

## Pantheon Report

Generated at 2019-06-28 17:55:20 (UTC).  
Tested in mahimahi: mm-link 12mbps.trace 12mbps.trace  
Repeated the test of 19 congestion control schemes once.  
Each test lasted for 30 seconds running 1 flow.

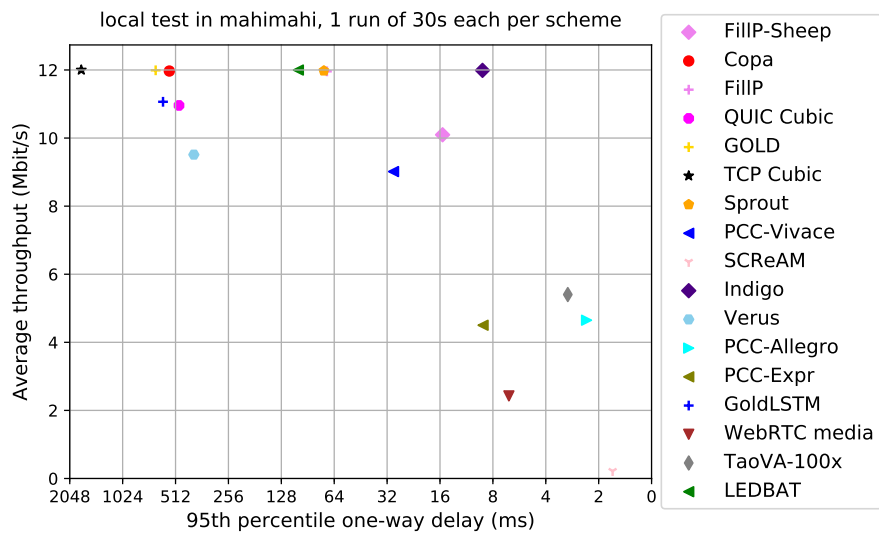
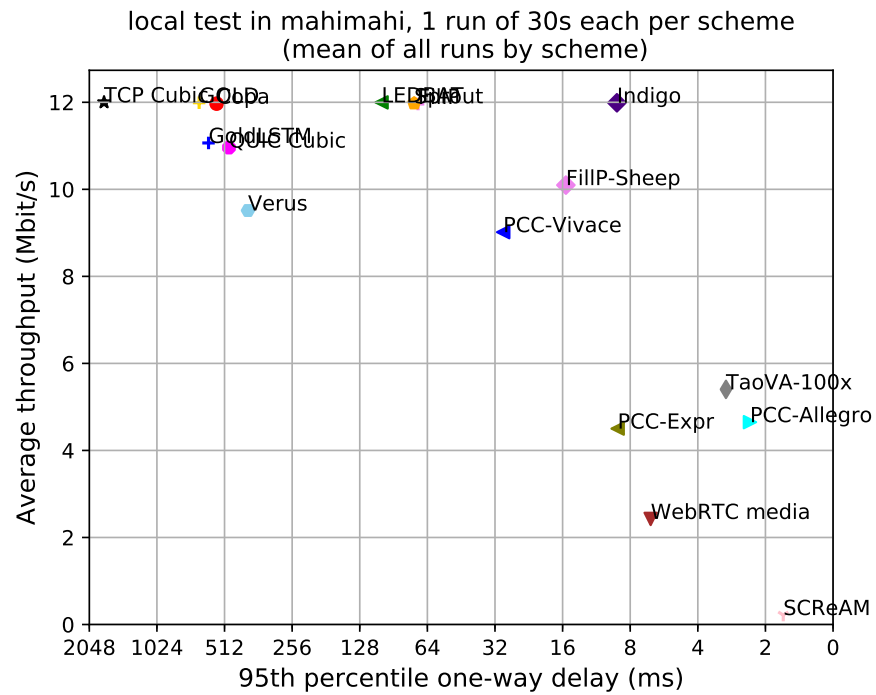
### System info:

Linux 4.15.0-52-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 @ f446c0304633ea2e6cc16758c423a2ae43448786  
third\_party/llp @ d6da1459332fcee56963885d7eba17e6a32d4519  
third\_party/llp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9  
third\_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4  
third\_party/gold @ b6948a72b216f2705f13bf3b588bc5ab5ff8ff9a  
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  
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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/environment.py  
M environment/learner.py  
M environment/logs.txt  
M environment/run\_receiver.py  
M model  
third\_party/goldLSTM @ 990886762be451b8f9c117e3eaa22d42692d7abb  
M sender-receiver/sender\_receiver/envs/sender\_receiver\_env.py  
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
TCP BBR	0	N/A	N/A	N/A
Copa	1	11.97	555.27	1.63
TCP Cubic	1	12.00	1760.85	3.19
FillP	1	11.96	70.43	0.24
FillP-Sheep	1	10.10	15.47	0.03
GOLD	1	11.99	664.33	2.68
GoldLSTM	1	11.07	603.29	1.43
Indigo	1	11.99	9.17	0.03
LEDBAT	1	12.00	102.41	0.34
PCC-Allegro	1	4.65	2.34	0.00
PCC-Expr	1	4.50	9.10	0.01
QUIC Cubic	1	10.96	489.18	1.79
SCReAM	1	0.22	1.47	0.00
Sprout	1	11.98	73.28	0.20
TaoVA-100x	1	5.40	3.00	0.00
TCP Vegas	0	N/A	N/A	N/A
Verus	1	9.51	402.73	0.00
PCC-Vivace	1	9.02	29.42	0.26
WebRTC media	1	2.43	6.49	0.03

Run 1: Statistics of TCP BBR

Start at: 2019-06-28 17:47:31

End at: 2019-06-28 17:48:01

Run 1: Report of TCP BBR — Data Link

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Run 1: Statistics of Copa

Start at: 2019-06-28 17:42:58

End at: 2019-06-28 17:43:28

# Below is generated by plot.py at 2019-06-28 17:54:56

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.97 Mbit/s (99.7% utilization)

95th percentile per-packet one-way delay: 555.275 ms

Loss rate: 1.63%

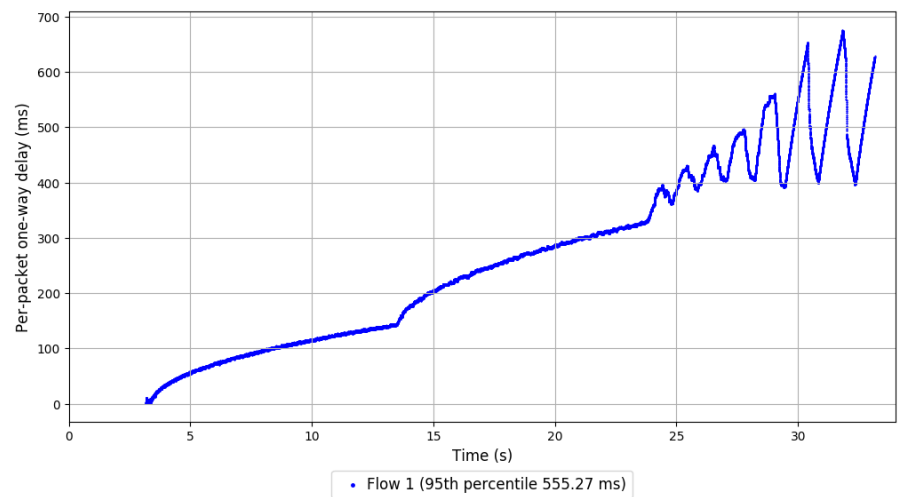
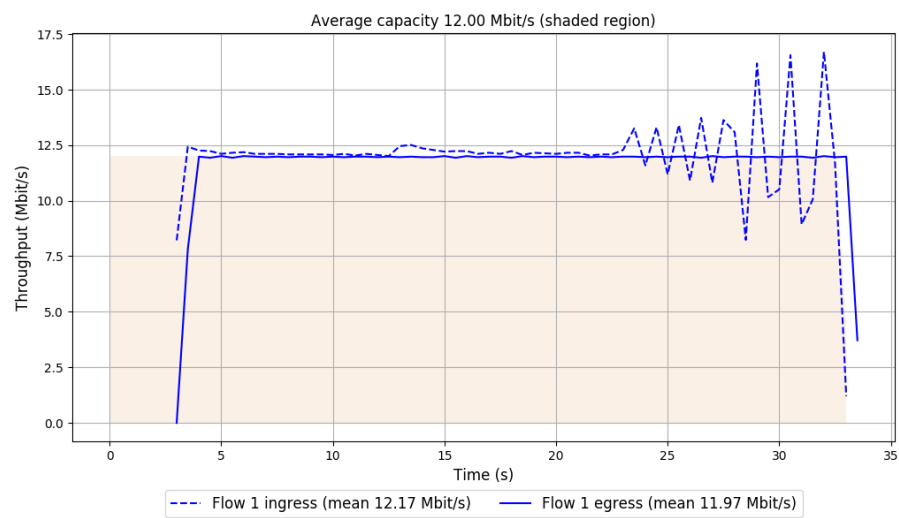
-- Flow 1:

Average throughput: 11.97 Mbit/s

95th percentile per-packet one-way delay: 555.275 ms

Loss rate: 1.63%

Run 1: Report of Copa — Data Link





Run 1: Statistics of TCP Cubic

Start at: 2019-06-28 17:45:15

End at: 2019-06-28 17:45:45

# Below is generated by plot.py at 2019-06-28 17:54:56

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 12.00 Mbit/s (100.0% utilization)

95th percentile per-packet one-way delay: 1760.852 ms

Loss rate: 3.19%

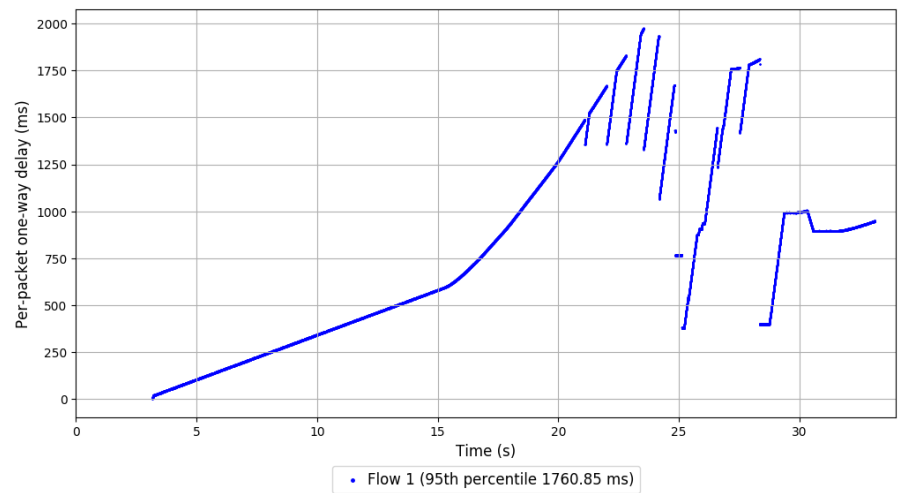
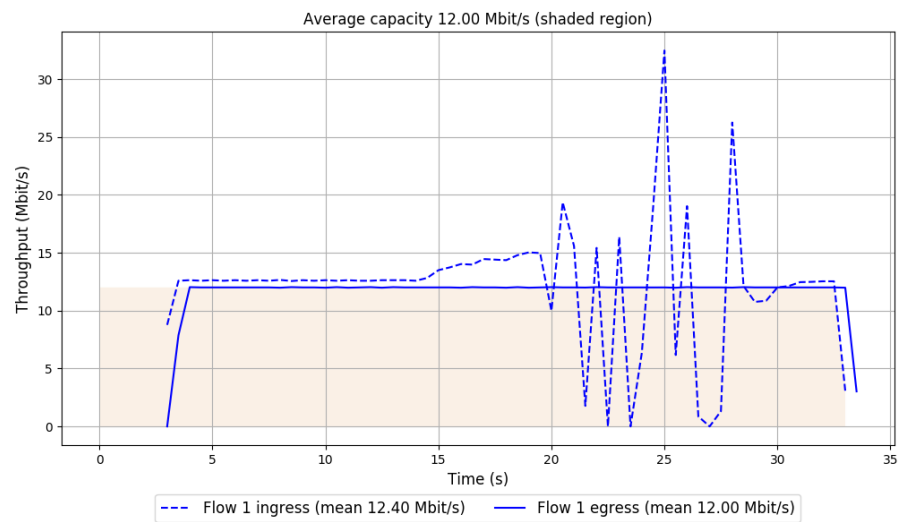
-- Flow 1:

Average throughput: 12.00 Mbit/s

95th percentile per-packet one-way delay: 1760.852 ms

Loss rate: 3.19%

Run 1: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

Start at: 2019-06-28 17:49:13

End at: 2019-06-28 17:49:43

# Below is generated by plot.py at 2019-06-28 17:54:56

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.96 Mbit/s (99.7% utilization)

95th percentile per-packet one-way delay: 70.427 ms

Loss rate: 0.24%

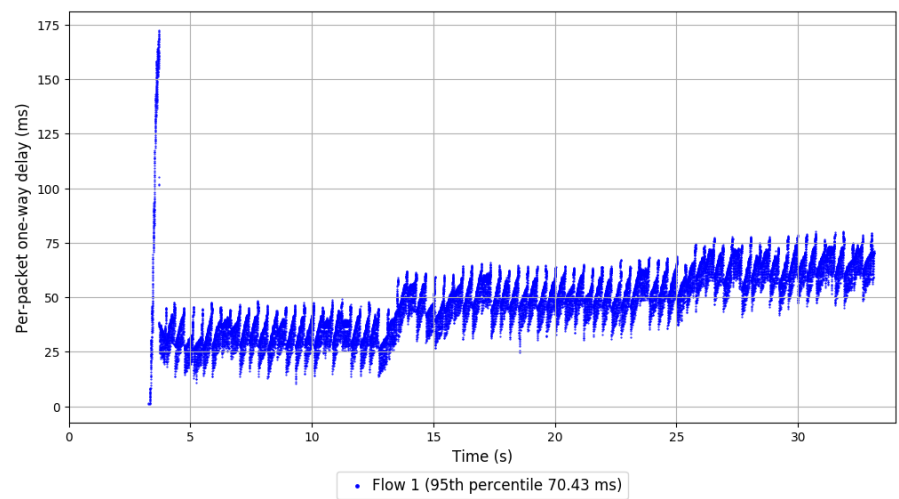
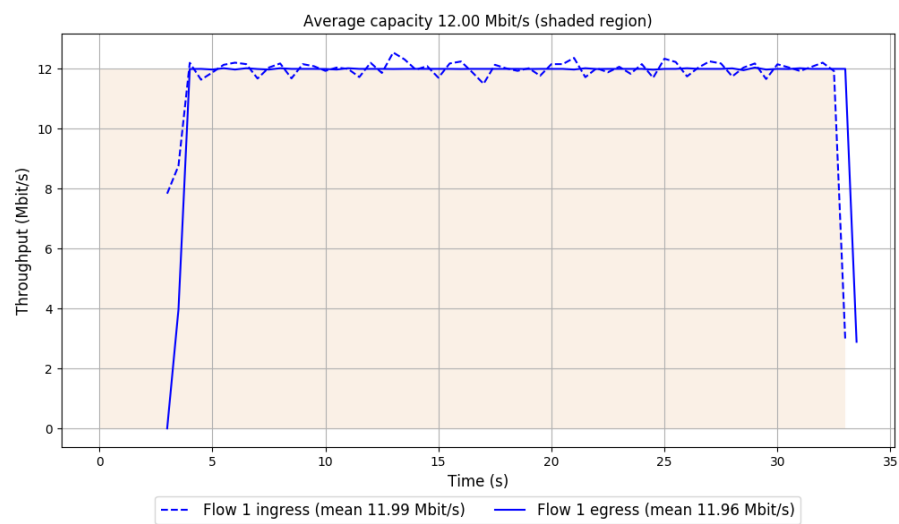
-- Flow 1:

Average throughput: 11.96 Mbit/s

95th percentile per-packet one-way delay: 70.427 ms

Loss rate: 0.24%

Run 1: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2019-06-28 17:42:23

End at: 2019-06-28 17:42:54

# Below is generated by plot.py at 2019-06-28 17:54:56

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.10 Mbit/s (84.1% utilization)

95th percentile per-packet one-way delay: 15.471 ms

Loss rate: 0.03%

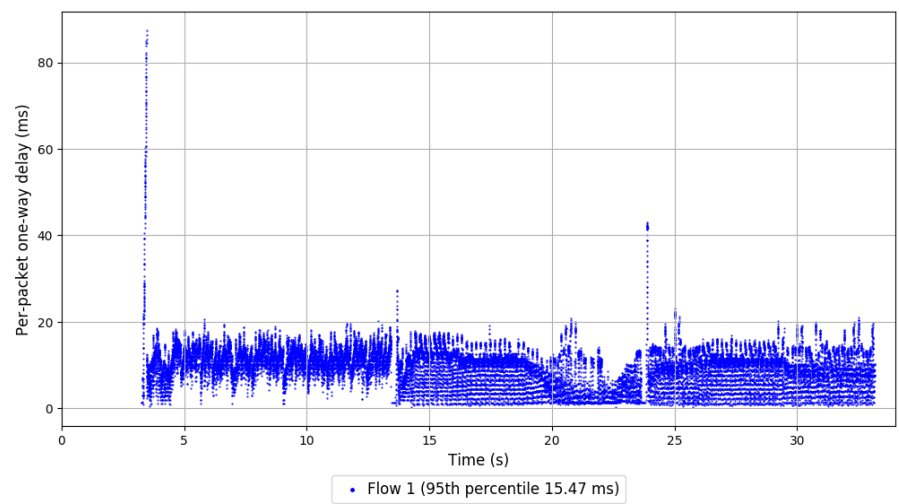
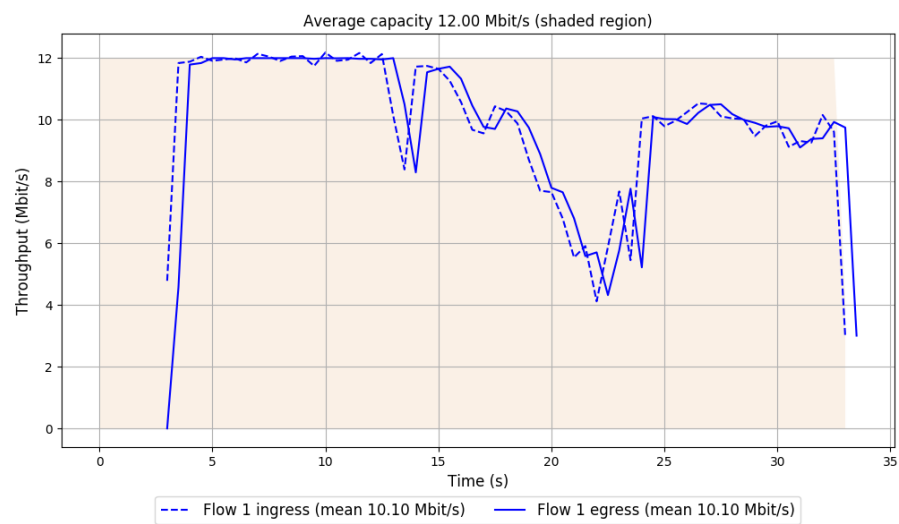
-- Flow 1:

Average throughput: 10.10 Mbit/s

95th percentile per-packet one-way delay: 15.471 ms

Loss rate: 0.03%

Run 1: Report of FillP-Sheep — Data Link



Run 1: Statistics of GOLD

Start at: 2019-06-28 17:44:41

End at: 2019-06-28 17:45:11

# Below is generated by plot.py at 2019-06-28 17:55:00

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.99 Mbit/s (99.9% utilization)

95th percentile per-packet one-way delay: 664.328 ms

Loss rate: 2.68%

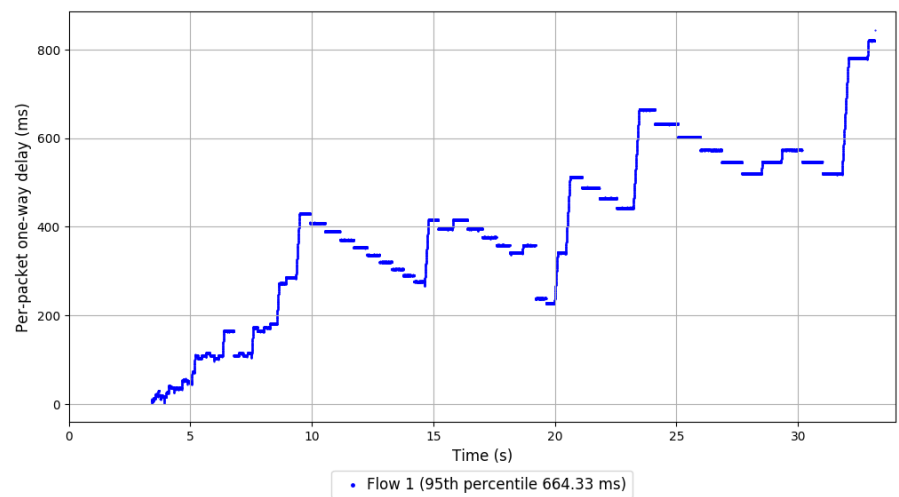
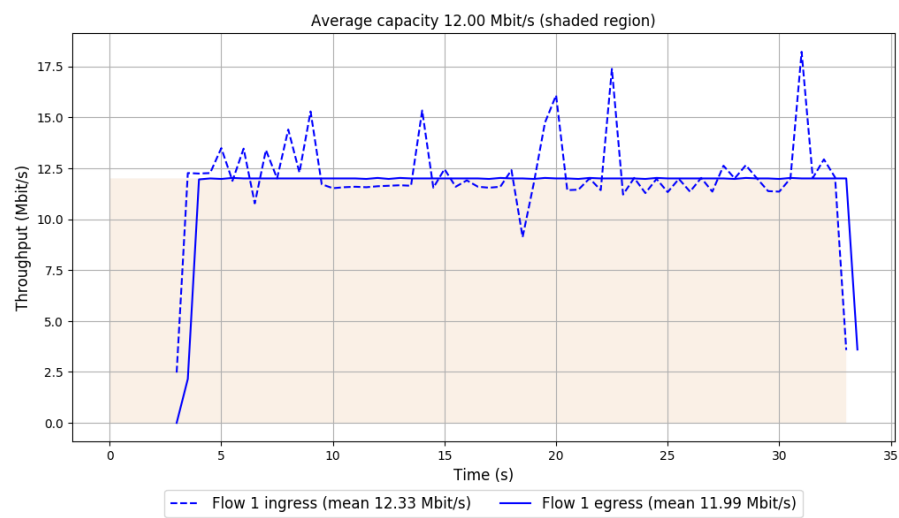
-- Flow 1:

Average throughput: 11.99 Mbit/s

95th percentile per-packet one-way delay: 664.328 ms

Loss rate: 2.68%

Run 1: Report of GOLD — Data Link



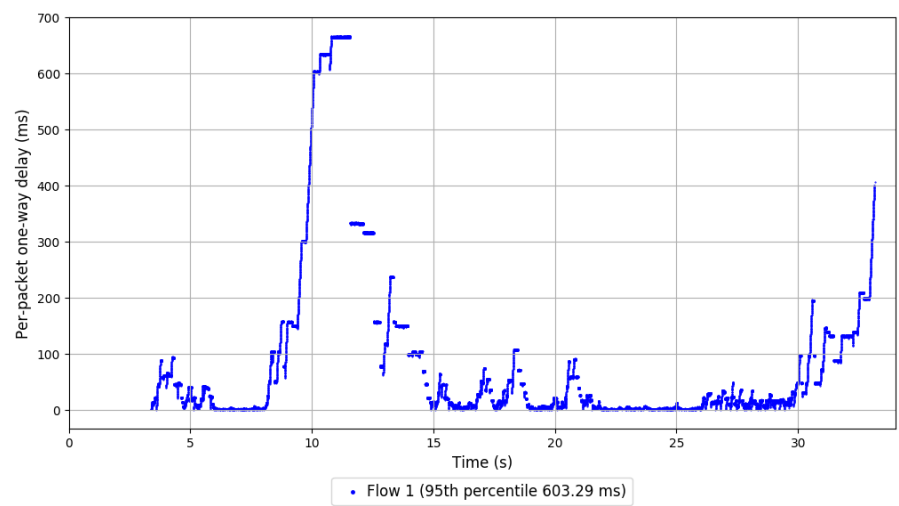
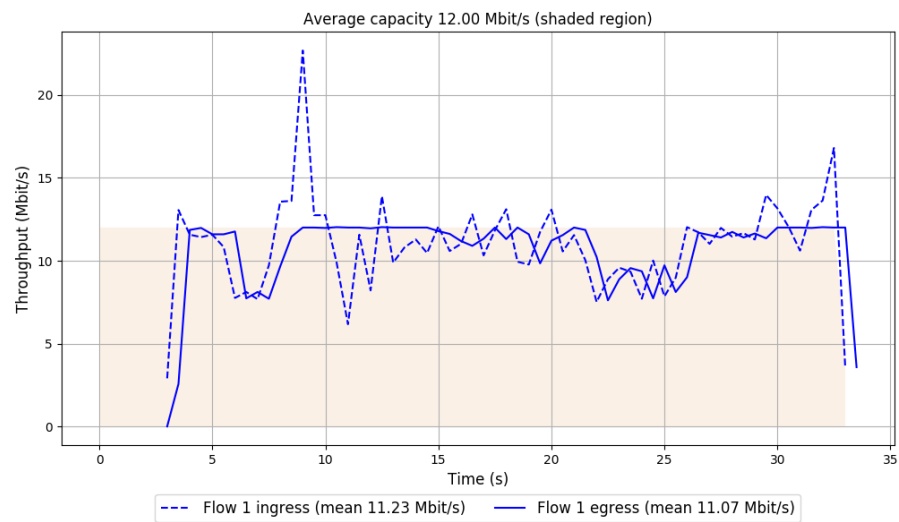


```
Run 1: Statistics of GoldLSTM

Start at: 2019-06-28 17:48:04
End at: 2019-06-28 17:48:34

# Below is generated by plot.py at 2019-06-28 17:55:00
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 11.07 Mbit/s (92.2% utilization)
95th percentile per-packet one-way delay: 603.292 ms
Loss rate: 1.43%
-- Flow 1:
Average throughput: 11.07 Mbit/s
95th percentile per-packet one-way delay: 603.292 ms
Loss rate: 1.43%
```

Run 1: Report of GoldLSTM — Data Link



Run 1: Statistics of Indigo

Start at: 2019-06-28 17:43:32

End at: 2019-06-28 17:44:02

# Below is generated by plot.py at 2019-06-28 17:55:00

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.99 Mbit/s (99.9% utilization)

95th percentile per-packet one-way delay: 9.168 ms

Loss rate: 0.03%

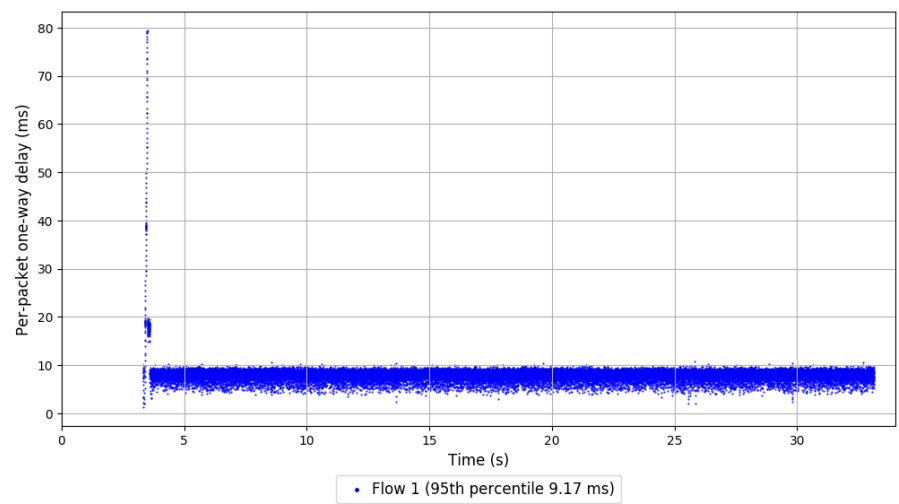
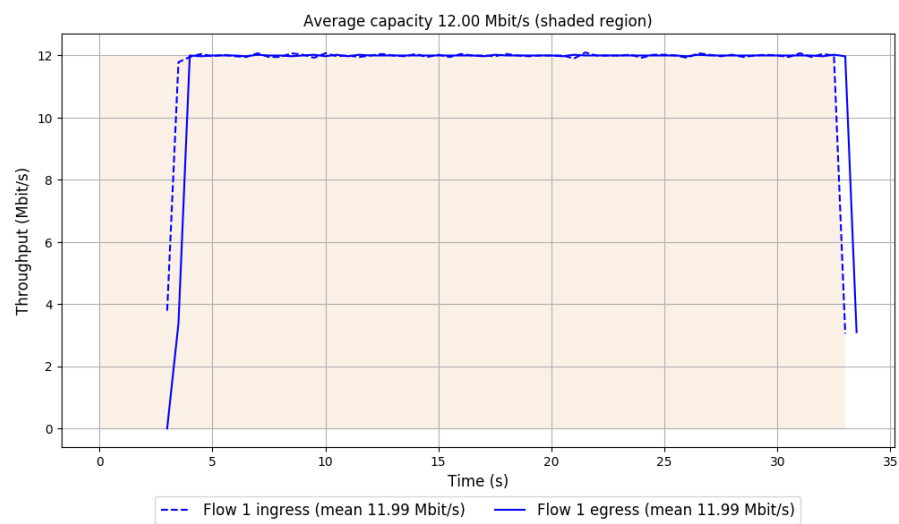
-- Flow 1:

Average throughput: 11.99 Mbit/s

95th percentile per-packet one-way delay: 9.168 ms

Loss rate: 0.03%

Run 1: Report of Indigo — Data Link

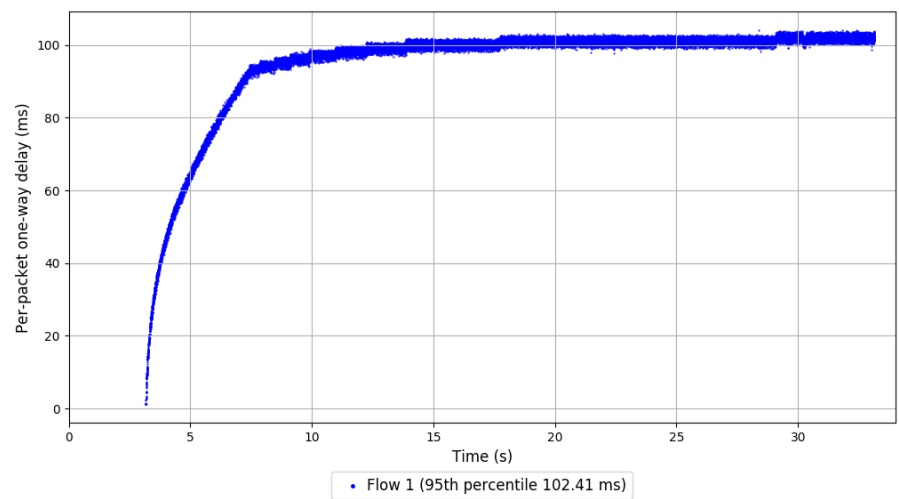
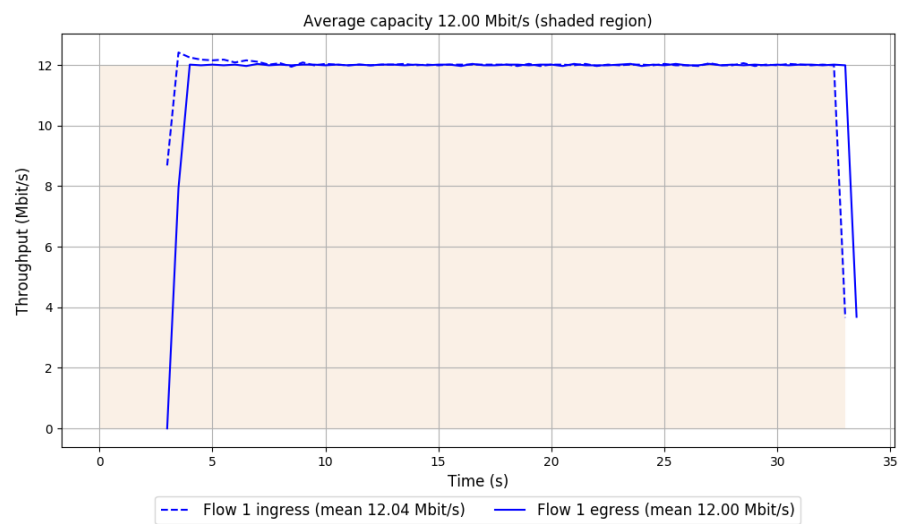


```
Run 1: Statistics of LEDBAT

Start at: 2019-06-28 17:52:03
End at: 2019-06-28 17:52:33

# Below is generated by plot.py at 2019-06-28 17:55:04
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 12.00 Mbit/s (100.0% utilization)
95th percentile per-packet one-way delay: 102.414 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 12.00 Mbit/s
95th percentile per-packet one-way delay: 102.414 ms
Loss rate: 0.34%
```

Run 1: Report of LEDBAT — Data Link

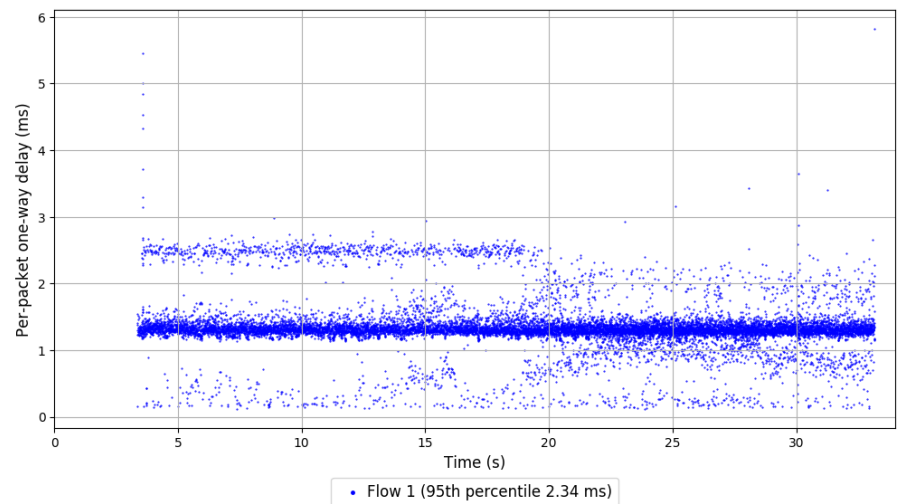
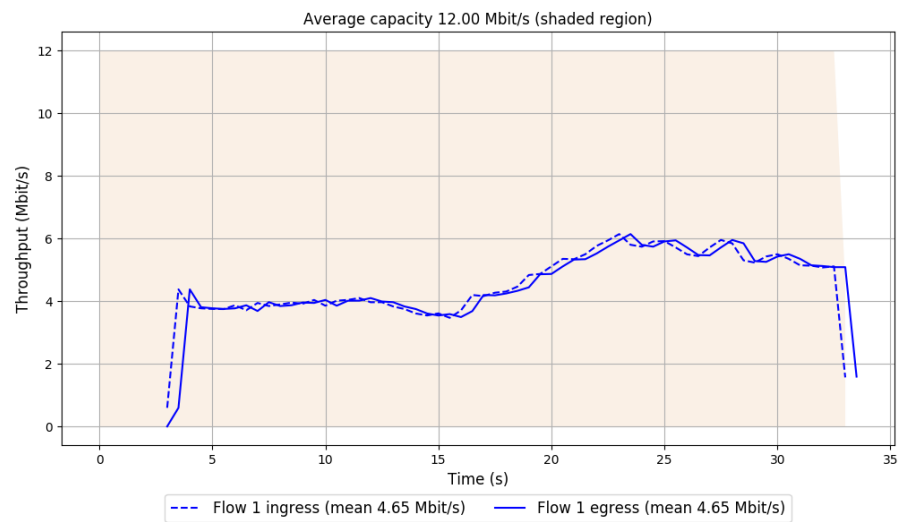


```
Run 1: Statistics of PCC-Allegro

Start at: 2019-06-28 17:50:55
End at: 2019-06-28 17:51:25

# Below is generated by plot.py at 2019-06-28 17:55:04
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 4.65 Mbit/s (38.7% utilization)
95th percentile per-packet one-way delay: 2.344 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 4.65 Mbit/s
95th percentile per-packet one-way delay: 2.344 ms
Loss rate: 0.00%
```

