Pantheon Report

Generated at 2018-08-28 10:21:54 (UTC).

Data path: Colombia on `p4p1` (*remote*) →AWS Brazil 2 on `ens5` (*local*).

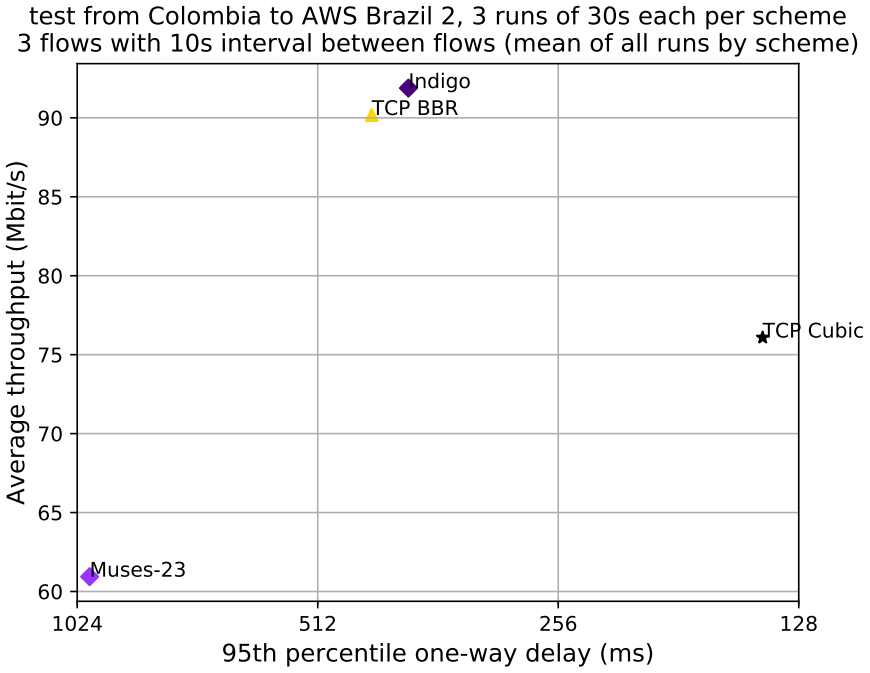
Repeated the test of 4 congestion control schemes 3 times.

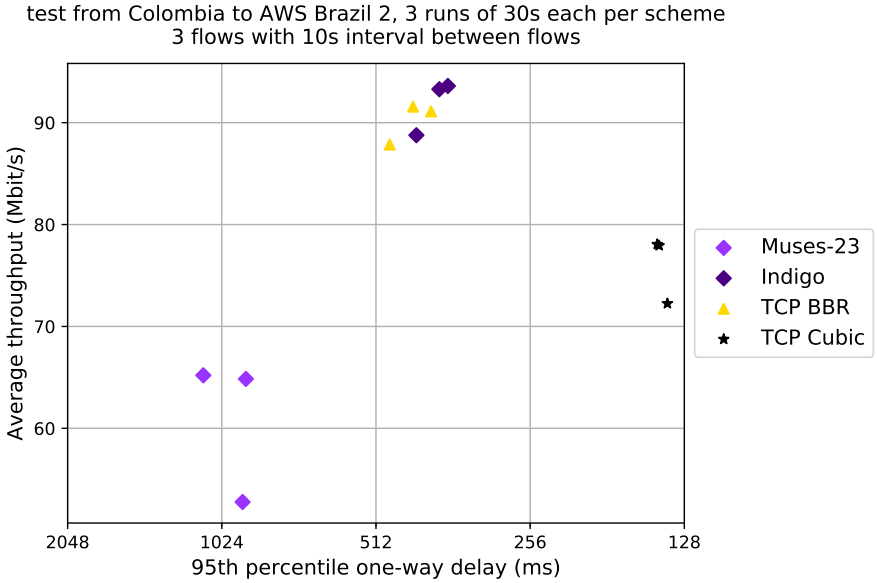
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

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

Git summary:
branch: muses-23 @ 88af05c5b0b7531637ca401951507a2fde628df6
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
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 Colombia to AWS Brazil 2, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)
Indigo
TCP BBR
TCP Cubic
Muses-23
Average throughput (Mbit/s)
90
85
80
75
70
65
60
1024
512
256
128
95th percentile one-way delay (ms)


test from Colombia to AWS Brazil 2, 3 runs of 30s each per scheme
3 flows with 10s interval between flows
Average throughput (Mbit/s)
90
80
70
60
2048
1024
512
256
128
95th percentile one-way delay (ms)
Muses-23
Indigo
TCP BBR
TCP Cubic

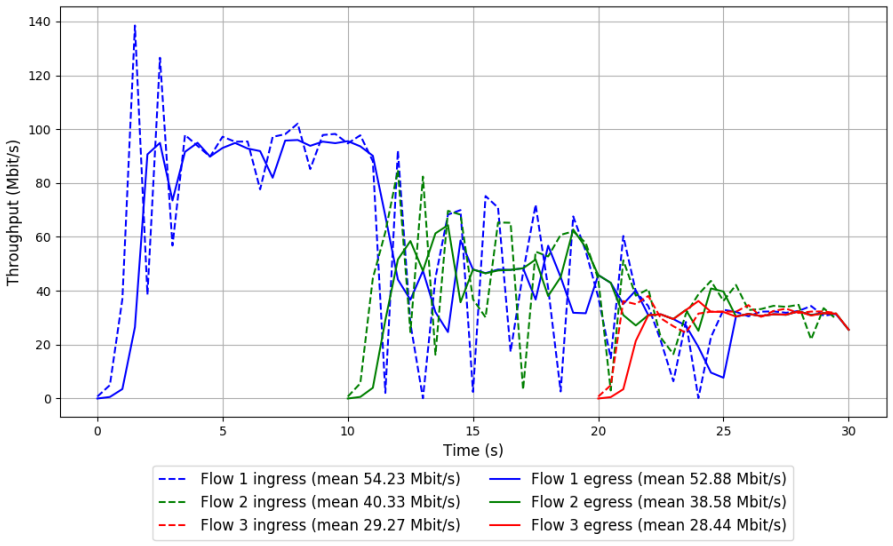
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	55.10	38.46	29.02	408.01	546.57	399.18	2.92	4.60	3.87
TCP Cubic	3	43.18	34.53	30.33	159.10	128.90	151.08	0.39	0.75	1.78
Indigo	3	57.41	37.88	28.77	416.65	140.94	136.79	6.59	1.50	2.74
Muses-23	3	35.49	27.99	21.76	811.40	1112.75	1033.37	21.33	47.15	59.97

