Pantheon Report

Generated at 2018-01-02 22:21:01 (UTC).

Data path: Colombia ppp0 (*remote*) →AWS Brazil 2 Ethernet (*local*).

Repeated the test of 14 congestion control schemes 3 times.

Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

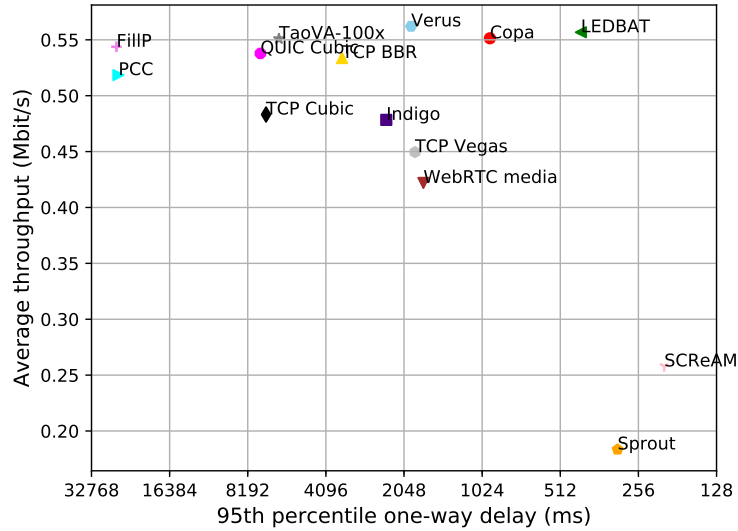Increased UDP receive buffer to 16 MB (default) and 32 MB (max).

Tested BBR with qdisc of Fair Queuing (`fq`), and other schemes with the default Linux qdisc (`pfifo_fast`).

NTP offsets were measured against `gps.ntp.br` and have been applied to correct the timestamps in logs.

```
Git summary:
branch: master @ 904a5750834816b1e46a2c86405d707788d27c16
third_party/calibrated_koho @ 3cb73c0d1c0322cdfae446ea37a522e53227db50
 M datagrump/sender.cc
third_party/fillp @ dcaef6b00654e660f73f7ed679d2eab61ce08639
third_party/genericCC @ 80b516c448f795fd6e9675f7177b69c622f07da8
third_party/indigo @ b19f3730105f9aa95452552af924e3719b03cc55
third_party/indigo-no-calib @ 7224f2202e8a044d8306fa0b983ad84360c53d89
third_party/koho_cc @ f0f2e693303aee82ea808e6928eac4f1083a6681
 M datagrump/sender.cc
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ fb1053193c2861da659ba9013db26744ccfcf993
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/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream @ c3370fd7bd17265a79aeb34e4016ad23f5965885
third_party/sourdough @ f1a14bffe749737437f61b1eaeeb30b267cde681
third_party/sprout @ 6f2efe6e088d91066a9f023df375eee2665089ce
 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/webrtc @ a488197ddd041ace68a42849b2540ad834825f42
```
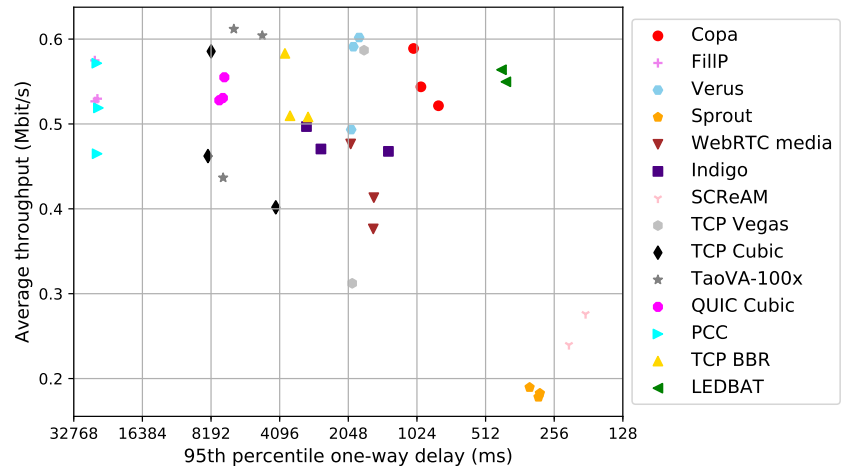
test from Colombia ppp0 to AWS Brazil 2 Ethernet, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)

test from Colombia ppp0 to AWS Brazil 2 Ethernet, 3 runs of 30s each per scheme
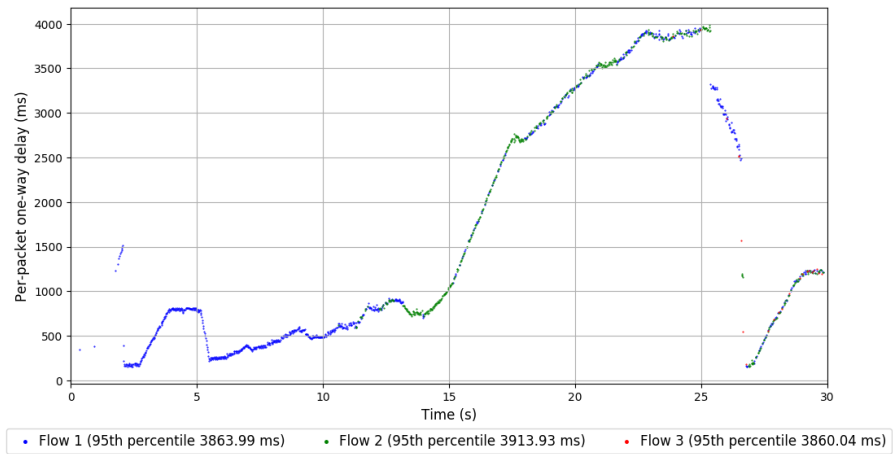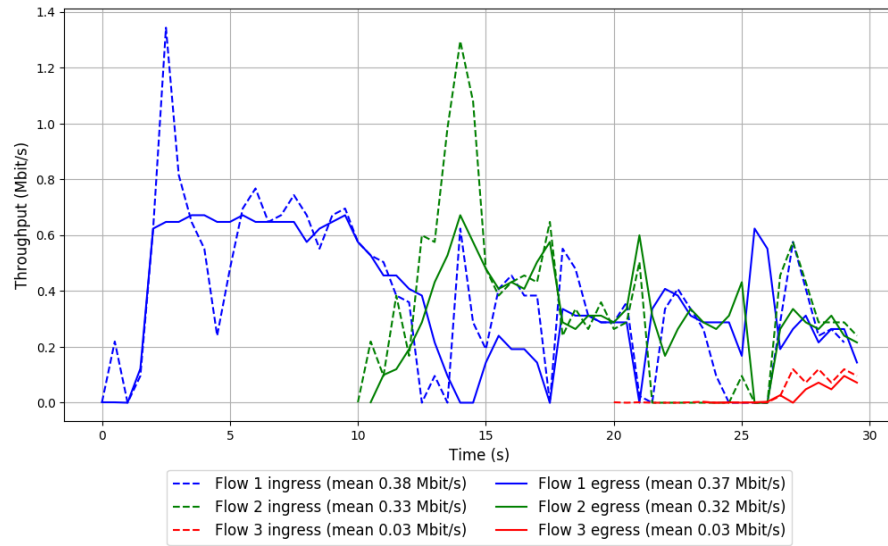### 3 flows with 10s interval between flows

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scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	0.34	0.29	0.02	3532.74	3585.80	3404.92	5.17	8.90	51.49
TCP Cubic	3	6.34	0.19	0.02	7143.59	5767.53	7148.39	20.81	45.45	71.09
LEDBAT	2	0.27	0.36	0.17	362.32	436.17	465.97	0.00	1.52	6.21
PCC	3	0.52	0.00	N/A	25802.72	N/A	N/A	98.61	N/A	N/A
QUIC Cubic	3	0.51	0.06	0.00	7267.26	7540.06	6789.05	26.18	22.06	22.22
SCReAM	2	0.08	0.17	0.16	192.74	204.07	210.17	0.80	1.05	1.70
WebRTC media	3	0.22	0.15	0.05	1651.94	1763.99	1640.11	0.47	1.55	6.33
Sprout	3	0.09	0.09	0.10	598.88	236.22	298.13	1.31	2.48	4.21
TaoVA-100x	3	0.37	0.31	0.02	6117.76	5746.53	5267.57	16.01	35.46	72.91
TCP Vegas	2	10.87	0.30	0.17	1887.23	1867.90	1834.11	1.58	7.04	21.25
Verus	3	0.55	0.01	0.01	1923.26	1870.28	1900.31	4.31	8.17	12.73
Copa	3	0.38	0.22	0.10	868.83	983.58	1096.09	2.62	5.49	8.36
FillP	3	0.54	0.00	N/A	26251.39	N/A	N/A	98.35	N/A	N/A
Indigo	3	0.18	0.28	0.38	2217.13	2433.73	2402.38	11.94	12.91	23.66

```
Run 1: Statistics of TCP BBR

Start at: 2018-01-02 20:44:12
End at: 2018-01-02 20:44:42
Local clock offset: -0.018 ms
Remote clock offset: -12.652 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.58 Mbit/s
95th percentile per-packet one-way delay: 3884.460 ms
Loss rate: 4.02%
-- Flow 1:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 3863.992 ms
Loss rate: 1.96%
-- Flow 2:
Average throughput: 0.32 Mbit/s
95th percentile per-packet one-way delay: 3913.934 ms
Loss rate: 5.65%
-- Flow 3:
Average throughput: 0.03 Mbit/s
95th percentile per-packet one-way delay: 3860.040 ms
Loss rate: 41.59%
```

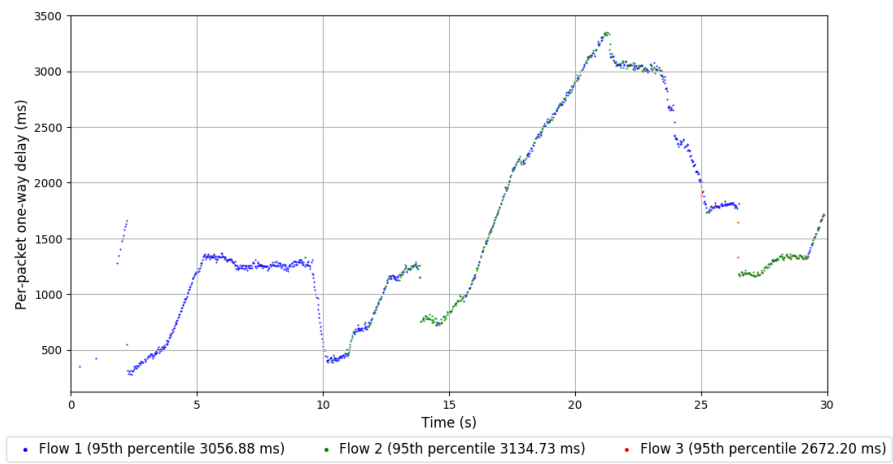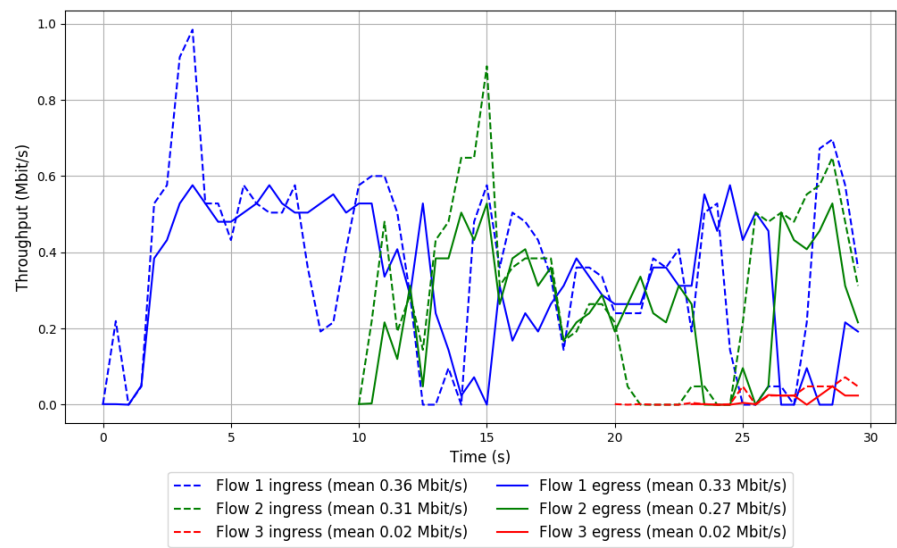Run 1: Report of TCP BBR — Data Link

```
Run 2: Statistics of TCP BBR

Start at: 2018-01-02 21:03:00
End at: 2018-01-02 21:03:30
Local clock offset: -0.094 ms
Remote clock offset: -17.369 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 3074.920 ms
Loss rate: 12.16%
-- Flow 1:
Average throughput: 0.33 Mbit/s
95th percentile per-packet one-way delay: 3056.884 ms
Loss rate: 9.82%
-- Flow 2:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 3134.732 ms
Loss rate: 15.09%
-- Flow 3:
Average throughput: 0.02 Mbit/s
95th percentile per-packet one-way delay: 2672.199 ms
Loss rate: 48.63%
```

Run 2: Report of TCP BBR — Data Link

```
Run 3: Statistics of TCP BBR

Start at: 2018-01-02 21:21:50
End at: 2018-01-02 21:22:20
Local clock offset: -0.177 ms
Remote clock offset: 0.538 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 3688.863 ms
Loss rate: 5.15%
-- Flow 1:
Average throughput: 0.32 Mbit/s
95th percentile per-packet one-way delay: 3677.352 ms
Loss rate: 3.73%
-- Flow 2:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 3708.722 ms
Loss rate: 5.96%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 3682.524 ms
Loss rate: 64.25%
```
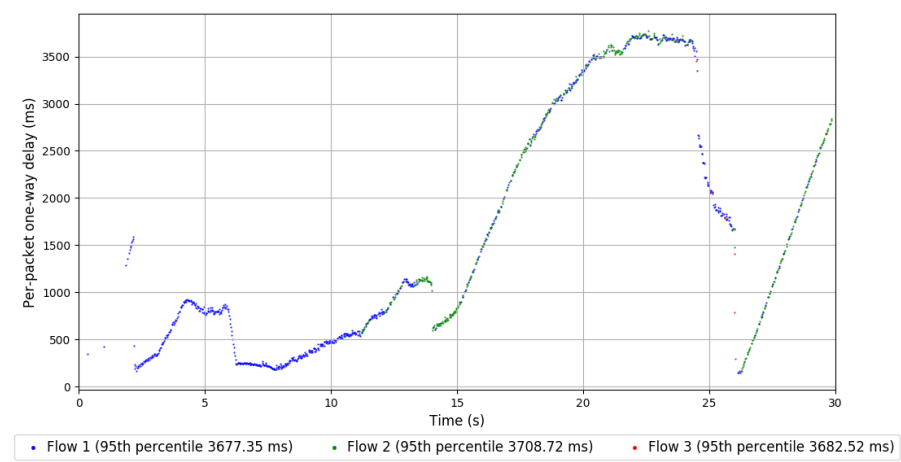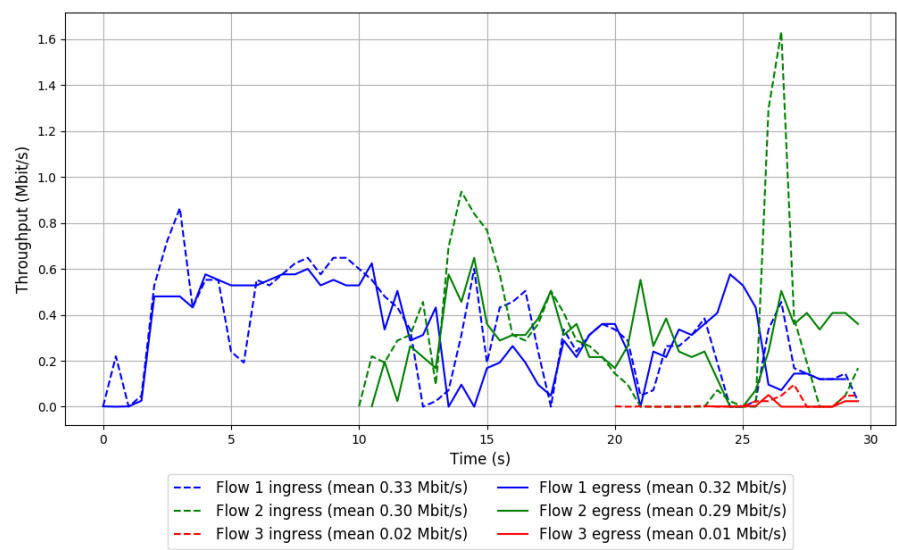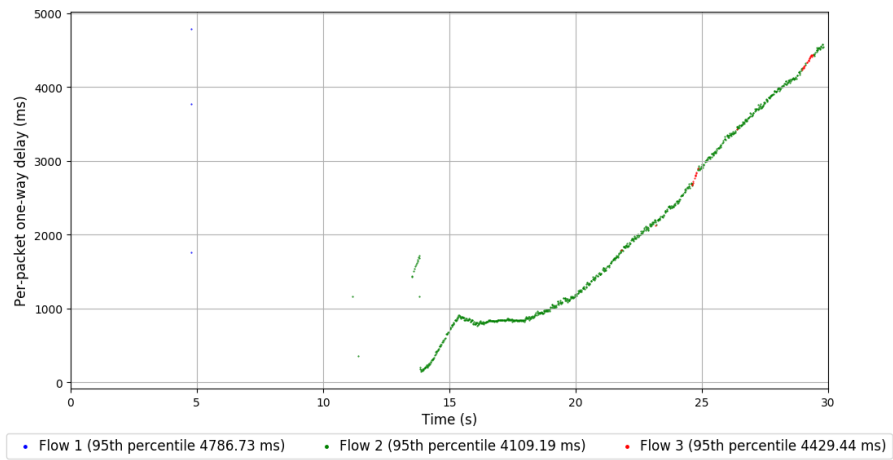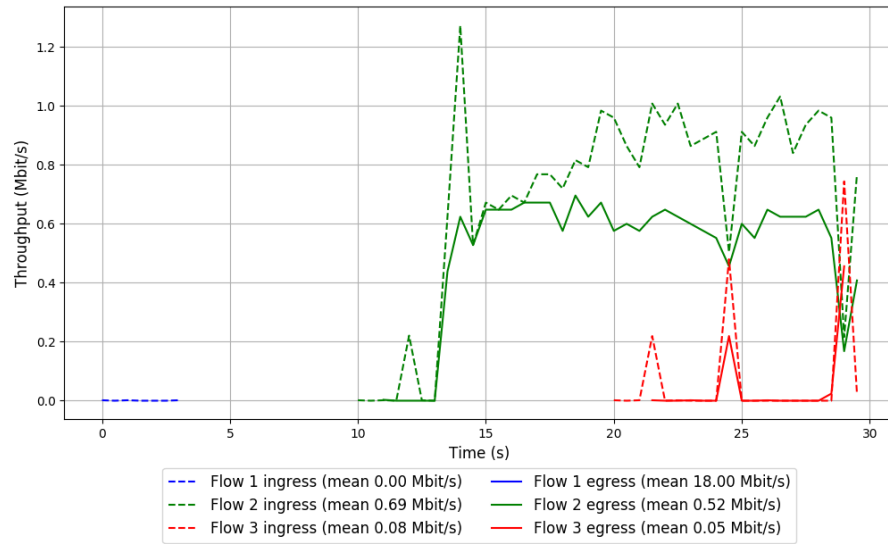
Run 3: Report of TCP BBR — Data Link

Flow 1 ingress (mean 0.33 Mbit/s)   Flow 1 egress (mean 0.32 Mbit/s)
Flow 2 ingress (mean 0.30 Mbit/s)   Flow 2 egress (mean 0.29 Mbit/s)
Flow 3 ingress (mean 0.02 Mbit/s)   Flow 3 egress (mean 0.01 Mbit/s)

