Pantheon Report

Generated at 2018-02-03 15:09:11 (UTC).

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

Repeated the test of 17 congestion control schemes 3 times.

Each test lasted for 30 seconds running 1 flow.

Increased UDP receive buffer to 16 MB (default) and 32 MB (max).
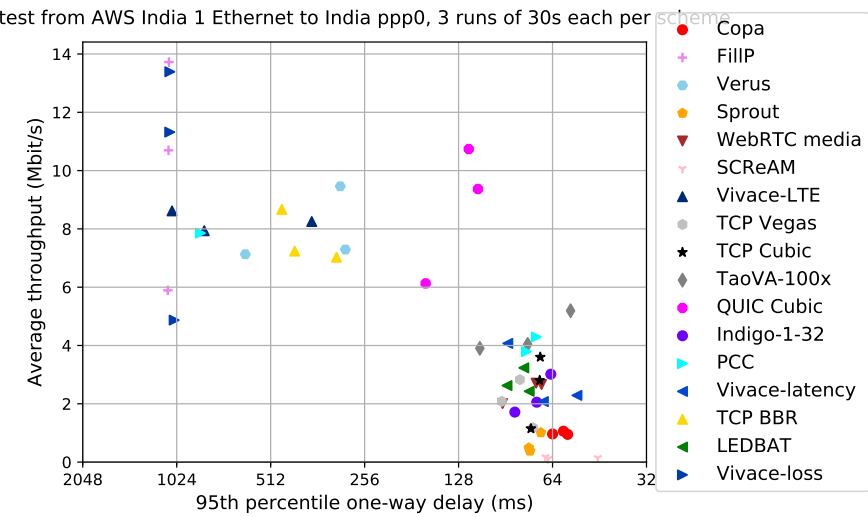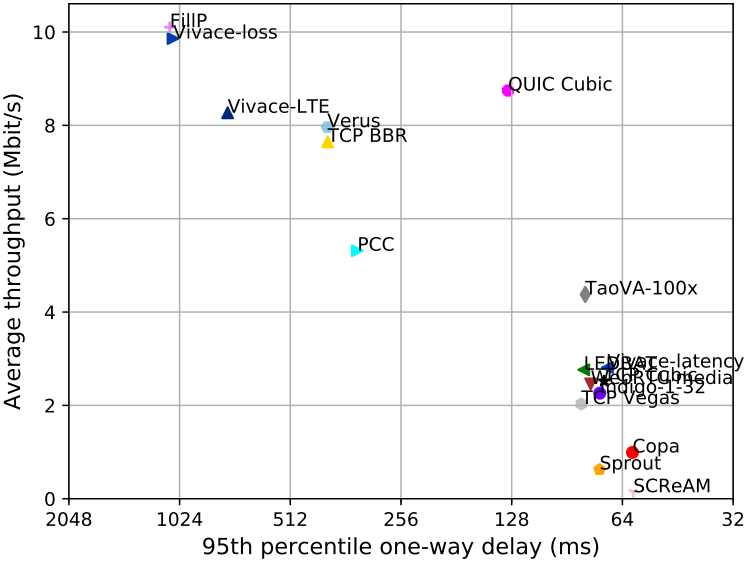
Tested BBR with qdisc of Fair Queuing (`fq`), and other schemes with the default Linux qdisc (`pfifo_fast`).

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

```
Git summary:
branch: master @ 70217998b3c9a7166a95460a70c0854d1326e100
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
 M datagrump/sender.cc
third_party/fillp @ fb9c9ab842e5614ad52911a76fb9bd1c1b0dca86
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ a9b2060d39e4da2e8987e893e3eca2a6c7cd0ab9
third_party/indigo-1-layer-128-unit @ 3ae9e4ef4230db7484501f82ce8b377695f2f66d
third_party/indigo-1-layer-32-unit @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/indigo-1-layer-32-unit-no-calib @ 1f3a7f75b41135ed5b540c0fd3505939528e2a5f
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
 M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ fb1053193c2861da659ba9013db26744ccfcf993
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
 M receiver/src/buffer.h
 M receiver/src/core.cpp
 M sender/src/buffer.h
 M sender/src/core.cpp
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ 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/vivace @ 7a4ba531e75b4a6f66f5c4580192120401784ce3
third_party/webrtc @ a488197ddd041ace68a42849b2540ad834825f42
```

test from AWS India 1 Ethernet to India ppp0, 3 runs of 30s each per scheme
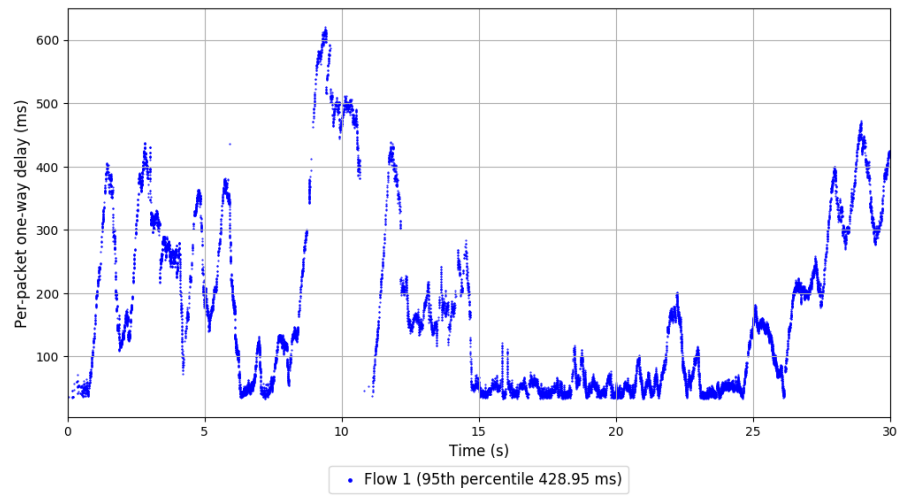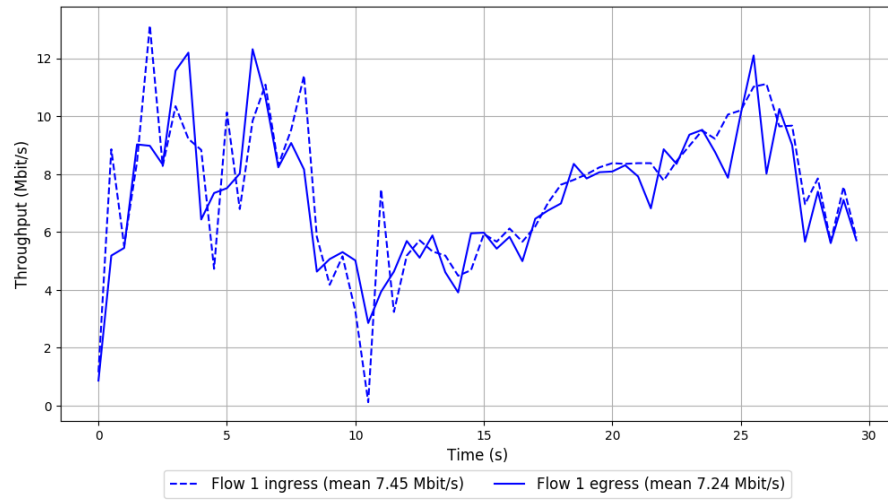(mean of all runs by scheme)

test from AWS India 1 Ethernet to India ppp0, 3 runs of 30s each per scheme

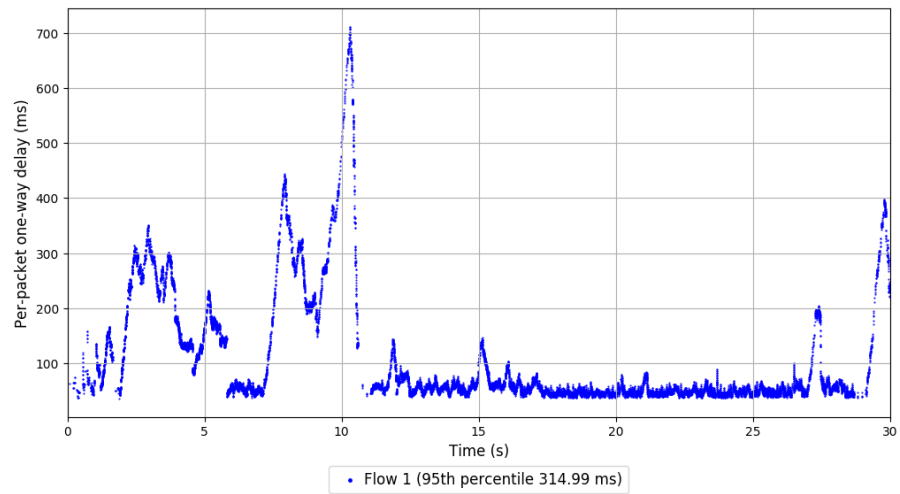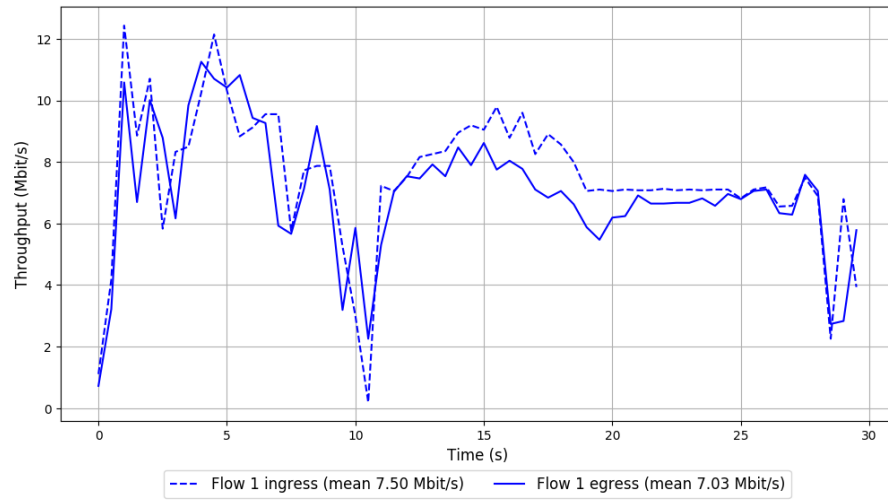| scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
TCP BBR	3	7.65	405.26	6.01
TCP Cubic	3	2.52	71.84	1.81
LEDBAT	3	2.76	81.58	1.13
PCC	3	5.31	336.38	2.32
QUIC Cubic	3	8.75	130.97	1.01
SCReAM	3	0.14	59.81	1.15
WebRTC media	3	2.46	78.07	0.99
Sprout	3	0.63	73.86	1.66
TaoVA-100x	3	4.38	80.78	1.50
TCP Vegas	3	2.03	82.79	2.23
Verus	3	7.96	406.24	2.81
Copa	3	0.99	60.09	0.76
FillP	3	10.10	1088.66	26.90
Indigo-1-32	3	2.26	73.76	2.77
Vivace-latency	3	2.81	70.34	1.01
Vivace-loss	3	9.86	1066.21	12.11
Vivace-LTE	3	8.27	758.00	5.33

```
Run 1: Statistics of TCP BBR

Start at: 2018-02-03 14:17:20
End at: 2018-02-03 14:17:50
Local clock offset: 4.124 ms
Remote clock offset: -31.526 ms


# Below is generated by plot.py at 2018-02-03 15:08:20
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.24 Mbit/s
95th percentile per-packet one-way delay: 428.950 ms
Loss rate: 2.96%
-- Flow 1:
Average throughput: 7.24 Mbit/s
95th percentile per-packet one-way delay: 428.950 ms
Loss rate: 2.96%
```
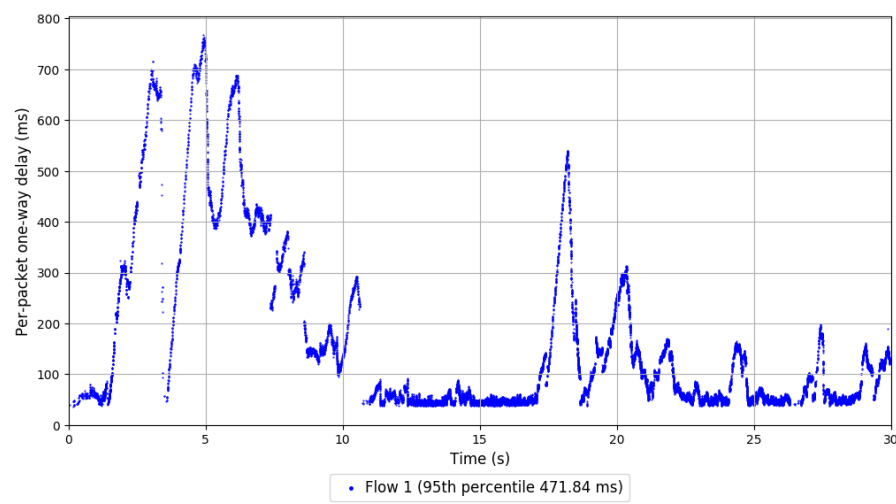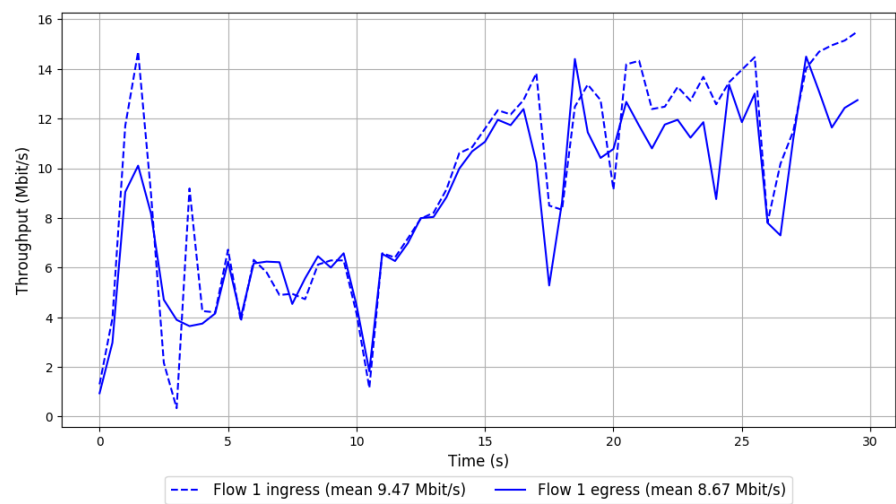
Run 1: Report of TCP BBR — Data Link

```
Run 2: Statistics of TCP BBR

Start at: 2018-02-03 14:37:00
End at: 2018-02-03 14:37:30
Local clock offset: 2.362 ms
Remote clock offset: -31.488 ms


# Below is generated by plot.py at 2018-02-03 15:08:20
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.03 Mbit/s
95th percentile per-packet one-way delay: 314.987 ms
Loss rate: 6.51%
-- Flow 1:
Average throughput: 7.03 Mbit/s
95th percentile per-packet one-way delay: 314.987 ms
Loss rate: 6.51%
```
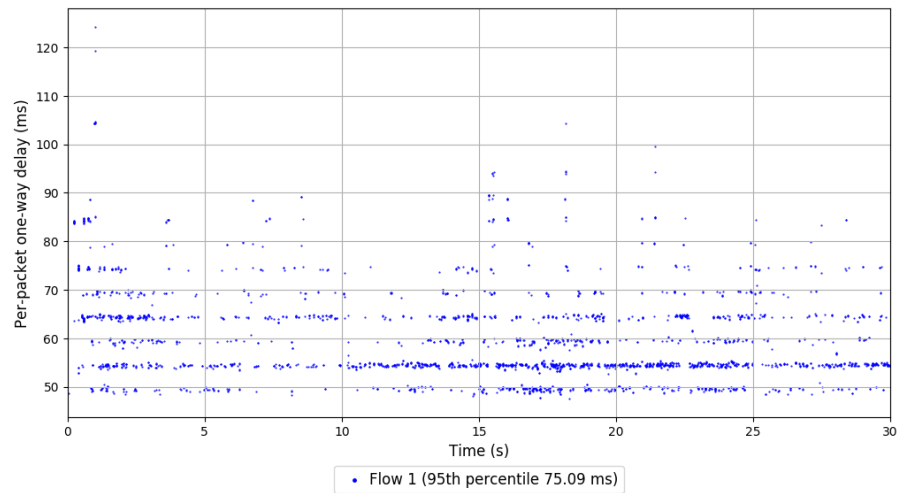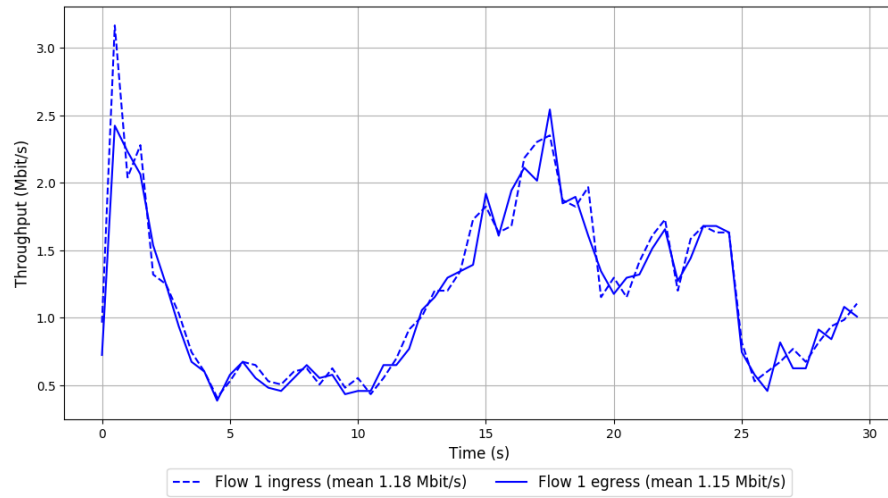
Run 2: Report of TCP BBR — Data Link

Flow 1 ingress (mean 7.50 Mbit/s)   Flow 1 egress (mean 7.03 Mbit/s)

