In-band Network Telemetry (INT) on Software Switch Programmed by P4
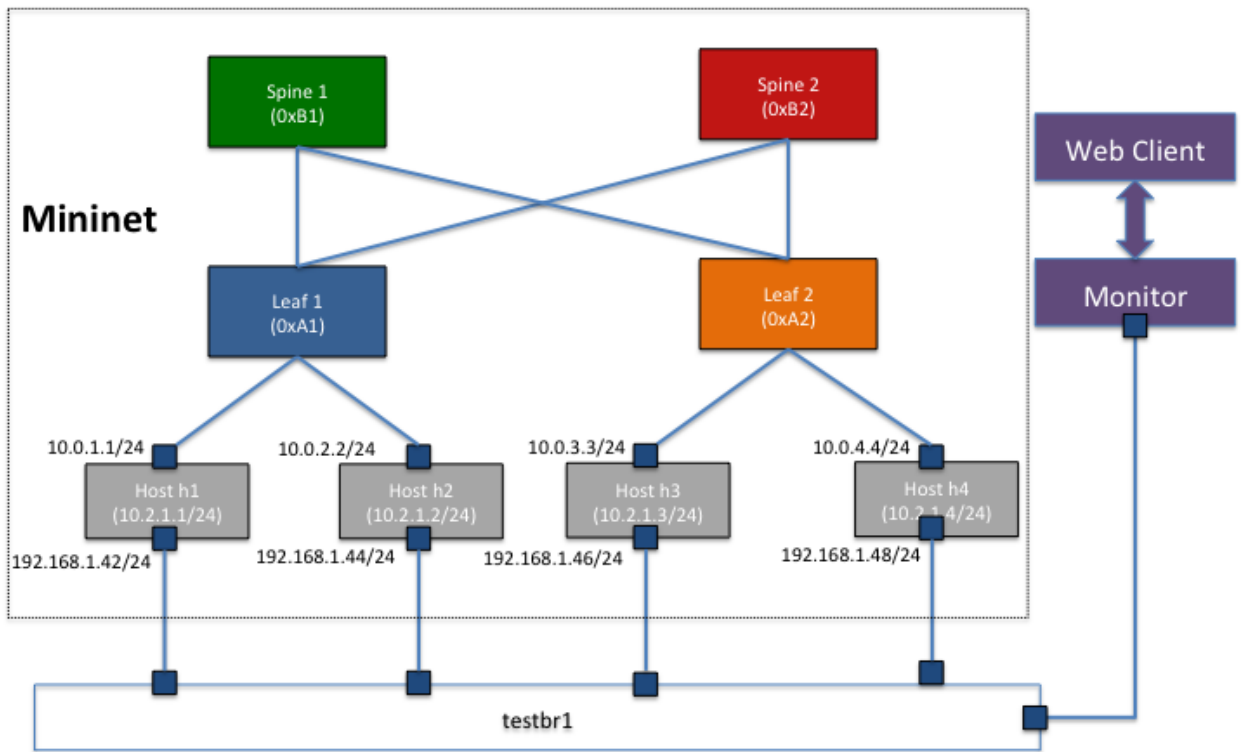
Abstract:

In-band Network Telemetry (INT) is a new framework designed to allow the collection and reporting of network state, by the data plane, without requiring intervention of additional control plane protocols. Data packets are instrumented with INT header fields that contain "Telemetry Instructions" to INT-capable network device. The instructions tell the devices what Telemetry data to collect and the collected data is written into the forwarded data packets.

INT data that can be collected includes: switch IDs, Input/Output Port IDs, Hop Latency, Queue Occupancy, In/Out Timestamps and more. Such telemetry data provides immense value in networks in general. It enables real-time debugging of network issues as well as "self healing" networks.

Programming Protocol-independent Packet Processor (P4) is a high-level language that can be deployed in the future into Software Defined Networks (SDN) and can actually serve as an alternative to OpenFlow that is currently used – due to its flexibility and ability to support emerging new protocols such as INT.

Spine 1
(0xB1)

Spine 2
(0xB2)

Web Client

Mininet

Monitor

Leaf 1
(0xA1)

Leaf 2
(0xA2)

10.0.1.1/24

10.0.2.2/24

10.0.3.3/24

10.0.4.4/24

Host h1
(10.2.1.1/24)

Host h2
(10.2.1.2/24)

Host h3
(10.2.1.3/24)

Host h4
(10.2.1.4/24)

192.168.1.42/24

192.168.1.44/24

192.168.1.46/24

192.168.1.48/24

testbr1

Goals:

- Refer to http://p4.org/wp-content/uploads/fixed/INT/INT-current-spec.pdf
- Build over Mininet a dockerized topology that includes 2 Hosts, 4 P4 SW switches and a Monitoring system – as described in https://github.com/p4lang/p4factory/tree/master/apps/int
- Generate traffic with Scapy or Pktgen and monitor the following: Per hop Latency , Per hop CPU utilization, Per hop receive queue size, Per certain flow stats (Latency, Jitter, Packet loss)
- Bonus: Integrate with ONOS – Refer to: https://wiki.onosproject.org/display/ONOS/P4+Experimental+Support+via+BMv2 ;jsessionid=0871B0D8948B400D12A78C7BAA4AF36C

Requirements:

Internet Networking Course, Phyton