Pantheon Report

Generated at 2019-06-27 02:15:21 (UTC).

Data path: AWS California 1 on `ens5` (*local*) →Stanford cellular on `ppp0` (*remote*).

Repeated the test of 22 congestion control schemes 3 times.

Each test lasted for 30 seconds running 1 flow.

NTP offsets were measured against `time.stanford.edu` and have been applied to correct the timestamps in logs.

```
System info:
Linux 4.15.0-1039-aws
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 @ c3953d08f32ec7ebbdede2d2f0cbdeed262571ef
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 5ce721187ad823da20955337730c746486ca4966
third_party/muses_dtree @ 11c9498ecb1596b02ccd896791a02d03172af7ed
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
```
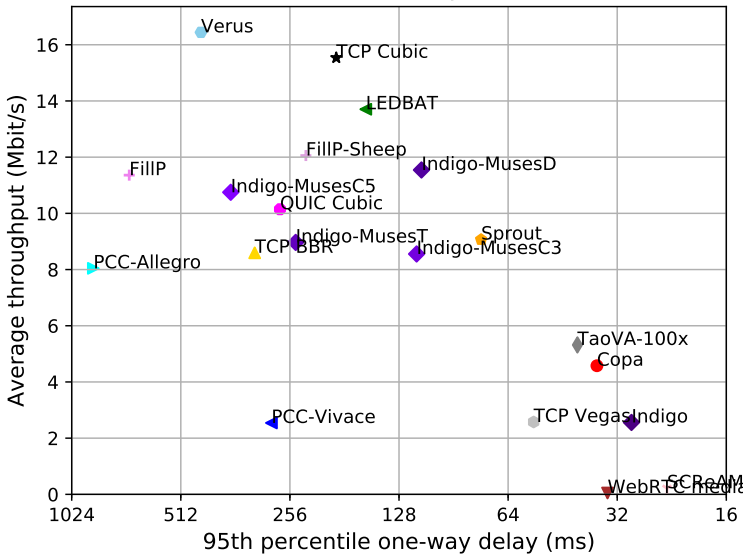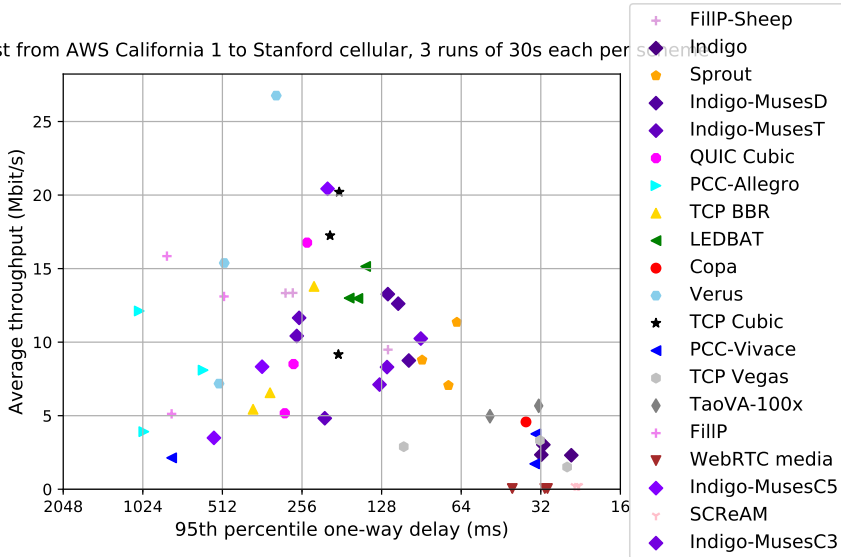
```
 M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```

test from AWS California 1 to Stanford cellular, 3 runs of 30s each per scheme
(mean of all runs by scheme)

test from AWS California 1 to Stanford cellular, 3 runs of 30s each per scheme

scheme	# runs	mean avg tput (Mbit/s) flow 1	mean 95th-%ile delay (ms) flow 1	mean loss rate (%) flow 1
TCP BBR	3	8.60	320.22	0.51
Copa	1	4.58	36.41	0.04
TCP Cubic	3	15.54	190.69	0.22
FillP	3	11.36	710.49	1.67
FillP-Sheep	3	12.06	231.33	0.18
Indigo	3	2.56	29.23	0.06
Indigo-MusesC3	3	8.55	114.47	0.22
Indigo-MusesC5	3	10.75	372.87	1.02
Indigo-MusesD	3	11.54	110.99	0.13
Indigo-MusesT	3	8.97	246.82	0.70
LEDBAT	3	13.71	158.10	0.17
Muses_DecisionTree	0	N/A	N/A	N/A
PCC-Allegro	3	8.04	892.29	11.22
PCC-Expr	0	N/A	N/A	N/A
QUIC Cubic	3	10.14	272.68	0.61
SCReAM	3	0.22	23.32	0.04
Sprout	3	9.07	75.98	0.06
TaoVA-100x	2	5.31	41.21	0.03
TCP Vegas	3	2.57	54.41	0.05
Verus	3	16.44	450.50	0.45
PCC-Vivace	3	2.54	287.96	0.92
WebRTC media	3	0.05	34.03	0.00

```
Run 1: Statistics of TCP BBR

Start at: 2019-06-27 01:00:32
End at: 2019-06-27 01:01:02
Local clock offset: -0.023 ms
Remote clock offset: 1.158 ms


# Below is generated by plot.py at 2019-06-27 02:14:08
# Datalink statistics
-- Total of 1 flow:
Average throughput: 6.56 Mbit/s
95th percentile per-packet one-way delay: 338.126 ms
Loss rate: 0.59%
-- Flow 1:
Average throughput: 6.56 Mbit/s
95th percentile per-packet one-way delay: 338.126 ms
Loss rate: 0.59%
```
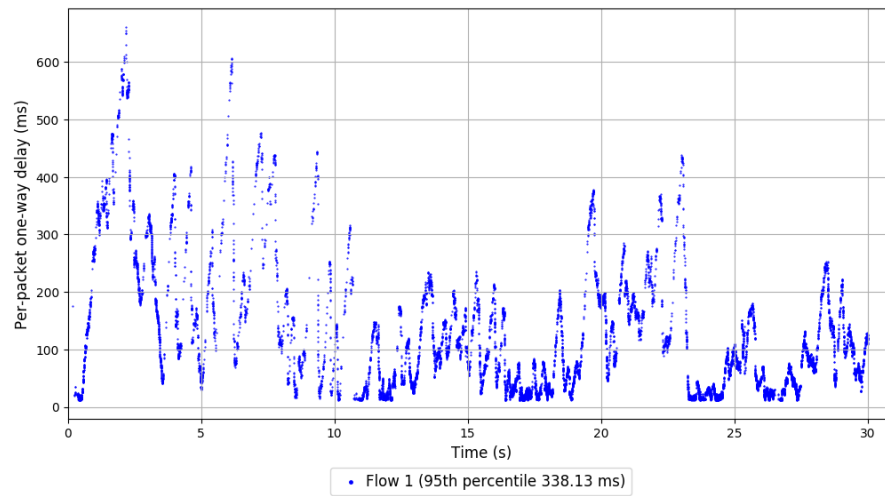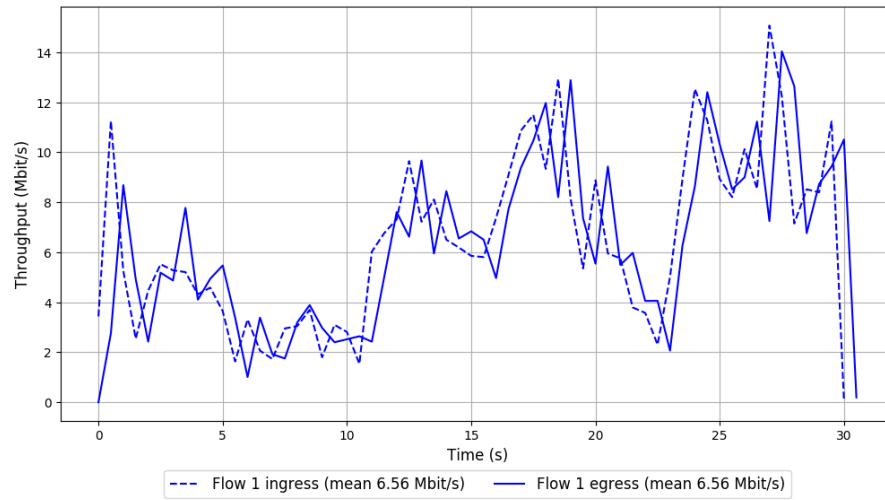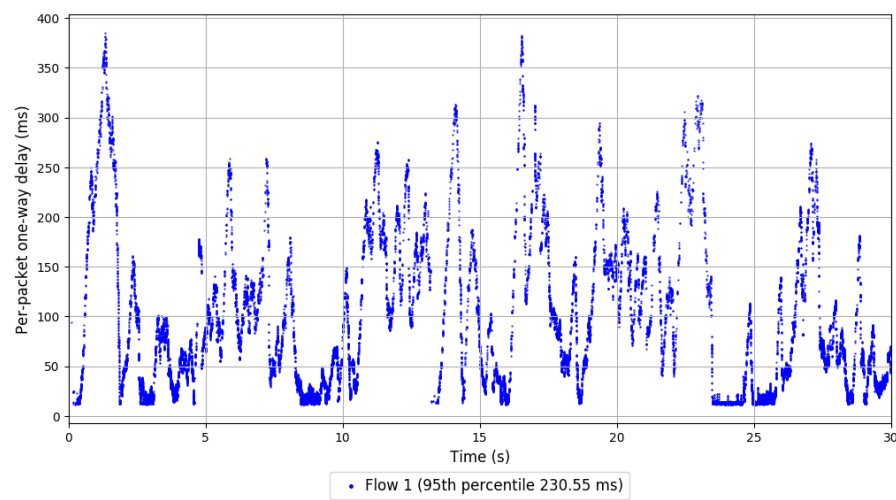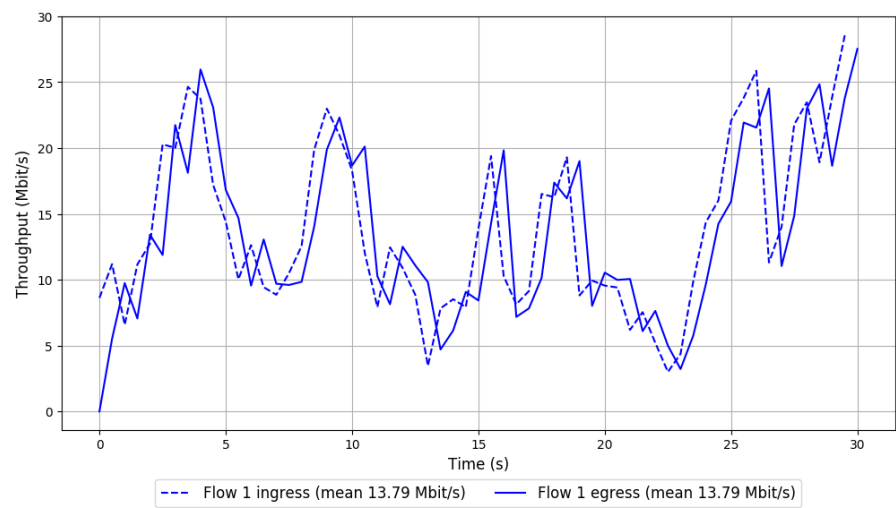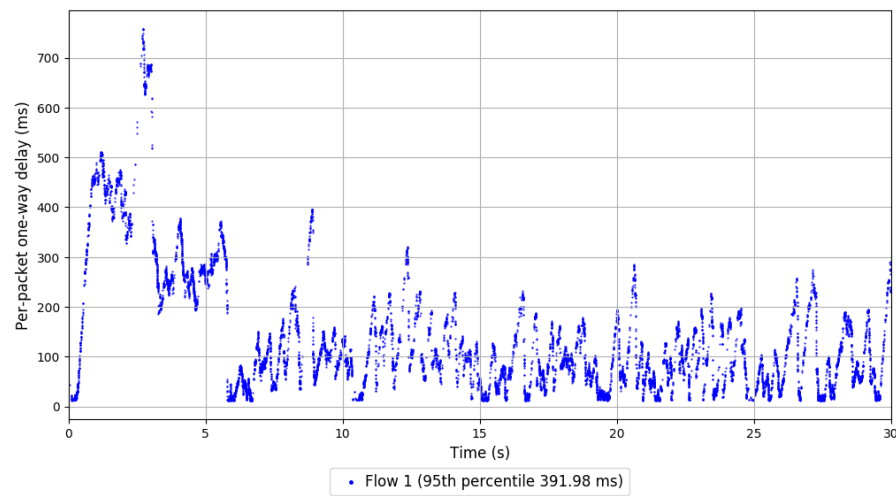
Run 1: Report of TCP BBR — Data Link

```
Run 2: Statistics of TCP BBR

Start at: 2019-06-27 01:27:38
End at: 2019-06-27 01:28:08
Local clock offset: -3.394 ms
Remote clock offset: -3.883 ms


# Below is generated by plot.py at 2019-06-27 02:14:14
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.79 Mbit/s
95th percentile per-packet one-way delay: 230.552 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 13.79 Mbit/s
95th percentile per-packet one-way delay: 230.552 ms
Loss rate: 0.34%
```
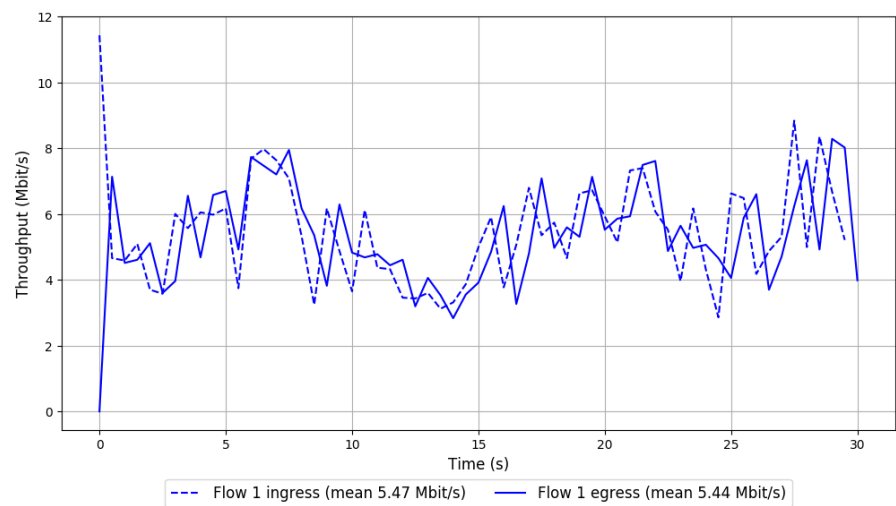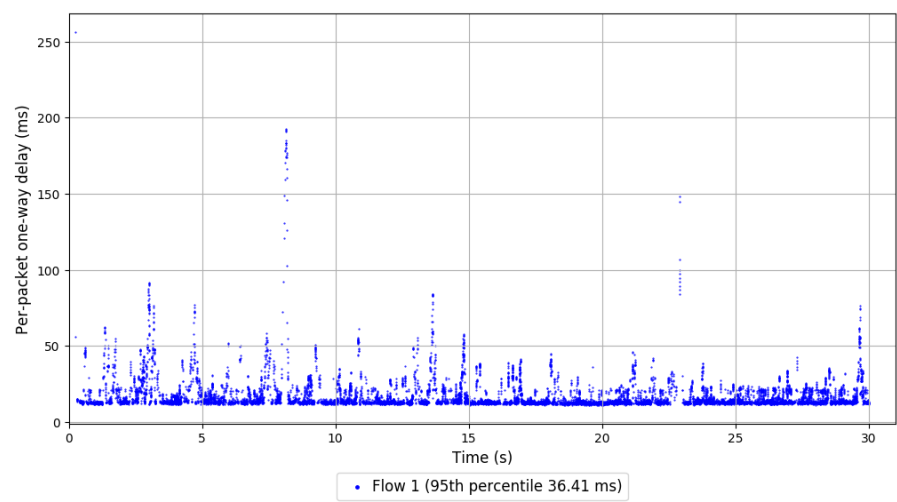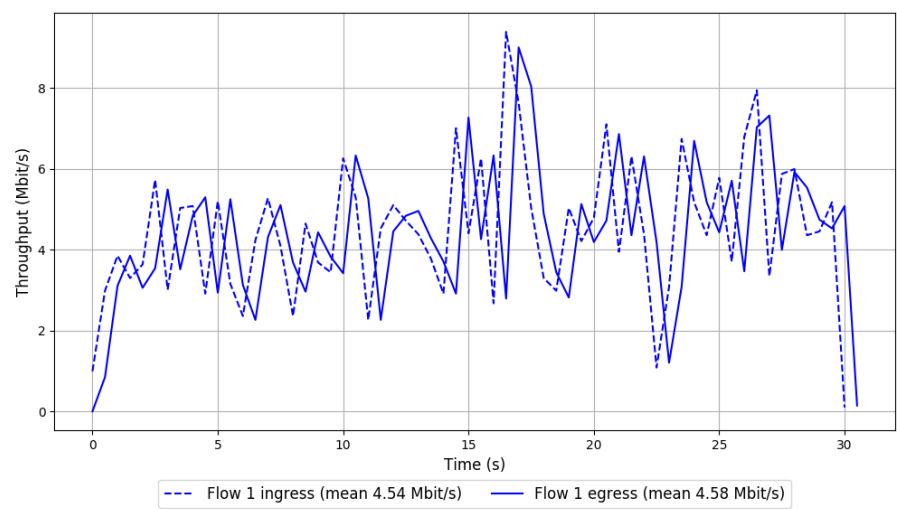
Run 2: Report of TCP BBR — Data Link

Flow 1 ingress (mean 13.79 Mbit/s) --- Flow 1 egress (mean 13.79 Mbit/s)

Flow 1 (95th percentile 230.55 ms)

8

```
Run 3: Statistics of TCP BBR

Start at: 2019-06-27 01:54:50
End at: 2019-06-27 01:55:20
Local clock offset: -2.895 ms
Remote clock offset: 0.126 ms


# Below is generated by plot.py at 2019-06-27 02:14:14
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.44 Mbit/s
95th percentile per-packet one-way delay: 391.984 ms
Loss rate: 0.61%
-- Flow 1:
Average throughput: 5.44 Mbit/s
95th percentile per-packet one-way delay: 391.984 ms
Loss rate: 0.61%
```

Run 3: Report of TCP BBR — Data Link

Flow 1 ingress (mean 5.47 Mbit/s) — Flow 1 egress (mean 5.44 Mbit/s)

• Flow 1 (95th percentile 391.98 ms)

```
Run 1: Statistics of Copa

Start at: 2019-06-27 01:17:47
End at: 2019-06-27 01:18:17
Local clock offset: -5.371 ms
Remote clock offset: -3.141 ms

# Below is generated by plot.py at 2019-06-27 02:14:14
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.58 Mbit/s
95th percentile per-packet one-way delay: 36.405 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 4.58 Mbit/s
95th percentile per-packet one-way delay: 36.405 ms
Loss rate: 0.04%
```
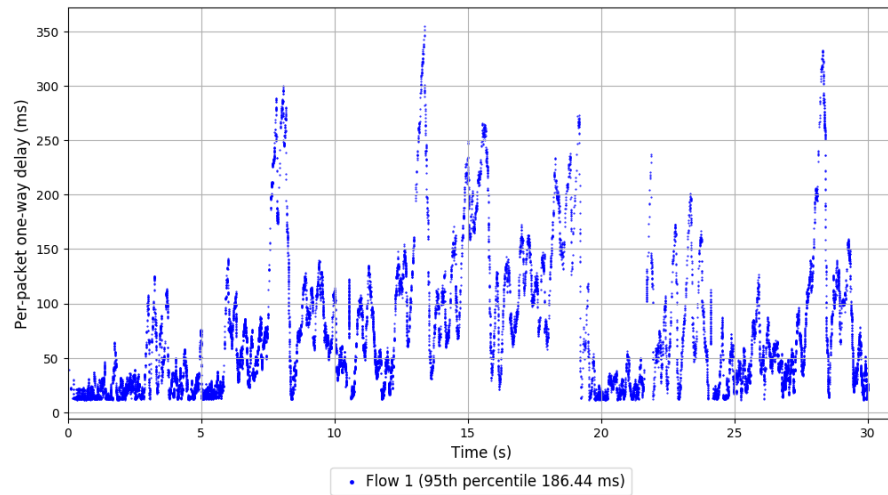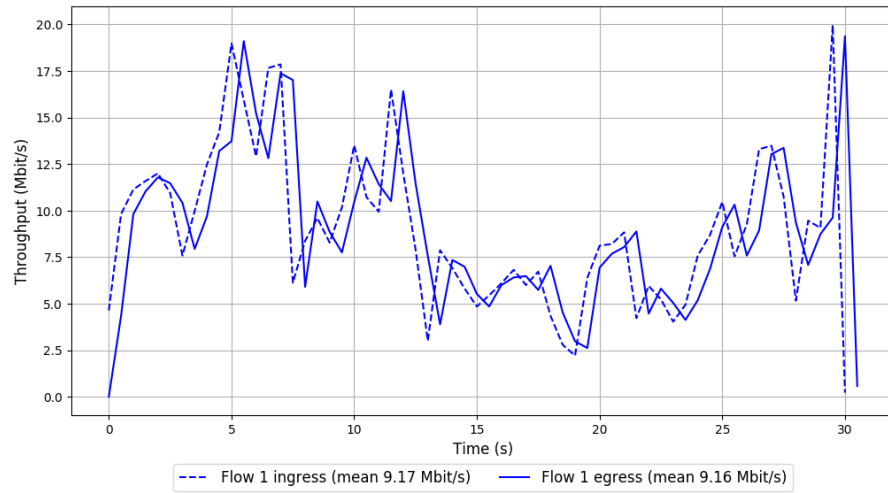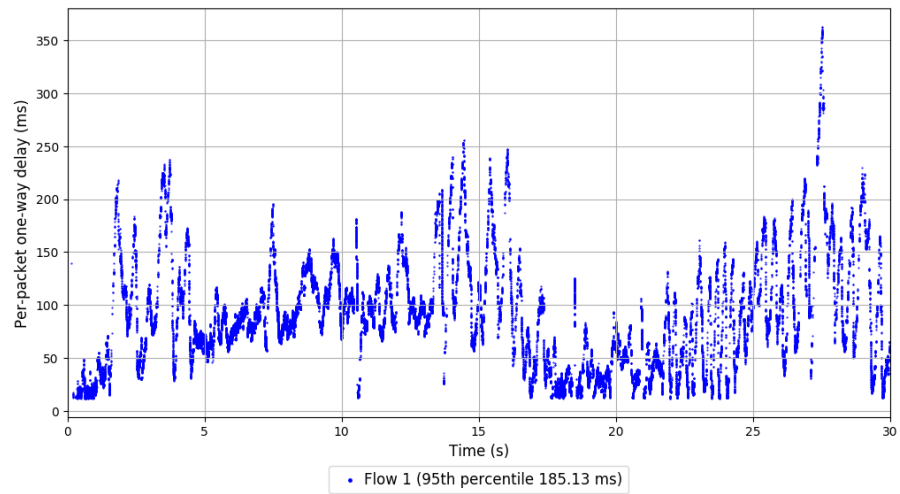
Run 1: Report of Copa — Data Link

Flow 1 ingress (mean 4.54 Mbit/s)   Flow 1 egress (mean 4.58 Mbit/s)

Flow 1 (95th percentile 36.41 ms)

```
Run 2: Statistics of Copa

Start at: 2019-06-27 01:44:59
End at: 2019-06-27 01:45:29
Local clock offset: -4.602 ms
Remote clock offset: -0.809 ms
```

Run 2: Report of Copa — Data Link

Flow 1 ingress (mean 0.35 Mbit/s)   Flow 1 egress (mean 0.03 Mbit/s)
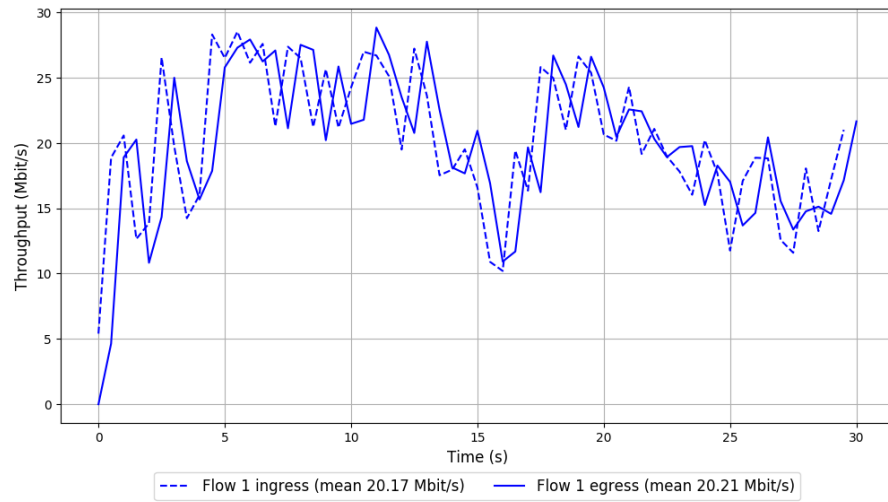

Flow 1 (95th percentile 157.80 ms)