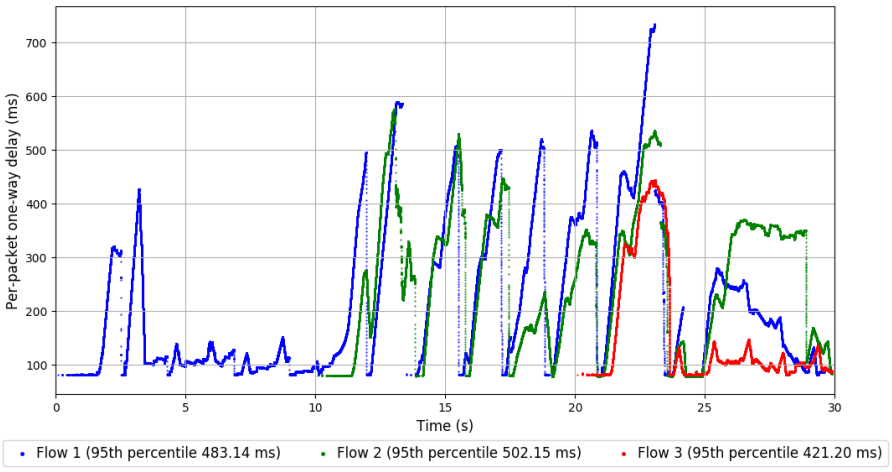
```
Run 1: Statistics of TCP BBR

Start at: 2018-08-28 10:09:17
End at: 2018-08-28 10:09:47
Local clock offset: 1.186 ms
Remote clock offset: 1.736 ms

# Below is generated by plot.py at 2018-08-28 10:21:20
# Datalink statistics
-- Total of 3 flows:
Average throughput: 87.85 Mbit/s
95th percentile per-packet one-way delay: 481.353 ms
Loss rate: 3.80%
-- Flow 1:
Average throughput: 52.88 Mbit/s
95th percentile per-packet one-way delay: 483.145 ms
Loss rate: 3.04%
-- Flow 2:
Average throughput: 38.58 Mbit/s
95th percentile per-packet one-way delay: 502.147 ms
Loss rate: 5.11%
-- Flow 3:
Average throughput: 28.44 Mbit/s
95th percentile per-packet one-way delay: 421.204 ms
Loss rate: 4.46%
```

Run 1: Report of TCP BBR — Data Link



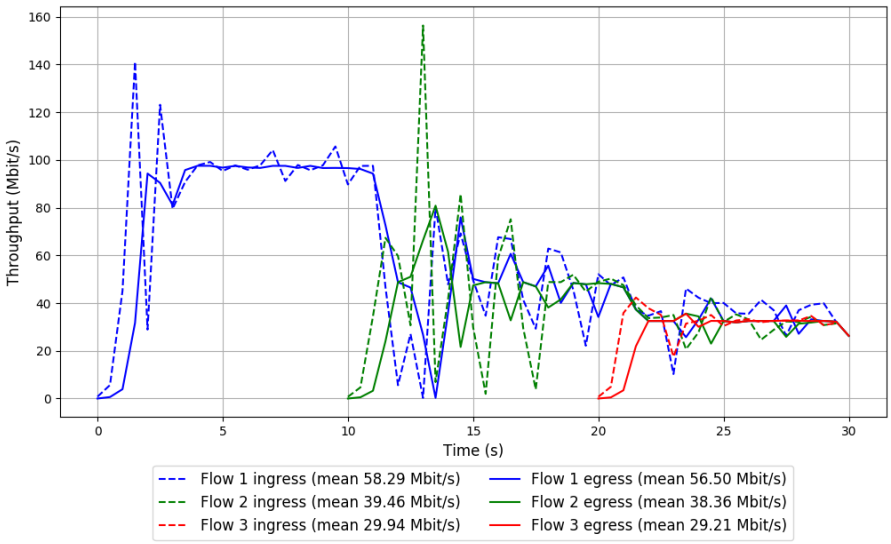


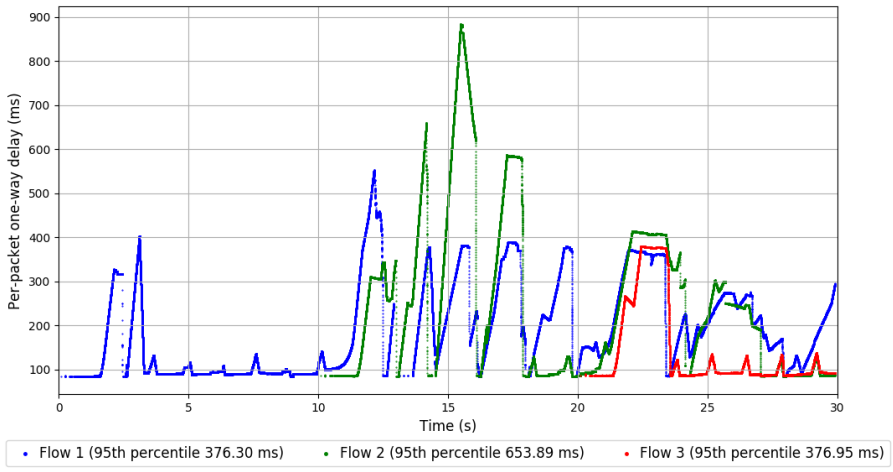
```
Run 2: Statistics of TCP BBR

Start at: 2018-08-28 10:14:19
End at: 2018-08-28 10:14:49
Local clock offset: 1.163 ms
Remote clock offset: -3.402 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 91.57 Mbit/s
95th percentile per-packet one-way delay: 433.445 ms
Loss rate: 3.64%
-- Flow 1:
Average throughput: 56.50 Mbit/s
95th percentile per-packet one-way delay: 376.303 ms
Loss rate: 3.60%
-- Flow 2:
Average throughput: 38.36 Mbit/s
95th percentile per-packet one-way delay: 653.891 ms
Loss rate: 3.58%
-- Flow 3:
Average throughput: 29.21 Mbit/s
95th percentile per-packet one-way delay: 376.955 ms
Loss rate: 4.07%
```

