

Pantheon Report

Generated at 2019-01-17 04:23:35 (UTC).

Data path: AWS California 1 on *ens5 (local)* → Stanford cellular on *ppp0 (remote)*.

Repeated the test of 19 congestion control schemes 3 times.

Each test lasted for 30 seconds running 1 flow.

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

System info:

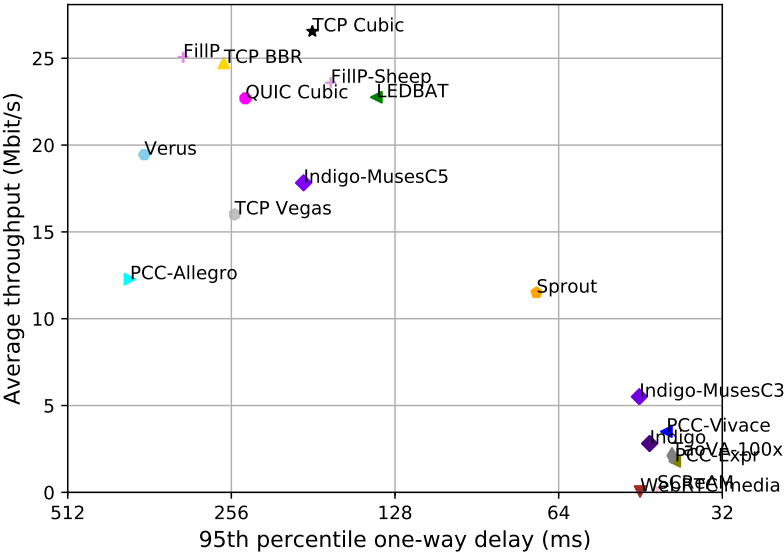
```
Linux 4.15.0-1031-aws
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
```

Git summary:

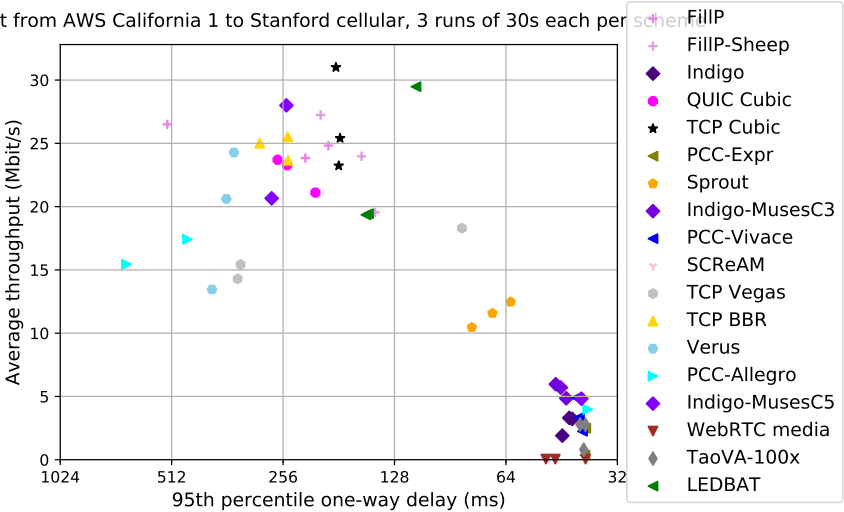
```
branch: muses @ 308b29cefdb093313dc8409e68bf4b4cecd405d1
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecd90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ c3eee875824760ec5b2fd207fefe166e1afe2170
third_party/pantheon-tunnel @ f866d3f58d27afd942717625ee3a354cc2e802bd
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/pcc-experimental @ cd43e34e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quick @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdb2
M src/ScreamClient
M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
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 @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851

test from AWS California 1 to Stanford cellular, 3 runs of 30s each per scheme
(mean of all runs by scheme)



test from AWS California 1 to Stanford cellular, 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	24.73	264.26	0.33
Copa	0	N/A	N/A	N/A
TCP Cubic	3	26.55	181.67	0.31
FillP	3	25.05	314.04	1.03
FillP-Sheep	3	23.59	168.07	0.17
Indigo	3	2.81	43.54	0.02
Indigo-MusesC3	3	5.51	45.48	0.07
Indigo-MusesC5	3	17.83	188.56	0.38
LEDBAT	3	22.76	138.55	0.30
PCC-Allegro	3	12.28	393.29	0.19
PCC-Expr	3	1.78	39.15	62.34
QUIC Cubic	3	22.69	241.27	0.51
SCReAM	3	0.22	42.17	0.13
Sprout	3	11.50	70.30	0.11
TaoVA-100x	3	2.12	39.61	58.97
TCP Vegas	3	16.01	252.45	0.04
Verus	3	19.45	370.14	0.45
PCC-Vivace	3	3.50	40.56	0.25
WebRTC media	3	0.05	45.34	0.00

Run 1: Statistics of TCP BBR

Start at: 2019-01-17 03:27:32

End at: 2019-01-17 03:28:02

Local clock offset: 3.331 ms

Remote clock offset: 3.62 ms

Below is generated by plot.py at 2019-01-17 04:22:21

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.66 Mbit/s

95th percentile per-packet one-way delay: 248.211 ms

Loss rate: 0.40%

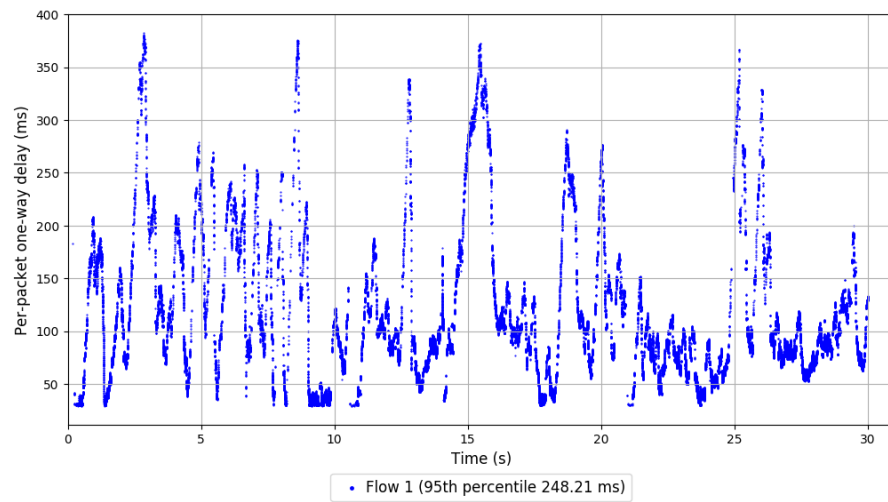
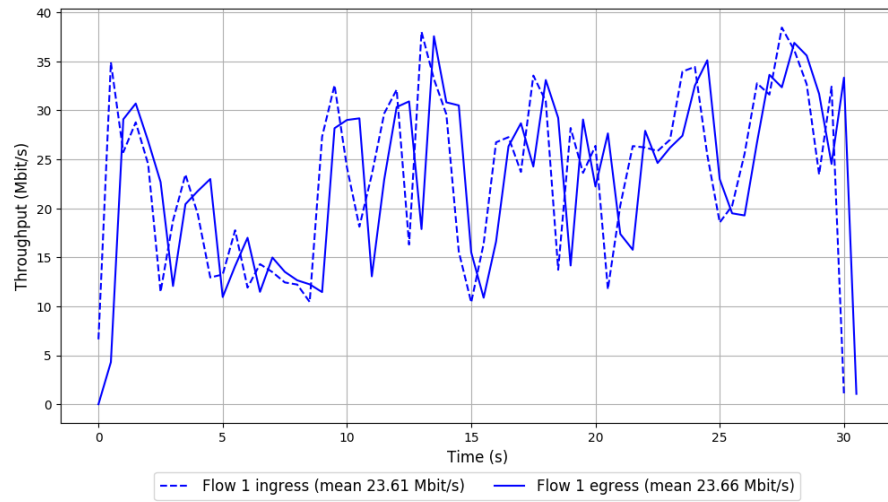
-- Flow 1:

Average throughput: 23.66 Mbit/s

95th percentile per-packet one-way delay: 248.211 ms

Loss rate: 0.40%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2019-01-17 03:50:46

End at: 2019-01-17 03:51:16

Local clock offset: 3.053 ms

Remote clock offset: 5.716 ms

Below is generated by plot.py at 2019-01-17 04:22:21

Datalink statistics

-- Total of 1 flow:

Average throughput: 25.01 Mbit/s

95th percentile per-packet one-way delay: 295.917 ms

Loss rate: 0.32%

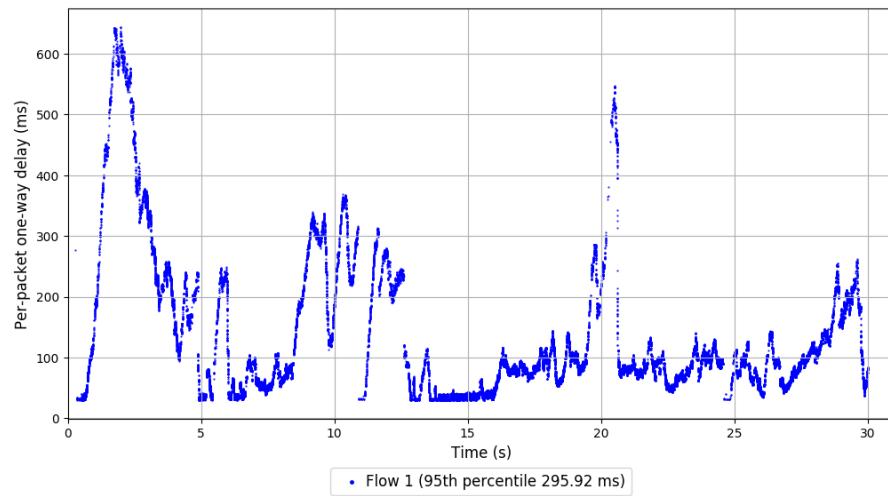
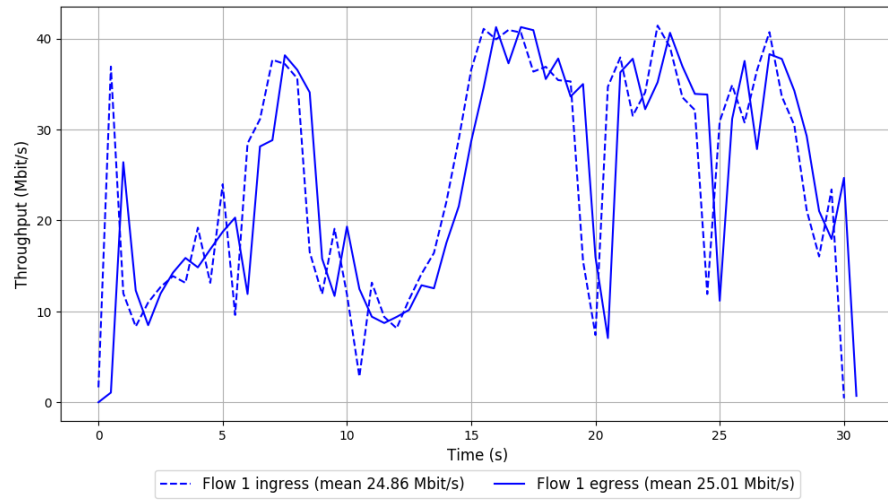
-- Flow 1:

Average throughput: 25.01 Mbit/s

95th percentile per-packet one-way delay: 295.917 ms

Loss rate: 0.32%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2019-01-17 04:13:59

End at: 2019-01-17 04:14:29

Local clock offset: -0.612 ms

Remote clock offset: 7.461 ms

Below is generated by plot.py at 2019-01-17 04:22:22

Datalink statistics

-- Total of 1 flow:

Average throughput: 25.52 Mbit/s

95th percentile per-packet one-way delay: 248.658 ms

Loss rate: 0.27%

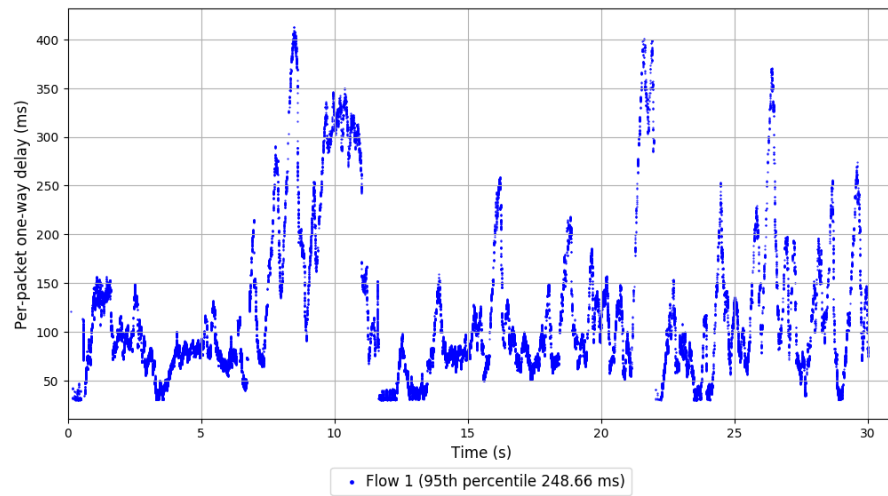
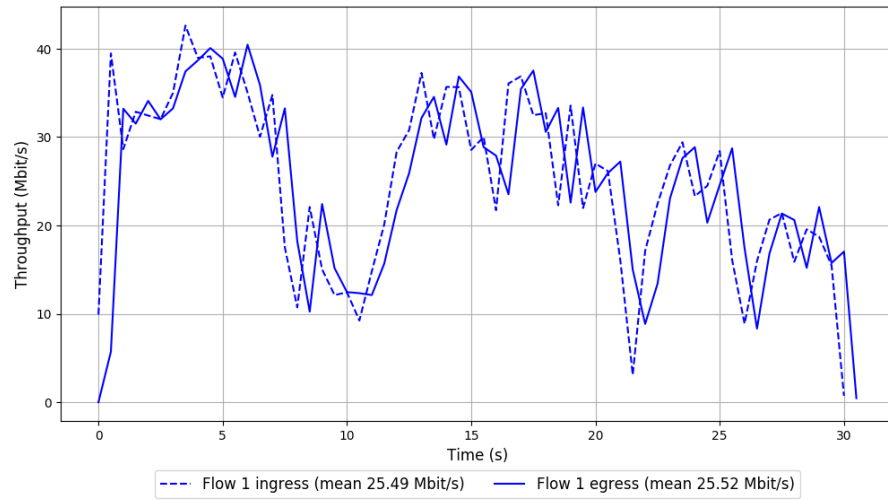
-- Flow 1:

Average throughput: 25.52 Mbit/s

95th percentile per-packet one-way delay: 248.658 ms

Loss rate: 0.27%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

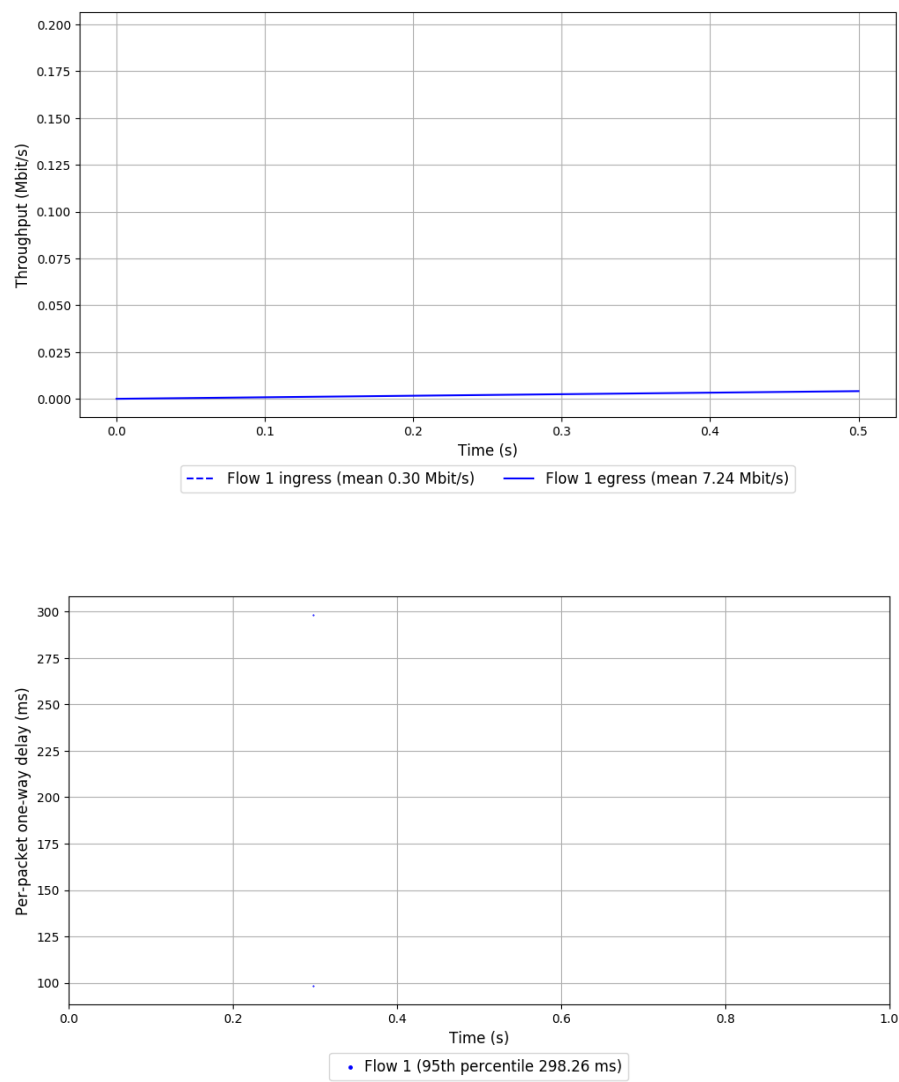
Start at: 2019-01-17 03:15:18

End at: 2019-01-17 03:15:48

Local clock offset: 3.566 ms

Remote clock offset: 1.133 ms

Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

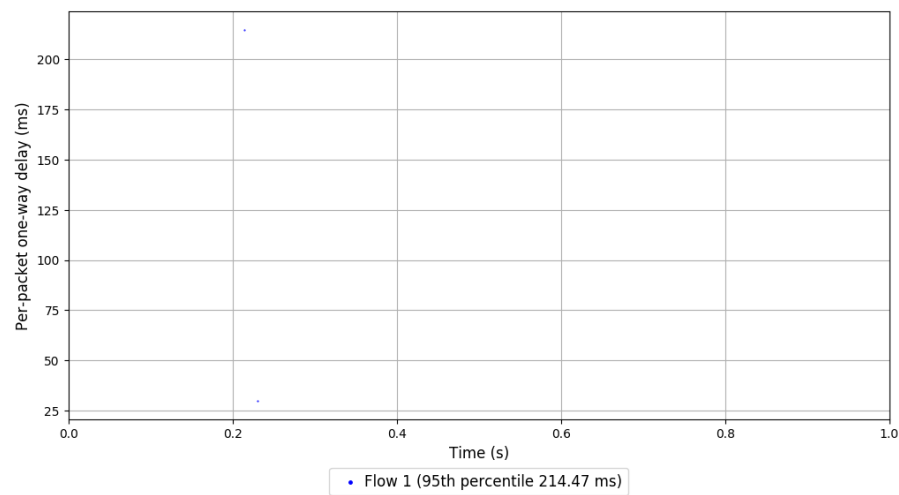
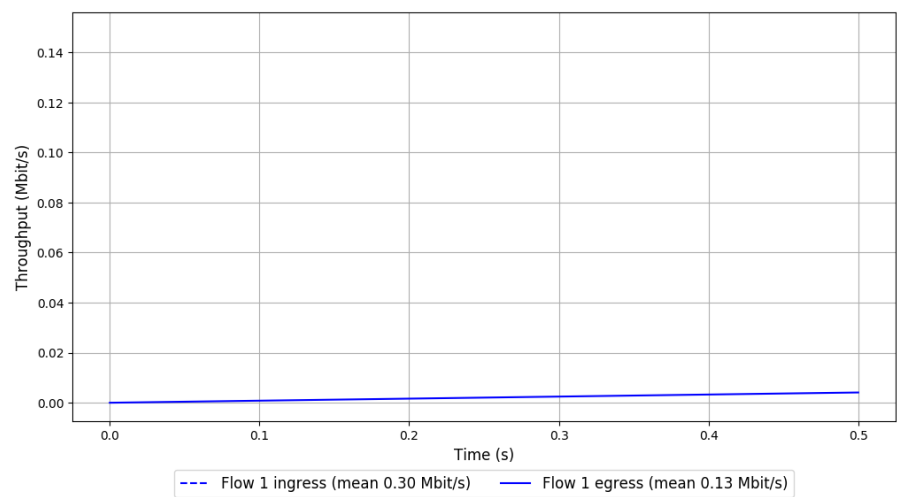
Start at: 2019-01-17 03:38:32

End at: 2019-01-17 03:39:02

Local clock offset: 3.195 ms

Remote clock offset: 4.769 ms

Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

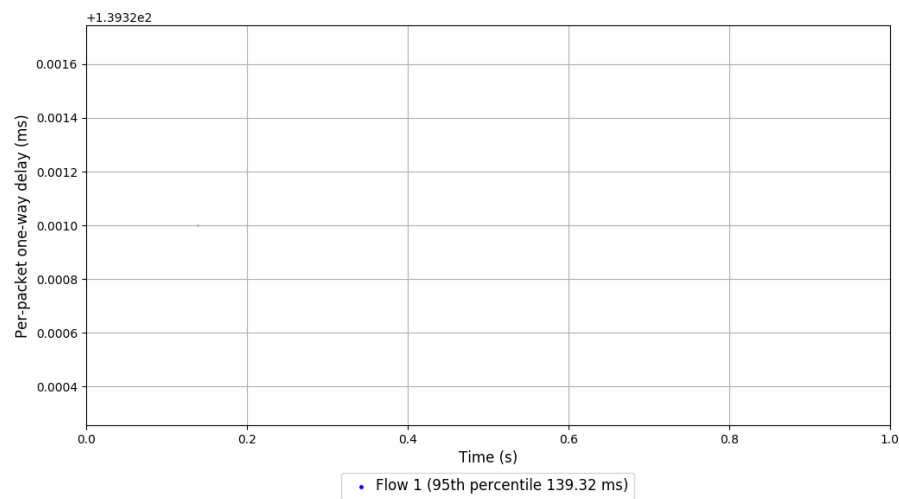
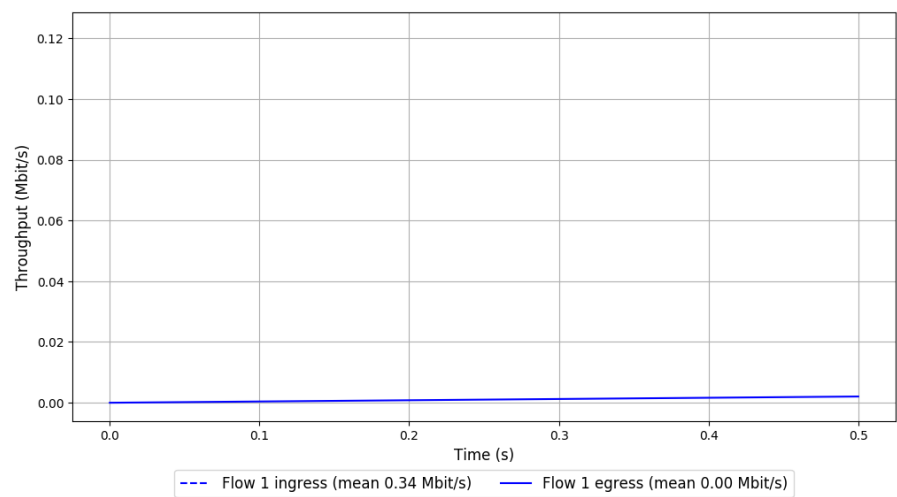
Start at: 2019-01-17 04:01:44

End at: 2019-01-17 04:02:14

Local clock offset: 0.462 ms

Remote clock offset: 6.499 ms

Run 3: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2019-01-17 03:17:44

End at: 2019-01-17 03:18:14

Local clock offset: 3.607 ms

Remote clock offset: 1.75 ms

Below is generated by plot.py at 2019-01-17 04:22:22

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.23 Mbit/s

95th percentile per-packet one-way delay: 181.114 ms

Loss rate: 0.25%

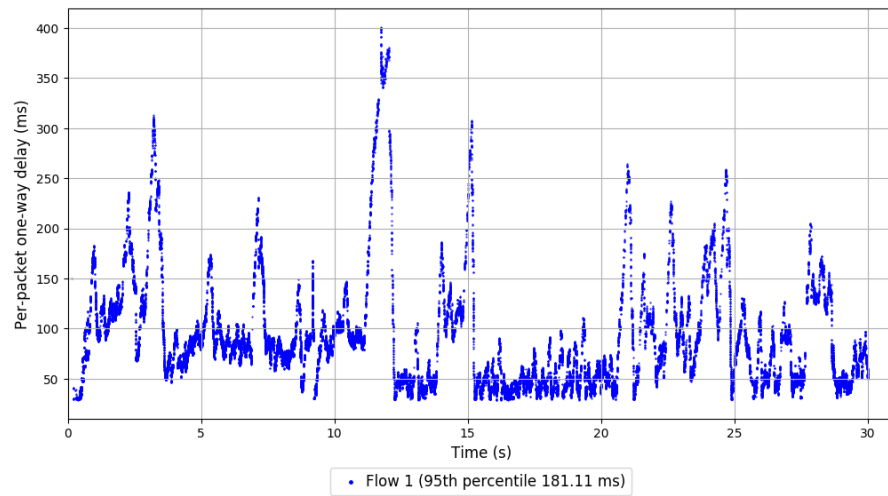
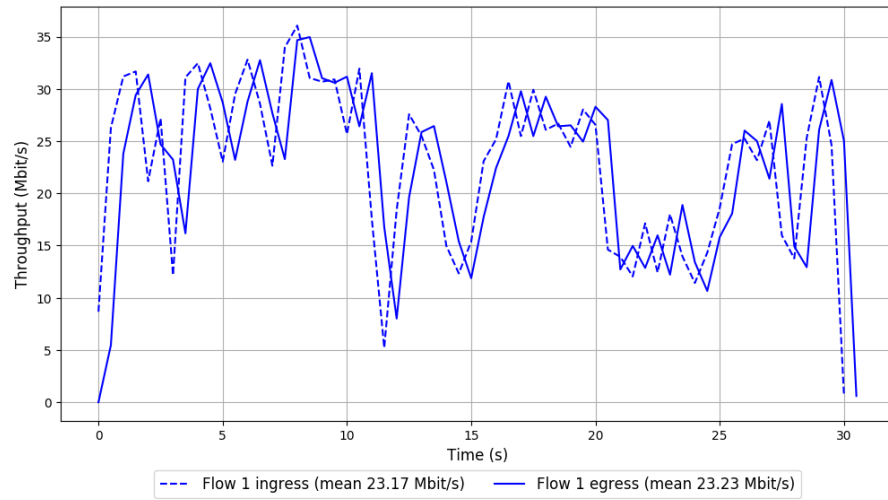
-- Flow 1:

Average throughput: 23.23 Mbit/s

95th percentile per-packet one-way delay: 181.114 ms

Loss rate: 0.25%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2019-01-17 03:40:58

End at: 2019-01-17 03:41:28

Local clock offset: 3.209 ms

Remote clock offset: 4.88 ms

Below is generated by plot.py at 2019-01-17 04:22:22

Datalink statistics

-- Total of 1 flow:

Average throughput: 25.40 Mbit/s

95th percentile per-packet one-way delay: 179.599 ms

Loss rate: 0.37%

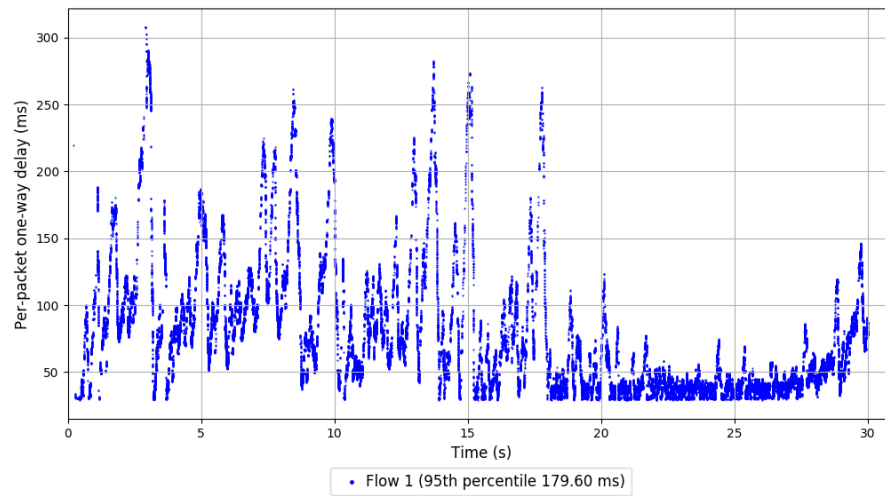
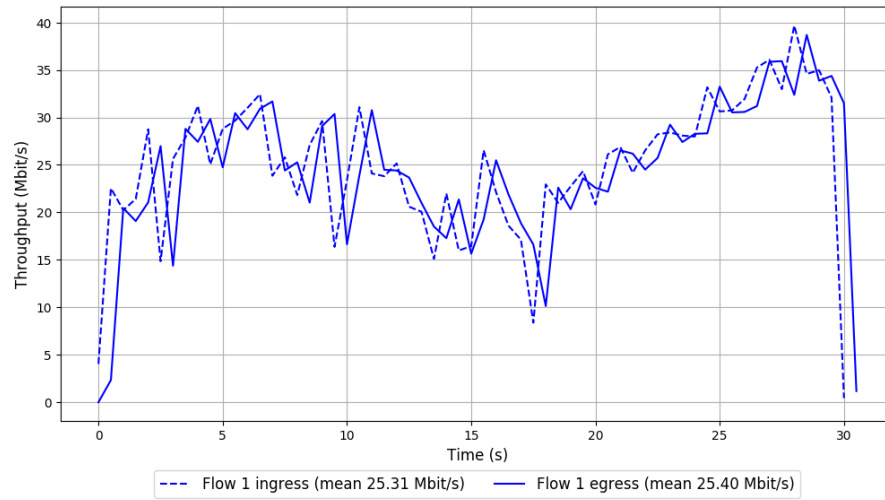
-- Flow 1:

Average throughput: 25.40 Mbit/s

95th percentile per-packet one-way delay: 179.599 ms

Loss rate: 0.37%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2019-01-17 04:04:10

End at: 2019-01-17 04:04:40

Local clock offset: 0.19 ms

Remote clock offset: 6.694 ms

Below is generated by plot.py at 2019-01-17 04:22:27

Datalink statistics

-- Total of 1 flow:

Average throughput: 31.01 Mbit/s

95th percentile per-packet one-way delay: 184.299 ms

Loss rate: 0.32%

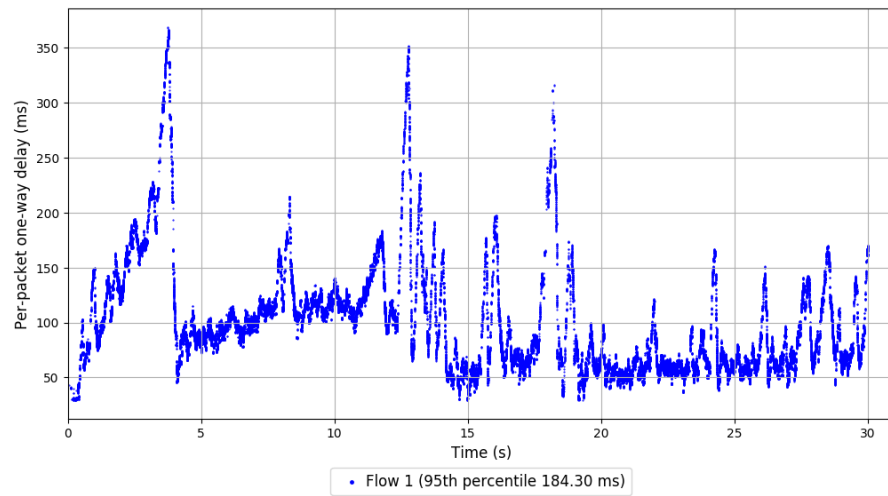
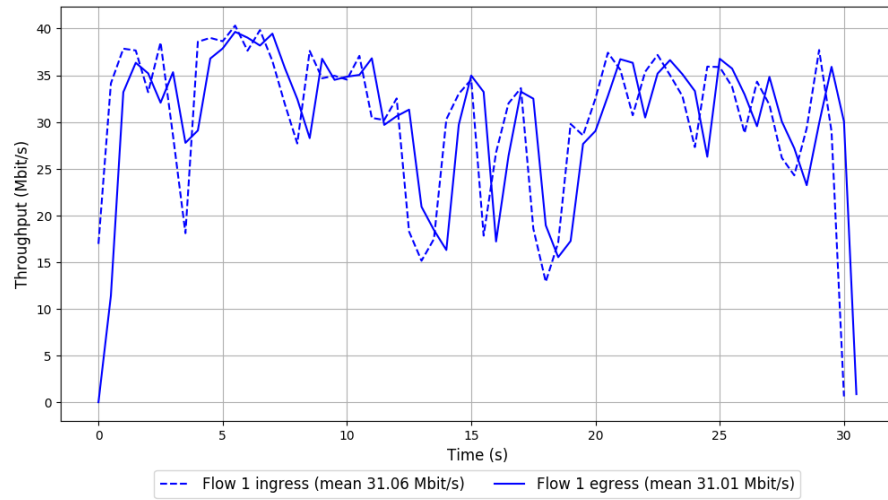
-- Flow 1:

Average throughput: 31.01 Mbit/s

95th percentile per-packet one-way delay: 184.299 ms

Loss rate: 0.32%

Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

Start at: 2019-01-17 03:25:05

End at: 2019-01-17 03:25:35

Local clock offset: 3.407 ms

Remote clock offset: 3.197 ms

Below is generated by plot.py at 2019-01-17 04:22:27

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.84 Mbit/s

95th percentile per-packet one-way delay: 222.850 ms

Loss rate: 0.60%

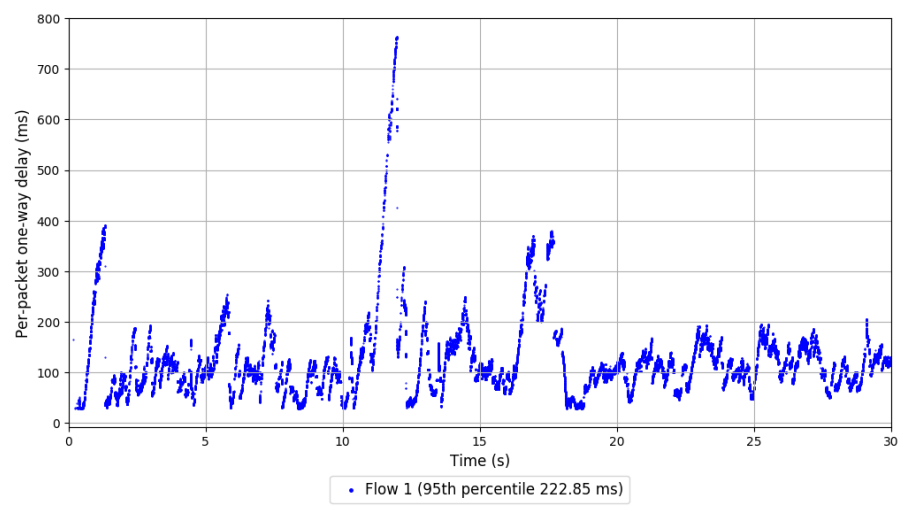
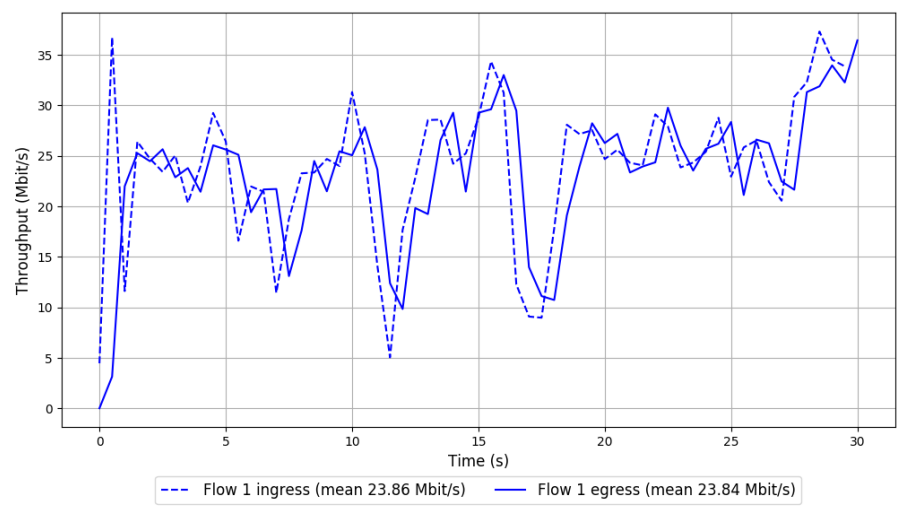
-- Flow 1:

Average throughput: 23.84 Mbit/s

95th percentile per-packet one-way delay: 222.850 ms

Loss rate: 0.60%

Run 1: Report of FillP — Data Link



Run 2: Statistics of FillP

Start at: 2019-01-17 03:48:18

End at: 2019-01-17 03:48:48

Local clock offset: 3.225 ms

Remote clock offset: 5.552 ms

Below is generated by plot.py at 2019-01-17 04:22:27

Datalink statistics

-- Total of 1 flow:

Average throughput: 24.82 Mbit/s

95th percentile per-packet one-way delay: 193.091 ms

Loss rate: 0.62%

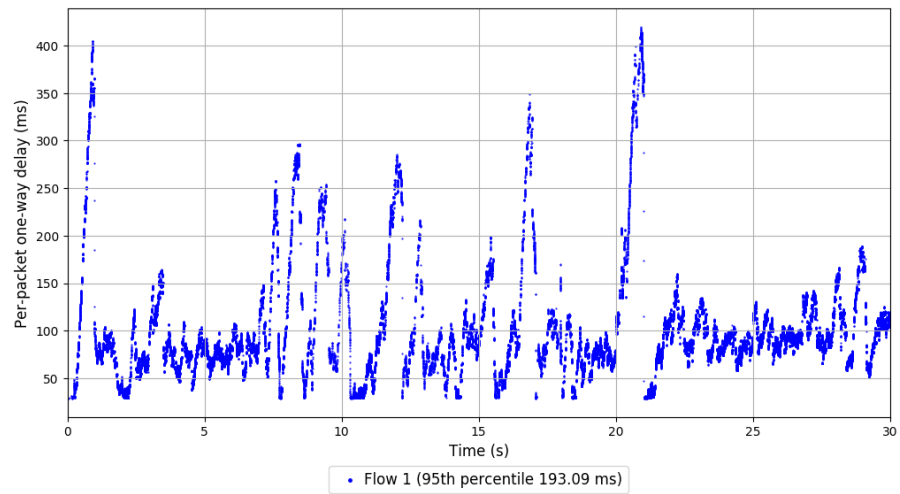
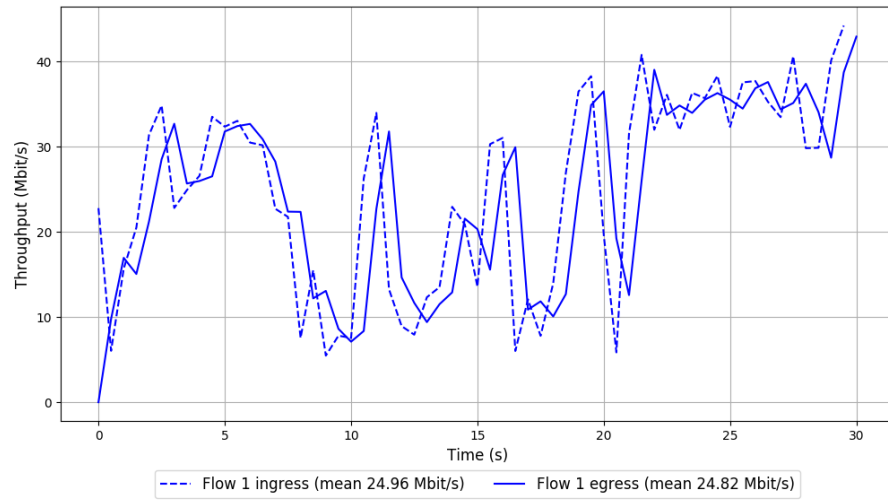
-- Flow 1:

Average throughput: 24.82 Mbit/s

95th percentile per-packet one-way delay: 193.091 ms

Loss rate: 0.62%

Run 2: Report of FillP — Data Link



Run 3: Statistics of FillP

Start at: 2019-01-17 04:11:31

End at: 2019-01-17 04:12:01

Local clock offset: -0.478 ms

Remote clock offset: 7.274 ms

Below is generated by plot.py at 2019-01-17 04:22:49

Datalink statistics

-- Total of 1 flow:

Average throughput: 26.50 Mbit/s

95th percentile per-packet one-way delay: 526.181 ms

Loss rate: 1.87%

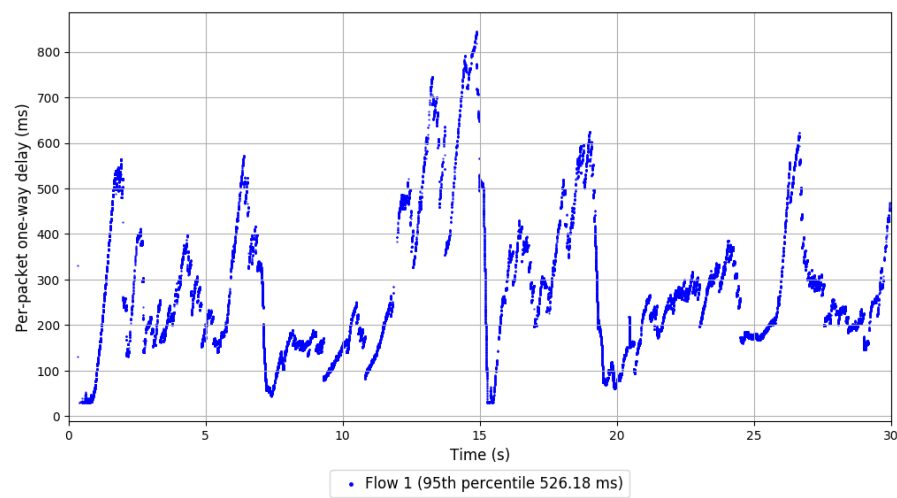
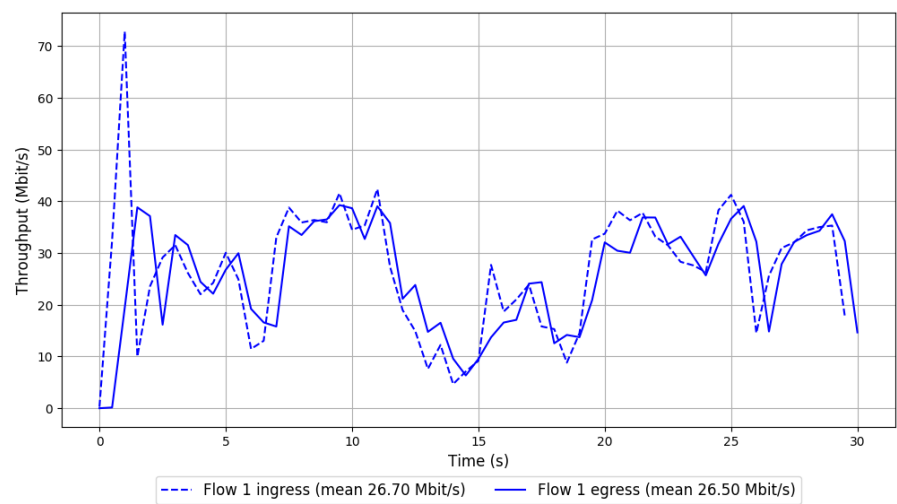
-- Flow 1:

Average throughput: 26.50 Mbit/s

95th percentile per-packet one-way delay: 526.181 ms

Loss rate: 1.87%

Run 3: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-01-17 03:34:52

End at: 2019-01-17 03:35:22

Local clock offset: 3.209 ms

Remote clock offset: 4.352 ms

Below is generated by plot.py at 2019-01-17 04:22:49

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.98 Mbit/s

95th percentile per-packet one-way delay: 157.080 ms

Loss rate: 0.22%

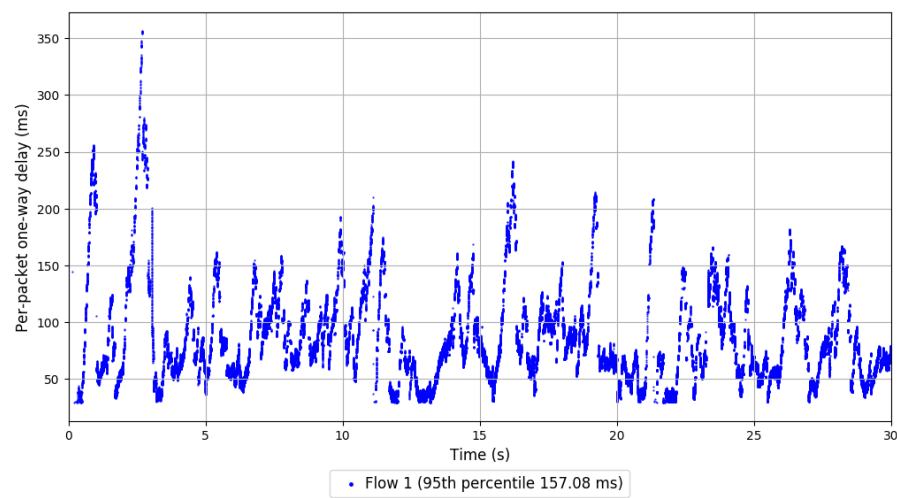
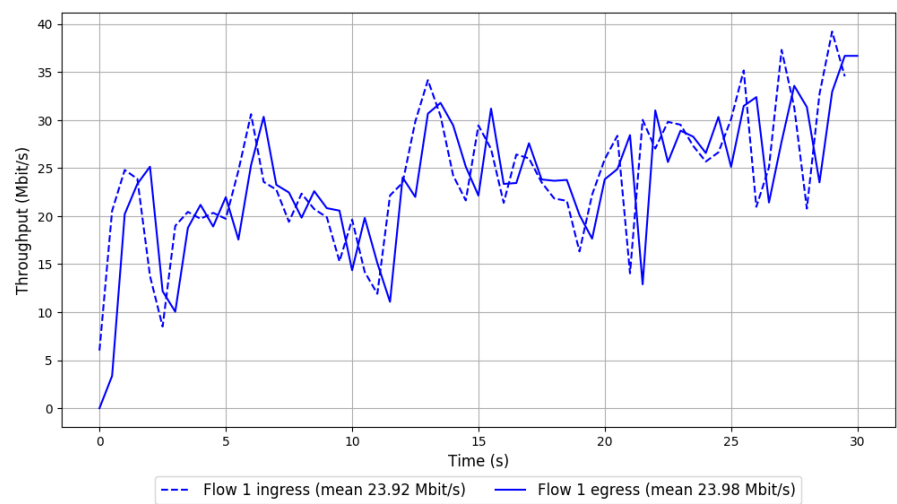
-- Flow 1:

Average throughput: 23.98 Mbit/s

95th percentile per-packet one-way delay: 157.080 ms

Loss rate: 0.22%

Run 1: Report of FillP-Sheep — Data Link



Run 2: Statistics of FillP-Sheep

Start at: 2019-01-17 03:58:05

End at: 2019-01-17 03:58:35

Local clock offset: 1.024 ms

Remote clock offset: 6.243 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 27.24 Mbit/s

95th percentile per-packet one-way delay: 202.631 ms

Loss rate: 0.18%

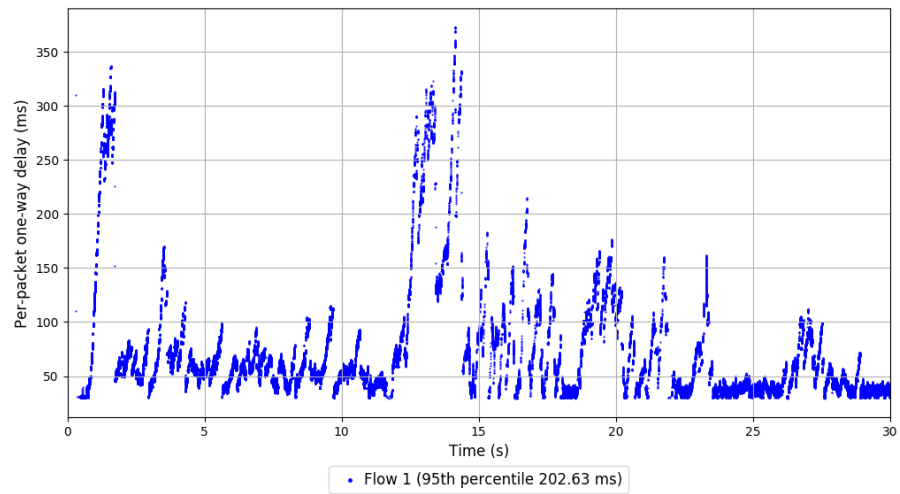
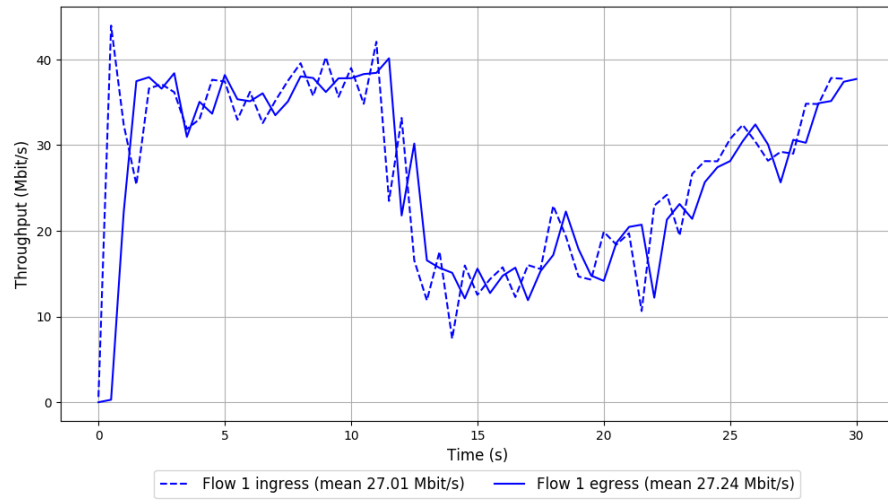
-- Flow 1:

Average throughput: 27.24 Mbit/s

95th percentile per-packet one-way delay: 202.631 ms

Loss rate: 0.18%

Run 2: Report of FillP-Sheep — Data Link



Run 3: Statistics of FillP-Sheep

Start at: 2019-01-17 04:21:19

End at: 2019-01-17 04:21:49

Local clock offset: -0.831 ms

Remote clock offset: 6.529 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 19.55 Mbit/s

95th percentile per-packet one-way delay: 144.490 ms

Loss rate: 0.11%

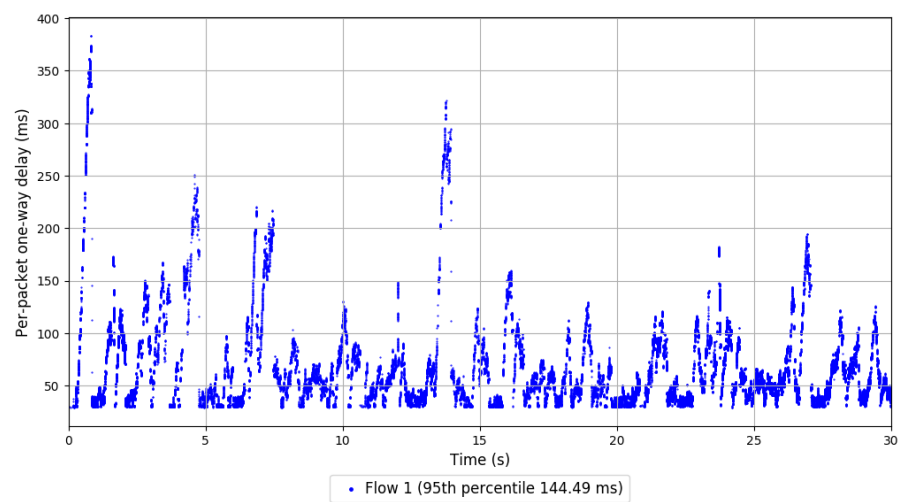
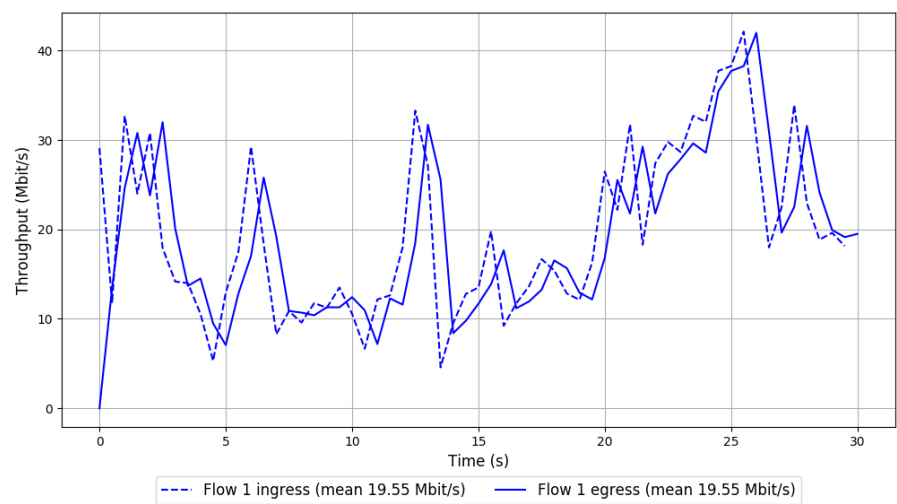
-- Flow 1:

Average throughput: 19.55 Mbit/s

95th percentile per-packet one-way delay: 144.490 ms

Loss rate: 0.11%

Run 3: Report of FillP-Sheep — Data Link

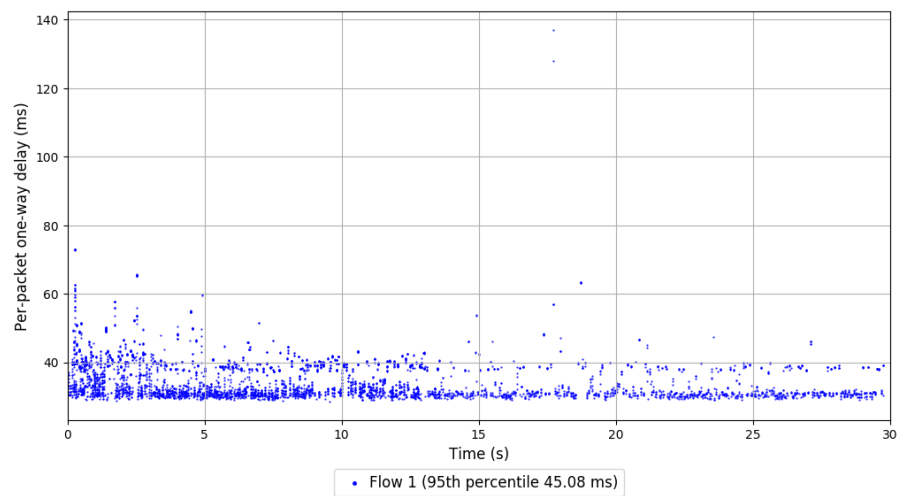
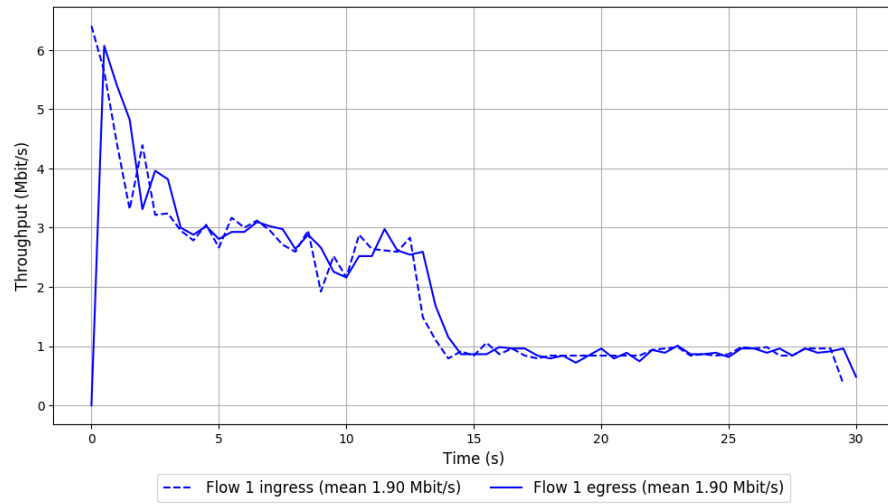


