

Pantheon Report

Generated at 2018-08-28 15:58:07 (UTC).
Data path: GCE Tokyo on `ens4` (*remote*) → GCE Iowa on `ens4` (*local*).
Repeated the test of 4 congestion control schemes twice.
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.
NTP offsets were measured against `time.google.com` and have been applied to correct the timestamps in logs.

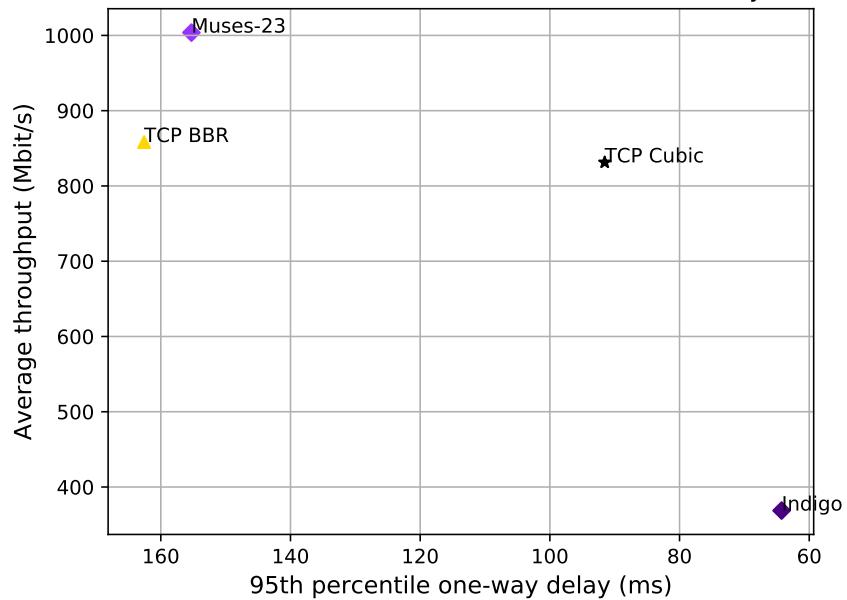
System info:

```
Linux 4.15.0-1017-gcp
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
```

