

Pantheon Report

Generated at 2018-08-31 10:03:11 (UTC).
Data path: Colombia on p4p1 (*remote*) → AWS Brazil 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 gps.ntp.br and have been applied to correct the timestamps in logs.

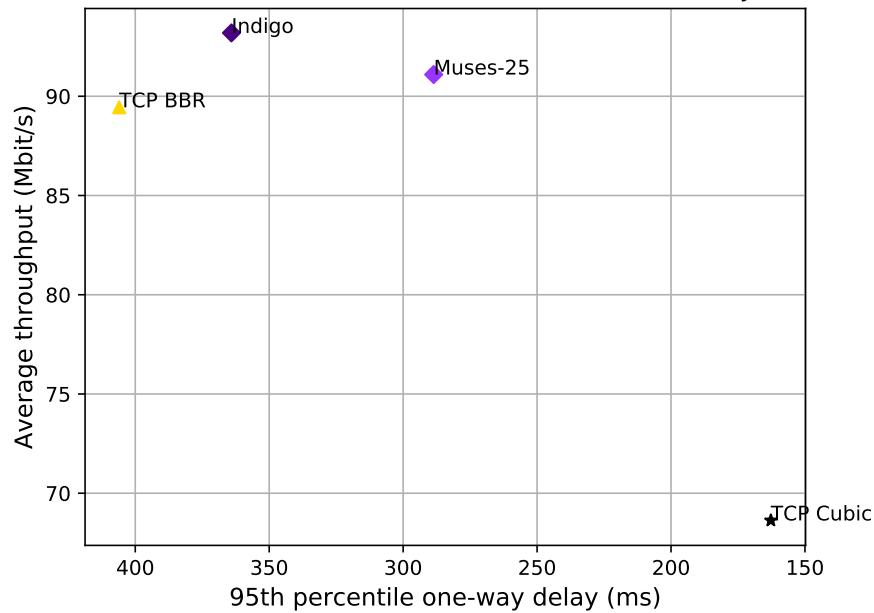
System info:

```
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
```

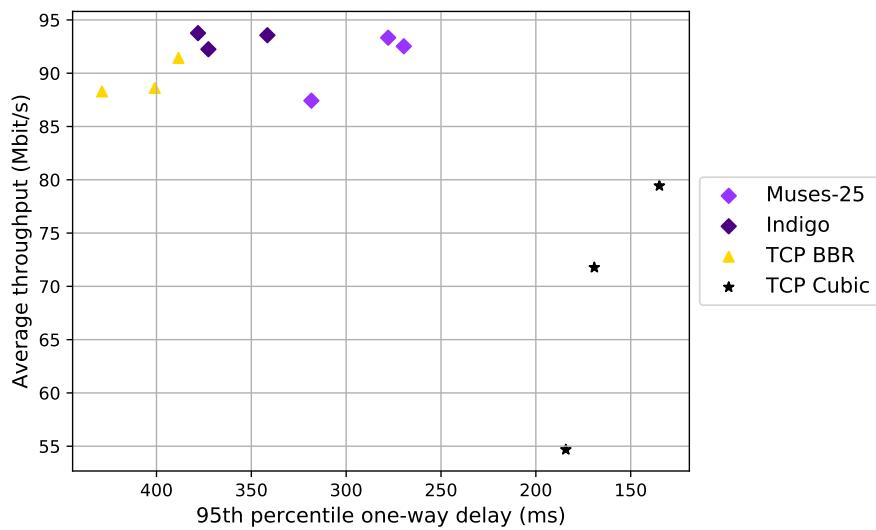
Git summary:

```
branch: muses @ e3c5aa19ca94c3066828fb83f16a8fb6b2731e7a
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 Colombia to AWS Brazil 2, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



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



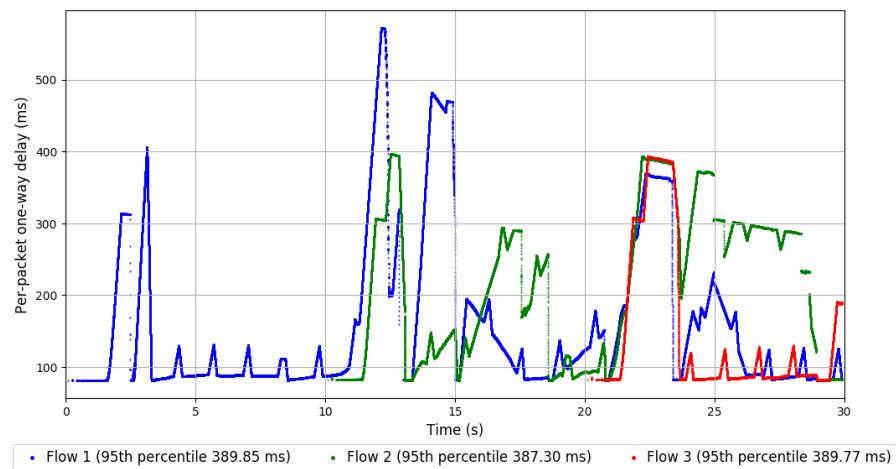
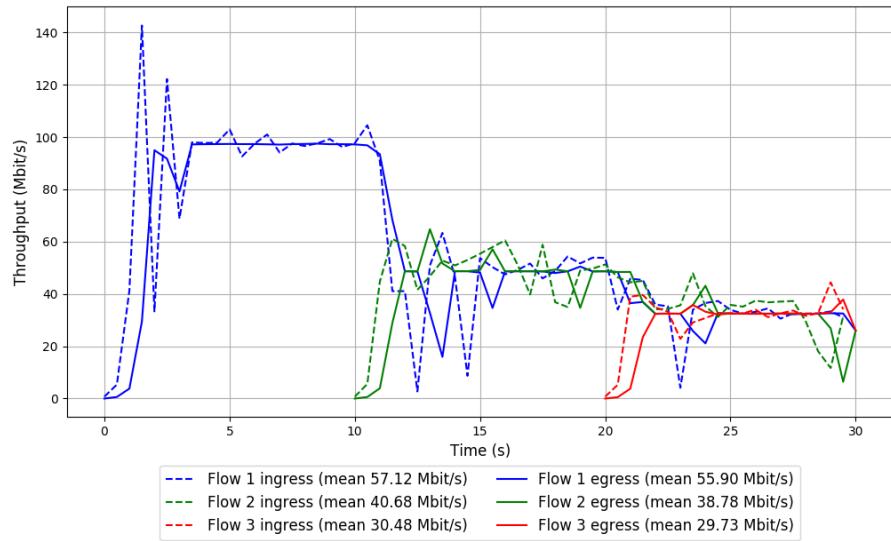
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	54.36	38.23	29.49	404.01	455.27	386.96	3.22	4.95	4.72
TCP Cubic	3	37.03	29.02	37.52	181.89	122.51	170.10	0.94	1.78	1.82
Indigo	3	58.19	38.32	29.45	391.56	135.21	122.64	7.39	2.20	2.75
Muses-25	3	54.99	36.72	36.07	132.02	386.52	332.97	0.40	0.95	3.40

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-31 09:46:06
End at: 2018-08-31 09:46:36
Local clock offset: -12.359 ms
Remote clock offset: -0.537 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 91.43 Mbit/s
95th percentile per-packet one-way delay: 388.408 ms
Loss rate: 3.62%
-- Flow 1:
Average throughput: 55.90 Mbit/s
95th percentile per-packet one-way delay: 389.853 ms
Loss rate: 2.67%
-- Flow 2:
Average throughput: 38.78 Mbit/s
95th percentile per-packet one-way delay: 387.300 ms
Loss rate: 5.46%
-- Flow 3:
Average throughput: 29.73 Mbit/s
95th percentile per-packet one-way delay: 389.771 ms
Loss rate: 4.06%
```

