

Pantheon Report

Generated at 2018-09-05 03:46:58 (UTC).
Data path: Brazil on p4p1 (*remote*) → AWS Brazil 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 gps.ntp.br and have been applied to correct the timestamps in logs.

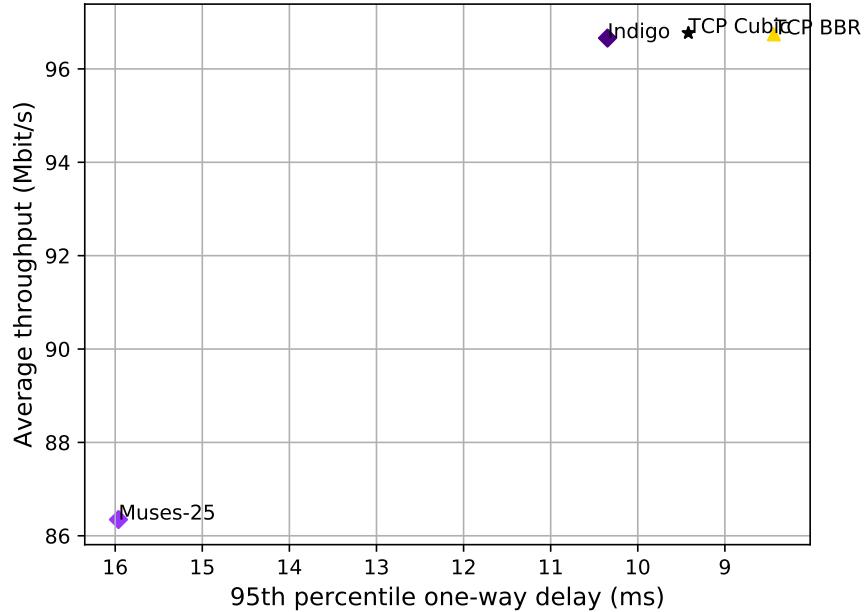
System info:

```
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
```

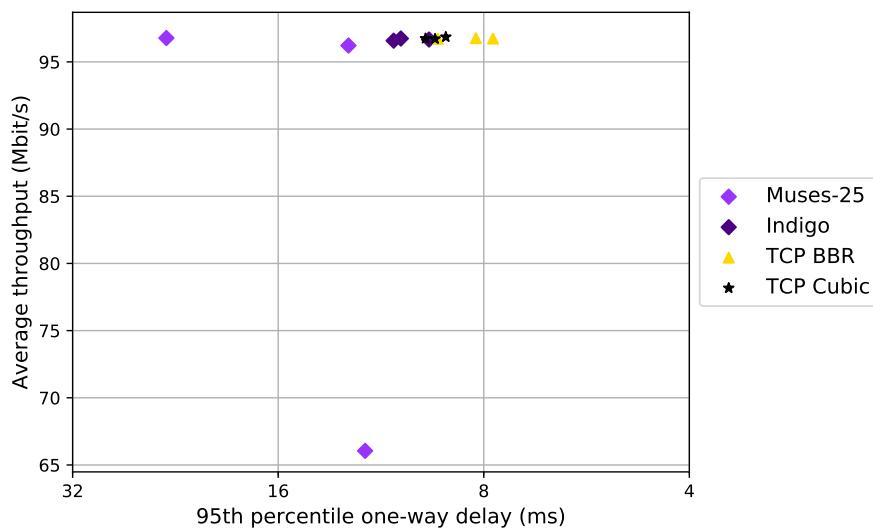
Git summary:

```
branch: muses @ 71e71e9a55b945431a7dea72180c1c9381097db9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 96fb95fb38373d71fb80c5a105e62e7636623b
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 Brazil to AWS Brazil 1, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



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



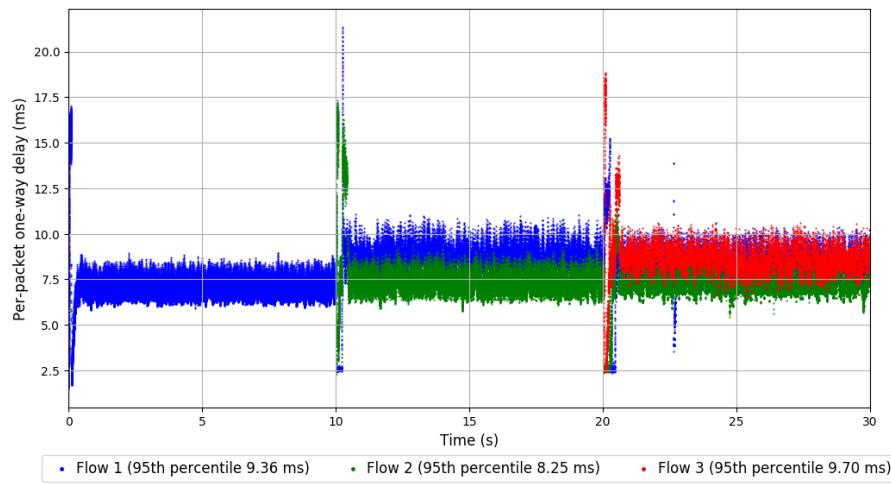
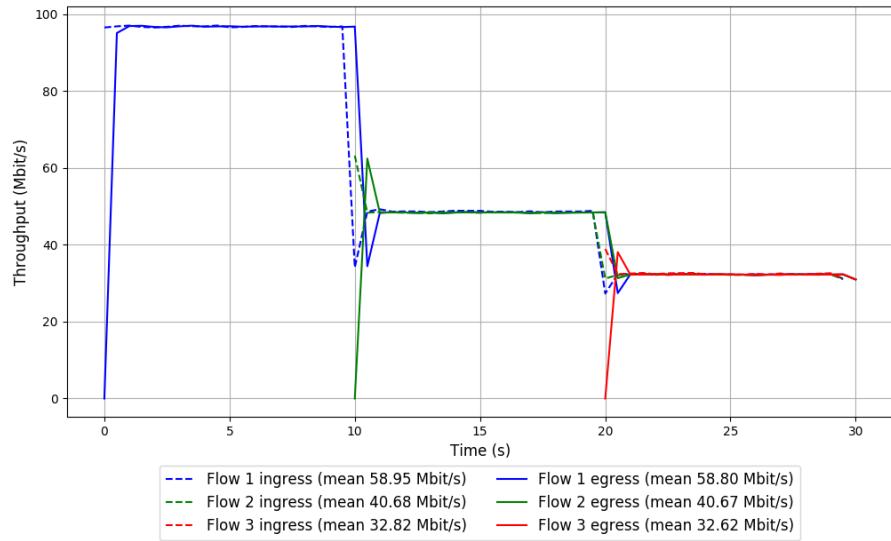
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	58.86	40.61	32.61	8.50	7.51	8.29	0.10	0.03	0.26
TCP Cubic	3	59.19	40.34	32.26	9.43	9.25	9.58	0.10	0.16	0.30
Indigo	3	59.21	40.37	32.20	9.98	10.50	8.96	0.26	1.52	0.24
Muses-25	3	51.81	37.16	29.59	8.70	22.37	36.47	0.01	0.32	0.57

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-05 03:33:58
End at: 2018-09-05 03:34:28
Local clock offset: 9.614 ms
Remote clock offset: 0.423 ms

# Below is generated by plot.py at 2018-09-05 03:46:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.72 Mbit/s
95th percentile per-packet one-way delay: 9.340 ms
Loss rate: 0.24%
-- Flow 1:
Average throughput: 58.80 Mbit/s
95th percentile per-packet one-way delay: 9.363 ms
Loss rate: 0.25%
-- Flow 2:
Average throughput: 40.67 Mbit/s
95th percentile per-packet one-way delay: 8.250 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 32.62 Mbit/s
95th percentile per-packet one-way delay: 9.702 ms
Loss rate: 0.66%
```

