

Pantheon Report

Generated at 2018-09-05 22:51:20 (UTC).
Data path: Saudi Arabia on `enp2s0` (*remote*) → AWS India 2 on `ens5` (*local*).
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 `nets.org.sg` and have been applied to correct the timestamps in logs.

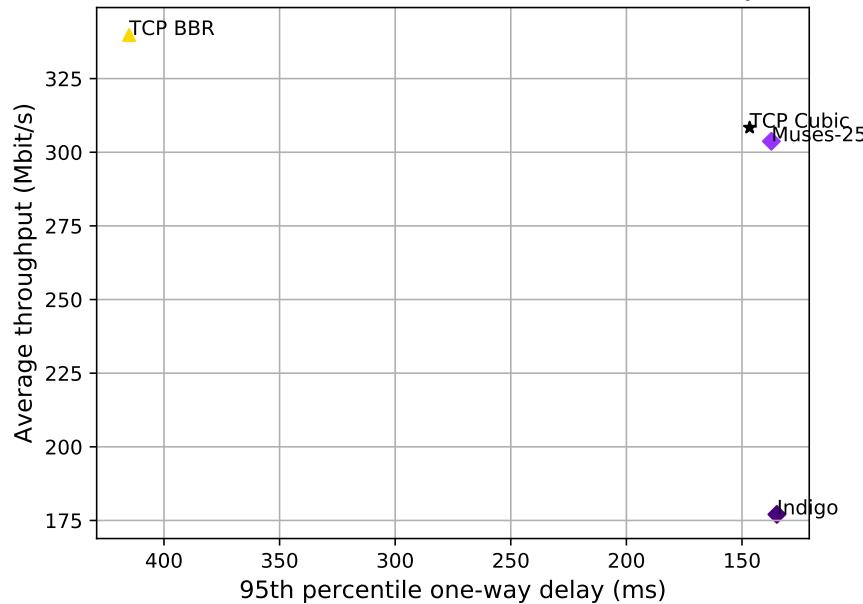
System info:

```
Linux 4.15.0-1020-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
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

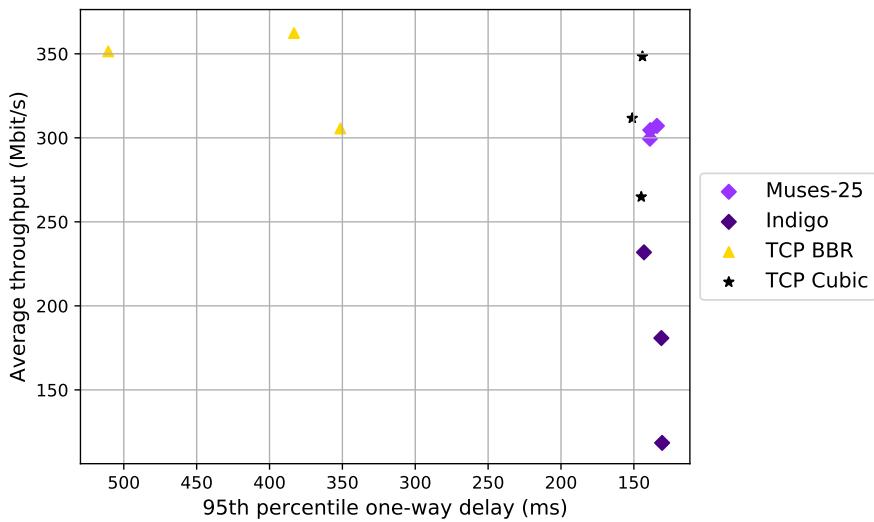
Git summary:

```
branch: muses @ 18b9165265c8ba2915c862e8713fd9ad82c1ac21
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ a28d20fb82a95a965a3da65fd1eb71b8994e9b84
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 Saudi Arabia to AWS India 2, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from Saudi Arabia to AWS India 2, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows



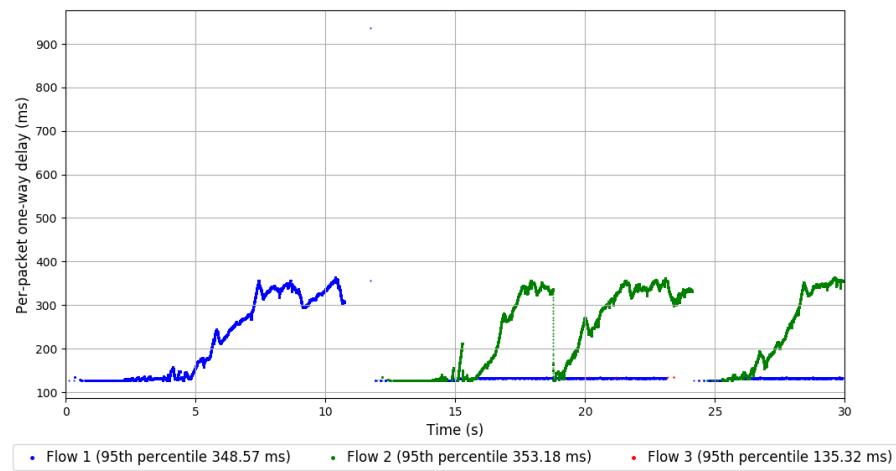
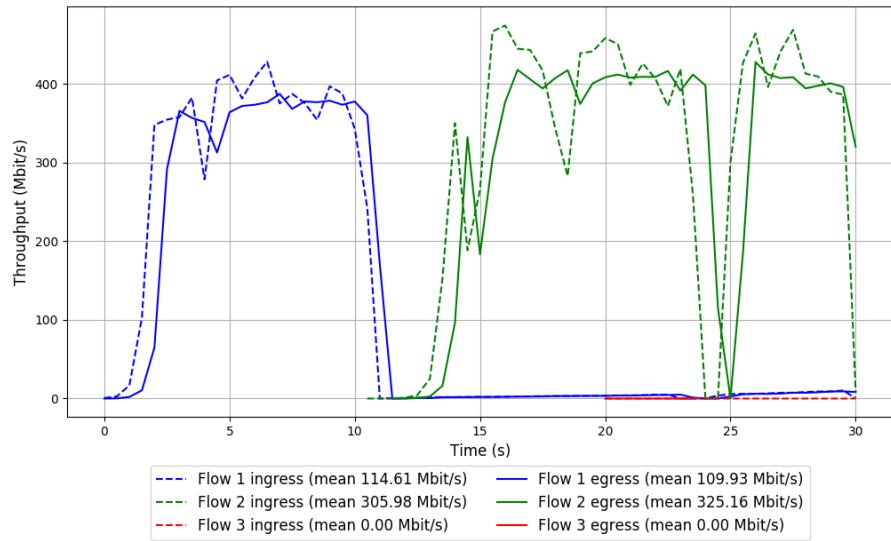
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	223.98	145.26	81.43	414.28	326.88	312.25	4.09	13.88	22.41
TCP Cubic	3	202.43	123.60	77.29	141.66	149.51	185.26	0.44	2.27	3.22
Indigo	3	102.95	68.43	88.50	134.27	134.74	136.78	0.64	1.03	2.34
Muses-25	3	218.85	78.57	100.34	137.45	136.15	138.09	0.41	1.26	2.35