Run 1: Report of TCP BBR — Data Link

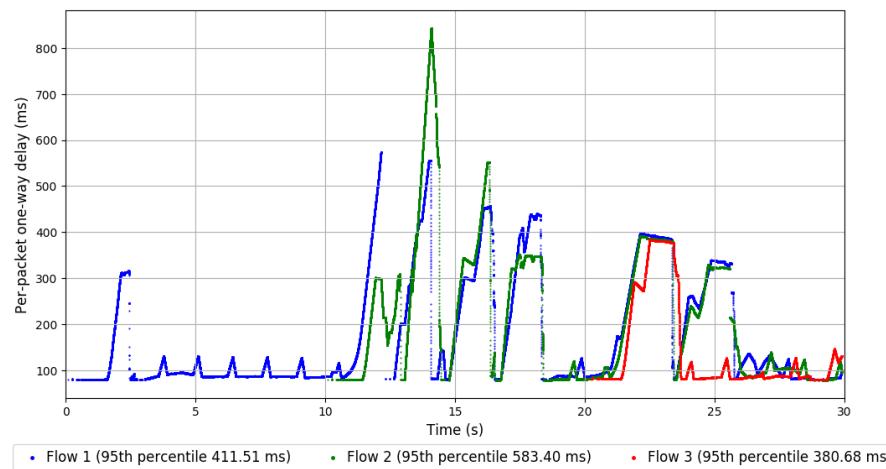
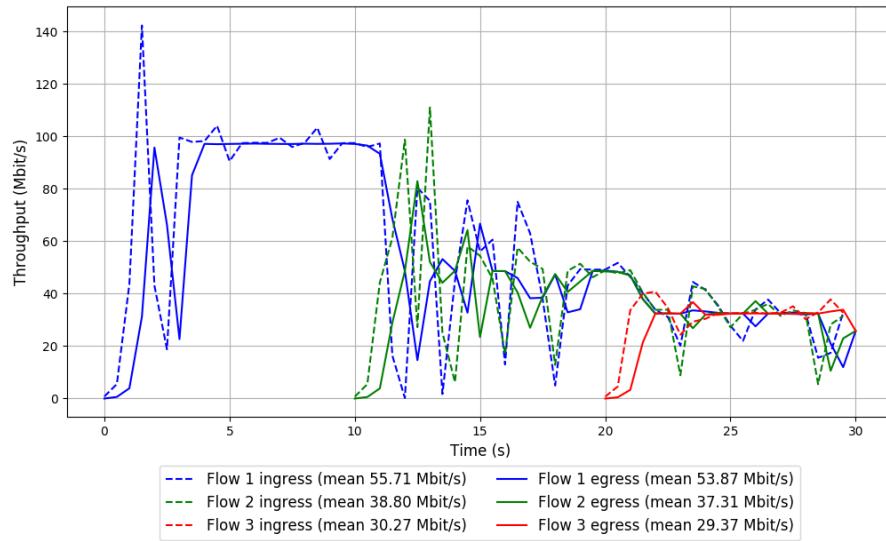


