Building a Home Hacking Lab for Testing and Fun

$ whoami

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Cyber Security PSA

- Humility goes a long way
- Imposter Syndrome is a real thing
- Don't let arrogance or feeling inadequate consume you
- Everyone has some value to add no matter how novice you are.

- "A true genius admits that he/she knows nothing." — **Albert Einstein**
- "There is nothing noble in being superior to your fellow man; true nobility is being superior to your former self." — **Ernest Hemingway**

Getting started in IT/Cyber Security

- What is the best way to learn anything in IT?
  - Play – Break — Fix – Try again
- The same thought process works for IT Security

Why a home lab is important

- So you you want to get started in learning, what is your first step
  - 1. Download and install Kali Linux …..
  - 2. Now what
    - Hack your neighbors?
    - Hack your work systems?
    - Search Shodan for vulnerable systems to attack?

Cyber Security Related Laws

- 1974 Privacy Act
- Electronic Communications Privacy Act (ECPA) 1986
- Computer Fraud And Abuse Act (CFAA)
- 2011 Cyber Intelligence Sharing And Protection Act (CISPA)
- 2012 Children's Online Privacy Protection Act (COPPA)
- And the list goes on ….

A person commits a "computer crime" when he or she:
1. accesses a computer system without authorization;
2. accesses or uses a computer system to obtain unauthorized computer services (including computer access, data processing, and data storage);
3. intentionally or recklessly disrupts, degrades, or causes disruption or degradation of computer services or denies or causes denial of computer services to an authorized user; or
4. intentionally or recklessly tampers with, takes, transfers, conceals, alters, or damages any equipment used in a computer system.

It is also a computer crime to misuse computer system data. A person commits this crime by:
1. accessing a computer system to use, disclose, or copy data residing in, communicated by, or produced by a computer system;
2. intentionally or recklessly and without authorization (a) tampering with, damaging, or taking data intended for use by a computer system or (b) intercepting or adding to data residing within a computer system;
3. knowingly receiving or retaining data obtained through misuse of computer system information; or
4. using or disclosing data he or she knows or believes was obtained through misuse of computer system information (CGS § 53a-251).

https://www.cga.ct.gov/2012/rpt/2012-R-0254.htm

Cyber Crime

Table 1: Degrees of Computer Crime and the Requirements for Each Penalty (CGS § 53a-252 et seq.)

Degree of Computer Crime	Amount of Damage or Harm Required	Penalty
1st degree	Damage to or the value of the property or computer services is over $10,000	A felony (up to 20 years in prison, a fine of up to $15,000, or both)
2nd degree	Damage to or the value of the property or computer services is over $5,000	C felony (up to 10 years in prison, a fine of up to $10,000, or both)
3rd degree	• Damage to or the value of the property or computer services is over $1,000 • Reckless conduct that creates a risk of serious physical injury to another person	D felony (up to five years in prison, a fine of up to $5,000, or both)
4th degree	Damage to or the value of the property or computer services is over $500	A misdemeanor (up to one year in prison, a fine of up to $2,000, or both)
5th degree	Damage to or the value of the property or computer services, if any, is $500 or less	B misdemeanor (up to six months in prison, a fine of up to $1,000, or both)

“Ethical Hacking”

“... ethical hacking is to evaluate the security of and identify vulnerabilities in systems, networks or system infrastructure. It includes finding and attempting to exploit any vulnerabilities to determine whether unauthorized access or other malicious activities are possible.”

https://searchsecurity.techtarget.com/definition/ethical-hacker

Why a home hacking lab is fun

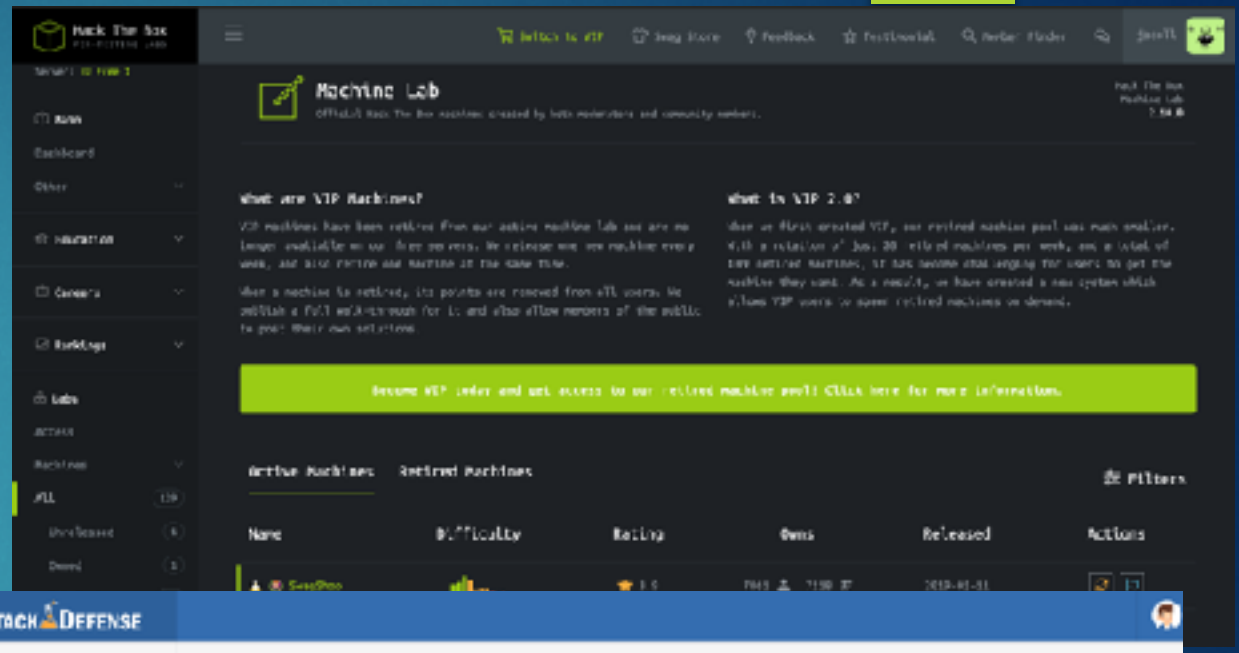
- Virtual Playground
- Hands on approach to learning
- Hacking is a a lot of fun

