

## Pantheon Report

Generated at 2018-09-06 01:50:42 (UTC).  
Data path: GCE London on `ens4 (local)` → GCE Iowa on `ens4 (remote)`.  
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.

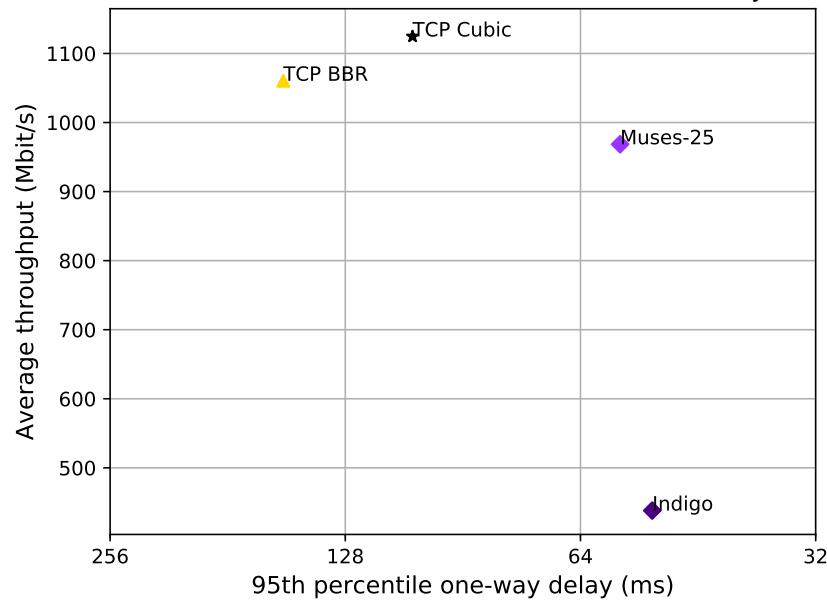
System info:

```
Linux 4.15.0-1018-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
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

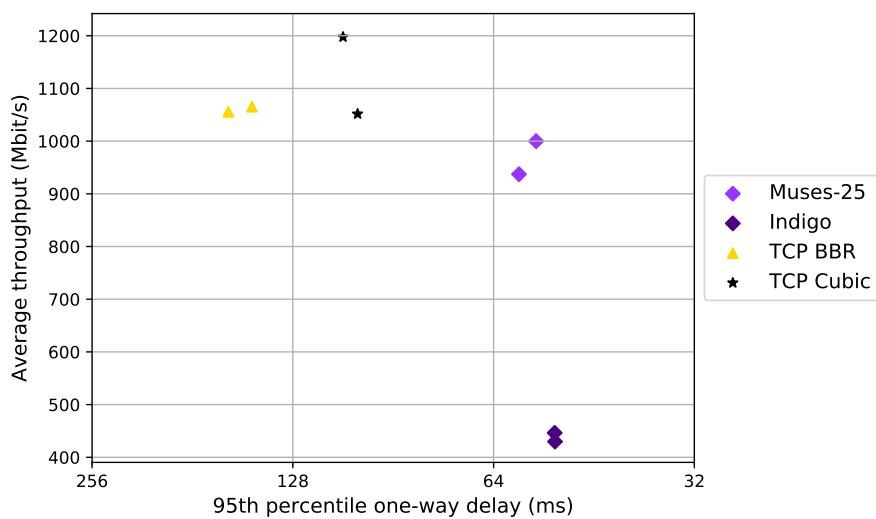
Git summary:

```
branch: muses @ 18b9165265c8ba2915c862e8713fd9ad82c1ac21
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ a28d20fb82a95a965a3da65fd1eb71b8994e9b84
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 Iowa, 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 Iowa, 2 runs of 30s each per scheme  
3 flows with 10s interval between flows



