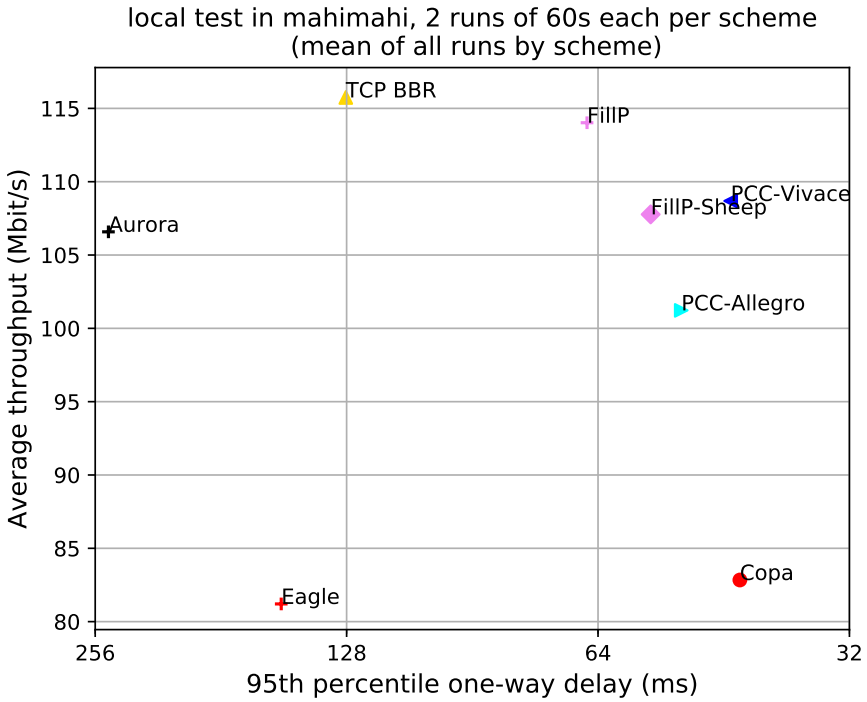
Pantheon Report

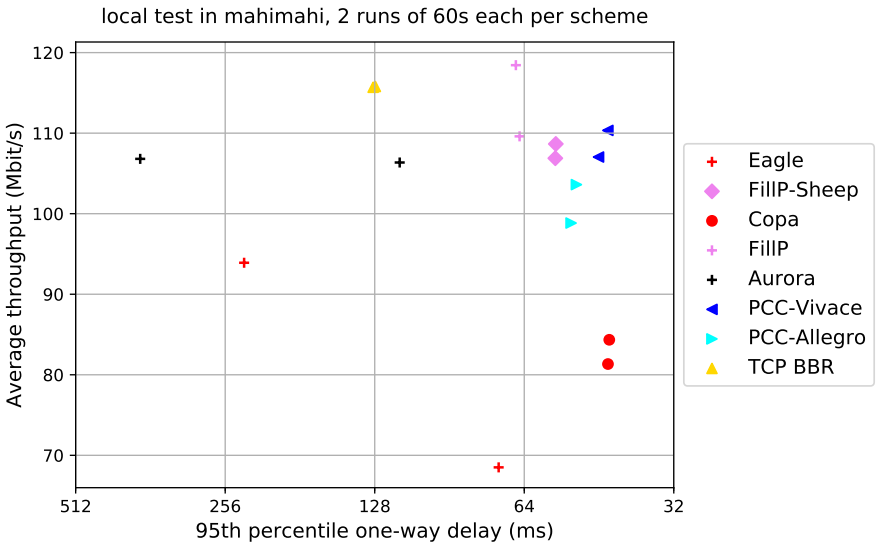
Generated at 2019-07-31 21:27:07 (UTC).
Tested in mahimahi: `mm-delay 40 mm-link 120mbps.trace 120mbps.trace`
Repeated the test of 8 congestion control schemes twice.
Each test lasted for 60 seconds running 1 flow.

```
System info:
Linux 4.15.0-55-generic
net.core.default_qdisc = fq
net.core.rmem_default = 212992
net.core.rmem_max = 212992
net.core.wmem_default = 212992
net.core.wmem_max = 212992
net.ipv4.tcp_rmem = 4096 87380 6291456
net.ipv4.tcp_wmem = 4096 16384 4194304
```

```
Git summary:
branch: master @ 6b6052a21ccd5c0227753570d36e92bb7650a2e5
third_party/aurora @ f3e943d61015b39960854ba6391797e0c7984d74
third_party/aurora-model @ e292c316c23fb837255c4e142e40590d154bbe95
third_party/eagle @ f66d3a824f0abdd3b1d0afc0cc323607b2c38eca
 M sender-receiver/sender-receiver/sender_receiver/envs/example-xentropy.py
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/gold @ e47bed6d7495aa223eec8de2c7a43035967074ef
 M environment/__pycache__/datagram_pb2.cpython-36.opt-1.pyc
 M environment/__pycache__/datagram_pb2.cpython-36.pyc
 M environment/__pycache__/environment.cpython-36.opt-1.pyc
 M environment/__pycache__/helpers.cpython-36.opt-1.pyc
 M environment/__pycache__/helpers.cpython-36.pyc
 M environment/__pycache__/mahimahi.cpython-36.opt-1.pyc
 M environment/__pycache__/project_root.cpython-36.opt-1.pyc
 M environment/__pycache__/project_root.cpython-36.pyc
 M environment/__pycache__/receiver.cpython-36.opt-1.pyc
 M environment/__pycache__/receiver.cpython-36.pyc
 M environment/logs.txt
 M model
third_party/goldLSTM @ 6b512ee75b163fd680d7bf3cde4cf6d6aa7102c4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
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-quic @ 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
```


local test in mahimahi, 2 runs of 60s each per scheme
(mean of all runs by scheme)
TCP BBR
FillP
PCC-Vivace
FillP-Sheep
Aurora
PCC-Allegro
Copa
Eagle
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
115
110
105
100
95
90
85
80
256
128
64
32


local test in mahimahi, 2 runs of 60s each per scheme
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
120
110
100
90
80
70
512
256
128
64
32
Eagle
FillP-Sheep
Copa
FillP
Aurora
PCC-Vivace
PCC-Allegro
TCP BBR

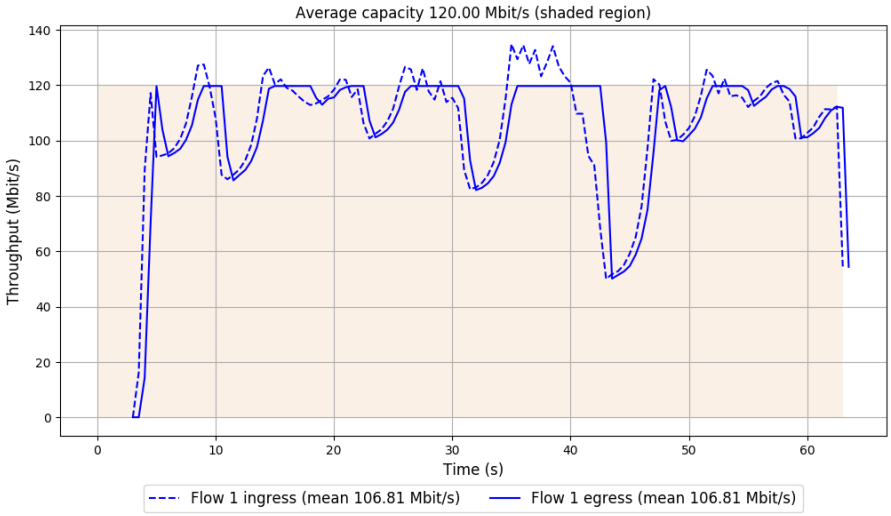
scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
Aurora	2	106.59	246.82	0.08
TCP BBR	2	115.75	128.29	0.21
Copa	2	82.84	43.28	0.11
Eagle	2	81.20	153.28	0.24
FillP	2	114.02	65.97	0.29
FillP-Sheep	2	107.77	55.35	0.12
PCC-Allegro	2	101.22	50.88	0.22
PCC-Vivace	2	108.69	44.40	0.51

