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Module 13

Hacking Web Servers

Hacking Web Servers: An Overview

Hacking a web server refers to exploiting vulnerabilities in the server's software, configurations, or the applications it hosts to gain unauthorized access or disrupt services. Understanding how attacks work helps in building secure systems. Below are the key concepts and common methods involved:

1️⃣ Common Vulnerabilities:

1. **SQL Injection (SQLi):**
   - Attackers manipulate SQL queries through user inputs (like forms or URLs).
   - Can lead to data breaches, authentication bypass, or data corruption.
2. **Cross-Site Scripting (XSS):**
   - Malicious scripts are injected into web pages viewed by other users.
   - Often used to steal session cookies, hijack accounts, or deliver malware.
3. **Cross-Site Request Forgery (CSRF):**
   - Tricks a user into executing unwanted actions while authenticated on a website.
   - Example: Submitting a form or making a purchase without consent.
4. **Remote Code Execution (RCE):**
   - Attackers execute arbitrary code on the server.
   - This can lead to complete control over the server.
5. **Directory Traversal:**

    - Manipulating paths to access restricted directories and files.
    - Example: http://example.com/page=../../etc/passwd.
6. **Server Misconfiguration:**
    - Default credentials, open ports, and unpatched software can be exploited.
    - Tools like **Nmap** and **Nikto** are used to discover these weaknesses.

2️⃣ Tools Commonly Used for Hacking Web Servers:

- **Nmap:** For network discovery and security auditing.
- **Nikto:** Web server scanner for vulnerabilities.
- **Burp Suite:** Used for testing web application security.
- **OWASP ZAP:** Open-source tool for finding security vulnerabilities.
- **Metasploit:** Framework for developing and executing exploit code.

3️⃣ Techniques Employed:

1. **Footprinting and Scanning:**
    - Identifying the server, technologies used, and open ports.
2. **Enumeration:**
    - Extracting usernames, paths, and configuration details.
3. **Exploitation:**
    - Using discovered vulnerabilities to inject code or manipulate data.
4. **Privilege Escalation:**
    - Gaining higher access rights after initial exploitation.
5. **Covering Tracks:**
    - Clearing logs, hiding backdoors to maintain access.

4️⃣ Mitigation Strategies:

- **Update and Patch Regularly:** Keep server software and libraries up-to-date.
- **Least Privilege Principle:** Limit access rights to only what's necessary.
- **Web Application Firewall (WAF):** Protects against common attacks like SQLi and XSS.
- **Input Validation and Sanitization:** Prevent injection attacks.

- **Secure Configuration:** Disable unnecessary features and services.

Real-World Example: Heartbleed Vulnerability (CVE-2014-0160)

🔍 Background:

Heartbleed was a major vulnerability discovered in **OpenSSL**, a widely-used library for securing communications over the internet. It affected millions of web servers, including major platforms like Yahoo, GitHub, and many others.

OpenSSL uses encryption protocols (like HTTPS, SSL, and TLS) to secure data. Heartbleed specifically targeted the **Heartbeat extension** of OpenSSL, which is meant to keep secure connections alive.

⚠️ How the Attack Worked:

1. **Heartbeat Extension:**
    - OpenSSL has a "heartbeat" feature where a client sends a small packet to the server, requesting a response to confirm the connection is still alive.
    - The client sends some data (e.g., "ping") along with the length of that data (e.g., 4 bytes).
2. **The Vulnerability:**
    - Attackers could manipulate the length of the data packet they claimed to send.
    - For example, they would send the word "ping" (4 bytes) but say the length was **64 KB**.
    - OpenSSL would then respond with 64 KB of memory data, even if the original message was just 4 bytes.
3. **Data Exposure:**
    - This extra memory data was random but could contain sensitive information like:
        - **Usernames and passwords**
        - **Private server keys**
        - **Session cookies**
    - This allowed attackers to capture critical information **without detection**.

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🛠️ **Tools Used to Exploit Heartbleed:**

- **Nmap (with Heartbleed module):** Scans for vulnerable servers.
- **Metasploit:** Automated exploitation of the vulnerability.
- **Heartbleed.py:** A simple Python script to extract data from the server's memory.

🔐 **How It Was Fixed:**

- OpenSSL released a patch **(OpenSSL 1.0.1g)** that corrected the memory handling.
- Websites were forced to:
  - Update their OpenSSL libraries.
  - **Regenerate SSL certificates** (since private keys might have been exposed).
  - **Invalidate old sessions** and force users to re-login.

🛡️ **Lessons Learned:**

1. **Patch Early, Patch Often:** Delaying updates creates attack windows.
2. **Memory Management Matters:** Careless handling of memory can expose sensitive data.
3. **Monitor Logs for Anomalies:** Massive data leaks often leave trails if monitored.

☞ Here are some command line that useful for scanning for hacking web servers

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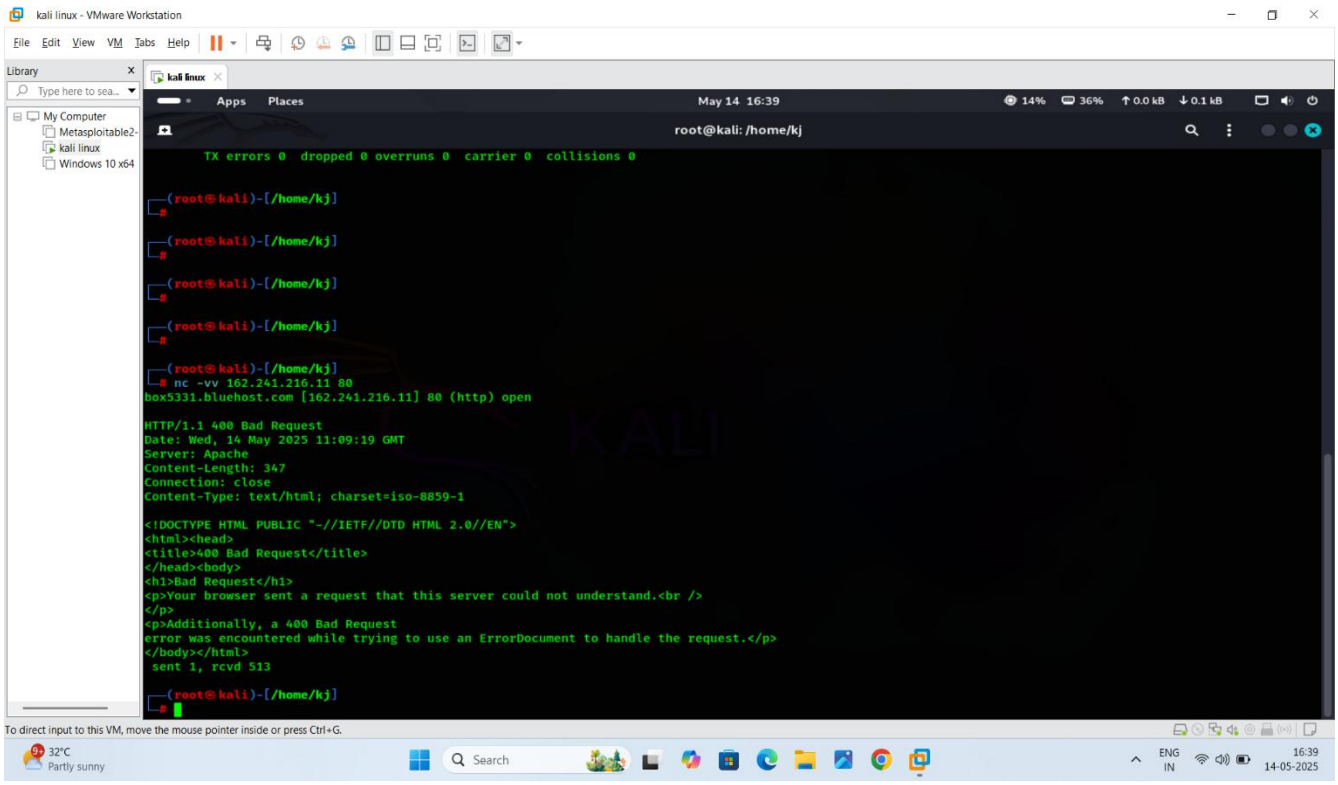
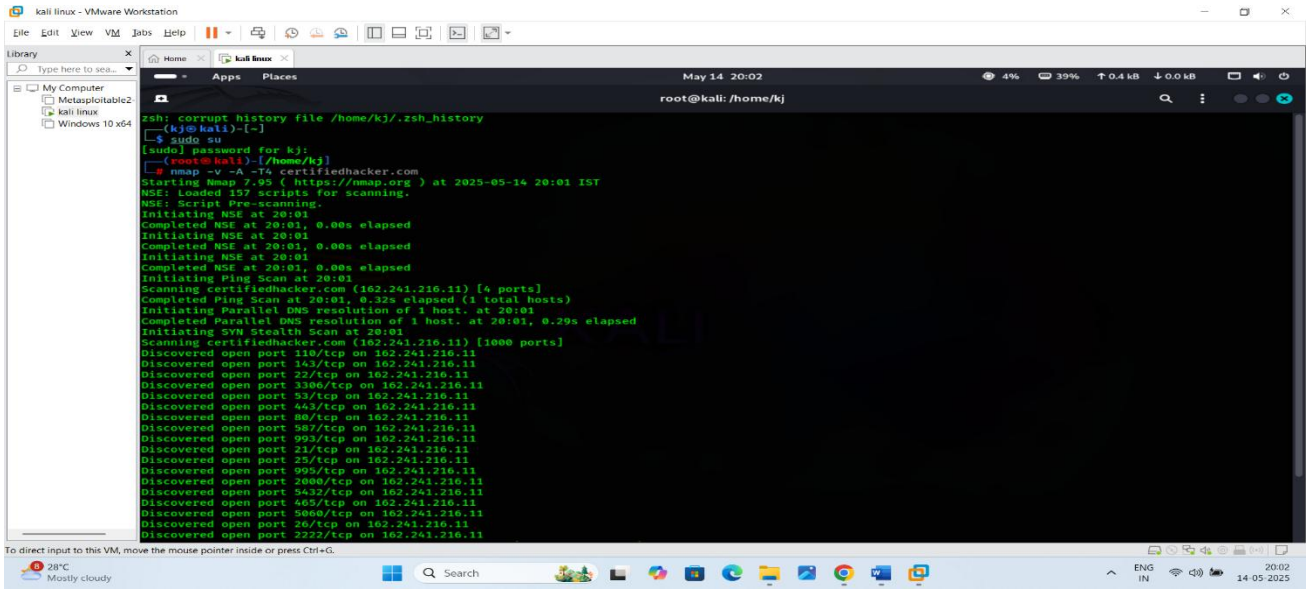
Commands :

1. # nc -vv <Target IP address> 80
   This command is used for check service or server



2. # nmap -v -A -T4 <Target website /IP>
   This command give you all information about the target



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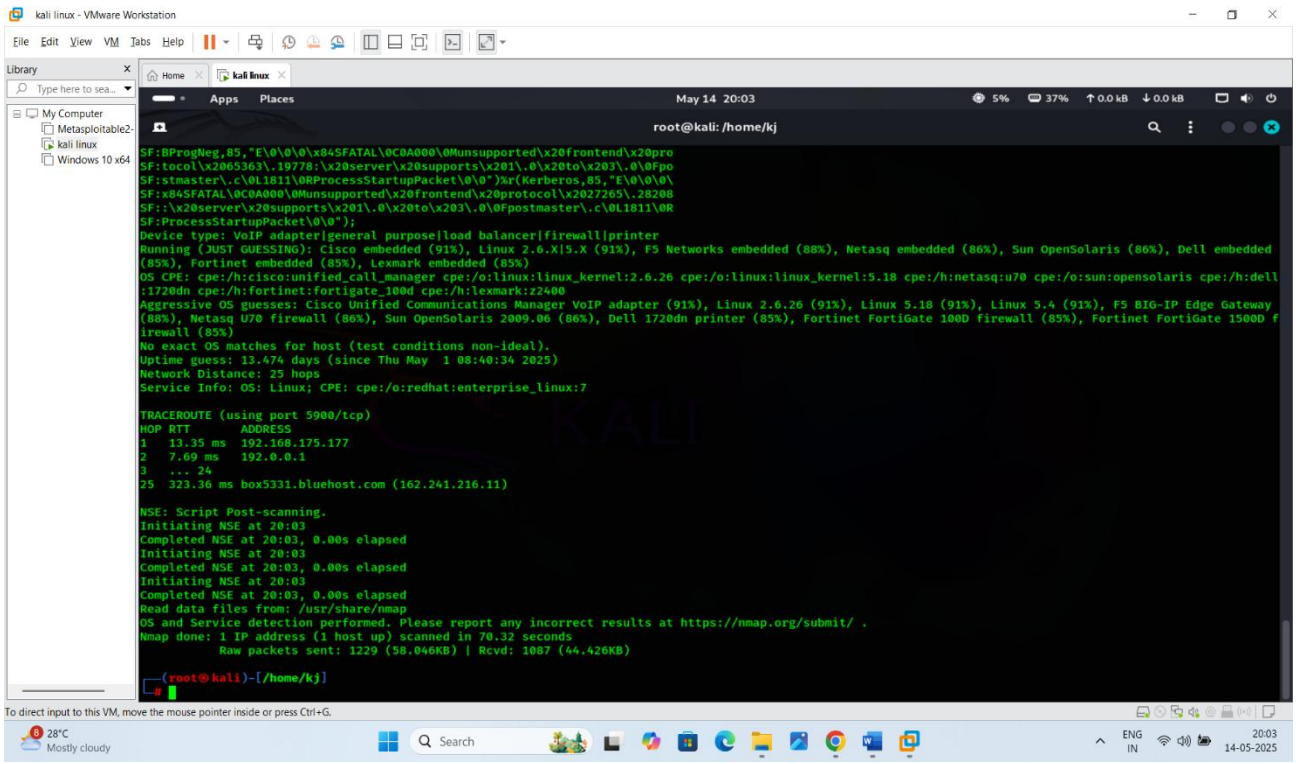
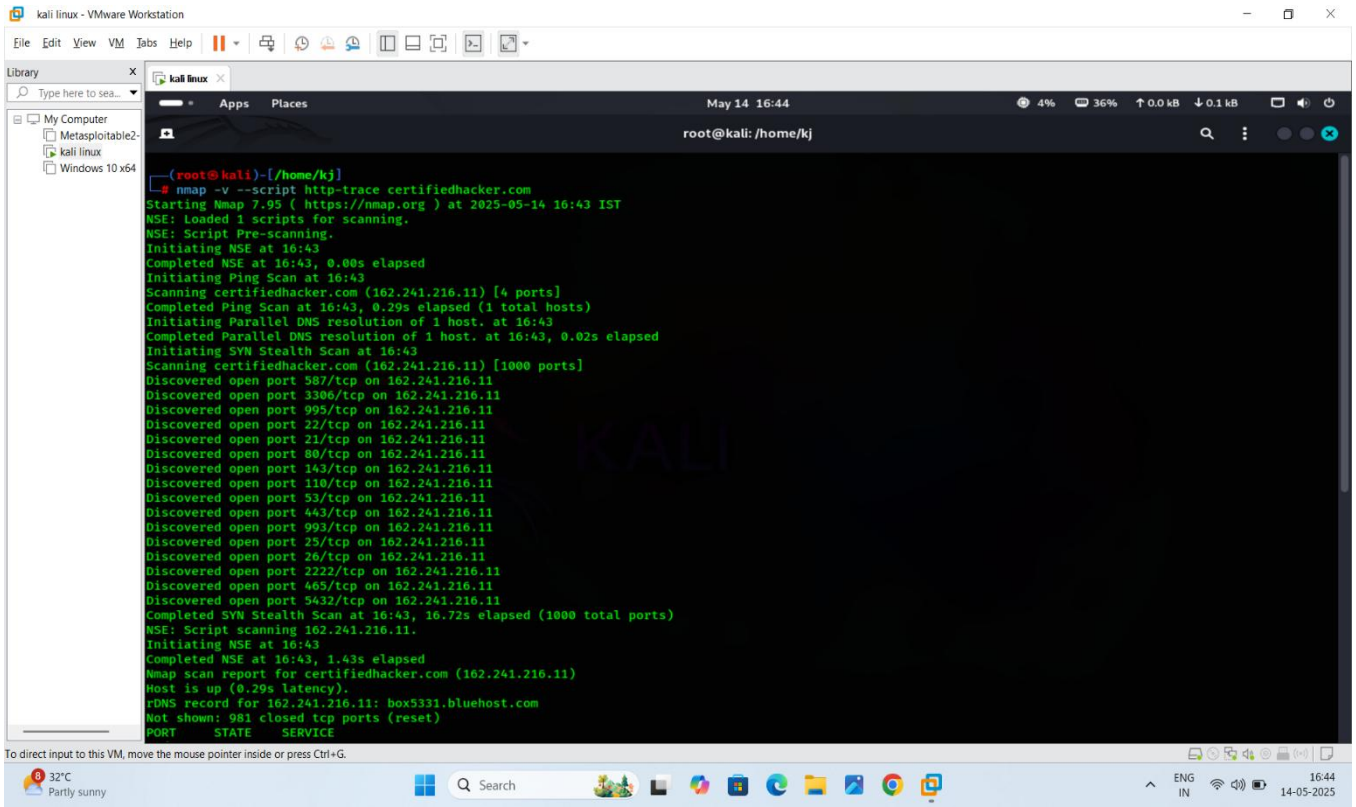


