Pantheon Report

Generated at 2018-08-28 05:26:02 (UTC).

Data path: AWS Brazil 1 on `ens5` (*local*) →Brazil on `p4p1` (*remote*).

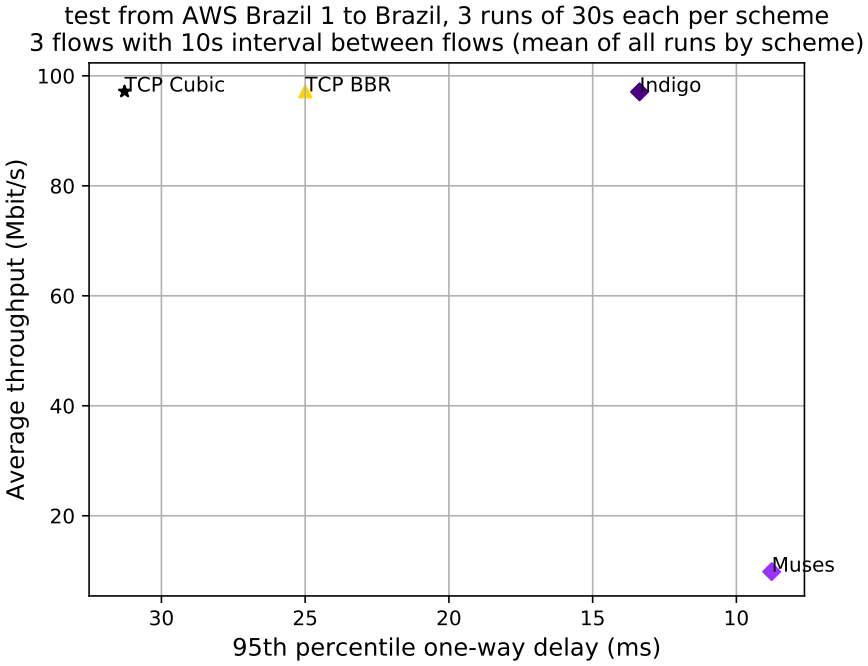
Repeated the test of 4 congestion control schemes 3 times.

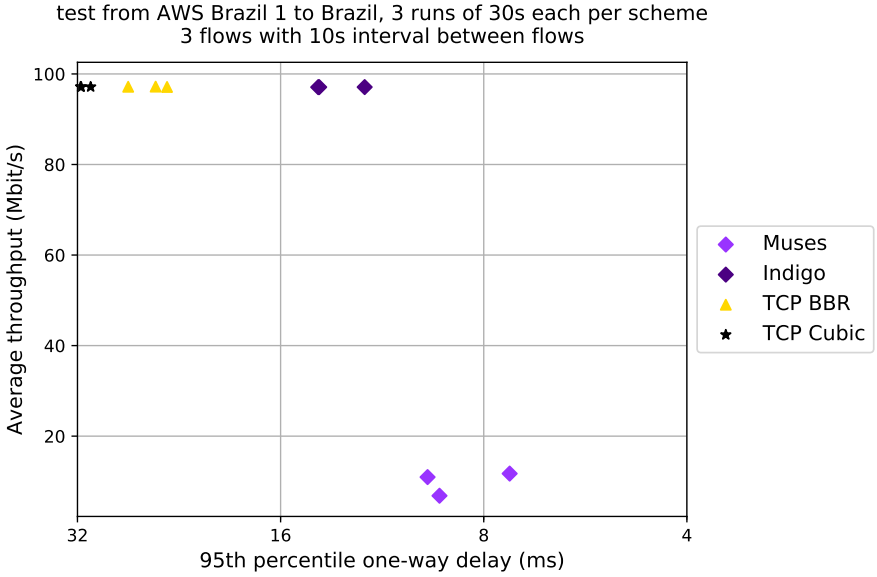
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

