

## Pantheon Report

Generated at 2017-12-20 19:33:34 (UTC).

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

Repeated the test of 14 congestion control schemes 3 times.

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

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

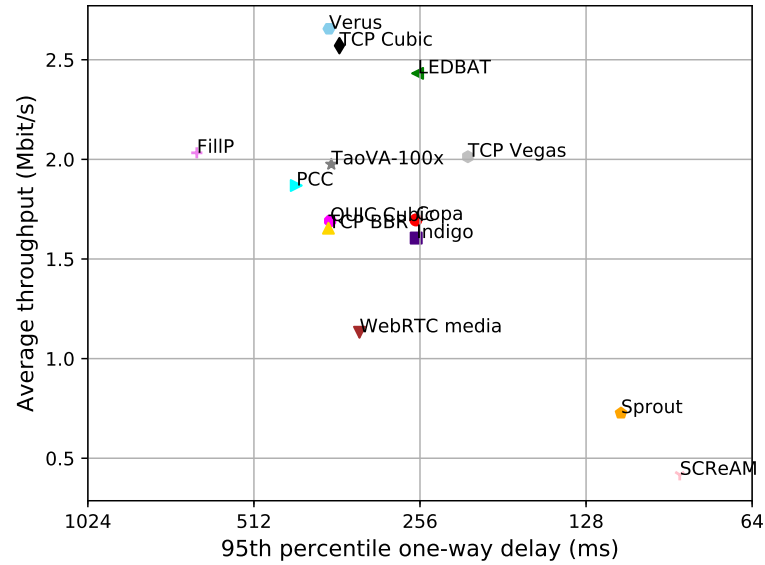
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo\_fast**).

NTP offsets were measured against **nets.org.sg** and have been applied to correct the timestamps in logs.

