

## Pantheon Report

Generated at 2018-08-28 15:55:20 (UTC).  
Data path: GCE London on `ens4` (*remote*) → GCE Sydney 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.

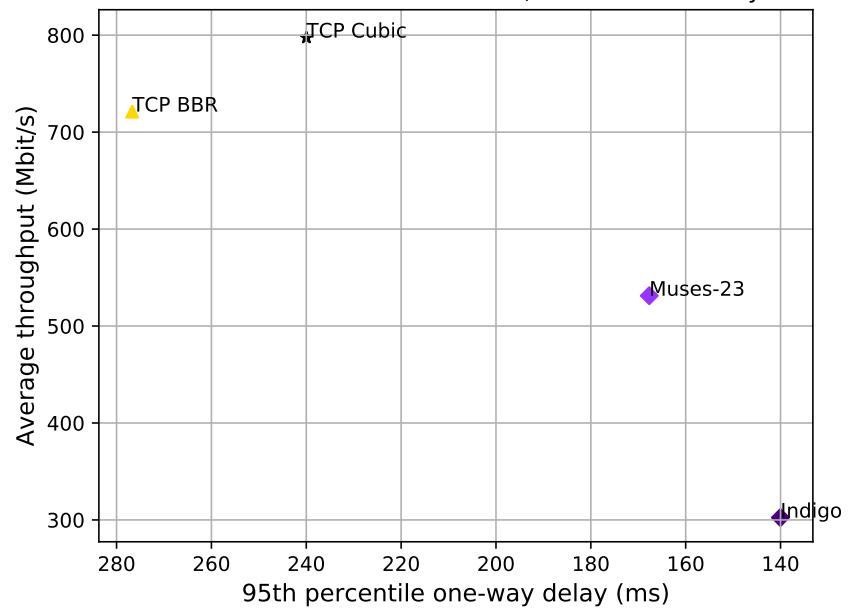
System info:

```
Linux 4.15.0-1015-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
```