Run 2: Report of TCP BBR — Data Link



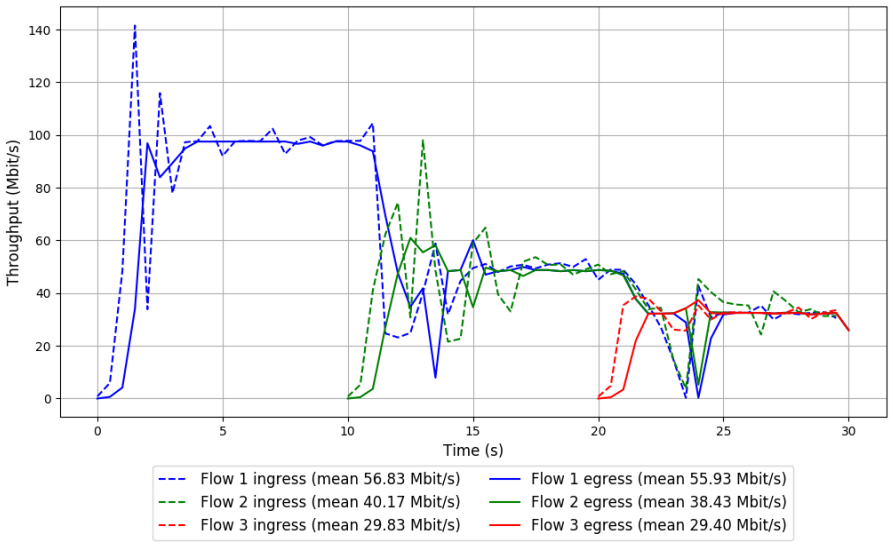


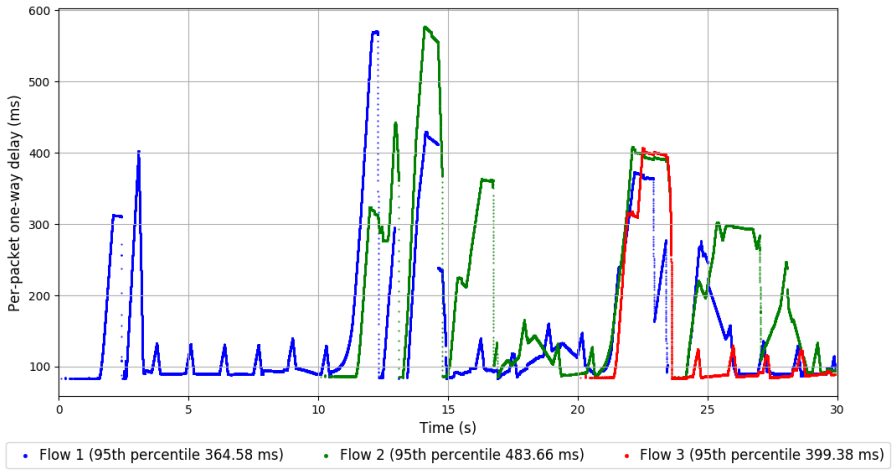
```
Run 3: Statistics of TCP BBR

Start at: 2018-08-28 10:19:21
End at: 2018-08-28 10:19:51
Local clock offset: 2.22 ms
Remote clock offset: -3.58 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 91.11 Mbit/s
95th percentile per-packet one-way delay: 399.794 ms
Loss rate: 3.07%
-- Flow 1:
Average throughput: 55.93 Mbit/s
95th percentile per-packet one-way delay: 364.576 ms
Loss rate: 2.11%
-- Flow 2:
Average throughput: 38.43 Mbit/s
95th percentile per-packet one-way delay: 483.659 ms
Loss rate: 5.11%
-- Flow 3:
Average throughput: 29.40 Mbit/s
95th percentile per-packet one-way delay: 399.384 ms
Loss rate: 3.07%
```