• Flow 1 (95th percentile 314.99 ms)

```
Run 3: Statistics of TCP BBR

Start at: 2018-02-03 14:56:40
End at: 2018-02-03 14:57:10
Local clock offset: 1.853 ms
Remote clock offset: -25.069 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.67 Mbit/s
95th percentile per-packet one-way delay: 471.838 ms
Loss rate: 8.55%
-- Flow 1:
Average throughput: 8.67 Mbit/s
95th percentile per-packet one-way delay: 471.838 ms
Loss rate: 8.55%
```
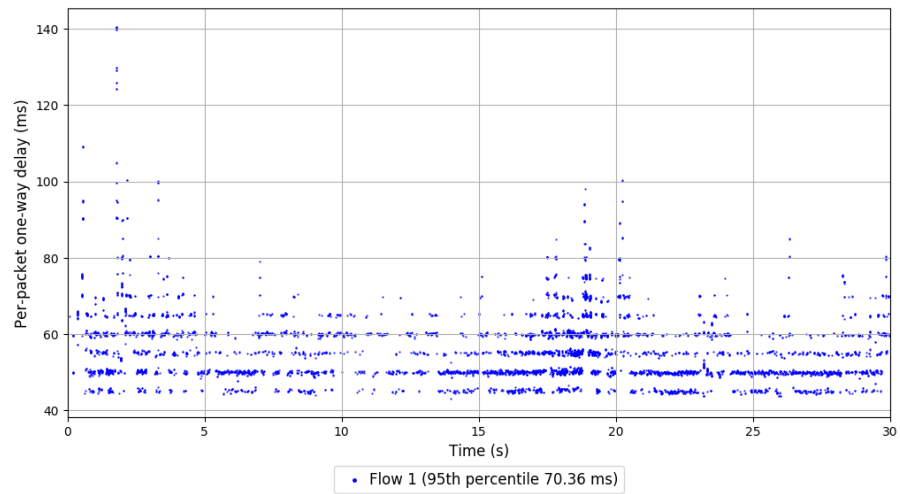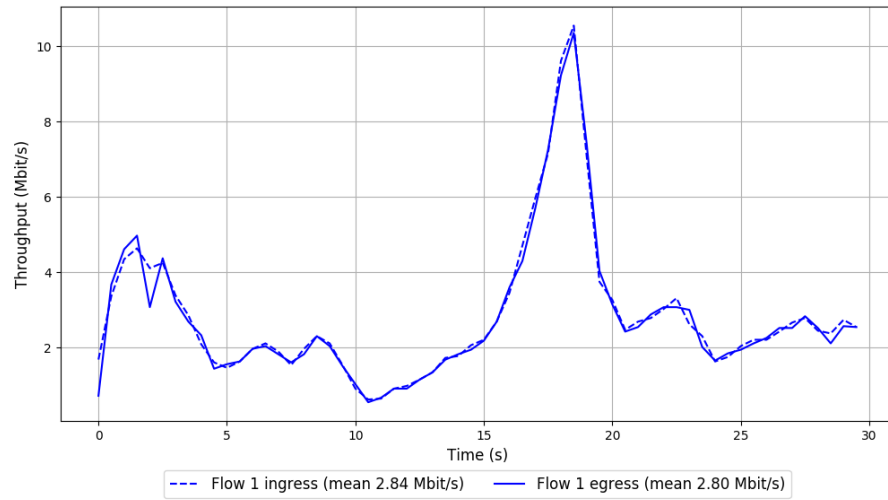
Run 3: Report of TCP BBR — Data Link

```
Run 1: Statistics of TCP Cubic

Start at: 2018-02-03 14:16:15
End at: 2018-02-03 14:16:45
Local clock offset: 1.908 ms
Remote clock offset: -29.673 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.15 Mbit/s
95th percentile per-packet one-way delay: 75.087 ms
Loss rate: 2.88%
-- Flow 1:
Average throughput: 1.15 Mbit/s
95th percentile per-packet one-way delay: 75.087 ms
Loss rate: 2.88%
```
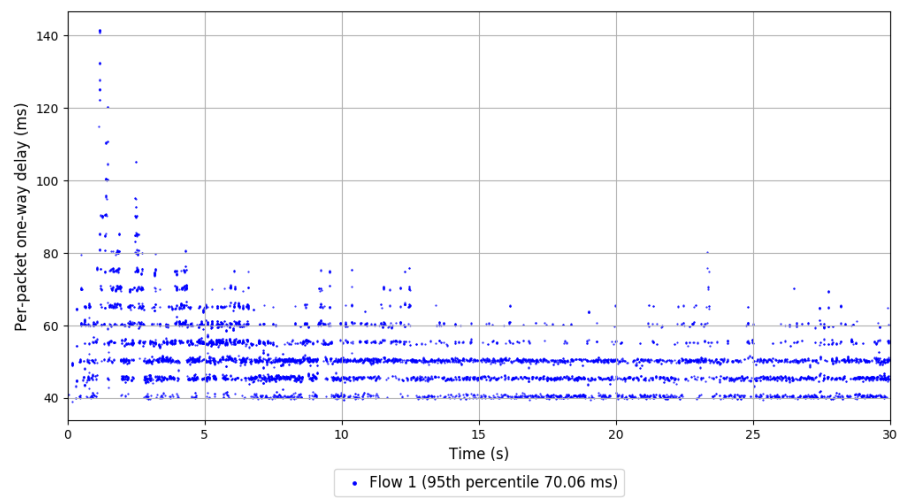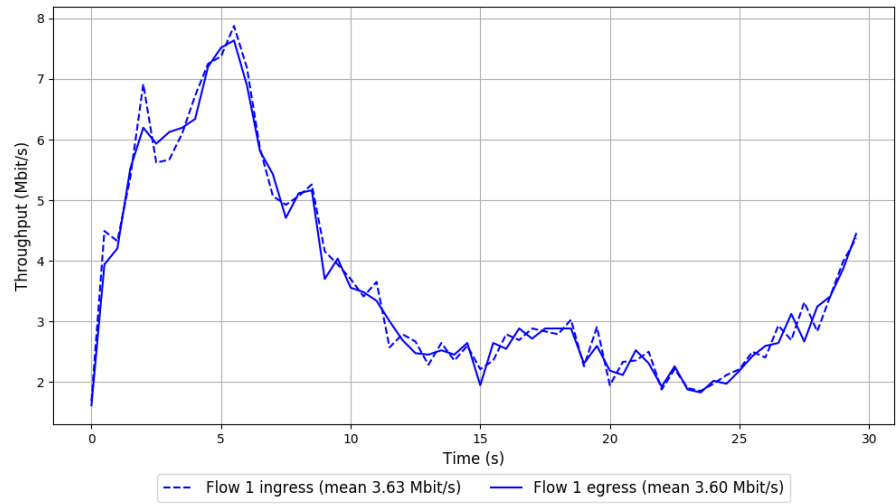
Run 1: Report of TCP Cubic — Data Link

```
Run 2: Statistics of TCP Cubic

Start at: 2018-02-03 14:35:55
End at: 2018-02-03 14:36:25
Local clock offset: -1.834 ms
Remote clock offset: -31.584 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.80 Mbit/s
95th percentile per-packet one-way delay: 70.365 ms
Loss rate: 1.56%
-- Flow 1:
Average throughput: 2.80 Mbit/s
95th percentile per-packet one-way delay: 70.365 ms
Loss rate: 1.56%
```
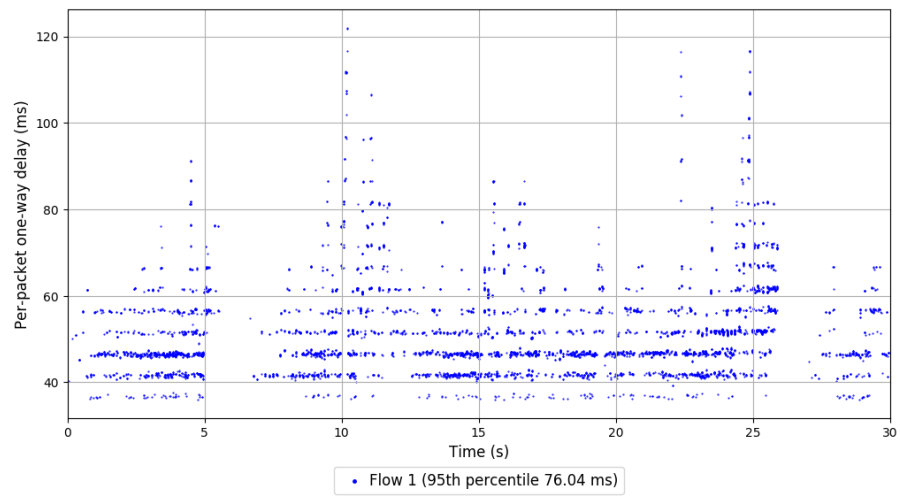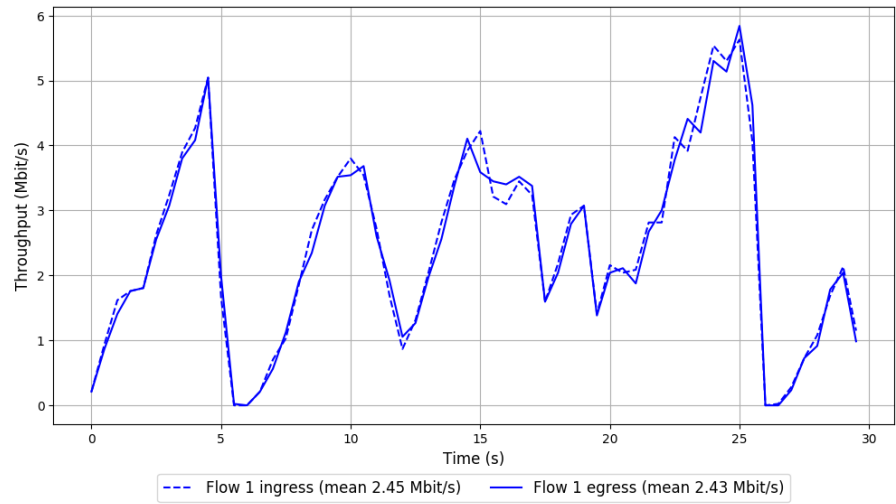
Run 2: Report of TCP Cubic — Data Link

Flow 1 ingress (mean 2.84 Mbit/s)   Flow 1 egress (mean 2.80 Mbit/s)

Flow 1 (95th percentile 70.36 ms)

```
Run 3: Statistics of TCP Cubic

Start at: 2018-02-03 14:55:35
End at: 2018-02-03 14:56:05
Local clock offset: -0.266 ms
Remote clock offset: -24.871 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.60 Mbit/s
95th percentile per-packet one-way delay: 70.061 ms
Loss rate: 1.00%
-- Flow 1:
Average throughput: 3.60 Mbit/s
95th percentile per-packet one-way delay: 70.061 ms
Loss rate: 1.00%
```
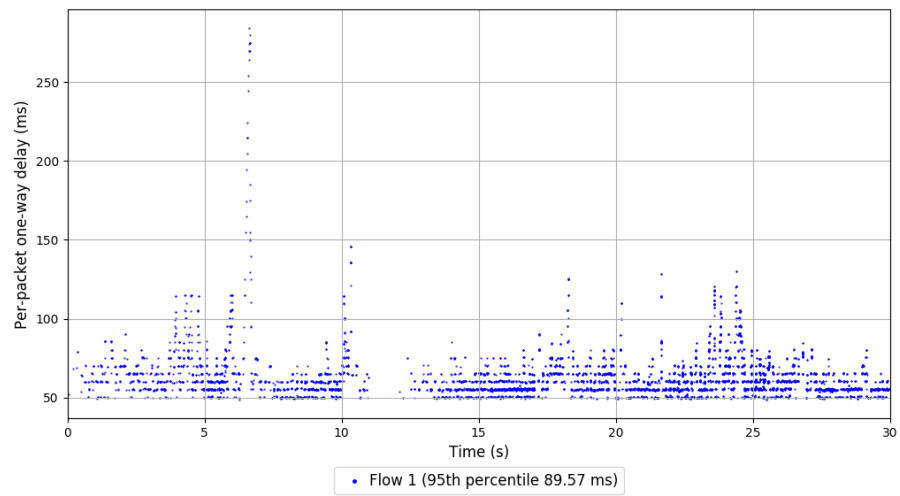
Run 3: Report of TCP Cubic — Data Link

Flow 1 ingress (mean 3.63 Mbit/s) — — —   Flow 1 egress (mean 3.60 Mbit/s) ———
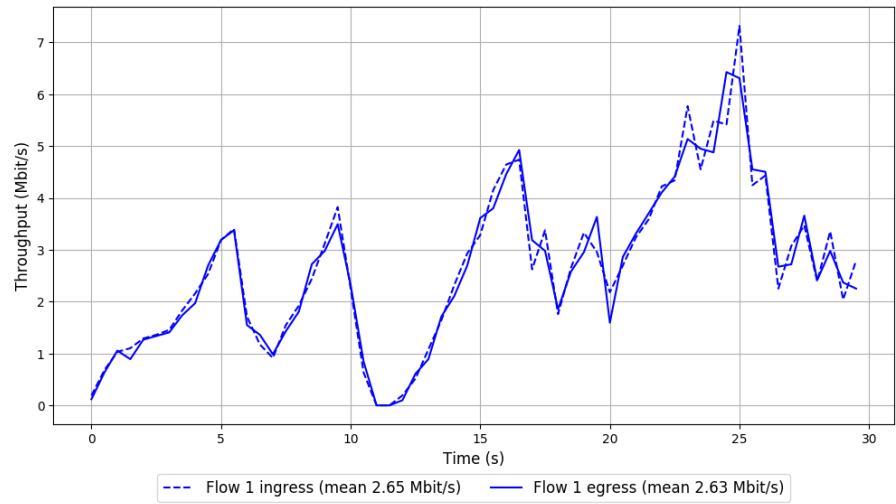

• Flow 1 (95th percentile 70.06 ms)

```
Run 1: Statistics of LEDBAT

Start at: 2018-02-03 14:23:56
End at: 2018-02-03 14:24:26
Local clock offset: 3.668 ms
Remote clock offset: -29.689 ms

# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.43 Mbit/s
95th percentile per-packet one-way delay: 76.040 ms
Loss rate: 1.23%
-- Flow 1:
Average throughput: 2.43 Mbit/s
95th percentile per-packet one-way delay: 76.040 ms
Loss rate: 1.23%
```
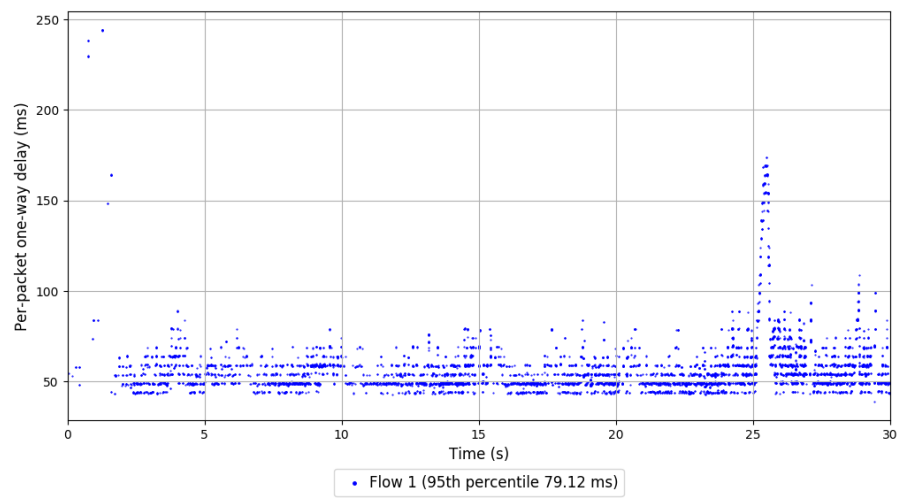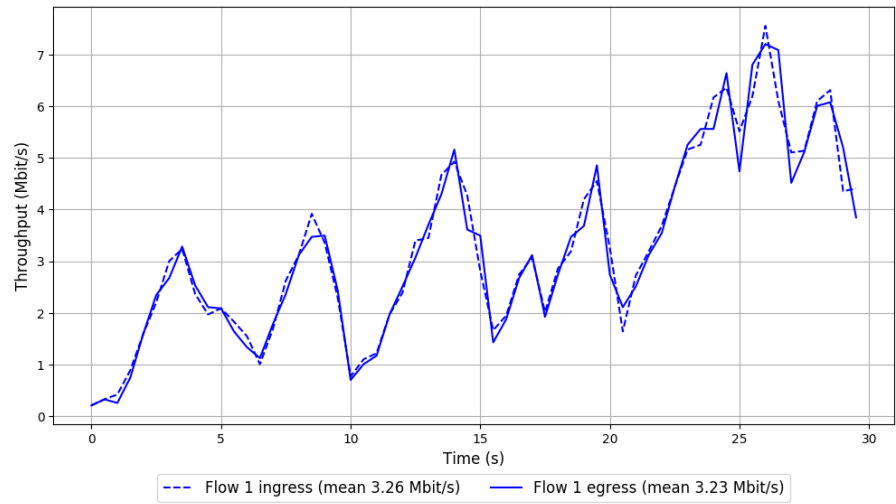
Run 1: Report of LEDBAT — Data Link

```
Run 2: Statistics of LEDBAT

Start at: 2018-02-03 14:43:33
End at: 2018-02-03 14:44:03
Local clock offset: 0.173 ms
Remote clock offset: -27.673 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.63 Mbit/s
95th percentile per-packet one-way delay: 89.573 ms
Loss rate: 1.09%
-- Flow 1:
Average throughput: 2.63 Mbit/s
95th percentile per-packet one-way delay: 89.573 ms
Loss rate: 1.09%
```

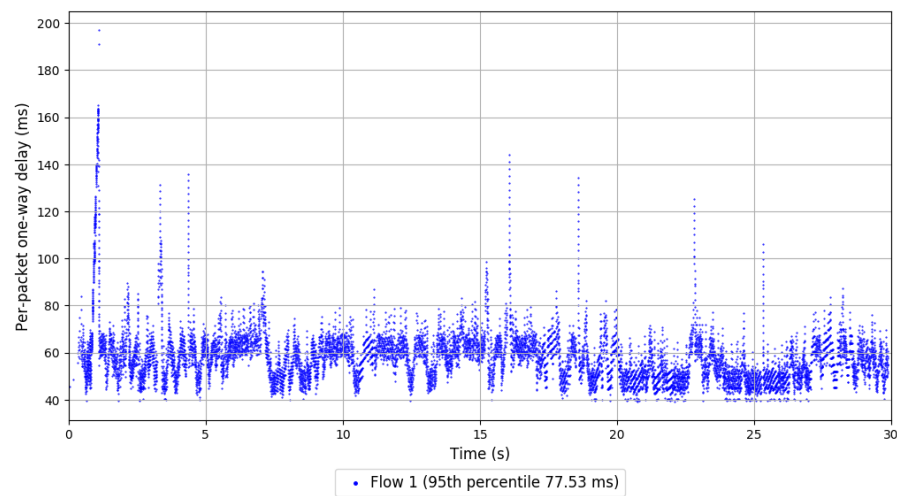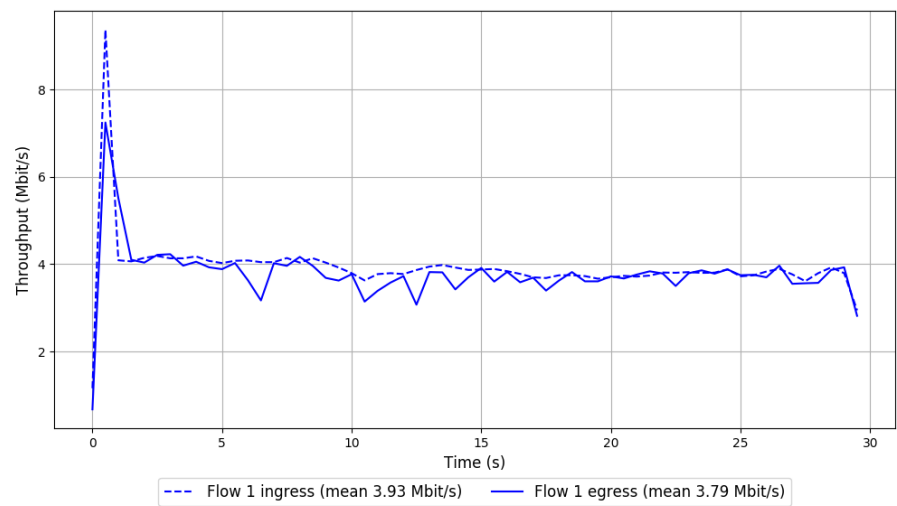Run 2: Report of LEDBAT — Data Link

```
Run 3: Statistics of LEDBAT

Start at: 2018-02-03 15:03:14
End at: 2018-02-03 15:03:44
Local clock offset: -2.445 ms
Remote clock offset: -23.932 ms

# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.23 Mbit/s
95th percentile per-packet one-way delay: 79.125 ms
Loss rate: 1.07%
-- Flow 1:
Average throughput: 3.23 Mbit/s
95th percentile per-packet one-way delay: 79.125 ms
Loss rate: 1.07%
```

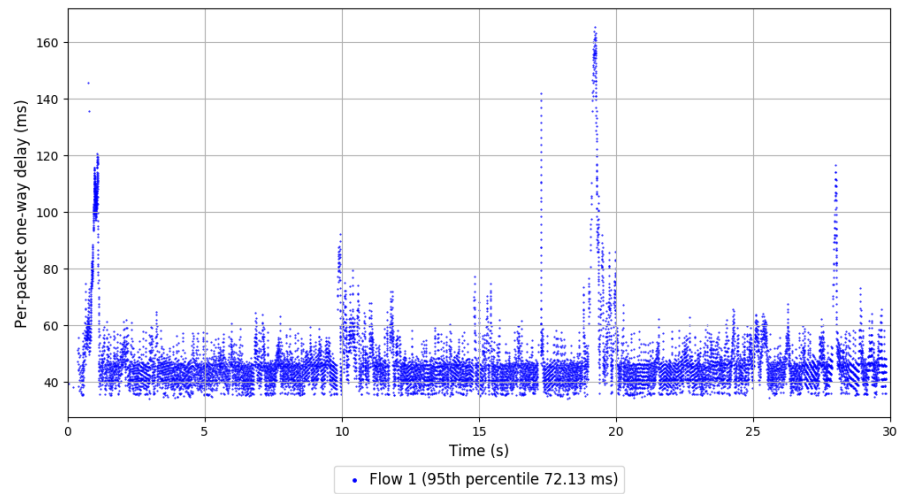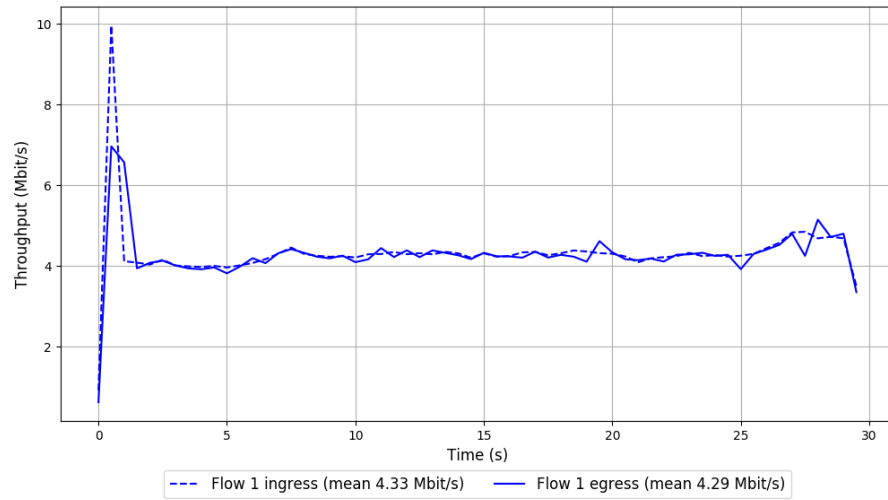# Run 3: Report of LEDBAT — Data Link

```
Run 1: Statistics of PCC

Start at: 2018-02-03 14:12:55
End at: 2018-02-03 14:13:25
Local clock offset: -2.823 ms
Remote clock offset: -28.623 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.79 Mbit/s
95th percentile per-packet one-way delay: 77.525 ms
Loss rate: 3.68%
-- Flow 1:
Average throughput: 3.79 Mbit/s
95th percentile per-packet one-way delay: 77.525 ms
Loss rate: 3.68%
```

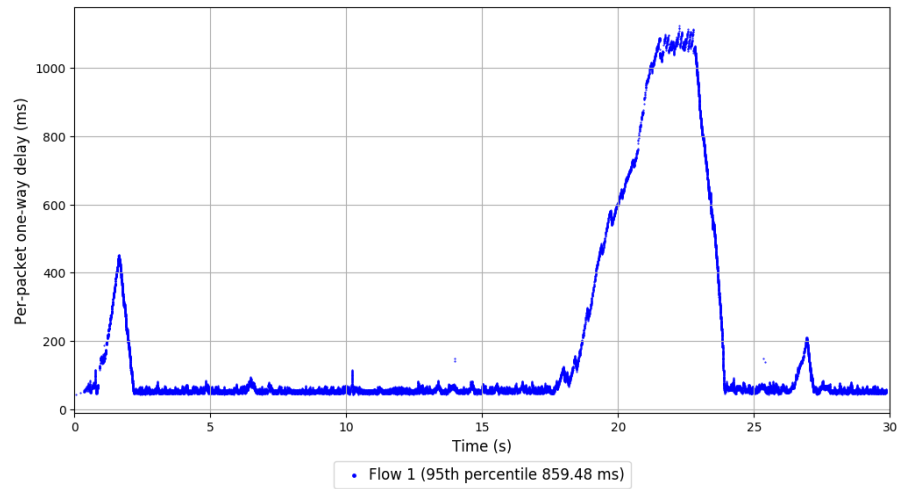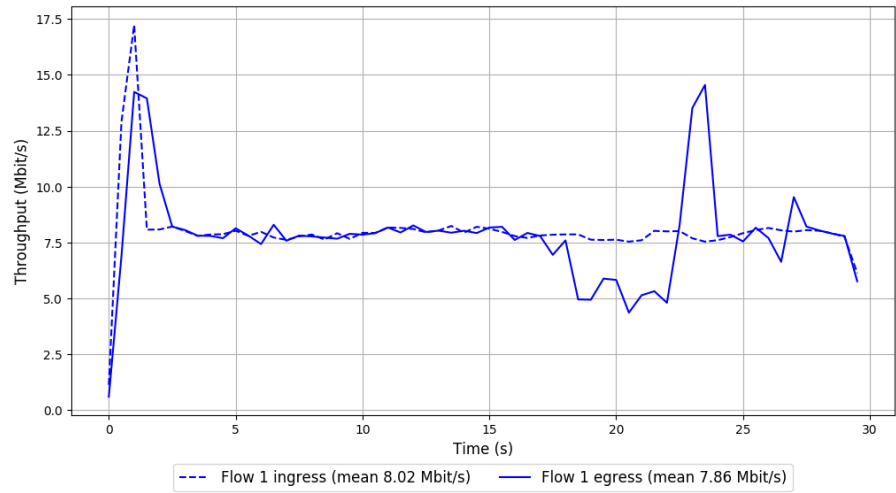# Run 1: Report of PCC — Data Link

```
Run 2: Statistics of PCC

Start at: 2018-02-03 14:32:39
End at: 2018-02-03 14:33:09
Local clock offset: 2.566 ms
Remote clock offset: -31.465 ms


# Below is generated by plot.py at 2018-02-03 15:08:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.29 Mbit/s
95th percentile per-packet one-way delay: 72.128 ms
Loss rate: 0.95%
-- Flow 1:
Average throughput: 4.29 Mbit/s
95th percentile per-packet one-way delay: 72.128 ms
Loss rate: 0.95%
```

