Pantheon Report

Generated at 2019-10-22 16:00:31 (UTC).

Tested in mahimahi: `mm-delay 51 mm-loss uplink 0.0006 mm-link 77.72mbps.trace 77.72mbps.trace --uplink-queue=droptail --uplink-queue-args=packets=94`

Repeated the test of 4 congestion control schemes 5 times.

Each test lasted for 30 seconds running 1 flow.

```
System info:
Linux 4.15.0-65-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 @ b54fc866b3140559c1fa1782d26fa636f7a43a8d
third_party/aurora @ f3e943d61015b39960854ba6391797e0c7984d74
third_party/aurora-model @ e292c316c23fb837255c4e142e40590d154bbe95
third_party/eagle-v1 @ c68d985e042be5c30704c0aee48c363861951a95
third_party/eagle-v2 @ c8a1737b3c84d7d49eada5b8785045d272a70120
third_party/eagle-v3 @ a63fea7809d9b57a6dbfc95c54181b54157c2b45
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/datagram_pb2.cpython-36.
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/helpers.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/mahimahi.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/project_root.cpython-36.
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/receiver.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/model-xentropy/model-xentropy.pt
 M sender-receiver/sender-receiver/sender_receiver/logs.txt
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
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
```
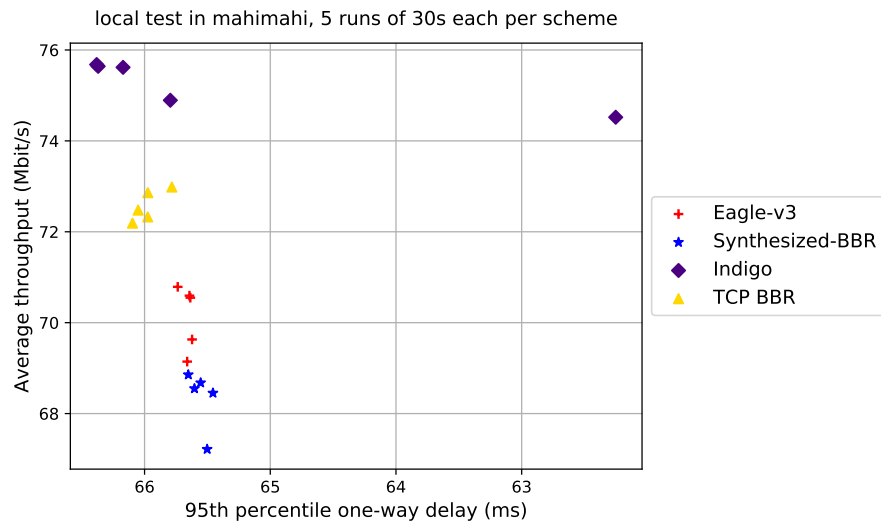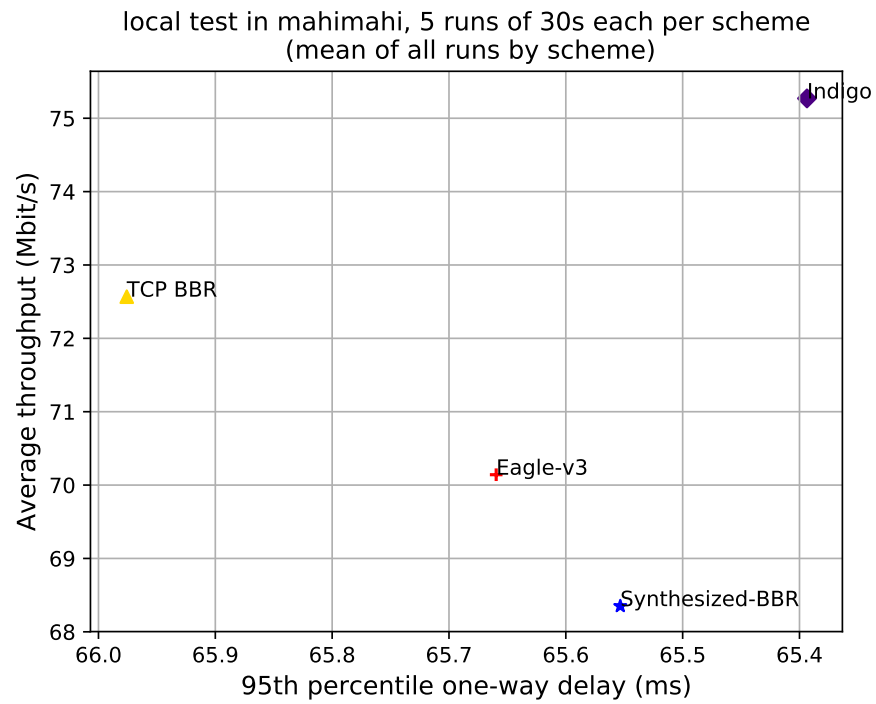
```
 M src/ScreamClient
 M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
 M src/examples/cellsim.cc
 M src/examples/sproutbt2.cc
 M src/network/sproutconn.cc
third_party/synthesizedBBR @ a63fea7809d9b57a6dbfc95c54181b54157c2b45
 M sender-receiver/sender-receiver/sender_receiver/__pycache__/__init__.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/__init__.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/datagram_pb2.cpython-36.
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/helpers.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/mahimahi.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/project_root.cpython-36.
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/receiver.cpython-36.pyc
 M sender-receiver/sender-receiver/sender_receiver/envs/__pycache__/sender_receiver_env.cpyt
 M sender-receiver/sender-receiver/sender_receiver/envs/model-xentropy/model-xentropy.pt
 M sender-receiver/sender-receiver/sender_receiver/envs/sender_receiver_env.py
 M sender-receiver/sender-receiver/sender_receiver/logs.txt
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
 M src/verus.hpp
 M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```

local test in mahimahi, 5 runs of 30s each per scheme
(mean of all runs by scheme)

local test in mahimahi, 5 runs of 30s each per scheme

scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
TCP BBR	5	72.57	65.98	3.64
Eagle-v3	5	70.14	65.66	3.65
Indigo	5	75.27	65.39	27.04
Synthesized-BBR	5	68.35	65.55	2.40

```
Run 1: Statistics of TCP BBR

Start at: 2019-10-22 15:41:58
End at: 2019-10-22 15:42:28

# Below is generated by plot.py at 2019-10-22 15:57:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 72.98 Mbit/s (93.9% utilization)
95th percentile per-packet one-way delay: 65.783 ms
Loss rate: 3.06%
-- Flow 1:
Average throughput: 72.98 Mbit/s
95th percentile per-packet one-way delay: 65.783 ms
Loss rate: 3.06%
```
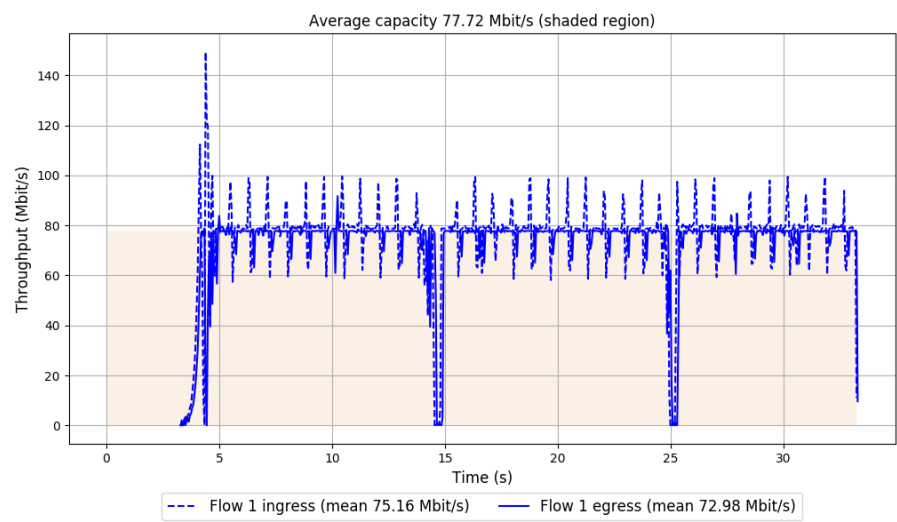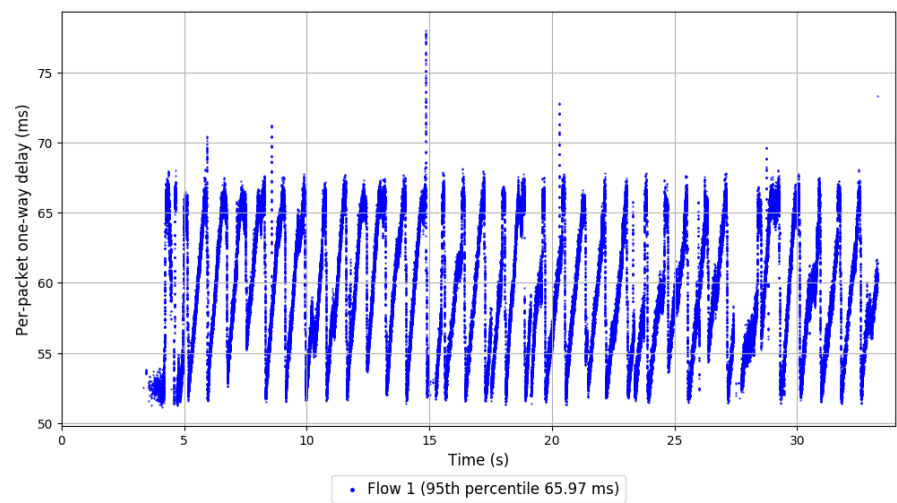
Run 1: Report of TCP BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)
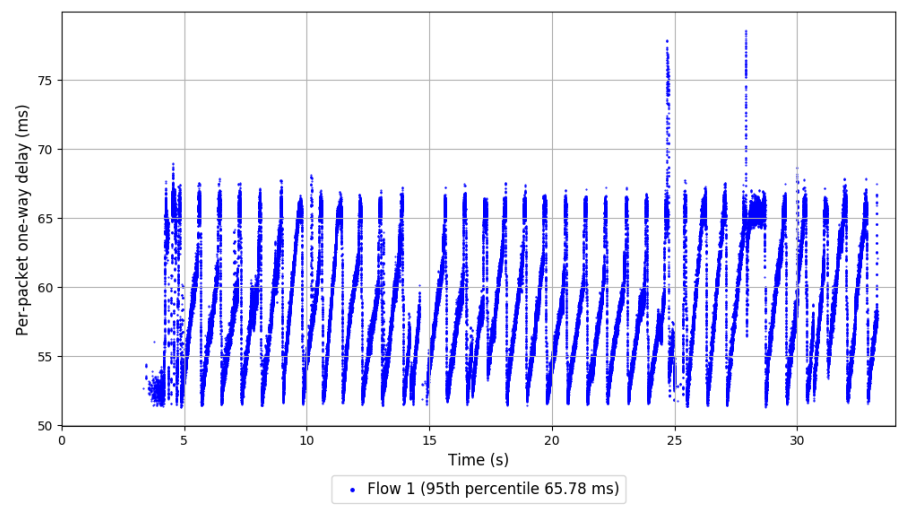
```
Run 2: Statistics of TCP BBR