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

```
System info:
Linux 4.15.0-1019-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 @ 86ef433b09b2f4ecae1186d6940af93bcf0969cd
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b261c9e99c63be452bc16f94ce0caa99a4c9d39a
third_party/pantheon-tunnel @ cbfce6db5ff5740dafe1771f813cd646339e1952
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
 M receiver/src/buffer.h
 M receiver/src/core.cpp
 M sender/src/buffer.h
 M sender/src/core.cpp
third_party/pcc-experimental @ cd43e34e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdb2
 M src/ScreamClient
 M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
 M src/verus.hpp
 M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```


test from AWS Brazil 1 to Brazil, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)
TCP Cubic
TCP BBR
Indigo
Muses
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
100
80
60
40
20
30
25
20
15
10


test from AWS Brazil 1 to Brazil, 3 runs of 30s each per scheme
3 flows with 10s interval between flows
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
Muses
Indigo
TCP BBR
TCP Cubic
100
80
60
40
20
32
16
8
4

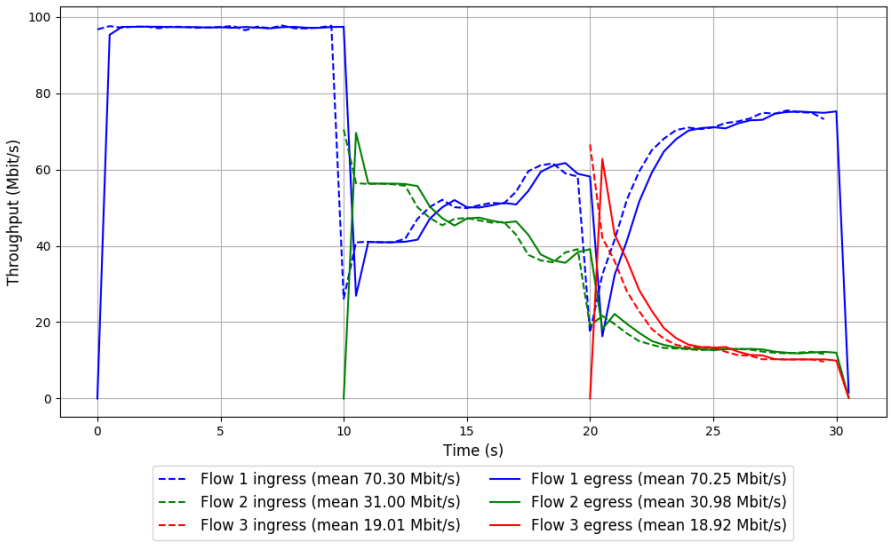
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	65.95	34.89	23.94	24.73	24.02	30.70	0.02	0.02	0.31
TCP Cubic	3	66.74	31.77	27.87	31.20	30.88	31.89	0.04	0.05	0.05
Indigo	3	47.18	43.67	64.26	10.41	13.44	14.12	0.00	0.00	0.00
Muses	3	4.70	6.73	2.71	3.30	7.93	27.77	59.72	34.92	31.36

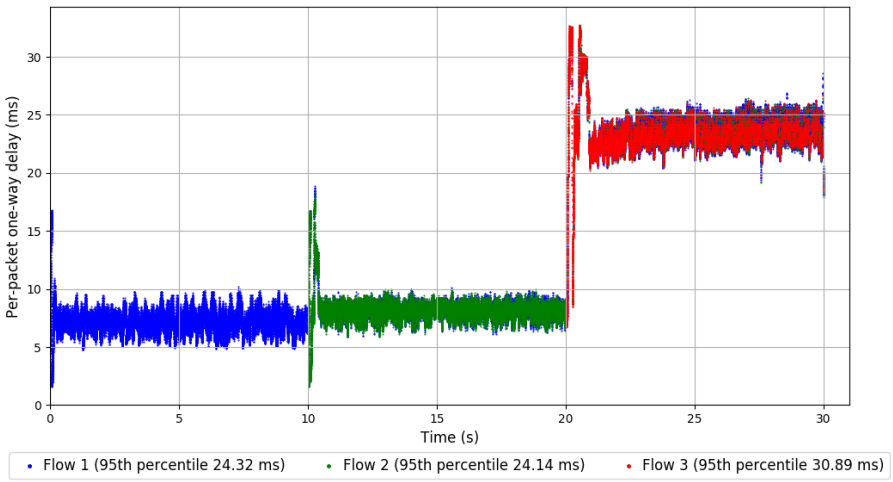
```
Run 1: Statistics of TCP BBR

Start at: 2018-08-28 05:13:51
End at: 2018-08-28 05:14:21
Local clock offset: 5.835 ms
Remote clock offset: 0.432 ms

# Below is generated by plot.py at 2018-08-28 05:25:53
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.20 Mbit/s
95th percentile per-packet one-way delay: 24.508 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 70.25 Mbit/s
95th percentile per-packet one-way delay: 24.323 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 30.98 Mbit/s
95th percentile per-packet one-way delay: 24.144 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 18.92 Mbit/s
95th percentile per-packet one-way delay: 30.893 ms
Loss rate: 0.34%
```

Run 1: Report of TCP BBR — Data Link



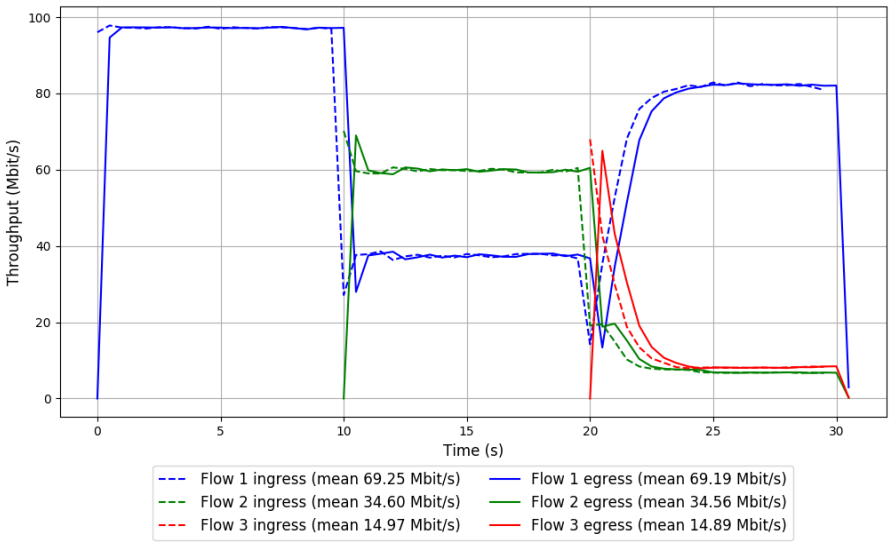


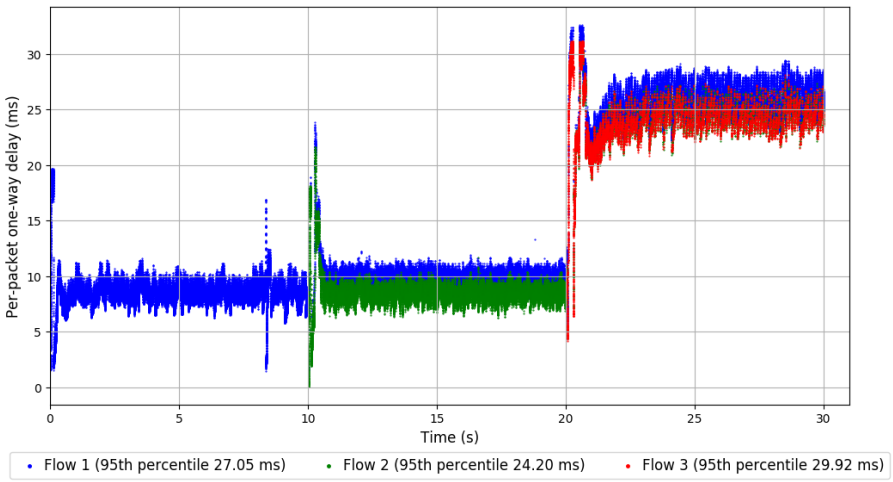
```
Run 2: Statistics of TCP BBR