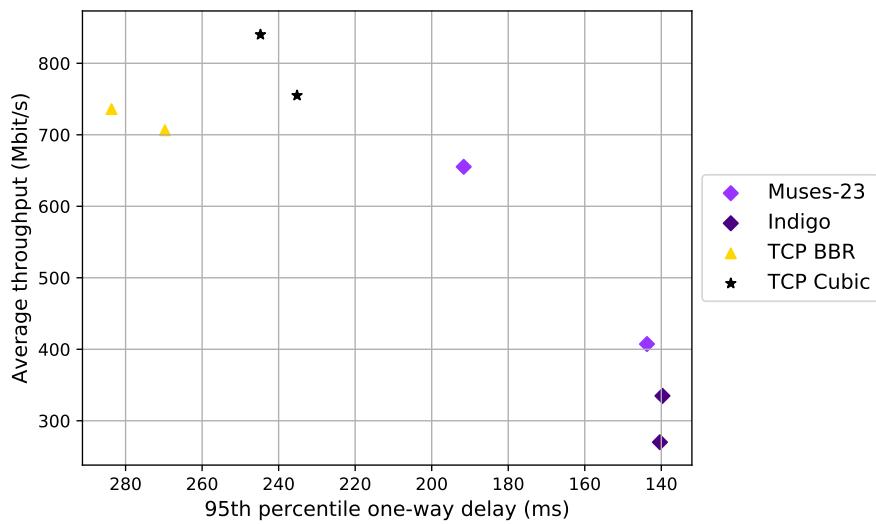
Git summary:

```
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 London to GCE Sydney, 2 runs of 30s each per scheme  
3 flows with 10s interval between flows (mean of all runs by scheme)



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



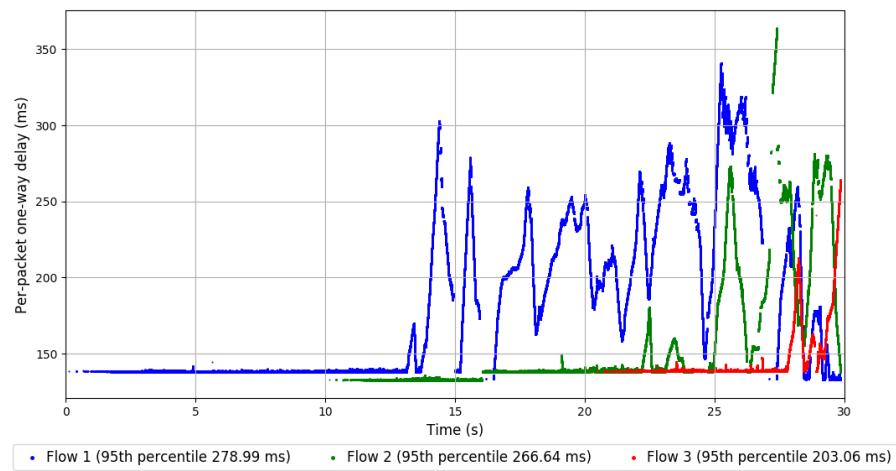
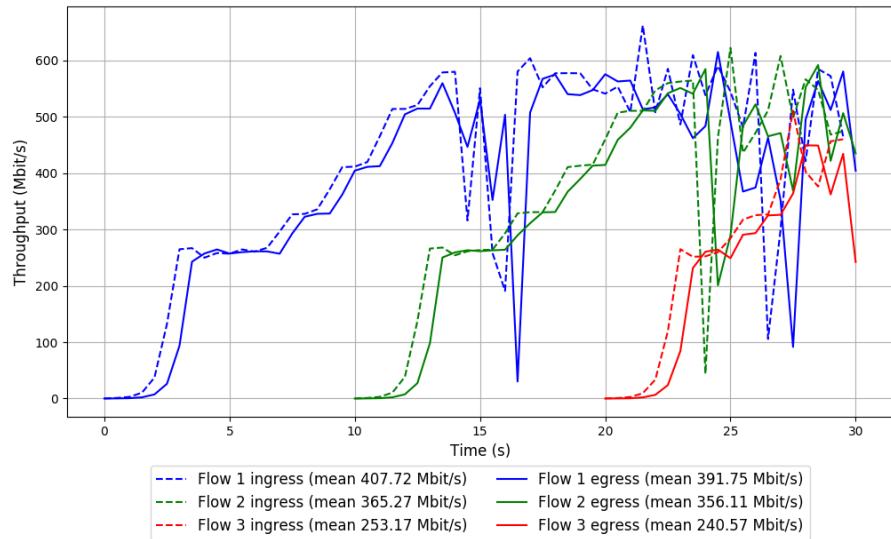
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	403.93	360.65	239.32	285.92	249.59	215.43	4.57	3.51	7.23
TCP Cubic	2	460.13	364.39	293.38	229.19	233.67	224.04	0.97	2.05	5.29
Indigo	2	156.30	145.77	155.49	139.47	138.35	152.96	0.90	1.39	3.32
Muses-23	2	294.66	170.74	382.96	152.53	140.24	182.08	0.98	1.37	2.85

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-28 15:26:20
End at: 2018-08-28 15:26:50
Local clock offset: -0.043 ms
Remote clock offset: -0.328 ms

# Below is generated by plot.py at 2018-08-28 15:54:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 706.33 Mbit/s
95th percentile per-packet one-way delay: 269.722 ms
Loss rate: 4.81%
-- Flow 1:
Average throughput: 391.75 Mbit/s
95th percentile per-packet one-way delay: 278.986 ms
Loss rate: 4.80%
-- Flow 2:
Average throughput: 356.11 Mbit/s
95th percentile per-packet one-way delay: 266.636 ms
Loss rate: 3.83%
-- Flow 3:
Average throughput: 240.57 Mbit/s
95th percentile per-packet one-way delay: 203.059 ms
Loss rate: 7.64%
```

