

## Pantheon Report

Generated at 2018-09-05 04:54:28 (UTC).

Data path: GCE Sydney on `ens4` (*local*) → GCE London 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:

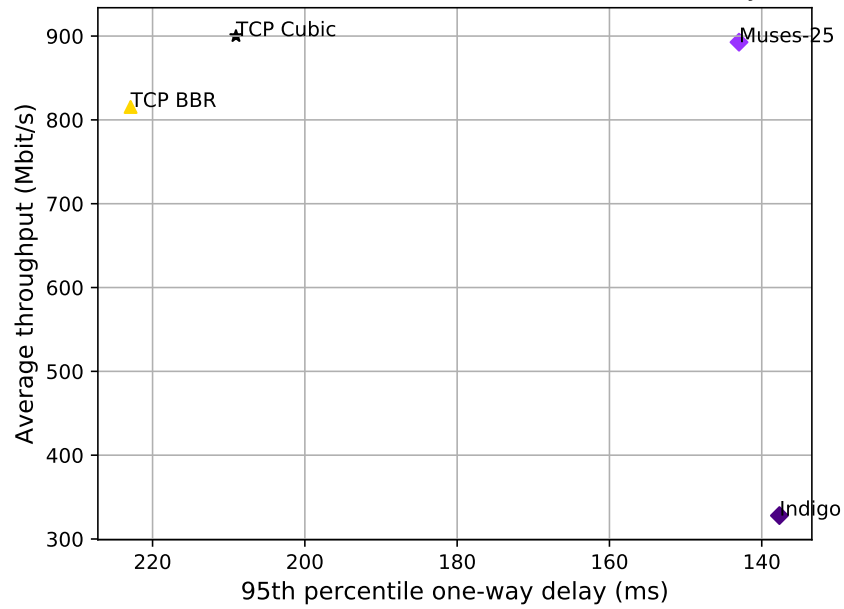
```
Linux 4.15.0-1018-gcp
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

### Git summary:

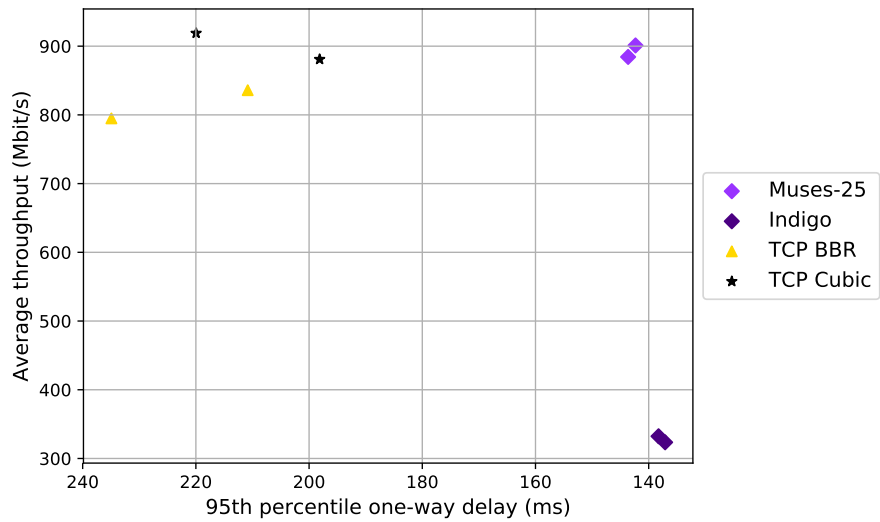
```
branch: muses @ 71e71e9a55b945431a7dea72180c1c9381097db9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecd90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 96fbc95fb38373d71fbc80c5a105e62e7636623b
third_party/pantheon-tunnel @ cbfce6db5ff5740d4fe1771f813cd646339e1952
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 Sydney to GCE London, 2 runs of 30s each per scheme  
3 flows with 10s interval between flows (mean of all runs by scheme)



test from GCE Sydney to GCE London, 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	473.71	376.09	274.93	233.72	197.11	187.65	0.91	0.35	0.07
TCP Cubic	2	504.64	434.29	318.97	202.84	238.77	194.39	0.21	0.17	0.19
Indigo	2	173.74	159.49	152.12	137.23	137.67	140.20	0.00	0.00	0.00
Muses-25	2	469.63	438.99	408.59	141.90	145.02	141.81	0.00	0.01	0.01