```
Run 3: Statistics of Copa

Start at: 2019-06-27 02:12:07
End at: 2019-06-27 02:12:37
Local clock offset: -1.408 ms
Remote clock offset: -1.064 ms
```

Run 3: Report of Copa — Data Link

Flow 1 ingress (mean 0.16 Mbit/s) — — —   Flow 1 egress (mean 9.62 Mbit/s) ———

• Flow 1 (95th percentile 316.07 ms)

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```
Run 1: Statistics of TCP Cubic

Start at: 2019-06-27 01:01:46
End at: 2019-06-27 01:02:16
Local clock offset: -0.421 ms
Remote clock offset: 0.588 ms

# Below is generated by plot.py at 2019-06-27 02:14:14
# Datalink statistics
-- Total of 1 flow:
Average throughput: 9.16 Mbit/s
95th percentile per-packet one-way delay: 186.438 ms
Loss rate: 0.27%
-- Flow 1:
Average throughput: 9.16 Mbit/s
95th percentile per-packet one-way delay: 186.438 ms
Loss rate: 0.27%
```
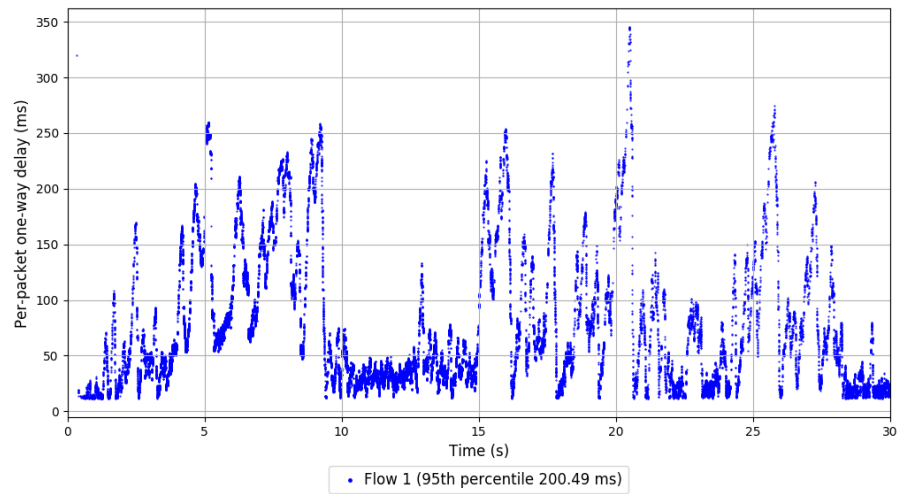
Run 1: Report of TCP Cubic — Data Link

```
Run 2: Statistics of TCP Cubic

Start at: 2019-06-27 01:28:52
End at: 2019-06-27 01:29:22
Local clock offset: -3.331 ms
Remote clock offset: -3.878 ms

# Below is generated by plot.py at 2019-06-27 02:14:22
# Datalink statistics
-- Total of 1 flow:
Average throughput: 20.21 Mbit/s
95th percentile per-packet one-way delay: 185.134 ms
Loss rate: 0.28%
-- Flow 1:
Average throughput: 20.21 Mbit/s
95th percentile per-packet one-way delay: 185.134 ms
Loss rate: 0.28%
```
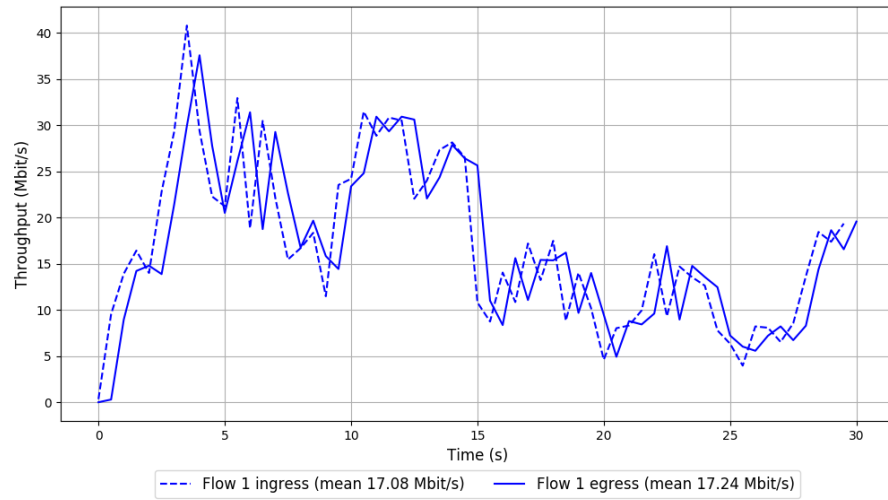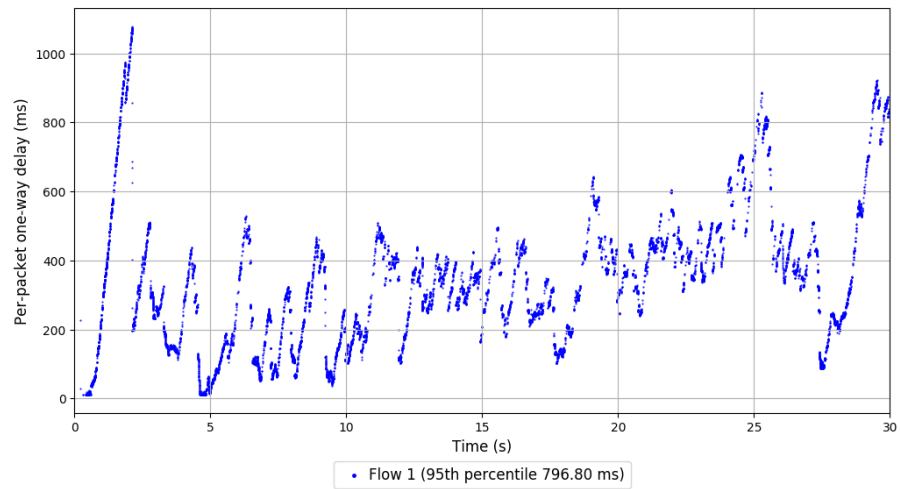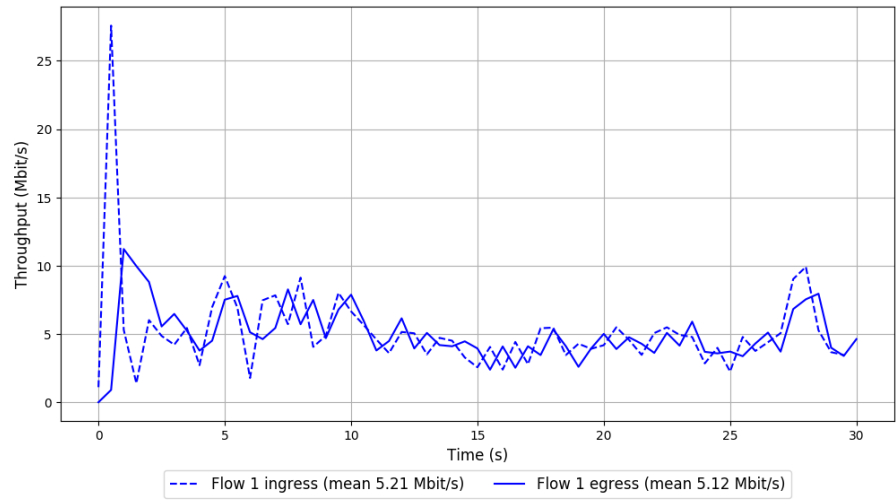
Run 2: Report of TCP Cubic — Data Link

```
Run 3: Statistics of TCP Cubic

Start at: 2019-06-27 01:56:04
End at: 2019-06-27 01:56:34
Local clock offset: -2.643 ms
Remote clock offset: 0.095 ms


# Below is generated by plot.py at 2019-06-27 02:14:22
# Datalink statistics
-- Total of 1 flow:
Average throughput: 17.24 Mbit/s
95th percentile per-packet one-way delay: 200.485 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 17.24 Mbit/s
95th percentile per-packet one-way delay: 200.485 ms
Loss rate: 0.10%
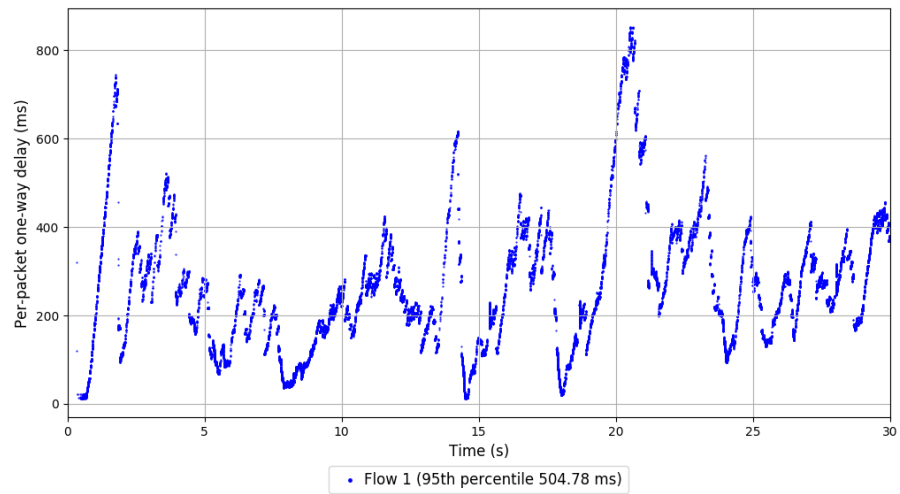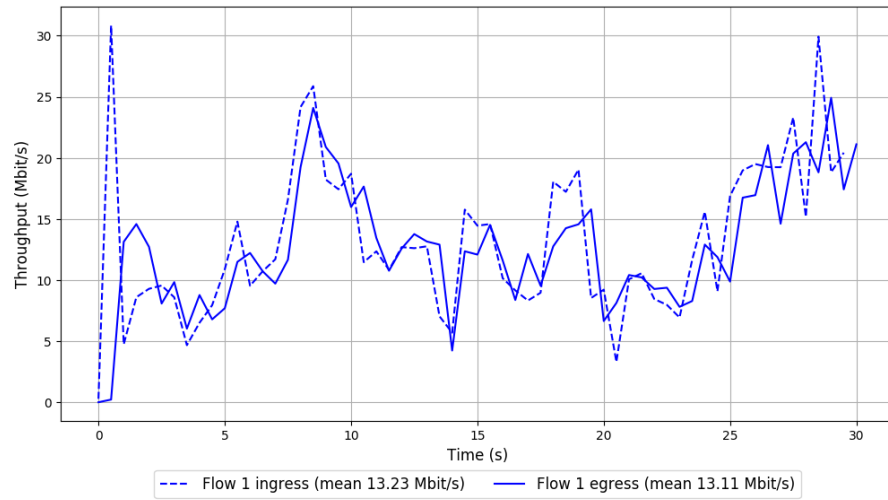```

Run 3: Report of TCP Cubic — Data Link

```
Run 1: Statistics of FillP

Start at: 2019-06-27 01:04:14
End at: 2019-06-27 01:04:44
Local clock offset: -1.126 ms
Remote clock offset: -0.401 ms


# Below is generated by plot.py at 2019-06-27 02:14:22
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.12 Mbit/s
95th percentile per-packet one-way delay: 796.797 ms
Loss rate: 2.42%
-- Flow 1:
Average throughput: 5.12 Mbit/s
95th percentile per-packet one-way delay: 796.797 ms
Loss rate: 2.42%
```

Run 1: Report of FillP — Data Link

```
Run 2: Statistics of FillP

Start at: 2019-06-27 01:31:20
End at: 2019-06-27 01:31:50
Local clock offset: -3.312 ms
Remote clock offset: -4.008 ms


# Below is generated by plot.py at 2019-06-27 02:14:24
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.11 Mbit/s
95th percentile per-packet one-way delay: 504.780 ms
Loss rate: 1.98%
-- Flow 1:
Average throughput: 13.11 Mbit/s
95th percentile per-packet one-way delay: 504.780 ms
Loss rate: 1.98%
```
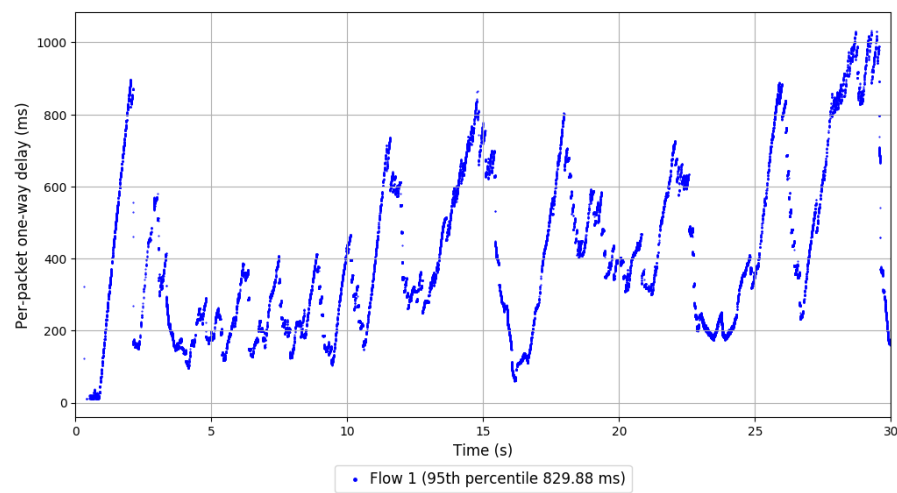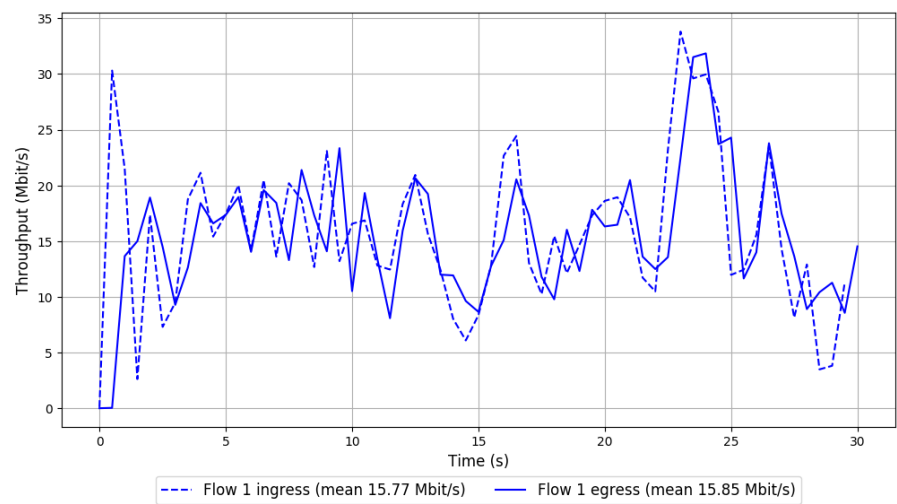
Run 2: Report of FillP — Data Link

Flow 1 ingress (mean 13.23 Mbit/s) --- Flow 1 egress (mean 13.11 Mbit/s)

Flow 1 (95th percentile 504.78 ms)

```
Run 3: Statistics of FillP

Start at: 2019-06-27 01:58:33
End at: 2019-06-27 01:59:03
Local clock offset: -2.195 ms
Remote clock offset: 0.218 ms


# Below is generated by plot.py at 2019-06-27 02:14:28
# Datalink statistics
-- Total of 1 flow:
Average throughput: 15.85 Mbit/s
95th percentile per-packet one-way delay: 829.883 ms
Loss rate: 0.60%
-- Flow 1:
Average throughput: 15.85 Mbit/s
95th percentile per-packet one-way delay: 829.883 ms
Loss rate: 0.60%
```
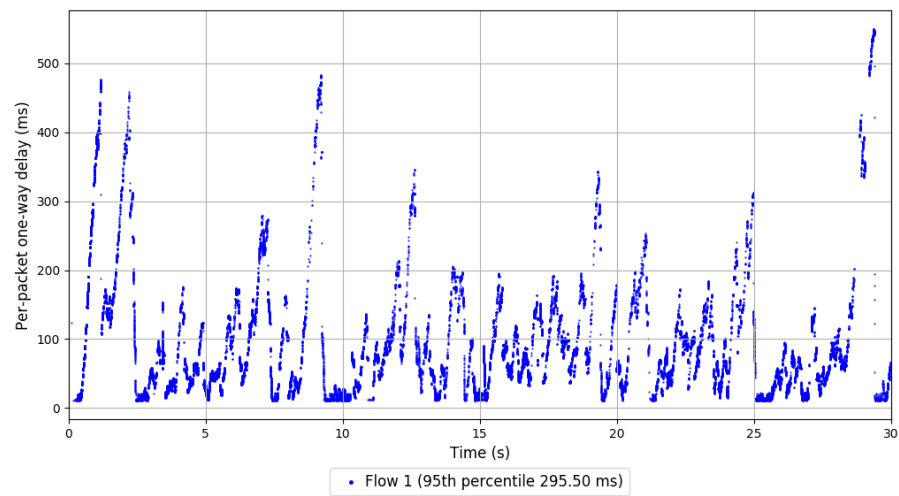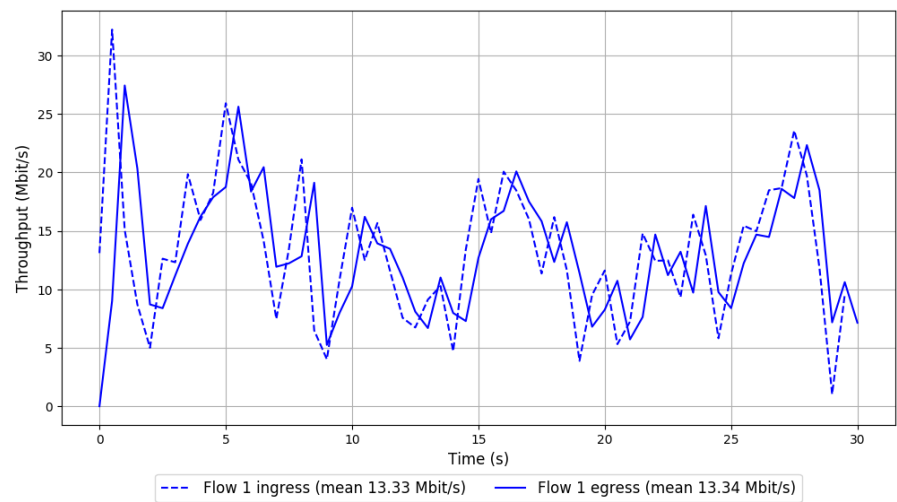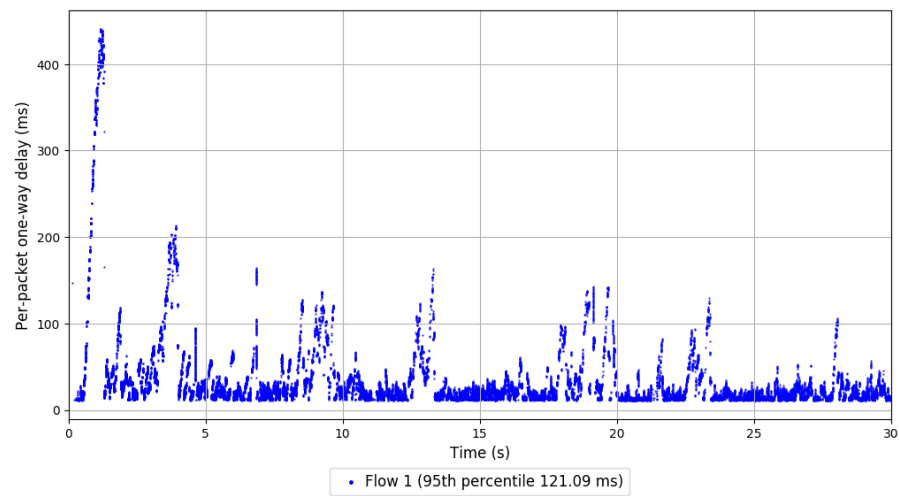
Run 3: Report of FillP — Data Link

Flow 1 ingress (mean 15.77 Mbit/s)   Flow 1 egress (mean 15.85 Mbit/s)

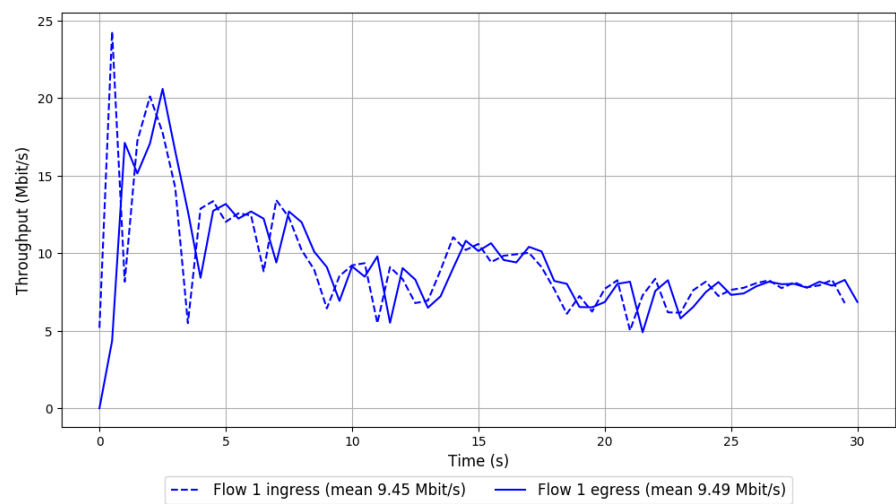Flow 1 (95th percentile 829.88 ms)

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```
Run 1: Statistics of FillP-Sheep

Start at: 2019-06-27 01:16:33
End at: 2019-06-27 01:17:03
Local clock offset: -5.075 ms
Remote clock offset: -2.911 ms


# Below is generated by plot.py at 2019-06-27 02:14:28
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.34 Mbit/s
95th percentile per-packet one-way delay: 295.500 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 13.34 Mbit/s
95th percentile per-packet one-way delay: 295.500 ms
Loss rate: 0.34%
```

