Contribution ID: **551** Type: **Parallel**

The DYNES Instrument: A Description and Overview

Thursday, May 24, 2012 1:30 PM (25 minutes)

Scientific innovation continues to increase requirements for the computing and networking infrastructures of the world. Collaborative partners, instrumentation, storage, and processing facilities are often geographically and topologically separated, as is the case with LHC virtual organizations. These separations challenge the technology used to interconnect available resources, often delivered by Research and Education (R&E) networking providers, and leads to complications in the overall process of end-to-end data management.

Capacity and traffic management are key concerns of R&E network operators; a delicate balance is required to serve both long-lived, high capacity network flows, as well as more traditional end-user activities. The advent of dynamic circuit services, a technology that enables the creation of variable duration, guaranteed bandwidth networking channels, allows for the efficient use of common network infrastructures. These gains are seen particularly in locations where overall capacity is scarce compared to the (sustained peak) needs of user communities. Related efforts, including those of the LHCOPN operations group and the emerging LHCONE project, may take advantage of available resources by designating specific network activities as a “high priority”, allowing reservation of dedicated bandwidth or optimizing for deadline scheduling and predicable delivery patterns.

This paper presents the DYNES instrument, an NSF funded cyberinfrastructure project designed to facilitate end-to-end dynamic circuit services. This combination of hardware and software innovation is being deployed across R&E networks in the United States at selected end-sites located on University Campuses. DYNES is peering with international efforts in other countries using similar solutions, and is increasing the reach of this emerging technology. This global data movement solution could be integrated into computing paradigms such as cloud and grid computing platforms, and through the use of APIs can be integrated into existing data movement software.

Summary

A description and overview of a distributed virtual instrument for the dynamic creation of end-to-end circuits to support distributed scientific collaborations.

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Session Classification: Computer Facilities, Production Grids and Networking

Track Classification: Computer Facilities, Production Grids and Networking (track 4)