3. # Nmap -v –script http-trace <target IP/website>

This triggers the **http-trace** NSE (Nmap Scripting Engine) script.The http-trace script checks if the **HTTP TRACE method** is enabled on the target web server



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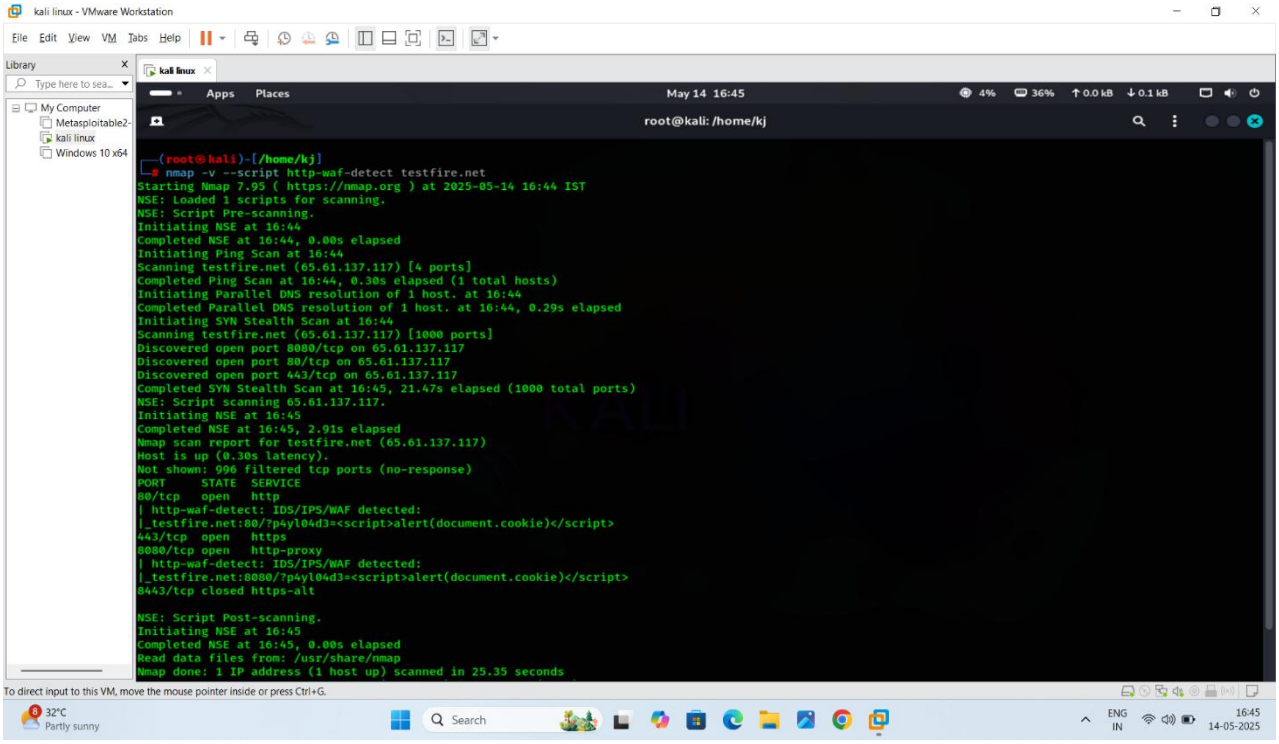
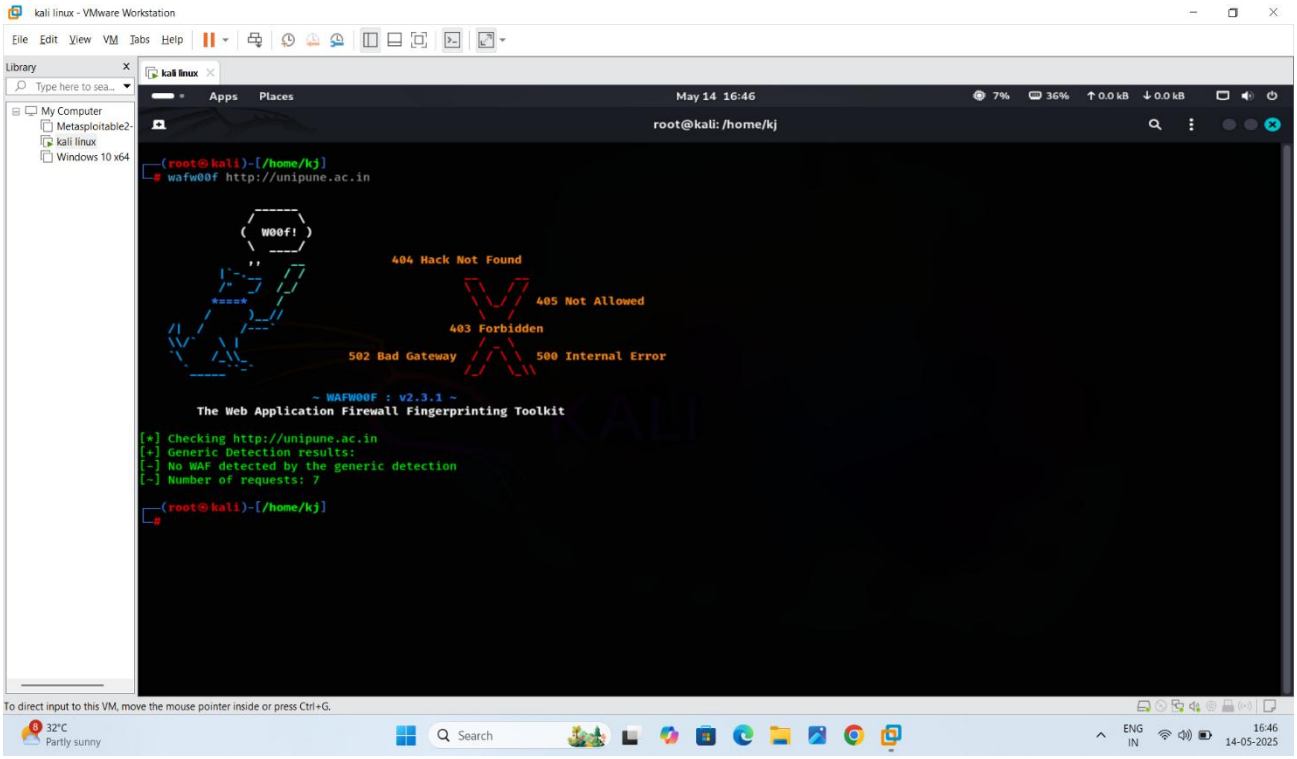
4. # nmap -v -- script http-waf-detect <target IP/website>
This command is used for check firewall,IDS is present or not



5. # wafwoof <targetIP/website>
This command is check the firewall is present or not



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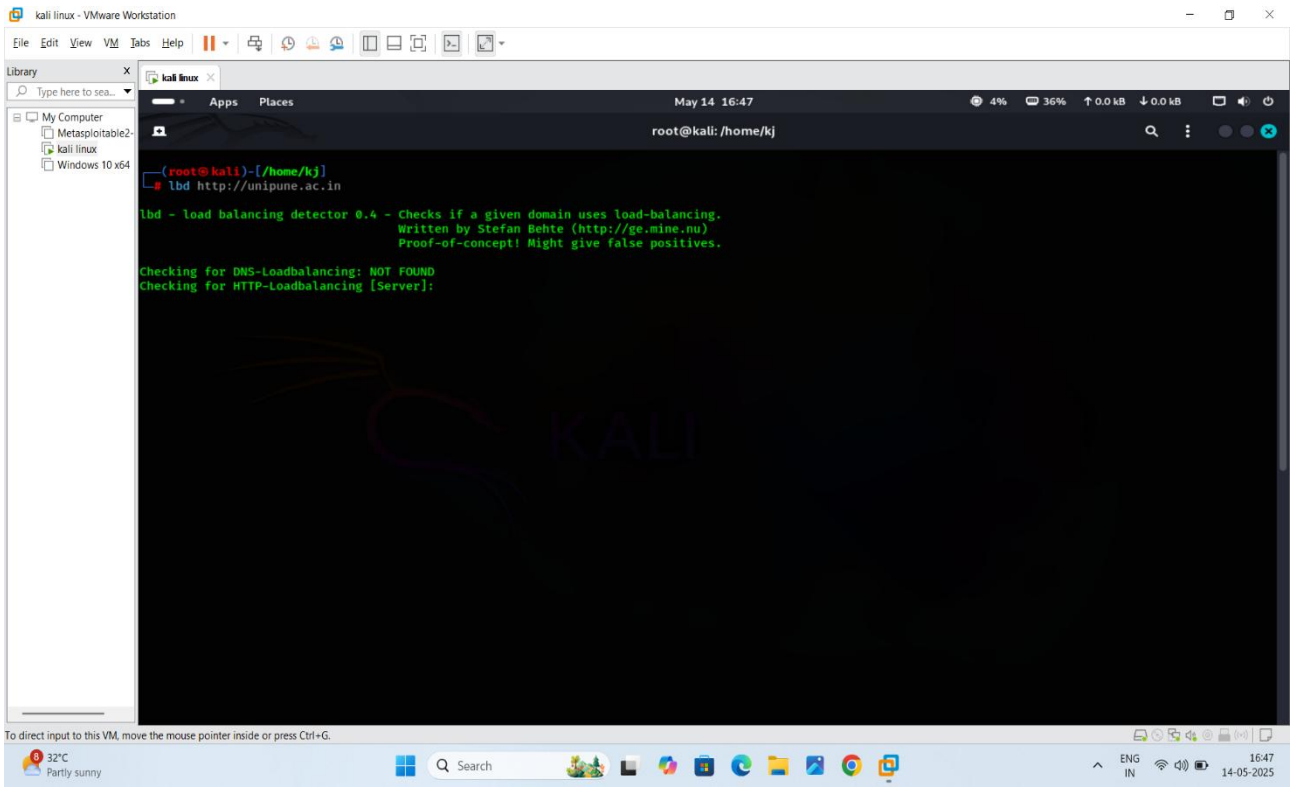
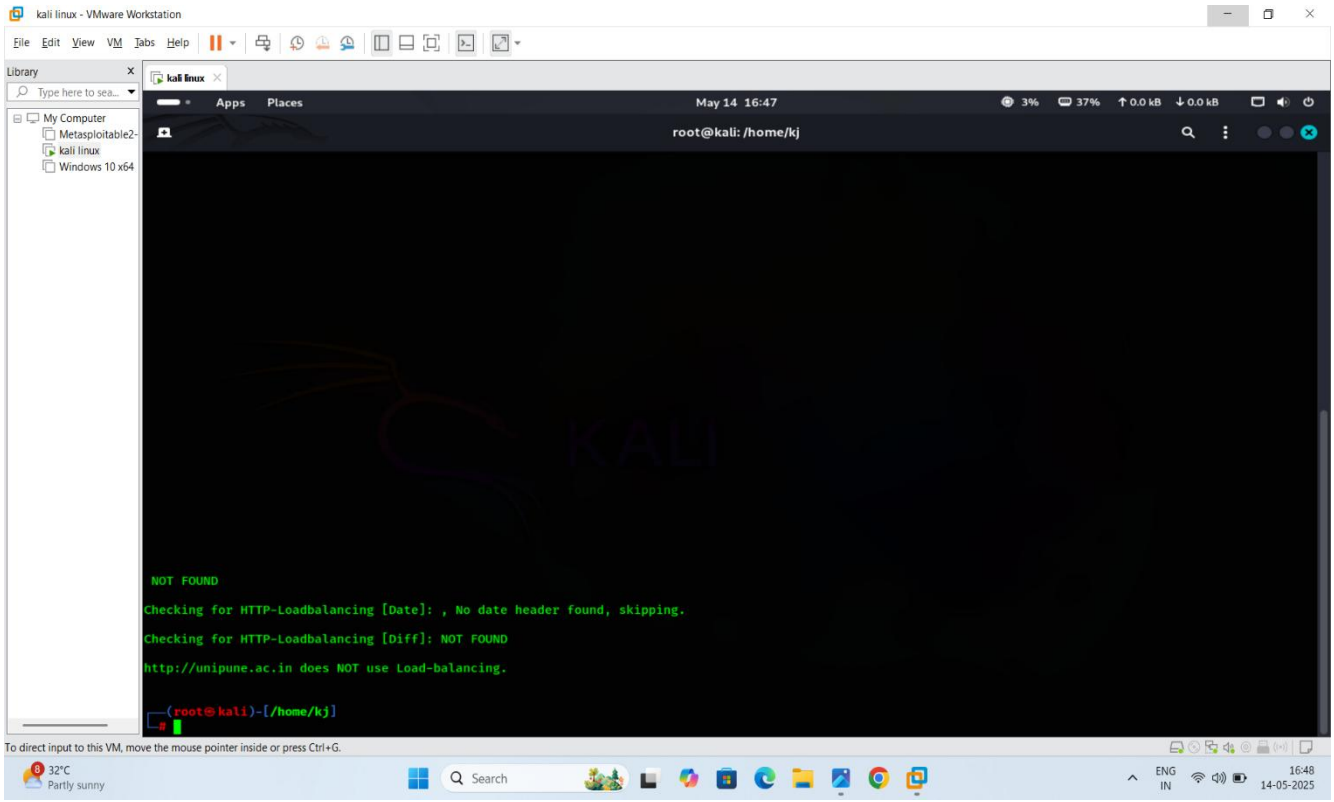
6. # lbd <target IP/website>
This command is for detect load balancer





/ Hydra for hacking web server

Hydra (also known as **THC-Hydra**) is a popular password-cracking tool used for brute-force attacks against various protocols and services. Its primary purpose is to **guess valid login credentials (username and password)** for services running on web servers and other networked applications.