Run 3: Report of TCP BBR — Data Link



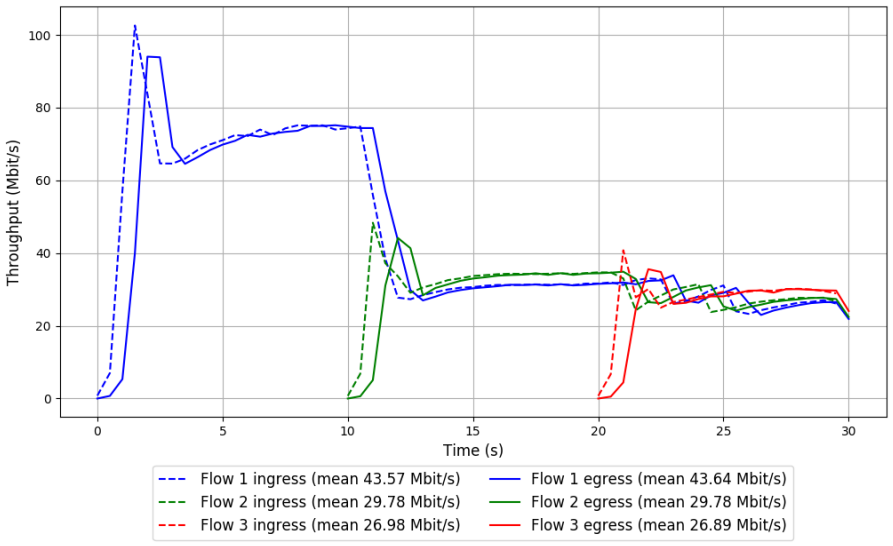


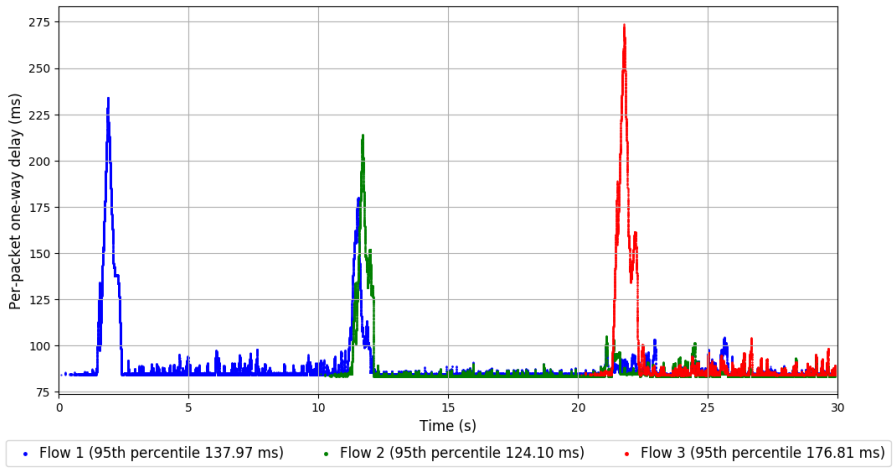
```
Run 1: Statistics of TCP Cubic

Start at: 2018-08-28 10:06:47
End at: 2018-08-28 10:07:17
Local clock offset: -0.335 ms
Remote clock offset: -3.176 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 72.25 Mbit/s
95th percentile per-packet one-way delay: 138.131 ms
Loss rate: 0.71%
-- Flow 1:
Average throughput: 43.64 Mbit/s
95th percentile per-packet one-way delay: 137.965 ms
Loss rate: 0.39%
-- Flow 2:
Average throughput: 29.78 Mbit/s
95th percentile per-packet one-way delay: 124.099 ms
Loss rate: 0.82%
-- Flow 3:
Average throughput: 26.89 Mbit/s
95th percentile per-packet one-way delay: 176.811 ms
Loss rate: 1.99%
```

Run 1: Report of TCP Cubic — Data Link



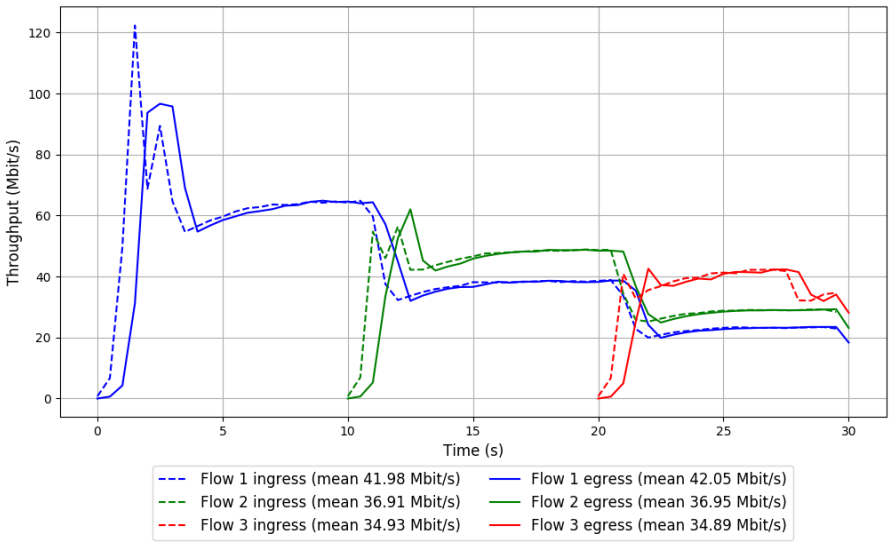


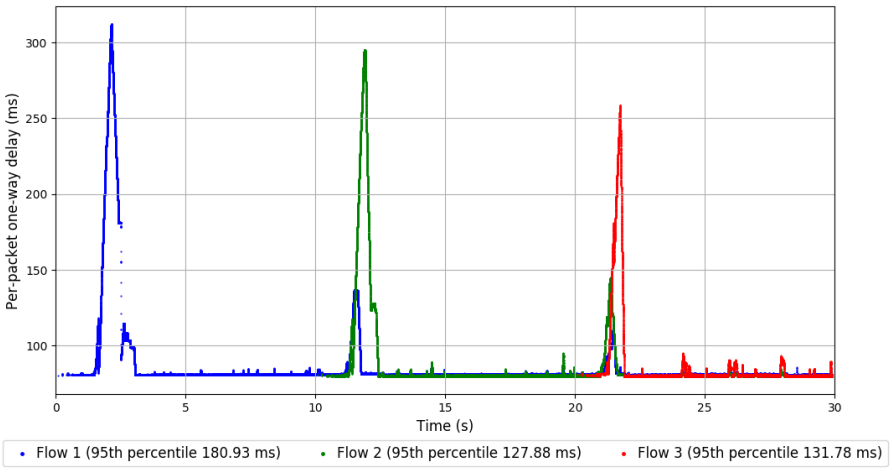
```
Run 2: Statistics of TCP Cubic

Start at: 2018-08-28 10:11:48
End at: 2018-08-28 10:12:18
Local clock offset: 0.865 ms
Remote clock offset: 1.706 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 78.06 Mbit/s
95th percentile per-packet one-way delay: 144.593 ms
Loss rate: 0.70%
-- Flow 1:
Average throughput: 42.05 Mbit/s
95th percentile per-packet one-way delay: 180.926 ms
Loss rate: 0.40%
-- Flow 2:
Average throughput: 36.95 Mbit/s
95th percentile per-packet one-way delay: 127.878 ms
Loss rate: 0.72%
-- Flow 3:
Average throughput: 34.89 Mbit/s
95th percentile per-packet one-way delay: 131.779 ms
Loss rate: 1.76%
```

