22nd CISSE Colloquium

Practical Hands-On Training and Foundation Skills in IT Curriculums

Kevin Cardwell, MSSE

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PREPARING THE NEXT GENERATION OF CYBER SECURITY EXPERTS

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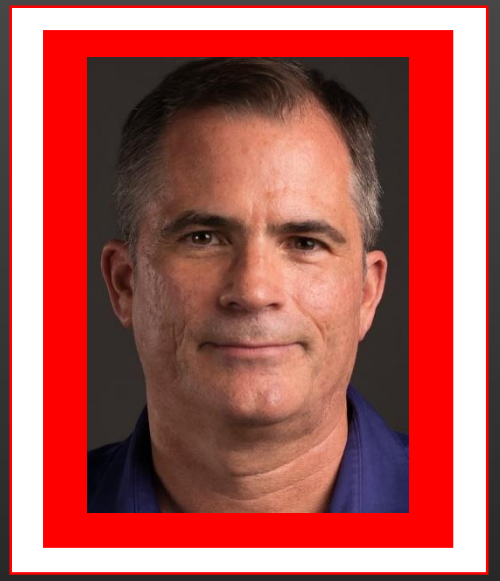

- Master of Science in Software Engineering
- Adjunct Faculty
  - UMUC – 18 years
  - UCLA Extension – 5 years
- EC-Council University(ECCU) Advisory Board
- 25 Years in IT Security Consulting
- 30 Years in Curriculum Development
- Author
  - EC-Council Center for Advanced Security Training (CAST)
  - EC-Council Licensed Penetration Testing(LPT) - Advanced Penetration Testing Course
  - Over 7 Other Additional Publications

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Agenda

1) Discussing Cybersecurity Training Observations

2) Exploring Requirements for Foundational Skills

3) Introducing the Mobile Security Toolkit, STORM

4) Identifying Examples of STORM Usage

5) Assessing Deployment Options for a Mobile Security Toolkit Network

Cybersecurity Training Observations

- It is critical that hands-on training be part of any Cybersecurity training program
- Theory based training is not effective for enforcing the skills needed to perform at a high level in Cybersecurity
- The practice of participating in a Capture-the-Flag(CTF) competition has become popular, and while a vehicle for skills development, it has to meet the realistic requirements, part of which includes…
  - The Network representative of an actual network

    (Many of the CTF exercises are on a flat and not a layered network)
  - The interface is accurate

    (Many of the CTF exercises are "gamified" and more video game than realistic)

CTF Research

- Effectiveness of Cybersecurity Competitions

- Ronald S. Cheung, Joseph Paul Cohen, Henry Z. Lo, Fabio Elia, Veronica Carrillo-Marquez *Department of Computer Science University of Massachusetts Boston* *CLICK HERE TO ACCESS*

- Using CTFs for an Undergraduate Cyber Education

- Martin Carlisle, Michael Chiaramonte, and David Caswell *Department of Computer Science United States Air Force Academy* *CLICK HERE TO ACCESS*

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Effectiveness of Cybersecurity Competitions

- Pique's student interest in Cybersecurity
- Effectiveness of this approach in producing high quality cybersecurity professionals is limited
- Knowledge barrier needed to compete in these competitions is extremely high
- Students have to be proficient in numerous topics
- Majority of CS majors feel that they do not possess the right skill set

Using CTFs for an Undergraduate Cyber Education

- Immensely beneficial experience gained from red-blue team exercises is the interplay between offensive operations and defensive operations
- Tough challenges and team based activities allow students to collaborate and teach each other
- CTF approach is highly effective at encouraging student learning of Cybersecurity
- A willingness for more self-directed learning

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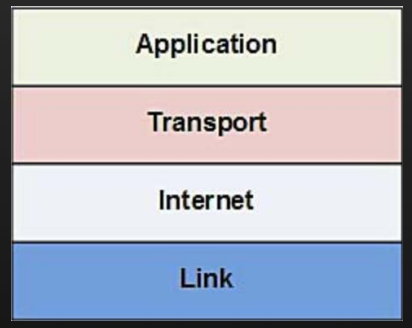
Job Skills

