SC25 Network Research Exhibition: Demonstration Publishable Abstract

Resilient, Performant Networks and Distributed Processing

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Abstract

This demonstration will build on our previous NRE SC demonstrations with significant advancements.
As in previous years, we aim to show dynamic arrangement and re-arrangement of widely distributed processing of large volumes of data across a set of compute and network resources organized in response to resource availability and changing application demands. We also aim to explore performance limitations and enablers for high volume bulk data transfers. A software-controlled network will be assembled using a number of switches and multiple SCinet Tbps connections from DC and Chicago to St. Louis. We plan to show rapid automated deployment and redeployment with prioritized optimization, real-time monitoring and QOS management application data flows with very different network demands. Technologies we intend to leverage include SDN, RDMA, RoCE, NVMe, GPU acceleration and others.

Goals

Similar to previous efforts but planned SC25 focus is on prioritized dynamic network monitoring and control, and Tbps enabled workflows.

1. Network deployment, monitoring, reporting, and redeployment.
2. Tbps RDMA performance over global distance for timely Terabyte bulk data transfers (goal << 1 min Tbyte NVMe to NVMe transfers on N by 400G network).
3. Prioritized dynamic shifting of processing and network resources from one location/path/system to another (in response to demand and availability).

Impacts

The expected outcomes of this NRE are confirmation of the stated goals in a complex, large scale environment that exceeds what our organization could expect outside of this collaborative environment. The leverage here is substantial not only in terms of the scale of the infrastructure but even more so in the benefit of working together with the SCinet team and other NRE collaborators. Accomplishments here translate into confident transition of technologies into operational environments.

Resources

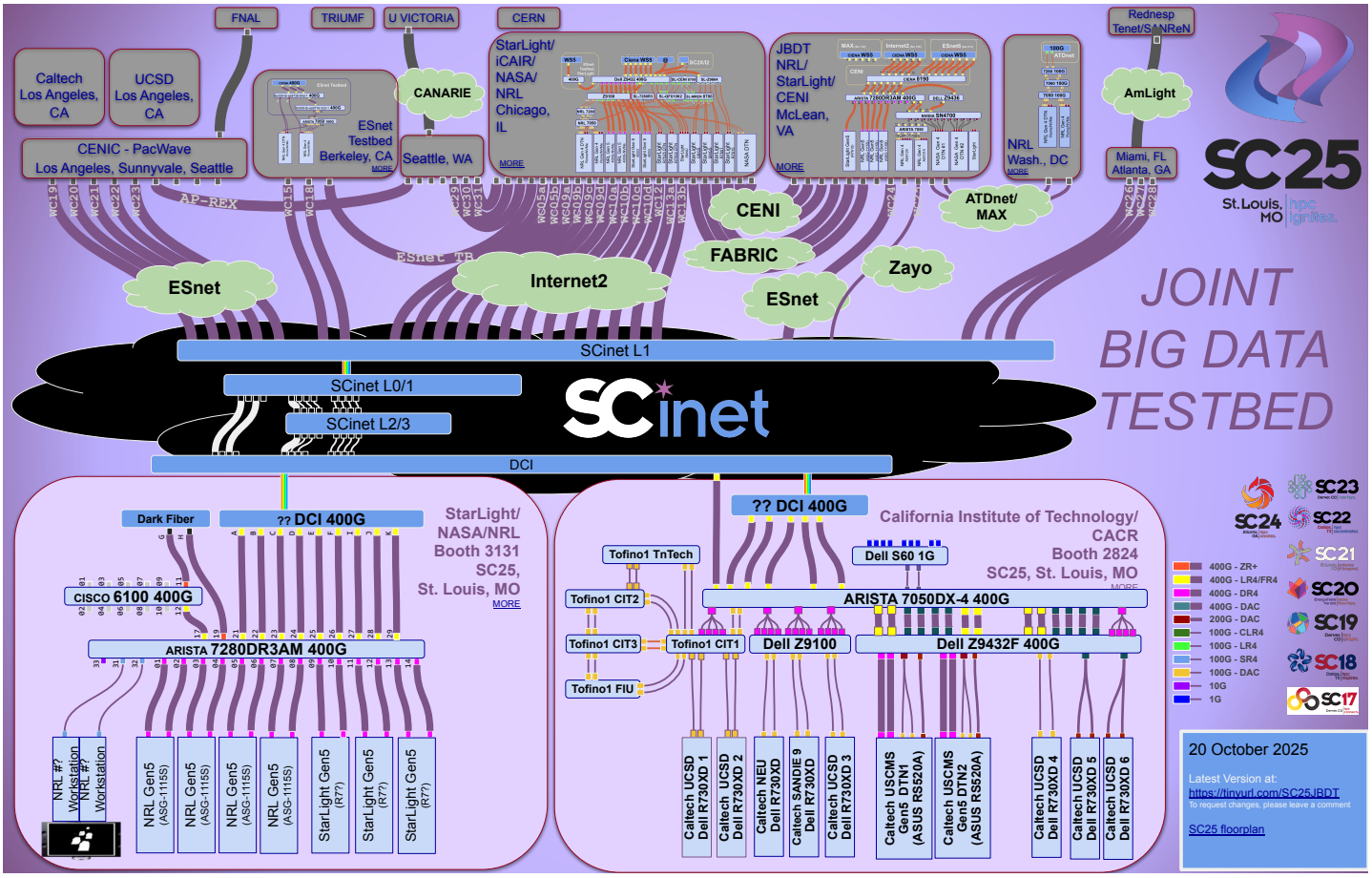
For this set of demonstration goals, NRL would like to have use of multiple Tbps WAN connections from DC to St. Louis and also through StarLight to the St. Louis SC25 SCinet and on to the StarLight booth at SC25 (resource use will be coordinated with NASA, iCAIR/StarLight and others). We will leverage in place CENI and anticipated FABRIC Tbps connections between StarLight and JBDT in McLean. Initial network submission NRI103s1.