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-31 09:51:23
End at: 2018-08-31 09:51:53
Local clock offset: -13.687 ms
Remote clock offset: 3.414 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 88.28 Mbit/s
95th percentile per-packet one-way delay: 428.712 ms
Loss rate: 4.15%
-- Flow 1:
Average throughput: 53.87 Mbit/s
95th percentile per-packet one-way delay: 411.508 ms
Loss rate: 3.84%
-- Flow 2:
Average throughput: 37.31 Mbit/s
95th percentile per-packet one-way delay: 583.403 ms
Loss rate: 4.64%
-- Flow 3:
Average throughput: 29.37 Mbit/s
95th percentile per-packet one-way delay: 380.675 ms
Loss rate: 4.58%
```

Run 2: Report of TCP BBR — Data Link

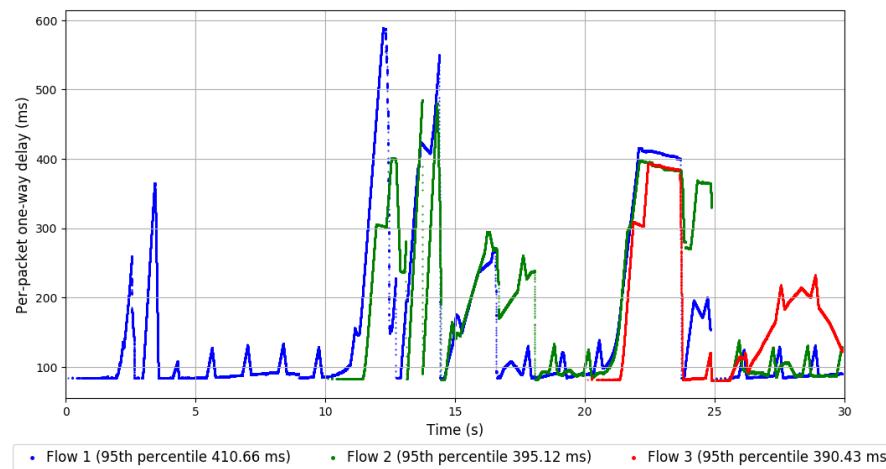
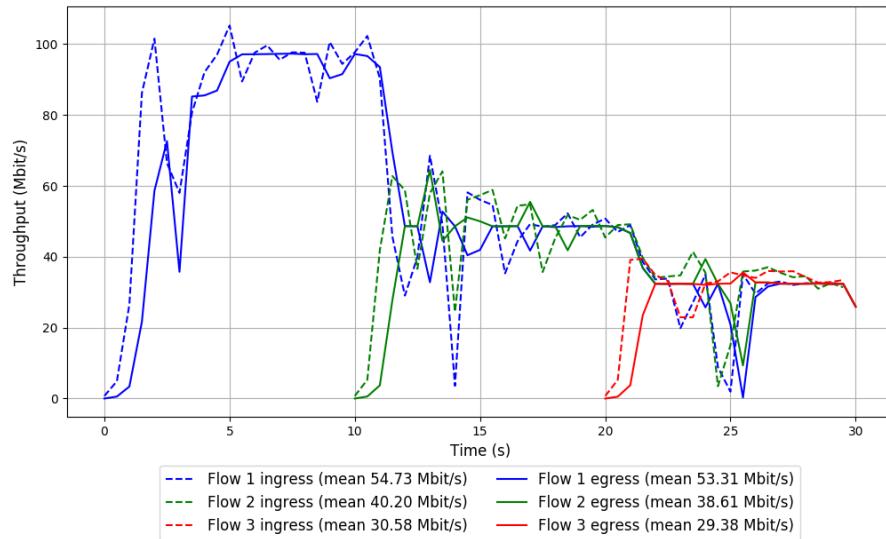


Run 3: Statistics of TCP BBR

```
Start at: 2018-08-31 09:56:37
End at: 2018-08-31 09:57:07
Local clock offset: -12.034 ms
Remote clock offset: -1.628 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 88.61 Mbit/s
95th percentile per-packet one-way delay: 400.905 ms
Loss rate: 3.87%
-- Flow 1:
Average throughput: 53.31 Mbit/s
95th percentile per-packet one-way delay: 410.664 ms
Loss rate: 3.14%
-- Flow 2:
Average throughput: 38.61 Mbit/s
95th percentile per-packet one-way delay: 395.121 ms
Loss rate: 4.74%
-- Flow 3:
Average throughput: 29.38 Mbit/s
95th percentile per-packet one-way delay: 390.431 ms
Loss rate: 5.53%
```

Run 3: Report of TCP BBR — Data Link

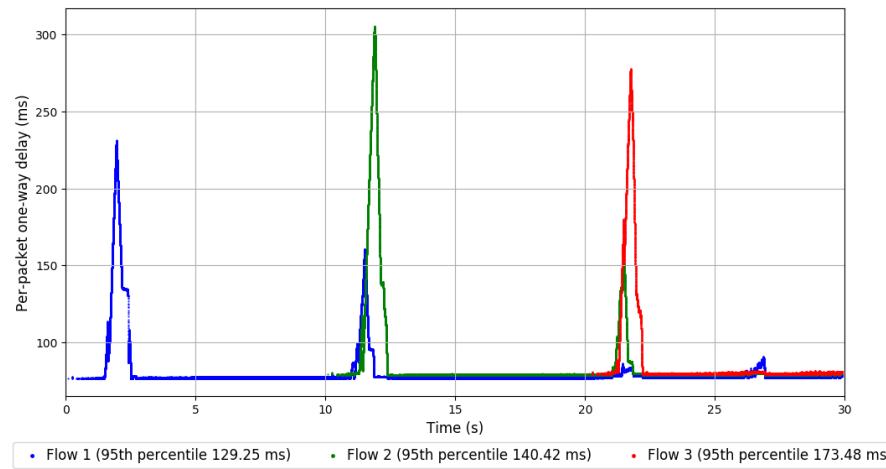
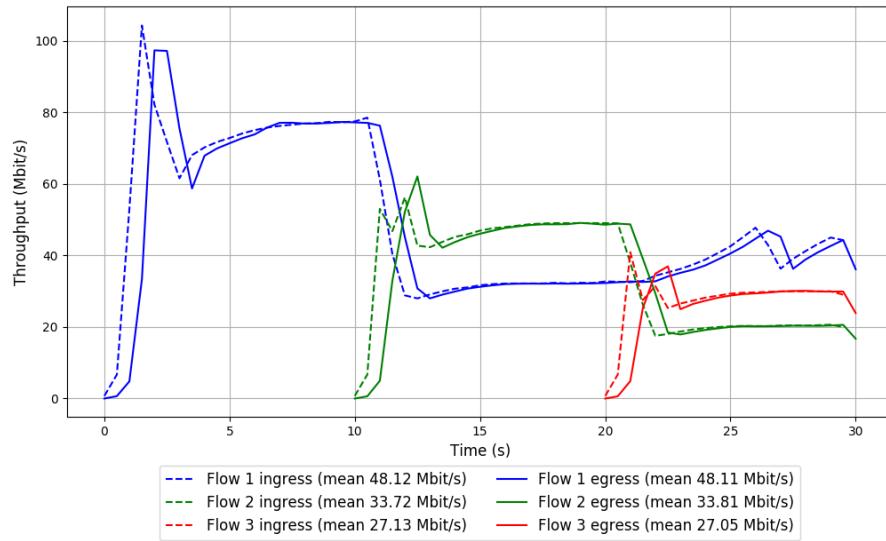


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-08-31 09:50:05
End at: 2018-08-31 09:50:35
Local clock offset: -14.595 ms
Remote clock offset: 3.367 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 79.43 Mbit/s
95th percentile per-packet one-way delay: 134.867 ms
Loss rate: 0.73%
-- Flow 1:
Average throughput: 48.11 Mbit/s
95th percentile per-packet one-way delay: 129.253 ms
Loss rate: 0.57%
-- Flow 2:
Average throughput: 33.81 Mbit/s
95th percentile per-packet one-way delay: 140.416 ms
Loss rate: 0.58%
-- Flow 3:
Average throughput: 27.05 Mbit/s
95th percentile per-packet one-way delay: 173.483 ms
Loss rate: 1.94%
```

