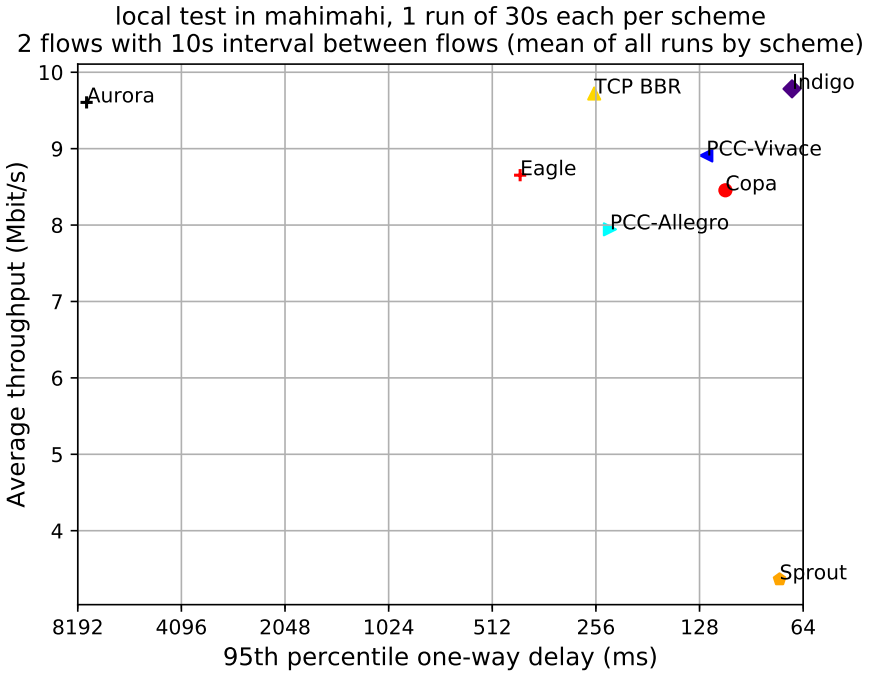
Pantheon Report

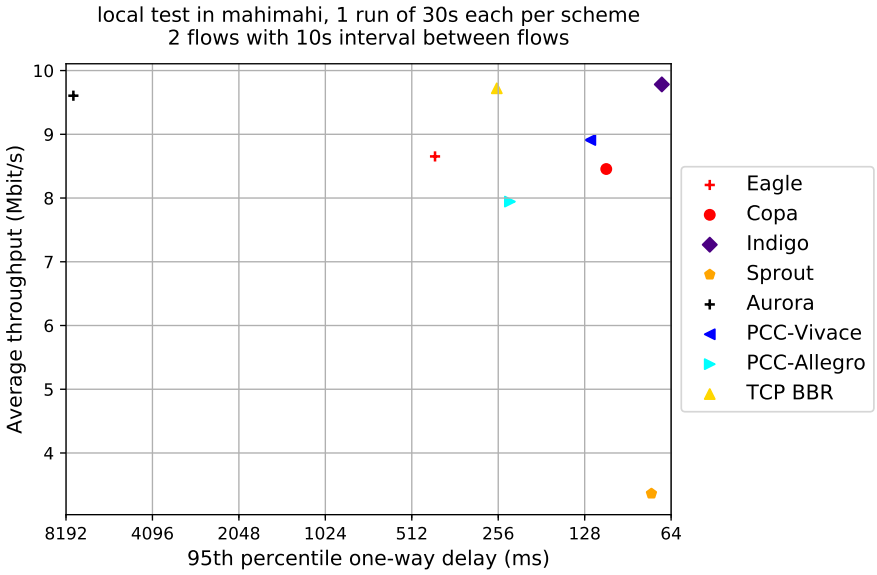
Generated at 2019-07-31 13:43:00 (UTC).
Tested in mahimahi: `mm-delay 50 mm-link 10mbps.trace 10mbps.trace`
Repeated the test of 8 congestion control schemes once.
Each test lasted for 30 seconds running 2 flows with 10-second interval between two flows.

```
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 @ 3600b7ed7f0c6f1265297fcee29e415b825f58af
third_party/aurora @ f3e943d61015b39960854ba6391797e0c7984d74
third_party/aurora-model @ e292c316c23fb837255c4e142e40590d154bbe95
third_party/eagle @ f66d3a824f0abdd3b1d0afc0cc323607b2c38eca
 M sender-receiver/sender-receiver/sender_receiver/envs/example-xentropy.py
 D sender-receiver/sender-receiver/sender_receiver/envs/model-xentropy.pt
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, 1 run of 30s each per scheme
