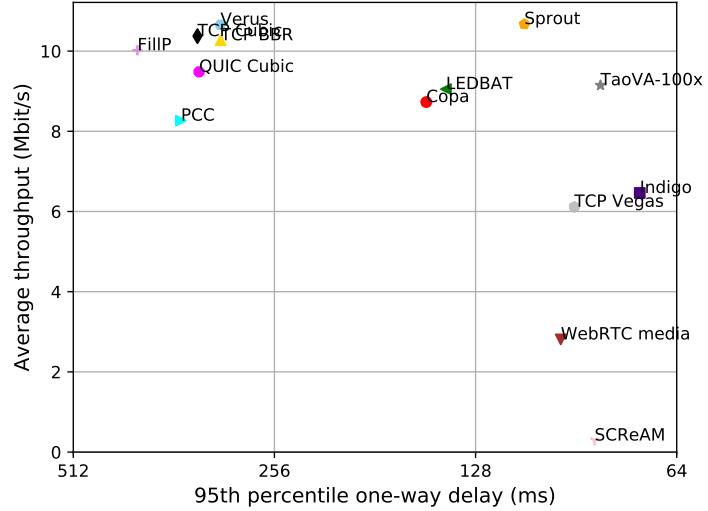


Pantheon Report

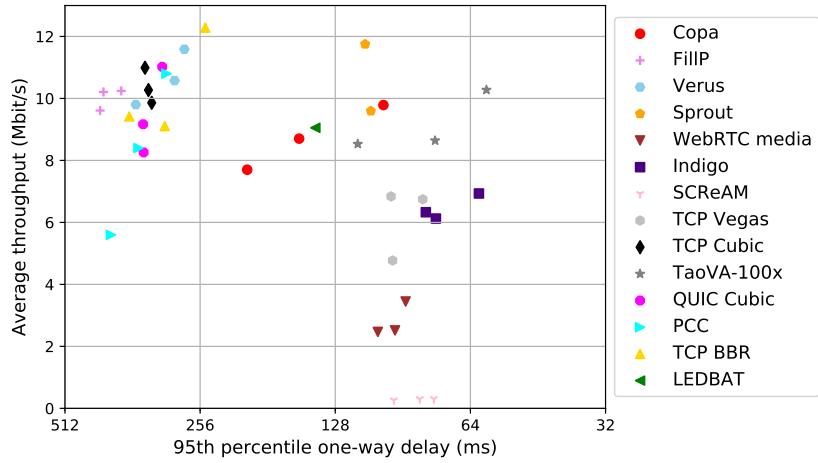
Generated at 2017-12-20 19:40:45 (UTC).
Data path: Stanford ppp0 (*remote*) → AWS California 1 Ethernet (*local*).
Repeated the test of 14 congestion control schemes 3 times.
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.
Increased UDP receive buffer to 16 MB (default) and 32 MB (max).
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).
NTP offsets were measured against `time.stanford.edu` and have been applied to correct the timestamps in logs.

Git summary:
branch: master @ 904a5750834816b1e46a2c86405d707788d27c16
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
M datagrump/sender.cc
third_party/fillp @ dcaef6b00654e660f73f7ed679d2eab61ce08639
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ b19f3730105f9aa95452552af924e3719b03cc55
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eab4a906ce6bb7cf3cf
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 @ f1a14bffe749737437f61b1eaeeb30b267cde681
third_party/sprout @ 6f2efe6e088d91066a9f023df375eee2665089ce
M src/examples/cellsim.cc
M src/examples/sproutbt2.cc
M src/network/sproutconn.cc
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
M src/verus.hpp
M tools/plot.py
third_party/webrtc @ a488197ddd041ace68a42849b2540ad834825f42

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



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



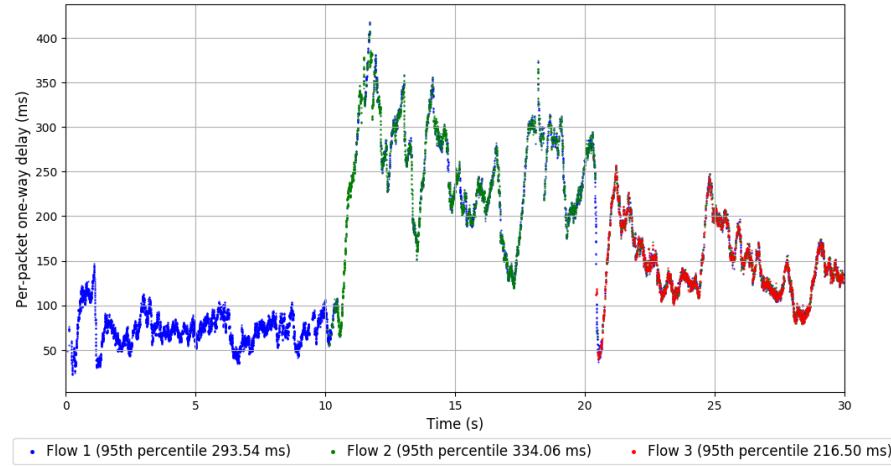
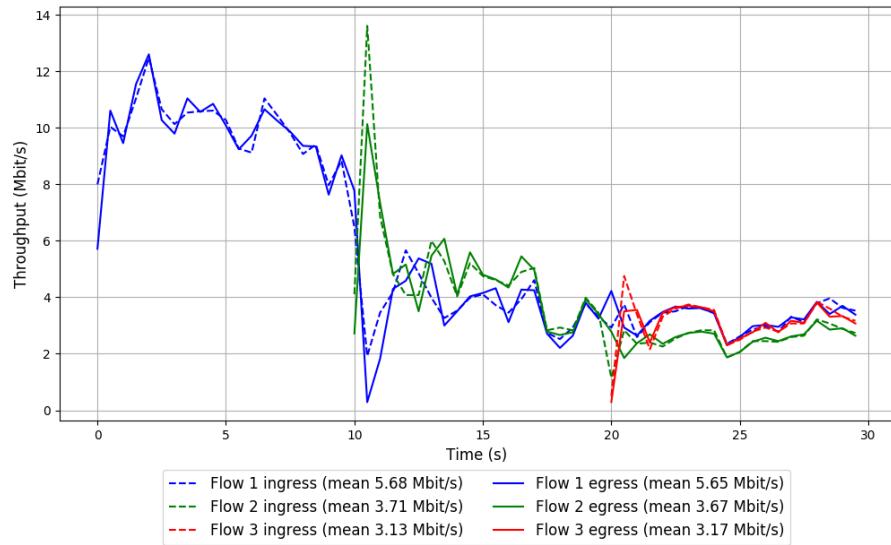
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	6.11	4.17	4.27	289.51	318.39	296.21	1.41	3.27	9.31
TCP Cubic		7.17	3.93	1.91	331.41	337.22	321.22	0.79	2.00	4.02
LEDBAT		5.48	4.22	2.39	142.27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

Run 1: Statistics of TCP BBR

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

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

Run 1: Report of TCP BBR — Data Link

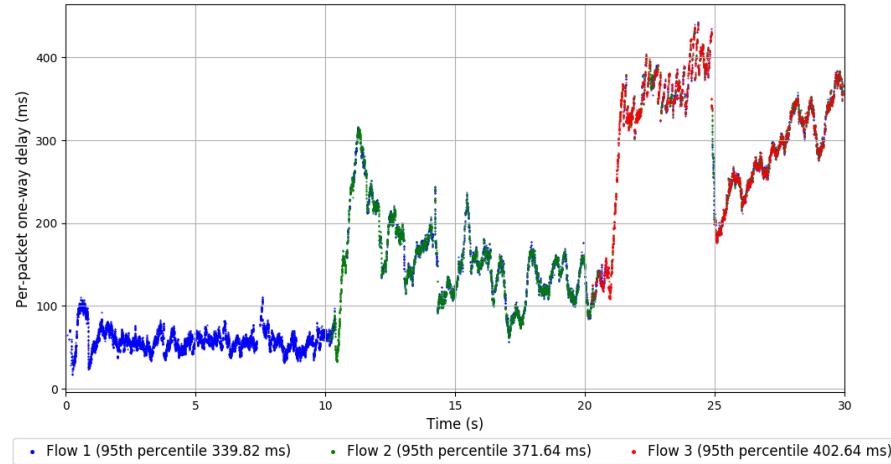
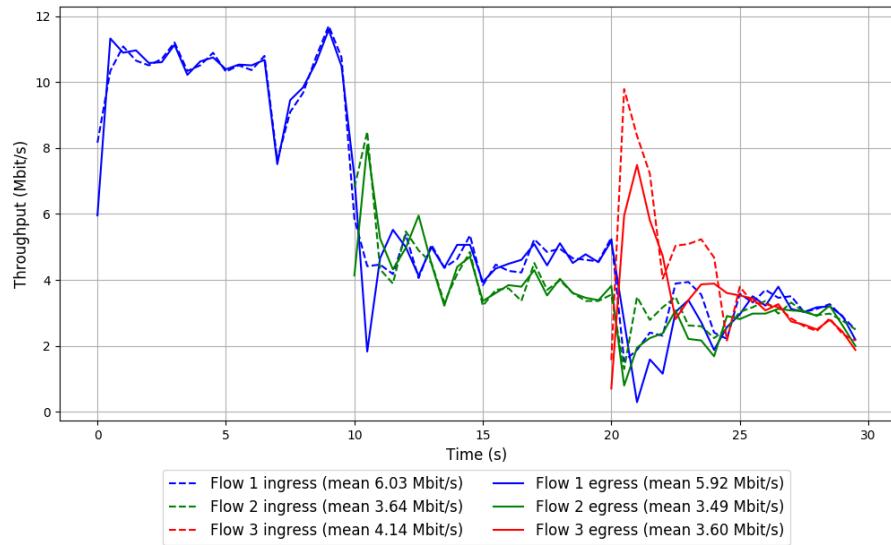


Run 2: Statistics of TCP BBR

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

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

Run 2: Report of TCP BBR — Data Link

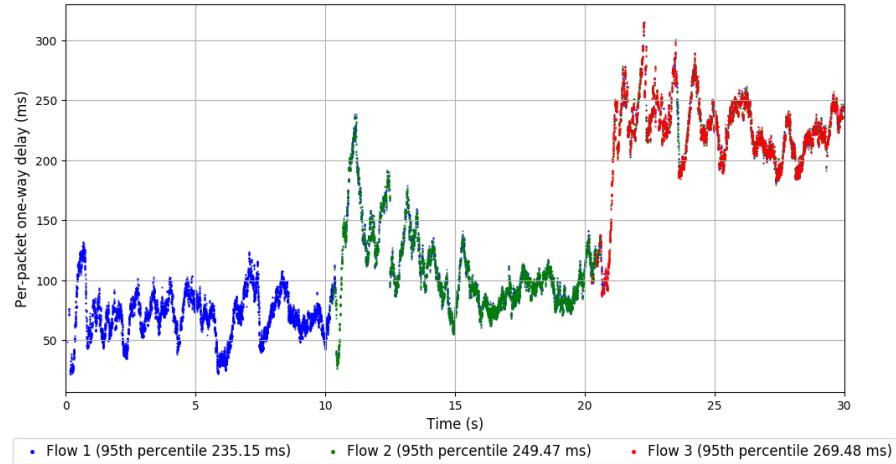
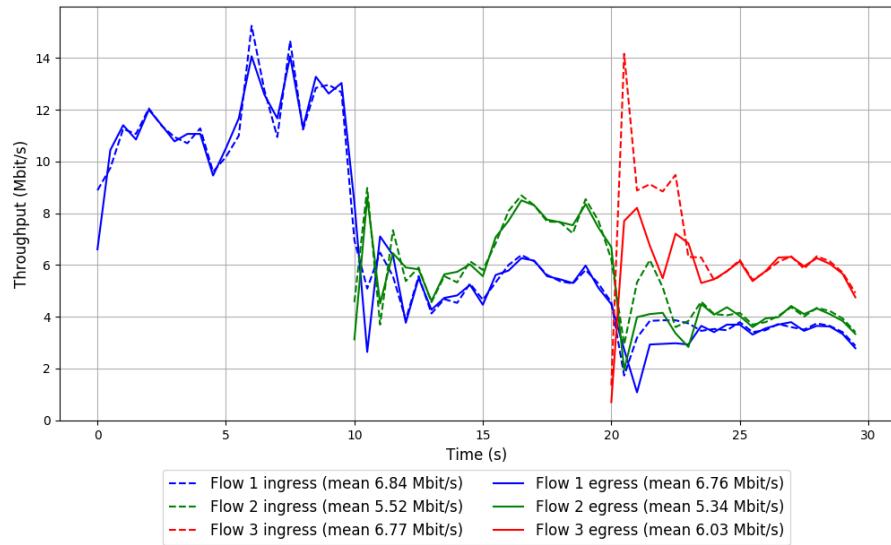


Run 3: Statistics of TCP BBR

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

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

Run 3: Report of TCP BBR — Data Link

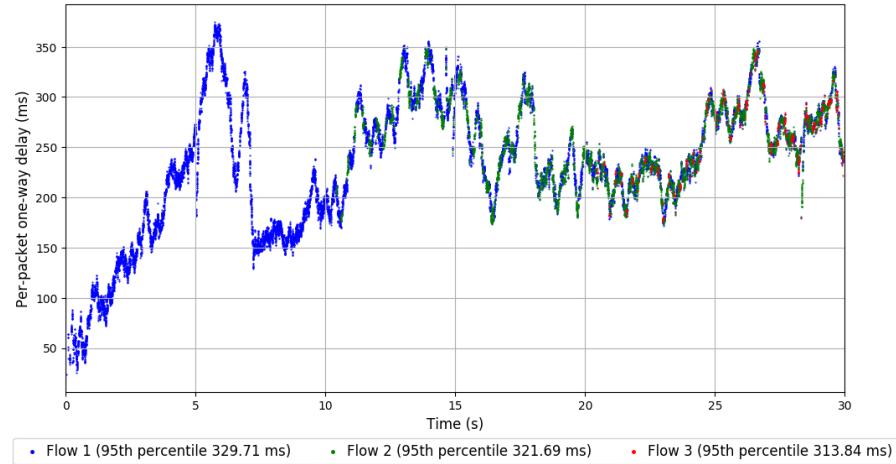
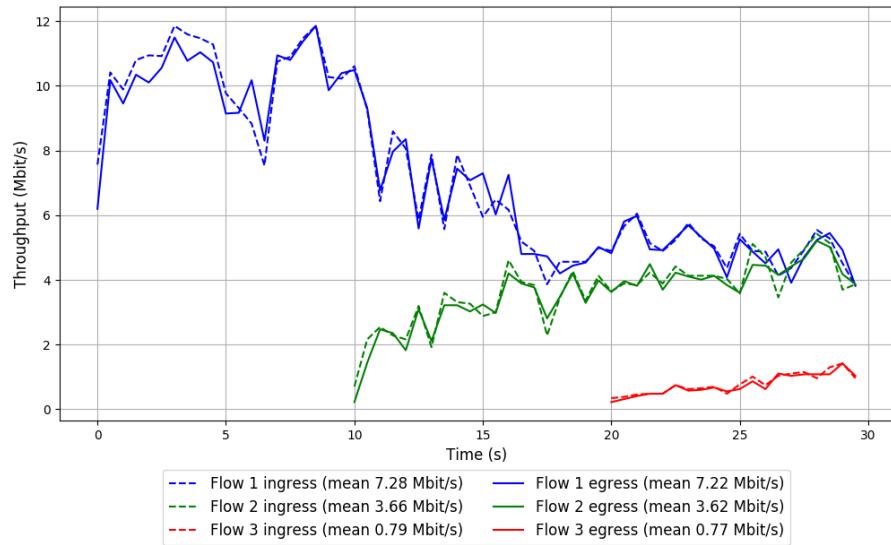


```
Run 1: Statistics of TCP Cubic
```