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-05 22:29:26
End at: 2018-09-05 22:29:56
Local clock offset: 3.864 ms
Remote clock offset: -30.483 ms

# Below is generated by plot.py at 2018-09-05 22:50:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 305.58 Mbit/s
95th percentile per-packet one-way delay: 351.406 ms
Loss rate: 3.74%
-- Flow 1:
Average throughput: 109.93 Mbit/s
95th percentile per-packet one-way delay: 348.569 ms
Loss rate: 4.83%
-- Flow 2:
Average throughput: 325.16 Mbit/s
95th percentile per-packet one-way delay: 353.177 ms
Loss rate: 3.12%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 135.316 ms
Loss rate: 44.43%
```

Run 1: Report of TCP BBR — Data Link

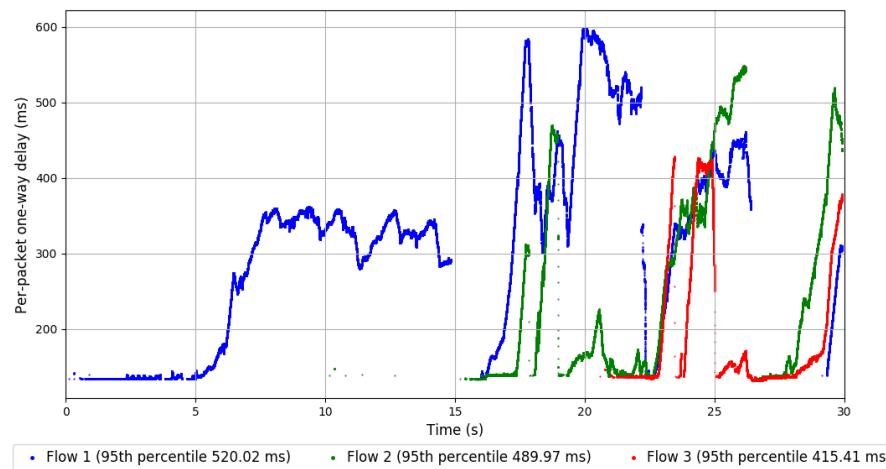
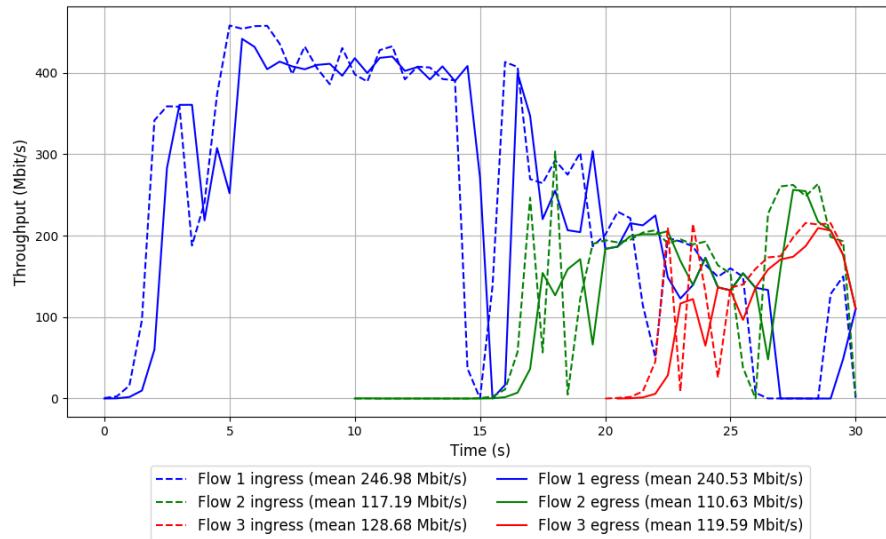


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-05 22:35:41
End at: 2018-09-05 22:36:11
Local clock offset: 3.484 ms
Remote clock offset: -34.295 ms

# Below is generated by plot.py at 2018-09-05 22:50:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 351.45 Mbit/s
95th percentile per-packet one-way delay: 510.647 ms
Loss rate: 5.05%
-- Flow 1:
Average throughput: 240.53 Mbit/s
95th percentile per-packet one-way delay: 520.017 ms
Loss rate: 3.34%
-- Flow 2:
Average throughput: 110.63 Mbit/s
95th percentile per-packet one-way delay: 489.967 ms
Loss rate: 8.30%
-- Flow 3:
Average throughput: 119.59 Mbit/s
95th percentile per-packet one-way delay: 415.414 ms
Loss rate: 9.07%
```