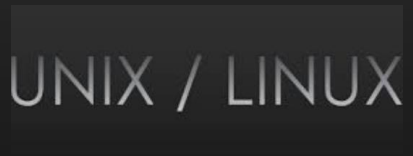
- Does the curriculum produce skilled students
- The NICE initiative was created for this
- Reality
  - *Many of the programs fall short at delivering job skill specific training*

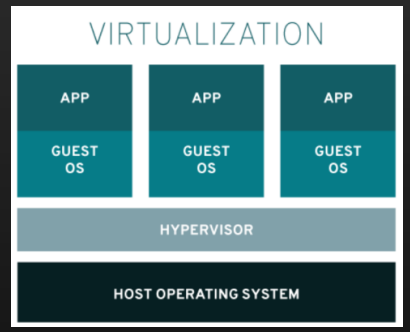
  - Focus is more on the application layer and the different tools than it is on the foundational skills

Foundational Skills

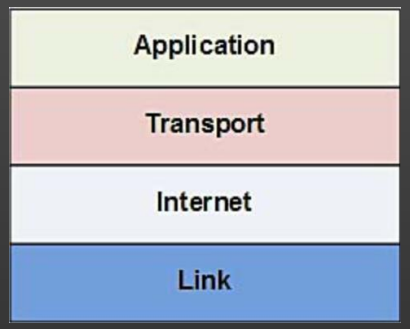
- A lack of focus at the building blocks of security
- Three main areas to develop
  - TCP/IP
  - Unix/Linux
  - Virtualization







TCP/IP

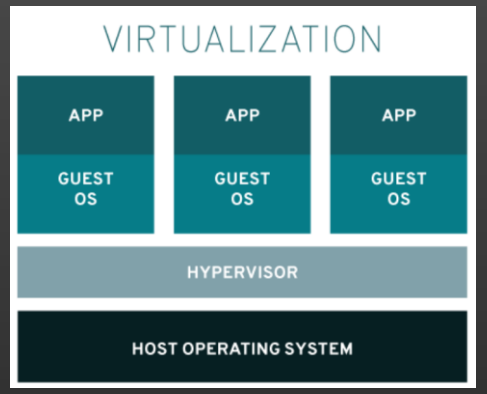


- The backbone of the Internet
- Everything takes place at the packet level unless we are isolated to the host machine
- Job skills need to be to the level of understanding the communication and transport of the network traffic
  - Flags of TCP
  - Components of normal traffic and attack traffic
  - Reading of protocol headers
  - Perform protocol analysis

Unix/Linux

- Virtually all of the open source tools come out with a *nix platform
- Takes approximately 6 months to port to Windows, and not necessarily stable
- All students who are “Windows” centric are behind the curve
- Provides the capability to teach the low level functionality of exploitation

Virtualization



- An area that is often overlooked
- Required to effectively build a range environment
- Most curriculums teach how to use ranges, but not build them
- We need to teach our students how to build their own ranges
  - This provides the best experience and skills for working in cyber security
  - When a student builds a range virtually they will acquire
    - Knowledge of routing and methods of controlling traffic
    - Multihomed methods of emulating true enterprise architectures

Recommendation

- Build Cybersecurity curriculums that focus on the foundational skills
- Enhance programs with these skills, so that they are practiced at every level
- Repetition is required and essential
- Foundational skills are perishable
- Place more focus on knowledge building on layer 2-4 of the network
- Require curriculums to train students to build their own cyber ranges

