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Using Cyber Ranges for Cybersecurity Education

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What is a *Cyber Range*?

- Isolated network
  - Activity will appear malicious
  - Some actual malware often used
- Usually virtualized
  - Allows for maximum configurability
  - Scripted network environment creation
- Used for hands-on cybersecurity training
  - Defensive *AND* offensive
  - Classroom exercises
  - Capture-the-flag and red/blue CTFs

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Cyber Range Approaches

- Host-based virtualization – VMWare Workstation or Virtualbox on the desktop
  - \+ Free virtualization software options available
  - \+ Works for small-scale (single VM) environments
  - – Requires relatively beefy client machine
- Local network virtualization – Network virtualization software deployed to on-prem infrastructure
  - \+ Can quickly replicate environments using scripting
  - – Requires significant capital investment and administrative overhead
  - – Limited scalability
- Commercial offerings – Infosec Learning, NETLAB+, and others
  - \+ Turnkey exercise environments get students up and running quickly
  - – Can be quite expensive
  - – Very limited flexibility for instructors

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powered by amazon web services

Virginia Cyber Range 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

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Why the Cloud?

- ***Unlimited scalability!***
- Quick start-up phase
- Low capital investment
- Rapid scalability
- Surge capacity
- Location independent
- Highly automated
- Pay as you use

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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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Step 1: Create Course

CFRS 660 Network Forensics

John Doe
1 exercise
9 students

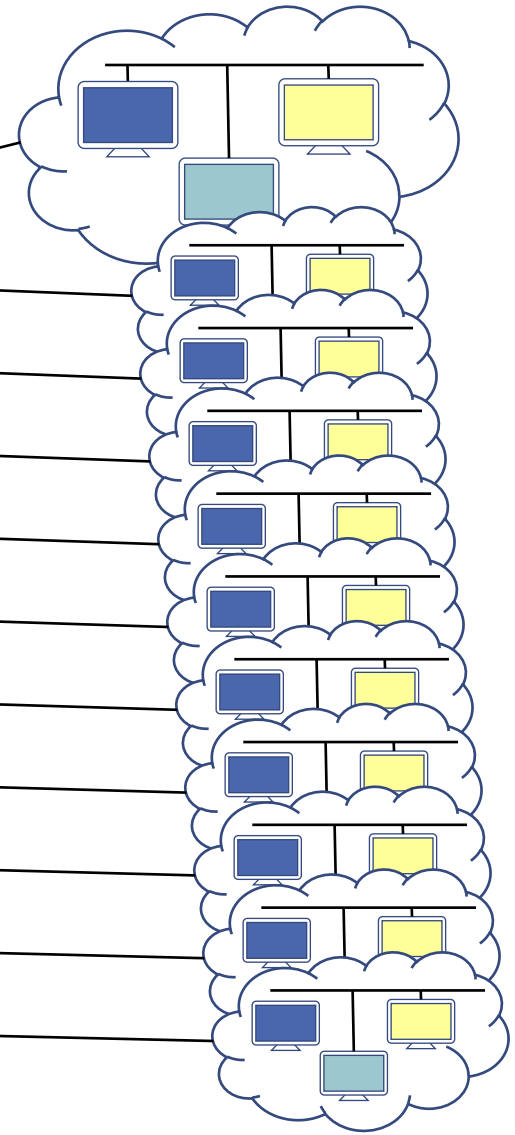
Step 2: Enroll Students

Courses / CFRS 660 Network Forensics / People

People 11

- Instructor: John Doe
- TA: Jane Smith
- Student: David White
- Student: Erin Brown
- Student: Sandra Black
- Student: Thomas Green
- Student: Russel Teal
- Student: Lolita Gray
- Student: Ellen Jade
- Student: Chris Gold
- Student: Amy Melon