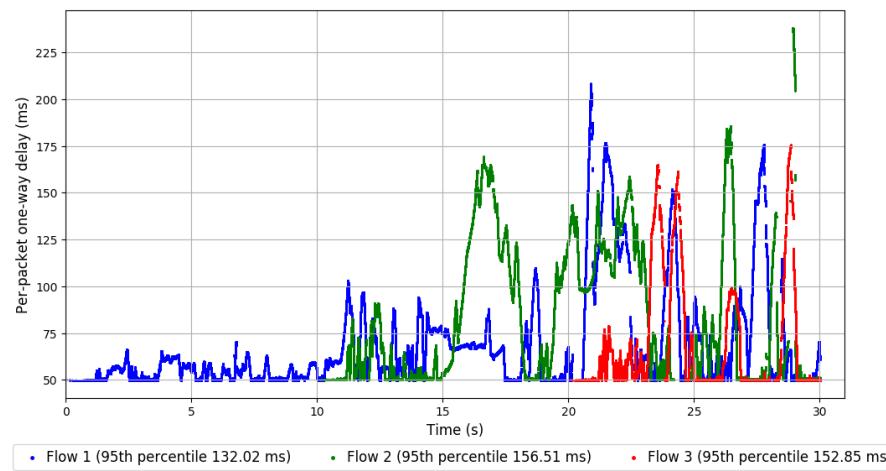
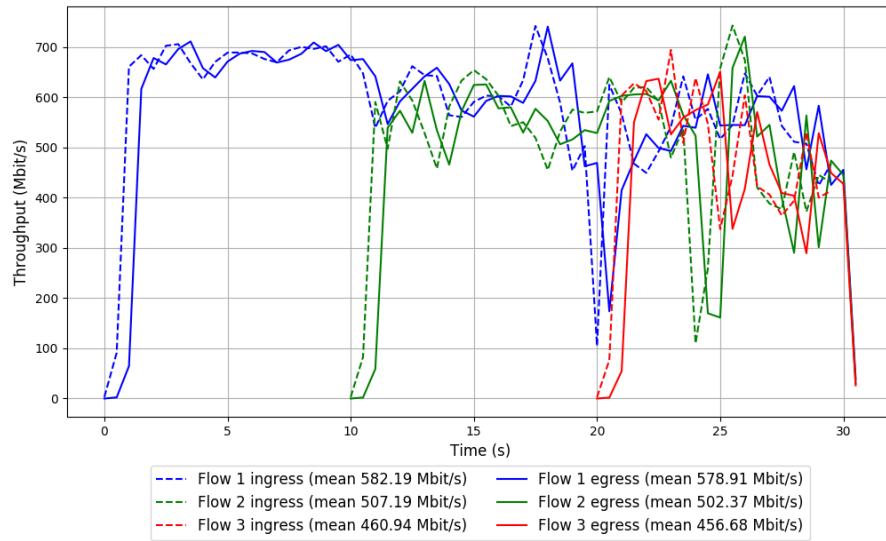
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	555.00	516.50	485.27	134.28	160.69	156.01	0.59	0.96	1.24
TCP Cubic	2	586.00	552.35	513.47	108.91	98.62	107.49	0.01	0.00	0.01
Indigo	2	233.14	218.20	185.06	51.46	52.09	52.20	0.00	0.01	0.00
Muses-25	2	510.10	476.68	433.81	57.95	57.42	53.92	0.00	0.00	0.01

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-06 01:23:31
End at: 2018-09-06 01:24:01
Local clock offset: 0.434 ms
Remote clock offset: -0.042 ms