Common Uses of Hydra in Hacking Web Servers:

1. **Brute-Force Login Forms:**
   - Hydra can attempt multiple username and password combinations against web login forms.
   - It supports different authentication methods such as **HTTP Basic Auth, HTTP Form-based Auth, and Digest Auth**.
2. **Attacking Web Applications:**
   - Hydra can be used to brute-force login pages of web applications like **WordPress, Joomla, and Drupal**.
   - Supports web interfaces that require login via POST or GET requests.
3. **Testing Web APIs:**
   - Can be configured to brute-force API endpoints that require authentication tokens or basic authentication.
4. **FTP, SSH, Telnet Services:**
   - Hydra is not limited to just HTTP(S); it can also target services like **FTP, SSH, Telnet, MySQL**, and more.
   - This extends its ability to attack web servers with exposed administrative protocols.
5. **Multi-threaded Attacks:**
   - Hydra supports multi-threading, enabling it to perform many attempts simultaneously, significantly speeding up brute-force attacks.
6. **Custom Parameters and Payloads:**
   - Supports custom parameters, cookies, headers, and payloads for evading WAFs (Web Application Firewalls) and intrusion detection systems.

Example of a Hydra Command for HTTP Form Login:

hydra -l admin -P /path/to/passwords.txt <target_ip> http-post-form "/login.php:username=^USER^&password=^PASS^:Invalid Login"

- -l admin: Specifies the username to test (admin).
- -P /path/to/passwords.txt: Path to the password list.
- <target_ip>: IP address of the target server.
- http-post-form: Specifies form-based login.
- "/login.php:username=^USER^&password=^PASS^:Invalid Login":
  - /login.php: Target login form.
  - username and password: Field names in the form.
  - Invalid Login: String returned when login fails.

Important Considerations:

1. **Legality**: Hydra should only be used for ethical hacking, penetration testing, or with **explicit permission**.
2. **Account Lockout Risks**: Many web servers are configured to **lock accounts** after multiple failed attempts.
3. **Detection**: Brute-force attacks are noisy and can easily trigger **IDS/IPS alerts**.
4. **Rate Limiting and CAPTCHA**: Modern web applications often have **rate limiting, CAPTCHAs, and 2FA**, making brute-force less effective.

☞ metasploitable password cracking using hydra brute force attack.

Command :- # hydra -l msfadmin -p /usr/share/wordlists/rockyou.txt <metasploitable IP> ftp

-l for username > if you don't know the username go for capital L and anywordlist like rockyou.txt

-P for password > if you know the password go for small -p and mention password

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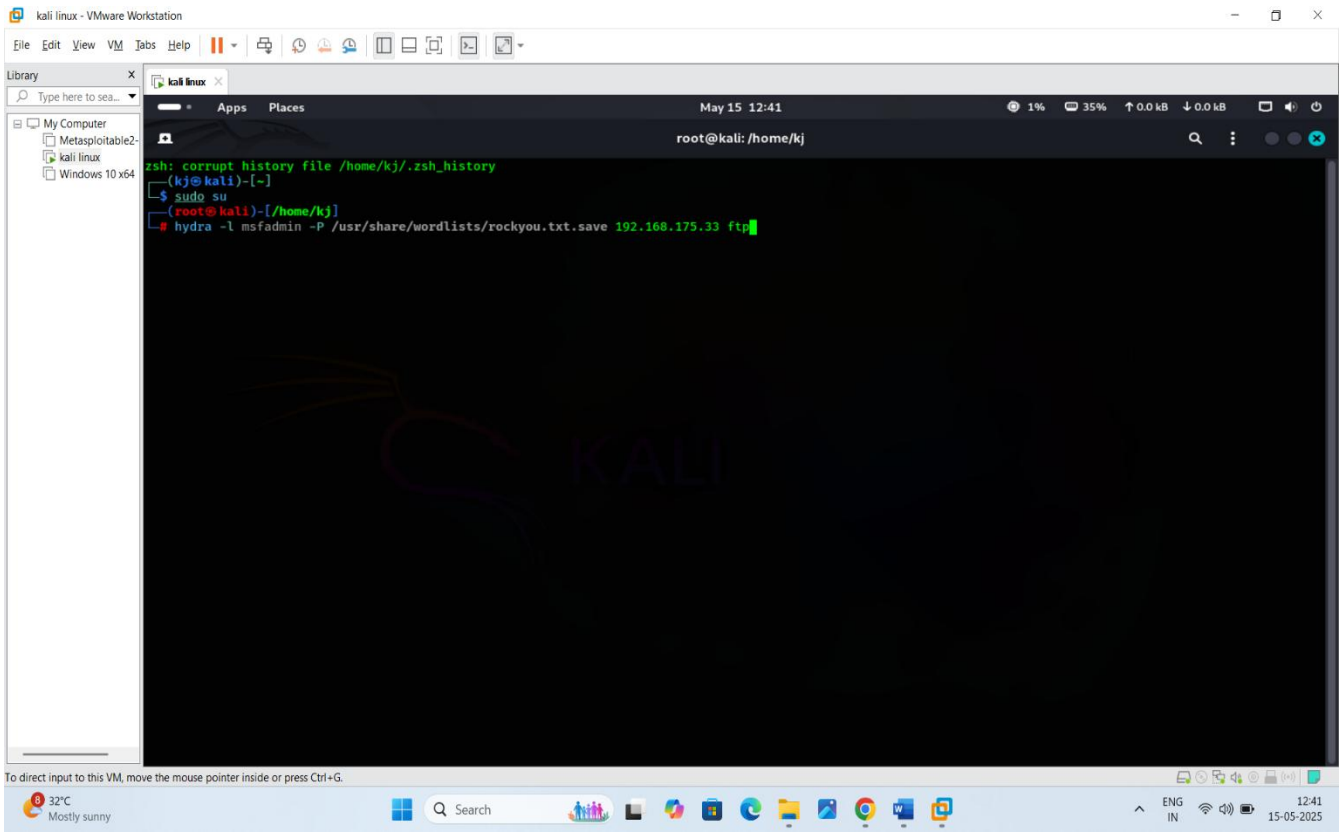
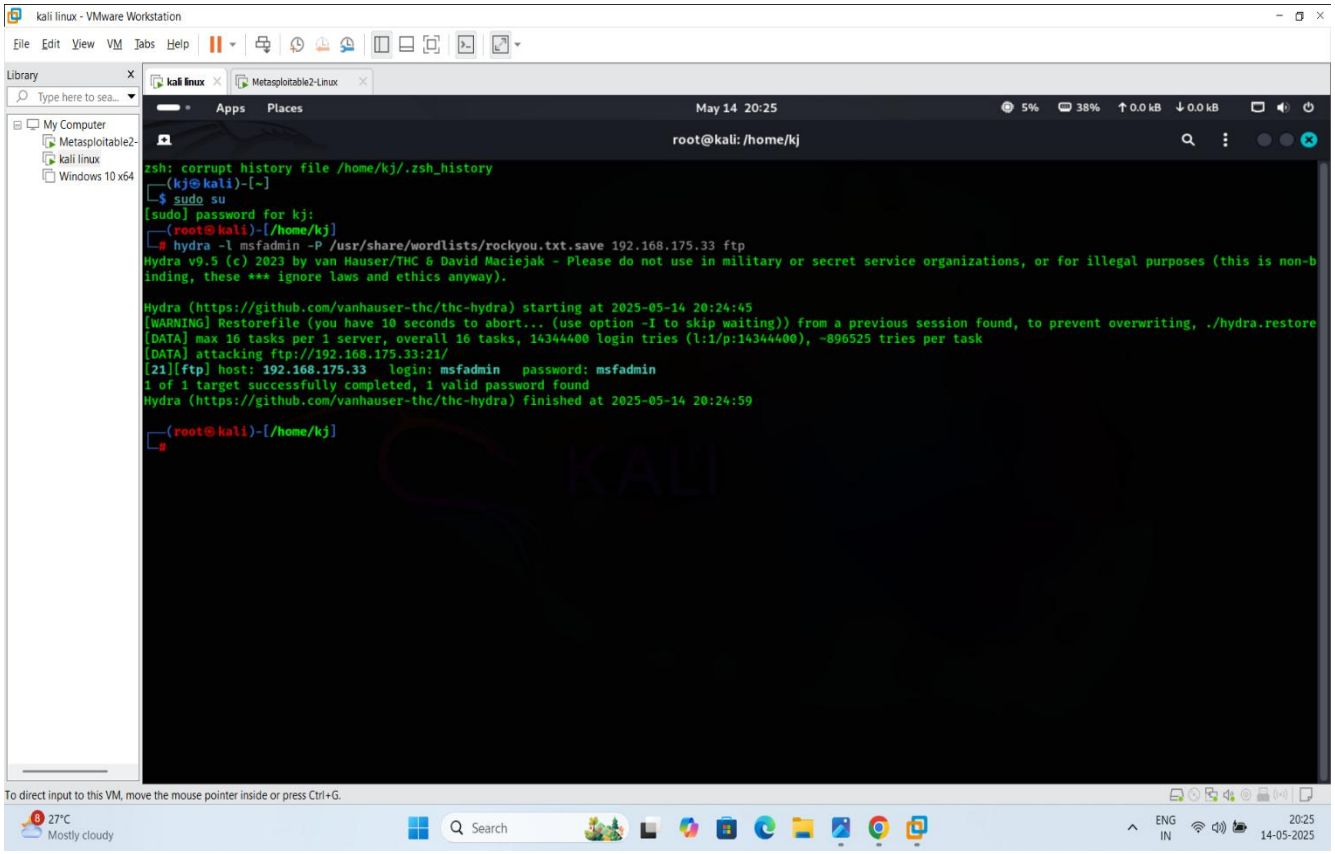


In the following screenshot u can see using hydra tool we crack metasploitable password using rockyou.txt wordlist :



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/ Skipfish

is an **automated web application security reconnaissance tool**. It is primarily used for **crawling and scanning web applications** to identify vulnerabilities. Developed by Google, Skipfish is efficient and fast, making it a popular choice in penetration testing and web application security assessments.

Primary Uses of Skipfish in Hacking Web Servers:

1. **Web Application Crawling:**
   - Skipfish aggressively crawls the target web server to **map its structure**, discovering hidden directories, files, and endpoints.
   - This process helps identify **attack surfaces** that may not be visible during manual inspection.
2. **Vulnerability Scanning:**
   - It scans for common vulnerabilities such as:
     - **SQL Injection**
     - **Cross-Site Scripting (XSS)**
     - **File Inclusion Vulnerabilities**
     - **Directory Traversal**
     - **Authentication Bypass**
   - It checks for **misconfigurations** and **default credentials** that could be exploited.
3. **Wordlist-based Testing:**
   - Skipfish uses **wordlists** to perform directory and file enumeration.
   - Custom wordlists can be supplied to extend its reach and improve the depth of the scan.
4. **SSL/TLS Scanning:**
   - It identifies issues with SSL/TLS configurations, like **insecure ciphers** or **expired certificates**.
5. **Session Management and Cookies Analysis:**
   - Detects **insecure session handling**, including weak cookie configurations and session ID predictability.
6. **Reporting and Analysis:**
   - Generates detailed **HTML reports** that are easy to navigate, with information about:
     - The discovered URLs and endpoints.
     - Types of vulnerabilities and their locations.

- Suggested remediations.

Example of a Skipfish Command:

skipfish -o /path/to/report -W wordlist.txt http://example.com

- -o /path/to/report: Specifies the output directory for the HTML report.
- -W wordlist.txt: Uses a custom wordlist for directory and file discovery.
- http://example.com: The target web application.

Advantages of Skipfish:

1. **High Speed & Efficiency:** Multi-threaded for fast crawling and scanning.
2. **Low Bandwidth Consumption:** Optimized to consume minimal bandwidth during scans.
3. **Customizable Wordlists:** Allows deeper and more targeted scans with custom wordlists.
4. **Detailed Reporting:** Provides interactive HTML reports for easy vulnerability analysis.
5. **False Positive Control:** Includes mechanisms to minimize false positives during scanning.

Limitations to Keep in Mind:

1. **Outdated Development:** Skipfish is no longer actively maintained, *which means it might miss newer vulnerabilities.*
2. **Limited Custom Scripts:** Unlike tools like **Burp Suite**, it has *limited support for custom scripting.*
3. **Detection by WAFs:** Many modern **Web Application Firewalls (WAFs)** can detect and block Skipfish scans.

Command for detect vulnerabilities in metasploitable using Skipfish :

