

Pantheon Report

Generated at 2017-09-22 15:11:44 (UTC).

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

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).

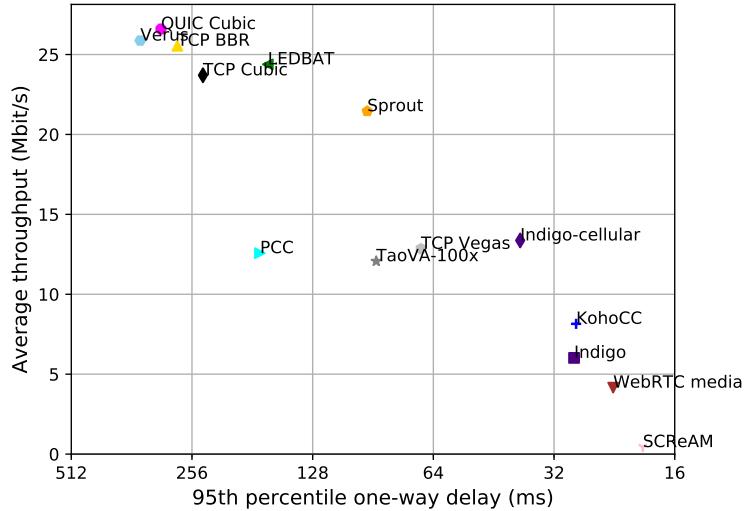
Tested BBR with qdisc of Fair Queuing (**fq**), and other schemes with the default Linux qdisc (**pfifo_fast**).

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

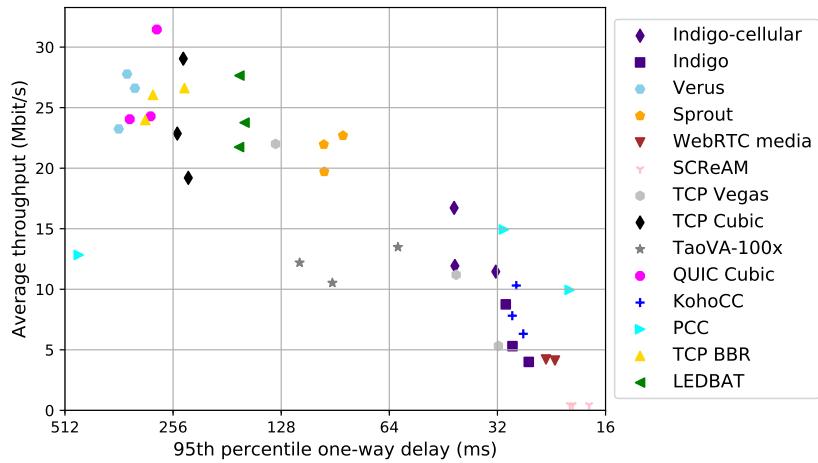
Git summary:

```
branch: indigos @ 46c7c812d4acb71eea4f5fb0b03b3657cea3062f
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
  M datagrump/sender.cc
third_party/genericCC @ f7ca42f251bf49b432bb71de6d13fa903515c366
third_party/indigo @ b19f3730105f9aa95452552af924e3719b03cc55
third_party/indigo-cellular @ aee99e8eb842cb053f8c9a80e28cd256a930bbc2
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/indigo-no-cwnd @ 3e58442c04028a11d7b02456e137604633ba2d6c
third_party/indigo-no-delivery-rate @ 57caa40858b964906edff4876d5a7e5bfff666c5
third_party/indigo-no-queuing-delay @ 03455460fd1a8ffbdad86fab936fdca204b80db
third_party/indigo-no-send-rate @ b39dfa6b2c5f19cb7cd89626cb4f5bb81f9fecda
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
  M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179aab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ baf443516dea3eeddeccaf9b916cc313273ca4f4
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
  M receiver/src/buffer.h
  M receiver/src/core.cpp
  M sender/src/buffer.h
  M sender/src/core.cpp
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ f1a14bffe749737437f61b1eaeeb30b267cde681
third_party/sprout @ 6f2efef6e088d91066a9f023df375eee2665089ce
  M src/examples/cellsim.cc
  M src/examples/sproutbt2.cc
  M src/network/sproutconn.cc
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
  M src/verus.hpp
  M tools/plot.py
third_party/webrtc @ a488197ddd041ace68a42849b2540ad834825f42
```

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



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



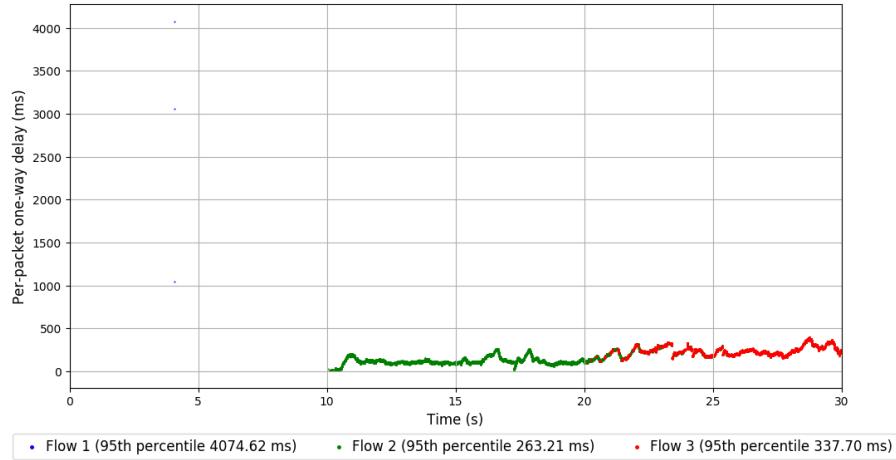
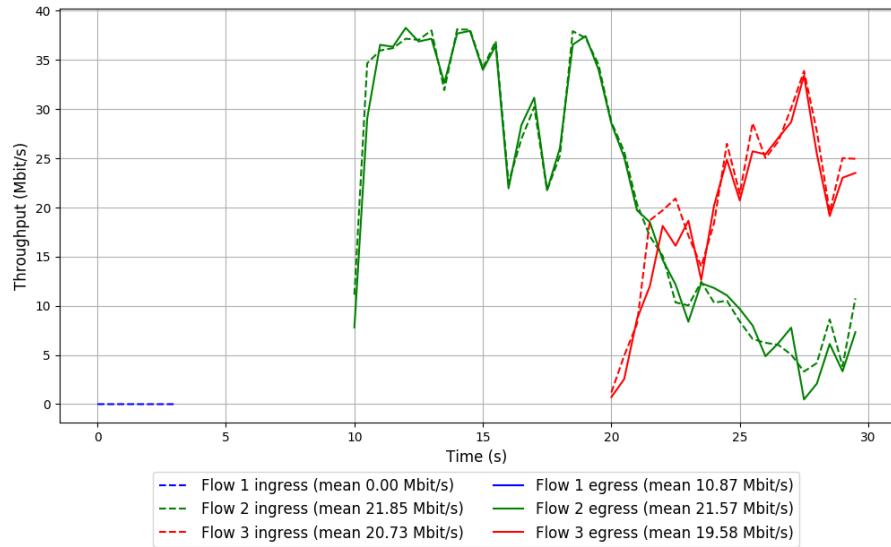
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	10.47	18.44	16.44	1479.81	265.60	302.64	0.25	2.86	7.08
TCP Cubic	3	15.70	9.39	5.29	223.64	256.94	275.05	0.16	0.57	1.08
LEDBAT	3	18.52	7.09	3.57	158.33	177.28	188.62	0.21	0.23	1.11
PCC	3	5.78	8.74	2.90	246.99	171.45	180.98	0.71	1.11	2.08
QUIC Cubic	3	18.87	9.28	4.94	273.47	336.59	369.57	0.39	1.39	3.14
SCReAM	3	0.22	0.22	0.22	17.84	19.19	19.77	0.00	0.00	0.00
WebRTC media	2	2.25	1.39	0.53	22.20	22.78	24.43	0.01	0.00	0.00
Sprout	3	11.83	10.40	7.93	85.45	95.06	107.53	0.09	0.11	0.13
TaoVA-100x	3	5.32	5.99	10.07	65.14	79.50	94.71	0.22	0.01	0.09
TCP Vegas	3	2.56	9.65	11.61	50.09	64.35	74.12	0.04	0.06	0.11
Verus	3	17.47	7.97	9.92	335.85	441.80	320.29	11.05	11.36	13.51
Indigo	3	2.14	3.25	5.37	28.23	28.12	29.18	0.00	0.00	0.00
Indigo-cellular	3	4.86	9.16	7.53	35.60	38.94	45.55	0.04	0.05	0.05
KohoCC	3	4.60	3.09	4.43	27.42	28.08	30.52	0.01	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2017-09-22 14:34:33
End at: 2017-09-22 14:35:03
Local clock offset: 0.425 ms
Remote clock offset: -2.301 ms

# Below is generated by plot.py at 2017-09-22 15:10:16
# Datalink statistics
-- Total of 3 flows:
Average throughput: 23.98 Mbit/s
95th percentile per-packet one-way delay: 306.010 ms
Loss rate: 3.05%
-- Flow 1:
Average throughput: 10.87 Mbit/s
95th percentile per-packet one-way delay: 4074.625 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 21.57 Mbit/s
95th percentile per-packet one-way delay: 263.210 ms
Loss rate: 1.51%
-- Flow 3:
Average throughput: 19.58 Mbit/s
95th percentile per-packet one-way delay: 337.703 ms
Loss rate: 6.30%
```

Run 1: Report of TCP BBR — Data Link

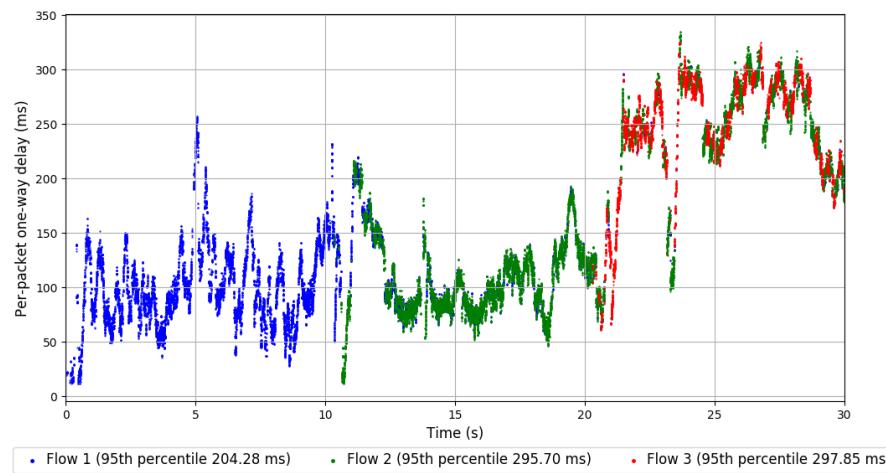
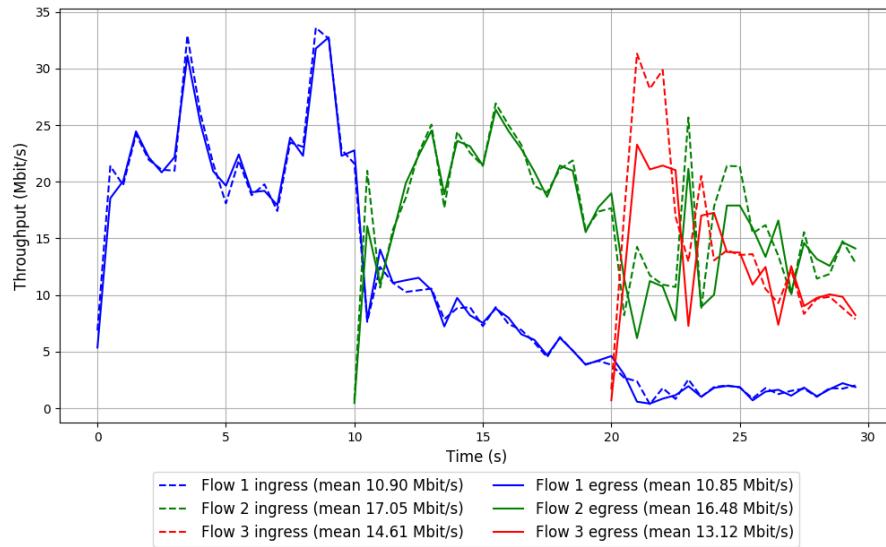


Run 2: Statistics of TCP BBR

```
Start at: 2017-09-22 14:51:15
End at: 2017-09-22 14:51:45
Local clock offset: 0.487 ms
Remote clock offset: -2.315 ms

# Below is generated by plot.py at 2017-09-22 15:10:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 26.05 Mbit/s
95th percentile per-packet one-way delay: 291.263 ms
Loss rate: 3.80%
-- Flow 1:
Average throughput: 10.85 Mbit/s
95th percentile per-packet one-way delay: 204.282 ms
Loss rate: 0.50%
-- Flow 2:
Average throughput: 16.48 Mbit/s
95th percentile per-packet one-way delay: 295.702 ms
Loss rate: 4.01%
-- Flow 3:
Average throughput: 13.12 Mbit/s
95th percentile per-packet one-way delay: 297.848 ms
Loss rate: 10.74%
```

Run 2: Report of TCP BBR — Data Link

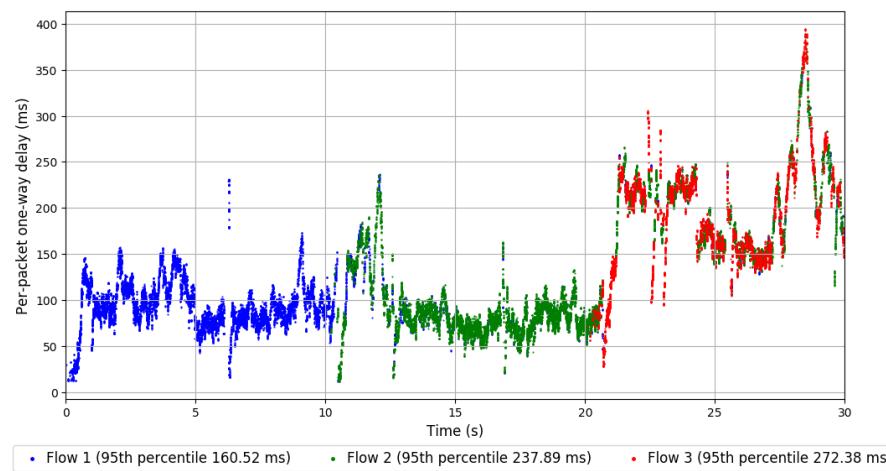
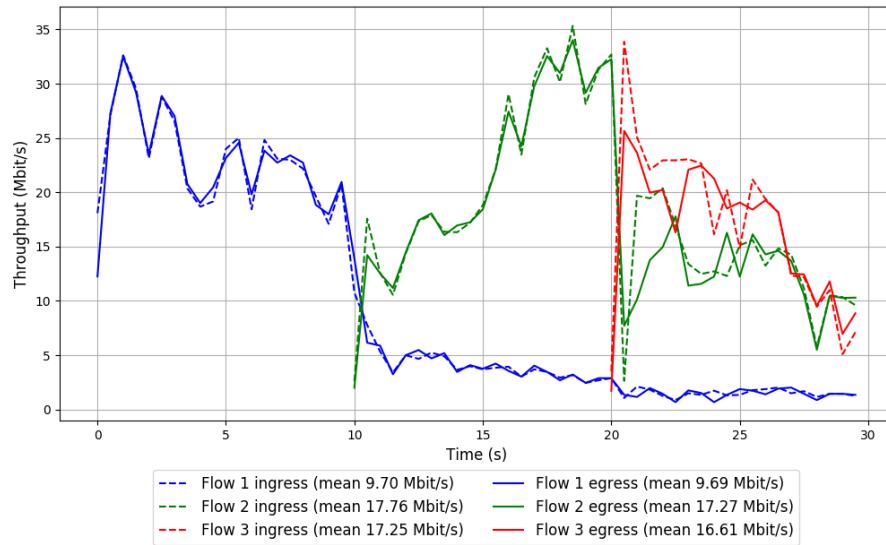


Run 3: Statistics of TCP BBR

```
Start at: 2017-09-22 15:07:58
End at: 2017-09-22 15:08:28
Local clock offset: 0.448 ms
Remote clock offset: -2.332 ms

# Below is generated by plot.py at 2017-09-22 15:10:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 26.61 Mbit/s
95th percentile per-packet one-way delay: 237.978 ms
Loss rate: 2.30%
-- Flow 1:
Average throughput: 9.69 Mbit/s
95th percentile per-packet one-way delay: 160.518 ms
Loss rate: 0.26%
-- Flow 2:
Average throughput: 17.27 Mbit/s
95th percentile per-packet one-way delay: 237.888 ms
Loss rate: 3.06%
-- Flow 3:
Average throughput: 16.61 Mbit/s
95th percentile per-packet one-way delay: 272.382 ms
Loss rate: 4.19%
```

Run 3: Report of TCP BBR — Data Link

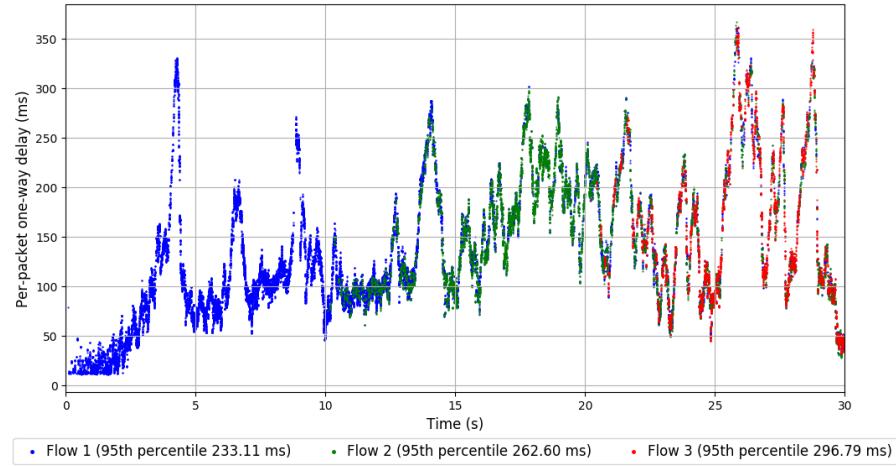
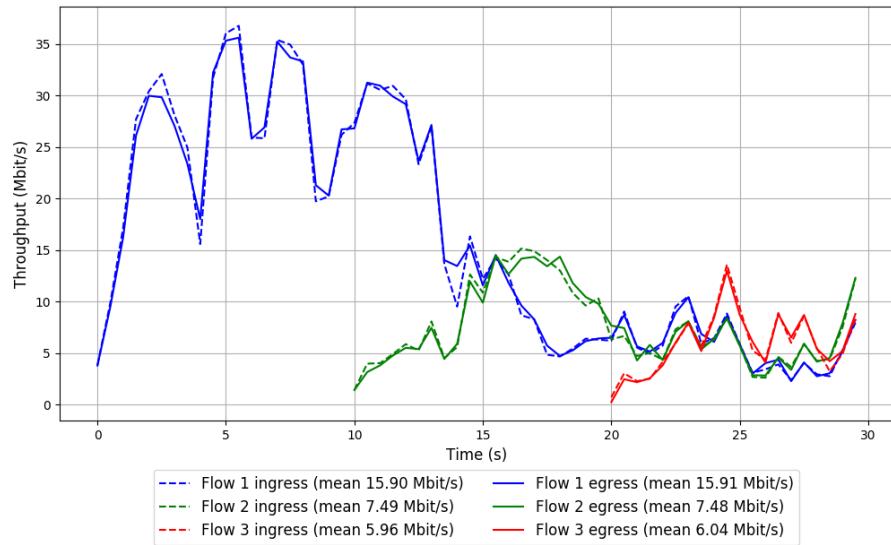


Run 1: Statistics of TCP Cubic

