

Pantheon Report

Generated at 2019-01-24 14:20:03 (UTC).

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

Repeated the test of 21 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:

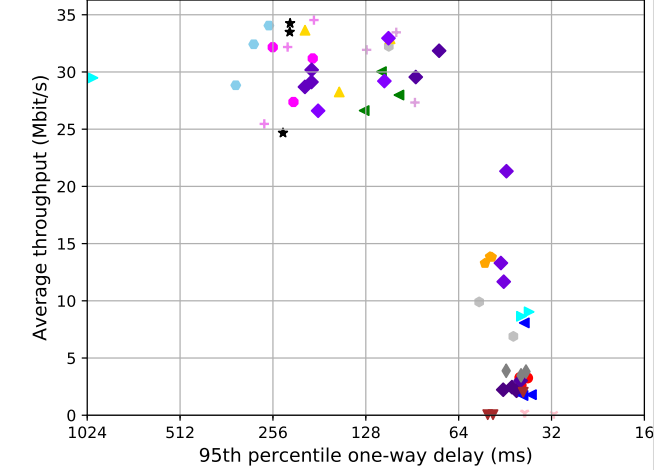
```
Linux 4.15.0-1031-aws
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
```

Git summary:

```
branch: muses @ 0b8e9a949603c3842368430acf469eec3b941f9f
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecd90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ d9c5ea33091330aca25ecd105ab2db6d34d5c40d
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

Figure 10: Average throughput vs. 95th percentile one-way delay. The plot shows a negative correlation between delay and throughput. Algorithms like Verus, TCP Cubic, and TCP BBR are in the top-left (high throughput, low delay), while algorithms like TCP Vegas, Indigo-MusesC3, and Sprout are in the bottom-right (low throughput, high delay).



scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
TCP BBR	3	31.60	154.78	0.34
Copa	3	3.05	39.64	14.63
TCP Cubic	3	30.81	229.51	0.42
FillP	3	30.73	230.33	0.69
FillP-Sheep	3	30.91	105.97	0.21
Indigo	3	2.28	43.49	0.05
Indigo-MusesC3	3	15.43	45.74	0.11
Indigo-MusesC5	3	29.59	134.09	0.16
Indigo-MusesD	3	21.48	67.50	0.15
Indigo-MusesT	3	29.33	195.13	0.52
LEDBAT	3	28.21	114.50	0.34
PCC-Allegro	3	15.73	352.95	3.10
PCC-Expr	0	N/A	N/A	N/A
QUIC Cubic	3	30.24	222.08	0.58
SCReAM	3	0.18	36.55	0.12
Sprout	3	13.65	51.09	0.11
TaoVA-100x	3	3.73	41.26	20.58
TCP Vegas	3	16.34	68.43	0.04
Verus	3	31.77	299.07	1.32
PCC-Vivace	3	3.86	38.67	0.08
WebRTC media	3	0.70	46.86	0.04

Run 1: Statistics of TCP BBR

Start at: 2019-01-24 13:12:00

End at: 2019-01-24 13:12:30

Local clock offset: 1.324 ms

Remote clock offset: 1.349 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 33.65 Mbit/s

95th percentile per-packet one-way delay: 201.488 ms

Loss rate: 0.54%

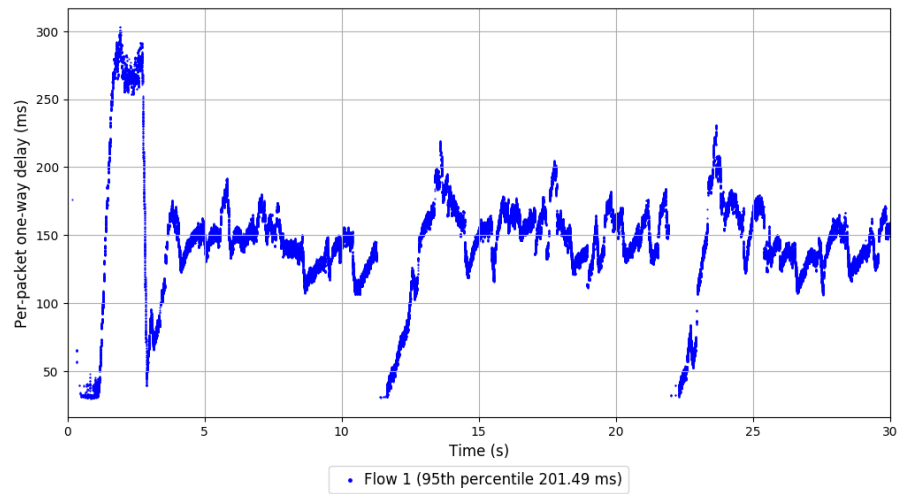
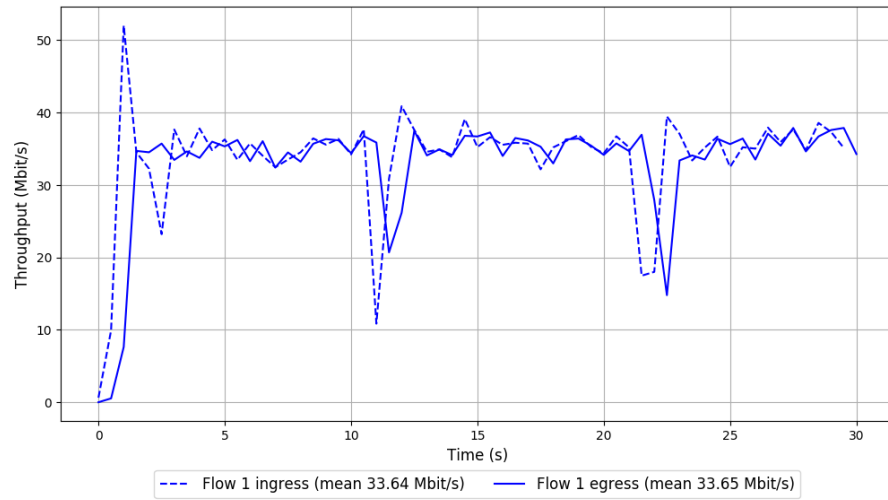
-- Flow 1:

Average throughput: 33.65 Mbit/s

95th percentile per-packet one-way delay: 201.488 ms

Loss rate: 0.54%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2019-01-24 13:37:44

End at: 2019-01-24 13:38:14

Local clock offset: 2.063 ms

Remote clock offset: 1.453 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.90 Mbit/s

95th percentile per-packet one-way delay: 106.796 ms

Loss rate: 0.27%

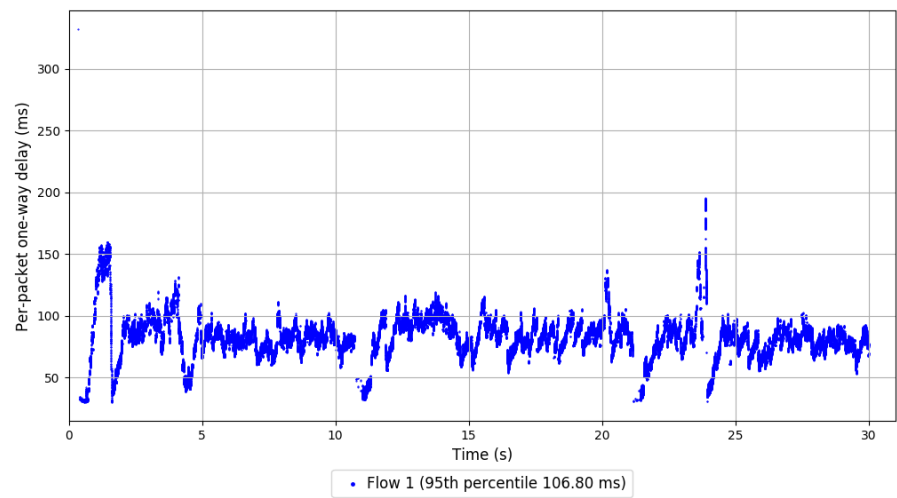
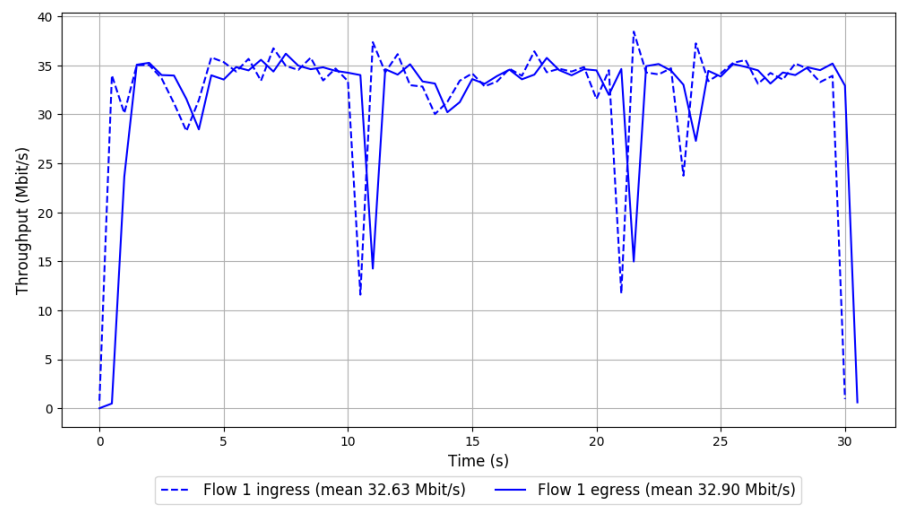
-- Flow 1:

Average throughput: 32.90 Mbit/s

95th percentile per-packet one-way delay: 106.796 ms

Loss rate: 0.27%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2019-01-24 14:03:32

End at: 2019-01-24 14:04:02

Local clock offset: 3.656 ms

Remote clock offset: 1.118 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 28.26 Mbit/s

95th percentile per-packet one-way delay: 156.055 ms

Loss rate: 0.21%

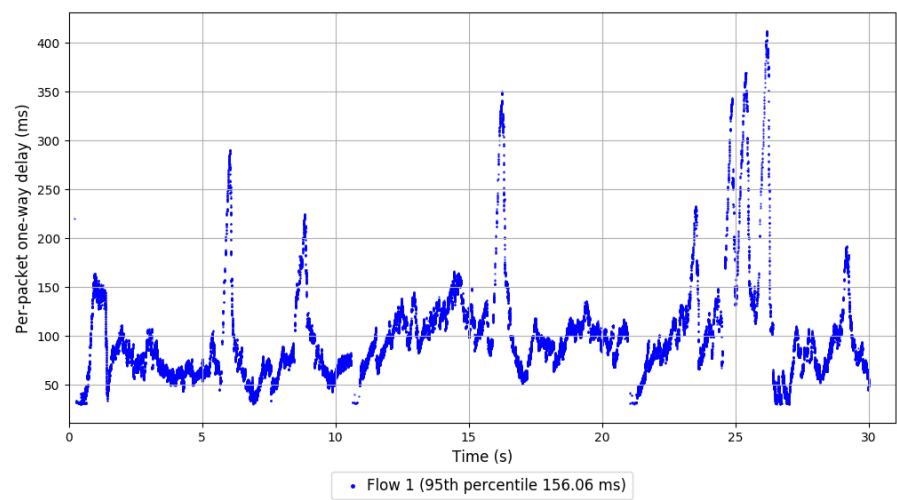
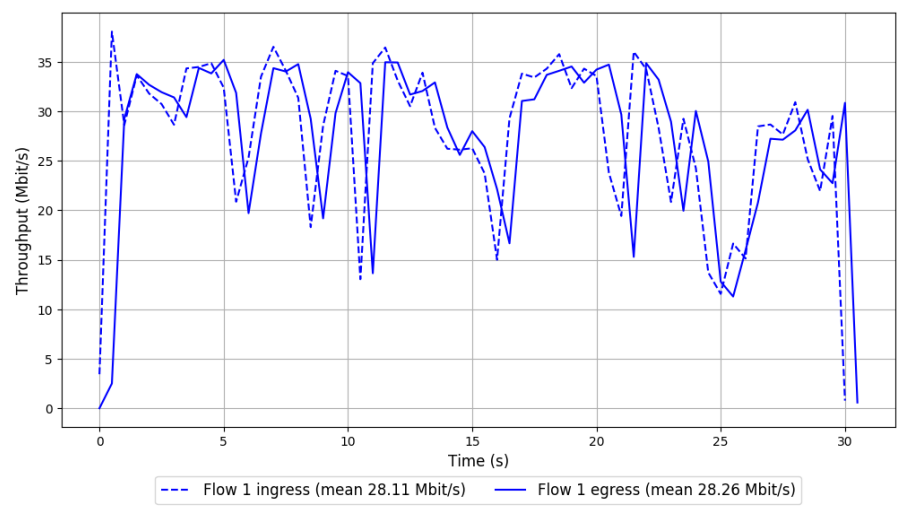
-- Flow 1:

Average throughput: 28.26 Mbit/s

95th percentile per-packet one-way delay: 156.055 ms

Loss rate: 0.21%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2019-01-24 13:08:20

End at: 2019-01-24 13:08:50

Local clock offset: -1.042 ms

Remote clock offset: 1.191 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.29 Mbit/s

95th percentile per-packet one-way delay: 40.541 ms

Loss rate: 13.70%

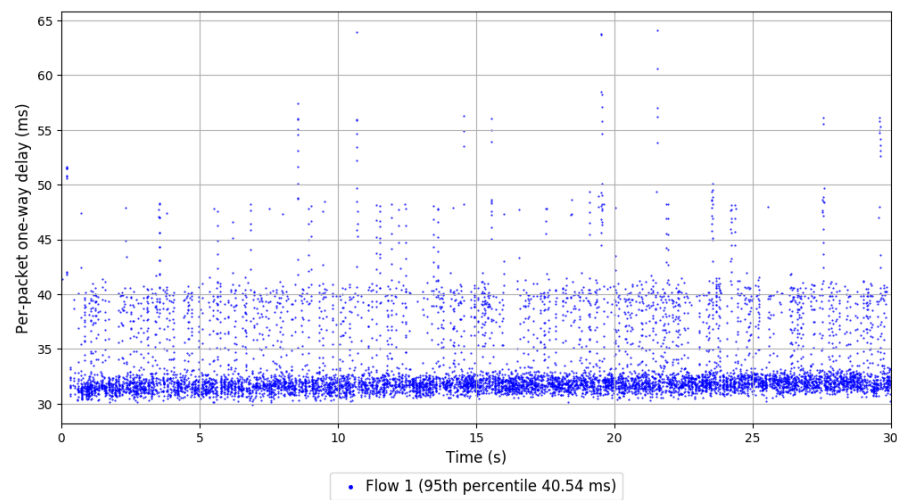
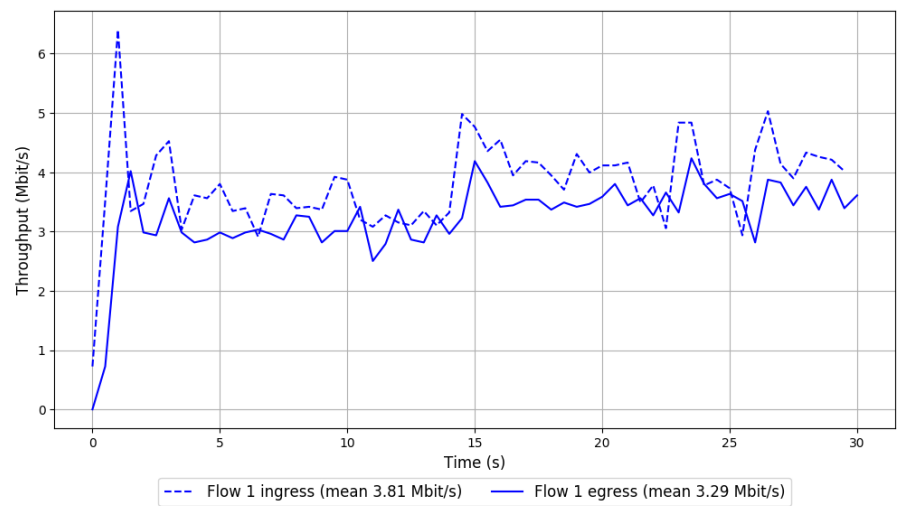
-- Flow 1:

Average throughput: 3.29 Mbit/s

95th percentile per-packet one-way delay: 40.541 ms

Loss rate: 13.70%

Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

Start at: 2019-01-24 13:34:05

End at: 2019-01-24 13:34:35

Local clock offset: 2.208 ms

Remote clock offset: 1.361 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.26 Mbit/s

95th percentile per-packet one-way delay: 38.246 ms

Loss rate: 12.72%

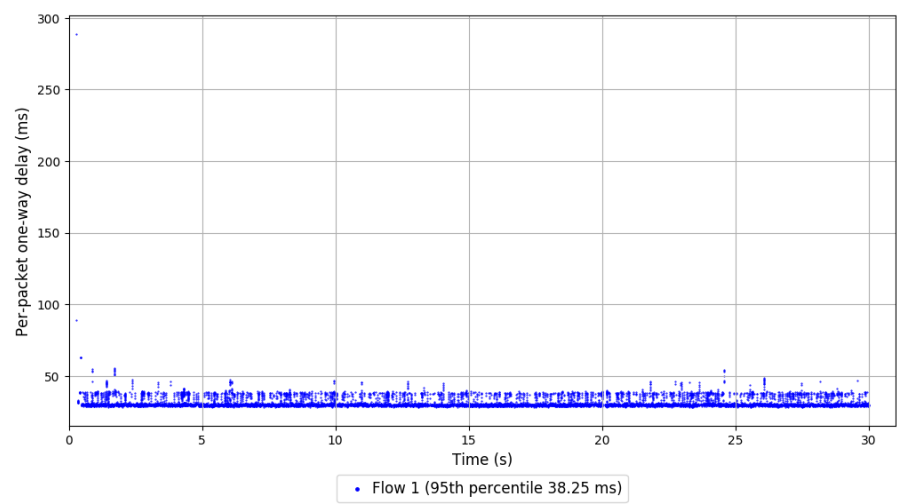
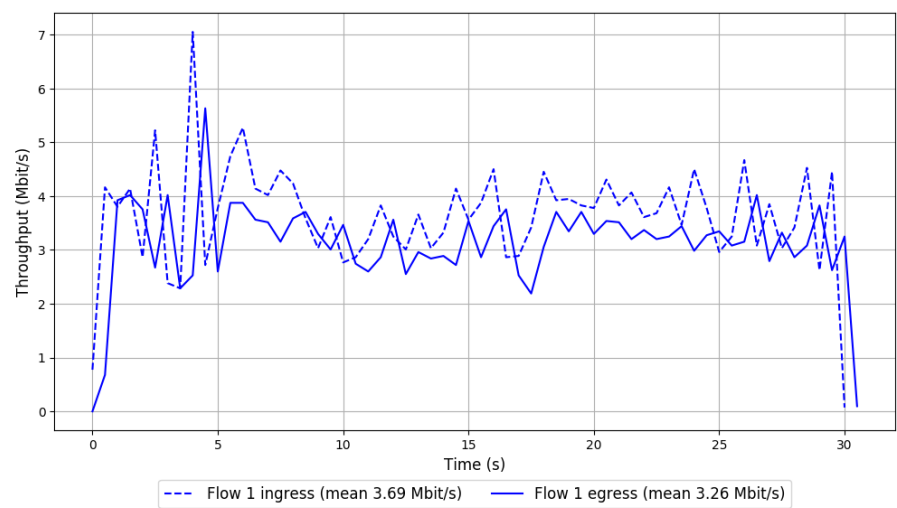
-- Flow 1:

Average throughput: 3.26 Mbit/s

95th percentile per-packet one-way delay: 38.246 ms

Loss rate: 12.72%

Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

Start at: 2019-01-24 13:59:53

End at: 2019-01-24 14:00:23

Local clock offset: 3.44 ms

Remote clock offset: 1.313 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.61 Mbit/s

95th percentile per-packet one-way delay: 40.141 ms

Loss rate: 17.46%

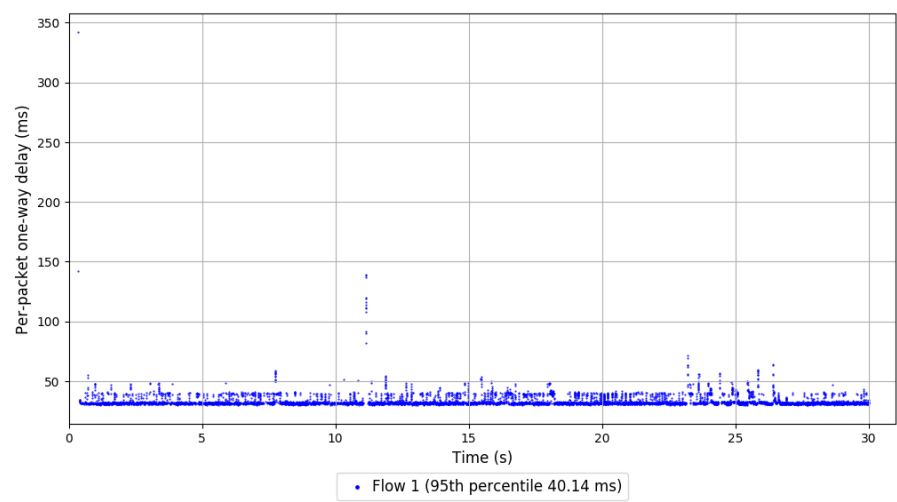
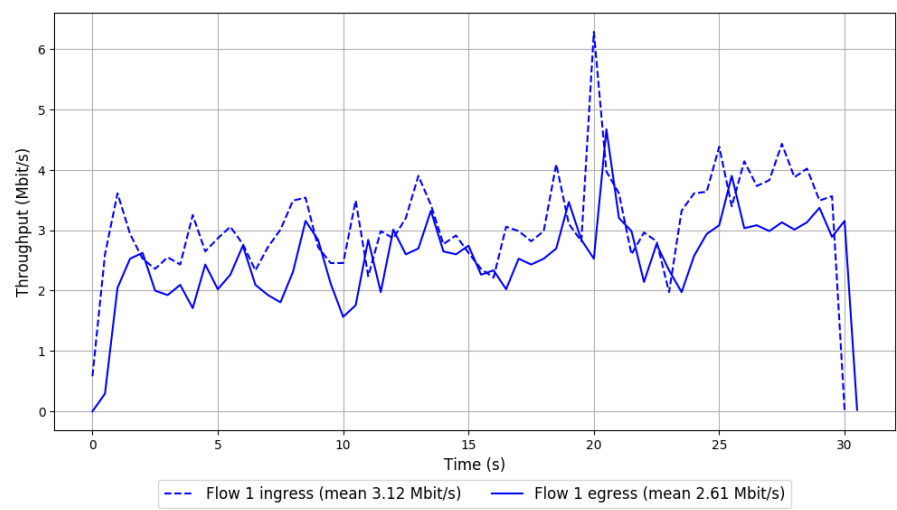
-- Flow 1:

Average throughput: 2.61 Mbit/s

95th percentile per-packet one-way delay: 40.141 ms

Loss rate: 17.46%

Run 3: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2019-01-24 13:04:38

End at: 2019-01-24 13:05:08

Local clock offset: -1.177 ms

Remote clock offset: 1.164 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 33.49 Mbit/s

95th percentile per-packet one-way delay: 225.820 ms