Step 3: Provision Environments



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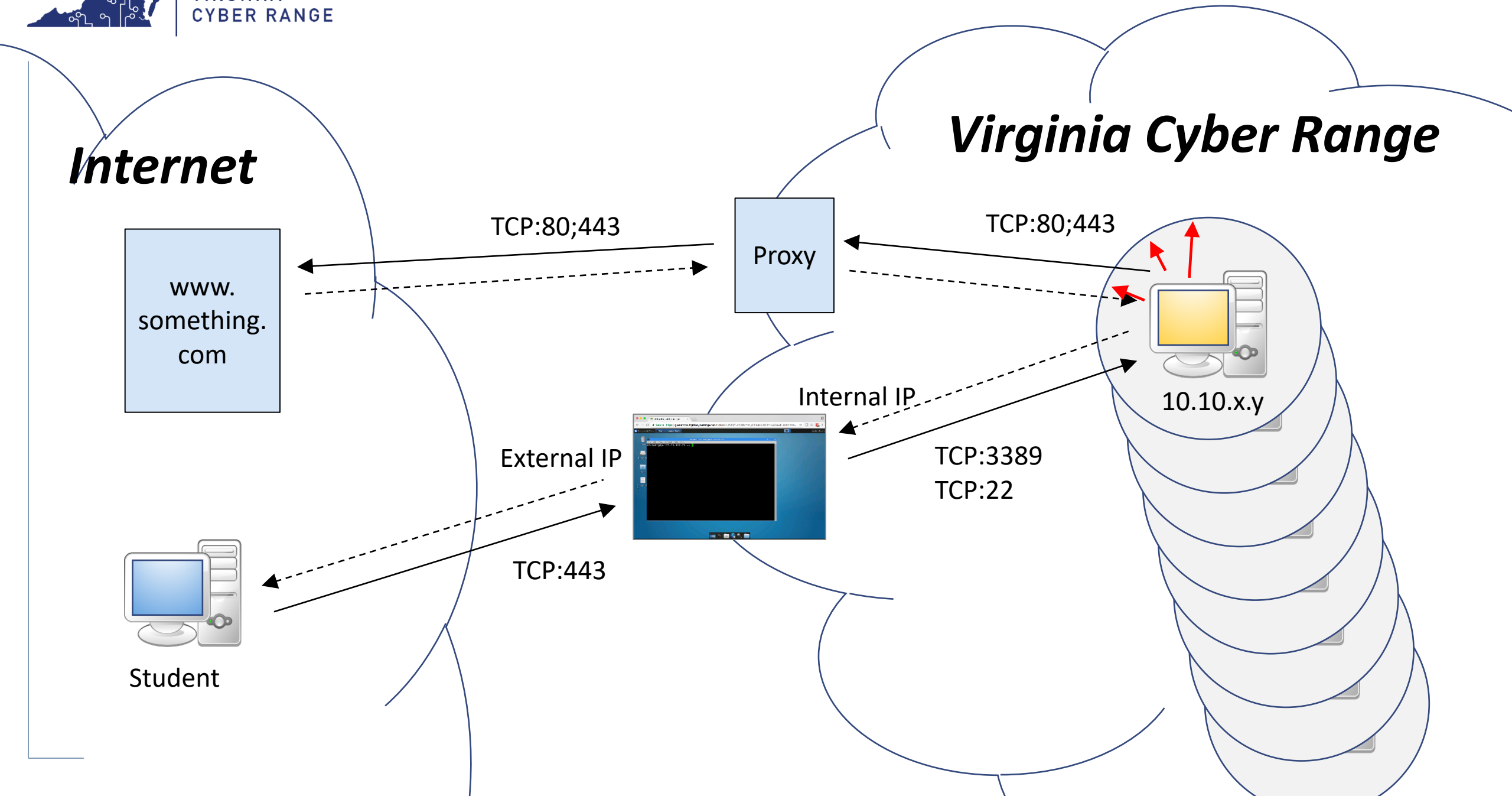