## Run 1: Report of TCP BBR — Data Link

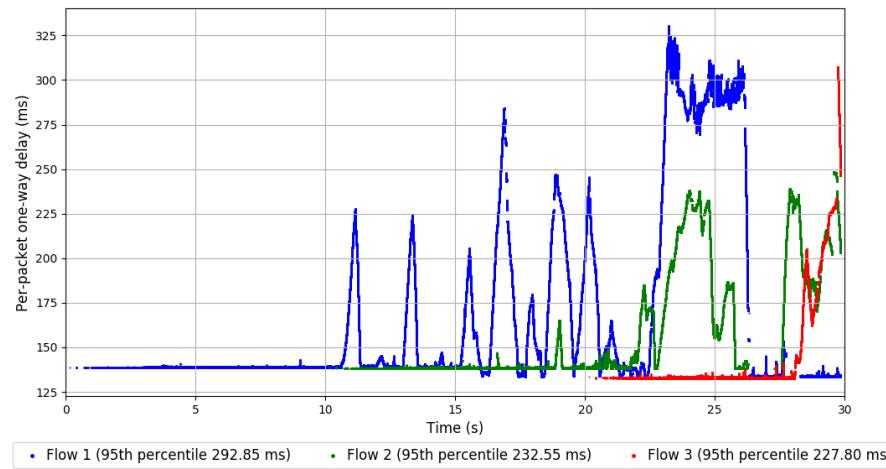
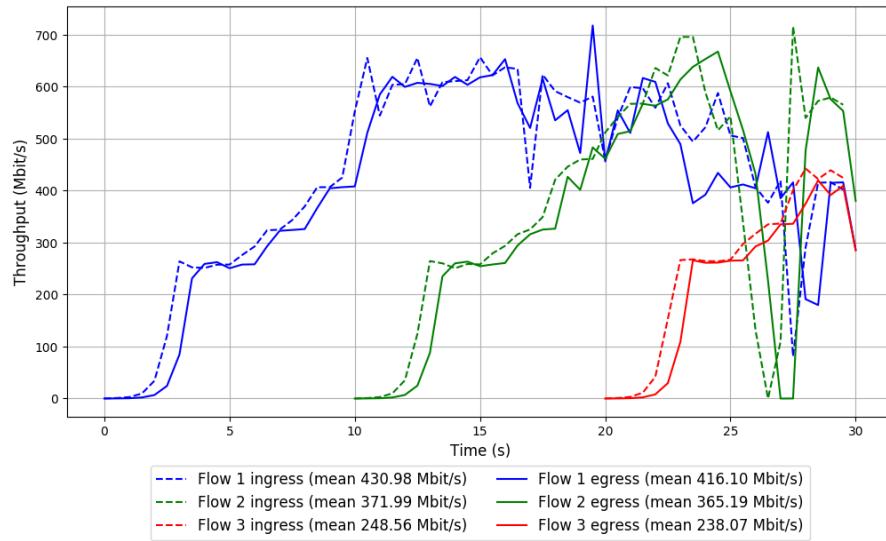


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-28 15:34:21
End at: 2018-08-28 15:34:51
Local clock offset: 0.26 ms
Remote clock offset: 0.011 ms

