

Scitags Demo 2025

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LHCONE Montreal Meeting
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SC25

Held in St. Louis, MO, Nov. 16-21

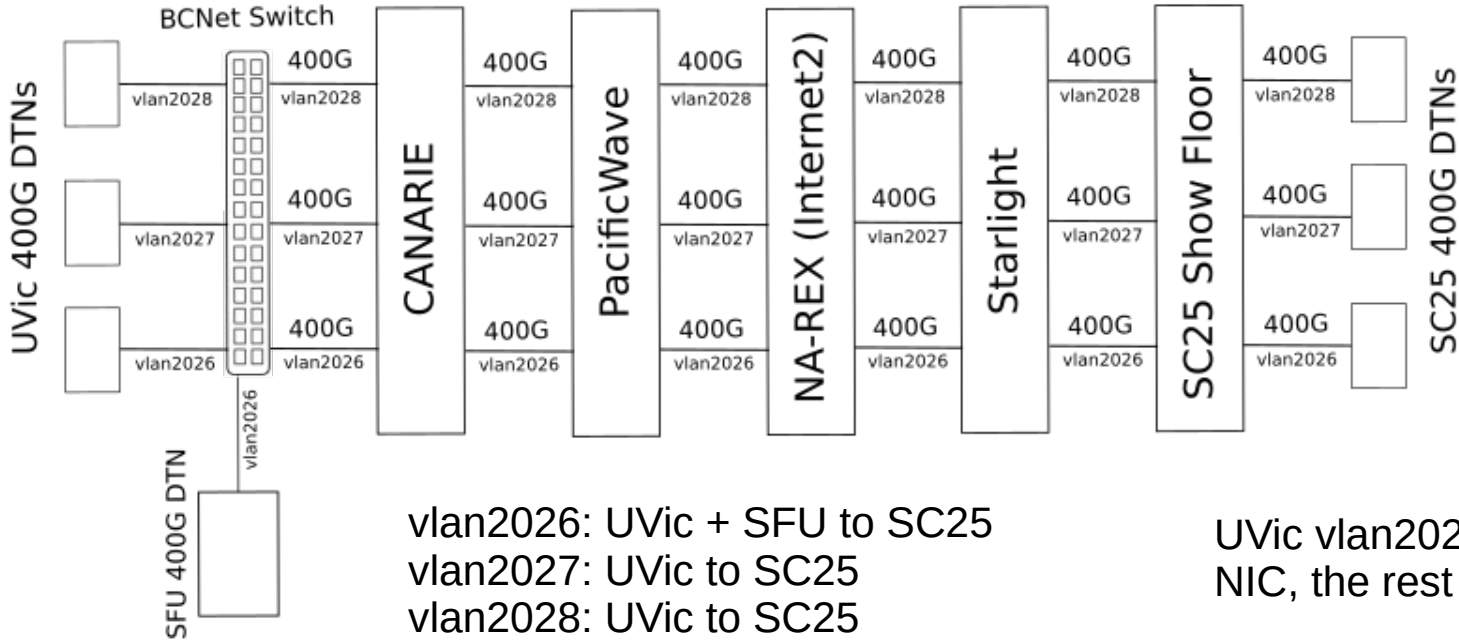
Networking Research Exhibitions (NREs):
Demonstrations of new network features,
cutting-edge performance, etc.

See talks on Scitags demos at previous
LHCONE meetings (**Manchester**, **Beijing**)

SC25: Demonstrate Scitags at 1.2 Tbps using
updated packet-marking software (**flowd-go**)



Network



```

vlan2026: UVic + SFU to SC25
vlan2027: UVic to SC25
vlan2028: UVic to SC25

```

UVic vlan2028 DTN had Mellanox CX-7 NIC, the rest had Broadcom 57608

DTNs supplied by Dell and Lenovo

Mellanox NIC supplied by NVIDIA

Total WAN capacity 1.2 Tbps
(3 x 400 Gbps)