2 flows with 10s interval between flows (mean of all runs by scheme)
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
Aurora
TCP BBR
Indigo
PCC-Vivace
Eagle
Copa
PCC-Allegro
Sprout
10
9
8
7
6
5
4
8192
4096
2048
1024
512
256
128
64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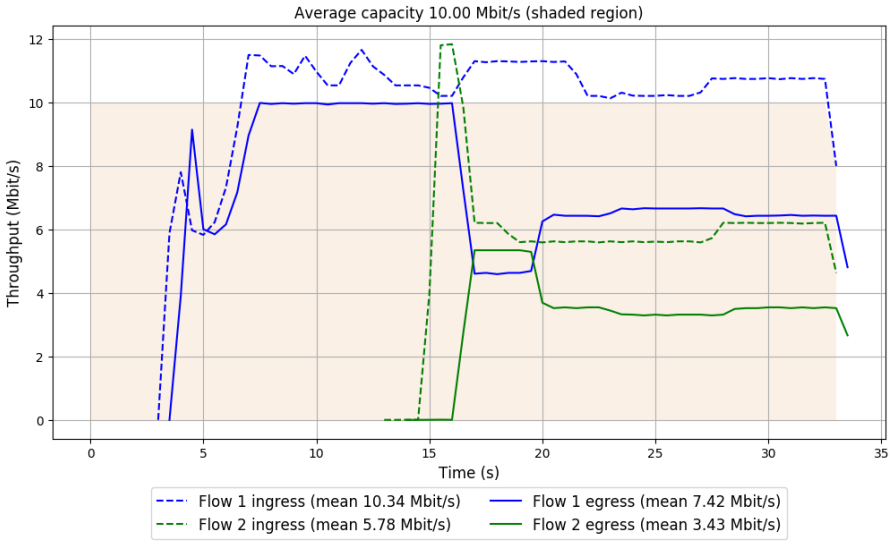
scheme	# runs	mean avg tput (Mbit/s)		mean 95th-%ile delay (ms)		mean loss rate (%)	
		flow 1	flow 2	flow 1	flow 2	flow 1	flow 2
Aurora	1	7.42	3.43	7617.27	7911.52	28.34	43.13
TCP BBR	1	7.21	3.79	258.49	267.07	0.46	0.93
Copa	1	5.06	5.10	113.99	98.12	0.08	0.37
Eagle	1	7.28	2.08	447.50	290.86	0.24	0.15
Indigo	1	6.88	4.38	69.47	68.54	0.13	0.33
PCC-Allegro	1	4.96	4.50	219.51	248.68	0.18	0.27
Sprout	1	2.10	1.91	74.42	76.05	0.42	0.17
PCC-Vivace	1	6.54	3.57	124.89	118.55	0.13	0.26

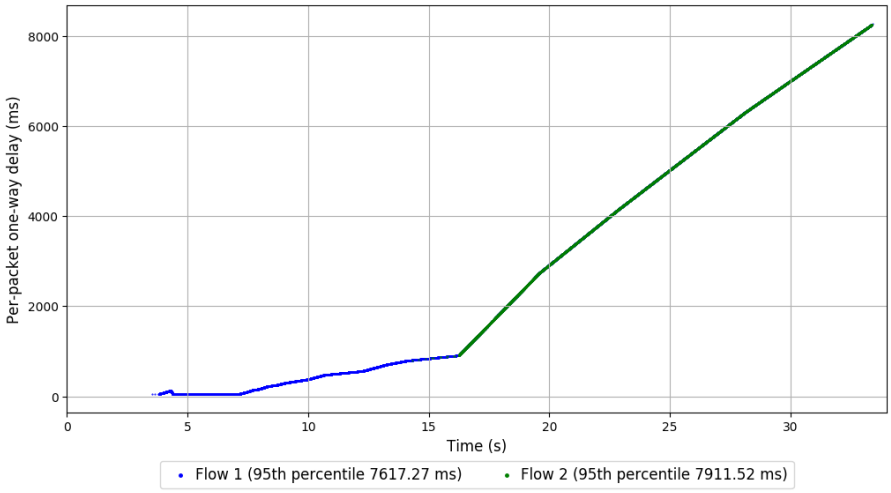
```
Run 1: Statistics of Aurora

