# Pantheon Report

Generated at 2019-01-24 17:12:37 (UTC).

Tested in mahimahi: `mm-delay 50 mm-link 12mbps.trace 12mbps.trace --uplink-queue=droptail --uplink-queue-args=packets=1 --downlink-queue=droptail --downlink-queue-args=packets=1`

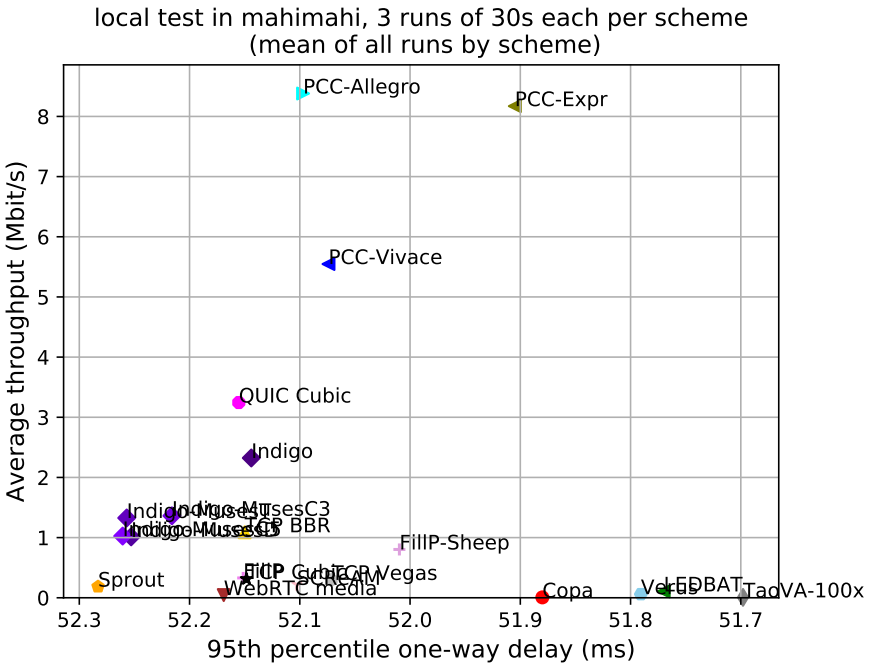
Repeated the test of 21 congestion control schemes 3 times.

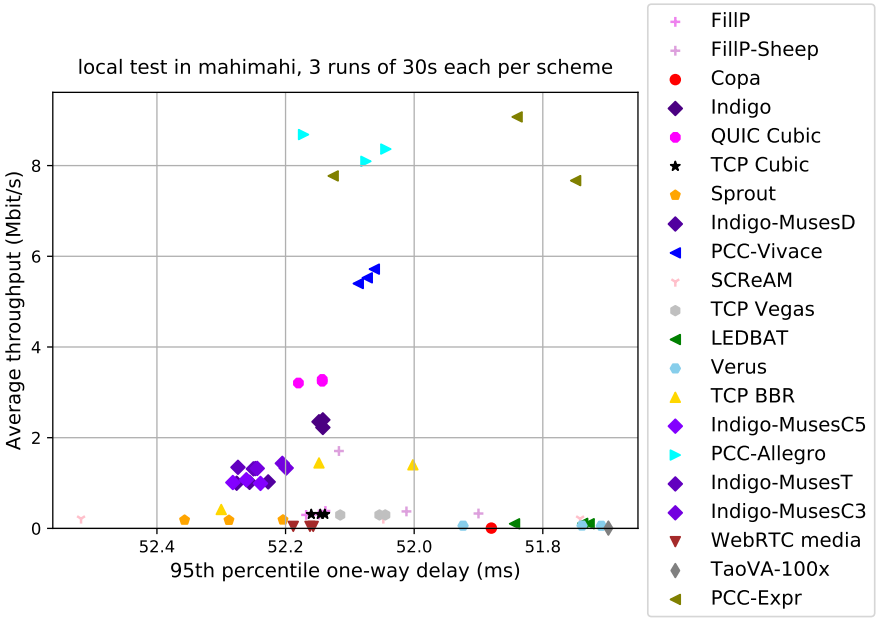
Each test lasted for 30 seconds running 1 flow.

```
System info:
Linux 4.15.0-1026-gcp
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
```

```
Git summary:
branch: muses @ 0b8e9a949603c3842368430acf469eec3b941f9f
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ d9c5ea33091330aca25ecd105ab2db6d34d5c40d
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, 3 runs of 30s each per scheme
(mean of all runs by scheme)
PCC-Allegro
PCC-Expr
PCC-Vivace
QUIC Cubic
Indigo
TCP BBR
FillP-Sheep
Sprout
TCP Vegas
WebRTC media
Copa
LEDBAT
TaoVA-100x
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
0
1
2
3
4
5
6
7
8
52.3
52.2
52.1
52.0
51.9
51.8
51.7


local test in mahimahi, 3 runs of 30s each per scheme
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
0
2
4
6
8
52.4
52.2
52.0
51.8
FillP
FillP-Sheep
Copa
Indigo
QUIC Cubic
TCP Cubic
Sprout
Indigo-MusesD
PCC-Vivace
SCReAM
TCP Vegas
LEDBAT
Verus
TCP BBR
Indigo-MusesC5
PCC-Allegro
Indigo-MusesT
Indigo-MusesC3
WebRTC media
TaoVA-100x
PCC-Expr

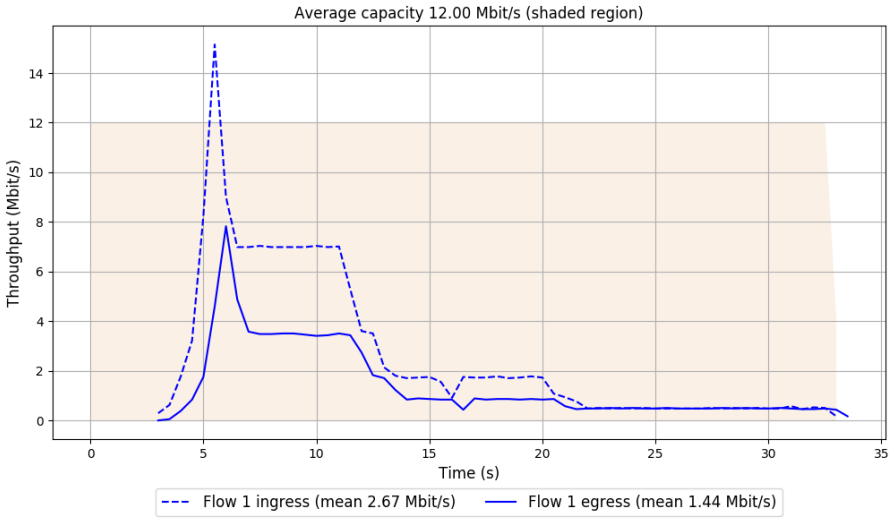
| scheme | # runs | mean avg tput (Mbit/s) flow 1 | mean 95th-%ile delay (ms) flow 1 | mean loss rate (%) flow 1 |
|---|---|---|---|---|
| TCP BBR | 3 | 1.09 | 52.15 | 39.93 |
| Copa | 1 | 0.01 | 51.88 | 90.36 |
| TCP Cubic | 3 | 0.31 | 52.15 | 8.19 |
| FillP | 3 | 0.33 | 52.15 | 46.37 |
| FillP-Sheep | 3 | 0.80 | 52.01 | 37.81 |
| Indigo | 3 | 2.32 | 52.14 | 97.29 |
| Indigo-MusesC3 | 3 | 1.36 | 52.22 | 30.89 |
| Indigo-MusesC5 | 3 | 1.02 | 52.26 | 45.84 |
| Indigo-MusesD | 3 | 1.02 | 52.25 | 39.11 |
| Indigo-MusesT | 3 | 1.33 | 52.26 | 25.71 |
| LEDBAT | 3 | 0.10 | 51.77 | 49.08 |
| PCC-Allegro | 3 | 8.38 | 52.10 | 2.85 |
| PCC-Expr | 3 | 8.17 | 51.91 | 66.05 |
| QUIC Cubic | 3 | 3.24 | 52.16 | 1.43 |
| SCReAM | 3 | 0.21 | 52.10 | 0.22 |
| Sprout | 3 | 0.18 | 52.28 | 8.10 |
| TaoVA-100x | 1 | 0.01 | 51.70 | 51.91 |
| TCP Vegas | 3 | 0.30 | 52.07 | 11.07 |
| Verus | 3 | 0.06 | 51.79 | 44.10 |
| PCC-Vivace | 3 | 5.55 | 52.07 | 0.32 |
| WebRTC media | 3 | 0.04 | 52.17 | 25.76 |

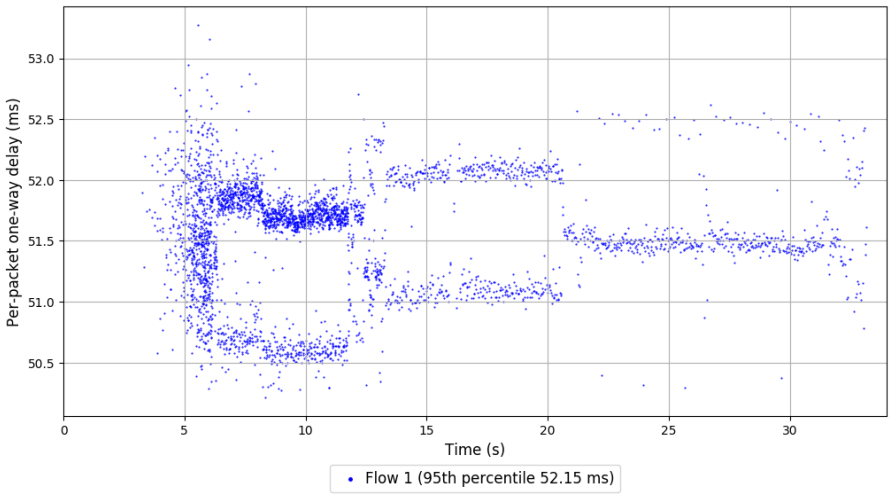
```
Run 1: Statistics of TCP BBR

Start at: 2019-01-24 16:34:56
End at: 2019-01-24 16:35:26

# Below is generated by plot.py at 2019-01-24 17:10:41
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.44 Mbit/s (12.0% utilization)
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 45.96%
-- Flow 1:
Average throughput: 1.44 Mbit/s
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 45.96%
```

Run 1: Report of TCP BBR — Data Link



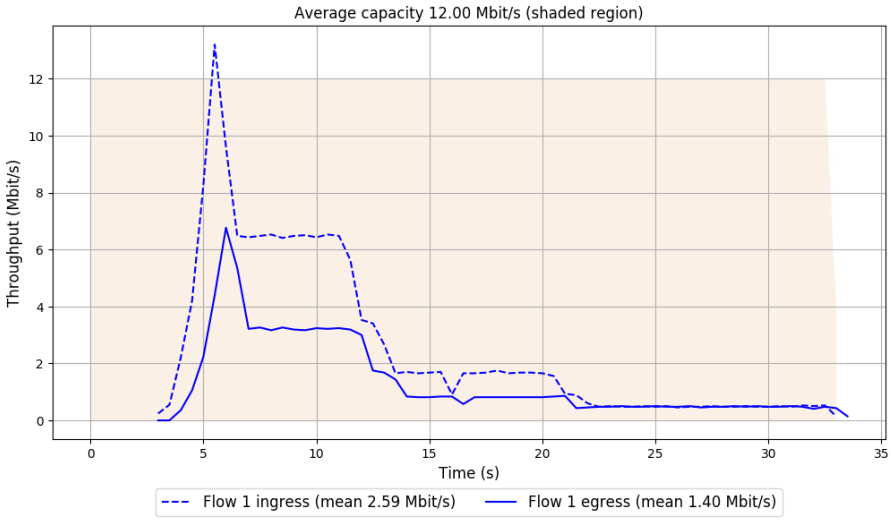



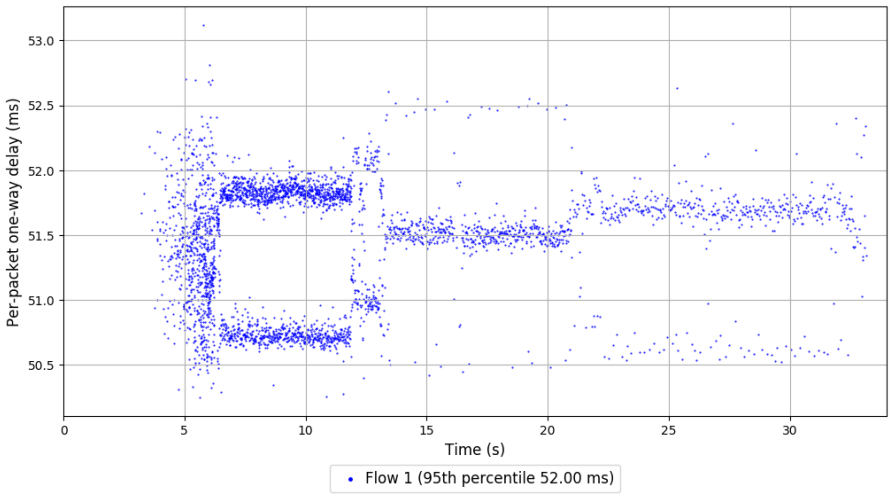
```
Run 2: Statistics of TCP BBR

Start at: 2019-01-24 16:47:20
End at: 2019-01-24 16:47:50

# Below is generated by plot.py at 2019-01-24 17:10:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.40 Mbit/s (11.7% utilization)
95th percentile per-packet one-way delay: 52.002 ms
Loss rate: 46.00%
-- Flow 1:
Average throughput: 1.40 Mbit/s
95th percentile per-packet one-way delay: 52.002 ms
Loss rate: 46.00%
```

Run 2: Report of TCP BBR — Data Link



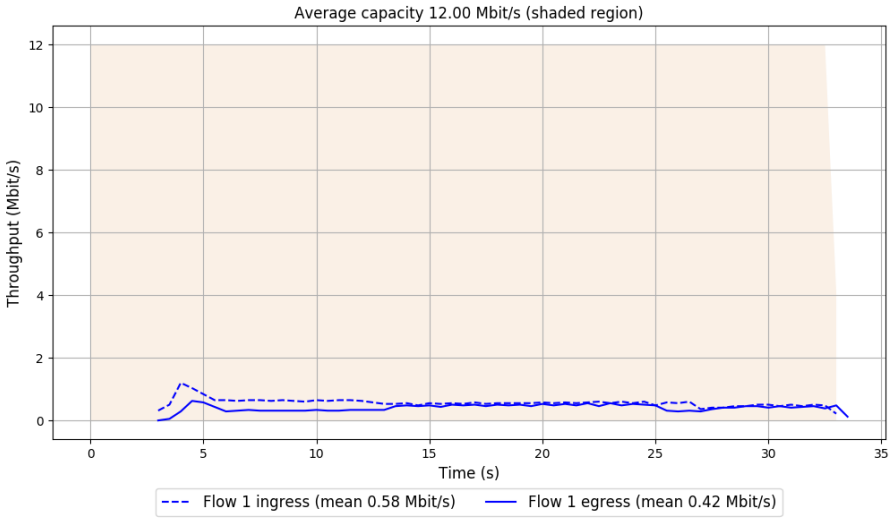



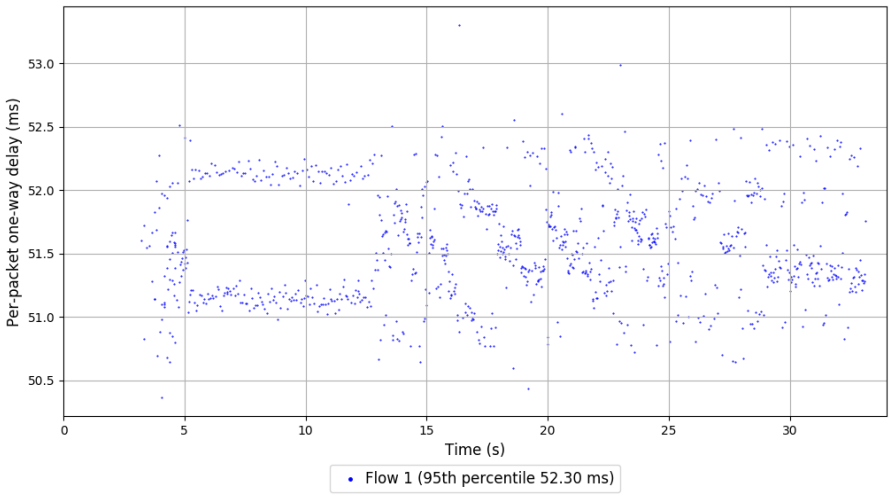
```
Run 3: Statistics of TCP BBR

Start at: 2019-01-24 16:59:49
End at: 2019-01-24 17:00:19

# Below is generated by plot.py at 2019-01-24 17:10:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.42 Mbit/s (3.5% utilization)
95th percentile per-packet one-way delay: 52.300 ms
Loss rate: 27.83%
-- Flow 1:
Average throughput: 0.42 Mbit/s
95th percentile per-packet one-way delay: 52.300 ms
Loss rate: 27.83%
```

Run 3: Report of TCP BBR — Data Link



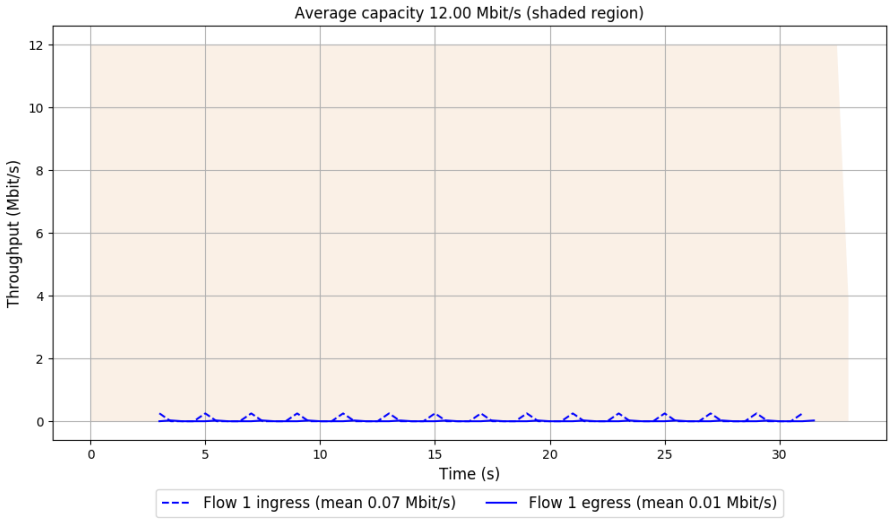



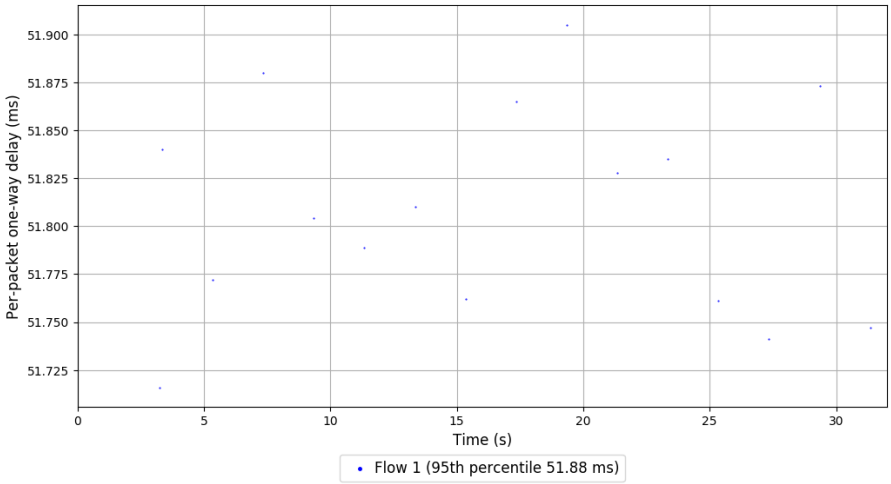
```
Run 1: Statistics of Copa

Start at: 2019-01-24 16:44:25
End at: 2019-01-24 16:44:55

# Below is generated by plot.py at 2019-01-24 17:10:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.01 Mbit/s (0.1% utilization)
95th percentile per-packet one-way delay: 51.880 ms
Loss rate: 90.36%
-- Flow 1:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 51.880 ms
Loss rate: 90.36%
```

Run 1: Report of Copa — Data Link

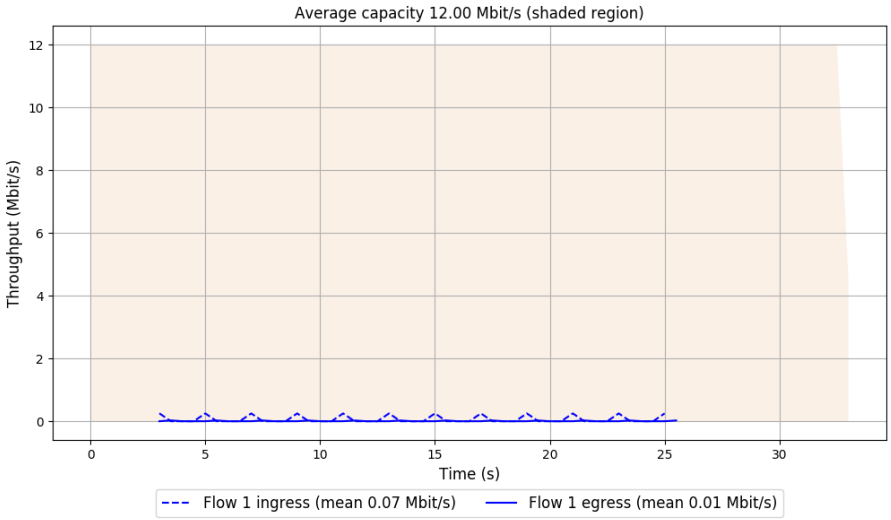


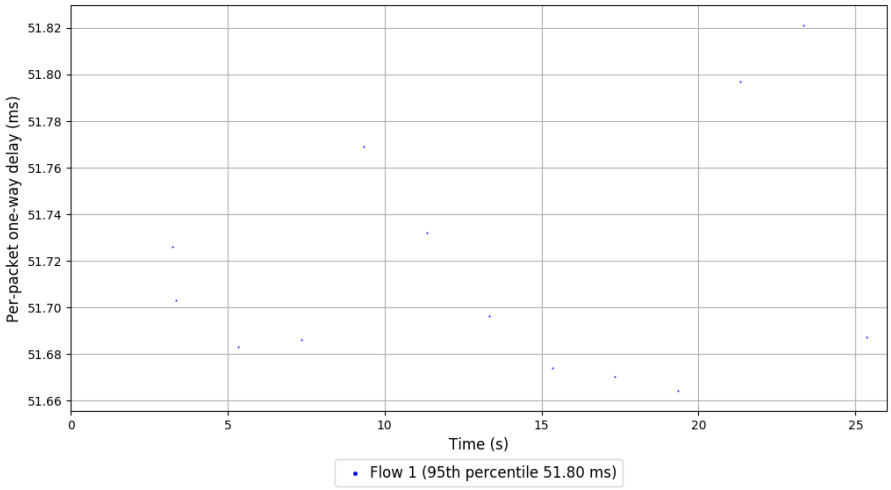



```
Run 2: Statistics of Copa

Start at: 2019-01-24 16:56:53
End at: 2019-01-24 16:57:23
```

Run 2: Report of Copa — Data Link

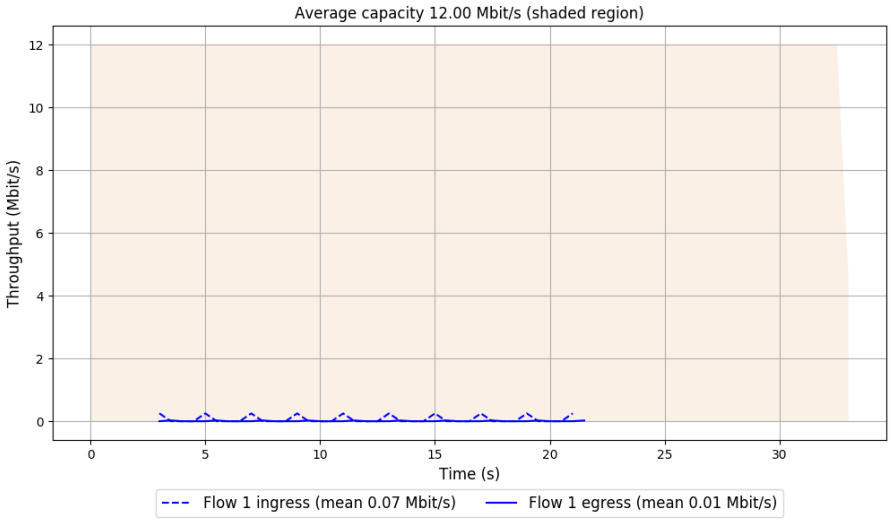


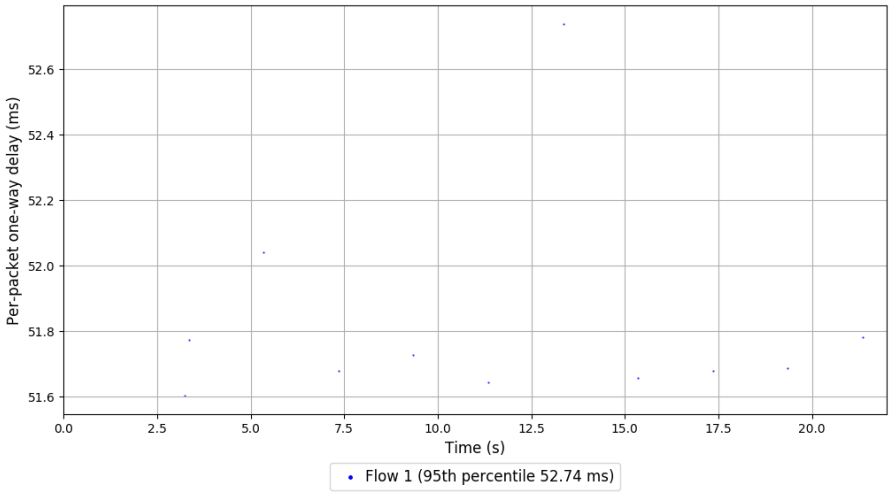