Run 1: Report of FillP-Sheep — Data Link

```
Run 2: Statistics of FillP-Sheep

Start at: 2019-06-27 01:43:40
End at: 2019-06-27 01:44:10
Local clock offset: -4.443 ms
Remote clock offset: -0.996 ms


# Below is generated by plot.py at 2019-06-27 02:14:28
# Datalink statistics
-- Total of 1 flow:
Average throughput: 9.49 Mbit/s
95th percentile per-packet one-way delay: 121.086 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 9.49 Mbit/s
95th percentile per-packet one-way delay: 121.086 ms
Loss rate: 0.04%
```
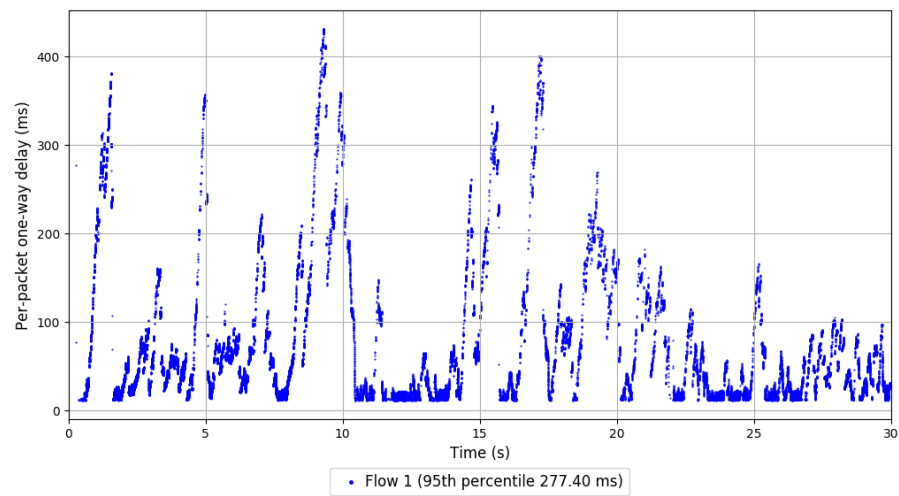
Run 2: Report of FillP-Sheep — Data Link

```
Run 3: Statistics of FillP-Sheep

Start at: 2019-06-27 02:10:53
End at: 2019-06-27 02:11:23
Local clock offset: -1.398 ms
Remote clock offset: -0.706 ms


# Below is generated by plot.py at 2019-06-27 02:14:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.35 Mbit/s
95th percentile per-packet one-way delay: 277.398 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 13.35 Mbit/s
95th percentile per-packet one-way delay: 277.398 ms
Loss rate: 0.16%
```
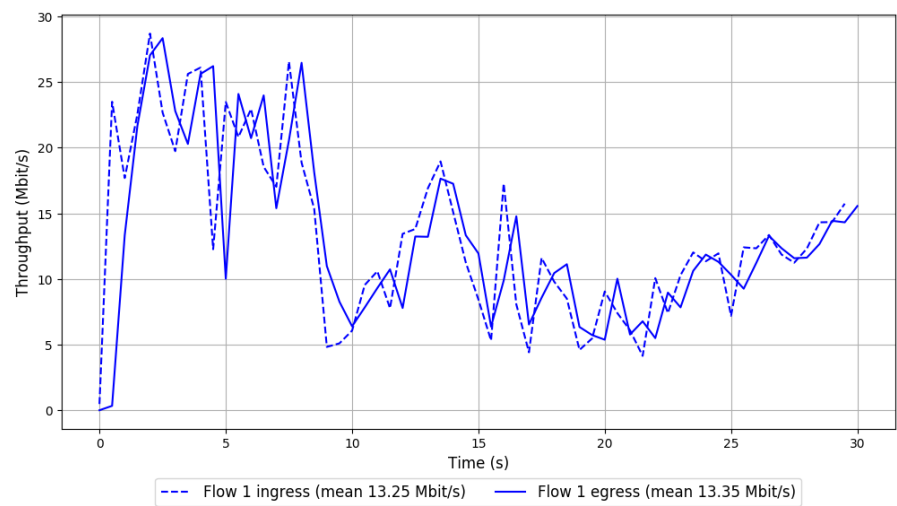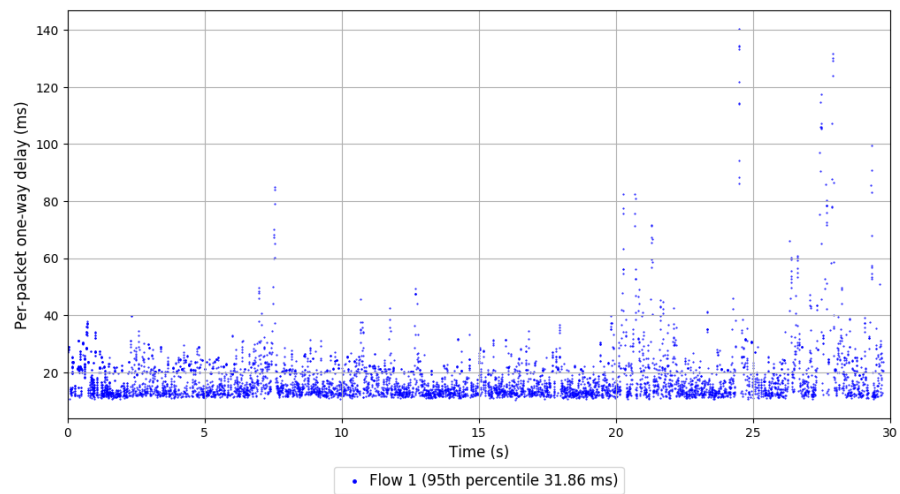
Run 3: Report of FillP-Sheep — Data Link

```
Run 1: Statistics of Indigo

Start at: 2019-06-27 00:58:04
End at: 2019-06-27 00:58:34
Local clock offset: 1.662 ms
Remote clock offset: 2.011 ms


# Below is generated by plot.py at 2019-06-27 02:14:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.34 Mbit/s
95th percentile per-packet one-way delay: 31.857 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 2.34 Mbit/s
95th percentile per-packet one-way delay: 31.857 ms
Loss rate: 0.12%
```
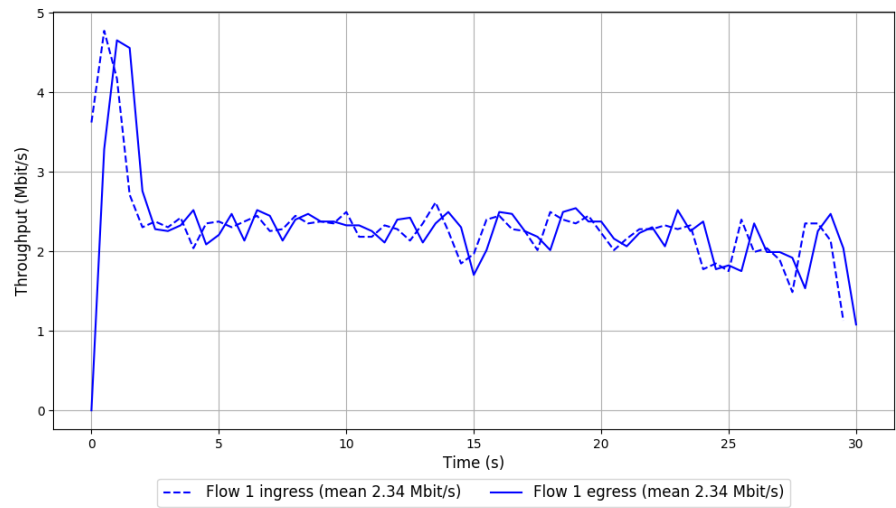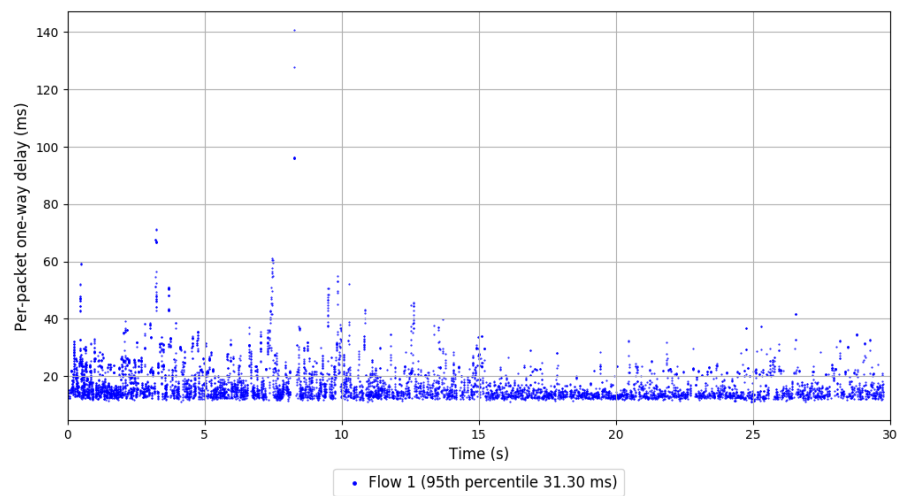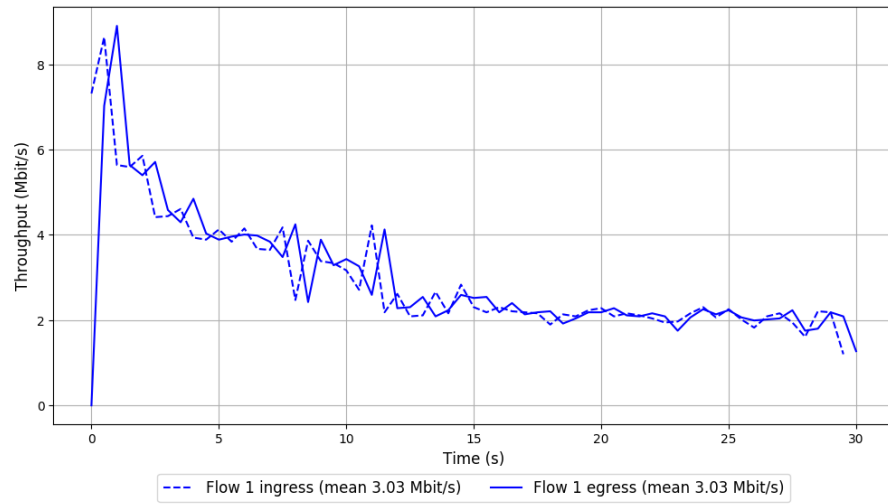
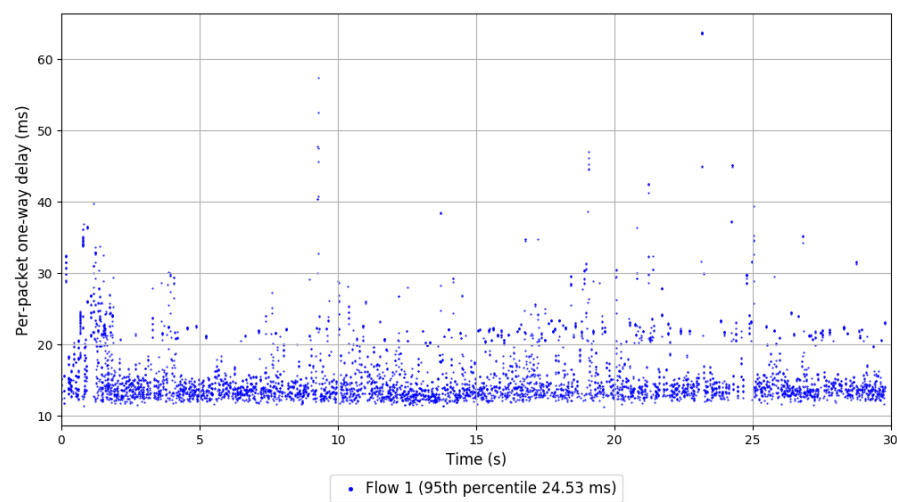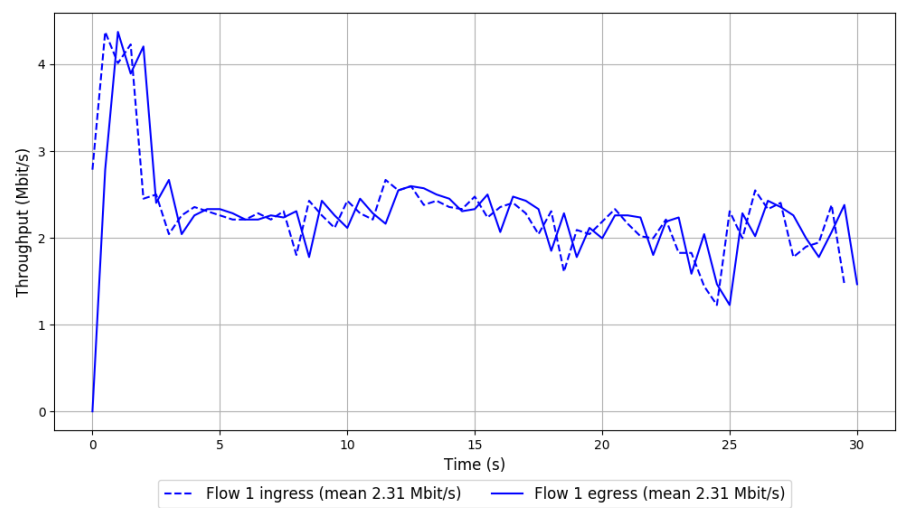# Run 1: Report of Indigo — Data Link

Flow 1 ingress (mean 2.34 Mbit/s) — — —   Flow 1 egress (mean 2.34 Mbit/s) ———

• Flow 1 (95th percentile 31.86 ms)

36

```
Run 2: Statistics of Indigo

Start at: 2019-06-27 01:25:10
End at: 2019-06-27 01:25:40
Local clock offset: -3.633 ms
Remote clock offset: -3.631 ms


# Below is generated by plot.py at 2019-06-27 02:14:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.03 Mbit/s
95th percentile per-packet one-way delay: 31.295 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 3.03 Mbit/s
95th percentile per-packet one-way delay: 31.295 ms
Loss rate: 0.03%
```

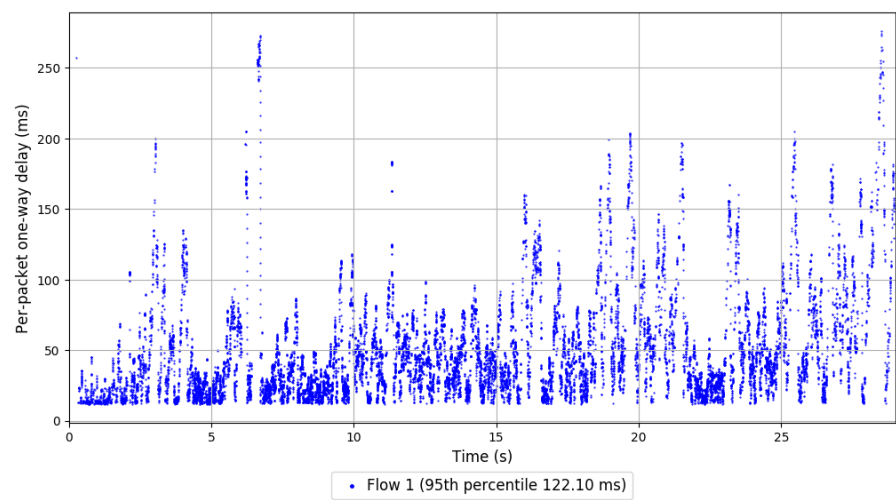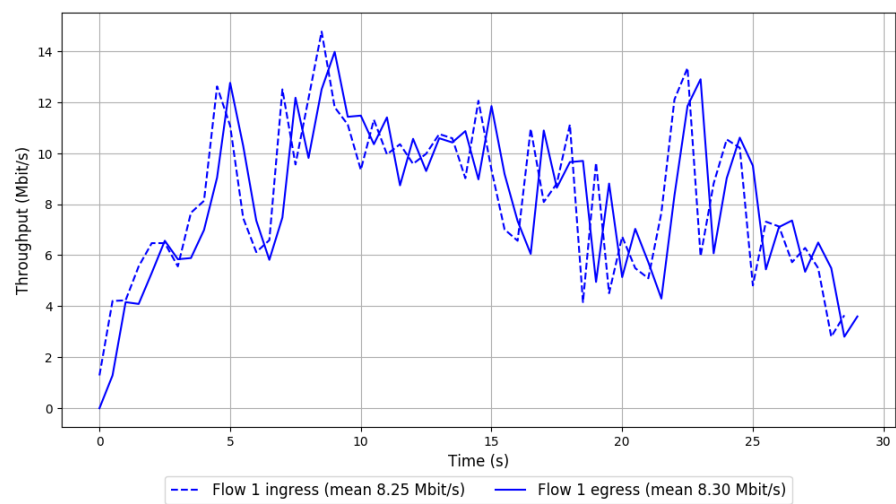Run 2: Report of Indigo — Data Link

```
Run 3: Statistics of Indigo

Start at: 2019-06-27 01:52:23
End at: 2019-06-27 01:52:53
Local clock offset: -3.551 ms
Remote clock offset: -0.099 ms


# Below is generated by plot.py at 2019-06-27 02:14:29
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.31 Mbit/s
95th percentile per-packet one-way delay: 24.533 ms
Loss rate: 0.02%
-- Flow 1:
Average throughput: 2.31 Mbit/s
95th percentile per-packet one-way delay: 24.533 ms
Loss rate: 0.02%
```
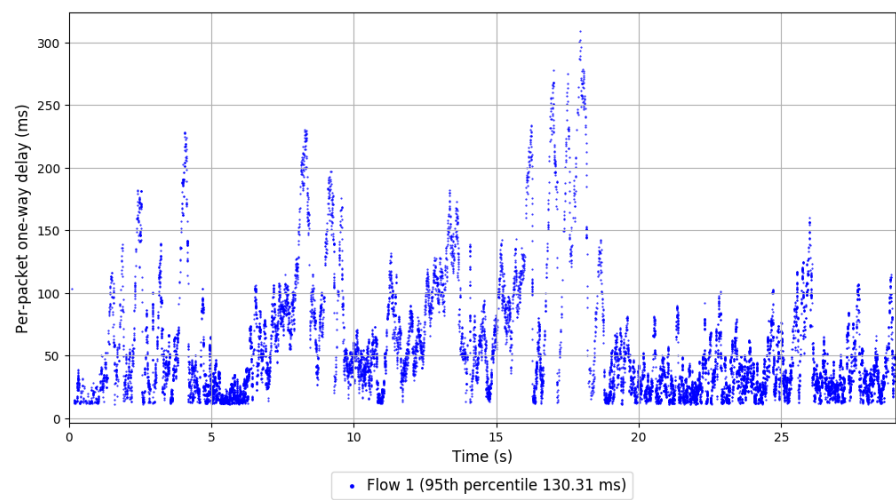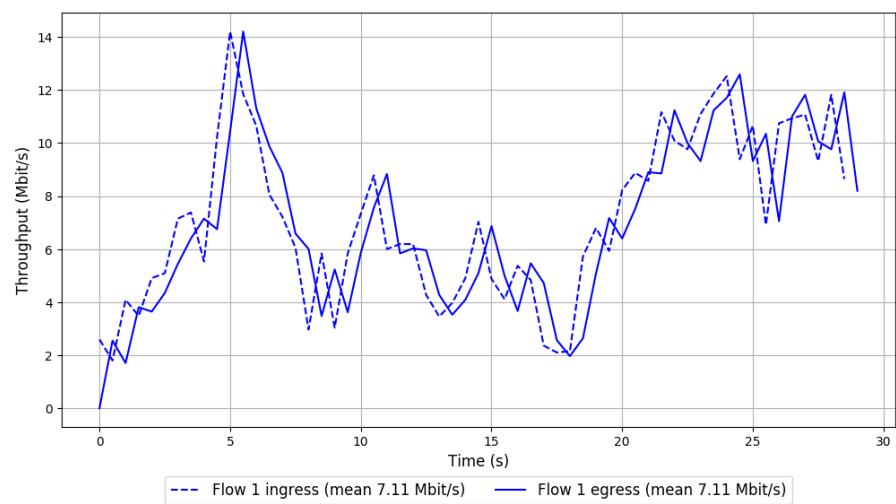
Run 3: Report of Indigo — Data Link

```
Run 1: Statistics of Indigo-MusesC3

Start at: 2019-06-27 01:19:01
End at: 2019-06-27 01:19:31
Local clock offset: -5.406 ms
Remote clock offset: -3.233 ms

# Below is generated by plot.py at 2019-06-27 02:14:31
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.30 Mbit/s
95th percentile per-packet one-way delay: 122.101 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 8.30 Mbit/s
95th percentile per-packet one-way delay: 122.101 ms
Loss rate: 0.21%
```
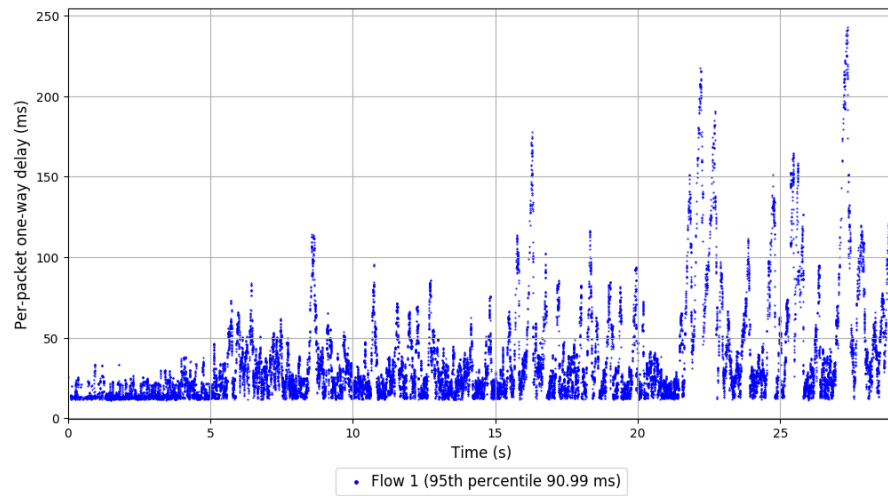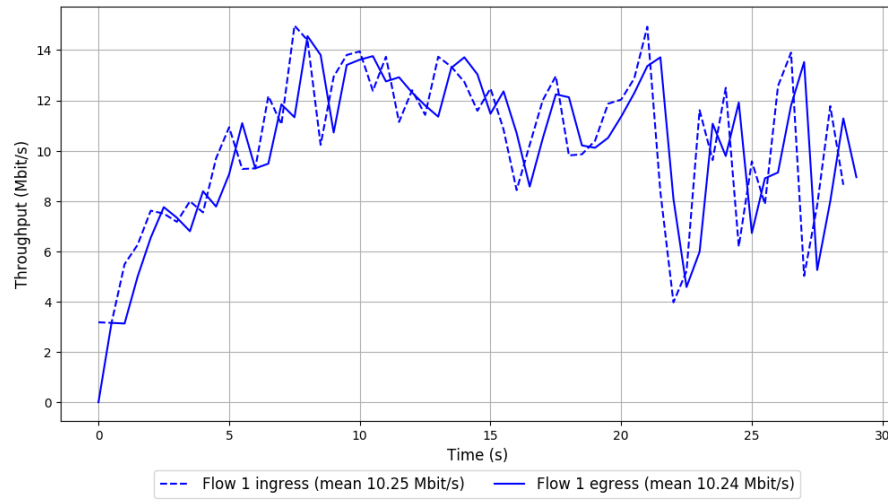
Run 1: Report of Indigo-MusesC3 — Data Link

Flow 1 ingress (mean 8.25 Mbit/s) --- Flow 1 egress (mean 8.30 Mbit/s)

• Flow 1 (95th percentile 122.10 ms)

```
Run 2: Statistics of Indigo-MusesC3

Start at: 2019-06-27 01:46:13
End at: 2019-06-27 01:46:43
Local clock offset: -4.77 ms
Remote clock offset: -0.664 ms


# Below is generated by plot.py at 2019-06-27 02:14:31
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.11 Mbit/s
95th percentile per-packet one-way delay: 130.310 ms
Loss rate: 0.28%
-- Flow 1:
Average throughput: 7.11 Mbit/s
95th percentile per-packet one-way delay: 130.310 ms
Loss rate: 0.28%
```

Run 2: Report of Indigo-MusesC3 — Data Link

```
Run 3: Statistics of Indigo-MusesC3

Start at: 2019-06-27 02:13:21
End at: 2019-06-27 02:13:51
Local clock offset: -1.442 ms
Remote clock offset: -1.349 ms


# Below is generated by plot.py at 2019-06-27 02:14:34
# Datalink statistics
-- Total of 1 flow:
Average throughput: 10.24 Mbit/s
95th percentile per-packet one-way delay: 90.992 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 10.24 Mbit/s
95th percentile per-packet one-way delay: 90.992 ms
Loss rate: 0.16%
```

Run 3: Report of Indigo-MusesC3 — Data Link

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```
Run 1: Statistics of Indigo-MusesC5

Start at: 2019-06-27 00:56:51
End at: 2019-06-27 00:57:21
Local clock offset: 2.709 ms
Remote clock offset: 1.911 ms


# Below is generated by plot.py at 2019-06-27 02:14:34
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.49 Mbit/s
95th percentile per-packet one-way delay: 551.283 ms
Loss rate: 1.96%
-- Flow 1:
Average throughput: 3.49 Mbit/s
95th percentile per-packet one-way delay: 551.283 ms
Loss rate: 1.96%
```
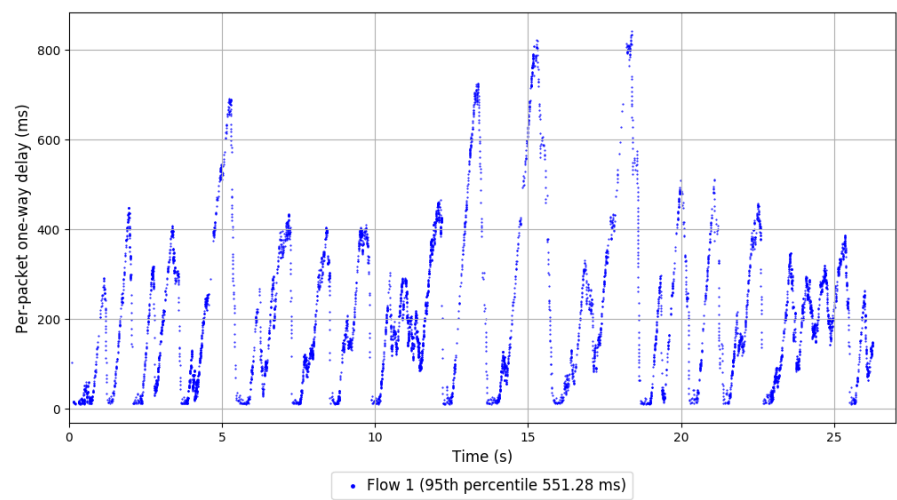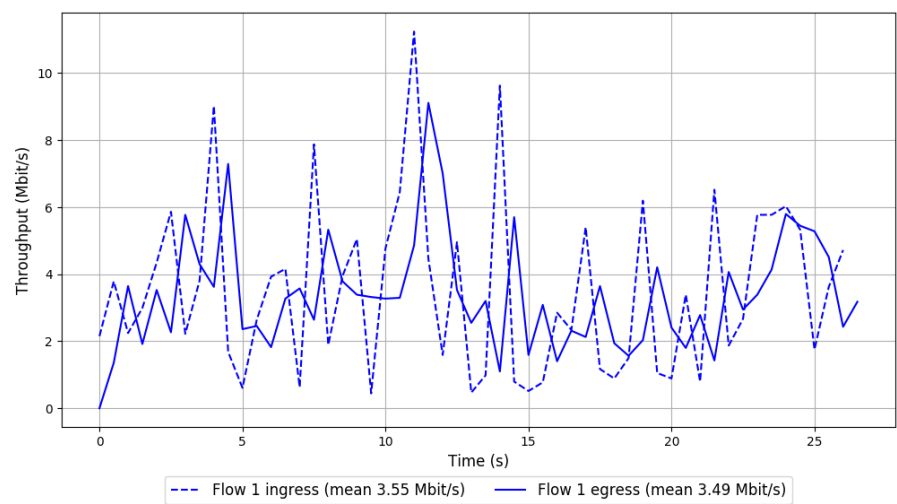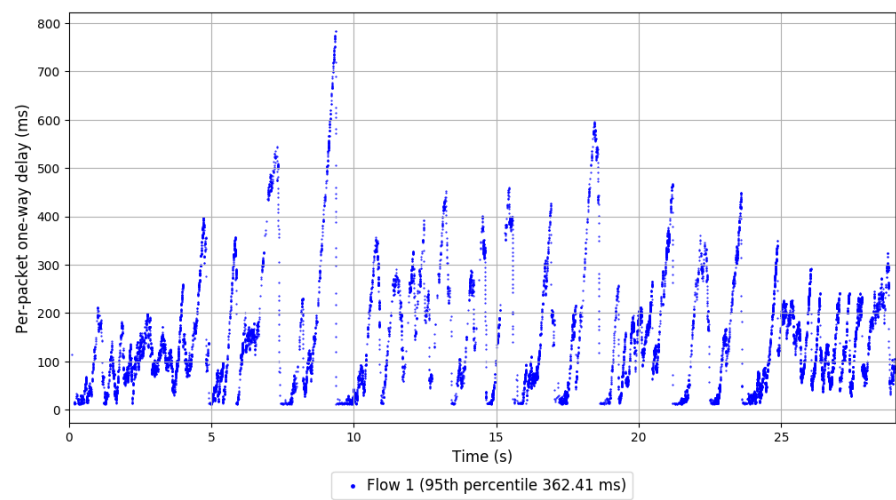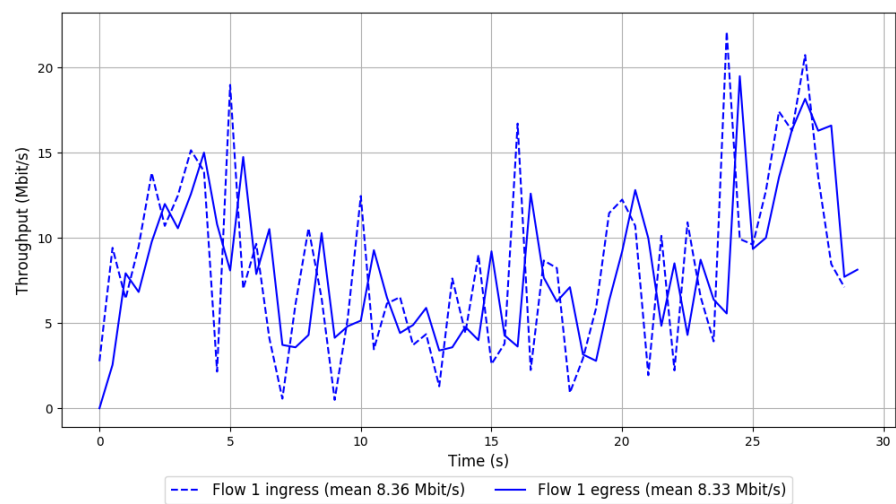
Run 1: Report of Indigo-MusesC5 — Data Link

```
Run 2: Statistics of Indigo-MusesC5

Start at: 2019-06-27 01:23:56
End at: 2019-06-27 01:24:26
Local clock offset: -3.877 ms
Remote clock offset: -3.586 ms