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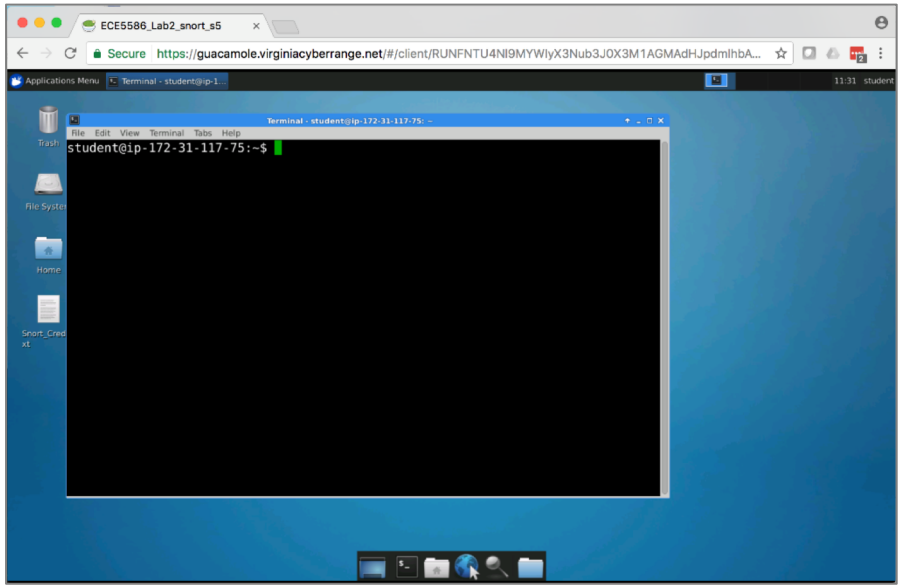
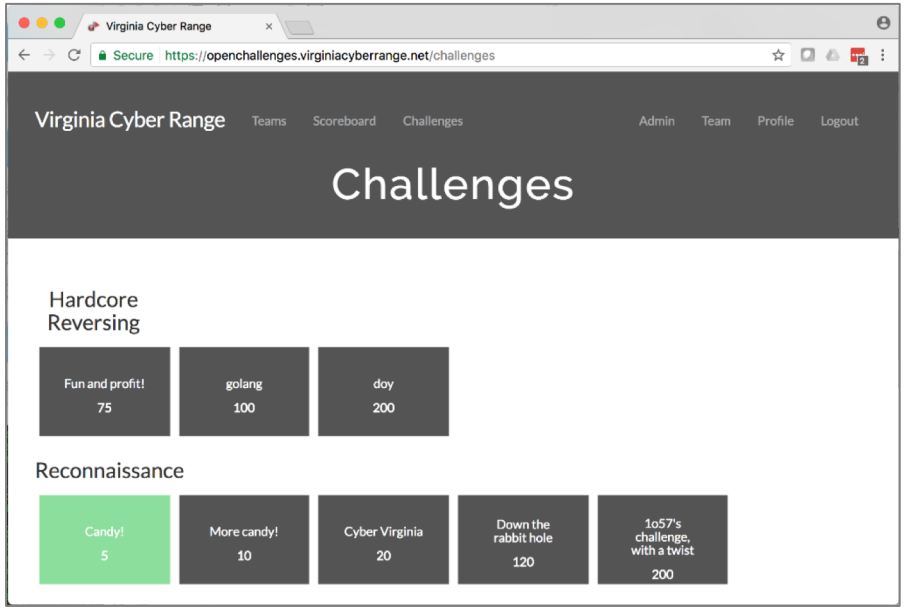
Where are we now?

- 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
  - Supporting annual state-wide collegiate CTFs
  - Several smaller events for high school educators and others