Start at: 2019-10-22 15:44:32
End at: 2019-10-22 15:45:02

# Below is generated by plot.py at 2019-10-22 15:57:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 72.86 Mbit/s (93.7% utilization)
95th percentile per-packet one-way delay: 65.974 ms
Loss rate: 3.34%
-- Flow 1:
Average throughput: 72.86 Mbit/s
95th percentile per-packet one-way delay: 65.974 ms
Loss rate: 3.34%
```
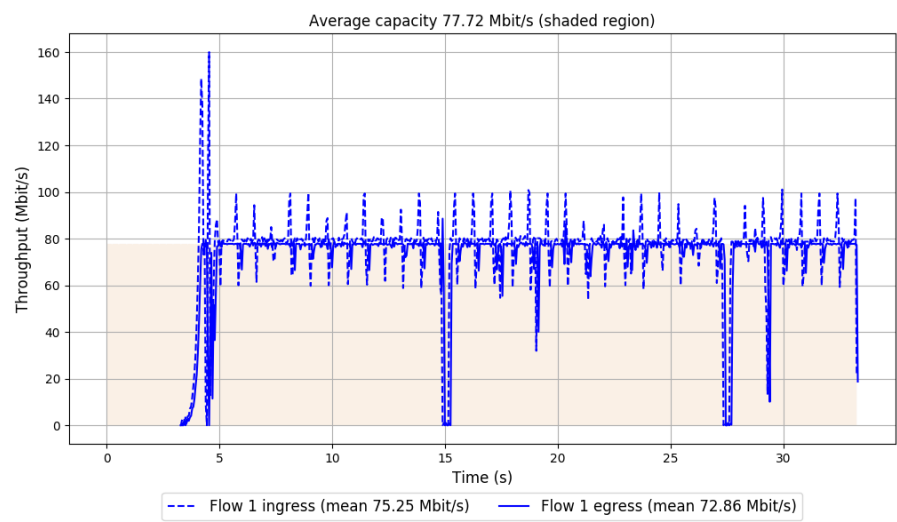
Run 2: Report of TCP BBR — Data Link

```
Run 3: Statistics of TCP BBR

Start at: 2019-10-22 15:47:06
End at: 2019-10-22 15:47:36


# Below is generated by plot.py at 2019-10-22 15:57:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 72.19 Mbit/s (92.9% utilization)
95th percentile per-packet one-way delay: 66.096 ms
Loss rate: 4.97%
-- Flow 1:
Average throughput: 72.19 Mbit/s
95th percentile per-packet one-way delay: 66.096 ms
Loss rate: 4.97%
```
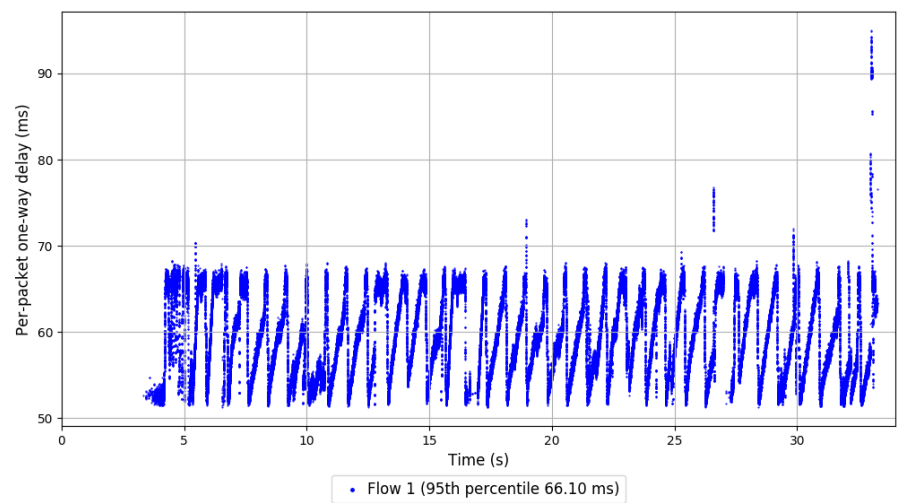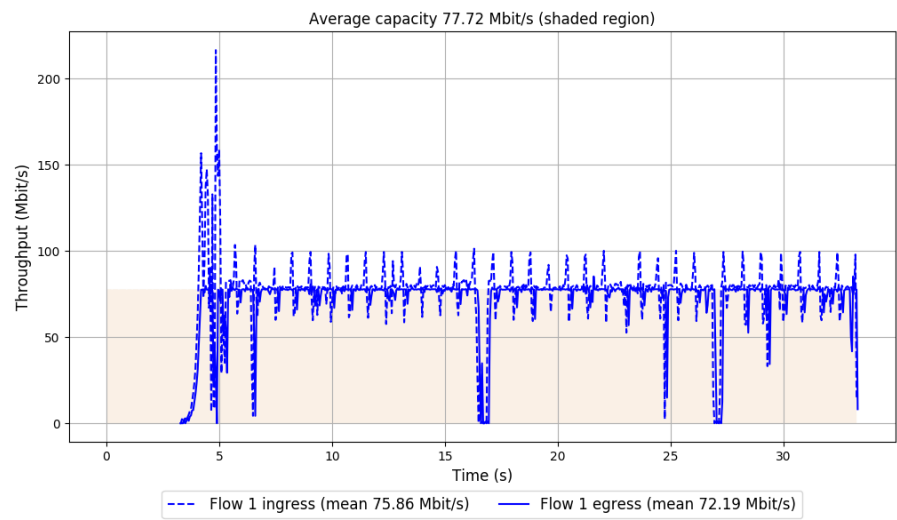
Run 3: Report of TCP BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 75.86 Mbit/s) — Flow 1 egress (mean 72.19 Mbit/s)

Flow 1 (95th percentile 66.10 ms)

```
Run 4: Statistics of TCP BBR

Start at: 2019-10-22 15:49:41
End at: 2019-10-22 15:50:11


# Below is generated by plot.py at 2019-10-22 15:57:33
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 72.33 Mbit/s (93.1% utilization)
95th percentile per-packet one-way delay: 65.975 ms
Loss rate: 3.18%
-- Flow 1:
Average throughput: 72.33 Mbit/s
95th percentile per-packet one-way delay: 65.975 ms
Loss rate: 3.18%
```
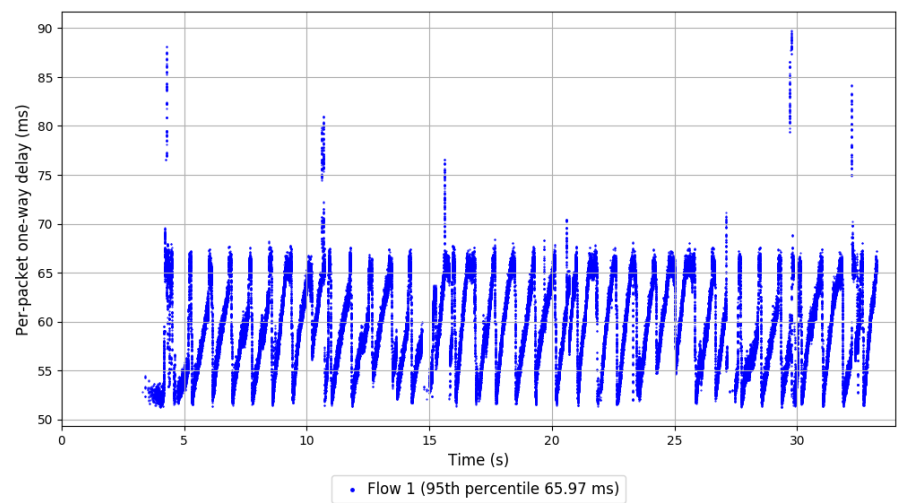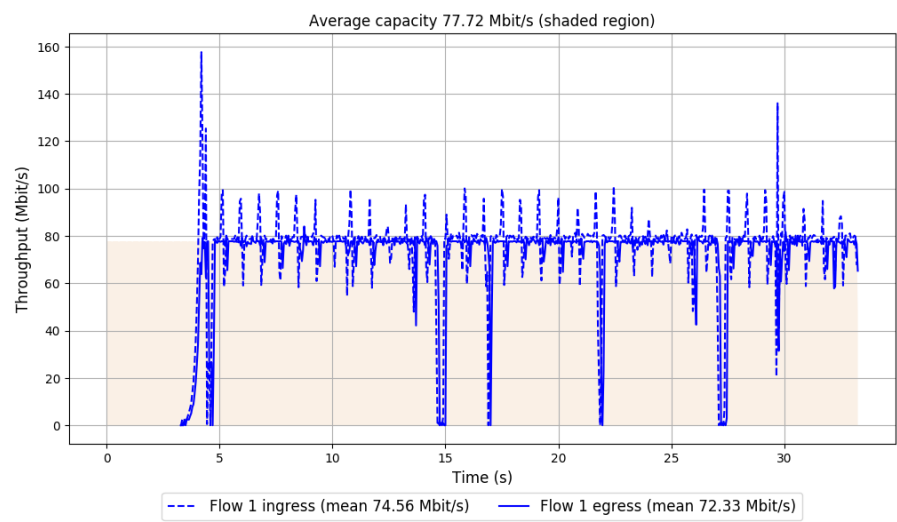
Run 4: Report of TCP BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 74.56 Mbit/s) —— Flow 1 egress (mean 72.33 Mbit/s)

• Flow 1 (95th percentile 65.97 ms)