Flow 1 (95th percentile 3677.35 ms)   Flow 2 (95th percentile 3708.72 ms)   Flow 3 (95th percentile 3682.52 ms)

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```
Run 1: Statistics of TCP Cubic

Start at: 2018-01-02 20:32:54
End at: 2018-01-02 20:33:24
Local clock offset: 0.006 ms
Remote clock offset: 1.171 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.40 Mbit/s
95th percentile per-packet one-way delay: 4259.990 ms
Loss rate: 30.34%
-- Flow 1:
Average throughput: 18.00 Mbit/s
95th percentile per-packet one-way delay: 4786.725 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 4109.187 ms
Loss rate: 29.18%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 4429.443 ms
Loss rate: 52.18%
```
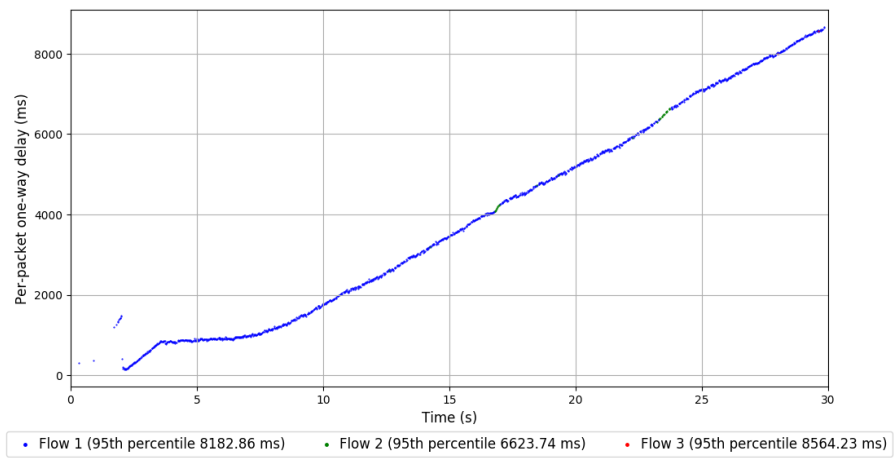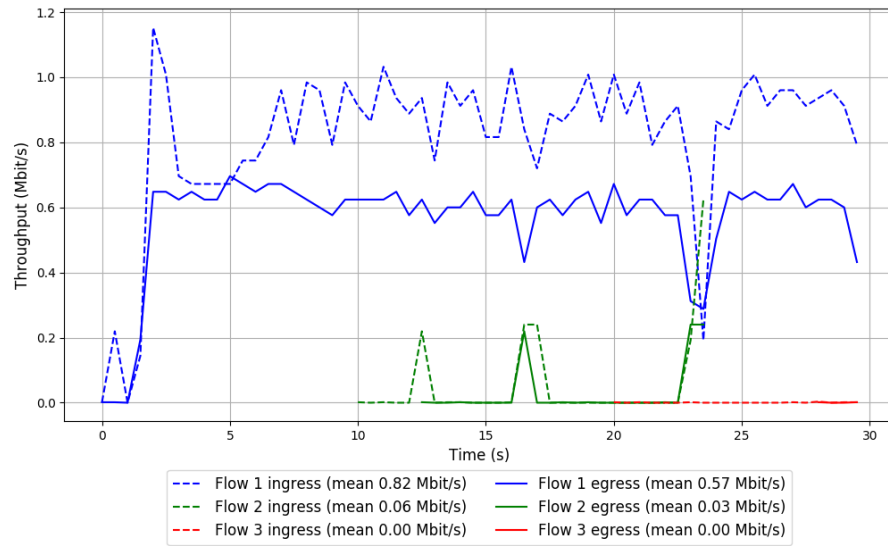
Run 1: Report of TCP Cubic — Data Link

Flow 1 ingress (mean 0.00 Mbit/s) — Flow 1 egress (mean 18.00 Mbit/s)
Flow 2 ingress (mean 0.69 Mbit/s) — Flow 2 egress (mean 0.52 Mbit/s)
Flow 3 ingress (mean 0.08 Mbit/s) — Flow 3 egress (mean 0.05 Mbit/s)

Flow 1 (95th percentile 4786.73 ms)   Flow 2 (95th percentile 4109.19 ms)   Flow 3 (95th percentile 4429.44 ms)

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```
Run 2: Statistics of TCP Cubic

Start at: 2018-01-02 20:51:43
End at: 2018-01-02 20:52:13
Local clock offset: -0.072 ms
Remote clock offset: 1.899 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.59 Mbit/s
95th percentile per-packet one-way delay: 8182.860 ms
Loss rate: 31.53%
-- Flow 1:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 8182.865 ms
Loss rate: 30.83%
-- Flow 2:
Average throughput: 0.03 Mbit/s
95th percentile per-packet one-way delay: 6623.744 ms
Loss rate: 53.59%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 8564.232 ms
Loss rate: 75.13%
```

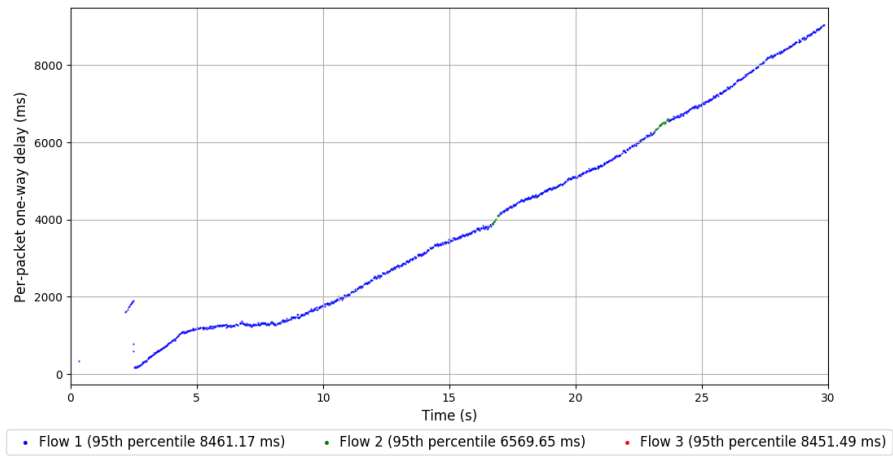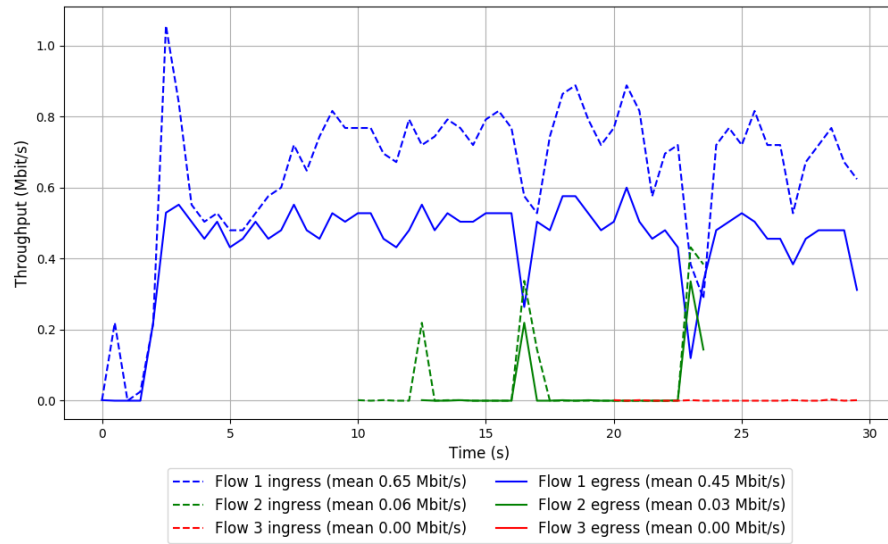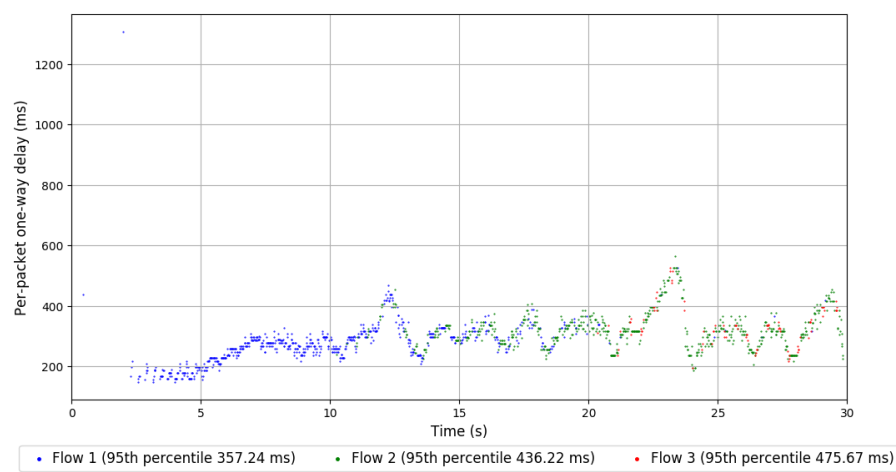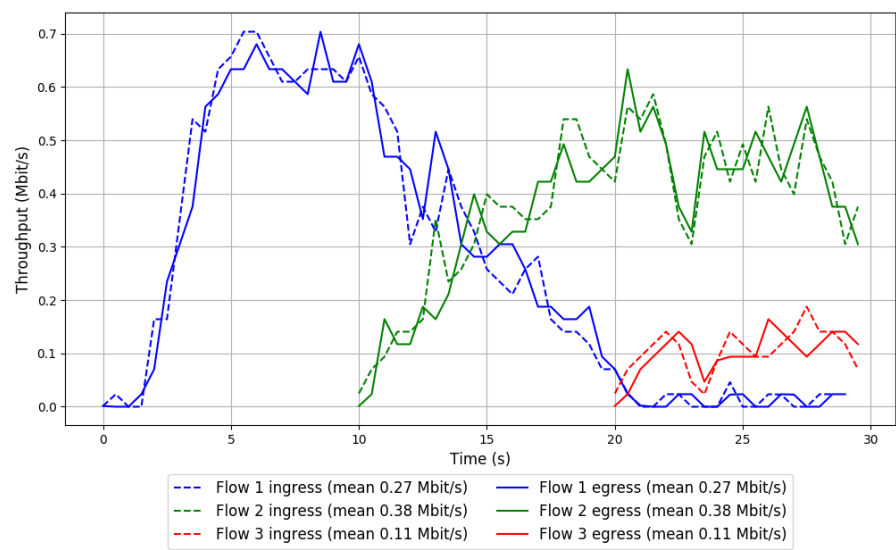Run 2: Report of TCP Cubic — Data Link

- - - Flow 1 ingress (mean 0.82 Mbit/s) —— Flow 1 egress (mean 0.57 Mbit/s)
- - - Flow 2 ingress (mean 0.06 Mbit/s) —— Flow 2 egress (mean 0.03 Mbit/s)
- - - Flow 3 ingress (mean 0.00 Mbit/s) —— Flow 3 egress (mean 0.00 Mbit/s)

• Flow 1 (95th percentile 8182.86 ms)   • Flow 2 (95th percentile 6623.74 ms)   • Flow 3 (95th percentile 8564.23 ms)

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```
Run 3: Statistics of TCP Cubic

Start at: 2018-01-02 21:10:29
End at: 2018-01-02 21:10:59
Local clock offset: -0.136 ms
Remote clock offset: -3.947 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.46 Mbit/s
95th percentile per-packet one-way delay: 8451.009 ms
Loss rate: 32.44%
-- Flow 1:
Average throughput: 0.45 Mbit/s
95th percentile per-packet one-way delay: 8461.171 ms
Loss rate: 31.60%
-- Flow 2:
Average throughput: 0.03 Mbit/s
95th percentile per-packet one-way delay: 6569.645 ms
Loss rate: 53.59%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 8451.492 ms
Loss rate: 85.96%
```

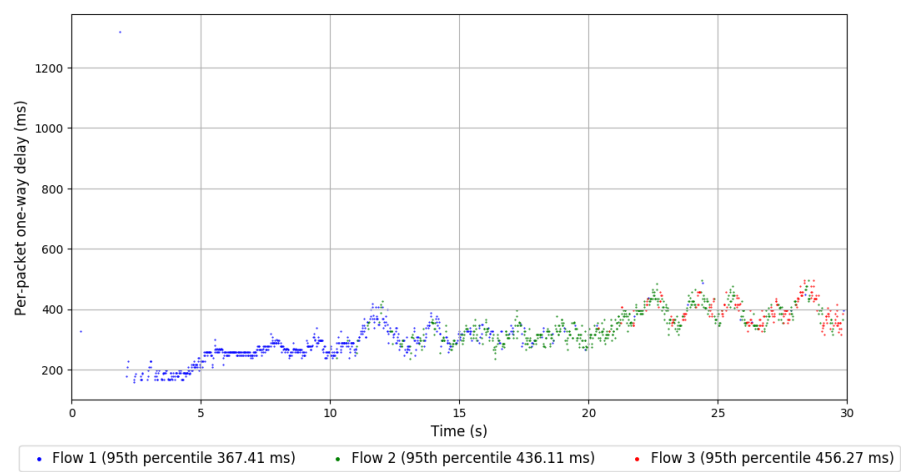Run 3: Report of TCP Cubic — Data Link

Flow 1 ingress (mean 0.65 Mbit/s)   Flow 1 egress (mean 0.45 Mbit/s)
Flow 2 ingress (mean 0.06 Mbit/s)   Flow 2 egress (mean 0.03 Mbit/s)
Flow 3 ingress (mean 0.00 Mbit/s)   Flow 3 egress (mean 0.00 Mbit/s)

Flow 1 (95th percentile 8461.17 ms)   Flow 2 (95th percentile 6569.65 ms)   Flow 3 (95th percentile 8451.49 ms)
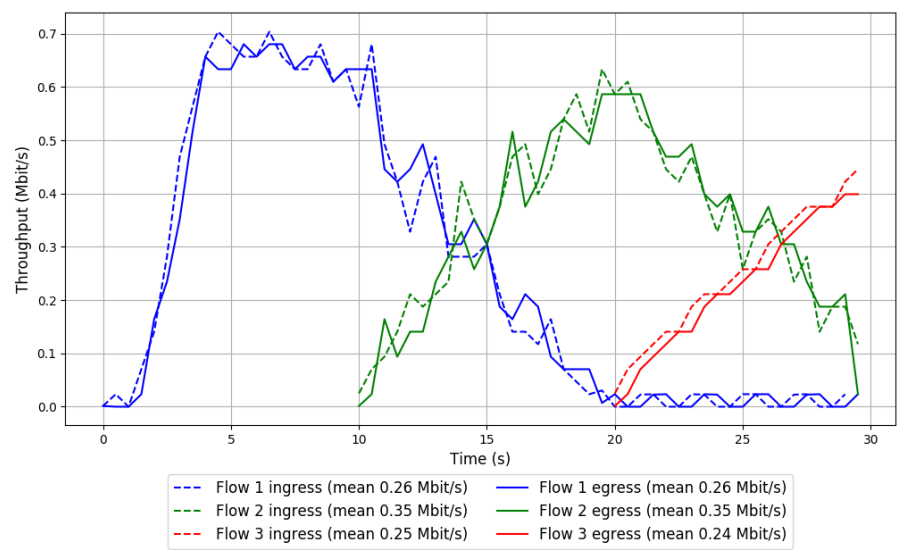
```
Run 1: Statistics of LEDBAT

Start at: 2018-01-02 20:29:09
End at: 2018-01-02 20:29:39
Local clock offset: 0.055 ms
Remote clock offset: 1.861 ms

# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.55 Mbit/s
95th percentile per-packet one-way delay: 417.081 ms
Loss rate: 1.08%
-- Flow 1:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 357.236 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 436.223 ms
Loss rate: 1.86%
-- Flow 3:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 475.666 ms
Loss rate: 3.38%
```

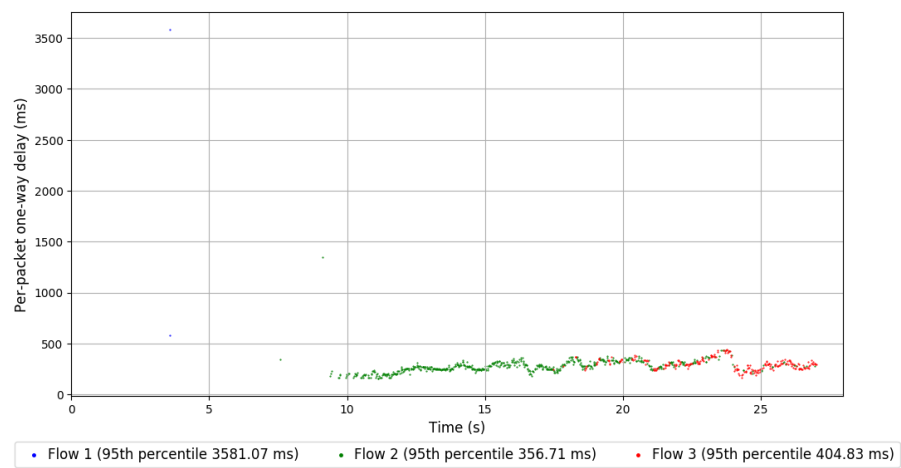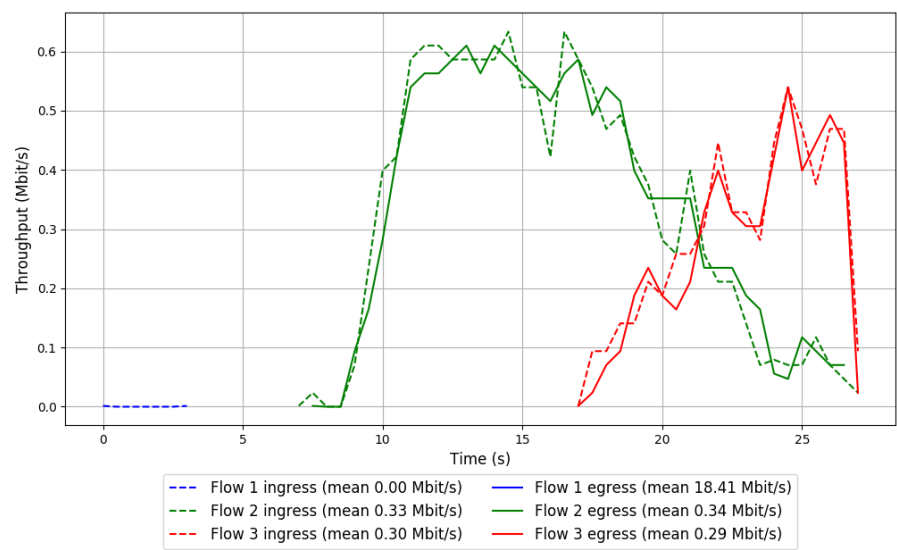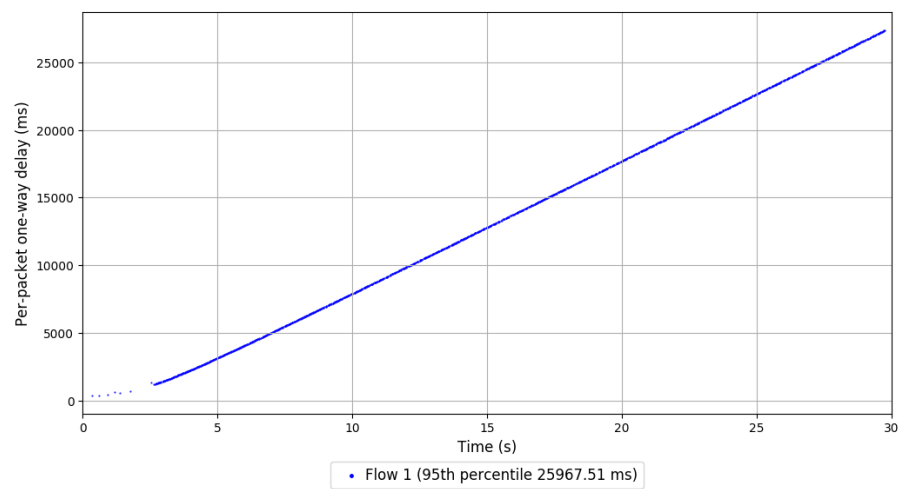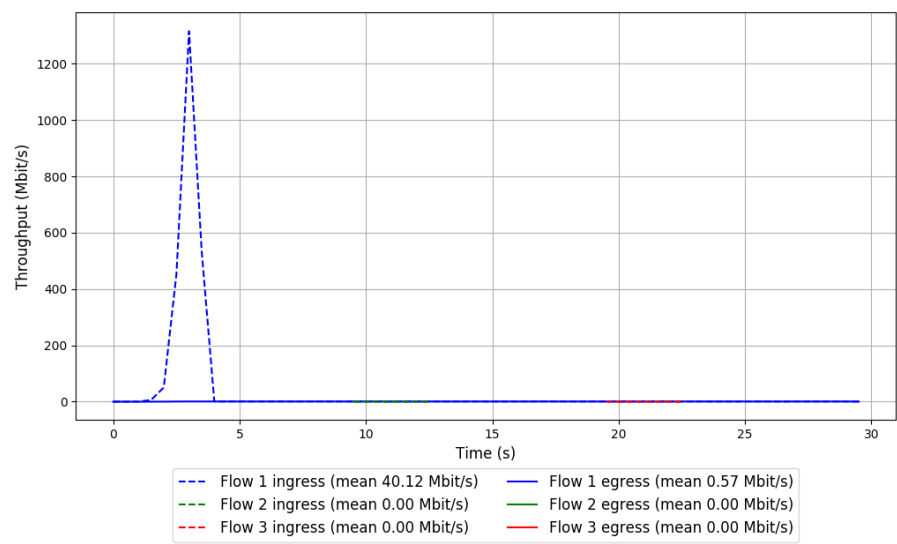## Run 1: Report of LEDBAT — Data Link