Run 2: Report of TCP BBR — Data Link

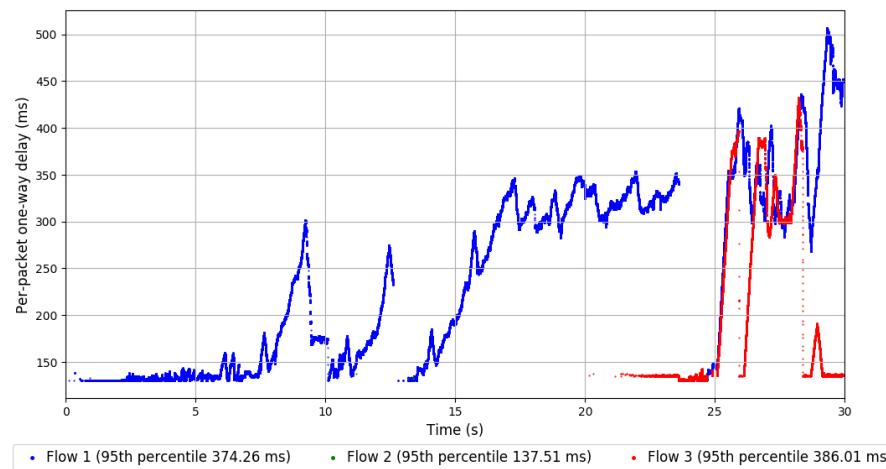
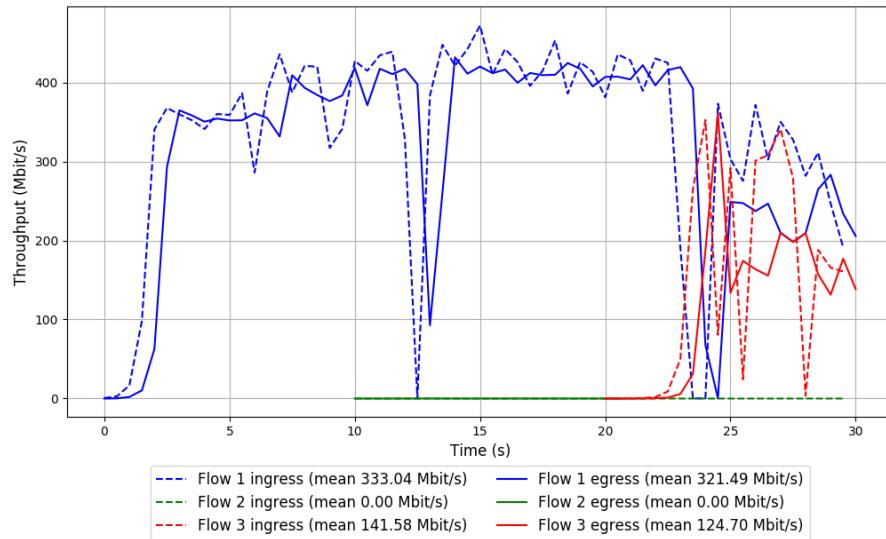


Run 3: Statistics of TCP BBR

```
Start at: 2018-09-05 22:41:49
End at: 2018-09-05 22:42:19
Local clock offset: -1.689 ms
Remote clock offset: -37.264 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 362.36 Mbit/s
95th percentile per-packet one-way delay: 383.213 ms
Loss rate: 5.29%
-- Flow 1:
Average throughput: 321.49 Mbit/s
95th percentile per-packet one-way delay: 374.260 ms
Loss rate: 4.10%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 137.510 ms
Loss rate: 30.22%
-- Flow 3:
Average throughput: 124.70 Mbit/s
95th percentile per-packet one-way delay: 386.014 ms
Loss rate: 13.72%
```

Run 3: Report of TCP BBR — Data Link

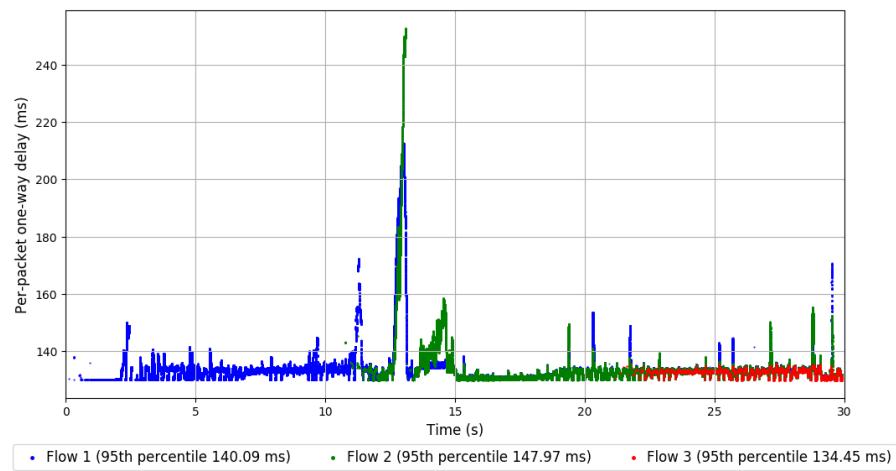
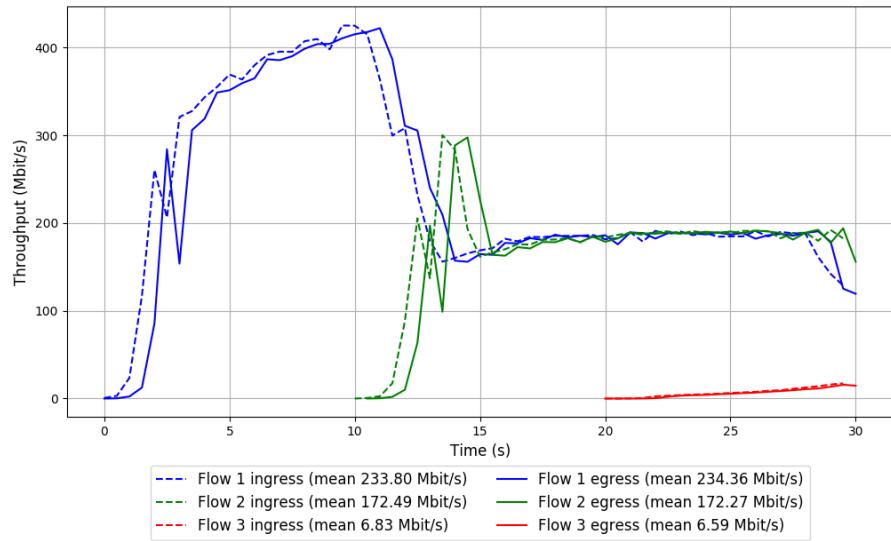


```
Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 22:31:01
End at: 2018-09-05 22:31:31
Local clock offset: 2.017 ms
Remote clock offset: -32.886 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 348.47 Mbit/s
95th percentile per-packet one-way delay: 144.093 ms
Loss rate: 0.68%
-- Flow 1:
Average throughput: 234.36 Mbit/s
95th percentile per-packet one-way delay: 140.086 ms
Loss rate: 0.41%
-- Flow 2:
Average throughput: 172.27 Mbit/s
95th percentile per-packet one-way delay: 147.972 ms
Loss rate: 1.13%
-- Flow 3:
Average throughput: 6.59 Mbit/s
95th percentile per-packet one-way delay: 134.453 ms
Loss rate: 5.47%
```