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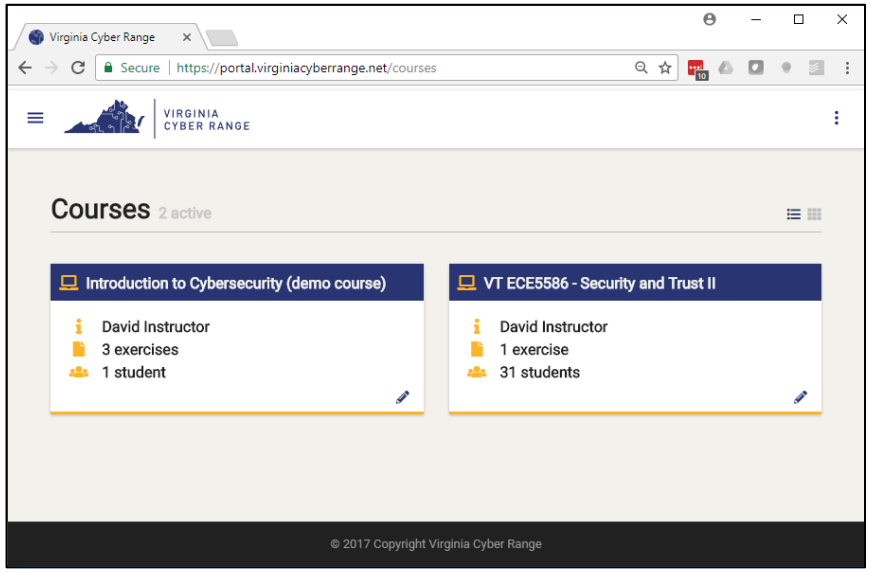
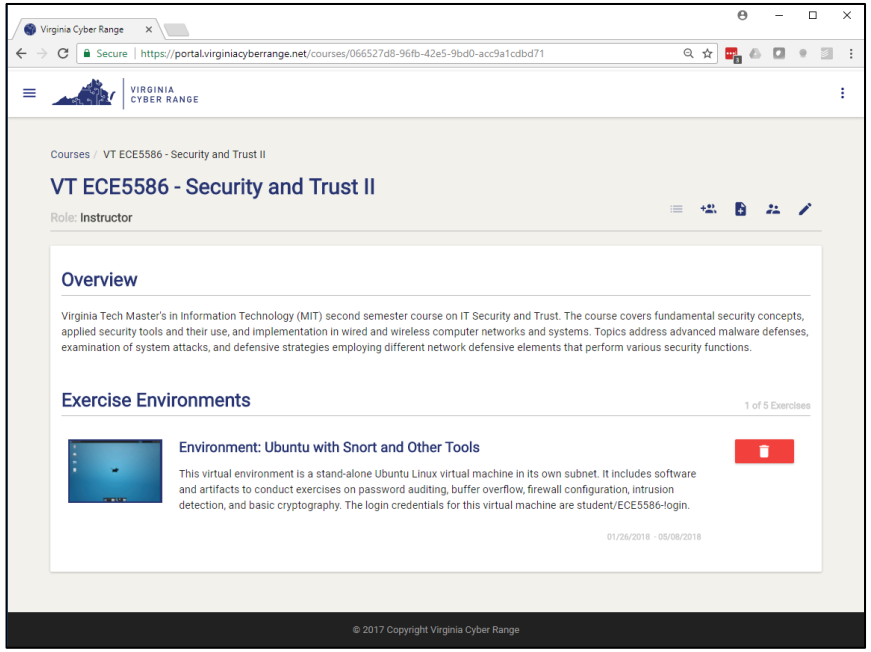
Way Ahead

