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Virginia Cyber Range

Cloud-based Resources for Cybersecurity Education

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Governor McAuliffe on Cyber Education:

"We have 36,000 open jobs in cyber; we either fill those jobs or we lose them to others."

"In Virginia and across the country, businesses, governments, and private individuals are impacted by the growing threat of cyber-attacks. We need a capable workforce that understands these threats and is ready to mount an agile defense."

"I want [Virginia] to be the capital of the world for cyber!"

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Virginia Cyber Range: Background

- Recommended by the Virginia Cyber Security Commission in August 2015
- Included in FY17/18 biennial budget

2016 Executive Budget Document, Item 224, Paragraph J:

"*Out of this appropriation, [two years of funding will be]* ***designated to support a cyber range platform*** *to be used for* ***cyber security training*** *by students in* ***Virginia's public high schools, community colleges, and four-year institutions****. Virginia Tech shall form a* ***consortium among participating institutions****, and shall serve as the coordinating entity for use of the platform. The* ***consortium should initially include all Virginia public institutions with a certification of academic excellence*** *from the federal government."*

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Mission of the Virginia Cyber Range

The Virginia Cyber Range, led by a **consortium of Virginia public institutions** of higher education, will **enhance cybersecurity education** for students in the Commonwealth's high schools and colleges and **boost Virginia's cybersecurity industry** through strategic educational investments. The Virginia Cyber Range seeks to **increase the number, and the preparedness, of students entering the cybersecurity workforce** in operations, development, and research.

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Courseware Repository

- ❑ Courses, modules, and exercises for use in HS, CC, and university cybersecurity curricula
  - Instructors/professors can select course content in full or *a la carte*
- ❑ Grants offered for courseware dev

Exercise Area

- ❑ Environment to run exercises as part of courses
- ❑ Team-based offensive and defensive, scenario-based cybersecurity exercises
- ❑ Cyber-physical system simulation (SCADA/IoT) for vulnerability exploration and analysis

Community of Purpose

- ❑ Consortium Governance
- ❑ Convene workshops to “teach the teachers” and share best practices
- ❑ Help expand NSA/DHS CAE certification among Virginia colleges and universities

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powered by amazon web services

Our Approach

- Hosted in the cloud
- Web portal for access to cyber range content
  - Role-based access
  - Login to see user-specific content
- Virtual environments will be dynamically created and destroyed
- Large target networks can be replicated for multiple, simultaneous use

Example Cybersecurity Topics

- Introduction to Cybersecurity
- Introduction to Networking
- Secure Network Configuration
- Network Defense
- Digital Forensics
- Network and Memory Forensics
- Reverse Engineering
- Cryptography
- Incident Response
- Penetration Testing
- Security Data Analytics
- Mobile Devices and IoT
- SCADA and Industrial Control Systems
- Cyber Policy and Law