Here are some details:

- Primary locations: JBDT at MAX in McLean, VA; StarLight at NW, Chicago, IL; SC25 in St. Louis, GA; ESnet TB Berkeley, CA
- Bandwidth to support multiple Tbps application flows
- Multiple paths between locations to allow more concurrent activities and network control/restoration test/demos (multiple – time shared – with full restoration option)
- Multiple Tbps systems established at StarLight and McLean (and possibly Berkeley), by iCAIR, NRL, NASA (adding new Gen5 NVMe systems)
- Engaging with vendors to augment and expand

Involved Parties

- StarLight, Joe Mambretti, Jim Chen
- Mid-Atlantic Crossroads (MAX), Dave Diller
- CENI
- SCinet
- ESnet Testbed
- Naval Research Laboratory (NRL)
- Other vendors and collaborators


FNAL
TRIUMF
U VICTORIA
CERN
Caltech
Los Angeles, CA
UCSD
Los Angeles, CA
CENIC - PacWave
Los Angeles, Sunnyvale, Seattle
ESnet Testbed
Berkeley, CA
MORE
CANARIE
Seattle, WA
StarLight/
iCAIR/
NASA/
NRL
Chicago, IL
MORE
JBDT
NRL/
StarLight/
CENI
McLean, VA
MORE
NRL
Wash., DC
MORE
Rednesp
Tenet/SANReN
AmLight
Miami, FL
Atlanta, GA
SC25
St. Louis, MO
hpc ignites.
AP-REX
ESnet TB
CENI
FABRIC
ATDnet/
MAX
ESnet
Internet2
ESnet
Zayo
JOINT
BIG DATA
TESTBED
SCinet L1
SCinet L0/1
SCinet L2/3
SCinet
DCI
Dark Fiber
?? DCI 400G
StarLight/
NASA/NRL
Booth 3131
SC25,
St. Louis, MO
MORE
cisco 6100 400G
ARISTA 7280DR3AM 400G
NRL #7 Workstation
NRL #7 Workstation
NRL Gen5 (ASG-1115S)
NRL Gen5 (ASG-1115S)
NRL Gen5 (ASG-1115S)
NRL Gen5 (ASG-1115S)
StarLight Gen5 (R7?)
StarLight Gen5 (R7?)
StarLight Gen5 (R7?)
?? DCI 400G
California Institute of Technology/
CACR
Booth 2824
SC25, St. Louis, MO
MORE
Tofino1 TnTech
Tofino1 CIT2
Tofino1 CIT3
Tofino1 FIU
Tofino1 CIT1
Dell S60 1G
Dell Z9100
ARISTA 7050DX-4 400G
Dell Z9432F 400G
Caltech UCSD Dell R730XD 1
Caltech UCSD Dell R730XD 2
Caltech NEU Dell R730XD
Caltech SANDIE 9 Dell R730XD
Caltech UCSD Dell R730XD 3
Caltech USCMS Gen5 DTN1 (ASUS RS520A)
Caltech USCMS Gen5 DTN2 (ASUS RS520A)
Caltech UCSD Dell R730XD 4
Caltech UCSD Dell R730XD 5
Caltech UCSD Dell R730XD 6
400G - ZR+
400G - LR4/FR4
400G - DR4
400G - DAC
200G - DAC
100G - CLR4
100G - LR4
100G - SR4
100G - DAC
10G
1G
SC23
SC24
SC22
SC21
SC20
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20 October 2025
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SC25 floorplan