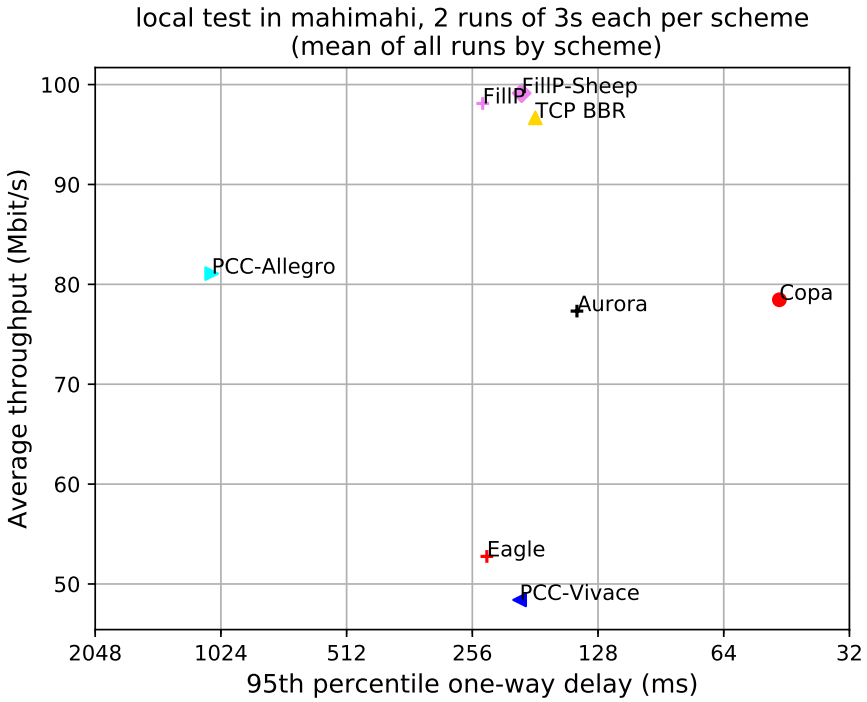
Pantheon Report

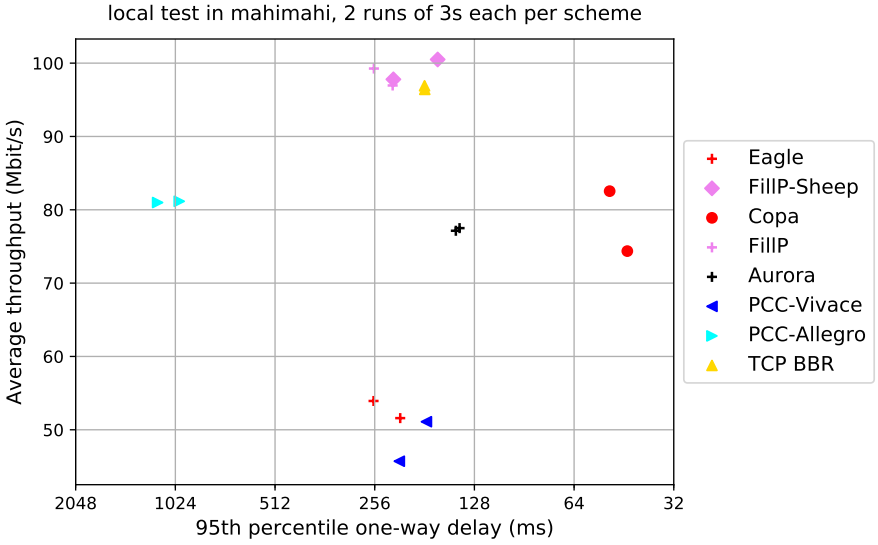
Generated at 2019-07-31 20:03:23 (UTC).
Tested in mahimahi: `mm-delay 40 mm-link 120mbps.trace 120mbps.trace`
Repeated the test of 8 congestion control schemes twice.
Each test lasted for 3 seconds running 1 flow.

```
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 @ 7c7d35f26fe6448ff6a9382483950d3d364f0759
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 3s each per scheme
(mean of all runs by scheme)
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
FillP
FillP-Sheep
TCP BBR
PCC-Allegro
Aurora
Copa
Eagle
PCC-Vivace
100
90
80
70
60
50
2048
1024
512
256
128
64
32


local test in mahimahi, 2 runs of 3s each per scheme
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
Eagle
FillP-Sheep
Copa
FillP
Aurora
PCC-Vivace
PCC-Allegro
TCP BBR
100
90
80
70
60
50
2048
1024
512
256
128
64
32

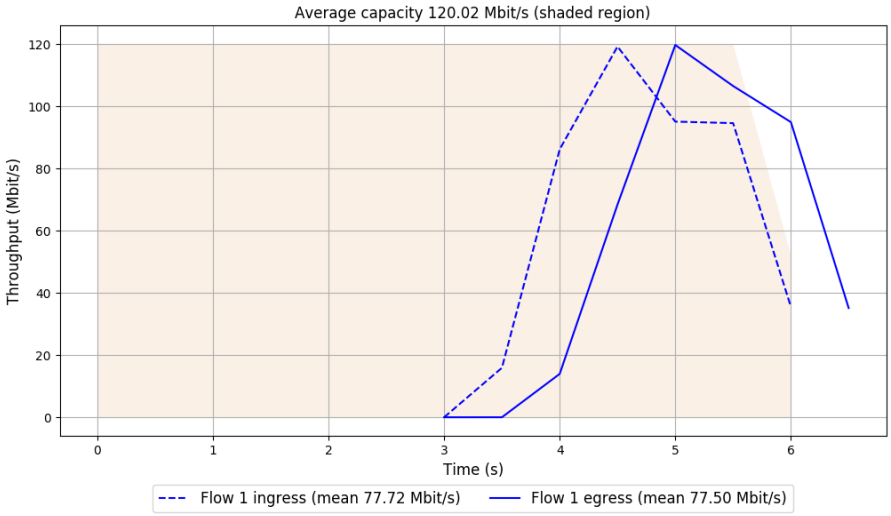
scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
Aurora	2	77.32	143.77	1.79
TCP BBR	2	96.67	180.90	2.21
Copa	2	78.46	47.09	1.65
Eagle	2	52.76	236.27	1.77
FillP	2	98.11	241.74	2.30
FillP-Sheep	2	99.15	195.06	2.04
PCC-Allegro	2	81.07	1077.45	38.48
PCC-Vivace	2	48.41	197.25	10.08

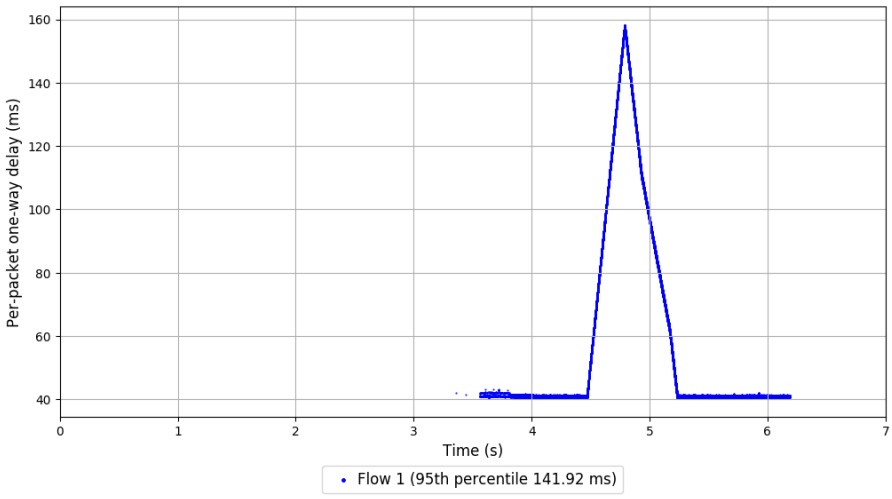
```
Run 1: Statistics of Aurora