# Below is generated by plot.py at 2019-06-27 02:14:34
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.33 Mbit/s
95th percentile per-packet one-way delay: 362.413 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 8.33 Mbit/s
95th percentile per-packet one-way delay: 362.413 ms
Loss rate: 0.75%
```
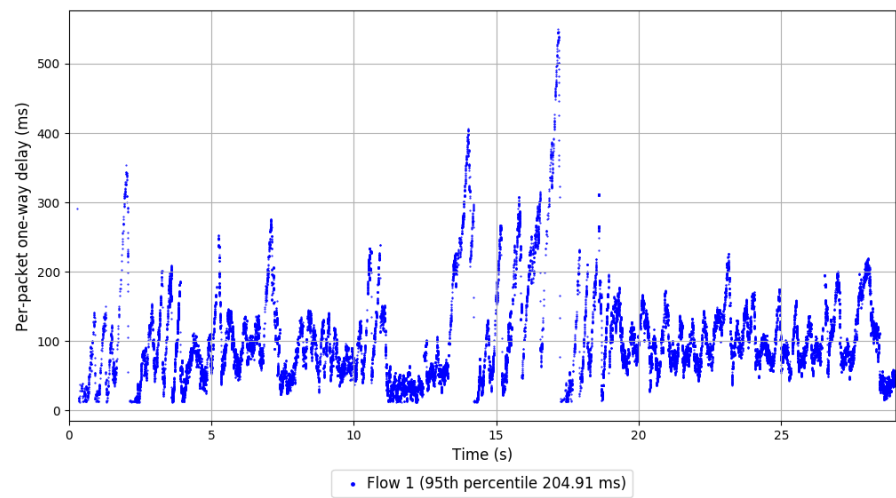
Run 2: Report of Indigo-MusesC5 — Data Link

Flow 1 ingress (mean 8.36 Mbit/s)   Flow 1 egress (mean 8.33 Mbit/s)
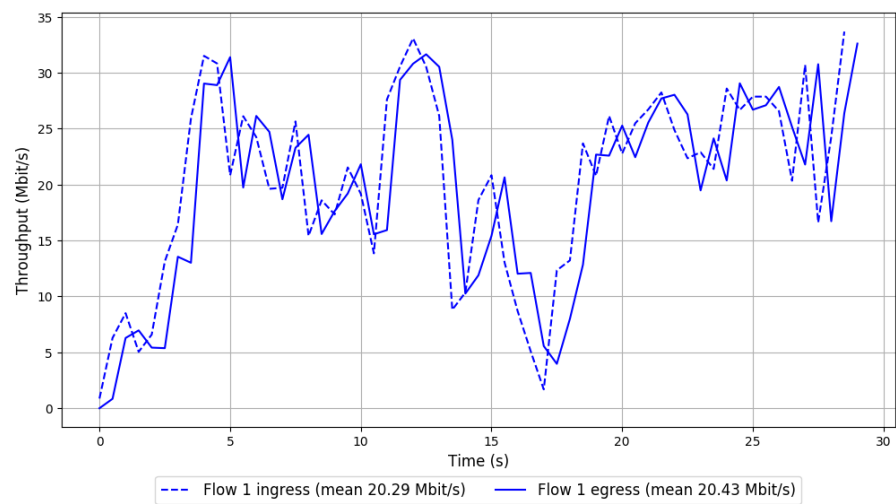

Flow 1 (95th percentile 362.41 ms)

```
Run 3: Statistics of Indigo-MusesC5

Start at: 2019-06-27 01:51:08
End at: 2019-06-27 01:51:38
Local clock offset: -4.052 ms
Remote clock offset: -0.114 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 20.43 Mbit/s
95th percentile per-packet one-way delay: 204.910 ms
Loss rate: 0.35%
-- Flow 1:
Average throughput: 20.43 Mbit/s
95th percentile per-packet one-way delay: 204.910 ms
Loss rate: 0.35%
```

Run 3: Report of Indigo-MusesC5 — Data Link

```
Run 1: Statistics of Indigo-MusesD

Start at: 2019-06-27 01:15:19
End at: 2019-06-27 01:15:49
Local clock offset: -4.776 ms
Remote clock offset: -2.767 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.75 Mbit/s
95th percentile per-packet one-way delay: 100.986 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 8.75 Mbit/s
95th percentile per-packet one-way delay: 100.986 ms
Loss rate: 0.21%
```
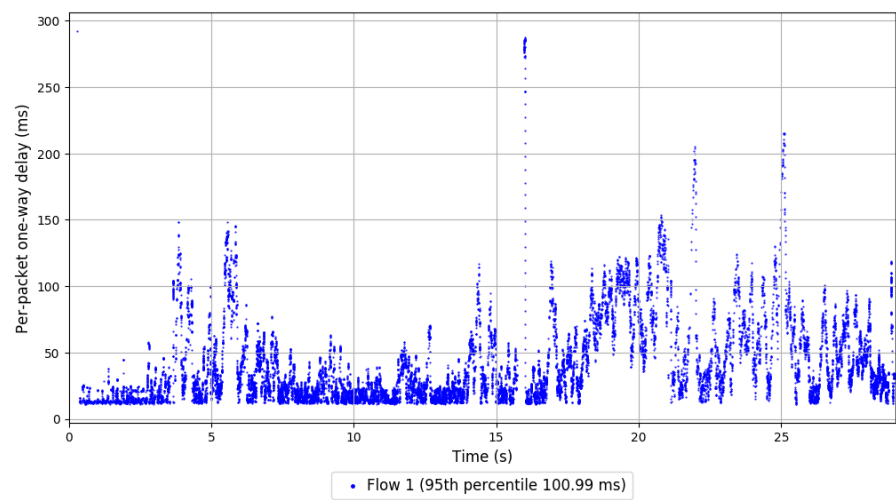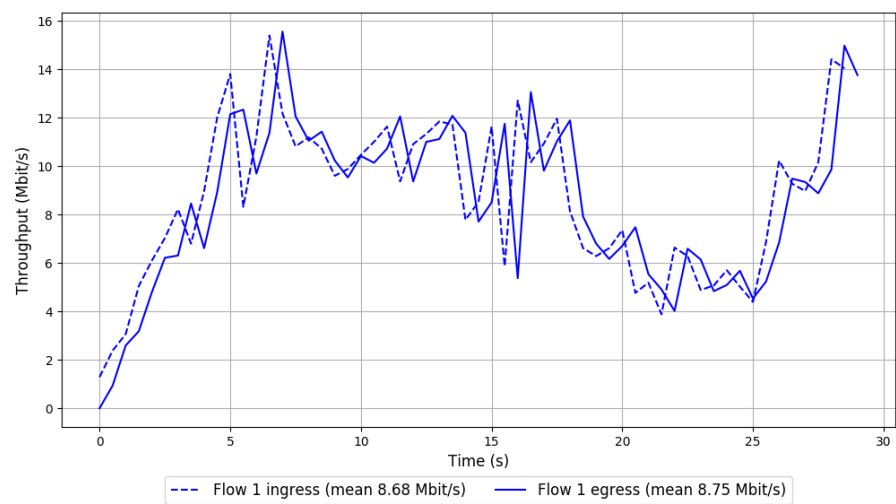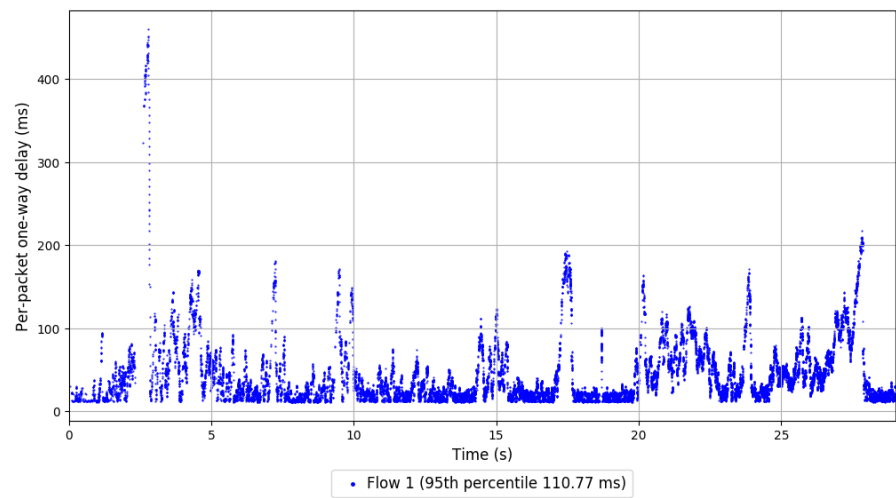
Run 1: Report of Indigo-MusesD — Data Link
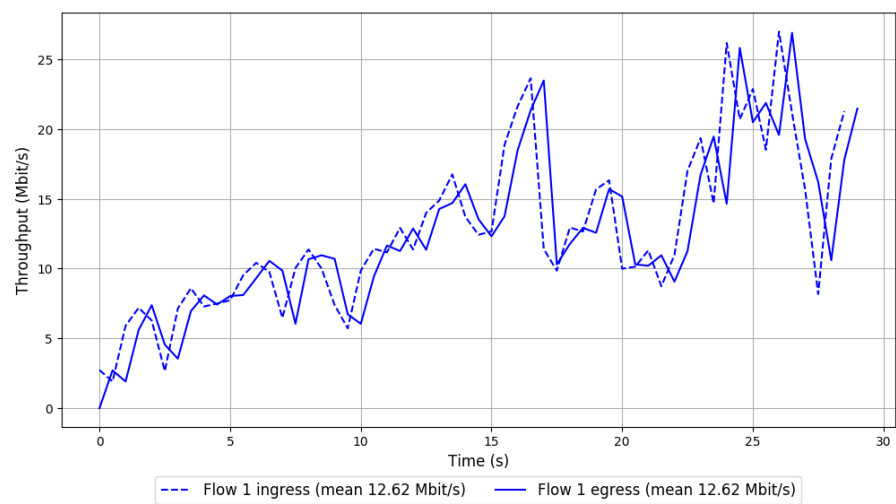

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```
Run 2: Statistics of Indigo-MusesD

Start at: 2019-06-27 01:42:26
End at: 2019-06-27 01:42:56
Local clock offset: -4.279 ms
Remote clock offset: -1.199 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 12.62 Mbit/s
95th percentile per-packet one-way delay: 110.766 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 12.62 Mbit/s
95th percentile per-packet one-way delay: 110.766 ms
Loss rate: 0.08%
```

Run 2: Report of Indigo-MusesD — Data Link

```
Run 3: Statistics of Indigo-MusesD

Start at: 2019-06-27 02:09:39
End at: 2019-06-27 02:10:09
Local clock offset: -1.408 ms
Remote clock offset: -0.377 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.26 Mbit/s
95th percentile per-packet one-way delay: 121.224 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 13.26 Mbit/s
95th percentile per-packet one-way delay: 121.224 ms
Loss rate: 0.11%
```
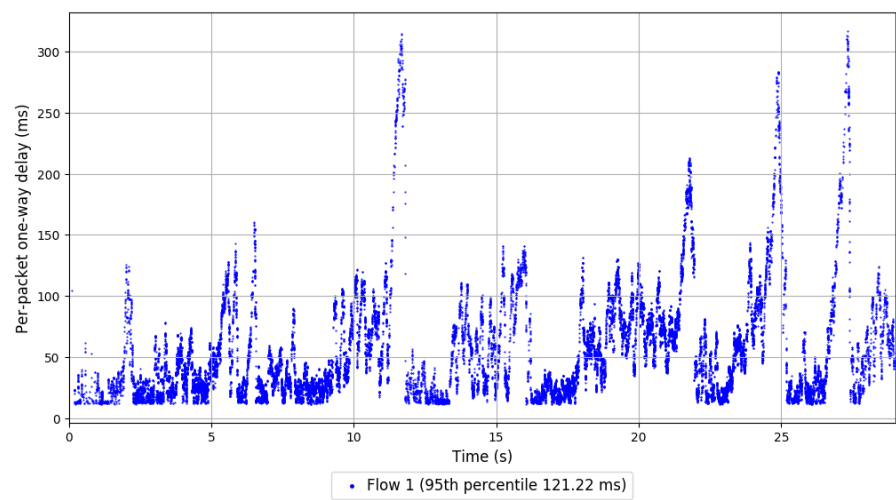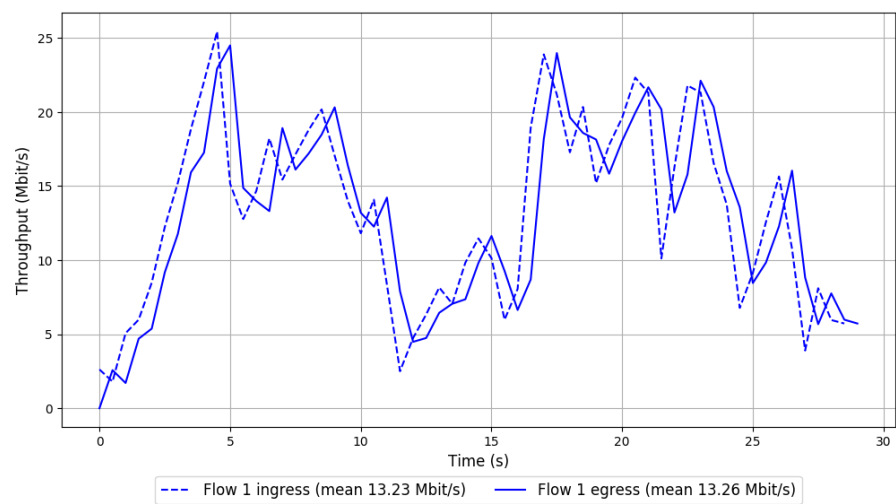
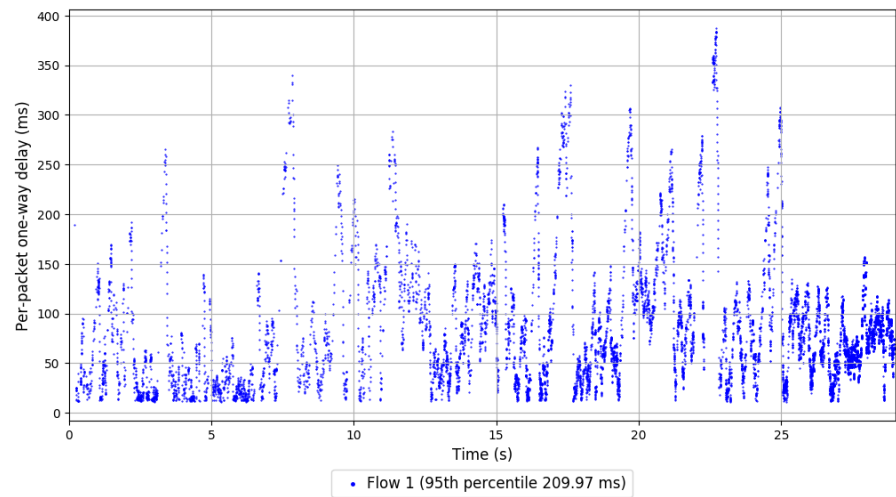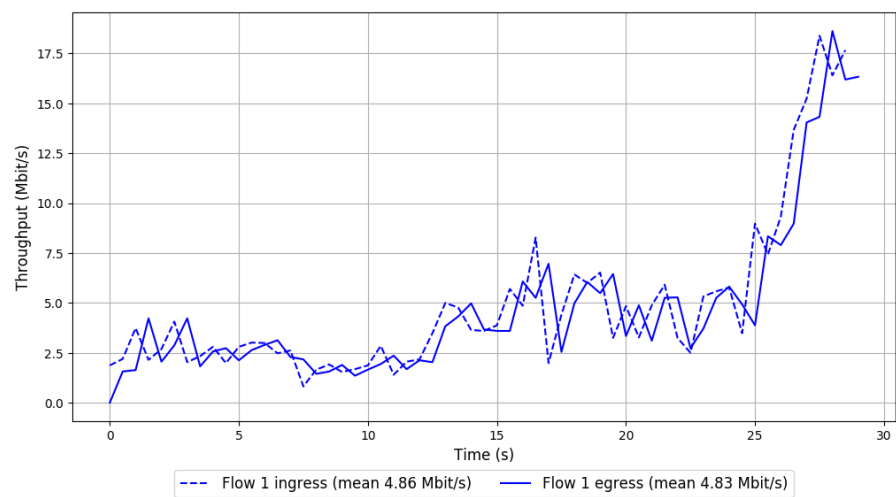# Run 3: Report of Indigo-MusesD — Data Link

```
Run 1: Statistics of Indigo-MusesT

Start at: 2019-06-27 01:06:41
End at: 2019-06-27 01:07:11
Local clock offset: -1.946 ms
Remote clock offset: -1.166 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.83 Mbit/s
95th percentile per-packet one-way delay: 209.969 ms
Loss rate: 1.30%
-- Flow 1:
Average throughput: 4.83 Mbit/s
95th percentile per-packet one-way delay: 209.969 ms
Loss rate: 1.30%
```
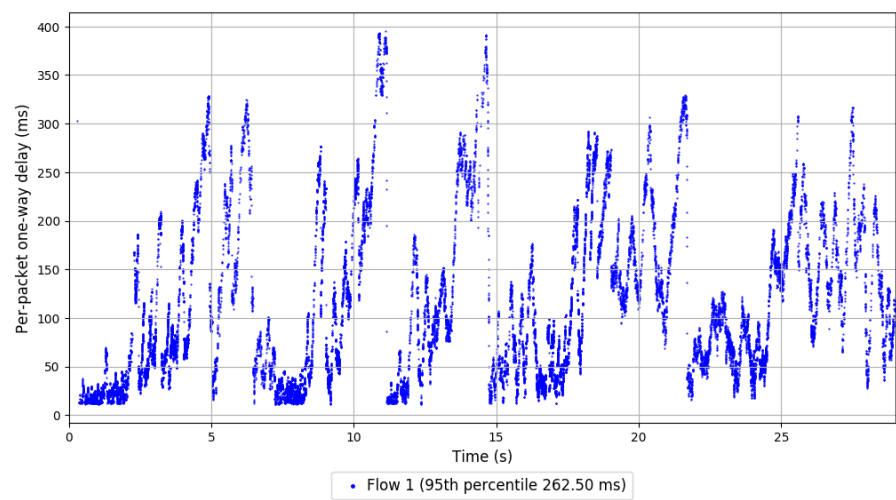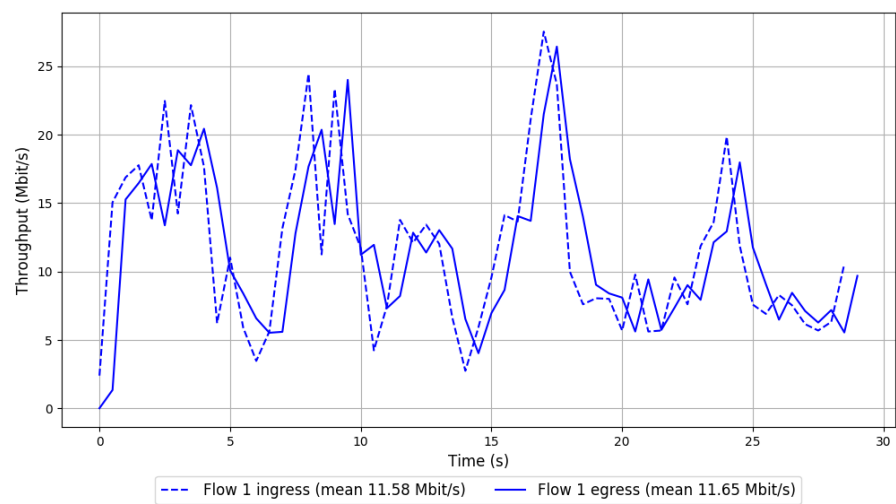
Run 1: Report of Indigo-MusesT — Data Link

```
Run 2: Statistics of Indigo-MusesT

Start at: 2019-06-27 01:33:48
End at: 2019-06-27 01:34:18
Local clock offset: -3.417 ms
Remote clock offset: -3.763 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 11.65 Mbit/s
95th percentile per-packet one-way delay: 262.497 ms
Loss rate: 0.46%
-- Flow 1:
Average throughput: 11.65 Mbit/s
95th percentile per-packet one-way delay: 262.497 ms
Loss rate: 0.46%
```

Run 2: Report of Indigo-MusesT — Data Link

```
Run 3: Statistics of Indigo-MusesT

Start at: 2019-06-27 02:01:00
End at: 2019-06-27 02:01:30
Local clock offset: -1.852 ms
Remote clock offset: 0.285 ms


# Below is generated by plot.py at 2019-06-27 02:14:49
# Datalink statistics
-- Total of 1 flow:
Average throughput: 10.42 Mbit/s
95th percentile per-packet one-way delay: 268.008 ms
Loss rate: 0.34%
-- Flow 1:
Average throughput: 10.42 Mbit/s
95th percentile per-packet one-way delay: 268.008 ms
Loss rate: 0.34%
```
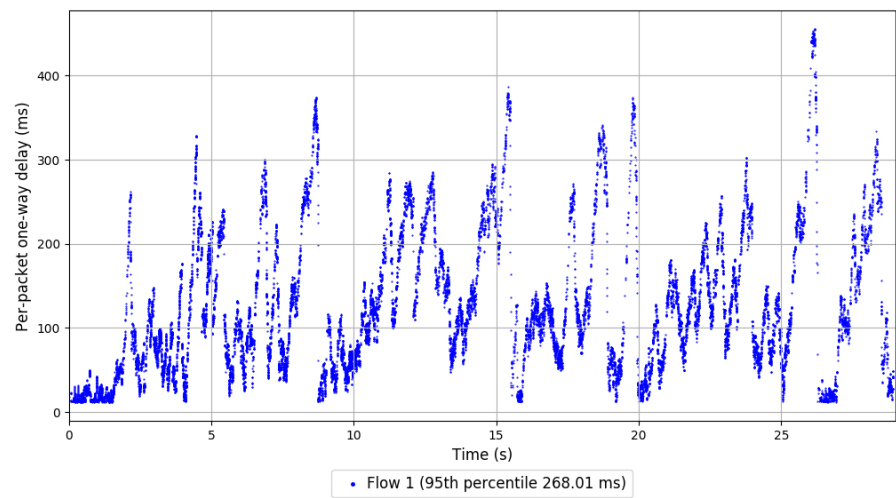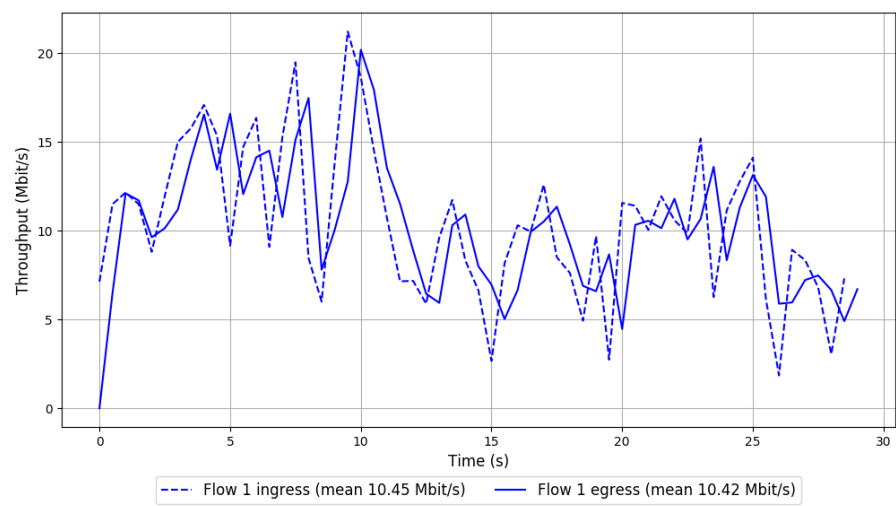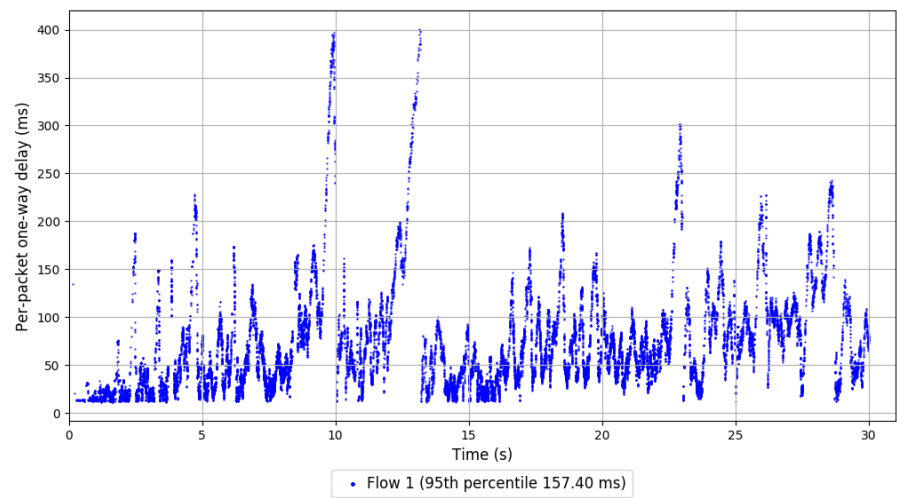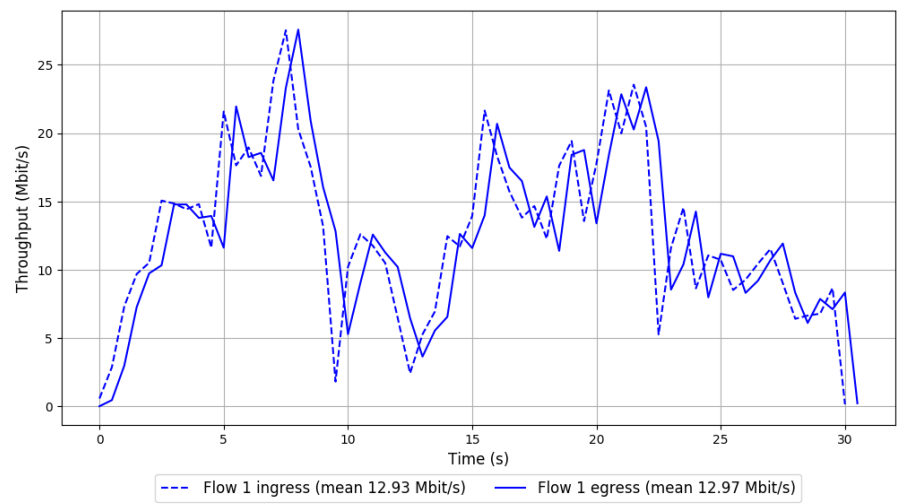
Run 3: Report of Indigo-MusesT — Data Link

```
Run 1: Statistics of LEDBAT

Start at: 2019-06-27 01:09:09
End at: 2019-06-27 01:09:39
Local clock offset: -2.999 ms
Remote clock offset: -1.752 ms

# Below is generated by plot.py at 2019-06-27 02:14:51
# Datalink statistics
-- Total of 1 flow:
Average throughput: 12.97 Mbit/s
95th percentile per-packet one-way delay: 157.397 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 12.97 Mbit/s
95th percentile per-packet one-way delay: 157.397 ms
Loss rate: 0.15%
```
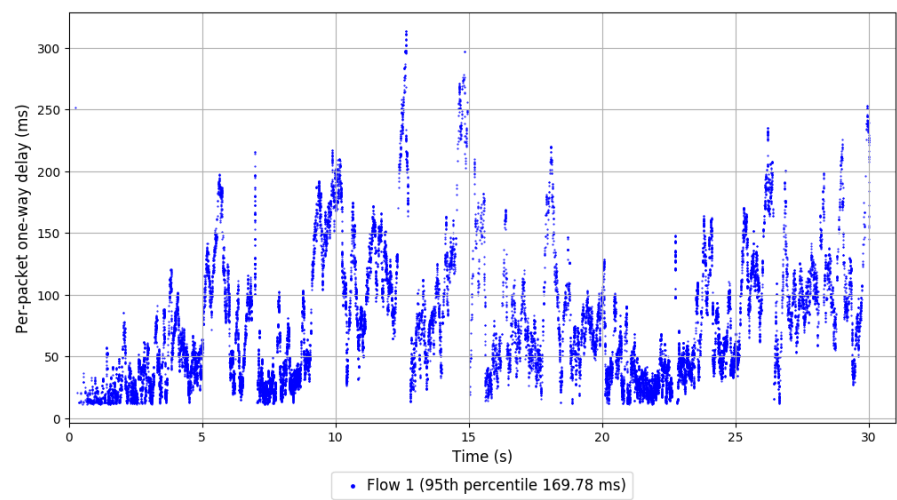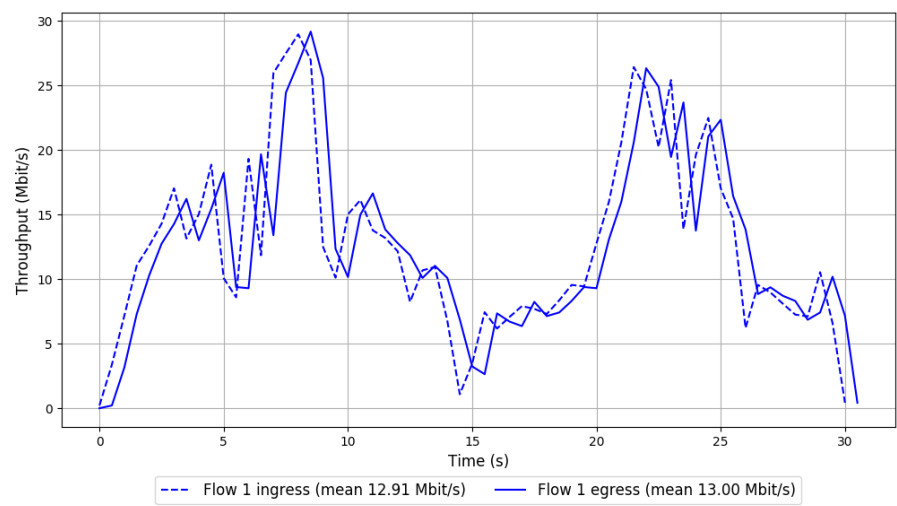
Run 1: Report of LEDBAT — Data Link

```
Run 2: Statistics of LEDBAT

Start at: 2019-06-27 01:36:16
End at: 2019-06-27 01:36:46
Local clock offset: -3.565 ms
Remote clock offset: -2.707 ms


# Below is generated by plot.py at 2019-06-27 02:14:55
# Datalink statistics
-- Total of 1 flow:
Average throughput: 13.00 Mbit/s
95th percentile per-packet one-way delay: 169.785 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 13.00 Mbit/s
95th percentile per-packet one-way delay: 169.785 ms
Loss rate: 0.19%
```