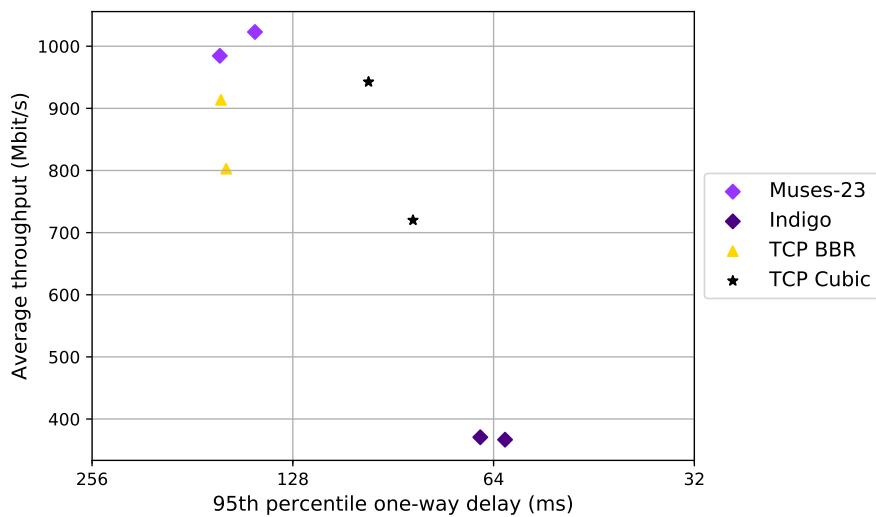
Git summary:

```
branch: muses-23 @ 88af05c5b0b7531637ca401951507a2fde628df6
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b261c9e99c63be452bc16f94ce0caa99a4c9d39a
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 GCE Tokyo to GCE Iowa, 2 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from GCE Tokyo to GCE Iowa, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



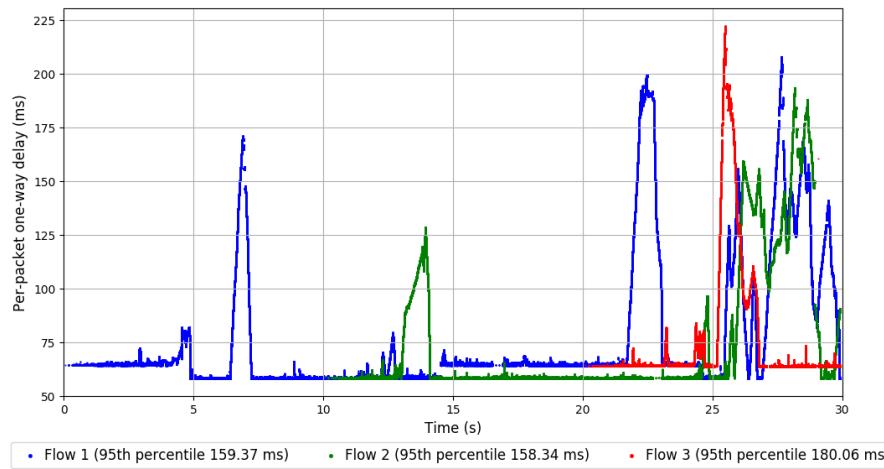
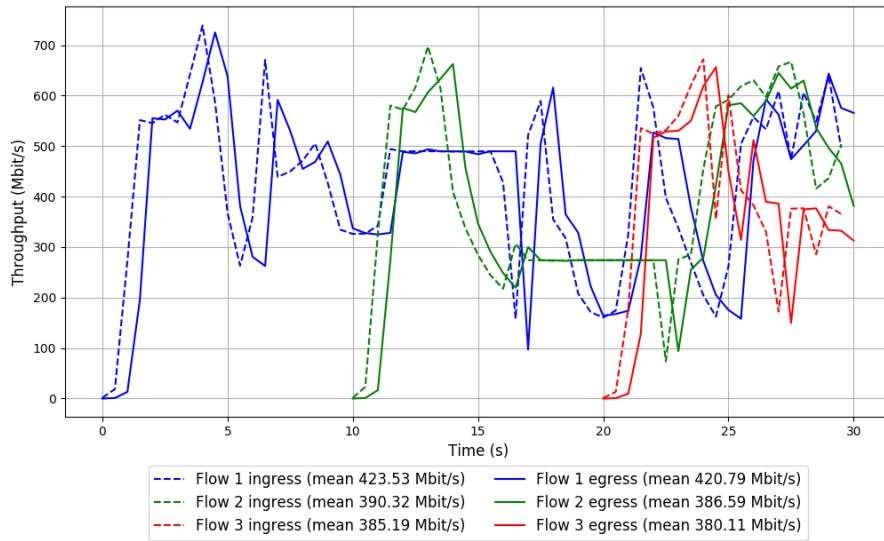
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	443.90	415.89	418.77	158.93	167.06	169.87	1.14	1.96	2.54
TCP Cubic	2	440.00	370.55	439.31	91.18	83.69	103.84	0.42	0.62	1.78
Indigo	2	201.45	178.05	153.06	61.95	64.45	61.75	0.39	0.66	1.50
Muses-23	2	519.92	513.58	441.04	159.48	151.75	144.81	3.72	2.51	2.48

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-28 15:28:02
End at: 2018-08-28 15:28:32
Local clock offset: -0.169 ms
Remote clock offset: 2.713 ms

# Below is generated by plot.py at 2018-08-28 15:54:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 802.95 Mbit/s
95th percentile per-packet one-way delay: 161.116 ms
Loss rate: 1.50%
-- Flow 1:
Average throughput: 420.79 Mbit/s
95th percentile per-packet one-way delay: 159.366 ms
Loss rate: 1.09%
-- Flow 2:
Average throughput: 386.59 Mbit/s
95th percentile per-packet one-way delay: 158.345 ms
Loss rate: 1.59%
-- Flow 3:
Average throughput: 380.11 Mbit/s
95th percentile per-packet one-way delay: 180.060 ms
Loss rate: 2.65%
```

