SC26 Network Research Exhibition Abstract

FABRIC - Programmable Cyberinfrastructure with External Resource Integration, NRE 123

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Abstract

FABRIC (FABRIC is Adaptive ProgrammaBle Research Infrastructure for Computer Science and Science Applications) is an International infrastructure that enables cutting-edge experimentation and research at-scale in the areas of networking, cybersecurity, distributed computing, storage, virtual reality, 5G, machine learning, and science applications.

The FABRIC infrastructure includes a distributed set of equipment at commercial colocation spaces, national labs and campuses. Each of the FABRIC sites has large amounts of compute and storage, interconnected by high speed, dedicated optical links. It also connects to specialized testbeds (5G/IoT PAWR, NSF Clouds), the Internet and high-performance computing facilities to create a rich environment for a wide variety of experimental activities.

The FABRIC Network includes 35 sites distributed across the United States, CERN (Switzerland), University of Amsterdam (Netherlands), University of Bristol (England), and University of Tokyo (Japan).

This demonstration will show the FABRIC Research Cyberinfrastructure in operation with a focus on the following capabilities:

- Experiment specific topology (i.e. slice) instantiation consisting of network embedded compute and customized storage resources. FABRIC compute capability includes CPU, FPGA, GPU, and DPU based resources. FABRIC programmable networking includes automated network provisioning, P4 controlled elements, and realtime monitoring.
- Integration of external resources into FABRIC slices via use of FABRIC "Facility Ports".
- R&E and commodity Internet routed infrastructure, and production Science DMZs at universities and domain science specific research production research facilities can also be included in FABRIC experiment topologies.

Goals

The SC26 goal of this experiment is to showcase the FABRIC Research Cyberinfrastructure and the integration with external resources. The external connection options include Chameleon, CloudLab, National Research Platform, Internet2 AL2S and Cloud Connect Services, ESnet OSCARS Layer2 services, CENIC, PacWave, AMPATH/AmLight, wireless testbeds, scientific instruments, and High Performance Compute centers.

Another goal is to show a new paradigm for "production data flow research and development". Combining FABRIC Facility Port external resource integration with fine grained per data flow path redirection, we will show how production data flows can be run across an experimental infrastructure. This allows for realtime direct comparison between production and research systems using the same end points and data across two different infrastructures.

Resources

Figure 1 shows a diagram of the FABRIC infrastructure with the Ciena built "FABRIC Traveling Rack" which is normally located in the CIENA R&D laboratory as part of the FABRIC Production topology. For SC26, this traveling rack will be located within the Ciena Booth on the Conference Exhibit Floor. This Ciena Traveling FABRIC Rack will be connected to the SCinet network infrastructure, local exhibit booth, and the rest of the FABRIC via wide area circuits made available as part of the SC26 SCinet infrastructure. The topology will include the following:

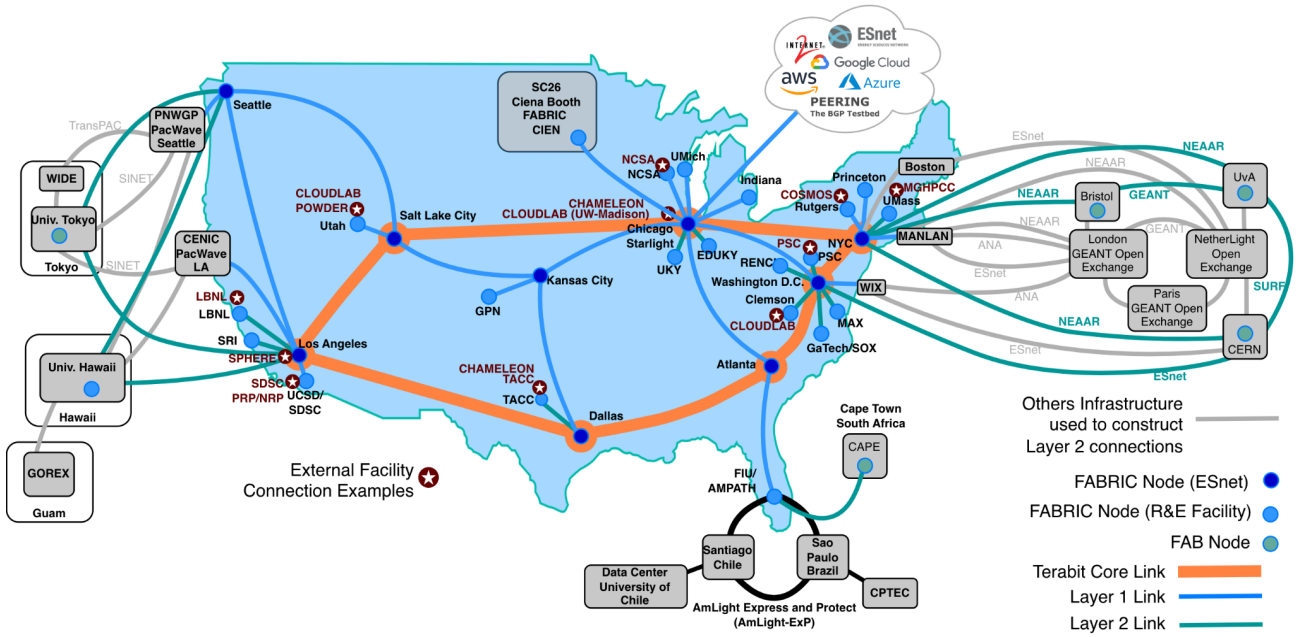


Figure 1 FABRIC Topology with SC26 Connection

- Wide area connections from StarLight in the Chicago area to the Ciena Booth located Traveling FABRIC Rack.
- This will allow attachment of the Traveling FABRIC Rack to the external FABRIC Terabit Core network.
- This FABRIC rack will also have a connection to the SENSE enabled switch/router next to the SCinet NRP cluster for Kubernetes network services integration.
- Figure 2 shows the placement of the Ciena Traveling FABRIC Rack within the SC26 Exhibit Floor. This includes connections to multiple wide area links which connect to the core FABRIC Infrastructure. Resources for the FABRIC related demonstrations will be located in other booths on the showroom floor and also at external locations.
- The SC26 demonstrations will also use the new FABRIC site at Cape Town South Africa, powered by a Ciena built FABRIC node. The network connections back to the FABRIC core are provided by AmLight. This infrastructure will be used to support a network-enabled transcontinental Cryo-EM (Cryogenic Electron Microscopy) workflow as part of NRE119.

Involved Parties

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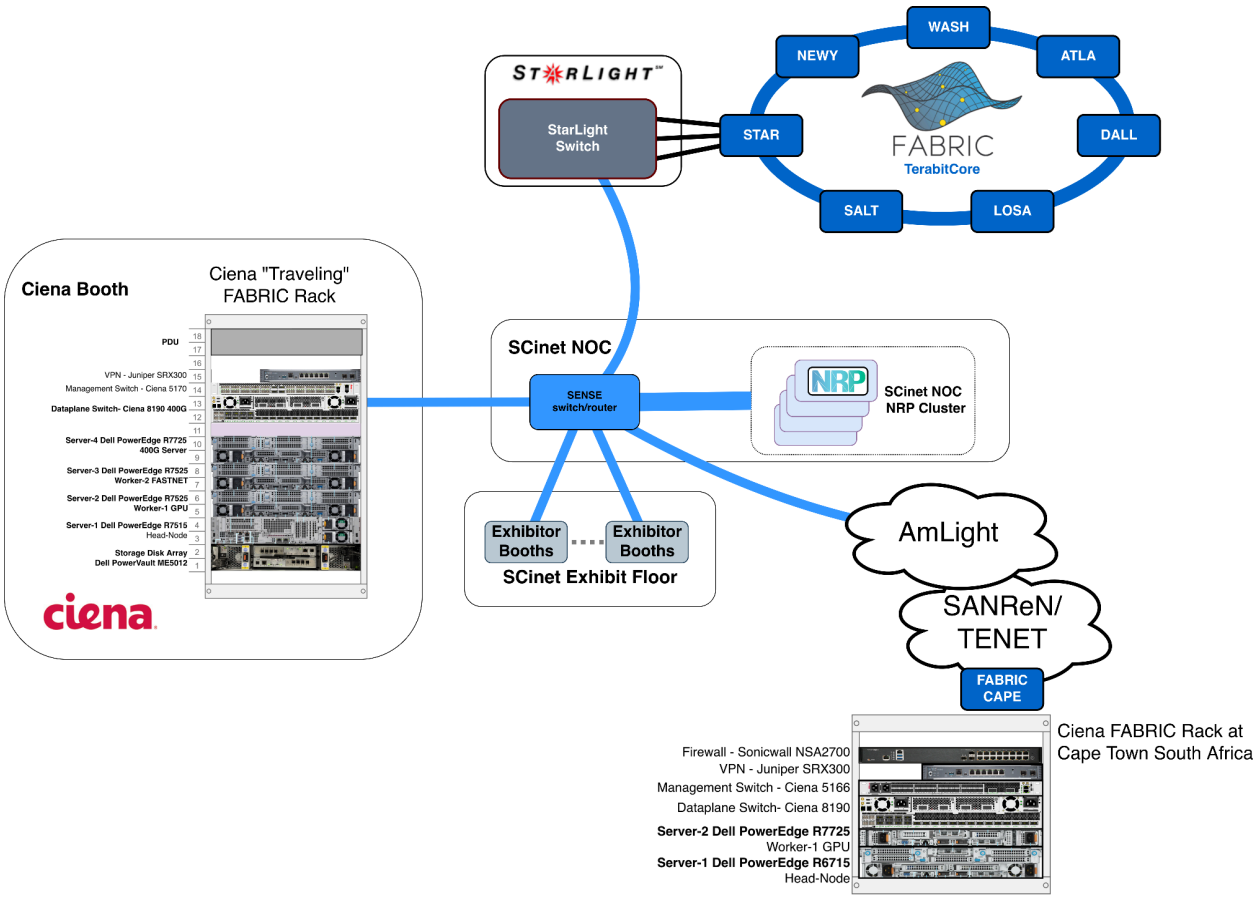


Figure 2 Ciena FABRIC Traveling Rack at SC26