Start at: 2019-07-31 19:59:52
End at: 2019-07-31 19:59:55

# Below is generated by plot.py at 2019-07-31 20:03:02
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 77.50 Mbit/s (64.6% utilization)
95th percentile per-packet one-way delay: 141.919 ms
Loss rate: 1.75%
-- Flow 1:
Average throughput: 77.50 Mbit/s
95th percentile per-packet one-way delay: 141.919 ms
Loss rate: 1.75%
```

Run 1: Report of Aurora — Data Link



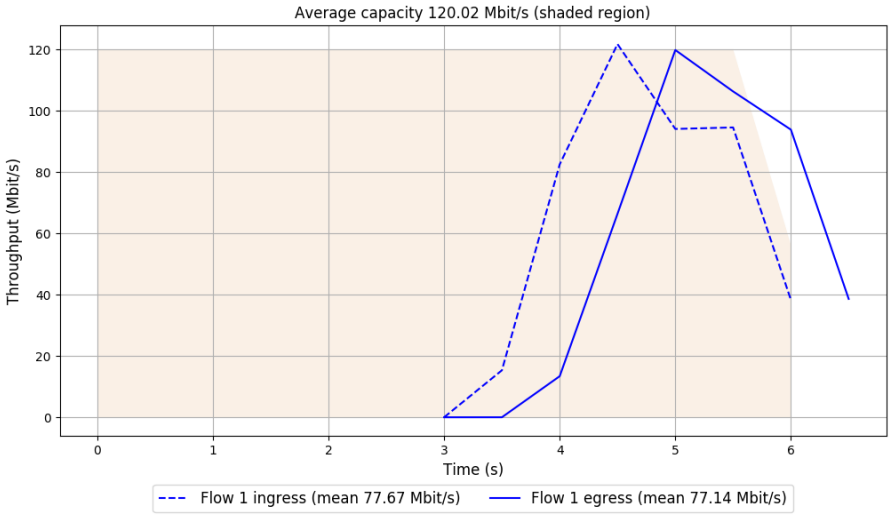


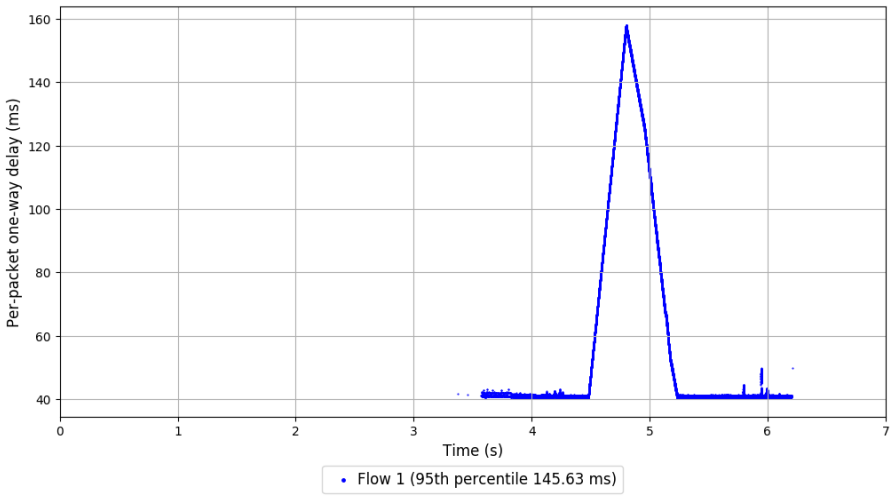
```
Run 2: Statistics of Aurora

Start at: 2019-07-31 20:00:53
End at: 2019-07-31 20:00:56

# Below is generated by plot.py at 2019-07-31 20:03:02
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 77.14 Mbit/s (64.3% utilization)
95th percentile per-packet one-way delay: 145.629 ms
Loss rate: 1.83%
-- Flow 1:
Average throughput: 77.14 Mbit/s
95th percentile per-packet one-way delay: 145.629 ms
Loss rate: 1.83%
```

Run 2: Report of Aurora — Data Link



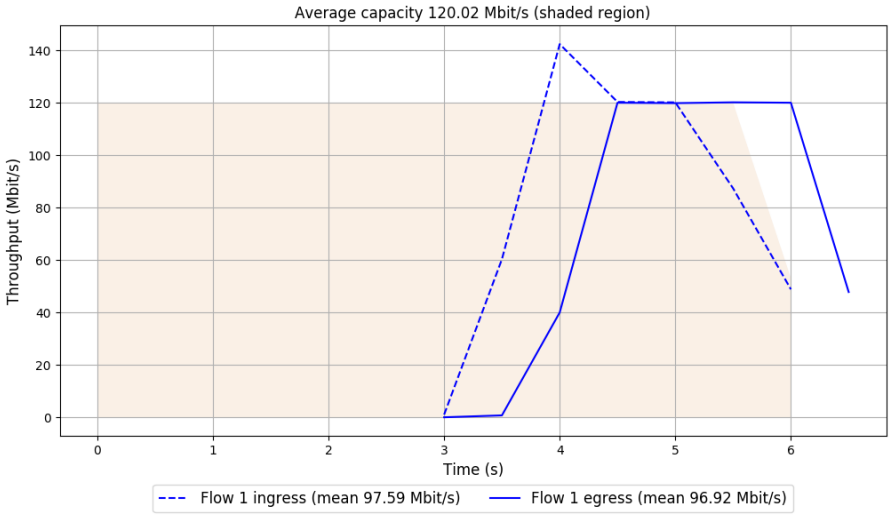


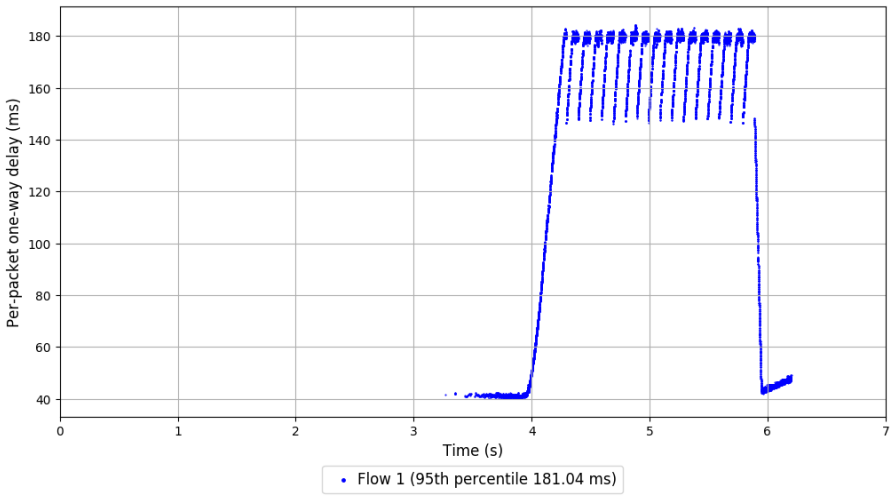
```
Run 1: Statistics of TCP BBR