Run 1: Report of TCP Cubic — Data Link

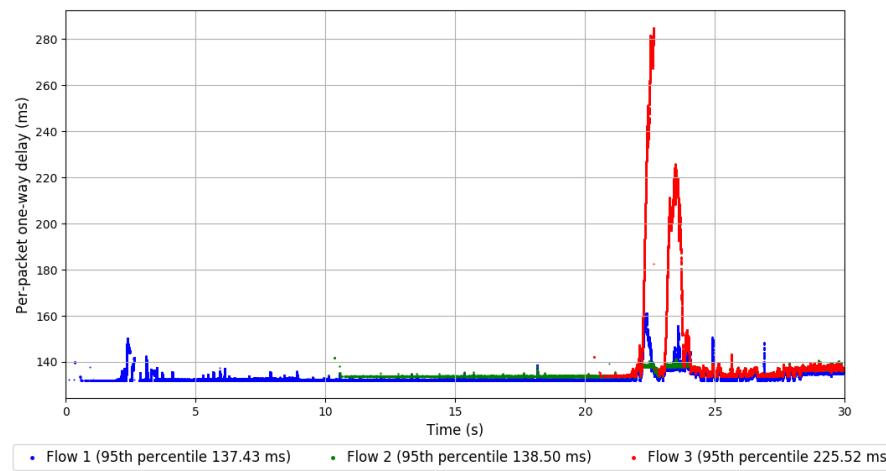
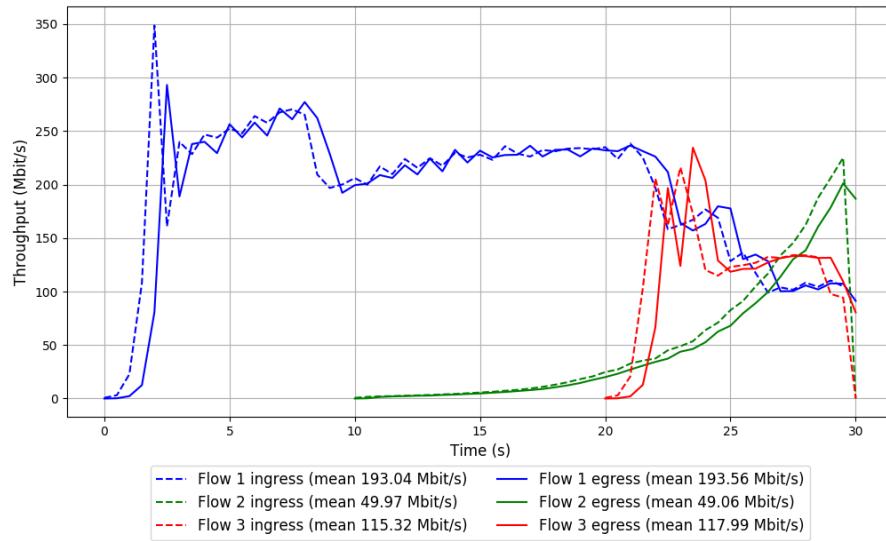