DTN Tuning

- Some tuning was done on the DTNs, but nothing very complicated:
 - MTU 9000
 - TCP buffers max
 - Congestion control BBR
 - NIC ring buffers max (8192)
 - Tx queue length set to 10k
 - Set RX and TX channels to 32 and combined to 0
- These servers didn't use the usual cpufreq driver, so just set to “peak frequency” mode in BIOS

Packet Marking

Offset	Octet	0								1								2								3							
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	Version				Traffic class								Flow label																			
4	32	Payload length																Next header								Hop limit							

Scitag added by eBPF when the kernel sends a packet to the NIC, not at the time of packet creation

Overwriting flow label lightest-weight option

Adding extension header requires changing next header field and inserting new header

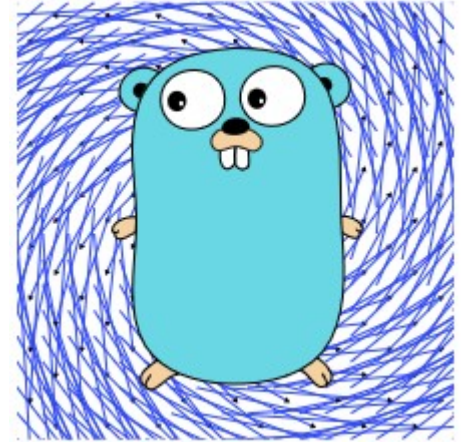
Next header values:

6: TCP

60: Destination Options

Flowd-go

- Re-implementation in Go of packet marking and flow labelling service by Pablo Soto from Universidad Autonoma de Madrid
- Packet marking implementation has significant advantage over original flowd – eBPF part uses libbpf, which supports Compile Once Run Everywhere (CO:RE)
- Flowd used bcc, which just-in-time compiles the eBPF code; better performance with flowd-go?
- Very easy to install and configure (see appendix)



