Pantheon Report

Generated at 2018-08-28 09:19:37 (UTC).

Data path: AWS Brazil 1 on `ens5` (*local*) →Brazil on `p4p1` (*remote*).

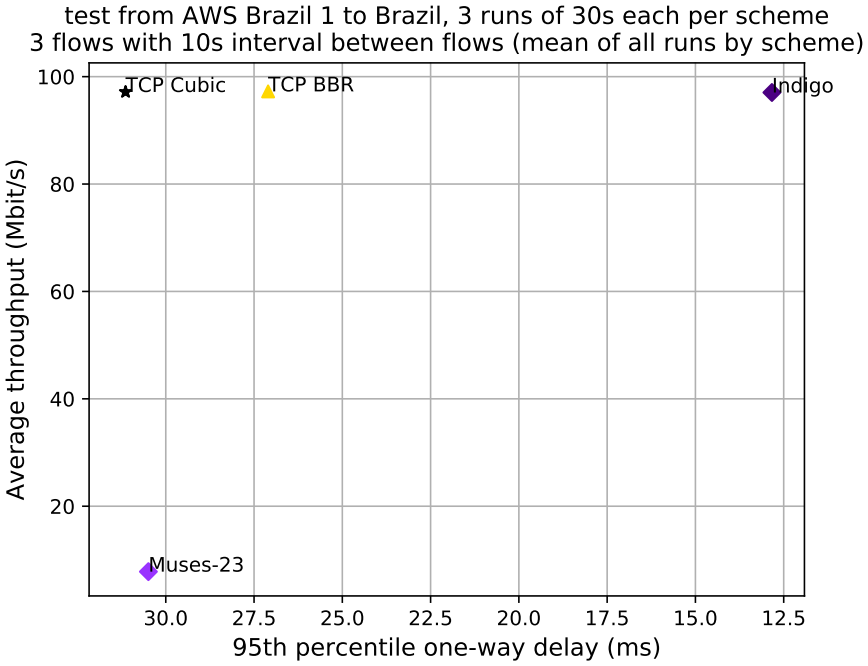
Repeated the test of 4 congestion control schemes 3 times.

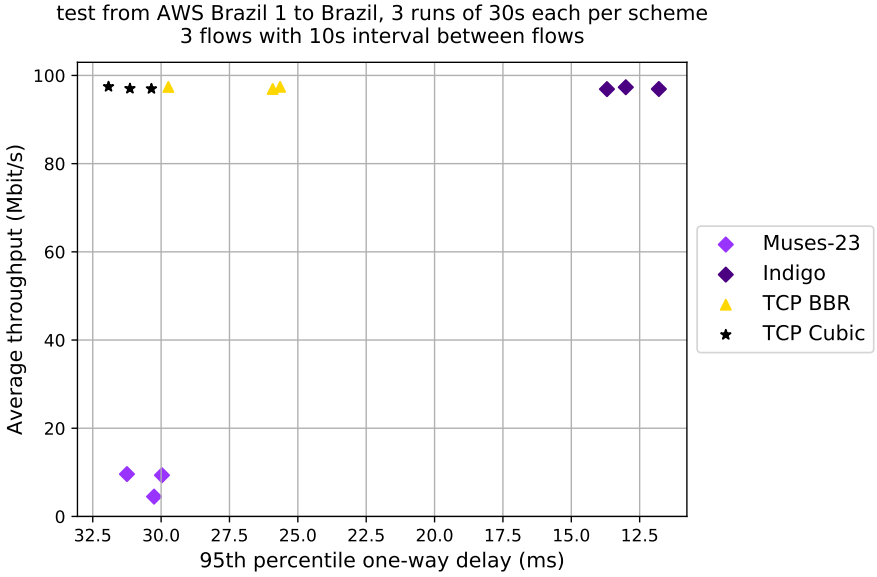
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

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 AWS Brazil 1 to Brazil, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)
TCP Cubic
TCP BBR
Indigo
Muses-23
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
100
80
60
40
20
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5


test from AWS Brazil 1 to Brazil, 3 runs of 30s each per scheme
3 flows with 10s interval between flows
Muses-23
Indigo
TCP BBR
TCP Cubic
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
100
80
60
40
20
0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5

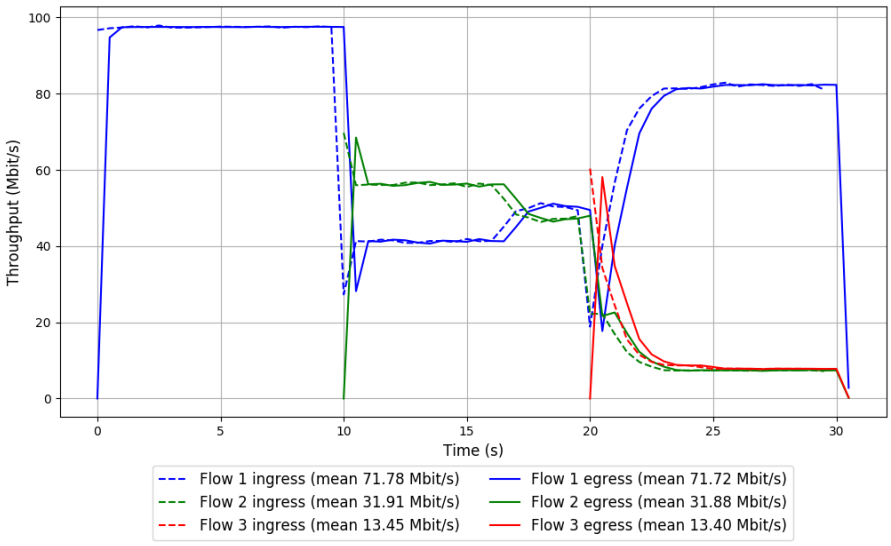
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	72.35	30.74	13.31	27.13	25.74	30.01	0.01	0.01	0.24
TCP Cubic	3	65.21	35.67	24.67	30.92	31.37	30.96	0.05	0.04	0.06
Indigo	3	45.74	47.23	61.38	10.96	13.09	12.56	0.00	0.00	0.00
Muses-23	3	3.91	4.08	3.91	19.88	29.35	27.48	52.54	41.50	50.69