Run 2: Report of TCP Cubic — Data Link



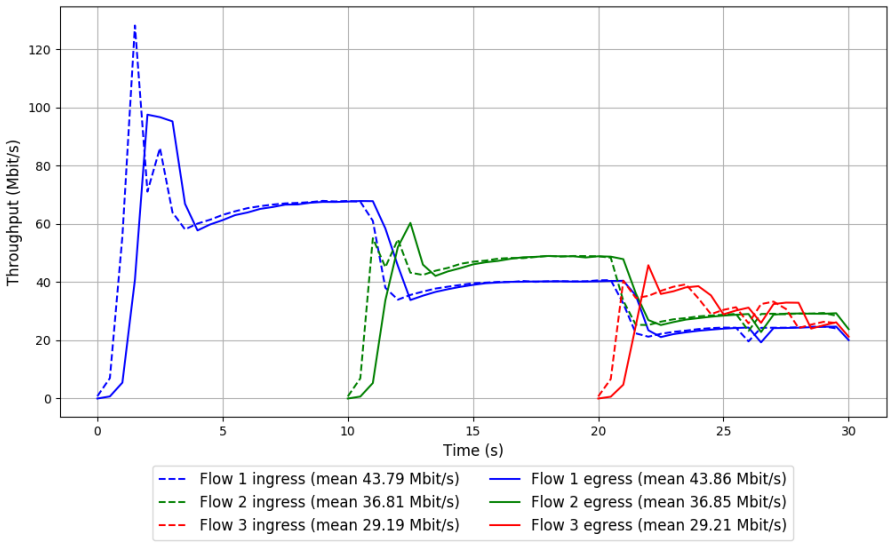


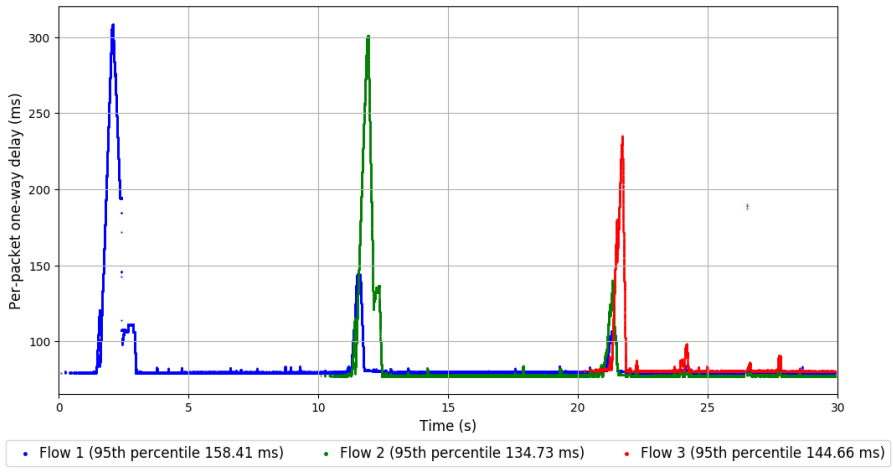
```
Run 3: Statistics of TCP Cubic

Start at: 2018-08-28 10:16:50
End at: 2018-08-28 10:17:20
Local clock offset: 1.27 ms
Remote clock offset: 1.591 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 77.94 Mbit/s
95th percentile per-packet one-way delay: 143.374 ms
Loss rate: 0.63%
-- Flow 1:
Average throughput: 43.86 Mbit/s
95th percentile per-packet one-way delay: 158.414 ms
Loss rate: 0.37%
-- Flow 2:
Average throughput: 36.85 Mbit/s
95th percentile per-packet one-way delay: 134.731 ms
Loss rate: 0.71%
-- Flow 3:
Average throughput: 29.21 Mbit/s
95th percentile per-packet one-way delay: 144.663 ms
Loss rate: 1.59%
```

