SC23 Network Research Exhibition: Demonstration Preliminary Abstract

AmLight 2.0:

Flexible control, deep visibility, and programmability @ Tbps!

Preliminary Abstract

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Abstract

The AmLight network uses a hybrid network strategy that combines optical spectrum and leased capacity to build a reliable, leading-edge network infrastructure for research and education. AmLight supports high-performance network connectivity required by international science and engineering research and education collaborations involving the National Science Foundation (NSF) research community, with expansion to South America and West Africa.

In 2023, AmLight deployed its newest custom-made Software-Defined Networking (SDN) fabric to support network experimentation with P4 and flexible forwarding pipelines and the deployment of new network functions through its brand-new SDN controller named Kytos-ng [https://kytos-ng.io]. With more than 24 long-haul 100G links connecting 12 sites in the U.S, Latin America, and South Africa, AmLight offers to the academic community dynamic provisioning, new pathfinding, per-packet network programmability and telemetry, integration with academic orchestrators and FABRIC, and 100G DTNs.

This demo aims to showcase the newest open SDN architecture built leveraging Edgecore Tofino 1 and Tofino 2 with a homemade SDN Controller built to support AmLight's science drivers and community. Among the benefits of the new SDN fabric, AmLight will present its support for In-band Network Telemetry (INT) in a long-haul production network and a flexible pathfinding approach created to support fine-grained traffic engineering.

Goals

With up to twenty Edgecore P4 switches in production, AmLight generates hundreds of thousands of telemetry reports per second, and this data is used for daily troubleshooting and monitoring. The P4 In-band Network Telemetry (INT) solution built via AmLight's SDN Controller Kytos-ng has supported AmLight's network engineering team in identifying under-provisioned buffers, microbursts, evaluating perfSonar test results, as well as running packet tracing to evaluate QoS policies. The goal of this demonstration is to share with the academic community how beneficial Kytos-ng + INT can be to support network provisioning, traffic engineering, network monitoring, and performance evaluation, profiling the network utilization at a per-packet level, evaluate the QoS policies implementation, and troubleshooting packet drops and jitter affecting science flows. All of this in real-time. During the demo, we plan to present the challenges, the implementation, the lessons learned, and opportunities for collaboration. In collaboration with AmLight members Vera Rubin Observatory, Rednesp (Academic network of the State of Sao Paulo, Brazil), and SPRACE (São Paulo Research and Analysis Center), we plan to demonstrate the network capabilities by generating from 200G to 400G of traffic starting at our DTNs in Chile and Sao Paulo to SC23 show floor, landing at Caltech's booth.

Resources

This NRE demonstration will be conducted using resources of the collaborating domains, see Involved Parties. Used resources will involve AmLight 100G long-haul links, AmLight P4 switches, AmLight SDN orchestrator, and Data Transfer Nodes (DTNs) at AmLight, Vera Rubin, Rednesp, and SPRACE

This NRE proposal submission is requesting, from 200Gbps to 400Gbps from Miami, FL, to Denver. This connectivity will be shared with Caltech, AutoGOLE, AP-REX 2.0, and P4 Testbed's NREs.

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