Experimentation on GENI with Industry Partners

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GENI and Applied Research

- Test, validate, and enable research using a real-life network
- Academy-Industry collaboration on a real-life R&D testbed
  - MS students: project/thesis within 2 years, hands-on experience (College of Technology), fast job placement
  - Teaching Classes: network programming, network security, network management, sensor networks, optical networks
- How to place "foreign" boxes on GENI?
- How to deploy custom images on GENI?

Network Programming

- Project assignments based on OpenVSwitch configuration examples:
  - QoS rate-limiting → manipulate flows to rate-limit applications
  - OFConfig implementation → management vs control plane
  - Network connectivity in SDN → *define* "connectivity" in SDN vs current networking practices
  - VLANs for VMs → firewall through flow definitions
- Next Fall: Network Management

What do I understand from programmability?

- Change, configure, provision, and manipulate network
  - Logical Topology
  - QoS
  - Path Computation and Assignment
- Based on application and service requirements
  - Against congestion
  - Security: encryption, application profiling
  - Mobility
  - VM migration
- And, resources on the network
  - Bandwidth
  - Network element resources
  - Compute resources

Experiment within virtualized lab resources FIRST

Custom network devices *inline*

Custom VMs

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- Purpose: Unless we have transparent control and monitoring of resources in the network, there is no network programmability – management plane vs control plane comparison study.

- Plan of experiment:
  - Setup experiments to enable programming of management plane through two emerging approaches: OVSDB protocol and OFConfig
  - Investigate capabilities in APIs: how to deliver deterministic performance?

- Resources:
  - VMs connected in simple topologies running applications
  - Management plane resource view: GENI provides slices of "pipes"
  - OVS as a VM to be sliced using FlowVisor

- To be presented as a work in progress during GREE 2013: OpenFlow Configuration (OFConfig) Protocol: Implementation for the OF Management Plane

Project in collaboration with:
S. Bailey, S. Narayan, S. Mysore

Infoblox ®

- Purpose: Distributed firewalls and security enforcement points – how to determine placement and rule space
- Plan of experiment: SDN/OpenFlow with multiple distributed enforcement points is an interesting setup, however, realization of such a scenario on GENI is very difficult.
  - Coordination of network interfacing over VLAN slices
  - OVS as a VM (interfaces turning into "a traffic trombone")
- Resources:
  - Custom VM: security enforcement point from industry partner
  - OVS as a VM
- More discussion during the demo session tonight

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- Purpose: Applications that run on *network nodes making "the network" programmable*

- Hypothesis: An application that performs TCP-SYN attack detection will be more effective than the end-point counterpart

- Plan of experiment: Run various scenarios with attacks and detect at end point and intermediate nodes and measure the time to detection

  – Reservations: insert a new hardware into the GENI infrastructure for this experiment

- SDN Application Innovation Platform to be presented at the demo session tonight.

Project in collaboration with:
R. Narayanan

Thank you!

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