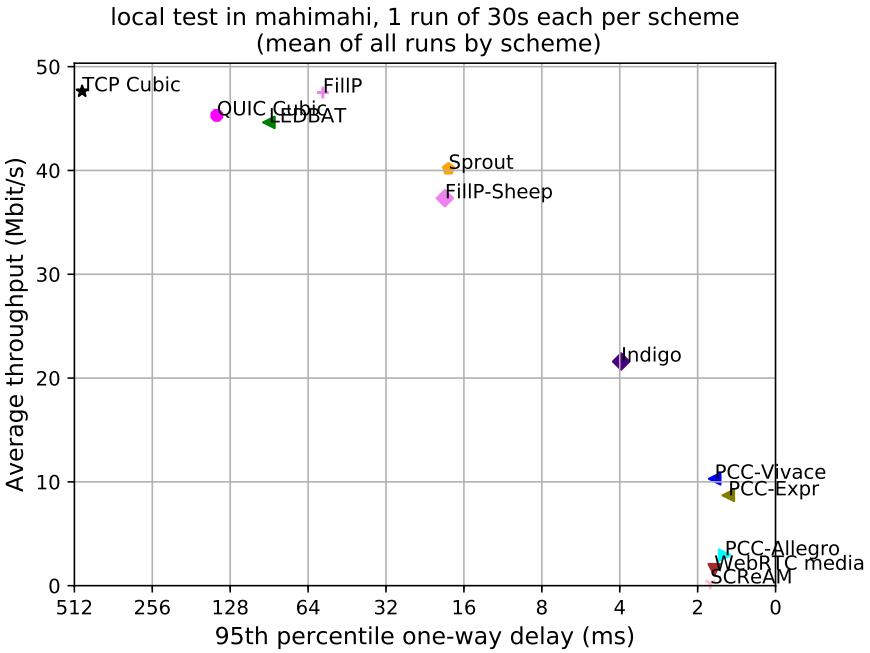
Pantheon Report

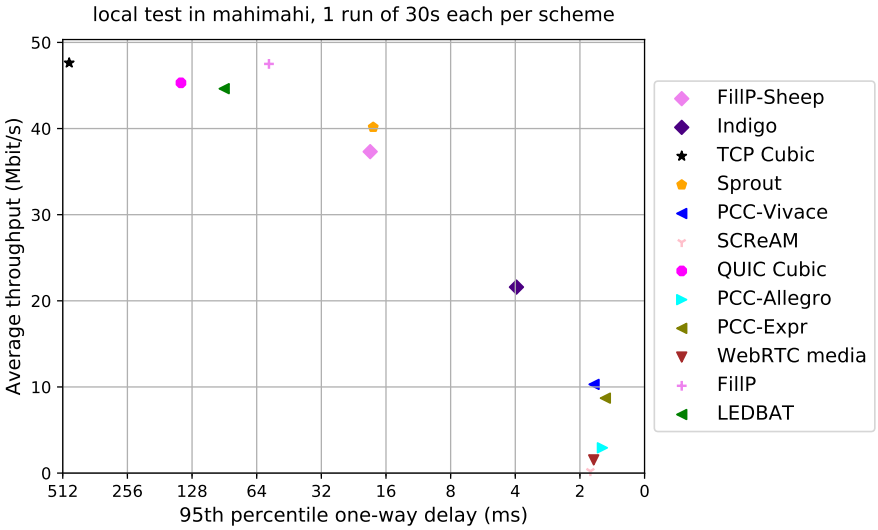
Generated at 2022-04-05 21:17:50 (UTC).
Tested in mahimahi: `mm-link wired48 trace-3189663-timessquare`
Repeated the test of 14 congestion control schemes once.
Each test lasted for 30 seconds running 1 flow.

```
System info:
Linux 5.13.0-39-generic
net.core.default_qdisc = fq_codel
net.core.rmem_default = 212992
net.core.rmem_max = 50000000
net.core.wmem_default = 212992
net.core.wmem_max = 1048576
net.ipv4.tcp_rmem = 4096 131072 6291456
net.ipv4.tcp_wmem = 4096 16384 4194304
```

```
Git summary:
branch: master @ 932ea819529bc7318f767ee187f6f0482584470f
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
 M makefile
 M python-wrapper.cc
third_party/indigo @ 463d89b09699a57bfdfbae351646df6a60040b90
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ f866d3f58d27afd942717625ee3a354cc2e802bd
 M configure.ac
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 src/verus_server.cpp
 M tools/plot.py
```

```
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```


local test in mahimahi, 1 run of 30s each per scheme
(mean of all runs by scheme)
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
TCP Cubic
FillP
QUIC Cubic
LEDBAT
Sprout
FillP-Sheep
Indigo
PCC-Vivace
PCC-Expr
PCC-Allegro
WebRTC media
SCReAM
50
40
30
20
10
0
512
256
128
64
32
16
8
4
2
0


local test in mahimahi, 1 run of 30s each per scheme
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
FillP-Sheep
Indigo
TCP Cubic
Sprout
PCC-Vivace
SCReAM
QUIC Cubic
PCC-Allegro
PCC-Expr
WebRTC media
FillP
LEDBAT
50
40
30
20
10
0
512
256
128
64
32
16
8
4
2
0

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
TCP Cubic	1	47.63	477.84	1.29
FillP	1	47.50	56.12	0.06
FillP-Sheep	1	37.32	18.95	0.07
Indigo	1	21.59	3.95	0.01
LEDBAT	1	44.63	90.73	0.33
PCC-Allegro	1	2.94	1.30	0.01
PCC-Expr	1	8.70	1.21	0.00
QUIC Cubic	1	45.31	144.17	0.54
SCReAM	1	0.22	1.68	0.00
Sprout	1	40.16	18.35	0.05
TCP Vegas	0	N/A	N/A	N/A
PCC-Vivace	1	10.30	1.56	0.00
WebRTC media	1	1.53	1.57	0.00