Run 1: Report of PCC-Allegro — Data Link



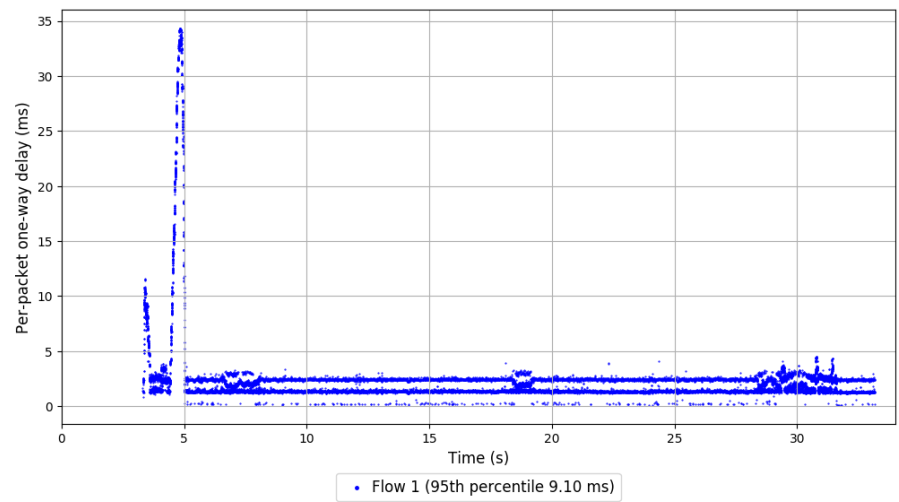
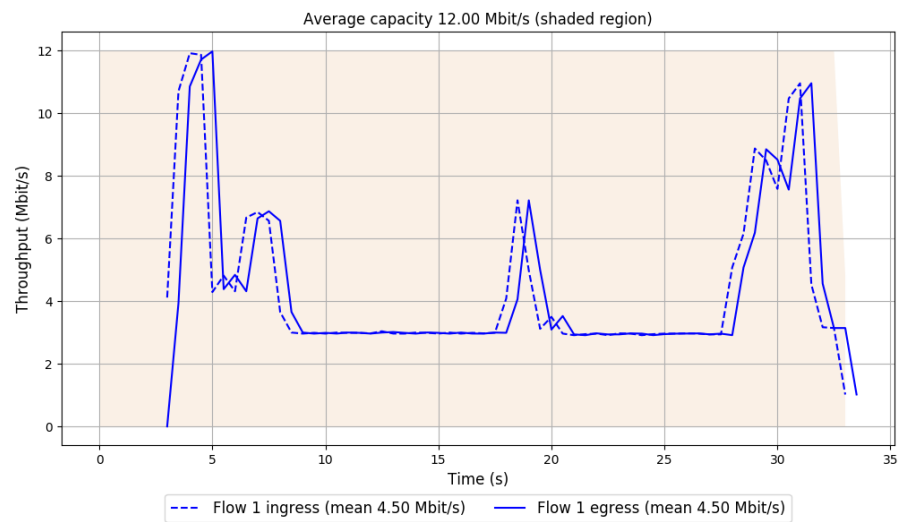


```
Run 1: Statistics of PCC-Expr

Start at: 2019-06-28 17:52:37
End at: 2019-06-28 17:53:07

# Below is generated by plot.py at 2019-06-28 17:55:07
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 4.50 Mbit/s (37.5% utilization)
95th percentile per-packet one-way delay: 9.102 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 4.50 Mbit/s
95th percentile per-packet one-way delay: 9.102 ms
Loss rate: 0.01%
```

Run 1: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2019-06-28 17:50:21

End at: 2019-06-28 17:50:51

# Below is generated by plot.py at 2019-06-28 17:55:09

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.96 Mbit/s (91.3% utilization)

95th percentile per-packet one-way delay: 489.178 ms

Loss rate: 1.79%

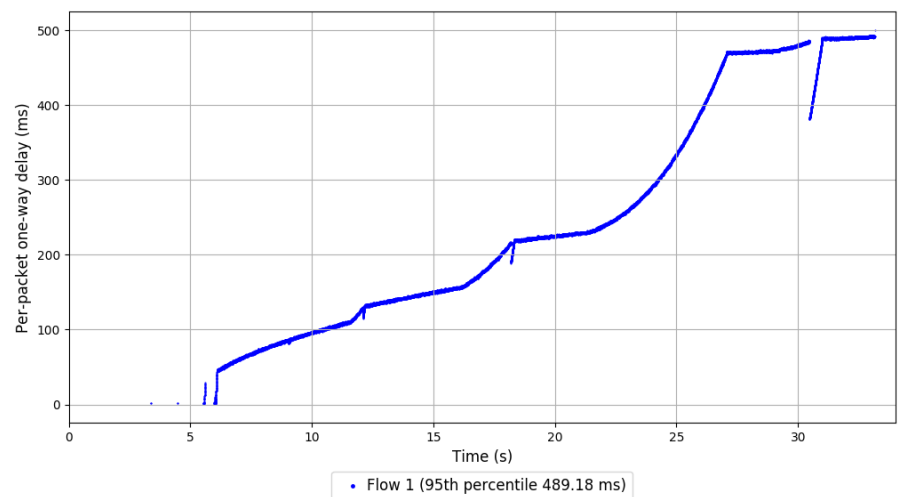
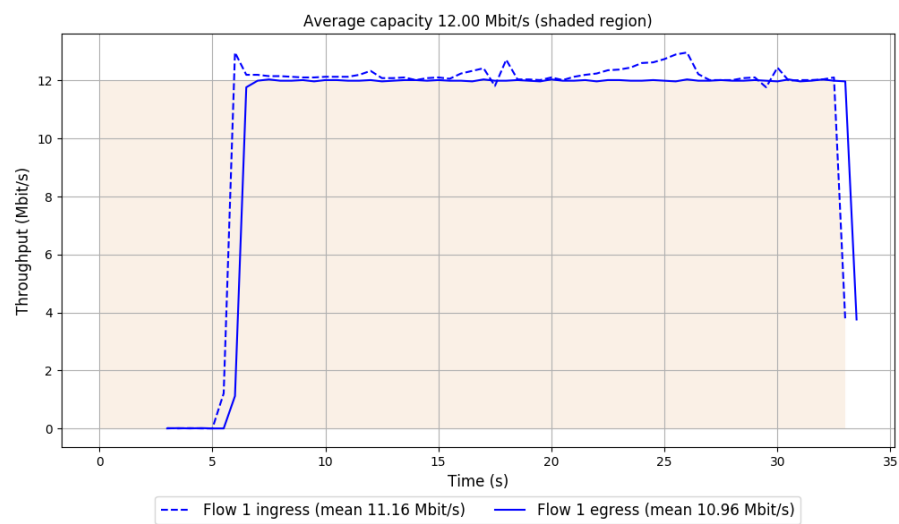
-- Flow 1:

Average throughput: 10.96 Mbit/s

95th percentile per-packet one-way delay: 489.178 ms

Loss rate: 1.79%

Run 1: Report of QUIC Cubic — Data Link



Run 1: Statistics of SCReAM

Start at: 2019-06-28 17:49:47

End at: 2019-06-28 17:50:17

# Below is generated by plot.py at 2019-06-28 17:55:09

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 0.22 Mbit/s (1.8% utilization)

95th percentile per-packet one-way delay: 1.473 ms

Loss rate: 0.00%

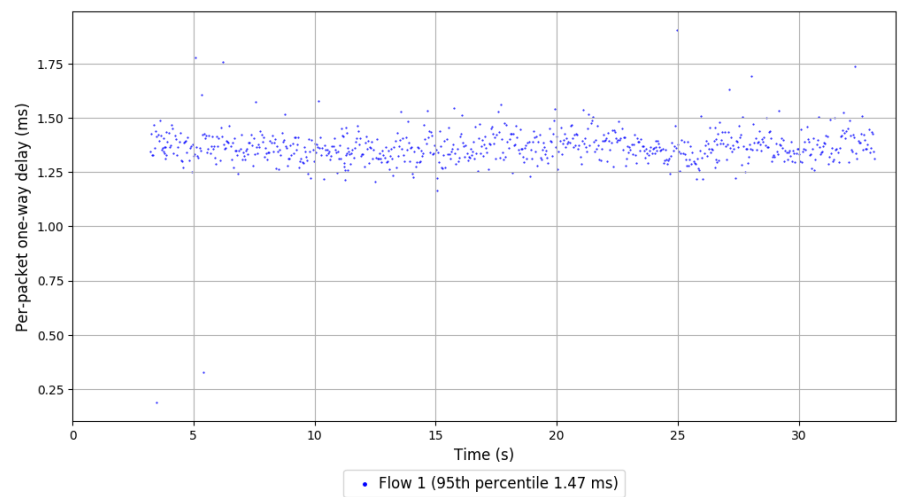
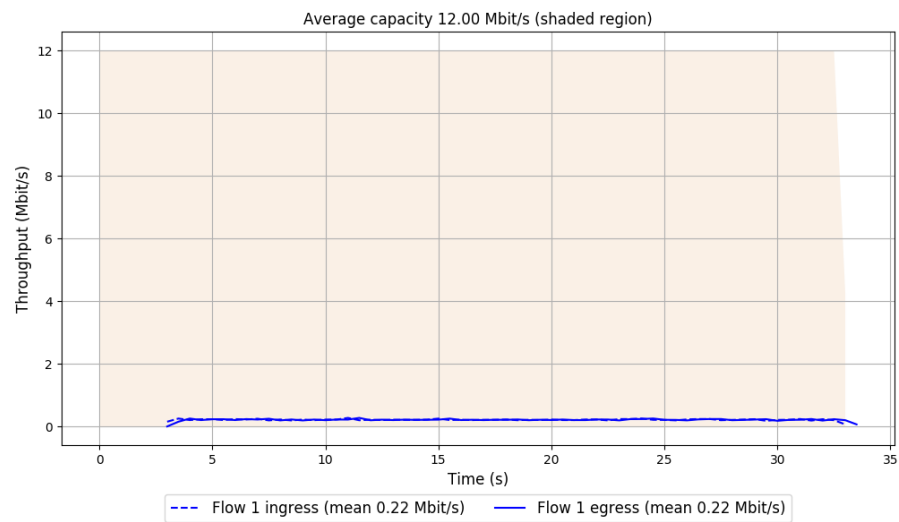
-- Flow 1:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 1.473 ms