# Below is generated by plot.py at 2018-09-06 01:50:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1065.30 Mbit/s
95th percentile per-packet one-way delay: 147.402 ms
Loss rate: 0.74%
-- Flow 1:
Average throughput: 578.91 Mbit/s
95th percentile per-packet one-way delay: 132.018 ms
Loss rate: 0.57%
-- Flow 2:
Average throughput: 502.37 Mbit/s
95th percentile per-packet one-way delay: 156.507 ms
Loss rate: 0.95%
-- Flow 3:
Average throughput: 456.68 Mbit/s
95th percentile per-packet one-way delay: 152.855 ms
Loss rate: 0.93%
```

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

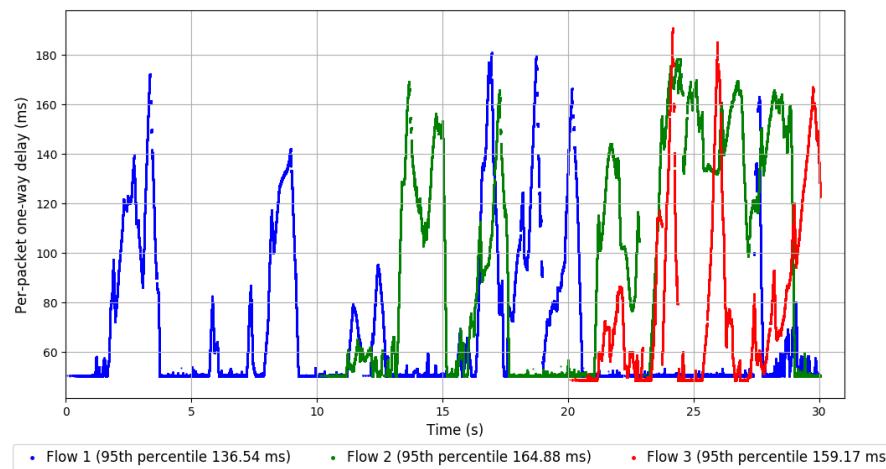
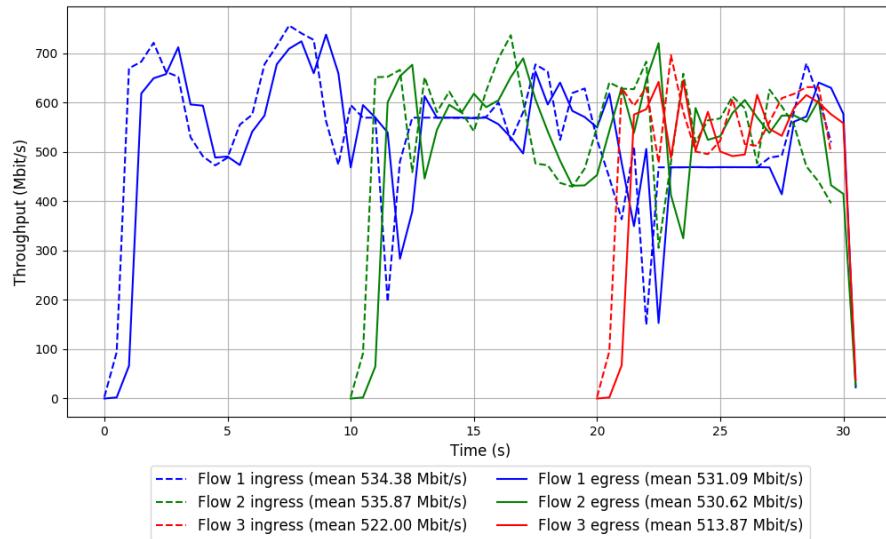


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-06 01:31:26
End at: 2018-09-06 01:31:56
Local clock offset: 0.076 ms
Remote clock offset: -0.076 ms

# Below is generated by plot.py at 2018-09-06 01:50:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1055.55 Mbit/s
95th percentile per-packet one-way delay: 159.921 ms
Loss rate: 0.89%
-- Flow 1:
Average throughput: 531.09 Mbit/s
95th percentile per-packet one-way delay: 136.543 ms
Loss rate: 0.61%
-- Flow 2:
Average throughput: 530.62 Mbit/s
95th percentile per-packet one-way delay: 164.876 ms
Loss rate: 0.98%
-- Flow 3:
Average throughput: 513.87 Mbit/s
95th percentile per-packet one-way delay: 159.171 ms
Loss rate: 1.54%
```