Run 3: Report of TCP Cubic — Data Link



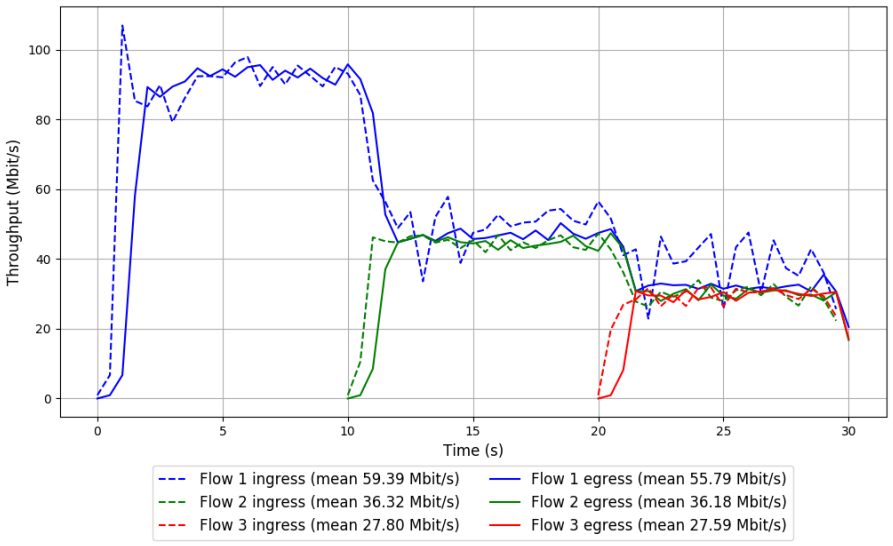


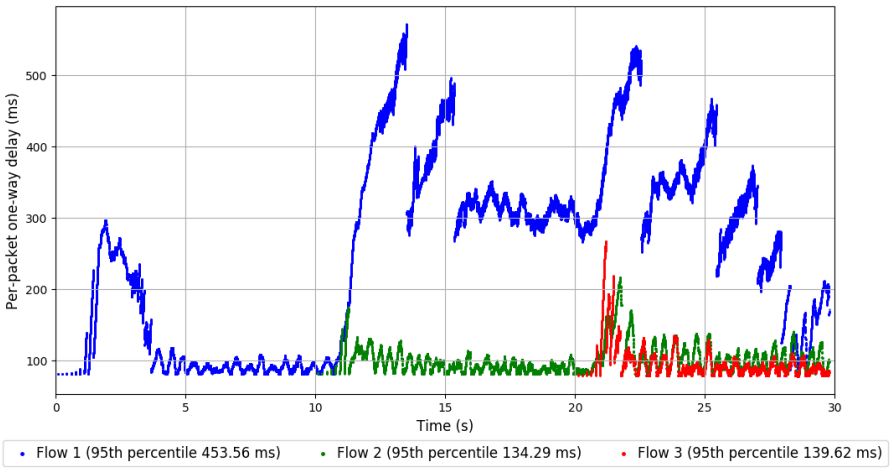
```
Run 1: Statistics of Indigo

Start at: 2018-08-28 10:08:01
End at: 2018-08-28 10:08:31
Local clock offset: 1.113 ms
Remote clock offset: 1.749 ms

# Below is generated by plot.py at 2018-08-28 10:21:23
# Datalink statistics
-- Total of 3 flows:
Average throughput: 88.77 Mbit/s
95th percentile per-packet one-way delay: 426.956 ms
Loss rate: 4.77%
-- Flow 1:
Average throughput: 55.79 Mbit/s
95th percentile per-packet one-way delay: 453.561 ms
Loss rate: 6.57%
-- Flow 2:
Average throughput: 36.18 Mbit/s
95th percentile per-packet one-way delay: 134.288 ms
Loss rate: 1.21%
-- Flow 3:
Average throughput: 27.59 Mbit/s
95th percentile per-packet one-way delay: 139.623 ms
Loss rate: 2.41%
```

Run 1: Report of Indigo — Data Link



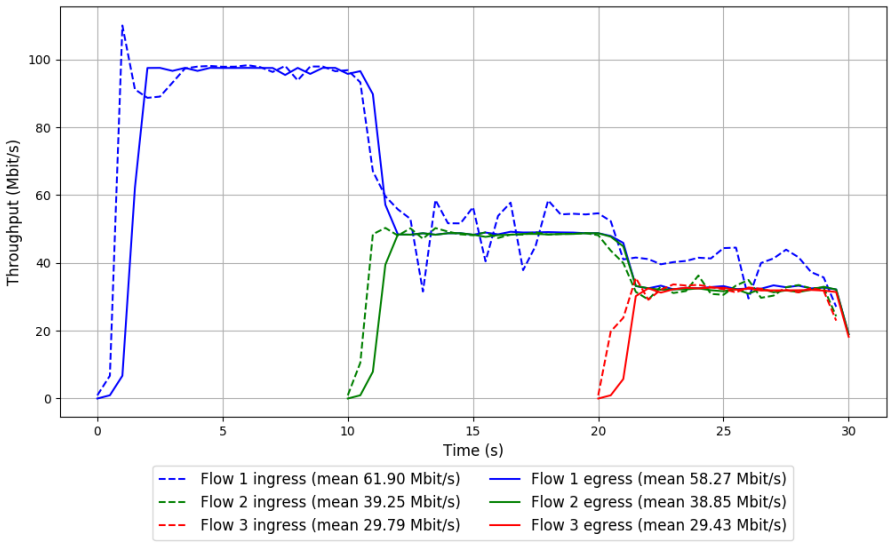


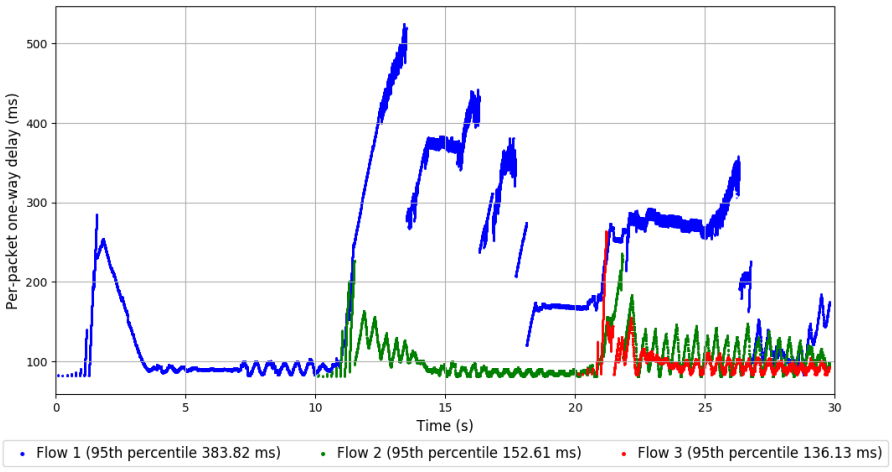
```
Run 2: Statistics of Indigo

Start at: 2018-08-28 10:13:02
End at: 2018-08-28 10:13:32
Local clock offset: 0.272 ms
Remote clock offset: -2.227 ms

# Below is generated by plot.py at 2018-08-28 10:21:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 93.60 Mbit/s
95th percentile per-packet one-way delay: 370.625 ms
Loss rate: 4.81%
-- Flow 1:
Average throughput: 58.27 Mbit/s
95th percentile per-packet one-way delay: 383.823 ms
Loss rate: 6.37%
-- Flow 2:
Average throughput: 38.85 Mbit/s
95th percentile per-packet one-way delay: 152.607 ms
Loss rate: 1.85%
-- Flow 3:
Average throughput: 29.43 Mbit/s
95th percentile per-packet one-way delay: 136.135 ms
Loss rate: 2.85%
```

