

Pantheon Report

Generated at 2019-07-04 16:33:36 (UTC).

Tested in mahimahi: mm-link 100mbps.trace 100mbps.trace

Repeated the test of 19 congestion control schemes once.

Each test lasted for 60 seconds running 1 flow.

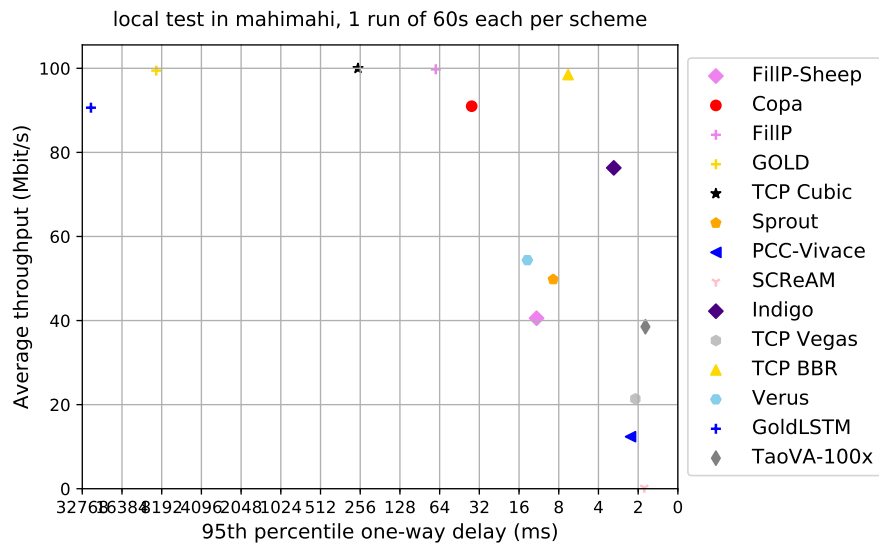
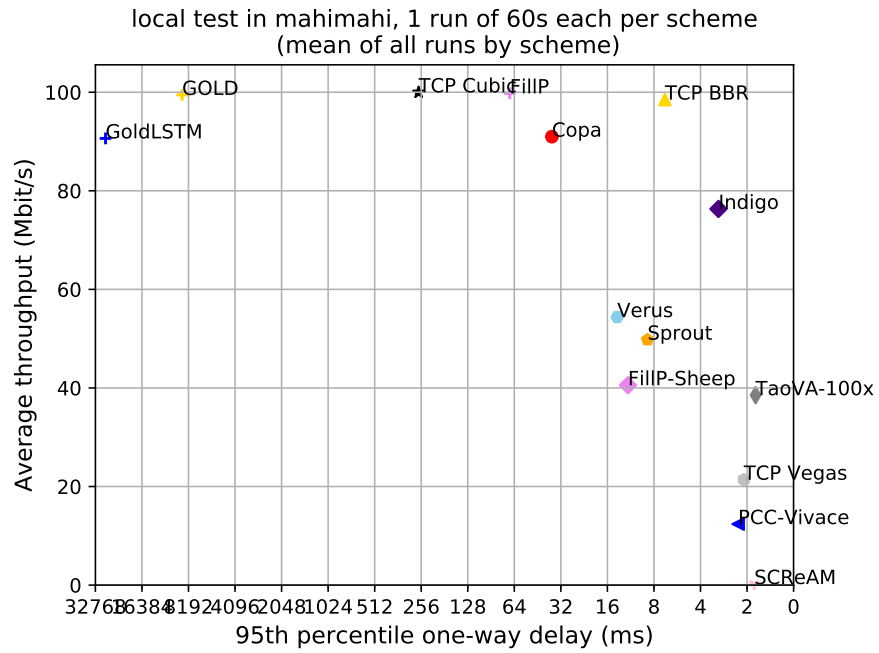
System info:

```
Linux 4.15.0-54-generic
net.core.default_qdisc = fq_codel
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 @ 0f268e696e147c77c8b24b35b04cd2ccab6c9fe2
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
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 @ 48278d12dd5c310d9876b568565b3e79d402d177
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ f866d3f58d27afd942717625ee3a354cc2e802bd
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
third_party/pcc-experimental @ cd43e34e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdb2
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
```



scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
TCP BBR	1	98.50	6.79	0.01
Copa	1	90.98	36.58	0.19
TCP Cubic	1	99.97	266.11	0.44
FillP	1	99.77	68.43	0.12
FillP-Sheep	1	40.55	11.78	0.00
GOLD	1	99.45	9007.51	12.82
GoldLSTM	1	90.63	28170.29	46.45
Indigo	1	76.32	3.06	0.00
LEDBAT	0	N/A	N/A	N/A
PCC-Allegro	0	N/A	N/A	N/A
PCC-Expr	0	N/A	N/A	N/A
QUIC Cubic	0	N/A	N/A	N/A
SCReAM	1	0.22	1.69	0.00
Sprout	1	49.79	8.81	0.00
TaoVA-100x	1	38.53	1.63	0.00
TCP Vegas	1	21.37	2.10	0.00
Verus	1	54.37	13.84	0.01
PCC-Vivace	1	12.38	2.29	0.14
WebRTC media	0	N/A	N/A	N/A

Run 1: Statistics of TCP BBR

Start at: 2019-07-04 16:17:33

End at: 2019-07-04 16:18:33

Below is generated by plot.py at 2019-07-04 16:30:48

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 98.50 Mbit/s (98.5% utilization)

95th percentile per-packet one-way delay: 6.792 ms

Loss rate: 0.01%

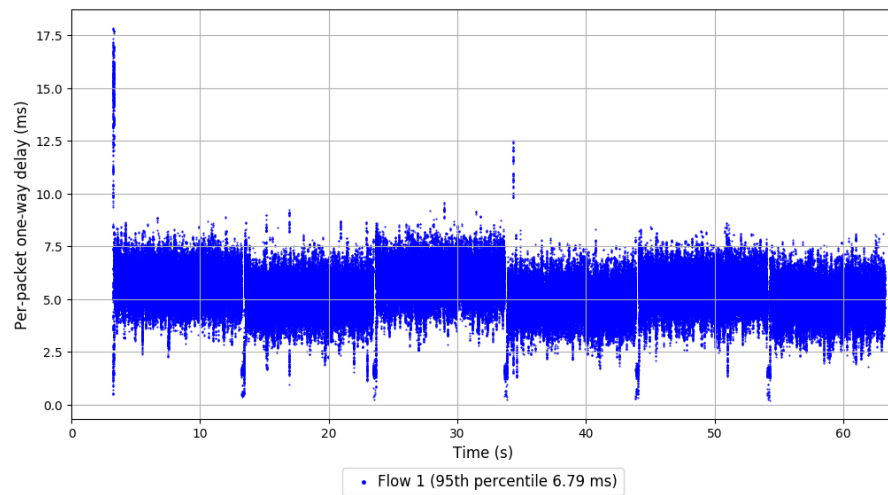
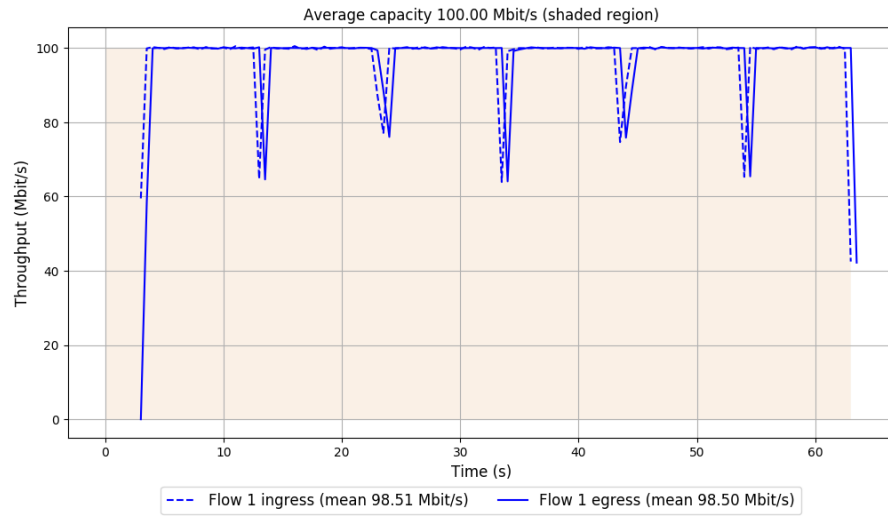
-- Flow 1:

Average throughput: 98.50 Mbit/s

95th percentile per-packet one-way delay: 6.792 ms

Loss rate: 0.01%

Run 1: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2019-07-04 16:07:49

End at: 2019-07-04 16:08:49

Below is generated by plot.py at 2019-07-04 16:31:33

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 90.98 Mbit/s (91.0% utilization)

95th percentile per-packet one-way delay: 36.577 ms

Loss rate: 0.19%

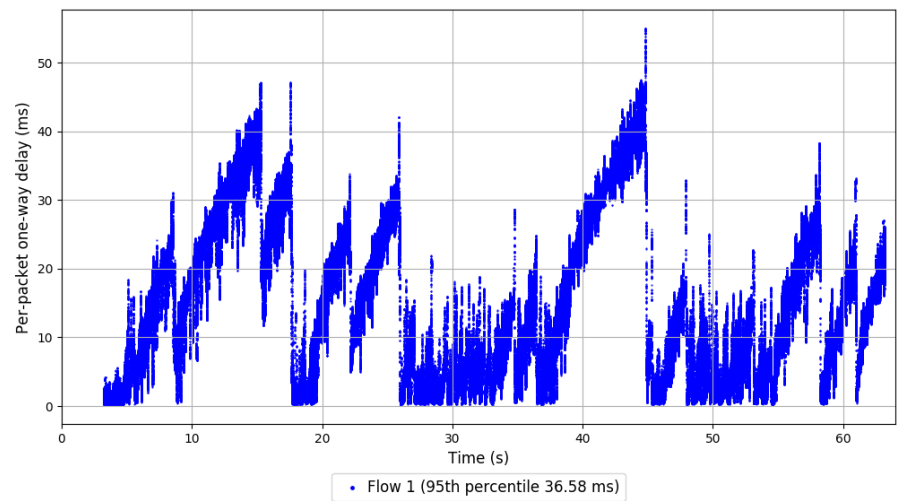
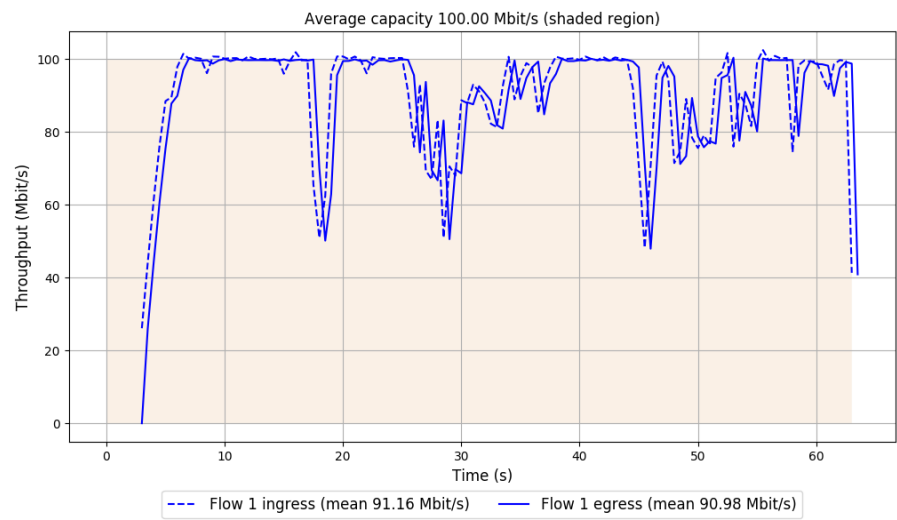
-- Flow 1:

Average throughput: 90.98 Mbit/s

95th percentile per-packet one-way delay: 36.577 ms

Loss rate: 0.19%

Run 1: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2019-07-04 16:12:54

End at: 2019-07-04 16:13:54

Below is generated by plot.py at 2019-07-04 16:31:33

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 99.97 Mbit/s (100.0% utilization)

95th percentile per-packet one-way delay: 266.114 ms

Loss rate: 0.44%

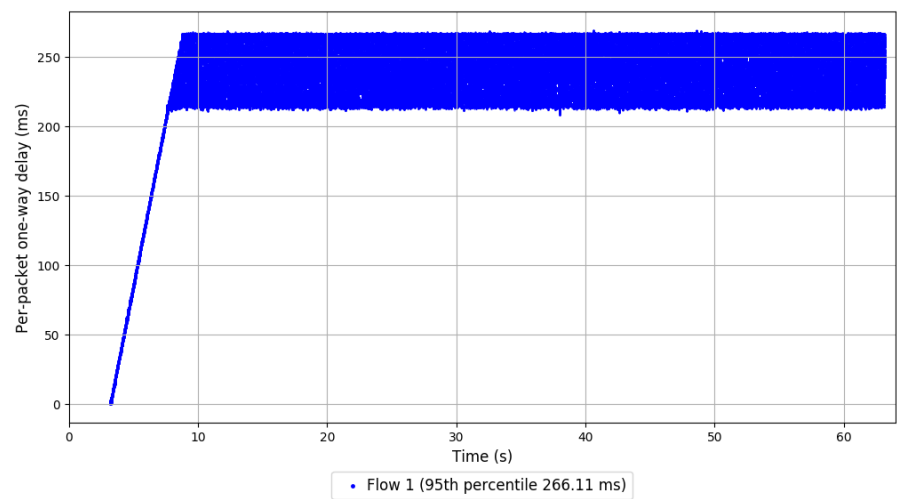
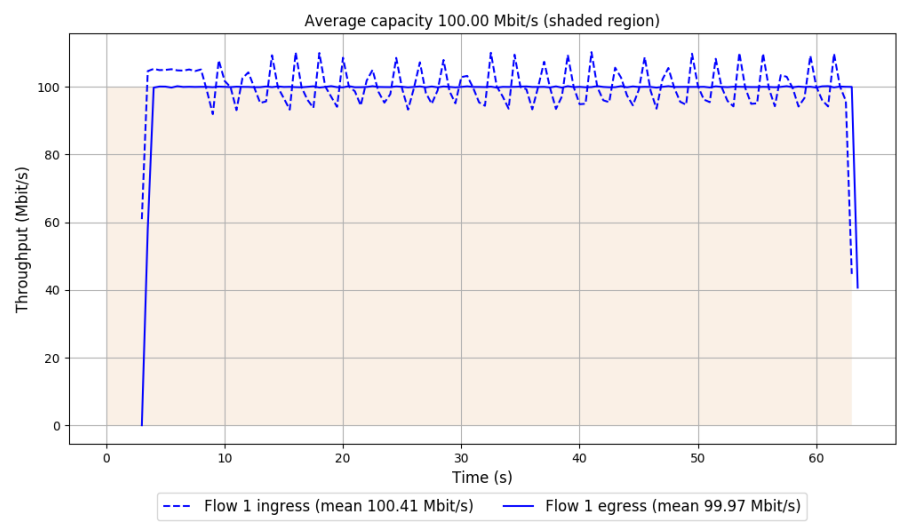
-- Flow 1:

Average throughput: 99.97 Mbit/s

95th percentile per-packet one-way delay: 266.114 ms

Loss rate: 0.44%

Run 1: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

Start at: 2019-07-04 16:21:19

End at: 2019-07-04 16:22:19

Below is generated by plot.py at 2019-07-04 16:31:33

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 99.77 Mbit/s (99.8% utilization)

95th percentile per-packet one-way delay: 68.432 ms

Loss rate: 0.12%

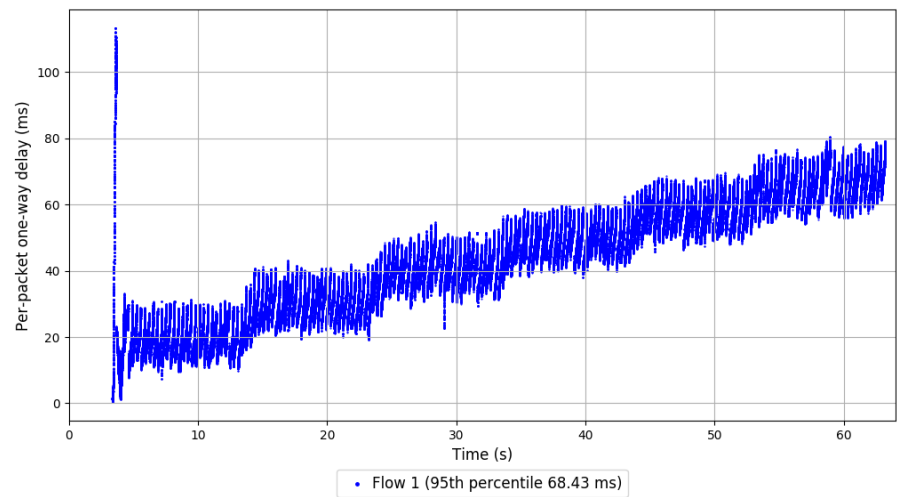
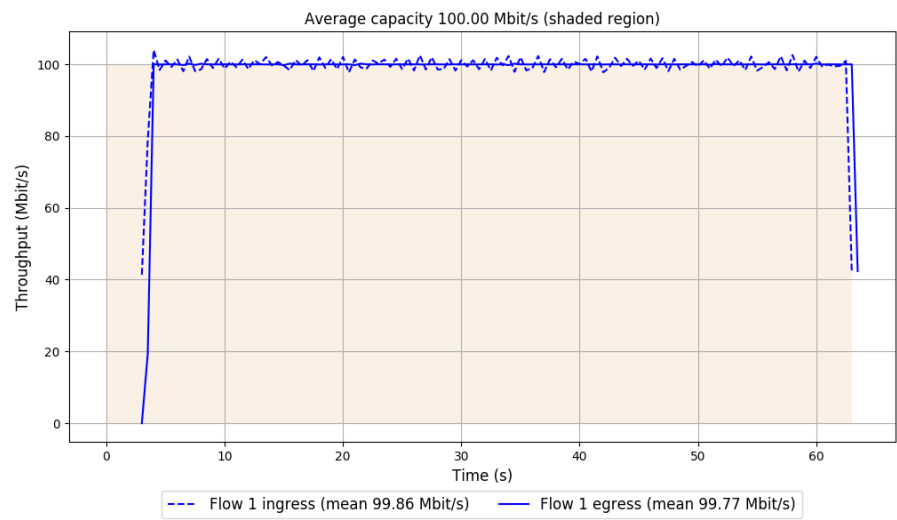
-- Flow 1:

Average throughput: 99.77 Mbit/s

95th percentile per-packet one-way delay: 68.432 ms

Loss rate: 0.12%

Run 1: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-07-04 16:06:40

End at: 2019-07-04 16:07:40

Below is generated by plot.py at 2019-07-04 16:31:41

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 40.55 Mbit/s (40.6% utilization)

95th percentile per-packet one-way delay: 11.783 ms

Loss rate: 0.00%

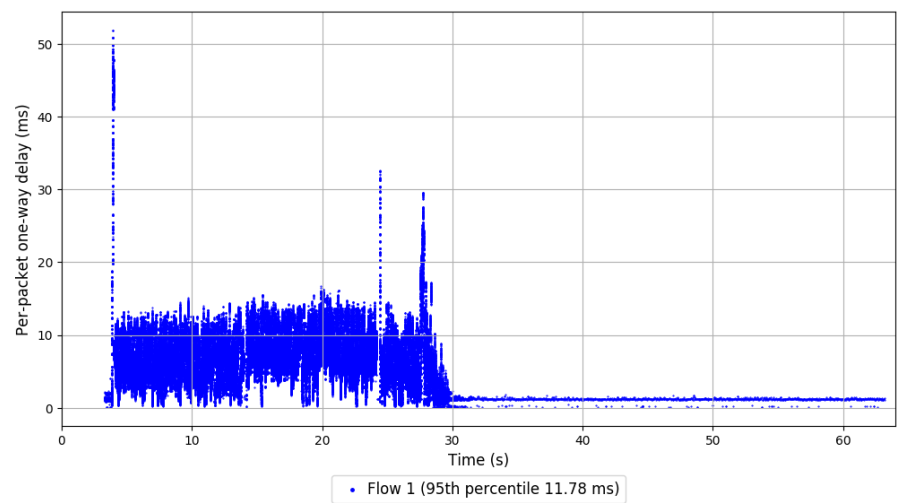
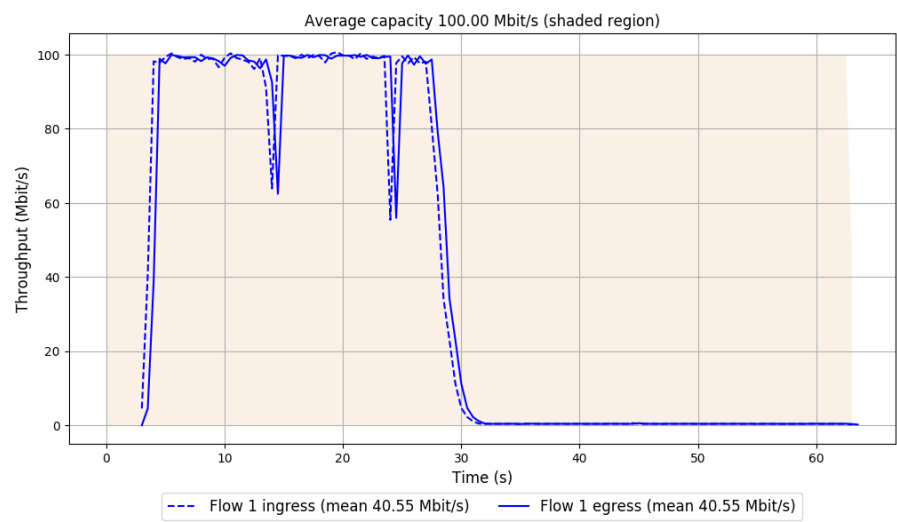
-- Flow 1:

Average throughput: 40.55 Mbit/s

95th percentile per-packet one-way delay: 11.783 ms

Loss rate: 0.00%

Run 1: Report of FillP-Sheep — Data Link



Run 1: Statistics of GOLD

Start at: 2019-07-04 16:11:36

End at: 2019-07-04 16:12:36

Below is generated by plot.py at 2019-07-04 16:32:17

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 99.45 Mbit/s (99.4% utilization)

95th percentile per-packet one-way delay: 9007.510 ms

Loss rate: 12.82%

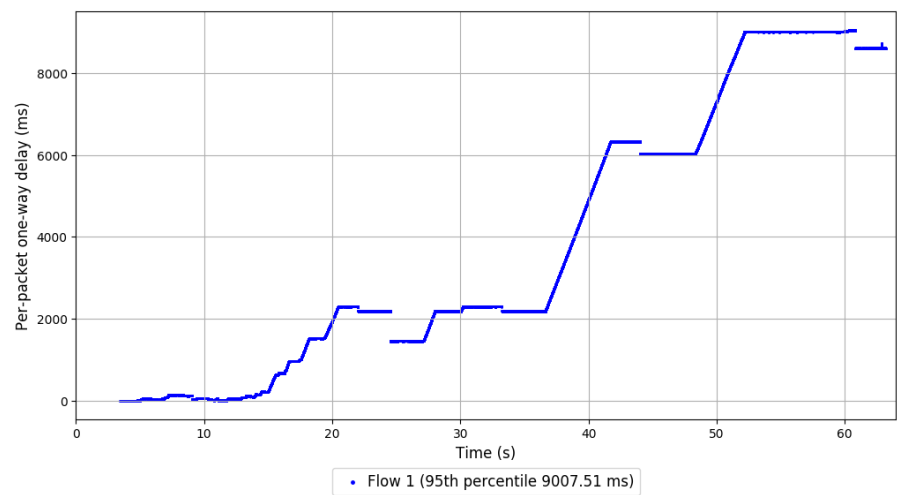
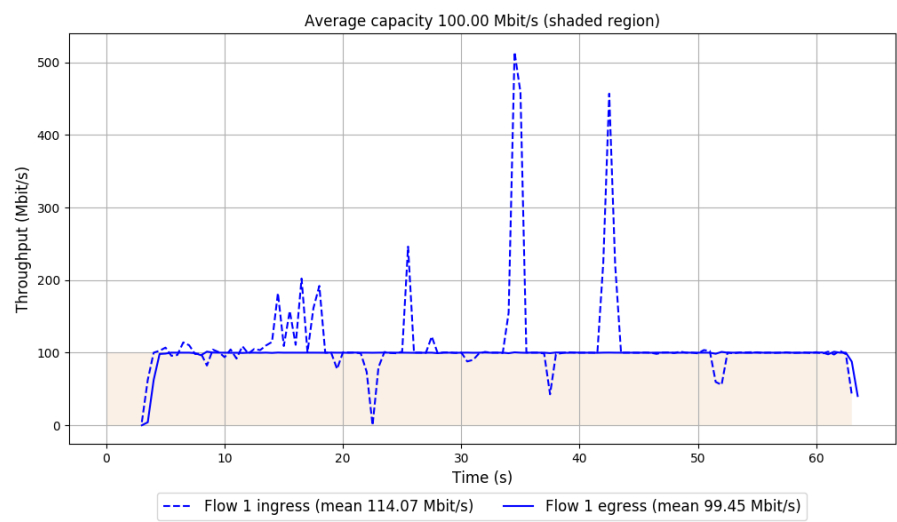
-- Flow 1:

Average throughput: 99.45 Mbit/s

95th percentile per-packet one-way delay: 9007.510 ms

Loss rate: 12.82%

Run 1: Report of GOLD — Data Link



Run 1: Statistics of GoldLSTM

Start at: 2019-07-04 16:18:48

End at: 2019-07-04 16:19:48

Below is generated by plot.py at 2019-07-04 16:32:41

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 90.63 Mbit/s (90.6% utilization)