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

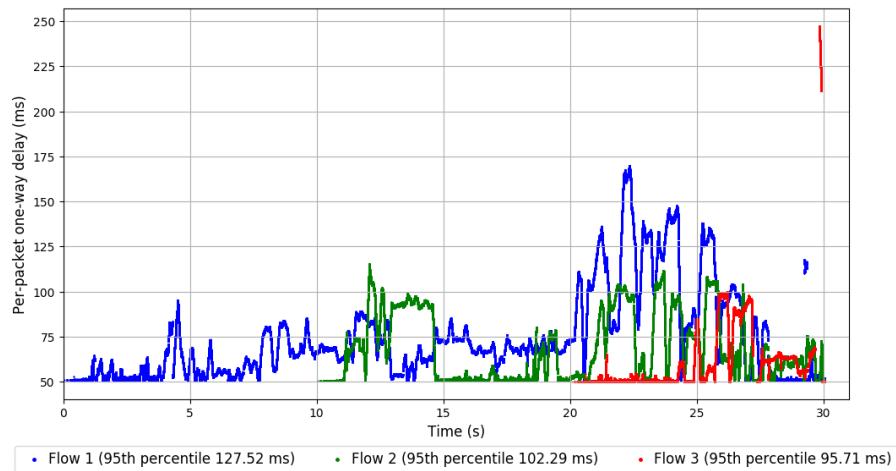
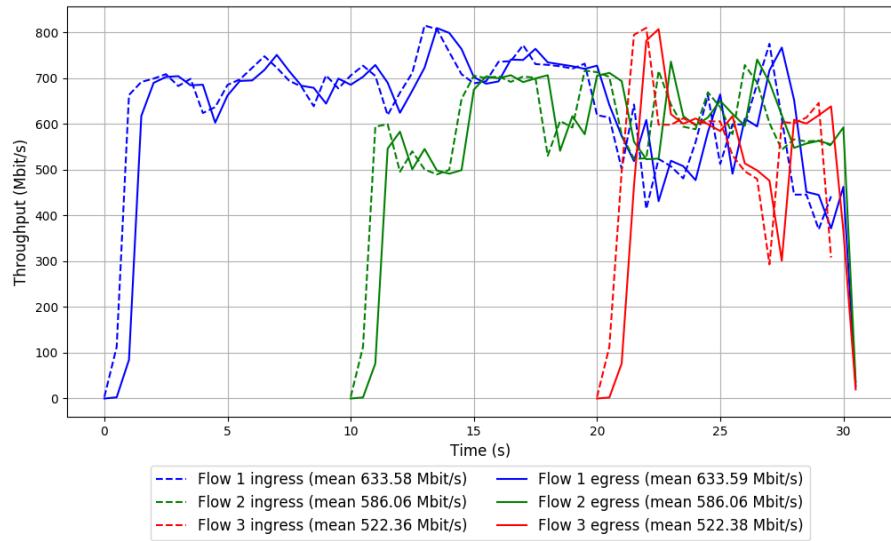


Run 1: Statistics of TCP Cubic

```
Start at: 2018-09-06 01:17:35
End at: 2018-09-06 01:18:05
Local clock offset: 0.078 ms
Remote clock offset: -0.002 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1197.60 Mbit/s
95th percentile per-packet one-way delay: 107.622 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 633.59 Mbit/s
95th percentile per-packet one-way delay: 127.515 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 586.06 Mbit/s
95th percentile per-packet one-way delay: 102.292 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 522.38 Mbit/s
95th percentile per-packet one-way delay: 95.707 ms
Loss rate: 0.01%
```

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

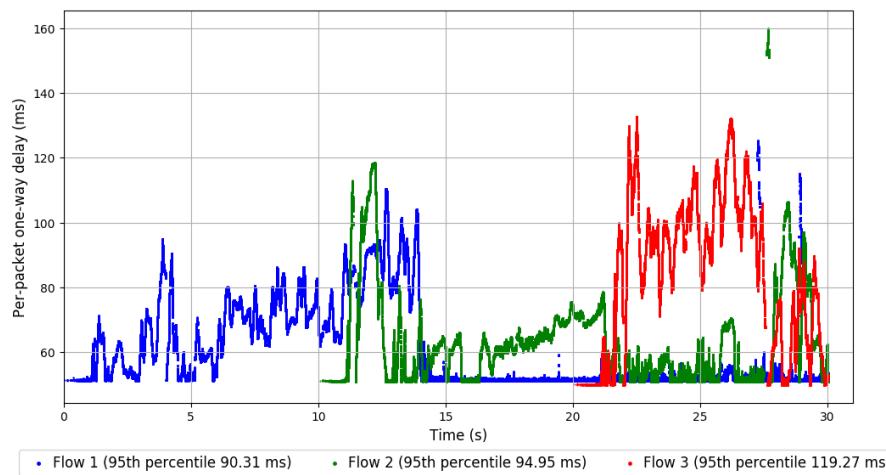
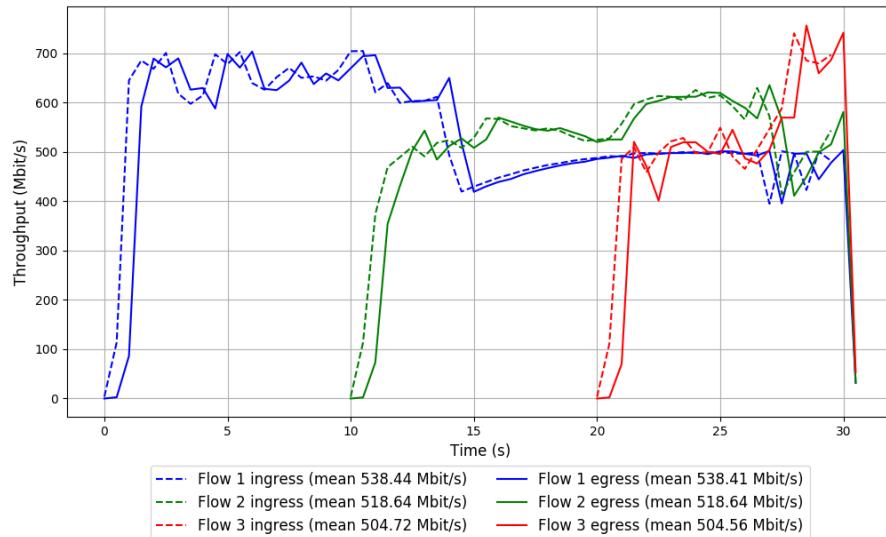