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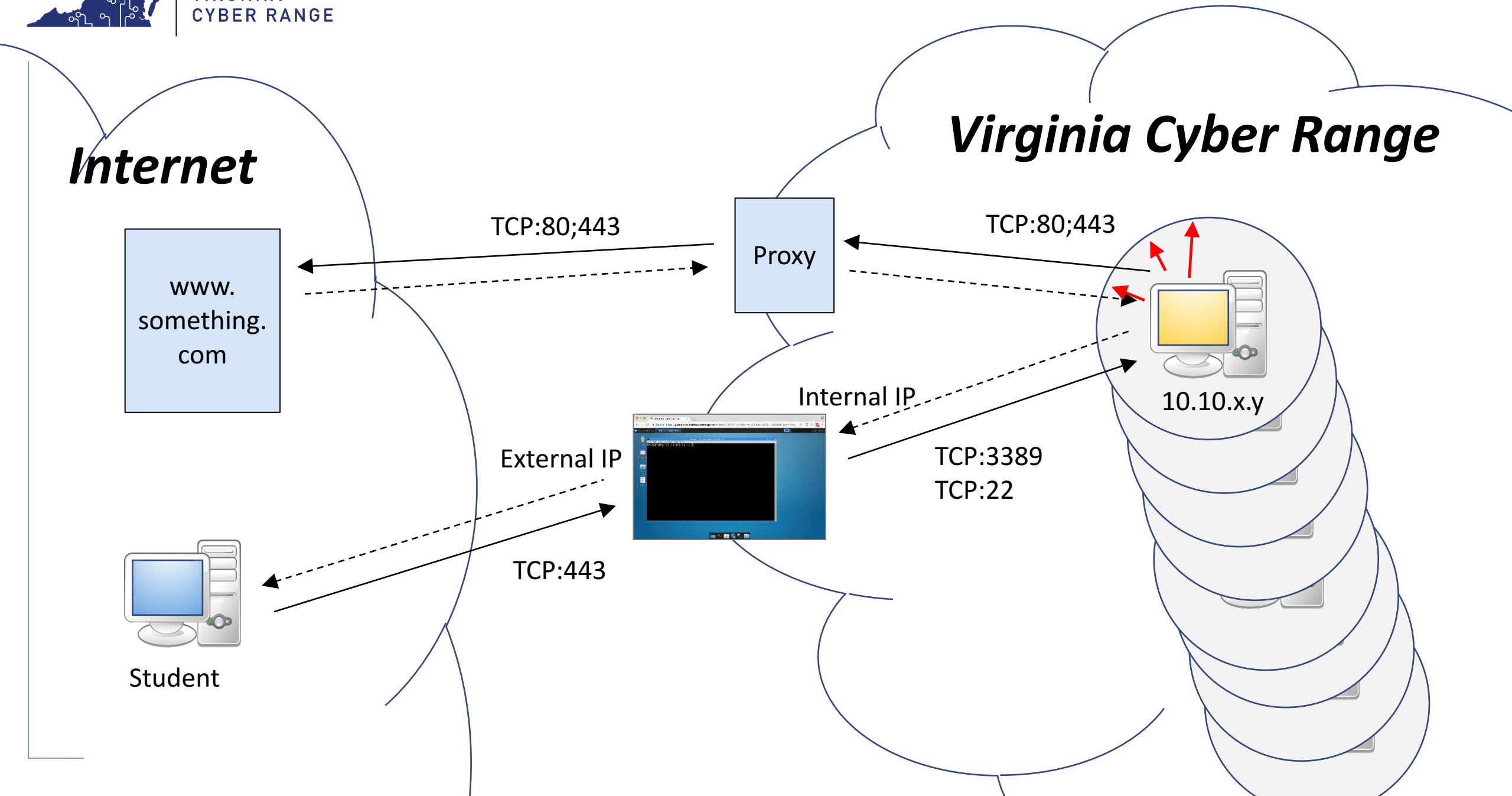