```
Run 2: Statistics of LEDBAT

Start at: 2018-01-02 20:47:57
End at: 2018-01-02 20:48:27
Local clock offset: -0.052 ms
Remote clock offset: -17.598 ms


# Below is generated by plot.py at 2018-01-02 22:20:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.56 Mbit/s
95th percentile per-packet one-way delay: 436.045 ms
Loss rate: 1.80%
-- Flow 1:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 367.413 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.35 Mbit/s
95th percentile per-packet one-way delay: 436.108 ms
Loss rate: 1.19%
-- Flow 3:
Average throughput: 0.24 Mbit/s
95th percentile per-packet one-way delay: 456.268 ms
Loss rate: 9.05%
```

Run 2: Report of LEDBAT — Data Link

Flow 1 ingress (mean 0.26 Mbit/s) Flow 1 egress (mean 0.26 Mbit/s)
Flow 2 ingress (mean 0.35 Mbit/s) Flow 2 egress (mean 0.35 Mbit/s)
Flow 3 ingress (mean 0.25 Mbit/s) Flow 3 egress (mean 0.24 Mbit/s)

Flow 1 (95th percentile 367.41 ms) Flow 2 (95th percentile 436.11 ms) Flow 3 (95th percentile 456.27 ms)

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Run 3: Statistics of LEDBAT

Start at: 2018-01-02 21:06:45
End at: 2018-01-02 21:07:15
Local clock offset: -0.127 ms
Remote clock offset: -12.612 ms
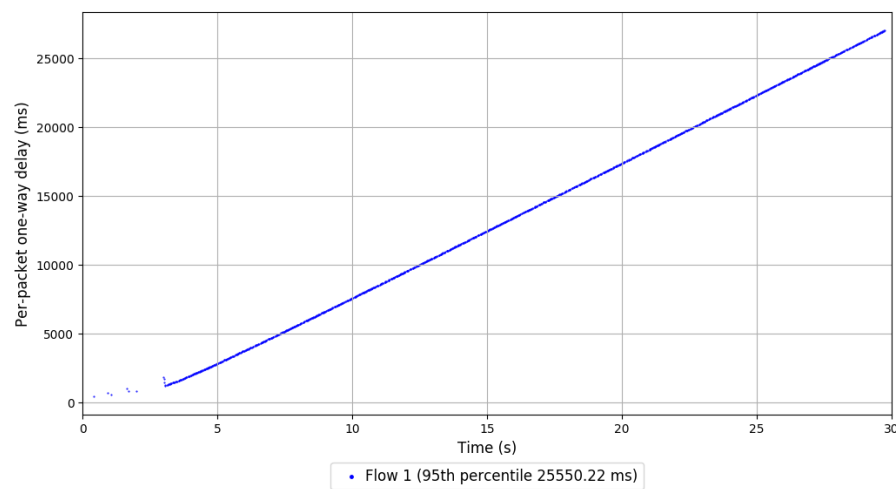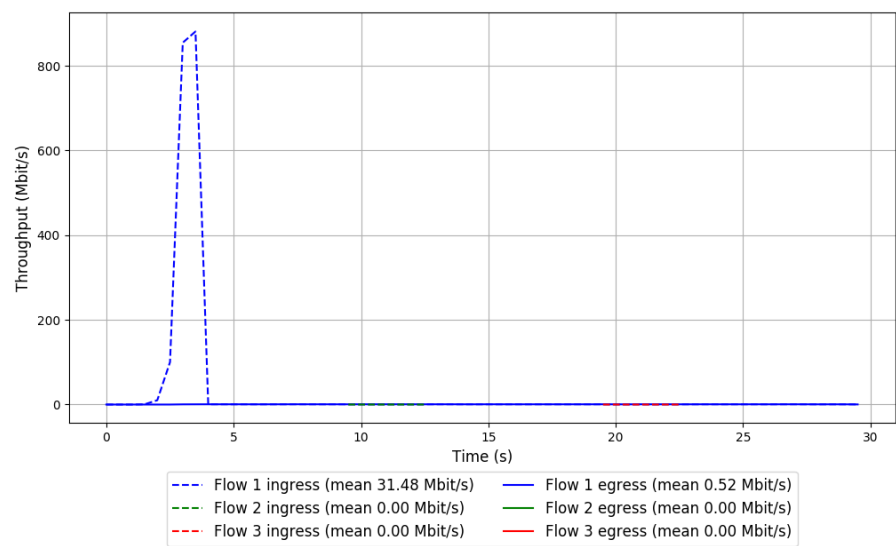
Run 3: Report of LEDBAT — Data Link

```
Run 1: Statistics of PCC

Start at: 2018-01-02 20:34:08
End at: 2018-01-02 20:34:38
Local clock offset: 0.024 ms
Remote clock offset: 0.04 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 25967.507 ms
Loss rate: 98.60%
-- Flow 1:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 25967.507 ms
Loss rate: 98.60%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```
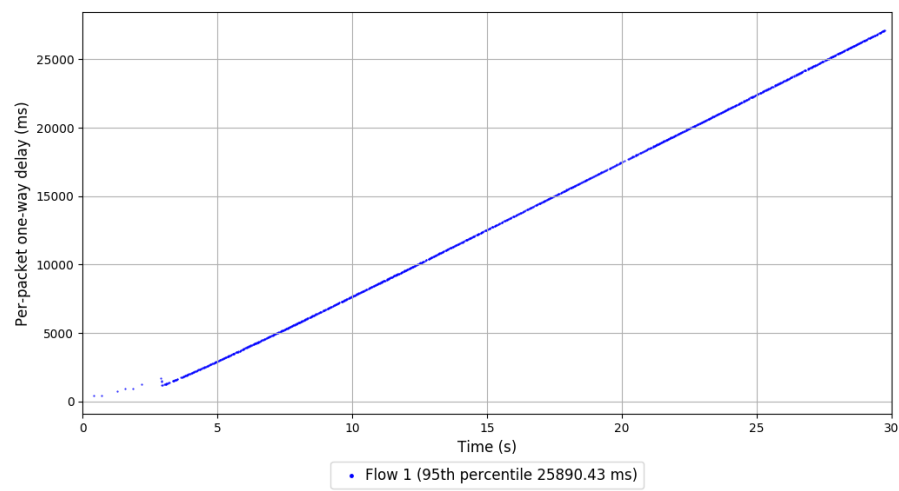
Run 1: Report of PCC — Data Link

Flow 1 ingress (mean 40.12 Mbit/s) --- Flow 1 egress (mean 0.57 Mbit/s) ---
Flow 2 ingress (mean 0.00 Mbit/s) --- Flow 2 egress (mean 0.00 Mbit/s) ---
Flow 3 ingress (mean 0.00 Mbit/s) --- Flow 3 egress (mean 0.00 Mbit/s)

• Flow 1 (95th percentile 25967.51 ms)

```
Run 2: Statistics of PCC

Start at: 2018-01-02 20:52:58
End at: 2018-01-02 20:53:28
Local clock offset: -0.071 ms
Remote clock offset: -3.519 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 25550.221 ms
Loss rate: 98.38%
-- Flow 1:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 25550.221 ms
Loss rate: 98.38%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```
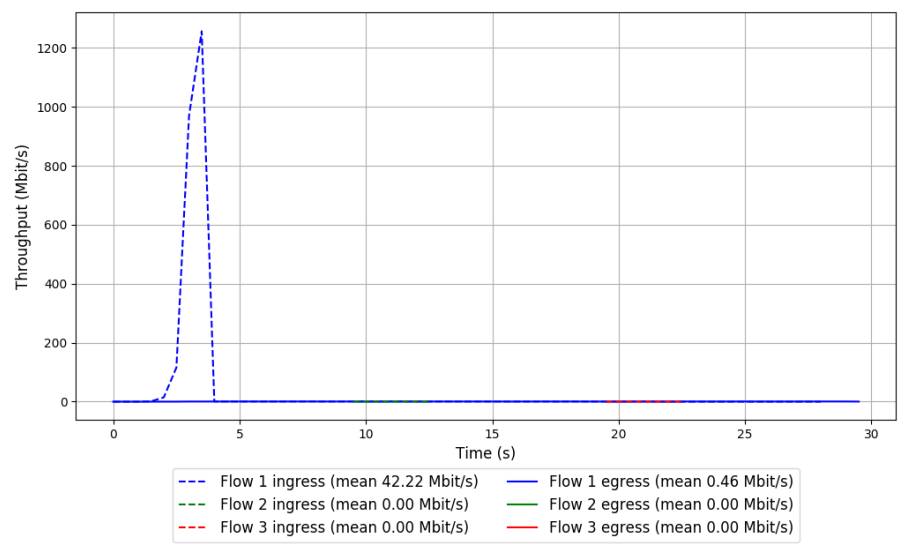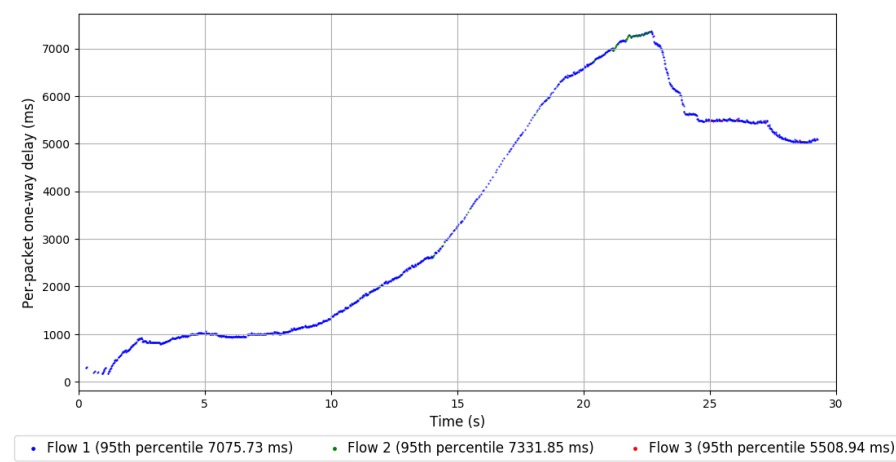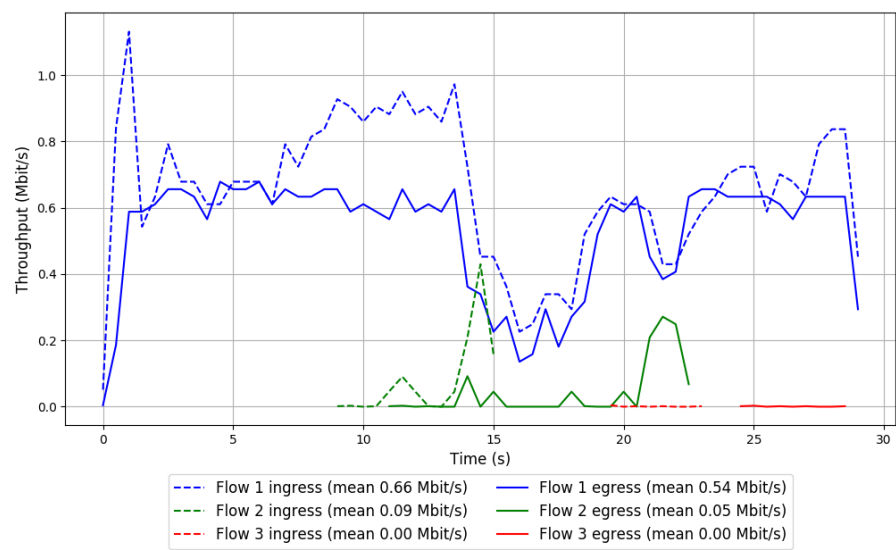
Run 2: Report of PCC — Data Link

Flow 1 ingress (mean 31.48 Mbit/s) — Flow 1 egress (mean 0.52 Mbit/s)
Flow 2 ingress (mean 0.00 Mbit/s) — Flow 2 egress (mean 0.00 Mbit/s)
Flow 3 ingress (mean 0.00 Mbit/s) — Flow 3 egress (mean 0.00 Mbit/s)
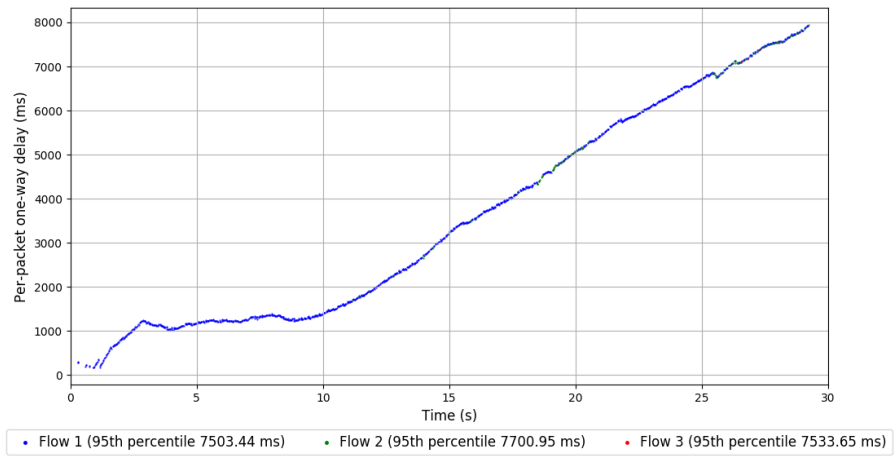

Flow 1 (95th percentile 25550.22 ms)

```
Run 3: Statistics of PCC

Start at: 2018-01-02 21:11:44
End at: 2018-01-02 21:12:14
Local clock offset: -0.213 ms
Remote clock offset: -3.99 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.46 Mbit/s
95th percentile per-packet one-way delay: 25890.433 ms
Loss rate: 98.85%
-- Flow 1:
Average throughput: 0.46 Mbit/s
95th percentile per-packet one-way delay: 25890.433 ms
Loss rate: 98.85%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```

Run 3: Report of PCC — Data Link

Flow 1 ingress (mean 42.22 Mbit/s) --- Flow 1 egress (mean 0.46 Mbit/s)
Flow 2 ingress (mean 0.00 Mbit/s) --- Flow 2 egress (mean 0.00 Mbit/s)
Flow 3 ingress (mean 0.00 Mbit/s) --- Flow 3 egress (mean 0.00 Mbit/s)
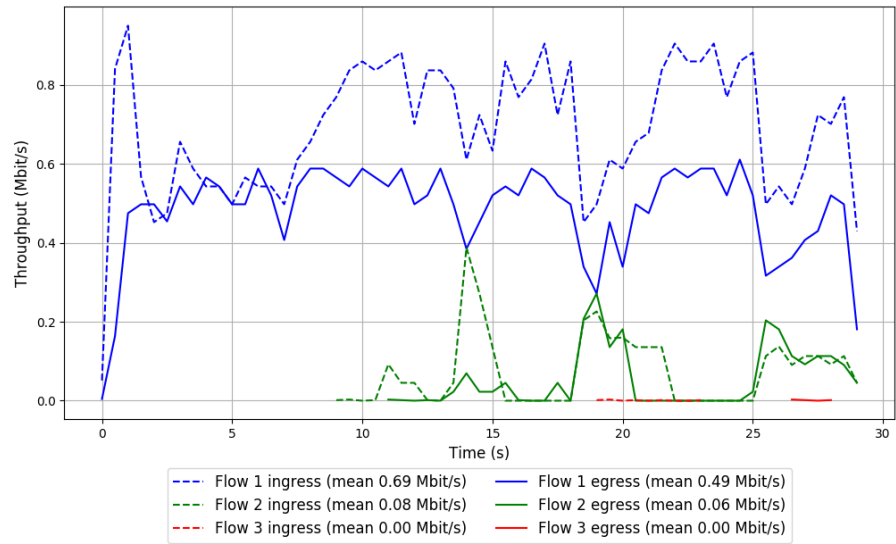

Flow 1 (95th percentile 25890.43 ms)

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```
Run 1: Statistics of QUIC Cubic