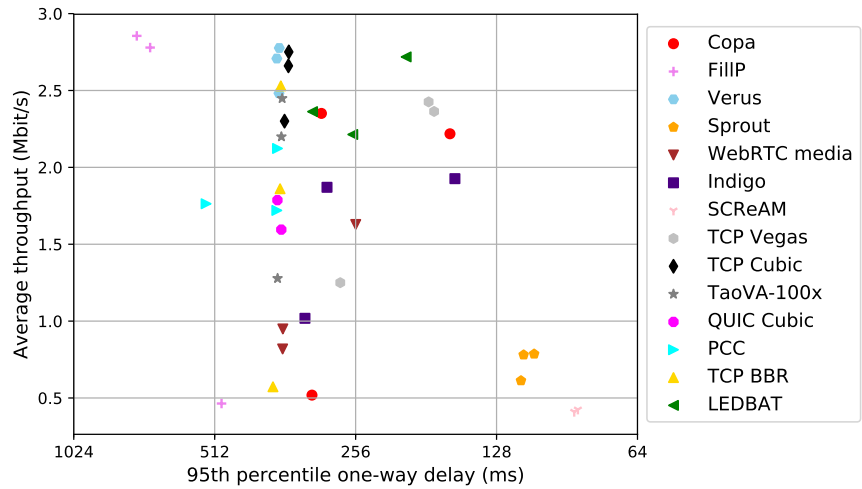
Git summary:

```
branch: master @ 904a5750834816b1e46a2c86405d707788d27c16
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
  M datagrump/sender.cc
third_party/fillp @ dcaef6b00654e660f73f7ed679d2eab61ce08639
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ b19f3730105f9aa95452552af924e3719b03cc55
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
  M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ fb1053193c2861da659ba9013db26744ccfcf993
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
  M receiver/src/buffer.h
  M receiver/src/core.cpp
  M sender/src/buffer.h
  M sender/src/core.cpp
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ 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 India ppp0 to AWS India 1 Ethernet, 3 runs of 30s each per scheme  
 3 flows with 10s interval between flows (mean of all runs by scheme)



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



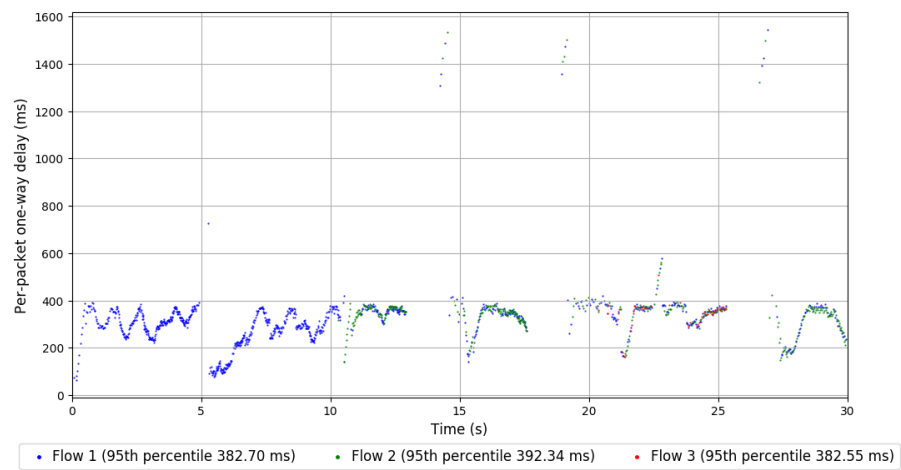
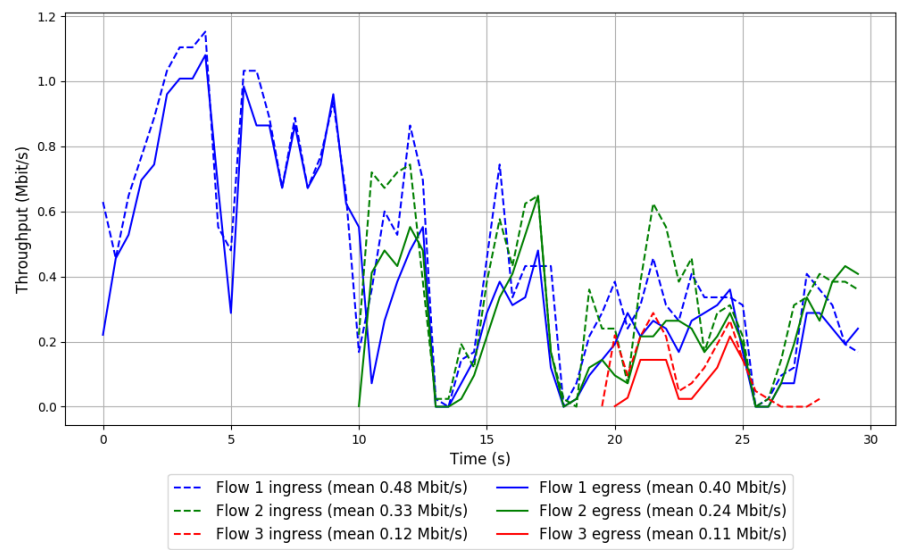
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	1.04	0.57	0.75	373.02	379.87	375.10	10.34	17.70	28.66
TCP Cubic	3	1.83	0.86	0.54	357.11	359.82	361.48	1.78	3.13	8.75
LEDBAT	3	1.31	1.29	0.83	235.45	270.05	278.41	0.36	1.03	3.49
PCC	3	1.12	0.89	0.50	374.68	483.65	747.06	49.96	67.04	84.84
QUIC Cubic	2	1.06	0.71	0.48	371.86	374.05	374.95	6.36	9.31	18.86
SCReAM	2	0.21	0.20	0.22	87.52	86.85	86.57	0.26	0.62	0.55
WebRTC media	3	0.55	0.43	0.16	325.35	332.91	322.93	7.48	11.95	16.16
Sprout	3	0.37	0.36	0.34	111.46	110.20	115.63	0.64	0.48	2.35
TaoVA-100x	3	1.21	0.93	0.72	368.66	372.44	375.18	14.32	24.33	45.21
TCP Vegas	3	1.15	0.85	0.92	193.70	202.61	236.72	0.74	1.01	2.67
Verus	3	2.21	0.59	0.25	372.37	381.22	374.40	21.05	76.41	43.76
Copa	3	1.28	0.62	0.60	210.89	252.18	289.14	0.26	0.92	5.66
FillP	3	1.28	0.81	0.69	465.82	1035.00	628.96	96.12	98.38	96.76
Indigo	3	0.65	0.99	0.93	236.46	277.65	216.56	1.94	4.03	4.56

Run 1: Statistics of TCP BBR

Start at: 2017-12-20 17:57:02  
End at: 2017-12-20 17:57:32  
Local clock offset: 4.261 ms  
Remote clock offset: -19.29 ms

# Below is generated by plot.py at 2017-12-20 19:32:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.57 Mbit/s  
95th percentile per-packet one-way delay: 384.420 ms  
Loss rate: 22.21%  
-- Flow 1:  
Average throughput: 0.40 Mbit/s  
95th percentile per-packet one-way delay: 382.703 ms  
Loss rate: 17.15%  
-- Flow 2:  
Average throughput: 0.24 Mbit/s  
95th percentile per-packet one-way delay: 392.339 ms  
Loss rate: 29.54%  
-- Flow 3:  
Average throughput: 0.11 Mbit/s  
95th percentile per-packet one-way delay: 382.545 ms  
Loss rate: 46.23%

Run 1: Report of TCP BBR — Data Link

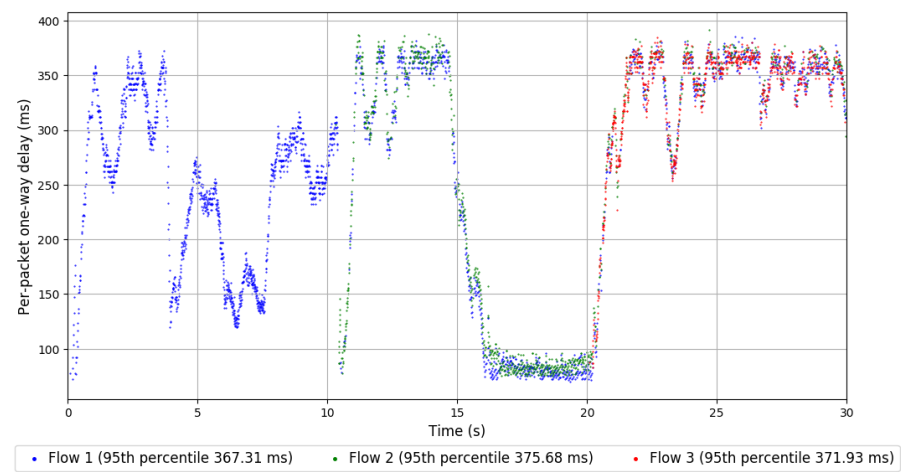
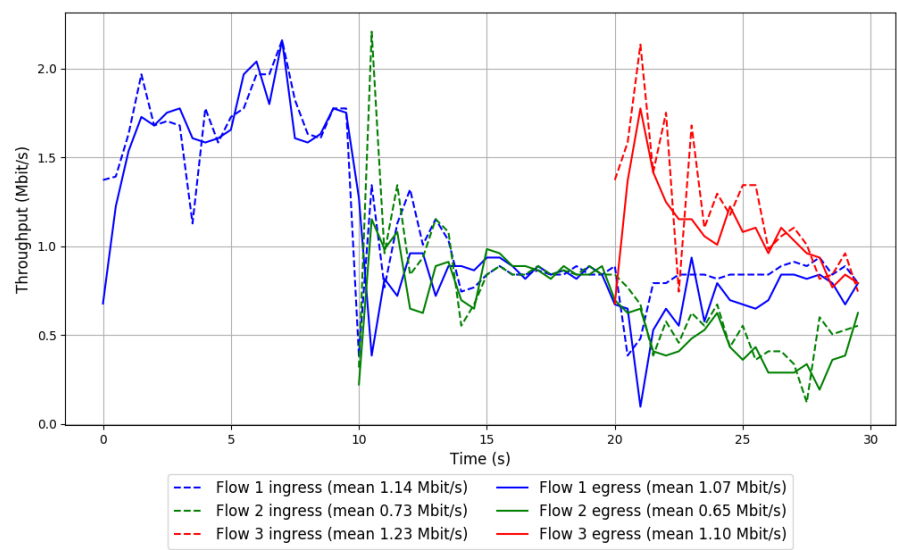


Run 2: Statistics of TCP BBR

Start at: 2017-12-20 18:13:56  
End at: 2017-12-20 18:14:26  
Local clock offset: 3.765 ms  
Remote clock offset: -20.904 ms

# Below is generated by plot.py at 2017-12-20 19:32:55  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.86 Mbit/s  
95th percentile per-packet one-way delay: 371.207 ms  
Loss rate: 8.76%  
-- Flow 1:  
Average throughput: 1.07 Mbit/s  
95th percentile per-packet one-way delay: 367.308 ms  
Loss rate: 6.41%  
-- Flow 2:  
Average throughput: 0.65 Mbit/s  
95th percentile per-packet one-way delay: 375.682 ms  
Loss rate: 12.01%  
-- Flow 3:  
Average throughput: 1.10 Mbit/s  
95th percentile per-packet one-way delay: 371.929 ms  
Loss rate: 11.48%

Run 2: Report of TCP BBR — Data Link

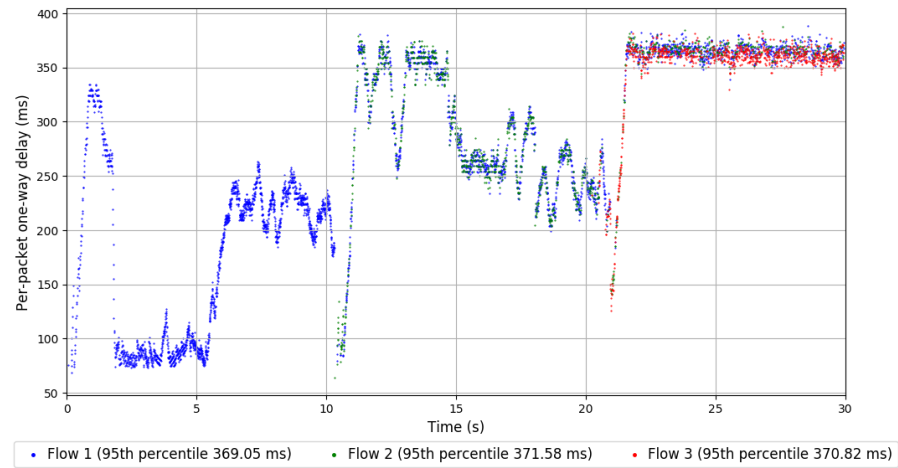
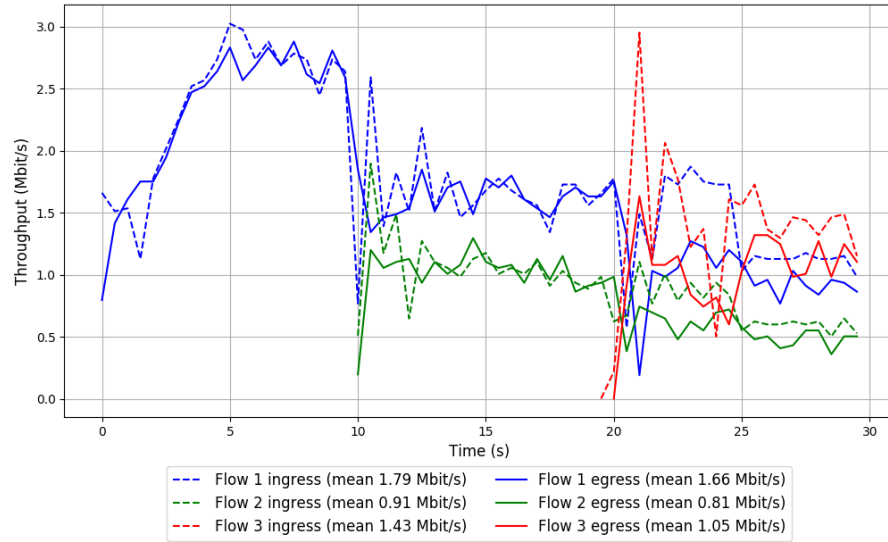


Run 3: Statistics of TCP BBR

Start at: 2017-12-20 18:30:39  
End at: 2017-12-20 18:31:09  
Local clock offset: 2.176 ms  
Remote clock offset: -22.042 ms

# Below is generated by plot.py at 2017-12-20 19:32:57  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.53 Mbit/s  
95th percentile per-packet one-way delay: 369.833 ms  
Loss rate: 11.77%  
-- Flow 1:  
Average throughput: 1.66 Mbit/s  
95th percentile per-packet one-way delay: 369.051 ms  
Loss rate: 7.47%  
-- Flow 2:  
Average throughput: 0.81 Mbit/s  
95th percentile per-packet one-way delay: 371.582 ms  
Loss rate: 11.54%  
-- Flow 3:  
Average throughput: 1.05 Mbit/s  
95th percentile per-packet one-way delay: 370.822 ms  
Loss rate: 28.28%

### Run 3: Report of TCP BBR — Data Link

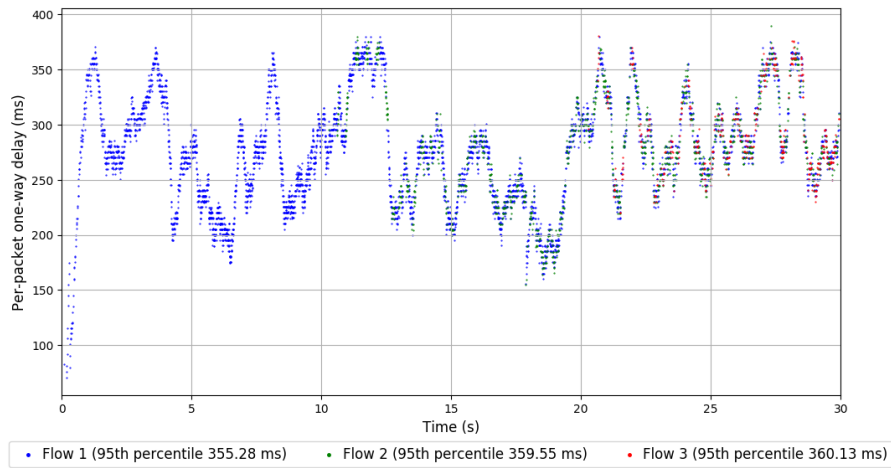
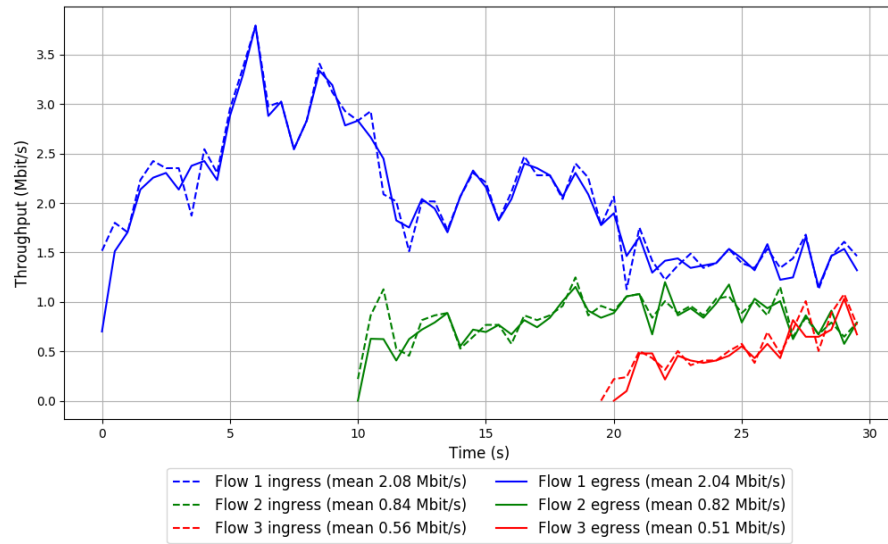


Run 1: Statistics of TCP Cubic

Start at: 2017-12-20 18:07:08  
End at: 2017-12-20 18:07:38  
Local clock offset: 4.659 ms  
