SC22 Network Research Exhibition: Demonstration Preliminary Abstract

[High Speed Network with International P4 Experimental Networks for The Global Research Platform and Other Research Platforms]

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Abstract

Recent successes of implemented "research platforms" have been demonstrated as key enablers of large-scale data intensive science. These platforms are based on architecture consisting of various orchestration techniques (e.g., Kubernetes), low management overhead, and tenant-oriented applications. This approach develops services focused on meeting requirements of research science communities, especially data intensive science. For major research platforms usage scenarios, high performance WAN networking is a high priority concern. Recently, P4 has become a major enabler for these types of services. Consequently, research testbeds such as the International P4 Experimental Networks testbed, have become important resources for exploring potential contributions of techniques for programmable data planes to high performance networking for science.

Goals

This SC22 NRE demonstration will illustrate the challenges to enabling Kubernetes integration with P4 Experimental Network Services over the Global Research Platform (GRP) over high-speed network. This demonstration will also showcase solutions to those challenges:
(1) P4 software only Experimental Network Services in a container/Kubernetes environment with a cluster in the Global Research Platform over high-performance WANs.
(2) P4 hardware only Experimental Network Services in a Container/Kubernetes environment with a dedicated cluster in the Global Research Platform across high performance WANs.
(3) P4 integrated hardware and software as Experimental Network Services in a Container/Kubernetes for the Global Research Platform across high performance WANs.
(4) Prototype Kubernetes L2 and L3 network integration with P4 Experimental Network Services for the Global Research Platform across high performance WANs.

Resources

(1) Selected US and international iP4EN sites will participate in these demonstrations. The current International P4 Experimental Networks and testbeds configuration is shown at the end of this document.

(2) The StarLight International/National Communications Exchange Facility.

(3) Required resources from SCinet WAN are 1 Tbps E2E WAN services from the StarLight International/National Communications Exchange Facility in Chicago to the SC22 venue, between StarLight and the JBDT Facility in McLean, between the JBDT Facility and the SC22 venue and among all sites.

(4) With support from the SC22 SCinet team, vlans will be implemented from StarLight over 100G/200G/400G paths to showcase floor and public L3 routes from the StarLight booth to PRP/TNRP/GRP sites and other partner booths at SC22.

Involved Parties

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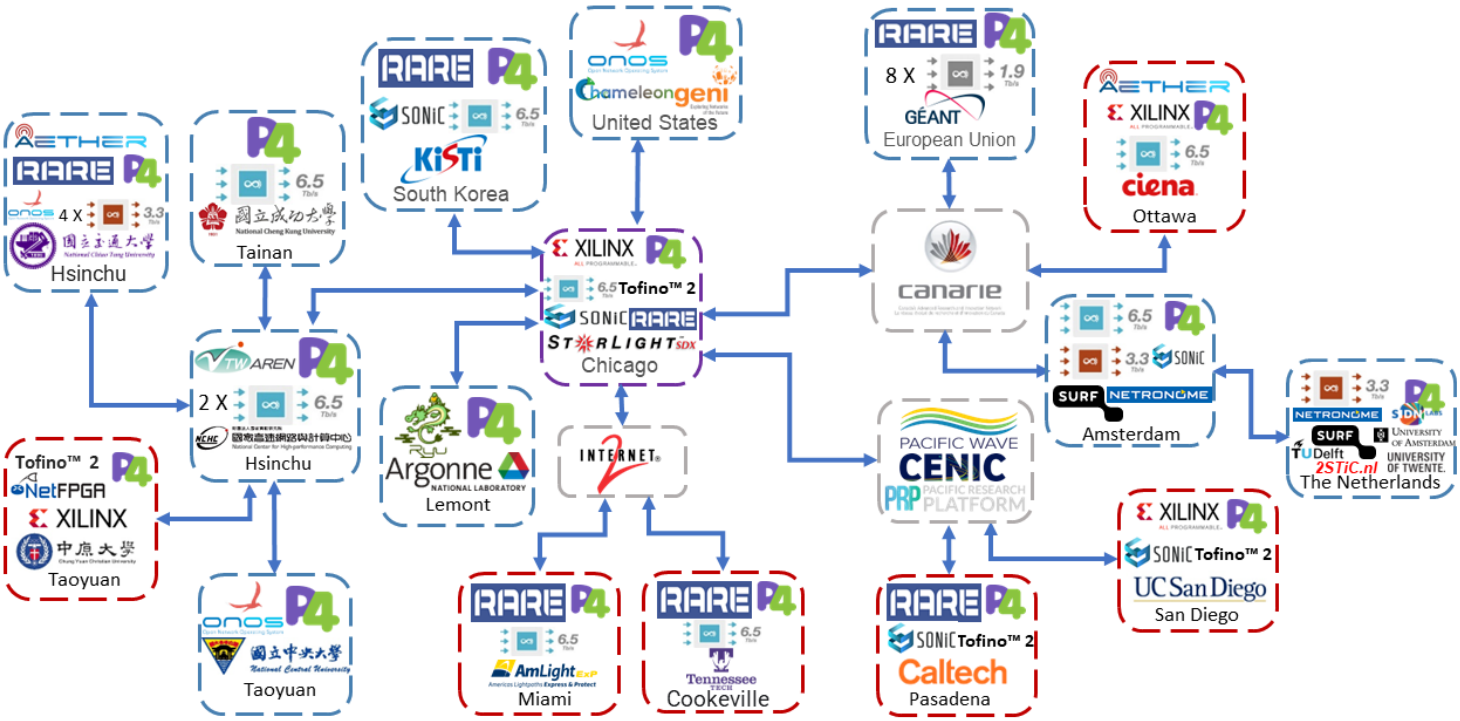
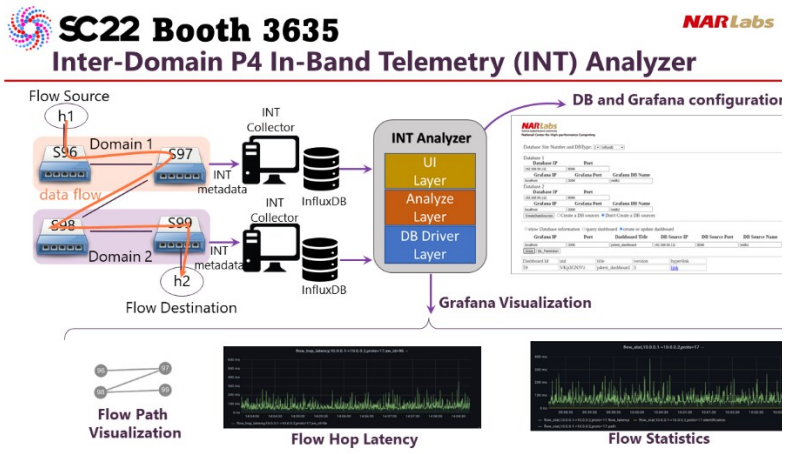
International P4 Experimental Networks (iP4EN)



Example #1: P4 prototype with BMv2 and Tofino switch:
Inter-Domain P4 In-Band Telemetry (INT) Analyzer



Example #2: P4 prototype with BMv2, Tofino and Tofino2 Switches and Xilix FPGAs:

Real-Time DDoS Attack Detection @40G/100G/400G