Run 2: Report of LEDBAT — Data Link

```
Run 3: Statistics of LEDBAT

Start at: 2019-06-27 02:03:28
End at: 2019-06-27 02:03:58
Local clock offset: -1.631 ms
Remote clock offset: 0.435 ms


# Below is generated by plot.py at 2019-06-27 02:14:57
# Datalink statistics
-- Total of 1 flow:
Average throughput: 15.15 Mbit/s
95th percentile per-packet one-way delay: 147.112 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 15.15 Mbit/s
95th percentile per-packet one-way delay: 147.112 ms
Loss rate: 0.16%
```
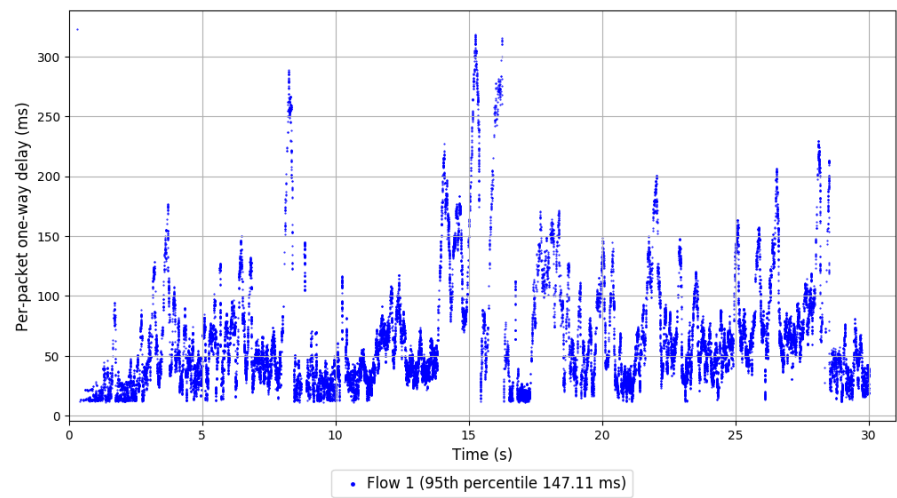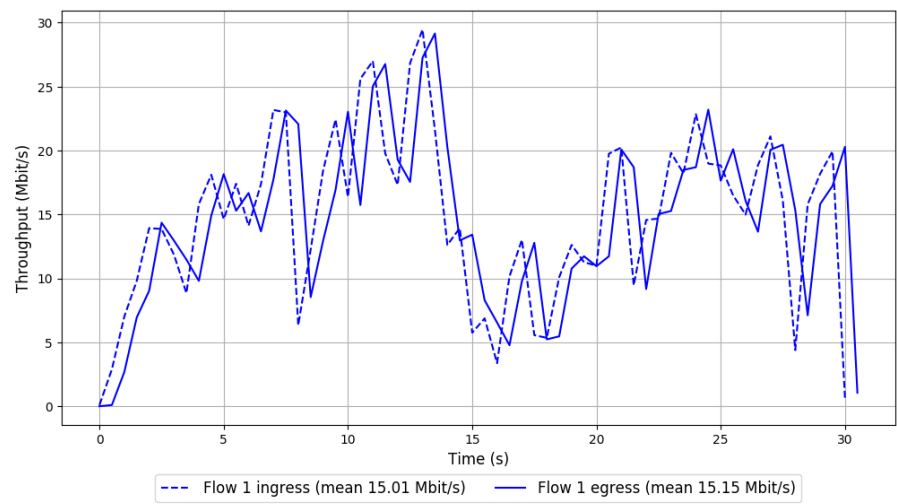
Run 3: Report of LEDBAT — Data Link

Flow 1 ingress (mean 15.01 Mbit/s)   Flow 1 egress (mean 15.15 Mbit/s)

Flow 1 (95th percentile 147.11 ms)

Run 1: Statistics of Muses_DecisionTree

Start at: 2019-06-27 01:12:51
End at: 2019-06-27 01:13:21
Local clock offset: -4.055 ms
Remote clock offset: -2.466 ms

Run 1: Report of Muses_DecisionTree — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of Muses_DecisionTree

Start at: 2019-06-27 01:39:58
End at: 2019-06-27 01:40:28
Local clock offset: -3.959 ms
Remote clock offset: -1.781 ms

Run 2: Report of Muses_DecisionTree — Data Link

Figure is missing

Figure is missing

Run 3: Statistics of Muses_DecisionTree

Start at: 2019-06-27 02:07:11
End at: 2019-06-27 02:07:41
Local clock offset: -1.444 ms
Remote clock offset: 0.572 ms

Run 3: Report of Muses_DecisionTree — Data Link

Figure is missing

Figure is missing

```
Run 1: Statistics of PCC-Allegro

Start at: 2019-06-27 01:03:00
End at: 2019-06-27 01:03:30
Local clock offset: -0.835 ms
Remote clock offset: -0.009 ms


# Below is generated by plot.py at 2019-06-27 02:14:57
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.91 Mbit/s
95th percentile per-packet one-way delay: 1014.882 ms
Loss rate: 3.23%
-- Flow 1:
Average throughput: 3.91 Mbit/s
95th percentile per-packet one-way delay: 1014.882 ms
Loss rate: 3.23%
```
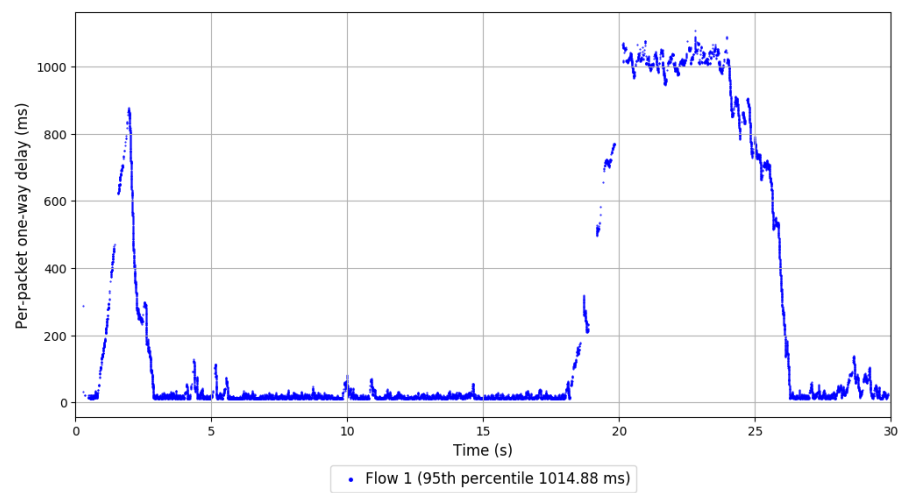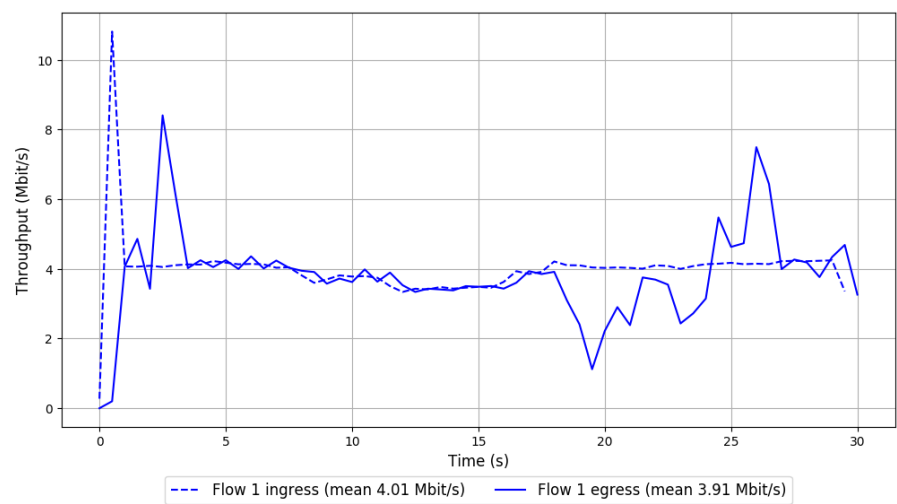
Run 1: Report of PCC-Allegro — Data Link

```
Run 2: Statistics of PCC-Allegro

Start at: 2019-06-27 01:30:07
End at: 2019-06-27 01:30:37
Local clock offset: -3.294 ms
Remote clock offset: -4.024 ms


# Below is generated by plot.py at 2019-06-27 02:14:57
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.10 Mbit/s
95th percentile per-packet one-way delay: 605.731 ms
Loss rate: 0.79%
-- Flow 1:
Average throughput: 8.10 Mbit/s
95th percentile per-packet one-way delay: 605.731 ms
Loss rate: 0.79%
```
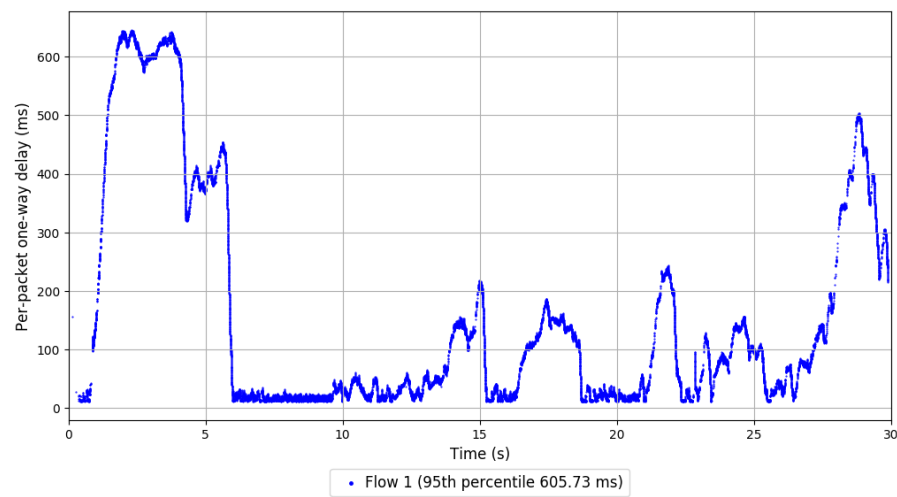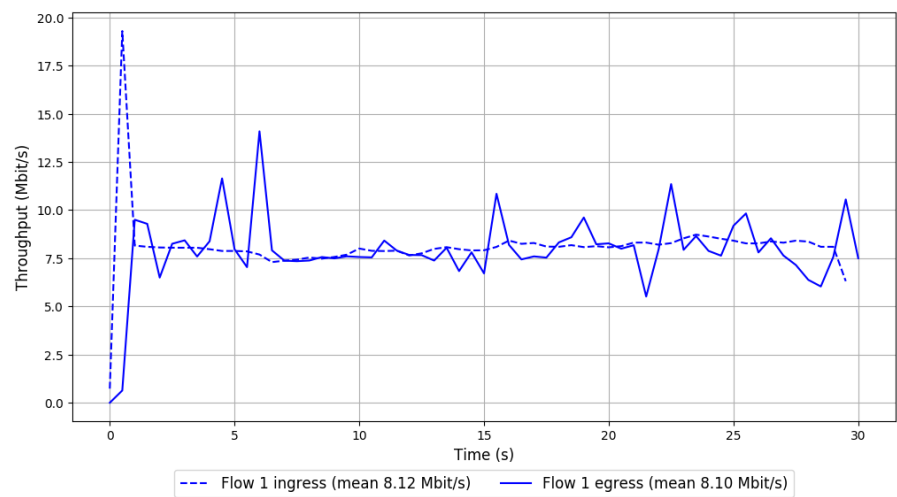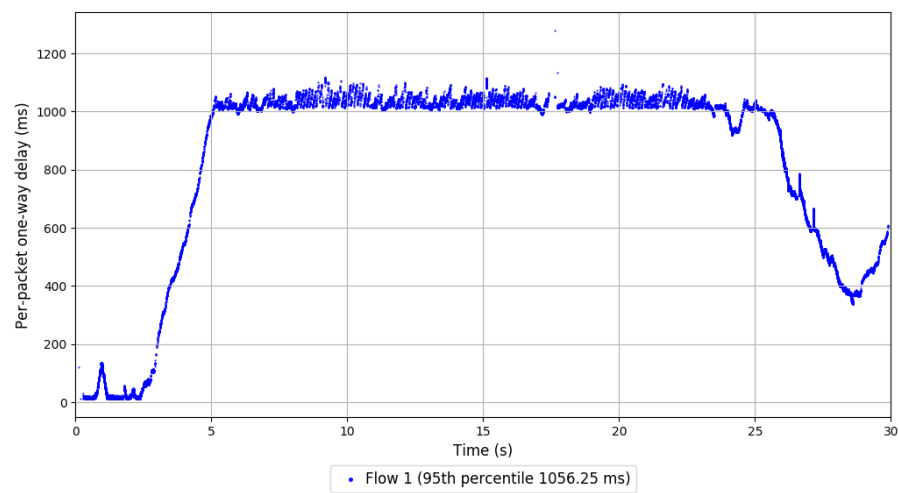
Run 2: Report of PCC-Allegro — Data Link

Flow 1 ingress (mean 8.12 Mbit/s) —— Flow 1 egress (mean 8.10 Mbit/s)

• Flow 1 (95th percentile 605.73 ms)

```
Run 3: Statistics of PCC-Allegro

Start at: 2019-06-27 01:57:18
End at: 2019-06-27 01:57:49
Local clock offset: -2.412 ms
Remote clock offset: 0.202 ms


# Below is generated by plot.py at 2019-06-27 02:15:03
# Datalink statistics
-- Total of 1 flow:
Average throughput: 12.12 Mbit/s
95th percentile per-packet one-way delay: 1056.248 ms
Loss rate: 29.64%
-- Flow 1:
Average throughput: 12.12 Mbit/s
95th percentile per-packet one-way delay: 1056.248 ms
Loss rate: 29.64%
```
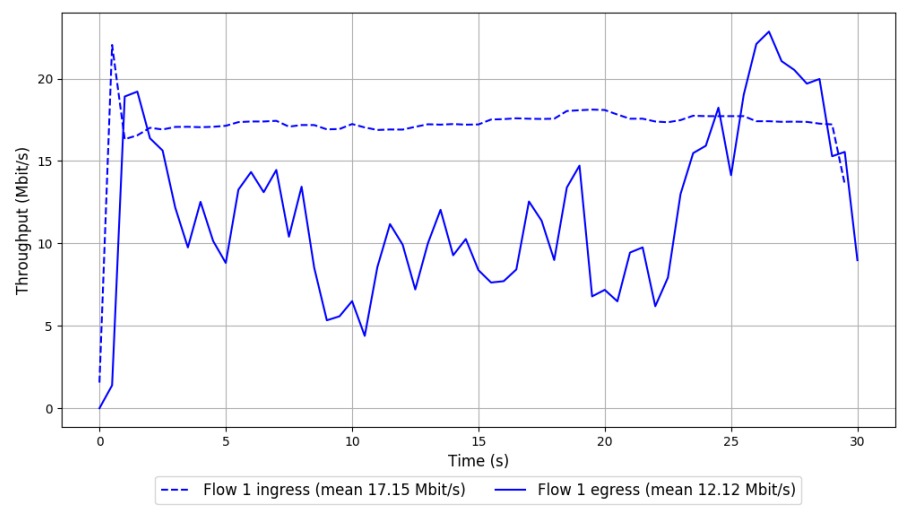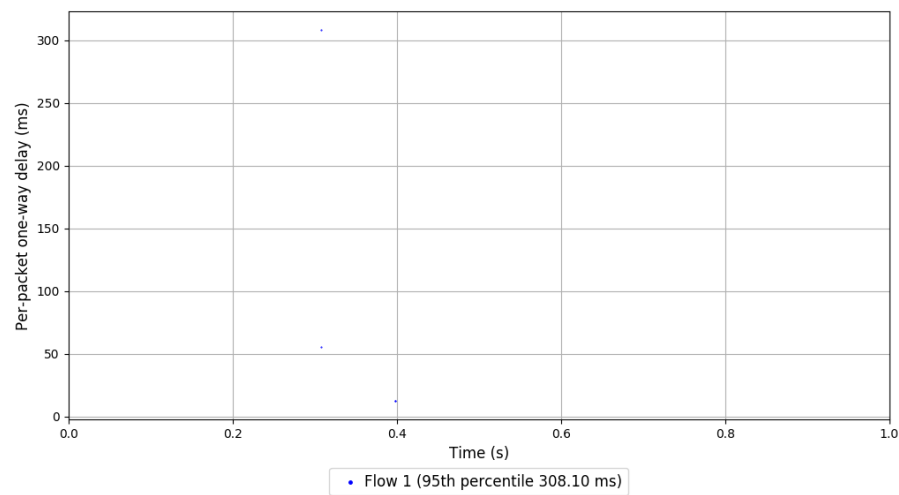
Run 3: Report of PCC-Allegro — Data Link
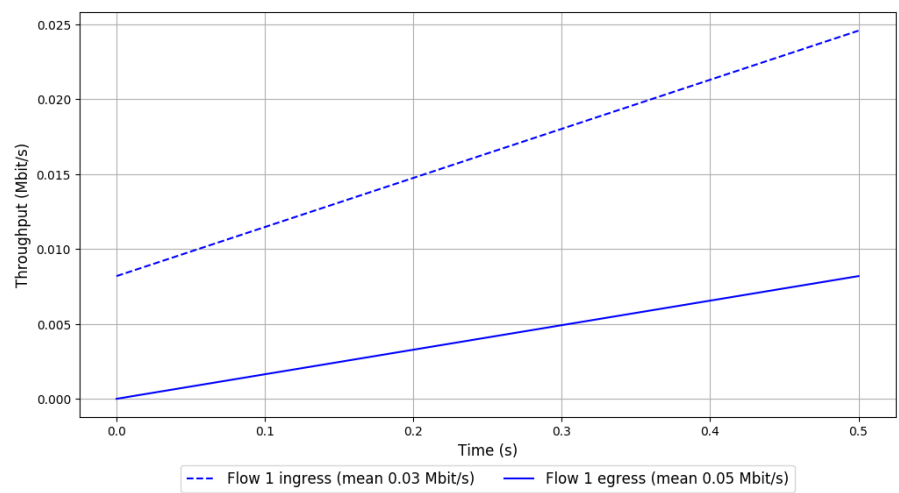

Flow 1 ingress (mean 17.15 Mbit/s)   Flow 1 egress (mean 12.12 Mbit/s)

Flow 1 (95th percentile 1056.25 ms)

```
Run 1: Statistics of PCC-Expr

Start at: 2019-06-27 01:05:28
End at: 2019-06-27 01:05:58
Local clock offset: -1.412 ms
Remote clock offset: -0.856 ms
```

Run 1: Report of PCC-Expr — Data Link

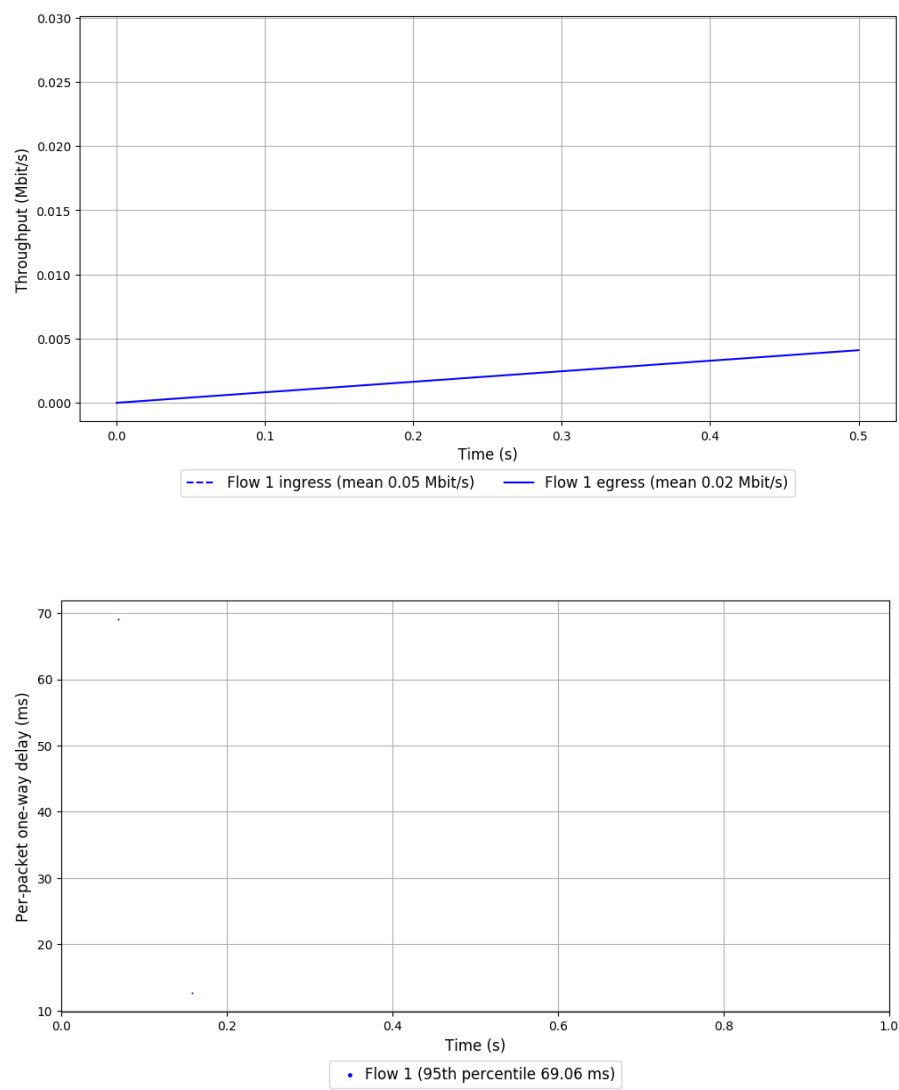Flow 1 ingress (mean 0.03 Mbit/s) --- Flow 1 egress (mean 0.05 Mbit/s)

Flow 1 (95th percentile 308.10 ms)

```
Run 2: Statistics of PCC-Expr

Start at: 2019-06-27 01:32:35
End at: 2019-06-27 01:33:05
Local clock offset: -3.352 ms
Remote clock offset: -4.095 ms
```