Remote clock offset: -20.293 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.75 Mbit/s  
95th percentile per-packet one-way delay: 355.634 ms  
Loss rate: 2.80%  
-- Flow 1:  
Average throughput: 2.04 Mbit/s  
95th percentile per-packet one-way delay: 355.279 ms  
Loss rate: 1.87%  
-- Flow 2:  
Average throughput: 0.82 Mbit/s  
95th percentile per-packet one-way delay: 359.546 ms  
Loss rate: 3.93%  
-- Flow 3:  
Average throughput: 0.51 Mbit/s  
95th percentile per-packet one-way delay: 360.130 ms  
Loss rate: 9.82%

# Run 1: Report of TCP Cubic — Data Link

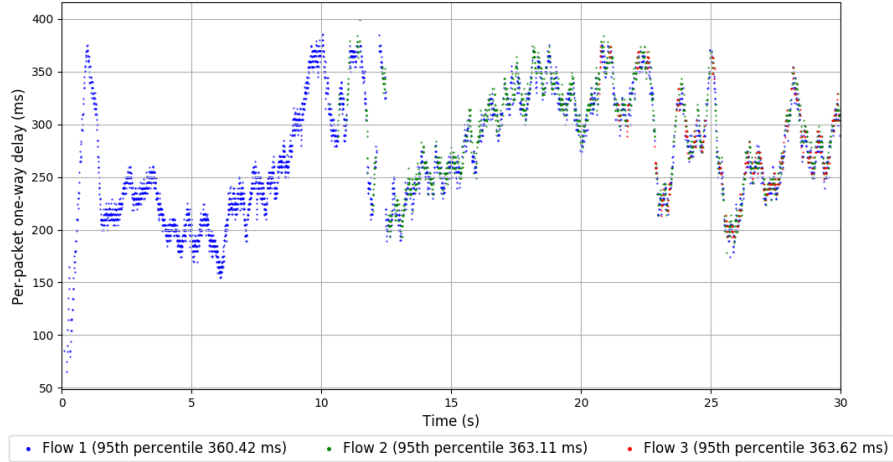
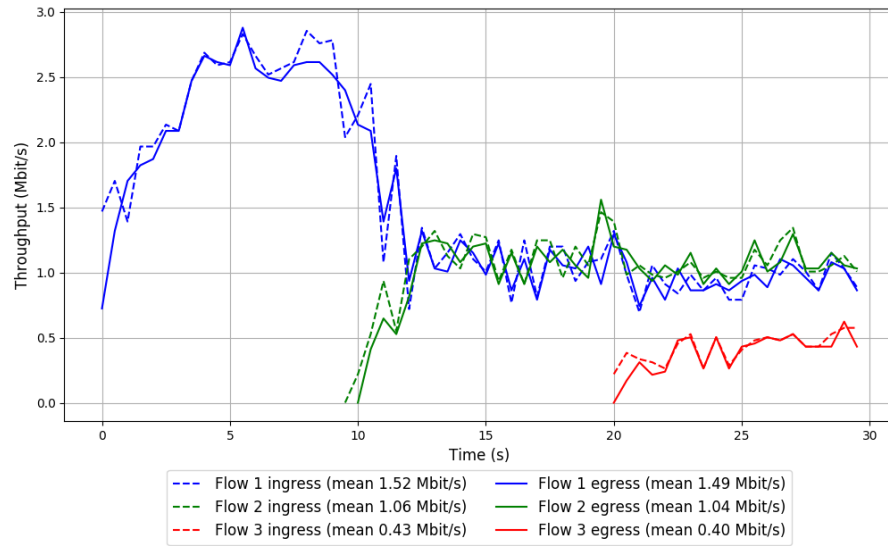


Run 2: Statistics of TCP Cubic

Start at: 2017-12-20 18:23:54  
End at: 2017-12-20 18:24:24  
Local clock offset: 5.697 ms  
Remote clock offset: -20.288 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.30 Mbit/s  
95th percentile per-packet one-way delay: 363.153 ms  
Loss rate: 2.97%  
-- Flow 1:  
Average throughput: 1.49 Mbit/s  
95th percentile per-packet one-way delay: 360.424 ms  
Loss rate: 2.40%  
-- Flow 2:  
Average throughput: 1.04 Mbit/s  
95th percentile per-packet one-way delay: 363.112 ms  
Loss rate: 2.90%  
-- Flow 3:  
Average throughput: 0.40 Mbit/s  
95th percentile per-packet one-way delay: 363.618 ms  
Loss rate: 9.32%

## Run 2: Report of TCP Cubic — Data Link

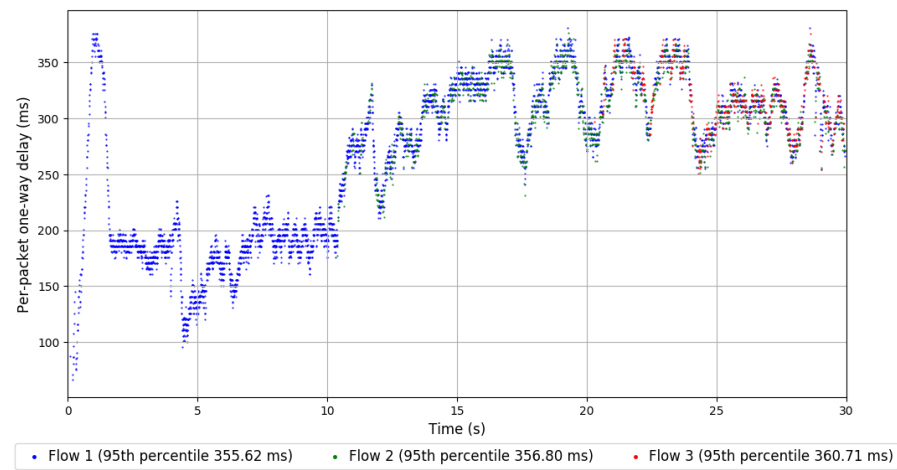
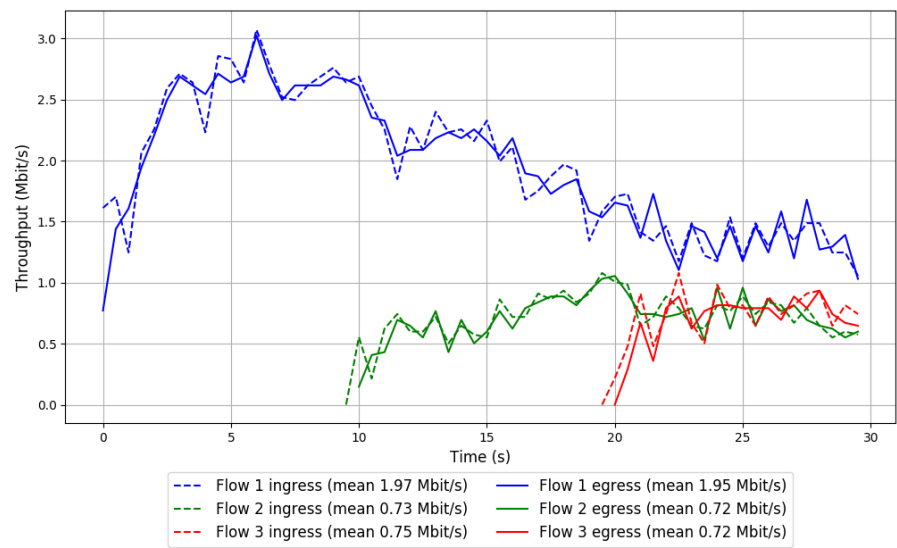


Run 3: Statistics of TCP Cubic

Start at: 2017-12-20 18:40:38  
End at: 2017-12-20 18:41:08  
Local clock offset: 2.336 ms  
Remote clock offset: -22.195 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.66 Mbit/s  
95th percentile per-packet one-way delay: 356.285 ms  
Loss rate: 1.88%  
-- Flow 1:  
Average throughput: 1.95 Mbit/s  
95th percentile per-packet one-way delay: 355.625 ms  
Loss rate: 1.06%  
-- Flow 2:  
Average throughput: 0.72 Mbit/s  
95th percentile per-packet one-way delay: 356.801 ms  
Loss rate: 2.55%  
-- Flow 3:  
Average throughput: 0.72 Mbit/s  
95th percentile per-packet one-way delay: 360.706 ms  
Loss rate: 7.12%

Run 3: Report of TCP Cubic — Data Link

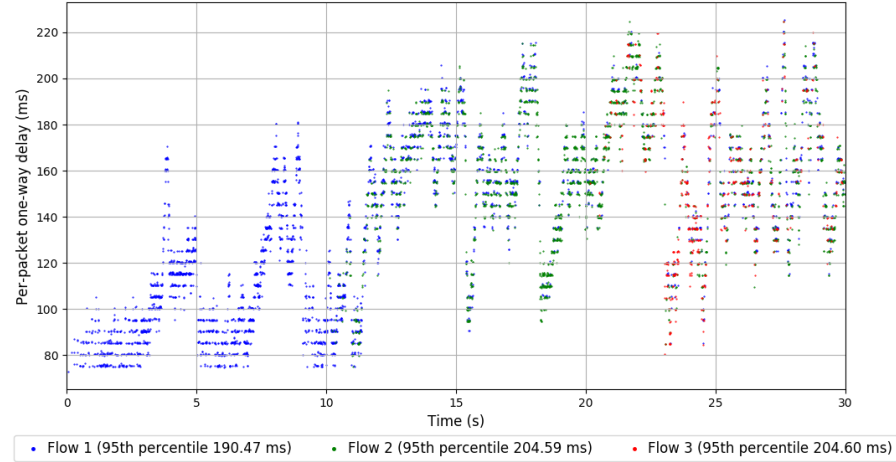
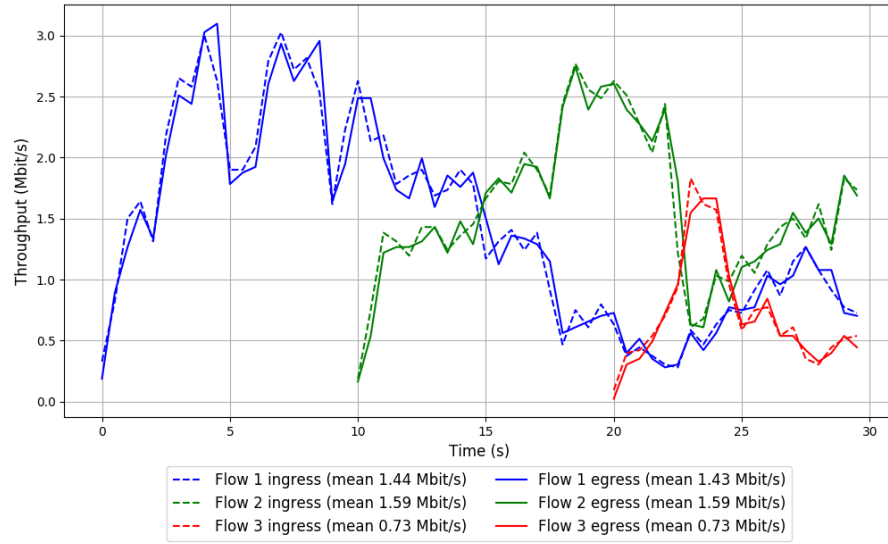


Run 1: Statistics of LEDBAT

Start at: 2017-12-20 18:06:01  
End at: 2017-12-20 18:06:31  
Local clock offset: 3.771 ms  
Remote clock offset: -20.95 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.72 Mbit/s  
95th percentile per-packet one-way delay: 199.690 ms  
Loss rate: 1.10%  
-- Flow 1:  
Average throughput: 1.43 Mbit/s  
95th percentile per-packet one-way delay: 190.474 ms  
Loss rate: 0.92%  
-- Flow 2:  
Average throughput: 1.59 Mbit/s  
95th percentile per-packet one-way delay: 204.587 ms  
Loss rate: 1.00%  
-- Flow 3:  
Average throughput: 0.73 Mbit/s  
95th percentile per-packet one-way delay: 204.603 ms  
Loss rate: 2.59%

# Run 1: Report of LEDBAT — Data Link

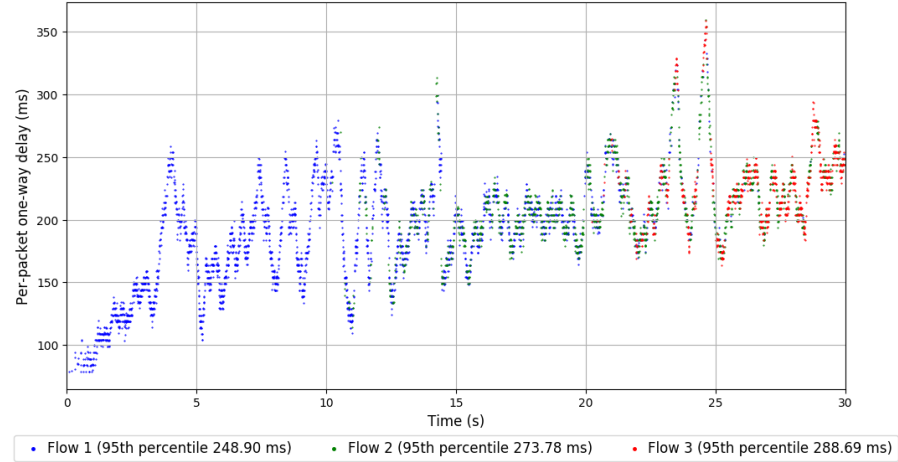
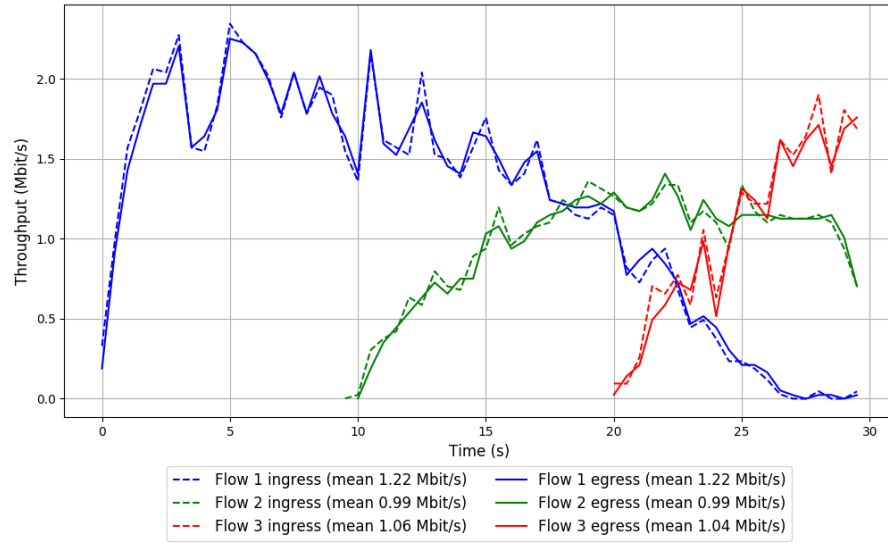


Run 2: Statistics of LEDBAT

Start at: 2017-12-20 18:22:47  
End at: 2017-12-20 18:23:17  
Local clock offset: 4.27 ms  
Remote clock offset: -21.761 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.21 Mbit/s  
95th percentile per-packet one-way delay: 259.651 ms  
Loss rate: 0.98%  
-- Flow 1:  
Average throughput: 1.22 Mbit/s  
95th percentile per-packet one-way delay: 248.895 ms  
Loss rate: 0.03%  
-- Flow 2:  
Average throughput: 0.99 Mbit/s  
95th percentile per-packet one-way delay: 273.777 ms  
Loss rate: 1.18%  
-- Flow 3:  
Average throughput: 1.04 Mbit/s  
95th percentile per-packet one-way delay: 288.691 ms  
Loss rate: 3.88%

## Run 2: Report of LEDBAT — Data Link

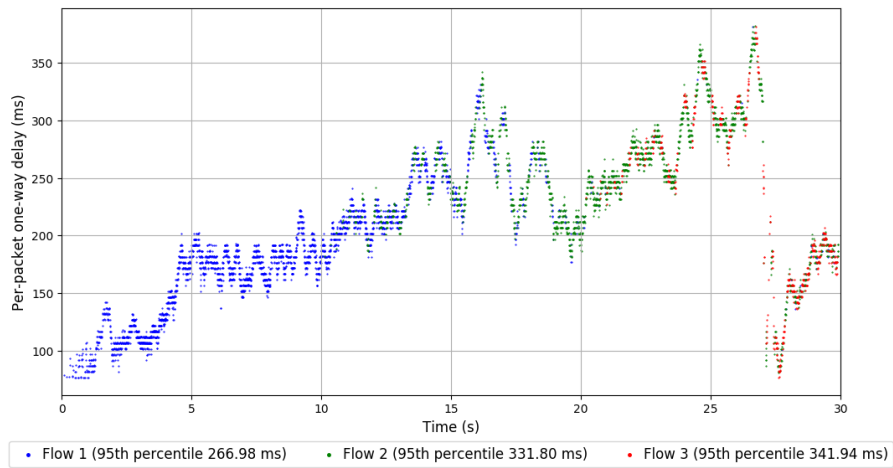
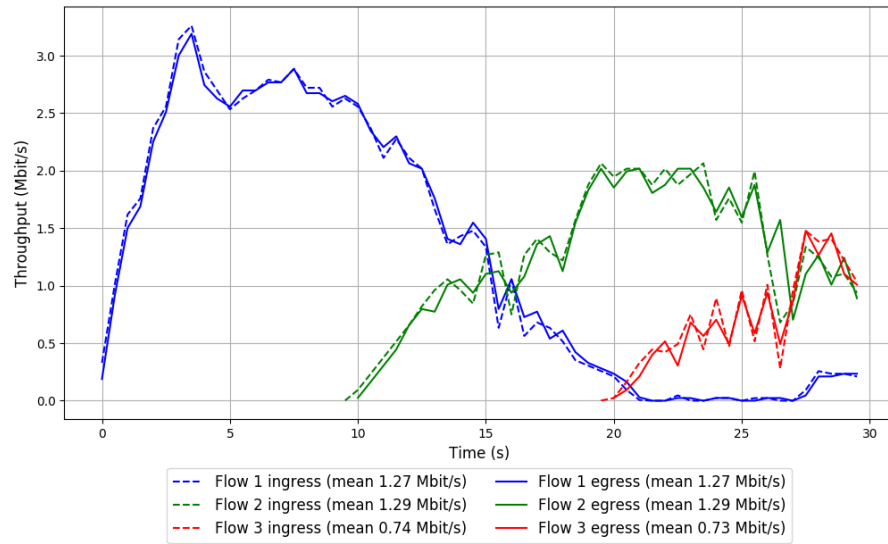


Run 3: Statistics of LEDBAT

Start at: 2017-12-20 18:39:31  
End at: 2017-12-20 18:40:01  
Local clock offset: 4.331 ms  
Remote clock offset: -20.858 ms

# Below is generated by plot.py at 2017-12-20 19:32:58  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.36 Mbit/s  
95th percentile per-packet one-way delay: 316.450 ms  
Loss rate: 0.81%  
-- Flow 1:  
Average throughput: 1.27 Mbit/s  
95th percentile per-packet one-way delay: 266.977 ms  
Loss rate: 0.12%  
-- Flow 2:  
Average throughput: 1.29 Mbit/s  
95th percentile per-packet one-way delay: 331.799 ms  
Loss rate: 0.91%  
-- Flow 3:  
Average throughput: 0.73 Mbit/s  
95th percentile per-packet one-way delay: 341.941 ms  
Loss rate: 3.99%

### Run 3: Report of LEDBAT — Data Link

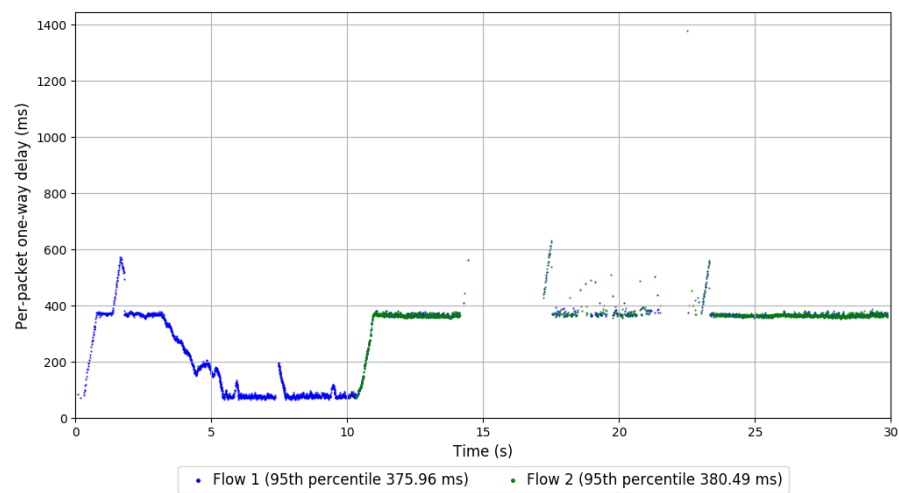
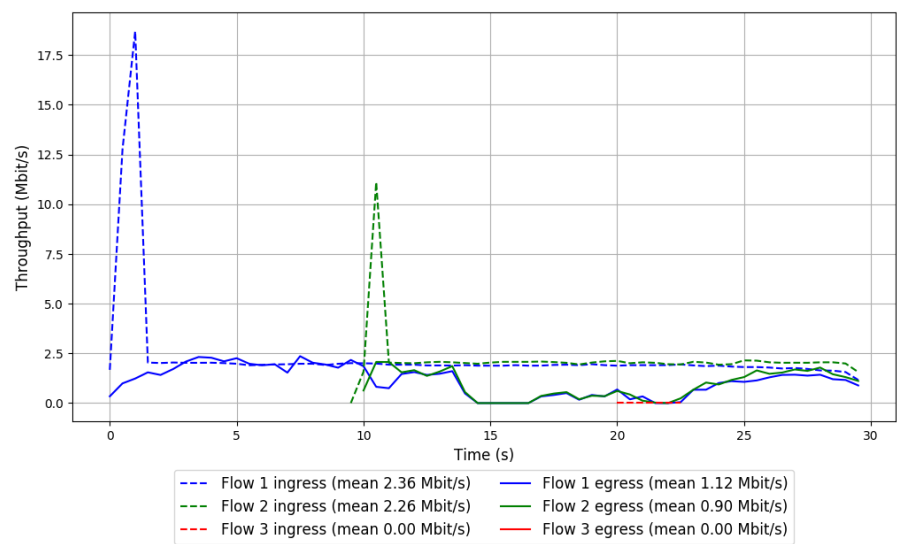


