Capstone Engagement

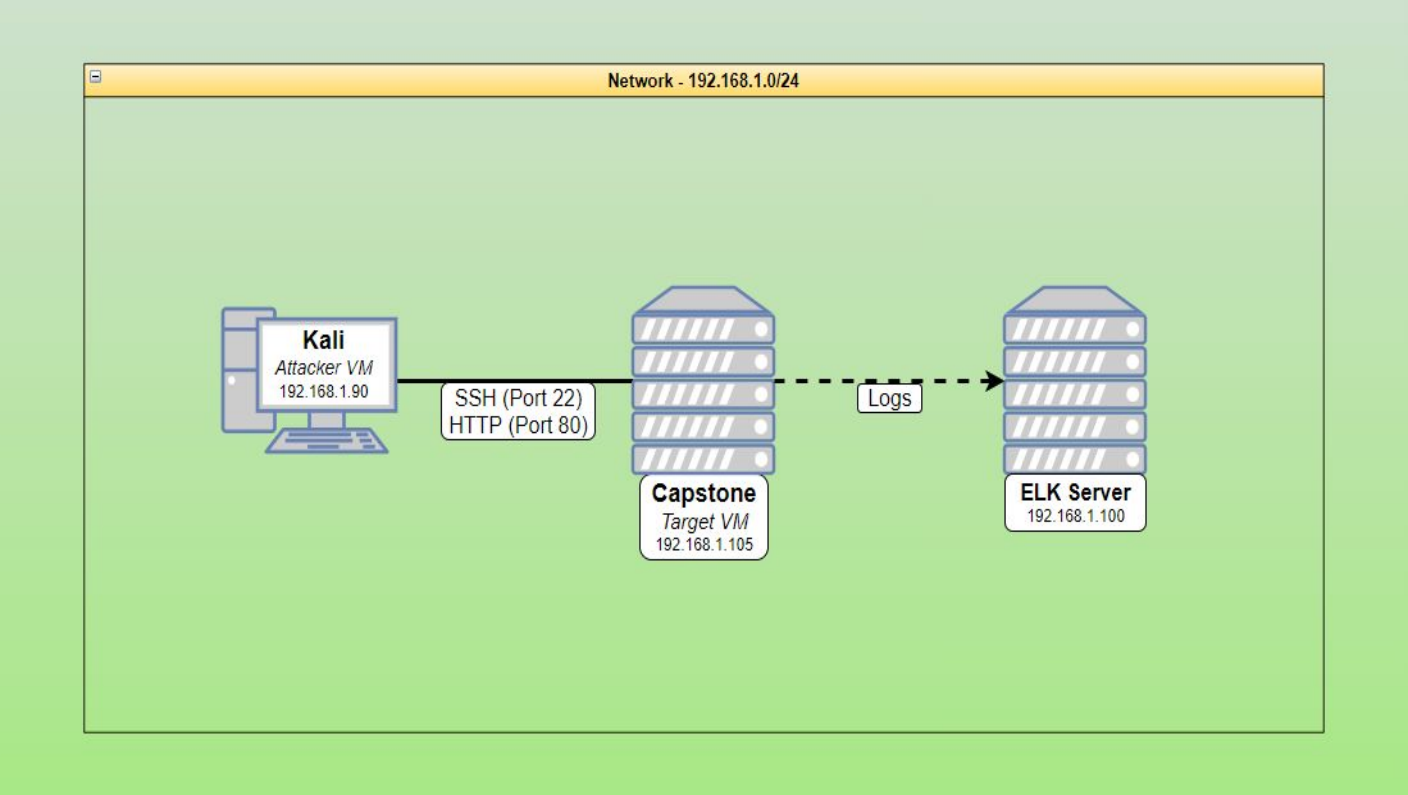
Assessment, Analysis, and Hardening of a Vulnerable System

Table of Contents

This document contains the following sections:

Network Topology

Network Topology



Network

IP Range: 192.168.1.0/24
Netmask: 255.255.255.0
Gateway: 192.168.1.1

Machines

IPv4: 192.168.1.90
OS: Linux
Hostname: Kali

IPv4: 192.168.1.100
OS: Linux
Hostname: ELK

IPv4: 192.168.1.105
OS: Linux
Hostname: Capstone

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 VM
ELK	192.168.1.100	Log Server
Capstone	192.168.1.105	Victim VM
	192.168.1.1	Switch

Vulnerability Assessment

The assessment uncovered the following critical vulnerabilities in the target:

Vulnerability	Description	Impact
Sensitive Data Exposure OWASP Top 10 #3 - **Critical**	The secret_folder is publicly accessible. and contains sensitive data intended only for authorized personnel.	It compromises credentials that attackers can use to break into the web server.
Unauthorized File Upload **Critical**	Users are allowed to upload files to the web server.	Allows attackers to upload PHP scripts to the server.
Remote Code Execution via Command Injection OWASP Top 10 #1 - **Critical**	Attackers can use PHP scripts to execute shell commands.	Attackers can open a reverse shell to the servers.

