

Pantheon Report

Generated at 2019-07-30 06:45:57 (UTC).

Tested in mahimahi: mm-delay 40 mm-link Verizon-LTE-short.up Verizon-LTE-short.down

Repeated the test of 21 congestion control schemes once.

Each test lasted for 30 seconds running 1 flow.

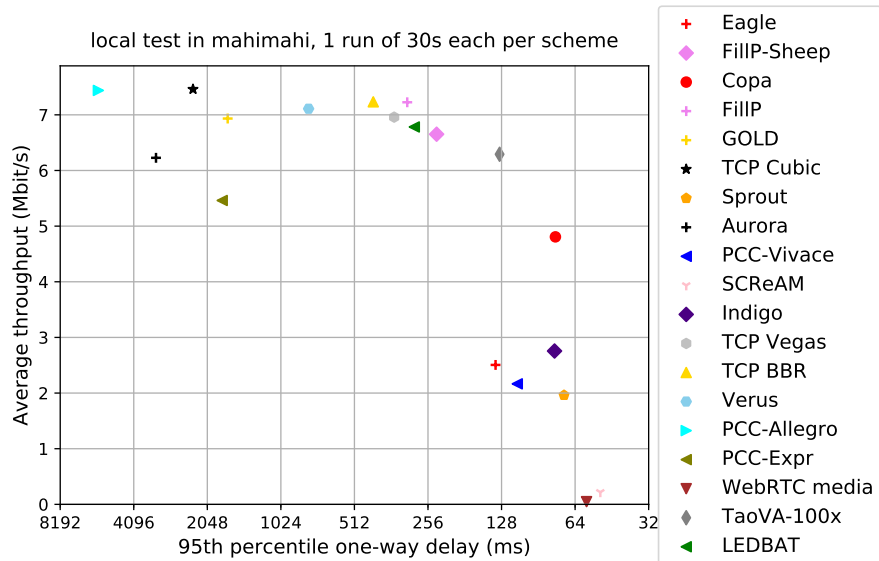
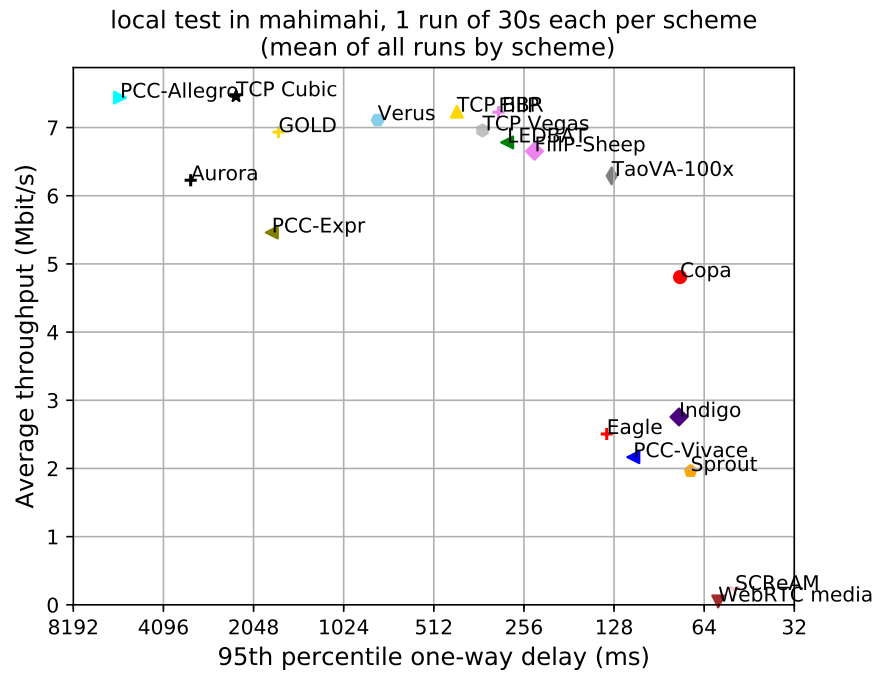
System info:

```
Linux 4.15.0-54-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 @ 5c283e597f9e572497174e0a7af75dd899473321
third_party/aurora @ f3e943d61015b39960854ba6391797e0c7984d74
third_party/aurora-model @ e292c316c23fb837255c4e142e40590d154bbe95
third_party/eagle @ ce4c8d9511b8dfde83c08384f81b2617bfb10438
third_party/illp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/illp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfc58e562f4
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-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
```



scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
Aurora	1	6.23	3321.46	3.16
TCP BBR	1	7.23	428.71	0.91
Copa	1	4.81	77.05	0.06
TCP Cubic	1	7.46	2343.74	8.62
Eagle	1	2.51	135.43	1.69
FillP	1	7.23	311.28	0.33
FillP-Sheep	1	6.65	236.03	0.18
GOLD	1	6.93	1690.22	4.25
GoldLSTM	0	N/A	N/A	N/A
Indigo	1	2.76	77.68	0.13
LEDBAT	1	6.78	291.28	0.67
PCC-Allegro	1	7.44	5716.33	11.56
PCC-Expr	1	5.46	1780.23	0.97
QUIC Cubic	0	N/A	N/A	N/A
SCReAM	1	0.22	50.47	0.13
Sprout	1	1.96	71.04	0.06
TaoVA-100x	1	6.29	130.37	0.13
TCP Vegas	1	6.96	352.14	0.26
Verus	1	7.11	788.47	0.90
PCC-Vivace	1	2.17	110.38	0.11
WebRTC media	1	0.05	57.45	0.00

Run 1: Statistics of Aurora

Start at: 2019-07-30 06:37:30

End at: 2019-07-30 06:38:00

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 6.23 Mbit/s (83.0% utilization)

95th percentile per-packet one-way delay: 3321.463 ms

Loss rate: 3.16%

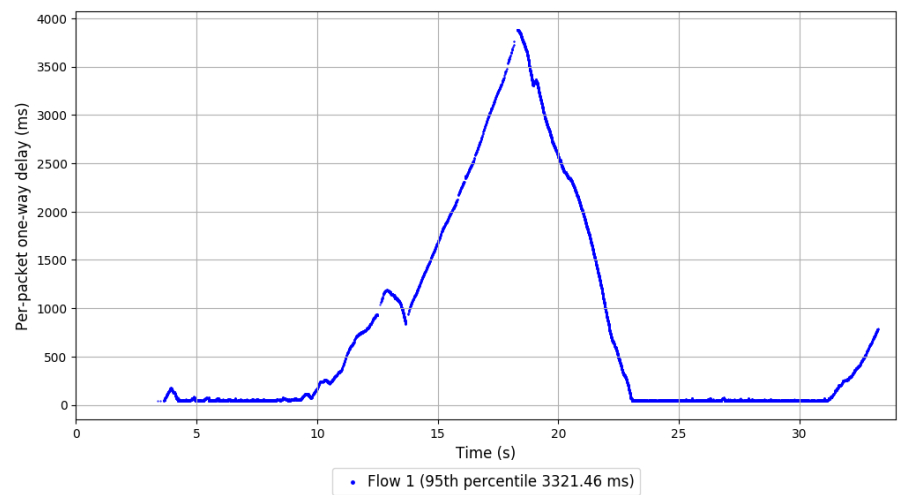
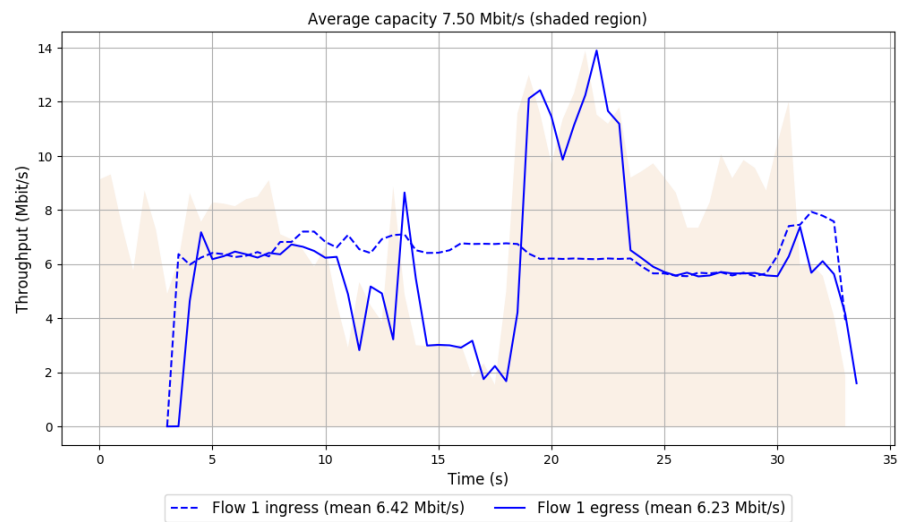
-- Flow 1:

Average throughput: 6.23 Mbit/s

95th percentile per-packet one-way delay: 3321.463 ms

Loss rate: 3.16%

Run 1: Report of Aurora — Data Link



Run 1: Statistics of TCP BBR

Start at: 2019-07-30 06:39:14

End at: 2019-07-30 06:39:44

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 7.23 Mbit/s (96.4% utilization)