Run 1: Statistics of TCP BBR

Start at: 2018-09-05 04:22:25

End at: 2018-09-05 04:22:55

Local clock offset: 0.549 ms

Remote clock offset: 0.32 ms

# Below is generated by plot.py at 2018-09-05 04:53:54

# Datalink statistics

-- Total of 3 flows:

Average throughput: 835.94 Mbit/s

95th percentile per-packet one-way delay: 210.843 ms

Loss rate: 0.74%

-- Flow 1:

Average throughput: 474.68 Mbit/s

95th percentile per-packet one-way delay: 221.622 ms

Loss rate: 0.87%

-- Flow 2:

Average throughput: 397.21 Mbit/s

95th percentile per-packet one-way delay: 196.847 ms

Loss rate: 0.71%

-- Flow 3:

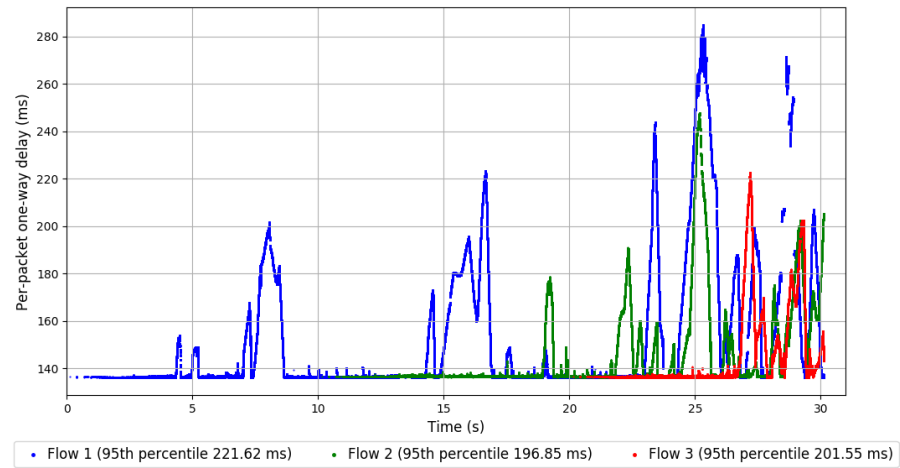
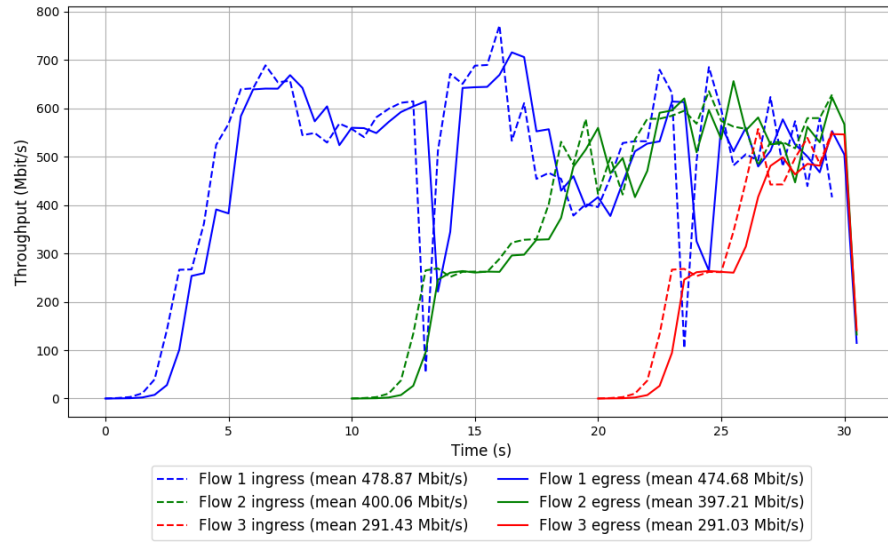
Average throughput: 291.03 Mbit/s