Run 1: Report of TCP Cubic — Data Link

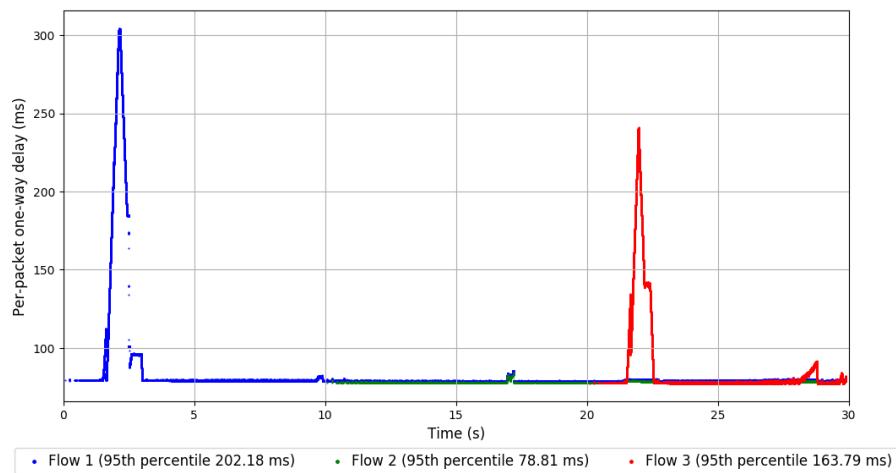
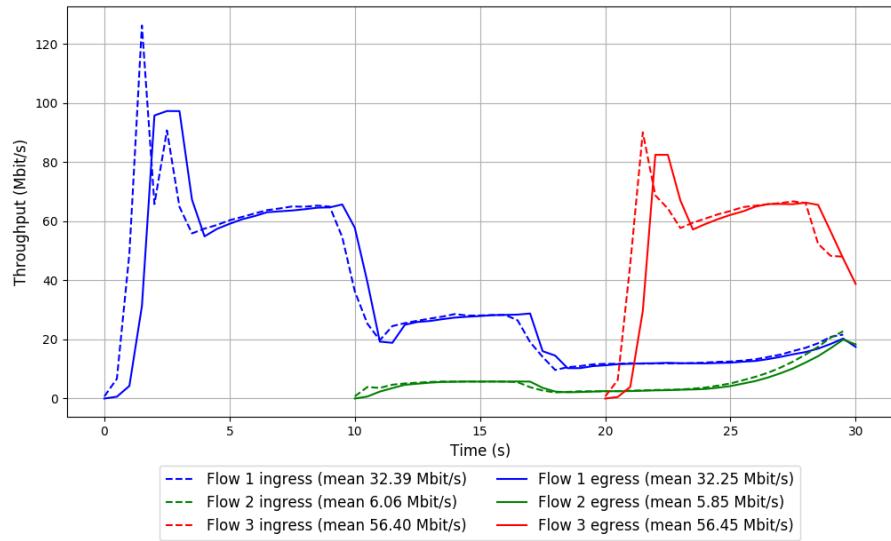