Start at: 2018-08-28 05:18:19
End at: 2018-08-28 05:18:49
Local clock offset: 6.789 ms
Remote clock offset: 0.382 ms

# Below is generated by plot.py at 2018-08-28 05:25:53
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.17 Mbit/s
95th percentile per-packet one-way delay: 26.914 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 69.19 Mbit/s
95th percentile per-packet one-way delay: 27.048 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 34.56 Mbit/s
95th percentile per-packet one-way delay: 24.195 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 14.89 Mbit/s
95th percentile per-packet one-way delay: 29.923 ms
Loss rate: 0.36%
```

Run 2: Report of TCP BBR — Data Link



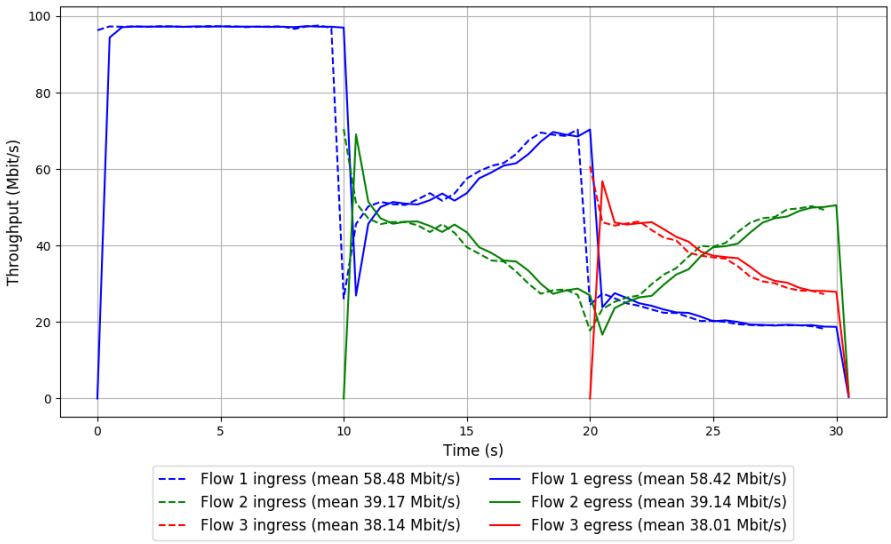


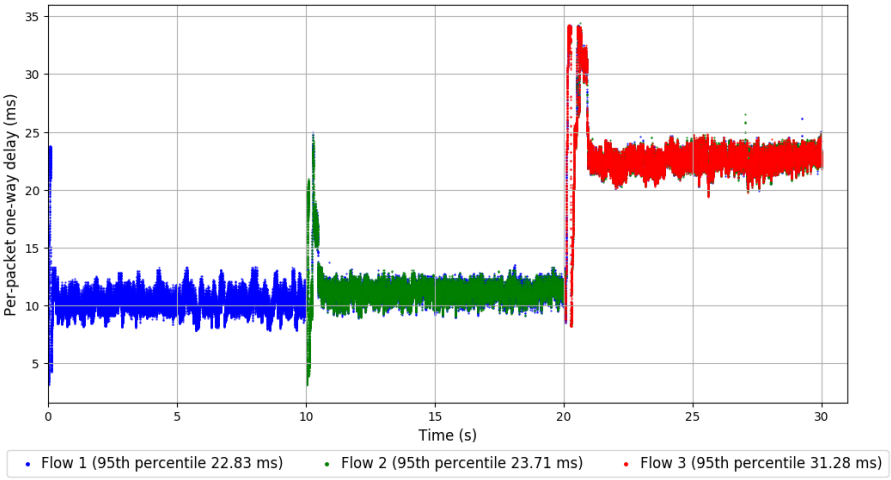
```
Run 3: Statistics of TCP BBR

Start at: 2018-08-28 05:22:47
End at: 2018-08-28 05:23:17
Local clock offset: 4.868 ms
Remote clock offset: 0.345 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.13 Mbit/s
95th percentile per-packet one-way delay: 23.572 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 58.42 Mbit/s
95th percentile per-packet one-way delay: 22.830 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 39.14 Mbit/s
95th percentile per-packet one-way delay: 23.715 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 38.01 Mbit/s
95th percentile per-packet one-way delay: 31.278 ms
Loss rate: 0.23%
```

Run 3: Report of TCP BBR — Data Link



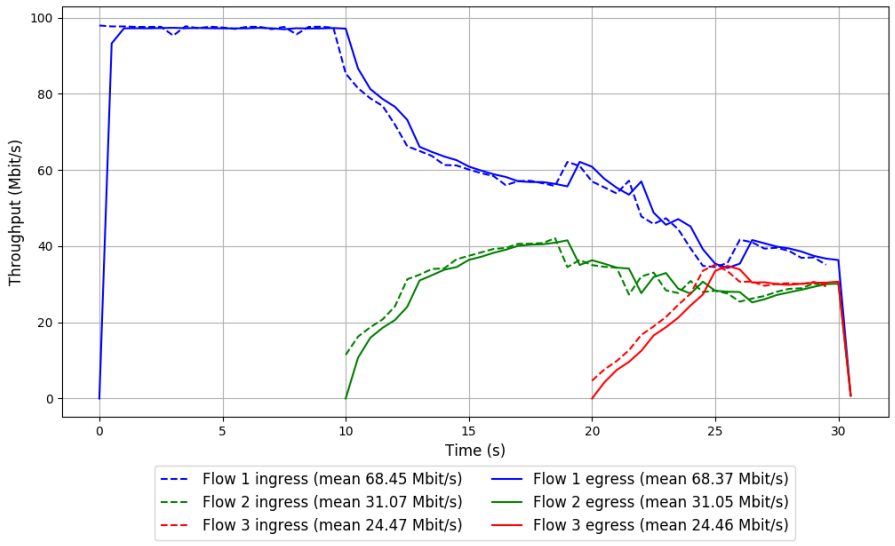


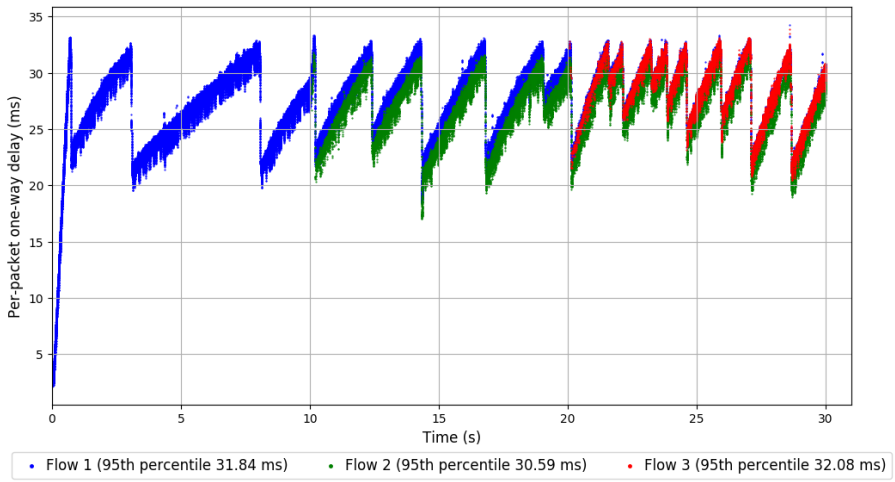
```
Run 1: Statistics of TCP Cubic