```
Run 5: Statistics of TCP BBR

Start at: 2019-10-22 15:52:15
End at: 2019-10-22 15:52:45


# Below is generated by plot.py at 2019-10-22 15:58:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 72.48 Mbit/s (93.3% utilization)
95th percentile per-packet one-way delay: 66.051 ms
Loss rate: 3.63%
-- Flow 1:
Average throughput: 72.48 Mbit/s
95th percentile per-packet one-way delay: 66.051 ms
Loss rate: 3.63%
```
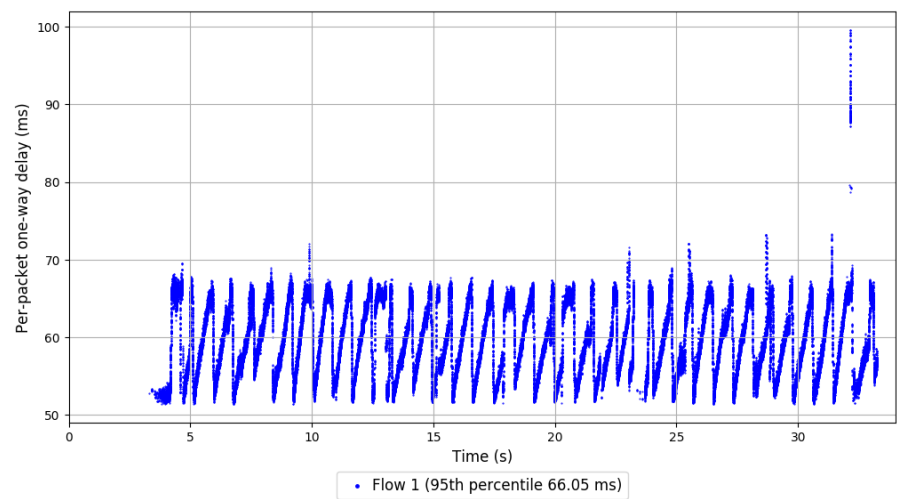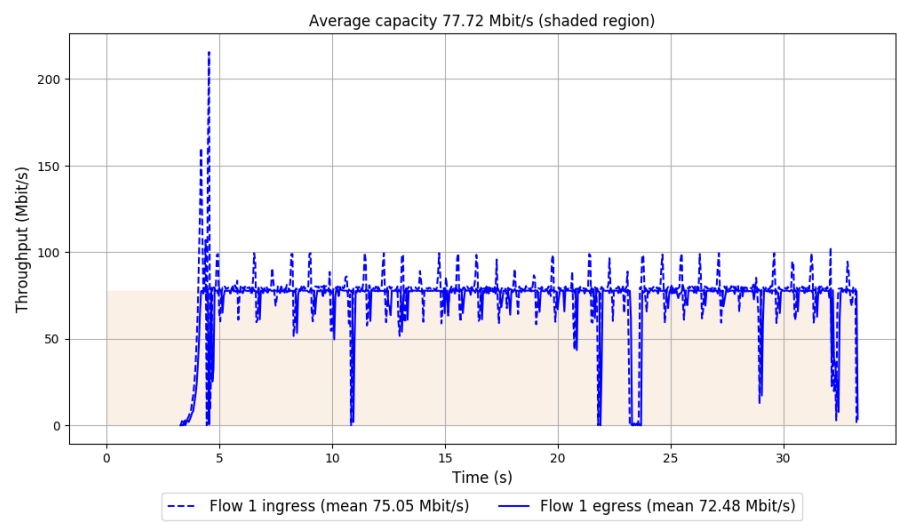
Run 5: Report of TCP BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 75.05 Mbit/s) — Flow 1 egress (mean 72.48 Mbit/s)

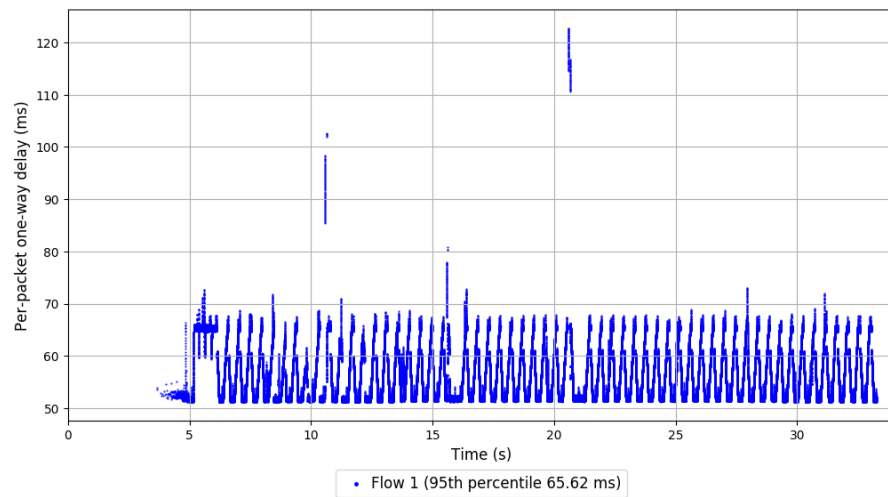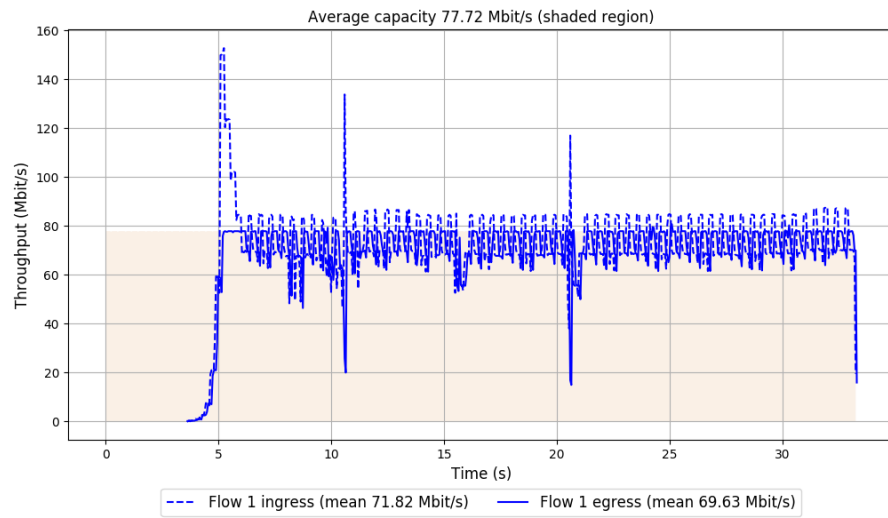Flow 1 (95th percentile 66.05 ms)

```
Run 1: Statistics of Eagle-v3

Start at: 2019-10-22 15:40:41
End at: 2019-10-22 15:41:11

# Below is generated by plot.py at 2019-10-22 15:58:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 69.63 Mbit/s (89.6% utilization)
95th percentile per-packet one-way delay: 65.622 ms
Loss rate: 3.28%
-- Flow 1:
Average throughput: 69.63 Mbit/s
95th percentile per-packet one-way delay: 65.622 ms
Loss rate: 3.28%
```

Run 1: Report of Eagle-v3 — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 71.82 Mbit/s) —— Flow 1 egress (mean 69.63 Mbit/s)

• Flow 1 (95th percentile 65.62 ms)