```
Run 3: Statistics of Copa

Start at: 2019-01-24 17:09:13
End at: 2019-01-24 17:09:43
```

Run 3: Report of Copa — Data Link



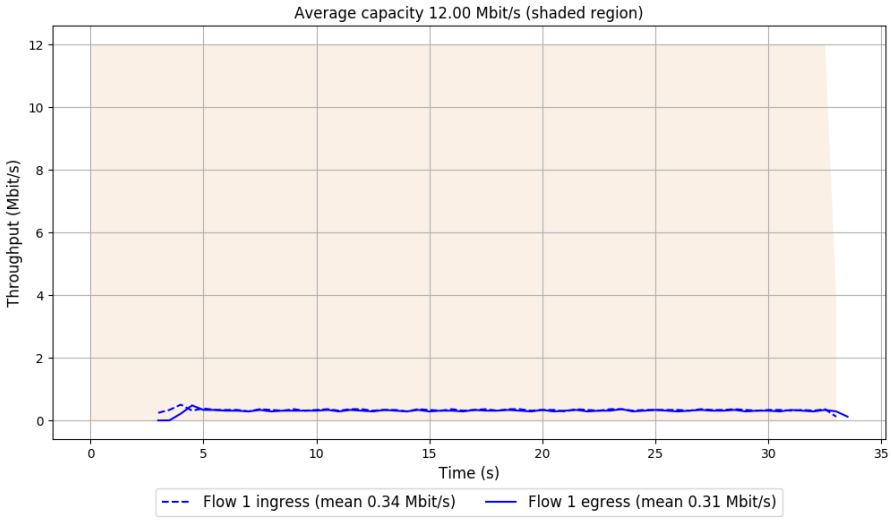



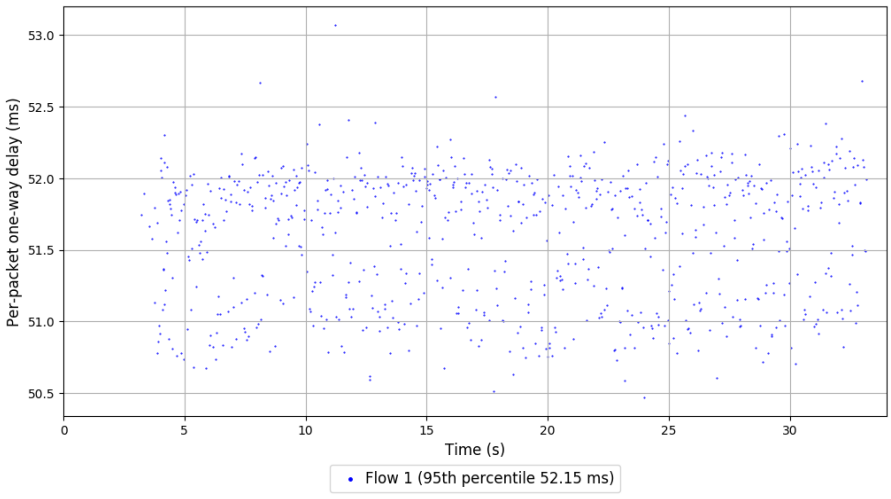
```
Run 1: Statistics of TCP Cubic

Start at: 2019-01-24 16:42:04
End at: 2019-01-24 16:42:34

# Below is generated by plot.py at 2019-01-24 17:10:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.31 Mbit/s (2.6% utilization)
95th percentile per-packet one-way delay: 52.146 ms
Loss rate: 8.05%
-- Flow 1:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 52.146 ms
Loss rate: 8.05%
```

Run 1: Report of TCP Cubic — Data Link



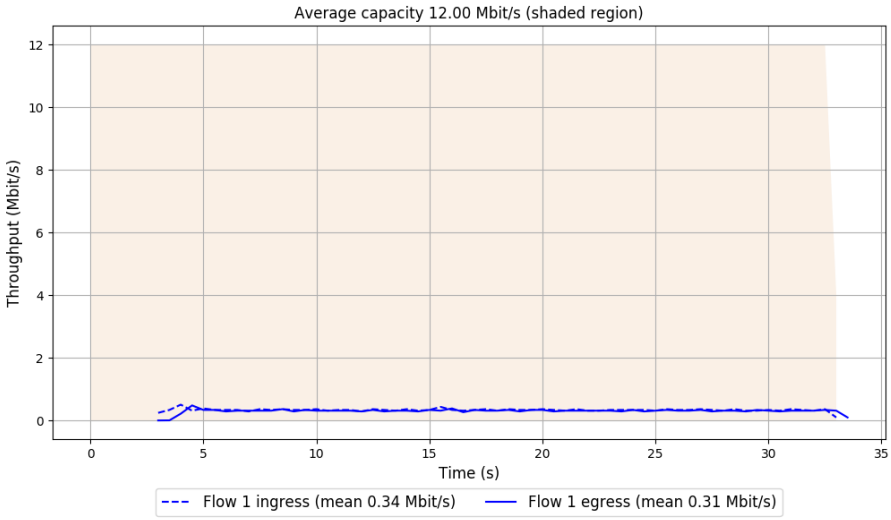



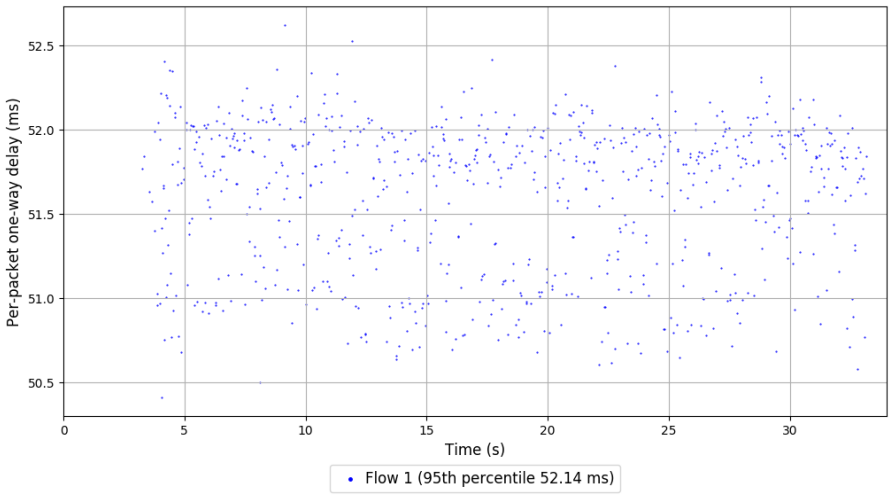
```
Run 2: Statistics of TCP Cubic

Start at: 2019-01-24 16:54:32
End at: 2019-01-24 16:55:02

# Below is generated by plot.py at 2019-01-24 17:10:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.31 Mbit/s (2.6% utilization)
95th percentile per-packet one-way delay: 52.139 ms
Loss rate: 8.14%
-- Flow 1:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 52.139 ms
Loss rate: 8.14%
```

Run 2: Report of TCP Cubic — Data Link



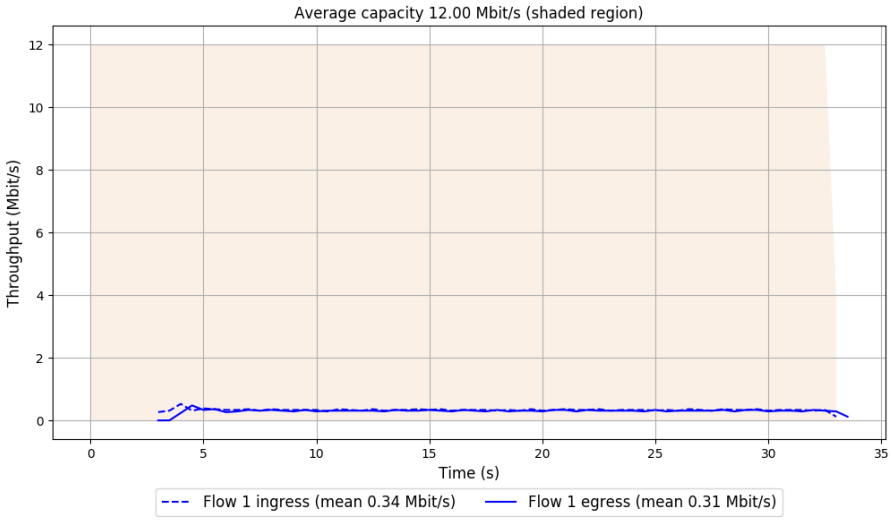



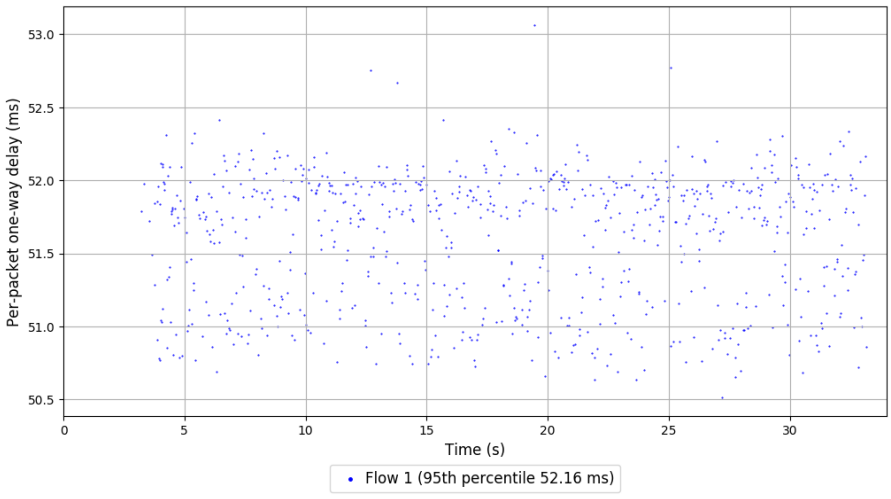
```
Run 3: Statistics of TCP Cubic

Start at: 2019-01-24 17:06:52
End at: 2019-01-24 17:07:22

# Below is generated by plot.py at 2019-01-24 17:10:45
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.31 Mbit/s (2.6% utilization)
95th percentile per-packet one-way delay: 52.160 ms
Loss rate: 8.37%
-- Flow 1:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 52.160 ms
Loss rate: 8.37%
```

Run 3: Report of TCP Cubic — Data Link



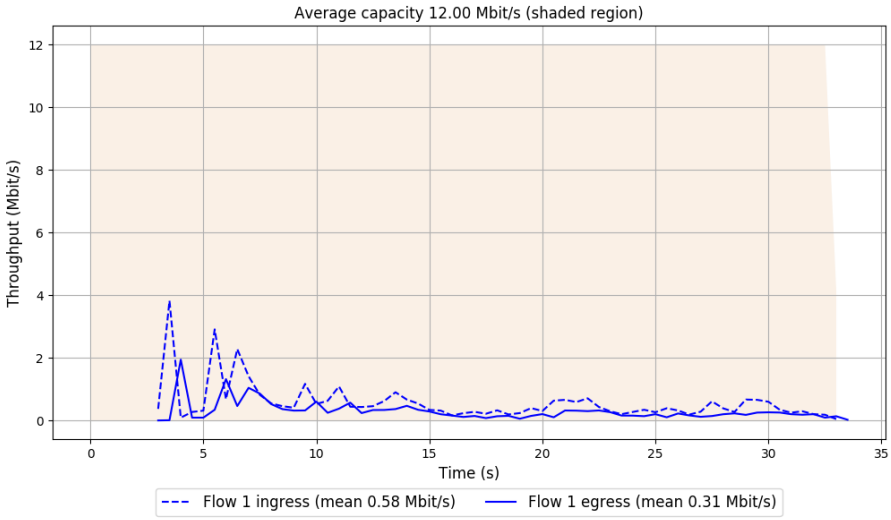



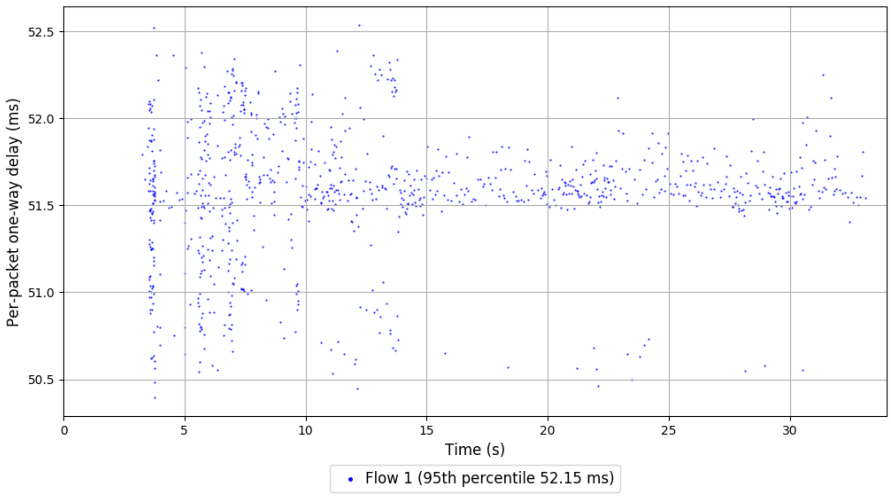
```
Run 1: Statistics of FillP

Start at: 2019-01-24 16:41:29
End at: 2019-01-24 16:41:59

# Below is generated by plot.py at 2019-01-24 17:10:50
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.31 Mbit/s (2.6% utilization)
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 47.27%
-- Flow 1:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 47.27%
```

Run 1: Report of FillP — Data Link



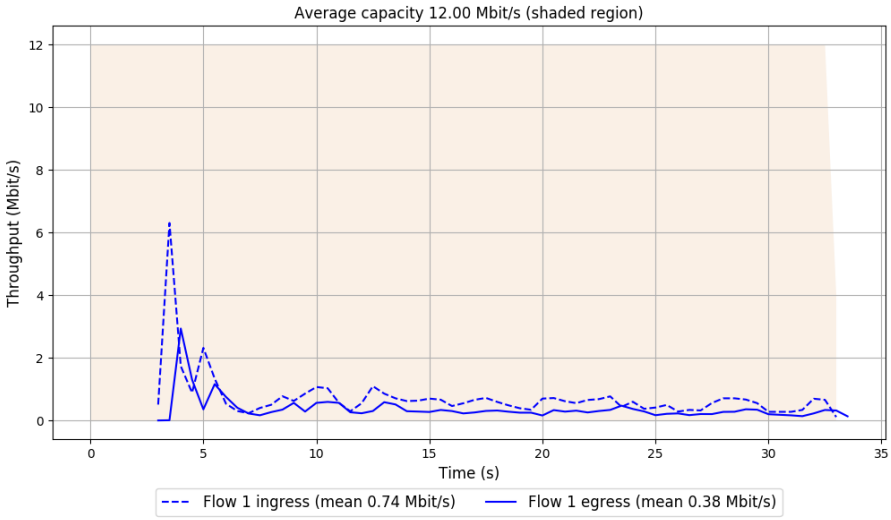



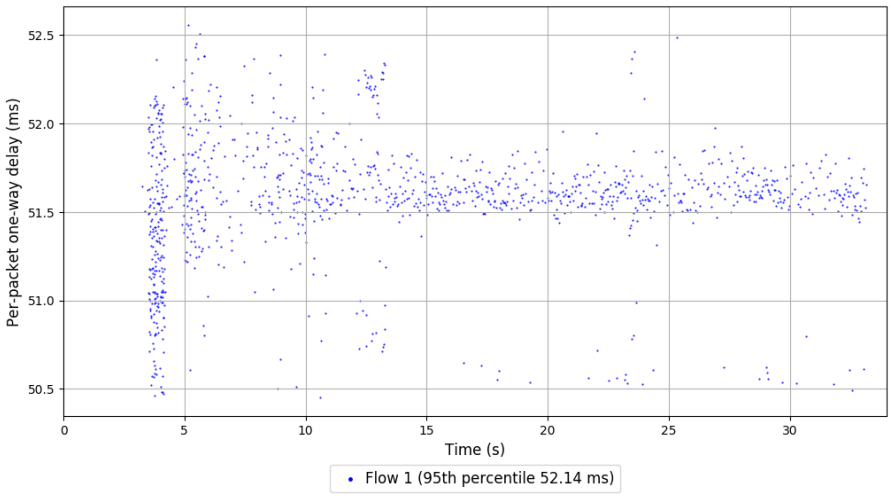
```
Run 2: Statistics of FillP

Start at: 2019-01-24 16:53:57
End at: 2019-01-24 16:54:27

# Below is generated by plot.py at 2019-01-24 17:10:50
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.38 Mbit/s (3.2% utilization)
95th percentile per-packet one-way delay: 52.138 ms
Loss rate: 47.86%
-- Flow 1:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 52.138 ms
Loss rate: 47.86%
```

Run 2: Report of FillP — Data Link



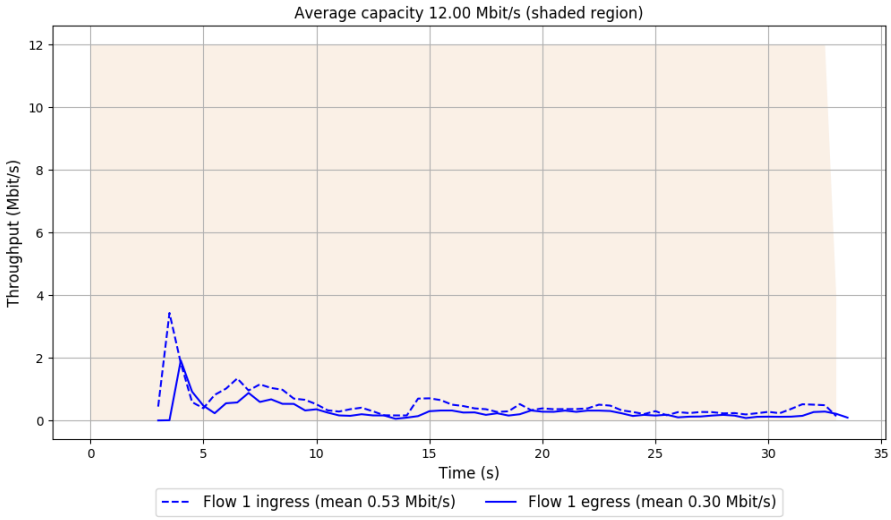



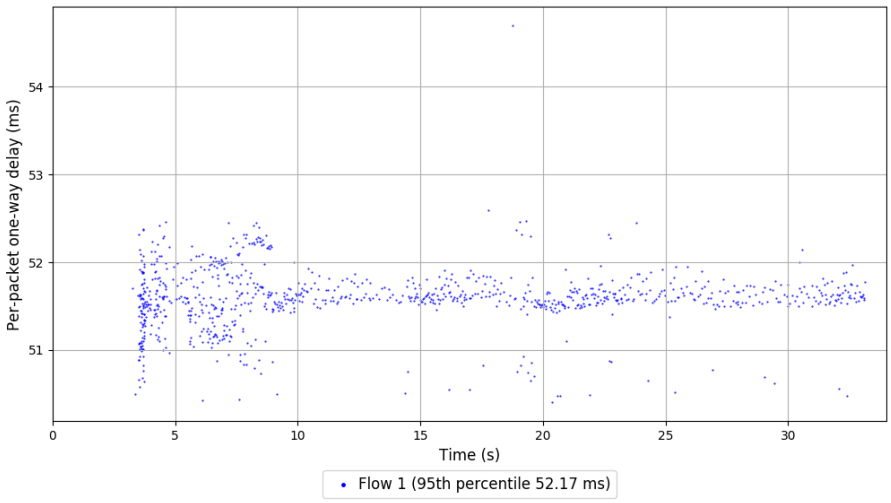
```
Run 3: Statistics of FillP

Start at: 2019-01-24 17:06:17
End at: 2019-01-24 17:06:47

# Below is generated by plot.py at 2019-01-24 17:10:50
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.30 Mbit/s (2.5% utilization)
95th percentile per-packet one-way delay: 52.168 ms
Loss rate: 43.97%
-- Flow 1:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 52.168 ms
Loss rate: 43.97%
```

Run 3: Report of FillP — Data Link



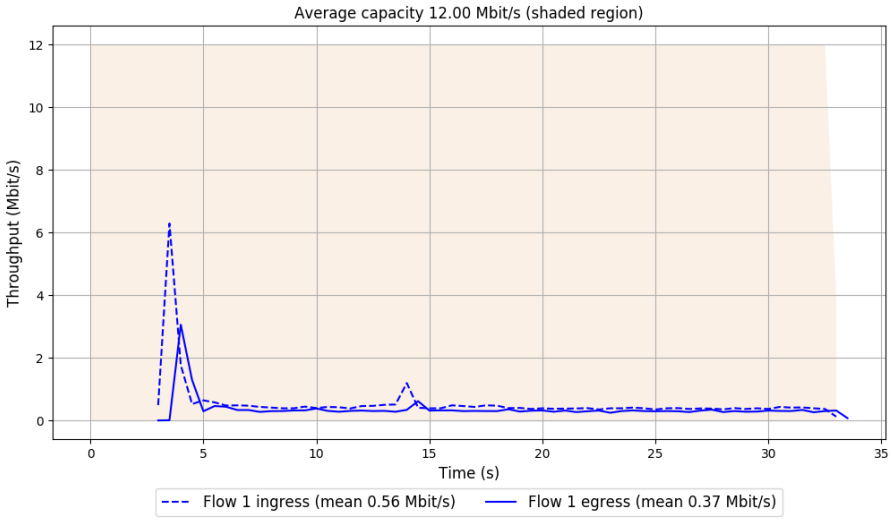



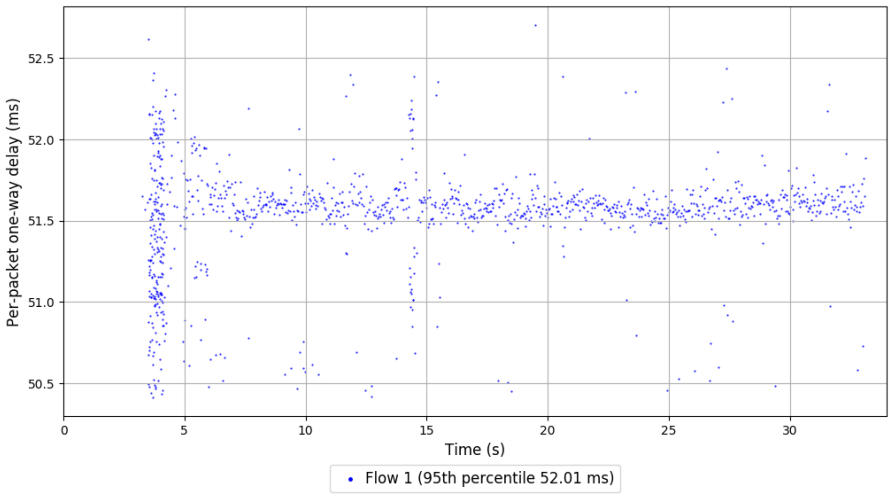
```
Run 1: Statistics of FillP-Sheep

Start at: 2019-01-24 16:34:20
End at: 2019-01-24 16:34:50

# Below is generated by plot.py at 2019-01-24 17:10:51
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.37 Mbit/s (3.1% utilization)
95th percentile per-packet one-way delay: 52.012 ms
Loss rate: 32.82%
-- Flow 1:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 52.012 ms
Loss rate: 32.82%
```

Run 1: Report of FillP-Sheep — Data Link



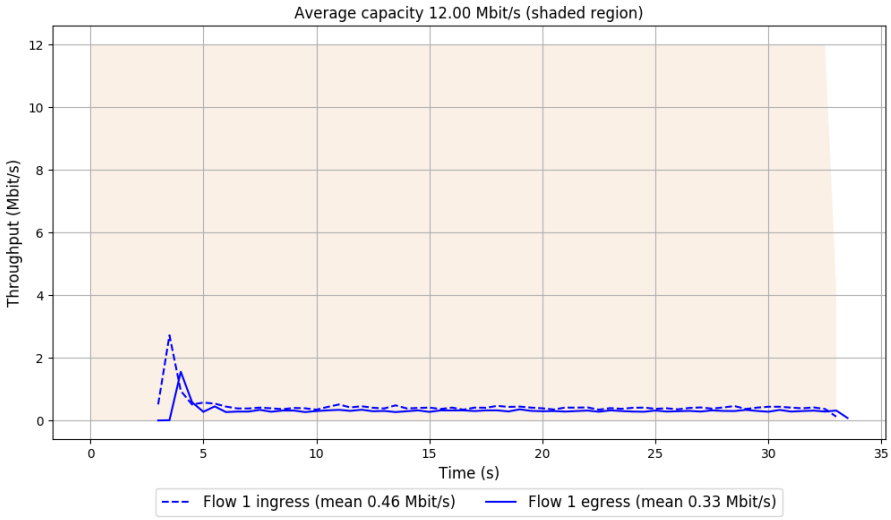



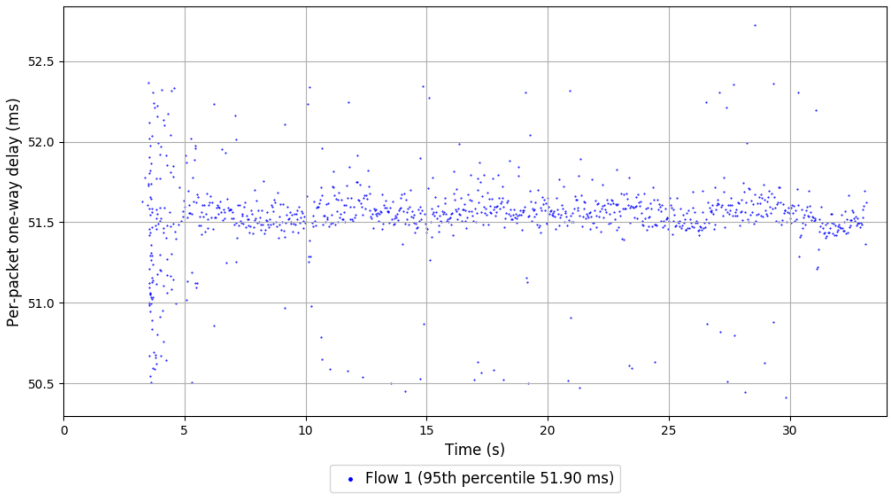
```
Run 2: Statistics of FillP-Sheep