Start at: 2018-08-28 05:14:58
End at: 2018-08-28 05:15:28
Local clock offset: 6.477 ms
Remote clock offset: 0.406 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.16 Mbit/s
95th percentile per-packet one-way delay: 31.656 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 68.37 Mbit/s
95th percentile per-packet one-way delay: 31.838 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 31.05 Mbit/s
95th percentile per-packet one-way delay: 30.592 ms
Loss rate: 0.05%
-- Flow 3:
Average throughput: 24.46 Mbit/s
95th percentile per-packet one-way delay: 32.080 ms
Loss rate: 0.05%
```

Run 1: Report of TCP Cubic — Data Link



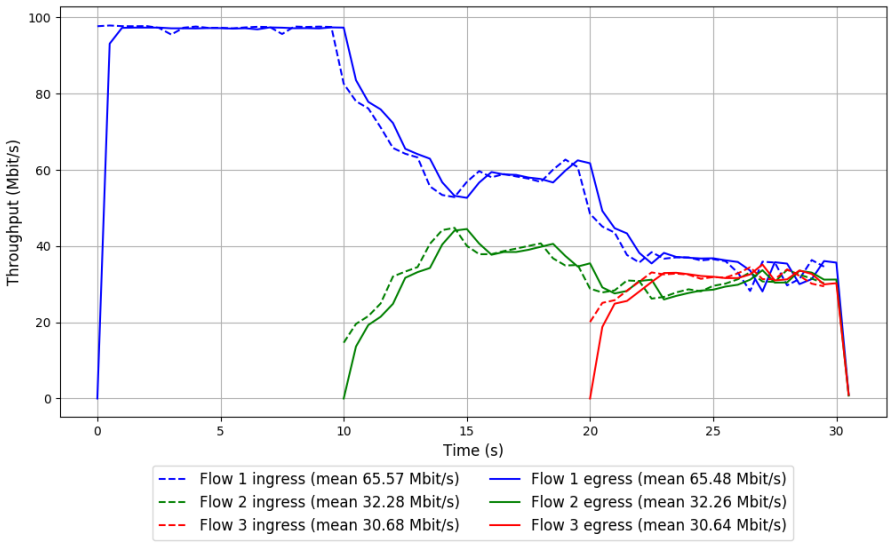


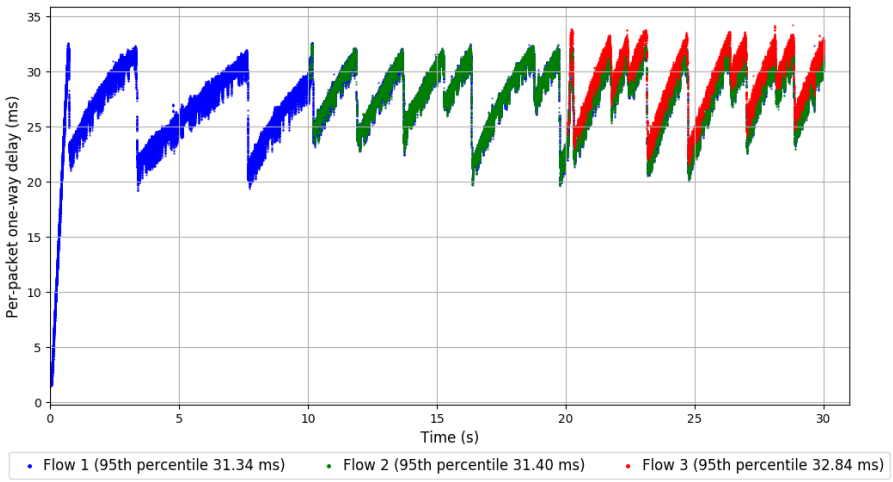
```
Run 2: Statistics of TCP Cubic