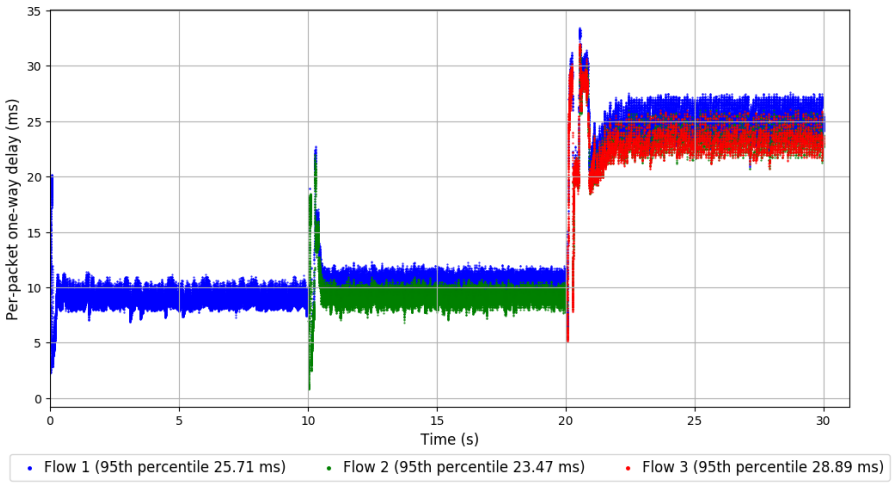
```
Run 1: Statistics of TCP BBR

Start at: 2018-08-28 09:05:16
End at: 2018-08-28 09:05:46
Local clock offset: -1.224 ms
Remote clock offset: 0.027 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.43 Mbit/s
95th percentile per-packet one-way delay: 25.649 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 71.72 Mbit/s
95th percentile per-packet one-way delay: 25.715 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 31.88 Mbit/s
95th percentile per-packet one-way delay: 23.467 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 13.40 Mbit/s
95th percentile per-packet one-way delay: 28.891 ms
Loss rate: 0.17%
```

Run 1: Report of TCP BBR — Data Link



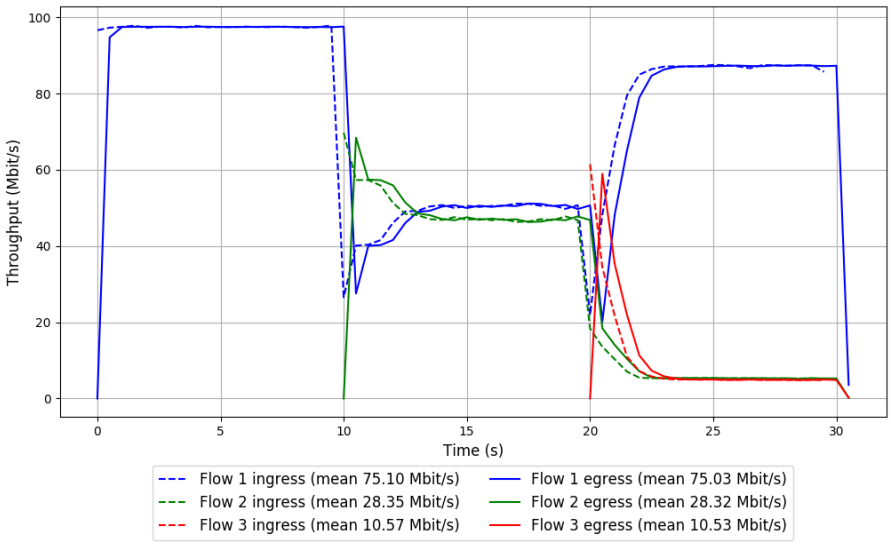


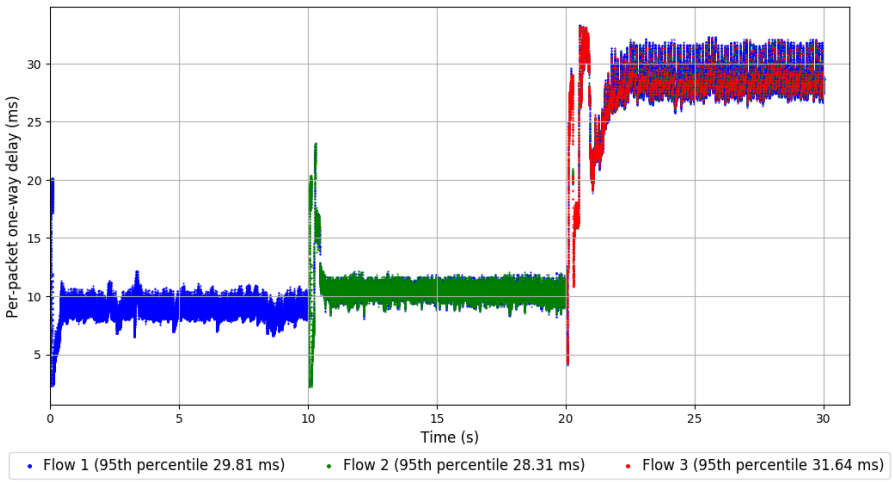
```
Run 2: Statistics of TCP BBR

Start at: 2018-08-28 09:09:44
End at: 2018-08-28 09:10:14
Local clock offset: -1.212 ms
Remote clock offset: 0.07 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.40 Mbit/s
95th percentile per-packet one-way delay: 29.736 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 75.03 Mbit/s
95th percentile per-packet one-way delay: 29.810 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 28.32 Mbit/s
95th percentile per-packet one-way delay: 28.311 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 10.53 Mbit/s
95th percentile per-packet one-way delay: 31.640 ms
Loss rate: 0.22%
```

