

Pantheon Report

Generated at 2019-07-31 02:41:17 (UTC).

Tested in mahimahi: 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.

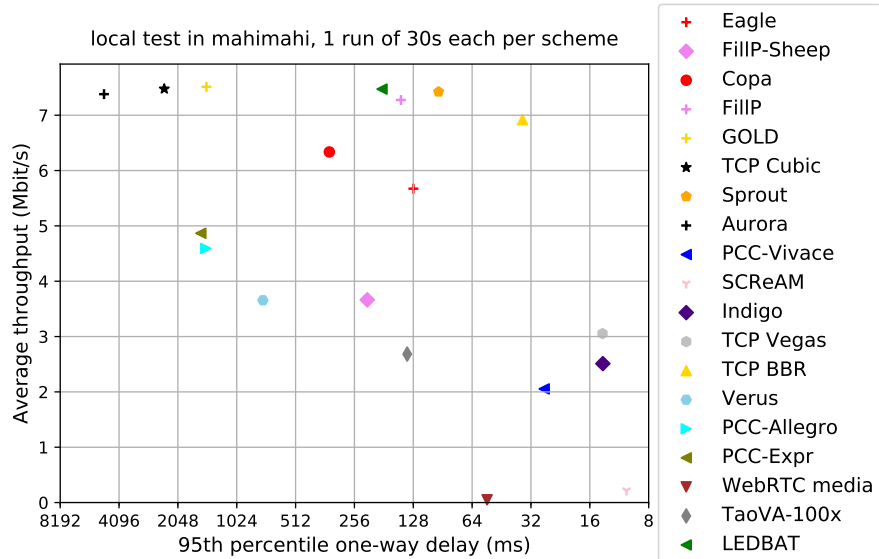
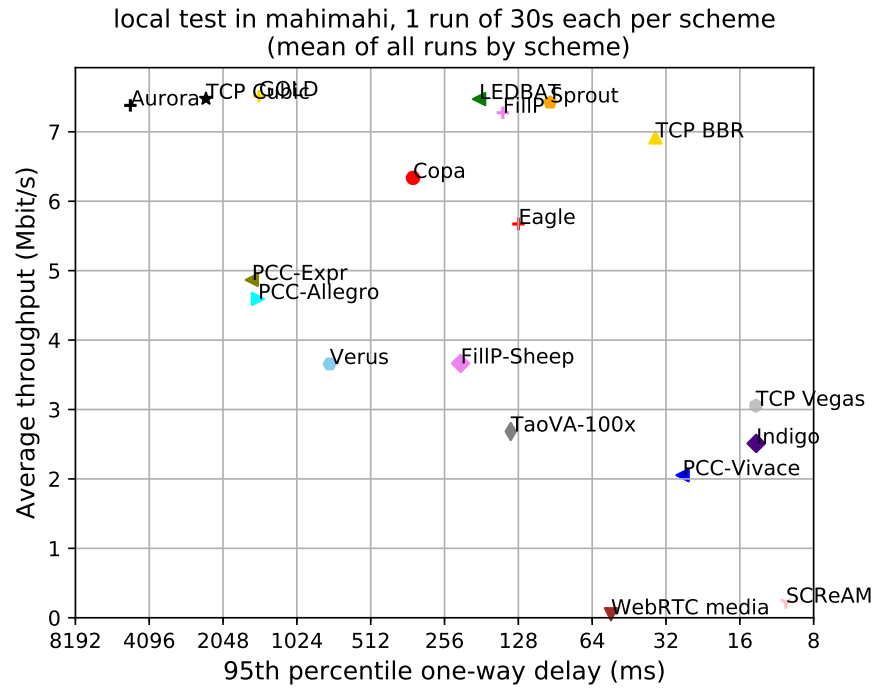
System info:

```
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 @ 5ccb1a79cac8ab634d3b1c92d5a9abf132a2d1b8
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 @ 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 @ 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	7.38	4888.62	11.54
TCP BBR	1	6.92	35.33	0.07
Copa	1	6.34	344.11	0.74
TCP Cubic	1	7.48	2404.48	8.84
Eagle	1	5.67	127.86	0.26
FillP	1	7.27	148.02	0.17
FillP-Sheep	1	3.66	220.14	0.02
GOLD	1	7.51	1463.19	4.90
GoldLSTM	0	N/A	N/A	N/A
Indigo	1	2.51	13.72	0.02
LEDBAT	1	7.47	185.03	0.37
PCC-Allegro	1	4.59	1474.55	0.48
PCC-Expr	1	4.87	1563.33	5.62
QUIC Cubic	0	N/A	N/A	N/A
SCReAM	1	0.22	10.38	0.00
Sprout	1	7.42	94.99	0.04
TaoVA-100x	1	2.68	137.50	0.00
TCP Vegas	1	3.05	13.78	0.03
Verus	1	3.66	752.40	0.01
PCC-Vivace	1	2.05	27.39	0.00
WebRTC media	1	0.05	53.65	0.00

Run 1: Statistics of Aurora

Start at: 2019-07-31 02:28:36

End at: 2019-07-31 02:29:06