```
Start at: 2017-09-22 14:32:10
End at: 2017-09-22 14:32:40
Local clock offset: 0.426 ms
Remote clock offset: -2.306 ms

# Below is generated by plot.py at 2017-09-22 15:10:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 22.86 Mbit/s
95th percentile per-packet one-way delay: 249.165 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 15.91 Mbit/s
95th percentile per-packet one-way delay: 233.113 ms
Loss rate: 0.12%
-- Flow 2:
Average throughput: 7.48 Mbit/s
95th percentile per-packet one-way delay: 262.601 ms
Loss rate: 0.45%
-- Flow 3:
Average throughput: 6.04 Mbit/s
95th percentile per-packet one-way delay: 296.791 ms
Loss rate: 0.41%
```

Run 1: Report of TCP Cubic — Data Link

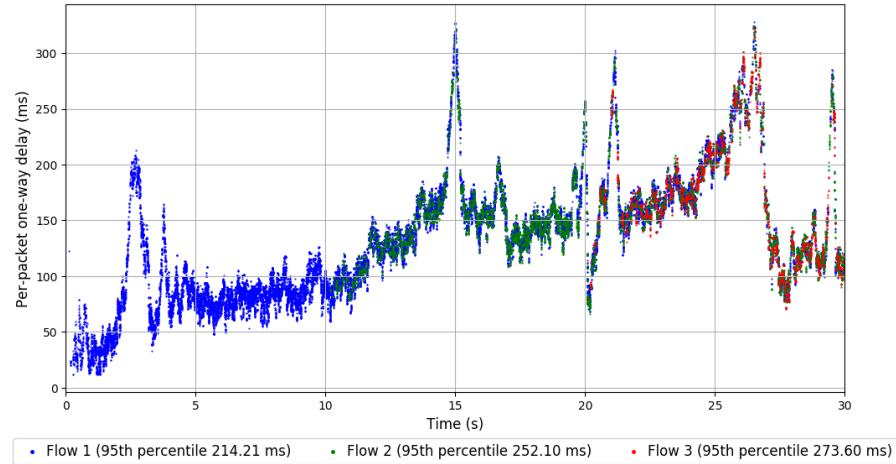
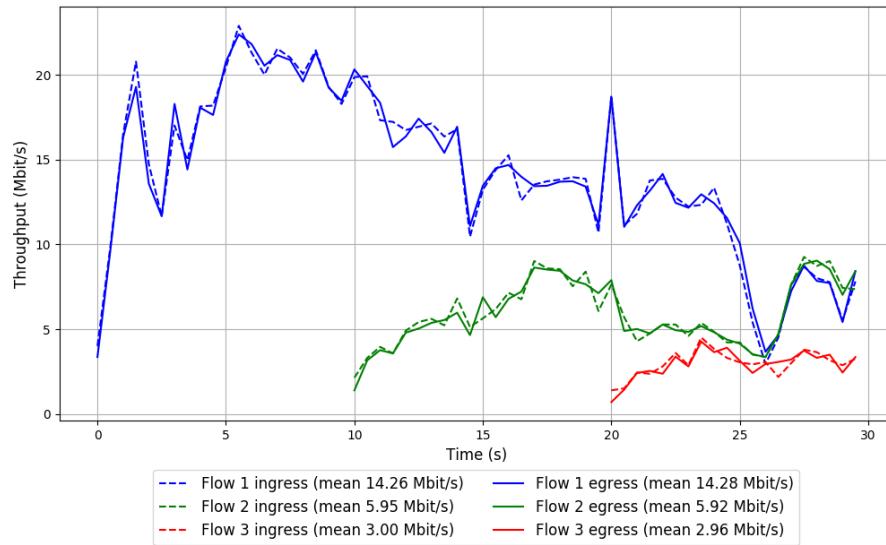


Run 2: Statistics of TCP Cubic

```
Start at: 2017-09-22 14:48:52
End at: 2017-09-22 14:49:22
Local clock offset: 0.492 ms
Remote clock offset: -2.441 ms

# Below is generated by plot.py at 2017-09-22 15:10:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 19.20 Mbit/s
95th percentile per-packet one-way delay: 232.195 ms
Loss rate: 0.40%
-- Flow 1:
Average throughput: 14.28 Mbit/s
95th percentile per-packet one-way delay: 214.209 ms
Loss rate: 0.21%
-- Flow 2:
Average throughput: 5.92 Mbit/s
95th percentile per-packet one-way delay: 252.104 ms
Loss rate: 0.77%
-- Flow 3:
Average throughput: 2.96 Mbit/s
95th percentile per-packet one-way delay: 273.596 ms
Loss rate: 1.65%
```

Run 2: Report of TCP Cubic — Data Link

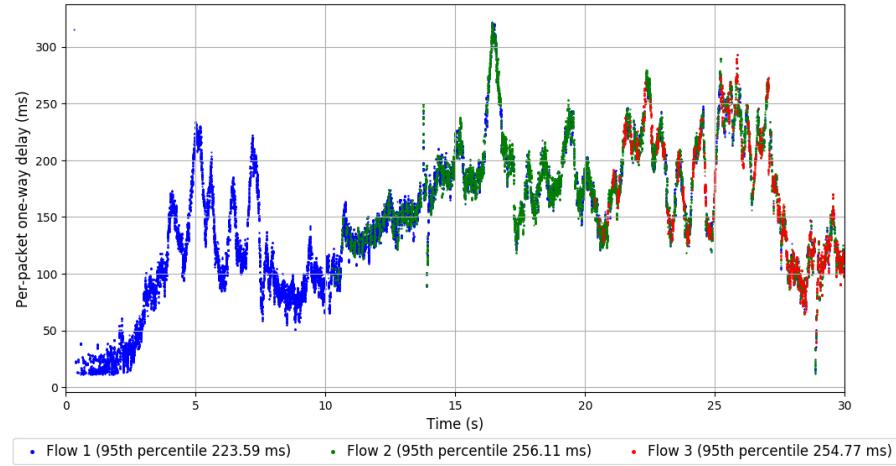
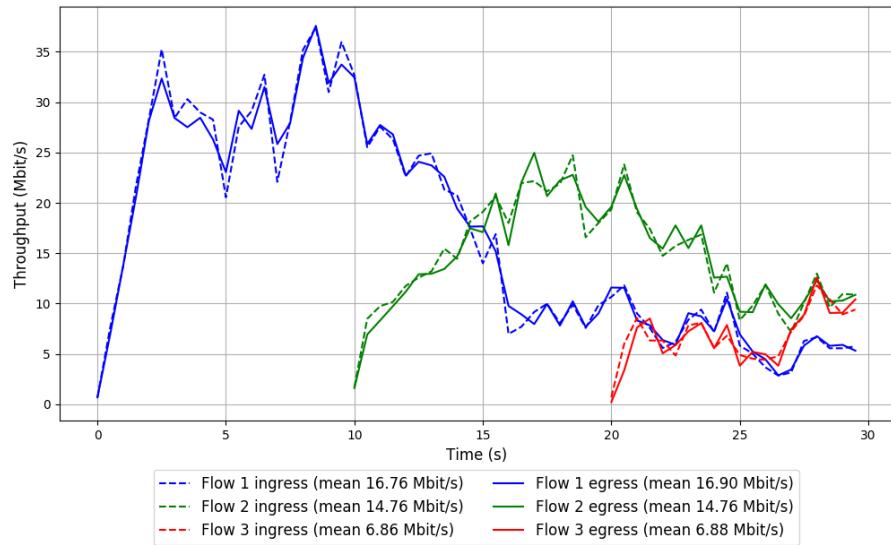


Run 3: Statistics of TCP Cubic

```
Start at: 2017-09-22 15:05:34
End at: 2017-09-22 15:06:04
Local clock offset: 0.428 ms
Remote clock offset: -2.31 ms

# Below is generated by plot.py at 2017-09-22 15:10:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 29.04 Mbit/s
95th percentile per-packet one-way delay: 239.764 ms
Loss rate: 0.35%
-- Flow 1:
Average throughput: 16.90 Mbit/s
95th percentile per-packet one-way delay: 223.588 ms
Loss rate: 0.16%
-- Flow 2:
Average throughput: 14.76 Mbit/s
95th percentile per-packet one-way delay: 256.112 ms
Loss rate: 0.49%
-- Flow 3:
Average throughput: 6.88 Mbit/s
95th percentile per-packet one-way delay: 254.771 ms
Loss rate: 1.18%
```

Run 3: Report of TCP Cubic — Data Link

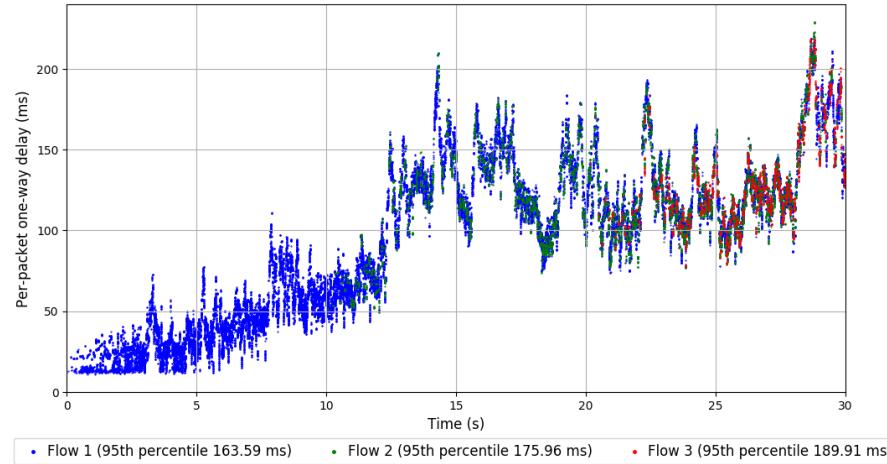
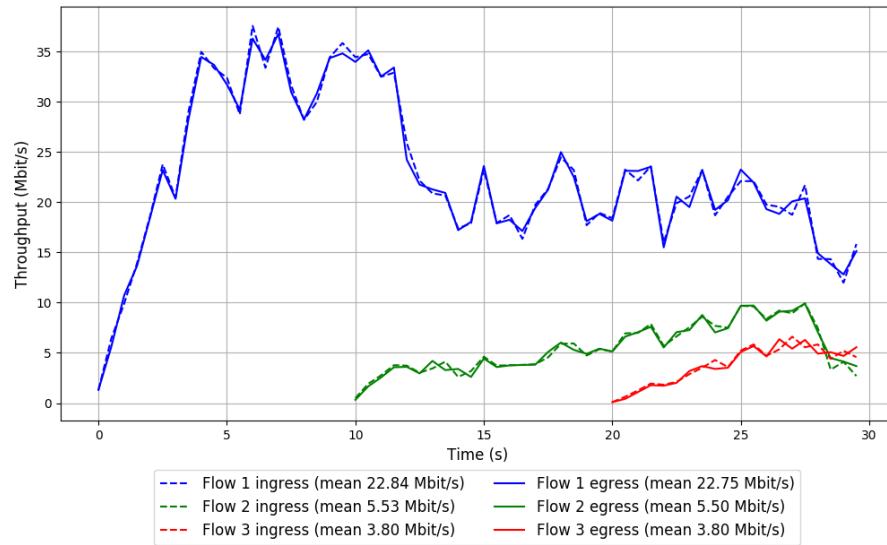


```
Run 1: Statistics of LEDBAT
```

```
Start at: 2017-09-22 14:21:24
End at: 2017-09-22 14:21:55
Local clock offset: 0.425 ms
Remote clock offset: -2.333 ms

# Below is generated by plot.py at 2017-09-22 15:10:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 27.65 Mbit/s
95th percentile per-packet one-way delay: 167.327 ms
Loss rate: 0.38%
-- Flow 1:
Average throughput: 22.75 Mbit/s
95th percentile per-packet one-way delay: 163.592 ms
Loss rate: 0.37%
-- Flow 2:
Average throughput: 5.50 Mbit/s
95th percentile per-packet one-way delay: 175.958 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 3.80 Mbit/s
95th percentile per-packet one-way delay: 189.910 ms
Loss rate: 1.12%
```

Run 1: Report of LEDBAT — Data Link

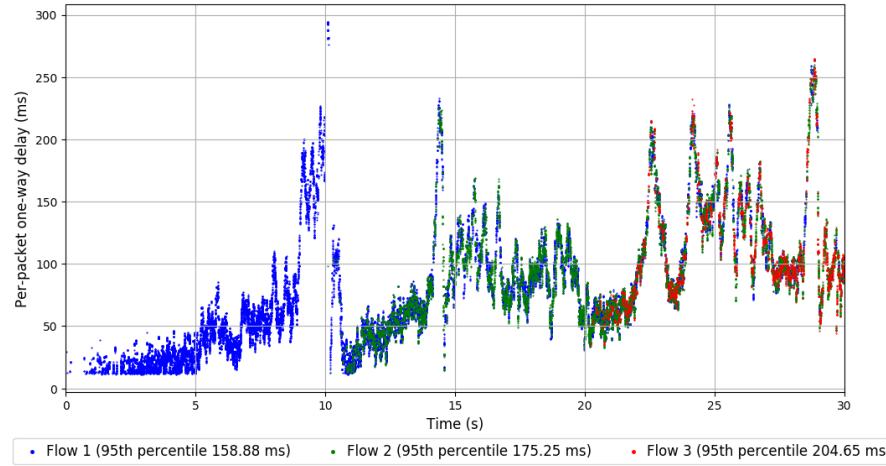
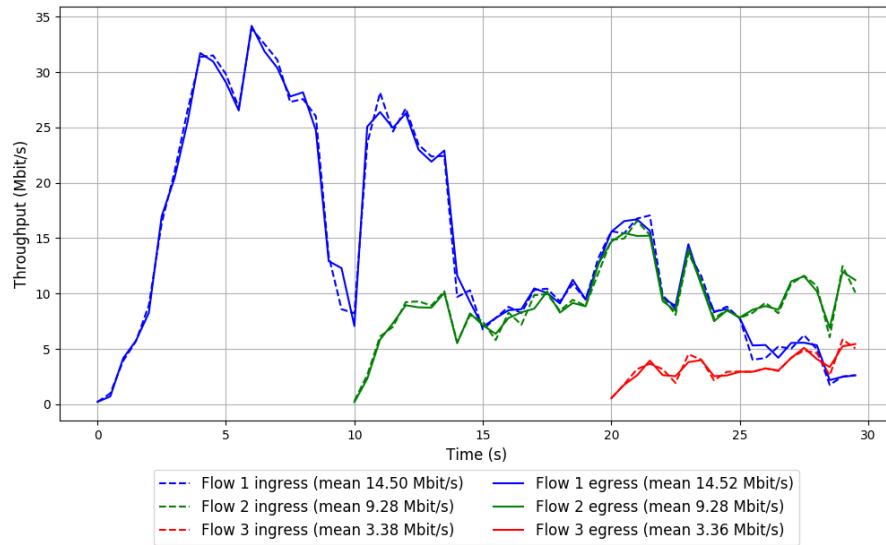


Run 2: Statistics of LEDBAT

```
Start at: 2017-09-22 14:38:08
End at: 2017-09-22 14:38:38
Local clock offset: 0.501 ms
Remote clock offset: -2.357 ms

# Below is generated by plot.py at 2017-09-22 15:10:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 21.74 Mbit/s
95th percentile per-packet one-way delay: 167.674 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 14.52 Mbit/s
95th percentile per-packet one-way delay: 158.875 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 9.28 Mbit/s
95th percentile per-packet one-way delay: 175.246 ms
Loss rate: 0.34%
-- Flow 3:
Average throughput: 3.36 Mbit/s
95th percentile per-packet one-way delay: 204.650 ms
Loss rate: 1.08%
```

Run 2: Report of LEDBAT — Data Link

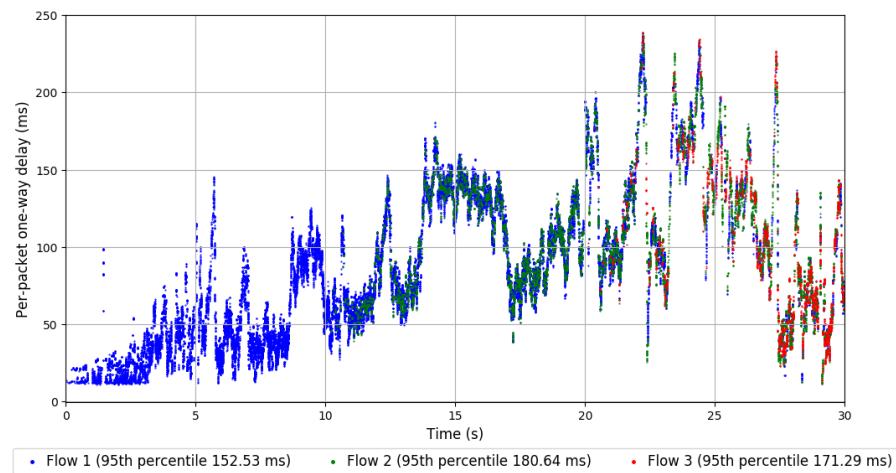
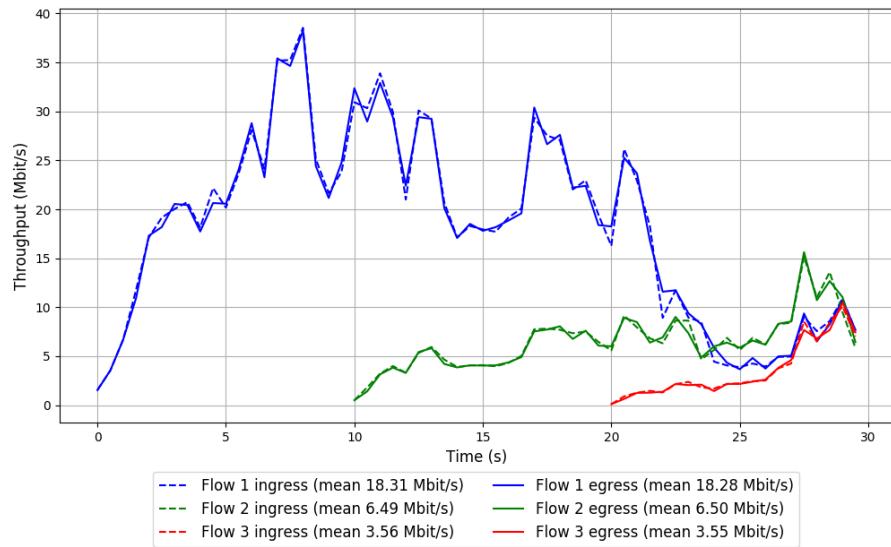


Run 3: Statistics of LEDBAT

