

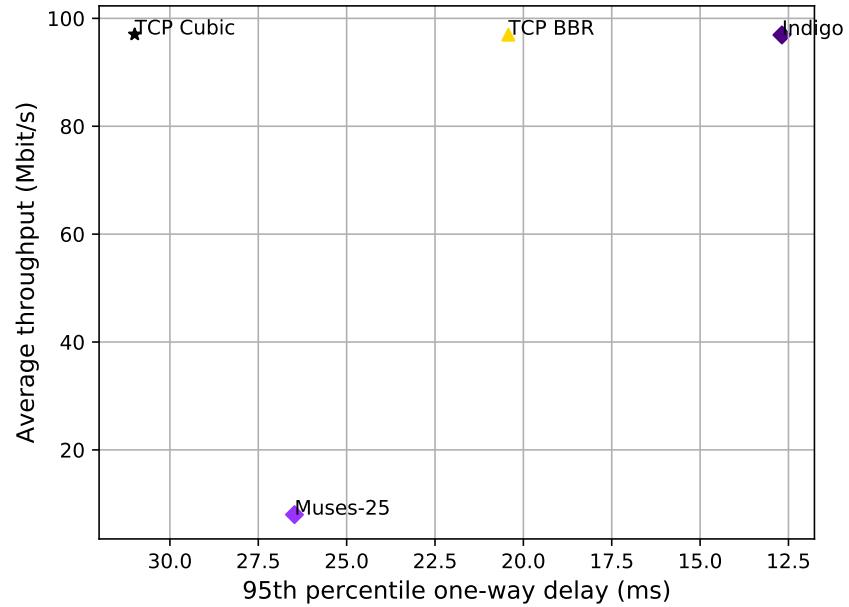
Pantheon Report

Generated at 2018-09-03 09:02:59 (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.

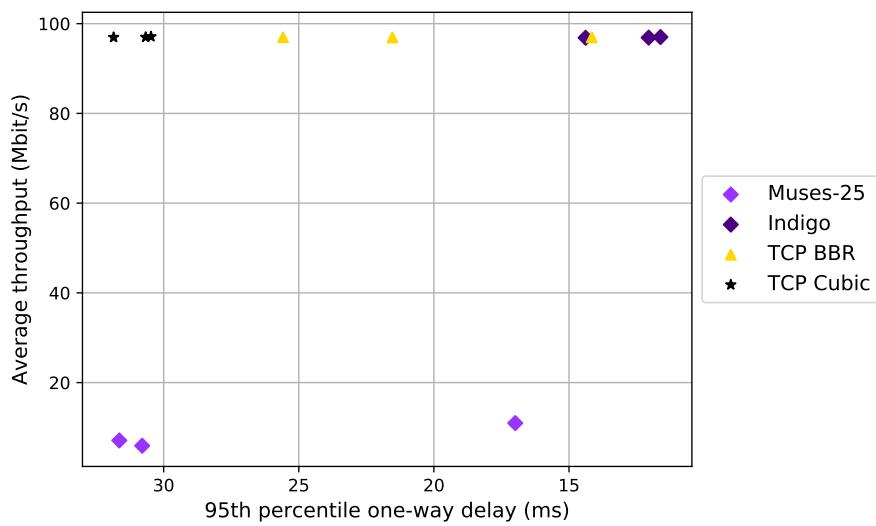
System info:
Linux 4.15.0-1020-aws
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
net.ipv4.tcp_mem = 536870912 536870912 536870912

Git summary:
branch: muses @ f309f5459e2c5237279a184e52ece7a2b47ef1c9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b8d5019b83a3a678804d830fcfe1da7b3a63421b
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)



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



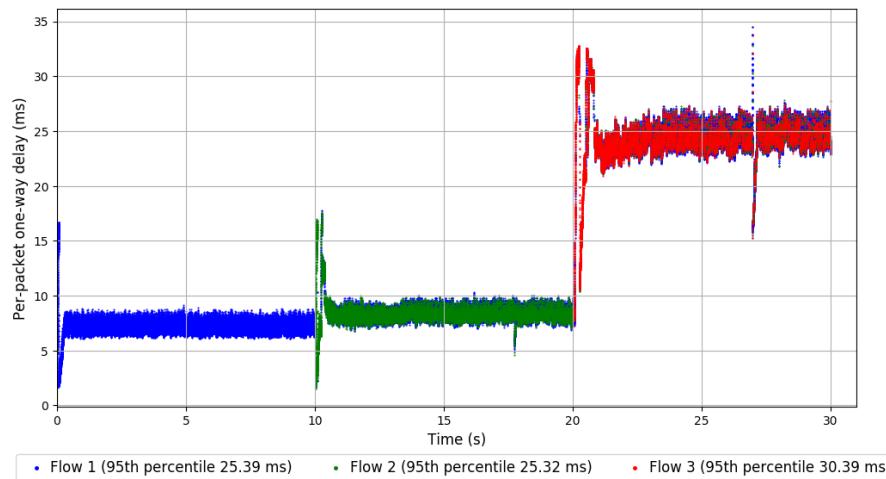
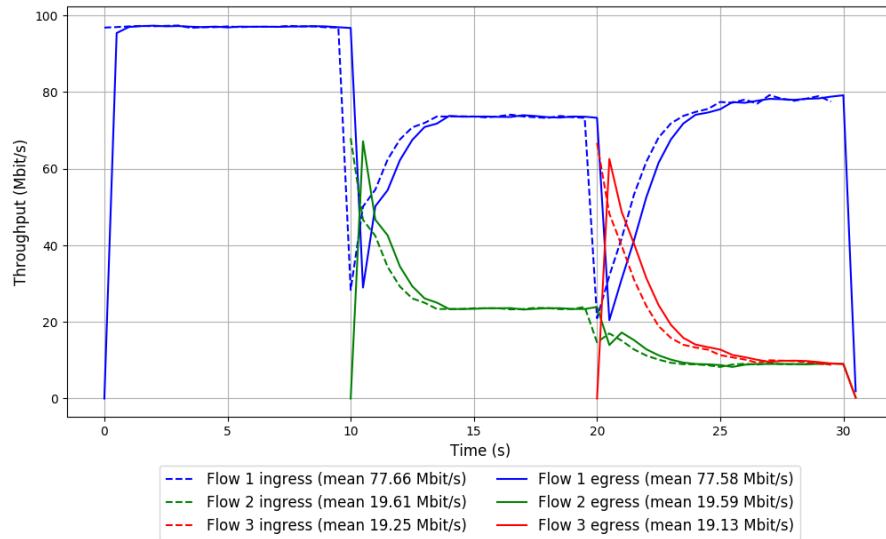
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	71.63	28.12	19.86	20.21	20.05	24.50	0.01	0.01	0.17
TCP Cubic	3	63.01	37.24	27.78	30.90	30.60	31.63	0.04	0.07	0.09
Indigo	3	44.96	43.79	70.40	11.54	12.51	13.17	0.00	0.01	0.00
Muses-25	3	3.56	5.31	2.94	14.48	29.88	24.27	56.64	38.91	36.92