95th percentile per-packet one-way delay: 201.549 ms

Loss rate: 0.14%



# Run 1: Report of TCP BBR — Data Link





Run 2: Statistics of TCP BBR

Start at: 2018-09-05 04:30:56

End at: 2018-09-05 04:31:26

Local clock offset: 0.808 ms

Remote clock offset: 0.613 ms

# Below is generated by plot.py at 2018-09-05 04:53:54

# Datalink statistics

-- Total of 3 flows:

Average throughput: 794.91 Mbit/s

95th percentile per-packet one-way delay: 234.924 ms

Loss rate: 0.57%

-- Flow 1:

Average throughput: 472.74 Mbit/s

95th percentile per-packet one-way delay: 245.816 ms

Loss rate: 0.95%

-- Flow 2:

Average throughput: 354.97 Mbit/s

95th percentile per-packet one-way delay: 197.377 ms

Loss rate: 0.00%

-- Flow 3:

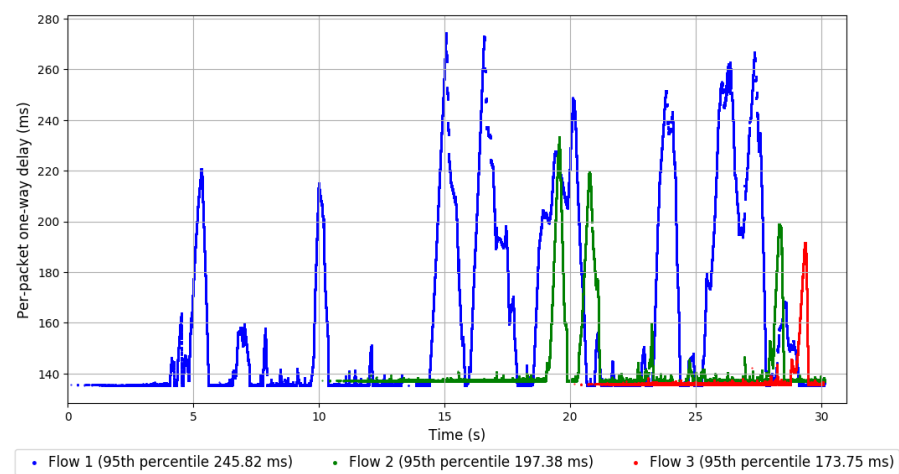
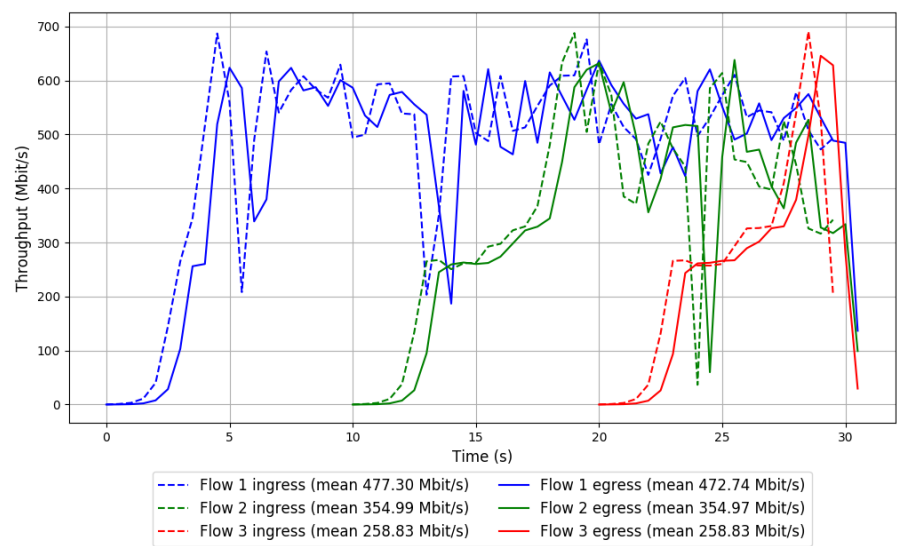
Average throughput: 258.83 Mbit/s