Start at: 2019-07-31 19:59:06
End at: 2019-07-31 19:59:09

# Below is generated by plot.py at 2019-07-31 20:03:02
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 96.92 Mbit/s (80.7% utilization)
95th percentile per-packet one-way delay: 181.040 ms
Loss rate: 2.03%
-- Flow 1:
Average throughput: 96.92 Mbit/s
95th percentile per-packet one-way delay: 181.040 ms
Loss rate: 2.03%
```

Run 1: Report of TCP BBR — Data Link



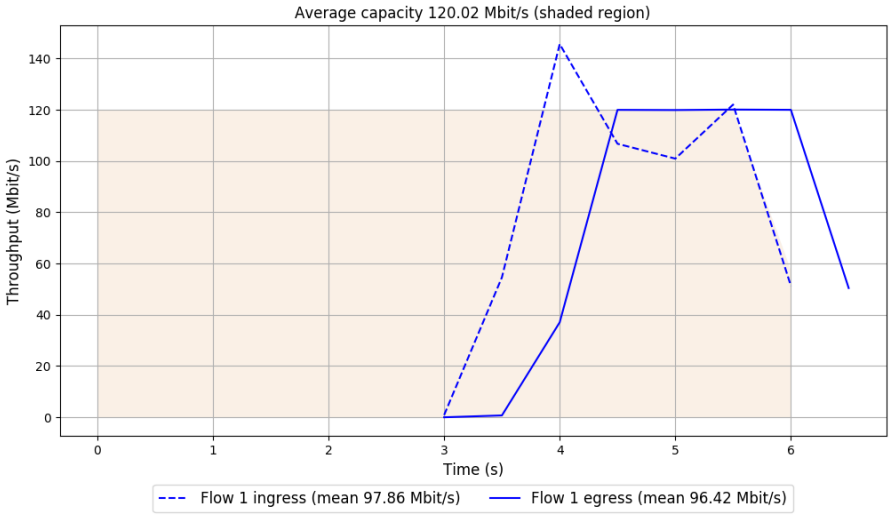


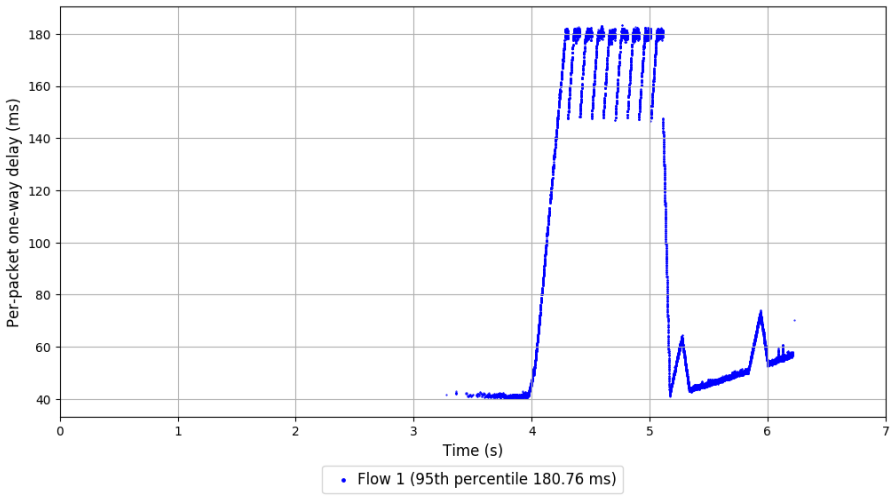
```
Run 2: Statistics of TCP BBR

Start at: 2019-07-31 20:00:07
End at: 2019-07-31 20:00:10

# Below is generated by plot.py at 2019-07-31 20:03:02
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 96.42 Mbit/s (80.3% utilization)
95th percentile per-packet one-way delay: 180.762 ms
Loss rate: 2.40%
-- Flow 1:
Average throughput: 96.42 Mbit/s
95th percentile per-packet one-way delay: 180.762 ms
Loss rate: 2.40%
```

Run 2: Report of TCP BBR — Data Link



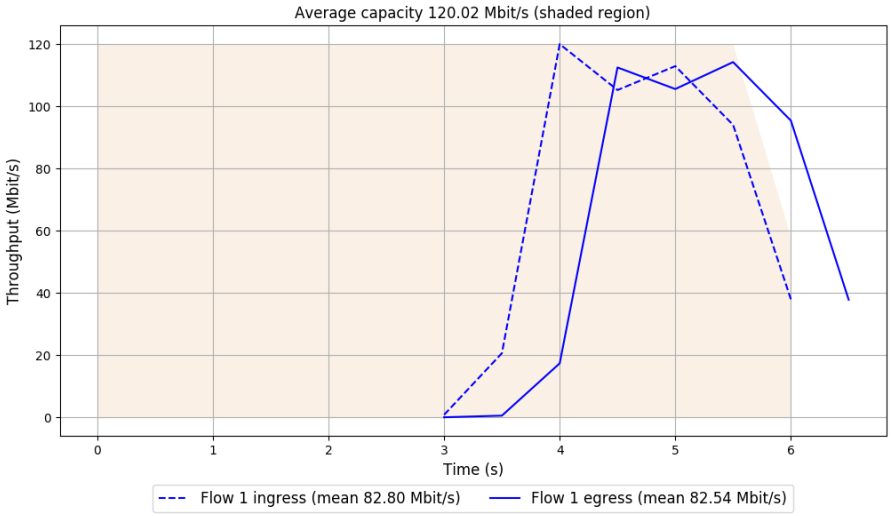


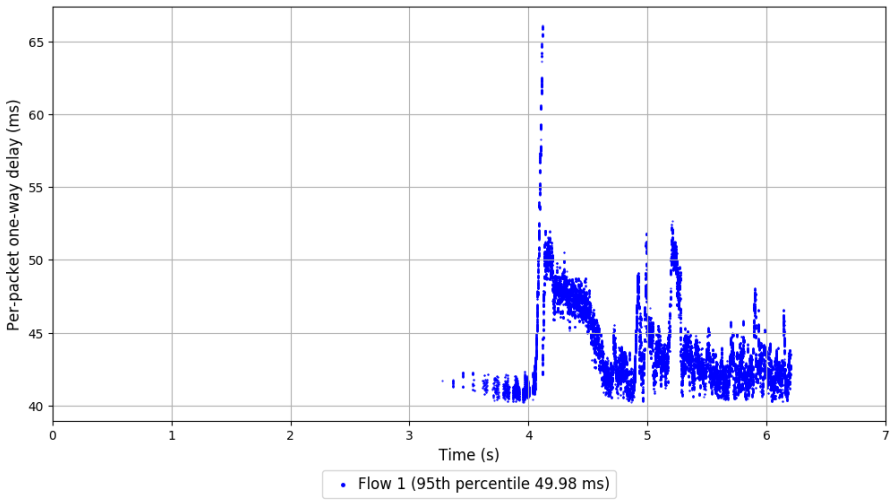
```
Run 1: Statistics of Copa