```
Run 1: Statistics of Indigo

Start at: 2019-01-17 03:12:52
End at: 2019-01-17 03:13:22
Local clock offset: 3.557 ms
Remote clock offset: 0.274 ms

# Below is generated by plot.py at 2019-01-17 04:22:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.90 Mbit/s
95th percentile per-packet one-way delay: 45.078 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.90 Mbit/s
95th percentile per-packet one-way delay: 45.078 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2019-01-17 03:36:06

End at: 2019-01-17 03:36:36

Local clock offset: 3.229 ms

Remote clock offset: 4.492 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.30 Mbit/s

95th percentile per-packet one-way delay: 43.165 ms

Loss rate: 0.00%

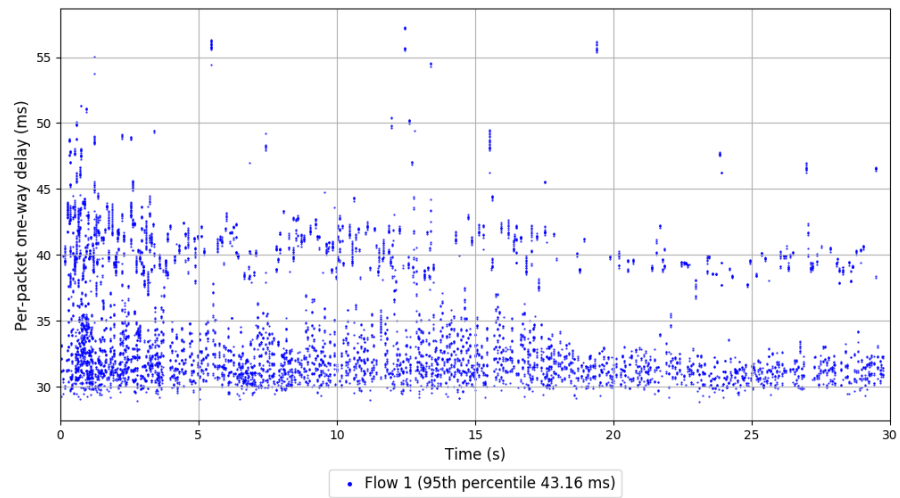
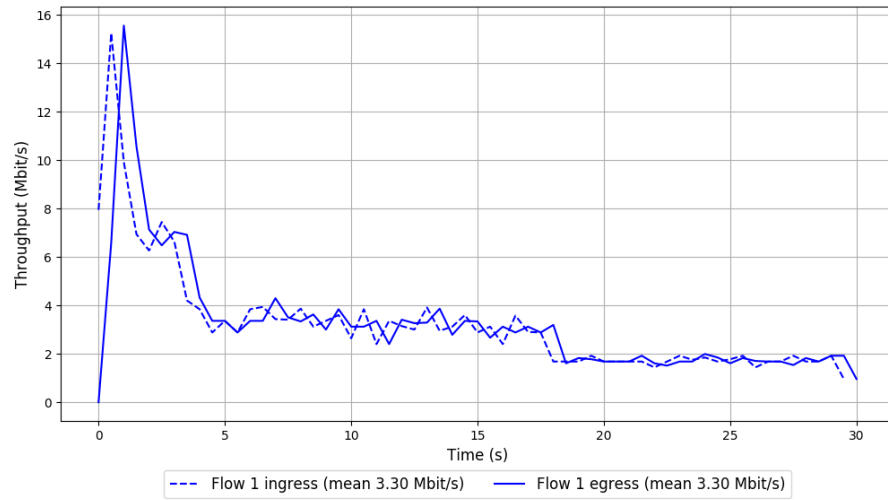
-- Flow 1:

Average throughput: 3.30 Mbit/s

95th percentile per-packet one-way delay: 43.165 ms

Loss rate: 0.00%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2019-01-17 03:59:18

End at: 2019-01-17 03:59:48

Local clock offset: 0.845 ms

Remote clock offset: 6.423 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.23 Mbit/s

95th percentile per-packet one-way delay: 42.385 ms

Loss rate: 0.05%

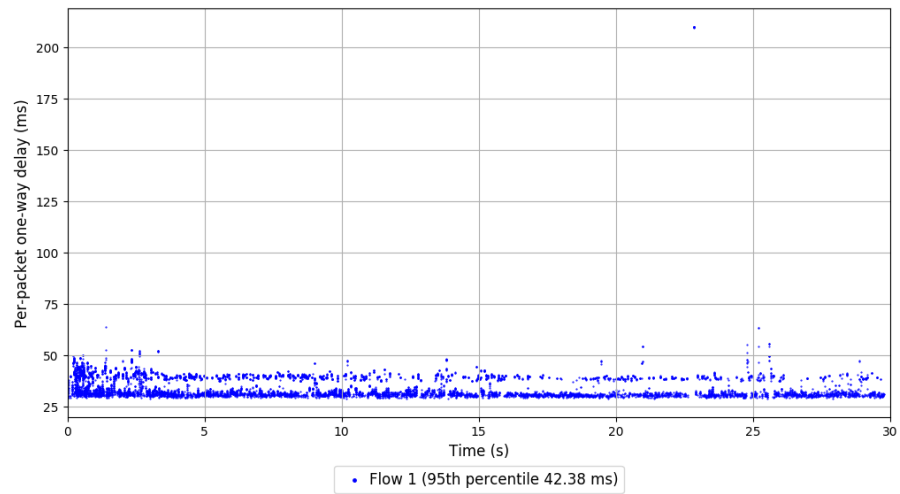
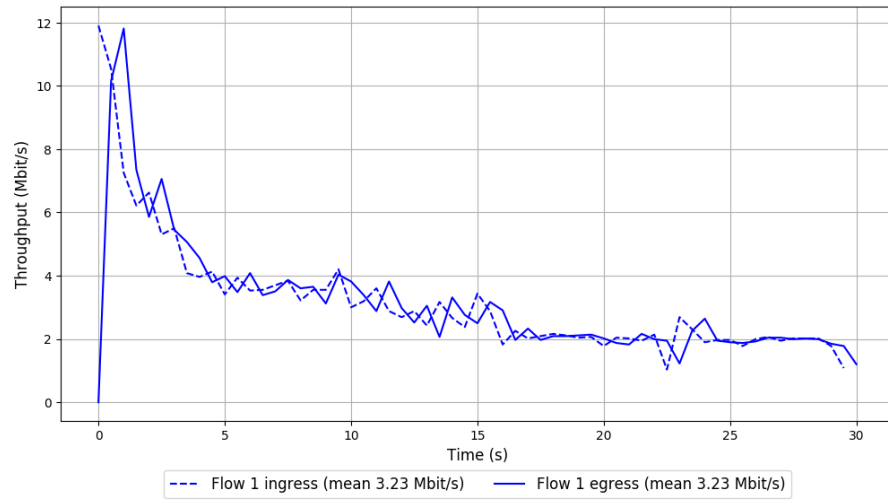
-- Flow 1:

Average throughput: 3.23 Mbit/s

95th percentile per-packet one-way delay: 42.385 ms

Loss rate: 0.05%

Run 3: Report of Indigo — Data Link



Run 1: Statistics of Indigo-MusesC3

Start at: 2019-01-17 03:16:31

End at: 2019-01-17 03:17:01

Local clock offset: 3.596 ms

Remote clock offset: 1.448 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 4.85 Mbit/s

95th percentile per-packet one-way delay: 43.983 ms

Loss rate: 0.02%

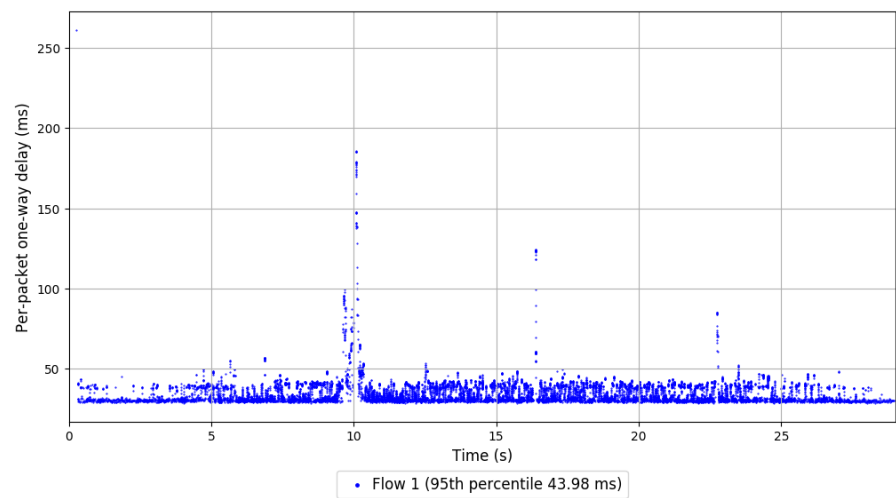
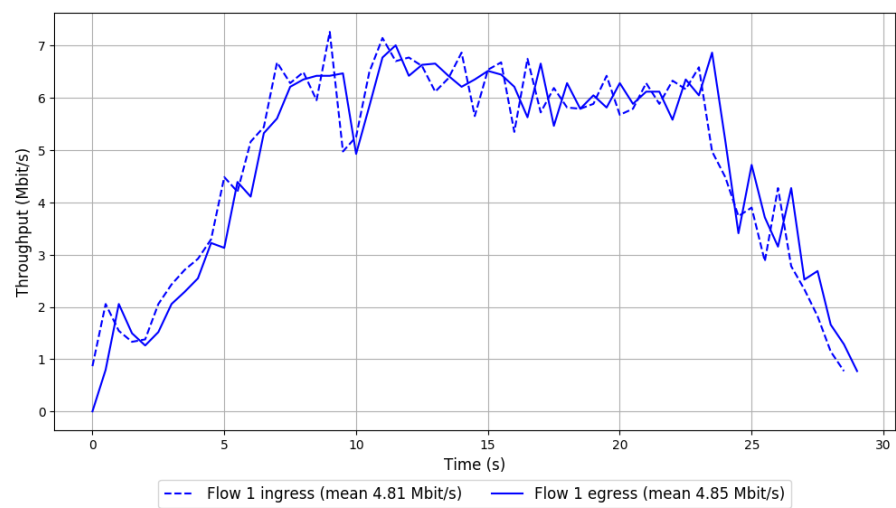
-- Flow 1:

Average throughput: 4.85 Mbit/s

95th percentile per-packet one-way delay: 43.983 ms

Loss rate: 0.02%

Run 1: Report of Indigo-MusesC3 — Data Link



Run 2: Statistics of Indigo-MusesC3

Start at: 2019-01-17 03:39:45

End at: 2019-01-17 03:40:15

Local clock offset: 3.204 ms

Remote clock offset: 4.814 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 5.97 Mbit/s

95th percentile per-packet one-way delay: 46.955 ms

Loss rate: 0.06%

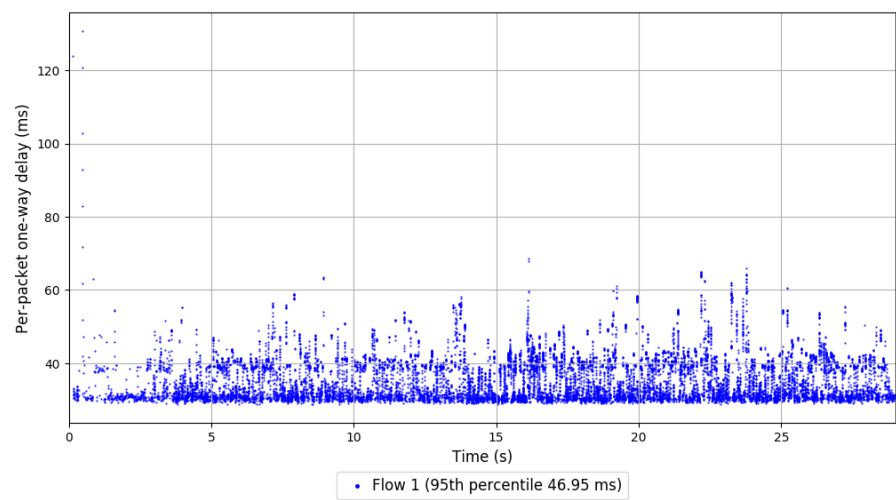
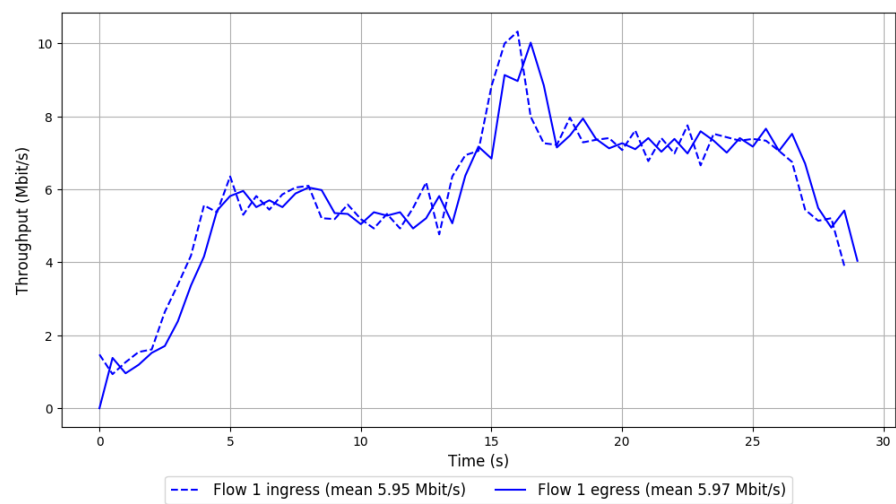
-- Flow 1:

Average throughput: 5.97 Mbit/s

95th percentile per-packet one-way delay: 46.955 ms

Loss rate: 0.06%

Run 2: Report of Indigo-MusesC3 — Data Link



Run 3: Statistics of Indigo-MusesC3

Start at: 2019-01-17 04:02:57

End at: 2019-01-17 04:03:27

Local clock offset: 0.336 ms

Remote clock offset: 6.616 ms

Below is generated by plot.py at 2019-01-17 04:22:51

Datalink statistics

-- Total of 1 flow:

Average throughput: 5.70 Mbit/s

95th percentile per-packet one-way delay: 45.504 ms

Loss rate: 0.13%

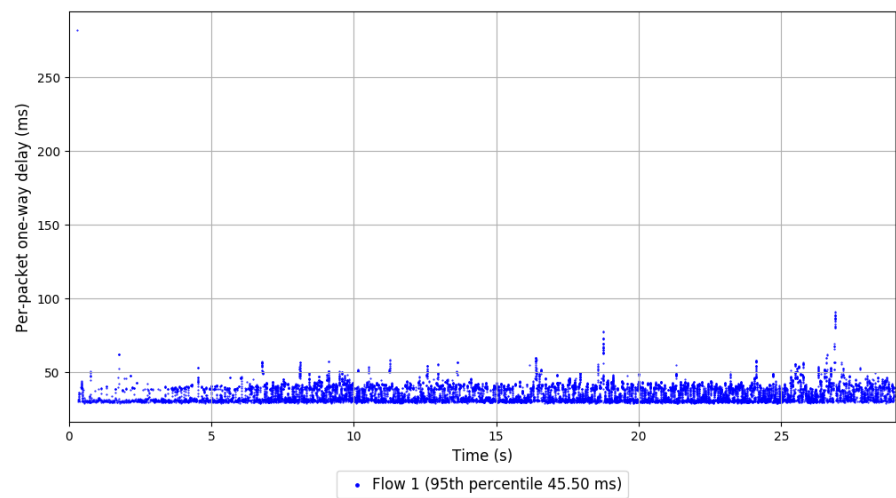
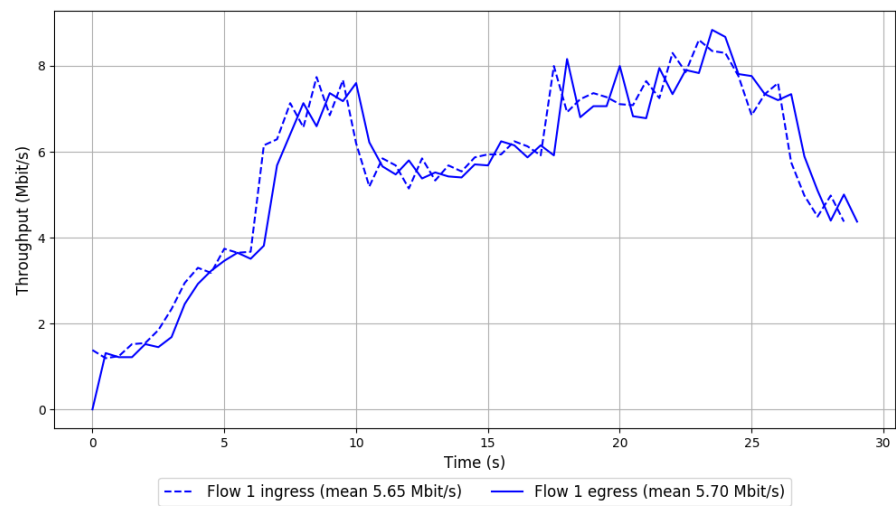
-- Flow 1:

Average throughput: 5.70 Mbit/s

95th percentile per-packet one-way delay: 45.504 ms

Loss rate: 0.13%

Run 3: Report of Indigo-MusesC3 — Data Link



Run 1: Statistics of Indigo-MusesC5

Start at: 2019-01-17 03:29:59

End at: 2019-01-17 03:30:29

Local clock offset: 3.294 ms

Remote clock offset: 3.829 ms

Below is generated by plot.py at 2019-01-17 04:22:55

Datalink statistics

-- Total of 1 flow:

Average throughput: 28.00 Mbit/s

95th percentile per-packet one-way delay: 250.817 ms

Loss rate: 0.61%

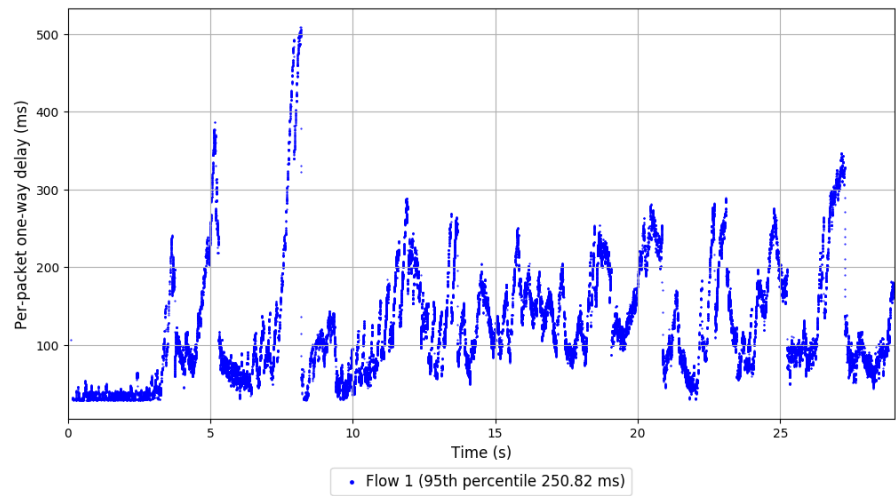
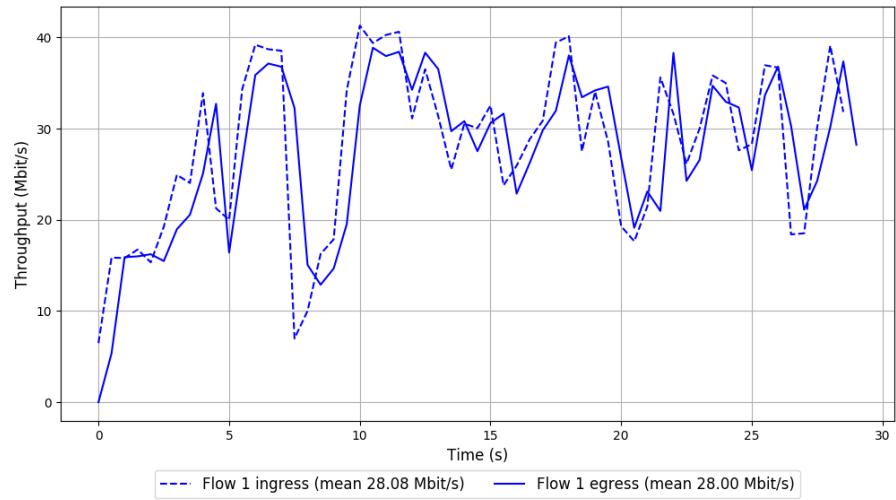
-- Flow 1:

Average throughput: 28.00 Mbit/s

95th percentile per-packet one-way delay: 250.817 ms

Loss rate: 0.61%

Run 1: Report of Indigo-MusesC5 — Data Link



Run 2: Statistics of Indigo-MusesC5

Start at: 2019-01-17 03:53:13

End at: 2019-01-17 03:53:43

Local clock offset: 2.187 ms

Remote clock offset: 5.912 ms

Below is generated by plot.py at 2019-01-17 04:22:55

Datalink statistics

-- Total of 1 flow:

Average throughput: 4.82 Mbit/s

95th percentile per-packet one-way delay: 40.029 ms

Loss rate: 0.03%

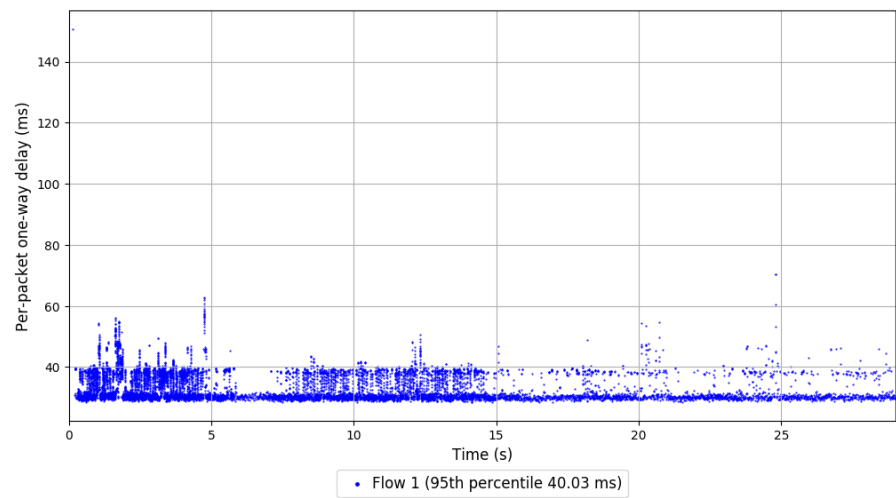
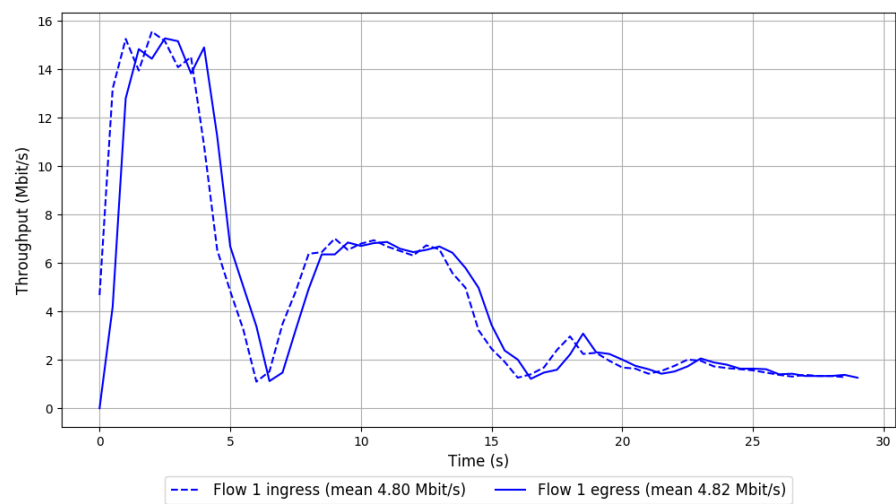
-- Flow 1:

Average throughput: 4.82 Mbit/s

95th percentile per-packet one-way delay: 40.029 ms

Loss rate: 0.03%

Run 2: Report of Indigo-MusesC5 — Data Link



Run 3: Statistics of Indigo-MusesC5

Start at: 2019-01-17 04:16:26

End at: 2019-01-17 04:16:56

Local clock offset: -0.747 ms

Remote clock offset: 7.692 ms

Below is generated by plot.py at 2019-01-17 04:22:55

Datalink statistics

-- Total of 1 flow:

Average throughput: 20.66 Mbit/s

95th percentile per-packet one-way delay: 274.847 ms

Loss rate: 0.49%

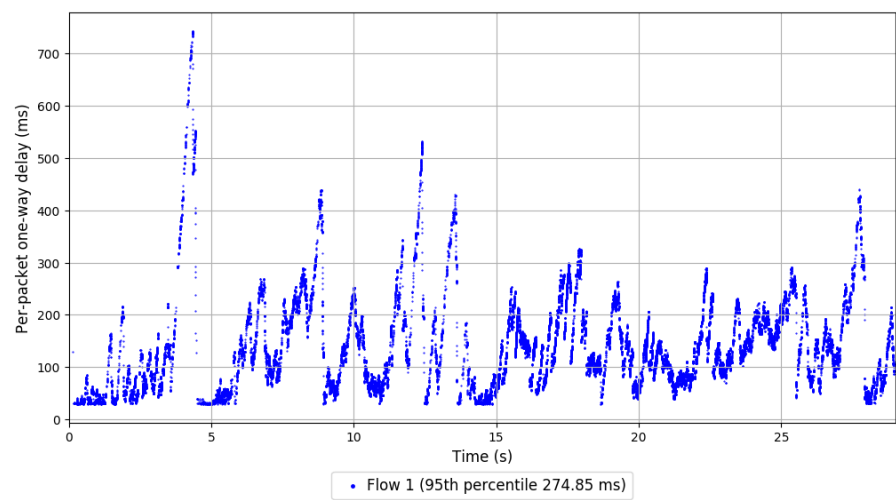
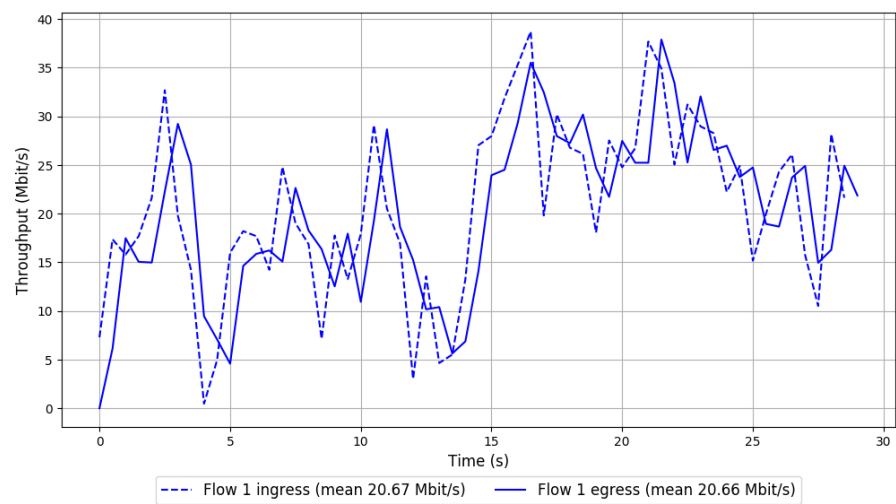
-- Flow 1:

Average throughput: 20.66 Mbit/s

95th percentile per-packet one-way delay: 274.847 ms

Loss rate: 0.49%

Run 3: Report of Indigo-MusesC5 — Data Link

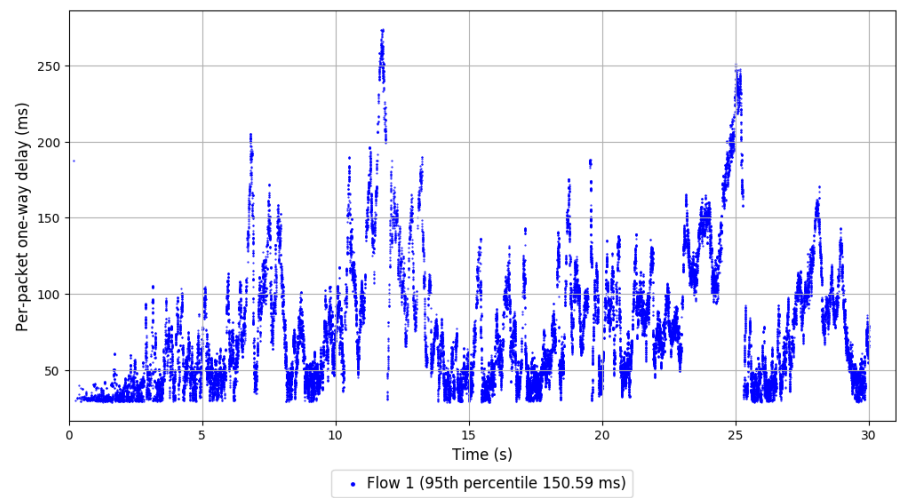
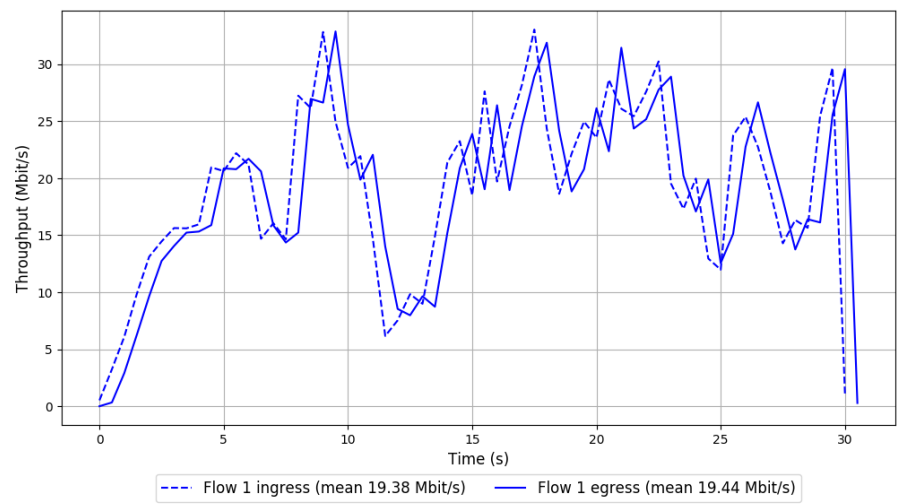


```
Run 1: Statistics of LEDBAT

Start at: 2019-01-17 03:26:19
End at: 2019-01-17 03:26:49
Local clock offset: 3.362 ms
Remote clock offset: 3.444 ms

# Below is generated by plot.py at 2019-01-17 04:22:55
# Datalink statistics
-- Total of 1 flow:
Average throughput: 19.44 Mbit/s
95th percentile per-packet one-way delay: 150.592 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 19.44 Mbit/s
95th percentile per-packet one-way delay: 150.592 ms
Loss rate: 0.34%
```

Run 1: Report of LEDBAT — Data Link



Run 2: Statistics of LEDBAT

Start at: 2019-01-17 03:49:32

End at: 2019-01-17 03:50:02

Local clock offset: 3.245 ms

Remote clock offset: 5.608 ms

Below is generated by plot.py at 2019-01-17 04:22:55

Datalink statistics

-- Total of 1 flow:

Average throughput: 19.35 Mbit/s

95th percentile per-packet one-way delay: 153.003 ms

Loss rate: 0.38%

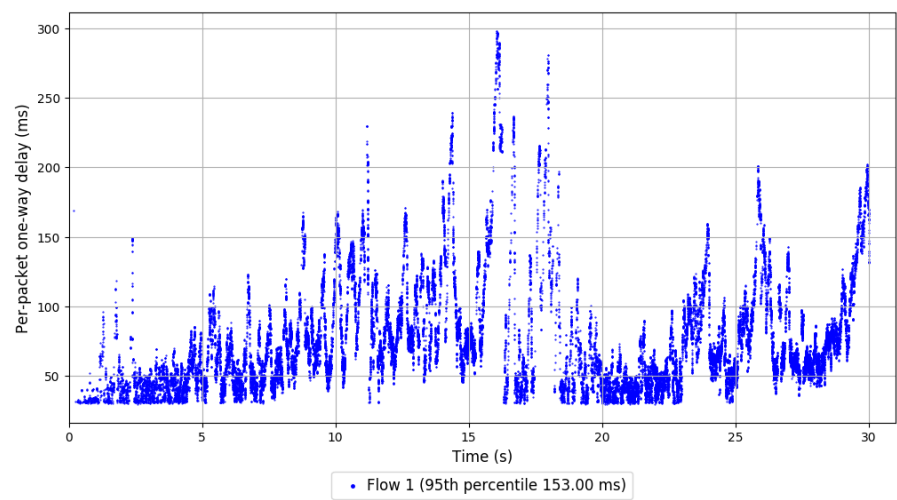
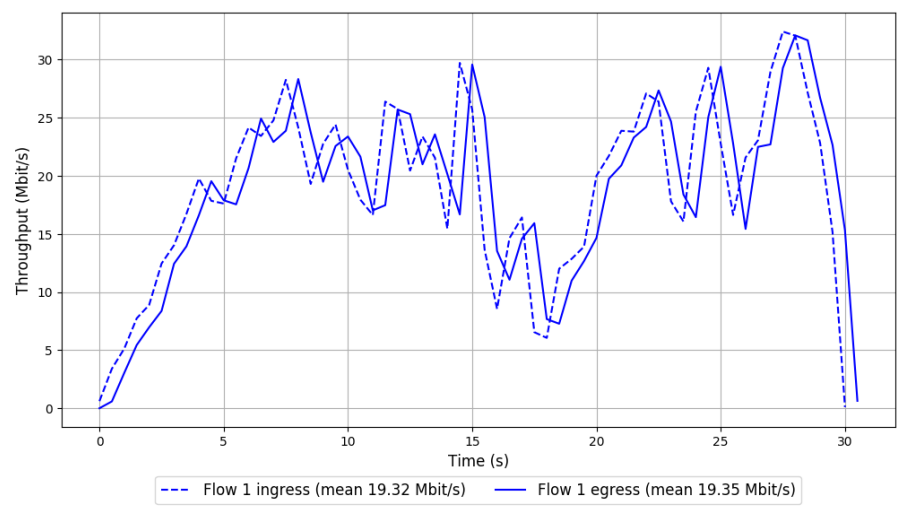
-- Flow 1:

Average throughput: 19.35 Mbit/s

95th percentile per-packet one-way delay: 153.003 ms

Loss rate: 0.38%

Run 2: Report of LEDBAT — Data Link



Run 3: Statistics of LEDBAT

Start at: 2019-01-17 04:12:45

End at: 2019-01-17 04:13:15

Local clock offset: -0.544 ms

Remote clock offset: 7.369 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 29.48 Mbit/s

95th percentile per-packet one-way delay: 112.043 ms

Loss rate: 0.18%

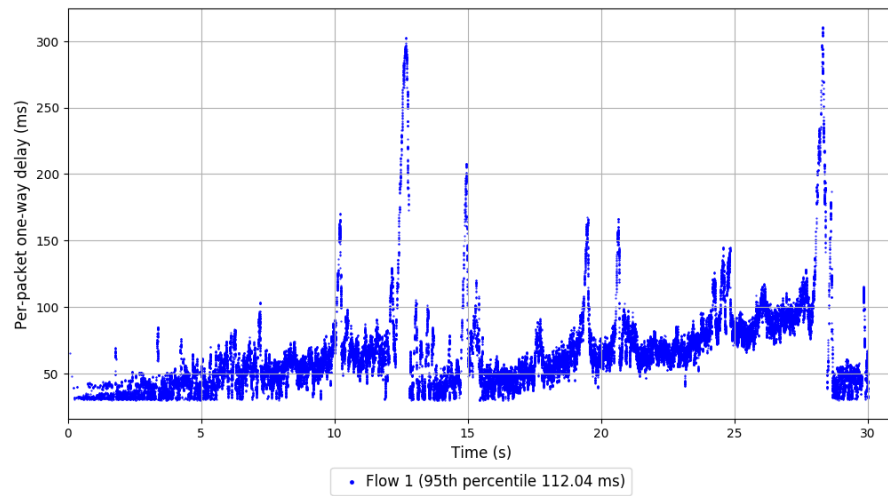
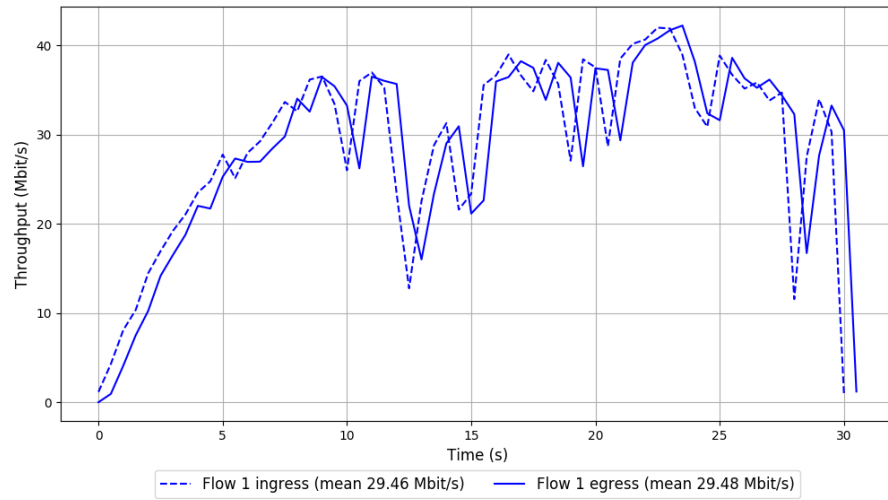
-- Flow 1:

Average throughput: 29.48 Mbit/s

95th percentile per-packet one-way delay: 112.043 ms

Loss rate: 0.18%

Run 3: Report of LEDBAT — Data Link



Run 1: Statistics of PCC-Allegro

Start at: 2019-01-17 03:31:13

End at: 2019-01-17 03:31:43

Local clock offset: 3.272 ms

Remote clock offset: 4.101 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 15.44 Mbit/s