# Below is generated by plot.py at 2018-08-28 15:54:43
# Datalink statistics
-- Total of 3 flows:
Average throughput: 735.98 Mbit/s
95th percentile per-packet one-way delay: 283.681 ms
Loss rate: 4.24%
-- Flow 1:
Average throughput: 416.10 Mbit/s
95th percentile per-packet one-way delay: 292.854 ms
Loss rate: 4.34%
-- Flow 2:
Average throughput: 365.19 Mbit/s
95th percentile per-packet one-way delay: 232.550 ms
Loss rate: 3.19%
-- Flow 3:
Average throughput: 238.07 Mbit/s
95th percentile per-packet one-way delay: 227.797 ms
Loss rate: 6.83%
```

## Run 2: Report of TCP BBR — Data Link

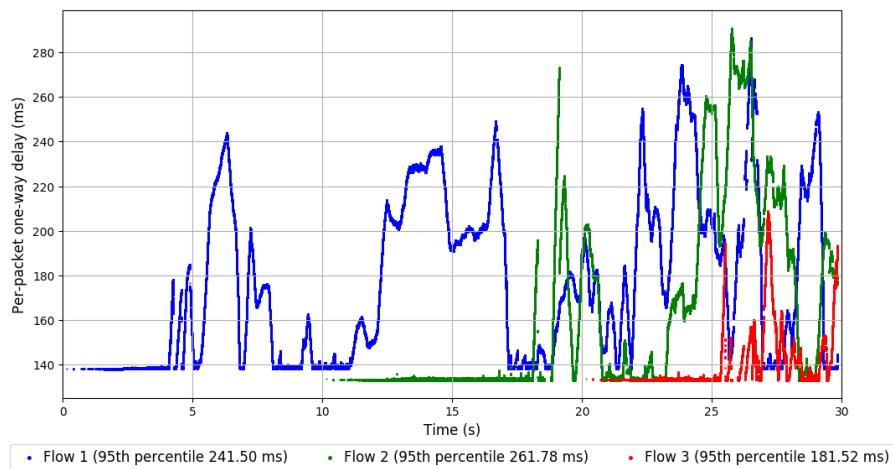
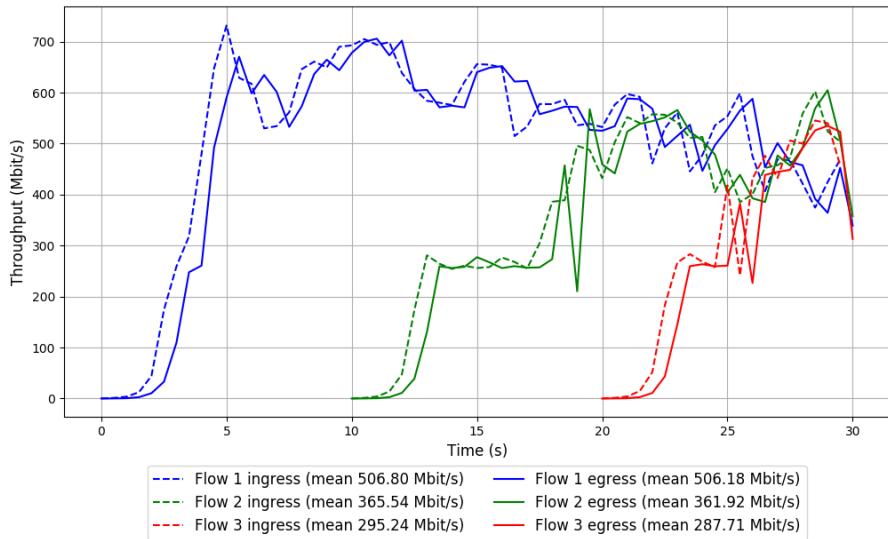


Run 1: Statistics of TCP Cubic

```
Start at: 2018-08-28 15:32:14
End at: 2018-08-28 15:32:44
Local clock offset: -0.022 ms
Remote clock offset: -0.241 ms