Run 1: Report of TCP BBR — Data Link

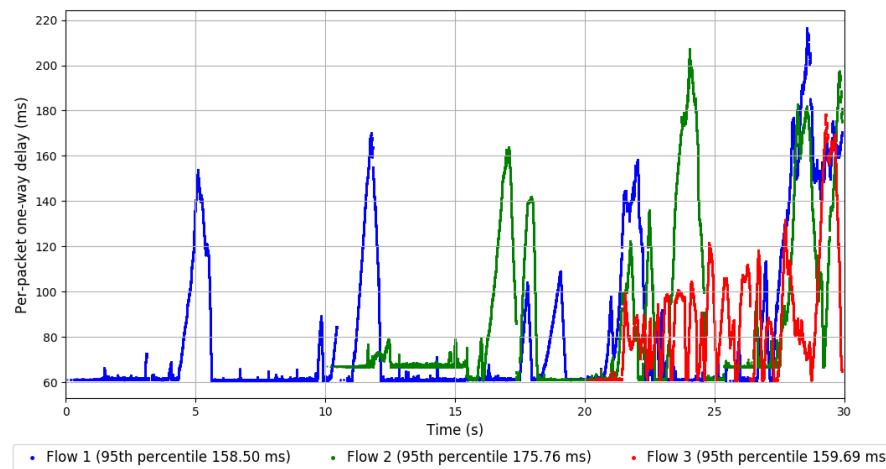
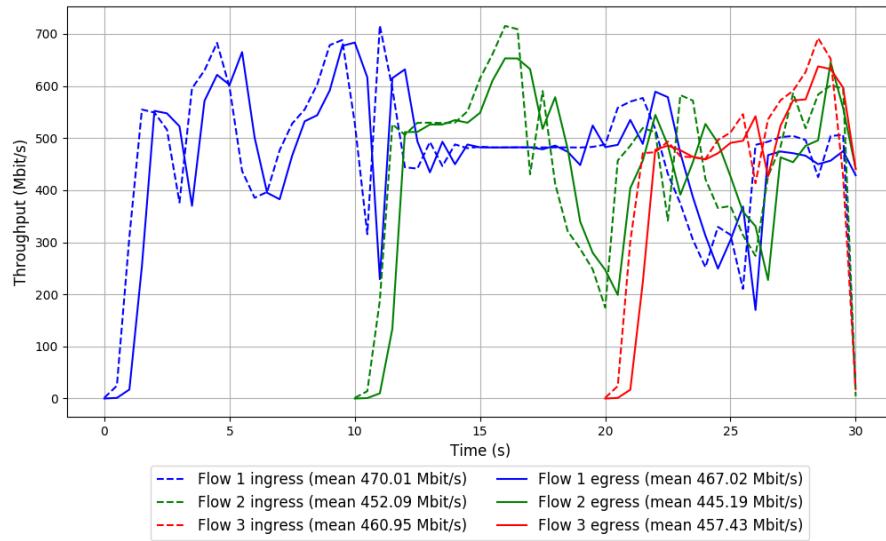


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-28 15:35:41
End at: 2018-08-28 15:36:11
Local clock offset: -0.223 ms
Remote clock offset: 0.031 ms