95th percentile per-packet one-way delay: 677.578 ms

Loss rate: 0.15%

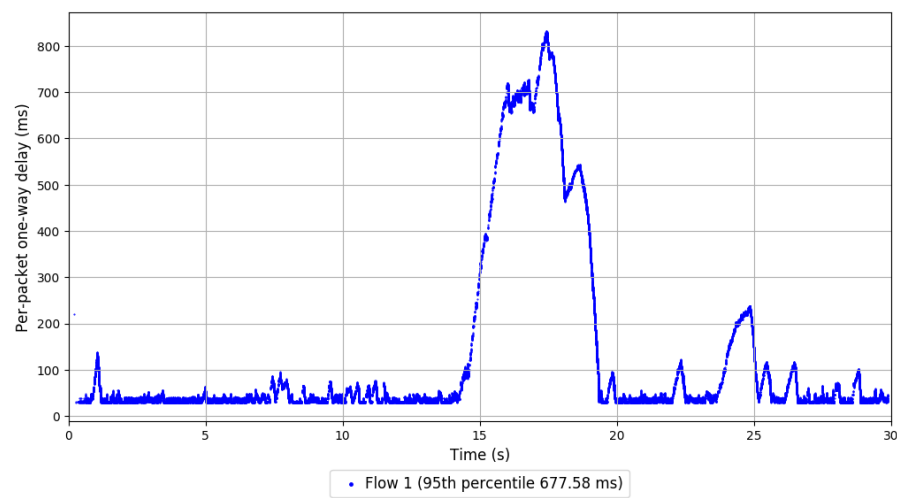
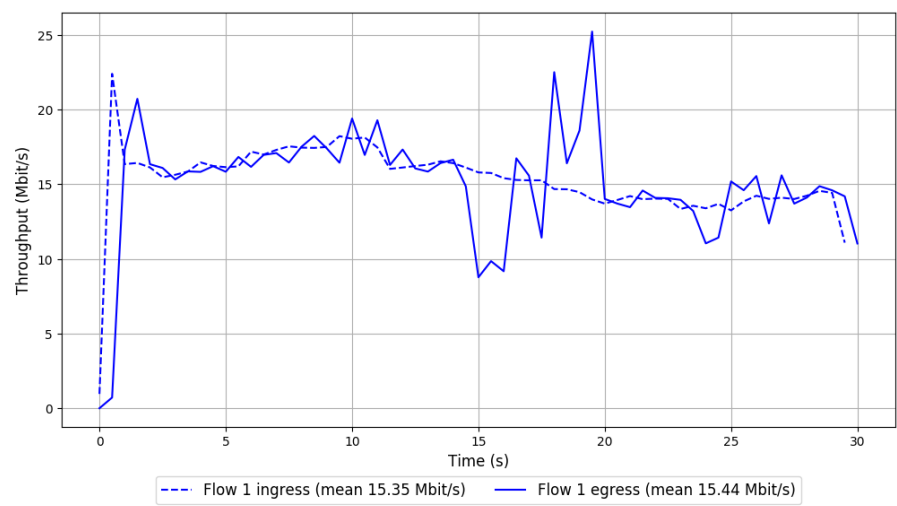
-- Flow 1:

Average throughput: 15.44 Mbit/s

95th percentile per-packet one-way delay: 677.578 ms

Loss rate: 0.15%

Run 1: Report of PCC-Allegro — Data Link



Run 2: Statistics of PCC-Allegro

Start at: 2019-01-17 03:54:26

End at: 2019-01-17 03:54:56

Local clock offset: 1.83 ms

Remote clock offset: 5.92 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.97 Mbit/s

95th percentile per-packet one-way delay: 38.470 ms

Loss rate: 0.11%

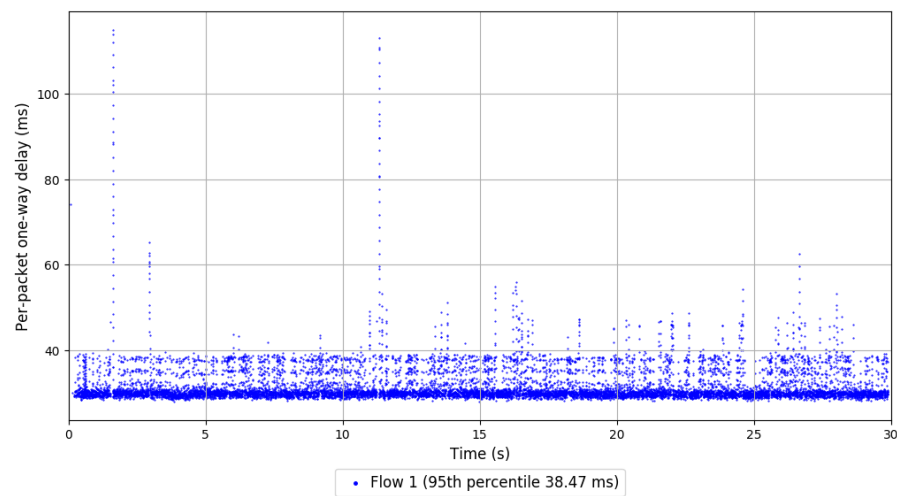
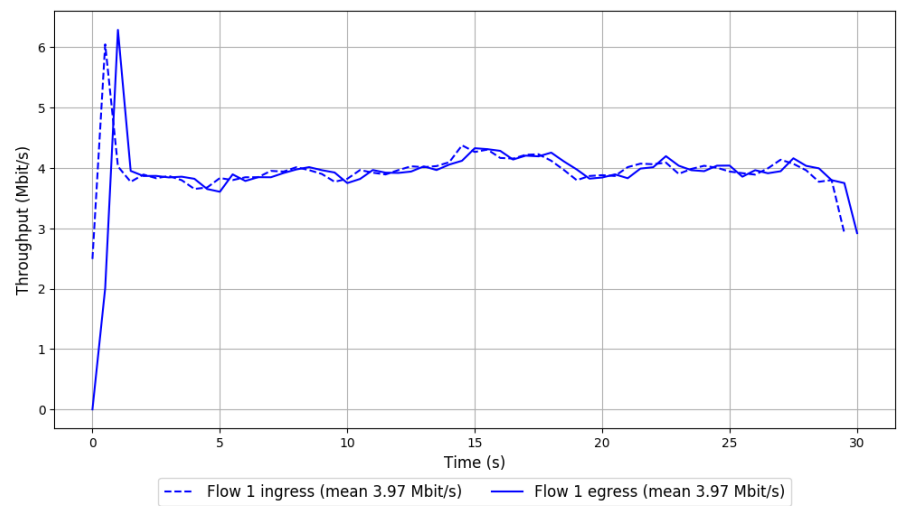
-- Flow 1:

Average throughput: 3.97 Mbit/s

95th percentile per-packet one-way delay: 38.470 ms

Loss rate: 0.11%

Run 2: Report of PCC-Allegro — Data Link



Run 3: Statistics of PCC-Allegro

Start at: 2019-01-17 04:17:39

End at: 2019-01-17 04:18:09

Local clock offset: -0.828 ms

Remote clock offset: 7.729 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 17.42 Mbit/s

95th percentile per-packet one-way delay: 463.834 ms

Loss rate: 0.31%

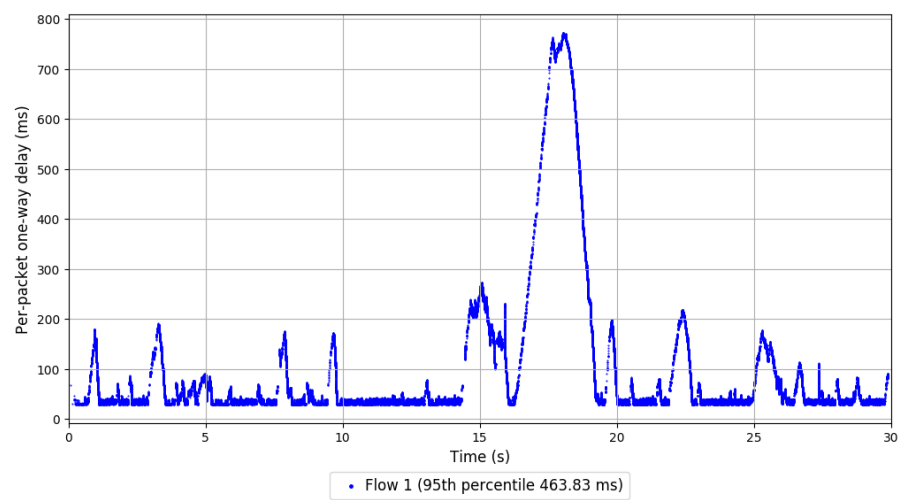
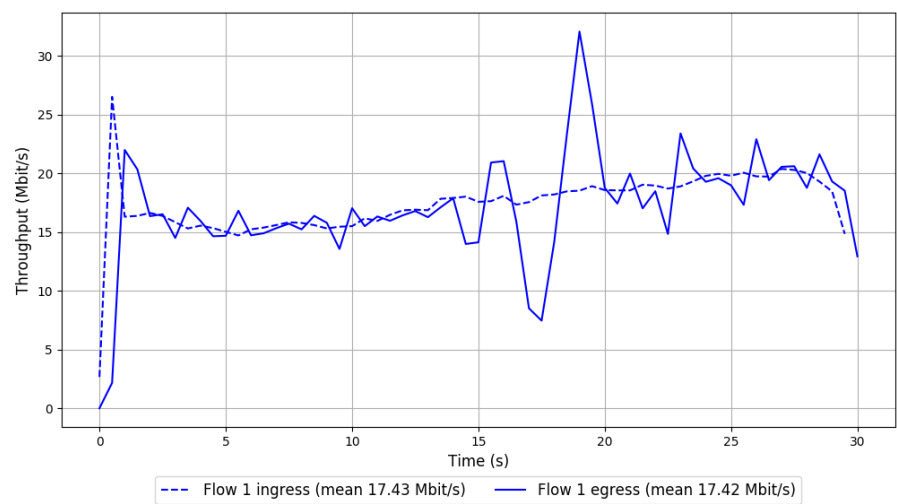
-- Flow 1:

Average throughput: 17.42 Mbit/s

95th percentile per-packet one-way delay: 463.834 ms

Loss rate: 0.31%

Run 3: Report of PCC-Allegro — Data Link

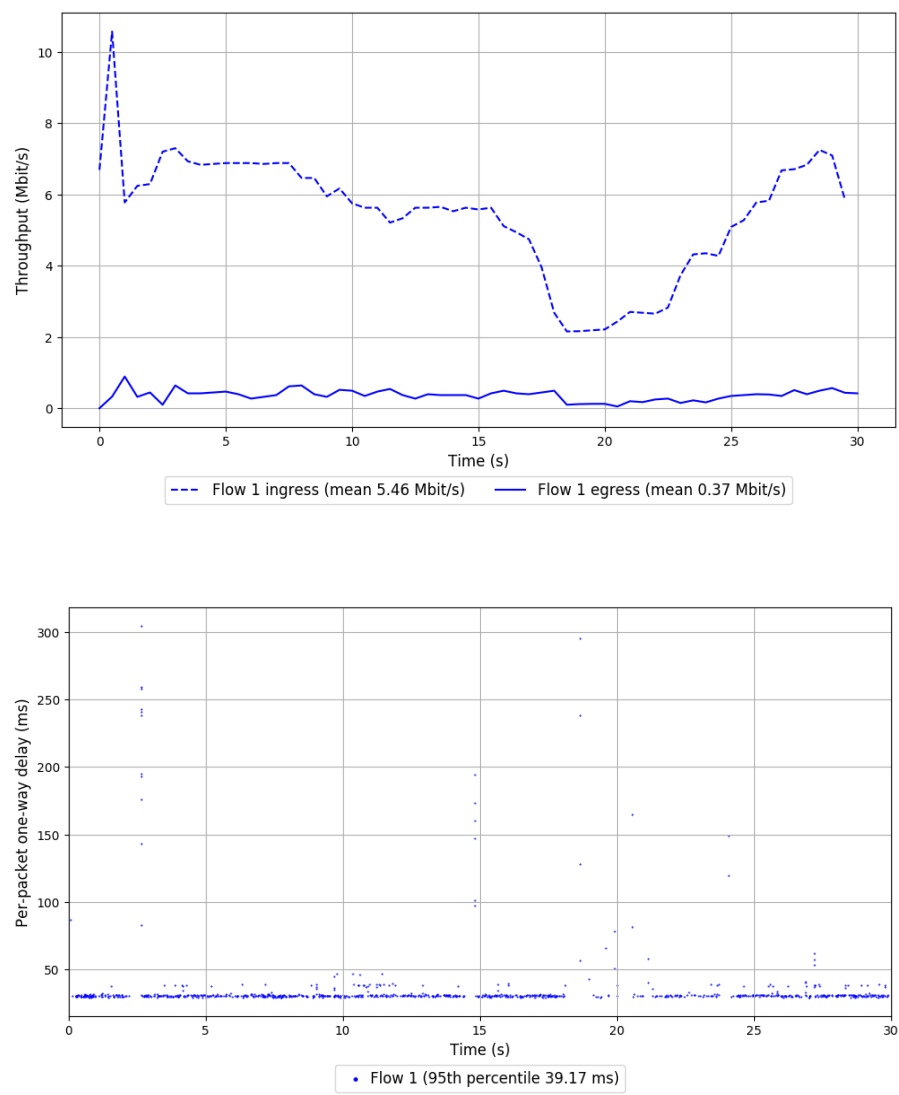



```
Run 1: Statistics of PCC-Expr

Start at: 2019-01-17 03:23:52
End at: 2019-01-17 03:24:22
Local clock offset: 3.441 ms
Remote clock offset: 2.977 ms

# Below is generated by plot.py at 2019-01-17 04:23:11
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 39.167 ms
Loss rate: 93.25%
-- Flow 1:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 39.167 ms
Loss rate: 93.25%
```

Run 1: Report of PCC-Expr — Data Link



Run 2: Statistics of PCC-Expr

Start at: 2019-01-17 03:47:05

End at: 2019-01-17 03:47:35

Local clock offset: 3.224 ms

Remote clock offset: 5.364 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.49 Mbit/s

95th percentile per-packet one-way delay: 38.962 ms

Loss rate: 39.29%

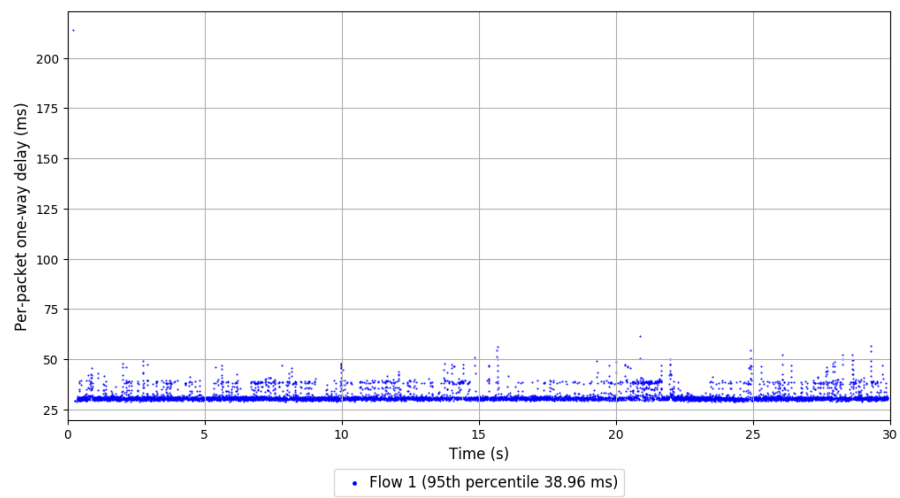
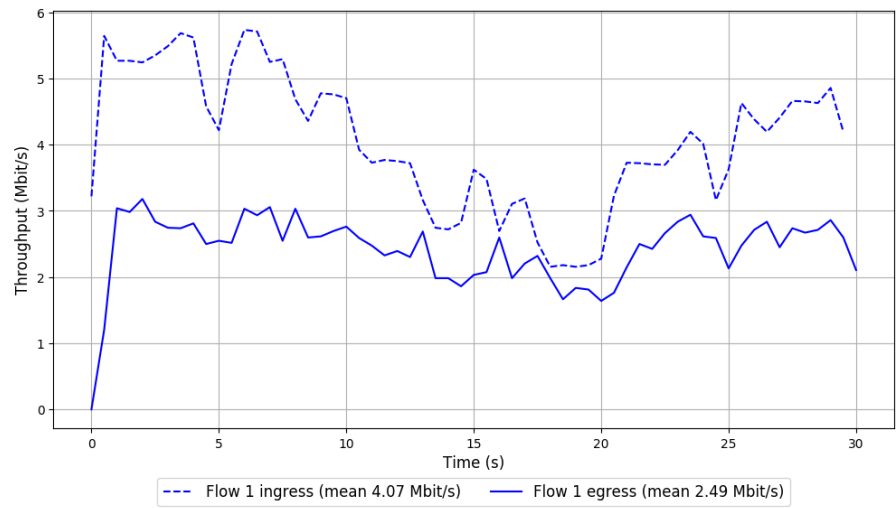
-- Flow 1:

Average throughput: 2.49 Mbit/s

95th percentile per-packet one-way delay: 38.962 ms

Loss rate: 39.29%

Run 2: Report of PCC-Expr — Data Link



Run 3: Statistics of PCC-Expr

Start at: 2019-01-17 04:10:18

End at: 2019-01-17 04:10:48

Local clock offset: -0.354 ms

Remote clock offset: 7.25 ms

Below is generated by plot.py at 2019-01-17 04:23:11

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.49 Mbit/s

95th percentile per-packet one-way delay: 39.306 ms

Loss rate: 54.48%

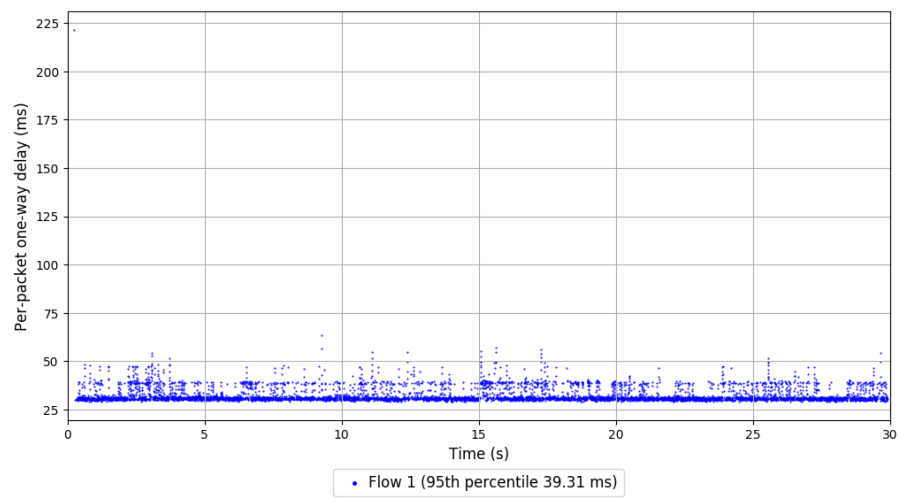
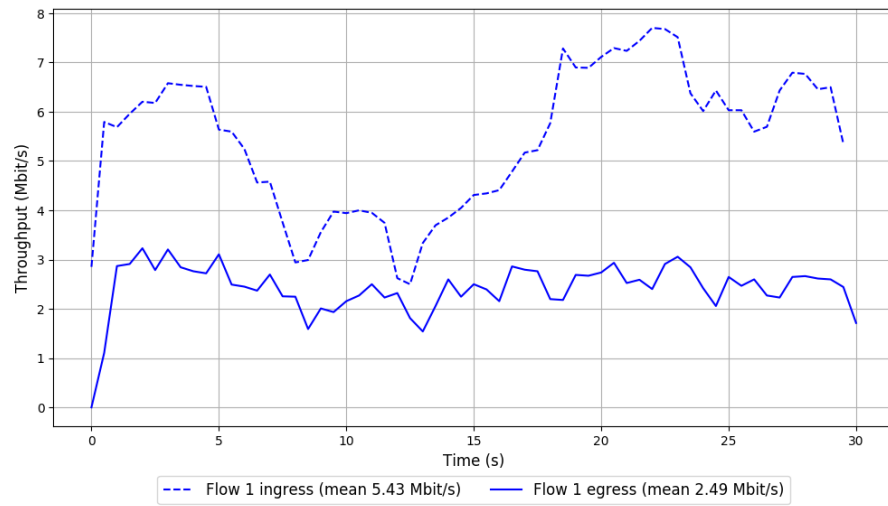
-- Flow 1:

Average throughput: 2.49 Mbit/s

95th percentile per-packet one-way delay: 39.306 ms

Loss rate: 54.48%

Run 3: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2019-01-17 03:21:25

End at: 2019-01-17 03:21:55

Local clock offset: 3.557 ms

Remote clock offset: 2.545 ms

Below is generated by plot.py at 2019-01-17 04:23:17

Datalink statistics

-- Total of 1 flow:

Average throughput: 21.11 Mbit/s

95th percentile per-packet one-way delay: 209.380 ms

Loss rate: 0.68%

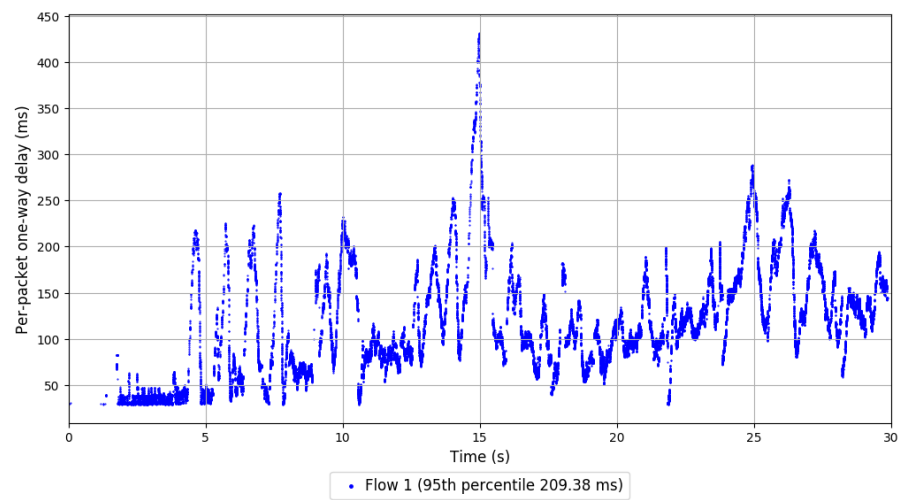
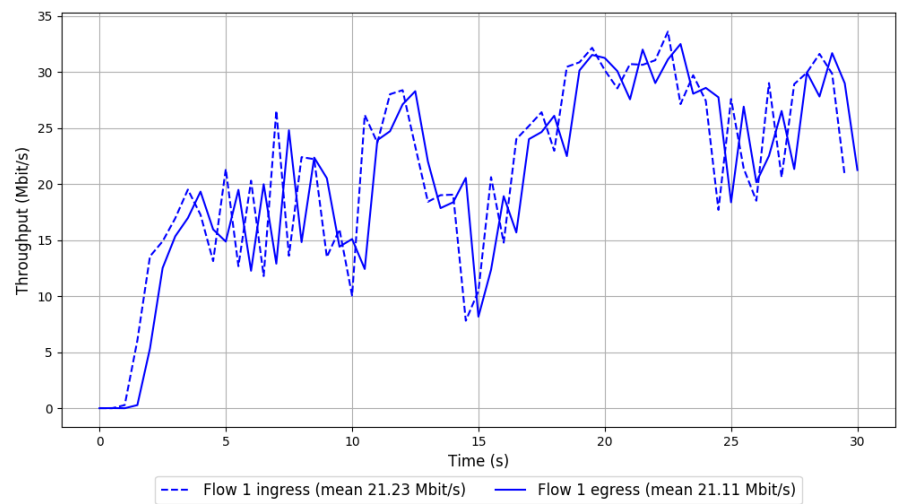
-- Flow 1:

Average throughput: 21.11 Mbit/s

95th percentile per-packet one-way delay: 209.380 ms

Loss rate: 0.68%

Run 1: Report of QUIC Cubic — Data Link



Run 2: Statistics of QUIC Cubic

Start at: 2019-01-17 03:44:38

End at: 2019-01-17 03:45:08

Local clock offset: 3.205 ms

Remote clock offset: 5.177 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.70 Mbit/s

