



# GENI at RIT

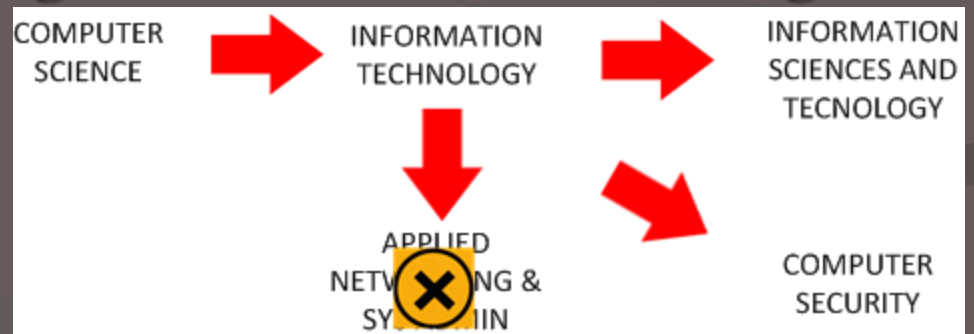
## IT and Networking Oriented Classes



Bruce Hartpence  
IST Dept., RIT

# A little about RIT

- RIT – eight colleges
  - GCCIS houses CS, SE, IST, IM, Ph.D.
  - Neighbors: CE, Telecom, Engr
- Current IST and CompSec departments grew out of a very large IT program
  - Somewhere in the neighborhood of 1200 undergrad, 600 grad, 55 faculty



# Facilities

- Lots of open computing labs
- Central to networking, sys admin and security were 5 labs dedicated to our area
- The Institute actually spent money on our labs
- Lots of donations
- Cascade



# Classwork

- A vast majority of our undergrad classes are lab based
  - Cisco, Juniper, Extreme, Avaya, Linux, Windows
- Labs also support coursework with desktop virtualization



# Labwork

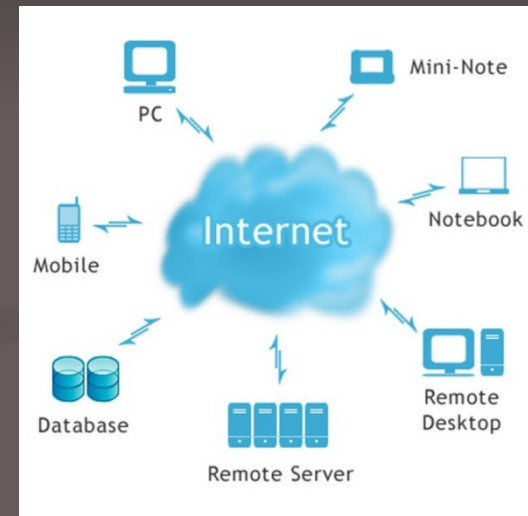
- As for GENI – I took a little convincing...
  - Immersed in production equipment
  - Openflow and SDN are a little off...
- Students have access to lots of equipment, hands on experience, security competitions, etc.
- Some is racked, some can be checked out from the cage
- As an example...





# What about advanced lab work?

- Even without this shift, well-equipped labs don't have all the answers
  - Can I build something big?
  - Can a student check out lots of gear?
  - Can I run long duration projects?
  - Do we have tools to reduce set up time?
  - Can I have a large number of VMs?
- Invariably...no.
- But the campus resources are sufficient right?
  - Still no.



# Changes to RIT

- Donations can dry up
- Shift in enrollments
- RIT has a greater interest in supporting research and projects
  - Significant impact on programs
  - Change from tuition cost models
- Space allocation
- Equipment refreshes



