

## Pantheon Report

Generated at 2018-09-25 09:06:46 (UTC).

Tested in mahimahi: mm-delay 30 mm-link 12mbps.trace 12mbps.trace  
--uplink-queue=droptail --uplink-queue-args=bytes=30000

Repeated the test of 19 congestion control schemes 3 times.

Each test lasted for 30 seconds running 1 flow.

### System info:

```
Linux 4.15.0-1019-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
net.ipv4.tcp_mem = 190986 254651 381972
```

### Git summary:

```
branch: muses @ 90192f6b64ce1a1191dcca0e9ff9ee24950674d7
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/indigo-96d2da3 @ 8413272d46f8aa0bcb967ed7048b6a8f994abb95
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 65ac1b19bbefed0c6349ae986009b4fa8643c40a
third_party/pantheon-tunnel @ cbfce6db5ff5740dafe1771f813cd646339e1952
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)	mean 95th-%ile delay (ms)	mean loss rate (%)
		flow 1	flow 1	flow 1
TCP BBR	3	11.68	49.05	2.80
Copa	3	11.11	47.75	1.23
TCP Cubic	3	11.78	48.83	0.40
FillP	3	11.75	50.86	9.05
FillP-Sheep	3	11.71	50.56	4.48
Indigo	3	11.57	43.12	3.41
Indigo-96d2da3	3	11.03	51.63	54.70
LEDBAT	3	8.81	49.56	1.14
Indigo-Muses	3	11.55	36.00	0.37
PCC-Allegro	3	9.66	38.60	0.89
PCC-Expr	3	11.10	50.51	1.08
QUIC Cubic	3	11.68	49.89	0.39
SCReAM	3	0.21	31.61	0.13
Sprout	3	4.37	48.77	7.35
TaoVA-100x	3	11.09	32.79	0.77
TCP Vegas	3	11.70	36.46	0.30
Verus	3	6.18	51.94	97.13
PCC-Vivace	3	10.91	36.02	0.19
WebRTC media	3	2.01	35.97	0.12

Run 1: Statistics of TCP BBR

Start at: 2018-09-25 08:32:50

End at: 2018-09-25 08:33:20

# Below is generated by plot.py at 2018-09-25 09:04:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.68 Mbit/s (97.3% utilization)

95th percentile per-packet one-way delay: 49.022 ms

Loss rate: 2.78%

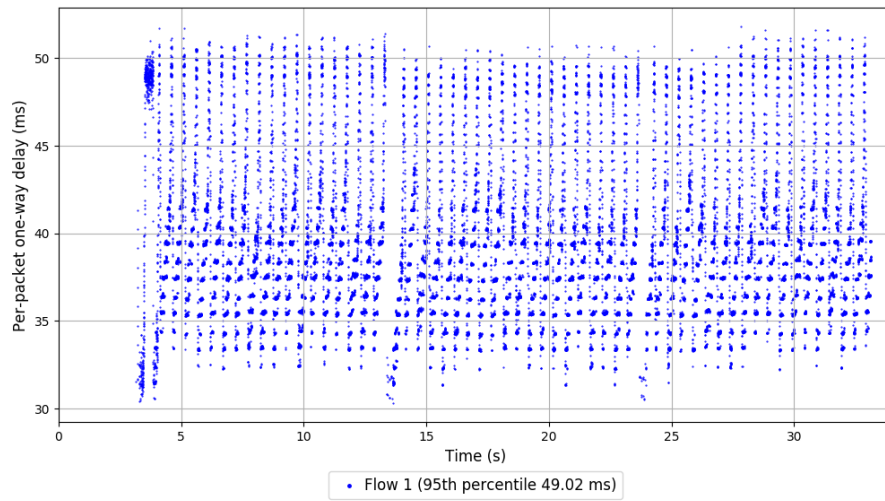
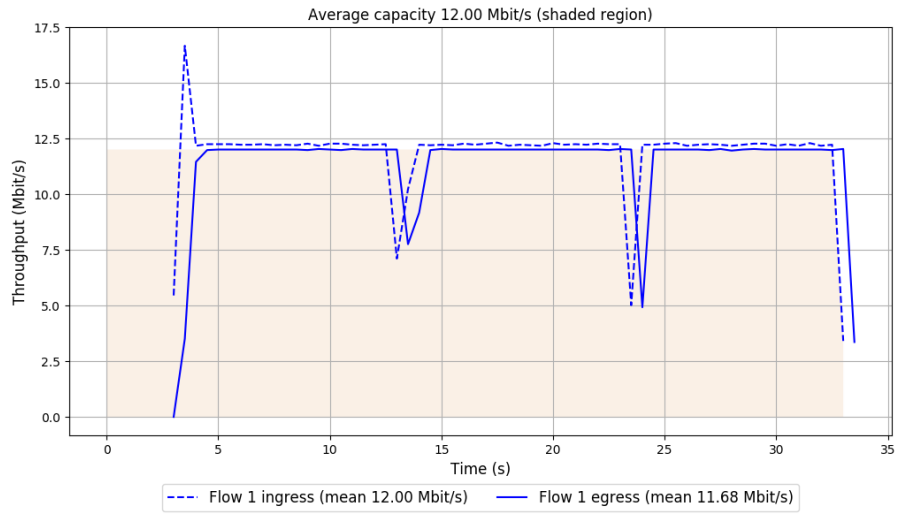
-- Flow 1:

Average throughput: 11.68 Mbit/s

95th percentile per-packet one-way delay: 49.022 ms

Loss rate: 2.78%

# Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-09-25 08:44:08

End at: 2018-09-25 08:44:38

# Below is generated by plot.py at 2018-09-25 09:04:24

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.69 Mbit/s (97.4% utilization)

95th percentile per-packet one-way delay: 49.045 ms

Loss rate: 2.76%

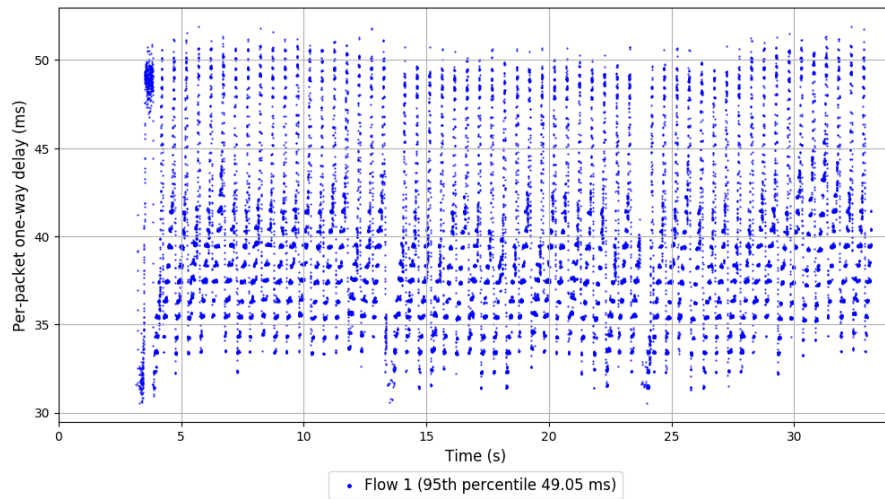
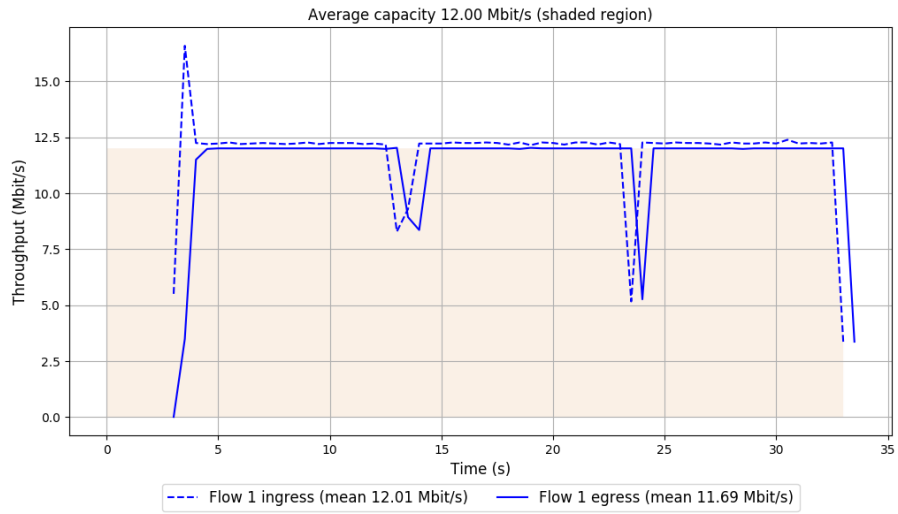
-- Flow 1:

Average throughput: 11.69 Mbit/s

95th percentile per-packet one-way delay: 49.045 ms

Loss rate: 2.76%

## Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2018-09-25 08:55:25

End at: 2018-09-25 08:55:55

# Below is generated by plot.py at 2018-09-25 09:04:24

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.68 Mbit/s (97.3% utilization)

95th percentile per-packet one-way delay: 49.072 ms

Loss rate: 2.87%

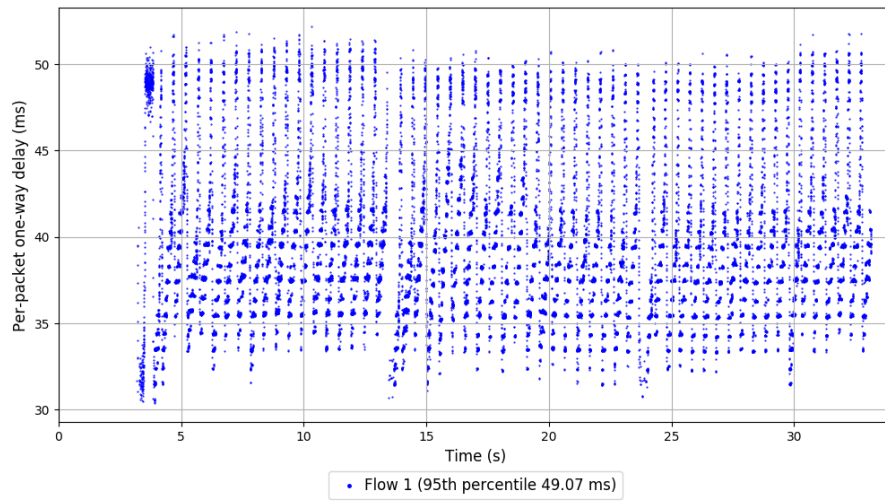
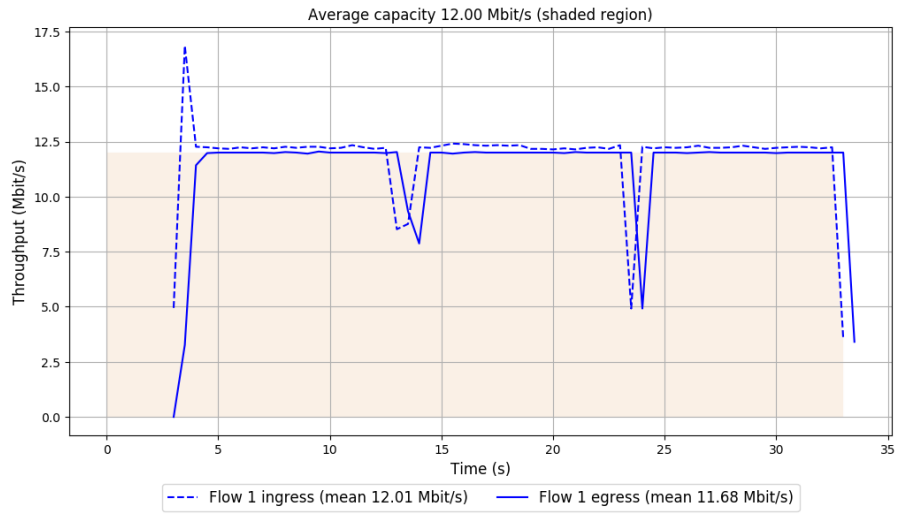
-- Flow 1:

Average throughput: 11.68 Mbit/s

95th percentile per-packet one-way delay: 49.072 ms

Loss rate: 2.87%

### Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2018-09-25 08:38:10

End at: 2018-09-25 08:38:40

# Below is generated by plot.py at 2018-09-25 09:04:34

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.16 Mbit/s (93.0% utilization)

95th percentile per-packet one-way delay: 47.274 ms

Loss rate: 0.94%

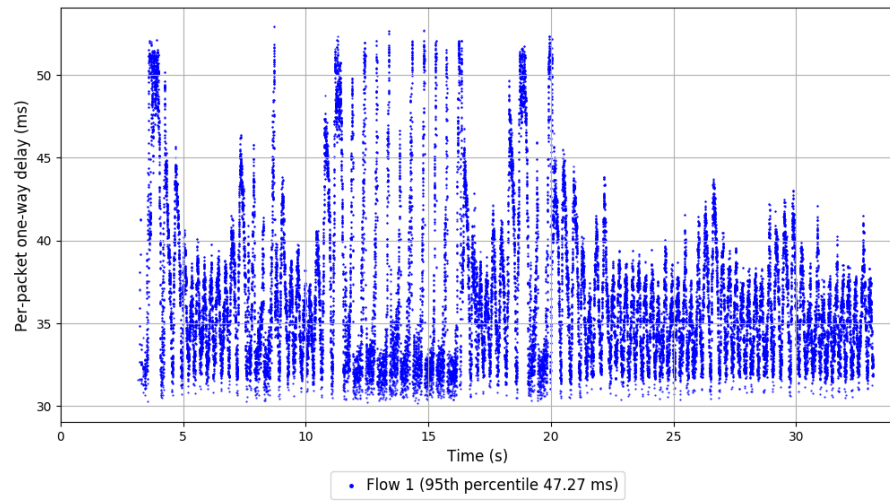
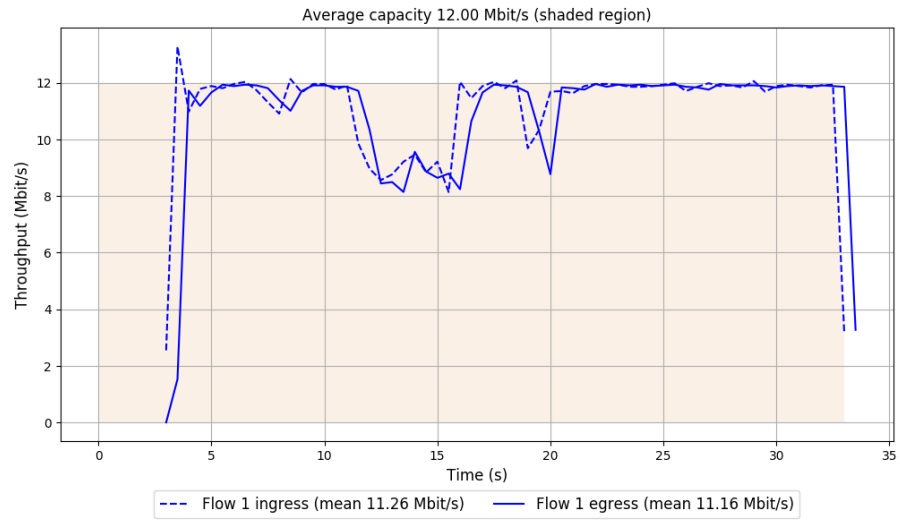
-- Flow 1:

Average throughput: 11.16 Mbit/s

95th percentile per-packet one-way delay: 47.274 ms

Loss rate: 0.94%

# Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

Start at: 2018-09-25 08:49:28

End at: 2018-09-25 08:49:58

# Below is generated by plot.py at 2018-09-25 09:04:34

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.89 Mbit/s (90.7% utilization)

95th percentile per-packet one-way delay: 49.294 ms

Loss rate: 1.80%

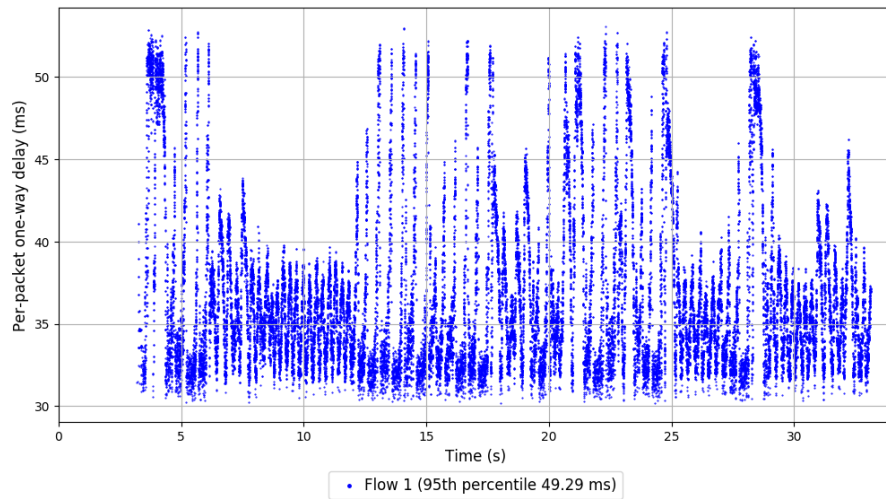
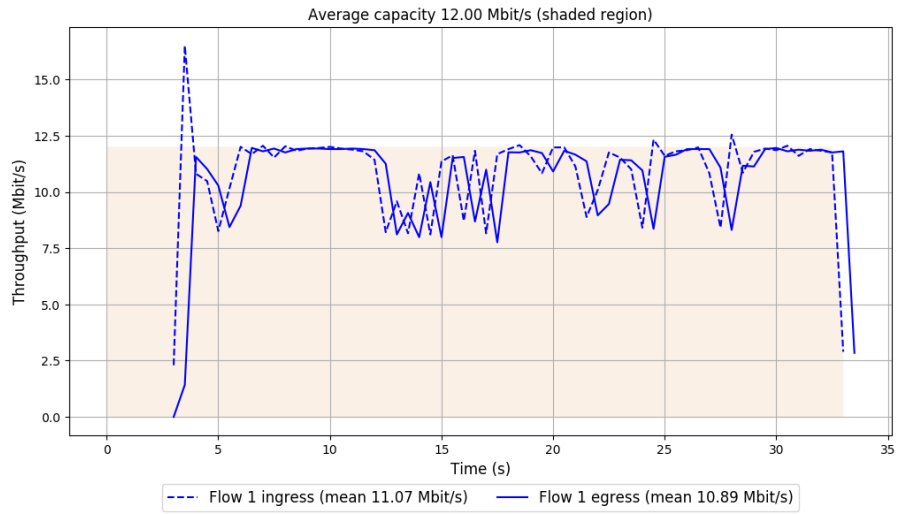
-- Flow 1:

Average throughput: 10.89 Mbit/s