95th percentile per-packet one-way delay: 28170.289 ms

Loss rate: 46.45%

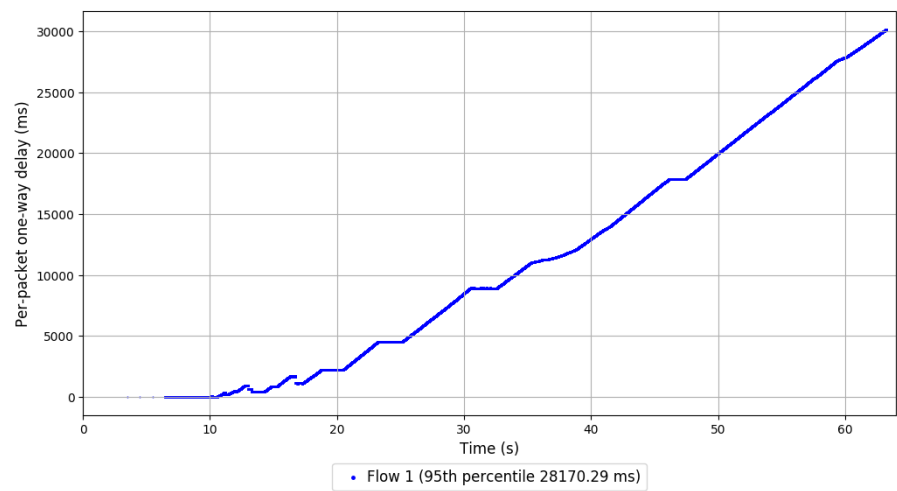
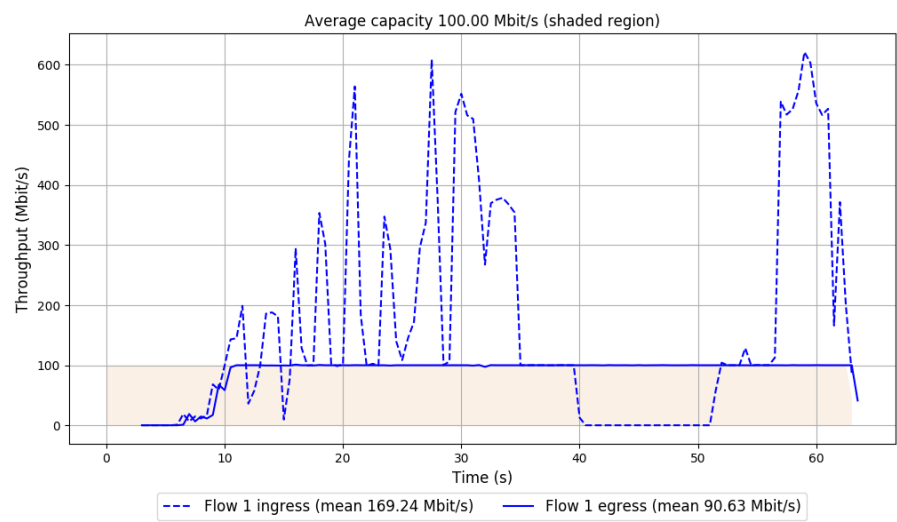
-- Flow 1:

Average throughput: 90.63 Mbit/s

95th percentile per-packet one-way delay: 28170.289 ms

Loss rate: 46.45%

Run 1: Report of GoldLSTM — Data Link



Run 1: Statistics of Indigo

Start at: 2019-07-04 16:09:10

End at: 2019-07-04 16:10:10

Below is generated by plot.py at 2019-07-04 16:32:45

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 76.32 Mbit/s (76.3% utilization)

95th percentile per-packet one-way delay: 3.061 ms

Loss rate: 0.00%

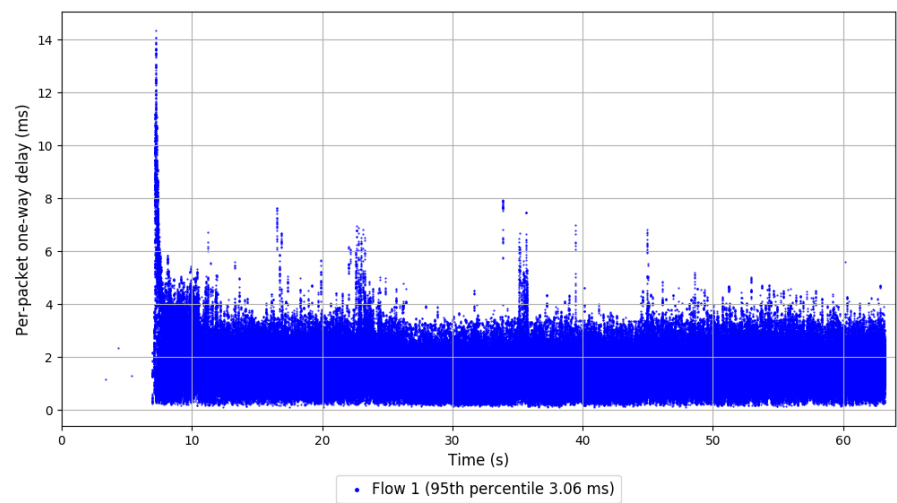
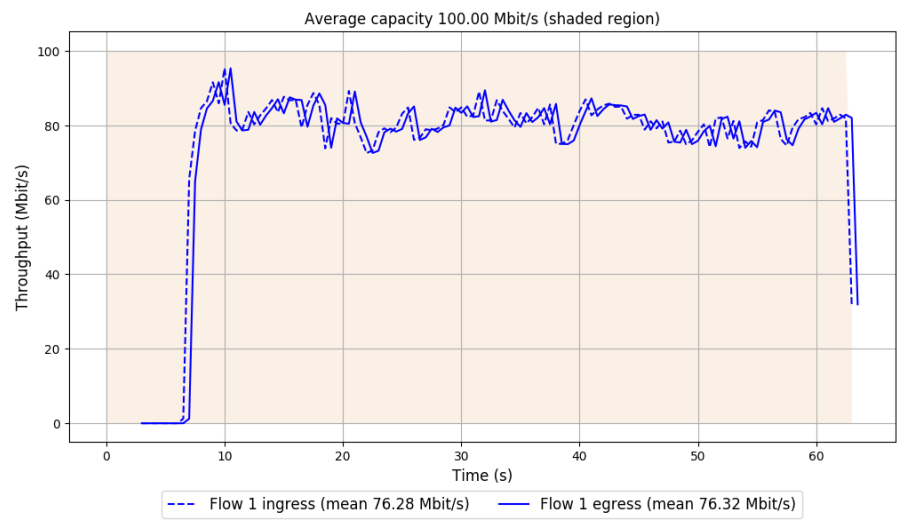
-- Flow 1:

Average throughput: 76.32 Mbit/s

95th percentile per-packet one-way delay: 3.061 ms

Loss rate: 0.00%

Run 1: Report of Indigo — Data Link



Run 1: Statistics of LEDBAT

Start at: 2019-07-04 16:26:51

End at: 2019-07-04 16:27:51

Run 1: Report of LEDBAT — Data Link

Figure is missing

Figure is missing

Run 1: Statistics of PCC-Allegro

Start at: 2019-07-04 16:24:42

End at: 2019-07-04 16:25:42

Run 1: Report of PCC-Allegro — Data Link

Figure is missing

Figure is missing

Run 1: Statistics of PCC-Expr

Start at: 2019-07-04 16:27:55

End at: 2019-07-04 16:28:55

Run 1: Report of PCC-Expr — Data Link

Figure is missing

Figure is missing

Run 1: Statistics of QUIC Cubic

Start at: 2019-07-04 16:23:38

End at: 2019-07-04 16:24:38

Run 1: Report of QUIC Cubic — Data Link

Figure is missing

Figure is missing

Run 1: Statistics of SCReAM

Start at: 2019-07-04 16:22:32

End at: 2019-07-04 16:23:32

Below is generated by plot.py at 2019-07-04 16:32:45

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 0.22 Mbit/s (0.2% utilization)