95th percentile per-packet one-way delay: 173.749 ms

Loss rate: 0.00%



Run 2: Report of TCP BBR — Data Link





Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 04:24:40

End at: 2018-09-05 04:25:10

Local clock offset: 0.65 ms

Remote clock offset: 0.117 ms

# Below is generated by plot.py at 2018-09-05 04:54:16

# Datalink statistics

-- Total of 3 flows:

Average throughput: 880.90 Mbit/s

95th percentile per-packet one-way delay: 198.139 ms

Loss rate: 0.14%

-- Flow 1:

Average throughput: 483.89 Mbit/s

95th percentile per-packet one-way delay: 190.940 ms

Loss rate: 0.25%

-- Flow 2:

Average throughput: 444.85 Mbit/s

95th percentile per-packet one-way delay: 231.141 ms

Loss rate: 0.01%

-- Flow 3:

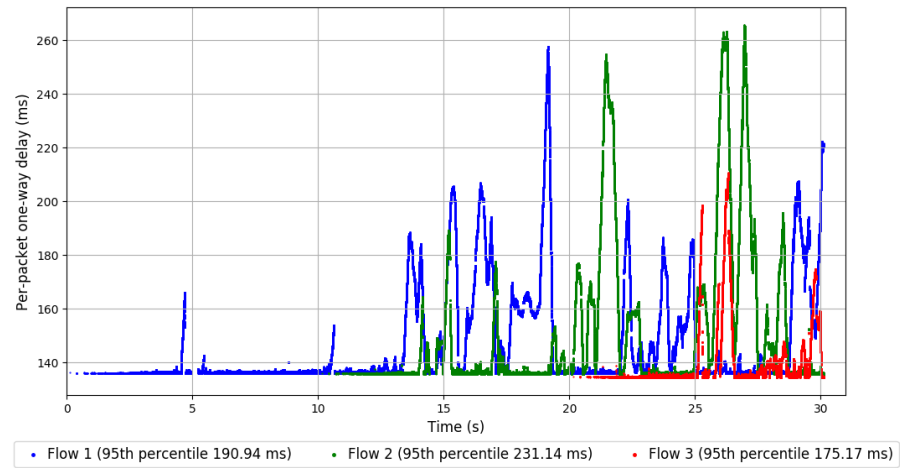
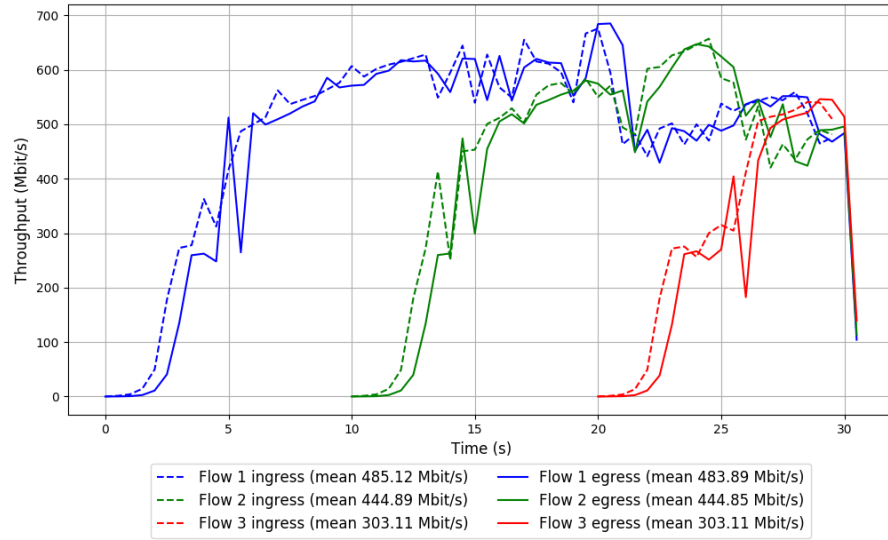
Average throughput: 303.11 Mbit/s

