

Pantheon Report

Generated at 2018-08-31 05:52:28 (UTC).
Data path: India on `em1` (*remote*) → AWS India 1 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.

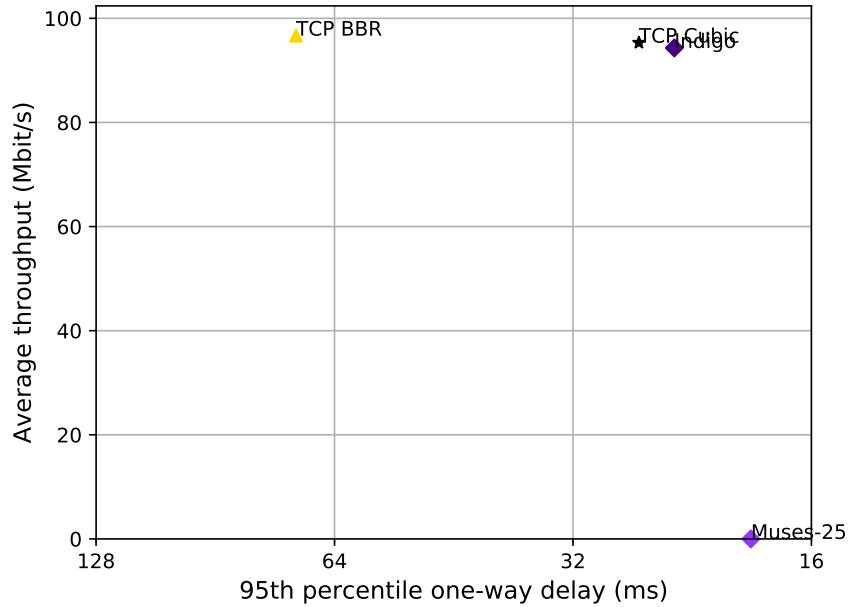
System info:

```
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
```

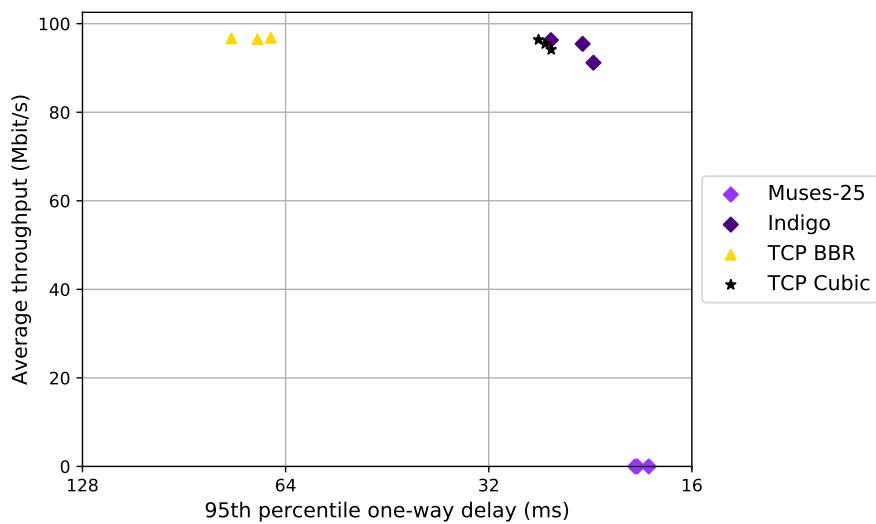
Git summary:

```
branch: muses @ 2de97ca91a065473c29a25ffffe63fb137c97a67c
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b59e0d118c50af3579569c462d33045741c85981
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 India to AWS India 1, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from India to AWS India 1, 3 runs of 30s each per scheme
3 flows with 10s interval between flows



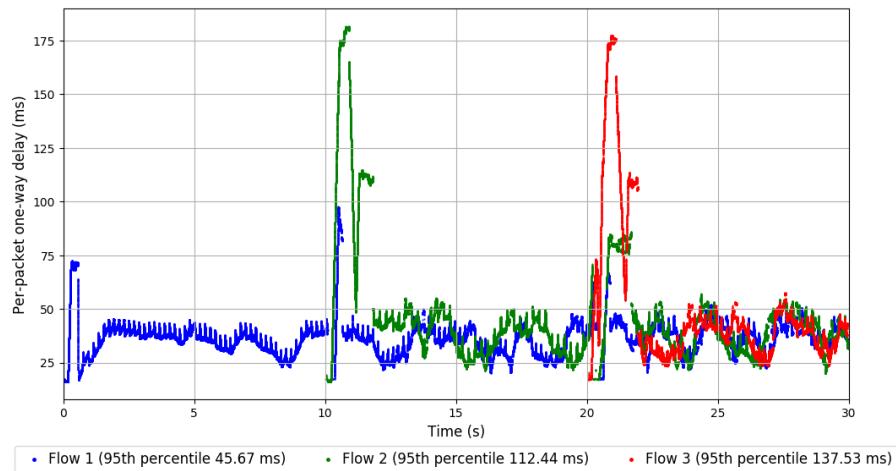
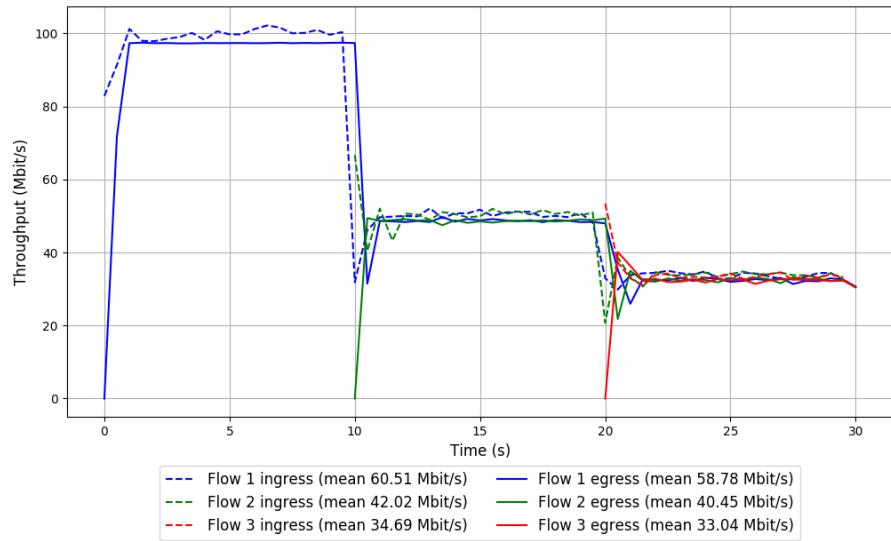
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	57.01	41.86	35.51	48.89	93.94	102.23	2.68	3.27	4.36
TCP Cubic	3	59.38	37.23	33.89	25.93	28.18	26.92	0.07	0.12	0.32
Indigo	3	56.11	40.06	32.51	22.70	23.77	26.59	0.05	0.12	0.31
Muses-25	3	0.00	0.00	0.00	19.04	19.11	19.43	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-31 05:40:52
End at: 2018-08-31 05:41:22
Local clock offset: -4.44 ms
Remote clock offset: -3.409 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.68 Mbit/s
95th percentile per-packet one-way delay: 76.989 ms
Loss rate: 3.44%
-- Flow 1:
Average throughput: 58.78 Mbit/s
95th percentile per-packet one-way delay: 45.666 ms
Loss rate: 2.94%
-- Flow 2:
Average throughput: 40.45 Mbit/s
95th percentile per-packet one-way delay: 112.438 ms
Loss rate: 3.86%
-- Flow 3:
Average throughput: 33.04 Mbit/s
95th percentile per-packet one-way delay: 137.529 ms
Loss rate: 5.00%
```

