SC26 Network Research Exhibition: Demonstration Preliminary Abstract

American Science Cloud Infrastructure for Genesis Mission Demonstrations

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Abstract

The American Science Cloud (AmSC) platform empowers AI-driven scientific advancements at scale by integrating data, models, and high-performance computing across DOE national laboratories. Through unified APIs, secure enclaves, and scalable services, AmSC fosters collaboration and innovation while seamlessly incorporating high performance computing centers, high performance networking, and commercial cloud solutions into a secure, adaptable hybrid environment. Serving as the backbone for the Transformational AI Models Consortium (ModCon), AmSC accelerates scientific discovery and strengthens U.S. leadership in science and technology. AmSC and ModCon the core infrastructure components of the overall Genesis Mission.

The DOE booth at SC26 will have a rotating set of Genesis demonstrations. Some will be technology focused and show AmSC capabilities, while others will be science focused and show how ModCon accelerates research. This NRE proposal is intended to support a variety of Genesis Mission demonstrations. Since the basis of AmSC is the integration of instruments, simulation, AI, data management, and networking, the SC26 NRE should support all these facets.

The DOE booth will have a small experiment or computer simulation generating data. The DOE booth will also have a display of AmSC resource status, so a low-latency link to all resources used in the demonstrations is needed.

Nodes in the SCinet cluster and nodes in the NRE hotel booth will be configured to run as an AmSC resource for storage and computing. The DOE booth, SCinet cluster and will need 100Gbps links to ESnet to enable workflows with resources at Argonne National Laboratory, Oak Ridge National Laboratory, Jefferson Laboratory and Lawrence Berkeley National Laboratory. In addition, connections to Amazon Web Services and Google Cloud are needed to reach AI resources.

Demonstrations will like include many of the AmSC infrastructure partners:

- DeepLynx - digital engineering integration hub
- EDX/MACH - platform for fossil energy R&D data and tools
- Fermi Data Platform - host and serve curated data sets
- HADIS - Hardware-accelerated AI-based Distributed Inverse Solver
- Femtomind - foundational infrastructure for QCD science
- S3DF - SLAC Shared Science Data Facility
- SCDF - Scientific Computing and Data Facilities
- Stellar-AI - combined HPC and AI for fusion energy research and deployment
- VEE-ARIES - Virtual Emulation Environment for large energy projects

Goals

1. Demonstrate capabilities of AmSC
2. Demonstrate how high performance networking supports the Genesis Mission
3. Demonstrate how additional resources (SCinet cluster and DOE cluster in NRE hotel booth) can be dynamically added to AmSC.
4. Provide an environment for AmSC and ModCon demonstrations.

Resources

- Experimental device or a computer running simulation in the DOE booth.
- Compute nodes in the NRE hotel booth
- Compute nodes in the SCinet cluster
- Wide area connections from ESnet to the SCinet cluster, NRE hotel booth and DOE booth.

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