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-03 08:51:57
End at: 2018-09-03 08:52:27
Local clock offset: 1.503 ms
Remote clock offset: 0.174 ms

# Below is generated by plot.py at 2018-09-03 09:02:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.99 Mbit/s
95th percentile per-packet one-way delay: 25.583 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 77.58 Mbit/s
95th percentile per-packet one-way delay: 25.386 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 19.59 Mbit/s
95th percentile per-packet one-way delay: 25.318 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 19.13 Mbit/s
95th percentile per-packet one-way delay: 30.388 ms
Loss rate: 0.39%
```

Run 1: Report of TCP BBR — Data Link

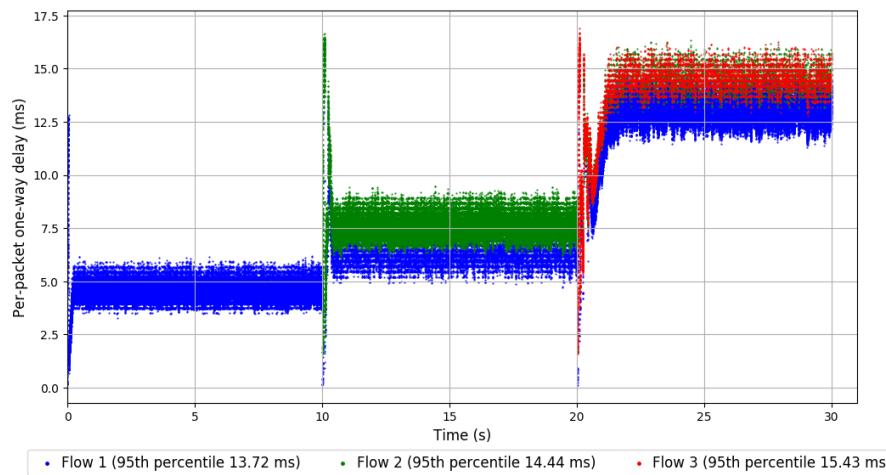
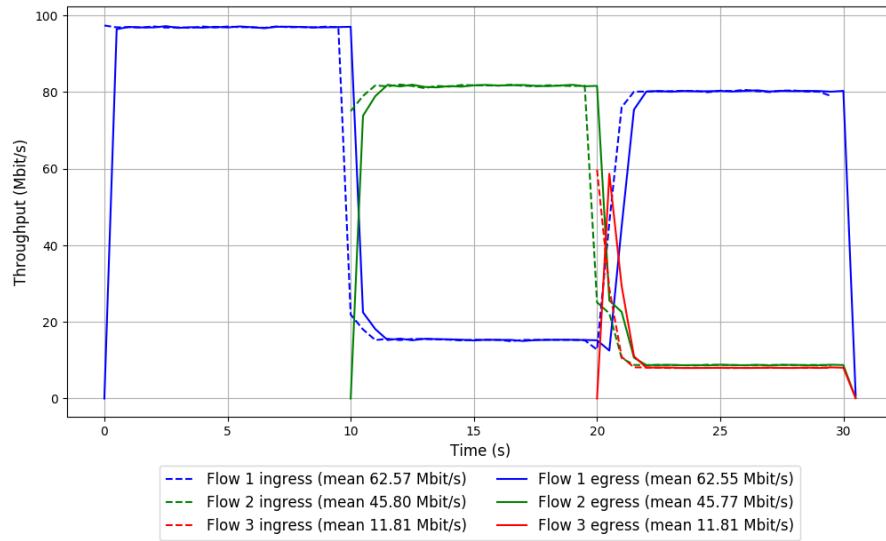


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-03 08:56:24
End at: 2018-09-03 08:56:54
Local clock offset: 1.934 ms
Remote clock offset: 0.22 ms

# Below is generated by plot.py at 2018-09-03 09:02:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.97 Mbit/s
95th percentile per-packet one-way delay: 14.158 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 62.55 Mbit/s
95th percentile per-packet one-way delay: 13.721 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 45.77 Mbit/s
95th percentile per-packet one-way delay: 14.439 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 11.81 Mbit/s
95th percentile per-packet one-way delay: 15.432 ms
Loss rate: 0.00%
```