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-06 01:25:37
End at: 2018-09-06 01:26:07
Local clock offset: -0.295 ms
Remote clock offset: -0.021 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1051.63 Mbit/s
95th percentile per-packet one-way delay: 102.354 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 538.41 Mbit/s
95th percentile per-packet one-way delay: 90.306 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 518.64 Mbit/s
95th percentile per-packet one-way delay: 94.946 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 504.56 Mbit/s
95th percentile per-packet one-way delay: 119.265 ms
Loss rate: 0.02%
```

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

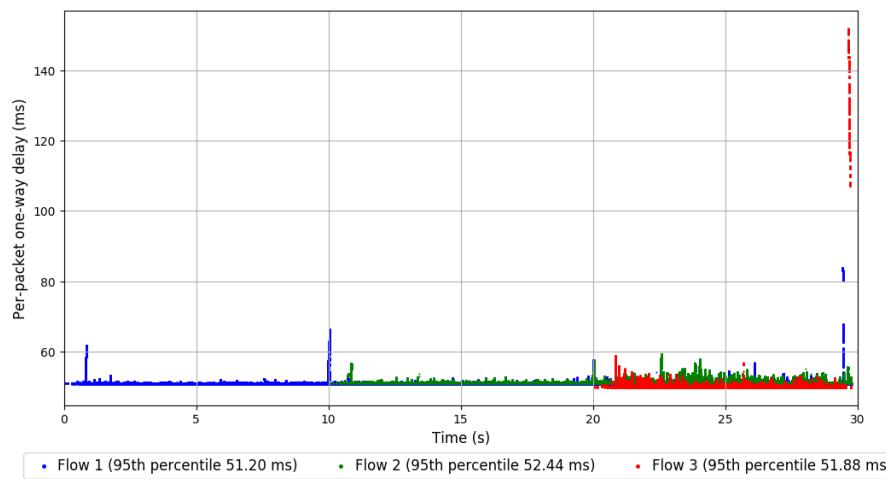
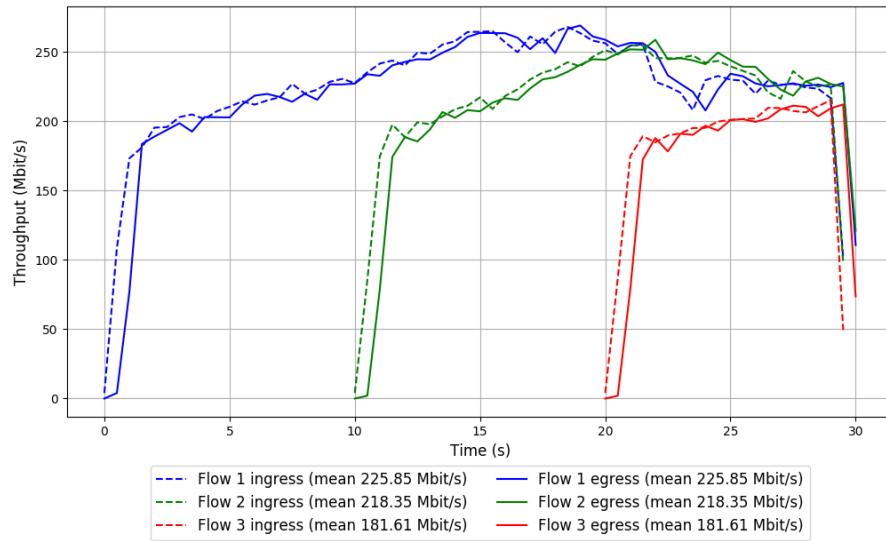


Run 1: Statistics of Indigo