Run 1: Report of TCP BBR — Data Link

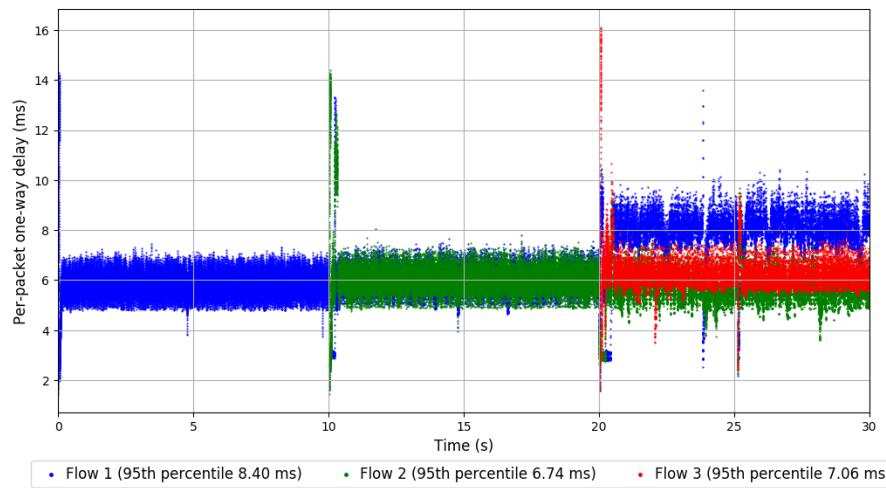
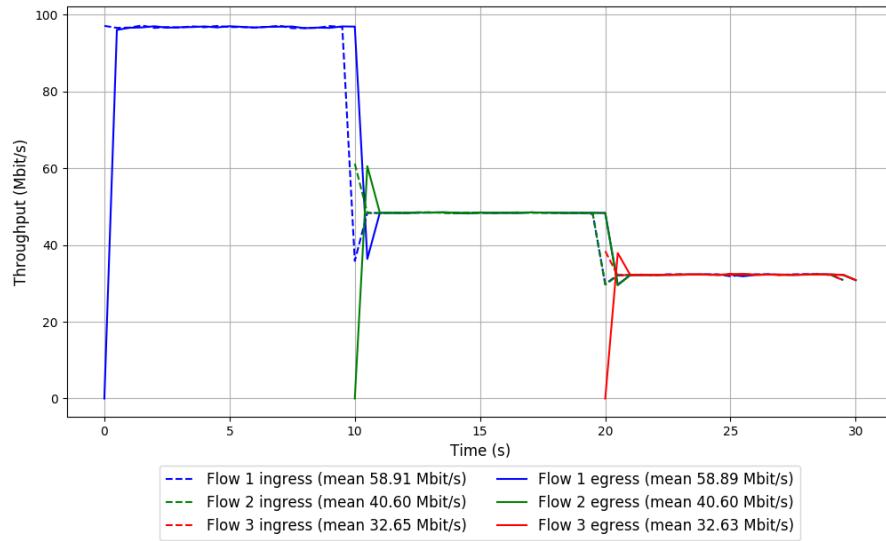


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-05 03:38:35
End at: 2018-09-05 03:39:05
Local clock offset: 10.119 ms
Remote clock offset: 0.449 ms

