Spiral 4 Experimental Deployment Plan

Chris Small, InCNTRE, Indiana University

Summary

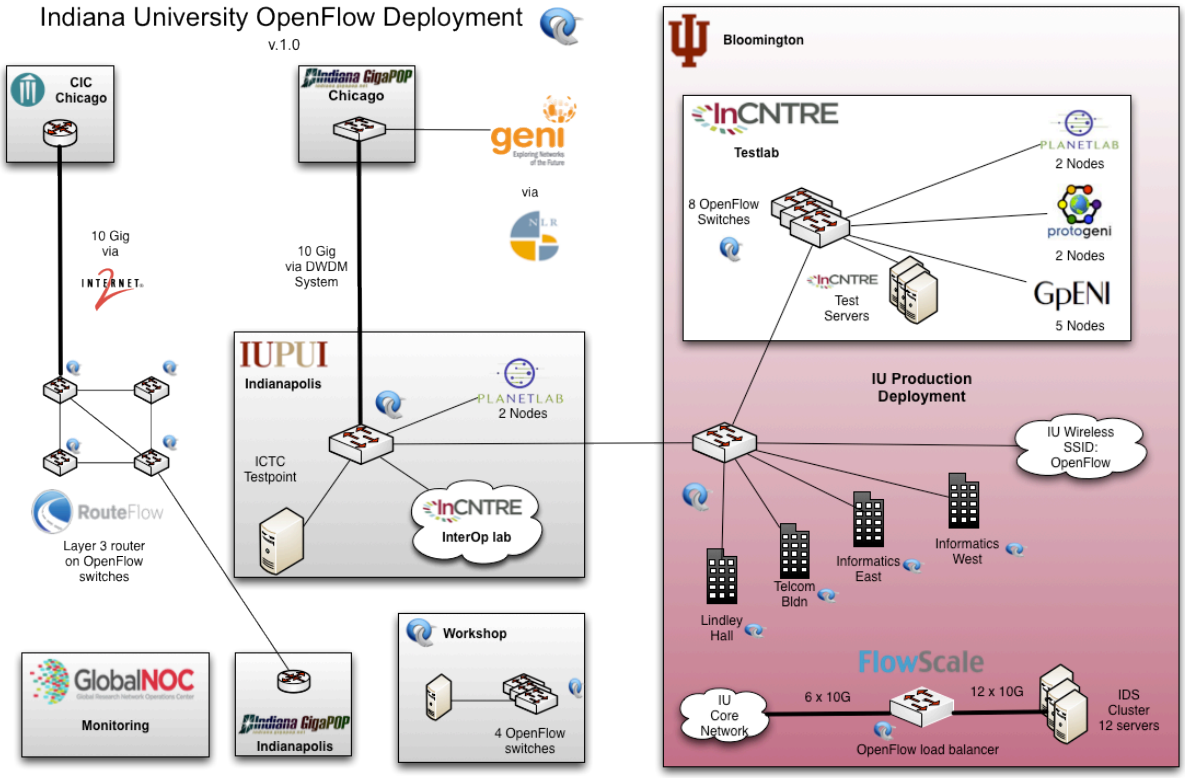
The Spiral 4 deployment plan is focusing on long term deployment plans setting the stage for moving from an OpenFlow deployment managed as a separate project to embedding OpenFlow technologies into the normal administration process. The goal is to allow as the technology develops the ability to convert all or most of the campus infrastructure to support OpenFlow and possible use by GENI researchers.

Activities include:

- Developing and deploying production OpenFlow applications into the network
- Incorporating OpenFlow into the managing and Operations tools
- Testbed and production expansions
- Training and tutorials
- Future high level planning

In addition there are a number of changes into the campus network related to GENI MesoScale backbone configuration and the introduction of a regional network (MOXI) between the campus network and the backbone. Details of the exact plan and what will be deployed is discussed in detail below.

High Level Map of Current OpenFlow Deployments



Application Deployment

One of the major ways to incentivize network operators to deploy out technologies, such as OpenFlow, that could be used by GENI is to have applications that use the same technologies. If the network operator needs to deploy and support OpenFlow switches for applications that need for their operations much of the hard work of creating GENI-capable deployments will be accomplished.

We have chosen a few simple applications that demonstrate the usefulness of SDN/OpenFlow and will allow operators to get familiar with the technology and deploy switches that can be added to the GENI testbed. The first application that is deployed in production use is FlowScale, a OpenFlow based loadbalancer. It is current deployed in the Bloomington Data Center and a similar configuration will be deployed in Indianapolis in the May-June 2012 time frame. FlowScale is using an OpenFlow switch to load balancer all campus traffic to a set of
More information on FlowScale is available at http://flowscale.openflowhub.org/

Due to security and privacy concerns the current FlowScale hardware is not connected to a GENI aggregate manager the goal is to 1) make the network operators experienced and comfortable with OpenFlow deployments and 2) Create an application that can be deployed in locations that can be made available to GENI researchers. It also creates tools and procedures developed for managing production applications be available for the management of GENI infrastructure.