Run 2: Report of TCP BBR — Data Link

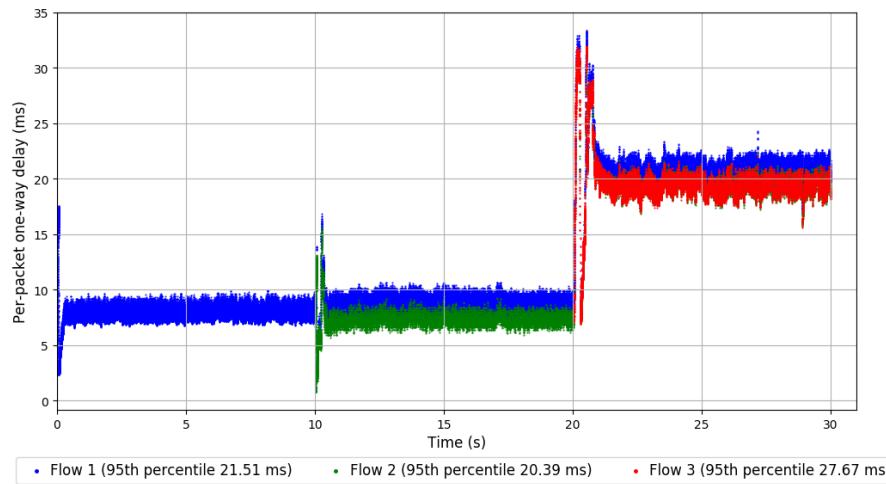
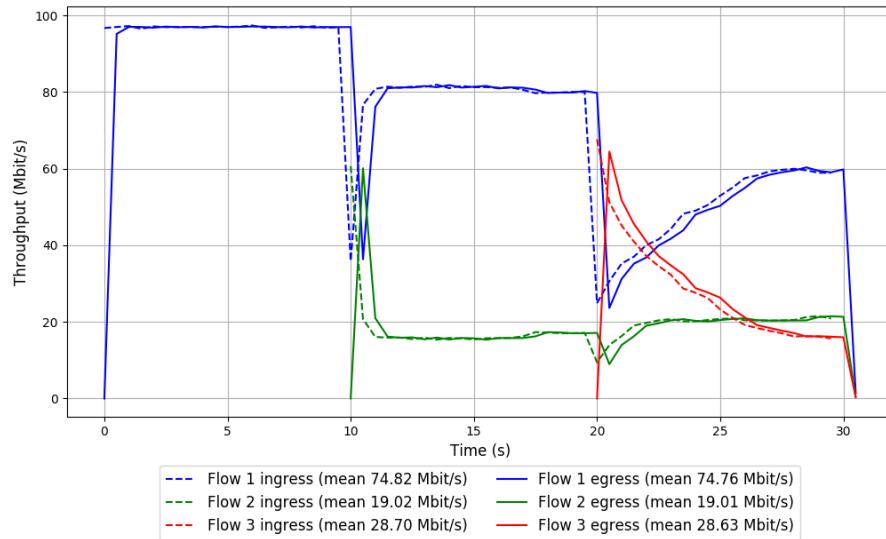


Run 3: Statistics of TCP BBR

```
Start at: 2018-09-03 09:00:52
End at: 2018-09-03 09:01:22
Local clock offset: 0.986 ms
Remote clock offset: 0.245 ms

# Below is generated by plot.py at 2018-09-03 09:02:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.95 Mbit/s
95th percentile per-packet one-way delay: 21.533 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 74.76 Mbit/s
95th percentile per-packet one-way delay: 21.511 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 19.01 Mbit/s
95th percentile per-packet one-way delay: 20.389 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 28.63 Mbit/s
95th percentile per-packet one-way delay: 27.669 ms
Loss rate: 0.13%
```

Run 3: Report of TCP BBR — Data Link

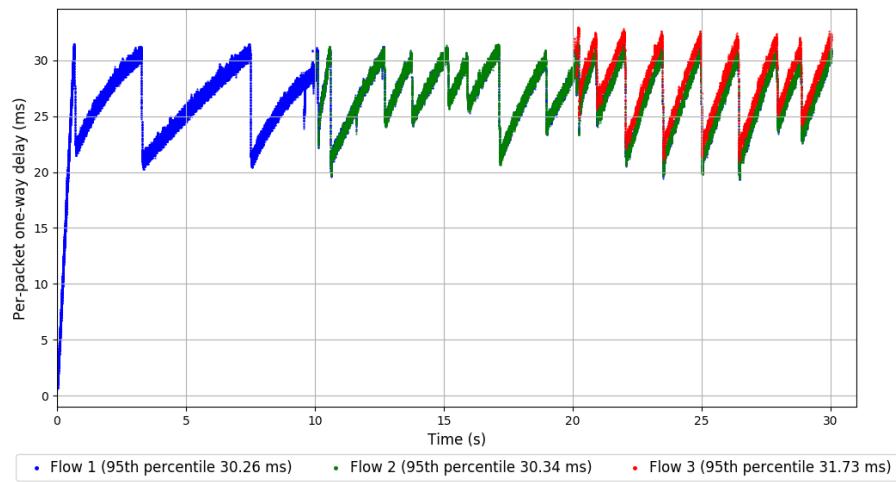
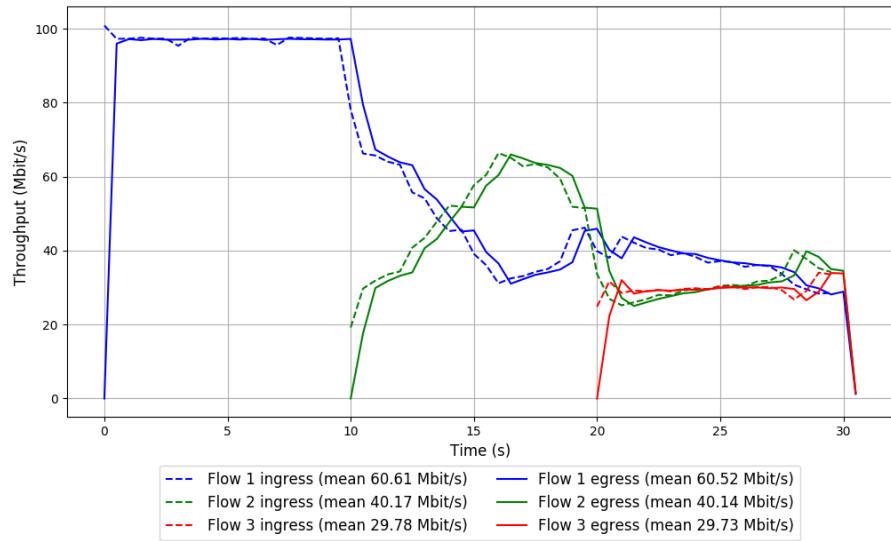


