OpenFlow Campus Trials at Univ. of Wisconsin
Spiral 2 Year-end Project Review

University of Wisconsin – Madison

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Project Summary

Deploy an OpenFlow testbed at the University of Wisconsin

- Place switches in multiple buildings across campus (Computer Science, Information Technology, Engineering)
- Include production machines in the network
- Establish connectivity with other OpenFlow networks
- Setup framework for utilizing flexible and heterogeneous slices
- Develop a generic load balancer (OpenSAFE)
- Run experiments within the network (Aster*x, SmartRE)
- Precursor to a larger OpenFlow campus deployment

Milestone & QSR Status

ID	Milestone	Status	On Time?	On Wiki?	GPO signoff?
S2.a1	Select vendors	Completed. Selected HP as vendor.	On time	Yes	Yes
S2.a2	Purchase equipment	Completed. Acquired 3 HP ProCurve 6600 and 7 ProCurve 5400.	< 2 months late	Yes	Yes
S2.b	Campus small deployments	Completed. Small deployment was demonstrated at GEC7, with sample traffic and a GUI showing flows.	On time	Yes	Yes
S2.c	Install GENI software with AM API implementation.	In progress. Some software components (NOX, FlowVisor, SNAC, and ENVI) are deployed within the network. GENI software is pending availability.	> 2 months late & incomplete	No	No
S2.d	Begin integration testing with Standford and BBN.	In progress. Connectivity to Stanford and BBN over NLR FrameNet has been confirmed via ping. Integration across OF networks still requires testing.	> 2 months late & incomplete	No	No
S2.e	Plan and engineer GEC9 demo.	In progress. Two demos Aster*x and SmartRE are planned. Infrastructure configuration is in progress.	< 2 months late	No	No
S2.f	Upgrade small deployments to use OF 1.0,	Complete. All deployed OpenFlow switches and software components have been upgraded. Status has been communicated with Stanford.	On time	No	No
	QSR: 4Q2009	Unknown.			
	QSR: 1Q2010	Complete.	On time	Yes	Yes
	QSR: 2Q2010	Unknown.			

Accomplishments 1: Advancing GENI Spiral 2 Goals

Continuous Experimentation

- OpenFlow network utilized for multiple demonstrations (Aster*X, SmartRE, Mobile Offloading) at GEC conferences.
- Active use and deployment of many test boxes and production-quality services (LDAP, NFS, automated installations) with continuous hands-on management of the network
- GENI Eager funding used to support experiments in cloud networking

Integration/Interoperability

- WAN connectivity between campuses to integrate OpenFlow networks
- The standard OpenFlow) software stack (NOX, FlowVisor, ENVI) has been deployed to contribute to consistency across OpenFlow networks

Instrumentation & Measurement

- OpenSAFE was developed for monitoring high bandwidth links by load balancing traffic amongst multiple monitoring boxes using a hardware OpenFlow switch and a NOX controller.

Accomplishments 2: Other Project Accomplishments

OpenSAFE

- Designed for security monitoring, OpenSAFE provides a policy specification language for automatically directing traffic amongst multiple middle boxes using an OpenFlow network
- Specifically targeted to high bandwidth links, but has applicability for monitoring any border within the GENI infrastructure

WAN Connectivity

- Connectivity to Stanford, BBN, and Georgia Tech has increased the flexibility of the OpenFlow network by enabling a wider variety of experiments and experiments at a larger scale

Issues

Production deployment

- Conversations are going slow due to concerns over support responsibility and service level agreements
- Confident milestones will be met but growing the production deployment will be slow

Scale of the network

- Might not see the scale originally envisioned
- Likely to hit roadblocks because of questions of support responsibility

Plans

Remainder of Spiral 2

- WAN connectivity over NLR and/or I2 with Stanford, BBN, NLR OpenFlow Core, and ProtoGENI (most connections almost there)
- Including production machines in the network
- Expanding the deployment to include more switches in the wiring closets and additional departments and buildings
- Run experiments within and between OpenFlow networks

Potential Spiral 3 Work

- Integration with Suman Banerjee's WiMax deployment (proposal submitted by Banerjee)
- Include OpenWrt OpenFlow wireless nodes in the network