Start at: 2018-01-02 20:42:56
End at: 2018-01-02 20:43:26
Local clock offset: -0.027 ms
Remote clock offset: -17.254 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.56 Mbit/s
95th percentile per-packet one-way delay: 7162.236 ms
Loss rate: 19.13%
-- Flow 1:
Average throughput: 0.54 Mbit/s
95th percentile per-packet one-way delay: 7075.728 ms
Loss rate: 19.64%
-- Flow 2:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 7331.855 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5508.939 ms
Loss rate: 0.00%
```
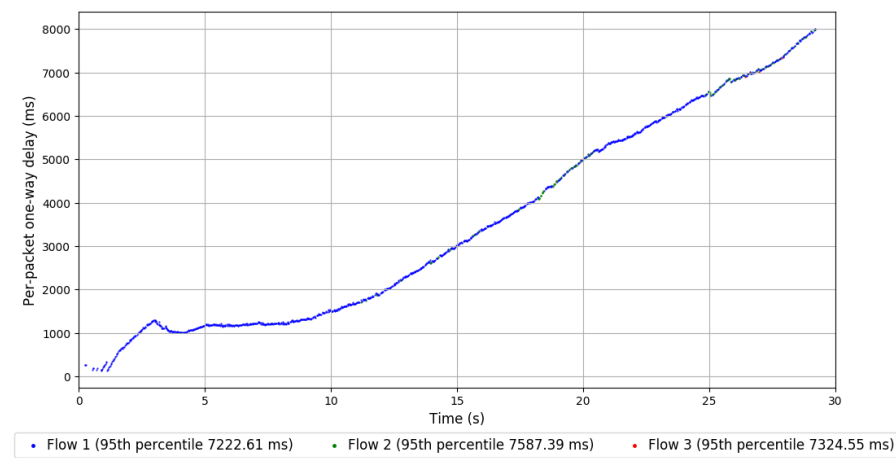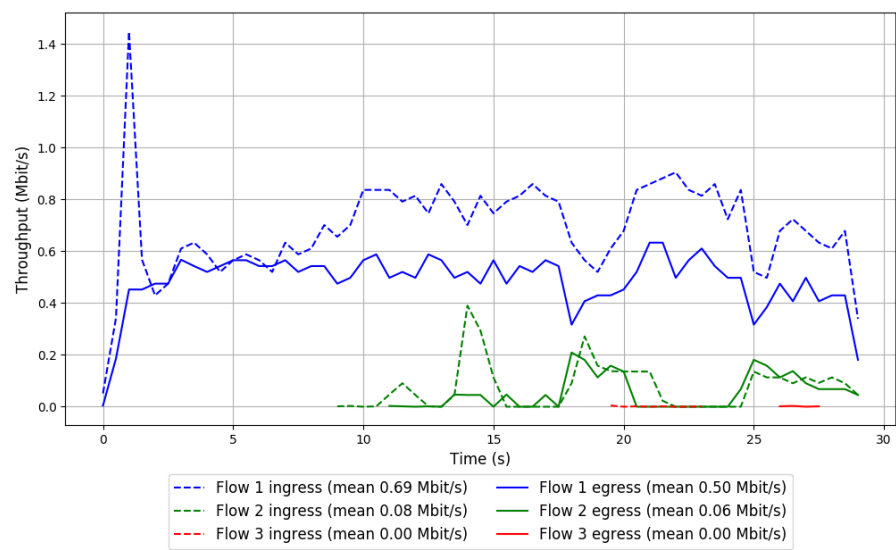
Run 1: Report of QUIC Cubic — Data Link

Flow 1 ingress (mean 0.66 Mbit/s) --- Flow 1 egress (mean 0.54 Mbit/s)
Flow 2 ingress (mean 0.09 Mbit/s) --- Flow 2 egress (mean 0.05 Mbit/s)
Flow 3 ingress (mean 0.00 Mbit/s) --- Flow 3 egress (mean 0.00 Mbit/s)

Flow 1 (95th percentile 7075.73 ms)   Flow 2 (95th percentile 7331.85 ms)   Flow 3 (95th percentile 5508.94 ms)

```
Run 2: Statistics of QUIC Cubic

Start at: 2018-01-02 21:01:45
End at: 2018-01-02 21:02:15
Local clock offset: -0.16 ms
Remote clock offset: -18.684 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 7533.655 ms
Loss rate: 29.84%
-- Flow 1:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 7503.439 ms
Loss rate: 29.58%
-- Flow 2:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 7700.954 ms
Loss rate: 33.24%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 7533.655 ms
Loss rate: 33.33%
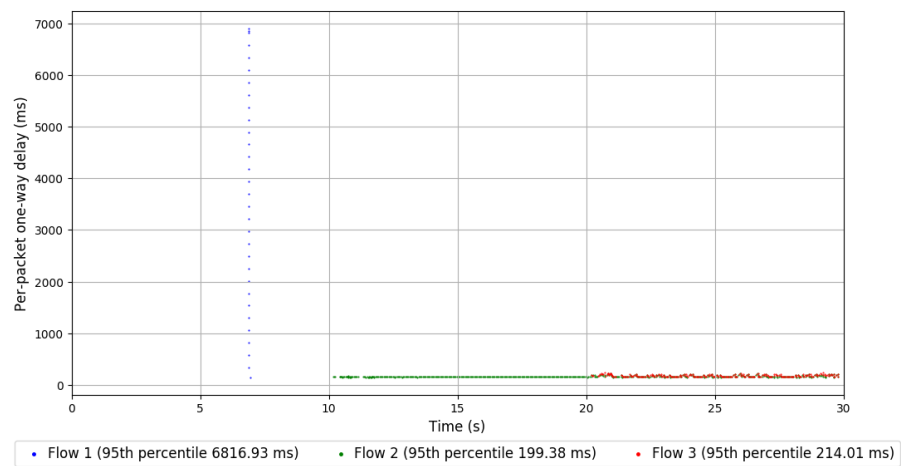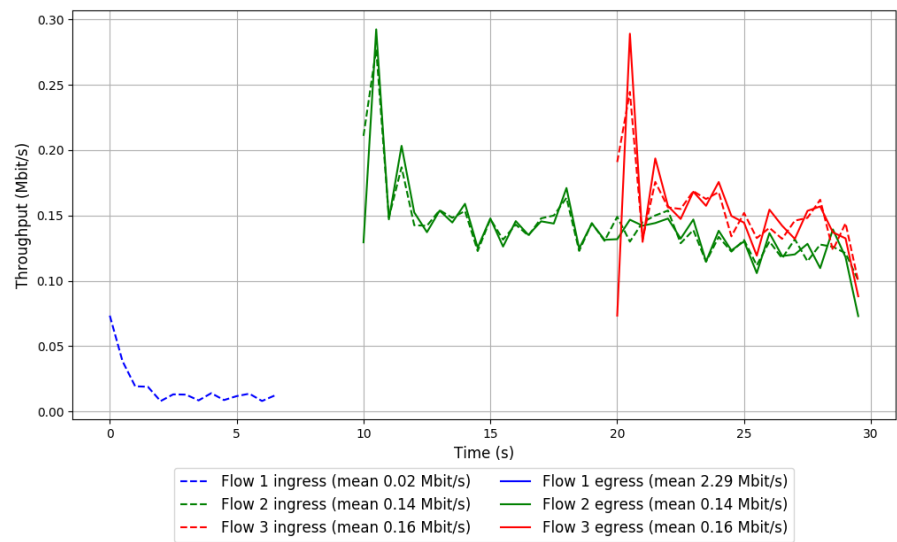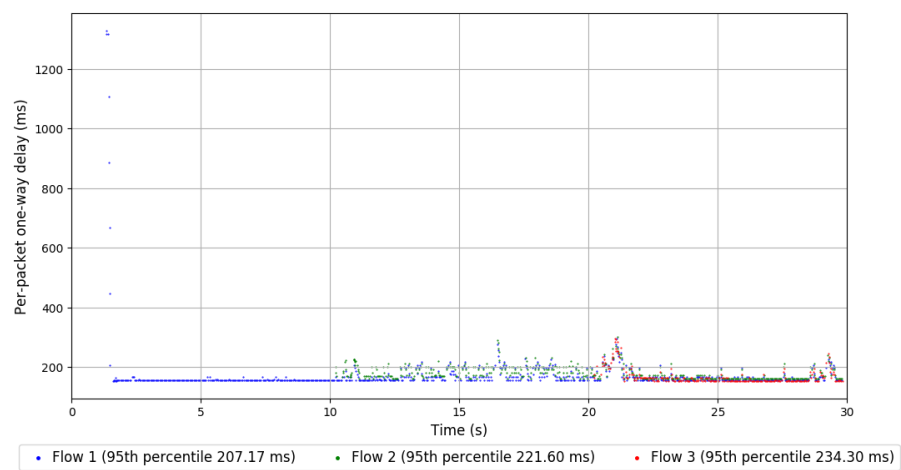```

Run 2: Report of QUIC Cubic — Data Link



Flow 1 ingress (mean 0.69 Mbit/s)     Flow 1 egress (mean 0.49 Mbit/s)
Flow 2 ingress (mean 0.08 Mbit/s)     Flow 2 egress (mean 0.06 Mbit/s)
Flow 3 ingress (mean 0.00 Mbit/s)     Flow 3 egress (mean 0.00 Mbit/s)



Flow 1 (95th percentile 7503.44 ms)     Flow 2 (95th percentile 7700.95 ms)     Flow 3 (95th percentile 7533.65 ms)
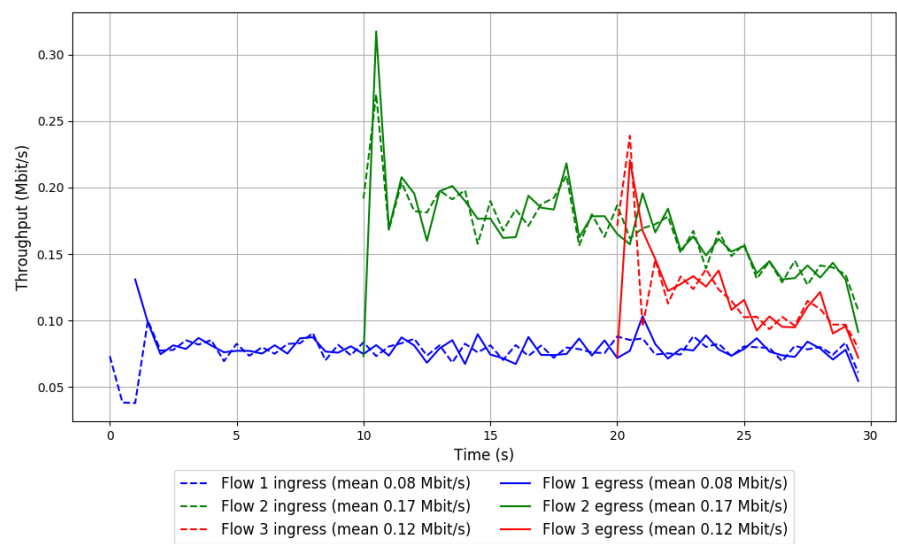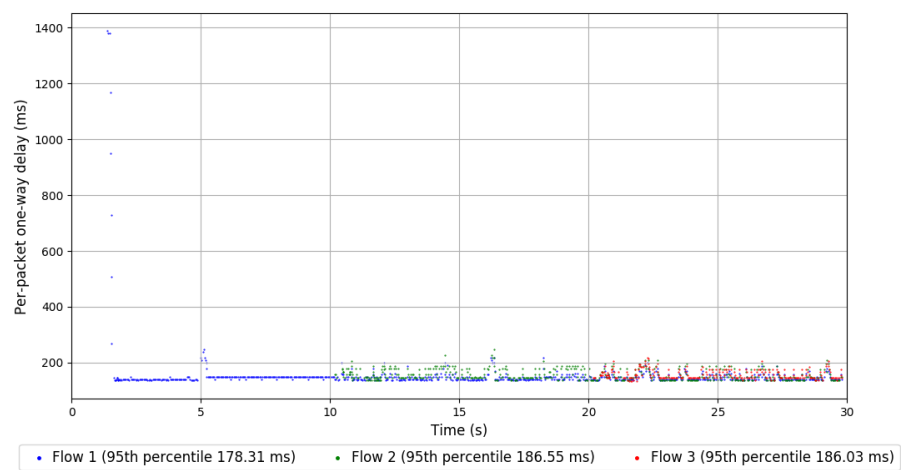
31

```
Run 3: Statistics of QUIC Cubic

Start at: 2018-01-02 21:20:35
End at: 2018-01-02 21:21:05
Local clock offset: -0.157 ms
Remote clock offset: 8.739 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 7270.194 ms
Loss rate: 29.58%
-- Flow 1:
Average throughput: 0.50 Mbit/s
95th percentile per-packet one-way delay: 7222.606 ms
Loss rate: 29.33%
-- Flow 2:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 7587.386 ms
Loss rate: 32.94%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 7324.553 ms
Loss rate: 33.33%
```

Run 3: Report of QUIC Cubic — Data Link

```
Run 1: Statistics of SCReAM

Start at: 2018-01-02 20:41:42
End at: 2018-01-02 20:42:12
Local clock offset: -0.033 ms
Remote clock offset: -18.086 ms
```
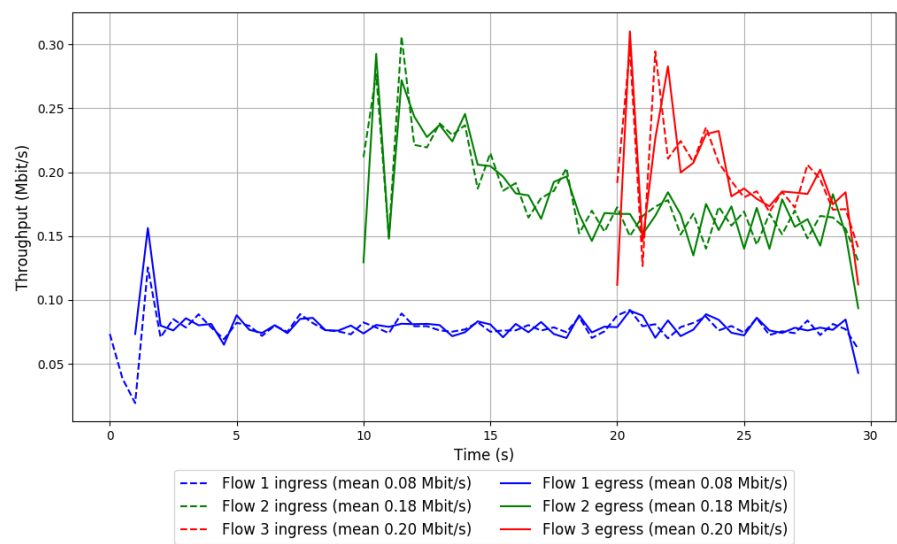
Run 1: Report of SCReAM — Data Link

```
Run 2: Statistics of SCReAM

Start at: 2018-01-02 21:00:30
End at: 2018-01-02 21:01:00
Local clock offset: -0.092 ms
Remote clock offset: -18.601 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.24 Mbit/s
95th percentile per-packet one-way delay: 220.618 ms
Loss rate: 1.03%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 207.169 ms
Loss rate: 0.79%
-- Flow 2:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 221.597 ms
Loss rate: 0.98%
-- Flow 3:
Average throughput: 0.12 Mbit/s
95th percentile per-packet one-way delay: 234.297 ms
Loss rate: 1.64%
```

Run 2: Report of SCReAM — Data Link

```
Run 3: Statistics of SCReAM

Start at: 2018-01-02 21:19:19
End at: 2018-01-02 21:19:49
Local clock offset: -0.151 ms
Remote clock offset: 0.595 ms

# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.28 Mbit/s
95th percentile per-packet one-way delay: 186.508 ms
Loss rate: 1.19%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 178.315 ms
Loss rate: 0.80%
-- Flow 2:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 186.553 ms
Loss rate: 1.12%
-- Flow 3:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 186.035 ms
Loss rate: 1.76%
```
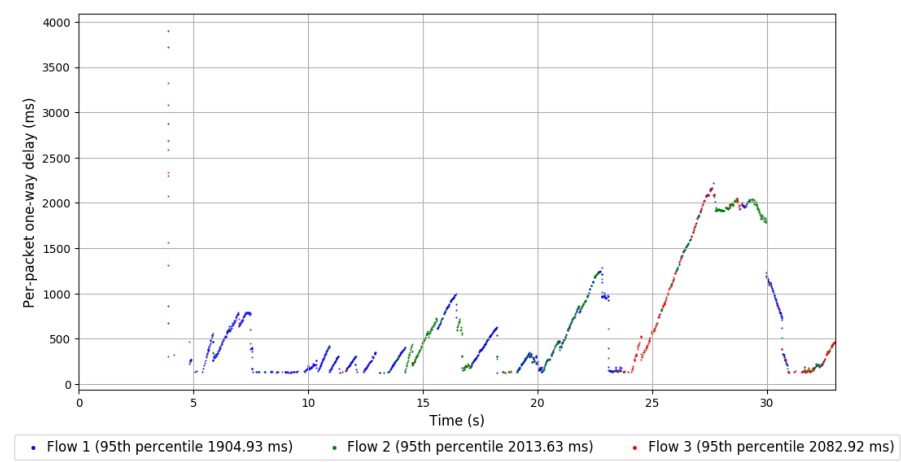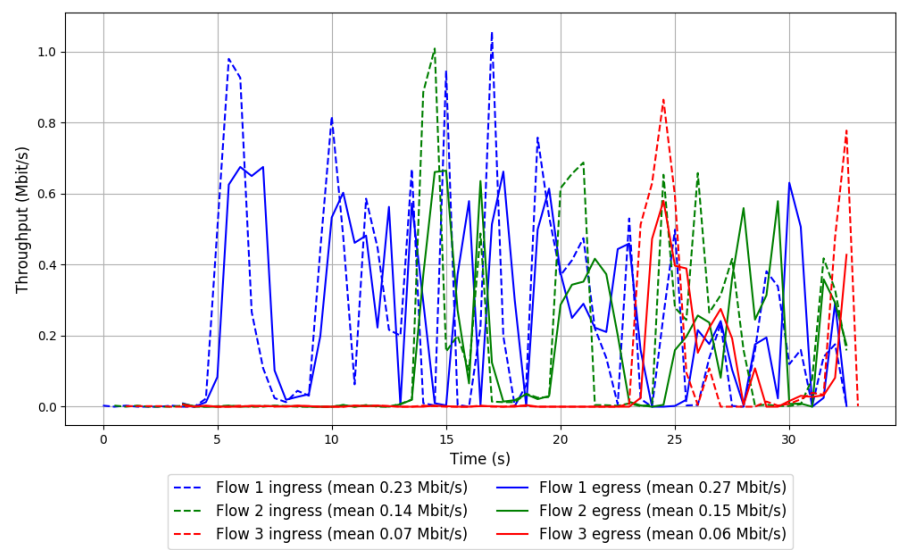
Run 3: Report of SCReAM — Data Link

```
Run 1: Statistics of WebRTC media

Start at: 2018-01-02 20:35:25
End at: 2018-01-02 20:35:55
Local clock offset: 0.005 ms
Remote clock offset: 0.897 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.48 Mbit/s
95th percentile per-packet one-way delay: 1999.845 ms
Loss rate: 3.38%
-- Flow 1:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 1904.935 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 2013.634 ms
Loss rate: 2.29%
-- Flow 3:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 2082.916 ms
Loss rate: 17.94%
```
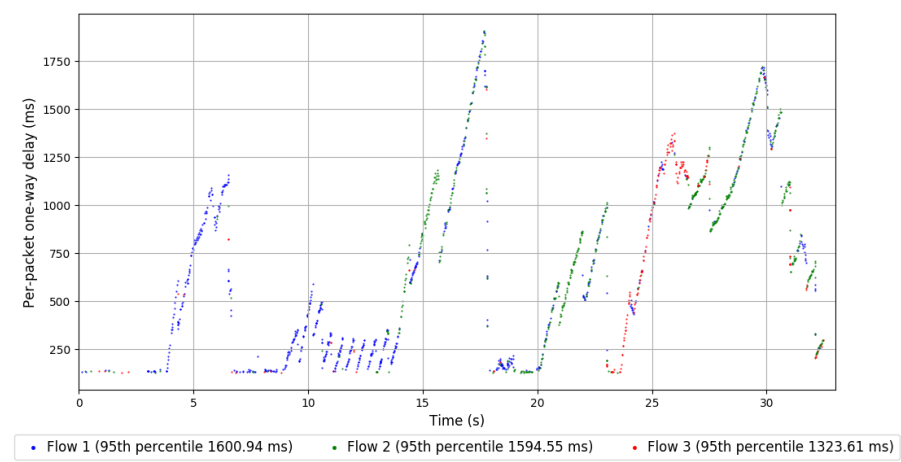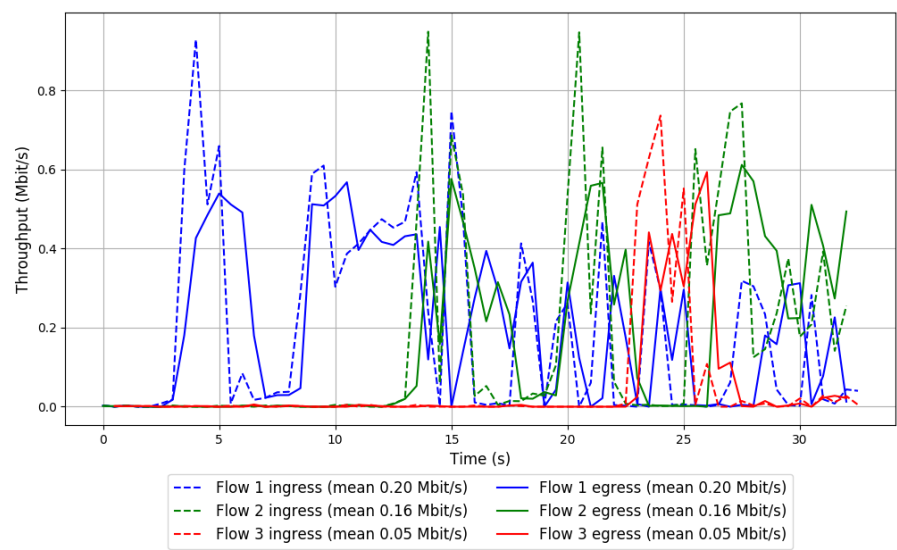
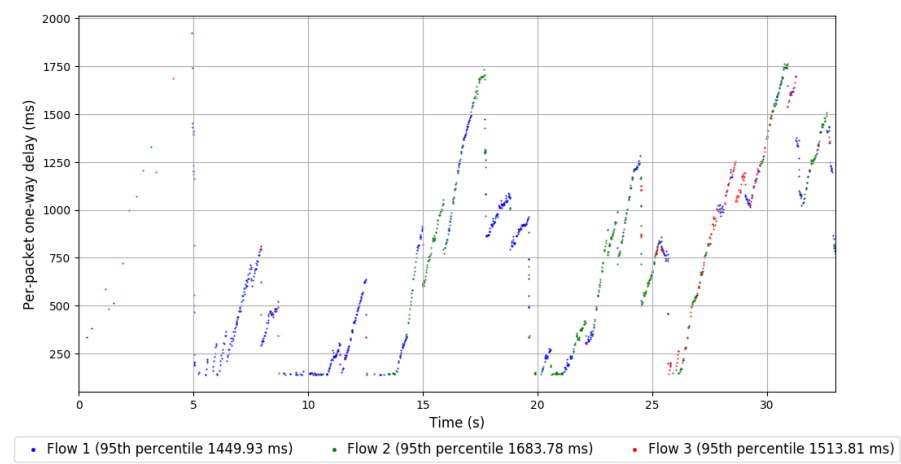Run 1: Report of WebRTC media — Data Link