Run 2: Report of PCC — Data Link

```
Run 3: Statistics of PCC

Start at: 2018-02-03 14:52:19
End at: 2018-02-03 14:52:49
Local clock offset: 2.606 ms
Remote clock offset: -25.877 ms


# Below is generated by plot.py at 2018-02-03 15:08:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.86 Mbit/s
95th percentile per-packet one-way delay: 859.476 ms
Loss rate: 2.33%
-- Flow 1:
Average throughput: 7.86 Mbit/s
95th percentile per-packet one-way delay: 859.476 ms
Loss rate: 2.33%
```
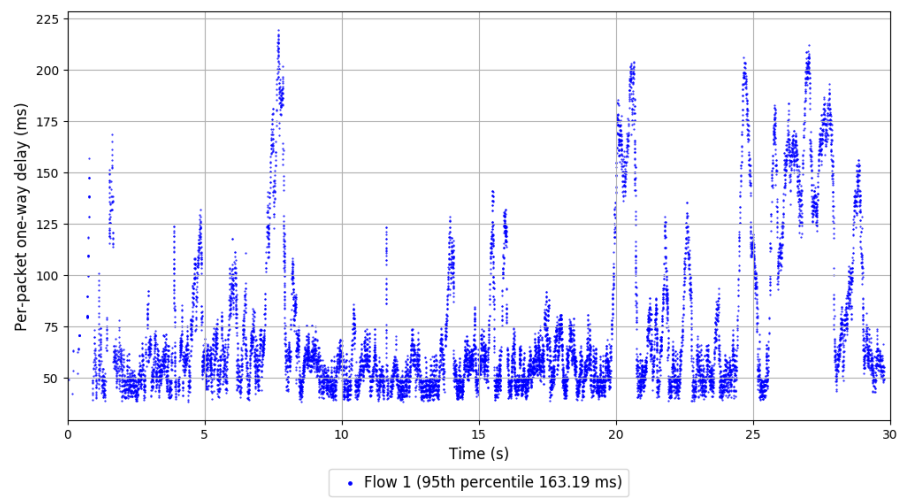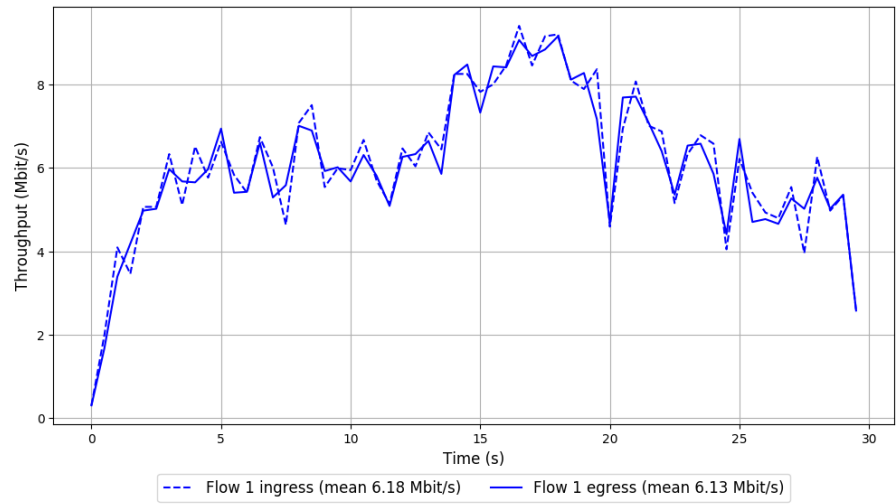
Run 3: Report of PCC — Data Link

Flow 1 ingress (mean 8.02 Mbit/s)   Flow 1 egress (mean 7.86 Mbit/s)
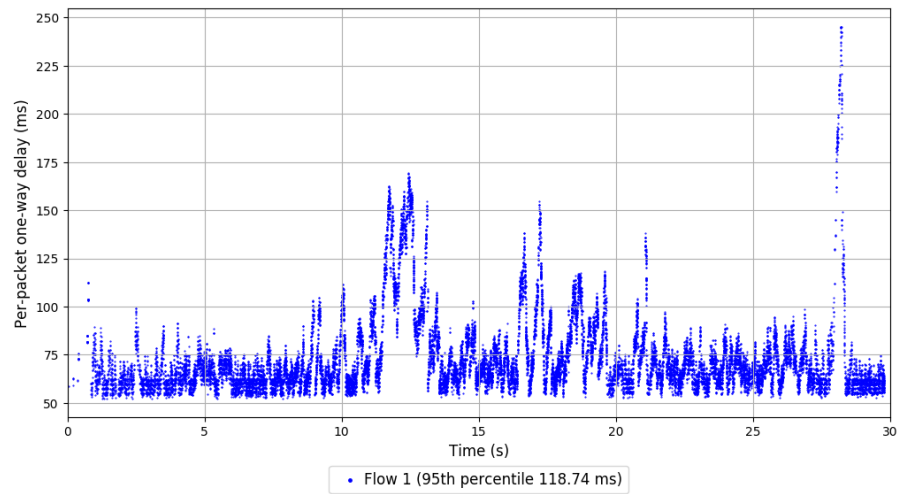

Flow 1 (95th percentile 859.48 ms)

27

```
Run 1: Statistics of QUIC Cubic

Start at: 2018-02-03 14:14:03
End at: 2018-02-03 14:14:33
Local clock offset: -2.816 ms
Remote clock offset: -28.95 ms


# Below is generated by plot.py at 2018-02-03 15:08:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 6.13 Mbit/s
95th percentile per-packet one-way delay: 163.193 ms
Loss rate: 1.04%
-- Flow 1:
Average throughput: 6.13 Mbit/s
95th percentile per-packet one-way delay: 163.193 ms
Loss rate: 1.04%
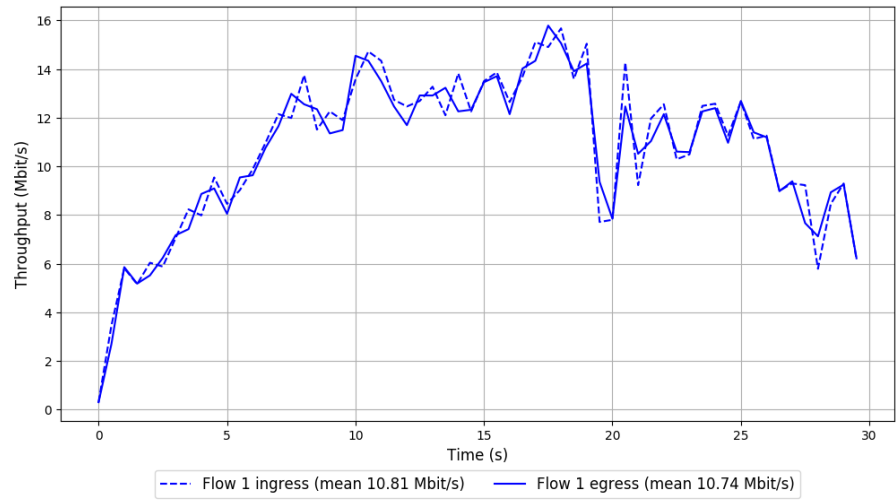```
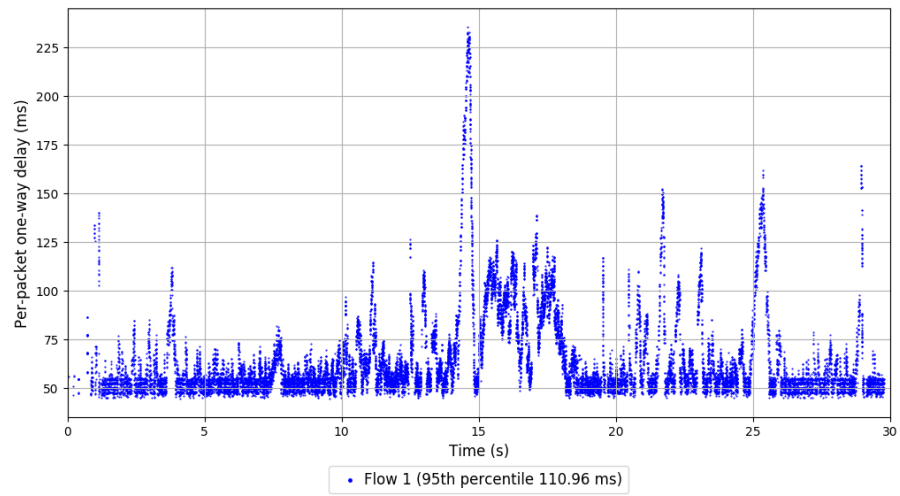
Run 1: Report of QUIC Cubic — Data Link

```
Run 2: Statistics of QUIC Cubic

Start at: 2018-02-03 14:33:44
End at: 2018-02-03 14:34:14
Local clock offset: -8.079 ms
Remote clock offset: -32.871 ms


# Below is generated by plot.py at 2018-02-03 15:08:36
# Datalink statistics
-- Total of 1 flow:
Average throughput: 10.74 Mbit/s
95th percentile per-packet one-way delay: 118.740 ms
Loss rate: 0.88%
-- Flow 1:
Average throughput: 10.74 Mbit/s
95th percentile per-packet one-way delay: 118.740 ms
Loss rate: 0.88%
```

Run 2: Report of QUIC Cubic — Data Link

Flow 1 ingress (mean 10.81 Mbit/s)   Flow 1 egress (mean 10.74 Mbit/s)
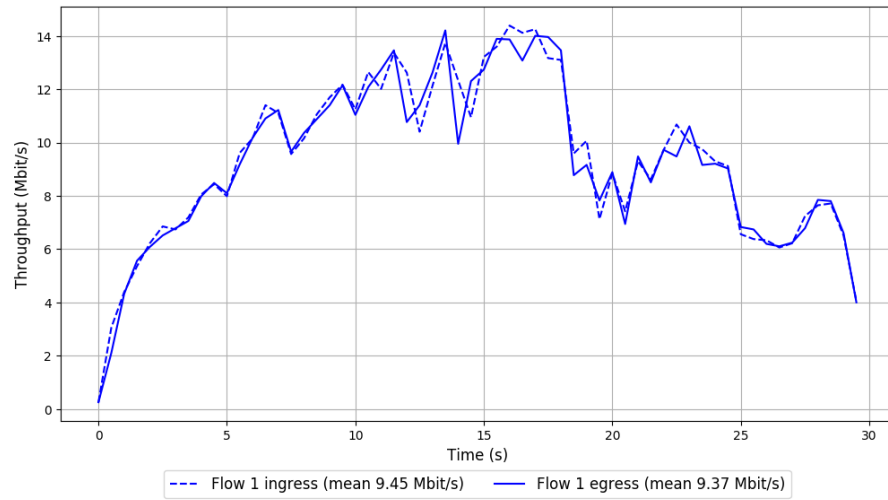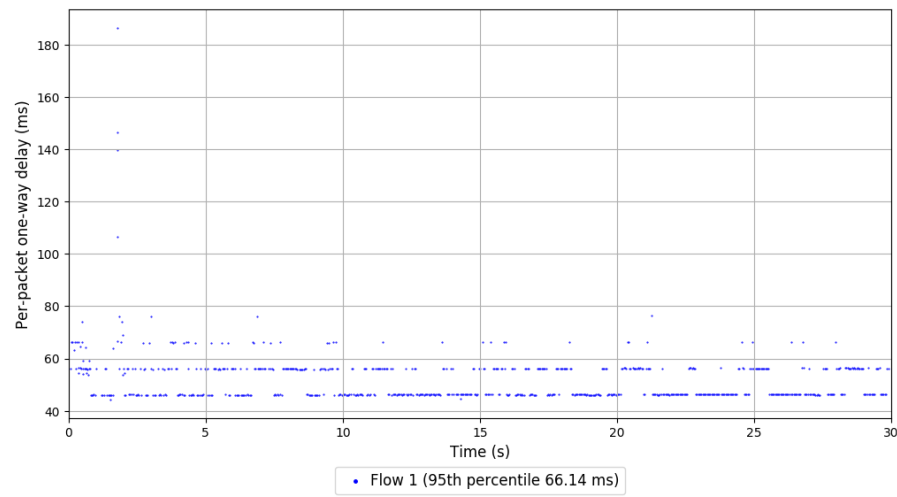

• Flow 1 (95th percentile 118.74 ms)

```
Run 3: Statistics of QUIC Cubic

Start at: 2018-02-03 14:53:24
End at: 2018-02-03 14:53:54
Local clock offset: -0.253 ms
Remote clock offset: -26.991 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 9.37 Mbit/s
95th percentile per-packet one-way delay: 110.964 ms
Loss rate: 1.11%
-- Flow 1:
Average throughput: 9.37 Mbit/s
95th percentile per-packet one-way delay: 110.964 ms
Loss rate: 1.11%
```

Run 3: Report of QUIC Cubic — Data Link

Flow 1 ingress (mean 9.45 Mbit/s) --- Flow 1 egress (mean 9.37 Mbit/s)

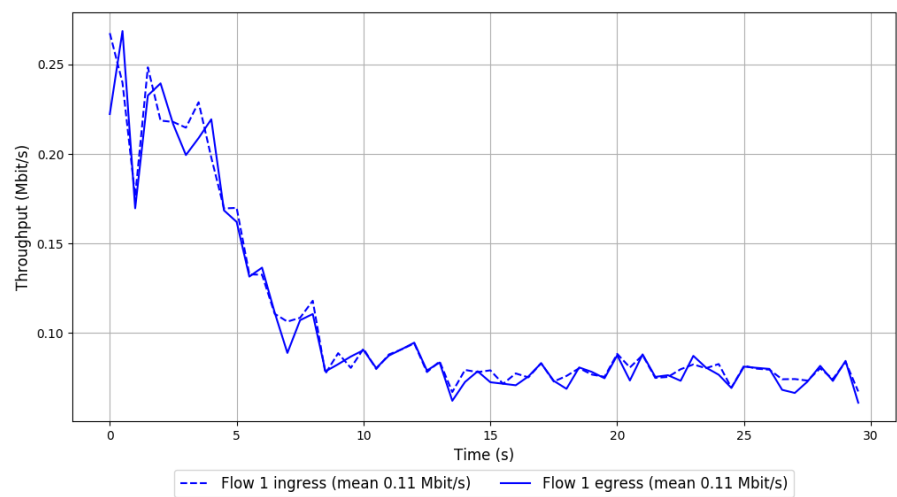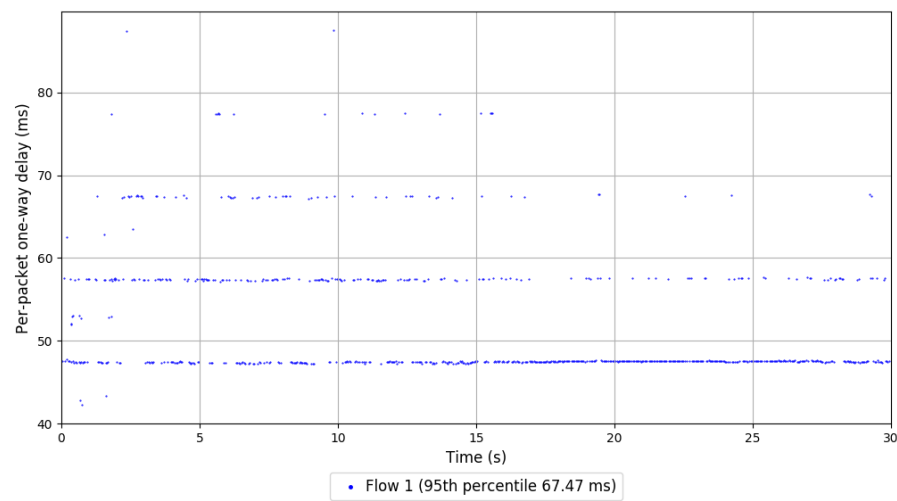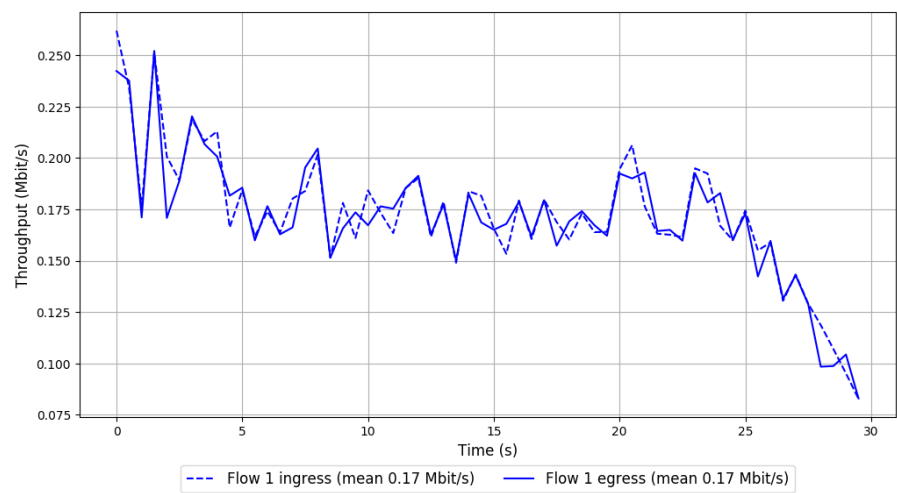

• Flow 1 (95th percentile 110.96 ms)

```
Run 1: Statistics of SCReAM

Start at: 2018-02-03 14:10:45
End at: 2018-02-03 14:11:15
Local clock offset: -2.84 ms
Remote clock offset: -27.744 ms

# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 66.142 ms
Loss rate: 1.95%
-- Flow 1:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 66.142 ms
Loss rate: 1.95%
```
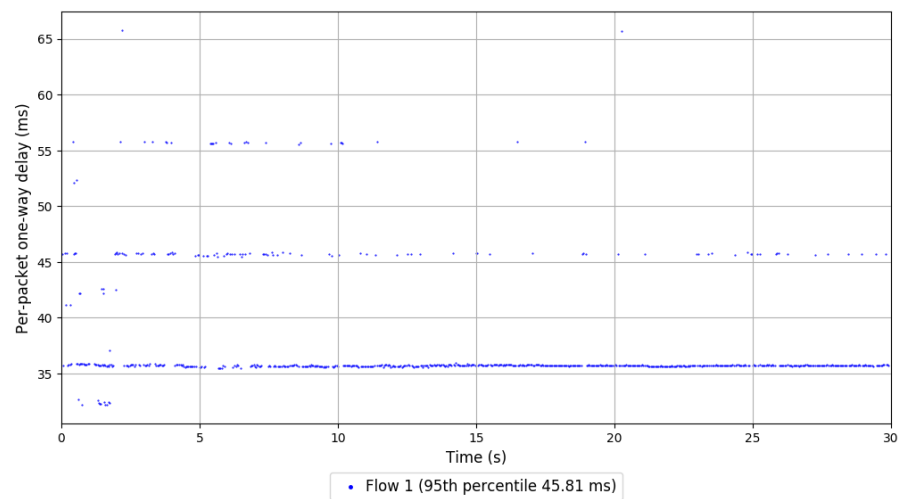
Run 1: Report of SCReAM — Data Link

```
Run 2: Statistics of SCReAM

Start at: 2018-02-03 14:30:28
End at: 2018-02-03 14:30:58
Local clock offset: 2.498 ms
Remote clock offset: -31.846 ms

# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 67.466 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 67.466 ms
Loss rate: 0.75%
```

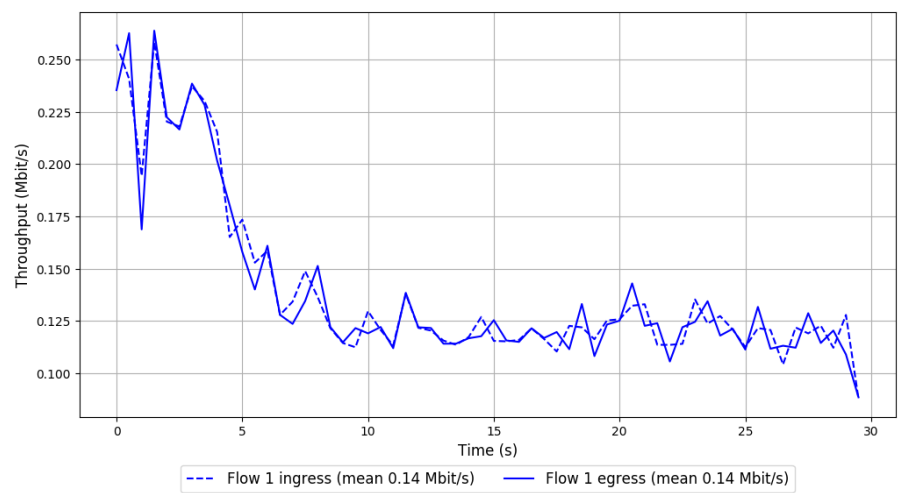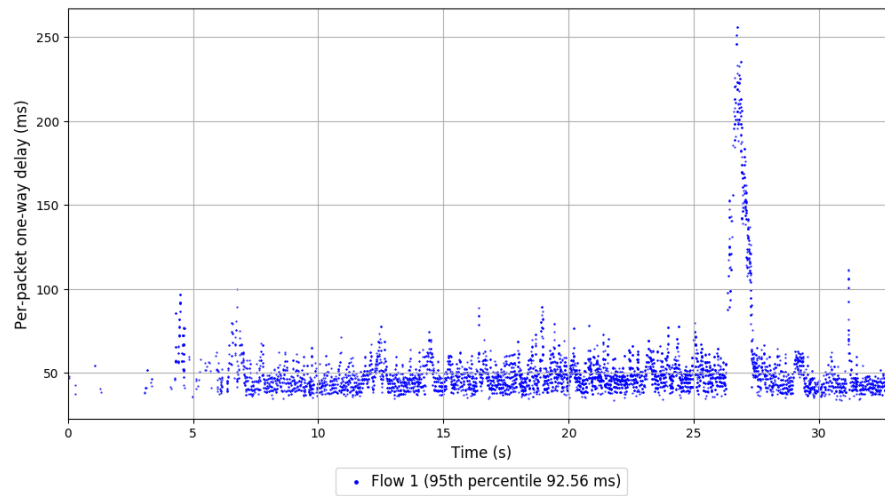Run 2: Report of SCReAM — Data Link