95th percentile per-packet one-way delay: 428.714 ms

Loss rate: 0.91%

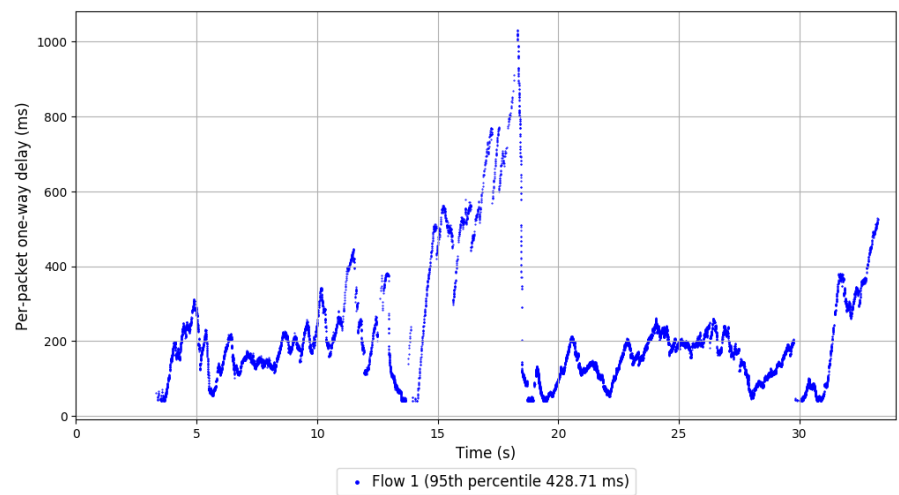
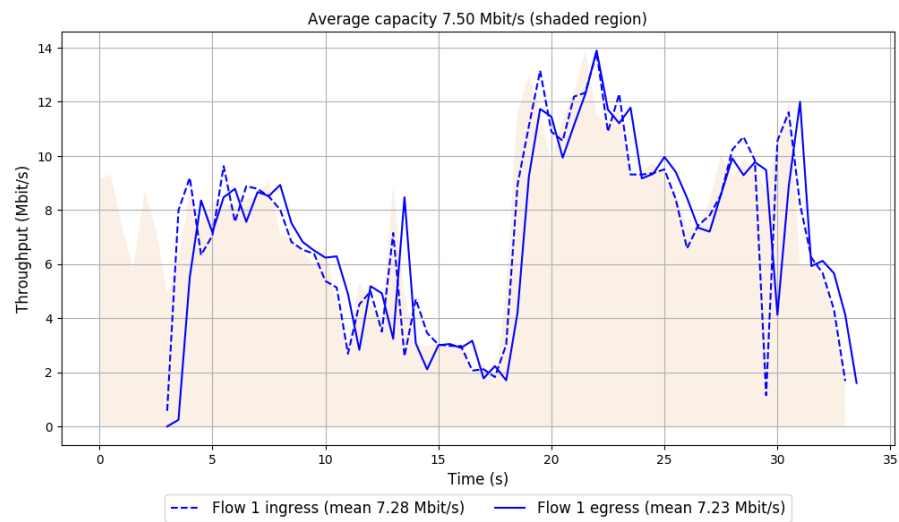
-- Flow 1:

Average throughput: 7.23 Mbit/s

95th percentile per-packet one-way delay: 428.714 ms

Loss rate: 0.91%

Run 1: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2019-07-30 06:34:03

End at: 2019-07-30 06:34:33

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 4.81 Mbit/s (64.1% utilization)

95th percentile per-packet one-way delay: 77.048 ms

Loss rate: 0.06%

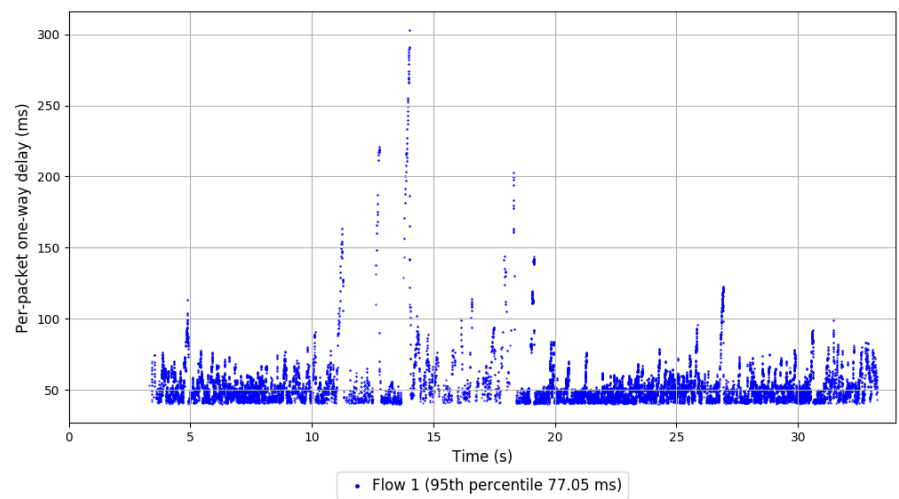
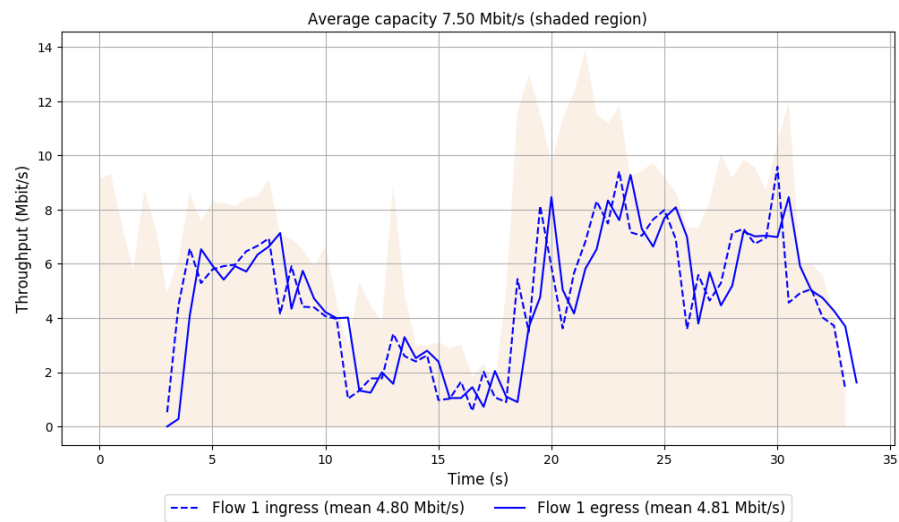
-- Flow 1:

Average throughput: 4.81 Mbit/s

95th percentile per-packet one-way delay: 77.048 ms

Loss rate: 0.06%

Run 1: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2019-07-30 06:36:21

End at: 2019-07-30 06:36:51

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 7.46 Mbit/s (99.5% utilization)

95th percentile per-packet one-way delay: 2343.743 ms

Loss rate: 8.62%

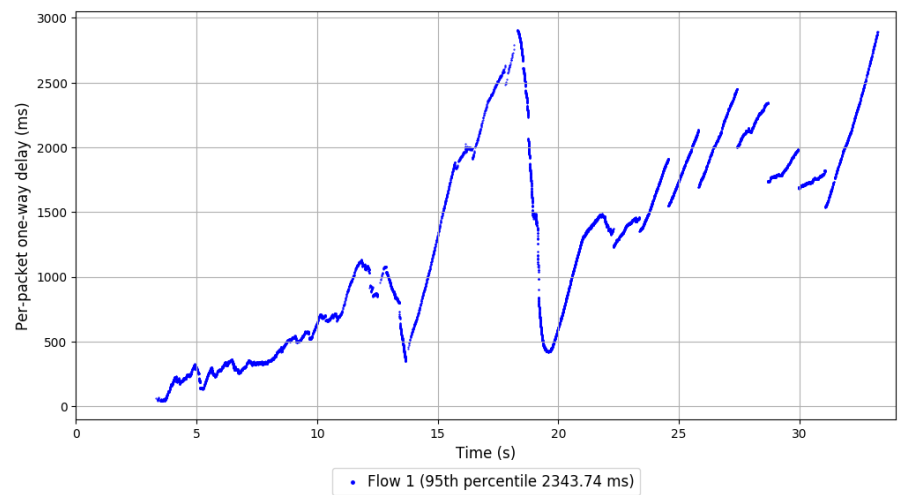
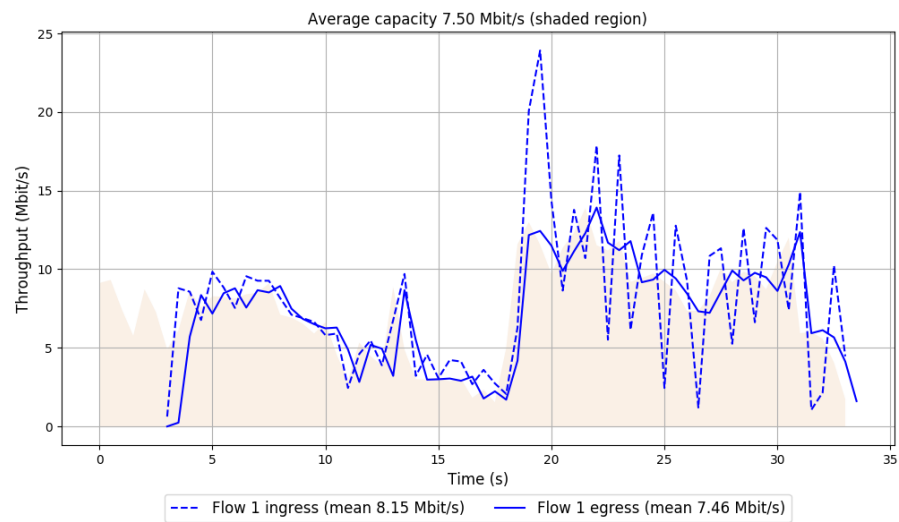
-- Flow 1:

Average throughput: 7.46 Mbit/s

95th percentile per-packet one-way delay: 2343.743 ms

Loss rate: 8.62%

Run 1: Report of TCP Cubic — Data Link



Run 1: Statistics of Eagle

Start at: 2019-07-30 06:32:55

End at: 2019-07-30 06:33:25

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 2.51 Mbit/s (33.4% utilization)

95th percentile per-packet one-way delay: 135.428 ms

Loss rate: 1.69%

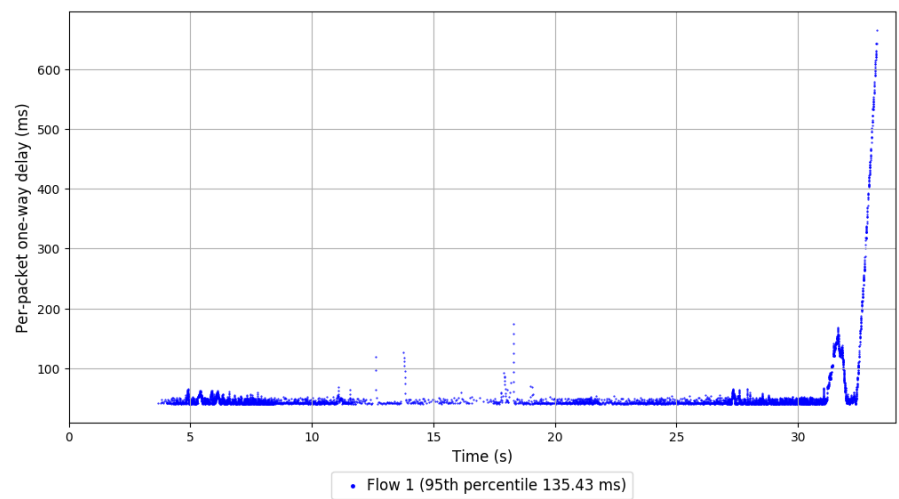
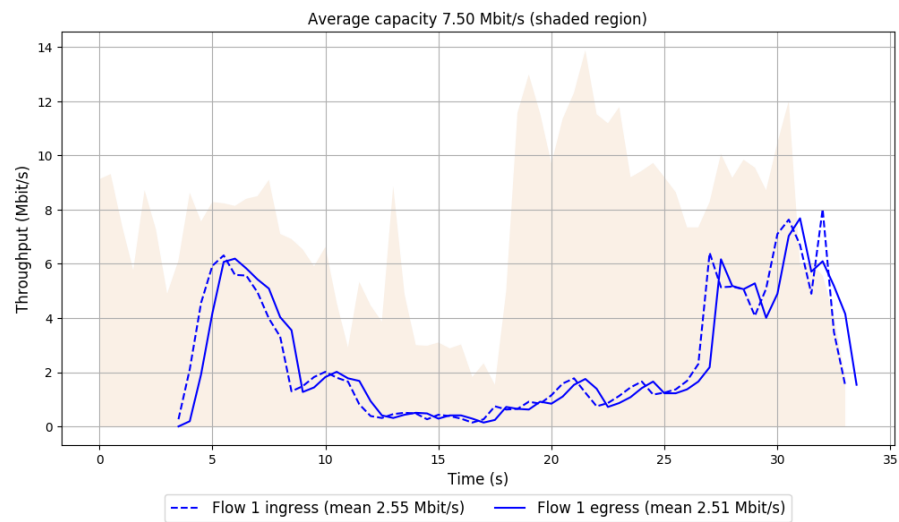
-- Flow 1:

Average throughput: 2.51 Mbit/s

95th percentile per-packet one-way delay: 135.428 ms

Loss rate: 1.69%

Run 1: Report of Eagle — Data Link



Run 1: Statistics of FillP

Start at: 2019-07-30 06:40:57

End at: 2019-07-30 06:41:27

Below is generated by plot.py at 2019-07-30 06:45:34

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 7.23 Mbit/s (96.3% utilization)

95th percentile per-packet one-way delay: 311.278 ms

Loss rate: 0.33%

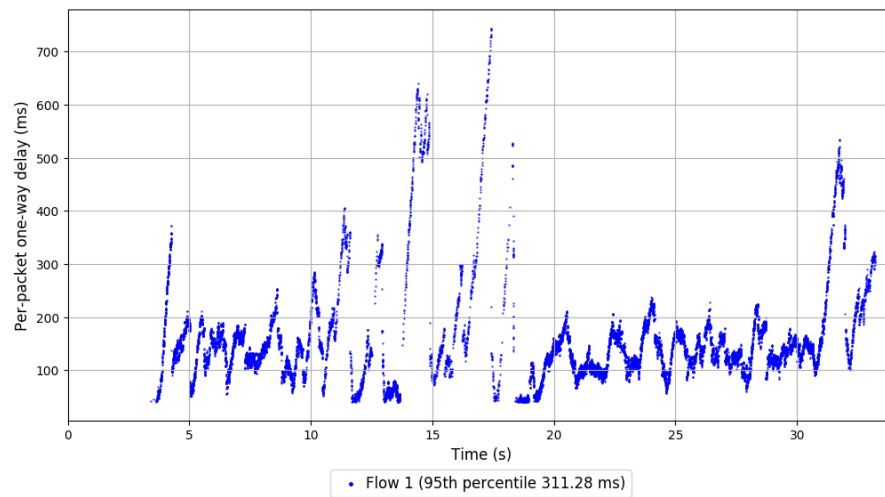
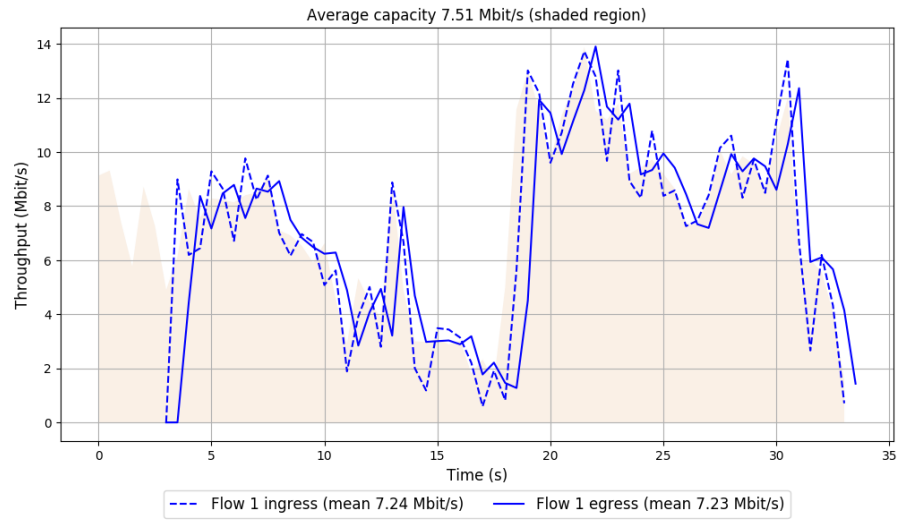
-- Flow 1:

Average throughput: 7.23 Mbit/s

95th percentile per-packet one-way delay: 311.278 ms

Loss rate: 0.33%

Run 1: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-07-30 06:33:29

End at: 2019-07-30 06:33:59

Below is generated by plot.py at 2019-07-30 06:45:36

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 6.65 Mbit/s (88.7% utilization)