```
Start at: 2017-09-22 14:54:49
End at: 2017-09-22 14:55:19
Local clock offset: 0.506 ms
Remote clock offset: -2.338 ms

# Below is generated by plot.py at 2017-09-22 15:10:45
# Datalink statistics
-- Total of 3 flows:
Average throughput: 23.76 Mbit/s
95th percentile per-packet one-way delay: 161.945 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 18.28 Mbit/s
95th percentile per-packet one-way delay: 152.530 ms
Loss rate: 0.17%
-- Flow 2:
Average throughput: 6.50 Mbit/s
95th percentile per-packet one-way delay: 180.641 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 3.55 Mbit/s
95th percentile per-packet one-way delay: 171.290 ms
Loss rate: 1.13%
```

Run 3: Report of LEDBAT — Data Link

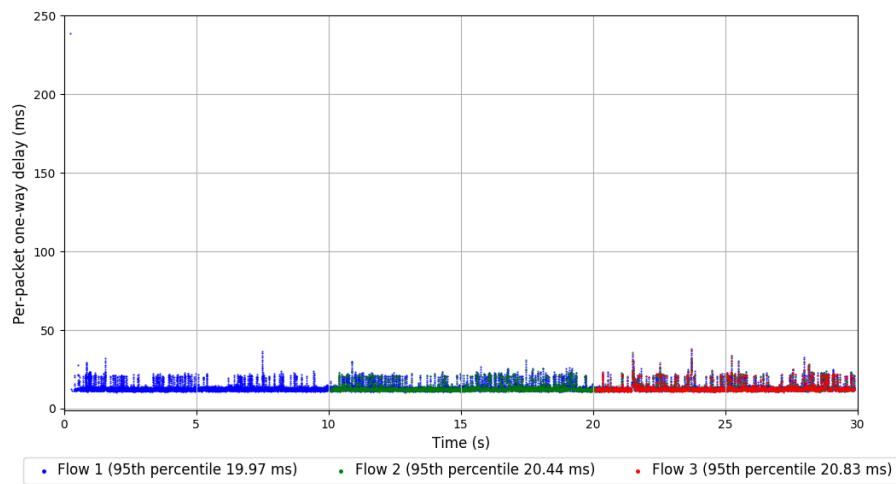
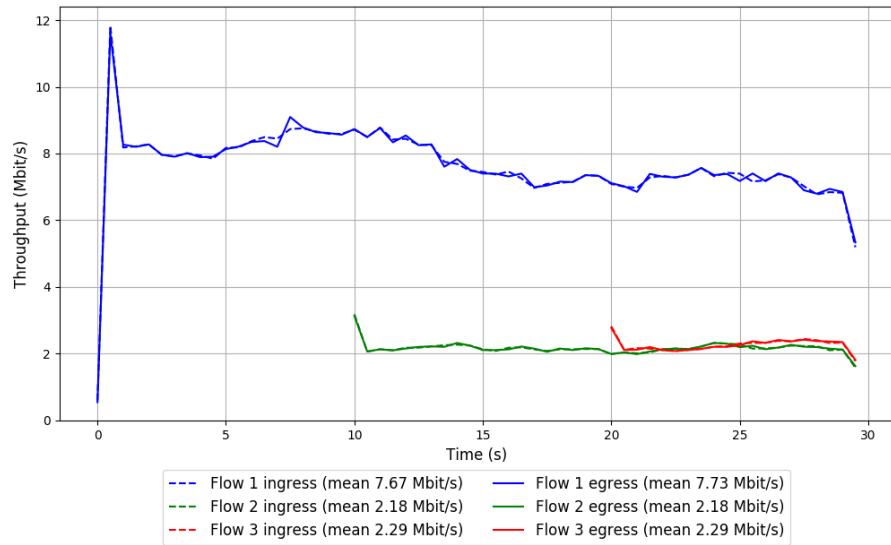


Run 1: Statistics of PCC

```
Start at: 2017-09-22 14:33:21
End at: 2017-09-22 14:33:51
Local clock offset: 0.406 ms
Remote clock offset: -2.315 ms

# Below is generated by plot.py at 2017-09-22 15:10:45
# Datalink statistics
-- Total of 3 flows:
Average throughput: 9.95 Mbit/s
95th percentile per-packet one-way delay: 20.140 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 7.73 Mbit/s
95th percentile per-packet one-way delay: 19.968 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 2.18 Mbit/s
95th percentile per-packet one-way delay: 20.444 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 2.29 Mbit/s
95th percentile per-packet one-way delay: 20.832 ms
Loss rate: 0.00%
```

Run 1: Report of PCC — Data Link

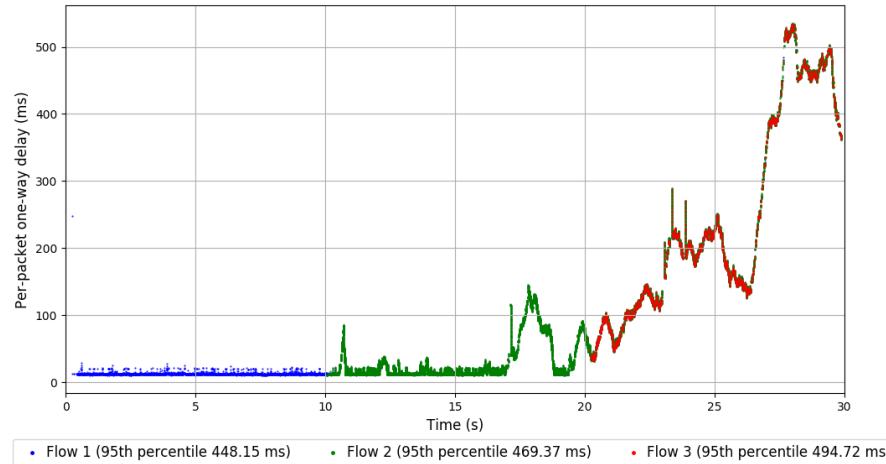
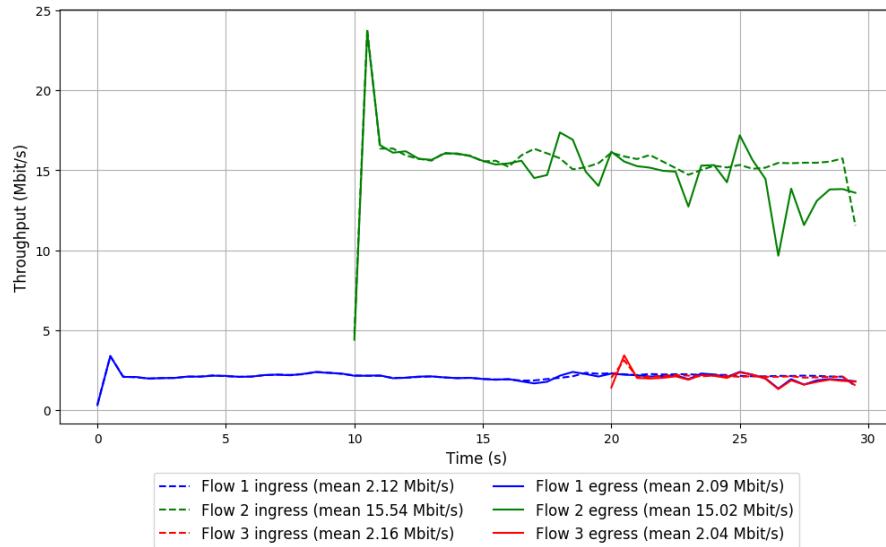


Run 2: Statistics of PCC

```
Start at: 2017-09-22 14:50:03
End at: 2017-09-22 14:50:33
Local clock offset: 0.409 ms
Remote clock offset: -2.447 ms

# Below is generated by plot.py at 2017-09-22 15:10:45
# Datalink statistics
-- Total of 3 flows:
Average throughput: 12.83 Mbit/s
95th percentile per-packet one-way delay: 468.673 ms
Loss rate: 3.30%
-- Flow 1:
Average throughput: 2.09 Mbit/s
95th percentile per-packet one-way delay: 448.149 ms
Loss rate: 2.12%
-- Flow 2:
Average throughput: 15.02 Mbit/s
95th percentile per-packet one-way delay: 469.374 ms
Loss rate: 3.34%
-- Flow 3:
Average throughput: 2.04 Mbit/s
95th percentile per-packet one-way delay: 494.716 ms
Loss rate: 6.23%
```

Run 2: Report of PCC — Data Link

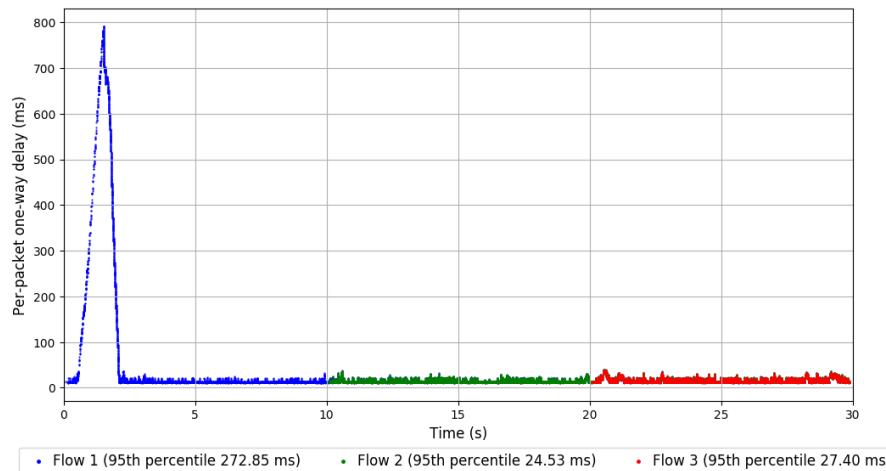
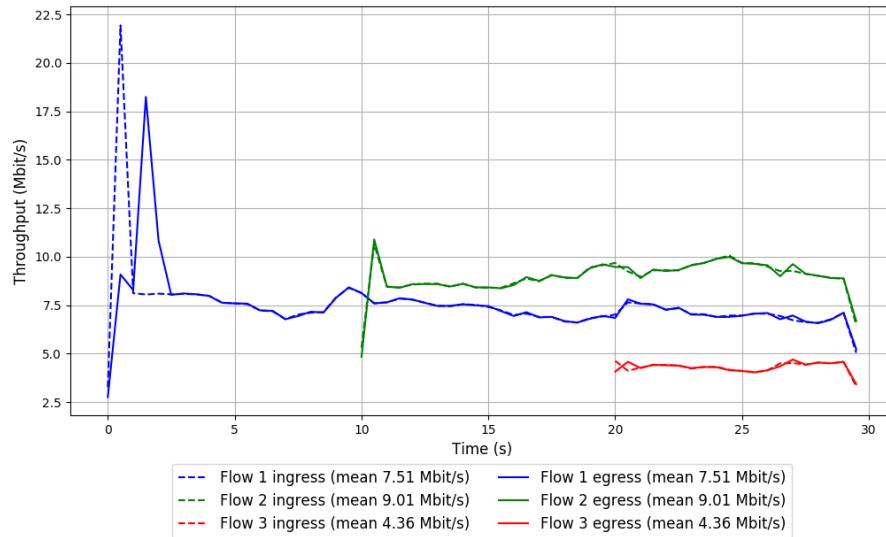


Run 3: Statistics of PCC

```
Start at: 2017-09-22 15:06:46
End at: 2017-09-22 15:07:16
Local clock offset: 0.442 ms
Remote clock offset: -2.251 ms

# Below is generated by plot.py at 2017-09-22 15:10:45
# Datalink statistics
-- Total of 3 flows:
Average throughput: 14.94 Mbit/s
95th percentile per-packet one-way delay: 30.696 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 7.51 Mbit/s
95th percentile per-packet one-way delay: 272.846 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 9.01 Mbit/s
95th percentile per-packet one-way delay: 24.534 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 4.36 Mbit/s
95th percentile per-packet one-way delay: 27.404 ms
Loss rate: 0.00%
```

Run 3: Report of PCC — Data Link

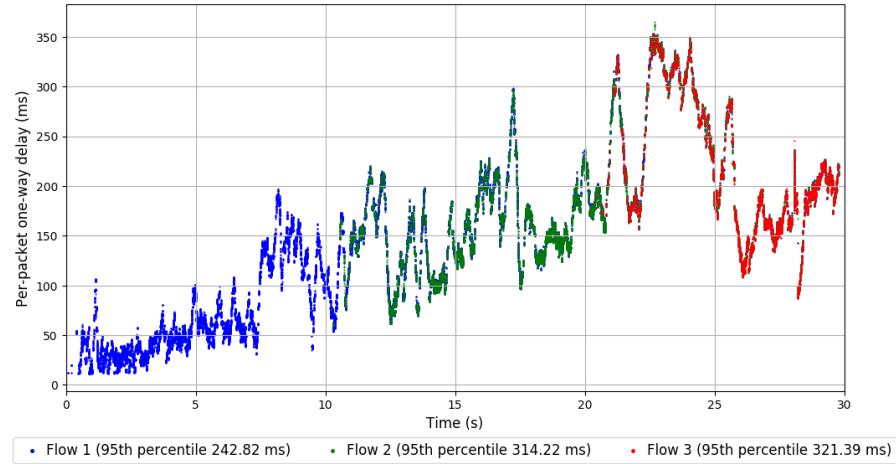
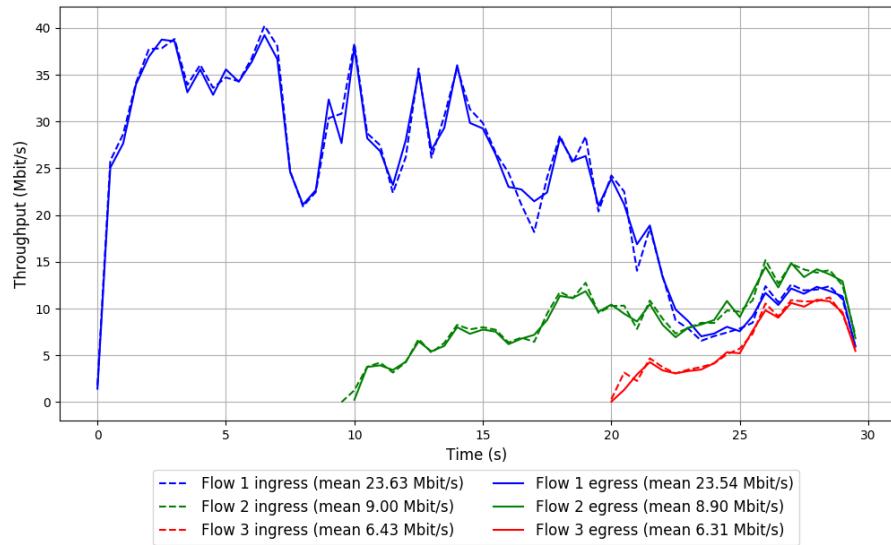


```
Run 1: Statistics of QUIC Cubic
```

```
Start at: 2017-09-22 14:20:12
End at: 2017-09-22 14:20:42
Local clock offset: 0.521 ms
Remote clock offset: -2.416 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 31.46 Mbit/s
95th percentile per-packet one-way delay: 284.162 ms
Loss rate: 0.83%
-- Flow 1:
Average throughput: 23.54 Mbit/s
95th percentile per-packet one-way delay: 242.822 ms
Loss rate: 0.39%
-- Flow 2:
Average throughput: 8.90 Mbit/s
95th percentile per-packet one-way delay: 314.221 ms
Loss rate: 1.61%
-- Flow 3:
Average throughput: 6.31 Mbit/s
95th percentile per-packet one-way delay: 321.395 ms
Loss rate: 3.65%
```

Run 1: Report of QUIC Cubic — Data Link

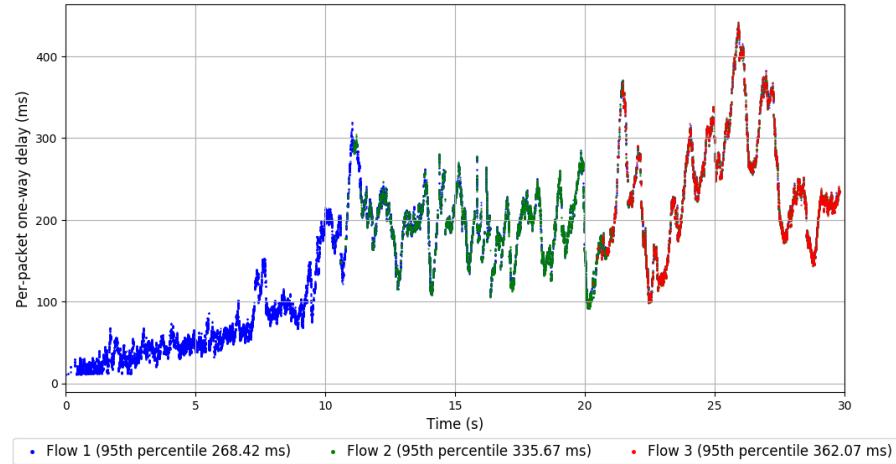
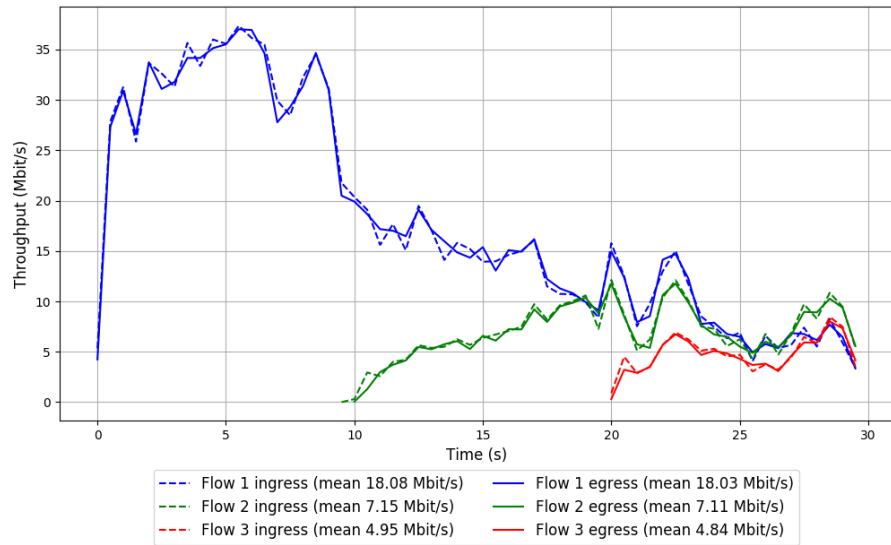


Run 2: Statistics of QUIC Cubic