```
Run 1: Statistics of TCP BBR

Start at: 2022-04-05 20:47:31
End at: 2022-04-05 20:48:01
```

Run 1: Report of TCP BBR — Data Link

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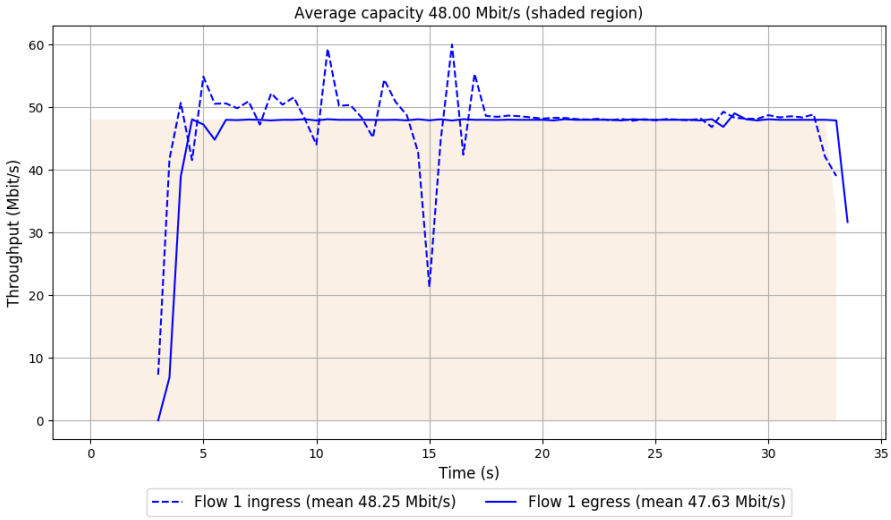
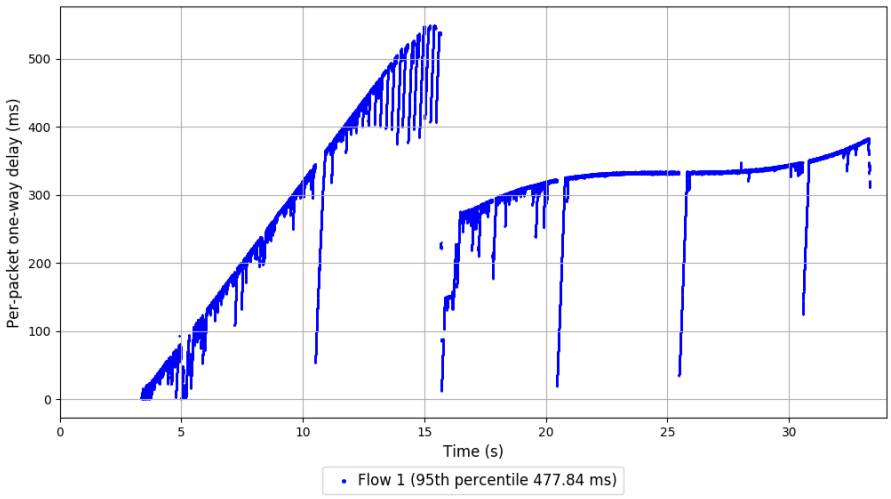
```
Run 1: Statistics of TCP Cubic

Start at: 2022-04-05 20:44:40
End at: 2022-04-05 20:45:10

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 47.63 Mbit/s (99.2% utilization)
95th percentile per-packet one-way delay: 477.841 ms
Loss rate: 1.29%
-- Flow 1:
Average throughput: 47.63 Mbit/s
95th percentile per-packet one-way delay: 477.841 ms
Loss rate: 1.29%
```

Run 1: Report of TCP Cubic — Data Link



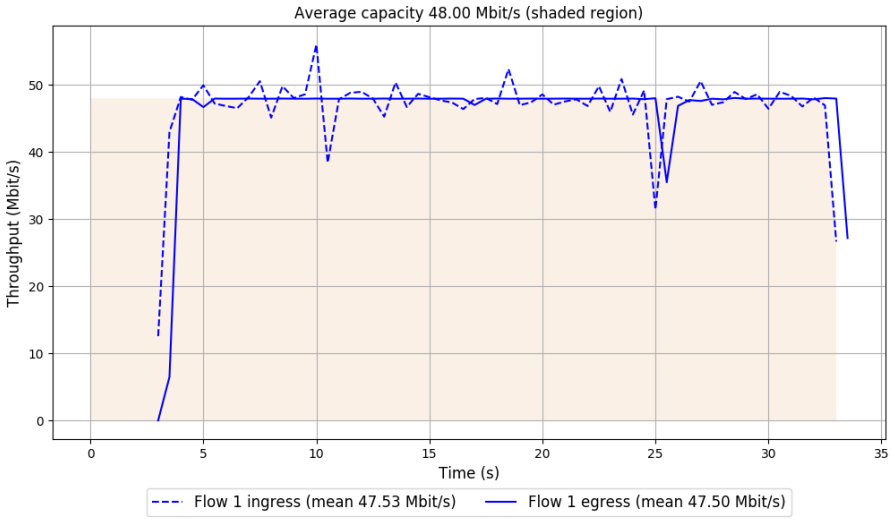


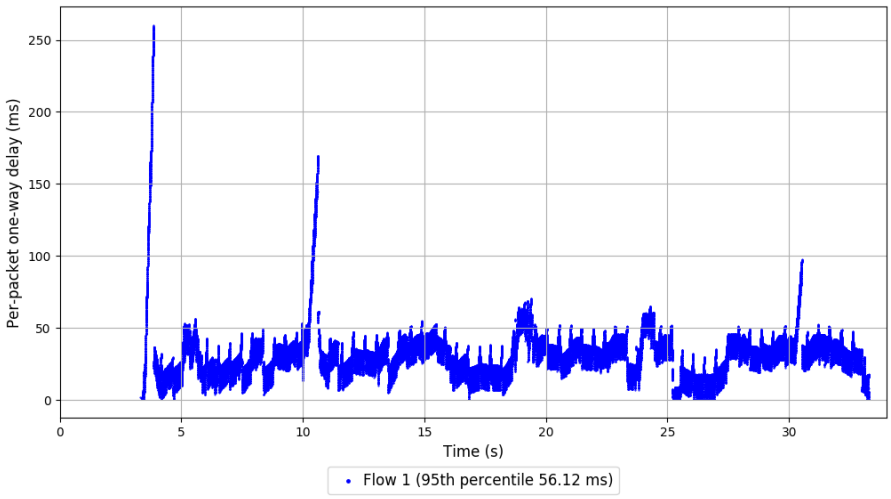
```
Run 1: Statistics of FillP