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 7.38 Mbit/s (98.3% utilization)

95th percentile per-packet one-way delay: 4888.622 ms

Loss rate: 11.54%

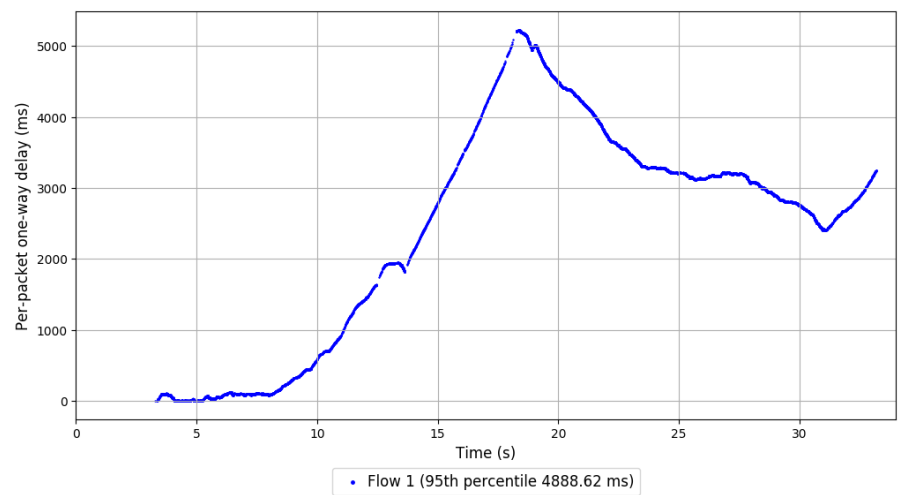
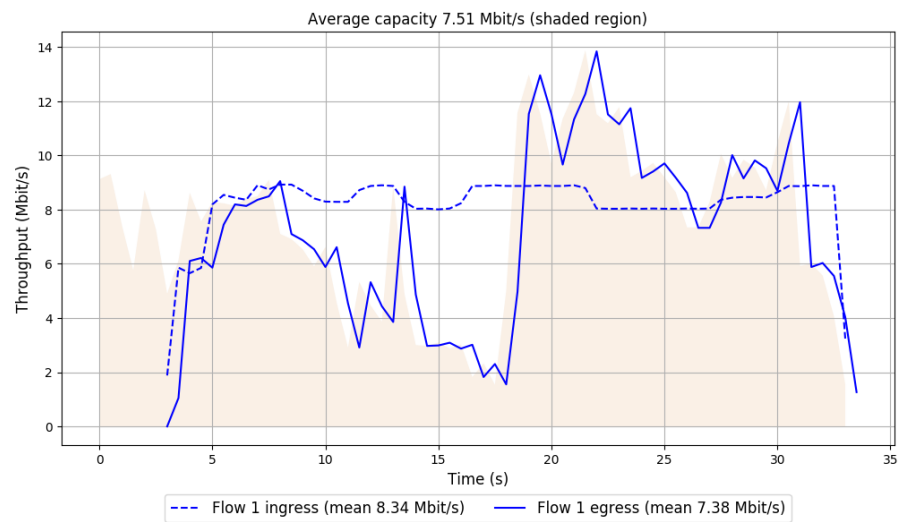
-- Flow 1:

Average throughput: 7.38 Mbit/s

95th percentile per-packet one-way delay: 4888.622 ms

Loss rate: 11.54%

Run 1: Report of Aurora — Data Link



Run 1: Statistics of TCP BBR

Start at: 2019-07-31 02:30:18

End at: 2019-07-31 02:30:48

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 6.92 Mbit/s (92.1% utilization)

95th percentile per-packet one-way delay: 35.328 ms

Loss rate: 0.07%

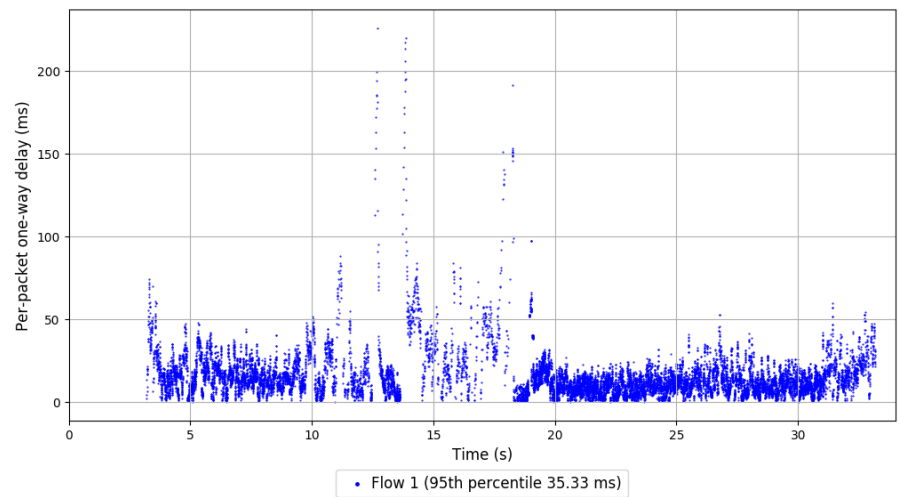
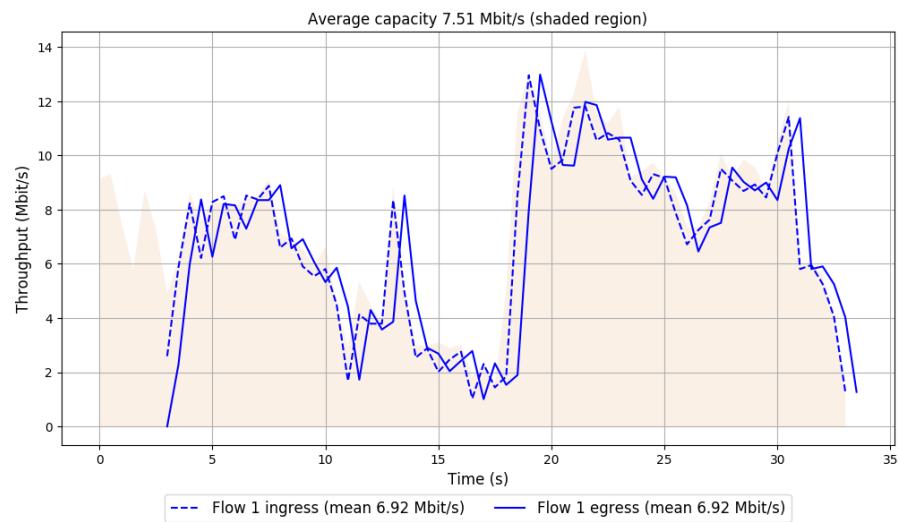
-- Flow 1:

Average throughput: 6.92 Mbit/s

95th percentile per-packet one-way delay: 35.328 ms

Loss rate: 0.07%

Run 1: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2019-07-31 02:25:11

End at: 2019-07-31 02:25:41

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 6.34 Mbit/s (84.4% utilization)

95th percentile per-packet one-way delay: 344.106 ms

Loss rate: 0.74%

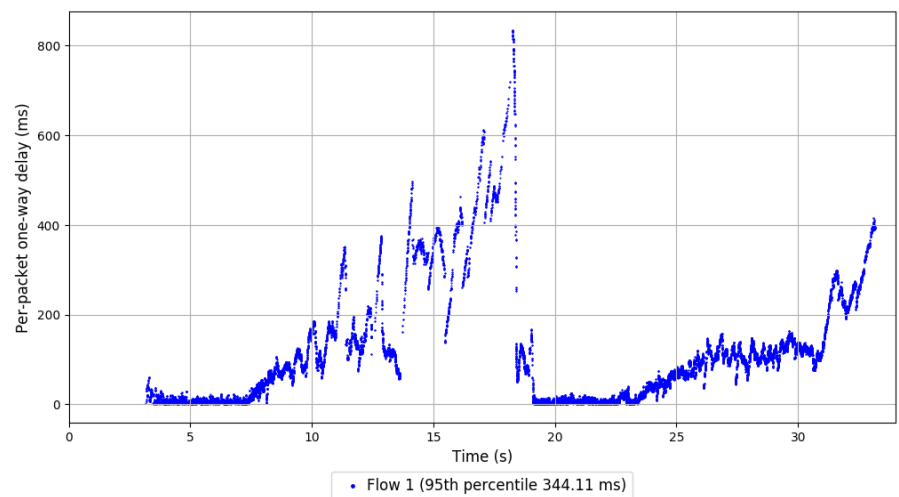
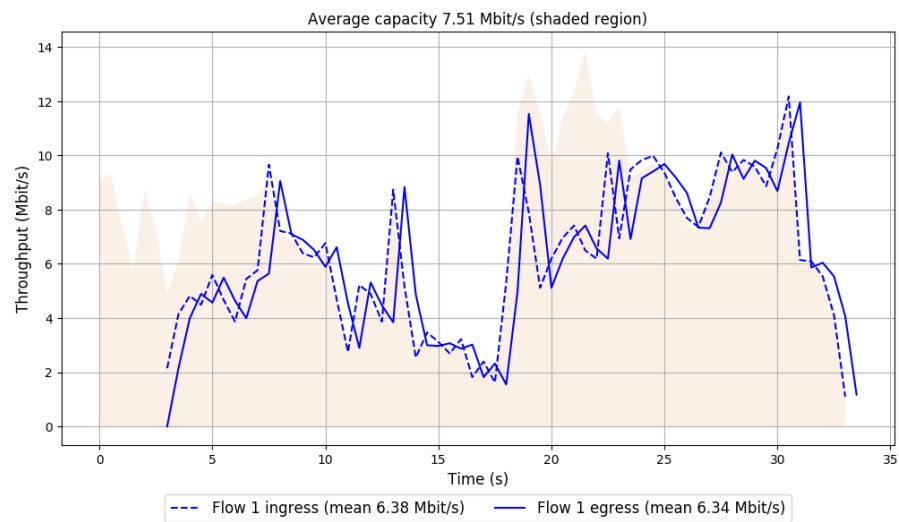
-- Flow 1:

Average throughput: 6.34 Mbit/s

95th percentile per-packet one-way delay: 344.106 ms

Loss rate: 0.74%

Run 1: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2019-07-31 02:27:27

End at: 2019-07-31 02:27:58

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 7.48 Mbit/s (99.5% utilization)

95th percentile per-packet one-way delay: 2404.484 ms

Loss rate: 8.84%

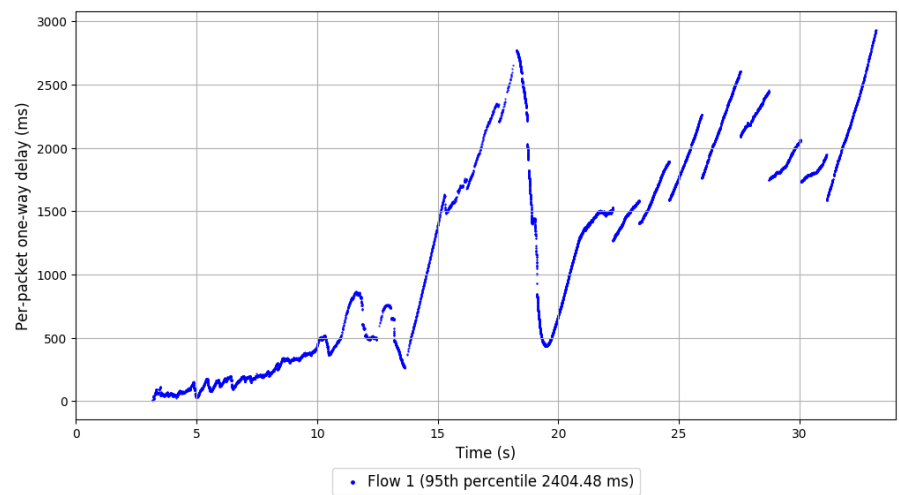
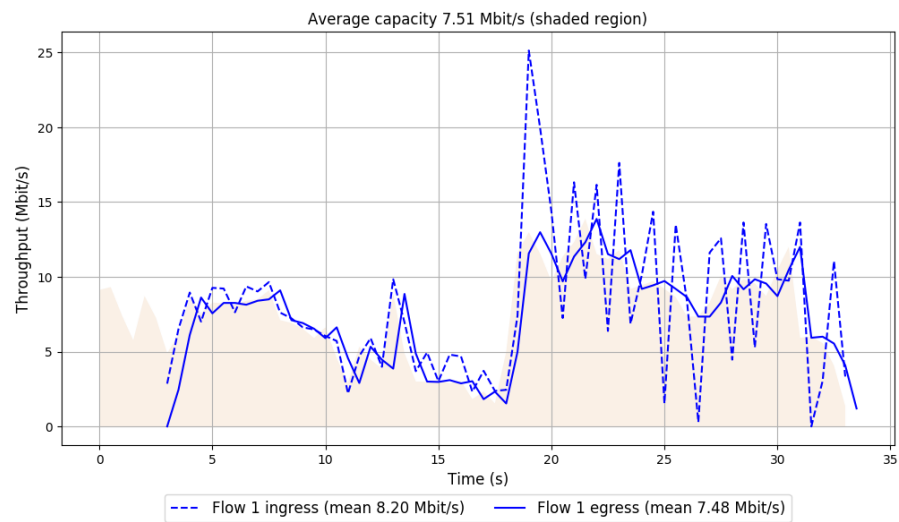
-- Flow 1:

Average throughput: 7.48 Mbit/s

95th percentile per-packet one-way delay: 2404.484 ms

Loss rate: 8.84%

Run 1: Report of TCP Cubic — Data Link



Run 1: Statistics of Eagle

Start at: 2019-07-31 02:24:03

End at: 2019-07-31 02:24:33

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 5.67 Mbit/s (75.5% utilization)

95th percentile per-packet one-way delay: 127.862 ms

Loss rate: 0.26%

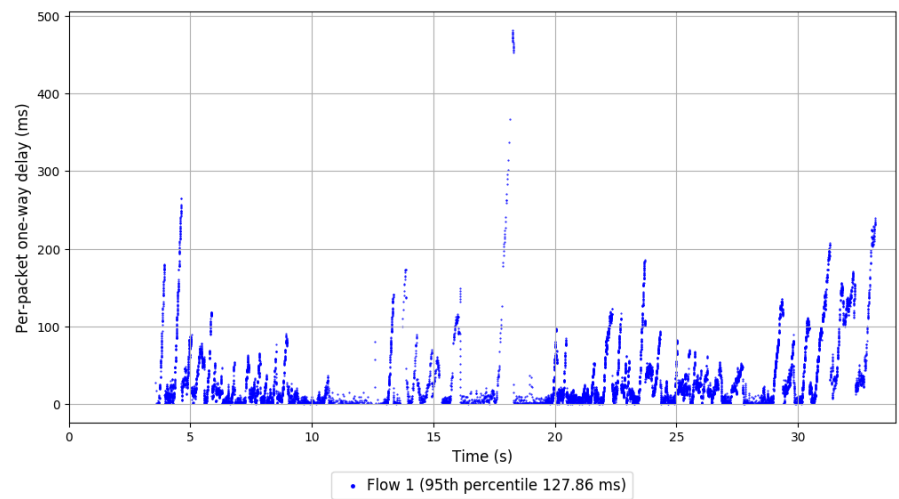
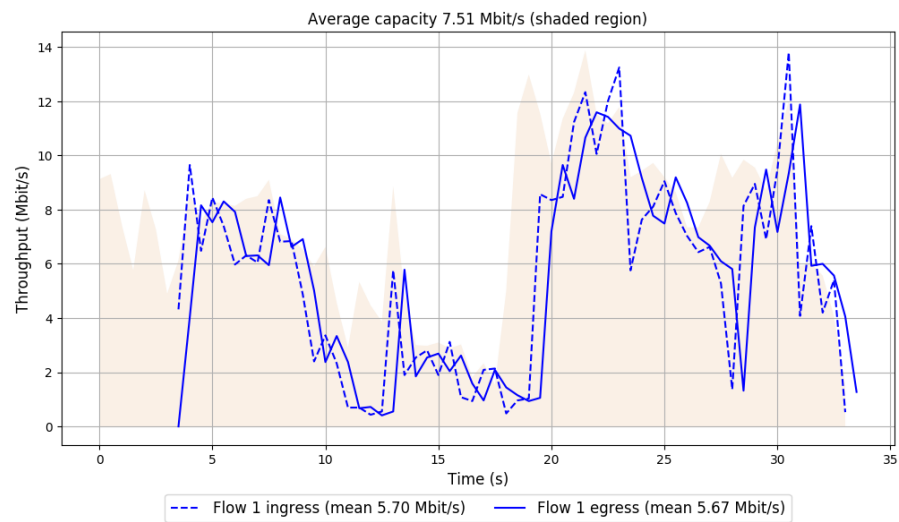
-- Flow 1:

Average throughput: 5.67 Mbit/s

95th percentile per-packet one-way delay: 127.862 ms

Loss rate: 0.26%

Run 1: Report of Eagle — Data Link

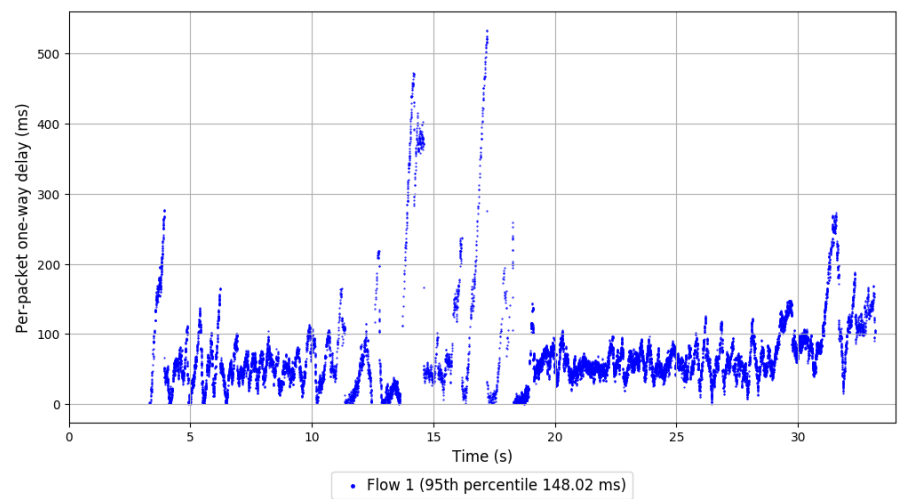
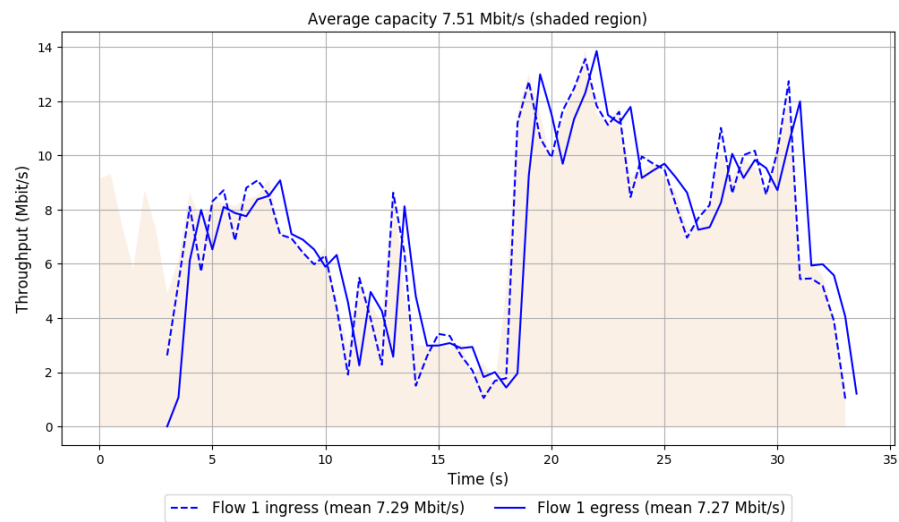