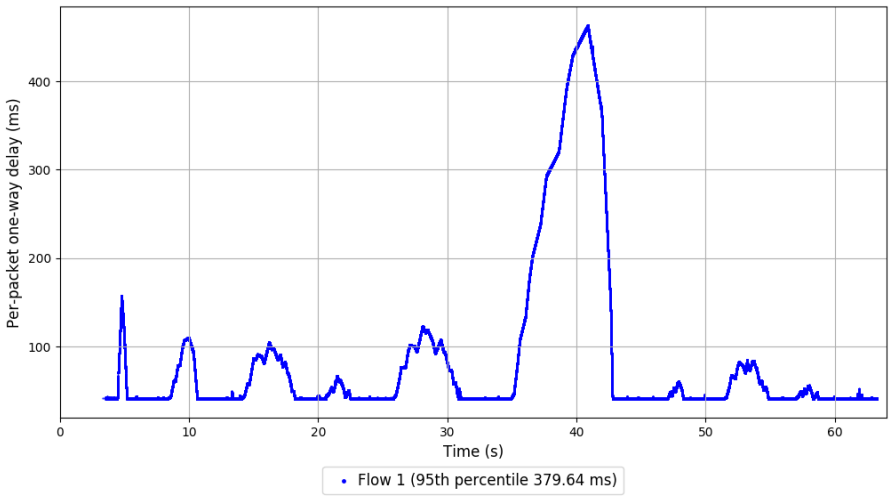
```
Run 1: Statistics of Aurora

Start at: 2019-07-31 20:16:46
End at: 2019-07-31 20:17:46

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 106.81 Mbit/s (89.0% utilization)
95th percentile per-packet one-way delay: 379.637 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 106.81 Mbit/s
95th percentile per-packet one-way delay: 379.637 ms
Loss rate: 0.09%
```

Run 1: Report of Aurora — Data Link



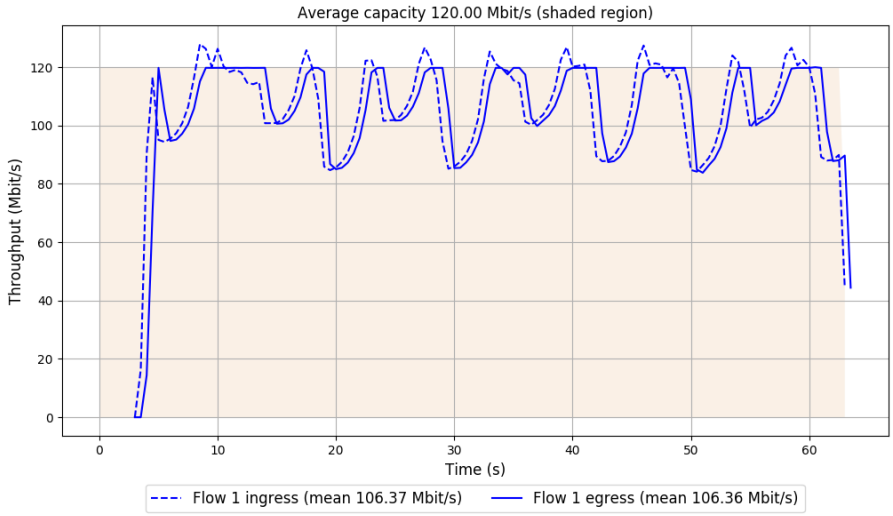


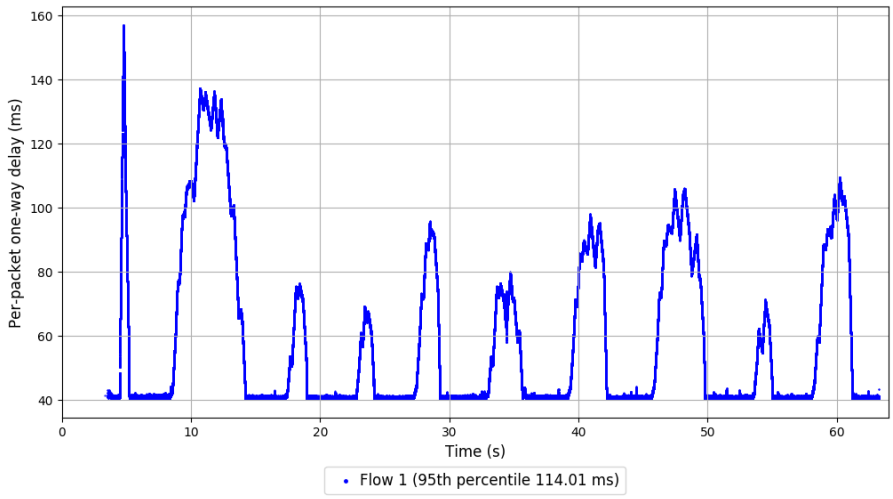
```
Run 2: Statistics of Aurora

Start at: 2019-07-31 20:27:05
End at: 2019-07-31 20:28:05

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 106.36 Mbit/s (88.6% utilization)
95th percentile per-packet one-way delay: 114.011 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 106.36 Mbit/s
95th percentile per-packet one-way delay: 114.011 ms
Loss rate: 0.08%
```