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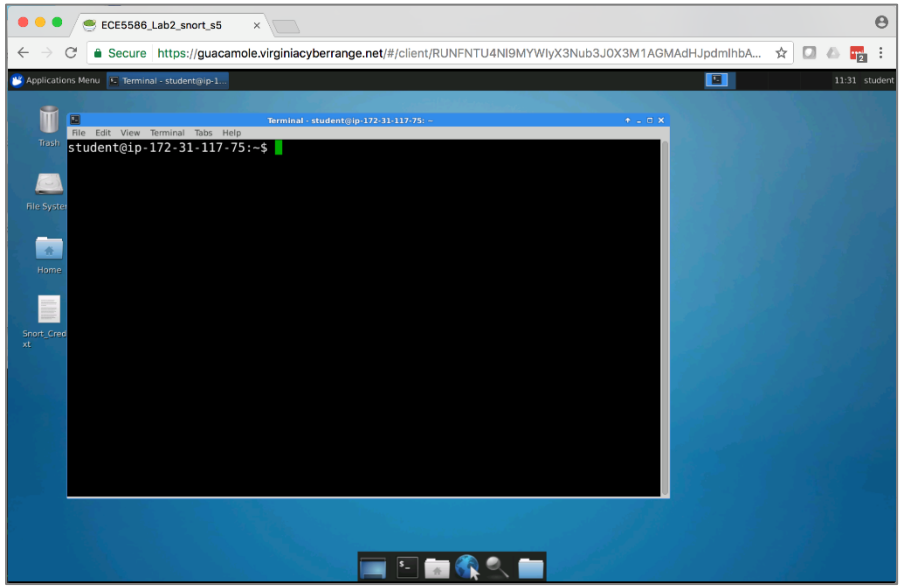
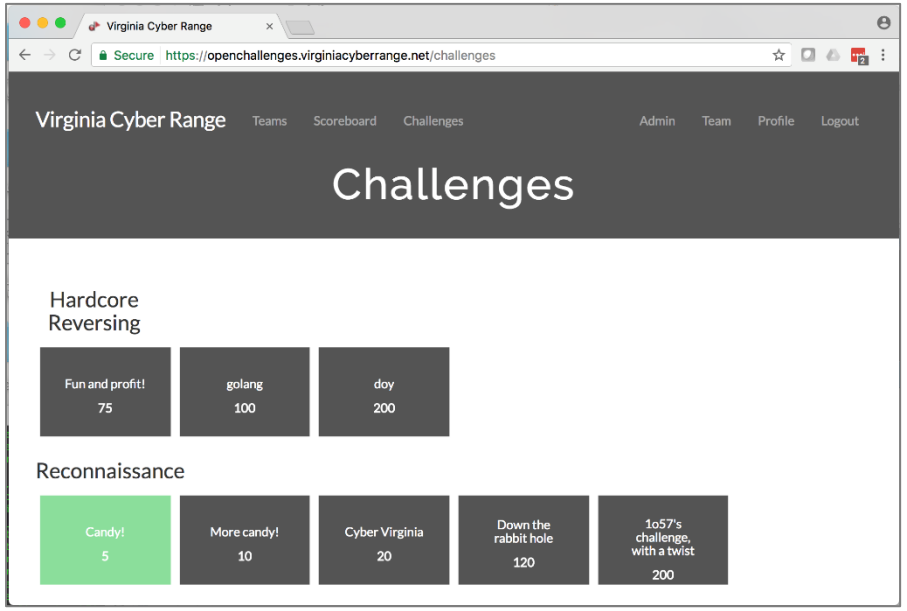
Where are we now?

- Providing support to dozens of high schools and colleges across Virginia
- Supporting a variety of environments and exercises
  - Network scanning basic penetration testing
  - Web application vulnerability analysis
  - Digital forensics
  - Introductory cryptography
  - Host-based firewall configuration and network intrusion detection
  - Server hardening
- Capture-the-Flag Infrastructure for classes and clubs
  - Supported two state-wide collegiate CTFs
  - Several smaller events for high school educators and others