# Below is generated by plot.py at 2018-08-28 15:55:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 840.09 Mbit/s
95th percentile per-packet one-way delay: 244.747 ms
Loss rate: 1.89%
-- Flow 1:
Average throughput: 506.18 Mbit/s
95th percentile per-packet one-way delay: 241.495 ms
Loss rate: 1.04%
-- Flow 2:
Average throughput: 361.92 Mbit/s
95th percentile per-packet one-way delay: 261.783 ms
Loss rate: 2.33%
-- Flow 3:
Average throughput: 287.71 Mbit/s
95th percentile per-packet one-way delay: 181.523 ms
Loss rate: 5.18%
```

## Run 1: Report of TCP Cubic — Data Link

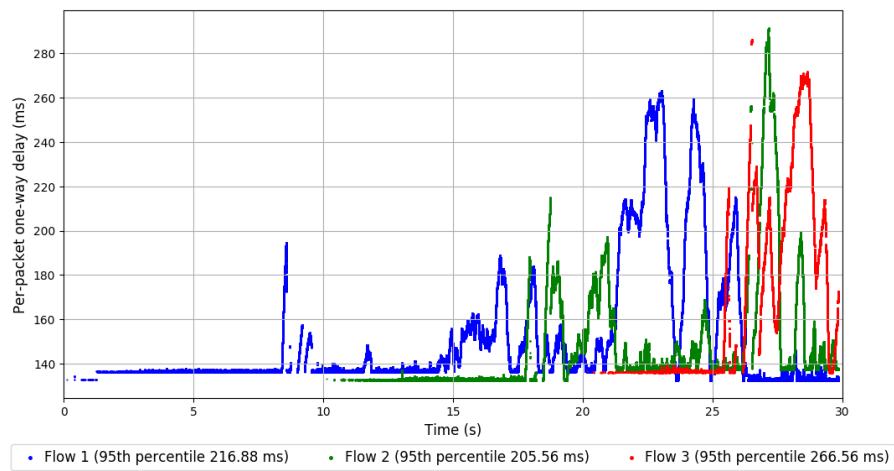
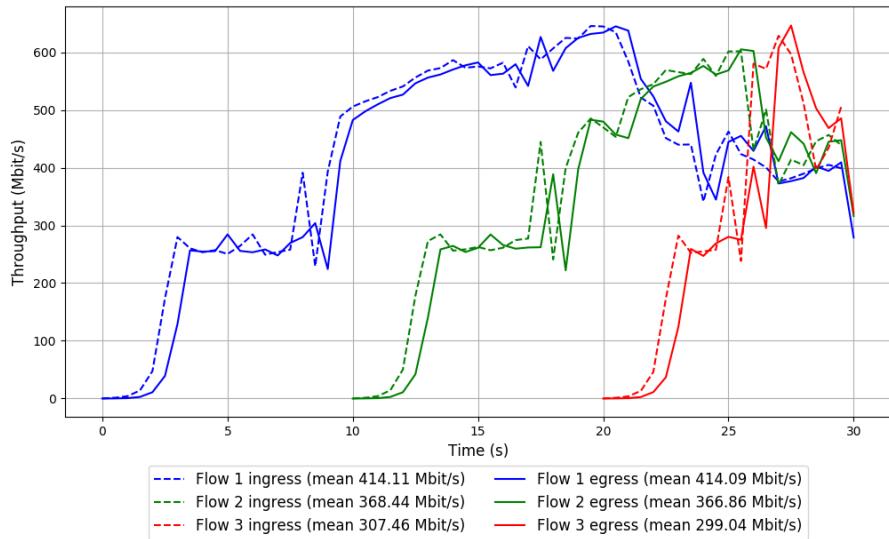


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-28 15:39:55
End at: 2018-08-28 15:40:25
Local clock offset: -0.041 ms
Remote clock offset: 0.377 ms

# Below is generated by plot.py at 2018-08-28 15:55:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 754.99 Mbit/s
95th percentile per-packet one-way delay: 235.187 ms
Loss rate: 1.79%
-- Flow 1:
Average throughput: 414.09 Mbit/s
95th percentile per-packet one-way delay: 216.877 ms
Loss rate: 0.90%
-- Flow 2:
Average throughput: 366.86 Mbit/s
95th percentile per-packet one-way delay: 205.561 ms
Loss rate: 1.77%
-- Flow 3:
Average throughput: 299.04 Mbit/s
95th percentile per-packet one-way delay: 266.564 ms
Loss rate: 5.41%
```