Loss rate: 0.00%

Run 1: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2019-06-28 17:45:49

End at: 2019-06-28 17:46:19

# Below is generated by plot.py at 2019-06-28 17:55:13

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.98 Mbit/s (99.8% utilization)

95th percentile per-packet one-way delay: 73.276 ms

Loss rate: 0.20%

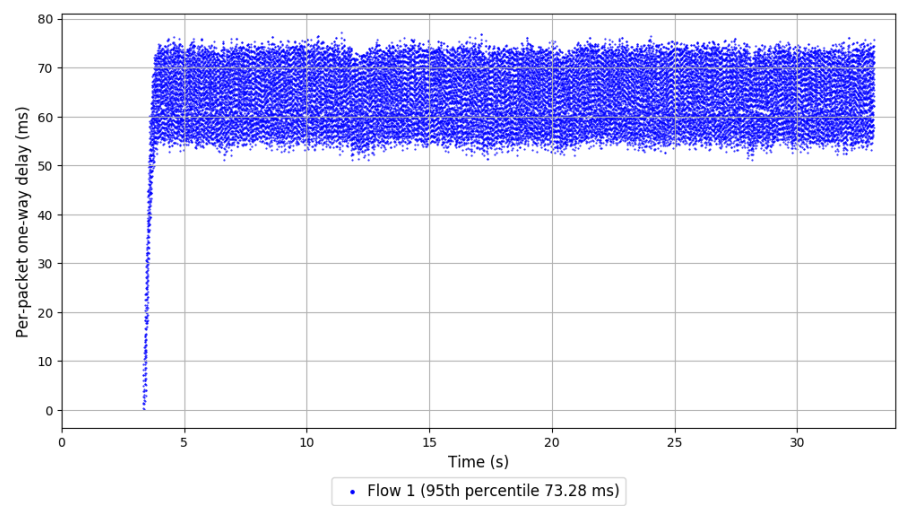
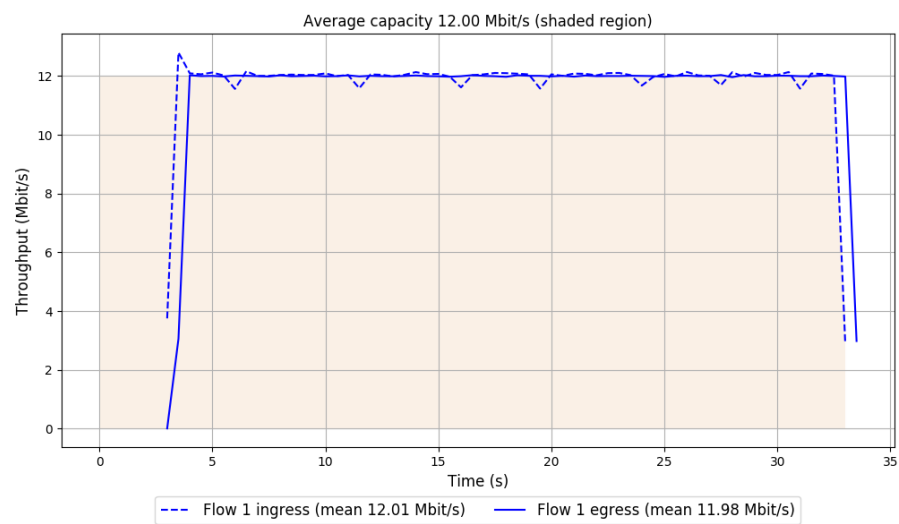
-- Flow 1:

Average throughput: 11.98 Mbit/s

95th percentile per-packet one-way delay: 73.276 ms

Loss rate: 0.20%

Run 1: Report of Sprout — Data Link



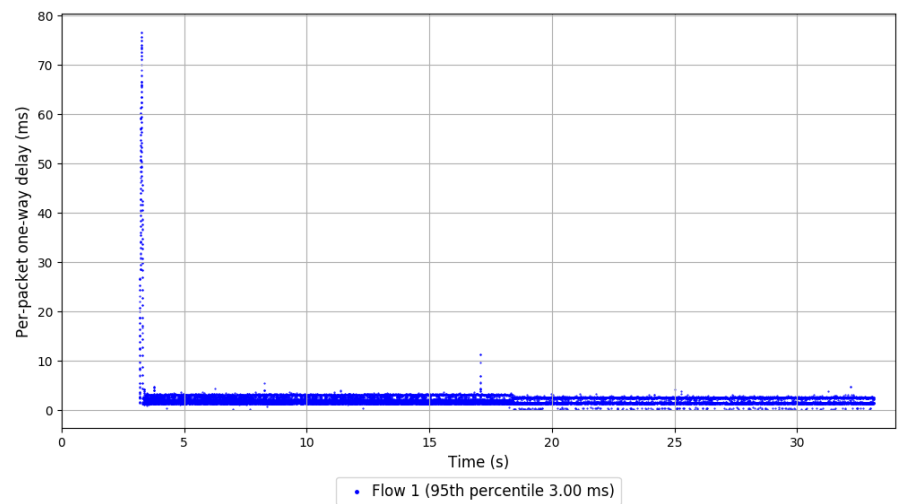
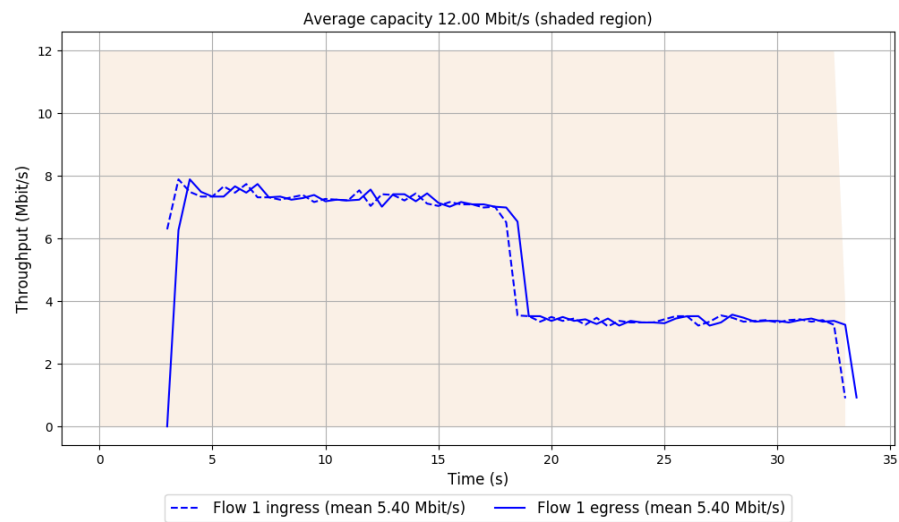


```
Run 1: Statistics of TaoVA-100x

Start at: 2019-06-28 17:48:39
End at: 2019-06-28 17:49:09

# Below is generated by plot.py at 2019-06-28 17:55:16
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.40 Mbit/s (45.0% utilization)
95th percentile per-packet one-way delay: 2.998 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 5.40 Mbit/s
95th percentile per-packet one-way delay: 2.998 ms
Loss rate: 0.00%
```