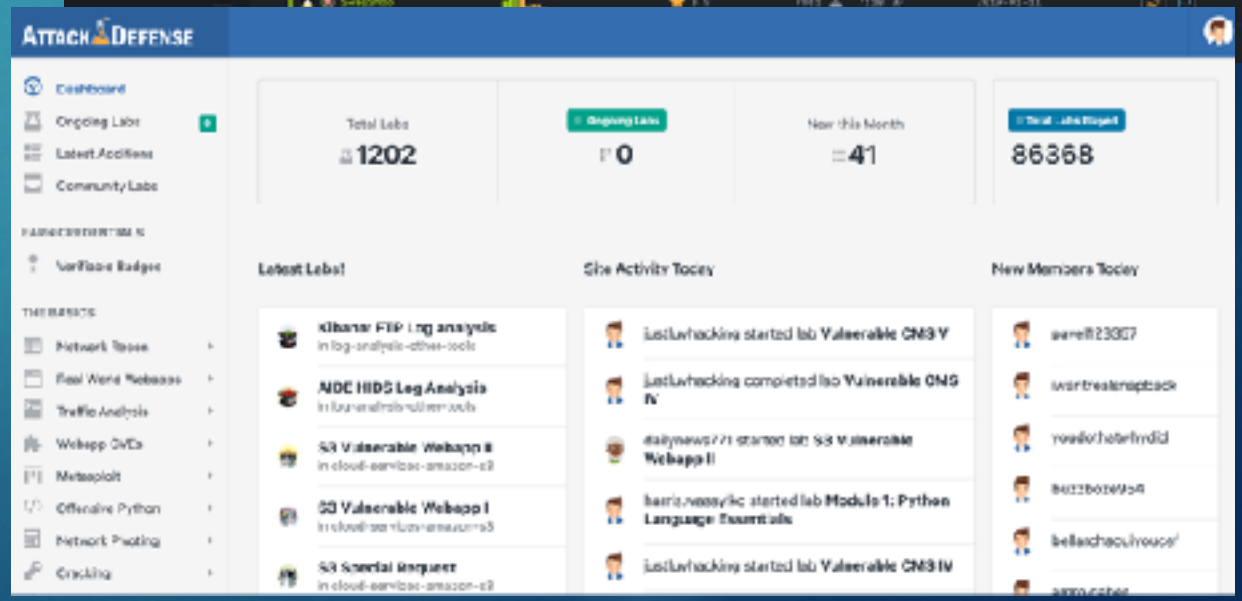
Additional Benefits of a Home Lab

- Mimic real-world environments
- Best way to learn about a technology is to build it yourself
- Test new toolsets

100% Online Options

- HacktheBox
  - Has a paid and a free option
  - VIP is $10/moth or $100/year
  - https://www.hackthebox.eu/home/machines
- Attack Defense
  - Has a cost associated but the labs are very comprehensive
  - Normally $69/month currently $39/month
  - https://www.attackdefense.com
- Other Options
  - https://www.hackthissite.org
  - https://www.enigmagroup.org

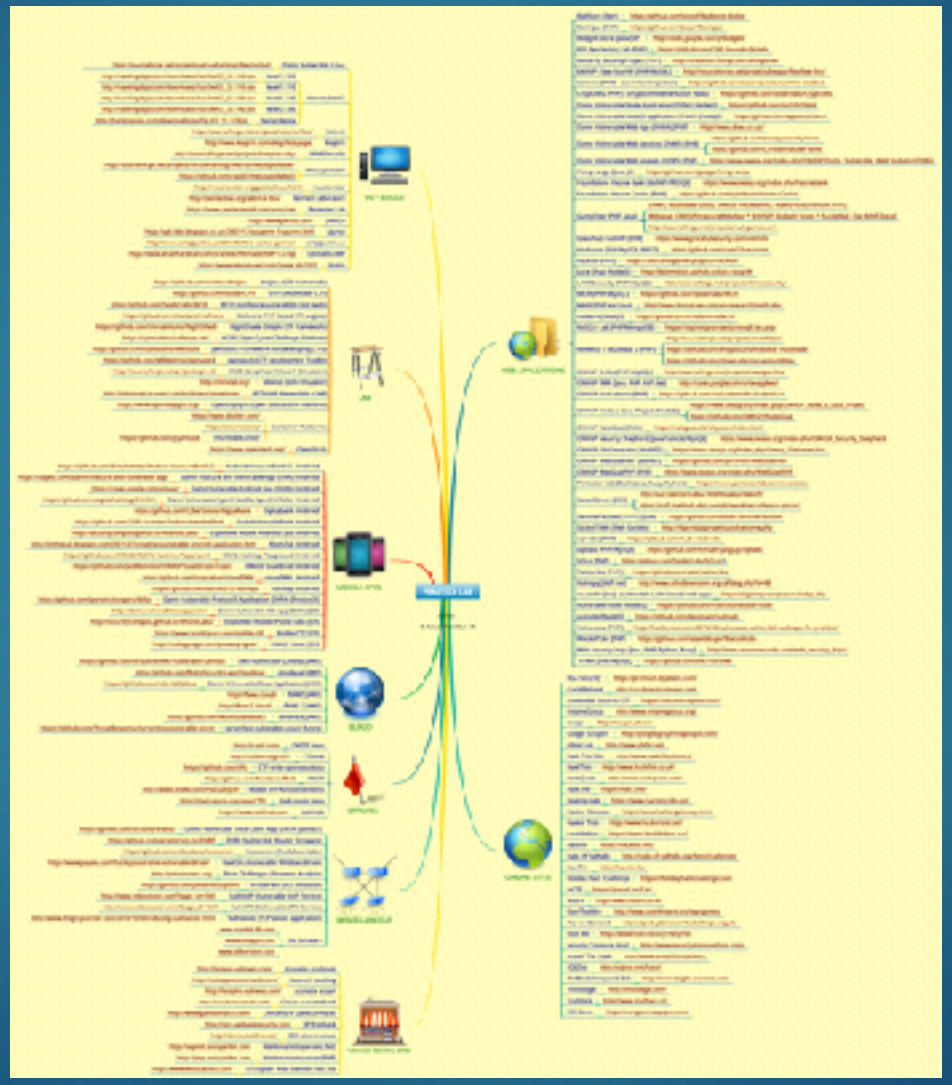




Now let's build your home hacking lab…

- Plan your focus
- Design a plan
- Segment your lab network
- Install/Purchase the tools you need
- Research …

Information OVERLOAD



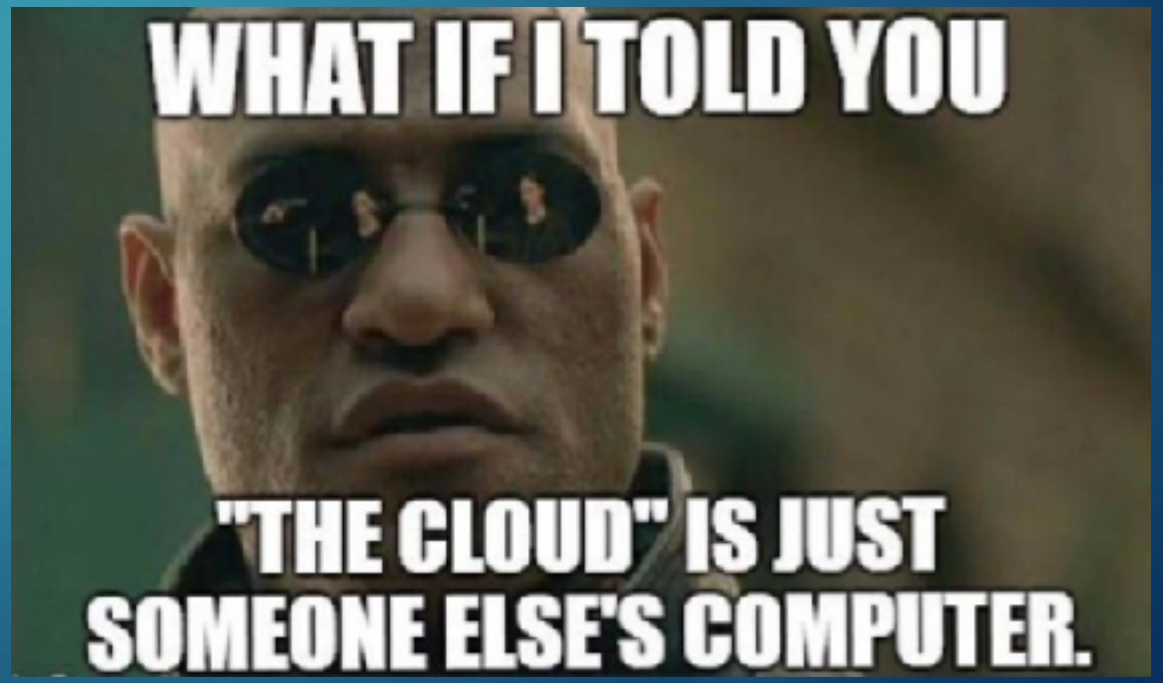
https://www.amanhardikar.com/mindmaps/Practice.html

Different options for your lab

- Bare Metal
- Cloud
- Virtualization

Cloud vs Physical

- The Cloud allows you to spin up and configure systems/images very quickly
- Cloud Options
  - AWS
  - GCS
  - Microsoft Azure
  - VPS Services
- Physical (In House)



Pros/Cons of Cloud

- Pros
  - Speed
  - Agility
  - Cost
- Cons
  - Cost
  - Networking
  - Traffic Flow

Microsoft Windows Server 2019 Base

Microsoft

Free tier eligible

Microsoft Windows Server 2019 Base

Amazon EC2 running Microsoft Windows Server is a fast and dependable environment for deploying applications using the Microsoft Web Platform. Amazon EC2 enables you to run compatible Windows-based solutions on AWS' high-performance, reliable, cost-effective, cloud computing platform.