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

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

Run 1: Report of TCP Cubic — Data Link

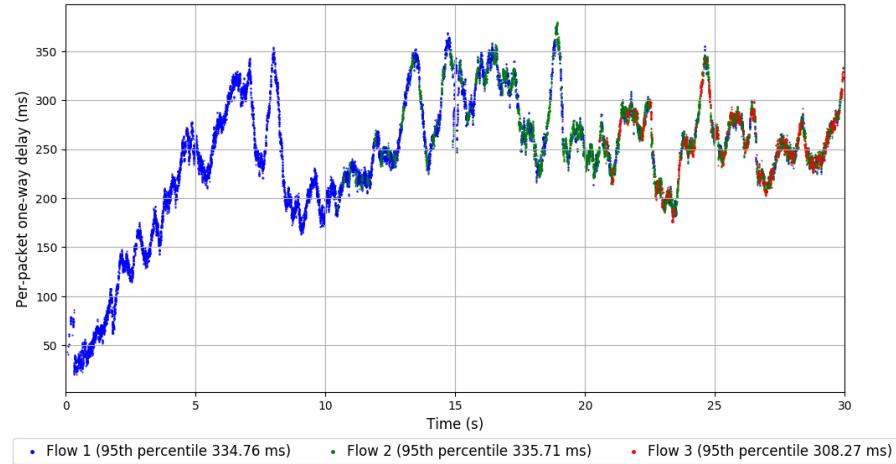
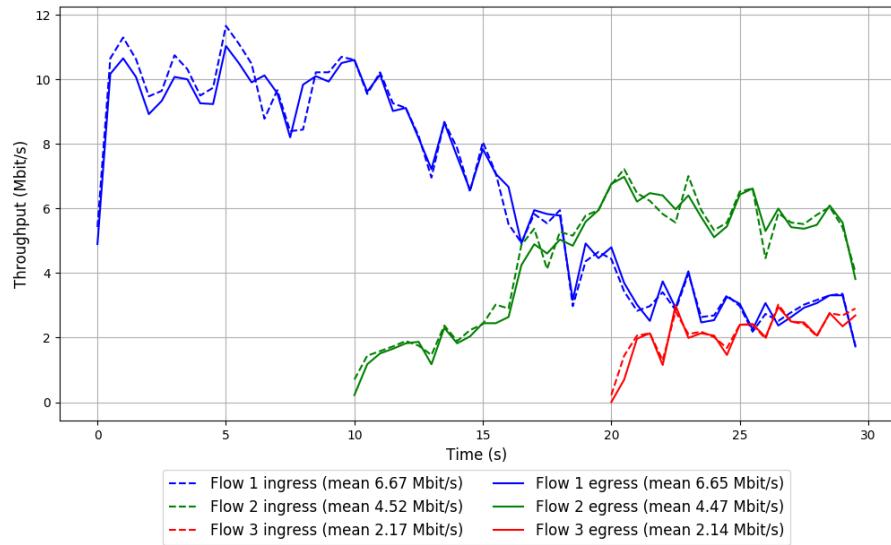


Run 2: Statistics of TCP Cubic

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

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

Run 2: Report of TCP Cubic — Data Link

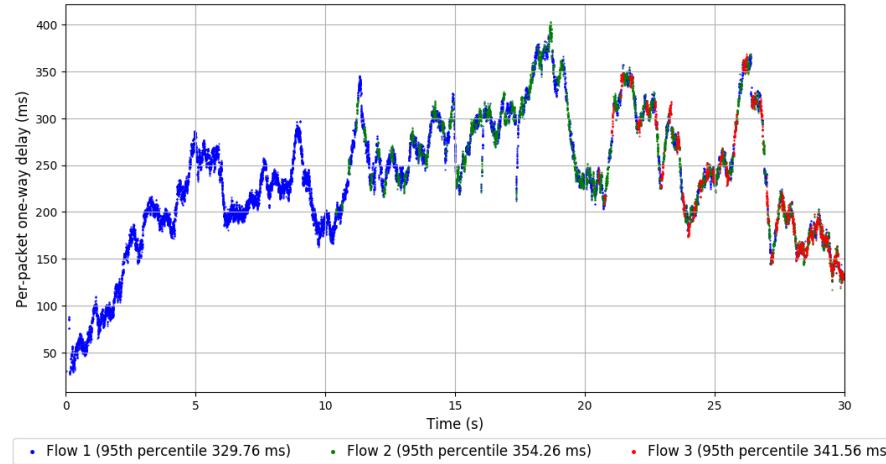
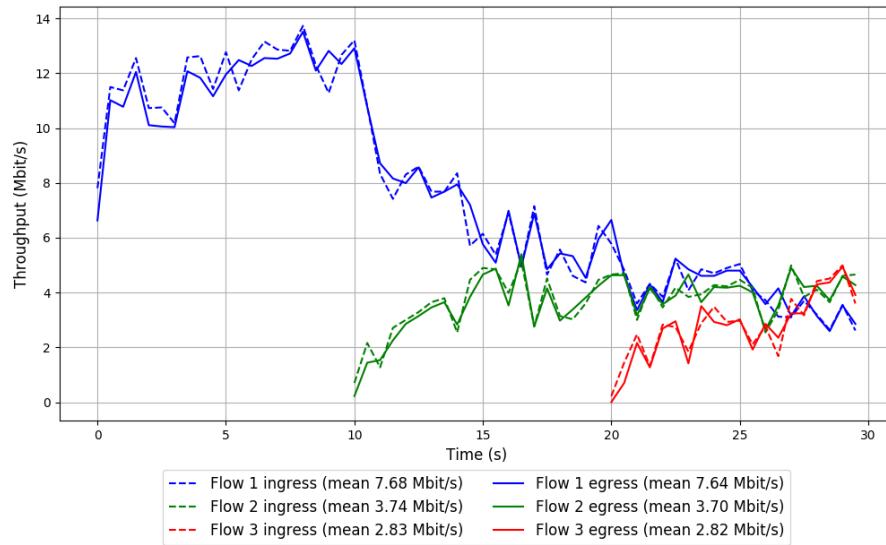


Run 3: Statistics of TCP Cubic

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

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

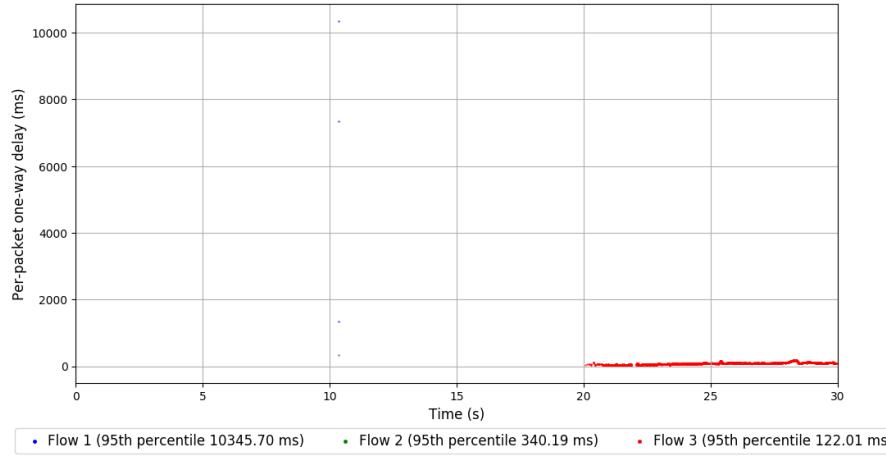
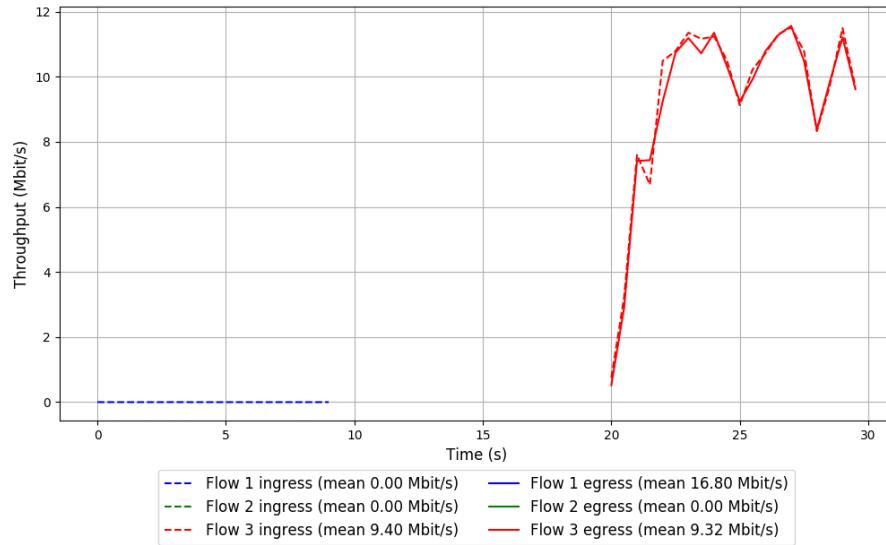
Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of LEDBAT

Start at: 2017-12-20 17:58:30
End at: 2017-12-20 17:59:00
Local clock offset: 0.523 ms
Remote clock offset: -2.619 ms

Run 1: Report of LEDBAT — Data Link

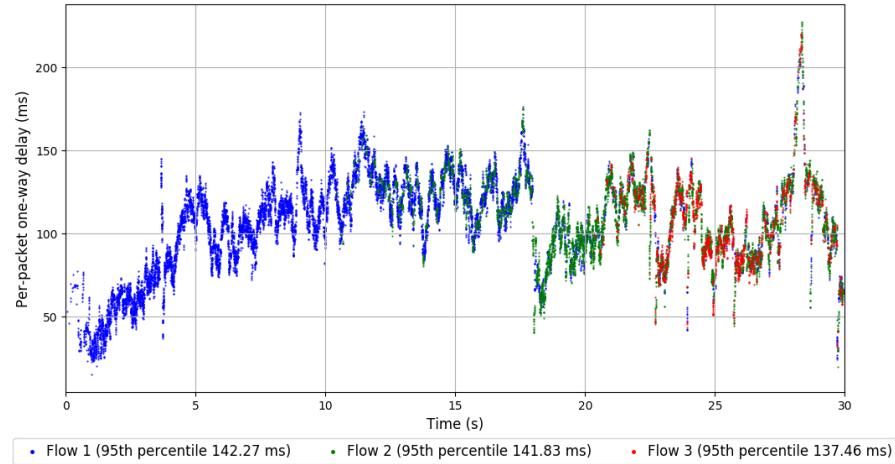
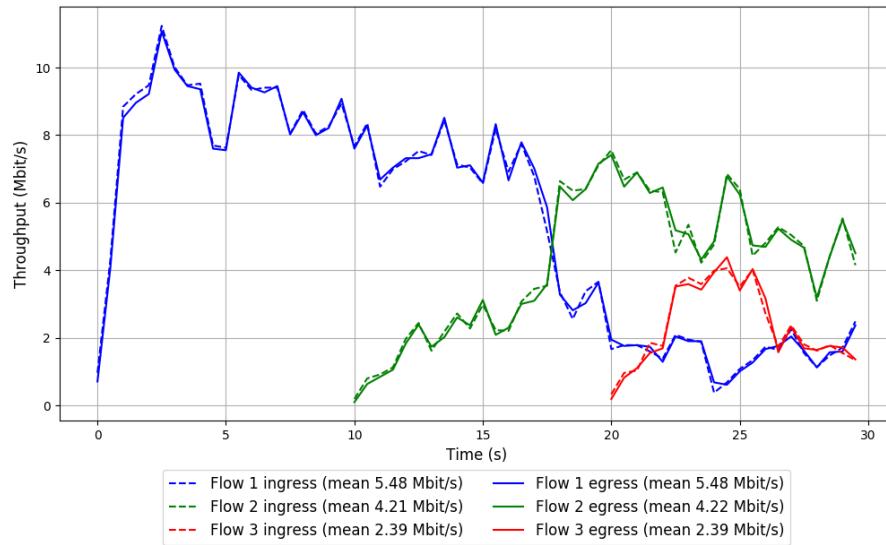


Run 2: Statistics of LEDBAT

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

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

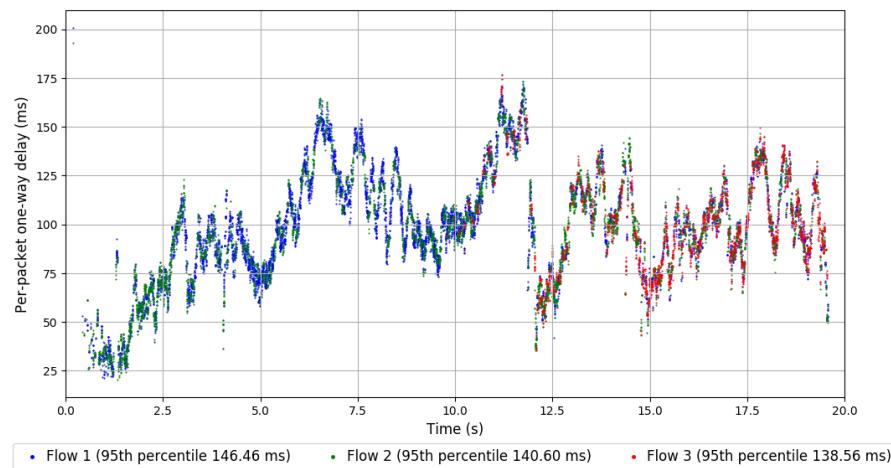
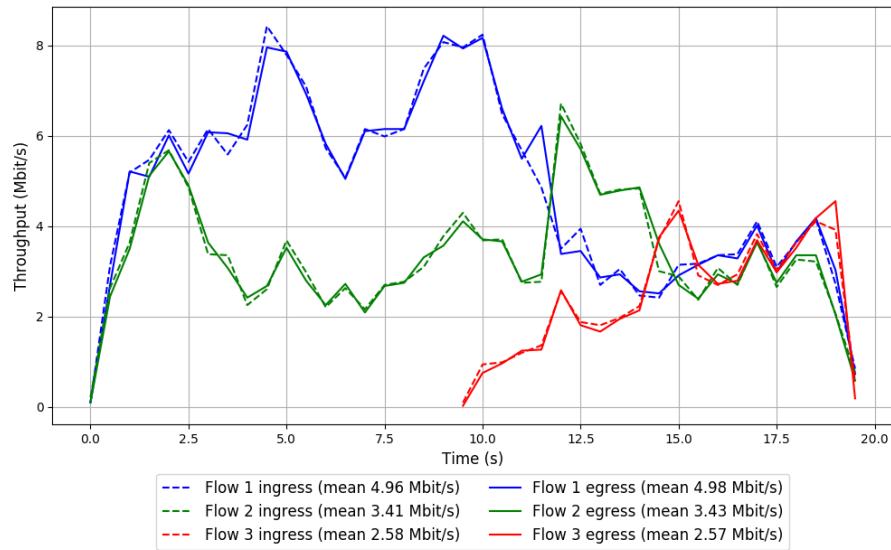
Run 2: Report of LEDBAT — Data Link



Run 3: Statistics of LEDBAT

Start at: 2017-12-20 18:34:13
End at: 2017-12-20 18:34:43
Local clock offset: 0.544 ms
Remote clock offset: -2.386 ms

