 0.14 Mbit/s

95th percentile per-packet one-way delay: 235.730 ms

Loss rate: 0.84%

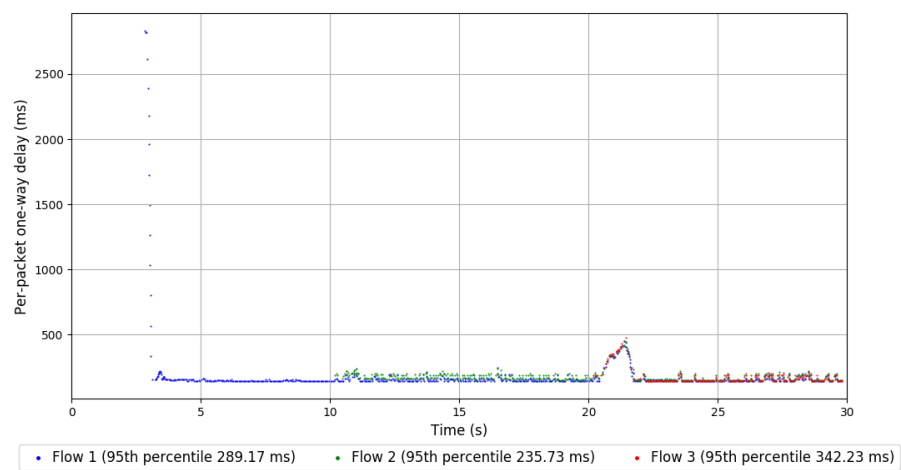
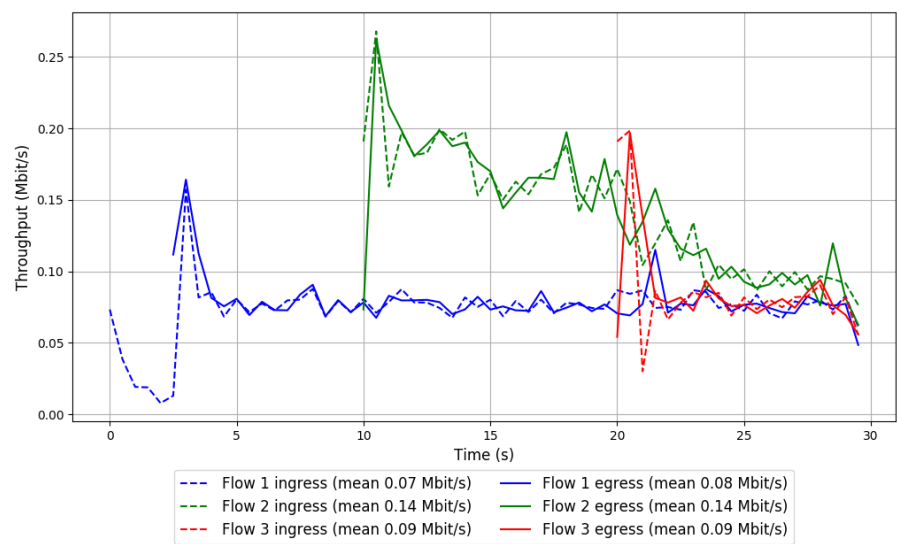
-- Flow 3:

Average throughput: 0.09 Mbit/s

95th percentile per-packet one-way delay: 342.230 ms

Loss rate: 1.75%

Run 3: Report of SReAM — Data Link

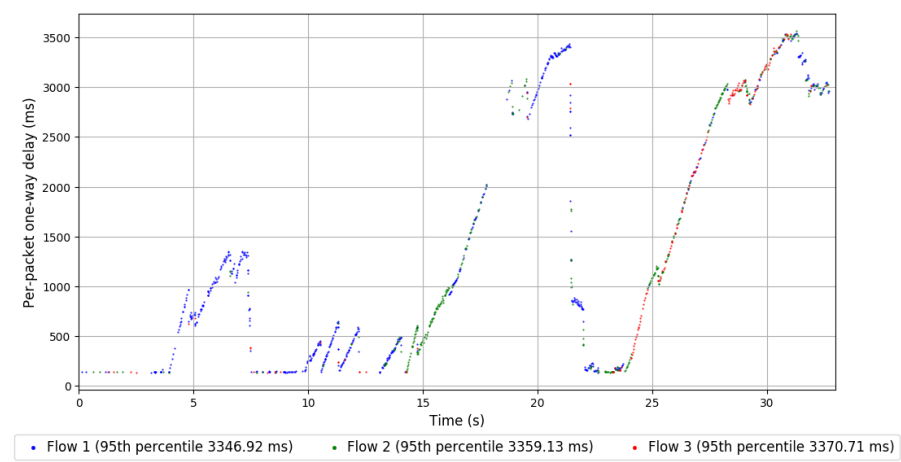
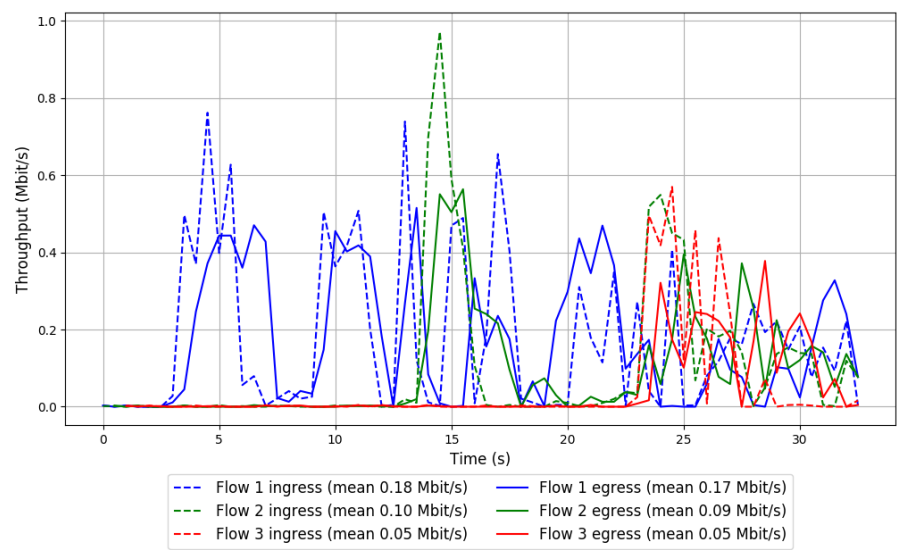


Run 1: Statistics of WebRTC media

Start at: 2018-01-25 18:29:38
End at: 2018-01-25 18:30:08
Local clock offset: 1.321 ms
Remote clock offset: -4.722 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 3362.209 ms
Loss rate: 6.61%
-- Flow 1:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 3346.916 ms
Loss rate: 6.98%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 3359.134 ms
Loss rate: 8.50%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 3370.711 ms
Loss rate: 0.83%

Run 1: Report of WebRTC media — Data Link

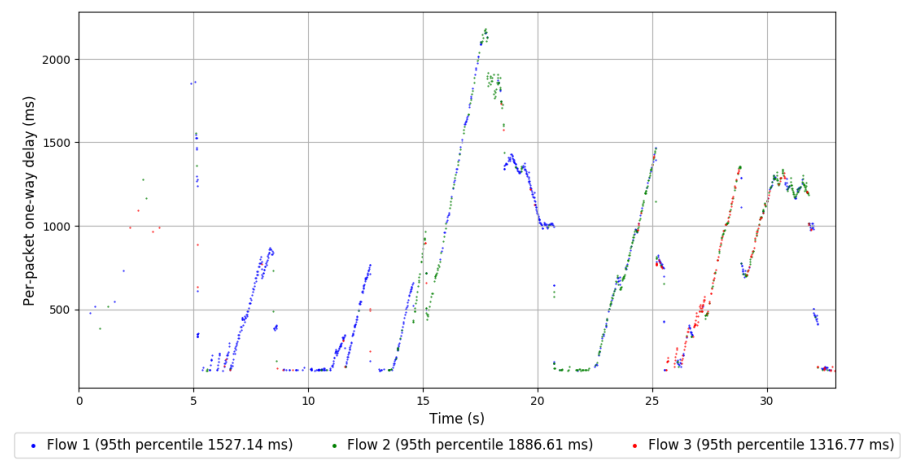
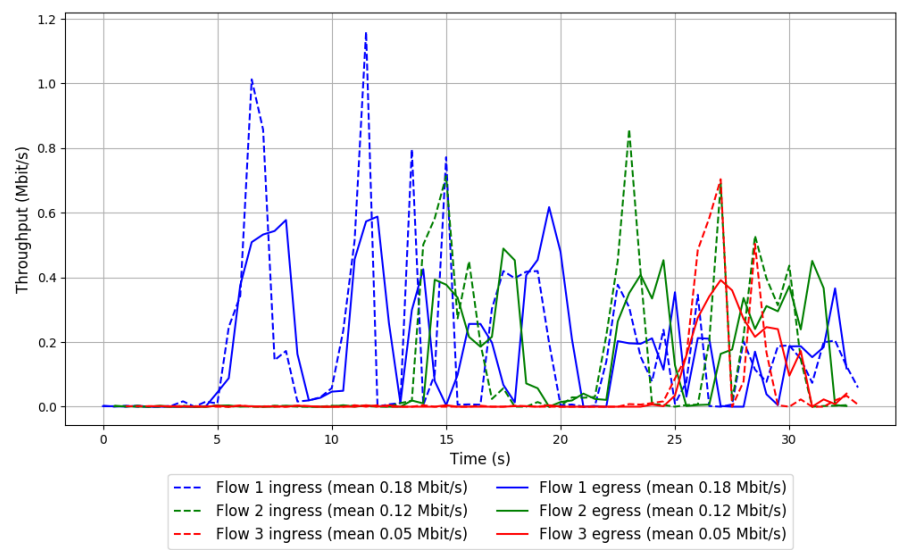


Run 2: Statistics of WebRTC media

Start at: 2018-01-25 18:49:56
End at: 2018-01-25 18:50:26
Local clock offset: 1.482 ms
Remote clock offset: -5.558 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.35 Mbit/s
95th percentile per-packet one-way delay: 1762.568 ms
Loss rate: 0.84%
-- Flow 1:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 1527.139 ms
Loss rate: 1.48%
-- Flow 2:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 1886.605 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 1316.765 ms
Loss rate: 0.39%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2018-01-25 19:10:15

End at: 2018-01-25 19:10:45

Local clock offset: 1.541 ms

Remote clock offset: 0.149 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.37 Mbit/s

95th percentile per-packet one-way delay: 1493.928 ms

Loss rate: 2.20%

-- Flow 1:

Average throughput: 0.19 Mbit/s

95th percentile per-packet one-way delay: 1457.298 ms

Loss rate: 3.29%

-- Flow 2:

Average throughput: 0.14 Mbit/s

95th percentile per-packet one-way delay: 1571.391 ms

Loss rate: 1.20%

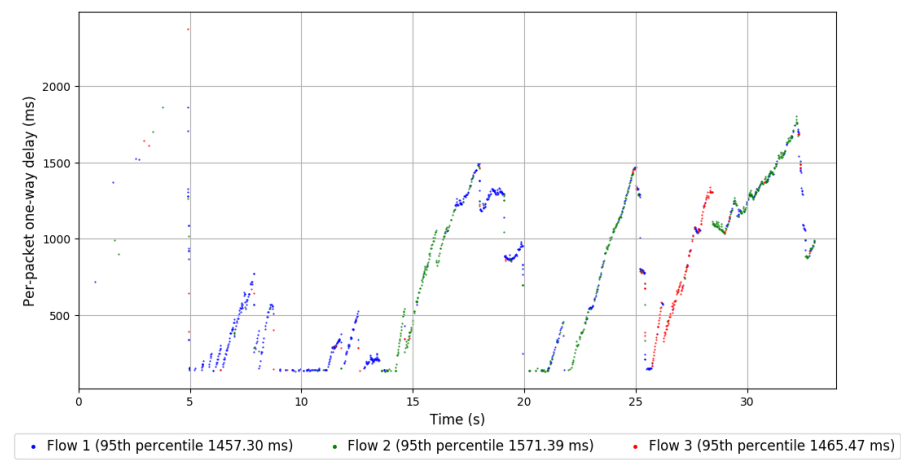
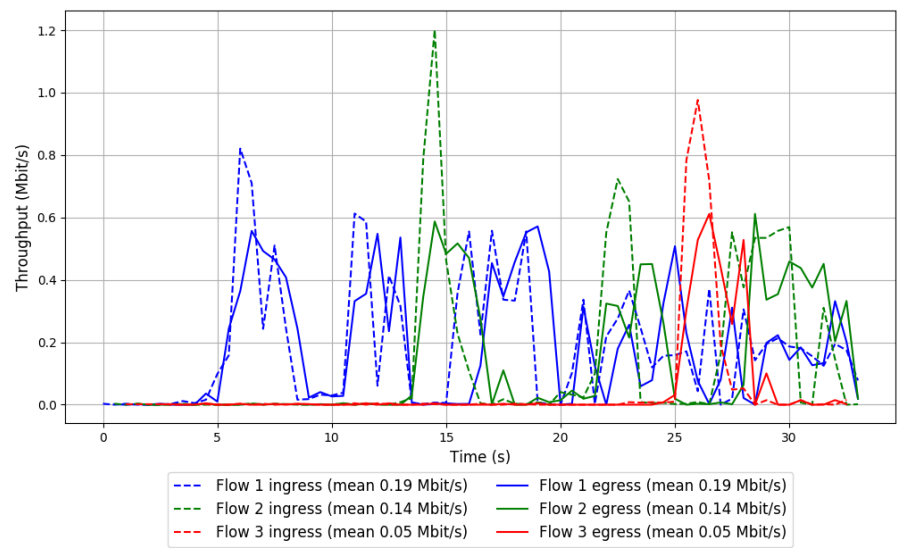
-- Flow 3:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 1465.475 ms

Loss rate: 0.60%

Run 3: Report of WebRTC media — Data Link



Run 1: Statistics of Sprout

Start at: 2018-01-25 18:27:06

End at: 2018-01-25 18:27:36

Local clock offset: 1.28 ms

Remote clock offset: 1.108 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.18 Mbit/s

95th percentile per-packet one-way delay: 406.876 ms

Loss rate: 2.53%

-- Flow 1:

Average throughput: 0.09 Mbit/s

95th percentile per-packet one-way delay: 790.934 ms

Loss rate: 1.38%

-- Flow 2:

Average throughput: 0.09 Mbit/s

95th percentile per-packet one-way delay: 250.125 ms

Loss rate: 2.98%

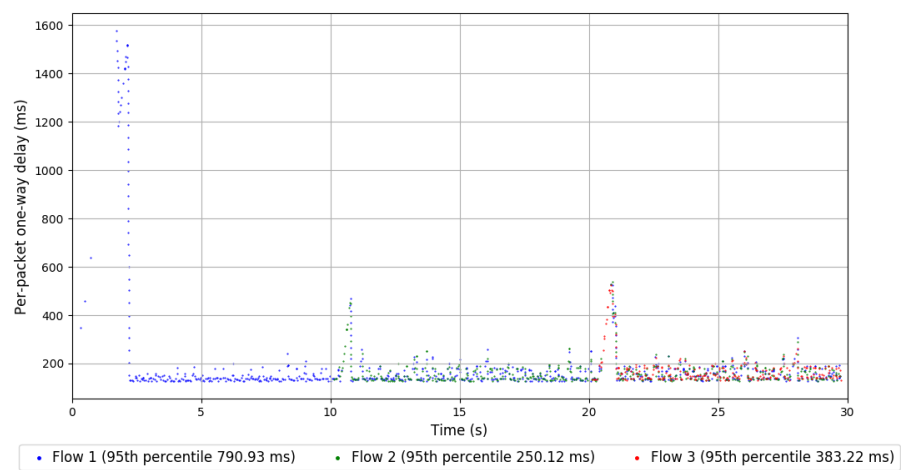
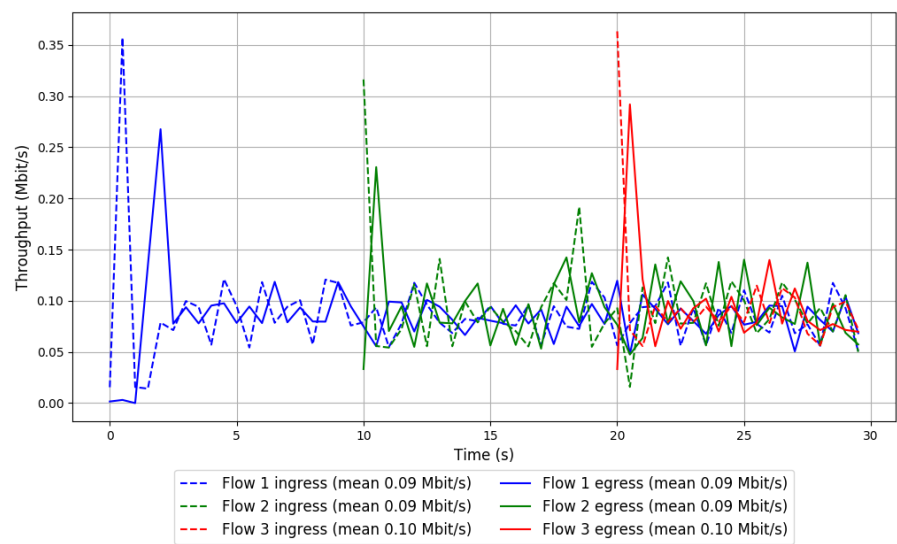
-- Flow 3:

Average throughput: 0.10 Mbit/s

95th percentile per-packet one-way delay: 383.217 ms

Loss rate: 4.68%

Run 1: Report of Sprout — Data Link

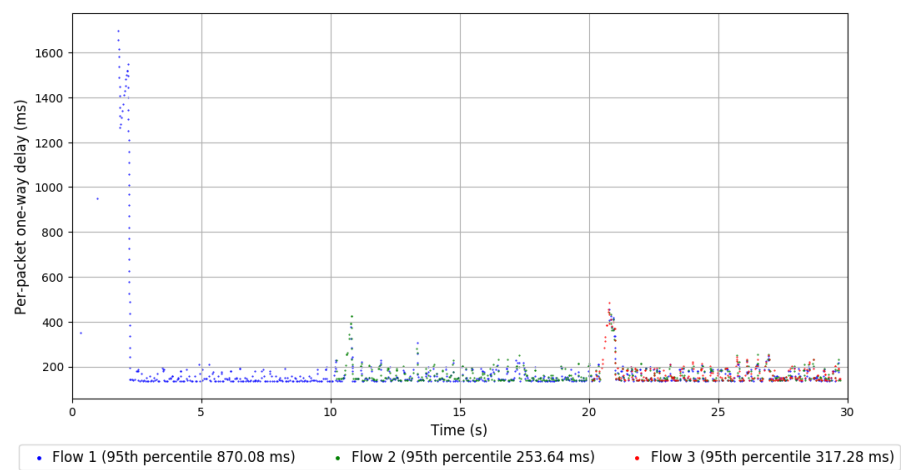
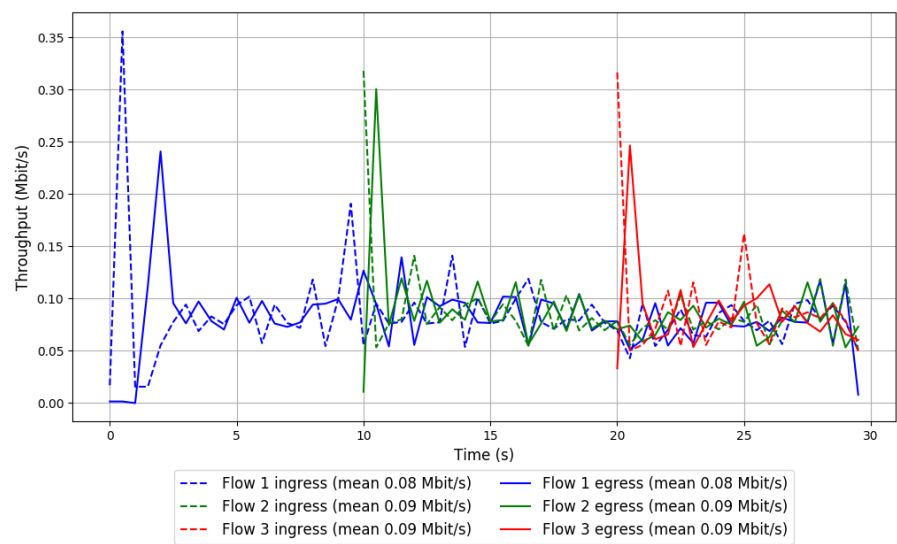


Run 2: Statistics of Sprout

Start at: 2018-01-25 18:47:23
End at: 2018-01-25 18:47:53
Local clock offset: 1.466 ms
Remote clock offset: -5.561 ms

```
# Below is generated by plot.py at 2018-01-25 20:29:08
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 372.514 ms
Loss rate: 2.50%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 870.077 ms
Loss rate: 2.11%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 253.640 ms
Loss rate: 1.86%
-- Flow 3:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 317.277 ms
Loss rate: 4.78%
```


Run 2: Report of Sprout — Data Link

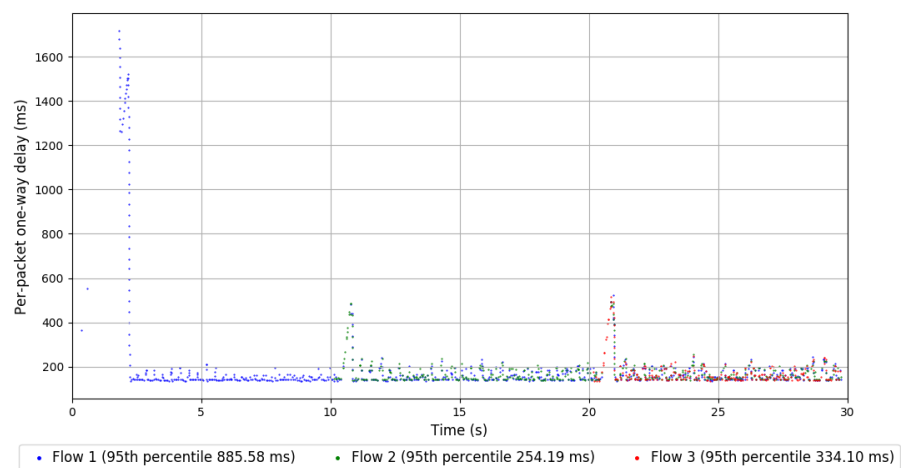
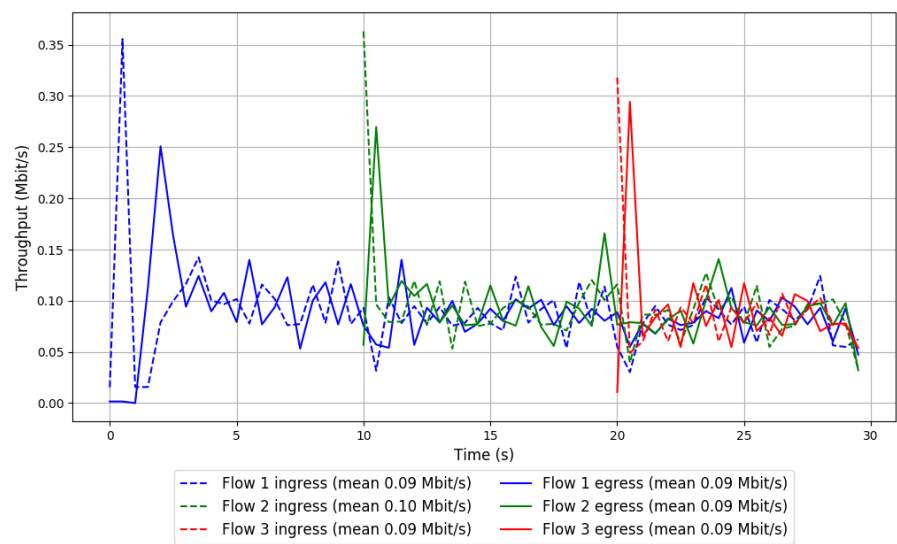


