

SC21 Network Research Exhibition: Demonstration Abstract

Global Research Platform: A Distributed Environment for Science Research and New Knowledge Discovery

Joe Mambretti, Jim Chen, Fei Yeh, Se Young Yu

International Center for Advanced Internet Research - Northwestern University

j-mambretti, jim-chen, fyeh, young.yu,

Abstract

An international collaboration has been established to design, develop, implement, and operate a highly distributed environment – the Global Research Platform (GRP) for large scale international science collaborations. For SC21 NRE, GRP will provide remote and show floor science resources orchestration and monitoring services for number of NRE projects, experiments, and demonstrations. These experiments and demonstrations showcase the capabilities of the GRP to support large scale data intensive world-wide science research. Additional capabilities will demonstrate globally accessible DTN-as-a-Service capabilities, network programming, including data plane programming with P4 and K8 as a large scale orchestrator for highly distributed workflows.

Goals

1 A motivation for this initiative is the recognition that large scale world-wide collaborative science, especially data intensive science research cannot be well supported by traditional commodity networks. Instead, specialized networks that address the demanding requirements of science applications and data workflows must be implemented, particularly services for high capacity individual data streams transported thousands of miles over multi-domain networks.

2 One inspiration for this approach has been the ESnet “Science DMZ” architecture. Another has been the National Science Foundation’s Campus Cyberinfrastructure. The Pacific Research Platform demonstrated the utility of extending local science DMZs to long distances across regions and nations. Currently, the Asia Pacific region is creating an Asia Pacific Research Platform and the US has implemented a prototype National Research Platform.

3 Essentially, the Global Research Platform is a world-wide Science DMZ. It is notable that these demonstrations extend beyond showcasing high

performance networking (e.g., almost all paths are 100 Gbps, with experiments also across 400 Gbps and 1.2 Tbps paths). They also showcase close integration of WAN paths with edge devices, including compute resources, data repositories, instruments, and storage systems.

4 An indication of the utility for such a platform has been demonstrated by the Data Mover Challenge staged by the organizers of Asia Supercomputing.

5 These demonstrations will showcase multiple components of the GRP, including orchestrators, resource discovery mechanisms, specialized middleware, integration with edge devices, performance measurements, and other services and capabilities

Resources

Required resources from SCinet are use of some portion of 1.2 Tbps Gbps circuits SCinet has been asked to provision from the StarLight facility in Chicago to the SC21 showfloor.

Involved Parties

- Joe Mambretti, iCAIR, j-mambretti@northwestern.edu
- Jim Chen, iCAIR, jim-chen@northwestern.edu
- Fei Yeh, iCAIR, fyeh@northwestern.edu
- Se-Young Yu, iCAIR, young.yu@northwestern.edu
- Tom DeFanti, UCSD, tdefanti@ucsd.edu
- Maxine Brown, UIC, Maxine@uic.edu
- Linda Winkler, ANL, lwinkler@anl.gov
- Metropolitan Research and Education Network
- StarLight International/National Communication Exchange Facility and Consortium
- SCinet