Flow 1 ingress (mean 0.23 Mbit/s) --- Flow 1 egress (mean 0.27 Mbit/s)
Flow 2 ingress (mean 0.14 Mbit/s) --- Flow 2 egress (mean 0.15 Mbit/s)
Flow 3 ingress (mean 0.07 Mbit/s) --- Flow 3 egress (mean 0.06 Mbit/s)

Flow 1 (95th percentile 1904.93 ms)   Flow 2 (95th percentile 2013.63 ms)   Flow 3 (95th percentile 2082.92 ms)
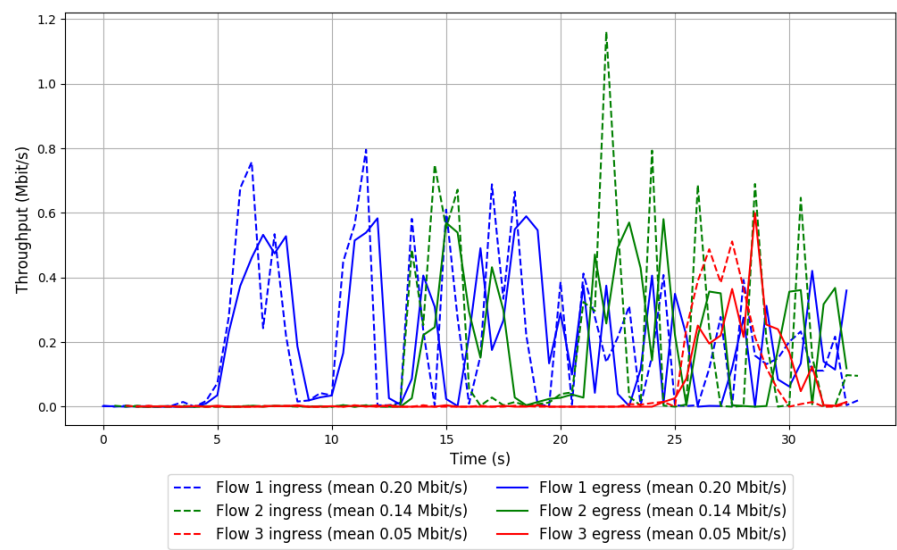
41

```
Run 2: Statistics of WebRTC media

Start at: 2018-01-02 20:54:14
End at: 2018-01-02 20:54:44
Local clock offset: -0.135 ms
Remote clock offset: -3.427 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 1582.612 ms
Loss rate: 0.45%
-- Flow 1:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 1600.938 ms
Loss rate: 0.60%
-- Flow 2:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 1594.554 ms
Loss rate: 0.20%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 1323.611 ms
Loss rate: 0.72%
```

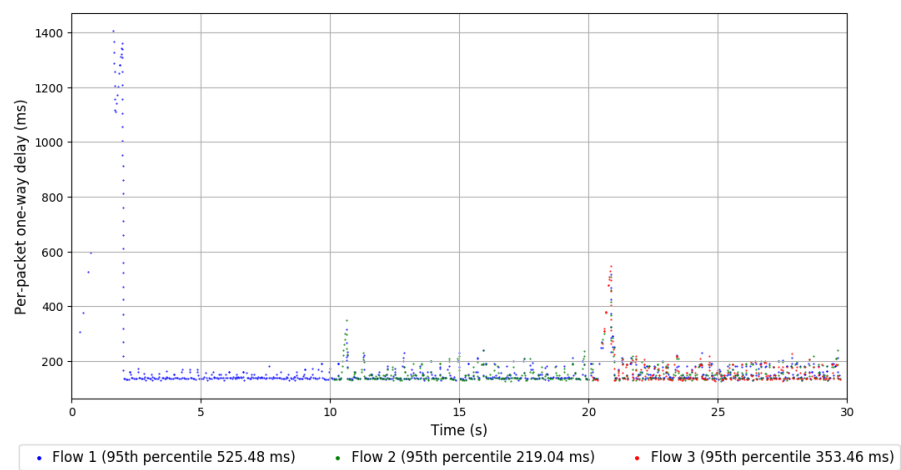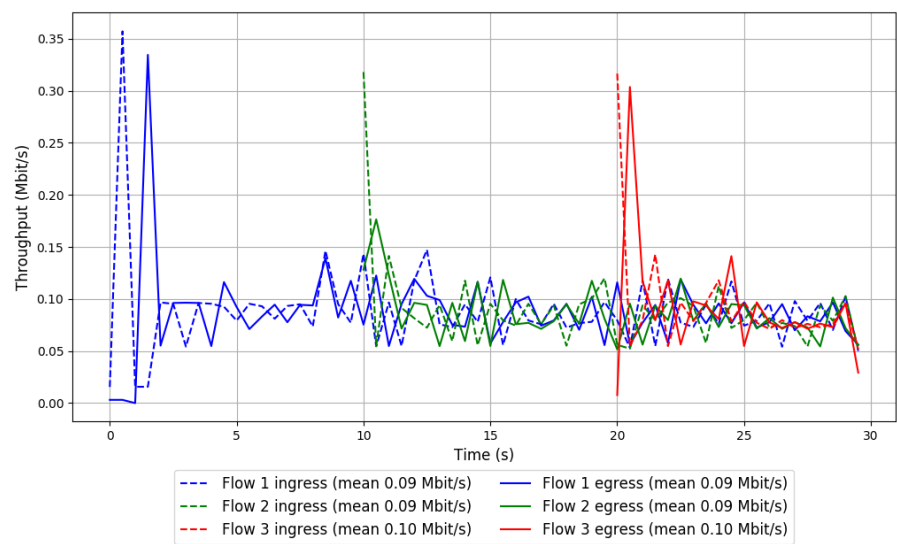Run 2: Report of WebRTC media — Data Link

```
Run 3: Statistics of WebRTC media

Start at: 2018-01-02 21:13:00
End at: 2018-01-02 21:13:30
Local clock offset: -0.135 ms
Remote clock offset: -12.116 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 1591.370 ms
Loss rate: 1.24%
-- Flow 1:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 1449.935 ms
Loss rate: 0.80%
-- Flow 2:
Average throughput: 0.14 Mbit/s
95th percentile per-packet one-way delay: 1683.775 ms
Loss rate: 2.17%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 1513.811 ms
Loss rate: 0.34%
```

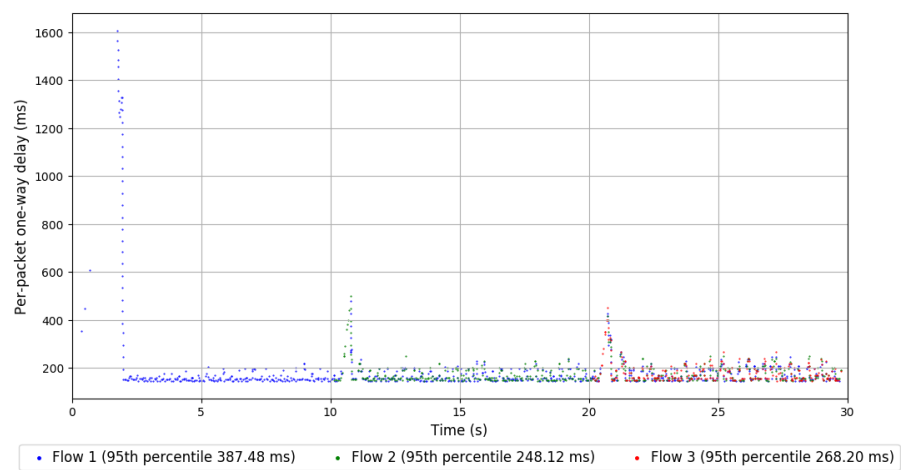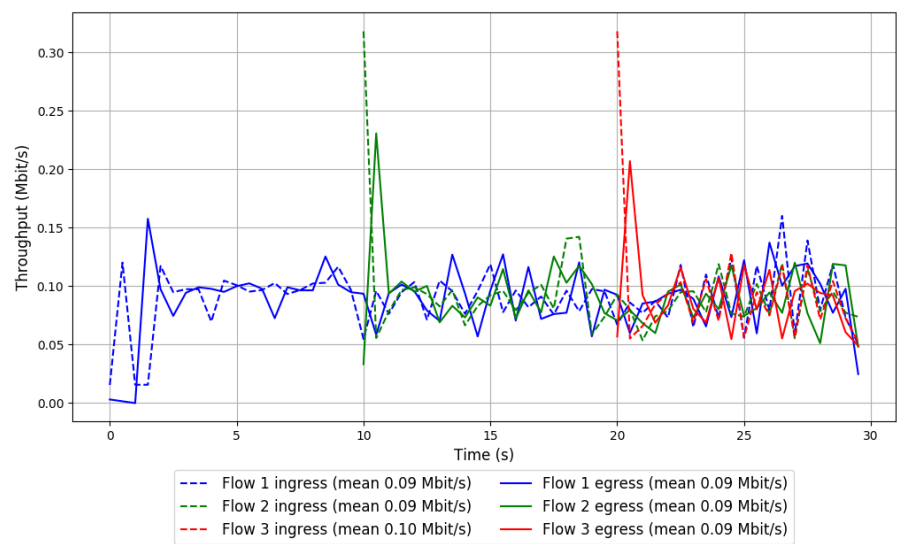Run 3: Report of WebRTC media — Data Link

```
Run 1: Statistics of Sprout

Start at: 2018-01-02 20:40:27
End at: 2018-01-02 20:40:57
Local clock offset: -0.011 ms
Remote clock offset: 0.269 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 300.082 ms
Loss rate: 2.64%
-- Flow 1:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 525.481 ms
Loss rate: 1.98%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 219.044 ms
Loss rate: 3.16%
-- Flow 3:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 353.463 ms
Loss rate: 3.50%
```
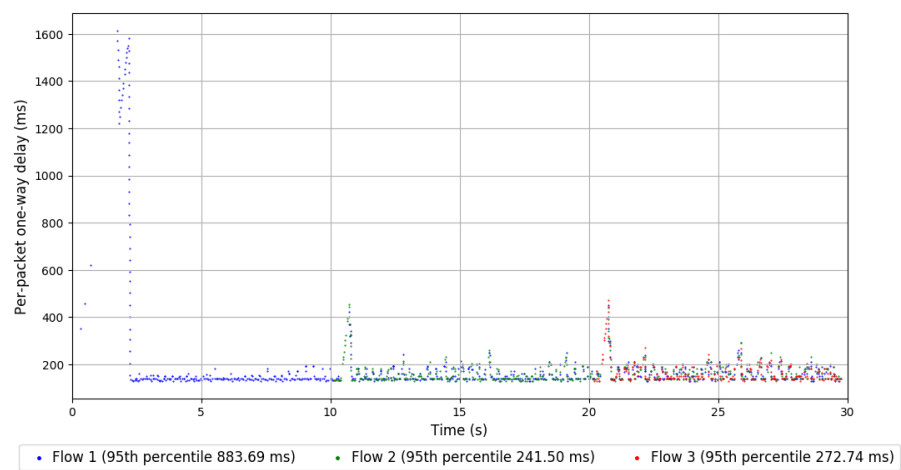
Run 1: Report of Sprout — Data Link

```
Run 2: Statistics of Sprout

Start at: 2018-01-02 20:59:16
End at: 2018-01-02 20:59:46
Local clock offset: -0.106 ms
Remote clock offset: -18.26 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 295.922 ms
Loss rate: 2.36%
-- Flow 1:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 387.483 ms
Loss rate: 0.91%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 248.119 ms
Loss rate: 2.59%
-- Flow 3:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 268.202 ms
Loss rate: 5.96%
```

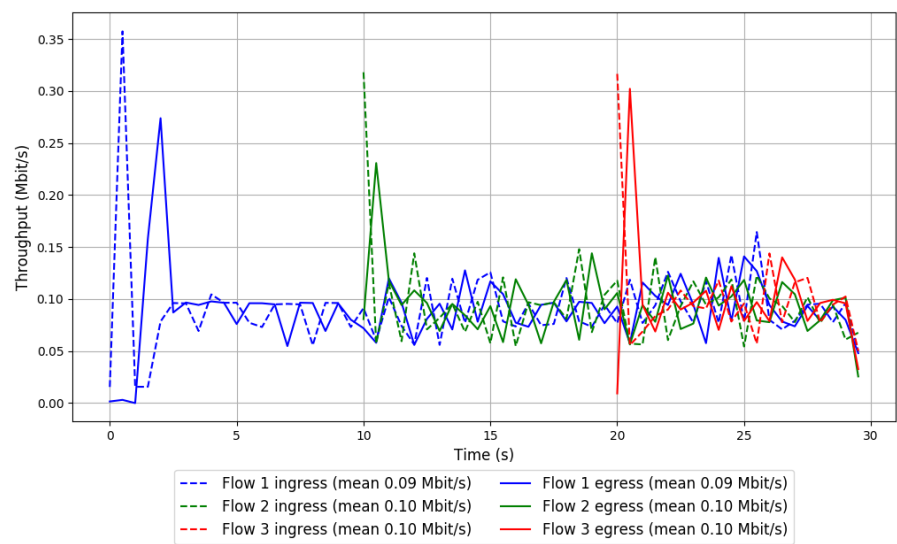Run 2: Report of Sprout — Data Link

```
Run 3: Statistics of Sprout

Start at: 2018-01-02 21:18:05
End at: 2018-01-02 21:18:35
Local clock offset: -0.15 ms
Remote clock offset: -4.286 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 328.224 ms
Loss rate: 1.64%
-- Flow 1:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 883.689 ms
Loss rate: 1.03%
-- Flow 2:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 241.503 ms
Loss rate: 1.68%
-- Flow 3:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 272.737 ms
Loss rate: 3.16%
```
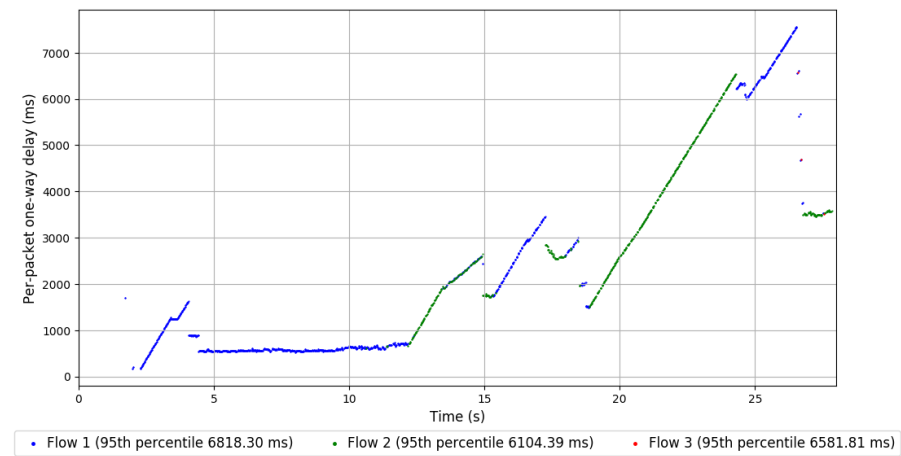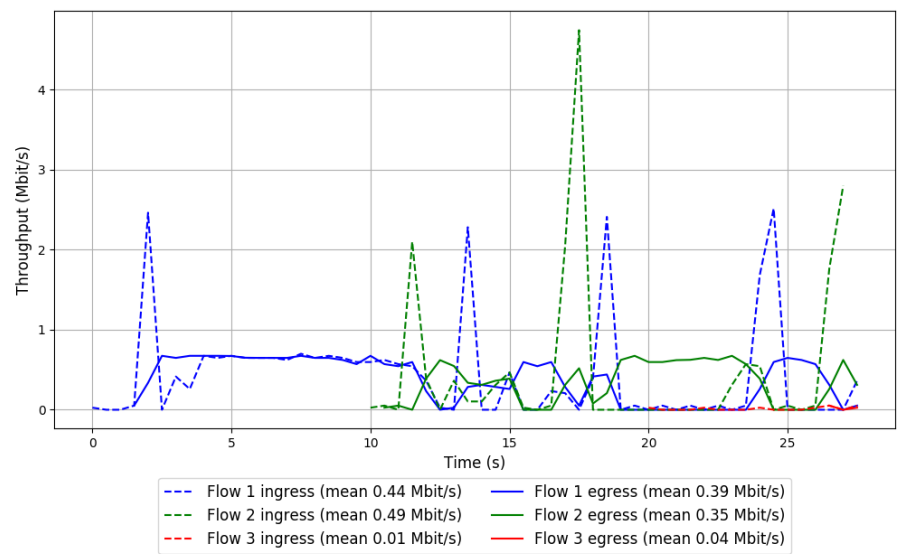
Run 3: Report of Sprout — Data Link

Flow 1 ingress (mean 0.09 Mbit/s) Flow 1 egress (mean 0.09 Mbit/s)
Flow 2 ingress (mean 0.10 Mbit/s) Flow 2 egress (mean 0.10 Mbit/s)
Flow 3 ingress (mean 0.10 Mbit/s) Flow 3 egress (mean 0.10 Mbit/s)

Flow 1 (95th percentile 883.69 ms)   Flow 2 (95th percentile 241.50 ms)   Flow 3 (95th percentile 272.74 ms)