```
Start at: 2018-09-06 01:19:44
End at: 2018-09-06 01:20:14
Local clock offset: -0.283 ms
Remote clock offset: 0.002 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 429.84 Mbit/s
95th percentile per-packet one-way delay: 51.770 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 225.85 Mbit/s
95th percentile per-packet one-way delay: 51.203 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 218.35 Mbit/s
95th percentile per-packet one-way delay: 52.443 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 181.61 Mbit/s
95th percentile per-packet one-way delay: 51.876 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

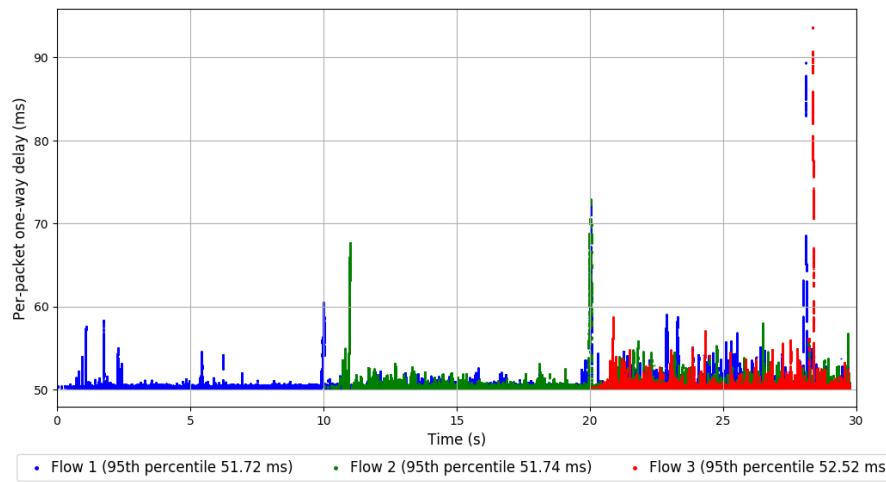
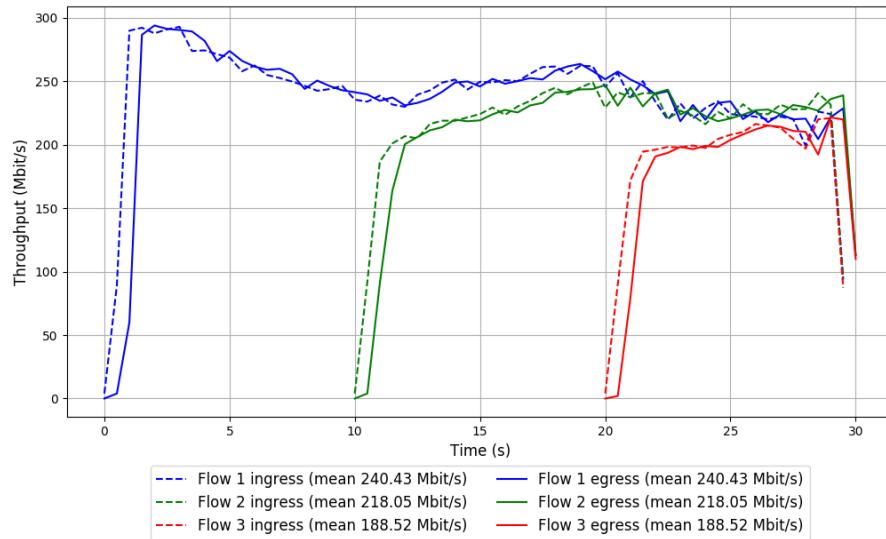


Run 2: Statistics of Indigo

```
Start at: 2018-09-06 01:27:40
End at: 2018-09-06 01:28:10
Local clock offset: 0.064 ms
Remote clock offset: 0.005 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 446.40 Mbit/s
95th percentile per-packet one-way delay: 51.832 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 240.43 Mbit/s
95th percentile per-packet one-way delay: 51.717 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 218.05 Mbit/s
95th percentile per-packet one-way delay: 51.741 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 188.52 Mbit/s
95th percentile per-packet one-way delay: 52.524 ms
Loss rate: 0.00%
```

