Campus Testbed for Network Management and Operations

Nick Feamster
Georgia Tech

Joint with Ankur Nayak, Russ Clark, Ron Hutchins, Campus OIT
Also input from Wenke Lee
Summary

• We are building an experimental network at Georgia Tech
  – Programmable network switches (OpenFlow)
  – Multiple on-campus sites
  – Dedicated fiber between these sites
  – Upstream connectivity and IP address space (“own AS”)

• Initial testing platform for network solutions deployed on-campus

• We are building this to test our own ideas in network management and operations
Network Management Tasks

• Security-related network management tasks
  – Authentication and access control
  – Resource allocation

• Today: Many solutions require operator vigilance, hacks, magic, etc.

• We are exploring how to make these tasks easier with programmable networking
Access Control and Monitoring

• New hosts
  – Assigned to private VLAN
  – Given private IP address space
  – Authenticated and scanned
Problems with Current Architecture

• Access control is too coarse-grained
  – All unauthenticated/unscanned hosts are on the same subnet
  – Hosts with access are all on the same VLAN

• Lack of dynamism
  – Hosts cannot be dynamically remapped

• Monitoring is not continuous
  – Reaction to alarms is manual
Simplify/Enhance: Programmable Networks

- Flow-table entries in switches redirect hosts to gardenwall
- Traffic is remapped with flow table entries per-host
- Continuous, real-time monitoring integrated with controller
“ Outsourcing ” Network Management

• Lots of independently operated networks
  – Each with view of network traffic
  – Including home networks (a known large source of unwanted traffic)

• Lots of distributed inference algorithms
  – SpamTracker
  – BotMiner

• What if these networks had programmable switches?
  – Use output from distributed inference to control network elements across many networks
Current Campus Testbed

- Space for running real-world projects and applications
- Need: Ability to “re-enact” network events
Looking Forward

• Campus-wide deployment
  – Network has 275 switches for access control that can run OpenFlow today
  – Firmware upgrade scheduled for Spring 2010

• Big questions
  – Sharing between production network and research
  – Connectivity to other campuses
  – Integration with measurement?