

**MAX GENI Stitching  
Project Status Report  
Post GEC 14 (July 9-11, 2012) Report  
Due July 27, 2012**

**I. Major accomplishments  
A. Milestones status**

**MAXREGIONAL: S4.b: Demonstration at GEC14**

- Demonstrate stitching between GENI resources at MAX and CRON using the prototype GENI stitching AMs for MAX, CRON and Internet2. Demonstrate GENI slices using stitched layer2 connections between MAX and CRON over Internet2. We anticipate that MAX will use the DYNES rack that should be installed in MAX before this demo, and that CRON will use traditional ION services provided by their LONI regional connection to Internet2, which will use appropriate services to interconnect them.
- Evaluate modifications required to PerfSonar Topology Service to build a GENI Topology Service. Share design on GENI wiki and review at a GENI teleconference. Assumptions: This is design work; no implementation is expected. However design will be to the level of detail where implementation could begin.

**Status:**

Our GEC14 demonstration showed multi-aggregate stitching involving four aggregate managers: MAX, ION, LONI, and CRON. This included demonstration of the MAX (and ION, LONI) Aggregate Managers compatibility with the GENIv3 RSpec formats (MAX:S4.c).

This functionality was demonstrated in the context of the larger multi-aggregate stitching architecture and implementation work underway. The OMNI Client was used to submit requests to the four aggregates (CRON AM, LONI AM, ION AM, MAX AM). We demonstrated the cases where the Dynamic Circuit Network (DCN) networks in between the GENI Aggregates all have a GENI Aggregate Manager "covering" them, and the case where some (or all) of the DCN networks do not have a GENI AM API.

A GENI Rack at MAX was not available, so we utilized PlanetLab Resources at MAX for the host resources in that aggregate.

More detailed descriptions of this demonstration, including example RSpecs and demo scripts are located here:

- <https://geni.maxgigapop.net/twiki/bin/view/GENI/Publications> =====> GEC14

Future work will include; i) enhancements to OMNI client to further automate the multi-aggregate stitching process, ii) updates to support latest RSpecs and stitching extensions, and iii) additional changes associated with other aggregates and GENI Racks.

The PerfSonar Topology Service has been evaluated in the context of modifying to create a

GENI Topology Service. We believe that there is much we can leverage and learn from the PerfSonar system and we also see benefits in developing some degree of interoperability between GENI and PerfSonar systems. We also participated in network stitching focused discussions as part of the GENI Architecture group regular telecons. During these calls we discussed the overall GENI Stitching design which includes a GENI Topology Service and a GENI Computation Service.

We believe we have a good plan to create a GENI Topology Service. We are working on another GENI Project, GEMINI, to see if their UNIS system can be used as the foundation for a GENI Topology Service implementation. This will also allow us to build a bridge between the GENI and PerfSonar and Dynamic Circuit Service worlds.

Additional plans for GENI Topology Service design and implementation and drawing/slides from the GENI Architecture telecons are available here:

- <https://geni.maxgigapop.net/twiki/bin/view/GENI/NetworkStitchingArch>

Future work for the GENI Topology Service includes: i) working with GEMINI project to see if implementation activities can leverage their work, ii) develop a GENI Topology Service API for GENI clients and computation service use.

#### **MAX: S4.c: Upgrade MAX AM to support GENI v3 RSpecs**

Upgrade MAX and early prototype ION stitching AM to GENI v3 RSpecs, including stitching extension. Update MAX aggregate information on GENI wiki to reflect prototype AM capabilities.

#### **Status:**

The MAX Aggregate Manager have been upgraded to utilize the GENI v3 RSpecs. This includes support for the stitching extension. In addition we have deployed additional instances of this Aggregate Manager to "cover" the LONI (Louisiana Regional Network) and ION DCN networks. We demonstrated the functionality of these features as part of our GEC14 demonstration. This included a four Aggregate slice instantiation; MAX AM, ION AM, LONI AM, and CRON AM.

Details on the MAX, ION, and LONI Aggregate Manager support for GENI v3 RSpecs are available on the MAX wiki here:

- <https://geni.maxgigapop.net/twiki/bin/view/GENI/MaxRspec>

Future MAX AM work will include software updates to reflect best practices agreements between Aggregates regarding RSpec and Stitching Extension information presentation and handling.

#### **B. Deliverables made**

During this reporting period we completed the following deliverables:

## GEC14 Stitching Demonstration

- [geni.maxgigapop.net](http://geni.maxgigapop.net) =====> Publications =====> GEC13
- or direct
- [https://geni.maxgigapop.net/twiki/bin/view/GENI/Publications#GENI\\_Engineering\\_Conference\\_14\\_M](https://geni.maxgigapop.net/twiki/bin/view/GENI/Publications#GENI_Engineering_Conference_14_M)
- [http://groups.geni.net/geni/wiki/GEC14Agenda/EveningDemoSession#MAXStitching Demonstration](http://groups.geni.net/geni/wiki/GEC14Agenda/EveningDemoSession#MAXStitchingDemonstration)

## Network Stitching Architecture and GENI Topology Service Designs:

- <https://geni.maxgigapop.net/twiki/bin/view/GENI/NetworkStitchingArch>

## MAX Aggregate Manager support for GENI v3 RSpecs:

- <https://geni.maxgigapop.net/twiki/bin/view/GENI/MaxRspec>

## **II Description of work performed during last quarter**

### **A. Activities and findings**

We have a well defined stitching architecture which consists of the following components:

- i. Stitching Extensions for RSpec Schemas
- ii. Stitching WorkFlow Function (basic and w/negotiation)
- iii. GENI AM API Extensions for Stitching
- iv. Stitching Topology Service
- v. Stitching Computation Service

Based on already completed design, implementation, testing, and demonstrations, the indications are that we will be able to implement a GENI multi-aggregate stitching capability which will satisfy the needs of the initial GENI Rack deployments as well as other sites which will have GENI Aggregate Managers. Now that the GENI AM API v3 has been finalized, we will need to update the current design for item ii (stitching w/ negotiation). These updates are primarily message type and format in nature, and do not change the planned architecture or design.

This initial capability set will likely be based on items i and iii (with basic stitching workflow). This capability will allow GENI experimenters to utilize the initially deployed infrastructure to instantiate slices which span multiple aggregates. Parallel to this initial stitching deployment, work will continue on items ii (stitching w/negotiation), and iv-v to prepare for larger scale deployments.

### **B. Project participants**

Tom Lehman (USC/ISI)

Xi Yang (USC/ISI)

Abdella Battou (MAX)

Balasubramania Pillai (MAX)

### **C. Publications (individual and organizational)**

No formal publications were funded by this project during this time period.

**D. Outreach activities**

The current focus of our outreach activities is thru our collaborations with other Aggregates such as CRON, ProtoGENI, ExoGENI, and GENI Rack deployment sites. We also plan to encourage more outreach to potential experimenters at University of Maryland and other universities in the MAX footprint.

**E. Collaborations**

As part of the activities and milestones described here, we have had extensive collaborations with many in the GENI community. This includes CRON, ProtoGENI, ExoGENI, and GPO developers. A large focus of our milestones during this reporting period revolved around network stitching architecture, design, and software development. These activities required collaborations with other GENI aggregate manager developers.

**F. Other Contributions**

none.