Run 1: Report of TCP BBR — Data Link

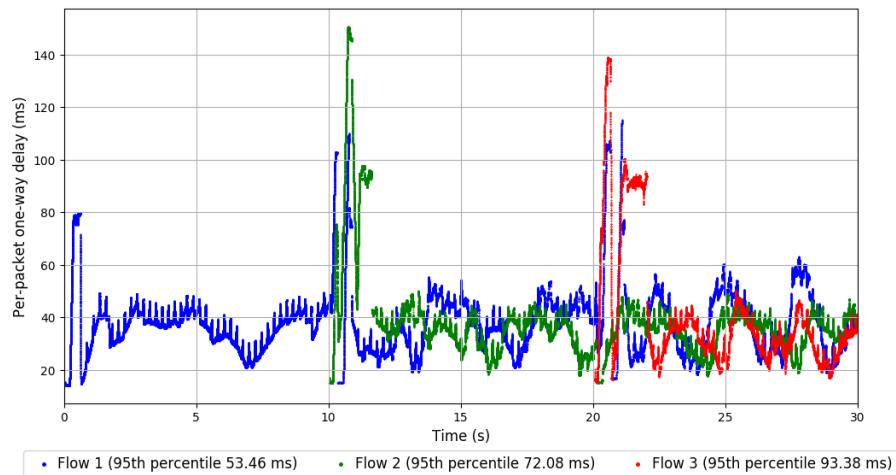
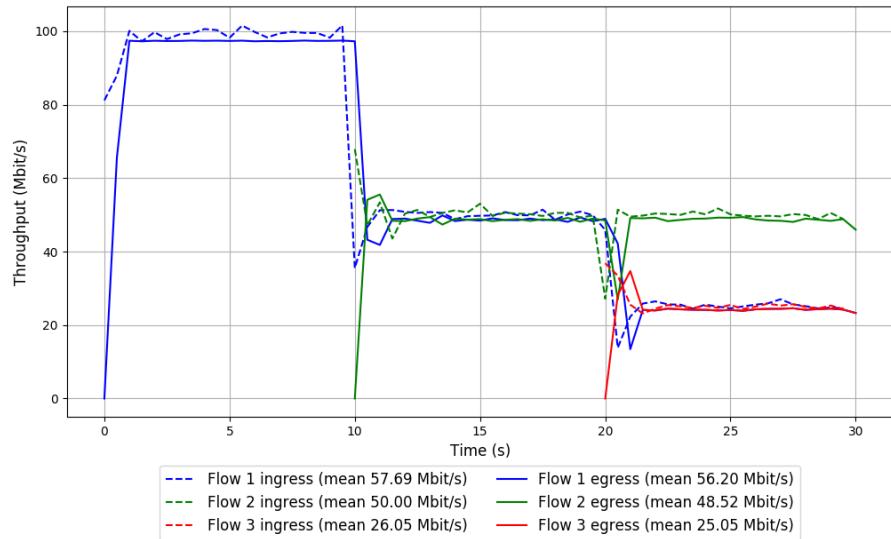