Start at: 2019-07-31 06:10:23
End at: 2019-07-31 06:10:53

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 9.61 Mbit/s (96.1% utilization)
95th percentile per-packet one-way delay: 7721.713 ms
Loss rate: 32.35%
-- Flow 1:
Average throughput: 7.42 Mbit/s
95th percentile per-packet one-way delay: 7617.270 ms
Loss rate: 28.34%
-- Flow 2:
Average throughput: 3.43 Mbit/s
95th percentile per-packet one-way delay: 7911.520 ms
Loss rate: 43.13%
```

Run 1: Report of Aurora — Data Link



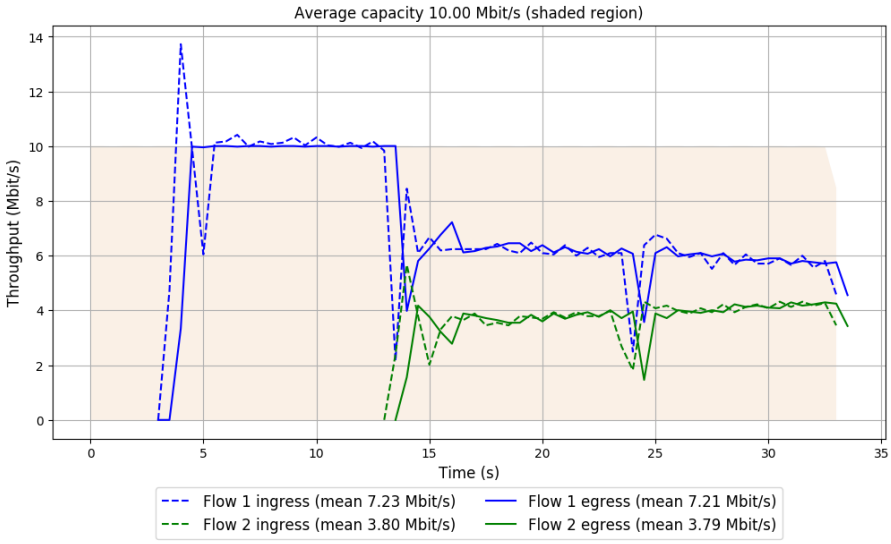


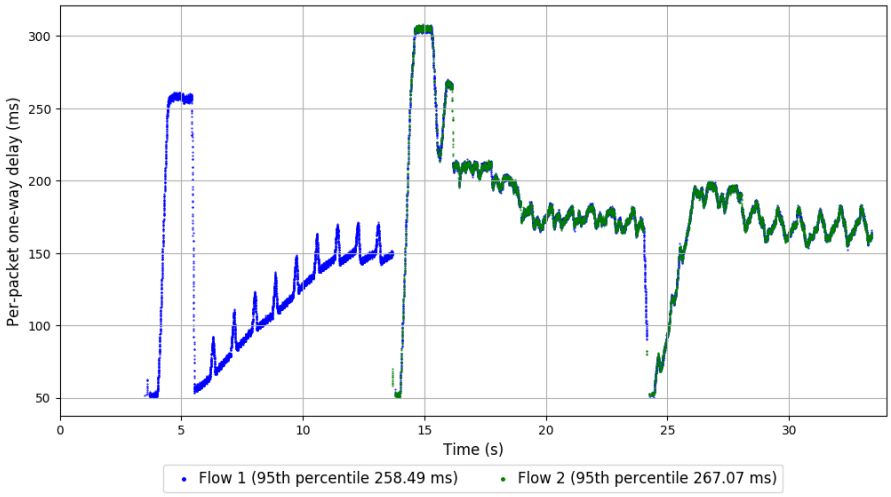
```
Run 1: Statistics of TCP BBR

