OFCLEM Project Status Report
Period: 11/5/2011-3/15/2012 (GEC13)

I. Major accomplishments

The project will deploy an OpenFlow (OF) testbed on the Clemson University campus and connect with wireless mesh access points and mobile terminals. This trial will conduct OF experimentation focused on OF enabled network operation solutions as a precursor to deployment into Clemson research and production networks.

During this period, key achievements include:
   a) Completed user interface and prototype traffic sensor for campus Data Analysis Network
   b) Support for various GENI experiments
   c) Poster demo at GEC13: "OpenFlow at Clemson: Data Analysis Network and Multi-controller OpenFlow Network"
   d) Two papers presented at the first GENI Research and Education Experiment Workshop: "Steroid OpenFlow Service" and "OneCloud"
   e) Outreach to Clemson IT staff

A. Milestones achieved

One milestone was planned for this period. To our understanding, it is considered completed given the conditions specified below:

   1. OFCLEM: S4.a Experimental and production deployment plans (Due 11/04/11): On switches: We have completed to-date ten OpenFlow switches (HP, Pronto) for experimental and production use. Additional Pronto switches are hosted in the lab for staging uses. On Servers: two MyPLC nodes and two Utah ProtoGENI rack servers are available for GENI experiments. One InstaGENI rack will be hosted as it becomes available. On upstream connections: three GENI core VLANs and five point-to-point VLANs (see http://groups.geni.net/geni/wiki/SiteClemson for more details). We will work with GPO on migration to the new GENI core VLAN planned.

No other milestones are due this period.

B. Deliverables made

   a) Completed "OneCloud" prototype, an Amazon EC2 like "Elastic IP" support using OpenFlow and OpenNebula
   b) Presented two papers at the first GENI Research and Education Experiment Workshop on "Steroid OpenFlow Service" and "OneCloud"

II. Description of work performed during last quarter

A. Activities and findings

   a) Completed user interface and prototype traffic sensor for campus Data Analysis Network
      Two REU students implemented a Google map interface and a form interface to select OpenFlow switches on campus and add/delete flow rules to the switches using dpctl. Test traffic is redirected to an open source security sensor.

   b) Support for various GENI experiments

Through the latest FOAM portal we have been supporting external GENI experiment requests on our OpenFlow switches.

c) Poster demo at GEC13: "OpenFlow at Clemson: Data Analysis Network and Multi-controller OpenFlow Network"
In addition to showing the live operation of the Data Analysis Network control interface, an additional, newly initiated REU project is presented to study the operation of multiple OpenFlow controllers on the same network (characteristic of dynamic network merge/split in mobile ad hoc networks or distributed controllers in a wired network domain).

d) Two papers presented at the first GENI Research and Education Experiment Workshop on "Steroid OpenFlow Service" and "OneCloud"

e) Continued outreach to campus IT staff
Gave a colloquium talk to CCIT staff to engage IT engineers in proposing new campus use cases for OpenFlow.

B. Project participants

The project team members are:
PI: Kuang-Ching Wang (ECE Associate Professor)
Co-PI: Jim Pepin (CTO)
IT: Dan Schmiedt (Director of Network Services and Telecommunications), Wayne Ficklin (Network Engineer), Brian Parker (Network Engineer)
ECE graduate research assistant: Aaron Rosen (MS), Fan Yang (PhD)
ECE undergraduate student: Benjamin Ujcich (sophomore), Jeff Heider (senior), Scott Groel (sophomore)

C. Publications (individual and organizational)

1. A. Rosen and K.-C. Wang, "Steroid OpenFlow Service: Seamless Network Service Delivery in Software Defined Networks," in Proceedings of the First GENI Research and Educational Experiment Workshop, pp.1~5, March 2012.
2. G. Stabler, S. Goasguen, A. Rosen, and K.-C. Wang, "OneCloud: Controlling the network in an OpenFlow cloud," in Proceedings of the First GENI Research and Educational Experiment Workshop, pp.1~6, March 2012.
3. G. Stabler, A. Rosen, K.-C. Wang, and S. Goasguen, "Poster Abstract: Dynamic virtualized networking in the cloud using OpenFlow," in Proceedings of IBM Cloud Academy Conference, April 2012.

D. Outreach activities

a) Gave GENI/OpenFlow talk at campus IT colloquium.

E. Collaborations

The project is conducted in collaboration with campuses and backbone providers on the OpenFlow trial. We have so far worked more closely with:
a) Nick McKeown, Guru Parulkar, and the Stanford OpenFlow group, assisting us in the acquisition, installation, configuration, and testing of OpenFlow software.

b) GENI Project Office

F. Other Contributions

None in this reporting period.