View Additional Details in AWS Marketplace

Product Details

By	Amazon Web Services
Customer Rating	★★★★★ (2)
Latest Version	2019.09.11
Base Operating System	Windows, Windows Server 2019 Base 10
Delivery Method	64-bit (x86) Amazon Machine Image (AMI)
License Agreement	End User License Agreement
On Marketplace Since	5/5/19
AWS Services Required	Amazon EC2, Amazon EBS

Highlights

- Amazon EC2 makes it easy to start and manage your Windows-based instances.
- Amazon EC2 running Windows Server provides seamless integration with

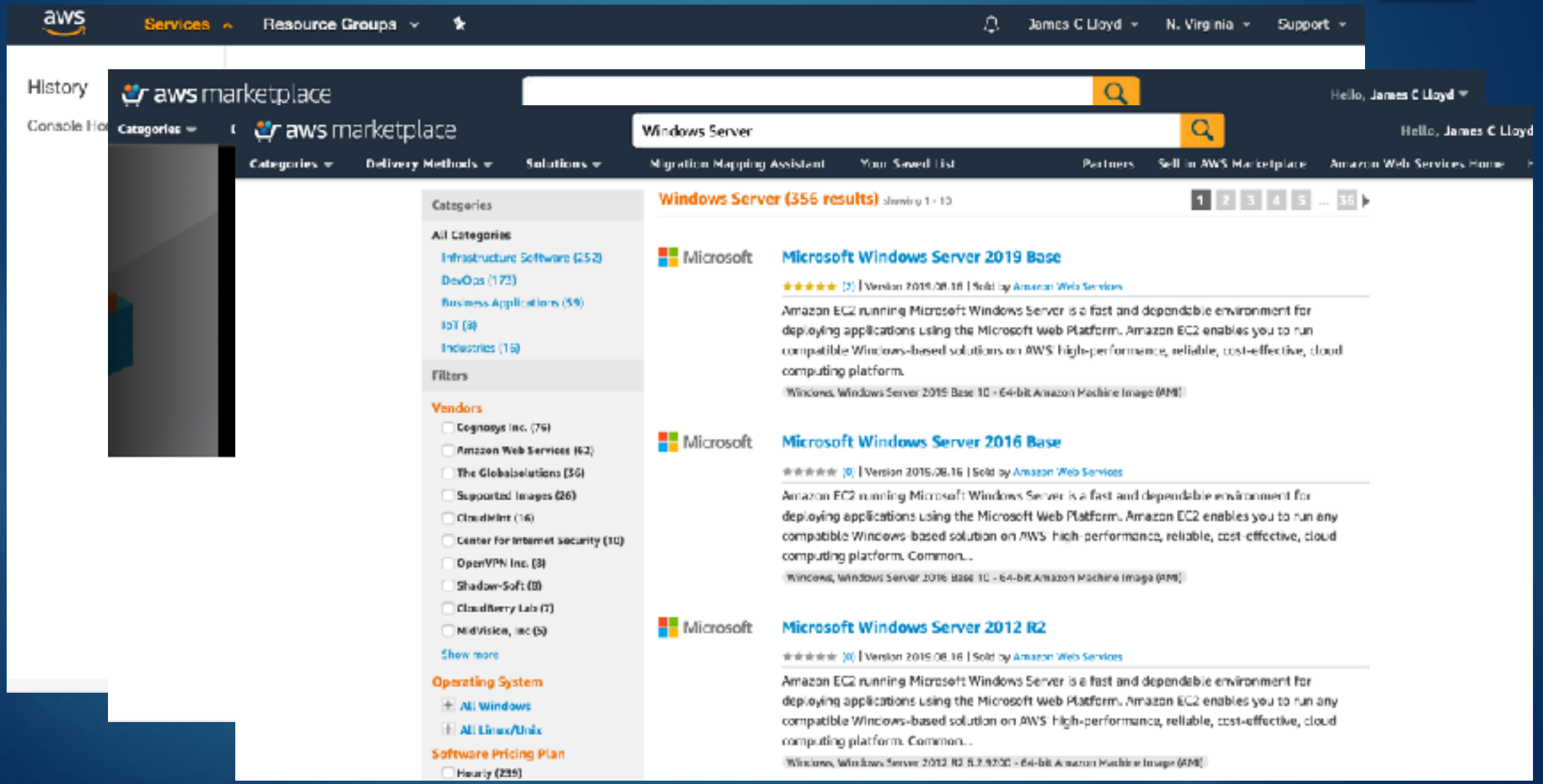
Pricing Details

Hourly Fees

Instance Type	Software	EC2	Total
t1.micro	$0.00	$0.02	$0.02/hr
t2.nano	$0.00	$0.008	$0.008/hr
t2.micro	$0.00	$0.016	$0.016/hr
t2.small	$0.00	$0.032	$0.032/hr
t2.medium	$0.00	$0.064	$0.064/hr
t2.large	$0.00	$0.121	$0.121/hr
t3a.nano	$0.00	$0.009	$0.009/hr
t3a.micro	$0.00	$0.019	$0.019/hr
t3a.small	$0.00	$0.037	$0.037/hr
t3a.medium	$0.00	$0.056	$0.056/hr
t3a.large	$0.00	$0.103	$0.103/hr
t3a.xlarge	$0.00	$0.224	$0.224/hr
t3a.2xlarge	$0.00	$0.448	$0.448/hr
t3.nano	$0.00	$0.01	$0.01/hr
t3.micro	$0.00	$0.02	$0.02/hr
t3.small	$0.00	$0.039	$0.039/hr
t3.medium	$0.00	$0.06	$0.06/hr

Cloud Demo

Amazon Web Services



Virtualization

Full Operating System Virtualization

Software Options

- VMWare Workstation/Fusion - $150-250
  - VMWare Player - Free
- Oracle Virtual Box - Free
- Parallels (MacOS Only) – $80-100
- ESXi – Full Hypervisor - Free

Pros and Cons of VMs

Pros

- Highly Configurable
- Expandable
- Full Operation System Level functionality
- Able to Limit availability
- Snapshotting