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-31 05:45:38
End at: 2018-08-31 05:46:08
Local clock offset: -6.369 ms
Remote clock offset: -2.689 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.83 Mbit/s
95th percentile per-packet one-way delay: 67.309 ms
Loss rate: 2.92%
-- Flow 1:
Average throughput: 56.20 Mbit/s
95th percentile per-packet one-way delay: 53.458 ms
Loss rate: 2.66%
-- Flow 2:
Average throughput: 48.52 Mbit/s
95th percentile per-packet one-way delay: 72.084 ms
Loss rate: 3.08%
-- Flow 3:
Average throughput: 25.05 Mbit/s
95th percentile per-packet one-way delay: 93.377 ms
Loss rate: 4.09%
```

Run 2: Report of TCP BBR — Data Link

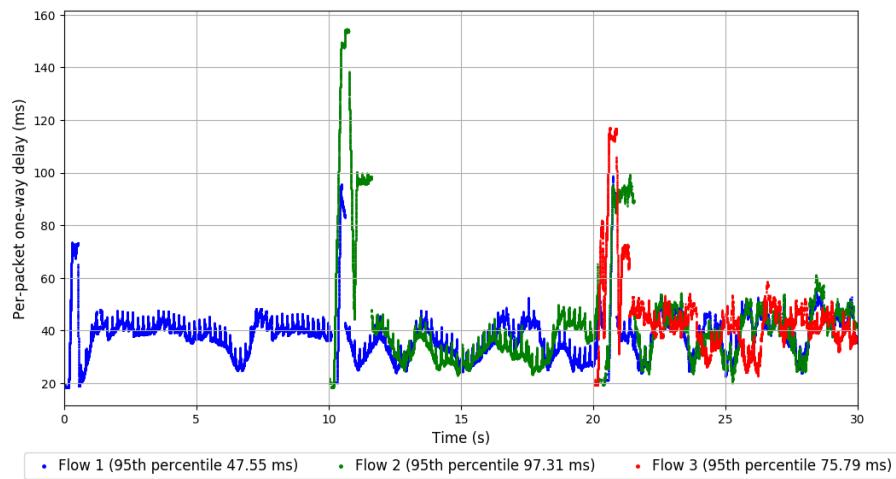
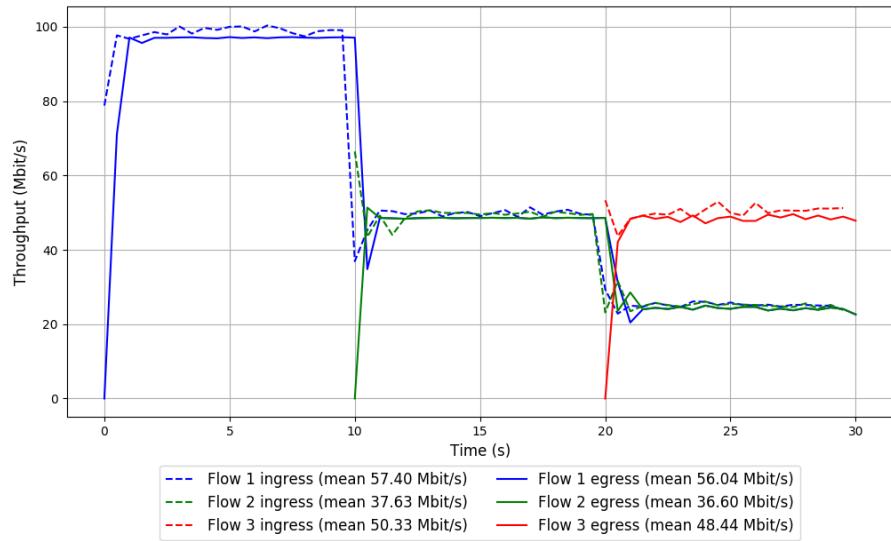


Run 3: Statistics of TCP BBR

```
Start at: 2018-08-31 05:50:17
End at: 2018-08-31 05:50:47
Local clock offset: -1.96 ms
Remote clock offset: -3.48 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.51 Mbit/s
95th percentile per-packet one-way delay: 70.426 ms
Loss rate: 2.81%
-- Flow 1:
Average throughput: 56.04 Mbit/s
95th percentile per-packet one-way delay: 47.546 ms
Loss rate: 2.45%
-- Flow 2:
Average throughput: 36.60 Mbit/s
95th percentile per-packet one-way delay: 97.313 ms
Loss rate: 2.86%
-- Flow 3:
Average throughput: 48.44 Mbit/s
95th percentile per-packet one-way delay: 75.787 ms
Loss rate: 3.99%
```

Run 3: Report of TCP BBR — Data Link

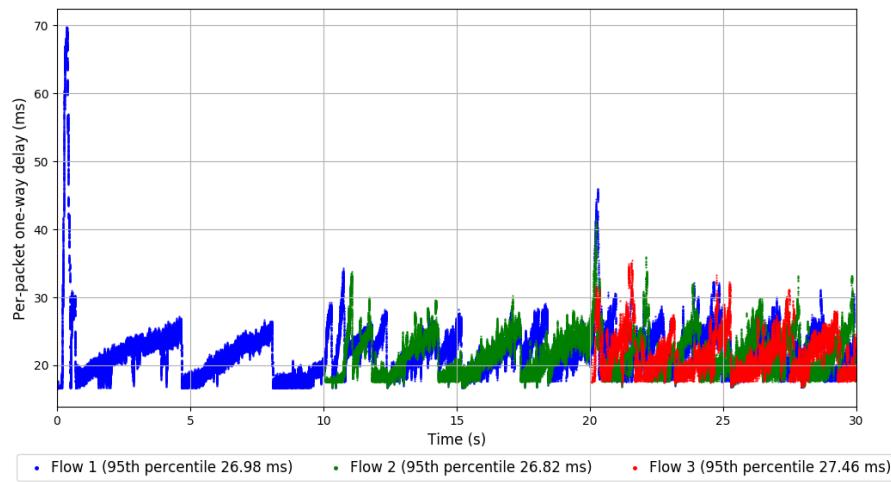
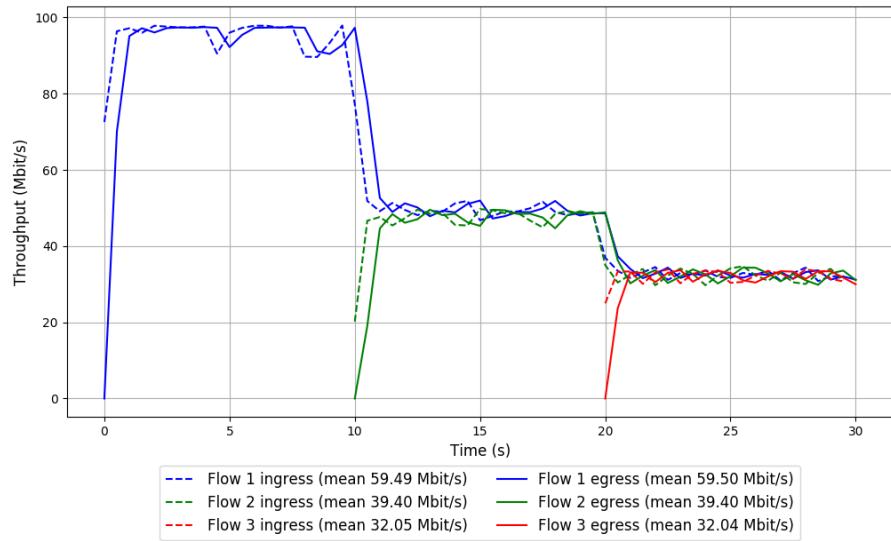


Run 1: Statistics of TCP Cubic