- 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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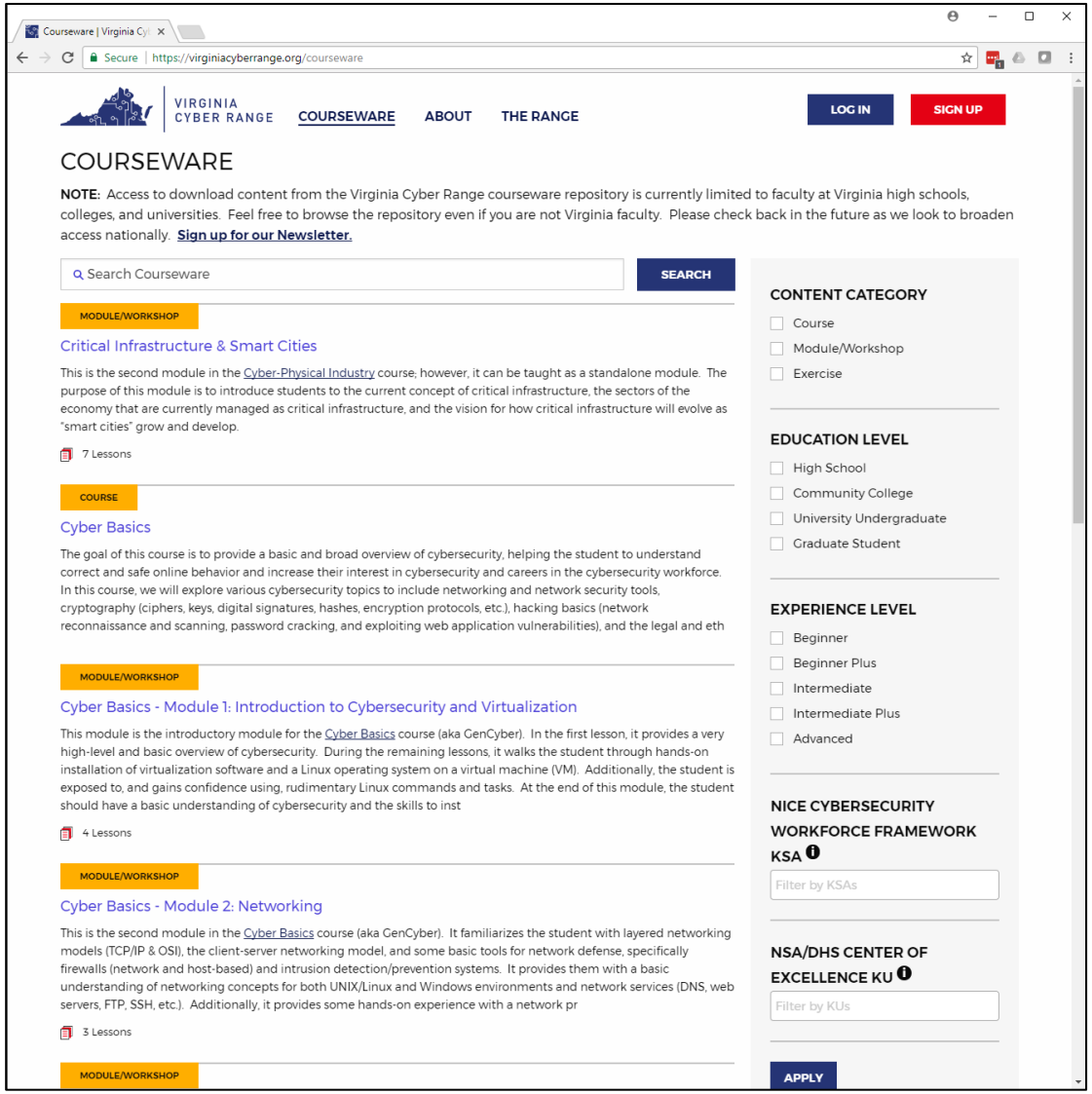
How are we Different?

- 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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What do we need from you?

- Do you have great courseware, exercises, or training we can use?
  - See https://virginiacyberrange.org/call-for-courseware for call-for-content, or email content@virginiacyberrange.org.
- Teaching? Use the Virginia Cyber Range for hands-on exercises in your classes!
  - Currently available for teachers in Virginia high schools and colleges
  - ***Will soon be available to state and federal agencies; schools outside Virginia; industry***
  - See https://virginiacyberrange.org for account information
- We're hiring! Tell your friends!
  - http://jobs.vt.edu → search "cyber range"
- Share these opportunities with colleagues.

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1st Annual Virginia Cybersecurity Education Conference

- Save the date! August 14 – 15, 2018
- James Madison University campus
  - Integrated Science and Technology (ISAT) building
- 1.5 days of workshops and talks on cybersecurity education
  - Resources for cyber education
  - VDOE/VCCS cybersecurity curriculum updates
  - Using the Virginia Cyber Range for classes and clubs
  - Much more!
- Call for proposals open
  - Go to https://virginiacyberrange.org – see link in middle of page
- Sponsorship opportunities also available

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Questions?

Follow us! *@VaCyberRange*