Start at: 2019-01-24 16:46:45
End at: 2019-01-24 16:47:15

# Below is generated by plot.py at 2019-01-24 17:10:51
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.33 Mbit/s (2.7% utilization)
95th percentile per-packet one-way delay: 51.900 ms
Loss rate: 29.11%
-- Flow 1:
Average throughput: 0.33 Mbit/s
95th percentile per-packet one-way delay: 51.900 ms
Loss rate: 29.11%
```

Run 2: Report of FillP-Sheep — Data Link



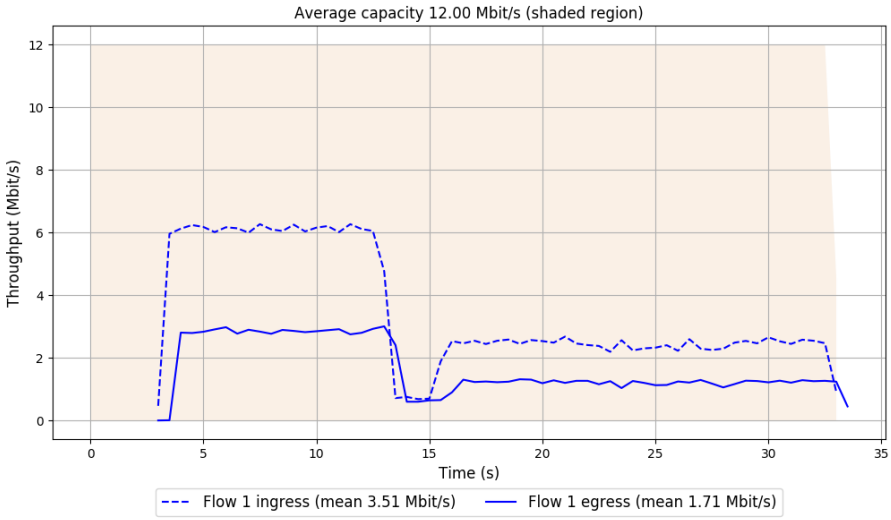



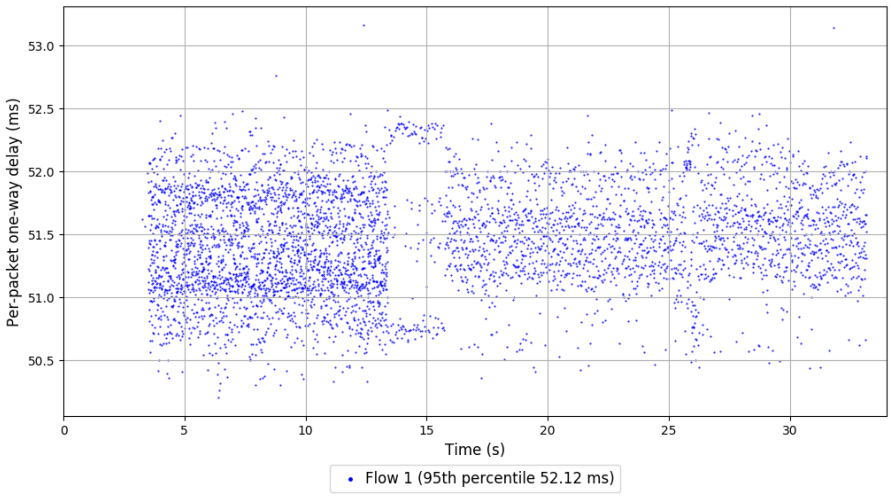
```
Run 3: Statistics of FillP-Sheep

Start at: 2019-01-24 16:59:14
End at: 2019-01-24 16:59:44

# Below is generated by plot.py at 2019-01-24 17:10:53
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.71 Mbit/s (14.2% utilization)
95th percentile per-packet one-way delay: 52.117 ms
Loss rate: 51.51%
-- Flow 1:
Average throughput: 1.71 Mbit/s
95th percentile per-packet one-way delay: 52.117 ms
Loss rate: 51.51%
```

Run 3: Report of FillP-Sheep — Data Link



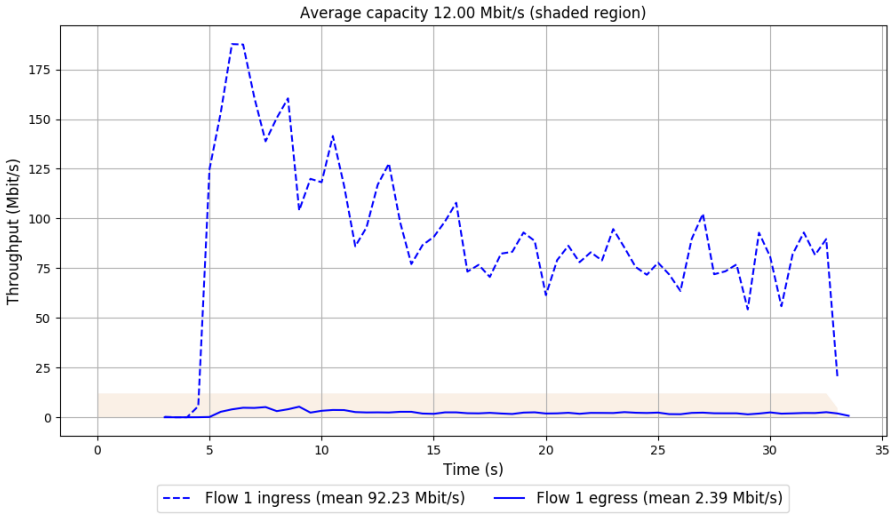



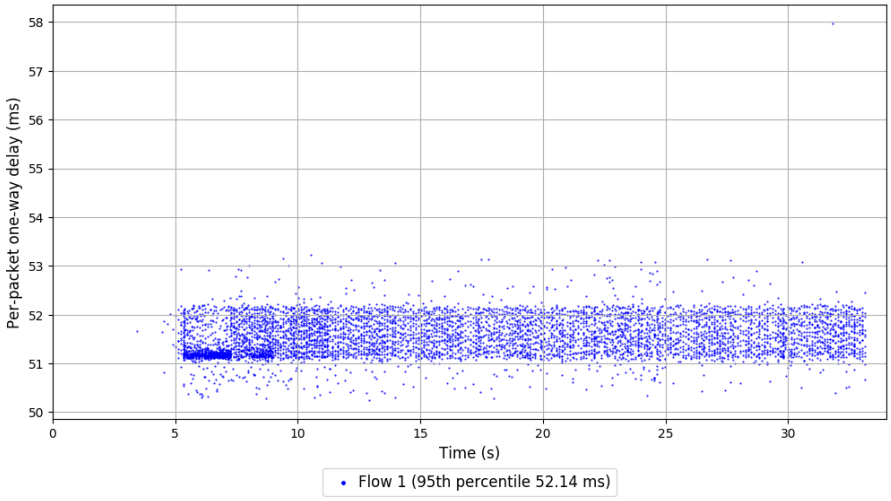
```
Run 1: Statistics of Indigo

Start at: 2019-01-24 16:37:16
End at: 2019-01-24 16:37:46

# Below is generated by plot.py at 2019-01-24 17:11:33
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.39 Mbit/s (19.9% utilization)
95th percentile per-packet one-way delay: 52.142 ms
Loss rate: 97.41%
-- Flow 1:
Average throughput: 2.39 Mbit/s
95th percentile per-packet one-way delay: 52.142 ms
Loss rate: 97.41%
```

Run 1: Report of Indigo — Data Link



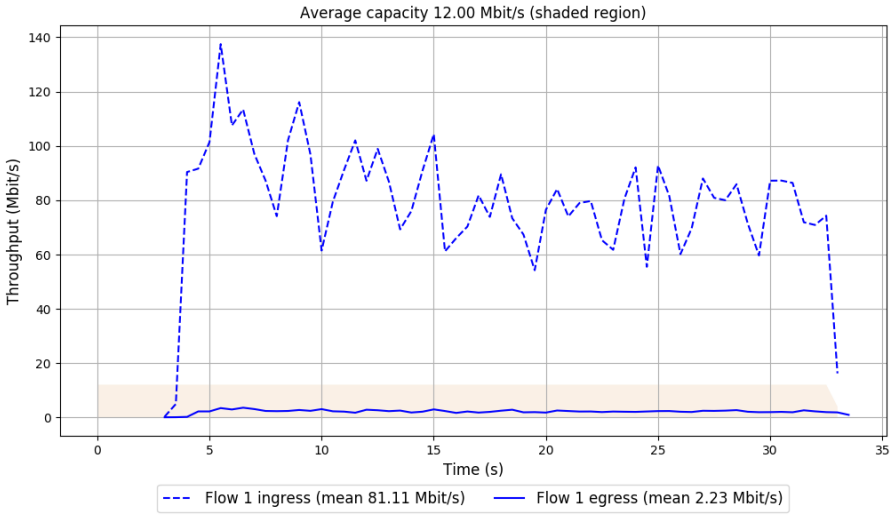



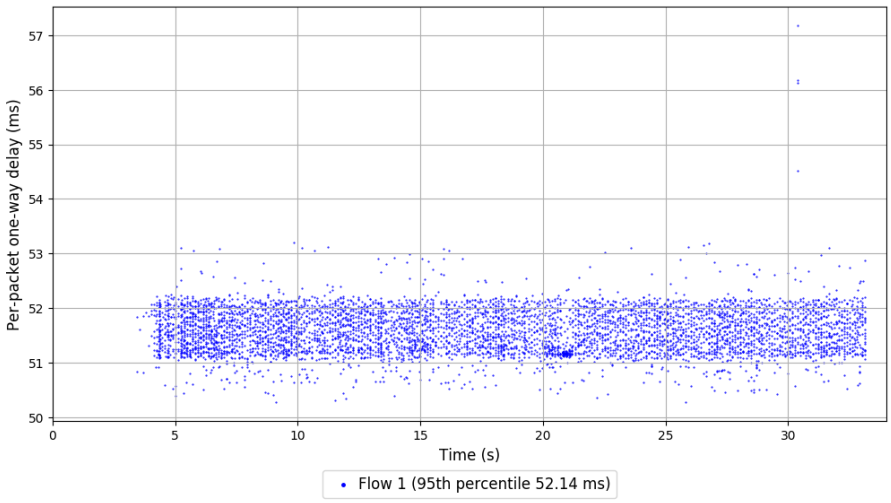
```
Run 2: Statistics of Indigo

Start at: 2019-01-24 16:49:40
End at: 2019-01-24 16:50:10

# Below is generated by plot.py at 2019-01-24 17:11:33
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.23 Mbit/s (18.5% utilization)
95th percentile per-packet one-way delay: 52.142 ms
Loss rate: 97.26%
-- Flow 1:
Average throughput: 2.23 Mbit/s
95th percentile per-packet one-way delay: 52.142 ms
Loss rate: 97.26%
```

Run 2: Report of Indigo — Data Link



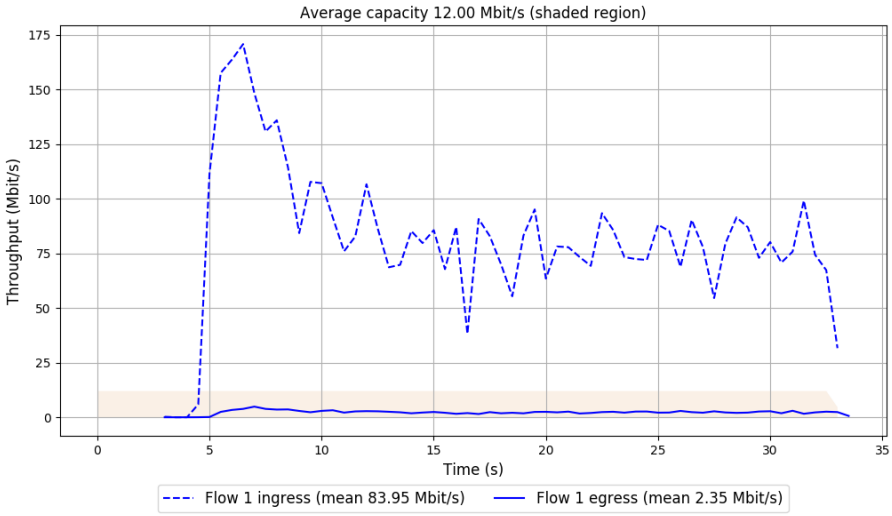



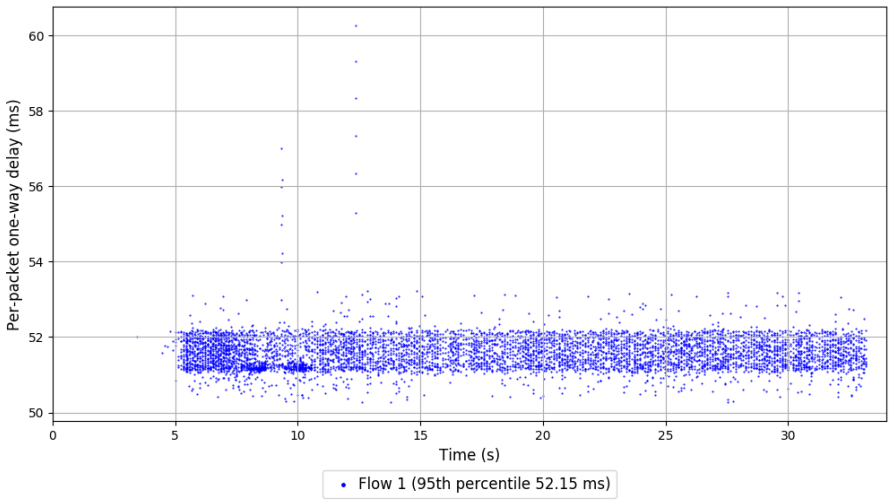
```
Run 3: Statistics of Indigo

Start at: 2019-01-24 17:02:09
End at: 2019-01-24 17:02:39

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.35 Mbit/s (19.6% utilization)
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 97.20%
-- Flow 1:
Average throughput: 2.35 Mbit/s
95th percentile per-packet one-way delay: 52.148 ms
Loss rate: 97.20%
```

Run 3: Report of Indigo — Data Link



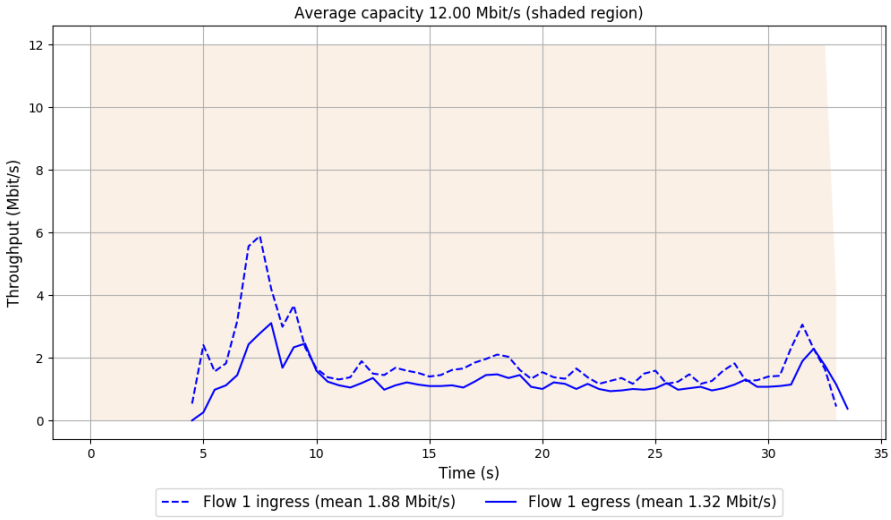



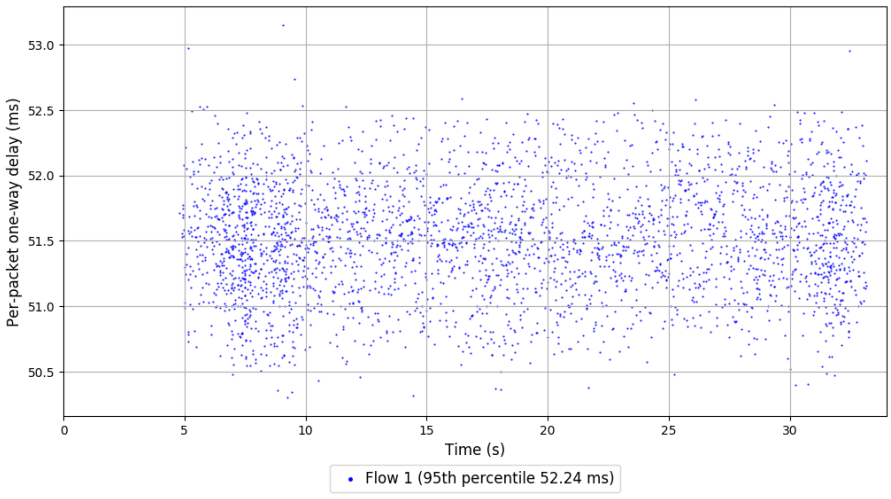
```
Run 1: Statistics of Indigo-MusesC3

Start at: 2019-01-24 16:33:45
End at: 2019-01-24 16:34:15

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.32 Mbit/s (11.0% utilization)
95th percentile per-packet one-way delay: 52.244 ms
Loss rate: 29.65%
-- Flow 1:
Average throughput: 1.32 Mbit/s
95th percentile per-packet one-way delay: 52.244 ms
Loss rate: 29.65%
```

Run 1: Report of Indigo-MusesC3 — Data Link



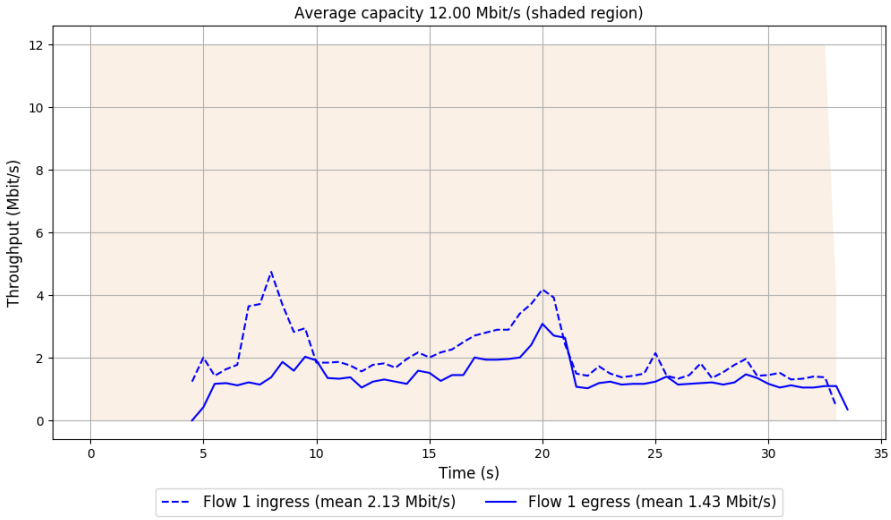



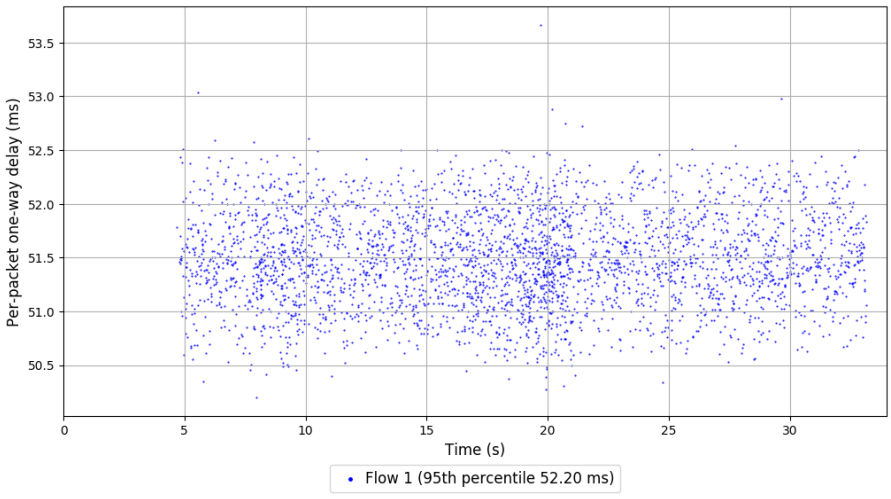
```
Run 2: Statistics of Indigo-MusesC3

Start at: 2019-01-24 16:46:10
End at: 2019-01-24 16:46:40

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.43 Mbit/s (11.9% utilization)
95th percentile per-packet one-way delay: 52.205 ms
Loss rate: 32.74%
-- Flow 1:
Average throughput: 1.43 Mbit/s
95th percentile per-packet one-way delay: 52.205 ms
Loss rate: 32.74%
```

Run 2: Report of Indigo-MusesC3 — Data Link



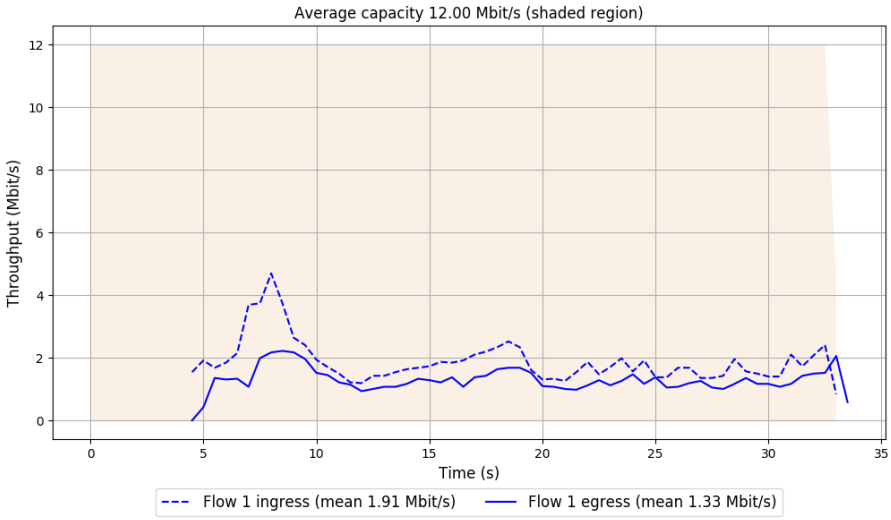



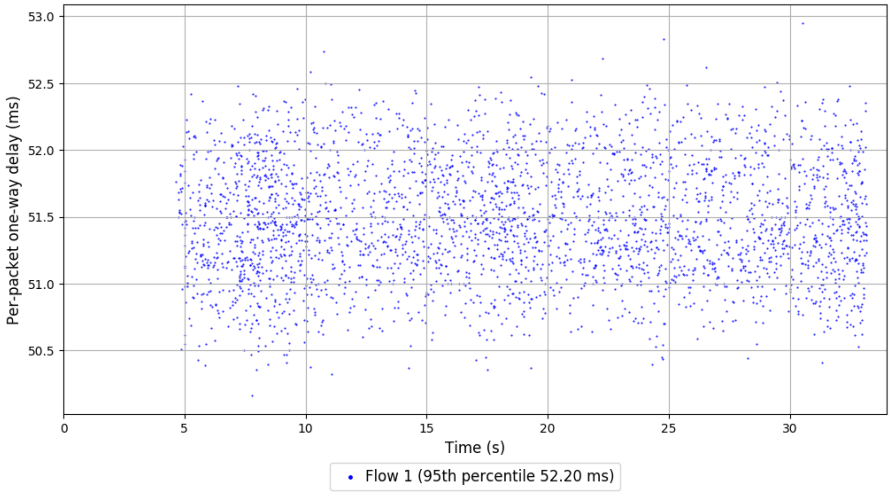
```
Run 3: Statistics of Indigo-MusesC3

Start at: 2019-01-24 16:58:38
End at: 2019-01-24 16:59:08

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.33 Mbit/s (11.1% utilization)
95th percentile per-packet one-way delay: 52.199 ms
Loss rate: 30.27%
-- Flow 1:
Average throughput: 1.33 Mbit/s
95th percentile per-packet one-way delay: 52.199 ms
Loss rate: 30.27%
```

Run 3: Report of Indigo-MusesC3 — Data Link



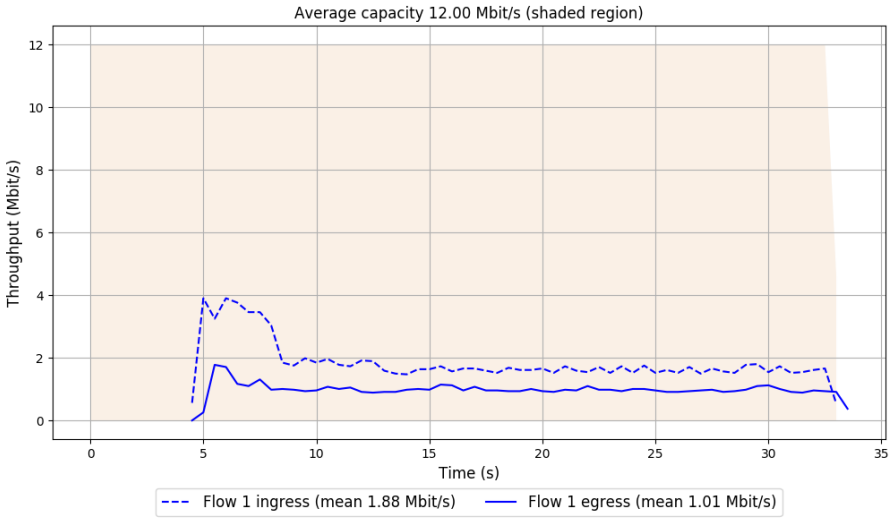



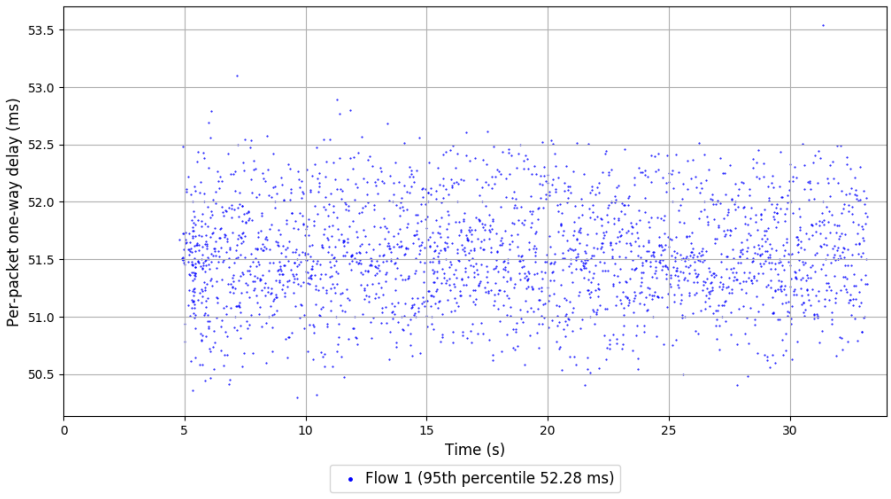
```
Run 1: Statistics of Indigo-MusesC5