Start at: 2019-07-31 19:59:14
End at: 2019-07-31 19:59:17

# Below is generated by plot.py at 2019-07-31 20:03:04
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 82.54 Mbit/s (68.8% utilization)
95th percentile per-packet one-way delay: 49.979 ms
Loss rate: 1.67%
-- Flow 1:
Average throughput: 82.54 Mbit/s
95th percentile per-packet one-way delay: 49.979 ms
Loss rate: 1.67%
```

Run 1: Report of Copa — Data Link



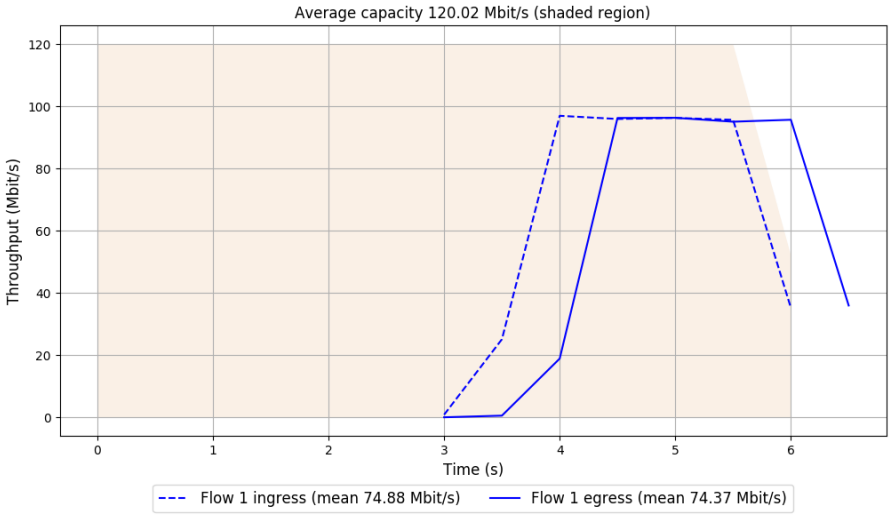


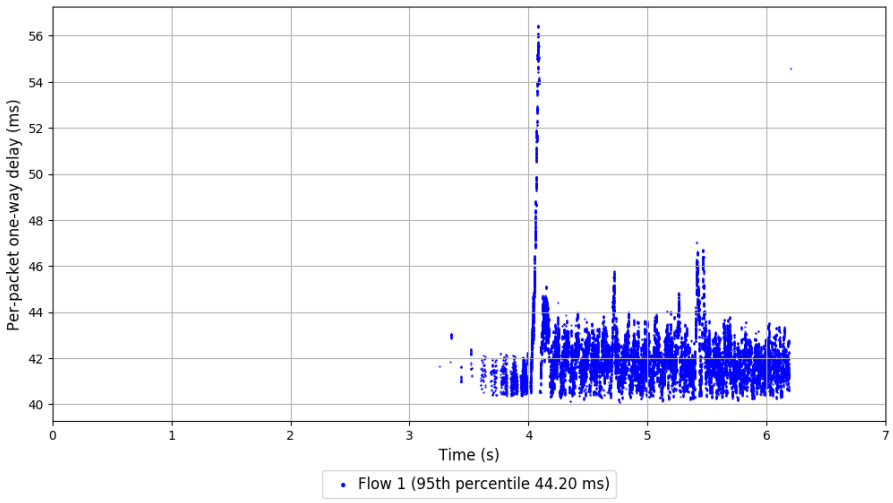
```
Run 2: Statistics of Copa

Start at: 2019-07-31 20:00:15
End at: 2019-07-31 20:00:18

# Below is generated by plot.py at 2019-07-31 20:03:04
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 74.37 Mbit/s (62.0% utilization)
95th percentile per-packet one-way delay: 44.205 ms
Loss rate: 1.63%
-- Flow 1:
Average throughput: 74.37 Mbit/s
95th percentile per-packet one-way delay: 44.205 ms
Loss rate: 1.63%
```

Run 2: Report of Copa — Data Link



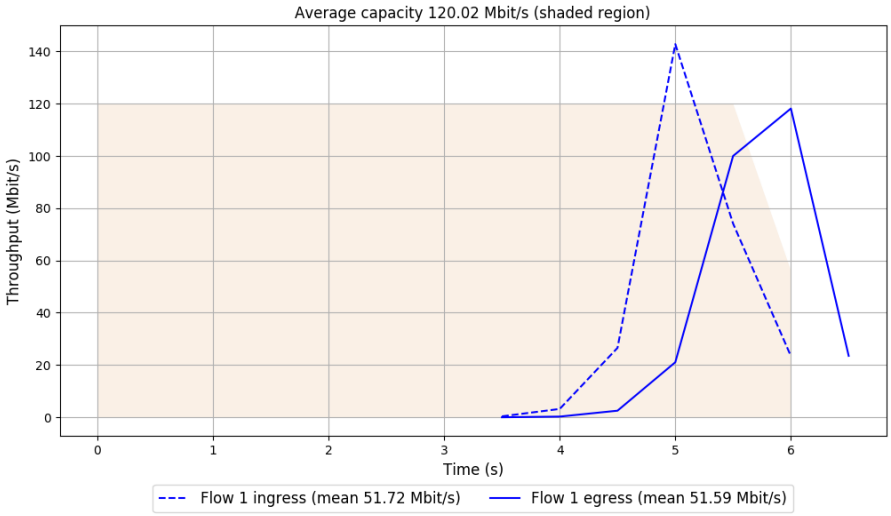


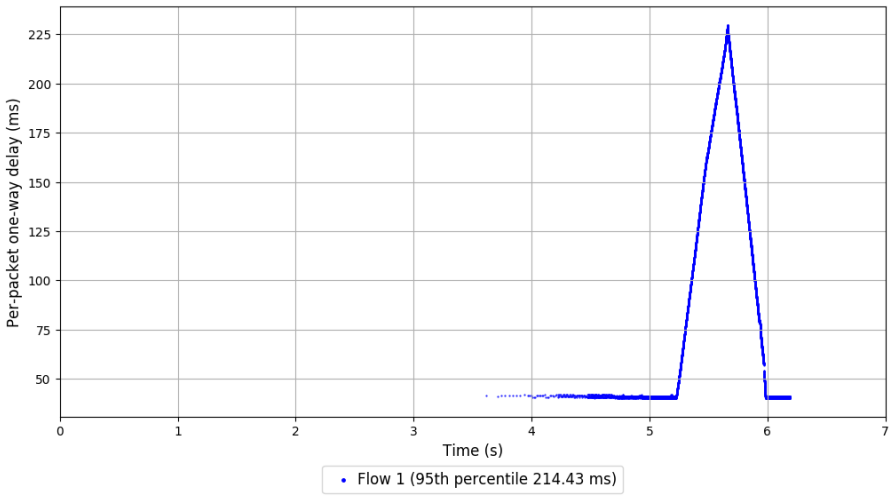
```
Run 1: Statistics of Eagle