Cons

- Resource Intensive
- Longer to setup and configure

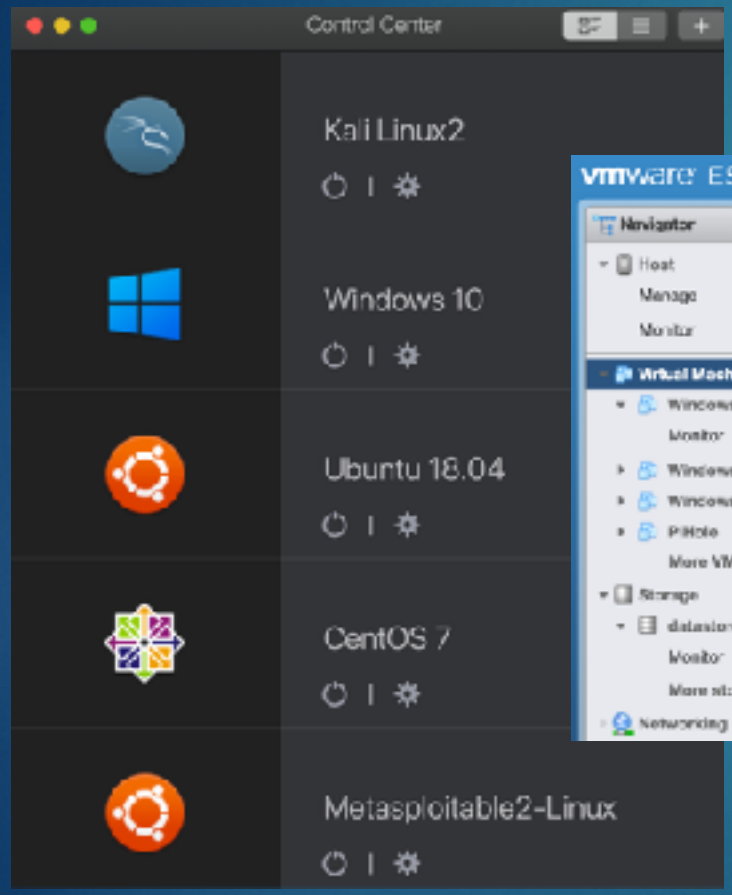
Windows 10 Subsystem for Linux

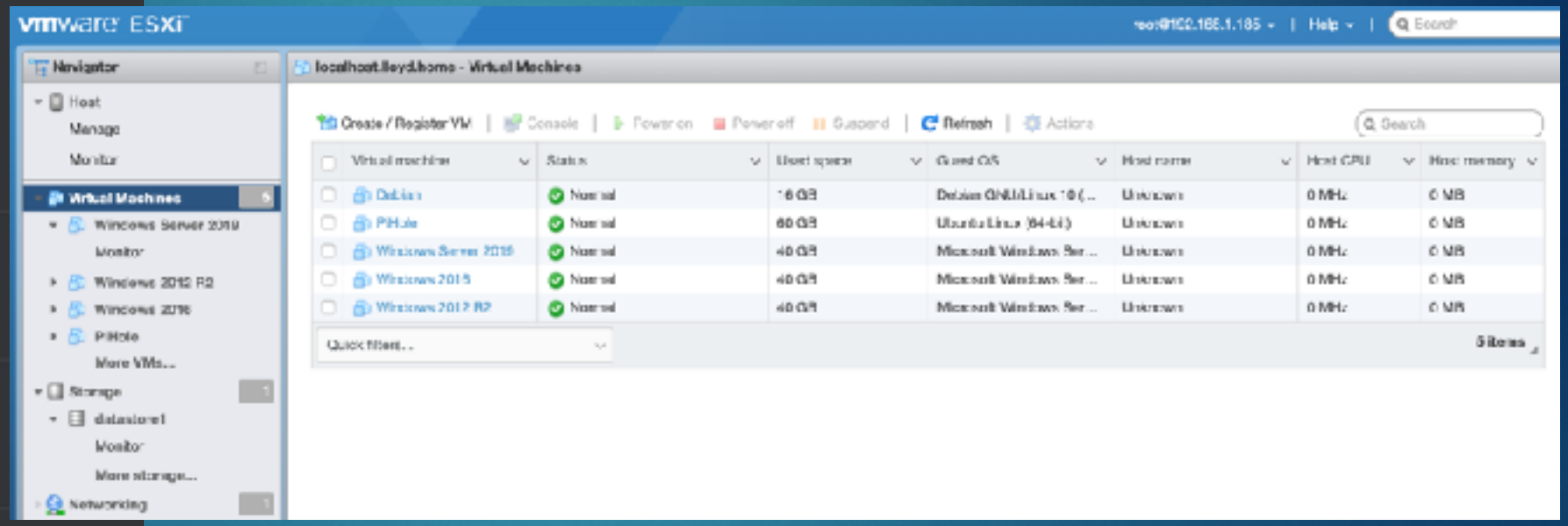
- Windows Subsystem for Linux, or WSL, is a feature-set in Windows 10 that allows Linux programs to run natively. Its not a true virtual machine, but a virtual environment

- "Our top requests from the WSL community have been to increase the file system performance, and make more apps work inside of WSL (i.e: introduce better system call compatibility). We have heard your feedback, and are glad to announce that WSL 2 helps solve these issues. WSL 2 is a new version of the architecture that powers the Windows Subsystem for Linux to run ELF64 Linux binaries on Windows. This new architecture changes how these Linux binaries interact with Windows and your computer's hardware, but still provides the same user experience as in WSL 1 (the current widely available version). Individual Linux distros can be run either as a WSL 1 distro, or as a WSL 2 distro, can be upgraded or downgraded at any time, and you can run WSL 1 and WSL 2 distros side by side. WSL 2 uses an entirely new architecture that uses a real Linux kernel."

https://devblogs.microsoft.com/commandline/announcing-wsl-2/

My Current Local VM Setup





Metasploitable

- Vulnerable Operation System Image
- Build by Offensive Security
- Offensive Security releases Kali
- "A test environment provides a secure place to perform penetration testing and security research. For your test environment, you need a Metasploit instance that can access a vulnerable target. The following sections describe the requirements and instructions for setting up a vulnerable target."

- https://metasploit.help.rapid7.com/docs/metasploitable-2

What is Docker?

- Docker is a tool designed to make it easier to create, deploy, and run applications by using containers. Containers allow a developer to package up an application with all the parts it needs, such as libraries and other dependencies, and ship it all out as one package.