Start at: 2018-08-28 05:19:26
End at: 2018-08-28 05:19:56
Local clock offset: 5.171 ms
Remote clock offset: 0.291 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.13 Mbit/s
95th percentile per-packet one-way delay: 31.598 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 65.48 Mbit/s
95th percentile per-packet one-way delay: 31.337 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 32.26 Mbit/s
95th percentile per-packet one-way delay: 31.399 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 30.64 Mbit/s
95th percentile per-packet one-way delay: 32.841 ms
Loss rate: 0.04%
```

Run 2: Report of TCP Cubic — Data Link



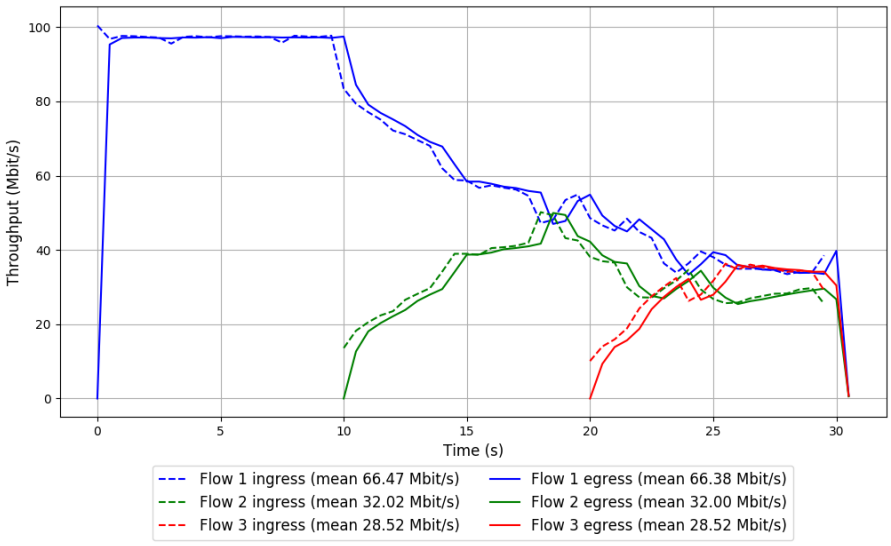


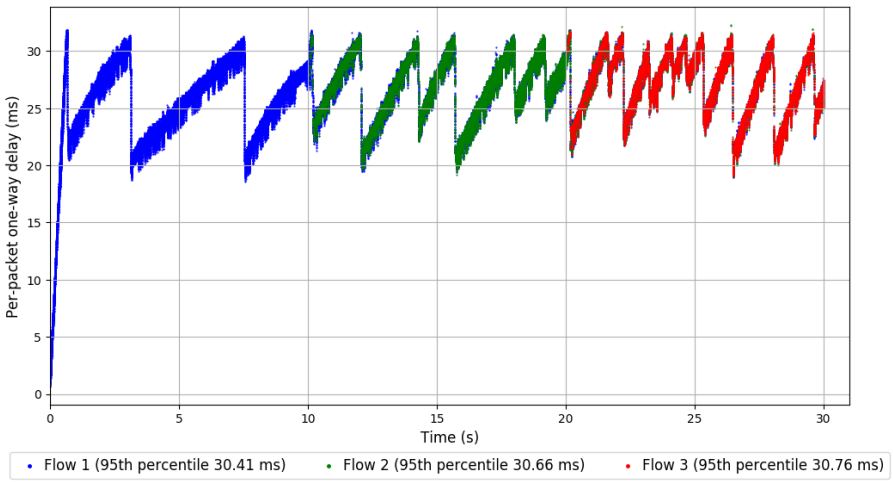
```
Run 3: Statistics of TCP Cubic

Start at: 2018-08-28 05:23:55
End at: 2018-08-28 05:24:25
Local clock offset: 5.689 ms
Remote clock offset: 0.258 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.15 Mbit/s
95th percentile per-packet one-way delay: 30.592 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 66.38 Mbit/s
95th percentile per-packet one-way delay: 30.412 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 32.00 Mbit/s
95th percentile per-packet one-way delay: 30.658 ms
Loss rate: 0.06%
-- Flow 3:
Average throughput: 28.52 Mbit/s
95th percentile per-packet one-way delay: 30.756 ms
Loss rate: 0.05%
```

Run 3: Report of TCP Cubic — Data Link



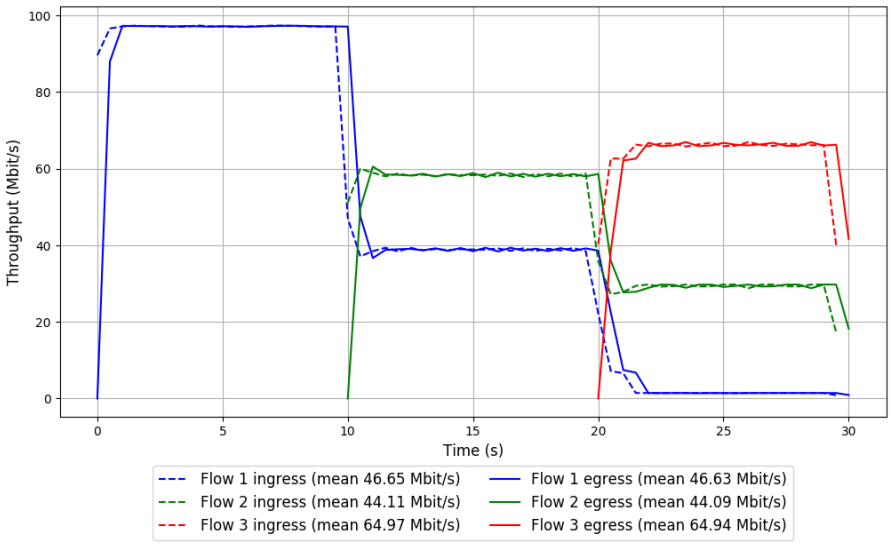


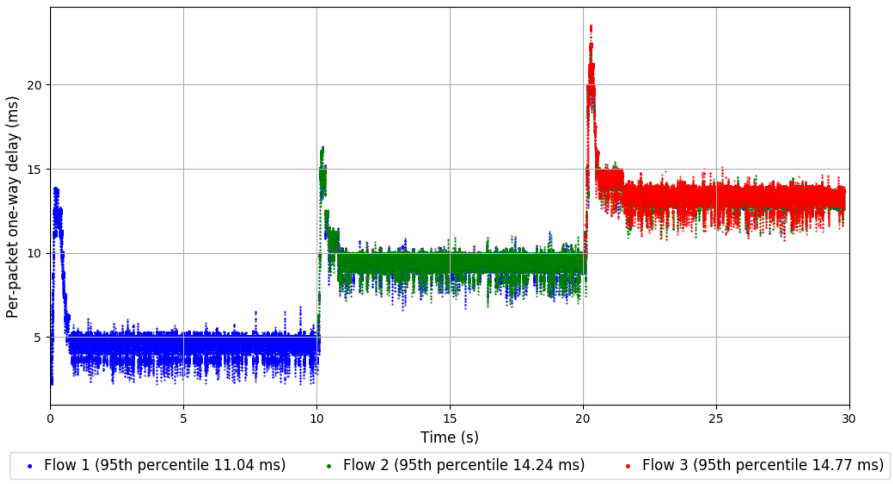
```
Run 1: Statistics of Indigo