95th percentile per-packet one-way delay: 236.032 ms

Loss rate: 0.18%

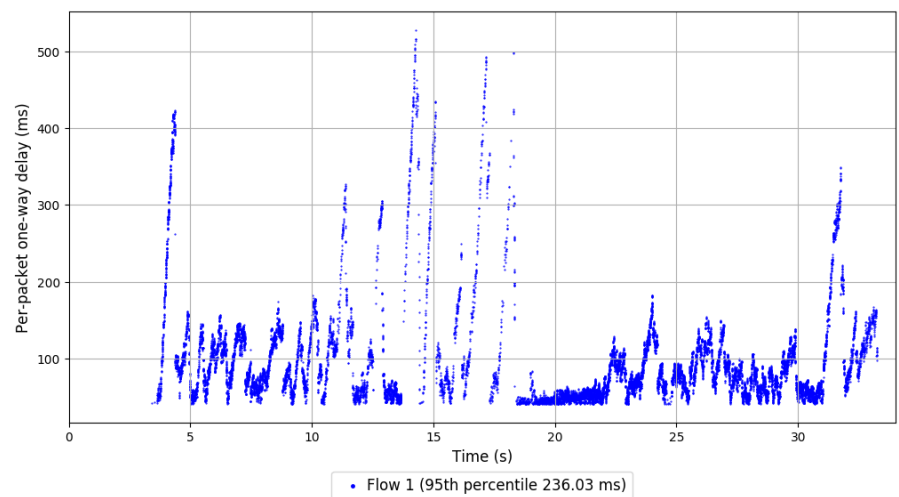
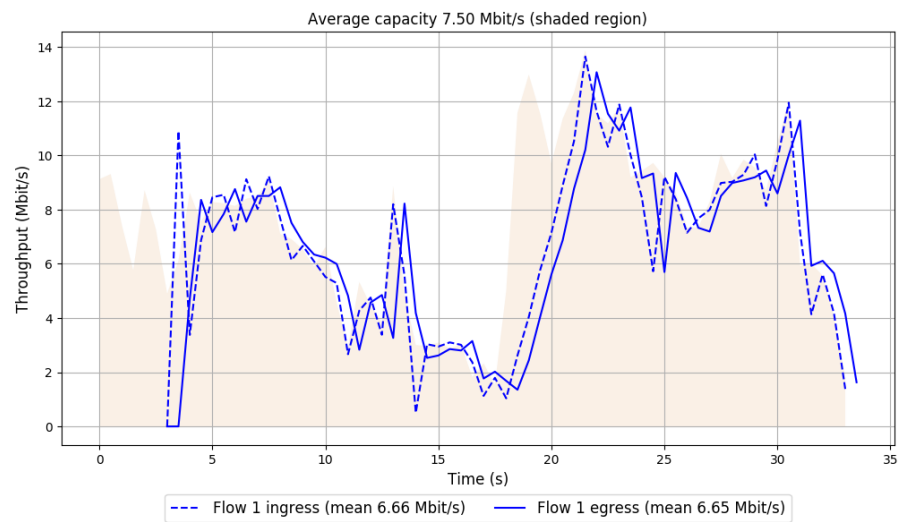
-- Flow 1:

Average throughput: 6.65 Mbit/s

95th percentile per-packet one-way delay: 236.032 ms

Loss rate: 0.18%

Run 1: Report of FillP-Sheep — Data Link



Run 1: Statistics of GOLD

Start at: 2019-07-30 06:35:47

End at: 2019-07-30 06:36:17

Below is generated by plot.py at 2019-07-30 06:45:39

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 6.93 Mbit/s (92.4% utilization)

95th percentile per-packet one-way delay: 1690.216 ms

Loss rate: 4.25%

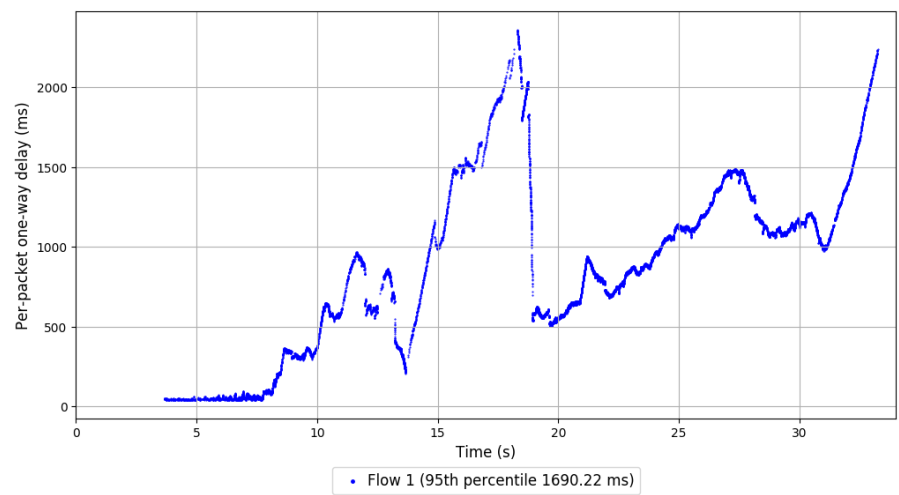
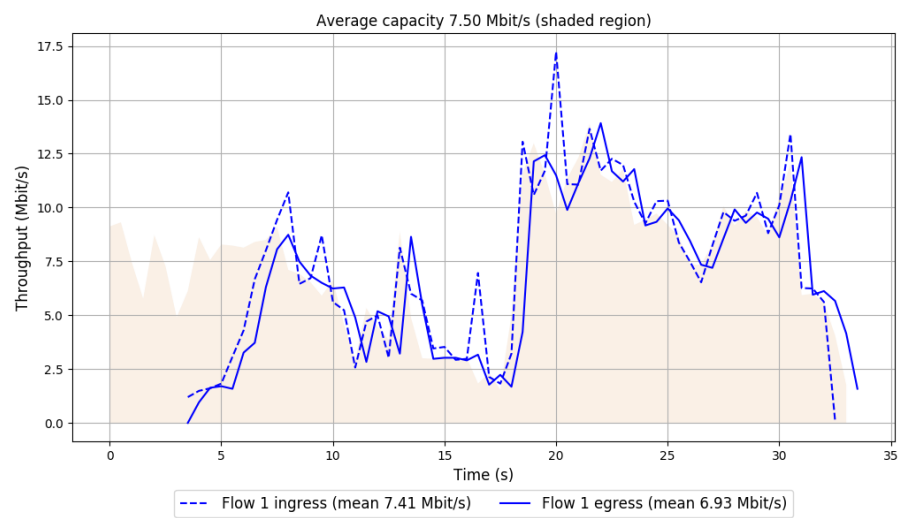
-- Flow 1:

Average throughput: 6.93 Mbit/s

95th percentile per-packet one-way delay: 1690.216 ms

Loss rate: 4.25%

Run 1: Report of GOLD — Data Link

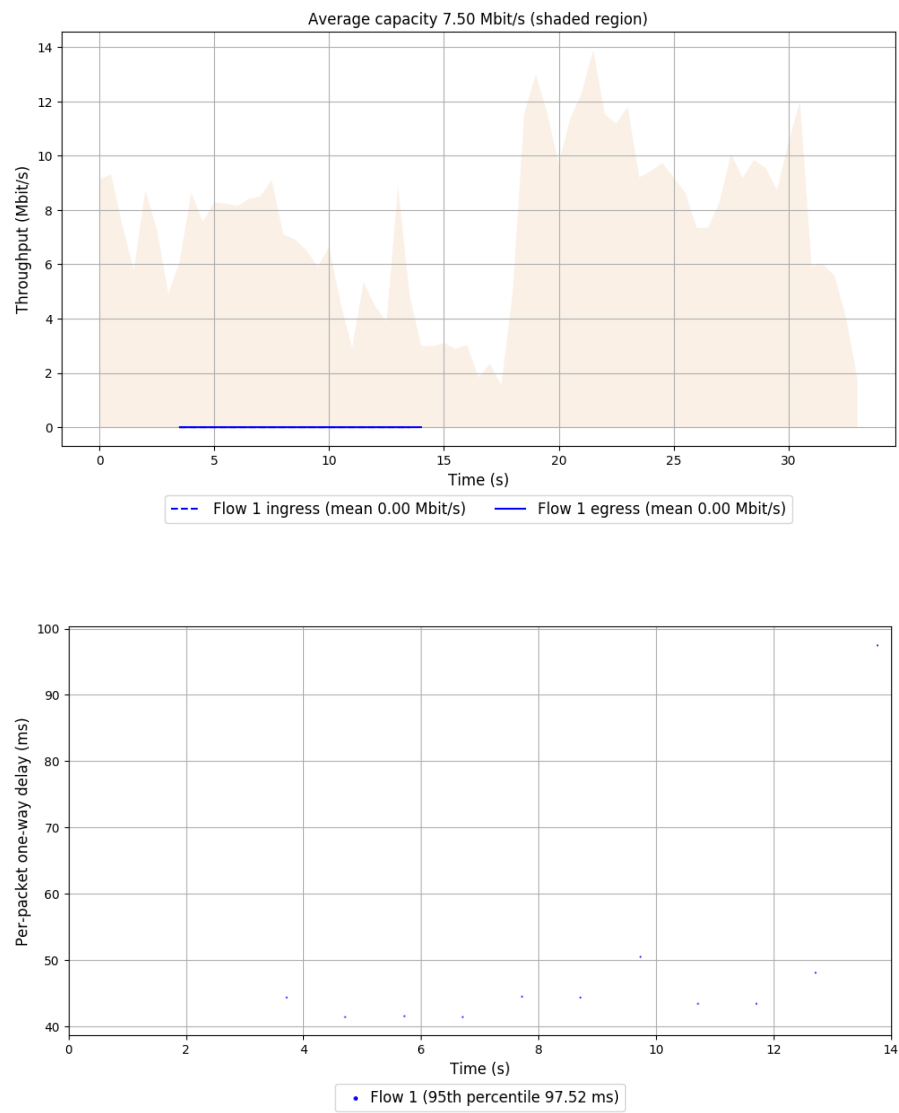


Run 1: Statistics of GoldLSTM

Start at: 2019-07-30 06:39:48

End at: 2019-07-30 06:40:18

Run 1: Report of GoldLSTM — Data Link

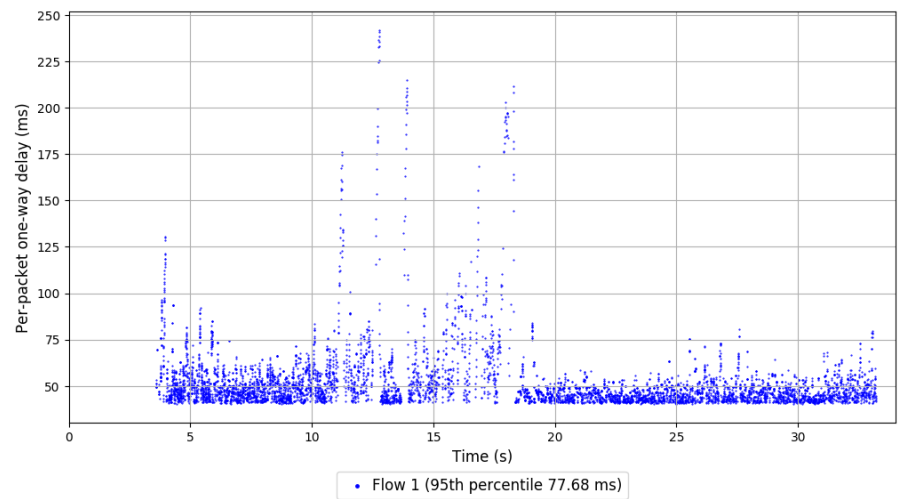
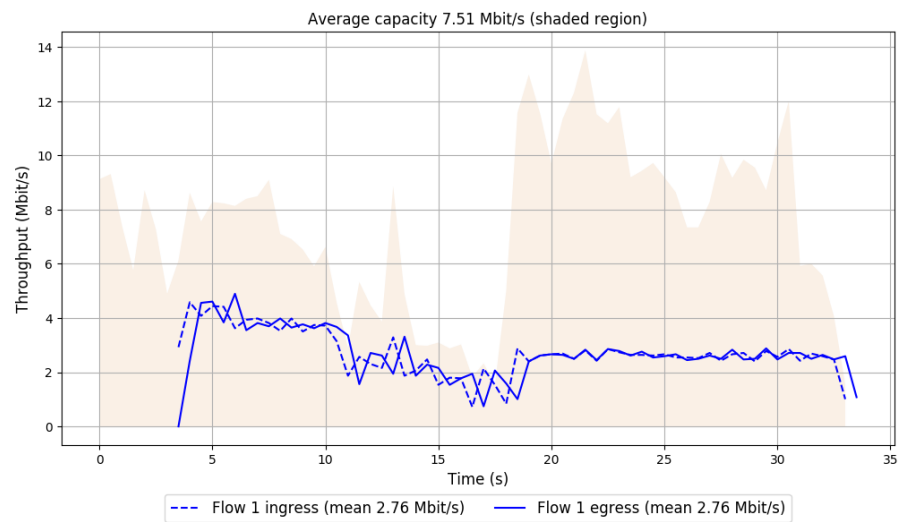


```
Run 1: Statistics of Indigo

Start at: 2019-07-30 06:34:38
End at: 2019-07-30 06:35:08

# Below is generated by plot.py at 2019-07-30 06:45:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 2.76 Mbit/s (36.7% utilization)
95th percentile per-packet one-way delay: 77.678 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 2.76 Mbit/s
95th percentile per-packet one-way delay: 77.678 ms
Loss rate: 0.13%
```

Run 1: Report of Indigo — Data Link

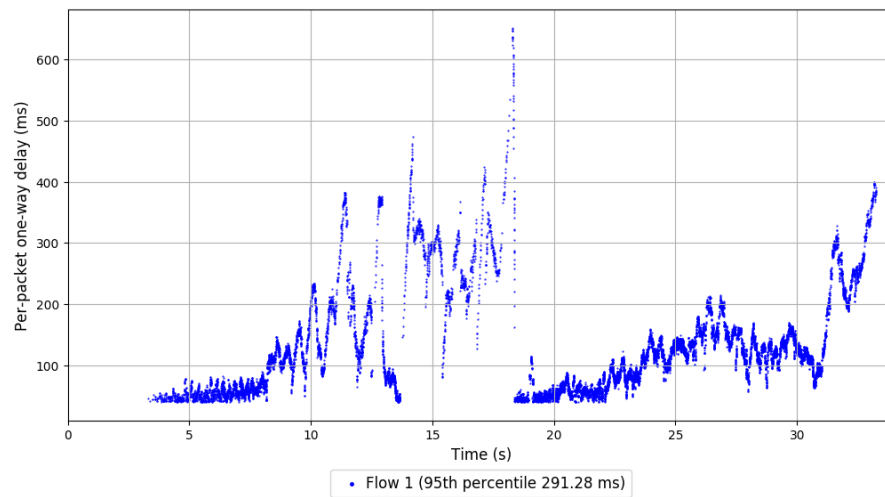
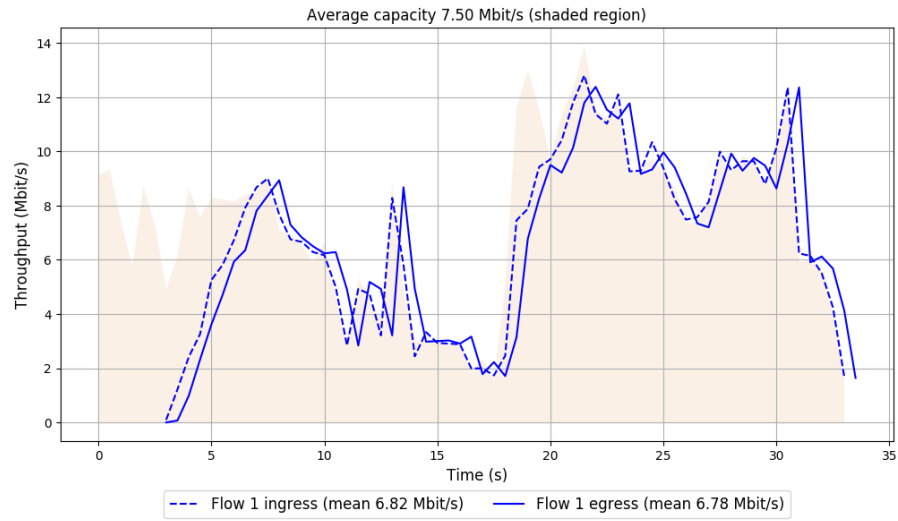



```
Run 1: Statistics of LEDBAT

Start at: 2019-07-30 06:43:48
End at: 2019-07-30 06:44:18

# Below is generated by plot.py at 2019-07-30 06:45:43
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 6.78 Mbit/s (90.4% utilization)
95th percentile per-packet one-way delay: 291.277 ms
Loss rate: 0.67%
-- Flow 1:
Average throughput: 6.78 Mbit/s
95th percentile per-packet one-way delay: 291.277 ms
Loss rate: 0.67%
```