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

Start at: 2018-01-02 20:31:39
End at: 2018-01-02 20:32:09
Local clock offset: -0.026 ms
Remote clock offset: 1.97 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.61 Mbit/s
95th percentile per-packet one-way delay: 6507.650 ms
Loss rate: 23.21%
-- Flow 1:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 6818.295 ms
Loss rate: 18.88%
-- Flow 2:
Average throughput: 0.35 Mbit/s
95th percentile per-packet one-way delay: 6104.392 ms
Loss rate: 29.03%
-- Flow 3:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 6581.807 ms
Loss rate: 62.50%
```
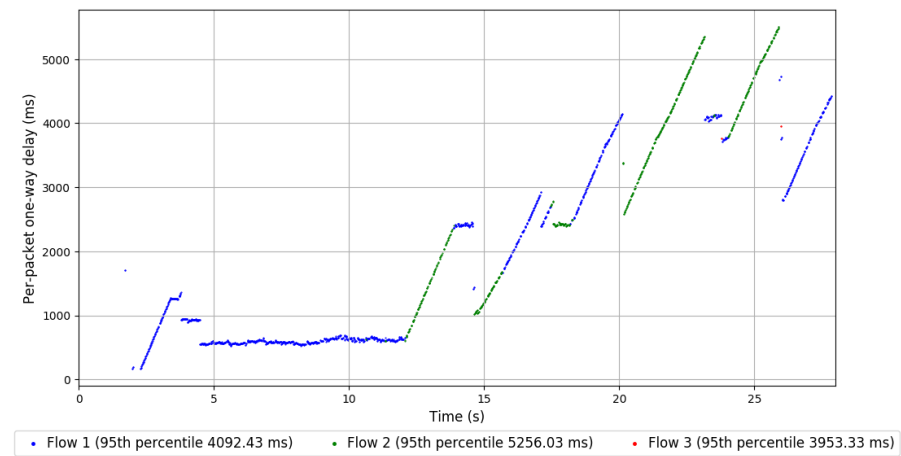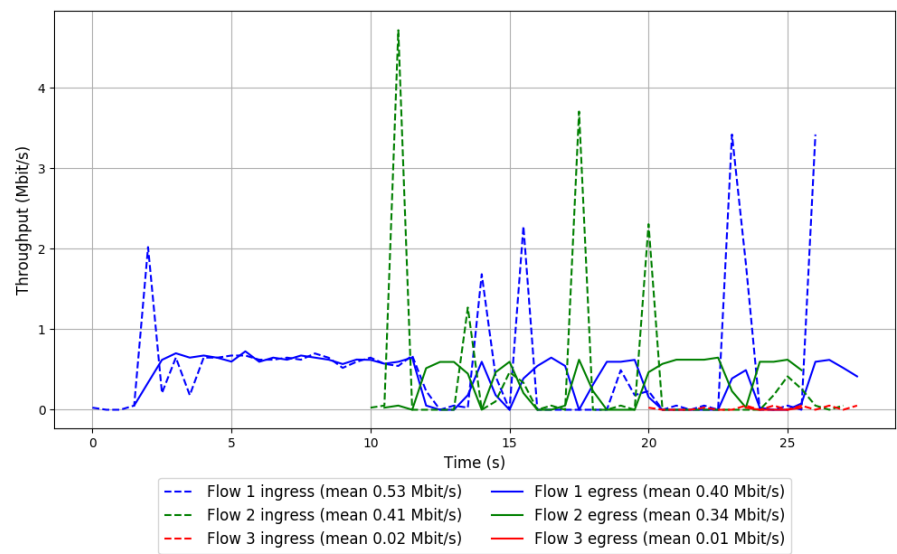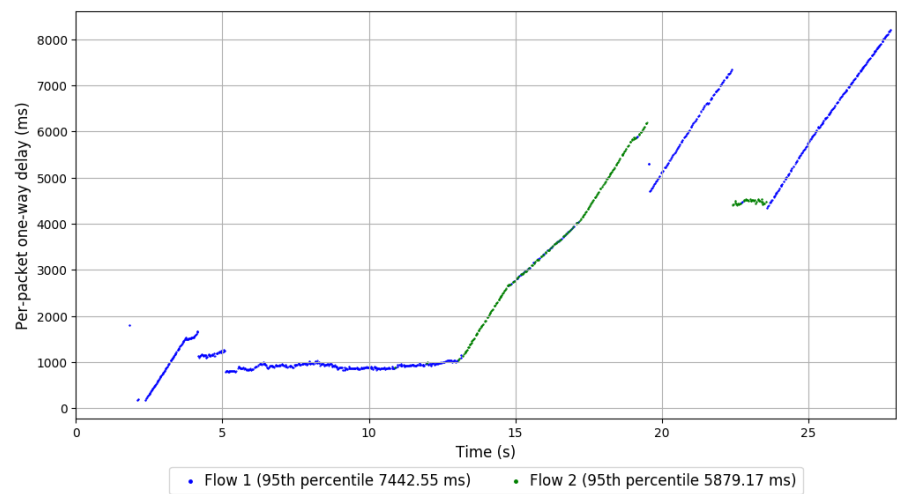
Run 1: Report of TaoVA-100x — Data Link

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

Start at: 2018-01-02 20:50:26
End at: 2018-01-02 20:50:56
Local clock offset: -0.051 ms
Remote clock offset: 0.57 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.60 Mbit/s
95th percentile per-packet one-way delay: 4880.776 ms
Loss rate: 24.76%
-- Flow 1:
Average throughput: 0.40 Mbit/s
95th percentile per-packet one-way delay: 4092.426 ms
Loss rate: 23.94%
-- Flow 2:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 5256.035 ms
Loss rate: 25.08%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 3953.332 ms
Loss rate: 83.33%
```

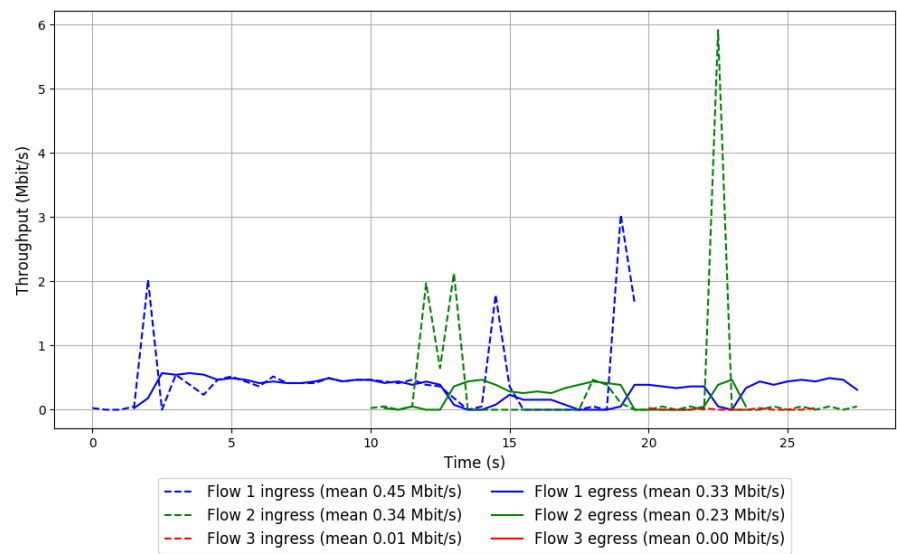Run 2: Report of TaoVA-100x — Data Link

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

Start at: 2018-01-02 21:09:14
End at: 2018-01-02 21:09:44
Local clock offset: -0.118 ms
Remote clock offset: -12.707 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.44 Mbit/s
95th percentile per-packet one-way delay: 7249.660 ms
Loss rate: 24.42%
-- Flow 1:
Average throughput: 0.33 Mbit/s
95th percentile per-packet one-way delay: 7442.552 ms
Loss rate: 5.21%
-- Flow 2:
Average throughput: 0.23 Mbit/s
95th percentile per-packet one-way delay: 5879.166 ms
Loss rate: 52.27%
-- Flow 3:
Average throughput: 0.00 Mbit/s
```

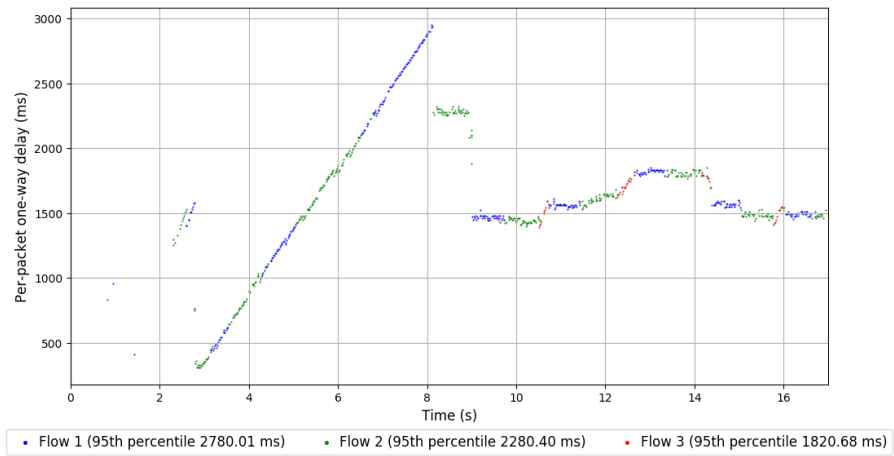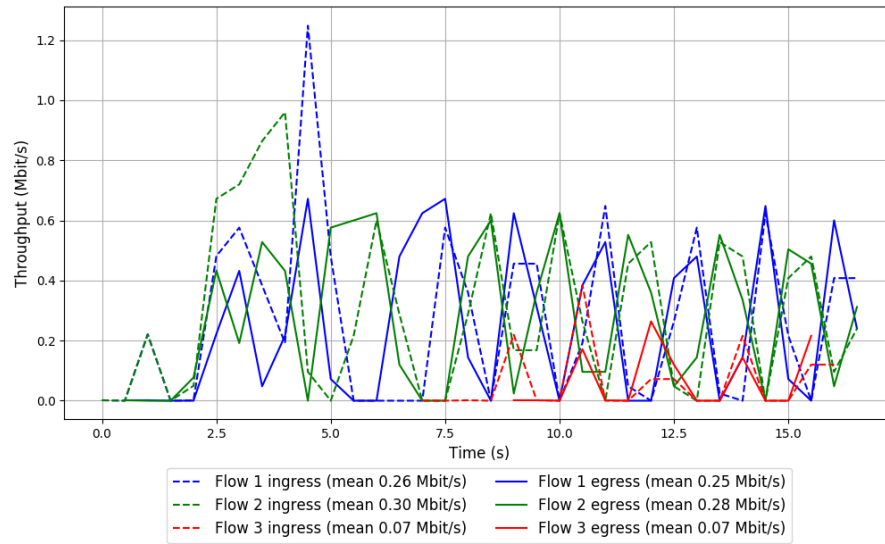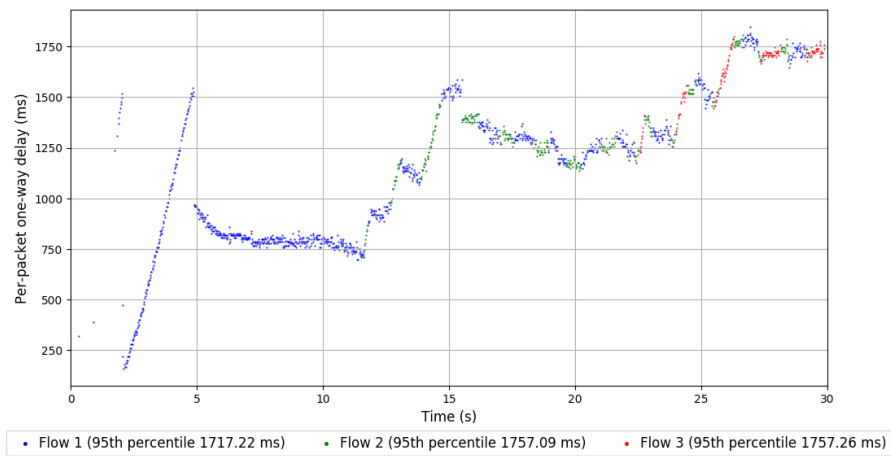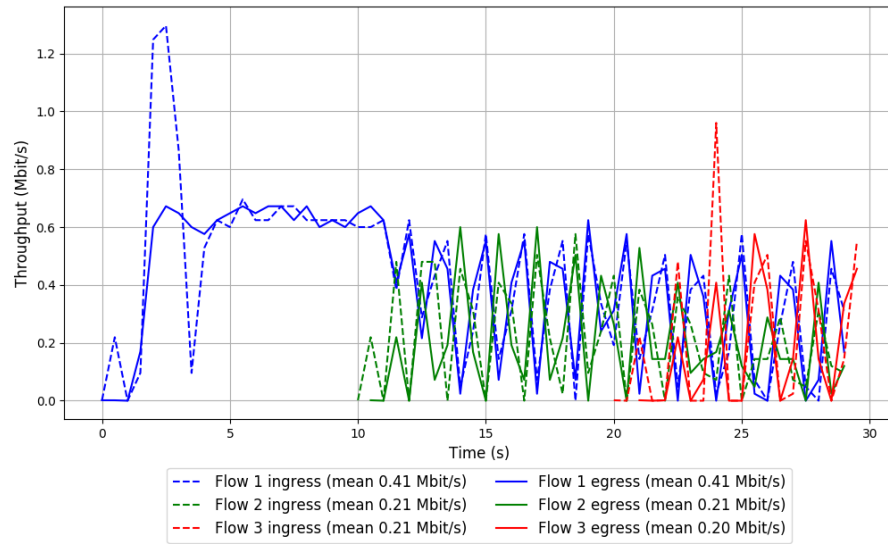## Run 3: Report of TaoVA-100x — Data Link

Flow 1 ingress (mean 0.45 Mbit/s) --- Flow 1 egress (mean 0.33 Mbit/s)
Flow 2 ingress (mean 0.34 Mbit/s) --- Flow 2 egress (mean 0.23 Mbit/s)
Flow 3 ingress (mean 0.01 Mbit/s) --- Flow 3 egress (mean 0.00 Mbit/s)

• Flow 1 (95th percentile 7442.55 ms)   • Flow 2 (95th percentile 5879.17 ms)

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```
Run 1: Statistics of TCP Vegas

Start at: 2018-01-02 20:27:54
End at: 2018-01-02 20:28:24
Local clock offset: 0.041 ms
Remote clock offset: 1.78 ms
```

Run 1: Report of TCP Vegas — Data Link

```
Run 2: Statistics of TCP Vegas

Start at: 2018-01-02 20:46:42
End at: 2018-01-02 20:47:12
Local clock offset: -0.053 ms
Remote clock offset: -12.428 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.59 Mbit/s
95th percentile per-packet one-way delay: 1747.130 ms
Loss rate: 5.68%
-- Flow 1:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 1717.220 ms
Loss rate: 3.17%
-- Flow 2:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 1757.087 ms
Loss rate: 6.32%
-- Flow 3:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 1757.259 ms
Loss rate: 19.04%
```

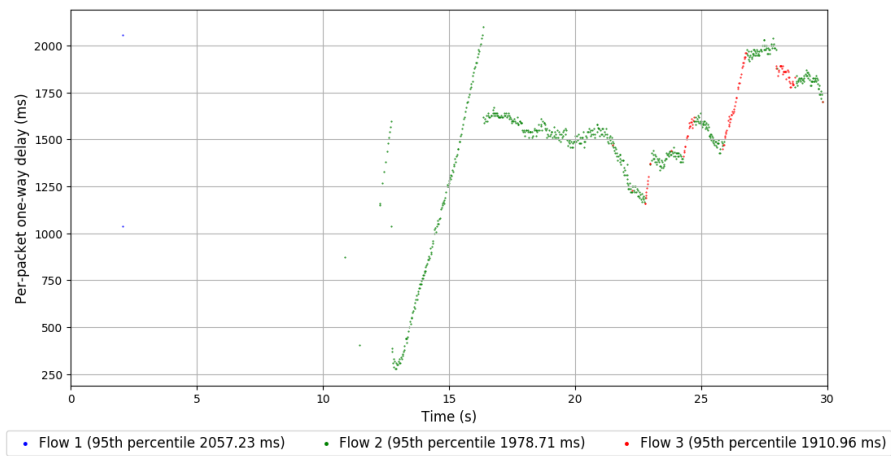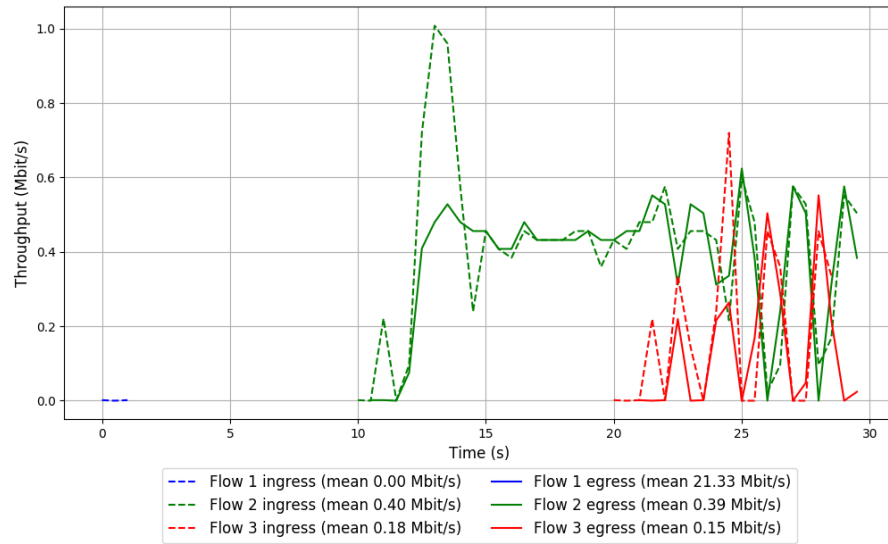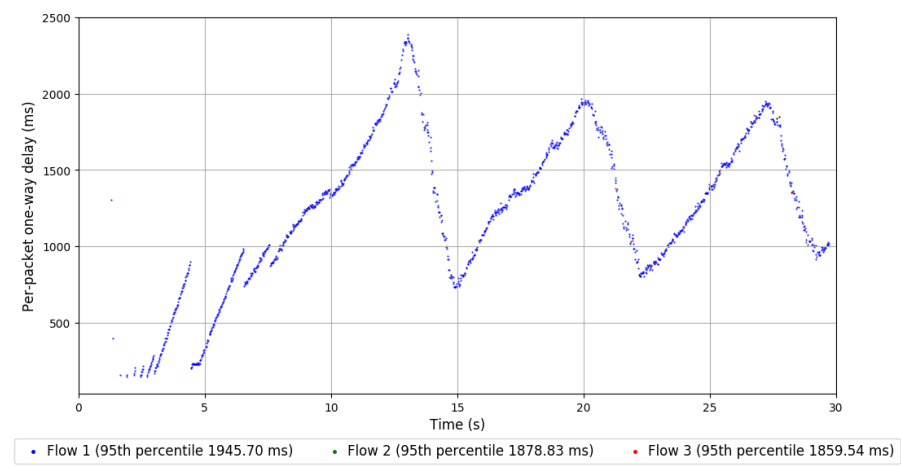Run 2: Report of TCP Vegas — Data Link

Flow 1 ingress (mean 0.41 Mbit/s) —— Flow 1 egress (mean 0.41 Mbit/s)
Flow 2 ingress (mean 0.21 Mbit/s) —— Flow 2 egress (mean 0.21 Mbit/s)
Flow 3 ingress (mean 0.21 Mbit/s) —— Flow 3 egress (mean 0.20 Mbit/s)

• Flow 1 (95th percentile 1717.22 ms)   • Flow 2 (95th percentile 1757.09 ms)   • Flow 3 (95th percentile 1757.26 ms)

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```
Run 3: Statistics of TCP Vegas