Loss rate: 0.45%

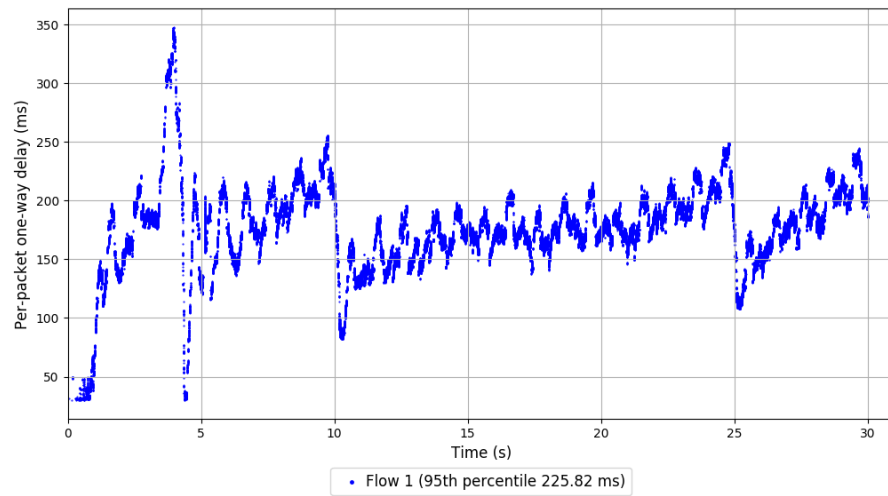
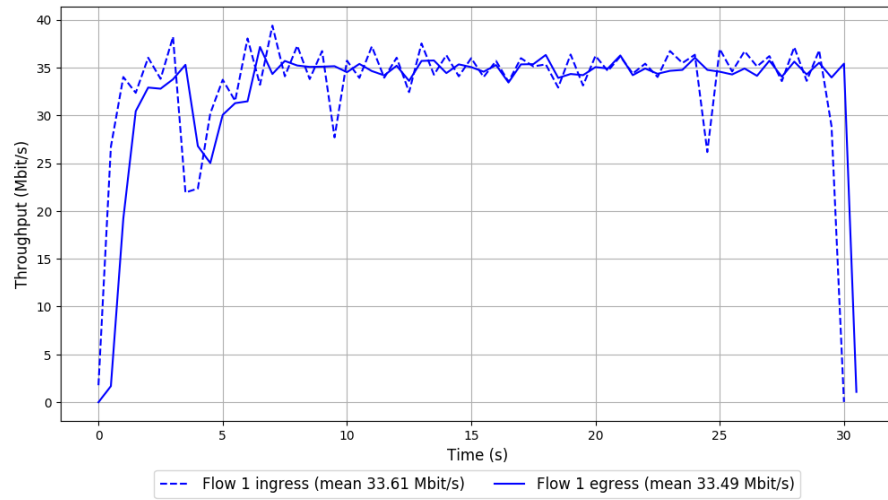
-- Flow 1:

Average throughput: 33.49 Mbit/s

95th percentile per-packet one-way delay: 225.820 ms

Loss rate: 0.45%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2019-01-24 13:30:24

End at: 2019-01-24 13:30:54

Local clock offset: 2.599 ms

Remote clock offset: 1.349 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 34.25 Mbit/s

95th percentile per-packet one-way delay: 225.224 ms

Loss rate: 0.61%

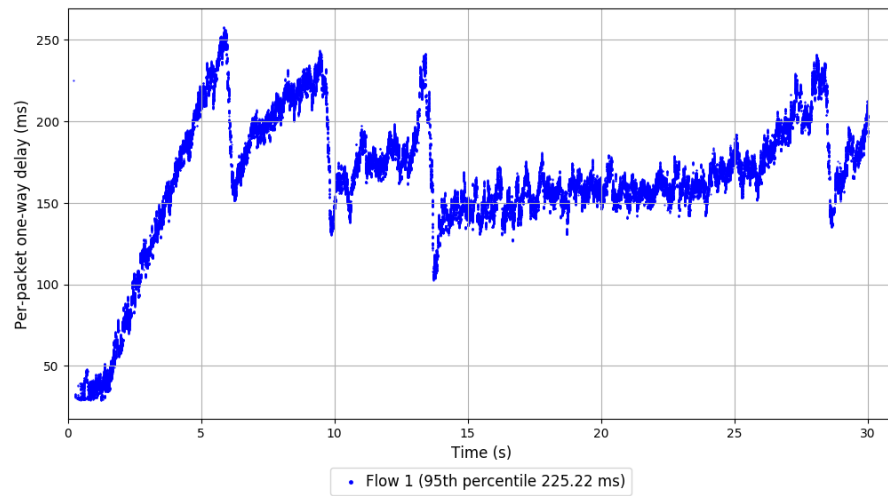
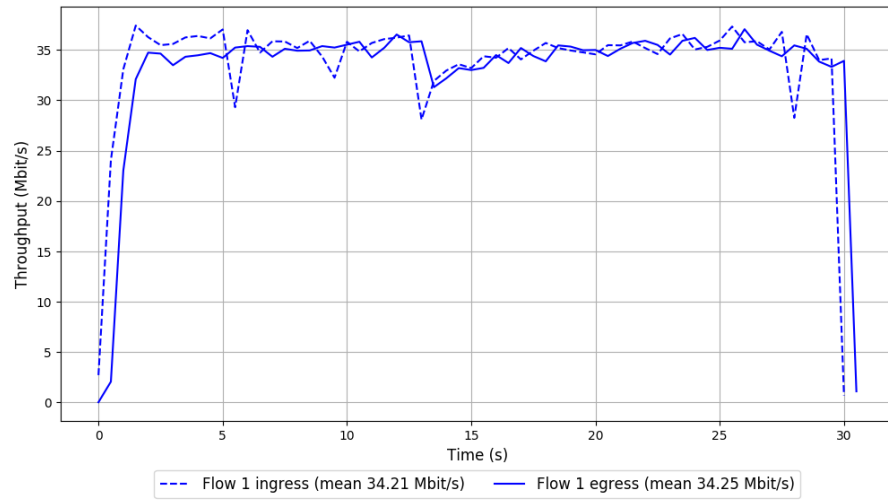
-- Flow 1:

Average throughput: 34.25 Mbit/s

95th percentile per-packet one-way delay: 225.224 ms

Loss rate: 0.61%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2019-01-24 13:56:12

End at: 2019-01-24 13:56:42

Local clock offset: 3.106 ms

Remote clock offset: 1.432 ms

Below is generated by plot.py at 2019-01-24 14:18:19

Datalink statistics

-- Total of 1 flow:

Average throughput: 24.68 Mbit/s

95th percentile per-packet one-way delay: 237.491 ms

Loss rate: 0.20%

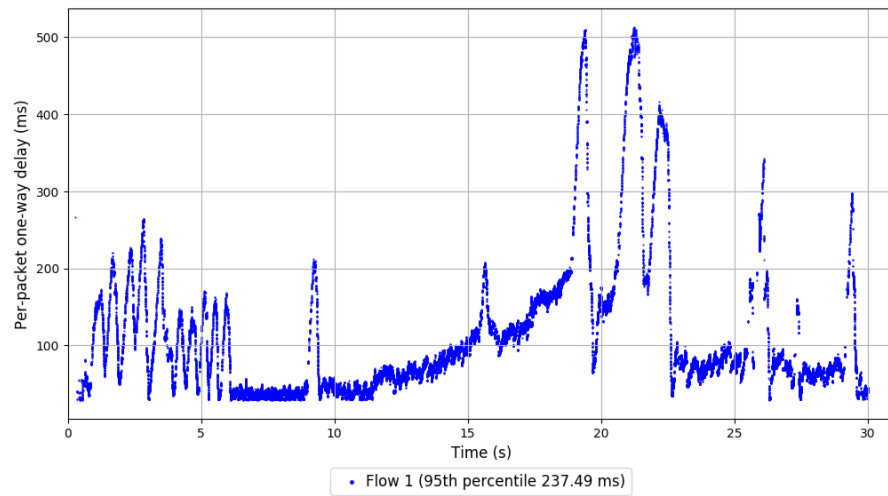
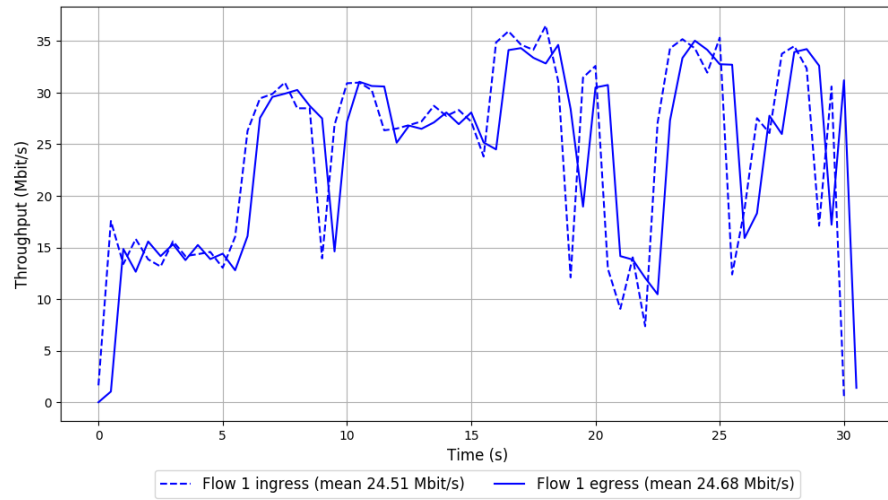
-- Flow 1:

Average throughput: 24.68 Mbit/s

95th percentile per-packet one-way delay: 237.491 ms

Loss rate: 0.20%

Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

Start at: 2019-01-24 13:07:06

End at: 2019-01-24 13:07:36

Local clock offset: -1.097 ms

Remote clock offset: 1.144 ms

Below is generated by plot.py at 2019-01-24 14:18:28

Datalink statistics

-- Total of 1 flow:

Average throughput: 34.54 Mbit/s

95th percentile per-packet one-way delay: 188.519 ms

Loss rate: 0.57%

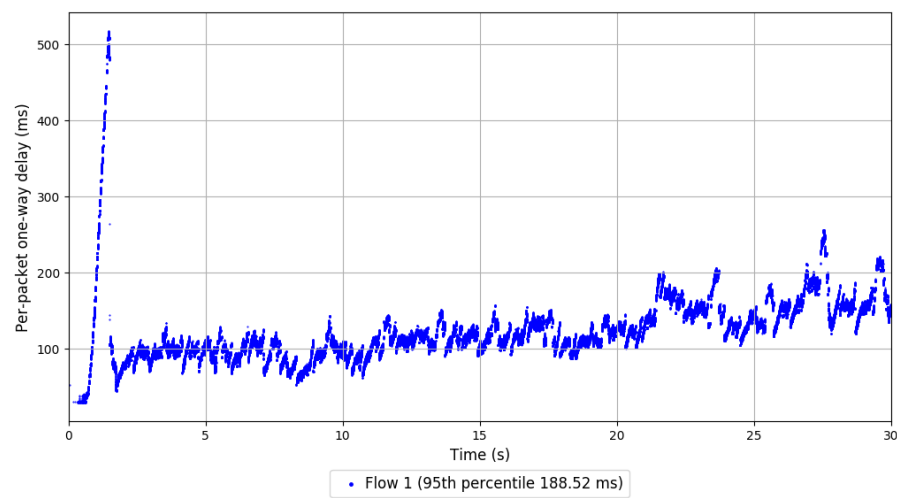
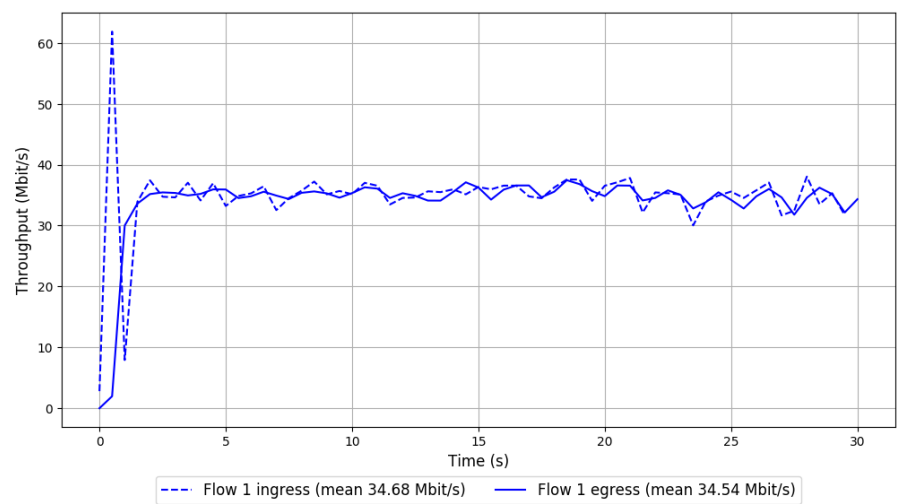
-- Flow 1:

Average throughput: 34.54 Mbit/s

95th percentile per-packet one-way delay: 188.519 ms

Loss rate: 0.57%

Run 1: Report of FillP — Data Link



Run 2: Statistics of FillP

Start at: 2019-01-24 13:32:51

End at: 2019-01-24 13:33:21

Local clock offset: 2.289 ms

Remote clock offset: 1.329 ms

Below is generated by plot.py at 2019-01-24 14:18:28

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.18 Mbit/s

95th percentile per-packet one-way delay: 229.418 ms

Loss rate: 0.86%

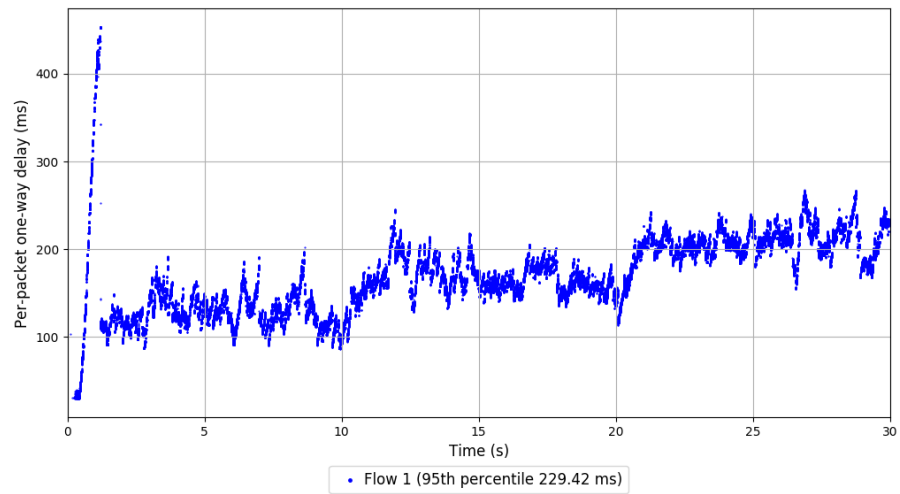
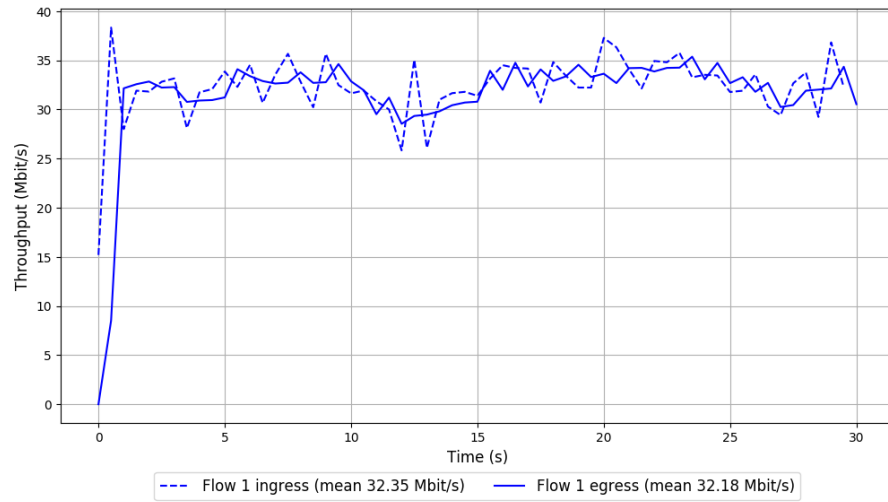
-- Flow 1:

Average throughput: 32.18 Mbit/s

95th percentile per-packet one-way delay: 229.418 ms

Loss rate: 0.86%

Run 2: Report of FillP — Data Link



Run 3: Statistics of FillP

Start at: 2019-01-24 13:58:39

End at: 2019-01-24 13:59:09

Local clock offset: 3.311 ms

Remote clock offset: 1.28 ms

Below is generated by plot.py at 2019-01-24 14:18:41

Datalink statistics

-- Total of 1 flow:

Average throughput: 25.46 Mbit/s

95th percentile per-packet one-way delay: 273.064 ms

Loss rate: 0.63%

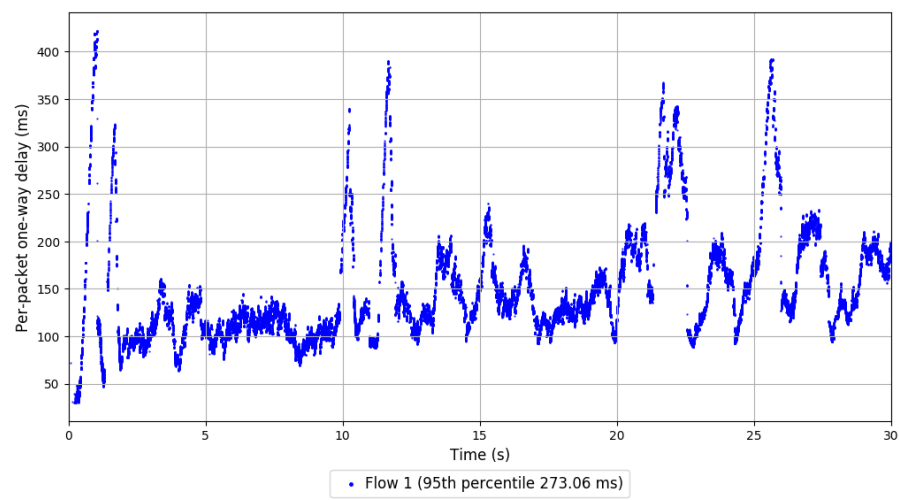
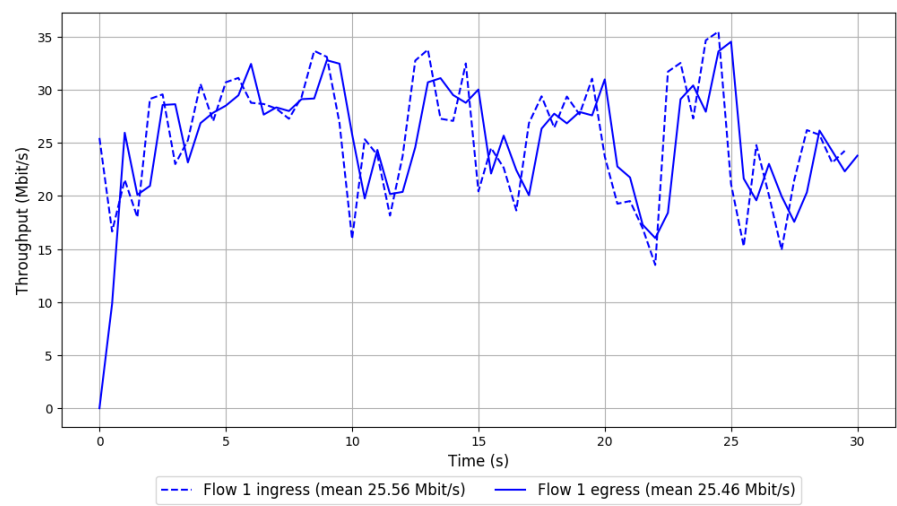
-- Flow 1:

Average throughput: 25.46 Mbit/s

95th percentile per-packet one-way delay: 273.064 ms

Loss rate: 0.63%

Run 3: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-01-24 13:18:09

End at: 2019-01-24 13:18:39

Local clock offset: 2.411 ms

Remote clock offset: 1.404 ms

Below is generated by plot.py at 2019-01-24 14:18:48

Datalink statistics

-- Total of 1 flow:

Average throughput: 33.46 Mbit/s

95th percentile per-packet one-way delay: 101.968 ms

Loss rate: 0.27%

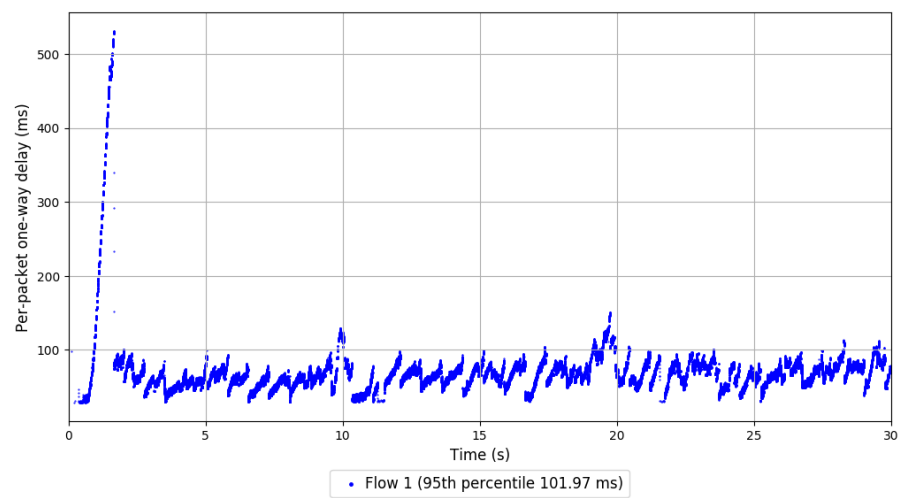
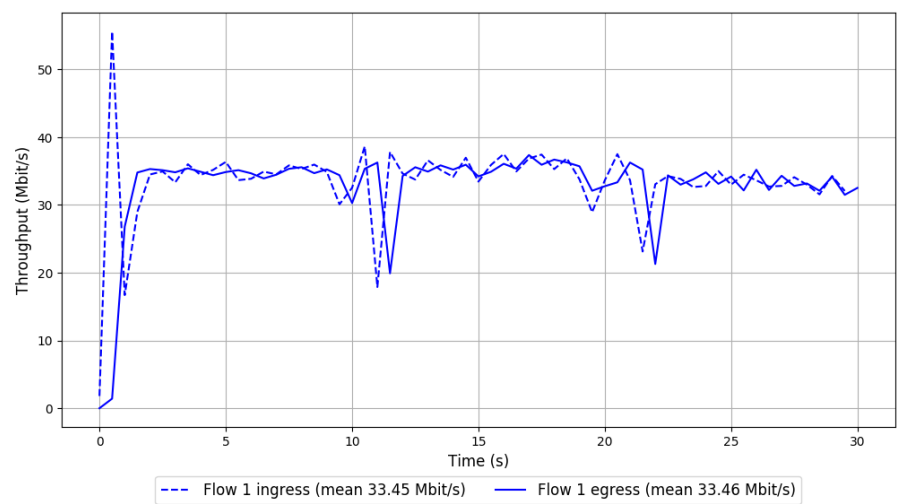
-- Flow 1:

Average throughput: 33.46 Mbit/s

95th percentile per-packet one-way delay: 101.968 ms

Loss rate: 0.27%

Run 1: Report of FillP-Sheep — Data Link

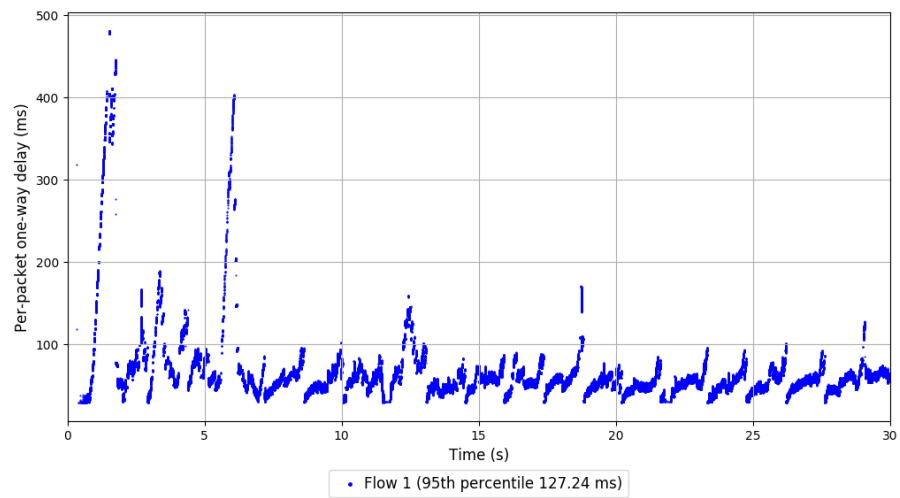
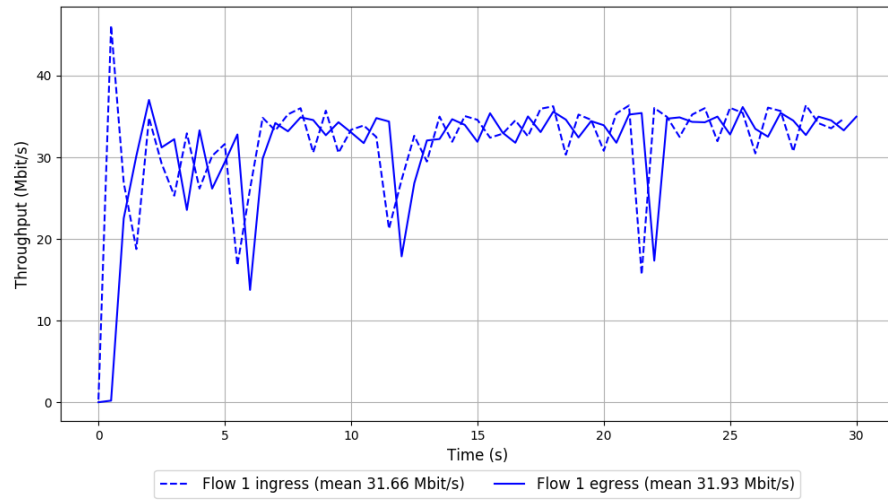


Run 2: Statistics of FillP-Sheep

Start at: 2019-01-24 13:43:53
End at: 2019-01-24 13:44:23
Local clock offset: 2.196 ms
Remote clock offset: 1.773 ms

Below is generated by plot.py at 2019-01-24 14:18:50
Datalink statistics
-- Total of 1 flow:
Average throughput: 31.93 Mbit/s
95th percentile per-packet one-way delay: 127.238 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 31.93 Mbit/s
95th percentile per-packet one-way delay: 127.238 ms
Loss rate: 0.22%

Run 2: Report of FillP-Sheep — Data Link



Run 3: Statistics of FillP-Sheep

Start at: 2019-01-24 14:09:40

End at: 2019-01-24 14:10:10

Local clock offset: 4.106 ms

Remote clock offset: 1.143 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 27.33 Mbit/s

95th percentile per-packet one-way delay: 88.697 ms

Loss rate: 0.15%

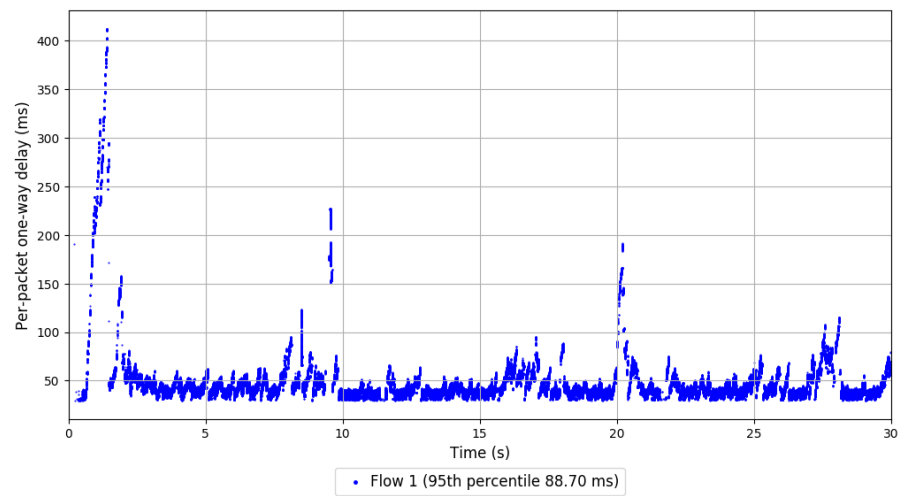
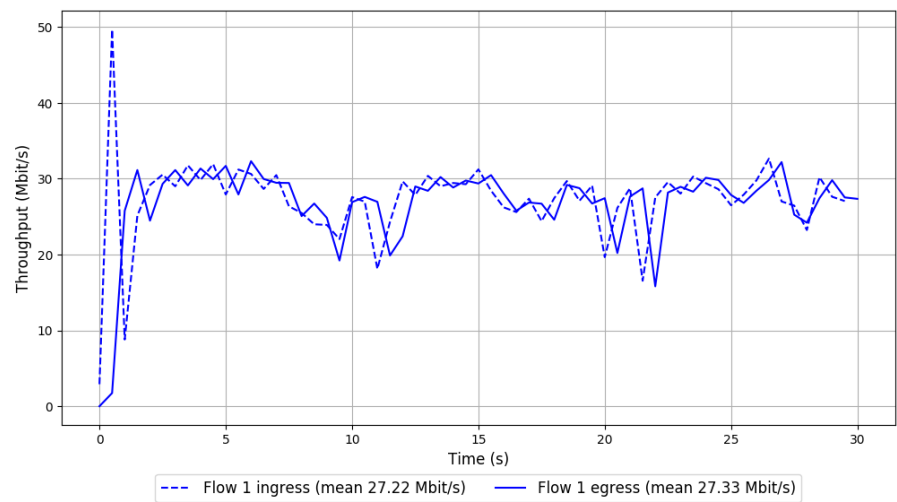
-- Flow 1:

Average throughput: 27.33 Mbit/s

95th percentile per-packet one-way delay: 88.697 ms

Loss rate: 0.15%

Run 3: Report of FillP-Sheep — Data Link

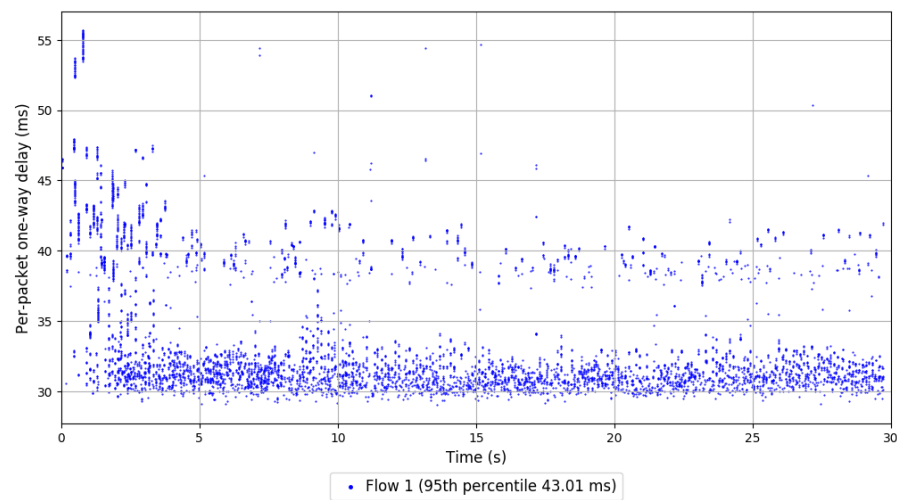
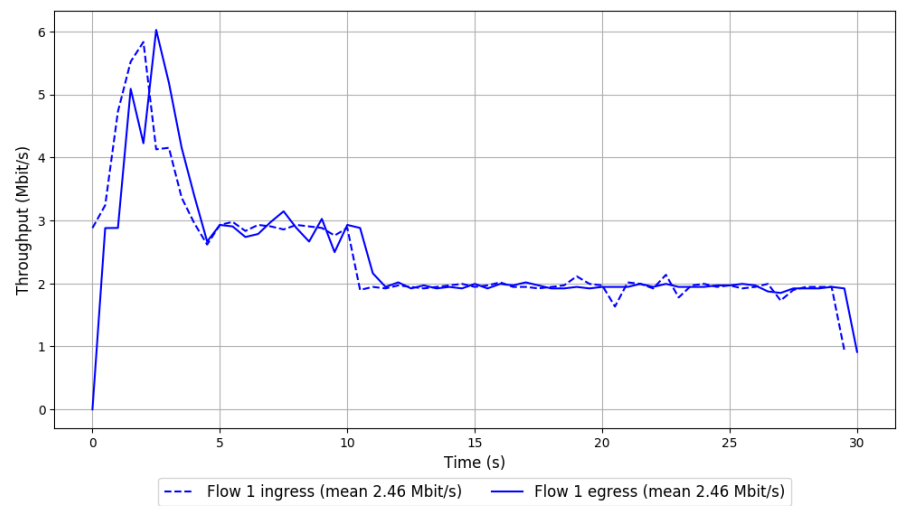