# Below is generated by plot.py at 2018-09-05 03:46:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.76 Mbit/s
95th percentile per-packet one-way delay: 8.215 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 58.89 Mbit/s
95th percentile per-packet one-way delay: 8.396 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 40.60 Mbit/s
95th percentile per-packet one-way delay: 6.739 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 32.63 Mbit/s
95th percentile per-packet one-way delay: 7.064 ms
Loss rate: 0.06%
```

Run 2: Report of TCP BBR — Data Link

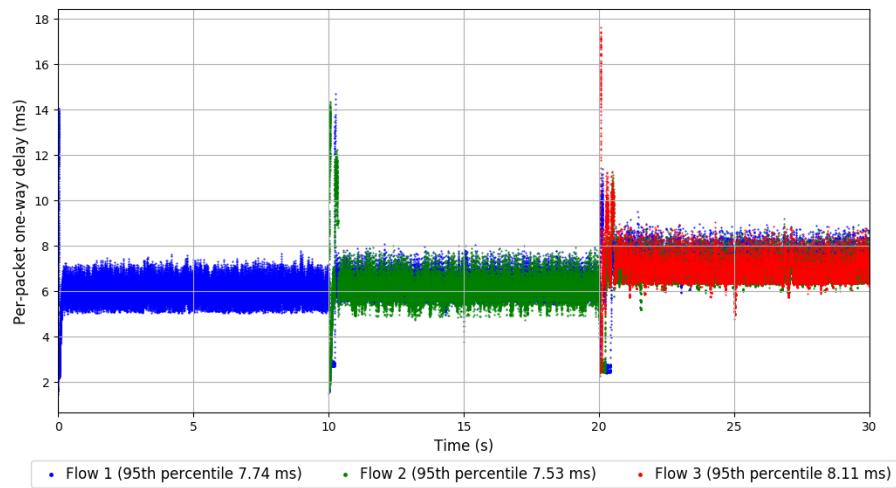
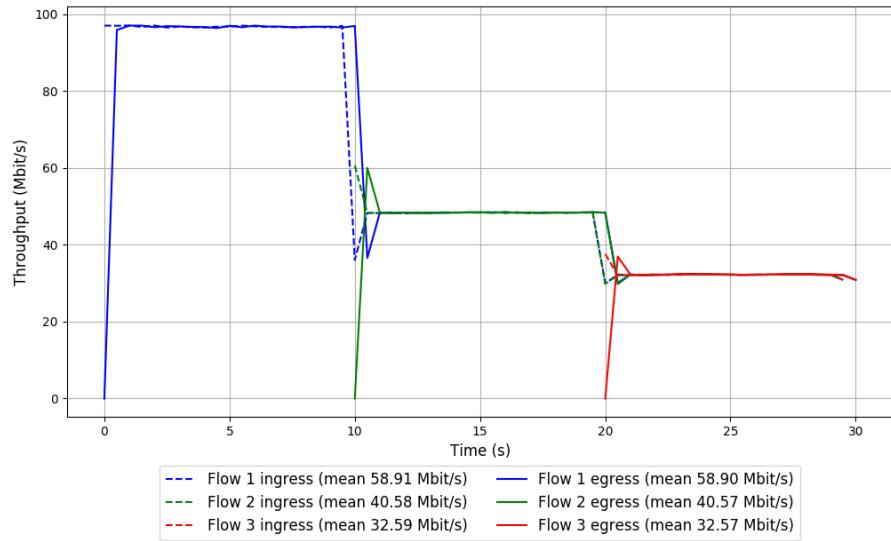


Run 3: Statistics of TCP BBR

```
Start at: 2018-09-05 03:43:13
End at: 2018-09-05 03:43:43
Local clock offset: 10.664 ms
Remote clock offset: 0.481 ms

# Below is generated by plot.py at 2018-09-05 03:46:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.74 Mbit/s
95th percentile per-packet one-way delay: 7.755 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 58.90 Mbit/s
95th percentile per-packet one-way delay: 7.739 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 40.57 Mbit/s
95th percentile per-packet one-way delay: 7.527 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 32.57 Mbit/s
95th percentile per-packet one-way delay: 8.106 ms
Loss rate: 0.07%
```

Run 3: Report of TCP BBR — Data Link

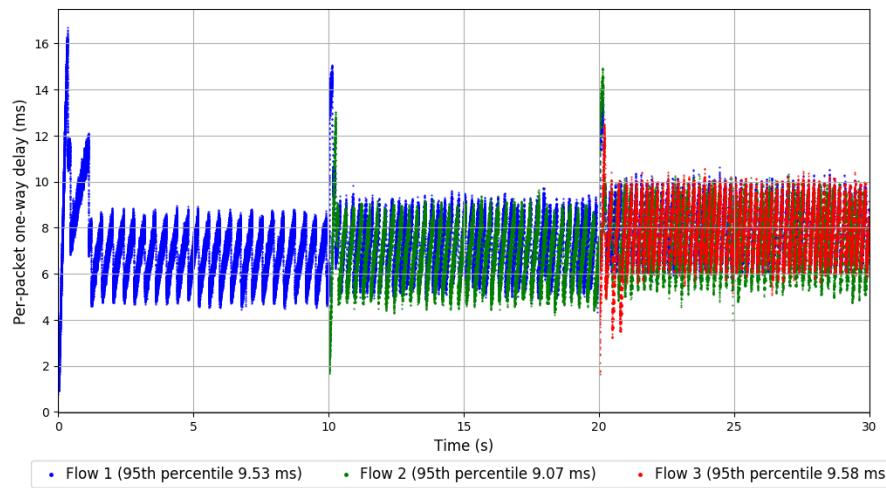
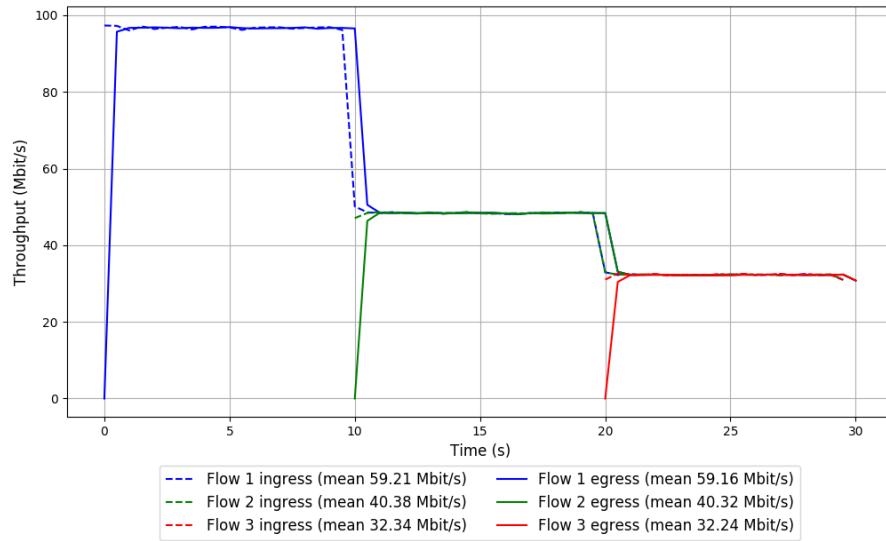