95th percentile per-packet one-way delay: 49.294 ms

Loss rate: 1.80%

## Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

Start at: 2018-09-25 09:00:45

End at: 2018-09-25 09:01:15

# Below is generated by plot.py at 2018-09-25 09:04:35

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.28 Mbit/s (94.0% utilization)

95th percentile per-packet one-way delay: 46.691 ms

Loss rate: 0.96%

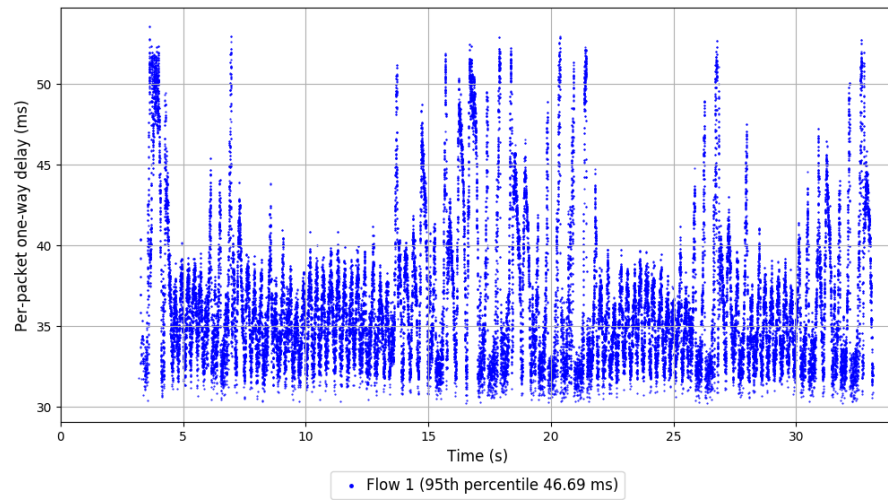
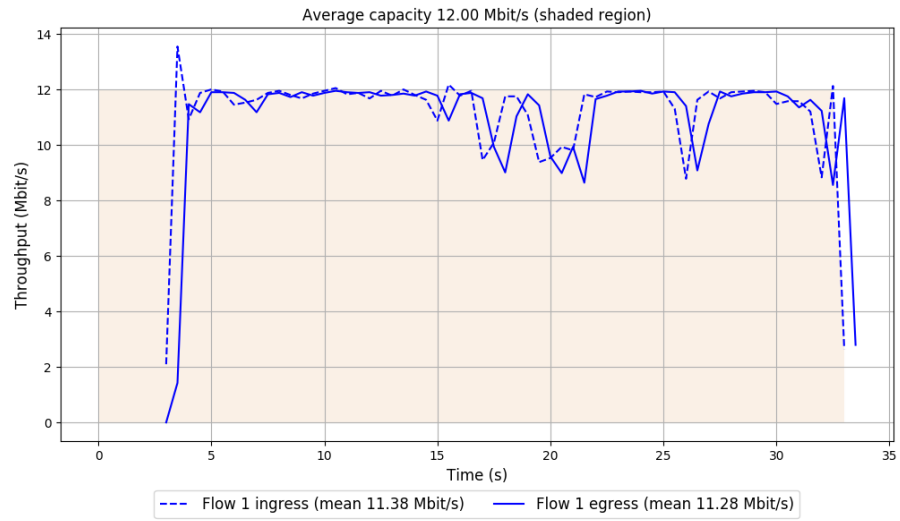
-- Flow 1:

Average throughput: 11.28 Mbit/s

95th percentile per-packet one-way delay: 46.691 ms

Loss rate: 0.96%

### Run 3: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-09-25 08:33:26

End at: 2018-09-25 08:33:56

# Below is generated by plot.py at 2018-09-25 09:04:35

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.78 Mbit/s (98.2% utilization)

95th percentile per-packet one-way delay: 48.887 ms

Loss rate: 0.43%

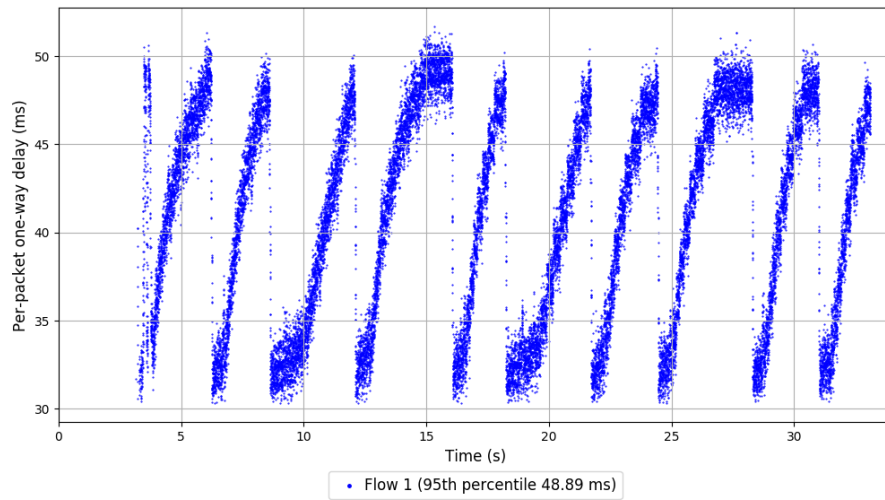
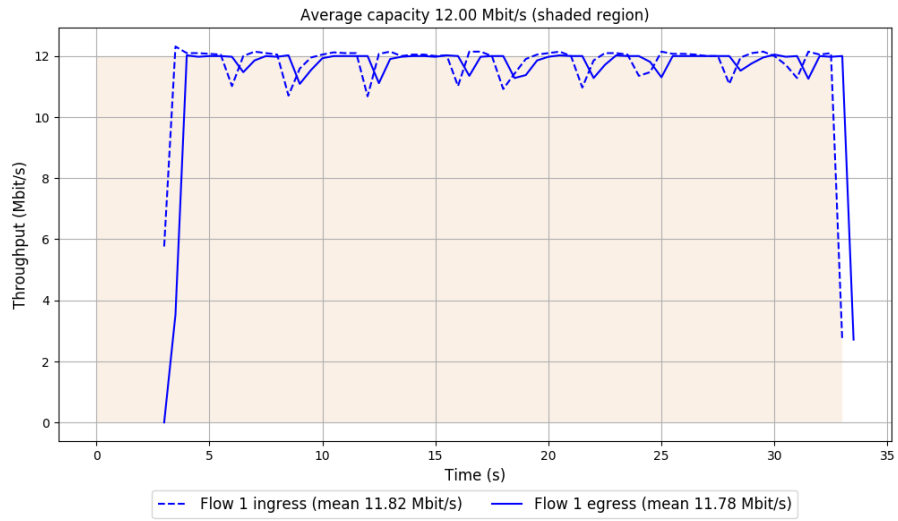
-- Flow 1:

Average throughput: 11.78 Mbit/s

95th percentile per-packet one-way delay: 48.887 ms

Loss rate: 0.43%

### Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2018-09-25 08:44:43

End at: 2018-09-25 08:45:13

# Below is generated by plot.py at 2018-09-25 09:04:35

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.78 Mbit/s (98.1% utilization)

95th percentile per-packet one-way delay: 48.853 ms

Loss rate: 0.39%

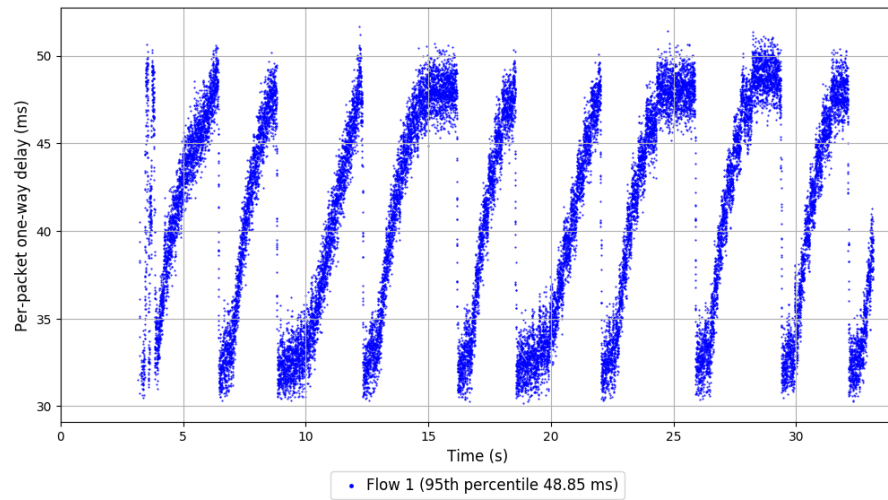
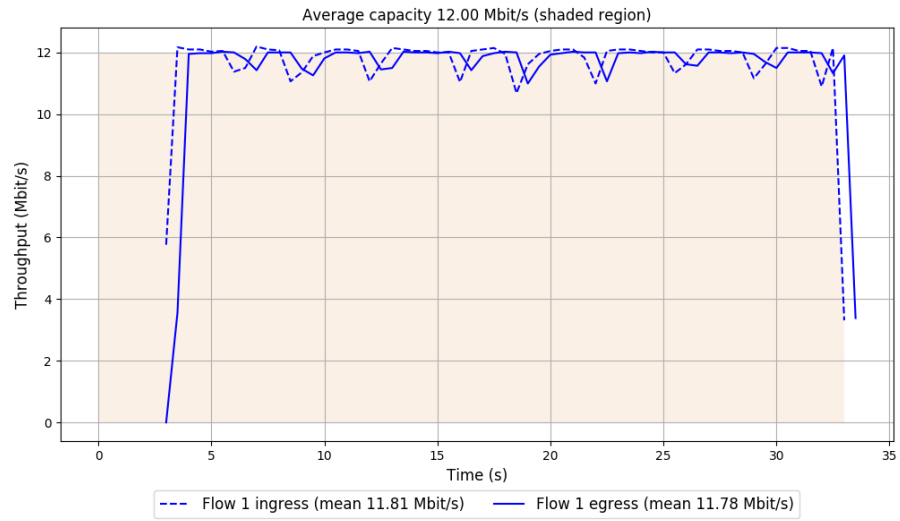
-- Flow 1:

Average throughput: 11.78 Mbit/s

95th percentile per-packet one-way delay: 48.853 ms

Loss rate: 0.39%

## Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-09-25 08:56:00

End at: 2018-09-25 08:56:30

# Below is generated by plot.py at 2018-09-25 09:04:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.77 Mbit/s (98.1% utilization)

95th percentile per-packet one-way delay: 48.763 ms

Loss rate: 0.37%

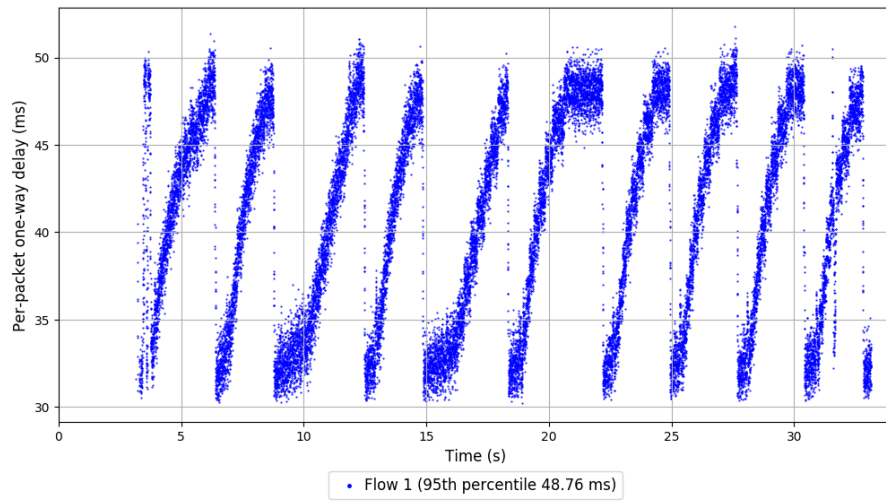
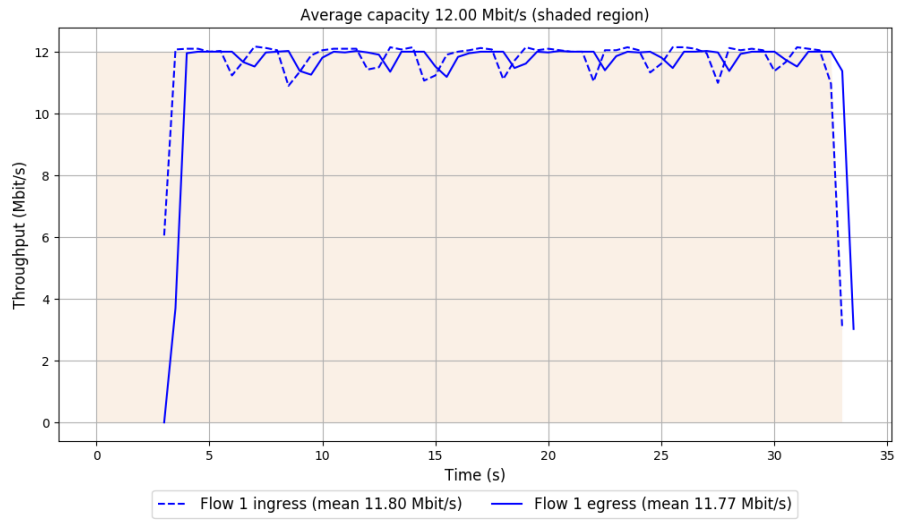
-- Flow 1:

Average throughput: 11.77 Mbit/s

95th percentile per-packet one-way delay: 48.763 ms

Loss rate: 0.37%

### Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

Start at: 2018-09-25 08:36:24

End at: 2018-09-25 08:36:54

# Below is generated by plot.py at 2018-09-25 09:04:48

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.80 Mbit/s (98.4% utilization)

95th percentile per-packet one-way delay: 50.875 ms

Loss rate: 11.15%

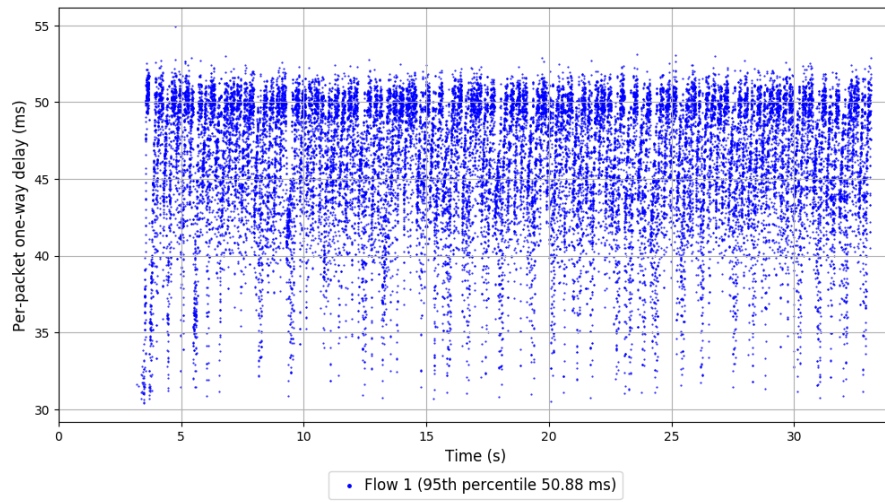
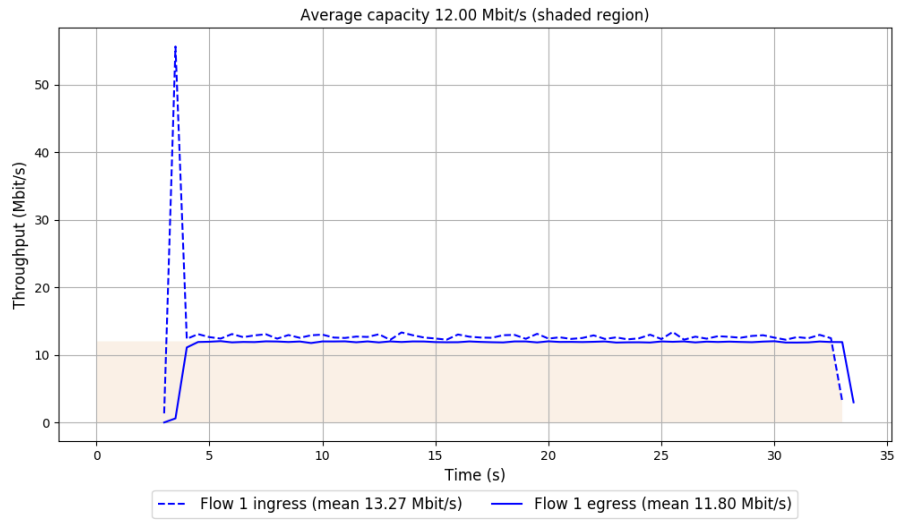
-- Flow 1:

Average throughput: 11.80 Mbit/s

95th percentile per-packet one-way delay: 50.875 ms

Loss rate: 11.15%

# Run 1: Report of FillP — Data Link



Run 2: Statistics of FillP

Start at: 2018-09-25 08:47:42

End at: 2018-09-25 08:48:12

# Below is generated by plot.py at 2018-09-25 09:04:48

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.82 Mbit/s (98.5% utilization)

95th percentile per-packet one-way delay: 50.835 ms

Loss rate: 9.40%

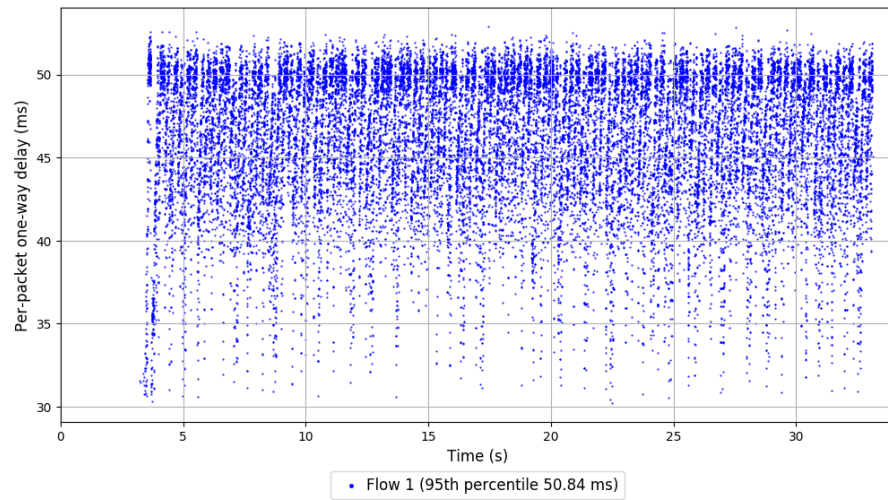
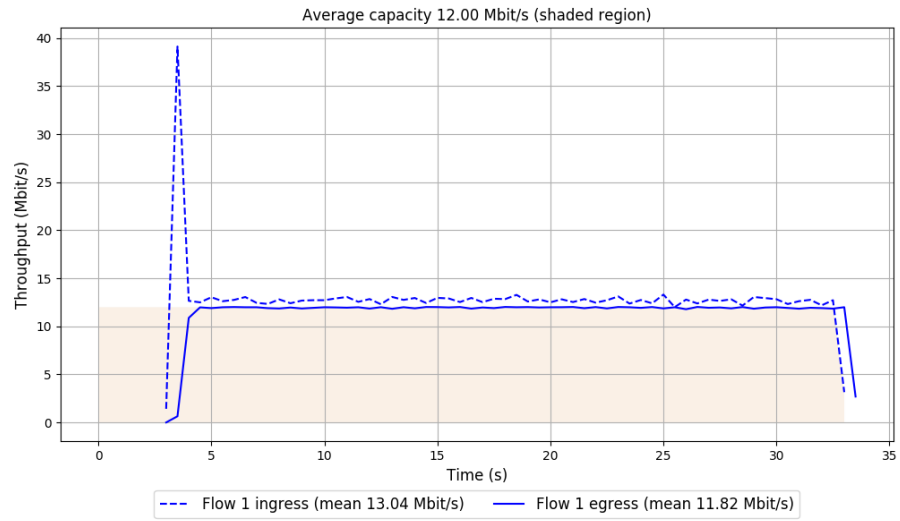
-- Flow 1:

Average throughput: 11.82 Mbit/s

95th percentile per-packet one-way delay: 50.835 ms

Loss rate: 9.40%

## Run 2: Report of FillP — Data Link



Run 3: Statistics of FillP

Start at: 2018-09-25 08:58:59

End at: 2018-09-25 08:59:29

# Below is generated by plot.py at 2018-09-25 09:04:48

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.62 Mbit/s (96.8% utilization)

95th percentile per-packet one-way delay: 50.881 ms

Loss rate: 6.61%

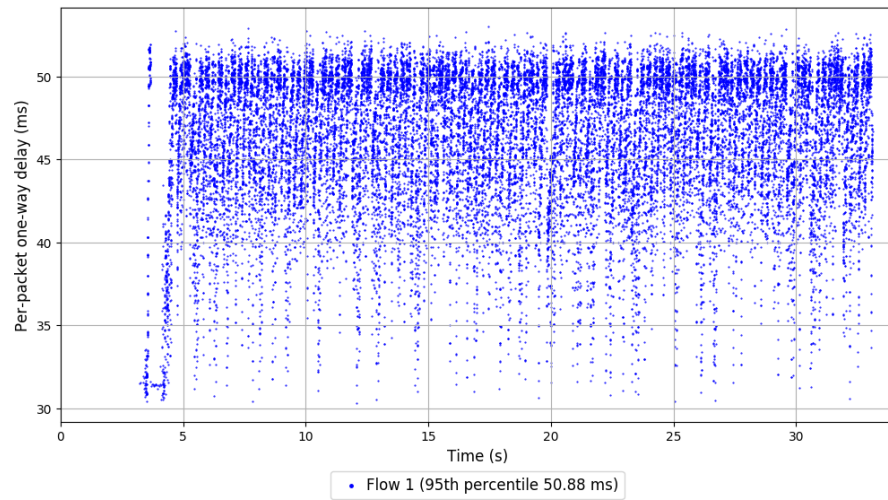
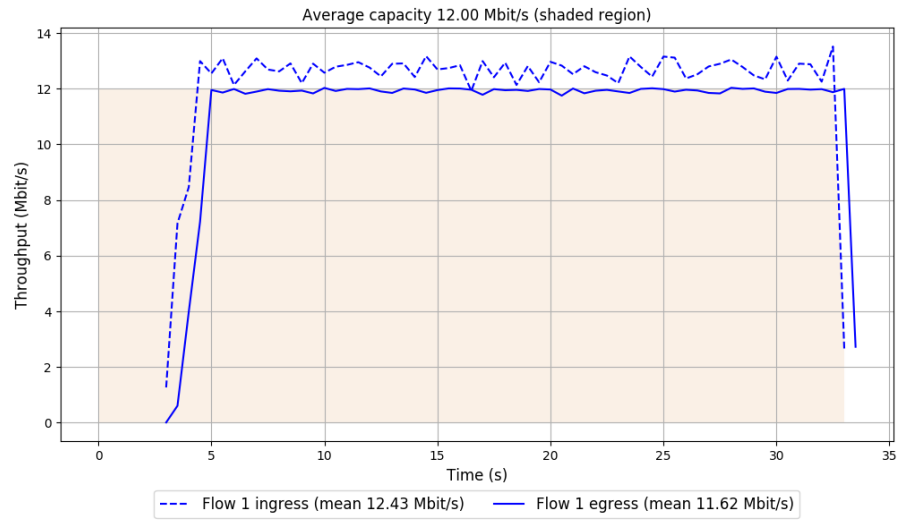
-- Flow 1:

Average throughput: 11.62 Mbit/s

95th percentile per-packet one-way delay: 50.881 ms

Loss rate: 6.61%

### Run 3: Report of FillP — Data Link



Run 1: Statistics of FillP-Sheep

Start at: 2018-09-25 08:39:59

End at: 2018-09-25 08:40:29