```
Start at: 2018-08-31 05:38:28
End at: 2018-08-31 05:38:58
Local clock offset: -4.098 ms
Remote clock offset: -3.79 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.37 Mbit/s
95th percentile per-packet one-way delay: 27.006 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 59.50 Mbit/s
95th percentile per-packet one-way delay: 26.981 ms
Loss rate: 0.07%
-- Flow 2:
Average throughput: 39.40 Mbit/s
95th percentile per-packet one-way delay: 26.823 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 32.04 Mbit/s
95th percentile per-packet one-way delay: 27.461 ms
Loss rate: 0.32%
```

Run 1: Report of TCP Cubic — Data Link

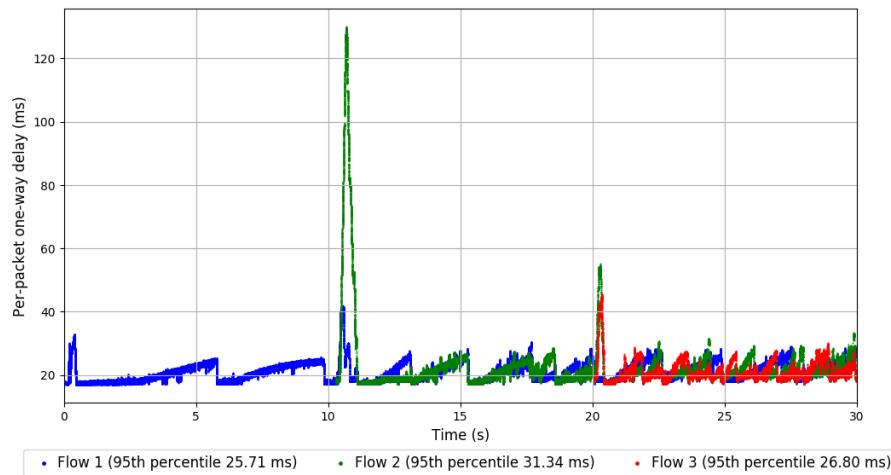
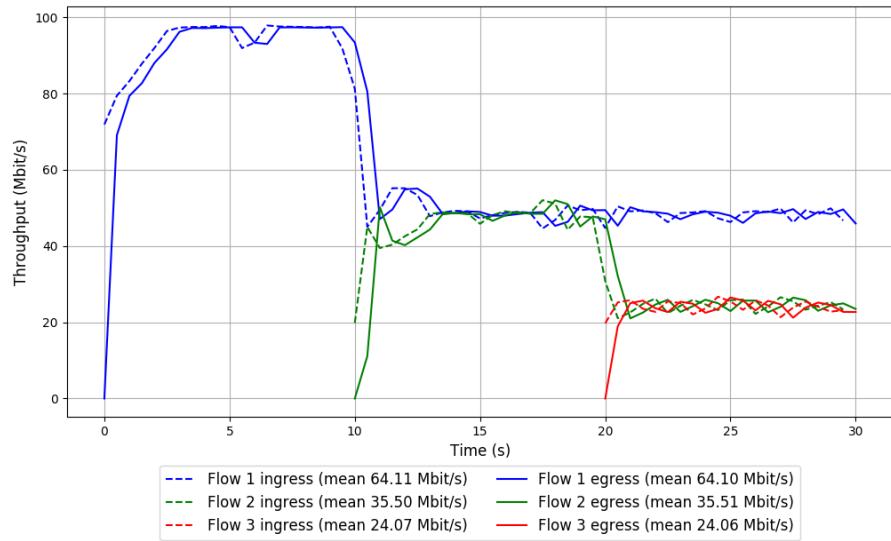


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-31 05:43:08
End at: 2018-08-31 05:43:38
Local clock offset: -4.49 ms
Remote clock offset: -3.999 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 95.45 Mbit/s
95th percentile per-packet one-way delay: 26.392 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 64.10 Mbit/s
95th percentile per-packet one-way delay: 25.714 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 35.51 Mbit/s
95th percentile per-packet one-way delay: 31.341 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 24.06 Mbit/s
95th percentile per-packet one-way delay: 26.803 ms
Loss rate: 0.32%
```