```
Start at: 2017-09-22 14:36:56
End at: 2017-09-22 14:37:26
Local clock offset: 0.426 ms
Remote clock offset: -2.401 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 24.28 Mbit/s
95th percentile per-packet one-way delay: 295.617 ms
Loss rate: 0.69%
-- Flow 1:
Average throughput: 18.03 Mbit/s
95th percentile per-packet one-way delay: 268.416 ms
Loss rate: 0.28%
-- Flow 2:
Average throughput: 7.11 Mbit/s
95th percentile per-packet one-way delay: 335.673 ms
Loss rate: 1.52%
-- Flow 3:
Average throughput: 4.84 Mbit/s
95th percentile per-packet one-way delay: 362.074 ms
Loss rate: 2.86%
```

Run 2: Report of QUIC Cubic — Data Link

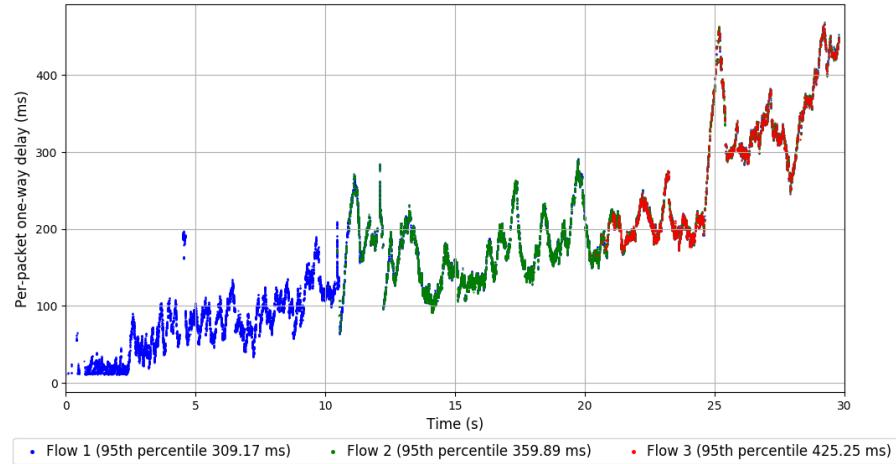
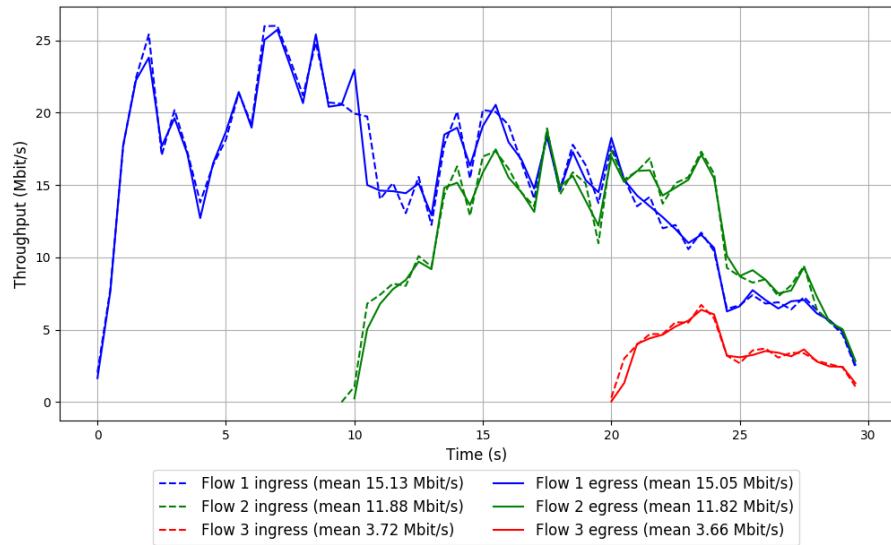


Run 3: Statistics of QUIC Cubic

```
Start at: 2017-09-22 14:53:38
End at: 2017-09-22 14:54:08
Local clock offset: 0.504 ms
Remote clock offset: -2.399 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 24.05 Mbit/s
95th percentile per-packet one-way delay: 338.038 ms
Loss rate: 0.79%
-- Flow 1:
Average throughput: 15.05 Mbit/s
95th percentile per-packet one-way delay: 309.166 ms
Loss rate: 0.49%
-- Flow 2:
Average throughput: 11.82 Mbit/s
95th percentile per-packet one-way delay: 359.890 ms
Loss rate: 1.04%
-- Flow 3:
Average throughput: 3.66 Mbit/s
95th percentile per-packet one-way delay: 425.255 ms
Loss rate: 2.91%
```

Run 3: Report of QUIC Cubic — Data Link

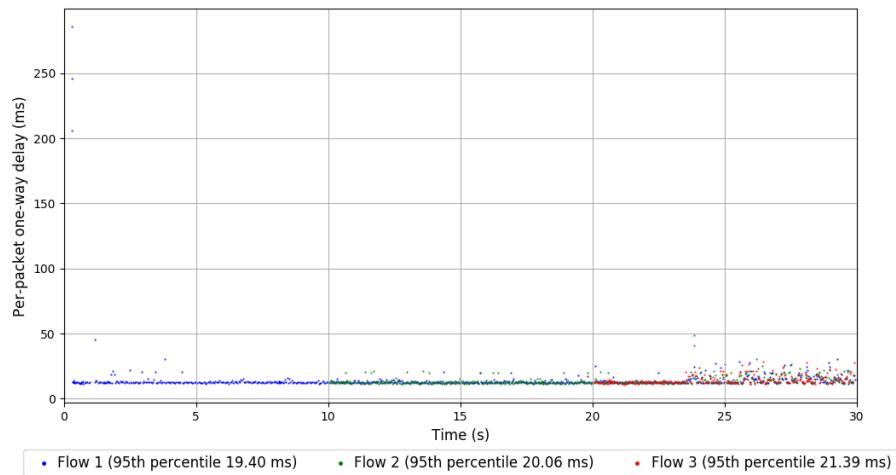
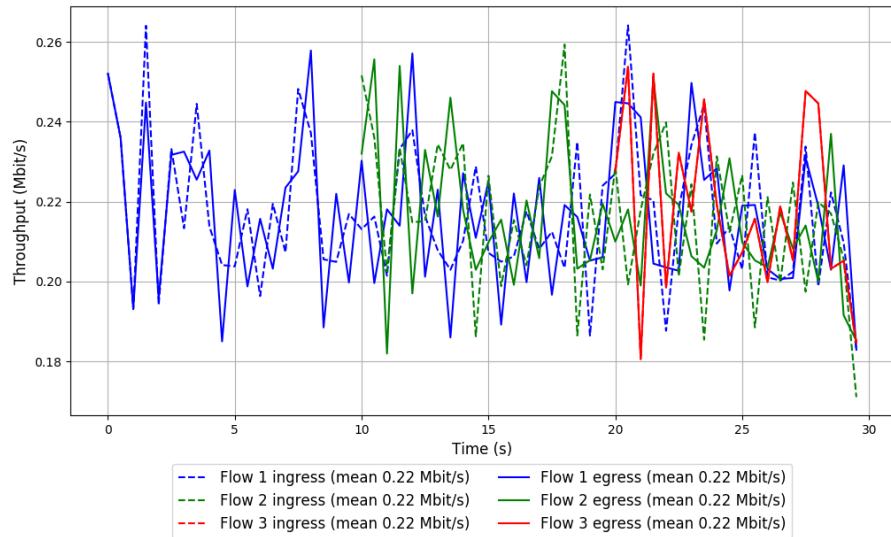


```
Run 1: Statistics of SCReAM
```

```
Start at: 2017-09-22 14:19:01
End at: 2017-09-22 14:19:31
Local clock offset: 0.401 ms
Remote clock offset: -2.417 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 20.109 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 19.398 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 20.063 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 21.385 ms
Loss rate: 0.00%
```

Run 1: Report of SCReAM — Data Link

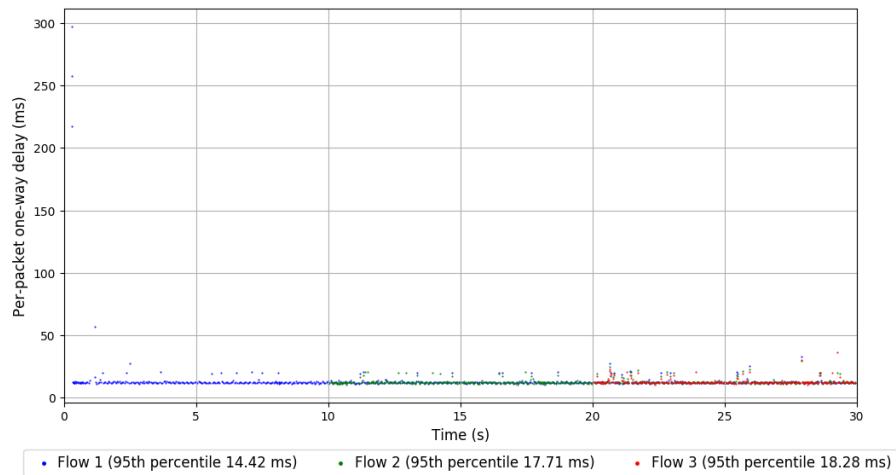
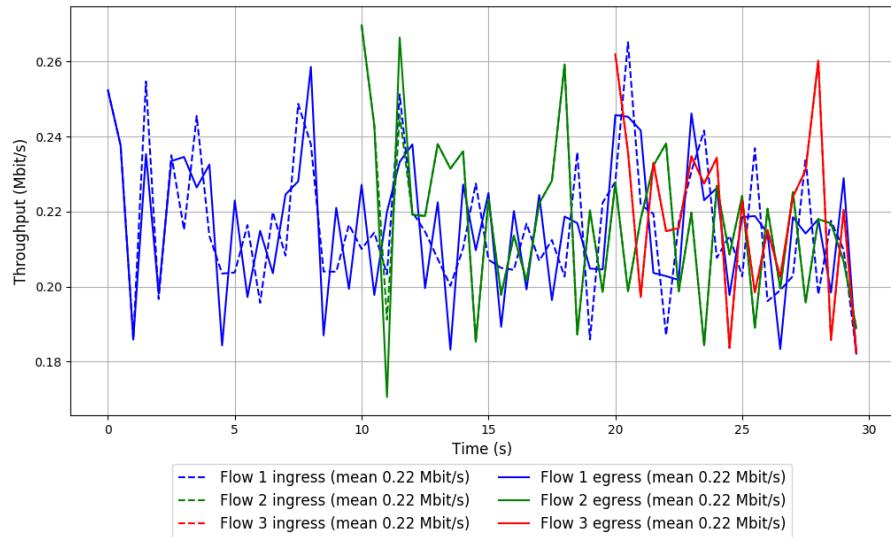


Run 2: Statistics of SCReAM

```
Start at: 2017-09-22 14:35:45
End at: 2017-09-22 14:36:15
Local clock offset: 0.427 ms
Remote clock offset: -2.353 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 17.785 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 14.418 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 17.709 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 18.282 ms
Loss rate: 0.00%
```

Run 2: Report of SCReAM — Data Link

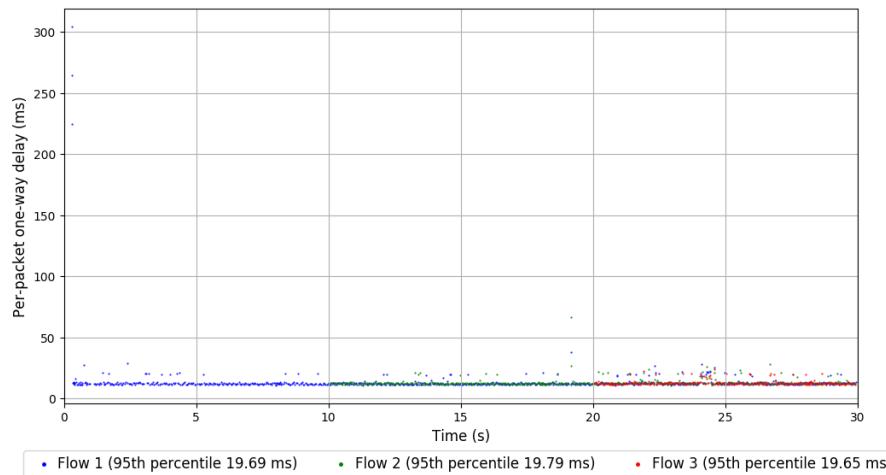
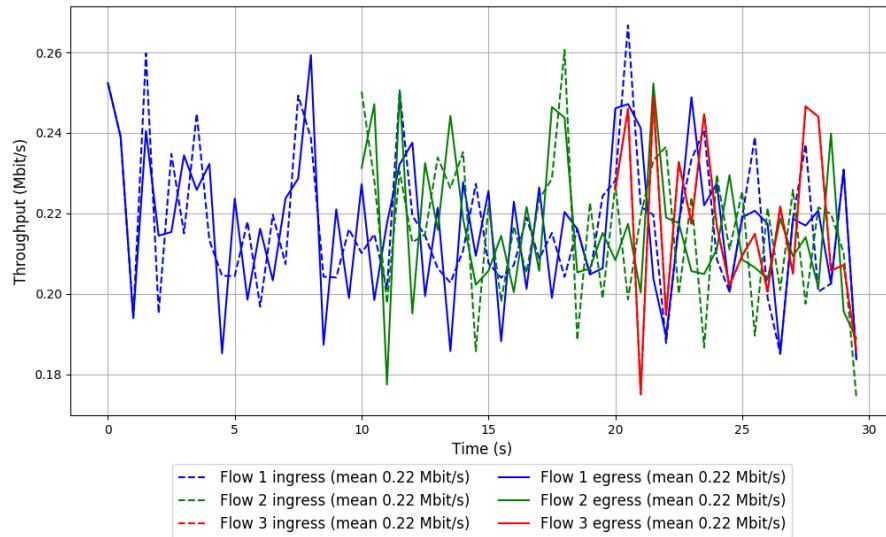


Run 3: Statistics of SCReAM

```
Start at: 2017-09-22 14:52:27
End at: 2017-09-22 14:52:57
Local clock offset: 0.414 ms
Remote clock offset: -2.355 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 19.759 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 19.692 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 19.786 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 19.646 ms
Loss rate: 0.00%
```

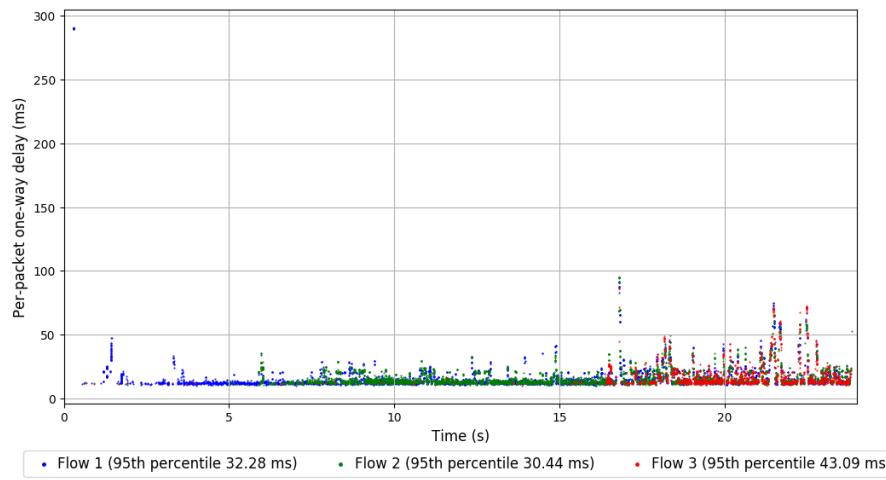
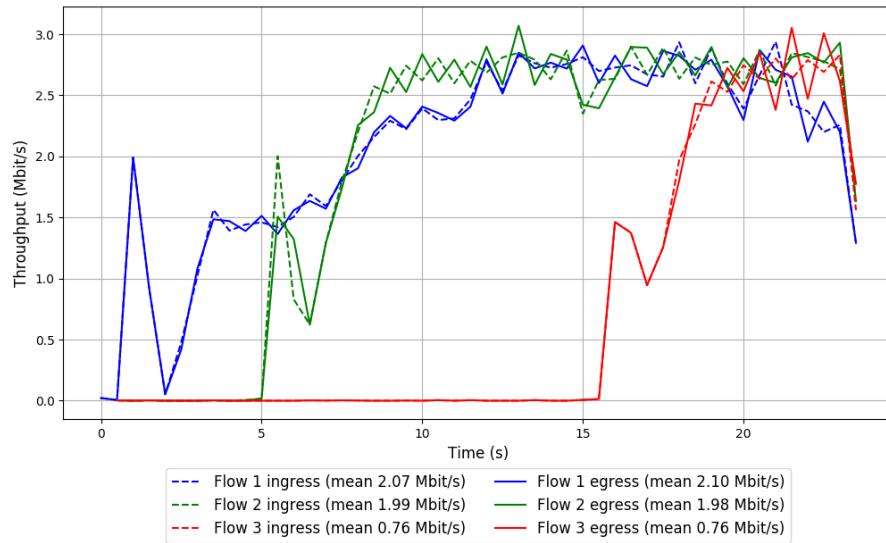
Run 3: Report of SCReAM — Data Link



Run 1: Statistics of WebRTC media

Start at: 2017-09-22 14:29:47
End at: 2017-09-22 14:30:17
Local clock offset: 0.501 ms
Remote clock offset: -2.268 ms

Run 1: Report of WebRTC media — Data Link

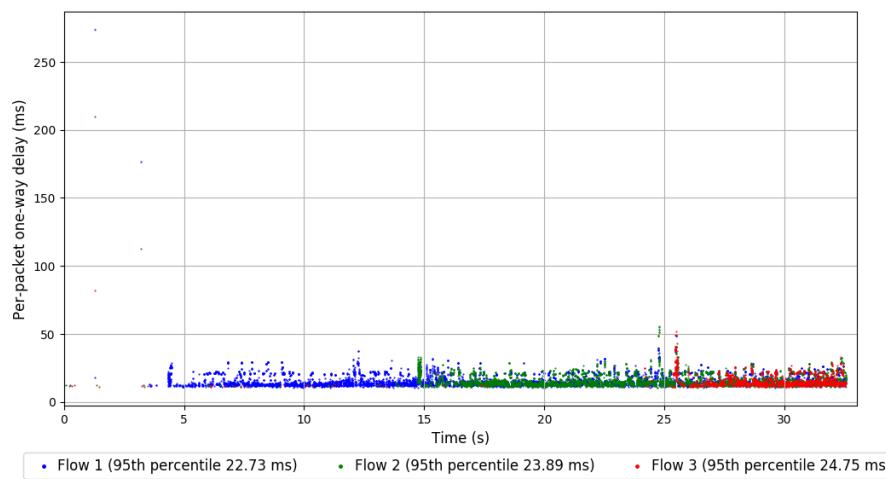
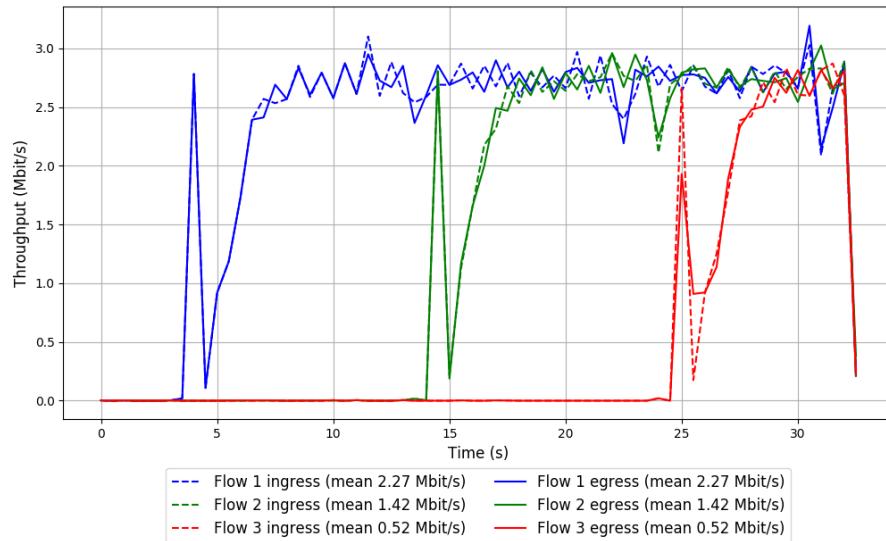


Run 2: Statistics of WebRTC media