Run 2: Report of TCP BBR — Data Link



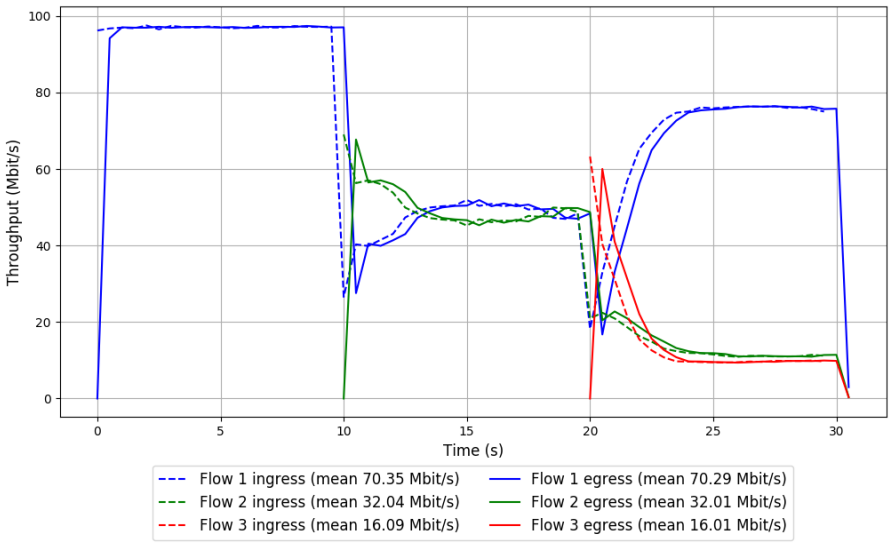


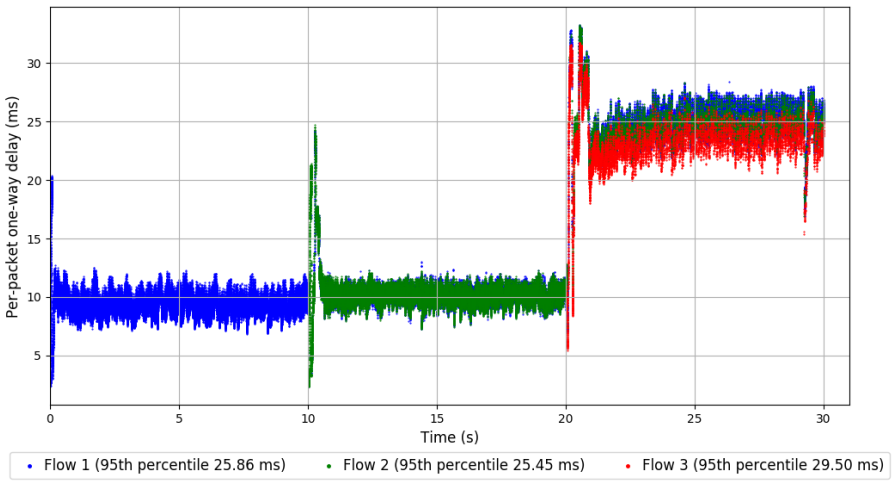
```
Run 3: Statistics of TCP BBR

Start at: 2018-08-28 09:14:12
End at: 2018-08-28 09:14:42
Local clock offset: -1.724 ms
Remote clock offset: 0.115 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.94 Mbit/s
95th percentile per-packet one-way delay: 25.920 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 70.29 Mbit/s
95th percentile per-packet one-way delay: 25.865 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 32.01 Mbit/s
95th percentile per-packet one-way delay: 25.448 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 16.01 Mbit/s
95th percentile per-packet one-way delay: 29.496 ms
Loss rate: 0.34%
```