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-09-03 08:48:37
End at: 2018-09-03 08:49:07
Local clock offset: 1.544 ms
Remote clock offset: 0.117 ms

# Below is generated by plot.py at 2018-09-03 09:02:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.11 Mbit/s
95th percentile per-packet one-way delay: 30.470 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 60.52 Mbit/s
95th percentile per-packet one-way delay: 30.257 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 40.14 Mbit/s
95th percentile per-packet one-way delay: 30.341 ms
Loss rate: 0.06%
-- Flow 3:
Average throughput: 29.73 Mbit/s
95th percentile per-packet one-way delay: 31.735 ms
Loss rate: 0.16%
```

Run 1: Report of TCP Cubic — Data Link

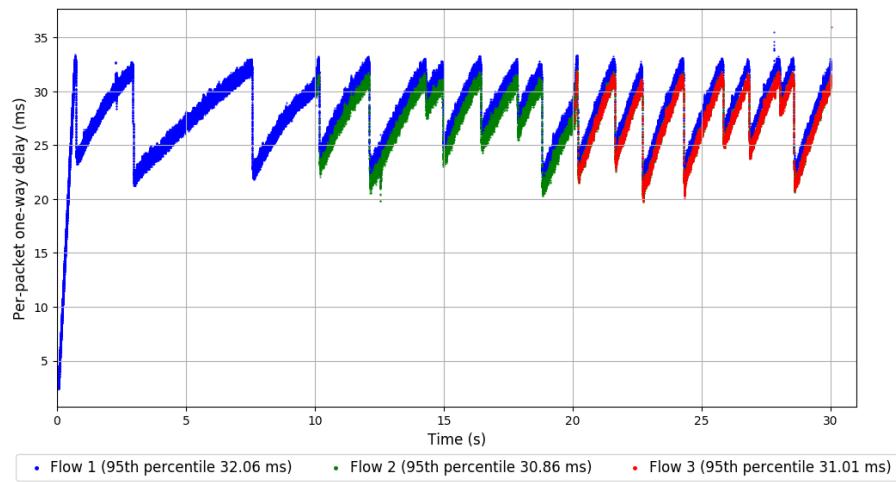
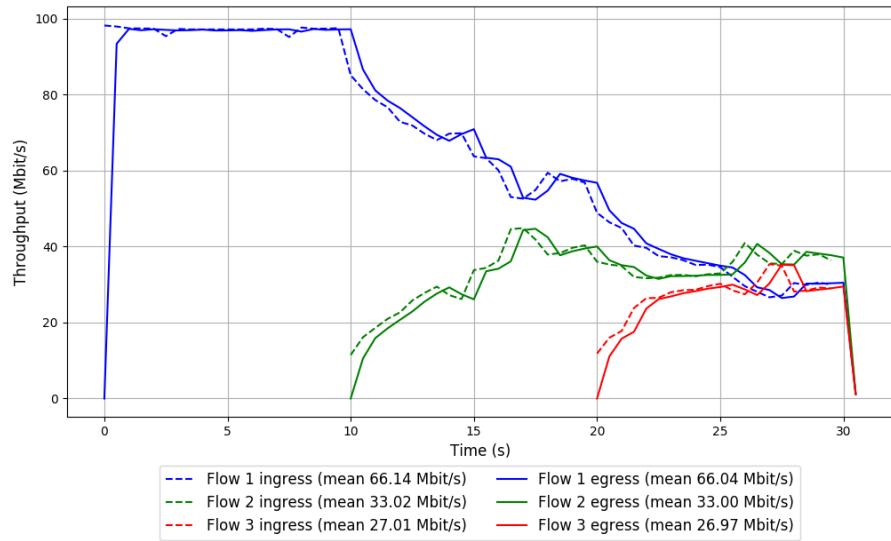


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-03 08:53:05
End at: 2018-09-03 08:53:35
Local clock offset: 0.931 ms
Remote clock offset: 0.193 ms

# Below is generated by plot.py at 2018-09-03 09:02:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.96 Mbit/s
95th percentile per-packet one-way delay: 31.853 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 66.04 Mbit/s
95th percentile per-packet one-way delay: 32.062 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 33.00 Mbit/s
95th percentile per-packet one-way delay: 30.858 ms
Loss rate: 0.06%
-- Flow 3:
Average throughput: 26.97 Mbit/s
95th percentile per-packet one-way delay: 31.014 ms
Loss rate: 0.07%
```