```
Start at: 2017-09-22 14:46:29
End at: 2017-09-22 14:46:59
Local clock offset: 0.408 ms
Remote clock offset: -2.429 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 4.20 Mbit/s
95th percentile per-packet one-way delay: 23.438 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 2.27 Mbit/s
95th percentile per-packet one-way delay: 22.725 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 1.42 Mbit/s
95th percentile per-packet one-way delay: 23.889 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 24.746 ms
Loss rate: 0.00%
```

Run 2: Report of WebRTC media — Data Link

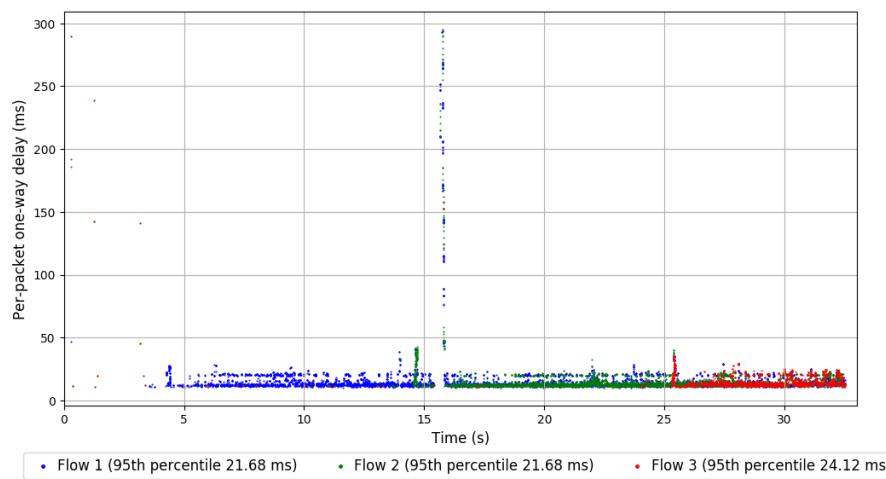
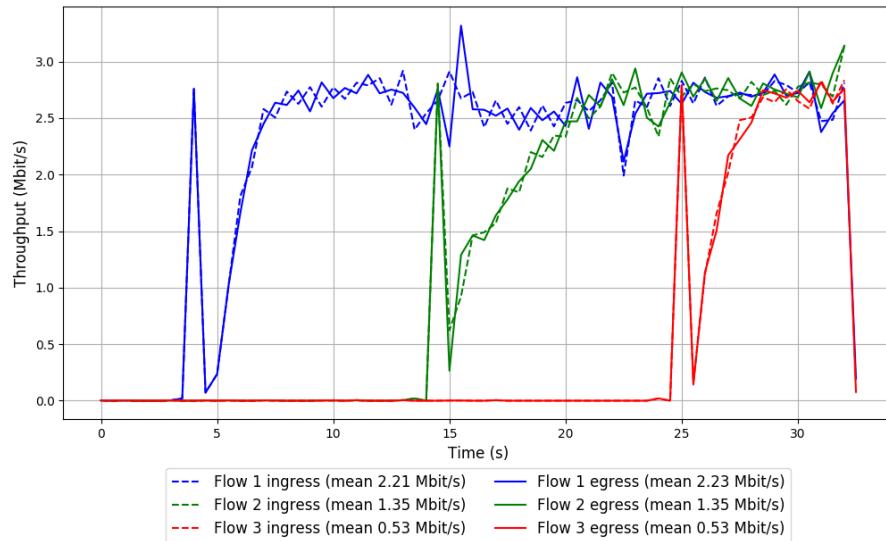


Run 3: Statistics of WebRTC media

```
Start at: 2017-09-22 15:03:11
End at: 2017-09-22 15:03:41
Local clock offset: 0.511 ms
Remote clock offset: -2.315 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 4.11 Mbit/s
95th percentile per-packet one-way delay: 22.134 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 2.23 Mbit/s
95th percentile per-packet one-way delay: 21.675 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 1.35 Mbit/s
95th percentile per-packet one-way delay: 21.677 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 24.120 ms
Loss rate: 0.00%
```

Run 3: Report of WebRTC media — Data Link

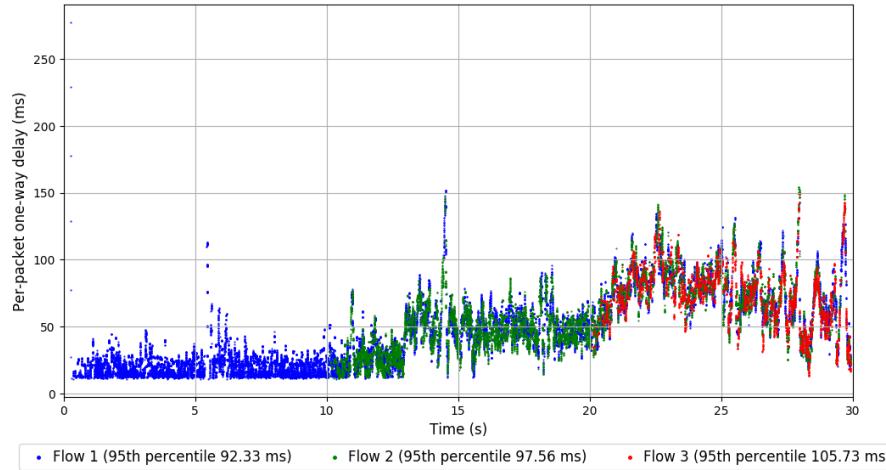
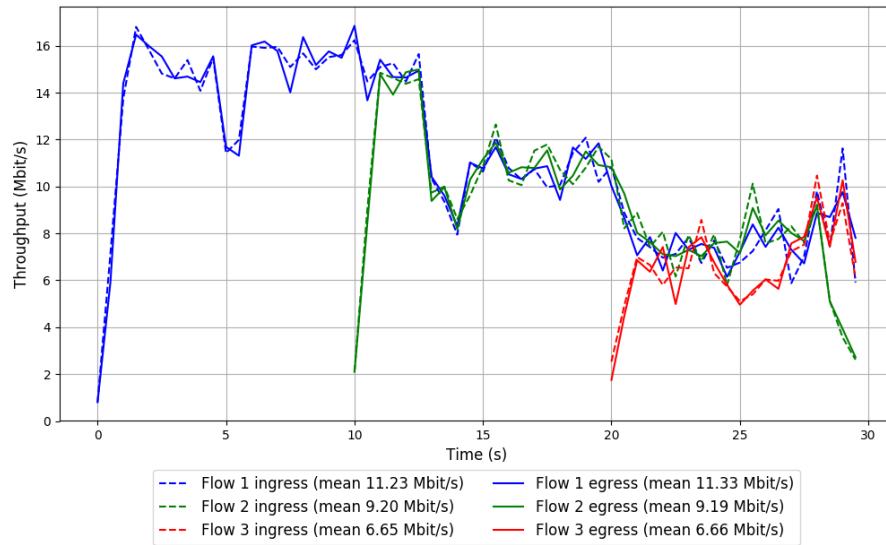


Run 1: Statistics of Sprout

```
Start at: 2017-09-22 14:27:24
End at: 2017-09-22 14:27:54
Local clock offset: 0.409 ms
Remote clock offset: -2.368 ms

# Below is generated by plot.py at 2017-09-22 15:11:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 19.71 Mbit/s
95th percentile per-packet one-way delay: 97.125 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 11.33 Mbit/s
95th percentile per-packet one-way delay: 92.332 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 9.19 Mbit/s
95th percentile per-packet one-way delay: 97.563 ms
Loss rate: 0.10%
-- Flow 3:
Average throughput: 6.66 Mbit/s
95th percentile per-packet one-way delay: 105.733 ms
Loss rate: 0.00%
```

Run 1: Report of Sprout — Data Link

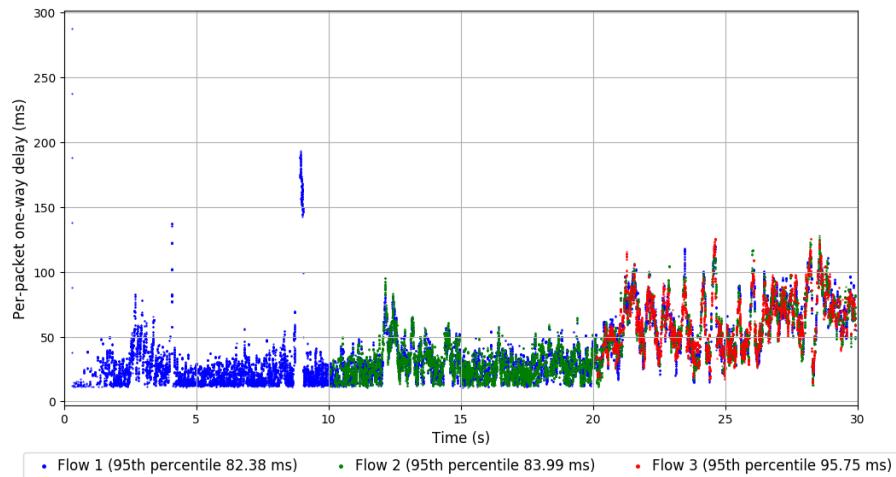
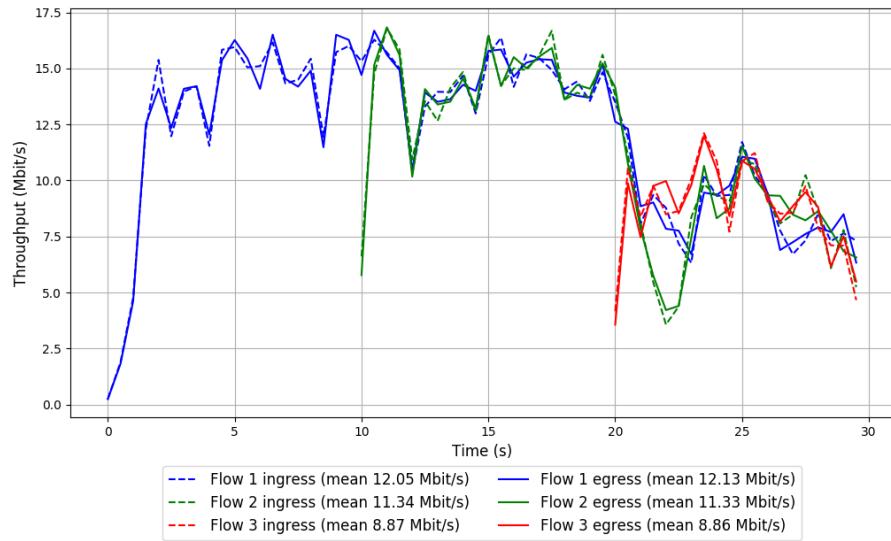


Run 2: Statistics of Sprout

```
Start at: 2017-09-22 14:44:06
End at: 2017-09-22 14:44:36
Local clock offset: 0.403 ms
Remote clock offset: -2.471 ms

# Below is generated by plot.py at 2017-09-22 15:11:09
# Datalink statistics
-- Total of 3 flows:
Average throughput: 22.70 Mbit/s
95th percentile per-packet one-way delay: 86.140 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 12.13 Mbit/s
95th percentile per-packet one-way delay: 82.378 ms
Loss rate: 0.17%
-- Flow 2:
Average throughput: 11.33 Mbit/s
95th percentile per-packet one-way delay: 83.993 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 8.86 Mbit/s
95th percentile per-packet one-way delay: 95.745 ms
Loss rate: 0.21%
```

Run 2: Report of Sprout — Data Link

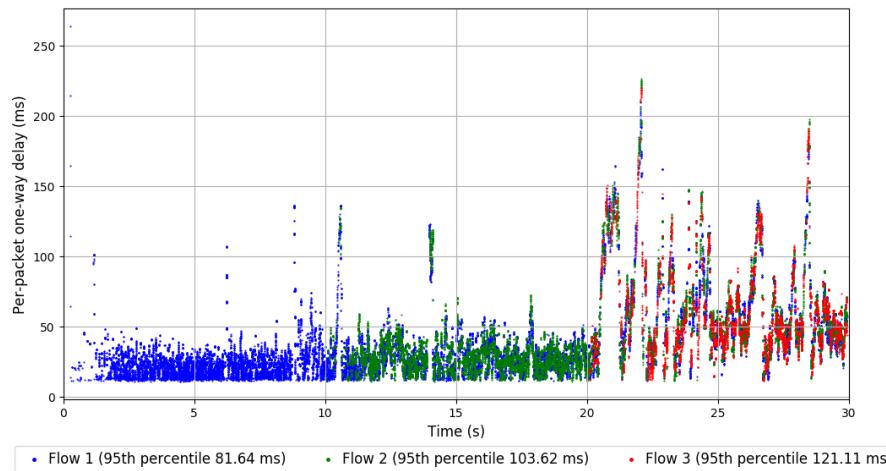
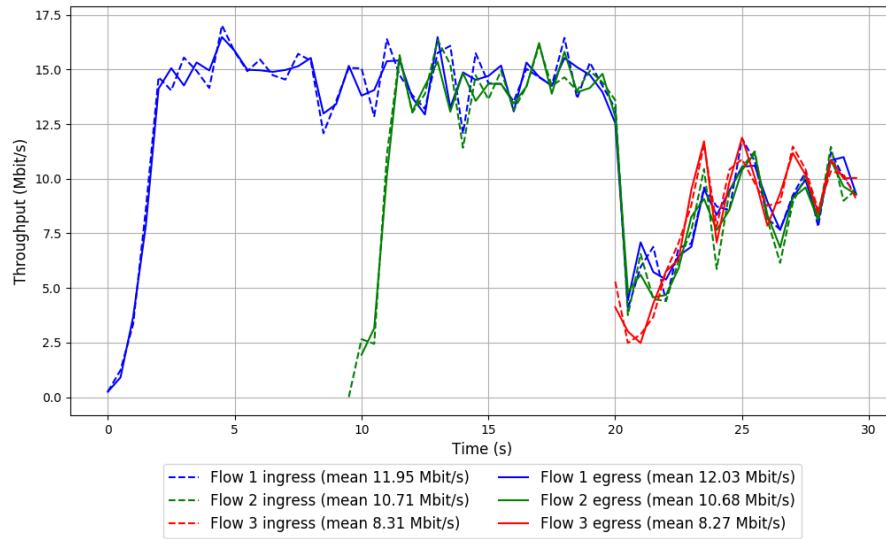


Run 3: Statistics of Sprout

```
Start at: 2017-09-22 15:00:48
End at: 2017-09-22 15:01:18
Local clock offset: 0.524 ms
Remote clock offset: -2.334 ms

# Below is generated by plot.py at 2017-09-22 15:11:09
# Datalink statistics
-- Total of 3 flows:
Average throughput: 21.96 Mbit/s
95th percentile per-packet one-way delay: 97.414 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 12.03 Mbit/s
95th percentile per-packet one-way delay: 81.637 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 10.68 Mbit/s
95th percentile per-packet one-way delay: 103.623 ms
Loss rate: 0.21%
-- Flow 3:
Average throughput: 8.27 Mbit/s
95th percentile per-packet one-way delay: 121.114 ms
Loss rate: 0.18%
```

Run 3: Report of Sprout — Data Link

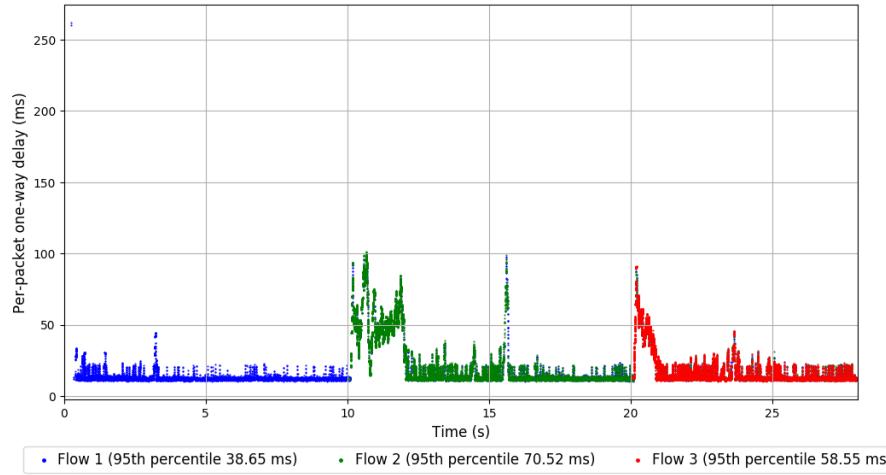
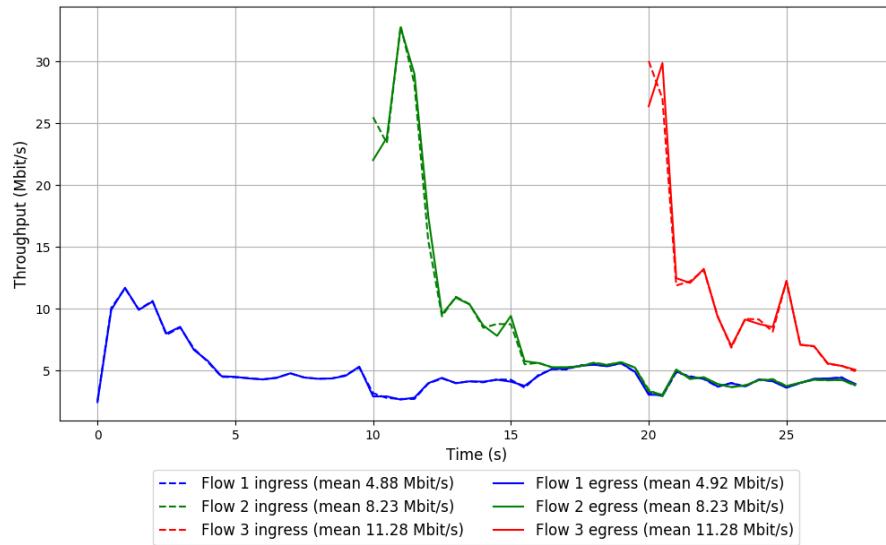


Run 1: Statistics of TaoVA-100x

```
Start at: 2017-09-22 14:23:49
End at: 2017-09-22 14:24:19
Local clock offset: 0.41 ms
Remote clock offset: -2.402 ms