```
Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 03:35:08
End at: 2018-09-05 03:35:38
Local clock offset: 8.956 ms
Remote clock offset: 0.357 ms

# Below is generated by plot.py at 2018-09-05 03:46:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.71 Mbit/s
95th percentile per-packet one-way delay: 9.428 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 59.16 Mbit/s
95th percentile per-packet one-way delay: 9.534 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 40.32 Mbit/s
95th percentile per-packet one-way delay: 9.070 ms
Loss rate: 0.15%
-- Flow 3:
Average throughput: 32.24 Mbit/s
95th percentile per-packet one-way delay: 9.578 ms
Loss rate: 0.31%
```

Run 1: Report of TCP Cubic — Data Link

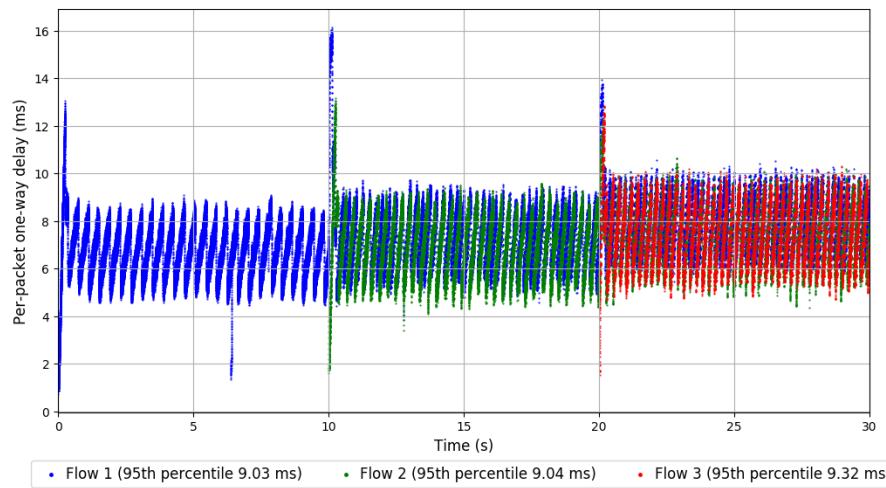
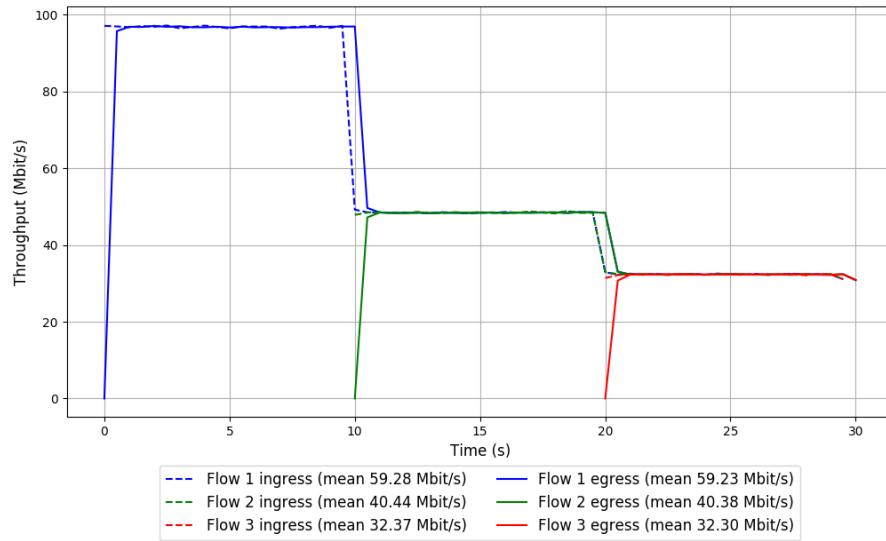


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-05 03:39:44
End at: 2018-09-05 03:40:14
Local clock offset: 9.466 ms
Remote clock offset: 0.398 ms

# Below is generated by plot.py at 2018-09-05 03:46:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.86 Mbit/s
95th percentile per-packet one-way delay: 9.093 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 59.23 Mbit/s
95th percentile per-packet one-way delay: 9.033 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 40.38 Mbit/s
95th percentile per-packet one-way delay: 9.038 ms
Loss rate: 0.15%
-- Flow 3:
Average throughput: 32.30 Mbit/s
95th percentile per-packet one-way delay: 9.325 ms
Loss rate: 0.25%
```