Run 3: Report of LEDBAT — Data Link

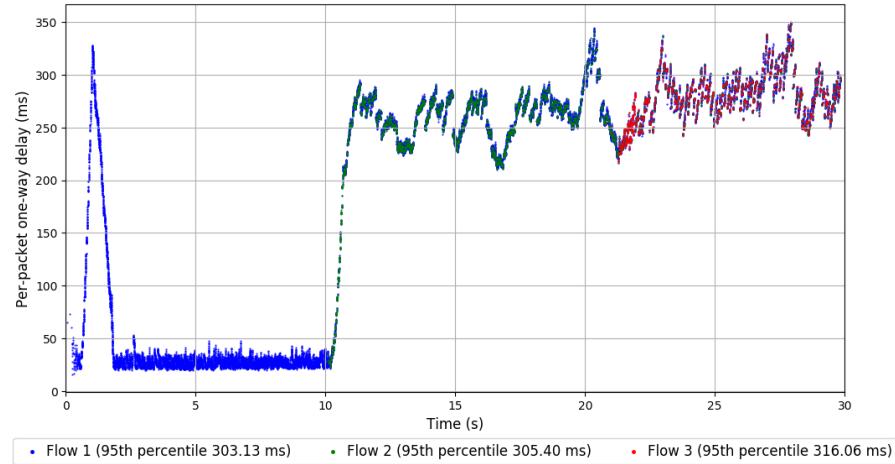
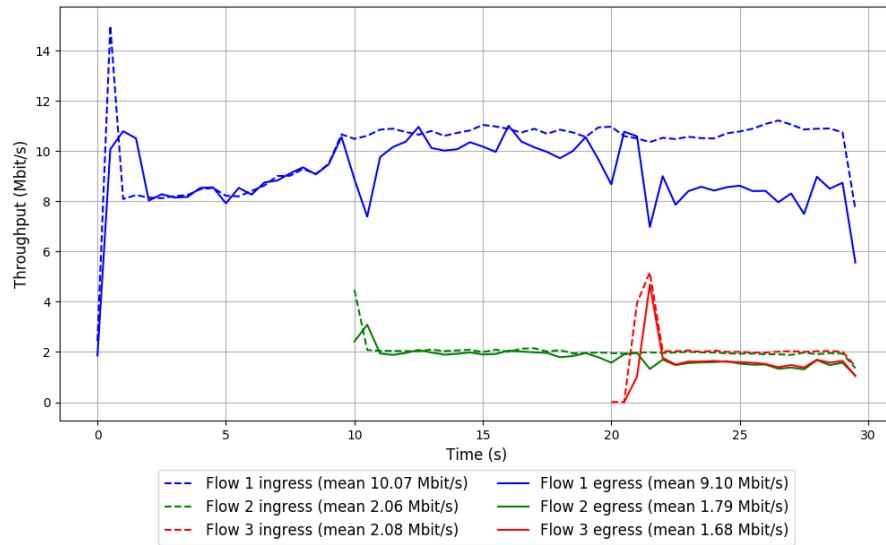


Run 1: Statistics of PCC

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

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

Run 1: Report of PCC — Data Link

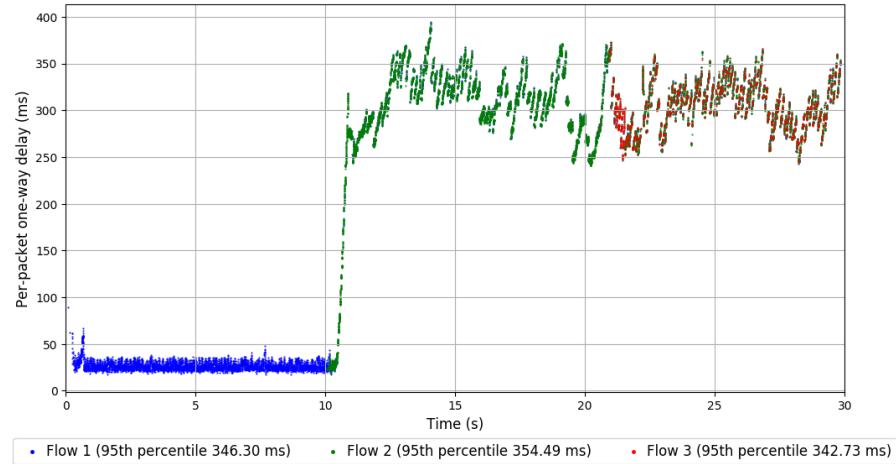
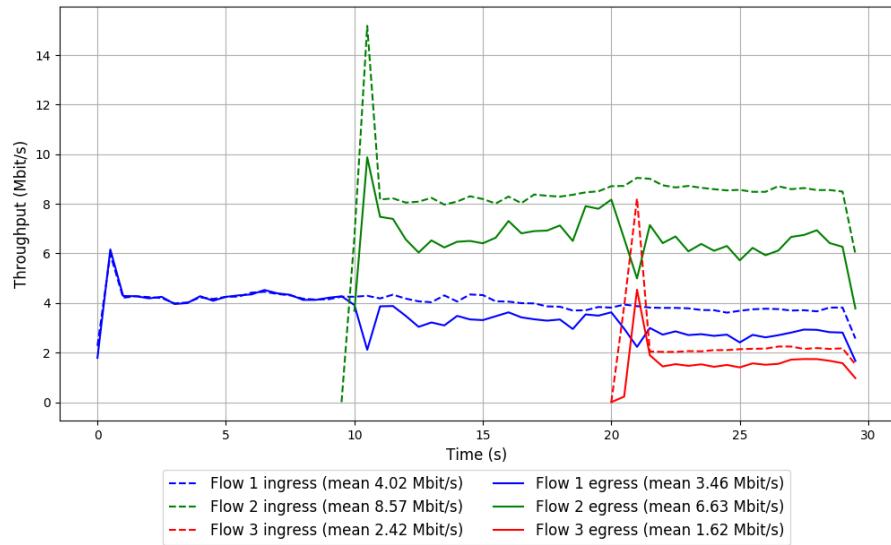


Run 2: Statistics of PCC

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

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

Run 2: Report of PCC — Data Link

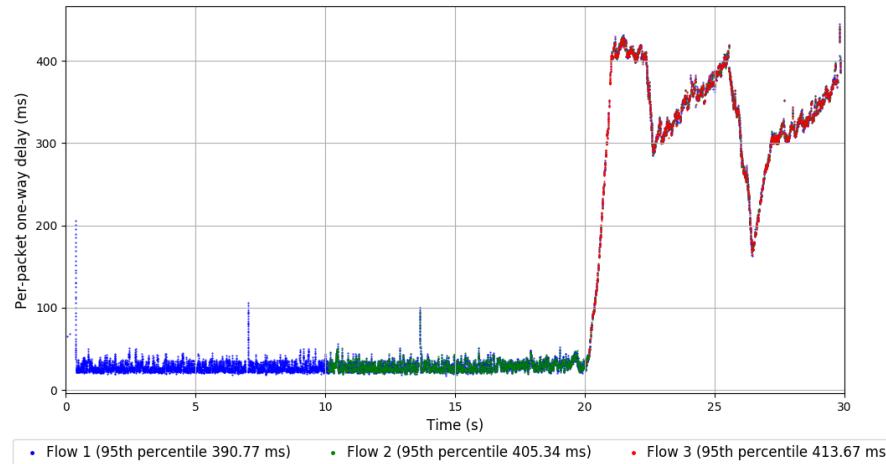
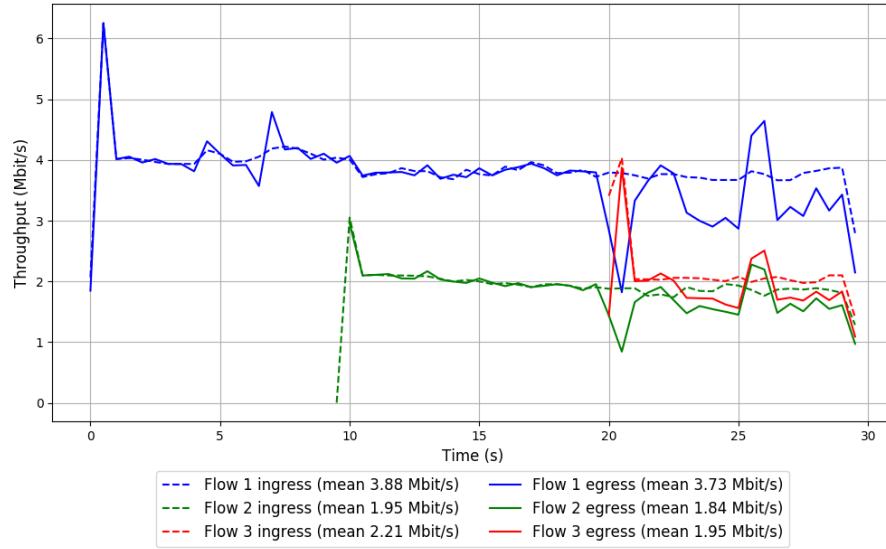


Run 3: Statistics of PCC

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

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

Run 3: Report of PCC — Data Link

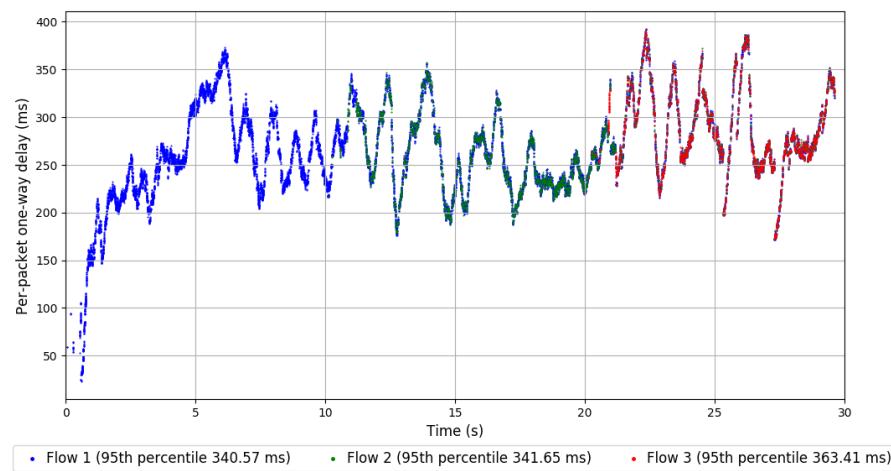
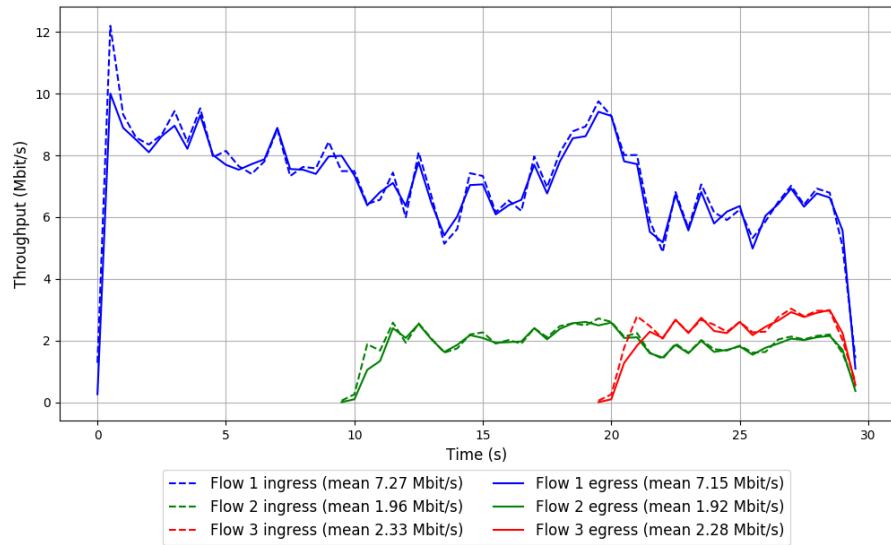


```
Run 1: Statistics of QUIC Cubic
```

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

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

Run 1: Report of QUIC Cubic — Data Link

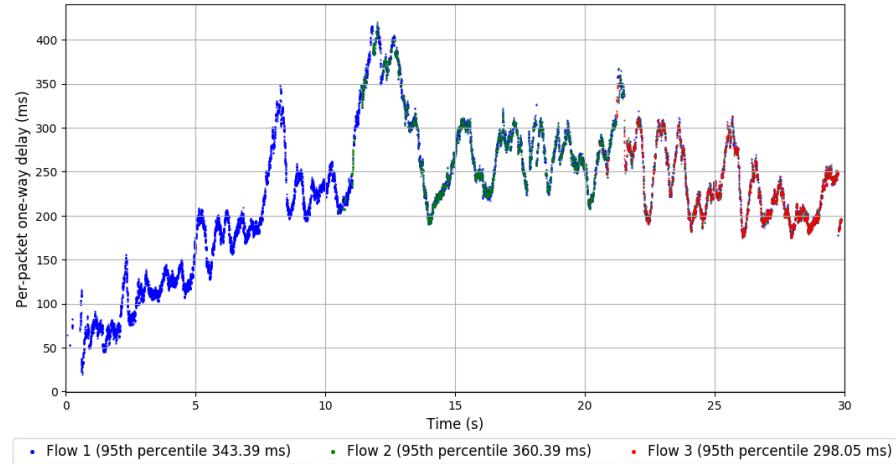
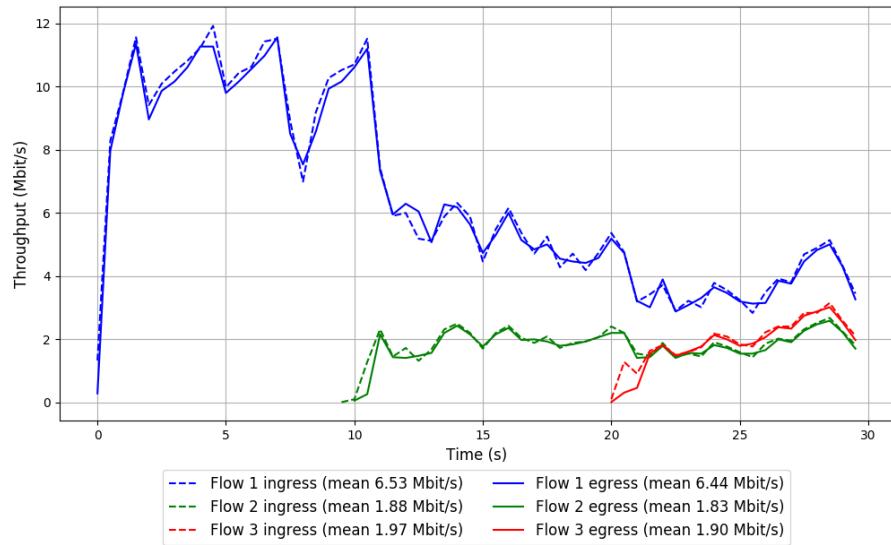


Run 2: Statistics of QUIC Cubic

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

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

Run 2: Report of QUIC Cubic — Data Link

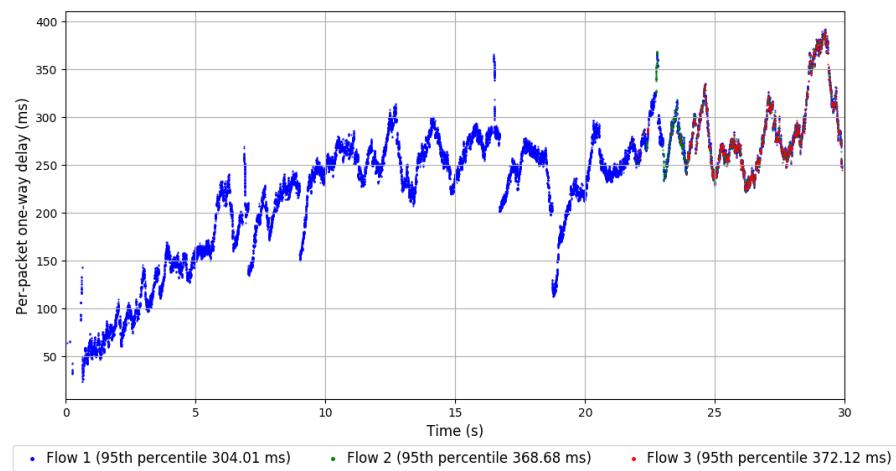
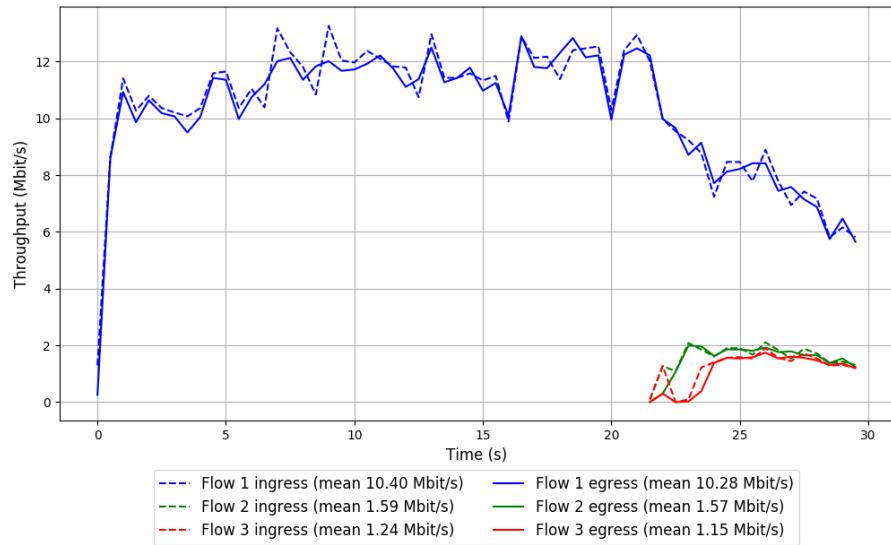