```
Run 3: Statistics of SCReAM

Start at: 2018-02-03 14:50:07
End at: 2018-02-03 14:50:38
Local clock offset: 4.862 ms
Remote clock offset: -25.987 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 45.809 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 45.809 ms
Loss rate: 0.75%
```

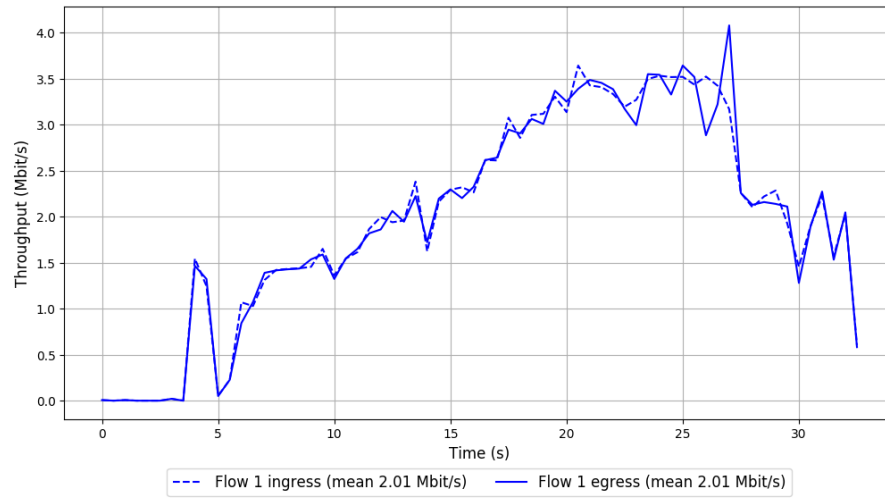Run 3: Report of SCReAM — Data Link

```
Run 1: Statistics of WebRTC media

Start at: 2018-02-03 14:21:42
End at: 2018-02-03 14:22:12
Local clock offset: 2.024 ms
Remote clock offset: -29.931 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.01 Mbit/s
95th percentile per-packet one-way delay: 92.559 ms
Loss rate: 0.53%
-- Flow 1:
Average throughput: 2.01 Mbit/s
95th percentile per-packet one-way delay: 92.559 ms
Loss rate: 0.53%
```

Run 1: Report of WebRTC media — Data Link

Flow 1 ingress (mean 2.01 Mbit/s)   Flow 1 egress (mean 2.01 Mbit/s)

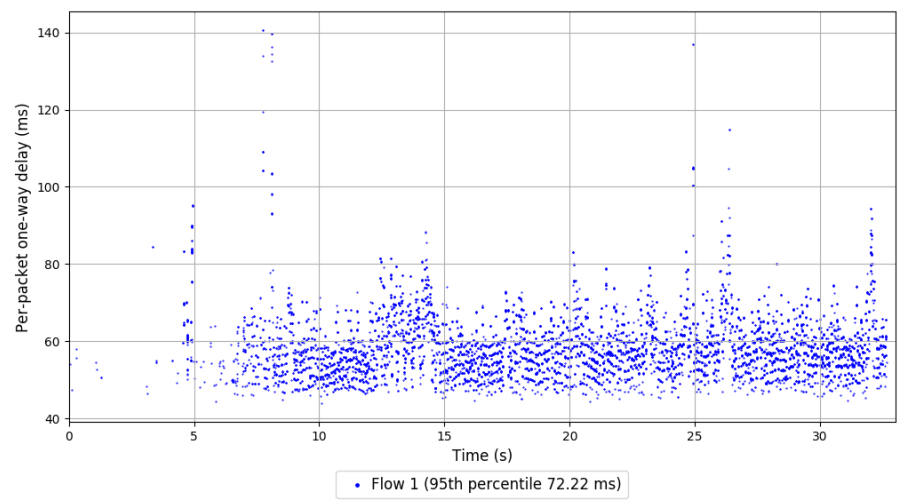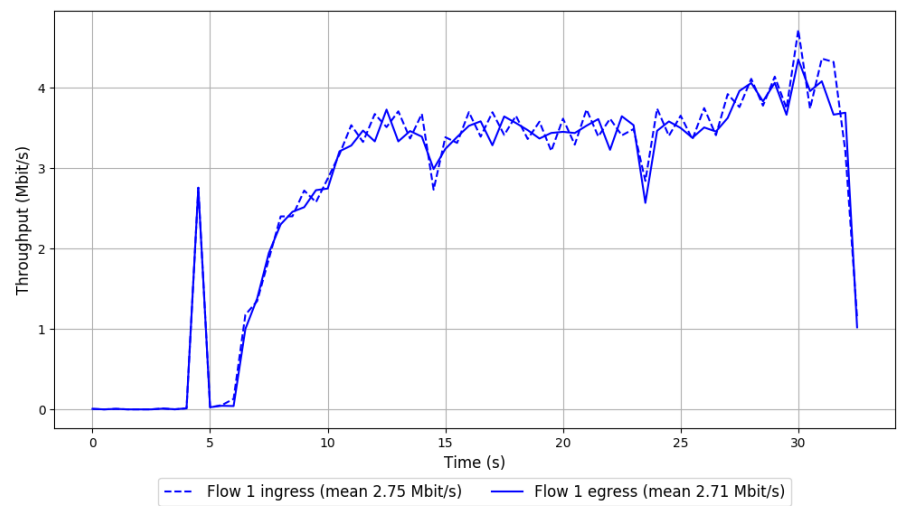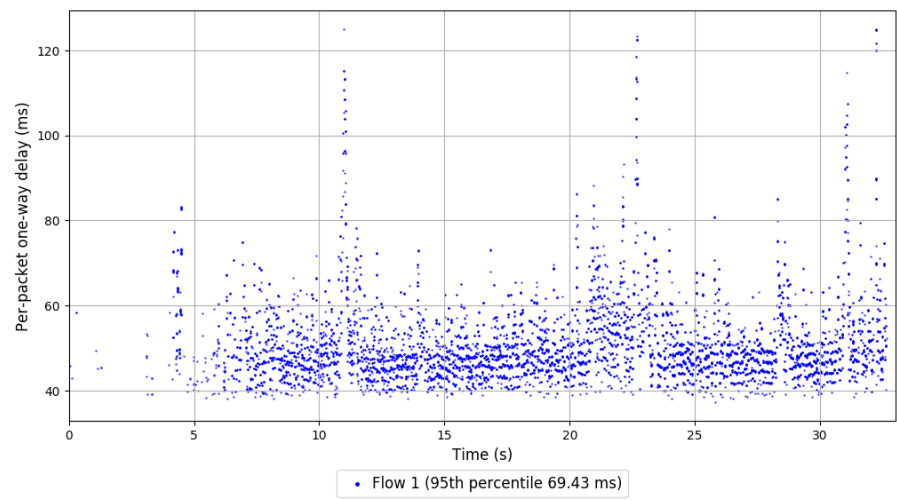

Flow 1 (95th percentile 92.56 ms)

```
Run 2: Statistics of WebRTC media

Start at: 2018-02-03 14:41:22
End at: 2018-02-03 14:41:52
Local clock offset: -0.248 ms
Remote clock offset: -28.182 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.71 Mbit/s
95th percentile per-packet one-way delay: 72.217 ms
Loss rate: 1.60%
-- Flow 1:
Average throughput: 2.71 Mbit/s
95th percentile per-packet one-way delay: 72.217 ms
Loss rate: 1.60%
```

Run 2: Report of WebRTC media — Data Link

Flow 1 ingress (mean 2.75 Mbit/s)   Flow 1 egress (mean 2.71 Mbit/s)
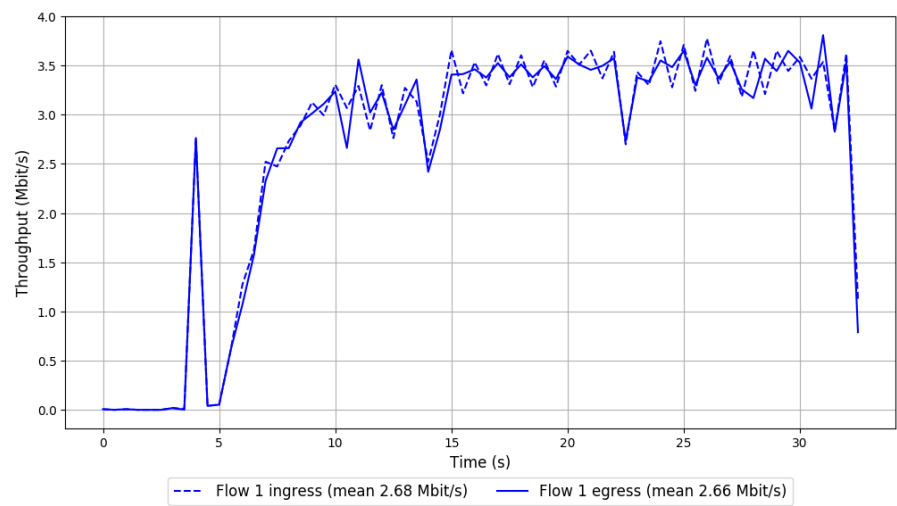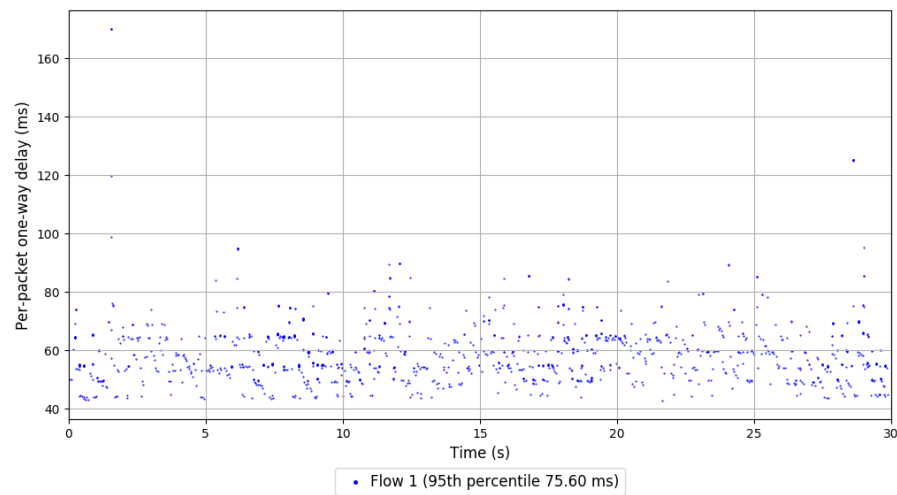

Flow 1 (95th percentile 72.22 ms)

```
Run 3: Statistics of WebRTC media

Start at: 2018-02-03 15:01:01
End at: 2018-02-03 15:01:31
Local clock offset: -2.442 ms
Remote clock offset: -24.088 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.66 Mbit/s
95th percentile per-packet one-way delay: 69.434 ms
Loss rate: 0.85%
-- Flow 1:
Average throughput: 2.66 Mbit/s
95th percentile per-packet one-way delay: 69.434 ms
Loss rate: 0.85%
```
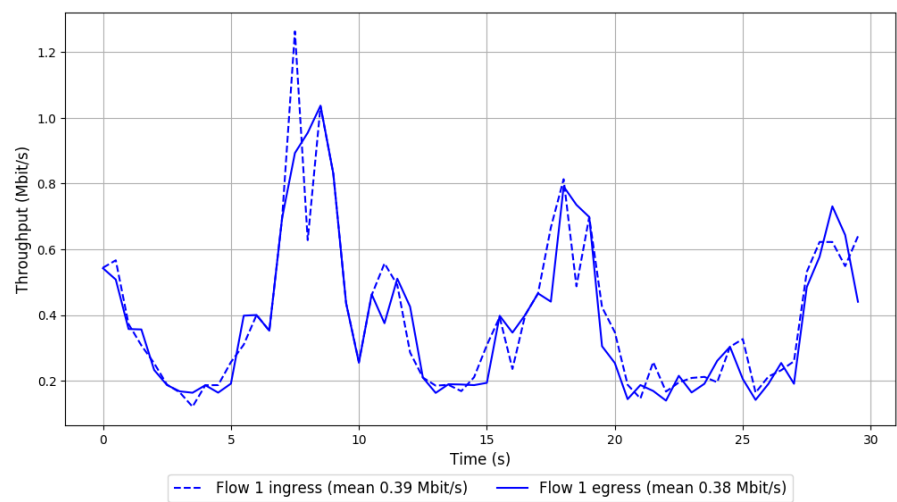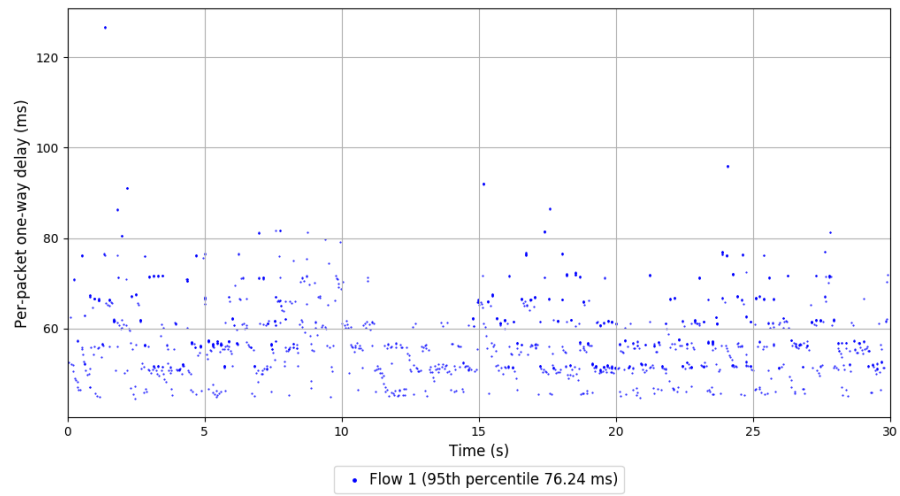
Run 3: Report of WebRTC media — Data Link

```
Run 1: Statistics of Sprout

Start at: 2018-02-03 14:15:09
End at: 2018-02-03 14:15:39
Local clock offset: 2.525 ms
Remote clock offset: -28.617 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 75.601 ms
Loss rate: 3.00%
-- Flow 1:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 75.601 ms
Loss rate: 3.00%
```
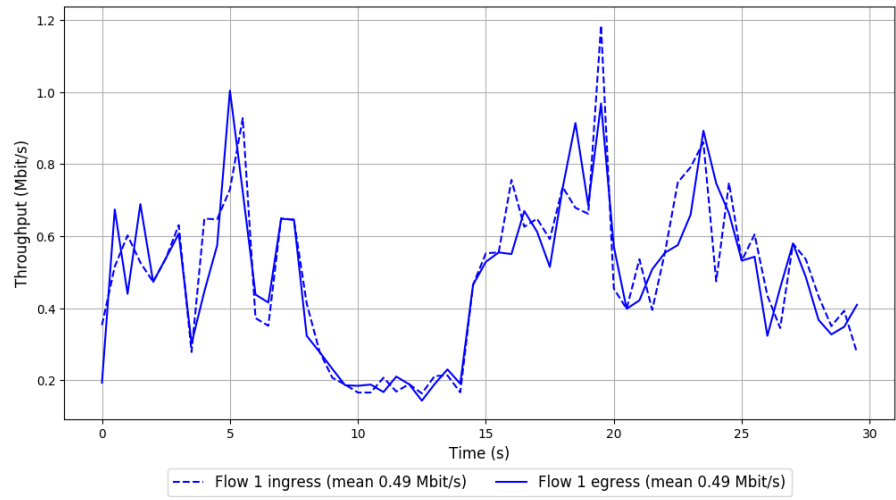
Run 1: Report of Sprout — Data Link

```
Run 2: Statistics of Sprout

Start at: 2018-02-03 14:34:49
End at: 2018-02-03 14:35:19
Local clock offset: -0.244 ms
Remote clock offset: -32.784 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 76.237 ms
Loss rate: 1.51%
-- Flow 1:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 76.237 ms
Loss rate: 1.51%
```

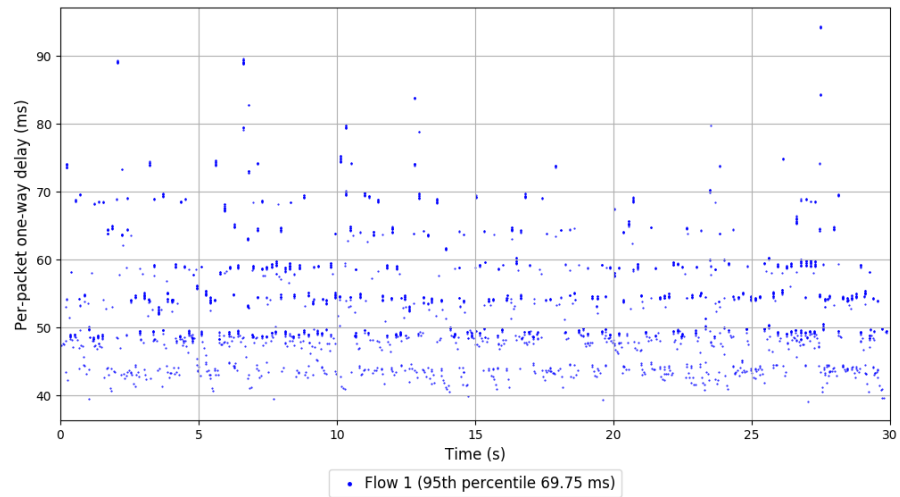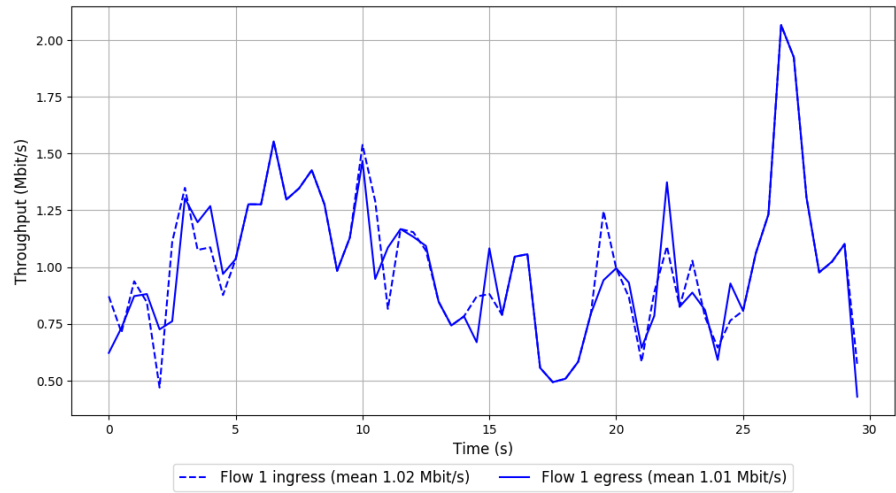Run 2: Report of Sprout — Data Link

```
Run 3: Statistics of Sprout

Start at: 2018-02-03 14:54:30
End at: 2018-02-03 14:55:00
Local clock offset: 4.028 ms
Remote clock offset: -26.171 ms


# Below is generated by plot.py at 2018-02-03 15:08:37
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.01 Mbit/s
95th percentile per-packet one-way delay: 69.748 ms
Loss rate: 0.47%
-- Flow 1:
Average throughput: 1.01 Mbit/s
95th percentile per-packet one-way delay: 69.748 ms
Loss rate: 0.47%
```

Run 3: Report of Sprout — Data Link

Flow 1 ingress (mean 1.02 Mbit/s)   Flow 1 egress (mean 1.01 Mbit/s)
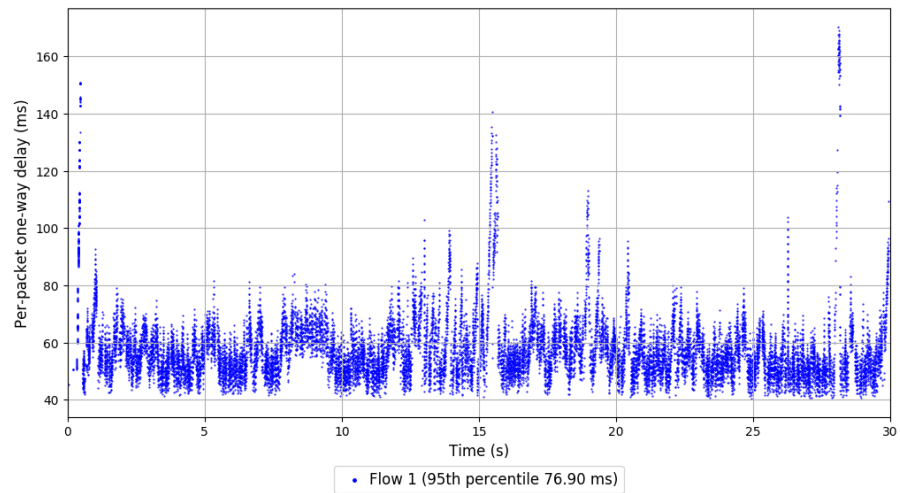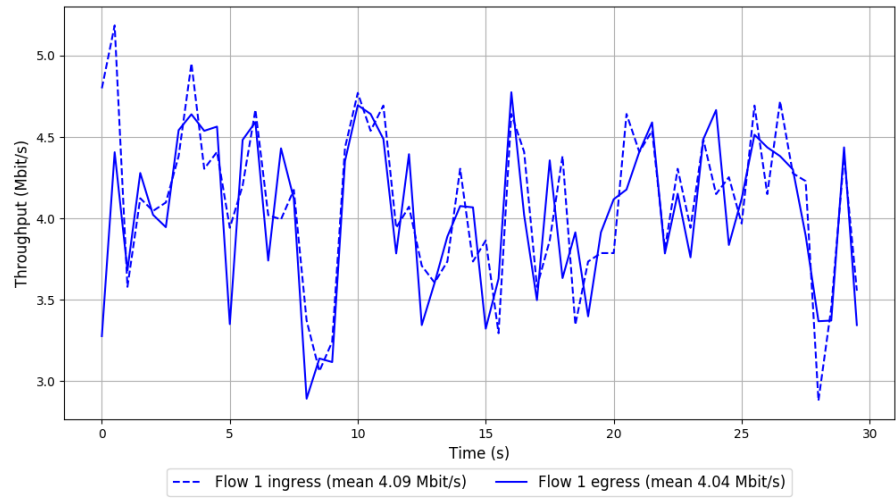

Flow 1 (95th percentile 69.75 ms)