- Think of Docker as virtualized applications/frameworks

Pros and Cons of Docker Containers

Pros

Someone has already done all the work for you

Very easy to deploy

Very easy to update

Ability to limit availability

Cons

Docker images are not very easily customizable

Stability is sometimes an issue

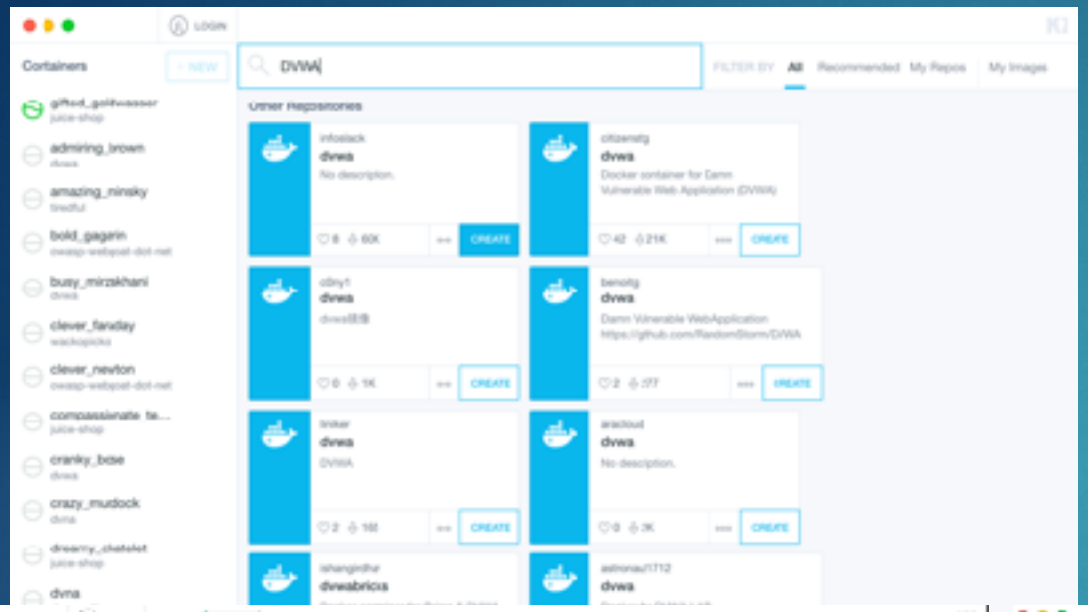
Trust in the source

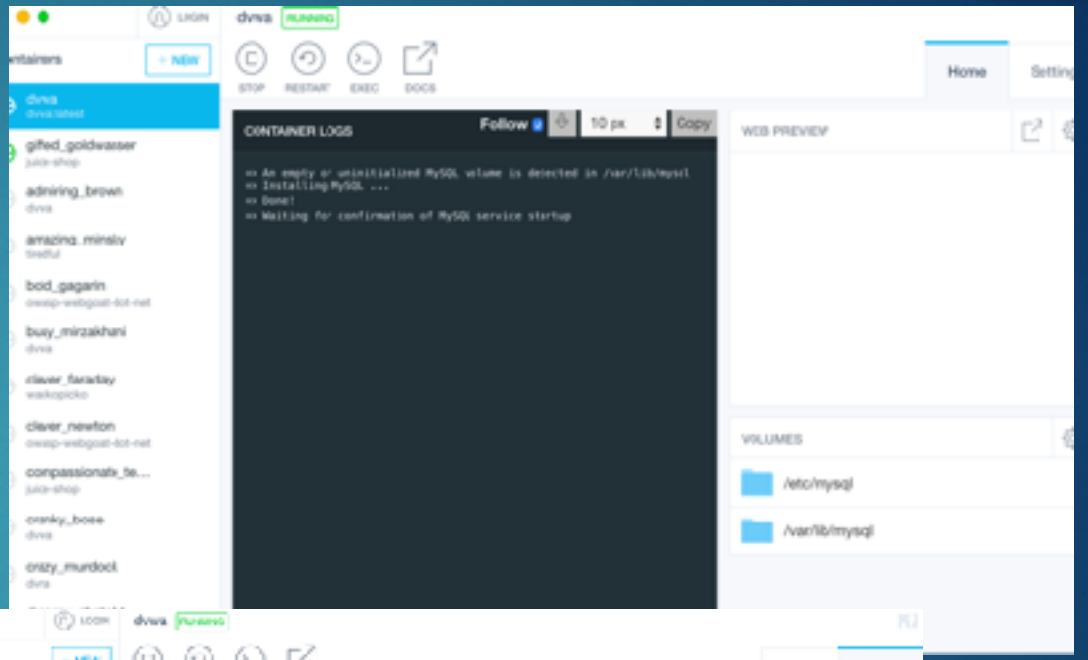
Important Docker Commands

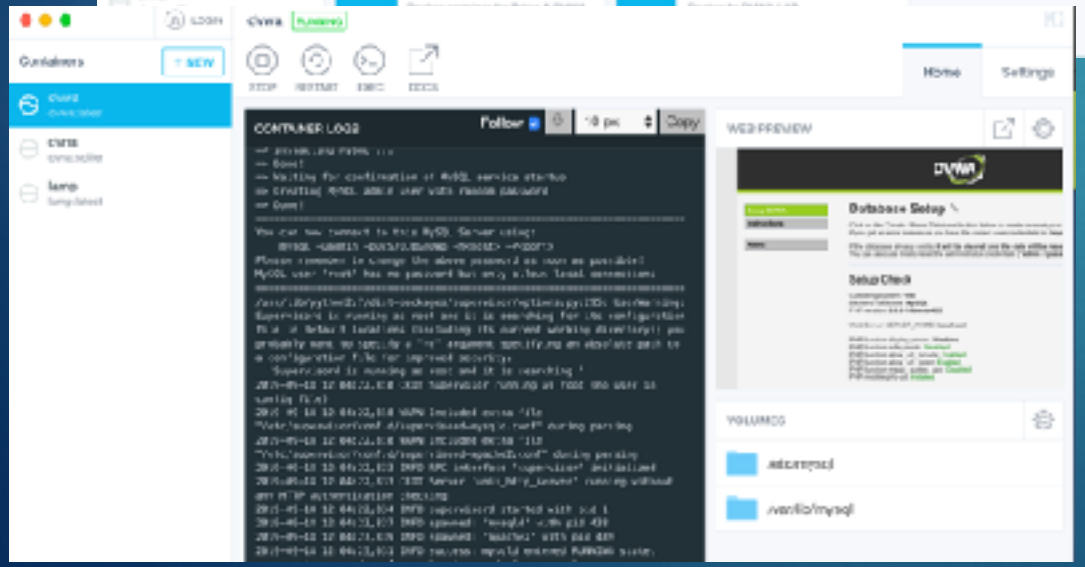
- docker run – Runs a command in a new container.
- docker start – Starts one or more stopped containers
- docker stop – Stops one or more running containers
- docker build – Builds an image form a Docker file
- docker pull – Pulls an image or a repository from a registry
- docker push – Pushes an image or a repository to a registry
- docker export – Exports a container's filesystem as a tar archive
- docker search – Searches the Docker Hub for images
- docker attach – Attaches to a running container
- docker commit – Creates a new image from a container's changes