```
Run 1: Statistics of PCC

Start at: 2017-12-20 18:01:35
End at: 2017-12-20 18:02:05
Local clock offset: 3.918 ms
Remote clock offset: -20.801 ms

# Below is generated by plot.py at 2017-12-20 19:33:06
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.72 Mbit/s
95th percentile per-packet one-way delay: 377.153 ms
Loss rate: 55.54%
-- Flow 1:
Average throughput: 1.12 Mbit/s
95th percentile per-packet one-way delay: 375.963 ms
Loss rate: 52.65%
-- Flow 2:
Average throughput: 0.90 Mbit/s
95th percentile per-packet one-way delay: 380.491 ms
Loss rate: 60.06%
-- Flow 3:
Average throughput: 0.00 Mbit/s
```

Run 1: Report of PCC — Data Link

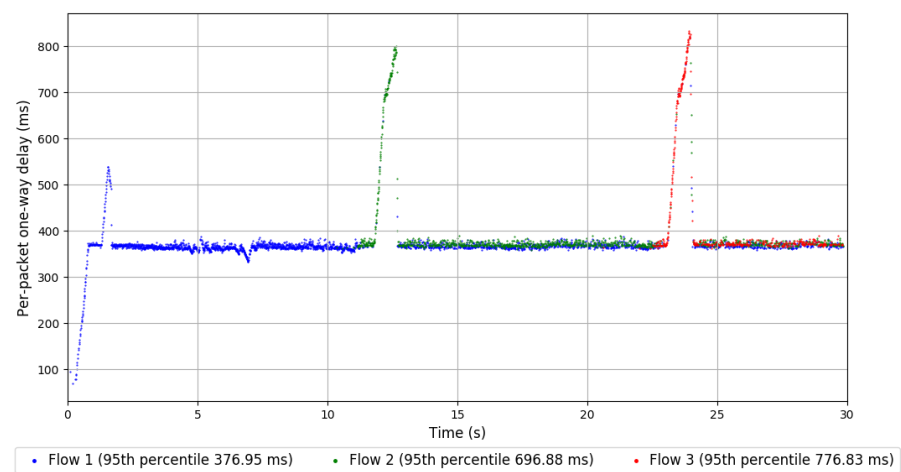
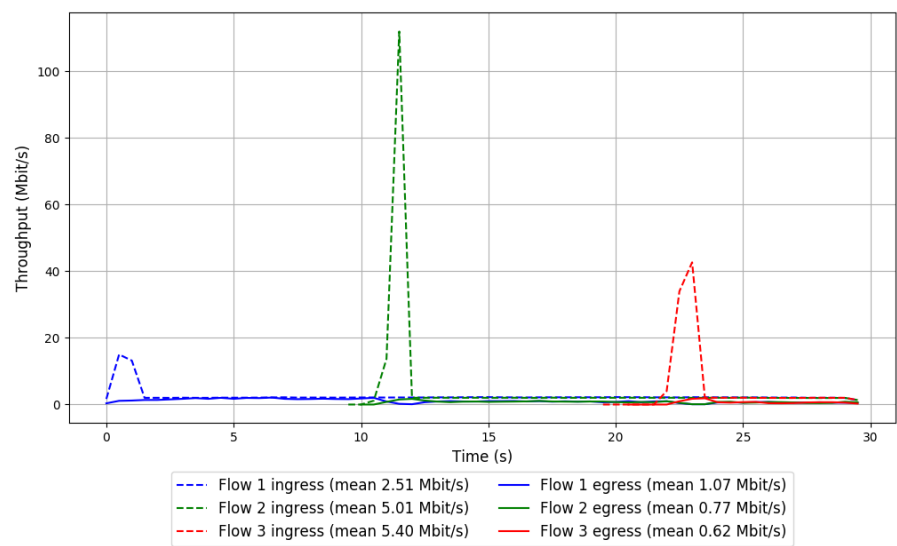


Run 2: Statistics of PCC

Start at: 2017-12-20 18:18:21  
End at: 2017-12-20 18:18:51  
Local clock offset: 2.288 ms  
Remote clock offset: -21.039 ms

# Below is generated by plot.py at 2017-12-20 19:33:07  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.76 Mbit/s  
95th percentile per-packet one-way delay: 534.097 ms  
Loss rate: 76.95%  
-- Flow 1:  
Average throughput: 1.07 Mbit/s  
95th percentile per-packet one-way delay: 376.953 ms  
Loss rate: 57.66%  
-- Flow 2:  
Average throughput: 0.77 Mbit/s  
95th percentile per-packet one-way delay: 696.879 ms  
Loss rate: 84.96%  
-- Flow 3:  
Average throughput: 0.62 Mbit/s  
95th percentile per-packet one-way delay: 776.833 ms  
Loss rate: 89.19%

Run 2: Report of PCC — Data Link

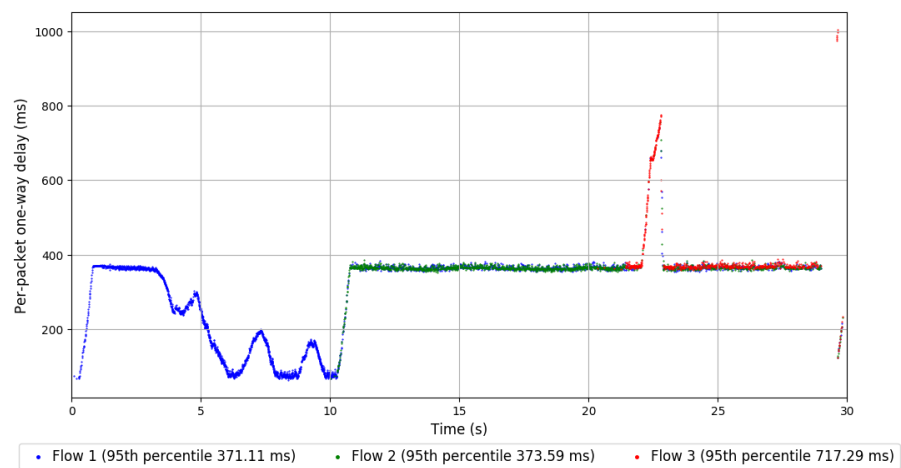
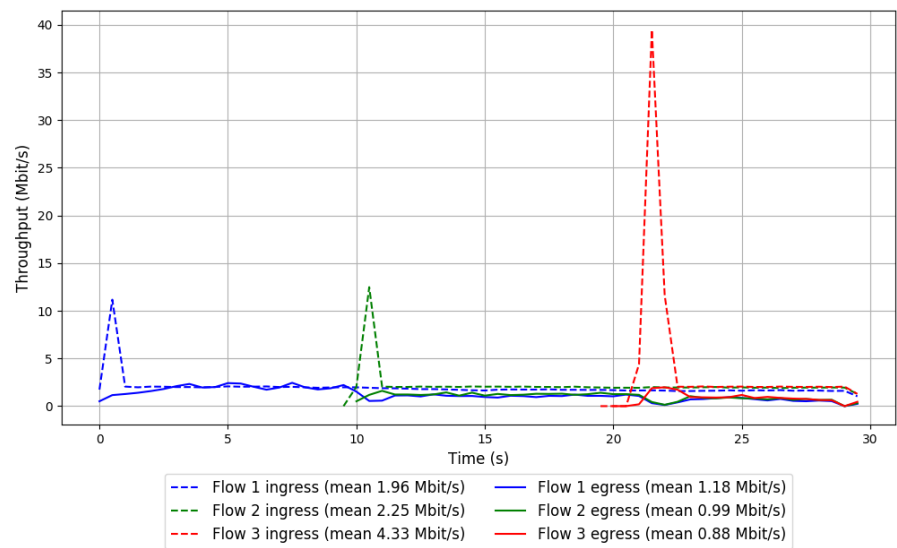


Run 3: Statistics of PCC

Start at: 2017-12-20 18:35:04  
End at: 2017-12-20 18:35:34  
Local clock offset: 3.207 ms  
Remote clock offset: -20.615 ms

# Below is generated by plot.py at 2017-12-20 19:33:07  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.12 Mbit/s  
95th percentile per-packet one-way delay: 375.933 ms  
Loss rate: 56.62%  
-- Flow 1:  
Average throughput: 1.18 Mbit/s  
95th percentile per-packet one-way delay: 371.110 ms  
Loss rate: 39.58%  
-- Flow 2:  
Average throughput: 0.99 Mbit/s  
95th percentile per-packet one-way delay: 373.586 ms  
Loss rate: 56.09%  
-- Flow 3:  
Average throughput: 0.88 Mbit/s  
95th percentile per-packet one-way delay: 717.289 ms  
Loss rate: 80.48%

Run 3: Report of PCC — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2017-12-20 18:02:42

End at: 2017-12-20 18:03:12

Local clock offset: 4.102 ms

Remote clock offset: -19.022 ms

Run 1: Report of QUIC Cubic — Data Link

Figure is missing

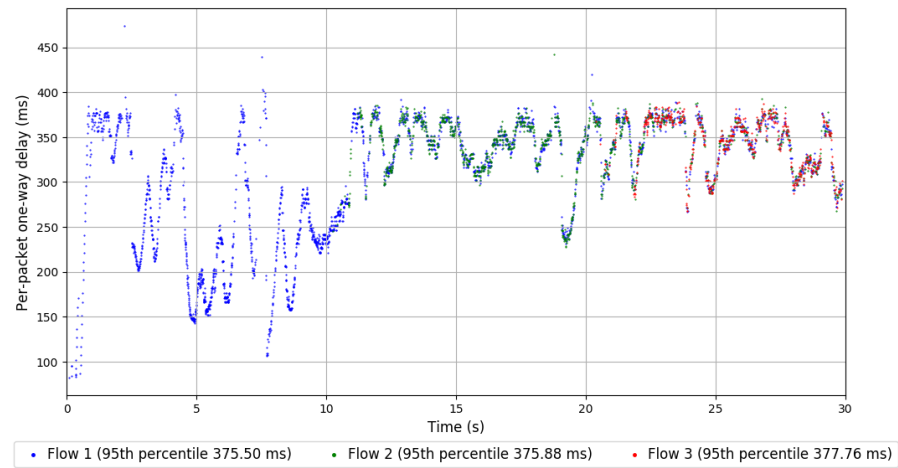
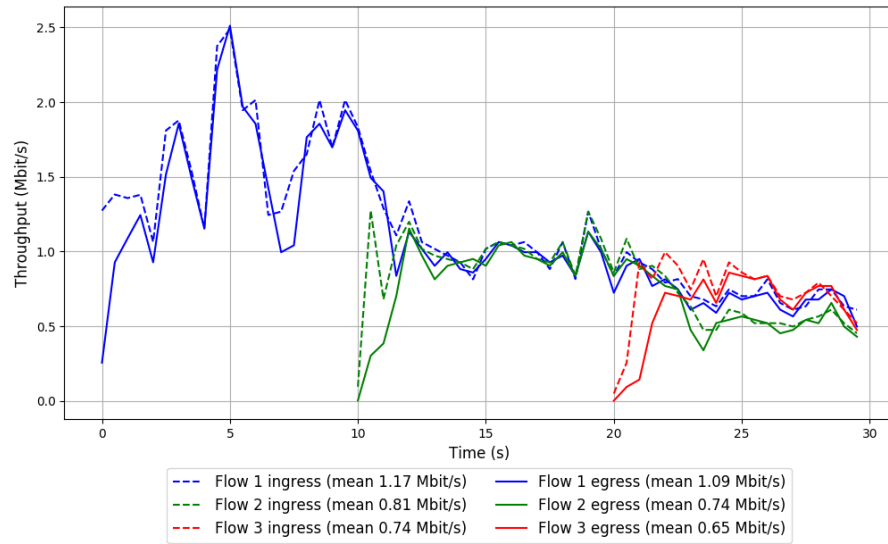
Figure is missing

Run 2: Statistics of QUIC Cubic

Start at: 2017-12-20 18:19:28  
End at: 2017-12-20 18:19:58  
Local clock offset: 6.49 ms  
Remote clock offset: -21.221 ms

# Below is generated by plot.py at 2017-12-20 19:33:07  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.79 Mbit/s  
95th percentile per-packet one-way delay: 376.080 ms  
Loss rate: 8.82%  
-- Flow 1:  
Average throughput: 1.09 Mbit/s  
95th percentile per-packet one-way delay: 375.505 ms  
Loss rate: 7.17%  
-- Flow 2:  
Average throughput: 0.74 Mbit/s  
95th percentile per-packet one-way delay: 375.885 ms  
Loss rate: 9.58%  
-- Flow 3:  
Average throughput: 0.65 Mbit/s  
95th percentile per-packet one-way delay: 377.759 ms  
Loss rate: 15.12%

## Run 2: Report of QUIC Cubic — Data Link

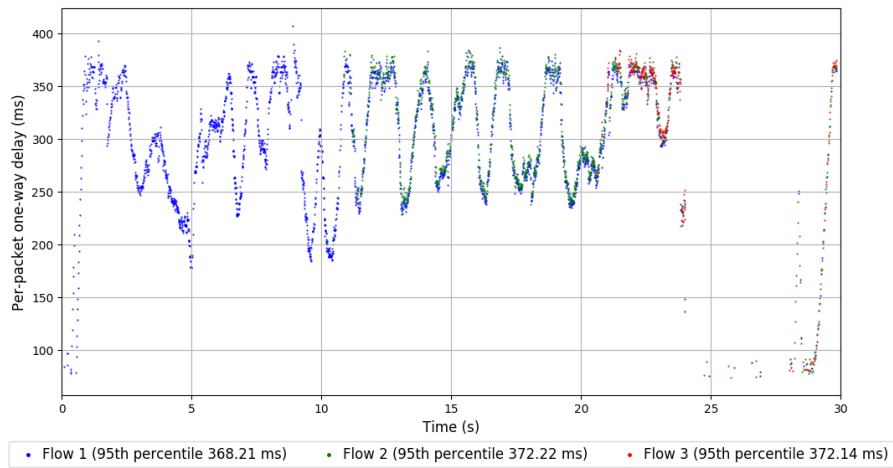
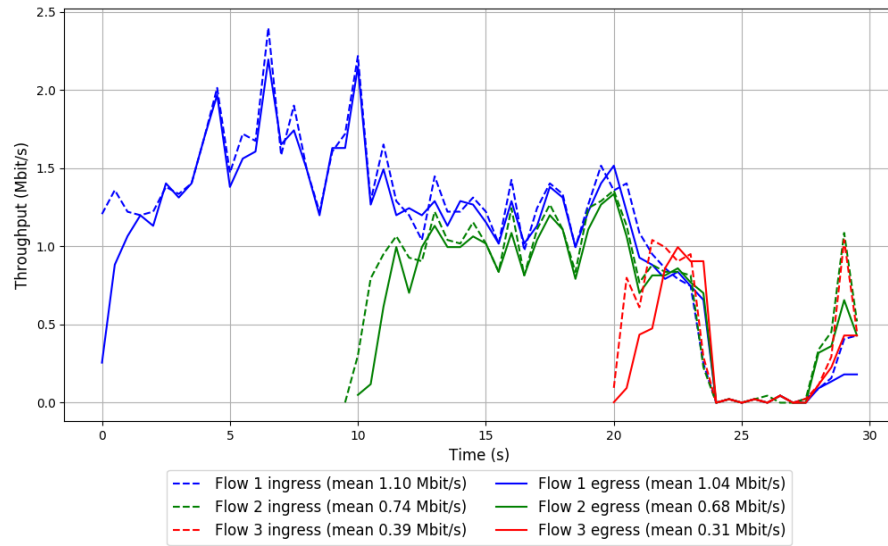


Run 3: Statistics of QUIC Cubic

Start at: 2017-12-20 18:36:11  
End at: 2017-12-20 18:36:41  
Local clock offset: 2.639 ms  
Remote clock offset: -22.723 ms

# Below is generated by plot.py at 2017-12-20 19:33:07  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.60 Mbit/s  
95th percentile per-packet one-way delay: 368.993 ms  
Loss rate: 7.82%  
-- Flow 1:  
Average throughput: 1.04 Mbit/s  
95th percentile per-packet one-way delay: 368.208 ms  
Loss rate: 5.54%  
-- Flow 2:  
Average throughput: 0.68 Mbit/s  
95th percentile per-packet one-way delay: 372.219 ms  
Loss rate: 9.04%  
-- Flow 3:  
Average throughput: 0.31 Mbit/s  
95th percentile per-packet one-way delay: 372.138 ms  
Loss rate: 22.61%

### Run 3: Report of QUIC Cubic — Data Link

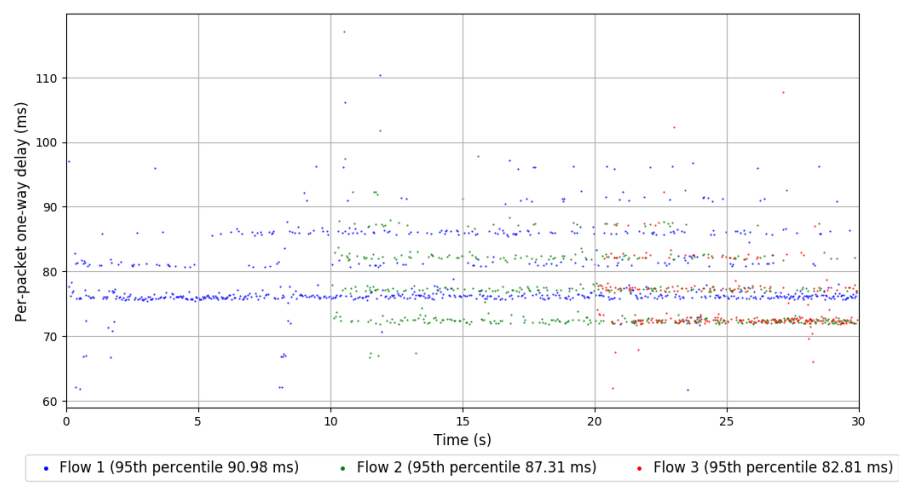
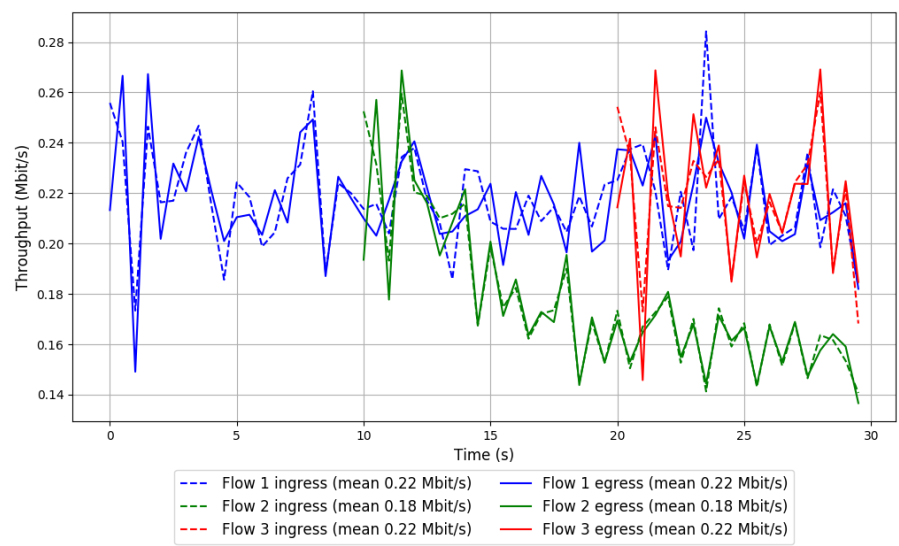