```
Run 1: Statistics of TaoVA-100x

Start at: 2018-02-03 14:11:50
End at: 2018-02-03 14:12:20
Local clock offset: 2.055 ms
Remote clock offset: -30.457 ms


# Below is generated by plot.py at 2018-02-03 15:08:41
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.04 Mbit/s
95th percentile per-packet one-way delay: 76.897 ms
Loss rate: 1.60%
-- Flow 1:
Average throughput: 4.04 Mbit/s
95th percentile per-packet one-way delay: 76.897 ms
Loss rate: 1.60%
```

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

```
Run 2: Statistics of TaoVA-100x

Start at: 2018-02-03 14:31:33
End at: 2018-02-03 14:32:03
Local clock offset: -2.355 ms
Remote clock offset: -30.2 ms


# Below is generated by plot.py at 2018-02-03 15:08:42
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.90 Mbit/s
95th percentile per-packet one-way delay: 109.424 ms
Loss rate: 2.43%
-- Flow 1:
Average throughput: 3.90 Mbit/s
95th percentile per-packet one-way delay: 109.424 ms
Loss rate: 2.43%
```
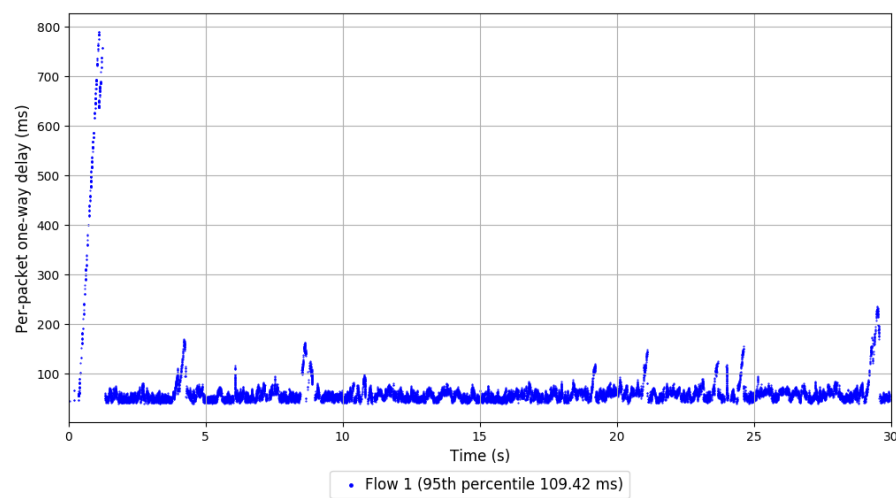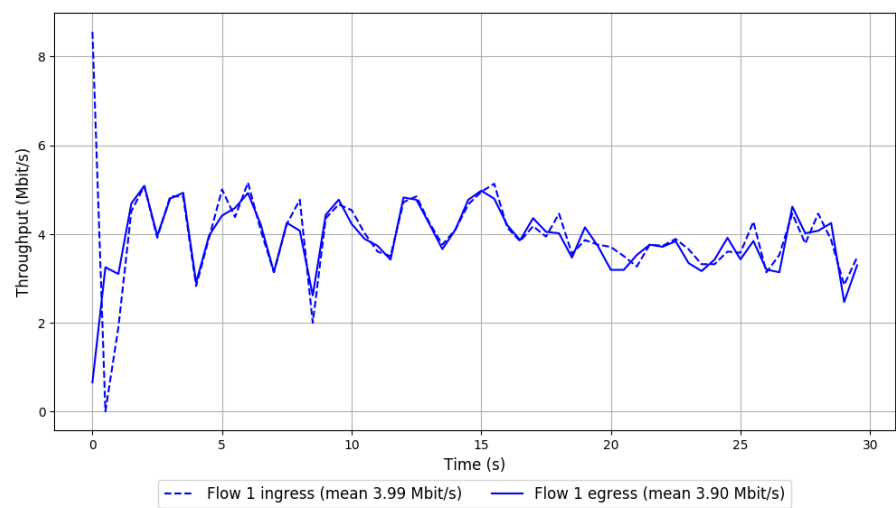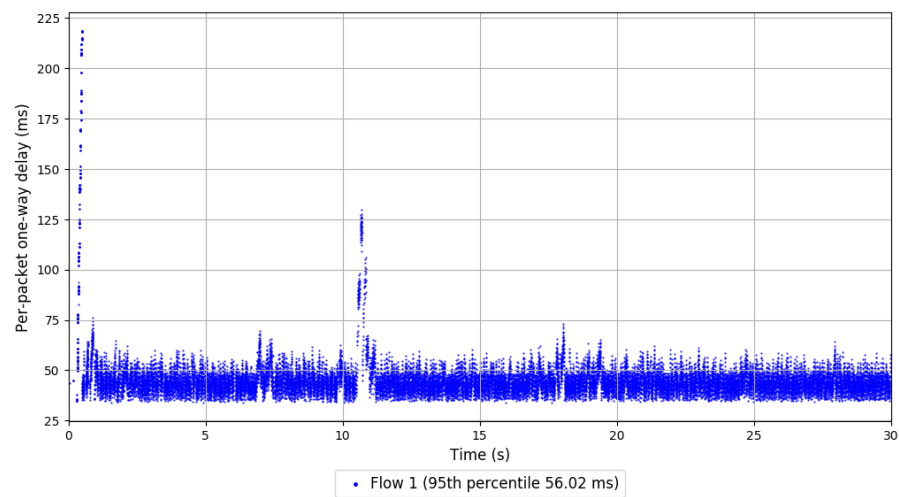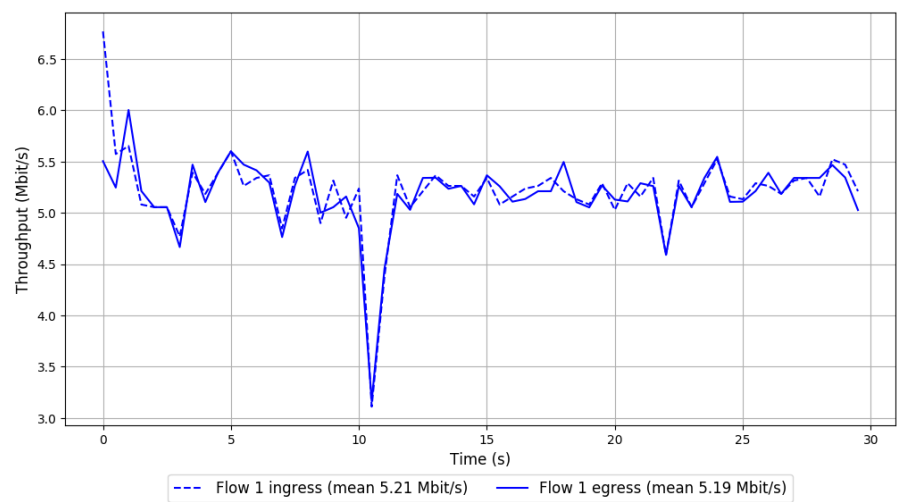
Run 2: Report of TaoVA-100x — Data Link

```
Run 3: Statistics of TaoVA-100x

Start at: 2018-02-03 14:51:12
End at: 2018-02-03 14:51:42
Local clock offset: 2.911 ms
Remote clock offset: -24.808 ms


# Below is generated by plot.py at 2018-02-03 15:08:46
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.19 Mbit/s
95th percentile per-packet one-way delay: 56.022 ms
Loss rate: 0.48%
-- Flow 1:
Average throughput: 5.19 Mbit/s
95th percentile per-packet one-way delay: 56.022 ms
Loss rate: 0.48%
```

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

Flow 1 ingress (mean 5.21 Mbit/s) — — — — Flow 1 egress (mean 5.19 Mbit/s)
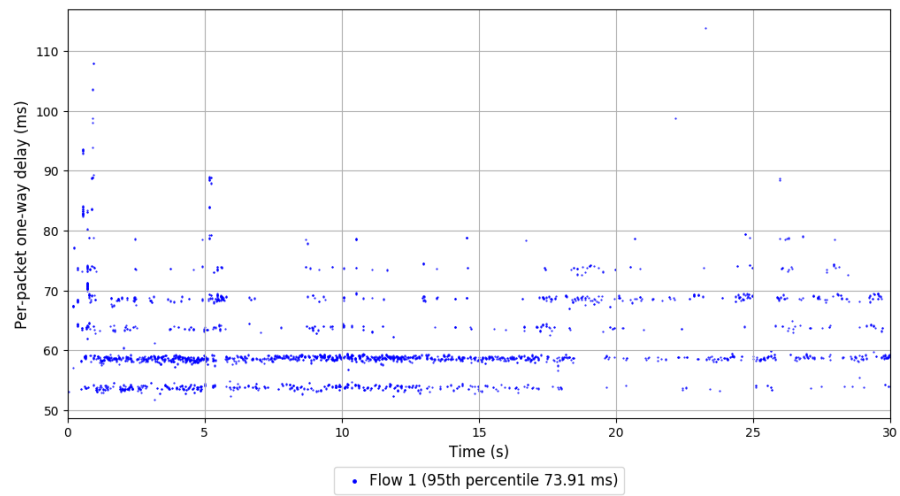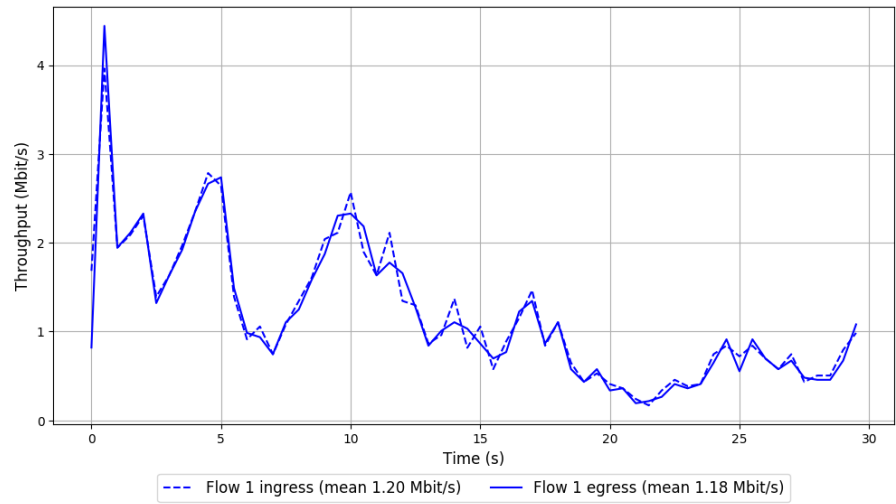

Flow 1 (95th percentile 56.02 ms)

```
Run 1: Statistics of TCP Vegas

Start at: 2018-02-03 14:19:32
End at: 2018-02-03 14:20:02
Local clock offset: -0.294 ms
Remote clock offset: -29.315 ms


# Below is generated by plot.py at 2018-02-03 15:08:46
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.18 Mbit/s
95th percentile per-packet one-way delay: 73.914 ms
Loss rate: 1.74%
-- Flow 1:
Average throughput: 1.18 Mbit/s
95th percentile per-packet one-way delay: 73.914 ms
Loss rate: 1.74%
```

Run 1: Report of TCP Vegas — Data Link

Flow 1 ingress (mean 1.20 Mbit/s) —— Flow 1 egress (mean 1.18 Mbit/s)

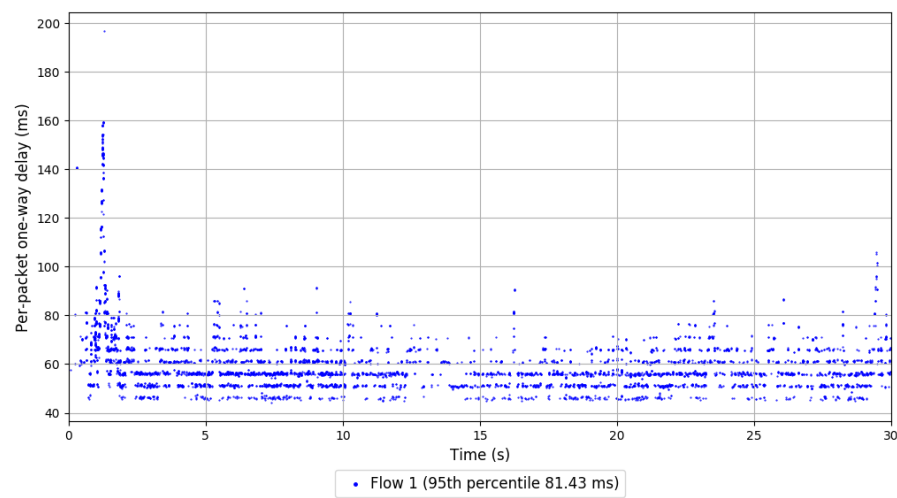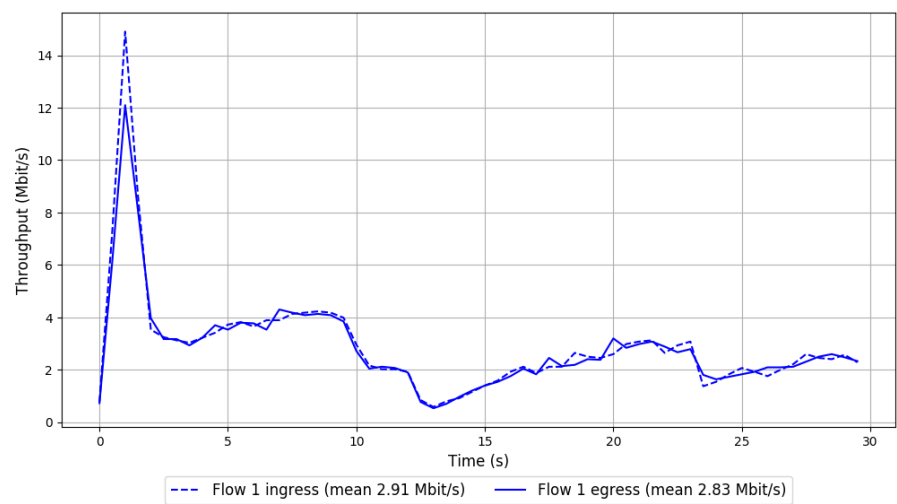• Flow 1 (95th percentile 73.91 ms)

```
Run 2: Statistics of TCP Vegas

Start at: 2018-02-03 14:39:11
End at: 2018-02-03 14:39:41
Local clock offset: 3.815 ms
Remote clock offset: -29.421 ms


# Below is generated by plot.py at 2018-02-03 15:08:46
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.83 Mbit/s
95th percentile per-packet one-way delay: 81.434 ms
Loss rate: 2.83%
-- Flow 1:
Average throughput: 2.83 Mbit/s
95th percentile per-packet one-way delay: 81.434 ms
Loss rate: 2.83%
```
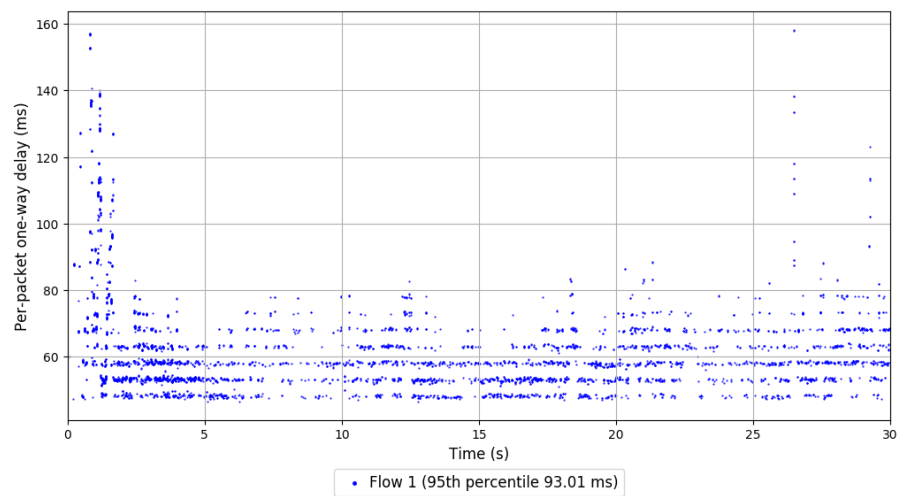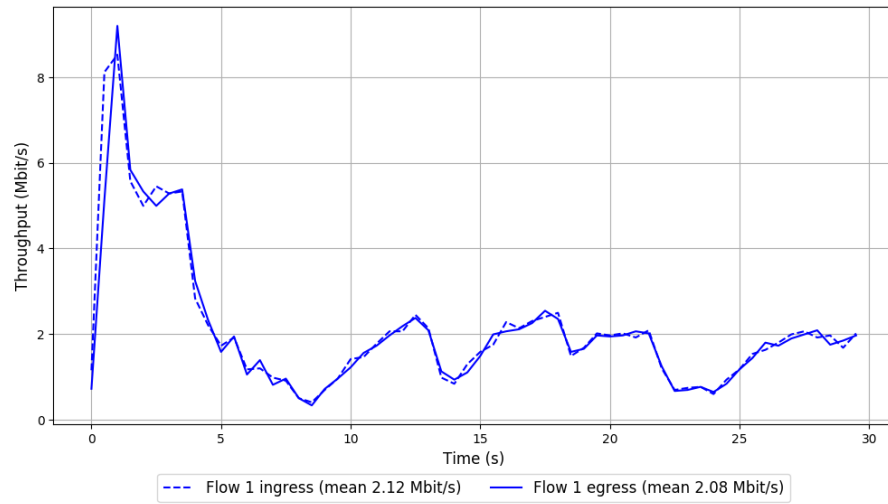
Run 2: Report of TCP Vegas — Data Link

```
Run 3: Statistics of TCP Vegas

Start at: 2018-02-03 14:58:51
End at: 2018-02-03 14:59:21
Local clock offset: 2.459 ms
Remote clock offset: -24.017 ms


# Below is generated by plot.py at 2018-02-03 15:08:46
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.08 Mbit/s
95th percentile per-packet one-way delay: 93.013 ms
Loss rate: 2.13%
-- Flow 1:
Average throughput: 2.08 Mbit/s
95th percentile per-packet one-way delay: 93.013 ms
Loss rate: 2.13%
```
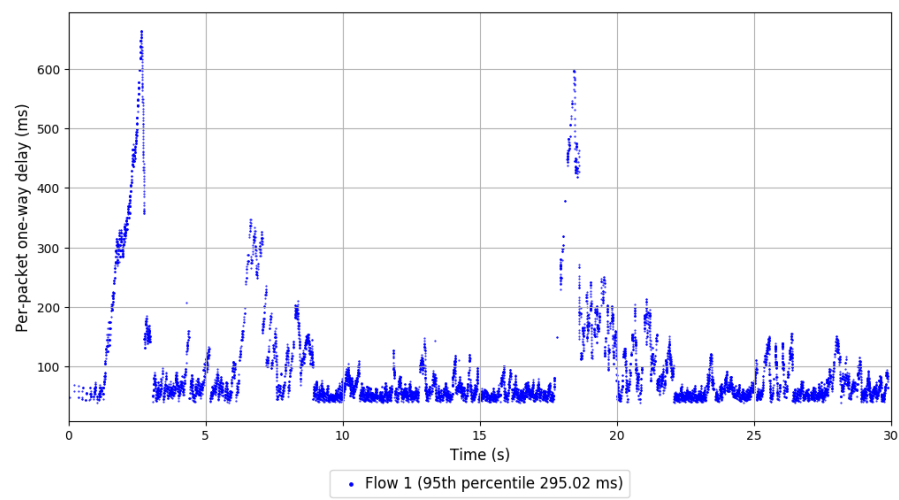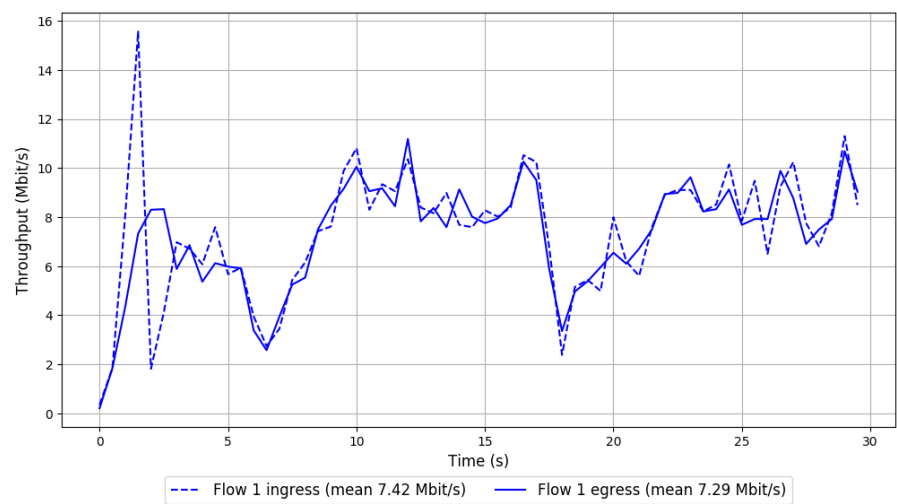
Run 3: Report of TCP Vegas — Data Link