Start at: 2019-01-24 16:42:39
End at: 2019-01-24 16:43:09

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.01 Mbit/s (8.4% utilization)
95th percentile per-packet one-way delay: 52.282 ms
Loss rate: 46.33%
-- Flow 1:
Average throughput: 1.01 Mbit/s
95th percentile per-packet one-way delay: 52.282 ms
Loss rate: 46.33%
```

Run 1: Report of Indigo-MusesC5 — Data Link



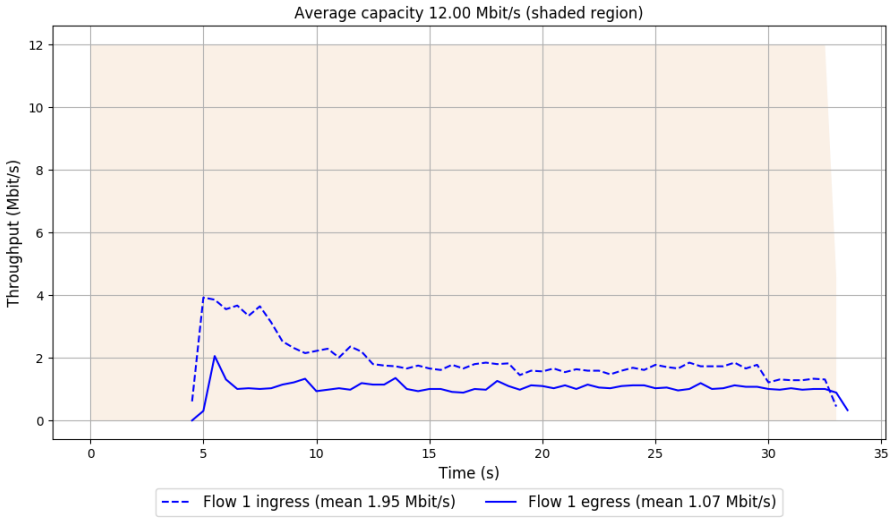



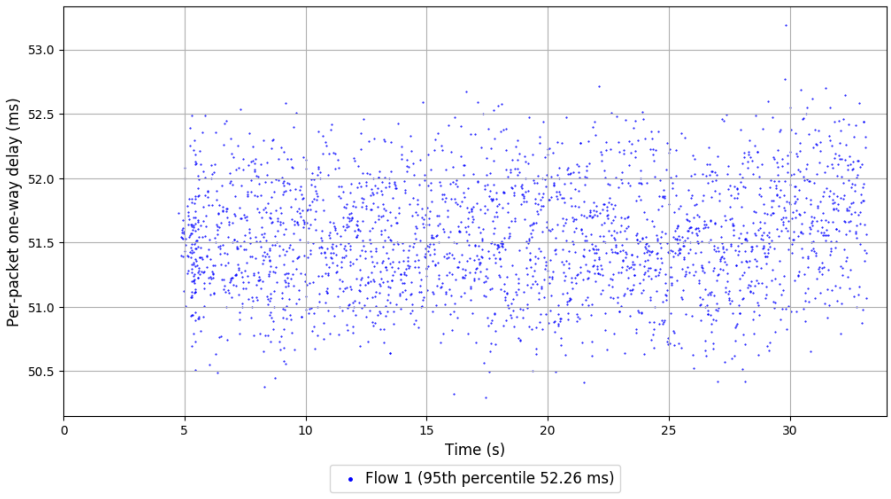
```
Run 2: Statistics of Indigo-MusesC5

Start at: 2019-01-24 16:55:08
End at: 2019-01-24 16:55:38

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.07 Mbit/s (8.9% utilization)
95th percentile per-packet one-way delay: 52.261 ms
Loss rate: 45.11%
-- Flow 1:
Average throughput: 1.07 Mbit/s
95th percentile per-packet one-way delay: 52.261 ms
Loss rate: 45.11%
```

Run 2: Report of Indigo-MusesC5 — Data Link



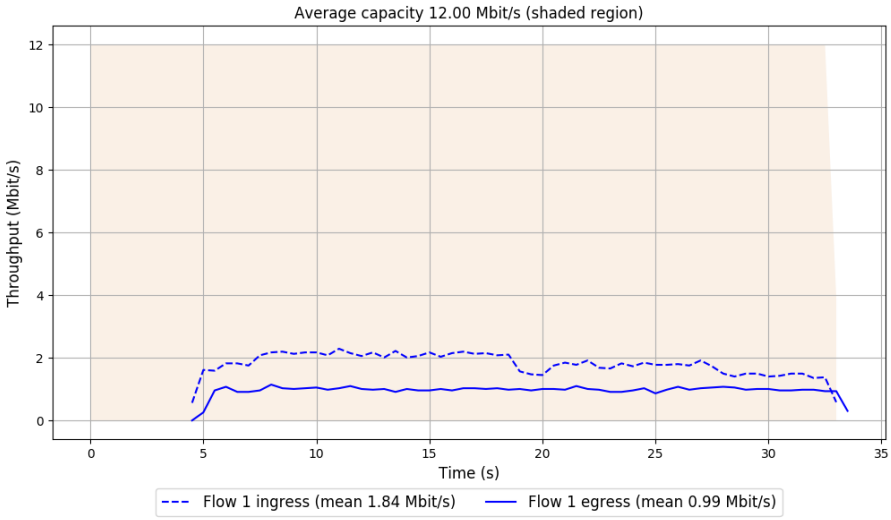



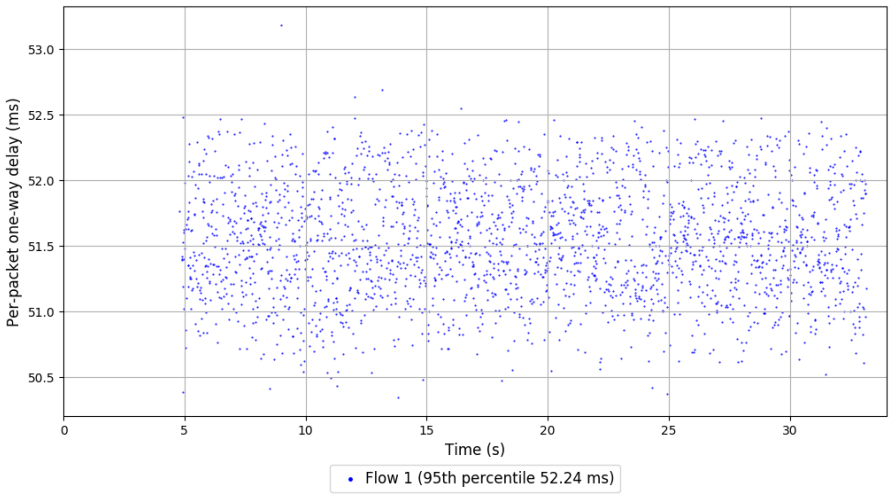
```
Run 3: Statistics of Indigo-MusesC5

Start at: 2019-01-24 17:07:27
End at: 2019-01-24 17:07:57

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.99 Mbit/s (8.3% utilization)
95th percentile per-packet one-way delay: 52.239 ms
Loss rate: 46.09%
-- Flow 1:
Average throughput: 0.99 Mbit/s
95th percentile per-packet one-way delay: 52.239 ms
Loss rate: 46.09%
```

Run 3: Report of Indigo-MusesC5 — Data Link



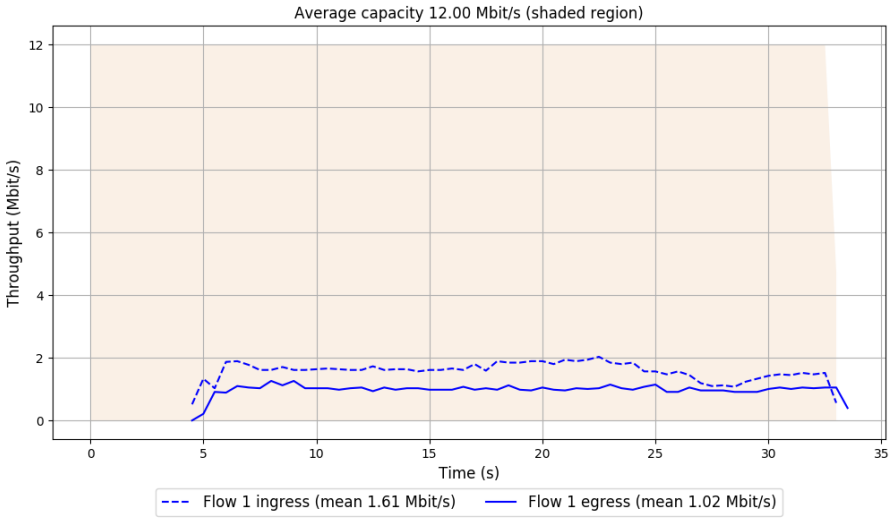



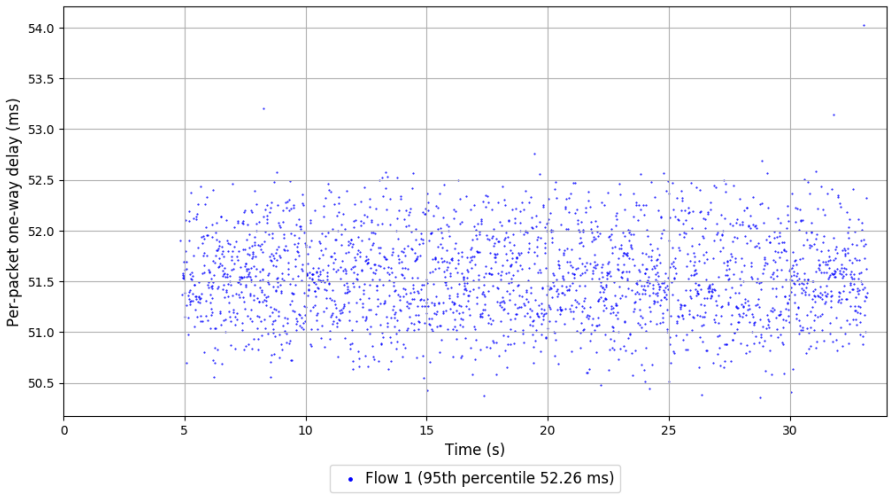
```
Run 1: Statistics of Indigo-MusesD

Start at: 2019-01-24 16:40:19
End at: 2019-01-24 16:40:49

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.02 Mbit/s (8.5% utilization)
95th percentile per-packet one-way delay: 52.256 ms
Loss rate: 36.91%
-- Flow 1:
Average throughput: 1.02 Mbit/s
95th percentile per-packet one-way delay: 52.256 ms
Loss rate: 36.91%
```

Run 1: Report of Indigo-MusesD — Data Link



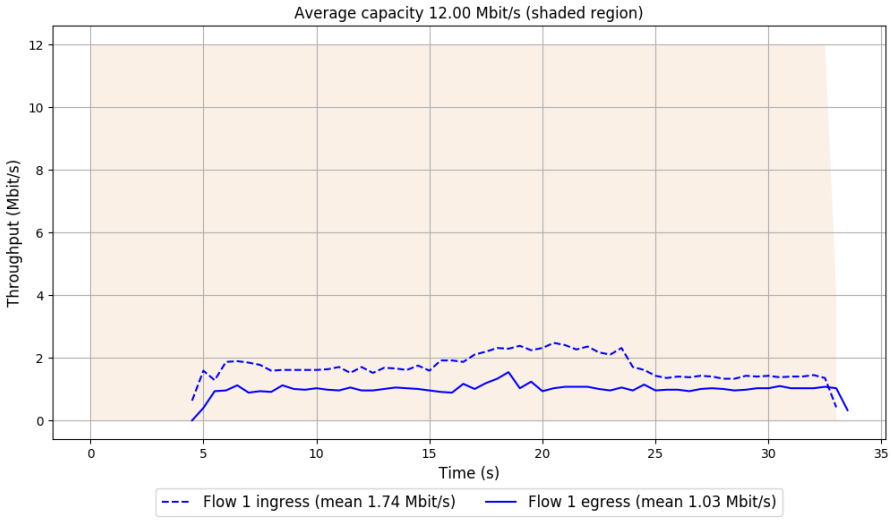



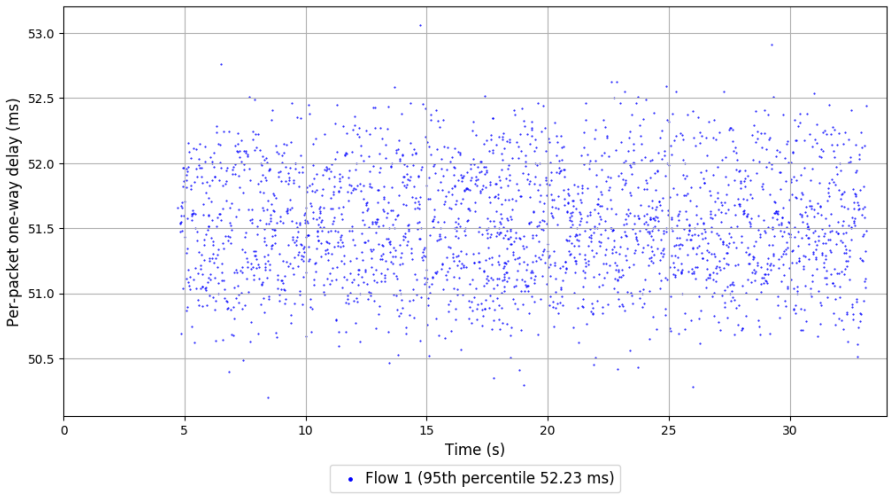
```
Run 2: Statistics of Indigo-MusesD

Start at: 2019-01-24 16:52:47
End at: 2019-01-24 16:53:17

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.03 Mbit/s (8.5% utilization)
95th percentile per-packet one-way delay: 52.227 ms
Loss rate: 41.05%
-- Flow 1:
Average throughput: 1.03 Mbit/s
95th percentile per-packet one-way delay: 52.227 ms
Loss rate: 41.05%
```

Run 2: Report of Indigo-MusesD — Data Link



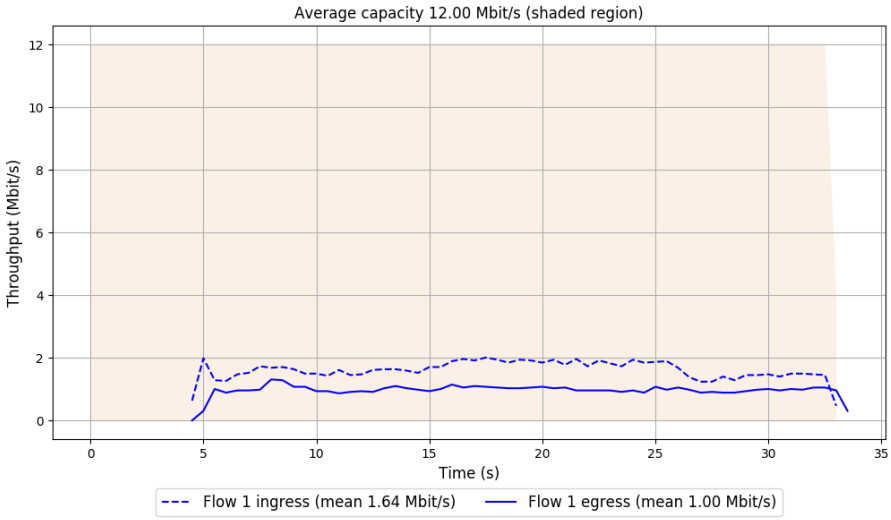



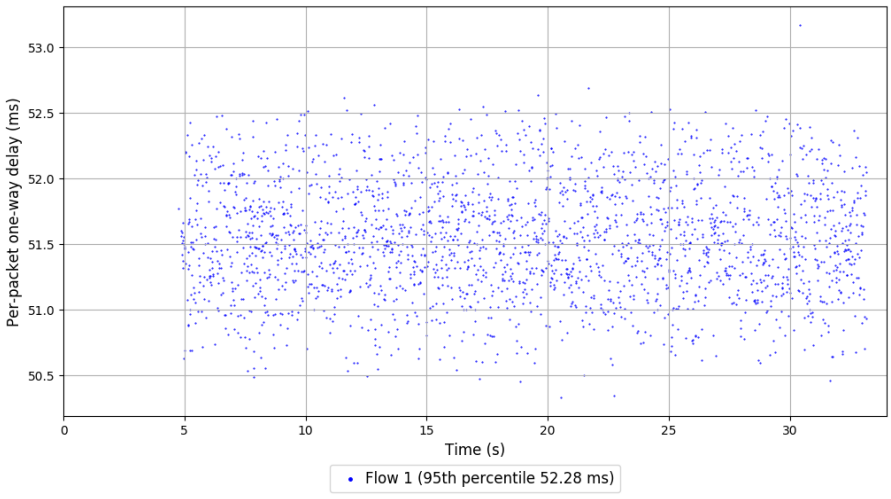
```
Run 3: Statistics of Indigo-MusesD

Start at: 2019-01-24 17:05:07
End at: 2019-01-24 17:05:37

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.00 Mbit/s (8.3% utilization)
95th percentile per-packet one-way delay: 52.276 ms
Loss rate: 39.38%
-- Flow 1:
Average throughput: 1.00 Mbit/s
95th percentile per-packet one-way delay: 52.276 ms
Loss rate: 39.38%
```

Run 3: Report of Indigo-MusesD — Data Link



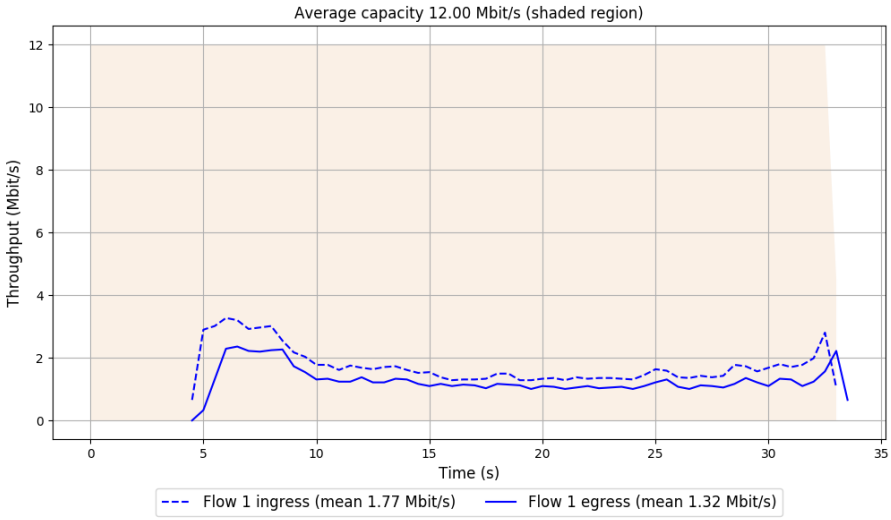



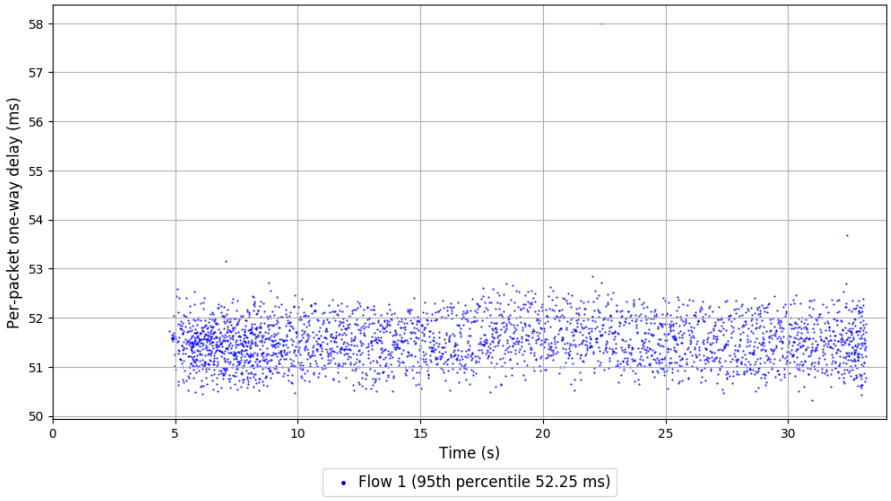
```
Run 1: Statistics of Indigo-MusesT

Start at: 2019-01-24 16:37:53
End at: 2019-01-24 16:38:23

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.32 Mbit/s (11.0% utilization)
95th percentile per-packet one-way delay: 52.247 ms
Loss rate: 25.53%
-- Flow 1:
Average throughput: 1.32 Mbit/s
95th percentile per-packet one-way delay: 52.247 ms
Loss rate: 25.53%
```

Run 1: Report of Indigo-MusesT — Data Link



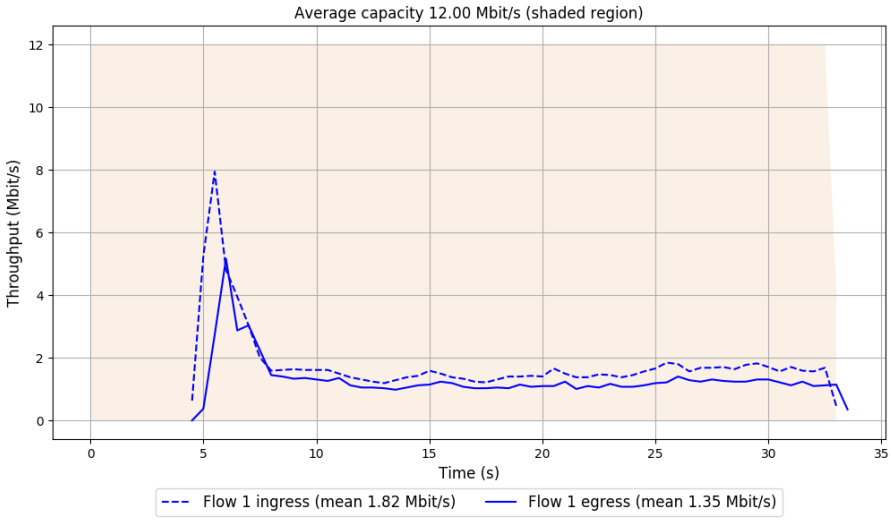



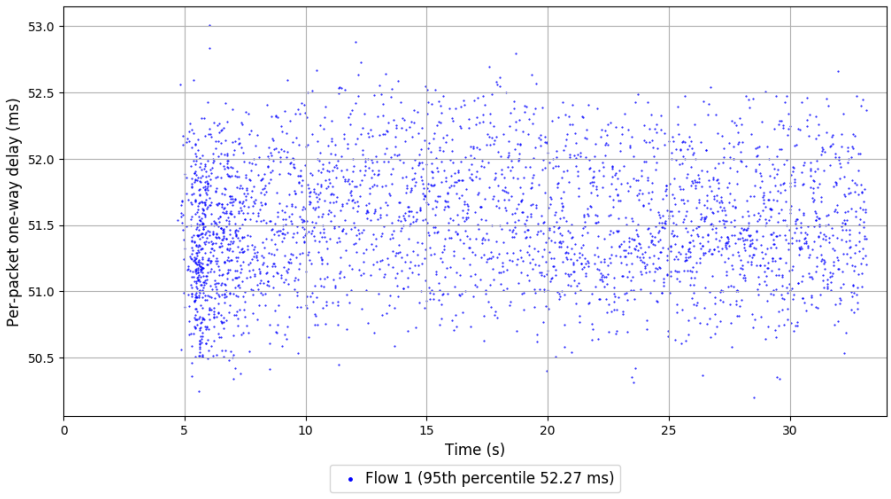
```
Run 2: Statistics of Indigo-MusesT

Start at: 2019-01-24 16:50:17
End at: 2019-01-24 16:50:47

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.35 Mbit/s (11.2% utilization)
95th percentile per-packet one-way delay: 52.274 ms
Loss rate: 26.25%
-- Flow 1:
Average throughput: 1.35 Mbit/s
95th percentile per-packet one-way delay: 52.274 ms
Loss rate: 26.25%
```

Run 2: Report of Indigo-MusesT — Data Link



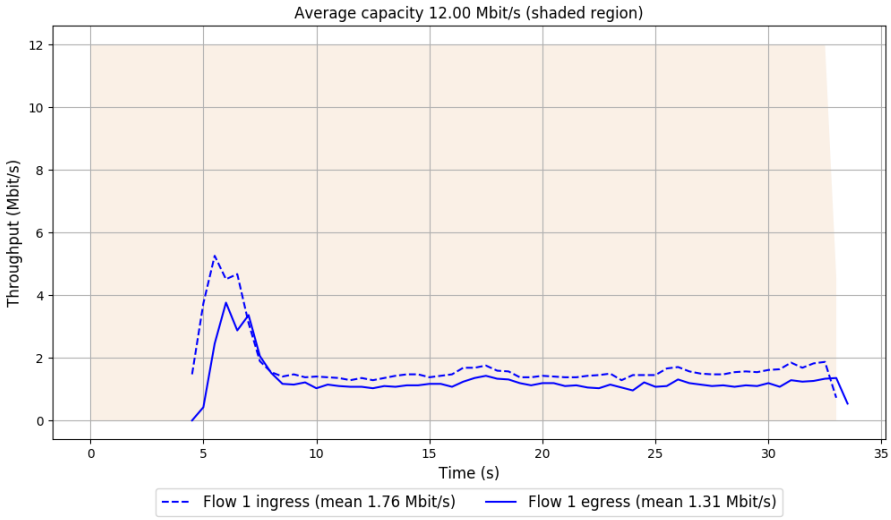



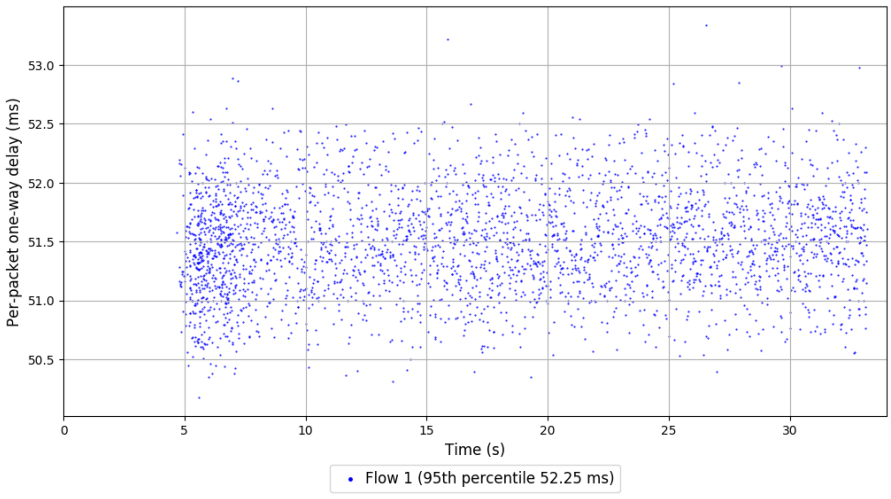
```
Run 3: Statistics of Indigo-MusesT