Run 2: Report of TCP Cubic — Data Link

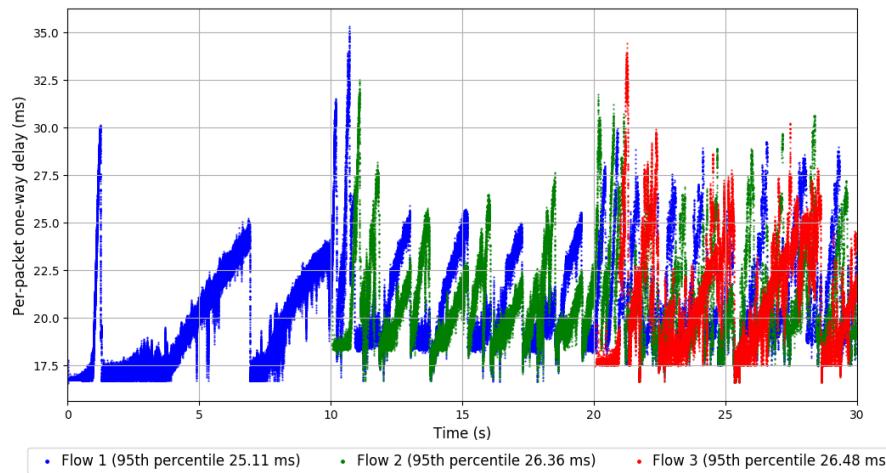
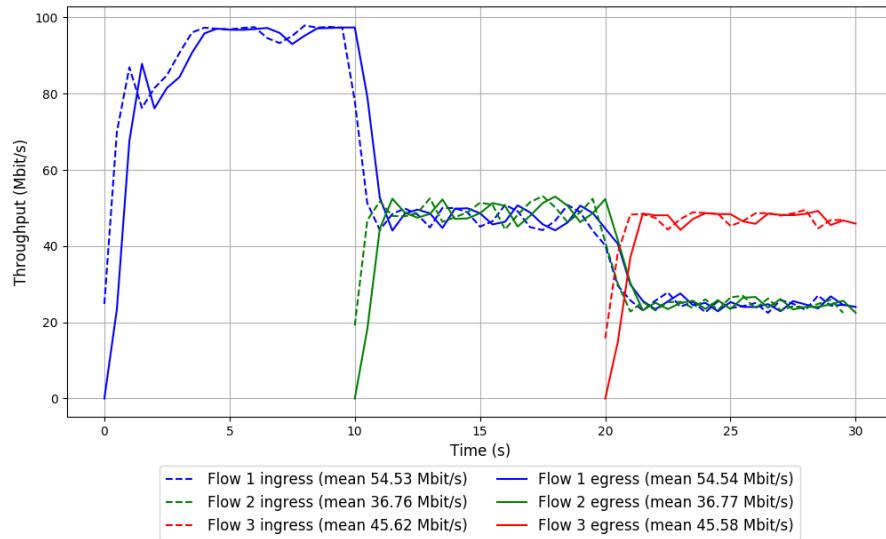


```
Run 3: Statistics of TCP Cubic
```

```
Start at: 2018-08-31 05:47:54
End at: 2018-08-31 05:48:24
Local clock offset: -3.707 ms
Remote clock offset: -2.95 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 94.14 Mbit/s
95th percentile per-packet one-way delay: 25.860 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 54.54 Mbit/s
95th percentile per-packet one-way delay: 25.109 ms
Loss rate: 0.06%
-- Flow 2:
Average throughput: 36.77 Mbit/s
95th percentile per-packet one-way delay: 26.361 ms
Loss rate: 0.11%
-- Flow 3:
Average throughput: 45.58 Mbit/s
95th percentile per-packet one-way delay: 26.485 ms
Loss rate: 0.32%
```