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-31 09:55:22
End at: 2018-08-31 09:55:52
Local clock offset: -13.188 ms
Remote clock offset: 4.641 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 54.68 Mbit/s
95th percentile per-packet one-way delay: 184.199 ms
Loss rate: 1.43%
-- Flow 1:
Average throughput: 32.25 Mbit/s
95th percentile per-packet one-way delay: 202.180 ms
Loss rate: 1.01%
-- Flow 2:
Average throughput: 5.85 Mbit/s
95th percentile per-packet one-way delay: 78.811 ms
Loss rate: 4.19%
-- Flow 3:
Average throughput: 56.45 Mbit/s
95th percentile per-packet one-way delay: 163.789 ms
Loss rate: 1.57%
```

Run 2: Report of TCP Cubic — Data Link

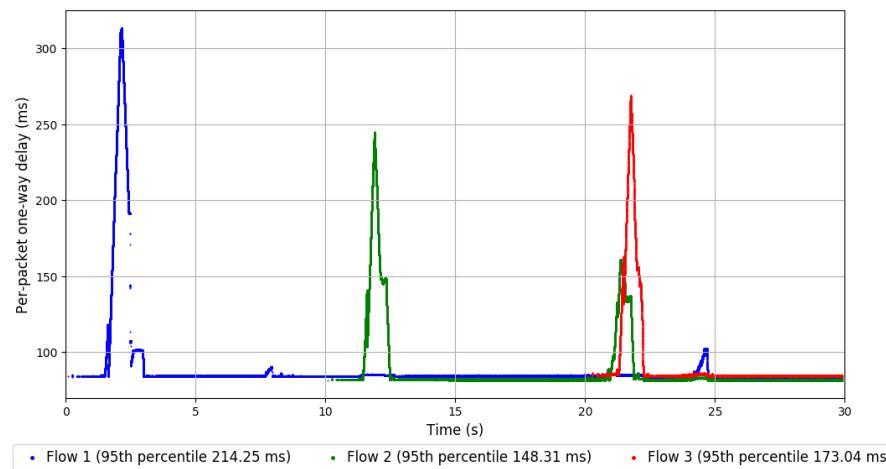
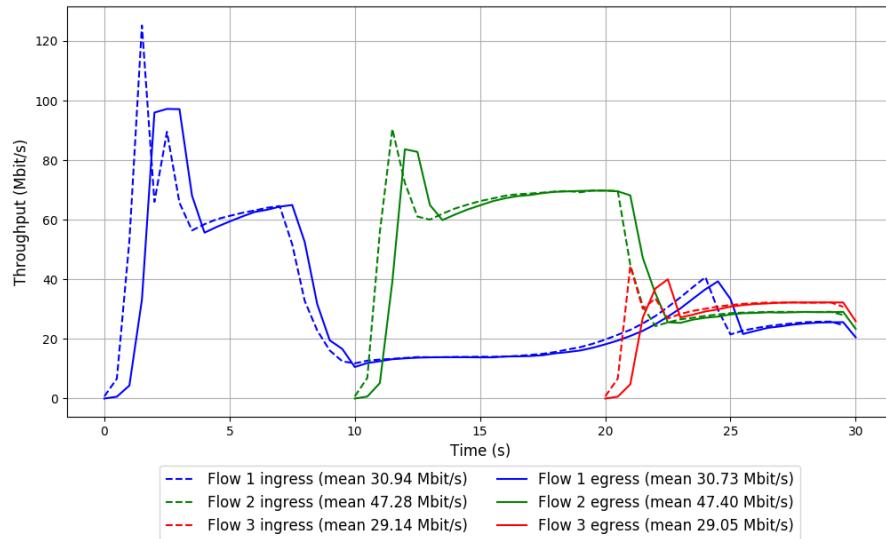


Run 3: Statistics of TCP Cubic

```
Start at: 2018-08-31 10:00:31
End at: 2018-08-31 10:01:01
Local clock offset: -8.303 ms
Remote clock offset: -1.536 ms

# Below is generated by plot.py at 2018-08-31 10:02:33
# Datalink statistics
-- Total of 3 flows:
Average throughput: 71.77 Mbit/s
95th percentile per-packet one-way delay: 169.169 ms
Loss rate: 1.04%
-- Flow 1:
Average throughput: 30.73 Mbit/s
95th percentile per-packet one-way delay: 214.248 ms
Loss rate: 1.24%
-- Flow 2:
Average throughput: 47.40 Mbit/s
95th percentile per-packet one-way delay: 148.308 ms
Loss rate: 0.58%
-- Flow 3:
Average throughput: 29.05 Mbit/s
95th percentile per-packet one-way delay: 173.042 ms
Loss rate: 1.94%
```

Run 3: Report of TCP Cubic — Data Link

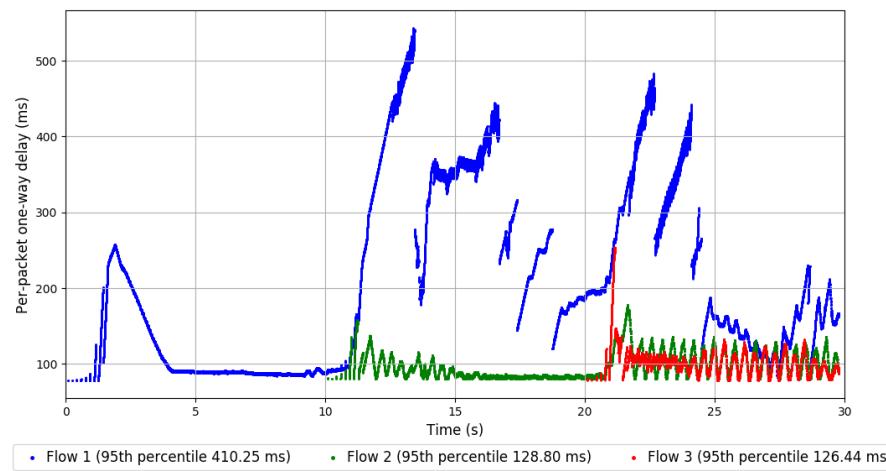
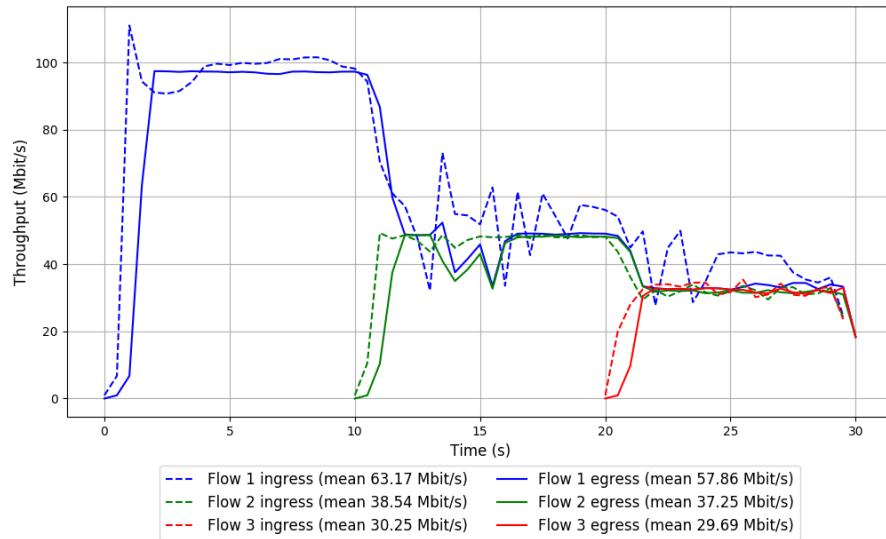


Run 1: Statistics of Indigo