# Below is generated by plot.py at 2017-09-22 15:11:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 13.48 Mbit/s
95th percentile per-packet one-way delay: 60.561 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 4.92 Mbit/s
95th percentile per-packet one-way delay: 38.647 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 8.23 Mbit/s
95th percentile per-packet one-way delay: 70.519 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 11.28 Mbit/s
95th percentile per-packet one-way delay: 58.547 ms
Loss rate: 0.00%
```

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

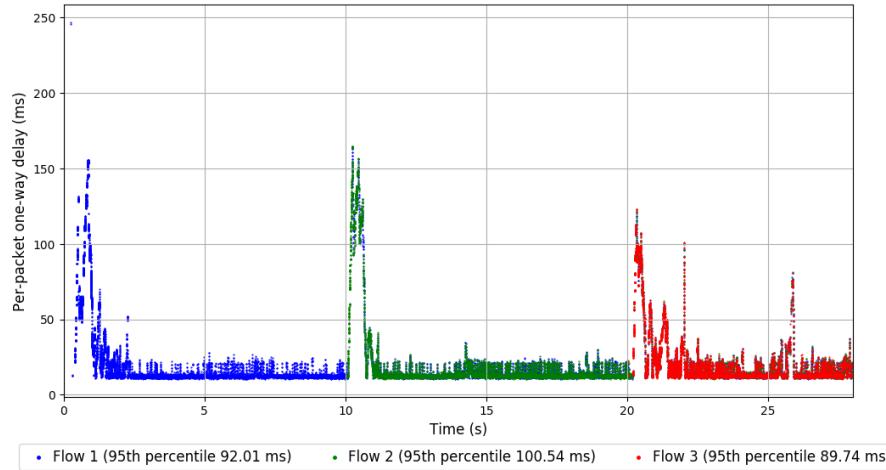
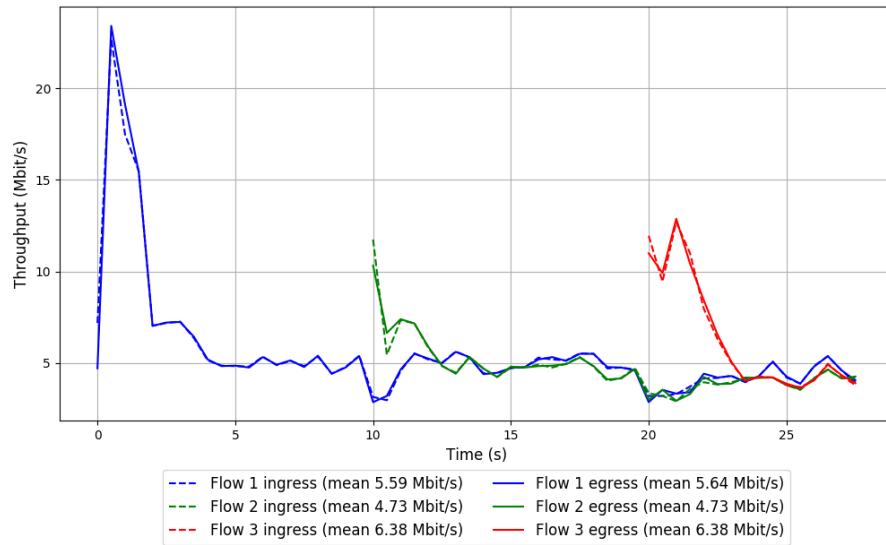


Run 2: Statistics of TaoVA-100x

```
Start at: 2017-09-22 14:40:33
End at: 2017-09-22 14:41:03
Local clock offset: 0.51 ms
Remote clock offset: -2.388 ms

# Below is generated by plot.py at 2017-09-22 15:11:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 10.53 Mbit/s
95th percentile per-packet one-way delay: 92.197 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 5.64 Mbit/s
95th percentile per-packet one-way delay: 92.009 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 4.73 Mbit/s
95th percentile per-packet one-way delay: 100.544 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 6.38 Mbit/s
95th percentile per-packet one-way delay: 89.742 ms
Loss rate: 0.00%
```

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

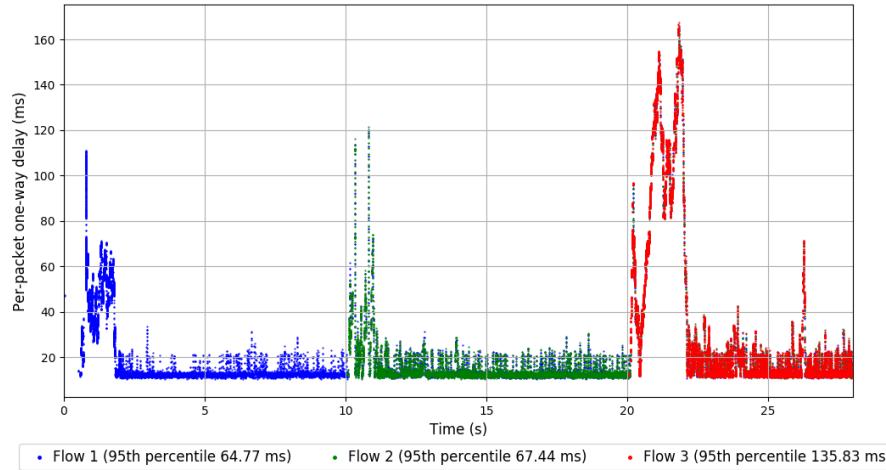
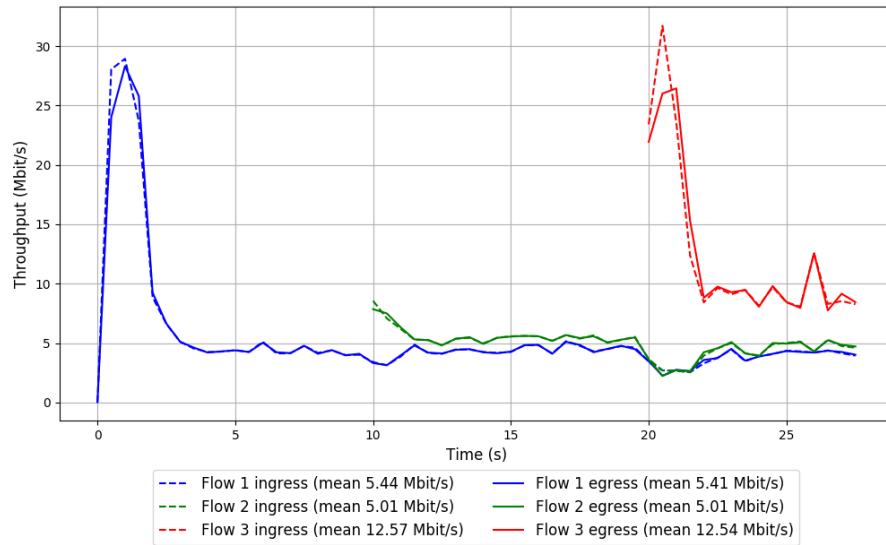


Run 3: Statistics of TaoVA-100x

```
Start at: 2017-09-22 14:57:14
End at: 2017-09-22 14:57:44
Local clock offset: 0.417 ms
Remote clock offset: -2.362 ms

# Below is generated by plot.py at 2017-09-22 15:11:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 12.20 Mbit/s
95th percentile per-packet one-way delay: 113.743 ms
Loss rate: 0.38%
-- Flow 1:
Average throughput: 5.41 Mbit/s
95th percentile per-packet one-way delay: 64.767 ms
Loss rate: 0.66%
-- Flow 2:
Average throughput: 5.01 Mbit/s
95th percentile per-packet one-way delay: 67.436 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 12.54 Mbit/s
95th percentile per-packet one-way delay: 135.828 ms
Loss rate: 0.27%
```

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

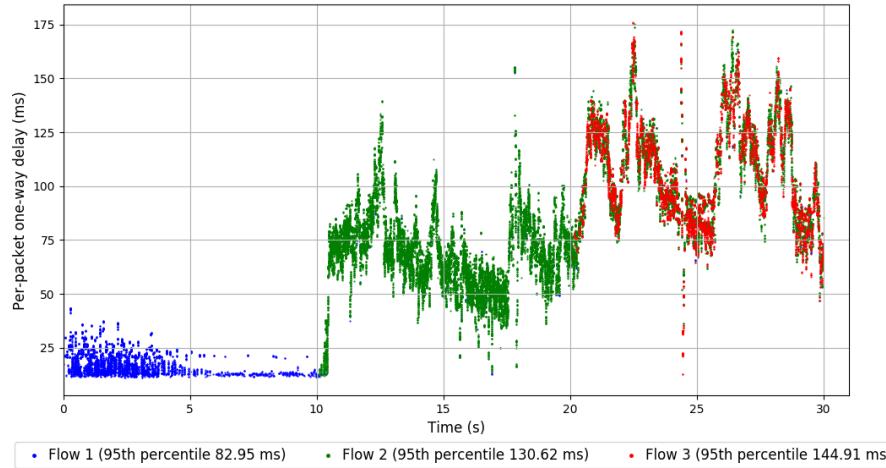
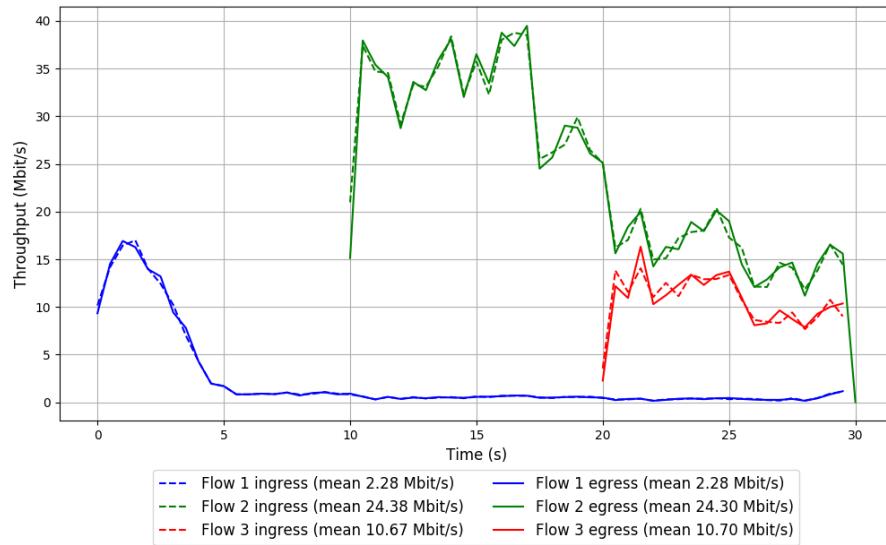


Run 1: Statistics of TCP Vegas

```
Start at: 2017-09-22 14:26:12
End at: 2017-09-22 14:26:42
Local clock offset: 0.424 ms
Remote clock offset: -2.341 ms

# Below is generated by plot.py at 2017-09-22 15:11:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 22.00 Mbit/s
95th percentile per-packet one-way delay: 132.729 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 2.28 Mbit/s
95th percentile per-packet one-way delay: 82.946 ms
Loss rate: 0.11%
-- Flow 2:
Average throughput: 24.30 Mbit/s
95th percentile per-packet one-way delay: 130.618 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 10.70 Mbit/s
95th percentile per-packet one-way delay: 144.905 ms
Loss rate: 0.32%
```

Run 1: Report of TCP Vegas — Data Link

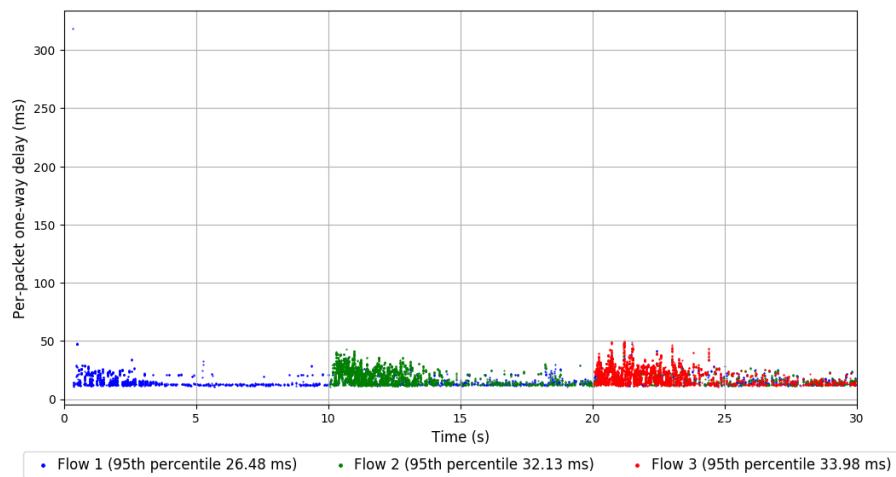
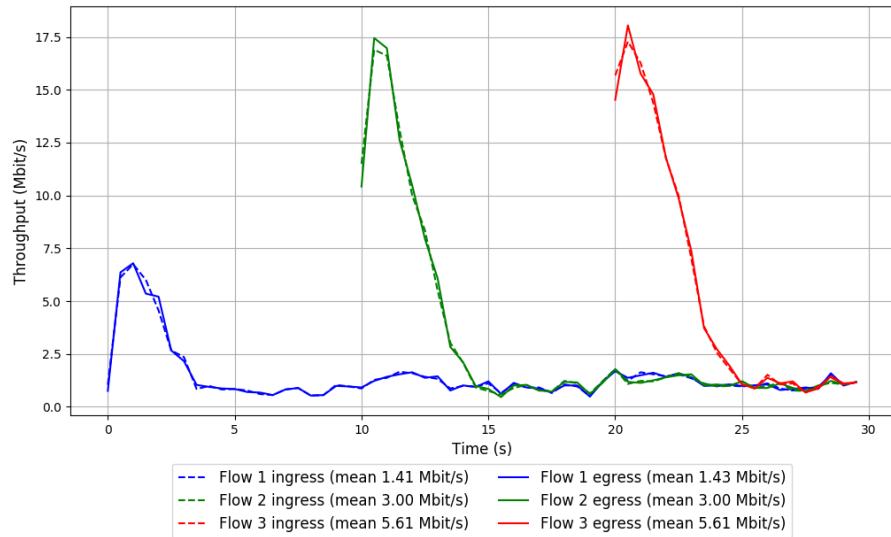


Run 2: Statistics of TCP Vegas

```
Start at: 2017-09-22 14:42:55
End at: 2017-09-22 14:43:25
Local clock offset: 0.423 ms
Remote clock offset: -2.505 ms

# Below is generated by plot.py at 2017-09-22 15:11:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 5.32 Mbit/s
95th percentile per-packet one-way delay: 31.804 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.43 Mbit/s
95th percentile per-packet one-way delay: 26.480 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 3.00 Mbit/s
95th percentile per-packet one-way delay: 32.130 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 5.61 Mbit/s
95th percentile per-packet one-way delay: 33.981 ms
Loss rate: 0.00%
```

Run 2: Report of TCP Vegas — Data Link

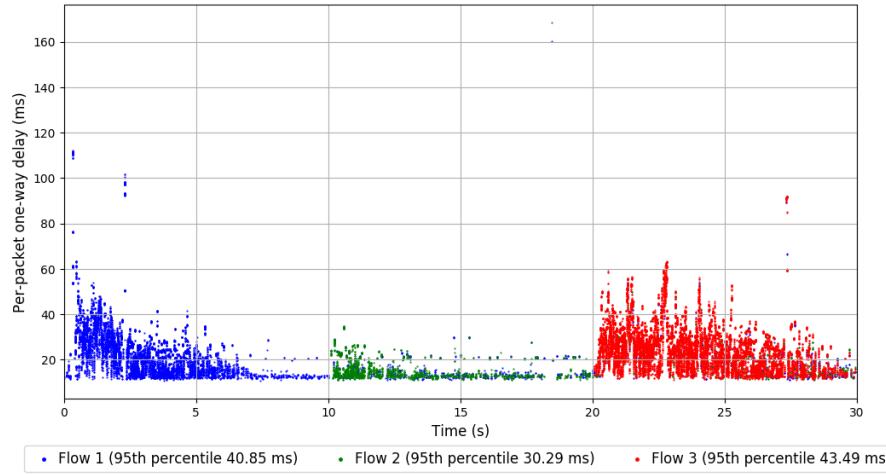
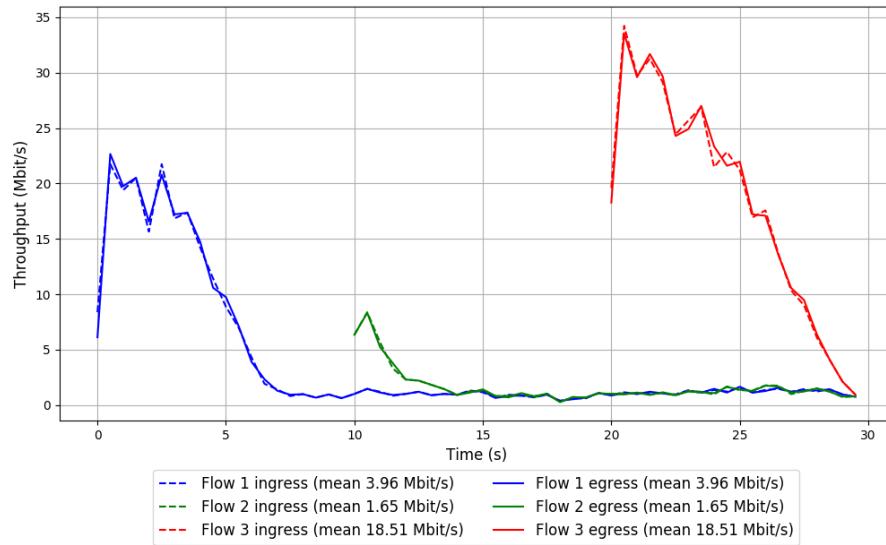


Run 3: Statistics of TCP Vegas

```
Start at: 2017-09-22 14:59:37
End at: 2017-09-22 15:00:07
Local clock offset: 0.406 ms
Remote clock offset: -2.329 ms

# Below is generated by plot.py at 2017-09-22 15:11:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 11.19 Mbit/s
95th percentile per-packet one-way delay: 41.693 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 3.96 Mbit/s
95th percentile per-packet one-way delay: 40.851 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 1.65 Mbit/s
95th percentile per-packet one-way delay: 30.294 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 18.51 Mbit/s
95th percentile per-packet one-way delay: 43.487 ms
Loss rate: 0.00%
```

Run 3: Report of TCP Vegas — Data Link

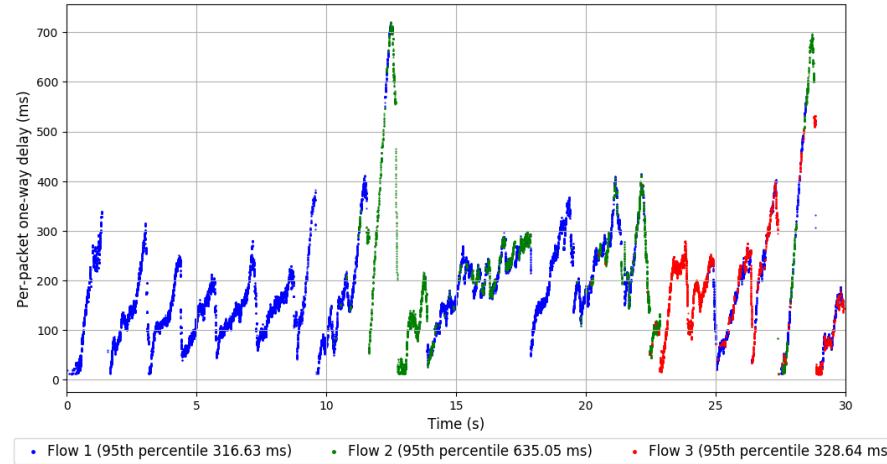
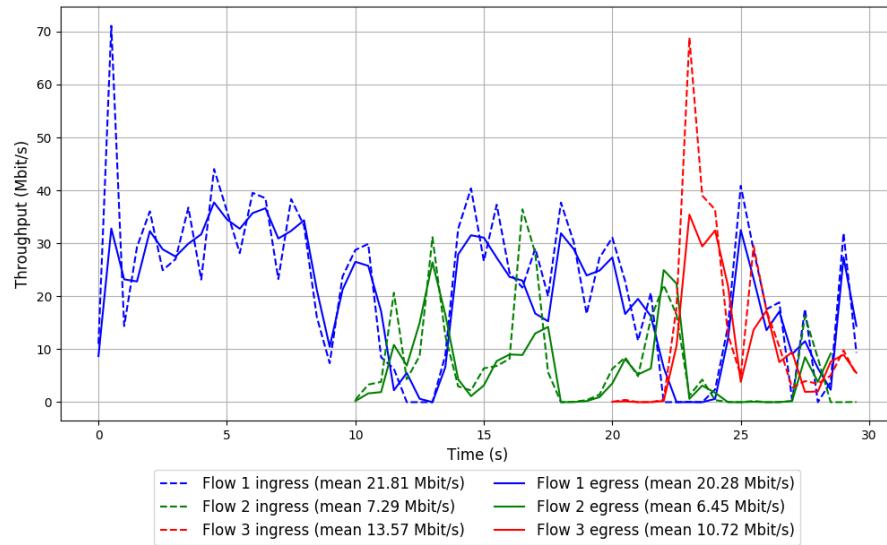


Run 1: Statistics of Verus