Start at: 2019-01-24 17:02:46
End at: 2019-01-24 17:03:16

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.31 Mbit/s (10.9% utilization)
95th percentile per-packet one-way delay: 52.250 ms
Loss rate: 25.36%
-- Flow 1:
Average throughput: 1.31 Mbit/s
95th percentile per-packet one-way delay: 52.250 ms
Loss rate: 25.36%
```

Run 3: Report of Indigo-MusesT — Data Link



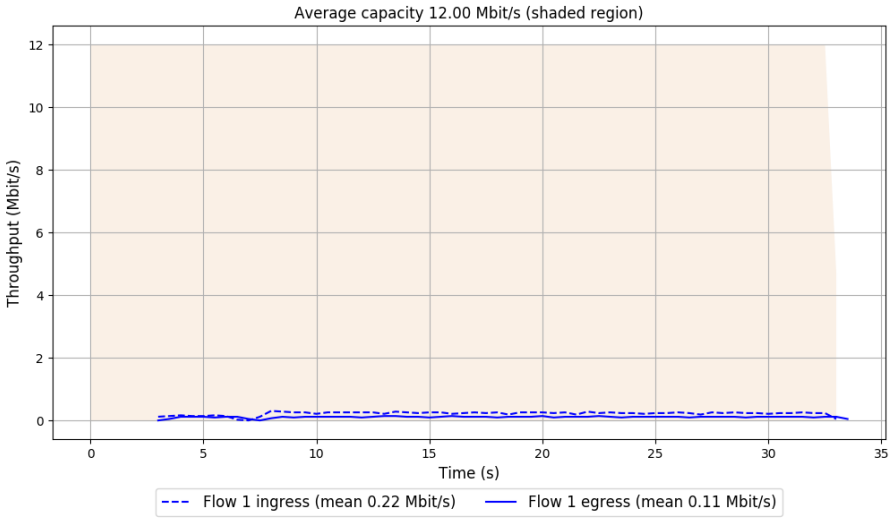



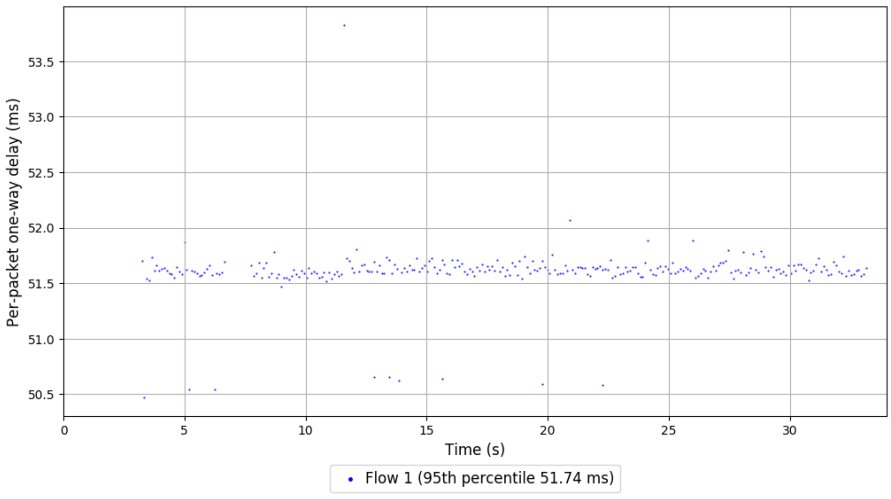
```
Run 1: Statistics of LEDBAT

Start at: 2019-01-24 16:43:50
End at: 2019-01-24 16:44:20

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.11 Mbit/s (0.9% utilization)
95th percentile per-packet one-way delay: 51.738 ms
Loss rate: 50.17%
-- Flow 1:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 51.738 ms
Loss rate: 50.17%
```

Run 1: Report of LEDBAT — Data Link



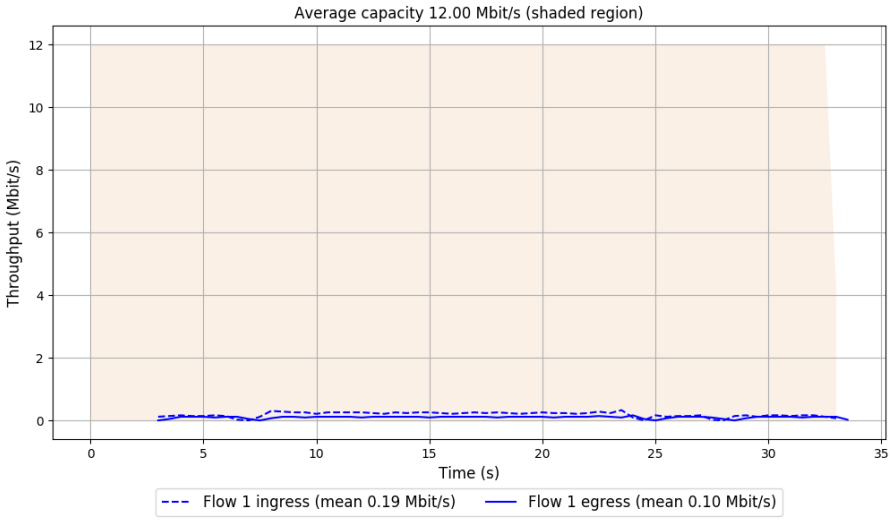



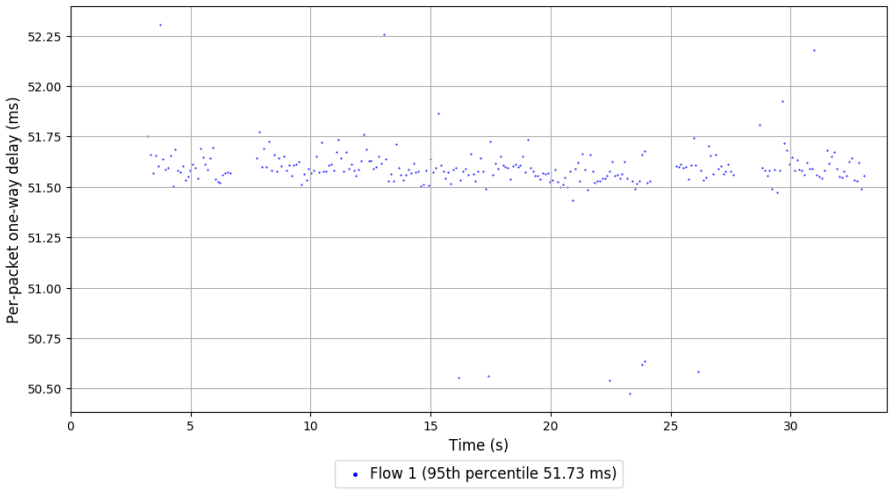
```
Run 2: Statistics of LEDBAT

Start at: 2019-01-24 16:56:18
End at: 2019-01-24 16:56:48

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.10 Mbit/s (0.9% utilization)
95th percentile per-packet one-way delay: 51.728 ms
Loss rate: 45.75%
-- Flow 1:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 51.728 ms
Loss rate: 45.75%
```

Run 2: Report of LEDBAT — Data Link



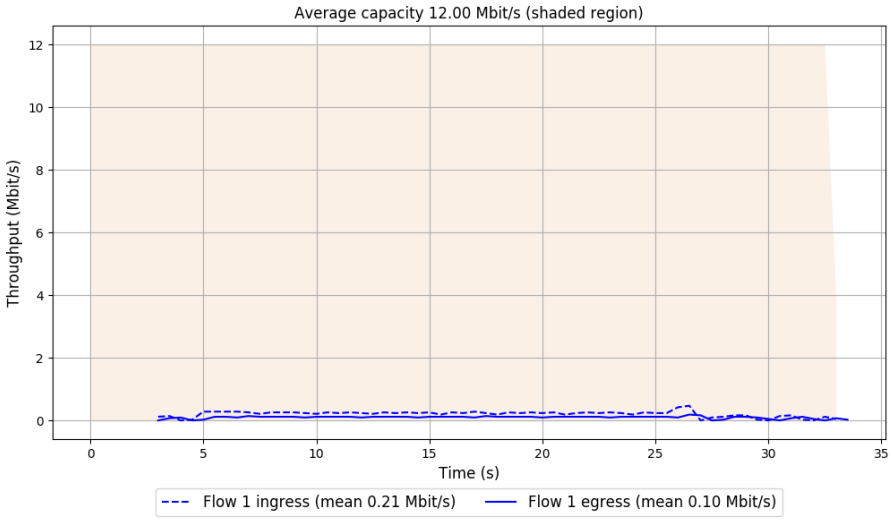



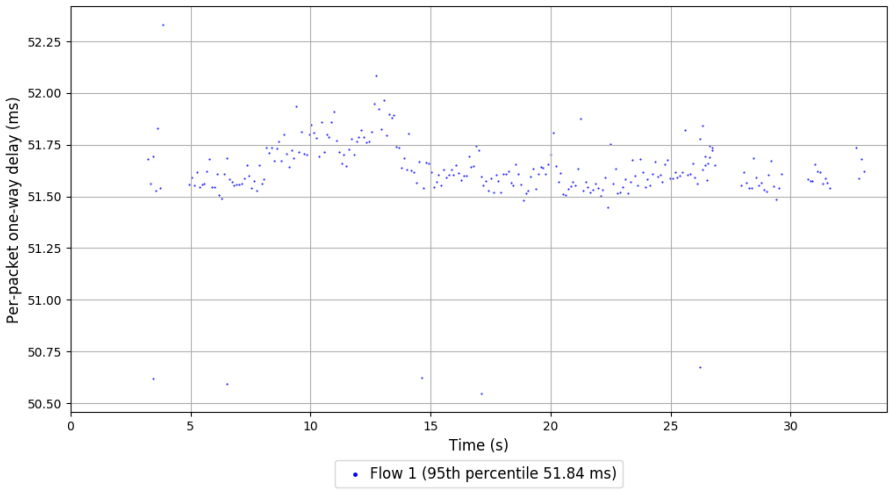
```
Run 3: Statistics of LEDBAT

Start at: 2019-01-24 17:08:38
End at: 2019-01-24 17:09:08

# Below is generated by plot.py at 2019-01-24 17:11:39
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.10 Mbit/s (0.8% utilization)
95th percentile per-packet one-way delay: 51.844 ms
Loss rate: 51.32%
-- Flow 1:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 51.844 ms
Loss rate: 51.32%
```

Run 3: Report of LEDBAT — Data Link



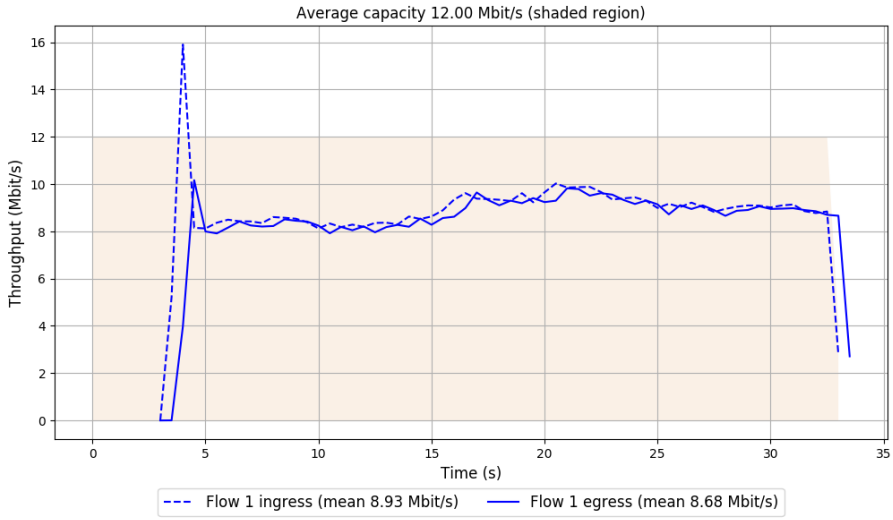



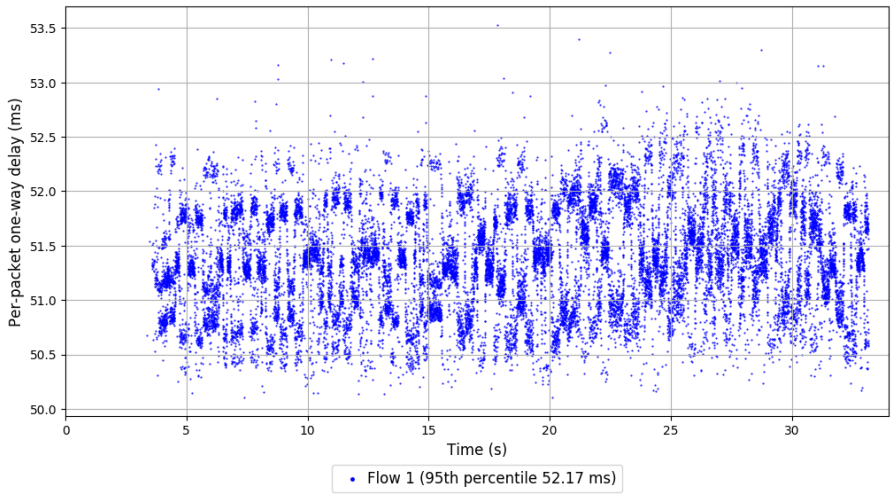
```
Run 1: Statistics of PCC-Allegro

Start at: 2019-01-24 16:39:43
End at: 2019-01-24 16:40:13

# Below is generated by plot.py at 2019-01-24 17:11:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 8.68 Mbit/s (72.4% utilization)
95th percentile per-packet one-way delay: 52.172 ms
Loss rate: 2.87%
-- Flow 1:
Average throughput: 8.68 Mbit/s
95th percentile per-packet one-way delay: 52.172 ms
Loss rate: 2.87%
```

Run 1: Report of PCC-Allegro — Data Link



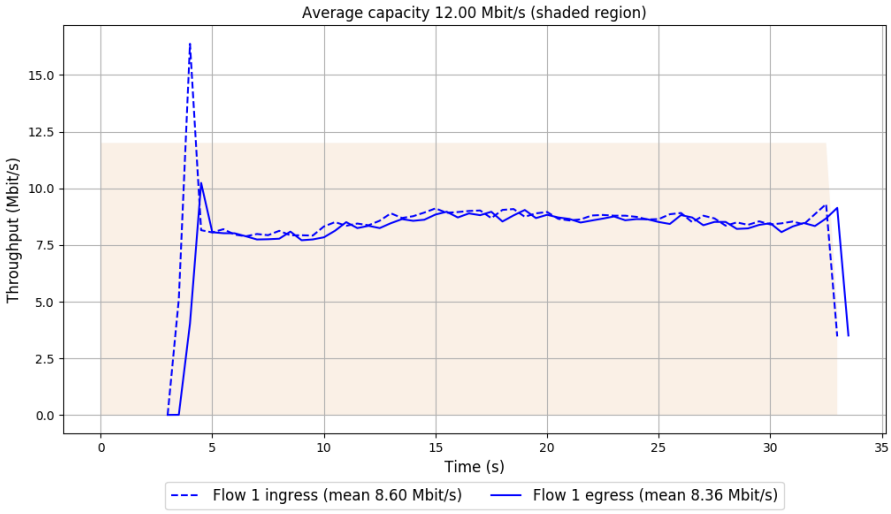



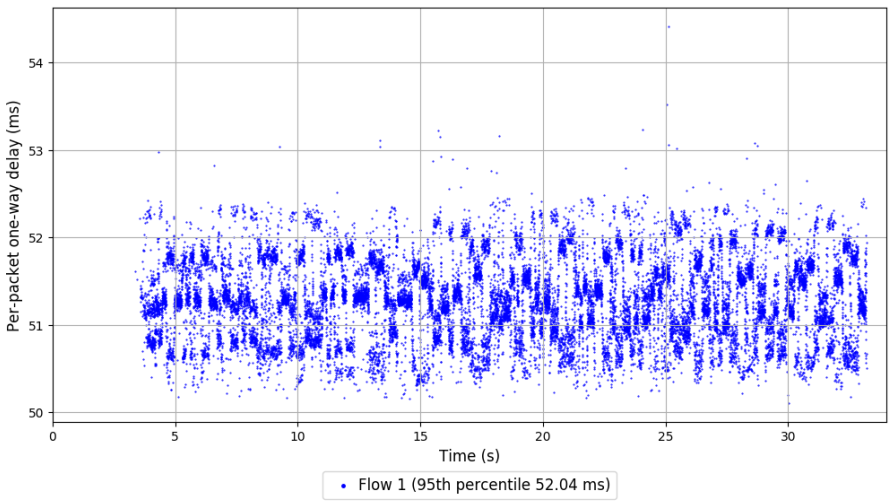
```
Run 2: Statistics of PCC-Allegro

Start at: 2019-01-24 16:52:12
End at: 2019-01-24 16:52:42

# Below is generated by plot.py at 2019-01-24 17:11:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 8.36 Mbit/s (69.7% utilization)
95th percentile per-packet one-way delay: 52.044 ms
Loss rate: 2.86%
-- Flow 1:
Average throughput: 8.36 Mbit/s
95th percentile per-packet one-way delay: 52.044 ms
Loss rate: 2.86%
```

Run 2: Report of PCC-Allegro — Data Link



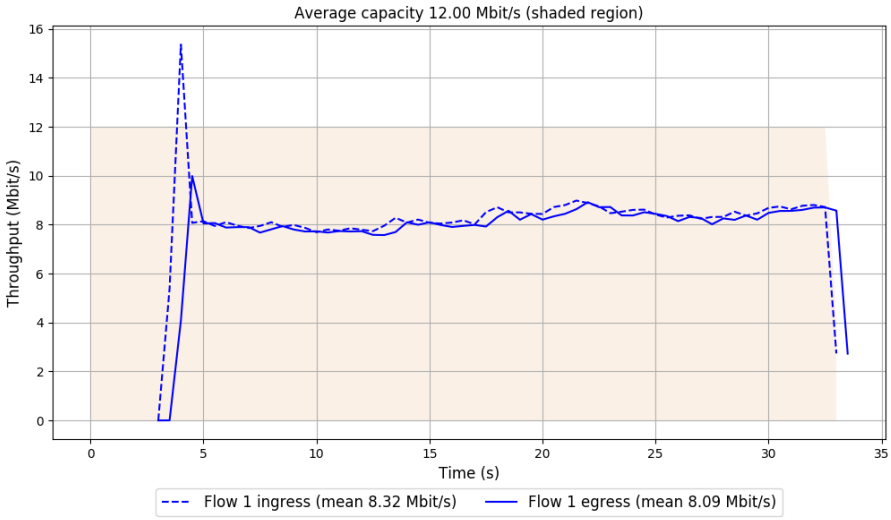



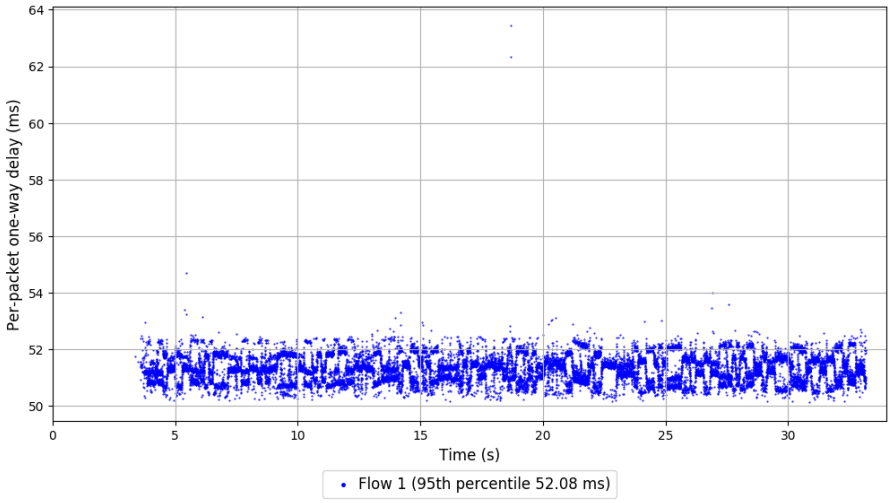
```
Run 3: Statistics of PCC-Allegro

Start at: 2019-01-24 17:04:32
End at: 2019-01-24 17:05:02

# Below is generated by plot.py at 2019-01-24 17:11:42
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 8.09 Mbit/s (67.5% utilization)
95th percentile per-packet one-way delay: 52.075 ms
Loss rate: 2.82%
-- Flow 1:
Average throughput: 8.09 Mbit/s
95th percentile per-packet one-way delay: 52.075 ms
Loss rate: 2.82%
```

Run 3: Report of PCC-Allegro — Data Link



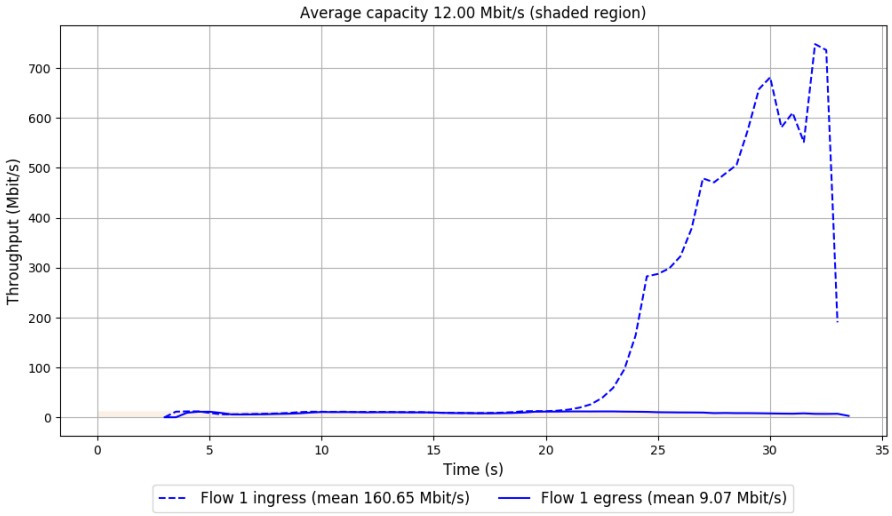



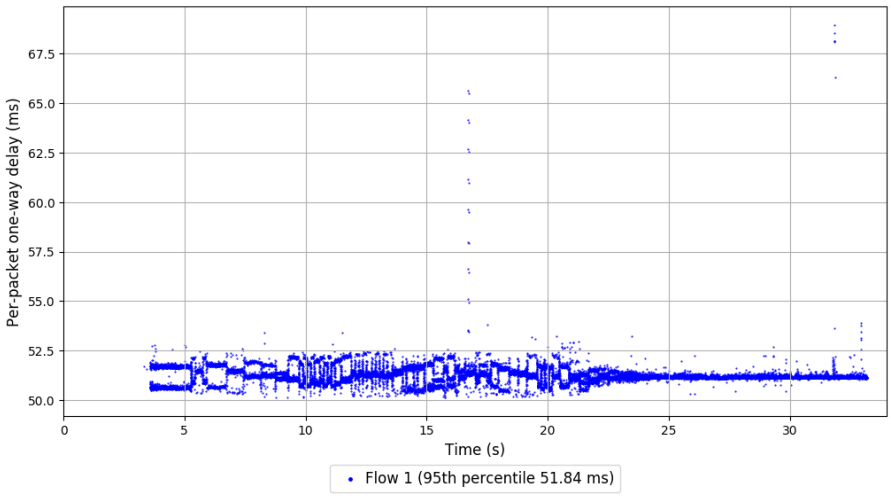
```
Run 1: Statistics of PCC-Expr

Start at: 2019-01-24 16:38:28
End at: 2019-01-24 16:38:58

# Below is generated by plot.py at 2019-01-24 17:12:33
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 9.07 Mbit/s (75.6% utilization)
95th percentile per-packet one-way delay: 51.840 ms
Loss rate: 94.36%
-- Flow 1:
Average throughput: 9.07 Mbit/s
95th percentile per-packet one-way delay: 51.840 ms
Loss rate: 94.36%
```

Run 1: Report of PCC-Expr — Data Link



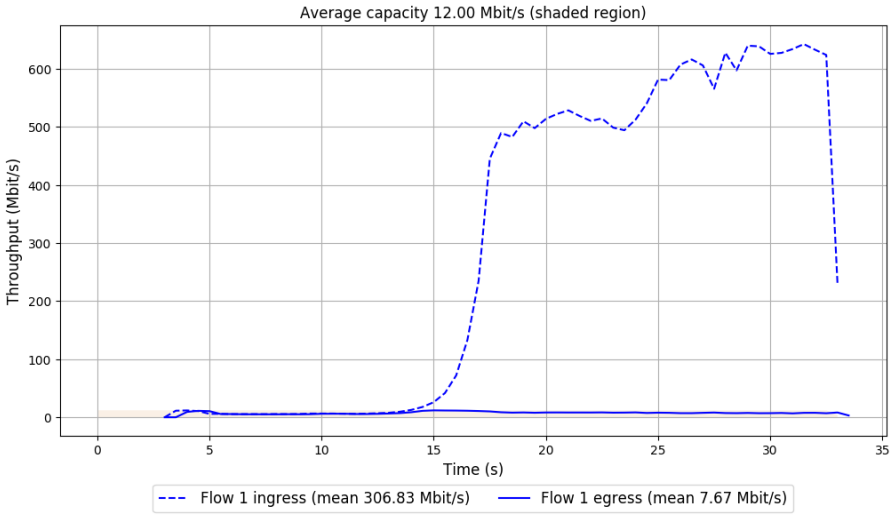



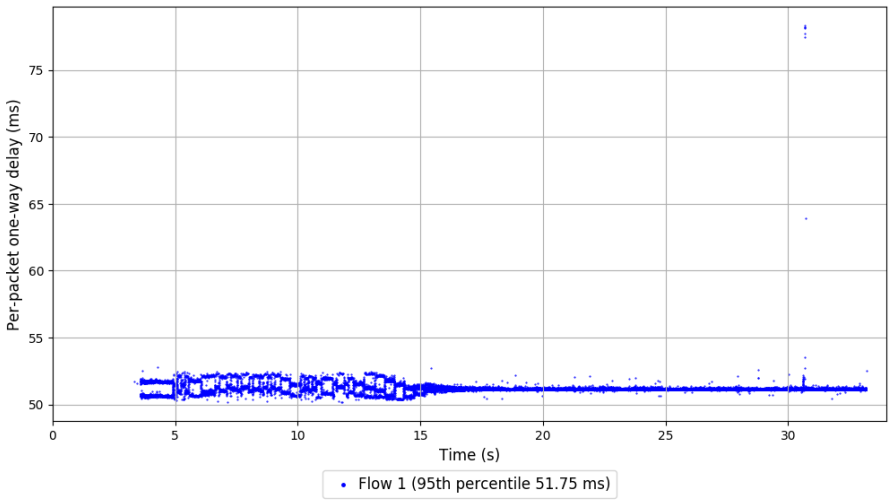
```
Run 2: Statistics of PCC-Expr