Run 2: Report of TCP Cubic — Data Link

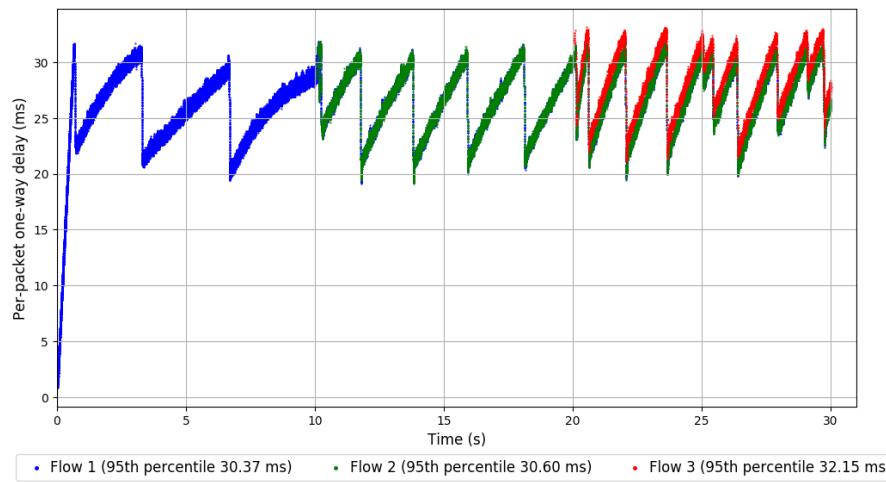
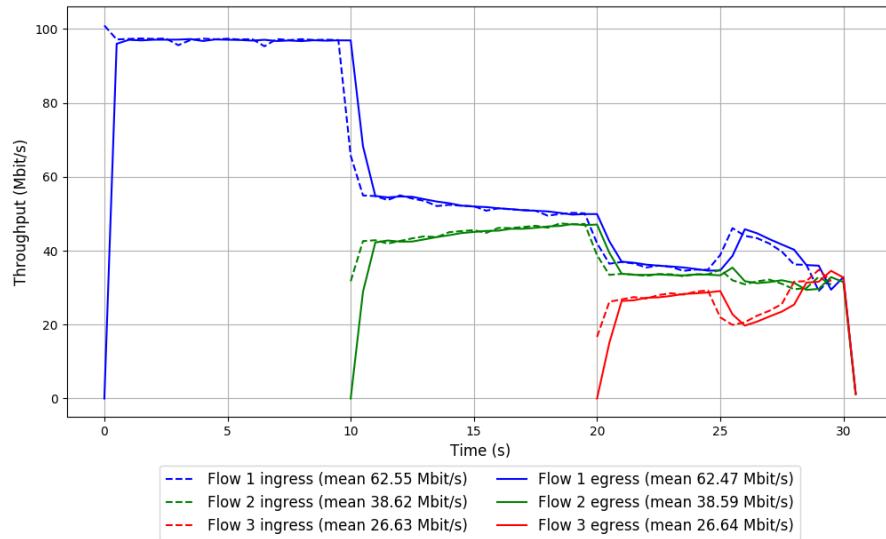


Run 3: Statistics of TCP Cubic

```
Start at: 2018-09-03 08:57:32
End at: 2018-09-03 08:58:02
Local clock offset: 1.177 ms
Remote clock offset: 0.164 ms

# Below is generated by plot.py at 2018-09-03 09:02:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.99 Mbit/s
95th percentile per-packet one-way delay: 30.667 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 62.47 Mbit/s
95th percentile per-packet one-way delay: 30.370 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 38.59 Mbit/s
95th percentile per-packet one-way delay: 30.597 ms
Loss rate: 0.09%
-- Flow 3:
Average throughput: 26.64 Mbit/s
95th percentile per-packet one-way delay: 32.145 ms
Loss rate: 0.04%
```

Run 3: Report of TCP Cubic — Data Link

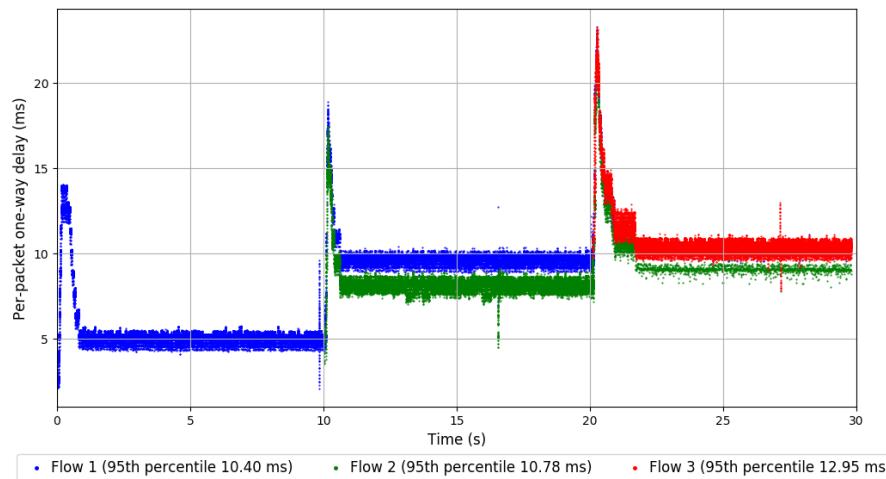
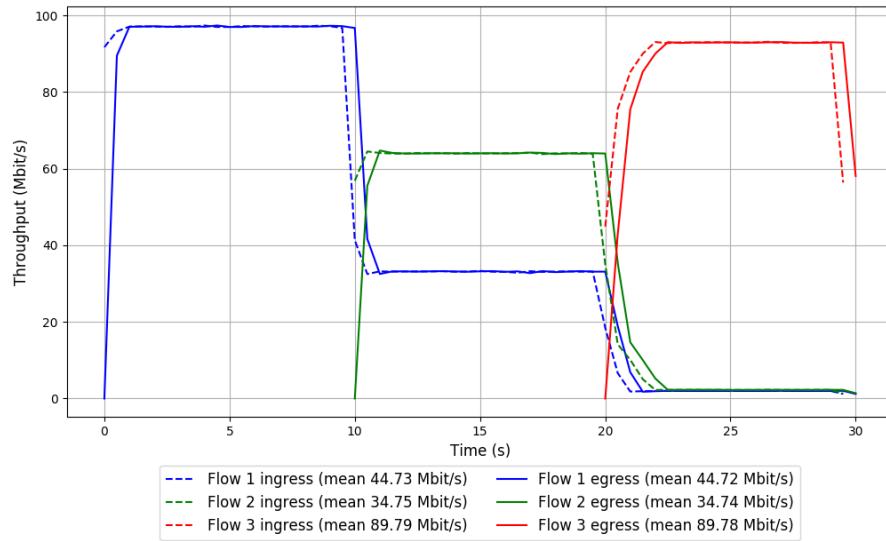