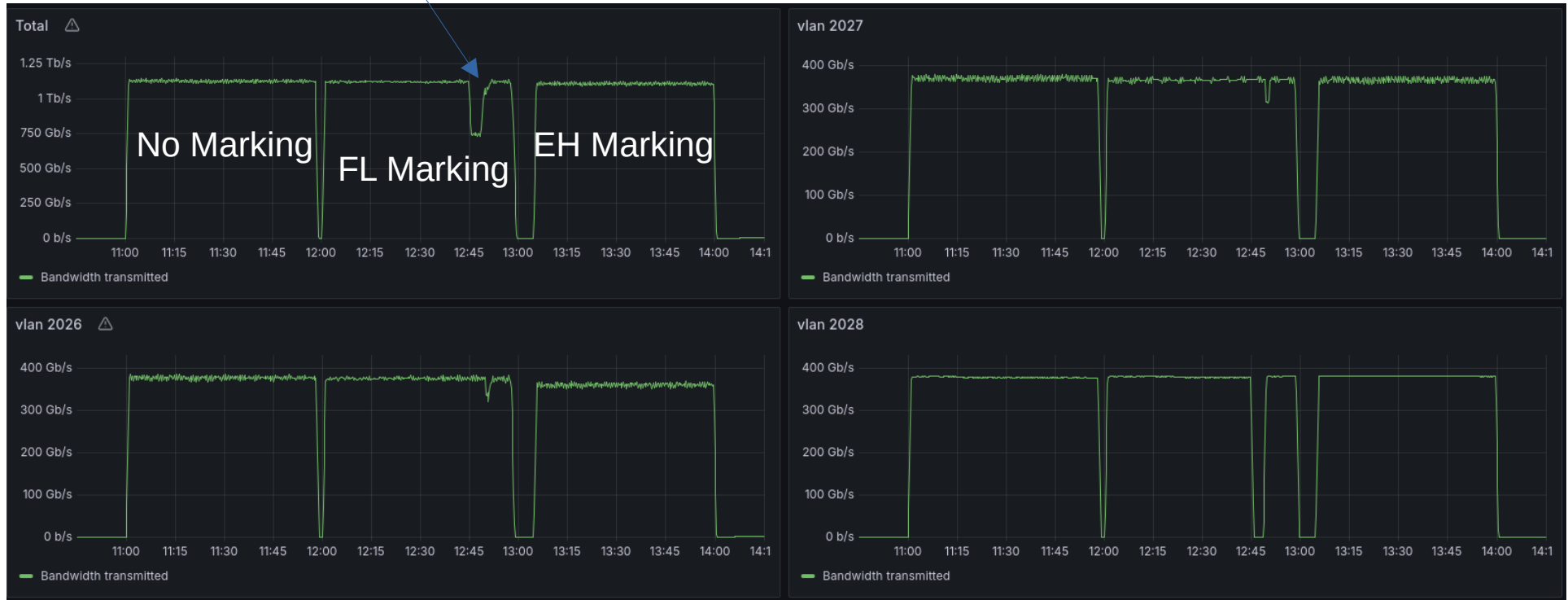
github.com/scitags/flowd-go

Demo

- Use iperf3 to generate memory-to-memory traffic: 32 streams per 400G link, each rate-limited to 12.5G
- Demo ran for two hours: 40 minutes with no marking, 40 minutes with flow-label marking, 40 minutes with extension header marking
- Servers monitored with Prometheus and sent sflow records to InMon collector (thanks to Neil McKee)