Start at: 2019-01-24 16:50:52
End at: 2019-01-24 16:51:22

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 7.67 Mbit/s (63.9% utilization)
95th percentile per-packet one-way delay: 51.749 ms
Loss rate: 97.50%
-- Flow 1:
Average throughput: 7.67 Mbit/s
95th percentile per-packet one-way delay: 51.749 ms
Loss rate: 97.50%
```

Run 2: Report of PCC-Expr — Data Link



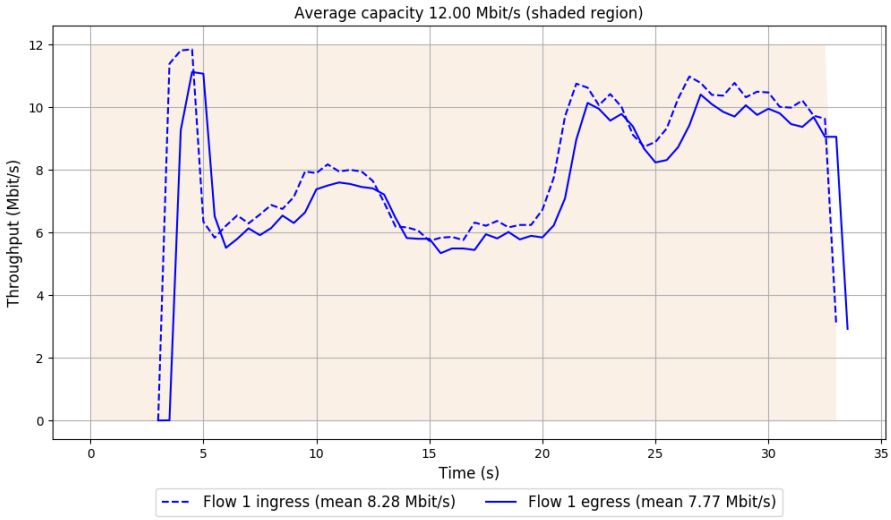



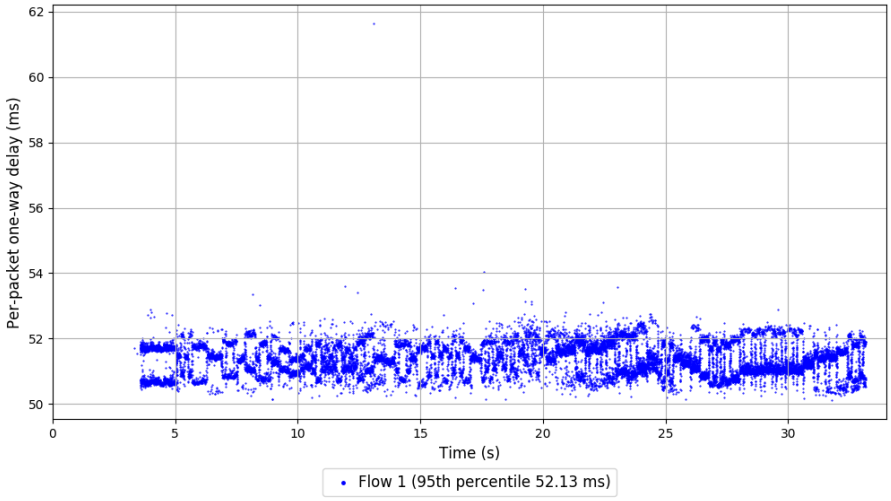
```
Run 3: Statistics of PCC-Expr

Start at: 2019-01-24 17:03:21
End at: 2019-01-24 17:03:51

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 7.77 Mbit/s (64.8% utilization)
95th percentile per-packet one-way delay: 52.126 ms
Loss rate: 6.30%
-- Flow 1:
Average throughput: 7.77 Mbit/s
95th percentile per-packet one-way delay: 52.126 ms
Loss rate: 6.30%
```

Run 3: Report of PCC-Expr — Data Link



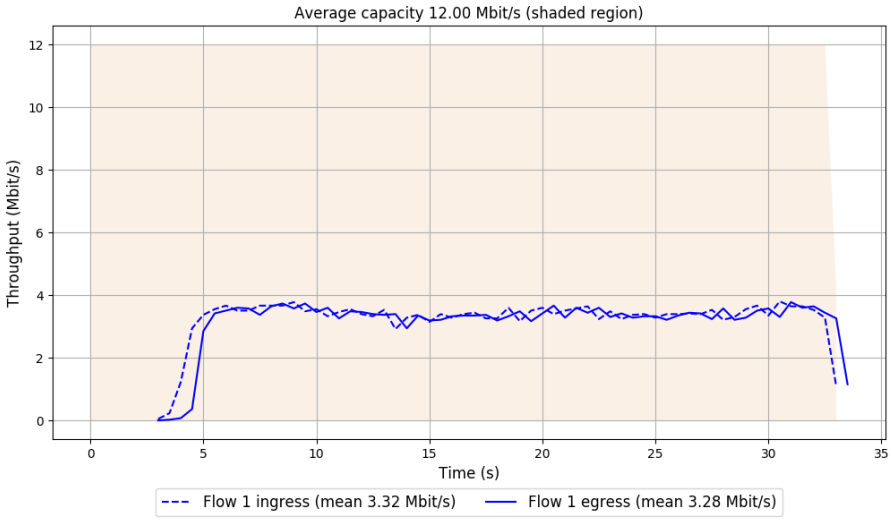



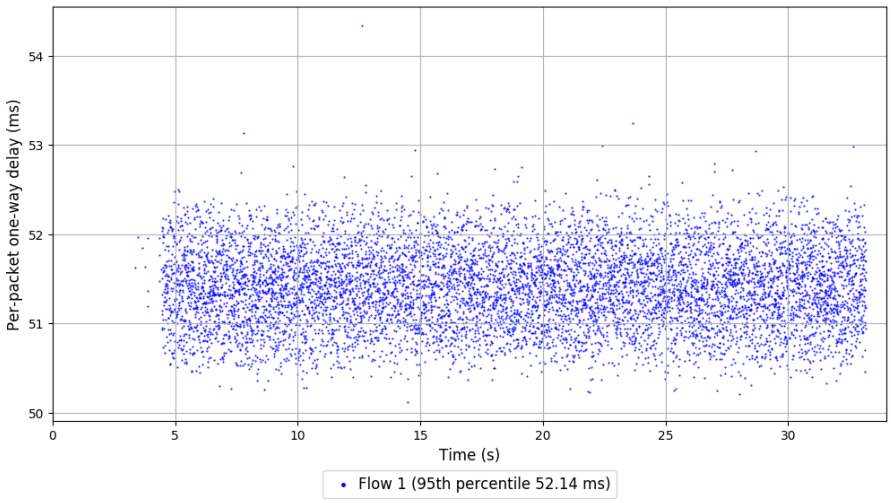
```
Run 1: Statistics of QUIC Cubic

Start at: 2019-01-24 16:33:10
End at: 2019-01-24 16:33:40

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.28 Mbit/s (27.4% utilization)
95th percentile per-packet one-way delay: 52.143 ms
Loss rate: 1.31%
-- Flow 1:
Average throughput: 3.28 Mbit/s
95th percentile per-packet one-way delay: 52.143 ms
Loss rate: 1.31%
```

Run 1: Report of QUIC Cubic — Data Link



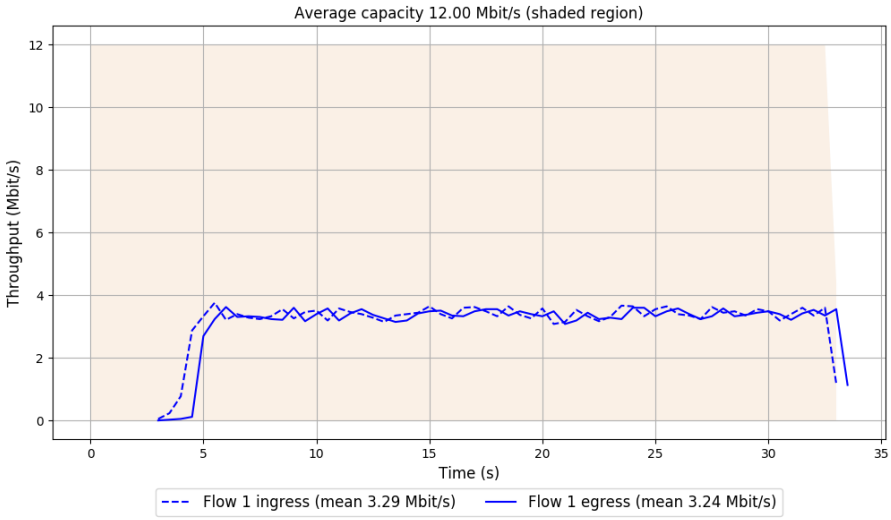



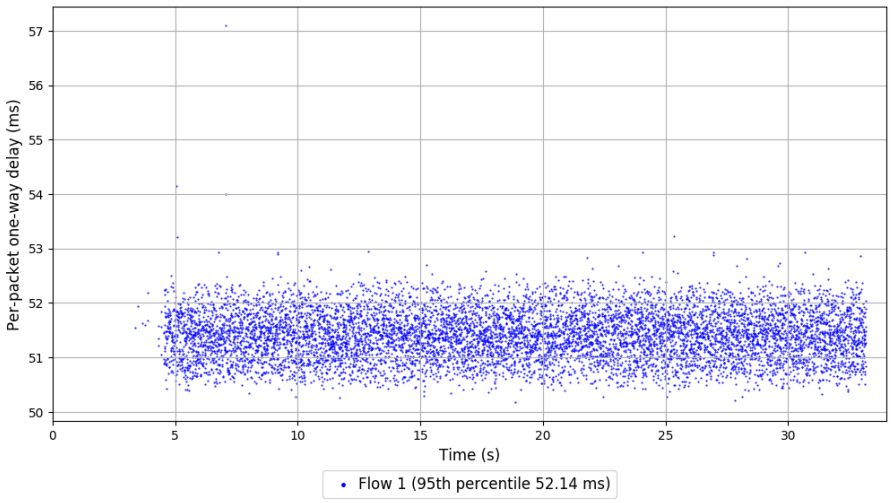
```
Run 2: Statistics of QUIC Cubic

Start at: 2019-01-24 16:45:35
End at: 2019-01-24 16:46:05

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.24 Mbit/s (27.0% utilization)
95th percentile per-packet one-way delay: 52.143 ms
Loss rate: 1.41%
-- Flow 1:
Average throughput: 3.24 Mbit/s
95th percentile per-packet one-way delay: 52.143 ms
Loss rate: 1.41%
```

Run 2: Report of QUIC Cubic — Data Link



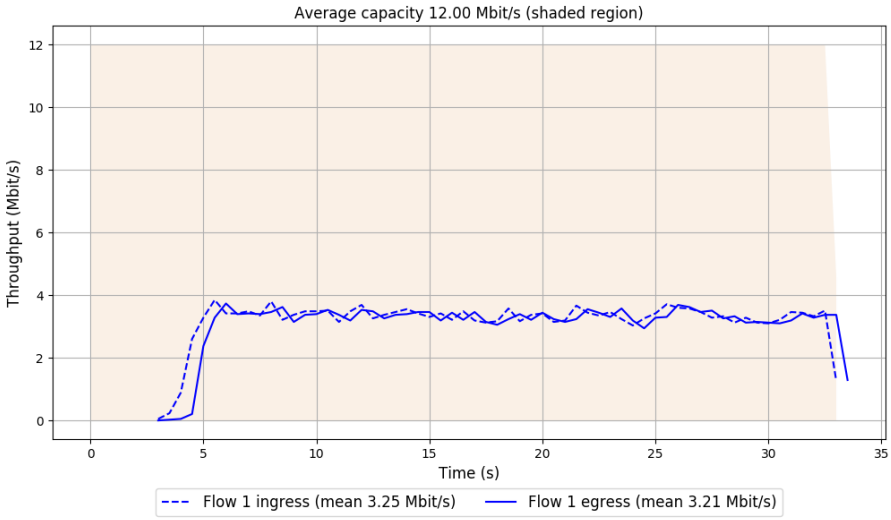



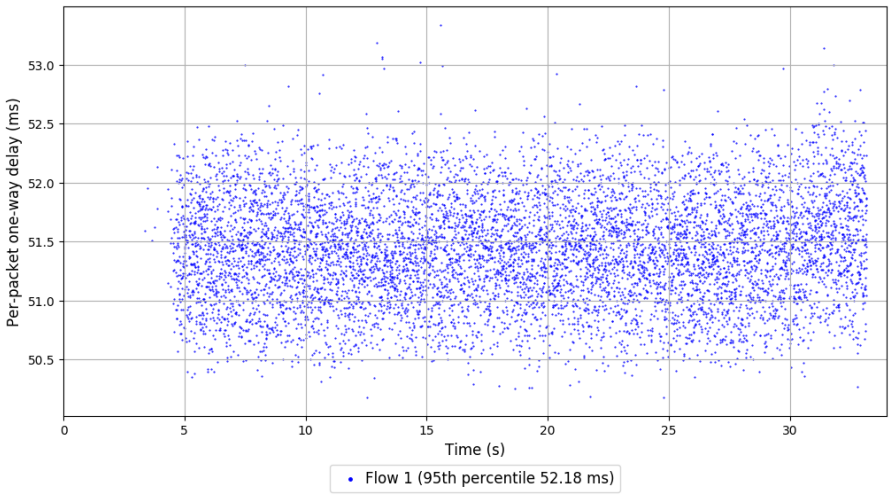
```
Run 3: Statistics of QUIC Cubic

Start at: 2019-01-24 16:58:03
End at: 2019-01-24 16:58:33

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.21 Mbit/s (26.7% utilization)
95th percentile per-packet one-way delay: 52.180 ms
Loss rate: 1.56%
-- Flow 1:
Average throughput: 3.21 Mbit/s
95th percentile per-packet one-way delay: 52.180 ms
Loss rate: 1.56%
```

Run 3: Report of QUIC Cubic — Data Link



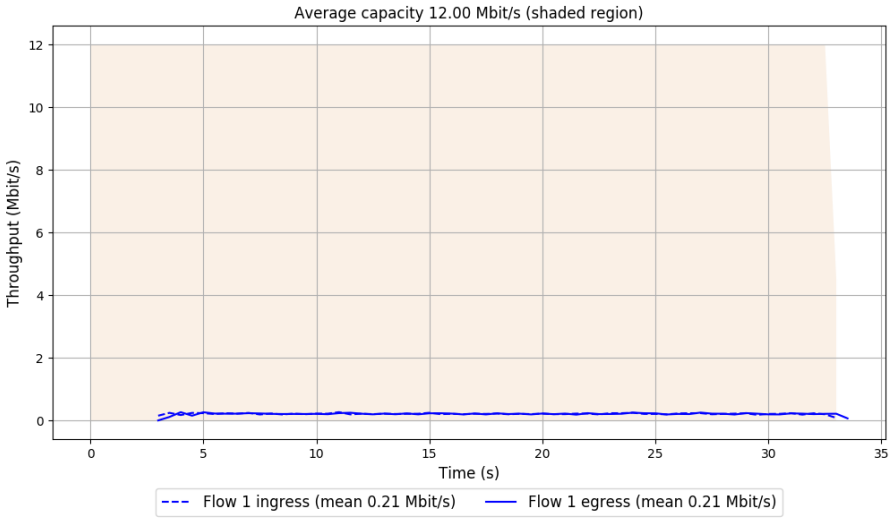



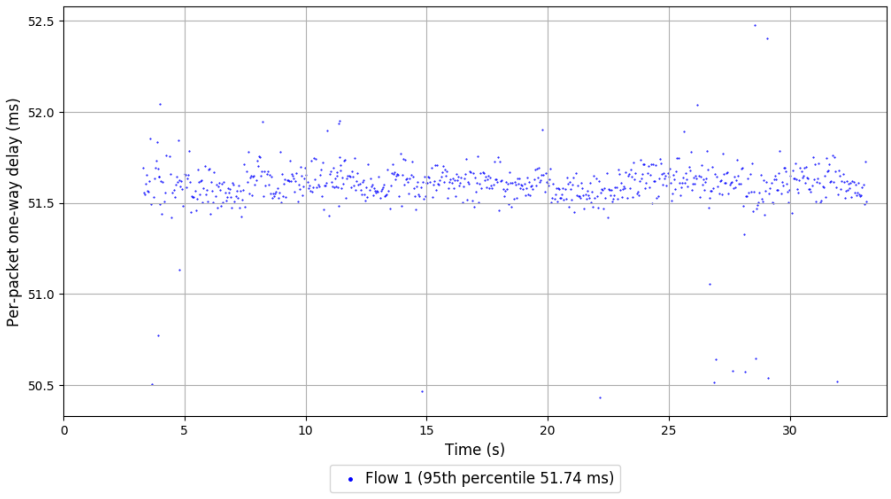
```
Run 1: Statistics of SCReAM

Start at: 2019-01-24 16:35:31
End at: 2019-01-24 16:36:01

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.21 Mbit/s (1.8% utilization)
95th percentile per-packet one-way delay: 51.742 ms
Loss rate: 0.26%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 51.742 ms
Loss rate: 0.26%
```

Run 1: Report of SCReAM — Data Link



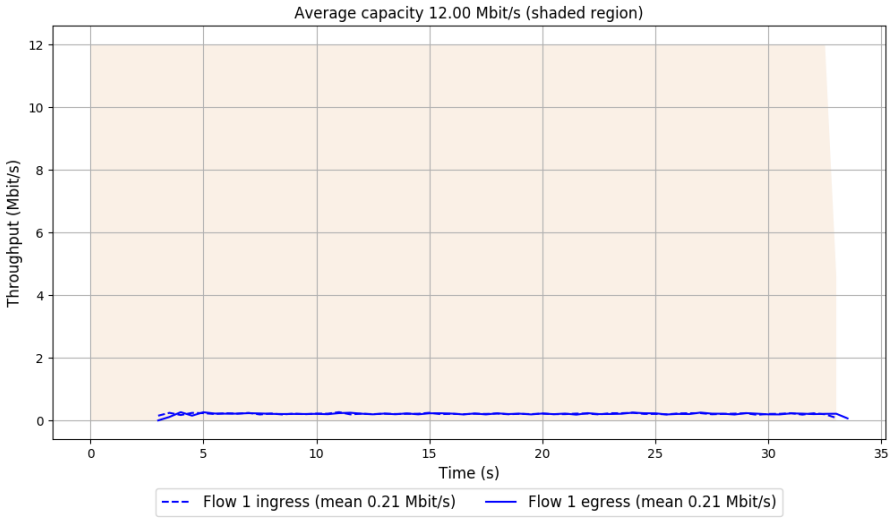



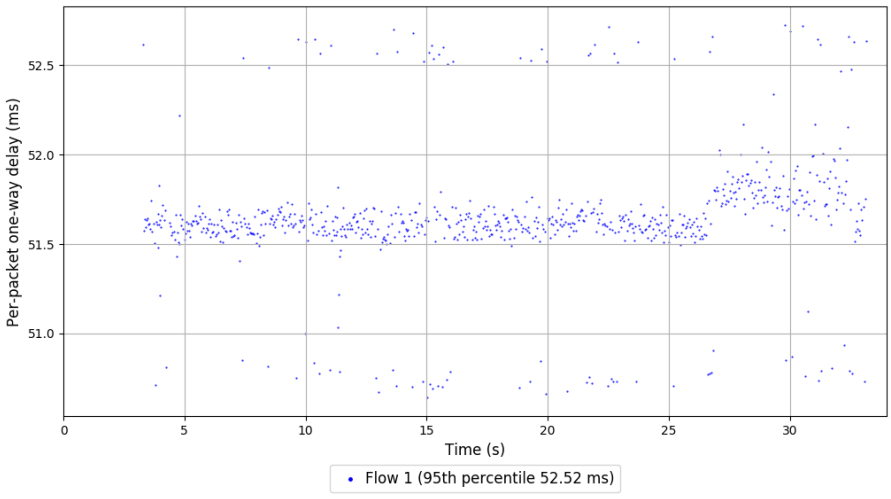
```
Run 2: Statistics of SCReAM

Start at: 2019-01-24 16:47:55
End at: 2019-01-24 16:48:25

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.21 Mbit/s (1.8% utilization)
95th percentile per-packet one-way delay: 52.518 ms
Loss rate: 0.26%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 52.518 ms
Loss rate: 0.26%
```

Run 2: Report of SCReAM — Data Link



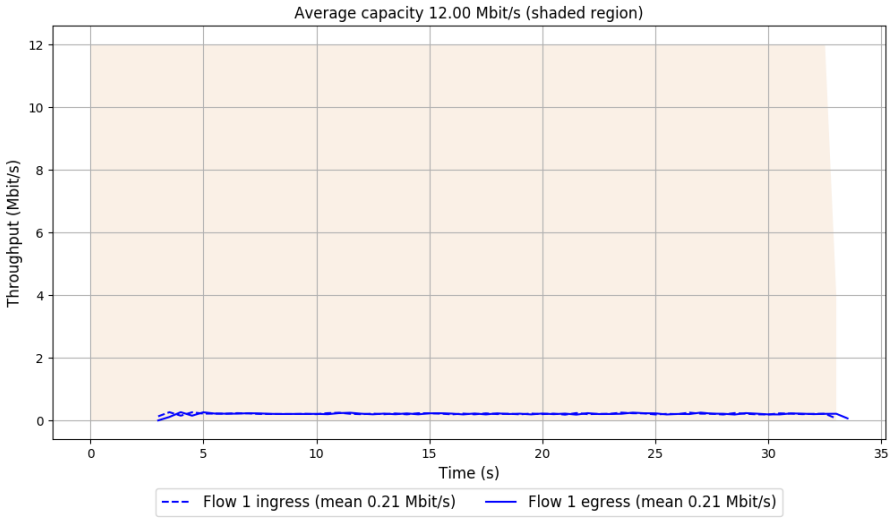



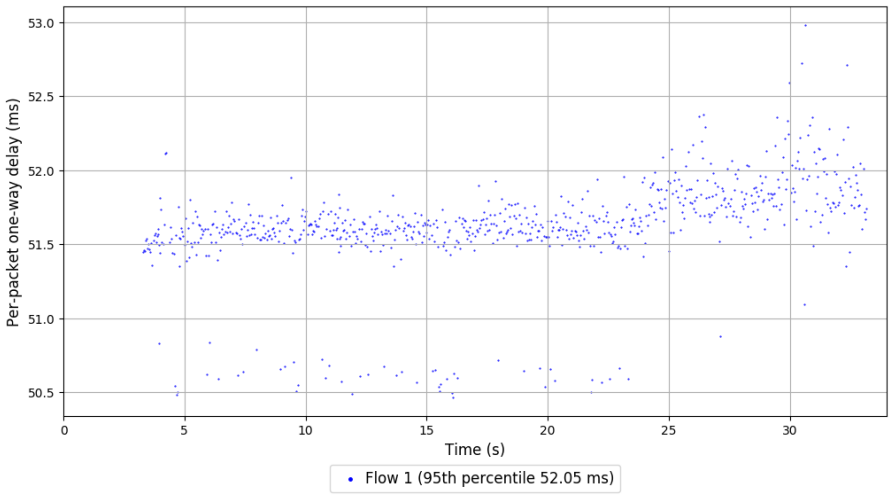
```
Run 3: Statistics of SCReAM

Start at: 2019-01-24 17:00:24
End at: 2019-01-24 17:00:54

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.21 Mbit/s (1.8% utilization)
95th percentile per-packet one-way delay: 52.048 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 52.048 ms
Loss rate: 0.13%
```

Run 3: Report of SCReAM — Data Link



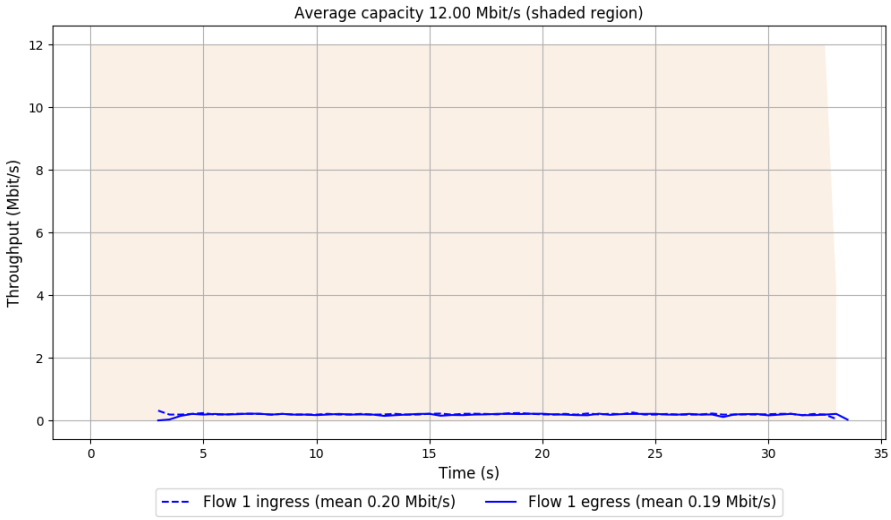



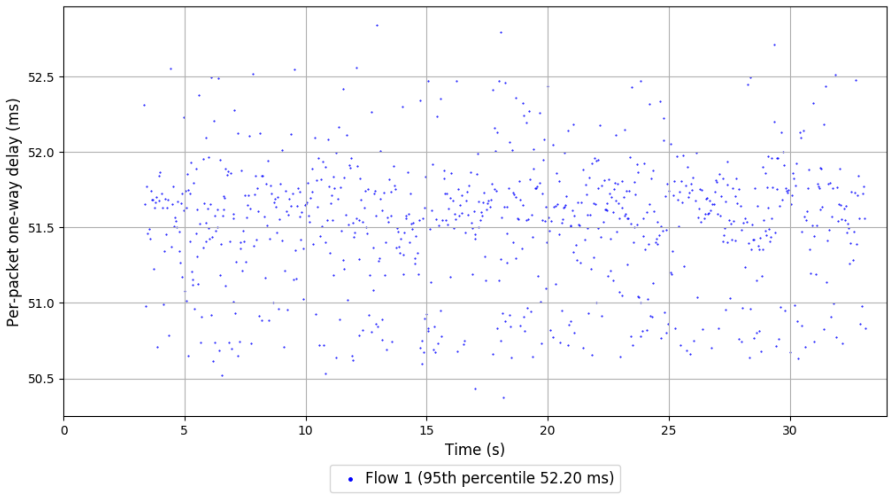
```
Run 1: Statistics of Sprout