Run 2: Report of TCP Cubic — Data Link

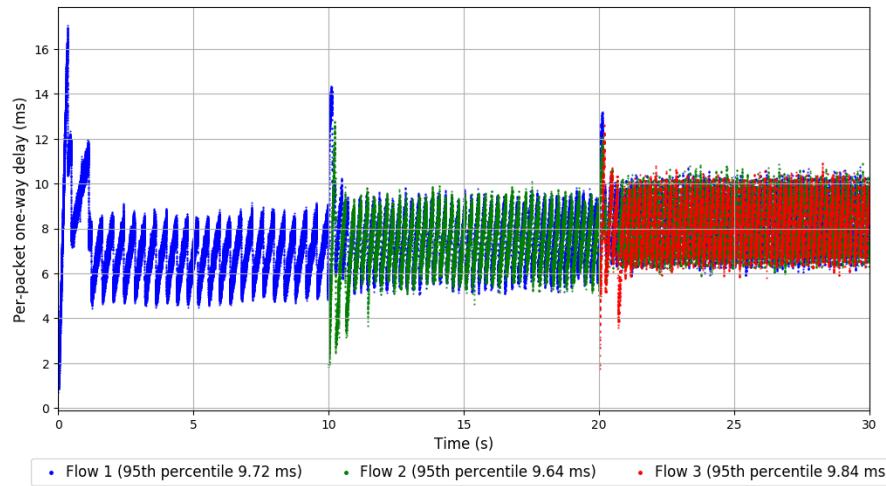
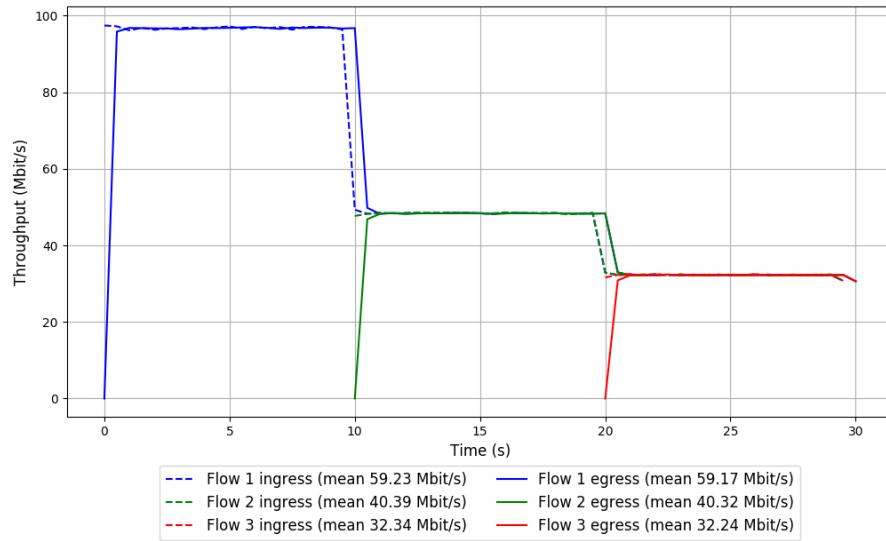


Run 3: Statistics of TCP Cubic

```
Start at: 2018-09-05 03:44:22
End at: 2018-09-05 03:44:52
Local clock offset: 9.962 ms
Remote clock offset: 0.496 ms

# Below is generated by plot.py at 2018-09-05 03:46:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.74 Mbit/s
95th percentile per-packet one-way delay: 9.737 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 59.17 Mbit/s
95th percentile per-packet one-way delay: 9.717 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 40.32 Mbit/s
95th percentile per-packet one-way delay: 9.639 ms
Loss rate: 0.18%
-- Flow 3:
Average throughput: 32.24 Mbit/s
95th percentile per-packet one-way delay: 9.840 ms
Loss rate: 0.33%
```

Run 3: Report of TCP Cubic — Data Link

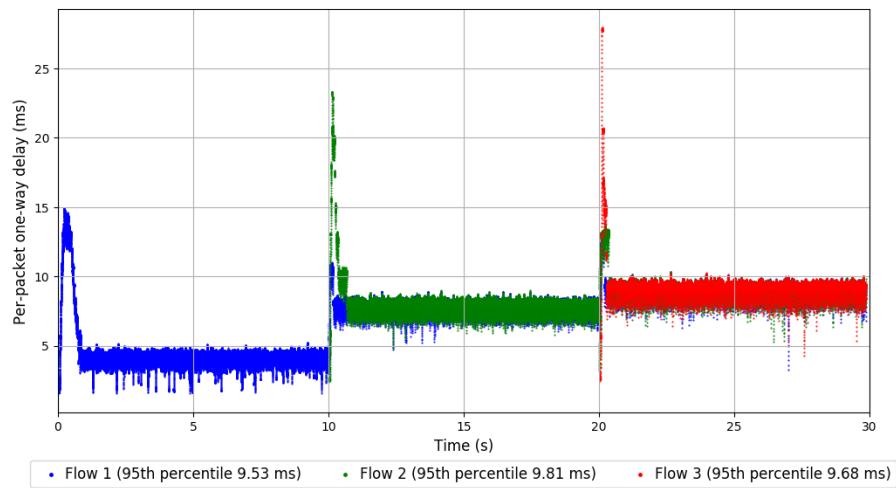
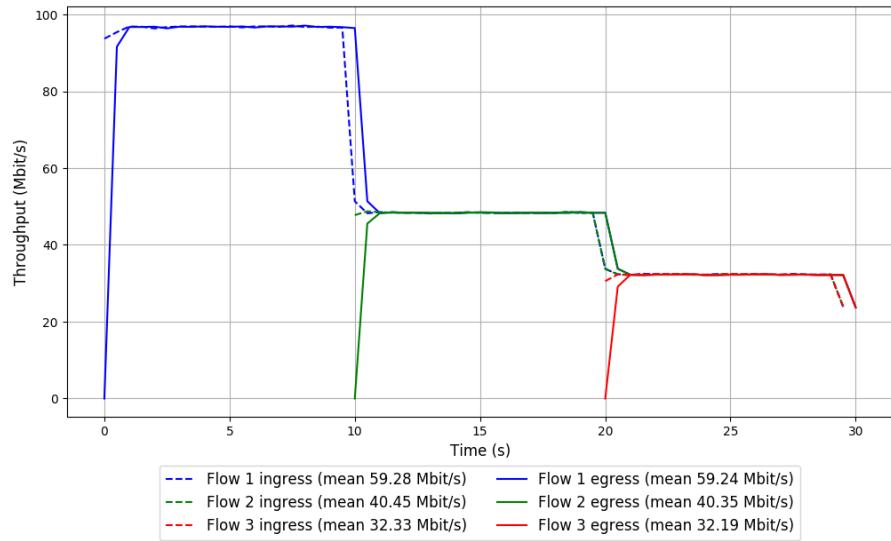