Run 2: Report of Aurora — Data Link



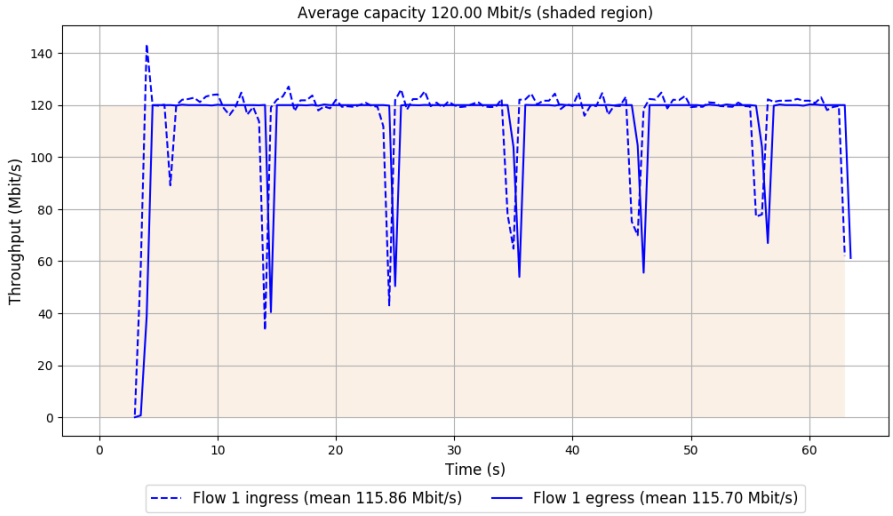


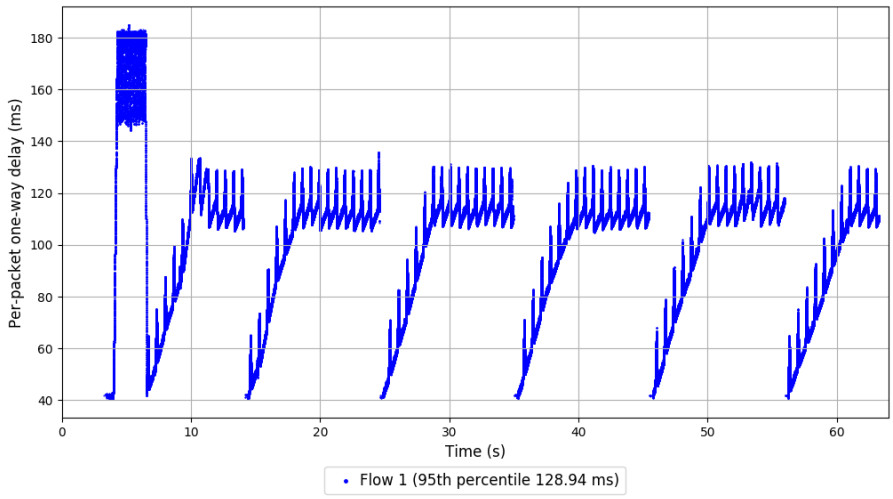
```
Run 1: Statistics of TCP BBR

Start at: 2019-07-31 20:09:04
End at: 2019-07-31 20:10:04

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 115.70 Mbit/s (96.4% utilization)
95th percentile per-packet one-way delay: 128.944 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 115.70 Mbit/s
95th percentile per-packet one-way delay: 128.944 ms
Loss rate: 0.21%
```

Run 1: Report of TCP BBR — Data Link



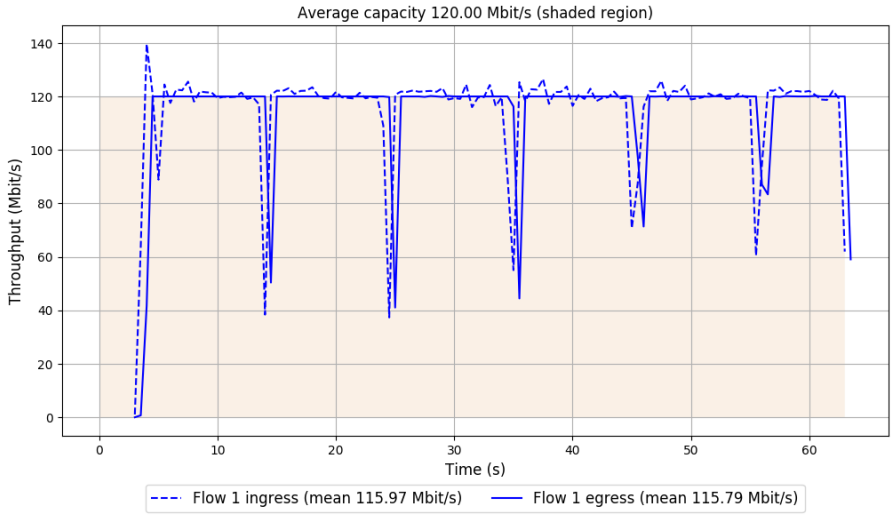


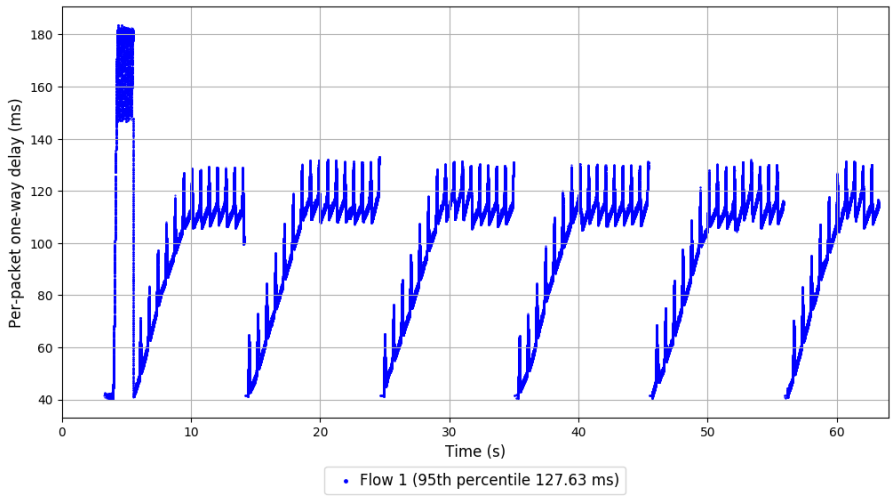
```
Run 2: Statistics of TCP BBR

Start at: 2019-07-31 20:19:25
End at: 2019-07-31 20:20:25

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 115.79 Mbit/s (96.5% utilization)
95th percentile per-packet one-way delay: 127.629 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 115.79 Mbit/s
95th percentile per-packet one-way delay: 127.629 ms
Loss rate: 0.21%
```