Run 3: Statistics of QUIC Cubic

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

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

Run 3: Report of QUIC Cubic — Data Link

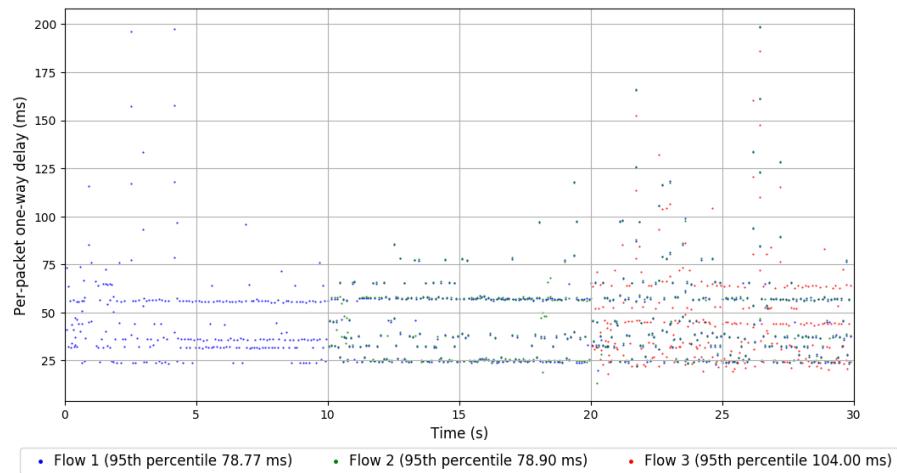
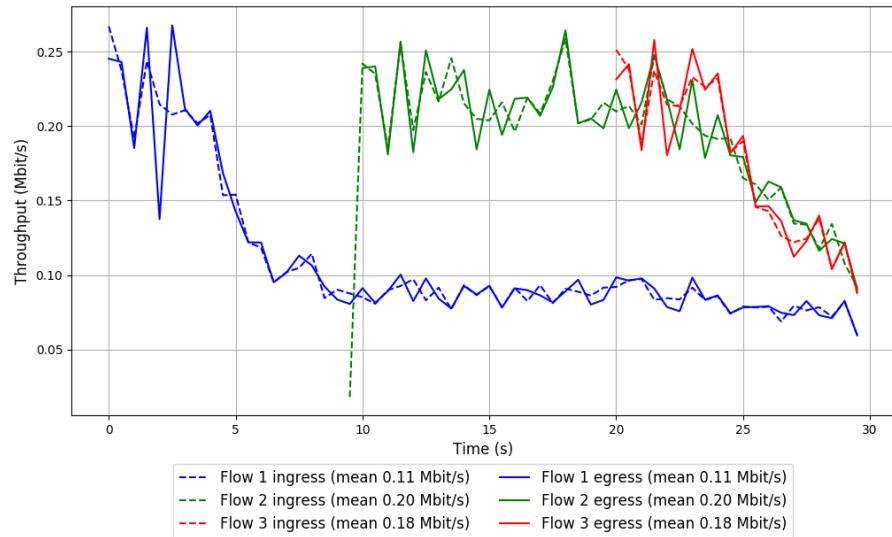


```
Run 1: Statistics of SCReAM
```

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

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

Run 1: Report of SCReAM — Data Link

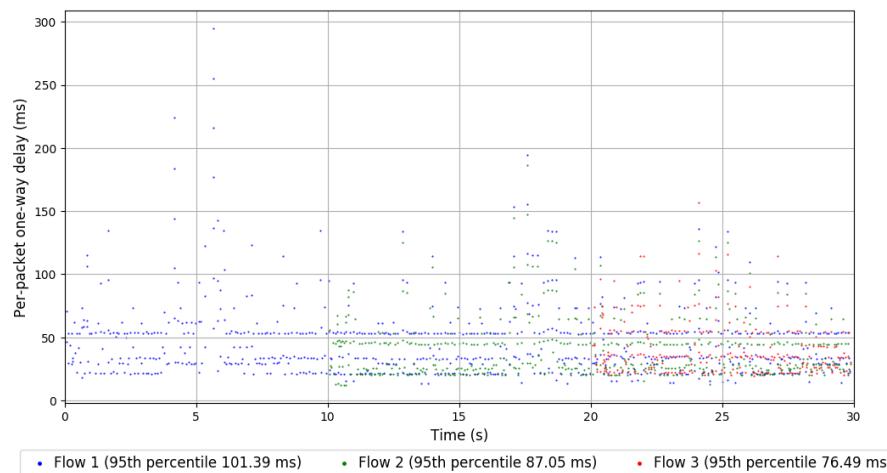
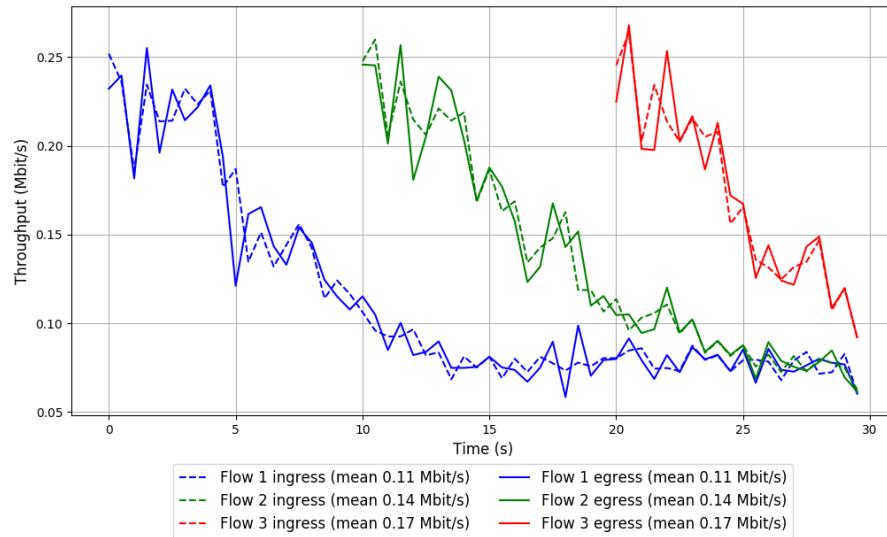


Run 2: Statistics of SCReAM

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

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

Run 2: Report of SCReAM — Data Link

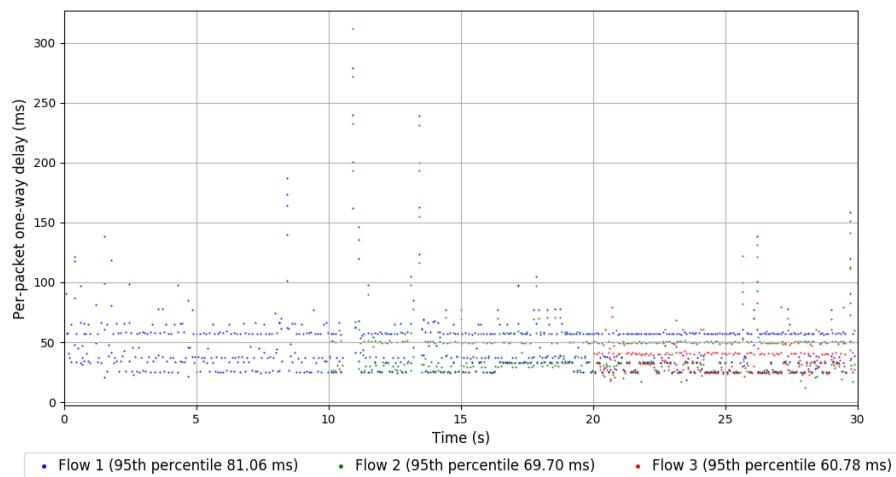
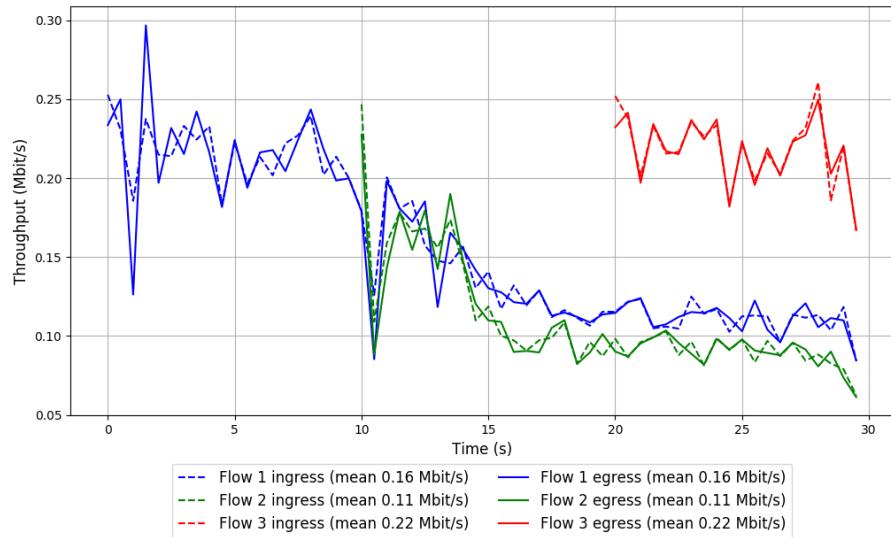