## Run 2: Report of TCP Cubic — Data Link

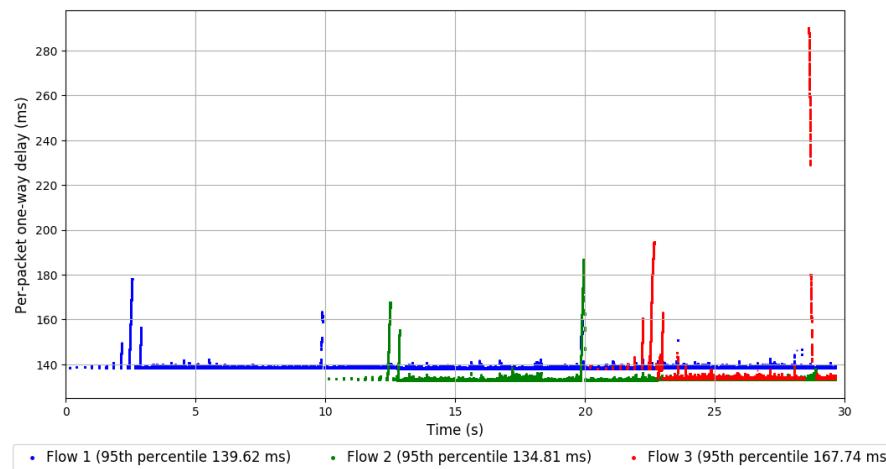
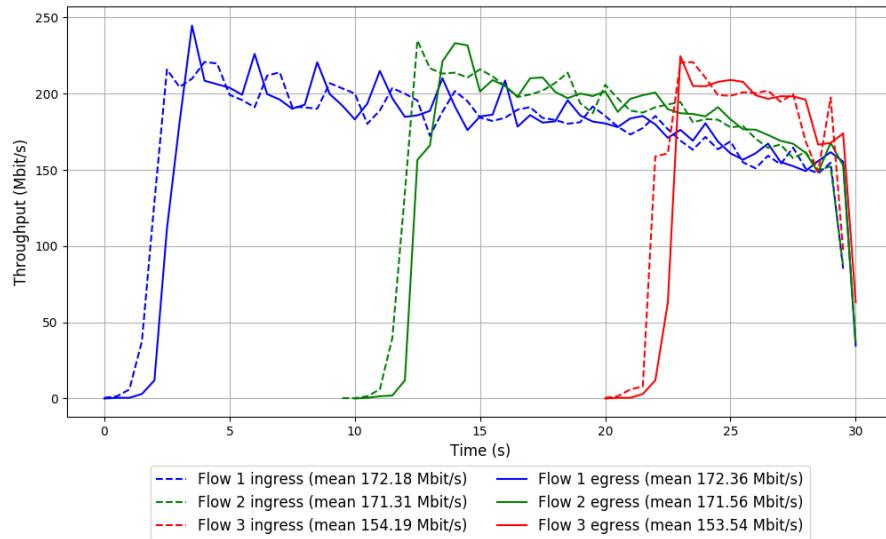


Run 1: Statistics of Indigo

```
Start at: 2018-08-28 15:28:23
End at: 2018-08-28 15:28:53
Local clock offset: -0.063 ms
Remote clock offset: -0.386 ms

# Below is generated by plot.py at 2018-08-28 15:55:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 334.85 Mbit/s
95th percentile per-packet one-way delay: 139.695 ms
Loss rate: 1.32%
-- Flow 1:
Average throughput: 172.36 Mbit/s
95th percentile per-packet one-way delay: 139.620 ms
Loss rate: 0.83%
-- Flow 2:
Average throughput: 171.56 Mbit/s
95th percentile per-packet one-way delay: 134.808 ms
Loss rate: 1.22%
-- Flow 3:
Average throughput: 153.54 Mbit/s
95th percentile per-packet one-way delay: 167.736 ms
Loss rate: 3.23%
```