Start at: 2022-04-05 20:44:05
End at: 2022-04-05 20:44:35

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 47.50 Mbit/s (99.0% utilization)
95th percentile per-packet one-way delay: 56.116 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 47.50 Mbit/s
95th percentile per-packet one-way delay: 56.116 ms
Loss rate: 0.06%
```

Run 1: Report of FillP — Data Link



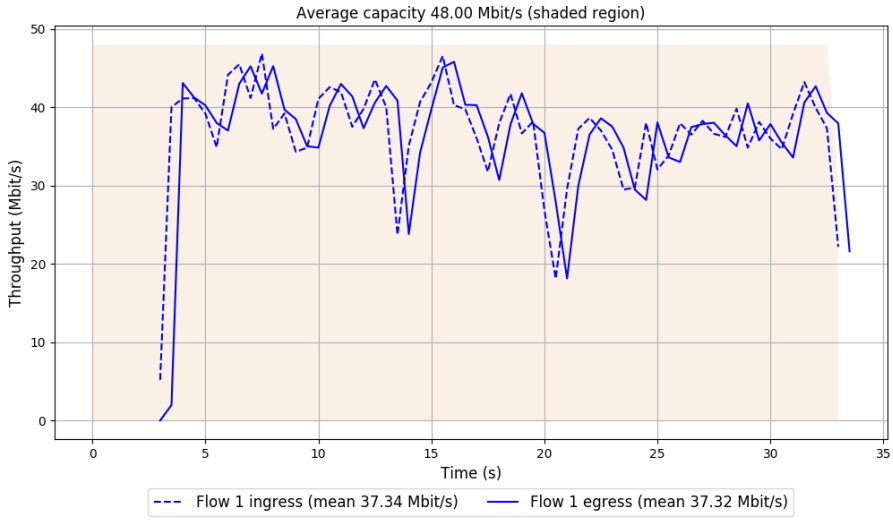


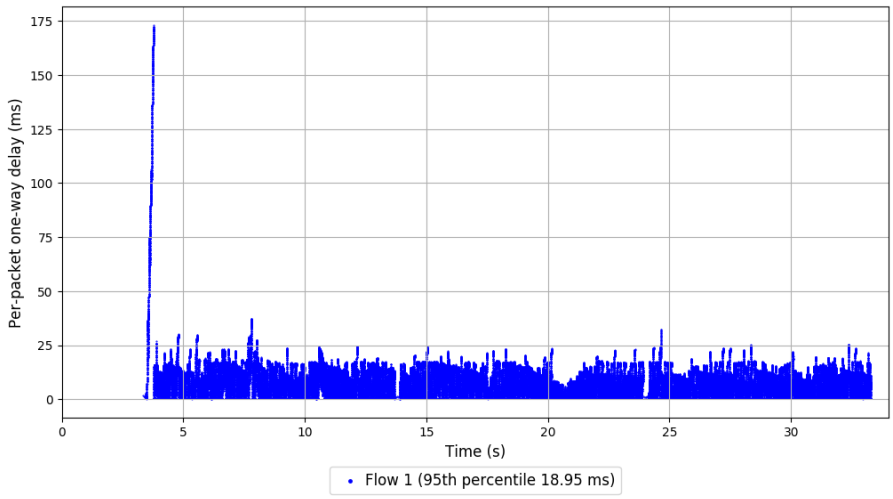
```
Run 1: Statistics of FillP-Sheep