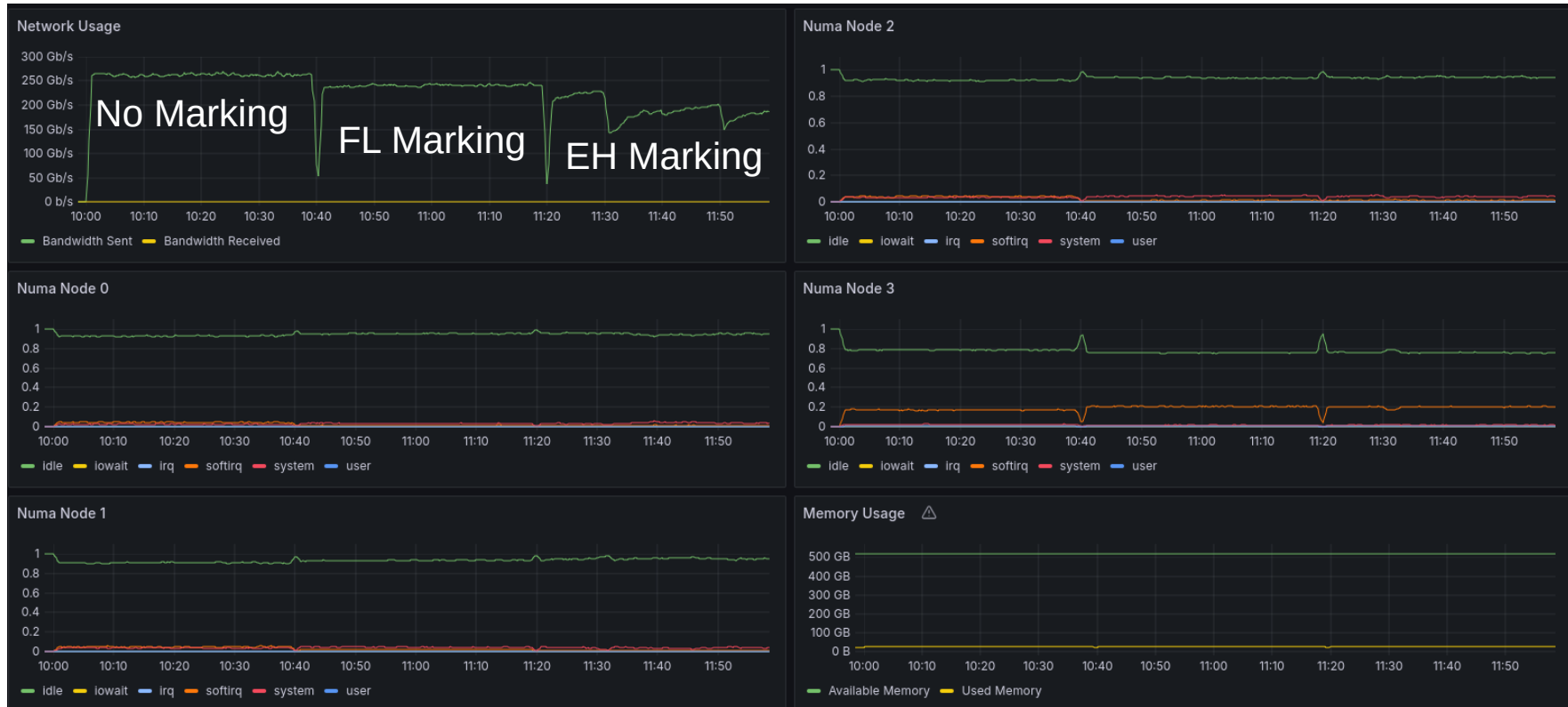
Results

Glitch, not real issue



Slight decline in bandwidth on vlan2026, essentially no change for the other two

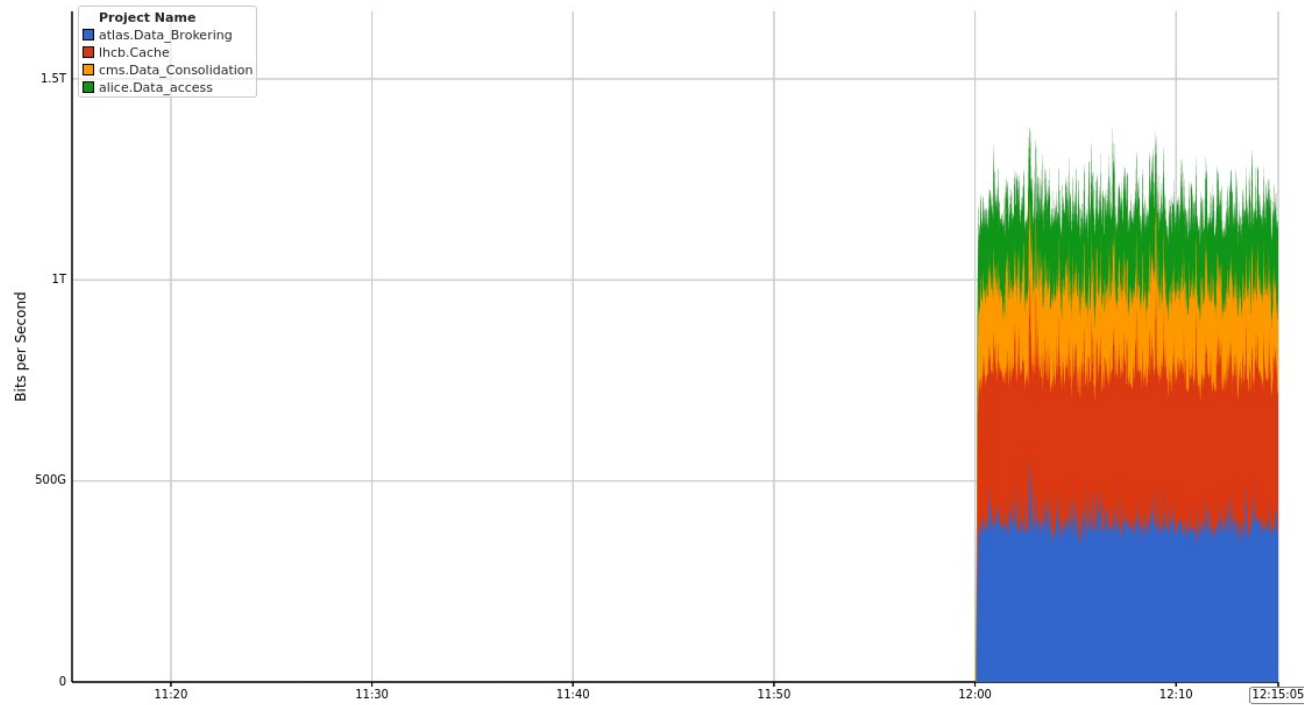
2024 Results



Large improvement in 2025, likely due to flowd-go

Tristan Sullivan

InMon sFlow Dashboard



This shows the transition between no marking and FL marking

One Scitag assigned (randomly) per vlan

Perfsonar With EH Marking