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-05 22:37:17
End at: 2018-09-05 22:37:47
Local clock offset: 2.81 ms
Remote clock offset: -34.684 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 264.88 Mbit/s
95th percentile per-packet one-way delay: 144.910 ms
Loss rate: 1.15%
-- Flow 1:
Average throughput: 193.56 Mbit/s
95th percentile per-packet one-way delay: 137.433 ms
Loss rate: 0.39%
-- Flow 2:
Average throughput: 49.06 Mbit/s
95th percentile per-packet one-way delay: 138.500 ms
Loss rate: 4.78%
-- Flow 3:
Average throughput: 117.99 Mbit/s
95th percentile per-packet one-way delay: 225.517 ms
Loss rate: 1.74%
```

Run 2: Report of TCP Cubic — Data Link

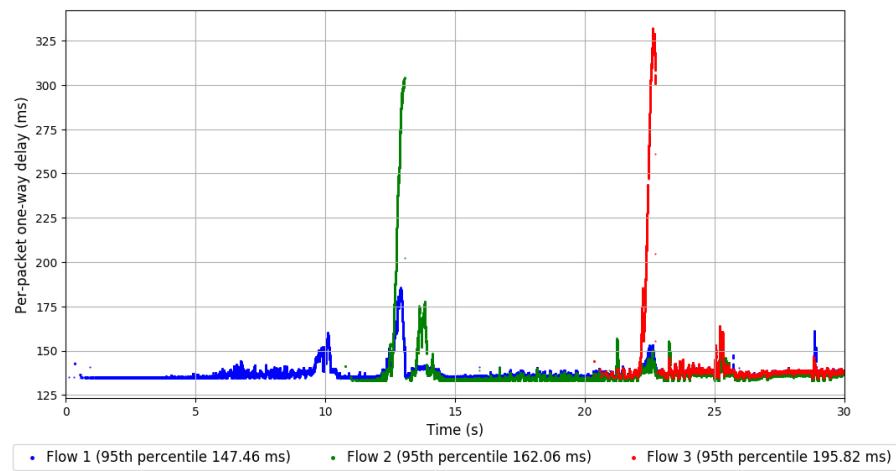
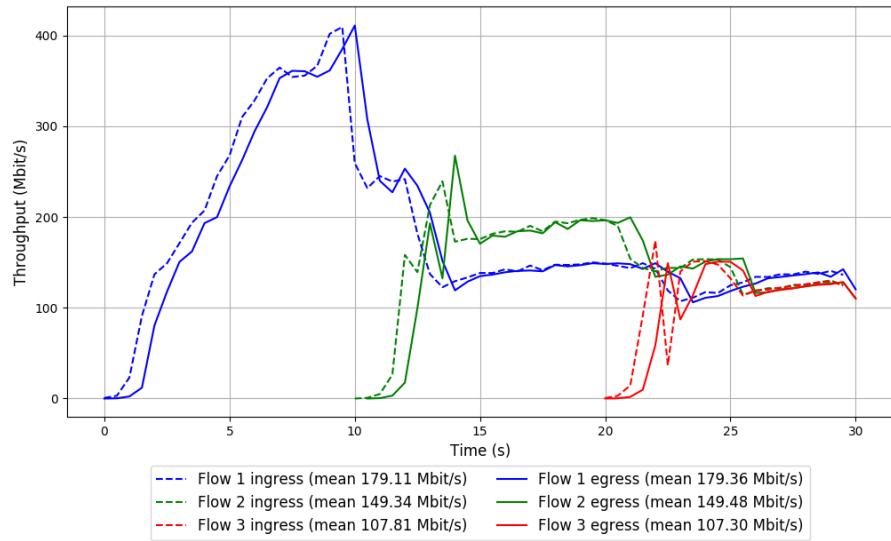


Run 3: Statistics of TCP Cubic

```
Start at: 2018-09-05 22:43:25
End at: 2018-09-05 22:43:55
Local clock offset: 1.12 ms
Remote clock offset: -37.321 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 311.68 Mbit/s
95th percentile per-packet one-way delay: 151.091 ms
Loss rate: 0.86%
-- Flow 1:
Average throughput: 179.36 Mbit/s
95th percentile per-packet one-way delay: 147.459 ms
Loss rate: 0.52%
-- Flow 2:
Average throughput: 149.48 Mbit/s
95th percentile per-packet one-way delay: 162.061 ms
Loss rate: 0.90%
-- Flow 3:
Average throughput: 107.30 Mbit/s
95th percentile per-packet one-way delay: 195.816 ms
Loss rate: 2.44%
```

Run 3: Report of TCP Cubic — Data Link

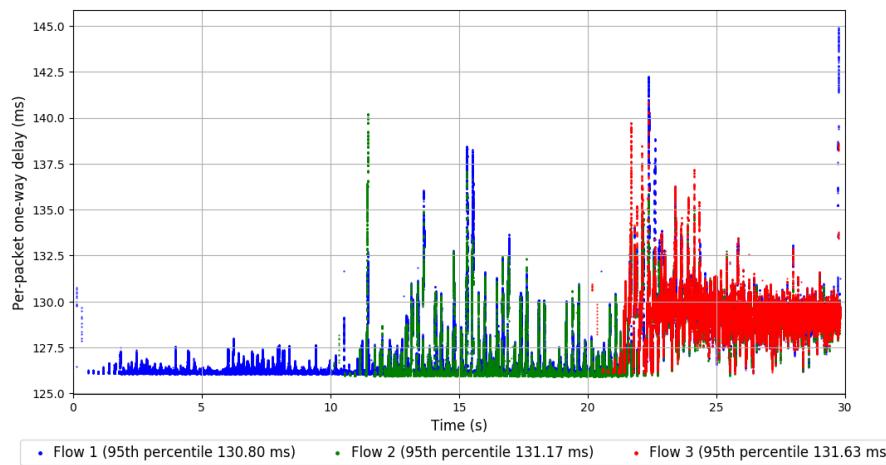
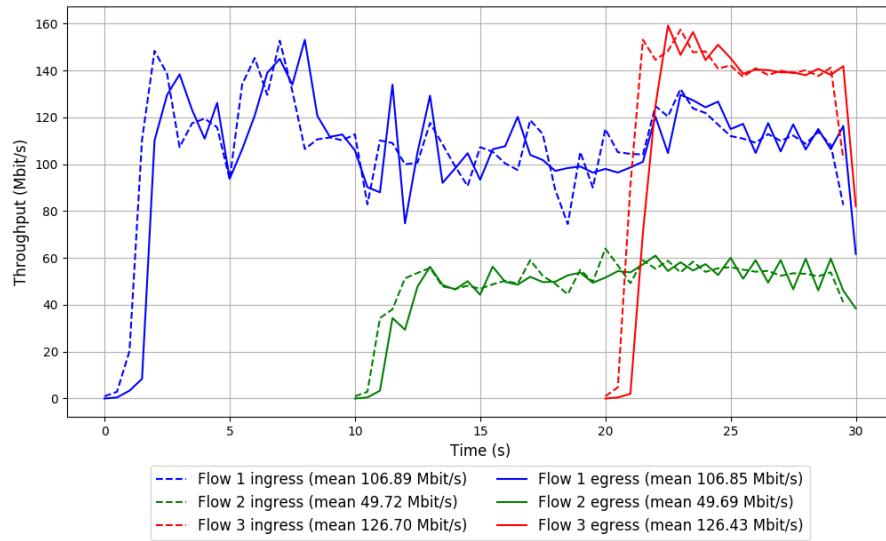


Run 1: Statistics of Indigo