# Below is generated by plot.py at 2018-09-25 09:04:48

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.71 Mbit/s (97.5% utilization)

95th percentile per-packet one-way delay: 50.501 ms

Loss rate: 4.02%

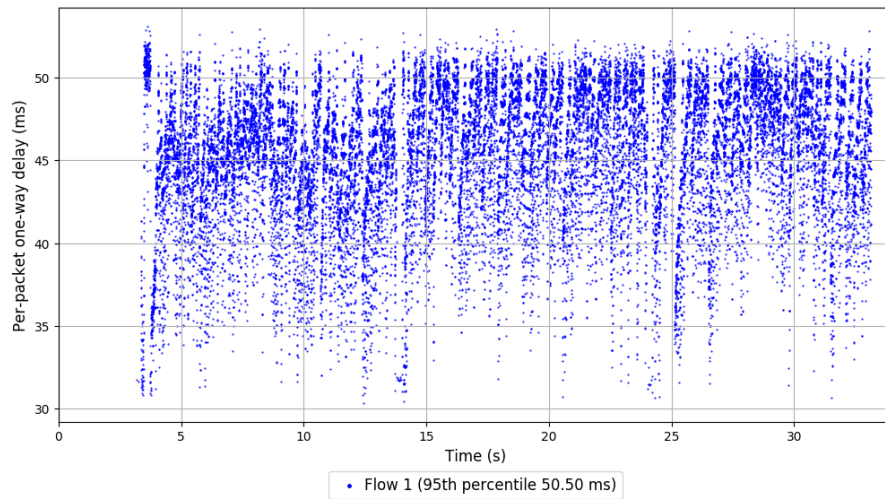
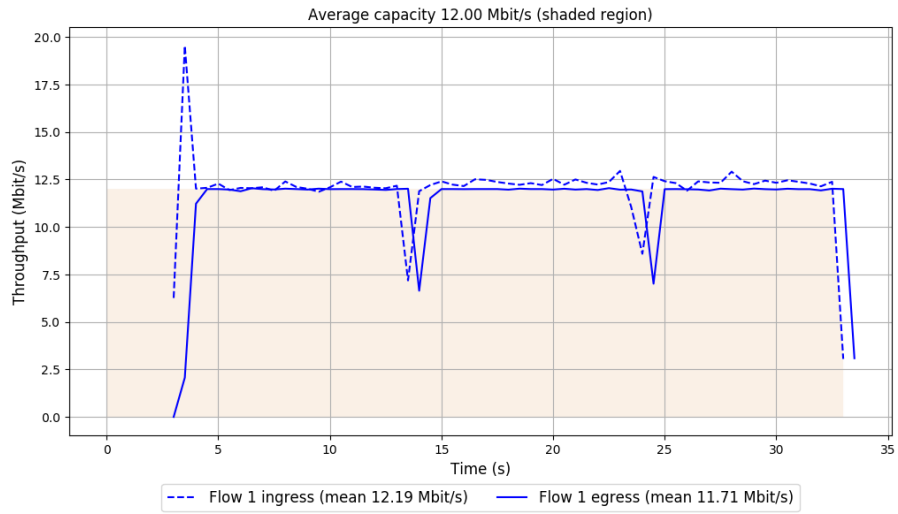
-- Flow 1:

Average throughput: 11.71 Mbit/s

95th percentile per-packet one-way delay: 50.501 ms

Loss rate: 4.02%

Run 1: Report of FillP-Sheep — Data Link



Run 2: Statistics of FillP-Sheep

Start at: 2018-09-25 08:51:16

End at: 2018-09-25 08:51:47

# Below is generated by plot.py at 2018-09-25 09:04:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.71 Mbit/s (97.6% utilization)

95th percentile per-packet one-way delay: 50.659 ms

Loss rate: 4.99%

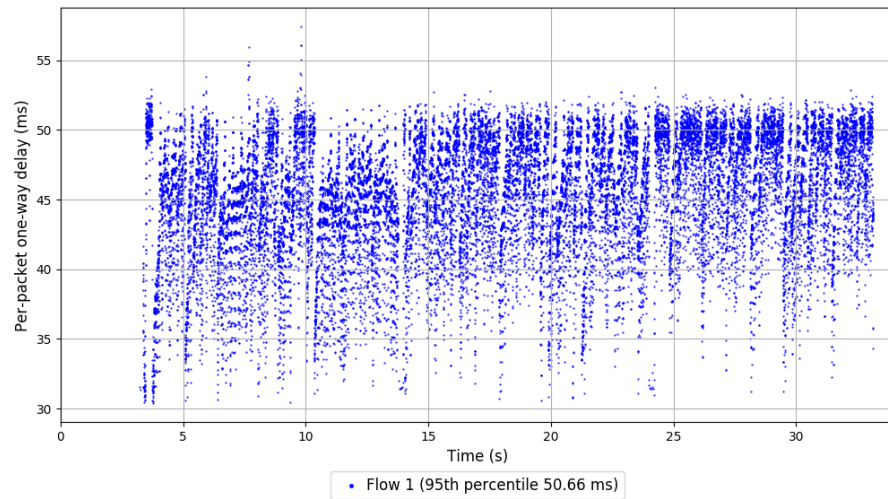
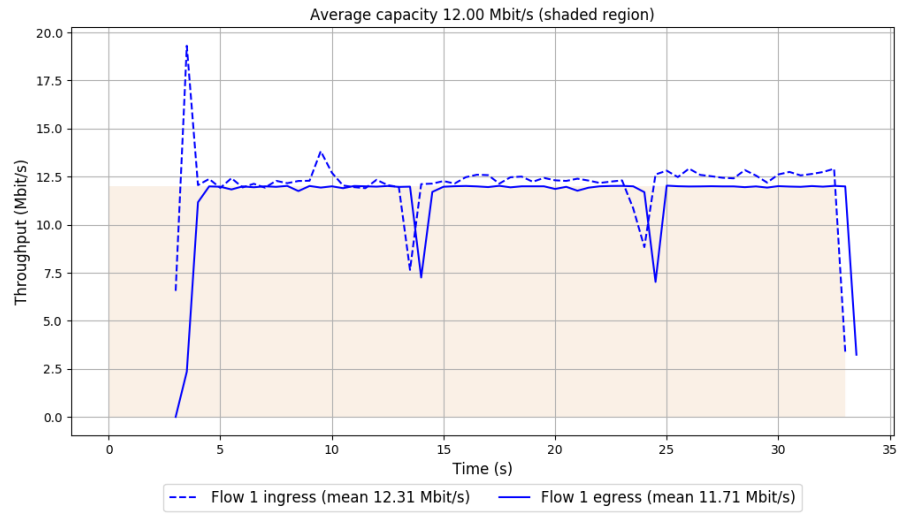
-- Flow 1:

Average throughput: 11.71 Mbit/s

95th percentile per-packet one-way delay: 50.659 ms

Loss rate: 4.99%

## Run 2: Report of FillP-Sheep — Data Link



Run 3: Statistics of FillP-Sheep

Start at: 2018-09-25 09:02:38

End at: 2018-09-25 09:03:08

# Below is generated by plot.py at 2018-09-25 09:04:59

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.72 Mbit/s (97.6% utilization)

95th percentile per-packet one-way delay: 50.535 ms

Loss rate: 4.44%

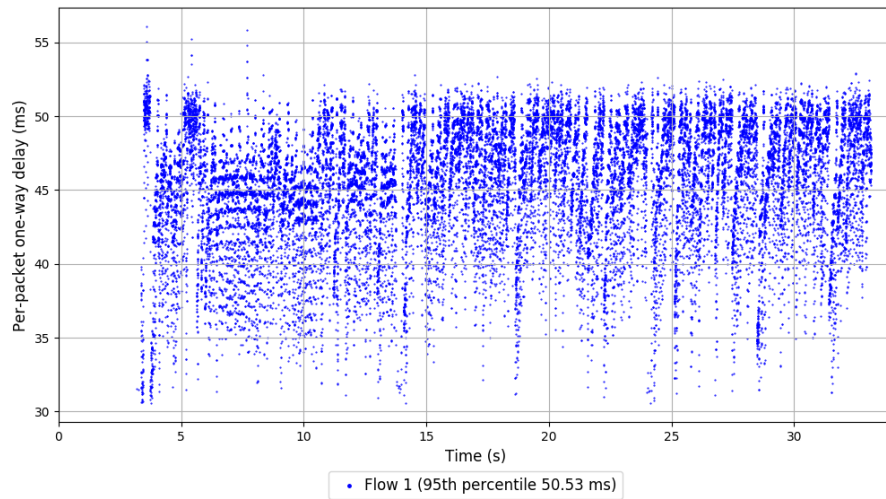
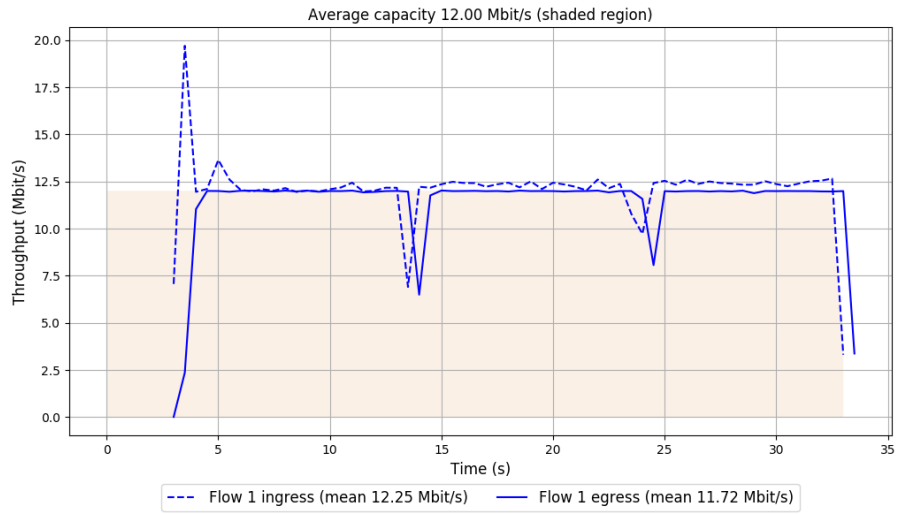
-- Flow 1:

Average throughput: 11.72 Mbit/s

95th percentile per-packet one-way delay: 50.535 ms

Loss rate: 4.44%

### Run 3: Report of FillP-Sheep — Data Link



Run 1: Statistics of Indigo

Start at: 2018-09-25 08:35:13

End at: 2018-09-25 08:35:43

# Below is generated by plot.py at 2018-09-25 09:04:59

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.75 Mbit/s (97.9% utilization)

95th percentile per-packet one-way delay: 48.381 ms

Loss rate: 8.34%

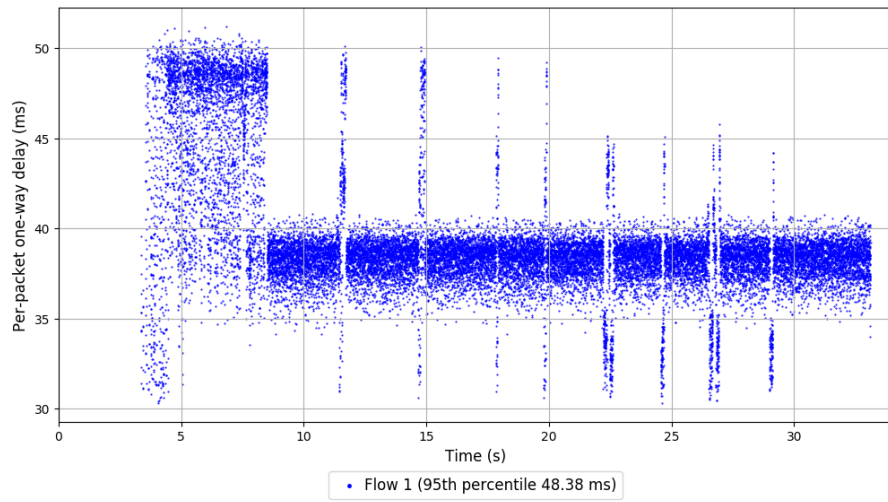
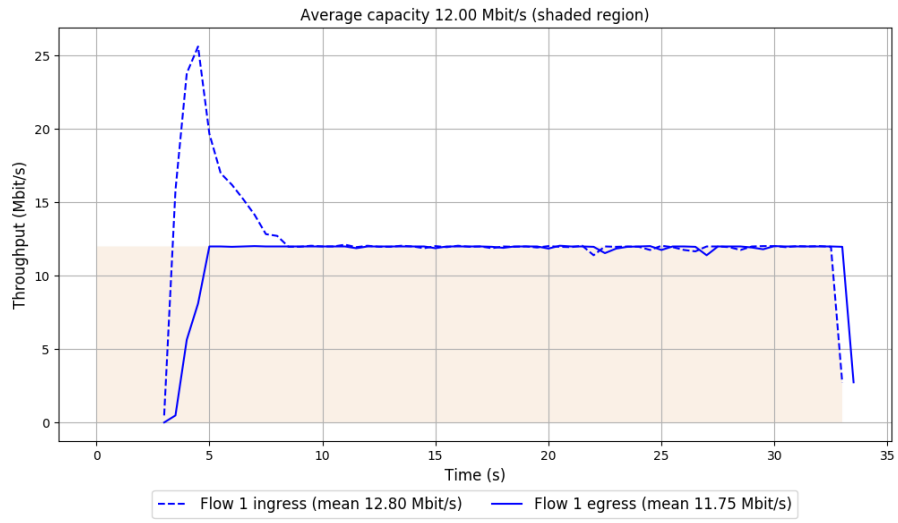
-- Flow 1:

Average throughput: 11.75 Mbit/s

95th percentile per-packet one-way delay: 48.381 ms

Loss rate: 8.34%

# Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2018-09-25 08:46:30

End at: 2018-09-25 08:47:00

# Below is generated by plot.py at 2018-09-25 09:05:01

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.09 Mbit/s (92.4% utilization)

95th percentile per-packet one-way delay: 41.212 ms

Loss rate: 0.94%

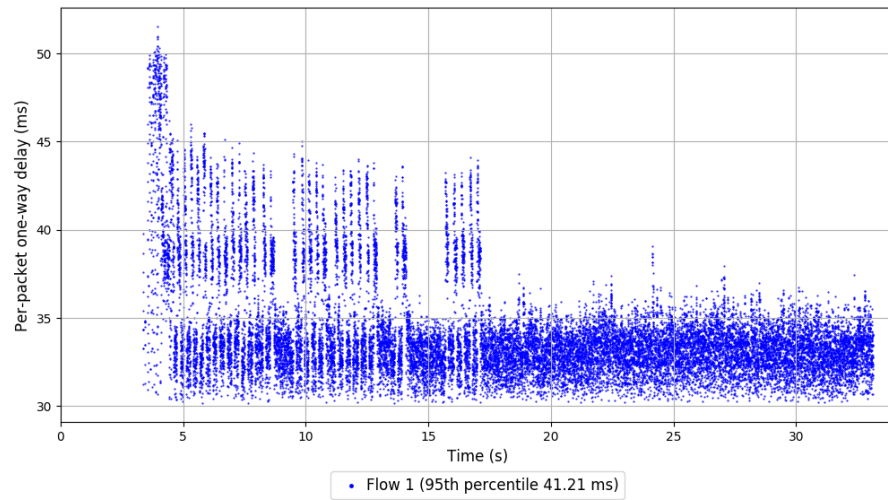
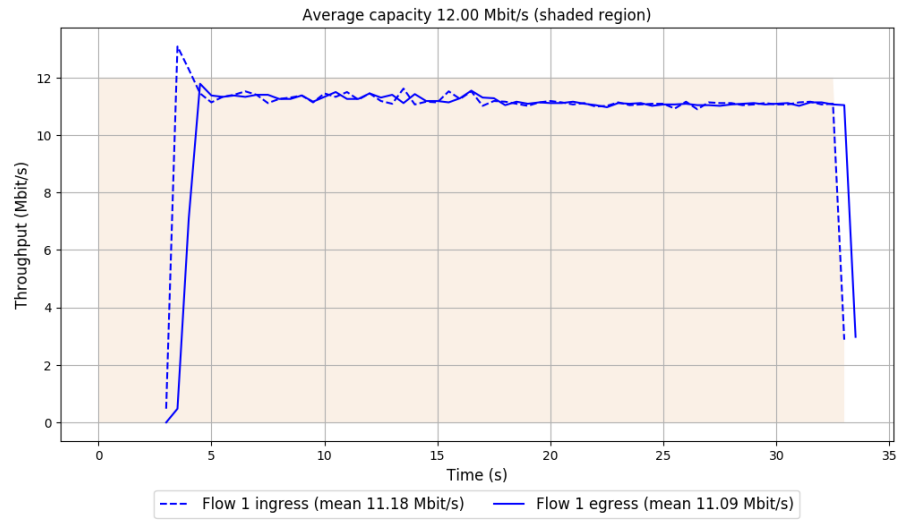
-- Flow 1:

Average throughput: 11.09 Mbit/s

95th percentile per-packet one-way delay: 41.212 ms

Loss rate: 0.94%

## Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2018-09-25 08:57:47

End at: 2018-09-25 08:58:17

# Below is generated by plot.py at 2018-09-25 09:05:06

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.88 Mbit/s (99.0% utilization)

95th percentile per-packet one-way delay: 39.772 ms

Loss rate: 0.95%

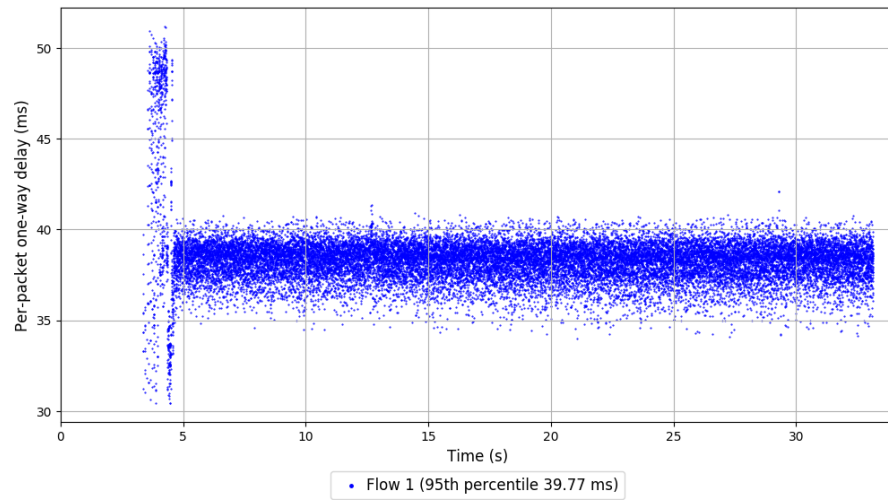
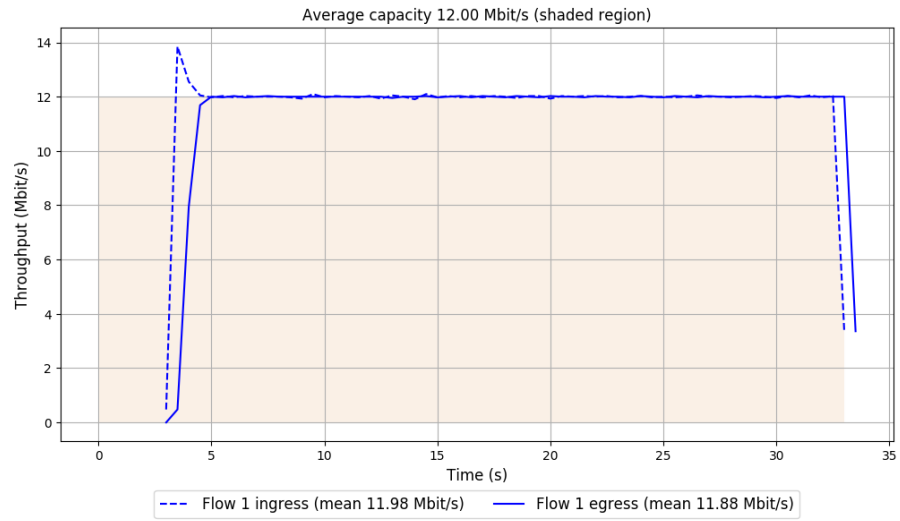
-- Flow 1:

Average throughput: 11.88 Mbit/s

95th percentile per-packet one-way delay: 39.772 ms

Loss rate: 0.95%

### Run 3: Report of Indigo — Data Link



Run 1: Statistics of Indigo-96d2da3

Start at: 2018-09-25 08:35:48

End at: 2018-09-25 08:36:18

# Below is generated by plot.py at 2018-09-25 09:05:12

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.23 Mbit/s (93.6% utilization)

95th percentile per-packet one-way delay: 51.598 ms

Loss rate: 50.02%

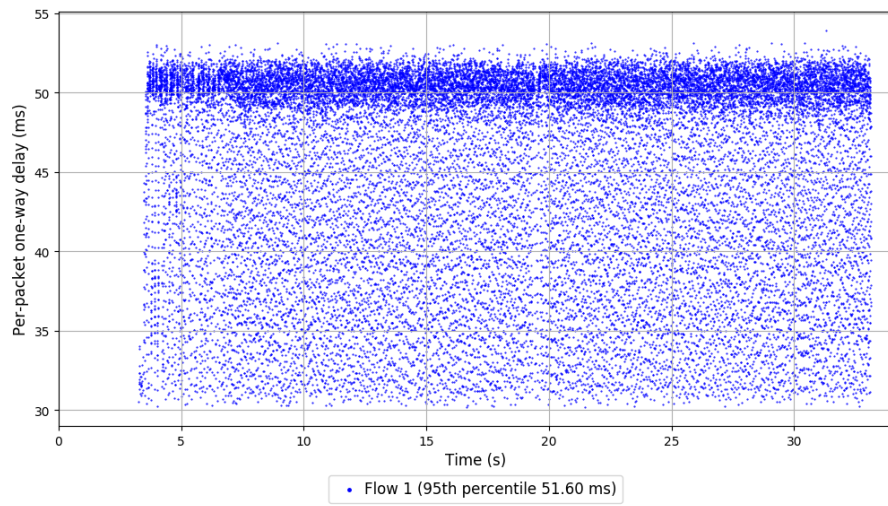
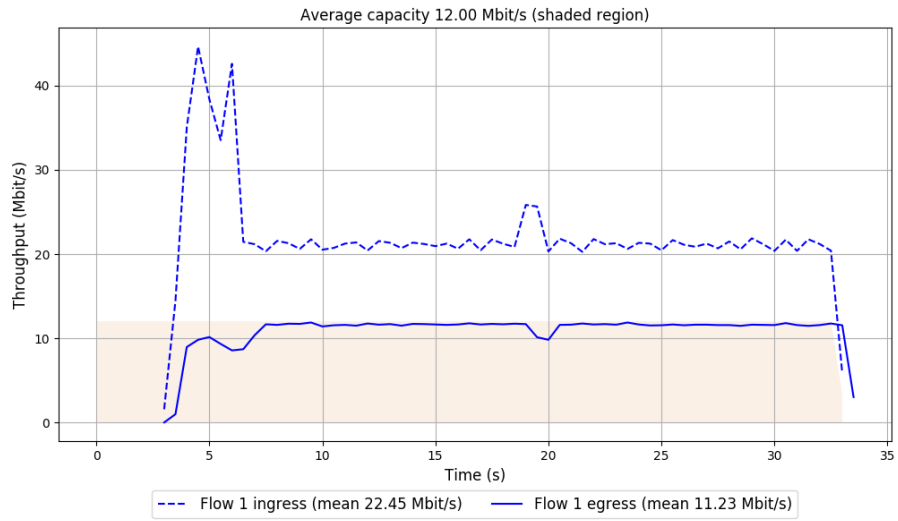
-- Flow 1:

Average throughput: 11.23 Mbit/s

95th percentile per-packet one-way delay: 51.598 ms

Loss rate: 50.02%

# Run 1: Report of Indigo-96d2da3 — Data Link



Run 2: Statistics of Indigo-96d2da3

Start at: 2018-09-25 08:47:06

End at: 2018-09-25 08:47:36

# Below is generated by plot.py at 2018-09-25 09:05:14

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.83 Mbit/s (90.2% utilization)

95th percentile per-packet one-way delay: 51.652 ms

Loss rate: 54.33%