```
Run 1: Statistics of Verus

Start at: 2018-02-03 14:22:47
End at: 2018-02-03 14:23:17
Local clock offset: -2.755 ms
Remote clock offset: -32.122 ms


# Below is generated by plot.py at 2018-02-03 15:08:46
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.29 Mbit/s
95th percentile per-packet one-way delay: 295.017 ms
Loss rate: 1.92%
-- Flow 1:
Average throughput: 7.29 Mbit/s
95th percentile per-packet one-way delay: 295.017 ms
Loss rate: 1.92%
```

Run 1: Report of Verus — Data Link

Flow 1 ingress (mean 7.42 Mbit/s)   Flow 1 egress (mean 7.29 Mbit/s)

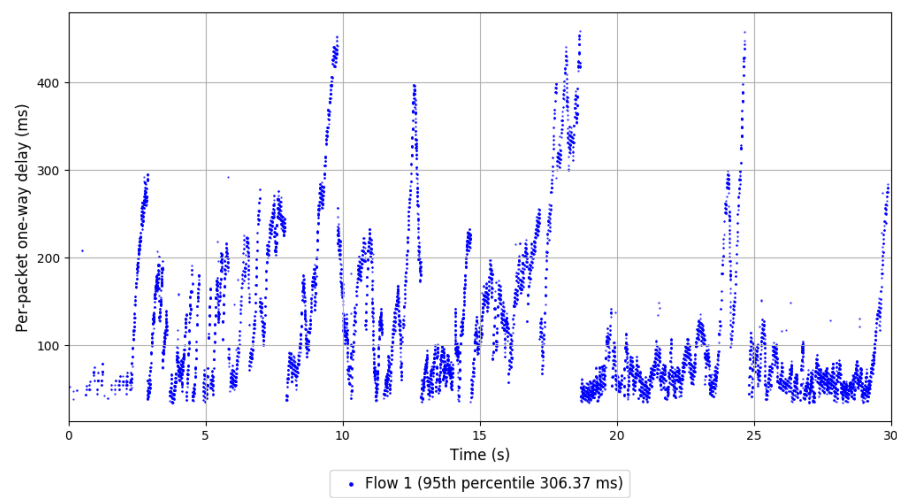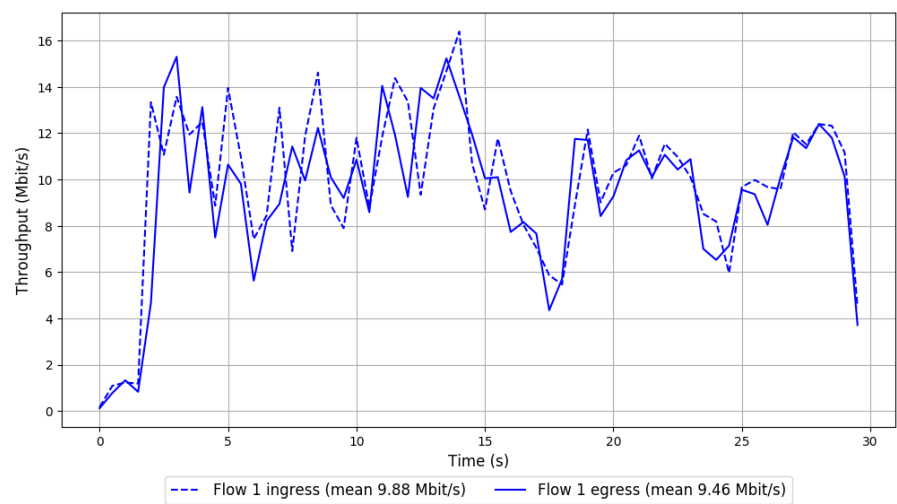Flow 1 (95th percentile 295.02 ms)

```
Run 2: Statistics of Verus

Start at: 2018-02-03 14:42:27
End at: 2018-02-03 14:42:57
Local clock offset: 4.706 ms
Remote clock offset: -28.303 ms


# Below is generated by plot.py at 2018-02-03 15:08:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 9.46 Mbit/s
95th percentile per-packet one-way delay: 306.373 ms
Loss rate: 4.45%
-- Flow 1:
Average throughput: 9.46 Mbit/s
95th percentile per-packet one-way delay: 306.373 ms
Loss rate: 4.45%
```

Run 2: Report of Verus — Data Link

Flow 1 ingress (mean 9.88 Mbit/s) --- Flow 1 egress (mean 9.46 Mbit/s)

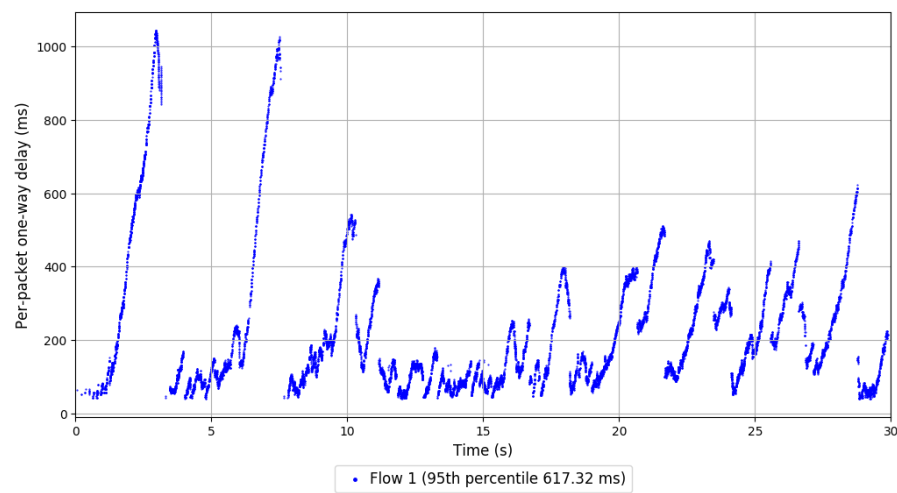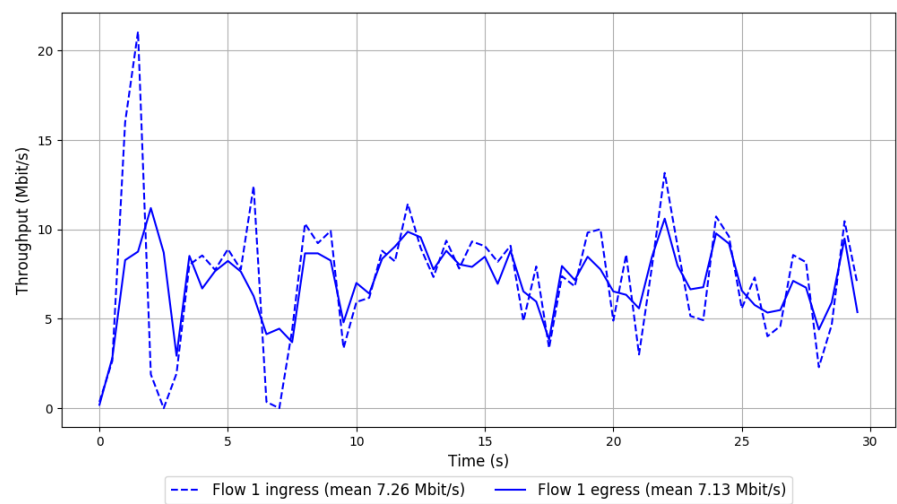• Flow 1 (95th percentile 306.37 ms)

```
Run 3: Statistics of Verus

Start at: 2018-02-03 15:02:07
End at: 2018-02-03 15:02:37
Local clock offset: -0.821 ms
Remote clock offset: -23.887 ms


# Below is generated by plot.py at 2018-02-03 15:08:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.13 Mbit/s
95th percentile per-packet one-way delay: 617.316 ms
Loss rate: 2.07%
-- Flow 1:
Average throughput: 7.13 Mbit/s
95th percentile per-packet one-way delay: 617.316 ms
Loss rate: 2.07%
```

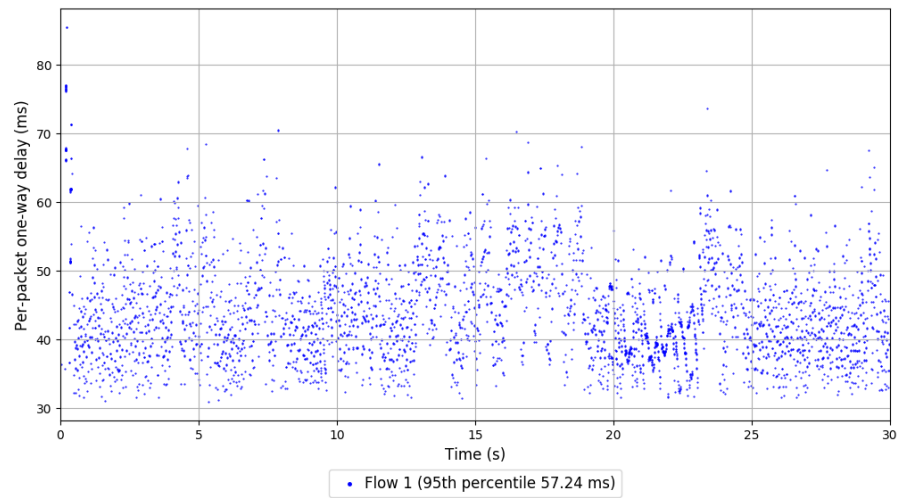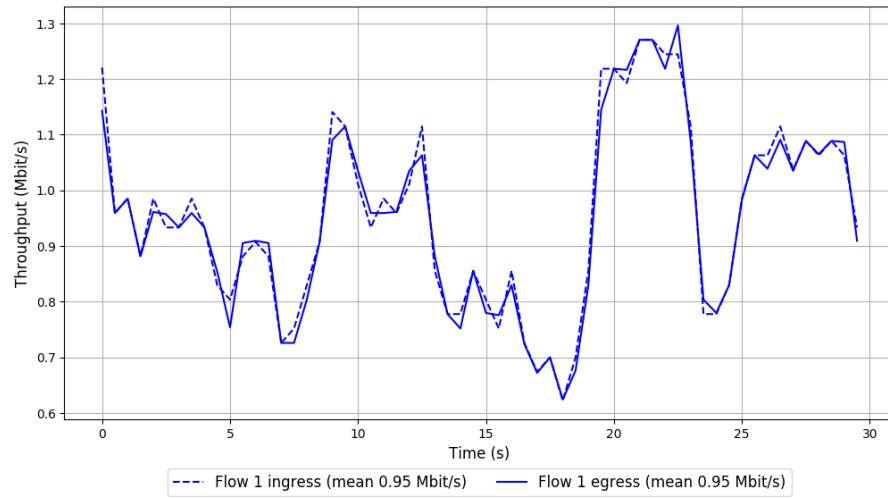Run 3: Report of Verus — Data Link

```
Run 1: Statistics of Copa

Start at: 2018-02-03 14:09:40
End at: 2018-02-03 14:10:10
Local clock offset: 3.183 ms
Remote clock offset: -28.802 ms


# Below is generated by plot.py at 2018-02-03 15:08:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.95 Mbit/s
95th percentile per-packet one-way delay: 57.242 ms
Loss rate: 0.59%
-- Flow 1:
Average throughput: 0.95 Mbit/s
95th percentile per-packet one-way delay: 57.242 ms
Loss rate: 0.59%
```

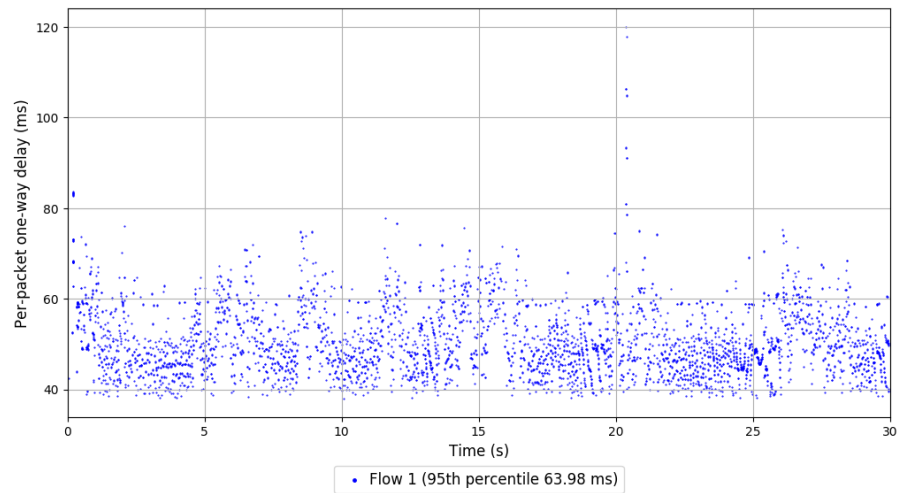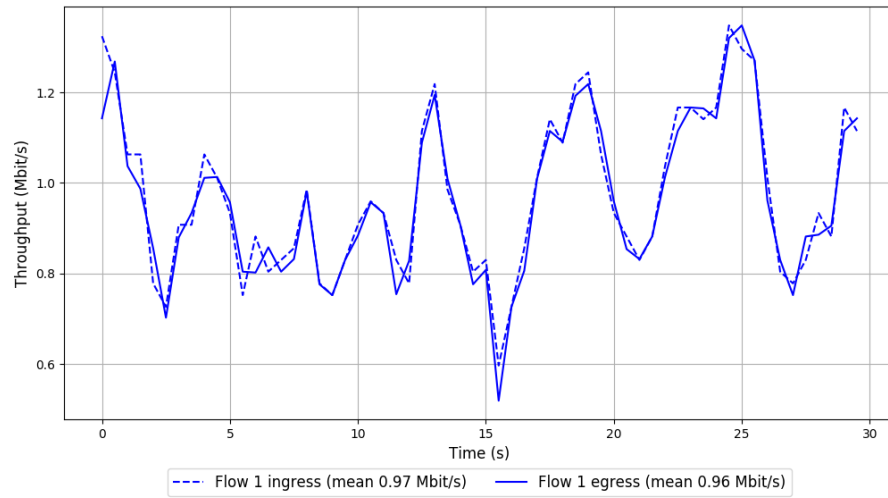Run 1: Report of Copa — Data Link

```
Run 2: Statistics of Copa

Start at: 2018-02-03 14:29:23
End at: 2018-02-03 14:29:53
Local clock offset: -2.16 ms
Remote clock offset: -30.784 ms


# Below is generated by plot.py at 2018-02-03 15:08:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.96 Mbit/s
95th percentile per-packet one-way delay: 63.976 ms
Loss rate: 1.10%
-- Flow 1:
Average throughput: 0.96 Mbit/s
95th percentile per-packet one-way delay: 63.976 ms
Loss rate: 1.10%
```

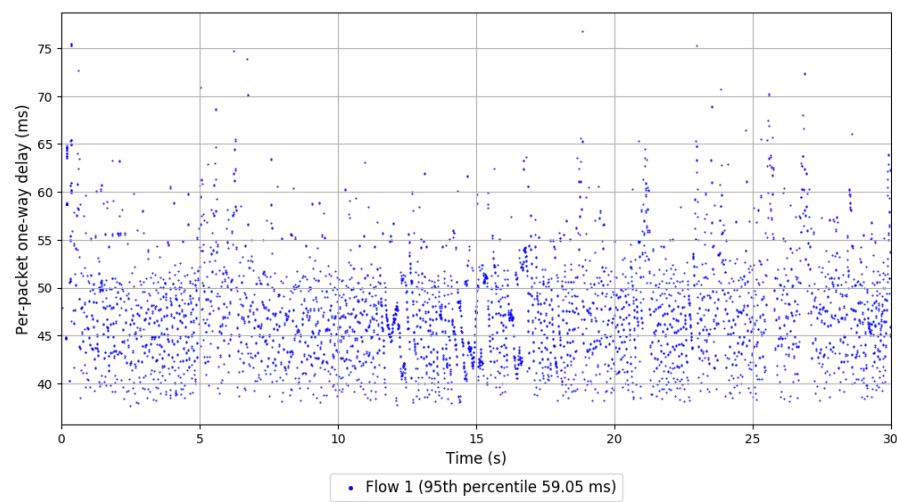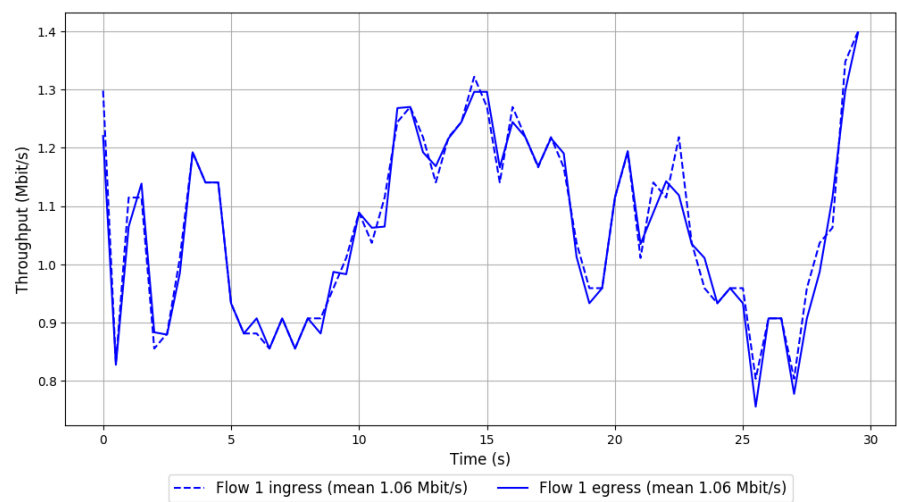Run 2: Report of Copa — Data Link

```
Run 3: Statistics of Copa

Start at: 2018-02-03 14:49:02
End at: 2018-02-03 14:49:32
Local clock offset: -2.429 ms
Remote clock offset: -26.042 ms


# Below is generated by plot.py at 2018-02-03 15:08:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.06 Mbit/s
95th percentile per-packet one-way delay: 59.049 ms
Loss rate: 0.60%
-- Flow 1:
Average throughput: 1.06 Mbit/s
95th percentile per-packet one-way delay: 59.049 ms
Loss rate: 0.60%
```

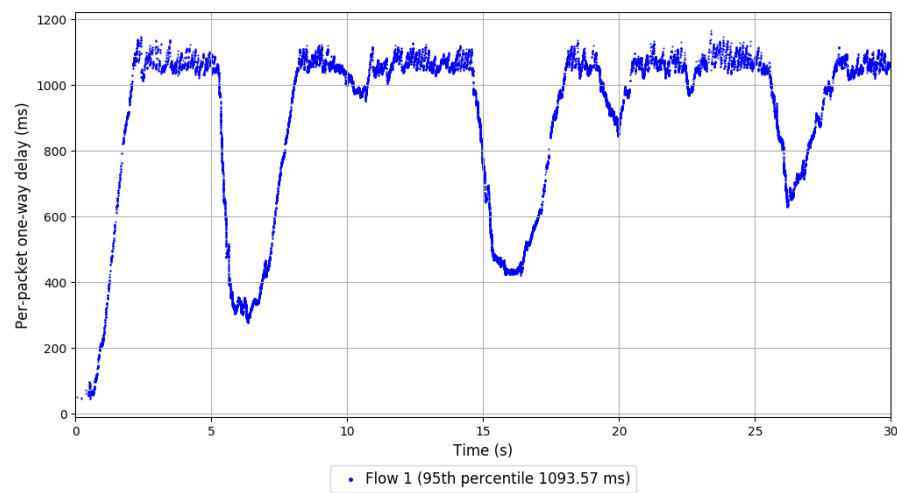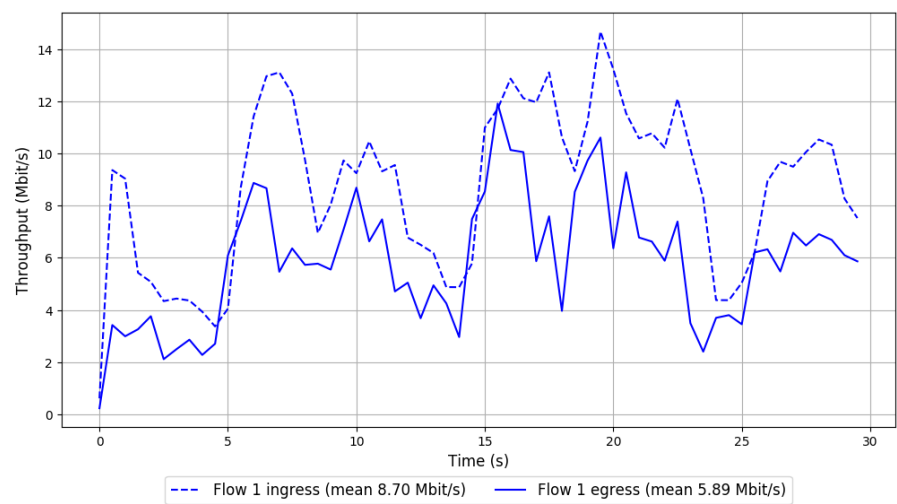Run 3: Report of Copa — Data Link

```
Run 1: Statistics of FillP

Start at: 2018-02-03 14:08:34
End at: 2018-02-03 14:09:04
Local clock offset: 2.222 ms
Remote clock offset: -28.88 ms