```
Run 1: Statistics of SCReAM

Start at: 2017-12-20 18:00:23
End at: 2017-12-20 18:00:53
Local clock offset: 3.456 ms
Remote clock offset: -21.489 ms

# Below is generated by plot.py at 2017-12-20 19:33:07
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 87.360 ms
Loss rate: 0.38%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 90.978 ms
Loss rate: 0.26%
-- Flow 2:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 87.308 ms
Loss rate: 0.63%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 82.806 ms
Loss rate: 0.36%
```

Run 1: Report of SReAM — Data Link

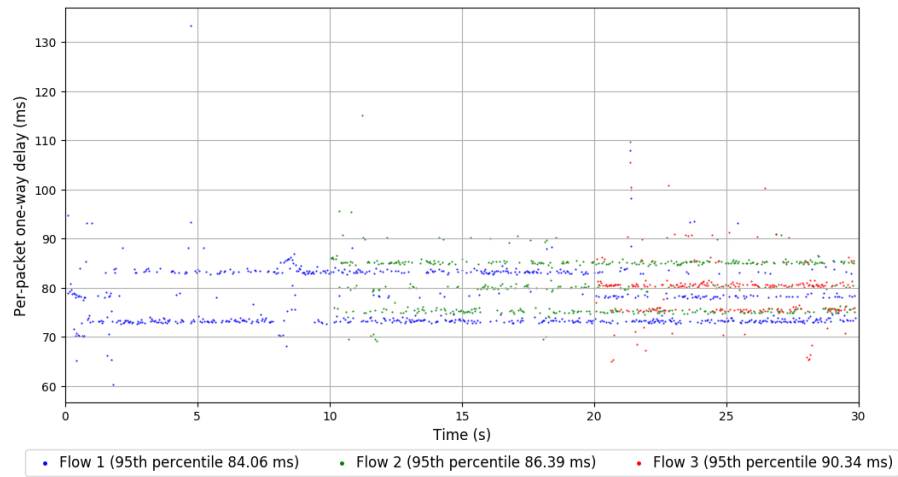
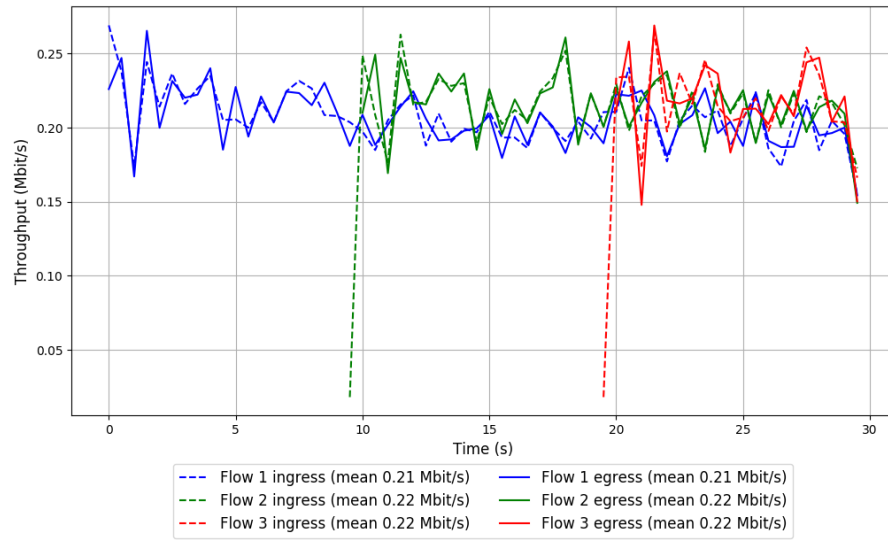


Run 2: Statistics of SReAM

Start at: 2017-12-20 18:17:15  
End at: 2017-12-20 18:17:45  
Local clock offset: 4.238 ms  
Remote clock offset: -20.533 ms

# Below is generated by plot.py at 2017-12-20 19:33:07  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.42 Mbit/s  
95th percentile per-packet one-way delay: 85.802 ms  
Loss rate: 0.46%  
-- Flow 1:  
Average throughput: 0.21 Mbit/s  
95th percentile per-packet one-way delay: 84.064 ms  
Loss rate: 0.25%  
-- Flow 2:  
Average throughput: 0.22 Mbit/s  
95th percentile per-packet one-way delay: 86.388 ms  
Loss rate: 0.61%  
-- Flow 3:  
Average throughput: 0.22 Mbit/s  
95th percentile per-packet one-way delay: 90.338 ms  
Loss rate: 0.74%

## Run 2: Report of SReAM — Data Link



Run 3: Statistics of SCReAM

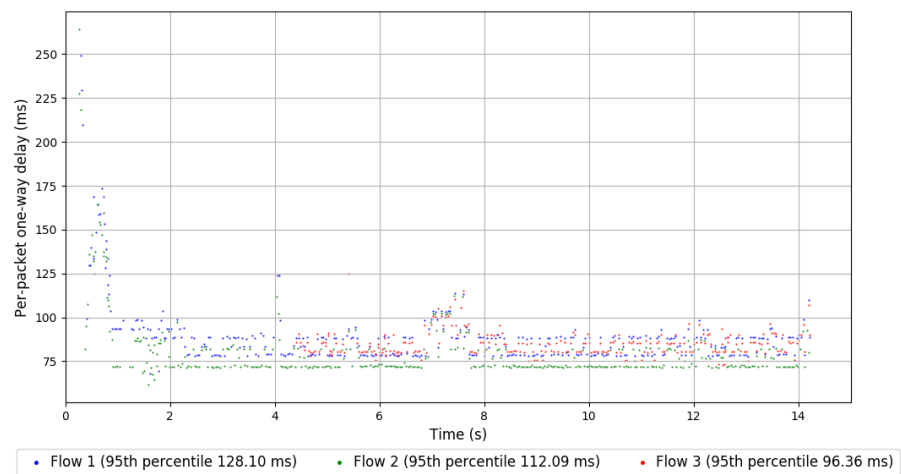
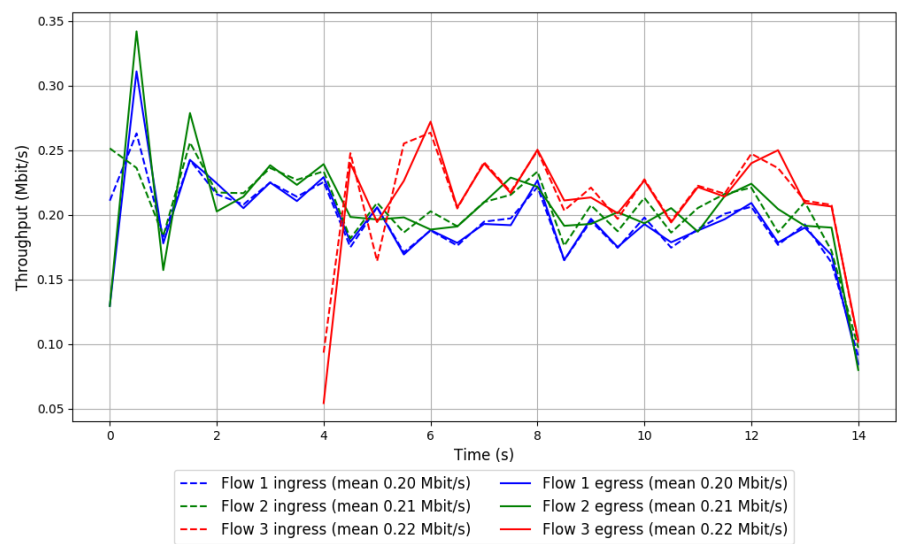
Start at: 2017-12-20 18:33:58

End at: 2017-12-20 18:34:28

Local clock offset: 4.186 ms

Remote clock offset: -21.182 ms

Run 3: Report of SReAM — Data Link

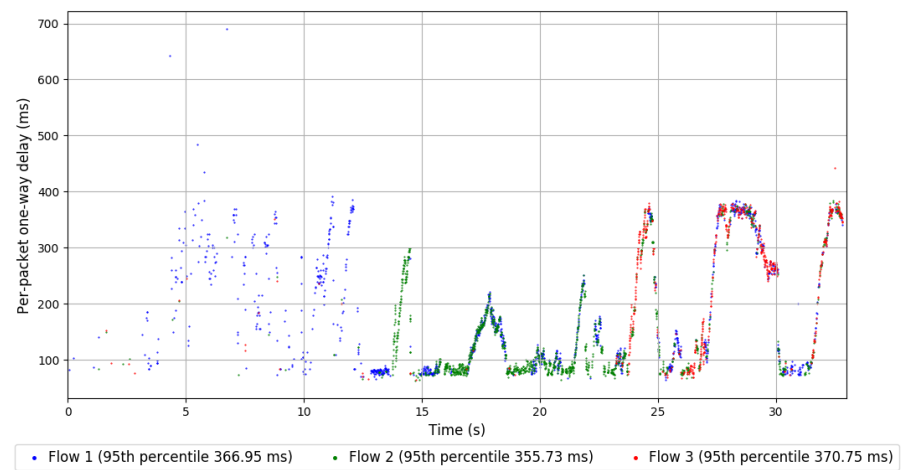
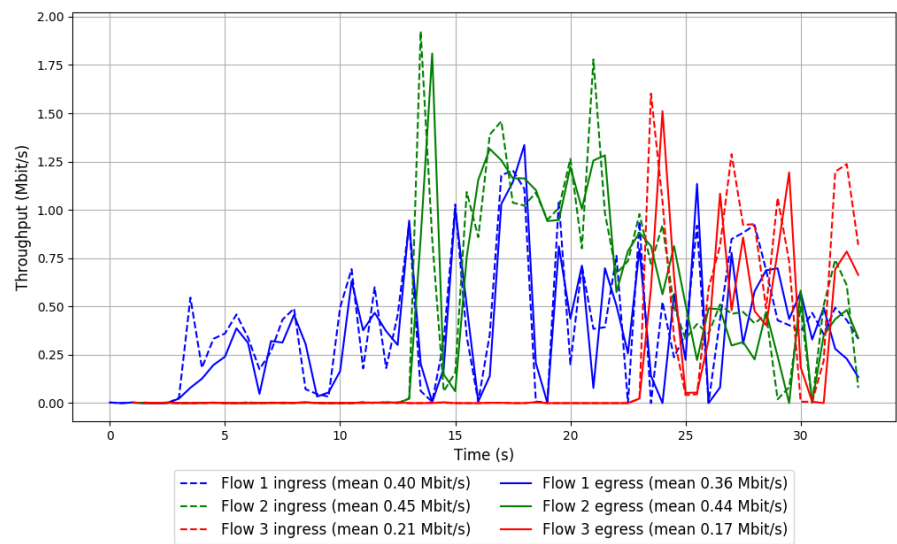


Run 1: Statistics of WebRTC media

Start at: 2017-12-20 17:58:09  
End at: 2017-12-20 17:58:39  
Local clock offset: 3.832 ms  
Remote clock offset: -21.31 ms

# Below is generated by plot.py at 2017-12-20 19:33:08  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.95 Mbit/s  
95th percentile per-packet one-way delay: 366.211 ms  
Loss rate: 8.84%  
-- Flow 1:  
Average throughput: 0.36 Mbit/s  
95th percentile per-packet one-way delay: 366.951 ms  
Loss rate: 9.69%  
-- Flow 2:  
Average throughput: 0.44 Mbit/s  
95th percentile per-packet one-way delay: 355.727 ms  
Loss rate: 3.11%  
-- Flow 3:  
Average throughput: 0.17 Mbit/s  
95th percentile per-packet one-way delay: 370.755 ms  
Loss rate: 19.20%

Run 1: Report of WebRTC media — Data Link

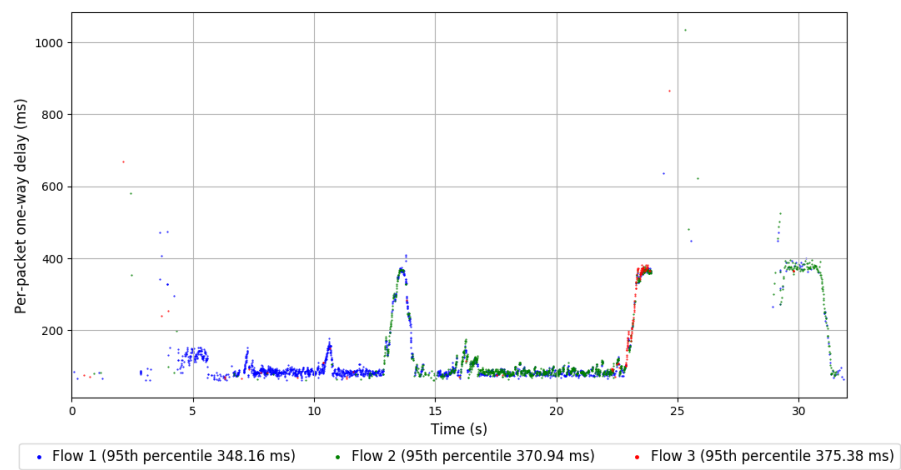
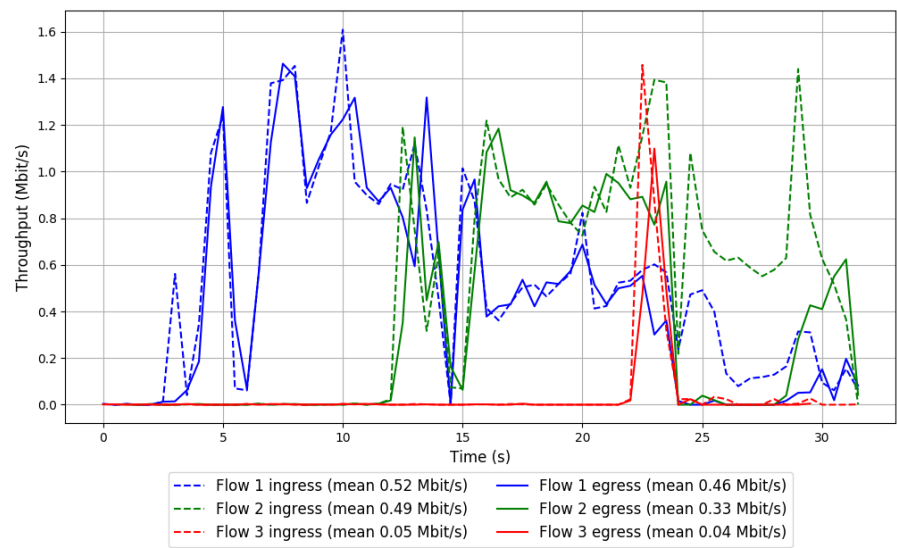


Run 2: Statistics of WebRTC media

Start at: 2017-12-20 18:15:02  
End at: 2017-12-20 18:15:32  
Local clock offset: 4.312 ms  
Remote clock offset: -20.409 ms

# Below is generated by plot.py at 2017-12-20 19:33:09  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.82 Mbit/s  
95th percentile per-packet one-way delay: 366.598 ms  
Loss rate: 21.30%  
-- Flow 1:  
Average throughput: 0.46 Mbit/s  
95th percentile per-packet one-way delay: 348.160 ms  
Loss rate: 11.99%  
-- Flow 2:  
Average throughput: 0.33 Mbit/s  
95th percentile per-packet one-way delay: 370.944 ms  
Loss rate: 31.29%  
-- Flow 3:  
Average throughput: 0.04 Mbit/s  
95th percentile per-packet one-way delay: 375.381 ms  
Loss rate: 25.53%

Run 2: Report of WebRTC media — Data Link

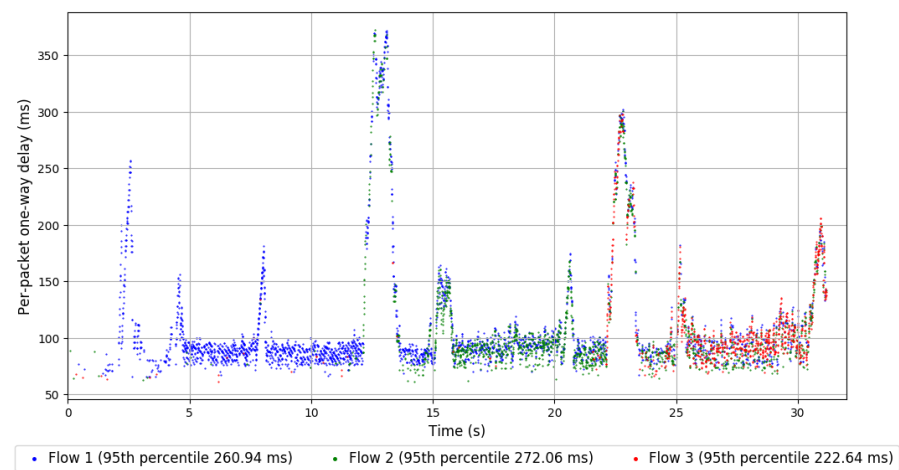
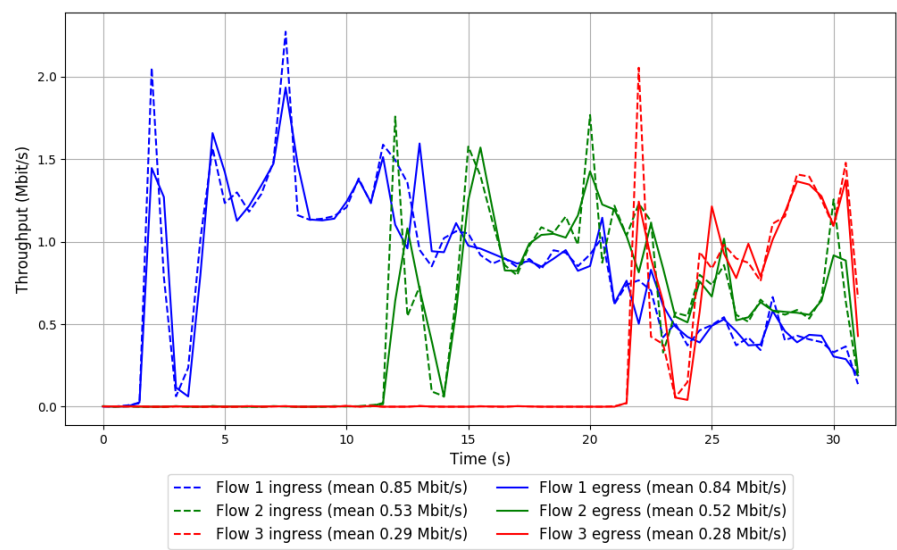


Run 3: Statistics of WebRTC media

Start at: 2017-12-20 18:31:45  
End at: 2017-12-20 18:32:15  
Local clock offset: 4.818 ms  
Remote clock offset: -22.325 ms

# Below is generated by plot.py at 2017-12-20 19:33:11  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.63 Mbit/s  
95th percentile per-packet one-way delay: 255.881 ms  
Loss rate: 1.51%  
-- Flow 1:  
Average throughput: 0.84 Mbit/s  
95th percentile per-packet one-way delay: 260.936 ms  
Loss rate: 0.76%  
-- Flow 2:  
Average throughput: 0.52 Mbit/s  
95th percentile per-packet one-way delay: 272.064 ms  
Loss rate: 1.46%  
-- Flow 3:  
Average throughput: 0.28 Mbit/s  
95th percentile per-packet one-way delay: 222.644 ms  
Loss rate: 3.75%

Run 3: Report of WebRTC media — Data Link

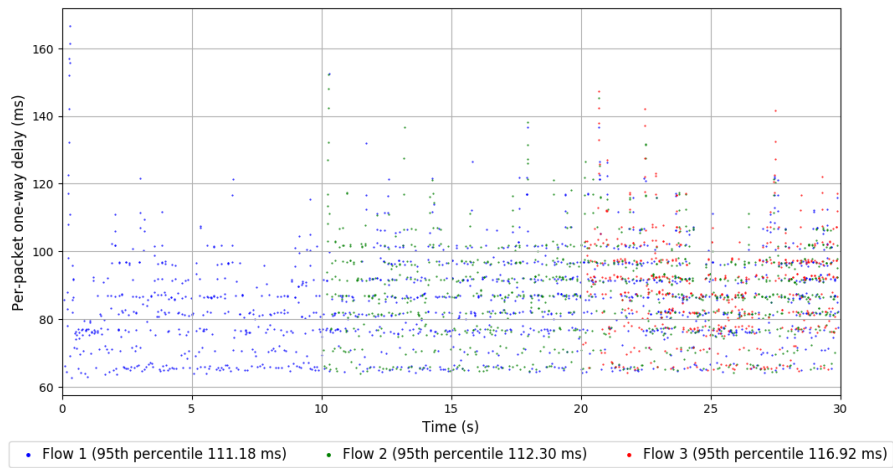
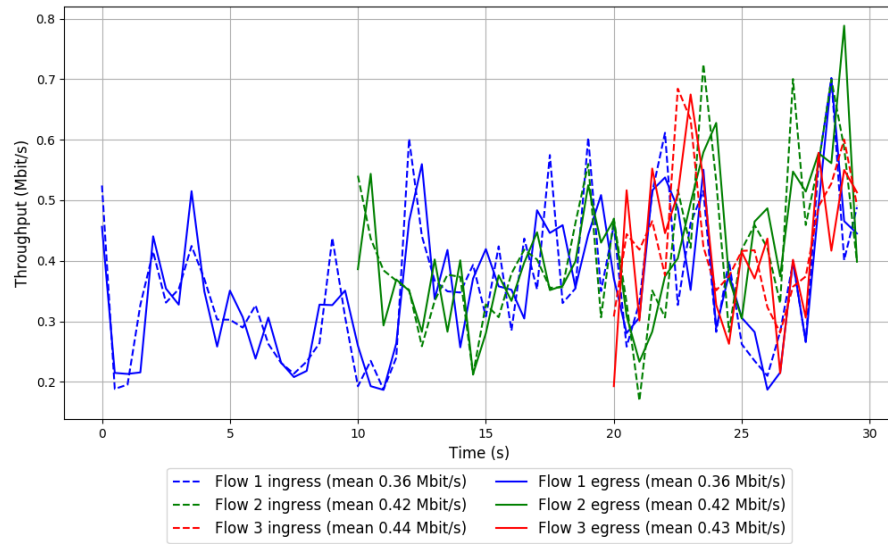


Run 1: Statistics of Sprout

Start at: 2017-12-20 18:03:49  
End at: 2017-12-20 18:04:19  
Local clock offset: 4.222 ms  
Remote clock offset: -22.22 ms

# Below is generated by plot.py at 2017-12-20 19:33:11  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.78 Mbit/s  
95th percentile per-packet one-way delay: 112.032 ms  
Loss rate: 0.98%  
-- Flow 1:  
Average throughput: 0.36 Mbit/s  
95th percentile per-packet one-way delay: 111.177 ms  
Loss rate: 0.74%  
-- Flow 2:  
Average throughput: 0.42 Mbit/s  
95th percentile per-packet one-way delay: 112.303 ms  
Loss rate: 0.38%  
-- Flow 3:  
Average throughput: 0.43 Mbit/s  
95th percentile per-packet one-way delay: 116.918 ms  
Loss rate: 2.71%

## Run 1: Report of Sprout — Data Link

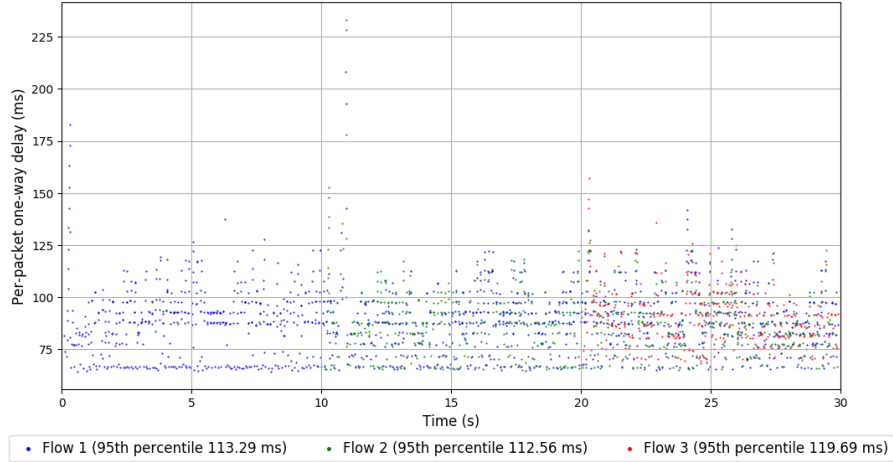
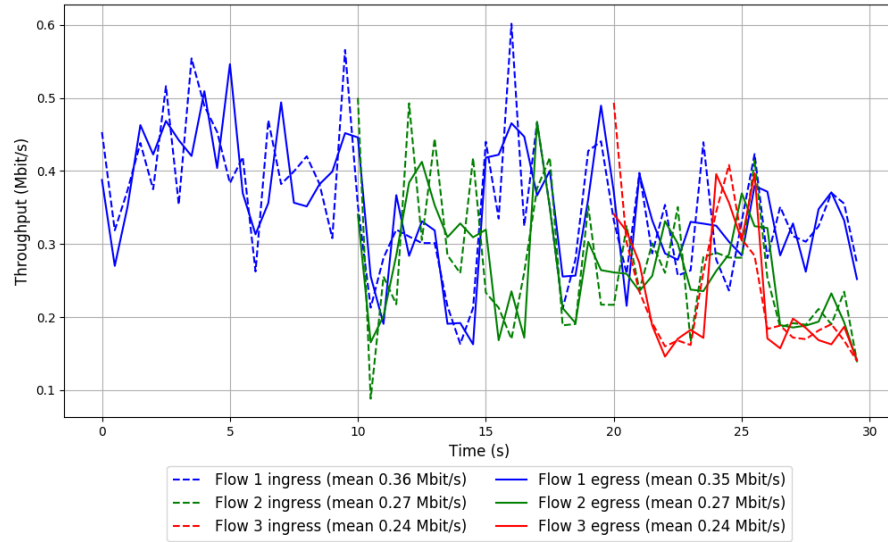


Run 2: Statistics of Sprout

Start at: 2017-12-20 18:20:34  
End at: 2017-12-20 18:21:04  
Local clock offset: 6.1 ms  
Remote clock offset: -22.356 ms

# Below is generated by plot.py at 2017-12-20 19:33:11  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.61 Mbit/s  
95th percentile per-packet one-way delay: 113.517 ms  
Loss rate: 0.93%  
-- Flow 1:  
Average throughput: 0.35 Mbit/s  
95th percentile per-packet one-way delay: 113.290 ms  
Loss rate: 0.63%  
-- Flow 2:  
Average throughput: 0.27 Mbit/s  
95th percentile per-packet one-way delay: 112.557 ms  
Loss rate: 1.04%  
-- Flow 3:  
Average throughput: 0.24 Mbit/s  
95th percentile per-packet one-way delay: 119.690 ms  
Loss rate: 2.01%

## Run 2: Report of Sprout — Data Link

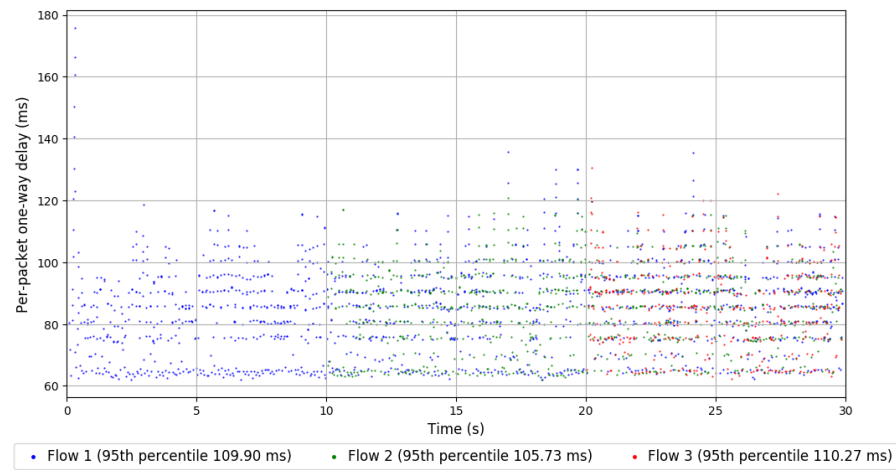
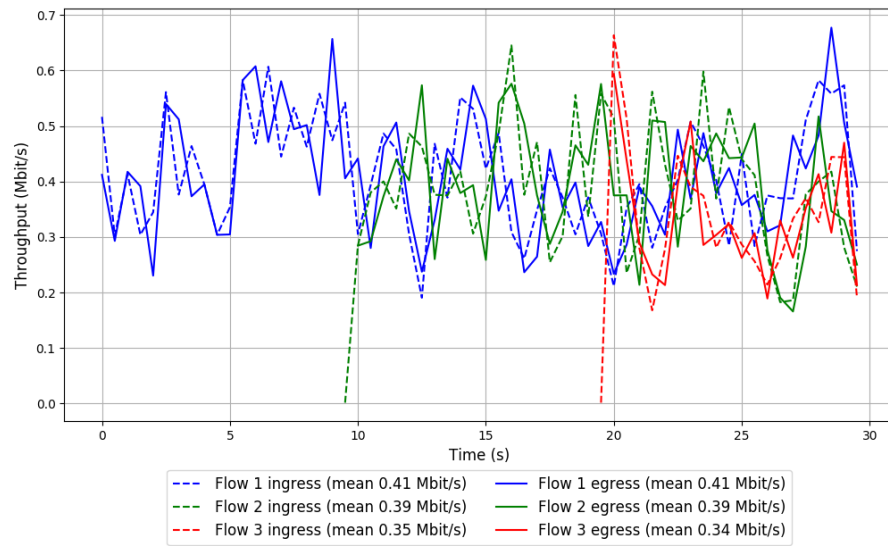


### Run 3: Statistics of Sprout

Start at: 2017-12-20 18:37:17  
End at: 2017-12-20 18:37:47  
Local clock offset: 4.82 ms  
Remote clock offset: -23.135 ms