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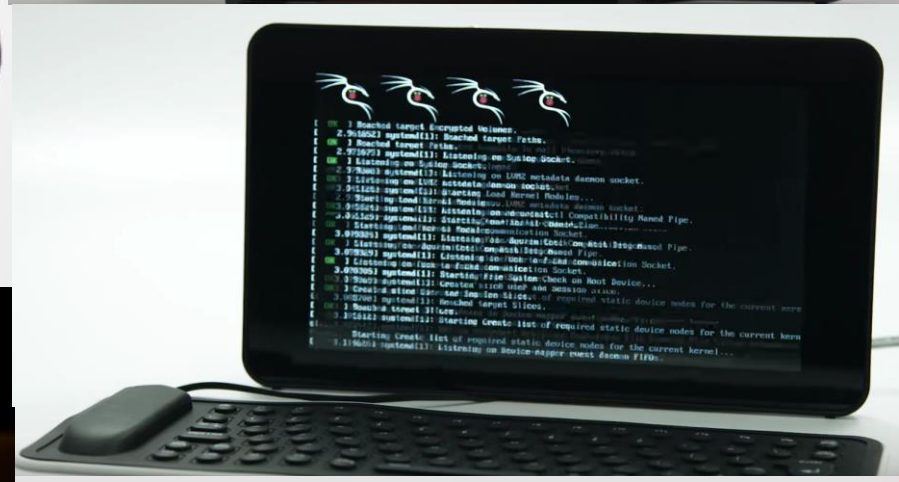
EC-Council

STORM

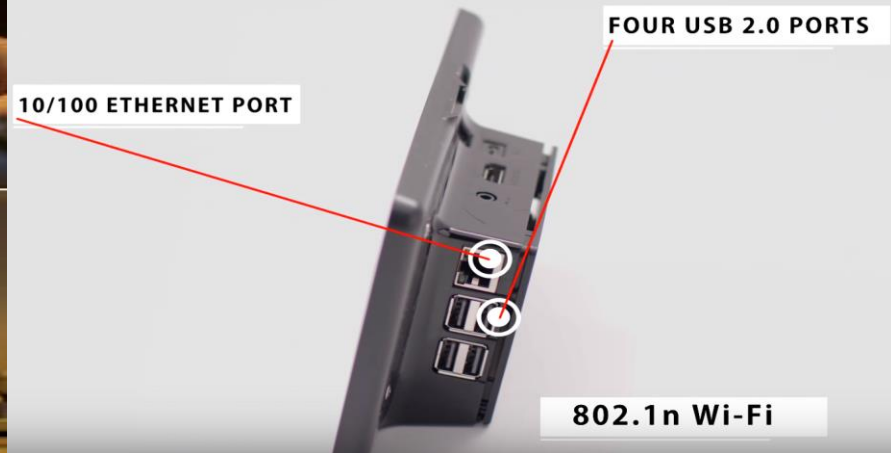
Mobile Security Tool Kit

ETHICAL HACKING WORKSHOP

[CLICK HERE TO SEE A VIDEO OVERVIEW]