Another Application that we are examining is a tool to allow 2 or more devices on the network to be located on the same broadcast domain. In the campus environment there are a number of applications that use zero-conf technologies to discover and transmit data. One example of a request from campus instructors is to be able to use AppleTVs and an iPad to display presentations wirelessly to a class using AirPlay. We expect many more of these requests as the OSX Mountain Lion software is released which has the same feature. The issue for campus is even with wireless two devices in the same room may be associated with different APs and be in different broadcast domains. It one device is on wired and one is on the wireless network it becomes a much harder problem as the wired and wireless infrastructure is completely logically separate. AirPlay requires the devices to be on the same network for discovery and data transmission. We are working with visiting faculty from Rose-Hillman to create a tool to using OpenFlow to securely connect AirPlay devices.

The deployment of the AirPlay application is very advantageous to GENI as any deployment will require deployment of OpenFlow switches on the edge. All of the switches converted to use a OpenFlow image will also be connected to the GENI infrastructure by a connection to the FOAM Aggregate Manager.

Troubleshooting tools

Another development effort in Spiral 4 is to have OpenFlow tools integrated into standard campus operations. We have developed a number of tools that resolve issues managing and maintaining OpenFlow controllers and networks. An area that we have worked at in the past 6 months is improving the alarm and logging capabilities in the OpenFlow. We continue development of the following tools.:

Visualization/debugging tool - We will created a Visualization tool incorporating topology discovery in FlowVisor, Controllers and applications. It is utilizing some of the visualization

libraries and components from the OESS code developed by IU and Internet2, GEMINI, the Measurement Manager, RouteFlow and NetKarma projects. It is using UNIS from the GEMINI project for describing the topology . The new RouteFlow DB, based on MongoDB, captures and displays all messages sent between the controller(s) and switches. We are utilizing this code to make it much easier to find and debug issues.

Event Generation – We are working on tools that will capture common problems with OpenFlow based network and controllers and pass these events to a generalized alarm system. This will utilize previous work for alert generation and open source tools such as Nagios. We will attempt to maintain GENI compatibility by implementing any event generation schema defined during Spiral 4.

OpenFlow testing tools – continued additional test development of oftest. Maintenance of the OpenFlow Test Tool (OFTT)

Source Code Repositories:

Cross Platform OpenFlow monitoring solution
https://github.com/InCNTRE/sdnm

Measurement Manager - takes a FlowVisor and exports topology information
https://github.com/InCNTRE/Measurement-Manager

RouteFlow - NewRouteFlow branch
https://github.com/CPqD/RouteFlow/tree/NewRouteFlow

NetKarma Portal visualization:
https://github.com/InCNTRE/NetKarma_Portal

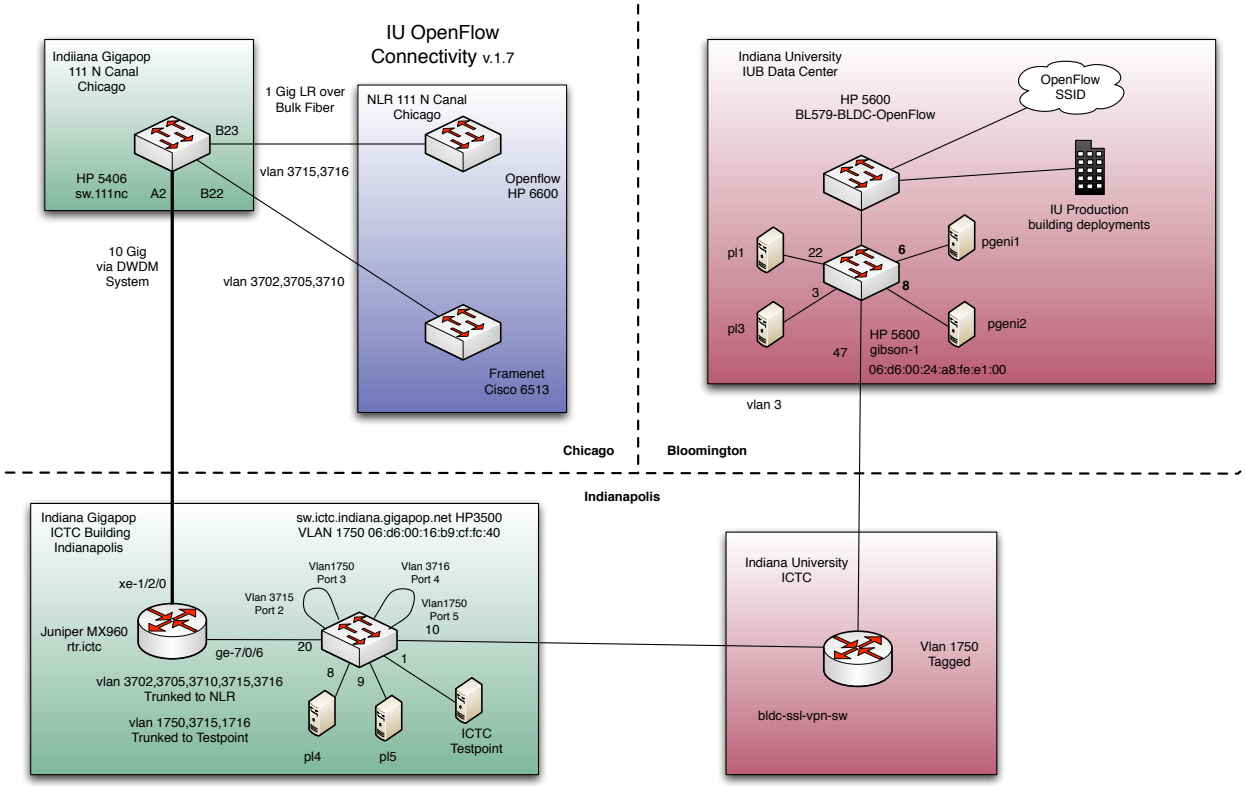
oftest for OF 1.1
https://github.com/InCNTRE/oftest11

