Data Flow Prioritization for Scientific Workflows Using A Virtual SDX on ExoGENI

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Abstract

- We present a novel, dynamically adaptable networked cloud infrastructure driven by the demand of a data-driven scientific workflow running on dynamically provisioned ‘slices’ spanning multiple ExoGENI racks.
- We show how a virtual Software Defined Exchange (SDX) platform, instantiated on ExoGENI, provides additional functionality for management of scientific workflows.
- We demonstrate how tools developed in the DoE Panorama project can enable the Pegasus Workflow Management System to monitor and manipulate network connectivity and performance.

ExoGENI Virtual SDX for Workflow Data Flows

Virtual Overlay acting as SDX

Data Flow Prioritization

Virtual SDX transparently arbitrates workflow data flows communicated by Pegasus

End-to-End Architecture

Demonstration

Pegasus Workflow Management System

1. Pegasus determines “Express flow” requirements for workflow data transfers
2. Pegasus sends “modifyNetwork” QoS requests to messaging space

ORCA/ExoGENI provisioning

Virtualized SDX

3. RM uses AHAB and VirtualSDX API to send SDN QoS requests to SDX Tree Network
4. SDX Tree Network actuates QoS actions using REST API of SDN controller
5. SDN controller contacts SDX switches for each site
6. Slice modified with required bandwidth QoS
7. RM sends ack. to Pegasus when Express flow QoS is set

NIaaS/Infrastructure

VirtualSDX + ExoGENI

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