```
Run 1: Statistics of Indigo

Start at: 2019-01-24 13:14:28
End at: 2019-01-24 13:14:58
Local clock offset: 2.042 ms
Remote clock offset: 1.46 ms

# Below is generated by plot.py at 2019-01-24 14:18:50
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.46 Mbit/s
95th percentile per-packet one-way delay: 43.005 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 2.46 Mbit/s
95th percentile per-packet one-way delay: 43.005 ms
Loss rate: 0.05%
```

Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2019-01-24 13:40:12

End at: 2019-01-24 13:40:42

Local clock offset: 2.076 ms

Remote clock offset: 1.628 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.14 Mbit/s

95th percentile per-packet one-way delay: 41.556 ms

Loss rate: 0.06%

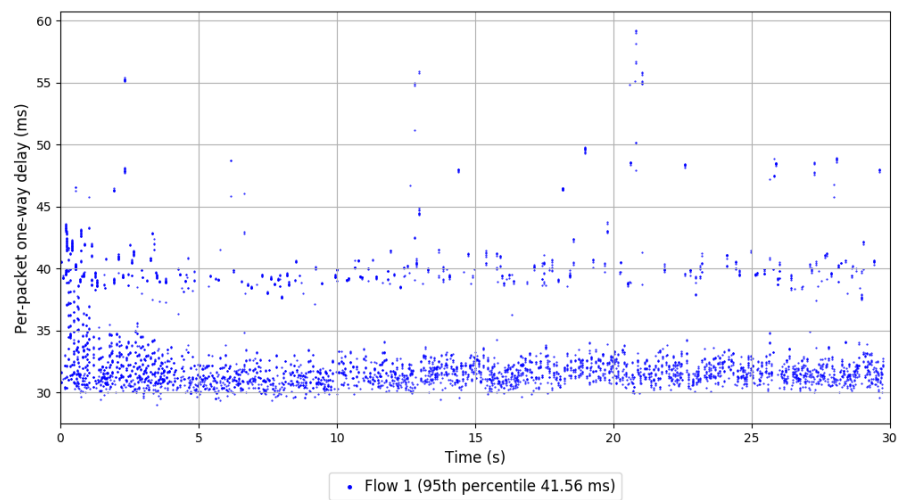
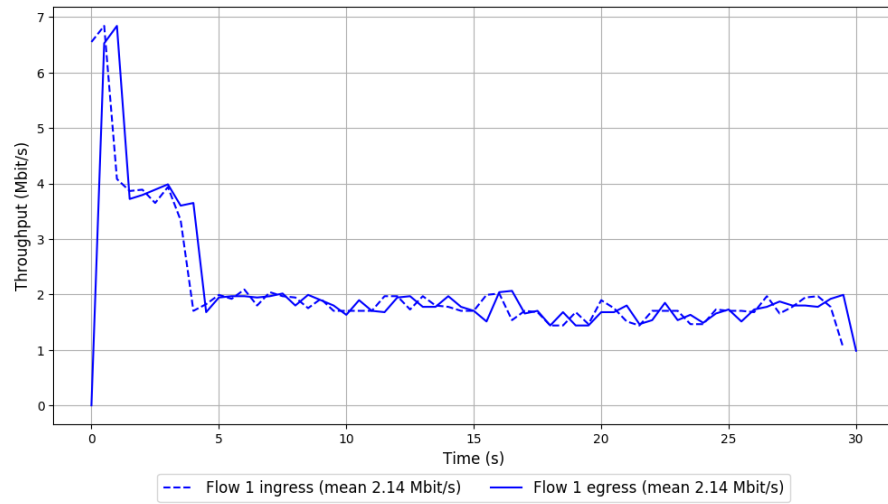
-- Flow 1:

Average throughput: 2.14 Mbit/s

95th percentile per-packet one-way delay: 41.556 ms

Loss rate: 0.06%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2019-01-24 14:05:59

End at: 2019-01-24 14:06:29

Local clock offset: 3.807 ms

Remote clock offset: 1.067 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.23 Mbit/s

95th percentile per-packet one-way delay: 45.897 ms

Loss rate: 0.05%

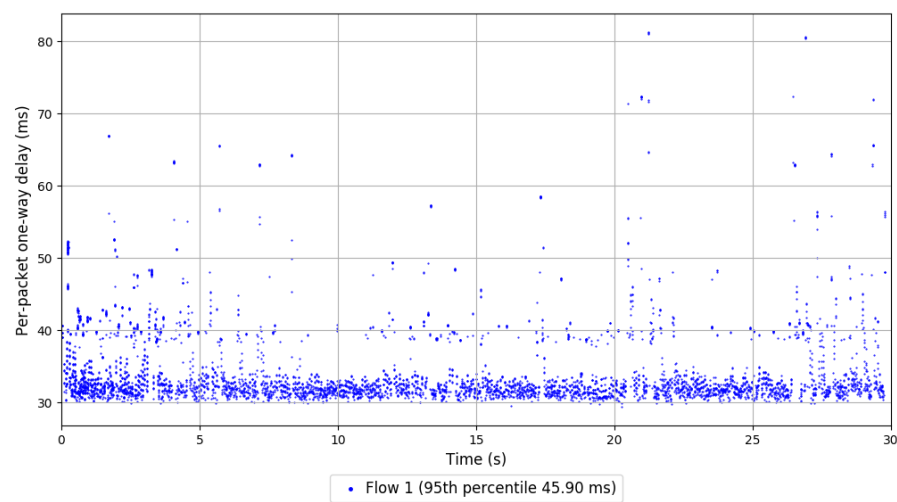
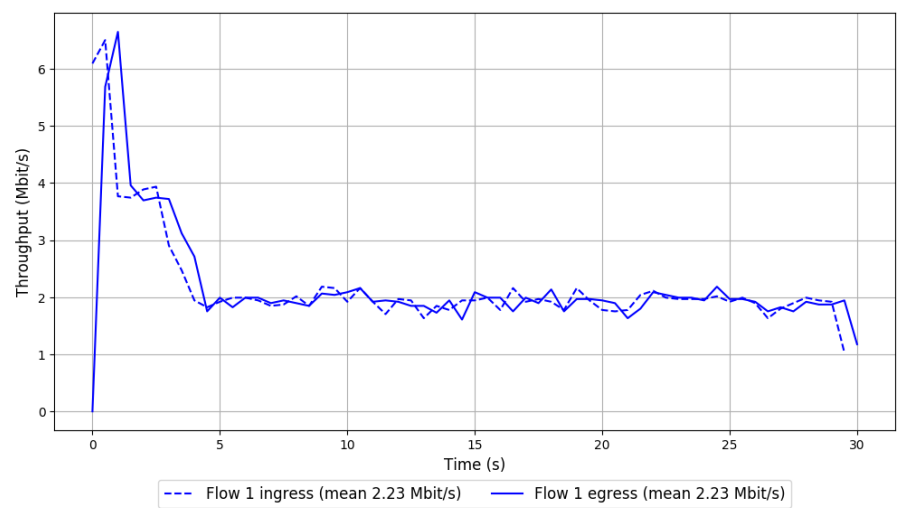
-- Flow 1:

Average throughput: 2.23 Mbit/s

95th percentile per-packet one-way delay: 45.897 ms

Loss rate: 0.05%

Run 3: Report of Indigo — Data Link



Run 1: Statistics of Indigo-MusesC3

Start at: 2019-01-24 13:16:55

End at: 2019-01-24 13:17:25

Local clock offset: 2.569 ms

Remote clock offset: 1.444 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 21.33 Mbit/s

95th percentile per-packet one-way delay: 44.803 ms

Loss rate: 0.06%

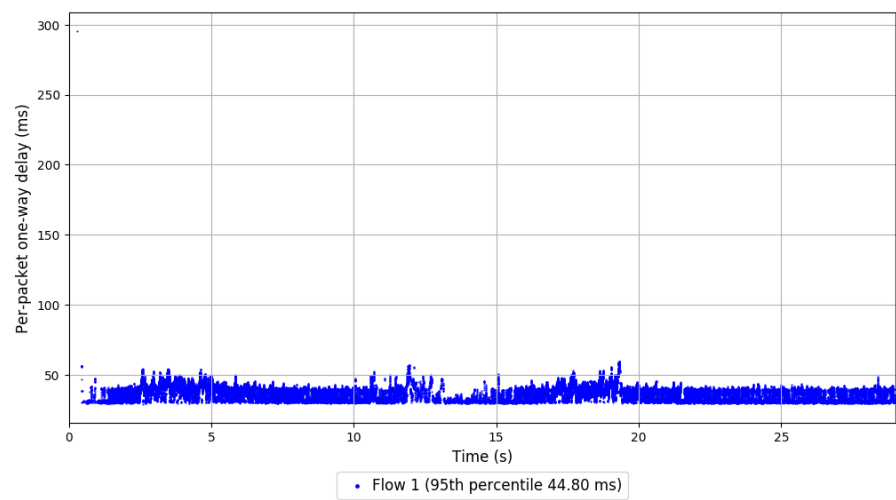
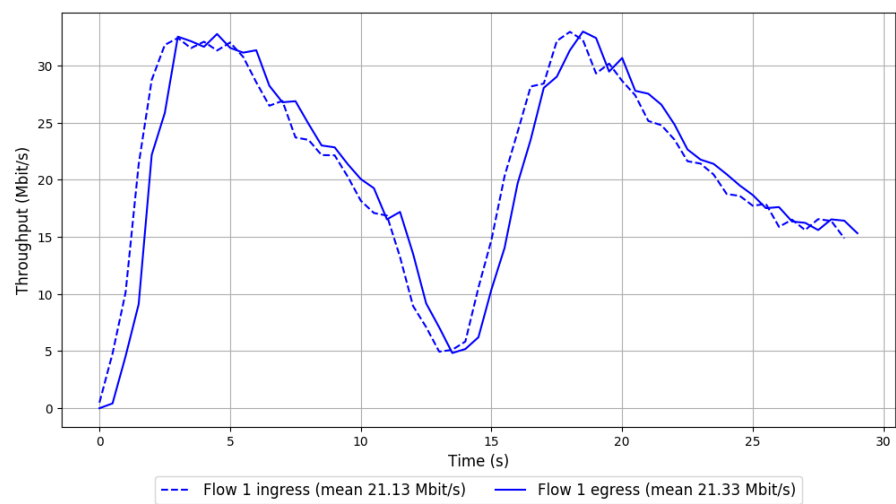
-- Flow 1:

Average throughput: 21.33 Mbit/s

95th percentile per-packet one-way delay: 44.803 ms

Loss rate: 0.06%

Run 1: Report of Indigo-MusesC3 — Data Link



Run 2: Statistics of Indigo-MusesC3

Start at: 2019-01-24 13:42:40

End at: 2019-01-24 13:43:10

Local clock offset: 2.158 ms

Remote clock offset: 1.668 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 11.67 Mbit/s

95th percentile per-packet one-way delay: 45.719 ms

Loss rate: 0.14%

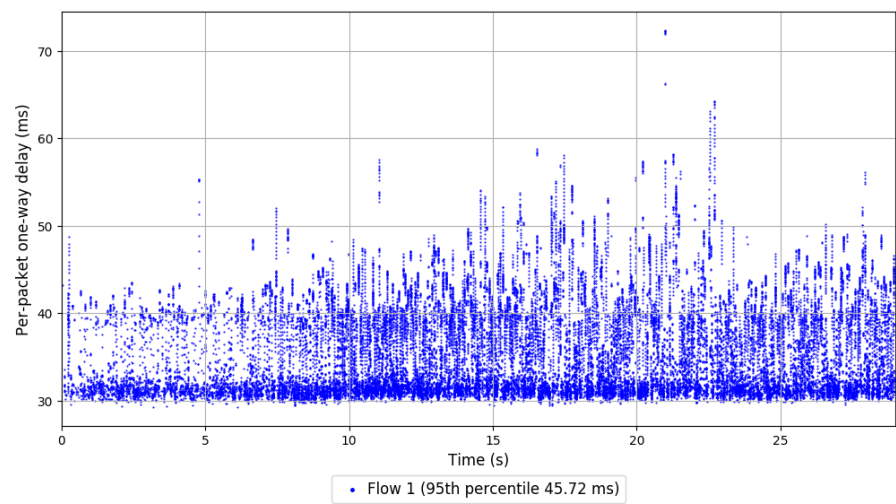
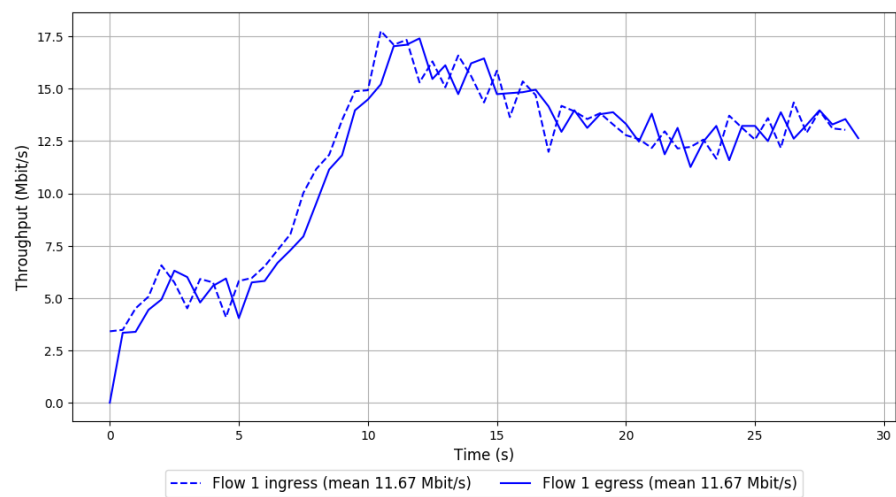
-- Flow 1:

Average throughput: 11.67 Mbit/s

95th percentile per-packet one-way delay: 45.719 ms

Loss rate: 0.14%

Run 2: Report of Indigo-MusesC3 — Data Link



Run 3: Statistics of Indigo-MusesC3

Start at: 2019-01-24 14:08:26

End at: 2019-01-24 14:08:57

Local clock offset: 3.998 ms

Remote clock offset: 1.038 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 13.30 Mbit/s

95th percentile per-packet one-way delay: 46.699 ms

Loss rate: 0.13%

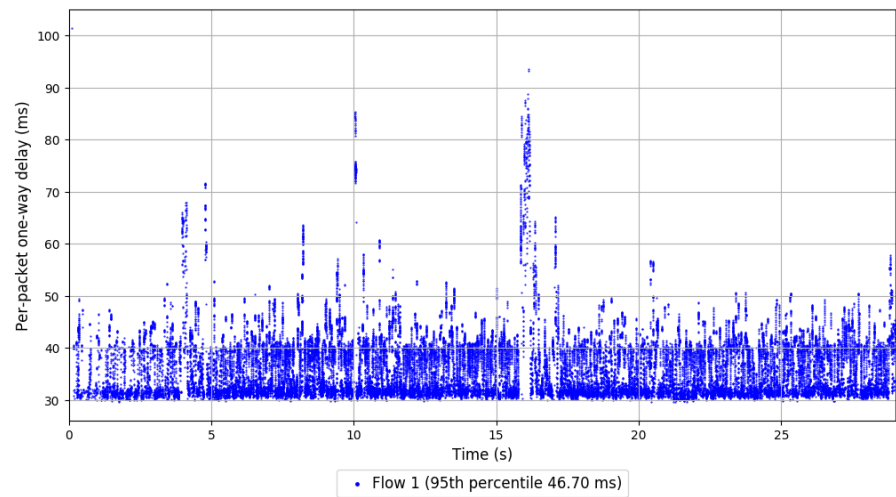
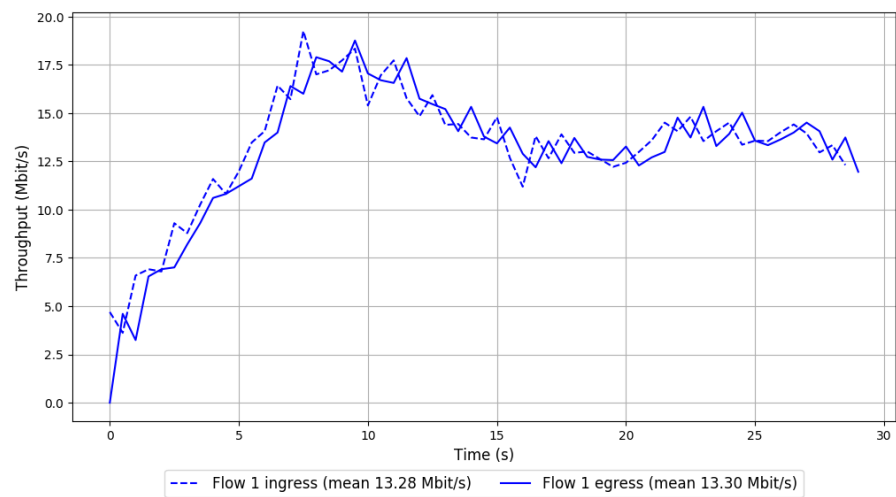
-- Flow 1:

Average throughput: 13.30 Mbit/s

95th percentile per-packet one-way delay: 46.699 ms

Loss rate: 0.13%

Run 3: Report of Indigo-MusesC3 — Data Link



Run 1: Statistics of Indigo-MusesC5

Start at: 2019-01-24 13:00:58

End at: 2019-01-24 13:01:28

Local clock offset: 1.767 ms

Remote clock offset: 1.031 ms

Below is generated by plot.py at 2019-01-24 14:18:50

Datalink statistics

-- Total of 1 flow:

Average throughput: 26.61 Mbit/s

95th percentile per-packet one-way delay: 182.738 ms

Loss rate: 0.00%

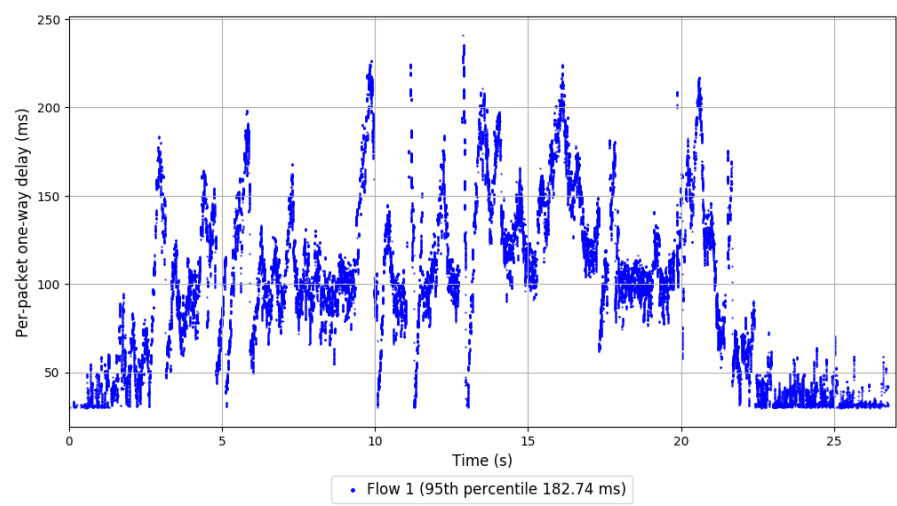
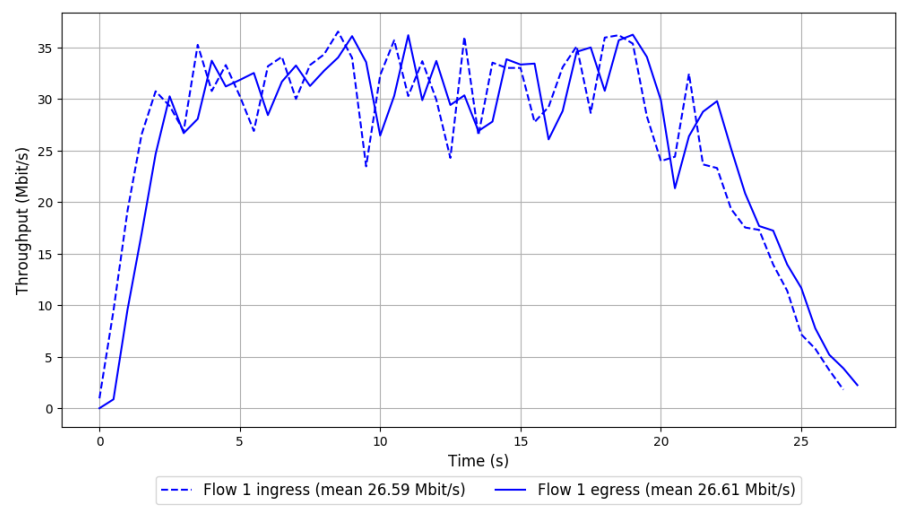
-- Flow 1:

Average throughput: 26.61 Mbit/s

95th percentile per-packet one-way delay: 182.738 ms

Loss rate: 0.00%

Run 1: Report of Indigo-MusesC5 — Data Link



Run 2: Statistics of Indigo-MusesC5

Start at: 2019-01-24 13:26:45

End at: 2019-01-24 13:27:15

Local clock offset: 2.318 ms

Remote clock offset: 1.346 ms

Below is generated by plot.py at 2019-01-24 14:18:59

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.95 Mbit/s

95th percentile per-packet one-way delay: 108.085 ms

Loss rate: 0.25%

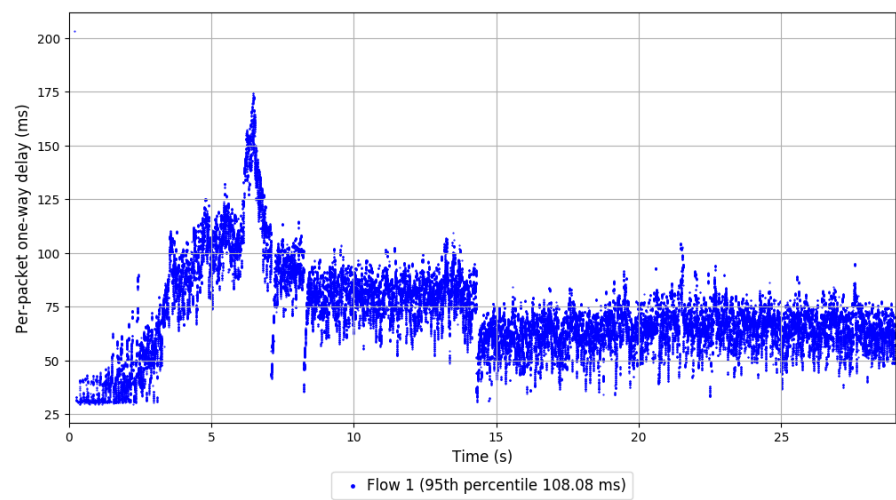
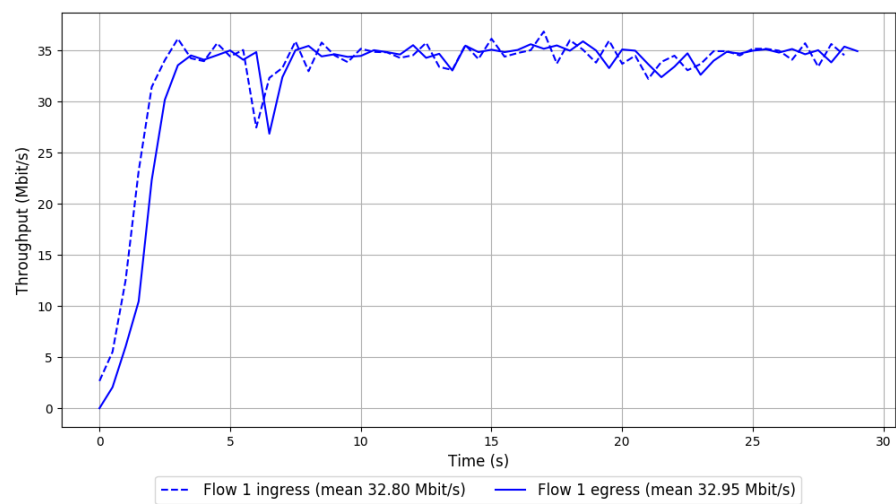
-- Flow 1:

Average throughput: 32.95 Mbit/s

95th percentile per-packet one-way delay: 108.085 ms

Loss rate: 0.25%

Run 2: Report of Indigo-MusesC5 — Data Link