# Below is generated by plot.py at 2018-08-28 15:55:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 913.70 Mbit/s
95th percentile per-packet one-way delay: 164.031 ms
Loss rate: 1.77%
-- Flow 1:
Average throughput: 467.02 Mbit/s
95th percentile per-packet one-way delay: 158.499 ms
Loss rate: 1.19%
-- Flow 2:
Average throughput: 445.19 Mbit/s
95th percentile per-packet one-way delay: 175.765 ms
Loss rate: 2.32%
-- Flow 3:
Average throughput: 457.43 Mbit/s
95th percentile per-packet one-way delay: 159.689 ms
Loss rate: 2.43%
```

Run 2: Report of TCP BBR — Data Link

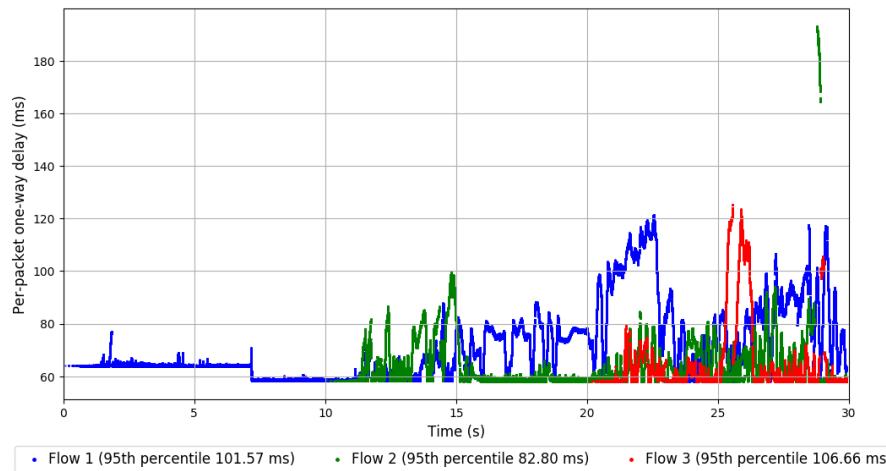
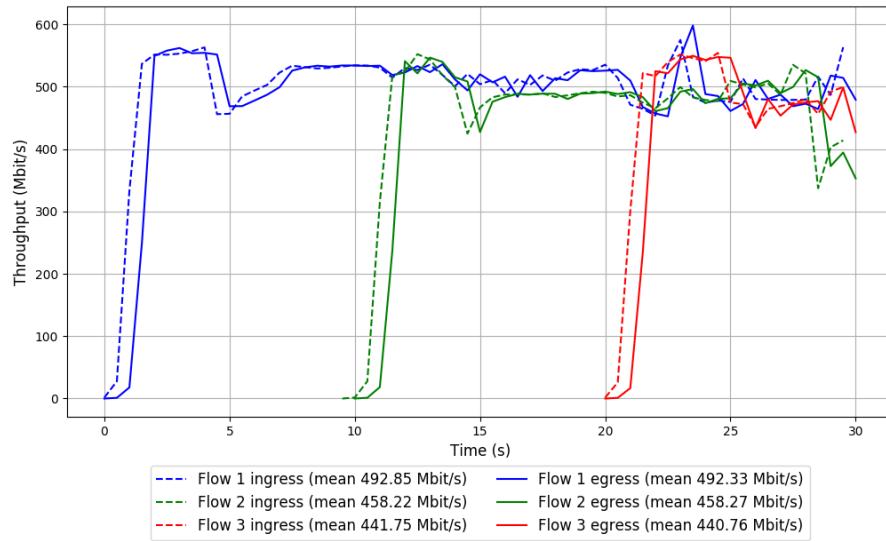


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-08-28 15:31:59
End at: 2018-08-28 15:32:29
Local clock offset: -0.211 ms
Remote clock offset: 2.783 ms

# Below is generated by plot.py at 2018-08-28 15:56:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 942.59 Mbit/s
95th percentile per-packet one-way delay: 98.556 ms
Loss rate: 0.71%
-- Flow 1:
Average throughput: 492.33 Mbit/s
95th percentile per-packet one-way delay: 101.573 ms
Loss rate: 0.53%
-- Flow 2:
Average throughput: 458.27 Mbit/s
95th percentile per-packet one-way delay: 82.795 ms
Loss rate: 0.60%
-- Flow 3:
Average throughput: 440.76 Mbit/s
95th percentile per-packet one-way delay: 106.661 ms
Loss rate: 1.51%
```