RESEARCH at RIT

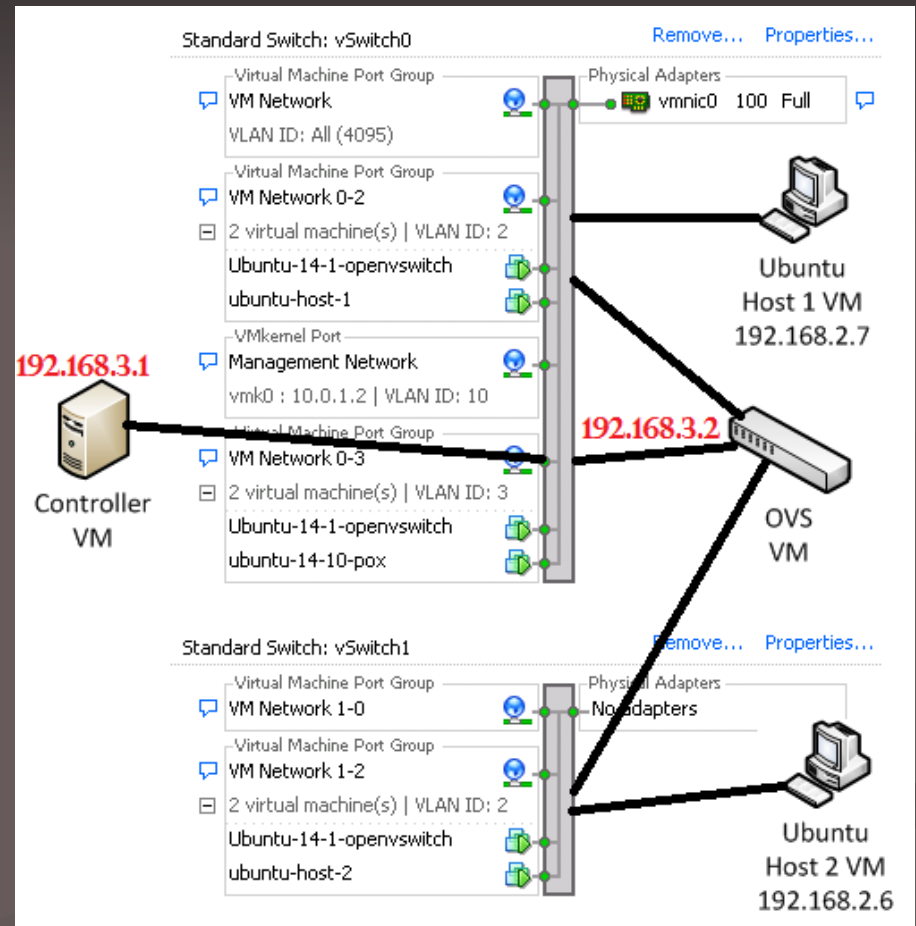


# What about students?

- Is there a difference between undergrads and grads? Yes.
  - So what do they need?
- Our undergrads understand the lingo and the topics
  - Many grad students have never touched a router
  - Graduate courses are typically NOT lab-based.

# GENI at RIT

- Lots of opportunities
  - Graduate students
  - “non-lab” lab work
- Several projects
  - slowly increasing
- Classwork, some of which supports growing the experiments
  - Enterprise Computing
  - SDN Seminar



# ISTE-602 Enterprise Computing

- Fairly broad course covering the general requirements of a large scale environment
- Virtualization, networking, database, cloud, services, etc.
- GENI was a way to give students an understanding of scale and the systems necessary to support users and experimentation



# ISTE-590 SDN Seminar

- Lots of building blocks
- Virtual topologies
- Virtualization
- Traditional switching models
- Traditional network design issues
- SDN architectures
- Building an SDN architecture
- Experimentation with GENI



# Our experiences with GENI

- At first students were confused by the infrastructure (just like I was at GEC 17)
  - So, we made some video tutorials
  - After the first assignment or so, students started to catch on
- Remember that there is a lot of networking behind some builds.
- Students were required to complete a couple of the posted projects (ex. l2 forwarding) and then design and complete their own
  - Some even did rspecs

# Future Work and Classes

- Formalizing virtualization coursework
- Spending more time with the related open source projects



OPEN NETWORKING  
FOUNDATION



- Increased experimentation with GENI
  - SDN studies
  - WAN experiments
  - IEEE 1910.1 Meshed Tree



# Future Work and Classes

- We can imagine a future with shrinking lab space and less equipment
- What if an entire advanced course sequence was taught on GENI?
  - There is some previous work
  - Could it be standardized?
  - Would students have the same level of skill and understanding?