```
Run 2: Statistics of Eagle-v3

Start at: 2019-10-22 15:43:15
End at: 2019-10-22 15:43:45

# Below is generated by plot.py at 2019-10-22 15:58:19
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 70.79 Mbit/s (91.1% utilization)
95th percentile per-packet one-way delay: 65.736 ms
Loss rate: 4.55%
-- Flow 1:
Average throughput: 70.79 Mbit/s
95th percentile per-packet one-way delay: 65.736 ms
Loss rate: 4.55%
```
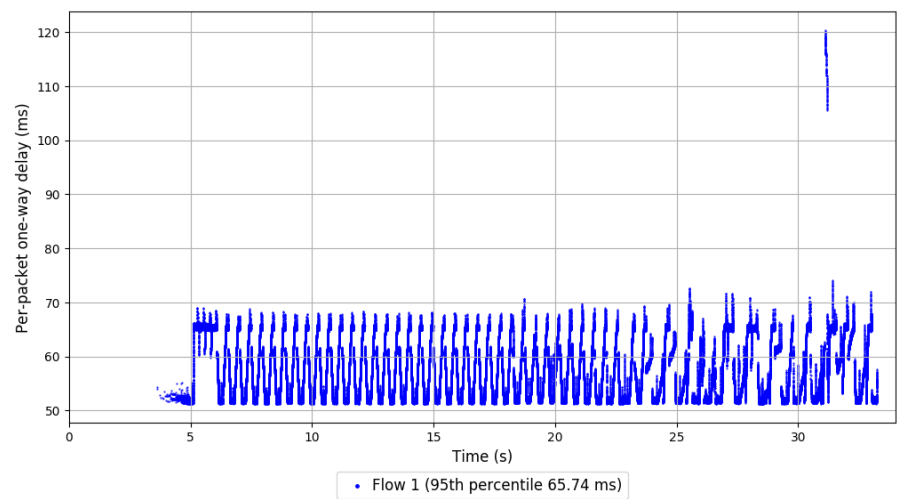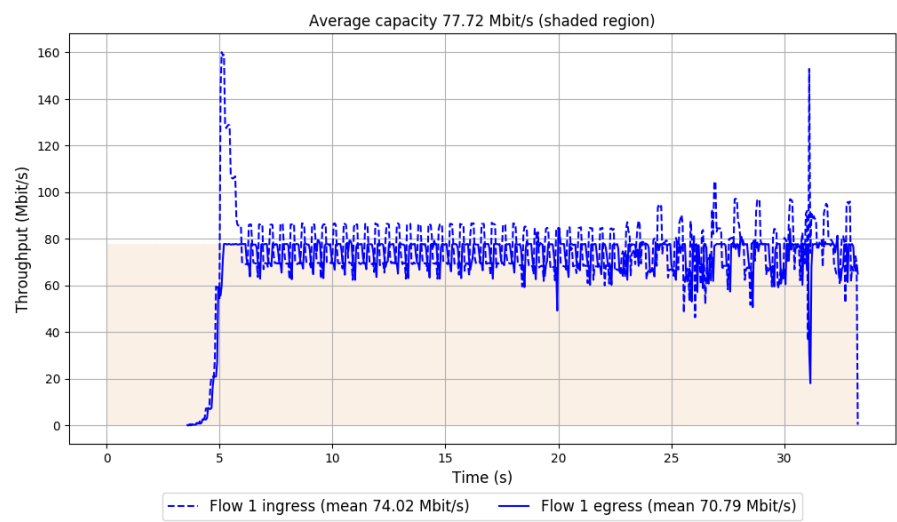
Run 2: Report of Eagle-v3 — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 74.02 Mbit/s) ——— Flow 1 egress (mean 70.79 Mbit/s)

· Flow 1 (95th percentile 65.74 ms)

```
Run 3: Statistics of Eagle-v3

Start at: 2019-10-22 15:45:49
End at: 2019-10-22 15:46:19


# Below is generated by plot.py at 2019-10-22 15:58:19
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 70.59 Mbit/s (90.8% utilization)
95th percentile per-packet one-way delay: 65.643 ms
Loss rate: 3.65%
-- Flow 1:
Average throughput: 70.59 Mbit/s
95th percentile per-packet one-way delay: 65.643 ms
Loss rate: 3.65%
```
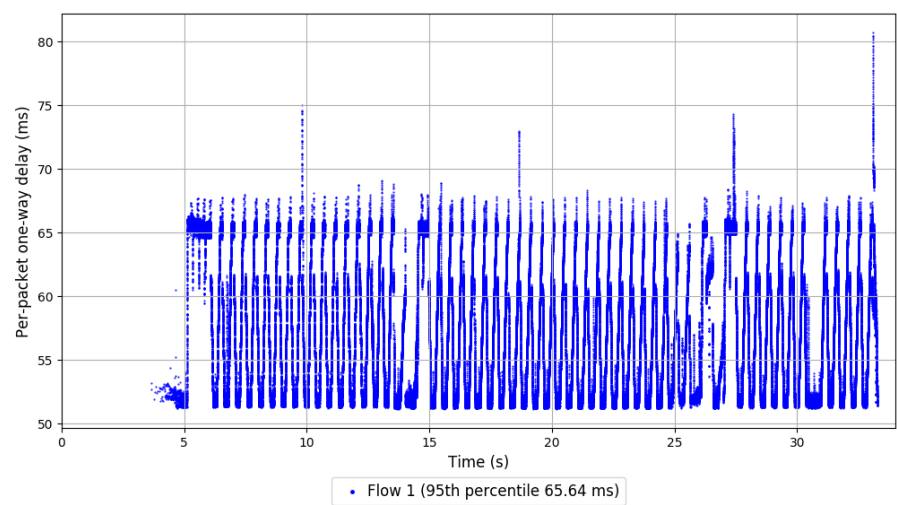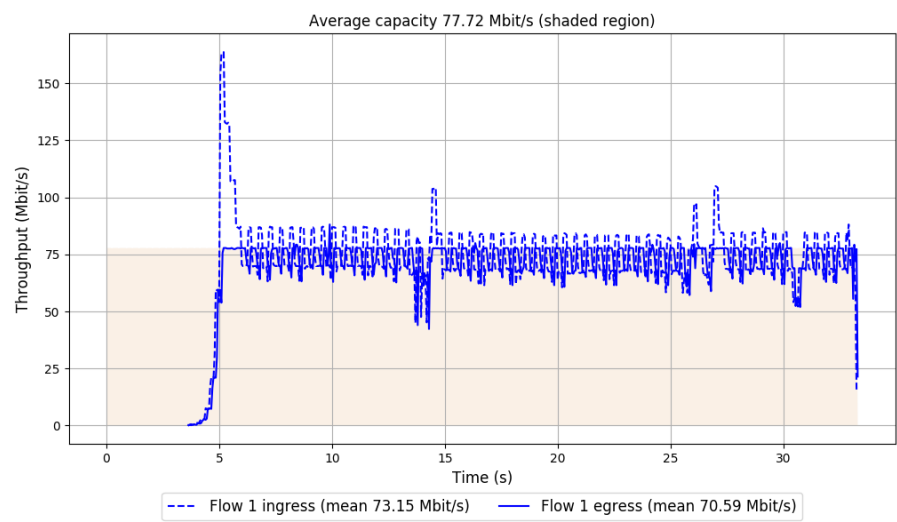
Run 3: Report of Eagle-v3 — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 73.15 Mbit/s)   Flow 1 egress (mean 70.59 Mbit/s)

Flow 1 (95th percentile 65.64 ms)

```
Run 4: Statistics of Eagle-v3

Start at: 2019-10-22 15:48:24
End at: 2019-10-22 15:48:54


# Below is generated by plot.py at 2019-10-22 15:58:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 70.55 Mbit/s (90.8% utilization)
95th percentile per-packet one-way delay: 65.636 ms
Loss rate: 3.47%
-- Flow 1:
Average throughput: 70.55 Mbit/s
95th percentile per-packet one-way delay: 65.636 ms
Loss rate: 3.47%
```
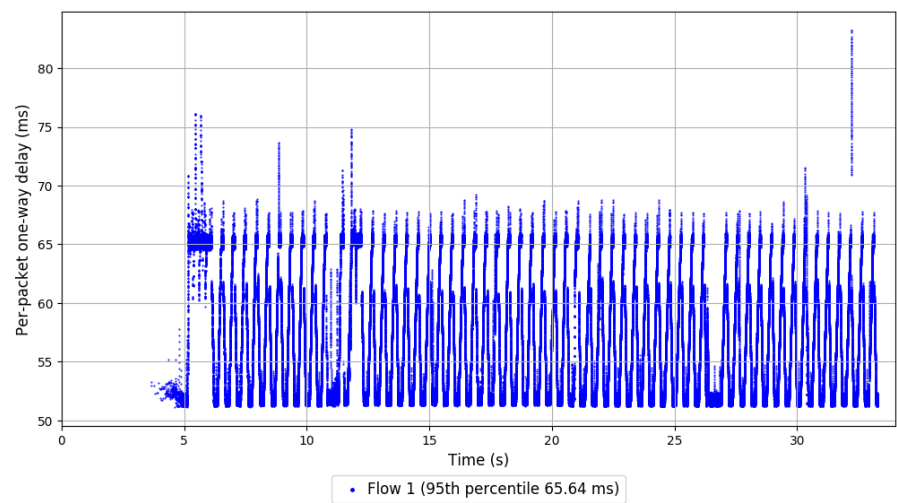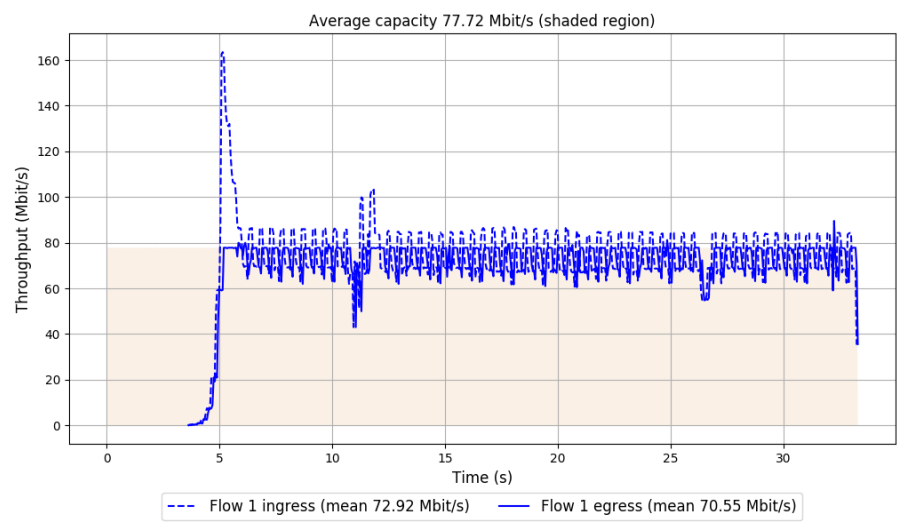
Run 4: Report of Eagle-v3 — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 72.92 Mbit/s) ----   Flow 1 egress (mean 70.55 Mbit/s) ——

• Flow 1 (95th percentile 65.64 ms)

