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
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
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
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
Step 1: Create Course

- CFRS 660 Network Forensics
  - Instructor: John Doe
  - 1 exercise
  - 9 students

Step 2: Enroll Students

- 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
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
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.
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
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
Questions?

Follow us! @VaCyberRange