Run 1: Report of TCP Cubic — Data Link

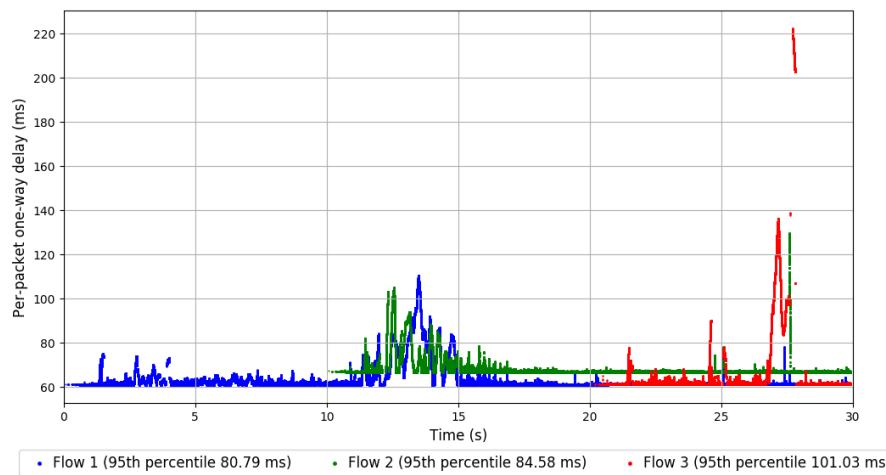
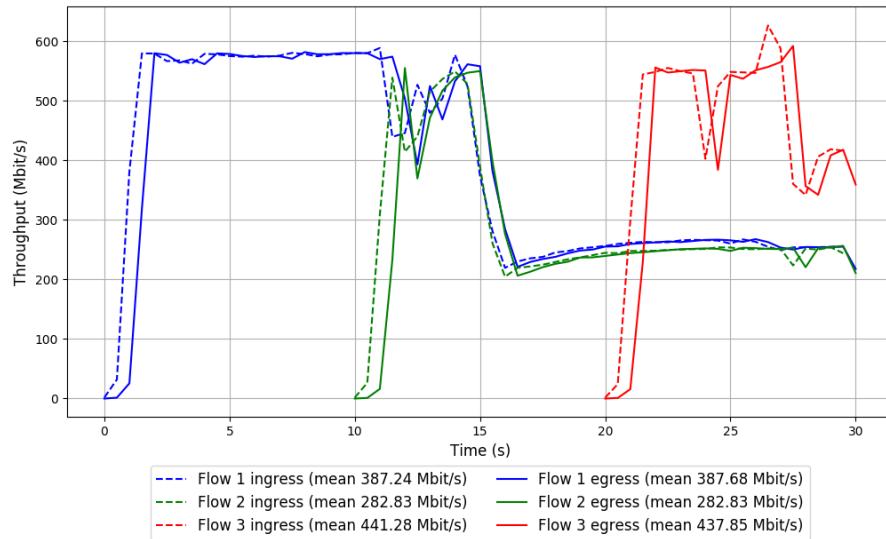


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-28 15:39:46
End at: 2018-08-28 15:40:16
Local clock offset: -0.193 ms
Remote clock offset: -0.107 ms