Run 2: Report of TCP BBR — Data Link



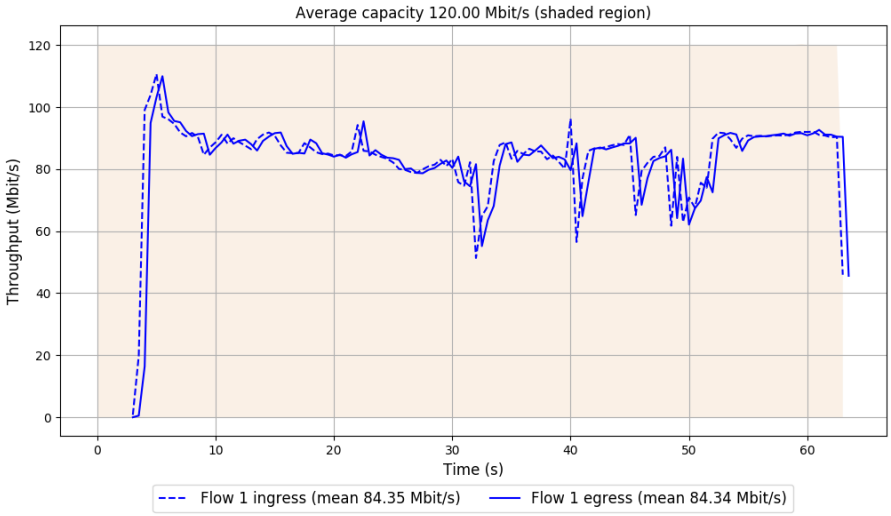


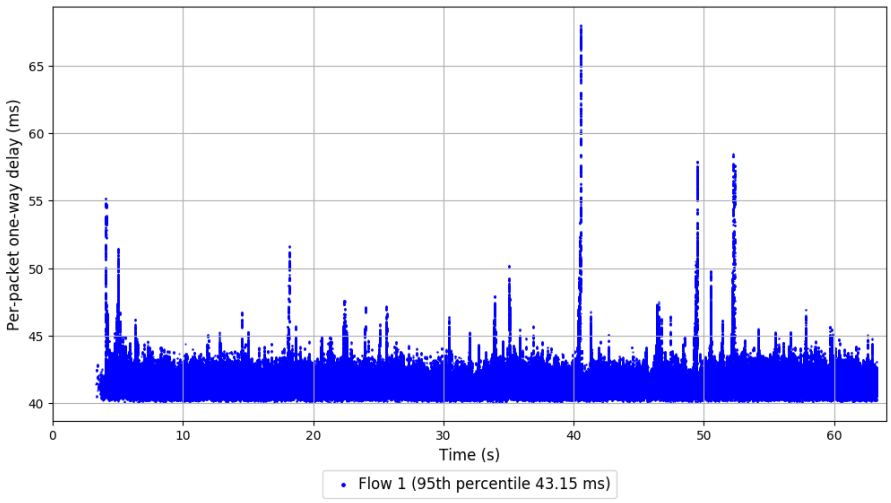
```
Run 1: Statistics of Copa

Start at: 2019-07-31 20:10:21
End at: 2019-07-31 20:11:21

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 84.34 Mbit/s (70.3% utilization)
95th percentile per-packet one-way delay: 43.154 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 84.34 Mbit/s
95th percentile per-packet one-way delay: 43.154 ms
Loss rate: 0.08%
```

Run 1: Report of Copa — Data Link



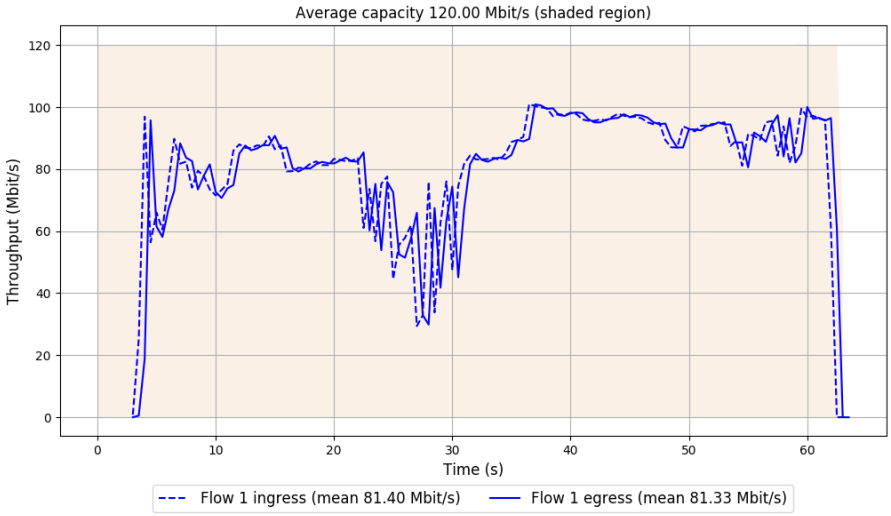


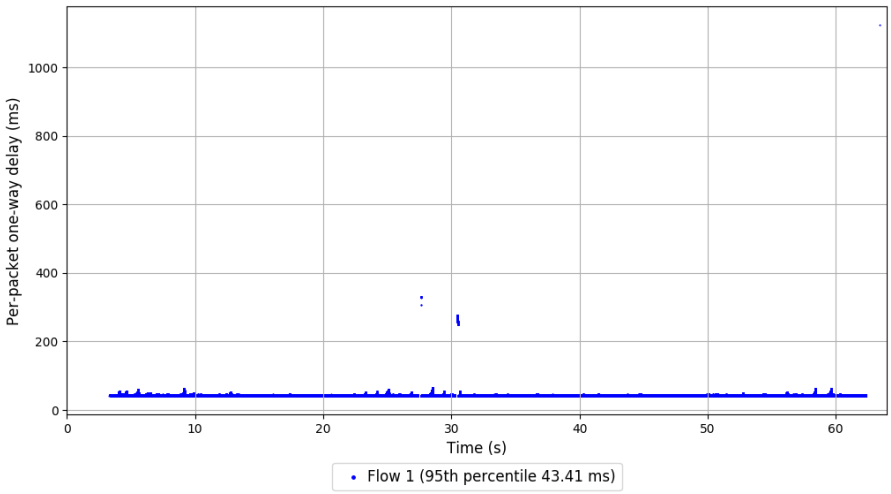
```
Run 2: Statistics of Copa

Start at: 2019-07-31 20:20:42
End at: 2019-07-31 20:21:42

# Below is generated by plot.py at 2019-07-31 21:23:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 81.33 Mbit/s (67.8% utilization)
95th percentile per-packet one-way delay: 43.415 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 81.33 Mbit/s
95th percentile per-packet one-way delay: 43.415 ms
Loss rate: 0.15%
```

Run 2: Report of Copa — Data Link



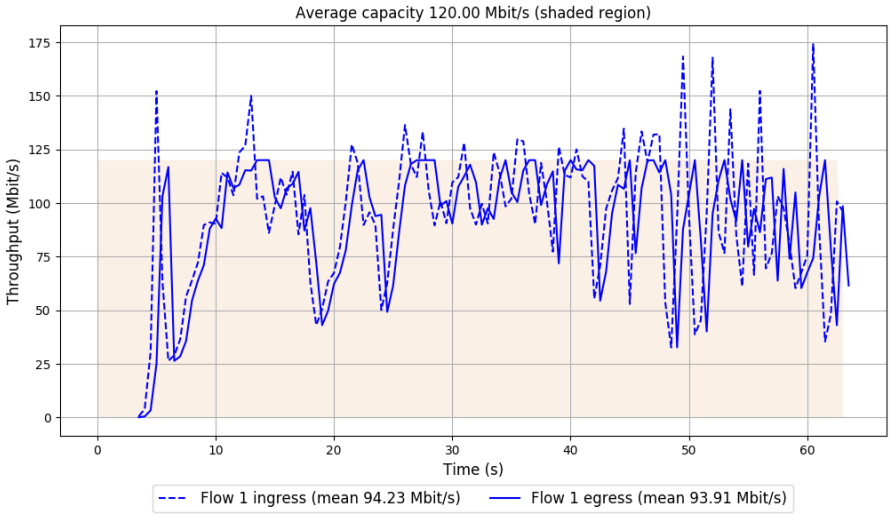


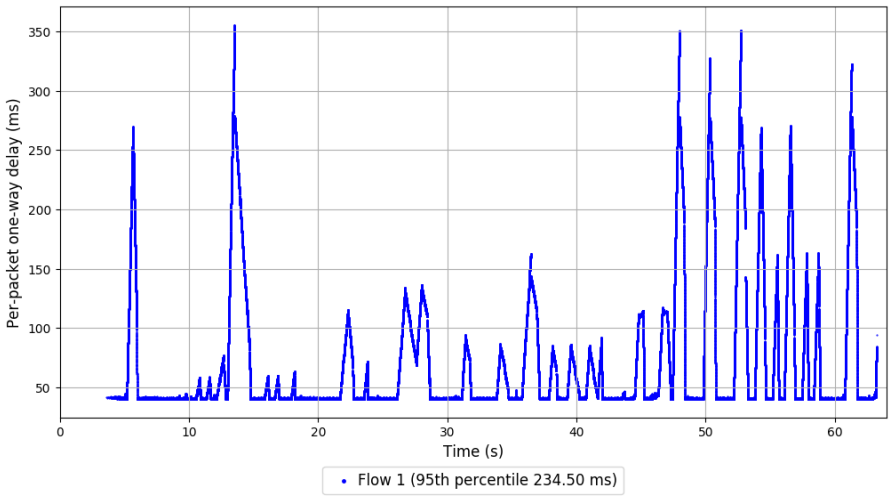
```
Run 1: Statistics of Eagle

Start at: 2019-07-31 20:07:47
End at: 2019-07-31 20:08:47

# Below is generated by plot.py at 2019-07-31 21:24:14
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 93.91 Mbit/s (78.3% utilization)
95th percentile per-packet one-way delay: 234.505 ms
Loss rate: 0.40%
-- Flow 1:
Average throughput: 93.91 Mbit/s
95th percentile per-packet one-way delay: 234.505 ms
Loss rate: 0.40%
```