```
Start at: 2018-08-31 09:47:25
End at: 2018-08-31 09:47:55
Local clock offset: -12.871 ms
Remote clock offset: 3.402 ms

# Below is generated by plot.py at 2018-08-31 10:02:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 92.25 Mbit/s
95th percentile per-packet one-way delay: 372.635 ms
Loss rate: 7.12%
-- Flow 1:
Average throughput: 57.86 Mbit/s
95th percentile per-packet one-way delay: 410.250 ms
Loss rate: 8.91%
-- Flow 2:
Average throughput: 37.25 Mbit/s
95th percentile per-packet one-way delay: 128.797 ms
Loss rate: 4.13%
-- Flow 3:
Average throughput: 29.69 Mbit/s
95th percentile per-packet one-way delay: 126.440 ms
Loss rate: 3.45%
```

Run 1: Report of Indigo — Data Link

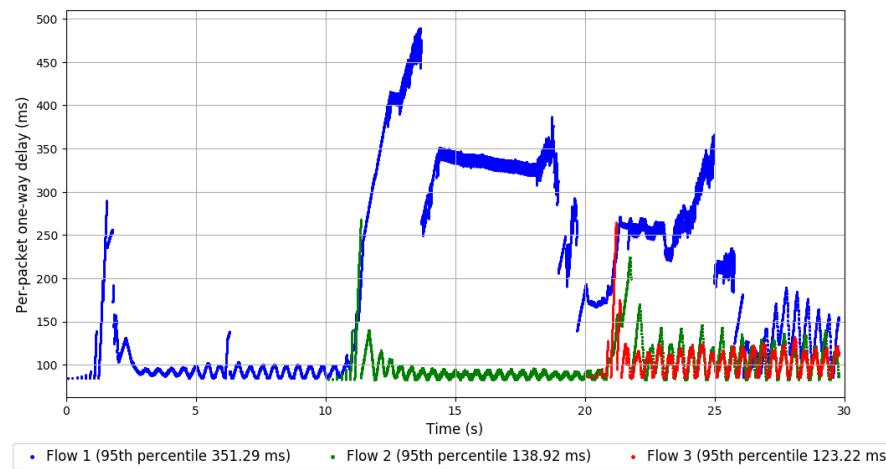
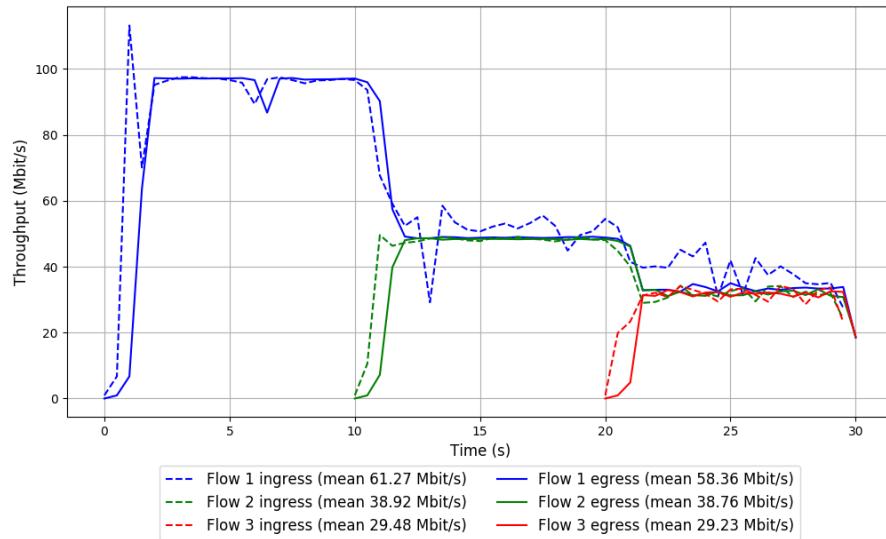


Run 2: Statistics of Indigo

```
Start at: 2018-08-31 09:52:46
End at: 2018-08-31 09:53:16
Local clock offset: -14.277 ms
Remote clock offset: -0.447 ms