Start at: 2019-07-31 06:09:49
End at: 2019-07-31 06:10:19

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 9.72 Mbit/s (97.2% utilization)
95th percentile per-packet one-way delay: 258.943 ms
Loss rate: 0.58%
-- Flow 1:
Average throughput: 7.21 Mbit/s
95th percentile per-packet one-way delay: 258.489 ms
Loss rate: 0.46%
-- Flow 2:
Average throughput: 3.79 Mbit/s
95th percentile per-packet one-way delay: 267.072 ms
Loss rate: 0.93%
```

Run 1: Report of TCP BBR — Data Link



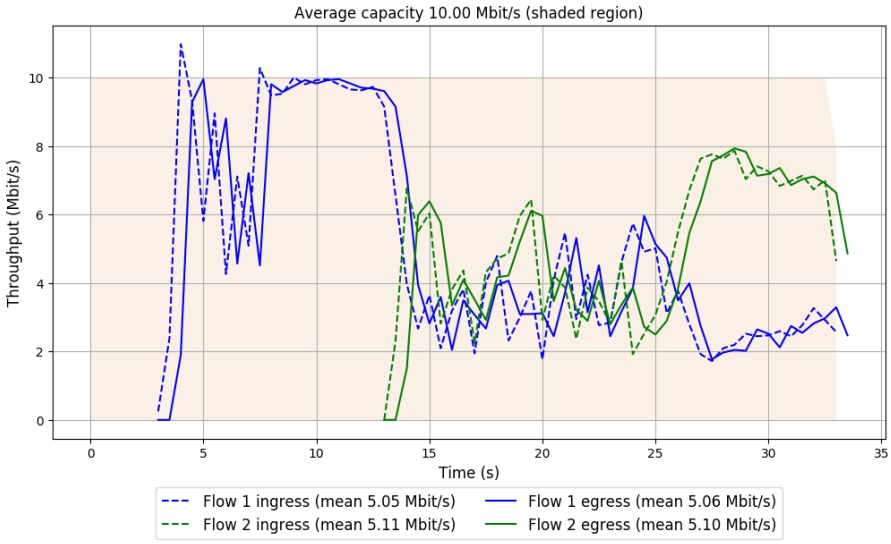


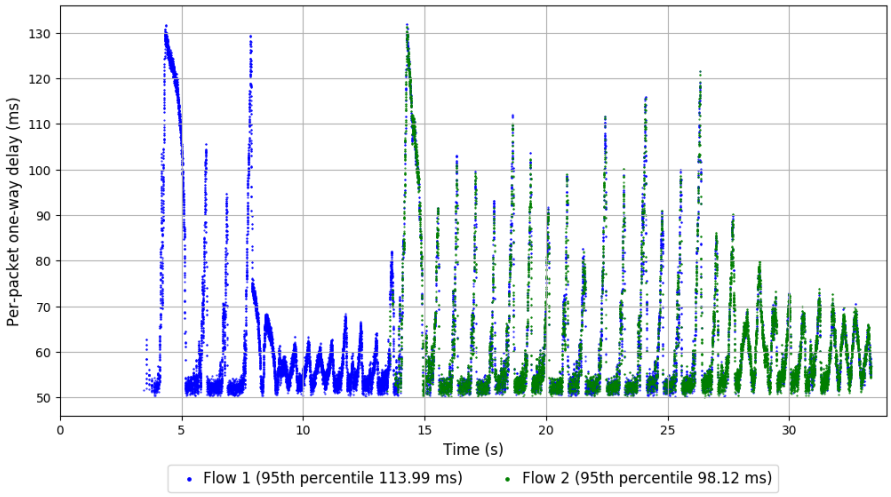
```
Run 1: Statistics of Copa