95th percentile per-packet one-way delay: 264.882 ms

Loss rate: 0.40%

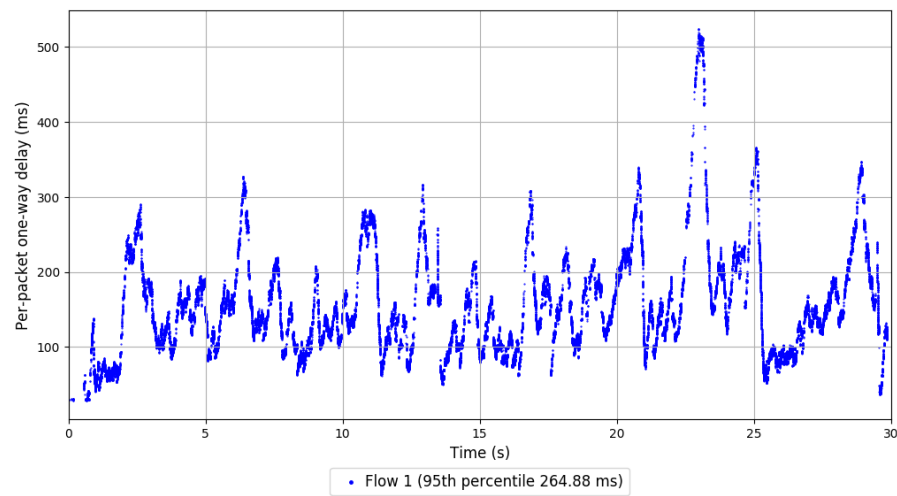
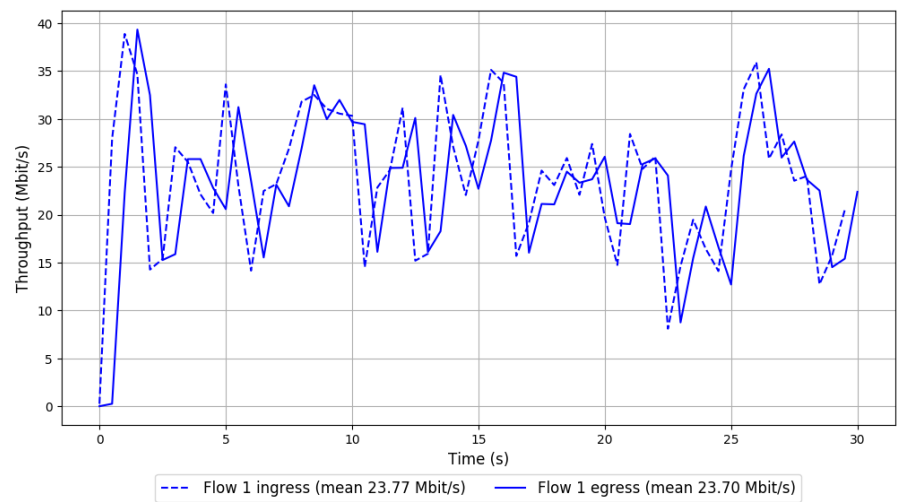
-- Flow 1:

Average throughput: 23.70 Mbit/s

95th percentile per-packet one-way delay: 264.882 ms

Loss rate: 0.40%

Run 2: Report of QUIC Cubic — Data Link



Run 3: Statistics of QUIC Cubic

Start at: 2019-01-17 04:07:50

End at: 2019-01-17 04:08:20

Local clock offset: -0.177 ms

Remote clock offset: 6.942 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 23.27 Mbit/s

95th percentile per-packet one-way delay: 249.542 ms

Loss rate: 0.45%

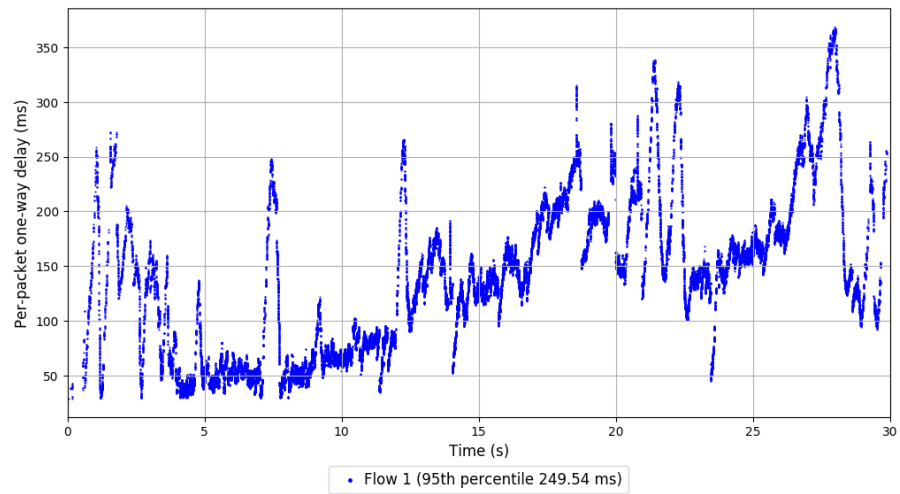
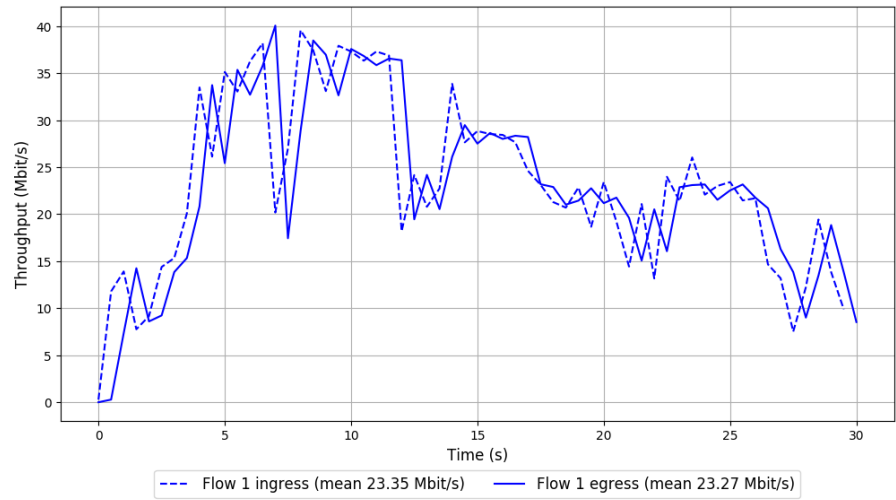
-- Flow 1:

Average throughput: 23.27 Mbit/s

95th percentile per-packet one-way delay: 249.542 ms

Loss rate: 0.45%

Run 3: Report of QUIC Cubic — Data Link



Run 1: Statistics of SCReAM

Start at: 2019-01-17 03:33:39

End at: 2019-01-17 03:34:09

Local clock offset: 3.236 ms

Remote clock offset: 4.326 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 38.694 ms

Loss rate: 0.13%

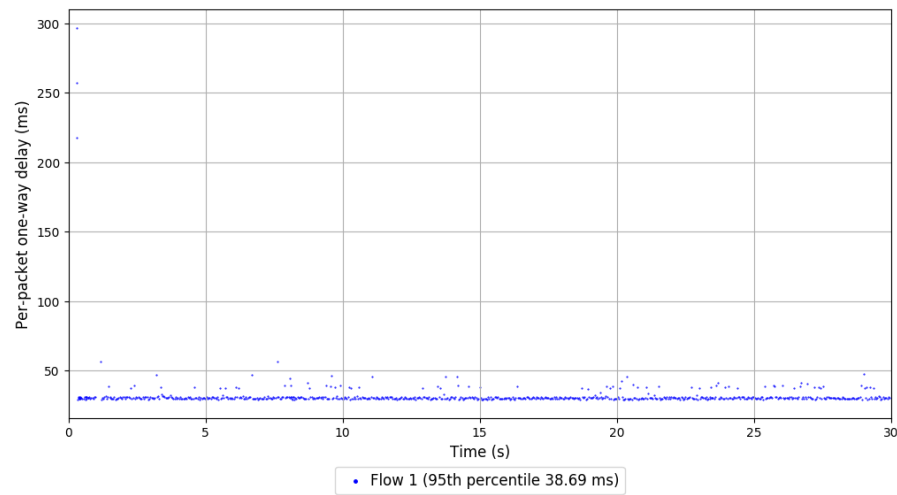
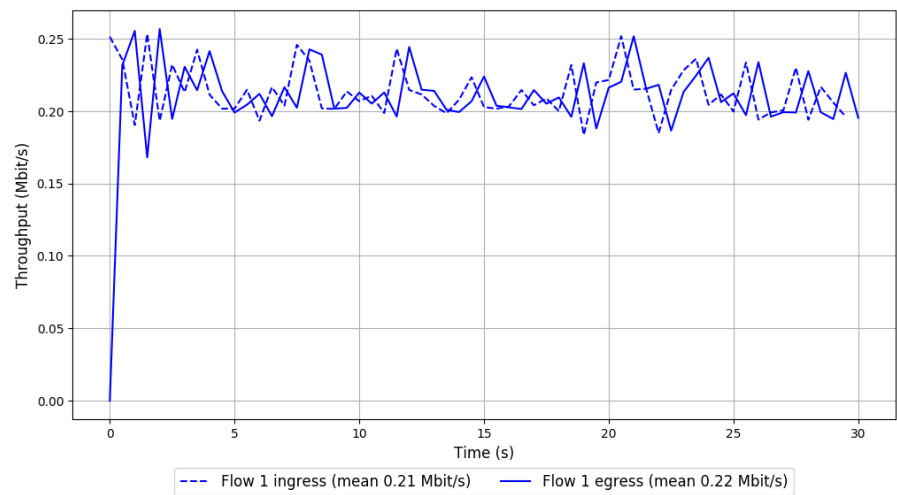
-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 38.694 ms

Loss rate: 0.13%

Run 1: Report of SReAM — Data Link



Run 2: Statistics of SCReAM

Start at: 2019-01-17 03:56:52

End at: 2019-01-17 03:57:22

Local clock offset: 1.291 ms

Remote clock offset: 6.194 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 38.782 ms

Loss rate: 0.13%

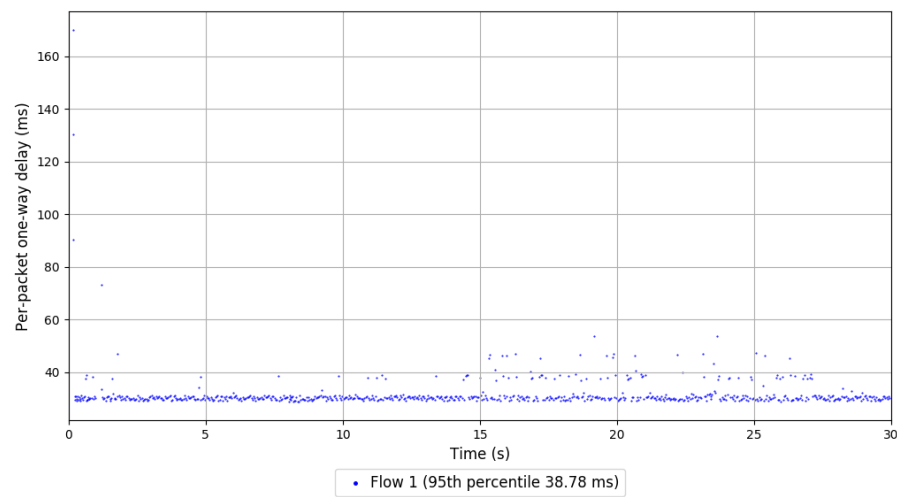
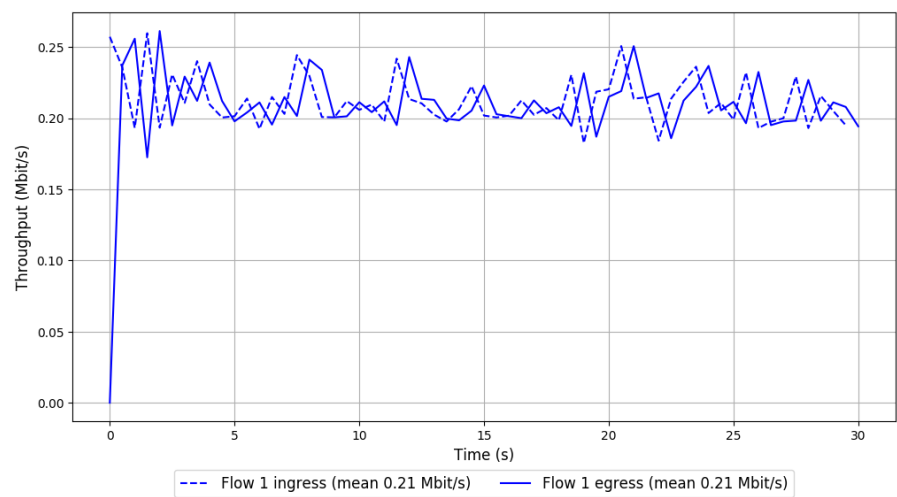
-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 38.782 ms

Loss rate: 0.13%

Run 2: Report of SReAM — Data Link



Run 3: Statistics of SCReAM

Start at: 2019-01-17 04:20:06

End at: 2019-01-17 04:20:36

Local clock offset: -0.944 ms

Remote clock offset: 7.372 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 49.041 ms

Loss rate: 0.13%

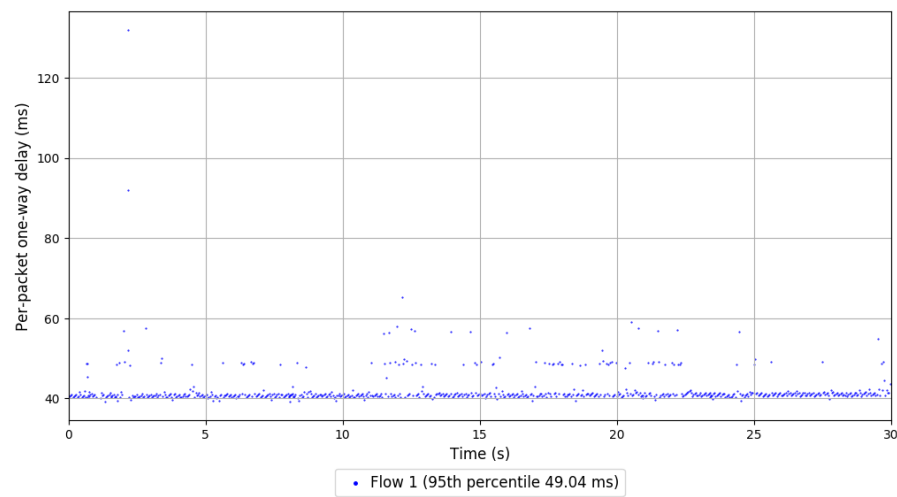
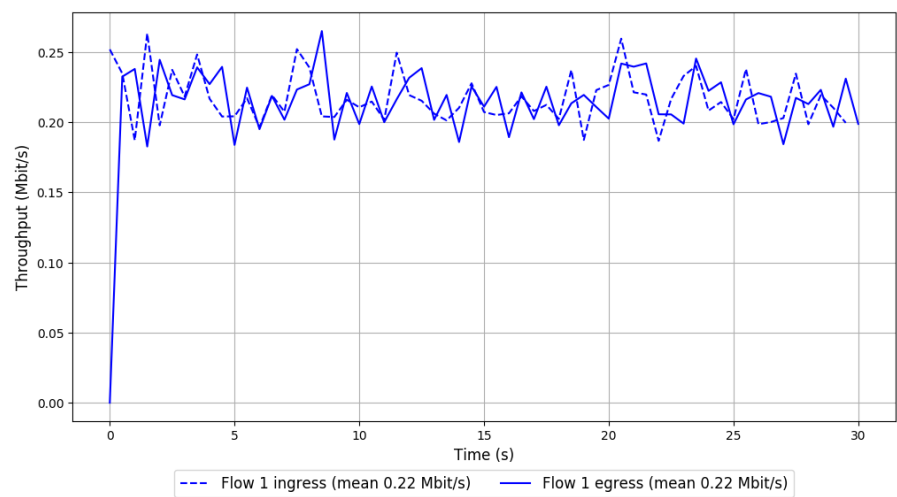
-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 49.041 ms

Loss rate: 0.13%

Run 3: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2019-01-17 03:18:58

End at: 2019-01-17 03:19:28

Local clock offset: 3.637 ms

Remote clock offset: 2.034 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 10.46 Mbit/s

95th percentile per-packet one-way delay: 79.150 ms

Loss rate: 0.11%

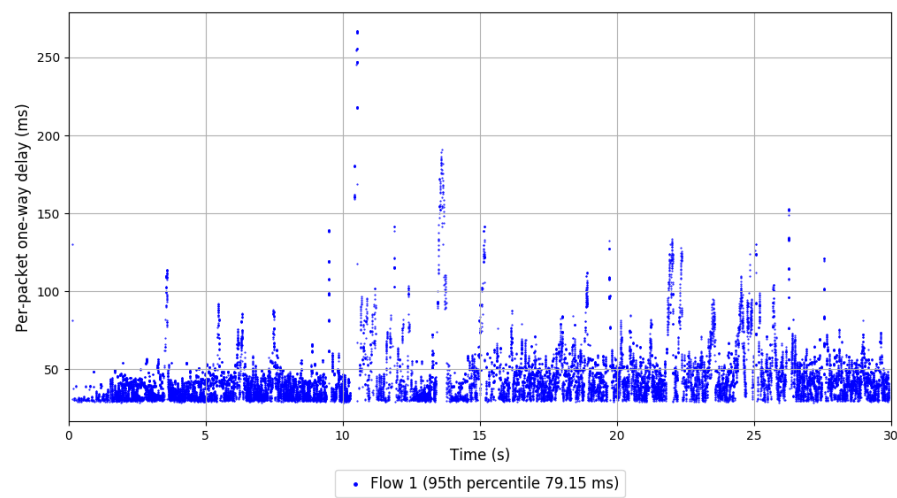
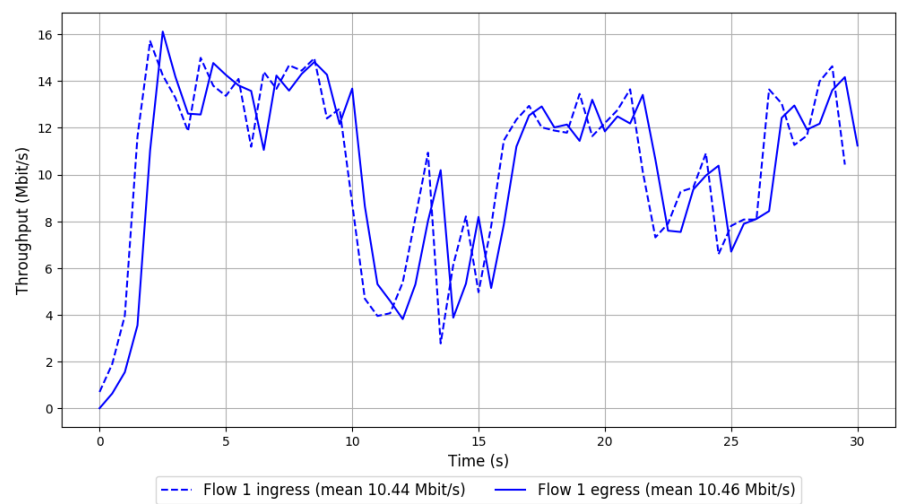
-- Flow 1:

Average throughput: 10.46 Mbit/s

95th percentile per-packet one-way delay: 79.150 ms

Loss rate: 0.11%

Run 1: Report of Sprout — Data Link



Run 2: Statistics of Sprout

Start at: 2019-01-17 03:42:12

End at: 2019-01-17 03:42:42

Local clock offset: 3.224 ms

Remote clock offset: 5.004 ms

Below is generated by plot.py at 2019-01-17 04:23:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 11.58 Mbit/s

95th percentile per-packet one-way delay: 69.611 ms

Loss rate: 0.15%

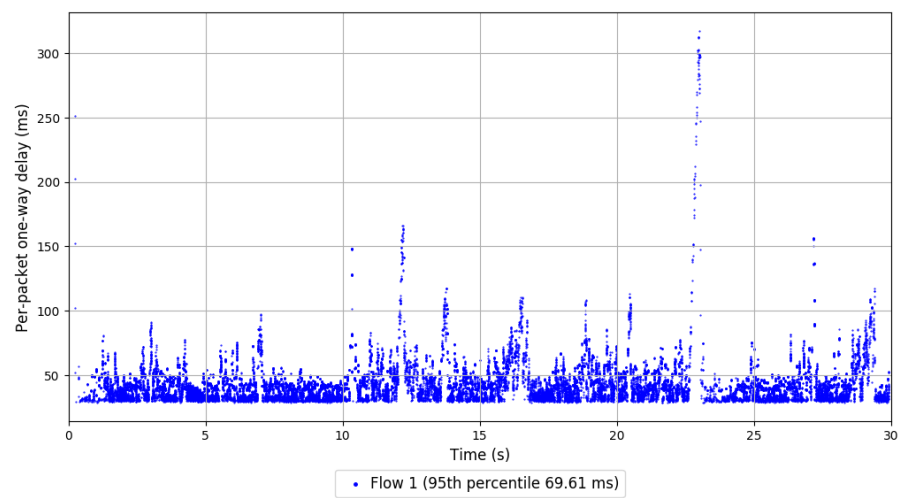
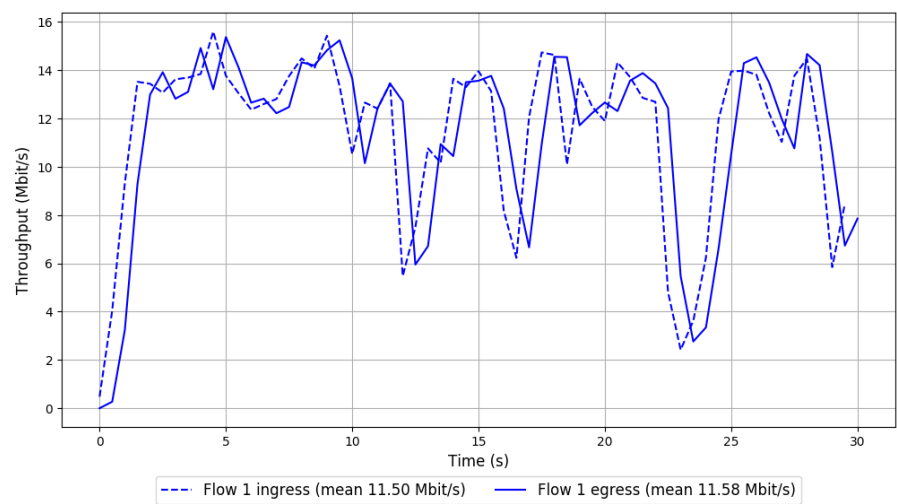
-- Flow 1:

Average throughput: 11.58 Mbit/s

95th percentile per-packet one-way delay: 69.611 ms

Loss rate: 0.15%

Run 2: Report of Sprout — Data Link

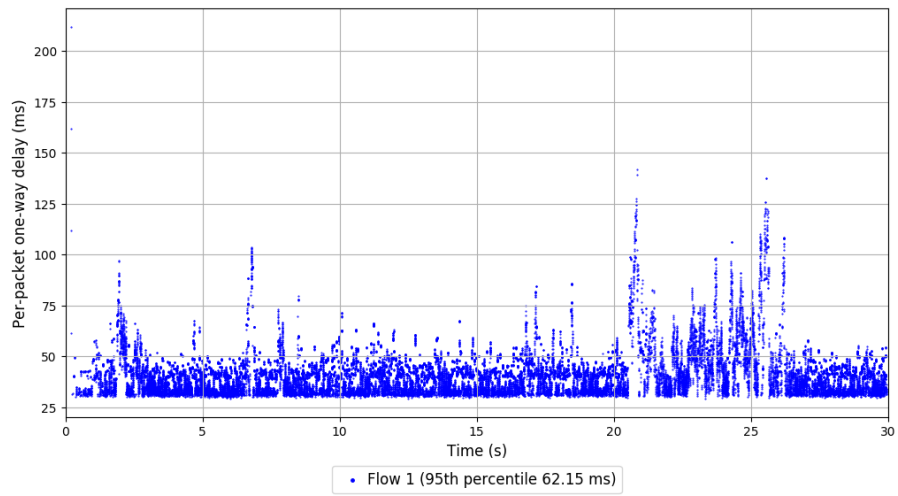
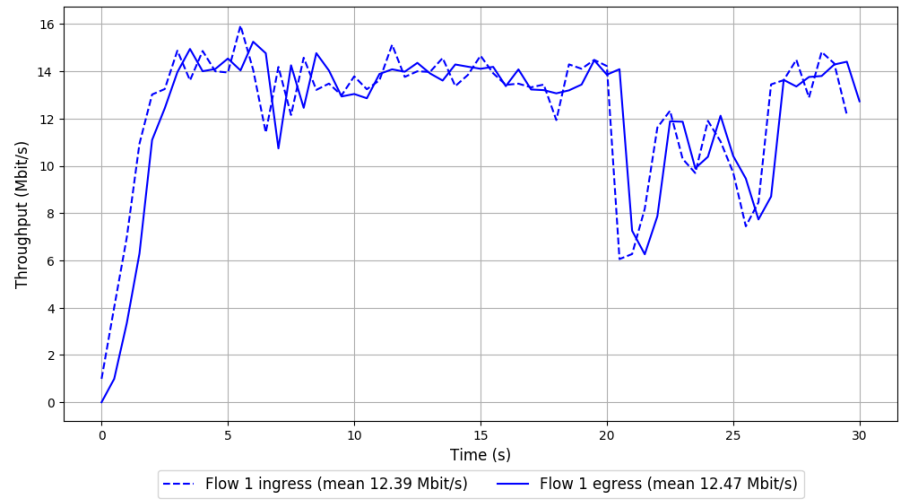