95th percentile per-packet one-way delay: 175.174 ms

Loss rate: 0.00%



# Run 1: Report of TCP Cubic — Data Link





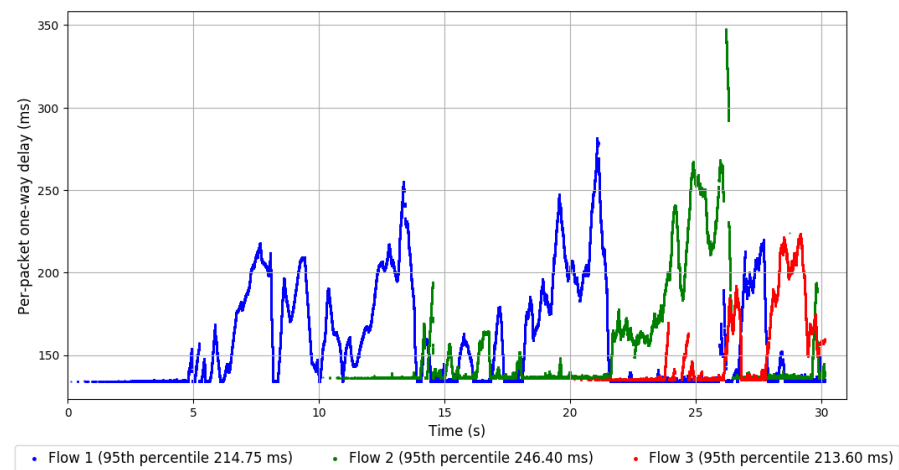
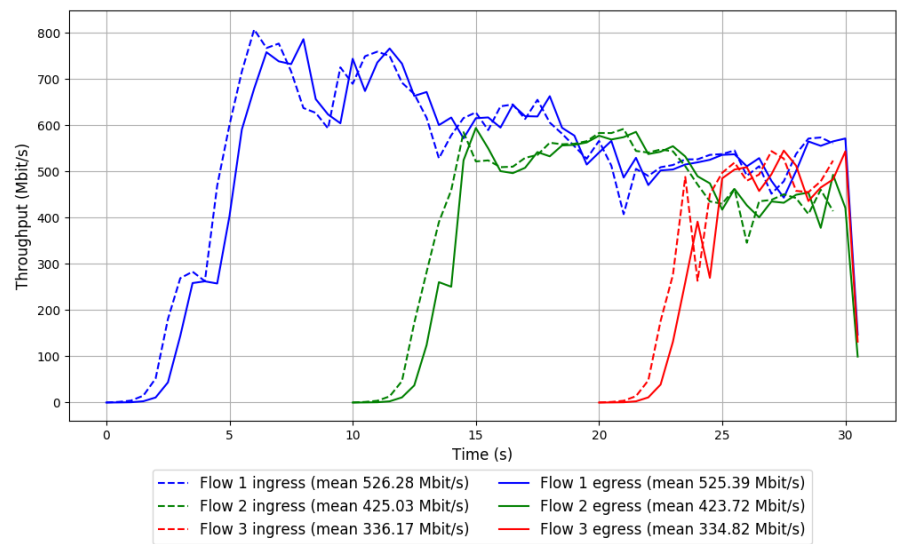
Run 2: Statistics of TCP Cubic

Start at: 2018-09-05 04:33:10  
End at: 2018-09-05 04:33:40  
Local clock offset: 1.004 ms  
Remote clock offset: -0.307 ms

# Below is generated by plot.py at 2018-09-05 04:54:26  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 918.94 Mbit/s  
95th percentile per-packet one-way delay: 219.954 ms  
Loss rate: 0.24%  
-- Flow 1:  
Average throughput: 525.39 Mbit/s  
95th percentile per-packet one-way delay: 214.746 ms  
Loss rate: 0.17%  
-- Flow 2:  
Average throughput: 423.72 Mbit/s  
95th percentile per-packet one-way delay: 246.399 ms  
Loss rate: 0.32%  
-- Flow 3:  
Average throughput: 334.82 Mbit/s  
95th percentile per-packet one-way delay: 213.602 ms  
Loss rate: 0.38%



