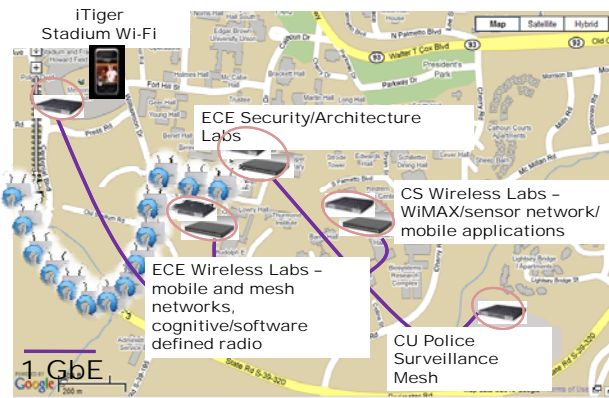


Project Goal

- The Clemson Openflow program has developed and deployed an outdoor mesh network to allow GENI researchers to conduct experiments on.
- This network allows for vehicular research to be performed in an outdoor environment.
- Test bed provides flexible control. Researches are able to implement their own controller and modify the software switch code.

Current Deployment

- 5 PC Engine APs deployed on Light Poles
 - 1 Gateway, 4 Mesh
 - 2 Wifi radios per node (One backhaul, one for Clients)
 - OpenVswitch – Openflow switch
 - Nox – controller platform
 - OLSRd – adhoc wireless mesh routing daemon
 - HostAPD

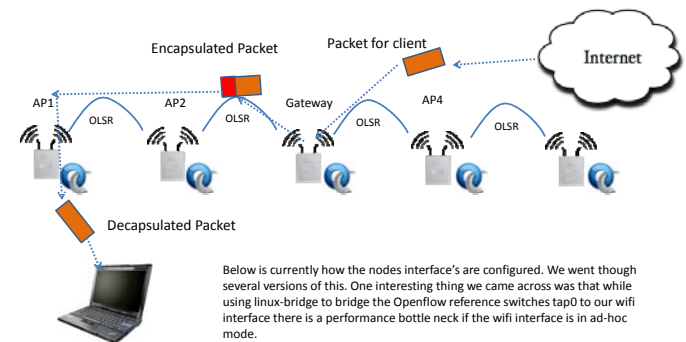


Demo: Mesh Network With Mobile Clients

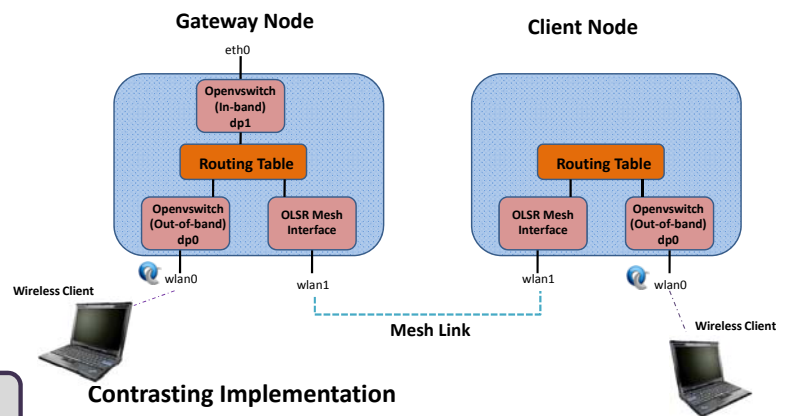
Key objective: Allow clients to hand off between layer 3 networks and still maintaining all connections.

Scenario: OLSR is used as our routing protocol for our backbone and is unable to dynamically provide route updates for clients as they move from one AP to another. In order to solve this problem we use Openflow to route clients packets to the correct location when they handoff between access points.

•**Openflow controller:** keeps mapping of where clients are located. Using this information the Openflow controlled gateway encapsulates the packets for the client so they get routed to the correct AP for each client. This allows for clients to roam between access points and still keep their connections alive.



Below is currently how the nodes interface's are configured. We went through several versions of this. One interesting thing we came across was that while using linux-bridge to bridge the Openflow reference switches tap0 to our wifi interface there is a performance bottle neck if the wifi interface is in ad-hoc mode.



Contrasting Implementation

- We also implemented a L2 VPN which bridges with the Openflow. In this implementation we have L2 across the whole mesh.
- Here an additional tap interface was joined in with dp0 to provide L2 connectivity between OpenVPN server (on campus Openflow subnet) and each client.
- This was done as another example of things that could easily be deployed on the network.

Future Research

- Openflow is generally central control oriented, all Openflow switches connect to one controller.
- In Mesh network architecture this may not be feasible due to lossy connections and mobility.
- Need for distributed cross controller communication
- Auto configuration