Run 3: Statistics of SCReAM

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

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

Run 3: Report of SCReAM — Data Link

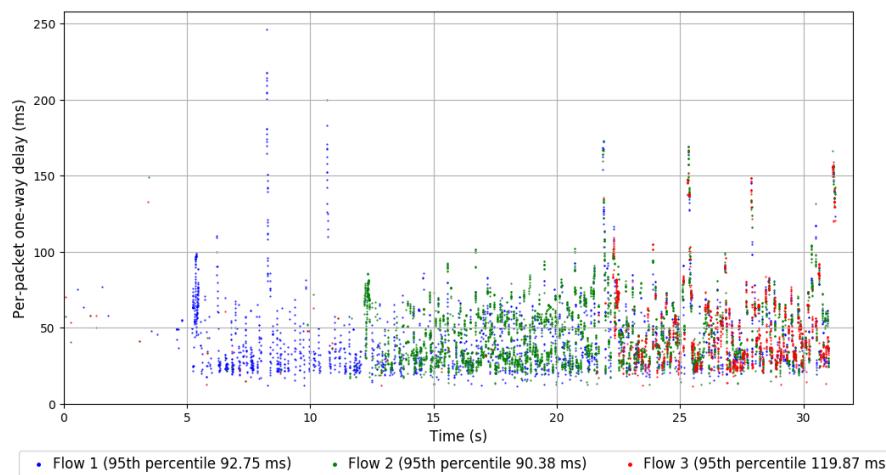
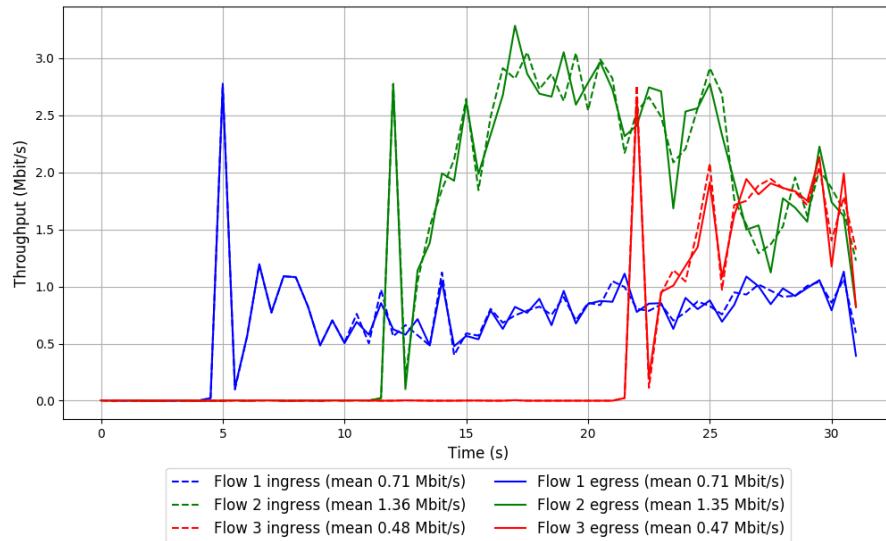


```
Run 1: Statistics of WebRTC media

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

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

Run 1: Report of WebRTC media — Data Link

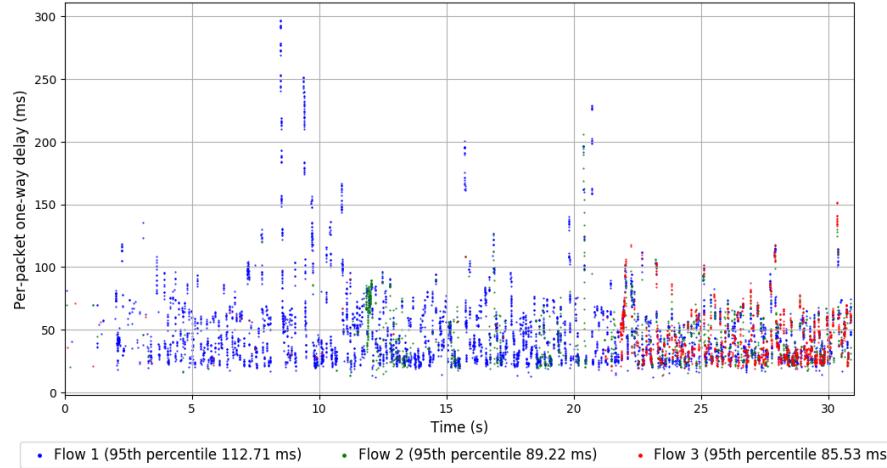
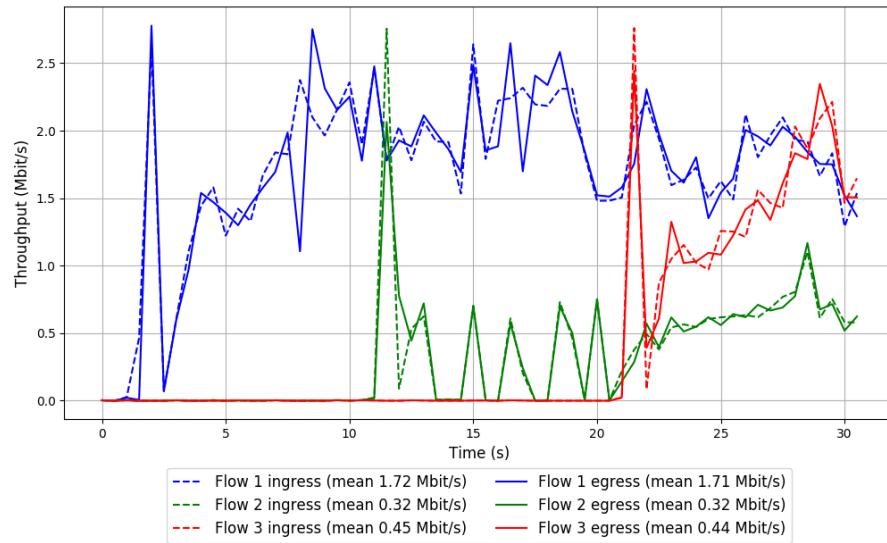


Run 2: Statistics of WebRTC media

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

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

Run 2: Report of WebRTC media — Data Link

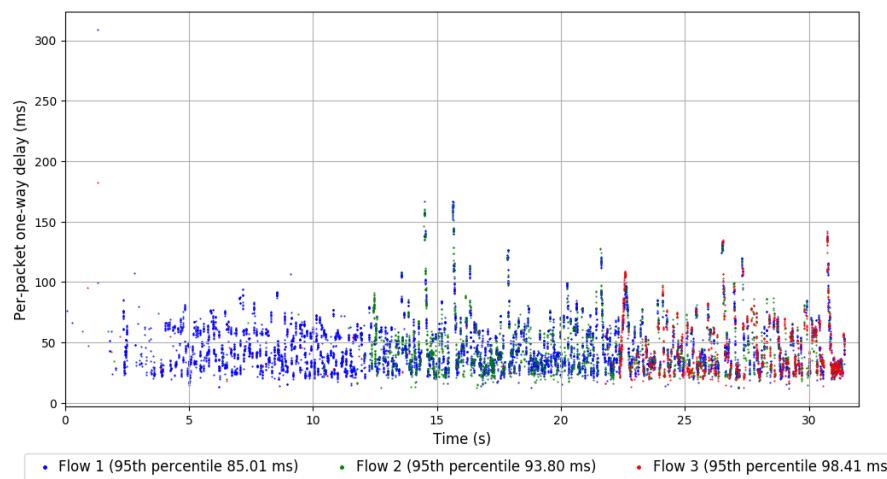
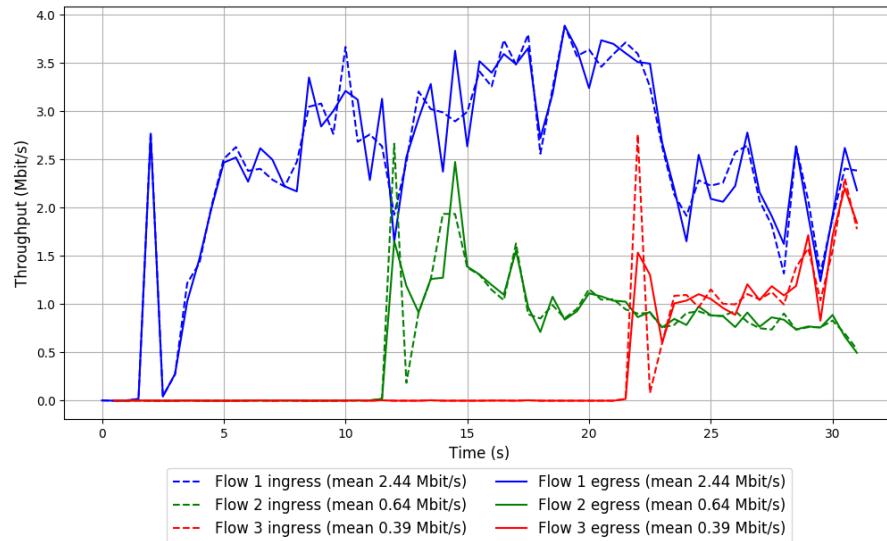


Run 3: Statistics of WebRTC media

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

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

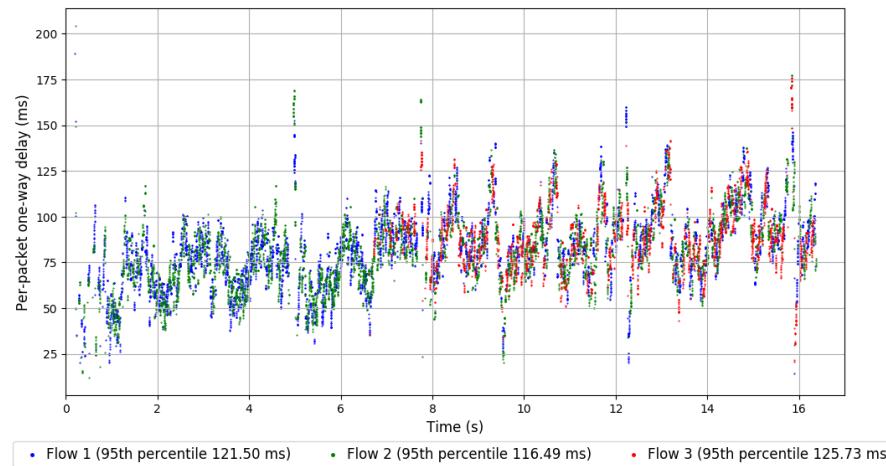
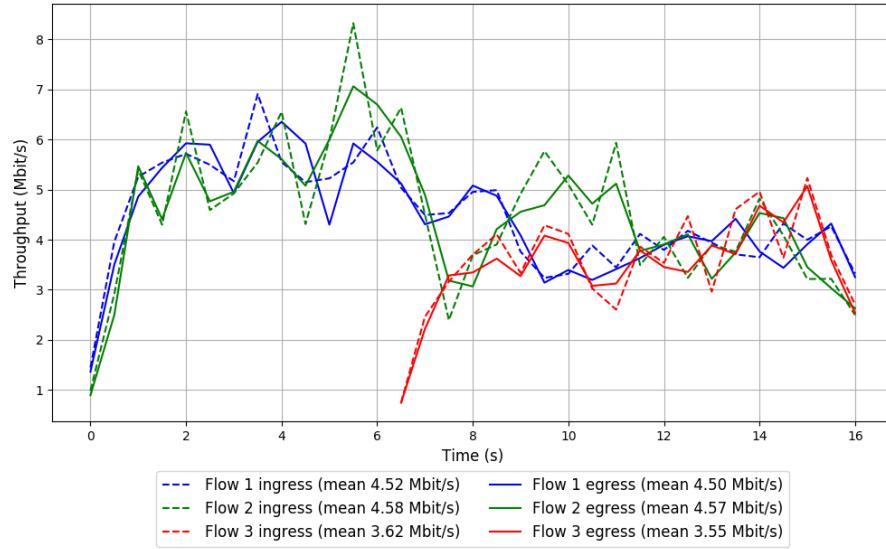
Run 3: Report of WebRTC media — Data Link



Run 1: Statistics of Sprout

Start at: 2017-12-20 18:04:28
End at: 2017-12-20 18:04:58
Local clock offset: 0.636 ms
Remote clock offset: -2.556 ms

Run 1: Report of Sprout — Data Link

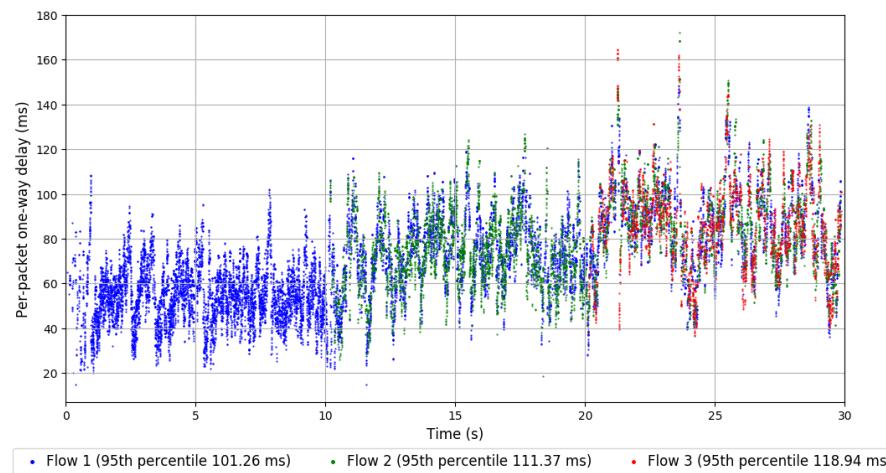
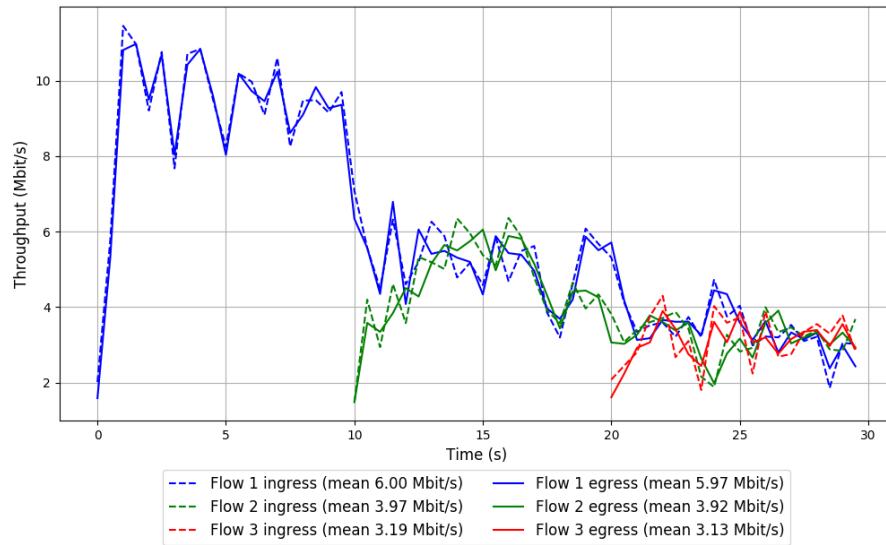


Run 2: Statistics of Sprout

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

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

Run 2: Report of Sprout — Data Link

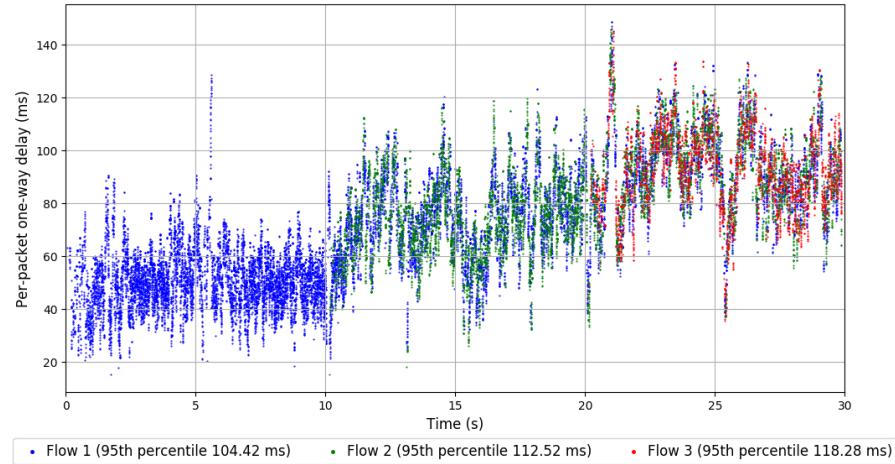
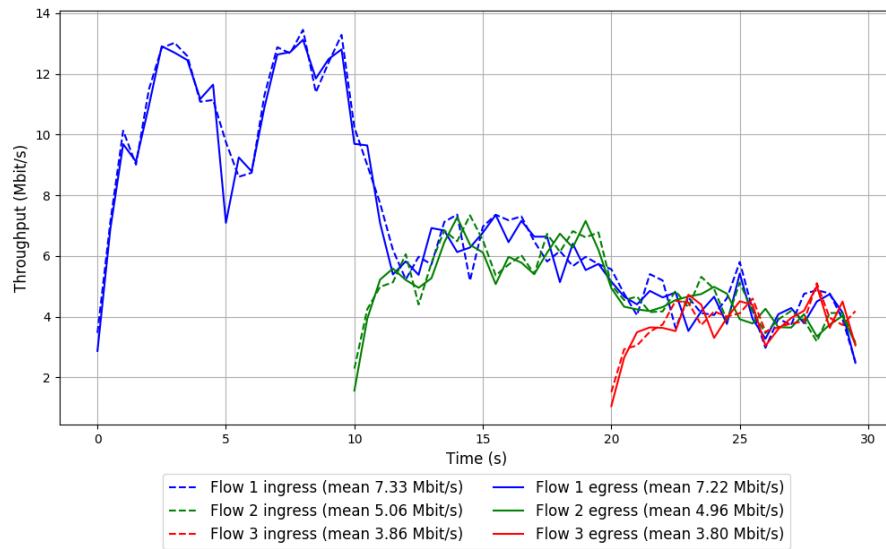


Run 3: Statistics of Sprout

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

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

Run 3: Report of Sprout — Data Link