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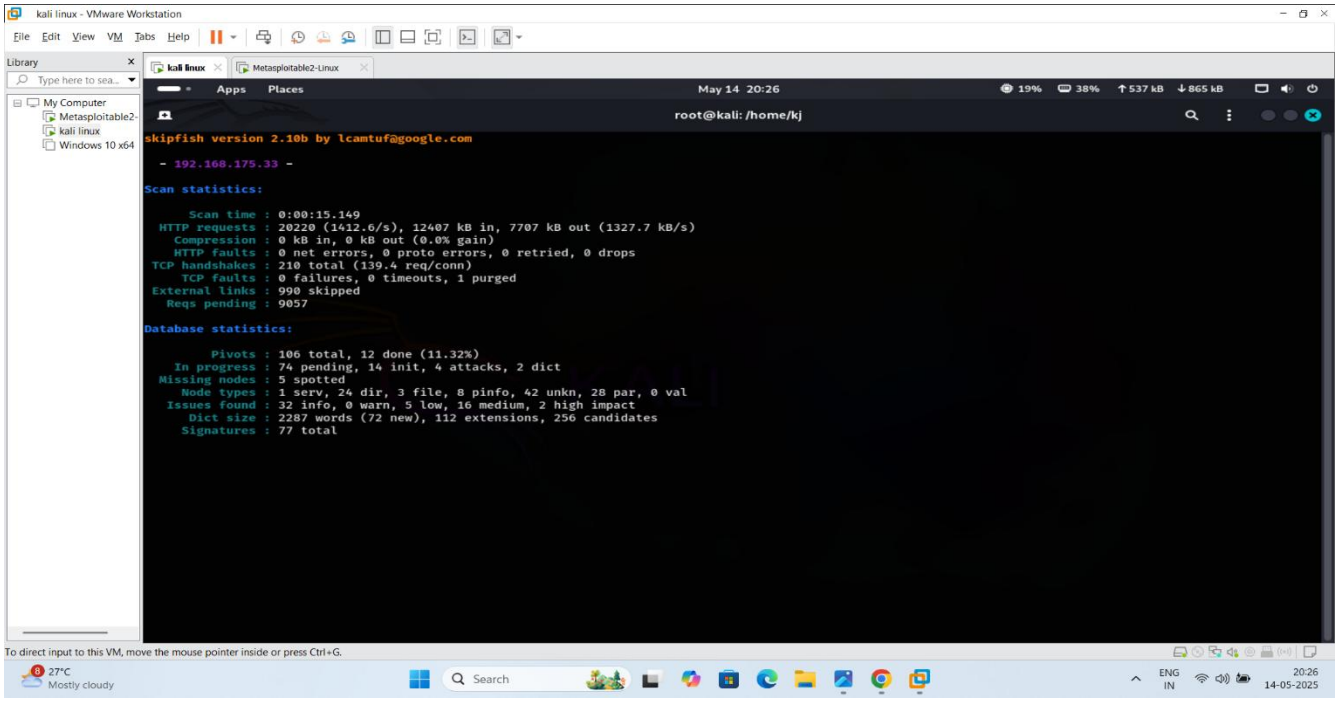
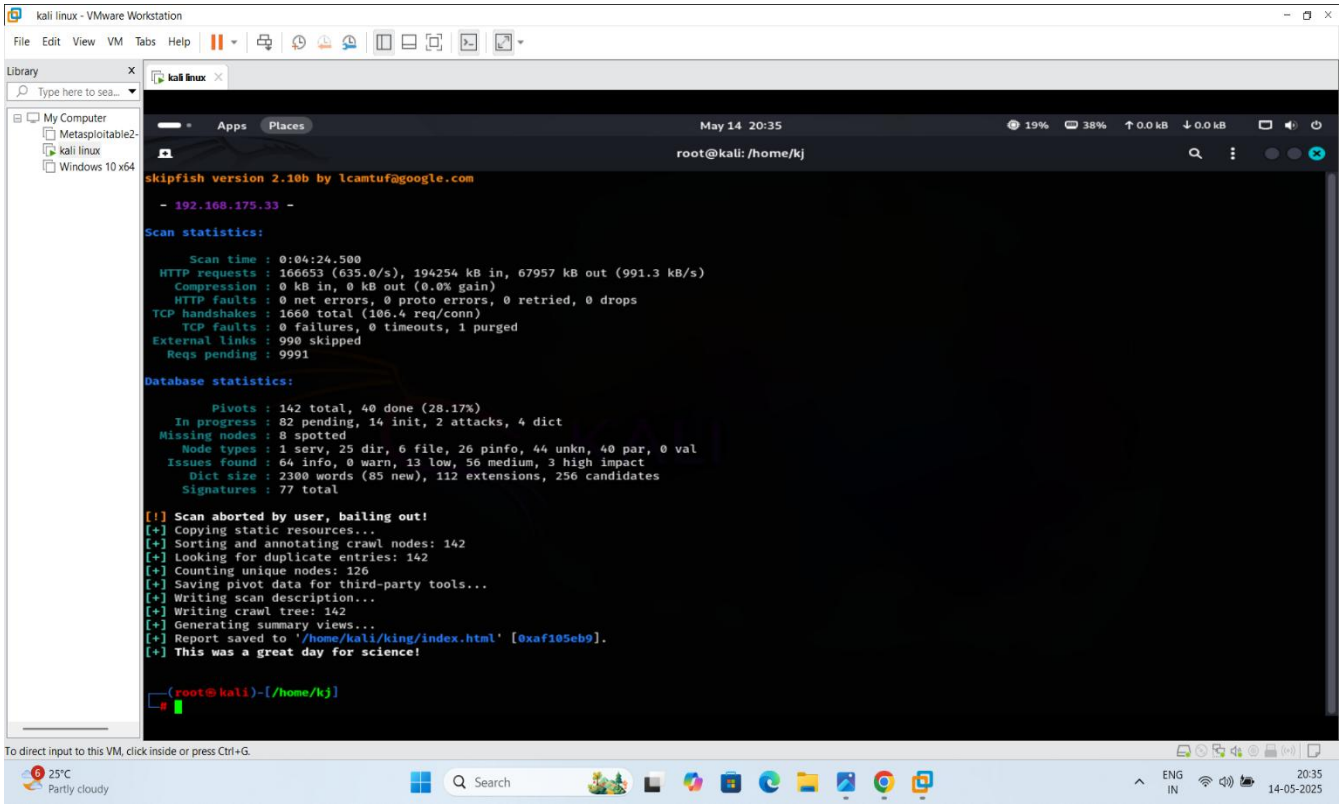
 # skipfish -o /home/kj/go -S /usr/share/skipfish/dictionaries/complete.wl/ http:// <metasplotable IP>

- *-o /home/kj/go :* Specifies the output directory for the HTML report.





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Skipfish is best scanning tool skipfish do all types of scanning .

/ Armitage

What is Armitage?

Armitage is a **graphical cyber attack management tool for the Metasploit Framework**. It allows for **visualizing targets, managing exploits, and performing network-based attacks** with an easy-to-use interface. Armitage was designed to make Metasploit more accessible and collaborative for penetration testers.

Primary Uses of Armitage in Hacking Web Servers:

1. **Target Discovery & Scanning:**
   - Armitage can automatically **discover live hosts**, **open ports**, and **running services** on a network.
   - It uses Nmap and other scanners to map the attack surface before launching attacks.
2. **Exploitation of Web Server Vulnerabilities:**
   - Provides a simple interface to launch **Metasploit exploits** against identified web server vulnerabilities.
   - Supports attacks on:
     - **Apache, Nginx, IIS** (Web servers)
     - **PHP, ASP.NET** (Web technologies)
     - **Databases (MySQL, MSSQL)** linked to web applications
3. **Web Application Attacks:**
   - You can execute attacks like:
     - **SQL Injection**
     - **Remote Code Execution (RCE)**
     - **File Upload Vulnerabilities**
     - **Remote File Inclusion (RFI)**
   - Armitage leverages Metasploit's payloads to gain shell access or meterpreter sessions.
4. **Post-Exploitation Management:**
   - Once access is gained, Armitage allows you to:
     - **Browse files and directories**
     - **Dump password hashes**
     - **Capture keystrokes**

        - **Escalate privileges**
    - It supports **pivoting**, which means using a compromised host to attack deeper into the network.
5. **Team Collaboration:**
    - Armitage allows multiple users to **collaborate in real-time** during penetration tests.
    - Attackers can share sessions, communicate through the platform, and divide tasks efficiently.
6. **Automated Attack Scripts:**
    - It includes **Hail Mary**, an automated attack option that attempts multiple exploits to find vulnerabilities quickly.

Example Workflow in Armitage:

1. **Scan the Network:**
    - Use built-in Nmap scanning to find live hosts and open ports.
2. **Identify Vulnerabilities:**
    - Armitage suggests possible exploits based on detected services and versions.
3. **Launch Exploits:**
    - Select an exploit, configure payloads, and launch it against the target.
4. **Post-Exploitation:**
    - Gain shell access, escalate privileges, and explore the target.
5. **Data Extraction and Cleanup:**
    - Extract sensitive data and clear logs if necessary.

Advantages of Armitage:

- **Graphical Interface:** Easier to use compared to command-line Metasploit.
- **Collaboration Support:** Multiple team members can work on the same project.
- **Real-time Visibility:** Live view of attacks, sessions, and compromised hosts.
- **Metasploit Integration:** Complete integration with Metasploit, extending its power.

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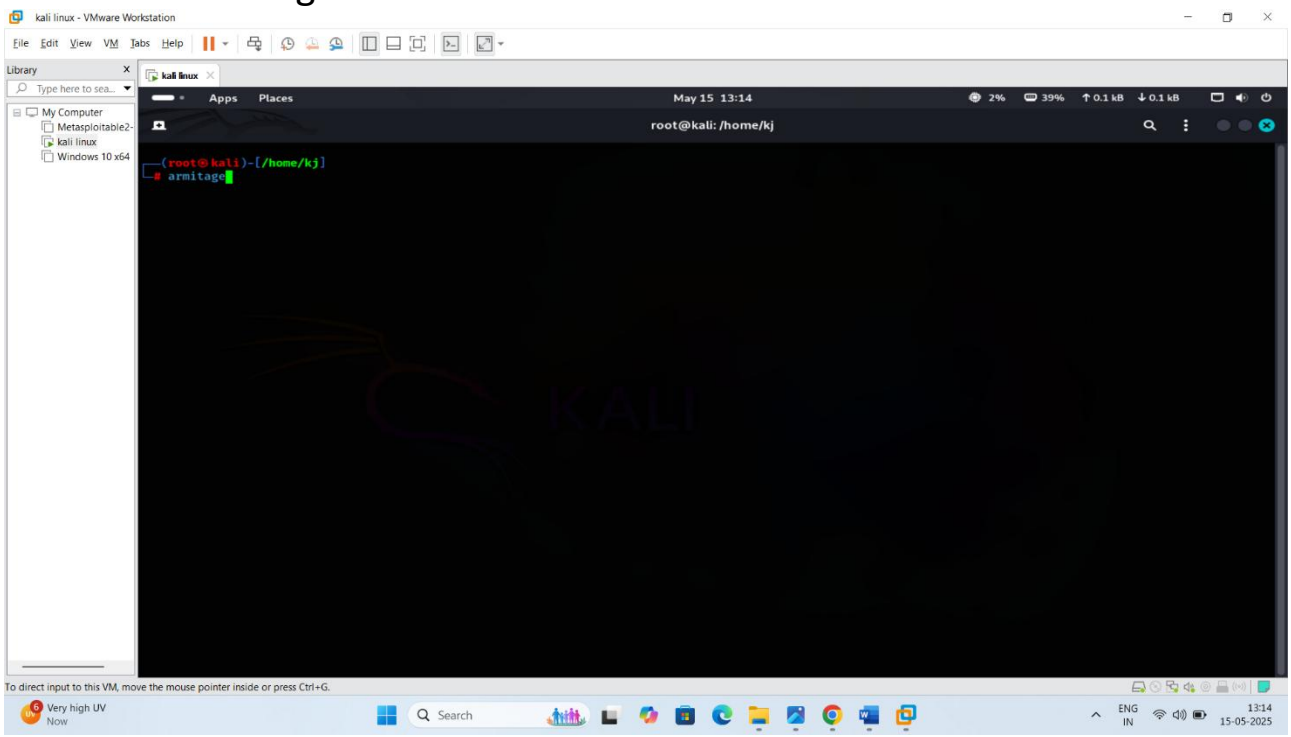
Limitations:

1. **Resource Intensive:** Requires significant CPU and memory resources to run smoothly.
2. **No Longer Actively Maintained:** As of recent years, Armitage is not actively updated, though Metasploit still is.
3. **Detection Risk:** Scans and exploits are easily detectable by Intrusion Detection Systems (IDS) and Web Application Firewalls (WAFs).
4. **Limited Web App Features:** Not as focused on web app vulnerabilities as tools like **Burp Suite** or **OWASP ZAP**.

☞ Use Armitage for get access of Metasploitable Server :

Steps :

1. On kali machine and metasploitable2
2. Run Armitage command in kali linux



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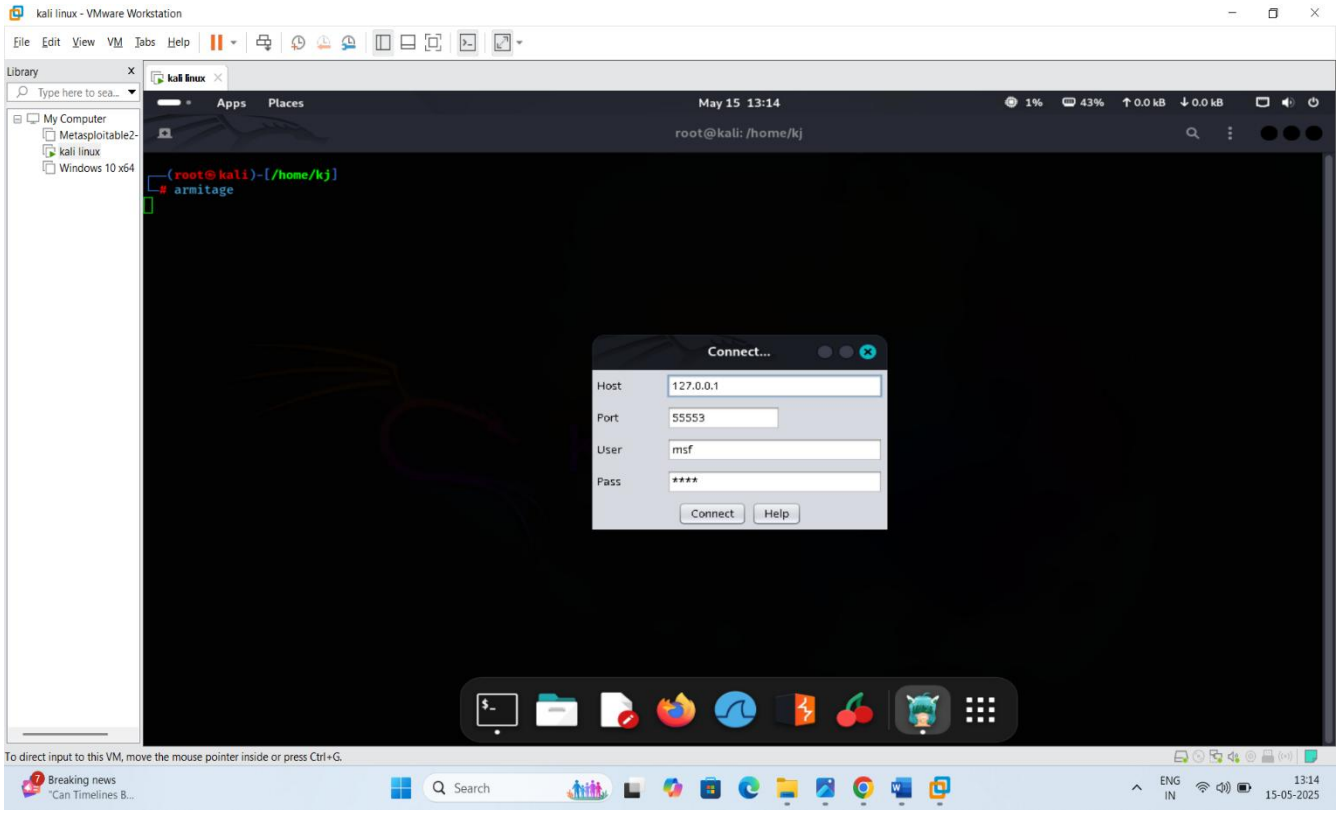
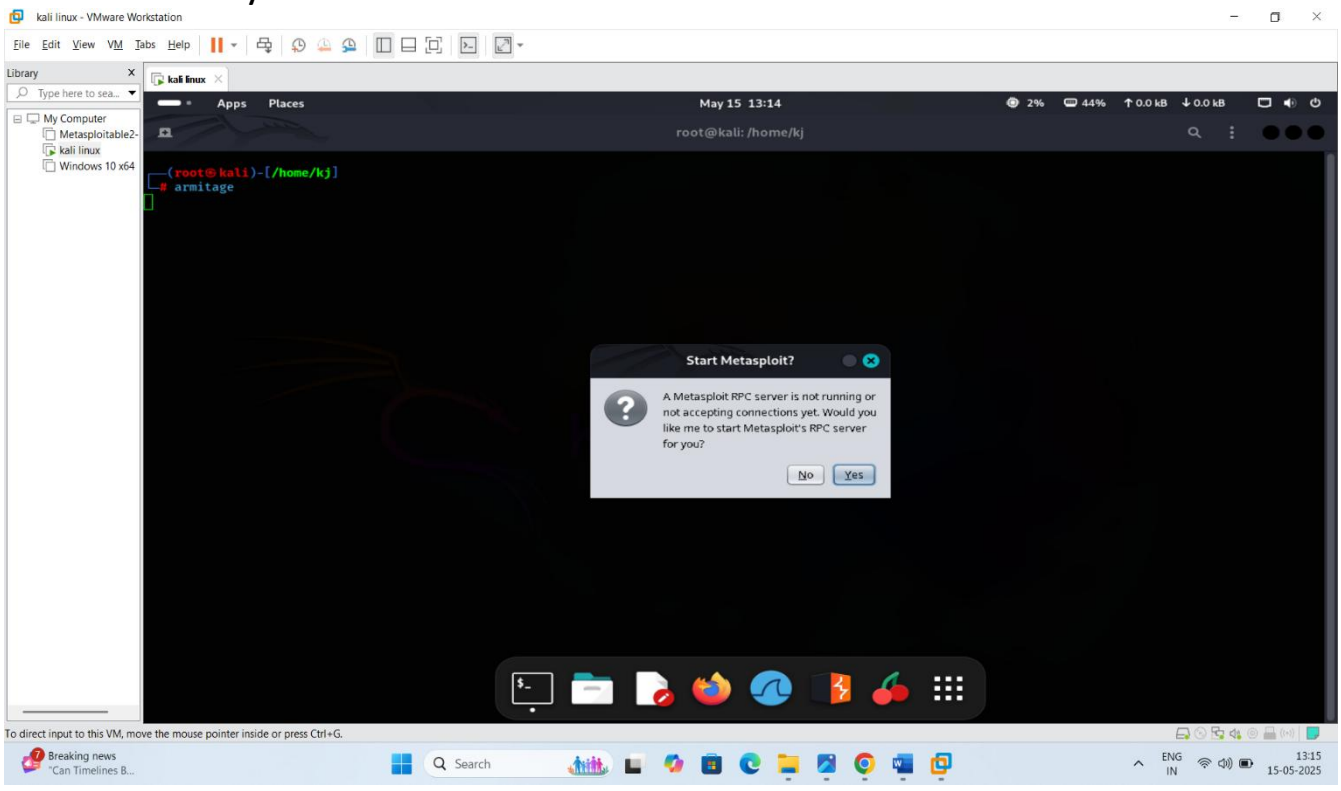
3. Click on connect