Exploitation: Sensitive Data Exposure

01

Tools & Processes

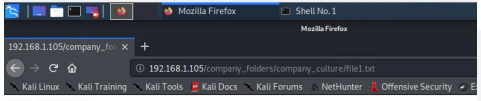
- ➔ Exposed secret_folder & connect_to_corp_server.
- ➔ Compromised credentials of WebDav folder.

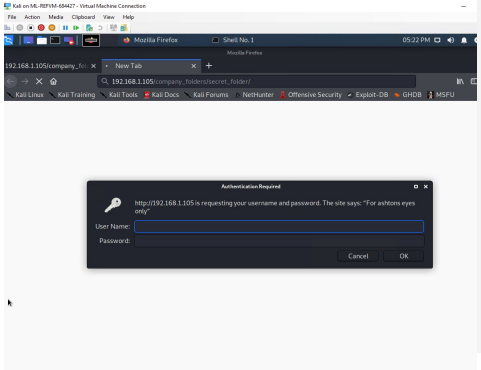
02

Achievements

- ➔ Secret_folder was accessible publicly with directions on the site to it.

03





Exploitation: Unauthorized File Upload

01

Tools & Processes

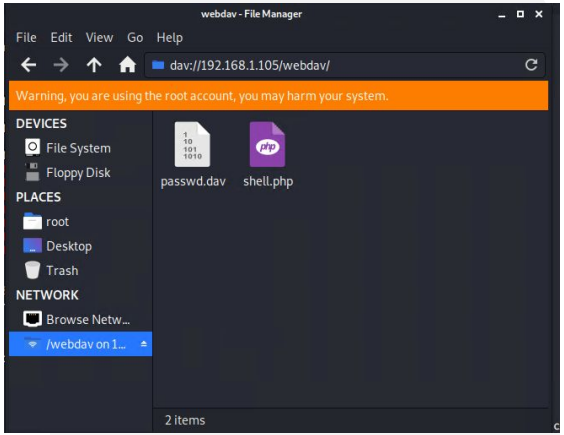
- ➔ Crack stolen credentials to connect via WebDAV.
- ➔ Generate custom web shell with msfconsole.
- ➔ Upload shell via WebDAV.

02

Achievements

- ➔ Uploading a web shell allows us to execute **arbitrary shell commands** on the target.

03



Exploitation: Remote Code Execution via Command Injection

01

Tools & Processes

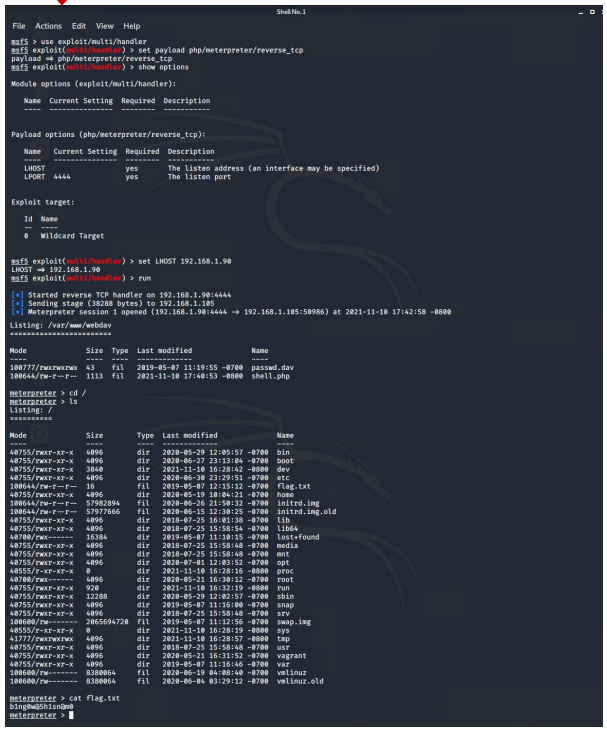
- ➔ Use Meterpreter to connect to uploaded web shell.
- ➔ Use shell to explore and compromise target.

02

Achievements

- ➔ Leveraging the RCE allows us to open a Meterpreter shell to the target.
- ➔ Once on the target, the full file system is available for exploration.

03



Blue Team

Log Analysis and Attack Characterization

Analysis: Identifying the Port Scan

- The Attack occurred at Noon on November 11th, 2021.
  - The attacker sent 36,557 packets from source IP 192.168.1.90, each packet going to a different port, indicating a port scan.

Analysis: Finding the Request for the Hidden Directory

➔ Starting at 20:42 on Nov 12, there was 1161 requests for the /company_folder/secret_folder.