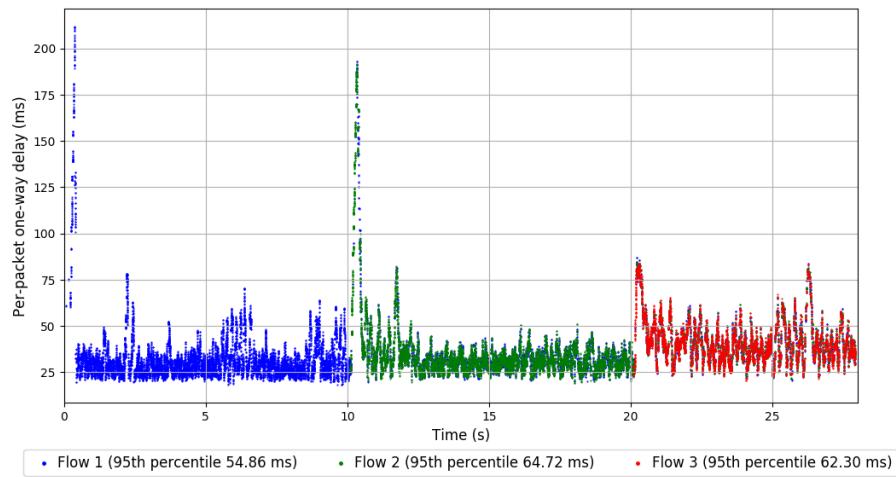
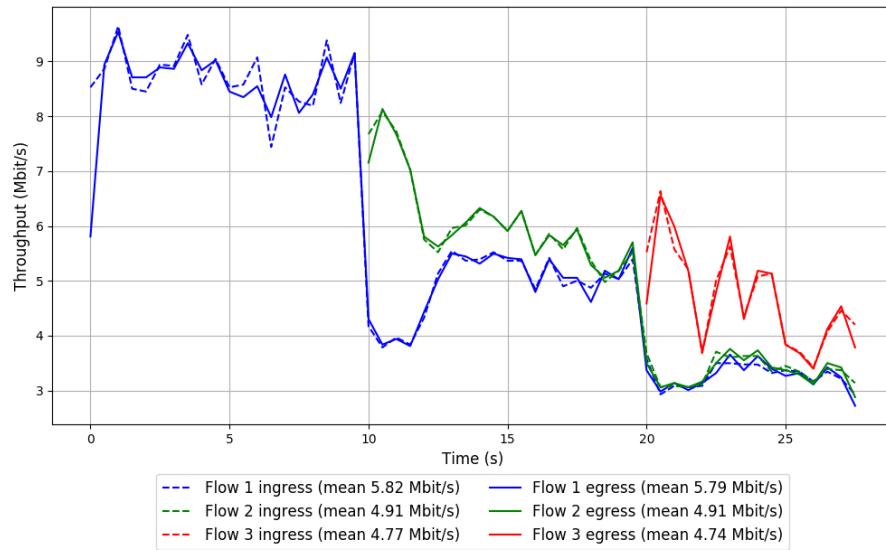


Run 1: Statistics of TaoVA-100x

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

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

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

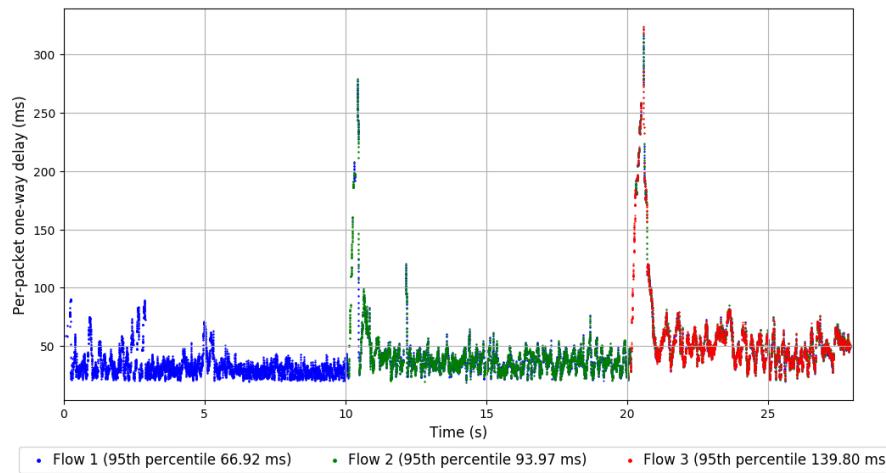
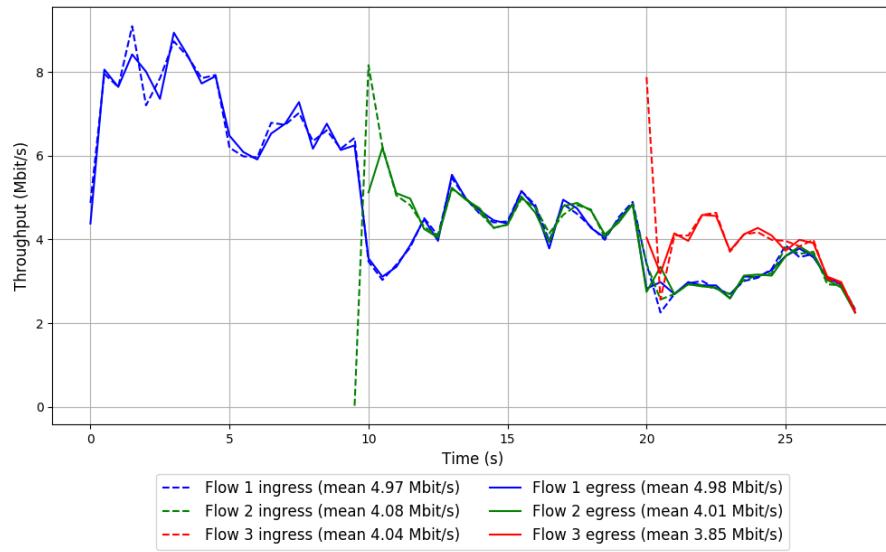


Run 2: Statistics of TaoVA-100x

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

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

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

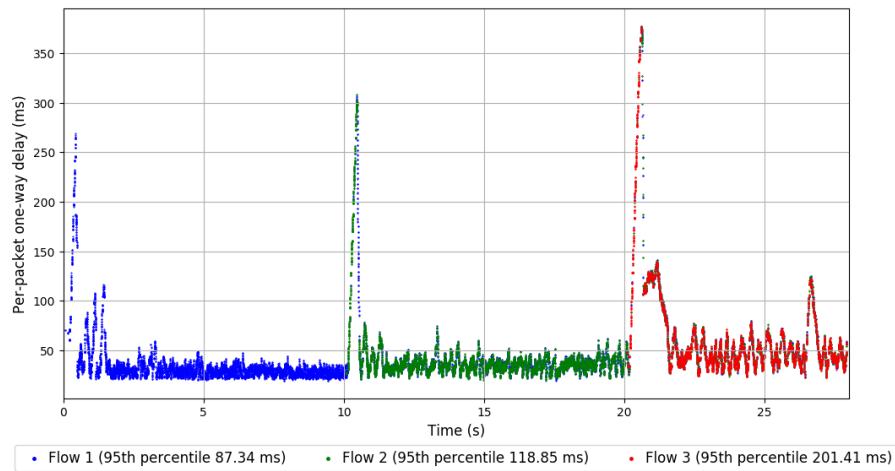
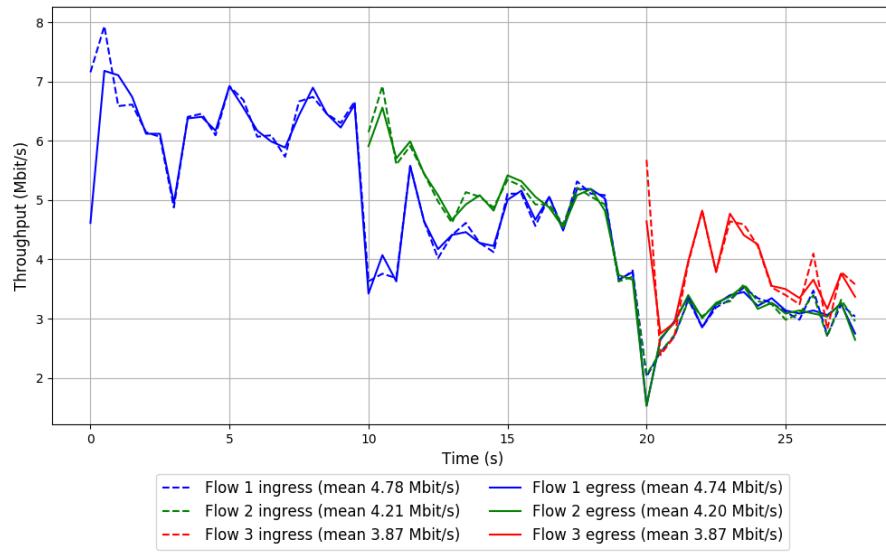


Run 3: Statistics of TaoVA-100x

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

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

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

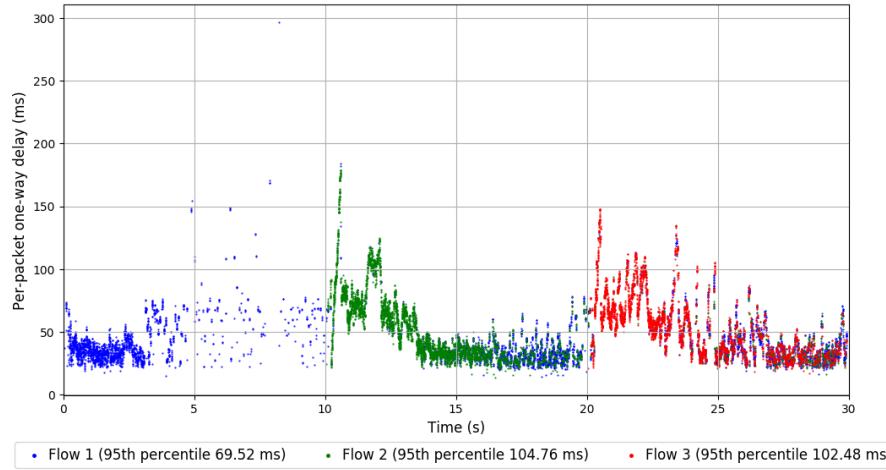
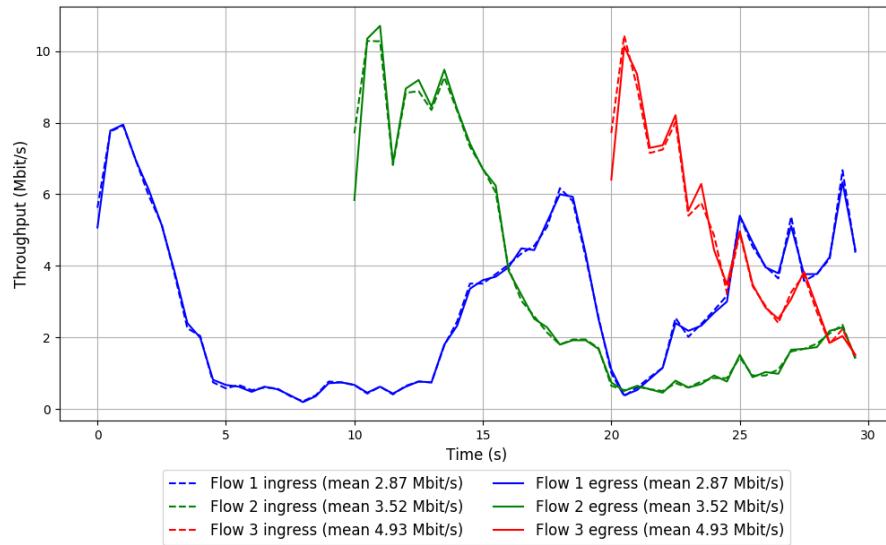


Run 1: Statistics of TCP Vegas

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

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

Run 1: Report of TCP Vegas — Data Link

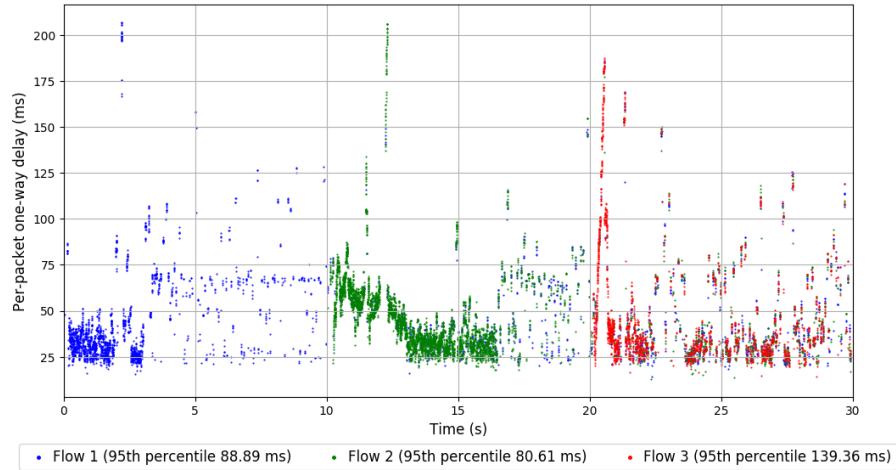
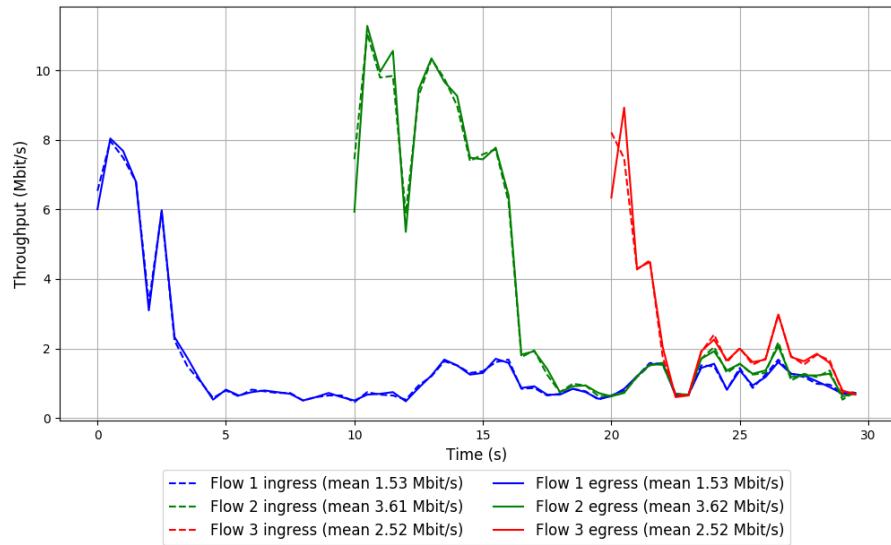


Run 2: Statistics of TCP Vegas

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

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

Run 2: Report of TCP Vegas — Data Link

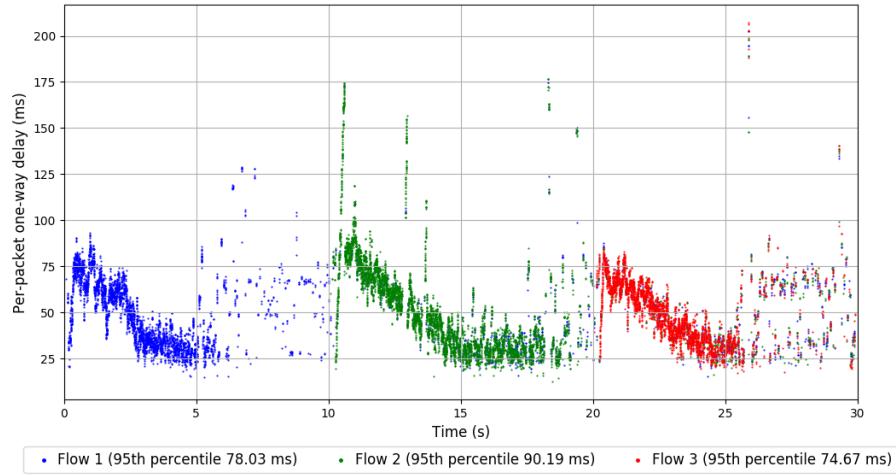
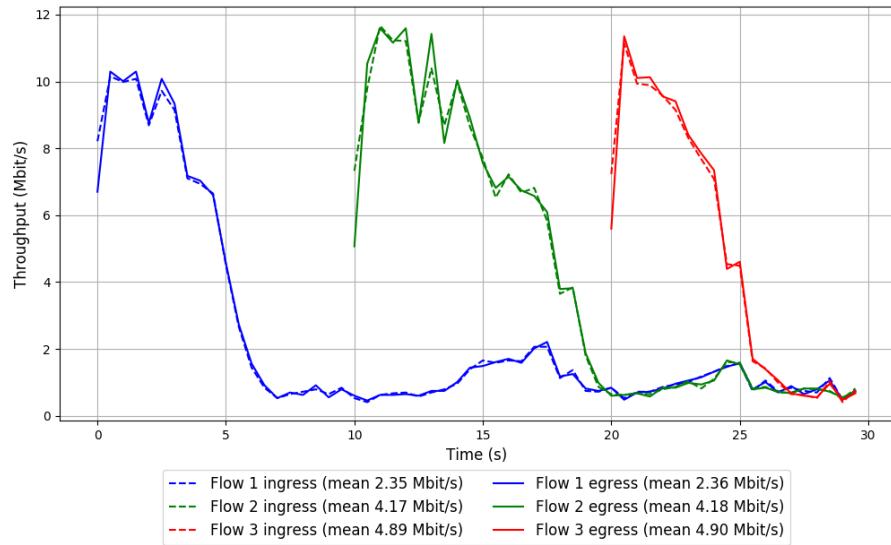


Run 3: Statistics of TCP Vegas

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

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

Run 3: Report of TCP Vegas — Data Link

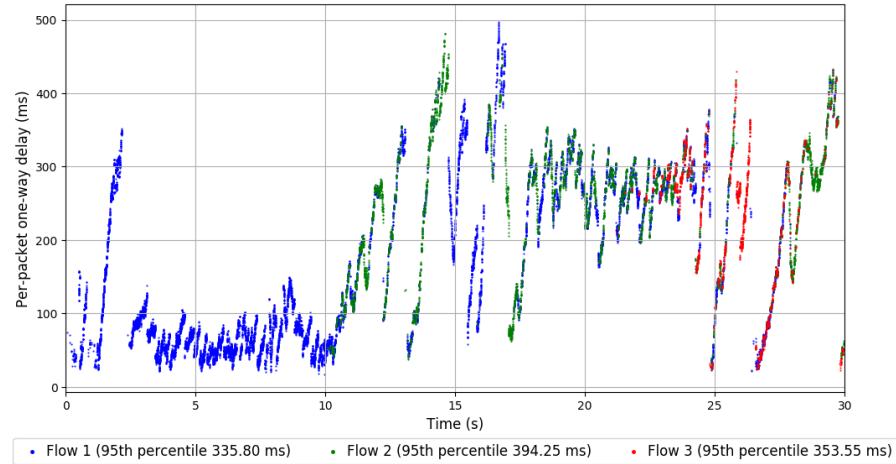
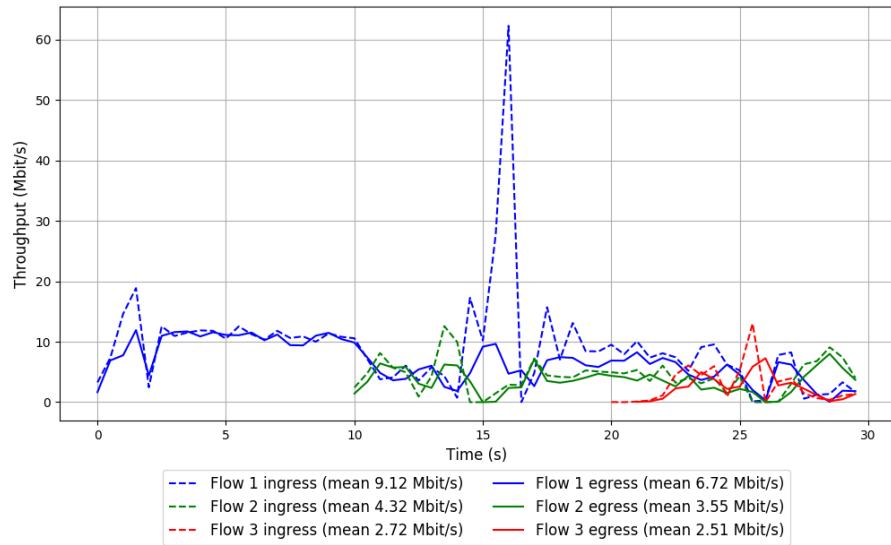


Run 1: Statistics of Verus