Run 2: Report of Indigo — Data Link



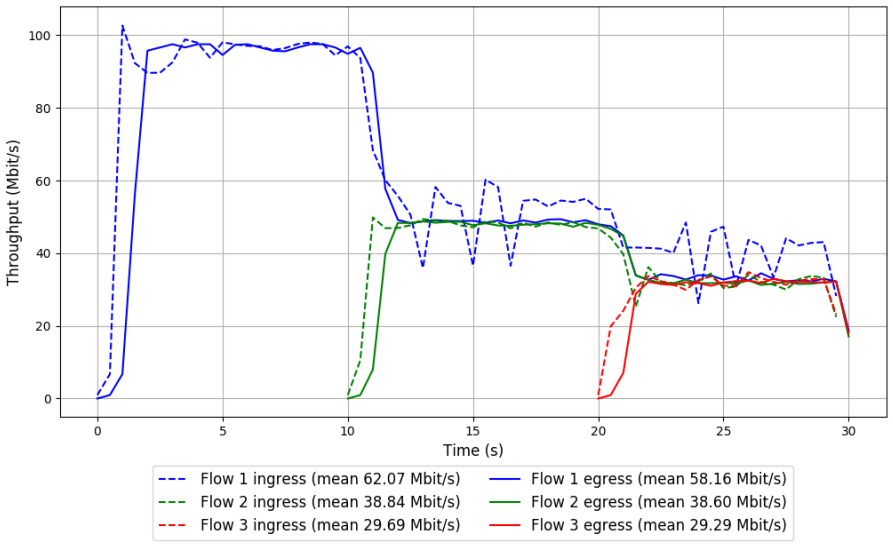


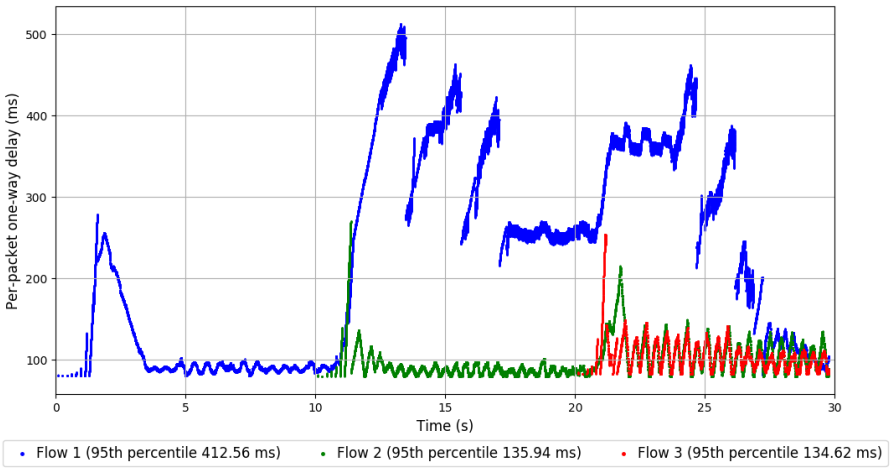
```
Run 3: Statistics of Indigo

Start at: 2018-08-28 10:18:05
End at: 2018-08-28 10:18:35
Local clock offset: 1.417 ms
Remote clock offset: 0.468 ms

# Below is generated by plot.py at 2018-08-28 10:21:47
# Datalink statistics
-- Total of 3 flows:
Average throughput: 93.28 Mbit/s
95th percentile per-packet one-way delay: 385.109 ms
Loss rate: 5.01%
-- Flow 1:
Average throughput: 58.16 Mbit/s
95th percentile per-packet one-way delay: 412.555 ms
Loss rate: 6.82%
-- Flow 2:
Average throughput: 38.60 Mbit/s
95th percentile per-packet one-way delay: 135.939 ms
Loss rate: 1.43%
-- Flow 3:
Average throughput: 29.29 Mbit/s
95th percentile per-packet one-way delay: 134.620 ms
Loss rate: 2.96%
```

Run 3: Report of Indigo — Data Link



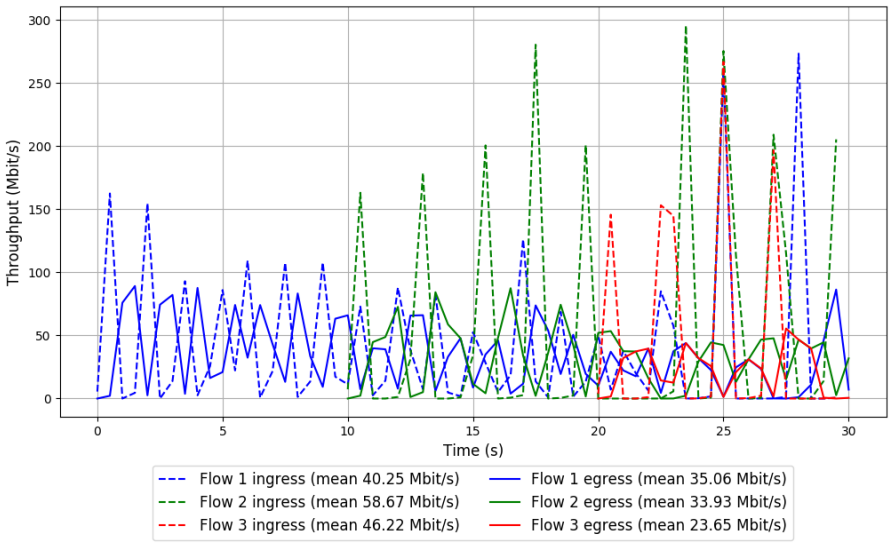


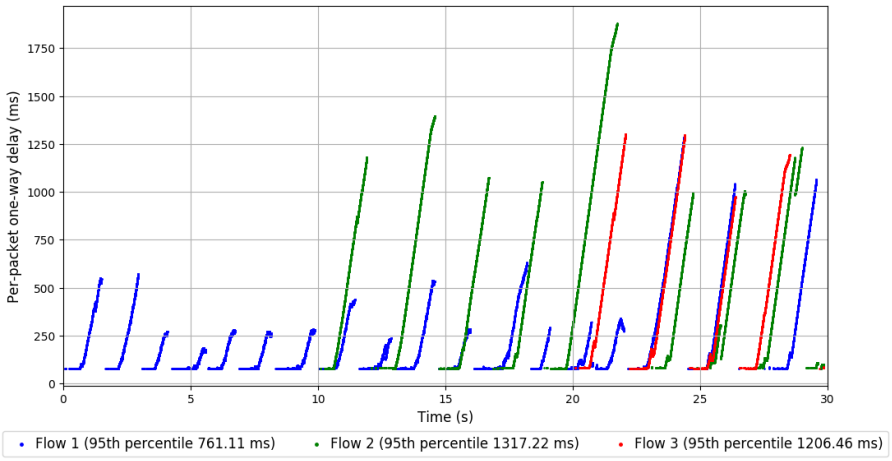
```
Run 1: Statistics of Muses-23

Start at: 2018-08-28 10:05:32
End at: 2018-08-28 10:06:02
Local clock offset: -0.238 ms
Remote clock offset: 0.796 ms

# Below is generated by plot.py at 2018-08-28 10:21:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 65.20 Mbit/s
95th percentile per-packet one-way delay: 1112.635 ms
Loss rate: 31.34%
-- Flow 1:
Average throughput: 35.06 Mbit/s
95th percentile per-packet one-way delay: 761.113 ms
Loss rate: 13.32%
-- Flow 2:
Average throughput: 33.93 Mbit/s
95th percentile per-packet one-way delay: 1317.224 ms
Loss rate: 42.64%
-- Flow 3:
Average throughput: 23.65 Mbit/s
95th percentile per-packet one-way delay: 1206.463 ms
Loss rate: 49.69%
```