Start at: 2019-01-24 16:40:54
End at: 2019-01-24 16:41:24

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.19 Mbit/s (1.6% utilization)
95th percentile per-packet one-way delay: 52.204 ms
Loss rate: 7.60%
-- Flow 1:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 52.204 ms
Loss rate: 7.60%
```

Run 1: Report of Sprout — Data Link



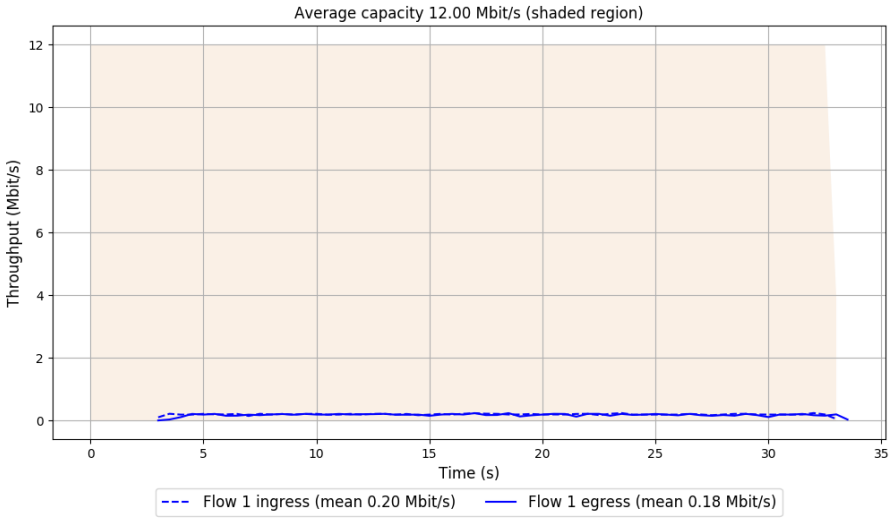



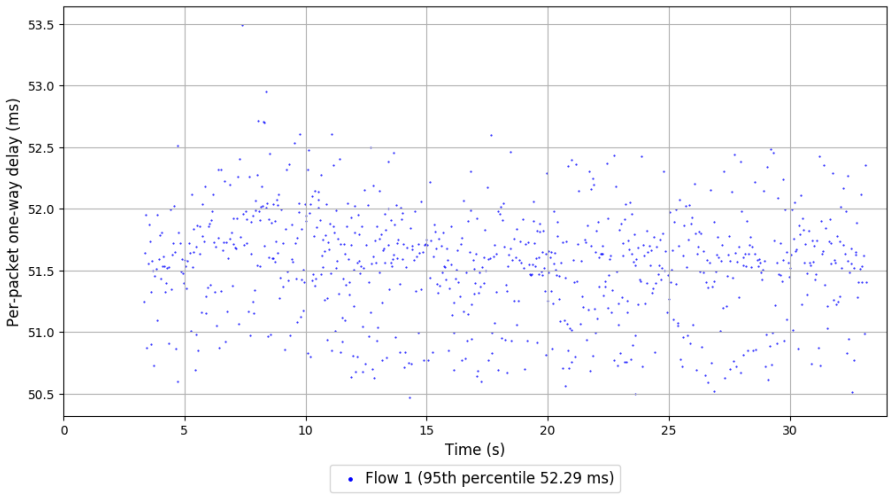
```
Run 2: Statistics of Sprout

Start at: 2019-01-24 16:53:22
End at: 2019-01-24 16:53:52

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.18 Mbit/s (1.5% utilization)
95th percentile per-packet one-way delay: 52.288 ms
Loss rate: 7.99%
-- Flow 1:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 52.288 ms
Loss rate: 7.99%
```

Run 2: Report of Sprout — Data Link



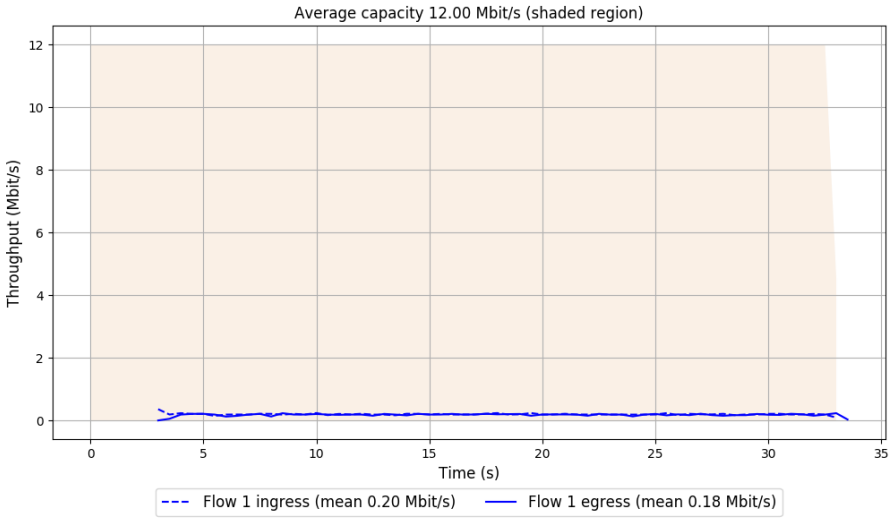



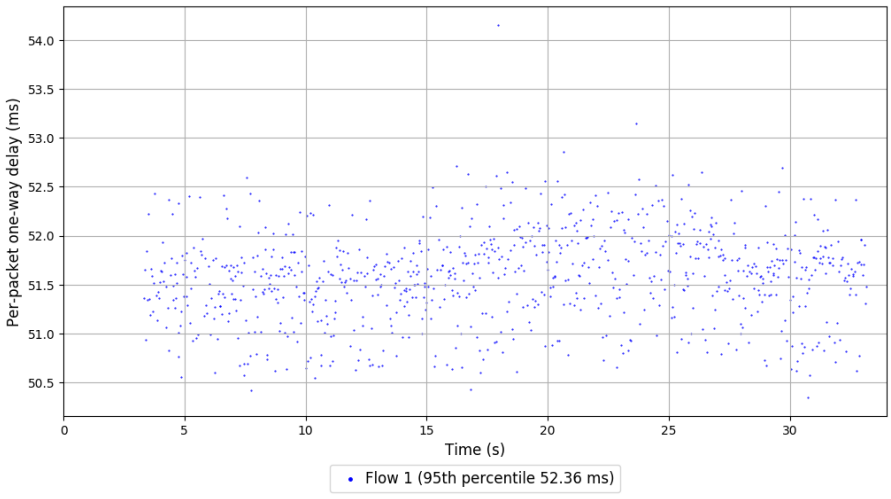
```
Run 3: Statistics of Sprout

Start at: 2019-01-24 17:05:42
End at: 2019-01-24 17:06:12

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.18 Mbit/s (1.5% utilization)
95th percentile per-packet one-way delay: 52.357 ms
Loss rate: 8.70%
-- Flow 1:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 52.357 ms
Loss rate: 8.70%
```

Run 3: Report of Sprout — Data Link

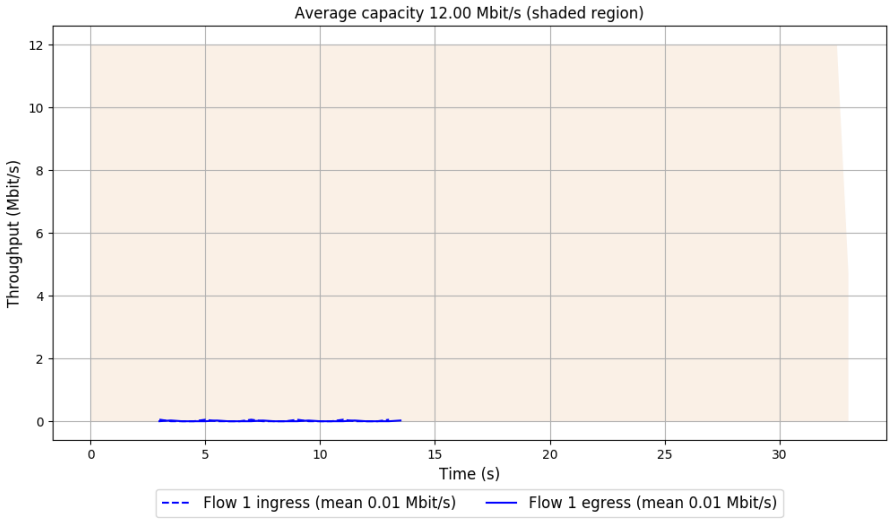


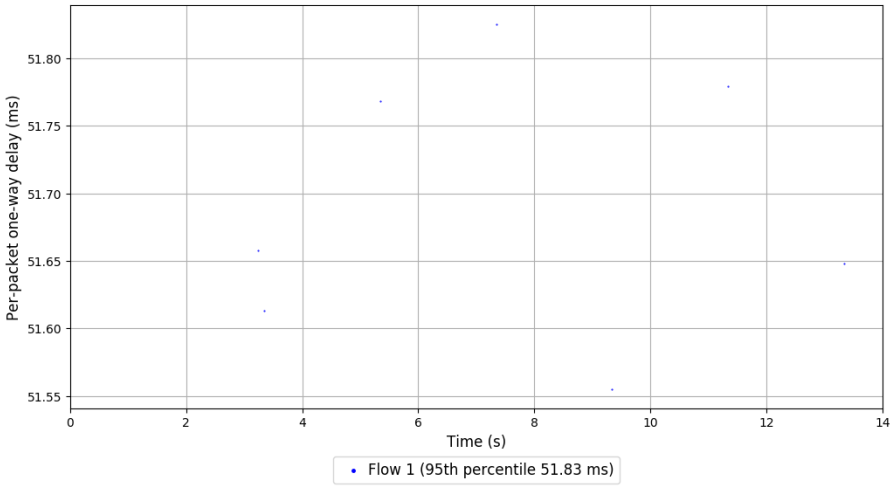



```
Run 1: Statistics of TaoVA-100x

Start at: 2019-01-24 16:45:00
End at: 2019-01-24 16:45:30
```

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



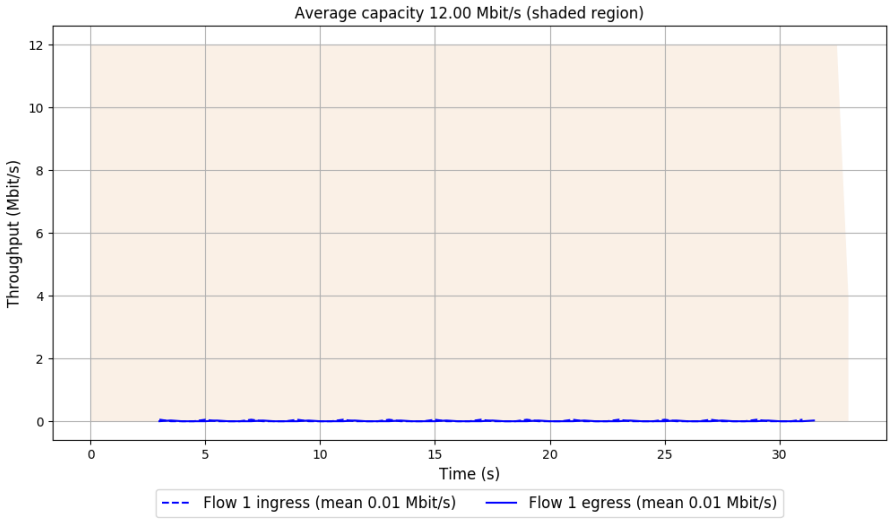



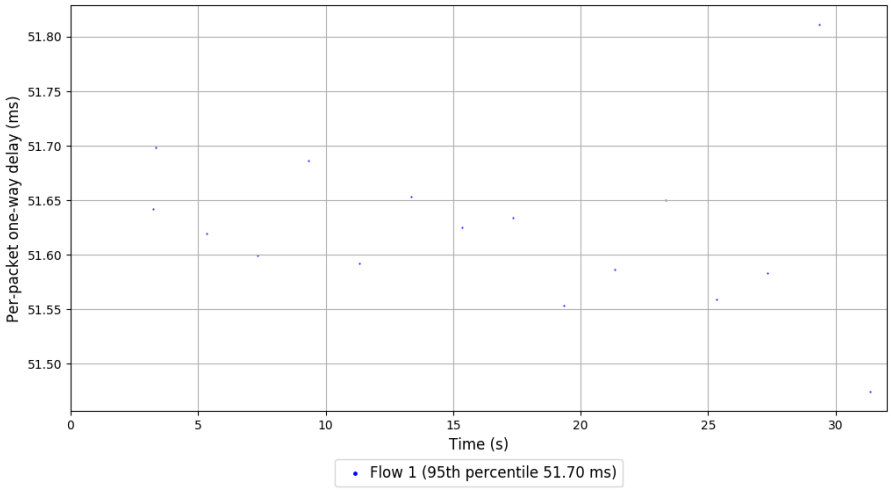
```
Run 2: Statistics of TaoVA-100x

Start at: 2019-01-24 16:57:28
End at: 2019-01-24 16:57:58

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.01 Mbit/s (0.1% utilization)
95th percentile per-packet one-way delay: 51.698 ms
Loss rate: 51.91%
-- Flow 1:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 51.698 ms
Loss rate: 51.91%
```

Run 2: Report of TaoVA-100x — Data Link

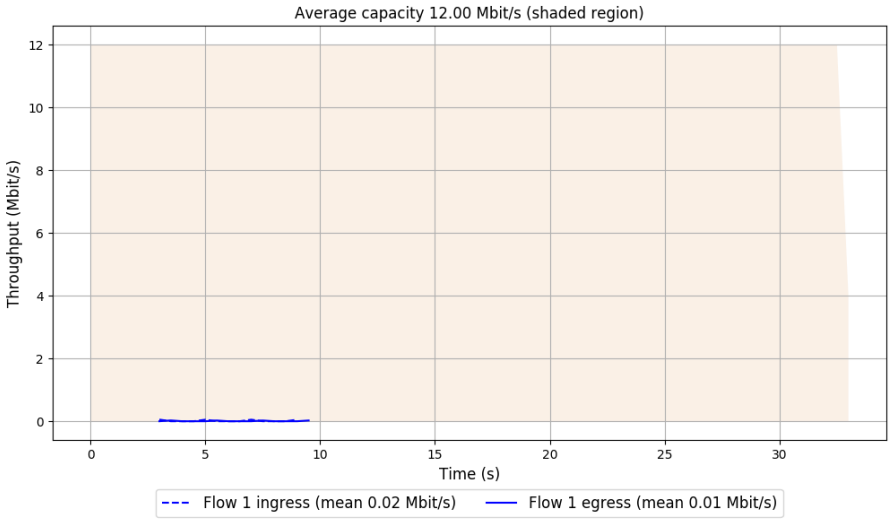


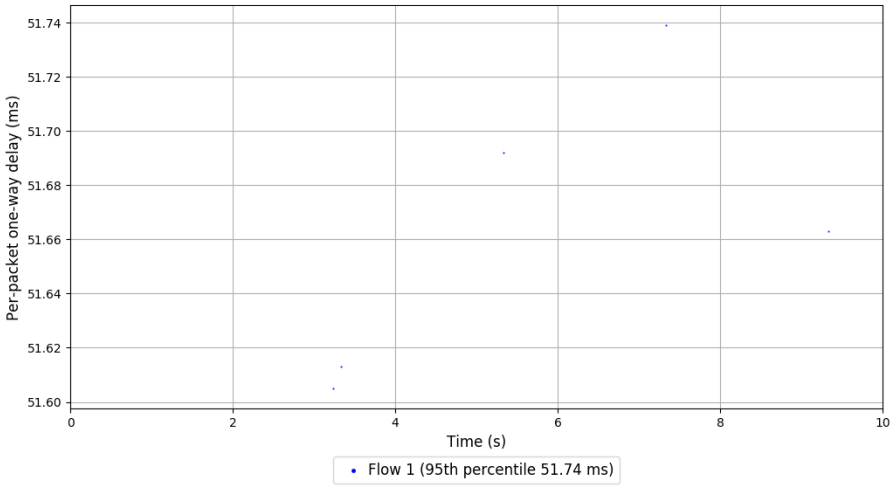



```
Run 3: Statistics of TaoVA-100x

Start at: 2019-01-24 17:09:48
End at: 2019-01-24 17:10:18
```

Run 3: Report of TaoVA-100x — Data Link



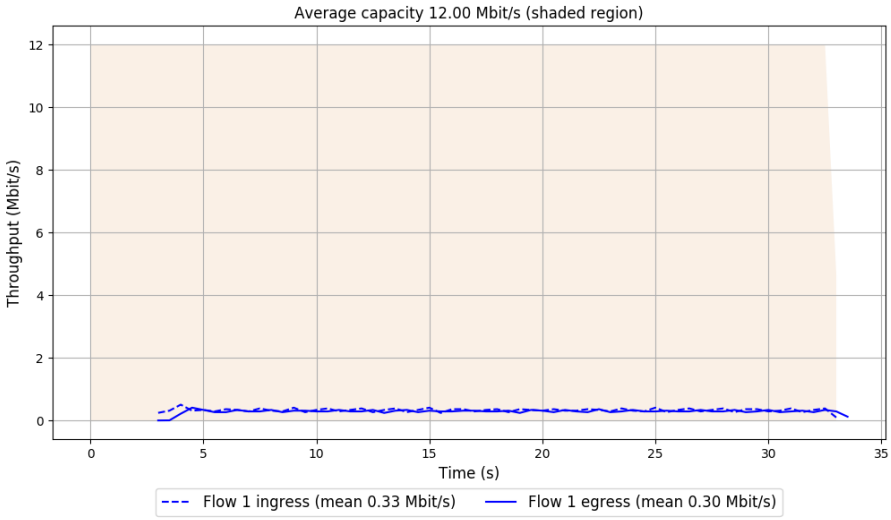



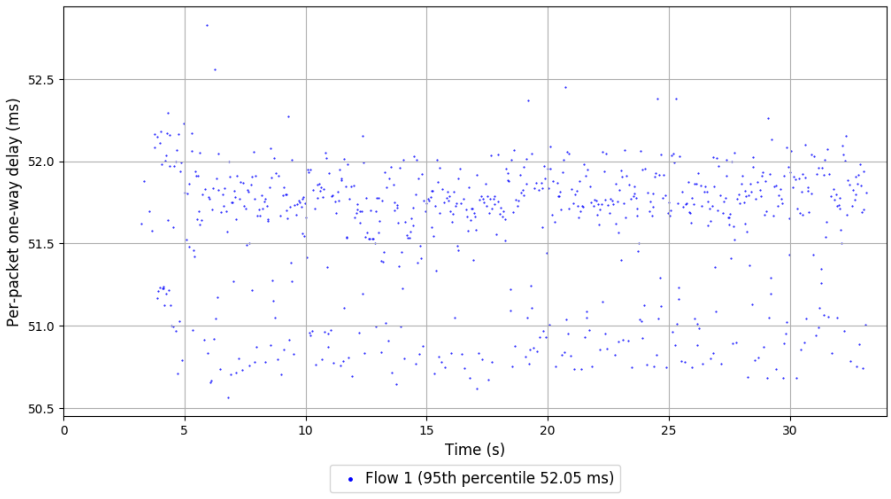
```
Run 1: Statistics of TCP Vegas

Start at: 2019-01-24 16:36:41
End at: 2019-01-24 16:37:11

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.30 Mbit/s (2.5% utilization)
95th percentile per-packet one-way delay: 52.054 ms
Loss rate: 11.06%
-- Flow 1:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 52.054 ms
Loss rate: 11.06%
```

Run 1: Report of TCP Vegas — Data Link



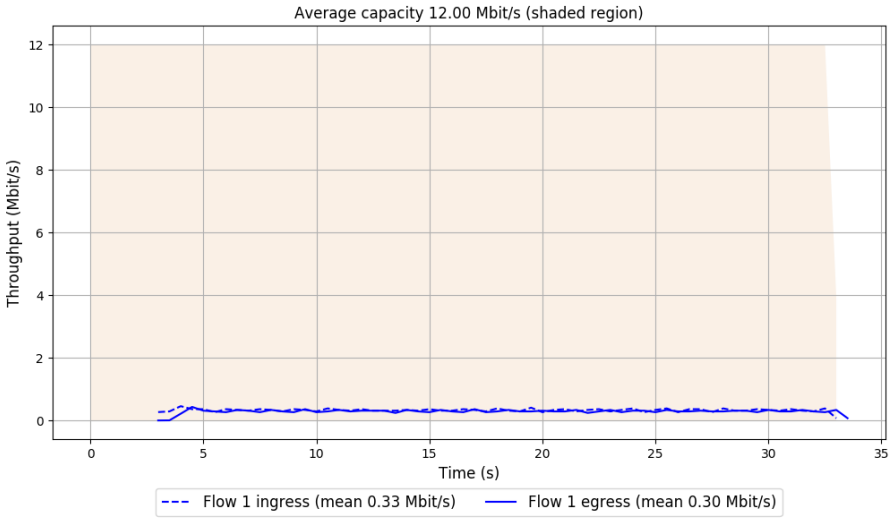



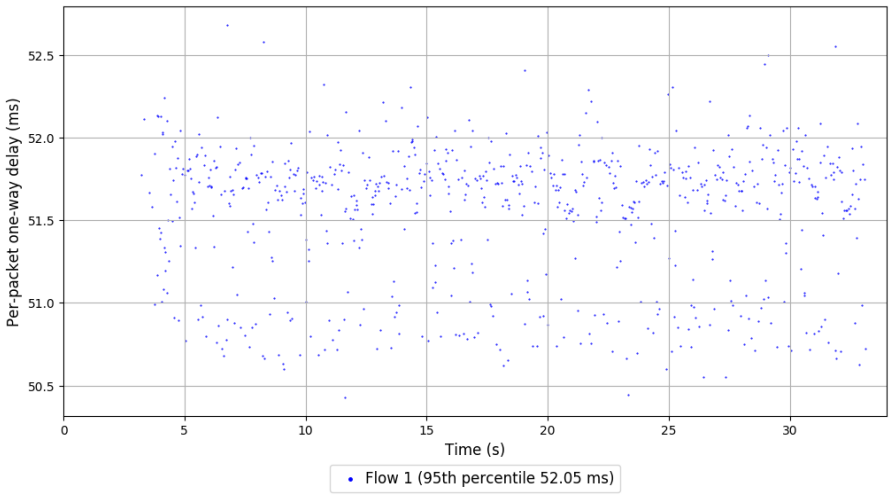
```
Run 2: Statistics of TCP Vegas

Start at: 2019-01-24 16:49:05
End at: 2019-01-24 16:49:35

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.30 Mbit/s (2.5% utilization)
95th percentile per-packet one-way delay: 52.045 ms
Loss rate: 10.84%
-- Flow 1:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 52.045 ms
Loss rate: 10.84%
```

Run 2: Report of TCP Vegas — Data Link



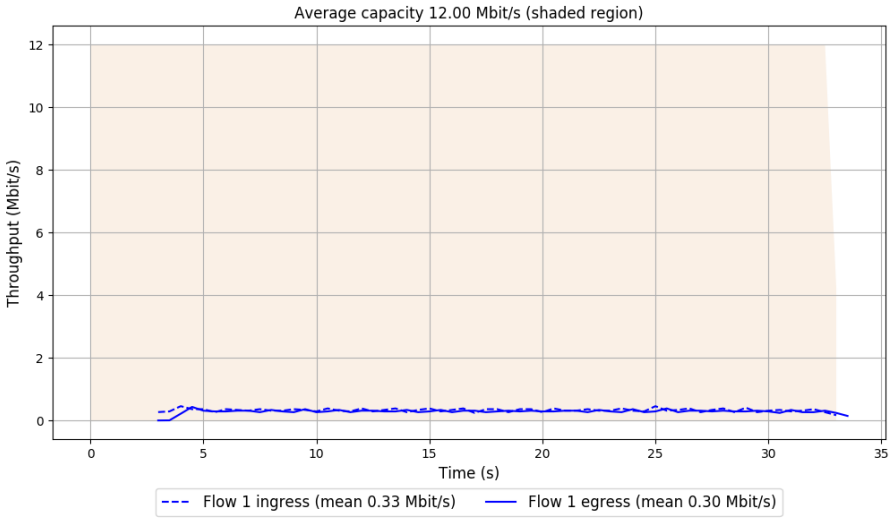



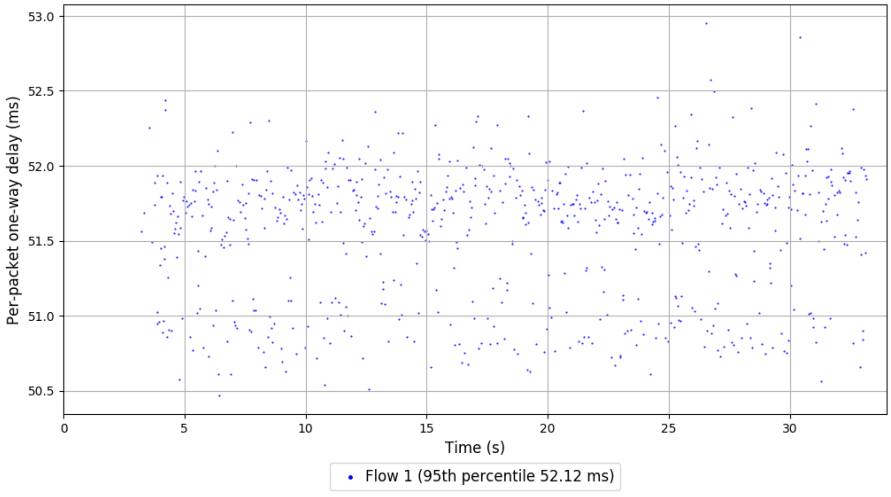
```
Run 3: Statistics of TCP Vegas