Start at: 2022-04-05 20:43:30
End at: 2022-04-05 20:44:00

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 37.32 Mbit/s (77.7% utilization)
95th percentile per-packet one-way delay: 18.953 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 37.32 Mbit/s
95th percentile per-packet one-way delay: 18.953 ms
Loss rate: 0.07%
```

Run 1: Report of FillP-Sheep — Data Link



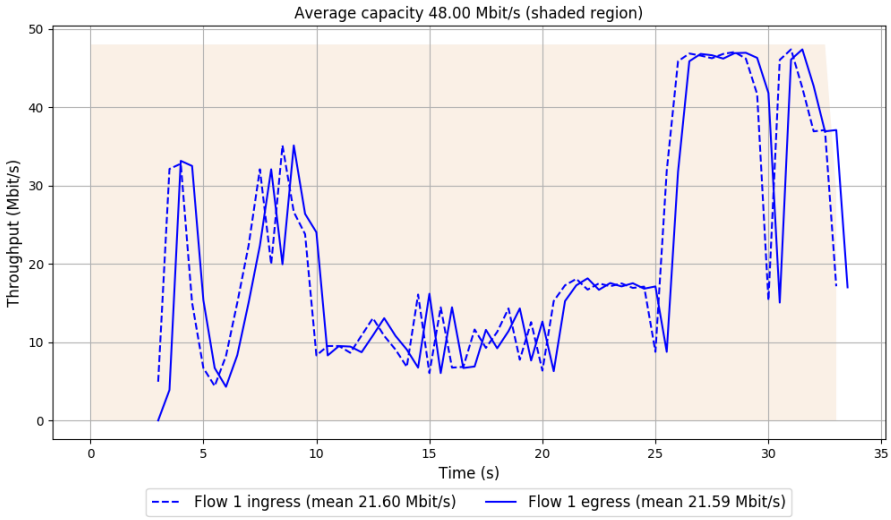


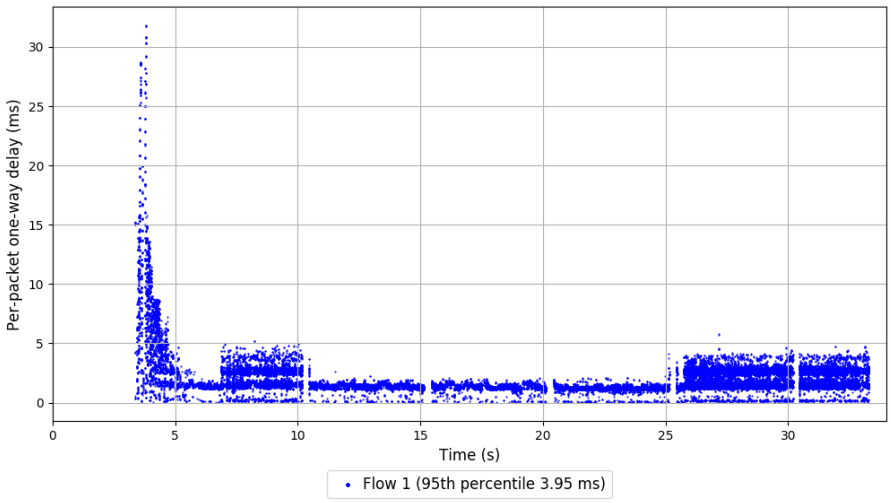
```
Run 1: Statistics of Indigo

Start at: 2022-04-05 20:49:14
End at: 2022-04-05 20:49:44

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 21.59 Mbit/s (45.0% utilization)
95th percentile per-packet one-way delay: 3.950 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 21.59 Mbit/s
95th percentile per-packet one-way delay: 3.950 ms
Loss rate: 0.01%
```

Run 1: Report of Indigo — Data Link



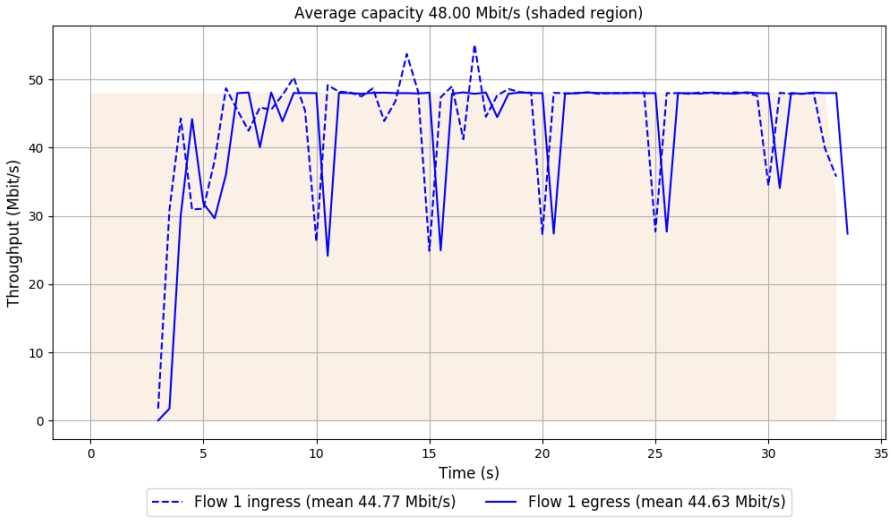


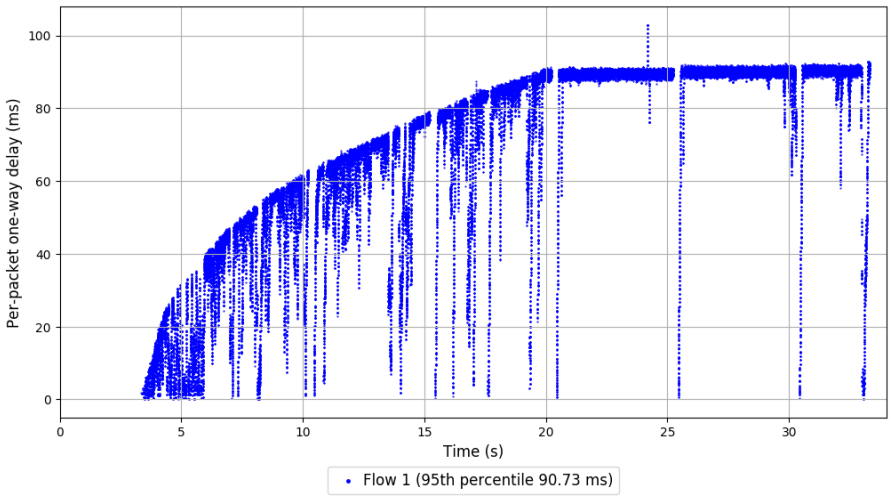
```
Run 1: Statistics of LEDBAT