Run 2: Report of PCC-Expr — Data Link

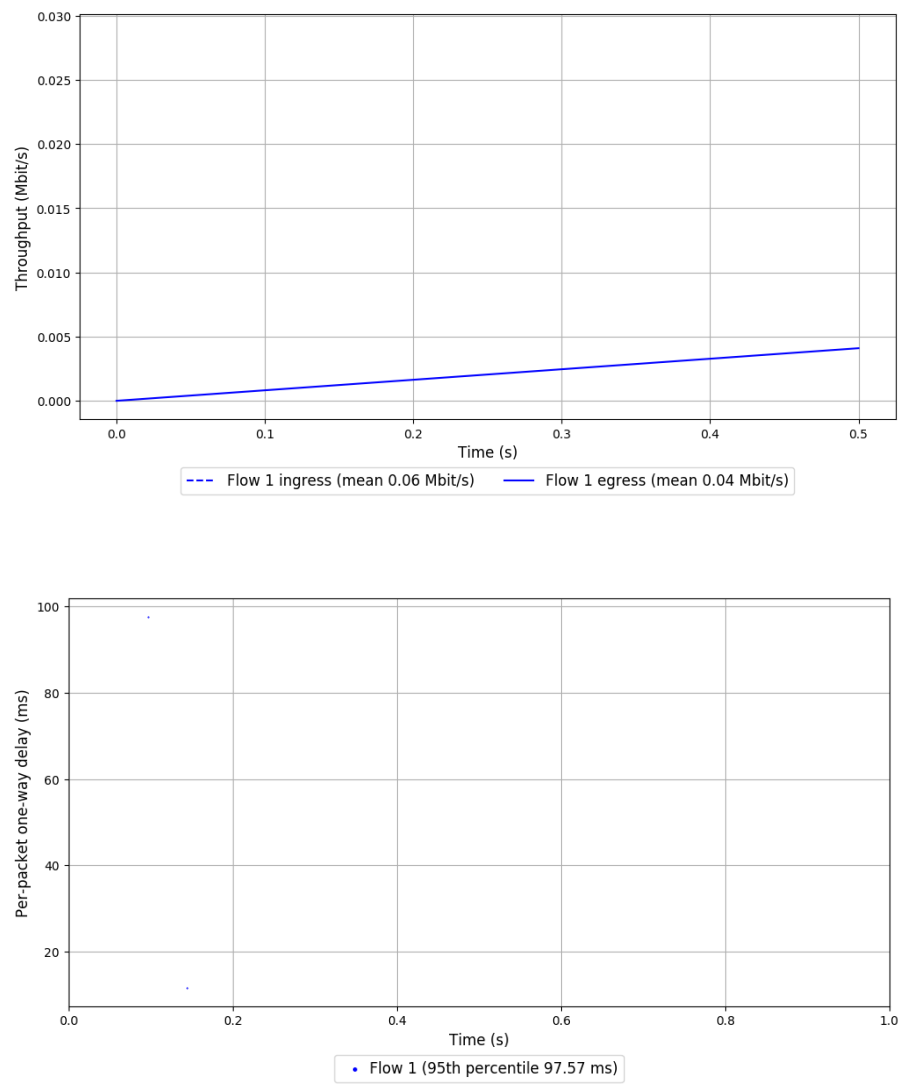Flow 1 ingress (mean 0.05 Mbit/s) —— Flow 1 egress (mean 0.02 Mbit/s)

• Flow 1 (95th percentile 69.06 ms)

Run 3: Statistics of PCC-Expr

Start at: 2019-06-27 01:59:47
End at: 2019-06-27 02:00:17
Local clock offset: -2.015 ms
Remote clock offset: 0.303 ms

Run 3: Report of PCC-Expr — Data Link

```
Run 1: Statistics of QUIC Cubic

Start at: 2019-06-27 00:53:09
End at: 2019-06-27 00:53:39
Local clock offset: -0.624 ms
Remote clock offset: 1.665 ms


# Below is generated by plot.py at 2019-06-27 02:15:03
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.16 Mbit/s
95th percentile per-packet one-way delay: 297.410 ms
Loss rate: 0.82%
-- Flow 1:
Average throughput: 5.16 Mbit/s
95th percentile per-packet one-way delay: 297.410 ms
Loss rate: 0.82%
```
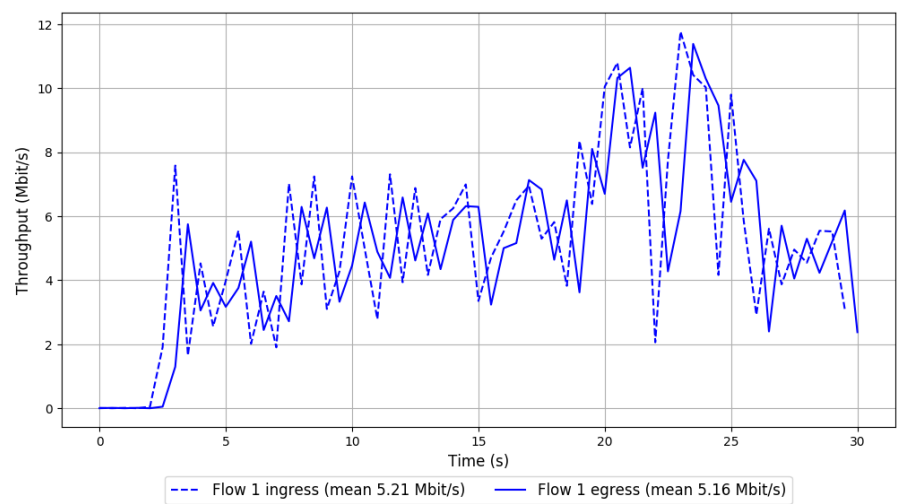
Run 1: Report of QUIC Cubic — Data Link

```
Run 2: Statistics of QUIC Cubic

Start at: 2019-06-27 01:20:15
End at: 2019-06-27 01:20:45
Local clock offset: -4.865 ms
Remote clock offset: -3.289 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 16.76 Mbit/s
95th percentile per-packet one-way delay: 245.021 ms
Loss rate: 0.27%
-- Flow 1:
Average throughput: 16.76 Mbit/s
95th percentile per-packet one-way delay: 245.021 ms
Loss rate: 0.27%
```
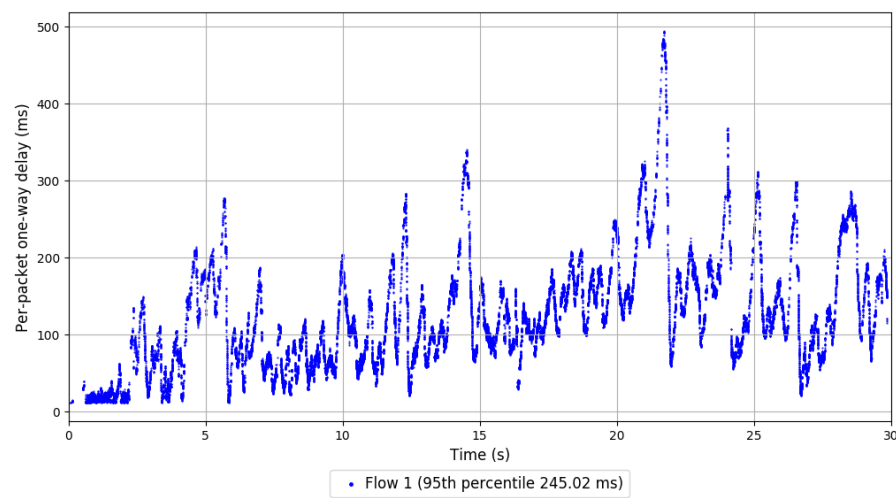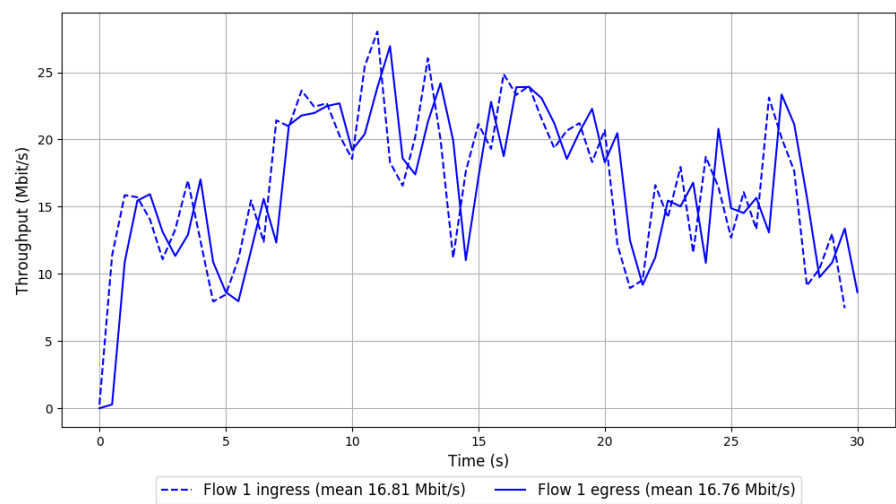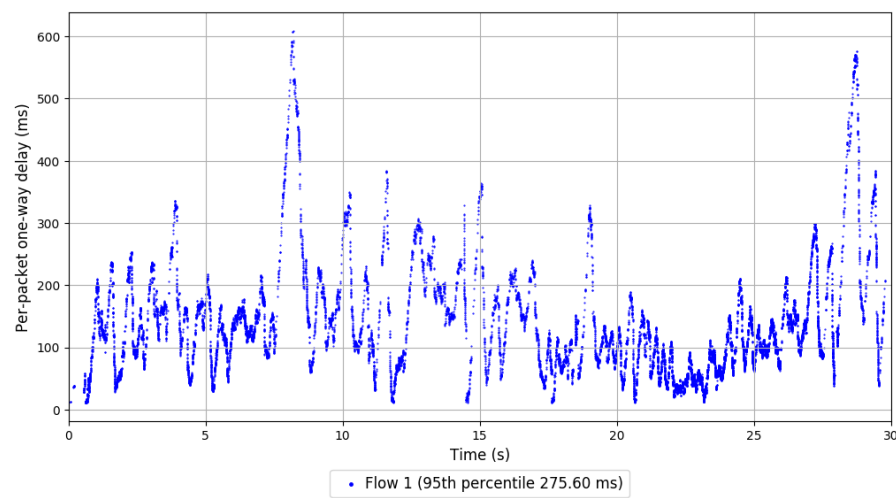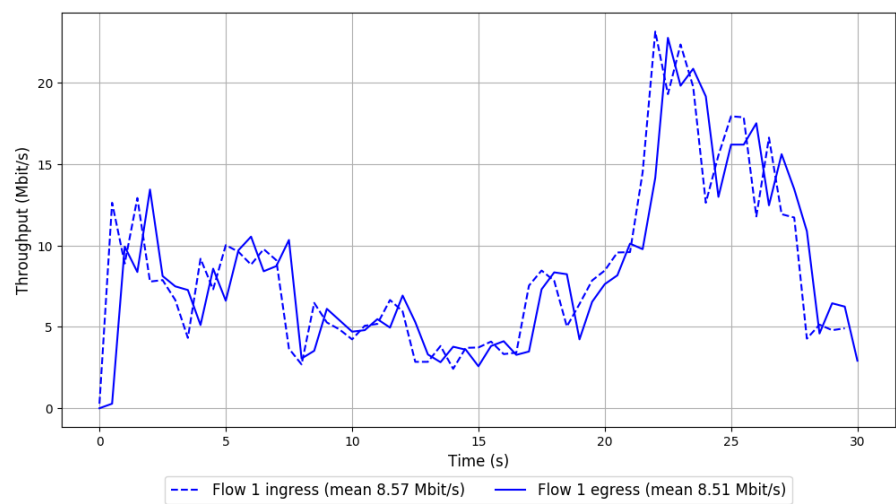
Run 2: Report of QUIC Cubic — Data Link

```
Run 3: Statistics of QUIC Cubic

Start at: 2019-06-27 01:47:27
End at: 2019-06-27 01:47:57
Local clock offset: -4.919 ms
Remote clock offset: -0.571 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.51 Mbit/s
95th percentile per-packet one-way delay: 275.601 ms
Loss rate: 0.74%
-- Flow 1:
Average throughput: 8.51 Mbit/s
95th percentile per-packet one-way delay: 275.601 ms
Loss rate: 0.74%
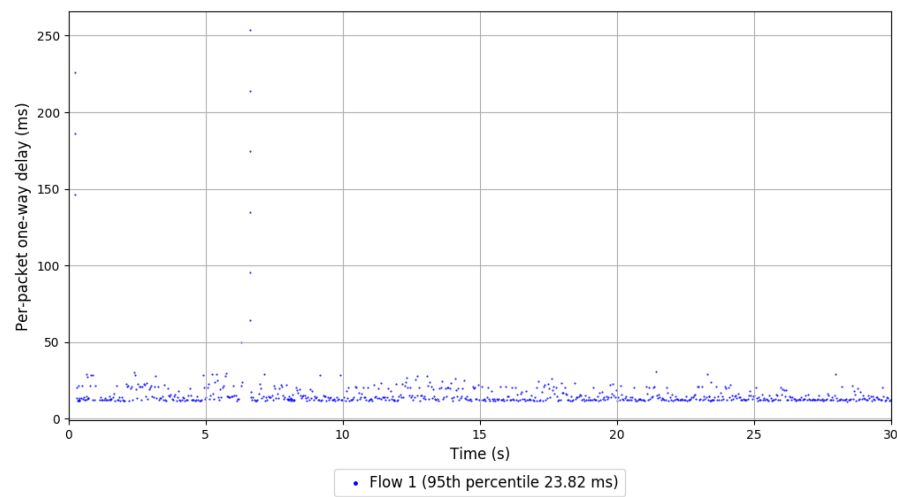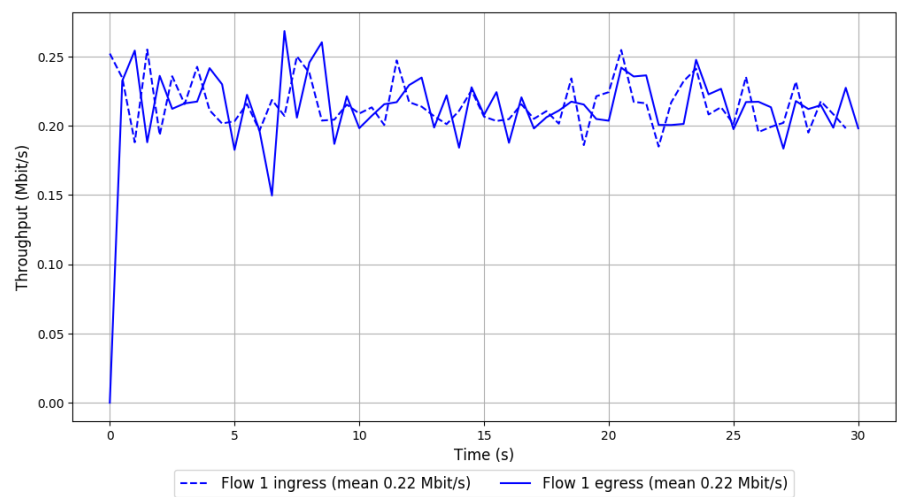```

Run 3: Report of QUIC Cubic — Data Link

```
Run 1: Statistics of SCReAM

Start at: 2019-06-27 00:59:18
End at: 2019-06-27 00:59:48
Local clock offset: 0.706 ms
Remote clock offset: 1.878 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 23.825 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 23.825 ms
Loss rate: 0.00%
```

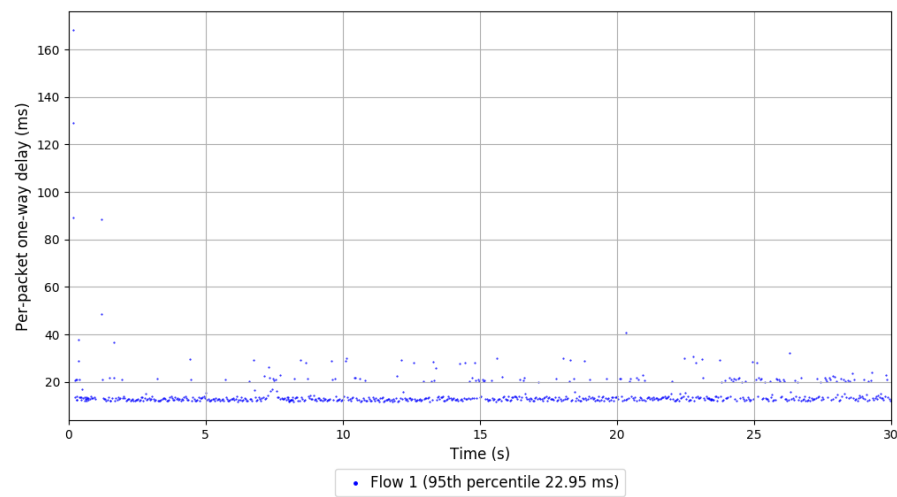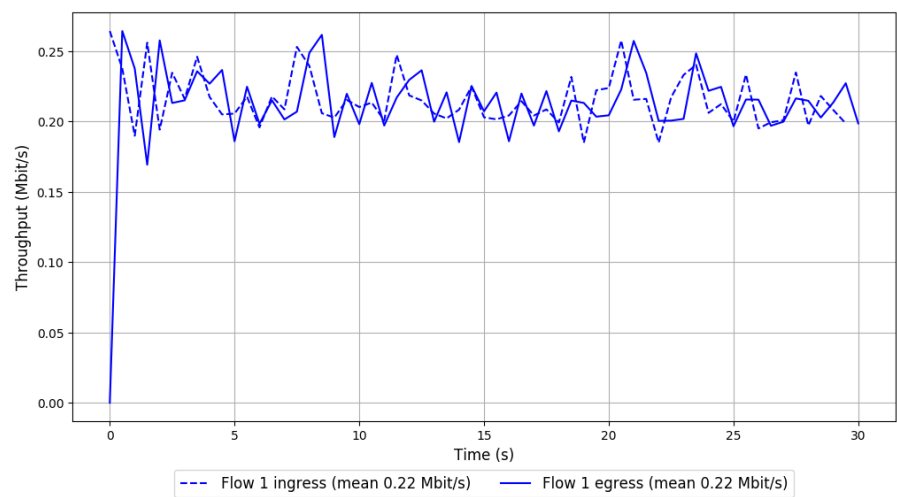Run 1: Report of SCReAM — Data Link

```
Run 2: Statistics of SCReAM

Start at: 2019-06-27 01:26:24
End at: 2019-06-27 01:26:54
Local clock offset: -3.538 ms
Remote clock offset: -3.664 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 22.947 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 22.947 ms
Loss rate: 0.00%
```

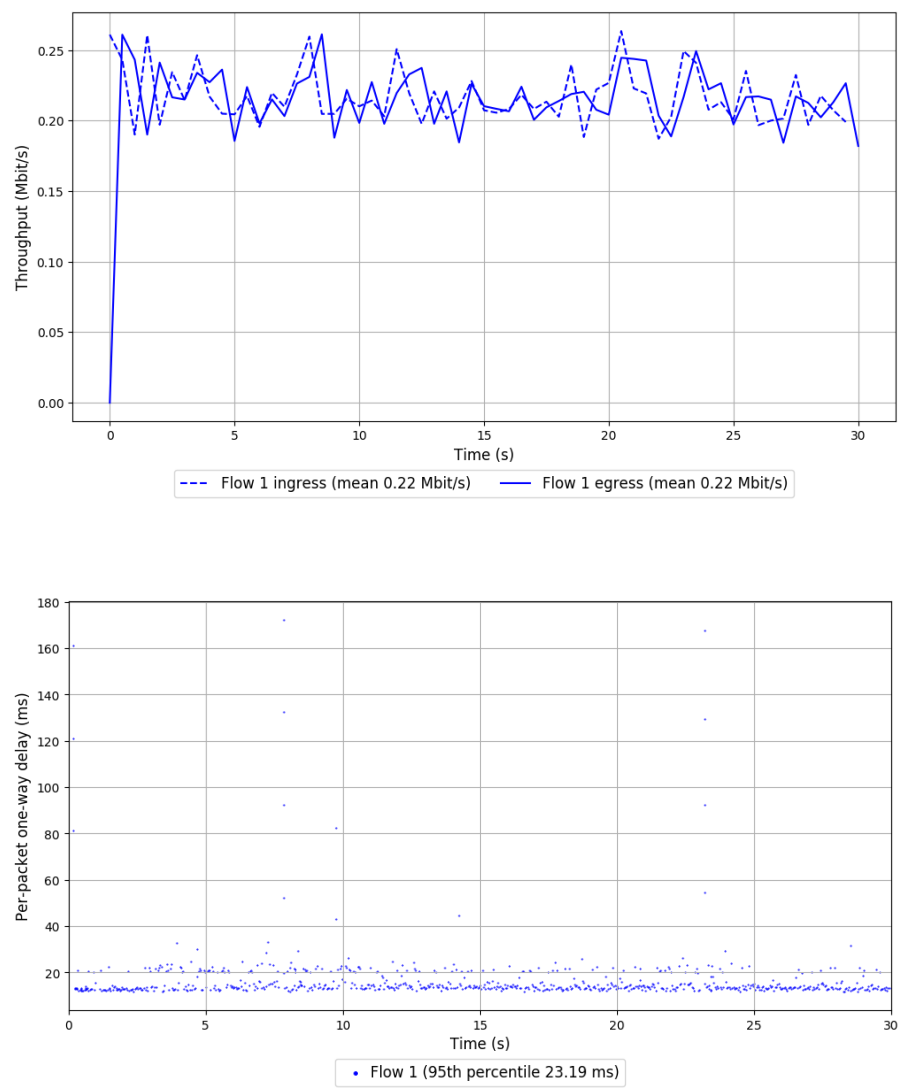Run 2: Report of SCReAM — Data Link

```
Run 3: Statistics of SCReAM

Start at: 2019-06-27 01:53:37
End at: 2019-06-27 01:54:07
Local clock offset: -3.208 ms
Remote clock offset: -0.024 ms

# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 23.187 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 23.187 ms
Loss rate: 0.13%
```

Run 3: Report of SCReAM — Data Link

```
Run 1: Statistics of Sprout

Start at: 2019-06-27 01:07:55
End at: 2019-06-27 01:08:25
Local clock offset: -2.45 ms
Remote clock offset: -1.449 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 8.79 Mbit/s
95th percentile per-packet one-way delay: 89.952 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 8.79 Mbit/s
95th percentile per-packet one-way delay: 89.952 ms
Loss rate: 0.06%
```
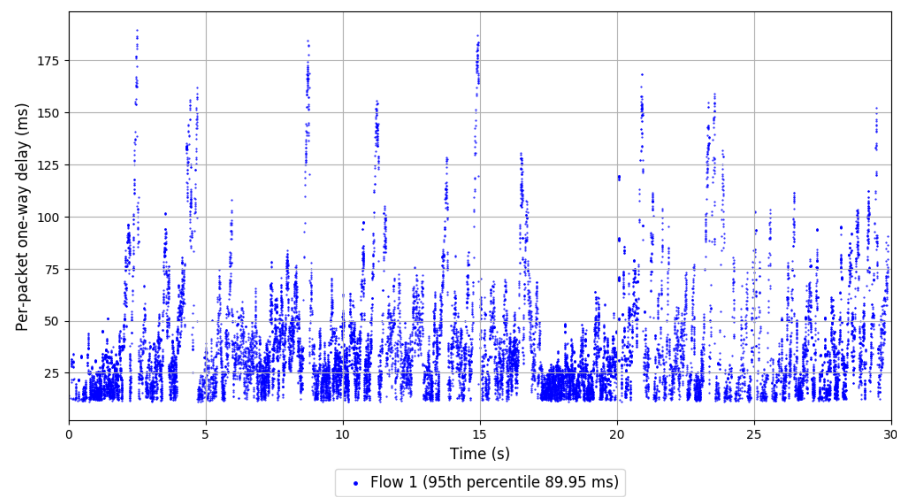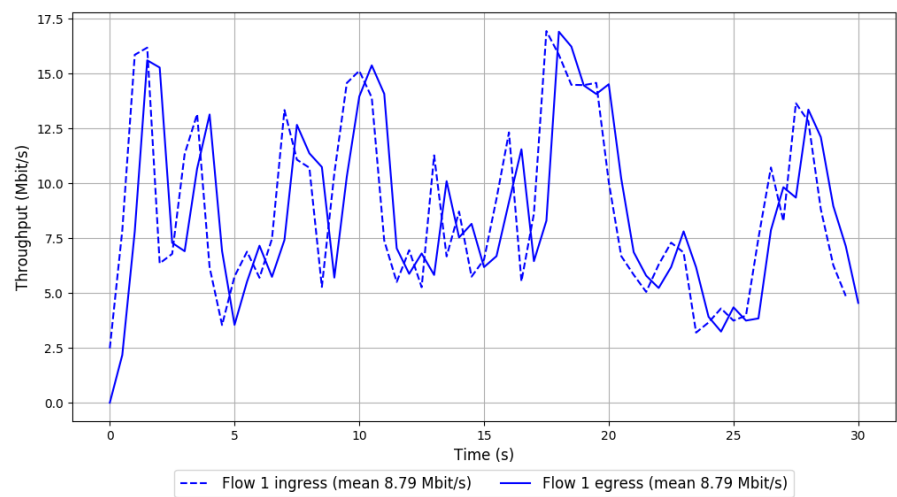
Run 1: Report of Sprout — Data Link

Flow 1 ingress (mean 8.79 Mbit/s)   Flow 1 egress (mean 8.79 Mbit/s)

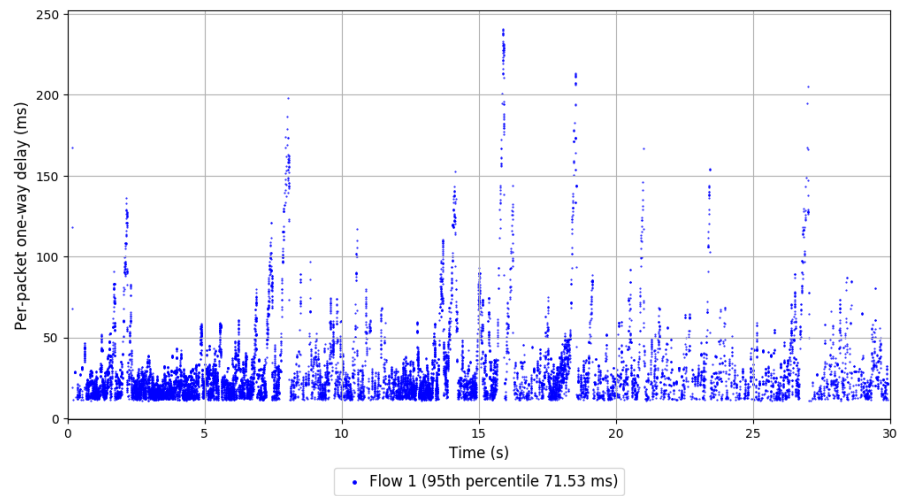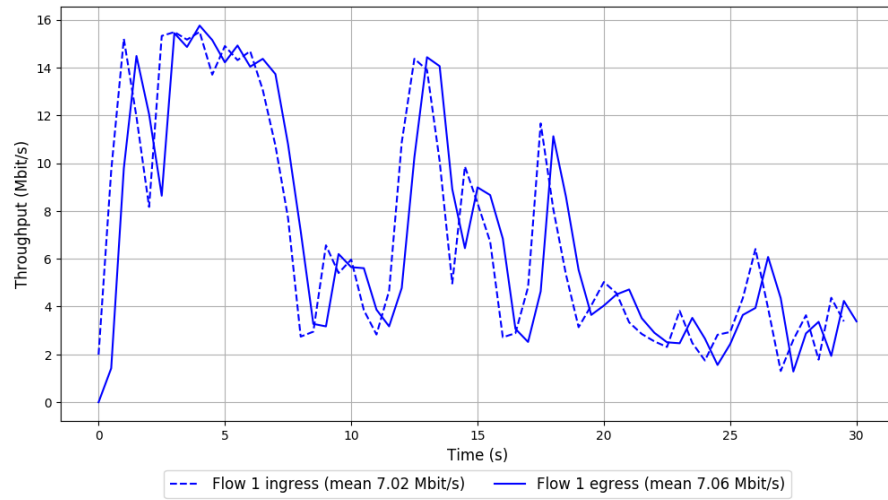Flow 1 (95th percentile 89.95 ms)