95th percentile per-packet one-way delay: 1.692 ms

Loss rate: 0.00%

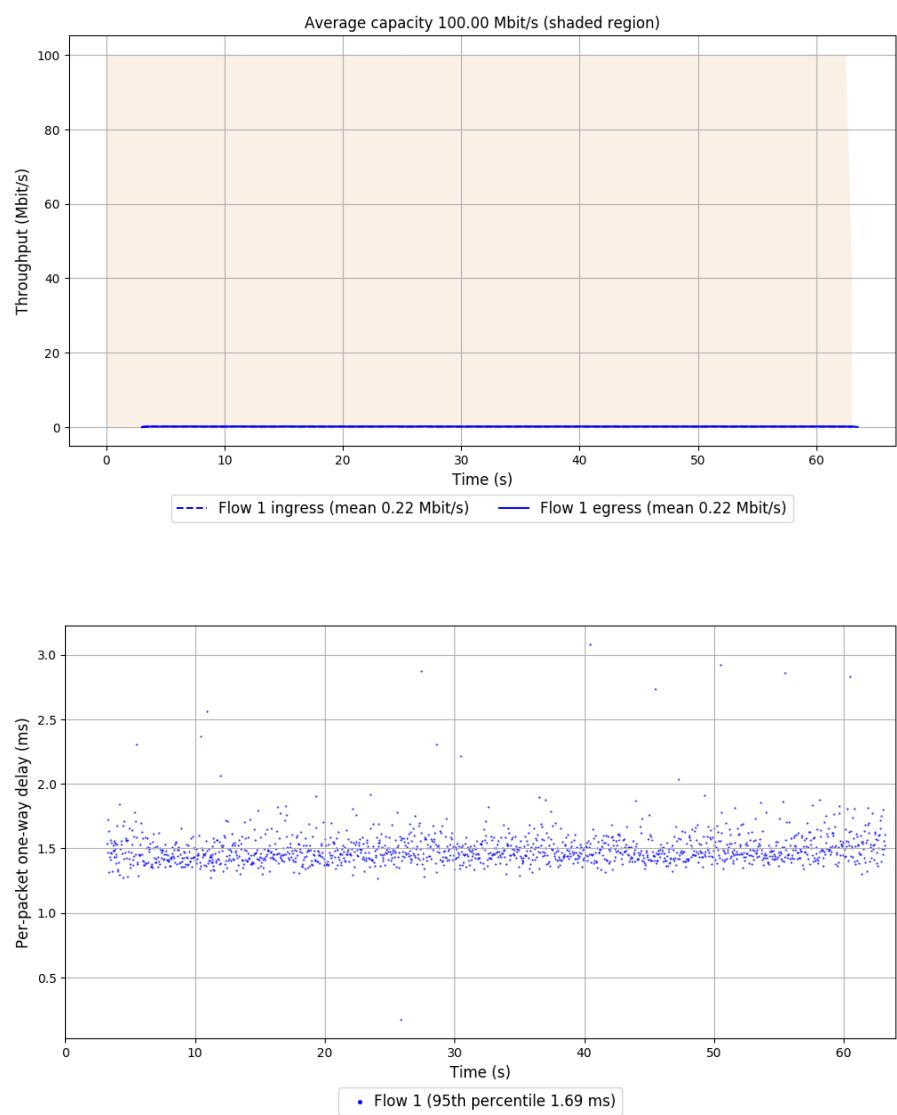
-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 1.692 ms

Loss rate: 0.00%

Run 1: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2019-07-04 16:14:09

End at: 2019-07-04 16:15:09

Below is generated by plot.py at 2019-07-04 16:32:59

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 49.79 Mbit/s (49.8% utilization)

95th percentile per-packet one-way delay: 8.811 ms

Loss rate: 0.00%

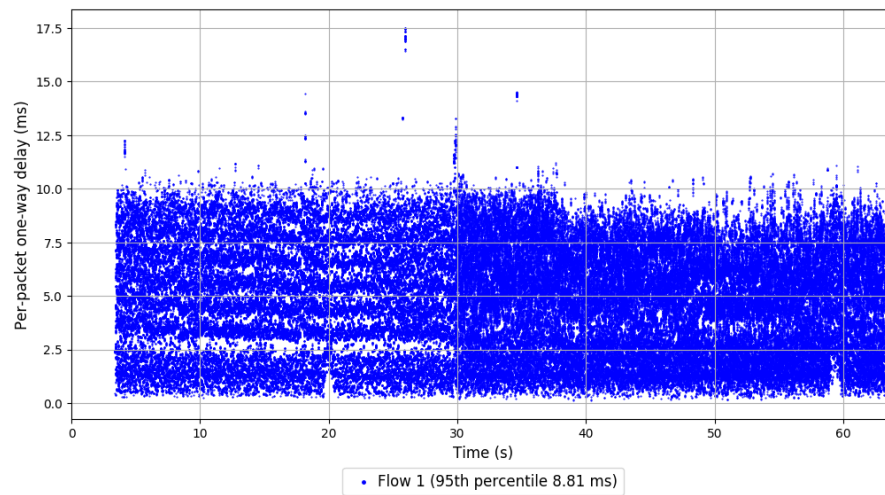
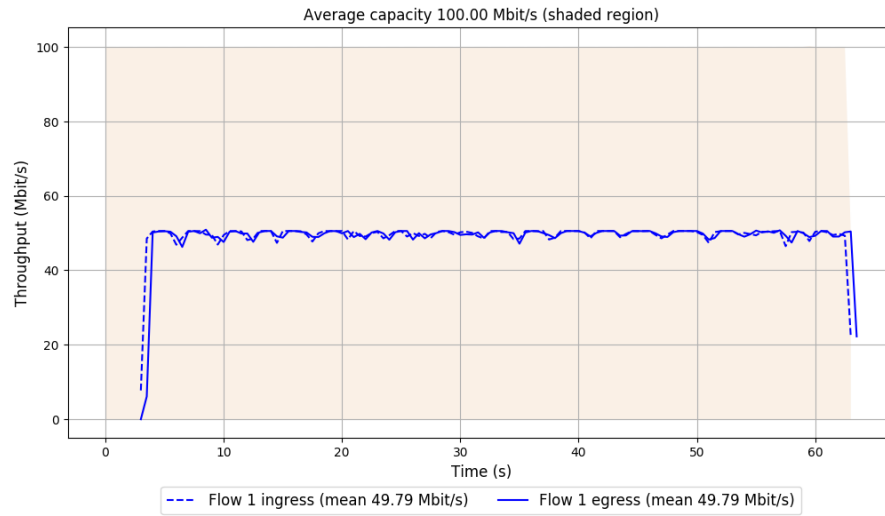
-- Flow 1:

Average throughput: 49.79 Mbit/s

95th percentile per-packet one-way delay: 8.811 ms

Loss rate: 0.00%

Run 1: Report of Sprout — Data Link

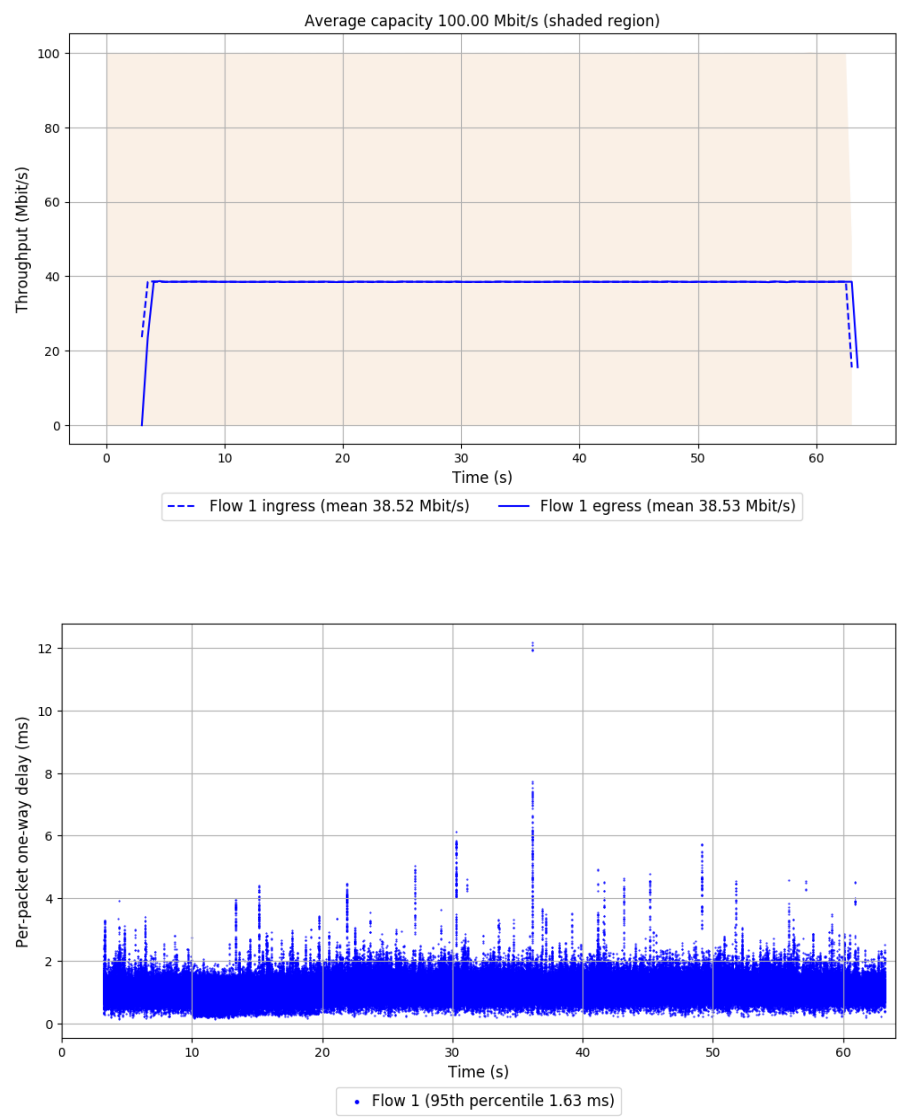



```
Run 1: Statistics of TaoVA-100x

Start at: 2019-07-04 16:20:07
End at: 2019-07-04 16:21:07

# Below is generated by plot.py at 2019-07-04 16:33:26
# Datalink statistics
-- Total of 1 flow:
Average capacity: 100.00 Mbit/s
Average throughput: 38.53 Mbit/s (38.5% utilization)
95th percentile per-packet one-way delay: 1.634 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 38.53 Mbit/s
95th percentile per-packet one-way delay: 1.634 ms
Loss rate: 0.00%
```

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



Run 1: Statistics of TCP Vegas

Start at: 2019-07-04 16:16:25

End at: 2019-07-04 16:17:25

Below is generated by plot.py at 2019-07-04 16:33:26

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 21.37 Mbit/s (21.4% utilization)

95th percentile per-packet one-way delay: 2.100 ms

Loss rate: 0.00%

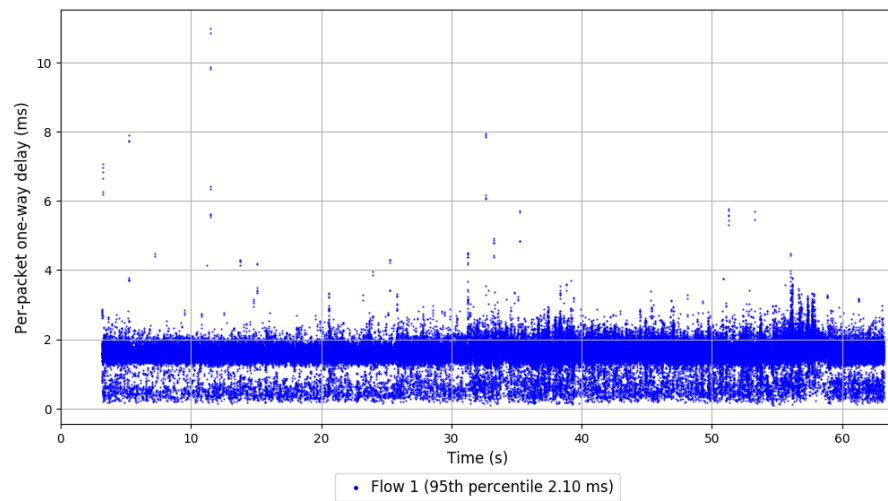
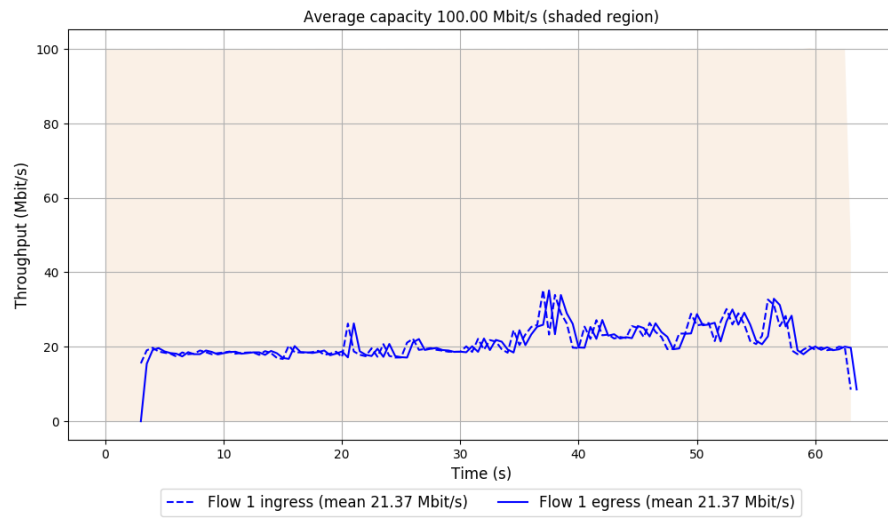
-- Flow 1:

Average throughput: 21.37 Mbit/s

95th percentile per-packet one-way delay: 2.100 ms

Loss rate: 0.00%

Run 1: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2019-07-04 16:10:24

End at: 2019-07-04 16:11:24

Below is generated by plot.py at 2019-07-04 16:33:33

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 54.37 Mbit/s (54.4% utilization)