Run 3: Statistics of Sprout

Start at: 2018-01-25 19:07:40
End at: 2018-01-25 19:08:10
Local clock offset: 1.469 ms
Remote clock offset: -4.642 ms

```
# Below is generated by plot.py at 2018-01-25 20:29:08
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 414.038 ms
Loss rate: 2.03%
-- Flow 1:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 885.584 ms
Loss rate: 1.35%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 254.188 ms
Loss rate: 2.04%
-- Flow 3:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 334.095 ms
Loss rate: 3.97%
```

Run 3: Report of Sprout — Data Link

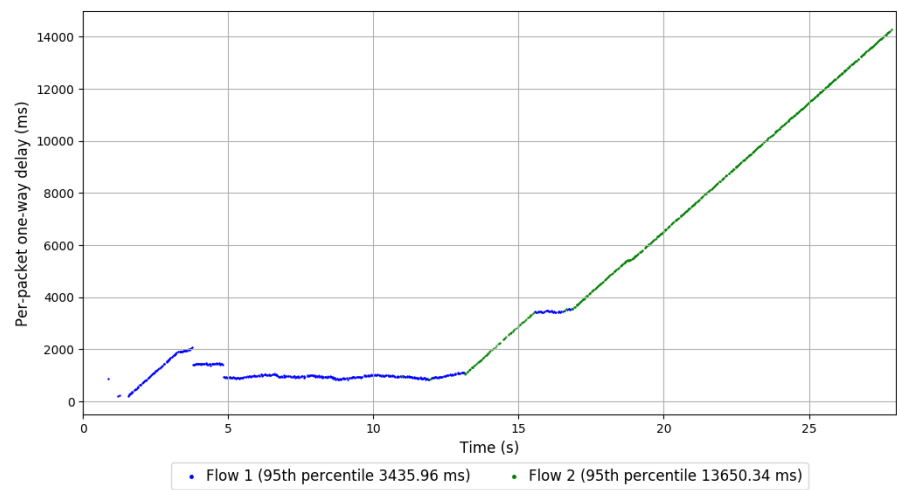
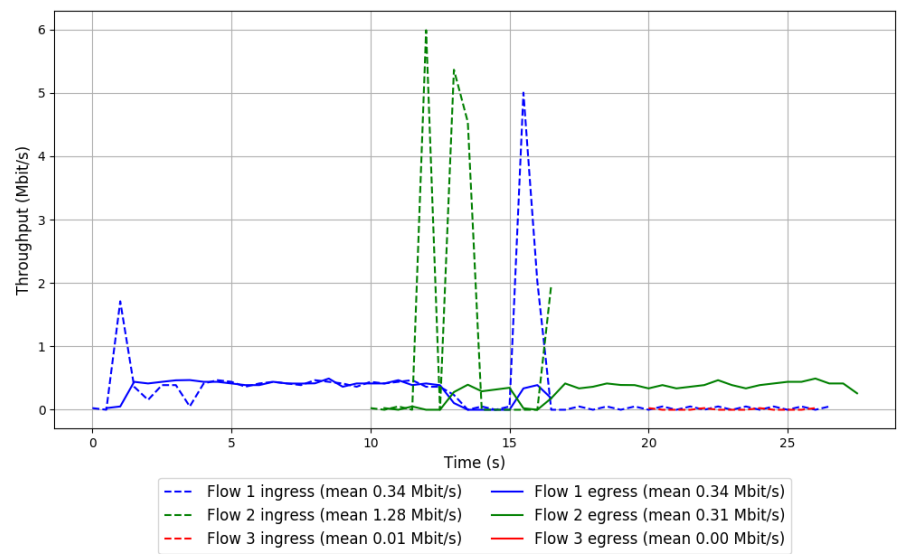


Run 1: Statistics of TaoVA-100x

Start at: 2018-01-25 18:32:10
End at: 2018-01-25 18:32:40
Local clock offset: 1.349 ms
Remote clock offset: -4.671 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.40 Mbit/s
95th percentile per-packet one-way delay: 12988.561 ms
Loss rate: 41.59%
-- Flow 1:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 3435.956 ms
Loss rate: 41.37%
-- Flow 2:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 13650.345 ms
Loss rate: 41.48%
-- Flow 3:
Average throughput: 0.00 Mbit/s

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



Run 2: Statistics of TaoVA-100x

Start at: 2018-01-25 18:52:27

End at: 2018-01-25 18:52:57

Local clock offset: 1.495 ms

Remote clock offset: -5.57 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.57 Mbit/s

95th percentile per-packet one-way delay: 2966.754 ms

Loss rate: 35.07%

-- Flow 1:

Average throughput: 0.37 Mbit/s

95th percentile per-packet one-way delay: 1866.156 ms

Loss rate: 28.53%

-- Flow 2:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 2940.403 ms

Loss rate: 23.02%

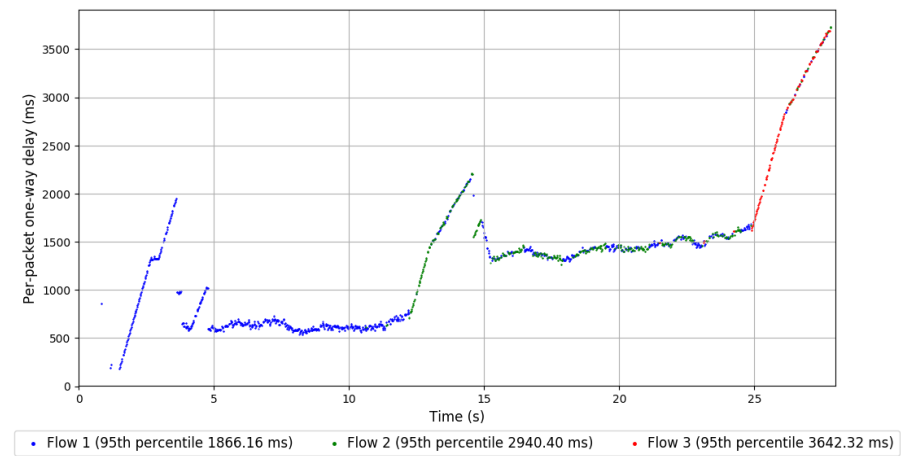
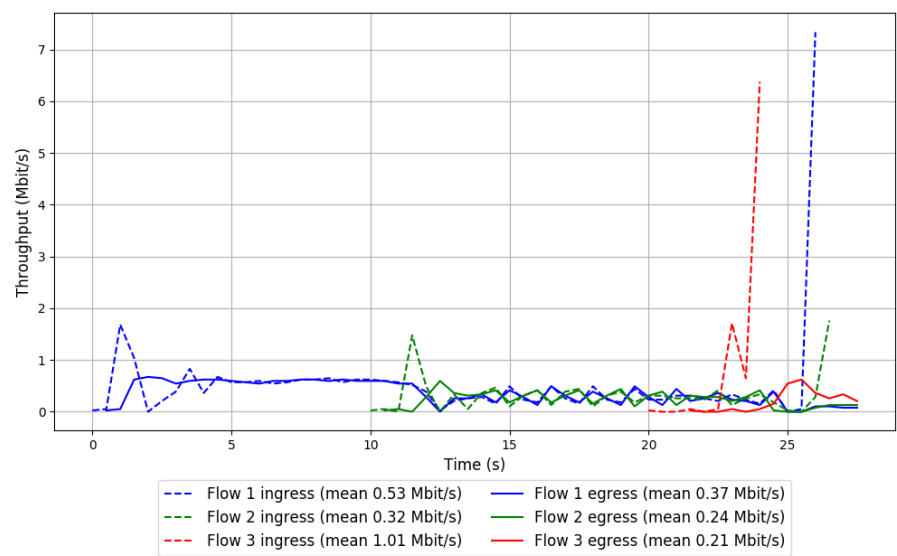
-- Flow 3:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 3642.322 ms

Loss rate: 70.47%

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



Run 3: Statistics of TaoVA-100x

Start at: 2018-01-25 19:12:48

End at: 2018-01-25 19:13:18

Local clock offset: 1.48 ms

Remote clock offset: 1.103 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.51 Mbit/s

95th percentile per-packet one-way delay: 11766.305 ms

Loss rate: 26.64%

-- Flow 1:

Average throughput: 0.28 Mbit/s

95th percentile per-packet one-way delay: 12063.639 ms

Loss rate: 34.10%

-- Flow 2:

Average throughput: 0.42 Mbit/s

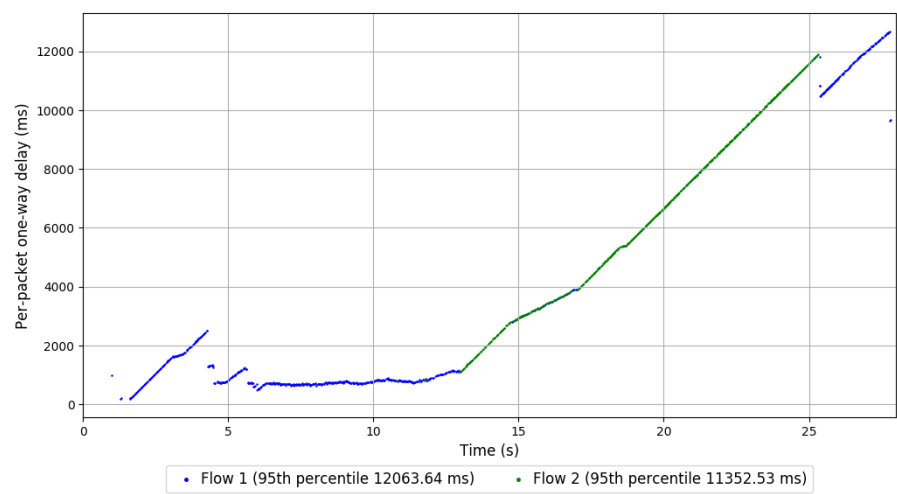
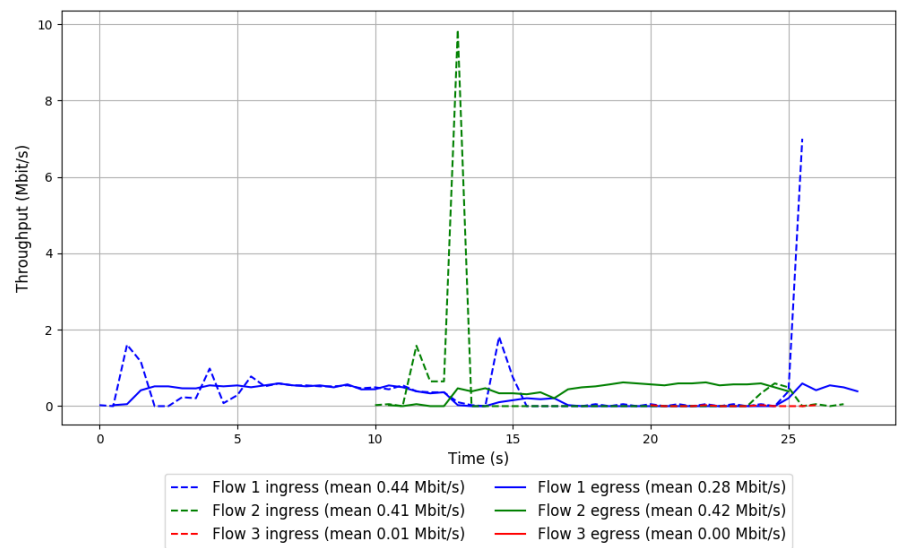
95th percentile per-packet one-way delay: 11352.533 ms

Loss rate: 14.30%

-- Flow 3:

Average throughput: 0.00 Mbit/s

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

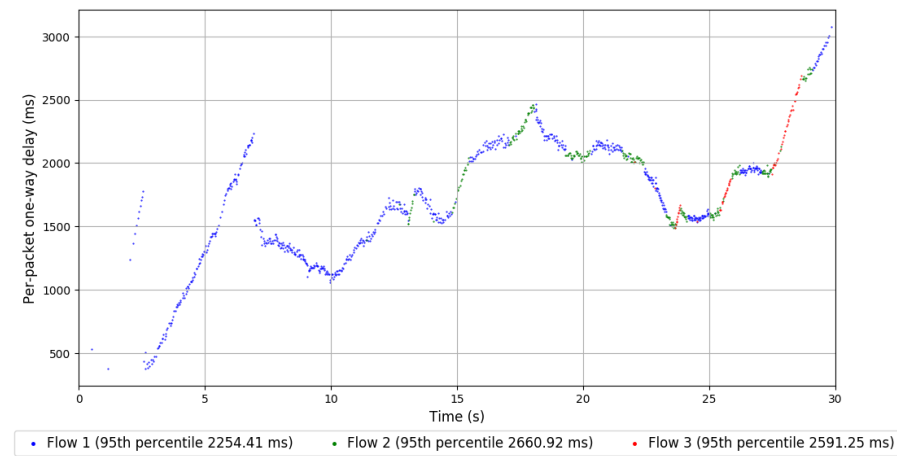
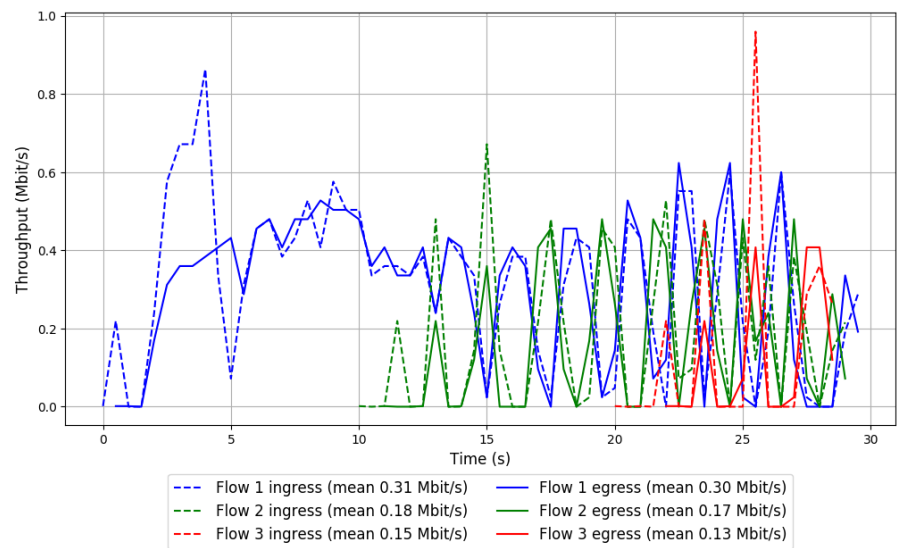


Run 1: Statistics of TCP Vegas

Start at: 2018-01-25 18:41:03
End at: 2018-01-25 18:41:33
Local clock offset: 1.397 ms
Remote clock offset: -4.603 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 2441.146 ms
Loss rate: 10.14%
-- Flow 1:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 2254.410 ms
Loss rate: 5.50%
-- Flow 2:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 2660.923 ms
Loss rate: 13.25%
-- Flow 3:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 2591.253 ms
Loss rate: 35.41%

Run 1: Report of TCP Vegas — Data Link

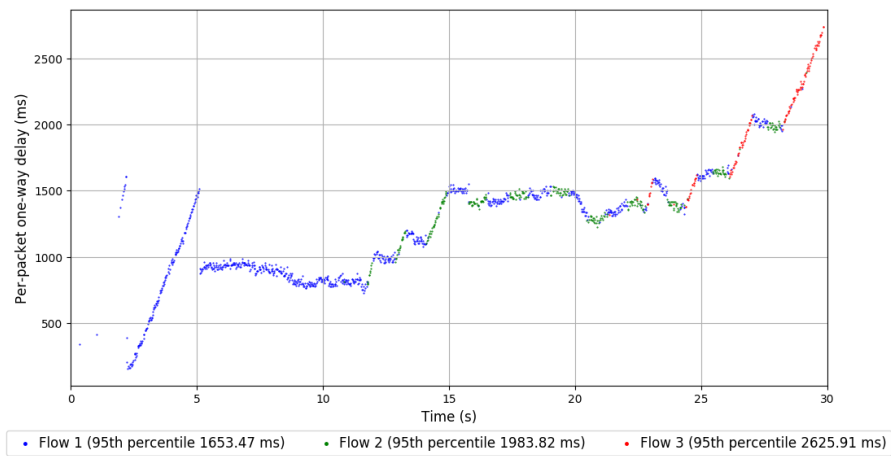
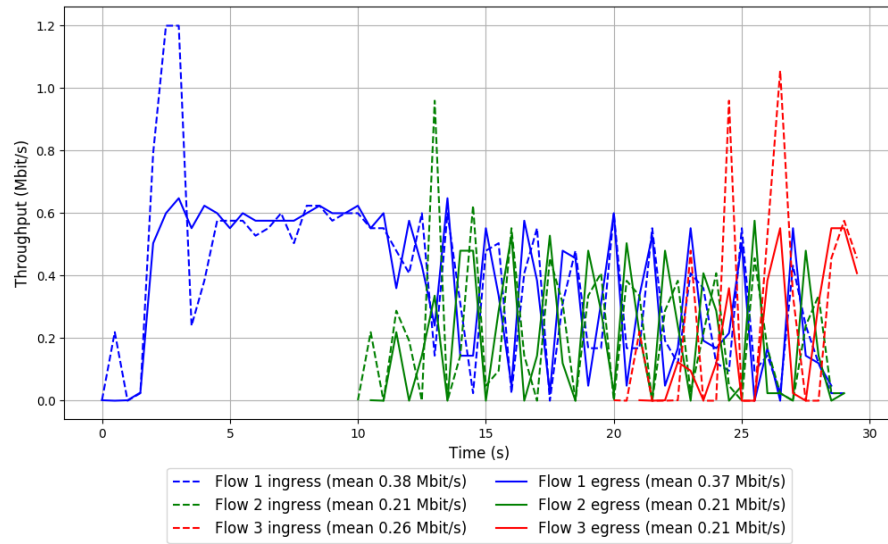


Run 2: Statistics of TCP Vegas

Start at: 2018-01-25 19:01:19
End at: 2018-01-25 19:01:49
Local clock offset: 1.497 ms
Remote clock offset: -5.446 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.55 Mbit/s
95th percentile per-packet one-way delay: 2096.478 ms
Loss rate: 8.61%
-- Flow 1:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 1653.474 ms
Loss rate: 3.78%
-- Flow 2:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 1983.821 ms
Loss rate: 7.66%
-- Flow 3:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 2625.915 ms
Loss rate: 31.23%

Run 2: Report of TCP Vegas — Data Link



Run 3: Statistics of TCP Vegas

Start at: 2018-01-25 19:21:43

End at: 2018-01-25 19:22:13

Local clock offset: 1.595 ms

Remote clock offset: -5.82 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.49 Mbit/s

95th percentile per-packet one-way delay: 3113.014 ms

Loss rate: 11.35%

-- Flow 1:

Average throughput: 0.41 Mbit/s

95th percentile per-packet one-way delay: 3182.970 ms

Loss rate: 7.88%

-- Flow 2:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 2766.594 ms

Loss rate: 13.70%

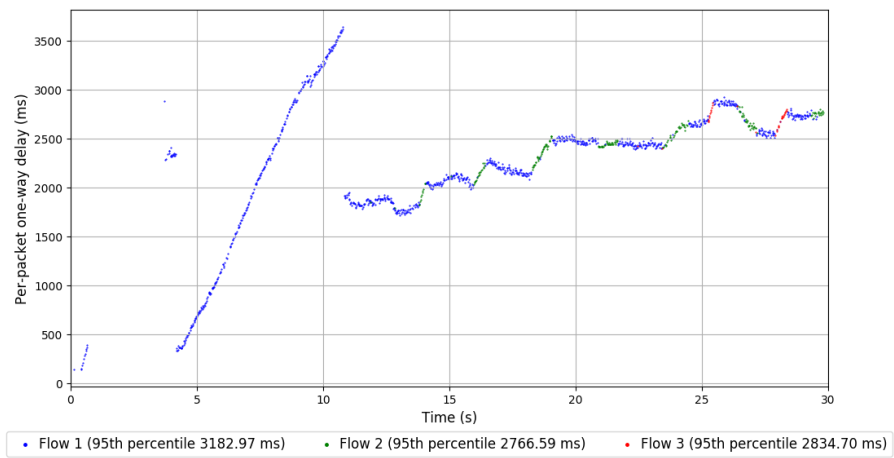
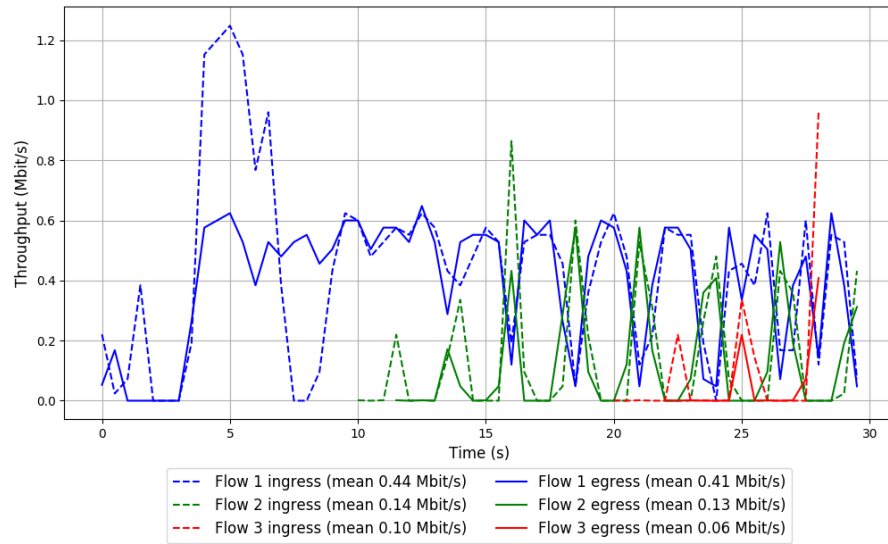
-- Flow 3:

Average throughput: 0.06 Mbit/s

95th percentile per-packet one-way delay: 2834.703 ms

Loss rate: 57.65%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2018-01-25 18:42:19

End at: 2018-01-25 18:42:49

Local clock offset: 1.417 ms

Remote clock offset: 0.106 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.40 Mbit/s

95th percentile per-packet one-way delay: 3901.764 ms

Loss rate: 20.66%

-- Flow 1:

Average throughput: 0.36 Mbit/s

95th percentile per-packet one-way delay: 3991.288 ms

Loss rate: 20.11%

-- Flow 2:

Average throughput: 0.03 Mbit/s

95th percentile per-packet one-way delay: 3228.108 ms

Loss rate: 4.55%

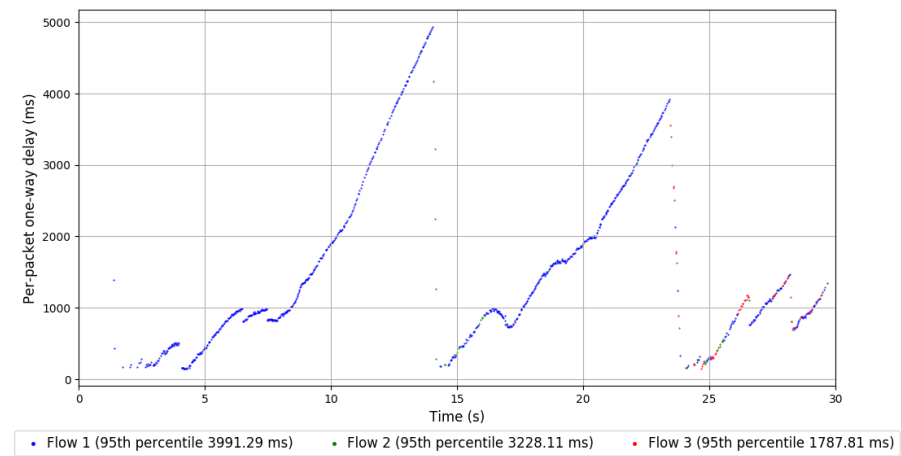
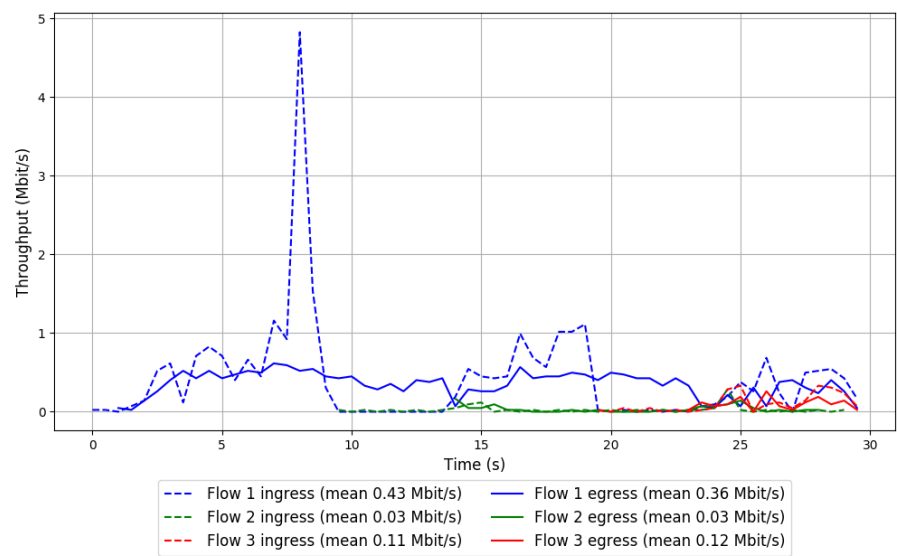
-- Flow 3:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 1787.810 ms