Run 3: Statistics of Indigo-MusesC5

Start at: 2019-01-24 13:52:33

End at: 2019-01-24 13:53:03

Local clock offset: 2.776 ms

Remote clock offset: 1.893 ms

Below is generated by plot.py at 2019-01-24 14:19:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 29.20 Mbit/s

95th percentile per-packet one-way delay: 111.438 ms

Loss rate: 0.23%

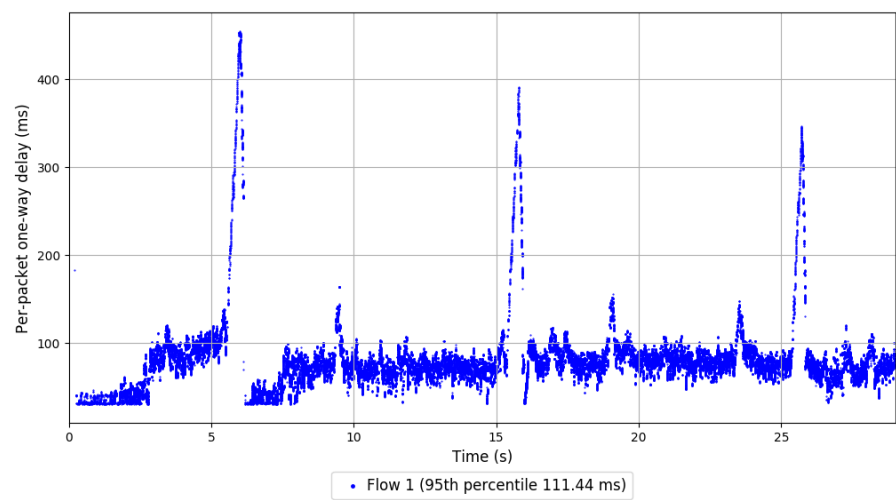
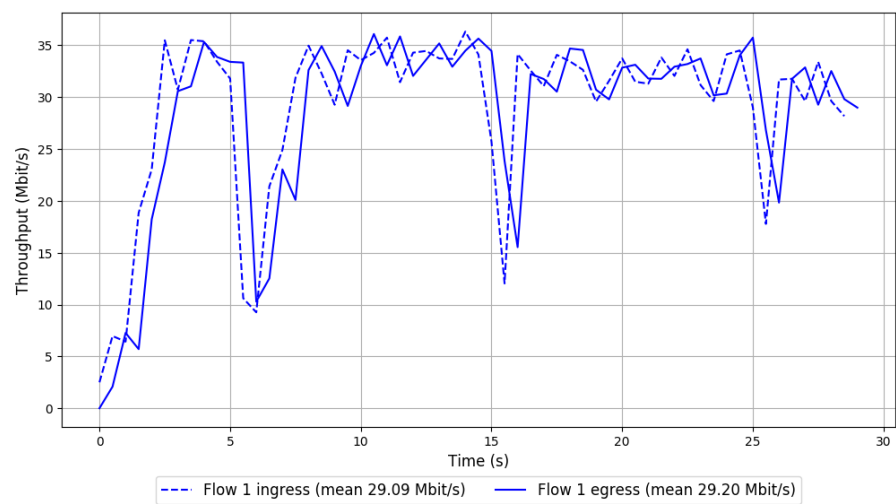
-- Flow 1:

Average throughput: 29.20 Mbit/s

95th percentile per-packet one-way delay: 111.438 ms

Loss rate: 0.23%

Run 3: Report of Indigo-MusesC5 — Data Link



Run 1: Statistics of Indigo-MusesD

Start at: 2019-01-24 13:19:23

End at: 2019-01-24 13:19:53

Local clock offset: 2.203 ms

Remote clock offset: 1.416 ms

Below is generated by plot.py at 2019-01-24 14:19:03

Datalink statistics

-- Total of 1 flow:

Average throughput: 31.85 Mbit/s

95th percentile per-packet one-way delay: 74.058 ms

Loss rate: 0.17%

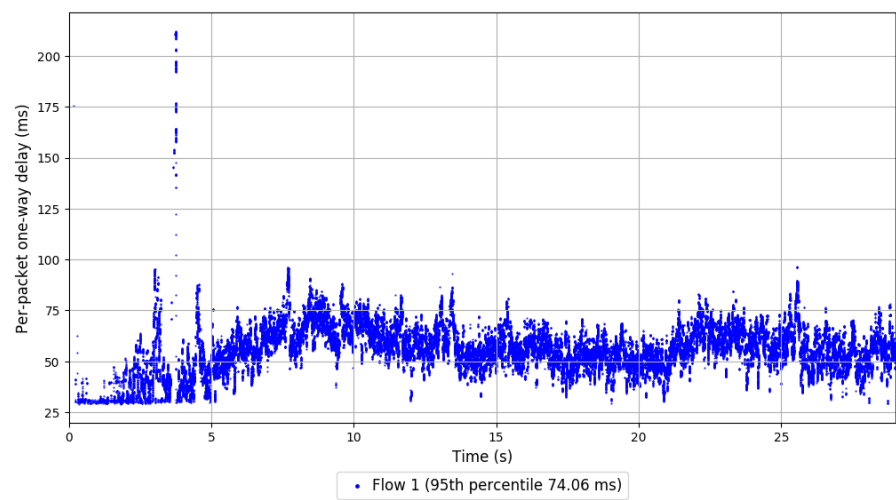
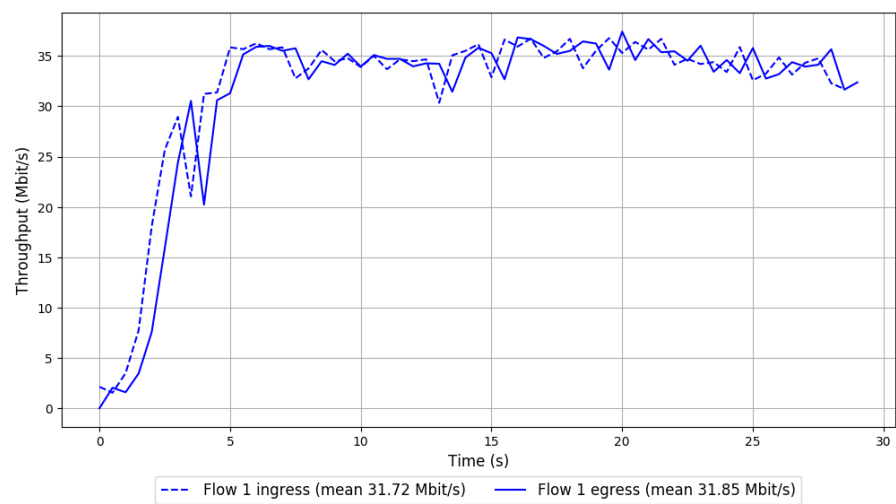
-- Flow 1:

Average throughput: 31.85 Mbit/s

95th percentile per-packet one-way delay: 74.058 ms

Loss rate: 0.17%

Run 1: Report of Indigo-MusesD — Data Link



Run 2: Statistics of Indigo-MusesD

Start at: 2019-01-24 13:45:07

End at: 2019-01-24 13:45:37

Local clock offset: 2.256 ms

Remote clock offset: 1.831 ms

Below is generated by plot.py at 2019-01-24 14:19:03

Datalink statistics

-- Total of 1 flow:

Average throughput: 29.56 Mbit/s

95th percentile per-packet one-way delay: 88.160 ms

Loss rate: 0.24%

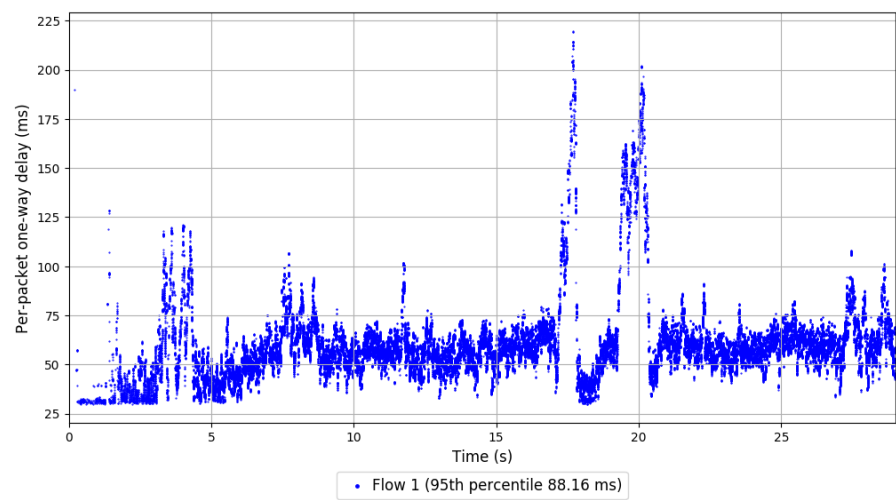
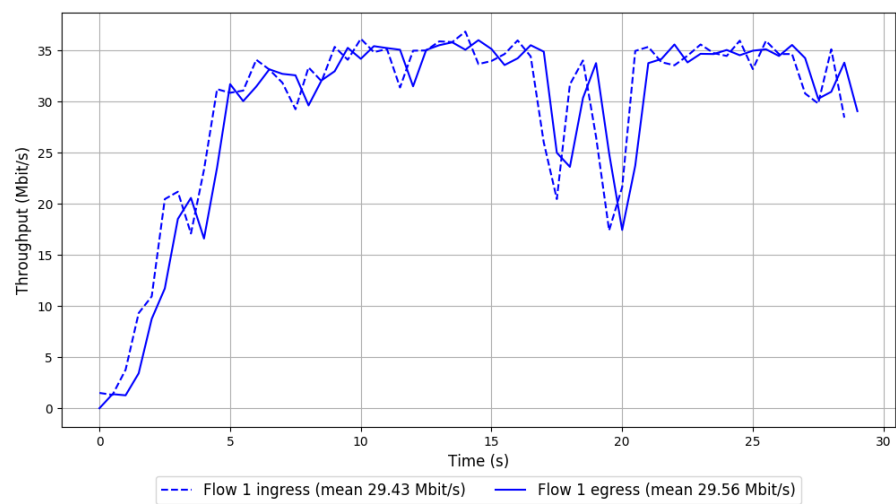
-- Flow 1:

Average throughput: 29.56 Mbit/s

95th percentile per-packet one-way delay: 88.160 ms

Loss rate: 0.24%

Run 2: Report of Indigo-MusesD — Data Link



Run 3: Statistics of Indigo-MusesD

Start at: 2019-01-24 14:10:53

End at: 2019-01-24 14:11:23

Local clock offset: 4.175 ms

Remote clock offset: 1.143 ms

Below is generated by plot.py at 2019-01-24 14:19:03

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.02 Mbit/s

95th percentile per-packet one-way delay: 40.286 ms

Loss rate: 0.03%

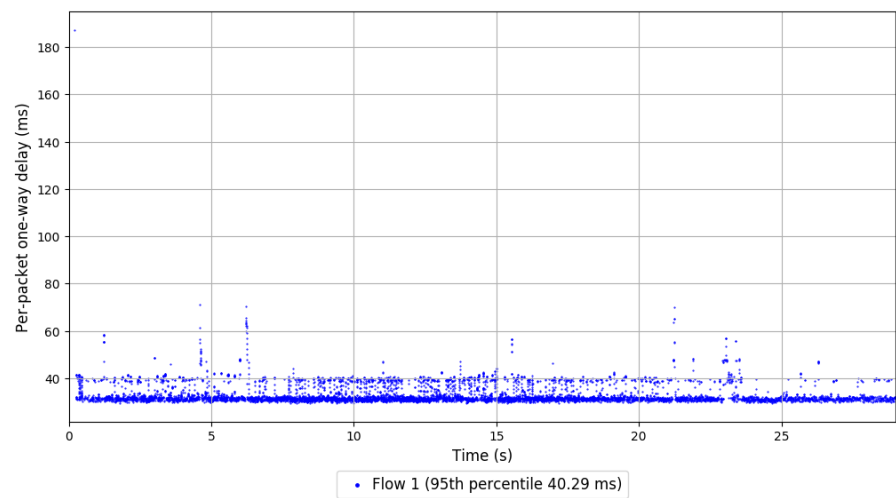
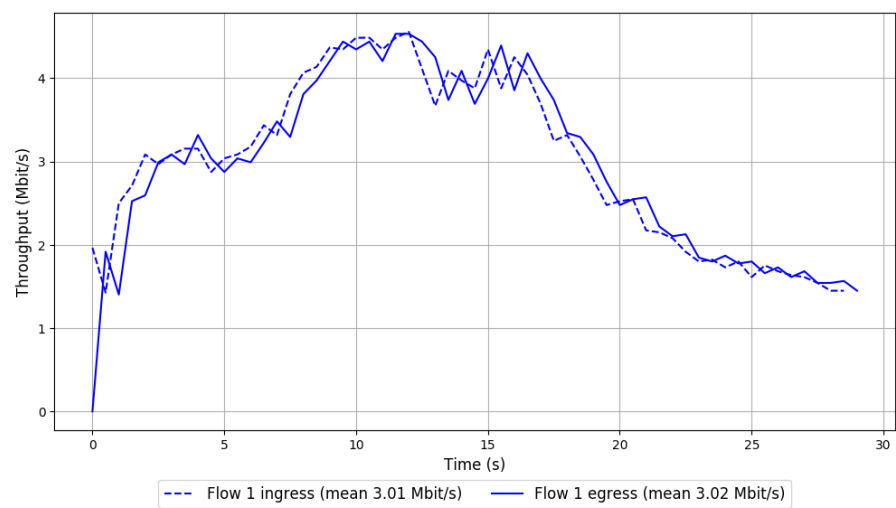
-- Flow 1:

Average throughput: 3.02 Mbit/s

95th percentile per-packet one-way delay: 40.286 ms

Loss rate: 0.03%

Run 3: Report of Indigo-MusesD — Data Link



Run 1: Statistics of Indigo-MusesT

Start at: 2019-01-24 13:24:17

End at: 2019-01-24 13:24:47

Local clock offset: 2.134 ms

Remote clock offset: 1.317 ms

Below is generated by plot.py at 2019-01-24 14:19:12

Datalink statistics

-- Total of 1 flow:

Average throughput: 29.12 Mbit/s

95th percentile per-packet one-way delay: 192.027 ms

Loss rate: 0.65%

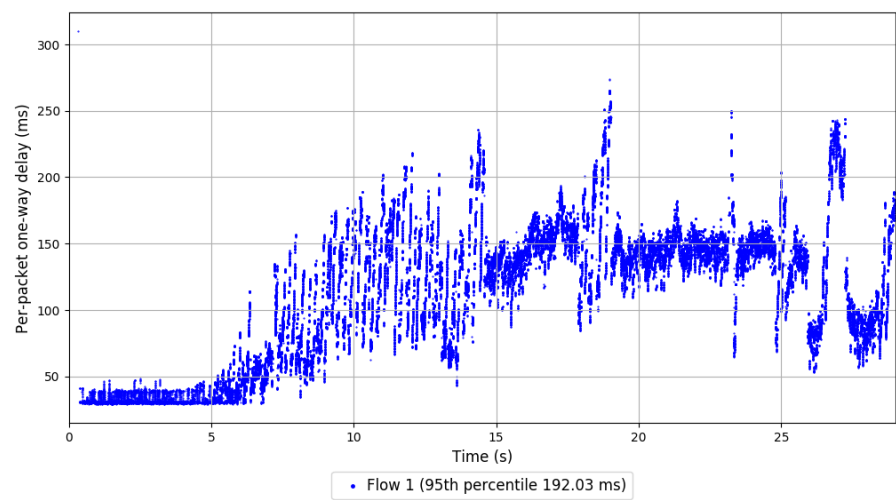
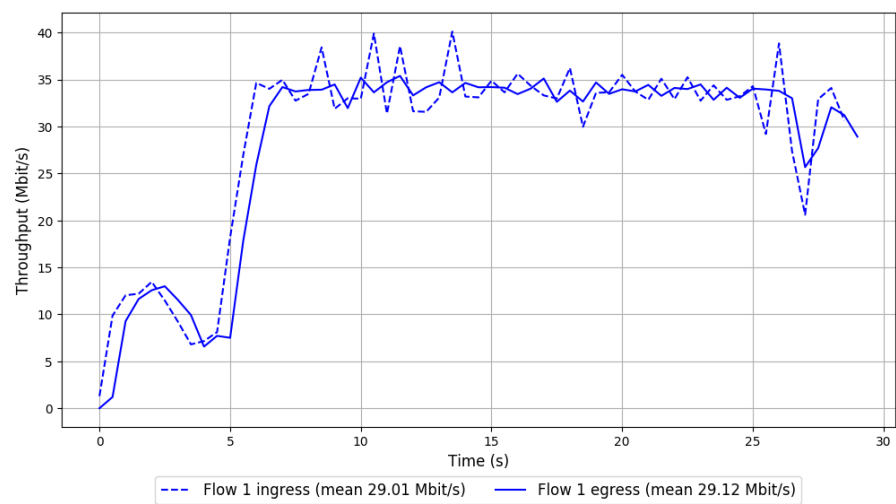
-- Flow 1:

Average throughput: 29.12 Mbit/s

95th percentile per-packet one-way delay: 192.027 ms

Loss rate: 0.65%

Run 1: Report of Indigo-MusesT — Data Link



Run 2: Statistics of Indigo-MusesT

Start at: 2019-01-24 13:50:06

End at: 2019-01-24 13:50:36

Local clock offset: 2.609 ms

Remote clock offset: 1.919 ms

Below is generated by plot.py at 2019-01-24 14:19:14

Datalink statistics

-- Total of 1 flow:

Average throughput: 30.18 Mbit/s

95th percentile per-packet one-way delay: 191.753 ms

Loss rate: 0.35%

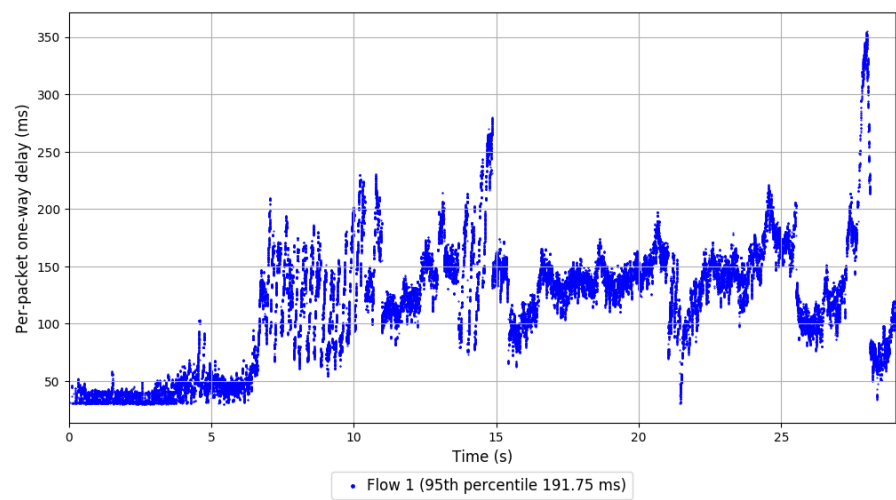
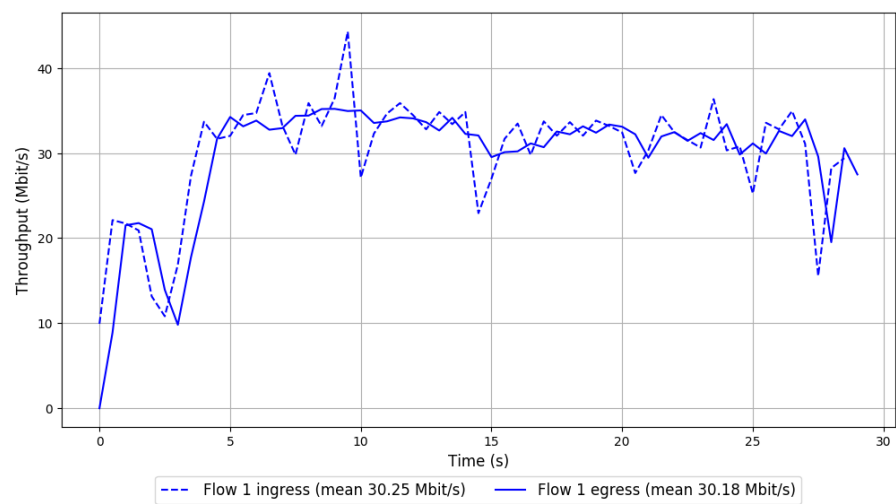
-- Flow 1:

Average throughput: 30.18 Mbit/s

95th percentile per-packet one-way delay: 191.753 ms

Loss rate: 0.35%

Run 2: Report of Indigo-MusesT — Data Link



Run 3: Statistics of Indigo-MusesT

Start at: 2019-01-24 14:15:47

End at: 2019-01-24 14:16:17

Local clock offset: 4.585 ms

Remote clock offset: 1.117 ms

Below is generated by plot.py at 2019-01-24 14:19:14

Datalink statistics

-- Total of 1 flow:

Average throughput: 28.70 Mbit/s

95th percentile per-packet one-way delay: 201.615 ms

Loss rate: 0.57%

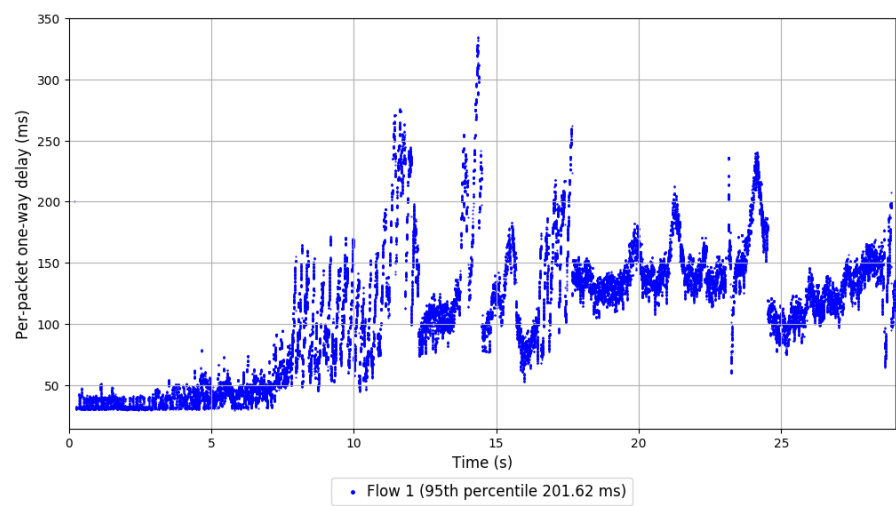
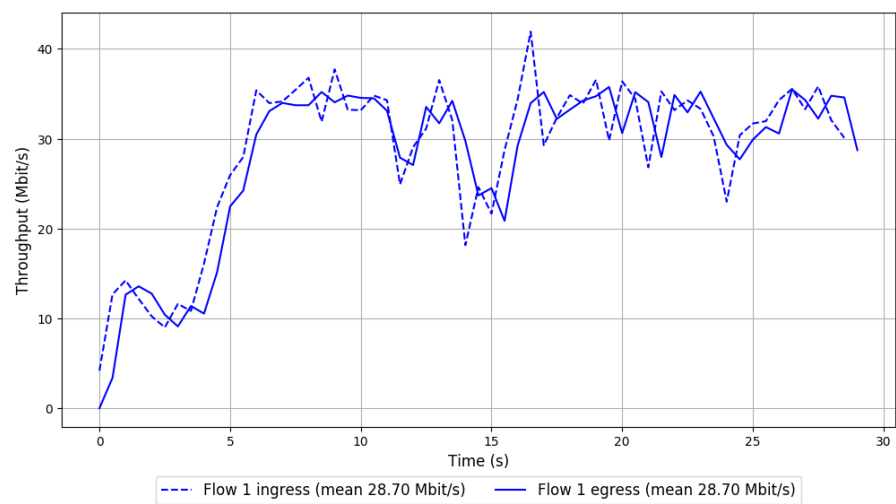
-- Flow 1:

Average throughput: 28.70 Mbit/s

95th percentile per-packet one-way delay: 201.615 ms

Loss rate: 0.57%

Run 3: Report of Indigo-MusesT — Data Link

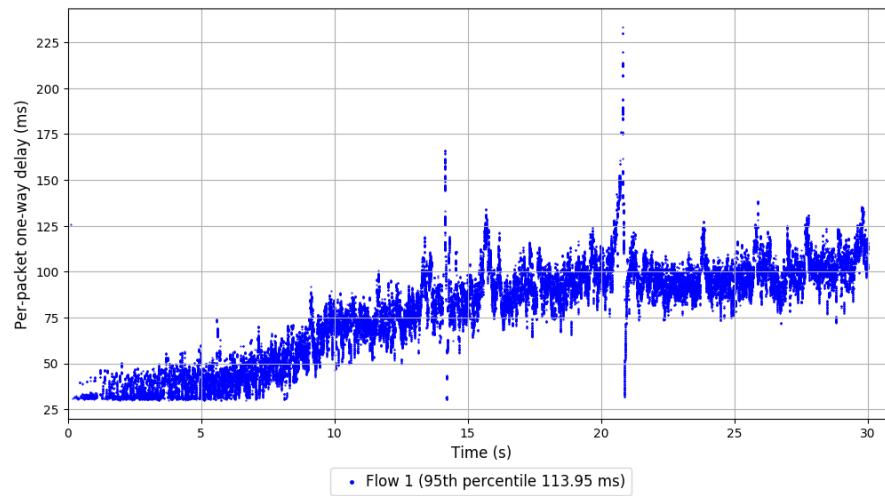
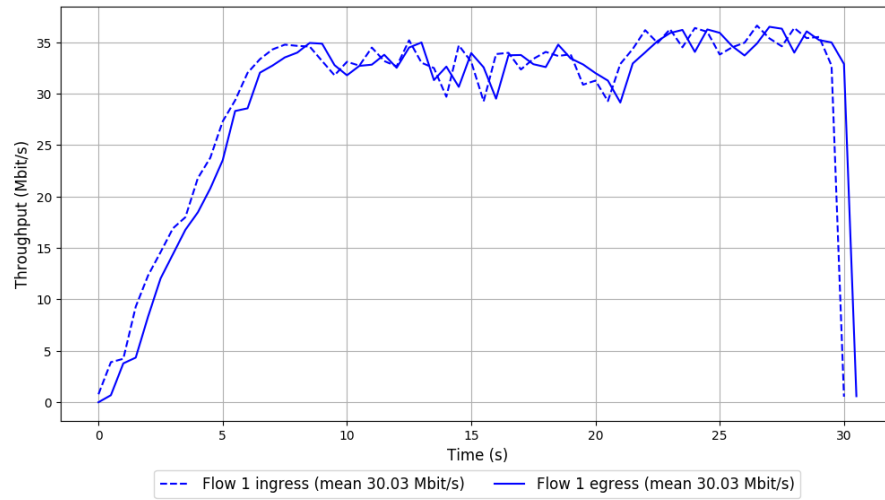


