

## OpenFlow Campus Trials at Clemson University (1833A)

### OFCLEM Project Status Report

Period: 10/1/2010-3/17/2011 (GEC10)

#### 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) Received additional equipment (6 Pronto switches) for extended campus OF Ethernet; completed deployment plan to support: research, teaching, and IT operation.
- b) Installed and running Expedient and Opt-in Manager.
- c) Enabled OF support on pilot roadside wireless mesh network.
- d) Launched IT engagement initiative involving graduate and undergraduate students via: 1) building a OF-based campus data analysis network, 2) regular student attendance at CCIT weekly technical meetings, 3) help planning campus IT internship program, and 4) presentation at Internet2 Joint Tech Spring 2011.
- e) Demos at GEC10: 1) mobility support on OF campus wireless mesh network, 2) GENI/OF-based networking curriculum for teaching and IT engagement, 3) Stanford Asterix (support).
- f) Reviewed aggregate provider agreement document v3.

#### A. Milestones achieved

Four milestones extended from the previous period were completed in this period, including:

1. OFCLEM: S2.d Begin integration testing with Stanford and BBN (original due 05/31/10)
2. OFCLEM: S2.f Upgrade small deployments to use OF 1.0 (original due 07/31/10)
3. OFCLEM: S2.e Plan and engineer GEC 9 demo (original due 07/31/10)
4. OFCLEM: S2.c Install GENI software with AM API implementation (original due 04/30/10)

No other milestones are due this period.

#### B. Deliverables made

- a) Equipment and plan for OF campus Ethernet extension
- b) Completed OF operation support on wireless mesh network pilot
- c) OF tutorial for Clemson IT (v.0)

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

##### A. Activities and findings

- a) Received additional equipment (6 Pronto switches) for extended campus OF Ethernet; completed deployment plan to support: research, teaching, and IT operation.

6 switches were received through Stanford, making a total of 13 OF switches (4 HP, 3 Toroki, 6 Pronto) at Clemson. The Pronto switches are planned for deployment after GEC10 to support a range of research, teaching, and IT operation engagement activities.

- b) Installed and running Expedient and Opt-in Manager.

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Both software have been installed and supported demos at both GEC9 and GEC10. After GEC10, the software will be made open to support open experiments through GENI API.

- c) Enabled OF support on pilot roadside wireless mesh network.

We resolved the network interface bandwidth issue and were now able to conduct flexible mobile experiments with OF on the mesh network.

- d) Launched IT engagement initiative involving graduate and undergraduate students via: 1) building a OF-based campus data analysis network, 2) regular student attendance at CCIT weekly technical meetings, 3) help planning campus IT internship program, and 4) presentation at Internet2 Joint Tech Spring 2011.
- e) Demos at GEC10: 1) mobility support on OF campus wireless mesh network, 2) GENI/OF-based networking curriculum for teaching and IT engagement, 3) Stanford Asterix (support).
- f) Reviewed aggregate provider agreement document v3.

### **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)

ECE graduate research assistant: Aaron Rosen (MS)

ECE undergraduate student: Benjamin Ujcich (freshman)

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

Not available at this time.

### **D. Outreach activities**

- a) Presented OpenFlow campus IT engagement efforts at Internet2 Joint Tech Spring 2011 conference.

### **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.

### **F. Other Contributions**

None in this reporting period.