Start at: 2019-07-31 06:13:19
End at: 2019-07-31 06:13:49

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 8.46 Mbit/s (84.5% utilization)
95th percentile per-packet one-way delay: 107.660 ms
Loss rate: 0.20%
-- Flow 1:
Average throughput: 5.06 Mbit/s
95th percentile per-packet one-way delay: 113.986 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 5.10 Mbit/s
95th percentile per-packet one-way delay: 98.118 ms
Loss rate: 0.37%
```

Run 1: Report of Copa — Data Link



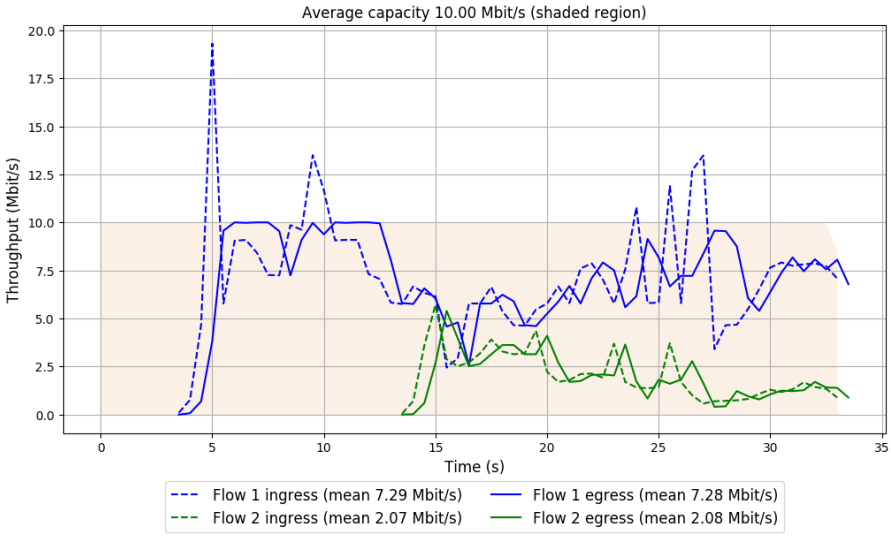


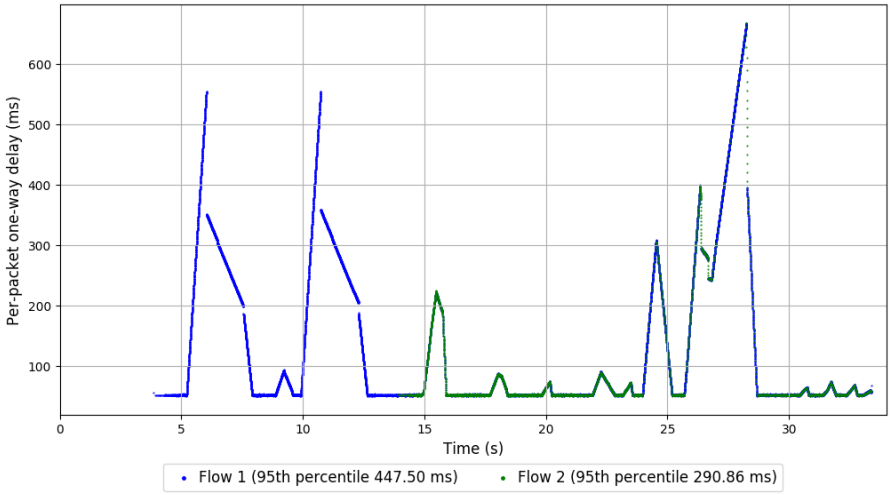
```
Run 1: Statistics of Eagle