Start at: 2018-08-28 05:11:38
End at: 2018-08-28 05:12:08
Local clock offset: 7.142 ms
Remote clock offset: 0.411 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.08 Mbit/s
95th percentile per-packet one-way delay: 14.073 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 46.63 Mbit/s
95th percentile per-packet one-way delay: 11.035 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 44.09 Mbit/s
95th percentile per-packet one-way delay: 14.244 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 64.94 Mbit/s
95th percentile per-packet one-way delay: 14.766 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link



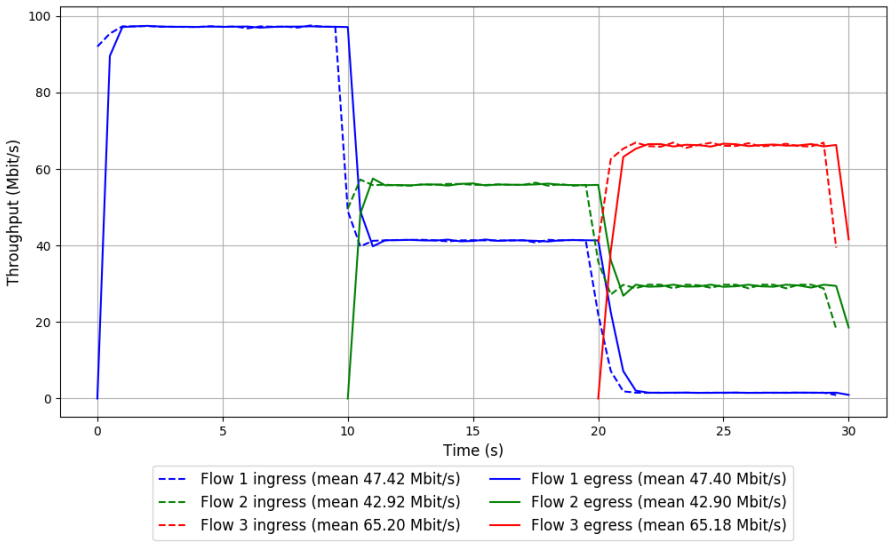


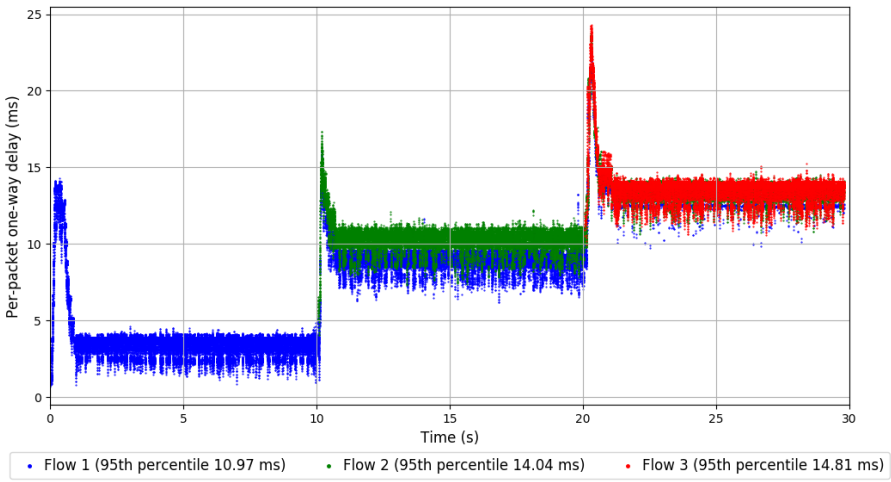
```
Run 2: Statistics of Indigo

Start at: 2018-08-28 05:16:06
End at: 2018-08-28 05:16:36
Local clock offset: 6.273 ms
Remote clock offset: 0.384 ms

# Below is generated by plot.py at 2018-08-28 05:25:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.09 Mbit/s
95th percentile per-packet one-way delay: 14.026 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 47.40 Mbit/s
95th percentile per-packet one-way delay: 10.974 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 42.90 Mbit/s
95th percentile per-packet one-way delay: 14.039 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 65.18 Mbit/s
95th percentile per-packet one-way delay: 14.814 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link



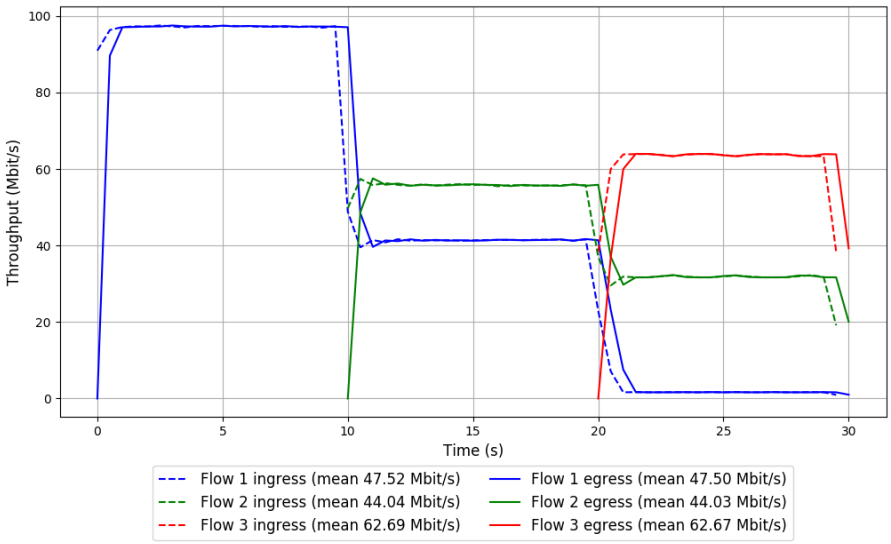


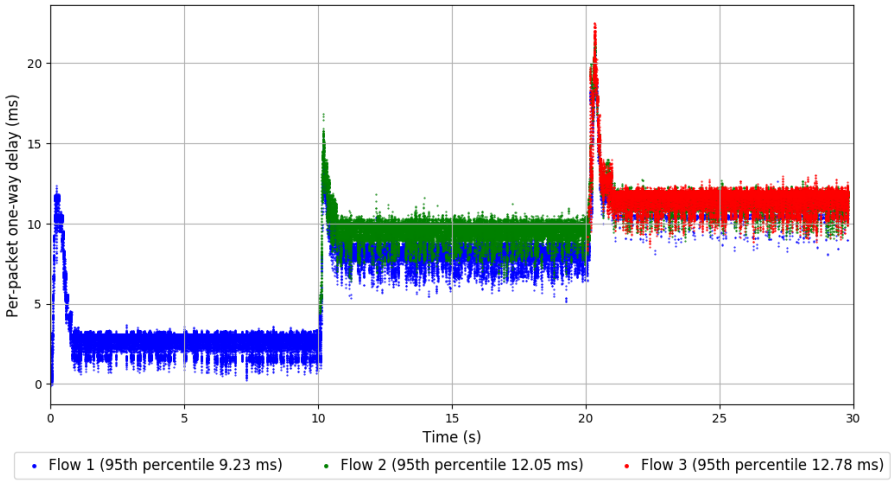
```
Run 3: Statistics of Indigo