```
Start at: 2017-12-20 17:53:46
End at: 2017-12-20 17:54:16
Local clock offset: 0.608 ms
Remote clock offset: -2.55 ms

# Below is generated by plot.py at 2017-12-20 19:40:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 9.80 Mbit/s
95th percentile per-packet one-way delay: 355.982 ms
Loss rate: 24.23%
-- Flow 1:
Average throughput: 6.72 Mbit/s
95th percentile per-packet one-way delay: 335.795 ms
Loss rate: 26.66%
-- Flow 2:
Average throughput: 3.55 Mbit/s
95th percentile per-packet one-way delay: 394.252 ms
Loss rate: 18.06%
-- Flow 3:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 353.552 ms
Loss rate: 19.36%
```

Run 1: Report of Verus — Data Link

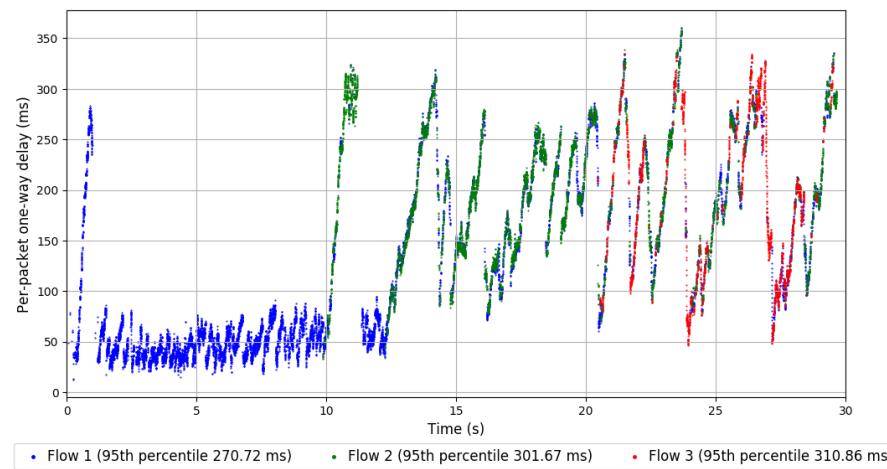
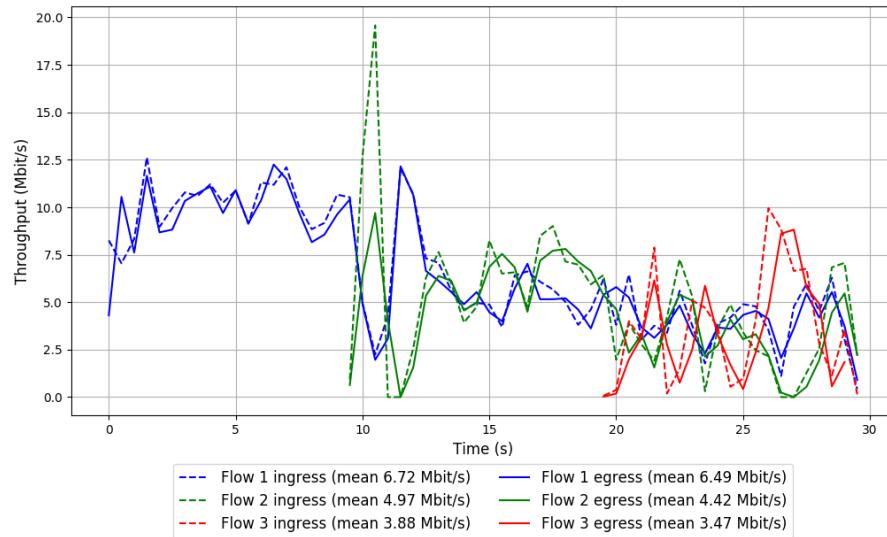


Run 2: Statistics of Verus

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

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

Run 2: Report of Verus — Data Link

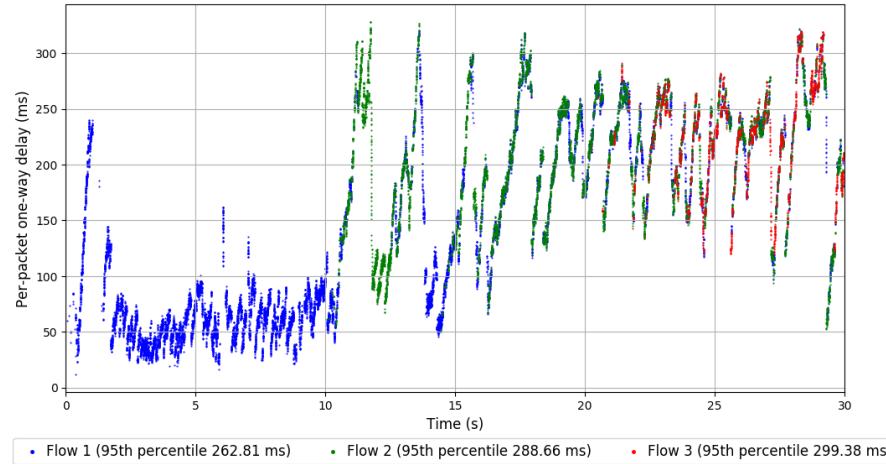
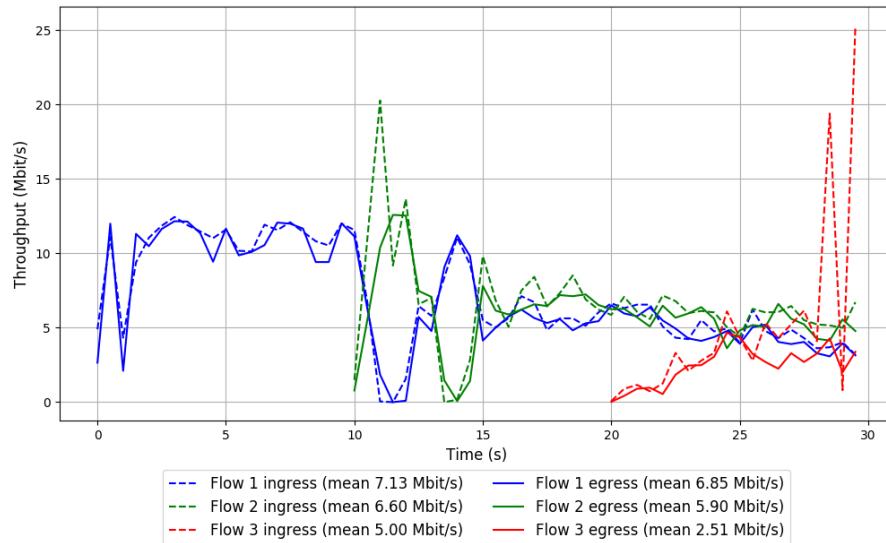


Run 3: Statistics of Verus

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

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

Run 3: Report of Verus — Data Link

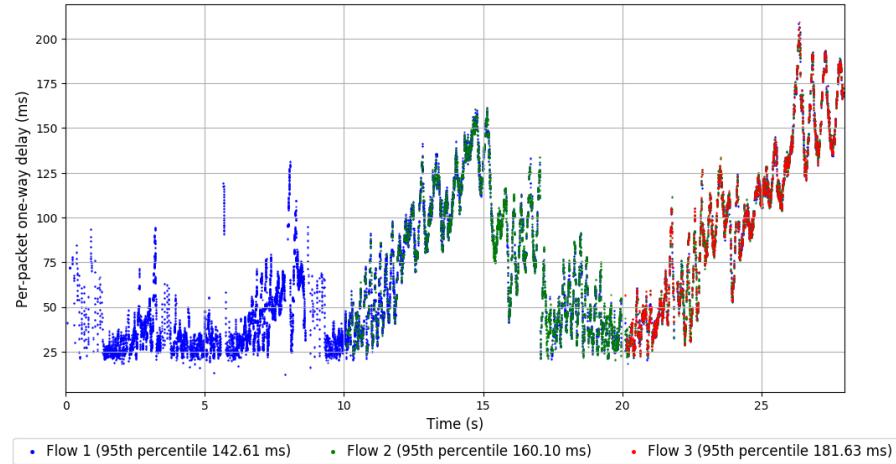
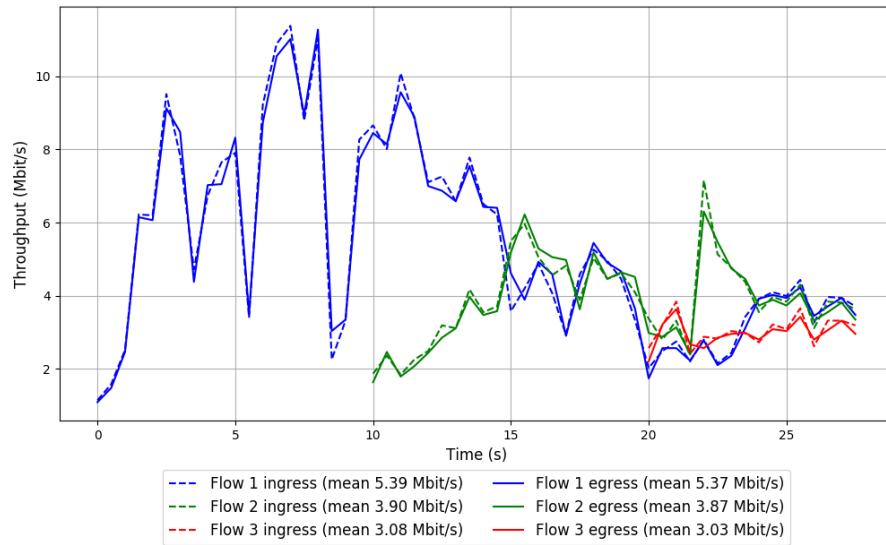


Run 1: Statistics of Copa

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

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

Run 1: Report of Copa — Data Link

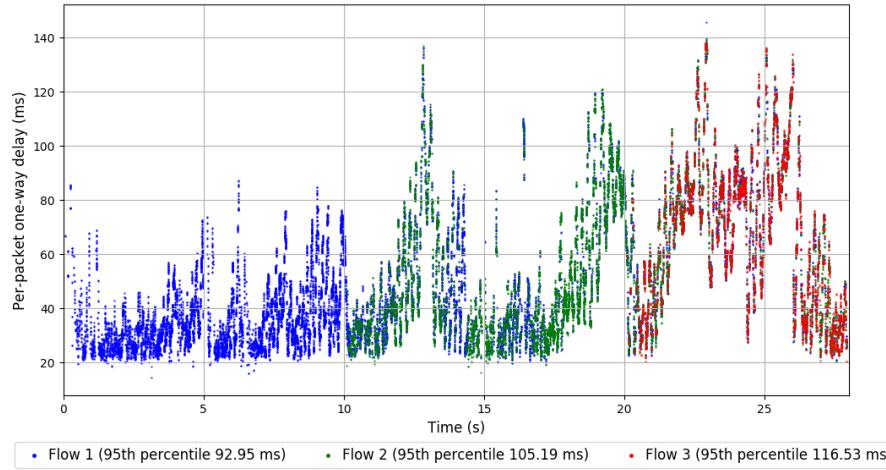
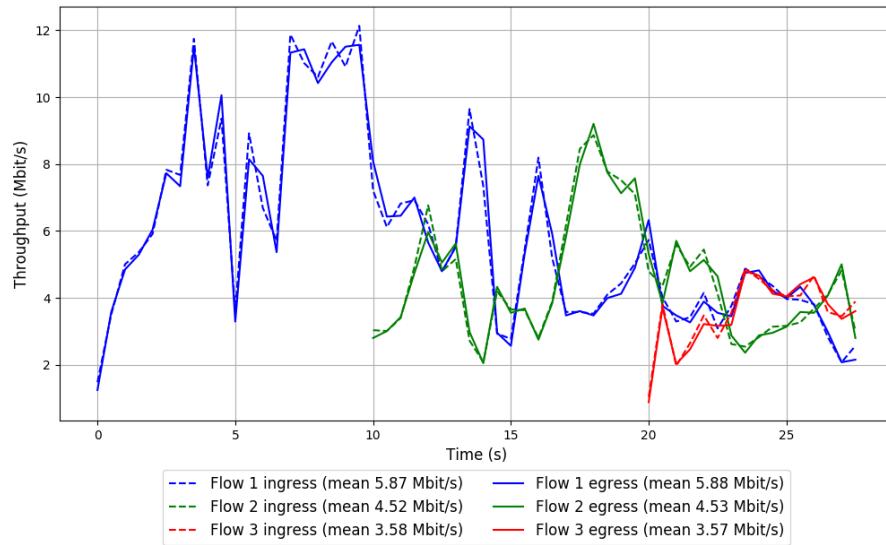


Run 2: Statistics of Copa

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

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

Run 2: Report of Copa — Data Link

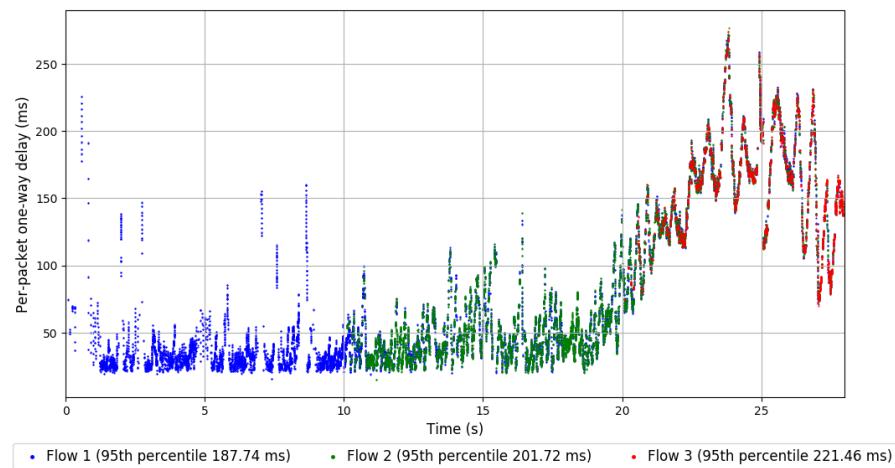
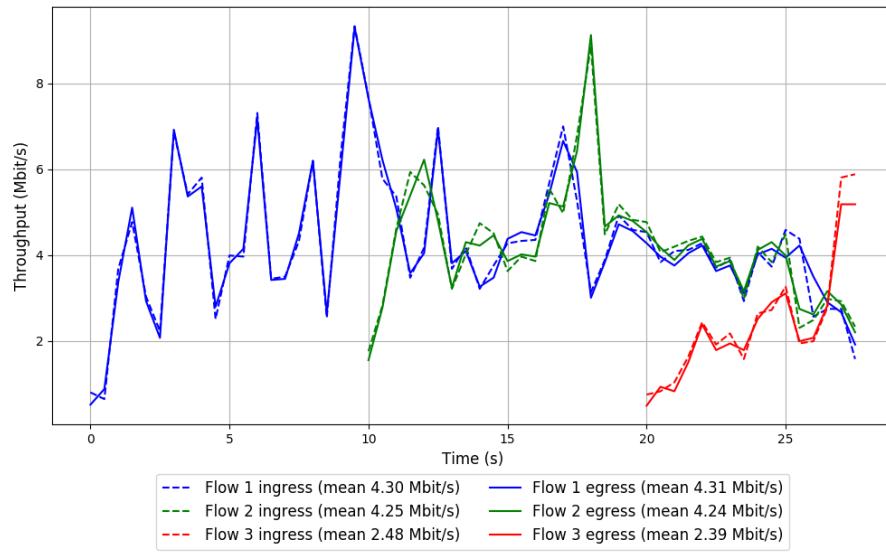


Run 3: Statistics of Copa

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

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

Run 3: Report of Copa — Data Link

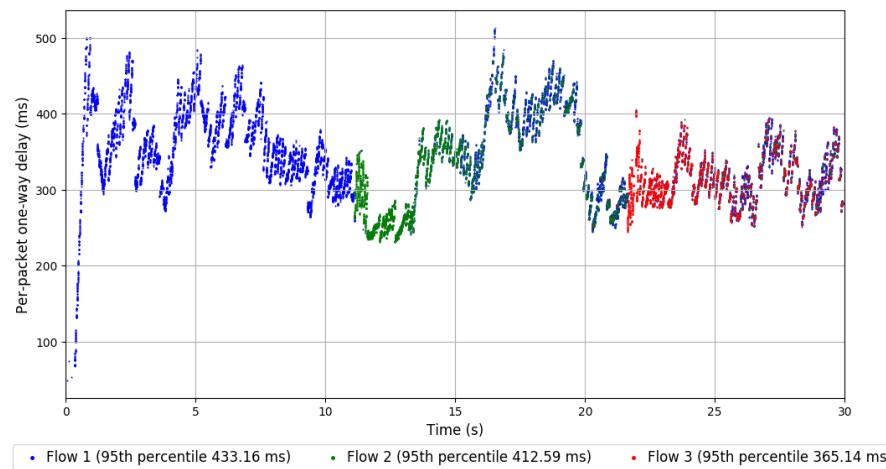
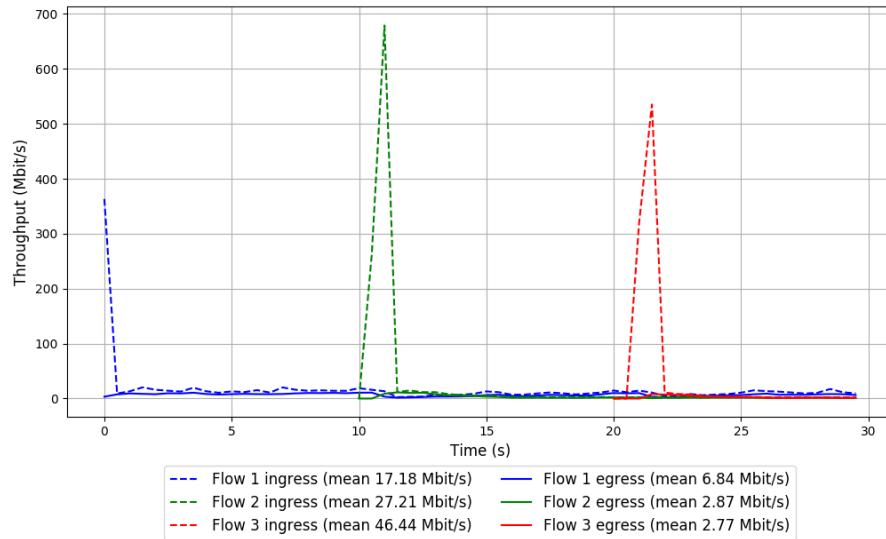