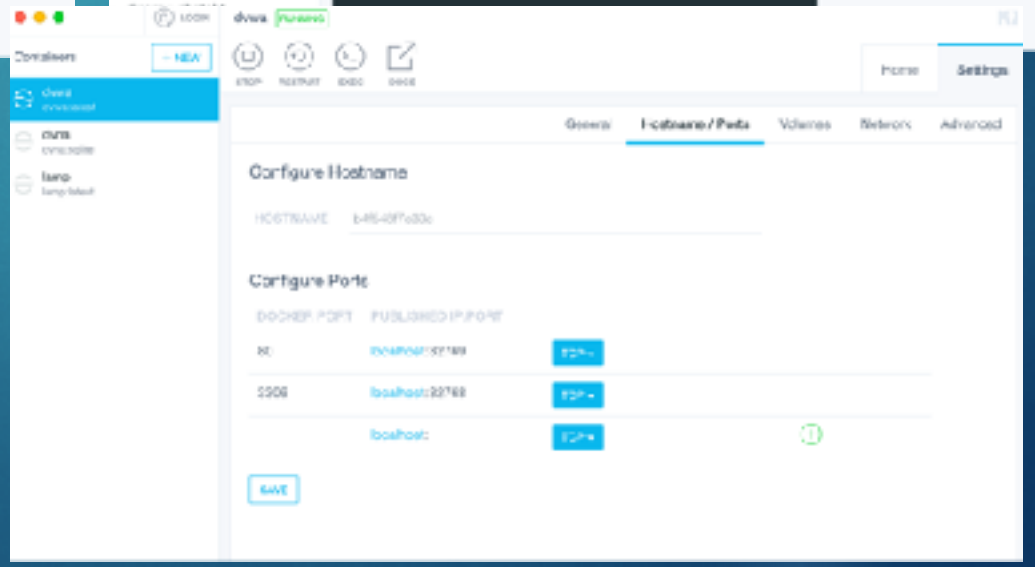
Kitematic

- A GUI for Docker









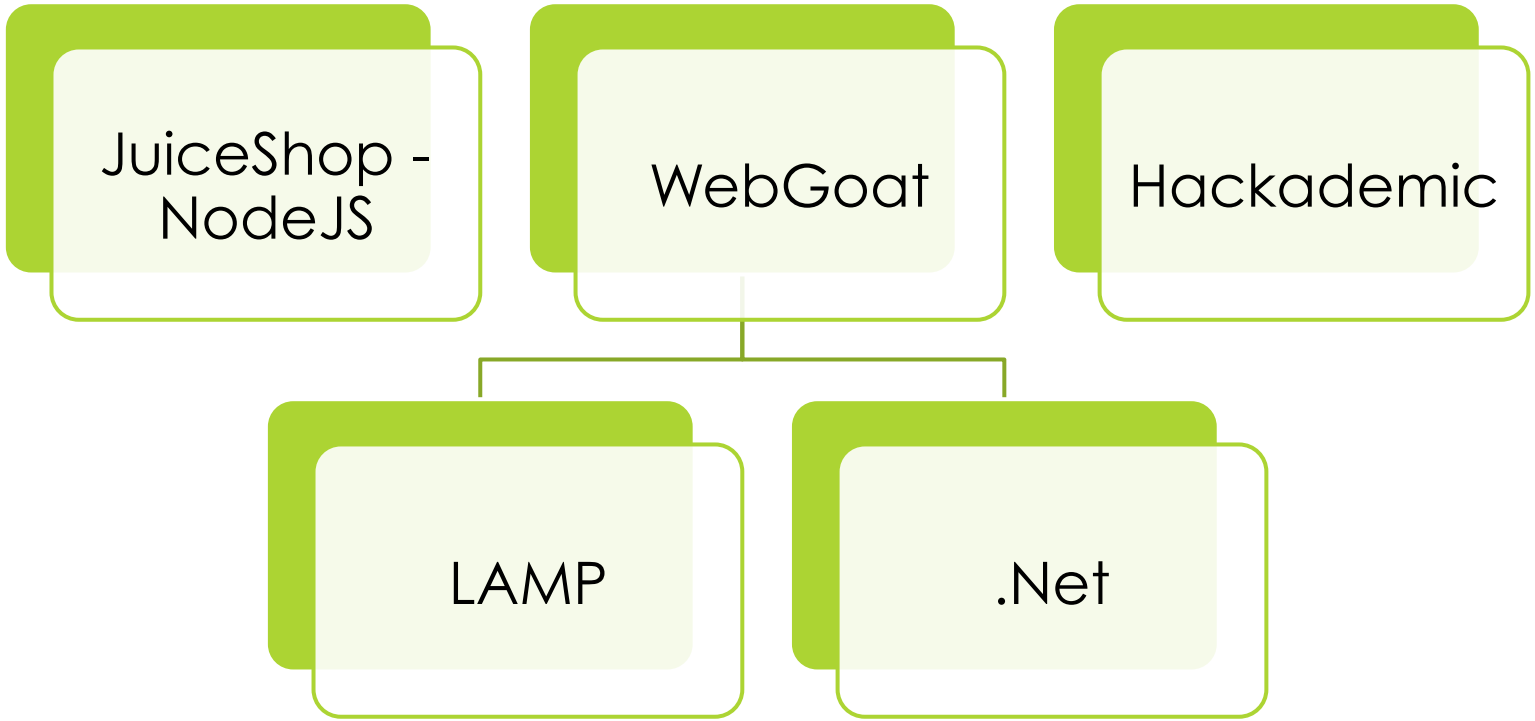
OWASP

- "The Open Web Application Security Project (OWASP) is a 501(c)(3) worldwide not-for-profit charitable organization focused on improving the security of software. Our mission is to make software security visible, so that individuals and organizations are able to make informed decisions"

https://www.owasp.org/index.php/Main_Page

- OWASP Top 10

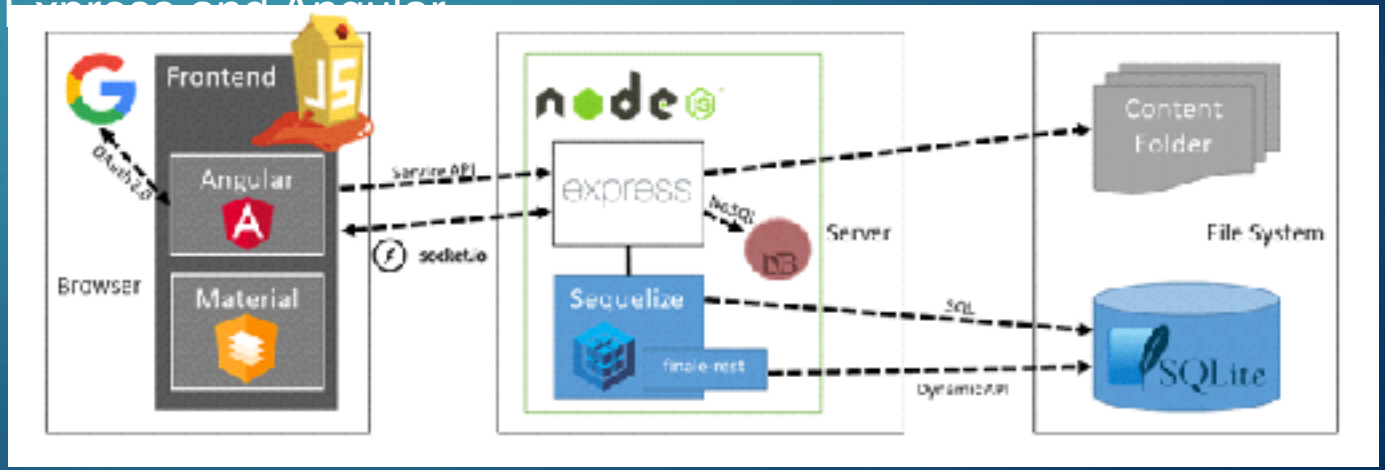
OWASP Images



OWASP Juice Shop

- OWASP Juice Shop is probably the most modern and sophisticated insecure web application! It can be used in security trainings, awareness demos, CTFs and as a guinea pig for security tools! Juice Shop encompasses vulnerabilities from the entire OWASP Top Ten along with many other security flaws found in real-world applications.