```
Run 5: Statistics of Eagle-v3

Start at: 2019-10-22 15:50:58
End at: 2019-10-22 15:51:28


# Below is generated by plot.py at 2019-10-22 15:58:58
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 69.14 Mbit/s (89.0% utilization)
95th percentile per-packet one-way delay: 65.661 ms
Loss rate: 3.31%
-- Flow 1:
Average throughput: 69.14 Mbit/s
95th percentile per-packet one-way delay: 65.661 ms
Loss rate: 3.31%
```
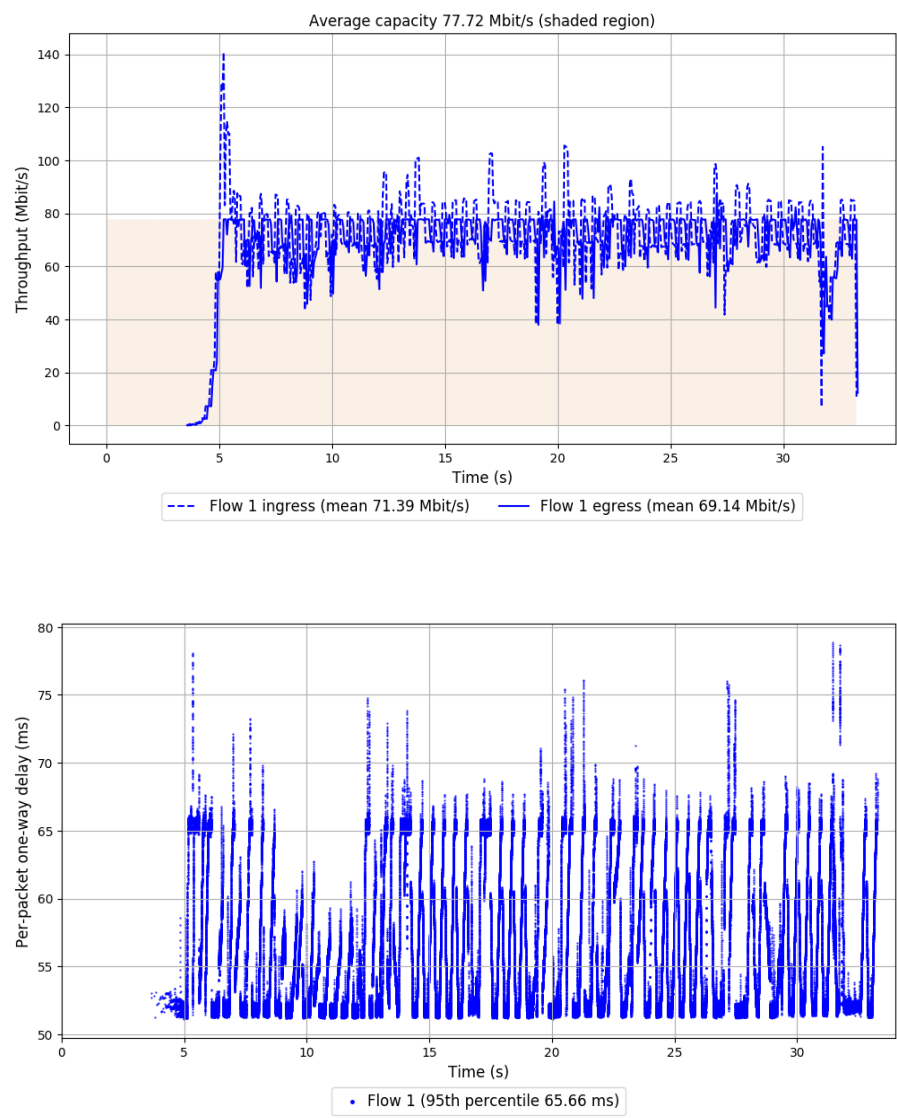
Run 5: Report of Eagle-v3 — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 71.39 Mbit/s)   Flow 1 egress (mean 69.14 Mbit/s)

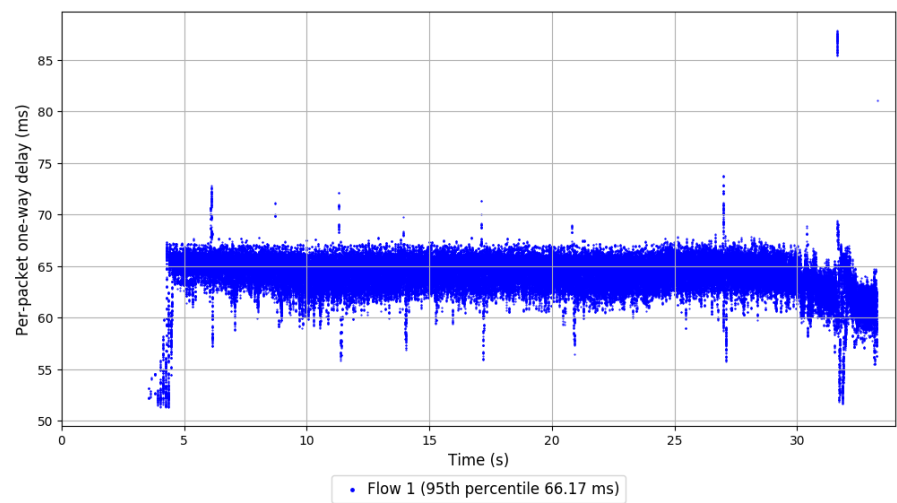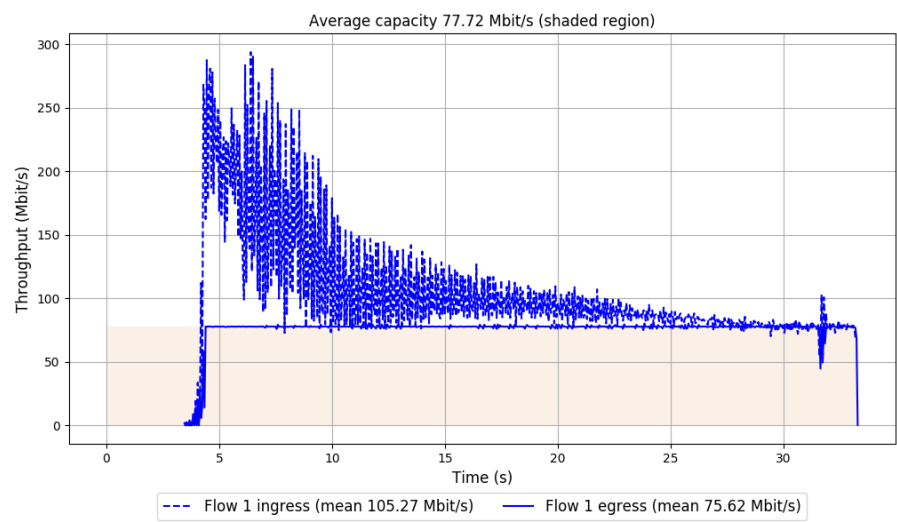Flow 1 (95th percentile 65.66 ms)

```
Run 1: Statistics of Indigo

Start at: 2019-10-22 15:42:36
End at: 2019-10-22 15:43:06

# Below is generated by plot.py at 2019-10-22 15:59:00
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 75.62 Mbit/s (97.3% utilization)
95th percentile per-packet one-way delay: 66.171 ms
Loss rate: 28.25%
-- Flow 1:
Average throughput: 75.62 Mbit/s
95th percentile per-packet one-way delay: 66.171 ms
Loss rate: 28.25%
```

Run 1: Report of Indigo — Data Link

Average capacity 77.72 Mbit/s (shaded region)

- - - Flow 1 ingress (mean 105.27 Mbit/s) —— Flow 1 egress (mean 75.62 Mbit/s)

• Flow 1 (95th percentile 66.17 ms)