Run 3: Report of TCP BBR — Data Link



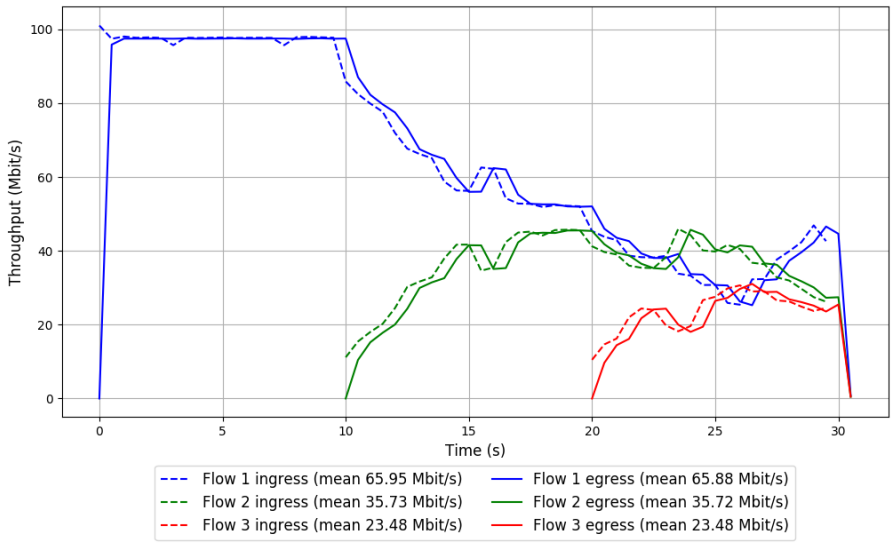


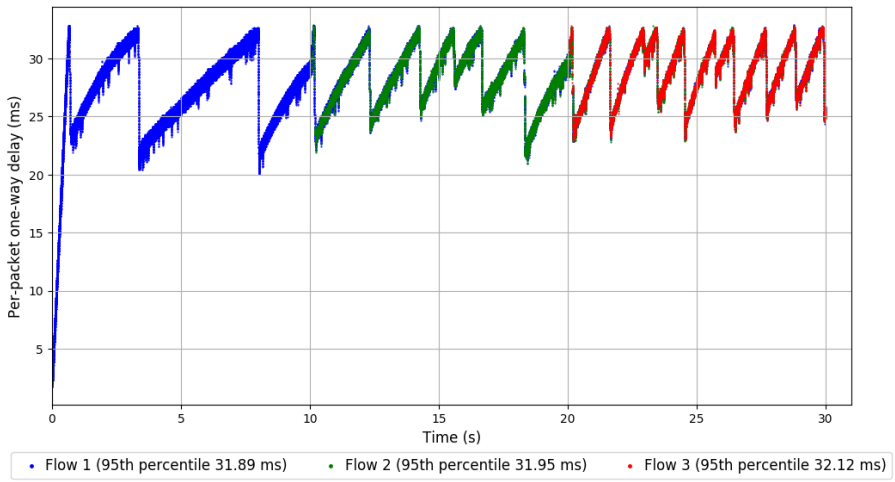
```
Run 1: Statistics of TCP Cubic

Start at: 2018-08-28 09:06:23
End at: 2018-08-28 09:06:53
Local clock offset: -1.992 ms
Remote clock offset: 0.104 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.45 Mbit/s
95th percentile per-packet one-way delay: 31.923 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 65.88 Mbit/s
95th percentile per-packet one-way delay: 31.895 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 35.72 Mbit/s
95th percentile per-packet one-way delay: 31.953 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 23.48 Mbit/s
95th percentile per-packet one-way delay: 32.120 ms
Loss rate: 0.06%
```

Run 1: Report of TCP Cubic — Data Link



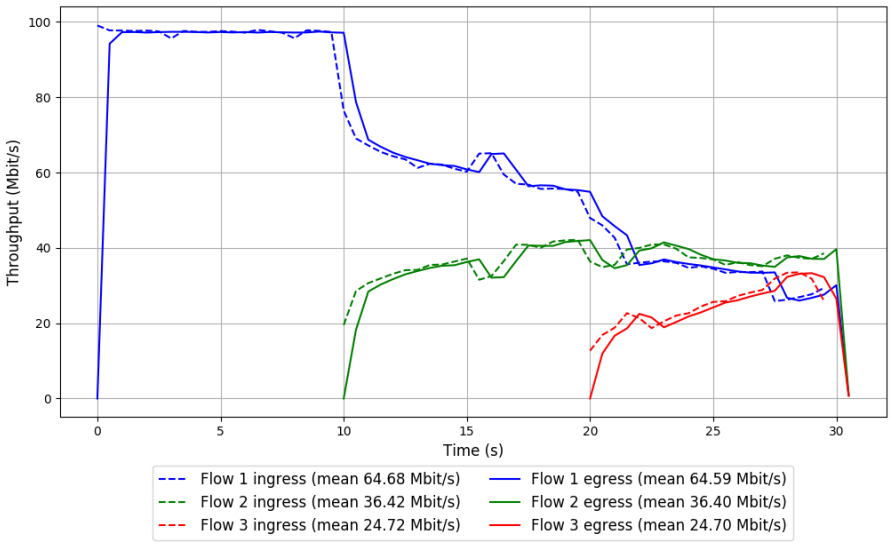


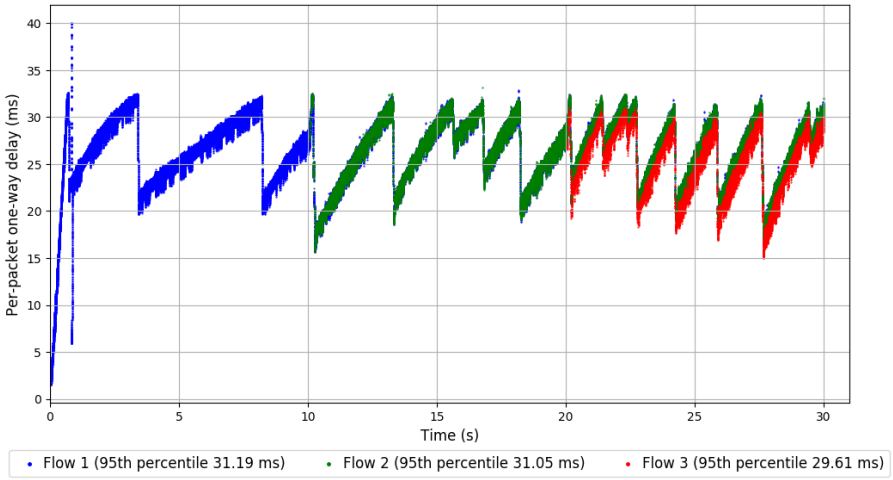
```
Run 2: Statistics of TCP Cubic

Start at: 2018-08-28 09:10:51
End at: 2018-08-28 09:11:21
Local clock offset: -0.592 ms
Remote clock offset: 0.124 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.02 Mbit/s
95th percentile per-packet one-way delay: 31.140 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 64.59 Mbit/s
95th percentile per-packet one-way delay: 31.192 ms
Loss rate: 0.05%
-- Flow 2:
Average throughput: 36.40 Mbit/s
95th percentile per-packet one-way delay: 31.053 ms
Loss rate: 0.05%
-- Flow 3:
Average throughput: 24.70 Mbit/s
95th percentile per-packet one-way delay: 29.615 ms
Loss rate: 0.06%
```