```
Run 1: Statistics of FillP

Start at: 2019-07-31 02:32:00
End at: 2019-07-31 02:32:30

# Below is generated by plot.py at 2019-07-31 02:40:56
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 7.27 Mbit/s (96.9% utilization)
95th percentile per-packet one-way delay: 148.018 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 7.27 Mbit/s
95th percentile per-packet one-way delay: 148.018 ms
Loss rate: 0.17%
```

Run 1: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-07-31 02:24:37

End at: 2019-07-31 02:25:07

Below is generated by plot.py at 2019-07-31 02:40:56

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 3.66 Mbit/s (48.8% utilization)

95th percentile per-packet one-way delay: 220.142 ms

Loss rate: 0.02%

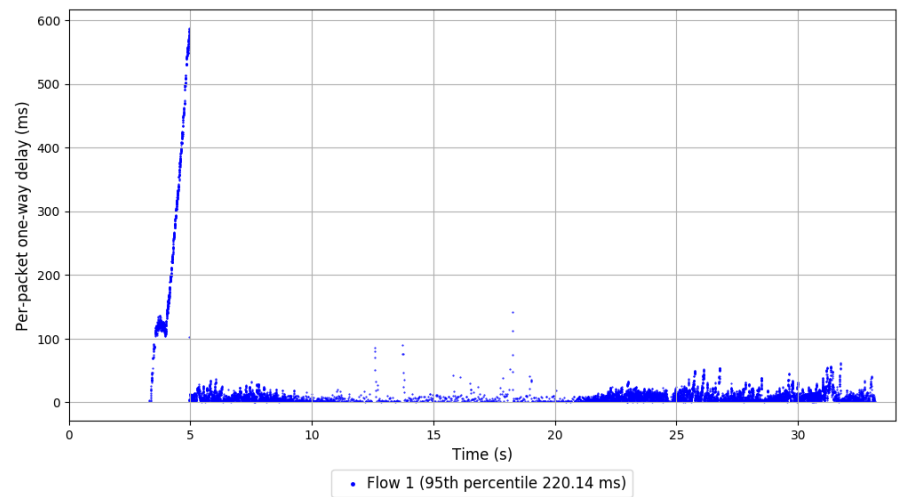
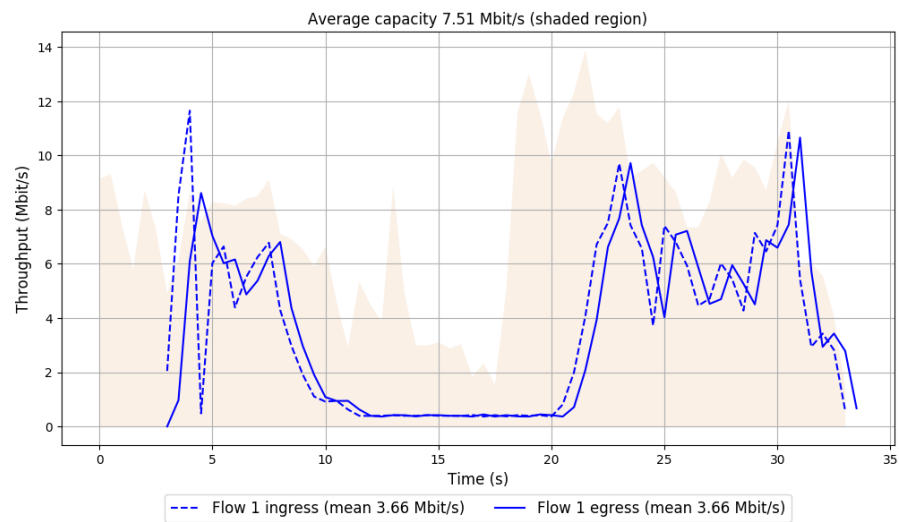
-- Flow 1:

Average throughput: 3.66 Mbit/s

95th percentile per-packet one-way delay: 220.142 ms

Loss rate: 0.02%

Run 1: Report of FillP-Sheep — Data Link



Run 1: Statistics of GOLD

Start at: 2019-07-31 02:26:53

End at: 2019-07-31 02:27:23

Below is generated by plot.py at 2019-07-31 02:40:59

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 7.51 Mbit/s (100.1% utilization)

95th percentile per-packet one-way delay: 1463.193 ms

Loss rate: 4.90%

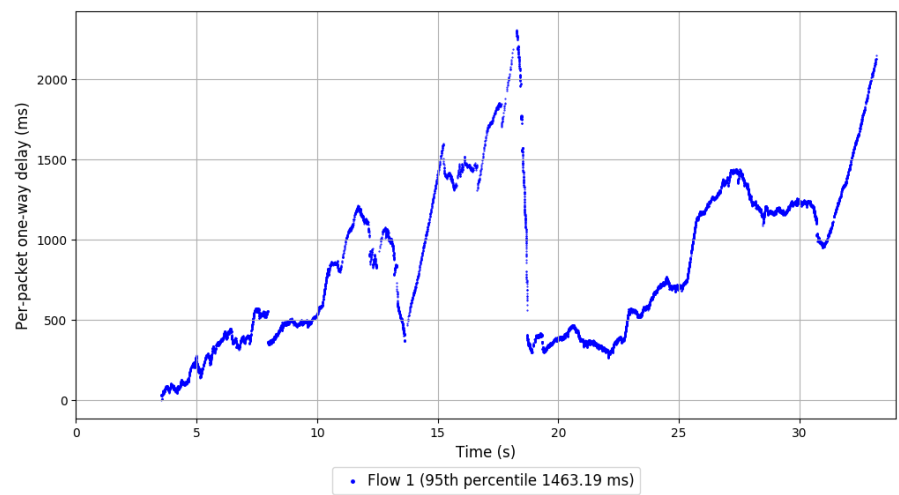
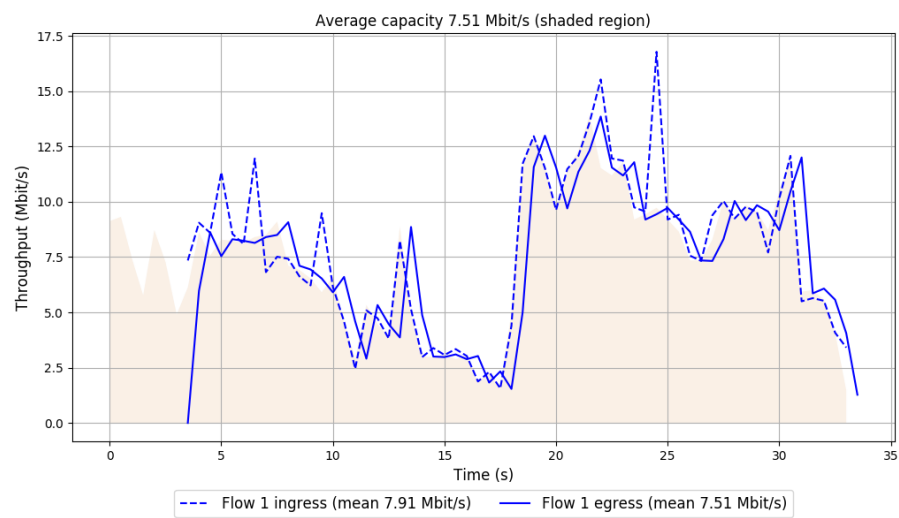
-- Flow 1:

Average throughput: 7.51 Mbit/s

95th percentile per-packet one-way delay: 1463.193 ms

Loss rate: 4.90%

Run 1: Report of GOLD — Data Link

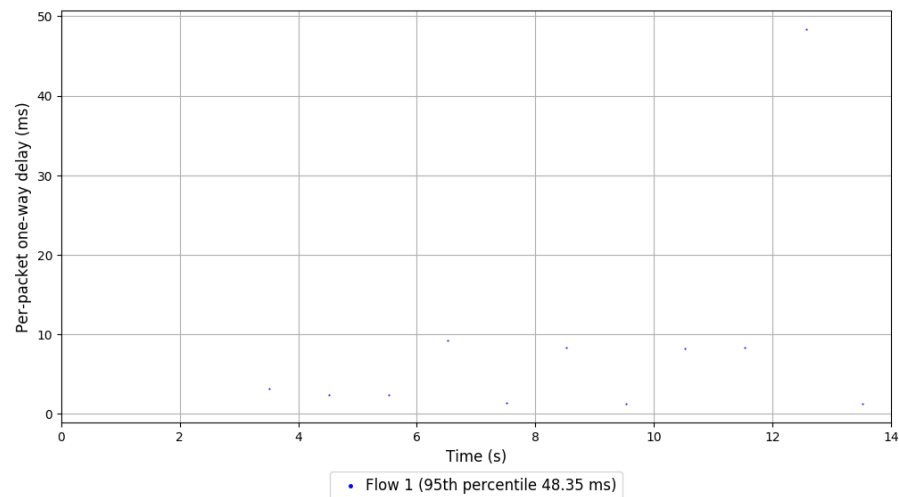
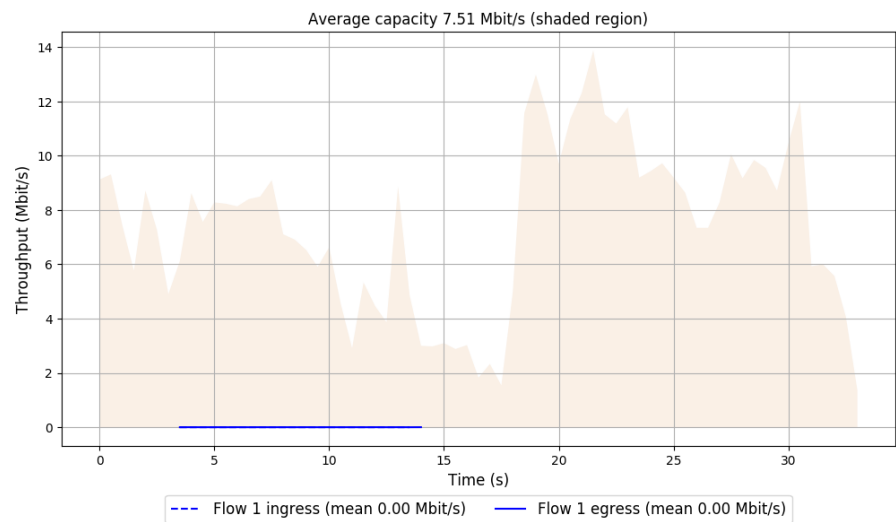


Run 1: Statistics of GoldLSTM

Start at: 2019-07-31 02:30:52

End at: 2019-07-31 02:31:22

Run 1: Report of GoldLSTM — Data Link

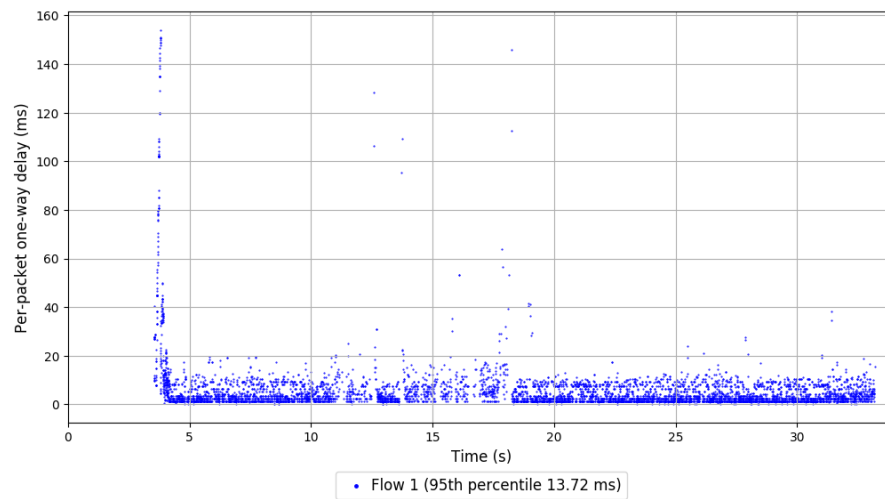
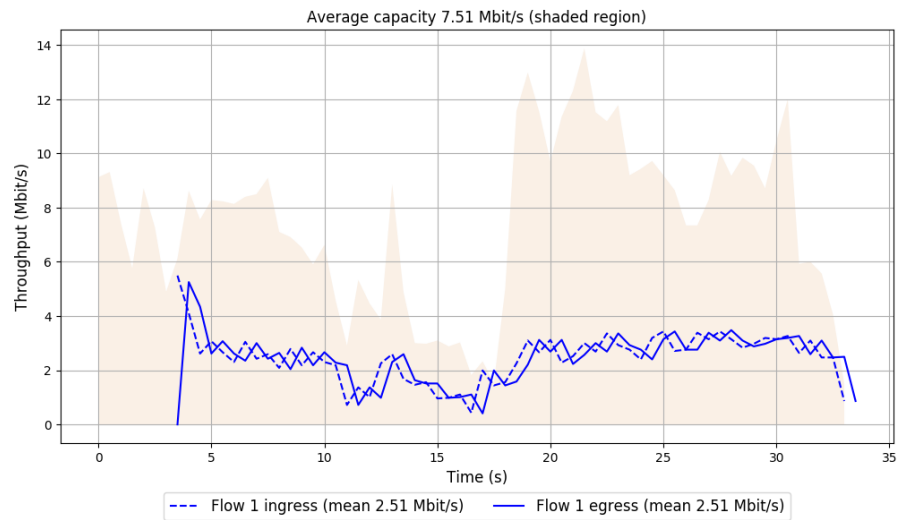


