

GENI: Slivers and Slices in a Diverse, Outdoor, Mobile Network Environment (DOME) Testbed

Quarterly Status Report, Q3 June 2009

Project Number 1599
University of Massachusetts, Amherst
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Major Accomplishments

The major accomplishments for April 2009 through June 2009 are summarized below.

- Completed Milestones 1c and 1d on schedule (see below).
- Added DOME support into the Cluster D control framework (ORCA).
- Added ORCA support to the DOME GENI portal.
- Implemented scheduling of experiments (VMs) on DOME nodes (bricks) based on ORCA leases.
- GEC4 demo.
- Along with the UMass ViSE project, we have begun working with UMass IT in an effort to get an Internet2 connection for GENI usage.

Milestones Achieved, Deliverables Made

We had two milestones this quarter. Both were completed and the documentation was delivered, on time, to the GPO. Milestone 1c was:

"Implement, integrate and document virtualized access to the WiFi radio for your mobile nodes (bricks)"

We have implemented virtual machines such that the WiFi device's PCI address is migrated to the guest VM. The implication of this is that experiments will have full access to the WiFi device, equivalent to root access on a non-virtualized Linux operating system.

Milestone 1d was:

"Import and setup a GENI-compliant control framework based on ORCA, from the '...Prototype GENI Control Plane (ORCA)...' project (project 1582, PI: Ilia Baldine ibaldin@renci.org), contingent upon receipt of documentation and reference software implementations."

This milestone was also completed on time. We implemented a DOME-specific ORCA controller and handler. The source code was made available to Cluster D, along with documentation detailing the steps to integrate with ORCA.

Description of Work Performed During Last Quarter, Activities and Findings

The primary effort of the prior quarter was the development of the foundation for defining, deploying, scheduling and launching experiments on DOME nodes (bricks). Our effort focused on four major tasks.

1. Setting up ORCA and becoming conversant with the framework.

With assistance from RENCi and David Irwin (ViSE), we built ORCA from source and installed it on a local system running under VMWare. We studied the existing ORCA plug-ins to understand how DOME might fit in. We are now in the process of working with ViSE to create a shared instance of ORCA on dedicated hardware. This configuration will eventually become what we use when DOME and ViSE are deployed as GENI testbeds.

2. Adding DOME-specific functionality to ORCA.

In order for ORCA to schedule DOME resources, we needed to implement two components and integrate them into ORCA. The first component was the DOME controller. The controller provides an XML-RPC interface for requesting leases. Once the controller has received an external lease request, it makes a request of ORCA to reserve the resources. The controller also handles events from ORCA regarding the state of the ticket.

The second component is the handler. The handler is responsible for notifying the DOME resource pool of the lease activation ("join") and termination ("leave"). ORCA instigates these events by executing DOME ant scripts, which invoke tasks that initiate XML-RPC calls.

3. Integrating ORCA with the DOME GENI portal.

We have added an ORCA component to the DOME portal that we are developing for GENI. The portal is the interface a researcher uses for reserving DOME resources; it shields end users from the specifics of ORCA. The portal makes XML-RPC calls to the DOME ORCA controller to request leases. The portal additionally makes calls into the controller to get the status of tickets.

The portal exports XML-RPC interfaces to be called by the DOME ORCA handler when leases are initiated or terminated. The portal maintains information about pending and active leases, and updates state when notified by ORCA.

Besides providing the user interface for researchers, the portal is accessed by the DOME nodes located on the buses. One interaction between the bricks and portal is to download experiment to the buses. The portal uses its knowledge of active and pending leases to assign download priorities to experiments. The bricks query the portal to find out if a lease has been granted or revoked in order to schedule experiments.

4. Adding ORCA lease support to the mobile nodes.

We have developed software for the bricks to make use of the download priorities assigned by the portal. The priorities are used for choosing an experiment to download, and for garbage collection if available disk space falls below a threshold. We have also developed software for the bricks to launch and terminate experiments as leases are granted or revoked. The bricks also provide information to the portal that can be used by end users, such as what experiments have been successfully downloaded and launched.

Project Participants

The project participants are Brian Levine (PI), Mark Corner (PI) and Brian Lynn (engineer).

Outreach Activities

We had an undergraduate work on DOME until the end of the spring semester. We continue to use DOME to offer Internet access on the UMass buses, and we have begun to collect statistics on usage. We are in discussions with the UMass Pioneer Valley Transit Authority (UMass PVTA) regarding the development of a service that would use text messaging (SMS) and DOME's GPS bus tracking to provide estimated bus arrival times to riders.

Collaborations

We have worked closely with the GENI ViSE project. We are in the process of creating a single instance of ORCA to be shared by ViSE and DOME. We continue to rely on ViSE's (David Irwin's) ORCA expertise.

There has been considerable interaction among the Cluster D participants. The DOME ORCA controller originated with code developed for ViSE. The DOME controller and handler source code was made available and has been useful to the Kansei project. The DOME ORCA code and access to the DOME portal was provided to a GPO intern.

We continue to work closely with the UMass PVTA, planning joint projects and working to ensure symbiotic collaboration.

We also continue to work with UMass OIT and the Town of Amherst in order to have access to the campus and town WiFi networks. Equipment for the town's WiFi mesh was provided by the DOME project.

We are working with ViSE and UMass OIT in an attempt to get an Internet2 connection with VLAN support for use with our GENI testbeds.

Diagram of DOME