Run 2: Report of TCP Cubic — Data Link





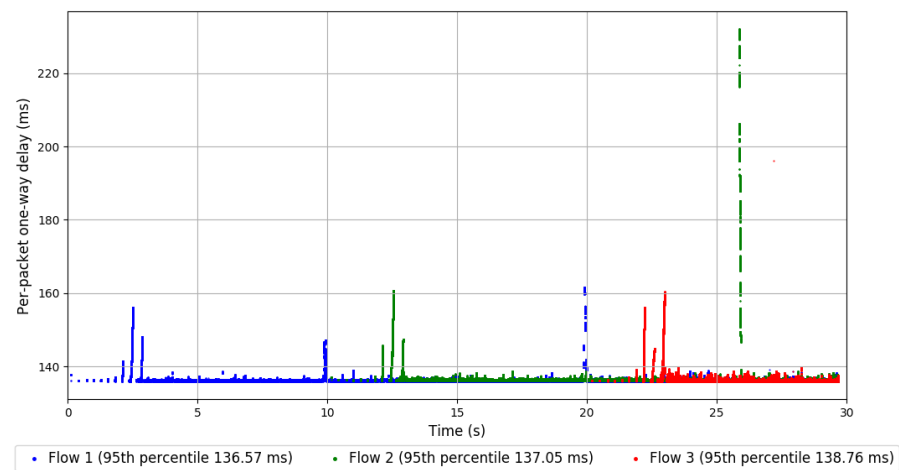
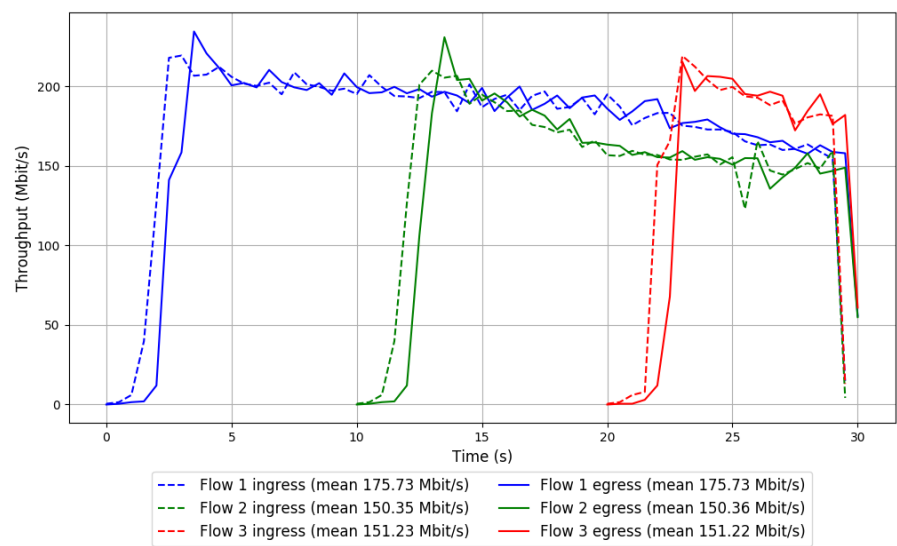
```
Run 1: Statistics of Indigo

Start at: 2018-09-05 04:29:01
End at: 2018-09-05 04:29:31
Local clock offset: 0.765 ms
Remote clock offset: 0.331 ms

# Below is generated by plot.py at 2018-09-05 04:54:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 323.53 Mbit/s
95th percentile per-packet one-way delay: 137.099 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 175.73 Mbit/s
95th percentile per-packet one-way delay: 136.575 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 150.36 Mbit/s
95th percentile per-packet one-way delay: 137.051 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 151.22 Mbit/s
95th percentile per-packet one-way delay: 138.763 ms
Loss rate: 0.00%
```



Run 1: Report of Indigo — Data Link





Run 2: Statistics of Indigo

Start at: 2018-09-05 04:37:36

End at: 2018-09-05 04:38:06

Local clock offset: 1.012 ms

Remote clock offset: 0.494 ms

# Below is generated by plot.py at 2018-09-05 04:54:26

# Datalink statistics

-- Total of 3 flows:

Average throughput: 332.34 Mbit/s

95th percentile per-packet one-way delay: 138.260 ms

Loss rate: 0.00%

-- Flow 1:

Average throughput: 171.74 Mbit/s

95th percentile per-packet one-way delay: 137.882 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 168.61 Mbit/s

95th percentile per-packet one-way delay: 138.287 ms

Loss rate: 0.00%

-- Flow 3:

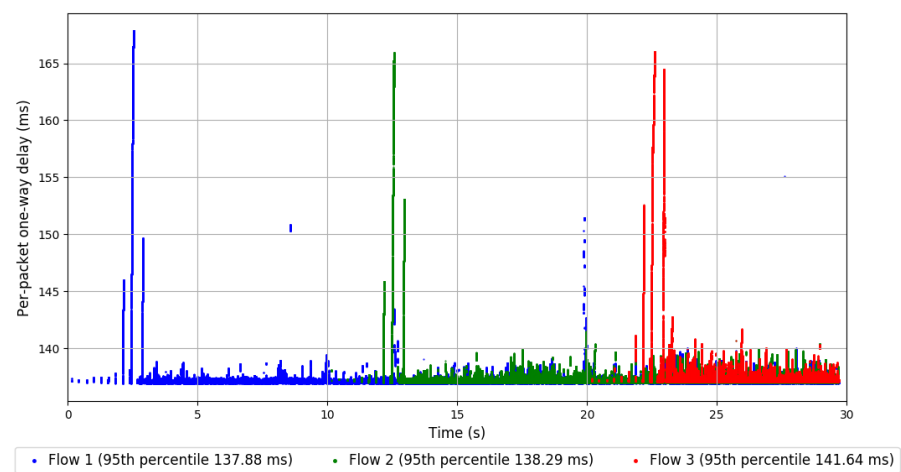
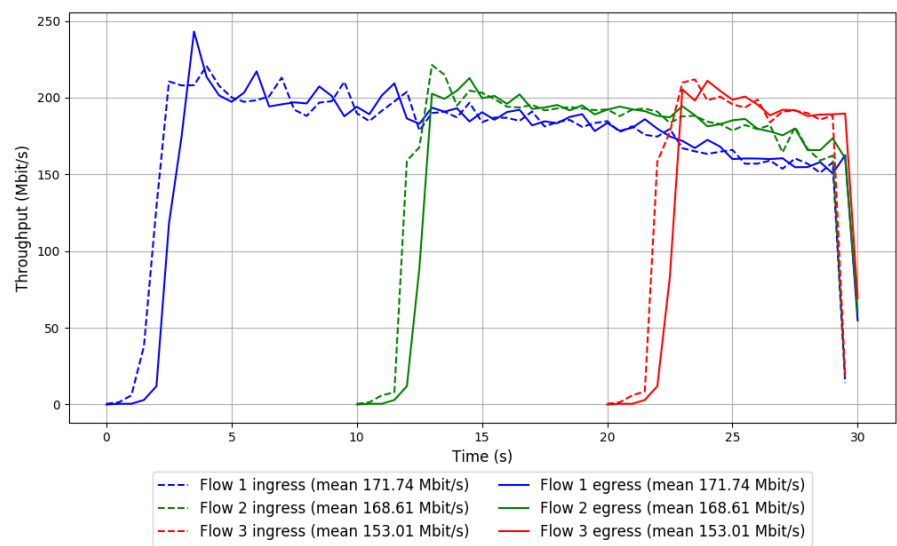
Average throughput: 153.01 Mbit/s