Start at: 2019-07-31 06:09:13
End at: 2019-07-31 06:09:43

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 8.65 Mbit/s (86.5% utilization)
95th percentile per-packet one-way delay: 424.944 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 7.28 Mbit/s
95th percentile per-packet one-way delay: 447.505 ms
Loss rate: 0.24%
-- Flow 2:
Average throughput: 2.08 Mbit/s
95th percentile per-packet one-way delay: 290.855 ms
Loss rate: 0.15%
```

Run 1: Report of Eagle — Data Link



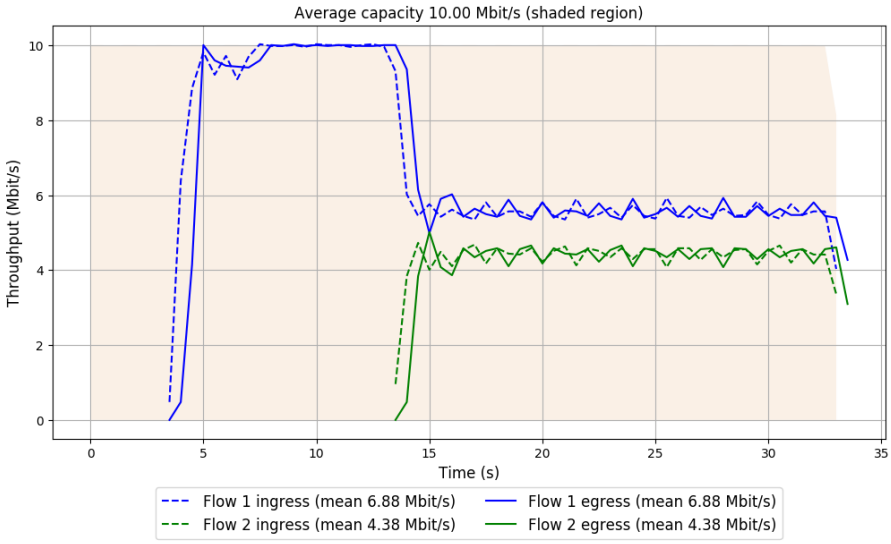


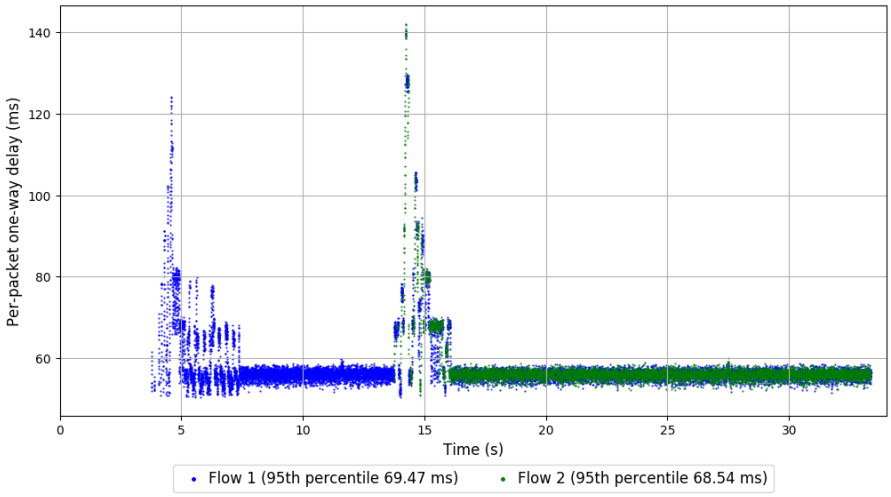
```
Run 1: Statistics of Indigo