```
Run 1: Statistics of LEDBAT

Start at: 2019-01-24 13:21:49
End at: 2019-01-24 13:22:19
Local clock offset: 2.074 ms
Remote clock offset: 1.344 ms

# Below is generated by plot.py at 2019-01-24 14:19:16
# Datalink statistics
-- Total of 1 flow:
Average throughput: 30.03 Mbit/s
95th percentile per-packet one-way delay: 113.953 ms
Loss rate: 0.43%
-- Flow 1:
Average throughput: 30.03 Mbit/s
95th percentile per-packet one-way delay: 113.953 ms
Loss rate: 0.43%
```

Run 1: Report of LEDBAT — Data Link



Run 2: Statistics of LEDBAT

Start at: 2019-01-24 13:47:38

End at: 2019-01-24 13:48:08

Local clock offset: 2.405 ms

Remote clock offset: 1.868 ms

Below is generated by plot.py at 2019-01-24 14:19:26

Datalink statistics

-- Total of 1 flow:

Average throughput: 27.98 Mbit/s

95th percentile per-packet one-way delay: 99.945 ms

Loss rate: 0.38%

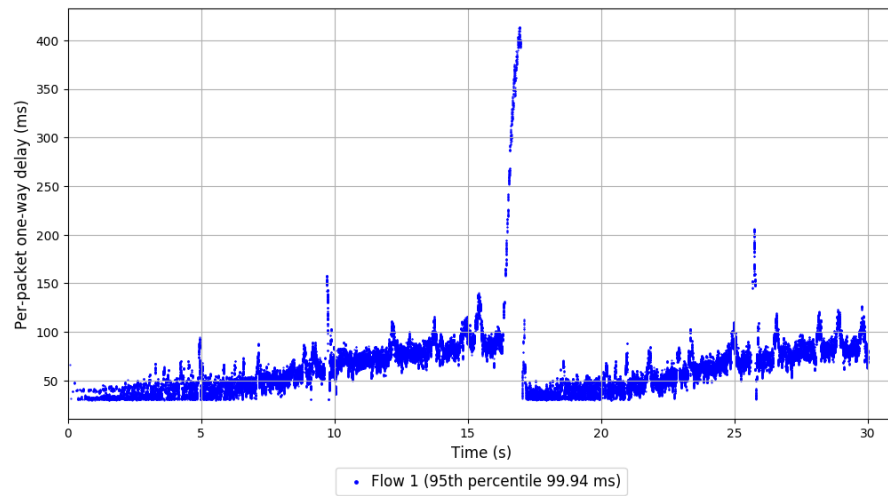
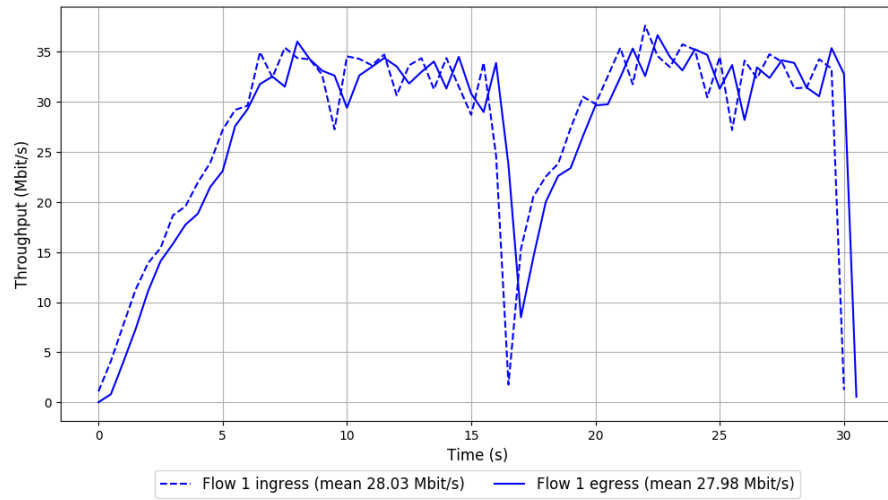
-- Flow 1:

Average throughput: 27.98 Mbit/s

95th percentile per-packet one-way delay: 99.945 ms

Loss rate: 0.38%

Run 2: Report of LEDBAT — Data Link



Run 3: Statistics of LEDBAT

Start at: 2019-01-24 14:13:19

End at: 2019-01-24 14:13:49

Local clock offset: 4.379 ms

Remote clock offset: 1.058 ms

Below is generated by plot.py at 2019-01-24 14:19:27

Datalink statistics

-- Total of 1 flow:

Average throughput: 26.63 Mbit/s

95th percentile per-packet one-way delay: 129.595 ms

Loss rate: 0.21%

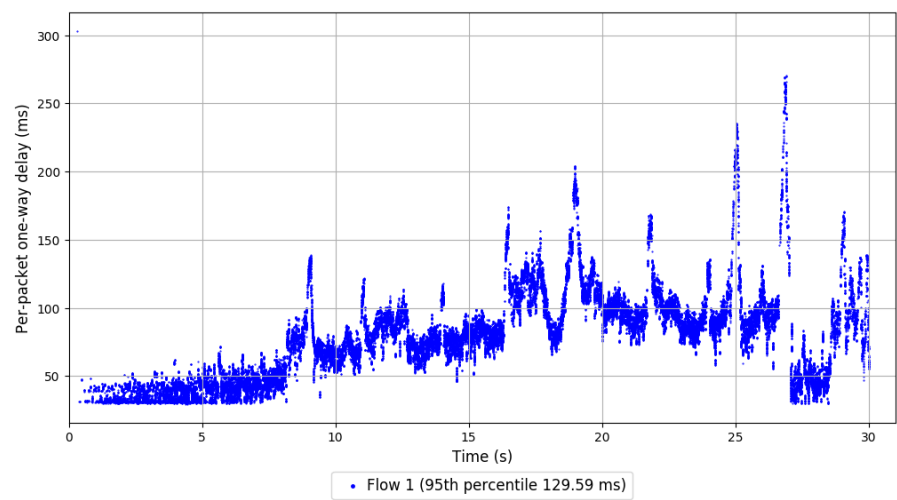
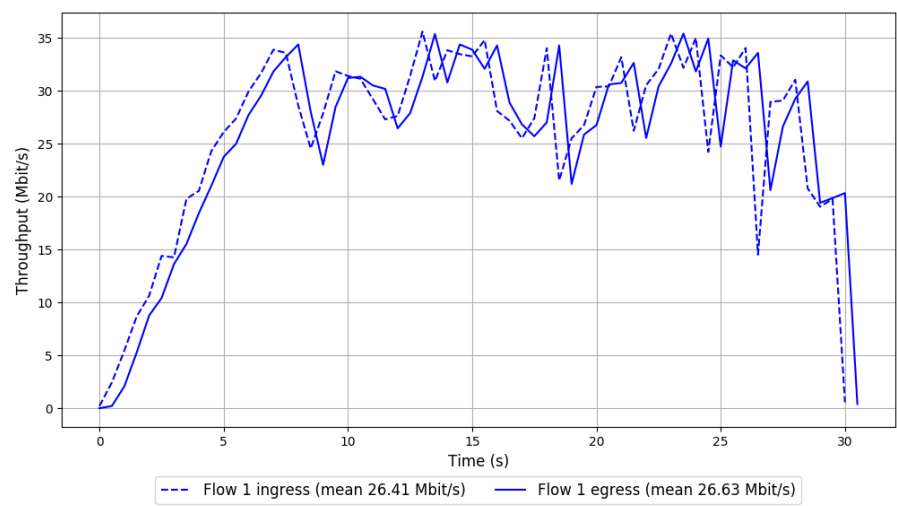
-- Flow 1:

Average throughput: 26.63 Mbit/s

95th percentile per-packet one-way delay: 129.595 ms

Loss rate: 0.21%

Run 3: Report of LEDBAT — Data Link

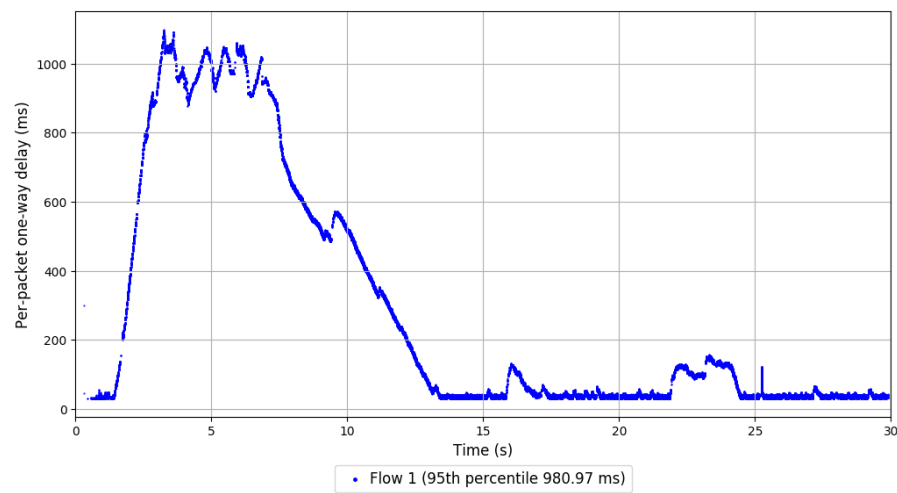
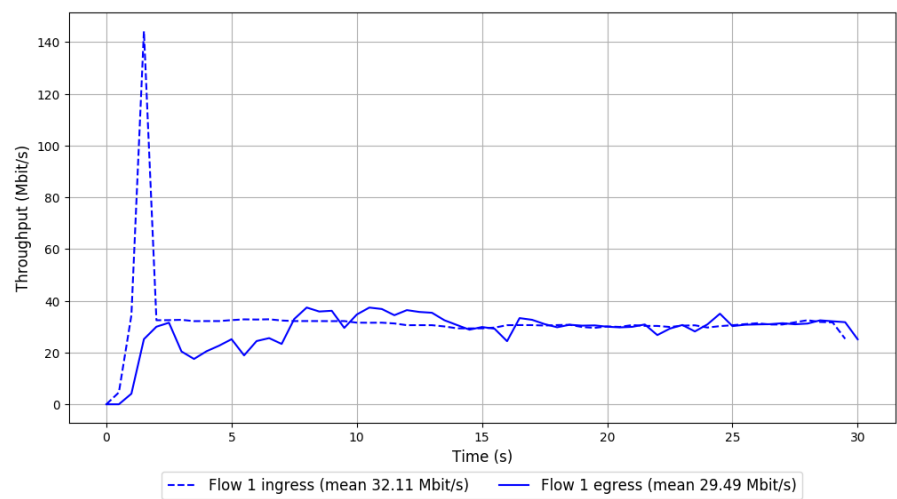


```
Run 1: Statistics of PCC-Allegro

Start at: 2019-01-24 13:10:46
End at: 2019-01-24 13:11:16
Local clock offset: 0.717 ms
Remote clock offset: 1.238 ms