Run 1: Statistics of Indigo

```
Start at: 2018-09-03 08:49:45
End at: 2018-09-03 08:50:15
Local clock offset: 1.207 ms
Remote clock offset: 0.192 ms

# Below is generated by plot.py at 2018-09-03 09:02:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.02 Mbit/s
95th percentile per-packet one-way delay: 11.616 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 44.72 Mbit/s
95th percentile per-packet one-way delay: 10.405 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 34.74 Mbit/s
95th percentile per-packet one-way delay: 10.784 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 89.78 Mbit/s
95th percentile per-packet one-way delay: 12.945 ms
Loss rate: 0.01%
```

Run 1: Report of Indigo — Data Link

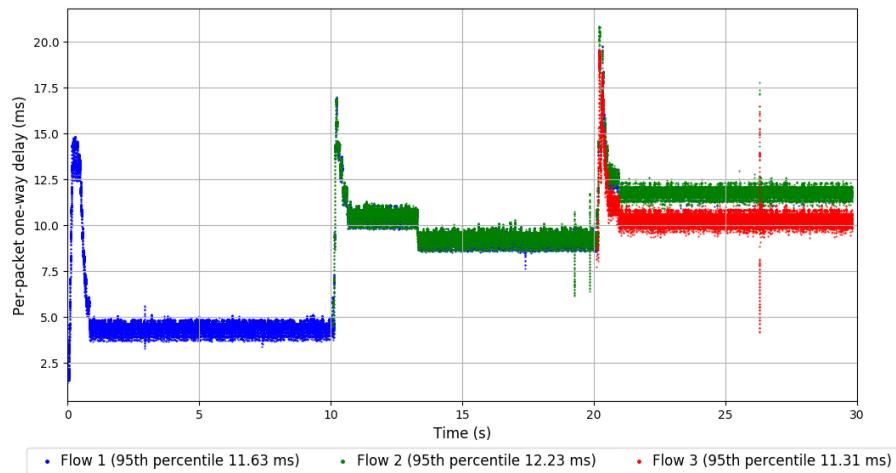
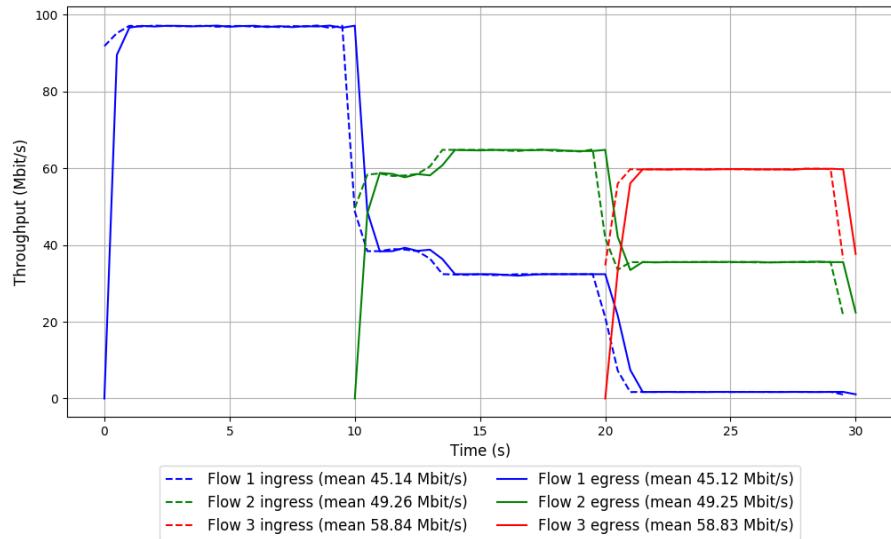