Run 1: Report of Eagle — Data Link



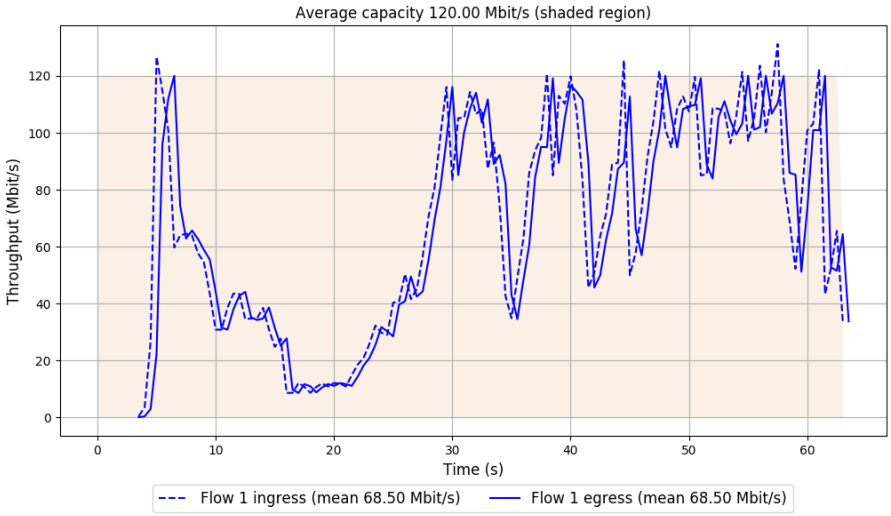


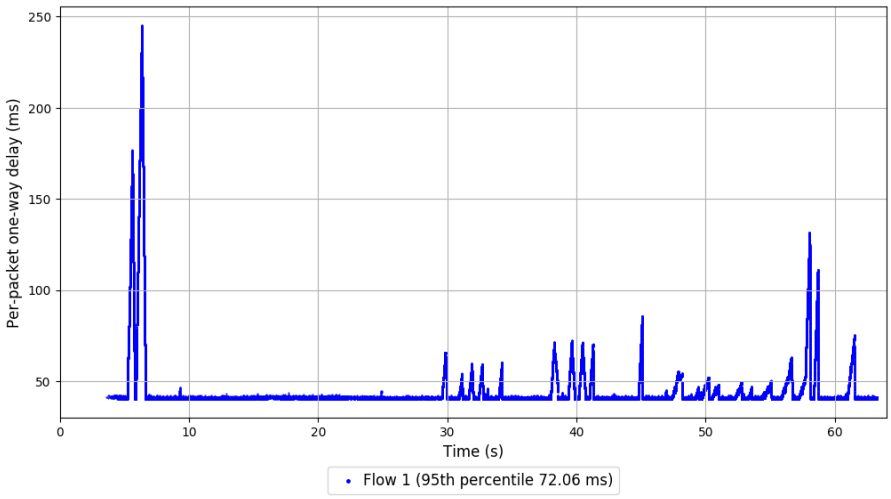
```
Run 2: Statistics of Eagle

Start at: 2019-07-31 20:18:11
End at: 2019-07-31 20:19:11

# Below is generated by plot.py at 2019-07-31 21:24:14
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 68.50 Mbit/s (57.1% utilization)
95th percentile per-packet one-way delay: 72.062 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 68.50 Mbit/s
95th percentile per-packet one-way delay: 72.062 ms
Loss rate: 0.07%
```

Run 2: Report of Eagle — Data Link



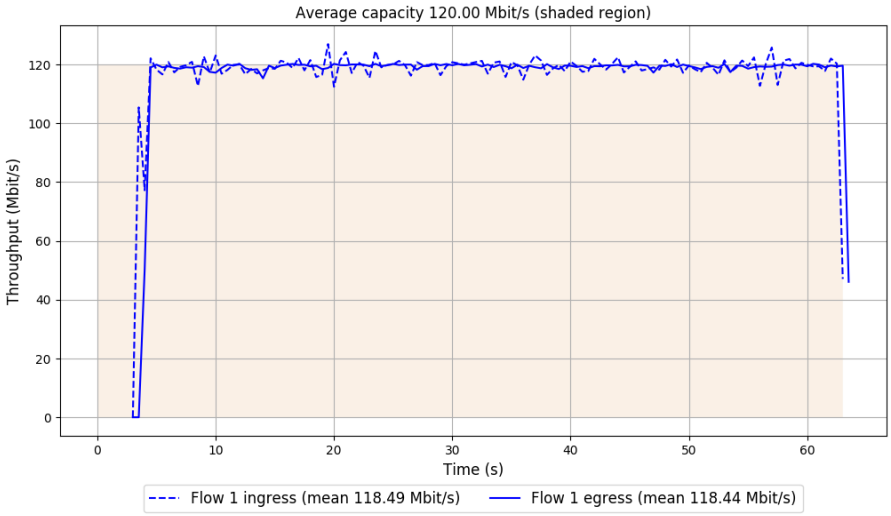


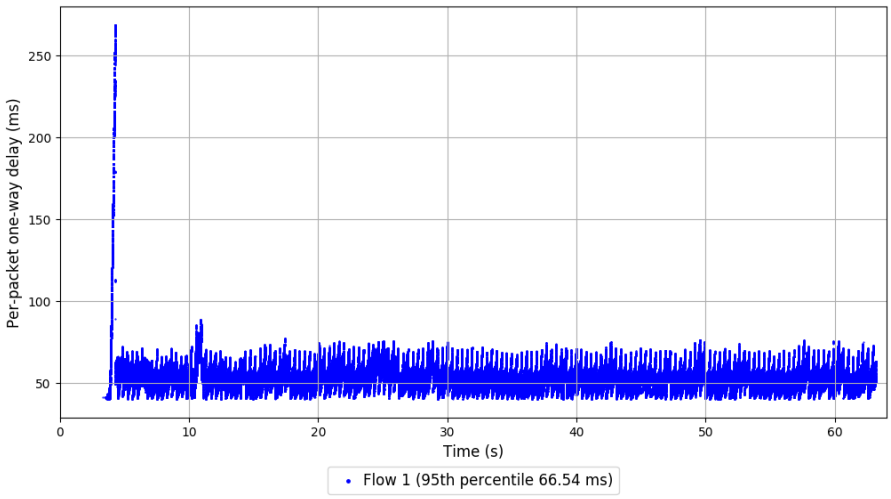
```
Run 1: Statistics of FillP

Start at: 2019-07-31 20:14:15
End at: 2019-07-31 20:15:15

# Below is generated by plot.py at 2019-07-31 21:25:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 118.44 Mbit/s (98.7% utilization)
95th percentile per-packet one-way delay: 66.536 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 118.44 Mbit/s
95th percentile per-packet one-way delay: 66.536 ms
Loss rate: 0.11%
```