## Run 1: Report of Indigo — Data Link

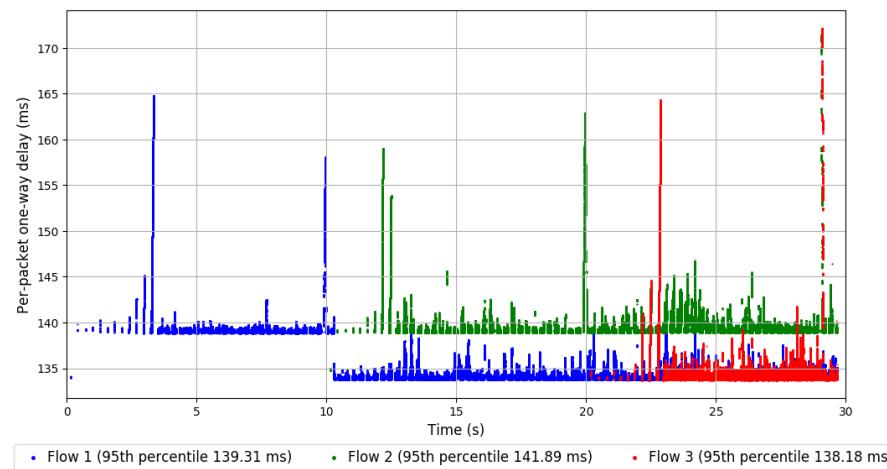
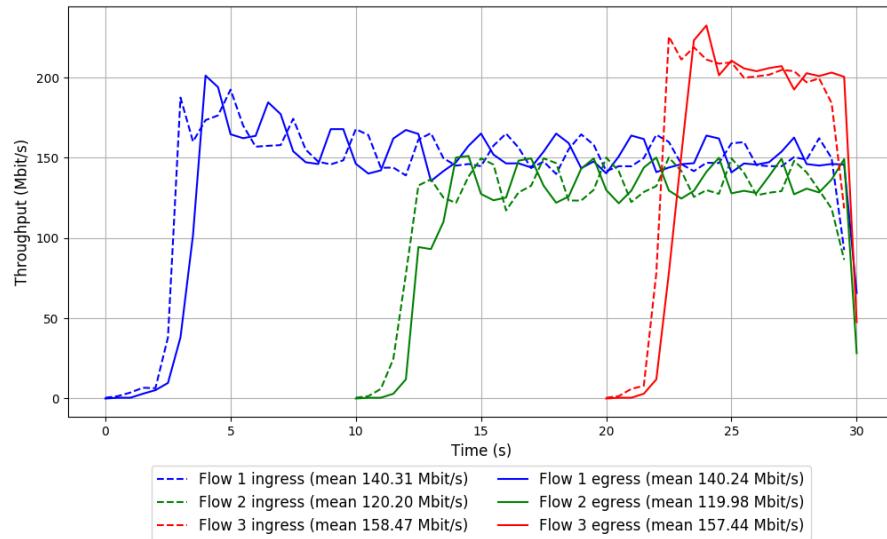


Run 2: Statistics of Indigo

```
Start at: 2018-08-28 15:36:26
End at: 2018-08-28 15:36:56
Local clock offset: -0.009 ms
Remote clock offset: -1.138 ms

# Below is generated by plot.py at 2018-08-28 15:55:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 270.02 Mbit/s
95th percentile per-packet one-way delay: 140.359 ms
Loss rate: 1.60%
-- Flow 1:
Average throughput: 140.24 Mbit/s
95th percentile per-packet one-way delay: 139.315 ms
Loss rate: 0.96%
-- Flow 2:
Average throughput: 119.98 Mbit/s
95th percentile per-packet one-way delay: 141.890 ms
Loss rate: 1.55%
-- Flow 3:
Average throughput: 157.44 Mbit/s
95th percentile per-packet one-way delay: 138.176 ms
Loss rate: 3.41%
```