Start at: 2018-08-28 05:20:34
End at: 2018-08-28 05:21:04
Local clock offset: 6.619 ms
Remote clock offset: 0.307 ms

# Below is generated by plot.py at 2018-08-28 05:26:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.10 Mbit/s
95th percentile per-packet one-way delay: 12.010 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 47.50 Mbit/s
95th percentile per-packet one-way delay: 9.235 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 44.03 Mbit/s
95th percentile per-packet one-way delay: 12.047 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 62.67 Mbit/s
95th percentile per-packet one-way delay: 12.781 ms
Loss rate: 0.00%
```

Run 3: Report of Indigo — Data Link



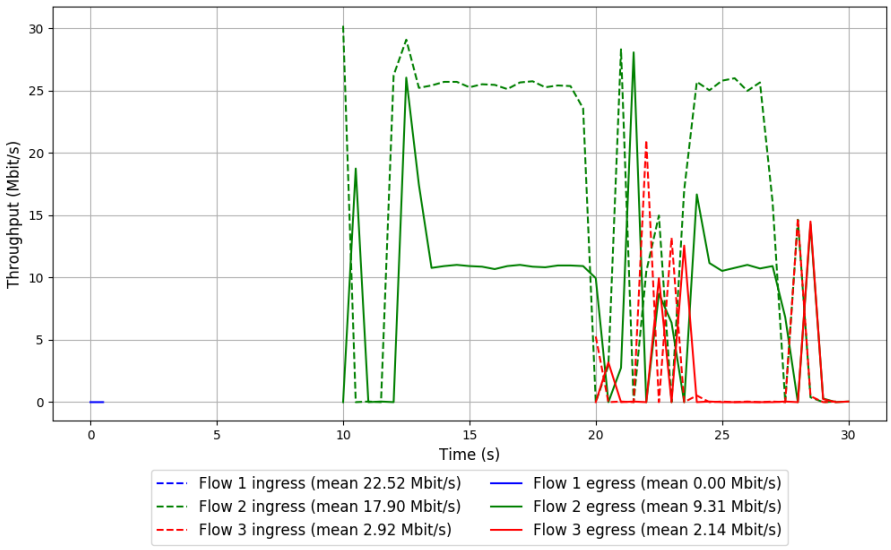


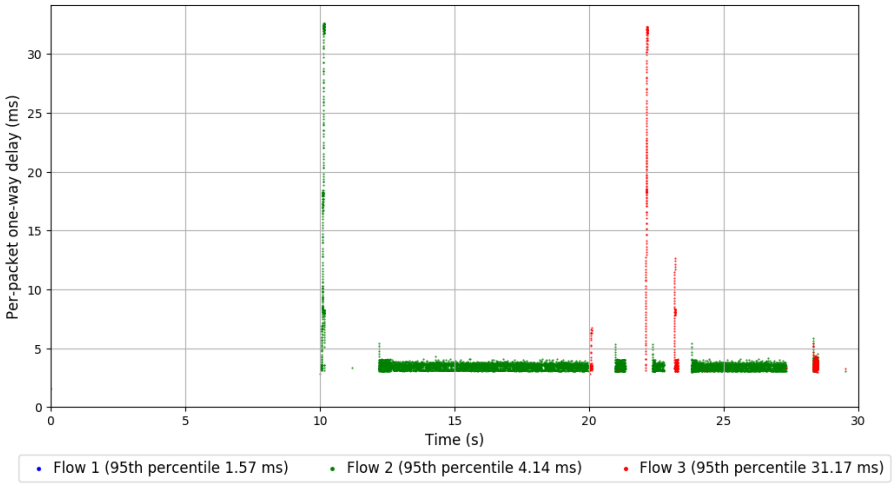
```
Run 1: Statistics of Muses