Run 3: Report of TCP Cubic — Data Link

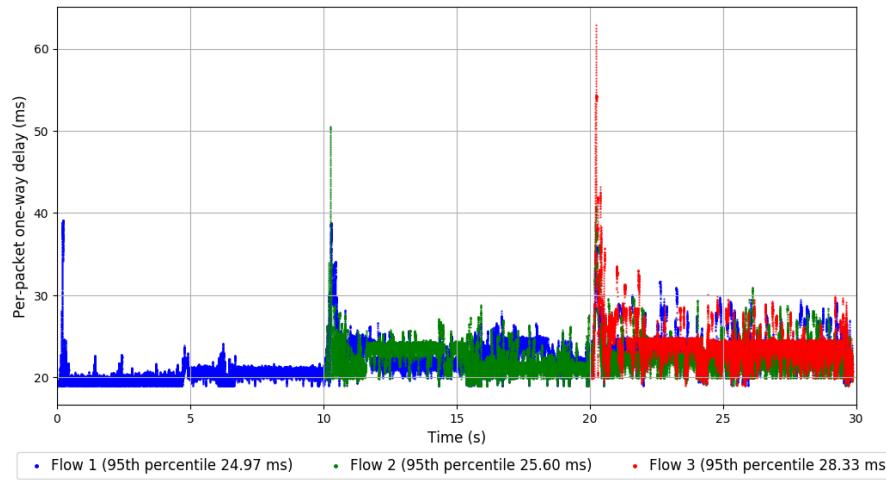
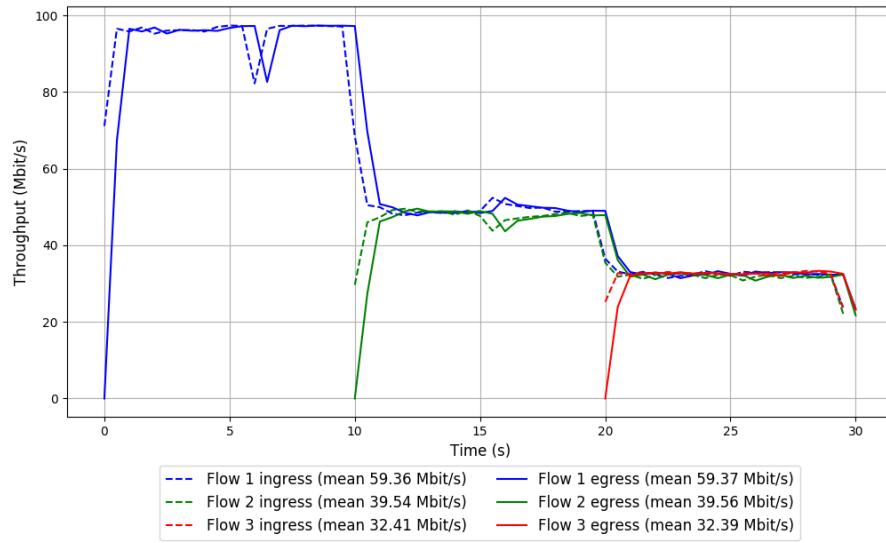


```
Run 1: Statistics of Indigo
```

```
Start at: 2018-08-31 05:39:40
End at: 2018-08-31 05:40:10
Local clock offset: -2.047 ms
Remote clock offset: -3.896 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.29 Mbit/s
95th percentile per-packet one-way delay: 25.889 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 59.37 Mbit/s
95th percentile per-packet one-way delay: 24.968 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 39.56 Mbit/s
95th percentile per-packet one-way delay: 25.604 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 32.39 Mbit/s
95th percentile per-packet one-way delay: 28.332 ms
Loss rate: 0.31%
```

Run 1: Report of Indigo — Data Link

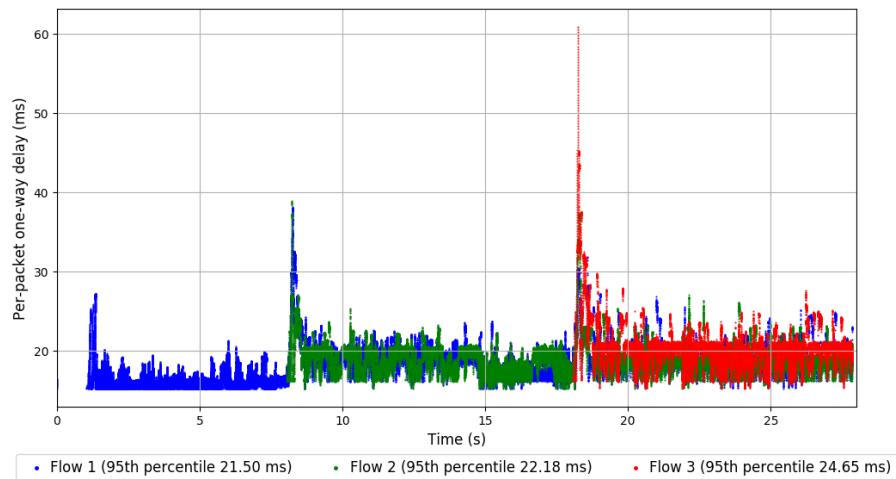
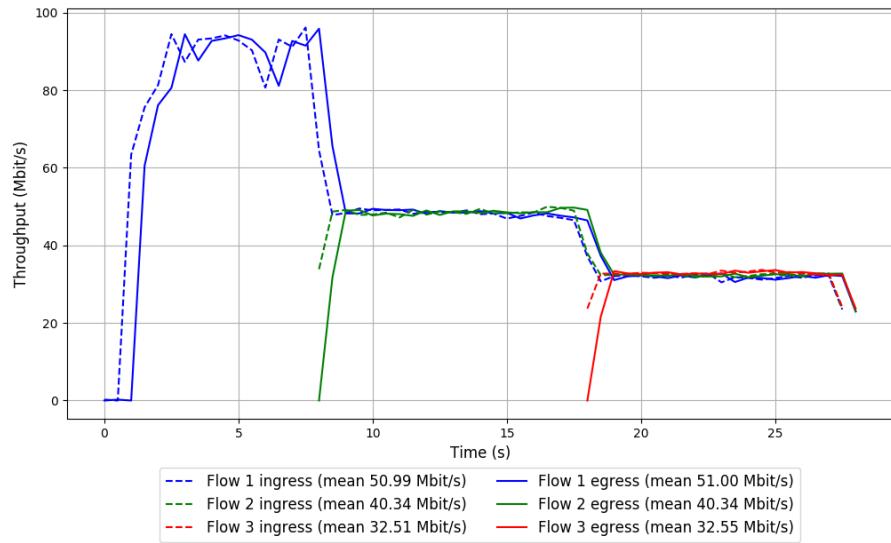