```
Run 2: Statistics of Sprout

Start at: 2019-06-27 01:35:02
End at: 2019-06-27 01:35:32
Local clock offset: -3.503 ms
Remote clock offset: -3.246 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.06 Mbit/s
95th percentile per-packet one-way delay: 71.533 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 7.06 Mbit/s
95th percentile per-packet one-way delay: 71.533 ms
Loss rate: 0.08%
```

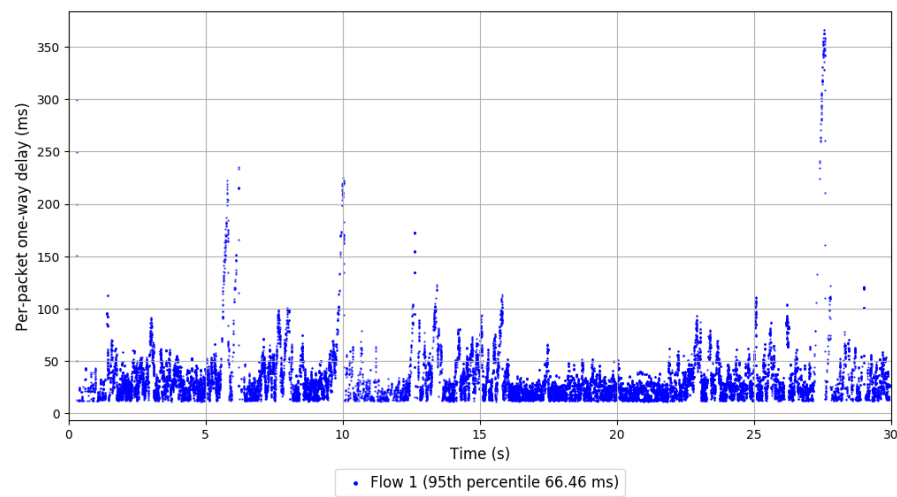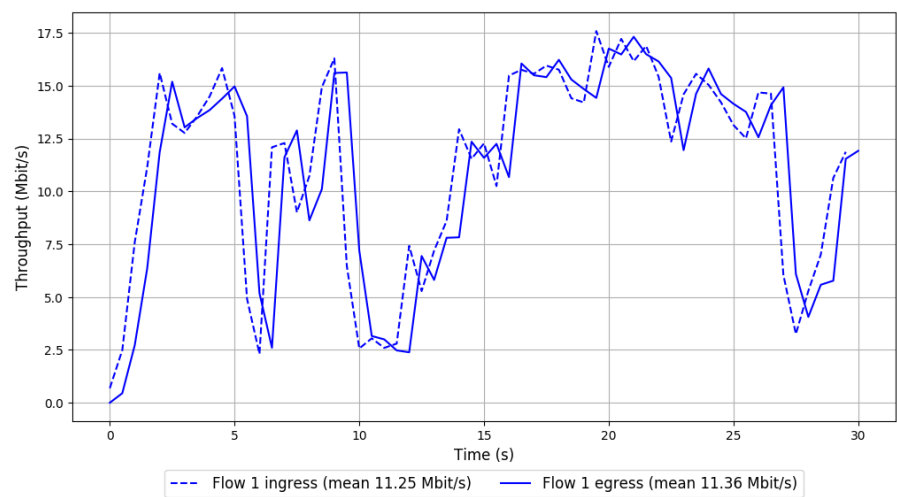Run 2: Report of Sprout — Data Link

```
Run 3: Statistics of Sprout

Start at: 2019-06-27 02:02:14
End at: 2019-06-27 02:02:44
Local clock offset: -1.732 ms
Remote clock offset: 0.419 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 11.36 Mbit/s
95th percentile per-packet one-way delay: 66.461 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 11.36 Mbit/s
95th percentile per-packet one-way delay: 66.461 ms
Loss rate: 0.05%
```

Run 3: Report of Sprout — Data Link
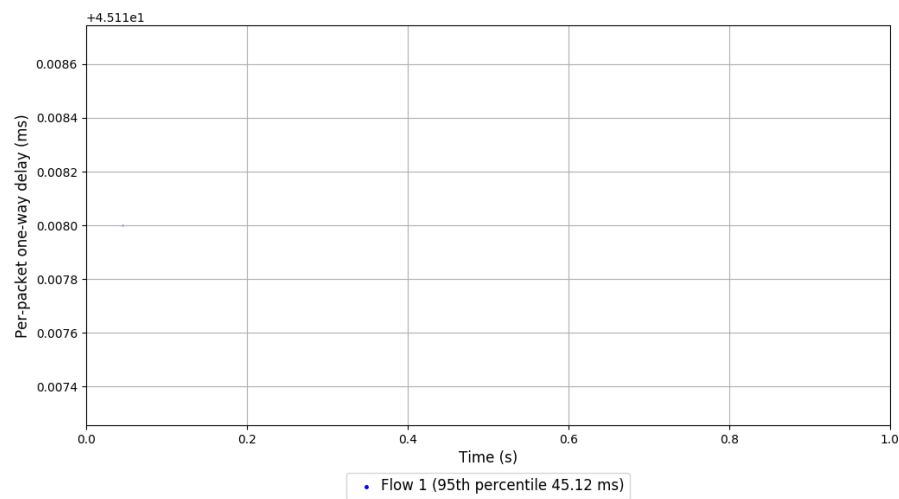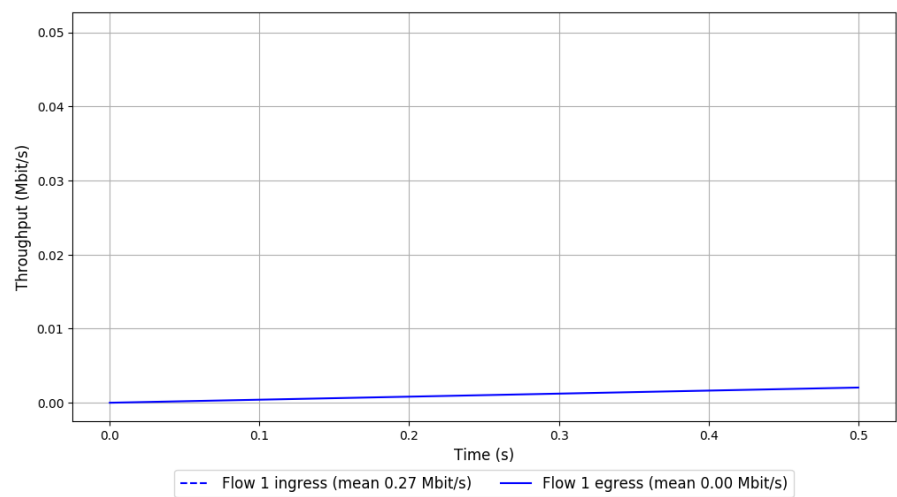
```
Run 1: Statistics of TaoVA-100x

Start at: 2019-06-27 01:11:37
End at: 2019-06-27 01:12:07
Local clock offset: -3.749 ms
Remote clock offset: -2.305 ms
```

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

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

Start at: 2019-06-27 01:38:44
End at: 2019-06-27 01:39:14
Local clock offset: -3.83 ms
Remote clock offset: -1.998 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 4.96 Mbit/s
95th percentile per-packet one-way delay: 49.823 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 4.96 Mbit/s
95th percentile per-packet one-way delay: 49.823 ms
Loss rate: 0.03%
```
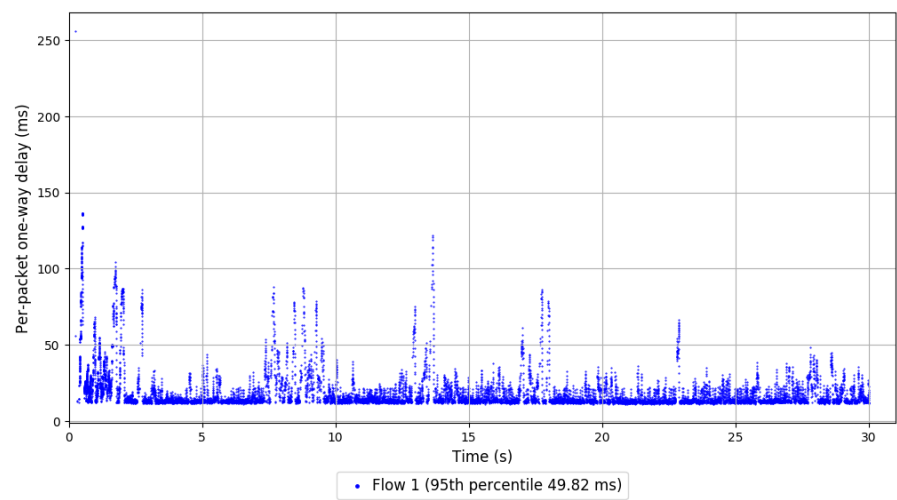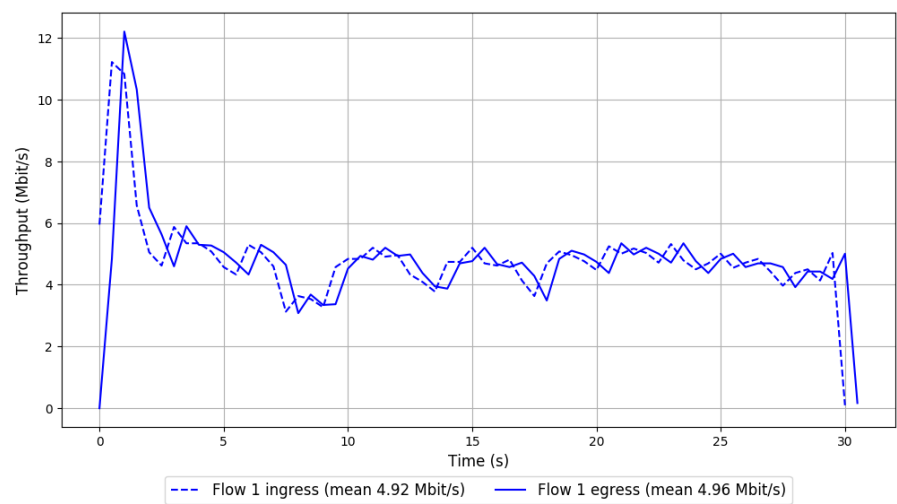
Run 2: Report of TaoVA-100x — Data Link

Flow 1 ingress (mean 4.92 Mbit/s)   Flow 1 egress (mean 4.96 Mbit/s)

Flow 1 (95th percentile 49.82 ms)

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

Start at: 2019-06-27 02:05:57
End at: 2019-06-27 02:06:27
Local clock offset: -1.463 ms
Remote clock offset: 0.42 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 5.67 Mbit/s
95th percentile per-packet one-way delay: 32.594 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 5.67 Mbit/s
95th percentile per-packet one-way delay: 32.594 ms
Loss rate: 0.03%
```
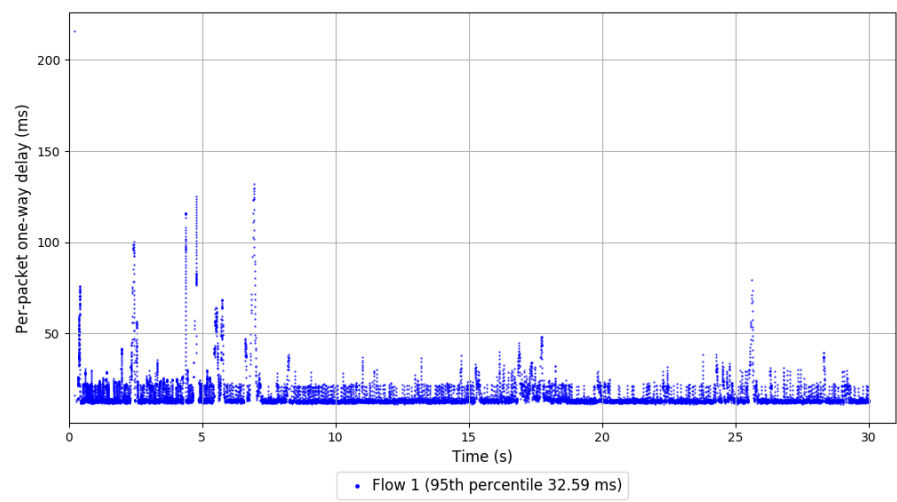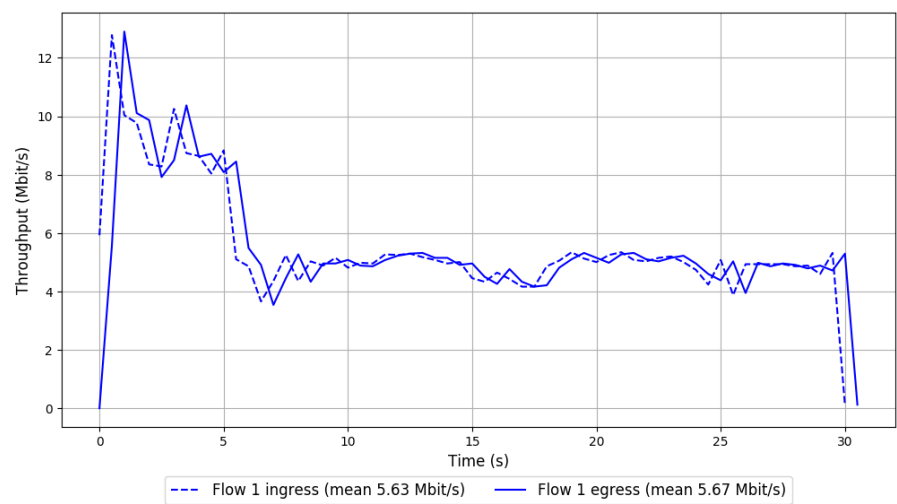
Run 3: Report of TaoVA-100x — Data Link

Flow 1 ingress (mean 5.63 Mbit/s) --- Flow 1 egress (mean 5.67 Mbit/s)

Flow 1 (95th percentile 32.59 ms)

```
Run 1: Statistics of TCP Vegas

Start at: 2019-06-27 00:54:23
End at: 2019-06-27 00:54:53
Local clock offset: 1.849 ms
Remote clock offset: 1.728 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.89 Mbit/s
95th percentile per-packet one-way delay: 105.550 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 2.89 Mbit/s
95th percentile per-packet one-way delay: 105.550 ms
Loss rate: 0.04%
```
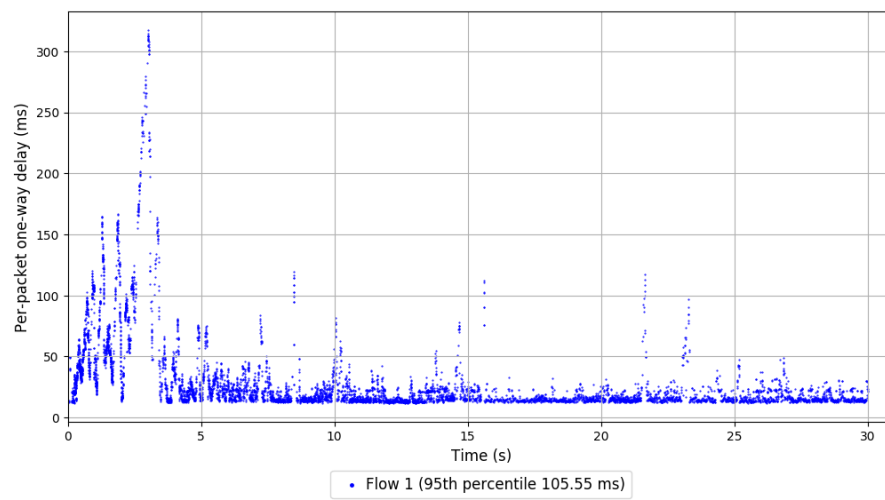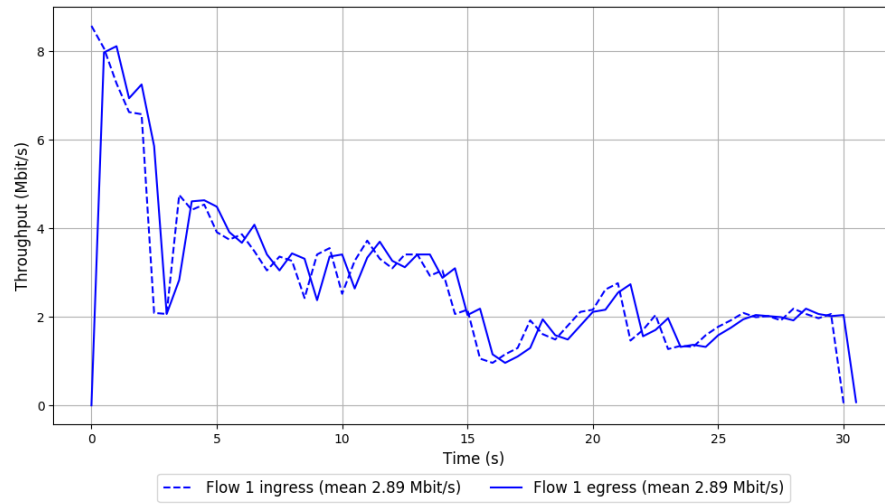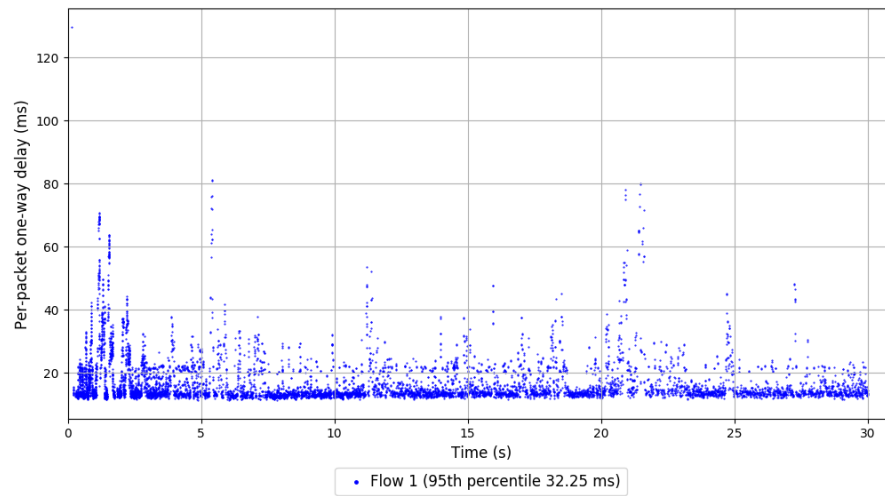
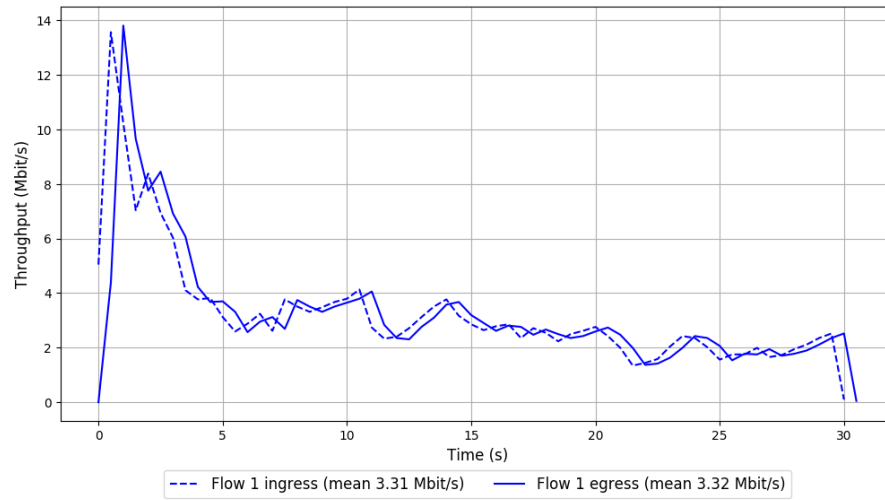Run 1: Report of TCP Vegas — Data Link

```
Run 2: Statistics of TCP Vegas

Start at: 2019-06-27 01:21:29
End at: 2019-06-27 01:21:59
Local clock offset: -4.454 ms
Remote clock offset: -3.391 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.32 Mbit/s
95th percentile per-packet one-way delay: 32.249 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 3.32 Mbit/s
95th percentile per-packet one-way delay: 32.249 ms
Loss rate: 0.05%
```
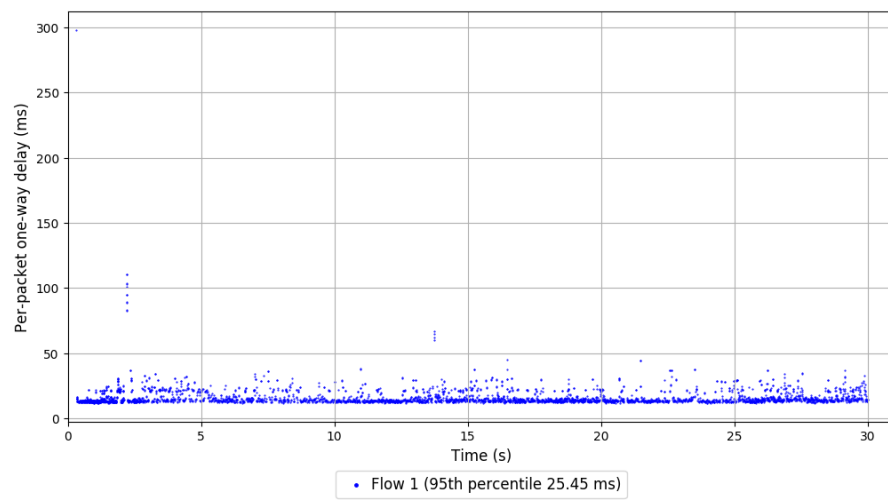
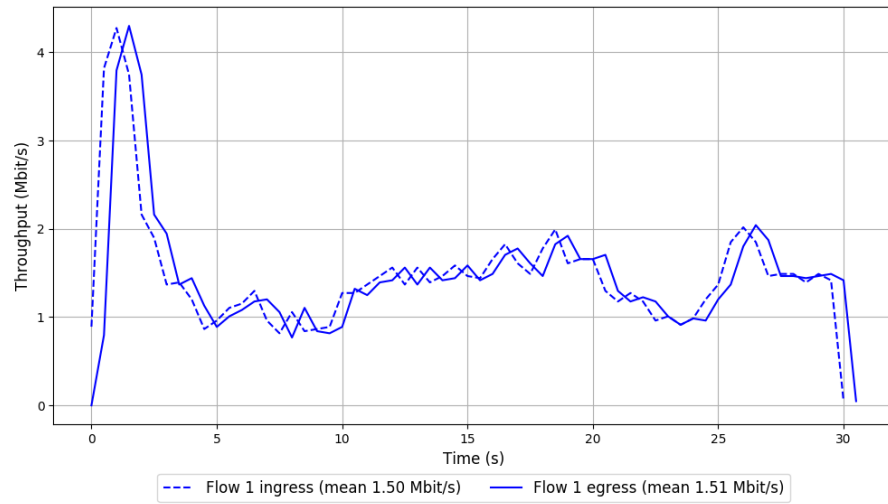Run 2: Report of TCP Vegas — Data Link

```
Run 3: Statistics of TCP Vegas

Start at: 2019-06-27 01:48:41
End at: 2019-06-27 01:49:11
Local clock offset: -5.086 ms
Remote clock offset: -0.412 ms


# Below is generated by plot.py at 2019-06-27 02:15:15
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.51 Mbit/s
95th percentile per-packet one-way delay: 25.445 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 1.51 Mbit/s
95th percentile per-packet one-way delay: 25.445 ms
Loss rate: 0.05%
```

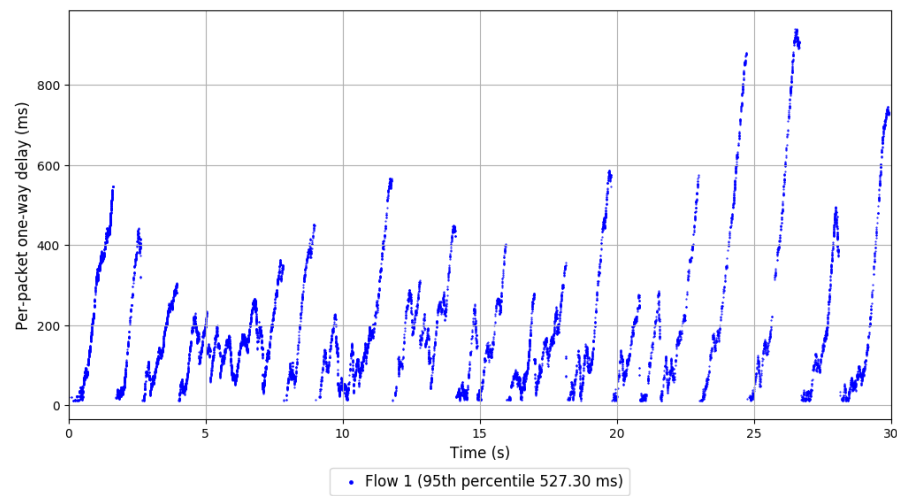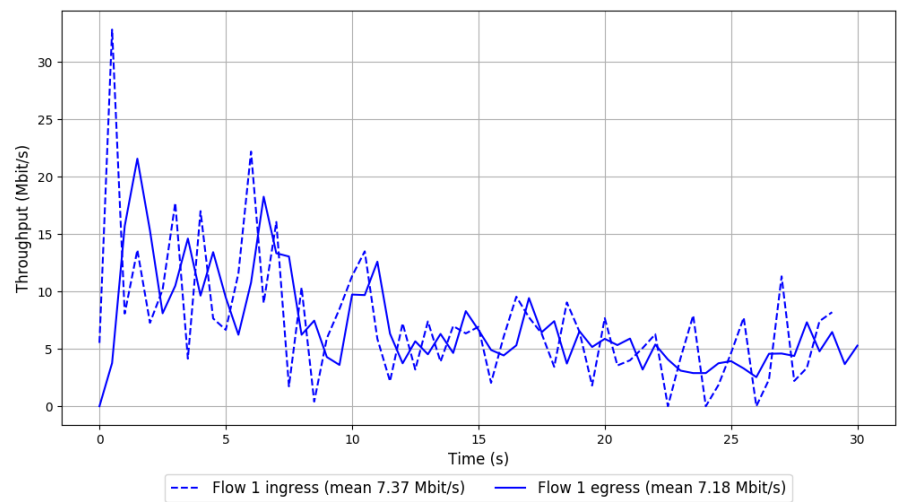## Run 3: Report of TCP Vegas — Data Link

