

## PrimoGENI – Developing GENI Aggregates for Real-Time Large-Scale Network Simulation

Jason Liu<sup>1</sup>, Julio Ibarra<sup>2</sup>, Heidi Alvarez<sup>2</sup>

Florida International University, Miami, Florida, USA.

<sup>1</sup>School of Computer Science and Information Sciences

<sup>2</sup>Center for Internet Augmented Research and Assessment

liux@cs.fiu.edu, {Julio, heidi}@fiu.edu

**Abstract.** *The Global Environment for Network Innovations (GENI) is an NSF-funded program to develop a nationwide research facility for developing programmable networking environments and experimenting with new network architectures and distributed systems. PrimoGENI is a project at FIU that will augment the GENI suite of interoperable infrastructure to enable large-scale experiments consisting of simulated, emulated and physical network entities. Support for large-scale simulation is currently missing in GENI. Simulation can significantly improve the flexibility and scalability of network experiments beyond what can be achieved on physical and emulation testbeds [Liu 2008a]. For example, simulation allows easier incorporation of abstract mathematical models (e.g., the epidemic worm propagation model and fluid network traffic model) and, through the use of parallel and distributed simulation, can accommodate extremely large and detailed network models. Real-time simulation refers to the technique of supporting the execution of large-scale detailed network models in real time [Liu 2008b]. We will discuss the PrimoGENI project plans to integrate simulation capabilities into the GENI “ecosystem” through real-time simulation methodologies.*

*GENI is building a meso-scale prototype infrastructure that is deploying OpenFlow switches at Internet2 and National LambdaRail backbone Points of Presence (POPs), and also at least 8 U.S. university campuses. The objective of the meso-scale build out is to “get real experiments up and running (Elliot, 2010)”. A GENI experiment is an interconnected set of reserved resources on platforms in diverse locations, such that each experiment is instantiated on shared infrastructure, yet runs within its own isolated slice, created end-to-end across an interoperable suite of federated infrastructure (GENI-SY-RQ, 2008). We will discuss FIU’s plans to participate in the GENI meso-scale prototype deployment, which would extend the OpenFlow infrastructure to Miami. We will also discuss our plans to create an OpenFlow testbed between the AMPATH Internet Exchange Point, in Miami, and the SouthernLight Exchange Point, in São Paulo, to support simulation/emulation experiments between the U.S. and Brazil.*

### References

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## Biographies

**Dr. Jason Liu** (PI) is an Assistant Professor at the School of Computing and Information Sciences of Florida International University (FIU). His current research focuses on fundamental technologies supporting real-time immersive large-scale network simulations. His research group designed and implemented PRIME, which is a high-performance network simulation and emulation framework. He received his B.A. degree from Beijing University of Technology in China in 1993, an M.S. degree from College of William and Mary in 2000, and a Ph.D. degree from Dartmouth College in 2003.

**Mr. Julio Ibarra** (Co-PI) is Assistant VP for Technology Augmented Research at FIU, where he is responsible for strategic planning and development of advanced research networking services, including the development and management of the AMPATH Internet Exchange Point for Research and Education networks. He is the PI of the Américas Lightpaths (AmLight) Project - an NSF International Research Network Connections (IRNC) grant. He has B.S. and M.S. degrees in computer science from Florida International University, and Ph.D. degree from Twente University (in progress).

**Dr. Heidi Alvarez** (Co-PI) is the Director of the Center for Internet Augmented Research and Assessment (CIARA) at FIU. She is responsible for supporting the center's directive to offer Internet, Internet2 and next-generation high-performance networking services to research and education institutions. Dr. Alvarez is the PI for the CyberBridges NSF CI-TEAM demonstration and implementation projects. She received her B.S. degree from the University of Miami, in Education, an M.A. degree from FIU, in English, and a Ph.D. from the Rotterdam School of Management (RSM) at Erasmus University.