- While this demonstrates the capability to mark packets at very high rates, there is a caveat – this is a layer-2 network
- How do R&E routers do with extension headers?
- Put flowd-go onto one of the UVic perfsonar machines and tried some bandwidth testing to find out

Results (VERY PRELIMINARY)

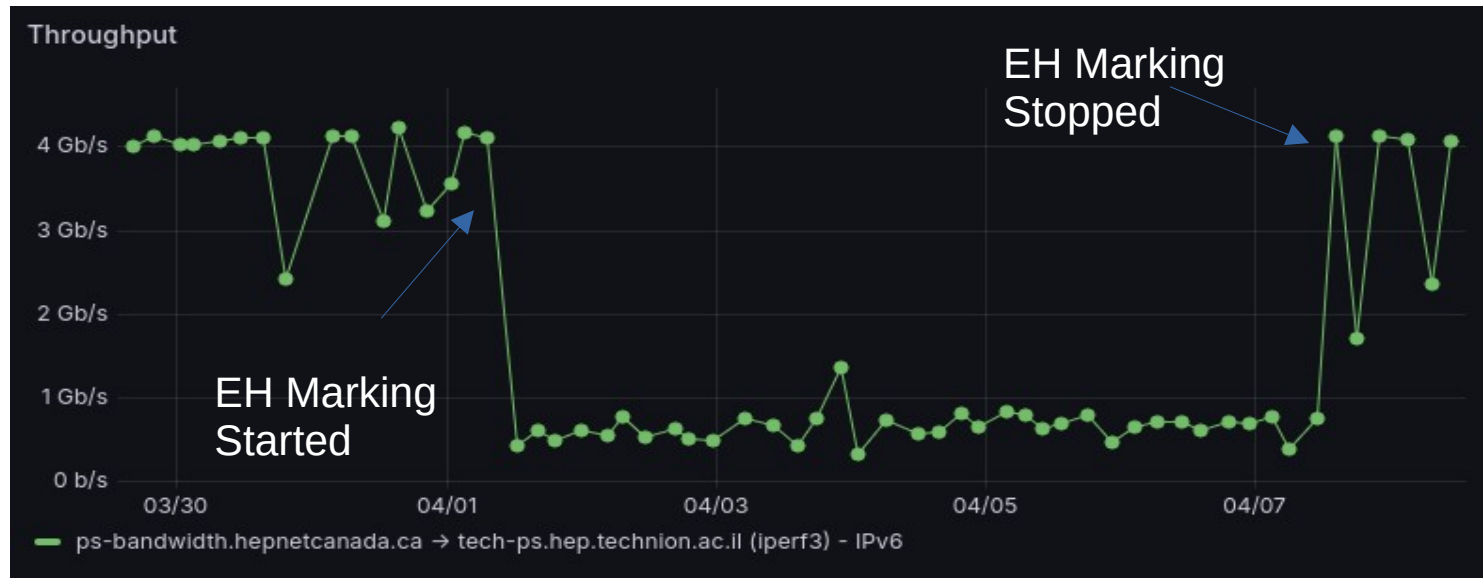
UVic to INFN



Some tests with reduced bandwidth, but mostly okay

Results (VERY PRELIMINARY)