Start at: 2022-04-05 20:50:22
End at: 2022-04-05 20:50:52

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 44.63 Mbit/s (93.0% utilization)
95th percentile per-packet one-way delay: 90.732 ms
Loss rate: 0.33%
-- Flow 1:
Average throughput: 44.63 Mbit/s
95th percentile per-packet one-way delay: 90.732 ms
Loss rate: 0.33%
```

Run 1: Report of LEDBAT — Data Link



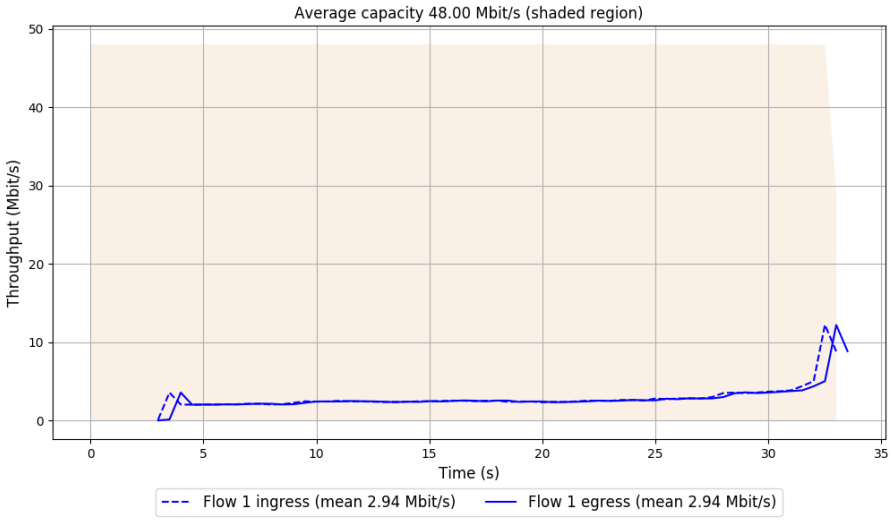


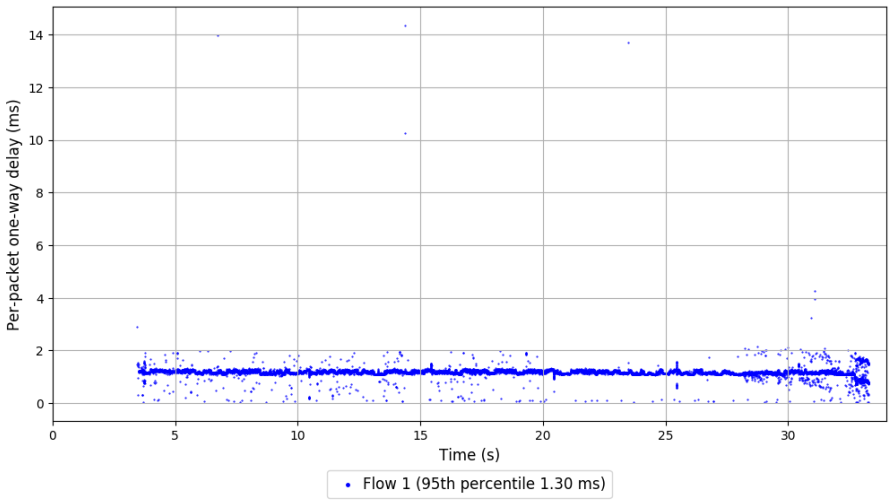
```
Run 1: Statistics of PCC-Allegro