Run 1: Statistics of Indigo

```
Start at: 2018-09-05 03:32:48
End at: 2018-09-05 03:33:18
Local clock offset: 9.504 ms
Remote clock offset: 0.42 ms

# Below is generated by plot.py at 2018-09-05 03:46:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.66 Mbit/s
95th percentile per-packet one-way delay: 9.622 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 59.24 Mbit/s
95th percentile per-packet one-way delay: 9.531 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 40.35 Mbit/s
95th percentile per-packet one-way delay: 9.813 ms
Loss rate: 0.26%
-- Flow 3:
Average throughput: 32.19 Mbit/s
95th percentile per-packet one-way delay: 9.679 ms
Loss rate: 0.48%
```

Run 1: Report of Indigo — Data Link

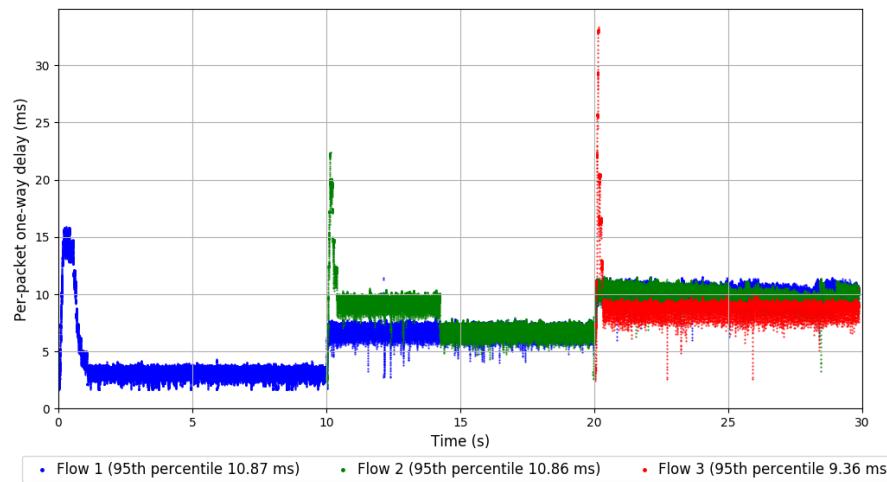
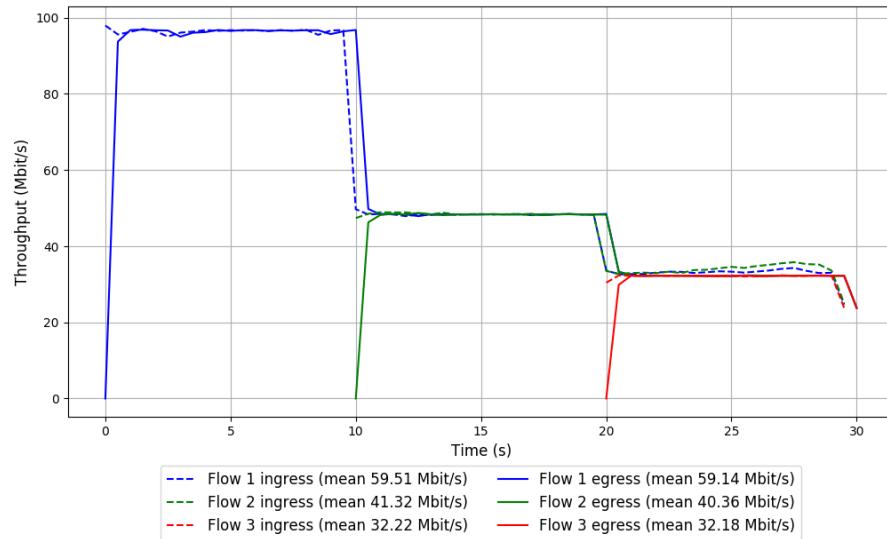


Run 2: Statistics of Indigo

```
Start at: 2018-09-05 03:37:25
End at: 2018-09-05 03:37:55
Local clock offset: 9.992 ms
Remote clock offset: 0.384 ms

# Below is generated by plot.py at 2018-09-05 03:46:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.58 Mbit/s
95th percentile per-packet one-way delay: 10.840 ms
Loss rate: 1.04%
-- Flow 1:
Average throughput: 59.14 Mbit/s
95th percentile per-packet one-way delay: 10.866 ms
Loss rate: 0.62%
-- Flow 2:
Average throughput: 40.36 Mbit/s
95th percentile per-packet one-way delay: 10.856 ms
Loss rate: 2.32%
-- Flow 3:
Average throughput: 32.18 Mbit/s
95th percentile per-packet one-way delay: 9.362 ms
Loss rate: 0.13%
```