```
Run 1: Statistics of Indigo

Start at: 2019-07-31 02:25:45
End at: 2019-07-31 02:26:15

# Below is generated by plot.py at 2019-07-31 02:40:59
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 2.51 Mbit/s (33.4% utilization)
95th percentile per-packet one-way delay: 13.722 ms
Loss rate: 0.02%
-- Flow 1:
Average throughput: 2.51 Mbit/s
95th percentile per-packet one-way delay: 13.722 ms
Loss rate: 0.02%
```

Run 1: Report of Indigo — Data Link

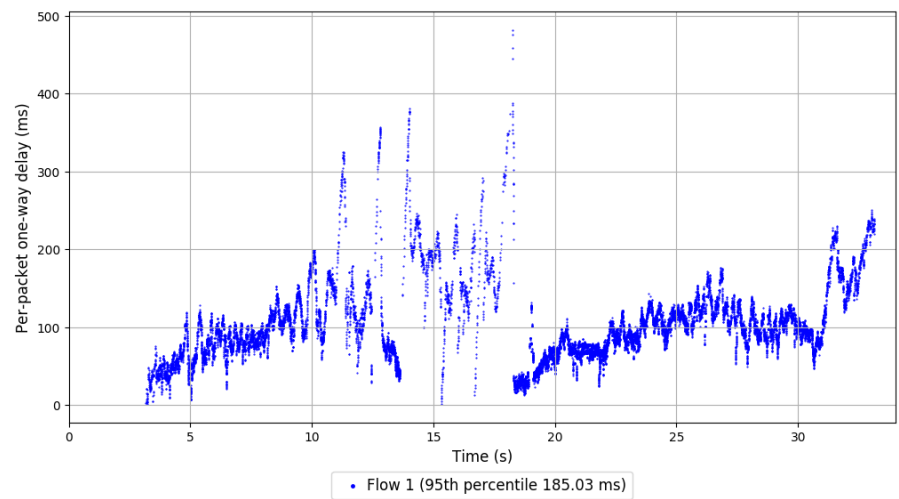
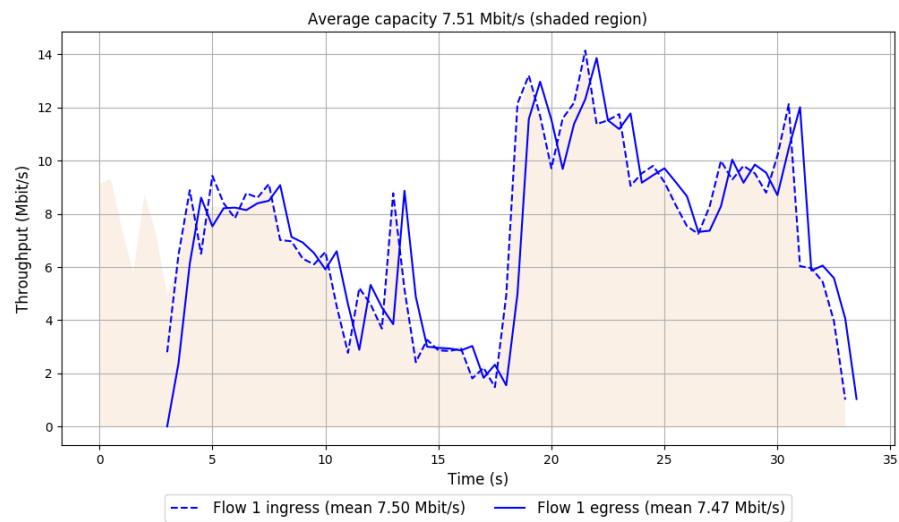



```
Run 1: Statistics of LEDBAT

Start at: 2019-07-31 02:34:50
End at: 2019-07-31 02:35:20

# Below is generated by plot.py at 2019-07-31 02:41:03
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 7.47 Mbit/s (99.4% utilization)
95th percentile per-packet one-way delay: 185.033 ms
Loss rate: 0.37%
-- Flow 1:
Average throughput: 7.47 Mbit/s
95th percentile per-packet one-way delay: 185.033 ms
Loss rate: 0.37%
```

Run 1: Report of LEDBAT — Data Link

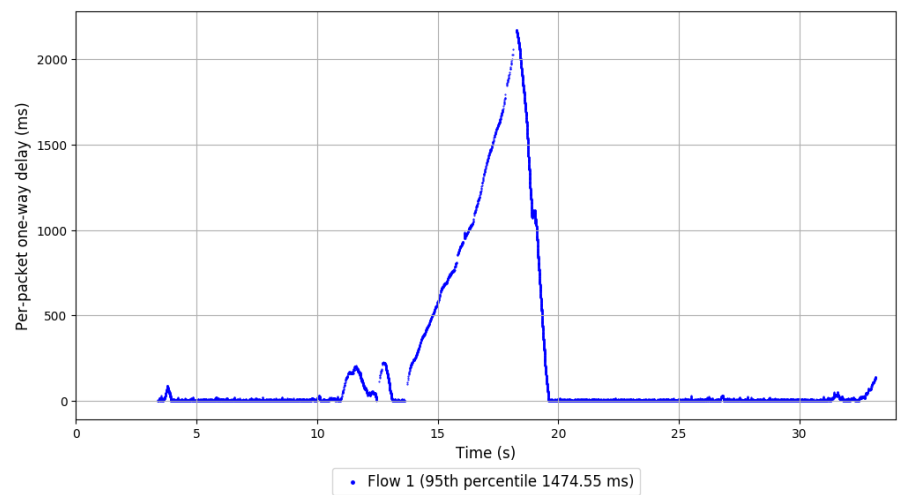
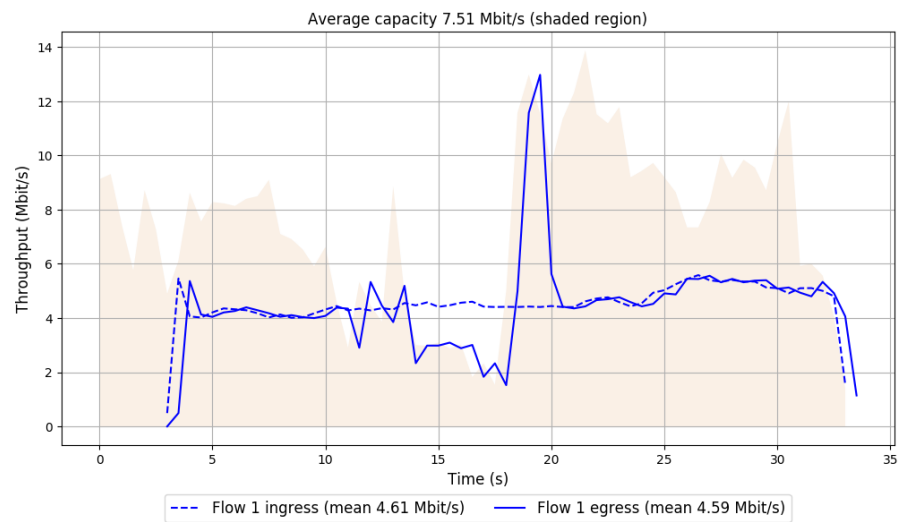