```
Start at: 2017-09-22 14:22:37
End at: 2017-09-22 14:23:07
Local clock offset: 0.42 ms
Remote clock offset: -2.348 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 27.77 Mbit/s
95th percentile per-packet one-way delay: 343.876 ms
Loss rate: 10.59%
-- Flow 1:
Average throughput: 20.28 Mbit/s
95th percentile per-packet one-way delay: 316.629 ms
Loss rate: 6.76%
-- Flow 2:
Average throughput: 6.45 Mbit/s
95th percentile per-packet one-way delay: 635.050 ms
Loss rate: 16.87%
-- Flow 3:
Average throughput: 10.72 Mbit/s
95th percentile per-packet one-way delay: 328.639 ms
Loss rate: 22.41%
```

Run 1: Report of Verus — Data Link

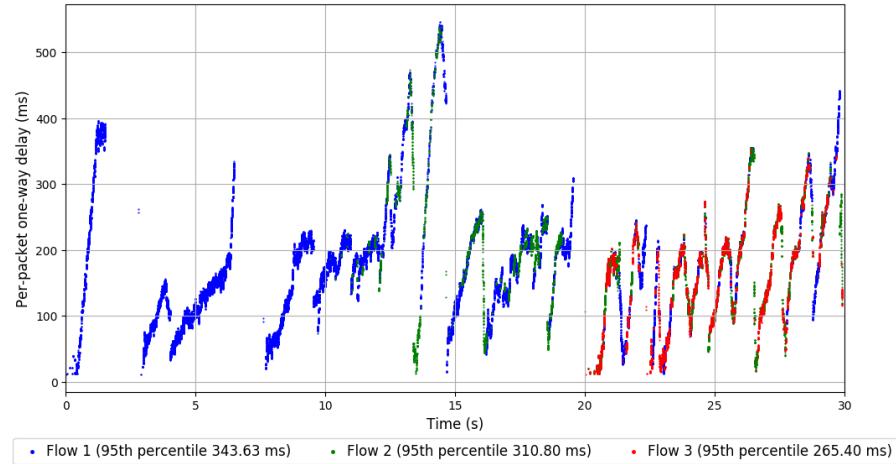
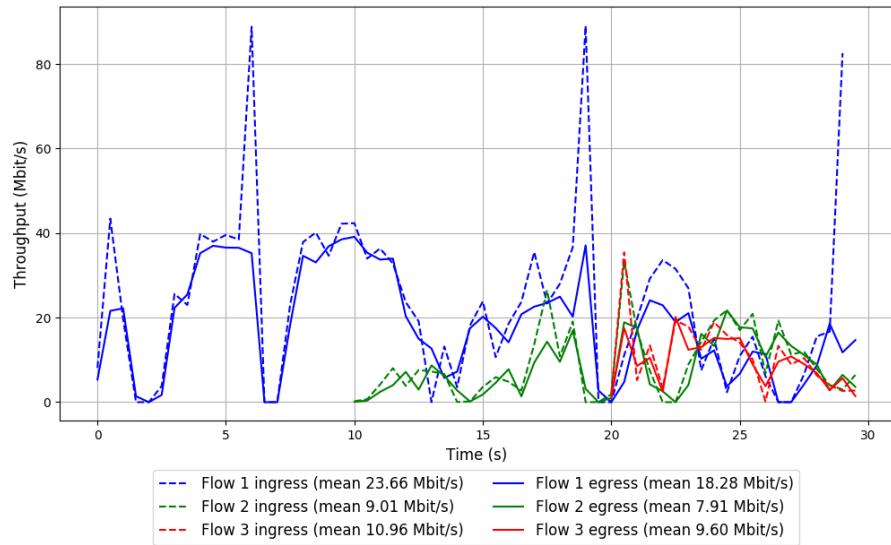


Run 2: Statistics of Verus

```
Start at: 2017-09-22 14:39:20
End at: 2017-09-22 14:39:50
Local clock offset: 0.533 ms
Remote clock offset: -2.43 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 26.60 Mbit/s
95th percentile per-packet one-way delay: 326.996 ms
Loss rate: 19.01%
-- Flow 1:
Average throughput: 18.28 Mbit/s
95th percentile per-packet one-way delay: 343.630 ms
Loss rate: 21.60%
-- Flow 2:
Average throughput: 7.91 Mbit/s
95th percentile per-packet one-way delay: 310.797 ms
Loss rate: 13.01%
-- Flow 3:
Average throughput: 9.60 Mbit/s
95th percentile per-packet one-way delay: 265.400 ms
Loss rate: 12.27%
```

Run 2: Report of Verus — Data Link

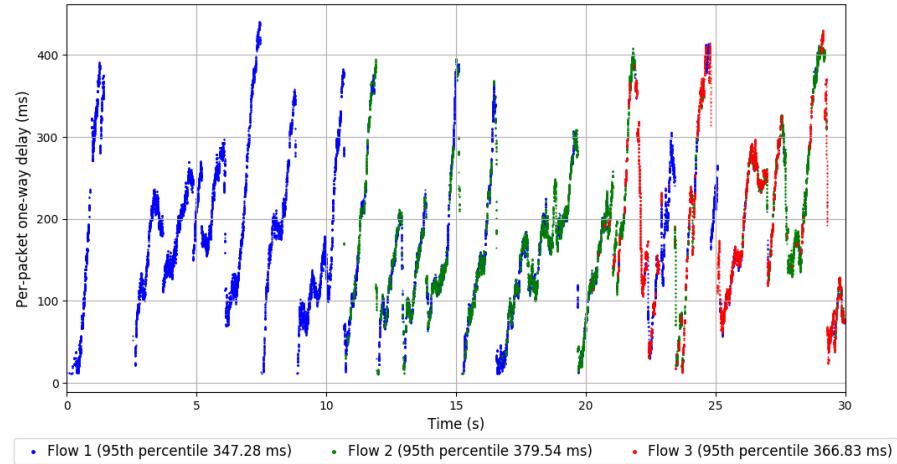
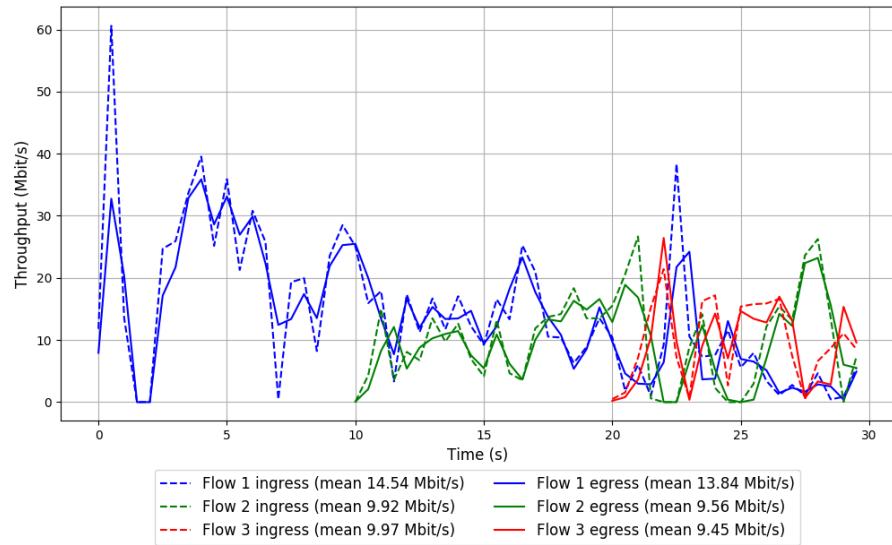


Run 3: Statistics of Verus

```
Start at: 2017-09-22 14:56:01
End at: 2017-09-22 14:56:31
Local clock offset: 0.5 ms
Remote clock offset: -2.393 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 23.24 Mbit/s
95th percentile per-packet one-way delay: 362.708 ms
Loss rate: 4.77%
-- Flow 1:
Average throughput: 13.84 Mbit/s
95th percentile per-packet one-way delay: 347.283 ms
Loss rate: 4.79%
-- Flow 2:
Average throughput: 9.56 Mbit/s
95th percentile per-packet one-way delay: 379.538 ms
Loss rate: 4.20%
-- Flow 3:
Average throughput: 9.45 Mbit/s
95th percentile per-packet one-way delay: 366.832 ms
Loss rate: 5.85%
```

Run 3: Report of Verus — Data Link

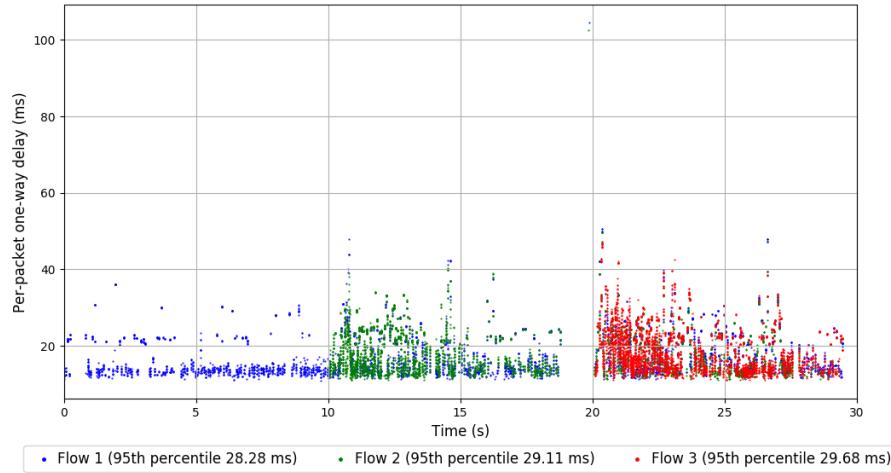
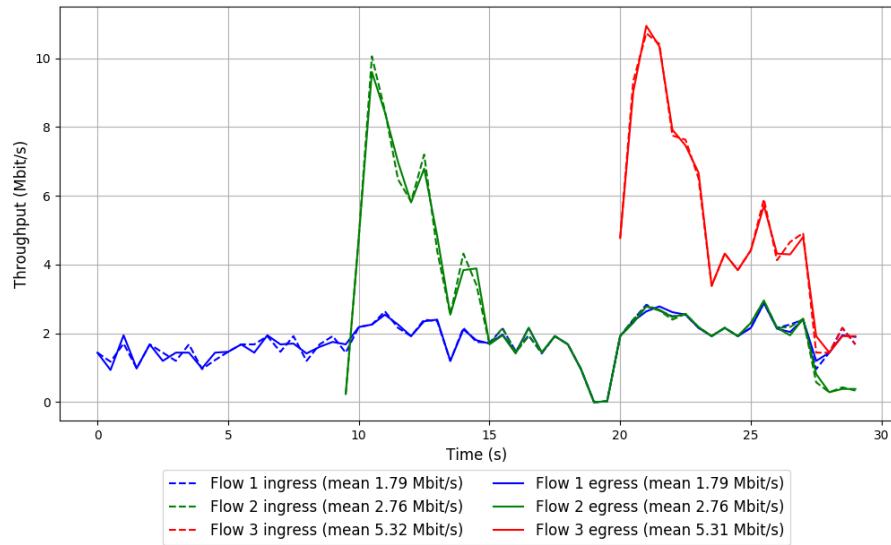


Run 1: Statistics of Indigo

```
Start at: 2017-09-22 14:25:01
End at: 2017-09-22 14:25:31
Local clock offset: 0.415 ms
Remote clock offset: -2.401 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 5.30 Mbit/s
95th percentile per-packet one-way delay: 29.059 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.79 Mbit/s
95th percentile per-packet one-way delay: 28.282 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 2.76 Mbit/s
95th percentile per-packet one-way delay: 29.110 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 5.31 Mbit/s
95th percentile per-packet one-way delay: 29.684 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

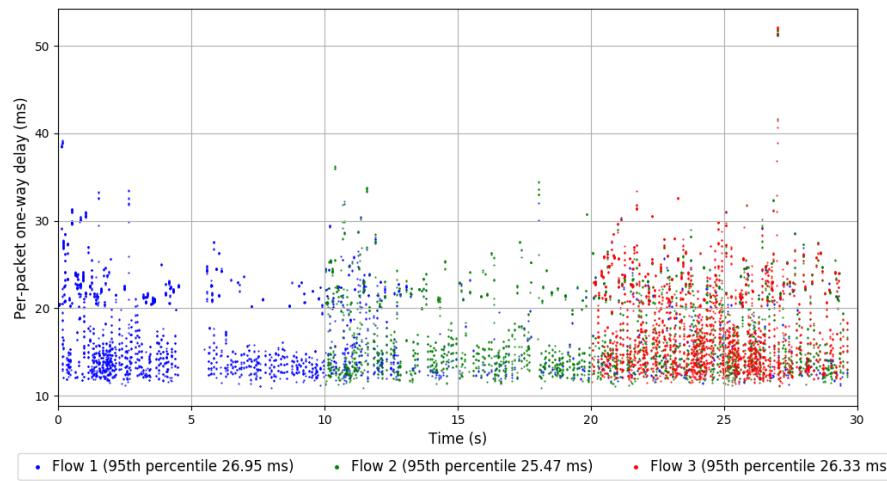
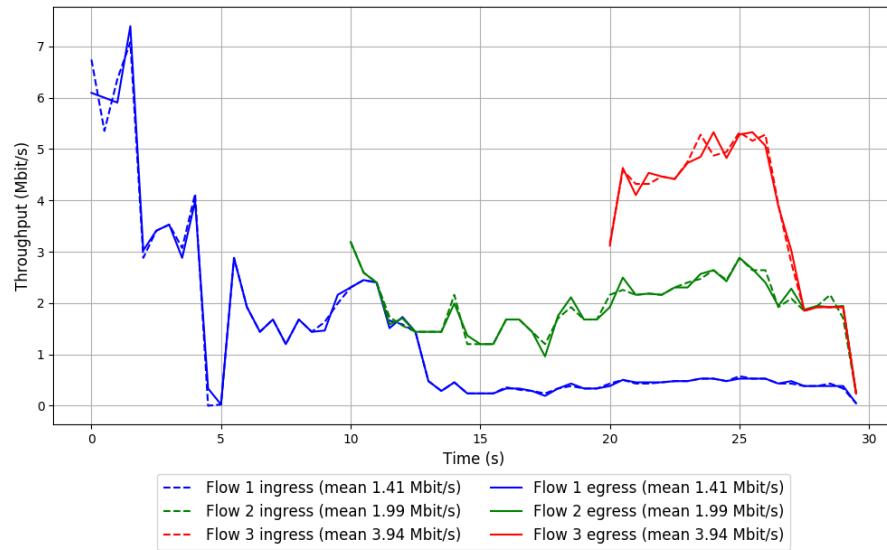


Run 2: Statistics of Indigo

```
Start at: 2017-09-22 14:41:44
End at: 2017-09-22 14:42:14
Local clock offset: 0.494 ms
Remote clock offset: -2.387 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 4.00 Mbit/s
95th percentile per-packet one-way delay: 26.177 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.41 Mbit/s
95th percentile per-packet one-way delay: 26.950 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 1.99 Mbit/s
95th percentile per-packet one-way delay: 25.470 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 3.94 Mbit/s
95th percentile per-packet one-way delay: 26.330 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

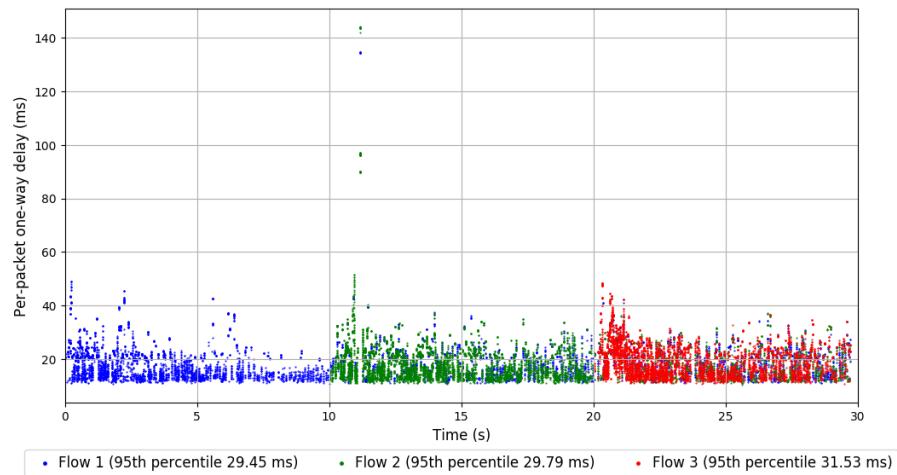
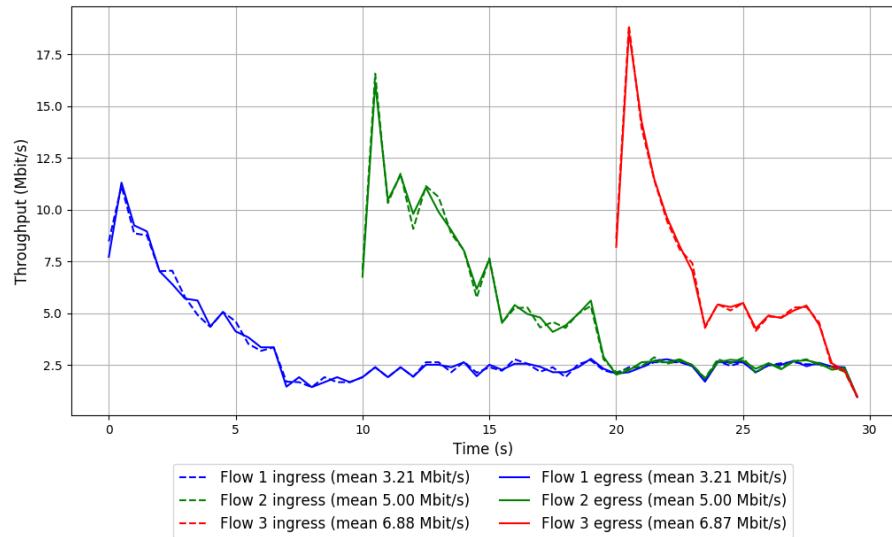


Run 3: Statistics of Indigo