Run 2: Report of TCP Cubic — Data Link



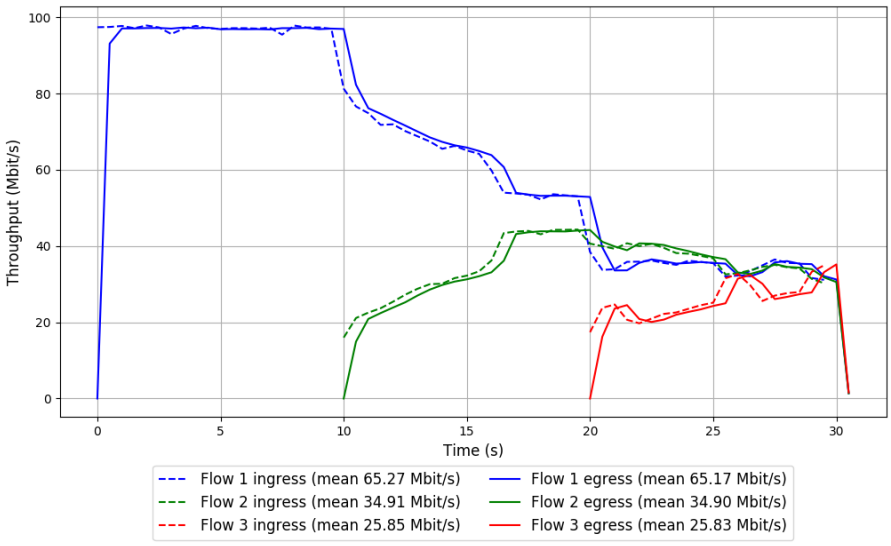


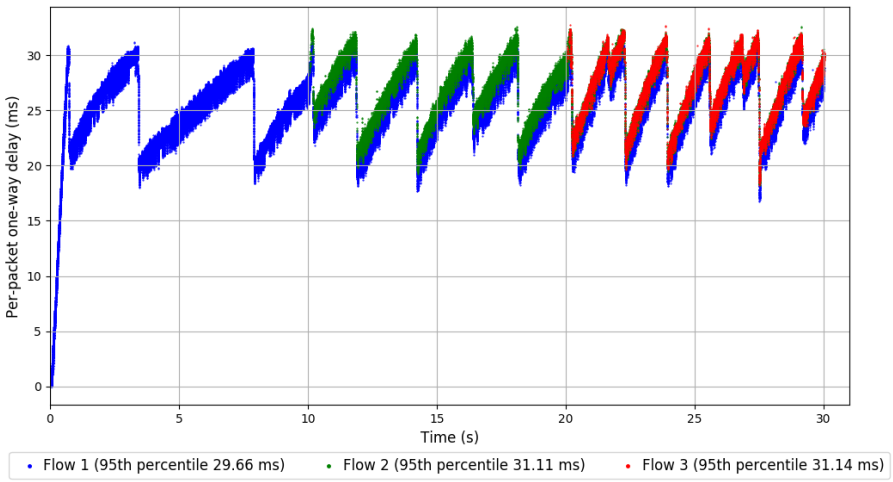
```
Run 3: Statistics of TCP Cubic

Start at: 2018-08-28 09:15:19
End at: 2018-08-28 09:15:49
Local clock offset: -0.999 ms
Remote clock offset: 0.024 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.97 Mbit/s
95th percentile per-packet one-way delay: 30.354 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 65.17 Mbit/s
95th percentile per-packet one-way delay: 29.658 ms
Loss rate: 0.06%
-- Flow 2:
Average throughput: 34.90 Mbit/s
95th percentile per-packet one-way delay: 31.115 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 25.83 Mbit/s
95th percentile per-packet one-way delay: 31.137 ms
Loss rate: 0.07%
```