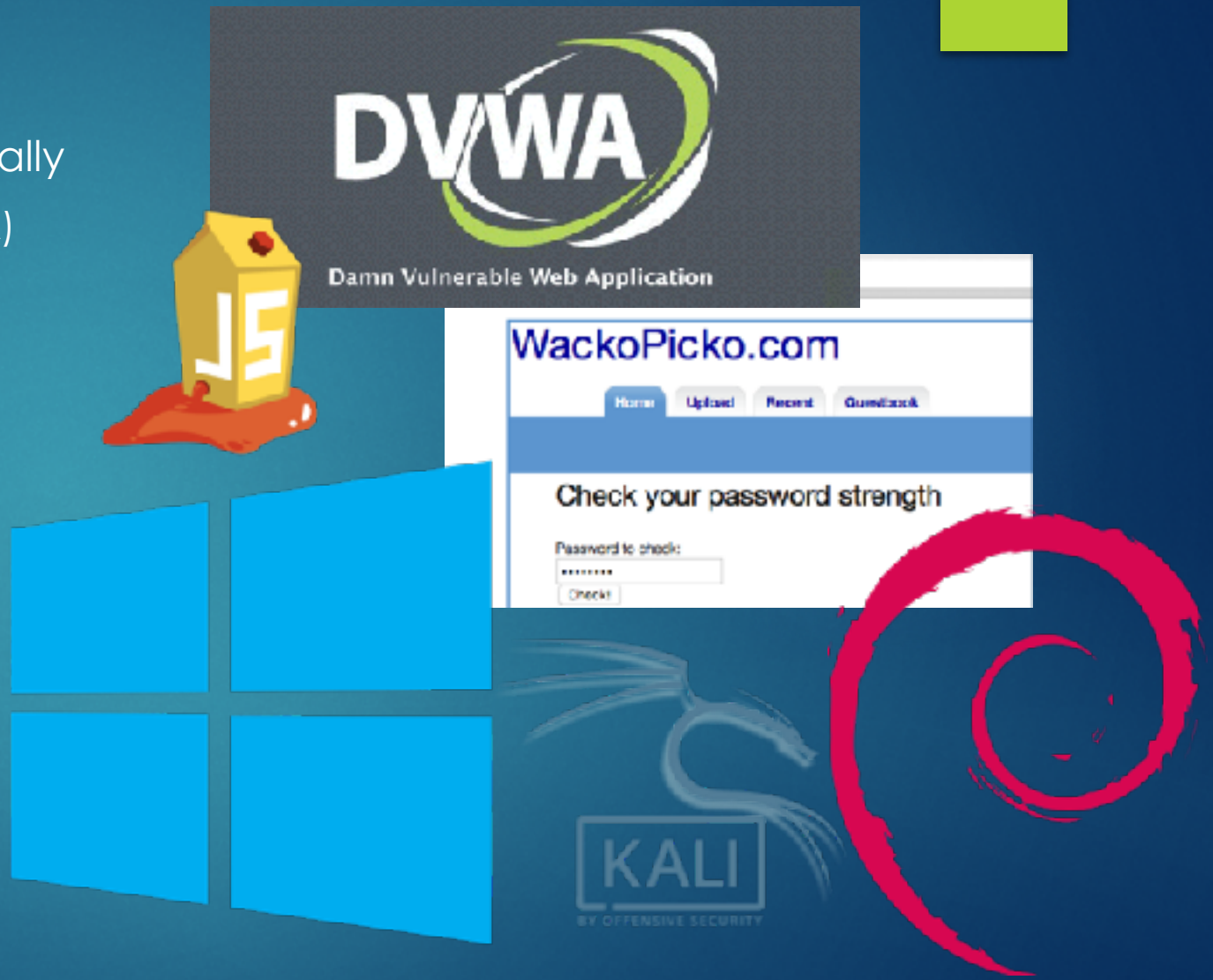
- Juice Shop is written in Node.js, Express and Angular

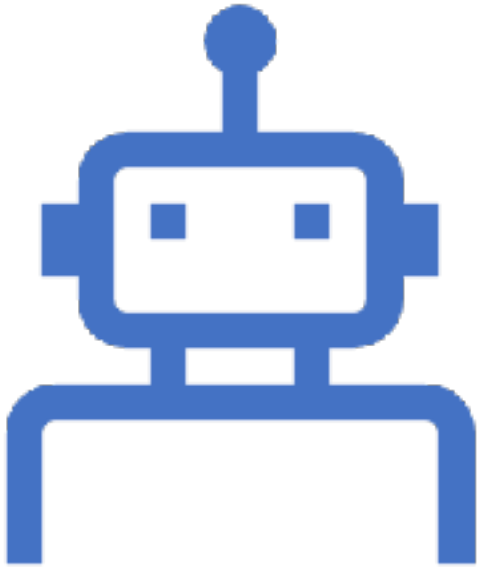


JuiceShop Demo

Current Lab Setup

- Current Docker images running locally
  - Damn Vulnerable Web App (DVWA)
  - OWASP JuiceShop
  - OWASP WebGoat.NET
  - Tiredful API
  - WackoPickto
- Current Virtual Machines
  - Kali Linux
  - Debian 10
  - Ubuntu
  - Windows 10
  - Metasploitable
  - Windows Server 2012 R2





Current Lab Demo

Demo

Why This Setup Works for Me

- I can to test from my host
  - Home Brew for mac
- Use of KALI VM
- Using Docker + Remote/Local VMs allows diversity

Past interactions of my setup

- Single Windows 7 on old laptop
- DISA STIGged Windows Image
- Any Operating System could get for free
- Couple Raspberry Pis