Run 3: Statistics of Sprout

Start at: 2019-01-17 04:05:24
End at: 2019-01-17 04:05:54
Local clock offset: 0.071 ms
Remote clock offset: 6.8 ms

Below is generated by plot.py at 2019-01-17 04:23:19
Datalink statistics
-- Total of 1 flow:
Average throughput: 12.47 Mbit/s
95th percentile per-packet one-way delay: 62.152 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 12.47 Mbit/s
95th percentile per-packet one-way delay: 62.152 ms
Loss rate: 0.07%

Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

Start at: 2019-01-17 03:20:11

End at: 2019-01-17 03:20:41

Local clock offset: 3.64 ms

Remote clock offset: 2.361 ms

Below is generated by plot.py at 2019-01-17 04:23:23

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.80 Mbit/s

95th percentile per-packet one-way delay: 39.452 ms

Loss rate: 98.26%

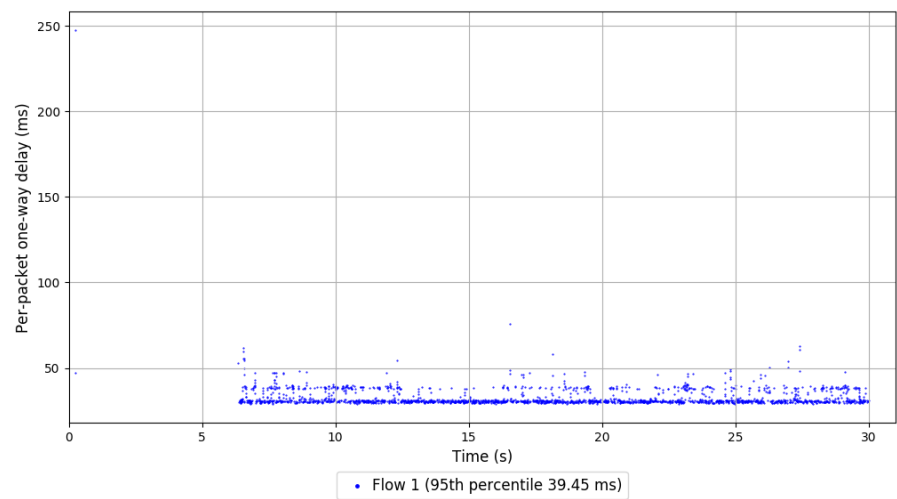
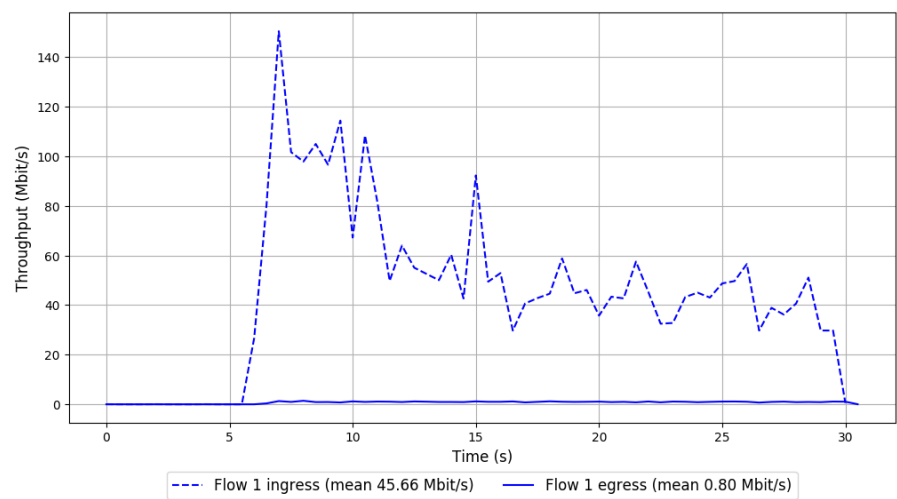
-- Flow 1:

Average throughput: 0.80 Mbit/s

95th percentile per-packet one-way delay: 39.452 ms

Loss rate: 98.26%

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



Run 2: Statistics of TaoVA-100x

Start at: 2019-01-17 03:43:25

End at: 2019-01-17 03:43:55

Local clock offset: 3.206 ms

Remote clock offset: 5.08 ms

Below is generated by plot.py at 2019-01-17 04:23:23

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.79 Mbit/s

95th percentile per-packet one-way delay: 40.357 ms

Loss rate: 39.42%

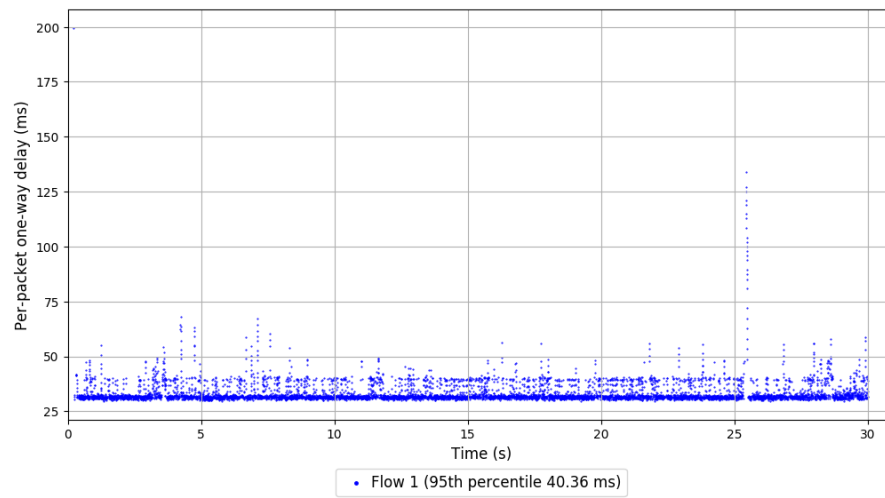
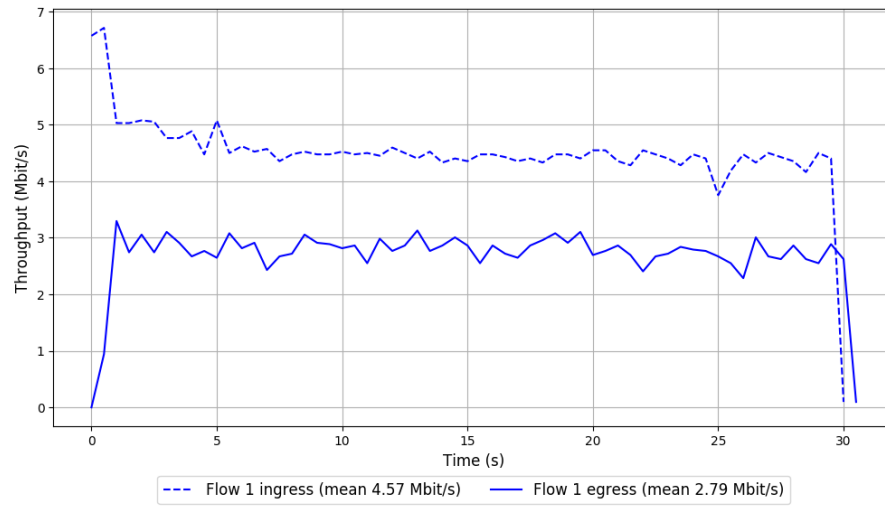
-- Flow 1:

Average throughput: 2.79 Mbit/s

95th percentile per-packet one-way delay: 40.357 ms

Loss rate: 39.42%

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



Run 3: Statistics of TaoVA-100x

Start at: 2019-01-17 04:06:37

End at: 2019-01-17 04:07:07

Local clock offset: -0.077 ms

Remote clock offset: 6.925 ms

Below is generated by plot.py at 2019-01-17 04:23:23

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.76 Mbit/s

95th percentile per-packet one-way delay: 39.019 ms

Loss rate: 39.24%

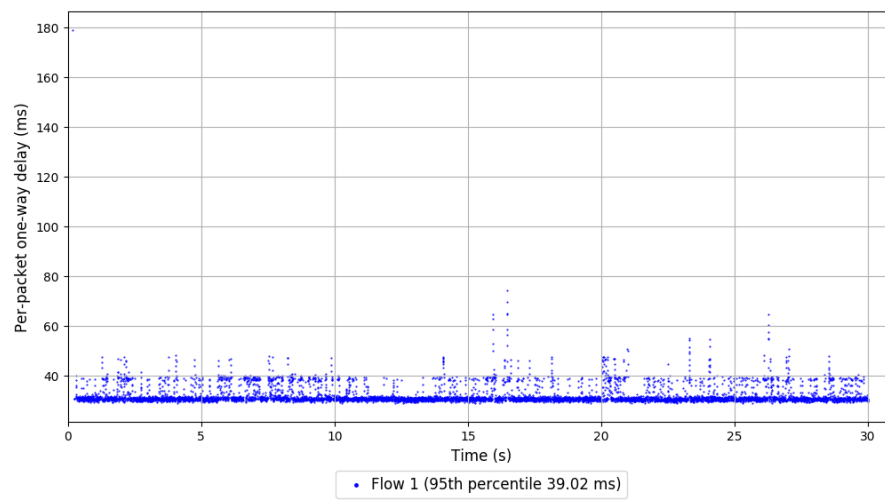
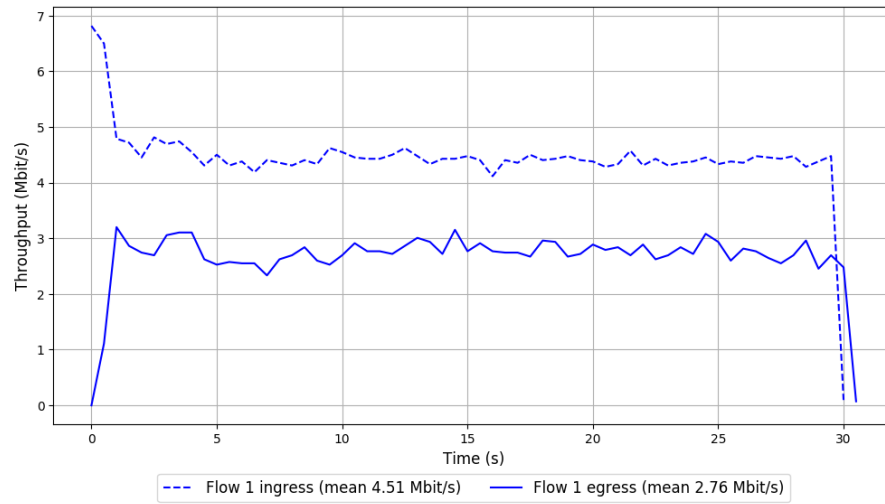
-- Flow 1:

Average throughput: 2.76 Mbit/s

95th percentile per-packet one-way delay: 39.019 ms

Loss rate: 39.24%

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



Run 1: Statistics of TCP Vegas

Start at: 2019-01-17 03:28:46

End at: 2019-01-17 03:29:16

Local clock offset: 3.29 ms

Remote clock offset: 3.693 ms

Below is generated by plot.py at 2019-01-17 04:23:27

Datalink statistics

-- Total of 1 flow:

Average throughput: 15.43 Mbit/s

95th percentile per-packet one-way delay: 333.539 ms

Loss rate: 0.05%

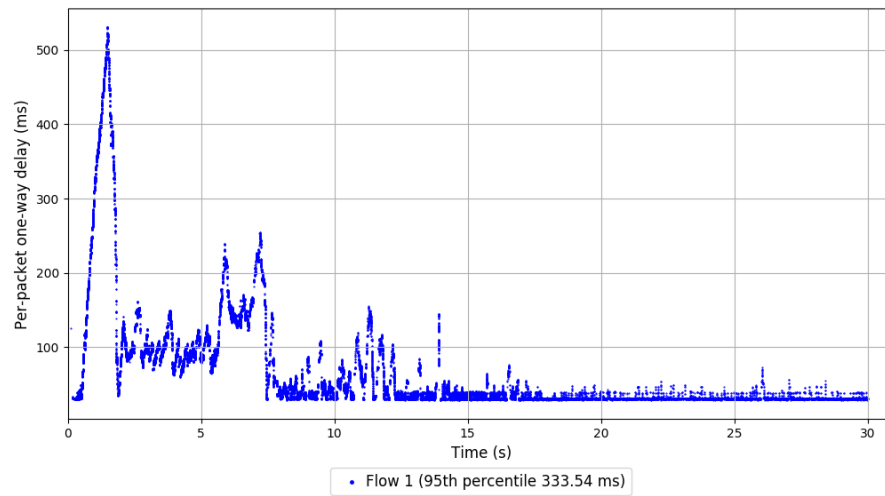
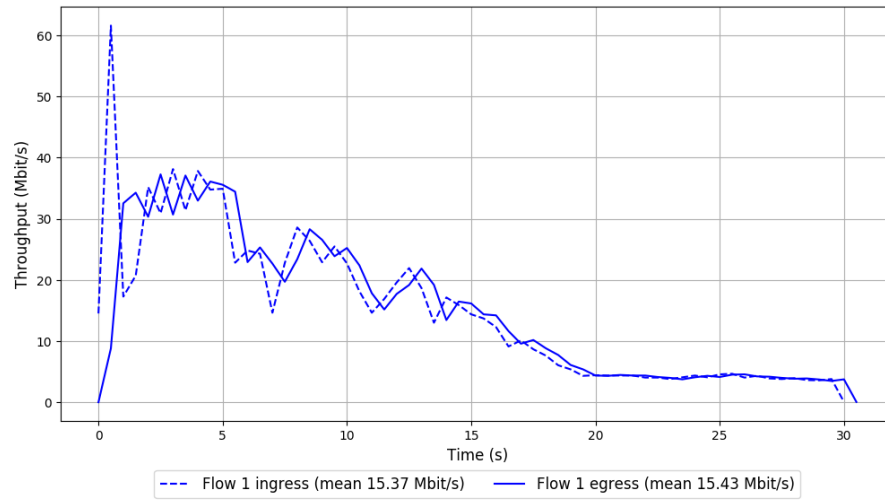
-- Flow 1:

Average throughput: 15.43 Mbit/s

95th percentile per-packet one-way delay: 333.539 ms

Loss rate: 0.05%

Run 1: Report of TCP Vegas — Data Link



Run 2: Statistics of TCP Vegas

Start at: 2019-01-17 03:51:59

End at: 2019-01-17 03:52:29

Local clock offset: 2.54 ms

Remote clock offset: 5.778 ms

Below is generated by plot.py at 2019-01-17 04:23:31

Datalink statistics

-- Total of 1 flow:

Average throughput: 18.30 Mbit/s

95th percentile per-packet one-way delay: 84.152 ms

Loss rate: 0.03%

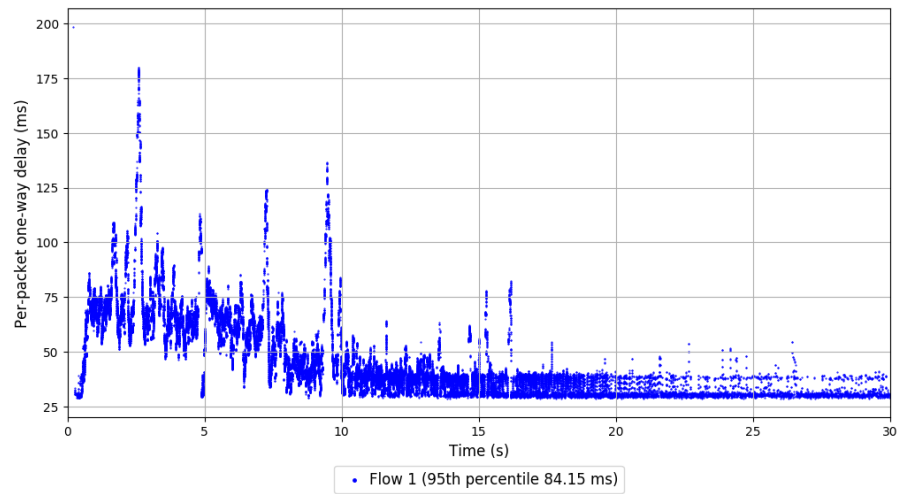
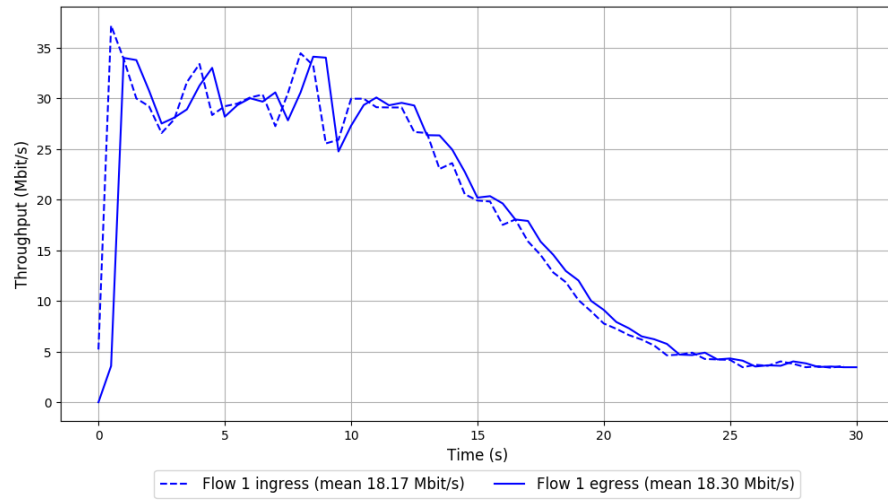
-- Flow 1:

Average throughput: 18.30 Mbit/s

95th percentile per-packet one-way delay: 84.152 ms

Loss rate: 0.03%

Run 2: Report of TCP Vegas — Data Link



Run 3: Statistics of TCP Vegas

Start at: 2019-01-17 04:15:12

End at: 2019-01-17 04:15:42

Local clock offset: -0.681 ms

Remote clock offset: 7.505 ms

Below is generated by plot.py at 2019-01-17 04:23:31

Datalink statistics

-- Total of 1 flow:

Average throughput: 14.29 Mbit/s

95th percentile per-packet one-way delay: 339.652 ms

Loss rate: 0.04%

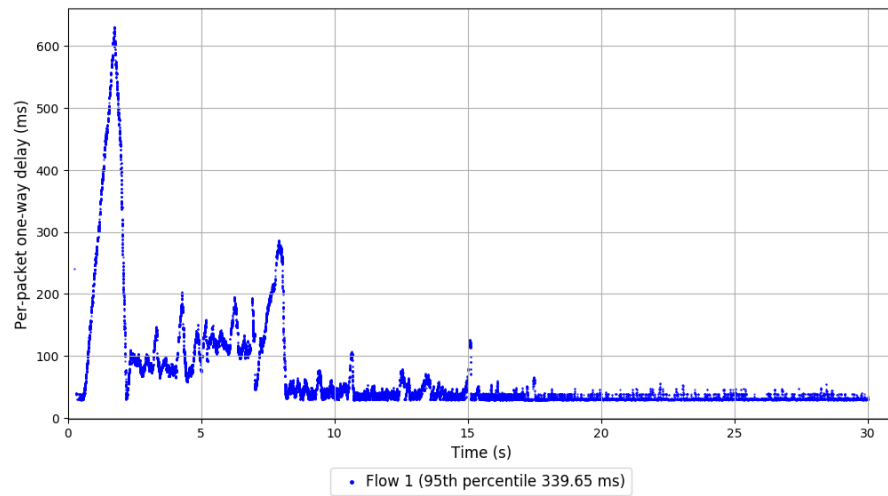
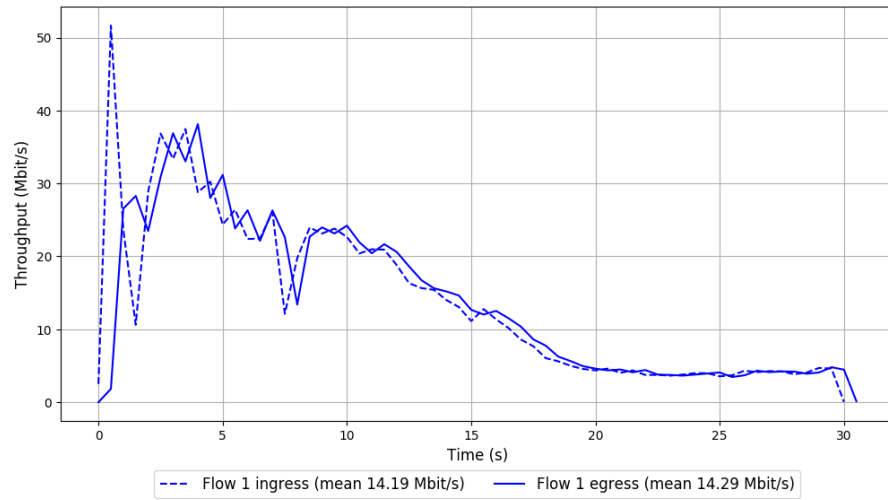
-- Flow 1:

Average throughput: 14.29 Mbit/s

95th percentile per-packet one-way delay: 339.652 ms

Loss rate: 0.04%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2019-01-17 03:22:38

End at: 2019-01-17 03:23:08

Local clock offset: 3.504 ms

Remote clock offset: 2.879 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 24.28 Mbit/s

95th percentile per-packet one-way delay: 347.478 ms

Loss rate: 0.16%

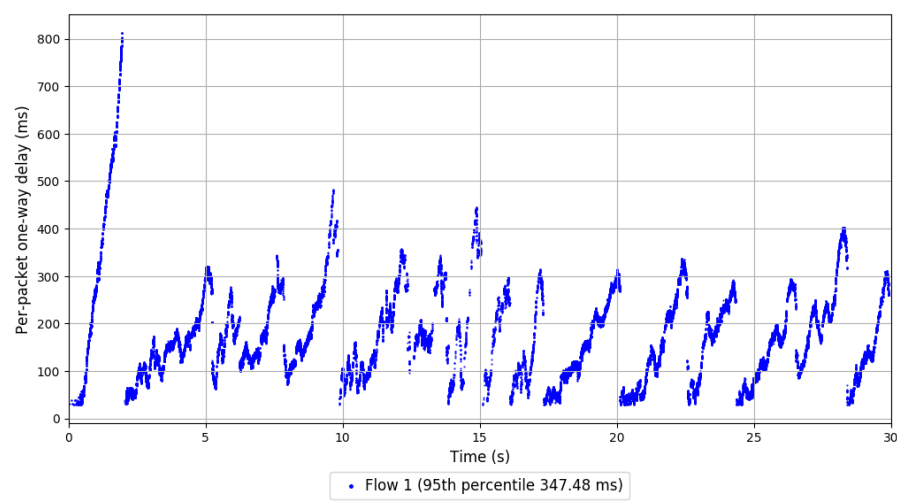
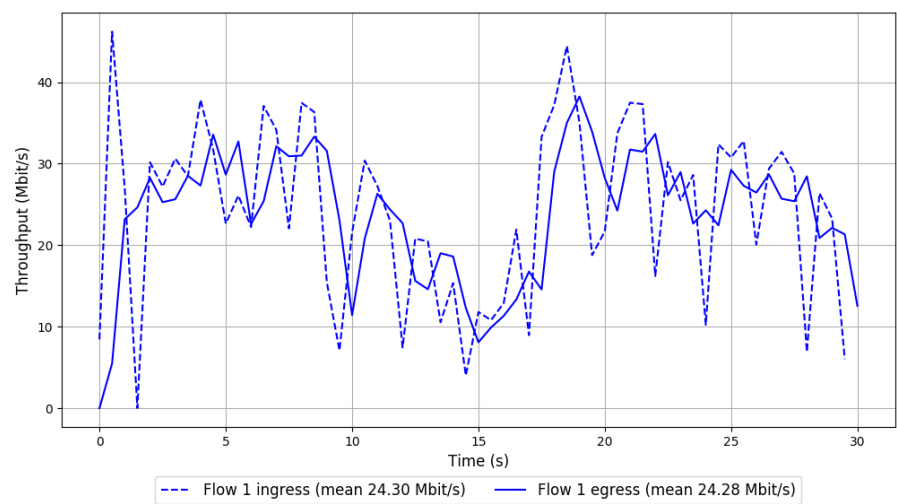
-- Flow 1:

Average throughput: 24.28 Mbit/s

95th percentile per-packet one-way delay: 347.478 ms

Loss rate: 0.16%

Run 1: Report of Verus — Data Link



Run 2: Statistics of Verus

Start at: 2019-01-17 03:45:52

End at: 2019-01-17 03:46:22

Local clock offset: 3.197 ms

Remote clock offset: 5.346 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 13.46 Mbit/s

95th percentile per-packet one-way delay: 398.503 ms

Loss rate: 0.65%

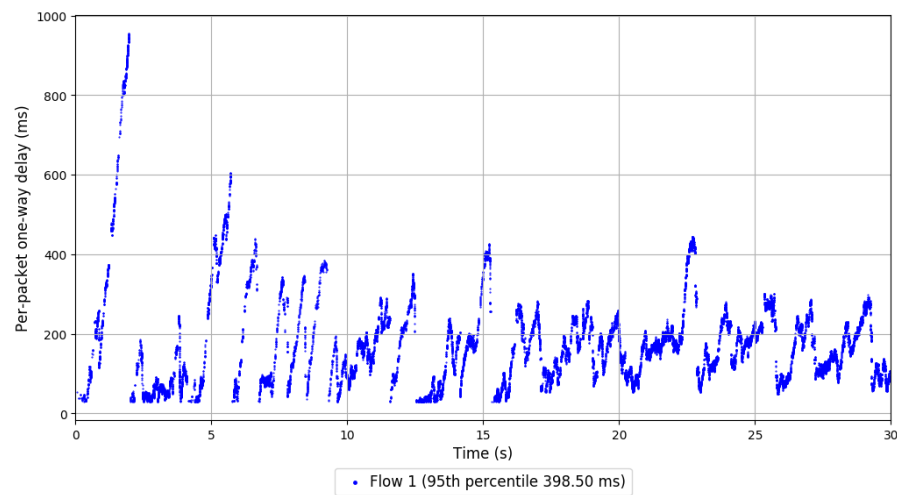
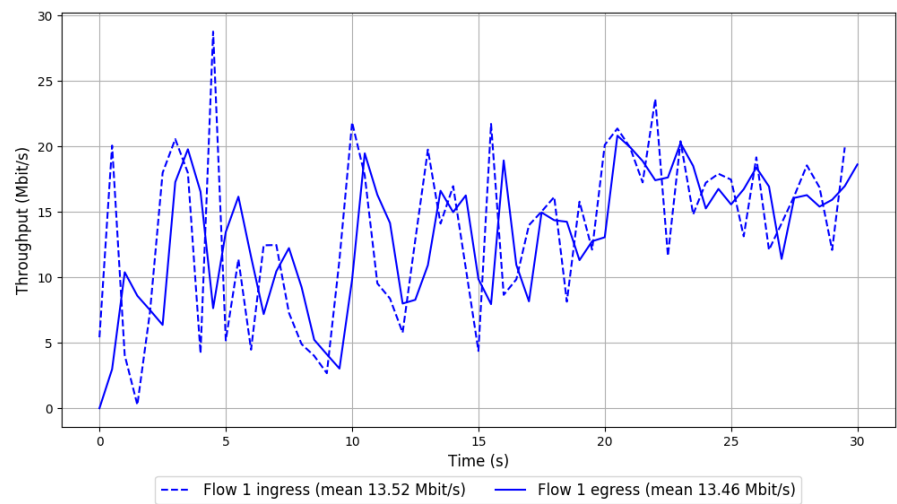
-- Flow 1:

Average throughput: 13.46 Mbit/s

95th percentile per-packet one-way delay: 398.503 ms

Loss rate: 0.65%

Run 2: Report of Verus — Data Link

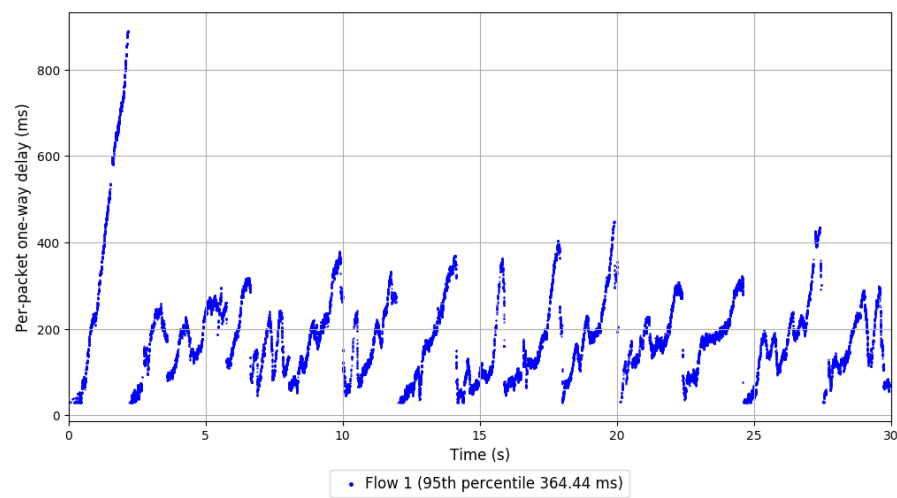
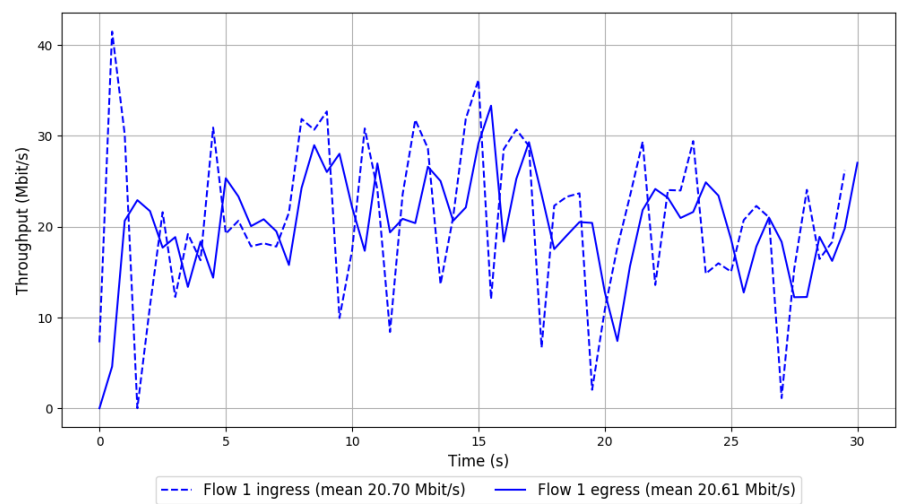


Run 3: Statistics of Verus

Start at: 2019-01-17 04:09:04
End at: 2019-01-17 04:09:34
Local clock offset: -0.266 ms
Remote clock offset: 7.141 ms

Below is generated by plot.py at 2019-01-17 04:23:33
Datalink statistics
-- Total of 1 flow:
Average throughput: 20.61 Mbit/s
95th percentile per-packet one-way delay: 364.436 ms
Loss rate: 0.54%
-- Flow 1:
Average throughput: 20.61 Mbit/s
95th percentile per-packet one-way delay: 364.436 ms
Loss rate: 0.54%

Run 3: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2019-01-17 03:14:05

End at: 2019-01-17 03:14:35

Local clock offset: 3.558 ms

Remote clock offset: 0.681 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.25 Mbit/s

95th percentile per-packet one-way delay: 39.777 ms

Loss rate: 0.04%

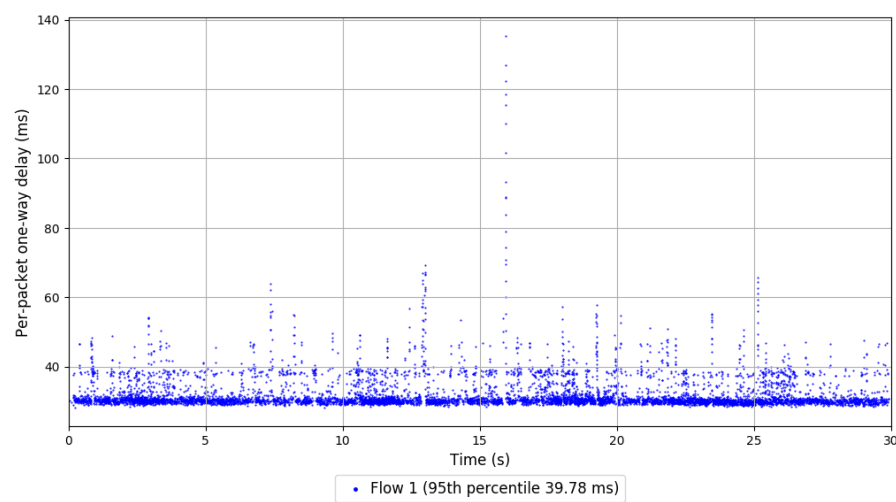
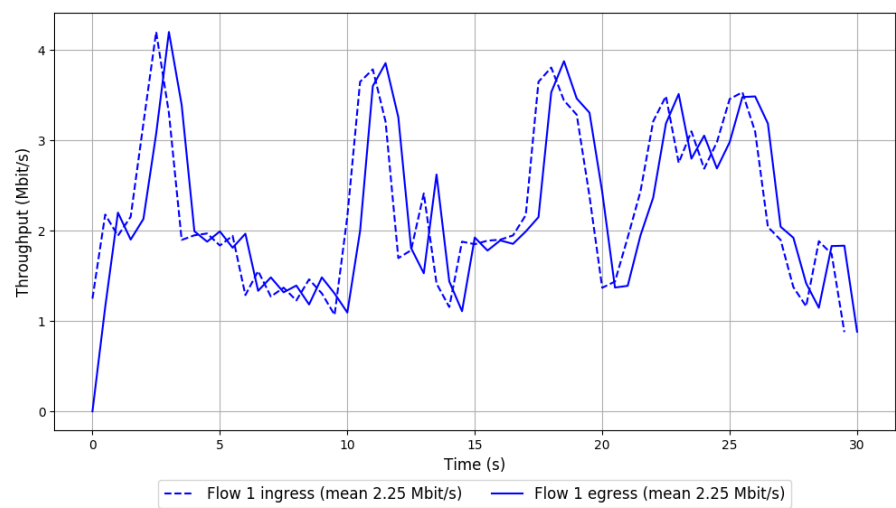
-- Flow 1:

Average throughput: 2.25 Mbit/s

95th percentile per-packet one-way delay: 39.777 ms

Loss rate: 0.04%

Run 1: Report of PCC-Vivace — Data Link



Run 2: Statistics of PCC-Vivace

Start at: 2019-01-17 03:37:19

End at: 2019-01-17 03:37:49

Local clock offset: 3.23 ms

Remote clock offset: 4.569 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 4.90 Mbit/s

95th percentile per-packet one-way delay: 41.356 ms

Loss rate: 0.19%

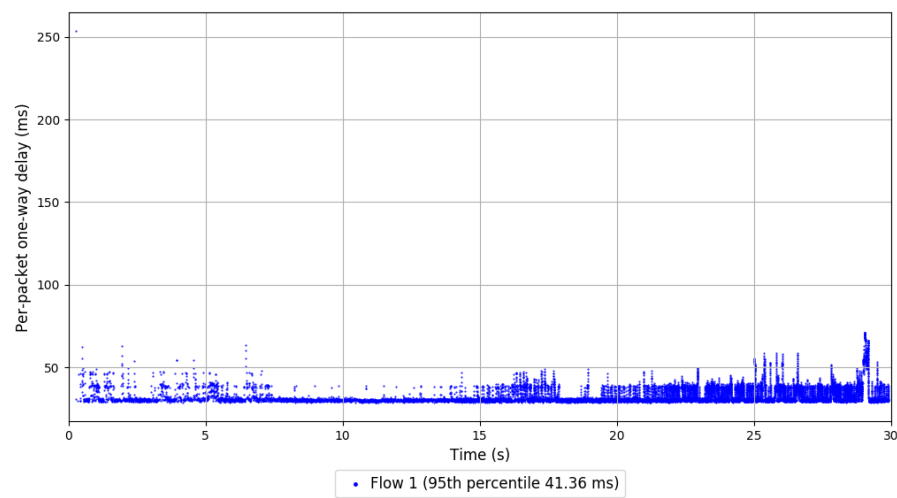
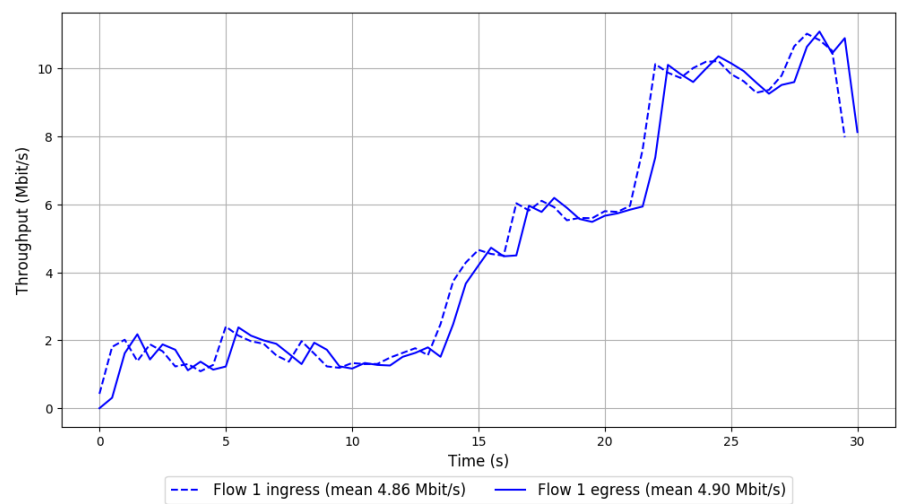
-- Flow 1:

Average throughput: 4.90 Mbit/s

95th percentile per-packet one-way delay: 41.356 ms

Loss rate: 0.19%

Run 2: Report of PCC-Vivace — Data Link



Run 3: Statistics of PCC-Vivace

Start at: 2019-01-17 04:00:31

End at: 2019-01-17 04:01:01

Local clock offset: 0.661 ms

Remote clock offset: 6.485 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.36 Mbit/s

95th percentile per-packet one-way delay: 40.536 ms

Loss rate: 0.53%

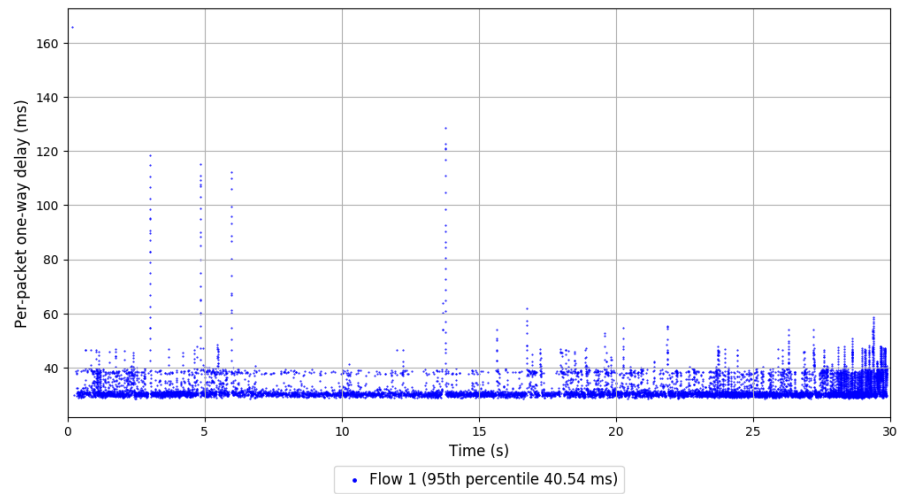
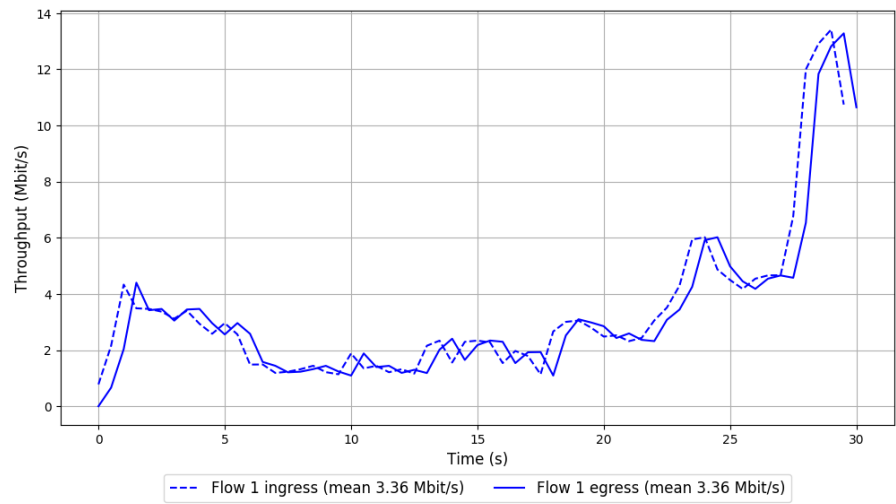
-- Flow 1:

Average throughput: 3.36 Mbit/s

95th percentile per-packet one-way delay: 40.536 ms

Loss rate: 0.53%

Run 3: Report of PCC-Vivace — Data Link

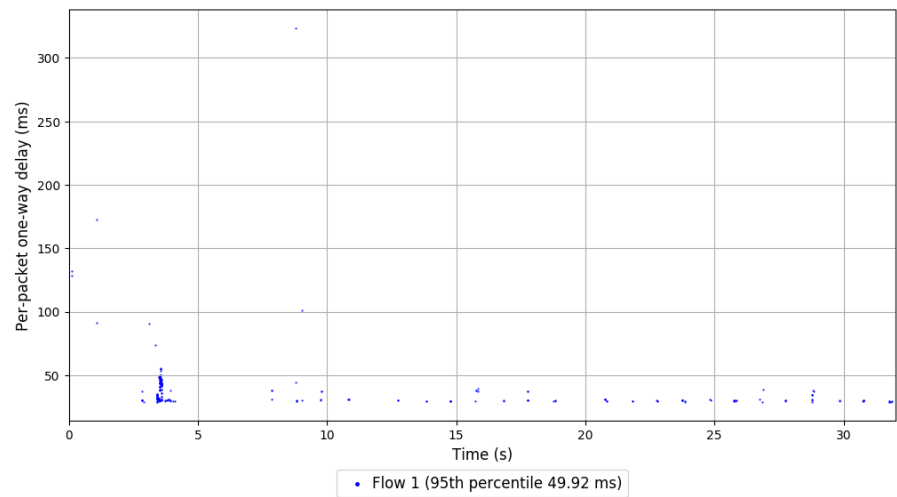
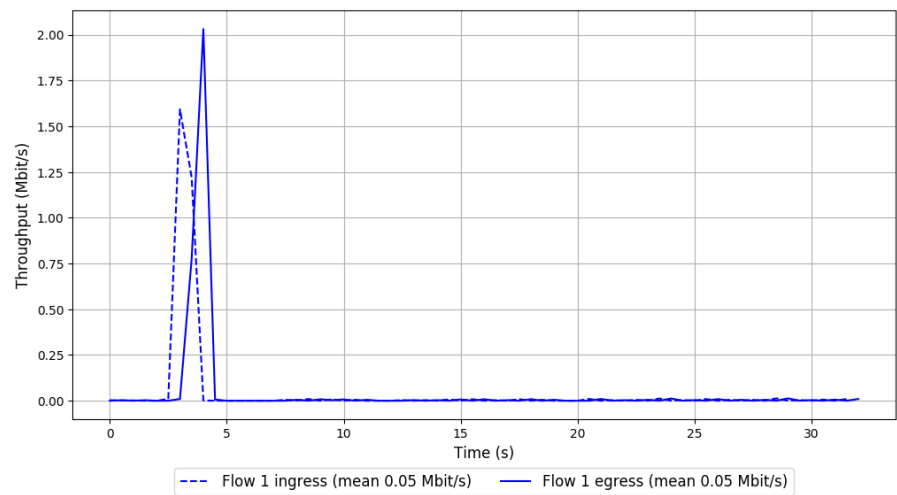



```
Run 1: Statistics of WebRTC media

Start at: 2019-01-17 03:32:27
End at: 2019-01-17 03:32:57
Local clock offset: 3.238 ms
Remote clock offset: 4.112 ms

# Below is generated by plot.py at 2019-01-17 04:23:33
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 49.925 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 49.925 ms
Loss rate: 0.00%
```

Run 1: Report of WebRTC media — Data Link



Run 2: Statistics of WebRTC media

Start at: 2019-01-17 03:55:39

End at: 2019-01-17 03:56:09

Local clock offset: 1.553 ms

Remote clock offset: 6.081 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 38.999 ms

Loss rate: 0.00%

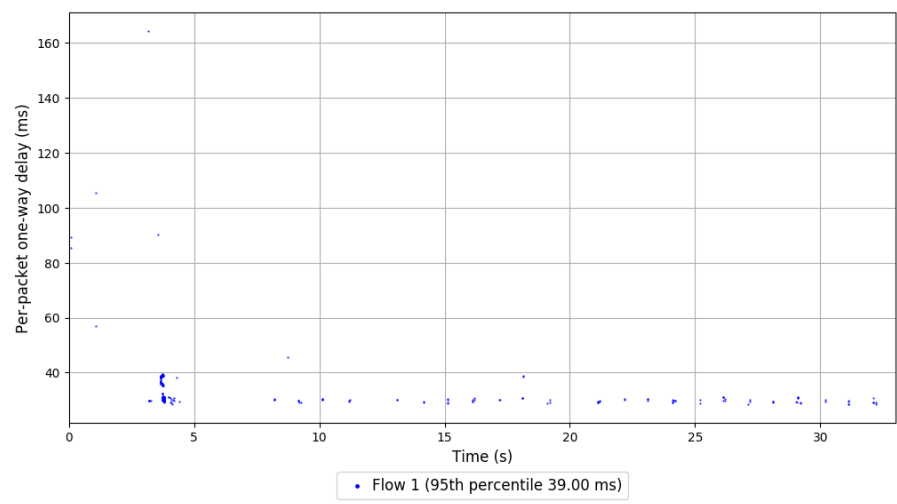
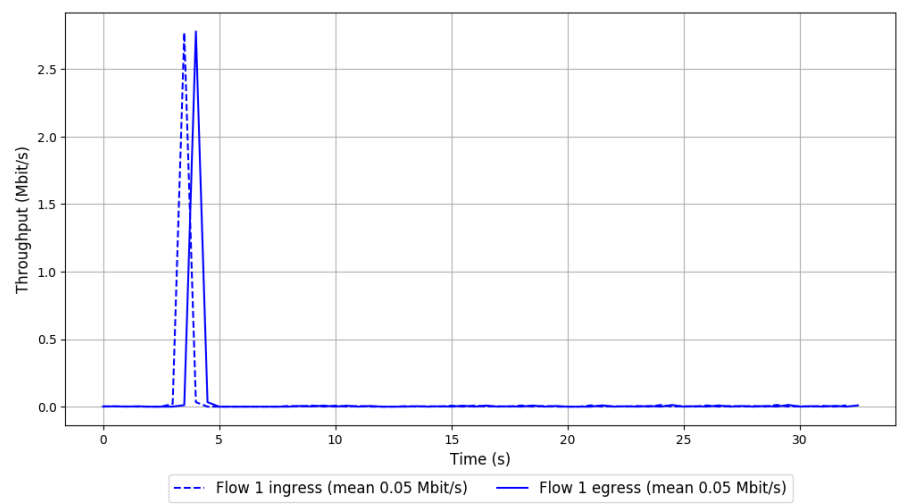
-- Flow 1:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 38.999 ms

Loss rate: 0.00%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2019-01-17 04:18:53

End at: 2019-01-17 04:19:23

Local clock offset: -0.876 ms

Remote clock offset: 7.885 ms

Below is generated by plot.py at 2019-01-17 04:23:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 47.084 ms

Loss rate: 0.00%

-- Flow 1:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 47.084 ms

Loss rate: 0.00%

Run 3: Report of WebRTC media — Data Link