```
Start at: 2017-09-22 14:58:25
End at: 2017-09-22 14:58:55
Local clock offset: 0.499 ms
Remote clock offset: -2.36 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 8.75 Mbit/s
95th percentile per-packet one-way delay: 30.335 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 3.21 Mbit/s
95th percentile per-packet one-way delay: 29.454 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 5.00 Mbit/s
95th percentile per-packet one-way delay: 29.788 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 6.87 Mbit/s
95th percentile per-packet one-way delay: 31.532 ms
Loss rate: 0.00%
```

Run 3: Report of Indigo — Data Link

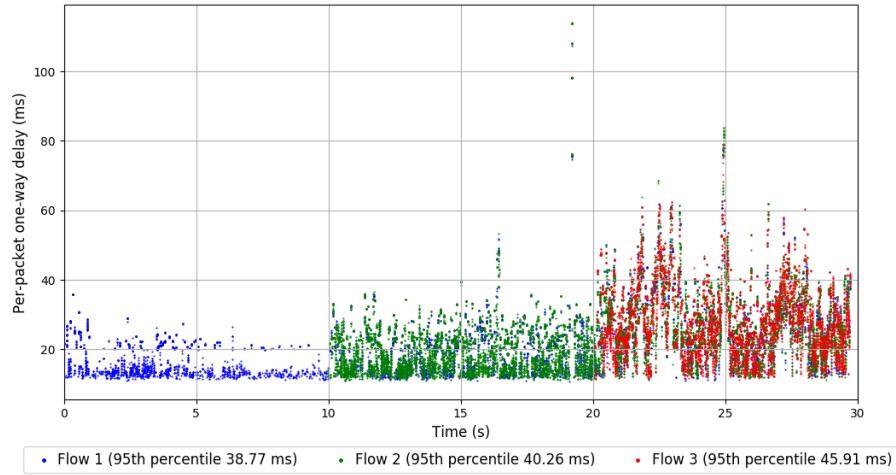
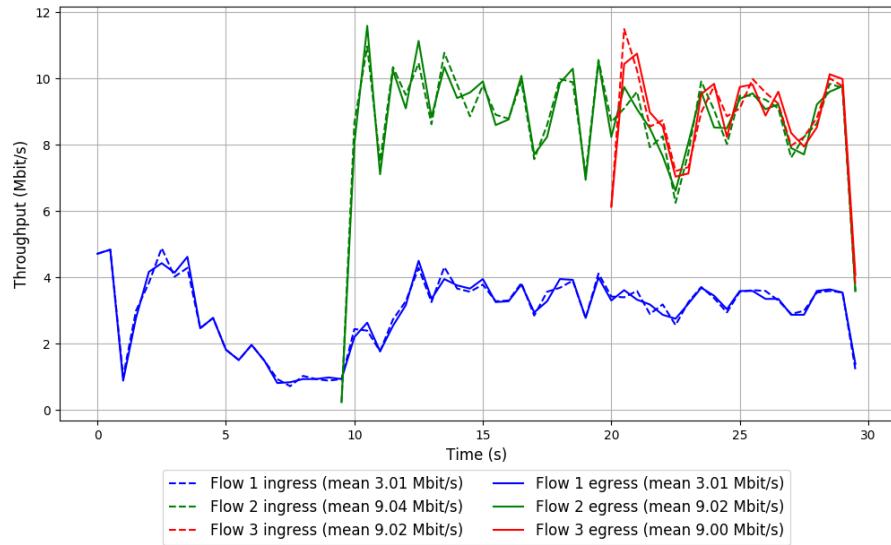


Run 1: Statistics of Indigo-cellular

```
Start at: 2017-09-22 14:28:36
End at: 2017-09-22 14:29:06
Local clock offset: 0.495 ms
Remote clock offset: -2.354 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 11.93 Mbit/s
95th percentile per-packet one-way delay: 42.035 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 3.01 Mbit/s
95th percentile per-packet one-way delay: 38.775 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 9.02 Mbit/s
95th percentile per-packet one-way delay: 40.255 ms
Loss rate: 0.11%
-- Flow 3:
Average throughput: 9.00 Mbit/s
95th percentile per-packet one-way delay: 45.914 ms
Loss rate: 0.03%
```

Run 1: Report of Indigo-cellular — Data Link

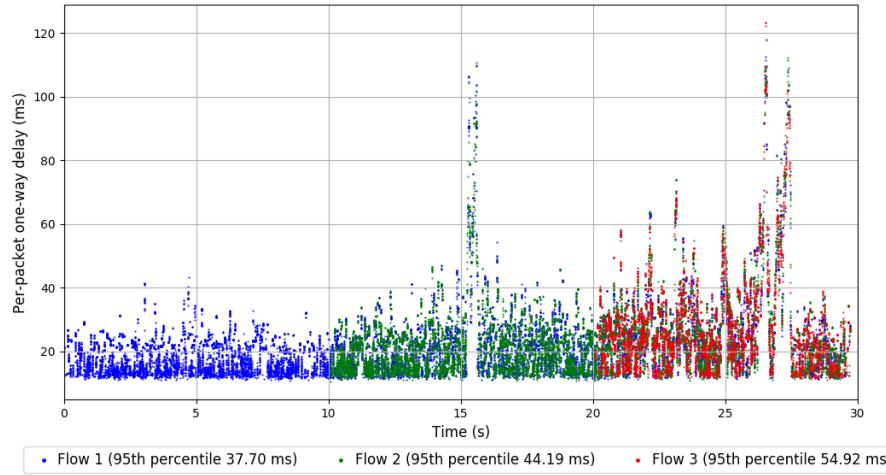
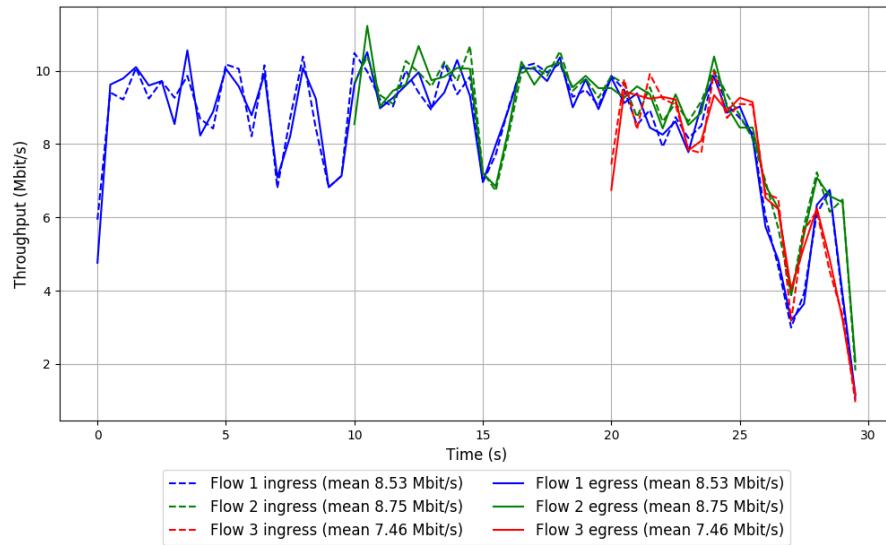


Run 2: Statistics of Indigo-cellular

```
Start at: 2017-09-22 14:45:18
End at: 2017-09-22 14:45:48
Local clock offset: 0.5 ms
Remote clock offset: -2.487 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 16.72 Mbit/s
95th percentile per-packet one-way delay: 42.240 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 8.53 Mbit/s
95th percentile per-packet one-way delay: 37.700 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 8.75 Mbit/s
95th percentile per-packet one-way delay: 44.186 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 7.46 Mbit/s
95th percentile per-packet one-way delay: 54.925 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo-cellular — Data Link

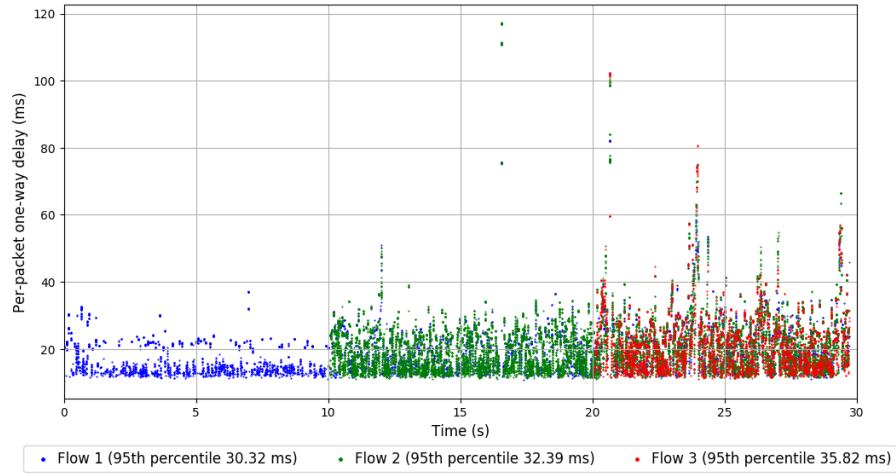
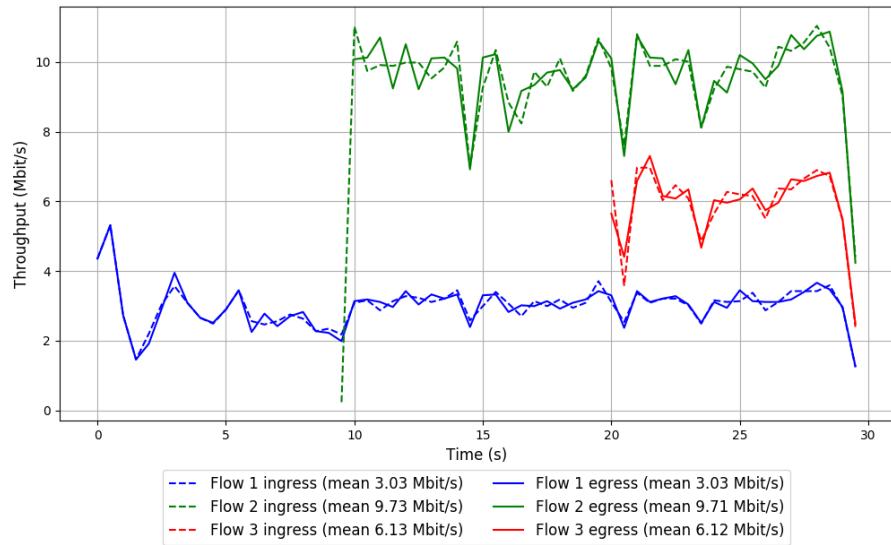


Run 3: Statistics of Indigo-cellular

```
Start at: 2017-09-22 15:02:00
End at: 2017-09-22 15:02:30
Local clock offset: 0.423 ms
Remote clock offset: -2.243 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 11.46 Mbit/s
95th percentile per-packet one-way delay: 32.342 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 3.03 Mbit/s
95th percentile per-packet one-way delay: 30.317 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 9.71 Mbit/s
95th percentile per-packet one-way delay: 32.386 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 6.12 Mbit/s
95th percentile per-packet one-way delay: 35.824 ms
Loss rate: 0.12%
```

Run 3: Report of Indigo-cellular — Data Link

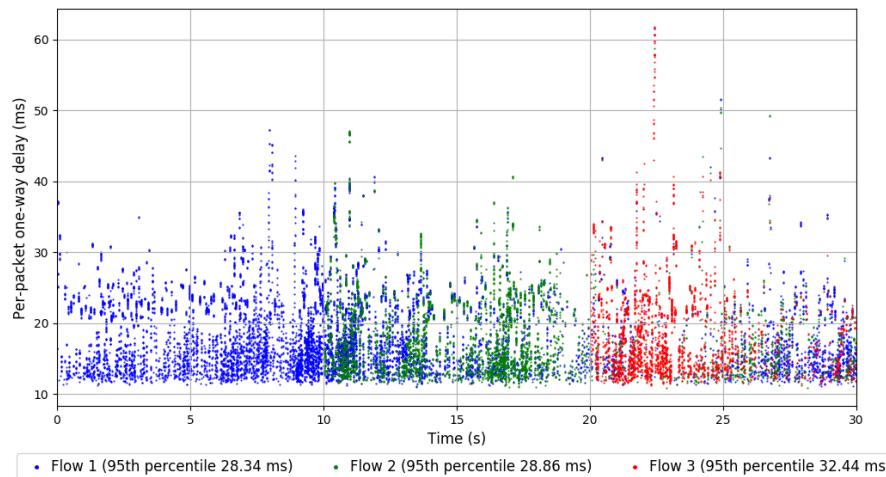
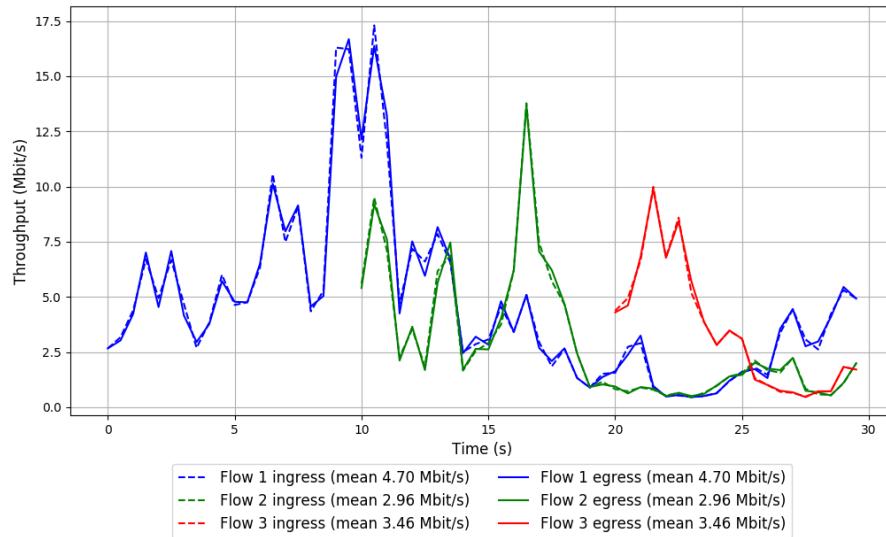


Run 1: Statistics of KohoCC

```
Start at: 2017-09-22 14:30:58
End at: 2017-09-22 14:31:28
Local clock offset: 0.408 ms
Remote clock offset: -2.307 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 7.82 Mbit/s
95th percentile per-packet one-way delay: 29.098 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 4.70 Mbit/s
95th percentile per-packet one-way delay: 28.337 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 2.96 Mbit/s
95th percentile per-packet one-way delay: 28.855 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 3.46 Mbit/s
95th percentile per-packet one-way delay: 32.443 ms
Loss rate: 0.00%
```

Run 1: Report of KohoCC — Data Link

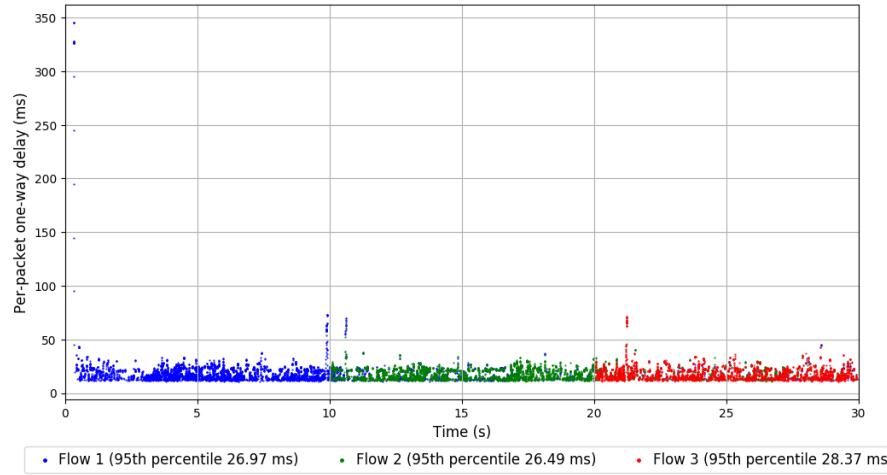
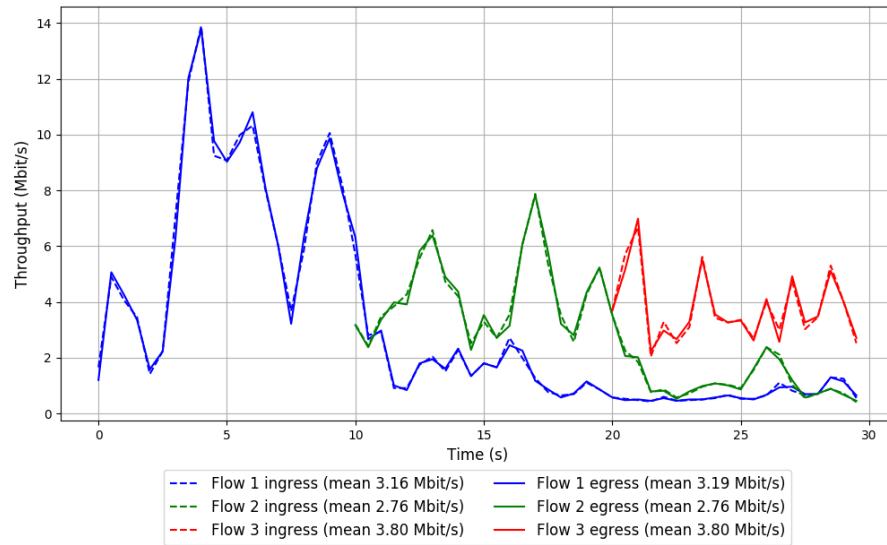


Run 2: Statistics of KohoCC

```
Start at: 2017-09-22 14:47:40
End at: 2017-09-22 14:48:10
Local clock offset: 0.422 ms
Remote clock offset: -2.415 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 6.32 Mbit/s
95th percentile per-packet one-way delay: 27.115 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 3.19 Mbit/s
95th percentile per-packet one-way delay: 26.966 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 2.76 Mbit/s
95th percentile per-packet one-way delay: 26.486 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 3.80 Mbit/s
95th percentile per-packet one-way delay: 28.367 ms
Loss rate: 0.00%
```

Run 2: Report of KohoCC — Data Link



Run 3: Statistics of KohoCC

```
Start at: 2017-09-22 15:04:22
End at: 2017-09-22 15:04:52
Local clock offset: 0.43 ms
Remote clock offset: -2.32 ms

# Below is generated by plot.py at 2017-09-22 15:11:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 10.31 Mbit/s
95th percentile per-packet one-way delay: 28.359 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 5.90 Mbit/s
95th percentile per-packet one-way delay: 26.971 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 3.56 Mbit/s
95th percentile per-packet one-way delay: 28.902 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 6.02 Mbit/s
95th percentile per-packet one-way delay: 30.754 ms
Loss rate: 0.00%
```

Run 3: Report of KohoCC — Data Link