Start at: 2018-01-02 21:05:30
End at: 2018-01-02 21:06:00
Local clock offset: -0.115 ms
Remote clock offset: -12.656 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 1968.950 ms
Loss rate: 10.42%
-- Flow 1:
Average throughput: 21.33 Mbit/s
95th percentile per-packet one-way delay: 2057.233 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 1978.711 ms
Loss rate: 7.77%
-- Flow 3:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 1910.957 ms
Loss rate: 23.47%
```

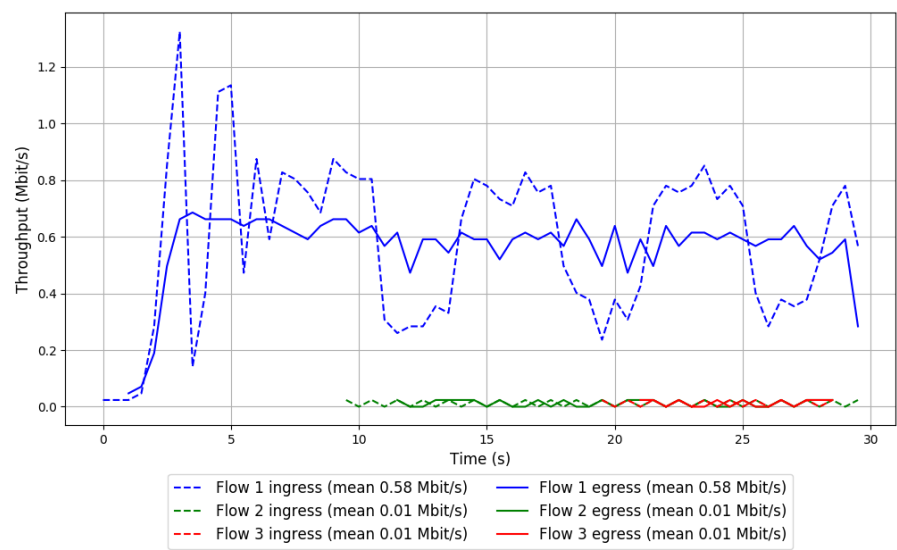Run 3: Report of TCP Vegas — Data Link

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```
Run 1: Statistics of Verus

Start at: 2018-01-02 20:30:24
End at: 2018-01-02 20:30:54
Local clock offset: 0.005 ms
Remote clock offset: -0.086 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.59 Mbit/s
95th percentile per-packet one-way delay: 1945.697 ms
Loss rate: 5.14%
-- Flow 1:
Average throughput: 0.58 Mbit/s
95th percentile per-packet one-way delay: 1945.697 ms
Loss rate: 5.05%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1878.830 ms
Loss rate: 9.52%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1859.535 ms
Loss rate: 10.00%
```

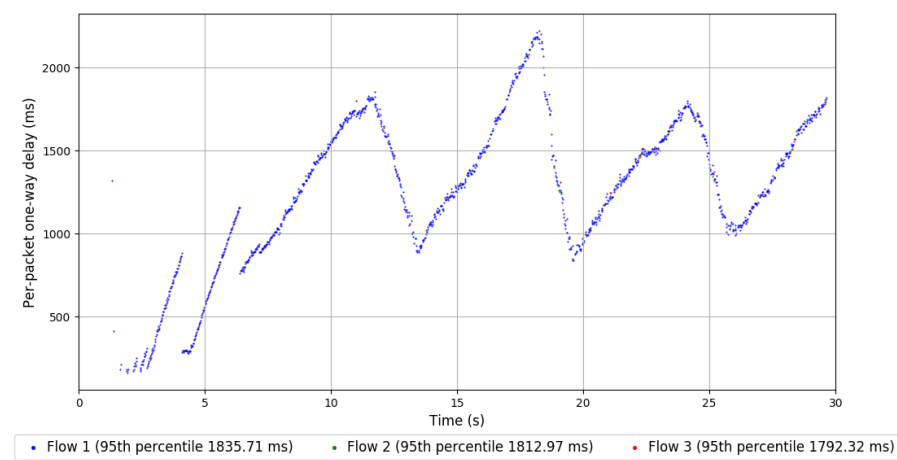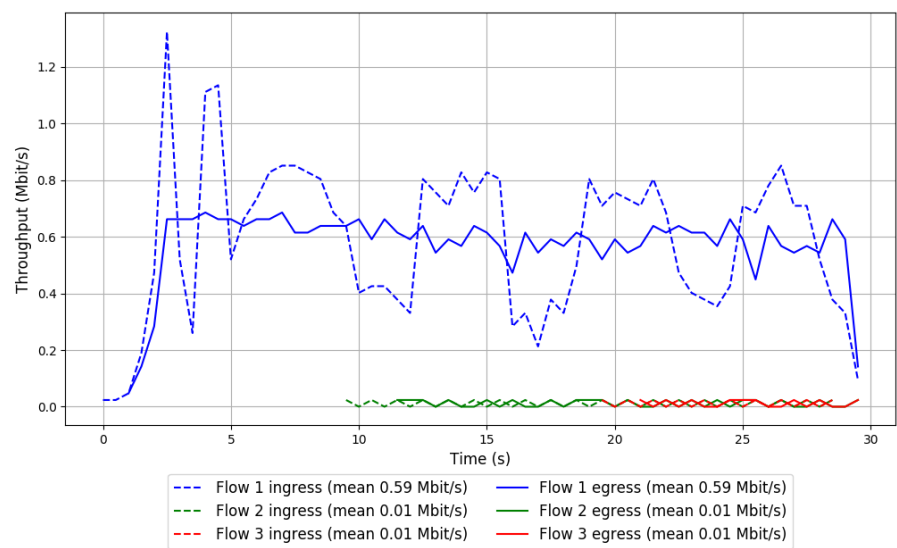# Run 1: Report of Verus — Data Link

```
Run 2: Statistics of Verus

Start at: 2018-01-02 20:49:11
End at: 2018-01-02 20:49:41
Local clock offset: -0.044 ms
Remote clock offset: -17.348 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.60 Mbit/s
95th percentile per-packet one-way delay: 1835.711 ms
Loss rate: 4.57%
-- Flow 1:
Average throughput: 0.59 Mbit/s
95th percentile per-packet one-way delay: 1835.711 ms
Loss rate: 4.53%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1812.967 ms
Loss rate: 5.00%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1792.323 ms
Loss rate: 10.00%
```

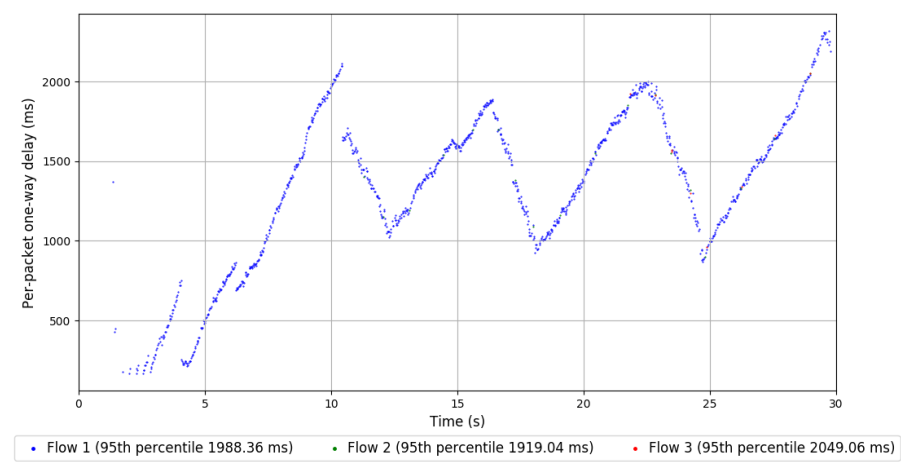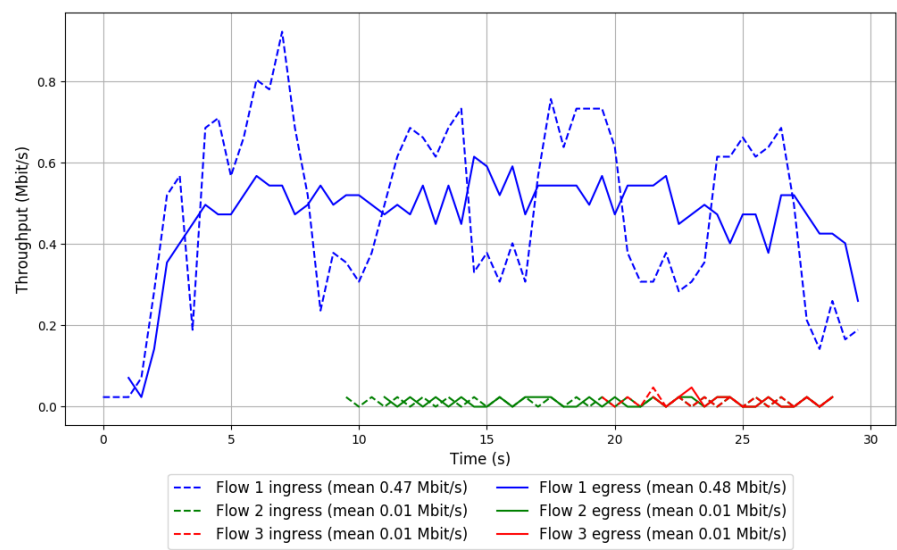# Run 2: Report of Verus — Data Link

```
Run 3: Statistics of Verus

Start at: 2018-01-02 21:07:59
End at: 2018-01-02 21:08:29
Local clock offset: -0.181 ms
Remote clock offset: -13.541 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 1989.608 ms
Loss rate: 3.58%
-- Flow 1:
Average throughput: 0.48 Mbit/s
95th percentile per-packet one-way delay: 1988.363 ms
Loss rate: 3.34%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1919.040 ms
Loss rate: 10.00%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 2049.060 ms
Loss rate: 18.18%
```

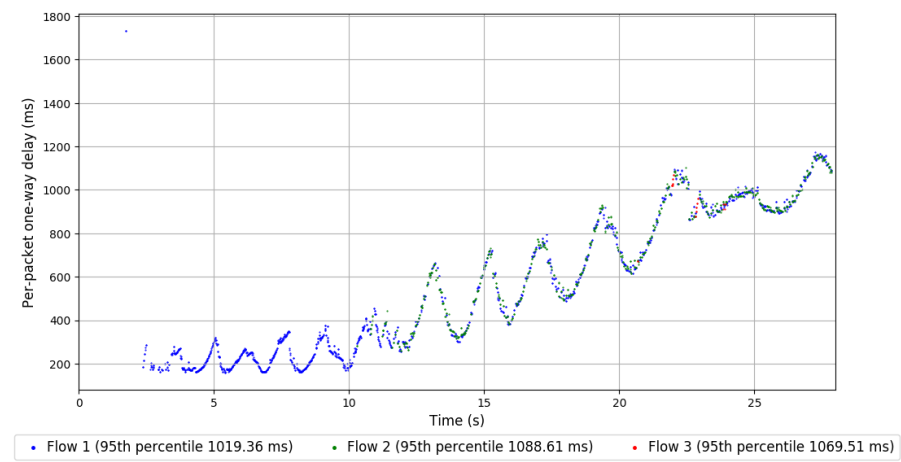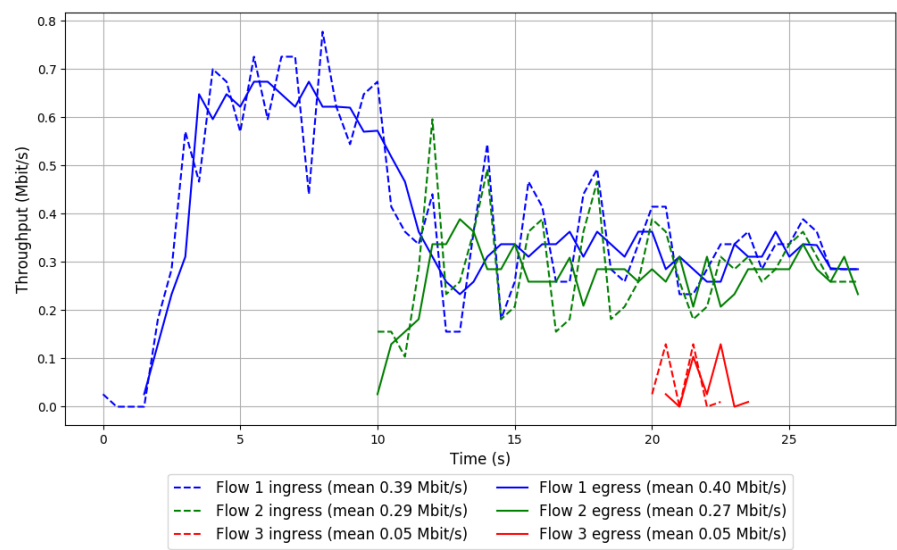## Run 3: Report of Verus — Data Link

```
Run 1: Statistics of Copa

Start at: 2018-01-02 20:37:57
End at: 2018-01-02 20:38:27
Local clock offset: -0.076 ms
Remote clock offset: -18.231 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.59 Mbit/s
95th percentile per-packet one-way delay: 1059.927 ms
Loss rate: 4.12%
-- Flow 1:
Average throughput: 0.40 Mbit/s
95th percentile per-packet one-way delay: 1019.359 ms
Loss rate: 3.25%
-- Flow 2:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 1088.608 ms
Loss rate: 6.08%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 1069.510 ms
Loss rate: 0.00%
```

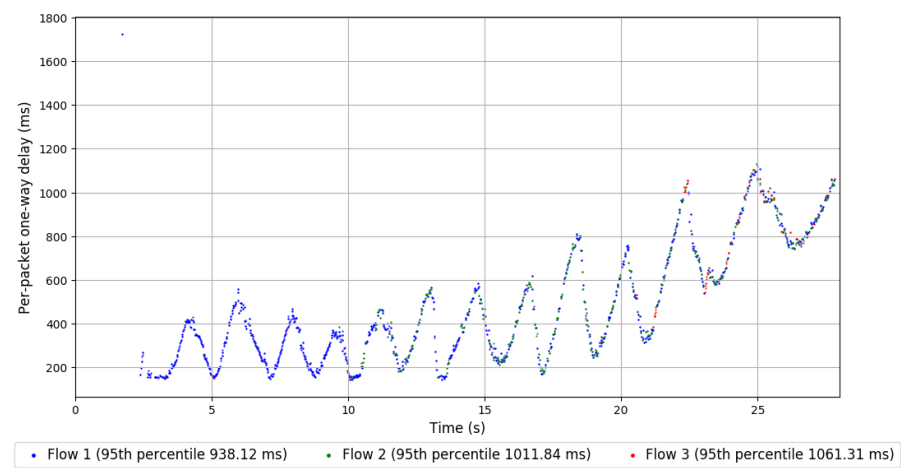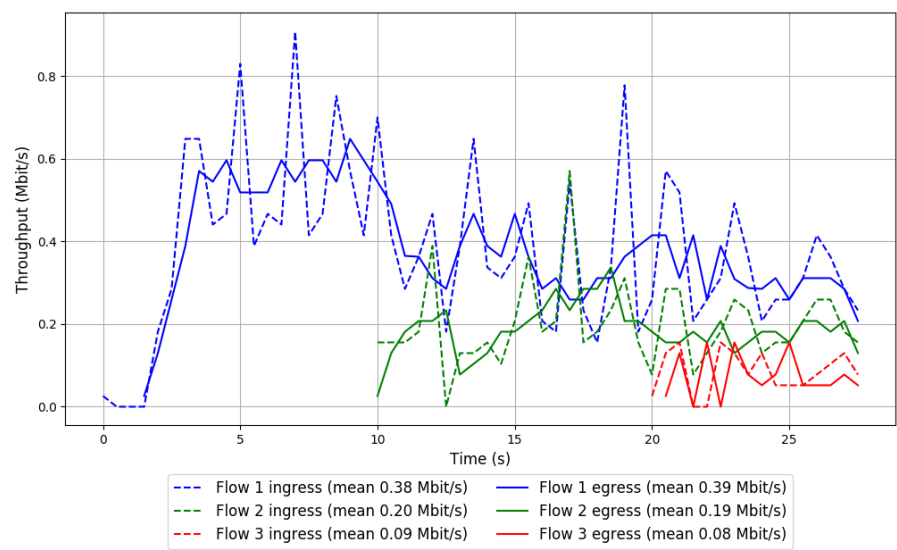Run 1: Report of Copa — Data Link

```
Run 2: Statistics of Copa

Start at: 2018-01-02 20:56:46
End at: 2018-01-02 20:57:16
Local clock offset: -0.079 ms
Remote clock offset: -4.325 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.54 Mbit/s
95th percentile per-packet one-way delay: 983.632 ms
Loss rate: 4.53%
-- Flow 1:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 938.121 ms
Loss rate: 3.17%
-- Flow 2:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 1011.835 ms
Loss rate: 6.16%
-- Flow 3:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 1061.309 ms
Loss rate: 17.31%
```

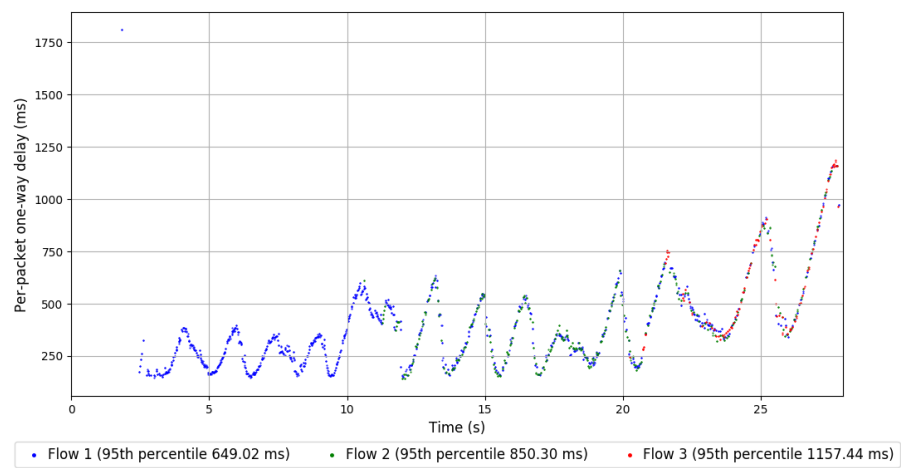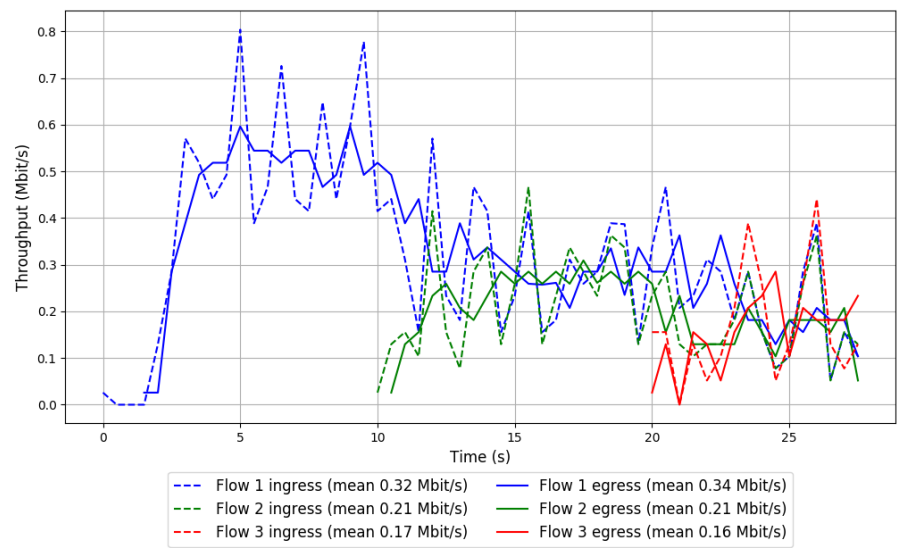# Run 2: Report of Copa — Data Link

```
Run 3: Statistics of Copa

Start at: 2018-01-02 21:15:33
End at: 2018-01-02 21:16:03
Local clock offset: -0.209 ms
Remote clock offset: -4.248 ms


# Below is generated by plot.py at 2018-01-02 22:20:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.52 Mbit/s
95th percentile per-packet one-way delay: 823.976 ms
Loss rate: 2.79%
-- Flow 1:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 649.018 ms
Loss rate: 1.45%
-- Flow 2:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 850.304 ms
Loss rate: 4.23%
-- Flow 3:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 1157.437 ms
Loss rate: 7.77%
```