Start at: 2019-07-31 06:10:59
End at: 2019-07-31 06:11:29

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 9.78 Mbit/s (97.8% utilization)
95th percentile per-packet one-way delay: 68.953 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 6.88 Mbit/s
95th percentile per-packet one-way delay: 69.471 ms
Loss rate: 0.13%
-- Flow 2:
Average throughput: 4.38 Mbit/s
95th percentile per-packet one-way delay: 68.540 ms
Loss rate: 0.33%
```

Run 1: Report of Indigo — Data Link



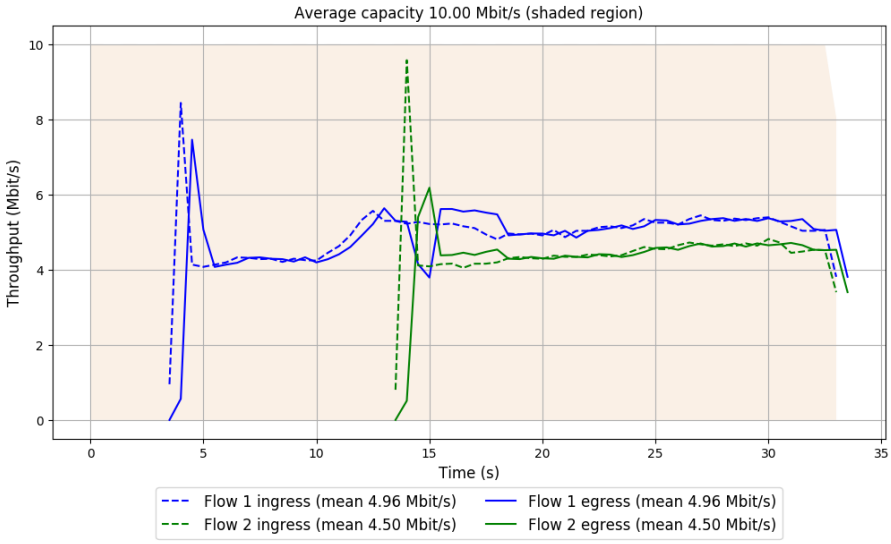


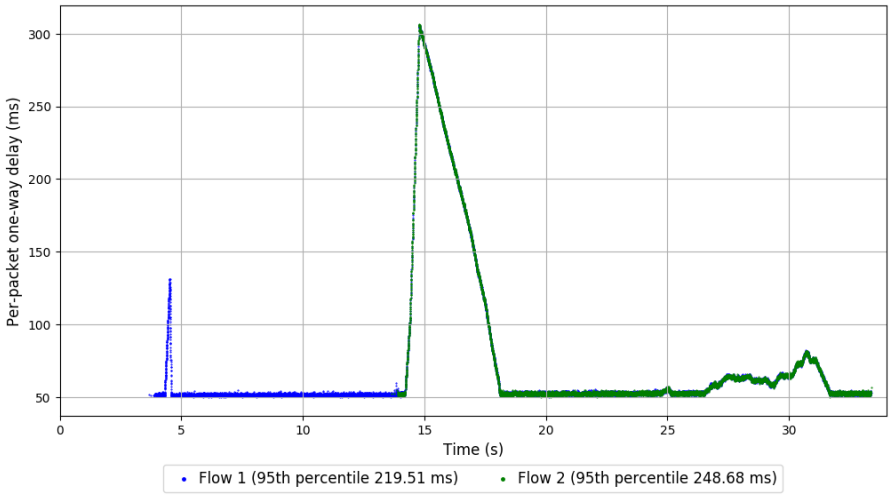
```
Run 1: Statistics of PCC-Allegro