# Below is generated by plot.py at 2019-01-24 14:19:33
# Datalink statistics
-- Total of 1 flow:
Average throughput: 29.49 Mbit/s
95th percentile per-packet one-way delay: 980.972 ms
Loss rate: 9.10%
-- Flow 1:
Average throughput: 29.49 Mbit/s
95th percentile per-packet one-way delay: 980.972 ms
Loss rate: 9.10%
```

Run 1: Report of PCC-Allegro — Data Link



Run 2: Statistics of PCC-Allegro

Start at: 2019-01-24 13:36:31

End at: 2019-01-24 13:37:01

Local clock offset: 2.08 ms

Remote clock offset: 1.522 ms

Below is generated by plot.py at 2019-01-24 14:19:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 9.04 Mbit/s

95th percentile per-packet one-way delay: 37.817 ms

Loss rate: 0.09%

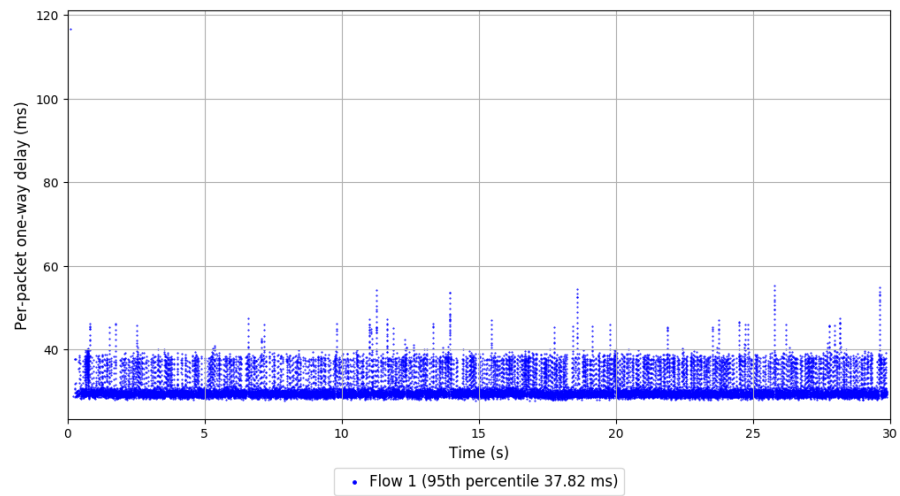
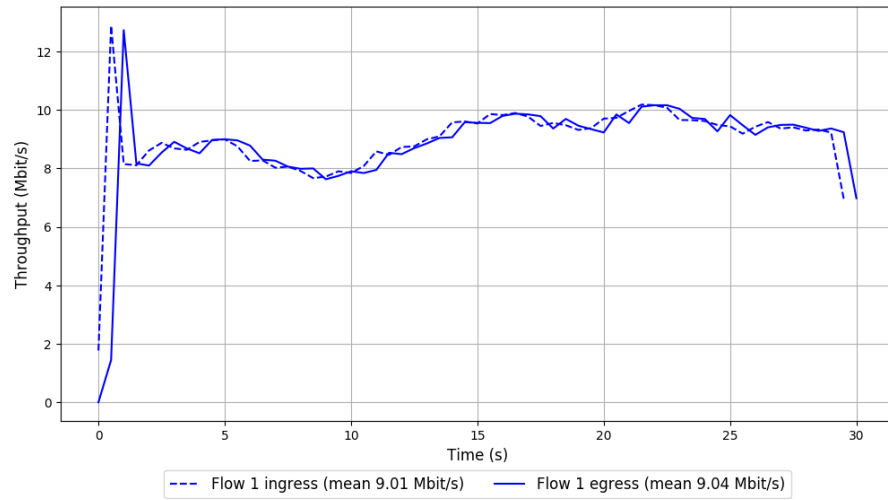
-- Flow 1:

Average throughput: 9.04 Mbit/s

95th percentile per-packet one-way delay: 37.817 ms

Loss rate: 0.09%

Run 2: Report of PCC-Allegro — Data Link



Run 3: Statistics of PCC-Allegro

Start at: 2019-01-24 14:02:19

End at: 2019-01-24 14:02:49

Local clock offset: 3.57 ms

Remote clock offset: 1.157 ms

Below is generated by plot.py at 2019-01-24 14:19:33

Datalink statistics

-- Total of 1 flow:

Average throughput: 8.65 Mbit/s

95th percentile per-packet one-way delay: 40.053 ms

Loss rate: 0.12%

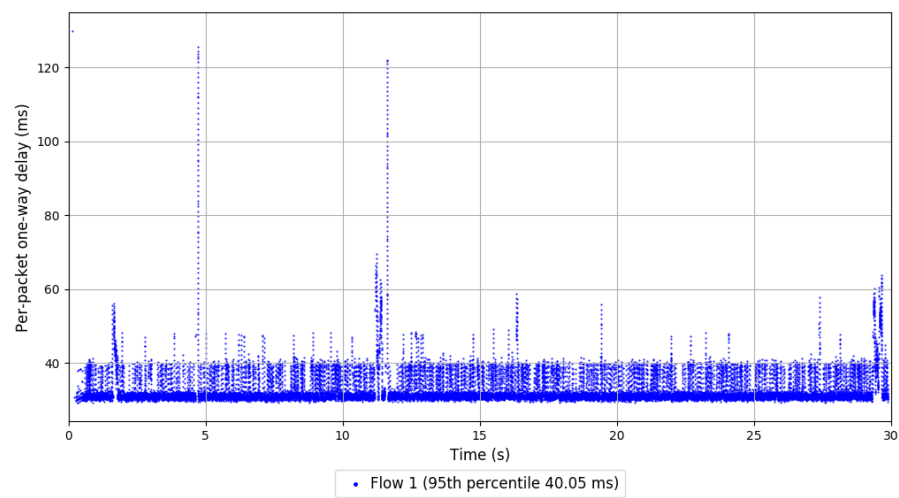
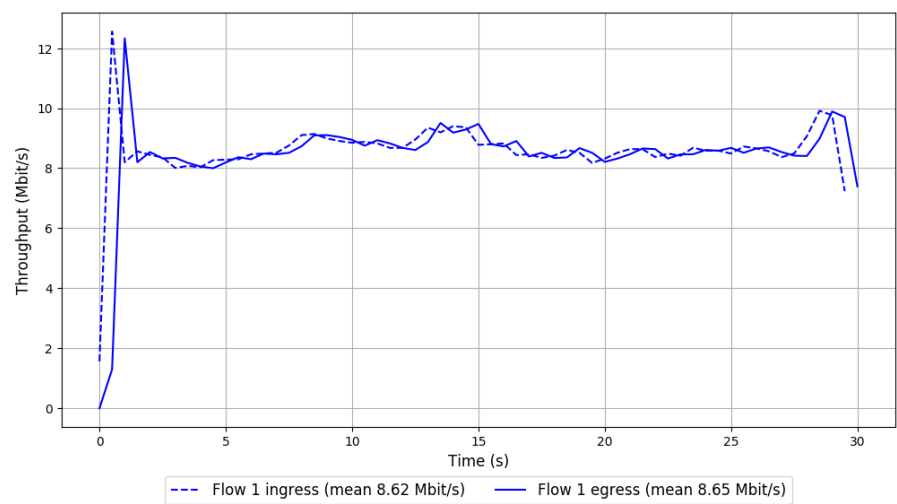
-- Flow 1:

Average throughput: 8.65 Mbit/s

95th percentile per-packet one-way delay: 40.053 ms

Loss rate: 0.12%

Run 3: Report of PCC-Allegro — Data Link



Run 1: Statistics of PCC-Expr

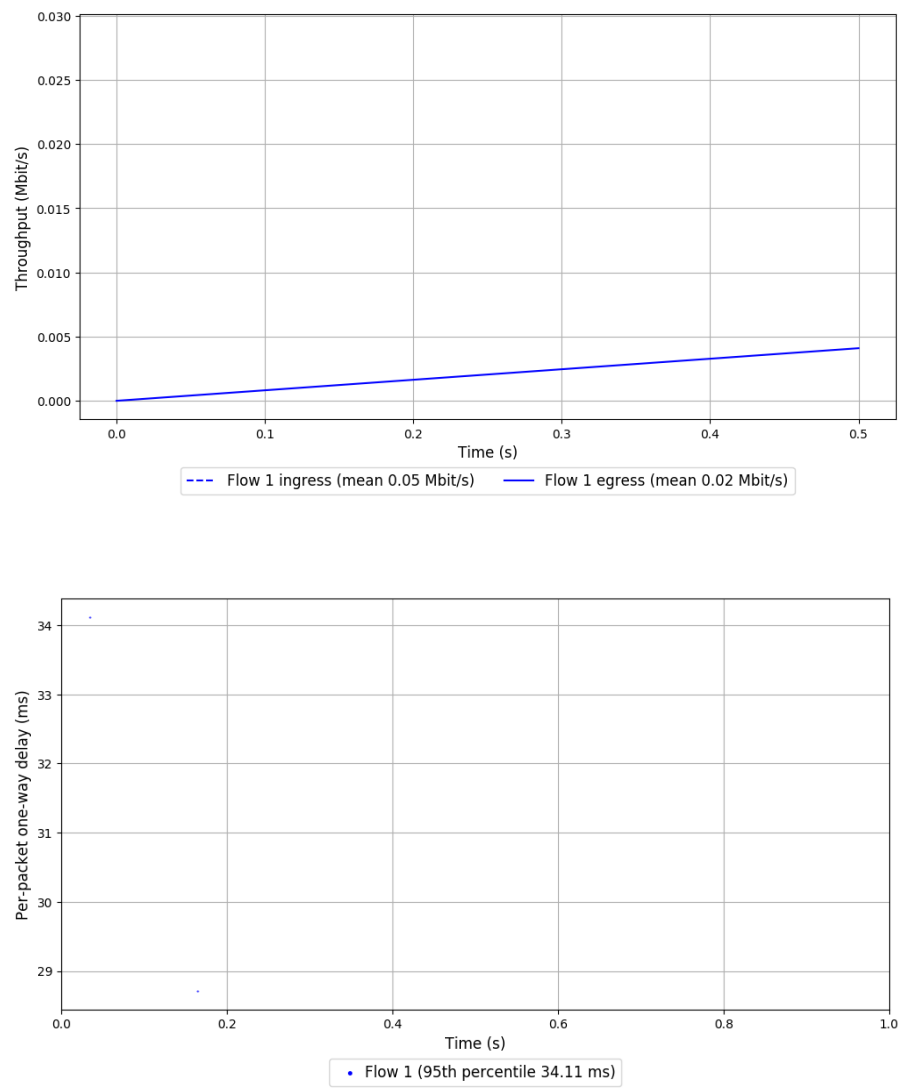
Start at: 2019-01-24 13:02:12

End at: 2019-01-24 13:02:42

Local clock offset: 2.097 ms

Remote clock offset: 1.066 ms

Run 1: Report of PCC-Expr — Data Link



Run 2: Statistics of PCC-Expr

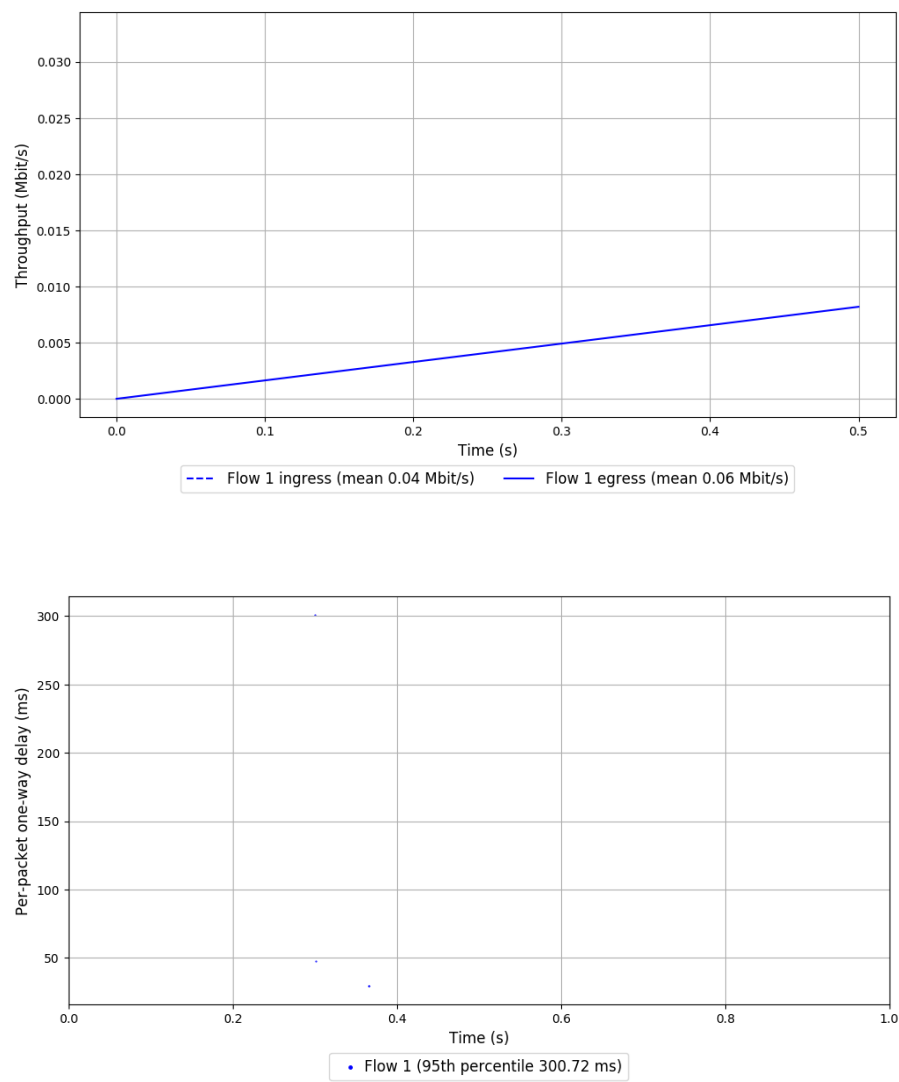
Start at: 2019-01-24 13:27:59

End at: 2019-01-24 13:28:29

Local clock offset: 2.416 ms

Remote clock offset: 1.231 ms

Run 2: Report of PCC-Expr — Data Link



Run 3: Statistics of PCC-Expr

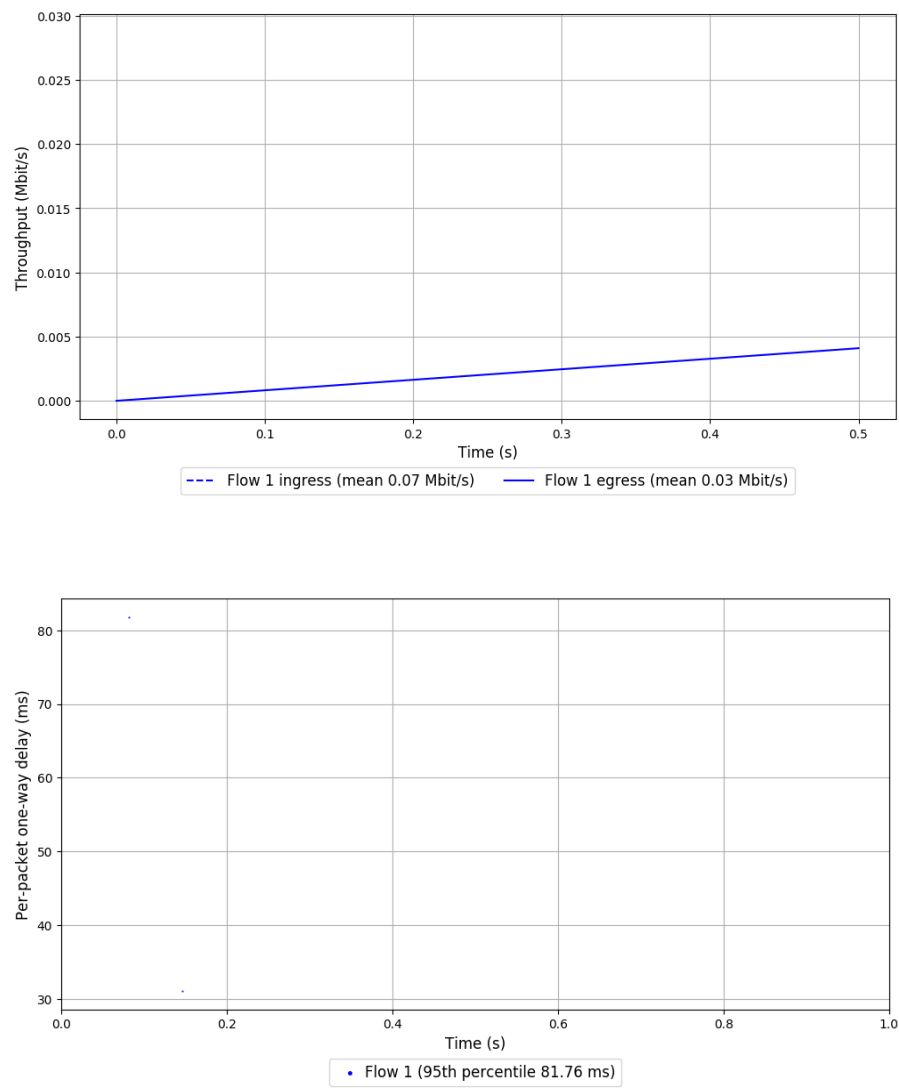
Start at: 2019-01-24 13:53:47

End at: 2019-01-24 13:54:17

Local clock offset: 2.891 ms

Remote clock offset: 1.597 ms

Run 3: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2019-01-24 13:13:14

End at: 2019-01-24 13:13:44

Local clock offset: 1.708 ms

Remote clock offset: 1.322 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.16 Mbit/s

95th percentile per-packet one-way delay: 256.384 ms

Loss rate: 0.31%

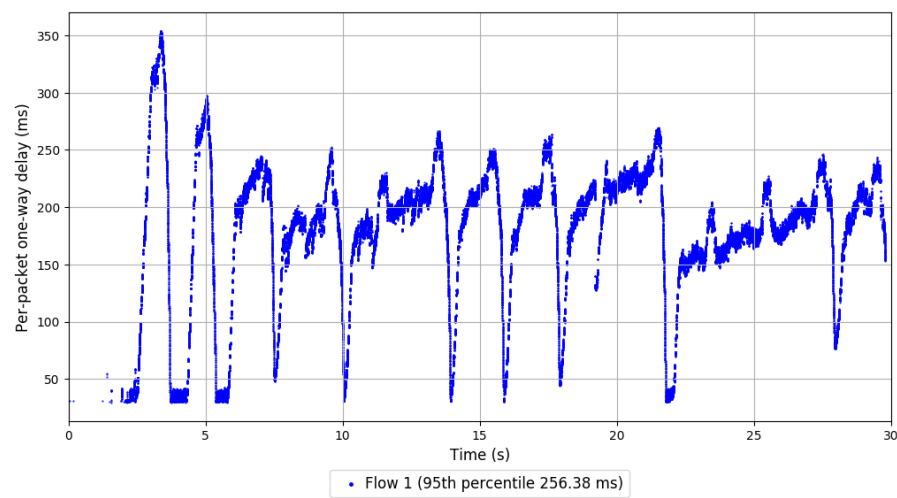
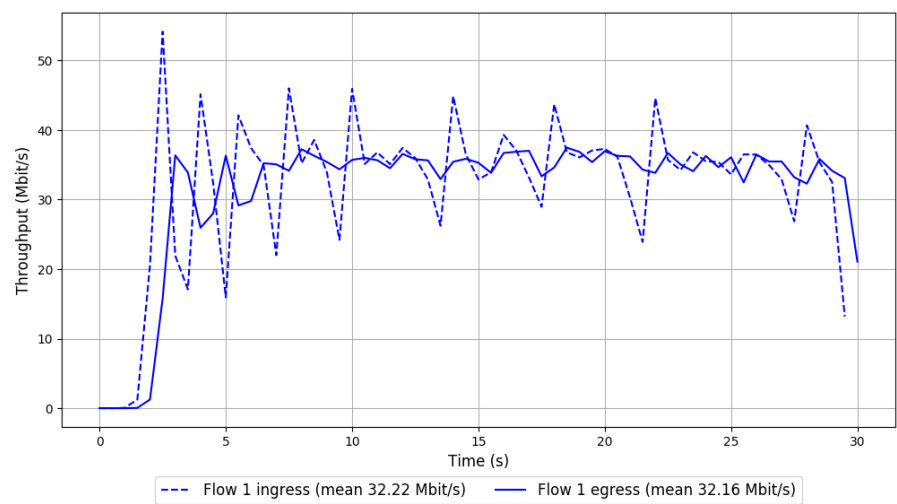
-- Flow 1:

Average throughput: 32.16 Mbit/s

95th percentile per-packet one-way delay: 256.384 ms

Loss rate: 0.31%

Run 1: Report of QUIC Cubic — Data Link



Run 2: Statistics of QUIC Cubic

Start at: 2019-01-24 13:38:58

End at: 2019-01-24 13:39:28

Local clock offset: 2.065 ms

Remote clock offset: 1.563 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 31.19 Mbit/s

95th percentile per-packet one-way delay: 190.219 ms

Loss rate: 0.75%

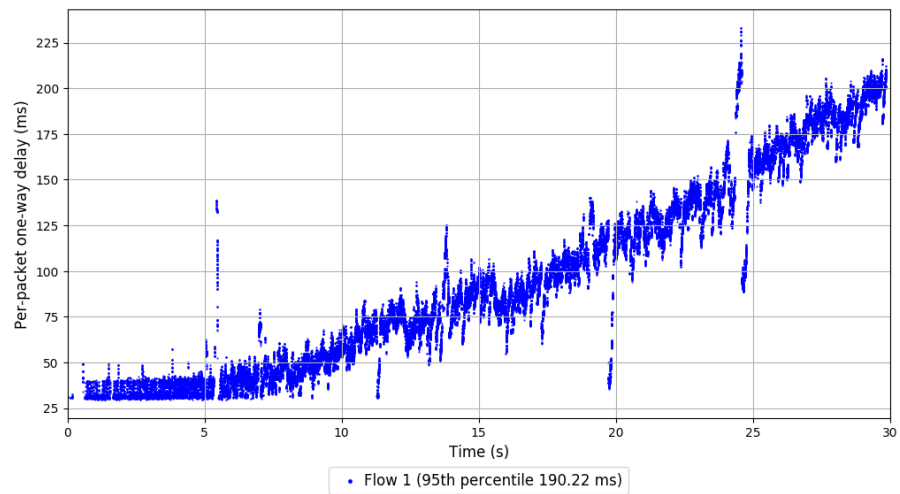
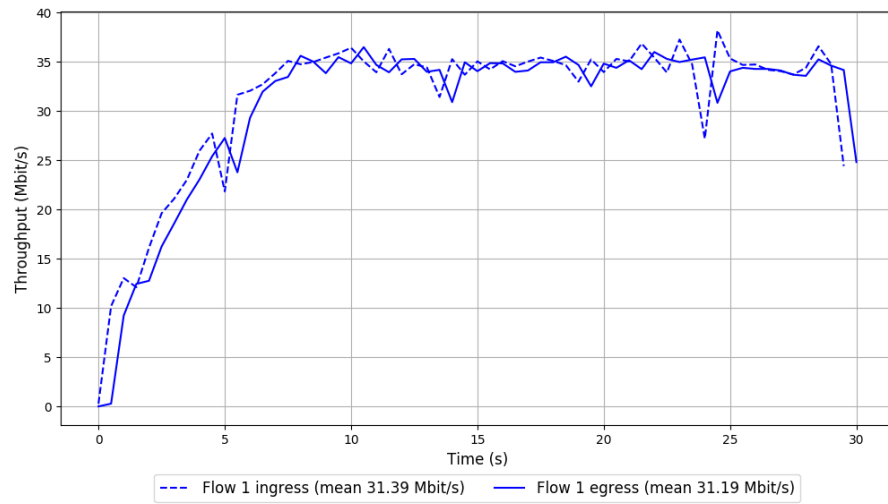
-- Flow 1:

Average throughput: 31.19 Mbit/s

95th percentile per-packet one-way delay: 190.219 ms

Loss rate: 0.75%

Run 2: Report of QUIC Cubic — Data Link



Run 3: Statistics of QUIC Cubic

Start at: 2019-01-24 14:04:46

End at: 2019-01-24 14:05:16

Local clock offset: 3.731 ms

Remote clock offset: 1.122 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 27.38 Mbit/s

95th percentile per-packet one-way delay: 219.646 ms

Loss rate: 0.68%

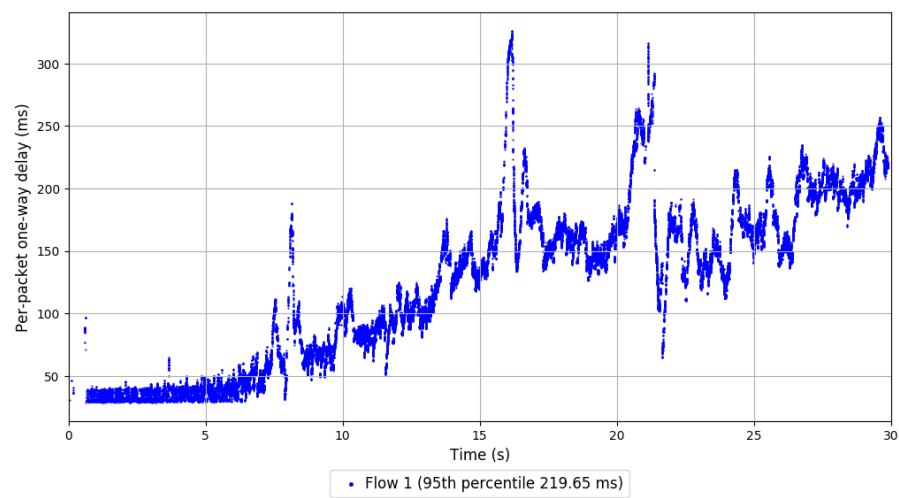
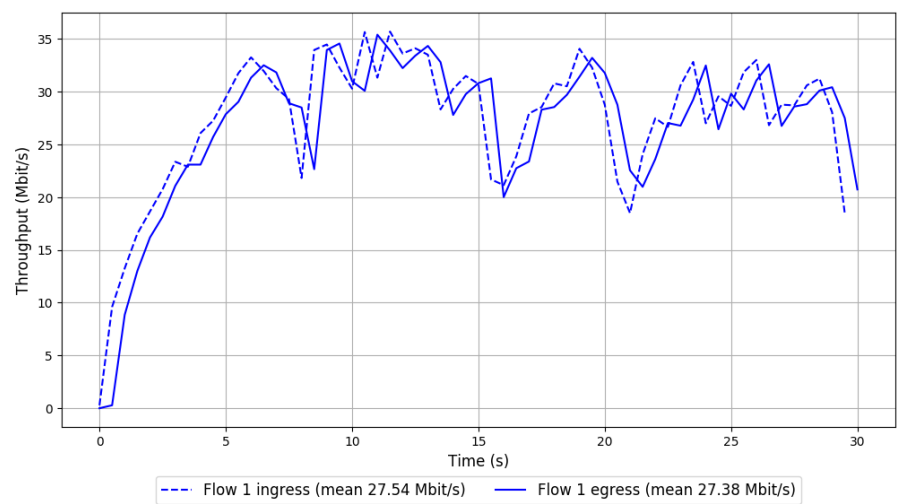
-- Flow 1:

Average throughput: 27.38 Mbit/s

95th percentile per-packet one-way delay: 219.646 ms

Loss rate: 0.68%

Run 3: Report of QUIC Cubic — Data Link



Run 1: Statistics of SCReAM

Start at: 2019-01-24 13:20:37

End at: 2019-01-24 13:21:07

Local clock offset: 2.118 ms

Remote clock offset: 1.295 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 38.951 ms

Loss rate: 0.13%

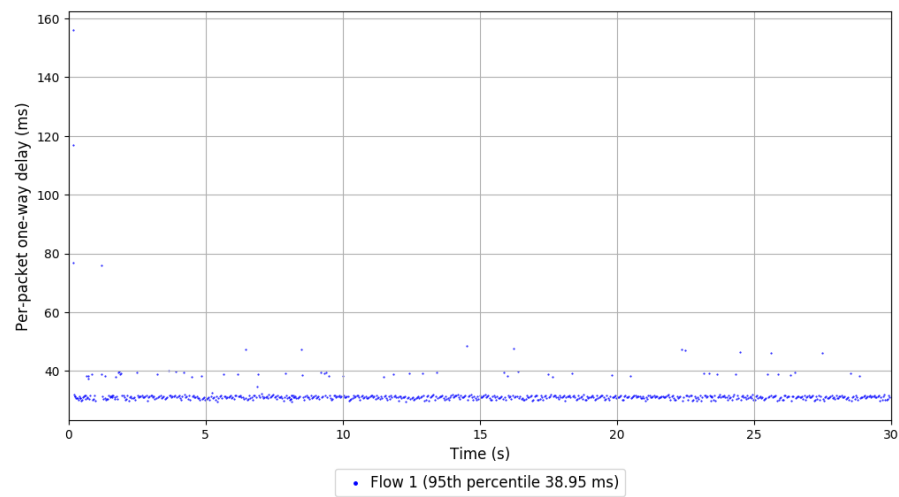
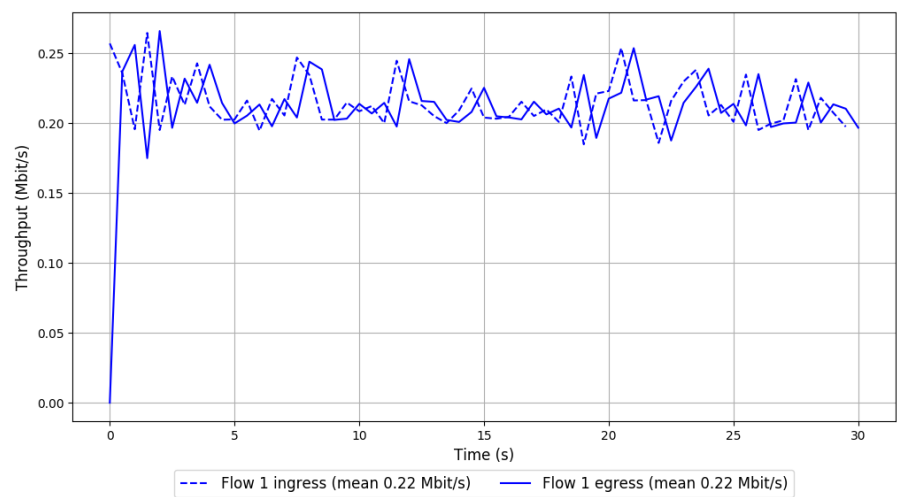
-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 38.951 ms

Loss rate: 0.13%

Run 1: Report of SReAM — Data Link



Run 2: Statistics of SReAM

Start at: 2019-01-24 13:46:25

End at: 2019-01-24 13:46:55

Local clock offset: 2.342 ms

Remote clock offset: 1.788 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 39.268 ms

Loss rate: 0.13%

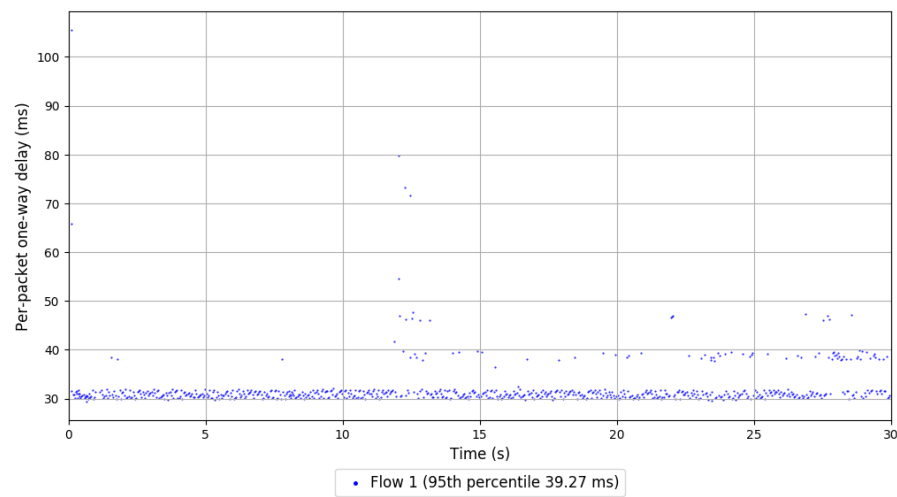
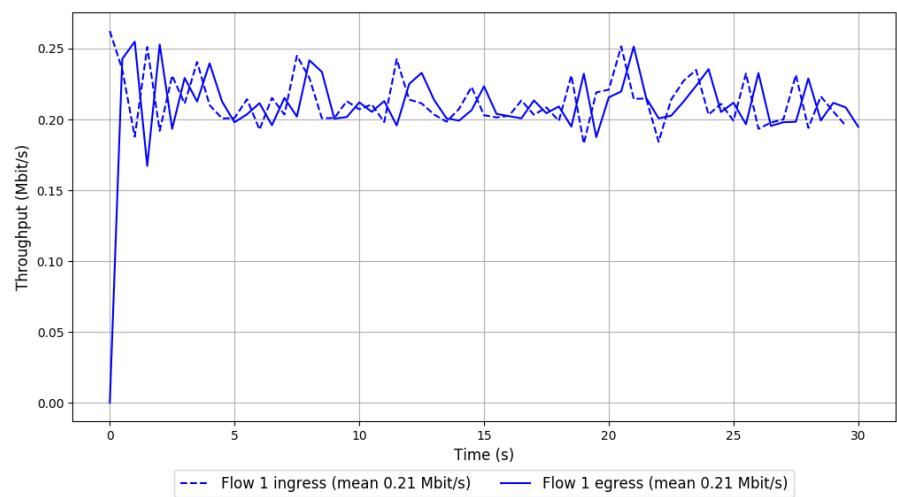
-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 39.268 ms

Loss rate: 0.13%

Run 2: Report of SReAM — Data Link



Run 3: Statistics of SCReAM

Start at: 2019-01-24 14:12:06

End at: 2019-01-24 14:12:36

Local clock offset: 4.265 ms

Remote clock offset: 1.103 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 31.431 ms