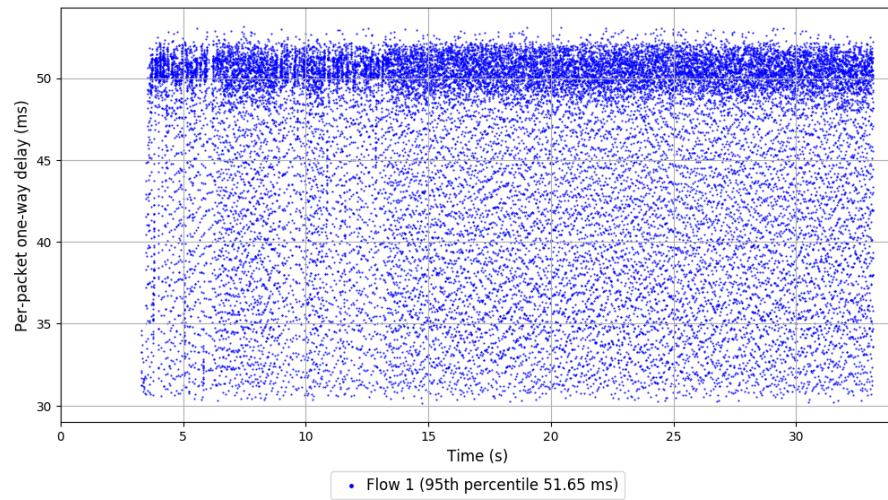
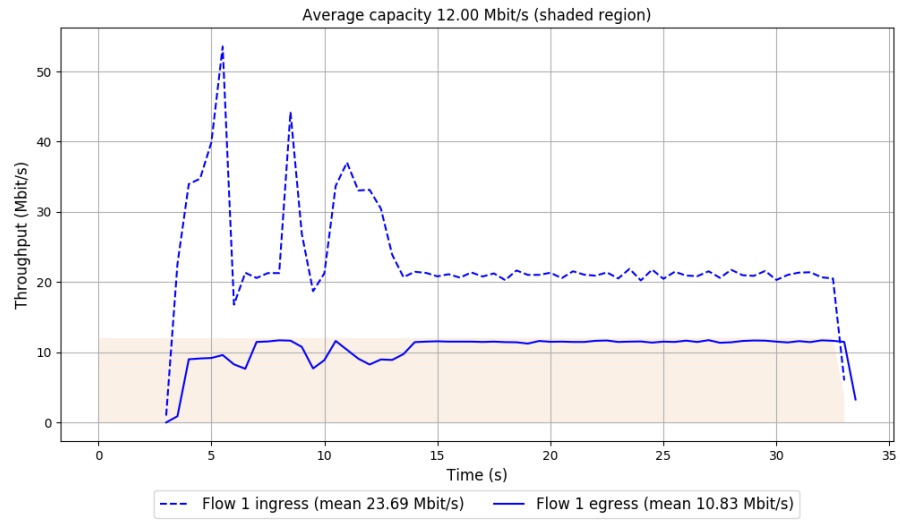
-- Flow 1:

Average throughput: 10.83 Mbit/s

95th percentile per-packet one-way delay: 51.652 ms

Loss rate: 54.33%

## Run 2: Report of Indigo-96d2da3 — Data Link



Run 3: Statistics of Indigo-96d2da3

Start at: 2018-09-25 08:58:23

End at: 2018-09-25 08:58:53

# Below is generated by plot.py at 2018-09-25 09:05:15

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.03 Mbit/s (91.9% utilization)

95th percentile per-packet one-way delay: 51.643 ms

Loss rate: 59.75%

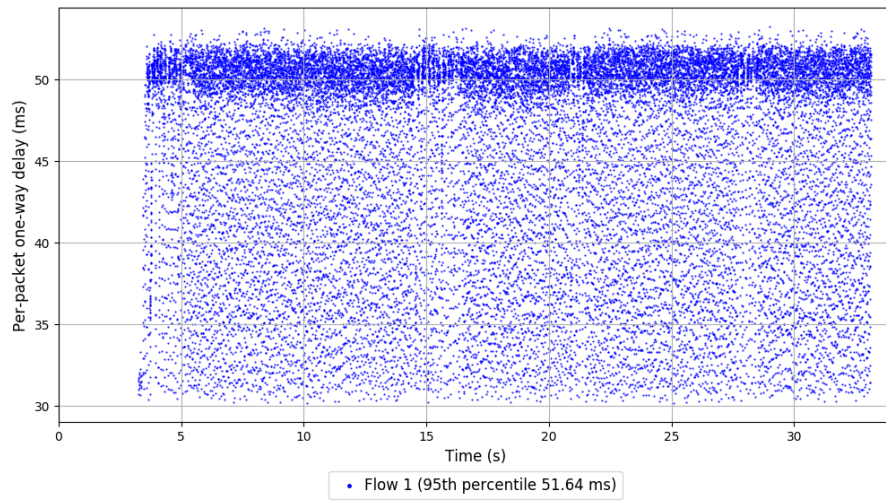
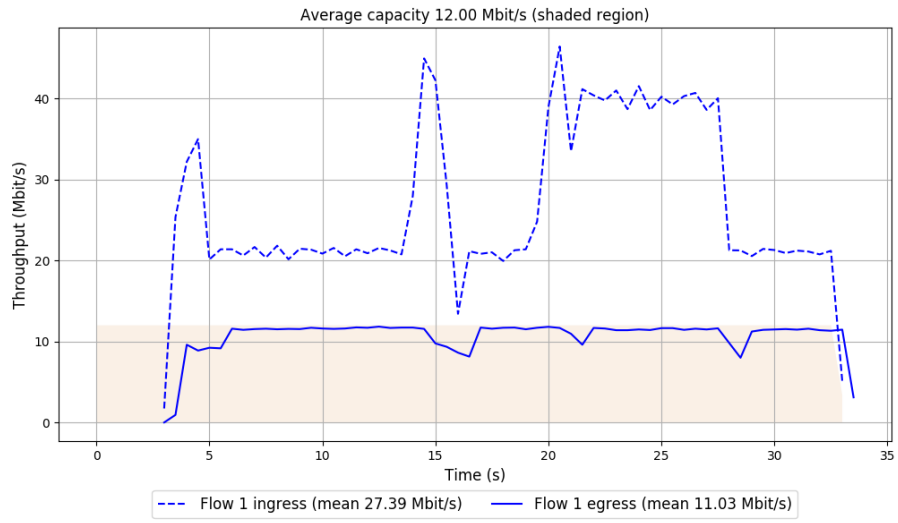
-- Flow 1:

Average throughput: 11.03 Mbit/s

95th percentile per-packet one-way delay: 51.643 ms

Loss rate: 59.75%

### Run 3: Report of Indigo-96d2da3 — Data Link



Run 1: Statistics of LEDBAT

Start at: 2018-09-25 08:31:40

End at: 2018-09-25 08:32:10

# Below is generated by plot.py at 2018-09-25 09:05:15

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 8.85 Mbit/s (73.7% utilization)

95th percentile per-packet one-way delay: 49.551 ms

Loss rate: 1.15%

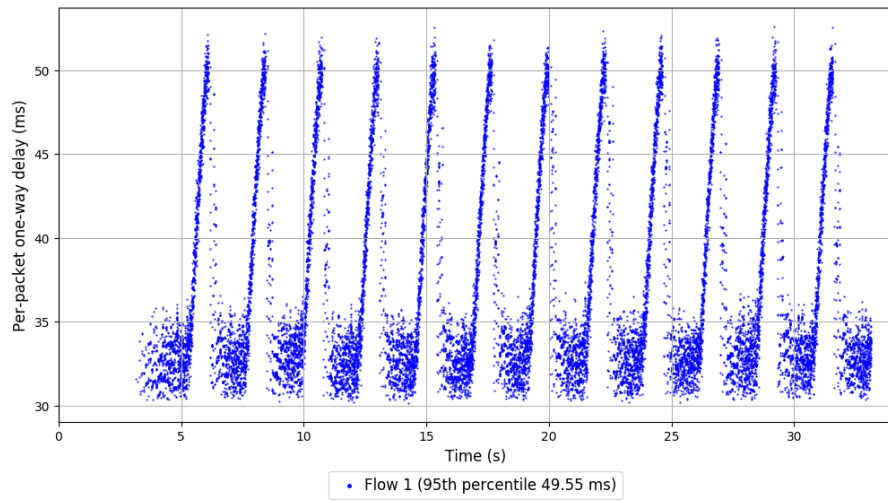
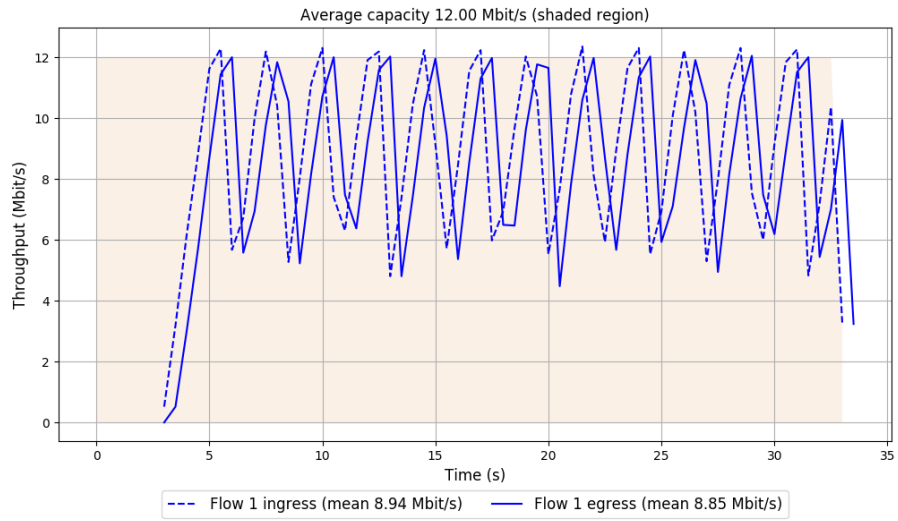
-- Flow 1:

Average throughput: 8.85 Mbit/s

95th percentile per-packet one-way delay: 49.551 ms

Loss rate: 1.15%

# Run 1: Report of LEDBAT — Data Link



Run 2: Statistics of LEDBAT

Start at: 2018-09-25 08:42:57

End at: 2018-09-25 08:43:27

# Below is generated by plot.py at 2018-09-25 09:05:16

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 8.74 Mbit/s (72.8% utilization)

95th percentile per-packet one-way delay: 49.542 ms

Loss rate: 1.13%

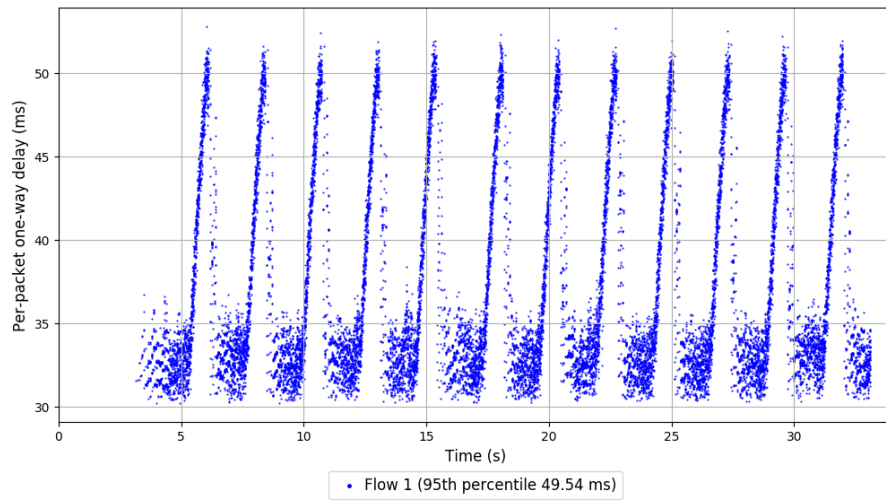
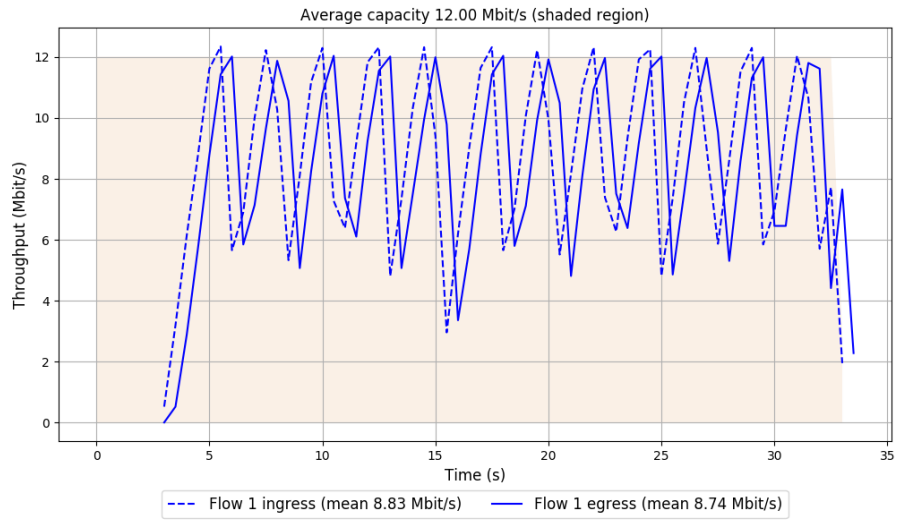
-- Flow 1:

Average throughput: 8.74 Mbit/s

95th percentile per-packet one-way delay: 49.542 ms

Loss rate: 1.13%

## Run 2: Report of LEDBAT — Data Link



Run 3: Statistics of LEDBAT

Start at: 2018-09-25 08:54:14

End at: 2018-09-25 08:54:44

# Below is generated by plot.py at 2018-09-25 09:05:17

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 8.85 Mbit/s (73.8% utilization)

95th percentile per-packet one-way delay: 49.588 ms

Loss rate: 1.14%

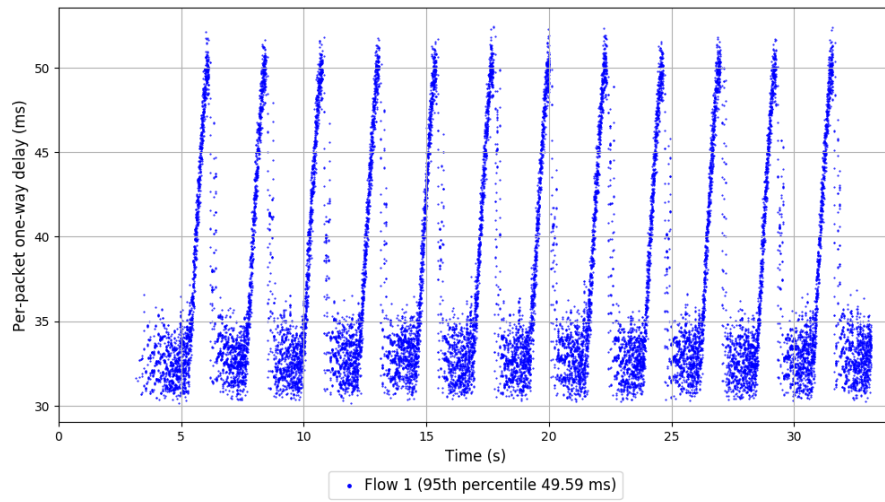
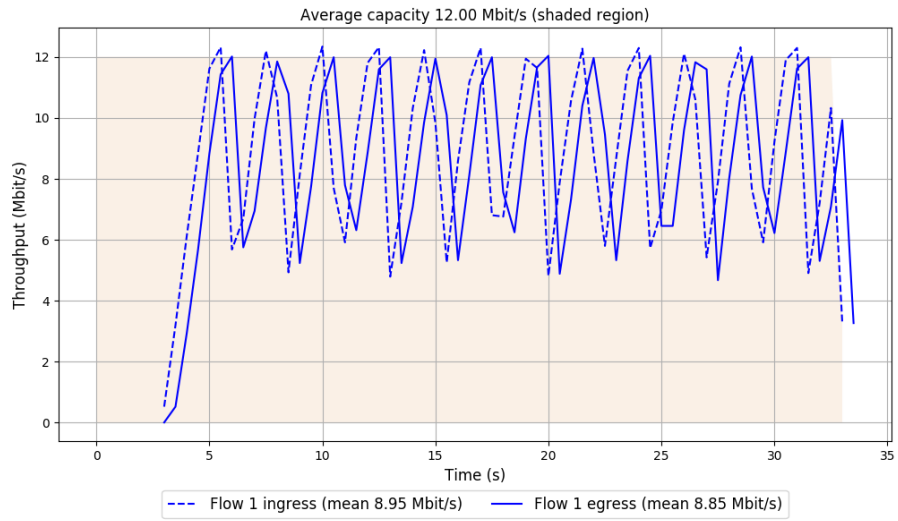
-- Flow 1:

Average throughput: 8.85 Mbit/s

95th percentile per-packet one-way delay: 49.588 ms

Loss rate: 1.14%

### Run 3: Report of LEDBAT — Data Link



Run 1: Statistics of Indigo-Muses

Start at: 2018-09-25 08:40:35

End at: 2018-09-25 08:41:05

# Below is generated by plot.py at 2018-09-25 09:05:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.55 Mbit/s (96.2% utilization)

95th percentile per-packet one-way delay: 35.918 ms

Loss rate: 0.35%

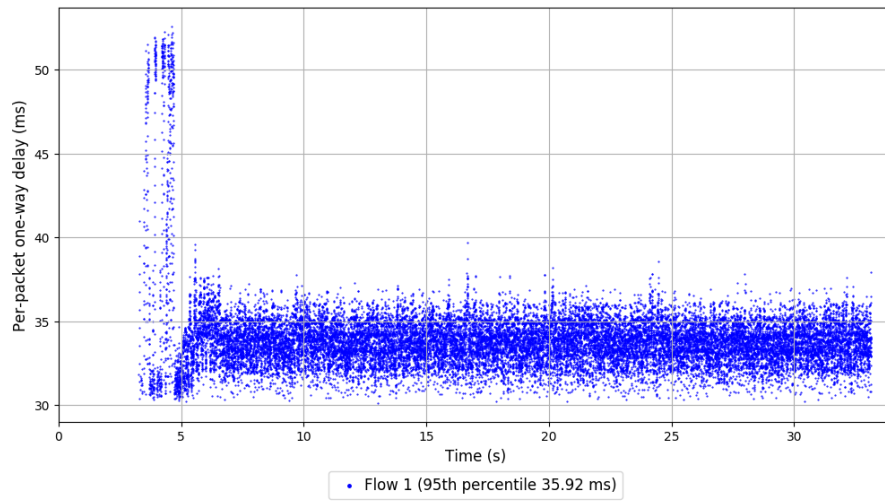
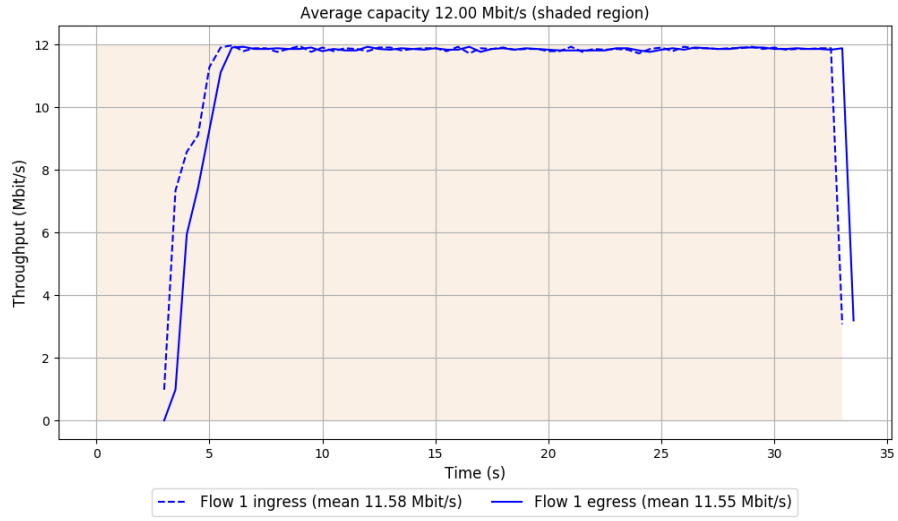
-- Flow 1:

Average throughput: 11.55 Mbit/s

95th percentile per-packet one-way delay: 35.918 ms

Loss rate: 0.35%

# Run 1: Report of Indigo-Muses — Data Link



Run 2: Statistics of Indigo-Muses

Start at: 2018-09-25 08:51:52

End at: 2018-09-25 08:52:22

# Below is generated by plot.py at 2018-09-25 09:05:29

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.56 Mbit/s (96.3% utilization)

95th percentile per-packet one-way delay: 36.124 ms

Loss rate: 0.42%

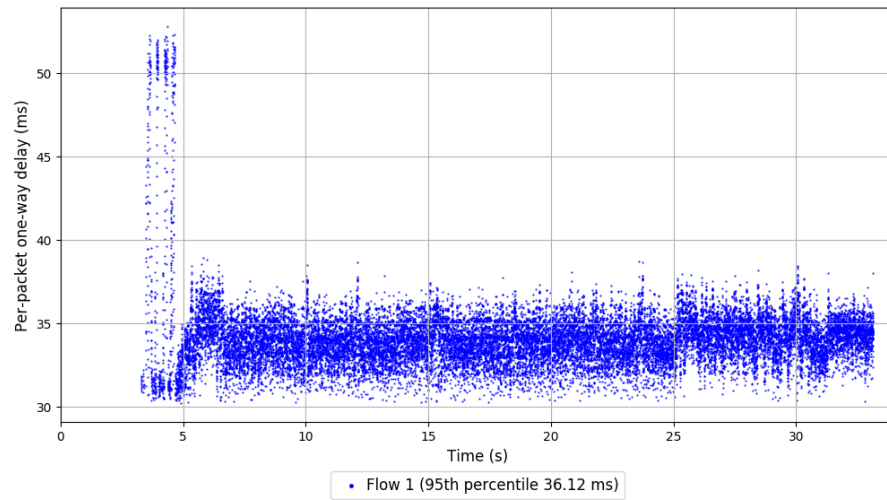
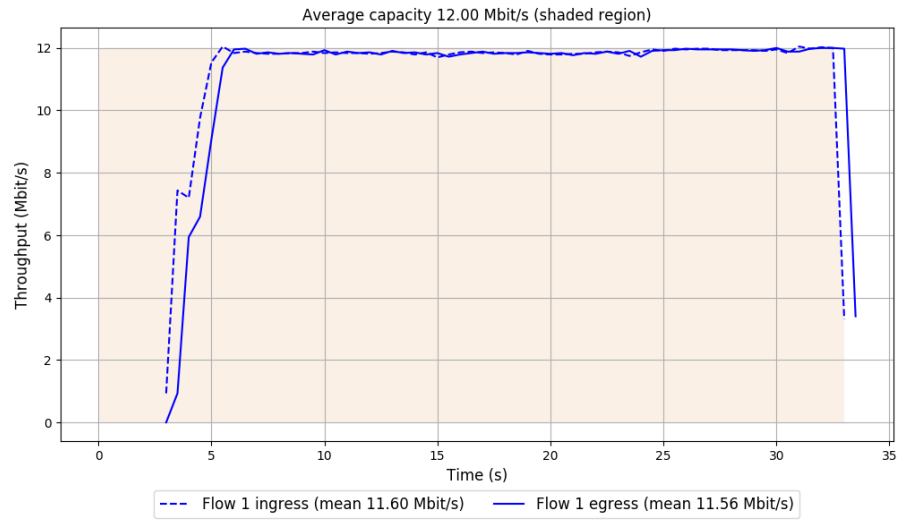
-- Flow 1:

Average throughput: 11.56 Mbit/s

95th percentile per-packet one-way delay: 36.124 ms

Loss rate: 0.42%

## Run 2: Report of Indigo-Muses — Data Link



Run 3: Statistics of Indigo-Muses

Start at: 2018-09-25 09:03:13

End at: 2018-09-25 09:03:43

# Below is generated by plot.py at 2018-09-25 09:05:32

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.55 Mbit/s (96.3% utilization)

95th percentile per-packet one-way delay: 35.953 ms

Loss rate: 0.33%

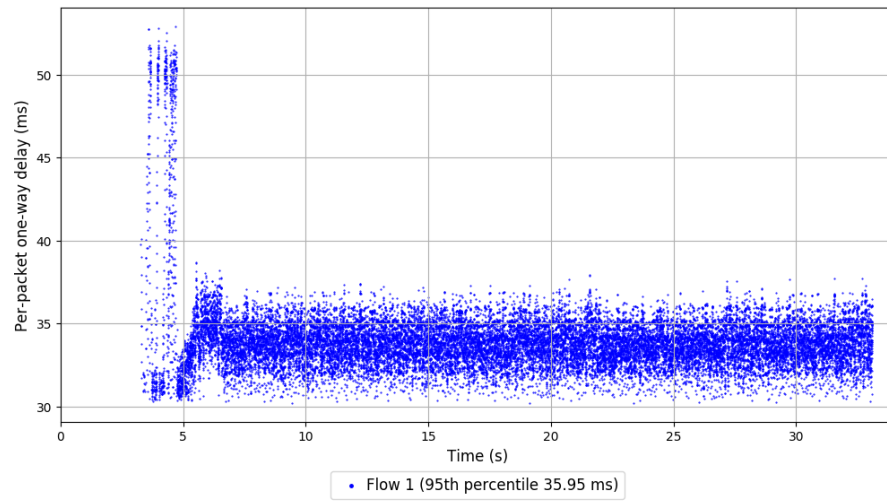
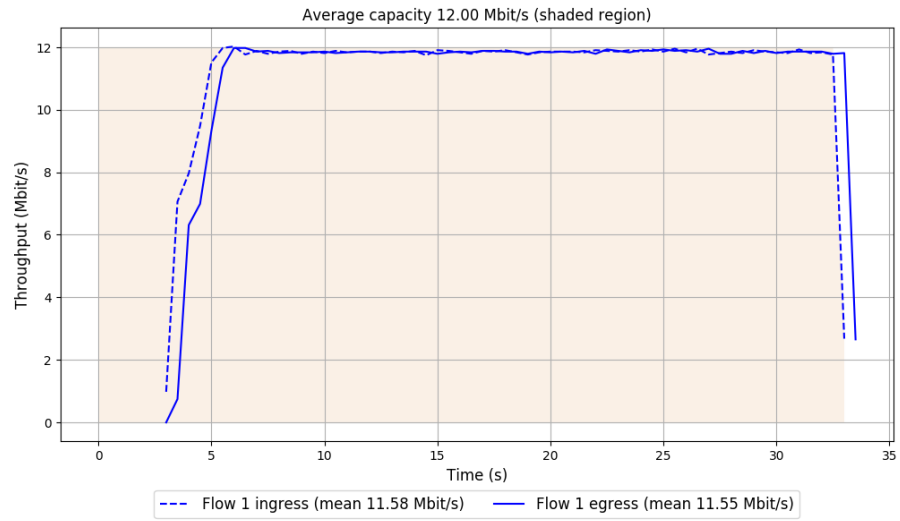
-- Flow 1:

Average throughput: 11.55 Mbit/s

95th percentile per-packet one-way delay: 35.953 ms

Loss rate: 0.33%

### Run 3: Report of Indigo-Muses — Data Link



Run 1: Statistics of PCC-Allegro

Start at: 2018-09-25 08:31:04

End at: 2018-09-25 08:31:34

# Below is generated by plot.py at 2018-09-25 09:05:32

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.11 Mbit/s (84.2% utilization)

95th percentile per-packet one-way delay: 36.683 ms

Loss rate: 0.85%

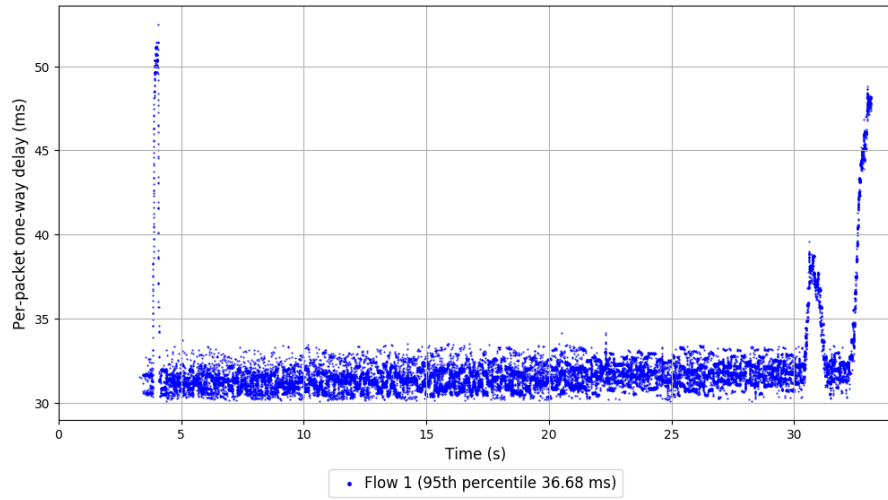
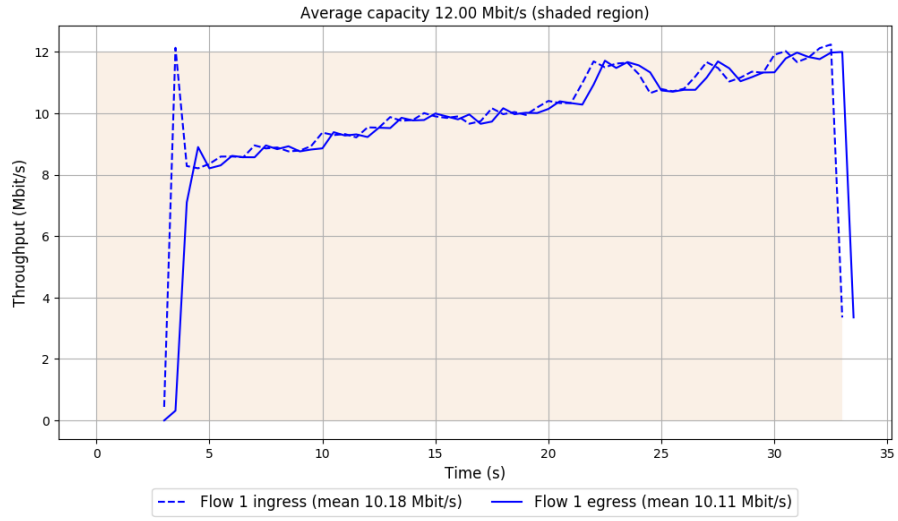
-- Flow 1:

Average throughput: 10.11 Mbit/s

95th percentile per-packet one-way delay: 36.683 ms

Loss rate: 0.85%

# Run 1: Report of PCC-Allegro — Data Link



Run 2: Statistics of PCC-Allegro

Start at: 2018-09-25 08:42:22

End at: 2018-09-25 08:42:52

# Below is generated by plot.py at 2018-09-25 09:05:32

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 9.19 Mbit/s (76.6% utilization)

95th percentile per-packet one-way delay: 32.602 ms

Loss rate: 0.91%

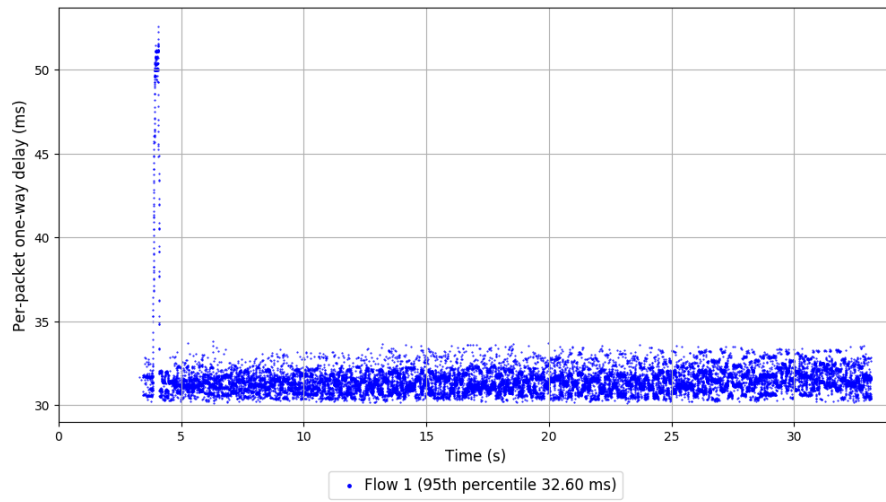
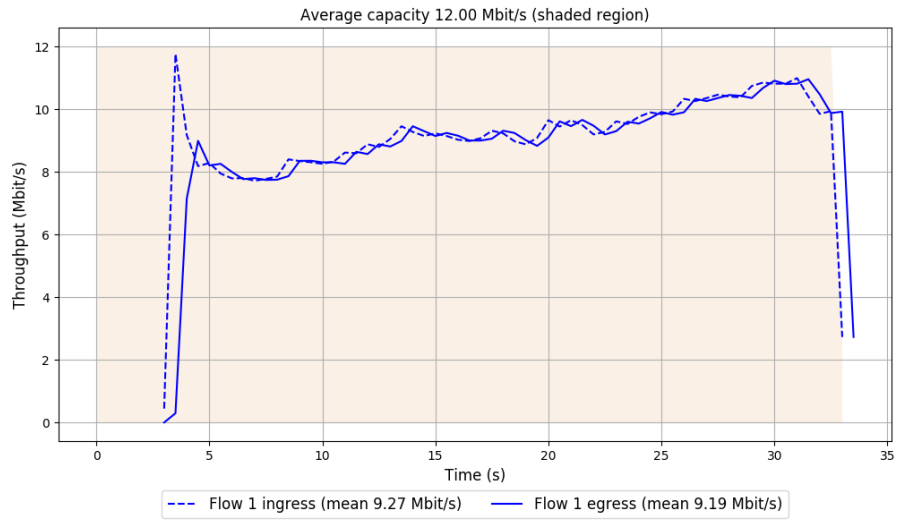
-- Flow 1:

Average throughput: 9.19 Mbit/s

95th percentile per-packet one-way delay: 32.602 ms

Loss rate: 0.91%

## Run 2: Report of PCC-Allegro — Data Link



Run 3: Statistics of PCC-Allegro

Start at: 2018-09-25 08:53:39

End at: 2018-09-25 08:54:09

# Below is generated by plot.py at 2018-09-25 09:05:33

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 9.67 Mbit/s (80.6% utilization)

95th percentile per-packet one-way delay: 46.510 ms

Loss rate: 0.90%

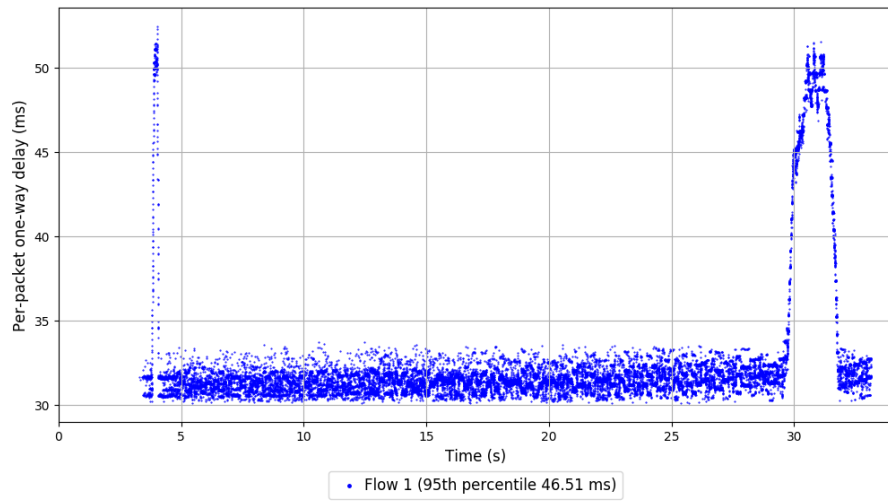
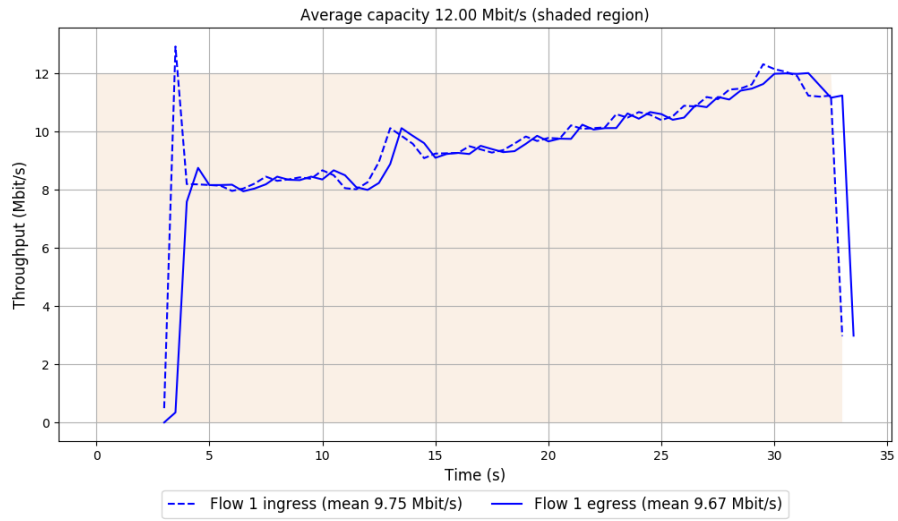
-- Flow 1:

Average throughput: 9.67 Mbit/s

95th percentile per-packet one-way delay: 46.510 ms

Loss rate: 0.90%

### Run 3: Report of PCC-Allegro — Data Link



Run 1: Statistics of PCC-Expr

Start at: 2018-09-25 08:30:28

End at: 2018-09-25 08:30:58

# Below is generated by plot.py at 2018-09-25 09:05:46

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.11 Mbit/s (92.6% utilization)

95th percentile per-packet one-way delay: 50.296 ms

Loss rate: 0.58%

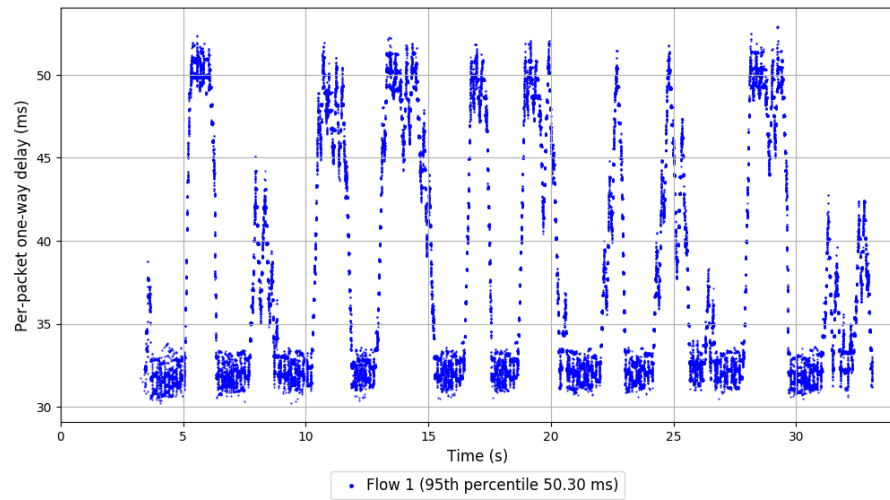
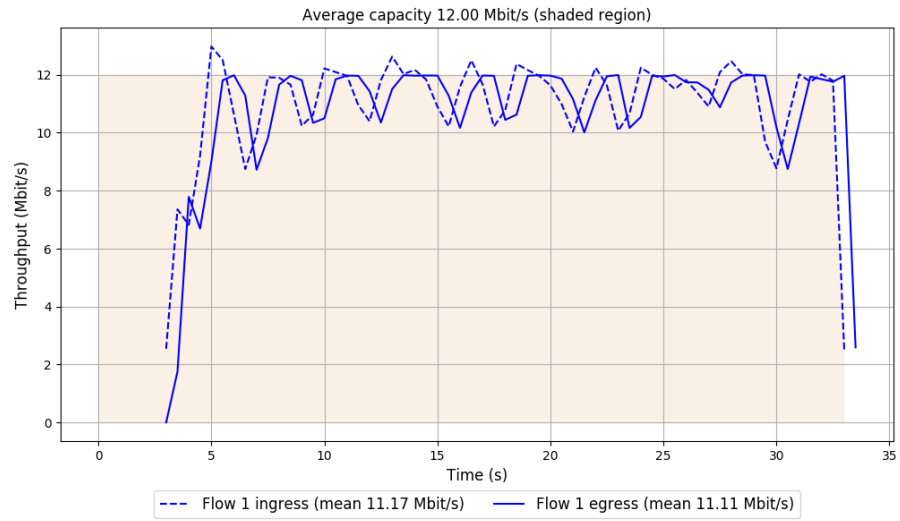
-- Flow 1:

Average throughput: 11.11 Mbit/s

95th percentile per-packet one-way delay: 50.296 ms

Loss rate: 0.58%

# Run 1: Report of PCC-Expr — Data Link



Run 2: Statistics of PCC-Expr

Start at: 2018-09-25 08:41:46

End at: 2018-09-25 08:42:16

# Below is generated by plot.py at 2018-09-25 09:05:47

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.97 Mbit/s (91.4% utilization)

95th percentile per-packet one-way delay: 50.663 ms

Loss rate: 1.01%

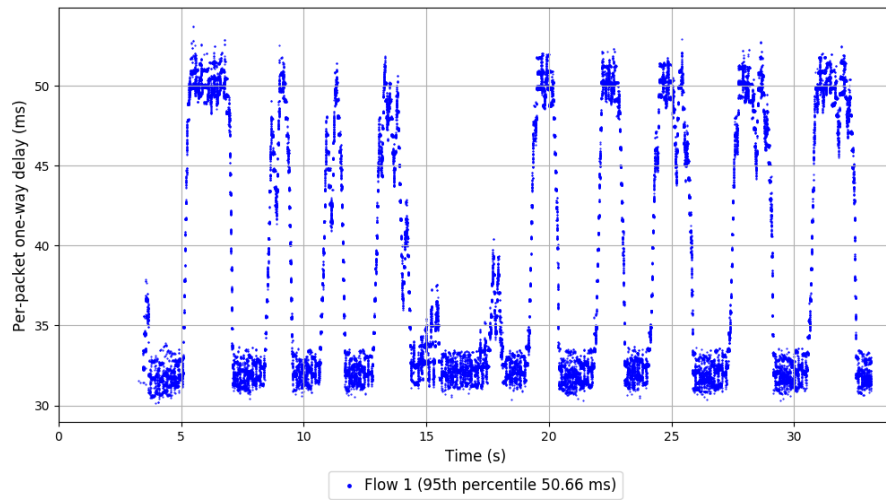
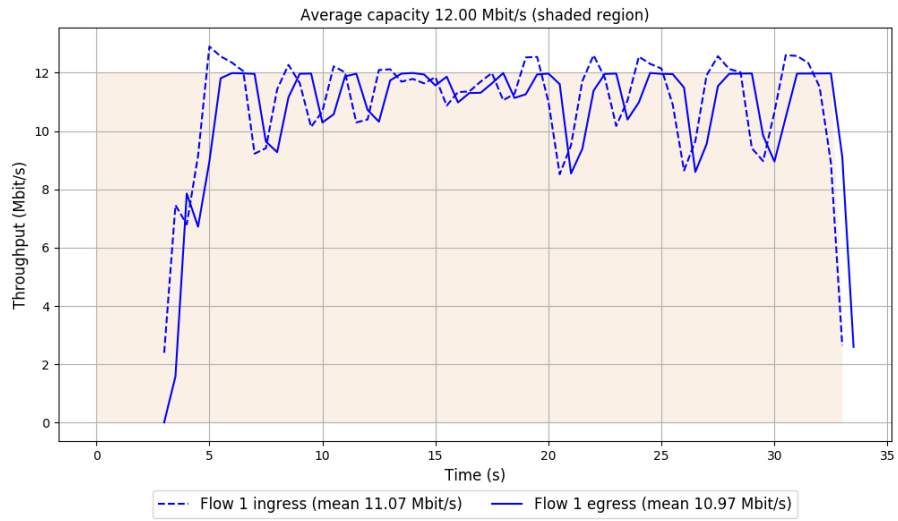
-- Flow 1:

Average throughput: 10.97 Mbit/s

95th percentile per-packet one-way delay: 50.663 ms

Loss rate: 1.01%

## Run 2: Report of PCC-Expr — Data Link



Run 3: Statistics of PCC-Expr

Start at: 2018-09-25 08:53:03

End at: 2018-09-25 08:53:33

# Below is generated by plot.py at 2018-09-25 09:05:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.23 Mbit/s (93.6% utilization)

95th percentile per-packet one-way delay: 50.577 ms

Loss rate: 1.64%

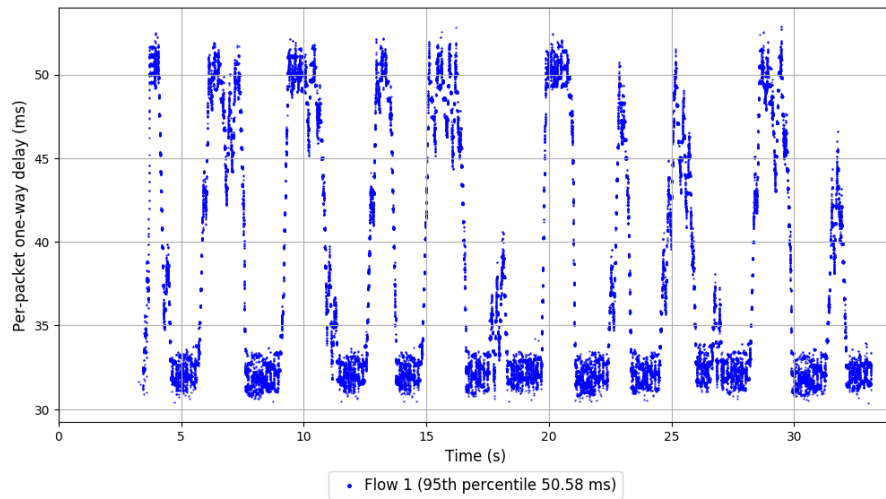
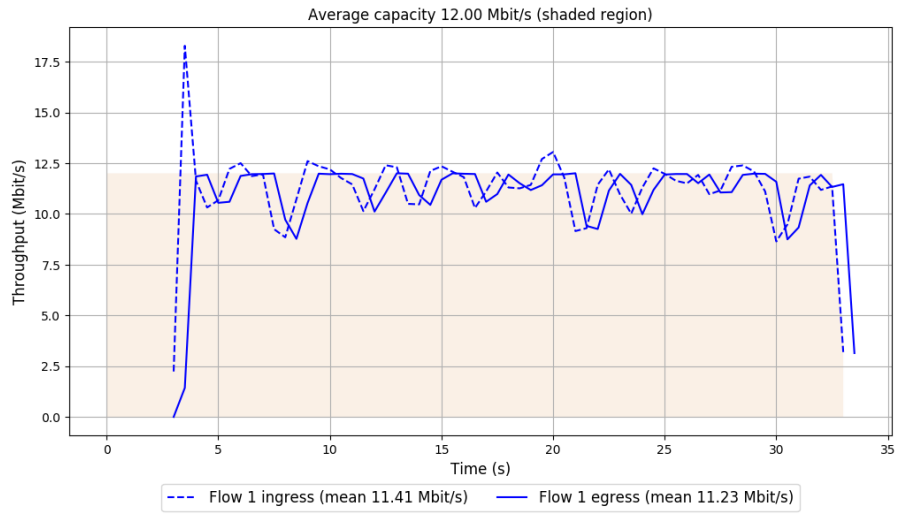
-- Flow 1:

Average throughput: 11.23 Mbit/s

95th percentile per-packet one-way delay: 50.577 ms

Loss rate: 1.64%

### Run 3: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2018-09-25 08:29:53

End at: 2018-09-25 08:30:23

# Below is generated by plot.py at 2018-09-25 09:05:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.68 Mbit/s (97.3% utilization)

95th percentile per-packet one-way delay: 50.020 ms

Loss rate: 0.36%

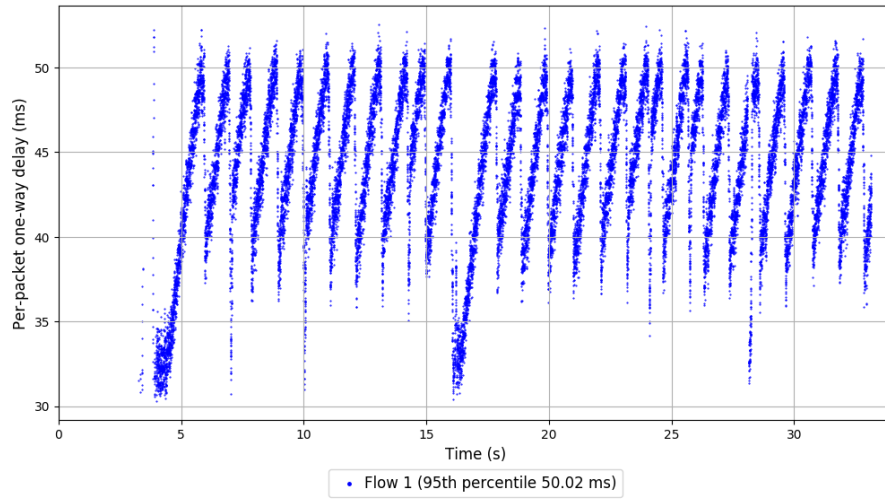
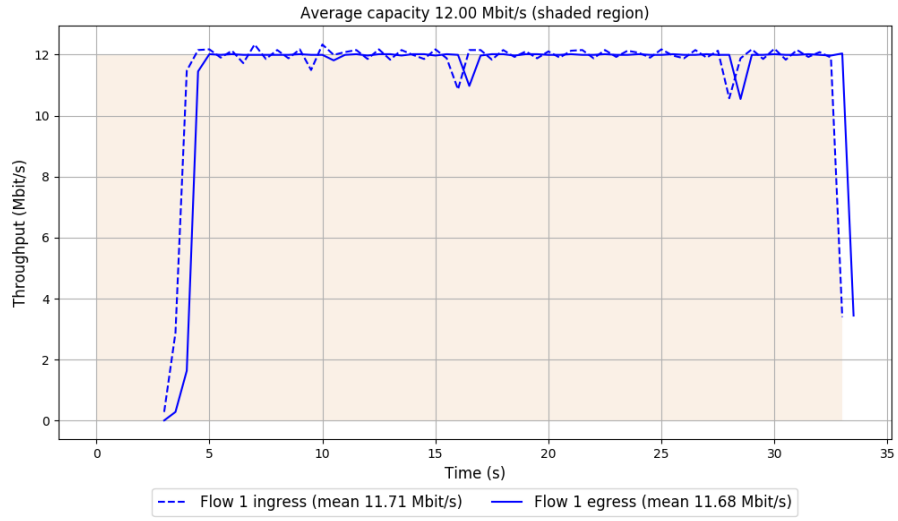
-- Flow 1:

Average throughput: 11.68 Mbit/s

95th percentile per-packet one-way delay: 50.020 ms

Loss rate: 0.36%