Start at: 2019-01-24 17:01:34
End at: 2019-01-24 17:02:04

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.30 Mbit/s (2.5% utilization)
95th percentile per-packet one-way delay: 52.115 ms
Loss rate: 11.30%
-- Flow 1:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 52.115 ms
Loss rate: 11.30%
```

Run 3: Report of TCP Vegas — Data Link



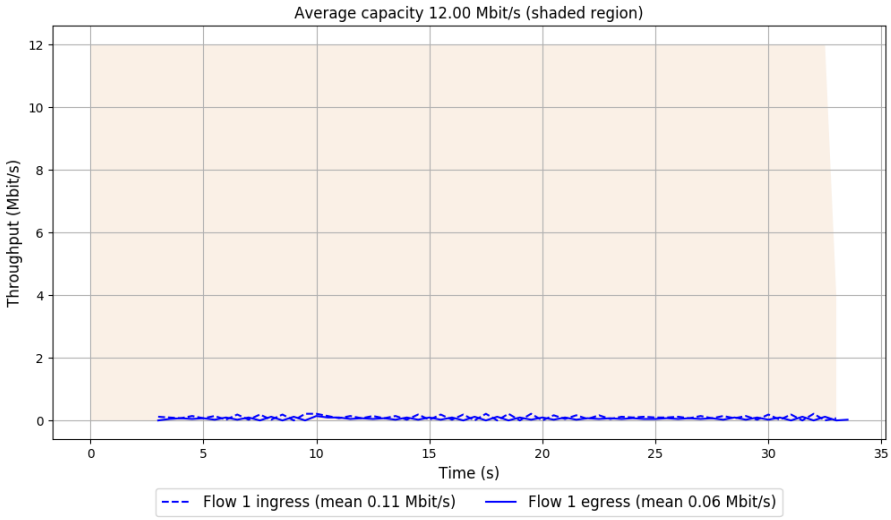



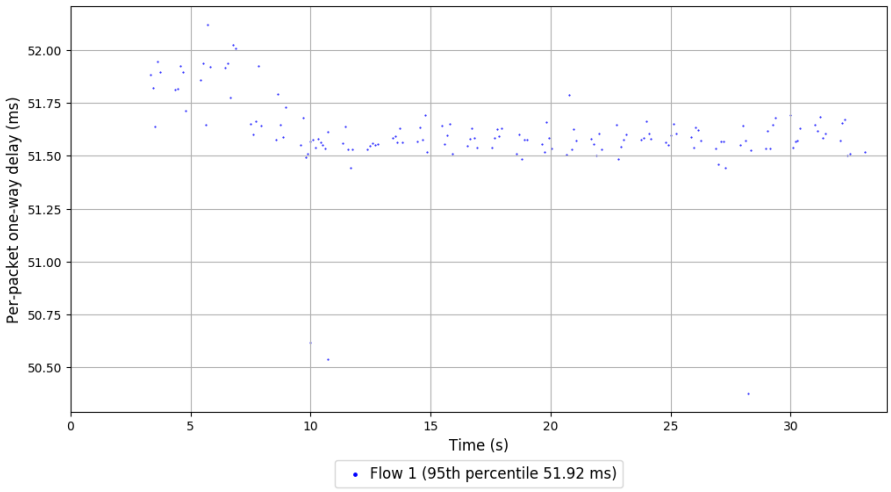
```
Run 1: Statistics of Verus

Start at: 2019-01-24 16:43:14
End at: 2019-01-24 16:43:44

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.06 Mbit/s (0.5% utilization)
95th percentile per-packet one-way delay: 51.924 ms
Loss rate: 44.44%
-- Flow 1:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 51.924 ms
Loss rate: 44.44%
```

Run 1: Report of Verus — Data Link



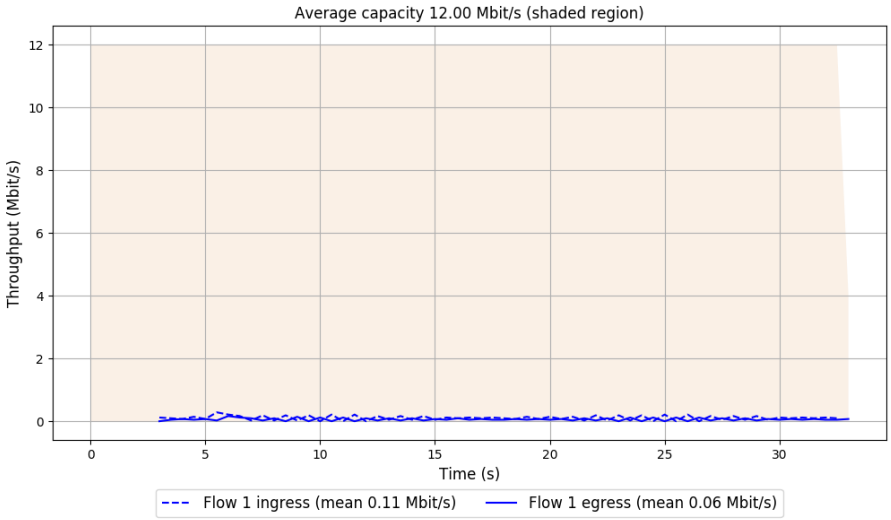



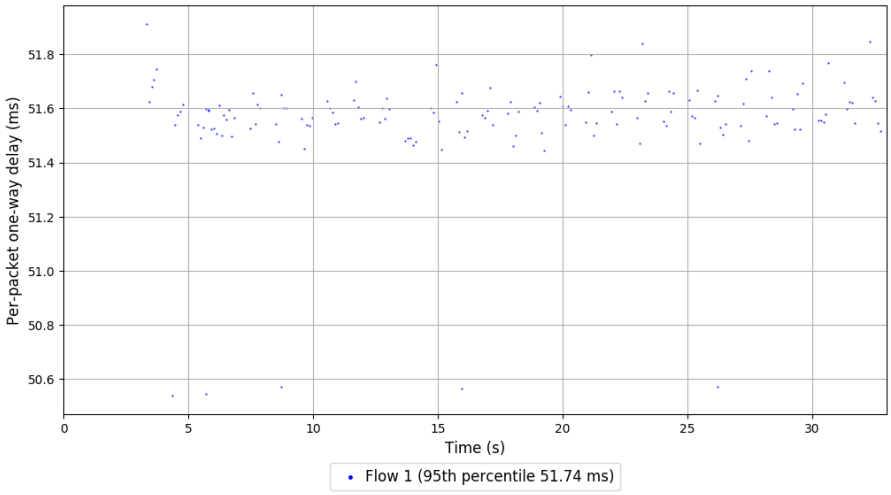
```
Run 2: Statistics of Verus

Start at: 2019-01-24 16:55:43
End at: 2019-01-24 16:56:13

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.06 Mbit/s (0.5% utilization)
95th percentile per-packet one-way delay: 51.739 ms
Loss rate: 43.43%
-- Flow 1:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 51.739 ms
Loss rate: 43.43%
```

Run 2: Report of Verus — Data Link



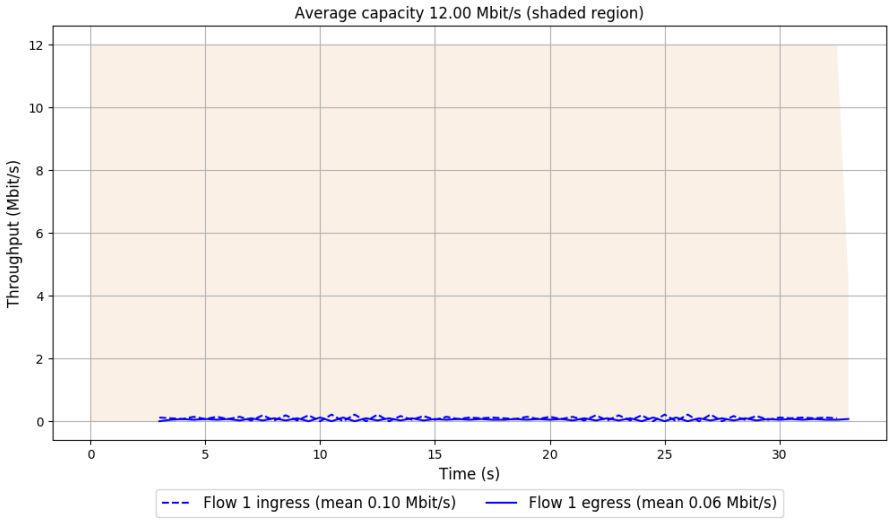



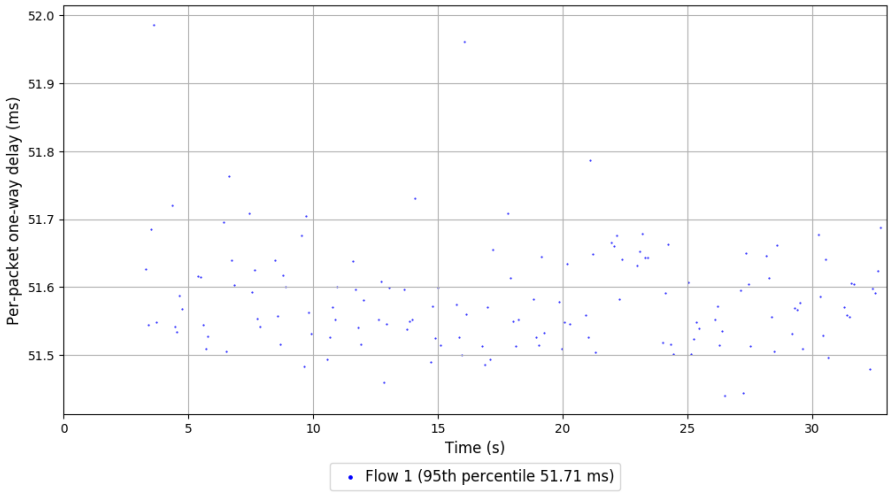
```
Run 3: Statistics of Verus

Start at: 2019-01-24 17:08:03
End at: 2019-01-24 17:08:33

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.06 Mbit/s (0.5% utilization)
95th percentile per-packet one-way delay: 51.709 ms
Loss rate: 44.44%
-- Flow 1:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 51.709 ms
Loss rate: 44.44%
```

Run 3: Report of Verus — Data Link



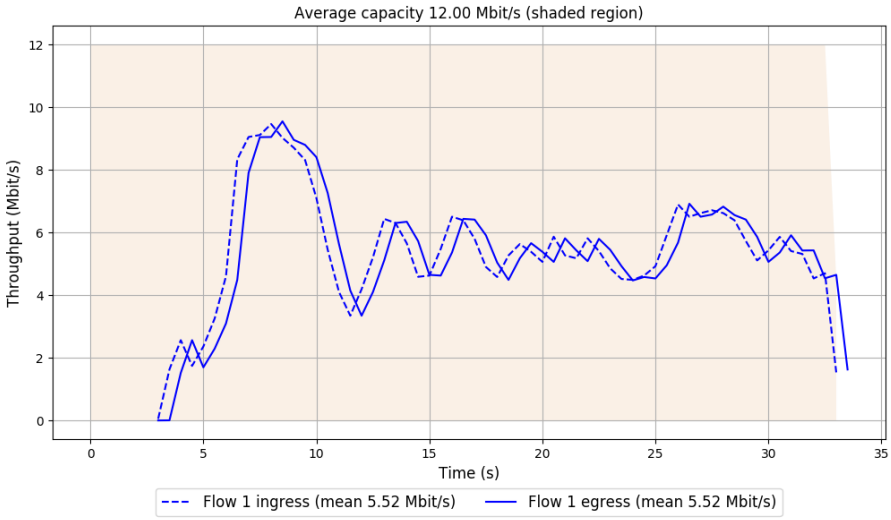



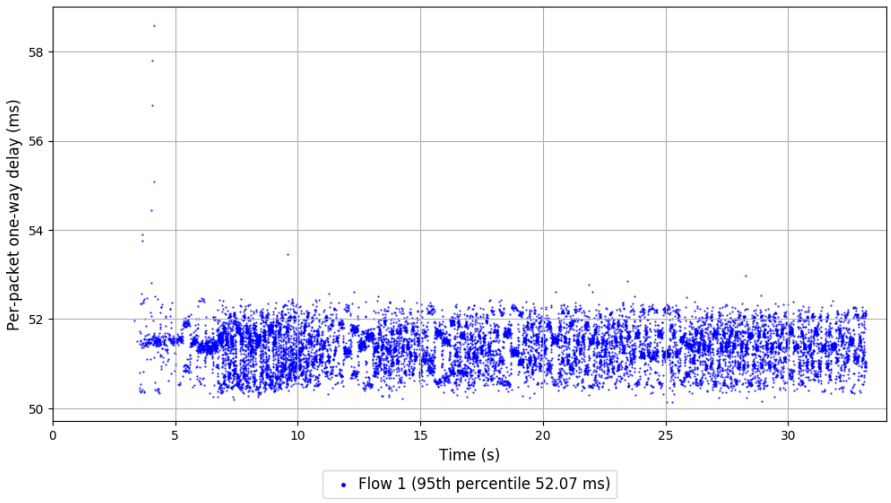
```
Run 1: Statistics of PCC-Vivace

Start at: 2019-01-24 16:39:08
End at: 2019-01-24 16:39:38

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.52 Mbit/s (46.0% utilization)
95th percentile per-packet one-way delay: 52.073 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 5.52 Mbit/s
95th percentile per-packet one-way delay: 52.073 ms
Loss rate: 0.15%
```

Run 1: Report of PCC-Vivace — Data Link



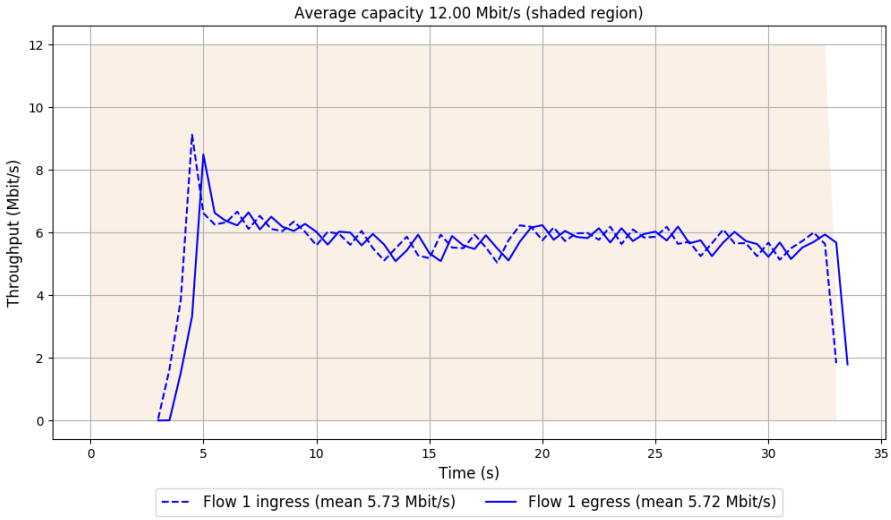



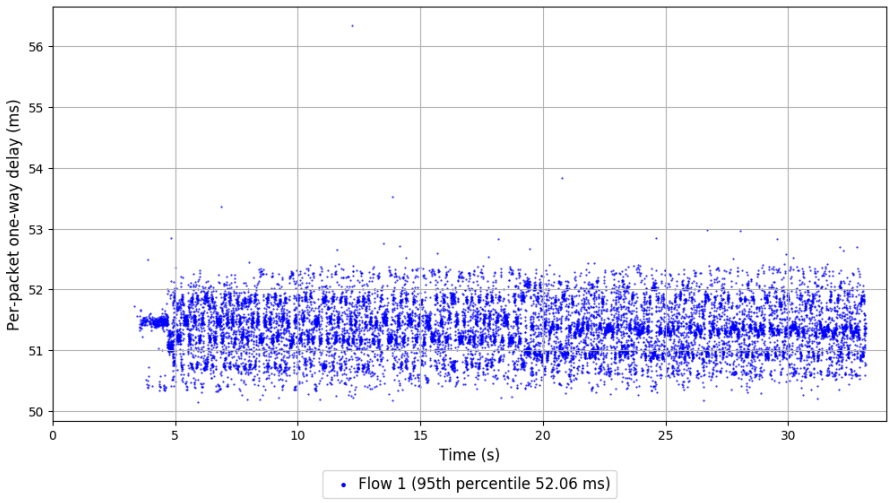
```
Run 2: Statistics of PCC-Vivace

Start at: 2019-01-24 16:51:36
End at: 2019-01-24 16:52:06

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.72 Mbit/s (47.6% utilization)
95th percentile per-packet one-way delay: 52.062 ms
Loss rate: 0.42%
-- Flow 1:
Average throughput: 5.72 Mbit/s
95th percentile per-packet one-way delay: 52.062 ms
Loss rate: 0.42%
```

Run 2: Report of PCC-Vivace — Data Link



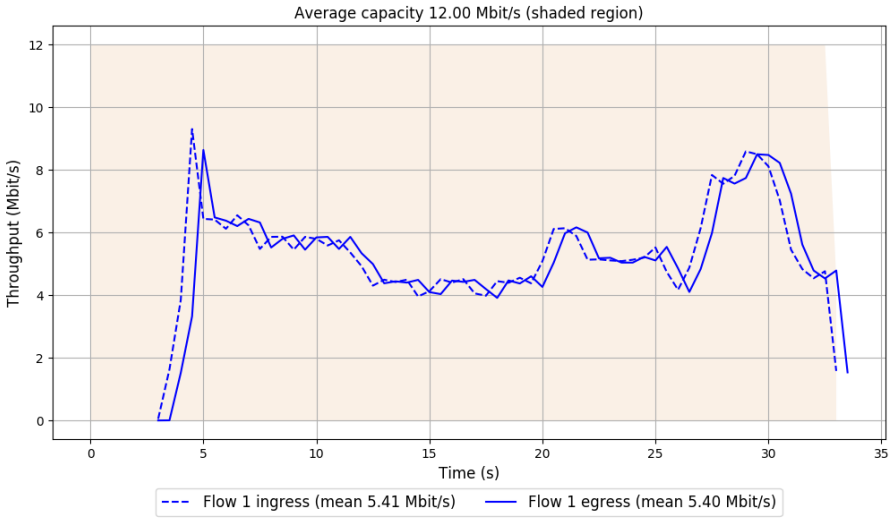



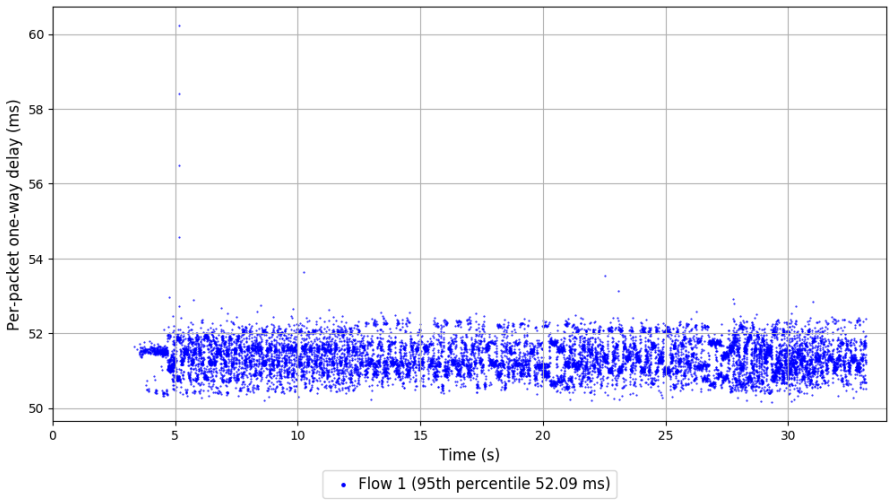
```
Run 3: Statistics of PCC-Vivace

Start at: 2019-01-24 17:03:56
End at: 2019-01-24 17:04:26

# Below is generated by plot.py at 2019-01-24 17:12:36
# 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: 52.087 ms
Loss rate: 0.38%
-- Flow 1:
Average throughput: 5.40 Mbit/s
95th percentile per-packet one-way delay: 52.087 ms
Loss rate: 0.38%
```

Run 3: Report of PCC-Vivace — Data Link



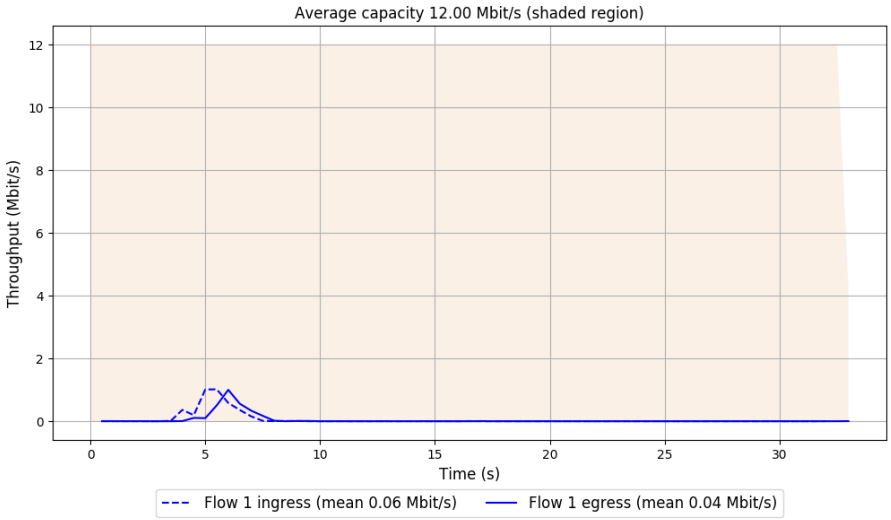



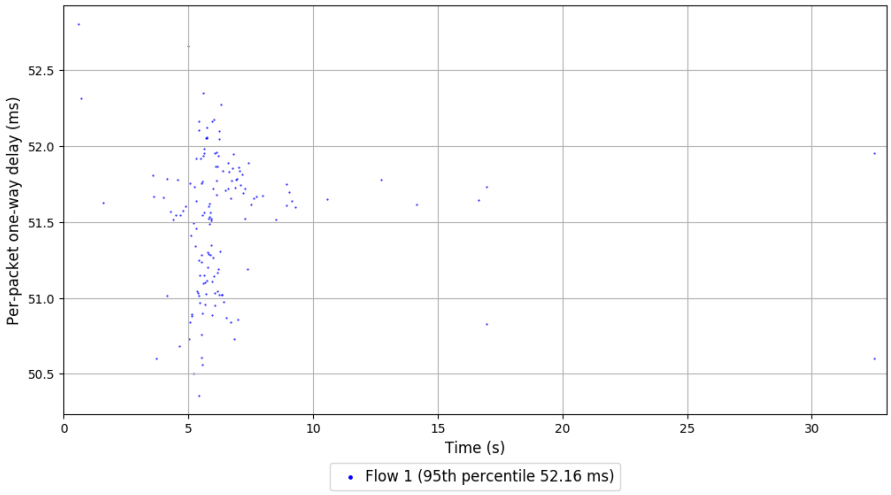
```
Run 1: Statistics of WebRTC media

Start at: 2019-01-24 16:36:06
End at: 2019-01-24 16:36:36

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.04 Mbit/s (0.4% utilization)
95th percentile per-packet one-way delay: 52.162 ms
Loss rate: 24.21%
-- Flow 1:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 52.162 ms
Loss rate: 24.21%
```

Run 1: Report of WebRTC media — Data Link



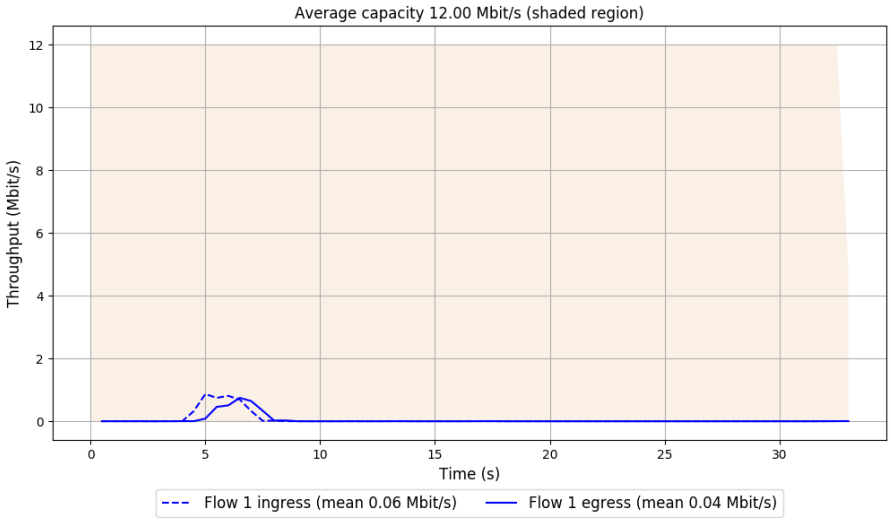



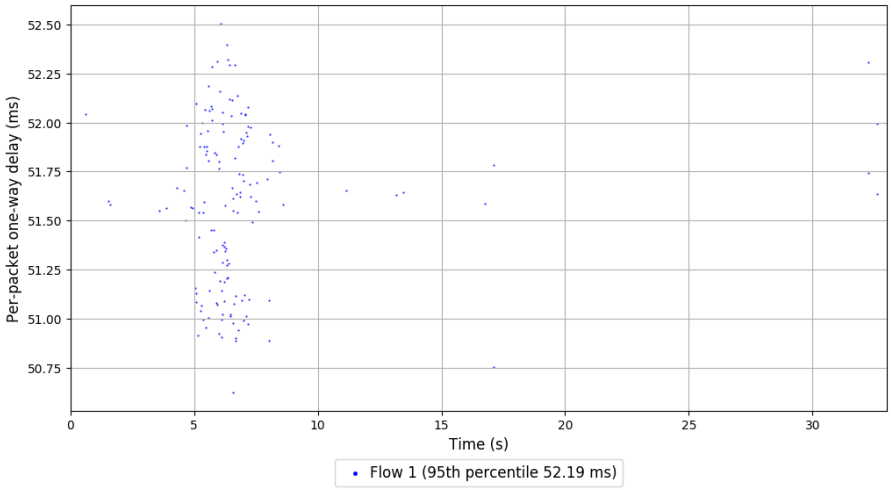
```
Run 2: Statistics of WebRTC media

Start at: 2019-01-24 16:48:30
End at: 2019-01-24 16:49:00

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.04 Mbit/s (0.4% utilization)
95th percentile per-packet one-way delay: 52.188 ms
Loss rate: 25.62%
-- Flow 1:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 52.188 ms
Loss rate: 25.62%
```

Run 2: Report of WebRTC media — Data Link



```
Run 3: Statistics of WebRTC media

Start at: 2019-01-24 17:00:59
End at: 2019-01-24 17:01:29

# Below is generated by plot.py at 2019-01-24 17:12:36
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.04 Mbit/s (0.4% utilization)
95th percentile per-packet one-way delay: 52.157 ms
Loss rate: 27.44%
-- Flow 1:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 52.157 ms
Loss rate: 27.44%
```

Run 3: Report of WebRTC media — Data Link