Loss rate: 0.11%

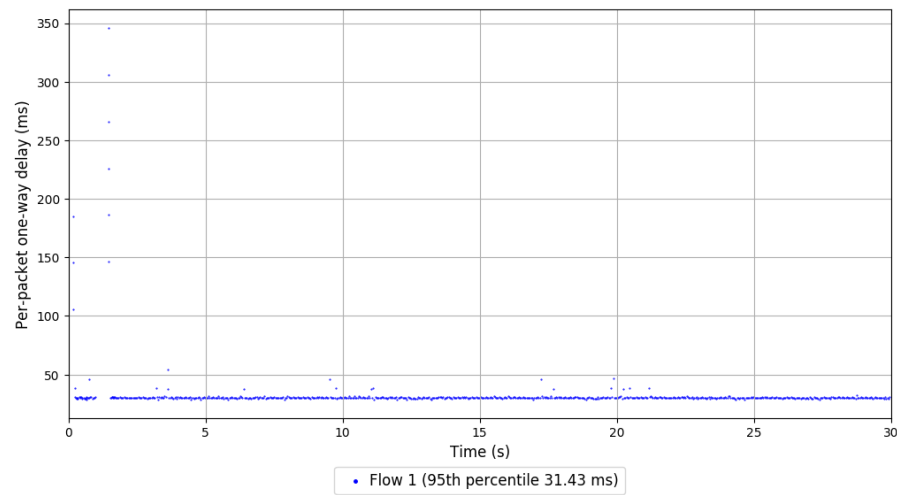
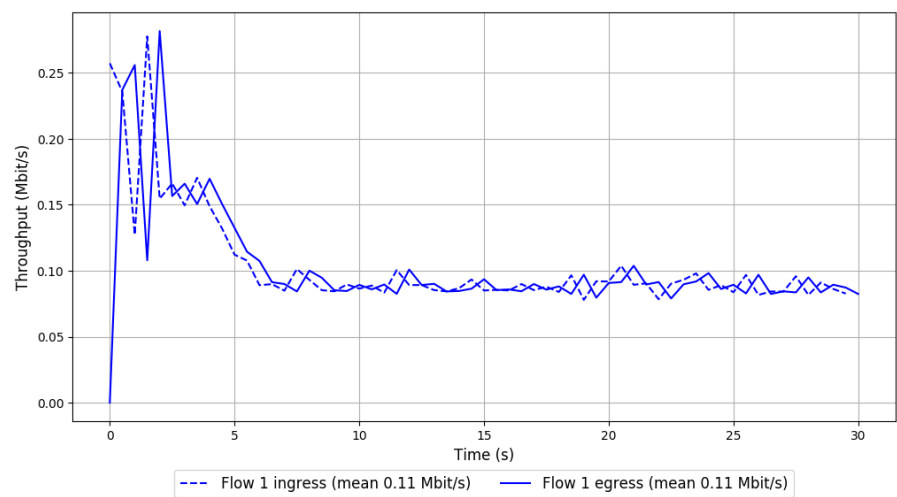
-- Flow 1:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 31.431 ms

Loss rate: 0.11%

Run 3: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2019-01-24 13:23:04

End at: 2019-01-24 13:23:34

Local clock offset: 2.082 ms

Remote clock offset: 1.326 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 13.85 Mbit/s

95th percentile per-packet one-way delay: 50.651 ms

Loss rate: 0.04%

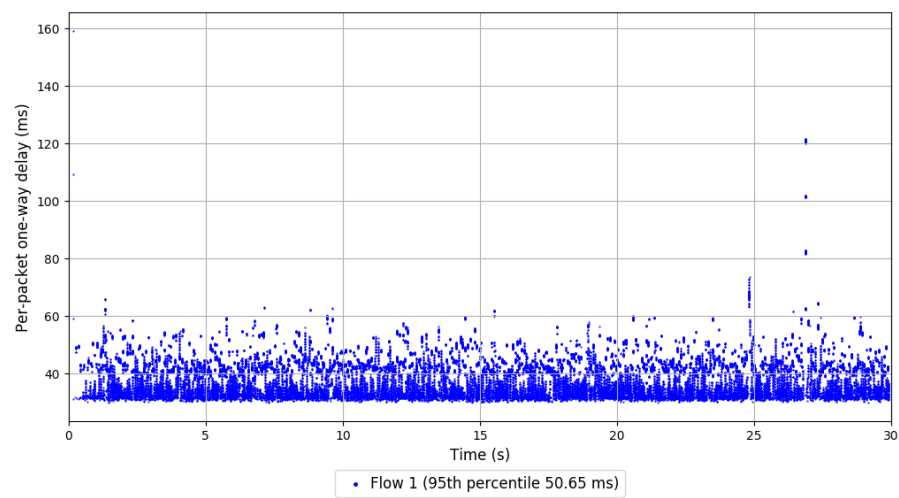
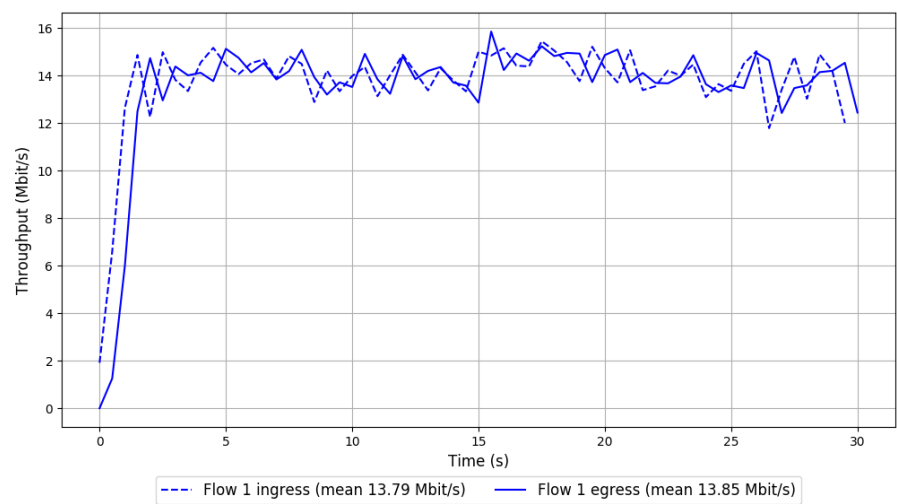
-- Flow 1:

Average throughput: 13.85 Mbit/s

95th percentile per-packet one-way delay: 50.651 ms

Loss rate: 0.04%

Run 1: Report of Sprout — Data Link



Run 2: Statistics of Sprout

Start at: 2019-01-24 13:48:52

End at: 2019-01-24 13:49:22

Local clock offset: 2.505 ms

Remote clock offset: 1.979 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 13.82 Mbit/s

95th percentile per-packet one-way delay: 50.013 ms

Loss rate: 0.16%

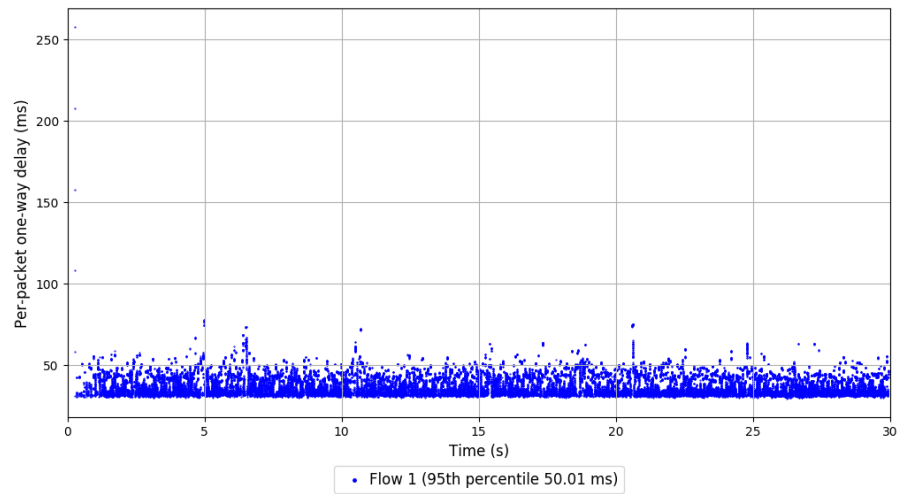
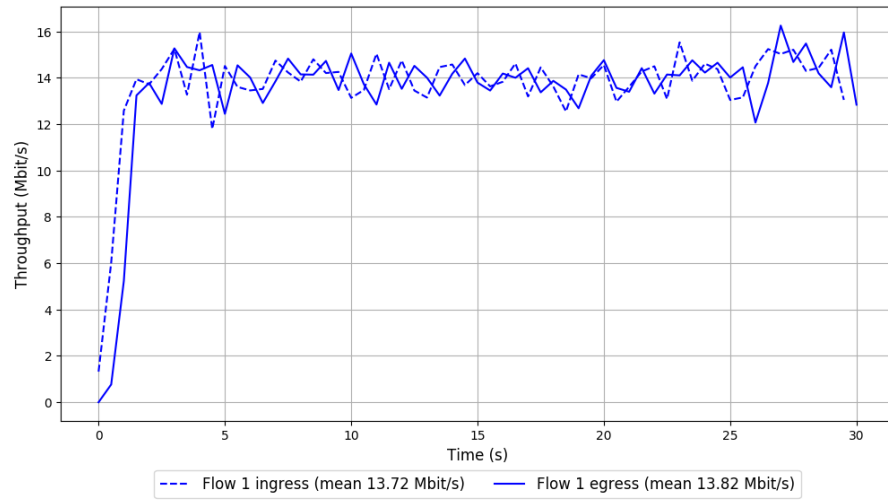
-- Flow 1:

Average throughput: 13.82 Mbit/s

95th percentile per-packet one-way delay: 50.013 ms

Loss rate: 0.16%

Run 2: Report of Sprout — Data Link



Run 3: Statistics of Sprout

Start at: 2019-01-24 14:14:33

End at: 2019-01-24 14:15:03

Local clock offset: 4.49 ms

Remote clock offset: 1.08 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 13.28 Mbit/s

95th percentile per-packet one-way delay: 52.606 ms

Loss rate: 0.13%

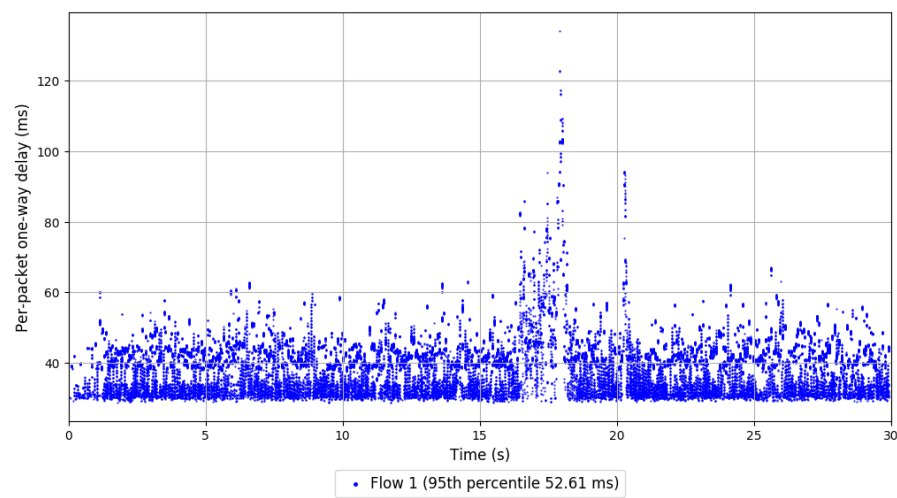
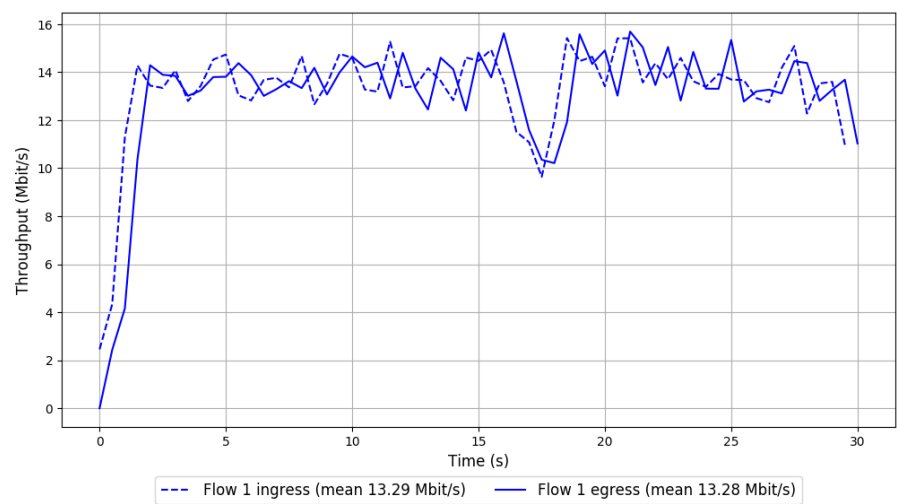
-- Flow 1:

Average throughput: 13.28 Mbit/s

95th percentile per-packet one-way delay: 52.606 ms

Loss rate: 0.13%

Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

Start at: 2019-01-24 13:09:33

End at: 2019-01-24 13:10:03

Local clock offset: -0.14 ms

Remote clock offset: 1.221 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.88 Mbit/s

95th percentile per-packet one-way delay: 44.887 ms

Loss rate: 21.98%

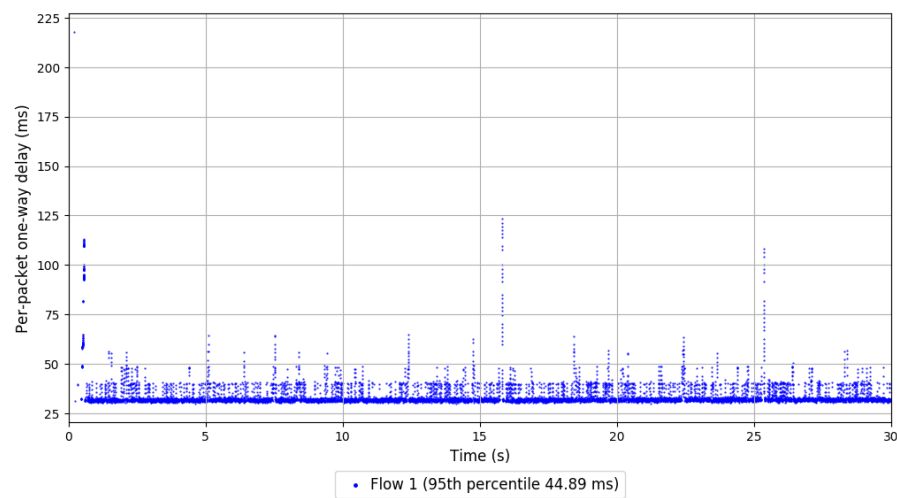
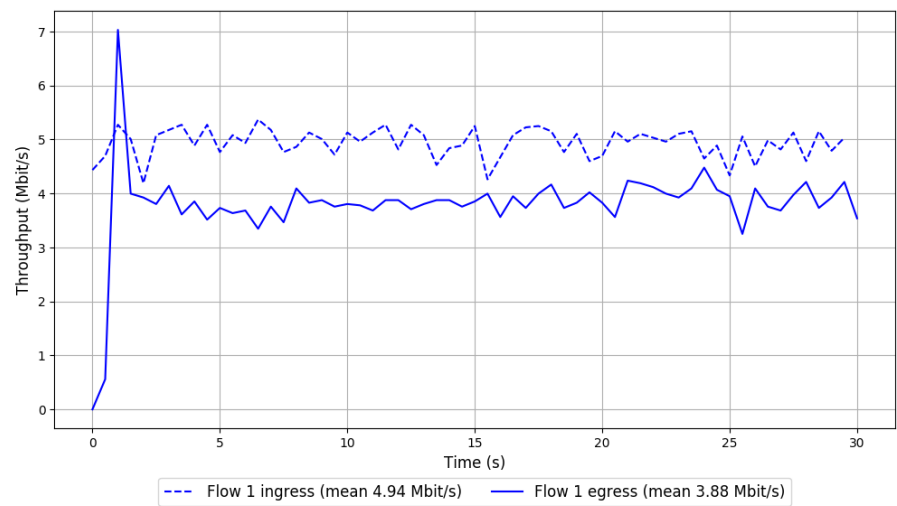
-- Flow 1:

Average throughput: 3.88 Mbit/s

95th percentile per-packet one-way delay: 44.887 ms

Loss rate: 21.98%

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



Run 2: Statistics of TaoVA-100x

Start at: 2019-01-24 13:35:18

End at: 2019-01-24 13:35:48

Local clock offset: 2.132 ms

Remote clock offset: 1.431 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.81 Mbit/s

95th percentile per-packet one-way delay: 38.716 ms

Loss rate: 17.88%

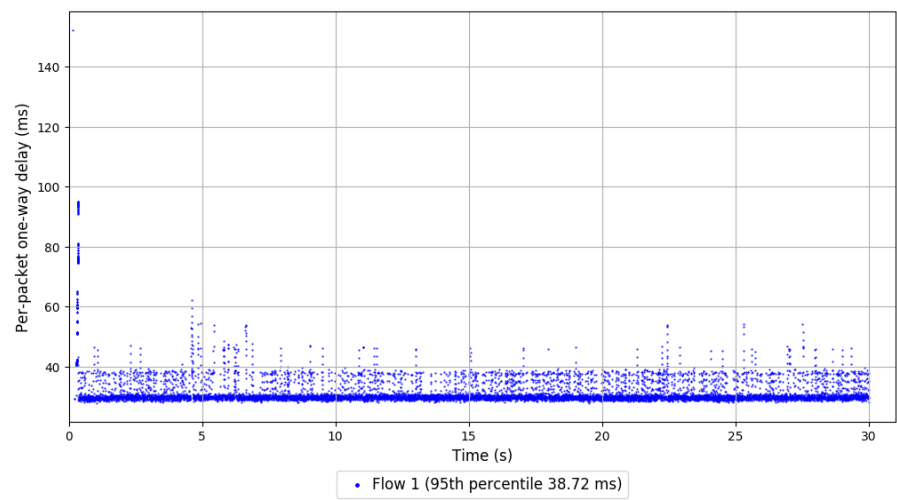
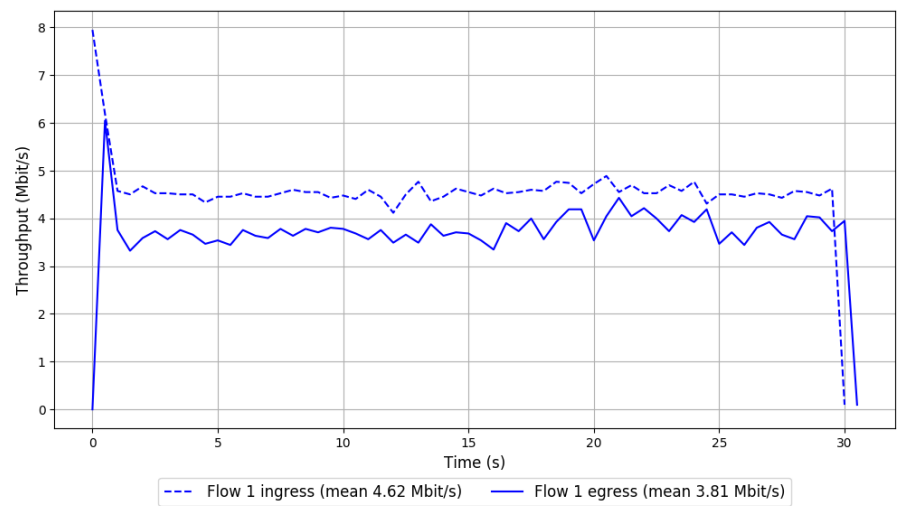
-- Flow 1:

Average throughput: 3.81 Mbit/s

95th percentile per-packet one-way delay: 38.716 ms

Loss rate: 17.88%

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



Run 3: Statistics of TaoVA-100x

Start at: 2019-01-24 14:01:06

End at: 2019-01-24 14:01:36

Local clock offset: 3.496 ms

Remote clock offset: 1.254 ms

Below is generated by plot.py at 2019-01-24 14:19:47

Datalink statistics

-- Total of 1 flow:

Average throughput: 3.49 Mbit/s

95th percentile per-packet one-way delay: 40.175 ms

Loss rate: 21.88%

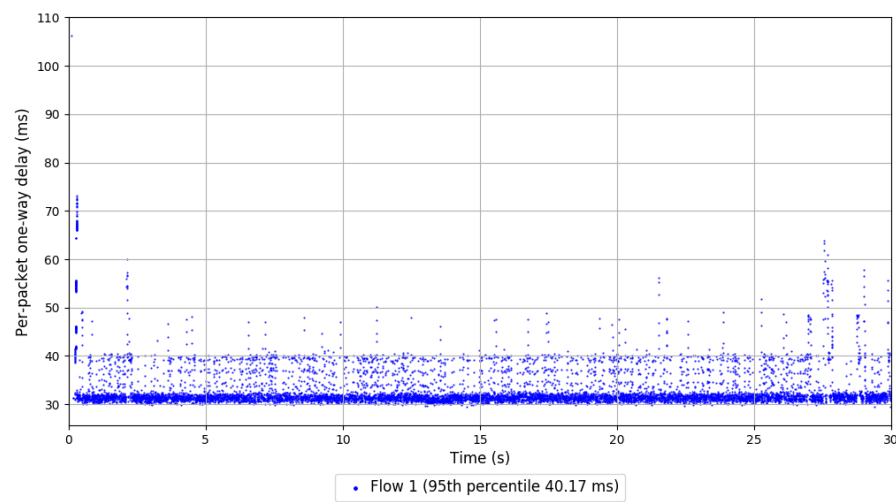
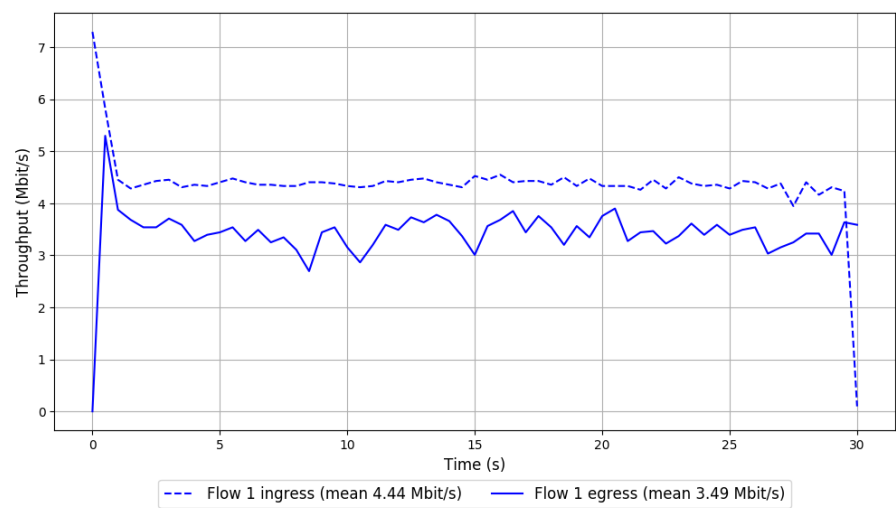
-- Flow 1:

Average throughput: 3.49 Mbit/s

95th percentile per-packet one-way delay: 40.175 ms

Loss rate: 21.88%

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



Run 1: Statistics of TCP Vegas

Start at: 2019-01-24 13:25:31

End at: 2019-01-24 13:26:01

Local clock offset: 2.207 ms

Remote clock offset: 1.31 ms

Below is generated by plot.py at 2019-01-24 14:20:00

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.24 Mbit/s

95th percentile per-packet one-way delay: 107.824 ms

Loss rate: 0.04%

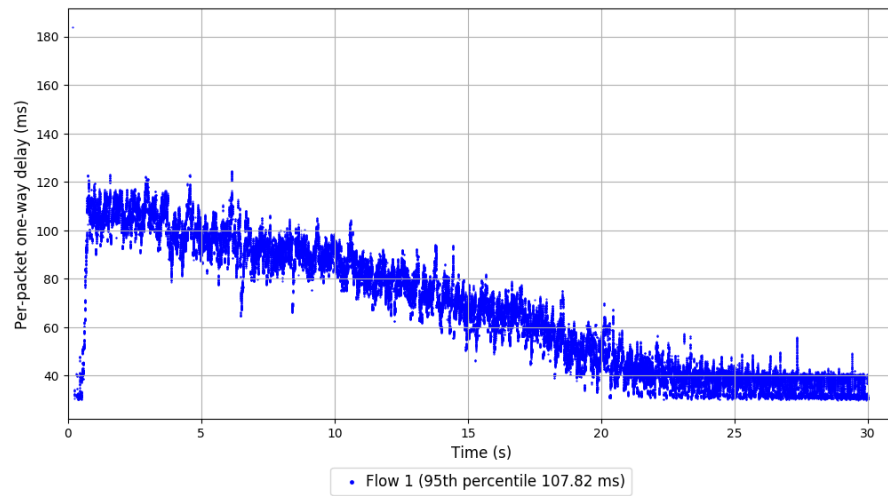
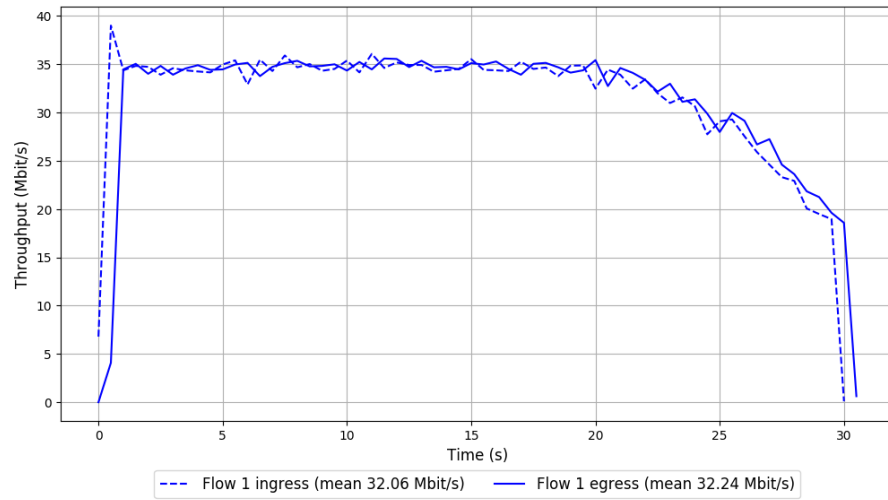
-- Flow 1:

Average throughput: 32.24 Mbit/s

95th percentile per-packet one-way delay: 107.824 ms

Loss rate: 0.04%

Run 1: Report of TCP Vegas — Data Link



Run 2: Statistics of TCP Vegas

Start at: 2019-01-24 13:51:19

End at: 2019-01-24 13:51:49

Local clock offset: 2.676 ms

Remote clock offset: 1.908 ms

Below is generated by plot.py at 2019-01-24 14:20:00

Datalink statistics

-- Total of 1 flow:

Average throughput: 9.90 Mbit/s

95th percentile per-packet one-way delay: 54.916 ms

Loss rate: 0.04%

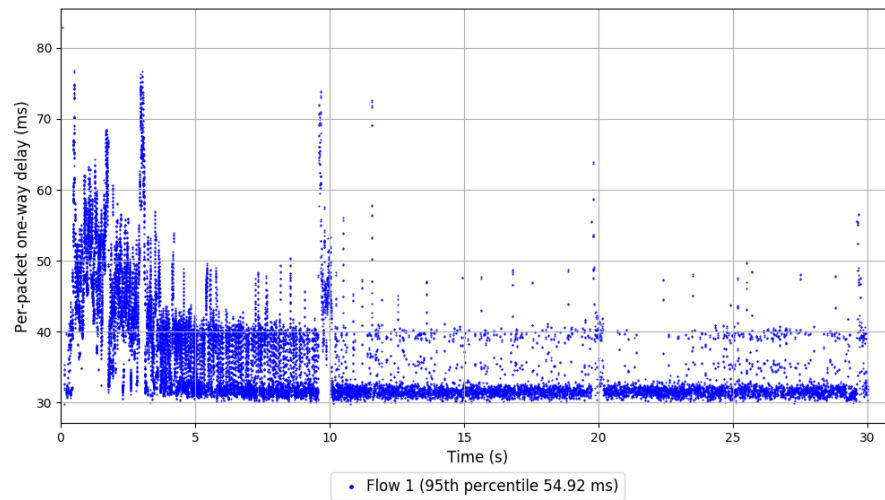
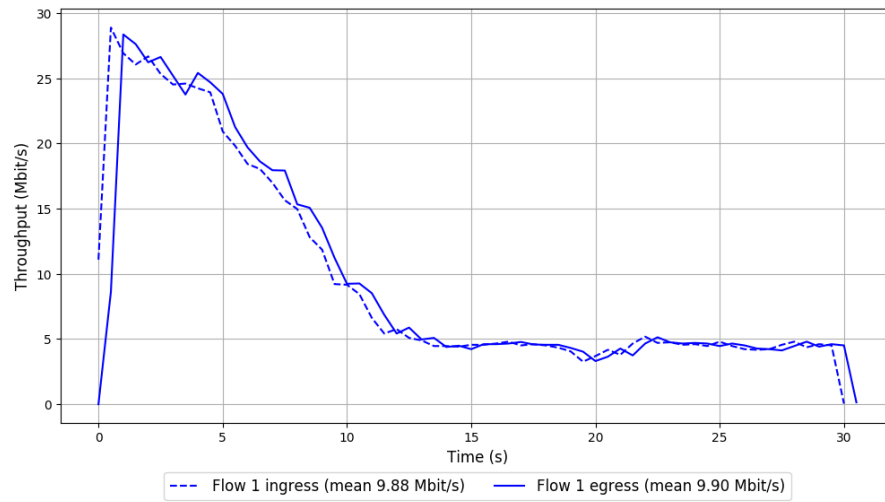
-- Flow 1:

Average throughput: 9.90 Mbit/s

95th percentile per-packet one-way delay: 54.916 ms

Loss rate: 0.04%

Run 2: Report of TCP Vegas — Data Link



Run 3: Statistics of TCP Vegas

Start at: 2019-01-24 14:17:05

End at: 2019-01-24 14:17:35

Local clock offset: 4.693 ms

Remote clock offset: 1.149 ms

Below is generated by plot.py at 2019-01-24 14:20:00

Datalink statistics