```
Run 1: Statistics of PCC-Allegro

Start at: 2019-07-31 02:33:42
End at: 2019-07-31 02:34:12

# Below is generated by plot.py at 2019-07-31 02:41:03
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 4.59 Mbit/s (61.1% utilization)
95th percentile per-packet one-way delay: 1474.546 ms
Loss rate: 0.48%
-- Flow 1:
Average throughput: 4.59 Mbit/s
95th percentile per-packet one-way delay: 1474.546 ms
Loss rate: 0.48%
```

Run 1: Report of PCC-Allegro — Data Link

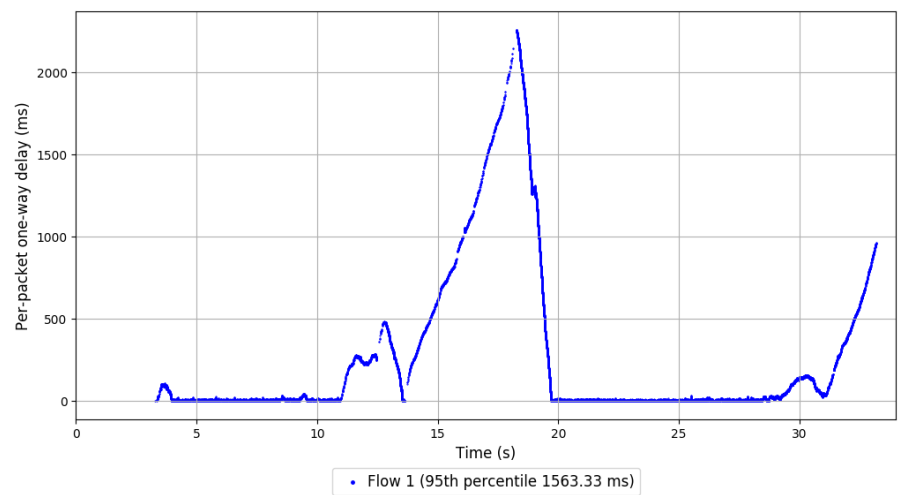
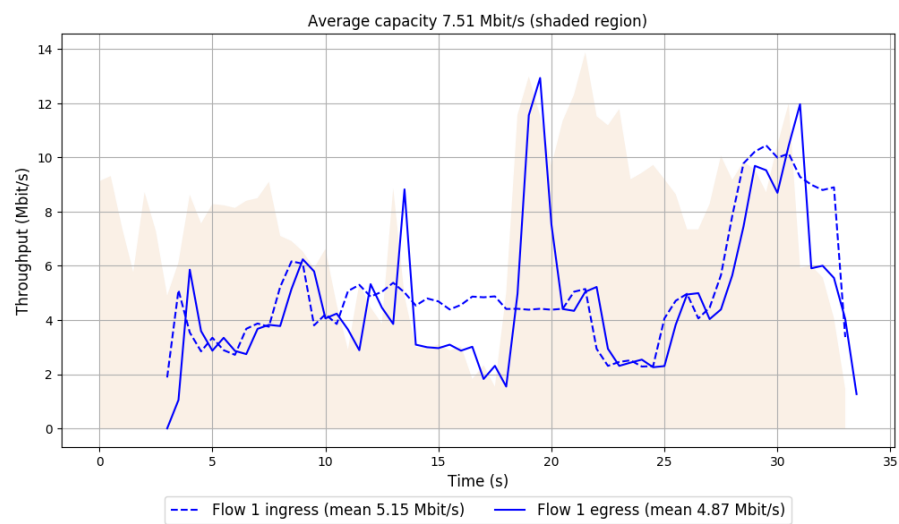


```
Run 1: Statistics of PCC-Expr

Start at: 2019-07-31 02:35:24
End at: 2019-07-31 02:35:54

# Below is generated by plot.py at 2019-07-31 02:41:11
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 4.87 Mbit/s (64.8% utilization)
95th percentile per-packet one-way delay: 1563.331 ms
Loss rate: 5.62%
-- Flow 1:
Average throughput: 4.87 Mbit/s
95th percentile per-packet one-way delay: 1563.331 ms
Loss rate: 5.62%
```

Run 1: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2019-07-31 02:33:08

End at: 2019-07-31 02:33:38

Run 1: Report of QUIC Cubic — Data Link

Figure is missing

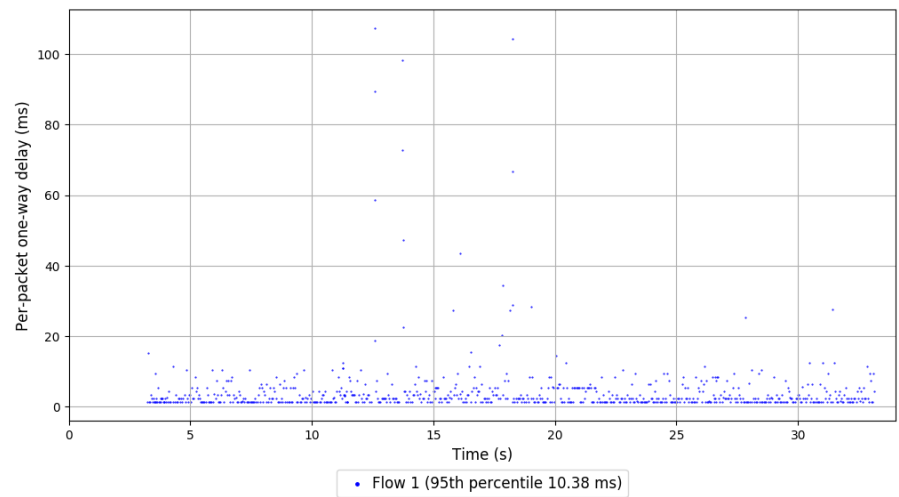
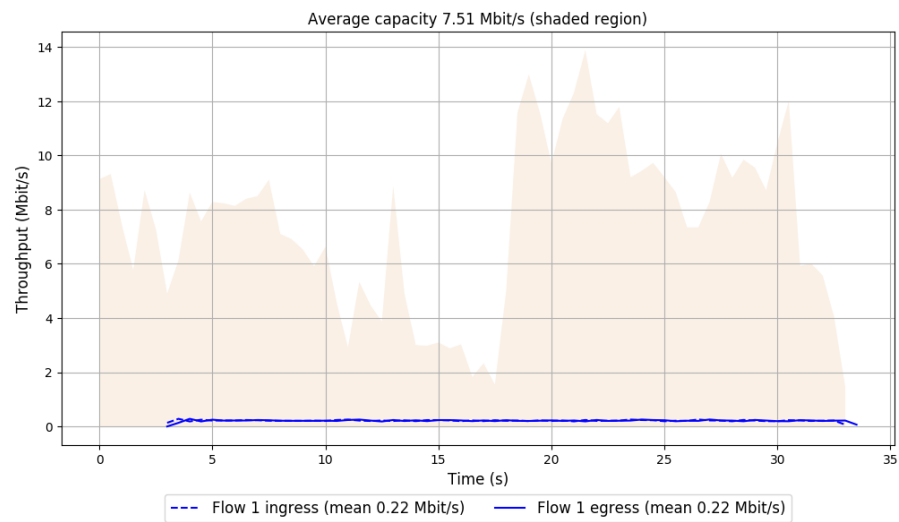
Figure is missing