Run 1: Report of Muses-23 — Data Link



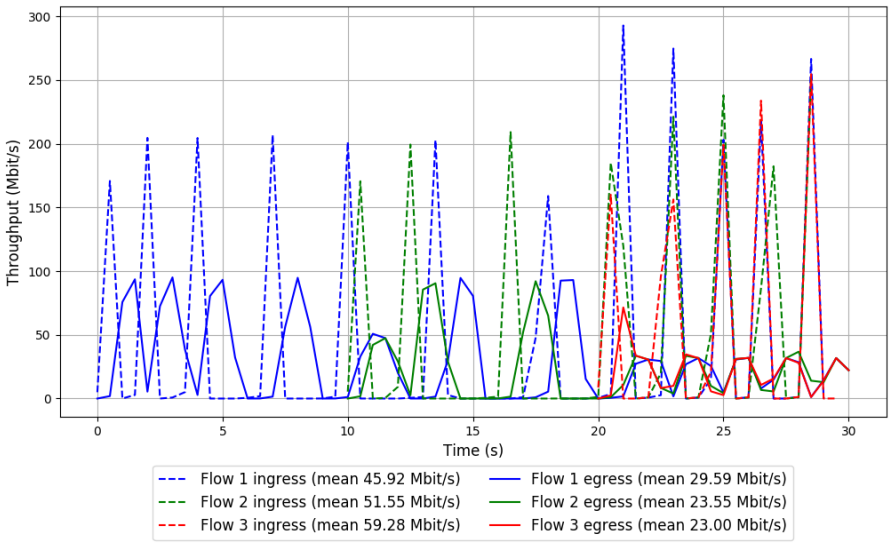


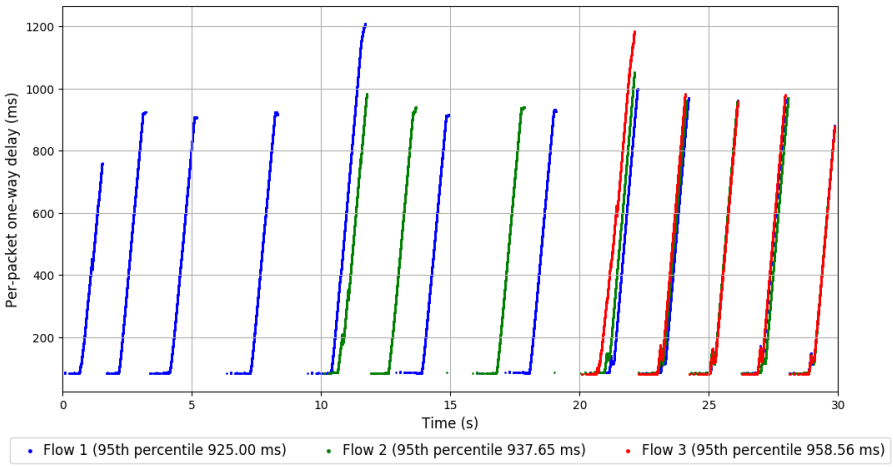
```
Run 2: Statistics of Muses-23

Start at: 2018-08-28 10:10:33
End at: 2018-08-28 10:11:03
Local clock offset: 0.676 ms
Remote clock offset: -3.258 ms

# Below is generated by plot.py at 2018-08-28 10:21:52
# Datalink statistics
-- Total of 3 flows:
Average throughput: 52.77 Mbit/s
95th percentile per-packet one-way delay: 932.584 ms
Loss rate: 45.74%
-- Flow 1:
Average throughput: 29.59 Mbit/s
95th percentile per-packet one-way delay: 925.001 ms
Loss rate: 34.76%
-- Flow 2:
Average throughput: 23.55 Mbit/s
95th percentile per-packet one-way delay: 937.650 ms
Loss rate: 52.42%
-- Flow 3:
Average throughput: 23.00 Mbit/s
95th percentile per-packet one-way delay: 958.564 ms
Loss rate: 60.37%
```

Run 2: Report of Muses-23 — Data Link





```
Run 3: Statistics of Muses-23

Start at: 2018-08-28 10:15:35
End at: 2018-08-28 10:16:05
Local clock offset: 2.03 ms
Remote clock offset: -2.331 ms

# Below is generated by plot.py at 2018-08-28 10:21:53
# Datalink statistics
-- Total of 3 flows:
Average throughput: 64.85 Mbit/s
95th percentile per-packet one-way delay: 918.753 ms
Loss rate: 36.35%
-- Flow 1:
Average throughput: 41.82 Mbit/s
95th percentile per-packet one-way delay: 748.091 ms
Loss rate: 15.90%
-- Flow 2:
Average throughput: 26.48 Mbit/s
95th percentile per-packet one-way delay: 1083.381 ms
Loss rate: 46.40%
-- Flow 3:
Average throughput: 18.64 Mbit/s
95th percentile per-packet one-way delay: 935.075 ms
Loss rate: 69.84%
```

Run 3: Report of Muses-23 — Data Link