```
Run 1: Statistics of Verus

Start at: 2019-06-27 01:14:05
End at: 2019-06-27 01:14:35
Local clock offset: -4.427 ms
Remote clock offset: -2.645 ms


# Below is generated by plot.py at 2019-06-27 02:15:16
# Datalink statistics
-- Total of 1 flow:
Average throughput: 7.18 Mbit/s
95th percentile per-packet one-way delay: 527.305 ms
Loss rate: 0.32%
-- Flow 1:
Average throughput: 7.18 Mbit/s
95th percentile per-packet one-way delay: 527.305 ms
Loss rate: 0.32%
```
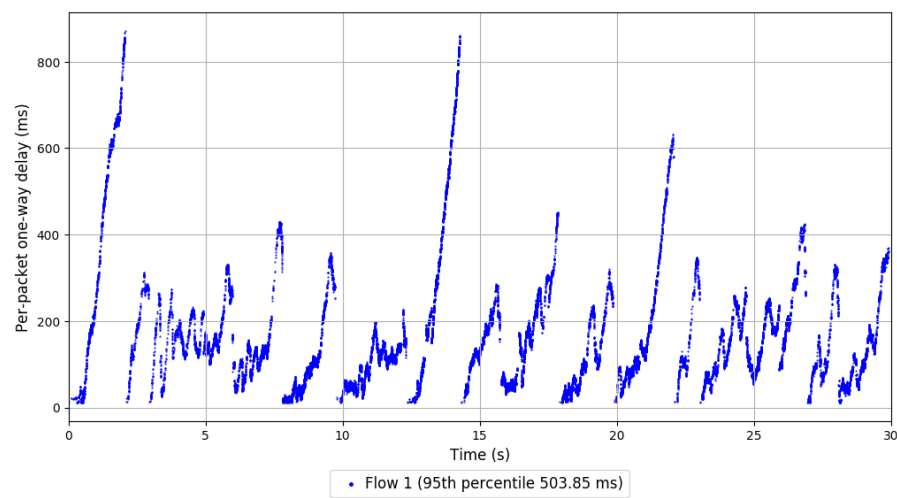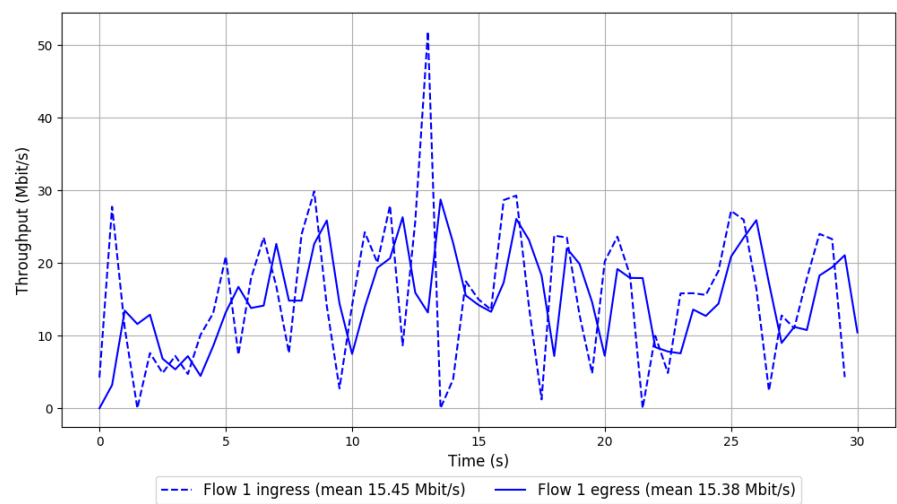
Run 1: Report of Verus — Data Link

```
Run 2: Statistics of Verus

Start at: 2019-06-27 01:41:12
End at: 2019-06-27 01:41:42
Local clock offset: -4.114 ms
Remote clock offset: -1.499 ms


# Below is generated by plot.py at 2019-06-27 02:15:18
# Datalink statistics
-- Total of 1 flow:
Average throughput: 15.38 Mbit/s
95th percentile per-packet one-way delay: 503.846 ms
Loss rate: 0.41%
-- Flow 1:
Average throughput: 15.38 Mbit/s
95th percentile per-packet one-way delay: 503.846 ms
Loss rate: 0.41%
```

Run 2: Report of Verus — Data Link

Flow 1 ingress (mean 15.45 Mbit/s)   Flow 1 egress (mean 15.38 Mbit/s)

Flow 1 (95th percentile 503.85 ms)

```
Run 3: Statistics of Verus

Start at: 2019-06-27 02:08:24
End at: 2019-06-27 02:08:54
Local clock offset: -1.388 ms
Remote clock offset: 0.141 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 26.76 Mbit/s
95th percentile per-packet one-way delay: 320.344 ms
Loss rate: 0.61%
-- Flow 1:
Average throughput: 26.76 Mbit/s
95th percentile per-packet one-way delay: 320.344 ms
Loss rate: 0.61%
```
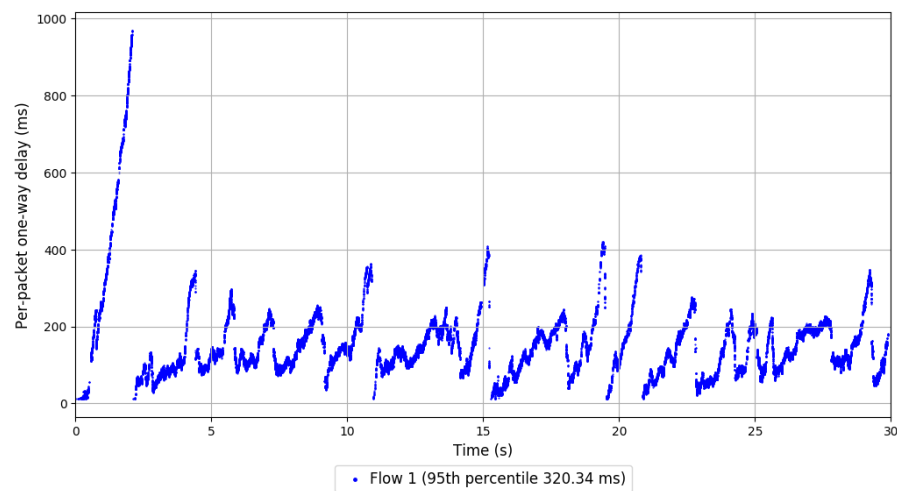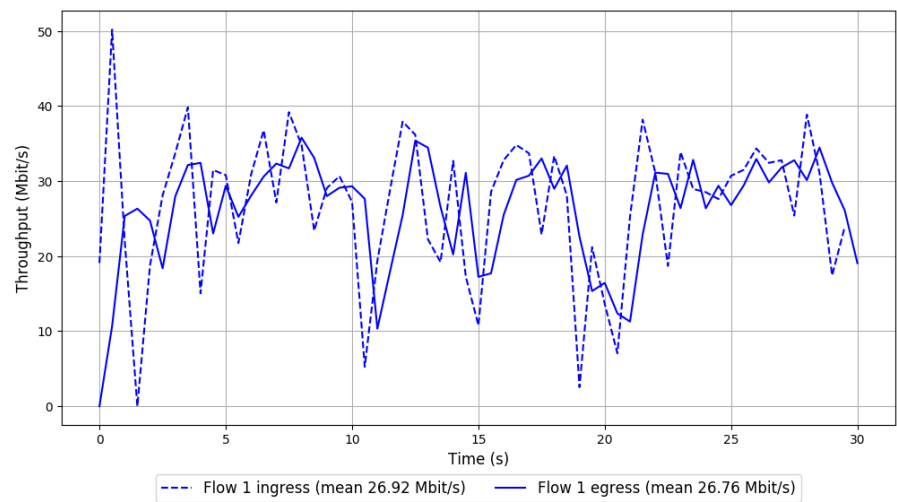
Run 3: Report of Verus — Data Link

Flow 1 ingress (mean 26.92 Mbit/s)   Flow 1 egress (mean 26.76 Mbit/s)

Flow 1 (95th percentile 320.34 ms)

```
Run 1: Statistics of PCC-Vivace

Start at: 2019-06-27 01:10:23
End at: 2019-06-27 01:10:53
Local clock offset: -3.375 ms
Remote clock offset: -1.998 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 2.13 Mbit/s
95th percentile per-packet one-way delay: 796.691 ms
Loss rate: 2.71%
-- Flow 1:
Average throughput: 2.13 Mbit/s
95th percentile per-packet one-way delay: 796.691 ms
Loss rate: 2.71%
```
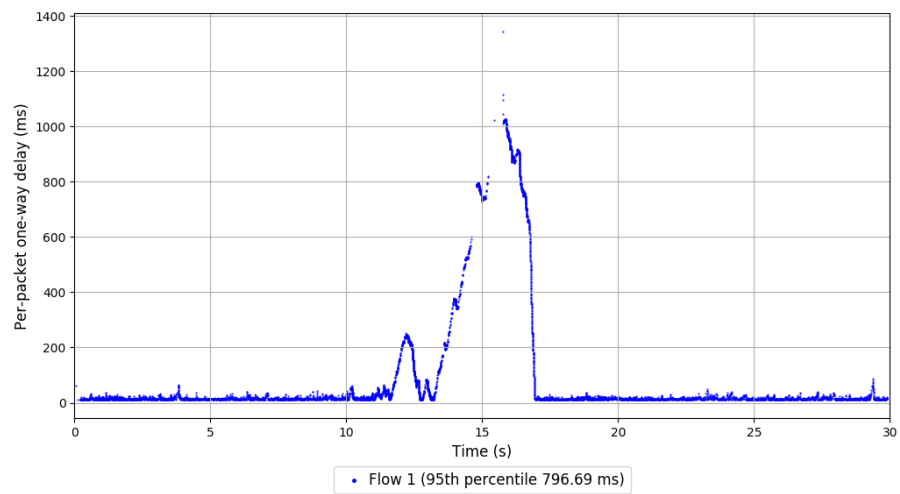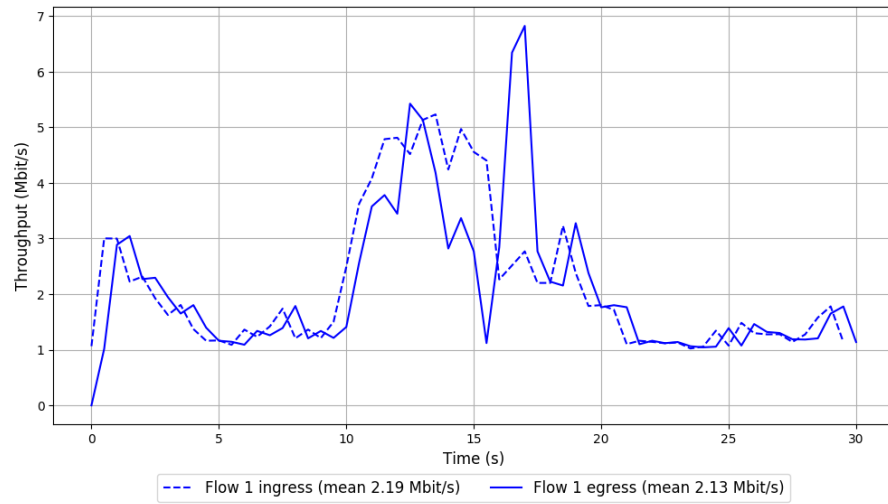
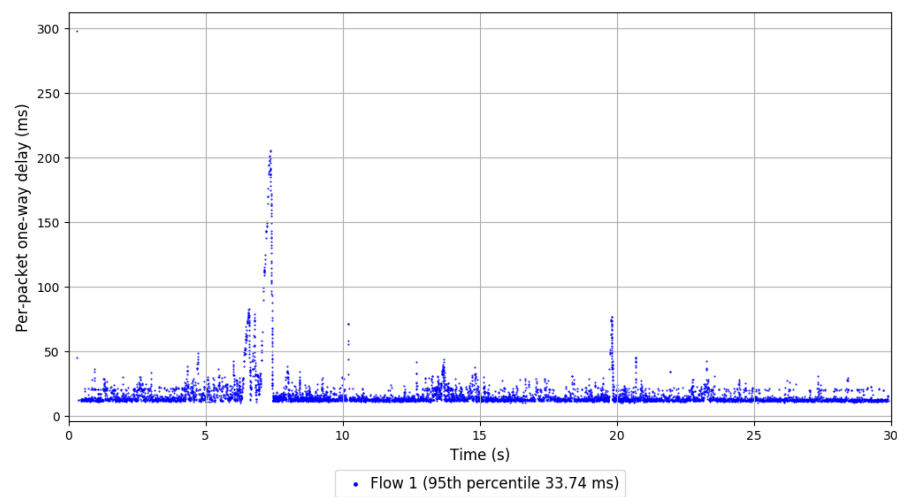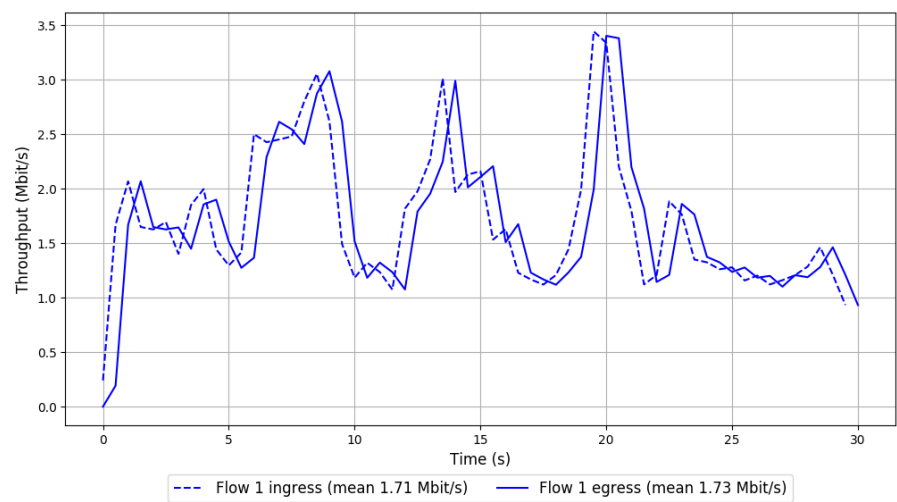Run 1: Report of PCC-Vivace — Data Link

```
Run 2: Statistics of PCC-Vivace

Start at: 2019-06-27 01:37:30
End at: 2019-06-27 01:38:00
Local clock offset: -3.691 ms
Remote clock offset: -2.337 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 1.73 Mbit/s
95th percentile per-packet one-way delay: 33.744 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 1.73 Mbit/s
95th percentile per-packet one-way delay: 33.744 ms
Loss rate: 0.03%
```

Run 2: Report of PCC-Vivace — Data Link

```
Run 3: Statistics of PCC-Vivace

Start at: 2019-06-27 02:04:43
End at: 2019-06-27 02:05:13
Local clock offset: -1.534 ms
Remote clock offset: 0.48 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 3.76 Mbit/s
95th percentile per-packet one-way delay: 33.431 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 3.76 Mbit/s
95th percentile per-packet one-way delay: 33.431 ms
Loss rate: 0.01%
```
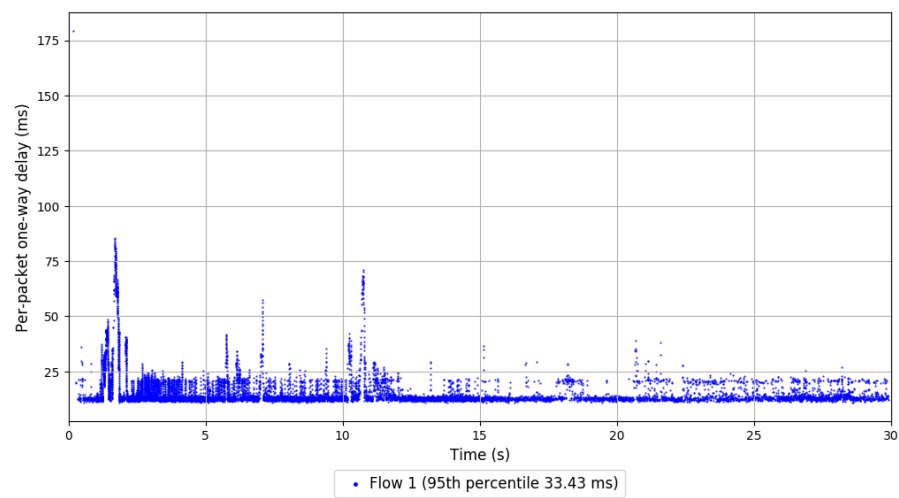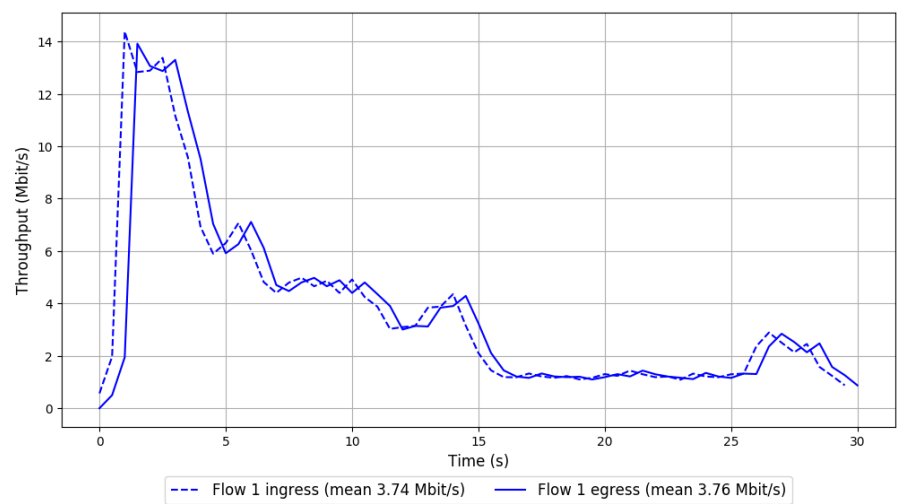
Run 3: Report of PCC-Vivace — Data Link

Flow 1 ingress (mean 3.74 Mbit/s)   Flow 1 egress (mean 3.76 Mbit/s)

Flow 1 (95th percentile 33.43 ms)

```
Run 1: Statistics of WebRTC media

Start at: 2019-06-27 00:55:37
End at: 2019-06-27 00:56:07
Local clock offset: 2.511 ms
Remote clock offset: 1.794 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 30.193 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 30.193 ms
Loss rate: 0.00%
```
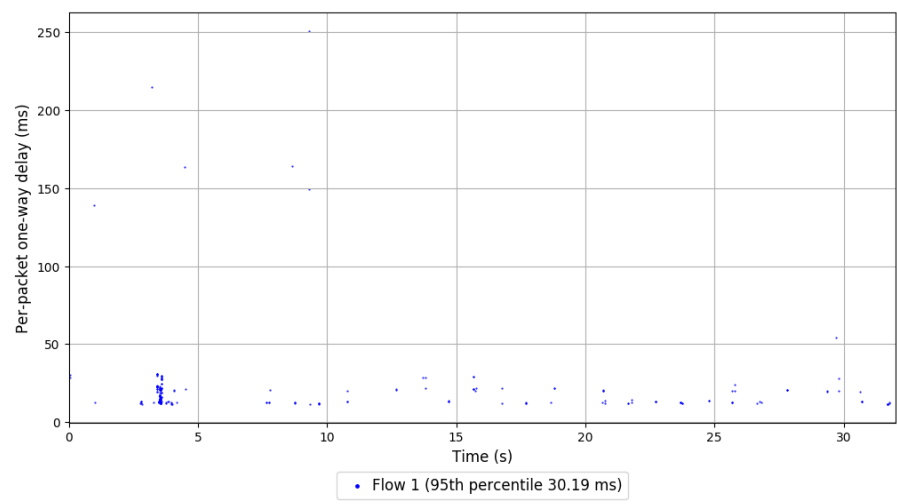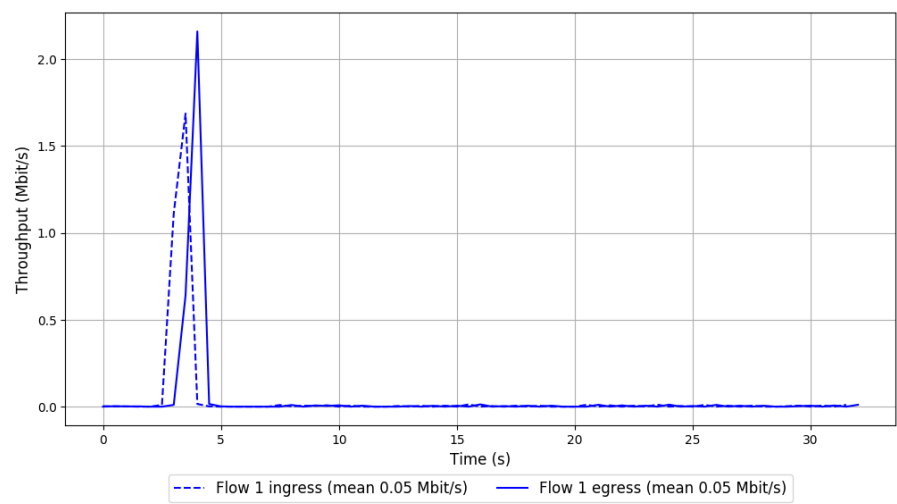
Run 1: Report of WebRTC media — Data Link

```
Run 2: Statistics of WebRTC media

Start at: 2019-06-27 01:22:43
End at: 2019-06-27 01:23:13
Local clock offset: -4.13 ms
Remote clock offset: -3.519 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 41.010 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 41.010 ms
Loss rate: 0.00%
```
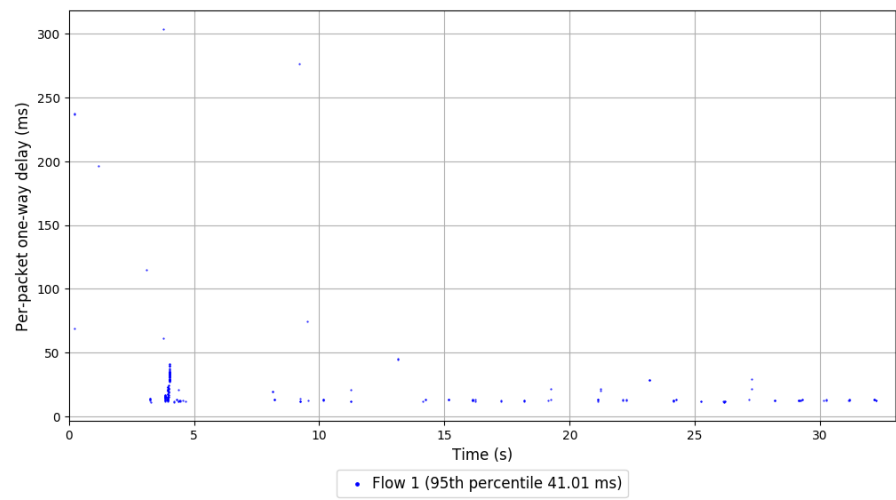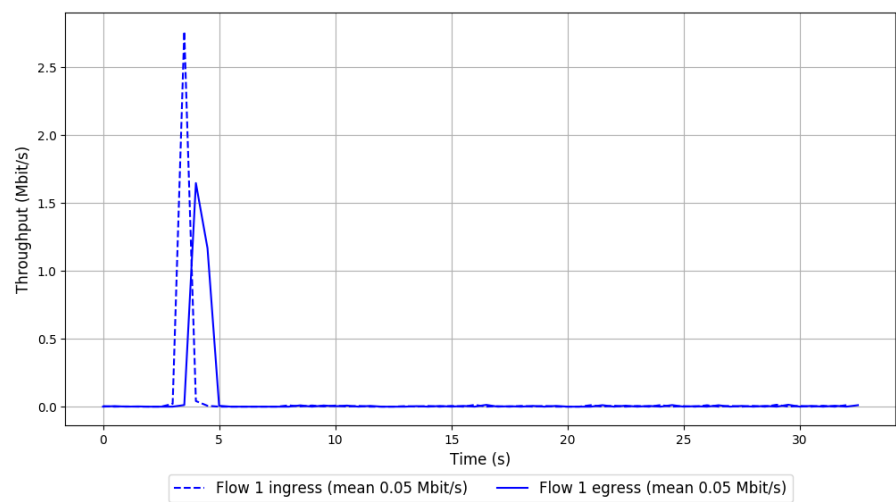
Run 2: Report of WebRTC media — Data Link

```
Run 3: Statistics of WebRTC media

Start at: 2019-06-27 01:49:55
End at: 2019-06-27 01:50:25
Local clock offset: -4.555 ms
Remote clock offset: -0.238 ms


# Below is generated by plot.py at 2019-06-27 02:15:19
# Datalink statistics
-- Total of 1 flow:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 30.897 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 30.897 ms
Loss rate: 0.00%
```

Run 3: Report of WebRTC media — Data Link