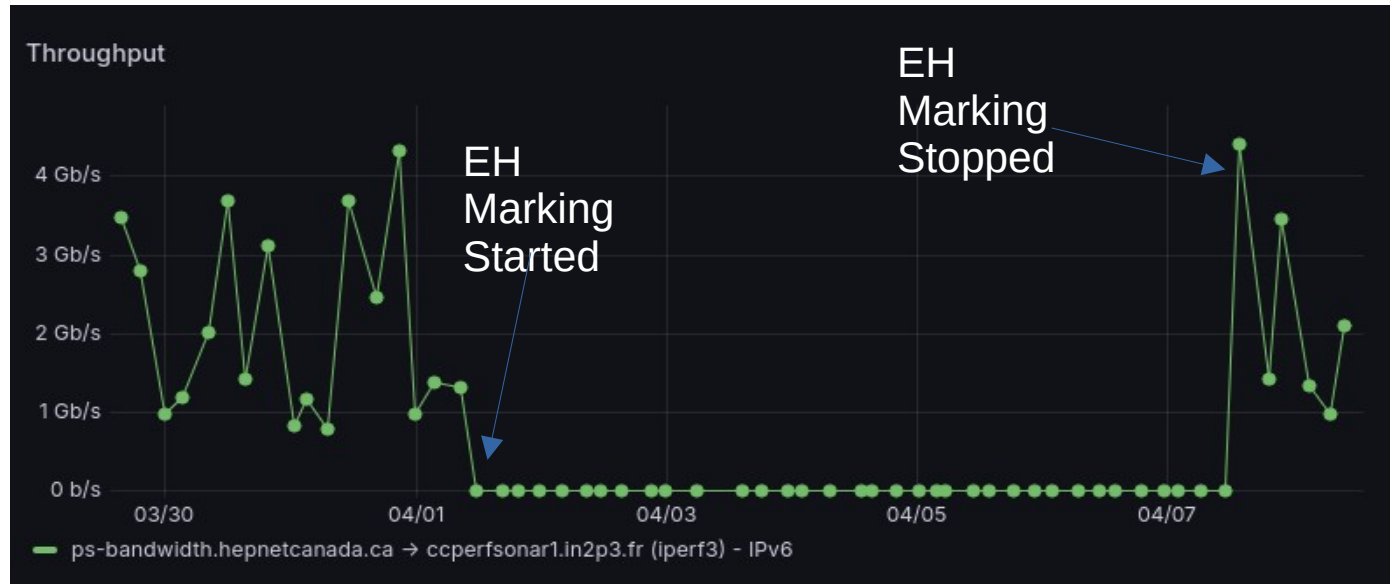
UVic to Technion



Consistently much reduced bandwidth

Results (VERY PRELIMINARY)

UVic to IN2P3



Tests don't work. This turned out to be an MTU issue: When sending from MTU 9000 machine on MTU 1500 link, EH Headers overflow the MTU. Under investigation. For now, set MTU to 1500 when EH marking is enabled.

Volunteers?

- Would be very nice to have a small mesh of test perfsonar machines at different sites with EH marking enabled, to test more network links and have more debugging information
- It is very straightforward to set up a perfsonar with flowd-go using Shawn's containerized deployment; if anyone is interested in participating, please get in touch!

Appendix

Flowd-go

Check repo to ensure this is still the latest version

wget https://linuxsoft.cern.ch/repos/scitags9al-testing/x86_64/os/Packages/f/flowd-go-2.5.0-1.x86_64.rpm
yum install ./flowd-go-2.5.0-1.x86_64.rpm

/etc/flowd-go/conf.yaml:

```
[tssulliv@ps-bandwidth ~]$ cat /etc/flowd-go/conf.yaml
plugins:
  perfsonar:
    activityId: 2
    experimentId: 2
backends:
  marker:
    targetInterfaces: [eno1, eno3]
    markingStrategy: destination
    forceHookRemoval: true
```

Causes all IPv6 traffic for the specified NICs to be marked (see documentation for other plugins)

ATLAS (1 is default)

Change to whatever interface(s) for which packet marking should be enabled

This causes extension header marking to occur. Set to "label" for flow label marking

systemctl start flowd-go