# Below is generated by plot.py at 2018-08-28 15:56:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 720.01 Mbit/s
95th percentile per-packet one-way delay: 84.530 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 387.68 Mbit/s
95th percentile per-packet one-way delay: 80.791 ms
Loss rate: 0.31%
-- Flow 2:
Average throughput: 282.83 Mbit/s
95th percentile per-packet one-way delay: 84.577 ms
Loss rate: 0.64%
-- Flow 3:
Average throughput: 437.85 Mbit/s
95th percentile per-packet one-way delay: 101.026 ms
Loss rate: 2.05%
```

Run 2: Report of TCP Cubic — Data Link

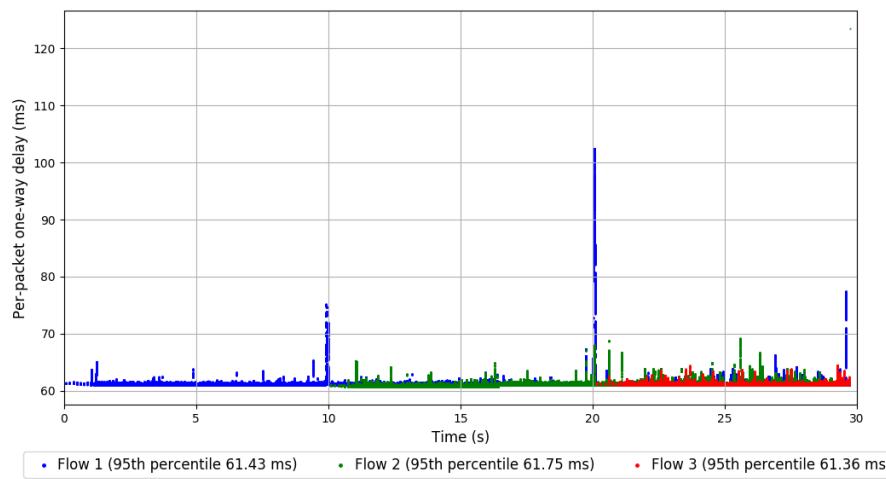
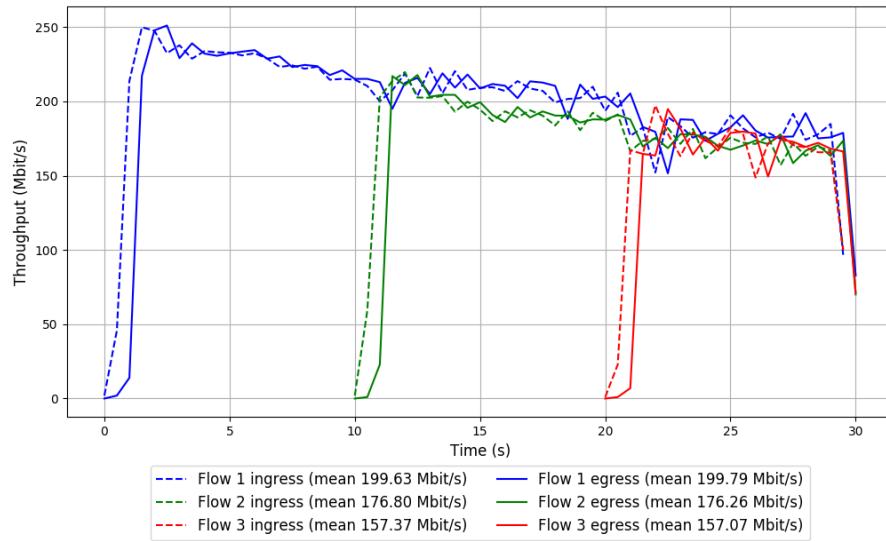


Run 1: Statistics of Indigo

```
Start at: 2018-08-28 15:26:18
End at: 2018-08-28 15:26:48
Local clock offset: -0.162 ms
Remote clock offset: -0.021 ms