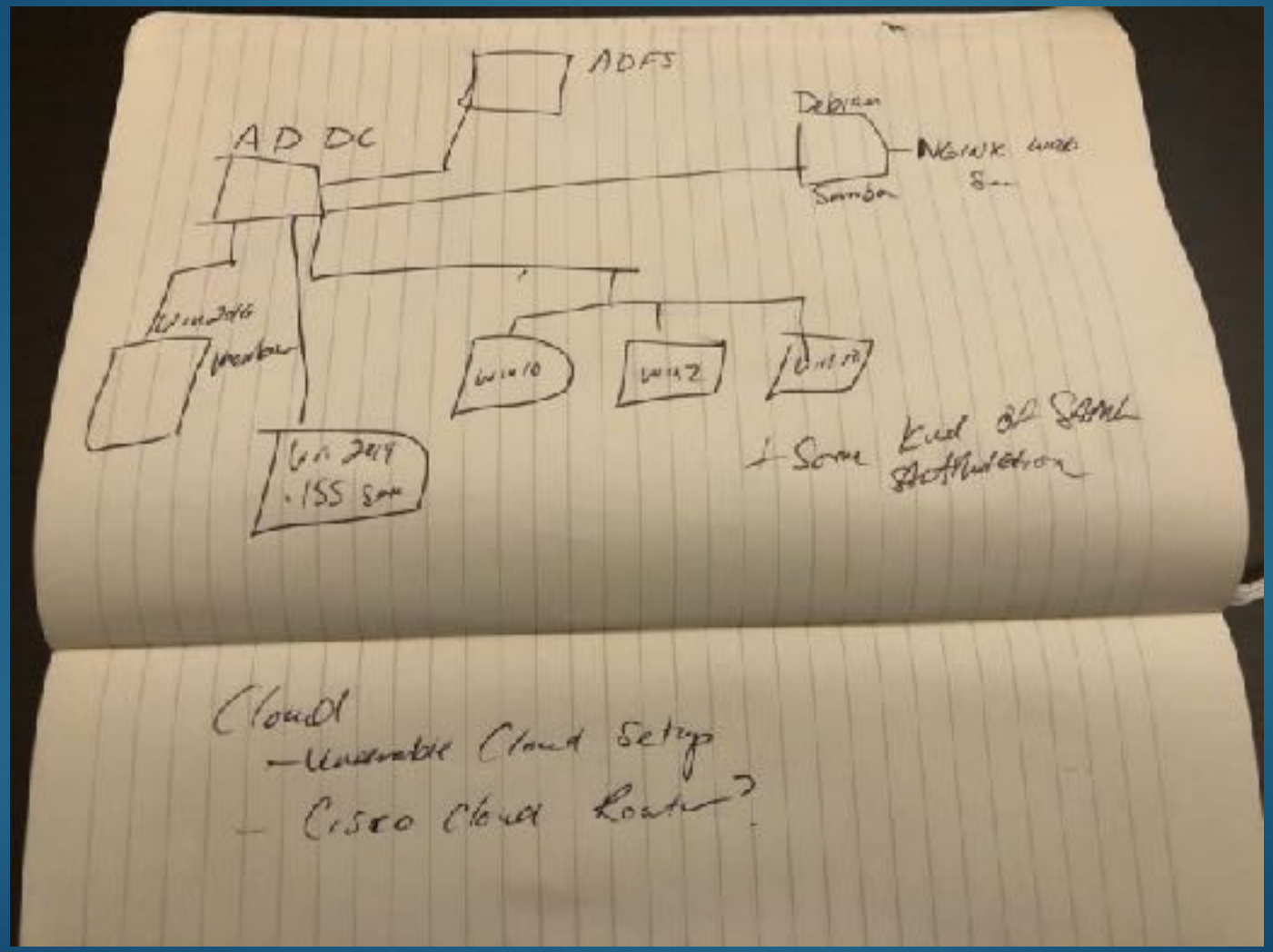
Past Issues

- Resources
- Time
- Patience

Future Ideas

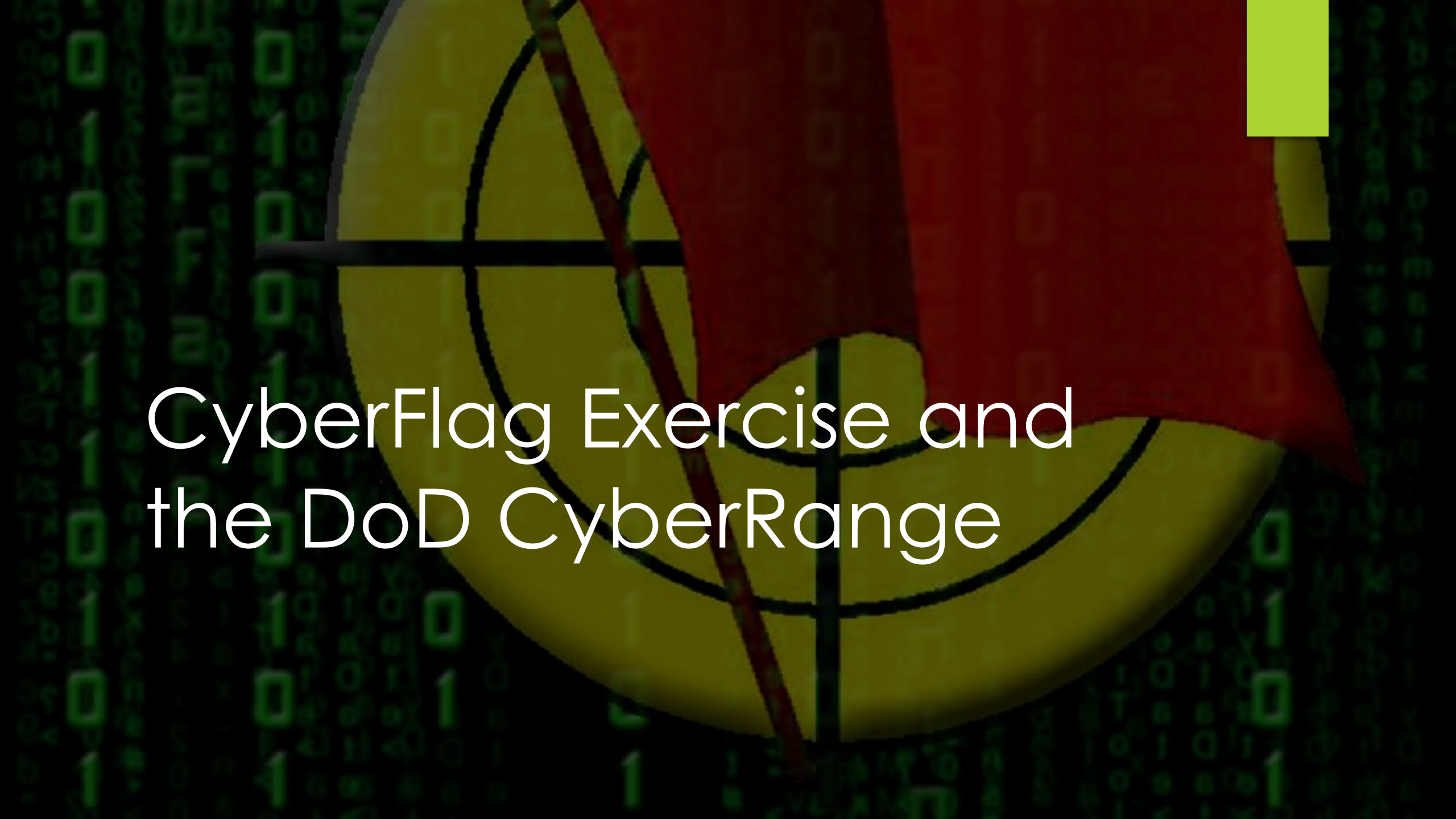
- ESXi Server hosting most full VM images
- Build completely “Cyber Range” in my home
- Build complete Windows Active Directory domain with clients, IIS/.Net web applications, and AD Federated Services
- Build custom vulnerable web applications (Apache, NGINX)
- Jenkins CICD Pipeline
- Automate deployment with tools like Puppet and Ansible
- Web Applications protected by WAF for bypass practice

Future Logical Diagram



Real World Testing Scenarios

- CyAn
  - Automated web app vulnerability scanner
  - https://github.com/jaconll12/CyAn
  - Needed a vulnerable web app to test my code
  - Enter Docker images
- Exploit development
- Bug Hunting
- Training



CyberFlag Exercise and the DoD CyberRange

USCyberCommand CyberFlag

- Department of Defense CyberFlag Exercise
- Blue Force
- Red Force (OpFor)
- White Cell
- CyberFlag's goal is to mimic real worth threats/APT and train defenders on what to look for

DoD Cyber Range and DISA MiniFlag

- DISA "MiniFlag" CyberFlag Prep
- Full featured VM environment
- Capable of hosting hundred of guest OS machines
- Capable of importing almost any toolset
  - Defender Tools
  - Red Team Injects
- My involvement
  - Build Red Team injects
  - Developed training plan and exercise flow

What I Learned from CyberFlag and the CyberRange

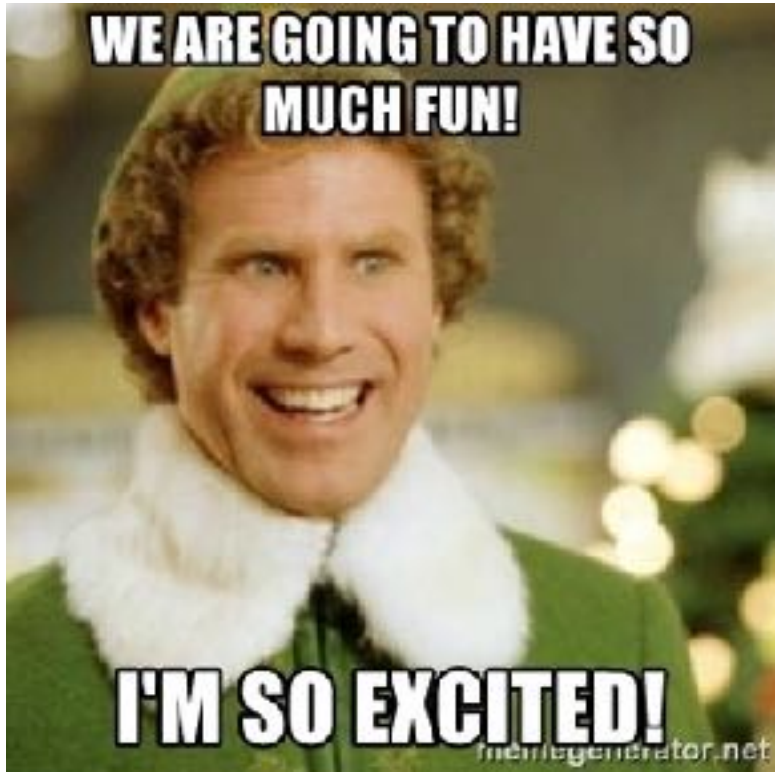
- Having a complete and flexible testing environment is imperative for any profession, especially CyberSec
- Planning is Key
- You can create a smaller scale CyberRange at your home …

Final Comments

- You will break EVERYTHING
- You will make mistakes and screw up … that's ok that's why you are doing this in a lab
- You will learn more than you ever could reading books
- Start Small, then build up….
- SEGMENT your lab network

Summary

- An in-home lab is important for learning and growing
- Its better than going to jail
- You do not need a lot of money or experience to get started
- Cloud, Physical, VM, or Docker
- Document, document, document
- Build upon your setup
- Give back to the community
- Have some fun
- Questions/Comments



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