Run 1: Report of FillP — Data Link



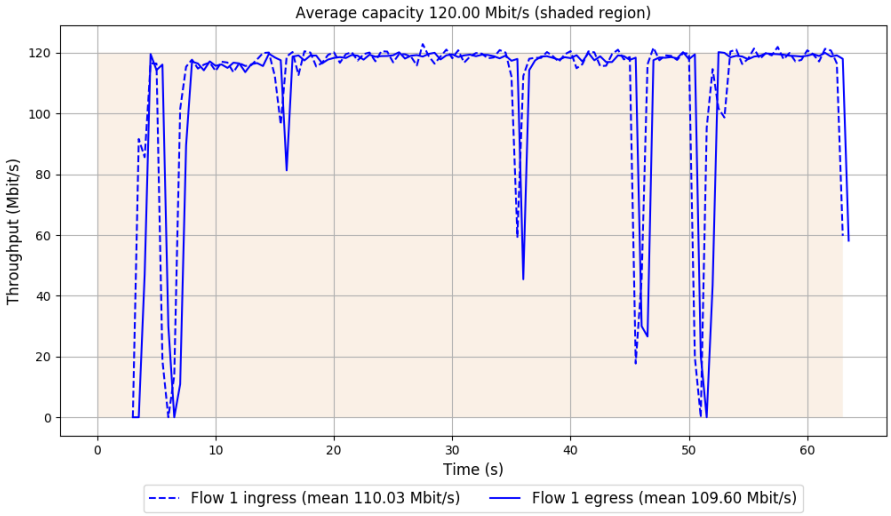


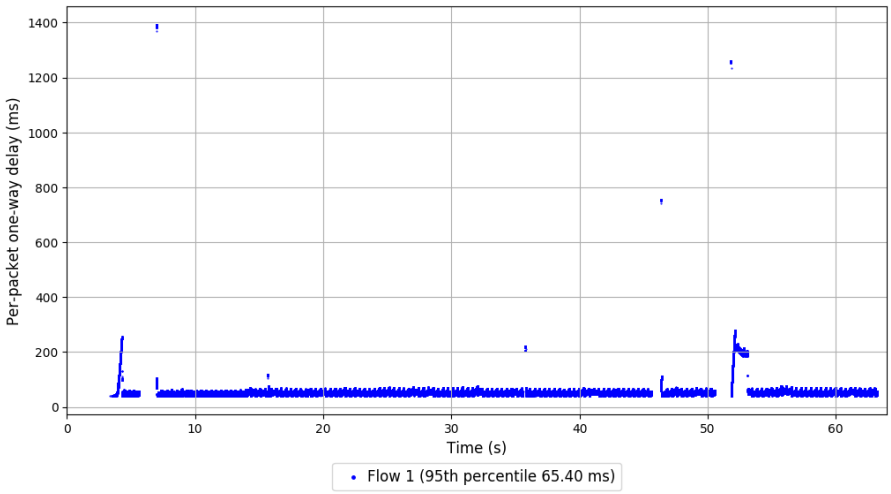
```
Run 2: Statistics of FillP

Start at: 2019-07-31 20:24:36
End at: 2019-07-31 20:25:36

# Below is generated by plot.py at 2019-07-31 21:25:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 109.60 Mbit/s (91.3% utilization)
95th percentile per-packet one-way delay: 65.402 ms
Loss rate: 0.46%
-- Flow 1:
Average throughput: 109.60 Mbit/s
95th percentile per-packet one-way delay: 65.402 ms
Loss rate: 0.46%
```

Run 2: Report of FillP — Data Link



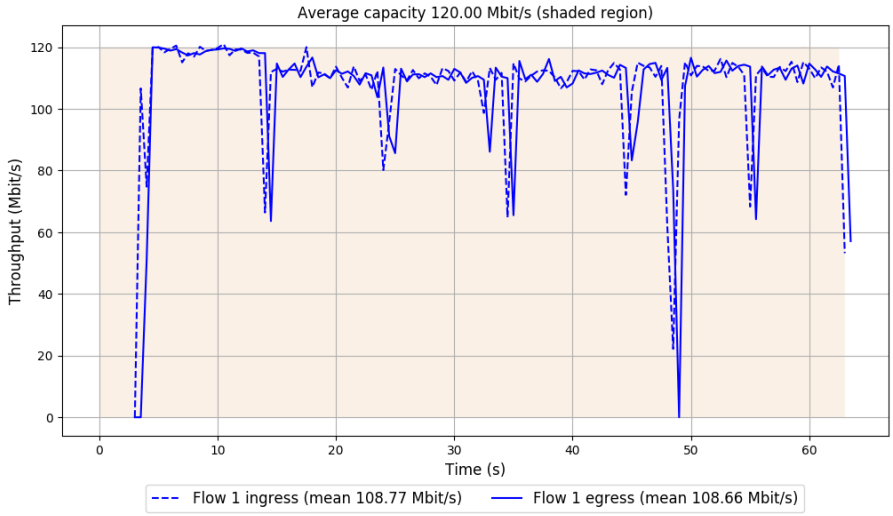


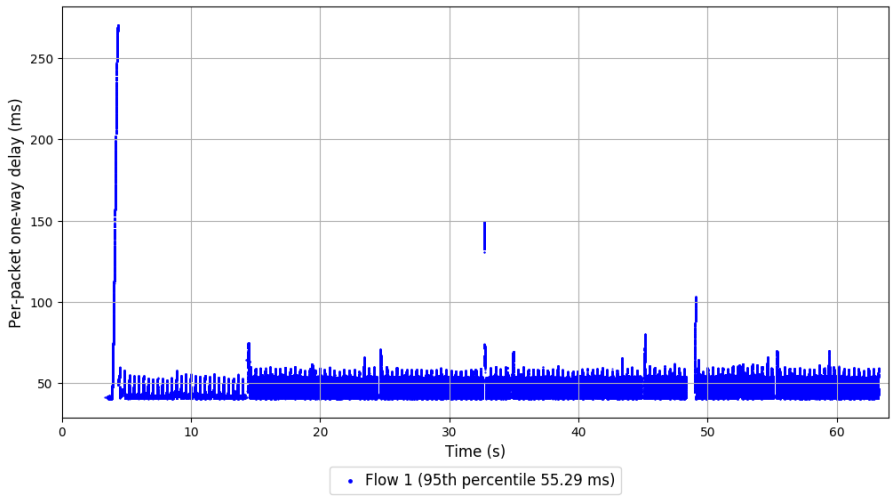
```
Run 1: Statistics of FillP-Sheep

Start at: 2019-07-31 20:15:31
End at: 2019-07-31 20:16:31

# Below is generated by plot.py at 2019-07-31 21:26:26
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 108.66 Mbit/s (90.5% utilization)
95th percentile per-packet one-way delay: 55.290 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 108.66 Mbit/s
95th percentile per-packet one-way delay: 55.290 ms
Loss rate: 0.15%
```