https://virginiacyberrange.org





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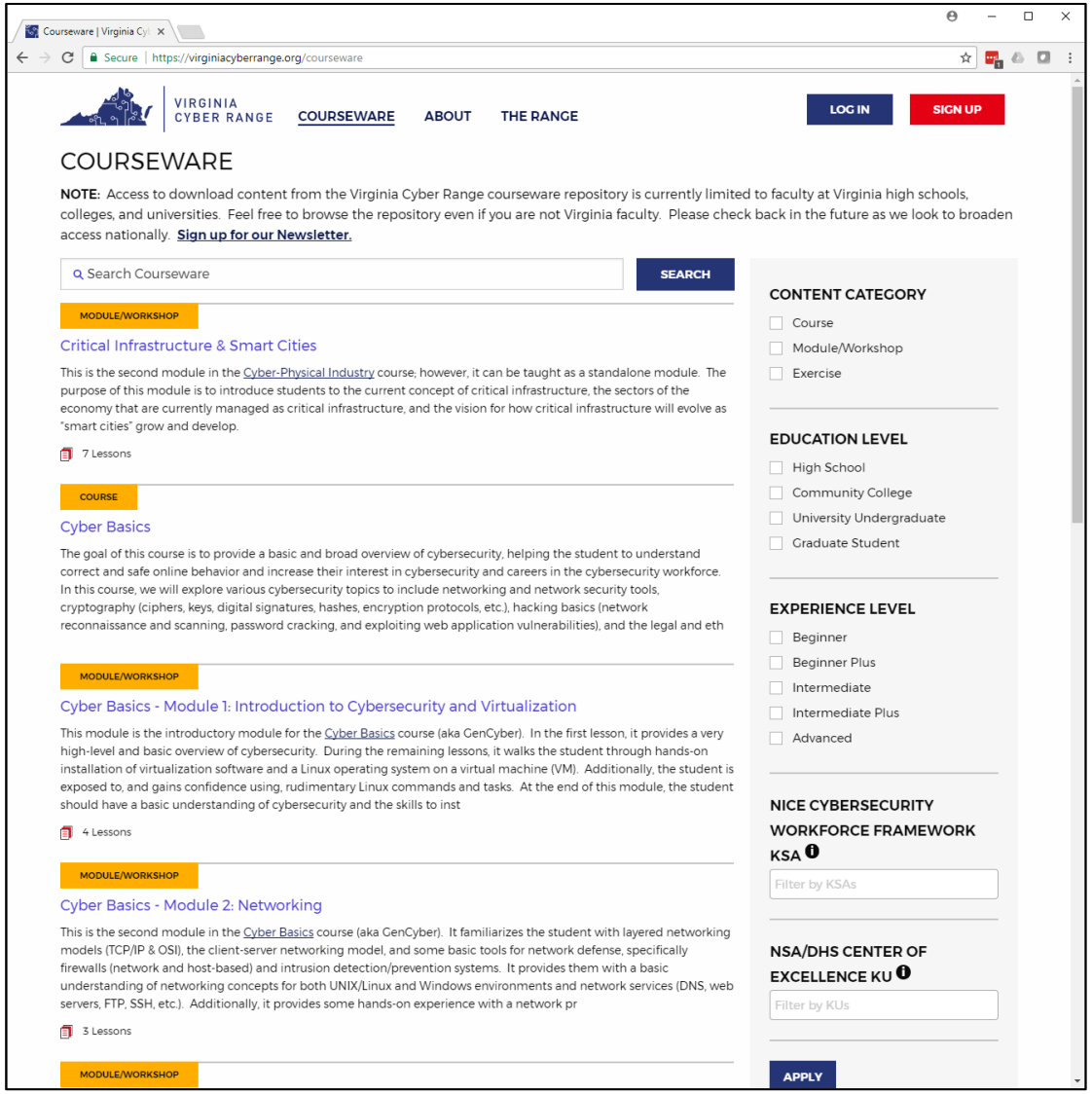
How are we Different?

- Flexible environments to support our labs, *or yours*
- Cloud-based – scalable and available everywhere
- Accessed via web portal – no special software or ports
- Searchable content library, indexed by NIST/NICE KSAs and CAE KUs
- On-demand CTF environments



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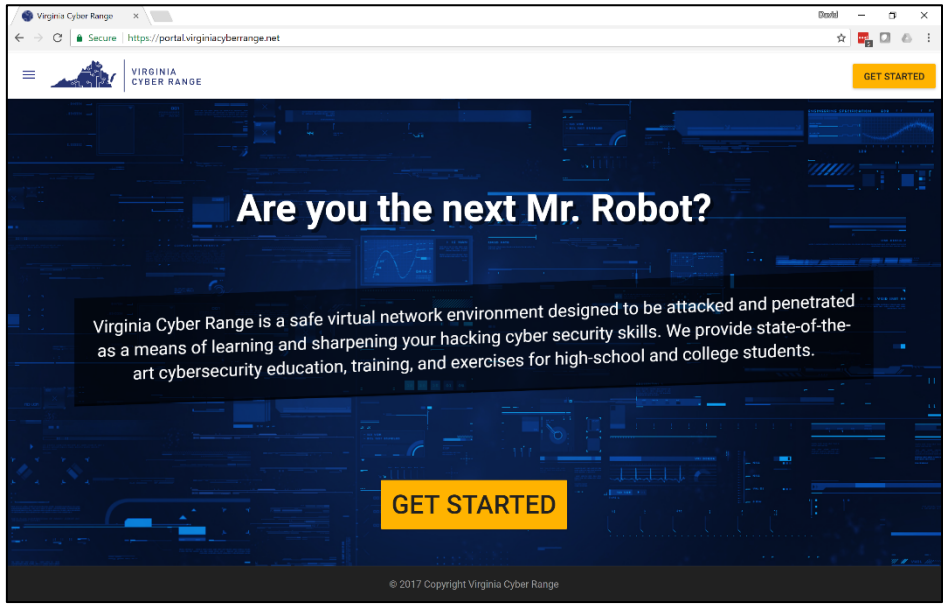
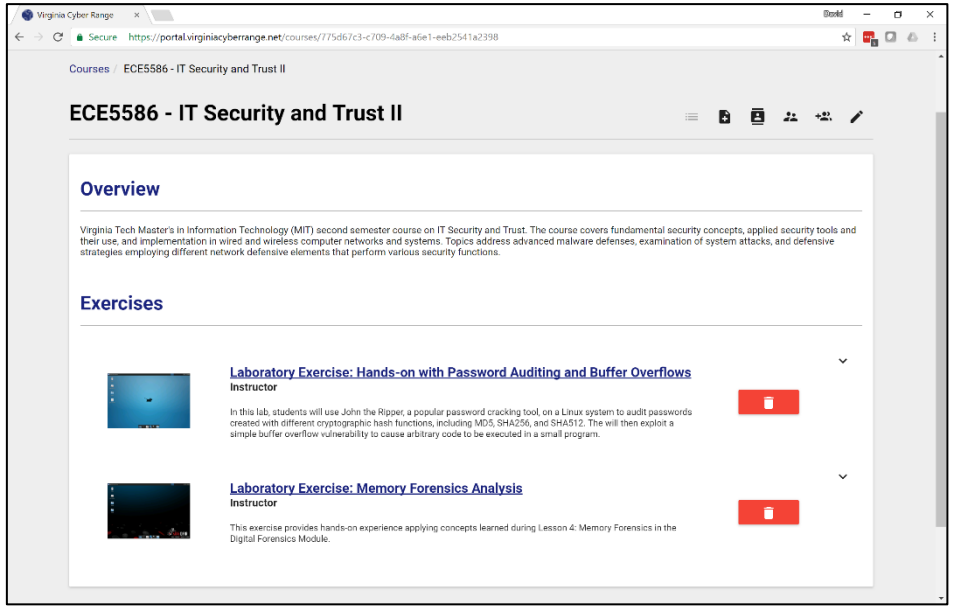
Way Ahead