Start at: 2019-07-31 19:58:59
End at: 2019-07-31 19:59:02

# Below is generated by plot.py at 2019-07-31 20:03:07
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 51.59 Mbit/s (43.0% utilization)
95th percentile per-packet one-way delay: 214.432 ms
Loss rate: 1.83%
-- Flow 1:
Average throughput: 51.59 Mbit/s
95th percentile per-packet one-way delay: 214.432 ms
Loss rate: 1.83%
```

Run 1: Report of Eagle — Data Link



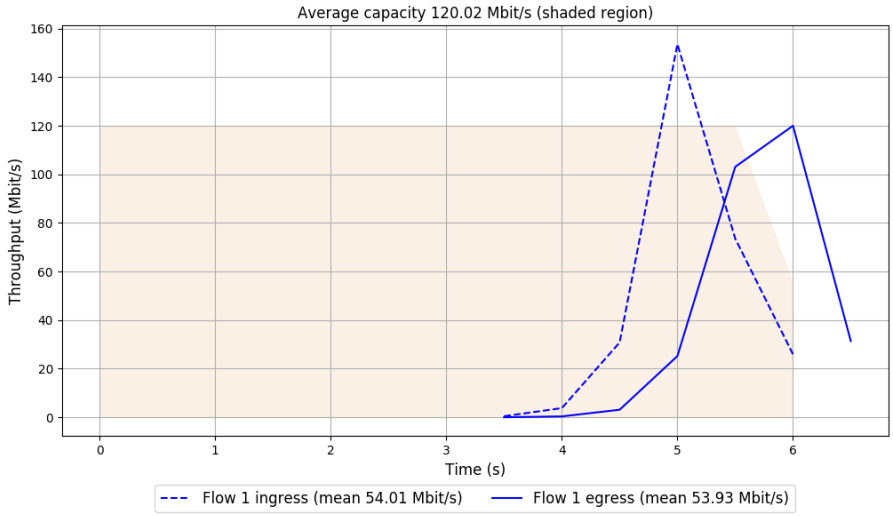


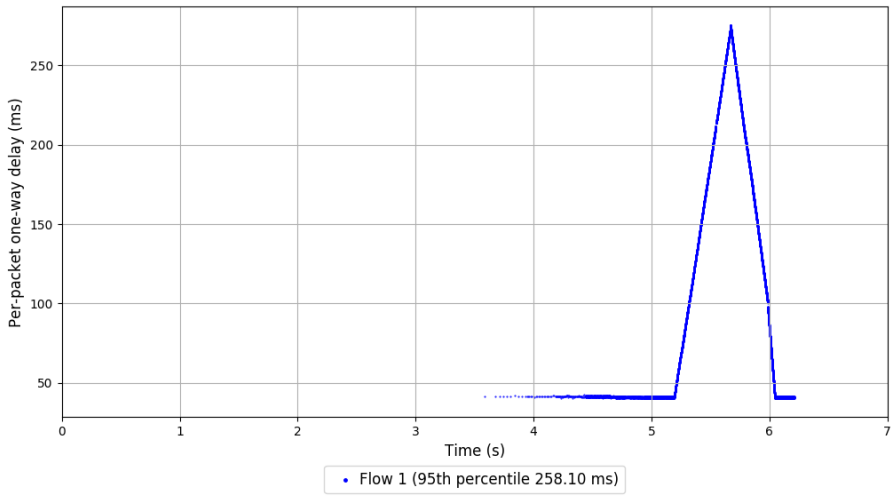
```
Run 2: Statistics of Eagle

Start at: 2019-07-31 20:00:00
End at: 2019-07-31 20:00:03

# Below is generated by plot.py at 2019-07-31 20:03:09
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 53.93 Mbit/s (44.9% utilization)
95th percentile per-packet one-way delay: 258.104 ms
Loss rate: 1.72%
-- Flow 1:
Average throughput: 53.93 Mbit/s
95th percentile per-packet one-way delay: 258.104 ms
Loss rate: 1.72%
```

Run 2: Report of Eagle — Data Link



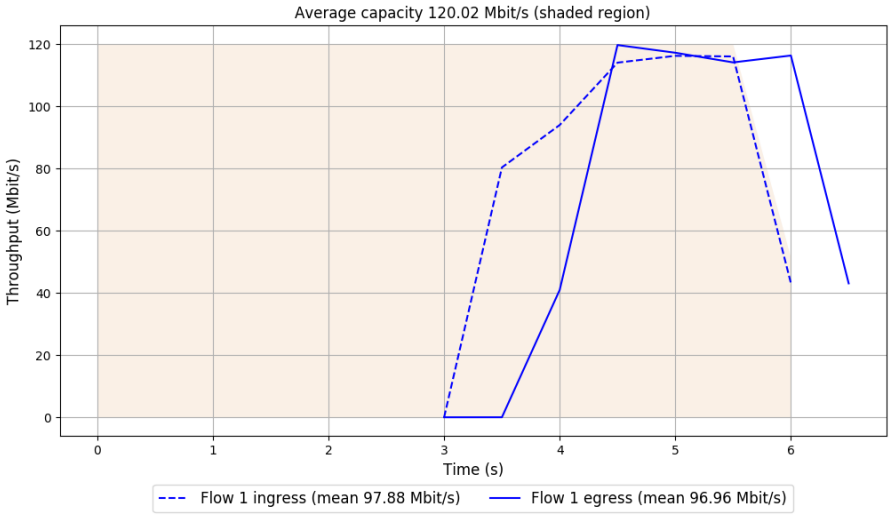


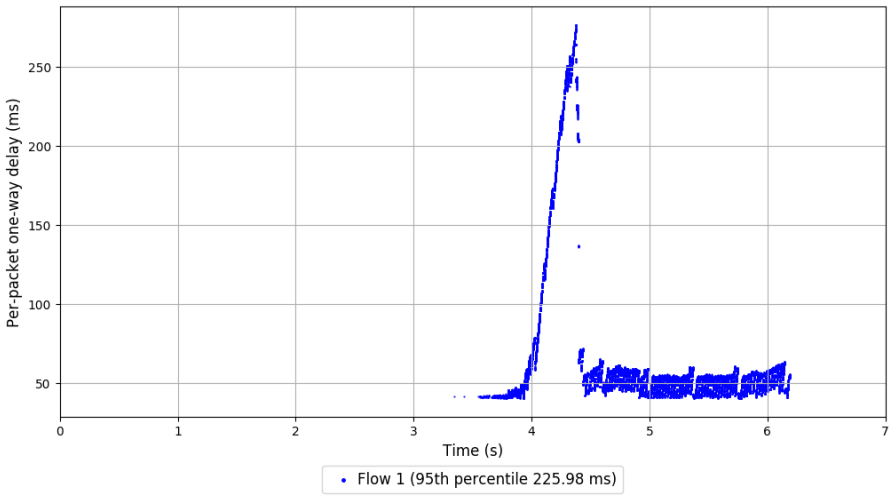
```
Run 1: Statistics of FillP