# Below is generated by plot.py at 2018-08-31 10:02:35
# Datalink statistics
-- Total of 3 flows:
Average throughput: 93.57 Mbit/s
95th percentile per-packet one-way delay: 341.548 ms
Loss rate: 3.92%
-- Flow 1:
Average throughput: 58.36 Mbit/s
95th percentile per-packet one-way delay: 351.286 ms
Loss rate: 5.27%
-- Flow 2:
Average throughput: 38.76 Mbit/s
95th percentile per-packet one-way delay: 138.924 ms
Loss rate: 1.25%
-- Flow 3:
Average throughput: 29.23 Mbit/s
95th percentile per-packet one-way delay: 123.215 ms
Loss rate: 2.51%
```

Run 2: Report of Indigo — Data Link

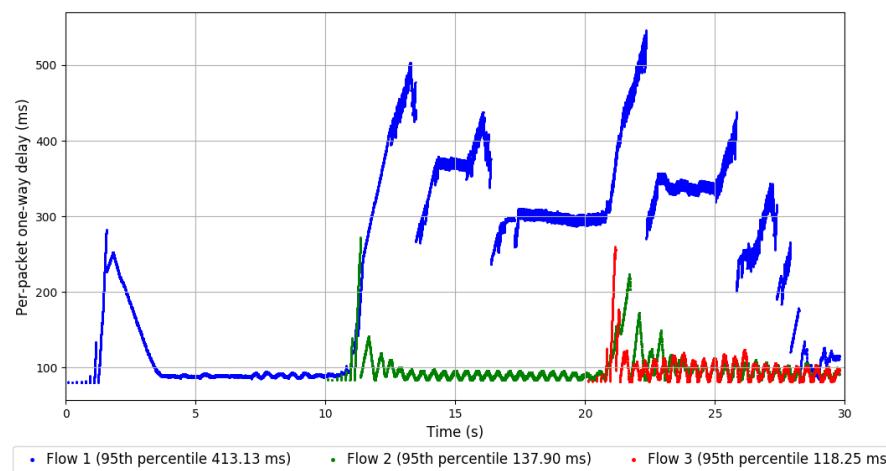
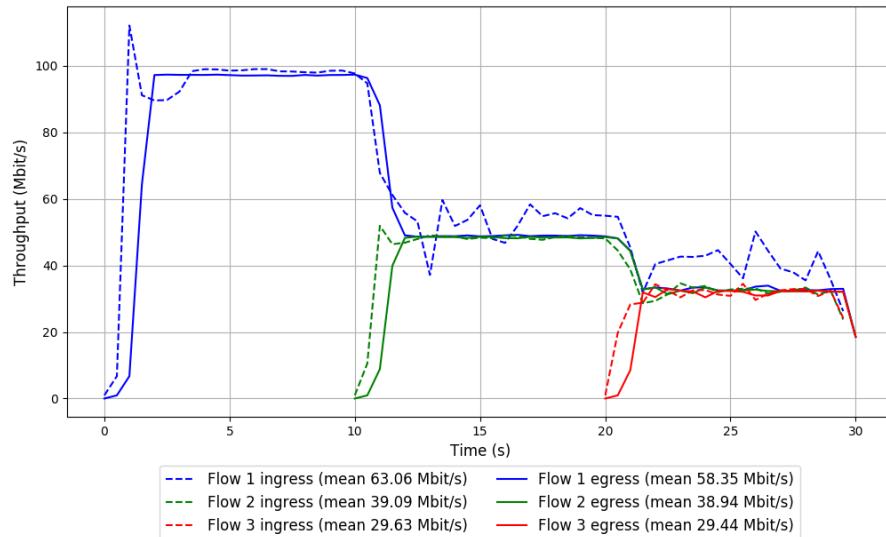


Run 3: Statistics of Indigo

```
Start at: 2018-08-31 09:57:57
End at: 2018-08-31 09:58:27
Local clock offset: -10.91 ms
Remote clock offset: -0.586 ms

# Below is generated by plot.py at 2018-08-31 10:02:51
# Datalink statistics
-- Total of 3 flows:
Average throughput: 93.76 Mbit/s
95th percentile per-packet one-way delay: 378.107 ms
Loss rate: 5.64%
-- Flow 1:
Average throughput: 58.35 Mbit/s
95th percentile per-packet one-way delay: 413.131 ms
Loss rate: 7.98%
-- Flow 2:
Average throughput: 38.94 Mbit/s
95th percentile per-packet one-way delay: 137.900 ms
Loss rate: 1.22%
-- Flow 3:
Average throughput: 29.44 Mbit/s
95th percentile per-packet one-way delay: 118.251 ms
Loss rate: 2.29%
```

Run 3: Report of Indigo — Data Link

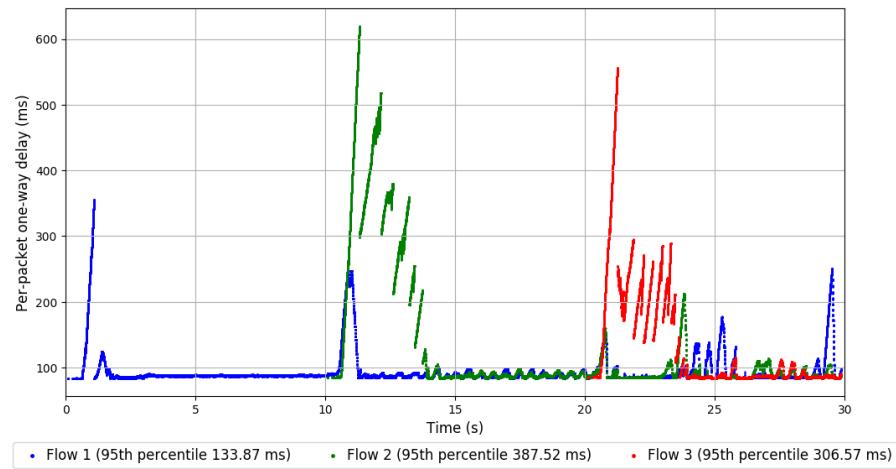
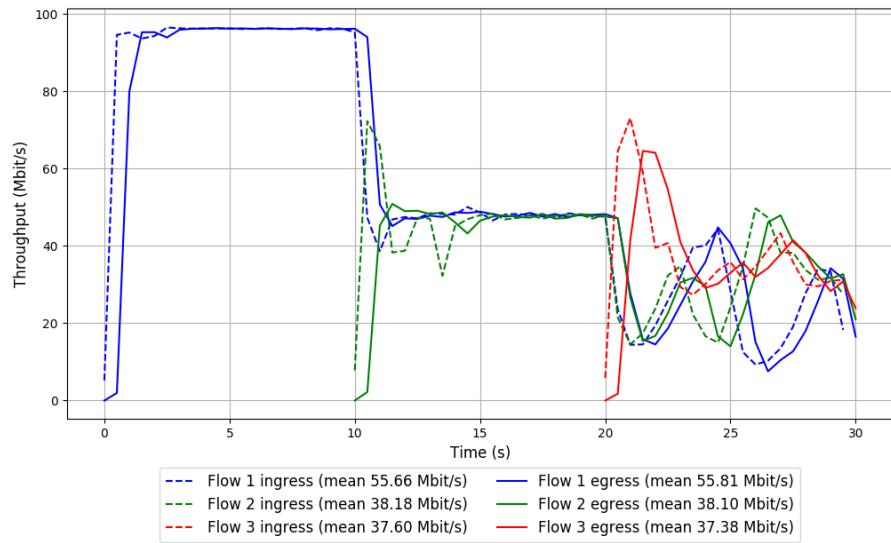


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-08-31 09:48:48
End at: 2018-08-31 09:49:18
Local clock offset: -13.314 ms
Remote clock offset: -0.632 ms

# Below is generated by plot.py at 2018-08-31 10:03:09
# Datalink statistics
-- Total of 3 flows:
Average throughput: 93.33 Mbit/s
95th percentile per-packet one-way delay: 277.862 ms
Loss rate: 0.76%
-- Flow 1:
Average throughput: 55.81 Mbit/s
95th percentile per-packet one-way delay: 133.871 ms
Loss rate: 0.30%
-- Flow 2:
Average throughput: 38.10 Mbit/s
95th percentile per-packet one-way delay: 387.523 ms
Loss rate: 1.05%
-- Flow 3:
Average throughput: 37.38 Mbit/s
95th percentile per-packet one-way delay: 306.567 ms
Loss rate: 2.22%
```