```
Start at: 2018-09-05 22:27:56
End at: 2018-09-05 22:28:26
Local clock offset: -1.219 ms
Remote clock offset: -32.211 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 180.84 Mbit/s
95th percentile per-packet one-way delay: 131.127 ms
Loss rate: 1.12%
-- Flow 1:
Average throughput: 106.85 Mbit/s
95th percentile per-packet one-way delay: 130.797 ms
Loss rate: 0.69%
-- Flow 2:
Average throughput: 49.69 Mbit/s
95th percentile per-packet one-way delay: 131.171 ms
Loss rate: 1.08%
-- Flow 3:
Average throughput: 126.43 Mbit/s
95th percentile per-packet one-way delay: 131.630 ms
Loss rate: 2.24%
```

Run 1: Report of Indigo — Data Link

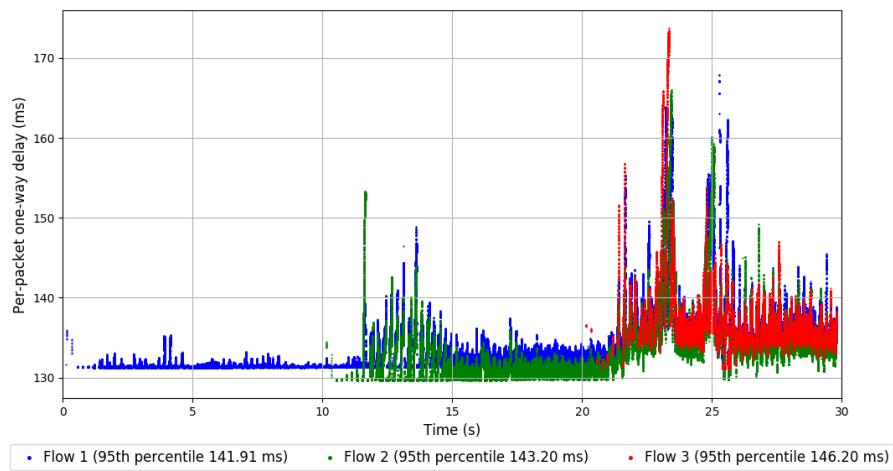
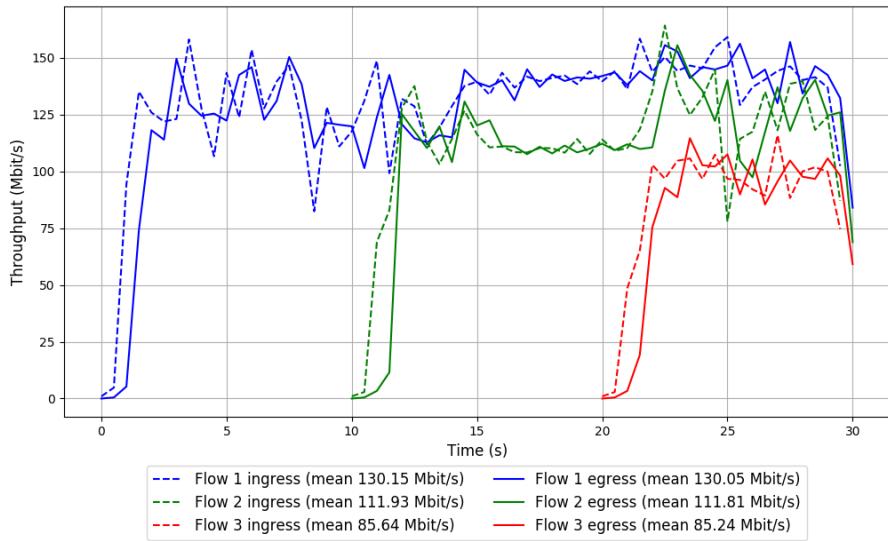


Run 2: Statistics of Indigo