Start at: 2019-07-31 19:59:37
End at: 2019-07-31 19:59:40

# Below is generated by plot.py at 2019-07-31 20:03:12
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 96.96 Mbit/s (80.8% utilization)
95th percentile per-packet one-way delay: 225.978 ms
Loss rate: 2.20%
-- Flow 1:
Average throughput: 96.96 Mbit/s
95th percentile per-packet one-way delay: 225.978 ms
Loss rate: 2.20%
```

Run 1: Report of FillP — Data Link



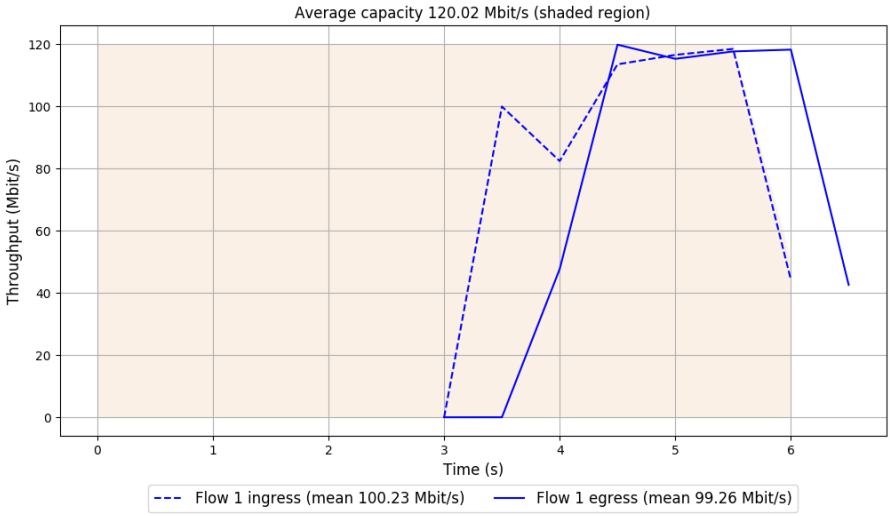


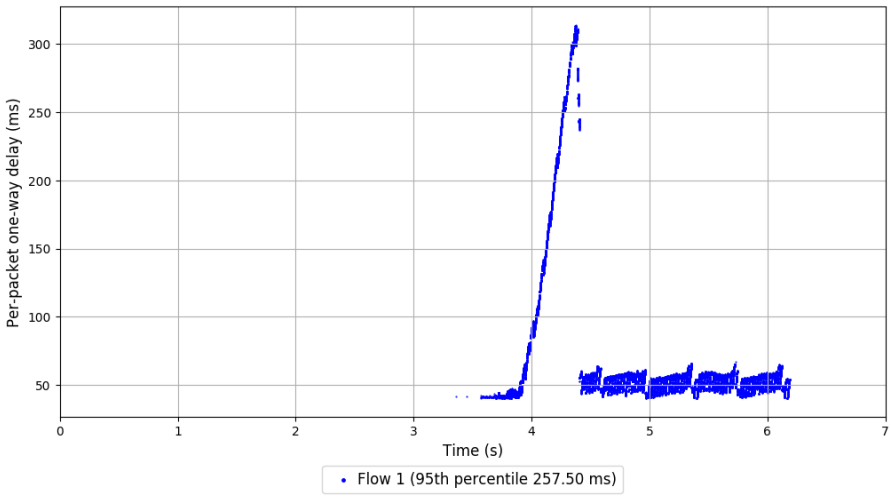
```
Run 2: Statistics of FillP

Start at: 2019-07-31 20:00:38
End at: 2019-07-31 20:00:41

# Below is generated by plot.py at 2019-07-31 20:03:15
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 99.26 Mbit/s (82.7% utilization)
95th percentile per-packet one-way delay: 257.496 ms
Loss rate: 2.40%
-- Flow 1:
Average throughput: 99.26 Mbit/s
95th percentile per-packet one-way delay: 257.496 ms
Loss rate: 2.40%
```

Run 2: Report of FillP — Data Link



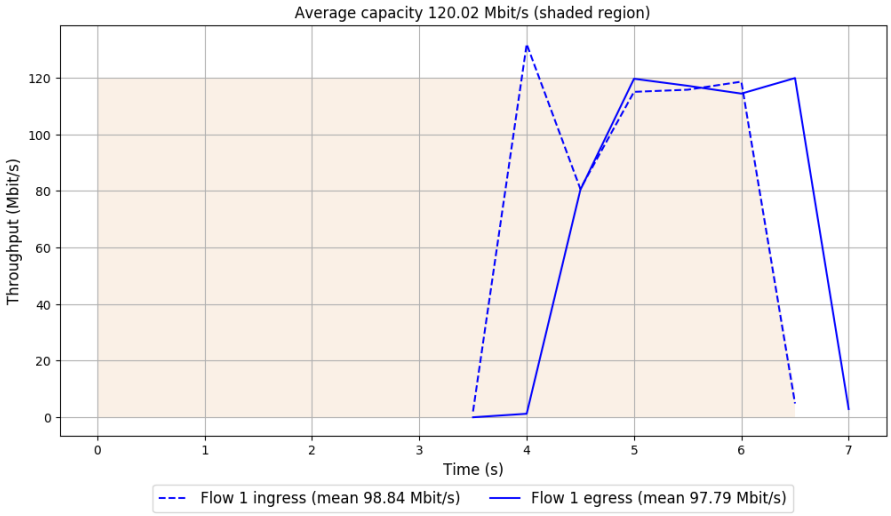


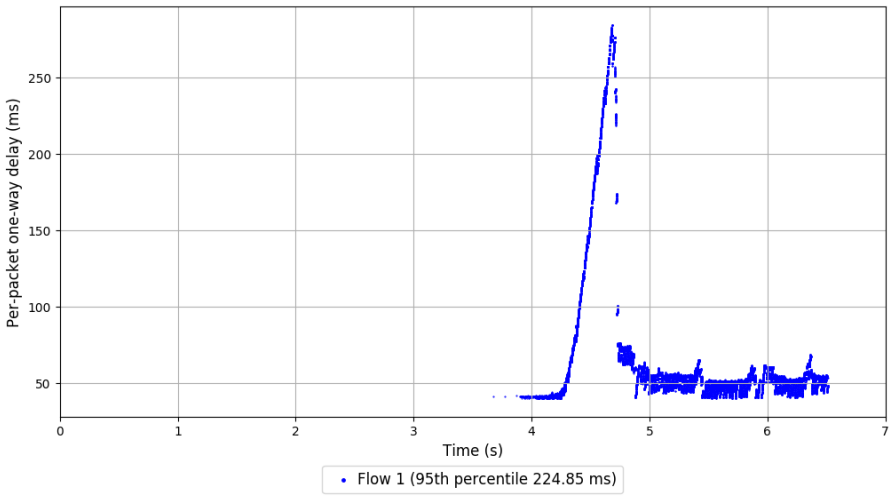
```
Run 1: Statistics of FillP-Sheep