Start at: 2022-04-05 20:48:40
End at: 2022-04-05 20:49:10

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 2.94 Mbit/s (6.1% utilization)
95th percentile per-packet one-way delay: 1.304 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 2.94 Mbit/s
95th percentile per-packet one-way delay: 1.304 ms
Loss rate: 0.01%
```

Run 1: Report of PCC-Allegro — Data Link



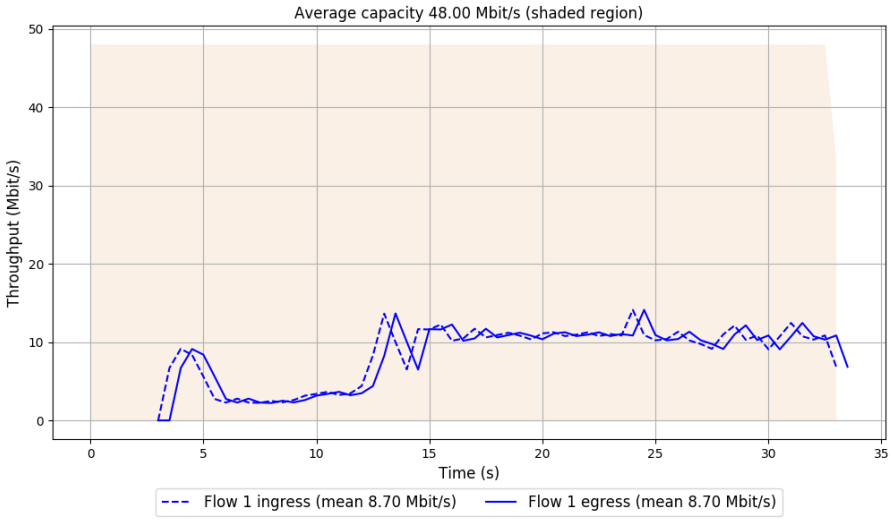


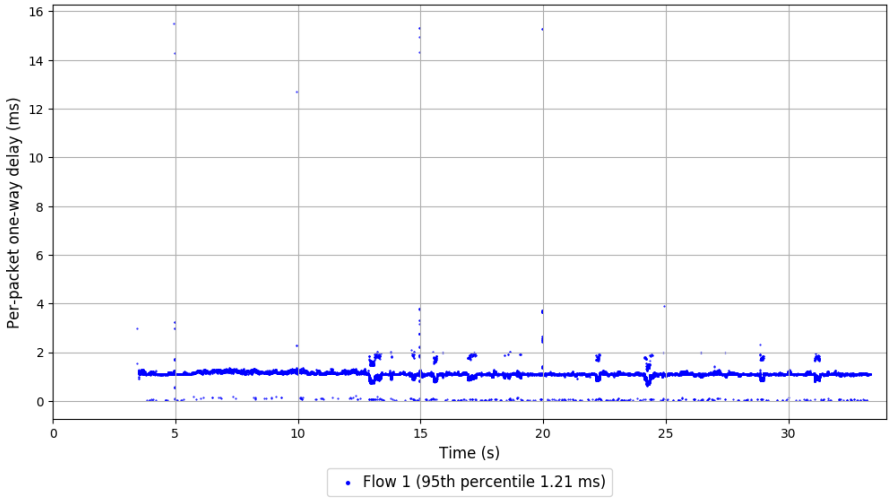
```
Run 1: Statistics of PCC-Expr

Start at: 2022-04-05 20:50:58
End at: 2022-04-05 20:51:28

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 8.70 Mbit/s (18.1% utilization)
95th percentile per-packet one-way delay: 1.214 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 8.70 Mbit/s
95th percentile per-packet one-way delay: 1.214 ms
Loss rate: 0.00%
```

Run 1: Report of PCC-Expr — Data Link



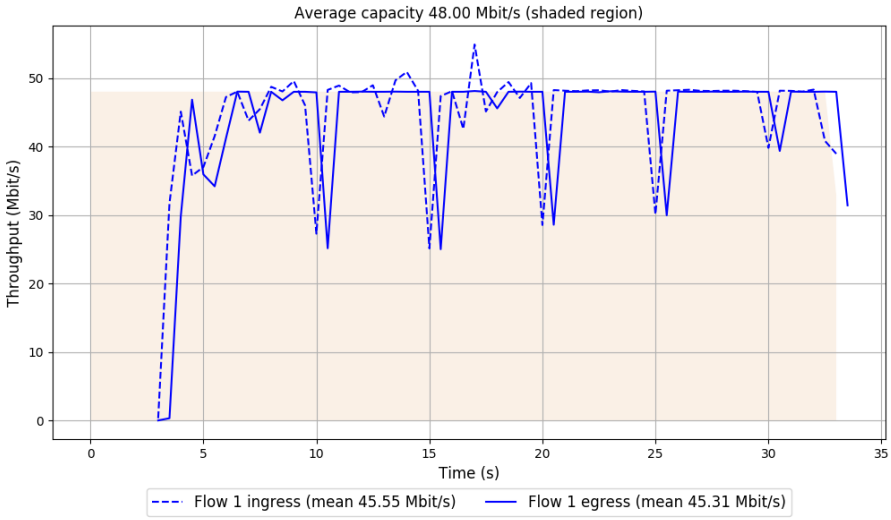


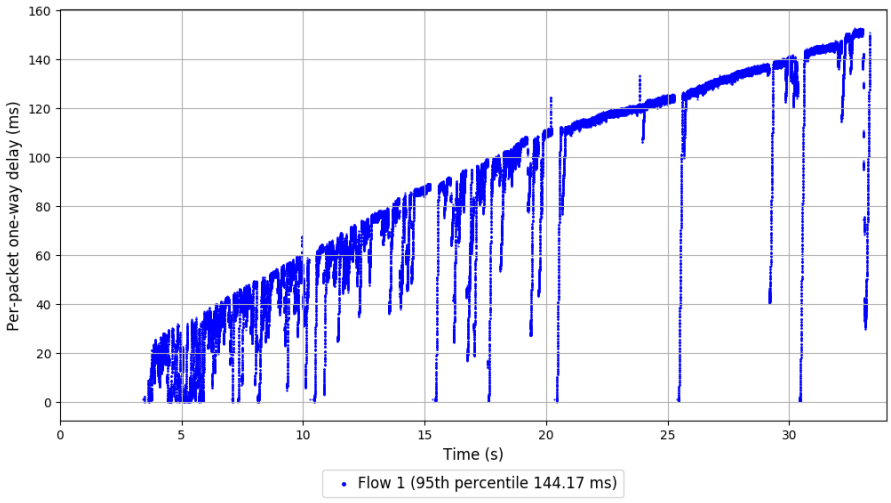
```
Run 1: Statistics of QUIC Cubic

