SC23 Network Research Exhibition: Demonstration Abstract

400 Gbps E2E WAN Services: Architecture, Technology and Control Systems

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Abstract

Data production among science research collaborations continues to accelerate, a long term trend that in part is propelled by large scale science instrumentation, including high luminosity research instruments. Consequently, the networking community is preparing for service paths beyond 100 Gbps, including 400 Gbps, 800 Gbps and 1 Tbps WAN and LAN services. In this progression, 400 Gbps E2E WAN services are a key building block. Consequently, the requirements and implications of 400 Gbps WAN services are being explored at scale, including 400 Gbps E2E over thousands of miles. These demonstrations will showcase 400 Gbps E2E WAN services from the StarLight International/National Communications Exchange Facility in Chicago to the SC23 venue, between StarLight and the multi-agency Joint Big Data Testbed (JBDT) Facility in McLean, Virginia, and between the JBDT Facility and the SC23 venue.

Goals

With its research partners including the SCinet WAN group and the StarLight Consortium, the International Center for Advanced Internet Research (iCAIR) at Northwestern University is designing, implementing and demonstrating an E2E 400 Gbps WAN services among several sites. Multiple issues related to 400 Gbps transport are being investigated and resolved to enable to transition to 400 Gbps WAN services.

1. At both ends of all 400 E2E paths, 400 Gbps switches will be implemented and interconnected to high performance WAN optical transport switches.
2. Those switches will be connected to optimized 400 Gbps Data Transfer Nodes (DTNs).
3. These demonstrations will leverage iCAIR's experimental research into the optimal design, configuration, components, and integration technologies for 400 Gbps (DTNs), including techniques for kernel bypass using zero-copy for memory and disk copy to avoid bottlenecks in multiple 100 Gbps data transfer over 400 Gbps WAN, NVMe over fabric, and optimal affinity bindings for NUMA architecture for optimal resource utilization
4. The demonstrations will also showcase software middleware for reliable high-speed network data transfer to orchestrate infrastructure resources for optimal high performance transfers.
5. In addition, measurement techniques for real-time monitoring, benchmarking and evaluation at 400 Gbps LAN and WAN will be shown.
6. Other technologies being investigated are high performance optical transport switches, 400 Gbps transceivers and 400 Gbps breakout cables.

Resources

Required resources from SCinet WAN are 1.2 Tbps E2E WAN services from the StarLight International/National Communications Exchange Facility in Chicago to the SC23 venue, between StarLight and the JBDT Facility in McLean, Virginia, and between the JBDT Facility and the SC23 venue. Another site utilized will be NERSC, which has a 400 Gbps ESnet testbed connection to the StarLight Facility.

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