OFCLEM Project Status Report
Period: 7/1/2010-9/30/2010

I. Major accomplishments

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

During this period, key achievements include:

a) Completed OpenFlow 1.0 transition of all (4) HP ProCurve switches in three buildings, flowvisor, and SNAC.
b) Confirmed plan to reload all (2) Toroki switches with Stanford firmware and cancel outstanding back order of two more Toroki switches.
c) Completed cross-campus L2 connectivity with BBN, Stanford, GT, and three GENI core VLANs.
d) Completed physical deployment of pilot OpenFlow wireless mesh network (5 IEEE 802.11a/g access points on light poles along S. Palmetto Street in front of Fluor Daniel Building).
e) Supported GEC9 plenary demos (Asterix, Pathlet, NetServ (planned), SmartRE (planned)).

Newly found and known issues:

a) Newly found packet drop and no route issue with SNAC and NoX routing implementation in our network. The issue recurs deterministically. Current resolution is to revert to simplerouting on NoX, which does not seem to have the same issue so far.
b) Known OpenFlow mesh network low bandwidth issue on its internal virtual interface.

A. Milestones achieved

Three milestones scheduled for this reporting period have not been completed pending Stanford's GENI API software:

1. OFCLEM: S2.c Install GENI software with AM API implementation (Due 04/30/10 (late))
2. OFCLEM: S2.d Begin integration testing with Stanford and BBN (Due 05/31/10 (late))
3. OFCLEM: S2.f Upgrade small deployments to use OF 1.0 (Due 07/31/10 (late))

The following milestone has been executed and will continue till GEC9:

4. OFCLEM: S2.e Plan and engineer GEC 9 demo (Due 07/31/10 (late))

B. Deliverables made

a) Completed campus OpenFlow Ethernet deployment (opt-in users from two ECE labs)
b) Completed campus OpenFlow wireless mesh network pilot

II. Description of work performed during last quarter

A. Activities and findings

a) Completed OpenFlow 1.0 transition of all (4) HP ProCurve switches in three buildings, flowvisor, and SNAC.

Four HP ProCurve 3500yl-48G switches were upgraded to v.2.02h OF 1.0 firmware. Four campus VLANs (non-OF 845, OF-production 846, OF-experimental 847, Pathlet 1734)

and six cross-campus VLANs (Clemson-GT 973, Clemson-Stanford 3707, Clemson-GT 3711, GENI-non-OF-core 3705, GENI-OF-core-north 3799 translated by GNROC to 3715, GENI-OF-core-South 3798 translated by GRNOC to 3716).

b) Confirmed plan to reload all (2) Toroki switches with Stanford firmware and cancel outstanding back order of two more Toroki switches.

Since it's not clear that Toroki will release its 1.0 OF firmware in the foreseeable near term, we decided to load the two Toroki switches we have with the Stanford Indigo firmware. We also dropped the order of two additional Toroki switches, and will purchase other OF switches instead with the funds. The Toroki upgrade and new switch orders will be started in the next quarter.

c) Completed cross-campus L2 connectivity with BBN, Stanford, GT, and three GENI core VLANs.

Three point-to-point and three multi-point VLANs have been setup and successfully tested. The point-to-point vlans are being used for GEC8 and GEC9 demos.

d) Completed physical deployment of pilot OpenFlow wireless mesh network (5 IEEE 802.11a/g access points along S. Palmetto Street in front of Fluor Daniel Building).

The access points have been mounted on light poles. All nodes are operational, but the mesh network has not been functional. We are currently debugging this issue.

e) Supported GEC9 plenary demos (Asterix, Pathlet, NetServ, SmartRE).

We are supporting these experiments with OF switch ports (Asterix, Pathlet), flowvisor slices (Asterix, Pathlet), and end hosts (Asterix). GPO has not informed details of the NetServ and SmartRE setups at the time this report is drafted; though Clemson has already committed to support them once they are ready for deployment.

B. Project participants

The project team members are:

PI: Kuang-Ching Wang, ECE Assistant Professor
Co-PI: Jim Pepin, CTO
IT: Dan Schmiedt, Director of Network Services and Telecommunications
ECE graduate research assistants: Sajindra Pradhananga (MS), Glenn Evans (MS), Aaron Rosen (MS)
ECE undergraduate students: Bob Strecansky (senior)

C. Publications (individual and organizational)

Not available at this time.

D. Outreach activities

None in this reporting period.

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, Guido Appenzeller and the Stanford OpenFlow group, assisting us in the acquisition, installation, configuration, and testing of OpenFlow software.

F. Other Contributions

None in this reporting period.