4. Click on yes .



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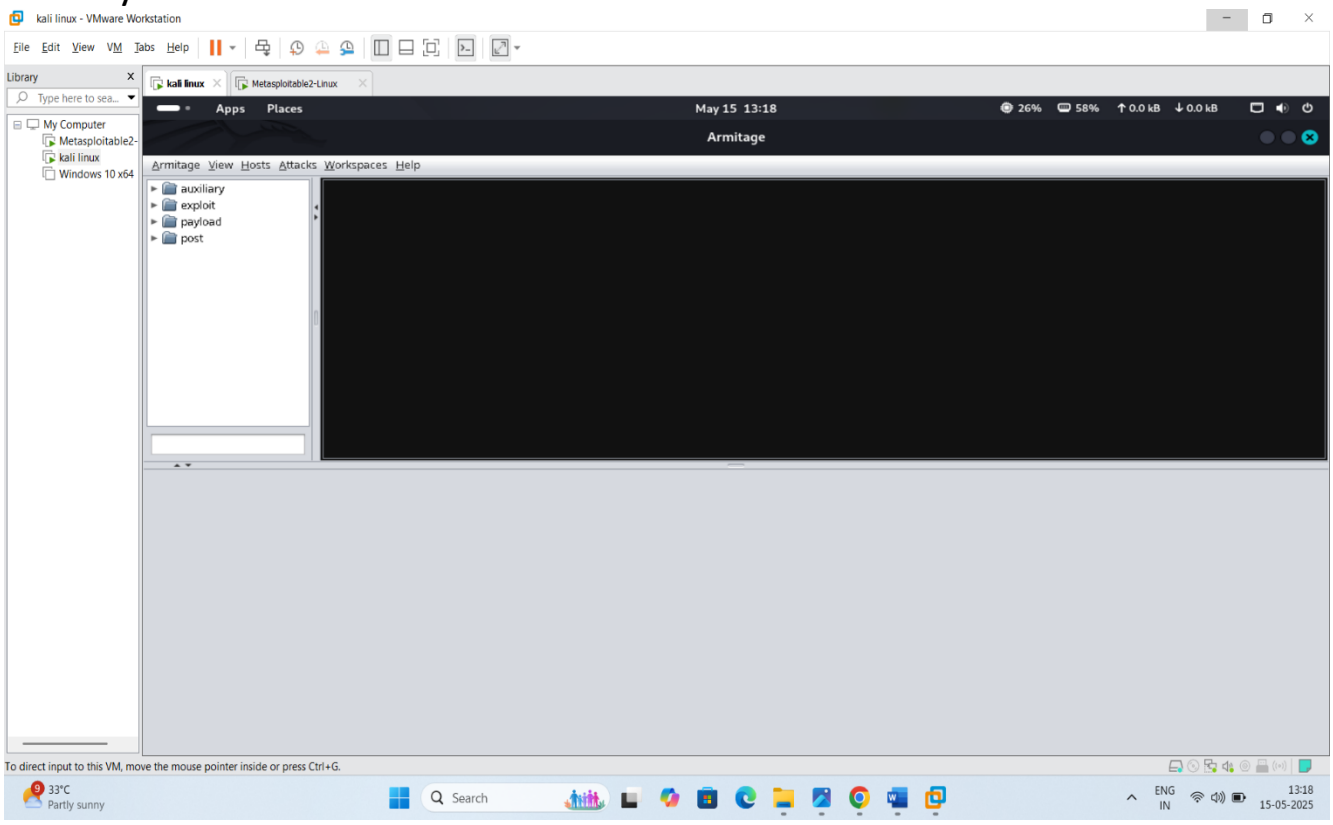
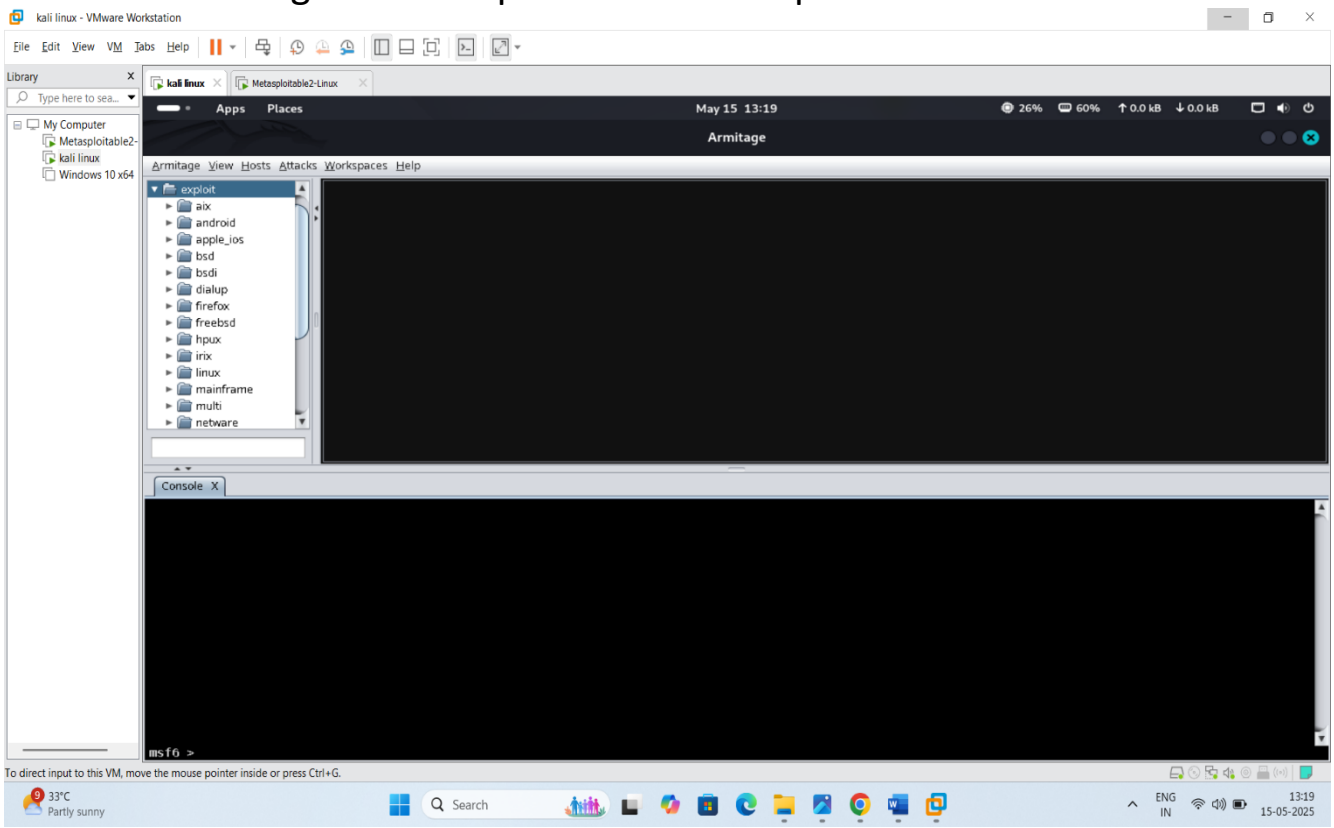
5. After click on yes you can see the armitage webpage on your system like this screenshot:



6. In left side give some options click on exploit



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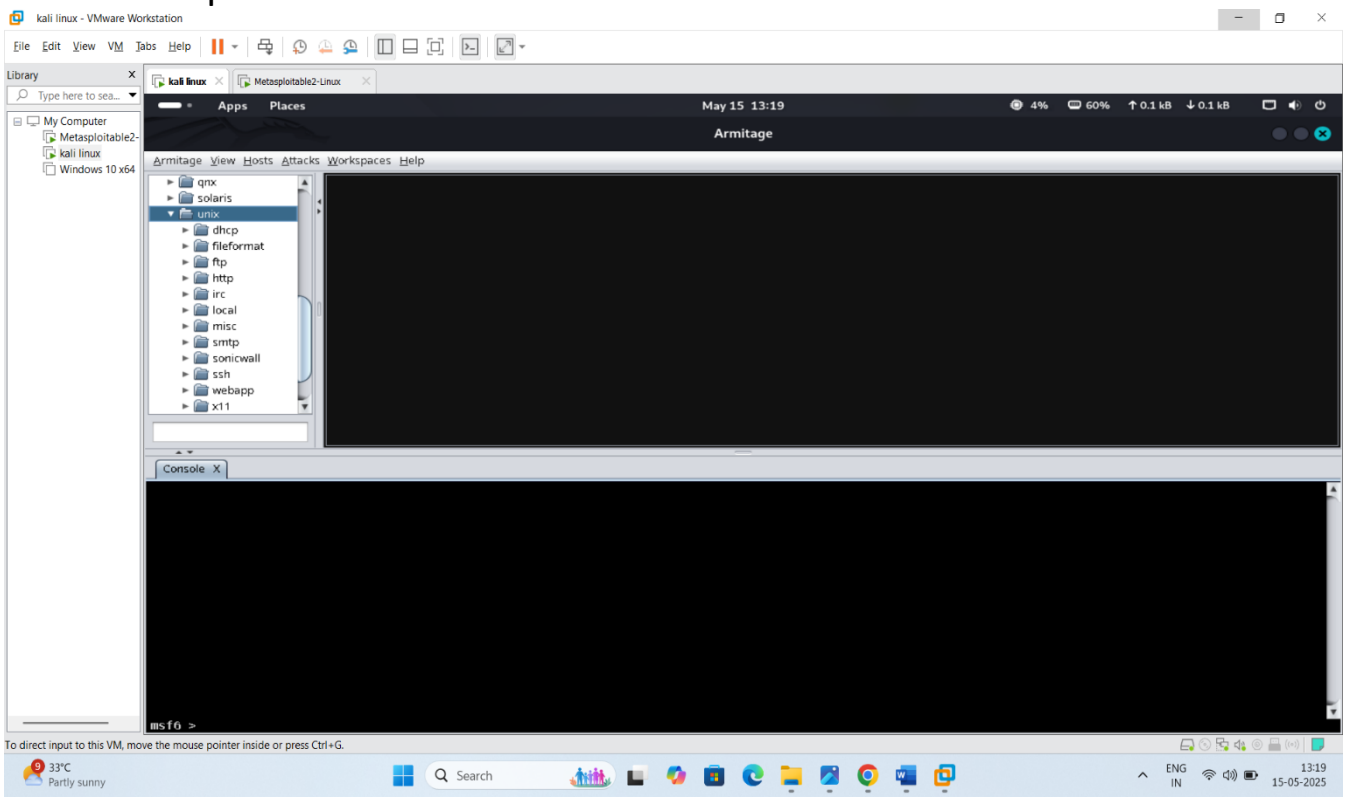
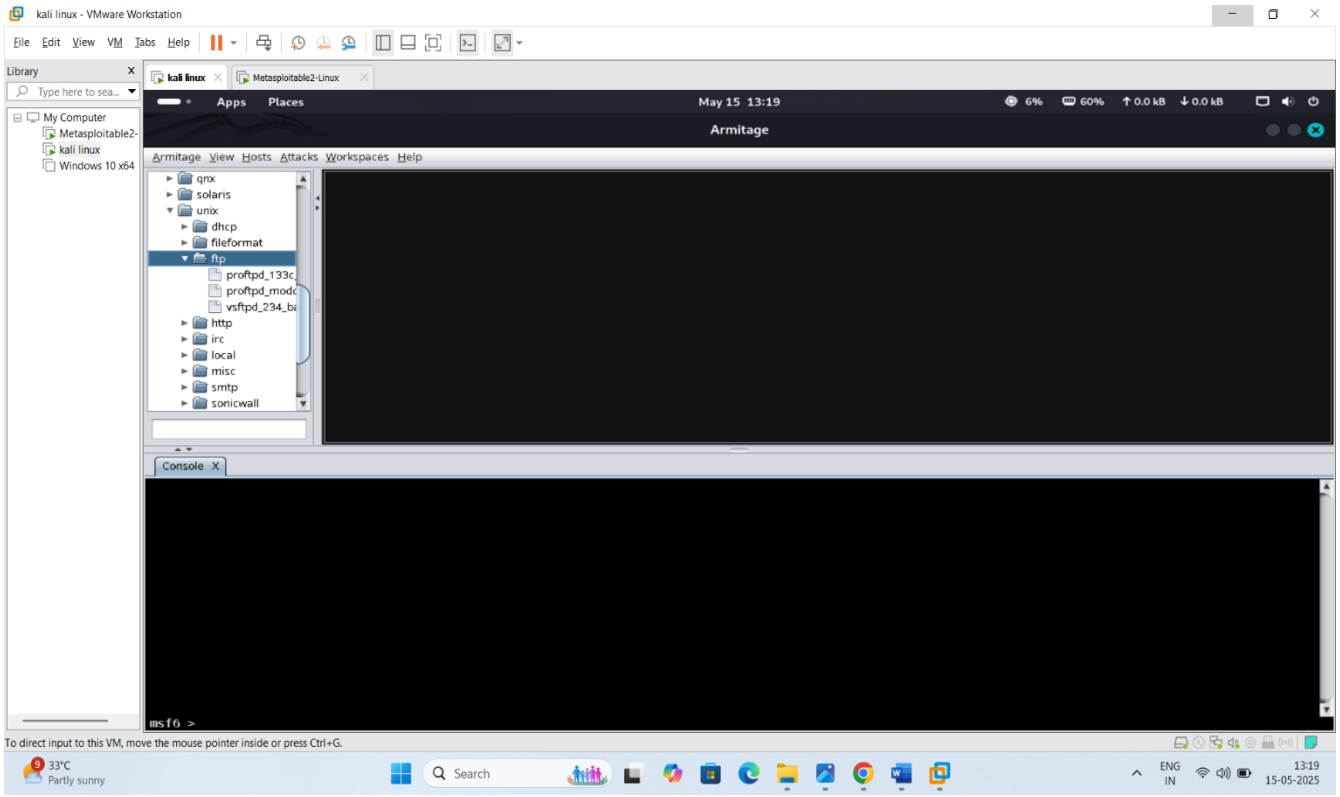
7. Go down and select unix because we have go for metasploitable