Run 3: Report of TCP Cubic — Data Link



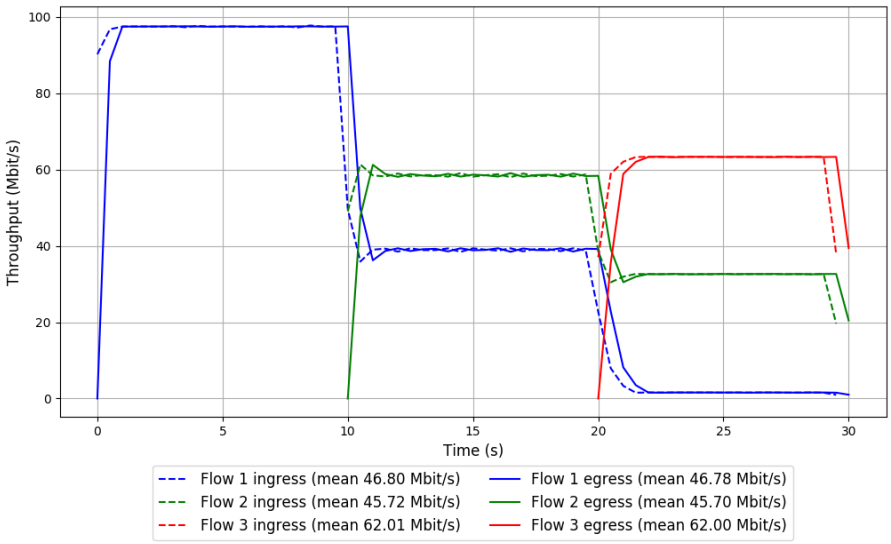


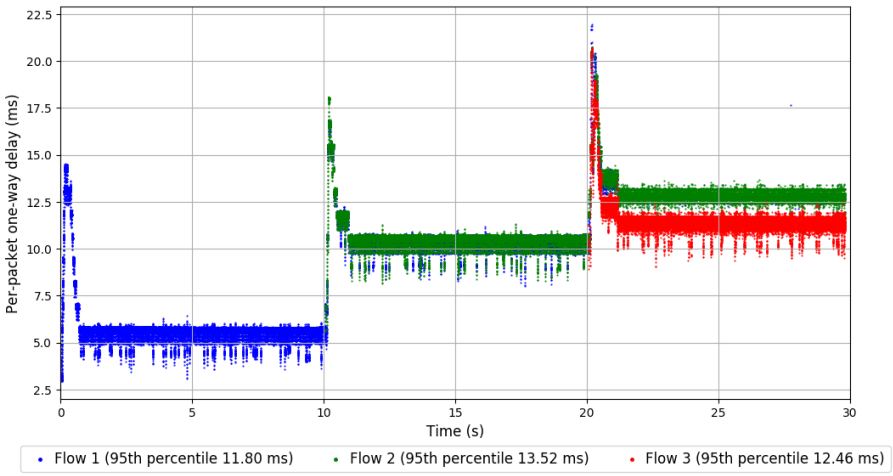
```
Run 1: Statistics of Indigo

Start at: 2018-08-28 09:08:35
End at: 2018-08-28 09:09:05
Local clock offset: -1.795 ms
Remote clock offset: 0.006 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 97.33 Mbit/s
95th percentile per-packet one-way delay: 13.007 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 46.78 Mbit/s
95th percentile per-packet one-way delay: 11.801 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 45.70 Mbit/s
95th percentile per-packet one-way delay: 13.518 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 62.00 Mbit/s
95th percentile per-packet one-way delay: 12.465 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link



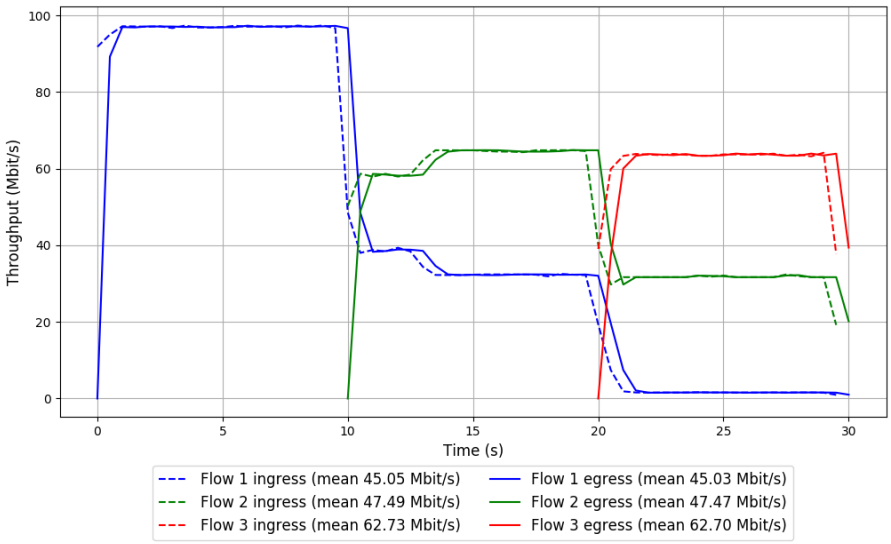


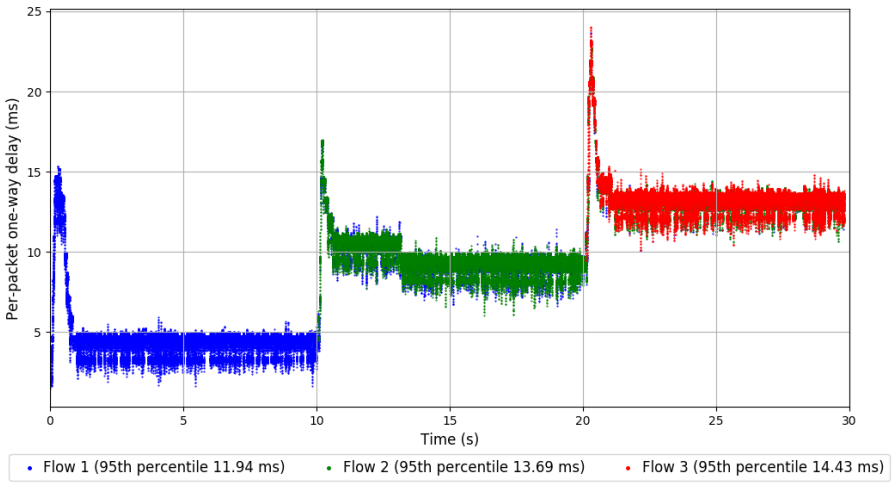
```
Run 2: Statistics of Indigo

Start at: 2018-08-28 09:13:03
End at: 2018-08-28 09:13:33
Local clock offset: -2.449 ms
Remote clock offset: 0.087 ms

# Below is generated by plot.py at 2018-08-28 09:19:30
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.90 Mbit/s
95th percentile per-packet one-way delay: 13.696 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 45.03 Mbit/s
95th percentile per-packet one-way delay: 11.941 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 47.47 Mbit/s
95th percentile per-packet one-way delay: 13.688 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 62.70 Mbit/s
95th percentile per-packet one-way delay: 14.426 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link