```
Run 2: Statistics of Indigo

Start at: 2019-10-22 15:45:11
End at: 2019-10-22 15:45:41


# Below is generated by plot.py at 2019-10-22 15:59:00
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 74.89 Mbit/s (96.4% utilization)
95th percentile per-packet one-way delay: 65.795 ms
Loss rate: 10.11%
-- Flow 1:
Average throughput: 74.89 Mbit/s
95th percentile per-packet one-way delay: 65.795 ms
Loss rate: 10.11%
```
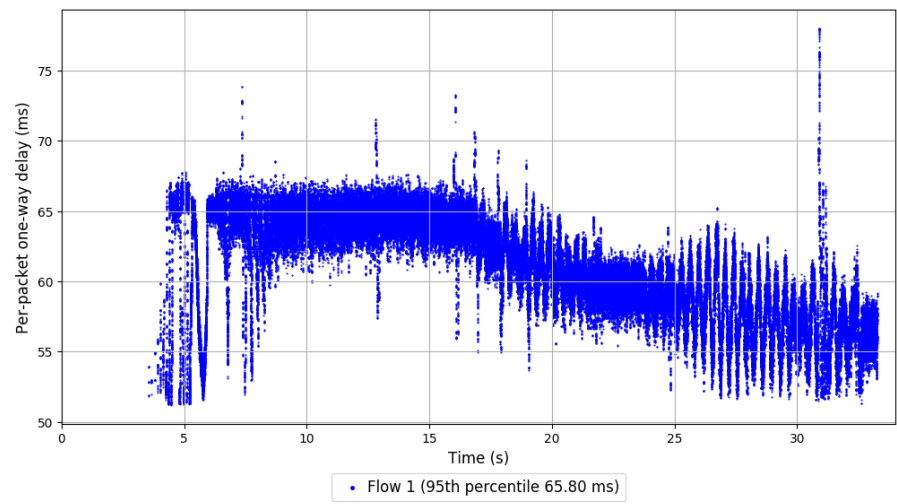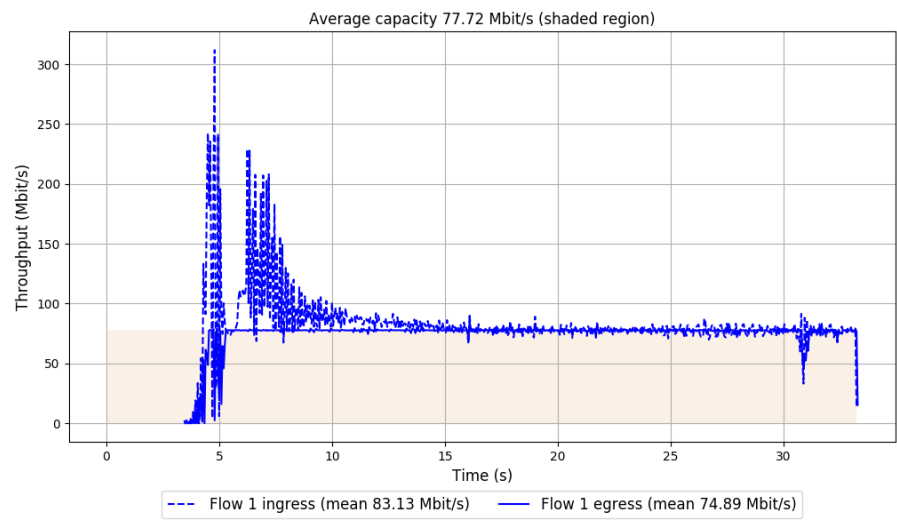
Run 2: Report of Indigo — Data Link

Average capacity 77.72 Mbit/s (shaded region)

--- Flow 1 ingress (mean 83.13 Mbit/s) —— Flow 1 egress (mean 74.89 Mbit/s)

• Flow 1 (95th percentile 65.80 ms)

```
Run 3: Statistics of Indigo

Start at: 2019-10-22 15:47:44
End at: 2019-10-22 15:48:14

# Below is generated by plot.py at 2019-10-22 15:59:50
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 75.64 Mbit/s (97.3% utilization)
95th percentile per-packet one-way delay: 66.369 ms
Loss rate: 43.82%
-- Flow 1:
Average throughput: 75.64 Mbit/s
95th percentile per-packet one-way delay: 66.369 ms
Loss rate: 43.82%
```
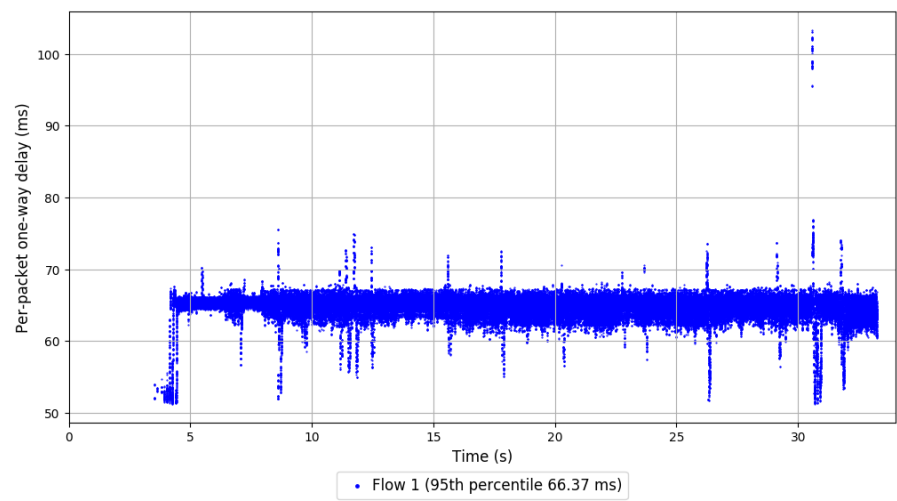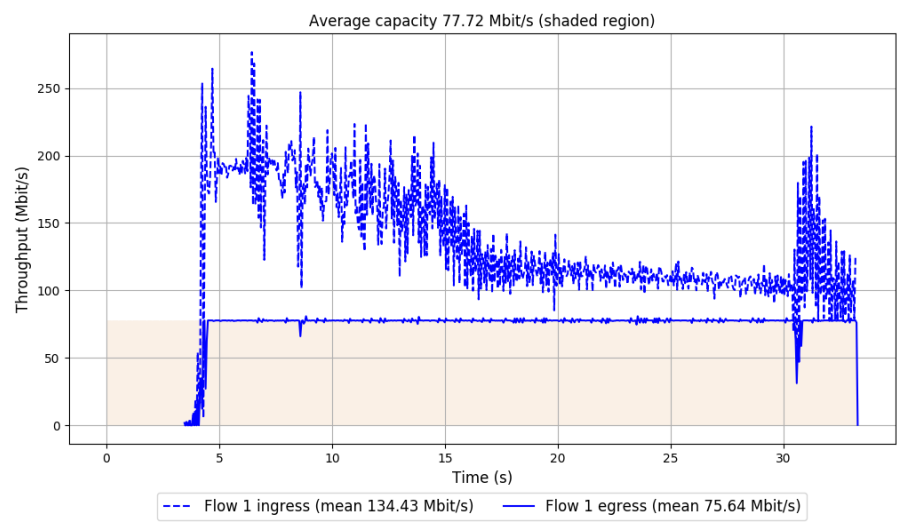
Run 3: Report of Indigo — Data Link

Average capacity 77.72 Mbit/s (shaded region)

--- Flow 1 ingress (mean 134.43 Mbit/s)   —— Flow 1 egress (mean 75.64 Mbit/s)

• Flow 1 (95th percentile 66.37 ms)

```
Run 4: Statistics of Indigo

Start at: 2019-10-22 15:50:19
End at: 2019-10-22 15:50:49

# Below is generated by plot.py at 2019-10-22 15:59:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 75.68 Mbit/s (97.4% utilization)
95th percentile per-packet one-way delay: 66.381 ms
Loss rate: 50.98%
-- Flow 1:
Average throughput: 75.68 Mbit/s
95th percentile per-packet one-way delay: 66.381 ms
Loss rate: 50.98%
```
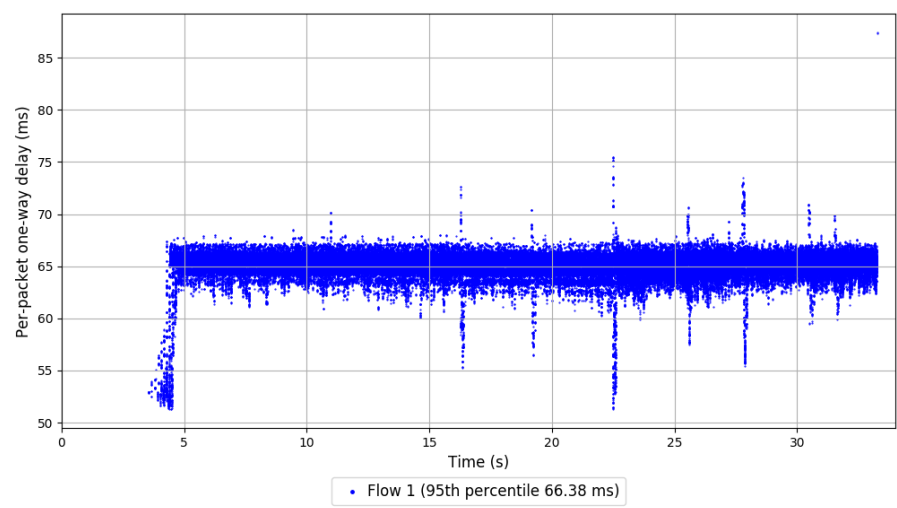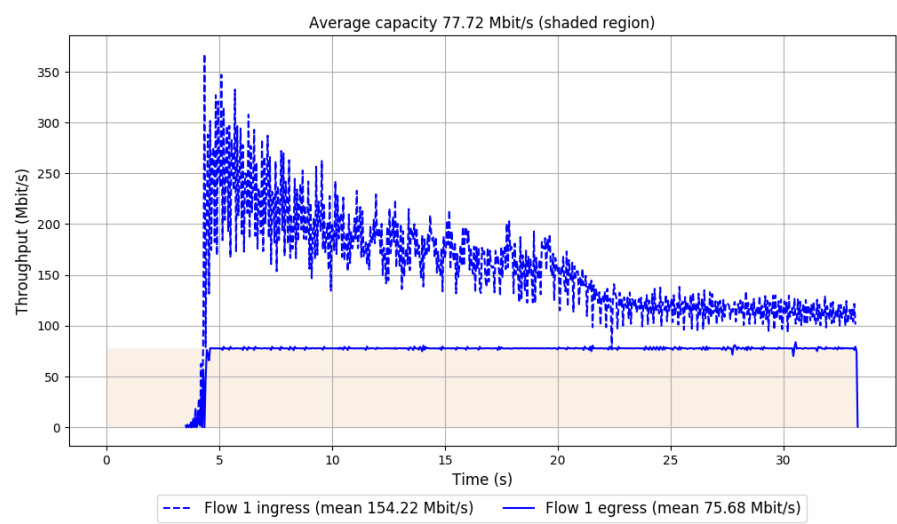
Run 4: Report of Indigo — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 154.22 Mbit/s) — Flow 1 egress (mean 75.68 Mbit/s)

Flow 1 (95th percentile 66.38 ms)