Run 1: Report of LEDBAT — Data Link

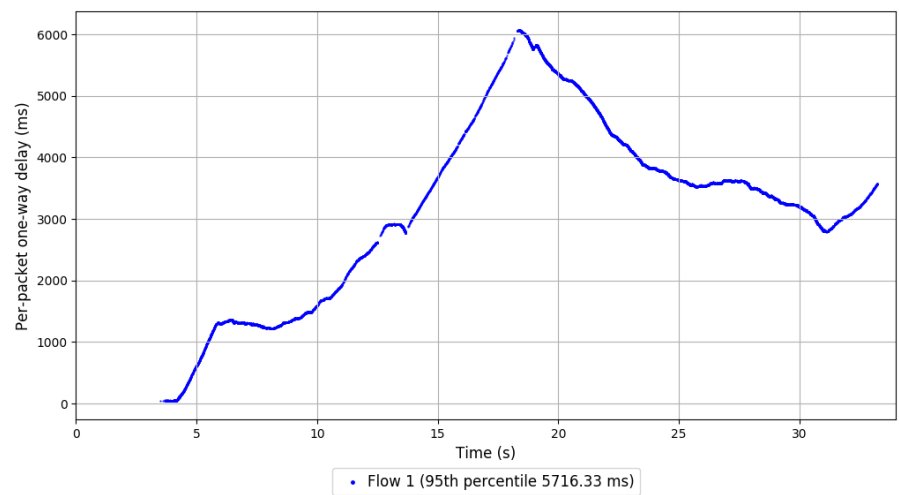
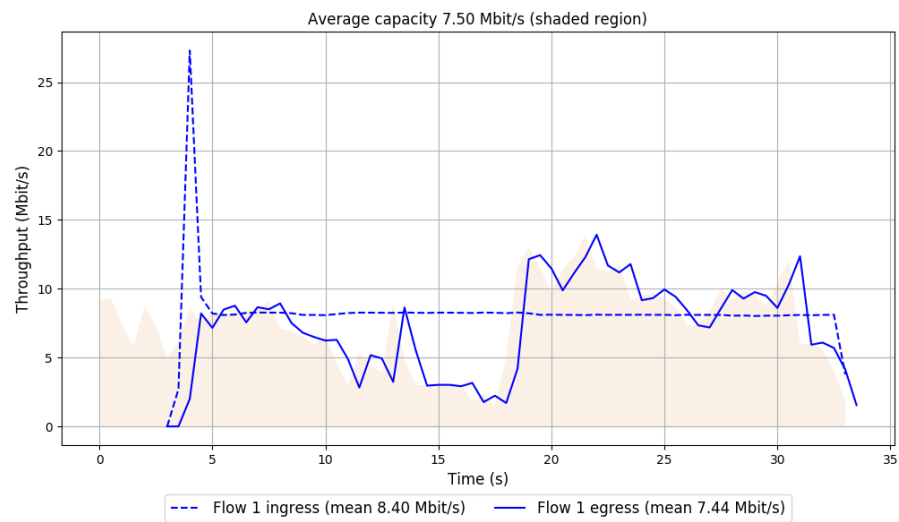


```
Run 1: Statistics of PCC-Allegro

Start at: 2019-07-30 06:42:39
End at: 2019-07-30 06:43:09

# Below is generated by plot.py at 2019-07-30 06:45:45
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 7.44 Mbit/s (99.2% utilization)
95th percentile per-packet one-way delay: 5716.331 ms
Loss rate: 11.56%
-- Flow 1:
Average throughput: 7.44 Mbit/s
95th percentile per-packet one-way delay: 5716.331 ms
Loss rate: 11.56%
```

Run 1: Report of PCC-Allegro — Data Link

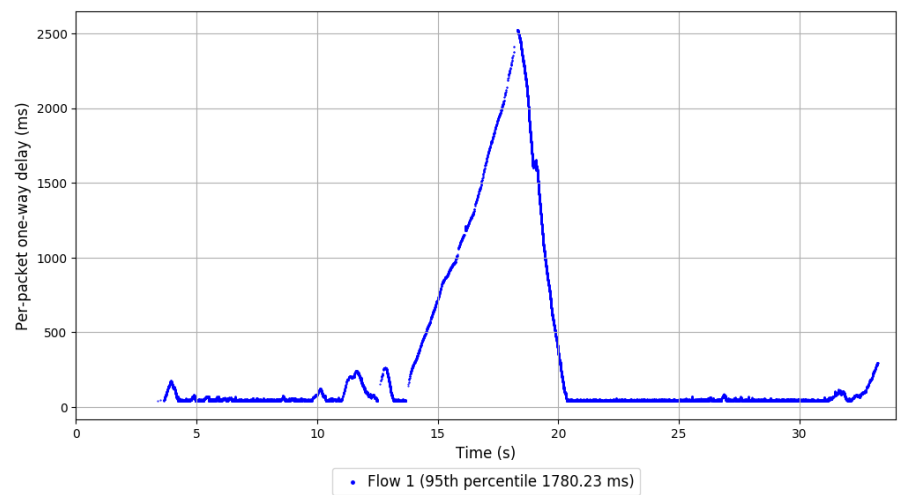
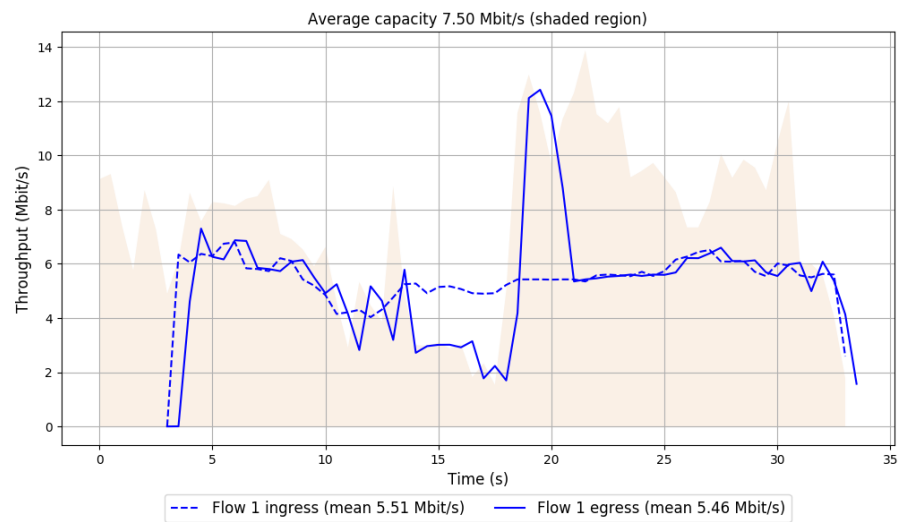


```
Run 1: Statistics of PCC-Expr

Start at: 2019-07-30 06:44:22
End at: 2019-07-30 06:44:52

# Below is generated by plot.py at 2019-07-30 06:45:49
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 5.46 Mbit/s (72.8% utilization)
95th percentile per-packet one-way delay: 1780.229 ms
Loss rate: 0.97%
-- Flow 1:
Average throughput: 5.46 Mbit/s
95th percentile per-packet one-way delay: 1780.229 ms
Loss rate: 0.97%
```

Run 1: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2019-07-30 06:42:05

End at: 2019-07-30 06:42:35

Run 1: Report of QUIC Cubic — Data Link

Figure is missing

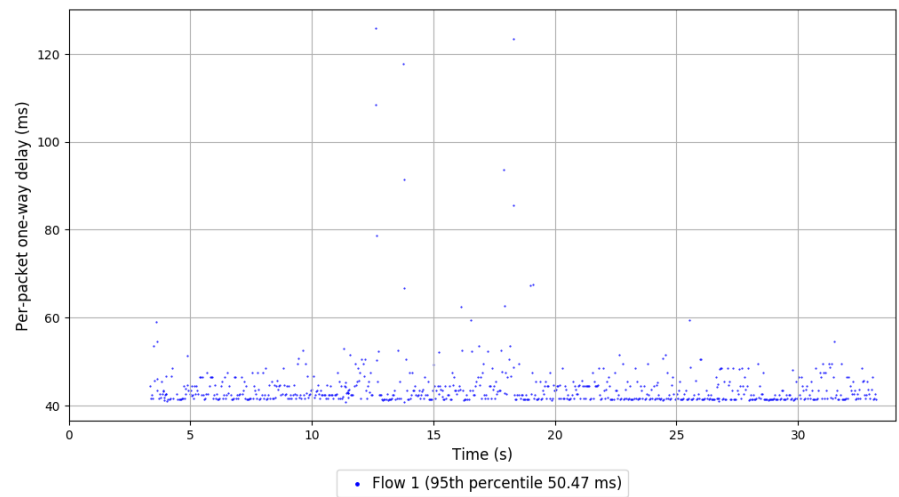
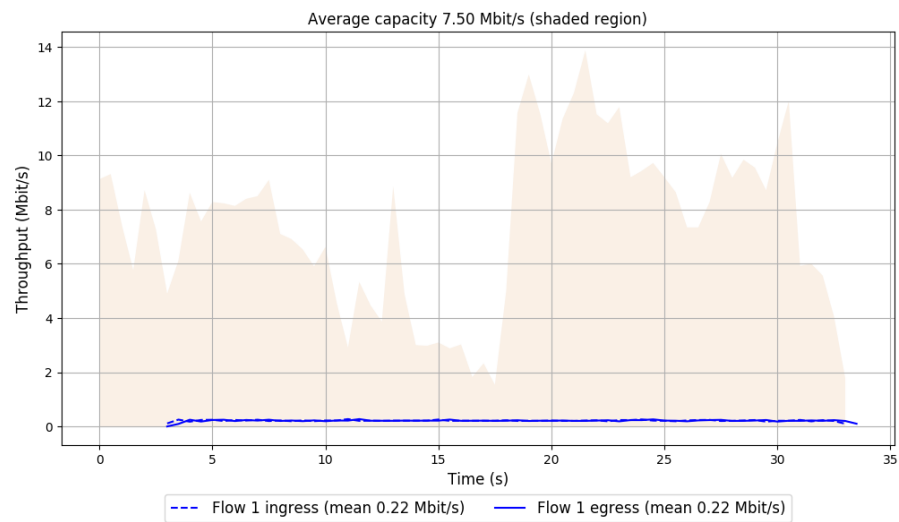
Figure is missing


```
Run 1: Statistics of SCReAM

Start at: 2019-07-30 06:41:31
End at: 2019-07-30 06:42:01

# Below is generated by plot.py at 2019-07-30 06:45:49
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 0.22 Mbit/s (2.9% utilization)
95th percentile per-packet one-way delay: 50.467 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 50.467 ms
Loss rate: 0.13%
```