```
Run 1: Statistics of SCReAM

Start at: 2019-07-31 02:32:34
End at: 2019-07-31 02:33:04

# Below is generated by plot.py at 2019-07-31 02:41:11
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 0.22 Mbit/s (2.9% utilization)
95th percentile per-packet one-way delay: 10.379 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 10.379 ms
Loss rate: 0.00%
```

Run 1: Report of SReAM — Data Link

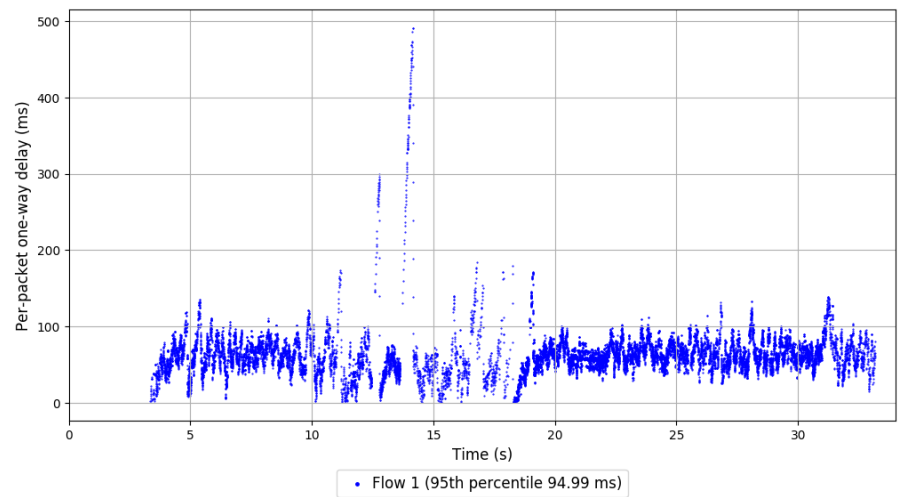
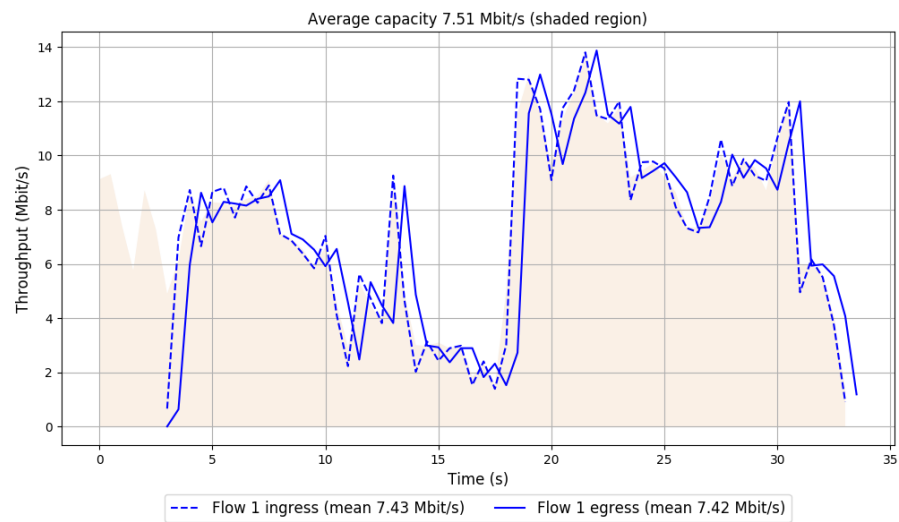


```
Run 1: Statistics of Sprout

Start at: 2019-07-31 02:28:02
End at: 2019-07-31 02:28:32

# Below is generated by plot.py at 2019-07-31 02:41:12
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 7.42 Mbit/s (98.8% utilization)
95th percentile per-packet one-way delay: 94.993 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 7.42 Mbit/s
95th percentile per-packet one-way delay: 94.993 ms
Loss rate: 0.04%
```

Run 1: Report of Sprout — Data Link

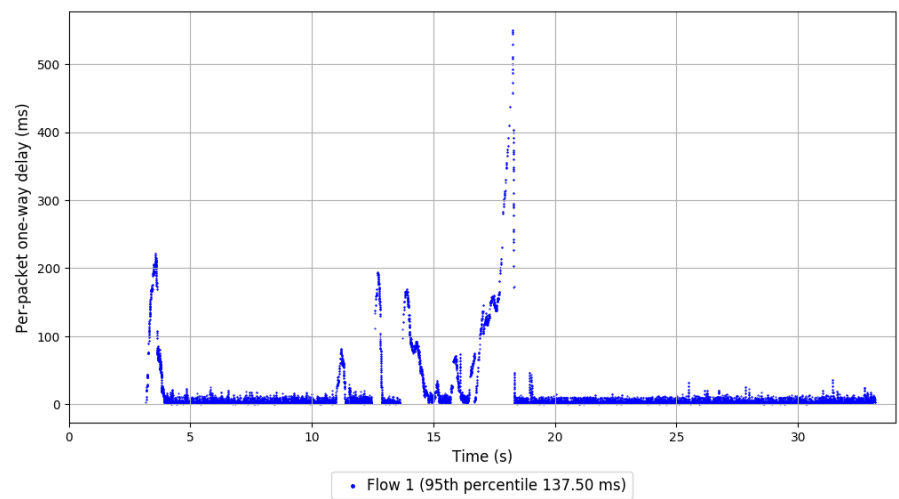
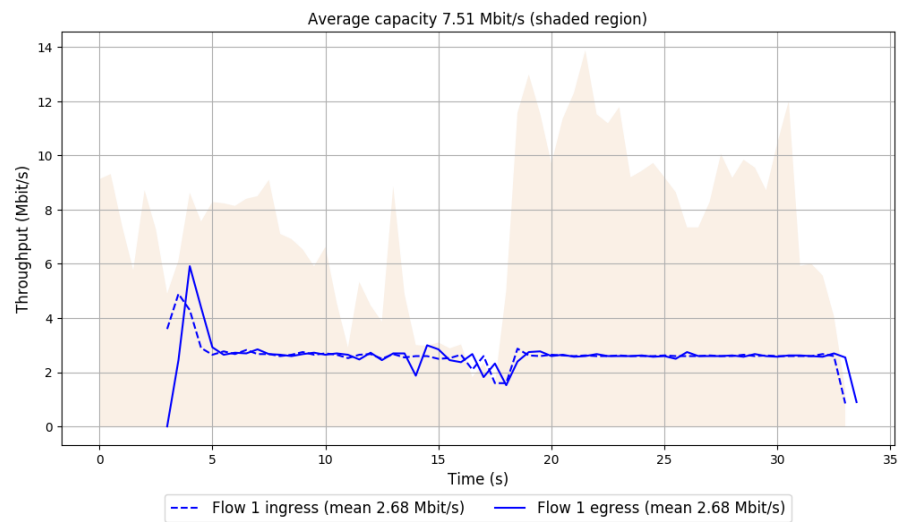