Run 2: Statistics of Indigo

```
Start at: 2018-08-31 05:44:21
End at: 2018-08-31 05:44:51
Local clock offset: -6.317 ms
Remote clock offset: -3.804 ms

# Below is generated by plot.py at 2018-08-31 05:52:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 91.18 Mbit/s
95th percentile per-packet one-way delay: 22.389 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 51.00 Mbit/s
95th percentile per-packet one-way delay: 21.495 ms
Loss rate: 0.06%
-- Flow 2:
Average throughput: 40.34 Mbit/s
95th percentile per-packet one-way delay: 22.176 ms
Loss rate: 0.11%
-- Flow 3:
Average throughput: 32.55 Mbit/s
95th percentile per-packet one-way delay: 24.648 ms
Loss rate: 0.28%
```

Run 2: Report of Indigo — Data Link

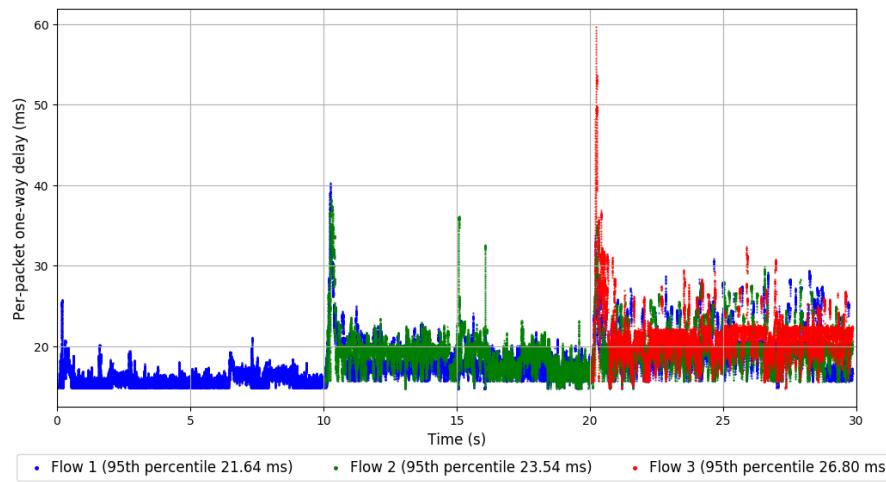
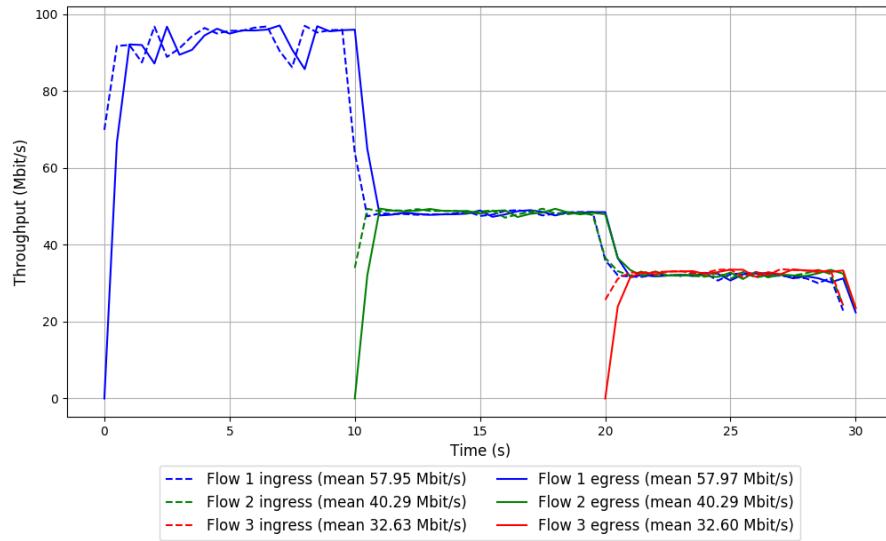


Run 3: Statistics of Indigo

```
Start at: 2018-08-31 05:49:04
End at: 2018-08-31 05:49:34
Local clock offset: -5.819 ms
Remote clock offset: -3.471 ms

# Below is generated by plot.py at 2018-08-31 05:52:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 95.44 Mbit/s
95th percentile per-packet one-way delay: 23.228 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 57.97 Mbit/s
95th percentile per-packet one-way delay: 21.645 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 40.29 Mbit/s
95th percentile per-packet one-way delay: 23.536 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 32.60 Mbit/s
95th percentile per-packet one-way delay: 26.797 ms
Loss rate: 0.33%
```