8. Scroll down and select ftp



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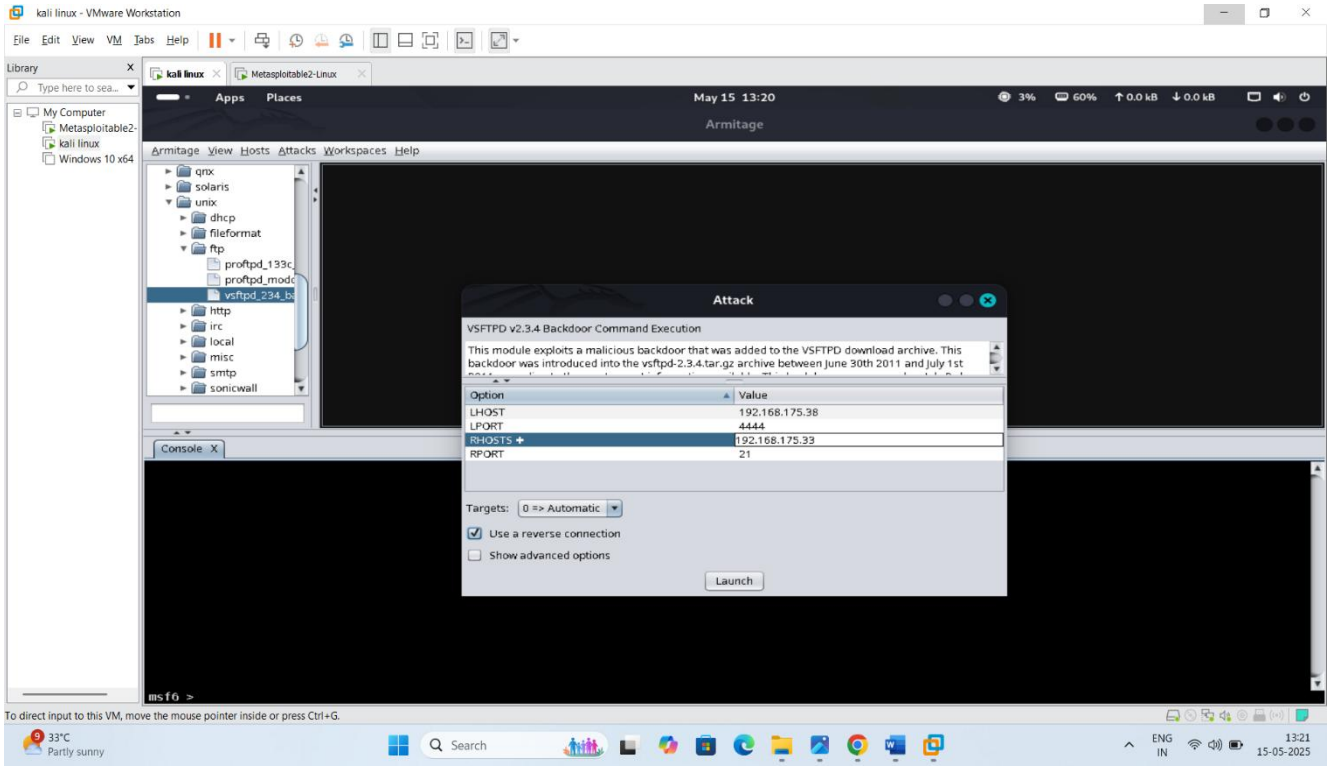
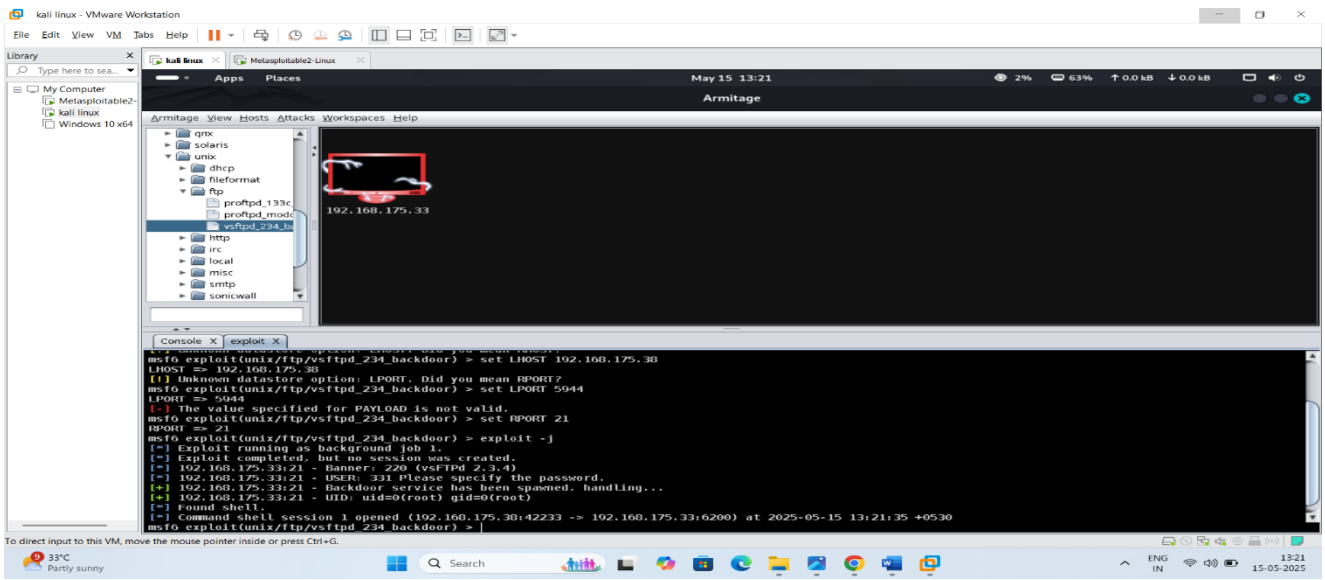
9. In ftp select the vulnerable version I select vsftpd and get some changes like LHOST = give your kali IP
   LPORT = 4444
   RHOST = give your Metasploitable IP
   And click on launch for exploit



10. After you done this you see the image like following screenshot if you click on this pc image there are options like this :



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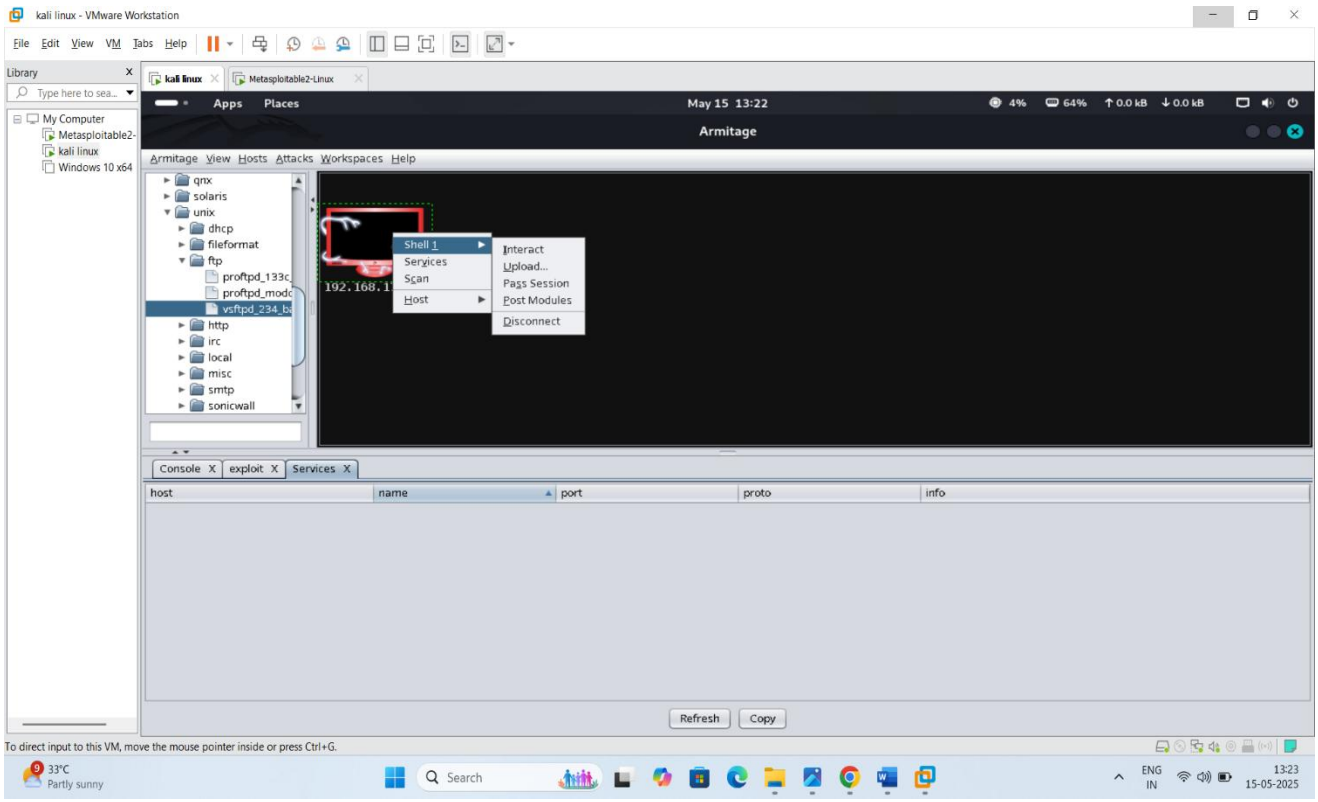
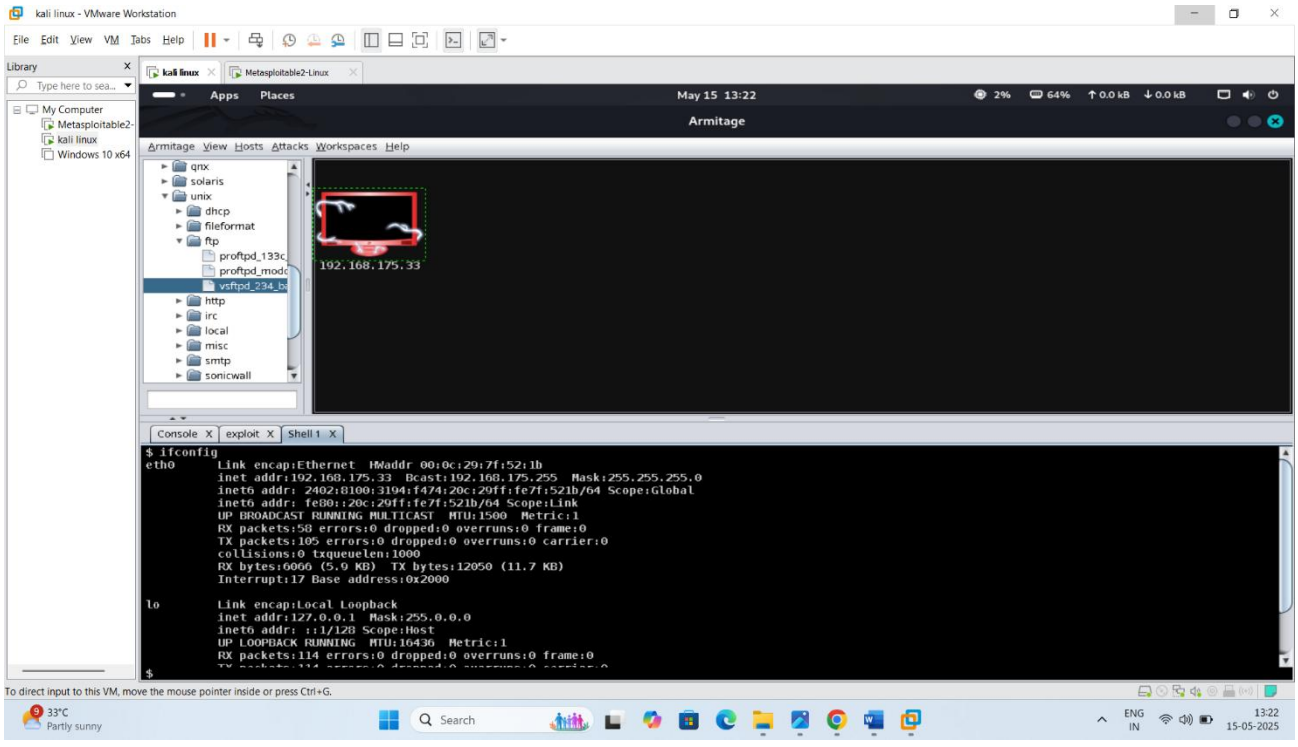


11. Click on shell so you can directly go in metasploitable terminal



U can see the IP address of metasploitable

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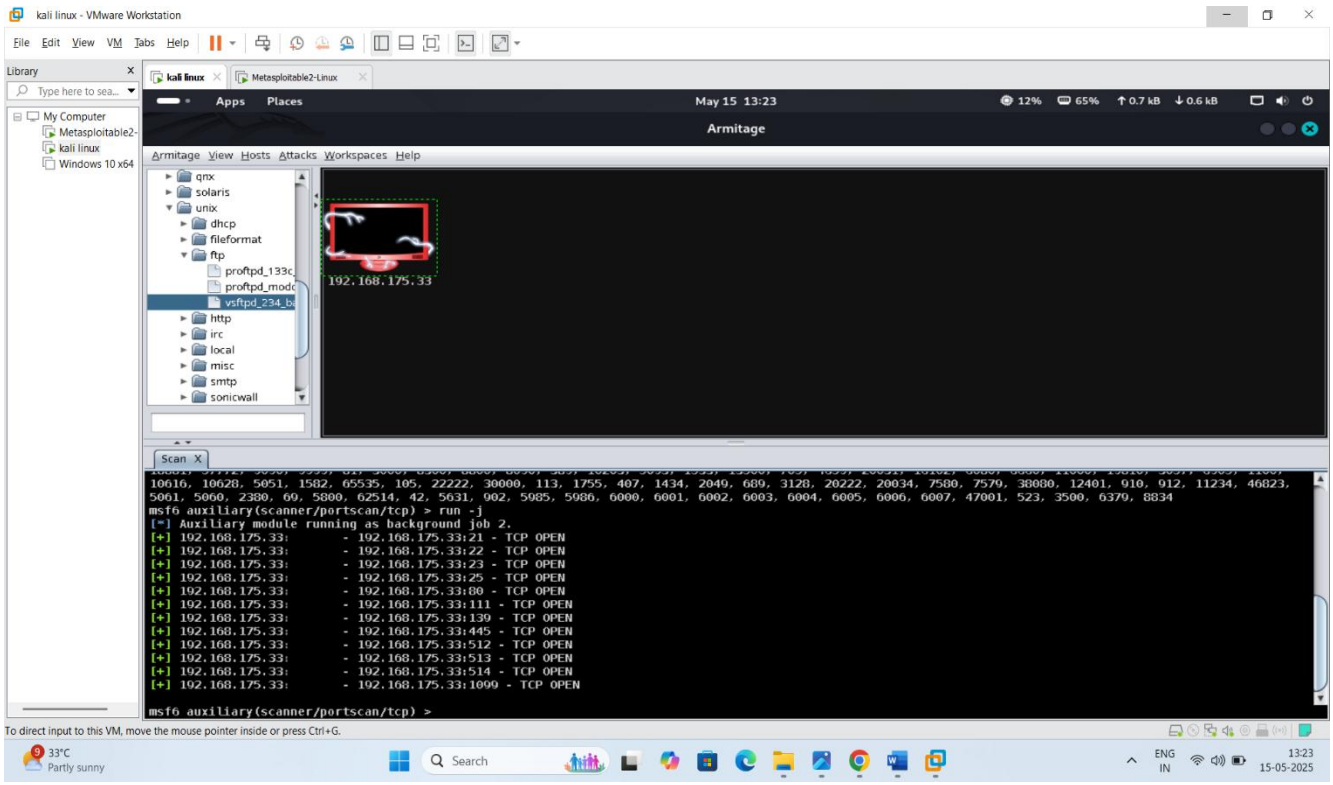
12. If you can go for scan the Armitage scan the metasploitable and show the open ports and etc. like this :



Armitage is a graphical version of msfconsole .