```
Start at: 2018-09-05 22:34:09
End at: 2018-09-05 22:34:39
Local clock offset: -1.319 ms
Remote clock offset: -36.996 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 231.86 Mbit/s
95th percentile per-packet one-way delay: 143.043 ms
Loss rate: 1.07%
-- Flow 1:
Average throughput: 130.05 Mbit/s
95th percentile per-packet one-way delay: 141.907 ms
Loss rate: 0.75%
-- Flow 2:
Average throughput: 111.81 Mbit/s
95th percentile per-packet one-way delay: 143.204 ms
Loss rate: 1.11%
-- Flow 3:
Average throughput: 85.24 Mbit/s
95th percentile per-packet one-way delay: 146.204 ms
Loss rate: 2.46%
```

Run 2: Report of Indigo — Data Link

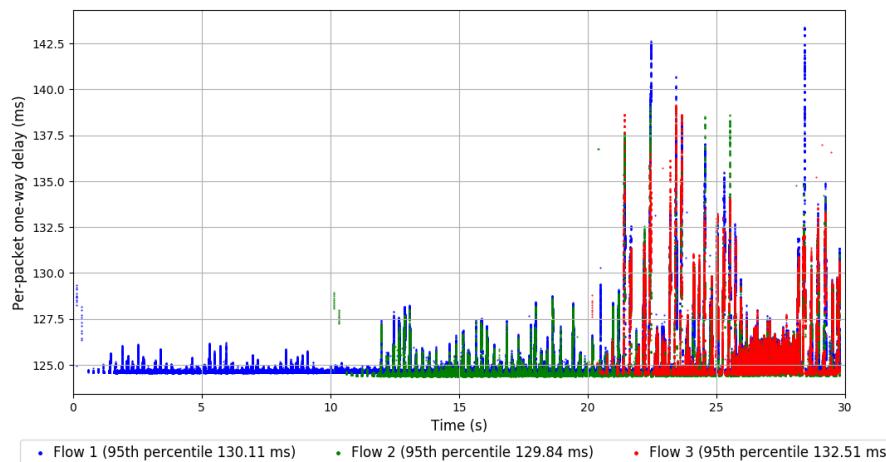
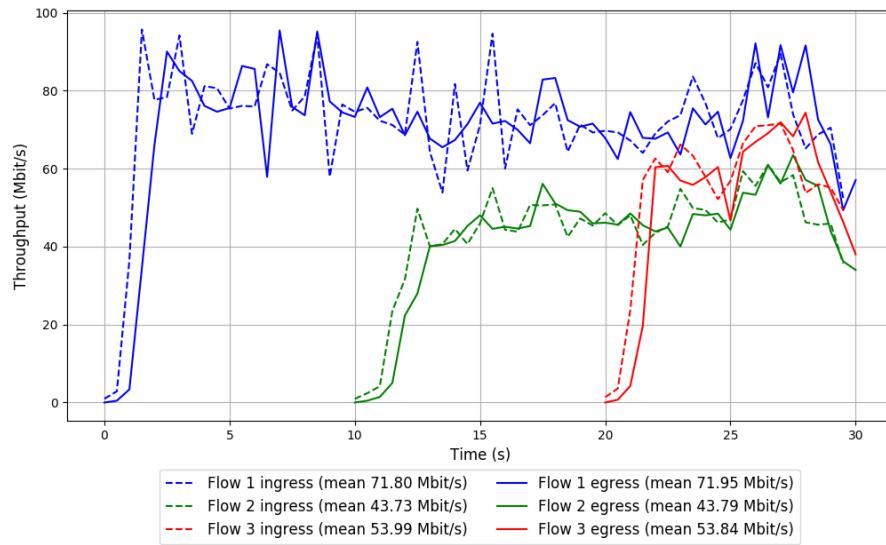


Run 3: Statistics of Indigo

```
Start at: 2018-09-05 22:40:23
End at: 2018-09-05 22:40:53
Local clock offset: -3.588 ms
Remote clock offset: -31.947 ms

# Below is generated by plot.py at 2018-09-05 22:50:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 118.47 Mbit/s
95th percentile per-packet one-way delay: 130.603 ms
Loss rate: 0.85%
-- Flow 1:
Average throughput: 71.95 Mbit/s
95th percentile per-packet one-way delay: 130.108 ms
Loss rate: 0.47%
-- Flow 2:
Average throughput: 43.79 Mbit/s
95th percentile per-packet one-way delay: 129.843 ms
Loss rate: 0.89%
-- Flow 3:
Average throughput: 53.84 Mbit/s
95th percentile per-packet one-way delay: 132.509 ms
Loss rate: 2.33%
```

Run 3: Report of Indigo — Data Link

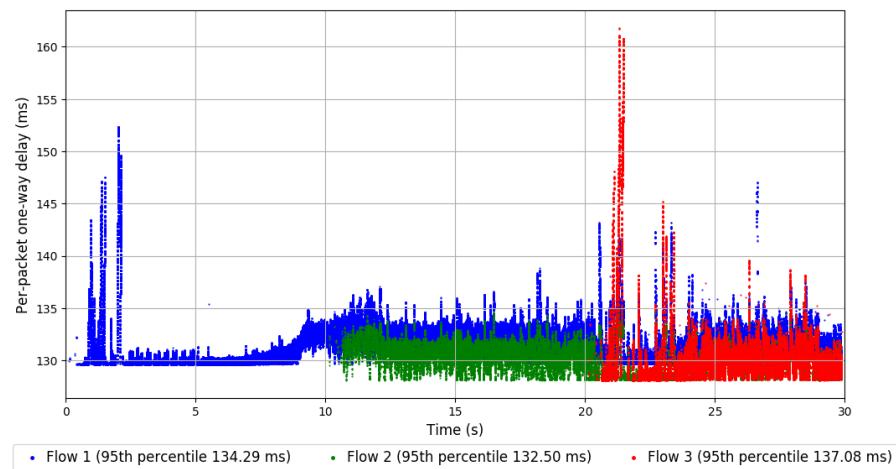
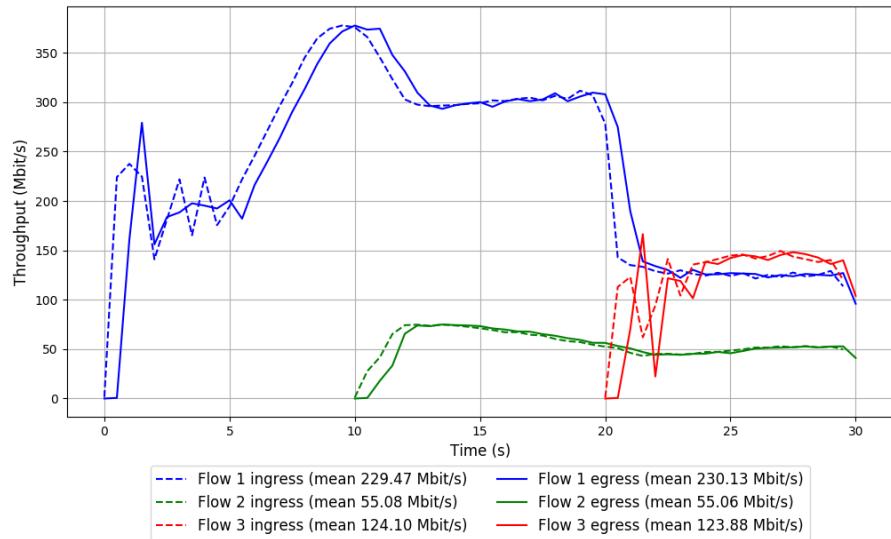


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-05 22:32:36
End at: 2018-09-05 22:33:06
Local clock offset: -2.729 ms
Remote clock offset: -37.061 ms

# Below is generated by plot.py at 2018-09-05 22:51:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 307.09 Mbit/s
95th percentile per-packet one-way delay: 134.188 ms
Loss rate: 0.69%
-- Flow 1:
Average throughput: 230.13 Mbit/s
95th percentile per-packet one-way delay: 134.288 ms
Loss rate: 0.38%
-- Flow 2:
Average throughput: 55.06 Mbit/s
95th percentile per-packet one-way delay: 132.496 ms
Loss rate: 1.02%
-- Flow 3:
Average throughput: 123.88 Mbit/s
95th percentile per-packet one-way delay: 137.083 ms
Loss rate: 2.13%
```