Run 2: Statistics of Indigo

```
Start at: 2018-09-03 08:54:12
End at: 2018-09-03 08:54:42
Local clock offset: 1.822 ms
Remote clock offset: 0.133 ms

# Below is generated by plot.py at 2018-09-03 09:02:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.89 Mbit/s
95th percentile per-packet one-way delay: 12.052 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 45.12 Mbit/s
95th percentile per-packet one-way delay: 11.629 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 49.25 Mbit/s
95th percentile per-packet one-way delay: 12.229 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 58.83 Mbit/s
95th percentile per-packet one-way delay: 11.309 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

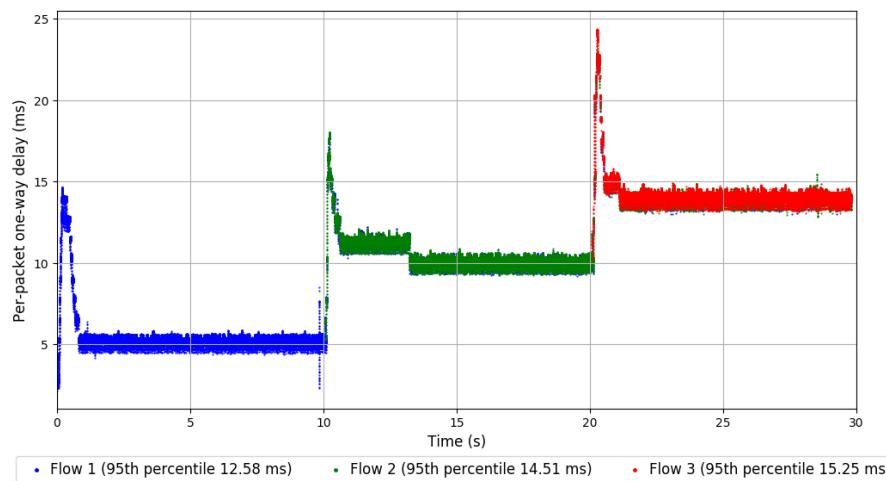
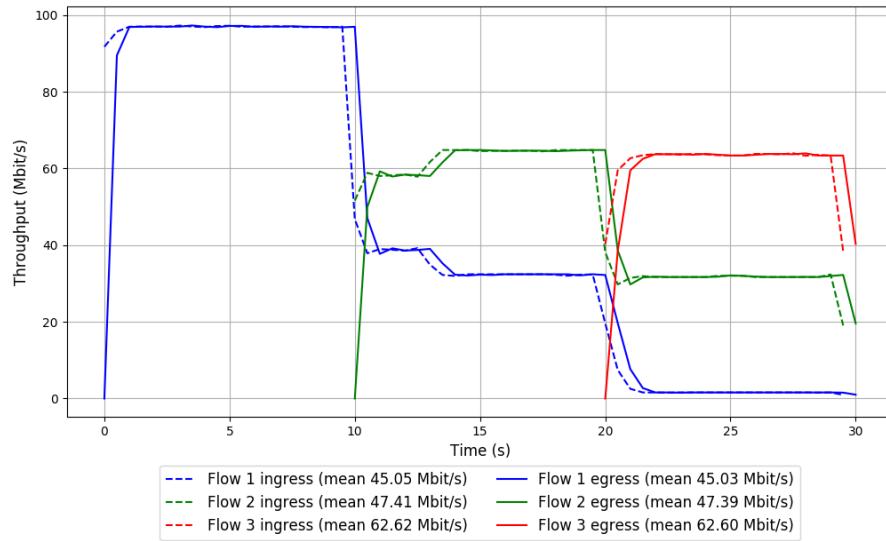


Run 3: Statistics of Indigo

```
Start at: 2018-09-03 08:58:39
End at: 2018-09-03 08:59:09
Local clock offset: 1.066 ms
Remote clock offset: 0.167 ms

# Below is generated by plot.py at 2018-09-03 09:02:58
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.86 Mbit/s
95th percentile per-packet one-way delay: 14.387 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 45.03 Mbit/s
95th percentile per-packet one-way delay: 12.579 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 47.39 Mbit/s
95th percentile per-packet one-way delay: 14.506 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 62.60 Mbit/s
95th percentile per-packet one-way delay: 15.246 ms
Loss rate: 0.00%
```

Run 3: Report of Indigo — Data Link

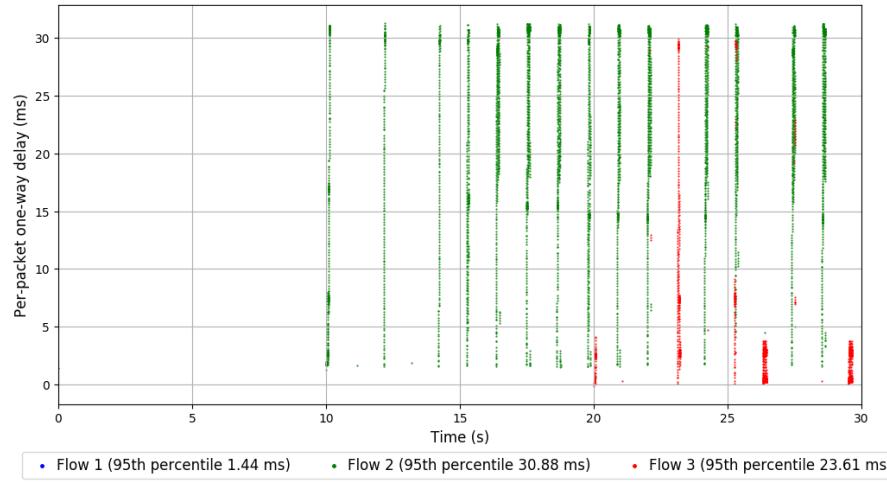
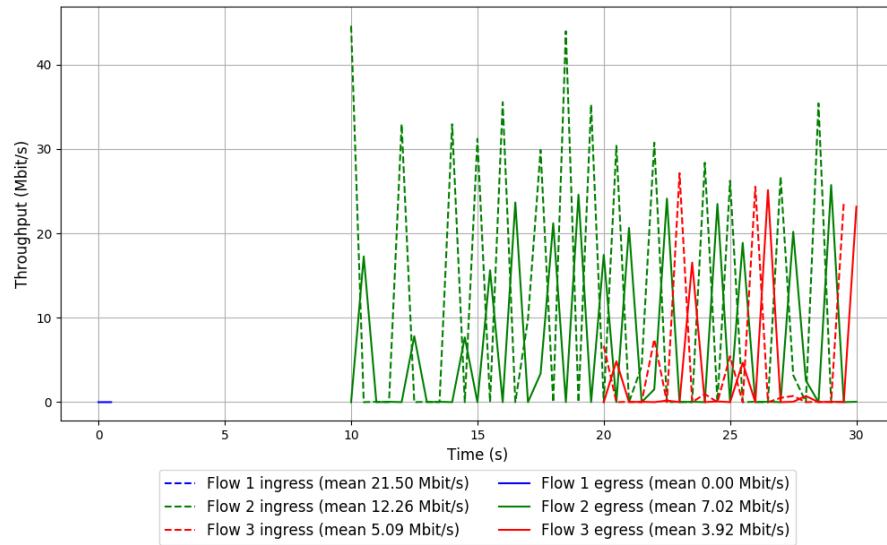


Run 1: Statistics of Muses-25