# Below is generated by plot.py at 2018-08-28 15:56:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 366.76 Mbit/s
95th percentile per-packet one-way delay: 61.517 ms
Loss rate: 0.62%
-- Flow 1:
Average throughput: 199.79 Mbit/s
95th percentile per-packet one-way delay: 61.431 ms
Loss rate: 0.35%
-- Flow 2:
Average throughput: 176.26 Mbit/s
95th percentile per-packet one-way delay: 61.751 ms
Loss rate: 0.70%
-- Flow 3:
Average throughput: 157.07 Mbit/s
95th percentile per-packet one-way delay: 61.360 ms
Loss rate: 1.51%
```

Run 1: Report of Indigo — Data Link

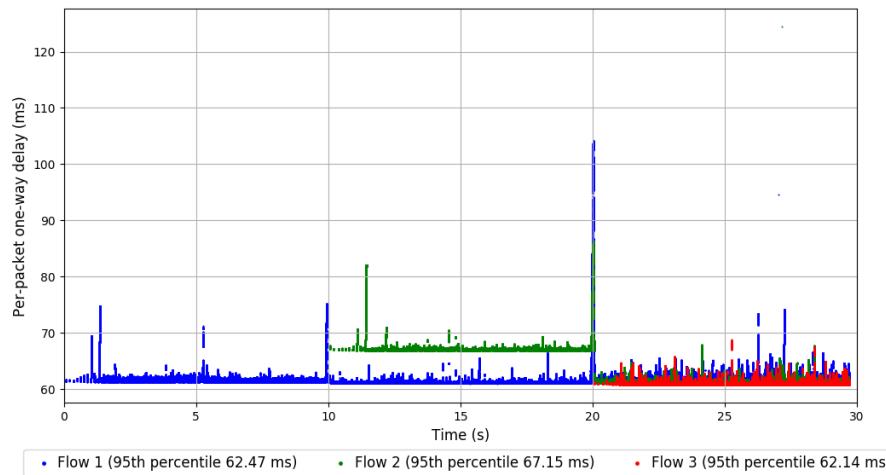
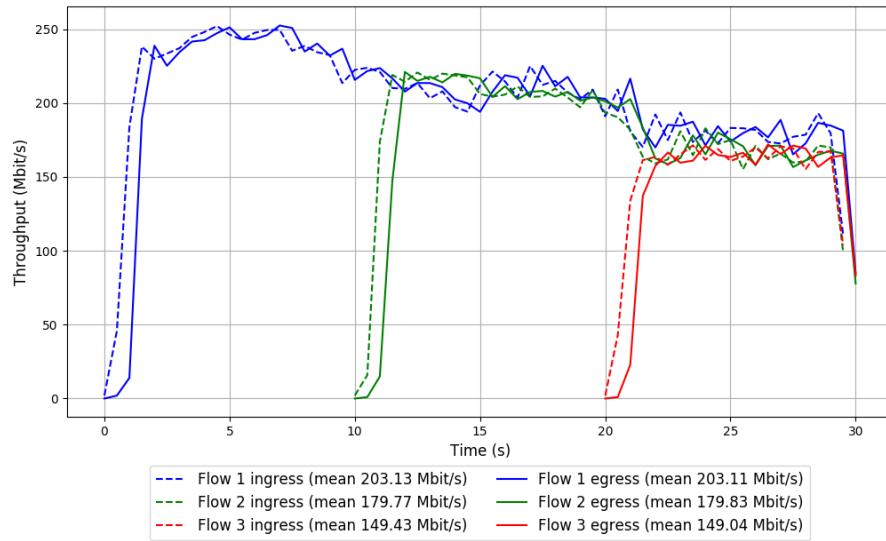


Run 2: Statistics of Indigo

```
Start at: 2018-08-28 15:33:56
End at: 2018-08-28 15:34:26
Local clock offset: -0.203 ms
Remote clock offset: -0.088 ms