95th percentile per-packet one-way delay: 13.837 ms

Loss rate: 0.01%

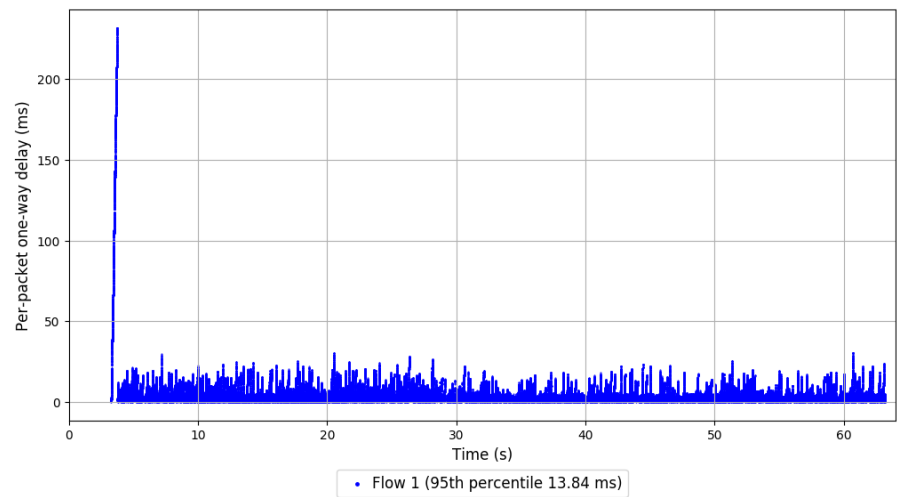
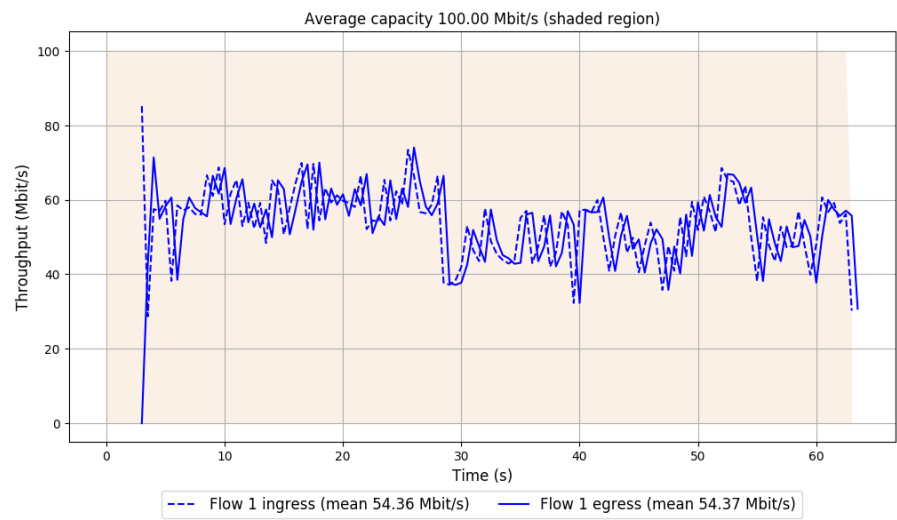
-- Flow 1:

Average throughput: 54.37 Mbit/s

95th percentile per-packet one-way delay: 13.837 ms

Loss rate: 0.01%

Run 1: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2019-07-04 16:15:17

End at: 2019-07-04 16:16:18

Below is generated by plot.py at 2019-07-04 16:33:33

Datalink statistics

-- Total of 1 flow:

Average capacity: 100.00 Mbit/s

Average throughput: 12.38 Mbit/s (12.4% utilization)

95th percentile per-packet one-way delay: 2.285 ms

Loss rate: 0.14%

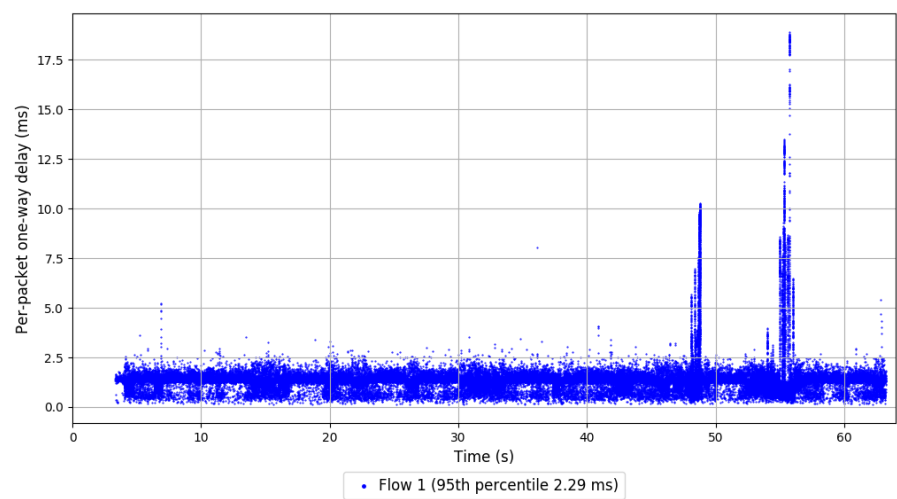
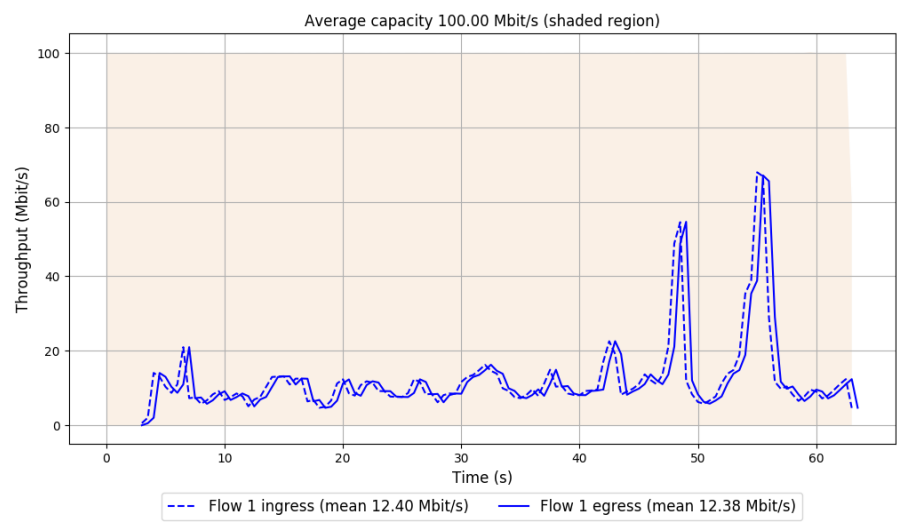
-- Flow 1:

Average throughput: 12.38 Mbit/s

95th percentile per-packet one-way delay: 2.285 ms

Loss rate: 0.14%

Run 1: Report of PCC-Vivace — Data Link



Run 1: Statistics of WebRTC media

Start at: 2019-07-04 16:25:45

End at: 2019-07-04 16:26:45

Run 1: Report of WebRTC media — Data Link