Start at: 2022-04-05 20:48:05
End at: 2022-04-05 20:48:35

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 45.31 Mbit/s (94.4% utilization)
95th percentile per-packet one-way delay: 144.171 ms
Loss rate: 0.54%
-- Flow 1:
Average throughput: 45.31 Mbit/s
95th percentile per-packet one-way delay: 144.171 ms
Loss rate: 0.54%
```

Run 1: Report of QUIC Cubic — Data Link



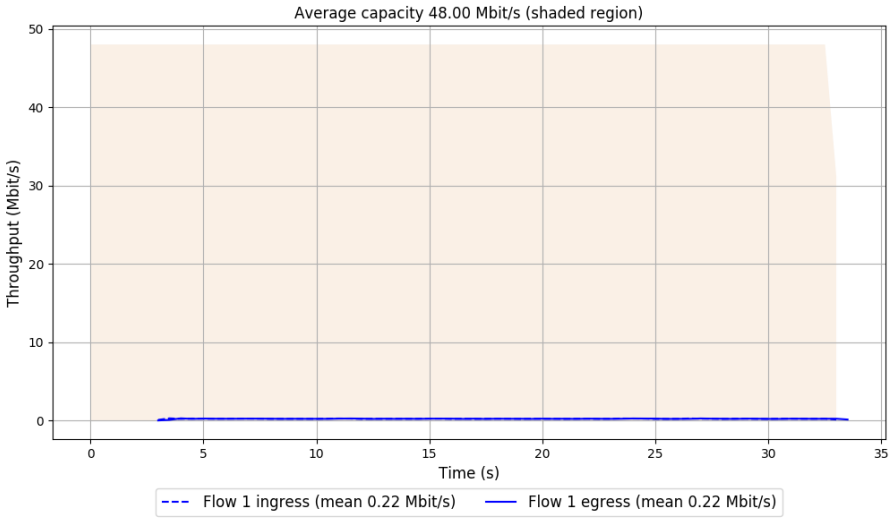


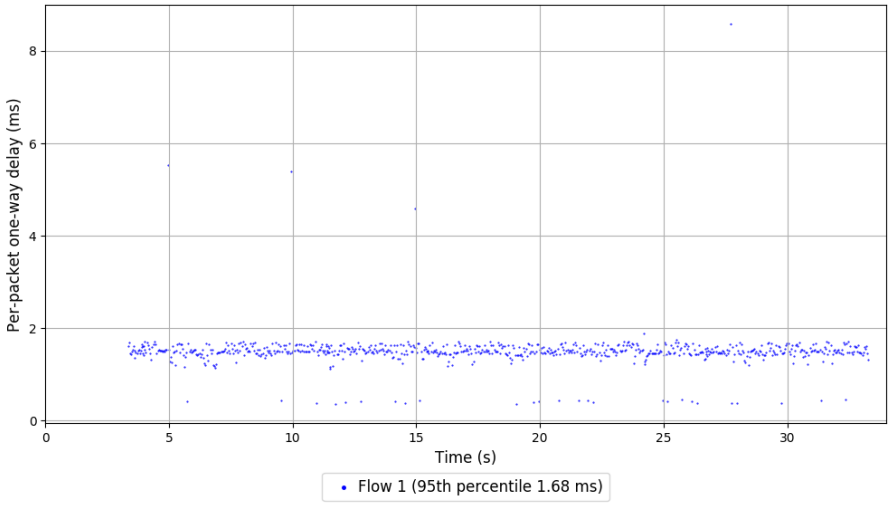
```
Run 1: Statistics of SCReAM

Start at: 2022-04-05 20:46:24
End at: 2022-04-05 20:46:54

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 0.22 Mbit/s (0.5% utilization)
95th percentile per-packet one-way delay: 1.677 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 1.677 ms
Loss rate: 0.00%
```

Run 1: Report of SCReAM — Data Link



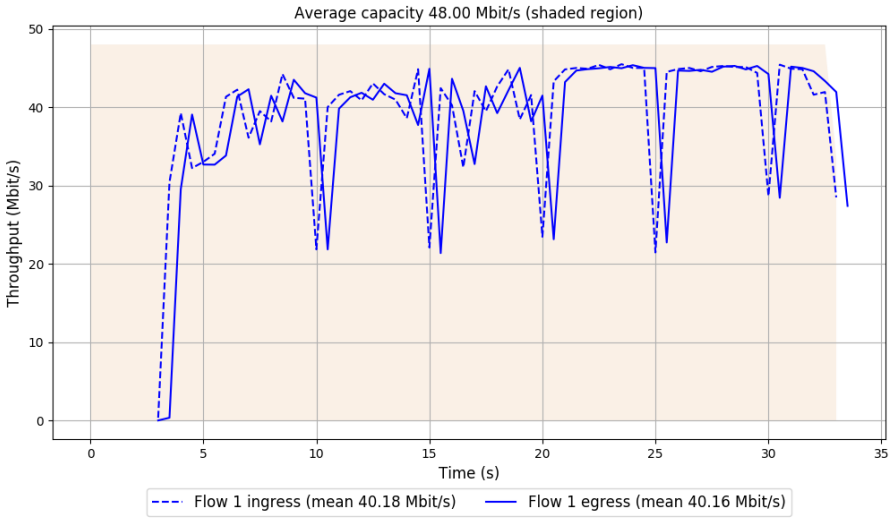


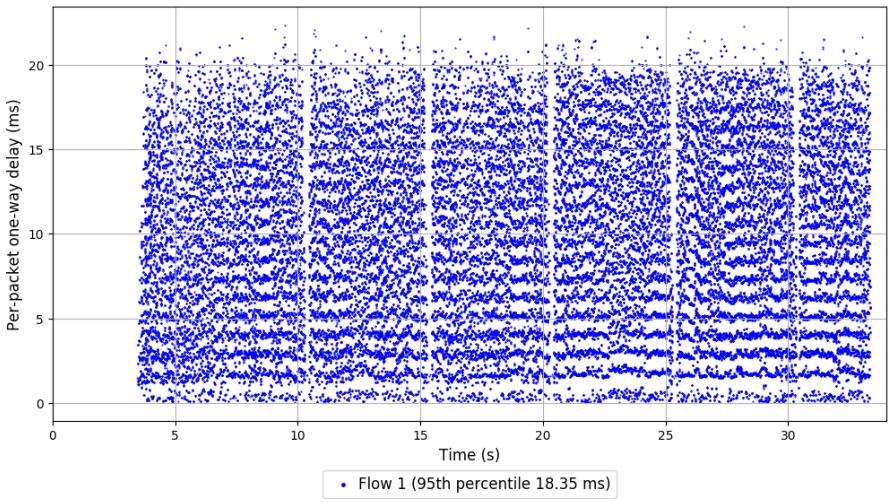
```
Run 1: Statistics of Sprout