```
Run 1: Statistics of FillP
```

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

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

Run 1: Report of FillP — Data Link

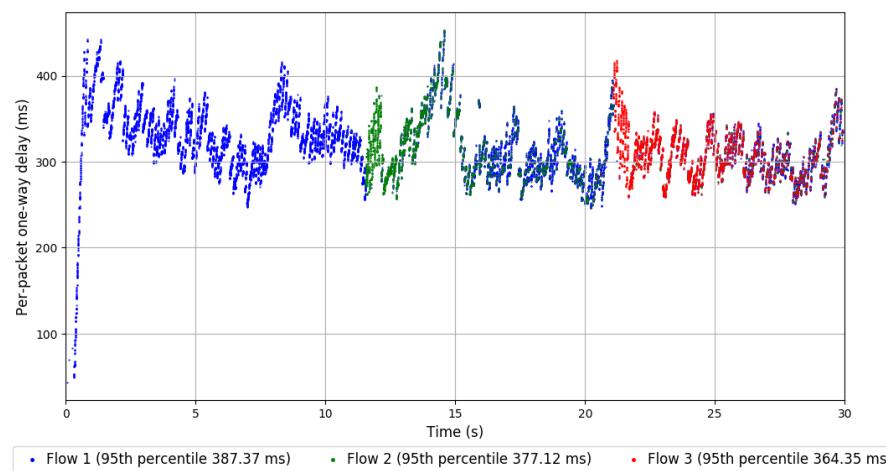
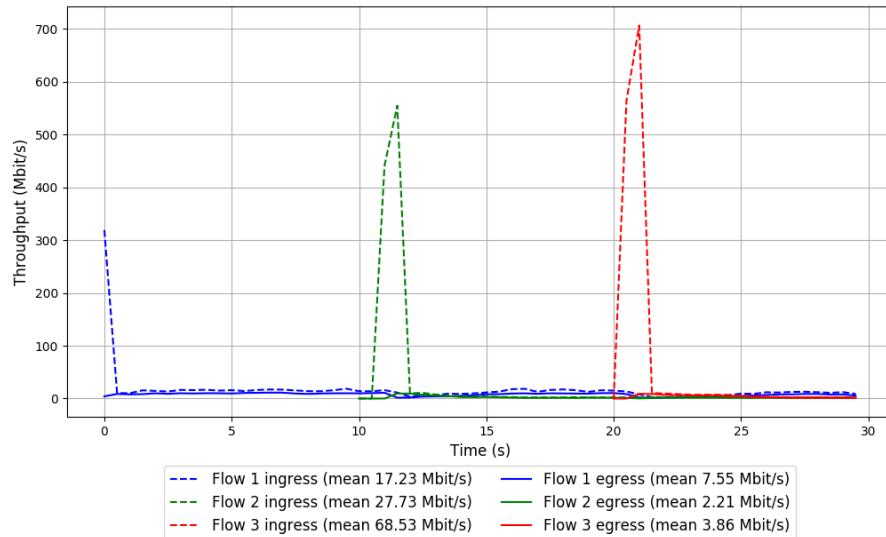


Run 2: Statistics of FillP

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

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

Run 2: Report of FillP — Data Link

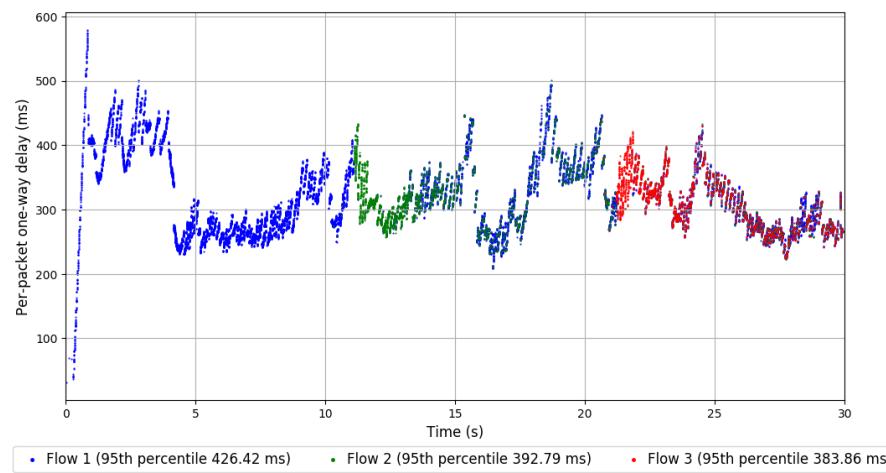
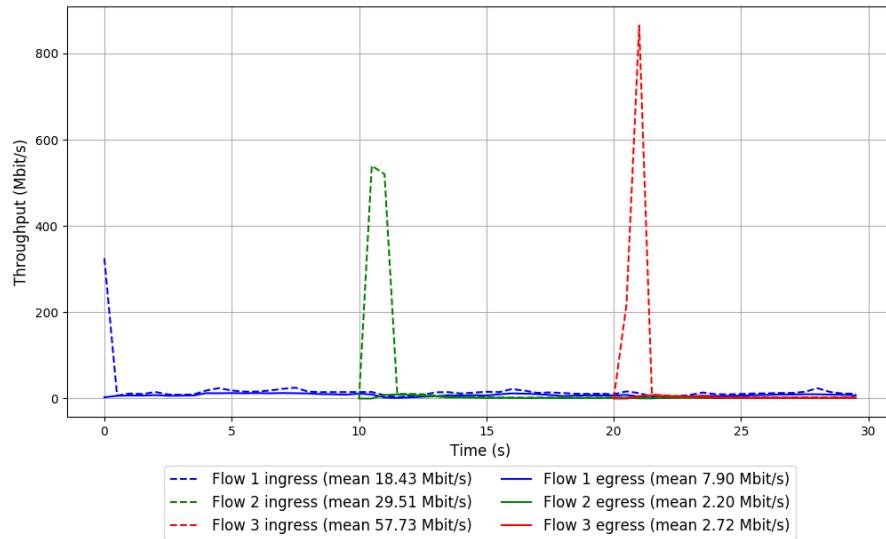


Run 3: Statistics of FillP

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

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

Run 3: Report of FillP — Data Link

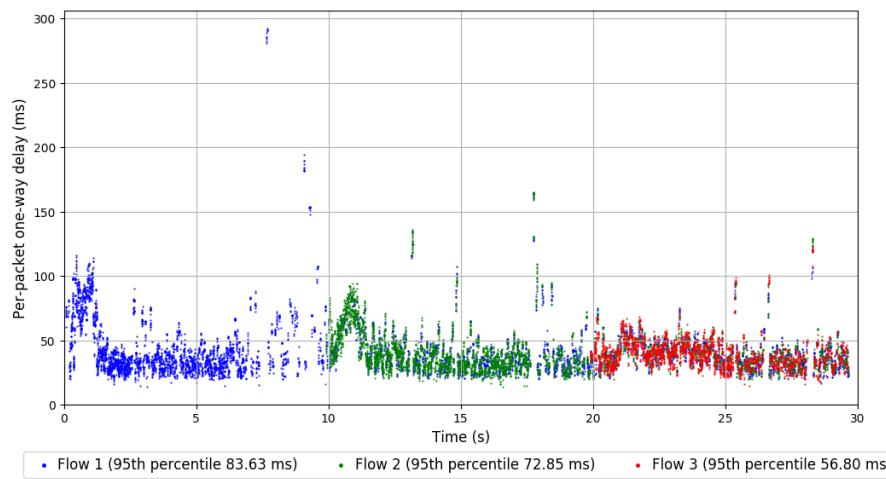
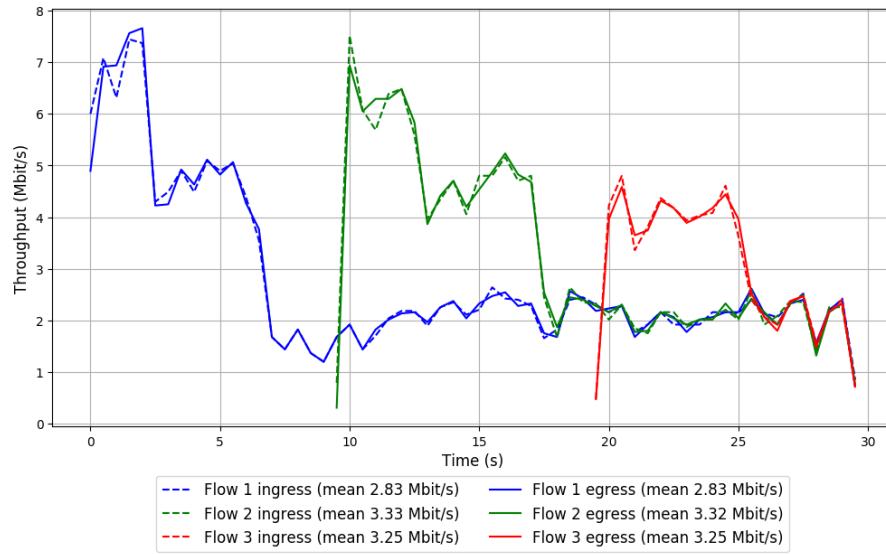


Run 1: Statistics of Indigo

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

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

Run 1: Report of Indigo — Data Link

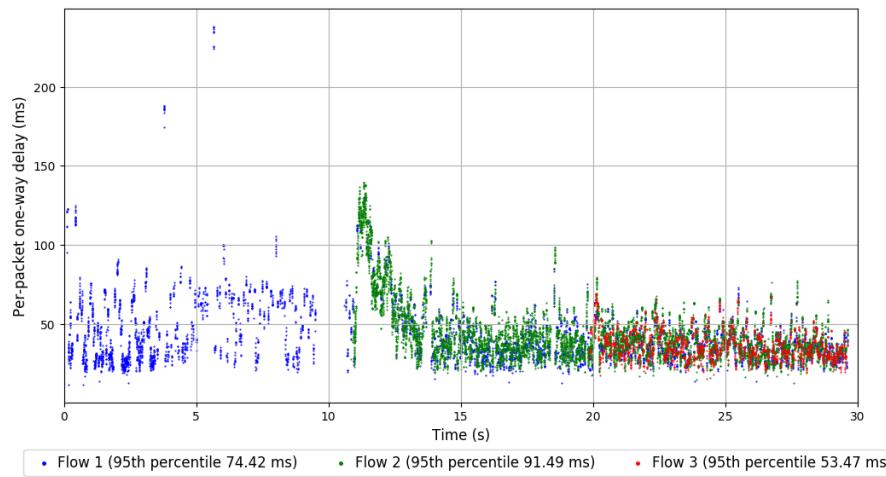
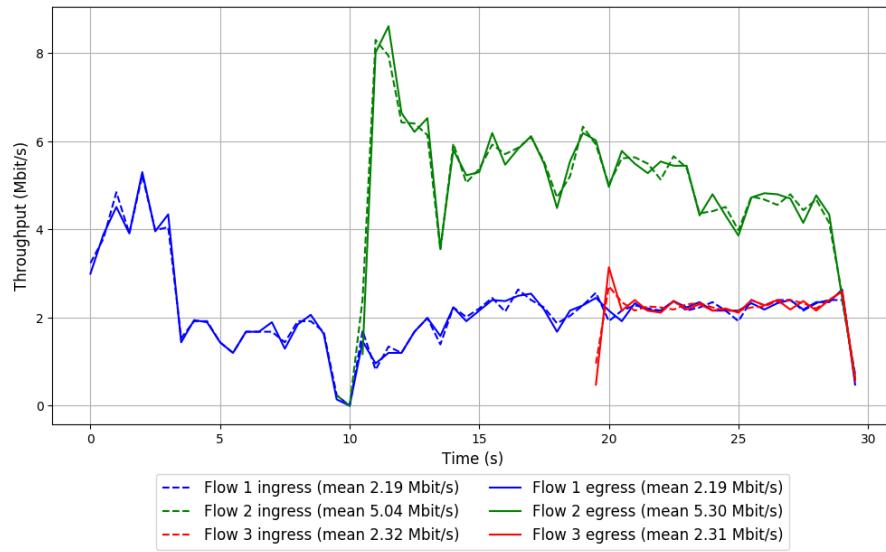


Run 2: Statistics of Indigo

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

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

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

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

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

Run 3: Report of Indigo — Data Link

