# SC22 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 increase, a long term trend that will accelerate with the advent of large scale data production instruments, including high luminosity research instrumentation. Consequently, the networking community is preparing for service paths beyond 100 Gbps, including 400 Gbps WAN and LAN services. Today, the requirements and implications of 400 Gbps WAN services are being explored at scale, including 0ver 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 SC22 venue, between StarLight and the JBDT Facility in McLean, between the JBDT Facility and the SC22 venue and among all sites. Another site utilized will be NERSC, which has a 400 Gbps testbed connection to the StarLight Facility.

**Goals**

With its research partners including the SCinet WAN group, the International Center for Advanced Internet Research (iCAIR) at Northwestern University is designing, implementing and demonstrating an E2E 400 Gbps WAN services among multiple 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 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 and optimal affinity bindings for NUMA architecture for higher 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 400 Gbps transceivers and 400 Gbps breakout cables.

**Resources**

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. Another site utilized will be NERSC, which has a 400 Gbps testbed connection to the StarLight Facility.

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