Run 1: Report of Muses-25 — Data Link

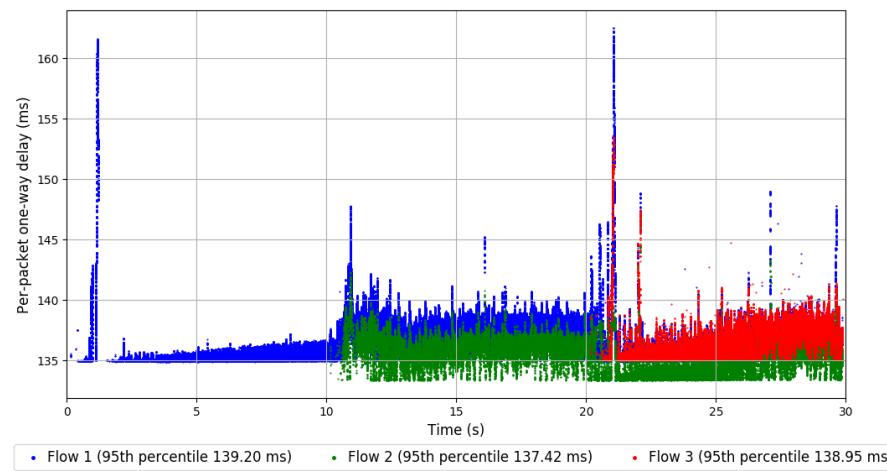
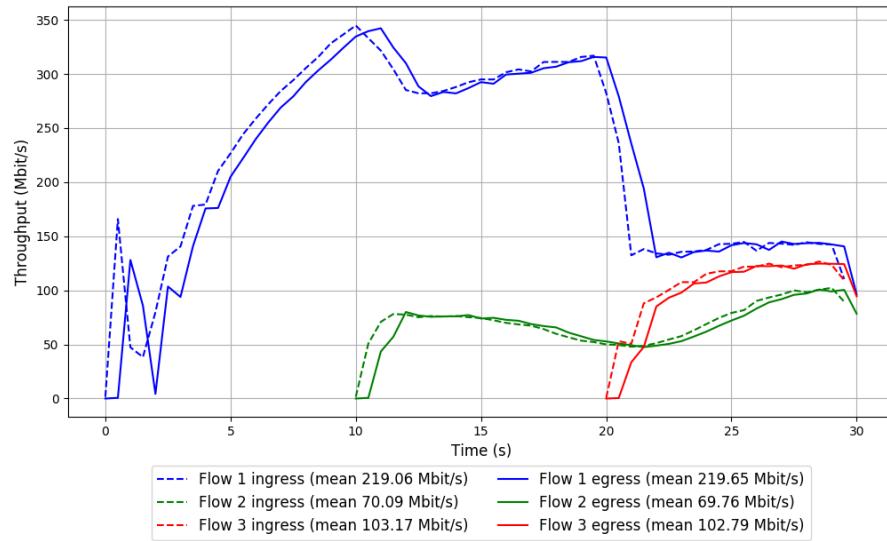


Run 2: Statistics of Muses-25

```
Start at: 2018-09-05 22:38:49
End at: 2018-09-05 22:39:19
Local clock offset: 1.29 ms
Remote clock offset: -37.623 ms

# Below is generated by plot.py at 2018-09-05 22:51:16
# Datalink statistics
-- Total of 3 flows:
Average throughput: 299.48 Mbit/s
95th percentile per-packet one-way delay: 138.955 ms
Loss rate: 0.81%
-- Flow 1:
Average throughput: 219.65 Mbit/s
95th percentile per-packet one-way delay: 139.196 ms
Loss rate: 0.42%
-- Flow 2:
Average throughput: 69.76 Mbit/s
95th percentile per-packet one-way delay: 137.422 ms
Loss rate: 1.45%
-- Flow 3:
Average throughput: 102.79 Mbit/s
95th percentile per-packet one-way delay: 138.950 ms
Loss rate: 2.43%
```

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

```
Start at: 2018-09-05 22:44:59
End at: 2018-09-05 22:45:29
Local clock offset: 1.081 ms
Remote clock offset: -36.96 ms

# Below is generated by plot.py at 2018-09-05 22:51:19
# Datalink statistics
-- Total of 3 flows:
Average throughput: 304.61 Mbit/s
95th percentile per-packet one-way delay: 138.709 ms
Loss rate: 0.81%
-- Flow 1:
Average throughput: 206.78 Mbit/s
95th percentile per-packet one-way delay: 138.870 ms
Loss rate: 0.44%
-- Flow 2:
Average throughput: 110.90 Mbit/s
95th percentile per-packet one-way delay: 138.542 ms
Loss rate: 1.30%
-- Flow 3:
Average throughput: 74.36 Mbit/s
95th percentile per-packet one-way delay: 138.234 ms
Loss rate: 2.50%
```

Run 3: Report of Muses-25 — Data Link