# Run 1: Report of QUIC Cubic — Data Link



Run 2: Statistics of QUIC Cubic

Start at: 2018-09-25 08:41:10

End at: 2018-09-25 08:41:40

# Below is generated by plot.py at 2018-09-25 09:05:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.68 Mbit/s (97.3% utilization)

95th percentile per-packet one-way delay: 49.848 ms

Loss rate: 0.40%

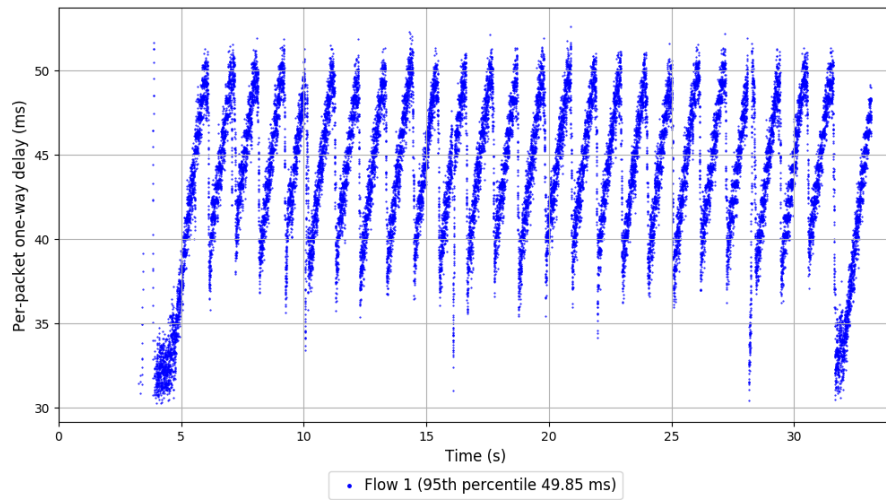
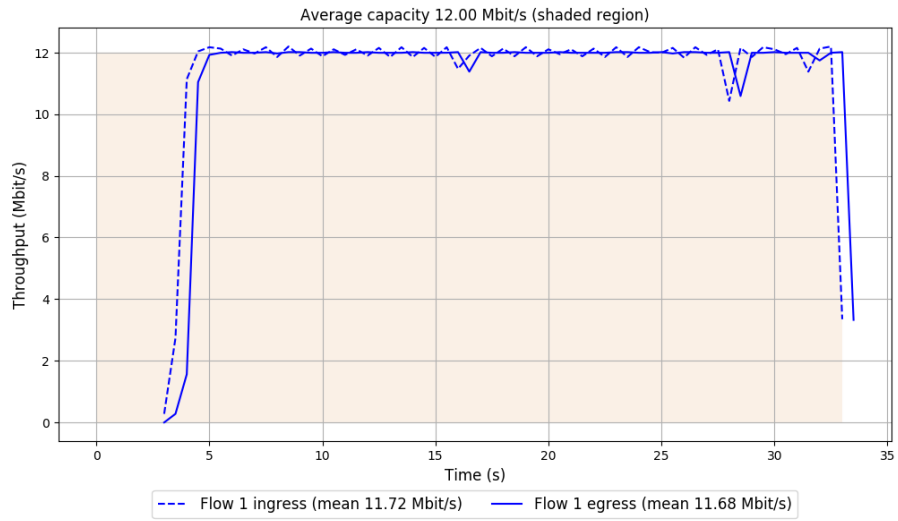
-- Flow 1:

Average throughput: 11.68 Mbit/s

95th percentile per-packet one-way delay: 49.848 ms

Loss rate: 0.40%

## Run 2: Report of QUIC Cubic — Data Link



Run 3: Statistics of QUIC Cubic

Start at: 2018-09-25 08:52:27

End at: 2018-09-25 08:52:57

# Below is generated by plot.py at 2018-09-25 09:05:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.67 Mbit/s (97.3% utilization)

95th percentile per-packet one-way delay: 49.813 ms

Loss rate: 0.40%

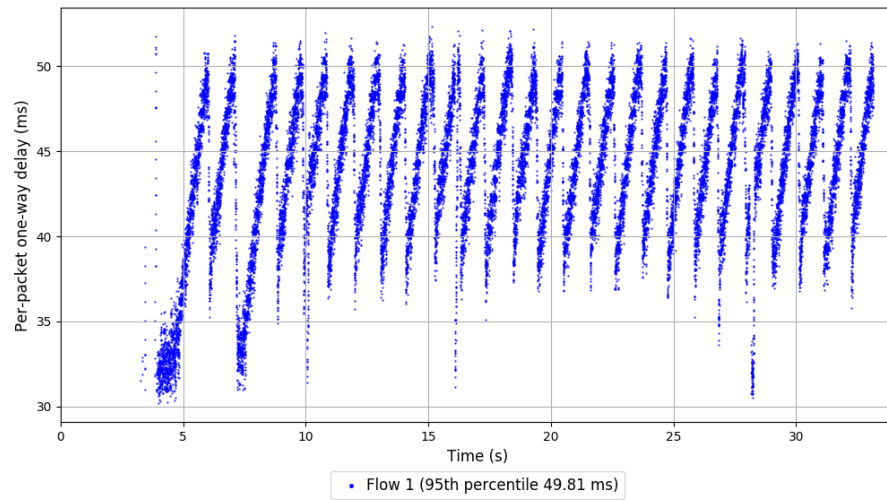
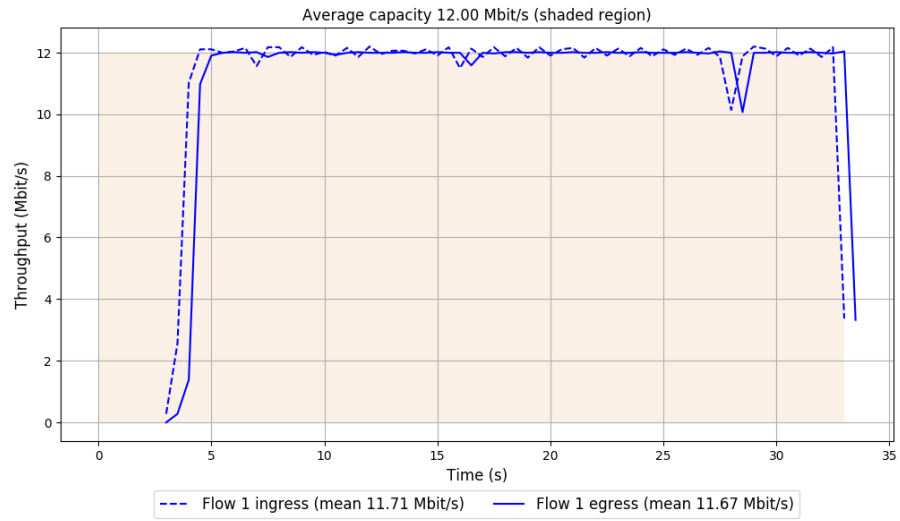
-- Flow 1:

Average throughput: 11.67 Mbit/s

95th percentile per-packet one-way delay: 49.813 ms

Loss rate: 0.40%

### Run 3: Report of QUIC Cubic — Data Link



Run 1: Statistics of SCReAM

Start at: 2018-09-25 08:32:15

End at: 2018-09-25 08:32:45

# Below is generated by plot.py at 2018-09-25 09:05:57

# 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: 31.586 ms

Loss rate: 0.13%

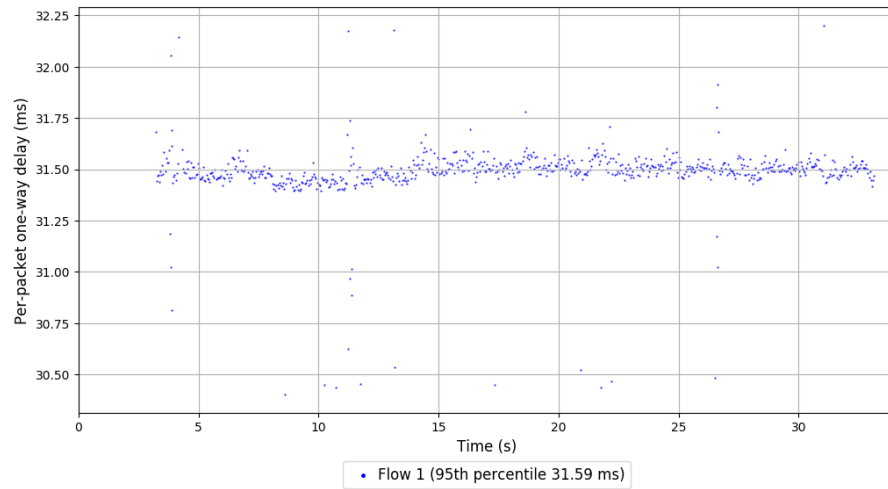
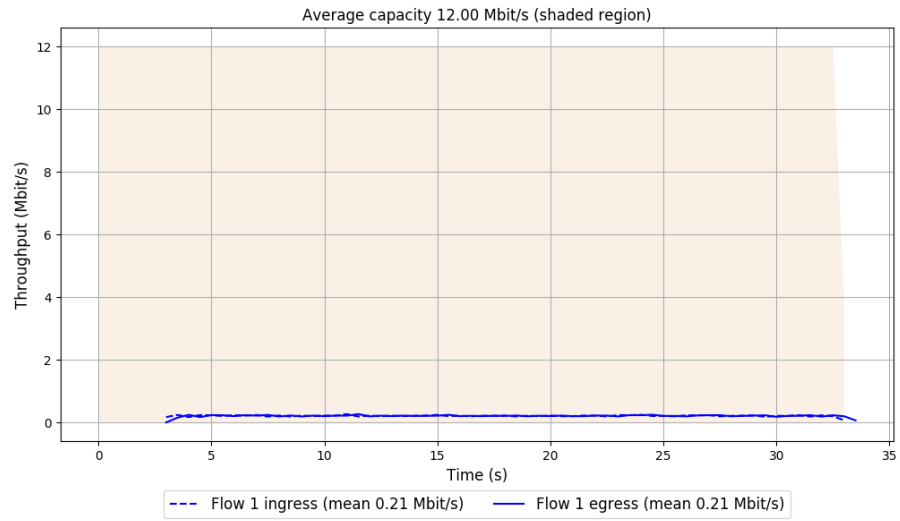
-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 31.586 ms

Loss rate: 0.13%

## Run 1: Report of SCReAM — Data Link



Run 2: Statistics of SCReAM

Start at: 2018-09-25 08:43:33

End at: 2018-09-25 08:44:03

# Below is generated by plot.py at 2018-09-25 09:05:57

# 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: 31.603 ms

Loss rate: 0.13%

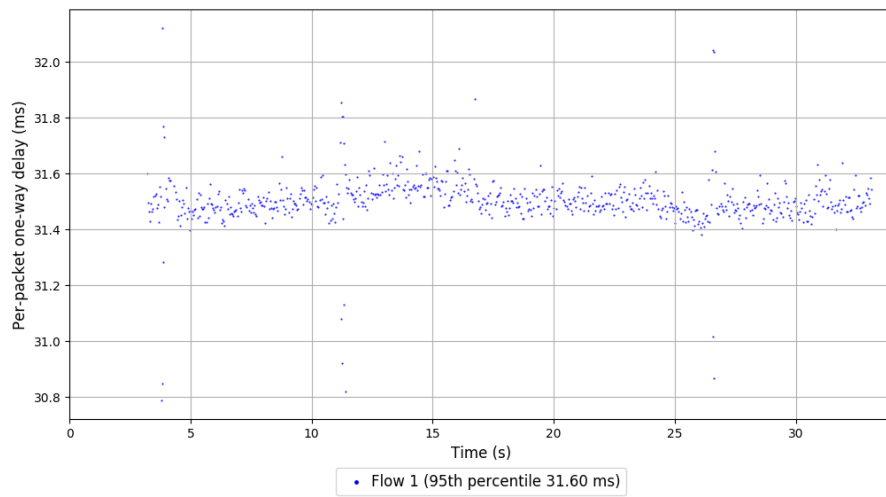
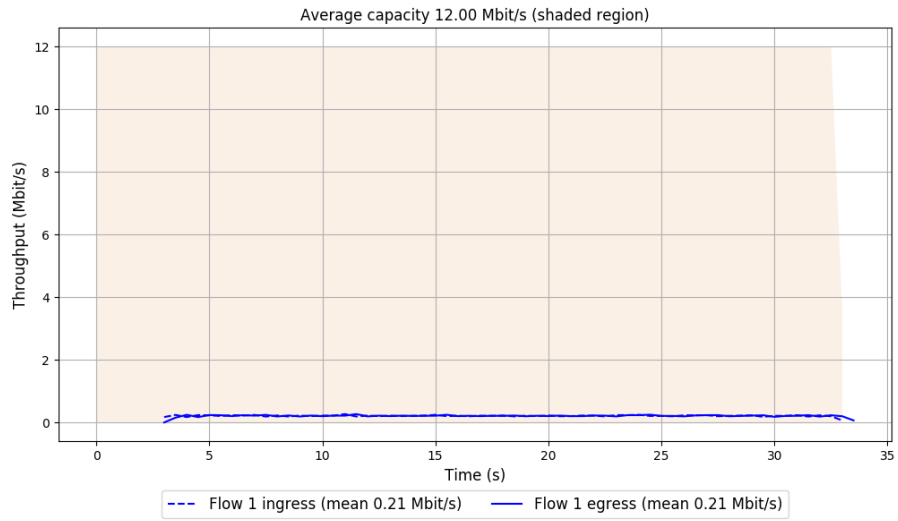
-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 31.603 ms

Loss rate: 0.13%

## Run 2: Report of SCReAM — Data Link



Run 3: Statistics of SCReAM

Start at: 2018-09-25 08:54:50

End at: 2018-09-25 08:55:20

# Below is generated by plot.py at 2018-09-25 09:05:57

# 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: 31.645 ms

Loss rate: 0.13%

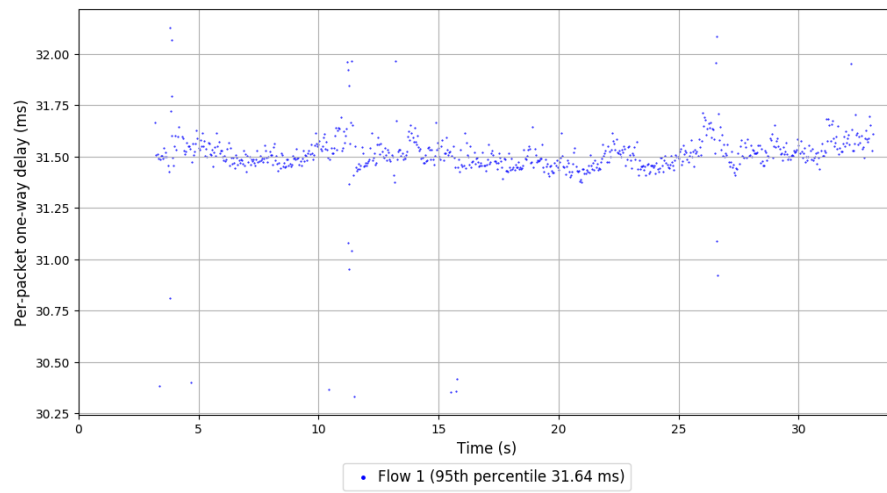
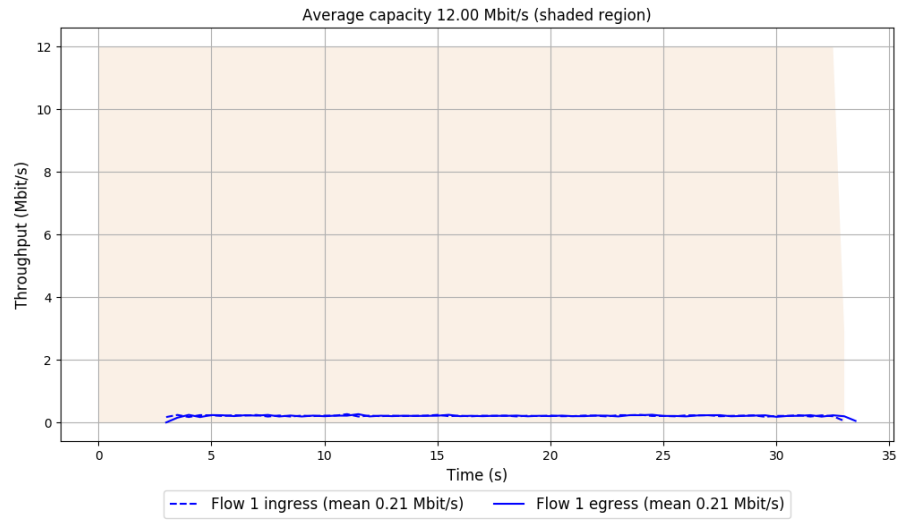
-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 31.645 ms

Loss rate: 0.13%

### Run 3: Report of SCReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2018-09-25 08:37:35

End at: 2018-09-25 08:38:05

# Below is generated by plot.py at 2018-09-25 09:05:57

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 4.30 Mbit/s (35.9% utilization)

95th percentile per-packet one-way delay: 48.814 ms

Loss rate: 7.54%

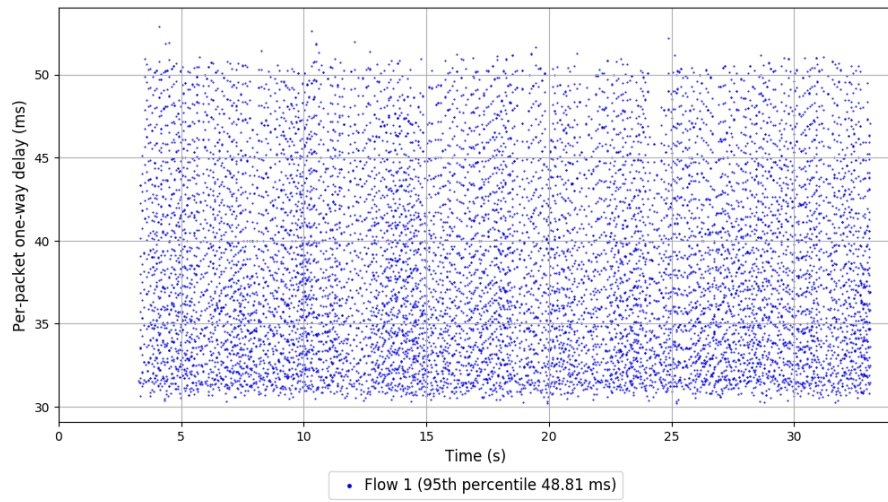
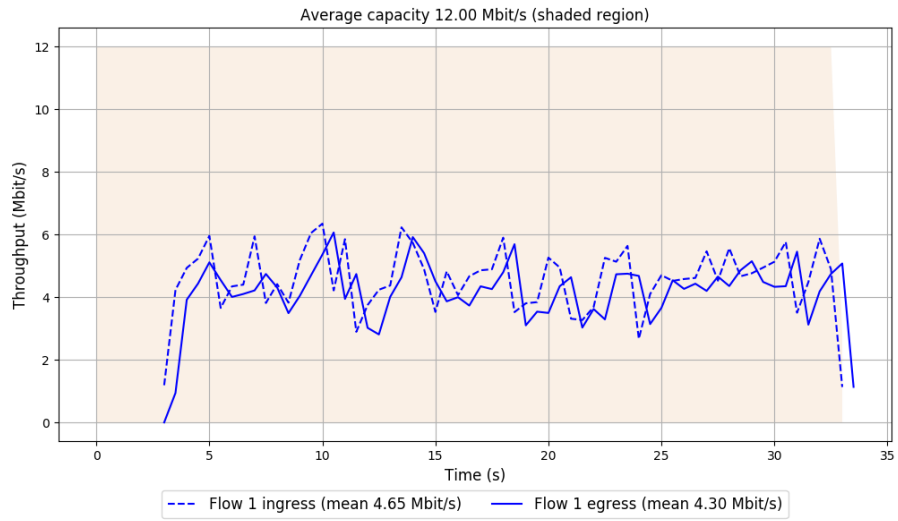
-- Flow 1:

Average throughput: 4.30 Mbit/s

95th percentile per-packet one-way delay: 48.814 ms

Loss rate: 7.54%

# Run 1: Report of Sprout — Data Link



Run 2: Statistics of Sprout

Start at: 2018-09-25 08:48:53

End at: 2018-09-25 08:49:23

# Below is generated by plot.py at 2018-09-25 09:06:00

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 4.28 Mbit/s (35.6% utilization)

95th percentile per-packet one-way delay: 48.786 ms

Loss rate: 7.11%

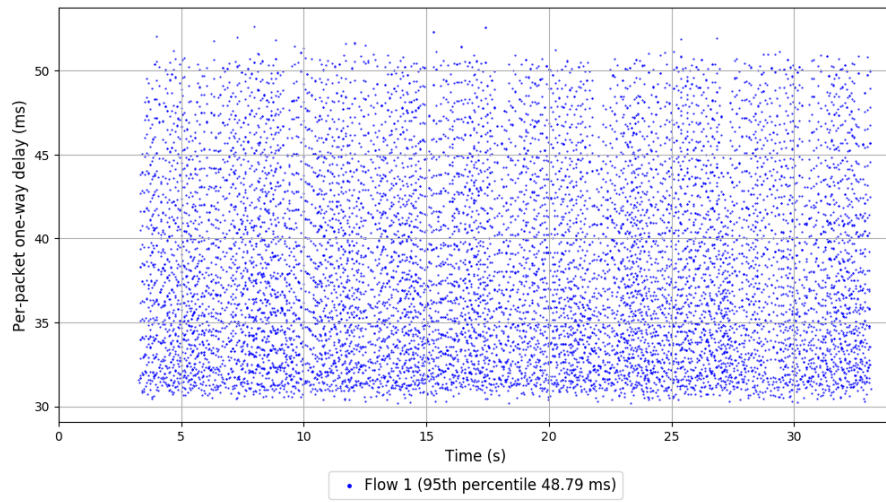
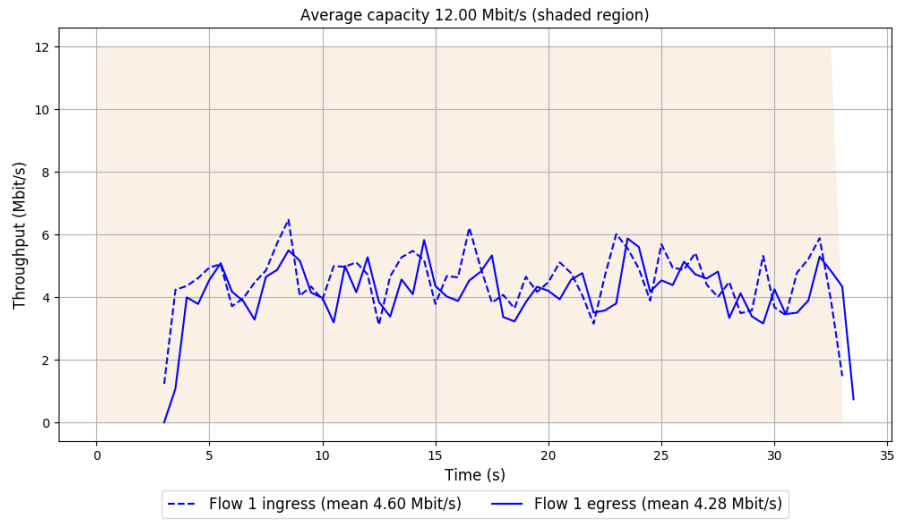
-- Flow 1:

Average throughput: 4.28 Mbit/s

95th percentile per-packet one-way delay: 48.786 ms

Loss rate: 7.11%

## Run 2: Report of Sprout — Data Link



Run 3: Statistics of Sprout

Start at: 2018-09-25 09:00:10

End at: 2018-09-25 09:00:40

# Below is generated by plot.py at 2018-09-25 09:06:01

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 4.52 Mbit/s (37.7% utilization)

95th percentile per-packet one-way delay: 48.700 ms

Loss rate: 7.40%

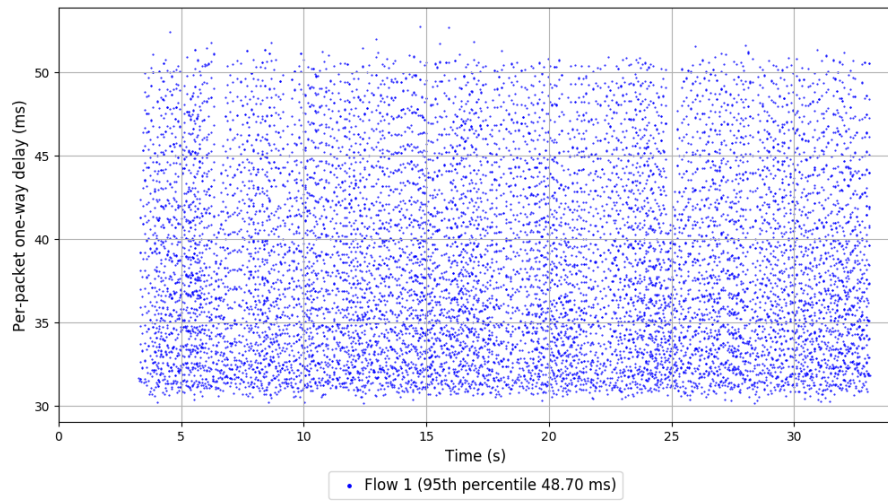
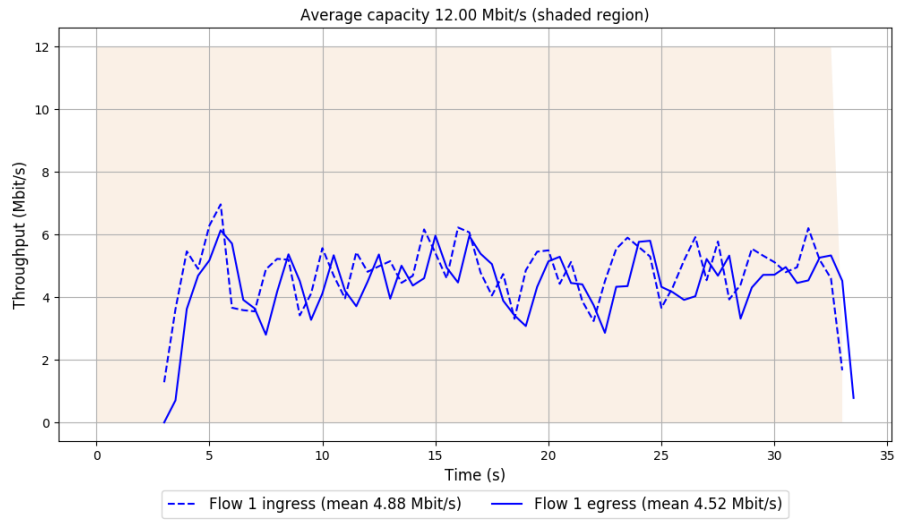
-- Flow 1:

Average throughput: 4.52 Mbit/s