/ dirbuster

What is DirBuster?

DirBuster is a **web application directory and file brute-forcing tool**. It is used to **discover hidden directories and files** on a web server that are not exposed through standard navigation or linked pages. These hidden resources often include sensitive information or administrative interfaces that can be exploited.

Primary Uses of DirBuster in Hacking Web Servers:

1. **Directory and File Enumeration:**

    - DirBuster brute-forces common directory and file names based on wordlists to **uncover hidden content** like:
        - /admin/
        - /backup/
        - /old/
        - /test/
        - .git/, .env, wp-config.php, etc.
2. **Finding Misconfigured or Forgotten Files:**
    - Web servers often have:
        - **Backup files** (index.php.bak, config.old)
        - **Temporary files** (temp.php, session.txt)
        - **Configuration files** (config.php, .htpasswd)
    - These files might contain **credentials, database information, or source code**.
3. **Identifying Vulnerable Endpoints:**
    - By discovering hidden endpoints, you can find:
        - **API endpoints** not intended for public use.
        - **Admin login panels** that are not listed publicly.
        - **Debug interfaces** with verbose error messages.
4. **Testing for Web Application Firewall (WAF) Evasion:**
    - DirBuster can attempt different URL encodings and variations to bypass simple WAF protections.
5. **Recursive Scanning:**
    - It allows recursive crawling of discovered directories, further expanding its attack surface.

Example of a DirBuster Scan:

To start a typical DirBuster scan:

dirbuster -u http://example.com -w /usr/share/wordlists/dirbuster/directory-list-2.3-medium.txt -e php,html,txt

- -u http://example.com: Target URL.
- -w /path/to/wordlist.txt: Path to the wordlist.
- -e php,html,txt: Limit search to specific extensions (e.g., .php, .html, .txt).

Common Wordlists Used with DirBuster:

- **directory-list-2.3-medium.txt** → Medium-sized list of common directory names.
- **directory-list-2.3-big.txt** → Large list for deeper searching.
- **common.txt** → Lightweight, faster scanning with common directories.
- **Apache and Nginx wordlists** → To find default paths.

Typical Discoveries from a DirBuster Scan:

Path Found	Description	Potential Exploit
/admin/	Admin panel login	Brute-force or exploit default creds
/backup.zip	Backup of the entire site	Extract sensitive data
/test/	Test scripts and files	Exploit test environments
/phpmyadmin/	Database admin interface	Login brute-force or default passwords
/wp-admin/	WordPress admin area	Brute-force or exploit plugin vulnerabilities
/logs/	Server logs	Sensitive info leakage

Advantages of DirBuster:

1. **Multithreaded Scanning:** Faster enumeration of directories and files.
2. **Customizable Wordlists:** Supports both pre-built and custom wordlists.
3. **File Extension Targeting:** Allows you to specify extensions like .php, .html, .txt, etc.
4. **Recursive Search:** Automatically digs deeper into newly found folders.

Limitations:

1. **High Noise Level:** Very noisy, easily detected by Intrusion Detection Systems (IDS).
2. **Long Scanning Time:** Large wordlists can take a long time to finish.

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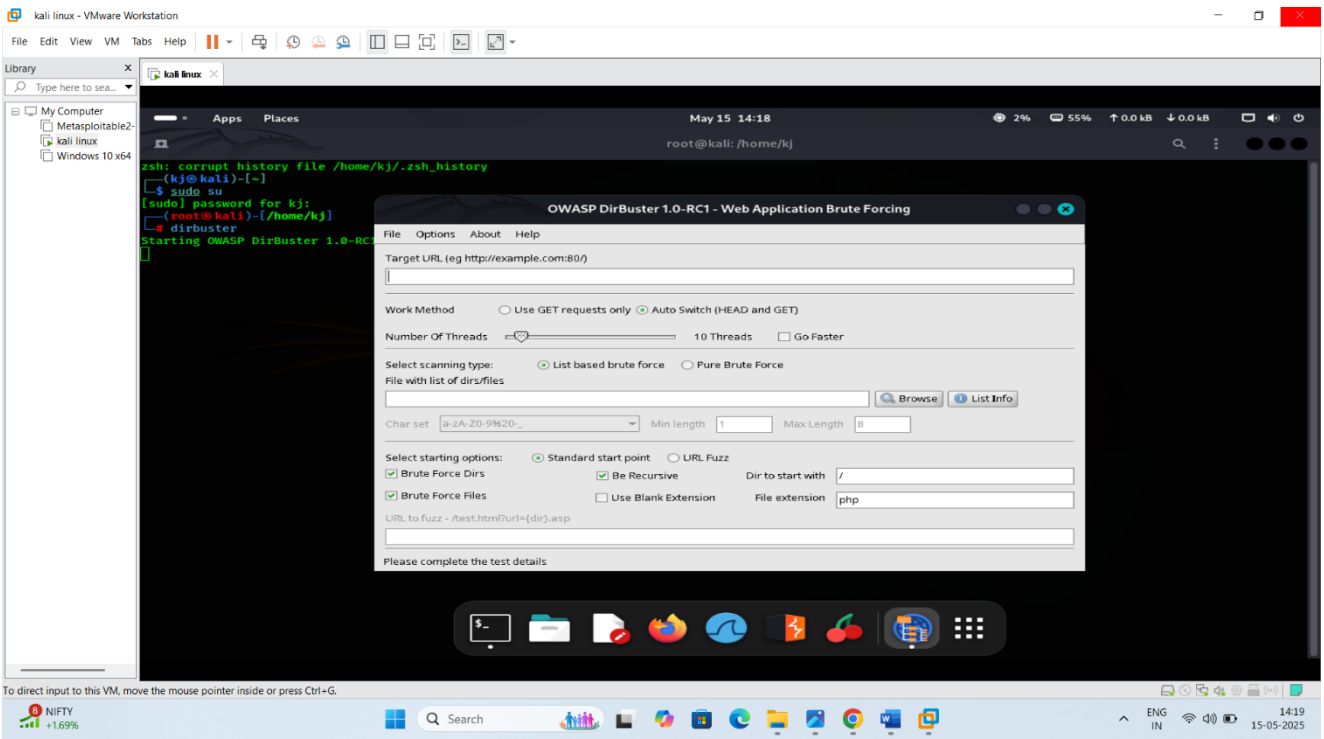
3. **Outdated Development:** DirBuster is not actively maintained; **gobuster** and **ffuf** are often used as modern replacements.
4. **WAF Blocking:** Modern WAFs may block or throttle aggressive scanning.

☞ Use dirbuster to find directory using bruteforce

Steps

1. on kali and type dirbuster for run the dirbuster



2. complete the target url and after click on browse option and click on usr

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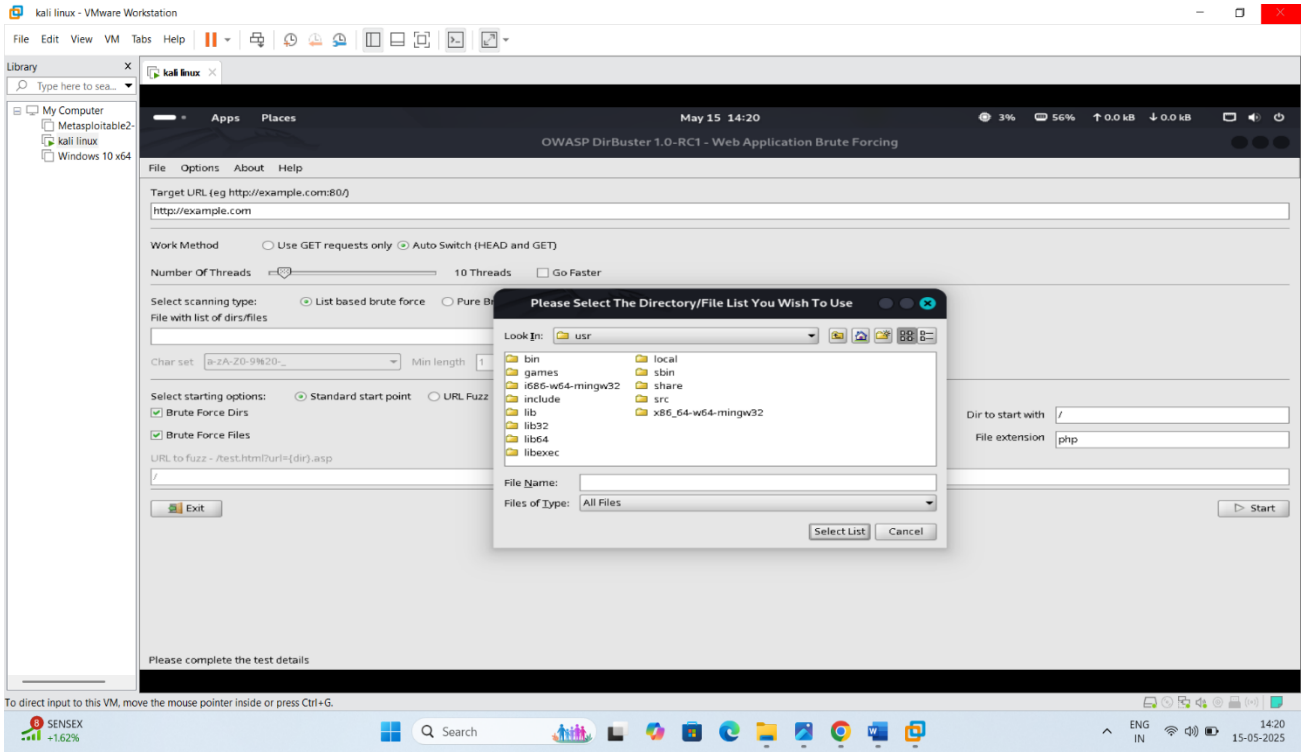
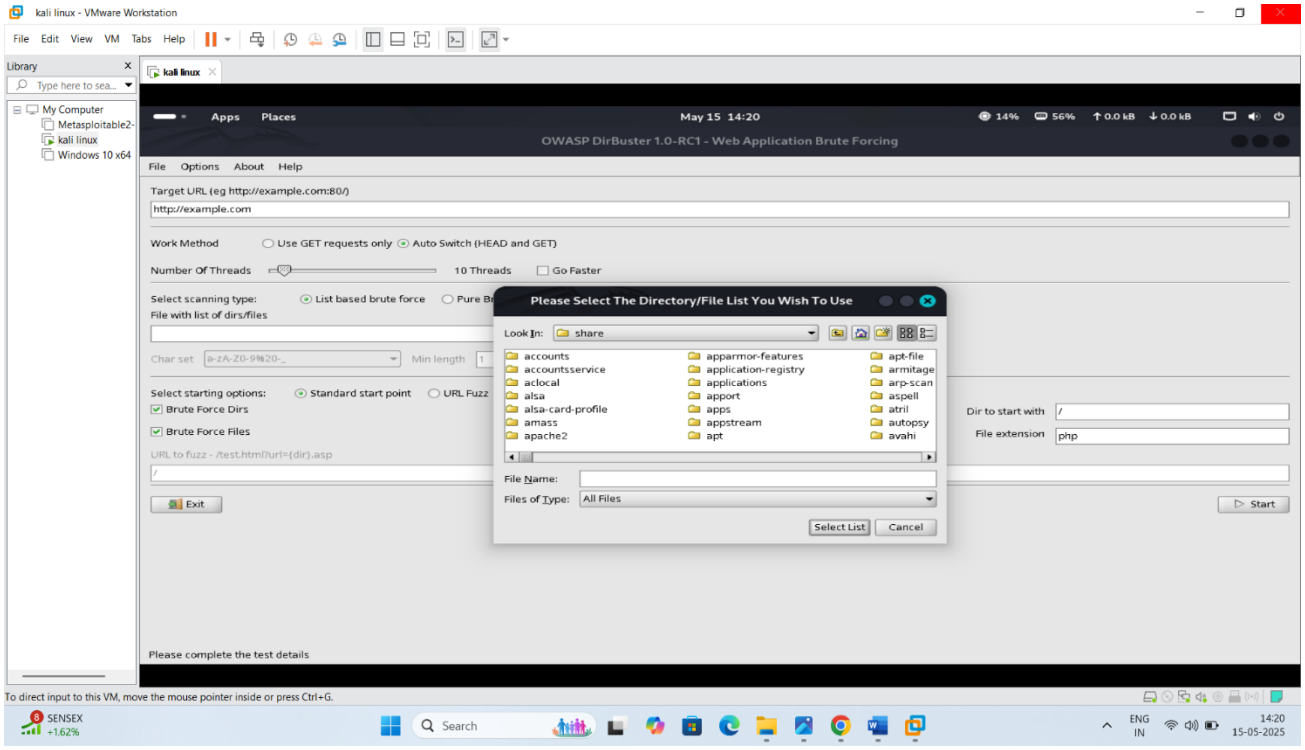