Run 3: Report of Indigo — Data Link

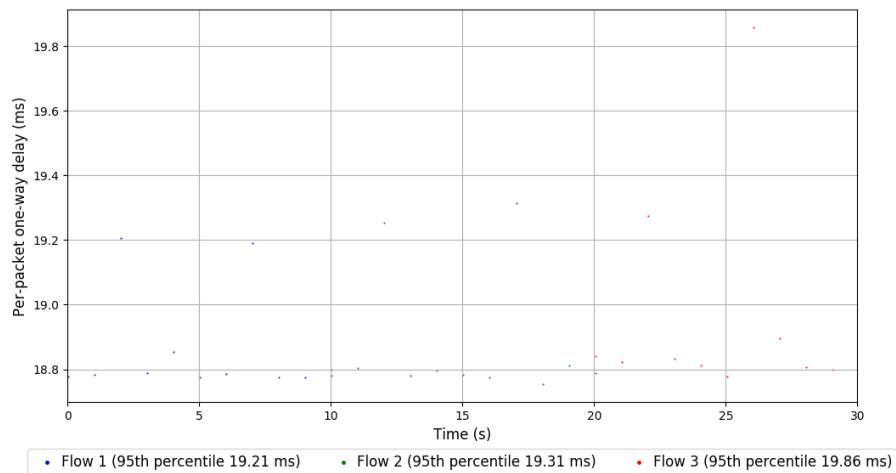
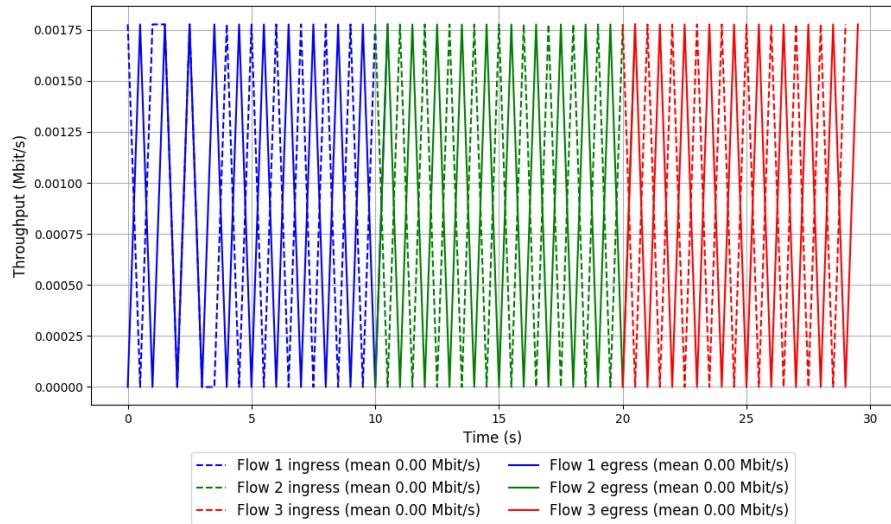


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-08-31 05:37:23
End at: 2018-08-31 05:37:53
Local clock offset: -2.011 ms
Remote clock offset: -4.027 ms

# Below is generated by plot.py at 2018-08-31 05:52:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.275 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.207 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.314 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.858 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link

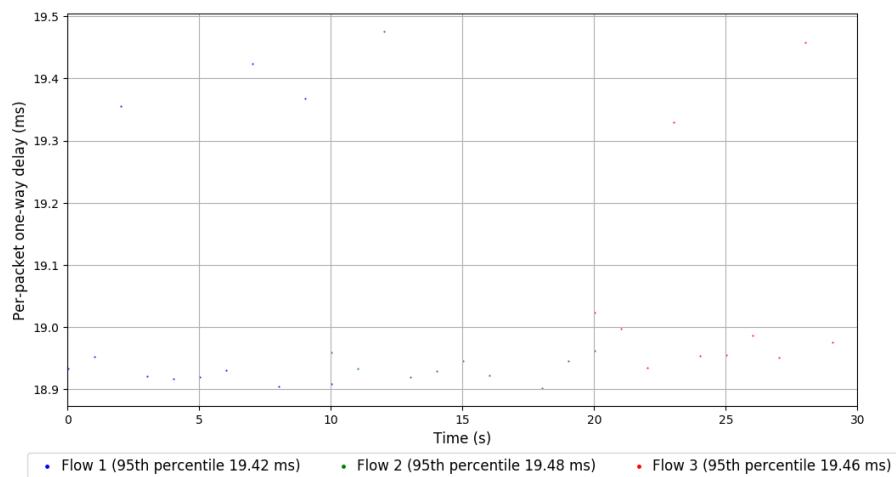
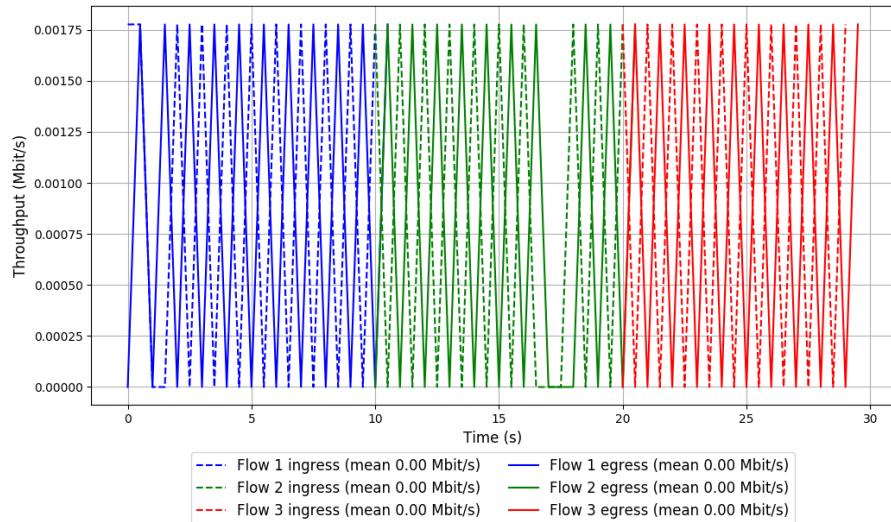


Run 2: Statistics of Muses-25

```
Start at: 2018-08-31 05:42:03
End at: 2018-08-31 05:42:33
Local clock offset: -2.007 ms
Remote clock offset: -3.652 ms

# Below is generated by plot.py at 2018-08-31 05:52:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.423 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.423 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.475 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 19.458 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

```
Start at: 2018-08-31 05:46:49
End at: 2018-08-31 05:47:19
Local clock offset: -3.526 ms
Remote clock offset: -4.041 ms

# Below is generated by plot.py at 2018-08-31 05:52:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 18.536 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 18.475 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 18.536 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 18.960 ms
Loss rate: 0.00%
```

Run 3: Report of Muses-25 — Data Link