- Continuing to evolve Cyber Range back-end and user interface
- Expanding capture-the-flag (CTF) infrastructure
  - Schools able to easily and quickly set up and run CTFs
- Expanding content library
  - More high school and college-level courseware
  - More flexible exercise environments
- ***Preparing to expand beyond Virginia . . .***

  . . . and beyond academia.





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Questions?

Follow us! *@VaCyberRange*

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Governance

- Consortium among participating institutions
  - Virginia Tech is the coordinating entity
  - Initial Consortium includes 2- and 4-year NSA/DHS Centers of Academic Excellence (CAE) in Cybersecurity Education and DoD Cyber Crimes Center Unit (DC3) National Centers of Digital Forensics Academic Excellence (CDFAE)
- Meet monthly to discuss way forward for the cyber range

- *Danville CC (NSA/DHS CAE-CDE 2Y)
- George Mason University (NSA/DHS CAE-CDE/R)
- James Madison University (NSA/DHS CAE-CDE)
- Longwood University (DC3 CDFAE)
- Lord Fairfax CC (NSA/DHS CAE-CDE 2Y)
- Norfolk State University (NSA/DHS CAE-CDE)
- Northern Virginia CC (NSA/DHS CAE-CDE 2Y)
- Radford University (NSA/DHS CAE-CDE)
- *Thomas Nelson CC (NSA/DHS CAE-CDE 2Y)
- Tidewater CC (NSA/DHS CAE-CDE 2Y)
- Virginia Tech (NSA/DHS CAE-R)

* Recently designated

Why the Cloud?

Image credit: http://silverlinecrm.com/

- Traditionally this would be done on local infrastructure using virtualization
- Cloud model provides many benefits
  - Quicker start-up phase
  - Low/no capital investment
  - Rapid scalability
  - Surge capacity for short-term events
  - Location independent
  - Highly automated
  - Pay-as-you-use

Challenges

- Using AWS in a unique way
  - AWS virtualization designed for standard server workloads; not direct user interaction with VMs
  - Soft/hard limits on resource creation
  - Creating ways to give students direct access to resources
  - Malicious activity flagged by AWS
- Building the plane while flying it
  - Creating a new organization from the ground up
  - Developing the Cyber Range back-end for user access
  - Building environments on-the-fly to support courses
  - Running a state-wide CTF

Image credit: http://www.keepcalm-o-matic.co.uk/