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



Run 1: Statistics of TCP Vegas

Start at: 2019-06-28 17:46:57

End at: 2019-06-28 17:47:27

Run 1: Report of TCP Vegas — Data Link

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Run 1: Statistics of Verus

Start at: 2019-06-28 17:44:06

End at: 2019-06-28 17:44:36

# Below is generated by plot.py at 2019-06-28 17:55:16

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 9.51 Mbit/s (79.3% utilization)

95th percentile per-packet one-way delay: 402.728 ms

Loss rate: 0.00%

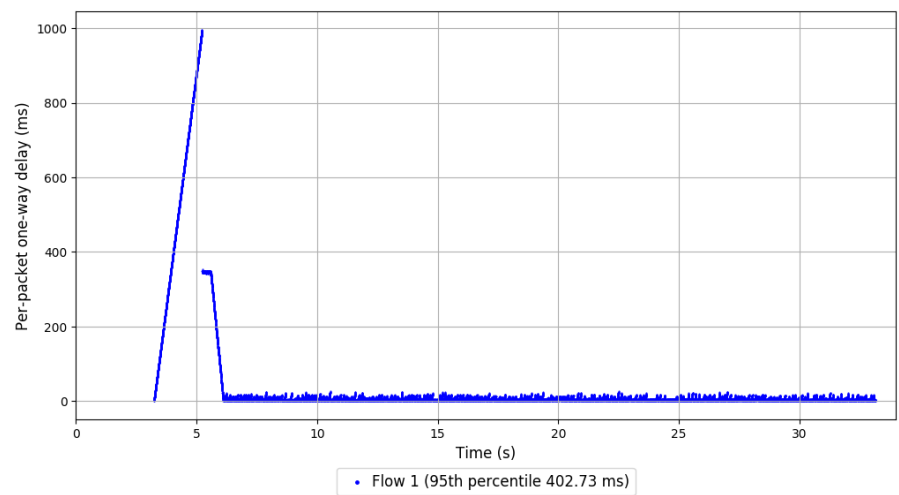
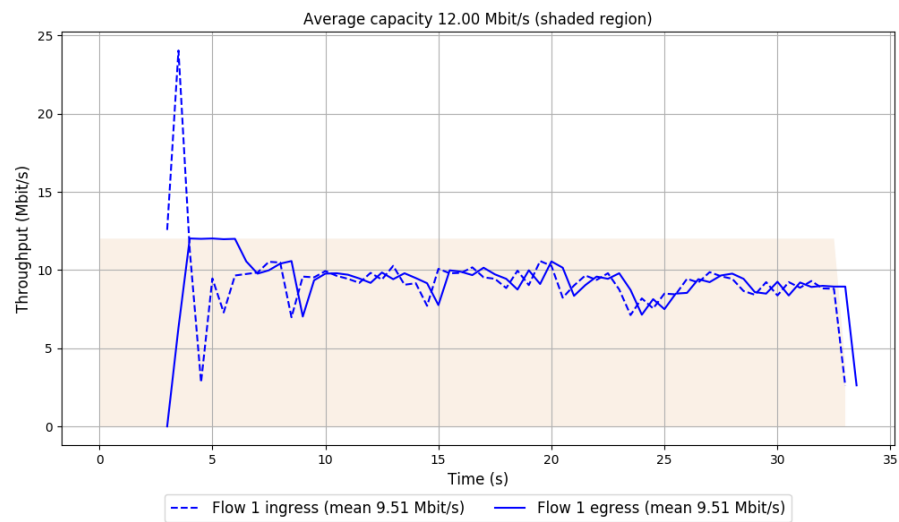
-- Flow 1:

Average throughput: 9.51 Mbit/s

95th percentile per-packet one-way delay: 402.728 ms

Loss rate: 0.00%

Run 1: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2019-06-28 17:46:23

End at: 2019-06-28 17:46:53

# Below is generated by plot.py at 2019-06-28 17:55:17

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 9.02 Mbit/s (75.1% utilization)

95th percentile per-packet one-way delay: 29.418 ms

Loss rate: 0.26%

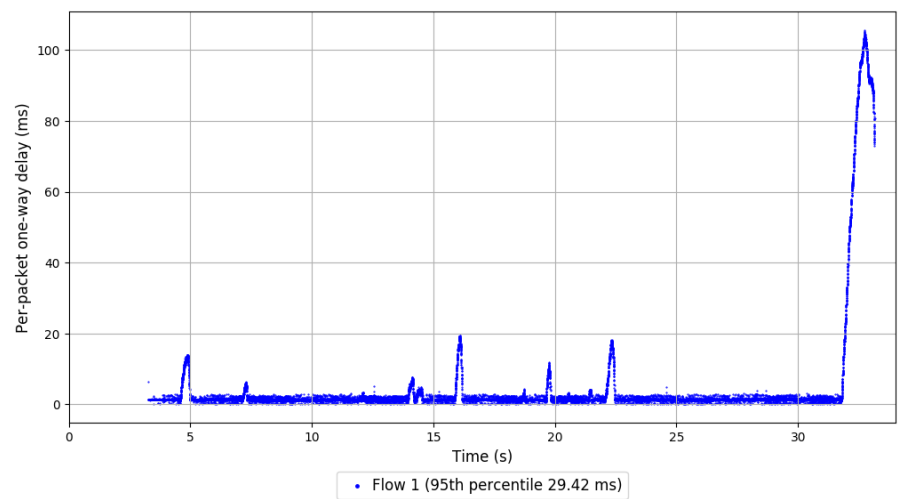
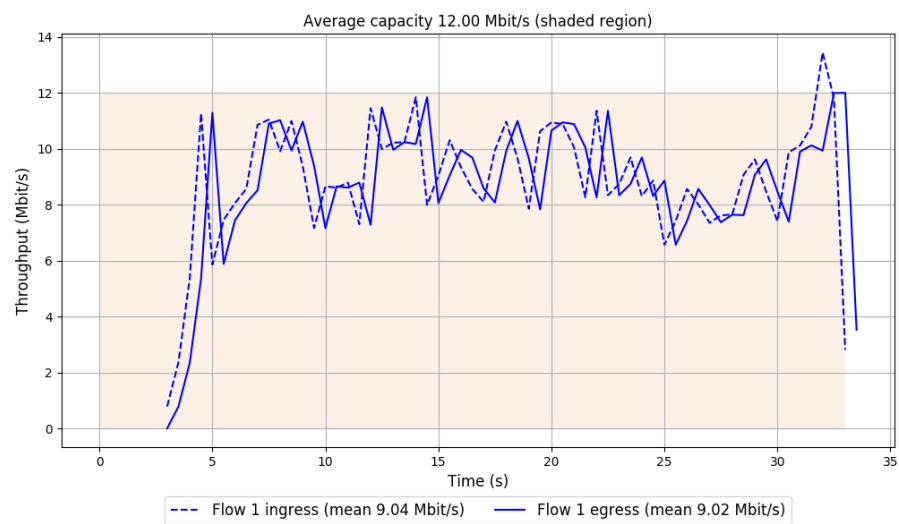
-- Flow 1:

Average throughput: 9.02 Mbit/s

95th percentile per-packet one-way delay: 29.418 ms

Loss rate: 0.26%

Run 1: Report of PCC-Vivace — Data Link





Run 1: Statistics of WebRTC media

Start at: 2019-06-28 17:51:29

End at: 2019-06-28 17:51:59

# Below is generated by plot.py at 2019-06-28 17:55:17

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 2.43 Mbit/s (20.2% utilization)

95th percentile per-packet one-way delay: 6.487 ms

Loss rate: 0.03%

-- Flow 1:

Average throughput: 2.43 Mbit/s

95th percentile per-packet one-way delay: 6.487 ms

Loss rate: 0.03%

Run 1: Report of WebRTC media — Data Link