Start at: 2019-07-31 19:59:45
End at: 2019-07-31 19:59:48

# Below is generated by plot.py at 2019-07-31 20:03:17
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 97.79 Mbit/s (81.5% utilization)
95th percentile per-packet one-way delay: 224.851 ms
Loss rate: 2.35%
-- Flow 1:
Average throughput: 97.79 Mbit/s
95th percentile per-packet one-way delay: 224.851 ms
Loss rate: 2.35%
```

Run 1: Report of FillP-Sheep — Data Link



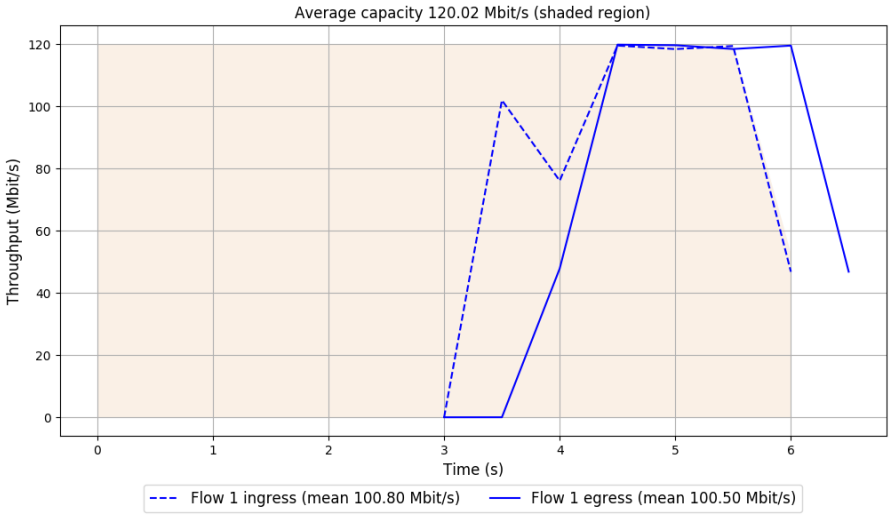


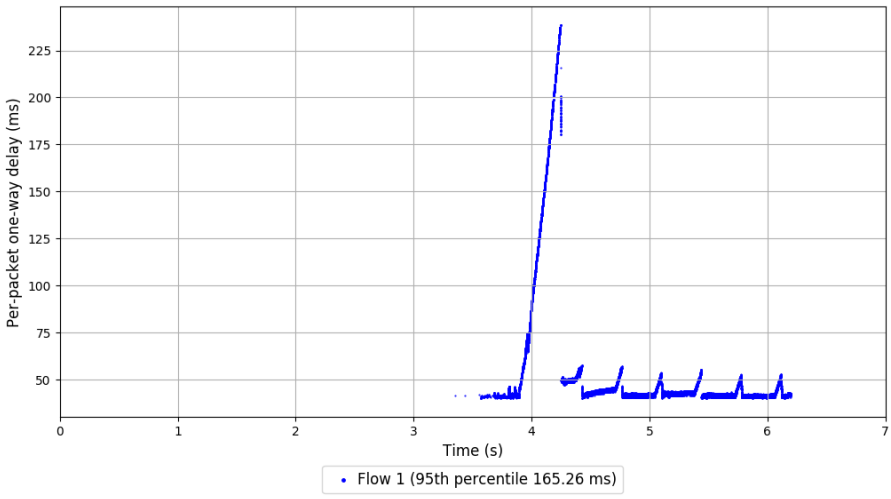
```
Run 2: Statistics of FillP-Sheep

Start at: 2019-07-31 20:00:45
End at: 2019-07-31 20:00:48

# Below is generated by plot.py at 2019-07-31 20:03:18
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 100.50 Mbit/s (83.7% utilization)
95th percentile per-packet one-way delay: 165.259 ms
Loss rate: 1.73%
-- Flow 1:
Average throughput: 100.50 Mbit/s
95th percentile per-packet one-way delay: 165.259 ms
Loss rate: 1.73%
```

Run 2: Report of FillP-Sheep — Data Link



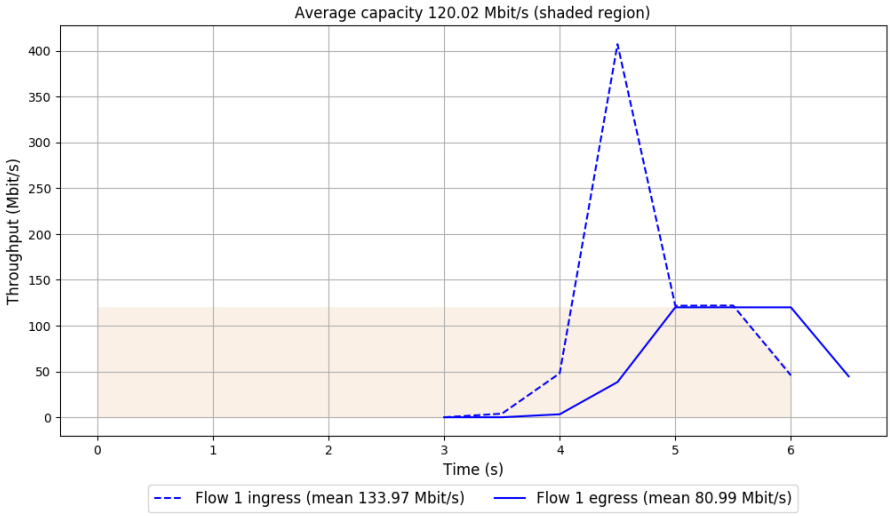


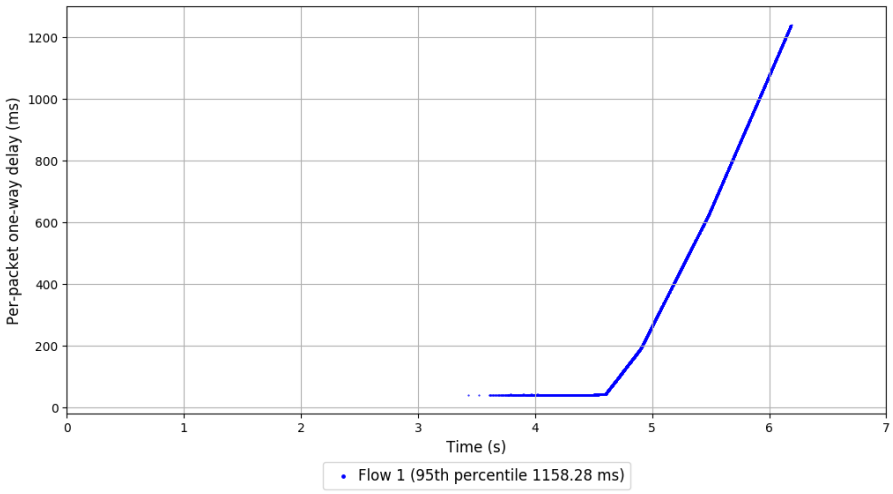
```
Run 1: Statistics of PCC-Allegro