3. after this click on share directory



4. in share directory search for dirbuster

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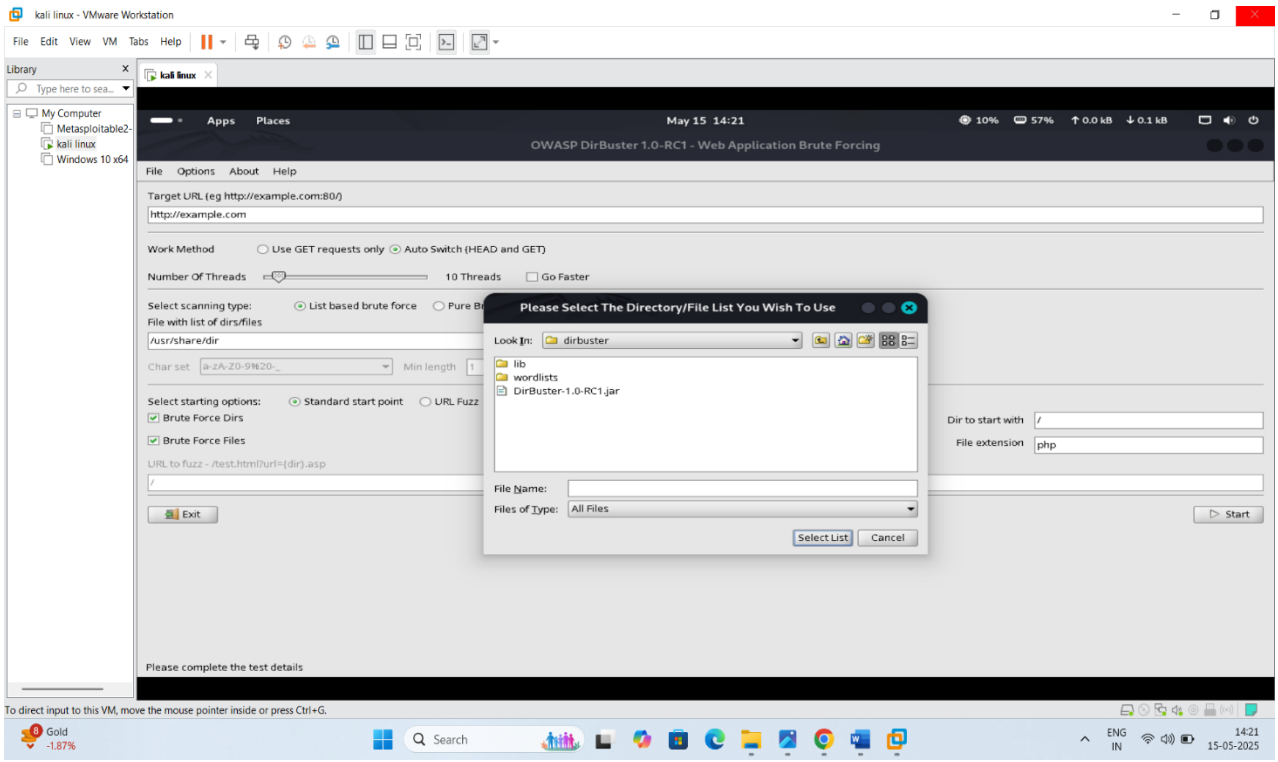
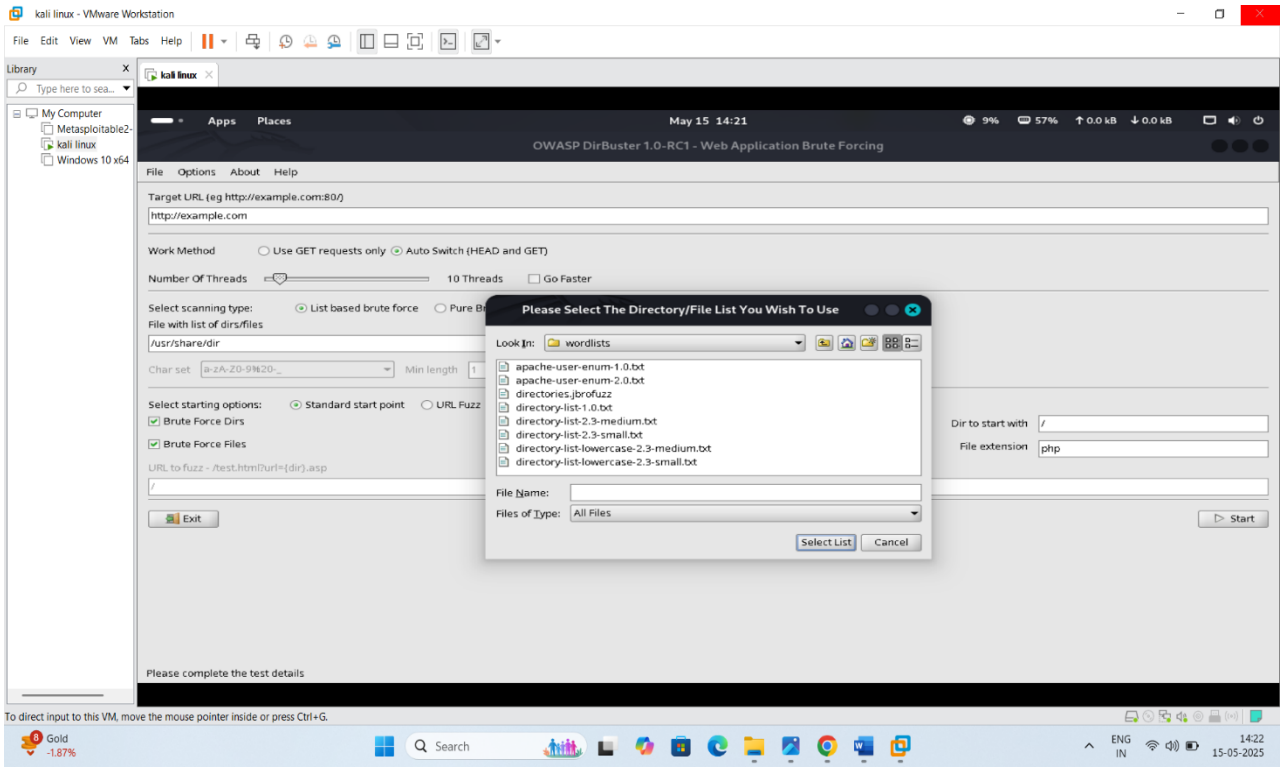


5. after coming dirbuster directory click on wordlists.



6. after come in wordlists select anyone you want

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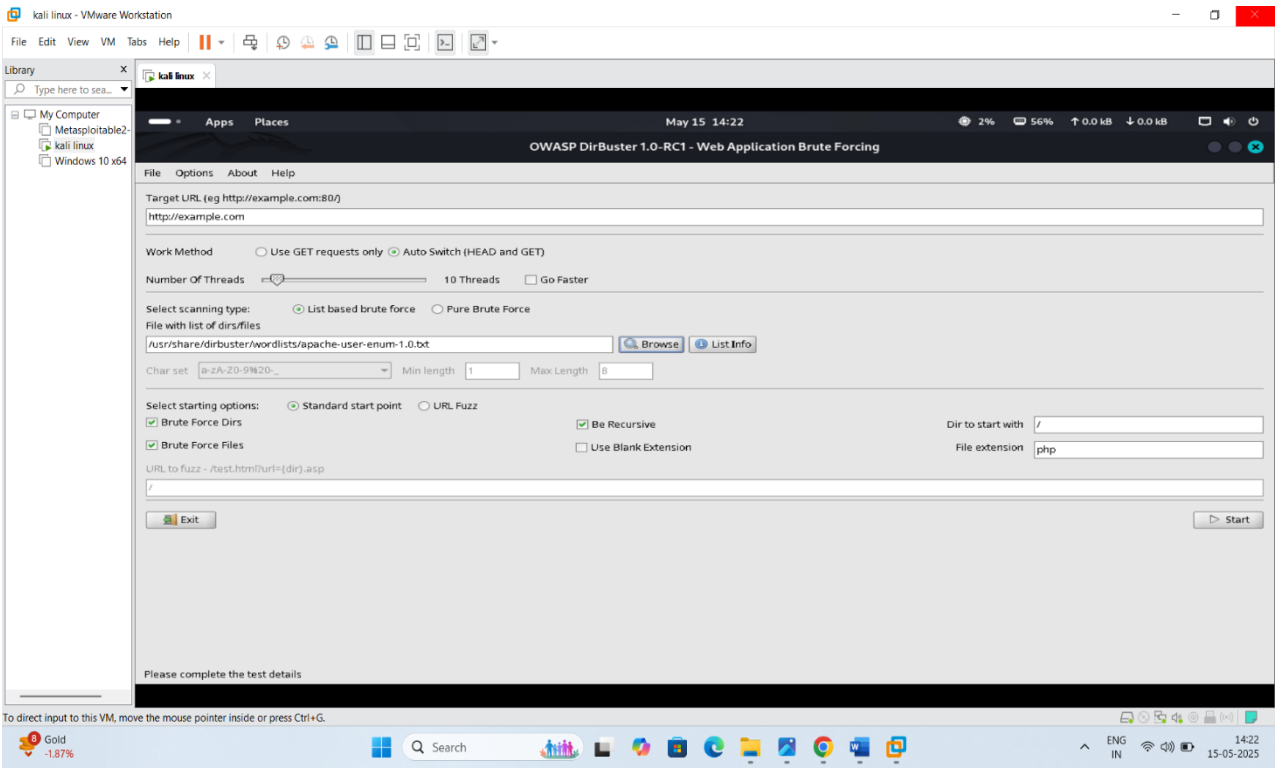
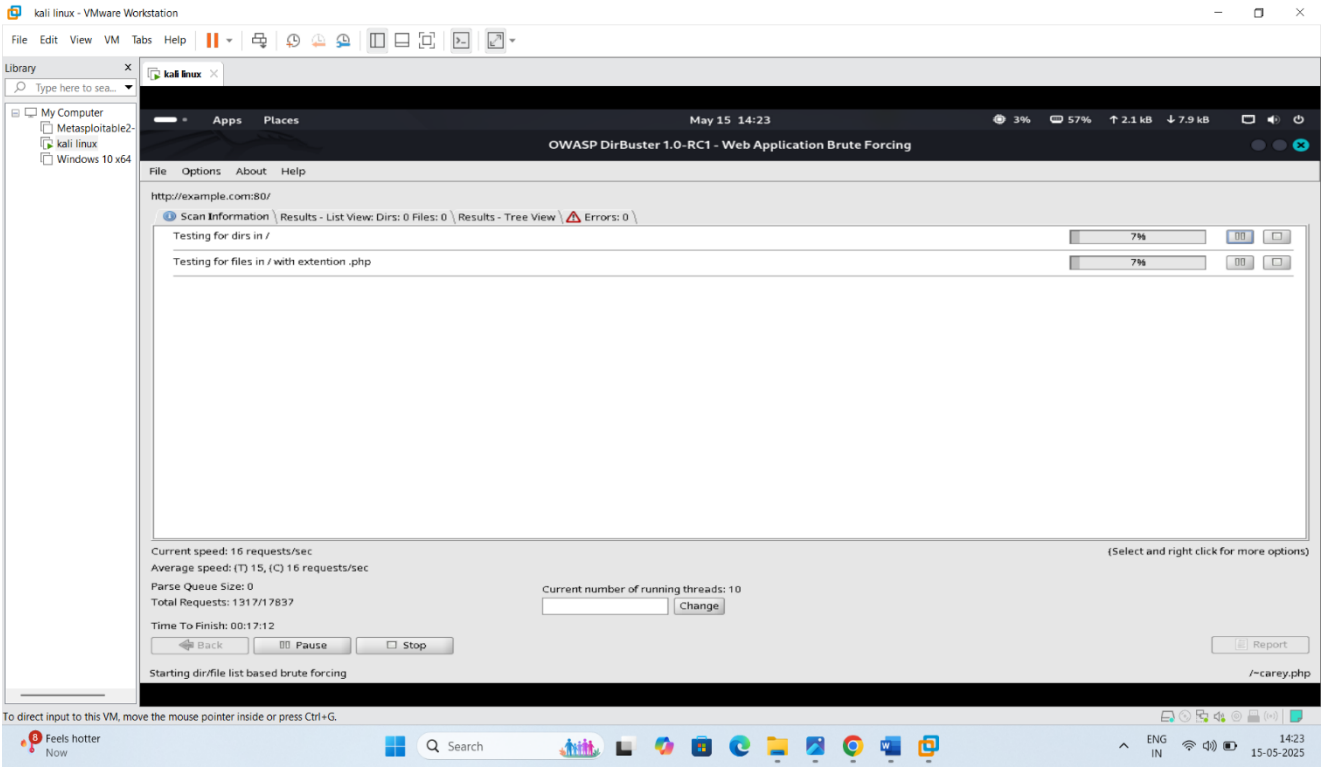


7. after all done click on start for brute force



The process in running …

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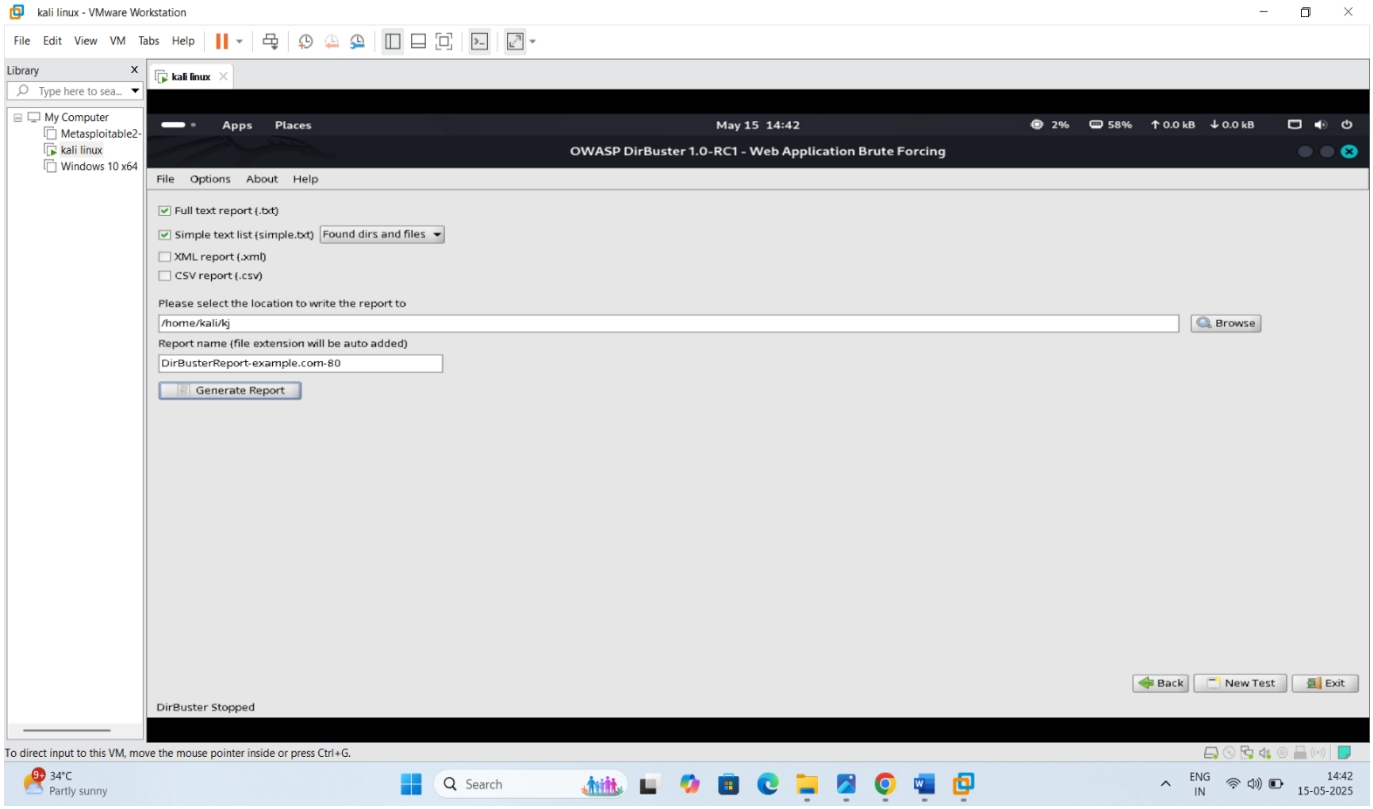
you can also generate the report using dirbuster like following screenshot :



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