Run 3: Report of Copa — Data Link

Flow 1 ingress (mean 0.32 Mbit/s)   Flow 1 egress (mean 0.34 Mbit/s)
Flow 2 ingress (mean 0.21 Mbit/s)   Flow 2 egress (mean 0.21 Mbit/s)
Flow 3 ingress (mean 0.17 Mbit/s)   Flow 3 egress (mean 0.16 Mbit/s)

Flow 1 (95th percentile 649.02 ms)   Flow 2 (95th percentile 850.30 ms)   Flow 3 (95th percentile 1157.44 ms)
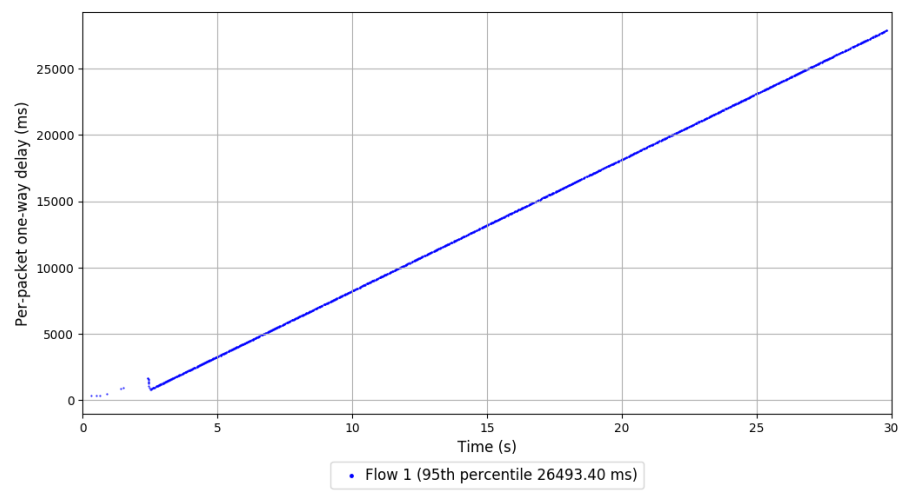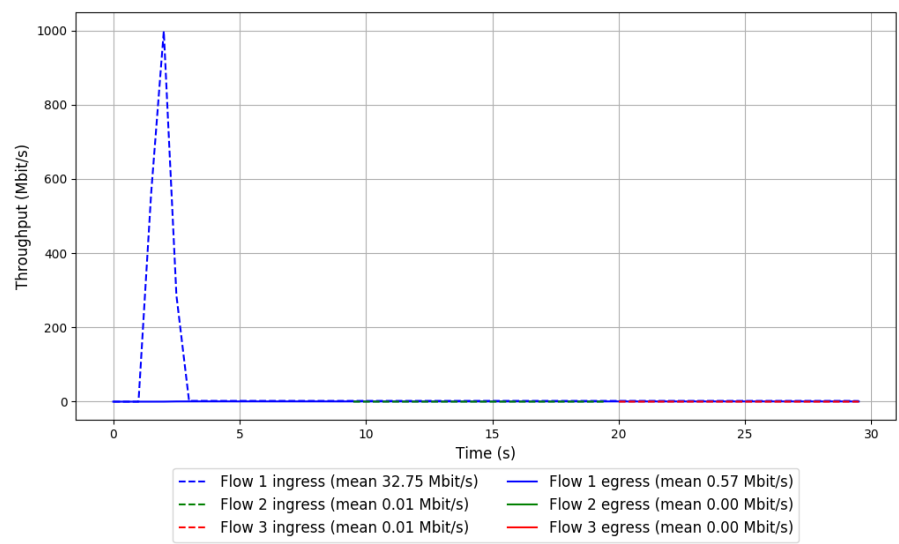
```
Run 1: Statistics of FillP

Start at: 2018-01-02 20:36:40
End at: 2018-01-02 20:37:10
Local clock offset: -0.007 ms
Remote clock offset: -4.38 ms


# Below is generated by plot.py at 2018-01-02 22:20:58
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 26493.395 ms
Loss rate: 98.27%
-- Flow 1:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 26493.395 ms
Loss rate: 98.27%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```
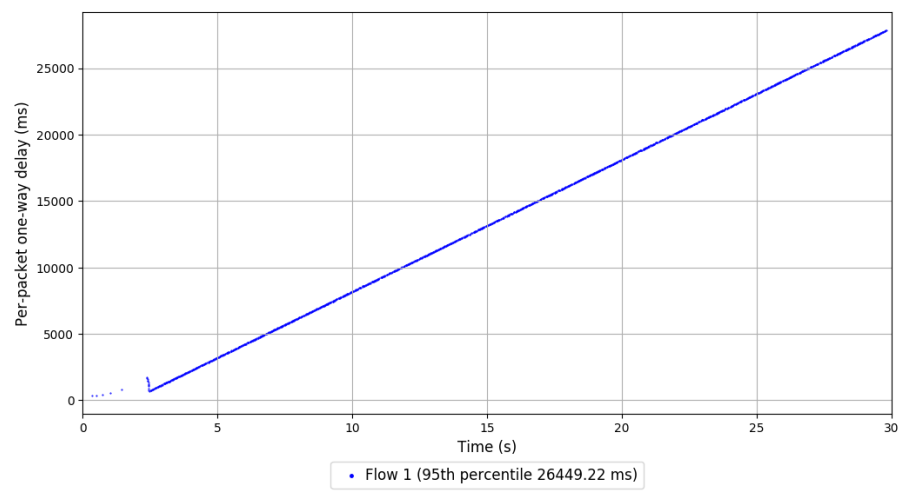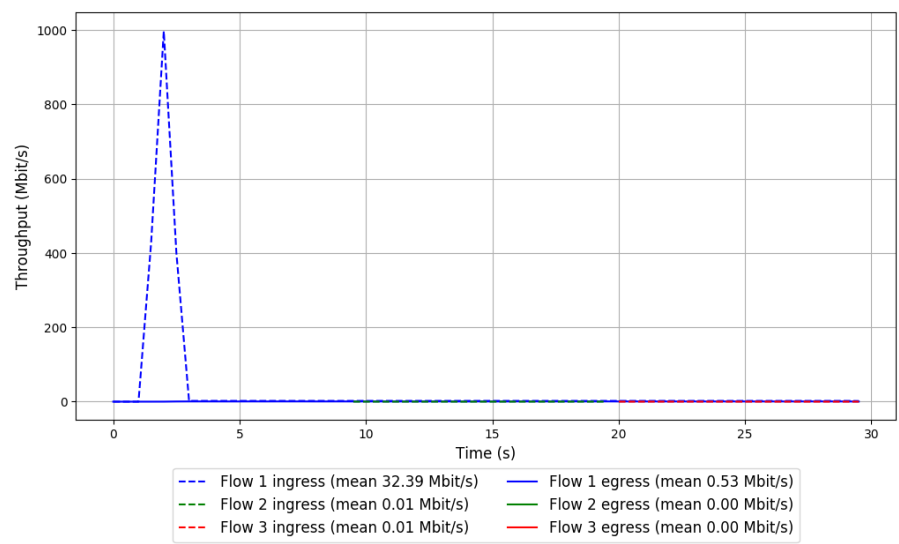
Run 1: Report of FillP — Data Link

```
Run 2: Statistics of FillP

Start at: 2018-01-02 20:55:29
End at: 2018-01-02 20:55:59
Local clock offset: -0.062 ms
Remote clock offset: -4.698 ms


# Below is generated by plot.py at 2018-01-02 22:20:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 26449.219 ms
Loss rate: 98.40%
-- Flow 1:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 26449.219 ms
Loss rate: 98.40%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```
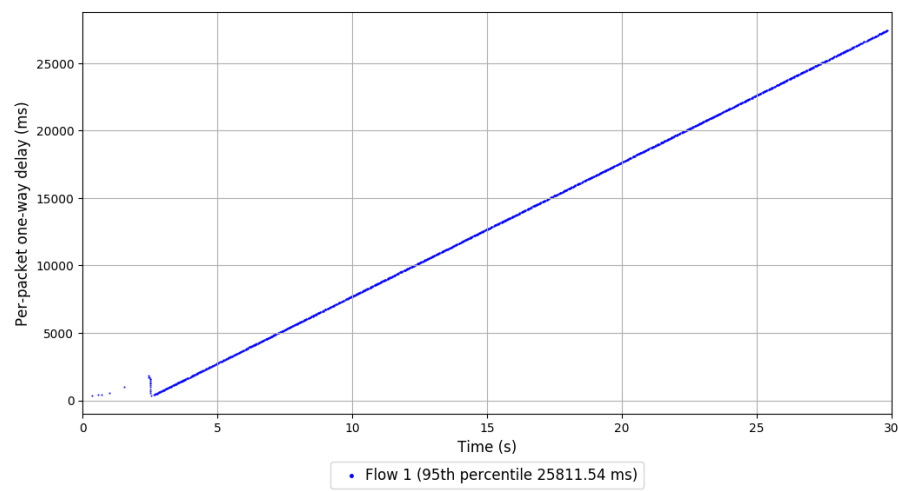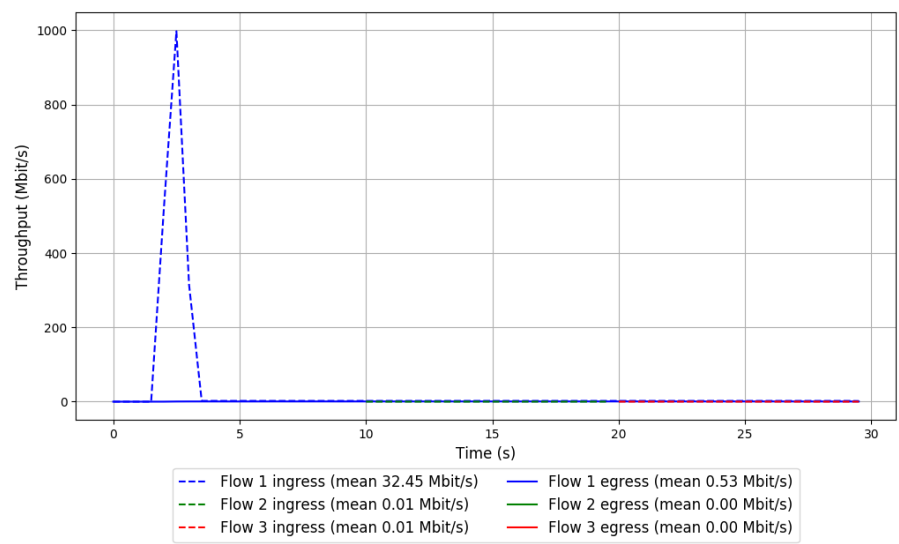
Run 2: Report of FillP — Data Link

```
Run 3: Statistics of FillP

Start at: 2018-01-02 21:14:16
End at: 2018-01-02 21:14:46
Local clock offset: -0.136 ms
Remote clock offset: -12.603 ms


# Below is generated by plot.py at 2018-01-02 22:20:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 25811.544 ms
Loss rate: 98.39%
-- Flow 1:
Average throughput: 0.53 Mbit/s
95th percentile per-packet one-way delay: 25811.544 ms
Loss rate: 98.39%
-- Flow 2:
Average throughput: 0.00 Mbit/s
-- Flow 3:
Average throughput: 0.00 Mbit/s
```

Run 3: Report of FillP — Data Link

Flow 1 ingress (mean 32.45 Mbit/s)   Flow 1 egress (mean 0.53 Mbit/s)
Flow 2 ingress (mean 0.01 Mbit/s)   Flow 2 egress (mean 0.00 Mbit/s)
Flow 3 ingress (mean 0.01 Mbit/s)   Flow 3 egress (mean 0.00 Mbit/s)

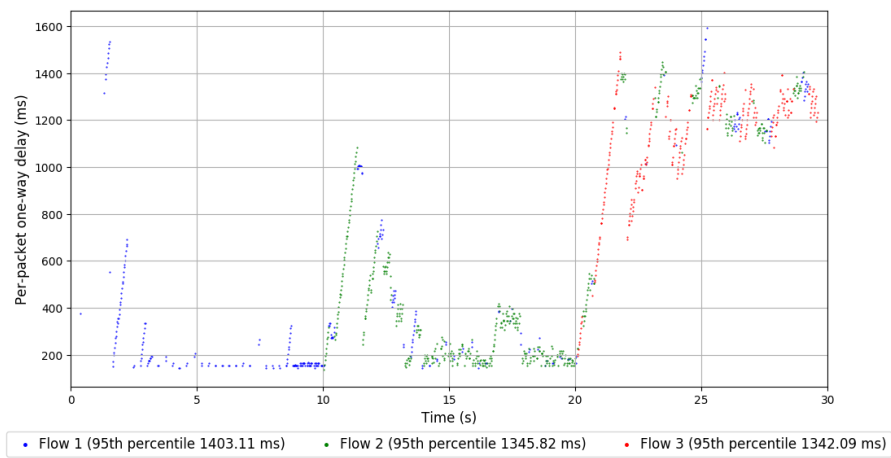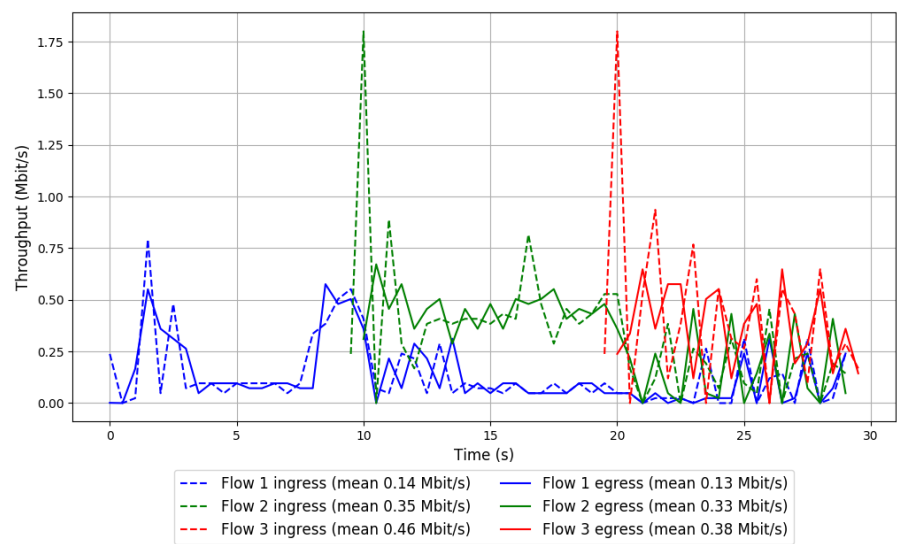Flow 1 (95th percentile 25811.54 ms)

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```
Run 1: Statistics of Indigo

Start at: 2018-01-02 20:39:12
End at: 2018-01-02 20:39:42
Local clock offset: -0.004 ms
Remote clock offset: 1.331 ms


# Below is generated by plot.py at 2018-01-02 22:20:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.47 Mbit/s
95th percentile per-packet one-way delay: 1365.795 ms
Loss rate: 9.75%
-- Flow 1:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 1403.106 ms
Loss rate: 3.29%
-- Flow 2:
Average throughput: 0.33 Mbit/s
95th percentile per-packet one-way delay: 1345.817 ms
Loss rate: 7.87%
-- Flow 3:
Average throughput: 0.38 Mbit/s
95th percentile per-packet one-way delay: 1342.092 ms
Loss rate: 18.43%
```
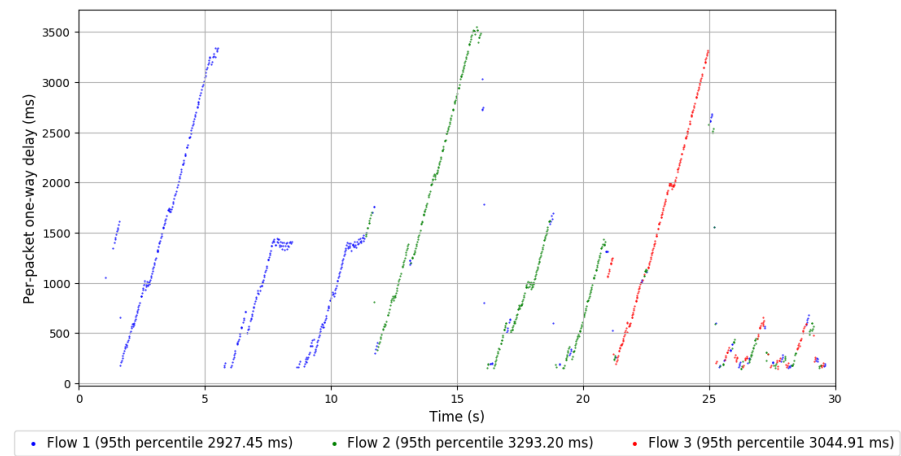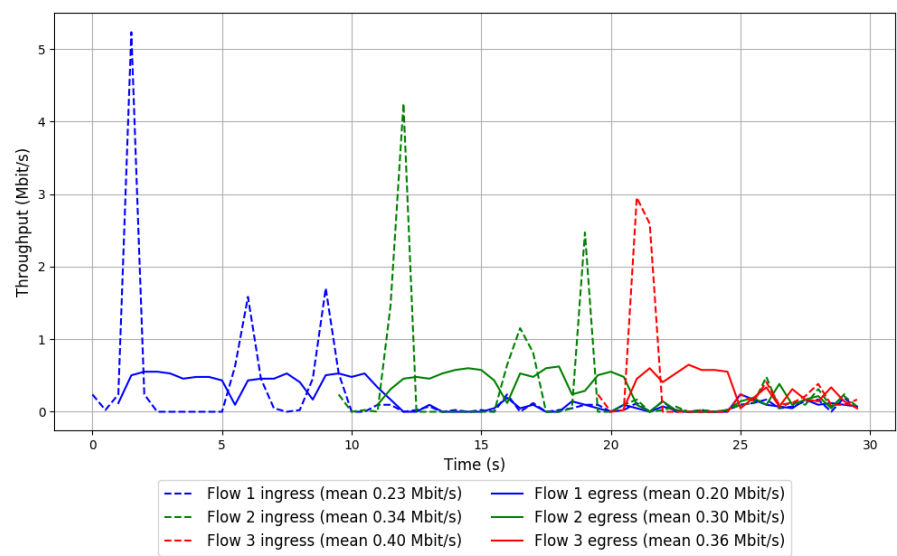
Run 1: Report of Indigo — Data Link

```
Run 2: Statistics of Indigo

Start at: 2018-01-02 20:58:01
End at: 2018-01-02 20:58:31
Local clock offset: -0.099 ms
Remote clock offset: -4.288 ms


# Below is generated by plot.py at 2018-01-02 22:20:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.50 Mbit/s
95th percentile per-packet one-way delay: 3124.775 ms
Loss rate: 18.26%
-- Flow 1:
Average throughput: 0.20 Mbit/s
95th percentile per-packet one-way delay: 2927.446 ms
Loss rate: 17.28%
-- Flow 2:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 3293.200 ms
Loss rate: 18.04%
-- Flow 3:
Average throughput: 0.36 Mbit/s
95th percentile per-packet one-way delay: 3044.905 ms
Loss rate: 20.38%
```

Run 2: Report of Indigo — Data Link

```
Run 3: Statistics of Indigo

Start at: 2018-01-02 21:16:48
End at: 2018-01-02 21:17:18
Local clock offset: -0.165 ms
Remote clock offset: 14.364 ms


# Below is generated by plot.py at 2018-01-02 22:20:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.47 Mbit/s
95th percentile per-packet one-way delay: 2700.472 ms
Loss rate: 19.62%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 2320.847 ms
Loss rate: 15.26%
-- Flow 2:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 2662.176 ms
Loss rate: 12.81%
-- Flow 3:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 2820.137 ms
Loss rate: 32.17%
```

Run 3: Report of Indigo — Data Link