```
# Below is generated by plot.py at 2017-12-20 19:33:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.79 Mbit/s
95th percentile per-packet one-way delay: 106.394 ms
Loss rate: 0.63%
-- Flow 1:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 109.903 ms
Loss rate: 0.54%
-- Flow 2:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 105.735 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 110.271 ms
Loss rate: 2.33%
```

### Run 3: Report of Sprout — Data Link

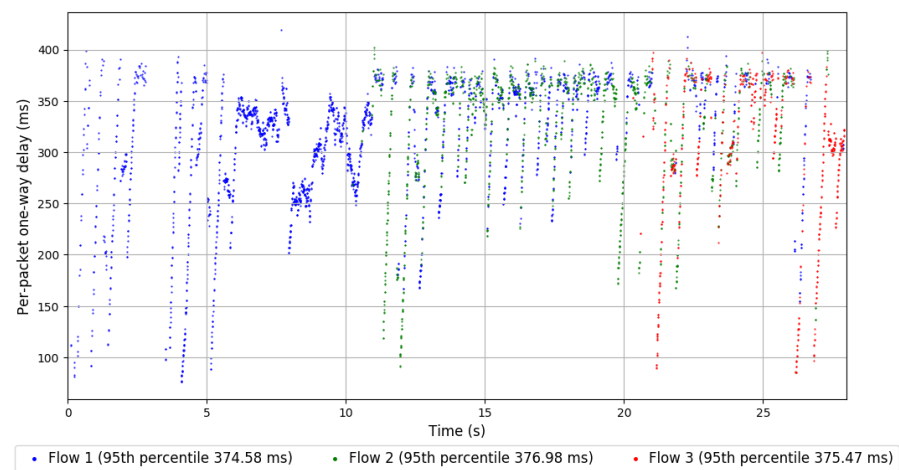
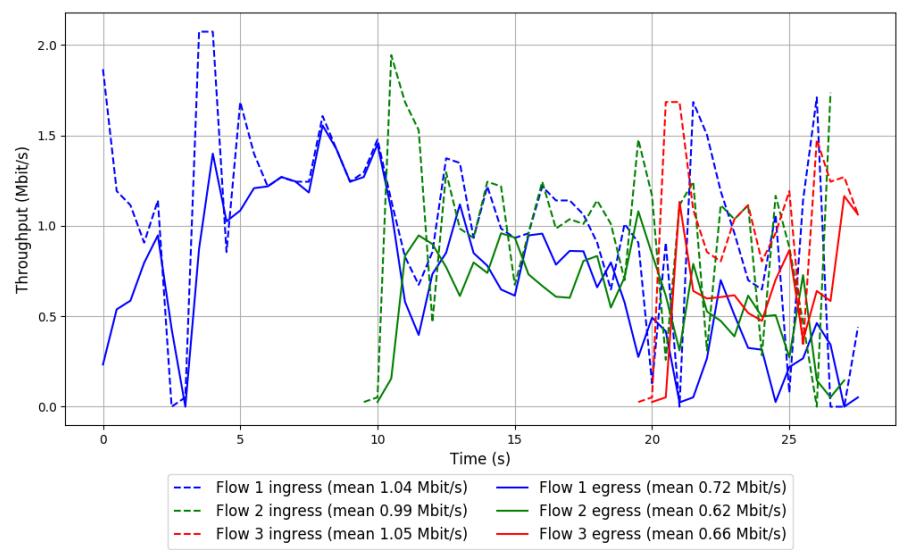


Run 1: Statistics of TaoVA-100x

Start at: 2017-12-20 17:52:30  
End at: 2017-12-20 17:53:00  
Local clock offset: 5.462 ms  
Remote clock offset: -20.025 ms

# Below is generated by plot.py at 2017-12-20 19:33:13  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.28 Mbit/s  
95th percentile per-packet one-way delay: 375.807 ms  
Loss rate: 34.21%  
-- Flow 1:  
Average throughput: 0.72 Mbit/s  
95th percentile per-packet one-way delay: 374.580 ms  
Loss rate: 31.11%  
-- Flow 2:  
Average throughput: 0.62 Mbit/s  
95th percentile per-packet one-way delay: 376.979 ms  
Loss rate: 36.79%  
-- Flow 3:  
Average throughput: 0.66 Mbit/s  
95th percentile per-packet one-way delay: 375.467 ms  
Loss rate: 39.79%

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

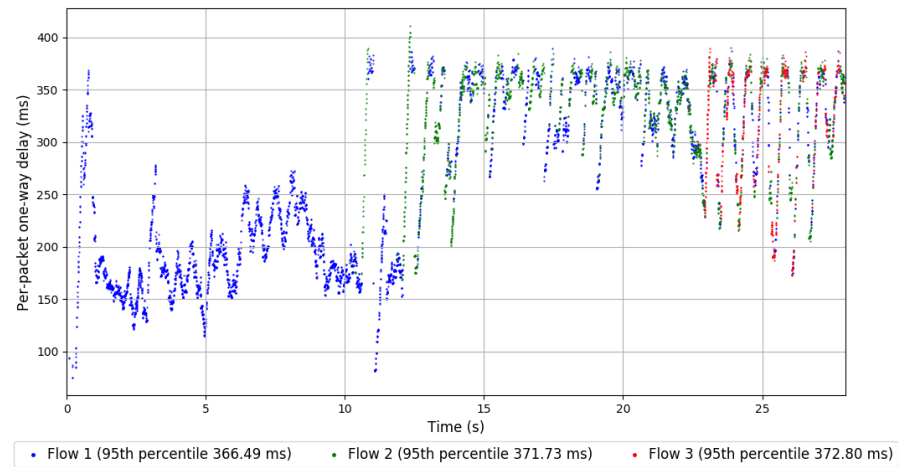
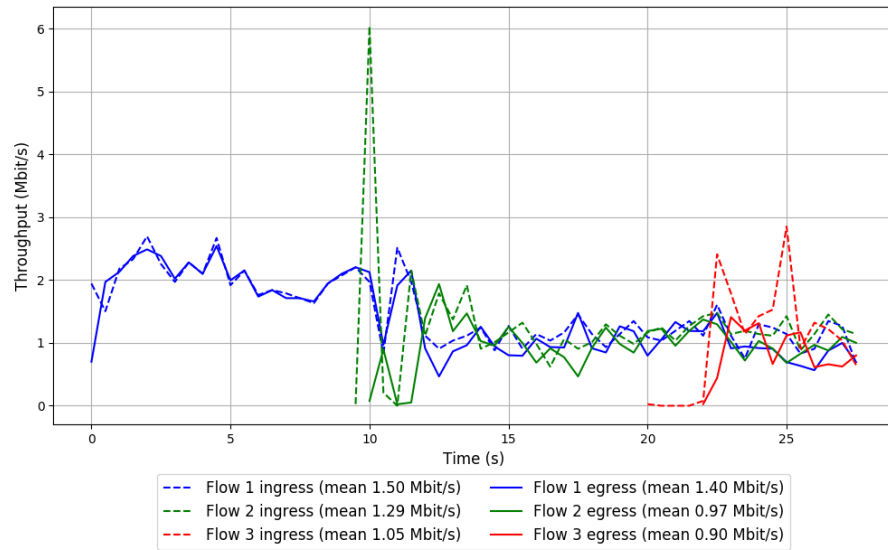


Run 2: Statistics of TaoVA-100x

Start at: 2017-12-20 18:09:24  
End at: 2017-12-20 18:09:54  
Local clock offset: 4.327 ms  
Remote clock offset: -20.95 ms

# Below is generated by plot.py at 2017-12-20 19:33:18  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.20 Mbit/s  
95th percentile per-packet one-way delay: 368.797 ms  
Loss rate: 16.58%  
-- Flow 1:  
Average throughput: 1.40 Mbit/s  
95th percentile per-packet one-way delay: 366.493 ms  
Loss rate: 7.15%  
-- Flow 2:  
Average throughput: 0.97 Mbit/s  
95th percentile per-packet one-way delay: 371.729 ms  
Loss rate: 25.83%  
-- Flow 3:  
Average throughput: 0.90 Mbit/s  
95th percentile per-packet one-way delay: 372.795 ms  
Loss rate: 38.72%

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

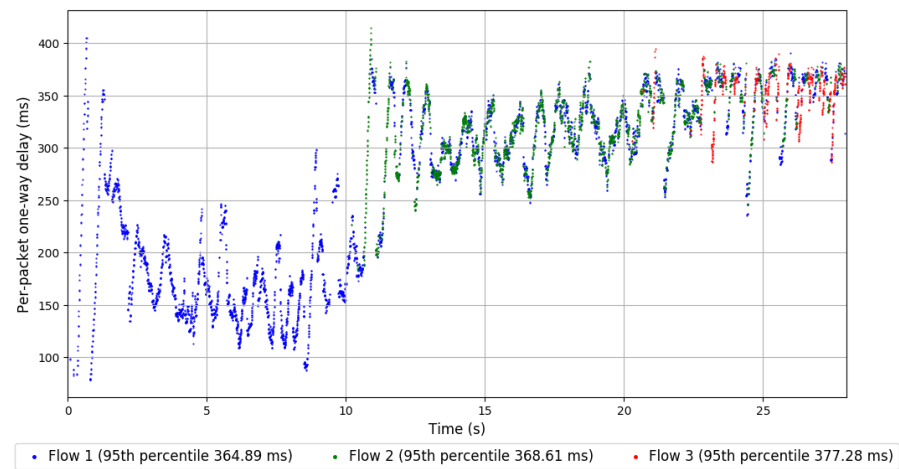
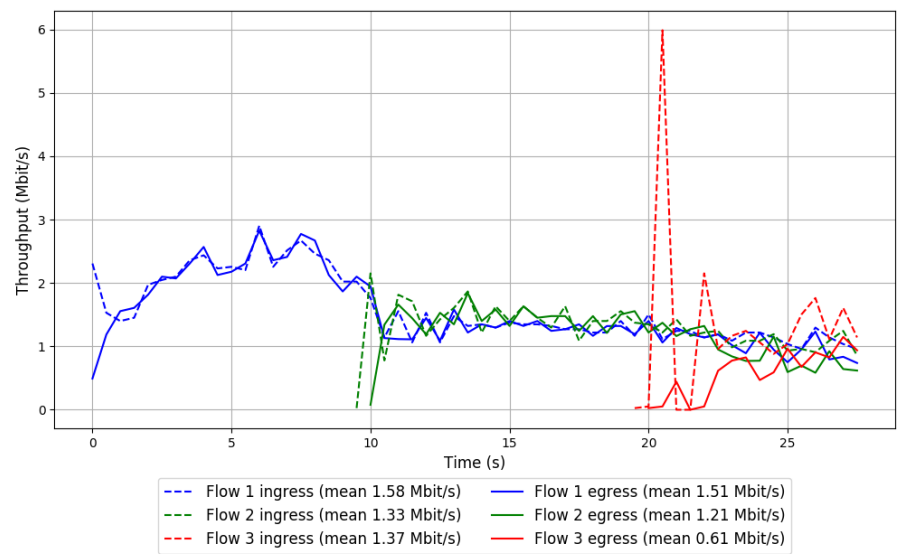


Run 3: Statistics of TaoVA-100x

Start at: 2017-12-20 18:26:07  
End at: 2017-12-20 18:26:37  
Local clock offset: 4.517 ms  
Remote clock offset: -21.598 ms

# Below is generated by plot.py at 2017-12-20 19:33:20  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.45 Mbit/s  
95th percentile per-packet one-way delay: 367.484 ms  
Loss rate: 13.62%  
-- Flow 1:  
Average throughput: 1.51 Mbit/s  
95th percentile per-packet one-way delay: 364.895 ms  
Loss rate: 4.71%  
-- Flow 2:  
Average throughput: 1.21 Mbit/s  
95th percentile per-packet one-way delay: 368.611 ms  
Loss rate: 10.36%  
-- Flow 3:  
Average throughput: 0.61 Mbit/s  
95th percentile per-packet one-way delay: 377.282 ms  
Loss rate: 57.11%

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

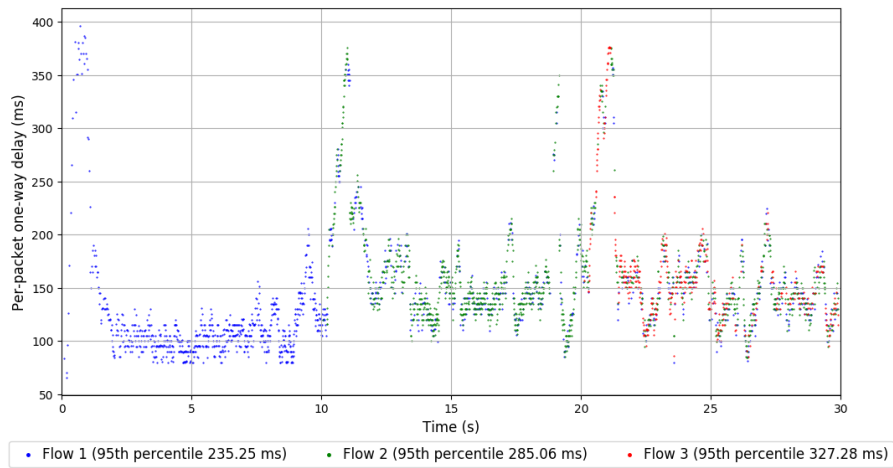
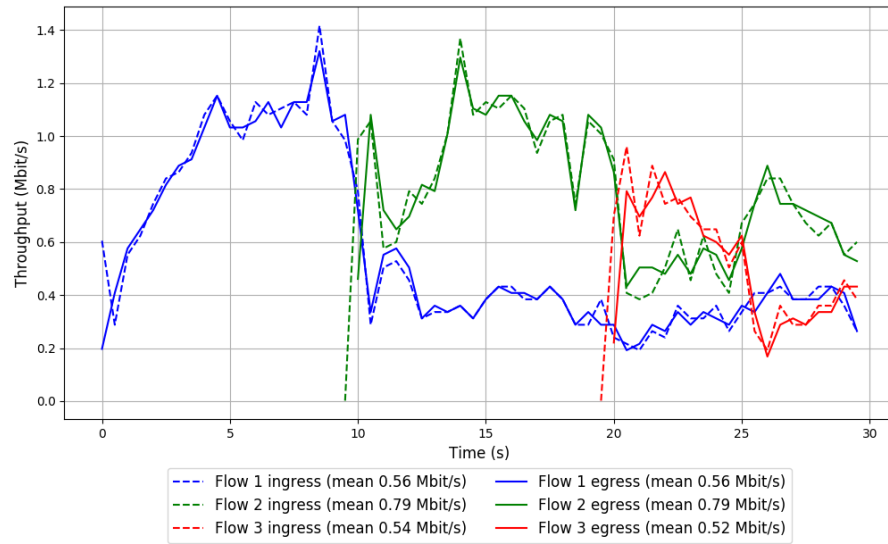


Run 1: Statistics of TCP Vegas

Start at: 2017-12-20 17:53:37  
End at: 2017-12-20 17:54:07  
Local clock offset: 4.936 ms  
Remote clock offset: -20.889 ms

# Below is generated by plot.py at 2017-12-20 19:33:20  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.25 Mbit/s  
95th percentile per-packet one-way delay: 276.083 ms  
Loss rate: 1.46%  
-- Flow 1:  
Average throughput: 0.56 Mbit/s  
95th percentile per-packet one-way delay: 235.245 ms  
Loss rate: 0.65%  
-- Flow 2:  
Average throughput: 0.79 Mbit/s  
95th percentile per-packet one-way delay: 285.055 ms  
Loss rate: 1.06%  
-- Flow 3:  
Average throughput: 0.52 Mbit/s  
95th percentile per-packet one-way delay: 327.279 ms  
Loss rate: 5.14%

# Run 1: Report of TCP Vegas — Data Link



Run 2: Statistics of TCP Vegas

Start at: 2017-12-20 18:10:31

End at: 2017-12-20 18:11:01

Local clock offset: 5.974 ms

Remote clock offset: -19.4 ms

# Below is generated by plot.py at 2017-12-20 19:33:20

# Datalink statistics

-- Total of 3 flows:

Average throughput: 2.36 Mbit/s

95th percentile per-packet one-way delay: 174.028 ms

Loss rate: 0.83%

-- Flow 1:

Average throughput: 1.43 Mbit/s

95th percentile per-packet one-way delay: 174.119 ms

Loss rate: 0.53%

-- Flow 2:

Average throughput: 0.87 Mbit/s

95th percentile per-packet one-way delay: 164.496 ms

Loss rate: 1.23%

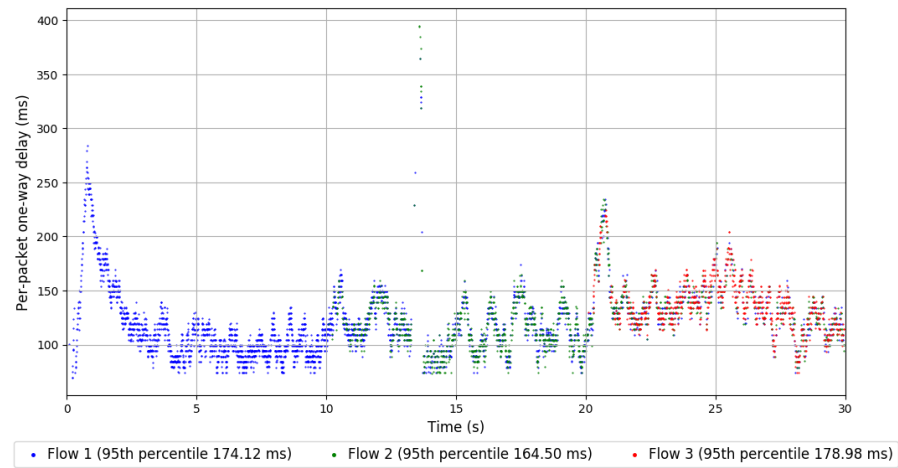
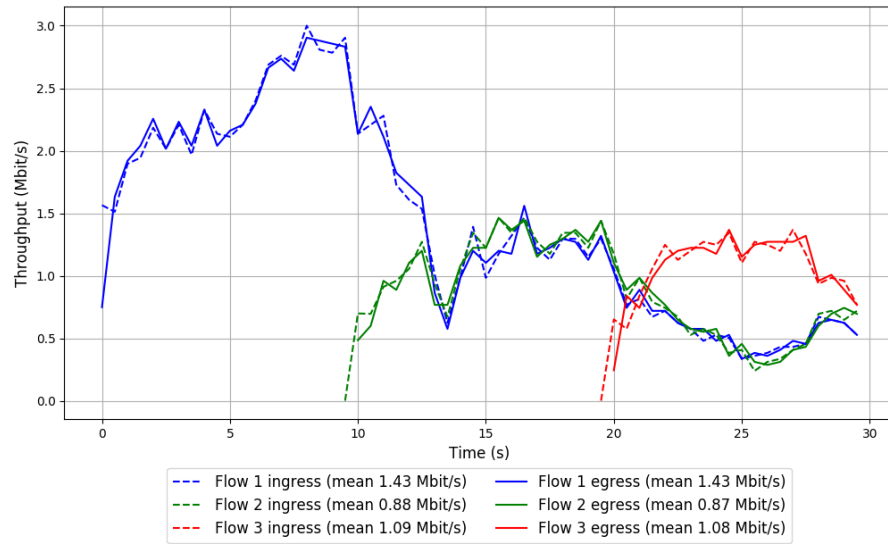
-- Flow 3:

Average throughput: 1.08 Mbit/s

95th percentile per-packet one-way delay: 178.982 ms

Loss rate: 1.33%

## Run 2: Report of TCP Vegas — Data Link

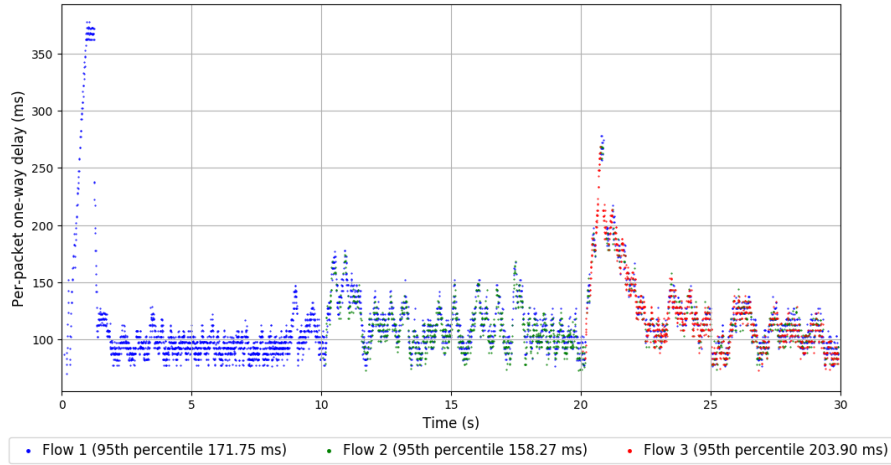
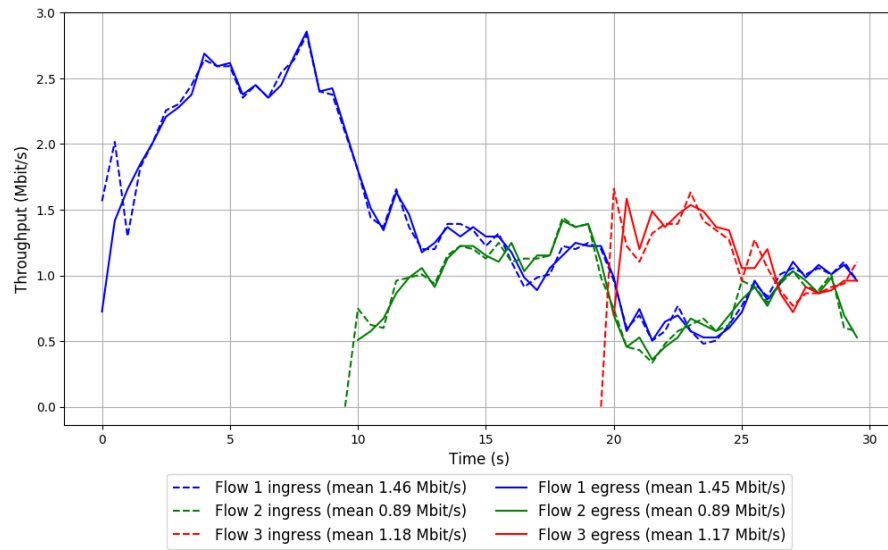


Run 3: Statistics of TCP Vegas

Start at: 2017-12-20 18:27:14  
End at: 2017-12-20 18:27:44  
Local clock offset: 4.433 ms  
Remote clock offset: -21.981 ms