Loss rate: 34.78%

Run 1: Report of Verus — Data Link



Run 2: Statistics of Verus

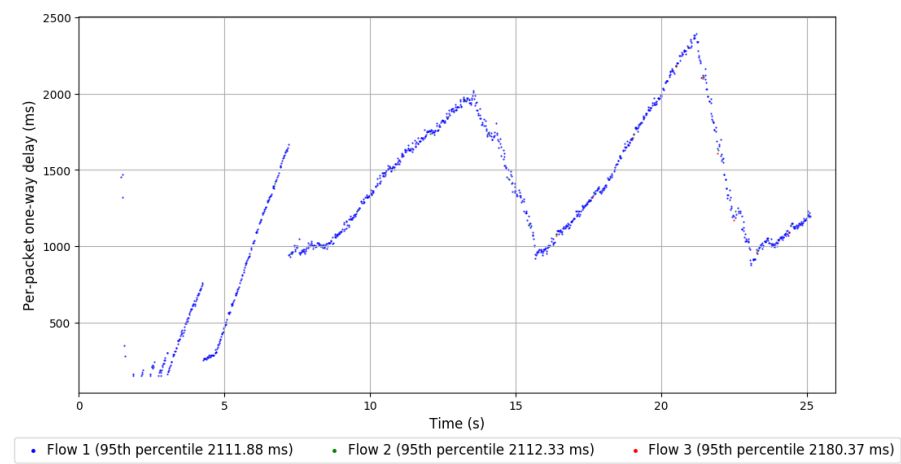
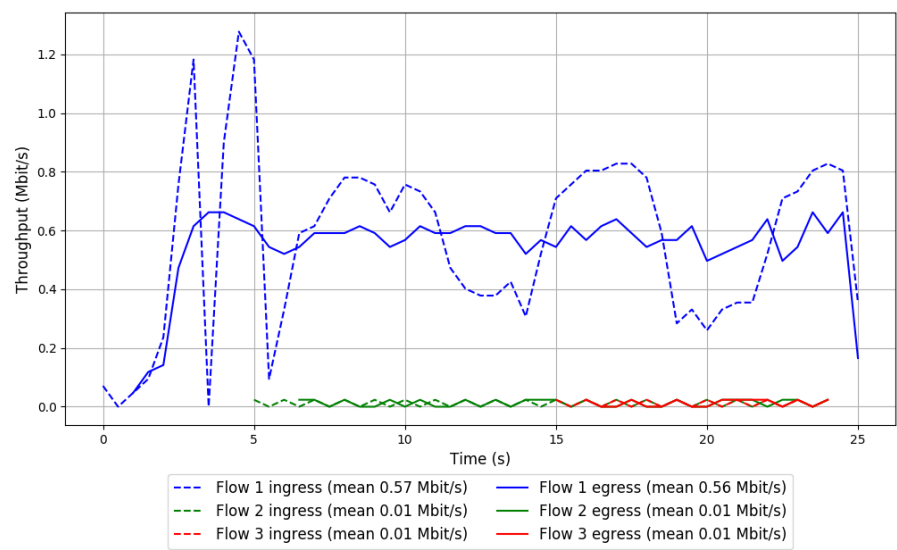
Start at: 2018-01-25 19:02:35

End at: 2018-01-25 19:03:05

Local clock offset: 1.507 ms

Remote clock offset: 0.184 ms

Run 2: Report of Verus — Data Link

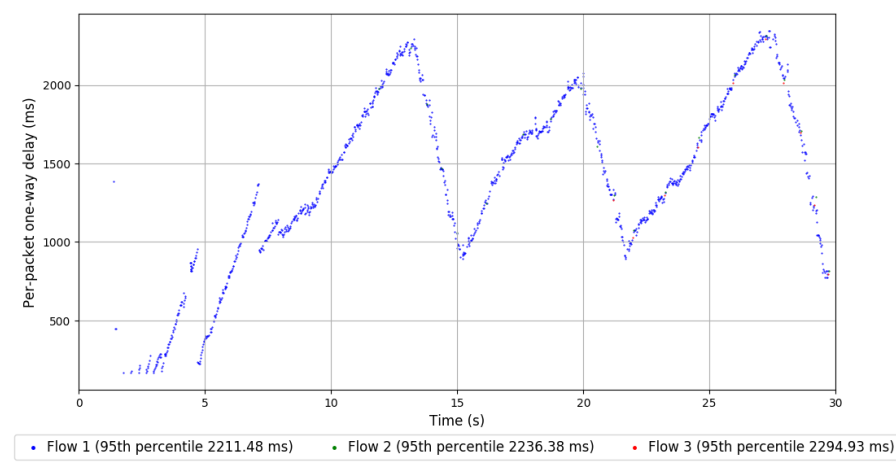
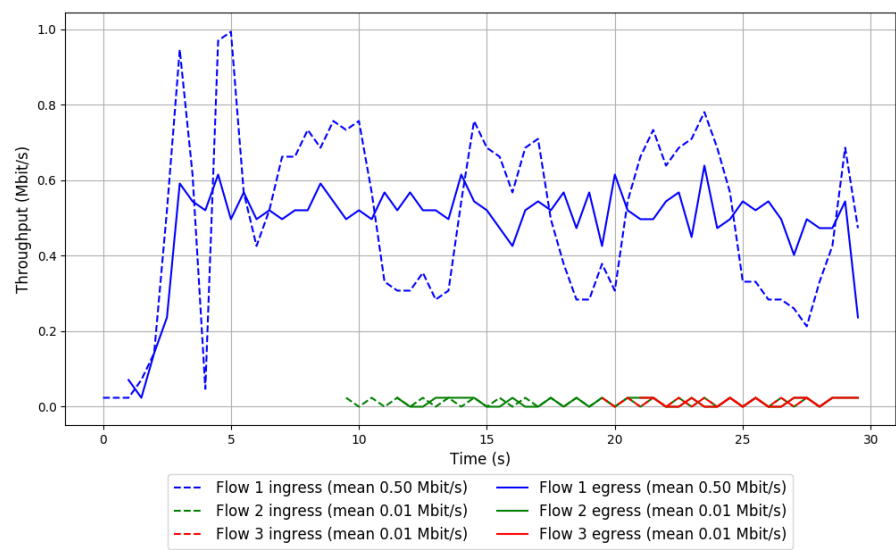


Run 3: Statistics of Verus

Start at: 2018-01-25 19:22:59
End at: 2018-01-25 19:23:29
Local clock offset: 1.551 ms
Remote clock offset: -5.908 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 2211.766 ms
Loss rate: 4.20%
-- Flow 1:
Average throughput: 0.50 Mbit/s
95th percentile per-packet one-way delay: 2211.479 ms
Loss rate: 4.30%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 2236.384 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 2294.935 ms
Loss rate: 0.00%

Run 3: Report of Verus — Data Link



Run 1: Statistics of Copa

Start at: 2018-01-25 18:46:05

End at: 2018-01-25 18:46:35

Local clock offset: 1.447 ms

Remote clock offset: 1.191 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.54 Mbit/s

95th percentile per-packet one-way delay: 704.289 ms

Loss rate: 3.56%

-- Flow 1:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 635.071 ms

Loss rate: 1.79%

-- Flow 2:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 777.762 ms

Loss rate: 4.69%

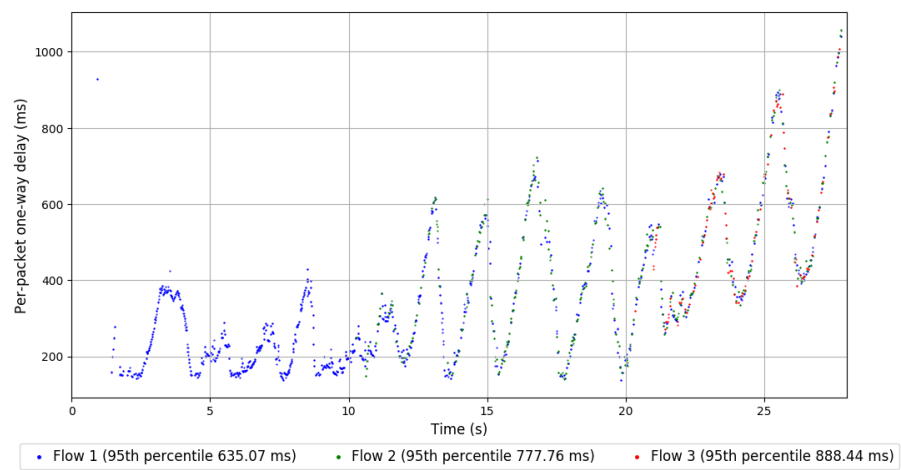
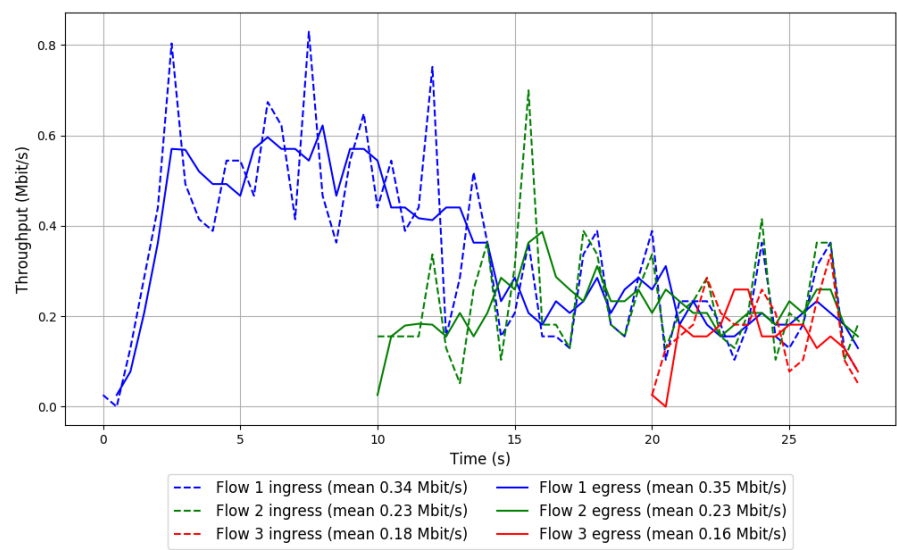
-- Flow 3:

Average throughput: 0.16 Mbit/s

95th percentile per-packet one-way delay: 888.442 ms

Loss rate: 12.38%

Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

Start at: 2018-01-25 19:06:24

End at: 2018-01-25 19:06:54

Local clock offset: 1.524 ms

Remote clock offset: 0.227 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.52 Mbit/s

95th percentile per-packet one-way delay: 629.349 ms

Loss rate: 1.85%

-- Flow 1:

Average throughput: 0.32 Mbit/s

95th percentile per-packet one-way delay: 588.117 ms

Loss rate: 0.75%

-- Flow 2:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 685.277 ms

Loss rate: 2.50%

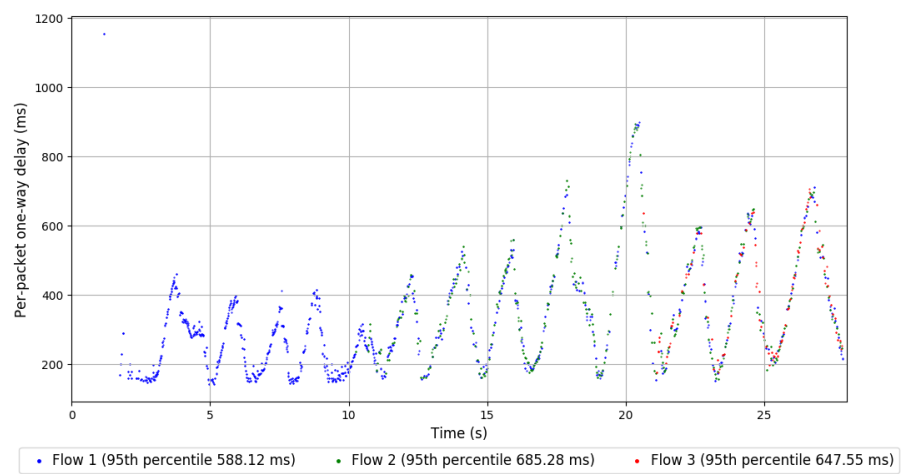
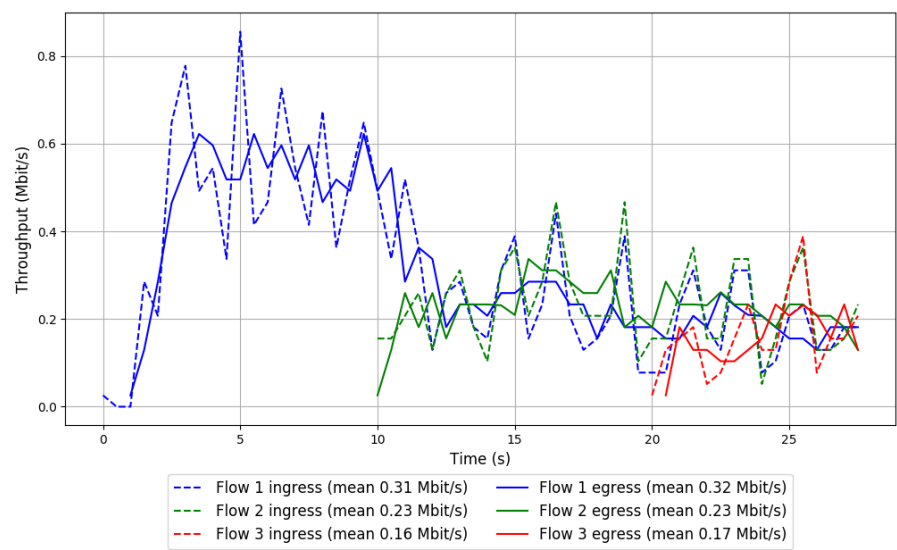
-- Flow 3:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 647.546 ms

Loss rate: 7.14%

Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

Start at: 2018-01-25 19:26:47

End at: 2018-01-25 19:27:17

Local clock offset: 1.651 ms

Remote clock offset: -0.24 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.55 Mbit/s

95th percentile per-packet one-way delay: 825.105 ms

Loss rate: 3.76%

-- Flow 1:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 719.532 ms

Loss rate: 2.15%

-- Flow 2:

Average throughput: 0.25 Mbit/s

95th percentile per-packet one-way delay: 857.661 ms

Loss rate: 4.43%

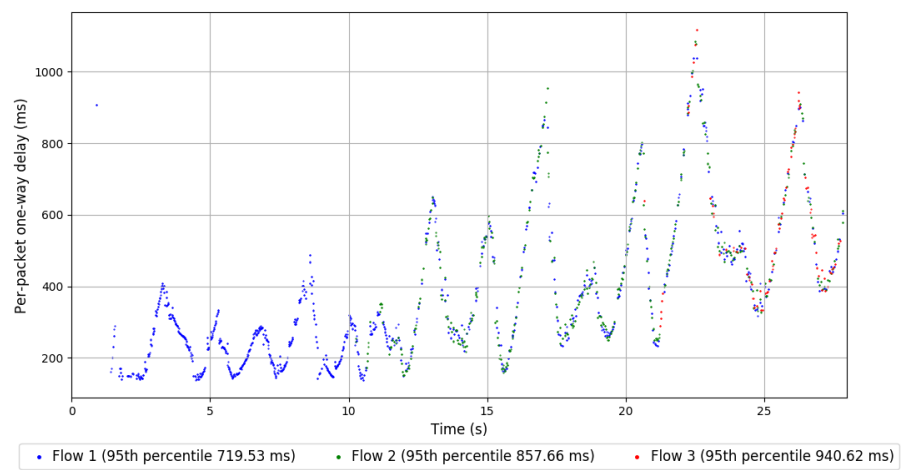
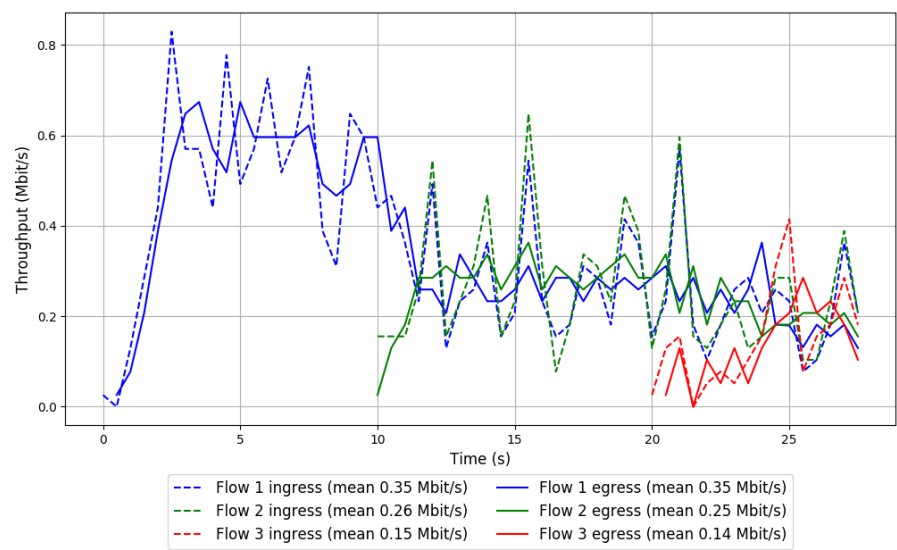
-- Flow 3:

Average throughput: 0.14 Mbit/s

95th percentile per-packet one-way delay: 940.625 ms

Loss rate: 14.29%

Run 3: Report of Copa — Data Link



Run 1: Statistics of Indigo-2-256

Start at: 2018-01-25 18:34:41

End at: 2018-01-25 18:35:11

Local clock offset: 1.359 ms

Remote clock offset: 0.114 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.37 Mbit/s

95th percentile per-packet one-way delay: 4325.608 ms

Loss rate: 15.74%

-- Flow 1:

Average throughput: 0.18 Mbit/s

95th percentile per-packet one-way delay: 2259.170 ms

Loss rate: 12.85%

-- Flow 2:

Average throughput: 0.16 Mbit/s

95th percentile per-packet one-way delay: 3071.541 ms

Loss rate: 6.27%

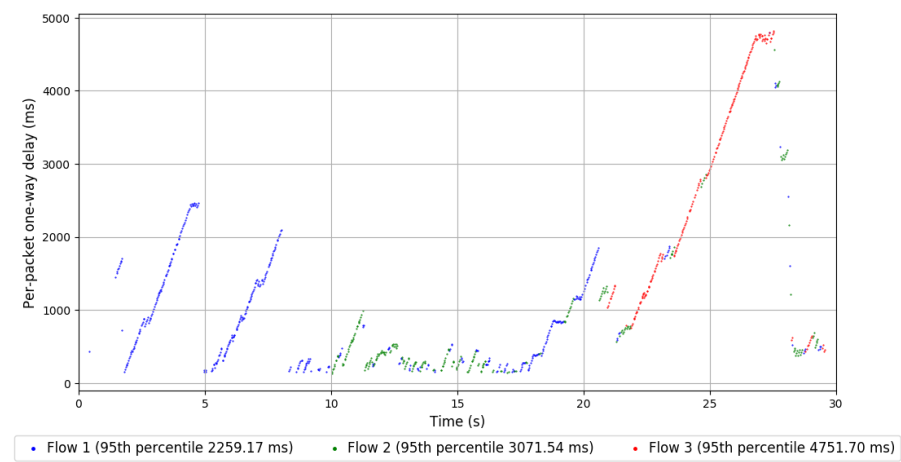
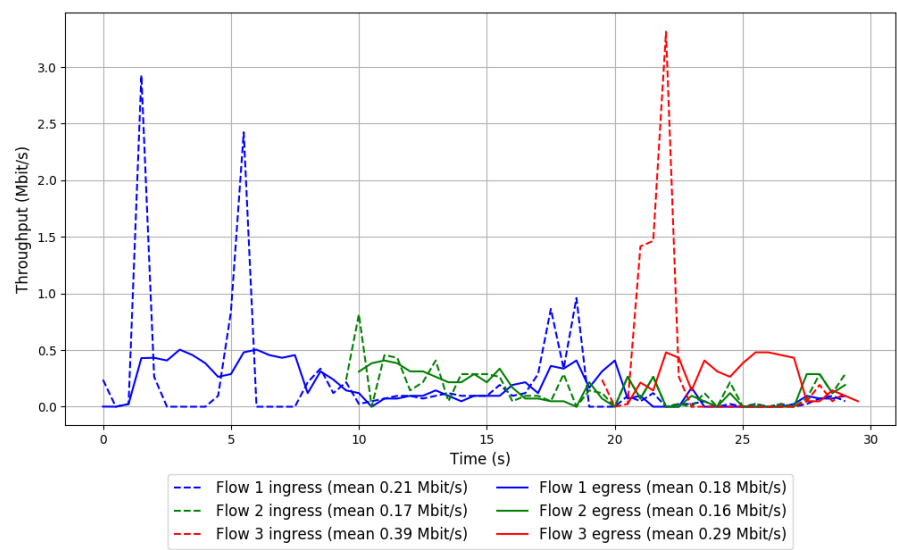
-- Flow 3:

Average throughput: 0.29 Mbit/s

95th percentile per-packet one-way delay: 4751.703 ms

Loss rate: 29.30%

Run 1: Report of Indigo-2-256 — Data Link

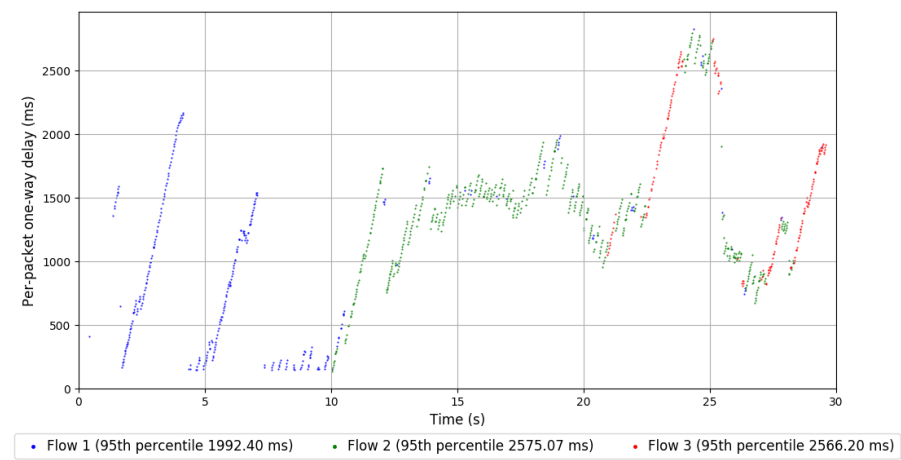
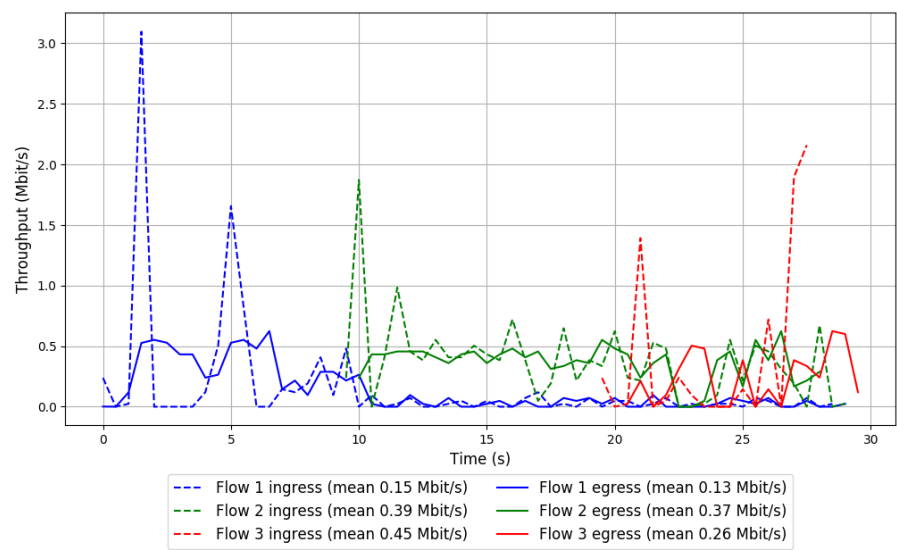