```
Run 1: Statistics of TaoVA-100x

Start at: 2019-07-31 02:31:26
End at: 2019-07-31 02:31:56

# Below is generated by plot.py at 2019-07-31 02:41:12
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 2.68 Mbit/s (35.7% utilization)
95th percentile per-packet one-way delay: 137.498 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 2.68 Mbit/s
95th percentile per-packet one-way delay: 137.498 ms
Loss rate: 0.00%
```

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



Run 1: Statistics of TCP Vegas

Start at: 2019-07-31 02:29:44

End at: 2019-07-31 02:30:14

Below is generated by plot.py at 2019-07-31 02:41:12

Datalink statistics

-- Total of 1 flow:

Average capacity: 7.51 Mbit/s

Average throughput: 3.05 Mbit/s (40.6% utilization)

95th percentile per-packet one-way delay: 13.777 ms

Loss rate: 0.03%

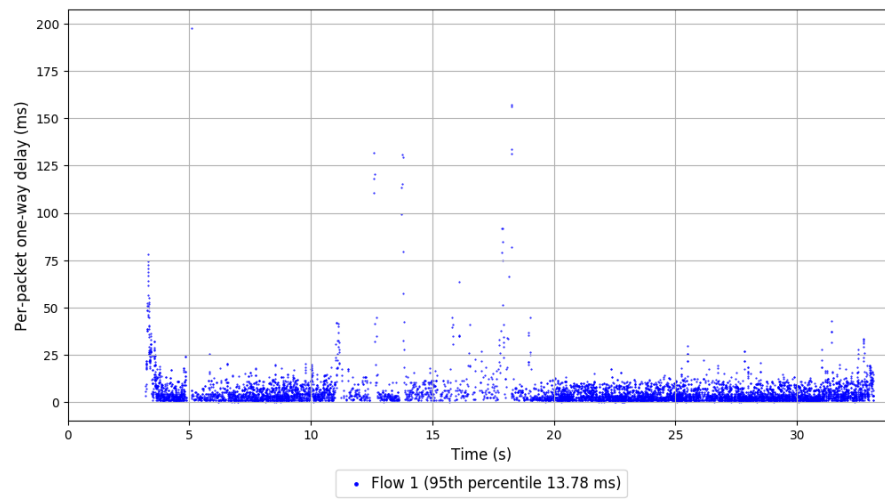
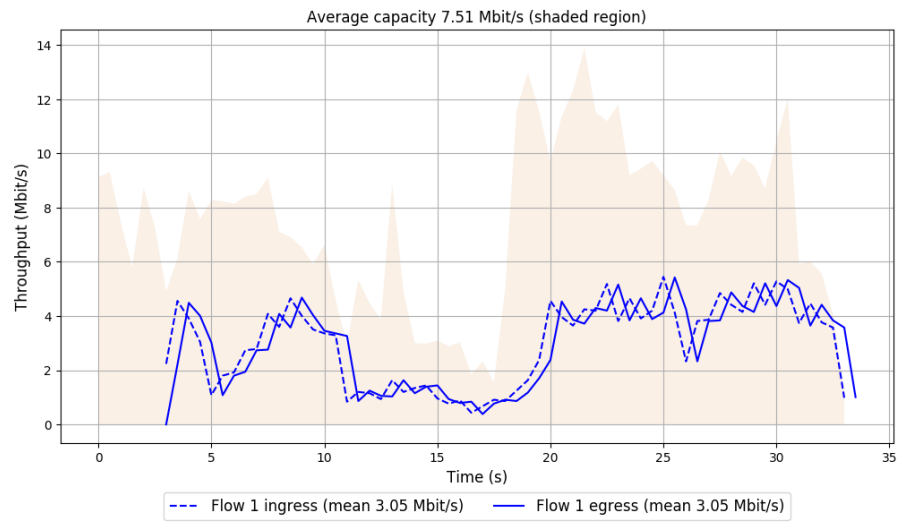
-- Flow 1:

Average throughput: 3.05 Mbit/s

95th percentile per-packet one-way delay: 13.777 ms

Loss rate: 0.03%

Run 1: Report of TCP Vegas — Data Link

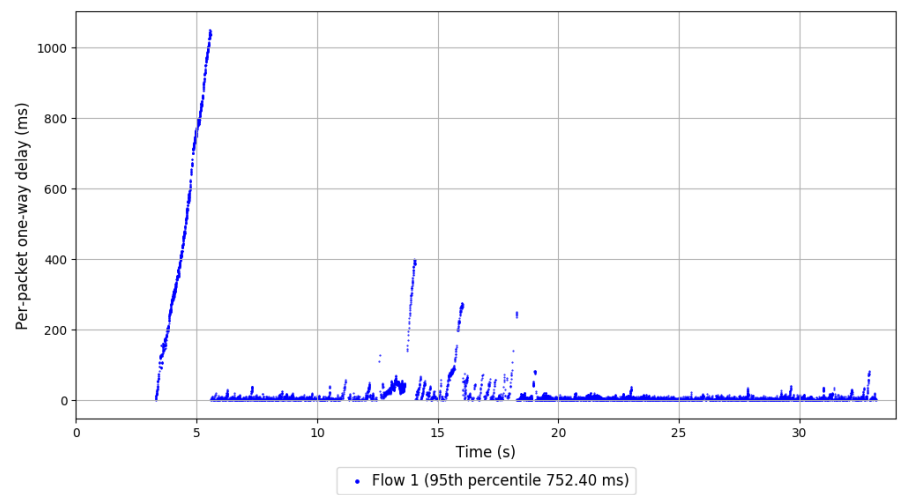
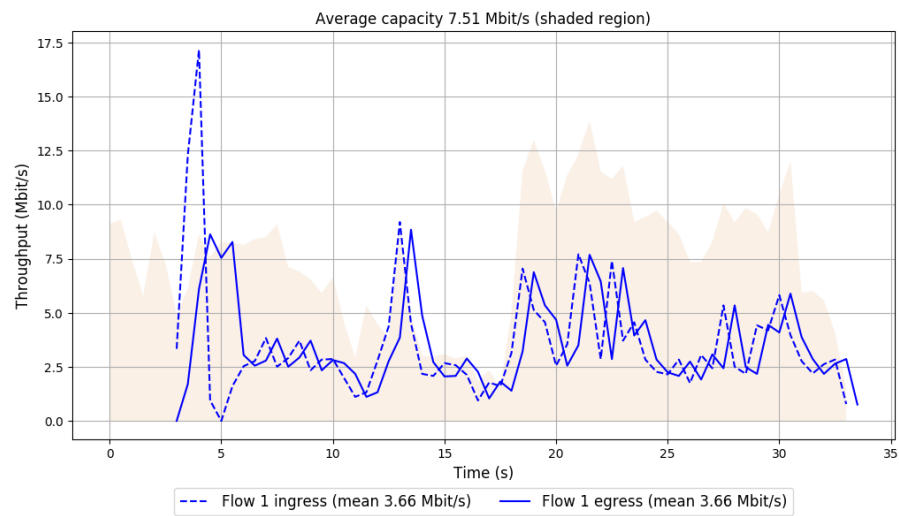



```
Run 1: Statistics of Verus

Start at: 2019-07-31 02:26:19
End at: 2019-07-31 02:26:49

# Below is generated by plot.py at 2019-07-31 02:41:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 3.66 Mbit/s (48.7% utilization)
95th percentile per-packet one-way delay: 752.403 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 3.66 Mbit/s
95th percentile per-packet one-way delay: 752.403 ms
Loss rate: 0.01%
```

Run 1: Report of Verus — Data Link

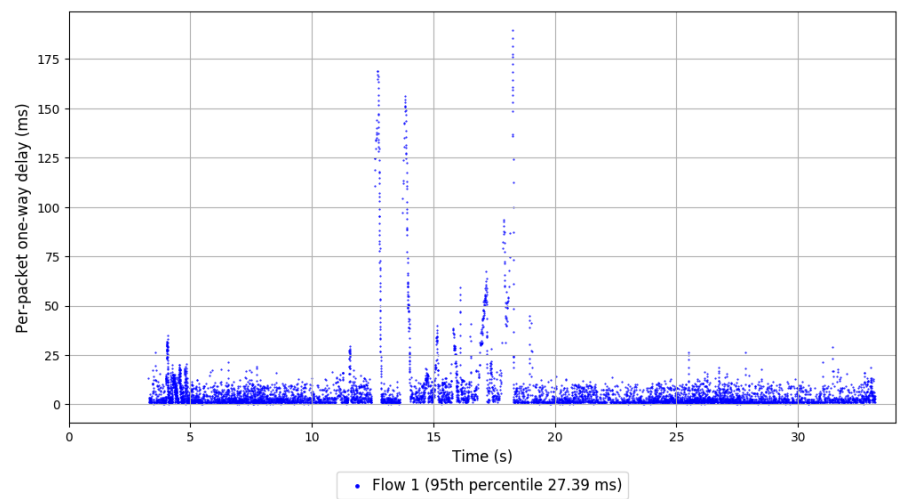
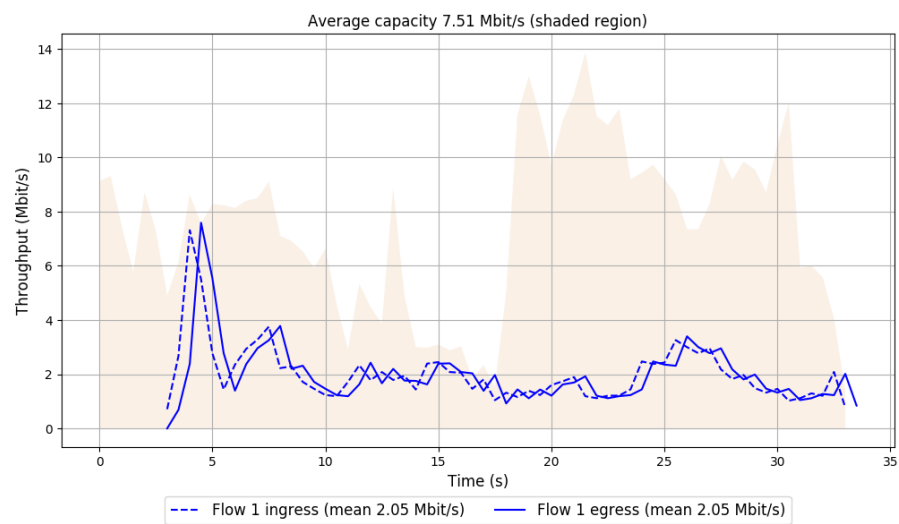


```
Run 1: Statistics of PCC-Vivace

Start at: 2019-07-31 02:29:10
End at: 2019-07-31 02:29:40

# Below is generated by plot.py at 2019-07-31 02:41:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 2.05 Mbit/s (27.3% utilization)
95th percentile per-packet one-way delay: 27.387 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 2.05 Mbit/s
95th percentile per-packet one-way delay: 27.387 ms
Loss rate: 0.00%
```

Run 1: Report of PCC-Vivace — Data Link



```
Run 1: Statistics of WebRTC media

Start at: 2019-07-31 02:34:16
End at: 2019-07-31 02:34:46

# Below is generated by plot.py at 2019-07-31 02:41:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 7.51 Mbit/s
Average throughput: 0.05 Mbit/s (0.7% utilization)
95th percentile per-packet one-way delay: 53.646 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 53.646 ms
Loss rate: 0.00%
```

Run 1: Report of WebRTC media — Data Link