Run 1: Report of Muses-25 — Data Link

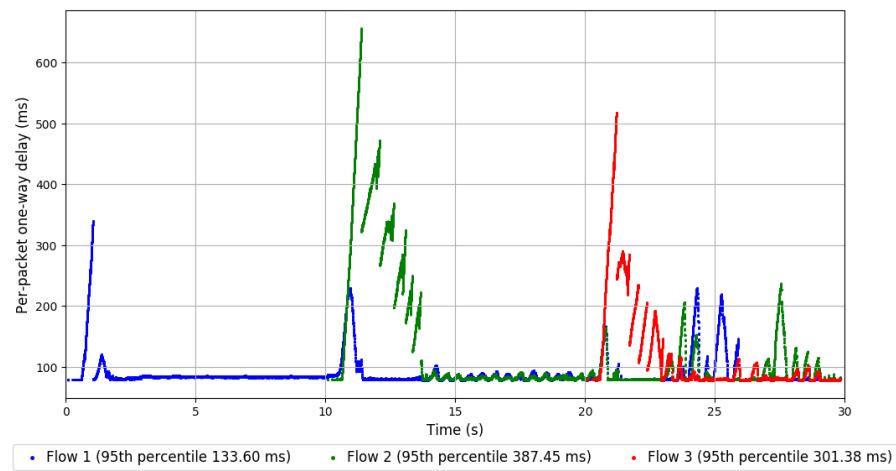
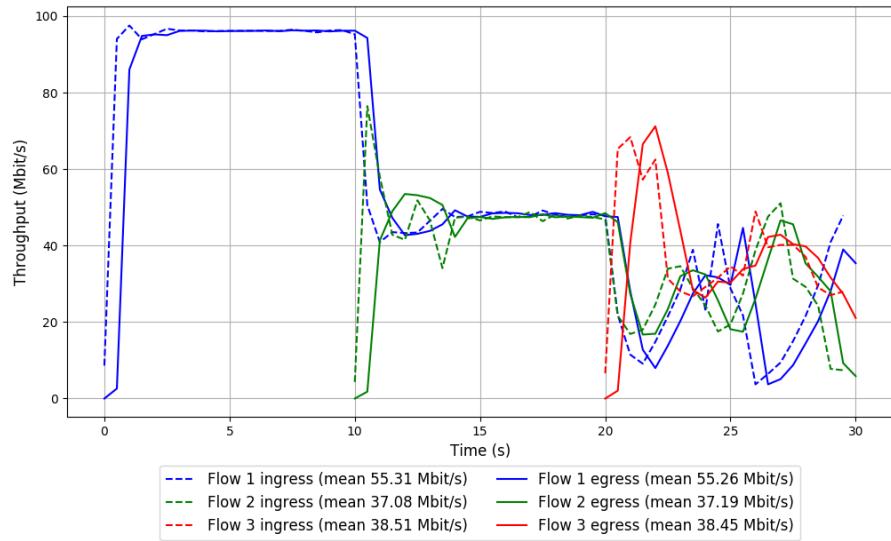


Run 2: Statistics of Muses-25

```
Start at: 2018-08-31 09:54:04
End at: 2018-08-31 09:54:34
Local clock offset: -16.349 ms
Remote clock offset: 3.381 ms

# Below is generated by plot.py at 2018-08-31 10:03:10
# Datalink statistics
-- Total of 3 flows:
Average throughput: 92.53 Mbit/s
95th percentile per-packet one-way delay: 269.609 ms
Loss rate: 0.76%
-- Flow 1:
Average throughput: 55.26 Mbit/s
95th percentile per-packet one-way delay: 133.601 ms
Loss rate: 0.64%
-- Flow 2:
Average throughput: 37.19 Mbit/s
95th percentile per-packet one-way delay: 387.452 ms
Loss rate: 0.50%
-- Flow 3:
Average throughput: 38.45 Mbit/s
95th percentile per-packet one-way delay: 301.380 ms
Loss rate: 1.81%
```

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

```
Start at: 2018-08-31 09:59:15
End at: 2018-08-31 09:59:45
Local clock offset: -9.464 ms
Remote clock offset: 4.529 ms

# Below is generated by plot.py at 2018-08-31 10:03:10
# Datalink statistics
-- Total of 3 flows:
Average throughput: 87.42 Mbit/s
95th percentile per-packet one-way delay: 318.325 ms
Loss rate: 1.29%
-- Flow 1:
Average throughput: 53.90 Mbit/s
95th percentile per-packet one-way delay: 128.581 ms
Loss rate: 0.26%
-- Flow 2:
Average throughput: 34.88 Mbit/s
95th percentile per-packet one-way delay: 384.574 ms
Loss rate: 1.31%
-- Flow 3:
Average throughput: 32.38 Mbit/s
95th percentile per-packet one-way delay: 390.959 ms
Loss rate: 6.16%
```

Run 3: Report of Muses-25 — Data Link