Top 10 HTTP requests [Packetbeat] ECS

url.full: Descending	Count
http://192.168.1.105/company_folders/secret_folder	11,161
http://192.168.1.105/webdav	34
http://192.168.1.105/webdav/shell.php	22
http://192.168.1.105/	6
http://192.168.1.105/company_folders/secret_folder/	4

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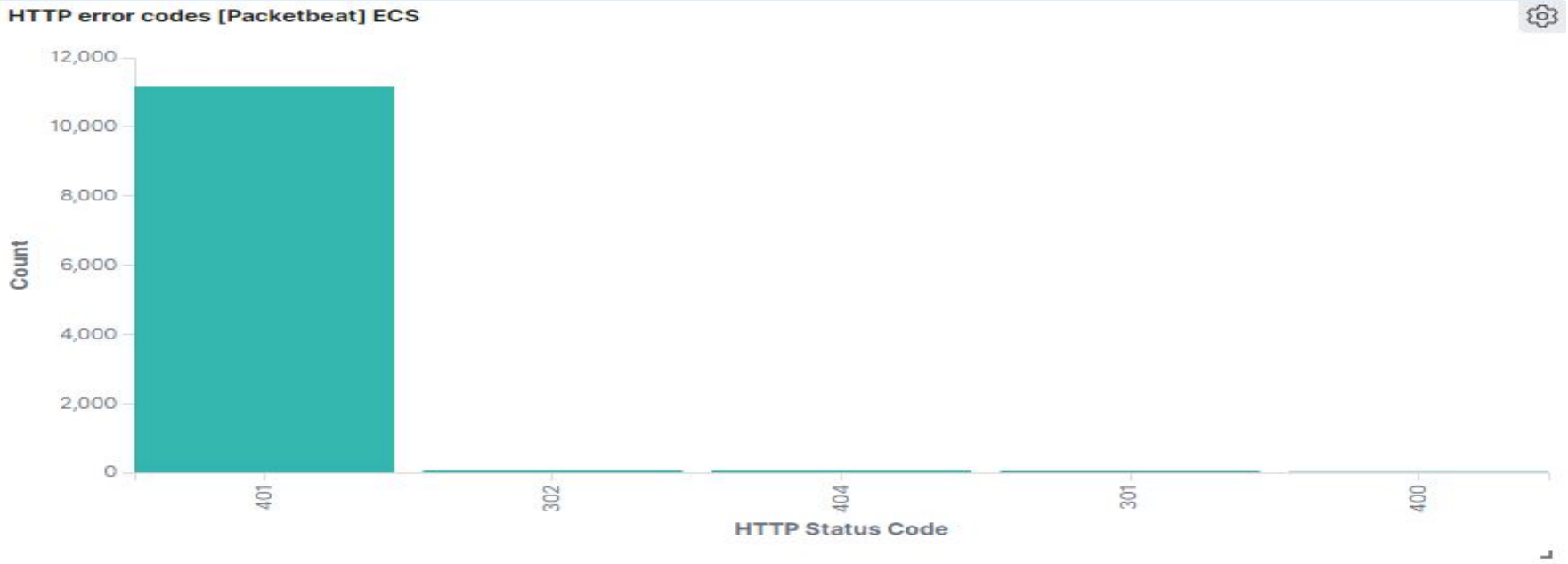
Analysis: Uncovering the Brute Force Attack

- ➔ 11,160 attempts to brute force user Ashton.
- ➔ It appears that they were able to crack the password.



Analysis: Finding the WebDAV Connection

Upon inspection it was discovered that Webdav folder was accessed 34 times.
Located in that folder was shell.php which is a malware file. It was accessed 22 times

Top 10 HTTP requests [Packetbeat] ECS

url.full: Descending	Count
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http://192.168.1.105/webdav/shell.php	22
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Blue Team

Proposed Alarms and Mitigation Strategies

Mitigation: Blocking the Port Scan

Alarm

- 50 # of Requests per Second
- Alarms should fire if a given IP address sends more than 50 requests per second for more than 5 seconds.

System Hardening

- The local firewall can be used to throttle incoming connections.
- ICMP traffic can be filtered.
- An IP allowed list can be enabled.

Mitigation: Finding the Request for the Hidden Directory

Alarm

- Allow authorized IP addresses.
- Trip alarm if an IP not on the allow list attempts to connect.
- This is a binary alarm: If the incoming IP is not allowed, an alert is sent.

System Hardening

- Access to the sensitive file can be locally restricted to a specific user.
- Someone who gets a shell not be able to read it.
- The file should be encrypted when at rest.

Mitigation: Preventing Brute Force Attacks

Alarm

- 250 # of Requests per Second
- More than 250 requests per second for 5 seconds should trigger the alarm

System Hardening

- Configuring fail2ban or a similar utility would mitigate brute force attacks

Mitigation: Detecting the WebDav Connection

Alarm

- ➔ Monitor access to WebDav with Filebeat.
- ➔ Fire an alarm on any read performed on files within WebDav.
- ➔ Simply fire the alarm whenever someone accesses the webdav directory.
- ➔ Ideally, allow valid IP addresses.

System Hardening

- ➔ Administrators must install and configure Filebeat on the host.

Mitigation: Identifying Reverse Shell Uploads

Alarm

- ➔ What kind of alarm can be set to detect future file uploads?
- ➔ Alert for all files uploaded.
- ➔ What threshold would you set to activate this alarm?
- ➔ Any files upload.

System Hardening

- ➔ Prevent .php files from being uploaded.
- ➔ To disable PHP execution, you add 4 lines of code to the .htaccess file on your web server. Those lines look like this:

  Order allow, Deny, Deny from all


FIN