-- Total of 1 flow:

Average throughput: 6.89 Mbit/s

95th percentile per-packet one-way delay: 42.549 ms

Loss rate: 0.05%

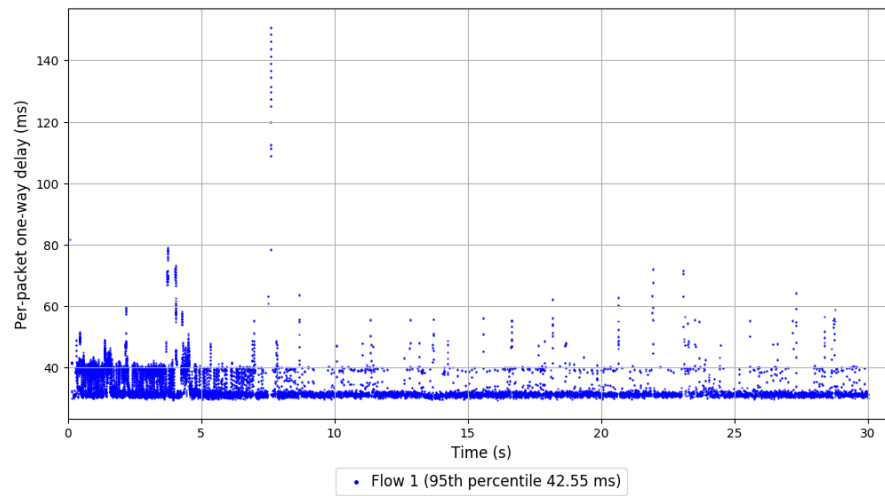
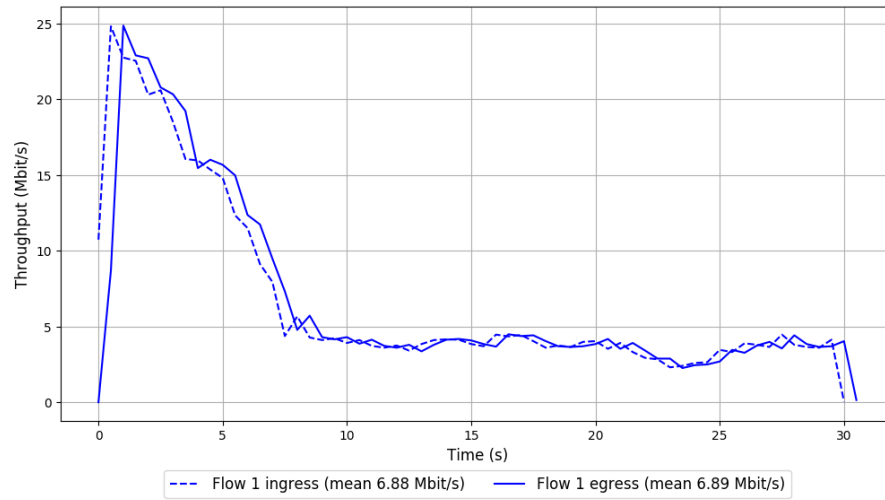
-- Flow 1:

Average throughput: 6.89 Mbit/s

95th percentile per-packet one-way delay: 42.549 ms

Loss rate: 0.05%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2019-01-24 13:15:41

End at: 2019-01-24 13:16:11

Local clock offset: 2.302 ms

Remote clock offset: 1.411 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 34.06 Mbit/s

95th percentile per-packet one-way delay: 263.849 ms

Loss rate: 1.77%

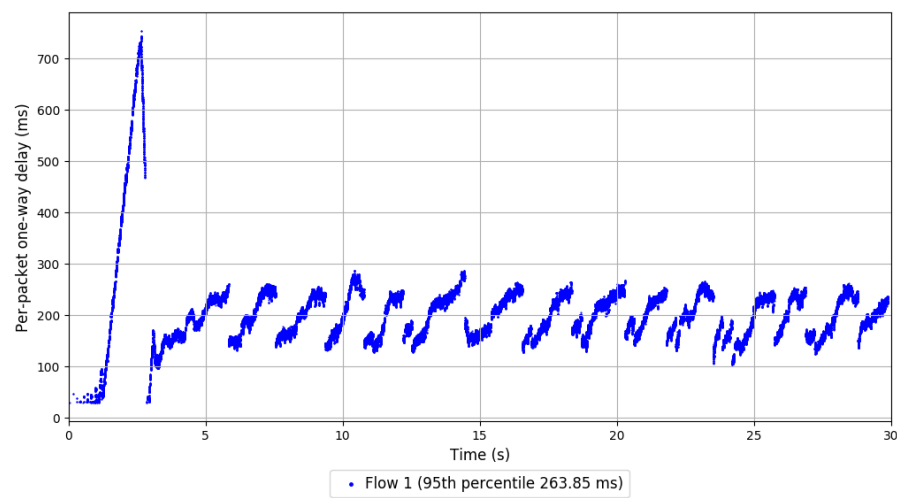
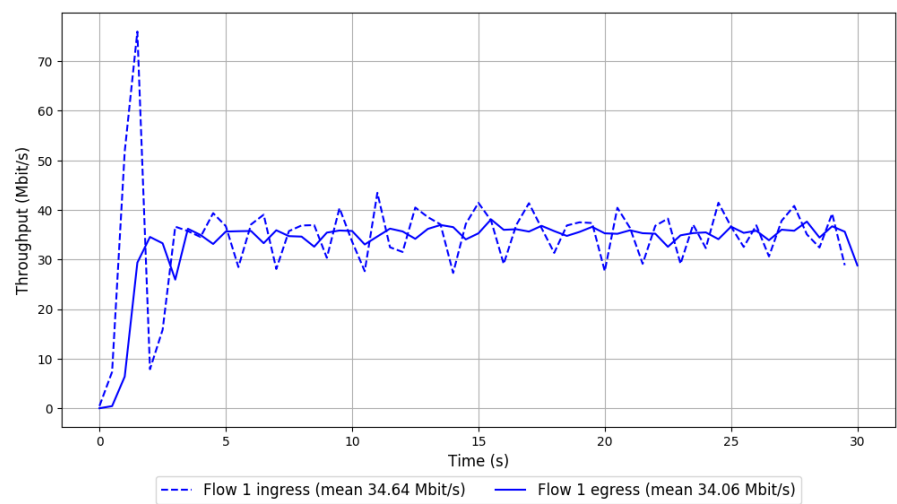
-- Flow 1:

Average throughput: 34.06 Mbit/s

95th percentile per-packet one-way delay: 263.849 ms

Loss rate: 1.77%

Run 1: Report of Verus — Data Link



Run 2: Statistics of Verus

Start at: 2019-01-24 13:41:25

End at: 2019-01-24 13:41:55

Local clock offset: 2.123 ms

Remote clock offset: 1.632 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 32.42 Mbit/s

95th percentile per-packet one-way delay: 295.501 ms

Loss rate: 1.55%

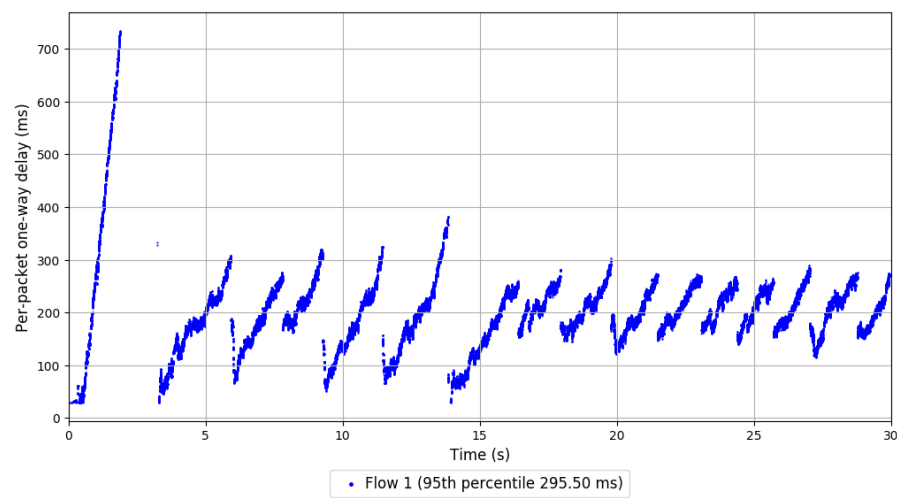
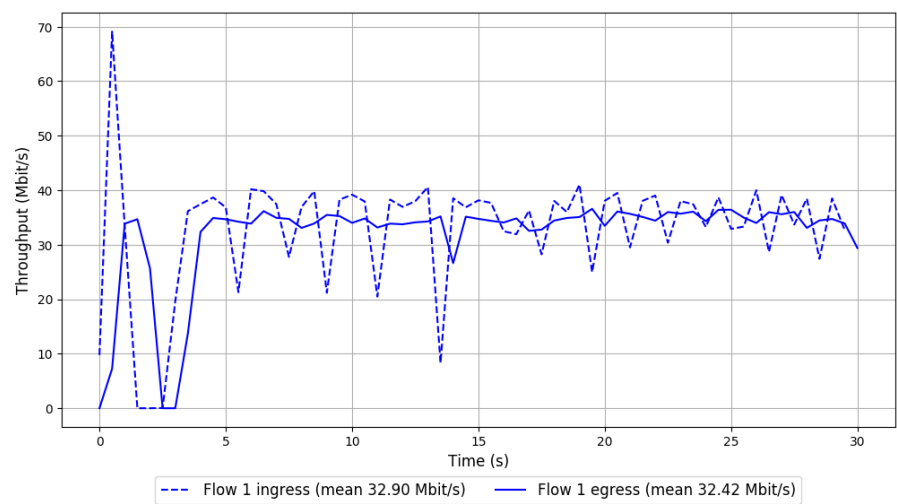
-- Flow 1:

Average throughput: 32.42 Mbit/s

95th percentile per-packet one-way delay: 295.501 ms

Loss rate: 1.55%

Run 2: Report of Verus — Data Link



Run 3: Statistics of Verus

Start at: 2019-01-24 14:07:12

End at: 2019-01-24 14:07:42

Local clock offset: 3.887 ms

Remote clock offset: 1.156 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 28.84 Mbit/s

95th percentile per-packet one-way delay: 337.853 ms

Loss rate: 0.64%

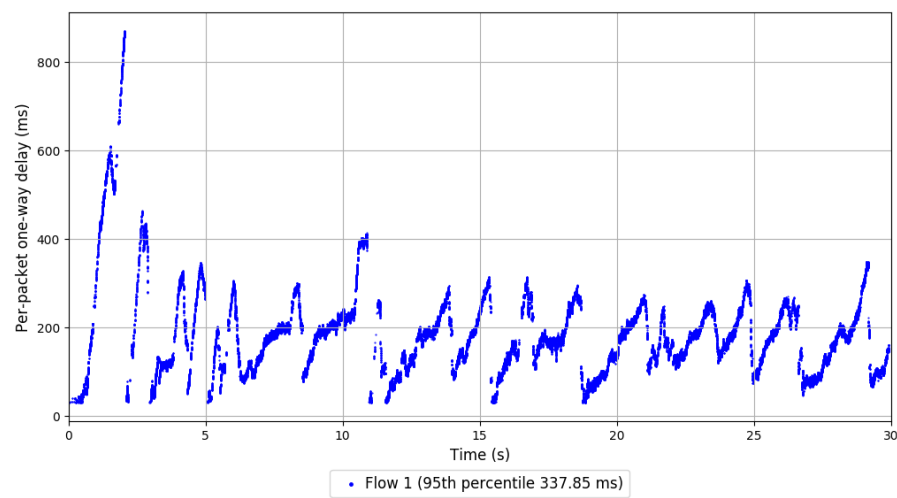
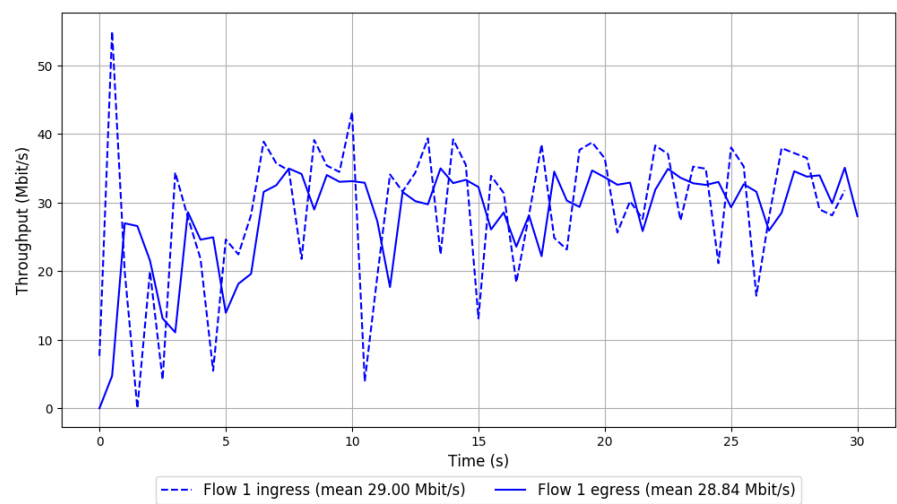
-- Flow 1:

Average throughput: 28.84 Mbit/s

95th percentile per-packet one-way delay: 337.853 ms

Loss rate: 0.64%

Run 3: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2019-01-24 13:05:52

End at: 2019-01-24 13:06:22

Local clock offset: -1.156 ms

Remote clock offset: 1.17 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 8.07 Mbit/s

95th percentile per-packet one-way delay: 39.220 ms

Loss rate: 0.13%

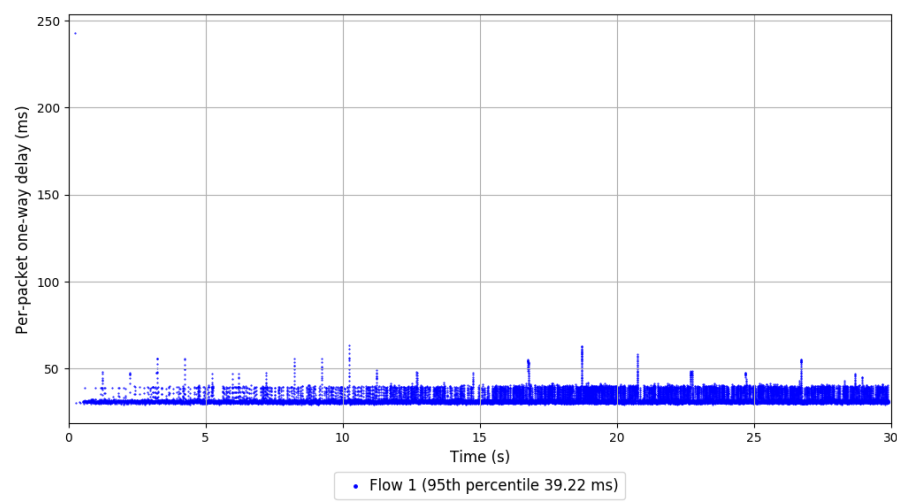
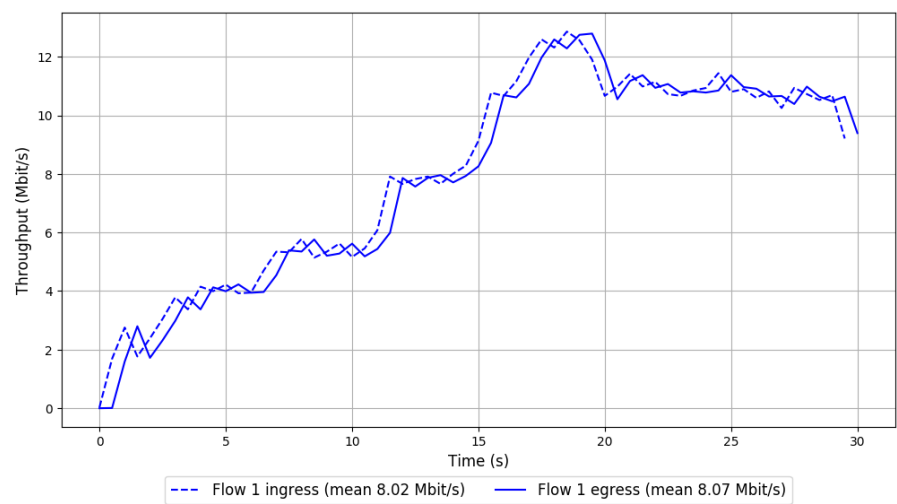
-- Flow 1:

Average throughput: 8.07 Mbit/s

95th percentile per-packet one-way delay: 39.220 ms

Loss rate: 0.13%

Run 1: Report of PCC-Vivace — Data Link



Run 2: Statistics of PCC-Vivace

Start at: 2019-01-24 13:31:38

End at: 2019-01-24 13:32:08

Local clock offset: 2.419 ms

Remote clock offset: 1.421 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 1.80 Mbit/s

95th percentile per-packet one-way delay: 37.190 ms

Loss rate: 0.05%

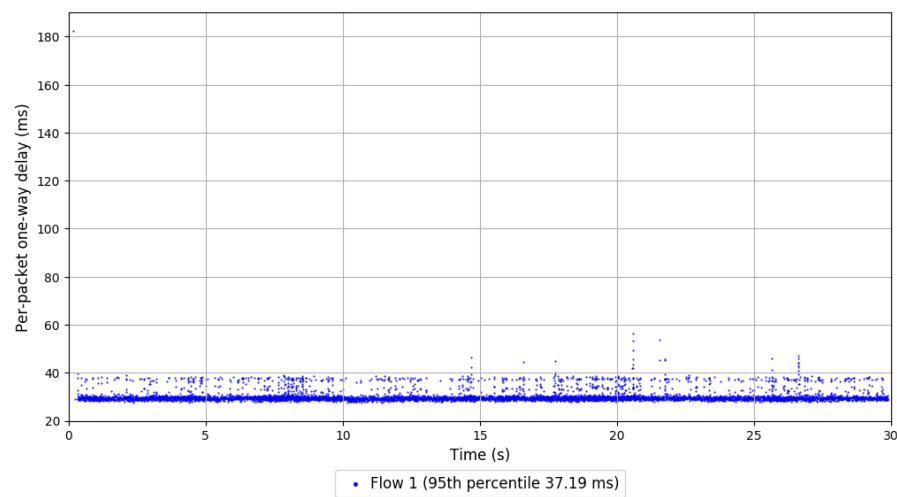
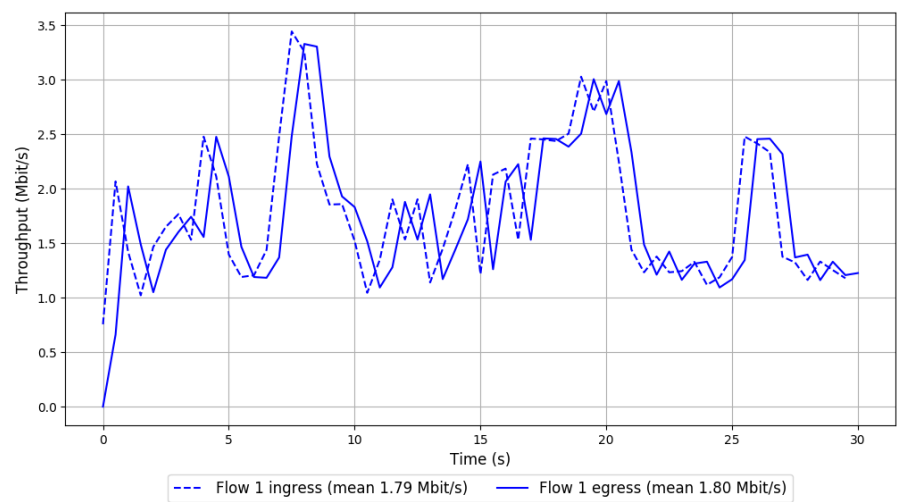
-- Flow 1:

Average throughput: 1.80 Mbit/s

95th percentile per-packet one-way delay: 37.190 ms

Loss rate: 0.05%

Run 2: Report of PCC-Vivace — Data Link



Run 3: Statistics of PCC-Vivace

Start at: 2019-01-24 13:57:26

End at: 2019-01-24 13:57:56

Local clock offset: 3.19 ms

Remote clock offset: 1.331 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 1.72 Mbit/s

95th percentile per-packet one-way delay: 39.594 ms

Loss rate: 0.07%

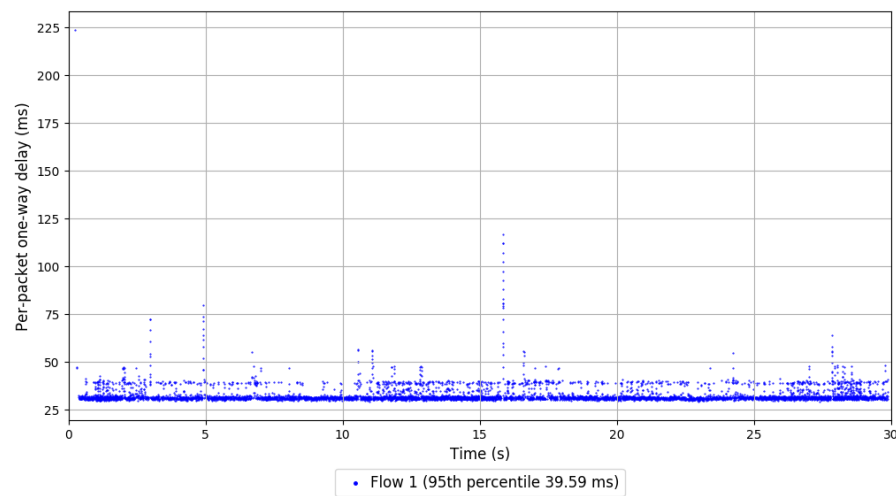
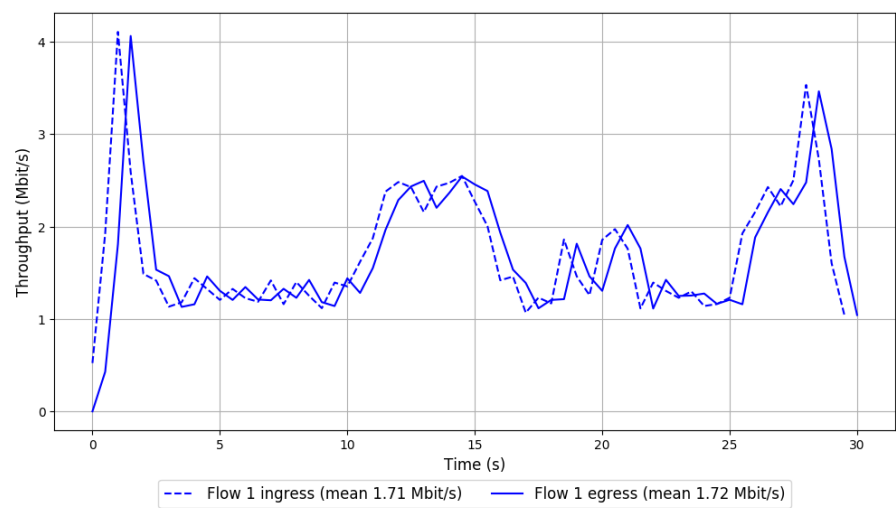
-- Flow 1:

Average throughput: 1.72 Mbit/s

95th percentile per-packet one-way delay: 39.594 ms

Loss rate: 0.07%

Run 3: Report of PCC-Vivace — Data Link



Run 1: Statistics of WebRTC media

Start at: 2019-01-24 13:03:25

End at: 2019-01-24 13:03:55

Local clock offset: -0.931 ms

Remote clock offset: 1.069 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 2.01 Mbit/s

95th percentile per-packet one-way delay: 39.530 ms

Loss rate: 0.12%

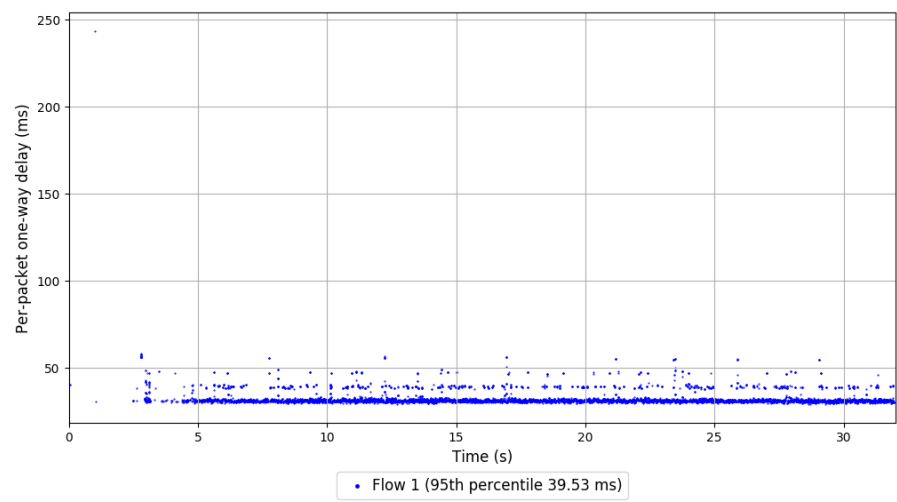
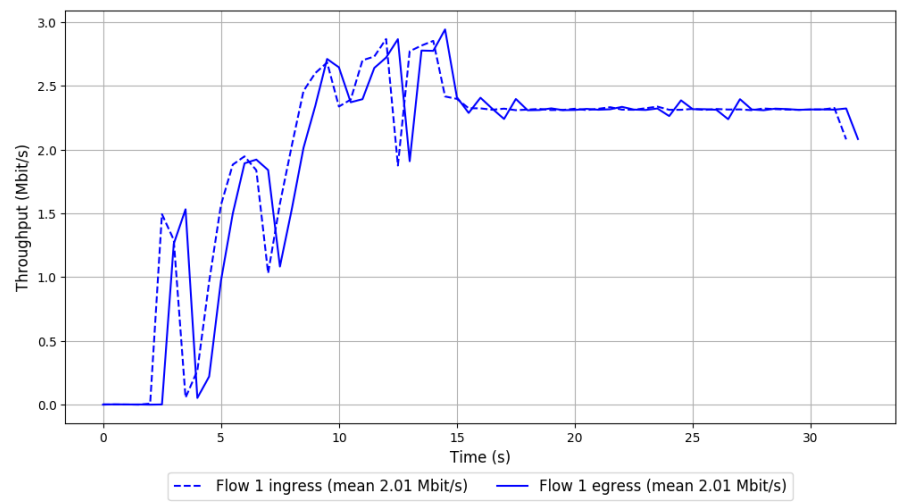
-- Flow 1:

Average throughput: 2.01 Mbit/s

95th percentile per-packet one-way delay: 39.530 ms

Loss rate: 0.12%

Run 1: Report of WebRTC media — Data Link



Run 2: Statistics of WebRTC media

Start at: 2019-01-24 13:29:11

End at: 2019-01-24 13:29:42

Local clock offset: 2.535 ms

Remote clock offset: 1.291 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 49.532 ms

Loss rate: 0.00%

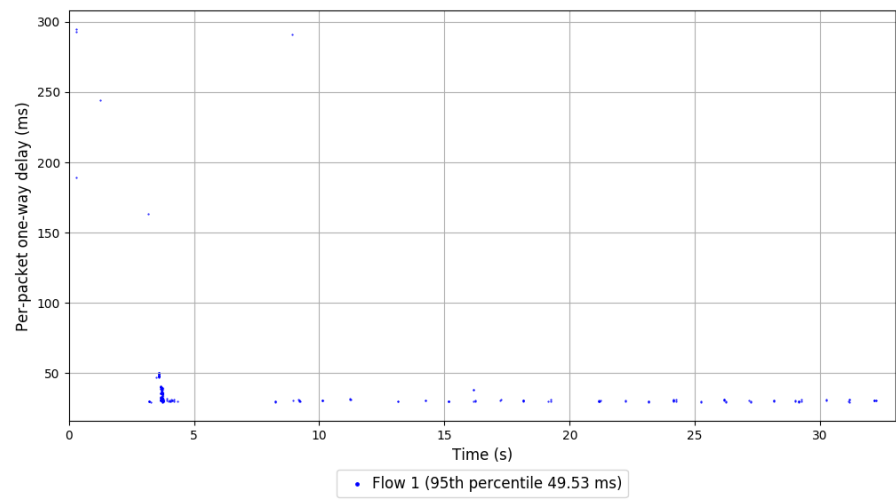
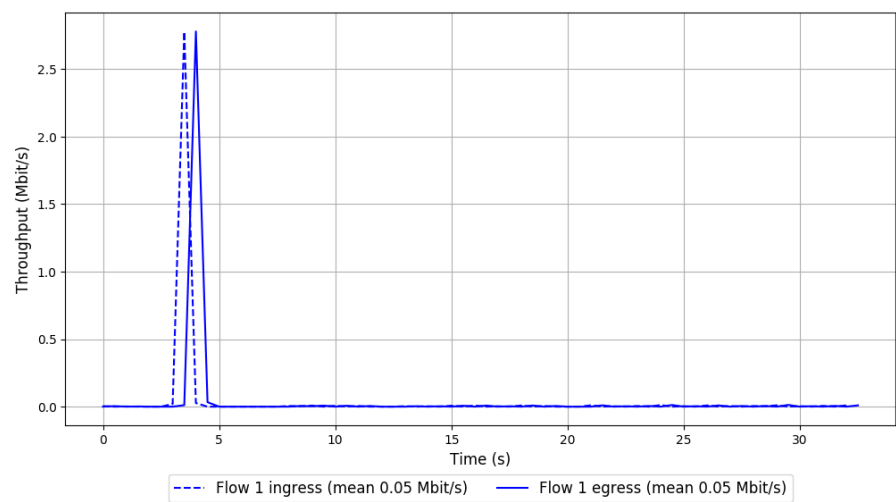
-- Flow 1:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 49.532 ms

Loss rate: 0.00%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2019-01-24 13:54:59

End at: 2019-01-24 13:55:29

Local clock offset: 2.99 ms

Remote clock offset: 1.522 ms

Below is generated by plot.py at 2019-01-24 14:20:01

Datalink statistics

-- Total of 1 flow:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 51.520 ms

Loss rate: 0.00%

-- Flow 1:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 51.520 ms

Loss rate: 0.00%

Run 3: Report of WebRTC media — Data Link