95th percentile per-packet one-way delay: 141.644 ms

Loss rate: 0.00%



Run 2: Report of Indigo — Data Link





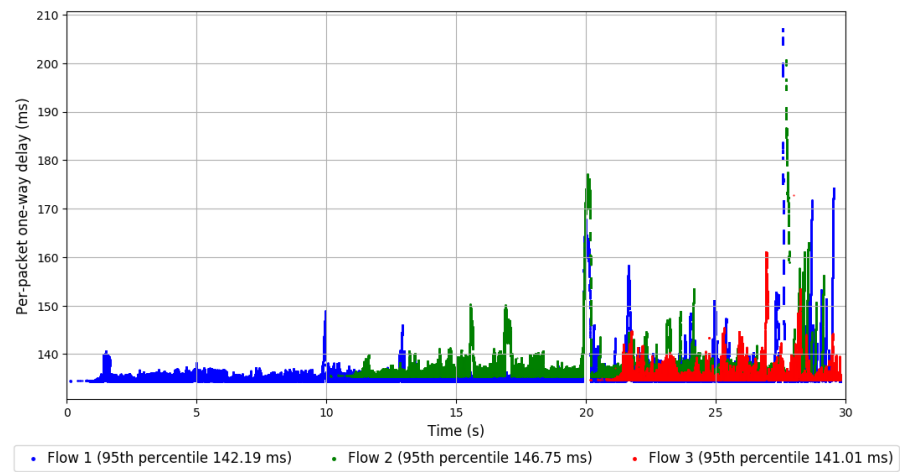
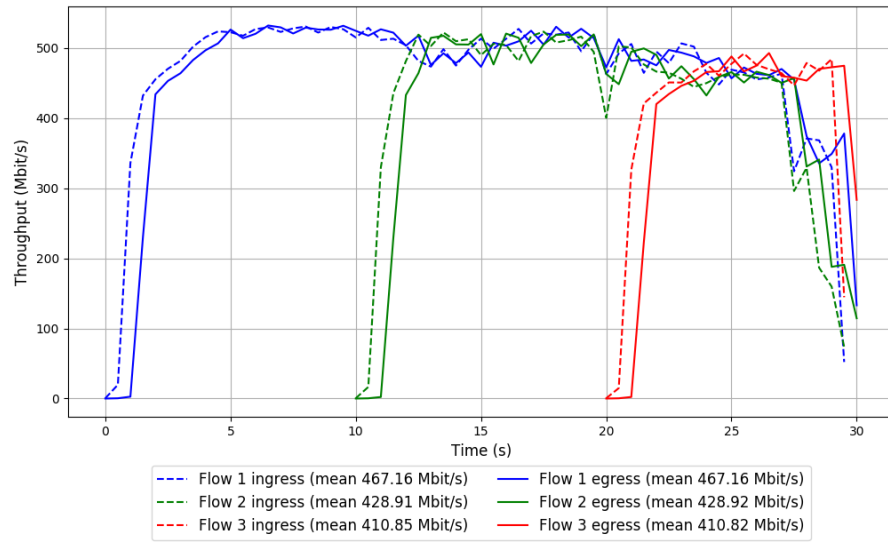
Run 1: Statistics of Muses-25

Start at: 2018-09-05 04:26:51  
End at: 2018-09-05 04:27:21  
Local clock offset: 0.74 ms  
Remote clock offset: -1.028 ms

# Below is generated by plot.py at 2018-09-05 04:54:26  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 884.34 Mbit/s  
95th percentile per-packet one-way delay: 143.637 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 467.16 Mbit/s  
95th percentile per-packet one-way delay: 142.187 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 428.92 Mbit/s  
95th percentile per-packet one-way delay: 146.746 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 410.82 Mbit/s  
95th percentile per-packet one-way delay: 141.009 ms  
Loss rate: 0.01%



# Run 1: Report of Muses-25 — Data Link





Run 2: Statistics of Muses-25

Start at: 2018-09-05 04:35:24  
End at: 2018-09-05 04:35:54  
Local clock offset: 0.877 ms  
Remote clock offset: -0.377 ms

# Below is generated by plot.py at 2018-09-05 04:54:26  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 901.05 Mbit/s  
95th percentile per-packet one-way delay: 142.331 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 472.11 Mbit/s  
95th percentile per-packet one-way delay: 141.615 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 449.06 Mbit/s  
95th percentile per-packet one-way delay: 143.299 ms  
Loss rate: 0.01%  
-- Flow 3:  
Average throughput: 406.35 Mbit/s  
95th percentile per-packet one-way delay: 142.608 ms  
Loss rate: 0.00%



## Run 2: Report of Muses-25 — Data Link