Run 2: Report of Indigo — Data Link

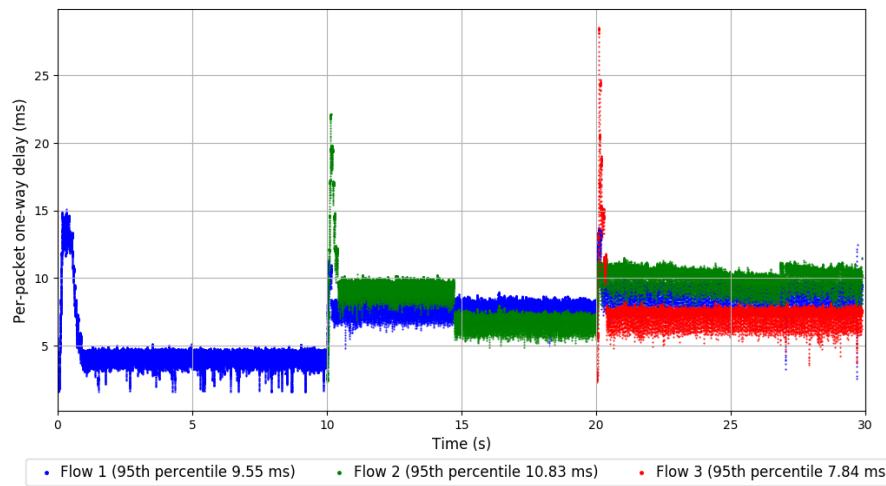
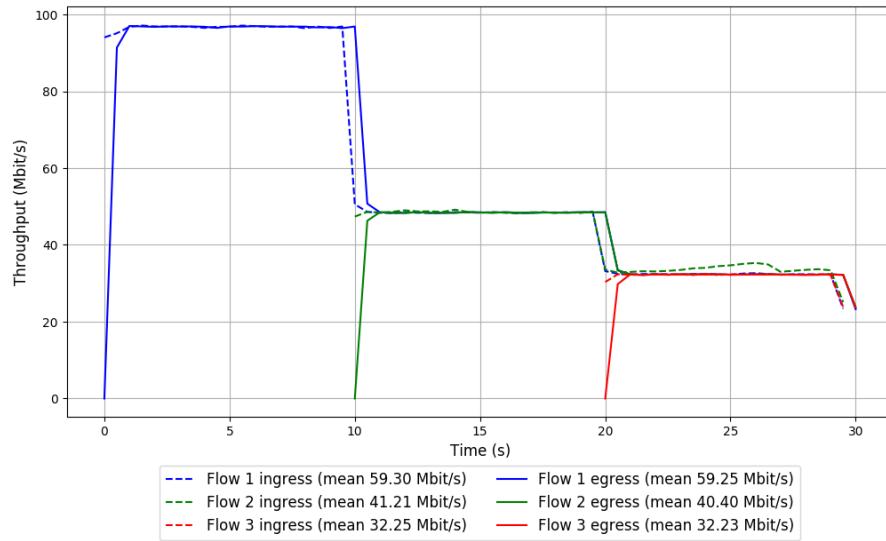


Run 3: Statistics of Indigo

```
Start at: 2018-09-05 03:42:02
End at: 2018-09-05 03:42:32
Local clock offset: 10.503 ms
Remote clock offset: 0.421 ms

# Below is generated by plot.py at 2018-09-05 03:46:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.74 Mbit/s
95th percentile per-packet one-way delay: 10.581 ms
Loss rate: 0.61%
-- Flow 1:
Average throughput: 59.25 Mbit/s
95th percentile per-packet one-way delay: 9.547 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 40.40 Mbit/s
95th percentile per-packet one-way delay: 10.828 ms
Loss rate: 1.97%
-- Flow 3:
Average throughput: 32.23 Mbit/s
95th percentile per-packet one-way delay: 7.843 ms
Loss rate: 0.10%
```

Run 3: Report of Indigo — Data Link

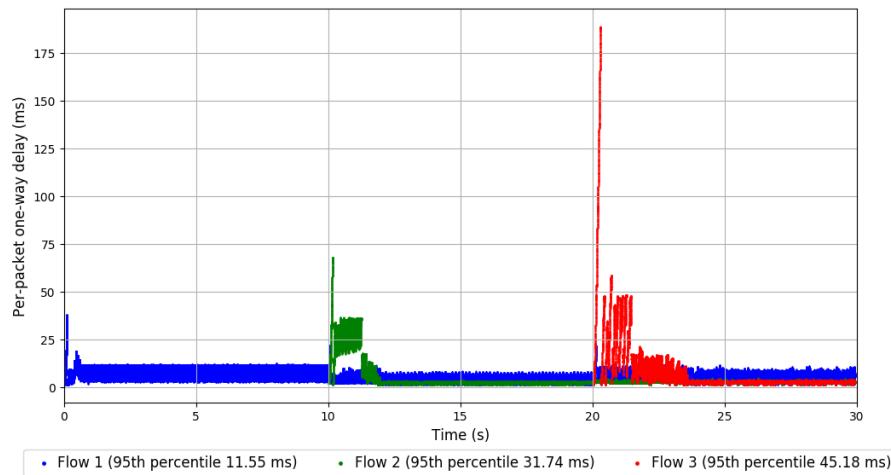
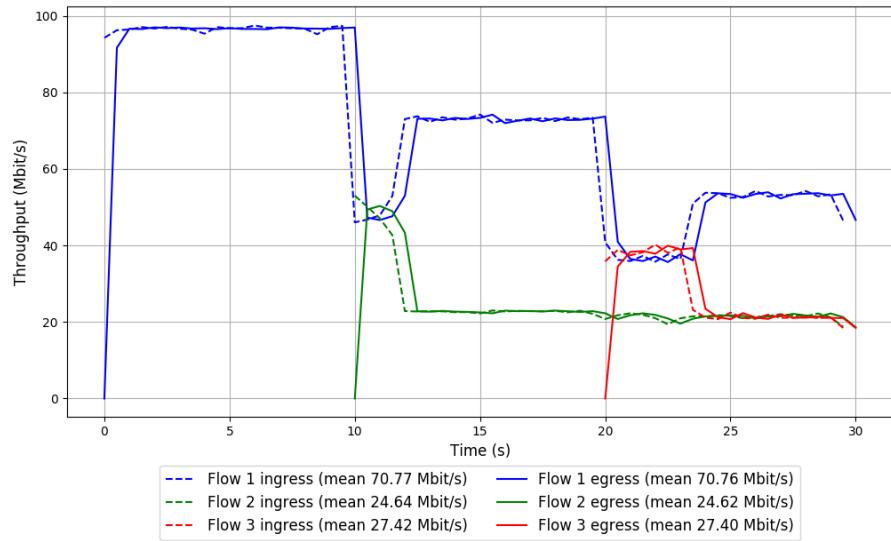