Run 2: Report of Indigo — Data Link

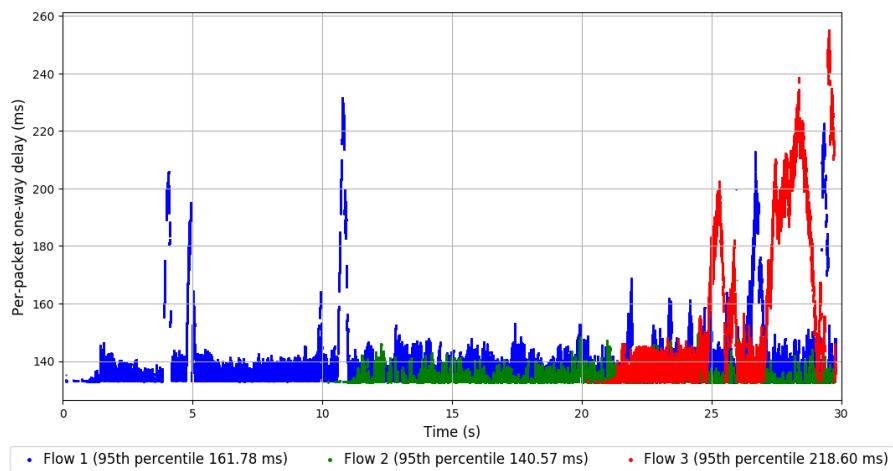
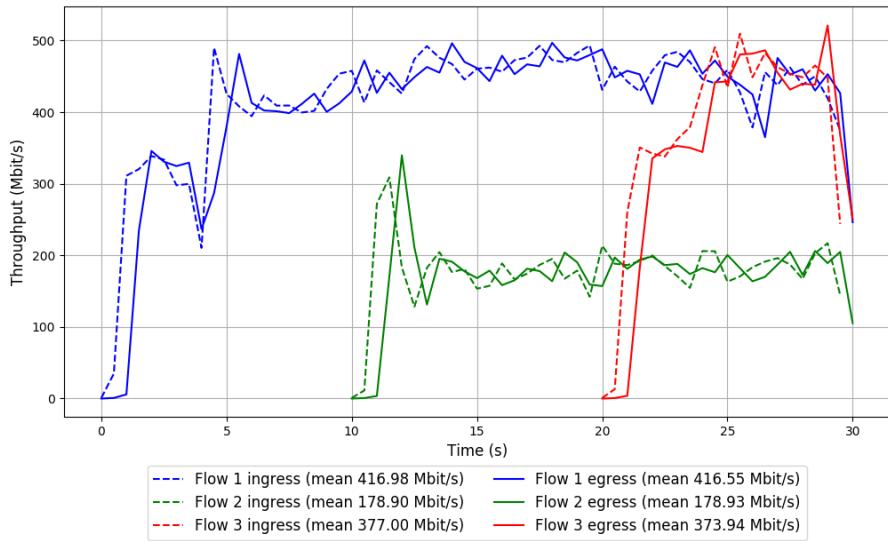


Run 1: Statistics of Muses-23

```
Start at: 2018-08-28 15:30:16
End at: 2018-08-28 15:30:46
Local clock offset: -0.044 ms
Remote clock offset: -0.057 ms

# Below is generated by plot.py at 2018-08-28 15:55:19
# Datalink statistics
-- Total of 3 flows:
Average throughput: 655.20 Mbit/s
95th percentile per-packet one-way delay: 191.632 ms
Loss rate: 1.42%
-- Flow 1:
Average throughput: 416.55 Mbit/s
95th percentile per-packet one-way delay: 161.781 ms
Loss rate: 0.99%
-- Flow 2:
Average throughput: 178.93 Mbit/s
95th percentile per-packet one-way delay: 140.568 ms
Loss rate: 1.36%
-- Flow 3:
Average throughput: 373.94 Mbit/s
95th percentile per-packet one-way delay: 218.601 ms
Loss rate: 2.92%
```

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

```
Start at: 2018-08-28 15:38:12
End at: 2018-08-28 15:38:42
Local clock offset: -0.008 ms
Remote clock offset: -0.262 ms

# Below is generated by plot.py at 2018-08-28 15:55:19
# Datalink statistics
-- Total of 3 flows:
Average throughput: 407.31 Mbit/s
95th percentile per-packet one-way delay: 143.734 ms
Loss rate: 1.65%
-- Flow 1:
Average throughput: 172.77 Mbit/s
95th percentile per-packet one-way delay: 143.275 ms
Loss rate: 0.97%
-- Flow 2:
Average throughput: 162.55 Mbit/s
95th percentile per-packet one-way delay: 139.910 ms
Loss rate: 1.38%
-- Flow 3:
Average throughput: 391.98 Mbit/s
95th percentile per-packet one-way delay: 145.564 ms
Loss rate: 2.78%
```

Run 2: Report of Muses-23 — Data Link