```
Run 5: Statistics of Indigo

Start at: 2019-10-22 15:52:53
End at: 2019-10-22 15:53:23

# Below is generated by plot.py at 2019-10-22 15:59:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 74.52 Mbit/s (95.9% utilization)
95th percentile per-packet one-way delay: 62.252 ms
Loss rate: 2.05%
-- Flow 1:
Average throughput: 74.52 Mbit/s
95th percentile per-packet one-way delay: 62.252 ms
Loss rate: 2.05%
```
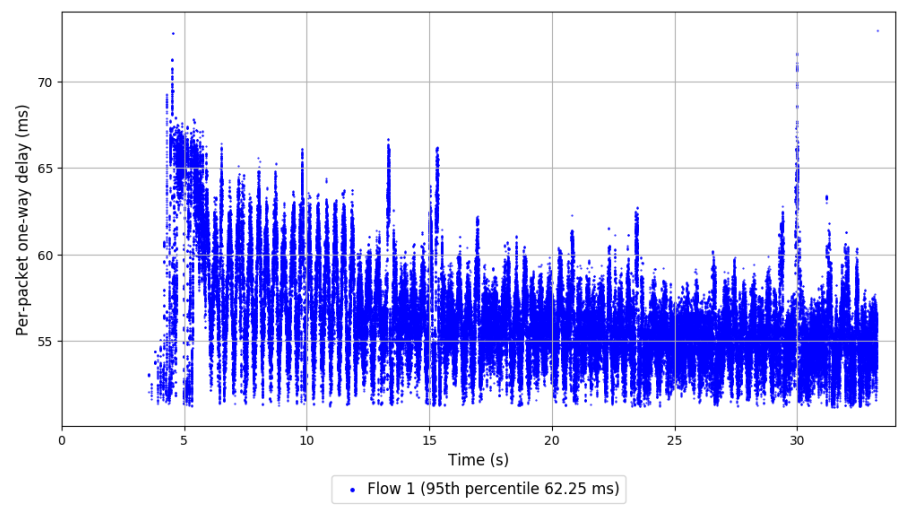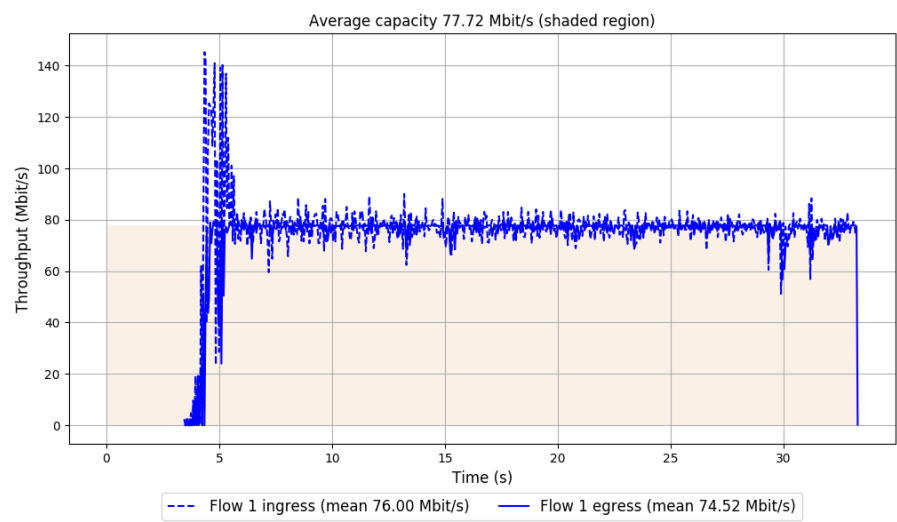
Run 5: Report of Indigo — Data Link

Average capacity 77.72 Mbit/s (shaded region)

--- Flow 1 ingress (mean 76.00 Mbit/s)   —— Flow 1 egress (mean 74.52 Mbit/s)

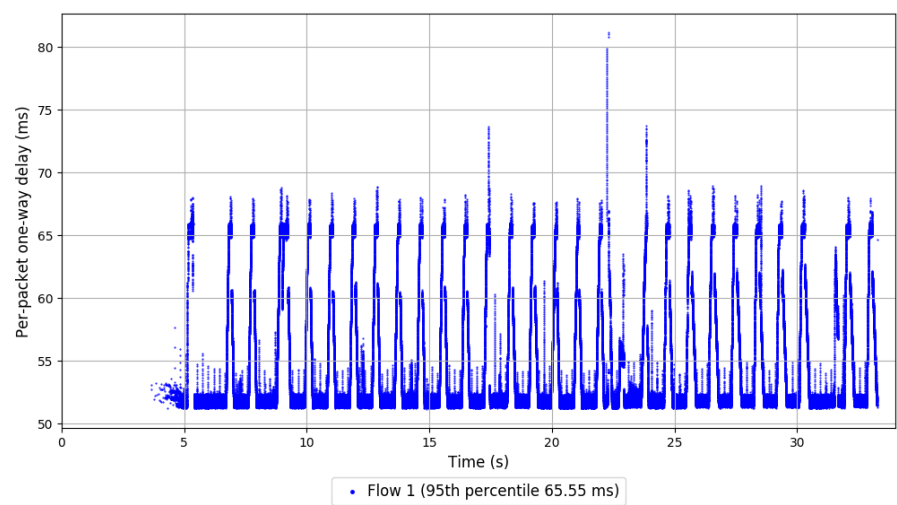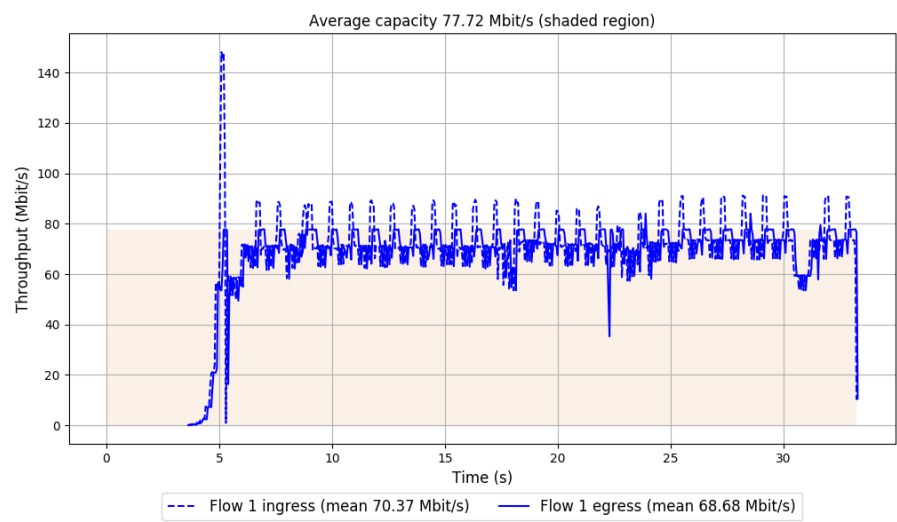

• Flow 1 (95th percentile 62.25 ms)

```
Run 1: Statistics of Synthesized-BBR

Start at: 2019-10-22 15:41:19
End at: 2019-10-22 15:41:49

# Below is generated by plot.py at 2019-10-22 15:59:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 68.68 Mbit/s (88.4% utilization)
95th percentile per-packet one-way delay: 65.554 ms
Loss rate: 2.53%
-- Flow 1:
Average throughput: 68.68 Mbit/s
95th percentile per-packet one-way delay: 65.554 ms
Loss rate: 2.53%
```

Run 1: Report of Synthesized-BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

--- Flow 1 ingress (mean 70.37 Mbit/s) —— Flow 1 egress (mean 68.68 Mbit/s)

• Flow 1 (95th percentile 65.55 ms)

```
Run 2: Statistics of Synthesized-BBR

Start at: 2019-10-22 15:43:54
End at: 2019-10-22 15:44:24

# Below is generated by plot.py at 2019-10-22 16:00:28
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 68.55 Mbit/s (88.2% utilization)
95th percentile per-packet one-way delay: 65.603 ms
Loss rate: 2.44%
-- Flow 1:
Average throughput: 68.55 Mbit/s
95th percentile per-packet one-way delay: 65.603 ms
Loss rate: 2.44%
```
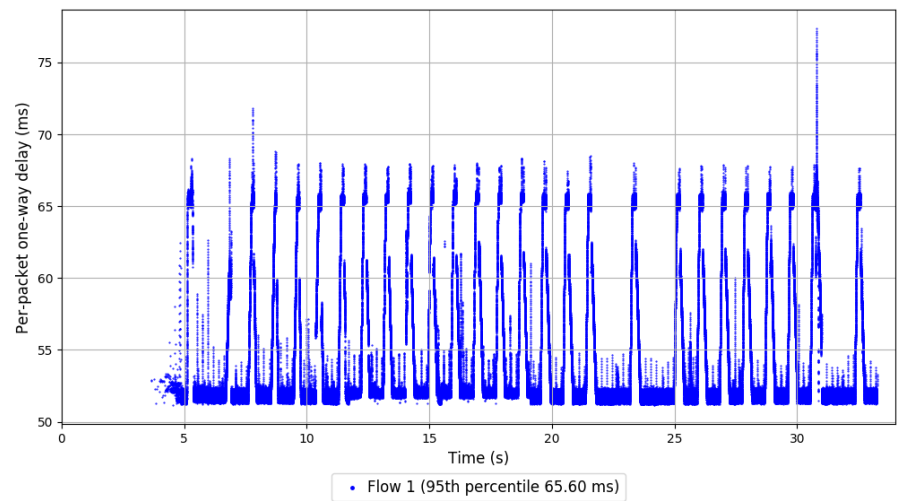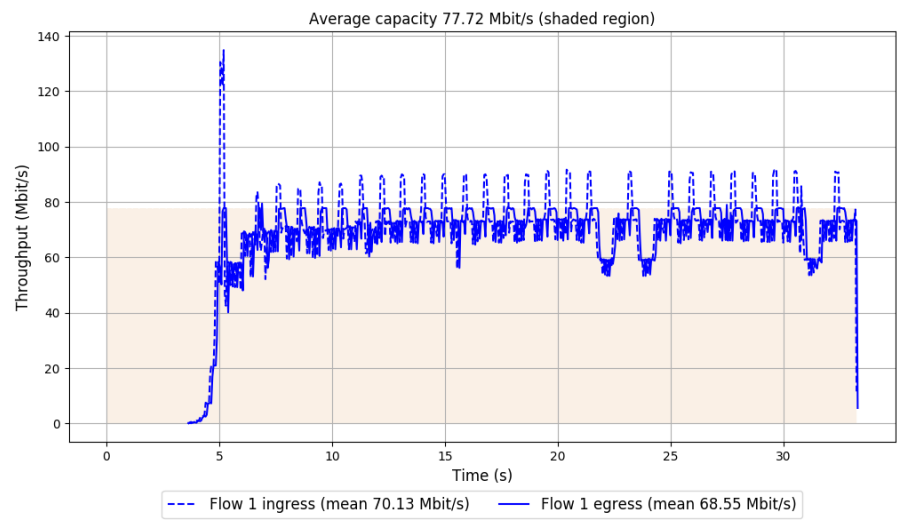
Run 2: Report of Synthesized-BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

--- Flow 1 ingress (mean 70.13 Mbit/s) —— Flow 1 egress (mean 68.55 Mbit/s)

• Flow 1 (95th percentile 65.60 ms)