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-05 03:31:39
End at: 2018-09-05 03:32:09
Local clock offset: 9.31 ms
Remote clock offset: 0.432 ms

# Below is generated by plot.py at 2018-09-05 03:46:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.22 Mbit/s
95th percentile per-packet one-way delay: 12.625 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 70.76 Mbit/s
95th percentile per-packet one-way delay: 11.546 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 24.62 Mbit/s
95th percentile per-packet one-way delay: 31.737 ms
Loss rate: 0.10%
-- Flow 3:
Average throughput: 27.40 Mbit/s
95th percentile per-packet one-way delay: 45.183 ms
Loss rate: 0.09%
```

Run 1: Report of Muses-25 — Data Link

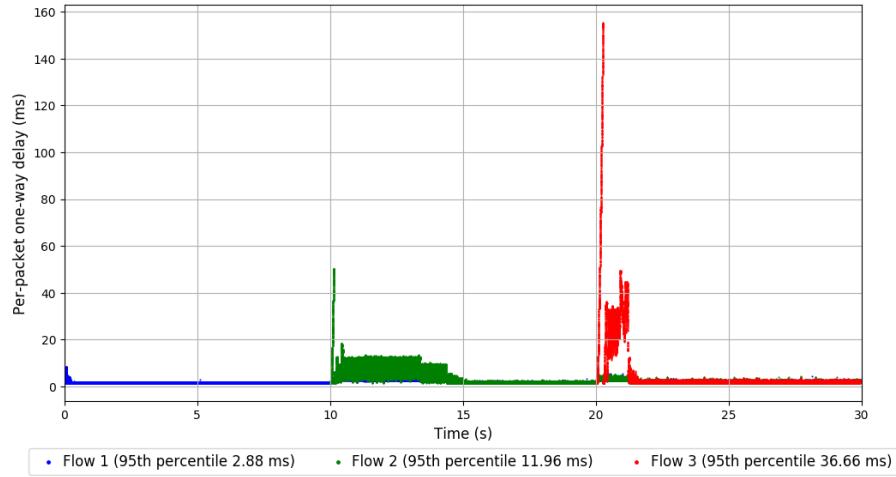
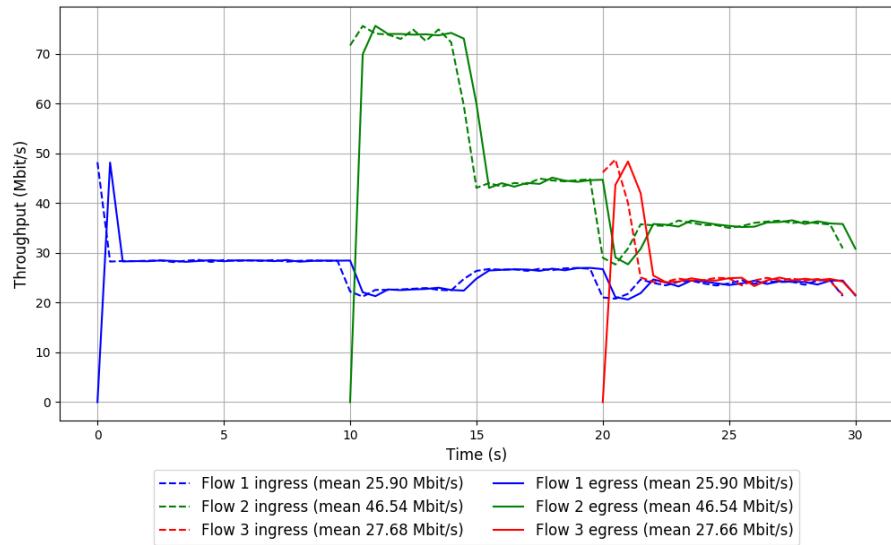


Run 2: Statistics of Muses-25

```
Start at: 2018-09-05 03:36:17
End at: 2018-09-05 03:36:47
Local clock offset: 9.86 ms
Remote clock offset: 0.465 ms

# Below is generated by plot.py at 2018-09-05 03:46:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 66.05 Mbit/s
95th percentile per-packet one-way delay: 11.935 ms
Loss rate: 0.02%
-- Flow 1:
Average throughput: 25.90 Mbit/s
95th percentile per-packet one-way delay: 2.881 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 46.54 Mbit/s
95th percentile per-packet one-way delay: 11.961 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 27.66 Mbit/s
95th percentile per-packet one-way delay: 36.663 ms
Loss rate: 0.11%
```

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

```
Start at: 2018-09-05 03:40:53
End at: 2018-09-05 03:41:23
Local clock offset: 10.367 ms
Remote clock offset: 0.459 ms

# Below is generated by plot.py at 2018-09-05 03:46:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.78 Mbit/s
95th percentile per-packet one-way delay: 23.327 ms
Loss rate: 0.42%
-- Flow 1:
Average throughput: 58.78 Mbit/s
95th percentile per-packet one-way delay: 11.679 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 40.31 Mbit/s
95th percentile per-packet one-way delay: 23.404 ms
Loss rate: 0.86%
-- Flow 3:
Average throughput: 33.70 Mbit/s
95th percentile per-packet one-way delay: 27.577 ms
Loss rate: 1.50%
```

Run 3: Report of Muses-25 — Data Link