# Below is generated by plot.py at 2017-12-20 19:33:20  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.43 Mbit/s  
95th percentile per-packet one-way delay: 178.781 ms  
Loss rate: 1.05%  
-- Flow 1:  
Average throughput: 1.45 Mbit/s  
95th percentile per-packet one-way delay: 171.746 ms  
Loss rate: 1.05%  
-- Flow 2:  
Average throughput: 0.89 Mbit/s  
95th percentile per-packet one-way delay: 158.267 ms  
Loss rate: 0.74%  
-- Flow 3:  
Average throughput: 1.17 Mbit/s  
95th percentile per-packet one-way delay: 203.896 ms  
Loss rate: 1.54%

### Run 3: Report of TCP Vegas — Data Link

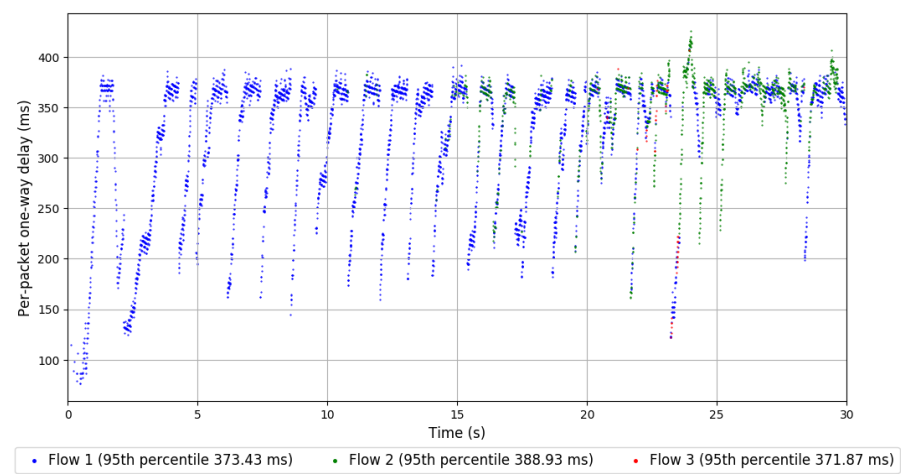
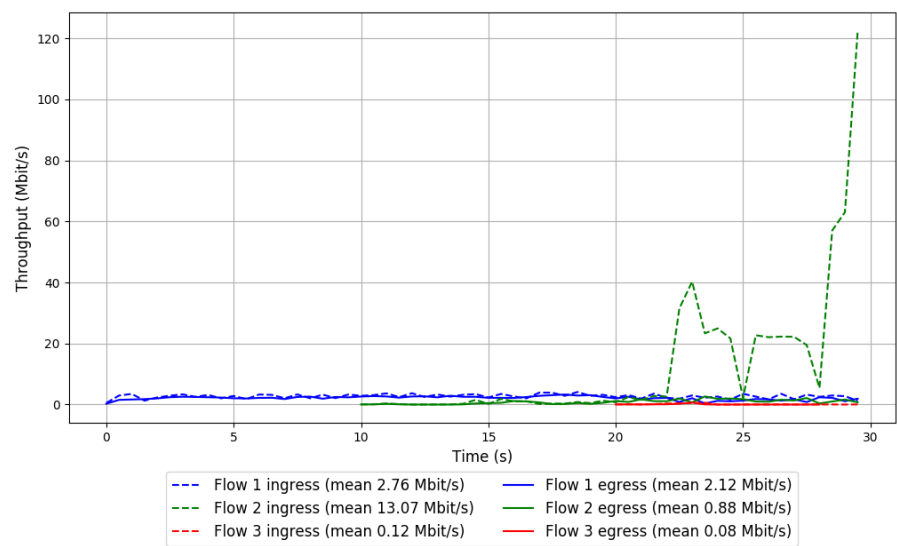


Run 1: Statistics of Verus

Start at: 2017-12-20 18:08:17  
End at: 2017-12-20 18:08:47  
Local clock offset: 1.44 ms  
Remote clock offset: -25.517 ms

# Below is generated by plot.py at 2017-12-20 19:33:24  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.71 Mbit/s  
95th percentile per-packet one-way delay: 377.169 ms  
Loss rate: 76.50%  
-- Flow 1:  
Average throughput: 2.12 Mbit/s  
95th percentile per-packet one-way delay: 373.434 ms  
Loss rate: 22.99%  
-- Flow 2:  
Average throughput: 0.88 Mbit/s  
95th percentile per-packet one-way delay: 388.934 ms  
Loss rate: 93.50%  
-- Flow 3:  
Average throughput: 0.08 Mbit/s  
95th percentile per-packet one-way delay: 371.870 ms  
Loss rate: 48.00%

Run 1: Report of Verus — Data Link

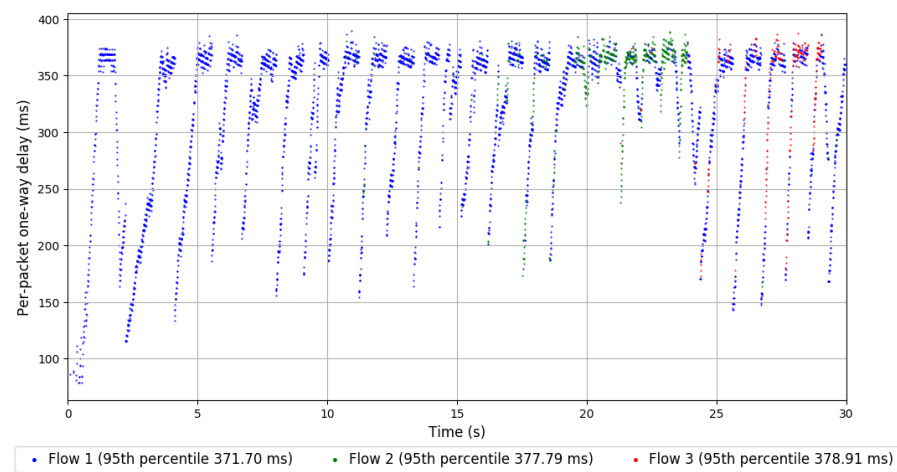
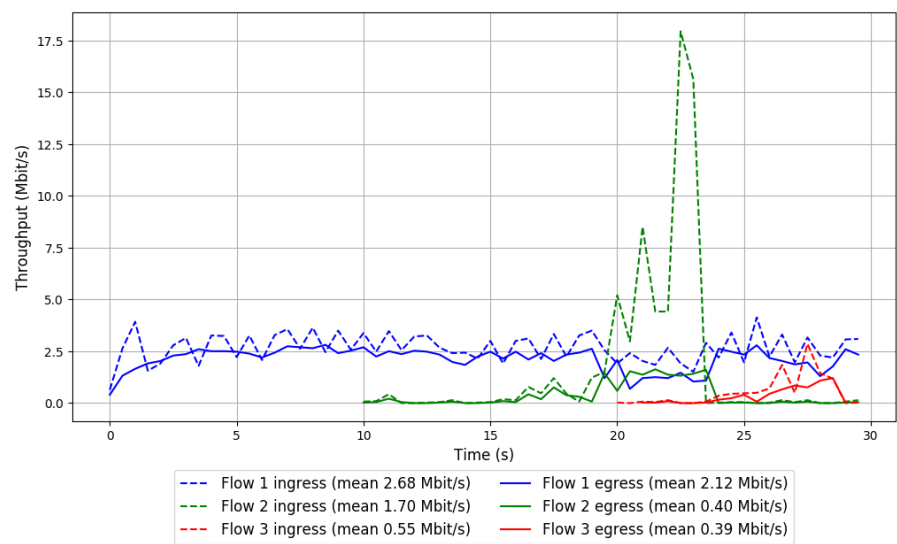


Run 2: Statistics of Verus

Start at: 2017-12-20 18:25:01  
End at: 2017-12-20 18:25:31  
Local clock offset: 2.968 ms  
Remote clock offset: -22.602 ms

# Below is generated by plot.py at 2017-12-20 19:33:24  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.48 Mbit/s  
95th percentile per-packet one-way delay: 373.259 ms  
Loss rate: 37.73%  
-- Flow 1:  
Average throughput: 2.12 Mbit/s  
95th percentile per-packet one-way delay: 371.699 ms  
Loss rate: 21.02%  
-- Flow 2:  
Average throughput: 0.40 Mbit/s  
95th percentile per-packet one-way delay: 377.791 ms  
Loss rate: 77.07%  
-- Flow 3:  
Average throughput: 0.39 Mbit/s  
95th percentile per-packet one-way delay: 378.912 ms  
Loss rate: 43.14%

Run 2: Report of Verus — Data Link

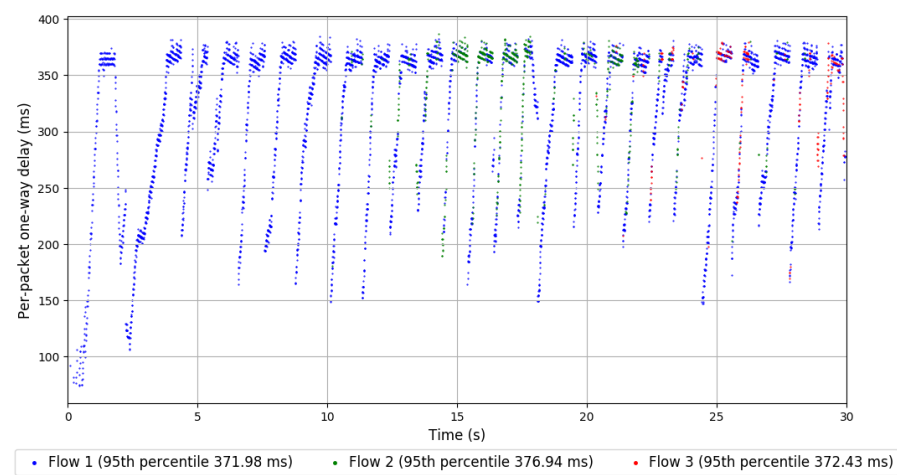
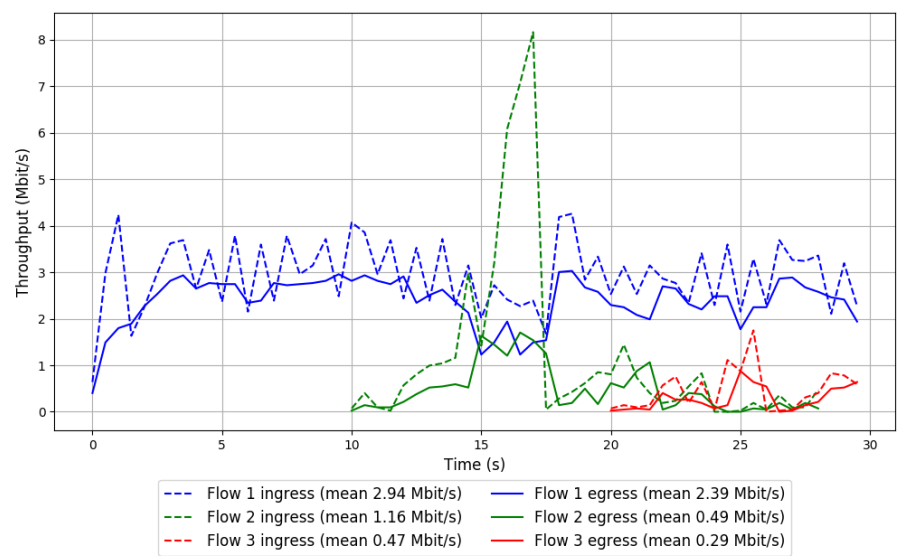


Run 3: Statistics of Verus

Start at: 2017-12-20 18:41:44  
End at: 2017-12-20 18:42:15  
Local clock offset: 2.64 ms  
Remote clock offset: -21.124 ms

# Below is generated by plot.py at 2017-12-20 19:33:24  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.78 Mbit/s  
95th percentile per-packet one-way delay: 372.632 ms  
Loss rate: 27.41%  
-- Flow 1:  
Average throughput: 2.39 Mbit/s  
95th percentile per-packet one-way delay: 371.978 ms  
Loss rate: 19.15%  
-- Flow 2:  
Average throughput: 0.49 Mbit/s  
95th percentile per-packet one-way delay: 376.944 ms  
Loss rate: 58.66%  
-- Flow 3:  
Average throughput: 0.29 Mbit/s  
95th percentile per-packet one-way delay: 372.429 ms  
Loss rate: 40.15%

Run 3: Report of Verus — Data Link

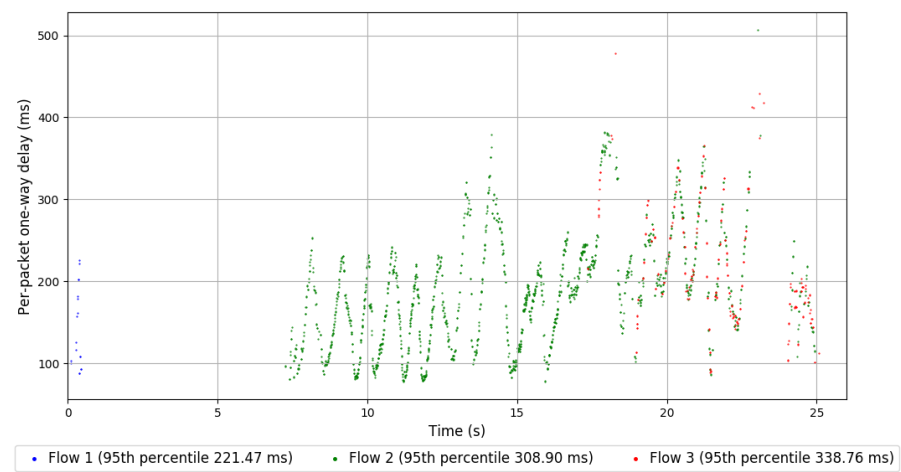
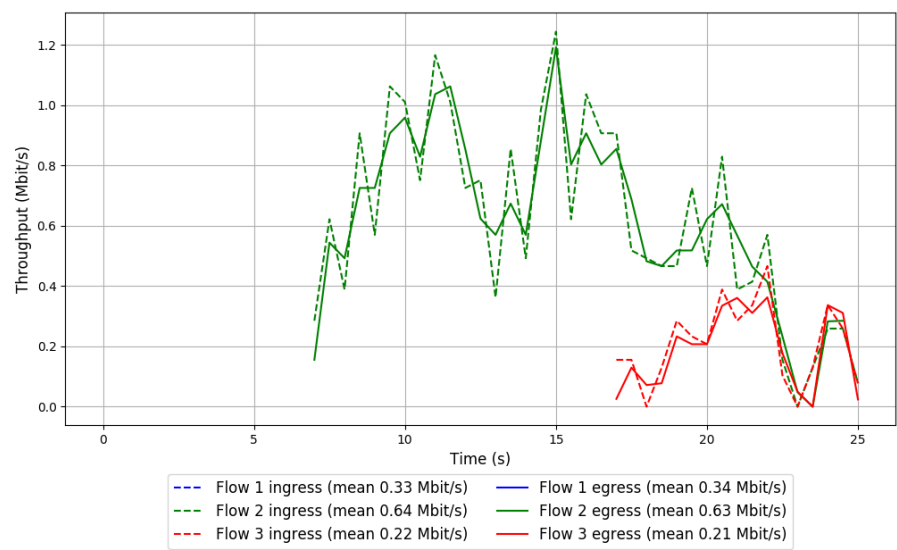


Run 1: Statistics of Copa

Start at: 2017-12-20 17:55:55  
End at: 2017-12-20 17:56:25  
Local clock offset: 3.945 ms  
Remote clock offset: -19.921 ms

# Below is generated by plot.py at 2017-12-20 19:33:24  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.52 Mbit/s  
95th percentile per-packet one-way delay: 317.319 ms  
Loss rate: 2.91%  
-- Flow 1:  
Average throughput: 0.34 Mbit/s  
95th percentile per-packet one-way delay: 221.470 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 0.63 Mbit/s  
95th percentile per-packet one-way delay: 308.902 ms  
Loss rate: 1.96%  
-- Flow 3:  
Average throughput: 0.21 Mbit/s  
95th percentile per-packet one-way delay: 338.756 ms  
Loss rate: 9.26%

Run 1: Report of Copa — Data Link

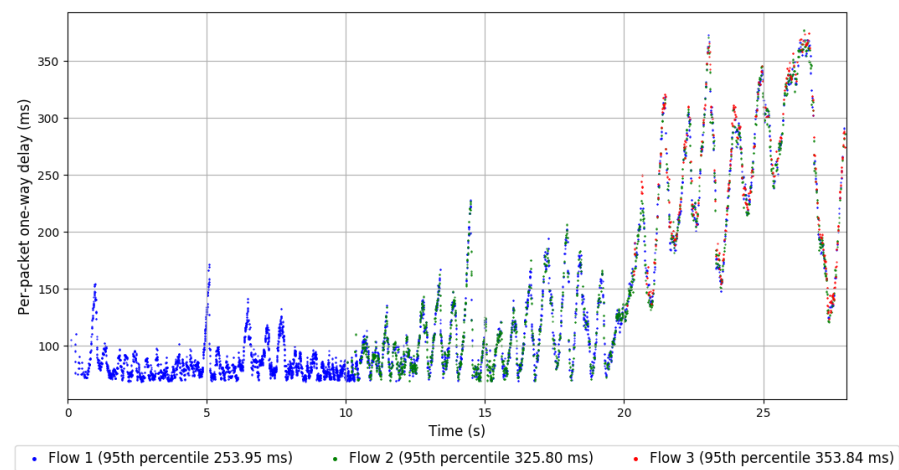
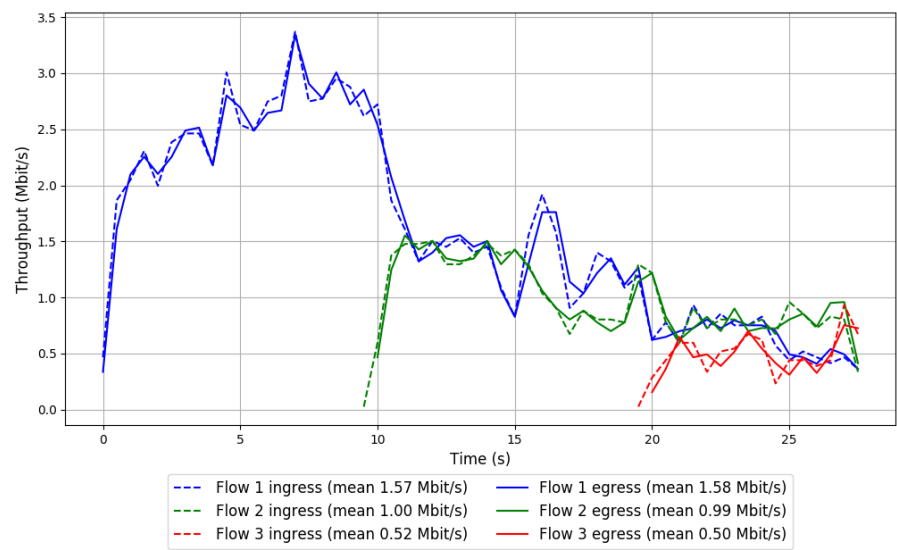


Run 2: Statistics of Copa

Start at: 2017-12-20 18:12:49  
End at: 2017-12-20 18:13:19  
Local clock offset: 3.887 ms  
Remote clock offset: -18.549 ms

# Below is generated by plot.py at 2017-12-20 19:33:25  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.35 Mbit/s  
95th percentile per-packet one-way delay: 302.892 ms  
Loss rate: 0.79%  
-- Flow 1:  
Average throughput: 1.58 Mbit/s  
95th percentile per-packet one-way delay: 253.951 ms  
Loss rate: 0.37%  
-- Flow 2:  
Average throughput: 0.99 Mbit/s  
95th percentile per-packet one-way delay: 325.797 ms  
Loss rate: 0.79%  
-- Flow 3:  
Average throughput: 0.50 Mbit/s  
95th percentile per-packet one-way delay: 353.842 ms  
Loss rate: 5.21%

Run 2: Report of Copa — Data Link

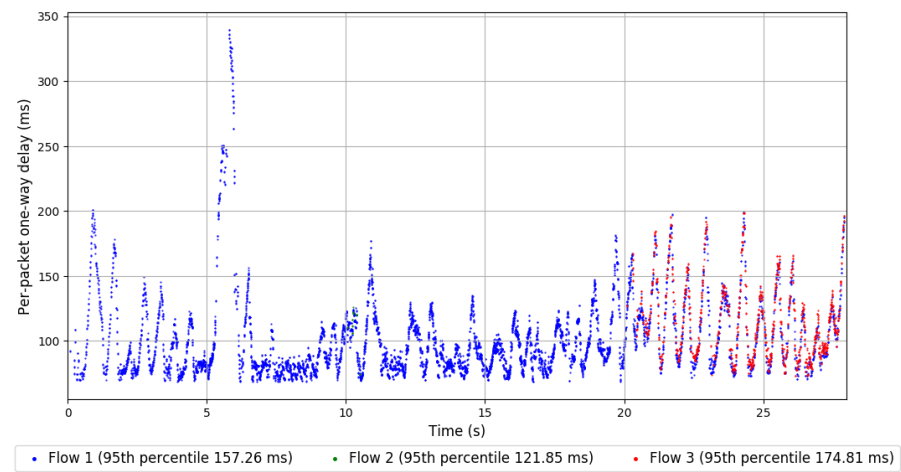
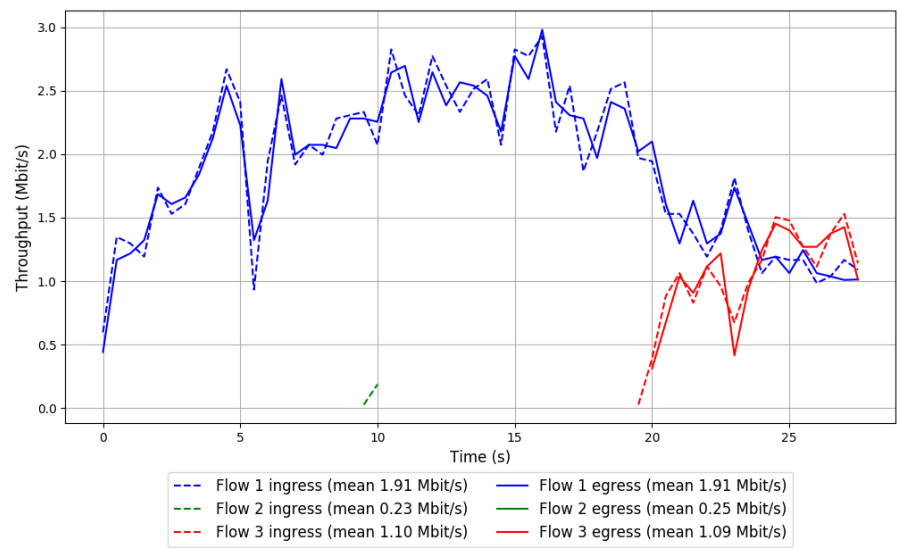


Run 3: Statistics of Copa

Start at: 2017-12-20 18:29:33  
End at: 2017-12-20 18:30:03  
Local clock offset: 2.613 ms  
Remote clock offset: -21.066 ms

# Below is generated by plot.py at 2017-12-20 19:33:26  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.22 Mbit/s  
95th percentile per-packet one-way delay: 160.965 ms  