Run 1: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2019-07-30 06:36:56

End at: 2019-07-30 06:37:26

Below is generated by plot.py at 2019-07-30 06:45:49

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 1.96 Mbit/s (26.2% utilization)

95th percentile per-packet one-way delay: 71.042 ms

Loss rate: 0.06%

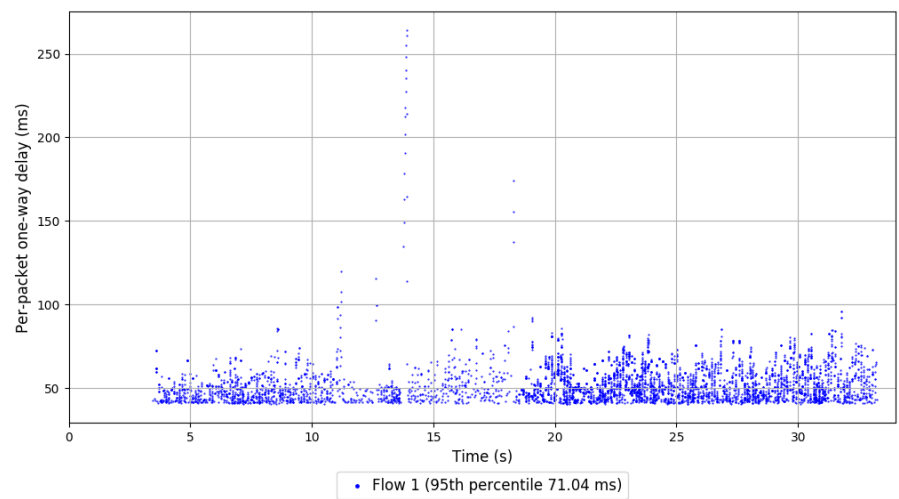
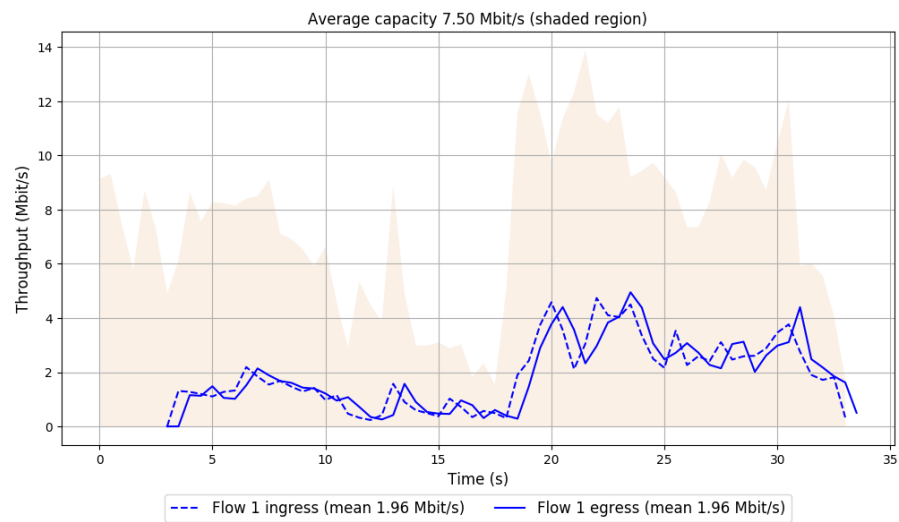
-- Flow 1:

Average throughput: 1.96 Mbit/s

95th percentile per-packet one-way delay: 71.042 ms

Loss rate: 0.06%

Run 1: Report of Sprout — Data Link

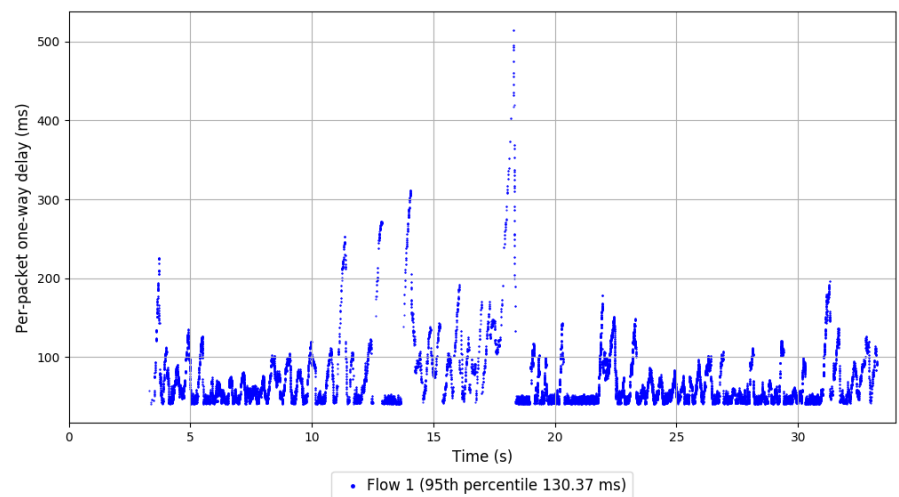
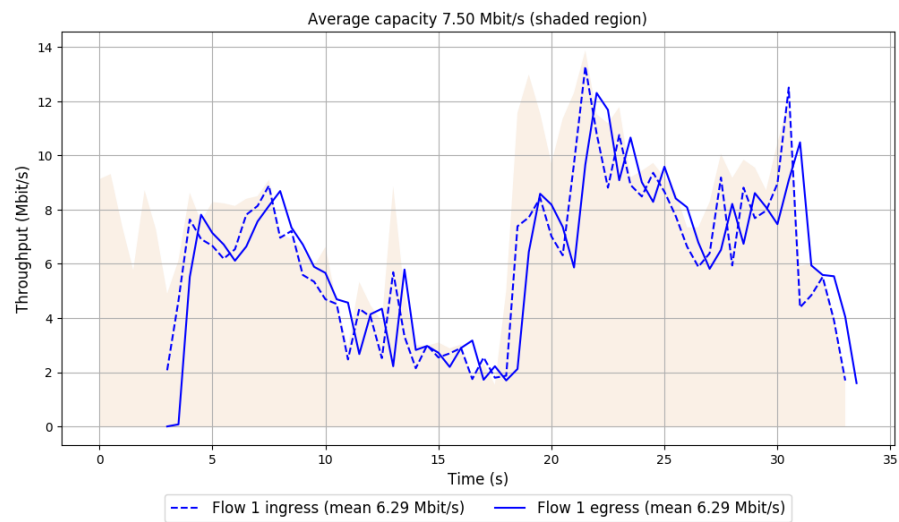


```
Run 1: Statistics of TaoVA-100x

Start at: 2019-07-30 06:40:22
End at: 2019-07-30 06:40:52

# Below is generated by plot.py at 2019-07-30 06:45:54
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 6.29 Mbit/s (83.9% utilization)
95th percentile per-packet one-way delay: 130.366 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 6.29 Mbit/s
95th percentile per-packet one-way delay: 130.366 ms
Loss rate: 0.13%
```

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



Run 1: Statistics of TCP Vegas

Start at: 2019-07-30 06:38:39

End at: 2019-07-30 06:39:09

Below is generated by plot.py at 2019-07-30 06:45:54

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 6.96 Mbit/s (92.7% utilization)

95th percentile per-packet one-way delay: 352.137 ms

Loss rate: 0.26%

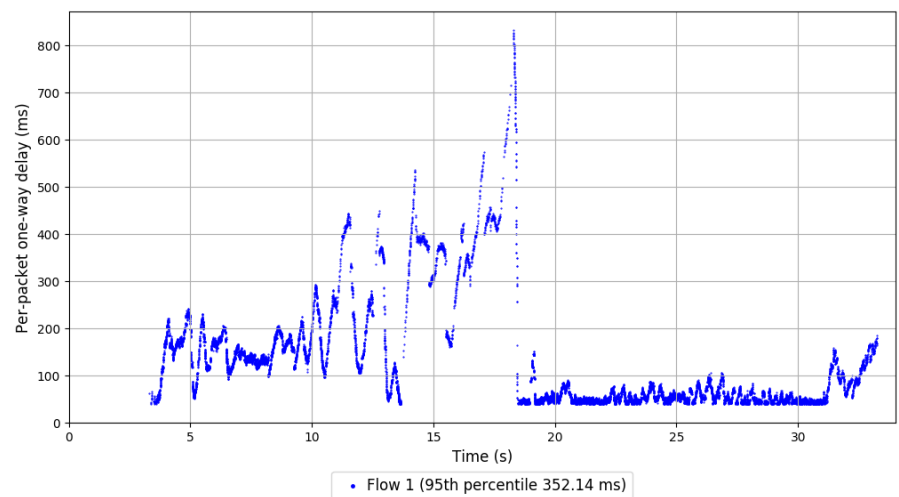
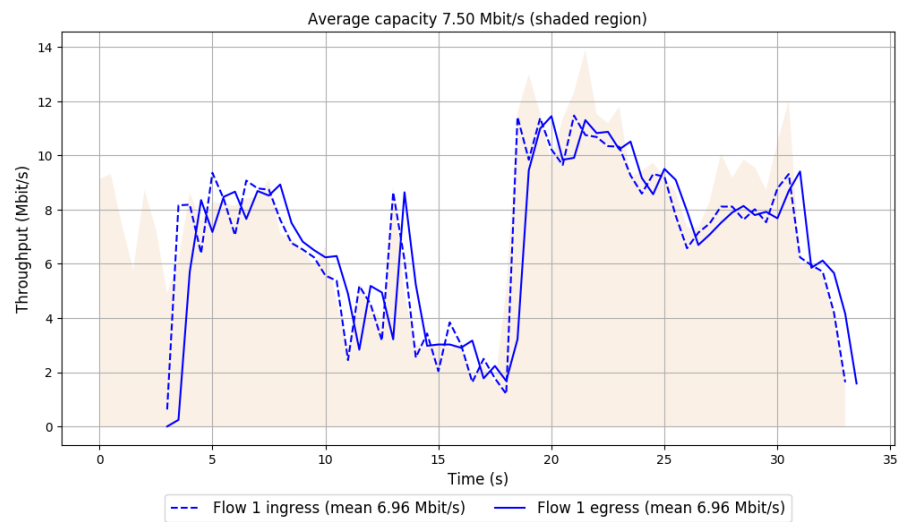
-- Flow 1:

Average throughput: 6.96 Mbit/s

95th percentile per-packet one-way delay: 352.137 ms

Loss rate: 0.26%

Run 1: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2019-07-30 06:35:12

End at: 2019-07-30 06:35:42

Below is generated by plot.py at 2019-07-30 06:45:54

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 7.11 Mbit/s (94.8% utilization)

95th percentile per-packet one-way delay: 788.470 ms

Loss rate: 0.90%

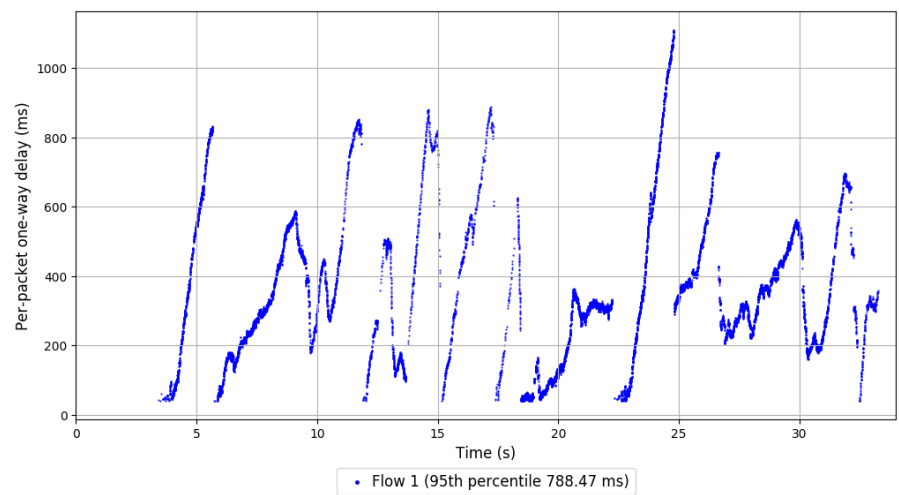
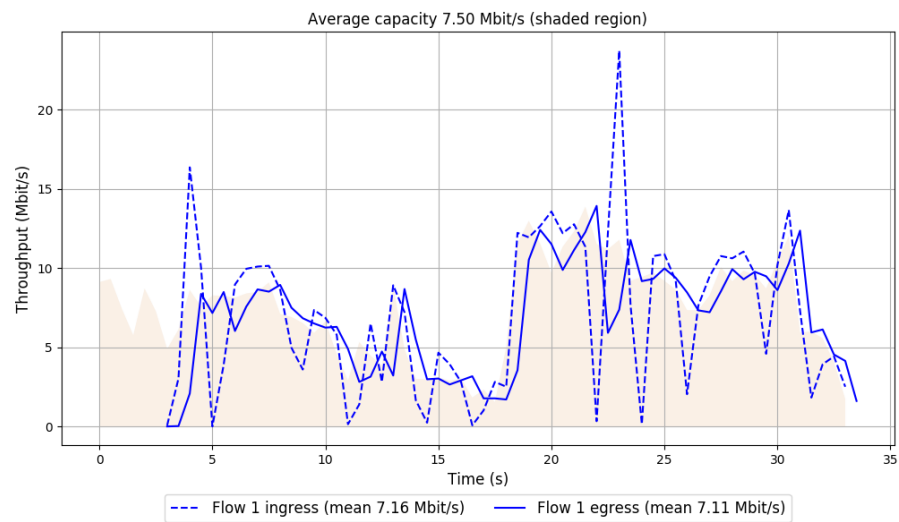
-- Flow 1:

Average throughput: 7.11 Mbit/s

95th percentile per-packet one-way delay: 788.470 ms

Loss rate: 0.90%

Run 1: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2019-07-30 06:38:05

End at: 2019-07-30 06:38:35

Below is generated by plot.py at 2019-07-30 06:45:54

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.50 Mbit/s

Average throughput: 2.17 Mbit/s (28.9% utilization)

95th percentile per-packet one-way delay: 110.383 ms

Loss rate: 0.11%

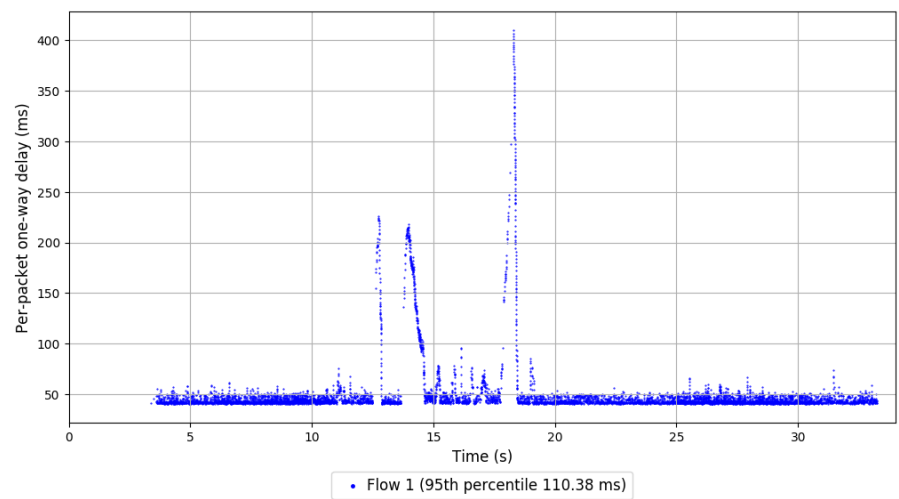
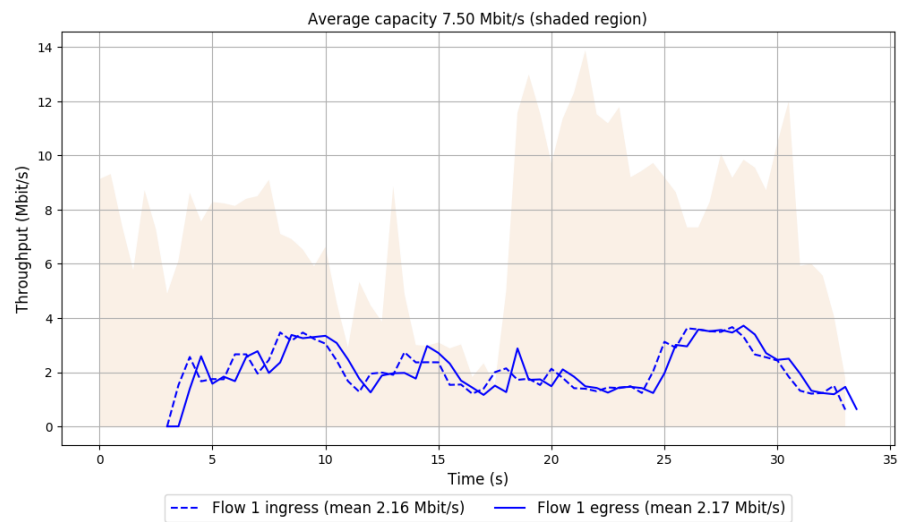
-- Flow 1:

Average throughput: 2.17 Mbit/s

95th percentile per-packet one-way delay: 110.383 ms

Loss rate: 0.11%

Run 1: Report of PCC-Vivace — Data Link



```
Run 1: Statistics of WebRTC media

Start at: 2019-07-30 06:43:14
End at: 2019-07-30 06:43:44

# Below is generated by plot.py at 2019-07-30 06:45:54
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.50 Mbit/s
Average throughput: 0.05 Mbit/s (0.7% utilization)
95th percentile per-packet one-way delay: 57.451 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 57.451 ms
Loss rate: 0.00%
```

Run 1: Report of WebRTC media — Data Link