Start at: 2019-07-31 06:11:34
End at: 2019-07-31 06:12:04

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 7.94 Mbit/s (79.4% utilization)
95th percentile per-packet one-way delay: 233.093 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 4.96 Mbit/s
95th percentile per-packet one-way delay: 219.515 ms
Loss rate: 0.18%
-- Flow 2:
Average throughput: 4.50 Mbit/s
95th percentile per-packet one-way delay: 248.676 ms
Loss rate: 0.27%
```

Run 1: Report of PCC-Allegro — Data Link



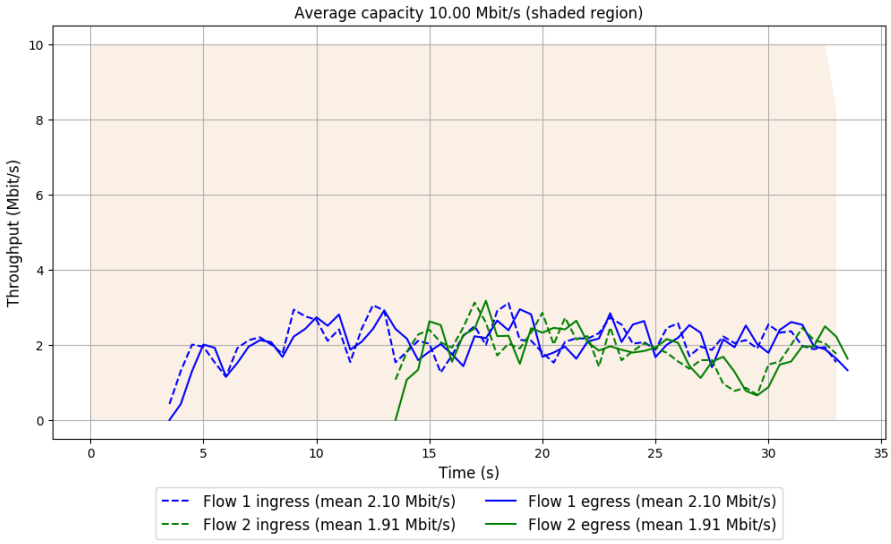


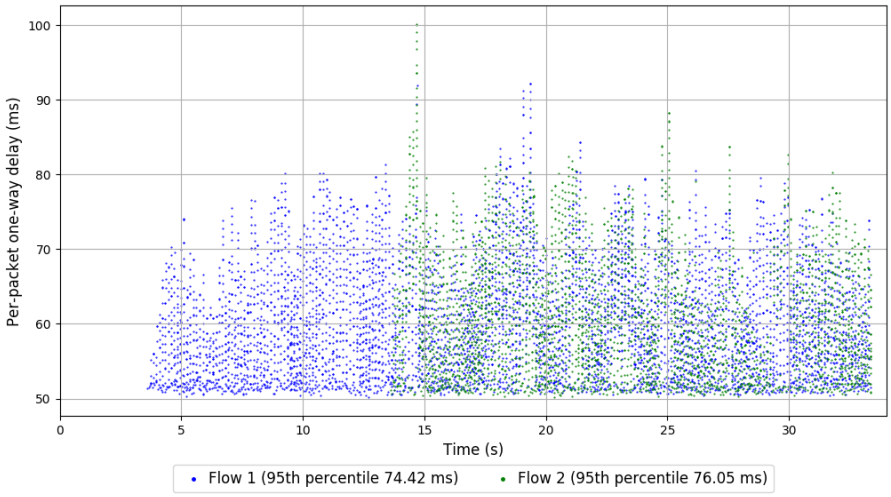
```
Run 1: Statistics of Sprout

Start at: 2019-07-31 06:12:44
End at: 2019-07-31 06:13:14

# Below is generated by plot.py at 2019-07-31 13:42:56
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 3.36 Mbit/s (33.6% utilization)
95th percentile per-packet one-way delay: 74.940 ms
Loss rate: 0.33%
-- Flow 1:
Average throughput: 2.10 Mbit/s
95th percentile per-packet one-way delay: 74.424 ms
Loss rate: 0.42%
-- Flow 2:
Average throughput: 1.91 Mbit/s
95th percentile per-packet one-way delay: 76.049 ms
Loss rate: 0.17%
```

Run 1: Report of Sprout — Data Link





```
Run 1: Statistics of PCC-Vivace

Start at: 2019-07-31 06:12:09
End at: 2019-07-31 06:12:39

# Below is generated by plot.py at 2019-07-31 13:42:57
# Datalink statistics
-- Total of 2 flows:
Average capacity: 10.00 Mbit/s
Average throughput: 8.91 Mbit/s (89.1% utilization)
95th percentile per-packet one-way delay: 122.356 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 6.54 Mbit/s
95th percentile per-packet one-way delay: 124.891 ms
Loss rate: 0.13%
-- Flow 2:
Average throughput: 3.57 Mbit/s
95th percentile per-packet one-way delay: 118.553 ms
Loss rate: 0.26%
```

Run 1: Report of PCC-Vivace — Data Link