Run 1: Report of FillP-Sheep — Data Link



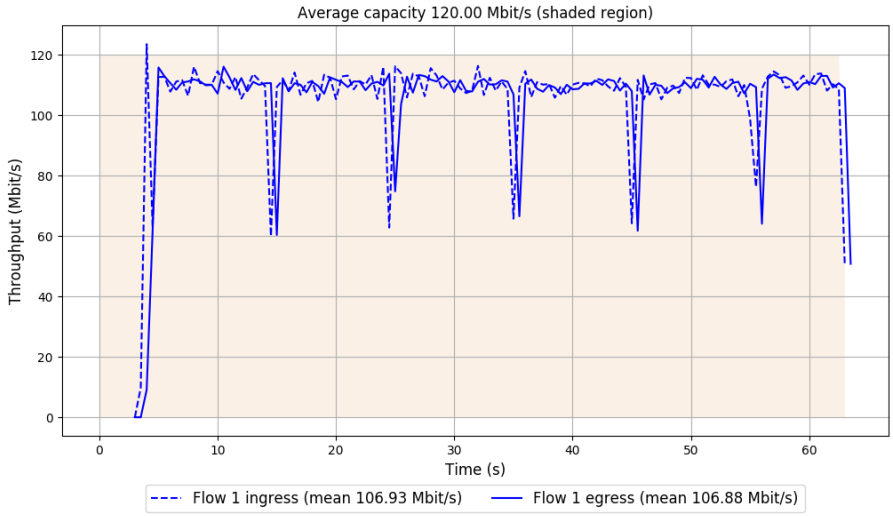


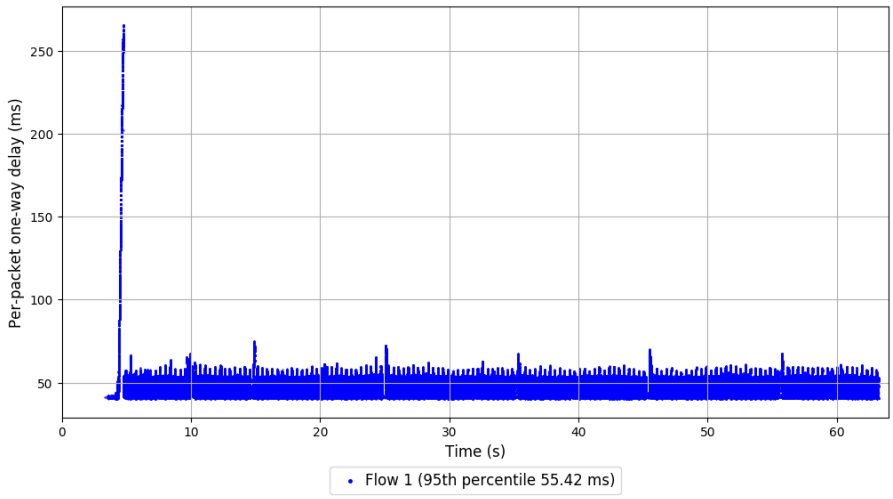
```
Run 2: Statistics of FillP-Sheep

Start at: 2019-07-31 20:25:50
End at: 2019-07-31 20:26:50

# Below is generated by plot.py at 2019-07-31 21:26:27
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 106.88 Mbit/s (89.1% utilization)
95th percentile per-packet one-way delay: 55.416 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 106.88 Mbit/s
95th percentile per-packet one-way delay: 55.416 ms
Loss rate: 0.10%
```

Run 2: Report of FillP-Sheep — Data Link



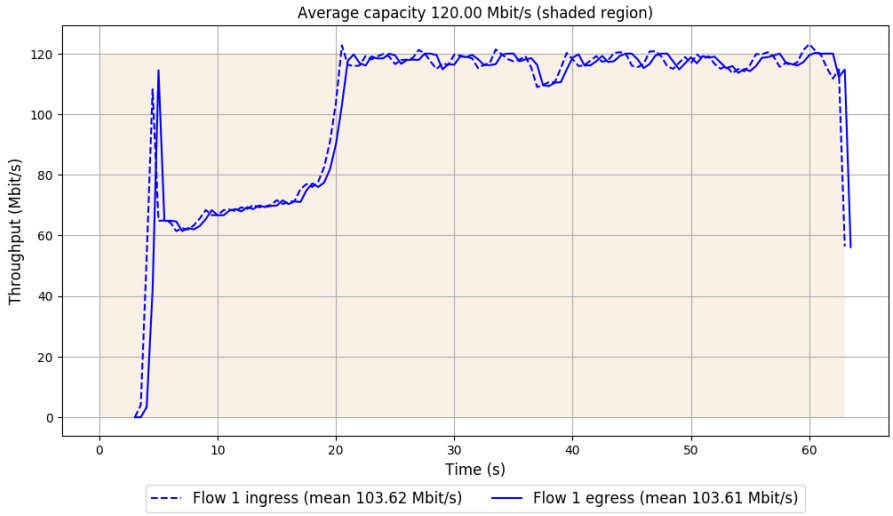


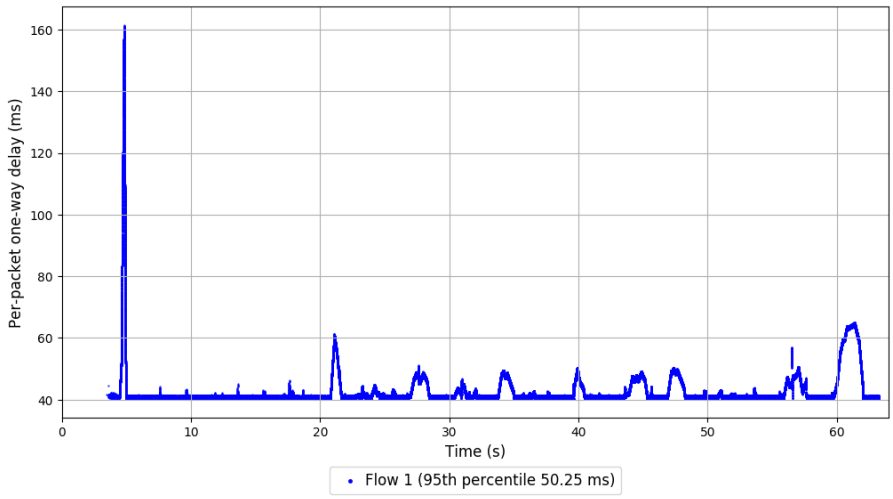
```
Run 1: Statistics of PCC-Allegro

Start at: 2019-07-31 20:11:42
End at: 2019-07-31 20:12:42

# Below is generated by plot.py at 2019-07-31 21:26:30
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 103.61 Mbit/s (86.3% utilization)
95th percentile per-packet one-way delay: 50.250 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 103.61 Mbit/s
95th percentile per-packet one-way delay: 50.250 ms
Loss rate: 0.09%
```