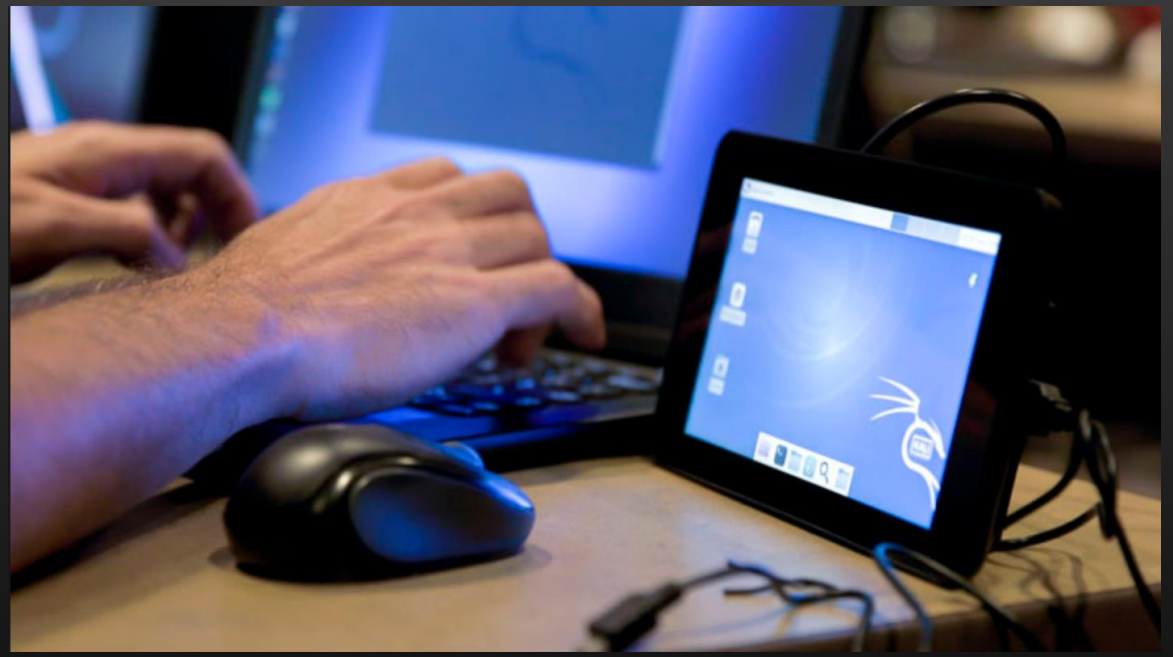


Click Here to see our full Mobile Security Workshop List



STORM Specifications

- 64 Bit – Quad Core Mobile System with Case
- 1 GB RAM
- 7 inch Touch Screen Display
- 64 GB MicroSD – Preloaded w/Custom Linux Hacking OS
- 100Mb Ethernet Port
- 4 USB Ports
- 802.11n Wireless
- Bluetooth 4.1



STORM G-Force 10 Expansion Pack Specifications

- JBtek Raspberry Pi Micro USB Cable ON/Off Switch
- 20000mAh, 4 Port Power Supply
- Software Defined Radio
- Super Mini Wired Keyboard
- HooTOo Wireless Travel Router
- TP-Link N150 Wireless High Gain USB Adapter
- USB Powered 10/100 5-Port Switch
- Raspberry Pi 3 Power Supply

STORM Image

- Custom Linux distribution
- Loaded with tools
- Portal for updates
  - We provide the latest working images
  - Saves you the challenge of keeping the updates and tools working
    - ARM images are not the most stable
- Support available
- Lifetime updates

Why the STORM was Created

- Too many struggle with getting their tools and attack platform setup
- Once setup, another challenge is getting the tools working
- At updates, the tools often break
- Numerous students come to classes with company provided laptops
  - Have endpoint protections
  - Cannot access the network configurations
  - Makes virtual machines difficult to setup
- Provides a working and portable platform for attack or defenses
  - Hack from the palm of your hand