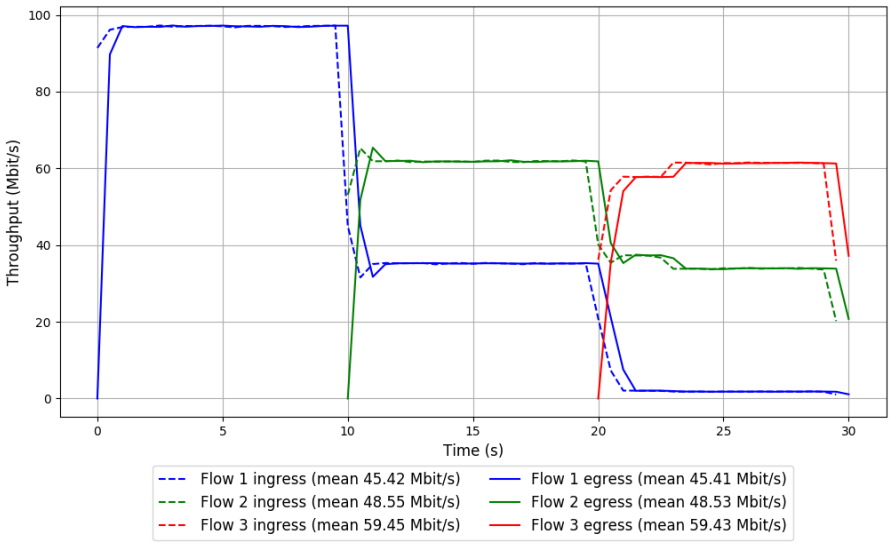


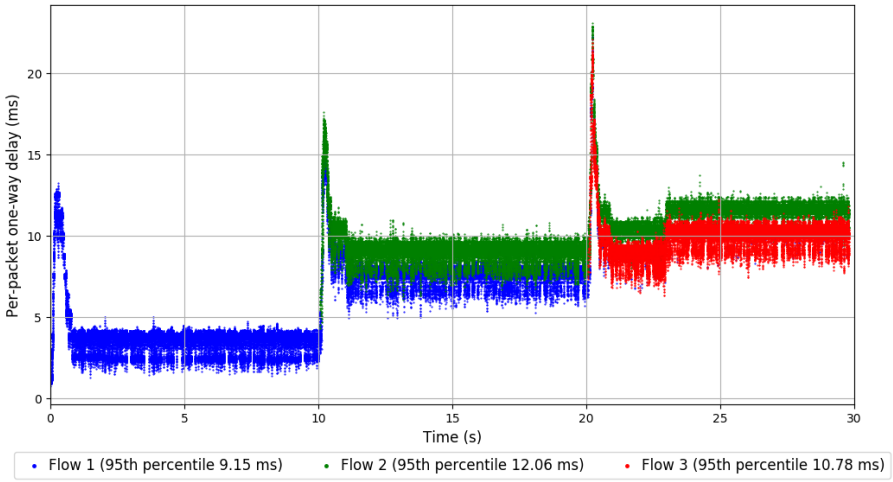
```
Run 3: Statistics of Indigo

Start at: 2018-08-28 09:17:31
End at: 2018-08-28 09:18:01
Local clock offset: -1.858 ms
Remote clock offset: 0.109 ms

# Below is generated by plot.py at 2018-08-28 09:19:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.93 Mbit/s
95th percentile per-packet one-way delay: 11.798 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 45.41 Mbit/s
95th percentile per-packet one-way delay: 9.152 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 48.53 Mbit/s
95th percentile per-packet one-way delay: 12.061 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 59.43 Mbit/s
95th percentile per-packet one-way delay: 10.777 ms
Loss rate: 0.00%
```

Run 3: Report of Indigo — Data Link



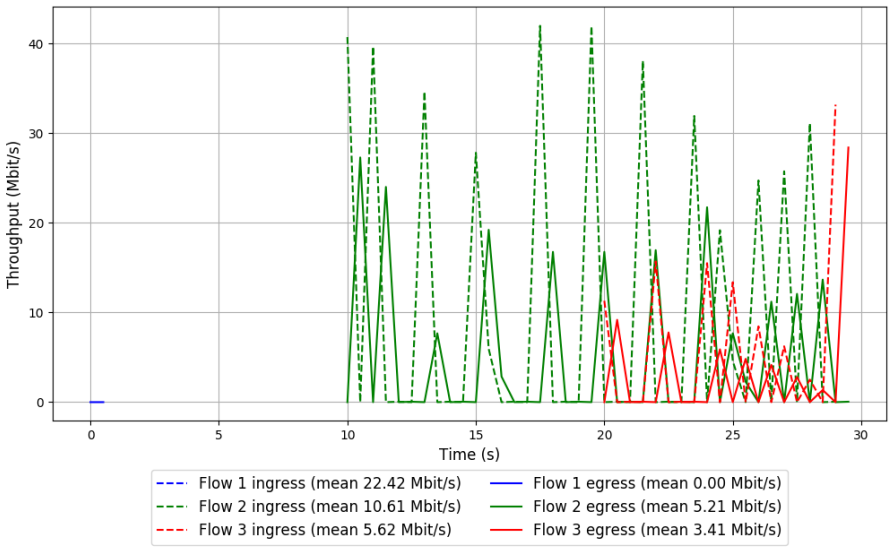


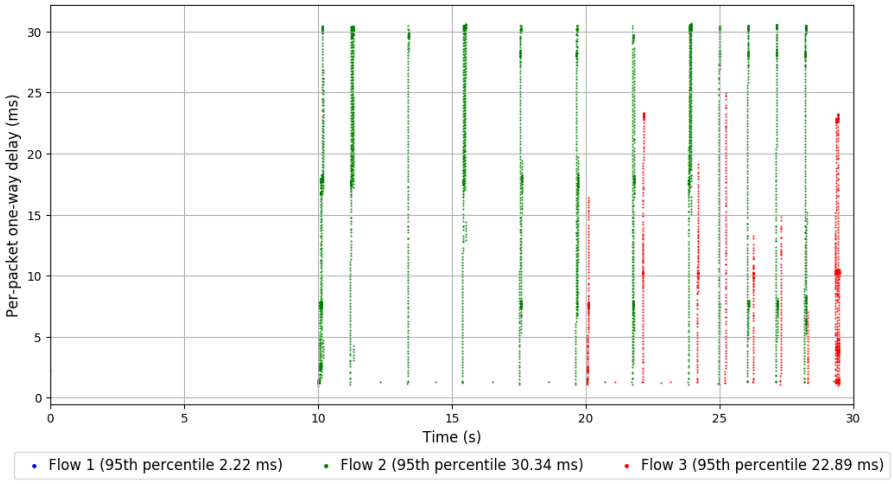
```
Run 1: Statistics of Muses-23

Start at: 2018-08-28 09:07:31
End at: 2018-08-28 09:08:01
Local clock offset: -1.159 ms
Remote clock offset: 0.032 ms

# Below is generated by plot.py at 2018-08-28 09:19:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 4.49 Mbit/s
95th percentile per-packet one-way delay: 30.258 ms
Loss rate: 48.52%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 2.218 ms
Loss rate: 97.39%
-- Flow 2:
Average throughput: 5.21 Mbit/s
95th percentile per-packet one-way delay: 30.335 ms
Loss rate: 50.90%
-- Flow 3:
Average throughput: 3.41 Mbit/s
95th percentile per-packet one-way delay: 22.886 ms
Loss rate: 39.37%
```