# Below is generated by plot.py at 2018-02-03 15:08:59
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.89 Mbit/s
95th percentile per-packet one-way delay: 1093.567 ms
Loss rate: 32.38%
-- Flow 1:
Average throughput: 5.89 Mbit/s
95th percentile per-packet one-way delay: 1093.567 ms
Loss rate: 32.38%
```
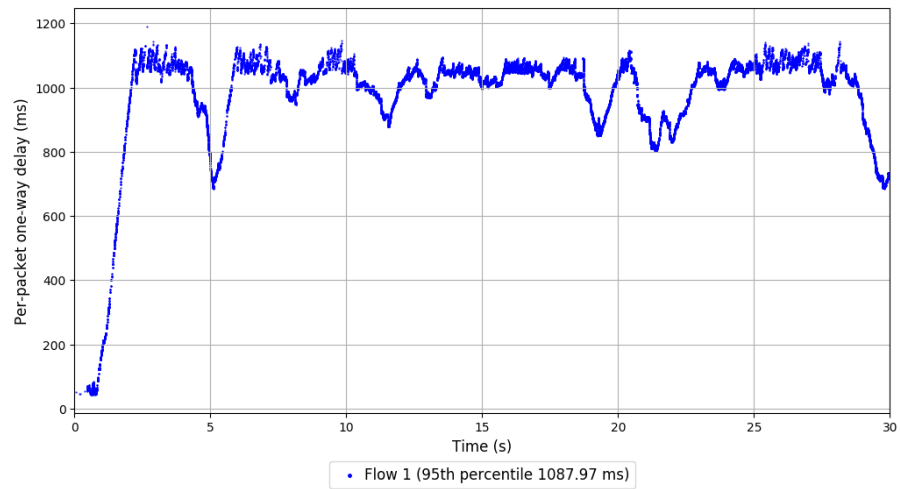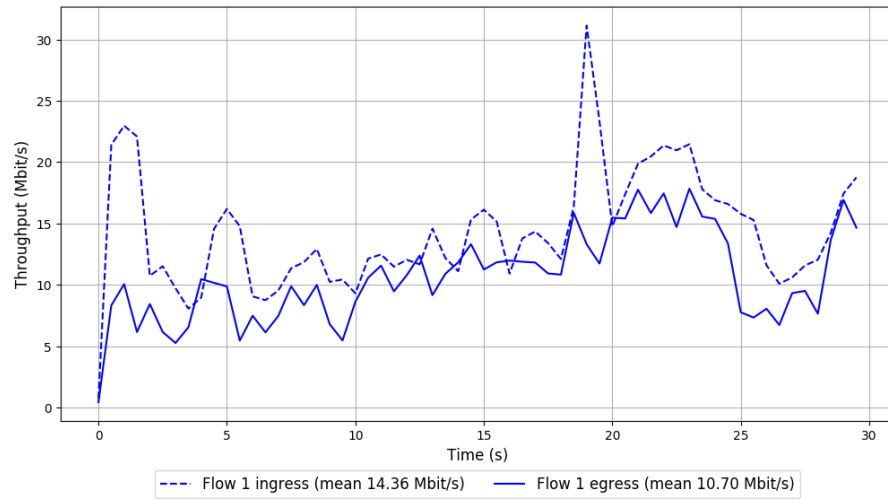
Run 1: Report of FillP — Data Link

```
Run 2: Statistics of FillP

Start at: 2018-02-03 14:28:17
End at: 2018-02-03 14:28:47
Local clock offset: 3.835 ms
Remote clock offset: -29.848 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 10.70 Mbit/s
95th percentile per-packet one-way delay: 1087.968 ms
Loss rate: 25.65%
-- Flow 1:
Average throughput: 10.70 Mbit/s
95th percentile per-packet one-way delay: 1087.968 ms
Loss rate: 25.65%
```
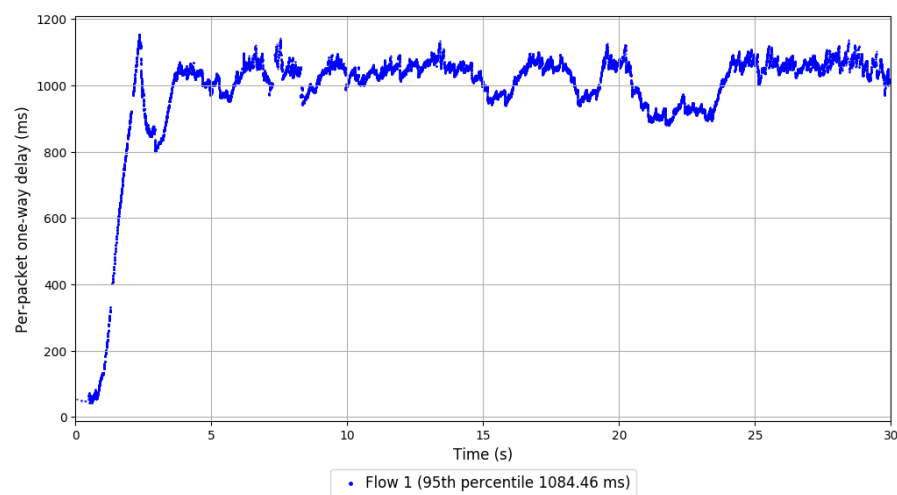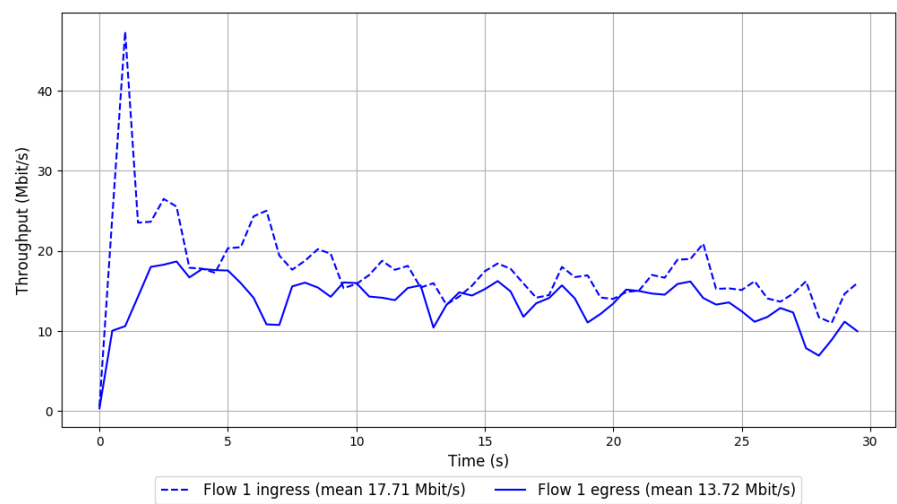
Run 2: Report of FillP — Data Link

```
Run 3: Statistics of FillP

Start at: 2018-02-03 14:47:56
End at: 2018-02-03 14:48:26
Local clock offset: 2.951 ms
Remote clock offset: -25.296 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.72 Mbit/s
95th percentile per-packet one-way delay: 1084.458 ms
Loss rate: 22.68%
-- Flow 1:
Average throughput: 13.72 Mbit/s
95th percentile per-packet one-way delay: 1084.458 ms
Loss rate: 22.68%
```

Run 3: Report of FillP — Data Link

Flow 1 ingress (mean 17.71 Mbit/s) --- Flow 1 egress (mean 13.72 Mbit/s)

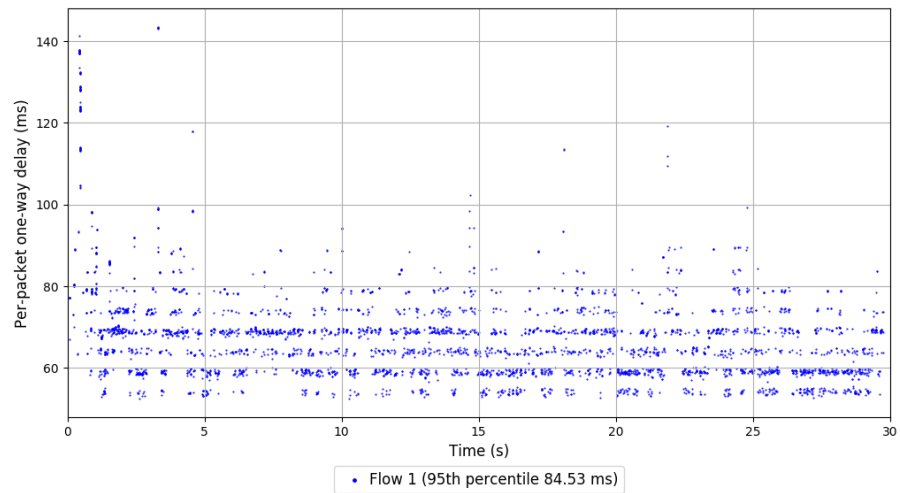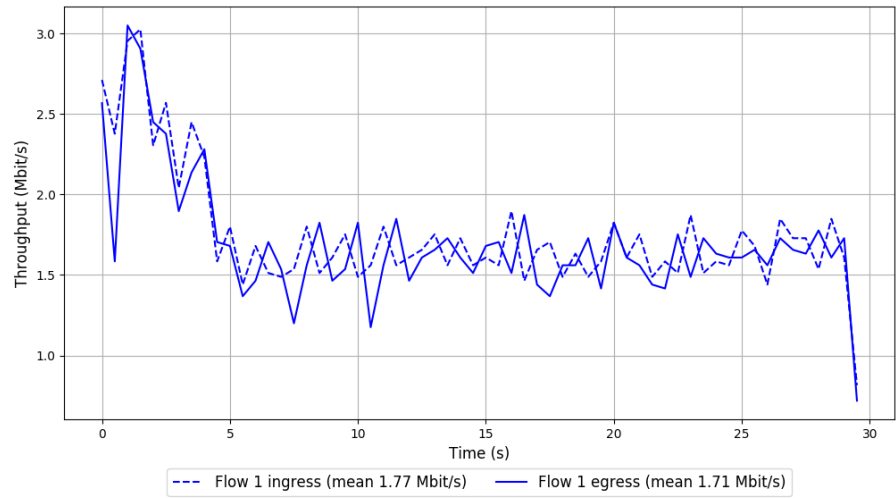Flow 1 (95th percentile 1084.46 ms)

```
Run 1: Statistics of Indigo-1-32

Start at: 2018-02-03 14:18:26
End at: 2018-02-03 14:18:56
Local clock offset: -2.303 ms
Remote clock offset: -30.18 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.71 Mbit/s
95th percentile per-packet one-way delay: 84.527 ms
Loss rate: 3.04%
-- Flow 1:
Average throughput: 1.71 Mbit/s
95th percentile per-packet one-way delay: 84.527 ms
Loss rate: 3.04%
```

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

```
Run 2: Statistics of Indigo-1-32

Start at: 2018-02-03 14:38:06
End at: 2018-02-03 14:38:36
Local clock offset: -1.481 ms
Remote clock offset: -29.137 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.05 Mbit/s
95th percentile per-packet one-way delay: 71.932 ms
Loss rate: 3.07%
-- Flow 1:
Average throughput: 2.05 Mbit/s
95th percentile per-packet one-way delay: 71.932 ms
Loss rate: 3.07%
```
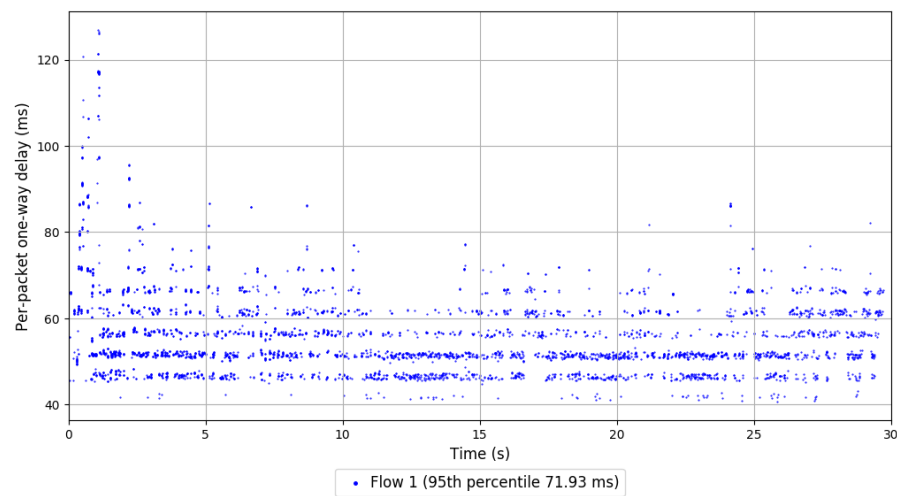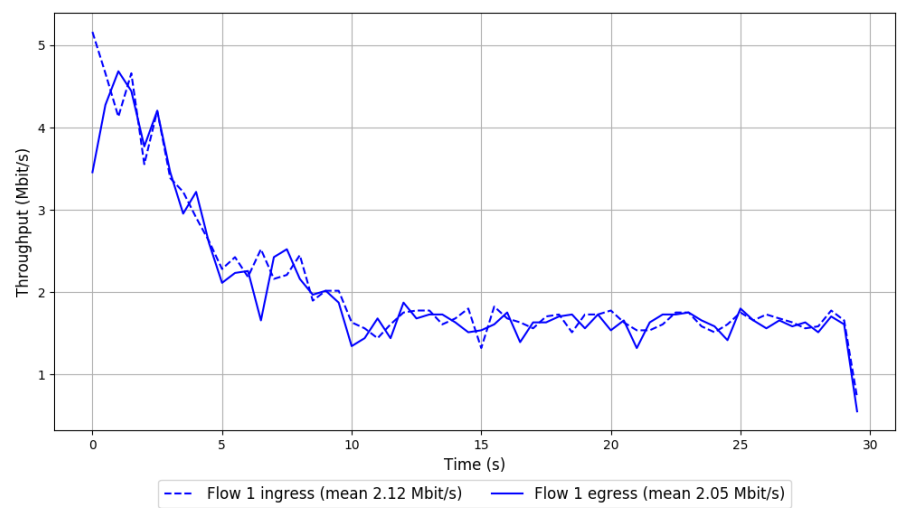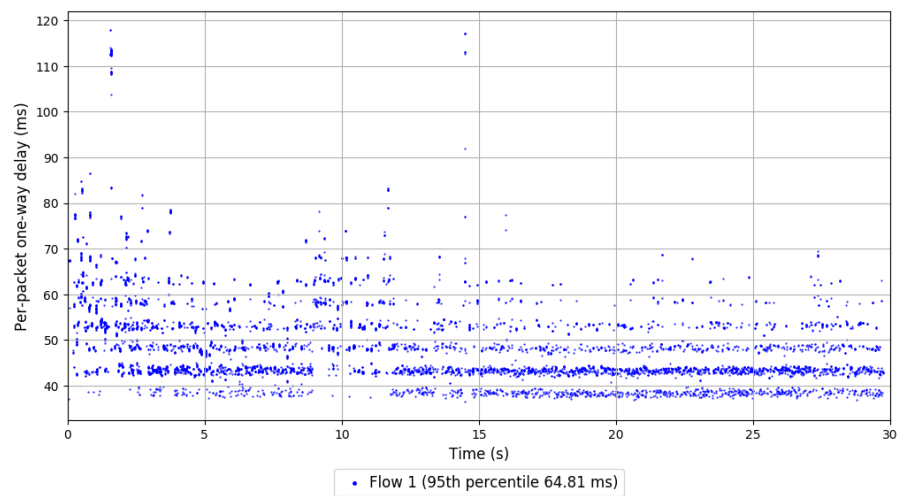
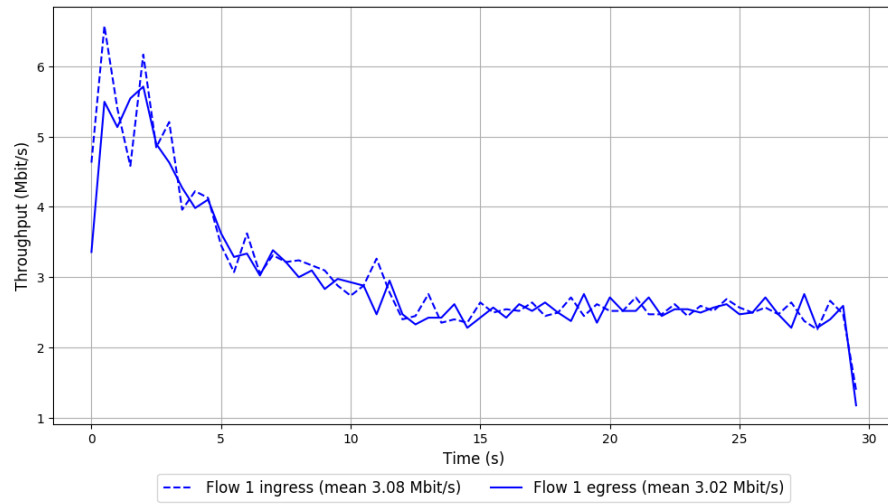Run 2: Report of Indigo-1-32 — Data Link

```
Run 3: Statistics of Indigo-1-32

Start at: 2018-02-03 14:57:46
End at: 2018-02-03 14:58:16
Local clock offset: 1.901 ms
Remote clock offset: -24.645 ms

# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.02 Mbit/s
95th percentile per-packet one-way delay: 64.814 ms
Loss rate: 2.21%
-- Flow 1:
Average throughput: 3.02 Mbit/s
95th percentile per-packet one-way delay: 64.814 ms
Loss rate: 2.21%
```

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

Flow 1 ingress (mean 3.08 Mbit/s) --- Flow 1 egress (mean 3.02 Mbit/s)
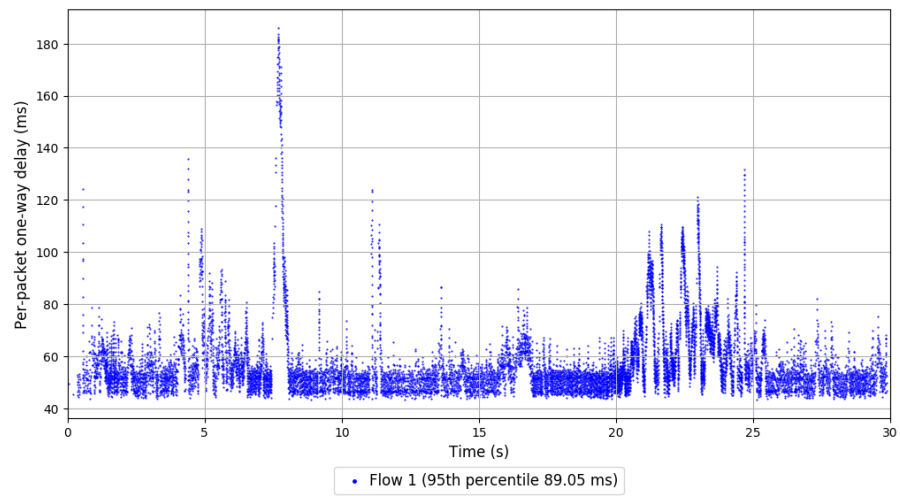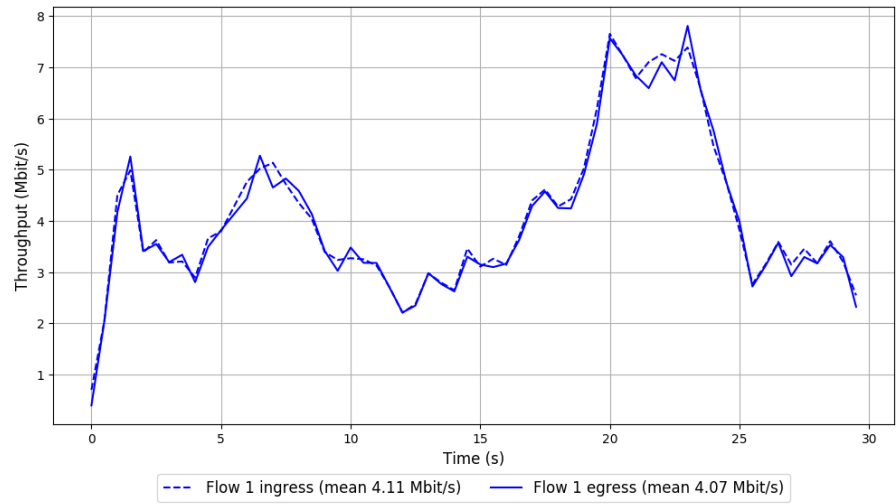

Flow 1 (95th percentile 64.81 ms)

```
Run 1: Statistics of Vivace-latency

Start at: 2018-02-03 14:20:37
End at: 2018-02-03 14:21:07
Local clock offset: 4.152 ms
Remote clock offset: -28.57 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.07 Mbit/s
95th percentile per-packet one-way delay: 89.050 ms
Loss rate: 1.17%
-- Flow 1:
Average throughput: 4.07 Mbit/s
95th percentile per-packet one-way delay: 89.050 ms
Loss rate: 1.17%
```
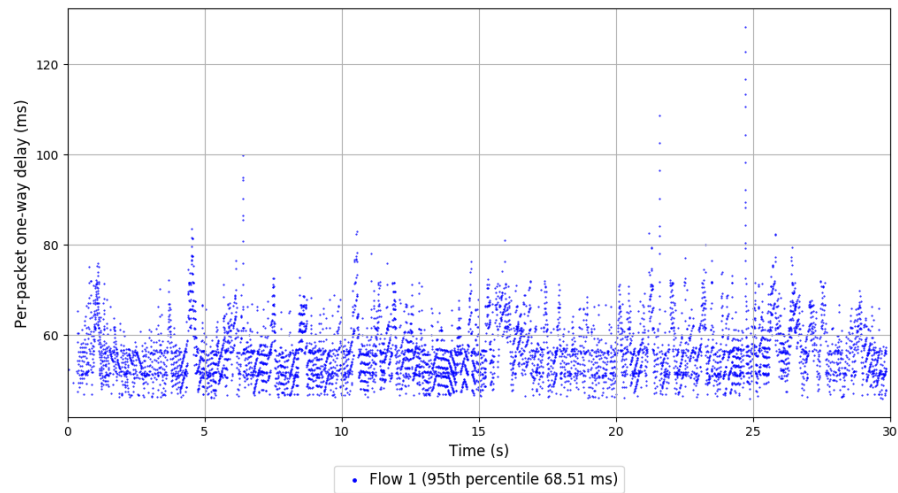
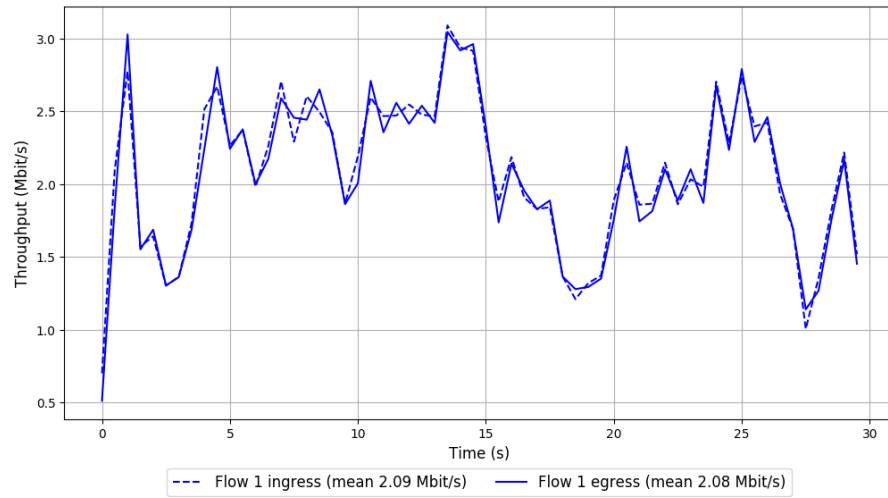Run 1: Report of Vivace-latency — Data Link