## Run 2: Report of Indigo — Data Link

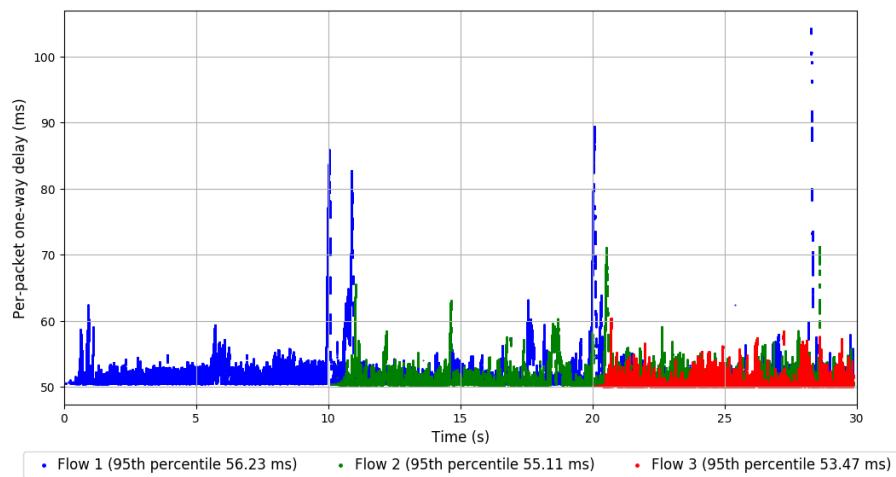
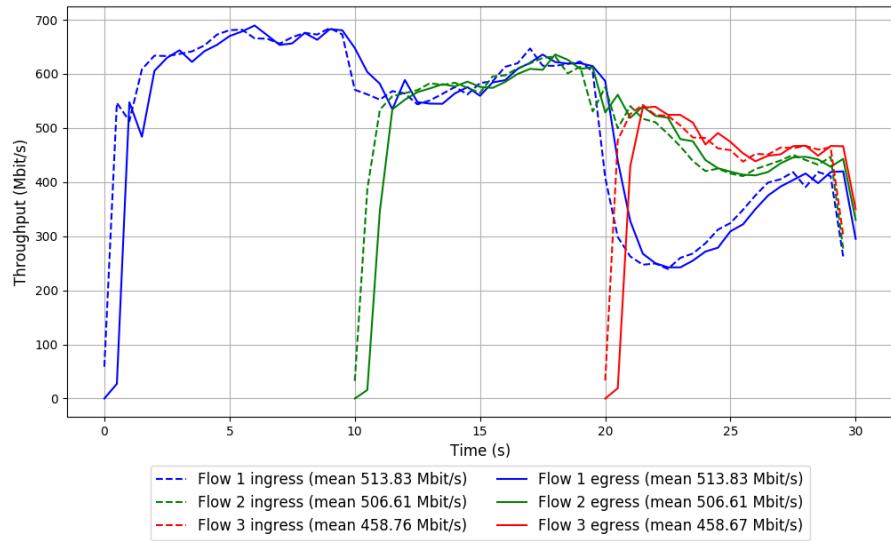


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-06 01:21:32
End at: 2018-09-06 01:22:02
Local clock offset: 0.074 ms
Remote clock offset: -0.009 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 999.90 Mbit/s
95th percentile per-packet one-way delay: 55.257 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 513.83 Mbit/s
95th percentile per-packet one-way delay: 56.227 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 506.61 Mbit/s
95th percentile per-packet one-way delay: 55.107 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 458.67 Mbit/s
95th percentile per-packet one-way delay: 53.473 ms
Loss rate: 0.01%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-06 01:29:30
End at: 2018-09-06 01:30:00
Local clock offset: -0.271 ms
Remote clock offset: -0.055 ms

# Below is generated by plot.py at 2018-09-06 01:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 937.17 Mbit/s
95th percentile per-packet one-way delay: 58.630 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 506.36 Mbit/s
95th percentile per-packet one-way delay: 59.670 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 446.75 Mbit/s
95th percentile per-packet one-way delay: 59.738 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 408.96 Mbit/s
95th percentile per-packet one-way delay: 54.374 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link