Run 2: Statistics of Indigo-2-256

Start at: 2018-01-25 18:55:01
End at: 2018-01-25 18:55:31
Local clock offset: 1.433 ms
Remote clock offset: -4.552 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 2534.454 ms
Loss rate: 17.10%
-- Flow 1:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 1992.403 ms
Loss rate: 12.84%
-- Flow 2:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 2575.073 ms
Loss rate: 10.97%
-- Flow 3:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 2566.197 ms
Loss rate: 35.87%

Run 2: Report of Indigo-2-256 — Data Link



Run 3: Statistics of Indigo-2-256

Start at: 2018-01-25 19:15:20

End at: 2018-01-25 19:15:50

Local clock offset: 1.563 ms

Remote clock offset: 0.115 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.48 Mbit/s

95th percentile per-packet one-way delay: 779.005 ms

Loss rate: 3.33%

-- Flow 1:

Average throughput: 0.20 Mbit/s

95th percentile per-packet one-way delay: 768.364 ms

Loss rate: 1.99%

-- Flow 2:

Average throughput: 0.31 Mbit/s

95th percentile per-packet one-way delay: 767.900 ms

Loss rate: 2.77%

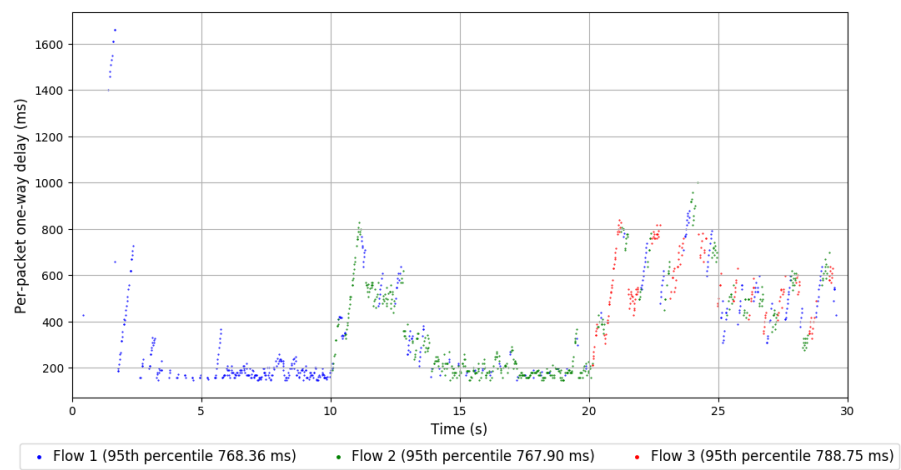
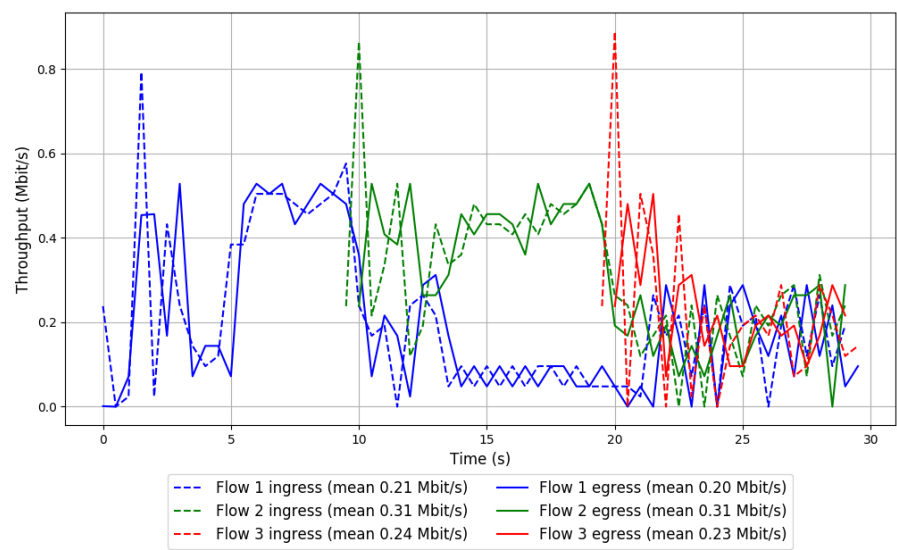
-- Flow 3:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 788.752 ms

Loss rate: 8.25%

Run 3: Report of Indigo-2-256 — Data Link

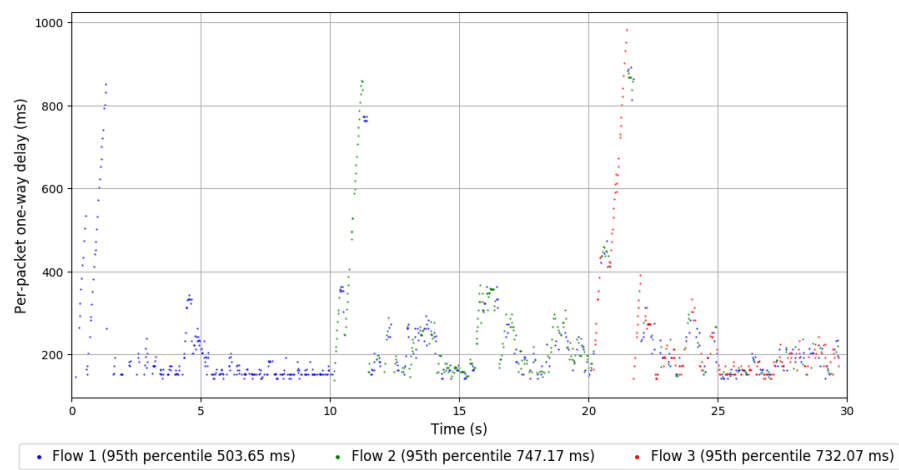
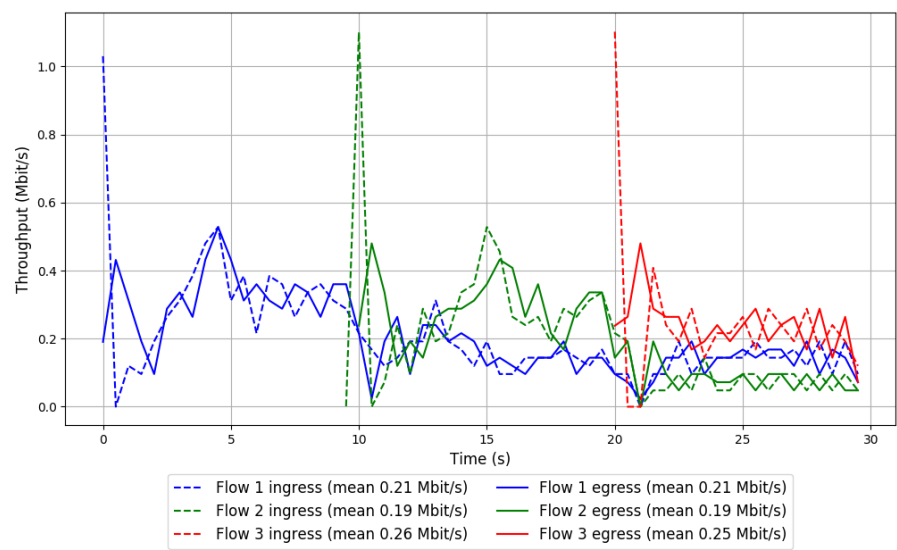


Run 1: Statistics of Indigo-1-32

Start at: 2018-01-25 18:37:16
End at: 2018-01-25 18:37:46
Local clock offset: 1.404 ms
Remote clock offset: -0.682 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.42 Mbit/s
95th percentile per-packet one-way delay: 672.139 ms
Loss rate: 2.29%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 503.646 ms
Loss rate: 1.73%
-- Flow 2:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 747.166 ms
Loss rate: 1.87%
-- Flow 3:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 732.074 ms
Loss rate: 4.35%

Run 1: Report of Indigo-1-32 — Data Link

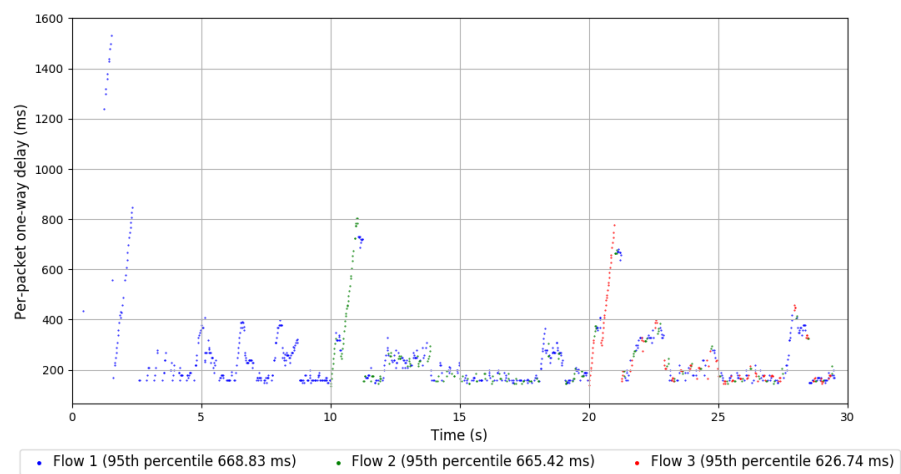
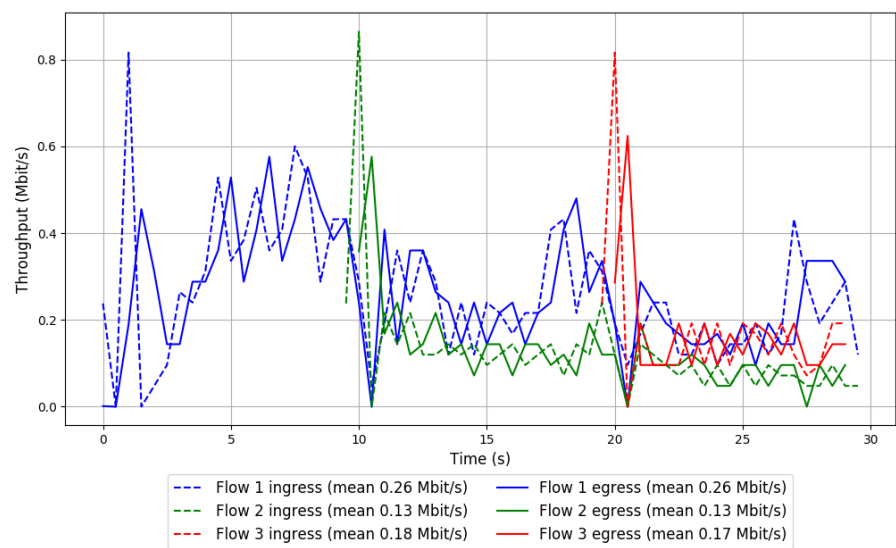