# Below is generated by plot.py at 2018-08-28 15:56:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 370.69 Mbit/s
95th percentile per-packet one-way delay: 67.005 ms
Loss rate: 0.63%
-- Flow 1:
Average throughput: 203.11 Mbit/s
95th percentile per-packet one-way delay: 62.468 ms
Loss rate: 0.42%
-- Flow 2:
Average throughput: 179.83 Mbit/s
95th percentile per-packet one-way delay: 67.151 ms
Loss rate: 0.62%
-- Flow 3:
Average throughput: 149.04 Mbit/s
95th percentile per-packet one-way delay: 62.139 ms
Loss rate: 1.50%
```

Run 2: Report of Indigo — Data Link

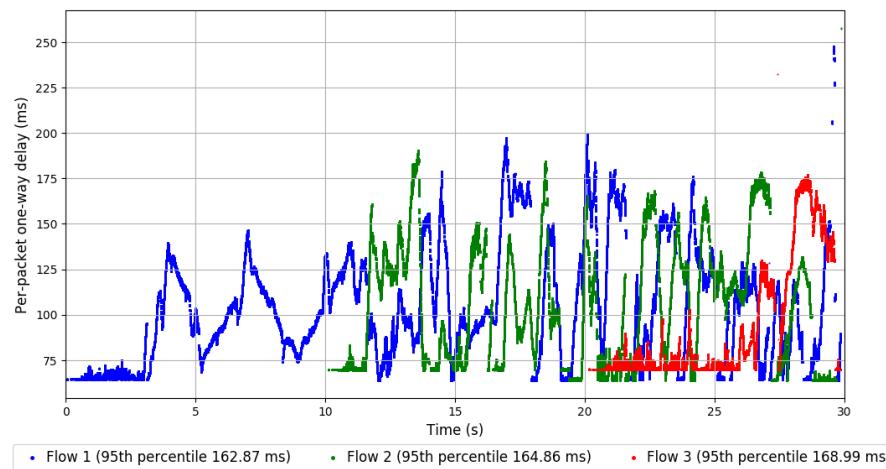
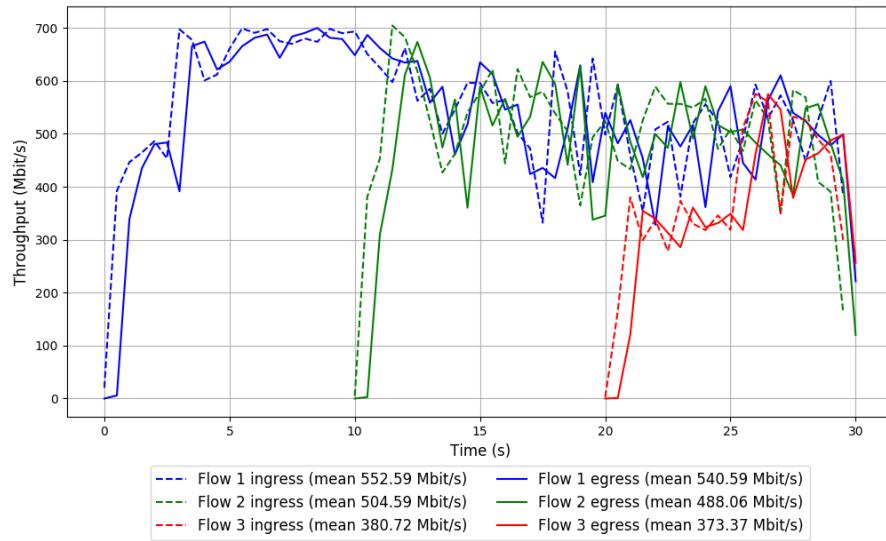


Run 1: Statistics of Muses-23

```
Start at: 2018-08-28 15:29:57
End at: 2018-08-28 15:30:27
Local clock offset: -0.186 ms
Remote clock offset: -2.867 ms

# Below is generated by plot.py at 2018-08-28 15:57:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 984.54 Mbit/s
95th percentile per-packet one-way delay: 164.686 ms
Loss rate: 2.78%
-- Flow 1:
Average throughput: 540.59 Mbit/s
95th percentile per-packet one-way delay: 162.872 ms
Loss rate: 2.58%
-- Flow 2:
Average throughput: 488.06 Mbit/s
95th percentile per-packet one-way delay: 164.856 ms
Loss rate: 2.95%
-- Flow 3:
Average throughput: 373.37 Mbit/s
95th percentile per-packet one-way delay: 168.989 ms
Loss rate: 3.22%
```

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

```
Start at: 2018-08-28 15:37:41
End at: 2018-08-28 15:38:11
Local clock offset: -0.18 ms
Remote clock offset: -0.048 ms

# Below is generated by plot.py at 2018-08-28 15:58:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1022.92 Mbit/s
95th percentile per-packet one-way delay: 145.872 ms
Loss rate: 3.40%
-- Flow 1:
Average throughput: 499.26 Mbit/s
95th percentile per-packet one-way delay: 156.081 ms
Loss rate: 4.86%
-- Flow 2:
Average throughput: 539.10 Mbit/s
95th percentile per-packet one-way delay: 138.638 ms
Loss rate: 2.07%
-- Flow 3:
Average throughput: 508.71 Mbit/s
95th percentile per-packet one-way delay: 120.635 ms
Loss rate: 1.74%
```

Run 2: Report of Muses-23 — Data Link