95th percentile per-packet one-way delay: 48.700 ms

Loss rate: 7.40%

### Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

Start at: 2018-09-25 08:34:01

End at: 2018-09-25 08:34:31

# Below is generated by plot.py at 2018-09-25 09:06:19

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.09 Mbit/s (92.4% utilization)

95th percentile per-packet one-way delay: 32.789 ms

Loss rate: 0.72%

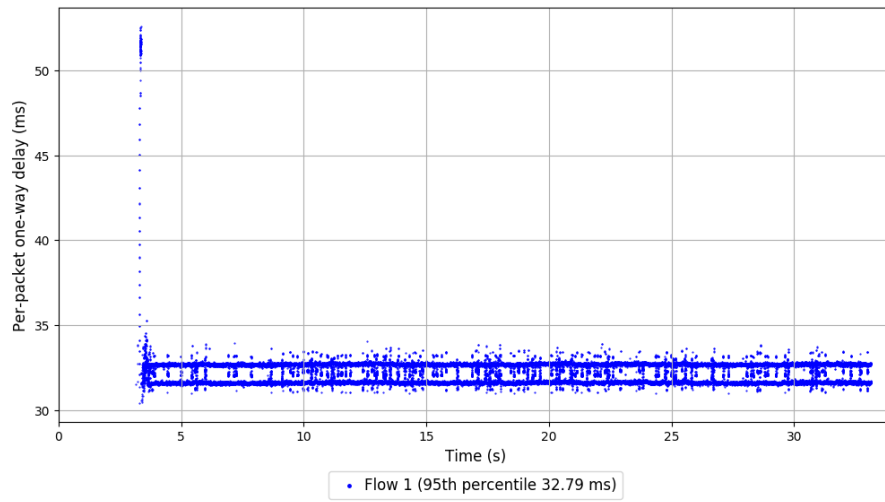
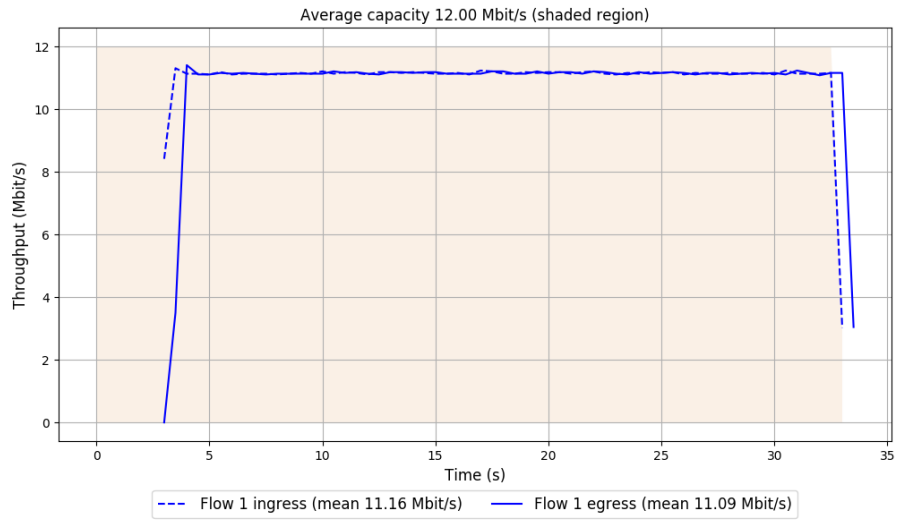
-- Flow 1:

Average throughput: 11.09 Mbit/s

95th percentile per-packet one-way delay: 32.789 ms

Loss rate: 0.72%

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



Run 2: Statistics of TaoVA-100x

Start at: 2018-09-25 08:45:19

End at: 2018-09-25 08:45:49

# Below is generated by plot.py at 2018-09-25 09:06:21

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.11 Mbit/s (92.6% utilization)

95th percentile per-packet one-way delay: 32.843 ms

Loss rate: 0.72%

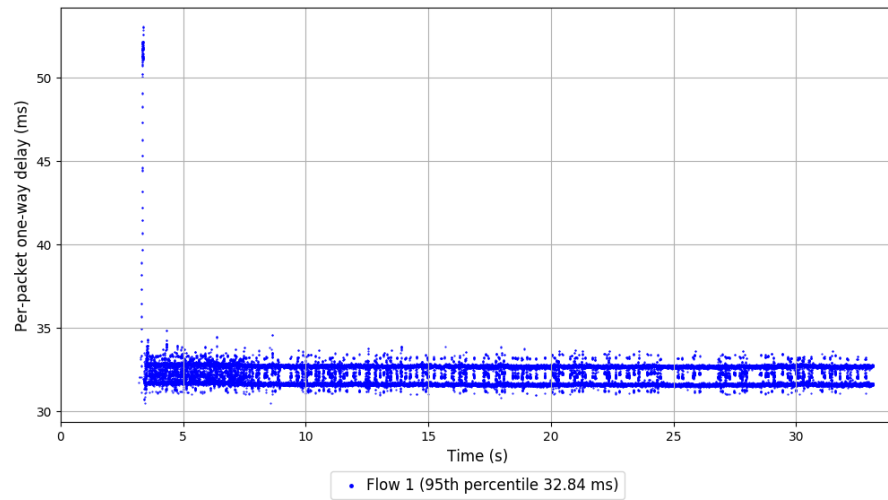
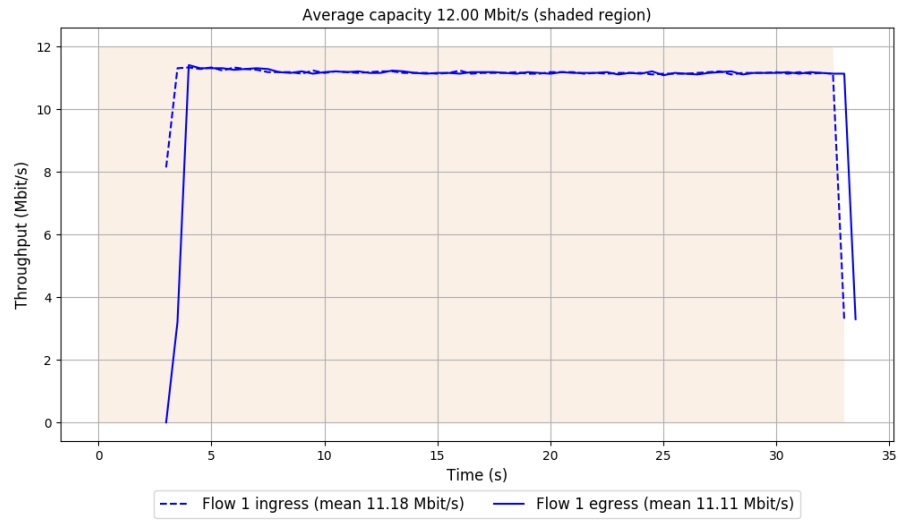
-- Flow 1:

Average throughput: 11.11 Mbit/s

95th percentile per-packet one-way delay: 32.843 ms

Loss rate: 0.72%

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



Run 3: Statistics of TaoVA-100x

Start at: 2018-09-25 08:56:36

End at: 2018-09-25 08:57:06

# Below is generated by plot.py at 2018-09-25 09:06:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.06 Mbit/s (92.1% utilization)

95th percentile per-packet one-way delay: 32.747 ms

Loss rate: 0.86%

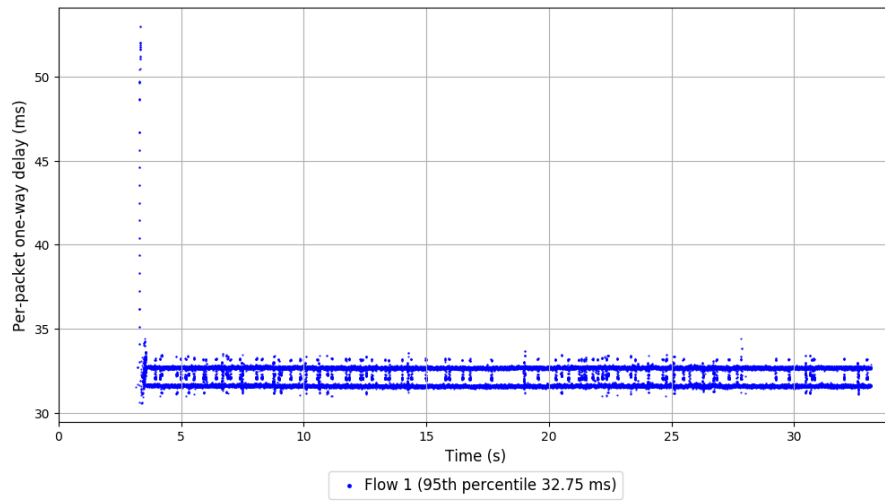
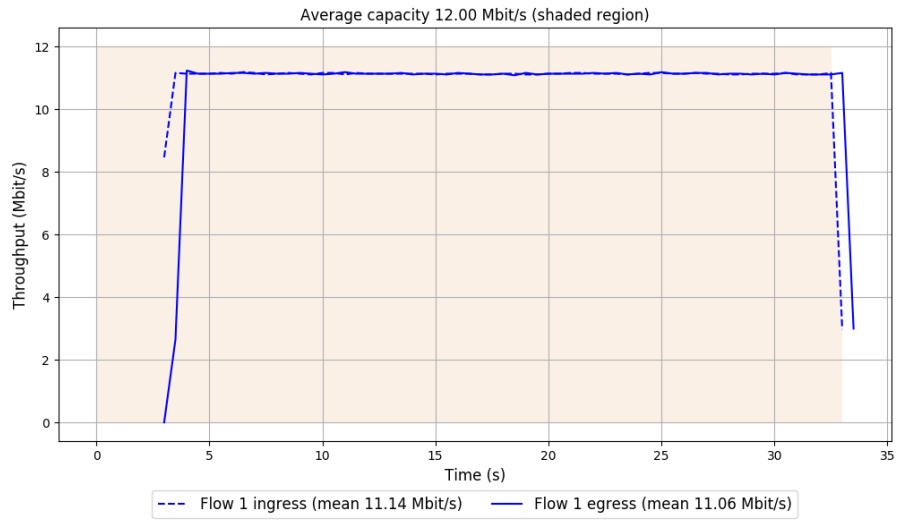
-- Flow 1:

Average throughput: 11.06 Mbit/s

95th percentile per-packet one-way delay: 32.747 ms

Loss rate: 0.86%

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



Run 1: Statistics of TCP Vegas

Start at: 2018-09-25 08:34:37

End at: 2018-09-25 08:35:07

# Below is generated by plot.py at 2018-09-25 09:06:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.71 Mbit/s (97.6% utilization)

95th percentile per-packet one-way delay: 35.812 ms

Loss rate: 0.32%

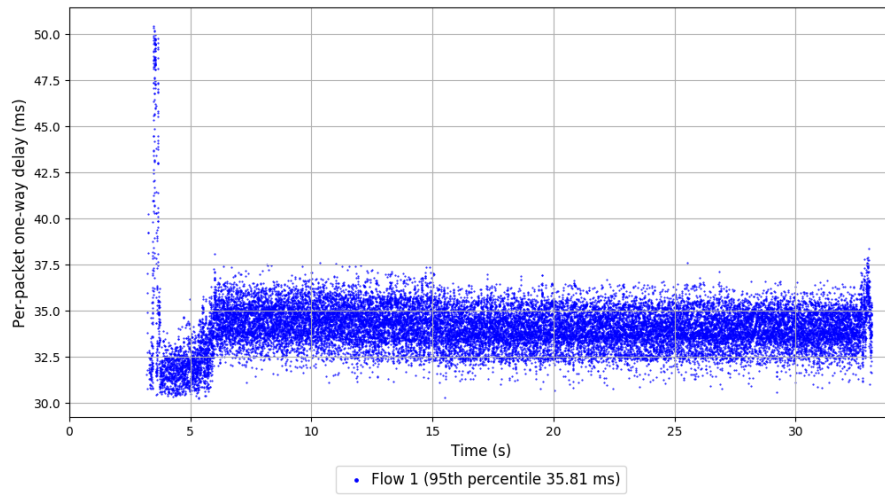
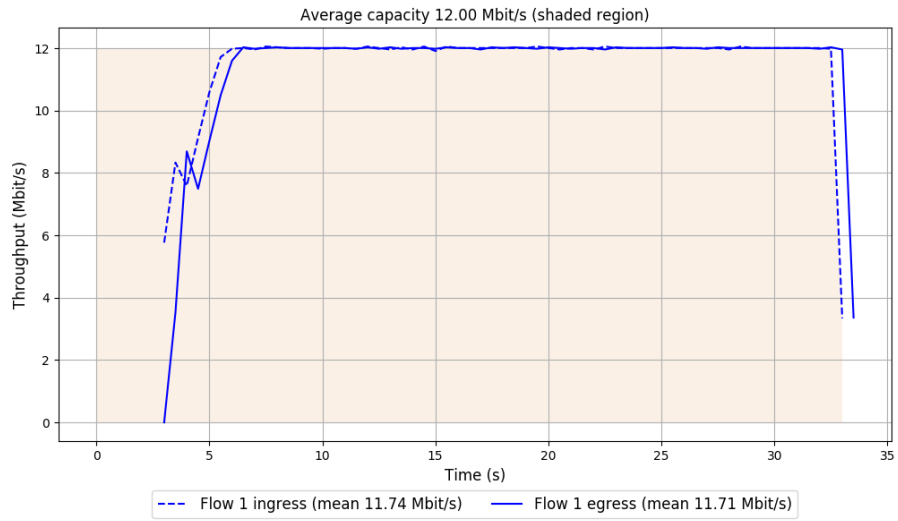
-- Flow 1:

Average throughput: 11.71 Mbit/s

95th percentile per-packet one-way delay: 35.812 ms

Loss rate: 0.32%

### Run 1: Report of TCP Vegas — Data Link



Run 2: Statistics of TCP Vegas

Start at: 2018-09-25 08:45:55

End at: 2018-09-25 08:46:25

# Below is generated by plot.py at 2018-09-25 09:06:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.70 Mbit/s (97.5% utilization)

95th percentile per-packet one-way delay: 36.679 ms

Loss rate: 0.29%

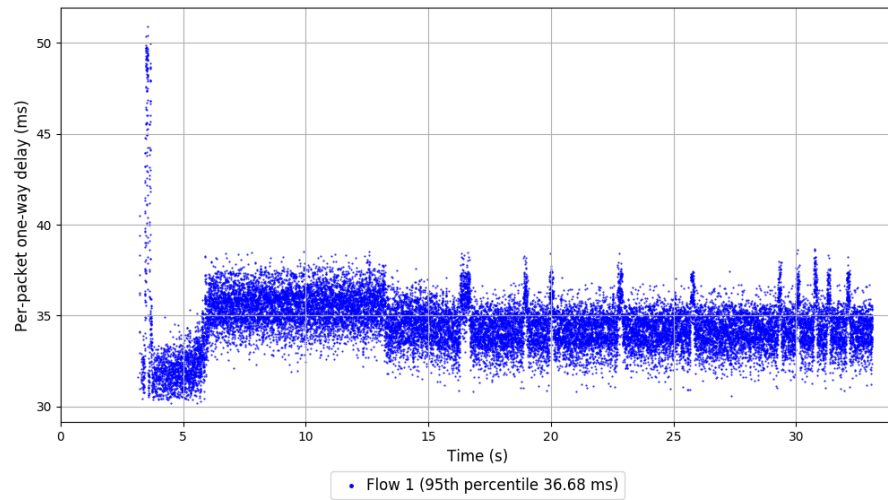
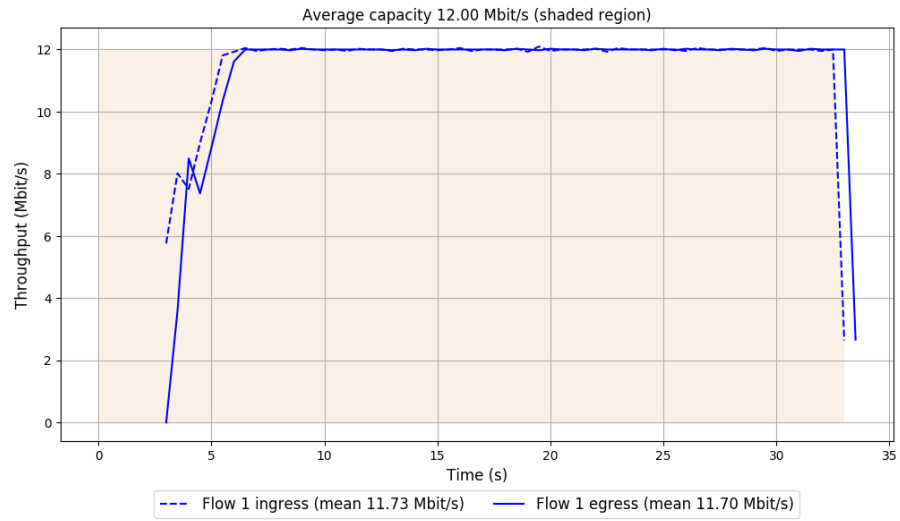
-- Flow 1:

Average throughput: 11.70 Mbit/s

95th percentile per-packet one-way delay: 36.679 ms

Loss rate: 0.29%

## Run 2: Report of TCP Vegas — Data Link



Run 3: Statistics of TCP Vegas

Start at: 2018-09-25 08:57:12

End at: 2018-09-25 08:57:42

# Below is generated by plot.py at 2018-09-25 09:06:22

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 11.70 Mbit/s (97.5% utilization)

95th percentile per-packet one-way delay: 36.889 ms

Loss rate: 0.30%

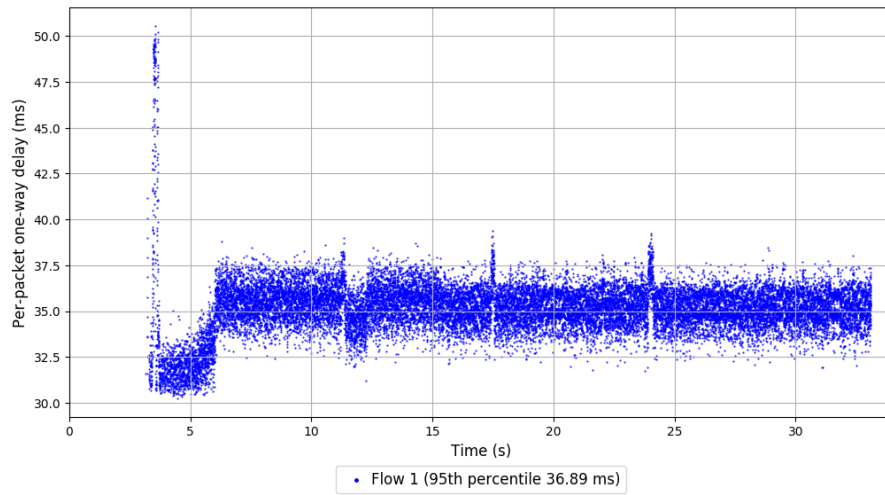
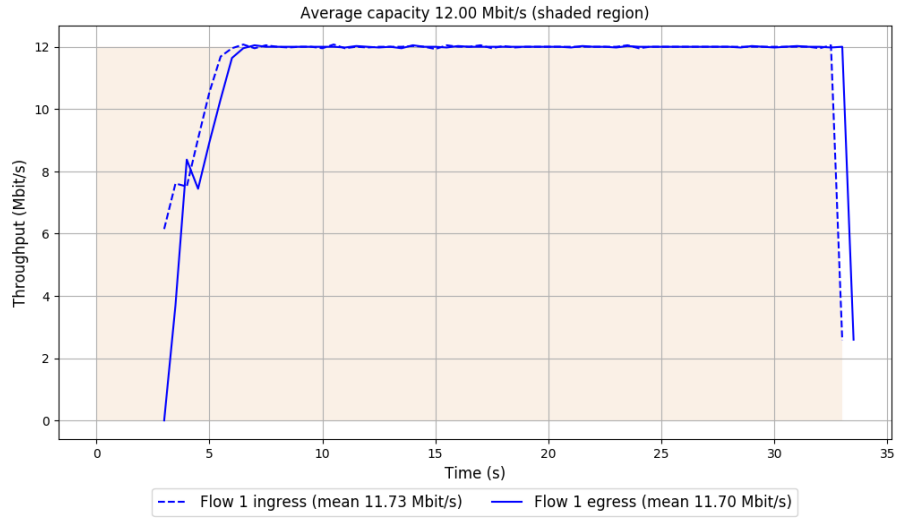
-- Flow 1:

Average throughput: 11.70 Mbit/s

95th percentile per-packet one-way delay: 36.889 ms

Loss rate: 0.30%

### Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2018-09-25 08:38:46

End at: 2018-09-25 08:39:16

# Below is generated by plot.py at 2018-09-25 09:06:43

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 6.28 Mbit/s (52.3% utilization)

95th percentile per-packet one-way delay: 51.933 ms

Loss rate: 96.84%

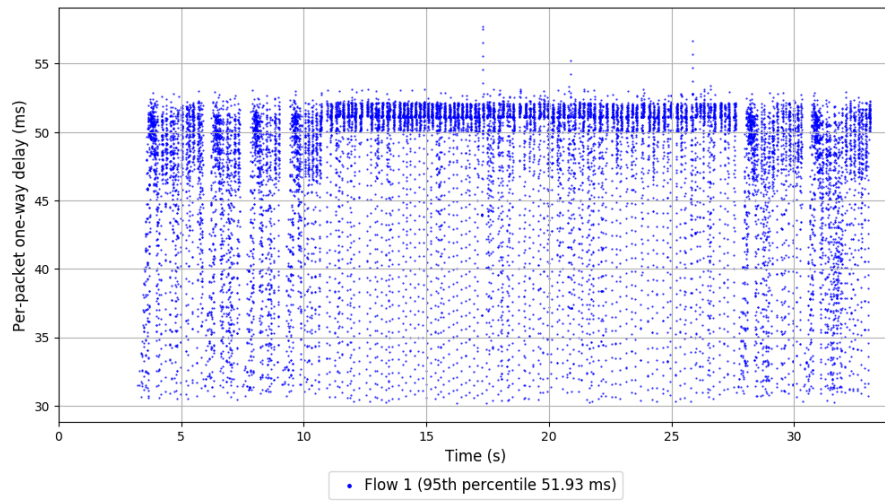
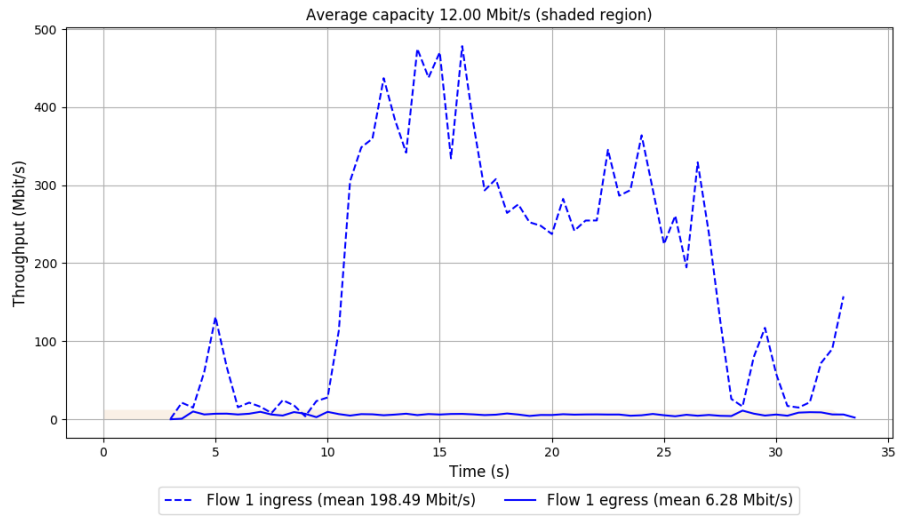
-- Flow 1:

Average throughput: 6.28 Mbit/s

95th percentile per-packet one-way delay: 51.933 ms

Loss rate: 96.84%

# Run 1: Report of Verus — Data Link



Run 2: Statistics of Verus