Run 1: Report of Muses-23 — Data Link



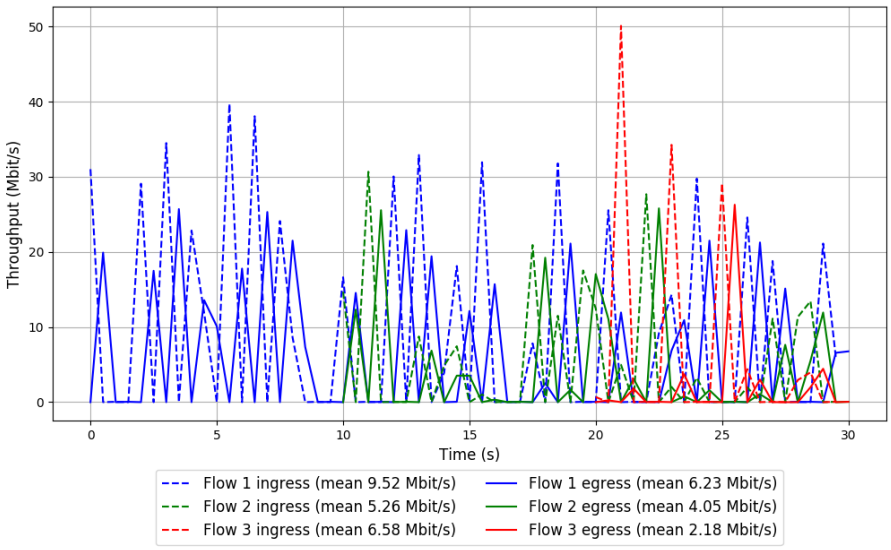


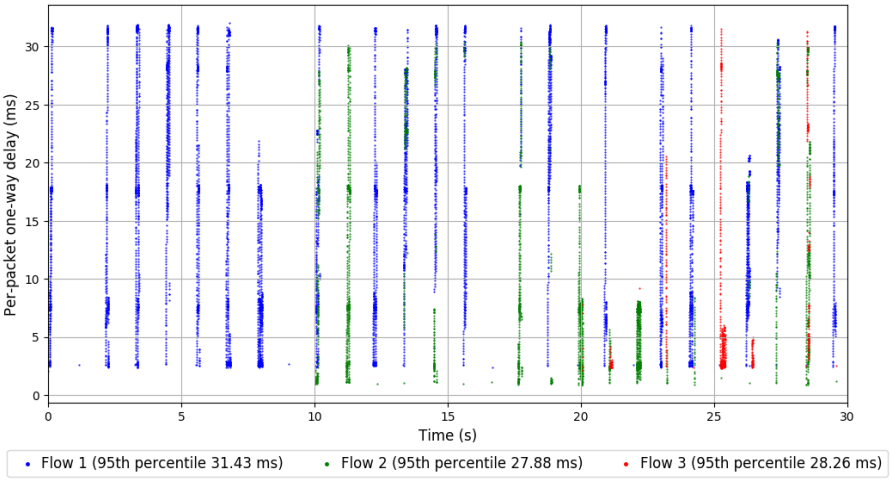
```
Run 2: Statistics of Muses-23

Start at: 2018-08-28 09:11:59
End at: 2018-08-28 09:12:29
Local clock offset: -1.516 ms
Remote clock offset: 0.08 ms

# Below is generated by plot.py at 2018-08-28 09:19:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 9.60 Mbit/s
95th percentile per-packet one-way delay: 31.249 ms
Loss rate: 36.40%
-- Flow 1:
Average throughput: 6.23 Mbit/s
95th percentile per-packet one-way delay: 31.435 ms
Loss rate: 34.53%
-- Flow 2:
Average throughput: 4.05 Mbit/s
95th percentile per-packet one-way delay: 27.882 ms
Loss rate: 22.91%
-- Flow 3:
Average throughput: 2.18 Mbit/s
95th percentile per-packet one-way delay: 28.264 ms
Loss rate: 66.90%
```

Run 2: Report of Muses-23 — Data Link





```
Run 3: Statistics of Muses-23

Start at: 2018-08-28 09:16:27
End at: 2018-08-28 09:16:57
Local clock offset: -1.816 ms
Remote clock offset: 0.038 ms

# Below is generated by plot.py at 2018-08-28 09:19:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 9.35 Mbit/s
95th percentile per-packet one-way delay: 29.969 ms
Loss rate: 37.12%
-- Flow 1:
Average throughput: 5.49 Mbit/s
95th percentile per-packet one-way delay: 25.986 ms
Loss rate: 25.69%
-- Flow 2:
Average throughput: 2.98 Mbit/s
95th percentile per-packet one-way delay: 29.841 ms
Loss rate: 50.68%
-- Flow 3:
Average throughput: 6.15 Mbit/s
95th percentile per-packet one-way delay: 31.291 ms
Loss rate: 45.81%
```

Run 3: Report of Muses-23 — Data Link