Run 1: Report of PCC-Allegro — Data Link



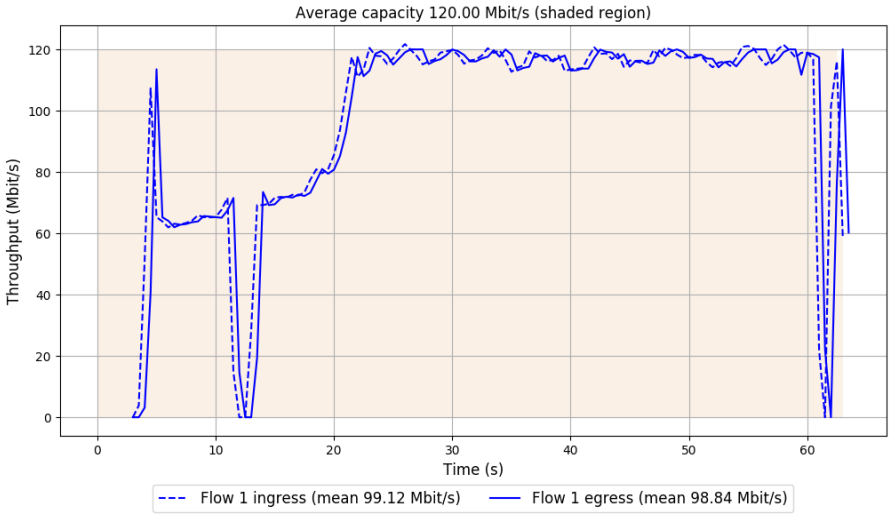


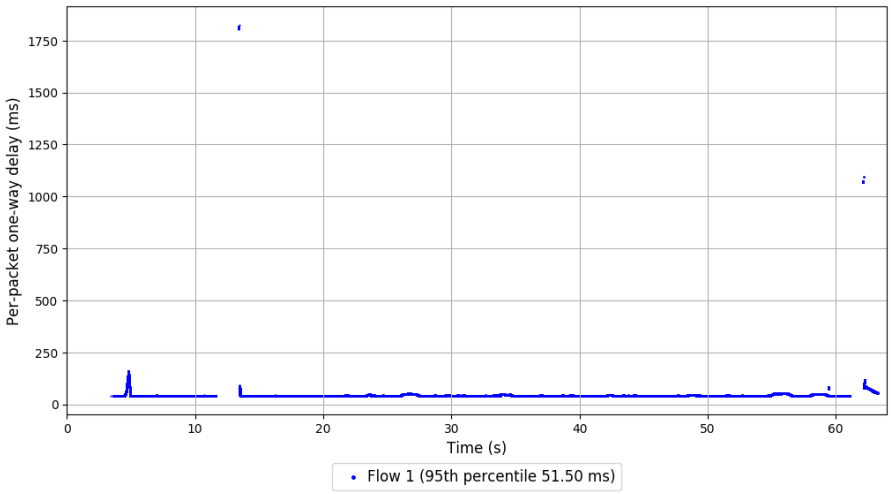
```
Run 2: Statistics of PCC-Allegro

Start at: 2019-07-31 20:22:03
End at: 2019-07-31 20:23:03

# Below is generated by plot.py at 2019-07-31 21:26:34
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 98.84 Mbit/s (82.4% utilization)
95th percentile per-packet one-way delay: 51.504 ms
Loss rate: 0.35%
-- Flow 1:
Average throughput: 98.84 Mbit/s
95th percentile per-packet one-way delay: 51.504 ms
Loss rate: 0.35%
```

Run 2: Report of PCC-Allegro — Data Link



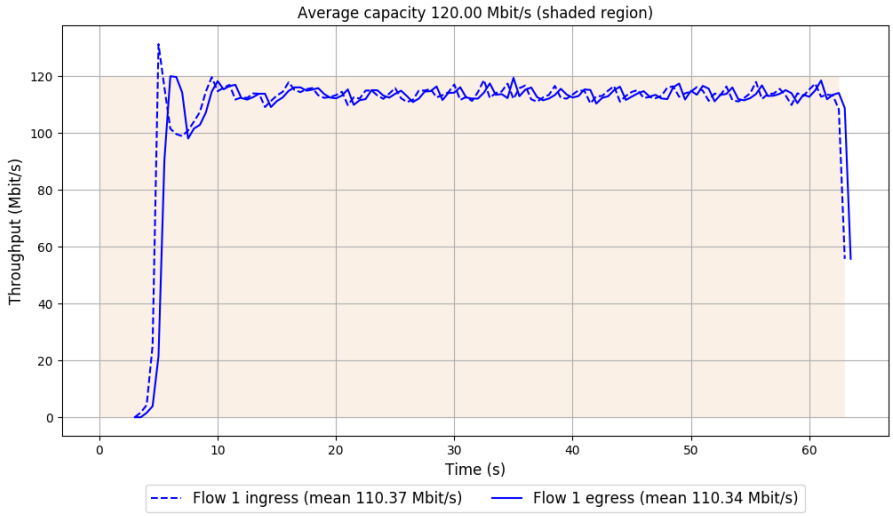


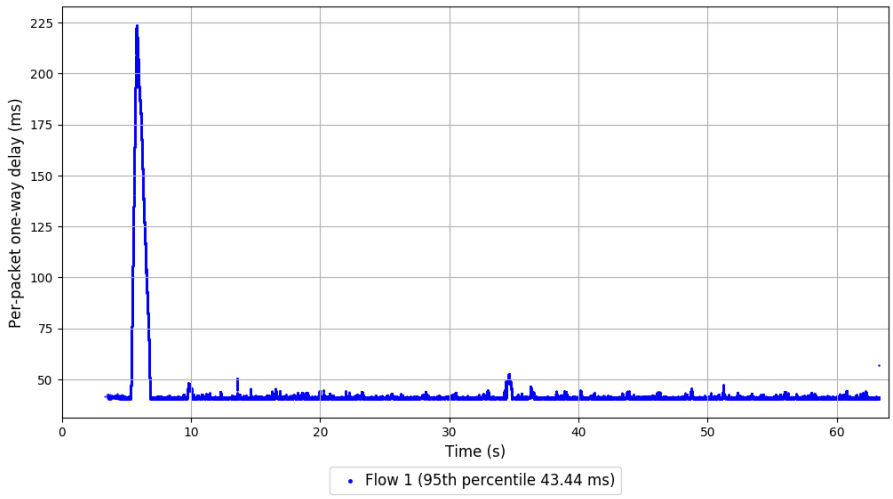
```
Run 1: Statistics of PCC-Vivace

Start at: 2019-07-31 20:12:55
End at: 2019-07-31 20:13:55

# Below is generated by plot.py at 2019-07-31 21:27:04
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 110.34 Mbit/s (91.9% utilization)
95th percentile per-packet one-way delay: 43.440 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 110.34 Mbit/s
95th percentile per-packet one-way delay: 43.440 ms
Loss rate: 0.07%
```

Run 1: Report of PCC-Vivace — Data Link





```
Run 2: Statistics of PCC-Vivace

Start at: 2019-07-31 20:23:16
End at: 2019-07-31 20:24:16

# Below is generated by plot.py at 2019-07-31 21:27:05
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.00 Mbit/s
Average throughput: 107.04 Mbit/s (89.2% utilization)
95th percentile per-packet one-way delay: 45.360 ms
Loss rate: 0.95%
-- Flow 1:
Average throughput: 107.04 Mbit/s
95th percentile per-packet one-way delay: 45.360 ms
Loss rate: 0.95%
```

Run 2: Report of PCC-Vivace — Data Link