Start at: 2018-08-28 05:12:47
End at: 2018-08-28 05:13:17
Local clock offset: 6.085 ms
Remote clock offset: 0.403 ms

# Below is generated by plot.py at 2018-08-28 05:26:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 6.84 Mbit/s
95th percentile per-packet one-way delay: 9.304 ms
Loss rate: 46.43%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 1.568 ms
Loss rate: 97.39%
-- Flow 2:
Average throughput: 9.31 Mbit/s
95th percentile per-packet one-way delay: 4.139 ms
Loss rate: 48.00%
-- Flow 3:
Average throughput: 2.14 Mbit/s
95th percentile per-packet one-way delay: 31.169 ms
Loss rate: 26.74%
```

Run 1: Report of Muses — Data Link



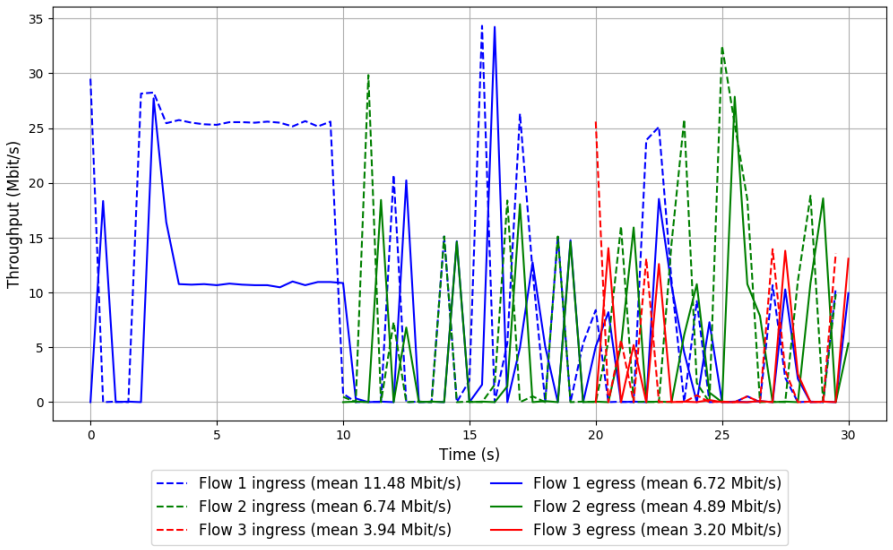


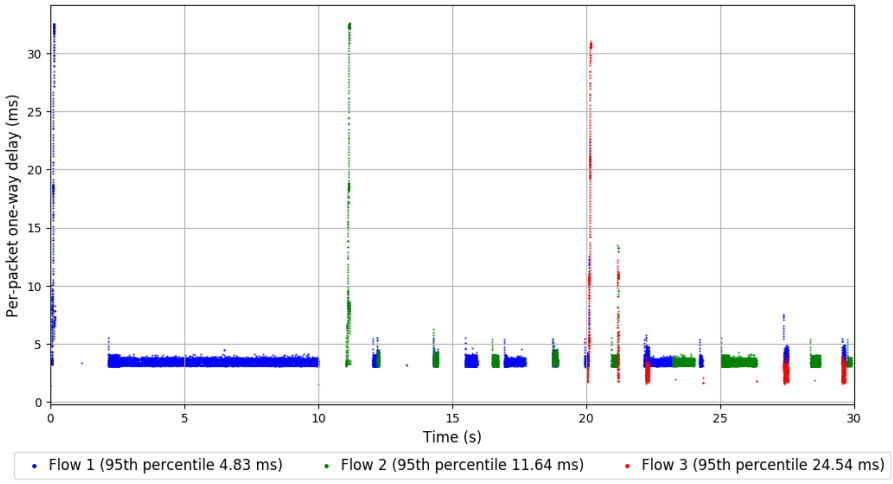
```
Run 2: Statistics of Muses

Start at: 2018-08-28 05:17:15
End at: 2018-08-28 05:17:45
Local clock offset: 5.374 ms
Remote clock offset: 0.32 ms

# Below is generated by plot.py at 2018-08-28 05:26:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 10.96 Mbit/s
95th percentile per-packet one-way delay: 9.690 ms
Loss rate: 36.12%
-- Flow 1:
Average throughput: 6.72 Mbit/s
95th percentile per-packet one-way delay: 4.829 ms
Loss rate: 41.46%
-- Flow 2:
Average throughput: 4.89 Mbit/s
95th percentile per-packet one-way delay: 11.637 ms
Loss rate: 27.47%
-- Flow 3:
Average throughput: 3.20 Mbit/s
95th percentile per-packet one-way delay: 24.543 ms
Loss rate: 18.86%
```

Run 2: Report of Muses — Data Link





```
Run 3: Statistics of Muses

Start at: 2018-08-28 05:21:43
End at: 2018-08-28 05:22:13
Local clock offset: 5.777 ms
Remote clock offset: 0.303 ms

# Below is generated by plot.py at 2018-08-28 05:26:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 11.73 Mbit/s
95th percentile per-packet one-way delay: 7.323 ms
Loss rate: 38.19%
-- Flow 1:
Average throughput: 7.38 Mbit/s
95th percentile per-packet one-way delay: 3.503 ms
Loss rate: 40.31%
-- Flow 2:
Average throughput: 5.99 Mbit/s
95th percentile per-packet one-way delay: 8.002 ms
Loss rate: 29.29%
-- Flow 3:
Average throughput: 2.80 Mbit/s
95th percentile per-packet one-way delay: 27.583 ms
Loss rate: 48.47%
```

Run 3: Report of Muses — Data Link