Start at: 2018-09-25 08:50:04

End at: 2018-09-25 08:50:34

# Below is generated by plot.py at 2018-09-25 09:06:43

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 5.77 Mbit/s (48.1% utilization)

95th percentile per-packet one-way delay: 51.932 ms

Loss rate: 96.29%

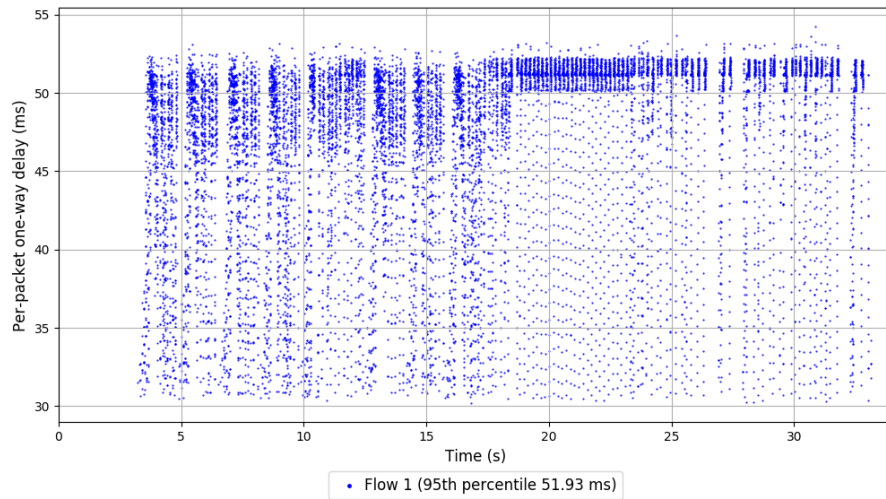
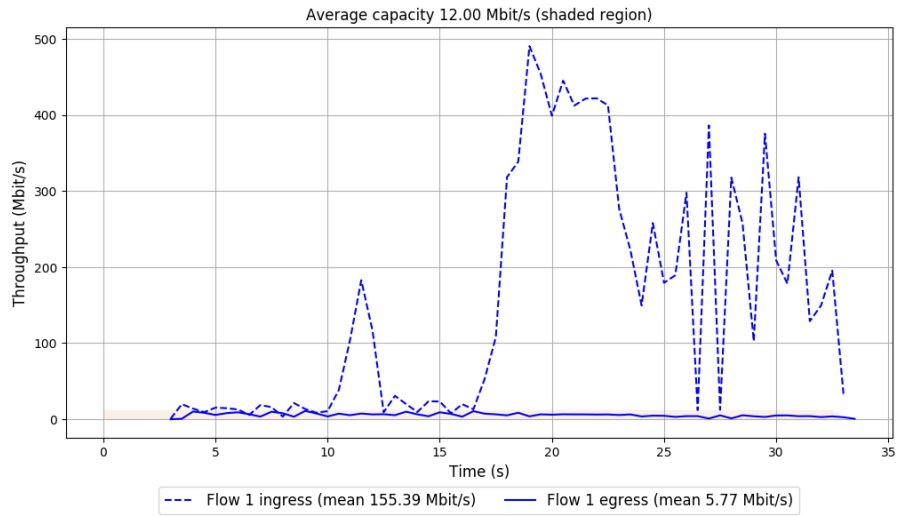
-- Flow 1:

Average throughput: 5.77 Mbit/s

95th percentile per-packet one-way delay: 51.932 ms

Loss rate: 96.29%

## Run 2: Report of Verus — Data Link



Run 3: Statistics of Verus

Start at: 2018-09-25 09:01:21

End at: 2018-09-25 09:01:51

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 6.49 Mbit/s (54.1% utilization)

95th percentile per-packet one-way delay: 51.955 ms

Loss rate: 98.26%

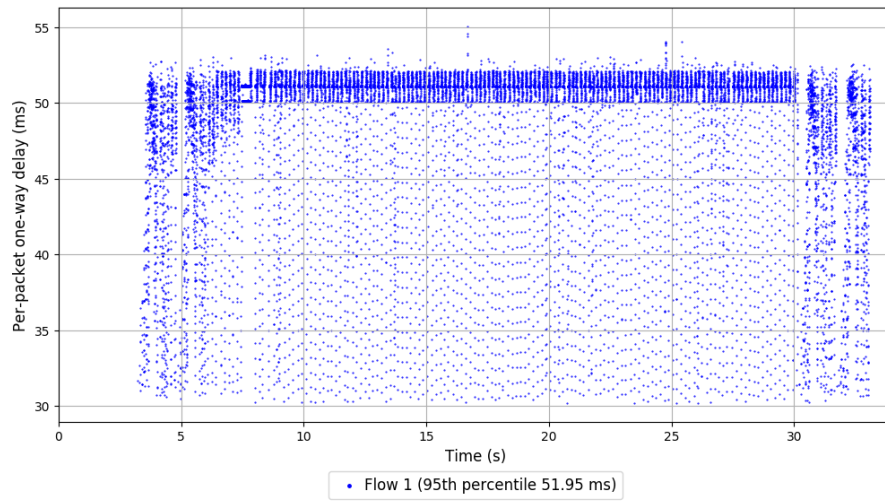
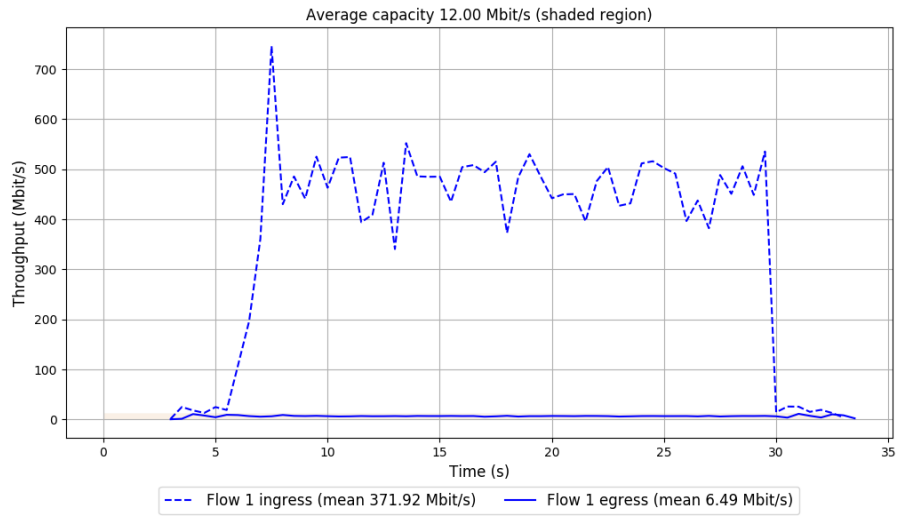
-- Flow 1:

Average throughput: 6.49 Mbit/s

95th percentile per-packet one-way delay: 51.955 ms

Loss rate: 98.26%

### Run 3: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

Start at: 2018-09-25 08:36:59

End at: 2018-09-25 08:37:29

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.94 Mbit/s (91.1% utilization)

95th percentile per-packet one-way delay: 36.600 ms

Loss rate: 0.19%

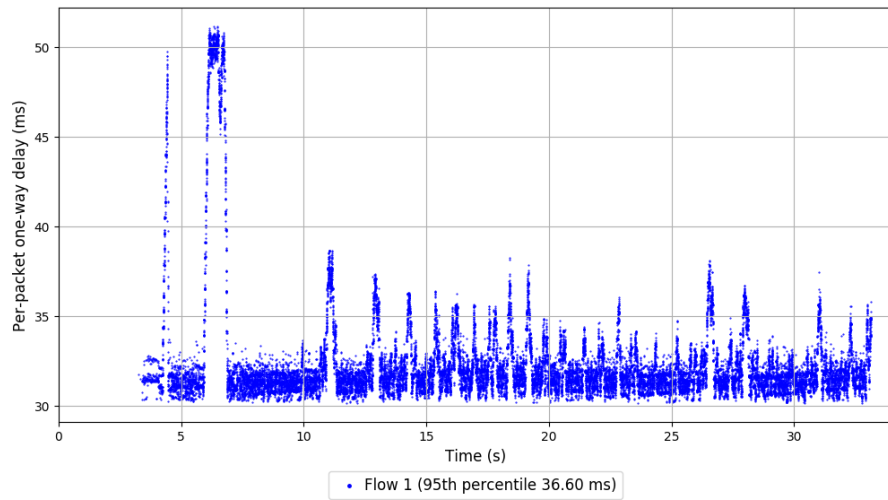
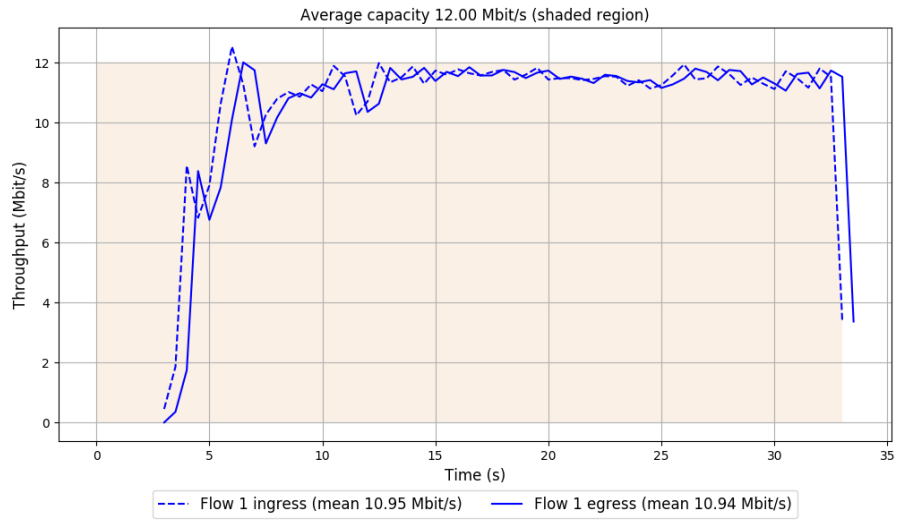
-- Flow 1:

Average throughput: 10.94 Mbit/s

95th percentile per-packet one-way delay: 36.600 ms

Loss rate: 0.19%

# Run 1: Report of PCC-Vivace — Data Link



Run 2: Statistics of PCC-Vivace

Start at: 2018-09-25 08:48:17

End at: 2018-09-25 08:48:47

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.90 Mbit/s (90.9% utilization)

95th percentile per-packet one-way delay: 36.059 ms

Loss rate: 0.18%

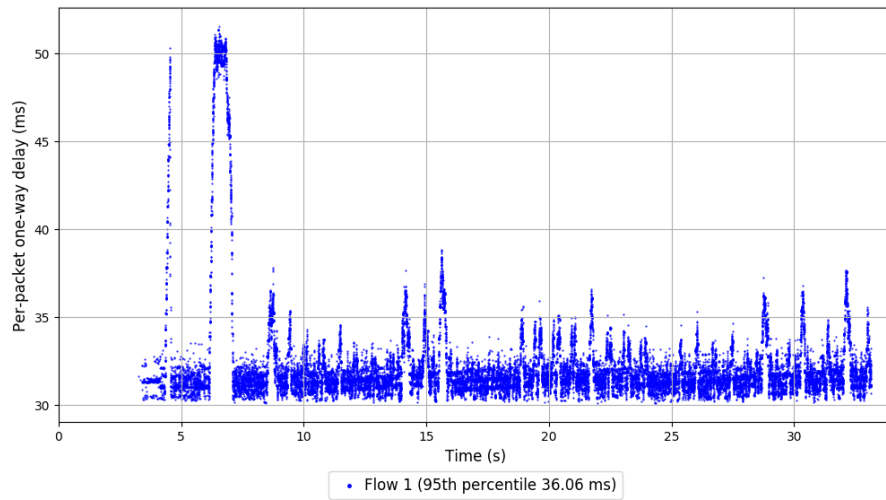
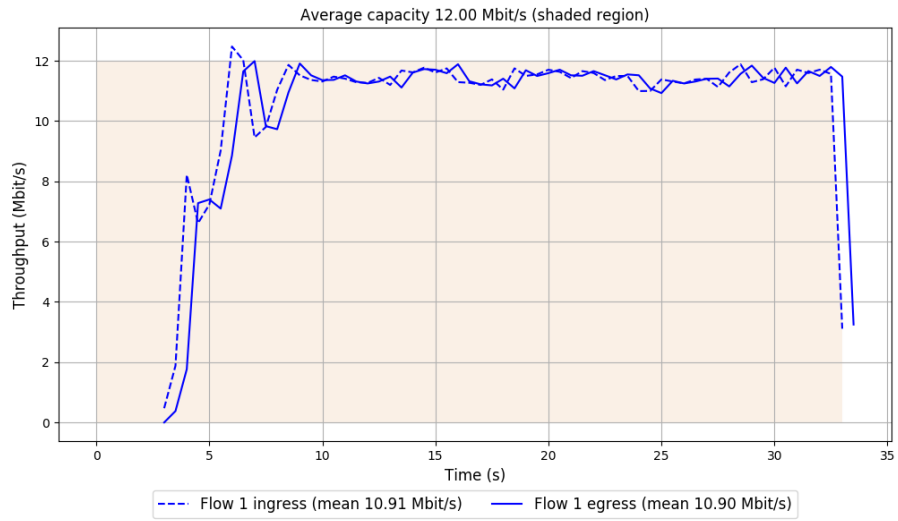
-- Flow 1:

Average throughput: 10.90 Mbit/s

95th percentile per-packet one-way delay: 36.059 ms

Loss rate: 0.18%

## Run 2: Report of PCC-Vivace — Data Link



Run 3: Statistics of PCC-Vivace

Start at: 2018-09-25 08:59:34

End at: 2018-09-25 09:00:05

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 10.90 Mbit/s (90.9% utilization)

95th percentile per-packet one-way delay: 35.391 ms

Loss rate: 0.21%

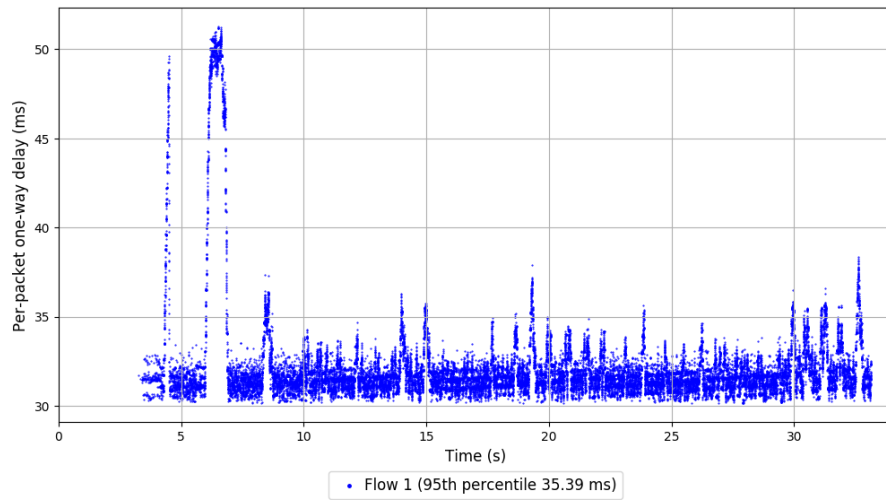
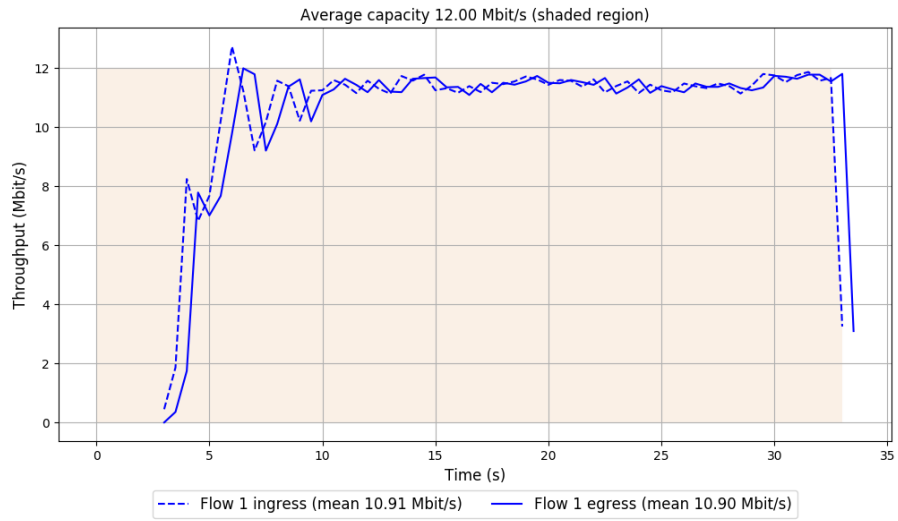
-- Flow 1:

Average throughput: 10.90 Mbit/s

95th percentile per-packet one-way delay: 35.391 ms

Loss rate: 0.21%

### Run 3: Report of PCC-Vivace — Data Link



Run 1: Statistics of WebRTC media

Start at: 2018-09-25 08:39:24

End at: 2018-09-25 08:39:54

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 2.06 Mbit/s (17.1% utilization)

95th percentile per-packet one-way delay: 35.969 ms

Loss rate: 0.12%

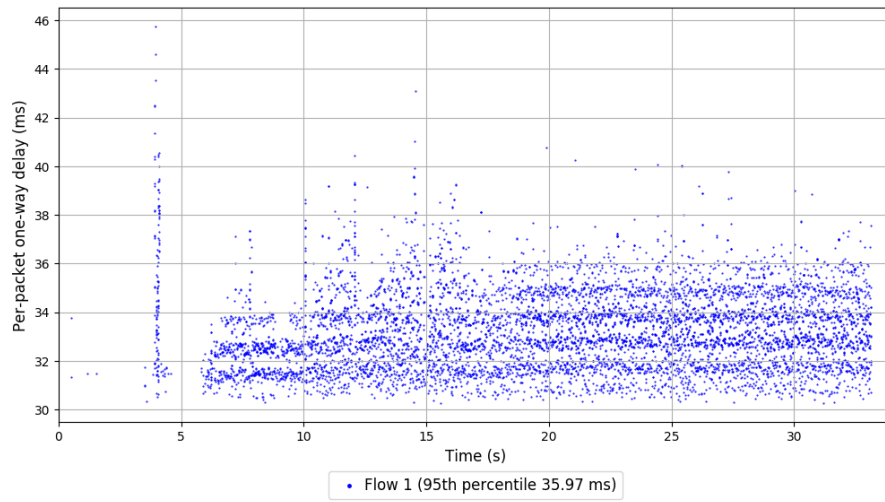
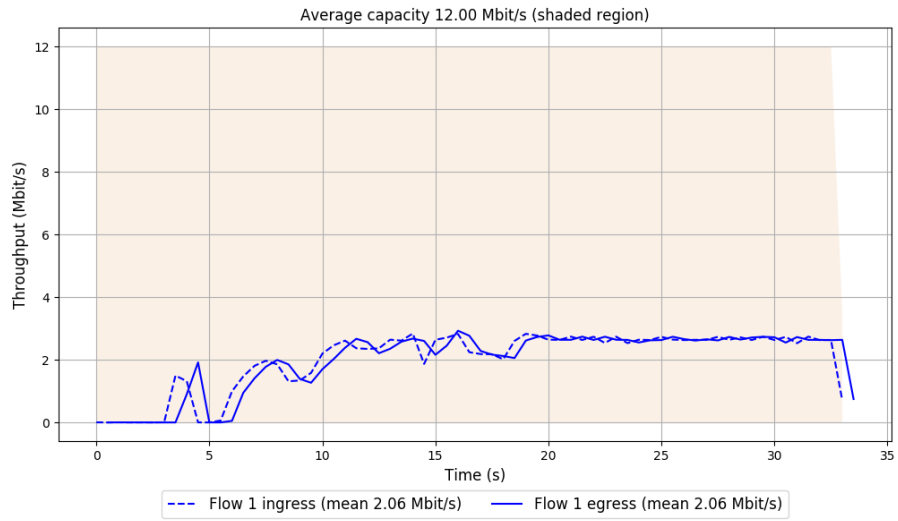
-- Flow 1:

Average throughput: 2.06 Mbit/s

95th percentile per-packet one-way delay: 35.969 ms

Loss rate: 0.12%

# Run 1: Report of WebRTC media — Data Link



Run 2: Statistics of WebRTC media

Start at: 2018-09-25 08:50:41

End at: 2018-09-25 08:51:11

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 2.02 Mbit/s (16.8% utilization)

95th percentile per-packet one-way delay: 36.012 ms

Loss rate: 0.12%

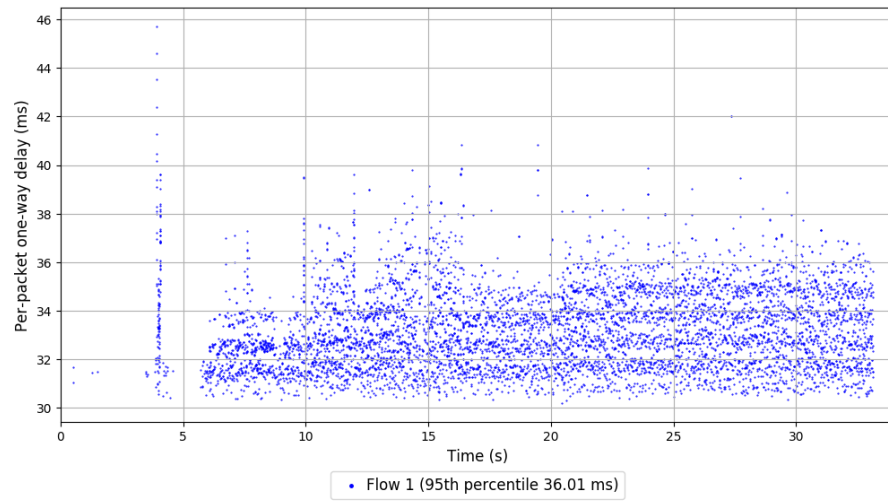
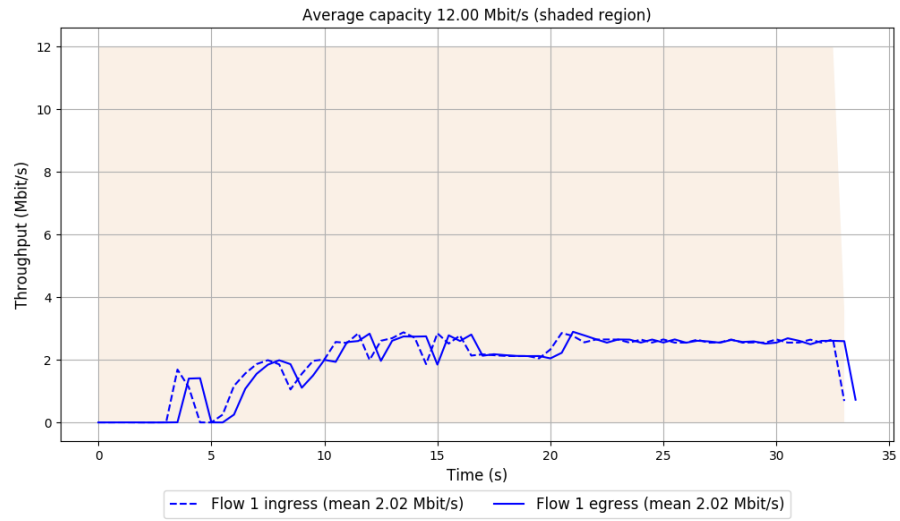
-- Flow 1:

Average throughput: 2.02 Mbit/s

95th percentile per-packet one-way delay: 36.012 ms

Loss rate: 0.12%

## Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2018-09-25 09:02:03

End at: 2018-09-25 09:02:33

# Below is generated by plot.py at 2018-09-25 09:06:45

# Datalink statistics

-- Total of 1 flow:

Average capacity: 12.00 Mbit/s

Average throughput: 1.96 Mbit/s (16.3% utilization)

95th percentile per-packet one-way delay: 35.939 ms

Loss rate: 0.12%

-- Flow 1:

Average throughput: 1.96 Mbit/s

95th percentile per-packet one-way delay: 35.939 ms

Loss rate: 0.12%

### Run 3: Report of WebRTC media — Data Link