Run 2: Statistics of Indigo-1-32

Start at: 2018-01-25 18:57:32
End at: 2018-01-25 18:58:02
Local clock offset: 1.487 ms
Remote clock offset: -4.515 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 667.974 ms
Loss rate: 2.67%
-- Flow 1:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 668.829 ms
Loss rate: 1.69%
-- Flow 2:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 665.419 ms
Loss rate: 2.80%
-- Flow 3:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 626.736 ms
Loss rate: 6.95%

Run 2: Report of Indigo-1-32 — Data Link



Run 3: Statistics of Indigo-1-32

Start at: 2018-01-25 19:17:53

End at: 2018-01-25 19:18:23

Local clock offset: 1.599 ms

Remote clock offset: 0.021 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.48 Mbit/s

95th percentile per-packet one-way delay: 741.438 ms

Loss rate: 2.37%

-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 602.329 ms

Loss rate: 2.02%

-- Flow 2:

Average throughput: 0.30 Mbit/s

95th percentile per-packet one-way delay: 741.438 ms

Loss rate: 1.43%

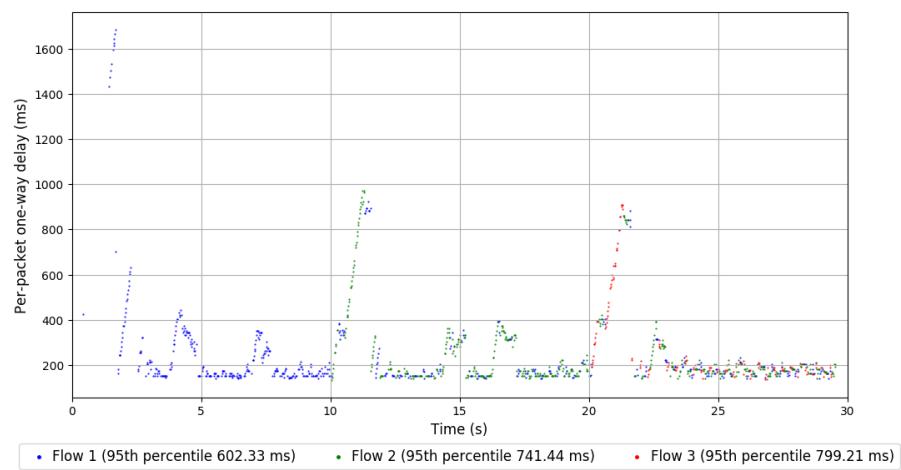
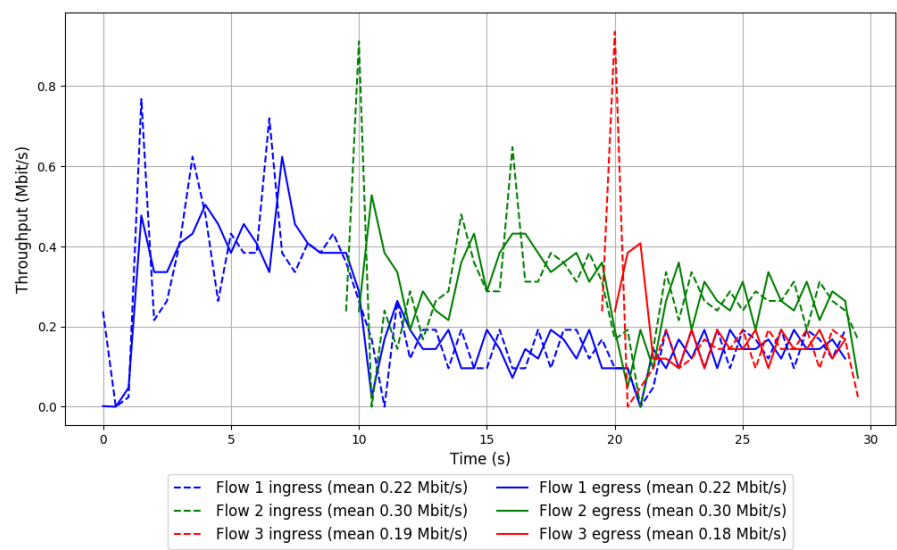
-- Flow 3:

Average throughput: 0.18 Mbit/s

95th percentile per-packet one-way delay: 799.211 ms

Loss rate: 6.63%

Run 3: Report of Indigo-1-32 — Data Link



Run 1: Statistics of Indigo-1-128

Start at: 2018-01-25 18:33:26

End at: 2018-01-25 18:33:56

Local clock offset: 1.342 ms

Remote clock offset: 0.281 ms

Below is generated by plot.py at 2018-01-25 20:29:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 2315.808 ms

Loss rate: 9.52%

-- Flow 1:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 2043.390 ms

Loss rate: 3.59%

-- Flow 2:

Average throughput: 0.16 Mbit/s

95th percentile per-packet one-way delay: 873.272 ms

Loss rate: 5.25%

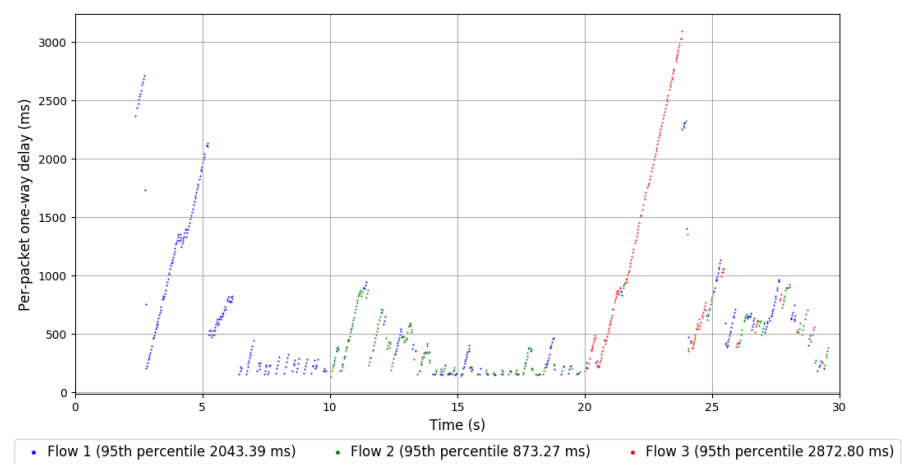
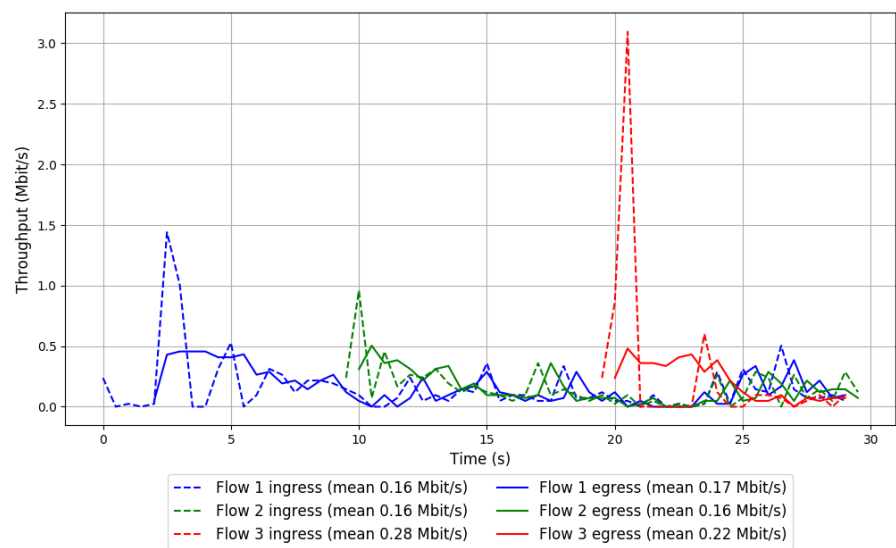
-- Flow 3:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 2872.805 ms

Loss rate: 24.79%

Run 1: Report of Indigo-1-128 — Data Link

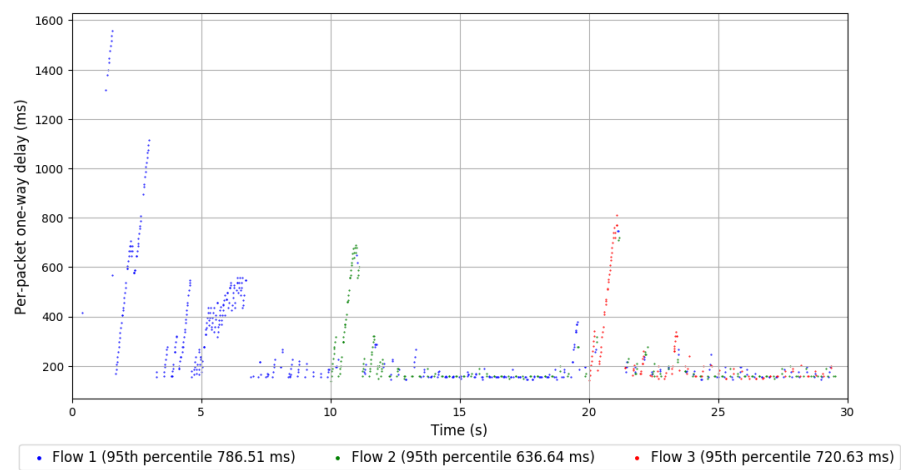
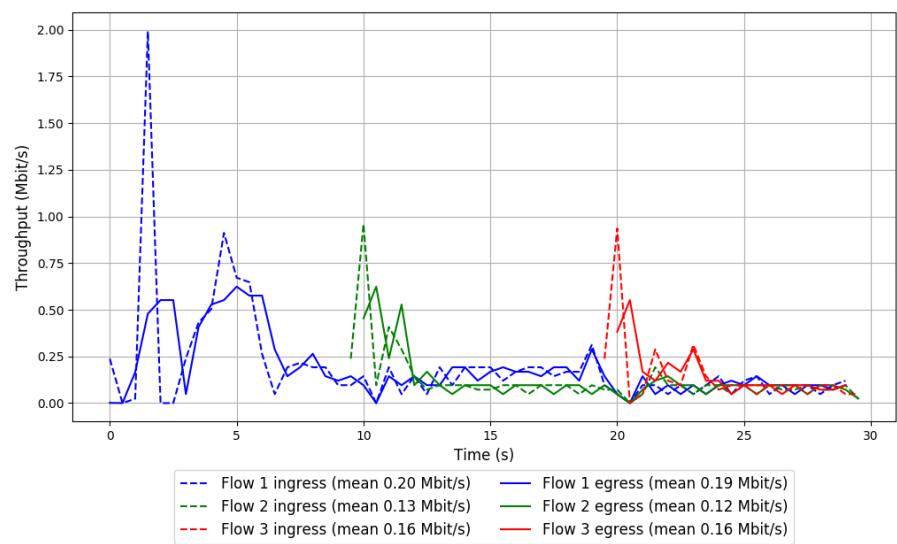


Run 2: Statistics of Indigo-1-128

Start at: 2018-01-25 18:53:43
End at: 2018-01-25 18:54:13
Local clock offset: 1.49 ms
Remote clock offset: -5.449 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.32 Mbit/s
95th percentile per-packet one-way delay: 707.996 ms
Loss rate: 4.77%
-- Flow 1:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 786.511 ms
Loss rate: 5.61%
-- Flow 2:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 636.636 ms
Loss rate: 2.42%
-- Flow 3:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 720.632 ms
Loss rate: 5.39%

Run 2: Report of Indigo-1-128 — Data Link



Run 3: Statistics of Indigo-1-128

Start at: 2018-01-25 19:14:04
End at: 2018-01-25 19:14:34
Local clock offset: 1.572 ms
Remote clock offset: -4.748 ms

Below is generated by plot.py at 2018-01-25 20:29:08
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 640.953 ms
Loss rate: 2.90%
-- Flow 1:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 648.985 ms
Loss rate: 1.99%
-- Flow 2:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 618.452 ms
Loss rate: 2.58%
-- Flow 3:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 649.340 ms
Loss rate: 5.74%

Run 3: Report of Indigo-1-128 — Data Link