Start at: 2022-04-05 20:45:15
End at: 2022-04-05 20:45:45

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 40.16 Mbit/s (83.7% utilization)
95th percentile per-packet one-way delay: 18.349 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 40.16 Mbit/s
95th percentile per-packet one-way delay: 18.349 ms
Loss rate: 0.05%
```

Run 1: Report of Sprout — Data Link





```
Run 1: Statistics of TCP Vegas

Start at: 2022-04-05 20:46:58
End at: 2022-04-05 20:47:28
```

Run 1: Report of TCP Vegas — Data Link

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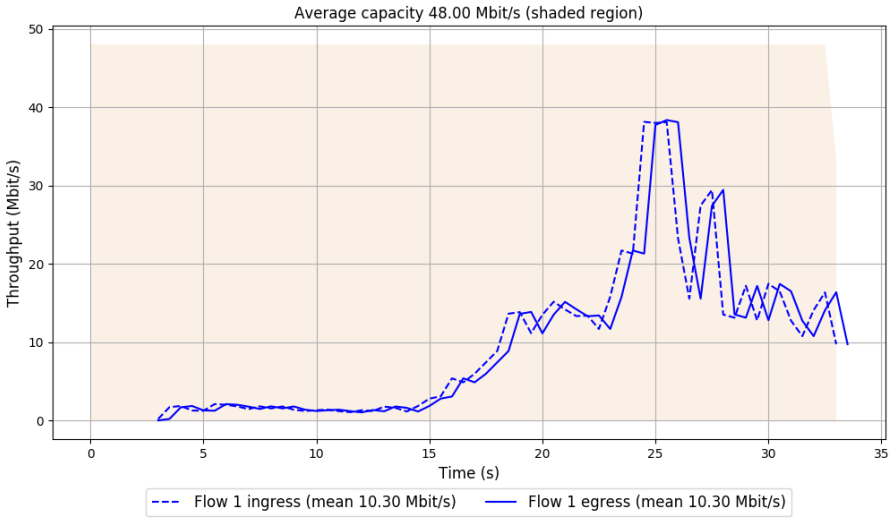
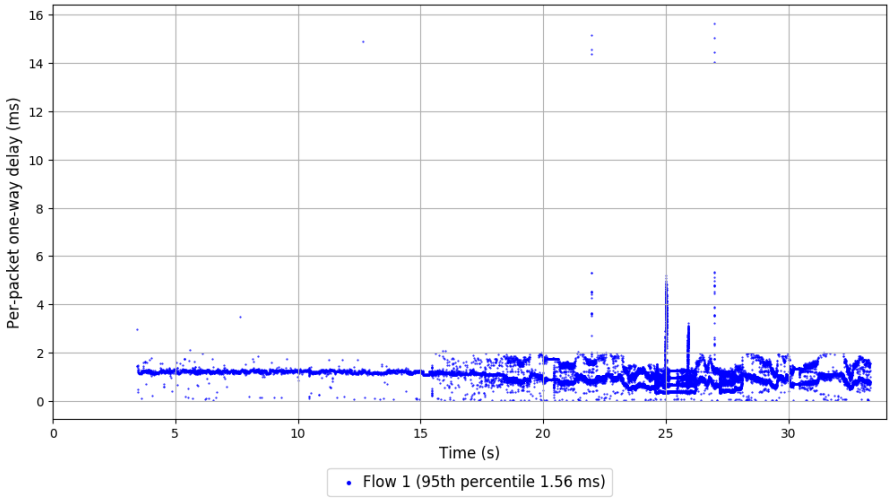
```
Run 1: Statistics of PCC-Vivace

Start at: 2022-04-05 20:45:50
End at: 2022-04-05 20:46:20

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 10.30 Mbit/s (21.5% utilization)
95th percentile per-packet one-way delay: 1.564 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 10.30 Mbit/s
95th percentile per-packet one-way delay: 1.564 ms
Loss rate: 0.00%
```

Run 1: Report of PCC-Vivace — Data Link





```
Run 1: Statistics of WebRTC media

Start at: 2022-04-05 20:49:48
End at: 2022-04-05 20:50:18

# Below is generated by plot.py at 2022-04-05 21:17:48
# Datalink statistics
-- Total of 1 flow:
Average capacity: 48.00 Mbit/s
Average throughput: 1.53 Mbit/s (3.2% utilization)
95th percentile per-packet one-way delay: 1.574 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.53 Mbit/s
95th percentile per-packet one-way delay: 1.574 ms
Loss rate: 0.00%
```

Run 1: Report of WebRTC media — Data Link