```
Run 2: Statistics of Vivace-latency

Start at: 2018-02-03 14:40:16
End at: 2018-02-03 14:40:46
Local clock offset: -0.403 ms
Remote clock offset: -28.174 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.08 Mbit/s
95th percentile per-packet one-way delay: 68.507 ms
Loss rate: 0.85%
-- Flow 1:
Average throughput: 2.08 Mbit/s
95th percentile per-packet one-way delay: 68.507 ms
Loss rate: 0.85%
```

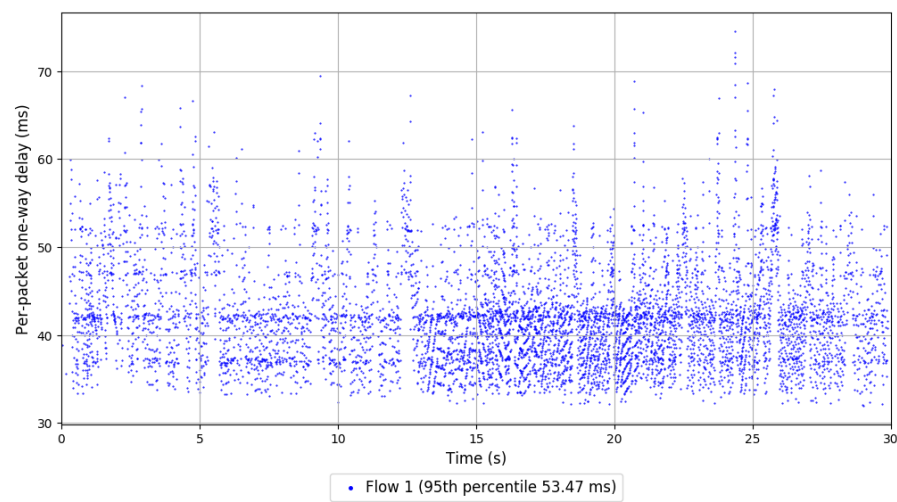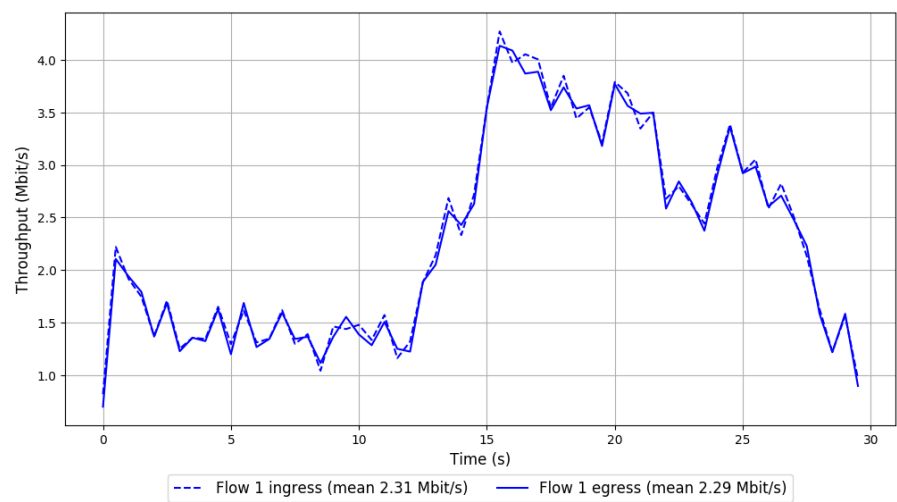Run 2: Report of Vivace-latency — Data Link

```
Run 3: Statistics of Vivace-latency

Start at: 2018-02-03 14:59:56
End at: 2018-02-03 15:00:26
Local clock offset: 3.71 ms
Remote clock offset: -24.002 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.29 Mbit/s
95th percentile per-packet one-way delay: 53.472 ms
Loss rate: 1.02%
-- Flow 1:
Average throughput: 2.29 Mbit/s
95th percentile per-packet one-way delay: 53.472 ms
Loss rate: 1.02%
```

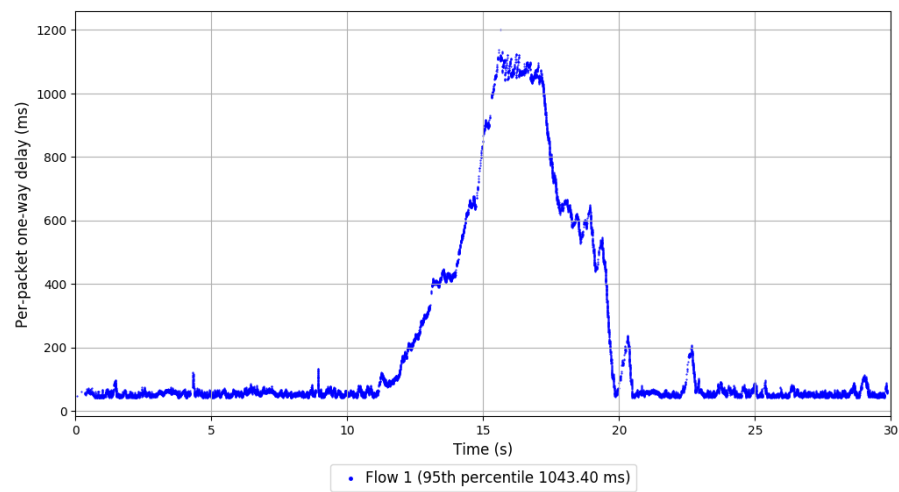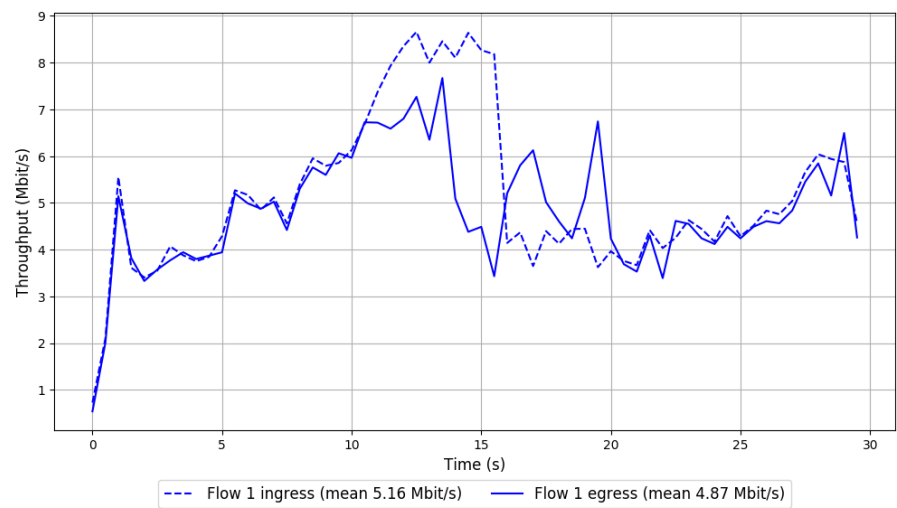Run 3: Report of Vivace-latency — Data Link

```
Run 1: Statistics of Vivace-loss

Start at: 2018-02-03 14:27:12
End at: 2018-02-03 14:27:42
Local clock offset: 3.854 ms
Remote clock offset: -31.244 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.87 Mbit/s
95th percentile per-packet one-way delay: 1043.397 ms
Loss rate: 5.80%
-- Flow 1:
Average throughput: 4.87 Mbit/s
95th percentile per-packet one-way delay: 1043.397 ms
Loss rate: 5.80%
```

Run 1: Report of Vivace-loss — Data Link

```
Run 2: Statistics of Vivace-loss

Start at: 2018-02-03 14:46:49
End at: 2018-02-03 14:47:19
Local clock offset: -2.203 ms
Remote clock offset: -27.104 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 11.32 Mbit/s
95th percentile per-packet one-way delay: 1077.948 ms
Loss rate: 11.30%
-- Flow 1:
Average throughput: 11.32 Mbit/s
95th percentile per-packet one-way delay: 1077.948 ms
Loss rate: 11.30%
```
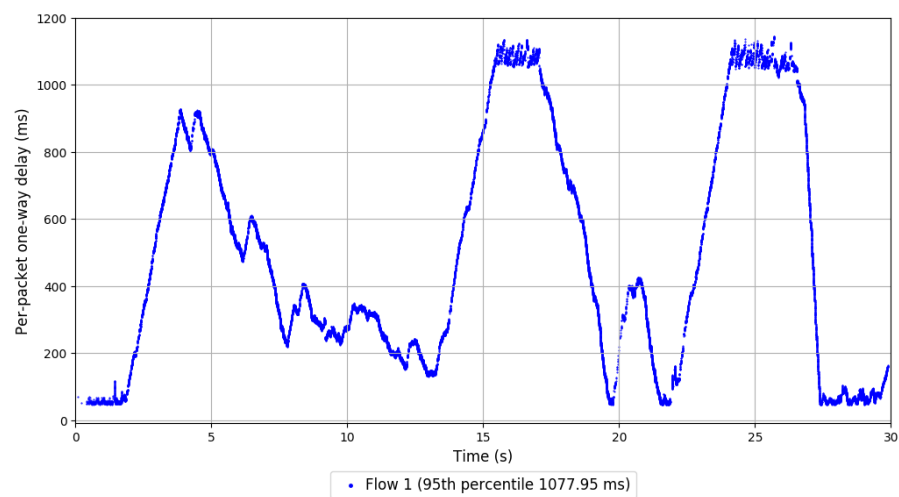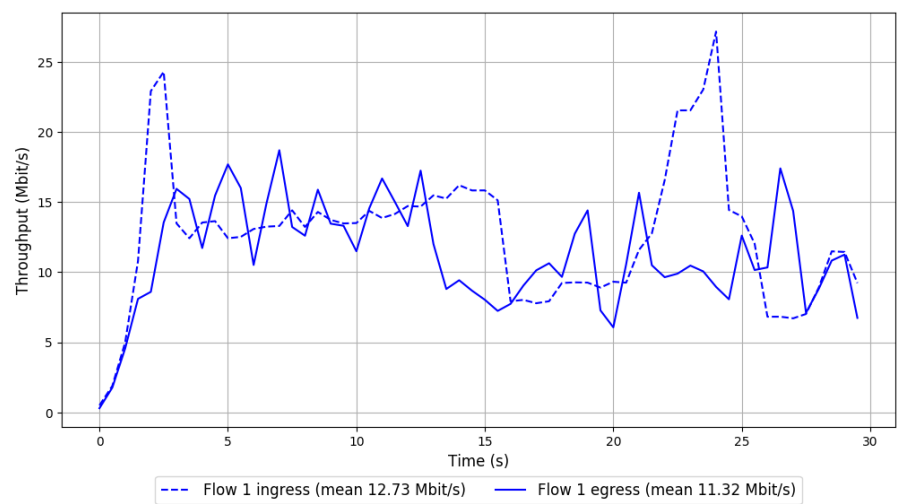
Run 2: Report of Vivace-loss — Data Link

```
Run 3: Statistics of Vivace-loss

Start at: 2018-02-03 15:06:36
End at: 2018-02-03 15:07:06
Local clock offset: 3.638 ms
Remote clock offset: -24.49 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.39 Mbit/s
95th percentile per-packet one-way delay: 1077.296 ms
Loss rate: 19.22%
-- Flow 1:
Average throughput: 13.39 Mbit/s
95th percentile per-packet one-way delay: 1077.296 ms
Loss rate: 19.22%
```
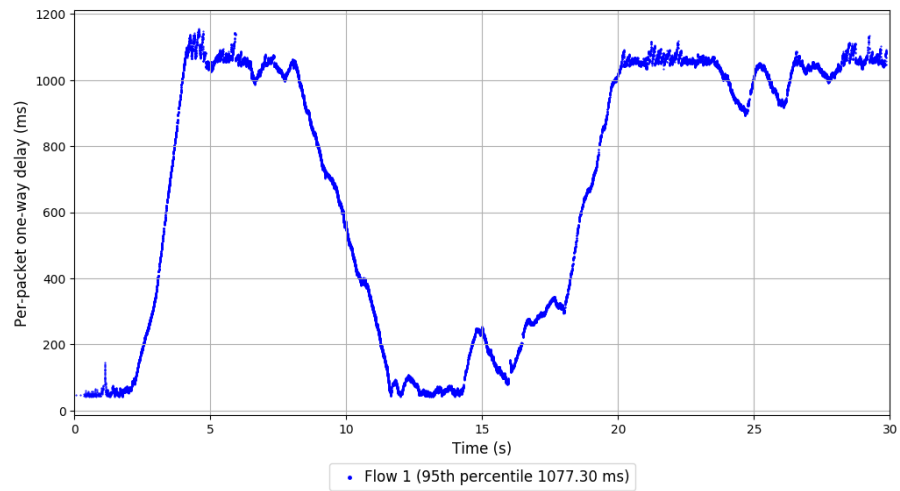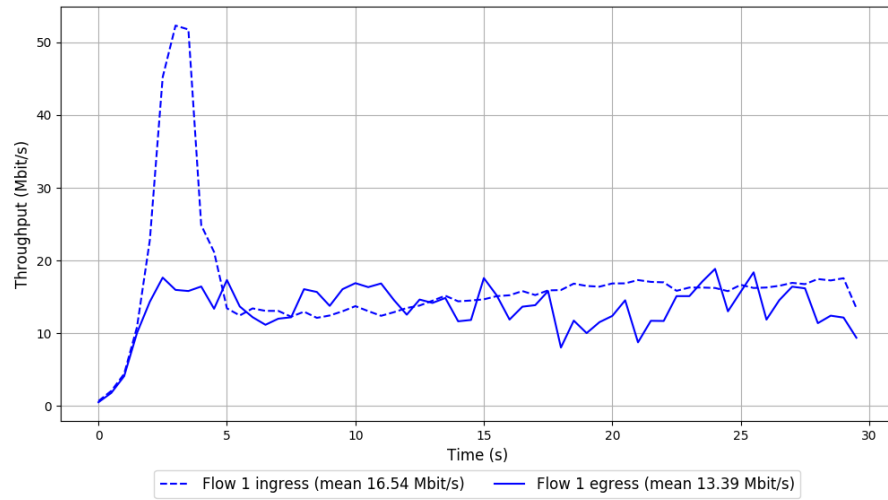
Run 3: Report of Vivace-loss — Data Link

Flow 1 ingress (mean 16.54 Mbit/s) --- Flow 1 egress (mean 13.39 Mbit/s)

Flow 1 (95th percentile 1077.30 ms)

```
Run 1: Statistics of Vivace-LTE

Start at: 2018-02-03 14:26:06
End at: 2018-02-03 14:26:36
Local clock offset: 2.869 ms
Remote clock offset: -29.59 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.62 Mbit/s
95th percentile per-packet one-way delay: 1059.961 ms
Loss rate: 8.91%
-- Flow 1:
Average throughput: 8.62 Mbit/s
95th percentile per-packet one-way delay: 1059.961 ms
Loss rate: 8.91%
```
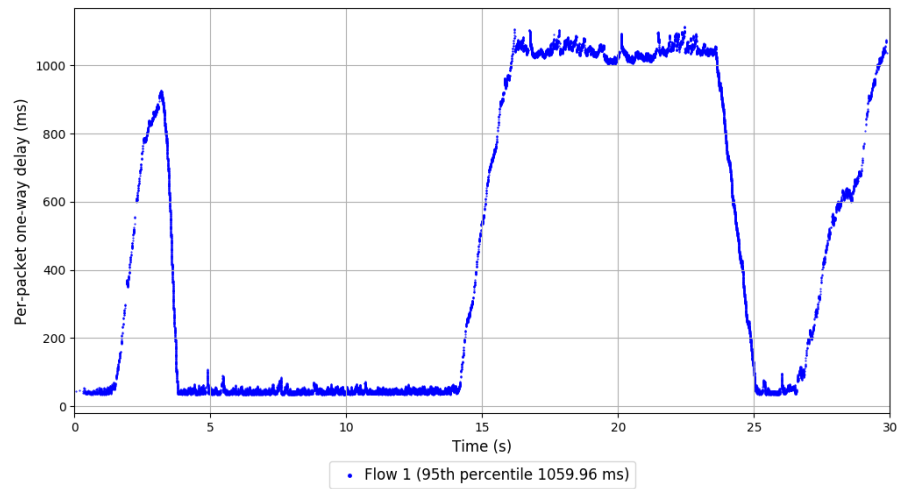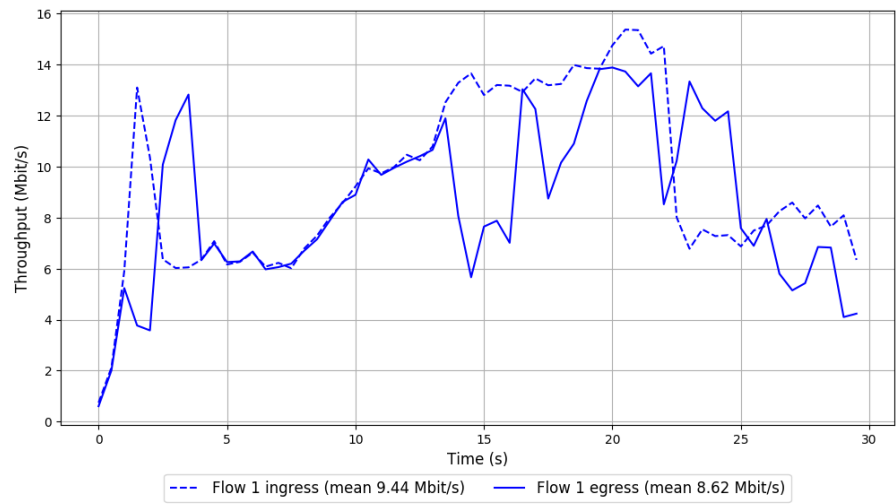
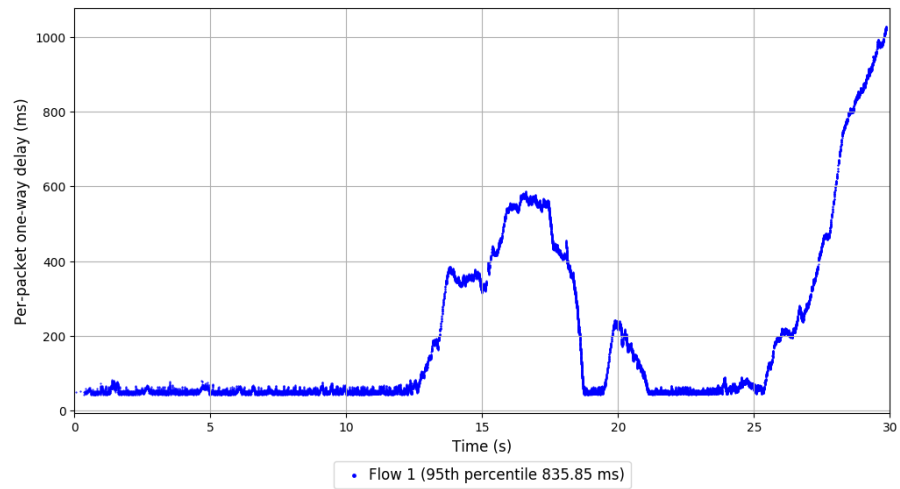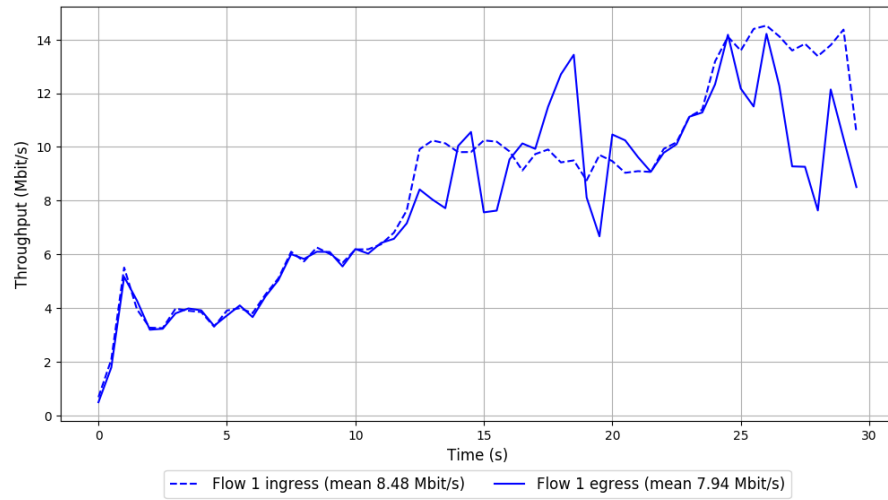Run 1: Report of Vivace-LTE — Data Link

```
Run 2: Statistics of Vivace-LTE

Start at: 2018-02-03 14:45:43
End at: 2018-02-03 14:46:13
Local clock offset: 2.292 ms
Remote clock offset: -26.567 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.94 Mbit/s
95th percentile per-packet one-way delay: 835.845 ms
Loss rate: 6.62%
-- Flow 1:
Average throughput: 7.94 Mbit/s
95th percentile per-packet one-way delay: 835.845 ms
Loss rate: 6.62%
```

Run 2: Report of Vivace-LTE — Data Link

Flow 1 ingress (mean 8.48 Mbit/s)   Flow 1 egress (mean 7.94 Mbit/s)

Flow 1 (95th percentile 835.85 ms)

```
Run 3: Statistics of Vivace-LTE

Start at: 2018-02-03 15:05:27
End at: 2018-02-03 15:05:57
Local clock offset: -0.947 ms
Remote clock offset: -23.732 ms


# Below is generated by plot.py at 2018-02-03 15:09:09
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.25 Mbit/s
95th percentile per-packet one-way delay: 378.193 ms
Loss rate: 0.47%
-- Flow 1:
Average throughput: 8.25 Mbit/s
95th percentile per-packet one-way delay: 378.193 ms
Loss rate: 0.47%
```

Run 3: Report of Vivace-LTE — Data Link