Loss rate: 0.71%  
-- Flow 1:  
Average throughput: 1.91 Mbit/s  
95th percentile per-packet one-way delay: 157.262 ms  
Loss rate: 0.42%  
-- Flow 2:  
Average throughput: 0.25 Mbit/s  
95th percentile per-packet one-way delay: 121.853 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 1.09 Mbit/s  
95th percentile per-packet one-way delay: 174.811 ms  
Loss rate: 2.52%

Run 3: Report of Copa — Data Link

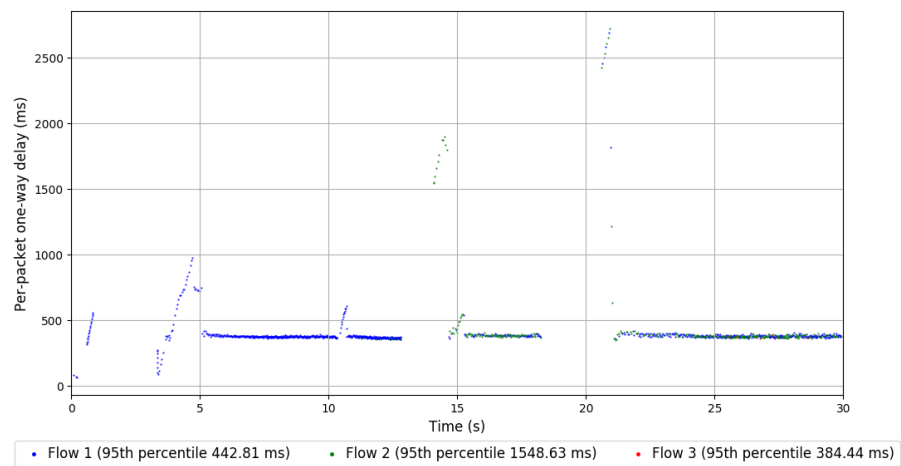
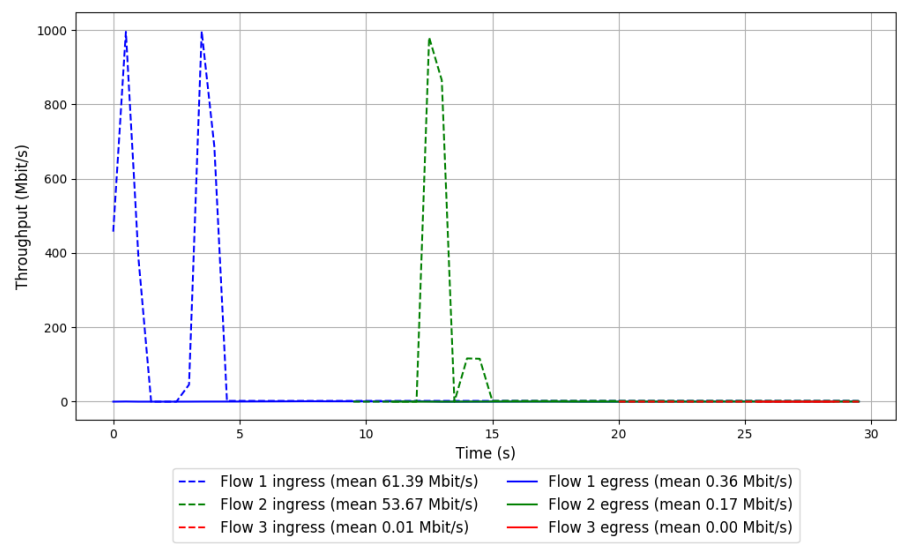


Run 1: Statistics of FillP

Start at: 2017-12-20 17:54:43  
End at: 2017-12-20 17:55:13  
Local clock offset: 6.385 ms  
Remote clock offset: -18.65 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.46 Mbit/s  
95th percentile per-packet one-way delay: 495.066 ms  
Loss rate: 99.52%  
-- Flow 1:  
Average throughput: 0.36 Mbit/s  
95th percentile per-packet one-way delay: 442.814 ms  
Loss rate: 99.42%  
-- Flow 2:  
Average throughput: 0.17 Mbit/s  
95th percentile per-packet one-way delay: 1548.635 ms  
Loss rate: 99.71%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 384.438 ms  
Loss rate: 92.36%

Run 1: Report of FillP — Data Link

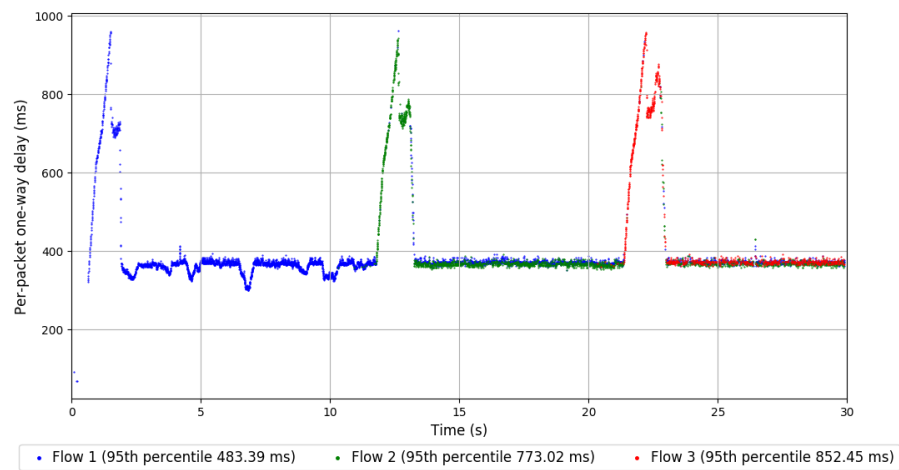
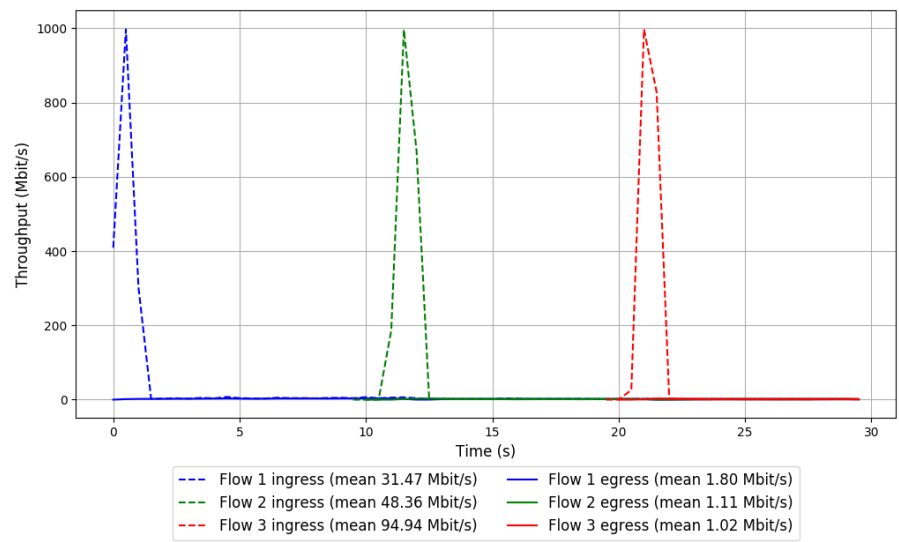


Run 2: Statistics of FillP

Start at: 2017-12-20 18:11:37  
End at: 2017-12-20 18:12:07  
Local clock offset: 6.156 ms  
Remote clock offset: -19.947 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.86 Mbit/s  
95th percentile per-packet one-way delay: 751.063 ms  
Loss rate: 97.01%  
-- Flow 1:  
Average throughput: 1.80 Mbit/s  
95th percentile per-packet one-way delay: 483.388 ms  
Loss rate: 94.30%  
-- Flow 2:  
Average throughput: 1.11 Mbit/s  
95th percentile per-packet one-way delay: 773.016 ms  
Loss rate: 97.75%  
-- Flow 3:  
Average throughput: 1.02 Mbit/s  
95th percentile per-packet one-way delay: 852.451 ms  
Loss rate: 98.97%

Run 2: Report of FillP — Data Link

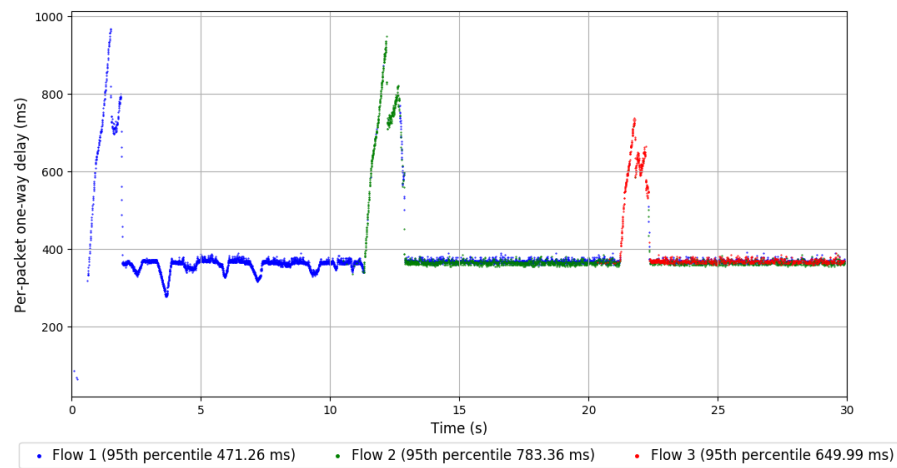
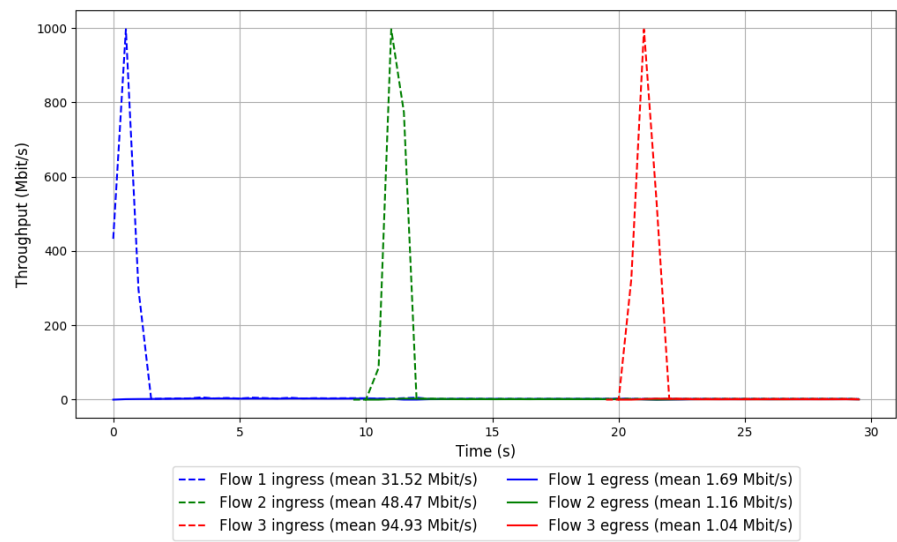


Run 3: Statistics of FillP

Start at: 2017-12-20 18:28:21  
End at: 2017-12-20 18:28:51  
Local clock offset: 4.833 ms  
Remote clock offset: -20.08 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.78 Mbit/s  
95th percentile per-packet one-way delay: 703.347 ms  
Loss rate: 97.09%  
-- Flow 1:  
Average throughput: 1.69 Mbit/s  
95th percentile per-packet one-way delay: 471.264 ms  
Loss rate: 94.65%  
-- Flow 2:  
Average throughput: 1.16 Mbit/s  
95th percentile per-packet one-way delay: 783.355 ms  
Loss rate: 97.67%  
-- Flow 3:  
Average throughput: 1.04 Mbit/s  
95th percentile per-packet one-way delay: 649.987 ms  
Loss rate: 98.95%

Run 3: Report of FillP — Data Link

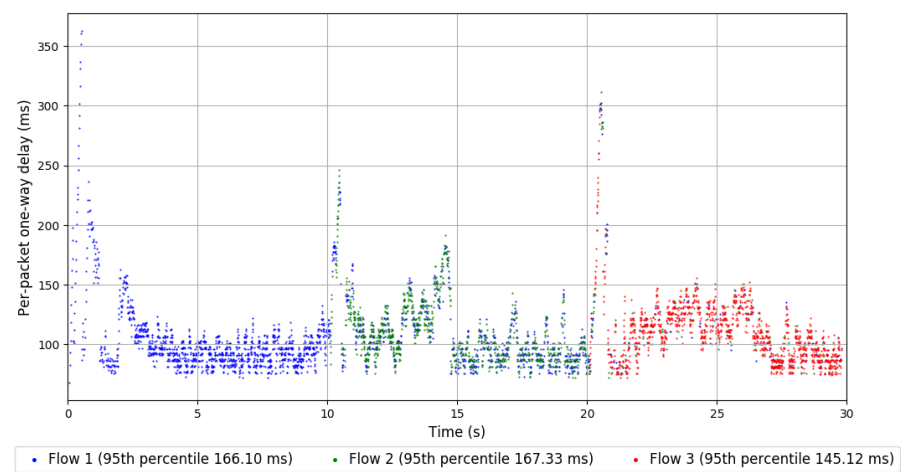
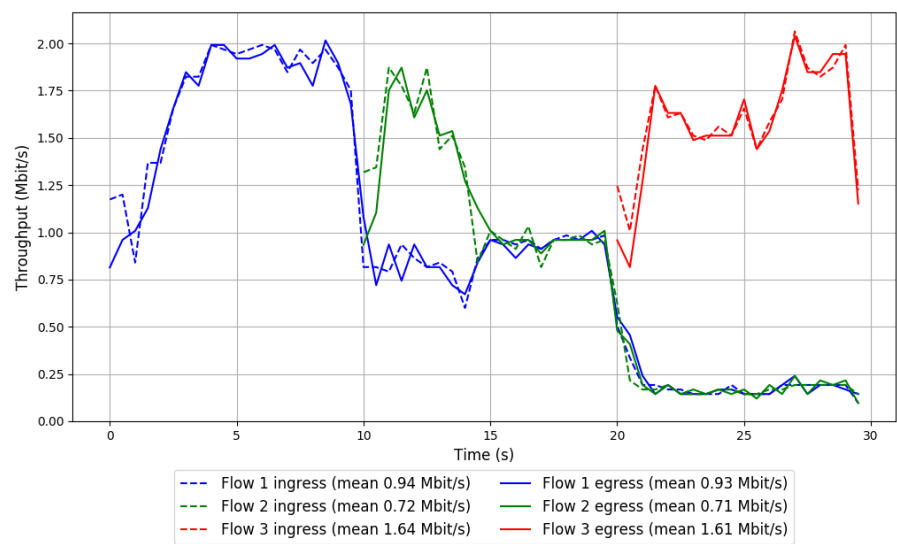


Run 1: Statistics of Indigo

Start at: 2017-12-20 17:59:16  
End at: 2017-12-20 17:59:46  
Local clock offset: 5.62 ms  
Remote clock offset: -18.925 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.93 Mbit/s  
95th percentile per-packet one-way delay: 157.097 ms  
Loss rate: 1.49%  
-- Flow 1:  
Average throughput: 0.93 Mbit/s  
95th percentile per-packet one-way delay: 166.101 ms  
Loss rate: 1.20%  
-- Flow 2:  
Average throughput: 0.71 Mbit/s  
95th percentile per-packet one-way delay: 167.326 ms  
Loss rate: 1.27%  
-- Flow 3:  
Average throughput: 1.61 Mbit/s  
95th percentile per-packet one-way delay: 145.125 ms  
Loss rate: 2.17%

Run 1: Report of Indigo — Data Link

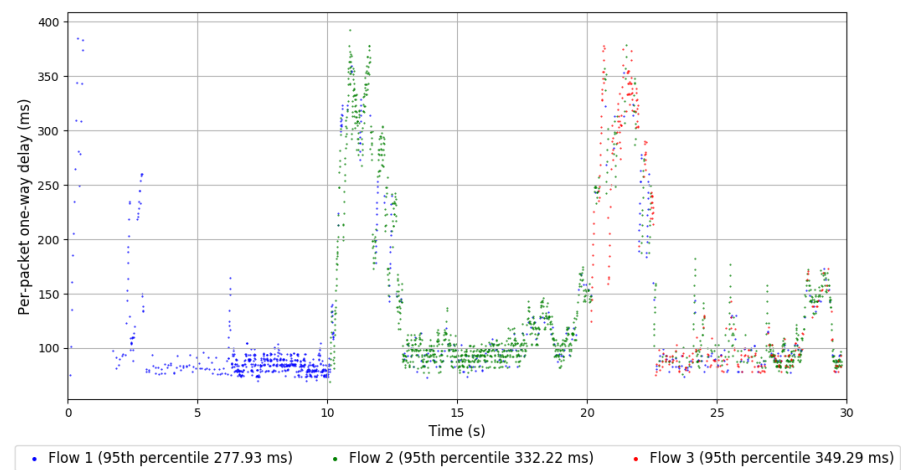
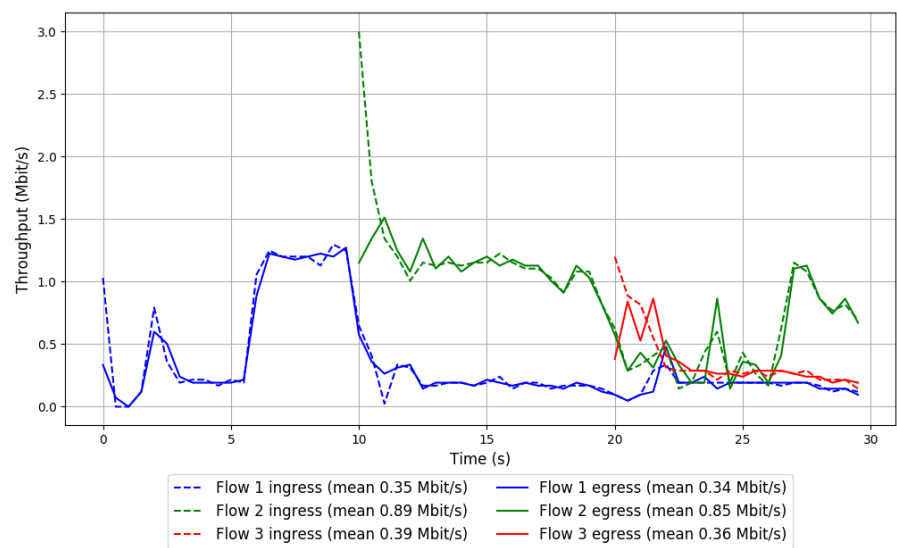


Run 2: Statistics of Indigo

Start at: 2017-12-20 18:16:09  
End at: 2017-12-20 18:16:39  
Local clock offset: 2.132 ms  
Remote clock offset: -21.081 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.02 Mbit/s  
95th percentile per-packet one-way delay: 328.449 ms  
Loss rate: 5.12%  
-- Flow 1:  
Average throughput: 0.34 Mbit/s  
95th percentile per-packet one-way delay: 277.931 ms  
Loss rate: 3.67%  
-- Flow 2:  
Average throughput: 0.85 Mbit/s  
95th percentile per-packet one-way delay: 332.218 ms  
Loss rate: 5.31%  
-- Flow 3:  
Average throughput: 0.36 Mbit/s  
95th percentile per-packet one-way delay: 349.289 ms  
Loss rate: 8.26%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2017-12-20 18:32:52  
End at: 2017-12-20 18:33:22  
Local clock offset: 5.013 ms  
Remote clock offset: -21.357 ms

# Below is generated by plot.py at 2017-12-20 19:33:32  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.87 Mbit/s  
95th percentile per-packet one-way delay: 294.700 ms  
Loss rate: 3.58%  
-- Flow 1:  
Average throughput: 0.68 Mbit/s  
95th percentile per-packet one-way delay: 265.353 ms  
Loss rate: 0.94%  
-- Flow 2:  
Average throughput: 1.40 Mbit/s  
95th percentile per-packet one-way delay: 333.419 ms  
Loss rate: 5.51%  
-- Flow 3:  
Average throughput: 0.81 Mbit/s  
95th percentile per-packet one-way delay: 155.267 ms  
Loss rate: 3.26%

### Run 3: Report of Indigo — Data Link