```
Run 3: Statistics of Synthesized-BBR

Start at: 2019-10-22 15:46:28
End at: 2019-10-22 15:46:58

# Below is generated by plot.py at 2019-10-22 16:00:28
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 68.86 Mbit/s (88.6% utilization)
95th percentile per-packet one-way delay: 65.652 ms
Loss rate: 2.73%
-- Flow 1:
Average throughput: 68.86 Mbit/s
95th percentile per-packet one-way delay: 65.652 ms
Loss rate: 2.73%
```
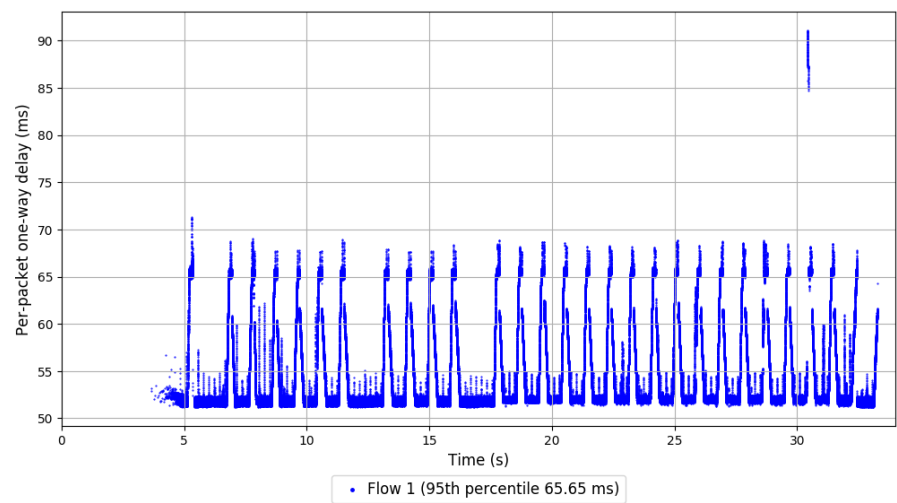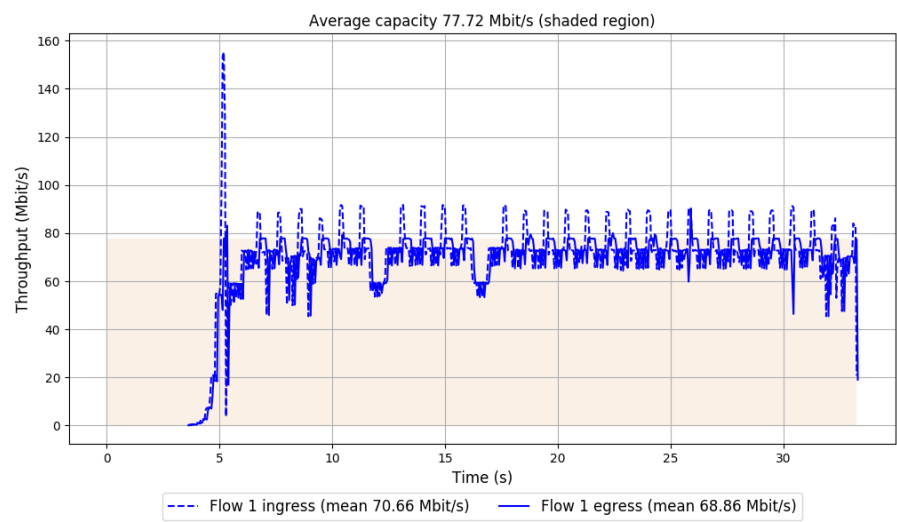
Run 3: Report of Synthesized-BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

- - - Flow 1 ingress (mean 70.66 Mbit/s) —— Flow 1 egress (mean 68.86 Mbit/s)

• Flow 1 (95th percentile 65.65 ms)

```
Run 4: Statistics of Synthesized-BBR

Start at: 2019-10-22 15:49:02
End at: 2019-10-22 15:49:32

# Below is generated by plot.py at 2019-10-22 16:00:28
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 67.22 Mbit/s (86.5% utilization)
95th percentile per-packet one-way delay: 65.502 ms
Loss rate: 2.22%
-- Flow 1:
Average throughput: 67.22 Mbit/s
95th percentile per-packet one-way delay: 65.502 ms
Loss rate: 2.22%
```
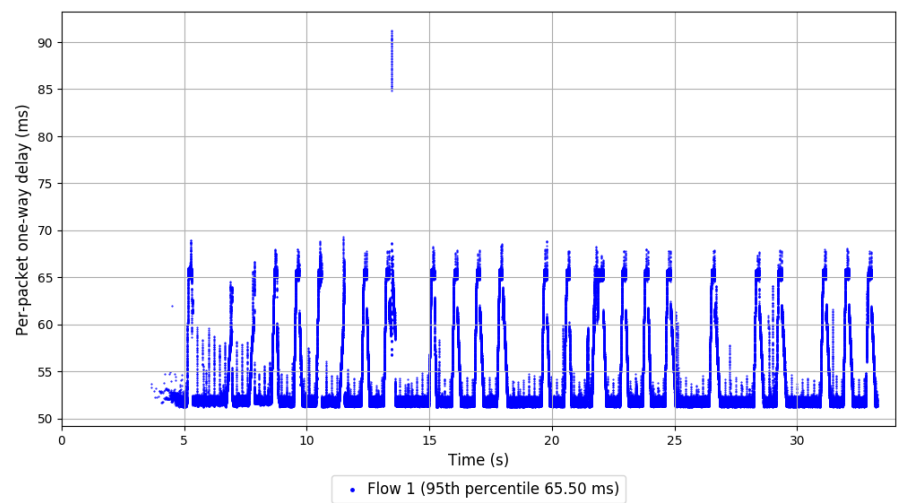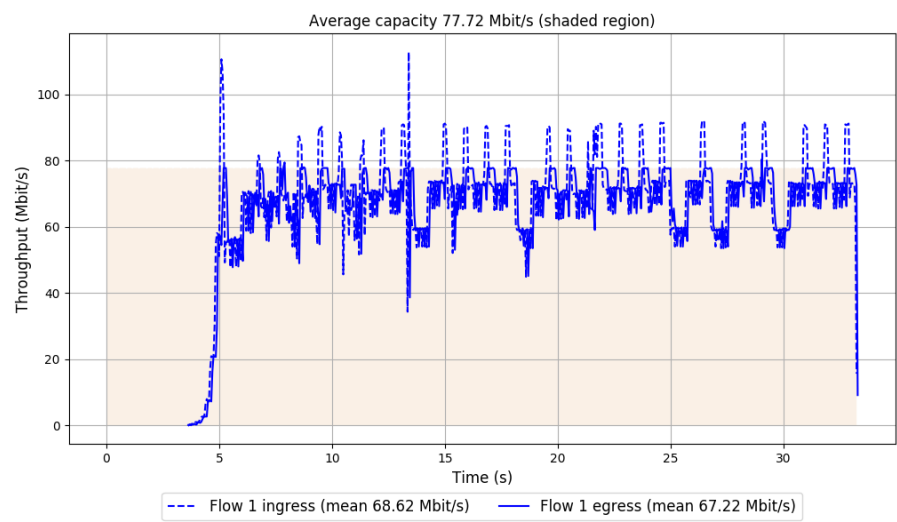
Run 4: Report of Synthesized-BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

- - - Flow 1 ingress (mean 68.62 Mbit/s) ——— Flow 1 egress (mean 67.22 Mbit/s)

• Flow 1 (95th percentile 65.50 ms)

```
Run 5: Statistics of Synthesized-BBR

Start at: 2019-10-22 15:51:37
End at: 2019-10-22 15:52:07

# Below is generated by plot.py at 2019-10-22 16:00:30
# Datalink statistics
-- Total of 1 flow:
Average capacity: 77.72 Mbit/s
Average throughput: 68.45 Mbit/s (88.1% utilization)
95th percentile per-packet one-way delay: 65.456 ms
Loss rate: 2.07%
-- Flow 1:
Average throughput: 68.45 Mbit/s
95th percentile per-packet one-way delay: 65.456 ms
Loss rate: 2.07%
```

Run 5: Report of Synthesized-BBR — Data Link

Average capacity 77.72 Mbit/s (shaded region)

Flow 1 ingress (mean 69.80 Mbit/s)   Flow 1 egress (mean 68.45 Mbit/s)

Flow 1 (95th percentile 65.46 ms)