Start at: 2019-07-31 19:59:22
End at: 2019-07-31 19:59:25

# Below is generated by plot.py at 2019-07-31 20:03:18
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 80.99 Mbit/s (67.5% utilization)
95th percentile per-packet one-way delay: 1158.276 ms
Loss rate: 40.38%
-- Flow 1:
Average throughput: 80.99 Mbit/s
95th percentile per-packet one-way delay: 1158.276 ms
Loss rate: 40.38%
```

Run 1: Report of PCC-Allegro — Data Link



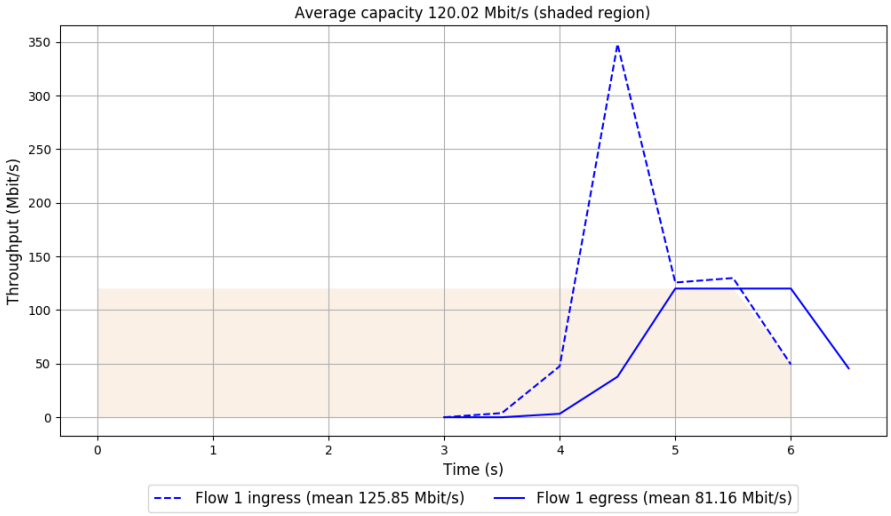


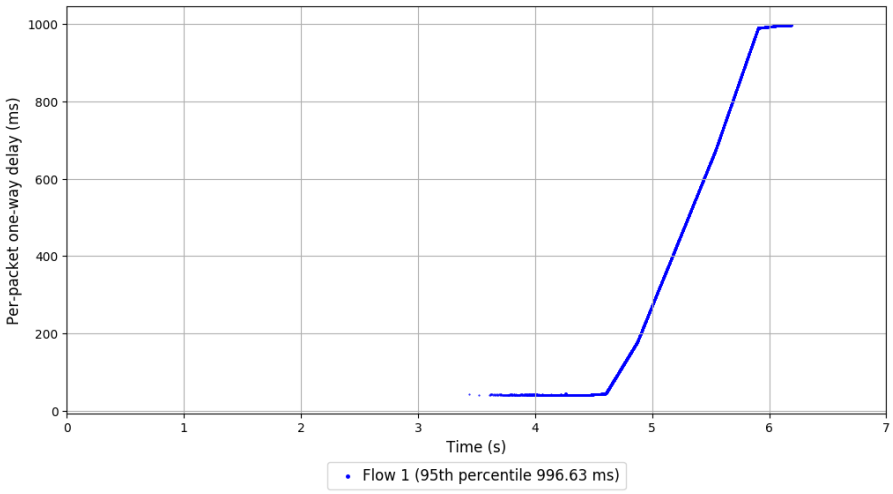
```
Run 2: Statistics of PCC-Allegro

Start at: 2019-07-31 20:00:23
End at: 2019-07-31 20:00:26

# Below is generated by plot.py at 2019-07-31 20:03:20
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 81.16 Mbit/s (67.6% utilization)
95th percentile per-packet one-way delay: 996.629 ms
Loss rate: 36.57%
-- Flow 1:
Average throughput: 81.16 Mbit/s
95th percentile per-packet one-way delay: 996.629 ms
Loss rate: 36.57%
```

Run 2: Report of PCC-Allegro — Data Link



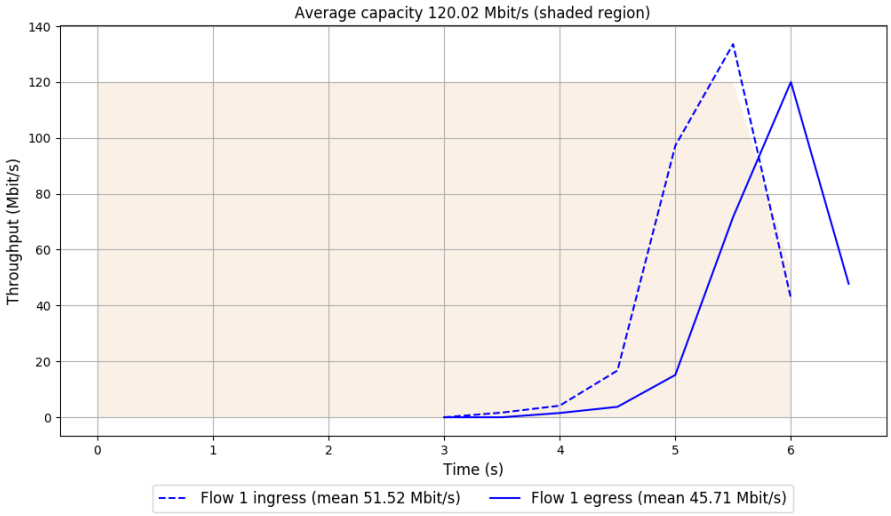


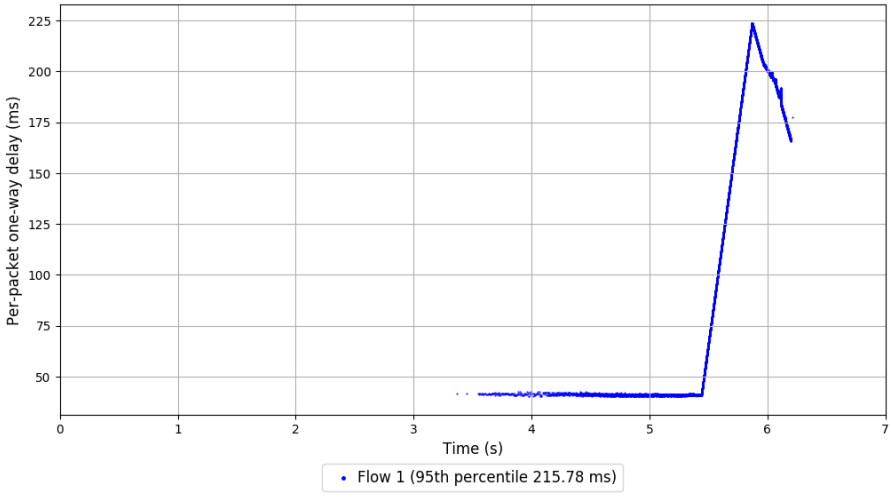
```
Run 1: Statistics of PCC-Vivace

Start at: 2019-07-31 19:59:29
End at: 2019-07-31 19:59:32

# Below is generated by plot.py at 2019-07-31 20:03:20
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 45.71 Mbit/s (38.1% utilization)
95th percentile per-packet one-way delay: 215.782 ms
Loss rate: 12.19%
-- Flow 1:
Average throughput: 45.71 Mbit/s
95th percentile per-packet one-way delay: 215.782 ms
Loss rate: 12.19%
```

Run 1: Report of PCC-Vivace — Data Link





```
Run 2: Statistics of PCC-Vivace

Start at: 2019-07-31 20:00:30
End at: 2019-07-31 20:00:33

# Below is generated by plot.py at 2019-07-31 20:03:21
# Datalink statistics
-- Total of 1 flow:
Average capacity: 120.02 Mbit/s
Average throughput: 51.10 Mbit/s (42.6% utilization)
95th percentile per-packet one-way delay: 178.717 ms
Loss rate: 7.97%
-- Flow 1:
Average throughput: 51.10 Mbit/s
95th percentile per-packet one-way delay: 178.717 ms
Loss rate: 7.97%
```

Run 2: Report of PCC-Vivace — Data Link