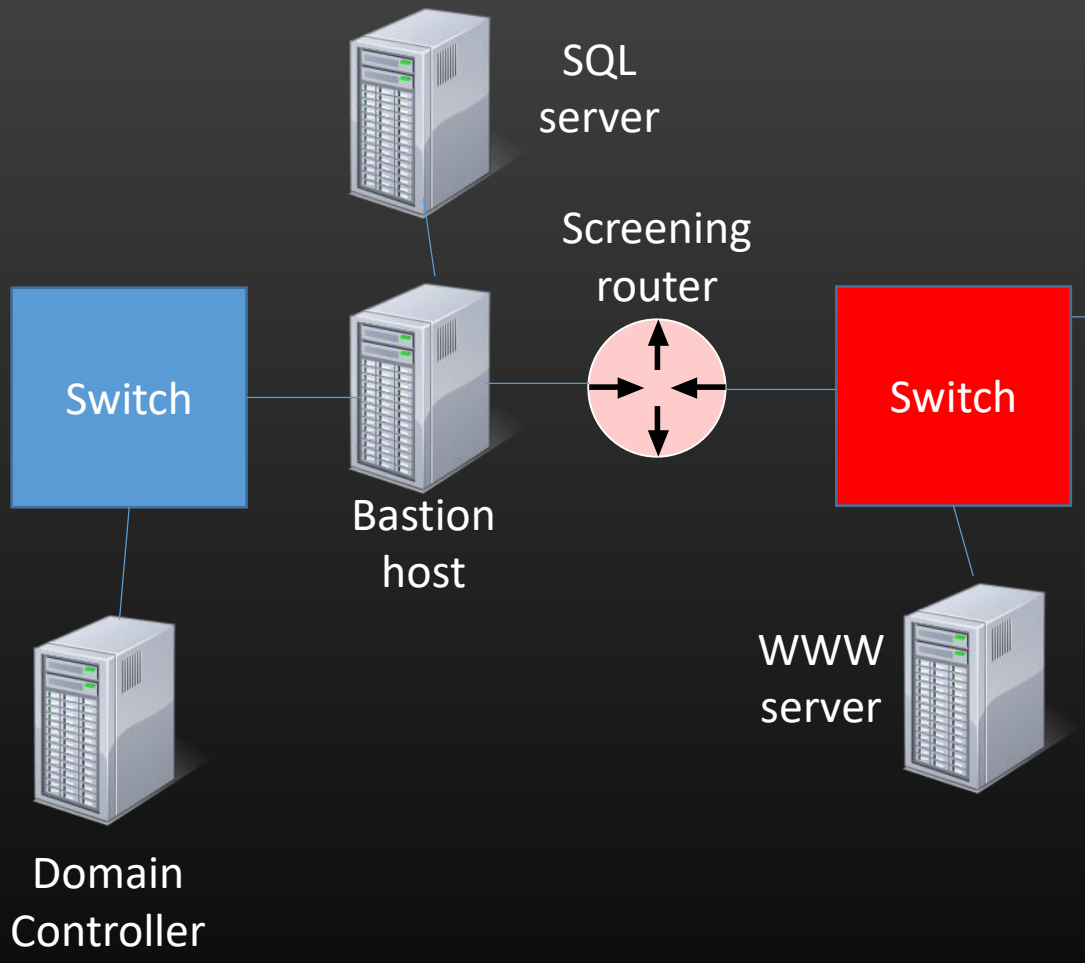
Examples of Storm Usage

- Use a virtual bridge
  - Connect your Storm device to your laptop/machine
  - Run virtual software
  - Create a switch and bridge it to your Storm device
- Isolate the Storm
  - With the bridge
  - Use wireless to wired routing
- Configure secure remote access, send a Storm device to your client and connect from the Internet
  - Do your assessments from your back yard ☺
  - No airport security checks!

Storm in the Curriculum

- Provides the students a working attack platform loaded with tools
- In the early stages of development the students can focus on practicing the processes of hacking and defense
- At the intermediate level the Storm can be used as a bridge device
- At an advanced level the Storm can be used for hardware as well as software customization

Mobile Testing Lab



Mobile Testing Lab in the Curriculum

Entry level

- Provide the machines for the architecture
- Have the students practice the process and methodology
- Explore the different layers of routing traffic

Intermediate level

- Have the students build the network machines and architecture
- Configure basic traffic rules through the perimeter filters

Advanced level

- Add more machines to the architecture and create advanced rule sets
- Create SQL applications and test them
- Hardening the machines in the net

Conclusion

- ✓Discussed Cybersecurity training observations
- ✓Explored requirements for foundational skills
- ✓Introduced the Mobile Security Toolkit STORM
- ✓Identified examples of STORM usage
- ✓Assessed deployment options for a Mobile Testing Lab

Thank you to all of the participants that registered for the Mobile Security Tool Kit class held at CISSE 2018!

Questions?