OpenFlow Test Tool (OFTT)
https://github.com/InCNTRE/OFTT

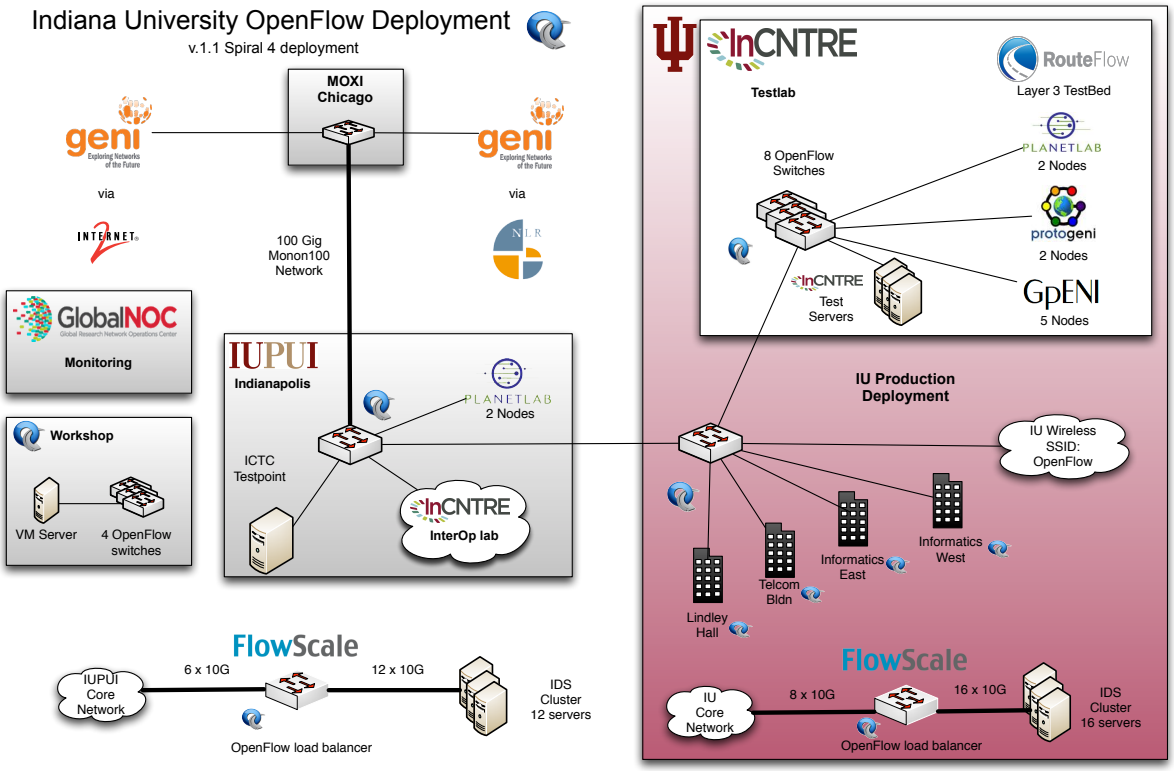
Testbed and Production expansions

The physical deployment will have a few new additions in Spiral 4.

- The addition of MOXI connections
- Addition of a Internet2 connection via MOXI over the 100G Monon100 network
- Layer 3 testbeds
    - Simulation of the Internet2 network
    - RouteFlow installation
- Additional edge switches deployed in Lindley Hall, CIB
- FlowScale deployment in Indianapolis



Spiral 4 deployment



Future Deployments

A major goal of Spiral 4 is to analyze and test what will be needed in the next 5 year Network Master Plan to have a near universal OpenFlow deployment on campus. The next 5 year Master Plan will require a RFP to be issued in approximately 18 months. In Spiral 4 we will formulate what we need to list as requirements for all network equipment in the RFP. This includes tests of possible applications and pilot programs.