```
Start at: 2018-09-03 08:50:53
End at: 2018-09-03 08:51:23
Local clock offset: 1.588 ms
Remote clock offset: 0.165 ms

# Below is generated by plot.py at 2018-09-03 09:02:58
# Datalink statistics
-- Total of 3 flows:
Average throughput: 5.93 Mbit/s
95th percentile per-packet one-way delay: 30.795 ms
Loss rate: 39.39%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 1.441 ms
Loss rate: 97.24%
-- Flow 2:
Average throughput: 7.02 Mbit/s
95th percentile per-packet one-way delay: 30.877 ms
Loss rate: 42.70%
-- Flow 3:
Average throughput: 3.92 Mbit/s
95th percentile per-packet one-way delay: 23.615 ms
Loss rate: 23.09%
```

Run 1: Report of Muses-25 — Data Link

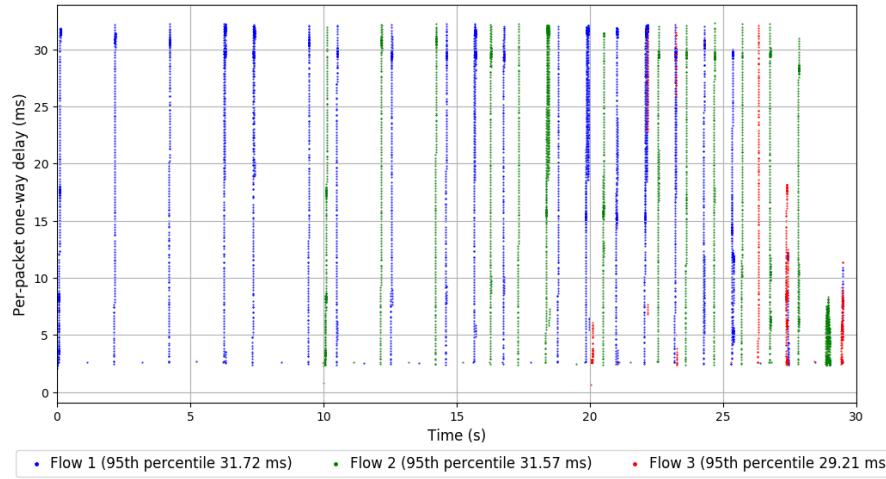
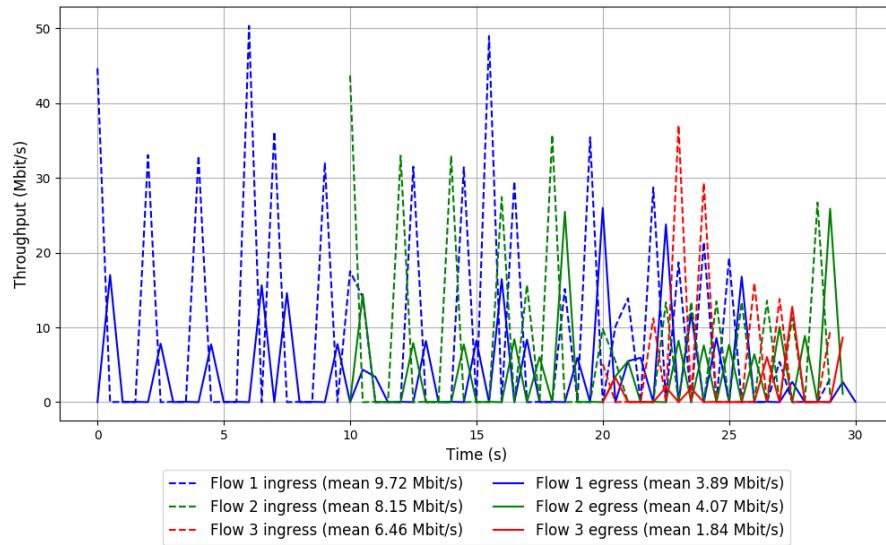


Run 2: Statistics of Muses-25

```
Start at: 2018-09-03 08:55:20
End at: 2018-09-03 08:55:51
Local clock offset: 1.141 ms
Remote clock offset: 0.171 ms

# Below is generated by plot.py at 2018-09-03 09:02:58
# Datalink statistics
-- Total of 3 flows:
Average throughput: 7.11 Mbit/s
95th percentile per-packet one-way delay: 31.642 ms
Loss rate: 58.30%
-- Flow 1:
Average throughput: 3.89 Mbit/s
95th percentile per-packet one-way delay: 31.717 ms
Loss rate: 59.96%
-- Flow 2:
Average throughput: 4.07 Mbit/s
95th percentile per-packet one-way delay: 31.573 ms
Loss rate: 50.01%
-- Flow 3:
Average throughput: 1.84 Mbit/s
95th percentile per-packet one-way delay: 29.207 ms
Loss rate: 71.53%
```

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

```
Start at: 2018-09-03 08:59:48
End at: 2018-09-03 09:00:18
Local clock offset: 1.847 ms
Remote clock offset: 0.185 ms

# Below is generated by plot.py at 2018-09-03 09:02:58
# Datalink statistics
-- Total of 3 flows:
Average throughput: 10.97 Mbit/s
95th percentile per-packet one-way delay: 16.989 ms
Loss rate: 16.67%
-- Flow 1:
Average throughput: 6.78 Mbit/s
95th percentile per-packet one-way delay: 10.280 ms
Loss rate: 12.73%
-- Flow 2:
Average throughput: 4.84 Mbit/s
95th percentile per-packet one-way delay: 27.204 ms
Loss rate: 24.01%
-- Flow 3:
Average throughput: 3.06 Mbit/s
95th percentile per-packet one-way delay: 19.978 ms
Loss rate: 16.15%
```

Run 3: Report of Muses-25 — Data Link

